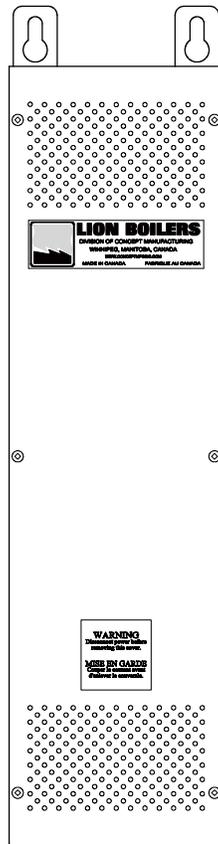


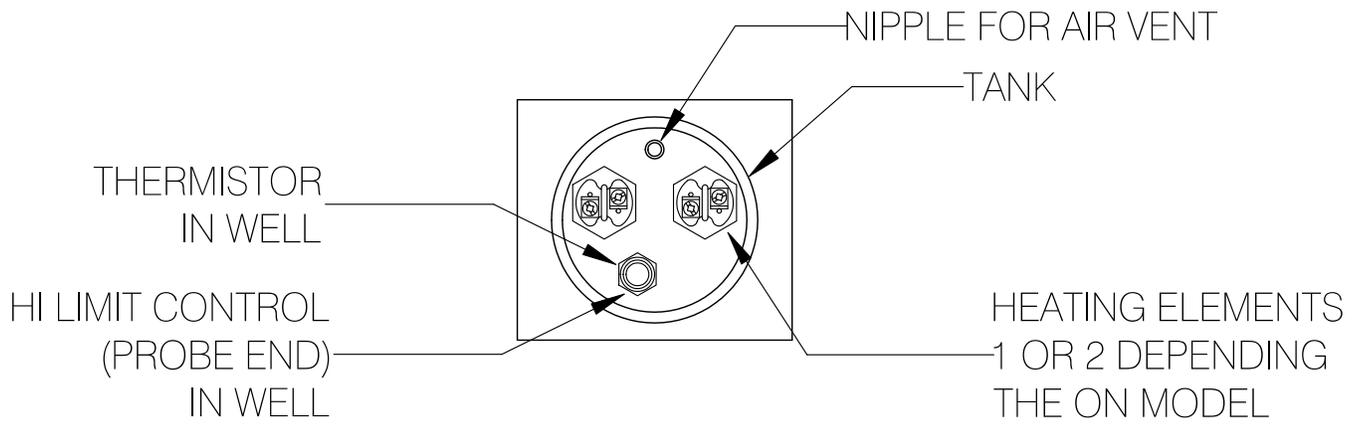


**Warning:** Use only water or an appropriate antifreeze. Do not use any other liquids especially methanol, automotive antifreeze or any kind of oil. Do not exceed 50% antifreeze.

