INSTALLATION & OPERATING MANUAL

EBX™ SERIES

Residential Electric Boiler

EBX4K-240 (model #IBEXSW1-004K)
EBX8K-240 (model #IBEXSW1-008K)
EBX10K-240 (model #IBEXSW1-010K)
EBX12K-240 (model #IBEXSW1-012K)

WARNING

Risk of electric shock. If the information in this manual is not followed exactly, a fire or electrocution may result causing property damage, personal injury, or loss of life.

Do not store or use gasoline or other flammable vapors and liquids or other combustible materials in the vicinity of this or any other appliance.

C SA® US

Water quality

Warning

Water quality has a significant impact on the lifetime and performance of a boiler's heat exchanger.

Improperly prepared water in a heating circuit may cause damage to the heat exchanger through fouling or corrosion. Repeated or uncontrolled water fills will increase the potential for damage.

High levels of dissolved solids or minerals may precipitate out of the fluid onto the hottest part of the heat exchanger, impairing heat transfer and resulting in overheating and premature failure. The amount of solids that may form on the heat exchanger will depend on the degree of hardness and the total water volume in the system. A high water volume system with a low hardness count may cause as much damage as a system with less volume and higher hardness, so it is recommended to treat water so as to reduce dissolved solids to the minimum 10 ppm, and to no more than 30 ppm. Water chemistry allowable limits are as follows:

- TDS 0.6 to 1.75 grains/ gal (10 to 30 ppm)
- Acidity pH is to be between 6.6 and 8.5
- Chloride is to be less than 125 mg/l
- Iron is to be less than 0.3 mg/l
- Cu less than 0.1 mg/l
- Conductivity is to be less than 400µS/cm at 77°F (25°C)

Important: Ensure that these limits are acceptable for the other water-side components in the system.

Shipped with the boiler:

- 1 x Wall mounting bracket
- 1 x 30 psig pressure relief valve, P-9009

2.0 Safety information

Manual safety markings

Danger

Points out an immediate hazardous situation that must be avoided to prevent serious injury or death.

Warning

Points out a potential hazardous situation that must be avoided to prevent serious injury or death.

Caution

Points out a potential hazardous situation that must be avoided to prevent possible moderate injury and/or property damage.

Note

Points out installation, maintenance and operational notes to enhance efficiency, longevity and proper operation of the boiler.

Important safety instructions

Installation, start-up and servicing of IBC boilers must be performed by competent, qualified, licensed and trained heating technicians.

Failure to read and comply with all instructions and applicable national and local codes may result in hazardous conditions that could result in property damage and injury to occupants, and in extreme cases to death. Keep instructions near the air handling appliance for future reference.

Danger

Do not store or use gasoline or other flammable vapors or liquids in the vicinity of this or any other appliance. If you smell gas vapors, do not try to operate any appliance - do not touch any electrical switch or use any phone in the building.

Warning

Do not use this boiler if any part has been under water. Immediately call a qualified service technician to inspect the boiler and to replace any part of the system that has been under water.

Warning

Improper installation, adjustment, alteration, service or maintenance can cause property damage, personal injury, or loss of life. Read and understand the entire manual before attempting installation, start-up, operation, or service. Installation and service must be performed only by an experienced, skilled installer or service agency.

Failure to follow all instructions in the proper order can cause personal injury or death. Read all instructions, including all those contained in component manufacturers' manuals before installing, starting up, operating, maintaining, or servicing the appliance.

Warning

Disconnect power supply before any wiring/service is performed. Failure to do so could result in damage to appliance and/or electric shock.

Caution

The boiler must be installed so that electrical components are not exposed to water during operation.

Known contaminants

Known Corrosive Contaminants to Avoid	
Cements and glues	Refrigerant leaks from cracks in coils
Paint or varnish removers	Sodium chloride or potassium chloride used for water softening
Adhesives used to fasten building products and other similar products	Chemicals in perming solutions
Chlorinated waxes or cleaners	Chlorofluorocarbon chemicals found in spray cans
Chlorine-based swimming pool chemicals	Antistatic dryer sheets in clothes dryers
Hydrochloric acid or muriatic acid used in household cleaning and stain removal	Chlorine-type bleaches, detergents, and cleaning solvents found in household laundry rooms
Calcium chloride used for snow clearing	

SAVE THESE INSTRUCTIONS

Contents

3 EBX-series Specifications

Boiler Specification	EBX4K-240	EBX8K-240	EBX10K-240	EBX12K-240
Power @ 240V	1.3 - 13.7 MBH 0.4 - 4.0 kW	2.7 - 27.3 MBH 0.8 - 8 kW	3.4- 34.1 MBH 1.0 - 10.0 kW	4.1 - 41.0 MBH 1.2 - 12.0 kW
Power @ 208V	1.0 - 10.2 MBH 0.3 - 3 kW	2.1 - 20.5 MBH 0.6 - 6.0 kW	2.6 - 25.6 MBH 0.8 - 7.5 kW	3.1 - 30.7 MBH 0.9 - 9.0 kW
Maximum Current Draw (with pump) @ 240V	17.6 A	34.2 A	42.6 A	50.9 A
Maximum Current Draw (with pump) @208V	15.4 A	30.0 A	37.1 A	44.3 A
Breaker Size	30 A	45 A	60 A	70 A
Minimum Ambient temperature	32°F / 0°C			
Max. Ambient temperature	122°F / 50°C			
Maximum relative humidity (non-condensing)	90%			
Minimum water temp.	34°F / 1°C			
Maximum water temp. (electronic hi-limit)	190°F/ 88°C			
Max. Water Temperature Lockout Limit	210°F/ 99°C			
Weight (empty)	29 lbs / 13.2 kgs			
Minimum boiler flow rate	0.7 USgpm / 2.6 Lpm	1.4 USgpm / 5.3 Lpm	1.7 USgpm / 6.4 Lpm	2.1 USgpm / 8.0 Lpm
Maximum boiler flow rate	4.2 USgpm / 16 Lpm			
Maximum operating water pressure*	50 psig / 345 kPa			
Minimum water pressure	8 psig / 55 kPa			
Element construction	Titanium			

*Boiler ships with a 30 psi Pressure Relief Valve

Cabinet dimensions

EBX-series dimensions

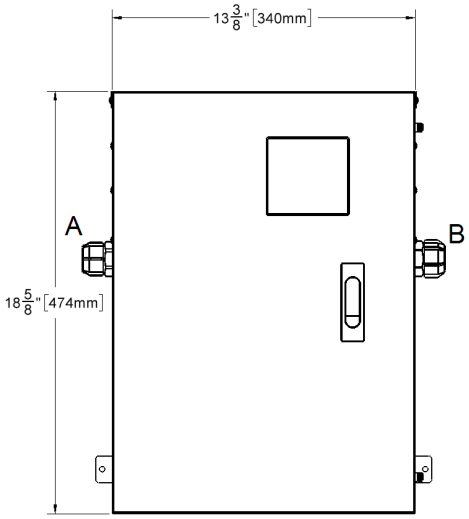

Figure 1 *Frontal view - EBX-series Boiler*

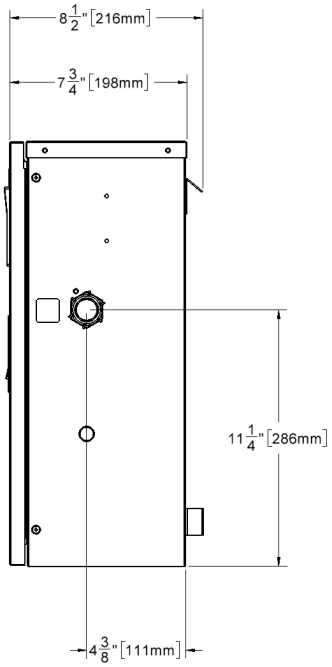

Figure 2 *Side view - EBX-series Boiler*

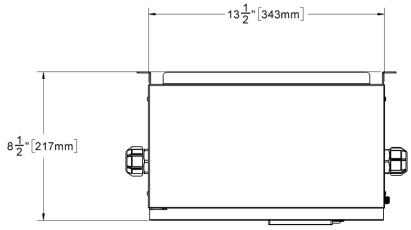

Figure 3 *Top view - EBX-series Boiler*

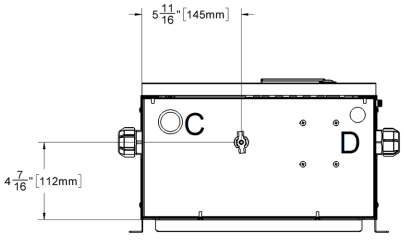

Figure 4 *Bottom view - EBX-series Boiler*

Connection specifications

The following table displays the required connection specifications.

	Description	EBX-series Boiler
A	Supply water outlet	3/4" NPT-M
B	Return water inlet	3/4" NPT-M
C	Supply power knock-out	Dual 3/4" and 1"
D	Control wiring knock-out	1/2"

Table 1 *Connections*

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4.0 Introduction

4.1 Standard features and benefits

- Compact
- Modulating
- Boiler pump built in
- Easy set-up for Set-Point or Outdoor Reset heating
- Flow-proving and high limit safeties built in

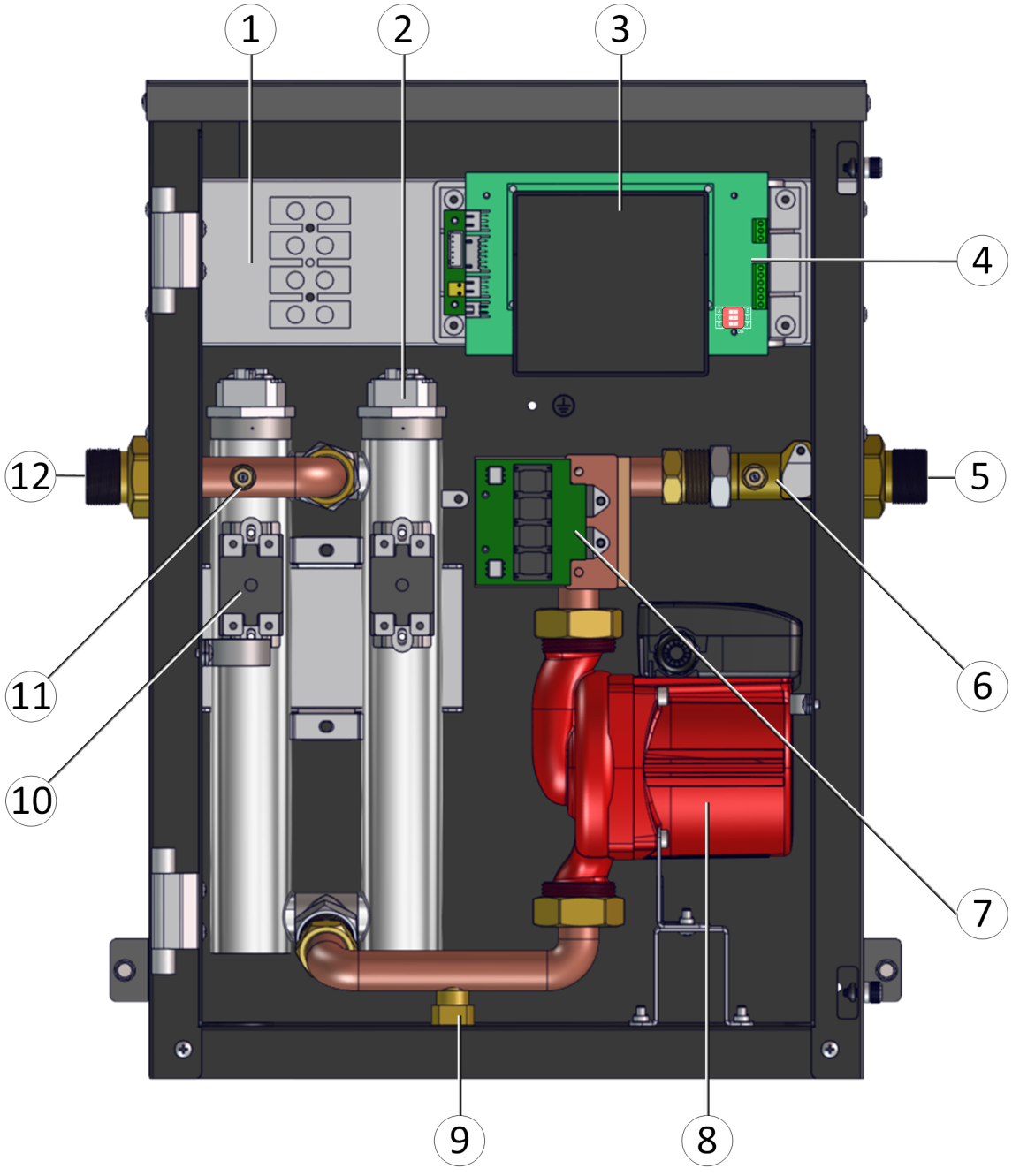
4.2 Warranty

For residential applications, IBC offers a 1-year warranty on the pump and the elements. All other parts carry a 5-year warranty against defects in materials or workmanship and failures due to thermal shock.

For commercial applications, IBC offers a 1-year warranty on all parts against defects in materials or workmanship and failures due to thermal shock.

To view the full warranty statement for the EBX-series Boiler, go to ibcboiler.com.

