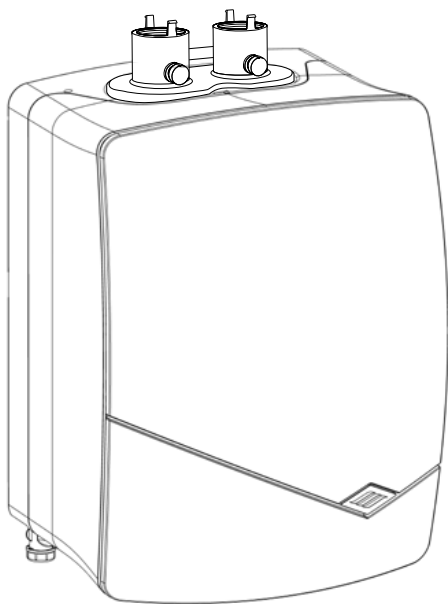




Eco-King

High Efficiency Wall Hung Boiler Installation & Operation Manual

For Models: H100A, H140A, H200A
 C100A, C140A, C200A

WARNING: If the information in these instructions is not followed exactly, a fire or explosion may result causing property damage, personal injury or death.

- Do not store or use gasoline or other flammable vapors and liquids in the vicinity of this or any other appliance.
- **WHAT TO DO IF YOU SMELL GAS**
 - Do not try to light any appliance
 - Do not touch any electrical switch; do not use any phone in your building.
 - Immediately call your gas supplier from a neighbor's phone. Follow the gas supplier's instructions.
 - If you cannot reach a gas supplier, call the fire department.
- Installation and service must be performed by a qualified installer, service agency or the gas supplier.



Conforms to: ANSI Z21.13 / CSA 4.9 - 2017 (R2022);
ANSI Z21.10.3 / CSA 4.3 - 2019



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Section 1 - Important Safety Information

1.1 Hazard Definitions

The following defined terms are used throughout this manual to bring attention to the presence of hazards of various risk levels or to important information concerning the life of the product.



Indicates a hazardous situation that, if not avoided, will result in death or serious injury.



Indicates a hazardous situation that, if not avoided, could result in death or serious injury.



Indicates a hazardous situation that, if not avoided, could result in minor or moderate injury.

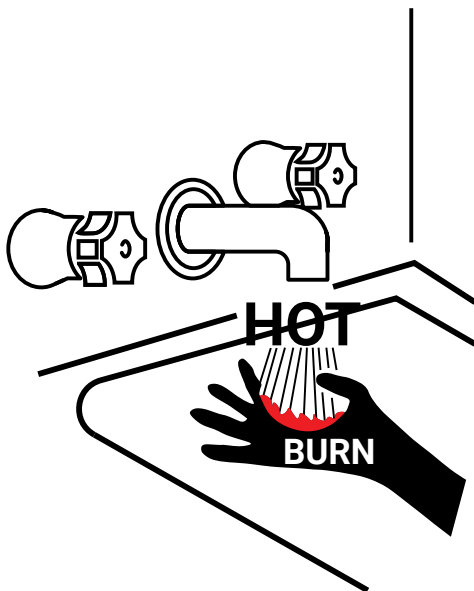


Indicates information considered important, but not hazard-related (e.g. messages relating to property damage).

1.2 General Safety Requirements

The installation of the Eco-King boiler must conform to the requirements of this manual, Local codes or, in the absence of local codes, the National Fuel Gas Code, ANSI Z223.1/NFPA 54 in the US, and CSA B149.1, Natural Gas and Propane Installation Code in Canada;.

Where required by the Authority, the installation must conform to the standard for Controls and Safety Devices for Automatically Fired Boilers ANSI/ASME CSD-1.



Water temperatures over 125°F (52°C) can cause severe burns or scalding resulting in death or severe injury.

Hot water can cause first degree burns with exposure for as little as:

- 1 seconds at 155°F (68°C)
- 1-1/2 seconds at 150°F (66°C)
- 3 seconds at 145°F (63°C)
- 5 seconds at 140°F (60°C)
- 10 seconds at 135°F (57°C)
- 30 seconds at 130°F (54°C)
- 1-1/2 minutes at 125°F (52°C)
- 5 minutes at 120°F (49°C)

Children, disabled, or elderly are at highest risk of being scalded.

Feel water before bathing or showering.

See instructions for setting the water temperature in the installation and operation manual.

DANGER

Should overheating occur or the gas supply fails to shut off, do not turn off or disconnect the electrical supply to the pump. Instead shut off the gas supply at a location external to the appliance.

WARNING

The installer must verify that at least one carbon monoxide alarm has been installed within a residential living space or home following the alarm manufacturer's instructions and applicable local codes before putting the appliance into operation. Failure to do so may result in severe injury or death.

Carefully read and understand this entire manual before attempting installation, start-up, operation, or service. Improper installation, adjustment, modification, service, or maintenance can result in death, severe injury or property damage.

All installation and service must be performed only by a qualified and experienced installer or service agency. Failure to follow the instructions in the correct sequence may lead to death or severe injury. Be sure to read all instructions, including those in the manuals provided by component manufacturers, before beginning installation, maintenance or service on the appliance.

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

If the boiler may be subjected to fluid temperatures below 34°F (1°C), implement a method to prevent condensate from freezing. For additional guidance, contact the factory.

Do not operate the boiler without connecting approved venting in accordance with Section 8 - Venting of this manual. Failure to comply may result in carbon monoxide poisoning or fire causing death, severe injury or property damage.

California Proposition 65: This product contains chemicals known to the State of California to cause cancer, birth defects or other reproductive harm.

Crystalline Silica - Certain components confined in the combustion chamber may contain this potential carcinogen. Improper installation, adjustment, alteration, service or maintenance can cause property damage, serious injury (exposure to hazardous materials) or death. Refer to section 13 for information on handling instructions and recommended personal protective equipment.

Installation and service must be performed by a qualified installer, service agency or the gas supplier (who must read and follow the supplied instructions before installing, servicing, or removing this appliance. This appliance contains materials that have been identified as carcinogenic, or possibly carcinogenic, to humans).

Void Warranty - This appliance must have water flowing through it whenever the burner is on or it will damage the unit and void the warranty. Failure to follow these instructions may result in serious injury or death.

Do not store or use gasoline or other flammable vapors and liquids in the vicinity of this or any other appliance. Failure to follow instructions may result in serious injury or death.

CAUTION

To avoid electric shock, disconnect electrical supply before performing Service/Maintenance.

Not taking into account the specified maximum calcium and chloride levels for the DHW and CH circuits will void the warranty. Commissioning new systems should include flushing the complete system with water.

For frost protection applications, only tested and approved antifreeze, compatible with all metals and plastics, can be used. For continued protection we recommend checking the concentration level and pH, at least once a year.

Section 2 - Introduction

2.1 User Responsibilities

This manual is for use only by a qualified heating installer / service technician. Only a registered installer / service technician is allowed to perform the installation of the appliance and the first start-up of the system. Ask the installer to explain the system to you. Refer to user's Information manual for user reference. Have this boiler and its vent system serviced / inspected by a qualified service technician annually (every 12 months) at a minimum or at more frequent intervals as recommended by the qualified heating installer/ service technician.

WARNING

The home/building owner shall be informed of the following responsibilities:

- The carbon monoxide detector must be tested for proper operation in accordance with the carbon monoxide detector's manufacturers instructions.
- The building owner is responsible for keeping the exhaust vent/ combustion air-Intake terminal free of snow, ice, or other potential blockages and for scheduling routine maintenance on the appliance (see Section 12 - Service & Maintenance).
- Keep boiler area clear and free from combustible materials, gasoline and other flammables, vapors and liquids
- Do not obstruct the flow of combustion and ventilation air.
- Periodically visually inspect the condition of the boiler and check for leaks.
- Periodically visually inspect the venting is supported and secure and that there are no cracks in the venting. Inform the home/building owner not to touch or attempt to repair the venting themselves and to shut the appliance down and call a qualified service technician immediately to repair if anything is found to be abnormal.

Failure to comply with the above could result in death, severe injury or property damage.

2.2 Boiler Operation

WARNING

Should overheating occur or gas supply fail to shut off, turn off the manual gas control valve to the appliance, at a location external to the appliance. Do not turn off or disconnect electrical supply to circulator.

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

2.3 Manufacturer Conditions

The manufacturer does not accept any liability for damage caused by non-compliance of the installation instructions.

WARNING

Service activities must exclusively be carried out by qualified installers using original parts.
Failure to comply with the above could result in death, severe injury or property damage.

2.4 Installer Responsibilities

A qualified installer is a licensed person who has appropriate training and a working knowledge of the applicable codes, regulations, tools, equipment and methods necessary to install a boiler or water heater. The Installer assumes all responsibility for a safe installation and that it meets the requirements of the Eco-King boiler installation and Operation manual, as well as National and local codes. It is also the installer's responsibility to inform the User / Owner of their obligation with respect to the description under "User Responsibilities". Failure to follow this warning could result in fire, serious injury, or death.

This manual contains information of the Eco-King Heating Only H100A, H140A, H200A and Combination C100A, C140A, and C200A boilers. Read all instructions, including this manual and all other information shipped with the boiler, before installing. Perform steps in the order given. Store the manual in the transparent envelope adjacent to the boiler. The installer is liable for the installation and the first start-up of the appliance.

The installer must comply with the following instructions:

- Read and comply with the instructions of the appliance in the manuals delivered.
- Install the appliance in compliance with the applicable law and standards.
- The installation of the Eco-King boiler must conform to the requirements of this manual, your local authority having jurisdiction or, in the absence of such requirements, to the *National Fuel Gas Code, ANSI Z223.1/NFPA 54* in the US and *Natural Gas and Propane Installation Code, CSA B149.1* in Canada. Where required by the authority having jurisdiction, the installation must conform to the *Standard for Controls and Safety Devices for Automatically Fired Boilers, ANSI/ASME CSD-1*.
- For manufactured homes (mobile homes) the installation must also conform to *The Manufactured Home Construction and Safety Standard, Title 24 CFR, Part 3280* and/or *CSA Z240 MH Series, Manufactured Homes*.
- Perform the first start-up and all checks that are required. See section 10.3 Commissioning for manual / automatic calibration.
- Explain system functioning to the user.
- Hand over all manuals to the user and inform the user about the storage location.

The Eco-King boiler is a "Direct Vent", Class IV appliance requiring a "Special Venting System" for both exhaust vent and combustion air.

When servicing boiler

To avoid electric shock, disconnect electrical supply before performing Service/Maintenance.

Pressure testing the gas supply line to the boiler

The gas supply line to the boiler must be disconnected from the boiler and capped prior to pressure testing the gas line. The boiler's gas valve must never be exposed to pressures in excess of ½ PSI (3.5 kPa).

The boiler must be isolated from the gas supply piping system by closing its individual manual shutoff valve during any pressure testing of the gas supply piping system at test pressures equal to or less than 1/2 psi (3.5 kPa)

2.5 Removing the Front Cover

Remove the safety screw at the top side of the cover. Using a Phillips screwdriver, press back the safety latches located at the top and bottom of the appliance. Once released, pull the front cover forward to remove it. To put the cover back in place, push it back over the safety latches and tighten the safety screw.

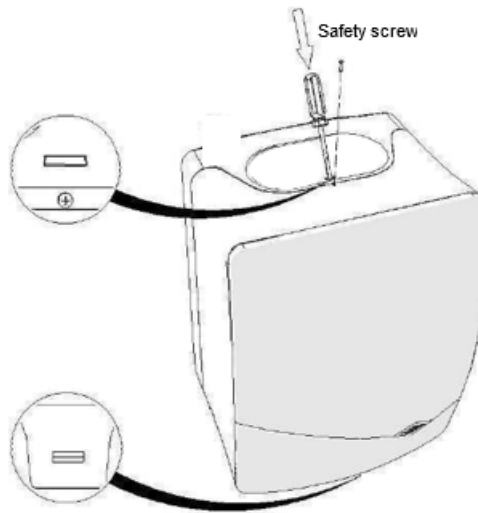


Figure 2.1 Safety screw location

⚠ WARNING

The Eco-King boiler does not use air (Oxygen) from the installation room, except with specific exceptions as noted in Section 8.9: Non-Direct Venting. The front cover closes the housing air-tight ensuring air is only supplied by the vent air intake. Therefore, ensure the front cover has always been placed in proper position during operation of the appliance. Failure to do so may lead to insufficient combustion air causing a fire or explosion resulting in death severe injury or property damage.

2.6 About the boiler

The Eco-King boiler is a high efficiency gas wall-hung boiler and is designed for heating a central heating (CH) system and producing domestic hot water (DHW).

Included with the boiler:

- 45 Psi 3/4" Pressure Relief Valve
- Wall Mounting Bracket
- Installation & Operation Manual
- User Manual
- Warranty Sheet
- Quick Start Sheet
- Outdoor Temperature Sensor
- Condensate Trap and 2' Flex Tube

The main functions of the Eco-King boiler are:

1. Heating the house: Central Heating (CH)
2. Producing Domestic Hot Water (DHW)



Figure 2.2

The total system for CH and DHW-production consists of:

- The boiler;
- Central heating and vent piping;
- Radiators; baseboard; in floor heating and/or hydronic air handlers
- Hot water taps.

Main Components

The Eco-King boiler consists of the following main components:

Central Heating (CH) Heat Exchanger

The heat exchanger located in the middle of the boiler makes sure that the heat that becomes available during the gas burning process is transferred to the central heating circuit.

DHW Heat Exchanger (only Cxxx types)

The plate heat exchanger located in the back of the boiler makes sure that the heat that becomes available during the gas burning process is transferred to the DHW circuit.

Fan

The air necessary for gas burning is propelled by a fan. To save electrical energy the Eco-King boiler has been equipped with a high efficiency fan.

Burner

The fan brings forward the gas / air mixture necessary for the burning process. The ignition electrode ignites the mixture to drive the burning process.

Gas Valve

The gas valve makes sure the exact amount of gas necessary for burning is supplied.

3-way Valve and Circulation Pump

The heat generated by the burning process is used within the CH or DHW circuit. The 3-way valve makes sure the correct circuit is driven depending on the demand. The pump makes sure the correct amount of water is delivered through the cold water intake.

Burner Control

The burner control drives the general steering and safety system of the boiler.

2.6.1 Boiler Dimensions

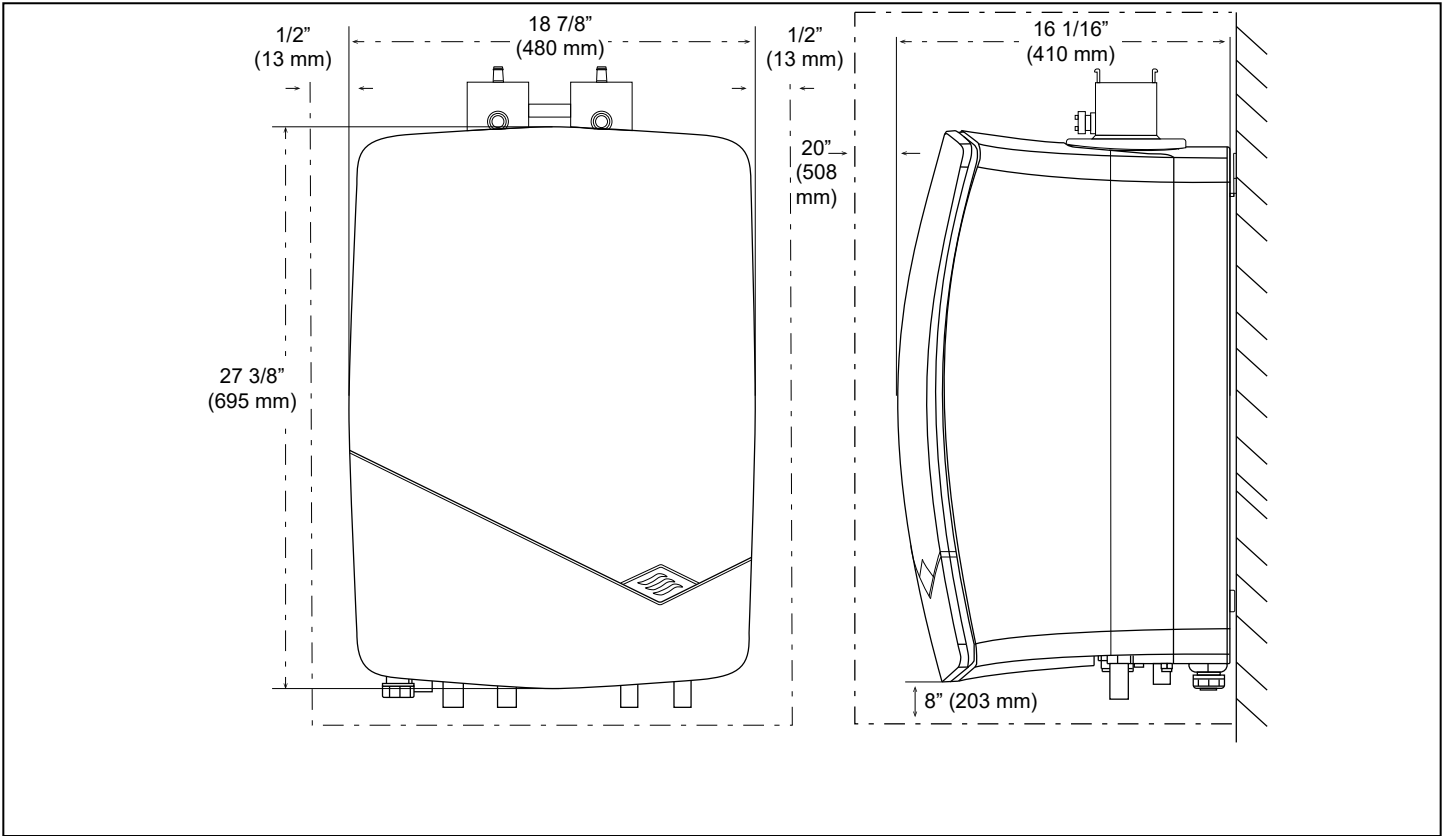


Figure 2.3: Dimensions, Front & Sides

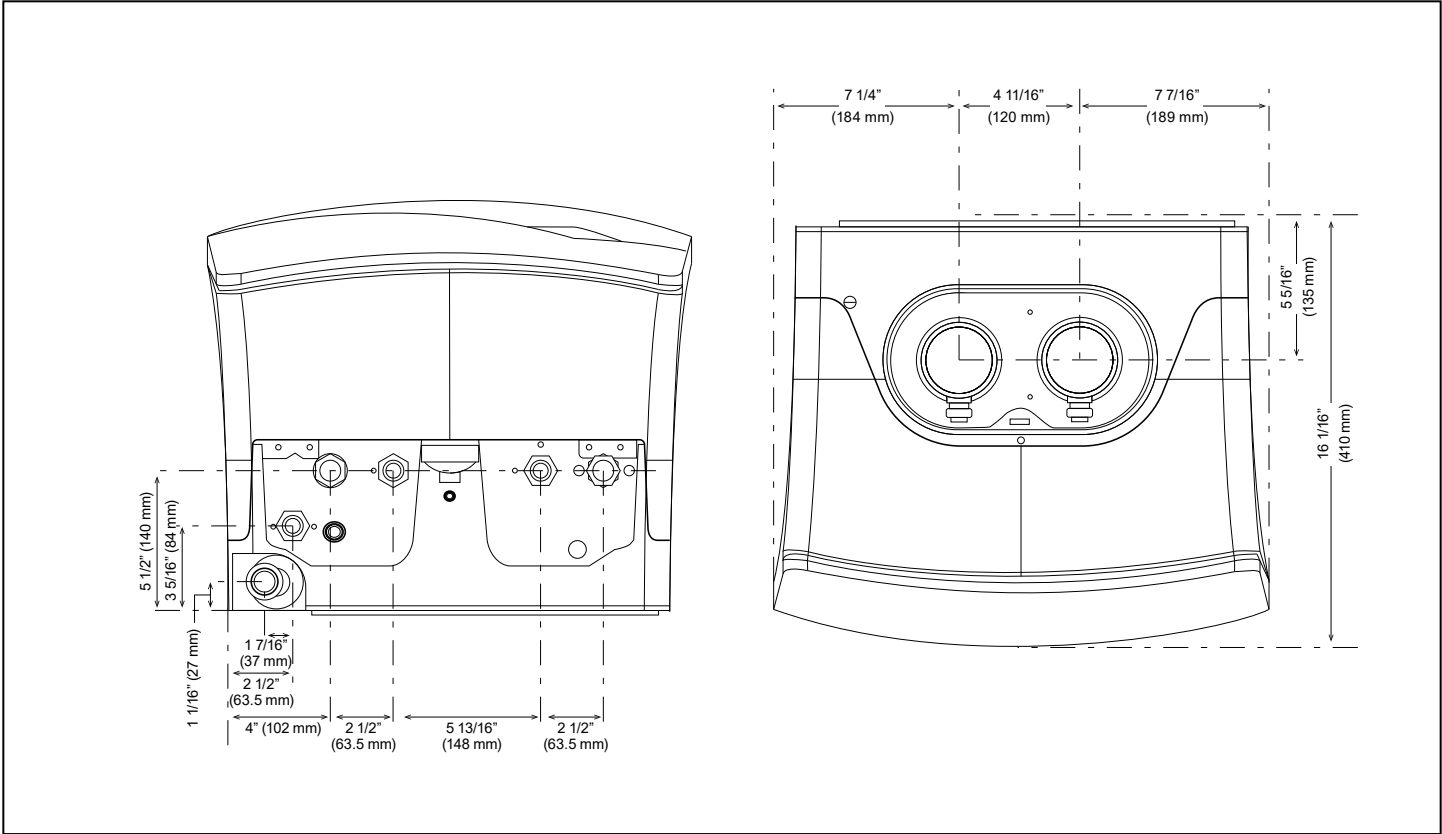
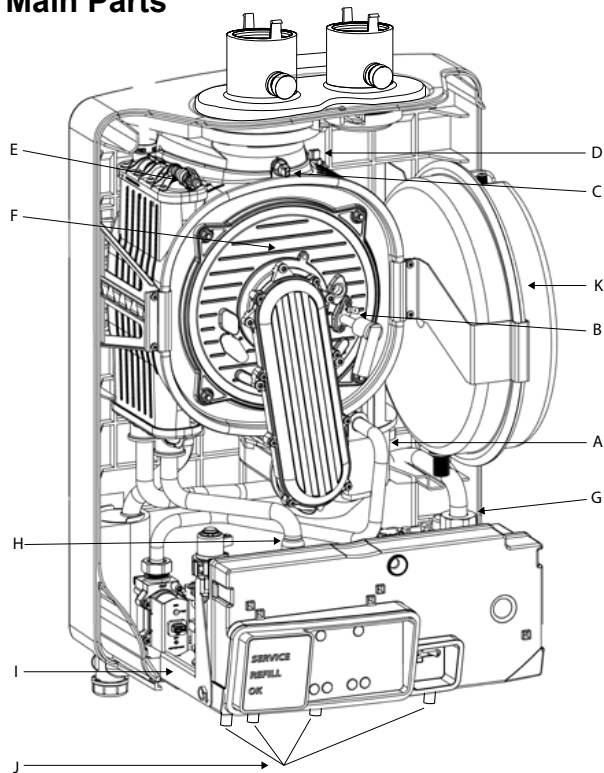


Figure 2.4: Dimensions, Top & Bottom

2.6.2 Main Components

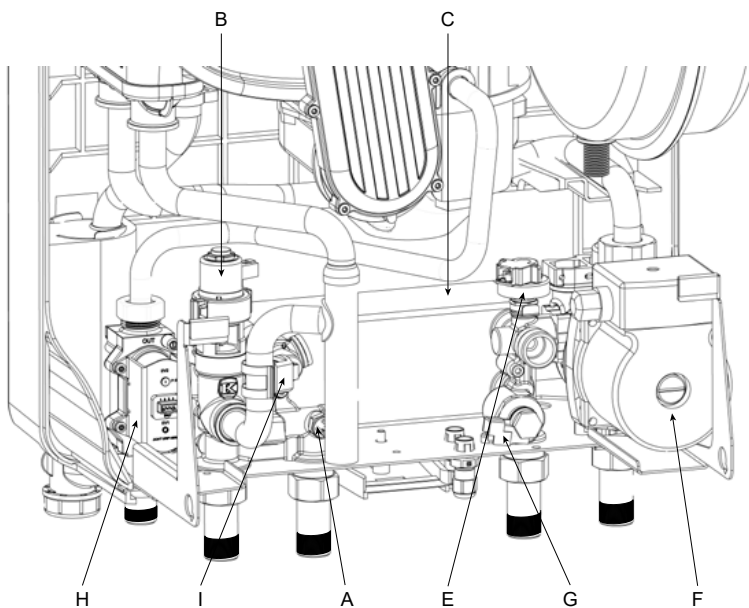
Main Parts



- A:** Fan
- B:** Igniter/ Flame Sensor
- C:** Maximum Temperature Fuse (TF)
- D:** Exhaust Gas Temperature High Limit Sensor (NTC)
- E:** Manual Air Vent (must open to bleed air before first ignition. Attach hose and open until smooth water flows)
- F:** Burner and Heat Exchanger
- G:** Pump Air Vent
- H:** CH Supply Sensor
- I:** Hydroblock
- J:** Water Connections
- K:** Internal Expansion Tank

Figure 2.5: Main Components

Hydroblock



- A:** DHW Temp Sensor
- B:** 3-way Valve Motor
- C:** DHW Heat Exchanger for C Model/ Indirect Tank Bypass for H model
- E:** Pressure Sensor
- F:** Pump
- G:** Flow Sensor for C Model
- H:** Gas Valve
- I:** CH Supply Temp Sensor
- J:** CH Return Temp Sensor

Figure 2.6: Hydroblock

2.7 Functionality of Main Parts

Control

The Eco-King boiler can be controlled by an on/off thermostat, zone valve end switch, or zone control panel. The heat delivery is continuously variable between approx. 14% and 100% of the power of the appliance to obtain a constant temperature in the house.

Variable Speed Fan

To save energy, a high efficiency fan (A, figure 2.4) has been applied. The fan has a variable speed and energy absorption. If less heat is needed, the fan rotates slower and uses less energy.

Pump

The Eco-King boiler has an integrated pump (F, Figure 2.5) that is controlled by the burner control and has a variable pump speed. The speed of the pump may vary between 50 and 100%. The burner control determines the speed of the pump by means of the temperature difference between the supply sensor (H, figure 2.4) and the return sensor (G, figure 2.5).

Domestic hot water production (Cxxx types)

This appliance has a built-in plate heat exchanger (C, figure 2.5) with limited domestic water storage. All connections are internal. While a flow restricter takes care of the maximum hot water quantity, the domestic water is heated up to about 142 °F (61 °C), which can be adjusted in the controller settings. The Eco-King boiler starts preparing domestic water at a flow of 0.66 gal. / min. (2.5 l / min) and stops when the flow drops below 0.48 gal. / min (1.8 l / min).

Automatic exhaust gas temperature high limit

The appliance has been equipped with a built-in protection against excessive exhaust gas temperatures. This protection closes the gas supply as soon as the exhaust gas temperature becomes too high, after which the unit is locked, displaying a fault code.

Drain valve

The boiler has a drain valve (J figure 2.5), allowing simple draining of the water.

Pressure relief valve

The supplied PRV appliance needs to be placed directly on the return pipe of the boiler.

Pump vent

The pump vent (G, figure 2.5) has been connected to the vent drain (E, figure 3.1), making visible any leakage from the vent on the outside of the appliance.

Adjustable by-pass

The boiler also has an internal, permanently adjustable by-pass (D, figure 2.5). The single purpose of this internal by-pass is to achieve circulation within the heat exchanger.

Option for solar boiler combination

If the boiler is used in combination with a solar tank, the boiler must remain switched on in summer in order to prevent Legionella bacteria infection.

WARNING

Make sure that the maximum DHW temperature does not exceed 149 °F (65 °C). This may cause a risk of burning for the user. Install a mixing valve in the hot water pipe between the boiler and the hot water supply to avoid this problem.

Frost protection

The appliance has a built-in frost protection that starts the boiler when the CH water temperature drops below 43°F (6°C).