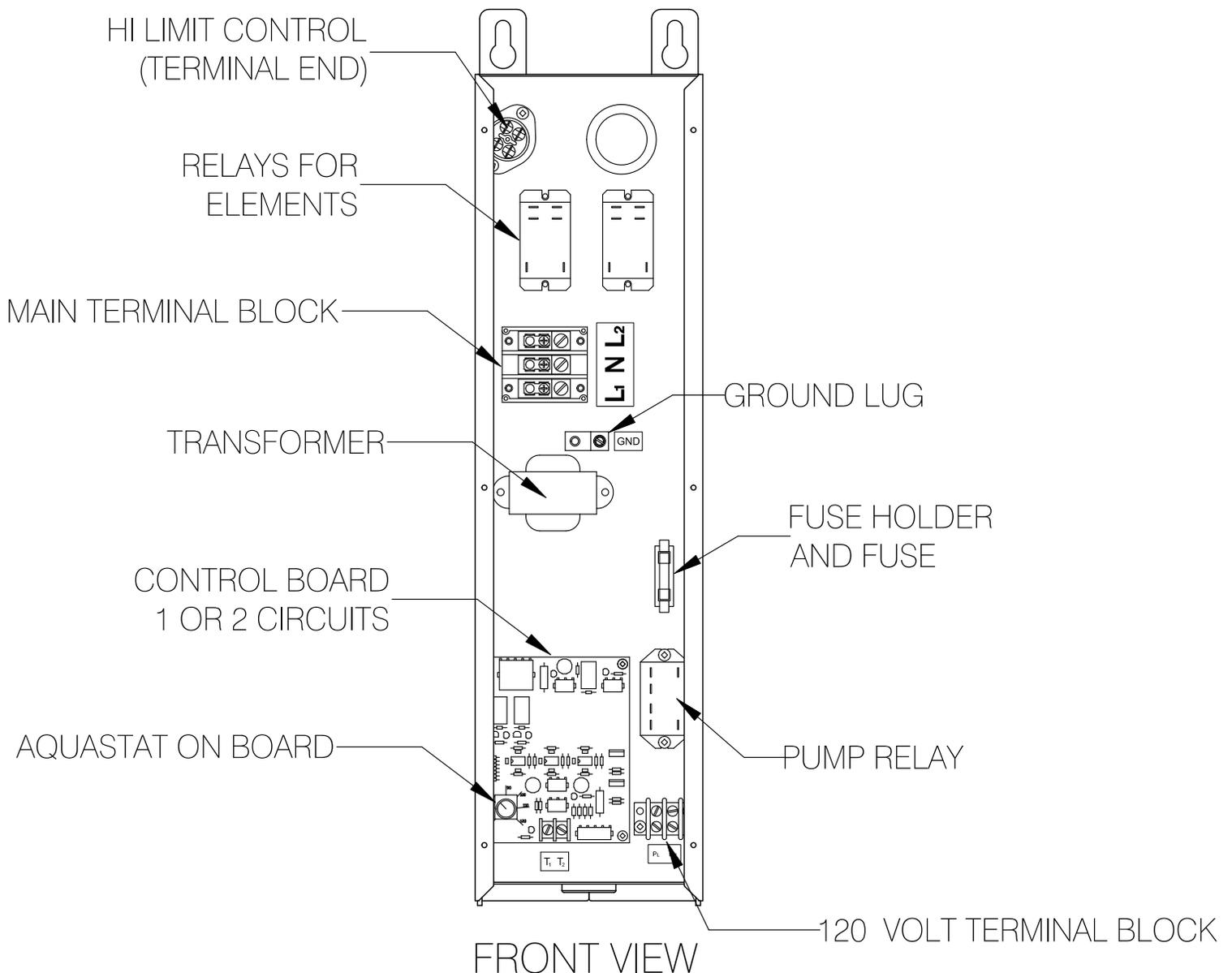
# LION BOILERS™

## LEB Series Boiler Installation Manual





TOP VIEW



FRONT VIEW

# LEB PARTS LAYOUT

# Before You Begin

Please read this manual thoroughly before you begin. If you encounter problems please see the troubleshooting section near the end of this manual. This boiler should only be installed and tested by qualified personnel with experience in hydronic heating systems, and electrical installations. This boiler should not be modified or altered in any manner. Any modification or alteration may cause the boiler to malfunction and cause serious damage and injury, and will void the manufacturer's warranty.

**The installation of this boiler must comply with local regulations and codes. Verify the “Name Plate” rating to properly size conductors, and overcurrent protection.**

- (1) Before installation, ensure that the local electrical inspection authority will accept connection of this boiler to the existing panel.
- (2) This boiler may only be installed and tested by qualified personnel.
- (3) The electrical power supply should be checked for adequacy for the additional load of the boiler. All models require connection of 240 volt single phase power to terminals L1 and L2, and connection of a neutral conductor to the N terminal (see Fig. 4).

## Introduction

Your Electric Boiler has been designed to exacting specifications to provide controlled efficient heating and maximum service life. The boiler is controlled internally by an electronic control board. The boiler is energized when the external thermostat wired to the control board calls for heat. The circulation pump is started first to provide flow through the heating system, then the heating elements are staged on as required. A temperature sensor mounted in the tank monitors the water temperature, and the internal control board maintains the temperature of the water exiting the boiler by staging the elements on or off as required. This is know as modulating. The temperature is set by the aquastat control on the lower left corner of the control board. The modulating control strategy built into the control board uses only the minimum number of elements necessary to maintain the desired temperature, resulting in maximum comfort.

# Specifications

Model	kW	Volts	Phase	Amps	Minimum Breaker Size	Wire Size (Amps)
LEB-3	3	240	1	12.5	20	16
LEB-4	4	240	1	16.7	30	24
LEB-5	5	240	1	20.8	30	24
LEB-6	6	240	1	25.0	40	32
LEB-7	7	240	1	29.2	40	32
LEB-8	8	240	1	33.3	50	40
LEB-9	9	240	1	37.5	50	40
LEB-10	10	240	1	41.7	60	48

Control Voltage 24 Volts AC

Tank Capacity – Approx. 1 Gallon

Shipping Weight – about 50 pounds

Inlet and Outlet pipe size 3/4” NPT

Pump Switch Rating, 120 Volt, 1 HP

Floor heating temperatures are generally 90° F to 110° F

Minimum Recommended Operating Pressure 12 PSI

**Warning: The control transformer is sized to power only the internal controls. External devices must be powered from a separate power source.**

## New Boiler Inspection

All Boilers are inspected and tested at the factory prior to shipment. On receipt of your new boiler, be sure to check for any damage that may have occurred during shipping. Any such damage should be reported to the carrier immediately.

**Never install a damaged boiler.**

## Unpacking

The Boiler is shipped to you in one carton, which contains the boiler, a pressure & temperature gauge, pressure relief valve, air vent, and fittings.

# System Design

For proper operation of the heating system, the boiler, the radiation system, and maximum heat loss of the building must be considered. The boiler selected should provide between 110% and 130% of the maximum design heat loss of the building. The radiation system should be designed to properly dissipate the heating capacity of the boiler at the radiation system design temperature.

The recommended cold fill pressure of the system is 12 psi; this pressure should leave at least 4 psi at the highest point in the heating system. Pressure will decrease at a rate of 0.433 psi per foot above the fill point. An expansion tank must be included to allow for approximately 4% expansion of the water in the entire heating system. As the water in the system is heated the pressure will increase, but a properly sized expansion tank will prevent the pressure from exceeding the recommended operating pressure.

The radiators or floor system should be designed with parallel loops. If too many radiators or floor loops are connected in series, the accumulated heat loss may cause uneven heating. The minimum recommended flow rate must be used, but higher flow rates may give more even heating. If a number of parallel heating circuits are used, valves are usually required to balance the flow in each circuit to provide uniform heating.

A zoned heating system is also possible with separate heating zones and individual thermostats in each zone. Individual thermostats in each zone can control a zone valve, or a circulation pump providing flow to that zone. End switches on the zone valves can be wired in parallel to the thermostat connection of the boiler.

**The entire heating system must comply with any local codes or regulations.**

## Installation

### Location

- (1) The site selected for installation of your boiler should leave at least 24" of clear space in front of the unit. The sides and bottom require only enough room for plumbing and electrical connections (see Fig. 2). The rear of the unit is considered a "Zero Clearance" face (see Fig. 2). When mounting the boiler on the wall, ensure that the wall can withstand the weight of the unit including water (approximately 60 lbs.). Mounting tabs are provided on top for 3/8" bolts or screws, these are for wall mounting.
- (2) The space selected should be well ventilated and kept normally below 77° F or 25°C. It must be clean, and dry. The boiler must not be subjected to water leakage, drips, splashes, or spray. Flammable materials must not be used or stored anywhere near the boiler.
- (3) Though the unit is suitable for wall mount, only the rear face indicated as "Zero Clearance" may be mounted against combustible surfaces.

- (4) Units must be mounted straight as shown in Fig. 2 with the outlet at the top, and the inlet on the bottom. See “Up Arrow” on label on side of boiler.
- (5) The circulation pump should be connected to the outlet side of the boiler (see Fig. 3).