4.3 Internal view



1	Incoming power wiring connections
2	Heating element (1 of 2)
3	Display screen / controller
4	Control wiring terminals
5	Return piping connection 3/4" NPT
6	Flow sensor / inlet temperature sensor assembly
7	Triac relay (modulation control block): see below for alternate
8	3-speed pump
9	Drain port
10	High temperature limit switch (manual reset)
11	Outlet temperature sensor
12	Outlet piping connection 3/4" NPT

Figure 5 *Interior view*

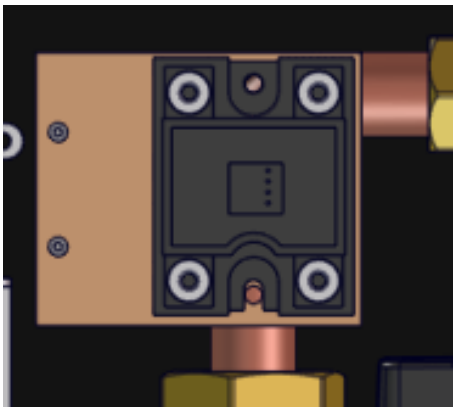


Figure 6 *Item 7 Solid state relay--alternate modulation control block*

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5.0 Before installation

Before installing the appliance, it is important to review and observe the following checklist of precautions:

Caution

Care must be taken to properly size the boiler for its intended use. Prolonged full output run time, over-sizing or under-sizing, and incorrect flow rates through the boiler can lead to increased maintenance costs, equipment stress and premature failure.

Precautions	Check
Exposure to corrosive chemical fumes such as chlorinated and/or fluorinated hydrocarbons can reduce the life of a boiler. Cleaners, bleaches, air fresheners, refrigerants, aerosol propellants, dry-cleaning fluids, de-greasers and paint-removers all contain vapors that can form corrosive acid compounds. Airborne chlorides such as those released with the use of laundry detergents are also to be avoided.	☐
Locate the boiler where water leakage will not result in damage to the area. If there is no suitable location, install a suitable drain pan under the boiler. Do not install above carpeting.	☐
At a new construction site, or during renovations, protect the boiler from drywall dust or other construction related contaminants. Do not seal boiler case openings directly when operating - allow for air circulation and ventilation in the immediate area.	☐
Ensure that the pressure relief valve is installed with no valves or other means of isolation between its inlet and the boiler. Make sure the relief valve outlet is piped with unobstructed piping (minimum ¾" diameter) to a safe discharge location.	☐

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6.0 Installation

If you haven't performed the necessary pre-installation checks, see Pre-installation checks.

Refer to the Specifications section for dimensional drawings and connection specifications. Use these drawings to find a suitable location for the appliance.

6.1 Code requirements

The appliances are tested and certified under CSA22.2 No.165-17 and/or UL834 (5th edition). Below are the code requirements for every installation.

Canada	US
Conform to local codes, or in the absence of these, with the latest editions of the Canadian Electrical Code Part 1 CSA C22.2 No. 165-17.	Conform to the current National Electrical Code ANSI/NFPA 70 and UL 834 (5th edition).

Table 2 *Code requirements by country*

6.2 Removing an existing gas boiler

When an existing gas boiler is removed from a common venting system, the common venting system may be too large for proper venting of the appliances that remain connected to it. When resizing any portion of the common venting system, use the minimum size according to the appropriate tables in the National Fuel Gas Code, ANSI Z223.1 - latest edition. In Canada, follow the B149.1 Installation Code.

When removing an existing gas boiler, the following checks must be carried out for each of the appliances still connected to the common exhaust system, by operating them one at a time:

- Seal any unused opening in the common venting system.
- Visually inspect the venting system for proper size and horizontal pitch. Determine that there is no blockage or restriction, leakage, corrosion and other deficiencies that could cause an unsafe condition.
- (Where practical) Close all building doors and windows such as doors adjacent to appliances remaining connected to the common venting system and other spaces of the building.
  - Turn on clothes dryers and any appliance not connected to the common venting system.
  - Turn on any exhaust fans, such as range hoods and bathroom exhausts, so they will operate at maximum speed. Do not operate a summer exhaust fan.
  - Close fireplace dampers.

- Place in operation the appliance being inspected.
  - Follow the lighting instructions.
  - Adjust the thermostat so that the appliance operates continuously.
- After determining that each appliance remaining connected to the common venting system properly vents when tested as outlined above, return doors, windows, exhaust fans, fireplace dampers and any other gas-burning appliance to their previous condition.
- Any improper operation of the common venting system should be corrected, so the installation conforms with the National Fuel Gas Code, ANSI Z223.1 - latest edition. In Canada, all installations must conform with the current CAN/CGA - B149.1-10 Installation Code and/or local codes.

6.3 Determining the location of the boiler

The boilers are designed and approved for indoor installation (wall or rack mounting) in areas such as an alcove, basement, or utility room. These areas should have a surrounding temperature of 32°F (0°C) to 122°F (50°C) and less than 90% relative humidity.

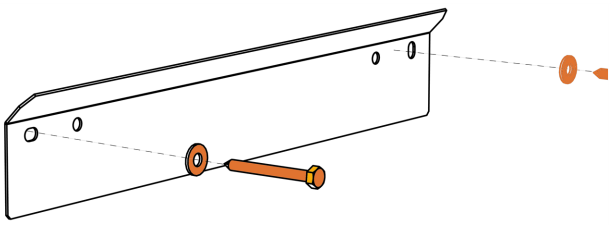
Warnings

- Keep the area around a boiler clear of combustible materials, gasoline, and other flammable vapors and liquids.
- Ensure that a boiler is not exposed to water leaks from piping or components located overhead, including condensation from uninsulated cold water lines overhead.
- Ensure that combustible materials do not make contact with exposed water piping and associated components (relief valves, circulators, etc.). Check local codes for required clearances and/or provide adequate insulation.

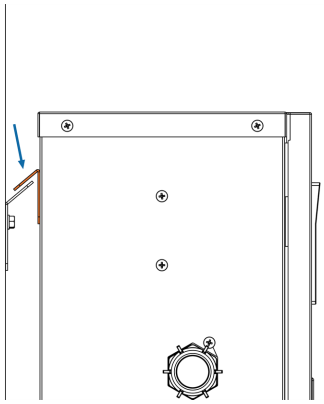
6.4 Mounting the boiler

Warning

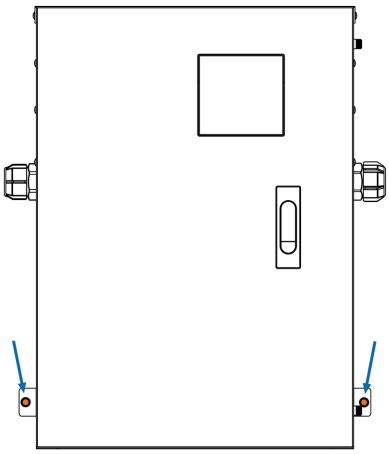
Do not mount the appliance to hollow wall structures - The combined weight of the boiler, its water content and associated piping components can exceed 30 pounds (14 kg). Fasteners must be rated for this strain, and must be firmly anchored into solid material that will support this weight. Installers must take necessary precautions to avoid injury during the installation of this boiler.



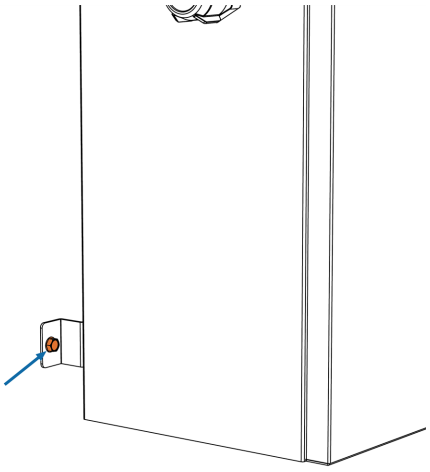
1. Attach the support bracket to the wall studs using two **¼" x 2½"** long lag screws with flat washers.



2. Hook the boiler tab (located on back of boiler) over the support bracket flange. Ensure that the boiler tab is flush against the mounting bracket flange.



3. Secure the lower part of the boiler to the wall with two field-supplied ¼" bolts.



4. Profile view of the lower mounting flange.

6.5 Installation clearances

Warning

Exposed water piping and associated components (relief valves, circulators, etc., should not be in contact with combustible materials. Check local codes for required clearances and / or provide adequate insulation.

EBX-Series		
Surface	**Minimum distance from combustible surfaces**	**Recommended clearance for installation and service**
Front	2"	24"
Left side	2"	4" (allow access to water connections)
Right side	2"	4" (allow access to water connections)
Top	2"	8" (to allow access to elements)
Bottom	2"	6" (for drain and power supply access)

Table 3 *Clearance distances for boiler mounting sites*

6.6 Closet installations

For installations in a confined space (such as a closet), ventilation openings may be needed through a door or wall to prevent excessive heat from building up inside the space.

The appliance must not be exposed to surrounding air above 122°F (50°C) or below 32°F (0°C).

6.7 Water Piping

IBC recommends using unions on the inlet and outlet water connections. Unions simplify many service procedures, notably the cleaning of the inlet water strainer. See *Installation on page 17*below for other piping recommendations.

Warning

Water quality has a significant impact on the lifetime and performance of a boiler's heat exchanger.

Improperly prepared water in a heating circuit may cause damage to the heat exchanger through fouling or corrosion. Repeated or uncontrolled water fills will increase the potential for damage.

High levels of dissolved solids or minerals may precipitate out of the fluid onto the hottest part of the heat exchanger, impairing heat transfer and resulting in overheating and premature failure. The amount of solids that may form on the heat exchanger will depend on the degree of hardness and the total water volume in the system. A high water volume system with a low hardness count may cause as much damage as a system with less volume and higher hardness, so it is recommended to treat water so as to reduce dissolved solids to the minimum 10 ppm, and to no more than 30 ppm. Water chemistry allowable limits are as follows:

- TDS 0.6 to 1.75 grains/ gal (10 to 30 ppm)
- Acidity pH is to be between 6.6 and 8.5
- Chloride is to be less than 125 mg/l
- Iron is to be less than 0.3 mg/l
- Cu less than 0.1 mg/l
- Conductivity is to be less than 400µS/cm at 77°F (25°C)

Important: Ensure that these limits are acceptable for the other water-side components in the system.

6.8 Boiler Pump

The factory-installed boiler pump can overcome the system head resistances listed below, according to the selected speed:

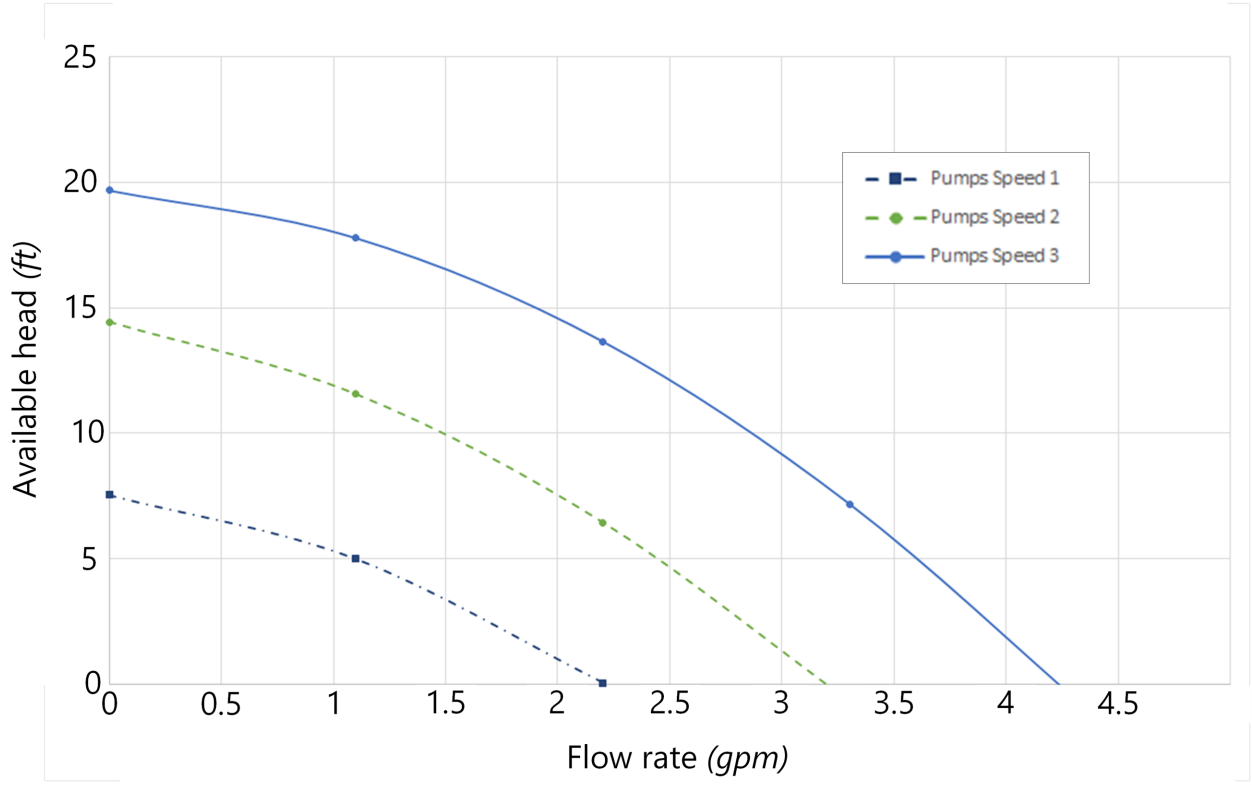


Table 4 *EBX-series pump available head, 3 speeds (water)*

The installed pump is rated for the designed water temperature range; some pumps have a minimum water temperature rating above the low temperature potential of the boiler.