Section 3 - Specifications

3.1 Connections

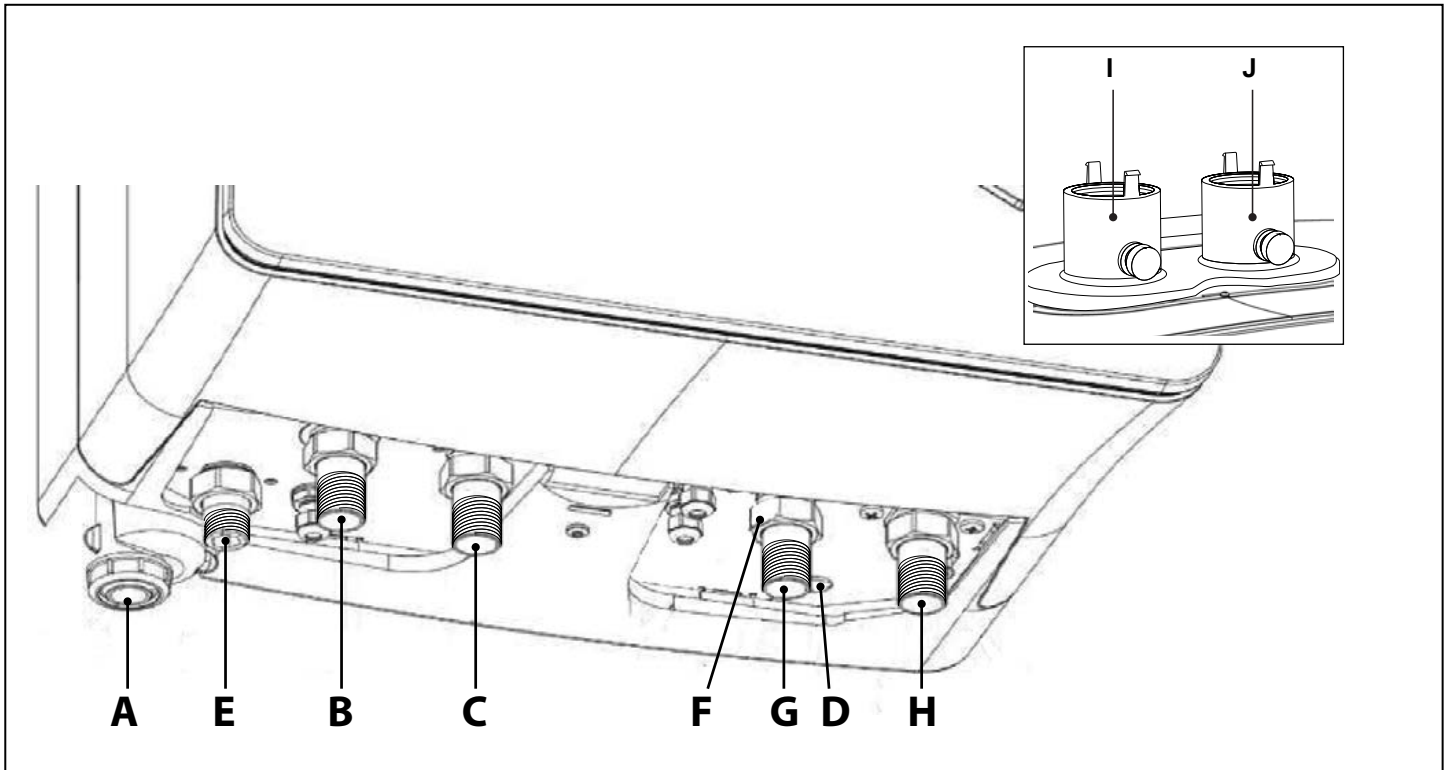


Figure 3.1: Connections

Character	Description	Connection size (inches)
A	Hose connection for condensate trap	1"
B	Central heating supply	3/4" NPT Male – with union nut
C	- DHW outlet (C models) - Tank Supply	Indirect Tank Supply (H models only)
D	Pump air vent drain outlet	-
E	Connection for gas line	1/2" NPT – Male – with Union nut
F	Flow limiter (C models only)	Located inside the boiler at inlet H
G	- Cold tap water (C models) - Indirect tank supply hot (H models)	3/4" NPT Male – with union nut
H	Central heating return	3/4" NPT Male – with union nut
I	Exhaust Vent Connection	2" (60mm) CPVC/PVC
J	Combustion Air Connection	2" (60mm) CPVC/PVC

Table 3.1: Connections

3.2 Technical Data

General	Units	C100A, H100A	C140A, C140A	C200A, H200A
Dimensions (h x w x d)	in. (mm)	27 3/8x18 7/8 x16 1/16 (695x480x410)	27 3/8x18 7/8 x16 1/16 (695x480x410)	27 3/8x18 7/8 x16 1/16 (695x480x410)
Weight (empty)	lb (kg)	68 (31)	75 (34)	82 (37)

Table 3.2: General Data

DHW Load	Units	C100A	C140A	C200A	
				NG	LPG
Input (0-2000 ft)	Btu/h (kW)	16,000 - 105,000 (4.7 - 30.8)	19,800 - 135,000 (5.8 - 39.6)	24,000 - 182,000 (7.0 - 53.3)	24,000 - 160,000 (7.0 - 46.9)
DHW Output 120°F(dT=50°F)	gal/min (L/min)	4.2 (16)	5.1 (19)	6.8 (26)	6.0 (23)
DHW Output 140°F(dT=77°F)	gal/min (L/min)	2.7 (10)	3.3 (12.5)	4.4 (17)	3.9 (15)
Max. Hot Water Temperature Setting	°F (°C)	158 (70)	158 (70)	158 (70)	158 (70)

Table 3.3: DHW Data

Central Heating Min/ Max BTU Range	Units	C100A & H100A	C140A & H140A	C200A & H200A
Input (0-2000 ft)	Btu/h (kW)	16,000 - 90,800 (4.7 - 26.6)	19,800 - 113,600 (5.8 - 33.3)	24,000 - 160,000 (7.0 - 46.9)
Max Output (0- 2000 ft) at 122/86°F (50/30°C)**	Btu/h (kW)	86,200 (25.3)	107,920 (31.6)	152,000 (44.6)
AFUE	95%	95%	95%	95%

Table 3.5: CH Input/ Output Rating

Electrical H/C100A - H/C200A
120V 60 Hz 2 Amps/ 110V 60 Hz 2 Amps

Table 3.6: Electrical

* MAX DHW Input levels listed occur in both C (combi) & H model boilers when producing hot water. H-model connected to an external indirect hot water tank.

CH Circuit Data		C100A & H100A	C140A & H140A	C200A & H200A
Available central heating pump pressure at dT 36°F(20°C)	ft.hd (m H ₂ O)	6.9 (2.1)	6.2 (1.9)	4.9 (1.5)
Maximum supply temperature	°C/ °F	85 / 185	85 / 185	85 / 185
Central Heating Fill Pressure min./ max.	psi (bar)	21.8 – 30 (1.5 - 2.1)	21.8 – 30 (1.5 - 2.1)	21.8 – 30 (1.5 - 2.1)
Allowable pH value water	pH	6.5-8.5	7 - 8.5	7 - 8.5

Table 3.6: CH Circuit Data

DHW Circuit Data		C100A & H100A	C140A & H140A	C200A & H200A
Max pressure drop DHW heat exchanger	psi (kPa)	50	70	100
Connection pressure potable water min./ max.	psi (bar)	2.9 - 145 (0.2 - 10)	2.9 - 145 (0.2 - 10)	2.9 - 145 (0.2 - 10)
Volume of Domestic Water Heat Exchanger	gal. (liter)	0.08 (0.3)	0.13 (0.5)	0.13 (0.5)
Max. Calcium level (CaCO ₃) DHW at 60°C*	ppm/ mg/l	7.3 (50)	7.3 (50)	7.3 (50)
Water hardness range (CaCO ₃) CH/ DHW	gpg	2 - 9	2 - 9	2 - 9
Max. chloride level DHW	ppm/ mg/l	200	150	150
Allowable pH value water	pH	6.5-8.5	7 - 8.5	7 - 8.5

Table 3.7: DHW Circuit Data

Combustion Data		C100A & H100A	C140A & H140A	C200A & H200A
Allowable Resistance of the Exhaust Gas System	in. w.c. (Pa)	0.8 (200)	0.8 (200)	0.8 (200)
pH value of the condensed water		4 - 5.5	4 - 5.5	4 - 5.5
High-fire Exhaust CO ₂ Content Natural Gas	%	9.0 +/- 0.3	9.0 +/- 0.3	9.0 +/- 0.3
Ignition Exhaust CO ₂ Content Natural Gas	%	9.0 +/- 0.3	9.0 +/- 0.3	9.0 +/- 0.3
Low-fire Exhaust CO ₂ Content Natural Gas	%	9.0 +/- 0.3	9.0 +/- 0.3	9.0 +/- 0.3
High-fire Exhaust CO ₂ Content LPG	%	10.0 +/- 0.3	10.0 +/- 0.3	10.0 +/- 0.3
Ignition Exhaust CO ₂ Content LPG	%	10.5 +/- 0.3	10.5 +/- 0.3	10.5 +/- 0.3
Low-fire Exhaust CO ₂ Content LPG	%	10.0 +/- 0.3	10.0 +/- 0.3	10.0 +/- 0.3
Temperature of exhaust gas at 176/140°F (80/60°C) (at an ambient temperature of 68°F (20°C))	°F(°C)	185 (85)	185 (85)	185 (85)

Table 3.9: CH Circuit Data

3.3 High Altitude Operation

The Eco-King boiler is designed to operate at its maximum listed capacity in installations less than or equal to 2000 ft (610 m) above Sea Level. Since the density of air decreases as elevation increases, maximum specified capacity should be de-rated for elevations above 2000 ft (610 m) in accordance with the table underneath.

Elevations	2000 ft (610 m)	3000 ft (910 m)	4000 ft (1219 m)	4500 ft (1372 m)
	De-rate by 3.6%	De-rate by 5.4%	De-rate by 7.2%	De-rate by 8.1%

De-rating is performed automatically by the Eco-King boiler via the electronic gas-air ratio controller.

Table 3.10: Altitude Deration

⚠ WARNING

Combustion – At elevations above 2000 feet (610 m), the combustion of the appliance must be checked with a calibrated (altitude corrected) combustion analyzer to ensure safe and reliable operation. **It is the Installers responsibility to check the combustion of the appliance.** Failure to follow these instructions may result in death, severe injury or property damage.

Section 4 - Appliance Location

In all cases, the Eco-King boiler must be installed indoors in a dry location where the ambient temperature must be maintained above freezing and below 100°F (38°C). Gas components must be protected from dripping, spraying water, or rain during operation and servicing. Consider the proximity of system piping, gas and electrical supply, condensate drain, and proximity to the vent terminal when determining the best appliance location.

WARNING

Water or flood damaged components must be replaced immediately with new factory approved components. Failure to do so may result in fire causing death, severe injury or property damage.

4.1 Location Checks

The wall must be strong enough to carry the weight of the Eco-King boiler. The boiler shall be installed such that the gas ignition system components are protected from water (dripping, spraying, rain, etc.) during boiler operation and service (circulator replacement, condensate trap, control replacement, etc.). Select a place where possible noise production by the boiler is not a nuisance. Both the combustion air supply and the exhaust gas vent pipe must be connected to the exterior wall or to the roof surface (use parts specified in section 8). Furthermore, for Cxxx models, install the boiler as close as possible to the most regularly used hot water points, to make sure that the DHW pipes are not unnecessary long. This reduces the wait time for hot water and unnecessary waste of water.

The boiler must not be installed on carpeting.

WARNING

Check the availability of the following provisions:

- Water supply;
- Venting connection;
- Gas supply;
- Electrical power (grounded);
- A connection for a condensate trap;
- A wall able to carry the appliance's weight.

Remove any combustible materials, gasoline and other flammable liquids from the installation area.

If the Eco-King boiler is to replace an existing boiler, check for and correct any existing system problems such as system leaks.

4.2 Before Installation

Care must be taken to place the boiler in a safe location prior to installation on the wall to prevent damage to the mechanical connections.

The contents contain:

- The boiler;
- Installation manual for the installer;
- User manual for the homeowner;
- Wall support bracket;
- Condensate trap with swivel nut;
- Condensate hose
- Pressure relief valve.
- An (internal) expansion tank

CAUTION

Cold weather handling

If the boiler has been stored in a cold location below 0°F (-18 °C) before installation, handle with extra care until the plastic components come to room temperature.

4.3 Clearances

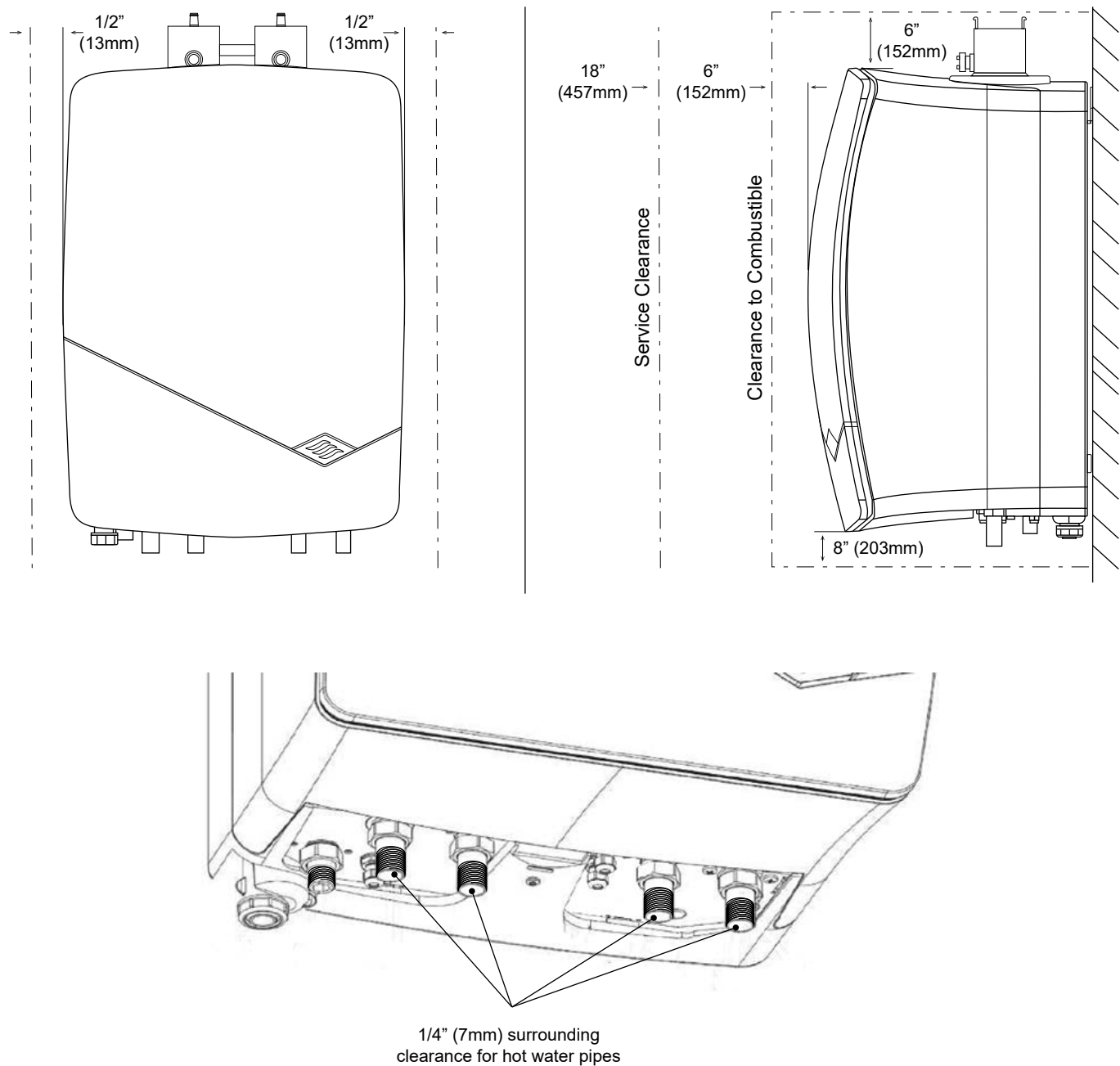


Figure 4.1: Clearances

Location	Clearance to Combustibles	Service Clearances
Top	6" (152 mm)	6" (152 mm)
Bottom	8" (203 mm)	8" (203 mm)
Back	0" (0 mm)	0" (0 mm)
Front	6" (152 mm)	18" (457 mm)
Sides (Left & Right)	1/2" (13 mm)	1/2" (13 mm)
Hot water pipes	1/4" (7 mm)	1/4" (7 mm)
Vent Connectors	1.2" (31 mm)	5" (127 mm)

Table 4.1: Clearances

4.4 Closet Installation

For closet installations, it's necessary to provide two ventilation air openings as shown in *Figure 4.2: Closet Clearances* each providing a minimum area equal to $22 \text{ cm}^2/\text{kW}$ (1 in^2 per 1000 Btu/hr), but not less than 645 cm^2 (100 in^2) and within 152 mm ($6''$) of the top and bottom of the closet door. See Table 4.2 for minimum recommended clearances.

⚠ WARNING

Closet/alcove installations require venting components approved to UL1738 in the United States, and approved to ULC-S636 in Canada. Failure to comply may result in carbon monoxide poisoning or fire causing death, severe injury or death.

Top View

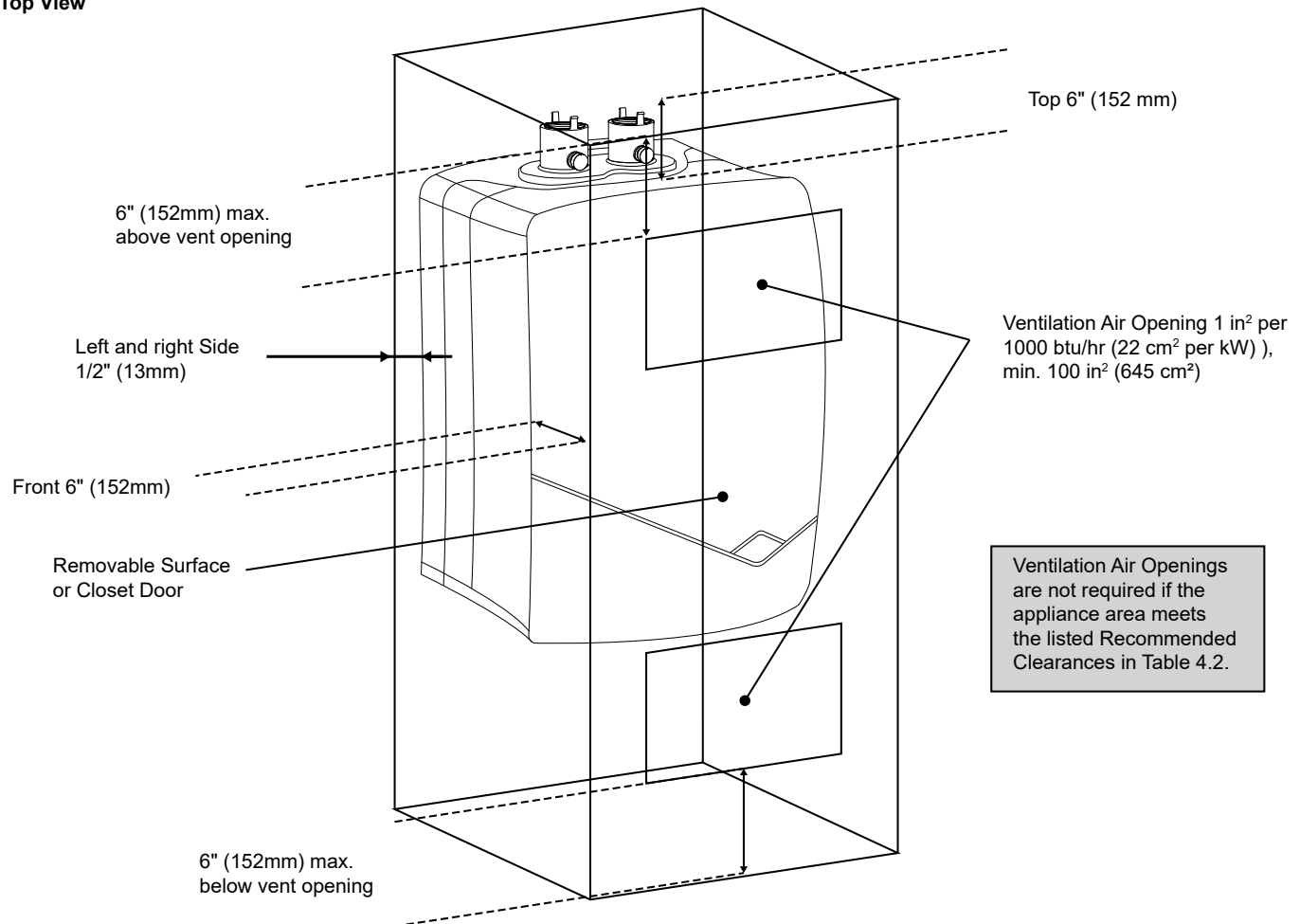


Figure 4.2: Closet Clearances

4.5 Alcove Installations

Alcove installations have the same minimum clearances as closet installations, except the front must be completely open to the room at a distance no greater than 18" (457 mm) from the front of the appliance and the room is at least three (3) times the size of the alcove. Provided these conditions are met, the appliance requires no extra ventilation air openings to the space. See *Figure 4.2: Closet Clearances* for minimum recommended clearances.

4.6 Appliance Area Ventilation Air Openings

If appliance area clearances are less than the recommended clearances specified in *Table 4.2: Minimum clearances for installation and services*, the appliance area must be ventilated (*Figure 4.2: Closet Clearances*). Each ventilation air opening must meet the minimum requirements of 1 in² per 1000 Btu/hr (22 cm² per kW) but not less than 100 in² (645 cm²). The lower ventilation opening must be located within 6" (152 mm) of the floor while the upper opening must be located 6" (152 mm) from the top of the space.

NOTICE

If the "Appliance Area" does not meet all of the recommended clearances listed in *Table 4.2: Minimum clearances for installation and services*, it is considered a Closet or Alcove.

Model	Clearances	Dimensions					
		Bottom inch (mm)	Front inch (mm)	Top inch (mm)	Left Side inch (mm)	Right Side inch (mm)	Rear inch (mm)
C100A/ H100A	Minimum	11 (280)	20 (508) ¹	6 (152)	0.5 (13)	0.5 (13)	0 (0)
	Recommended	18 (457)	20 (508) or more ¹	6 (152) or more	12 (305) or more	12 (305) or more	0 (0)
C140A/ H140A	Minimum	11 (280)	20 (508) ¹	6 (152)	0.5 (13)	0.5 (13)	0 (0)
	Recommended	18 (457)	20 (508) or more ¹	6 (152) or more	12 (305) or more	12 (305) or more	0 (0)
C200A/ H200A	Minimum	11 (280)	20 (508) ¹	6 (152)	0.5 (13)	0.5 (13)	0 (0)
	Recommended	18 (457)	20 (508) ¹	6 (152) or more	12 (305) or more	12 (305) or more	0 (0)

¹ 6" (152 mm) if front surface is removable allowing 20" (508mm) clearance (i.e. closet installation). See ventilation air opening dimensions in figure 4.2

Table 4.2: Minimum clearances for installation and services

4.7 Residential Garage Installations

When installed in a residential garage, mount the appliance a minimum of 18" (457 mm) above the floor. Locate or protect the appliance so it cannot be damaged by a moving vehicle. Check with your local codes for proper install practices.

4.8 Mounting the Boiler

Determine and mark the location for the gas and water connection pipes. Secure the wall mounting bracket to a solid wall using field supplied lag screws (anchors when mounting on a concrete wall), capable of supporting the weight of the appliance.

Ensure the bracket is mounted in a level position. Refer to *Table 3.2: General Data* for the appliance weight.

Mount the appliance to the bracket by aligning the slot in the back of the appliance with the hook protruding from the wall bracket. The top of the slot must rest at the bottom of the groove in the lower hooked part of the wall mounting bracket.

⚠ CAUTION

In unusually dirty or dusty conditions, care must be taken to keep heater cabinet door in place at all times. Failure to do so VOIDS WARRANTY!

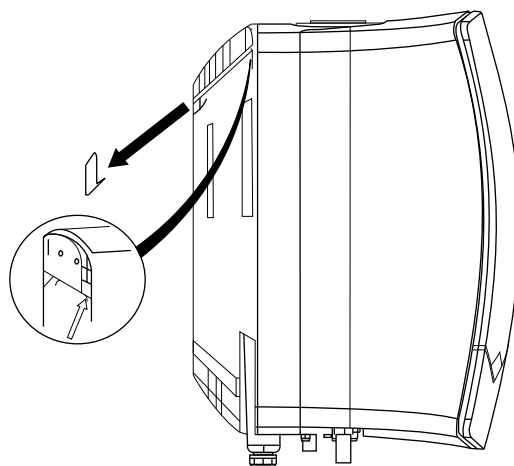


Figure 4.3: Mounting the boiler

Section 5 - Condensate Drain

This appliance produces liquid condensate in the heat exchanger and venting system as a product of combustion. Provisions must be taken to ensure that condensate does not collect in the venting system; therefore, all exhaust piping must slope back to the appliance a minimum 1/4"/ft (21mm/m). Condensate must be drained from the appliance into a household drain.

Condensate produced by the Eco-King boilers is typically acidic (pH 4.0–5.5). To prevent damage to drains, piping, and the environment, a condensate neutralizer may be required before discharge. Always follow local plumbing codes and manufacturer recommendations.

NOTICE

Check with your municipality, or local gas company to determine how the disposal of combustion condensate is permitted in your area.

The following are important notes that must be taken into consideration when constructing the condensate drain system (See figure 5.1 for further details):

- **DO NOT** install condensate lines outside. A frozen or blocked drain will cause the condensate to fill the combustion chamber.
- **NEVER** use copper, steel, or galvanized piping in the construction of the condensate system (condensate is very corrosive and will corrode most metals). Use synthetic material only.

⚠ WARNING

If the combustion chamber has been flooded due to the condensate drain backing up, or for any other reason, the combustion chamber door must be removed and the inside of the appliance must be inspected for component damage by a certified technician, e.g. the internal insulation at the front and back of the chamber. Failure to follow these instructions may result in fire, property damage, serious injury or death.

5.1 Connecting the Condensate Drain

The boiler is shipped with a 24" (61 cm) long 0.98" (25mm) diameter condensate hose that needs to be connected to the condensate trap situated at the left lower side of the boiler. The supplied condensate hose must be attached to the condensate trap with the nut and gasket supplied. The condensate trap is mounted into the boiler by turning it clockwise 1/8th of a turn.

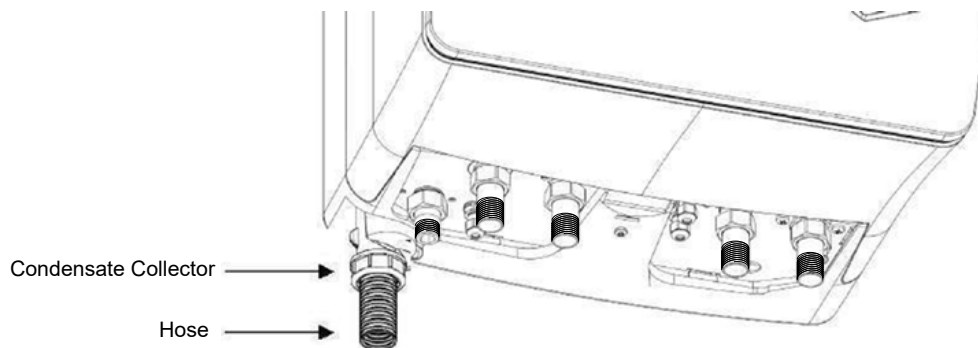


Figure 5.1: Condensate Collector & Hose Location

Connect the condensate trap with the flexible hose to an appropriate drainage system, ensuring there is an air gap between the condensate pipe and the drain. If an additional hose is required to extend the hose, ensure the additional hose is at least the same diameter as the 1" (25mm) hose provided.

⚠ WARNING

Do not connect the condensate line directly to an appropriate drainage system. An air gap must be provided to prevent the entry of sewer gases into the appliance if the drain becomes dry. Failure to do so could allow hazardous gases in to the combustion chamber causing fire or explosion. Failure to comply may cause death, severe injury or property damage.

Make sure that the condensate trap will be accessible for maintenance, ensure a minimum space below the boiler of 11" (270 mm) for maintenance.

All condensate piping must be below the level where the condensate leaves the boiler. The condensate line must have a downward slope from the boiler's condensate trap to the drain in order to assure proper drainage.

⚠ WARNING

Blocking the condensate drain can cause damage to the boiler. The boiler has been constructed in such a way that in the situation of a blocked siphon / air trap the boiler will shut down.

Check with your local authorities regarding disposal of condensate (regulations may require the use of a neutralizer).

The condensate drain can be routed in one of the four methods:

1. Directly to an external drain (Figure 5.2)
2. To a laundry tub (Figure 5.3)
3. To a condensate neutralizer (Figure 5.4)
4. To a condensate pump (Figure 5.5)

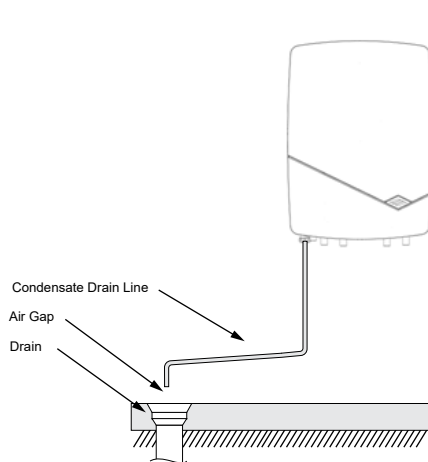


Figure 5.2: Condensate Direct to an External Drain

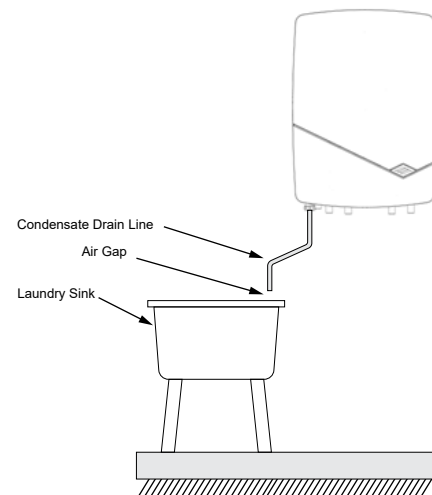


Figure 5.3: Condensate To a Laundry Tub

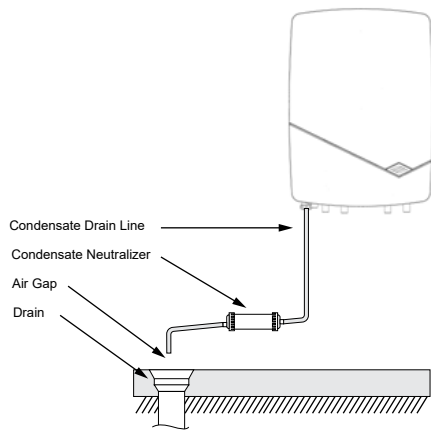


Figure 5.4: Condensate to a Neutralizer

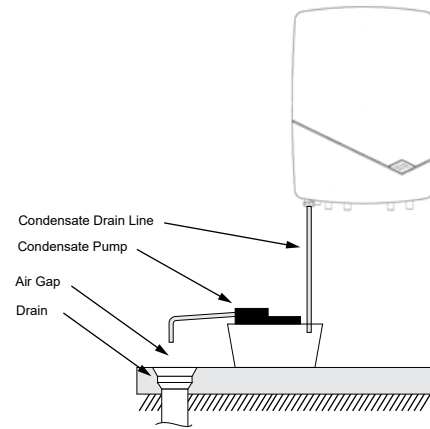


Figure 5.5: Condensate To a Condensate Pump

5.2 Priming the Condensate Trap

Prior to connecting the boiler's exhaust vent, prime the condensate trap by pouring water into the boiler's exhaust vent outlet until water begins to come out the condensate drain.

