

**Slant/Fin**<sup>®</sup>

# MINITRON

## MODEL EH-M3 ELECTRIC BOILER

Multi-stage electronic control with energy saving and other features.

EH-08-135-M3 through EH-20-135-M3, single phase, 3 wire, 120/208V, 120/240V

EH-12-345-M3 through EH-20-345-M3, three phase, 4 wire, 120/208V, 120/240V



LISTED  
89C4



### OPERATION AND INSTALLATION INSTRUCTIONS

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**IMPORTANT:**  
This manual must be left with owner and should be hung on or adjacent to the boiler for reference.

<p><b>Heating Contractor</b></p> <hr/>	<p><b>Model Number</b></p> <hr/>
<p><b>Address</b></p> <hr/>	<p><b>Serial Number</b></p> <hr/>
<p><b>Phone Number</b></p> <hr/>	<p><b>Installation Date</b></p> <hr/>

## DESCRIPTION

The Minitron boiler is a low pressure hot water heating electric boiler. The control is a **two** stage electronic control with energy saving and other features. The heating elements are sheathed resistance type. The heat exchanger is cast-iron. The heat exchanger is constructed, inspected, and stamped in accordance with Section IV of the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code. In addition, the Minitron Boiler is equipped with a safety relief valve conforming to ASME requirements and two separate limit controls conforming to U.L. requirements. The Minitron boiler is Underwriters' Laboratories, Inc. listed.

## MOUNTING THE BOILER ON A WALL

Be sure that the wall is vertically plumb and capable of carrying the weight of the boiler and the system piping, when full of water. The boiler full of water is approximately 110 lbs. Add to this the weight of the system piping that the boiler will be supporting.

Be sure that there are studs available in the proper locations, for securing the boiler wall bracket and back panel.  
(See Figures 1 and 1a).

For wood stud walls, use lag screws or wood screws with a coarse thread and a minimum of 3" in length.

For metal stud walls, use toggle-style bolts that are specifically designed for such and maximum capacity exceeds the weight of the boiler and the system piping when full of water.

DO NOT use anchors driven into sheetrock to hold the boiler up on the wall. If mounting the boiler on a cement wall, use anchors that are specifically designed for such, and maximum capacity exceeds the weight of the boiler and the system piping, when full of water.

### A. INSTALL THE WALL BRACKET. SEE FIGURE 1a.

1. Remove the wall bracket from the wood packing, by unfastening the two screws that holds it in place, for shipping purposes only.
2. Select the location on the wall where the boiler will be mounted. The upward facing tabs of the wall bracket will align with the top surface of the boiler jacket.
3. For sheetrock and stud construction, locate the studs and determine which set of holes in the wall bracket best align with the center of the studs. For cement walls, determine a location for the wall bracket to mount where the anchors will be secure, devoid of seams or cracks.
4. Place the bracket in the selected location, with the 2 tabs positioned up and facing outward, level it out, and mark the holes to be used. A minimum of 4 of these holes must be utilized, regardless of wall material.
5. Drill the appropriate diameter and depth holes for the fasteners used in the wall, where marked.
6. Fasten the wall bracket to the wall, being sure that the tabs face upward and outward, and the fasteners have engaged the wall properly.

### B. INSTALL THE BOILER ON THE WALL. SEE FIGURE 1.

1. Lift the boiler up against the wall, with the top edge of the jacket slightly above the wall bracket tabs. Engage the boiler jacket near top lip notches properly.
2. There are fastener holes in the lower area of the boiler rear panel to ensure that the boiler does not move off the wall bracket. Mark these 2 holes, with the boiler in place, then lift the boiler off the wall bracket.
3. Determine which fastener type will best engage with the wall construction at the location of the 2 market holes. Drill out the appropriate diameter and depth holes for the fasteners, where marked.
4. Lift the boiler up onto the wall bracket again, as described in Step 1. Secure the boiler to the wall, with the 2 fasteners in the lower rear panel area.

## PIPING

### Air Separator and Expansion Tanks

The recommended piping arrangement is shown in Figures 2 through 4. Note that there is a built-in air eliminator in the heat exchanger (air vent, however, is by others). A 1/8" air vent may be used (bushing is needed for 1/2" NPT tapping). Additional air vents should be installed at points just upstream from all drops in elevation of the piping system (high points).

### Relief Valve Discharge Piping

Use same size or larger piping than valve outlet piping. Must terminate 152mm ( 6") minimum from floor with a plain (no threads) end. Place a bucket under pressure relief valve discharge piping. Make sure discharge is always visible. DO NOT hard-pipe to drain piping.

### Flow Switch

A FLOW SWITCH MUST BE INSTALLED. It is intended to prevent the burnout of heater elements should the circulator fail, or should air accumulate in the boiler due to faulty air elimination (see Table 2 for flow switch size required). FLOW SWITCH MUST BE INSTALLED IN HORIZONTAL POSITION.