6.9 Propylene glycol usage

Warning

Do not use automotive-type ethylene or other types of automotive glycol antifreeze, or undiluted antifreeze of any kind. This may result in severe boiler damage. Installers must ensure that glycol solutions are formulated to inhibit corrosion in hydronic heating systems of mixed materials. Improper mixtures and chemical additives may cause damage to ferrous and non-ferrous components as well as non-metallic, wetted components, normally found in hydronic systems. Ethylene glycol is toxic, and may be prohibited for use by codes applicable to your installation location. For environmental and toxicity reasons, IBC recommends only using non-toxic propylene glycol.

Propylene glycol solution is commonly used in a closed loop where freeze protection is required. Its density is lower than that of water, resulting in lower thermal performance at a given flow and pressure. Generally, a 50%:50% solution of propylene glycol and water requires an increased system circulation rate (gpm up 10%), and system head (up 20%) to provide performance equivalent to straight water. For the EBX-series boilers propylene glycol concentrations between 25% and 50% are permitted.

These boilers are designed for use within a closed loop, forced circulation, low pressure system. A 30 psi pressure relief is supplied for field installation on the outlet piping. Relief valve discharge piping must terminate between 6" (15 cm) and 12" (30 cm) above the floor or per local code.

Warning

During operation, the relief valve may discharge large amounts of steam and/or hot water. To reduce the potential for bodily injury and property damage, install a discharge line that:

- Is connected from the valve outlet with no intervening valve and directed downward to a safe point of discharge.
- Allows complete drainage of both the valve and the discharge line.
- Is independently supported and securely anchored, so as to avoid applied stress on the valve.
- Is as short and straight as possible.
- Terminates freely to atmosphere where any discharge will be clearly visible and is at no risk of freezing. terminates with a plain end which is not threaded.
- Is constructed of a material suitable for exposure to temperatures of 375° F or greater.
- Is, over its entire length, of a pipe size equal to or greater than that of the valve outlet (¾" NPT).

Do not cap, plug or obstruct the discharge pipe outlet.

6.10 Relief Valve

Ensure that the pressure relief valve is installed with no valves or other means of isolation between its inlet and the boiler.

Make sure the relief valve outlet is piped with unobstructed piping (minmum 3/4" diameter) to a safe discharge location.

6.10.1 Pressure Gauge

The boiler does not include a water pressure sensor. Field piping should always include a water pressure gauge or a tridicator.

6.11 General piping best practices

Primary/secondary piping, or the use of a hydraulic separator, is recommended for maximum flexibility in multi-load applications. Piping loads in parallel is also encouraged in systems that only have two loads, or when loads are operating simultaneously.

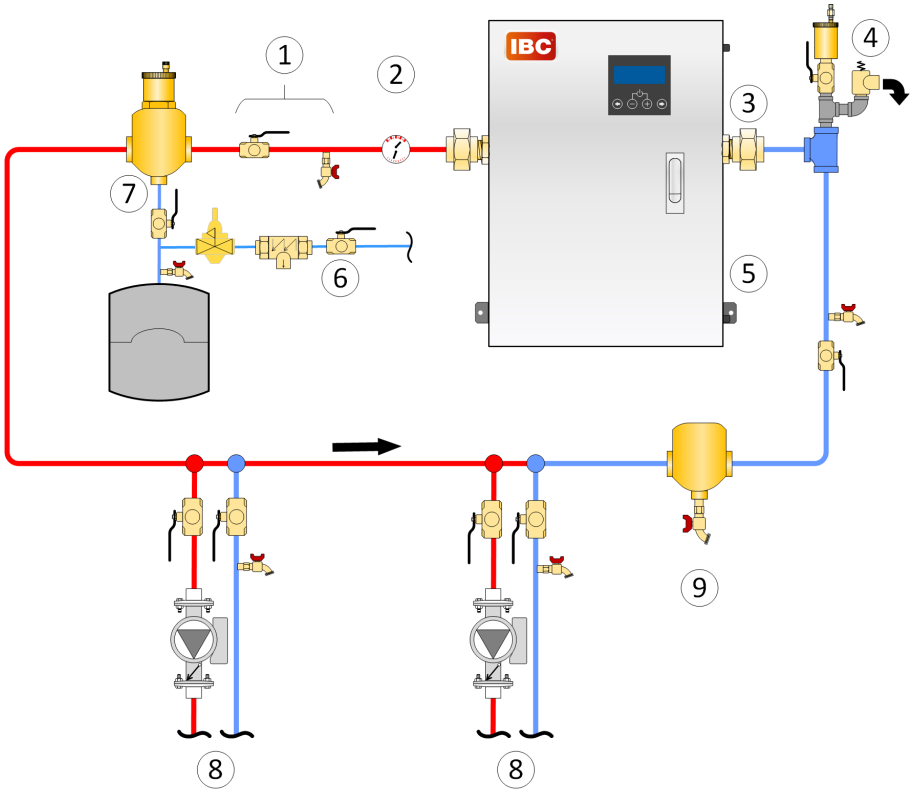
Caution

Contact local water purveyors about the suitability of the supply for use in hydronic heating systems. If unsure about water quality, bring water or hydronic fluid of known quality to the site. Alternatively, request testing and assessment (and treatment, if required) from a local water treatment expert.

Note

The piping drawings in this manual are simple schematic guides to a successful installation. For further information and details, consult our concept drawings – which provide details on specific single and multiple boiler applications (available in IBC's Technical portal). There are many necessary components not shown, and details such as thermal traps are left out so the drawings have greater clarity. Our boilers must be installed by licensed and experienced heating professionals familiar with the applicable local and national codes. System design is to be completed by an experienced hydronic designer or engineer. You should carefully read and follow the installation instructions along with the application drawing that fits your system.

System piping is connected to the boiler using 3/4" NPT-Male threaded fittings. To simplify servicing, we recommend using unions at the boiler's supply and return water connections. **A union is necessary to clean the inlet mesh filter.**



1	Isolation valve and hose bib for purging air from boiler
2	Water pressure gauge
3	A union is necessary to clean the inlet mesh filter
4	Pressure relief valve (shipped with the boiler): no isolation valve permitted between boiler and relief valve
5	Boiler (primary) pump is integral to boiler
6	Fill station with isolation valve closed, or fill tank.
7	Microbubble air eliminators are best installed where the fluid is at the highest temperature and lowest pressure, on boiler outlet at expansion tank connection (point of no pressure change); there should be minimal pressure drop to pump inlet (in this case boiler inlet)
8	To/ from load
9	Dirt separator (shown) or external strainer (P-913) recommended

Figure 7 *Boiler trim options - single boiler*

Fluid fill is most often accomplished by using a boiler regulator and fill valve set at 12 psig or higher, with the backflow prevention device required by local code. This is acceptable in areas where municipal water or well water has been treated and filtered to remove excessive minerals and sediment, and water chemistry is known to be suitable for closed loop hydronic systems. Follow the applicable codes and good piping practice.

Warning

Close the fill valve after any addition of water to the system, to reduce risk of water escaping.

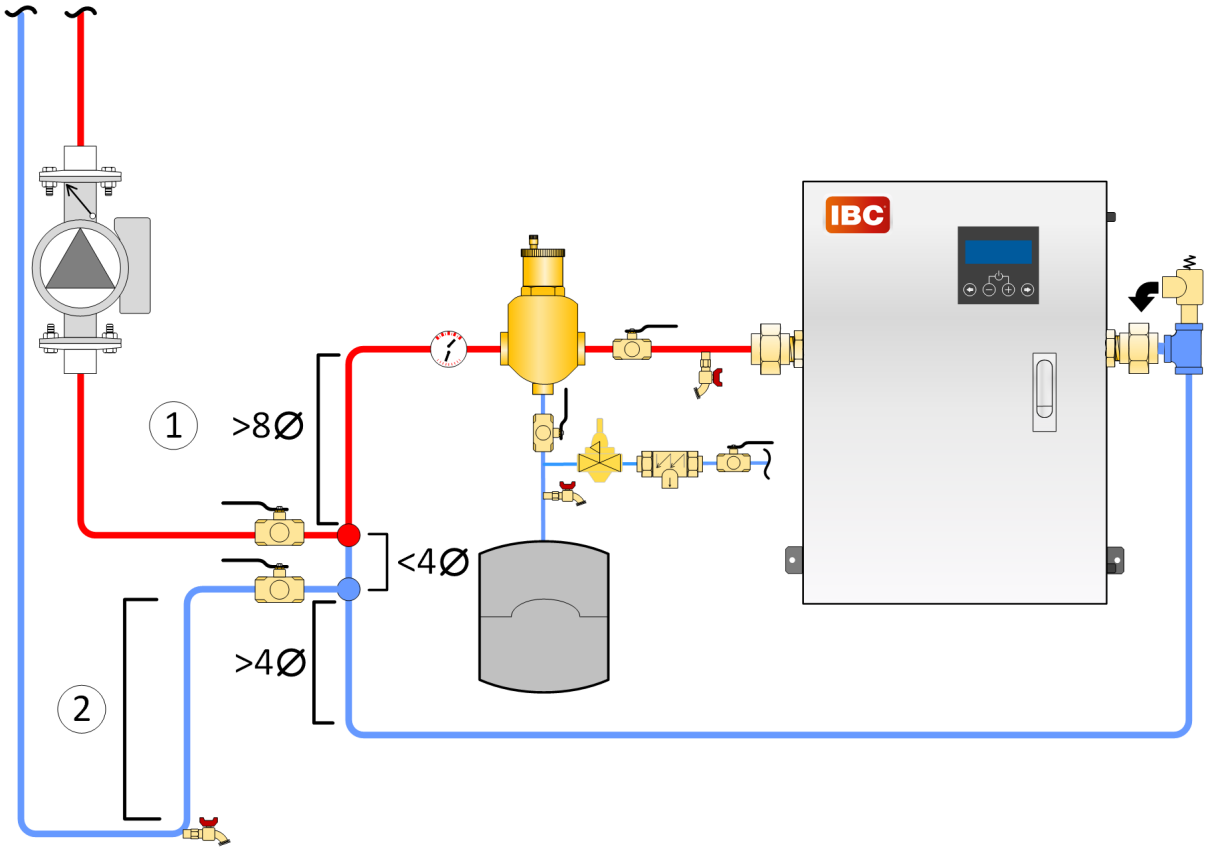
In areas where water quality is in question, or when chemical treatment or glycol is required, other options should be considered. Today there are a number of boiler feed and pressurization devices on the market that may be a better choice than a raw water fill from the mains. When regular maintenance requires relief valve blow-off, the discharge may be directed back into the pressurization appliance for recycling of boiler fluid and chemicals back into the system. In buildings that may be unoccupied for long periods of time, pressurization appliances are useful to prevent flood damage should leakage occur from any component in the system. An additional benefit is that backflow prevention devices are not required when using these devices.

To avoid damage to controls, do not place any water connections above the boiler . If needed, create a shield over the top of the cover, but allow clearance for airflow and service access.

6.11.0.1 Primary-Secondary piping

For best results, use a primary/secondary piping system, with a pumped boiler loop using 1" or 1¼" piping. Primary/Secondary piping ensures adequate flow and de-couples ΔT issues (boiler vs. distribution). Aim for a 10-20°F ΔT (6-11°C) across the boiler at full output.

Check valves or thermal traps should be used to isolate both the supply and return piping for each load - to avoid thermal siphoning and reverse flow.



1 Closely-spaced tees: Install tees a maximum of four pipe diameters apart with no restrictions between fittings, and with a minimum of eight pipe diameters of straight piping upstream of the first tee and a minimum of four pipe diameters of straight piping downstream of the second tee.

2 Heat Migration—on secondary loops that extend vertically to a load that is above the primary loop, steps must be taken such as fabricating a thermal trap in the return piping –minimum 18" (46cm) drop– to prevent thermal siphoning and heat migration to the load when there is no demand for heat to that loop. Alternatively, use check valves on both supply and return of secondary piping.