⚠ WARNING

Do not pour water into the boiler's combustion air intake or components may be damaged. If there is power to the boiler, unplug the boiler immediately to prevent electric shock. Ensure components are dry and not damaged before applying power to the unit. Failure to do so may result in death, severe injury or property damage.

NOTICE

The condensate trap shall be primed before the boiler is put into operation. Failure to do so may result in a nuisance lockout due to an air lock in the condensate trap.

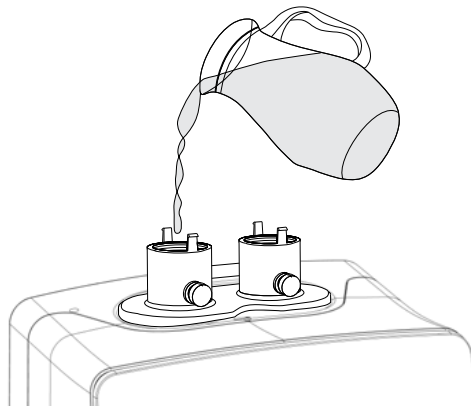


Figure 5.6: Priming the Condensate Trap

5.3 Cleaning the Condensate Drain

It is recommended to clean the condensate drain once a year by rinsing / washing it with tap water:

1. Shut off power to the appliance.
2. Remove the condensate hose from the condensate trap by loosening the nut.
3. Remove the condensate trap from the boiler by turning it 1/8th of a turn to the left and carefully pulling down.
4. Clean the drain by rinsing / washing it with tap water.
5. Refill the condensate trap with clean water and re-install on the boiler. Tighten by turning the condensate trap right, 1/8th of a turn until it stops turning.
6. Reconnect the hose.
7. Put power to the appliance.

The internal and external flexible condensate hose can be inspected and cleaned by rinsing with clean water.

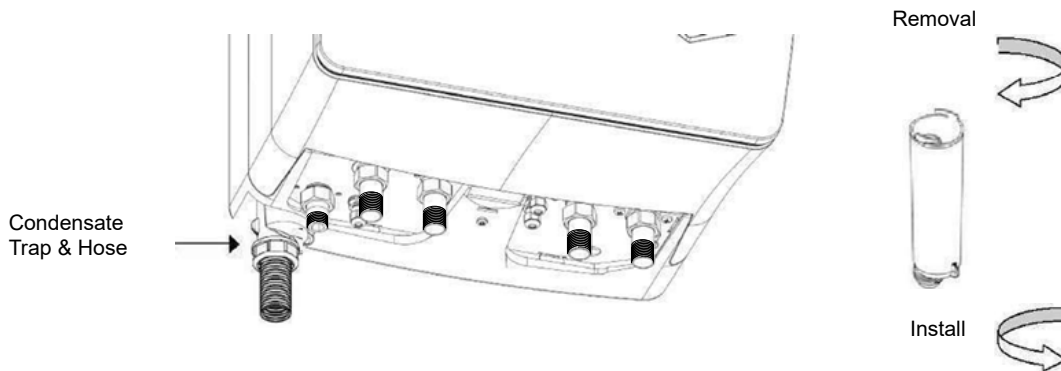


Figure 5.7: Condensate Trap Installation & Removal

Section 6 - Central Heating (CH) and Domestic Hot Water (DHW) circuit

WARNING

If oxygen barrier pipes for supply and return (CH circuit) are not used, install an isolation heat exchanger between the CH water of the boiler and the water in the system. E.g. use a plate heat exchanger. A plate heat exchanger prevents contamination of the boilers heat exchanger from magnetite and other contaminants. If an isolation heat exchanger is not used, the warranty will be null and void.

CAUTION

To prevent residue build-up in the boiler when installed in older systems, possibly containing dirt, it is highly recommended to flush and clean the CH circuit before removing the old boiler and commissioning the new boiler; and install an external magnetic strainer or dirt separator in the CH return pipe.

When these actions are not executed, residue from the CH system might cause the boiler to clog and overheat, voiding the warranty.

The boiler, when used in connection with a refrigeration system, must be installed so the chilled medium is piped in parallel with the boiler with appropriate valves to prevent the chilled medium from entering the boiler.

The boiler piping system of a hot water boiler connected to heating coils located in air handling units where they may be exposed to refrigerated air circulation must be equipped with flow control valves or other automatic means to prevent gravity circulation of the boiler water during the cooling cycle.

The boiler should be located in an area where leakage of the connections will not result in damage to the area adjacent to the boiler or to lower floors of the structure. When such locations cannot be avoided, it is recommended that a suitable drain pan, adequately drained, be installed under the boiler. The pan must not restrict combustion air flow.

The boiler has been equipped with a drain valve allowing simple draining of the water.

The boiler is supplied a pressure relief valve that needs to be installed directly outside the boiler on the return pipe.

The pump air vent has been connected through the overflow valve connection making any leakage visible from the vent on the outside of the boiler.

The boiler also has an internal adjustable by-pass to achieve circulation. If necessary, place an external by-pass a minimum of 20 feet (6 meters) away from the boiler. Flush the system with clean tap water before the first start-up to prevent contamination of the boilers heat exchanger.

The boiler shall be installed such that the gas ignition system components are protected from water (dripping, spraying, rain etc.) during boiler operation and service (circulator replacement, condensate trap, control replacement, etc.).

Properly support the piping with hangers. Do not allow the piping to be supported by the boiler or its accessories.

Frost protection

CAUTION

Do **not** connect the heating circuit to the domestic potable water side of the appliance. The heating and domestic portions of the appliance have separate internal circuits that do not come in contact with each other. The building heating circuit shall only be connected to the heating connections of the appliance.

For C model appliances the piping and components connected to the potable water side of the appliance shall be suitable for use with potable water.

The unit has a built-in frost protection system that starts up the CH pump and the burner if the boilers CH water temperature drops below 43 °F (6 °C) at the supply heating sensor.

Purge

Purge the system of air after filling the system and before putting the system into operation. Detailed instructions can be found in Section 10: Lighting th Boiler/ Commissioning.

Control module

The Eco-King boiler control module uses temperature sensors to provide both high limit protection and modulating temperature control.

Backflow preventer

A backflow preventer should be installed on the CH cold water fill supply line per local codes. Also make sure that the maximum cold water inlet pressure into the boiler cannot exceed 116 psi (8 bar).

6.1 Central Heating (CH) Water Quality

To prevent the CH system from corroding, pay attention to the following:

- Only use pure filling water (no additives).
- The pH-value must be neutral (7 – 8.5). If not, contact the supplier.
- Thoroughly flush the CH system before putting it into operation.
- Any synthetic pipes used must have an oxygen barrier. If not, place a isolation heat exchanger between the boiler circuit and the circuit with the plastic pipes.
- Ensure the entire system has no leaks and the expansion tanks are properly charged.

6.2 Domestic Water Quality

WARNING

If you suspect your water is contaminated have the water tested immediately.

Toxic chemicals, such as those used for boiler treatment, shall not be introduced into the potable water.

Failure to do so may result in serious health risks, illness, or injury.

The following table illustrates the tolerances set forth by Eco-King with respect to domestic water quality.

Technical Data		C100A & H100A	C140A & H140A	C200A & H200A
Max. Calcium level (CaCO ₃) DHW at 60°C*	ppm/ mg/l	50	50	50
Water hardness range (CaCO ₃) CH/ DHW	gpg	2 - 9	2 - 9	2 - 9
Max. chloride level DHW	ppm/ mg/l	200	150	150
Allowed pH value water	pH	7 - 8.5	7 - 8.5	7 - 8.5

Table 6.1 : Eco-King Domestic Water Quality

The following table illustrates the water quality guidelines per the EPA National Secondary Drinking Water Regulations (40 CFR part 143.3).

Contaminant	Maximum Limit
Aluminum	0.05 to 0.2 mg/l
Copper	Up to 1.0 mg/l
Iron	Up to 0.3 mg/l
Manganese	Up to 0.05 mg/l
Sulfate	Up to 250 mg/l
Total Dissolved Solids (TDS)	Up to 500 mg/l
Zinc	Up to 5 mg/l
Chlorine	Up to 4 mg/l

Table 6.2 : EPA National Secondary Drinking Water Regulations

6.3 Use of Glycol

To prevent boilers and heating systems from freezing, the boiler controller has a prevention mechanism on board. At temperatures below 10°C/50°F the pump will run. At temperatures below 5°C/41°F the burner will start. To mitigate the risk of a defect pump the use of glycol can be considered. All materials, used in the boiler, are resistant to propylene glycol.

Minimum glycol concentration of 25% to prevent bacterial growth.

Glycol at itself will acidify because of thermal degradation over time. This acidity will cause serious damage to most components in the heating system including the boiler. Because of this, specific anti-freeze products are available in the market for use in heating systems. These consist mainly of glycol but they have additives added which act against internal corrosion and/or scale formation. An important part of these additives are so called “balancers” which are added to the product, to absorb the rise of acidity of the glycol over time because of thermal degradation.

The chemical compatibility of two specific anti-freeze products has been tested by the heat exchanger producer. These products mainly consist of glycol next to the described additives. If these products are used according to the instruction, they will not harm the boiler.

These anti-freeze products are:

Manufacturer	Type	Composition
Fernox	Alphi 11	(consists of 97% Mono Propylene Glycol next to some additives)
Sentinel	X500	(estimated as being between 90-100% Mono Propylene Glycol)

Table 6.3: Approved Glycol

When using other glycol based anti-freeze products make sure that it is an equivalent product to the two mentioned above which will behave exactly the same on all materials and equipment in the heating systems.

Maximum glycol concentration is 40%. This protects up to -10°F/ -23°C.

Because of the higher viscosity of the glycol mixture, increase pump head by 20% at 40% glycol. For use with glycol, select a pump with glycol seals.

Because of the lower heat capacity of the glycol mixture, power will be reduced by ± 10% at 40% glycol. No fan speed or maximum temperature reduction will be necessary.

It is advised to check the frost protection and acidity of the mixture in the heating system every year.

6.4 Use of pumps and maximum remaining pump head of internal pump at CH supply connection

The boiler is equipped with an internal pump. This pump is intended to be used in the primary circuit only. The boiler pump shall be decoupled from the system using a hydraulic separator or a primary/secondary piping configuration. When the only heat emitter in the system is an air handler, it is acceptable to pipe the boiler directly to the air handler. Consult Eco-King Technical Support for approval of any other configuration.

⚠ WARNING

Installing a pump in series with the internal pump is not permitted. It will cause unwanted effects on the boiler control. This might result in noise or delta T irregularities.

In the graph below the maximum remaining head at the boilers CH supply is depicted. Installations with a higher internal resistance should be supplied via a hydraulic separator and zone pumps (see examples).

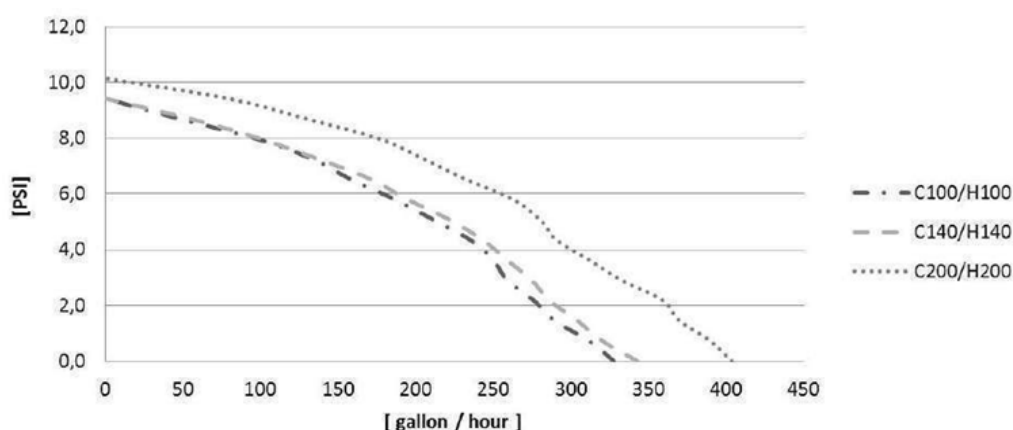


Table 6.4: Remaining Head After the Heat Exchanger of the CH Supply

6.5 Central Heating Water Connections

The boiler is supplied with adapters already in place that convert the water connections from BSP gasketed union nut to 3/4" Male NPT.

⚠ CAUTION

Do not remove the factory installed adapters. Connecting NPT connections without the adapters in place may damage the boilers internal components.

Ensure the adapters connections are tight to the boiler to avoid nuisance leaks.

NOTICE

To avoid damaging the connection on the boiler, use two wrenches when tightening piping to the boiler. Damaged connectors may result in system leaks.

6.5.1 Connecting the Supply and Return Piping of the CH Circuit: FOR H & C MODEL BOILERS

Connect the CH supply and the return pipes using hot water couplings (Fig. 5.1)

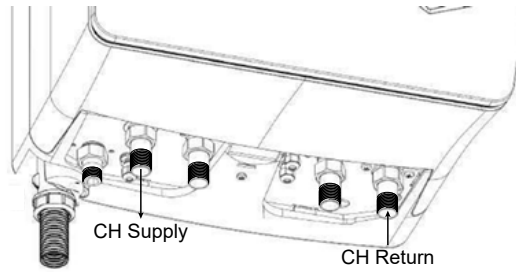


Figure 6.1: Central Heating (CH) supply and return connectors

6.5.2 Connecting Central Heating Pressure Relief Valve

The pressure relief valve shall be accessible for servicing and replacement and shall ANSI/ ASME *Boiler and Pressure Vessel Code, Section IV "Heating Boilers"*

The appliance supplied with either a 45 or 50 psi $\frac{3}{4}$ " pressure relief valve (figure 6.2) that needs to be installed directly outside the boiler in the return pipe (Figure 7.3) and, if installed, downstream of the external expansion tank. Connect discharge piping to a safe disposal location.



Figure 6.2: Pressure Relief Valve

⚠ DANGER

No valve is to be placed between the pressure relief valve and the appliance.

Do not plug or restrict the pressure relief valve.

Failure to comply may result in personal injury, substantial property damage or death.

⚠ WARNING

To avoid water damage or scalding due to relief valve operation, take the following into account when installing the valve:

- Discharge line must be connected to relief valve outlet and run to a safe place of disposal. Terminate the discharge line in a manner that will prevent the possibility of severe burns or property damage in case the valve discharges.
- Provide piping that is the same size as the safety relief valve outlet, no reducing couplings or other restrictions shall be installed in the discharge line.
- Install the pressure relief valve as close to the boiler as possible. No other valve should be installed between the pressure relief valve and boiler.
- The pressure relief valve must be installed in the vertical position with the drain pipe outlet exiting the side of the pressure relief valve.
- Discharge line must pitch downward from the valve and terminate at least 6" (152 mm) above the floor drain where any discharge will be clearly visible.
- The discharge line shall be installed to allow complete drainage of both the valve and line.
- The discharge line shall terminate plain, not threaded, with a material serviceable for temperatures of 190 °C (375 °F) or greater.
- Do not pipe the discharge to any place where freezing could occur. Do not plug or place any obstruction in the discharge line.
- Ensure the pressure relief valve's discharge capacity is equal to or greater than the maximum pressure rating of the boiler's space heating system and the BTU/H rating on the pressure relief valve is greater than or equal to the maximum input rating of the boiler.
- After the system has been pressurized, test the pressure relief valve operation by lifting the lever. If the pressure relief valve fails to discharge, immediately replace the pressure relief valve.

Failure to comply with the above guidelines may result in failure of the relief valve to operate, resulting in possibility of severe personal injury, death or substantial property damage.

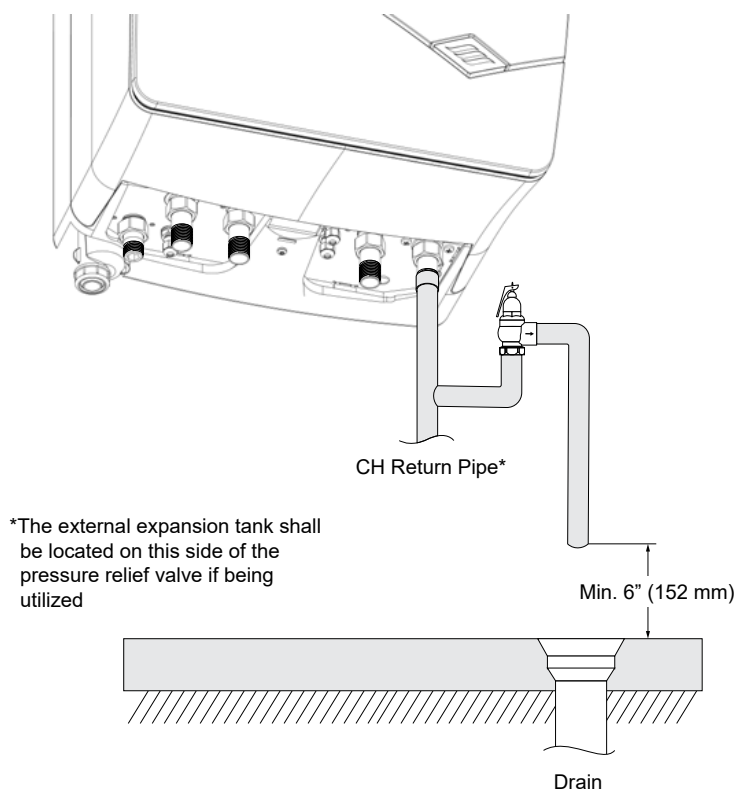


Figure 6.3 Pressure relief valve installation location

6.5.3 Connecting an External Expansion Tank to the Central Heating (CH) System

The boiler comes standard with a 8 liter (2.1 US Gallon) internal expansion tank. In case the total size of the installation configuration requires this, an extra expansion tank needs to be selected with regard to the total installation size and static pressure. Install the external expansion tank in the CH return pipe (figure 6.4). Make sure there is always an open line in the CH system and expansion tank.

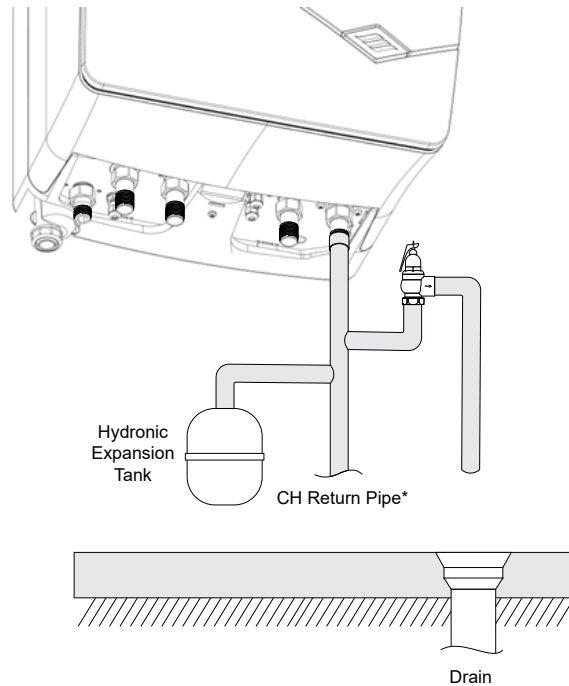


Figure 6.4 External expansion tank to be located in the CH return pipe

NOTICE

Installation volume using internal expansion vessel

If the installation operates at 194/158 F (90/70°C) and 29 PSI (2 Bar) installation pressure the volume of the installation is maximized to 17 Gallon (63 liters).

If the installation operates at 194/158 F (90/70°C) and 22 PSI (1.5 Bar) installation pressure the volume of the installation is maximized to 30 Gallon (115 liters).

If the installation operates at 176/140 F (80/60°C) and 22 PSI (1.5 Bar) installation pressure the volume of the installation is maximized to 40 Gallon (150 liters).

6.5.4 Connecting a Backflow Preventer/ Autofill to the Central Heating System

A Means to fill the system shall be piped externally to the central heating return of the boiler as shown below. When using potable water to fill the appliance central heating circuit a backflow preventor with a double check valve and vent shall be piped between the potable water line and the pressure reducing valve (see Figure 6.5 Backflow Preventer/ Fill Valve Location).

When utilizing a glycol feeder follow the installation instructions of the glycol feeder manufacturer.

⚠ WARNING

Failure to use a proper backflow preventor as described above between the potable cold water circuit and the central heating circuit can lead to harmful contaminants, bacteria and toxic chemicals leeching into the potable water which can cause death or severe injury.

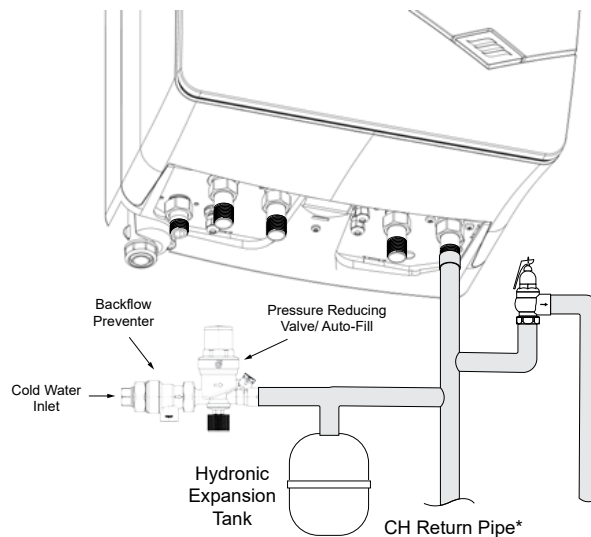


Figure 6.5 Backflow Preventer/ Fill Valve Location

6.6 Central Heating Water Connection

6.6.1 Connecting the DHW Water Circuit: FOR C (COMBI) MODELS

The supply pipe for cold tap water (Fig. 6.6) is provided with a flow restricter depending on the type of Eco-King boiler (e.g. Eco-King C100A: 8litres/min. (2.1 gal/min) of 60 °C (140 °F)). Connect the cold domestic water inlet to (C) DCW Inlet, Connected the domestic hot water pipe to (B) DHW Outlet.

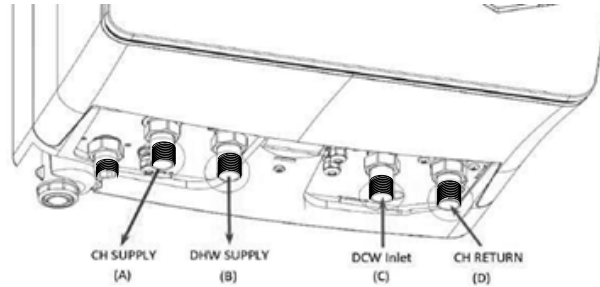


Figure 6.6 DHW connectors, flow limiter location

6.6.2 Connecting DHW Pressure Relief Valve - C (COMBI) Model

A 3/4" pressure relief valve (not supplied) must be added to the domestic hot water outlet with 150 psi maximum pressure relief at the domestic hot water outlet at the boiler where local code and the authorities having jurisdiction require it or when a back flow preventer is used on the cold water supply inlet.

The pressure relief valve shall be accessible for servicing or replacement and shall comply with the Standard for Relief Valves for Hot Water Supply Systems, ANSI Z21.22 • CSA 4.4, or the ANSI/ASME Boiler and Pressure Vessel Code, IV ("Heating Boilers").

⚠ DANGER

No valve is to be placed between the temperature/ pressure relief valve and the appliance.

Do not plug or restrict the pressure relief valve.

Failure to comply may result in personal injury, substantial property damage or death.

⚠ WARNING

To avoid water damage or scalding due to relief valve operation, take the following into account when installing the valve:

- Discharge line must be connected to relief valve outlet and run to a safe place of disposal. Terminate the discharge line in a manner that will prevent the possibility of severe burns or property damage in case the valve discharges.
- Provide piping that is the same size as the safety relief valve outlet, no reducing couplings or other restrictions shall be installed in the discharge line.
- Install the pressure relief valve as close to the boiler as possible. No other valve should be installed between the pressure relief valve and boiler.
- The pressure relief valve must be installed in the vertical position with the drain pipe outlet exiting the side of the pressure relief valve.
- Discharge line must pitch downward from the valve and terminate at least 6" (152 mm) above the floor drain where any discharge will be clearly visible.
- The discharge line shall be installed to allow complete drainage of both the valve and line.
- The discharge line shall terminate plain, not threaded, with a material serviceable for temperatures of 190 °C (375 °F) or greater.
- Do not pipe the discharge to any place where freezing could occur. Do not plug or place any obstruction in the discharge line.
- Ensure the pressure relief valve's discharge capacity is equal to or greater than the maximum pressure rating of the boiler's space heating system and the BTU/H rating on the pressure relief valve is greater than or equal to the maximum input rating of the boiler.
- After the system has been pressurized, test the pressure relief valve operation by lifting the lever. If the pressure relief valve fails to discharge, immediately replace the pressure relief valve.

Failure to comply with the above guidelines may result in failure of the relief valve to operate, resulting in possibility of severe personal injury, death or substantial property damage.

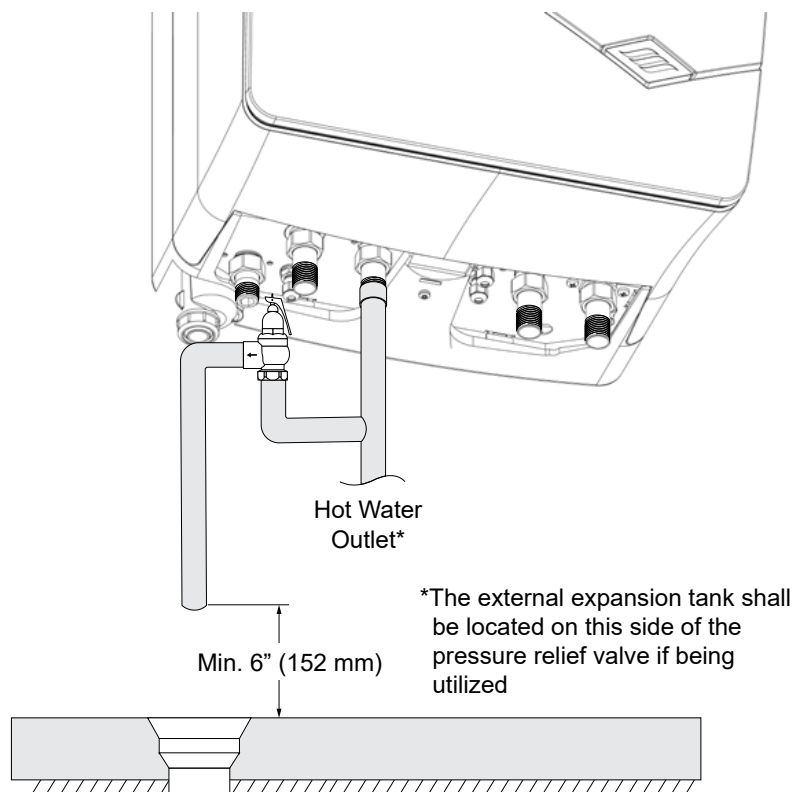


Figure 6.7 Pressure relief valve installation location

6.6.3 Connecting an External Expansion Tank to the Domestic system: C (COMBI) MODELS

If the domestic circuit of the appliance is installed in a closed water supply system, such as one having domestic hot water storage tank, means shall be provided to control thermal expansion. An expansion tank rated for potable water and properly sized shall be installed between the domestic hot water supply to the hot water storage tank.

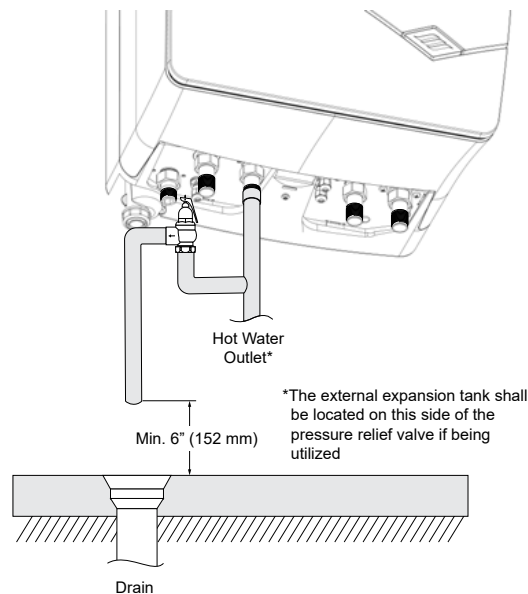


Figure 6.8 Pressure relief valve installation location

6.6.4 Connecting an Indirect Tank: H MODEL BOILERS

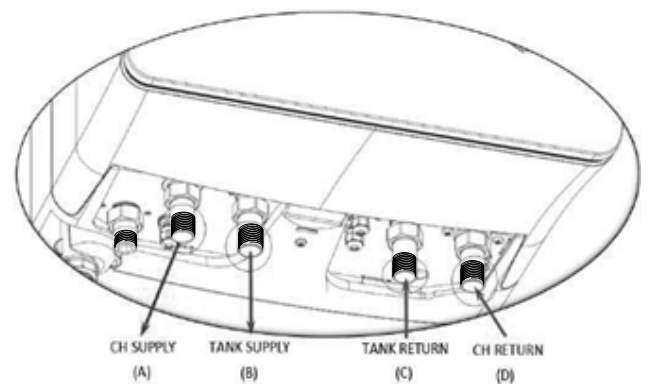
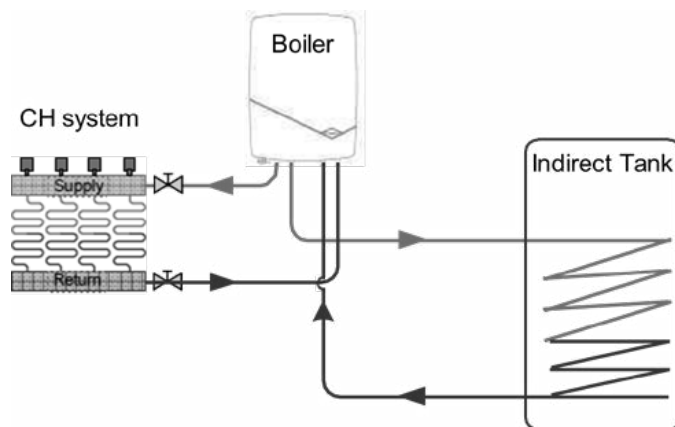


Figure 6.9 Connecting an Indirect Tank

Hydraulic:

Connect the (hot) tank supply to the hot water coil connection of the tank (B)

Connect the CH supply to the CH system in accordance with the (local) regulations. (A) Connect the CH return to CH system (D)

Connect the DHW Tank return to (C)

Electric:

Disconnect the power to the appliance.