### Bypass

The bypass shown must be set so that a sufficient amount of water can circulate through the boiler when all zone valves are closed. See Figure 3.

### Multi-zone Balancing

Raise all zone thermostat settings and verify that all zone valves are open (not bypassed). Close all electrical panels. Turn on 10 amp control circuit breaker ONLY. Pump should operate. Note the pressure reading on the pump discharge. Lower each zone thermostat setting to close corresponding zone valve. Adjust the corresponding balancing valve to maintain pump discharge pressure. The pump discharge pressure should remain the same when all zones are in bypass or when all zones are open or any combination of opened and closed. See Figure 4.

## WIRING

To wire the electric boiler, perform the following procedures:

### 1. Wall Thermostat Flow Switch and Circulator

- All circuit breakers ahead of and at boiler must be OFF. Remove the Control Panel (left-hand front) Cover by removing 5 screws from top, bottom and side flanges.
- The right-hand compartment under the Control Panel Cover contains a terminal board marked, (SLANT/FIN "INTERFACE BOARD"). Wire a 2-wire 24V room heating thermostat or the auxiliary end switch terminals of zone valves (see Figure 5) to terminals 3 and 4 at this time. The 1 and 2 terminals are for the flow switch. The flow switch circuit is a low voltage circuit.
- Wire the circulator and connect 115V wires and conduit through 1/2" knockout. provided on bottom left hand corner, to the "INTERFACE BOARD" at terminals "L" and "N", where it is marked "CIRC. PUMP".

### 2. Service Connections and Electrical Ratings

- A. All circuit breakers ahead of and at boiler must be OFF. Remove the Service Connection Panel (right hand front). Cover by removing 5 screws from the top, bottom and side flanges (see wiring diagram on back of the Service Connection Panel and Figure 5).
- B. Draw power feeder cable (75°C minimum) and conduit through service knockout provided on top and bottom.
- C. Connect hot lines to distribution block provided in service compartment. A ground lead should be drawn and wired to the ground lug in the service compartment. If rating plate indicates boiler is a single phase 3-wire or 3-phase 4-wire model, draw a neutral wire #12 AWG maximum, 75°C. minimum and connect to neutral lug mount provided in service compartment. See Tables 1 and 3 for lug sizes and current ratings.

### 3. Wiring Control

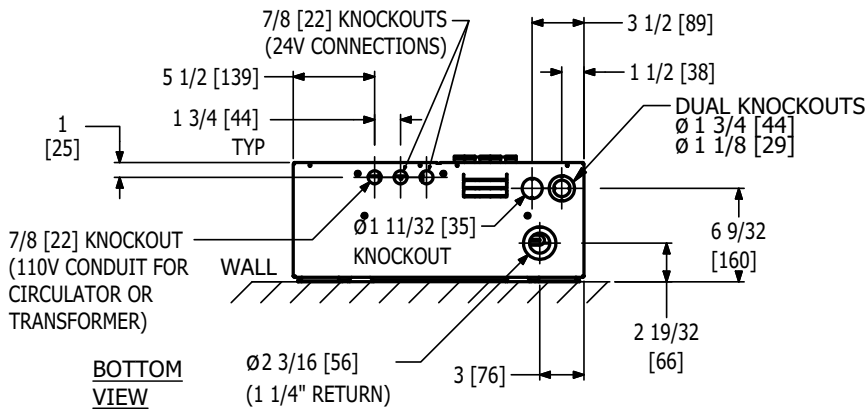
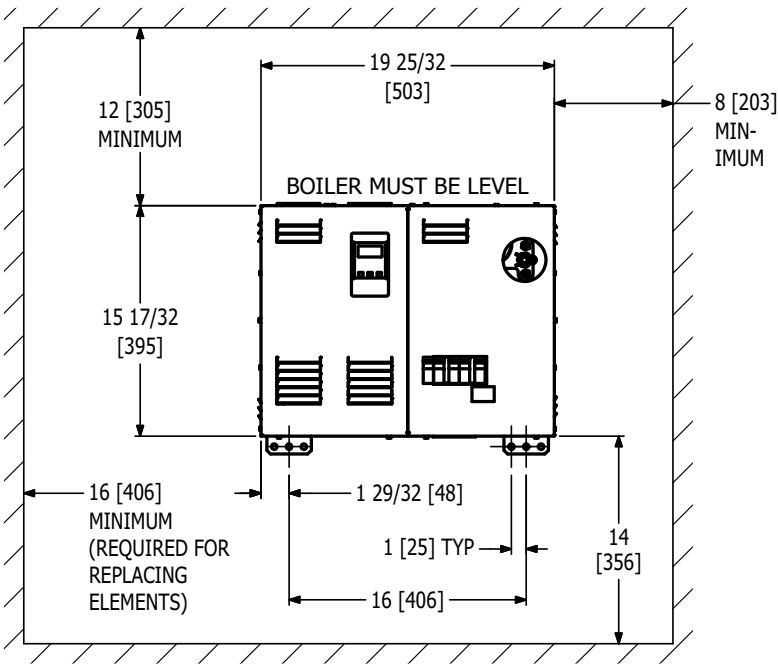
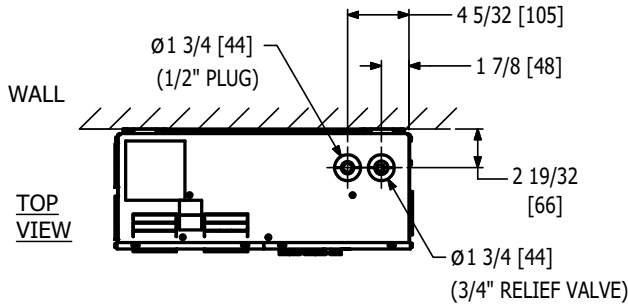
- See EM-10 Electronic Control Set Up Instructions #790860000 for setting up control.