## Mechanical Installation

- (1) Refer to Fig. 3 for a typical system before installation.
- (2) Packed with your boiler are the following.
  - a) Temperature & Pressure Gauge
  - b) Pressure Relief Valve
  - c) Air Vent
  - d) Necessary fittings.
- (3) Mount unit as per instructions under “Location”
- (4) Install Pressure Relief Valve and Pressure & Temperature Gauge. These must be connected directly to the boiler as shown in Fig. 1
- (5) A discharge line must be attached to the outlet of the pressure relief valve. The discharge line will direct water or steam from the pressure relief valve should it open. The discharge line must be as short as possible, not have any valves or restrictions, not be smaller than the outlet of the pressure relief valve, slope downwards, and the end must be open to the atmosphere. The discharge line should terminate at a drain 6 inches above the floor level.
- (6) Install inlet and outlet piping.
- (7) An expansion tank must be installed (see Fig. 3) to allow for water expansion as the system is heated.

## Dissimilar Metals

Do not connect dissimilar metals to the inlet and outlet. Dielectric Unions should be used. Another solution is to use brass or cast iron fittings between the boiler and any copper fittings that you may be using. Failure to do so will result in galvanic corrosion and cause the tank to fail over time.

**This is not covered under the warranty.**

## Pump Installation

The circulation pump should be positioned as close to the boiler as possible, with the delivery arranged to pump out of the tank outlet on the upper left side of the boiler (see Fig. 3)

The pump is powered by the boiler through terminals PL and PN located on the 120 volt terminal block (lower right terminal block see Fig. 4). The pump starts when the thermostat terminals on the control board are closed, and stops when these terminals are opened.

If desired, the pump may be operated continuously during the heating season. Should you decide to wire the pump in this manner, it should be wired to the same supply circuit as the boiler to prevent the pump from being turned off while the boiler is still powered.

## Thermostat Connection

The thermostat connection is 24 volt AC. **Only connect the thermostat after all other work is complete, the entire heating system is filled with water and is thoroughly purged of air.** The thermostat is connected to the terminals T1 and T2 on the control circuit board (see Fig. 4). In zoned systems, the end switches of all the zone valves may be connected in parallel and hooked up to the thermostat connection on the control board. For a typical system (see Fig. 5).

**Thermostats described as “Power Stealing” or as “Parasitic Thermostats” must not be used.**

## Thermostat Cycle Length and Anticipator

Electronic thermostats typically have provisions for the cycle length, and type of heating system. The instructions for the thermostat should be followed.

Older thermostats with anticipators should be set to 0.2 amps. Failure to correctly adjust this setting may result in unsatisfactory comfort conditions, and could result in damage to the thermostat.

In zoned systems where the thermostat is controlling a zone valve, or circulation pump and not the boiler, the anticipator should be set to match the current draw of the zone valve being used.

This setting may have to be adjusted slightly to ideally match the boiler control system to the thermostat, as well as overcome the normal inertia of the radiation system. A setting too low will be characterized by a short cycle, which does not allow the room temperature to be satisfied before the boiler shuts down. A setting too high will be characterized by a long cycle, which allows the room temperature to rise too high before the boiler shuts down. Adjustments should be made to the setting, if required, but should not exceed 0.1 amps per adjustment.

## Temperature Control Setting (Aquastat)

The boiler has a temperature control knob, known as an aquastat on the lower left corner of the control board. This sets the maximum temperature that the boiler will operate at. The internal control system monitors the water temperature in the tank and modulates the heating elements to maintain the water temperature. Note that the setting on the knob only sets the maximum temperature, it is normal for the boiler to operate at lower temperatures than this setting at times, this is especially true in the spring and fall when it is not so cold outside. **The actual temperature setting you need to set it to will be determined by the type of**

**heating system the boiler is installed in.** The range of the aquastat is from 15 to 54° C (60 to 130° F).

## Start Up

A new system must be thoroughly cleaned, flushed and drained, then refilled with clean water. Foreign material circulating through the system could be detrimental to the pump and to the heat transfer efficiency of the system and may lead to future problems. **The system must be thoroughly purged of air before it is energized for the first time. Elements will burn out if the boiler is not full of water when the boiler is turned on. Do not connect the thermostat wires until the entire system is full of water, and thoroughly purged of air.**

The automatic air vent is to assist in removing air from the top of the tank to prevent elements from burning out. It alone is not sufficient in removing air from the entire heating system. **Additional air vents must be installed throughout the system to eliminate any air that may enter the system.**

## Check List

- (1) Plumbing complete.
- (2) System flushed.
- (3) System free of air (purged).
- (4) Pump rotates freely.
- (5) Thermostat connected.
- (6) Thermostat anticipator set.
- (7) Electrical supply connections complete.

## Maintenance

At the start of each heating season it is advisable to have a qualified technician check and inspect the boiler and the heating system for proper operation.

# Troubleshooting Guide

<b>Problem</b>	<b>Correction</b>
Boiler not heating, water cool.	Check power supply, fuses or breakers. Check thermostat setting. Check temperature control inside the boiler.
Boiler heating pipes cool.	Check for air in system. Check pump circulation. Check all valves. Check for flow stoppage, or air locks.
Boiler rapid cycles.	Check anticipator setting. Check pump circulation.
Boiler operates continuously.	Check anticipator setting.
Boiler noisy.	Oversized pump. Flow rate too high. Flow rate too low. Pump location incorrect.
Boiler not heating enough	Insufficient capacity. Burnt Elements. Flow rate too low.
Pressure too high.	Defective expansion tank. Defective automatic fill valve. Expansion tank too small.
Safety relief valve dripping.	Check expansion tank. Flush relief valve.

See the troubleshooting step by step procedure at the end of this manual for additional information.

# Lion Boilers Limited Warranty

Concept Manufacturing Inc. (the "Manufacturer") warrants its Hydronic Boiler (the "Boiler") to be free from defects in material and workmanship under normal use and maintenance for a period of two (2) years from the date of original installation. The Manufacturer further warrants the tank to be free from defects in material and workmanship under normal use and maintenance for an additional eight (8) years for a total of ten (10) years from the date of original installation.