Figure 8 *Primary-secondary piping details with closely-spaced tees*

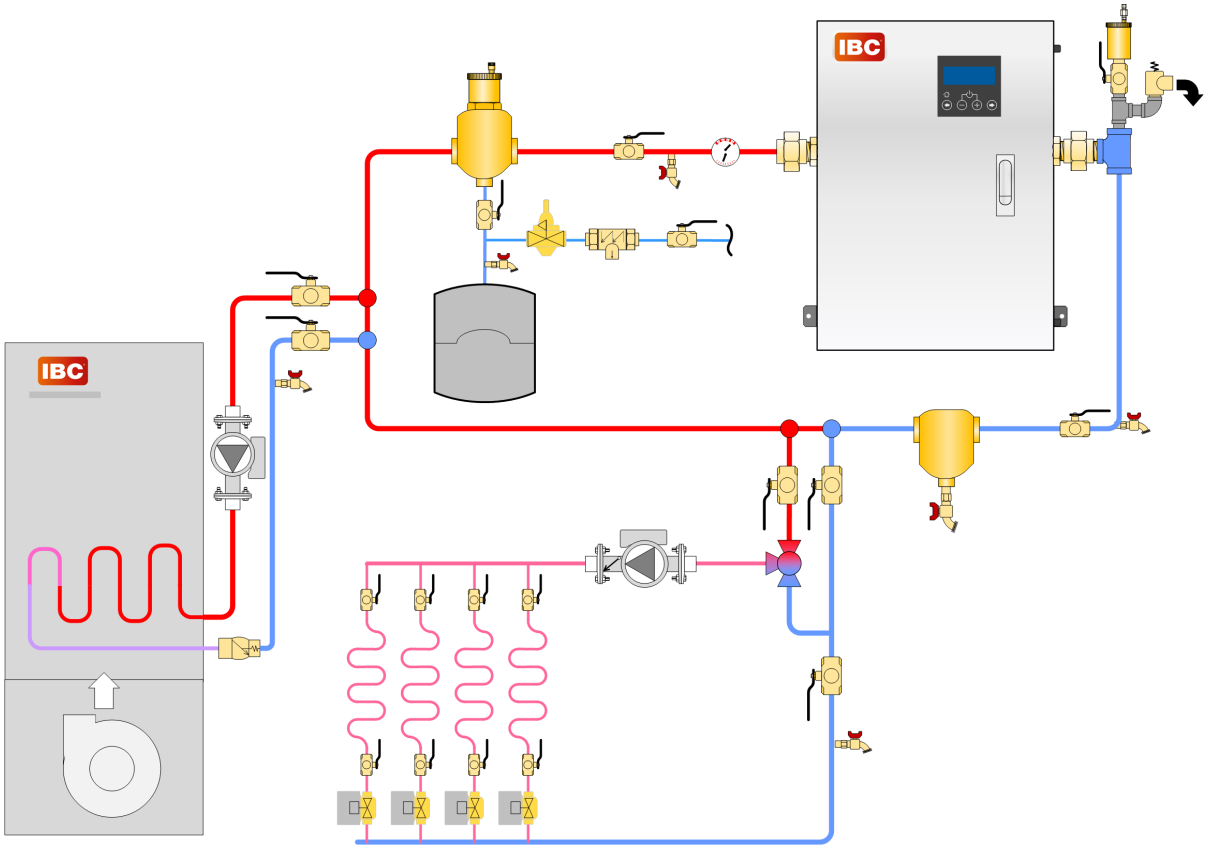
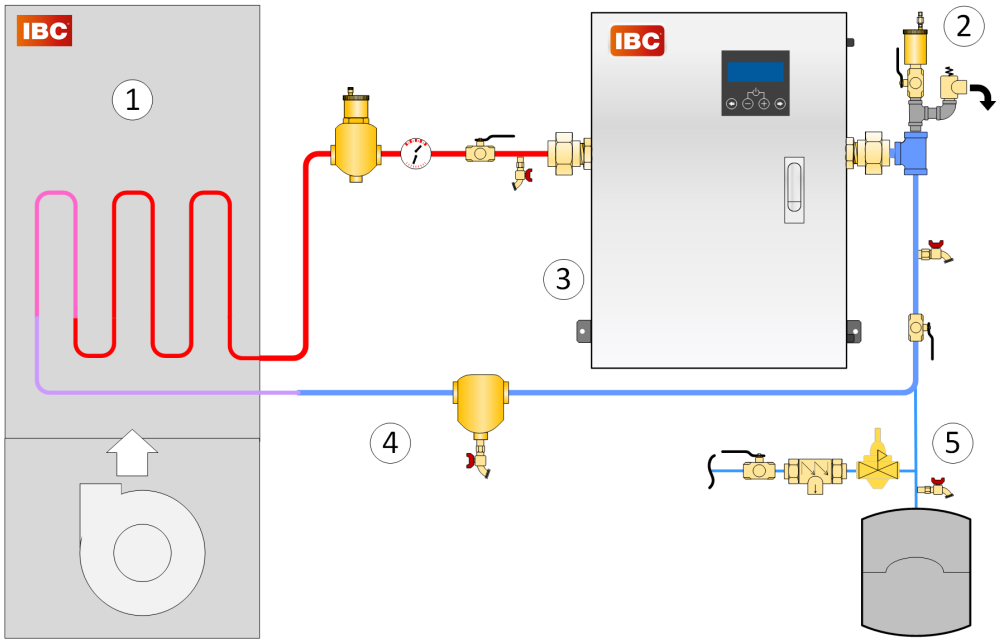


Figure 9 *Primary-secondary piping with simultaneous heating calls*

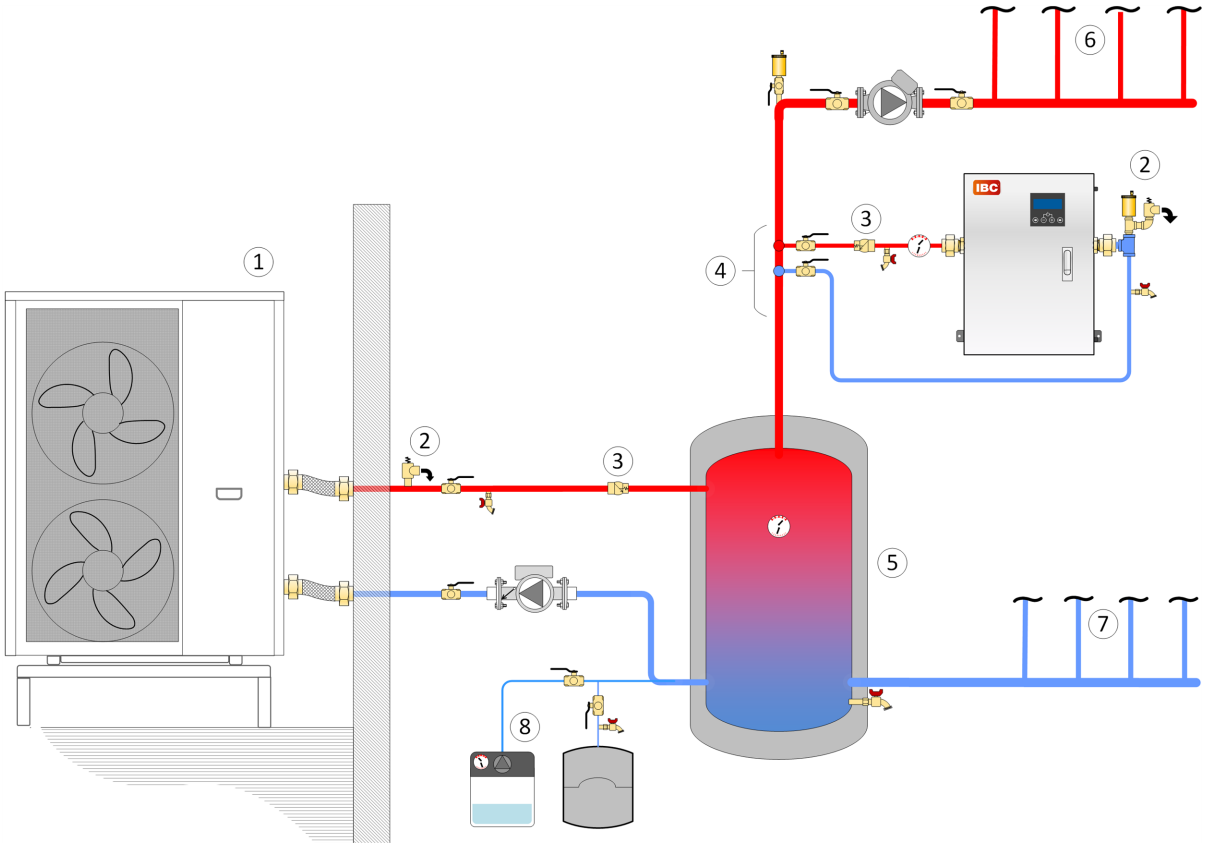
The boilers can supply multiple heating loads with compatible supply temperature requirements. Always ensure that loads sensitive to high temperatures are protected using means such as mixing valves.



1	Air handler with low head loss coil
2	Pressure relief valve—no isolation valve between relief and boiler
3	Pump integral to boiler must be verified capable of overcoming combined pressure drops of boiler, system piping, and air handler coil
4	Dirt separator recommended where water quality is unknown
5	Expansion tank connection point between air handler coil and boiler inlet

Figure 10 *One load direct piping concept*

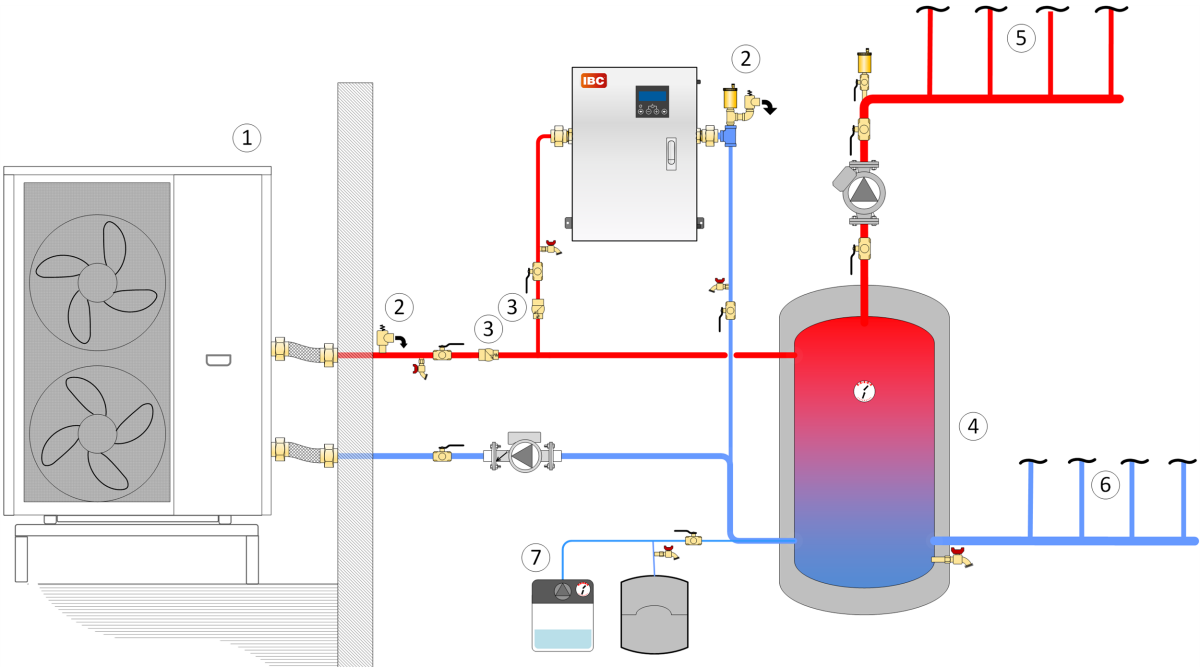
EBX boilers can supply 'top-up' heat for a primary heat source, such as a heat pump as shown below. The call for backup may come from the primary source, or from third-party controls.



1	Heat Pump boiler (shown without integral pump)
2	Relief valve
3	Check valves
4	Closely-spaced tees
5	Generously sized buffer tank connections hydraulically separate heat pump from loads
6	Supply manifold
7	Return manifold
8	Glycol fill tank

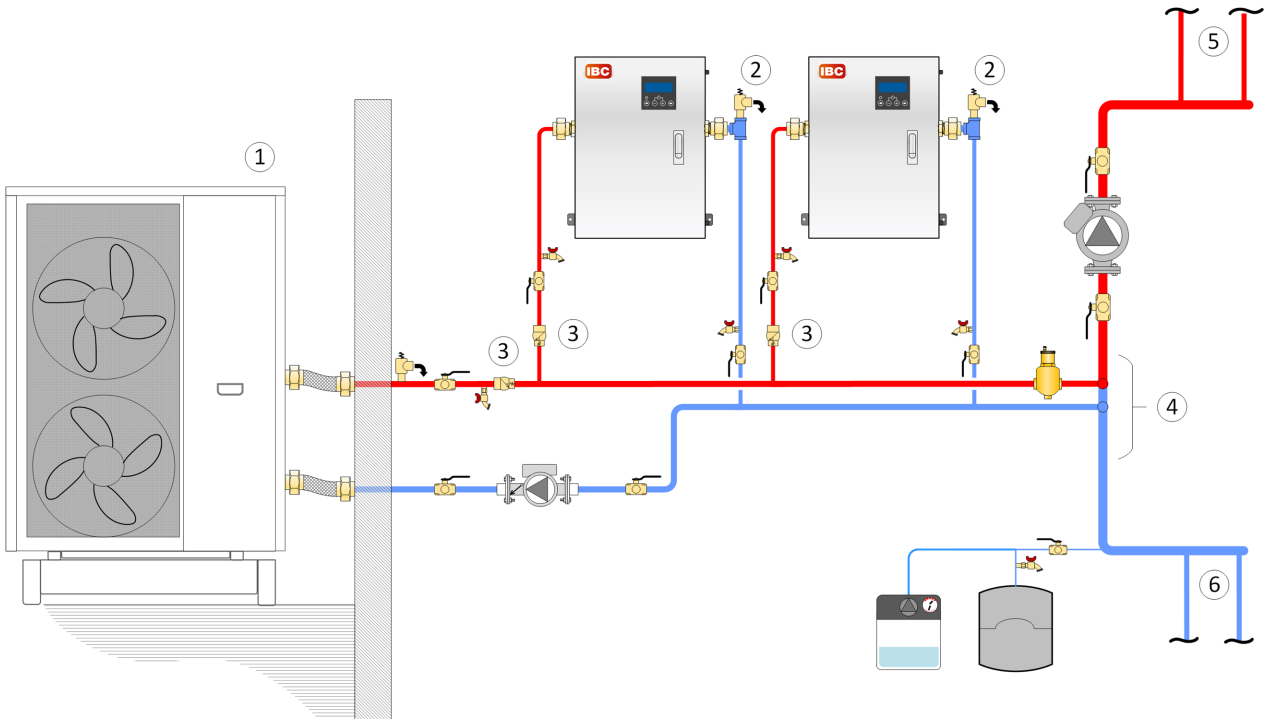
Figure 11 *Heat pump boiler and backup EBX*