*\* See page 8 for basic setup example.*

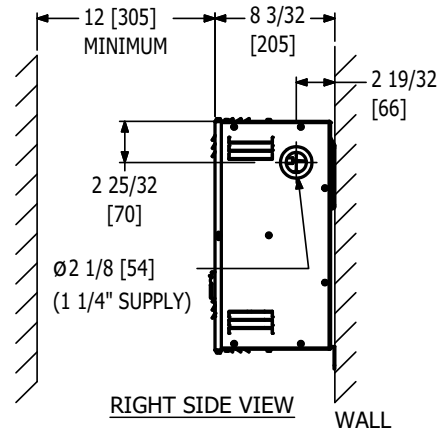
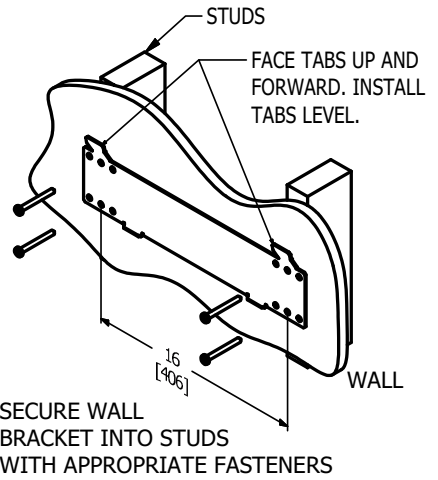
**Figure 1.**

**MINITRON "ROUGH-IN" DIMENSIONS**

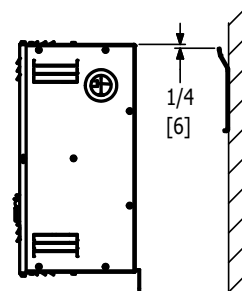
1. UNIT MAY BE FULLY ENCLOSED IF CLEARANCE DIMENSIONS ARE RESPECTED.
2. DUAL DIMENSIONS ARE: INCH [MM]