If any part of the Boiler is found by the Manufacturer, as sole judge, to be defective in material or workmanship, the Manufacturer, at its sole discretion, agrees to:

- (i) Repair any defect;
- (ii) replace any defective Boiler; or
- (iii) refund the original purchase price of the Boiler.

The Manufacturer, at its sole discretion, reserves the right, at any time during the warranty period, to refund the original purchase price to the current owner of the Boiler regardless of any prior attempt by the Manufacturer to repair or replace that Boiler.

The obligation of the Manufacturer to repair, replace or refund the purchase price exists provided the defective part or complete unit is returned to the Manufacturer. ANY AND ALL TRANSPORTATION COSTS WILL BE BORNE BY THE PURCHASER.

Repair, replacement or refund of any defective part or unit shall be considered as complete fulfillment of this warranty.

THIS WARRANTY DOES NOT APPLY TO:

1. Labor or other costs incurred for diagnosing, repairing, removing, installing, reinstalling, shipping, servicing or handling of any defective part or complete unit;
2. Costs incurred for normal maintenance;
3. The workmanship of any installer of the Boiler. In addition, this warranty does not assume any liability of any nature for unsatisfactory performance caused by improper installation;
4. Damage or repair as a consequence of storage and handling, improper or careless installation, improper maintenance, or misuse or neglect as determined by the Manufacturer as sole judge;
5. Damage as a consequence of misapplication, abuse, improper servicing, unauthorized alteration, improper operation or usage contrary to the Manufacturer's direction, design or specifications, as to any and all of which the Manufacturer shall be the sole judge;

6. Damage as a consequence of electrical surges, inadequacy or interruption of electrical services or corrosion, whether caused by chemicals or the environment;
7. Damages as a consequence of floods, winds, fires, lightning, freezing conditions or other conditions beyond the control of the Manufacturer.

### **LIMITATION OF WARRANTY**

THIS LIMITED WARRANTY IS IN LIEU OF ALL OTHER WARRANTIES WHETHER EXPRESS OR IMPLIED, AND ALL SUCH OTHER WARRANTIES, INCLUDING WITHOUT LIMITATION IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE, ARE HEREBY DISCLAIMED AND EXCLUDED FROM THIS LIMITED WARRANTY.

THE MANUFACTURER'S LIABILITY ON ANY CLAIM OF ANY KIND, INCLUDING NEGLIGENCE, WITH RESPECT TO THE GOODS OR SERVICES COVERED HEREUNDER, SHALL IN NO WAY EXCEED THE PURCHASE PRICE OF THE BOILER, OR PART THEREOF, WHICH GIVES RISE TO THE CLAIM. IN NO EVENT SHALL THE MANUFACTURER BE LIABLE FOR SPECIAL, INCIDENTAL, INDIRECT, OR CONSEQUENTIAL DAMAGES, OR ANY DAMAGES IN THE NATURE OF PENALTIES. ALL WORK UNDER THE TERMS OF THIS WARRANTY SHALL BE PERFORMED DURING NORMAL WORKING HOURS.

ALL REPLACEMENT PARTS OR UNITS, WHETHER NEW OR REMANUFACTURED, ASSUME AS THEIR WARRANTY PERIOD ONLY THE REMAINING TIME PERIOD OF THIS WARRANTY.