Connect the 10k Ohm NTC sensor in the tank to the tank connector on the Printed Circuit Board (*Figure 9.3 Printed circuit board main connections*)

In the event no 10K Ohm NTC tank sensor came with the tank contact the supplier.

Reconnect the power supply.

6.7 Low Water Cutoff (LWCO)

The control module also provides low water protection by means of a factory installed, pressure sensing low water cutoff in the CH circuit. Some codes / jurisdictions or insurance companies may require an additional controls for high limit and / or low water cutoff protection. Especially when the boiler is installed above radiation level. The manufacturer's instructions of the low water cutoff and the authority having jurisdiction shall be followed. The external low water cutoff shall be positioned a minimum of 6" above the top of the heat exchanger. The LWCO device must be rated for 120V to switch the boilers main power supply.

⚠ WARNING

Electric Shock Hazard

ALWAYS check that the power to the boiler is turned off before making wiring connections. Failure to do so may result in death or severe injury.

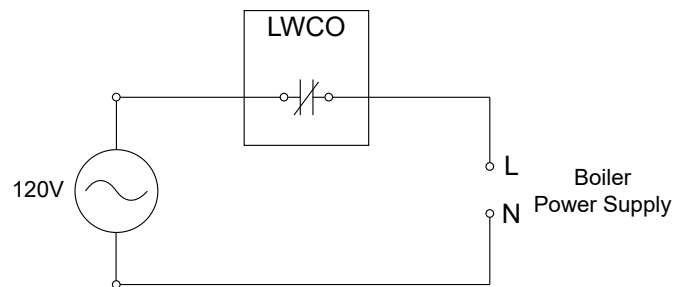
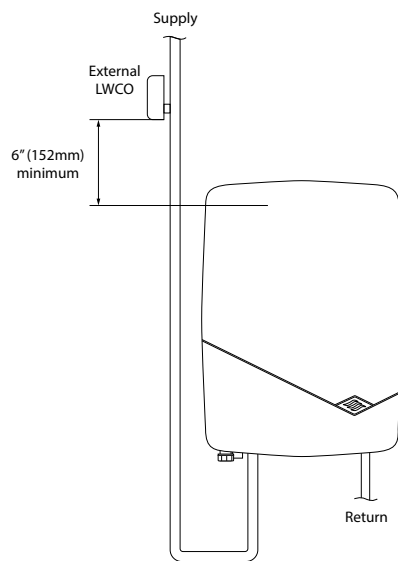
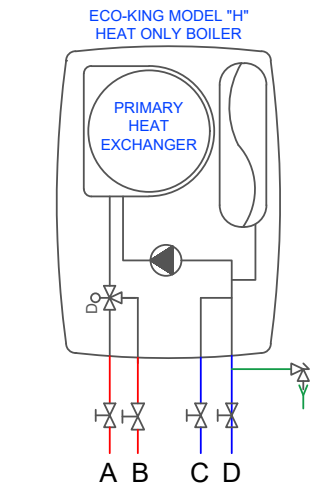


Figure 6.10: LWCO Positioning & Wiring Example

6.8 Installation Examples

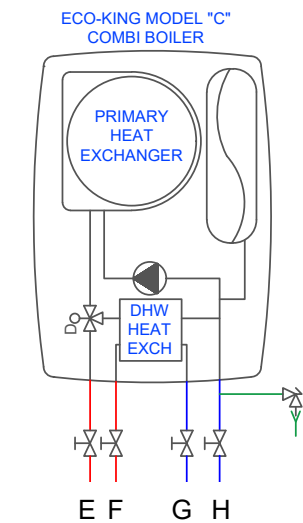
The schematics on the following pages are provided as general guidelines only. They do not represent all possible system types, safety devices, or design options. Layouts 1 and 2 illustrate how to connect the boiler to the CH and/or DHW system. Layouts 3 through 10 show example configurations for integrating the boiler into various system arrangements.



Legend

HO	Heating Only appliance
IET	Internal Expansion Tank
EET	External Expansion Tank
AV	Air Vent (Automatic)
PRV	Pressure Relief Valve
A	CH supply
B	Tank Supply / capped if not used Tank
C	Return / capped if not used
D	CH return

1. Boiler layout : Eco-King boiler H model

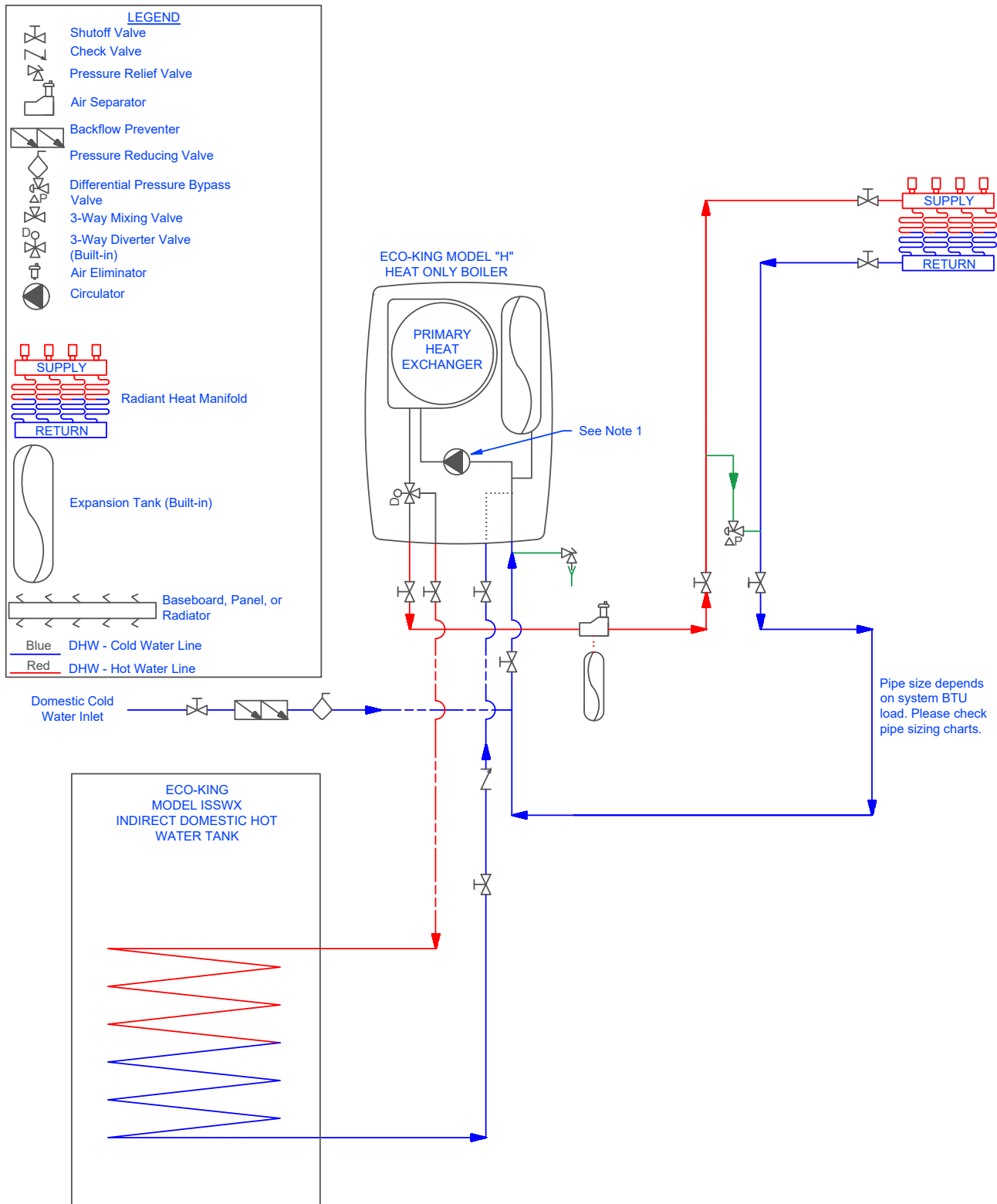


Legend

Combi	Combi appliance
IET	Internal Expansion Tank
EET	External Expansion Tank
AV	Air Vent (Automatic)
PRV	Pressure Relief Valve
E	CH supply
F	DHW outlet
G	Cold tap water inlet (Cxxx types)
H	CH return (Cxxx types)

2. Boiler Layout: Eco-King boiler Combi (C model)

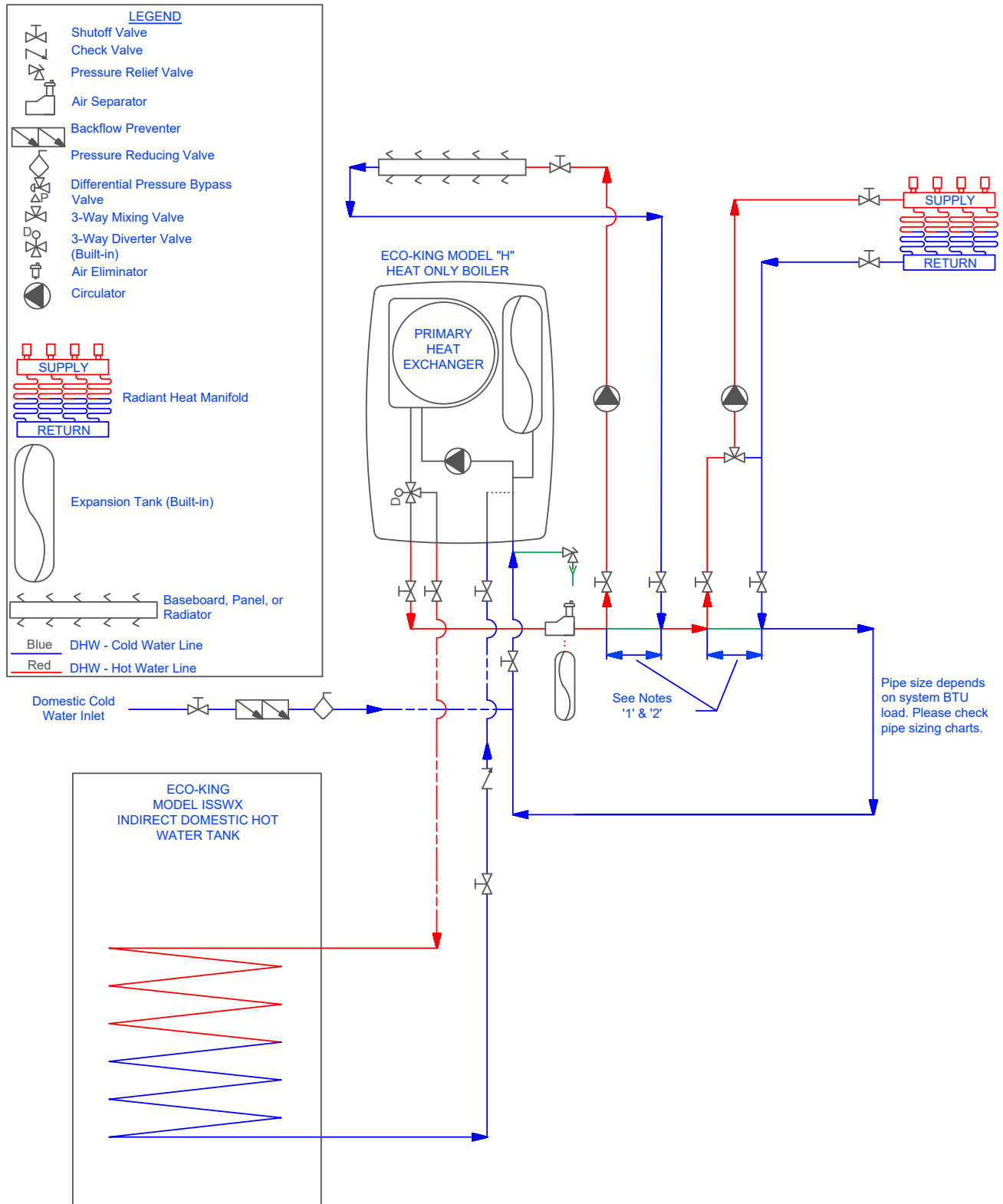
H Model System layout 1: H model boiler using internal pump for central heating and optional connection with an indirect tank for DHW. Only use this option if heat system heat loss is less than 50,000 BTU and consists of one zone of heating. If not, please use system layout 2.



NOTES

1. When only using built-in pump in boiler for the entire heating system, ensure the pump has the capacity to handle the load (Consult Eco-King for pump specs).
2. Air vents are recommended at the highest point(s) of the system and drain points at the lowest points of the system.
3. This diagram illustrates a general arrangement and may not show all the necessary components and accessories that can be utilized or required for the proper operation of the system or that may be required by local codes.

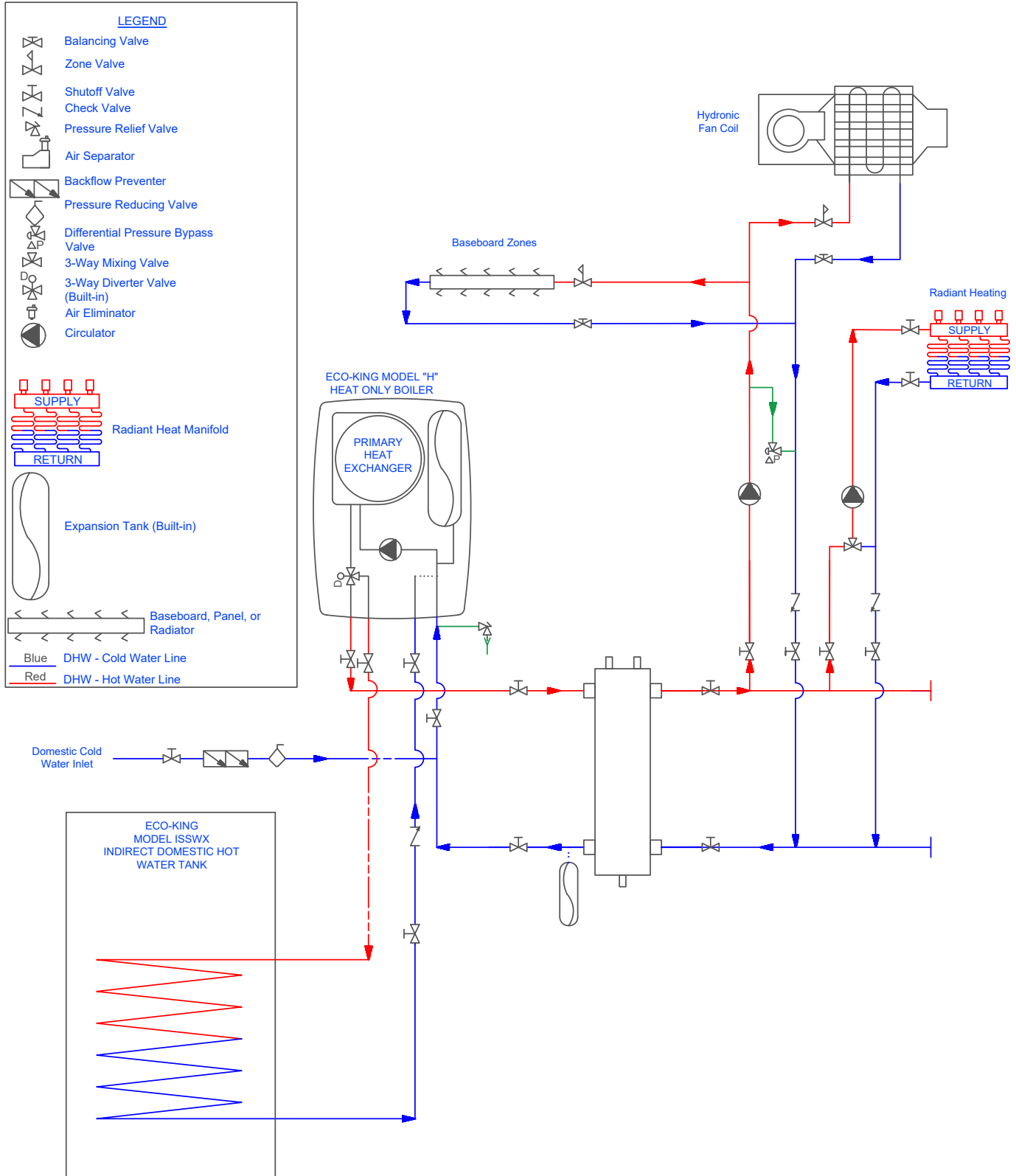
H Model System layout 2: H model boiler using Primary Secondary piping via closely spaced T's or a Low Loss Header (LLH). Can also be connected to an indirect tank for DHW. Recommended piping schematic. External expansion tank can be added if required.



NOTES

1. Maximum 4x the smallest pipes diameter distance between closely spaced supply and return tees. Minimum 6" length of pipe required before and after closely spaced tees.
2. Set boiler to the higher temperature and branch off the high temperature heating loop first from the primary loop. The lower temperature heating loop is branched off next and requires a mixing valve.
3. Air vents are recommended at the highest point(s) of the system and drain points at the lowest points of the system.
4. This diagram illustrates a general arrangement and may not show all the necessary components and accessories that can be utilized or required for the proper operation of the system or that may be required by local codes.

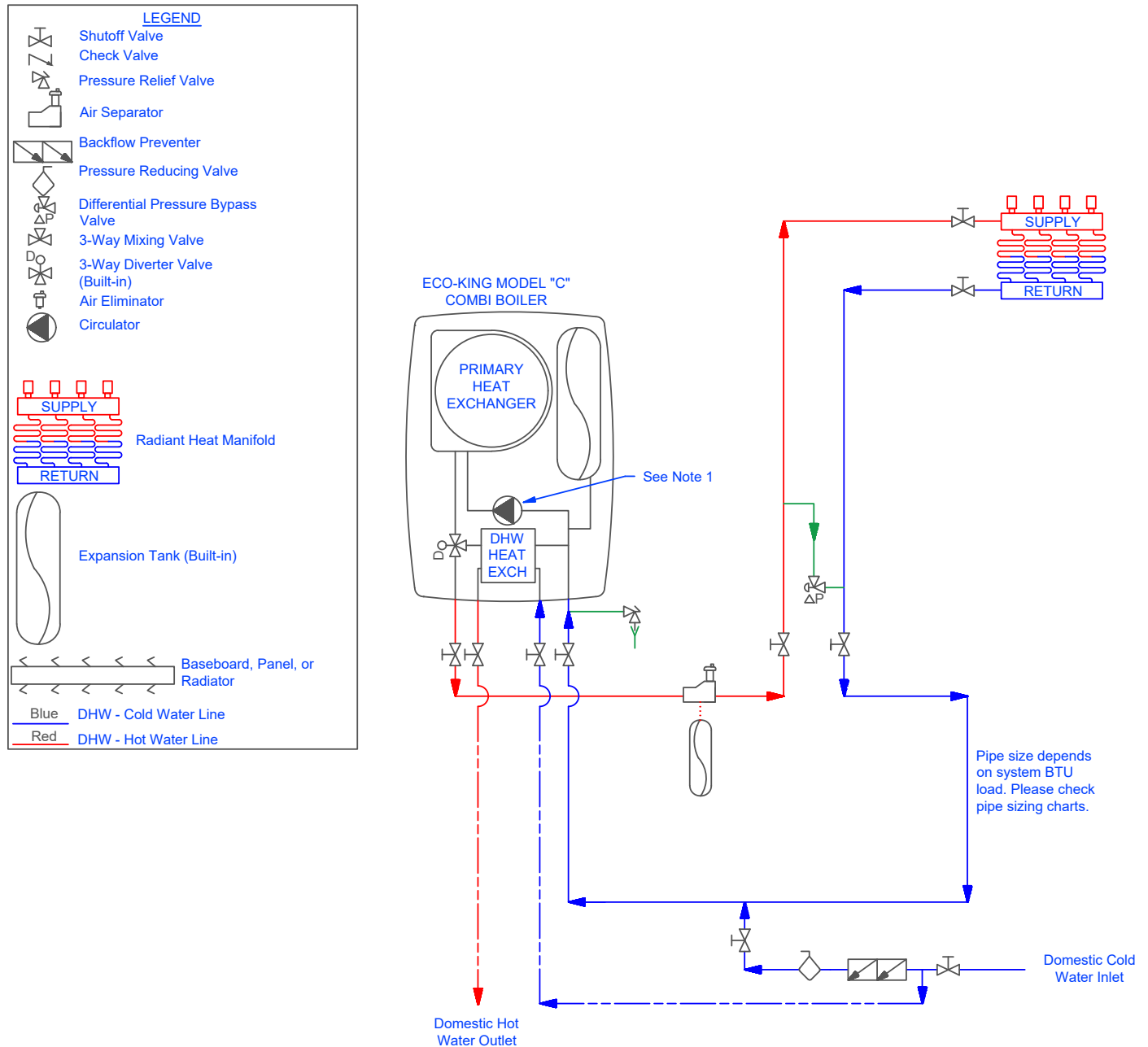
H Model System layout 3: H Model boiler with two temperature zones for heating; one high temp heating and one low temp heating zone. Also can be used with an indirect tank for DHW. External expansion tank can be added if required.



NOTES

1. Boilers used in radiant heating systems without the use of mixing controls must be approved for condensing operation by the manufacturer and the local code having jurisdiction. The venting system must also be approved for condensing operation. The boiler should utilize a control system to ensure higher than required radiant temperature does not enter the radiant system.
2. The hydraulic separator replaces the primary circuit's closely spaced tees by providing total hydraulic separation from the secondary system which also eliminates the need for check valves to prevent thermal flow when the secondary pumps are not in operation.
3. Air vents are recommended at the highest point(s) of the system and drain points at the lowest points of the system.
4. This diagram illustrates a general arrangement and may not show all the necessary components and accessories that can be utilized or required for the proper operation of the system or that may be required by local codes.

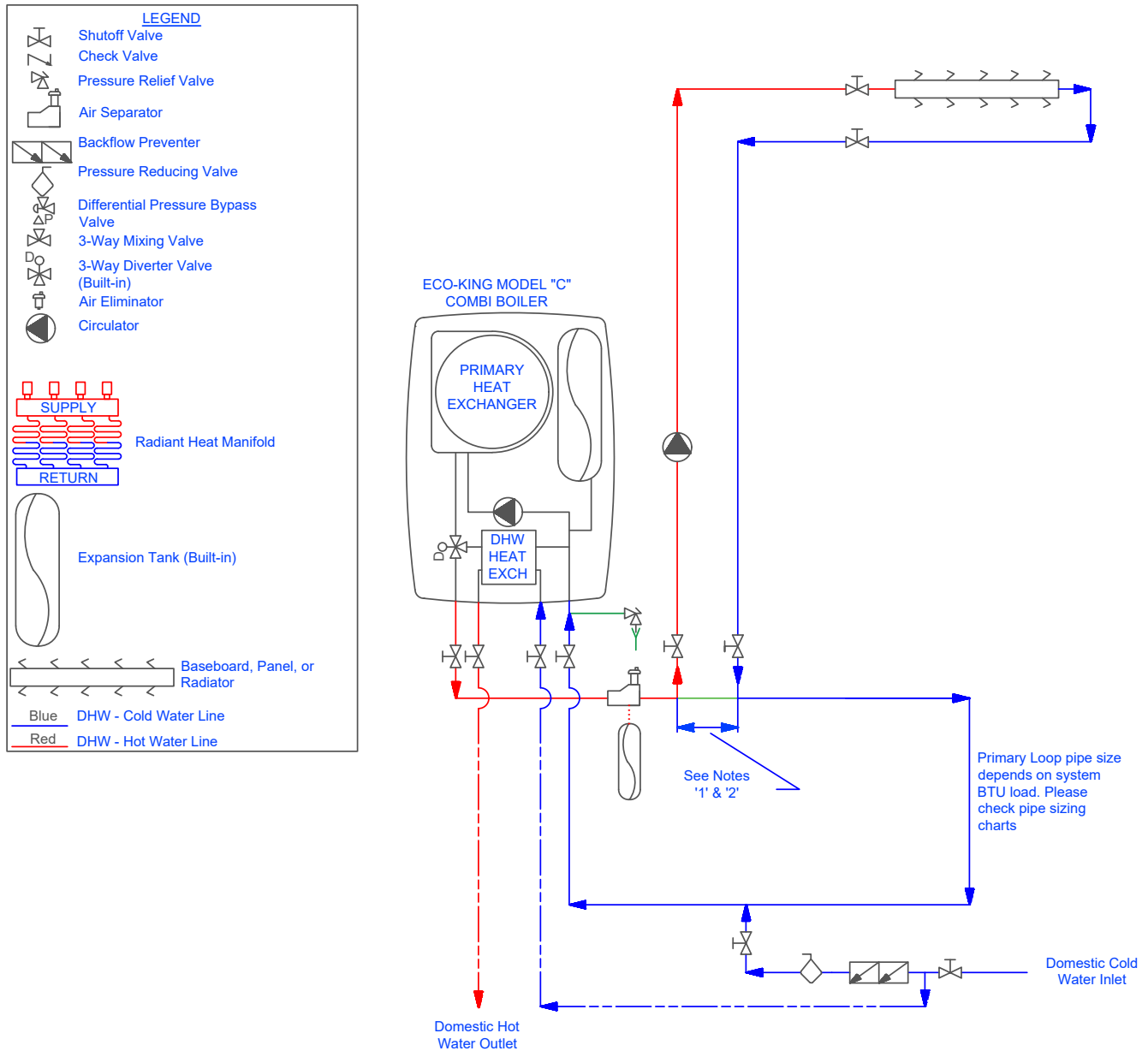
C Model System layout 4: Combi Model boiler using internal pump for central heating and on demand DHW. Only use this option if heat system heat loss is less than 50,000 BTU and consists of one zone of heating. If not, please use system layout 2. Sizing of expansion tank on page 42



NOTES

1. When only using built-in pump in boiler for the entire heating system, ensure the pump has the capacity to handle the load (Consult Eco-King for pump specs).
2. Air vents are recommended at the highest point(s) of the system and drain points at the lowest points of the system.
3. This diagram illustrates a general arrangement and may not show all the necessary components and accessories that can be utilized or required for the proper operation of the system or that may be required by local codes.

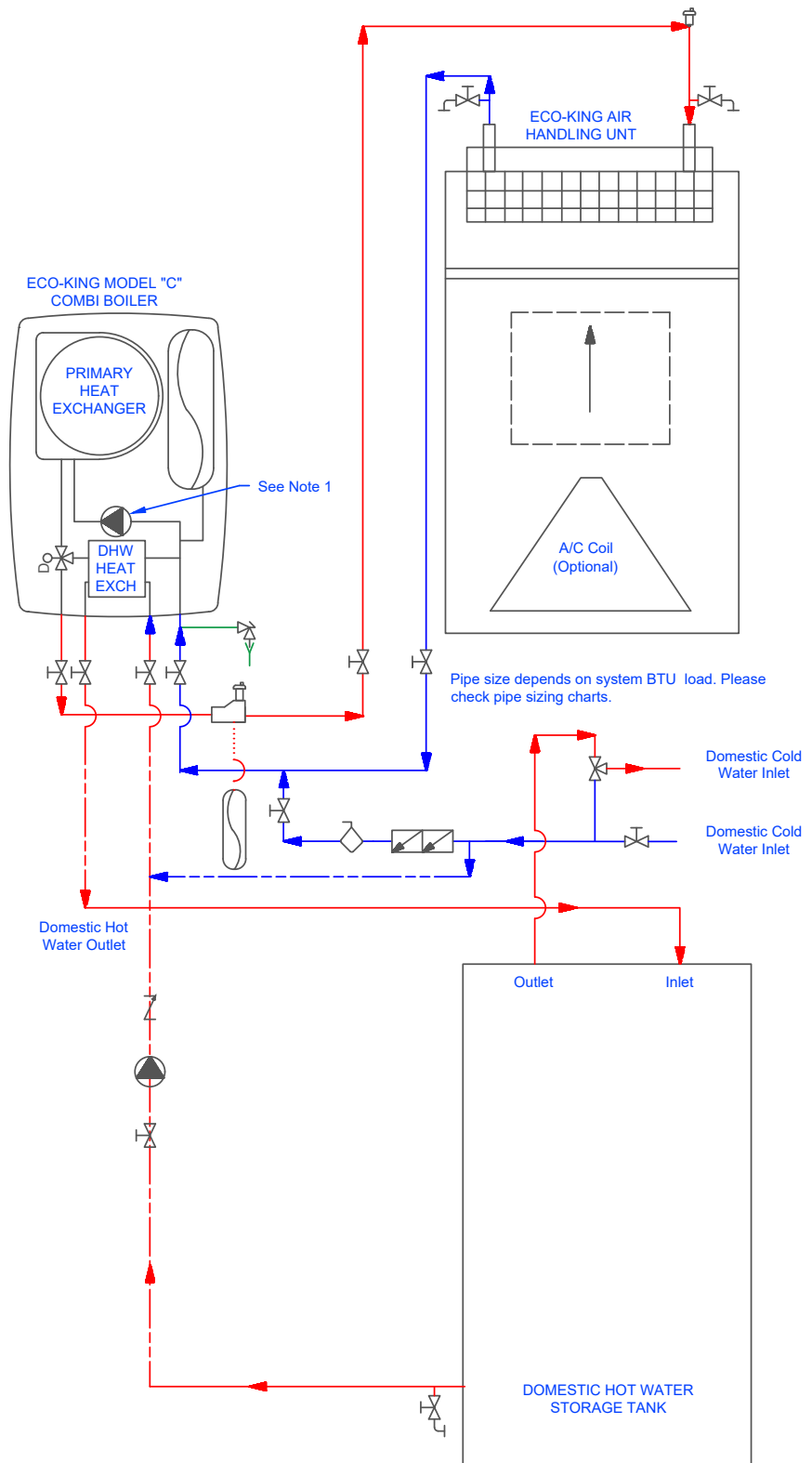
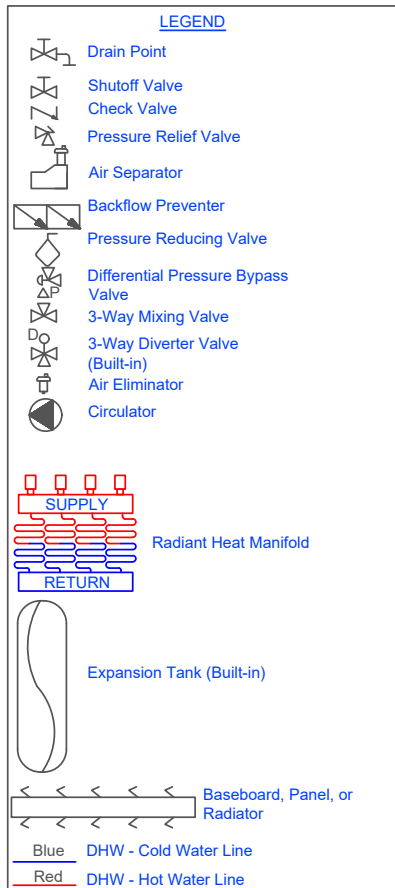
C Model System layout 5: Combi model boiler using Primary Secondary piping via closely spaced T's or a Low Loss Header (LLH). On Demand DHW. Recommended piping schematic. External expansion tank can be added if required.