The following drawing allows the designer to benefit from electric utility variable rates and for example have an EBX boiler raise the buffer tank temperature overnight:



1	Heat Pump boiler (shown without integral pump)
2	Relief valve
3	Check valves
4	Generously sized buffer tank connections hydraulically separate heat pump from loads
5	Supply manifold
6	Return manifold

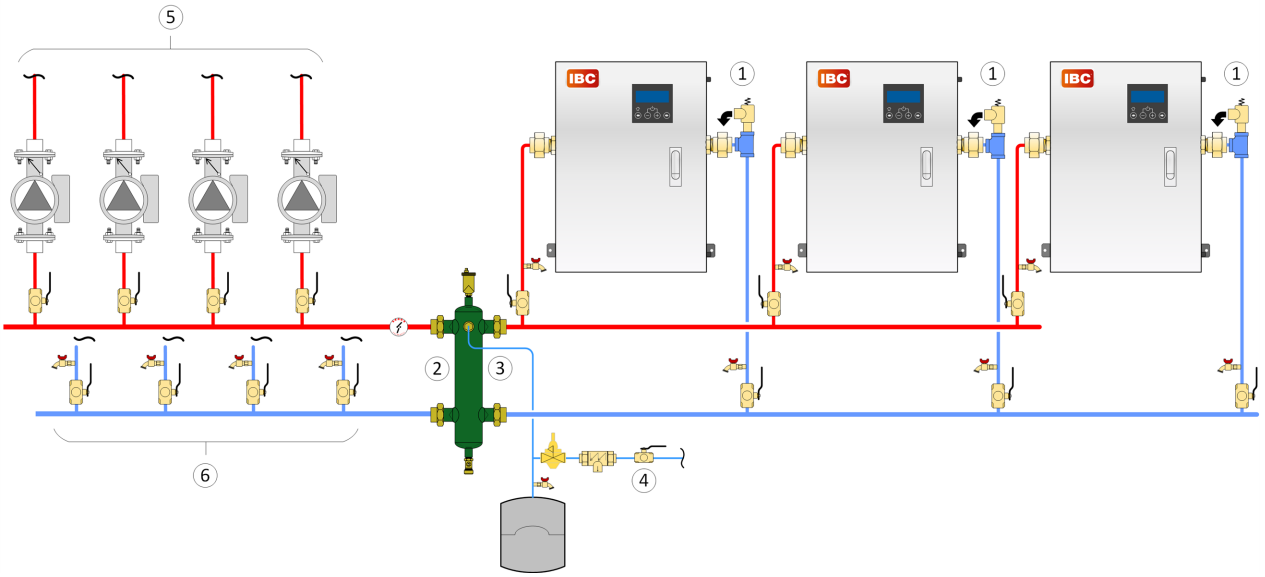
Figure 12 *Heat pump boiler and backup EBX serving heat loads through a buffer tank--variable metering option*



1	Heat Pump boiler; system fluid circulates outdoors so typically requires glycol treatment.
2	Electric boilers staged to supplement heat pump below system balance point.
3	Check Valves
4	Closely-spaced tees are a maximum of four pipe diameters apart, with a minimum of eight pipe diameters of straight piping upstream of the first tee and a minimum of four pipe diameters of straight piping downstream of the second tee.
5	Supply to Heating System: heat pump piping without buffer tank requires that every zone have a large thermal mass.
6	Return from Heating System: see above.

Figure 13 *Multiple boiler piping*

Multiple-boiler installations will require an external controller .



1	Pressure relief valve (shipped with boiler): no isolation valve permitted between boiler and relief valve
2	Hydraulic separator
3	Recommended expansion tank connection point
4	Fill station with isolation valve closed, or fill tank
5	Supply piping to loads
6	Returns to loads

Figure 14 *Primary-Secondary multiboiler piping concept with hydraulic separator*

6.12 Electrical connections

All electrical wiring to the boiler (including grounding) must conform to local electrical codes and/or to the National Electrical Code, ANS/NFPA No. 70 – latest edition, or to the Canadian Electrical Code, C22.1 - Part 1.

Warning

CAUTION: A.C. ONLY, USE COPPER WIRE ONLY. DO NOT USE ALUMINUM

6.12.1 Power management, quality and electrical protection

In areas of unreliable power, appropriate surge protectors and or power conditioning equipment should be installed in power supply wiring circuits.

Note

The IBC boiler (like any modern appliance that contains electronic equipment) must have a “clean” power supply, and is susceptible to power surges and spikes, lightning strikes and other forms of severe electrical “noise”. Power conditioning equipment (surge protectors) may be required in areas where power quality is suspect.

In temporary or manual operation, for example in new construction heating, use a construction thermostat or jumper with an in-line switch for on/off management of the boiler. **Do not** turn off the heat by removing power to the boiler as this interrupts the pump post-purge.

6.12.2 240VAC line-voltage hook-up

Line-voltage wiring is done within the field-wiring box (see *Wiring diagrams on page 1*). Connect the boiler to the grid power using a separate, fused circuit and on/off switch within sight of the boiler. Use appropriately-sized wire in conduit or metallic sheath properly anchored to the boiler case for mains supply and pump circuits.

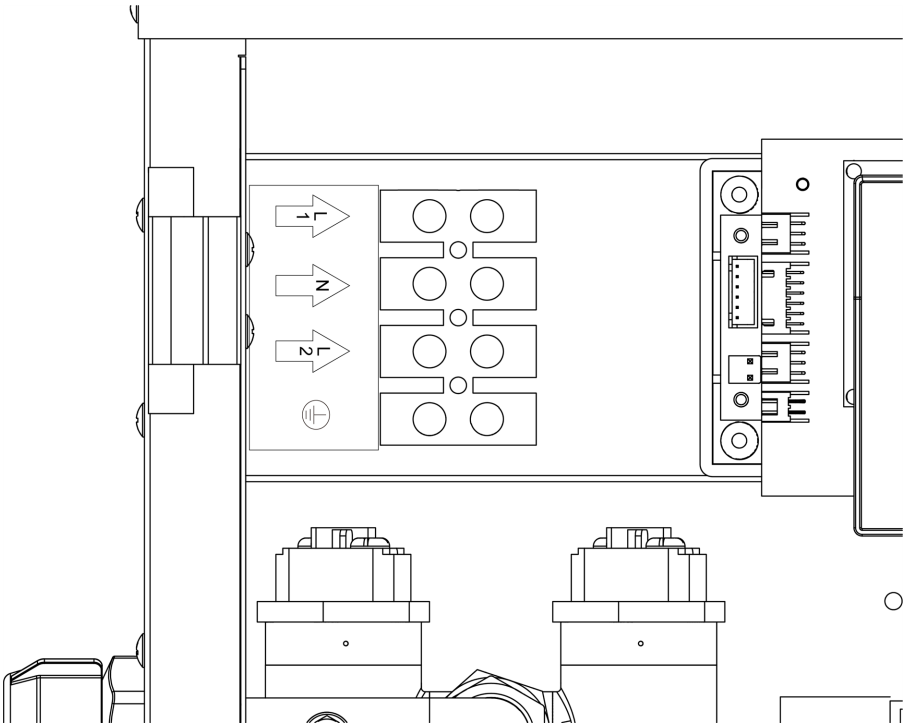


Figure 15 *Line voltage load pump terminals*

The Neutral connection is necessary for 120V operation of the boiler pump.

6.12.3 Boiler pump

The boiler pump is factory installed and wired. It has three speeds to choose from. The installer may adjust the speed setting to best match the system requirements. See section 3.8 for boiler pump curve chart.

6.12.4 Thermostat wiring

Thermostat-type control wiring will go to the three terminals of the CN2 block; these are labeled "VAC24-R / VAC24-W / VAC24-C"). Closing a dry contact between terminals 1 and 2 (VAC24-R & W) initiates a call for heat.

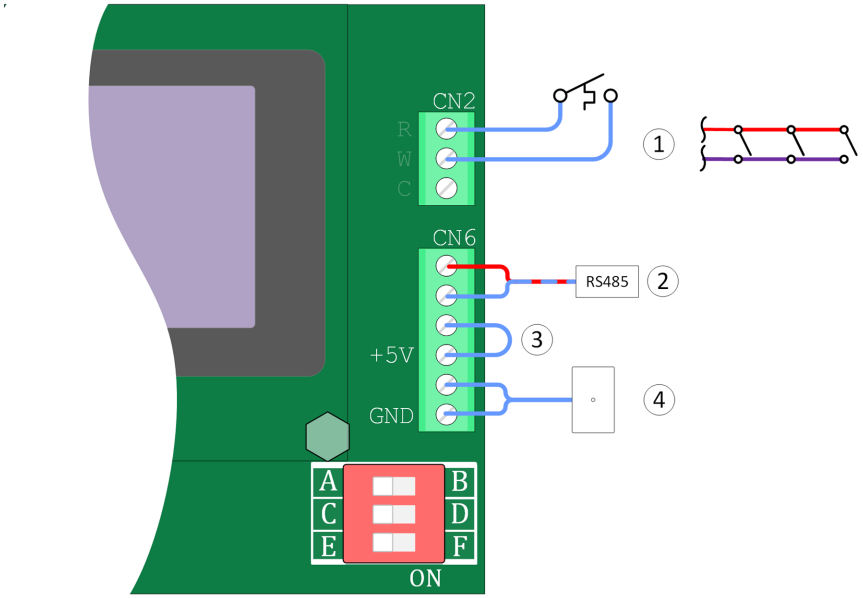
For a load with multiple zones (e.g. thermostats controlling zone valves), wiring the end-switches of each zone valve in parallel to terminals 1 and 2 presents a common thermostat signal to the controller.

Ensure that there are no disturbing influences on the call-for-heat lines - for example, that there are no coils to switch an air handler motor. Most power stealing thermostats can be connected directly to the CN2 terminals.

6.12.5 Other wiring

Other optional low voltage connections to the control board include:

- An auxiliary Interlock at CN6 terminals 3 & 4- for external safety devices as may be required by some jurisdictions, such as an external low-water cutoff.
- Contacts for outdoor temperature sensor associated with reset heating at CN6 terminals 5 & 6. A 10K ohm sensor for outdoor reset feature is sold separately as IBC part P-9067.



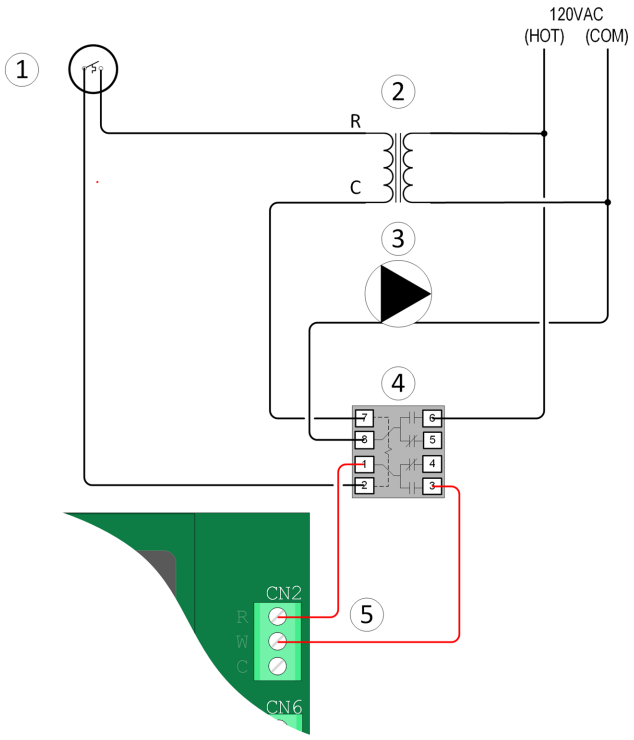
1	Thermostat, or zone valve endswitches parallel-wired (three shown)
2	RS485 connection for MODBus control*: see ibcboiler.com for more details
3	Jumper, or to dry contact on external safety device (interlock)
4	Outdoor temperature sensor, located on North exterior of building

*The dipswitches set MODBus addresses only and do not affect normal operation.