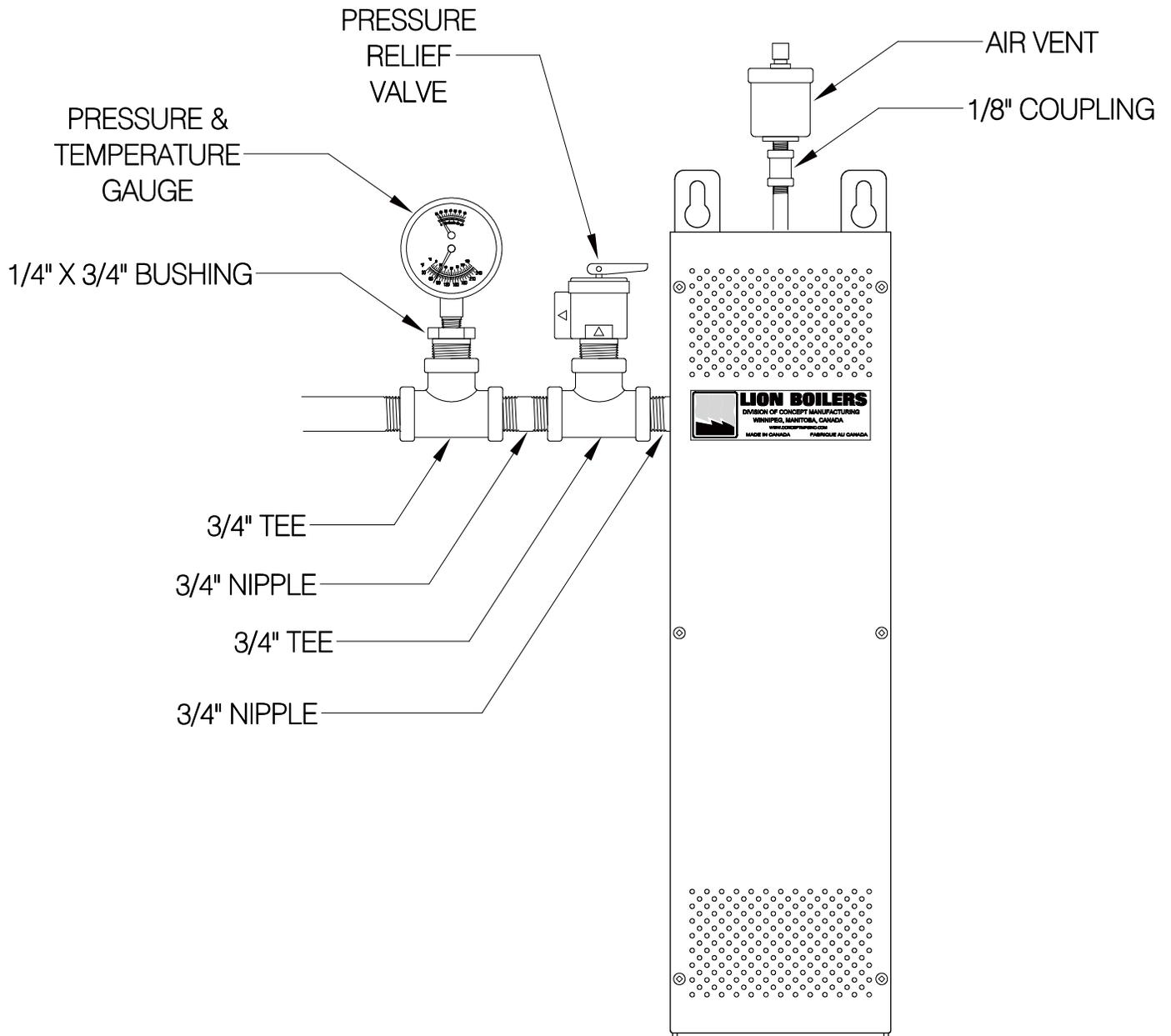
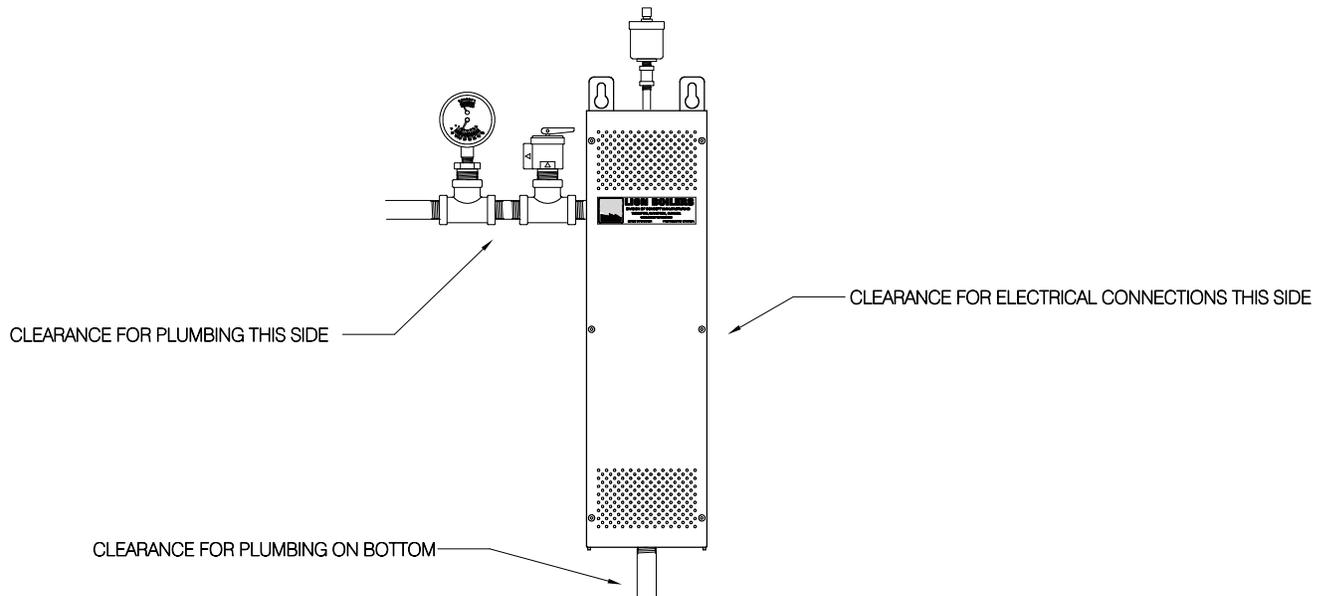