**Figure 1a.**



**BOILER HEIGHT ABOVE WALL BRACKET TABS**



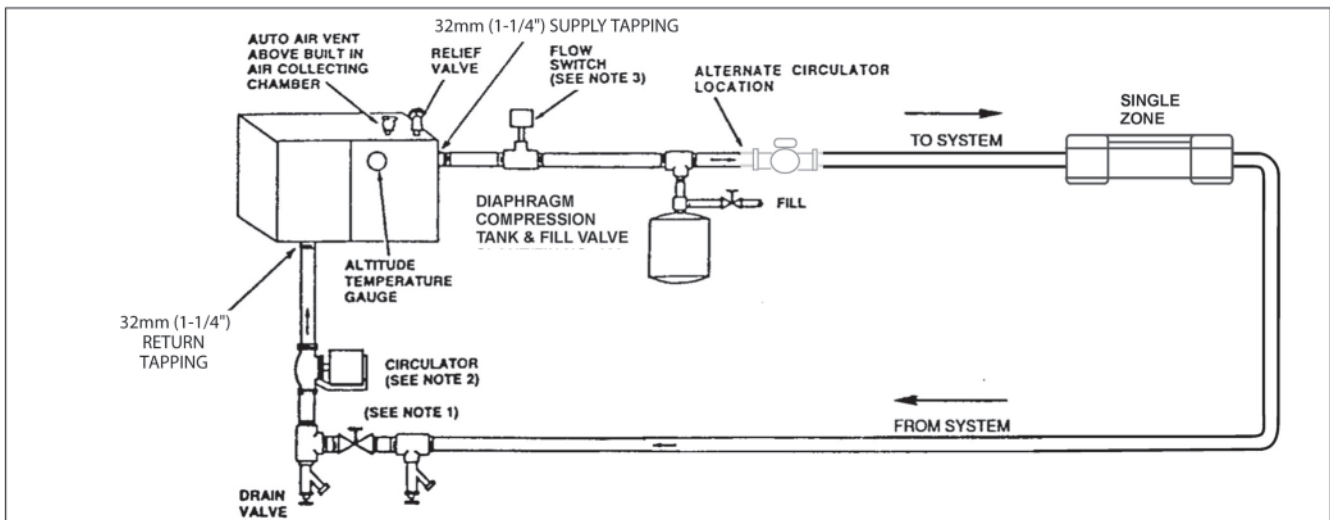


Figure 2. Typical Single Zone Piping

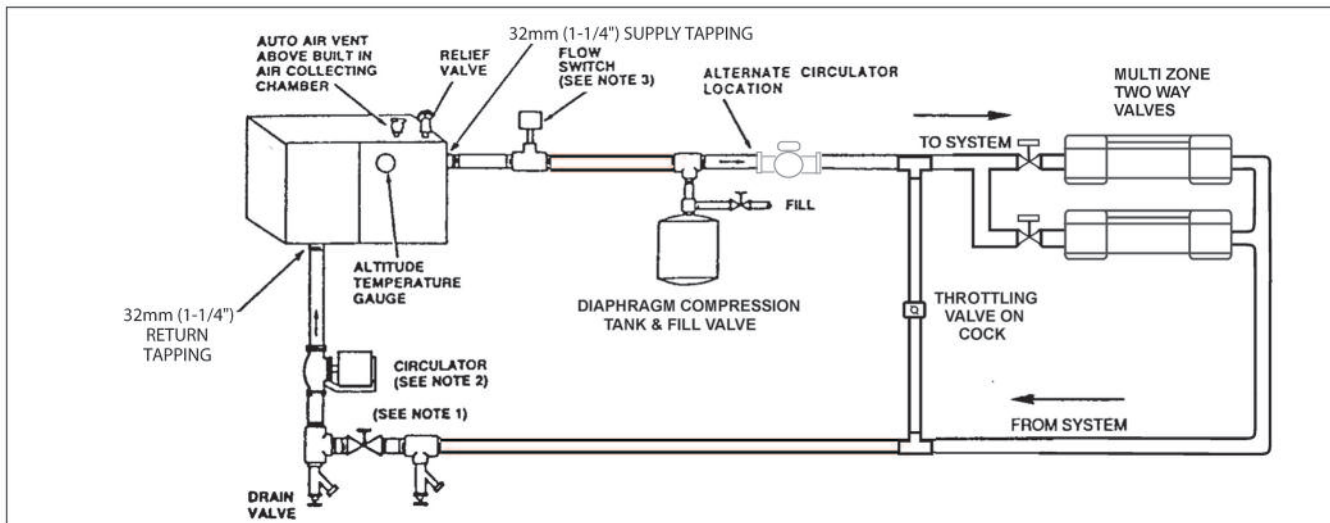


Figure 3. Typical Multi-Zone Using 2-Way Valves

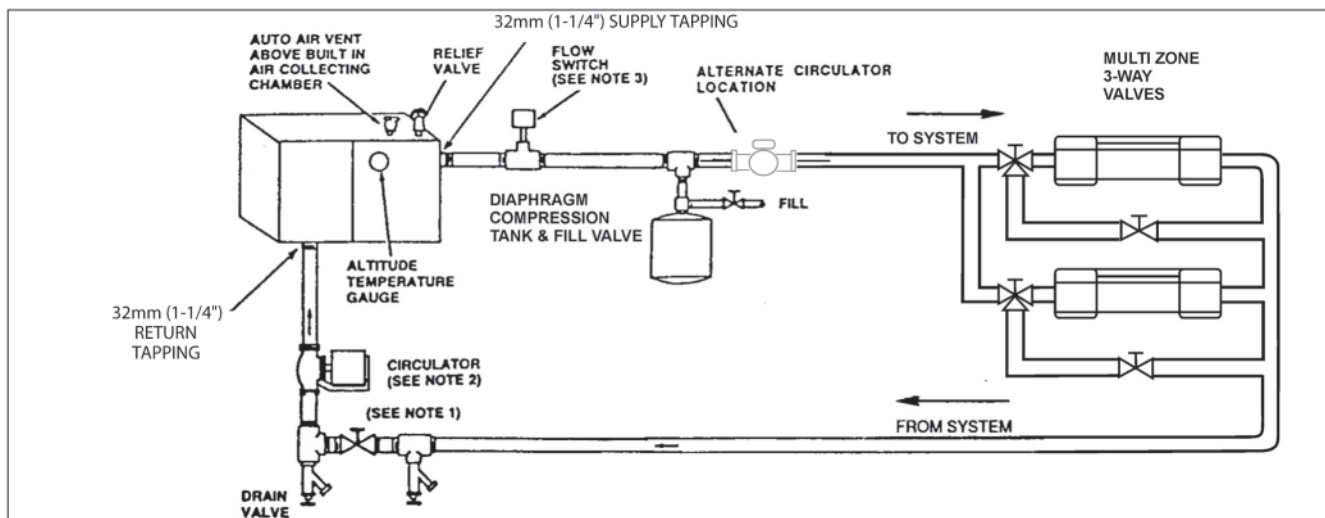


Figure 4. Typical Multi-Zone Using 3-Way Valves

NOTES:

1. Optional blocking gate valve and hose end valve used (with drain valve) for fast fill and purge of system.  
**IMPORTANT:** Close bypass line valve (if used) during purging.
2. Circulator should not be installed at lowest point of piping.
3. There should be no elbows, tees, or change of pipe size for at least 5 diameters of pipe size (see Table 2) upstream and downstream of flow switch.  
**Flow switch should always be mounted in the horizontal position. See Table 2.**

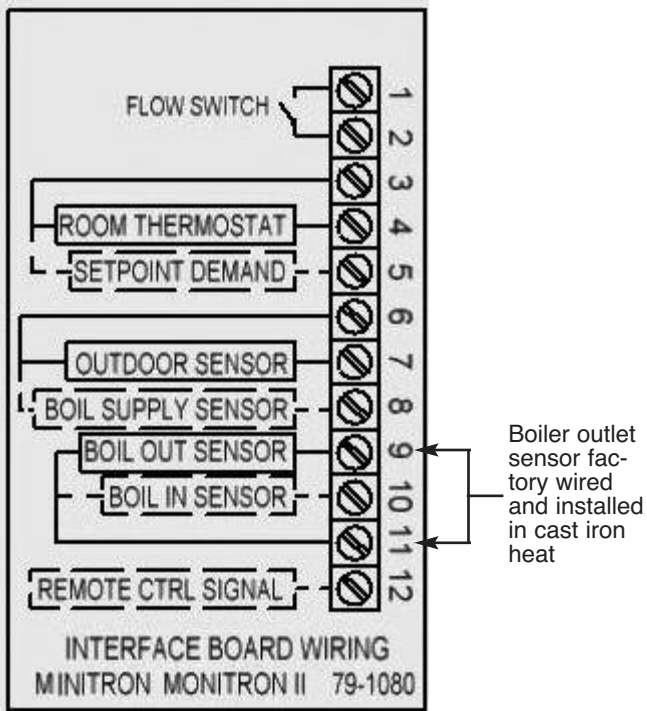


Figure 5. Electrical Connections

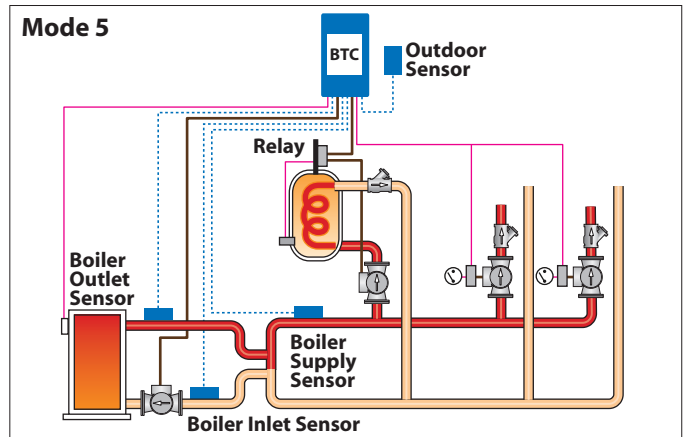
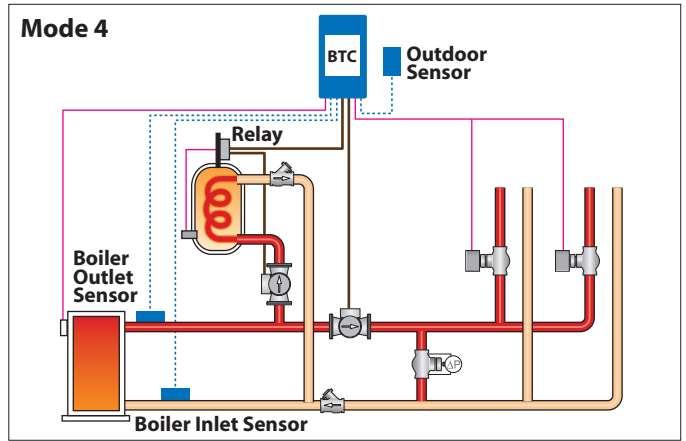


Figure 5A. Sensor Location (See EM-10 Manual for details)