Figure 16 *Thermostat, interlock and outdoor sensor field wiring*

6.12.6 Load pump wiring

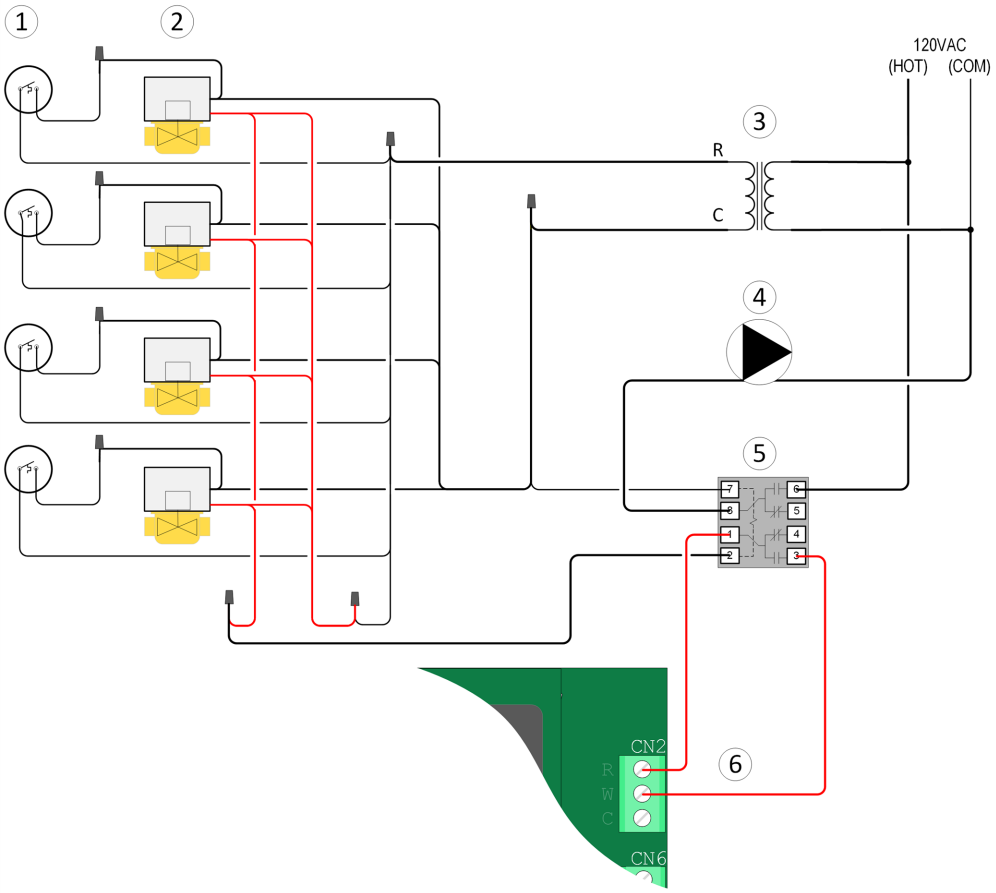
The EBX-series does not control load pumps. IBC recommends for load pump control either its Sky 35 controller, a third-party pump module , or field-wiring a double-pole relay, as shown here:



1	Thermostat
2	24V Transformer
3	Space-heating pump
4	24V double pole relay: can be DPDT (shown) or DPST
5	Call for heat to boiler CN2 terminals 1 and 2

Figure 17 *Load pump relay field-wiring*

This wiring can be expanded to use multiple zone valves, as shown here:



1	Thermostats
2	Zone valves (four-wire type shown; 3-wire also applicable here)
3	40VA Transformer; typically adequate for up to four zone valves
4	Space-heating pump
5	24V double pole relay: can be DPDT (shown) or DPST
6	Call for heat to boiler CN2 terminals 1 and 2

Figure 18 *Load pump relay field-wiring with zone valves*

Alternatively, using a pressure-activated load pump may make pump control unnecessary.

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7.0 About the boiler controller

> **Note**
>
> Use a finger to interact with the controller buttons.

The controller provides:

- Home Page display of the Target, Outlet and Inlet temperatures
- Status Page displaying Output power (in %)
- Set-Point temperature regulation
- Easy-to-set Outdoor Reset control
- Heat Enable from Thermostat
- Error Message Reporting
- Warning Message Reporting
- Unit selection for °F or °C

7.1 Controller

When the boiler is first energized, the controller will go through a brief power up sequence. During this time the controller is completing a self-diagnostic and loading all previous settings. In the event of a power interruption the boiler will automatically resume operation when power is restored with all the previously stored values.

The controller provides overall management of the boiler operations including:

- Power-up and self-diagnostics
- Safety management systems, call-for-heat management
- Real time boiler data
- Temperature and throttle operation. The variable power level will be based on the flow rate measured and the required outlet temperature.

Figure 19 *Controller screen and navigation buttons*

7.2 Control interface

The control interface is provided through four navigation buttons which respond to a light finger touch, and a display screen.

Prior to any interaction with the control, the Home Page shows the current boiler status.

The control has three levels:

1. Home Menu
    - Status: Ready, Heating, Circulating, Warning or Error
    - Target [temperature]
    - Outlet [temperature]
    - Inlet [temperature]

Figure 20 *Controller Home screen*

2. Settings Menu
    - Setpoint T.
        - range: 68°F to190°F (20°C to 88°C)
        - default: 120°F (48.9°C)
    - Outdoor Design T.
        - range: -31°F to 59°F (-35°C to 15°C)
        - default: 10°F (-12.2°C)
    - Heat Type: Setpoint (SET) or Outdoor Reset (ODR)
    - Units: °F/°C

- Summer Shutdown
  - range: 50°F to 104°F (10°C to 40°C)
  - default: 65°F (18.3°C)
  - Status is ON in ODR mode
- Post-Purge Time: pump will run set number of seconds after a call

3. Status Menu
   - Outlet [Temperature]
   - Inlet [Temperature]
   - Outdoor [Temperature]
   - Power % (current output)
   - Faults and Warnings: press Enter for code with plain language description.
     - For warning codes see *Troubleshooting error messages on page 1*

Figure 21 *Controller Status screen*

The control automatically returns next higher level in 1 minute if no button has been touched.

If the controller is in an error state, the Error Code and an explanatory text will be displayed.

If the controller has a warning to declare, the screen will rotate between the Home Screen and the Warning(s), each displayed for 10 seconds. Warnings do not prevent operation.

7.2.1 Heat Types

The EBX-series controller can be programmed for either of two Heat Types: Setpoint (SET) and Outdoor Reset (ODR).

Note that if an outdoor sensor is connected and reports a temperature above the setting *Summer Shutdown*, the boiler will not fire: it will stay in Ready mode and report *E3: Summer Shutdown*.

7.2.1.1 Setpoint (SET)

When *Heat Type* is defined as *Setpoint*, the setting *Setpoint T*is the water temperature the boiler will target during a call for heat.

7.2.1.2 Outdoor Reset (ODR)

Outdoor Reset is a water temperature strategy for optimizing end-user comfort and building power consumption. Outdoor reset modulates the water target temperature according to the outdoor temperature, reserving the hottest water for the coldest weather.

When *Heat Type* is set to *ODR*, the controller needs only two variables defined: *Setpoint T* for the hottest water and *Outdoor Design T* for the local climate's winter temperature. The graphs below sample four Outdoor Design Temperatures to show how the target temperature tracks building heat loss over a heating season.

For ODR mode, an outdoor sensor is necessary (IBC part P-9067 sold separately). The sensor must be mounted on the North face of the building , unaffected by heat sources, and above the anticipated snow line.

If the boiler is in Outdoor Reset mode but an outdoor sensor is not attached, the boiler will operate but flash a warning: see *Troubleshooting warning messages on page 59*.

7.2.1.3 Sample ODR Temperatures: Imperial units

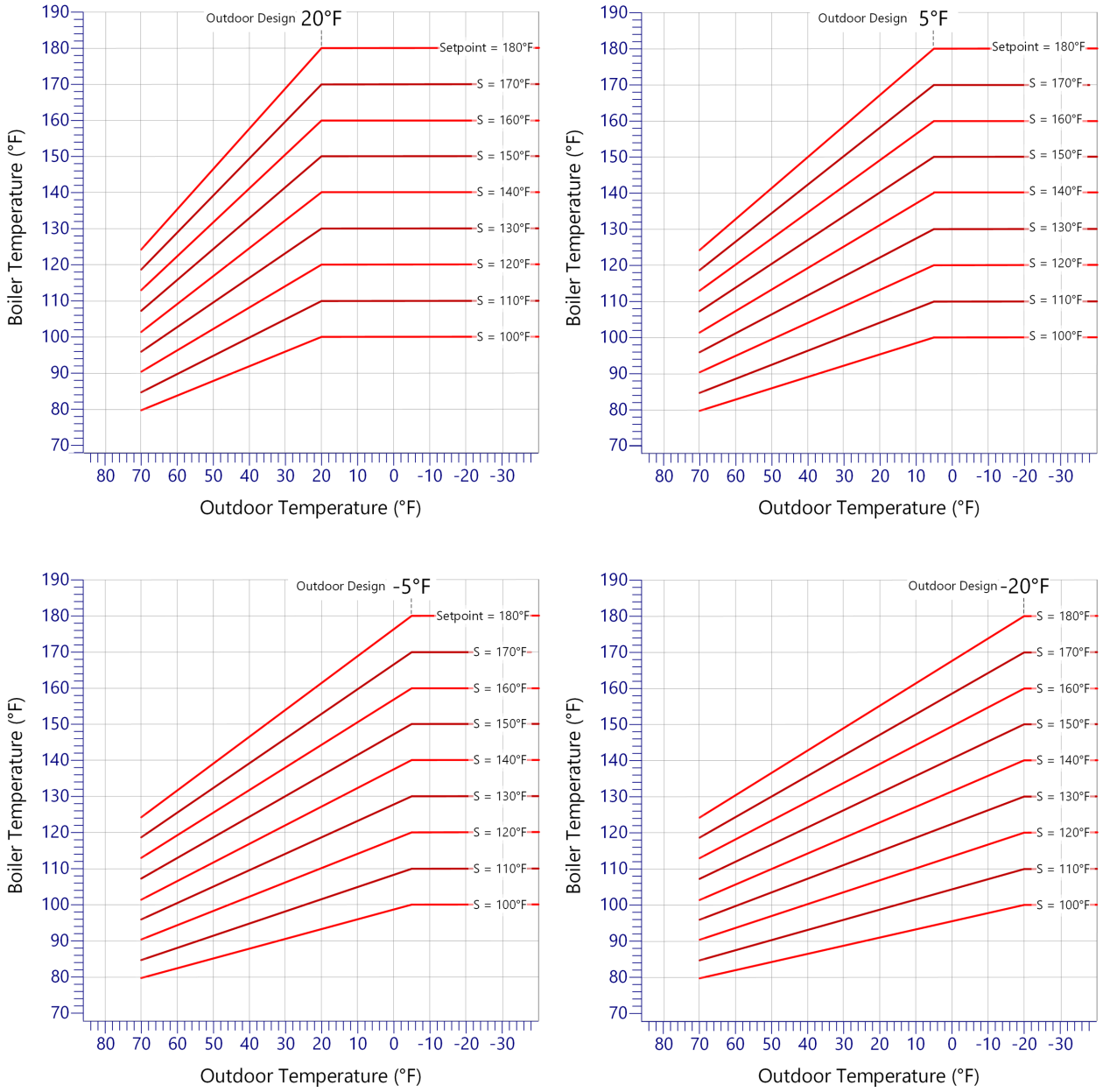

Figure 22 *Outdoor reset lines for sample Outdoor Design Temperatures and Setpoints in Imperial units 100°F-180°F*

7.2.1.4 Sample ODR Temperatures: Metric units

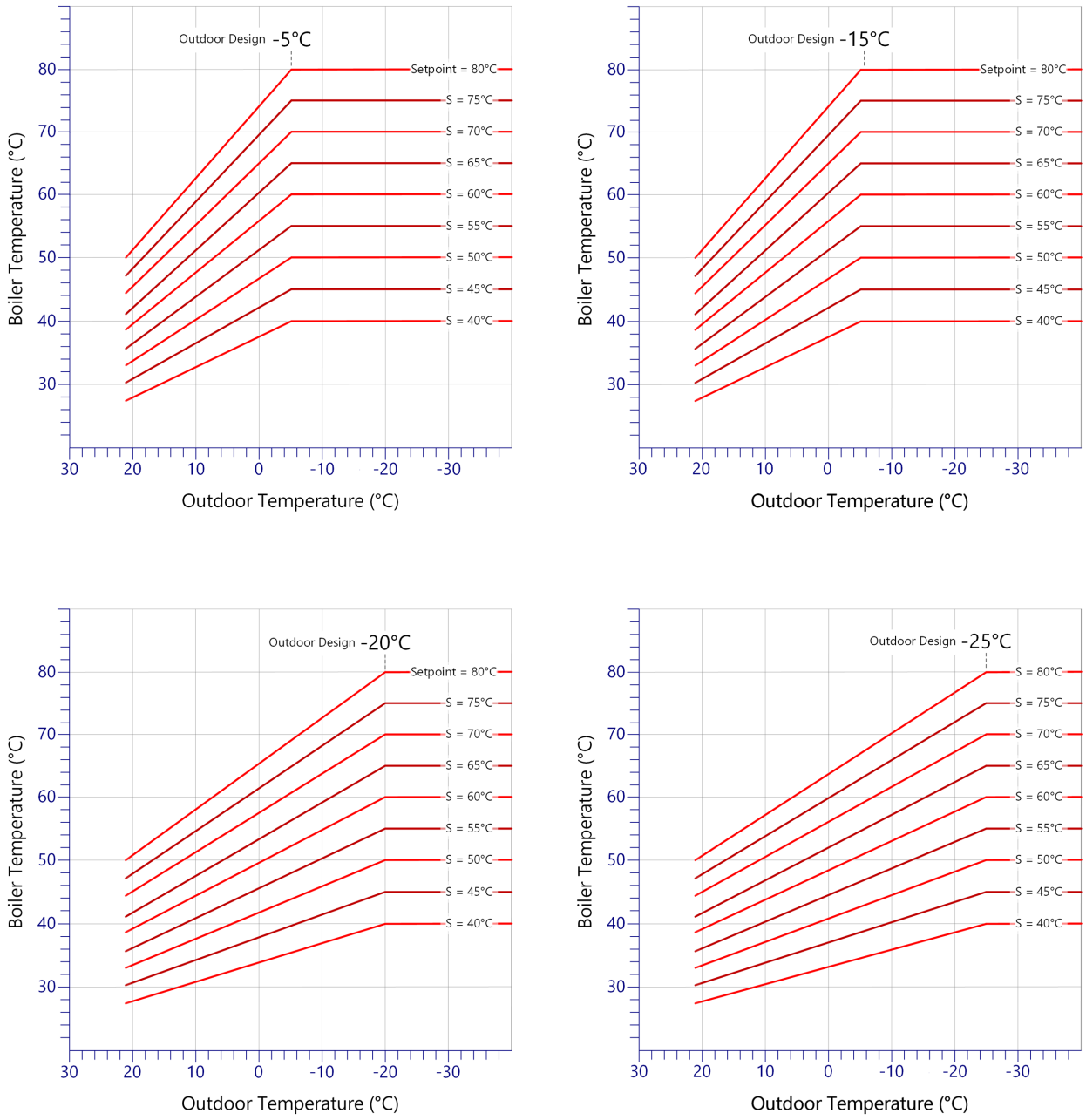

Figure 23 *Outdoor reset lines for sample Outdoor Design Temperatures and Setpoints in Metric units 40°F-80°C*

8.0 Before operating the boiler

Danger

Do not store or use gasoline or other flammable vapors or liquids in the vicinity of this or any other appliance. If you smell gas vapors, do not try to operate any appliance - do not touch any electrical switch or use any phone in the building.