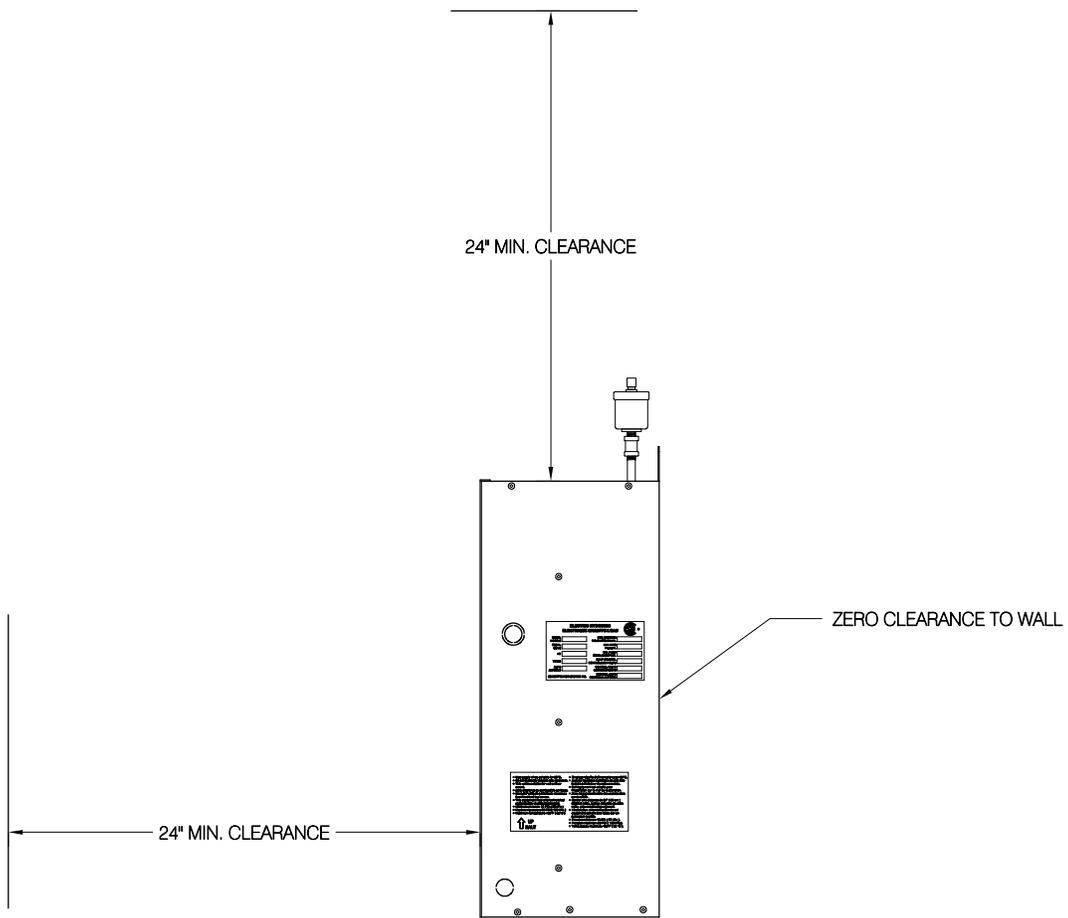
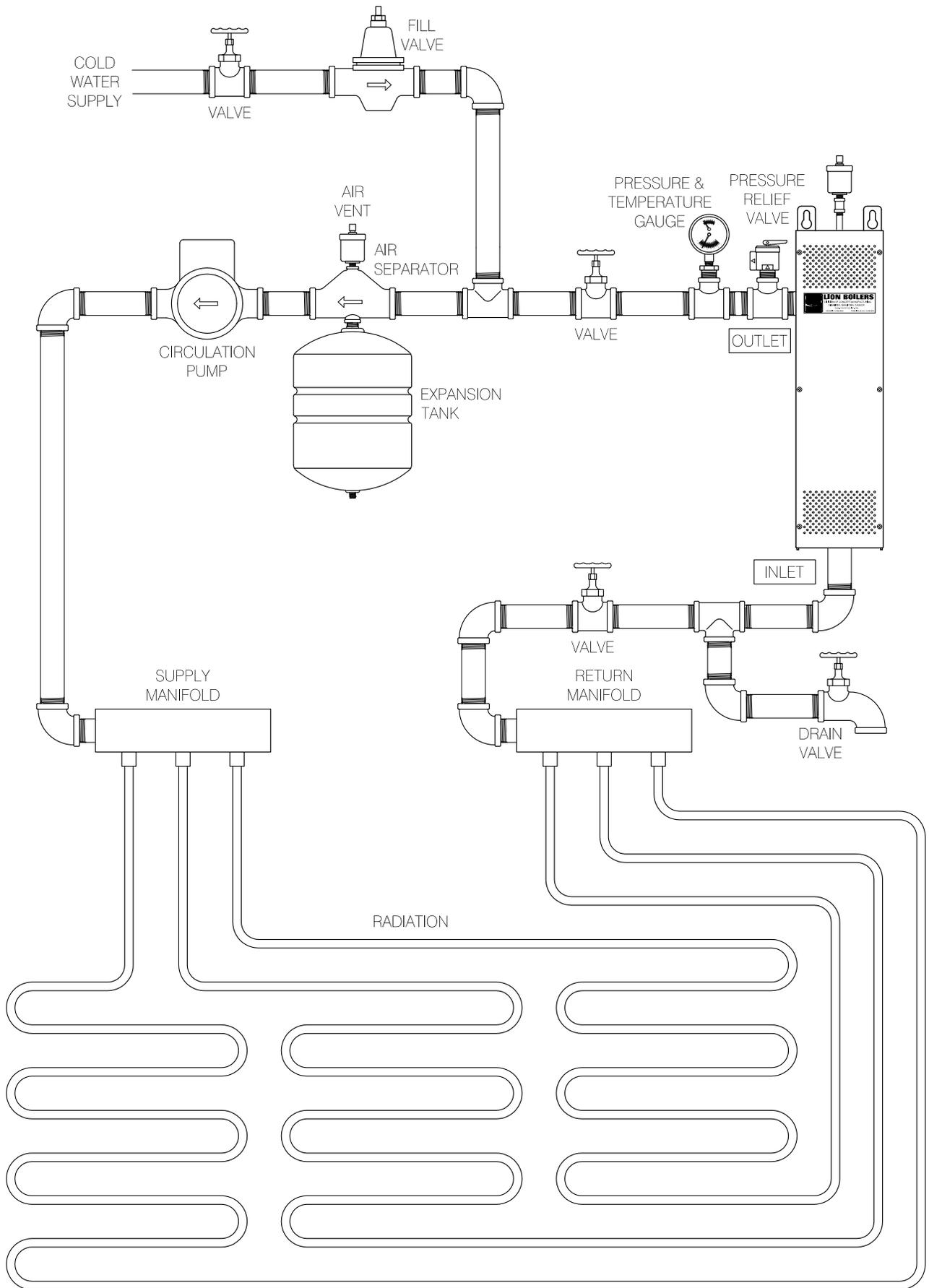