NOTES

- Maximum 4x the smallest pipes diameter distance between closely spaced supply and return tees. Minimum 6" length of pipe required before and after closely spaced tees.
- Primary/ Secondary piping with pump is only required when built-in pump in boiler does not provide enough GPM or ft. hd. for the heating system. Otherwise, use boiler pump for the entire system and do not install closely spaced tees as shown in this drawing. (Contact Eco-King for pump specs, if needed)
- Air vents are recommended at the highest point(s) of the system and drain points at the lowest points of the system.
- This diagram illustrates a general arrangement and may not show all the necessary components and accessories that can be utilized or required for the proper operation of the system or that may be required by local codes.

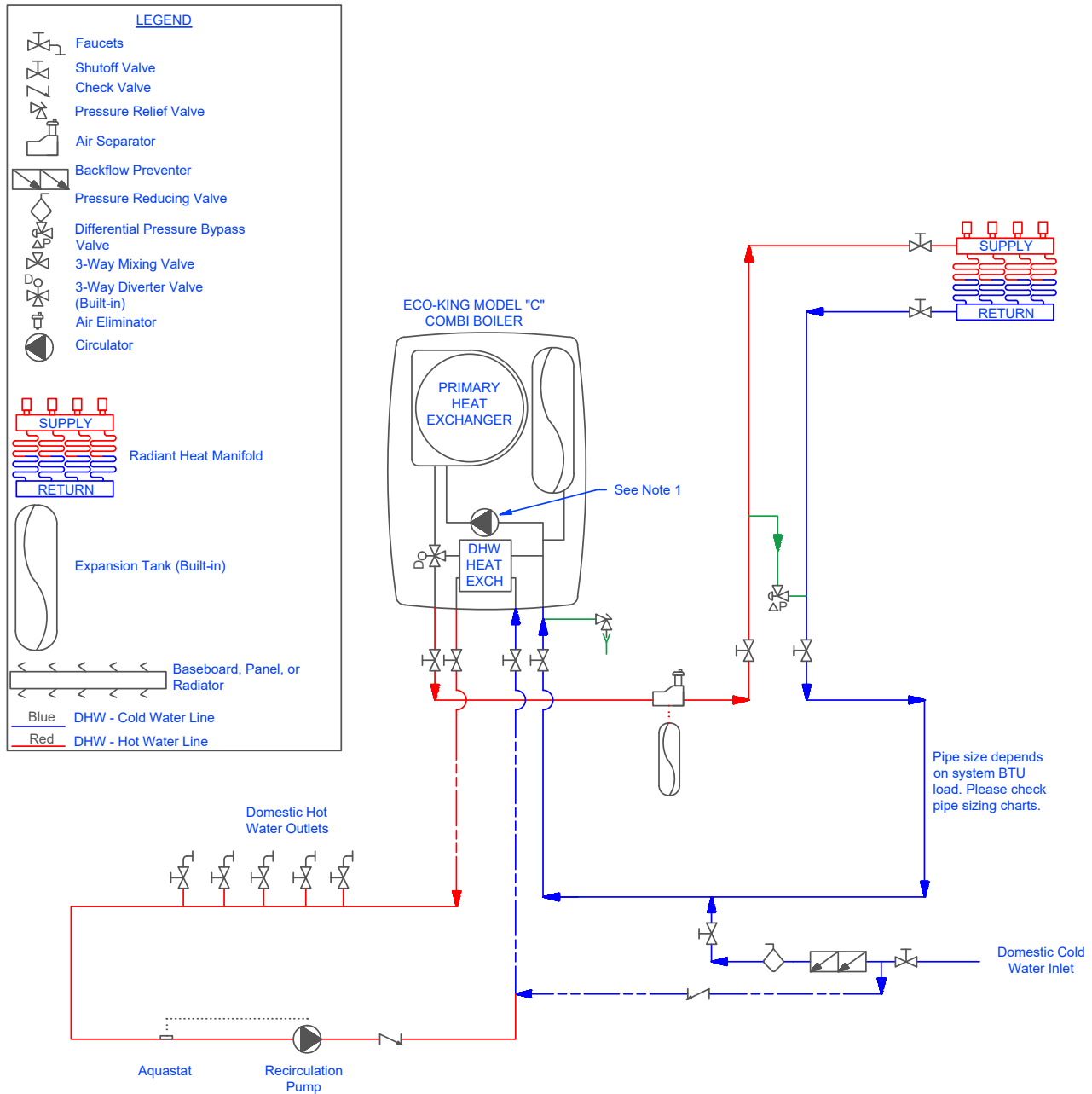
C Model System layout 6: Combi model boiler using direct supply piping for heating an air handler and an on demand hot water WITH a storage tank for DHW. External expansion tank can be added if required.



NOTES

1. When only using built-in pump in boiler for the entire heating system, ensure the pump has the capacity to handle the load (Consult Eco-King for pump specs).
2. Air vents are recommended at the highest point(s) of the system and drain points at the lowest points of the system.
3. This diagram illustrates a general arrangement and may not show all the necessary components and accessories that can be utilized or required for the proper operation of the system or that may be required by local codes.

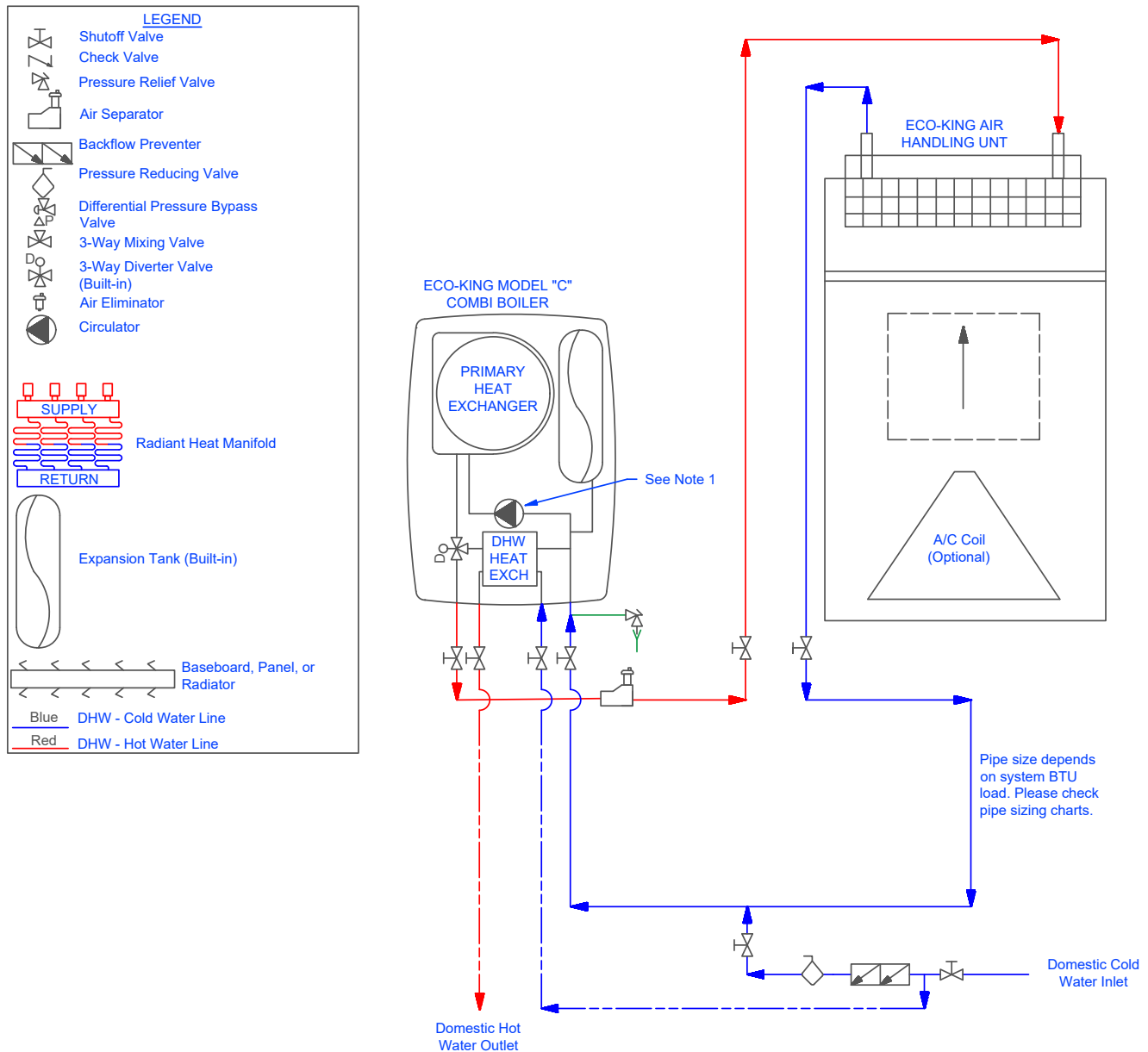
C Model System layout 7: Combi model boiler using direct supply piping for heating and on demand hot water WITH recirculation pump for DHW.



NOTES

1. When only using built-in pump in boiler for the entire heating system, ensure the pump has the capacity to handle the load (Consult Eco-King for pump specs).
2. Use a aquastat to turn on the pump or run a pump on a timer (Grundfos 15-10 recommended)
3. Air vents are recommended at the highest point(s) of the system and drain points at the lowest points of the system.
4. This diagram illustrates a general arrangement and may not show all the necessary components and accessories that can be utilized or required for the proper operation of the system or that may be required by local codes.

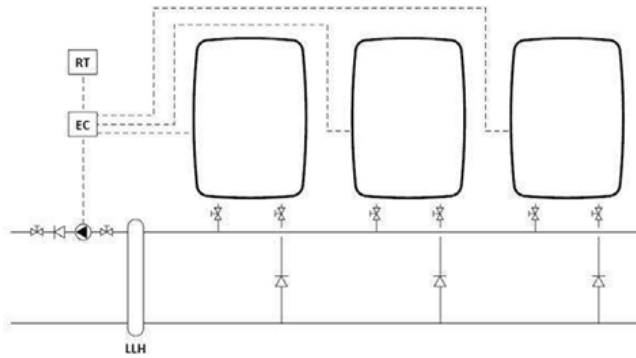
C Model System layout 8: Combi model boiler using direct supply piping for heating and on demand hot water for DHW. External expansion tank can be added if required.



NOTES

1. When only using built-in pump in boiler for the entire heating system, ensure the pump has the capacity to handle the load (Consult Eco-King for pump specs).
2. Air vents are recommended at the highest point(s) of the system and drain points at the lowest points of the system.
3. This diagram illustrates a general arrangement and may not show all the necessary components and accessories that can be utilized or required for the proper operation of the system or that may be required by local codes.

Boiler System layout 9. System layout: Combi or Heating only appliance in cascade configuration with: Heating circuit with low loss header and external cascade control (i.e. Tekmar 261)



Legend

For boiler details refer to layout no. 1 and 2.

LLH Low Loss Header
 EC External control (cascade control)
 RT Room Thermostat

Further piping diagrams are available upon request. Email us at sales@ecokingheating.com

Section 7 - Installing the Gas Piping

⚠ WARNING

The gas installation must only be carried out by a qualified technician, service agency or the gas utility. The installation shall comply local codes and the authorities having jurisdiction or, in the absence of such requirements, to the latest edition of the National Fuel Gas Code, ANSI Z223.1/NFPA 54. In Canada, installation must be in accordance with the requirements of CAN/CSA B149.1, Natural Gas and Propane Installation Code. Where required by the authority having jurisdiction.

Do not use gas piping as a ground for electrical appliances. Doing so can create fire, explosion, or shock hazards, and may damage the gas system. Always connect electrical grounds to a proper, dedicated grounding point in accordance with local electrical codes. Failure to do so may result in death, severe injury or property damage.

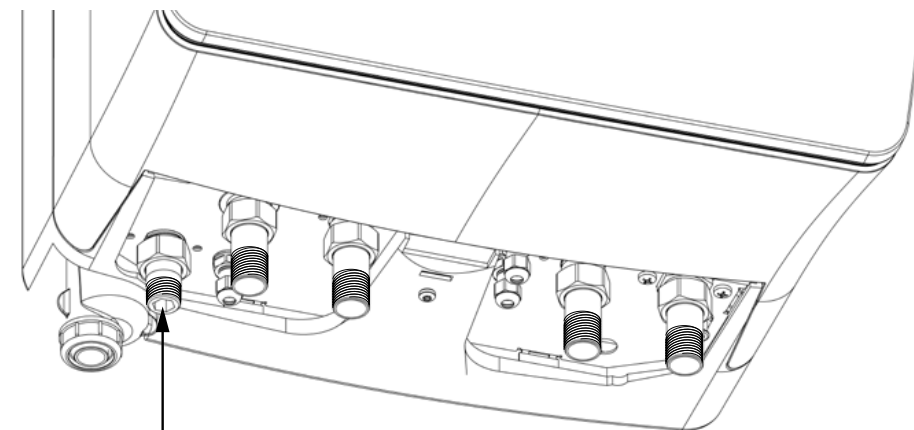
The maximum inlet gas pressure must never exceed the value specified by the manufacturer and the minimum value listed is for the purposes of input adjustment. Exceeding maximum inlet gas pressure limit can result in equipment damage, fire, or explosion. Always verify supply pressure before operation. Failure to do so may result in death, severe injury or property damage.

Ensure that the gas piping is protected from physical damage and freezing where required. Failure to follow these instructions could result in gas leakage and result in fire, explosion, property damage, severe personal injury, or death.

Pipe size to the appliance is dependent on:

- Length of pipe;
- Number of fittings;
- Maximum input requirement of all gas appliances in the residence.

Gas piping shall be sized in accordance with to the latest edition of the National Fuel Gas Code, ANSI Z223.1/NFPA 54. In Canada, installation must be in accordance with the requirements of CAN/CSA B149.1, Natural Gas and Propane Installation Code. Where required by the authority having jurisdiction.



BSP gasketed union nut to
1/2" Male NPT

Figure 7.1 Gas Line Connection Location

The gas connection tube diameter is not indicative of the gas pipe that should be connected to it. For example the connection on boiler is ½", but the larger Eco-King boilers at 187,000BTU require a larger gas pipe to be piped to the boiler. Consult the gas code to determine gas pipe size. It is necessary to install a manual shutoff gas valve in front of the gas pressure regulator to ensure that the gas line can be closed in case of maintenance. The entire piping system, gas meter and regulator must be sized properly to prevent a pressure drop greater than 1 in. w.c. as stated in the National Fuel Gas Code. If you experience a pressure drop greater than 1 in. w.c. the meter, regulator or gas line is undersized.

Ideally 7-10 in. w.c. of gas pressure when using Natural gas and 11-13 in. w.c. when using LPG, will be available to the boiler gas valve inlet at maximum boiler operation. The minimum gas pressure required is 3.5 in. w.c. and the maximum is 14 in w.c. during static and dynamic testing.

When an in-line regulator is used to drop gas pressure from 2 psi to 0.5 psi, it must be located a minimum of 6ft (1.83 m) from the Eco-King boiler.

Eco-King recommends minimum ¾" diameter flex hose if flex gas hose is going to be used. Ensure the appliance connector is as short as practical and is correctly sized for the BTU load it will be supplying.

Great care must be taken when installing corrugated appliance connectors or tubing; they typically have large pressure drops and noise may occur.

Create an installation layout so that the piping does not interfere with the vent pipe, or any other serviceable components.

Ensure the gas piping is large enough for all the appliances in the home. No significant drop in line pressure should occur when any unit (or combination of units) lights or runs. Use common gas line sizing practices. Make sure the gas pressure is within specification during all conditions.

Always use a pipe-threading compound. Apply sparingly to all male threads, starting two threads from the end. Over doping or applying dope to the female end, can result in a blocked gas line.

Properly support the piping with hangers. Do not allow the piping to be supported by the boiler or its accessories.

Install a manual "Equipment Shut-Off Valve". The shut-off valve must be listed by a nationally recognized testing lab.

Should overheating occur or the gas supply fail to shut off, turn off the manual gas control valve. The gas line piping can safely be removed from the appliance for servicing.

7.1 Connecting the Gas Line

WARNING

To avoid damaging the connection on the boiler, use two wrenches when tightening piping to the boiler. Damaged connectors may result in system leaks that may cause fire or explosions resulting in death severe injury or property damage.

Strain on the gas valve and fittings may result in vibration, premature component failure and leakage and may result in a fire, explosion, property damage, serious injury or death.

The boiler is supplied with BSP gasketed union nut to 1½" Male NPT adapter already installed to the boiler. Verify the adapter is tightly connected and tested for gas leaks.

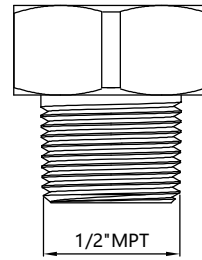


Figure 7.2 Gas Connection - BSP gasketed union nut to 1/2" Male NPT

A sediment trap (drip lag) shall be installed at the inlet of the gas supply connection to the boiler. (See *Figure 7.3: Gas Line Configuration*)

A manual gas shutoff valve shall be install outside of the boiler jacket upstream of the union connection. (See *Figure 7.3: Gas Line Configuration*)

DO NOT TIGHTEN FITTINGS WITHOUT SUPPORTING THE GAS VALVE.

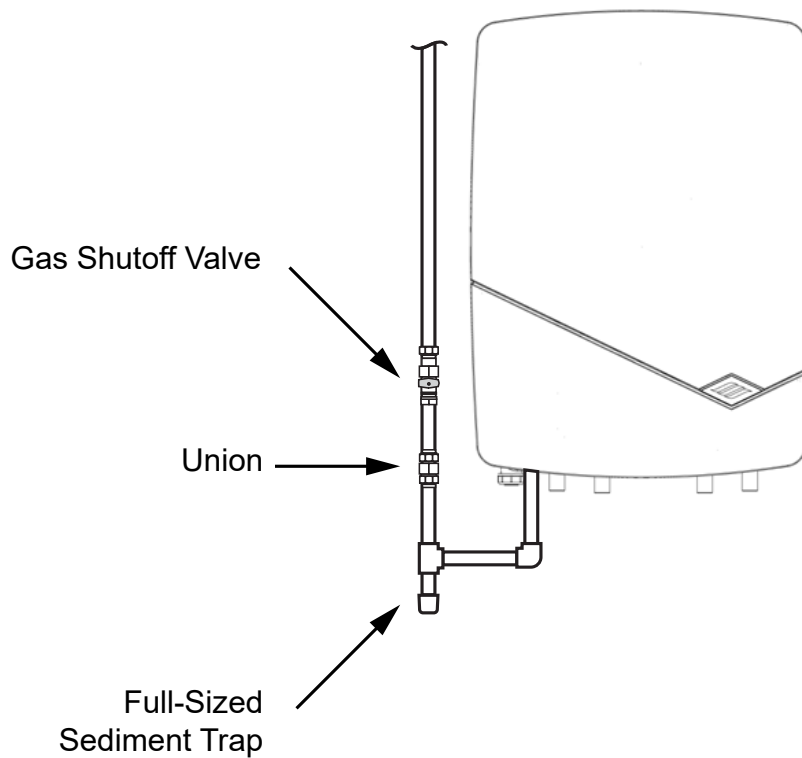


Figure 7.3 Gas Line Configuration

7.2 Testing for Leaks

The appliance and its gas connection must be leak tested before placing the appliance in operation.

DANGER

To avoid danger from explosion and fire, do not use a flame to check for a gas leak. Perform a bubble test on the joints to check for gas leaks. If a leak exists, bubbles will form at the leaking joint. A gas leak could result in substantial property damage, severe personal injury, or death.

WARNING

The inlet gas pressure should be checked by a LICENSED PROFESSIONAL ONLY. The boiler cannot function properly without sufficient inlet gas pressure.

When performing a gas pressure test on the gas line piping, The appliance must be disconnected and isolated if the test pressure is expected to exceed 0.5 PSI (3.5kPa), as damage to the valve could occur resulting in fire, property damage, serious injury or death.

Immediately turn off the boiler and stop the gas supply if a gas leak is detected. Perform a bubble test to find the leak and repair the leak immediately. Do not start the boiler again until the leak is repaired. Operating the boiler with a gas leak could result in substantial property damage, severe personal injury, or death.

Carefully purge the new gas pipe (outside in open air) before putting appliance into operation for the 1st time.

7.3 Converting to Propane (LPG)

C100A, H100A, C140A & H140A boiler models only require setting 15 to be changed to 02. See *Table 10.1: Setting Parameters*, C200A and H200A models require setting 15 to be changed to 02 AND gas tube to be changed.

You must separately order a propane gas tube (part number 204-1231) for an H200A or C200A boiler to be used on propane. The propane gas tube slides into the fan gas inlet connection and is then connected on the gas valve outlet, internally in the boiler.

All other sizes do not need this tube replaced.

WARNING

Do not over tighten the propane gas tube connection. over tightening could damage the gas valve or cause a gas leak. ALWAYS leak test the connections afterwards. Failure to do so may cause death, severe injury or property damage.

Section 8 - Venting

Adequate combustion and ventilation air shall be in accordance with the *National Fuel Gas Code*, ANSI Z223.1/NFPA 54 (latest edition) or the *Natural Gas and Propane Installation Code*, CSA B149.1 (latest edition), or applicable provisions of the local building codes. Ensure the venting system manufacturer's installation instructions are closely followed.

For boiler connections to gas vents, vent installations must be in accordance with the *National Fuel Gas Code*, ANSI Z223.1/NFPA 54 (latest edition) or the *Natural Gas and Propane Installation Code*, CSA B149.1 (latest edition), or applicable provisions of the local building codes. Ensure the venting system manufacturer's installation instructions are closely followed.

The venting system shall be installed in accordance with this installation and operation manual and the venting system manufacturer's instructions.

When the appliance is installed in a manufactured home, the venting system installation shall conform to The Manufactured Home Construction and Safety Standard, Title 24 CFR, Part 3280 and/or CSA Z240 MH Series, Manufactured Homes.

The safe operation of a venting system is based on the use of parts supplied by the venting systems manufacturer and the performance of the system may be affected if the combination of these parts is not used in actual building construction. Do not mix venting systems parts.

Acceptance of the venting system is dependent upon full compliance with the venting systems manufacturer's instructions.

The Eco-King boiler is a direct vent, category IV, appliance with sealed combustion requiring special venting systems. All combustion air is drawn directly from the outdoors, with some non-direct venting applications as an exceptions (see Section 8.9 Non-Direct Venting). The housing cover closes the appliance on the rear plate air-tight. All products of combustion are vented directly outdoors. Both the vent and combustion air piping should be piped to the outdoors, using the vent material and rules outlined in this section.

Safety provisions with regards to high exhaust gas temperatures to protect the non-metallic exhaust piping have been provided within the boiler. The safety system shuts down the gas supply in case the temperature of the exhaust gasses becomes too high, after which the appliance will not run until reset.

Under no conditions may this appliance vent gases into a masonry chimney. The appliance shall not be connected to a chimney flue serving a separate appliance, designed to burn solid fuel.

WARNING

Under no circumstances may an existing chimney be used to vent the Eco-King boiler. A chimney may be used as a chase with approved venting material. The appliance shall not be connected to a chimney flue serving a separate appliance, designed to burn solid fuel. Failure to follow these instructions will result in fire, property damage, serious injury or death.

Before installation, consult the authority having jurisdiction (such as gas inspection authority, municipal building department, fire department, fire prevention bureau, etc) to determine the need to obtain a permit or for applicable local or national codes.

- Examine all venting components for possible shipping damage prior to installation;
- Proper joint assembly is essential for a safe installation. Read all instructions before beginning the installation and follow these instructions exactly as written;
- Check for proper joint construction when joining pipe to fittings;
- This venting system must be free to expand and contract under normal operation; This venting system must be supported in accordance with venting system manufacturer instructions;
- Check for unrestricted vent movement through walls, ceilings and roof penetrations.
- Different manufacturer's have different joint systems and adhesives. Do not mix pipe, fittings or joining methods from different vent system manufacturers.

- Ensure proper airflow by creating an airtight seal from the boiler collar to the vent termination, directing all intake and exhaust air directly outside the building.
- The maximum length, the correct diameter and number of fittings must be in conformance with the specifications within this instruction manual.
- - Ensure the horizontal portion of the venting system is graded at a minimum of ¼" per foot (21 mm/m) back to the boiler.

Framing of openings in ceilings and floors to provide fire stopping in joist areas and the installation of fire stop spacer assemblies shall be installed to the venting systems manufacturer's instructions and in accordance with the *National Fuel Gas Code*, ANSI Z223.1/NFPA 54 (latest edition) or the *Natural Gas and Propane Installation Code*, CSA B149.1 (latest edition), or applicable provisions of the local building codes.

Except for installation in single-and two-family dwellings, metal venting systems which extend through any storey above that on which the connected appliance is located are to be provided with enclosures having a fire resistance rating equal to or greater than that of the floor or roof assemblies through which they pass.

Whenever the venting system penetrates a floor or ceiling and is not running in a fire-rated shaft, a fire-stop is required. Nail the fire stop to the structure and pass the venting sections through the hole.

Plastic venting systems shall not pass through fire rated separations.

WARNING

The instructions with regard to installation of the condensate drain must be followed (section 5). If not, the exhaust gases can be blown out under a locked vent condition before the appliance's blocked vent detection system can function.

Covering non-metallic vent pipe and fittings with thermal insulation is prohibited. Failure to comply could result in excessive heat or melted venting causing death, severe injury or property damage.

Insulation or other materials shall not be in required clearance spaces surrounding the vent unless specified by the venting systems manufacturer's instructions.

The boiler does not use air (Oxygen) from the installation room, except with specific exceptions as noted later in this manual. The front cover closes the housing air-tight ensuring air is only supplied by the vent air intake. Therefore, ensure the front cover has always been placed in proper position during operation of the boiler.

If the appliance is to be connected to a pre-existing venting system. Ensure the venting has been inspected and is in good working condition and is in accordance to these installation instructions as well as the venting systems manufacturer's instructions, local codes and the authorities having jurisdiction. Failure to comply may result in carbon monoxide poisoning or fire causing death, severe injury or property damage.

Vent connectors serving other appliances shall not be connected into any portion of the mechanical draft system.

Have horizontal runs sloping backwards to the boiler based on vent pipe Manufacturer specifications from the terminal to the boiler preventing condensate moisture from running into the air intake piping.

When installing the vent system ensure:

1. The power is turned off to the appliance, until the vent and combustion air intake system are completely installed.
2. Ensure the appliance gas supply shut-off valve is in the off position.
3. Disconnect the power supply by unplugging the boiler from the electrical outlet.

8.1 Approved Venting Materials

WARNING

Only use vent and air systems as specified in this manual. Failure to comply may result in death, serious injury or property damage.

Material	Approved Use	Standard Approved To:	
		United States	Canada
Polypropylene (pp)	Both Combustion Air & Exhaust Vent	UL 1738	ULC-S636
CPVC Sch. 40	Both Combustion Air & Exhaust Vent	UL 1738	ULC-S636
CPVC Sch. 80	Combustion Air ONLY	UL 1738	ULC-S636
PVC Sch. 40	Both Combustion Air & Exhaust Vent	UL 1738	ULC-S636
PVC Sch. 80	Combustion Air ONLY	UL 1738	ULC-S636
PVC DWV	Combustion Air ONLY	ANSI/ ASTM D2665	Approved but no applicable standard exists
ABS	Combustion Air ONLY	Approved but no applicable standard exists	Approved but no applicable standard exists
Sheet Metal	Combustion Air ONLY	Approved but no applicable standard exists	Approved but no applicable standard exists
PVC Cement & Primer	Both Combustion Air & Exhaust Vent	ASTM D2564 (for cement) / ASTM F656 (for primer)	ULC-S636
CPVC Cement & Primer	Both Combustion Air & Exhaust Vent	ASTM F493 (for cement) / ASTM F656 (for primer)	ULC-S636
ABS Cement	Combustion Air ONLY	ASTM D2235	Approved but no applicable standard exists

Table 8.1: Approved air intake material for Eco-King Boilers

WARNING

For installations using PVC exhaust vent, the first seven (7) equivalent feet of vent must be CPVC to allow exhaust temperatures to cool. Failure to do so may result in the PVC pipe melting causing carbon monoxide poisoning or fire resulting in death, severe injury or property damage. (e.g. 2 ft (0.6 m) of vent and 1 90° Elbow with an equivalent length of 5 ft (1.5 m) equals 7 equivalent feet)

Use of cellular core PVC (such as identified by the marking “ASTM F891”), cellular core CPVC, or Radel® (polyphenylsulfone) in venting systems is prohibited.