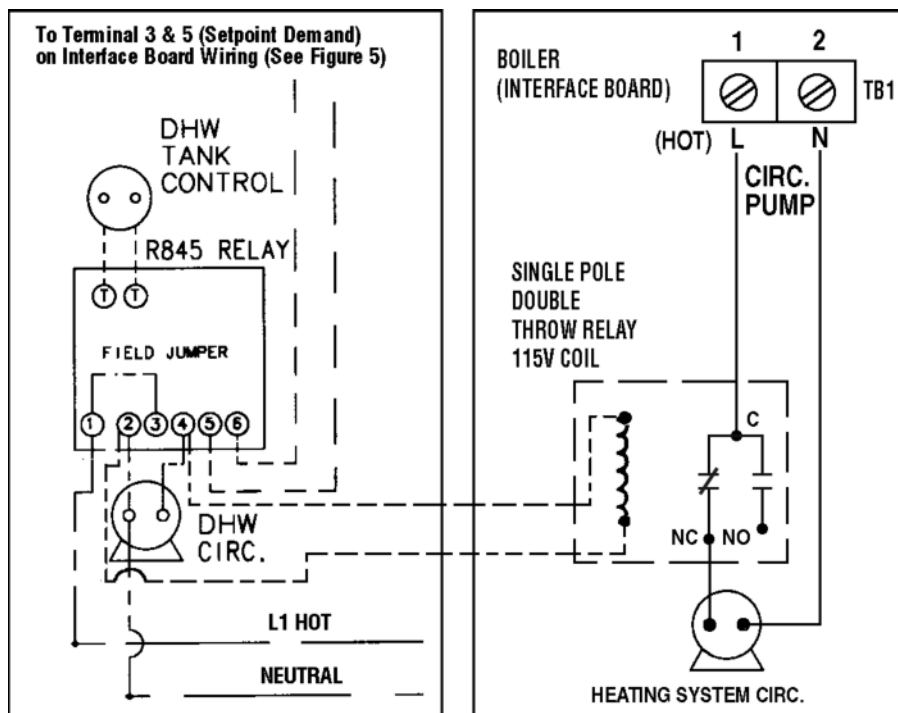


Figure 6. DHW Connections

**Table 1. Lug Sizes**

Model	Phase	Distribution Block Wire Size CU-AL†	Grounding Lug Wire Size CU-AL†	Neutral Lug Wire Size CU-AL†
EH-8 thru 20	1	6-2/0	6-2/0	6-2/0
EH-12 thru 20	3	6-2/0	6-2/0	6-2/0

Neutral Lug Wire Size: For 3-wire single phase and 4-wire 3 phase models equipped with circuit breakers. The neutral tap is for the circulator and control transformer.

† ALUMINUM conductors may be used, lug size, conduit size, ampacity and all applicable codes permitting.

**Table 2. Flow Switch Size Selection**

Model No.	Flow Switch McDonnell & Miller No.	Pipe Size	Minimum Pipe Length*
EH-8-M3 thru EH-20-M3	FS4-3T3-1	1"	6-1/2"

\* Straight pipe upstream and downstream of flow switch.

**Table 3. Current Ratings**

SINGLE PHASE 3 WIRE, 120/208V‡		SINGLE PHASE 3 WIRE, 120/240V‡	
Basic Model No.	Heater Amperes @ 208V	Basic Model No.	Heater Amperes @ 240V
EH8-13-5-M3	29	EH8-13-5-M3	33
EH10-13-5-M3	36	EH10-13-5-M3	42
EH12-13-5-M3	43.4	EH12-13-5-M3	50
EH16-13-5-M3	58	EH16-13-5-M3	67
EH20-13-5-M3	72	EH20-13-5-M3	83

THREE PHASE 4 WIRE, 120/208V WYE CIRCUIT ONLY‡		THREE PHASE 4 WIRE, 120/240V DELTA CIRCUIT ONLY‡	
Basic Model No.	Heater Amperes † @ 208V	Basic Model No.	Heater Amperes † @ 240V
—	—	—	—
—	—	—	—
EH12-34-5-M3	43	EH12-34-5-M3	50
EH16-34-5-M3	58 †	EH16-34-5-M3	67 †
EH20-34-5-M3	72 †	EH20-34-5-M3	83 †

† Leg with the highest value of line current of an unbalanced 3-phase load.

‡ 125 VAC maximum rating of all hot conductors.

## START-UP

NOTE: Make sure that all circuit breakers ahead of and at the boiler are OFF.

### Fill System

See Figures 2 through 4 for suggested purge valve and blocking valve. If system is filled but not purged, radiators must be vented individually, to prevent air blocking of water flow. Fill to approximately 12 psi (cold water), whether automatic or manual fill is used. DO NOT apply full line pressure to system; boiler and relief valve are rated at 30 or 50 psi (see rating plate). Suddenly applied main pressure can exceed 100 psi.