FIG. 1 BOILER COMPONENTS



**FIG. 2 BOILER INSTALLATION**



**FIG. 3 TYPICAL HEATING SYSTEM**

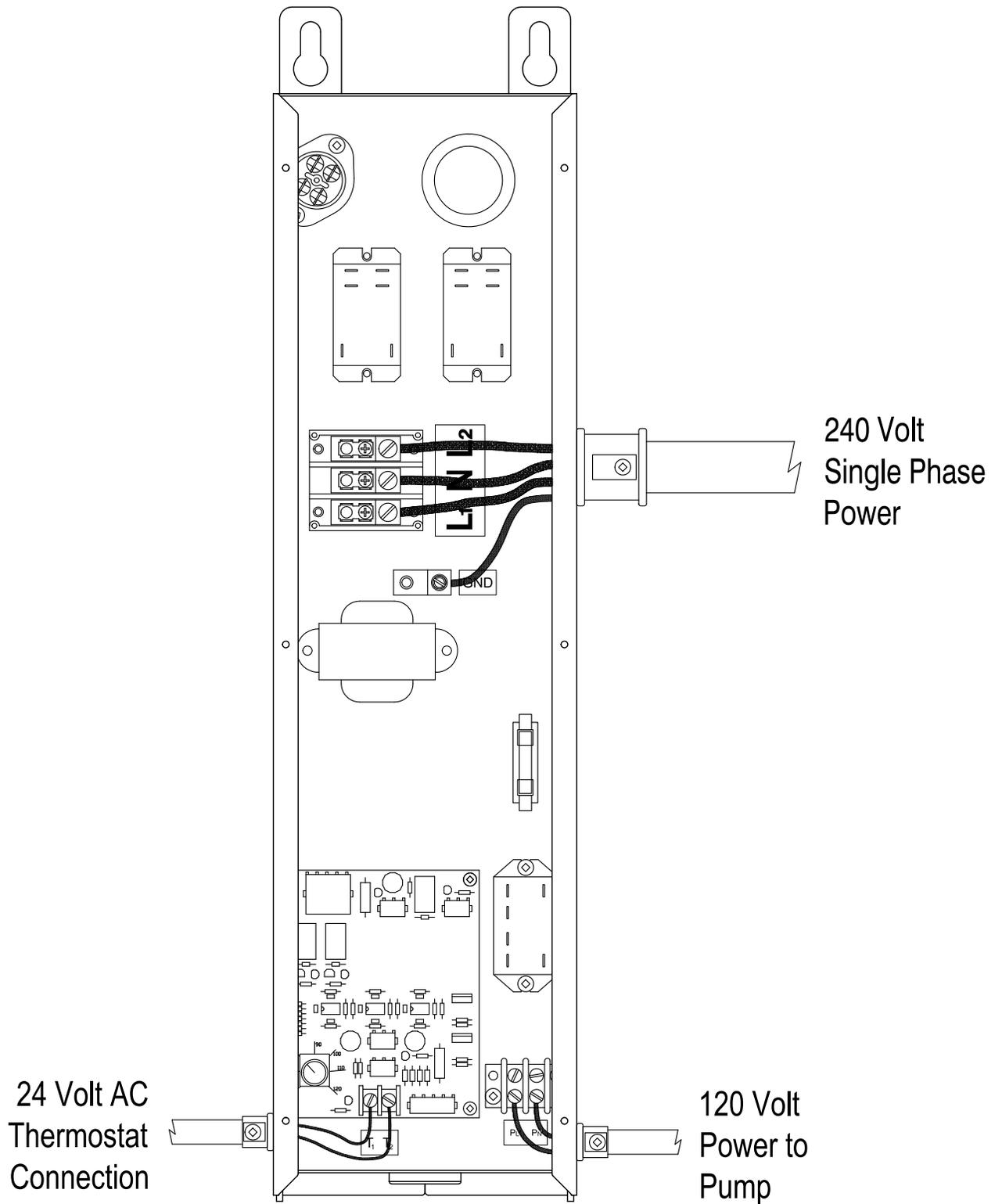
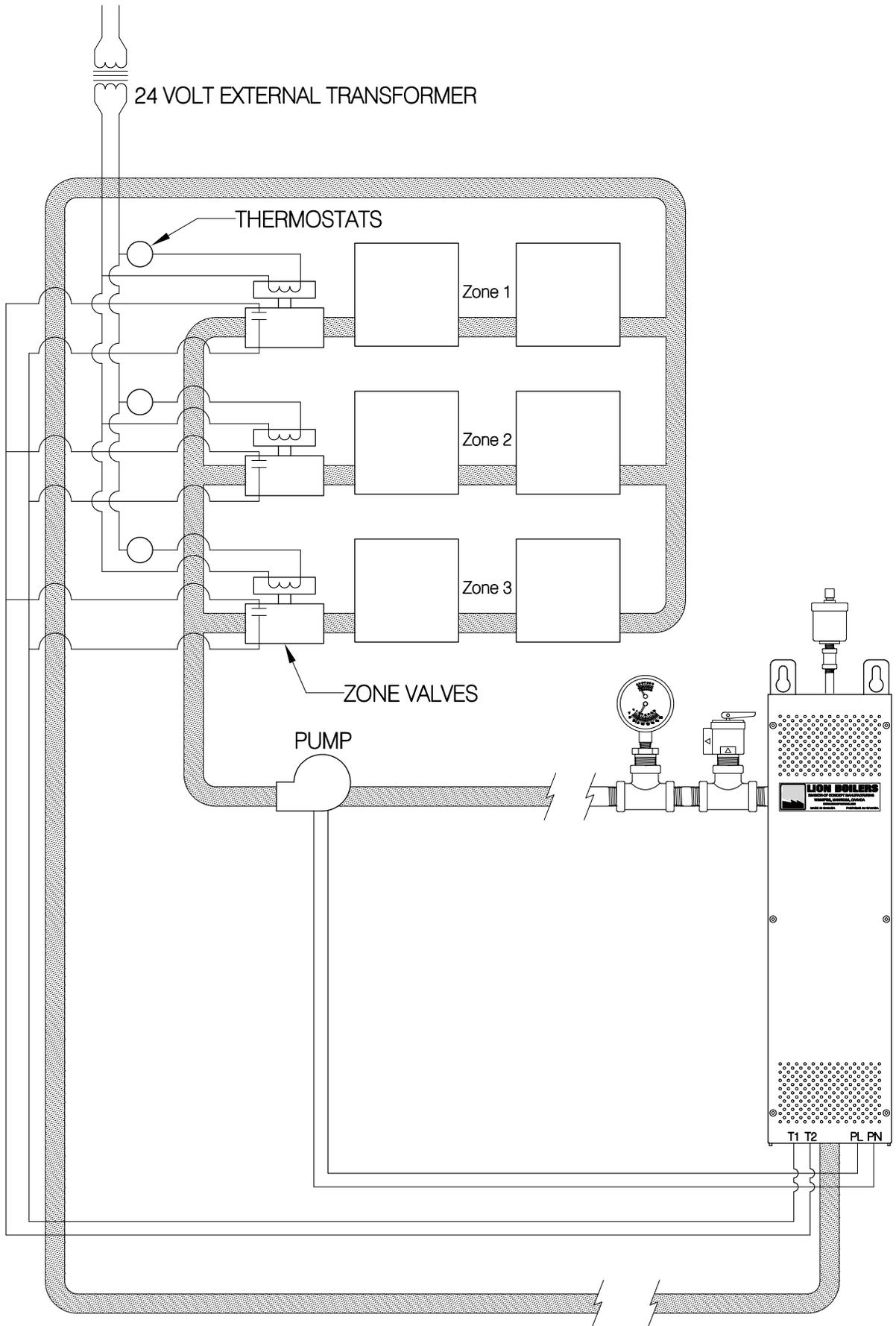