NOTICE

PVC In Canada - Safety authorities in some jurisdictions are not allowing PVC venting materials with appliances of any kind, even if System 636 certified. Check with the local safety inspector to verify compliance.

Combustion air - intake materials can be made of ABS, PVC, CPVC, PP, galvanized or stainless steel, corrugated aluminum or any other such materials. If you use a corrugated material, ensure that there is not inadvertent crimping of, or damage to, the combustion air - intake pipe.

8.2 Approved Vent Sizes

The table below illustrates the approved vent size diameters that can be used with the appliance.

Vent Type	Diameter
Concentric	2"/4" (60 mm/ 100 mm)
	3"/5" (80 mm/ 125 mm)
Single Pipe	2" (60 mm)
	3" (80 mm)

Table 8.2: Max. Concentric Pipe length determination

8.3 Vent Lengths

8.3.1 Concentric Vent Pipe Maximum Length & Equivalent Length of Fittings

Refer to *Table 8.3: Max. Concentric Pipe length determination* and *Table 8.4: Concentric Fitting Equivalent Lengths* to determine the maximum allowable pipe length. The table accounts for the use of 90° and 45° elbows, and lists the permitted lengths for both vent and air-intake piping for the boiler.

Number of Elbows and Equivalent Feet (Meters)											
Connection Type	Length	1	2	3	4	5	6	7	8	9	10
Concentric 2"/4" (60/100mm)	65 ft (20m)	60 (18.5)	55 (17)	50 (15.5)	45 (14)	41 (12.5)	36 (11)	31 (9.5)	26 (8)	21 (6.5)	16 (5)
Concentric 3"/5" (80/125mm)	82 ft (25m)	77 (23.5)	72 (22)	67 (20.5)	62 (19)	57 (17.5)	52 (16)	47.6 (14.5)	42 (13)	37 (11.5)	32 (10)

Table 8.3: Max. Concentric Pipe length determination

Fitting	Equivalent Length	
	2"/4" (60/100mm) Ø	3"/5" (80/125mm) Ø
90° Elbow	3.28 ft. (1 m)	3.28 ft. (1 m)
45° Elbow	1.64 ft. (0.5 m)	1.64 ft. (0.5 m)

Table 8.4: Concentric Fitting Equivalent Lengths

8.3.2 Single Vent Pipe Maximum Length & Equivalent Length of Fittings

Eco-King recommends using 3" venting, however 2" venting is permitted. In *Table 8.5: Maximum Pipe Lengths* the boiler max vent lengths are outlined. Each elbow or tee has a value equal to a number of feet of straight pipe. The following chart outlines the equivalent feet of straight pipe for each fitting.

Eco-King recommends using as few fittings as possible on the exhaust and intake air piping.

Connection Type	Max vent run with no elbows	Each 45° elbow equivalent to:*	Each 90° elbow equivalent to:*	Each tee fitting equivalent to:*
2" (60mm) ø exhaust vent length	100 ft (30.5m)**	3 ft. (0.9 m)	5 ft. (1.5 m)	9 ft. (2.74 m)
2" (60mm) ø combustion air length	100 ft (30.5m)**	3 ft. (0.9 m)	5 ft. (1.5 m)	9 ft. (2.74 m)
3" (80mm) ø exhaust vent length	110 ft. (33.5m)**	3 ft. (0.9 m)	5 ft. (1.5 m)	9 ft. (2.74 m)
3" (80mm) ø combustion air length	110 ft. (33.5m)**	3 ft. (0.9 m)	5 ft. (1.5 m)	9 ft. (2.74 m)

Table 8.5: Maximum Pipe lengths

*: each elbow reduces vent length distance by the amount shown in the table.

**Power reduction:

There is an output power reduction when using longer vent lengths. Using 2" venting there is a power reduction of 2% starting at a combined vent length of 90ft. That reduction increases to 7% at max combined vent length of 150ft. Using 3" venting there is a power reduction of 2% starting at 160ft combined vent length which increases to 7% at max combined vent length of 200ft.

Notes: an installer must adhere to the following when 2" venting with exhaust vent lengths between 45 and 75ft and 3" venting with exhaust vent lengths between 60 and 100ft:

1. Manually calibrate boiler upon commissioning with a combustion analyzer. See Manual calibration section in installation manual for instructions.
2. Maximum 6 elbows permitted on all vent applications. This limit on elbows used is only when at least one side of 2" vent length exceeds 45ft and 3" vent lengths exceed 75'.

Figure 8.1: Pressure Resistance illustrates the relationship between system power (BTU/hr) and resistance (Psi) of the intake and exhaust venting up to a pressure of 200 Pa (0.030 Psi), power will remain the same. Larger resistances will cause the power decrease.

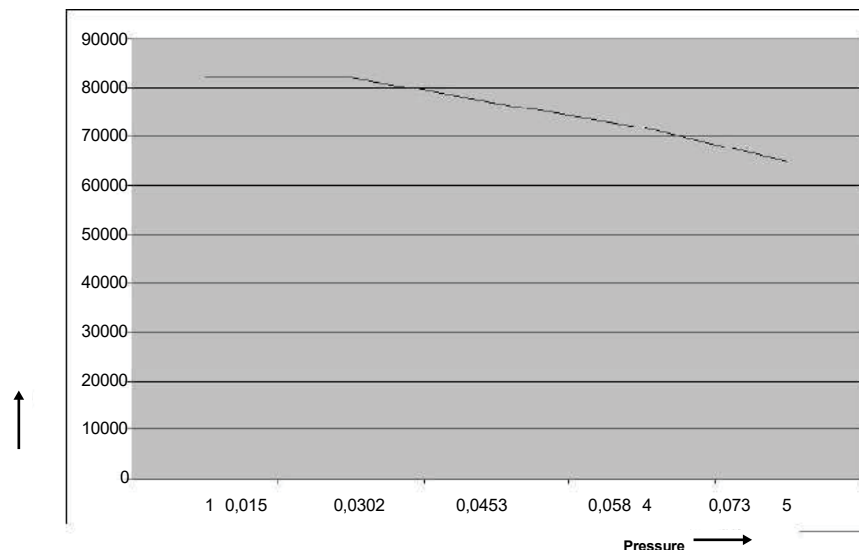


Figure 8.1: Pressure Resistance vs. Power

8.4 Combustion Air-Intake Contamination

Air for combustion must be drawn from outdoors from an area free of dust and contaminants. Combustion air containing chemicals such as chloride, fluoride, bromine or iodine or dust and debris will cause corrosion damage of the heat exchanger voiding your Eco-King boiler warranty. Refer to *Table 8.6: Corrosive Products and Contaminant Sources* for a list of corrosive products and contaminants sources to avoid.

Do not to locate the Air-Intake terminal in an area where contaminants can be drawn in and used for combustion. See *Table 8.6: Corrosive Products and Contaminant Sources* for a list of areas to strictly avoid when terminating air-intake piping. These same conditions should be avoided when drawing intake air from a boiler room.

WARNING

Combustion air containing dust, debris or air-borne contaminants will drastically increase the required maintenance and may cause a corrosive reaction in the heat exchanger which could result in premature failure, fire, serious injury, or death.

Products to Avoid	Contaminated Sources to Avoid
Anti-static fabric softeners, bleaches, detergents, cleaners	Laundry facilities
Perchloroethylene (PCE), hydrocarbon based cleaners	Dry cleaning facilities
Chemical fertilizer, herbicides/pesticides, dust, methane gas	Farms or areas with livestock and manure
Paint or varnish removers, cements or glues, sawdust	Wood working or furniture refinishing shops
Water chlorination chemicals (chloride, fluoride)	Swimming pools, hot tubs
Solvents, cutting oils, fiberglass, cleaning solvents	Auto body or metal working shops
Refrigerant charge with CFC or HCFC	Refrigerant repair shops
Permanent wave solutions	Beauty shops
Fixer, hydrochloric acid (muriatic acid), bromide, iodine	Photo labs, chemical / plastics processing plants
Cement powder, crack fill dust, cellulose, fiber based insulation	Concrete plant or construction site

Table 8.6: Corrosive Products and Contaminant Sources

CAUTION

Venting Options - Due to potential moisture build-up (loading) along the exterior wall, sidewall venting may not be the preferred venting option. Be aware of this possibility when choosing sidewall or roof termination

NOTICE

In new home installs it is mandatory to bring clean, uncontaminated air in from outside the home while the home is being built. This is done to prevent dust and any other contaminants from entering the boiler housing and affecting operation. The warranty may be void if these instructions are not followed.

8.5 Connecting Venting to the Appliance

The first **piece** of vent piping off of the top of the boiler must be readily accessible for inspection.

Venting shall be sloped and supported per section 8.6 Venting Slope and Supports.

WARNING

Risk of carbon monoxide poisoning. The instructions for connecting venting to the appliance must be followed exactly. Failure to do so may result in vent separation resulting in death or severe injury.

Do not use grease, centrocerin or other lubricant on the appliance vent connection gaskets. Only water may be used for this purpose. Grease, centrocerin or other lubricant can make the gasket brittle or result in tears in the surface of the gasket, this may result in exhaust gas leakage causing carbon monoxide poisoning or fire resulting in death, severe injury or property damage.

The appliance is designed to connect directly to 2" (60mm) CPVC/PVC or Polypropylene venting material only. To adapt to a larger diameter a transition adapters approved by the venting systems manufacturer shall be used. Failure to do so may lead to joint separation resulting in carbon monoxide poisoning, fire or explosion causing death, severe injury or property damage.

Use only vent pipe listed in section 8.1 Approved Venting Materials. Failure to do so may cause the vent system not to fit correctly to the boiler creating an improper seal resulting in carbon monoxide poisoning or fire causing death, severe injury or property damage.

Ensure vent pipes are cut perpendicular and square to avoid combustion leakage resulting in carbon monoxide poisoning causing death or severe injury.

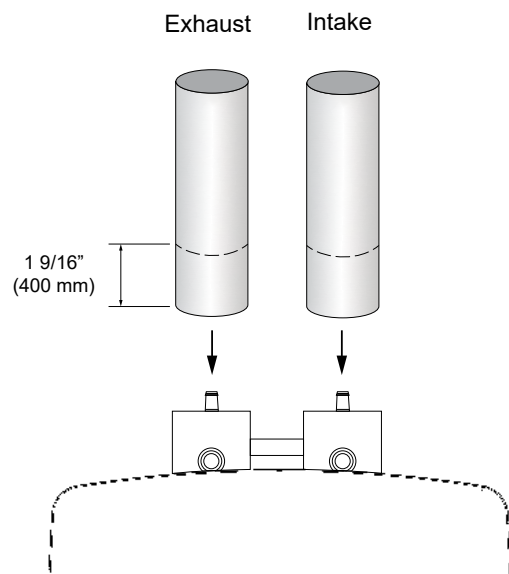
The appliance can be vented using a two pipe system, one pipe to convey exhaust gases out of the building to the outside and one to convey fresh combustion air from the outside to the appliances combustion air intake. The instructions below illustrate the proper procedure for connecting a two pipe venting system to the appliance.

WARNING

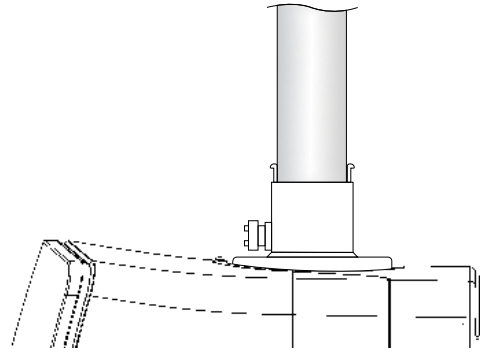
Ensure the sealing gaskets do not get rolled, pinched or damage when inserting vent system pipes into the appliance. Failure to do so may result in carbon monoxide poisoning causing death or severe injury.

1. Cut the exhaust vent pipe to length and deburr the cut end to ensure it will not damage the exhaust outlet sealing gasket.
2. Measure 1 9/16" (40 mm) on the end of the vent pipe to be inserted into the exhaust and mark a straight line perpendicularly on the pipe. This is the insertion depth that the pipe should go into the exhaust outlet of the appliance.
3. Insert the pipe into the exhaust outlet ensuring it is fully inserted and past the sealing gasket. (Fig. 7.2(1, 2a, 2b))
4. Position the supplied exhaust vent locking band in place and tighten the screw to secure the vent to the boiler.
Tighten the clamp with a socket wrench to ensure the clamp is very tight. (Fig. 7.2(3)).
5. Cut the combustion air intake pipe to length and deburr the cut end to ensure it will not damage the combustion air intake sealing gasket.
6. Measure 1 9/16" (40 mm) on the end of the combustion air intake pipe to be inserted into the combustion air intake and mark a straight line perpendicularly on the pipe. This is the insertion depth that the pipe should go into the combustion air intake of the appliance.
7. Insert the pipe into the combustion air intake ensuring it is fully inserted and past the sealing gasket. (Fig. 7.2(1, 2a, 2b))
8. Position the supplied combustion air intake locking band in place and tighten the screw to secure the vent to the boiler.
Tighten the clamp with a socket wrench to ensure the clamp is very tight. (Fig. 7.2(3))
9. Ensure that the venting system is supported properly and does not apply a load or strain on the appliance exhaust outlet adapter using a wall support.

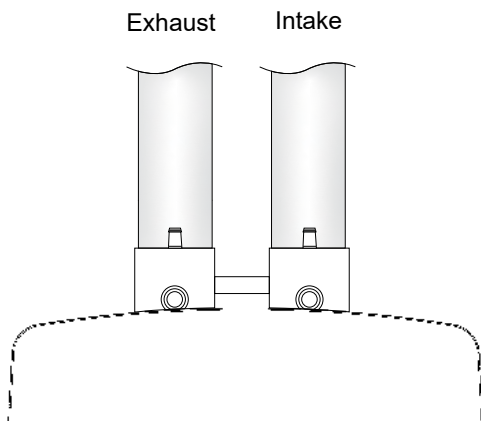
1.



2 a.



2b.



3.

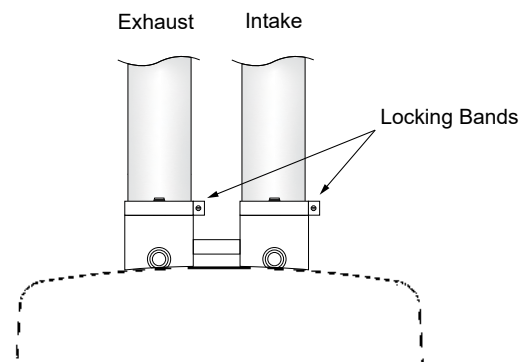


Figure 8.2: Connecting Venting to Appliance

8.5.1 Connecting/ Transitioning PVC Vent to the Exhaust

⚠ WARNING

When using PVC to vent the boiler exhaust from the boiler the first equivalent 7 ft (2.13 m) of vent must be CPVC as PVC has a lower melting point than CPVC.

Ensure a solvent and primer is used that is approved for transitioning between the materials by the venting systems manufacturer. Failure to do so may result in joint separation that can cause carbon monoxide poisoning, fire or explosion resulting in death, severe injury or property damage.

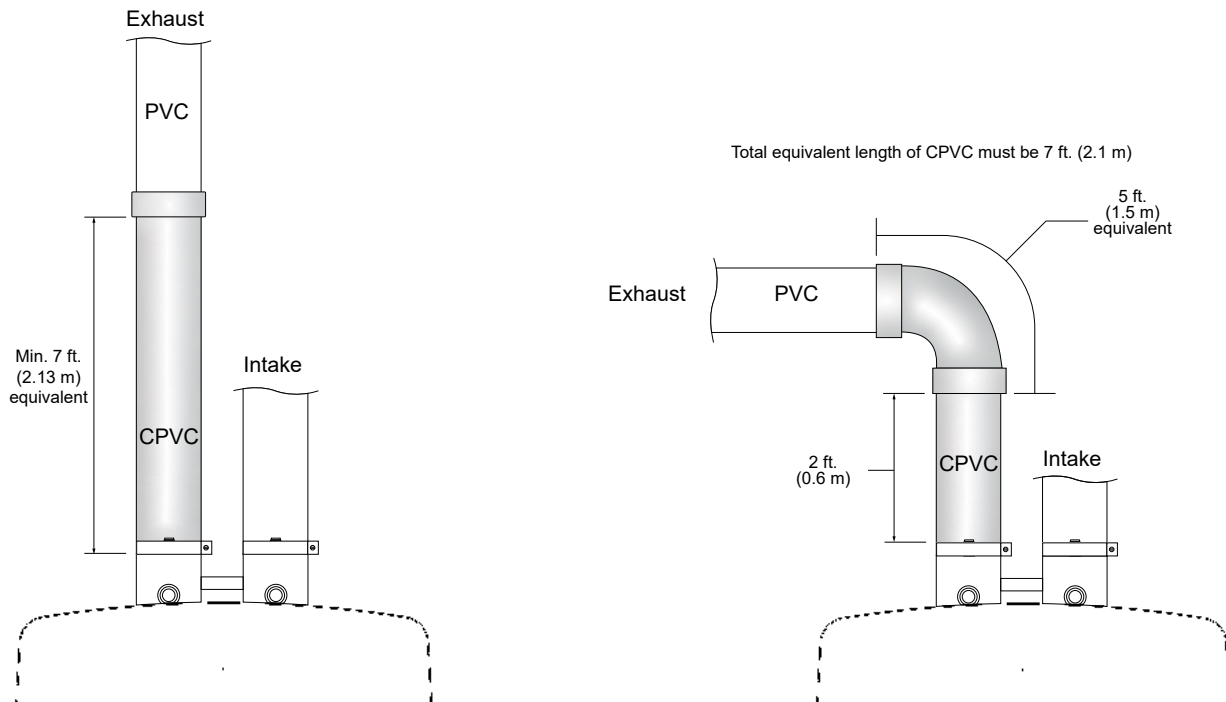


Figure 8.3: Transitioning Exhaust to PVC

⚠ WARNING

The equivalent length of elbows changed dependent on venting material. Always consult 7.3 Vent Lengths or the venting manufacturers instructions for equivalent lengths of fittings. Failure to do so may cause venting to overheat resulting in carbon monoxide poisoning due to joint separation or fire causing death, severe injury or death.

8.6 Connecting Vent Pipes

The vent pipe shall be connected and secured in accordance with the vent manufacturer's instructions, with the *National Fuel Gas Code*, ANSI Z223.1/NFPA 54 (latest edition) or the *Natural Gas and Propane Installation Code*, CSA B149.1 (latest edition), or applicable provisions of the local building codes.

WARNING

Follow the vent manufacturer's instructions exactly for proper joint assembly. Ensure all joints are secured, supported and that pipe is inserted into fittings at the recommended depths stated by the manufacturer of the vent. Failure to comply may result in the risk of carbon monoxide poisoning or fire due to joint separation or pipe breakage resulting in death, severe injury or property damage.

Do not apply force or strike the pipe after making a connection as this may cause the pipe or fitting to leak resulting in carbon monoxide poisoning or fire due to joint separation or pipe breakage resulting in death, severe injury or property damage.

Follow the manufacturer's instructions for proper guidelines for allowing pipe expansion. Failure to do so may result in carbon monoxide poisoning or fire due to joint separation or pipe breakage resulting in death, severe injury or property damage.

8.6.1 When Using Cement

WARNING

- ALWAYS work in a well-ventilated area, or wear an approved organic vapor respirator when handling primers and solvent cements. Failure to do so may result in serious injury or death.
 - Fumes from primers and solvent cements may cause nausea.
 - Do not use solvents (e.g. paint thinners, etc. or adhesives other than those recommended by the plastic vent system manufacturer
- Ensure cut pipe is cut square and free from burrs before assembly.
 - Use only approved solvent type cements and primers for the vent material.
 - Any adhesives or sealants such as primers and solvent cements shall be used within their marked time limitations.
 - Ensure the surface area of the pipe and fitting that is to be bonded has been properly cleaned per the vent manufacturer's instructions.
 - Installing vent systems in cold ambient temperatures may result in longer solvent cement drying times.

8.6.2 When Push-Fit Gasket System

WARNING

- When using screws (concentric vent only), only use screws supplied by the vent manufacturer intended for assembling the vent system together. Follow the vent manufacturer's installation instructions for proper placement. Ensure the screw does not penetrate the inner polypropylene exhaust pipe. Failure to comply may result in carbon monoxide poisoning causing death or severe injury.
- Do not use screws to assemble single pipe exhaust vent penetrating the exhaust pipe may result in carbon monoxide poisoning causing death or severe injury.
- Do not use grease, centrocerin or other lubricants other than those approved by the vent manufacturer on gaskets. Grease, centrocerin or other lubricant can make the gasket brittle or result in tears in the surface of the seal, this may result in exhaust gas leakage causing carbon monoxide poisoning or fire resulting in death, severe injury or property damage.

- Ensure cut pipe is cut square and free from burrs before assembly.
- Use approved lubricant(s) on the vent gaskets when/if specified by the vent manufacturer.
- The vent pipe and fittings must be secured and sealed properly at every joint. Follow the vent manufacturer's installation instructions for proper securing means (e.g. locking clamps, locking bands, screws, etc.)

8.6.3 Vent Increases

Pipe size can be increased from 2" (60 mm) to 3" (80 mm) using a venting systems manufacturer's approved increaser. For ease, a list of single pipe vent increasers by approved vent system manufacturer can be found below:

⚠ WARNING

Consult the venting systems manufacturer for approval of an increaser to be used, if it is not listed below. The increaser must be in accordance to section 8.1 Approved Venting Materials, local codes and the authorities having jurisdiction. Failure to comply may result in joint separation causing carbon monoxide poisoning, fire or explosion resulting in death, severe injury or property damage.

When using PVC to vent the boiler exhaust from the boiler the first equivalent 7 ft (2.13 m) of vent must be CPVC as PVC has a lower melting point than CPVC. Refer to section 8.5.1 Connecting/ Transitioning PVC Vent to the Exhaust

Material	Manufacturer	Manufacturer Part Number	Description
Polypropylene	Centrotherm	ISIA0203	2" (60 mm) to 3" (80 mm) polypropylene increaser
	DuraVent	2PPC-HCT	2" (60 mm) to 3" (80 mm) polypropylene increaser
	Ecco	203PINC	2" (60 mm) to 3" (80 mm) polypropylene increaser
	Z-Flex	2ZDCTH24	2" (60 mm) to 3" (80 mm) polypropylene increaser
CPVC	IPEX	197470	2" to 3" CPVC increaser
	Royal	197470	2" to 3" CPVC increaser
PVC	IPEX	196352	2" to 3" PVC Increaser
	Royal	196364	2" to 3" PVC Increaser

Table 8.7 Increases

NOTICE

To avoid larger resistance on airflow it's recommended to increase the vent size as close to the boiler as possible. Vent increasers may only be installed on the vertical exhaust piping as close to the boiler as practicable."

8.7 Venting Slope and Supports

The venting must have a horizontal run sloping upwards not less than 1/4 in/ft (21 mm/m) from the boiler to the vent terminal. This allows condensate to flow back towards the boiler and through the boiler's condensate drain preventing ice build-up and blockage and avoids the collection of condensate in the venting system. The boiler must be installed with a means for condensate disposal. See Section 5 - Condensate Drain.



Figure 8.4: Horizontal Vent Slope

⚠ WARNING

RISK OF CARBON MONOXIDE POISONING OR FIRE DUE TO JOINT SEPARATION OR PIPE BREAKAGE

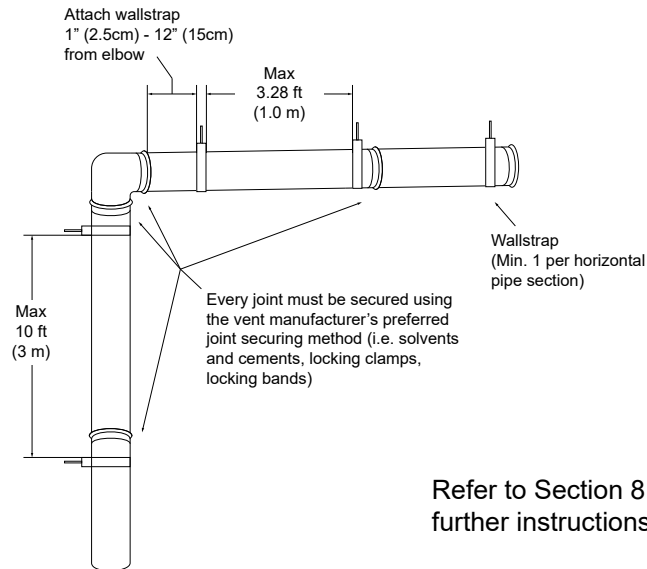
- Exhaust venting must be supported to reduce strain on piping joints. Failure to follow these instructions may result in damage, serious injury or death.
- Horizontal portions of the venting system shall be supported to prevent sagging as per venting manufacturers instructions. Failure to comply may lead to severe personal injury, substantial property damage or death.
- Every horizontal run shall be supported.
- Follow the manufacturer's instructions for proper guidelines for allowing pipe expansion. Failure to do so may result in carbon monoxide poisoning or fire due to joint separation or pipe breakage resulting in death, severe injury or property damage.
- Ensure the vent load is not supported by the appliance, failure to do so may cause leakage resulting in carbon monoxide (CO) spillage which may cause death, severe injury.

The framing of openings in walls or roofs must provide adequate support and attachment of termination assemblies.

Two Pipe Venting

Venting shall be supported per the venting manufacturers instructions and local code requirements. In the absence of the aforementioned:

- Venting shall be supported horizontally every 5 ft (1.5m), or less, and vertically every 10 ft. (3.0 m), or less, using suitable hangers or wallstraps approved by the vent manufacturer. Each horizontal section of venting must have a minimum of 1 wallstrap
- Elbows and Tees shall be sufficiently supported by attaching a wall support approved by the vent manufacturer within 1" (2.54 cm) - 12" (15 cm) of the joint holding the fittings.
- Support hardware (i.e wallstraps, wall supports, etc.) must be fixed to a rigid surface such as a wall, stud or framing and must not deform or damage the vent.



Refer to Section 8.6 : Connecting Vent Pipes for
further instructions on proper connection methods

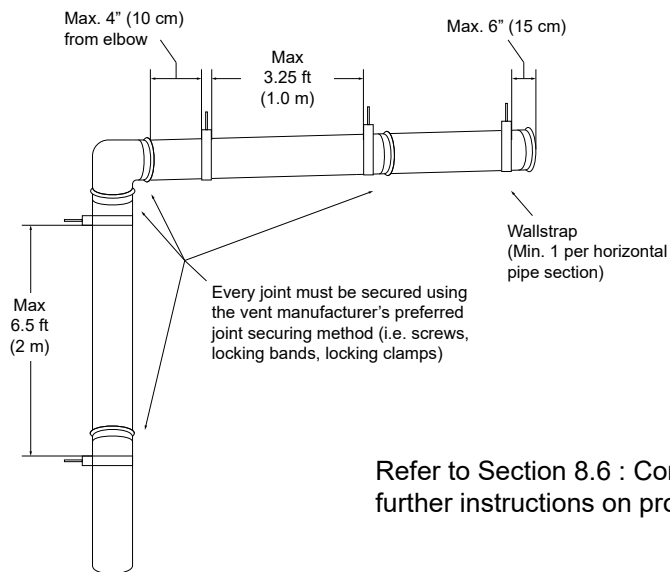
Figure 8.5: Single Pipe Vent Supports

Concentric Venting

Venting shall be supported per the venting manufacturers instructions and local code requirements. In the absence of the aforementioned:

Venting shall be supported with a wallstrap approved by the vent manufacturer at every joint within 6" (15 cm) of the female end. The maximum allowable space between wallstraps is 6.5 ft (2 m) or less vertically, all other orientations must be supported every 3.28 ft (1 m) or less. Each section of venting must have a minimum of 1 wallstrap. Elbows and Tees shall be sufficiently supported by attaching a wall support approved by the vent manufacturer within 4" (10 cm) after the elbow or tee.

Support hardware (i.e wallstraps, wall supports, etc.) must be fixed to a rigid surface such as a wall, stud or framing and must not deform or damage the vent.



Refer to Section 8.6 : Connecting Vent Pipes for
further instructions on proper connection methods

Figure 8.6: Concentric Vent Supports

8.8 Venting Terminals

⚠ WARNING

The vent pipe shall be connected and secured in accordance with the vent manufacturer's instructions, with the *National Fuel Gas Code*, ANSI Z223.1/NFPA 54 (latest edition) or the *Natural Gas and Propane Installation Code*, CSA B149.1 (latest edition), or applicable provisions of the local building codes. The vent termination shall be installed, connected and secured per the vent manufacturer's installation instructions. Vent terminals may only be used with the vent systems they are approved and intended for. Failure to comply may result in carbon monoxide poisoning or fire causing death, severe injury or property damage.

Always ensure proper terminal clearances are adhered to. Failure to do so may cause recirculation of products of combustions resulting in a fire or explosion causing death, severe injury or property damage.

When cutting a hole from the exterior of the roof or wall for a combustion air or exhaust terminal, ensure that no wood shavings, dust or dirt drop into the boiler exhaust or combustion air intake piping. Failure to do so may result in restricted air flow causing a fire or explosion that could cause death, severe injury or property damage.

Where required, the termination assemblies shall have be located in an area or have a guard to prevent possible contact. Follow the vent system manufacturer's installation instructions for approved guards and proper installation. Failure to prevent contact to the vent may result in burns causing severe injury. Failure to follow the vent system manufacturer's installation instructions may result in fire or explosion causing death, severe injury or property damage.

In Canada, the venting system shall terminate in accordance with the requirements of CAN/CSA B149.1, Natural Gas and Propane Installation Code, or CAN/CSA-B149.2, Propane Storage and Handling Code, as applicable.