Do not use this boiler if any part has been under water. Immediately call a qualified service technician to inspect the boiler and to replace any part of the system that has been under water.

Checklist for electrical conditions and water connections

Checking electrical conditions	Check
Check all line voltage electrical connections to ensure all connections are correct and tight.	☐
Check thermostat connections.	☐
Thermostat in a suitable location.	☐

Checking piping connections	Check
All connections are pressure tested and leak free.	☐
All piping flushed to ensure all air is removed.	☐

Powering on the boiler	Check
Perform a final check of electrical wiring, and provide power to the boiler to initialize operation.	☐

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9.0 Boiler operation

Before operating the appliance, there are some important checks that need to be performed. For more information, see *Before operating the boiler on page 47*.

9.1 Starting and shutting down the boiler

Start-up Checklist	Check
With the boiler power turned off, check that all electrical connections are tight.	☐
Check with a gauge that the system pressure is stable and appropriate for the application: at all times it should be between 8 psi and 50 psi.	☐
A pressure relief valve must be installed on the system. A 30 psi relief valve is supplied.	☐
Perform a thorough visual check for any leaks or signs of corrosion.	☐

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10.0 Service and maintenance

Inspection of the boiler is to be performed annually by a qualified service technician.

Caution

The owner is responsible for general care of the boiler. Improper maintenance of the boiler may result in a hazardous condition.

10.1 Maintenance checklist for homeowner

Maintenance Required	Frequency	Check
Inspect system for unusual noises. Call your local heating contractor for service if needed	As needed	☐
Keep combustible materials and flammable liquids and vapors away from the boiler.	As needed	☐
Inspection of the boiler is to be performed annually by a qualified service technician.	Annually	☐

Caution

Label all wires prior to disconnection when servicing controls. Wiring errors can cause improper and dangerous operation.

10.2 Replacing the elements

Heating elements come in sizes 2kW for the EBX4K-240, 4kW for the EBX8K-240, 5kW for the EBX10K-240, and 6kW for the EBX12K-240. The elements can be replaced only by models of identical wattage.

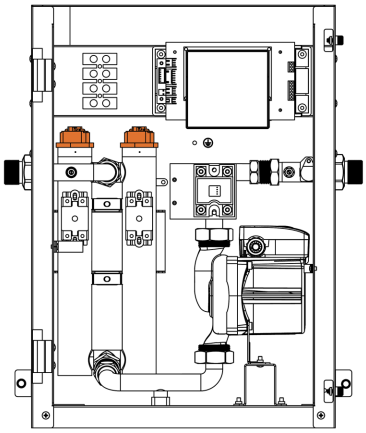


Figure 24 *Element hex heads*

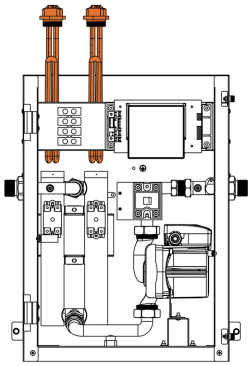
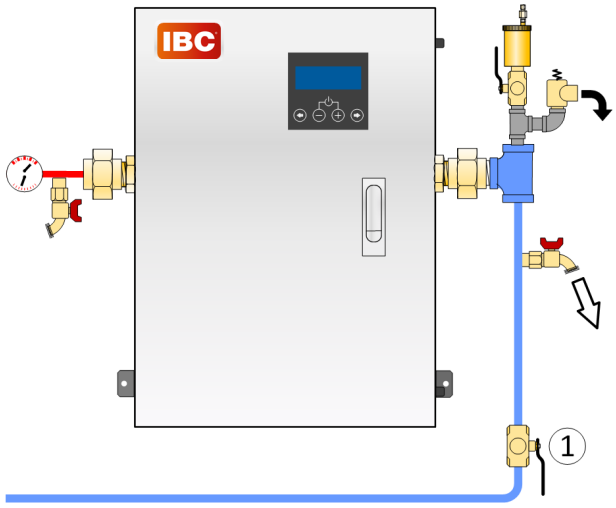


Figure 25 *Unscrew and lift out elements*

1. Power off boiler and open cabinet door.
2. Close the water isolation valves and drain the boiler.
3. Remove and set aside the four screws of the cabinet lid. Remove the cabinet lid.
4. Label the element wires and disconnect them.
5. Unscrew the elements from the heat exchanger and lift straight upwards to remove.
6. Reassemble in reverse order.

10.3 Cleaning the mesh filter



① Valve closed during flushing (boiler powered off).

Figure 26 *Back-flushing to clean mesh filter*

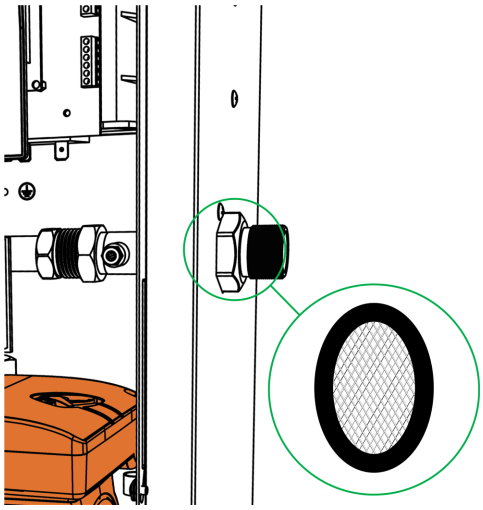


Figure 27 *Inlet water connection-mesh filter inside*

To clean filter, back-flush with the fittings shown above in *Figure 26* . Alternatively, remove the filter to clean it:

1. Power off boiler and open cabinet door.
2. Close the water isolation valves and drain the boiler.
3. Undo the union on the inlet connection.
    a. If a union is not present, install one for future maintenance, or consider replacing the inlet mesh filter with a serviceable strainer on the exterior of the boiler, such as IBC's P-913 (for horizontal piping).
4. The mesh filter sits approximately one inch inside the inlet pipe: a rubber gasket holds it in place by friction. Remove filter carefully with tweezers.
5. Flush the filter clean with water.
6. Reassemble in reverse order.

10.4 Replacing the pump

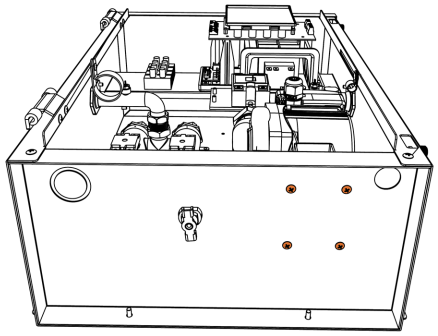


Figure 28 *Remove bracket screws*

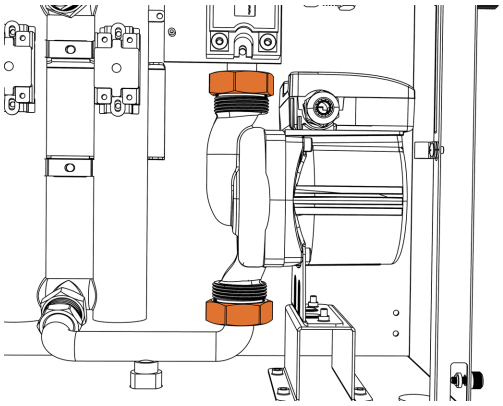


Figure 29 *Undo pump unions*

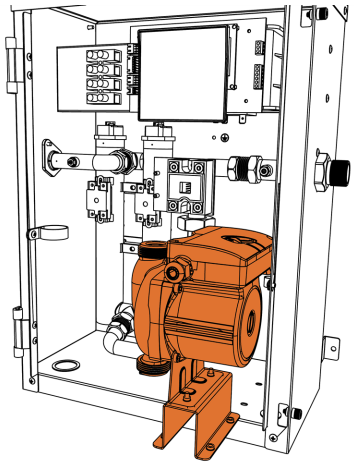


Figure 30 *Pull pump forward to disconnect wiring.*

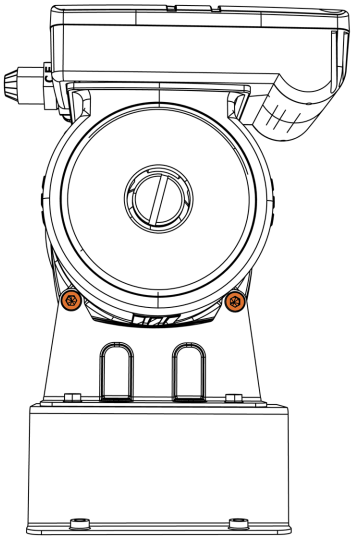


Figure 31 *Remove bolts holding pump to bracket. Re-use bracket.*

1. Power off boiler and open cabinet door.
2. Close the water isolation valves and drain the boiler.
3. Remove the four screws to the pump bracket on the cabinet underside.

4. Undo the two union nuts on the pump volute.
5. Slide the pump on its bracket forward enough to access the wiring box: prevent the pump from falling forward and pulling on its wiring harness.
6. Disconnect the wiring harness.
7. Remove the pump and bracket. Inspect gaskets carefully, or replace.
8. Remove the bolts holding the pump to the bracket and transfer the bracket to the new pump.
9. Reassemble in reverse order.

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11.0 Troubleshooting

This section includes various conditions as well as possible solutions. Often, a problem can be identified and solved through basic checks: confirming the electrical power supply and resetting the thermostat control. Below are some common troubleshooting issues including fixes.

1. Preliminary Checks
    a. Confirm power to the boiler: check that the display is lit.
    b. Check that the boiler is not in a safety lockout.
    c. Ensure wiring is clean and secure.
    d. Confirm that the water pressure is within specifications.
2. Electronics Components Checks
    a. See sections on checking the status of various control circuit components such as:
        i. Temperature sensors
        ii. Water flow sensor
        iii. Water high limit switch
3. Symptoms, Diagnoses and Fixes
    a. See sections covering diagnoses and fixes including:
        i. Cycling
        ii. Temperature
        iii. Miscellaneous

11.1 Electronic components

This section details the method for troubleshooting the non-standard electronic components on the boiler.

11.1.1 Temperature sensors

The resistance of the temperature sensors varies inversely with temperature. To test, measure the temperature of the sensed environment and compare with the value derived from the measurement of the resistance (obtained by connecting a good quality test meter capable of measuring up to 5,000 kΩ (5,000,000Ω) at the controller end of the sensor lead).

To obtain a resistance reading, remove power to the boiler. For the supply water and return water temperature sensors, remove the wire leads by disconnecting their respective Molex connectors. Place multi-meter probes into the sensor's female Molex connector socket. Do not apply voltage to the sensor as damage may result.