FIG. 4 LEB ELECTRICAL WIRING, SINGLE PHASE



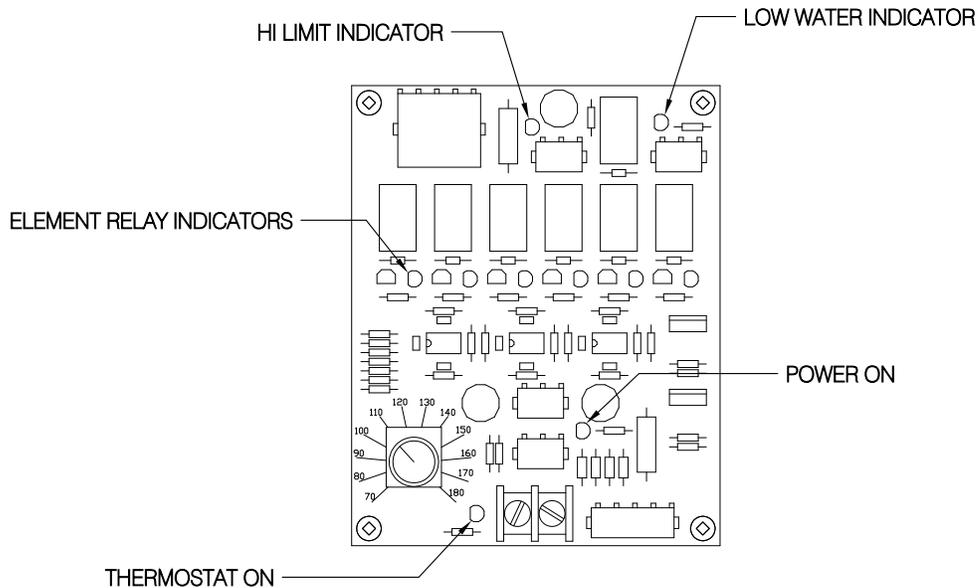
**FIG. 5 MULTI ZONE INSTALLATION**

# Troubleshooting Step By Step Procedure

The following is a step by step procedure to help in troubleshooting any problems with this boiler. These steps should be performed only by qualified personnel with experience in hydronic heating systems, and electrical heating equipment. You are working with high voltages and should be extremely careful.

## **Before energizing boiler, ensure system is full of water.**

- (1) Make sure that there is power to the boiler. There must be power to the boiler to complete these troubleshooting steps.
  - a) There should be power at the main terminal block. You should read 120 volts between L1 and N, 120 volts between L2 and N, and 240 volts between L1 and L2.
  - b) Disconnect the thermostat wires from terminals T1 and T2. Measure the voltage at the top of the boiler at each heating element. If you read voltage at any of the elements, then the element relay for that element is stuck on and needs to be replaced.
- (2) Check the fuse.
  - a) Remove the fuse located inside the boiler. Check it for continuity. Replace with a new fuse of the correct type if necessary.
  - b) Otherwise replace the existing fuse.
- (3) Check that there is 24 volt AC power on the secondary side of the transformer. This is where the two red wires are connected to the transformer. There must be 24 volt AC power on the secondary side of the transformer for the boiler to operate. If there is no power the transformer needs to be replaced. When there is 24 volt power to the board the "Power On" light on the board should be on.
- (4) With the thermostat wires still disconnected from step (1)b), connect a jumper wire from terminal T1 to terminal T2. The "Thermostat On" light should now be on.
  - a) This should energize the relay to the right of the control board, you should hear a click. If not check that there is 24 volt AC power on the two relay terminals with purple wires.
  - b) If there is no power at the relay, the control board needs to be replaced.
  - c) If there is power, but the relay is not turning on, replace the relay.
- (5) When the relay is energized, it will supply 120 volt power for running the pump, and activate the control board.
  - a) There should now be 120 volt AC power to the terminals labeled PL and PN.
  - b) If there is no power, replace the relay.



- (6) With the circuit board now activated, the power relays should turn on one at a time. If they have not started to come on as yet, temporarily turn up the temperature on the aquastat to the maximum setting, it should be returned to the normal setting when you are finished troubleshooting. The power relays for controlling the elements should now start to turn on. As each relay turns on, one “element relay indicator” light on the control board should come on as well.
- a) If the element relay indicator lights do not come on, disconnect the temperature sensor by pulling out the connector at the control board (the one with the two gray wires).
  - b) If the lights now come on the temperature sensor needs to be replaced. If they still do not come on, short the two gray wires at the pump relay. If they come on then the pump relay needs to be replaced.
  - c) If they still do not come on then the control board needs to be replaced.
  - d) If the element relay indicator lights come on, but the power relays do not come on then the high limit control may be preventing them from coming on. This may be due to a faulty component, or may be an actual temperature condition. A faulty high limit control will prevent the “hi limit indicator” light from coming on.
- (7) Temporarily (no more than one second) place a jumper wire across the two terminals on the high limit control.
- a) If the relays energize, replace the high limit control.
- (8) If all the relays energize and there is no heat, then check for power to each of the heating elements.
- a) With all the relays energized, check that there is power to each of the elements with a volt meter. If there is no voltage reading, replace the relay connected to that element.
  - b) If there is power to the elements, but no heat, then with the all the power disconnected to the boiler, check the resistance of each element with an ohm meter

to see if is correct. Replace any elements, as necessary. If the element is open circuit and the cause is unknown, it is advisable to also change the relay connected to that element.

If you have gone through the above steps, and the boiler is still not working, please contact us for assistance.

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