Under normal operating conditions this appliance will produce a vapor plume, and should be taken into consideration when selecting an adequate location.

8.8.1 Direct Vent Exhaust Vent /Combustion Air Terminal Clearances

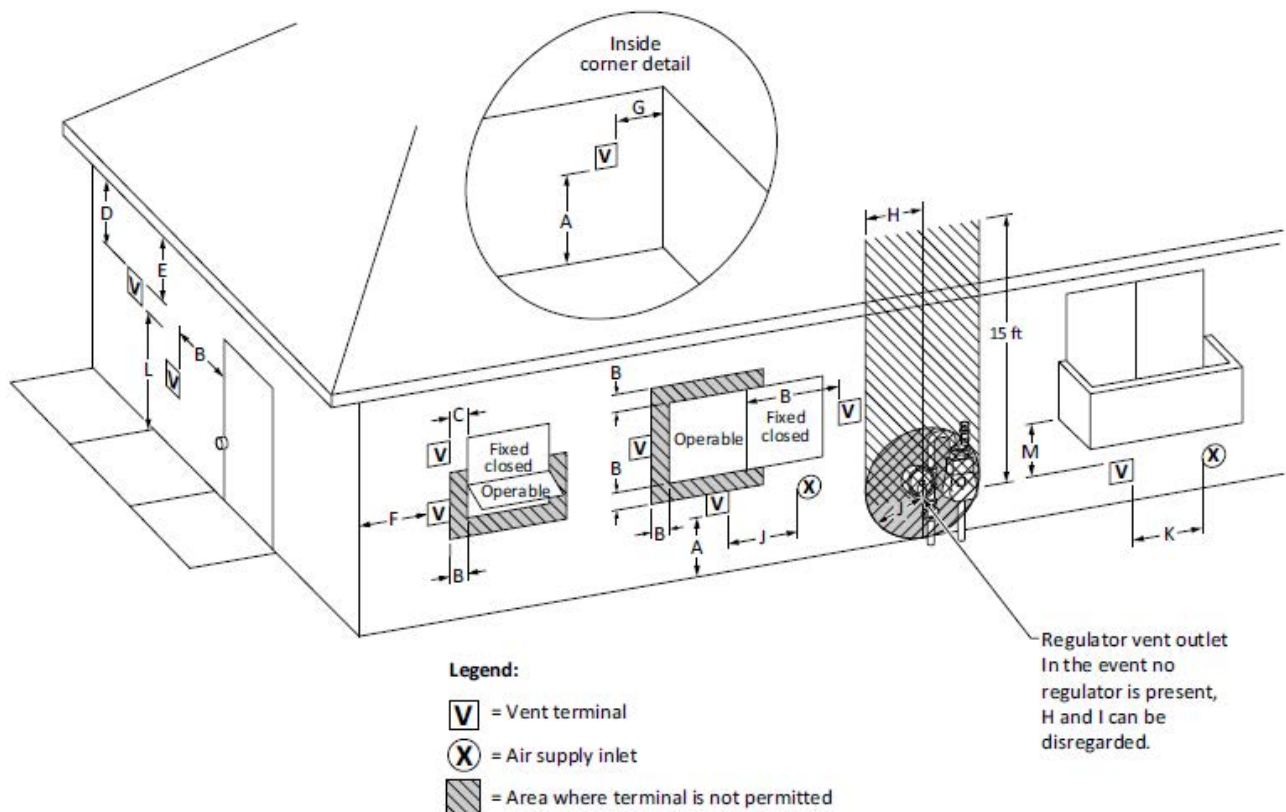


Figure 8.7: Vent/ Air Intake Terminal Clearances

		Canadian Installations	US Installations
A =	Clearance above grade, veranda, porch, deck, or balcony	12 in. (30 cm)	12 in. (30 cm)
B =	Clearance to window or door that may be opened	36 in. (91 cm)*Except for C100A and H100A = 12 in.	12 in. (30 cm)
C =	Clearance to permanently closed window	12 in. (30 cm)	12 in. (30 cm)
D =	Vertical clearance to ventilated soffit, located above the terminal within a horizontal distance of 2 ft (61 cm) from the center line of the terminal	18 in. (46 cm)	18 in. (46 cm)
E =	Clearance to unventilated soffit	18 in. (46 cm)	18 in. (46 cm)
F =	Clearance to outside corner	9 in. (23 cm)	9 in. (23 cm)
G =	Clearance to inside corner	36 in. (91 cm)	36 in. (91 cm)
H =	Clearance to each side of center line extended above meter/regulator assembly	4 ft (1.22 m)	4 ft (1.22 m)
I =	Clearance to service regulator vent outlet	4 ft (1.22 m)	4 ft (1.22 m)
J =	Clearance to non-mechanical air supply inlet to building or the combustion air inlet to any other appliance	36 in. (91 cm) *Except C100A and H100A = 12 in.	12 in. (30 cm)
K =	Clearance to a mechanical air supply inlet	6 ft (1.83 m)	3 ft (91 cm) above if within 10ft (3 m) horizontally
L =	Clearance above paved sidewalk or paved driveway located on public property	7 ft (2.13 m) †	7 ft (2.13 m) † Vents for Category IV appliances cannot be located above public walkways or other areas where condensate or vapor can cause a nuisance or hazard.
M =	Clearance under veranda, porch, deck, or balcony	12 in. (30 cm) ‡	12 in. (30 cm) ‡

For clearances not specified in ANSI Z223.1/NFPA 54 or CSA B149.1, clearance will be in accordance with local installation codes and the requirements of the gas supplier and these installation instructions.

i) The minimum distance from adjacent public walkways, adjacent buildings, openable windows, and building openings shall not be less than those values specified in the National Fuel Gas Code, ANSI Z223.1/ NFPA 54 in the US and the National Gas and Propane Installation Code, CSA B149.1 in Canada;

ii) Information on preventing blockage by snow; and

iii) Information on protecting building materials from degradation by flue gases.

† A vent shall not terminate directly above a sidewalk or paved driveway that is that is located between two single family dwellings and serves both dwellings. The vent for this appliance shall not terminate:

A) over public walkways;

B) near soffit vents or crawl space vents or other area where condensate or vapor could create a nuisance or hazard or cause property damage; or

C) where condensate or vapor could cause damage or could be detrimental to the operation of regulators, relief valves, or other equipment.

‡ Permitted only if veranda, porch, deck, or balcony is fully open on a minimum of two sides beneath the floor.

Notes:

- 1) In accordance with the current CSA B149.1, Natural Gas and Propane Installation Code
- 2) In accordance with the current ANSI Z223.1/NFPA 54, National Fuel Gas Code.
- 3) If locally adopted installation codes specify clearances different than those illustrated, then the most stringent clearance shall prevail.
- 4) Local Codes or Regulations may require different clearances. The exhaust terminal must be exposed to the external air and the position must always allow the free passage of air across it. In certain weather conditions the terminal may emit a plume of steam. Avoid positioning the terminal where this may cause a nuisance

Table 8.8: Vent/ Air Intake Terminal Clearances

8.8.2 Sidewall Direct Vent Terminations

WARNING

The venting shall be installed to prevent accumulation of condensate; and where necessary, shall have means provided for drainage of condensate. Avoid venting over public walkways, driveways or parking lots. Condensate could drip and freeze resulting in a slip hazard or damage to vehicles and machinery.

Sidewall direct vent applications shall terminate as follows:

- Both inlet and exhaust terminals should be 12" (305 mm) minimum above grade, the anticipated snow level, or as required by local code, whichever is greater. (24" (610 mm) plus snow allowance is highly recommended). Consult your weather office, for the maximum typical snowfall for your region.
- The combustion air intake on a two pipe system shall be down-turned to avoid recirculation.

- The elevation of both pipes in a sidewall two pipe system can be raised in “periscope style” after passing through the wall, then configured as in **Figure 8.8**, to meet required clearances.
- Ideally on a sidewall two pipe system, using a 45° elbow on the exhaust terminal to launch the plume up and off the sidewall, for protection of the wall is recommended; a 90° elbow is permitted as well.
- On two pipe systems a bird screen is recommended to guard against foreign objects.
- Both inlet and exhaust can be piped to the side wall and terminated with a concentric terminal as seen in **Figure 8.13** and **Figure 8.14**.
- Adhere to normal clearance restrictions as seen in **Table 8.8**.
- A straight pipe exhaust terminal is permitted when intake pipe is a minimum 12” away from the exhaust and grade to avoid re- circulation. See **Figure 8.9**
- Two pipe “pancake” vent terminal as pictured in **Figure 8.11** is permitted. .
- Keep exhaust plumes well away from all building air intakes including those of neighboring properties.
- Ensure exhaust vent is sloped back towards the appliance per Section 8.7 Venting Slope and Supports.
- The framing of openings in walls or roofs must provide adequate support and attachment of termination assemblies.
- Air for combustion must be drawn from outdoors from an area free of dust and contaminants.
- Ensure the vent is located where it will not be exposed to abnormal prevailing winds.

⚠ CAUTION

Position the vent terminal where vapors cannot make accidental contact and damage nearby surfaces, shrubs and plants.

⚠ WARNING

The following illustrations depict various approved vent terminal configurations and clearances. They are not intended to show a full venting system. Follow the venting instructions in this manual in their entirety as well as the vent manufacturer's installation instructions for the respective venting system. Failure to do so may cause carbon monoxide poisoning or fire resulting in death, severe injury or property damage.

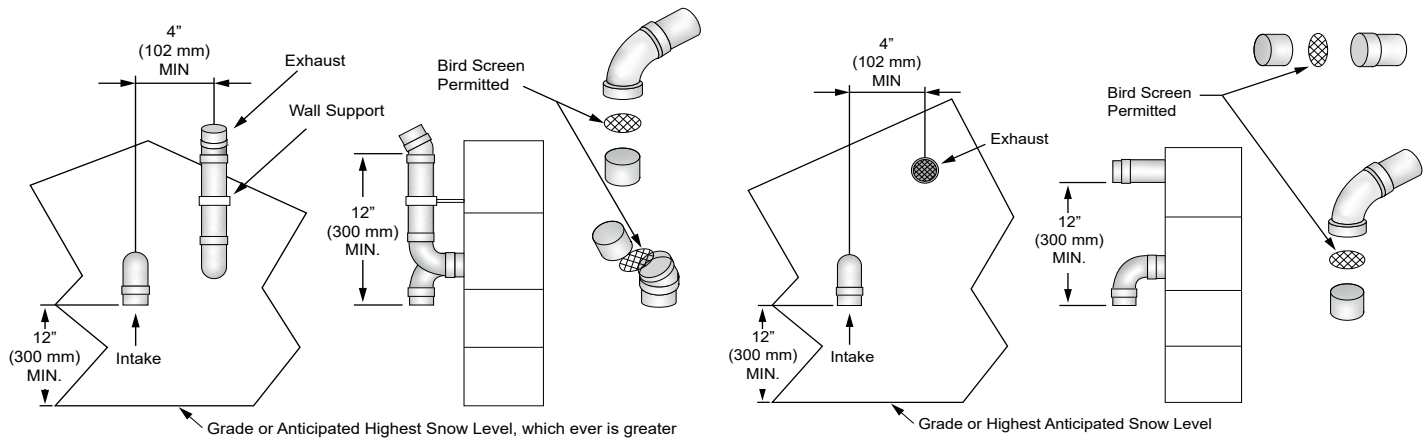


Figure 8.8: Sidewall Two Pipe Terminal Clearances *Figure 8.9: Sidewall Two Pipe Terminal Clearances, Straight Exhaust*

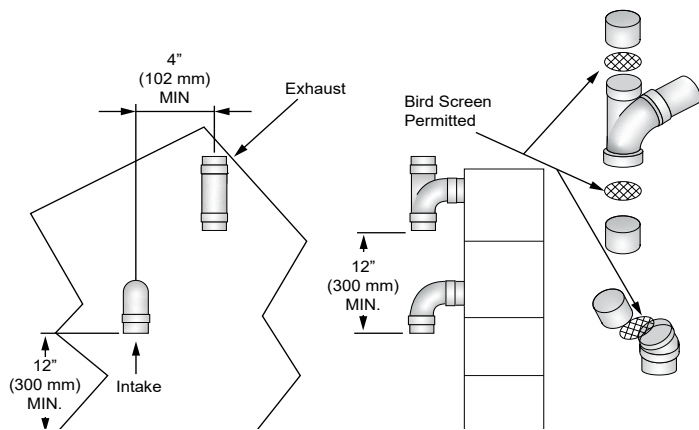


Figure 8.10: Sidewall Two Pipe Terminal Clearances with a Tee

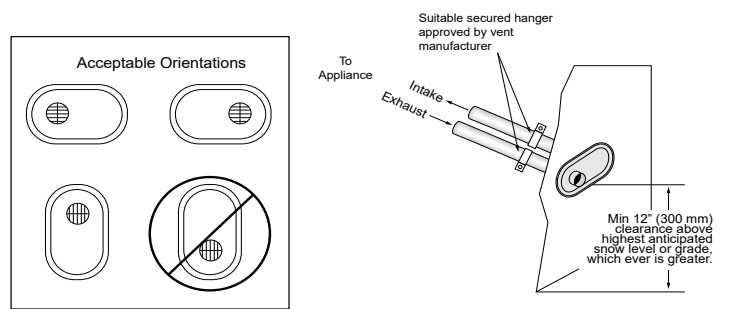


Figure 8.11: Sidewall Clearances with Pancake Terminal

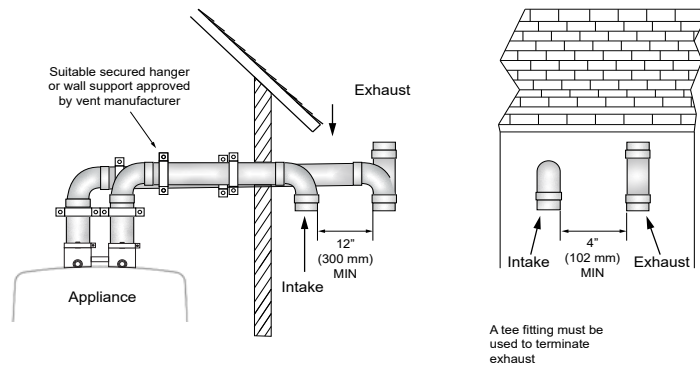


Figure 8.12: Sidewall Two Pipe Terminal Clearances When Extending Past a Soffit

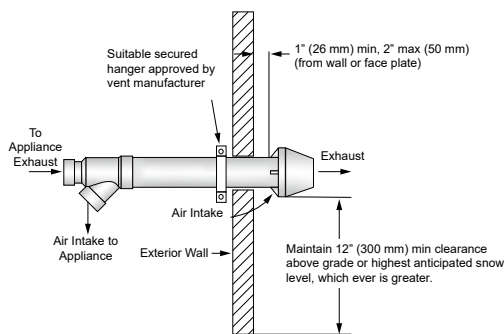


Figure 8.13 CPVC/ PVC Concentric Terminal Clearances

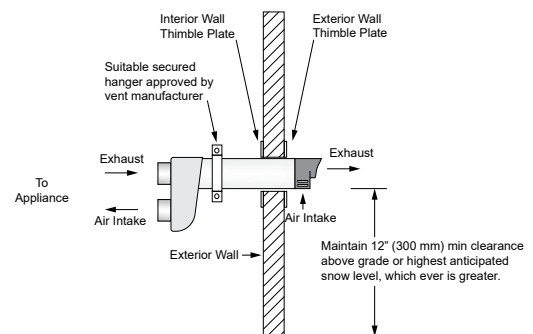


Figure 8.14: Polypropylene Concentric Terminal Clearances

8.8.3 Rooftop Direct Vent Terminals

Rooftop vents must terminate as follows:

- The exhaust pipe can terminate in an open vertical orientation without concern about rain infiltration because this will drain away through a properly configured condensate trap.
- In all roof applications the discharge must point away from the pitch of the roof.
- For two pipe systems, if used in a vertical application the intake air pipe is not typically drained, so it must be terminated with a down-turned elbow to prevent rain ingress thru the air intake (**see Figure 8.15**).
- For two pipe installations, the intake pipe does not need to penetrate the roof at the same elevation as the exhaust; lower down the roof is OK.
- For two pipe installations, to promote the projection of exhaust away from the building and from the intake pipe, minimum distance between intake and exhaust outlet should be 12". Optional bird screen may be placed in a terminal fitting.
- For two pipe systems, Inlet & exhaust can be piped to the roof and terminated with a concentric terminal as seen in **Figure 8.16** and **Figure 8.17**.
- The mechanical room can be used for boiler combustion air intake (non-direct vent) with a single side wall or roof terminal for exhaust. See **Section 8.9 Non-Direct Venting**.
- Keep exhaust plumes well away from all building air intakes including those of neighboring properties.
- The vent system must terminate at least 2 feet above the roof line or any wall or vertical structure within 10 feet
- Always secure the roof terminal with its support clamp.
- Do not install an extra rain cap on the exhaust terminals. The exhaust terminals are specially designed for high efficiency boilers which produce large quantities of combustion gases. The design allows rain to enter the exhaust terminals which also serves to dilute acidic condensate. However, a drain must be incorporated to allow condensation and rainwater to escape from the venting system and appliance. Follow the instructions in Section 5: Condensate Drain for proper installation of the condensate line. Follow the vent system manufacturer's installation instructions for proper assembly of their approved rain caps.
- Roof flashing assemblies shall be installed in accordance to the venting systems manufacturer's instructions, local code and the authorities having jurisdiction.
- Air for combustion must be drawn from outdoors from an area free of dust and contaminants. In certain circumstances intake air can be taken from the room. Please see *section 8.9 Non-Direct Venting* for more information.
- The framing of openings in walls or roofs must provide adequate support and attachment of termination assemblies
- Ensure the vent is located where it will not be exposed to abnormal prevailing winds.

WARNING

Extra precaution must be taken to adequately support the weight of the Vent/Air-Intake piping in applications using rooftop terminals. Ensure these instructions as well as the vent manufacturer's instructions are followed. Failure to do so may result in venting or appliance component failure resulting in exhaust gas spillage leading to death, serious injury or property damage.

The following illustrations depict various approved vent terminal configurations and clearances. They are not intended to show a full venting system. Follow the venting instructions in this manual in their entirety as well as the vent manufacturer's installation instructions for the respective venting system. Failure to do so may cause carbon monoxide poisoning or fire resulting in death, severe injury or property damage.

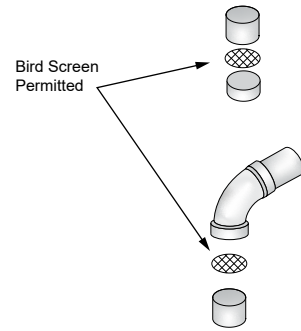
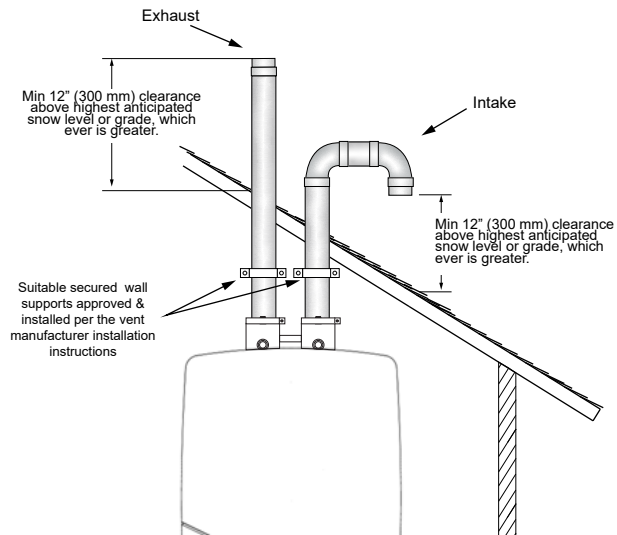


Figure 8.15 Two Pipe Roof Terminal Clearances

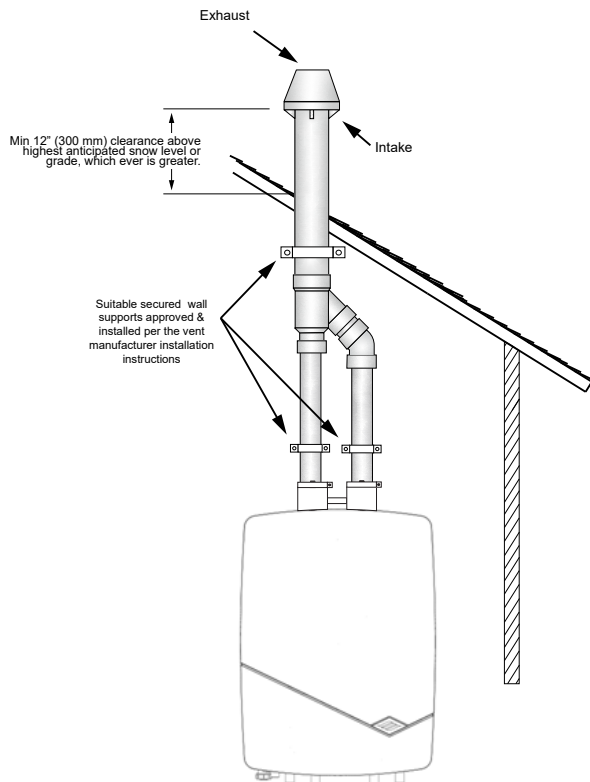


Figure 8.16: CPVC/PVC Two Pipe Roof Terminal Clearances

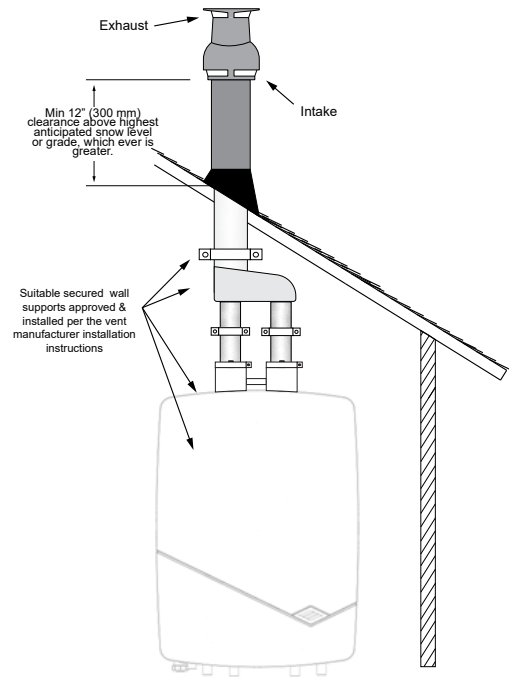


Figure 8.17: Polypropylene Concentric Roof Terminal Clearances

8.8.4 Unbalanced Direct Vent Terminals

Eco-King also permits unbalanced vent terminations where exhaust is terminated at the roof of building and intake is piped directly to the boiler from building side wall. Follow guidelines for each as noted above in Sections 8.9.2 Sidewall Direct Vent Terminals and 8.9.3 Rooftop Direct Vent Terminals. For example, in the Rooftop Direct Vent Terminals section it states the exhaust pipe can terminate in an open vertical orientation without concern about rain infiltration because this will drain away through a properly configured condensate trap.. The combustion air intake on a two pipe system shall be down-turned to avoid recirculation

⚠ WARNING

Extra precaution must be taken to adequately support the weight of the Vent/Air-Intake piping in applications using rooftop terminals. Ensure these instructions as well as the vent manufacturer's instructions are followed. Failure to do so may result in venting or appliance component failure resulting in exhaust gas spillage leading to death, serious injury or property damage.

The following illustrations depict various approved vent terminal configurations and clearances. They are not intended to show a full venting system. Follow the venting instructions in this manual in their entirety as well as the vent manufacturer's installation instructions for the respective venting system. Failure to do so may cause carbon monoxide poisoning or fire resulting in death, severe injury or property damage.

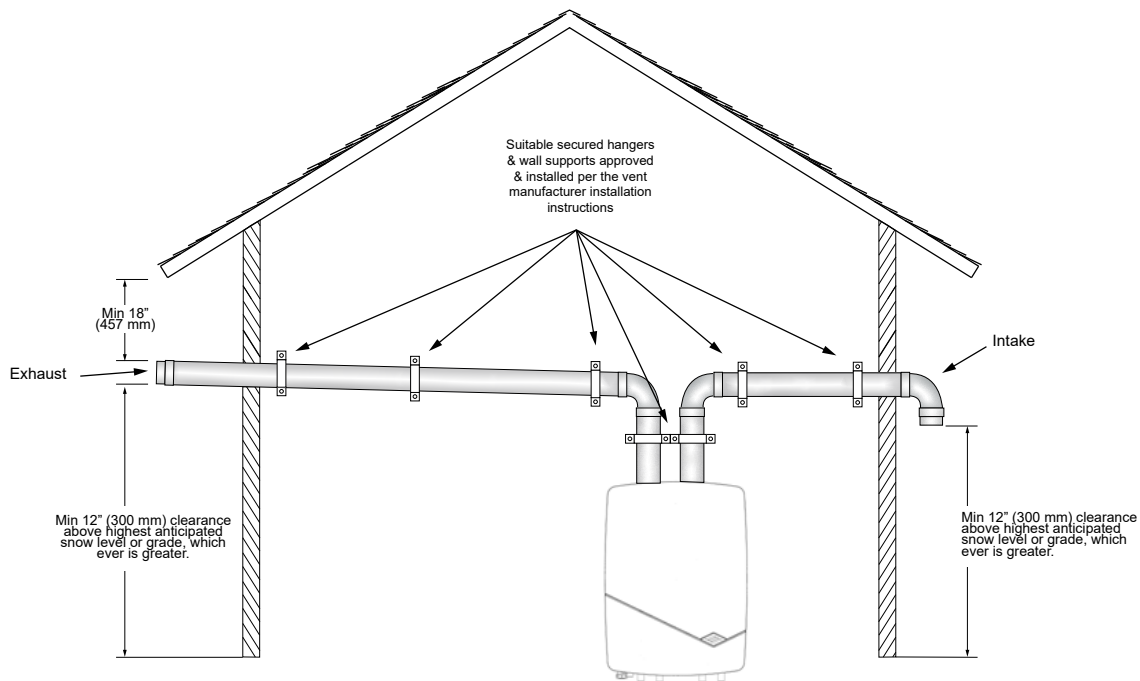


Figure 8.17: Sidewall Two Pipe Unbalanced System Clearances

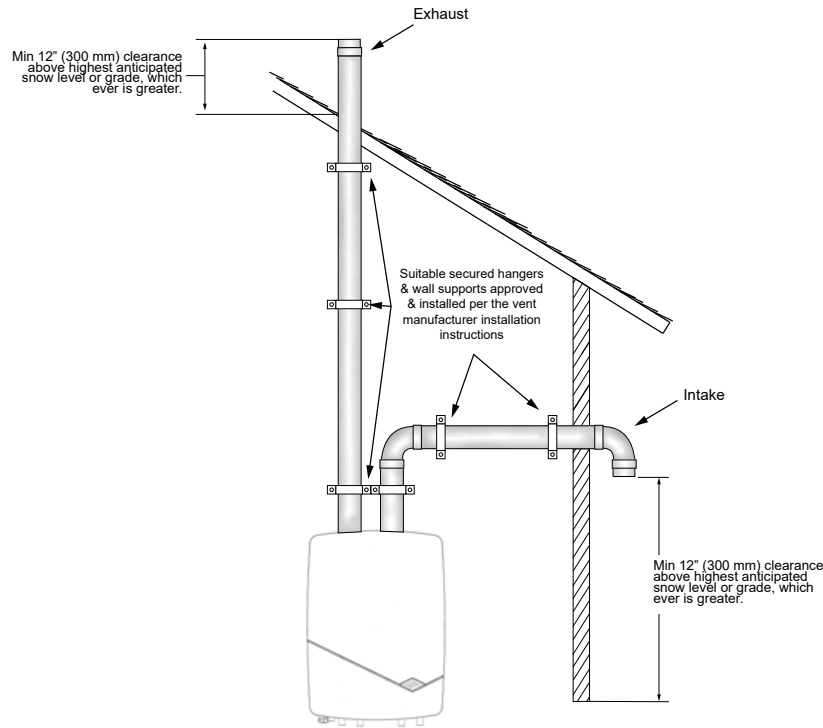


Figure 8.18: Two Pipe Unbalanced Systems Clearances, Sidewall Combustion Air Intake Terminal, Roof Exhaust Terminal

8.8.5 Approved Venting Terminals

⚠ WARNING

Only use genuine roof or wall terminals for concentric installs. Terminating the vent pipe or combustion air inlet with elbow or tee for a terminal is prohibited when using concentric venting. Failure to do so may cause carbon monoxide poisoning or fire resulting in death, severe injury or property damage.

Two pipe applications permit elbows or tees as terminals as explained later in the manual. Always refer to the installation manual(s) delivered with the parts.

Refer to the vent manufacturer's instructions included with vent terminal materials for proper installation procedures and guidelines for installing the terminal.

Wall Thickness: Vent terminals are designed to work with any standard wall thickness. Installation guidelines for min/max wall thickness are as follows: Min.= 25mm (1"), Max.= 1.52m (60")

Only use terminations of the manufacturer of the same vent system used.

Only the terminations listed in table 8.10: Approved Vent Terminations are approved for use with this appliance.