### Air Elimination

Diaphragm tank and air vent valve are recommended, see Figures 2 through 4. Air remaining in system will vent from the automatic vent valve during system operation. Valve cap must be loose or removed to allow automatic venting. Open relief valve briefly after filling to pressure, to make sure boiler is free of air.

### Bypass flow adjustment (Figure 3)

Close bypass valve. Turn down all zone thermostats. Inspect all zone valves to be sure all are closed. Put a jumper on thermostat terminals 3 and 4. Close ALL panels and turn on the 10 AMP control circuit breaker ONLY. Be certain that the flow switch wires are not connected to the flow switch terminals 1 and 2 and the ends of the wires are taped. Be certain that a jumperwire is between terminals 1 and 2. Connect the ohmmeter or other continuity tester across the flow switch common terminal and the terminal that is normally open during NO FLOW. Slowly open bypass valve until continuity tester lights or ohmmeter kicks to zero: flow switch now has closed contacts, indicating required minimum bypass flow rate when piping circuits are shut off. Bypass valves should be locked at this position. Shut OFF ALL circuit breakers ahead of and at boiler and open CONTROL PANEL (left hand) FRONT COVER. Remove jumper on thermostat terminals 3 and 4. Remove flow switch jumper wire from terminals 1 and 2. Connect flow switch wire to flow switch terminals 1 and 2. Connect zone valve end switches (in parallel) to thermostat terminals 3 and 4. See Figure 5 and wiring diagram on boiler. Replace CONTROL PANEL COVER.

### Check for Proper Boiler and System Operation

To check for proper boiler and system operation, perform the following procedure:

1. Turn up all room thermostats.
2. On boiler models with a multiple stage electronic control system (model number on rating plate contains an "M3"), there will be a delay whose response time will depend on operating mode and other settings.
3. Current may be checked by a qualified electrician at the feeder panel and compared to the values shown in Table 3.
4. Water flow through the boiler should be sufficient to keep the flow switch closed. The limit thermostat should also remain closed. Consult the multiple stage electronic control manual for control setup.

## OPERATION - HOMEOWNER INFORMATION

### IMPORTANT:

**DO NOT operate boiler until the following criteria have been met:**

1. **Must be installed by qualified heating and electrical contractors in accordance with instructions in this manual.**
2. **Must be installed in compliance with local codes.**
3. **Must be inspected and approved by installing contractors and any local authority having jurisdiction, and be approved for operation by them.**

- Ask the installer to explain operation of the entire heating system.
- Turn on all circuit breakers for boiler and circulator.
- Adjust wall thermostat to required temperature. If room temperature is lower than the thermostat setting, the first heater stage will go on and the balance of the heater stages will go on one at a time with a delay between stages.

### IMPORTANT

You must turn on the circuit breaker marked "10" in order to operate the boiler control system. You then may turn on the other circuit breakers (those marked 25, 30, 50 or 60).

## PERIODIC INSPECTION

The hot water system, which includes the Minitron boiler, the radiators and water control devices, should remain filled with water at all times. DO NOT drain except to make repairs or to prevent freeze-up during extended cold weather shutdown.

The pressure/temperature gauge on the Minitron should be checked frequently: at the highest operating temperature, pressure should be the same throughout the heating season. If pressure (at a constant temperature) consistently rises or falls over a period of time, a fill valve leak, a system leak or compression tank malfunction is indicated. Leaks anywhere in the system must be repaired without delay. Regular addition of fresh water to replenish leaks adds oxygen and lime. Oxygen corrosion will cause further leaks and parts failure, lime buildup on heating elements will cause element failure due to overheating. If any leaks are found, or if pressure changes, call for service immediately.

### IMPORTANT

**Under no circumstances should any electrical wiring or internal controls be touched, except by an authorized electrician (wiring and controls) or heating system service expert (system service, repair, shutdown). Any mechanical adjustments to the heating equipment and system must be made by a qualified heating serviceperson.**