Temp. °F/°C	Resist. Ω – Ohm	Temp. °F/°C	Resist. Ω – Ohm
0 / -18	85,362	100 / 38	5,828
5 / -15	72,918	105 / 41	5,210
10 / -12	62,465	110 / 43	4,665
15 / -9	53,658	115 / 46	4,184
20 / -7	42,218	120 / 49	3,760
25 / -4	39,913	125 / 52	3,383
30 / -1	34,558	130 / 54	3,050
35 / 2	29,996	135 / 57	2,754
40 / 4	26,099	140 / 60	2,490
45 / 7	22,763	145 / 63	2,255
50 / 10	19,900	150 / 66	2,045
55 / 13	17,436	155 / 68	1,857
60 / 16	15,311	160 / 71	1,689
65 / 18	13,474	165 / 74	1,538
70 / 21	11,883	170 / 77	1,403
75 / 24	10,501	175 / 79	1,281
80 / 27	9,299	180 / 82	1,172
85 / 29	8,250	185 / 85	1,073
90 / 35	7,334	190 / 88	983
95 / 35	6,532	195 / 91	903

Table 5 *Outdoor temperature sensor resistance values - 10K ohms*

11.2 Troubleshooting error messages

ERROR MESSAGES	
Error	**Comment**
Over temperature limit	Outlet Temperature ≥ 200°F (88°C); auto reset at 190°F (82°C)
No flow	Flow of 0 gpm for 1 min after pump is started If temperature rise and operation sound give evidence of no flow: • inspect for fouled inlet filter or other constriction • purge air through boiler (see ① in *Figure 7*) • use access hole (right cabinet) to remove air through pump bleed valve • if necessary remove pump cap and exercise volute • test for failed pump If temperature rise and operation sound give evidence of flow that is not recognized by the sensor, treat as a fouled flow sensor.
Temp Sensor Inlet	Inlet Negative Temperature Coefficient (NTC) sensor is open or closed
Temp Sensor Outlet	Outlet NTC sensor is open or closed
Temp Sensor Outdoor	Outdoor NTC sensor is open or closed
Interlock Open	An external safety dry contact may be tied into CN6 block terminals 3 & 4 (labeled INTLCK A / B). A jumper must be installed if an external interlock is not required.
MODbus Error	Displayed after successful MODbus communication has stopped for two continuous minutes. Error must be cleared by a power cycle to boiler.

11.3 Troubleshooting warning messages

WARNING MESSAGES	
Warning Description	**Comment**
Low Water Flow	Water flow is read as below 0.5 gpm (1.9 lps). • inspect for fouled inlet filter or other constriction • purge air through boiler (see ① in *Figure 7*)

WARNING MESSAGES	
Warning Description	**Comment**
Open Outdoor Sensor	Active only for ODR heating mode. If outdoor sensor is open controller presumes a temperature of 32°F (0°C)
Summer Shutdown	Current outdoor temperature has exceeded programmed Design Temperature

11.4 Temperature issues

Temperature issues		
Issue	**Diagnosis**	**Fix**
Low heat	Operating temperature too low.	Increase temperature target.
	Load configuration improperly set up.	Review load configuration parameters.
	Boiler undersized.	Refer to Load Calculation vs. Boiler Output.
	Air trapped within system.	Bleed system as required.
	Improper system piping.	Refer to recommended piping guidelines for the respective boiler model.
	System pump undersized.	Check pump manufacturer’s data.
	Defective thermostat.	Refer to manufacturer’s instructions.
	Boiler cycling on operating/ safety controls.	Check operation with Ohmmeter/Voltmeter.
	System radiation undersized.	Check manufacturer’s rating tables for capacity per foot.
Temperature exceeds mercury thermostat setting	Incorrect anticipator setting.	Check with Ammeter.
	Thermostat not level.	Check level.
One or more zones do not heat properly	Air trapped within zone (s) piping	Vent system/zone as required.
	Low radiation/ excessive heat loss.	Check actual length of pipe using radiation / heat loss calculation.
	Low flow rate to zone(s).	Check temperature drop across zone.
	Defective zone valve/ zone circulator.	Check operation per manufacturer’s instructions.

11.5 Miscellaneous issues

Miscellaneous issues		
Issue	**Diagnosis**	**Fix**
'Ghost' call for heat.	Triac or 'Power-robbing' thermostat sending current to boiler.	Remove CN2 connections from boiler to confirm that stray voltage, or current induced in thermostat wiring, is source of nuisance signal. Replace the Power Robbing thermostat or isolate the thermostat with a relay.

11.5.1 Cycling issues

Cycling issues		
Issue	**Diagnosis**	**Fix**
Rapid Cycling	Incorrect settings or defective thermostat.	Check operation. Refer to manufacturer's instructions. Check setting with ammeter.
	Air in system or marginal water flow.	Bleed/purge system as required. Confirm temp rise in the heat exchanger.
	Low water flow due to improper piping.	Review pressure drop of boiler piping.
	Low water flow due to restrictions in water pipe.	Check temperature differential across zone/heat exchanger.
	Low radiation.	Check actual amount of radiation per zone and refer to manufacturer's rating tables.
	Appliance Oversized.	Check load calculation vs. minimum boiler output.
	Improperly set or defective controls.	Check operation with ohmmeter/voltmeter.

Appendices

Wiring diagrams

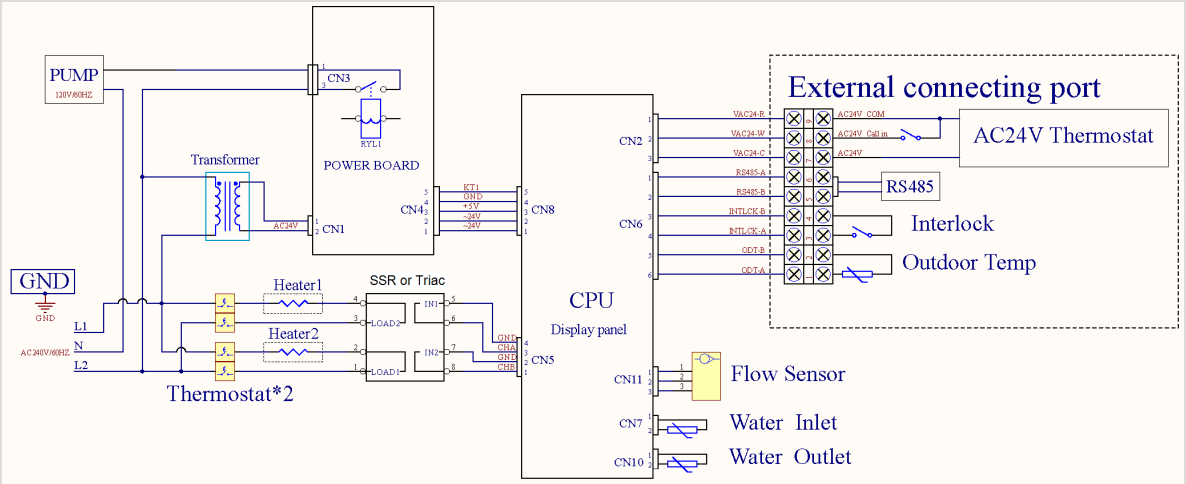
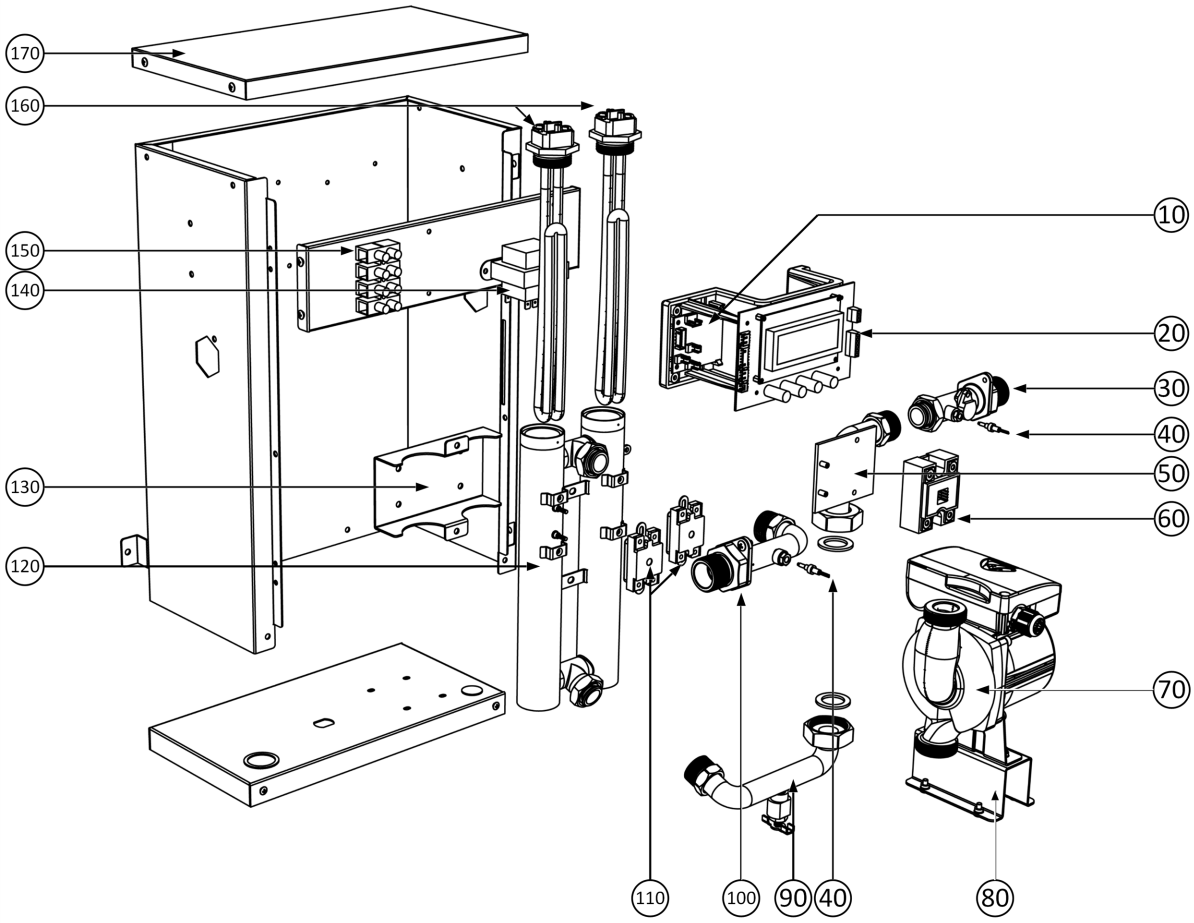


Figure 32 *EBX-series Boilerinternal wiring diagram*

Boiler parts diagram - EBX-series Boiler



Item ID	Description	P-kit replacement #	Quantity
10	Power / Pump Relay Board	P-1700	1
20	Digital Controller Screen / Terminal Assembly	P-1701	1
30	Inlet Water Pipe with Flow Sensor Assembly	P-1702	1
40	Water Temperature Sensor	P-1703	2
50	Inlet Pipe / plate assembly	P-1704	1
60	Modulation control block (Solid State Relay version) *or*	P-1705	1
	Modulation control block (Triac version)	P-1706	

Item ID	Description	P-kit replacement #	Quantity
70	3-Speed 120V Pump (not including bracket)	P-1707	1
80	Pump bracket	P-1708	1
90	Drain Pipe Assembly	P-1709	1
100	Outlet Pipe Assembly	P-1710	1
110	Manual Reset High Limit Switch	P-1711	2
120	Heat Exchanger	P-1712	1
130	Heat Exchanger Bracket	P-1713	1
140	EBX 240V Transformer	P-1714	1
150	Input Power Terminal Strip	P-1715	1
160	**Heating Elements**		
	2kW (EBX4K-240)	P-1716	2
	4kW (EBX8K-240)	P-1717	2
	5kW (EBX10K-240)	P-1718	2
	6kW (EBX12K-240)	P-1719	2
170	Cabinet lid	P-1720	1
	Hardware package (o-rings, screws etc.)	P-1721	
	Wiring harnesses (sold as set; not shown)	P-1722	
	Gasket pack (including inlet filter: sold as set, not shown)	P-1723	

Optional Parts: Description	P-kit replacement #
Outdoor Sensor	P-9067
Mesh filter (exterior installation, 3/4")	P-913
Air Vent Piping Kit	P-195
External Tridicator	P-9014
Boiler Stand	P-267
Pressure Relief Valve: 45 psi	P-9020
Pressure Relief Valve: 50 psi	P-9134

Installation & Commissioning Report

Model Number _____ Serial Number _____

Date of Installation _____ Address of installation _____

User contact information _____

Installer Information (Company & Address)_____

Phone/Fax/E-mail _____

Circuit Breaker # ____ Labeled? ☐

Power supply wire gauge _____

☐Leak testing completed

☐ System Cleaned and Flushed (type of cleaner used) _____

☐ System Filled (type/concentration of any glycol/chemicals used) _____

☐ Air purge completed

☐ Relief Valve correctly installed and piped Relief valve “try lever” test performed

☐ Owner advised and instructed in the safe operation and maintenance of the boiler and system.

☐ Information regarding the appliance and installation received and left with owner

Commissioning has been completed as listed on this report

Installer's Signature _____

The following message is relevant to users in the USA:

Important

This Boiler is equipped with a feature that saves energy by reducing the boiler water temperature as the heating load decreases. This feature is equipped with an override which is provided primarily to permit the use of an external energy management system that serves the same function. THIS OVERRIDE MUST NOT BE USED UNLESS AT LEAST ONE OF THE FOLLOWING CONDITIONS IS TRUE: An external energy management system is installed that reduces the boiler water temperature as the heating load decreases. This boiler is not used for any space heating. This boiler is part of a modular or multiple boiler system having a total input of 300,000 BTU/hr or greater. This boiler is equipped with a tankless coil (not applicable to these boilers). US installers should contact IBC for any further information required.

For Tech Support, call toll-free **1-844-432-8422**. For Technical Information online, scan:

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T604-877-0277
F604-877-0295

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Toll Free: 1-844-HEAT-IBC / 1-844-432-8422
www.ibcboiler.com

Information in this document is subject to change without notice. IBC assumes no responsibility for changes made to the manual due to clerical errors, to regulation changes, or to product development.

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