## Basic Monitron II and Minitron M3 Setup Dual Temperatures are Fahrenheit (Celsius)

Field Entry Example for Mode 4 or Mode 5

Field Entry	Baseboard System		Low Temp System	Note
Mode	4 or 5		4 or 5	4 = Parallel Piping, 5 = Primary/Secondary Piping
STGMODE	PID	P	P	
BOIL TARGET	180(82)	180(82)	180(82)	This is for DHW setpoint demand - if used
OUTDR START	70(21)	70(21)	70(21)	
OUTDR DSGN*	-10(-23)	-10(-23)	-10(-23)	May be -20(-29) or -30F(-34) depending on area design temp.
BOIL START	70(21)	70(21)	70(21)	This is used in the calculation of slope
BOIL DSGN	180(82)	180(82)	130(54)	Radiant - 130(54) Wet, 140(60) or 150F(66) for Dry system
BOIL OUT MAX	182(83)	182(83)	150(66)	Default 182(83) - Use "FACTORY" Dip Switch to Adjust - DO NOT EXCEED THIS MAX
BOIL MAX	170(77)	170(77)	130(54)	Default 180(82) - Use "FACTORY" Dip Switch to Adjust. Set same as BOIL DSGN
BOIL MIN	140(60)	140(60)	80(27)	Default 140(60) - Use "FACTORY" Dip Switch to Adjust. Note: Some heating equipment may require a minimum water temperature - ie fan coils
DLY	No Entry			Not valid for Electric Boiler application
BOIL MASS	1	N/A	N/A	
STG DLY	Au if PID in STGMODE	N/A	N/A	Minimum time between firing stages
DIFF	Au if PID in STGMODE	2(1)	2(1)	1/2 differential around target temp
STG DIFF		4(2)	4(2)	Temperature drop at which next stage turns on
ON DLY		1:00	1:00	Time before turning on next stage
OFF DLY		0:30	0:30	Time before turning off next stage
MIN ON		0:30	0:30	Minimum time stage is on before allowed to go off
MIN OFF		0:30	0:30	Minimum time stage is off before allowed to come on
PUMP DELAY	Off	Off	Off	
WWSD	65(18)			
0° F	F or C			

Set the "MODE" to 1 or 2 if an outdoor Sensor is not used (1 = parallel piping, 2 = primary/secondary piping)

**Caution:**

"Factory" position on dip switch has to be returned to "installer" position to prevent unauthorized changes to factory settings.

\*Local design input may vary from the example shown. Be sure to use design inputs for your geographical location.

**EXAMPLE SETTINGS MAY VARY ACCORDING TO ACTUAL DESIGN REQUIREMENTS.**



## Appendix A

### Thermostat Heat Anticipator Settings

Fixed anticipator thermostats are not adjustable. Adjustable anticipator thermostats, depending on thermostat model, may be adjustable from a .18 to a .9 setting by moving a pointer on the anticipator.

The higher the anticipator setting (towards .9) the longer it will take for the thermostat to respond to a change in room temperature. Too high a setting and the boiler will be slow to respond to a temperature change in the room. This can cause the room temperature to drop to an uncomfortable level before the boiler starts. This may generate homeowner complaints.

The lower the anticipator setting (toward .18) the faster the thermostat will respond to a change in room temperature. Too low a setting and the boiler will short cycle. Boiler short cycling will cause unnecessary wear on the equipment and in the case of oil boilers it can lead to poor combustion and more frequent cleaning of the combustion area.

It is important to understand what the thermostat is controlling and then determine the amp rating of that relay, gas valve, zone valve or control. This information is usually stamped somewhere on the component. A properly set anticipator will allow the system to operate at its maximum effectiveness.

## Appendix B

### Accumulation of foreign deposits in heat exchanger

Recent investigations of boilers which were installed in hard water areas, revealed that mineral deposits had accumulated in the heat exchanger. In addition, sludge, scale and other solid contaminants were present in boilers installed in older systems or where the water was supplied from a well. This accumulation creates an insulating layer that drastically may affect boiler efficiency.

THE TERMS OF THE BOILER WARRANTY WILL NOT APPLY TO FAILURES ENCOUNTERED UNDER THESE CIRCUMSTANCES.

#### RECOMMENDATIONS:

On all installations in hard water areas:

1. The system should be thoroughly inspected for leaks which must be repaired however minor they may be.

2. The initial water charge of the system must be treated to reduce its hardness to an acceptable level.

In addition to the aforementioned, older systems and those supplied from wells may require that a filter or strainer be incorporated in the circuit at some point on the return line closest to the boiler. Suitable water treatment filters are commercially available for this purpose.

WE STRONGLY RECOMMEND THAT YOU CONVEY THIS VITAL INFORMATION TO ALL PARTIES CONCERNED.

### Water Treatment

A good water treatment program will not only extend the useful life of this boiler but it will also save much of the time and expense of repairs made necessary by preventable occurrences. A reputable water treatment company should be consulted to evaluate and determine the best overall treatment program for your boiler equipment.

## Appendix C

### Replacement of Electric Heaters and gaskets

When replacing heating elements replace the gasket at the same time. It is not recommended to re-use an old gasket as it may have become damaged or brittle. To prevent binding and leaks when installing a new gasket wet the gasket with water or coat it with talcum powder to allow it to move into position properly without binding.

## Appendix D

### Use of Non-oxygen Diffusion Barrier Underfloor Tubing

The boiler warranty does not cover leaks resulting from corrosion caused by the use of underfloor plastic tubing without an oxygen diffusion barrier. Systems must have the non-oxygen diffusion barrier tubing separated from the boiler with a heat exchanger. Slant/Fin recommends the use of underfloor plastic tubing with an oxygen diffusion barrier. Other systems components may also require protection from oxygen permeation.







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