Material	Manufacturer	Manufacturer Part Number	Description
Polypropylene	Centrotherm	ICWT242	2"/4" (60/100mm) Concentric Horizontal Terminal
		ICWT352	3"/5" (80/125mm) Concentric Horizontal Terminal
		ICRT2439	2"/4" (60/100mm) Concentric Vertical Terminal
		ICRT3539	3"/5" (80/125mm) Concentric Vertical Terminal
		ISELL0287UV	2" (60mm) 87° Long PPS-UV
		ISELL0387UV	3" (80mm) 87° Long PPS-UV
		ISTT0220	2" (60mm) Termination Tee
		ISTT0320	3" (80mm) Termination Tee
		ISLPT0202	2" (60mm) Low Profile Wall Terminal
		ISLPT0303	3" (80mm) Low Profile Wall Terminal
	DuraVent	2PPC-HCT	2"/4" Concentric Horizontal Terminal
		3PPC-HCT	3"/5" Concentric Horizontal Terminal
		2PPC-VCT	2"/4" Concentric Vertical Terminal
		3PP-VCT	3"/5" Concentric Vertical Terminal
		2PPS-HTPL	2" (60mm) Twin Pipe Terminal
		3PPS-HTPL	3" (80mm) Twin Pipe Terminal
		2PPS-HSTL	2" (60mm) Single Horizontal Terminal
		3PPS-HSTL	3" (80mm) Single Horizontal Terminal
		2PPS-TBL	2" (60mm) Black UV Resistant Tee
		3PPS-TBL	3" (80mm) Black UV Resistant Tee
	Z-Flex	2ZDCTH24	Z-DENS Concentric Terminal Horizontal 2"/4" (60/100 mm) L = 31.5"
		2ZDCTV24	Z-DENS Concentric Terminal Vertical 2"/4" (60/100 mm) H1 = 21.4" H2 = 45.3"
		2ZDE287UV	Z-DENS 90 ° Elbow 2" (60 mm) UV Black
		2ZDE387UV	Z-DENS 90° Elbow 3" (80 mm) UV Black
		2ZDE245UV	Z-DENS 45° Elbow 2" (60 mm) UV Black
		2ZDE345UV	Z-DENS 90 ° Elbow 3" UV Black
		2ZDCTH35	Z-DENS Concentric Terminal Horizontal 3"/5" (80/125 mm) L = 30.9"
		2ZDCTV35	Z-DENS Concentric Terminal Vertical 3"/5" (80/125 mm) H1 = 21.7" H2 = 45.6"
CPVC	IPEX	197040	2" FGV CPVC Concentric Vent Kit Length 16"
		197033	2" FGV CPVC Concentric Vent Kit Length 28"
		197009	3" FGV CPVC Concentric Vent Kit Length 20"
		197107	3" FGV CPVC Concentric Vent Kit Length 32"
		197117	3" FGV CPVC Concentric Vent Kit Length 44"
	Royal	52CVKGVSF9003	3" CPVC Concentric Vent Kit Length 20"
		52CVKGVSF9003-32	3" CPVC Concentric Vent Kit Length 32"
		52CVKGVSF9003-44	3" CPVC Concentric Vent Kit Length 44"
	Misc.	Tee, 90° Elbow, 45° Elbow, Vent Screen	Misc. fittings in 2" & 3" schedule 40 CPVC for Terminals

Table 8.9: Approved Vent Terminals

Material	Manufacturer	Manufacturer Part Number	Description
PVC	IPEX	196984	2" FGV PVC Low Profile Terminal Kit
		196985	3" FGV PVC Low Profile Terminal Kit
		081216	2" FGV PVC Wall Terminal Kit
		081219	3" FGV PVC Wall Terminal Kit
		196005	2" FGV PVC Concentric Vent Kit Length 16"
		196105	2" FGV PVC Concentric Vent Kit Length 28"
		196125	2" FGV PVC Concentric Vent Kit Length 40"
		196006	3" FGV PVC Concentric Vent Kit Length 20"
		196106	3" FGV PVC Concentric Vent Kit Length 32"
		196116	3" FGV PVC Concentric Vent Kit Length 44"
	Royal	52SWVKGS6502	2" PVC Side Wall Vent Kits
		52WTVKGS6502	2" PVC Wall Vent Kits
		52SWVKGS6503	3" PVC Side Wall Vent Kits
		52WTVKGS6503	3" PVC Wall Vent Kits
		52CVKGS6502	2" PVC Concentric Vent Kit Length 16"
		52CVKGS6502-28	2" PVC Concentric Vent Kit Length 28"
		52CVKGS6502-40	2" PVC Concentric Vent Kit Length 40"
		52CVKGS6503	3" PVC Concentric Vent Kit Length 20"
PVC	Royal	52CVKGS6503-32	3" PVC Concentric Vent Kit Length 32"
		52CVKGS6503-44	3" PVC Concentric Vent Kit Length 44"
	Misc.	Tee, 90° Elbow, 45° Elbow, Vent Screen	Misc. fittings in 2" & 3" schedule 40 PVC for Terminals

Table 8.9: Approved Vent Terminals Continued

8.9 Non-Direct Venting

The Eco-King boilers are Category IV boilers and are recommended to be direct vented (sealed combustion) whenever possible. However, if direct venting the boiler is not possible, non-direct venting is permitted.

The figure below illustrates the configuration for the combustion air intake in a non-direct application. Although the unit uses combustion air, a combustion air intake pipe shall be connected to the appliance to avoid objects inadvertently being stored on top of the appliance, blocking the combustion air intake. An approved venting system manufacturer screen shall be installed at the combustion air intake vent terminal cap to prevent debris from blocking the combustion air intake.

For non-direct vent applications, the appliance must be located as close as practicable to a chimney or gas vent.

⚠ WARNING

Under no circumstances may an existing chimney be used to vent the Eco-King boiler. A chimney may be used as a chase with approved venting material. The appliance shall not be connected to a chimney flue serving a separate appliance, designed to burn solid fuel. Failure to follow these instructions will result in fire, property damage, serious injury or death.

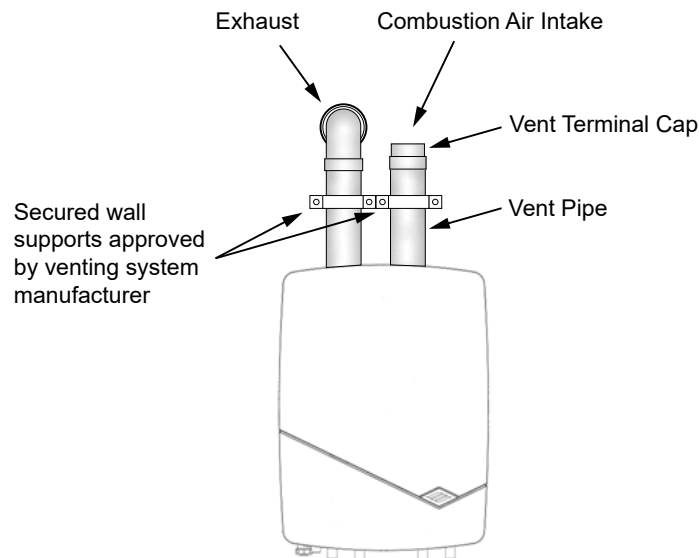


Figure 8.19: Non-Direct Combustion Air Intake Configuration

8.9.1 Non-Direct Combustion Air Requirements

Combustion air requirements are based on the latest edition of the National Fuel Gas Code, NFPA 54/ANSI Z223.1, in the US; In Canada, refer to the latest edition of the National Gas and Propane Installation Code, CSA B149.1.

⚠ WARNING

Do not block combustion air openings to a room the water heater is installed in. Failure to provide adequate make-up air can result in incomplete combustion, production of carbon monoxide, property damage, serious injury, or death.

To ensure ample make-up air is available, openings to the outdoors may be required in the boiler room. If the boiler is not in a room adjacent to an outside wall air may be ducted in from outside wall openings.

Provide two openings to provide circulation of combustion air as specified in National Fuel Gas Code, NFPA 54/ANSI Z223.1; and in Canada, the National Gas and Propane Installation Code, CSA B149.1

⚠ WARNING

When using a non-direct venting application, ensure that ample make-up air is available at the installation location. Failure to provide adequate make-up air can result in incomplete combustion, production of carbon monoxide, property damage, serious injury, or death.

Model	Maximum Input (btu/h)	Outdoor Make-Up Air Provided (1 in ² per 4000 btu/h)			Indoor Make-Up Air Provided (1 in ² per 1000 btu/h)		
		Area	Rectangular Opening	Round Opening Ø	Area	Rectangular Opening	Round Opening Ø
H100A & C100A	105,000	27 in ² (174 cm ²)	3" × 9" (7.6 × 22.9 cm)	6" (15.2 cm)	105 in ² (678 cm ²)	7" × 14" (18 × 36 cm)	12" (40.6 cm)
H140A & C140A	135,000	34 in ² (219 cm ²)	4" × 9" (10.2 × 22.9 cm)	7" (17.8 cm)	135 in ² (871 cm ²)	8" × 16" (18 × 41 cm)	14" (35.6 cm)
H200A & C200A	182,000	46 in ² (297 cm ²)	6" × 8" (15.2 × 20.3 cm)	8" (20.3 cm)	182 in ² (1,181 cm ²)	10" × 19" (25 × 48 cm)	16" (40.6 cm)

Table 8.10: Minimum Make-Up Air Requirements

For Mobile home applications, when only a screened opening(s) is utilized for combustion air, the type of screen to be used shall be metal with no less than 1/4" (6.4 mm) mesh.

NOTICE

For installations in manufactured homes (mobile homes), combustion air shall not be supplied from occupied spaces.

8.9.2 Non-Direct Vent Terminal Clearances

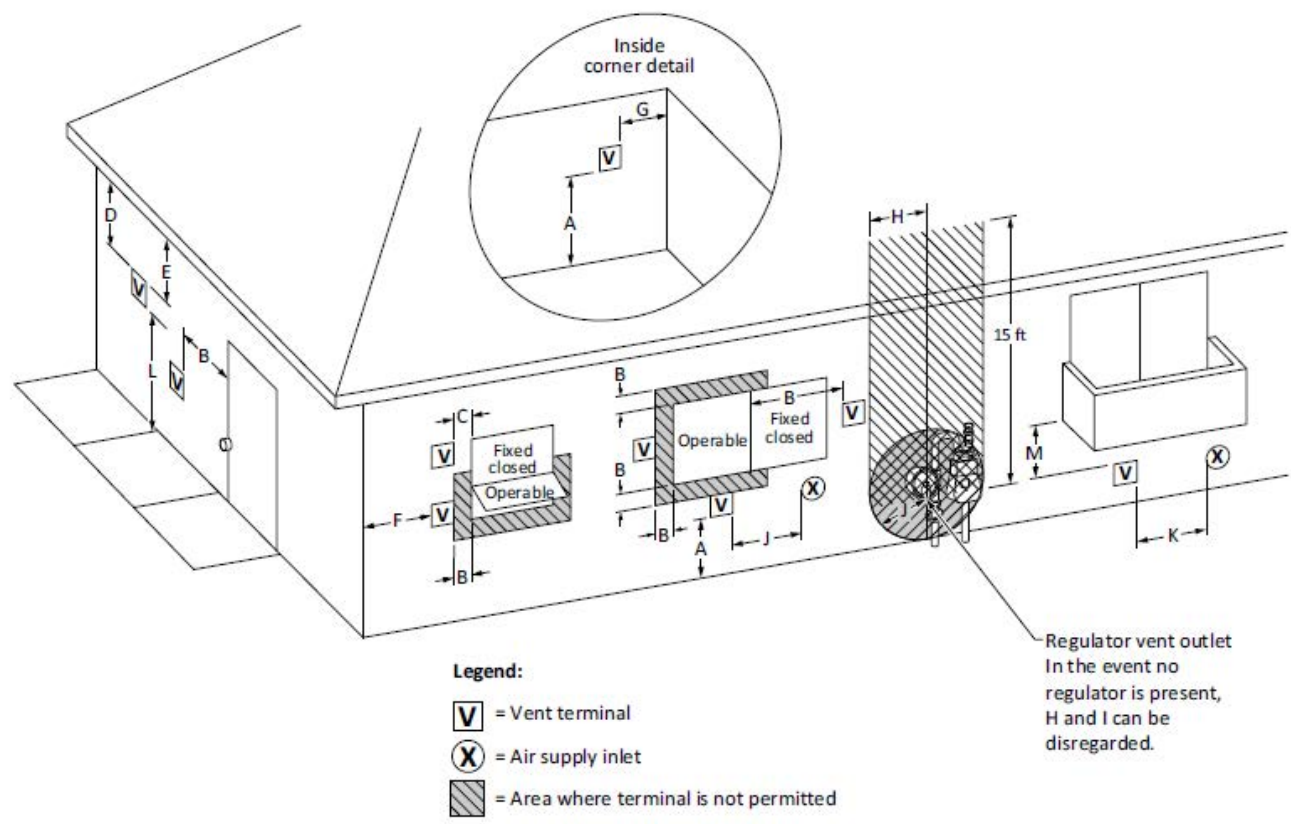


Figure 8.20: Non-Direct Vent Terminal Clearances

		Canadian Installations ¹	US Installations ²
A =	Clearance above grade, veranda, porch, deck, or balcony	12 in. (30 cm)	12 in. (30 cm)
B =	Clearance to window or door that may be opened	36 in. (91 cm)*Except for C100A and H100A = 12 in.	4 ft (1.2 m) below or to side of opening; 1 ft (300 mm) above opening
C =	Clearance to permanently closed window	12 in. (30 cm)	12 in. (30 cm)
D =	Vertical clearance to ventilated soffit, located above the terminal within a horizontal distance of 2 ft (61 cm) from the center line of the terminal	18 in. (46 cm)	18 in. (46 cm)
E =	Clearance to unventilated soffit	18 in. (46 cm)	18 in. (46 cm)
F =	Clearance to outside corner	9 in. (23 cm)	9 in. (23 cm)
G =	Clearance to inside corner	36 in. (91 cm)	36 in. (91 cm)
H =	Clearance to each side of center line extended above meter/regulator assembly	4 ft (1.22 m)	4 ft (1.22 m)
I =	Clearance to service regulator vent outlet	4 ft (1.22 m)	4 ft (1.22 m)
J =	Clearance to non-mechanical air supply inlet to building or the combustion air inlet to any other appliance	36 in. (91 cm) *Except C100A and H100A = 12 in.	4 ft (1.2 m) below or to side of opening; 1 ft (300 mm) above opening
K =	Clearance to a mechanical air supply inlet	6 ft (1.83 m)	3 ft (91 cm) above if within 10ft (3 m) horizontally
L =	Clearance above paved sidewalk or paved driveway located on public property	7 ft (2.13 m) †	7 ft (2.13 m) † Vents for Category IV appliances cannot be located above public walkways or other areas where condensate or vapor can cause a nuisance or hazard.
M =	Clearance under veranda, porch, deck, or balcony	12 in. (30 cm) ‡	12 in. (30 cm) ‡

For clearances not specified in ANSI Z223.1/NFPA 54 or CSA B149.1, clearance will be in accordance with local installation codes and the requirements of the gas supplier and these installation instructions.

i) The minimum distance from adjacent public walkways, adjacent buildings, openable windows, and building openings shall not be less than those values specified in the National Fuel Gas Code, ANSI Z223.1/ NFPA 54 in the US and the National Gas and Propane Installation Code, CSA B149.1 in Canada;

ii) Information on preventing blockage by snow; and

iii) Information on protecting building materials from degradation by flue gases.

† A vent shall not terminate directly above a sidewalk or paved driveway that is that is located between two single family dwellings and serves both dwellings. The vent for this appliance shall not terminate:

A) over public walkways;

B) near soffit vents or crawl space vents or other area where condensate or vapor could create a nuisance or hazard or cause property damage; or

C) where condensate or vapor could cause damage or could be detrimental to the operation of regulators, relief valves, or other equipment.

‡ Permitted only if veranda, porch, deck, or balcony is fully open on a minimum of two sides beneath the floor.

Notes:

- 1) In accordance with the current CSA B149.1, Natural Gas and Propane Installation Code
- 2) In accordance with the current ANSI Z223.1/NFPA 54, National Fuel Gas Code.
- 3) If locally adopted installation codes specify clearances different than those illustrated, then the most stringent clearance shall prevail.
- 4) Local Codes or Regulations may require different clearances. The exhaust terminal must be exposed to the external air and the position must always allow the free passage of air across it. In certain weather conditions the terminal may emit a plume of steam. Avoid positioning the terminal where this may cause a nuisance

Table 8.11: Non-Direct Vent Terminal Clearances

8.10 Combustion Air Condensate Trap

In certain conditions, installations in unconditioned space or having long horizontal or vertical runs may accumulate condensate in the combustion air intake pipe. To prevent condensate from draining back into the boiler in these situations, we recommend a condensate trap be installed on the combustion air inlet as close as practical to the boiler. A similar condensate trap (P-trap), as pictured below, is permitted if it prevents rain, condensate or any other liquid from entering the boiler. When installing the condensate trap, fill the trap half way with water, as a precaution, to prevent exhaust gases from entering the home in the event of a mechanical failure.

⚠ DANGER

Do Not connect the combustion air intake condensate drain into any portion of the appliances condensate drain. This will result in recirculation of products of combustion. Failure to do so will result in improper combustion, production of carbon monoxide, property damage, serious injury, or death.

⚠ WARNING

When using a condensate drain in the combustion air inlet ensure the combustion air intake pipe is sloped 1/4" / ft. (21mm/m) from the combustion air terminal to the condensate drain. The vent shall be supported to prevent sagging to ensure condensate drains back to the condensate drain to avoid freezing and blockages. Failure to do so can result in improper combustion, production of carbon monoxide, property damage, serious injury, or death.

The appliance must be connected to the sewer system in a way to prevent obstructions or freezing of the condensate.

Use only non-corrosive materials for the condensate drain such as plastic tubing.

Ensure there is an air gap between the external drain and the condensate drain tubing that is open to the atmosphere.

⚠ CAUTION

When connecting the drain, avoid horizontal sections of pipe, always guarantee a minimum slope to ensure correct drainage of the condensate products.

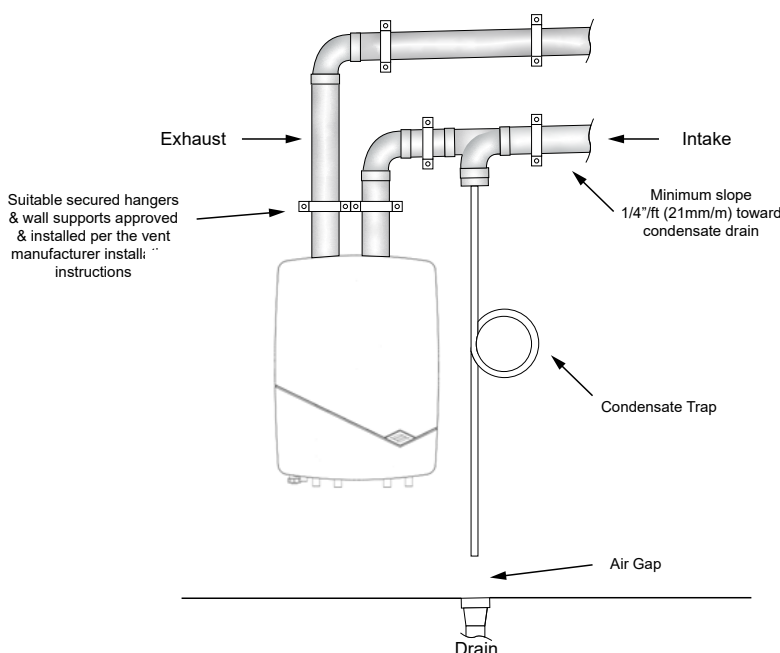


Figure 8.21: Combustion Air Condensate Trap

8.11 Multi-Story & Common Venting

Common venting systems is prohibited.

WARNING

Do not install the Eco-King boiler into a common vent or combustion air system with any other appliances. Failure to comply with this warning can cause exhaust gas spillage and leech carbon monoxide emissions into the surrounding air causing death or serious injury.

8.11.1 Removal of an existing boiler from a common venting system

When an existing boiler is removed from a common venting system, the common venting system is likely to be too large for proper venting of the remaining appliances connected to it. Instructions have been provided on how to remove the existing boiler and how to resize the remaining venting system. Failure to follow these instructions may result in property damage, serious injury or death.

At the time of removal of an existing boiler, the following steps shall be followed with each appliance remaining connected to the common venting system placed in operation.

1. Seal any unused openings in the common venting system.
2. Visually inspect the venting system for proper size and horizontal pitch and determine there is no blockage or restriction, leakage, corrosion and other deficiencies which could cause an unsafe condition.
3. Insofar as is practical, close all building doors and windows and all doors between the space in which the appliances remaining connected to the common venting system are located 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.
4. Place in operation the appliance being inspected. Follow the lighting instructions. Adjust thermostat so appliance will operate continuously.
5. Test for spillage at the draft hood relief opening after 5 minutes of main burner operation. Use the flame of a match or candle, or smoke from a cigarette, cigar, or pipe.
6. After it has been determined that each appliance remaining connected to the common venting system properly vents when tested, return doors, windows, exhaust fans, fireplace dampers, and any other gas-burning appliance to their previous conditions of use.
7. Any improper operation of the common venting system must be corrected so the installation conforms with the National Fuel Gas Code, ANSI Z223.1/NFPA 54 in the US and the Natural Gas and Propane Installation Code, CSA B149.1 in Canada. When resizing any portion of the common venting system, the common venting system must be resized to approach the minimum size as determined using the appropriate tables in the National Fuel Gas Code, ANSI Z223.1/NFPA 54 in the US and the Natural Gas and Propane Installation Code, CSA B149.1 in Canada.

8.11.2 Multi-Story Venting

Multi-story venting systems shall be in accordance with the National Fuel Gas Code, ANSI Z223.1/NFPA 54 and/or the CSA B149.1, Natural Gas and Propane Installation Code (Current Editions), local codes, Section 8 - Venting of these instructions and the venting manufacturer's instructions. Where there is a discrepancy the most stringent instructions shall apply.

Framing of openings in ceilings and floors to provide fire stopping in joist areas and the installation of fire stop spacer assemblies shall be installed to the venting systems manufacturer's instructions and in accordance with the *National Fuel Gas Code*, ANSI Z223.1/NFPA 54 (latest edition) or the *Natural Gas and Propane Installation Code*, CSA B149.1 (latest edition), or applicable provisions of the local building codes.

Section 9 - Electrical Connections

⚠ WARNING

The electrical installation shall be in accordance with local codes and the authorities having jurisdiction. In the absence of such requirements, it shall comply with the latest edition of the National Electrical Code (NFPA 70) in the USA, or with the latest edition of the Canadian Electrical Code, Part I (CSA C22.1) in Canada.

Ensure the breaker is off and there is no voltage to the circuit when working on the electrical circuit.

Failure to comply with the above statements may result in death, severe injury or property damage.

⚠ CAUTION

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

Verify proper operation after servicing.

9.1 Removing the Front Cover

Remove the safety screw at the top side of the cover. Using a Phillips screwdriver, press back the safety latches located at the top and bottom of the appliance. Once released, pull the front cover forward to remove it. To put the cover back in place, push it back over the safety latches and tighten the safety screw.

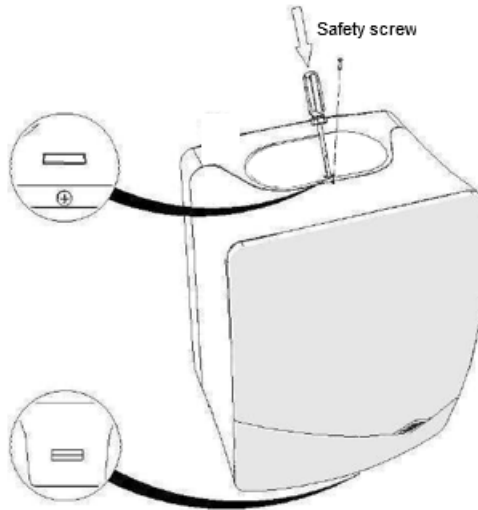


Figure 9.1 Safety screw location

⚠ WARNING

The Eco-King boiler does not use air (Oxygen) from the installation room, except with specific exceptions as noted in Section 8.9: Non-Direct Venting. The front cover closes the housing air-tight ensuring air is only supplied by the vent air intake. Therefore, ensure the front cover has always been placed in proper position during operation of the appliance. Failure to do so may lead to insufficient combustion air causing a fire or explosion resulting in death severe injury or property damage.

9.2 Power Connection

The appliance is 120V- 60 hz single phase and has been equipped with a grounded three pronged power cord. The boiler, when installed, must be electrically bonded to ground in accordance with the requirements of the authority having jurisdiction or, in the absence of such requirements, with the *National Electrical Code, NFPA 70*, in the US and the *Canadian Electrical Code Part I*, in Canada.

⚠ WARNING

If the power cord becomes damaged it must be fully replaced with an official Eco-King power cord (See Appendices for part numbers). The power cord and wall receptacle accessible for service at all times. Failure to follow these instructions may result in serious injury or death.

Ensure the electrical receptacle the boiler is connected to is properly grounded. Failure to do so may lead to electric shock causing death or severe injury.

Do not use the water or gas pipes for the appliance as a ground.

Ensure proper polarity at the electrical receptacle. Line to ground should be 120V and Neutral to ground should be 0V.

In areas where local code or the authority having jurisdiction require the appliance to be on a dedicated circuit the installation must be in accordance to the local codes and the authorities having jurisdiction.

9.3 Thermostat Connection

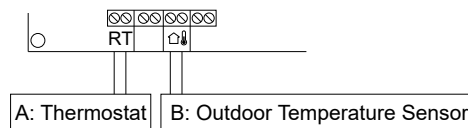


Figure 9.2 Room thermostat and outside sensor connection

1. Disconnect power to the unit.
2. After removing the front cover of the Eco-King boiler, access the printed circuit board (PCB) by manually pushing the plastic clips at the sides of the PCB housing and subsequently pulling forward the drop down box.
3. Connect the room thermostat (A) and, if present, the outdoor temperature sensor (B) to the terminal strip (see figures 9.2 and 9.3). The outdoor temperature sensor is optional, does NOT have to be installed for the Eco-King boiler to function.

Connections:

A: Room thermostat (on/off end switch/dry contact connection ONLY. Do NOT supply 24v to this connection)

B: Outdoor temperature sensor (optional)

9.3 Connecting an Indirect Tank Sensor

1. Disconnect the power to the appliance.
2. Connect the 10k Ohm NTC sensor in the tank to the tank connector on the Printed Circuit Board (*Figure 9.3 Printed circuit board main connections*)

In the event no 10K Ohm NTC tank sensor came with the tank contact the supplier.

3. Reconnect the power supply.

See Section 6.6.4 Connecting an Indirect Tank: H MODEL BOILERS for more information pertaining to connecting an indirect tank to the boilers water connections.

9.4 Wiring Diagram

If any of the original wire as supplied with the appliance must be replaced, it must be replaced with only OEM Eco-King wiring harnesses. Do not splice wires.

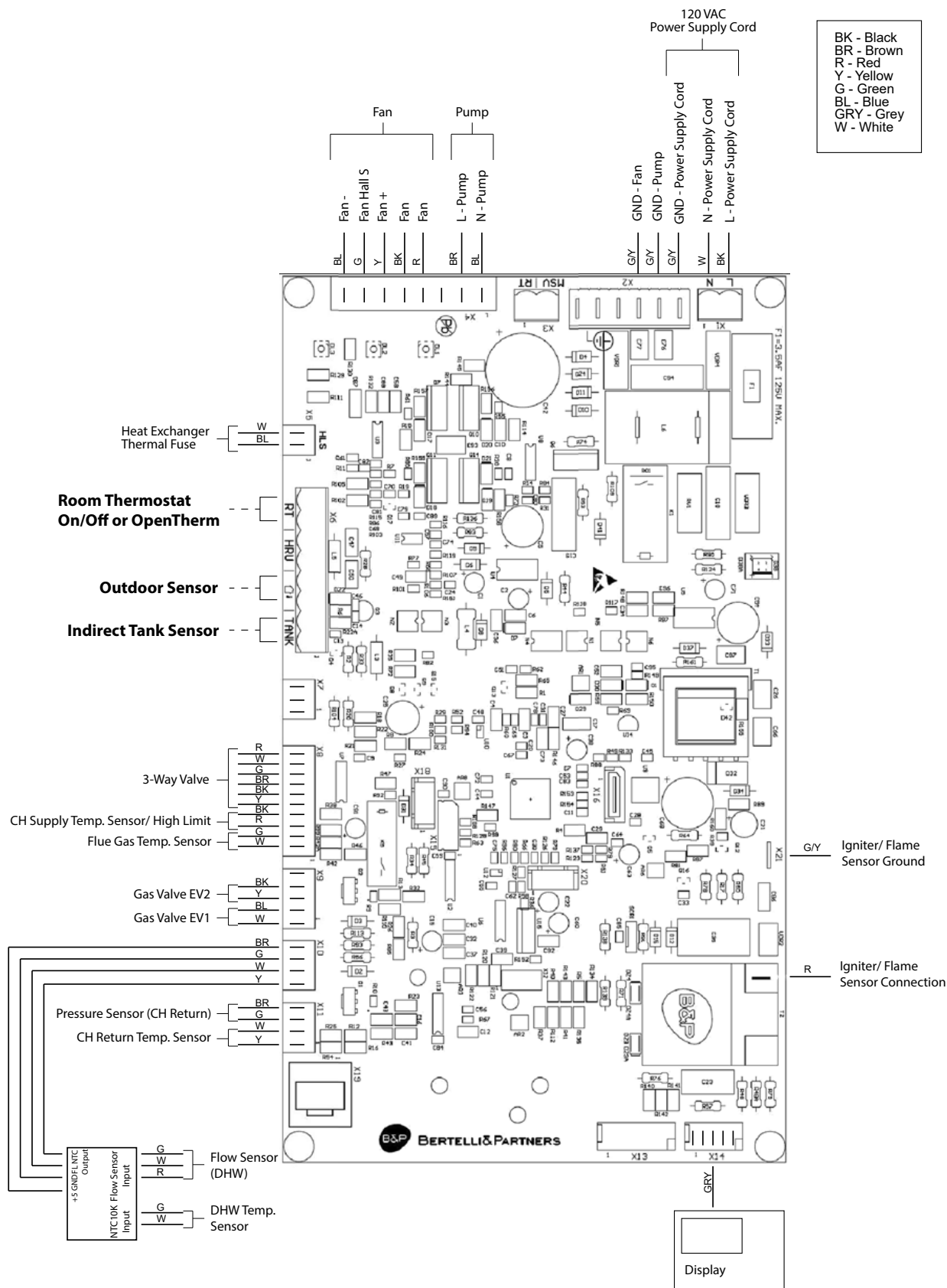
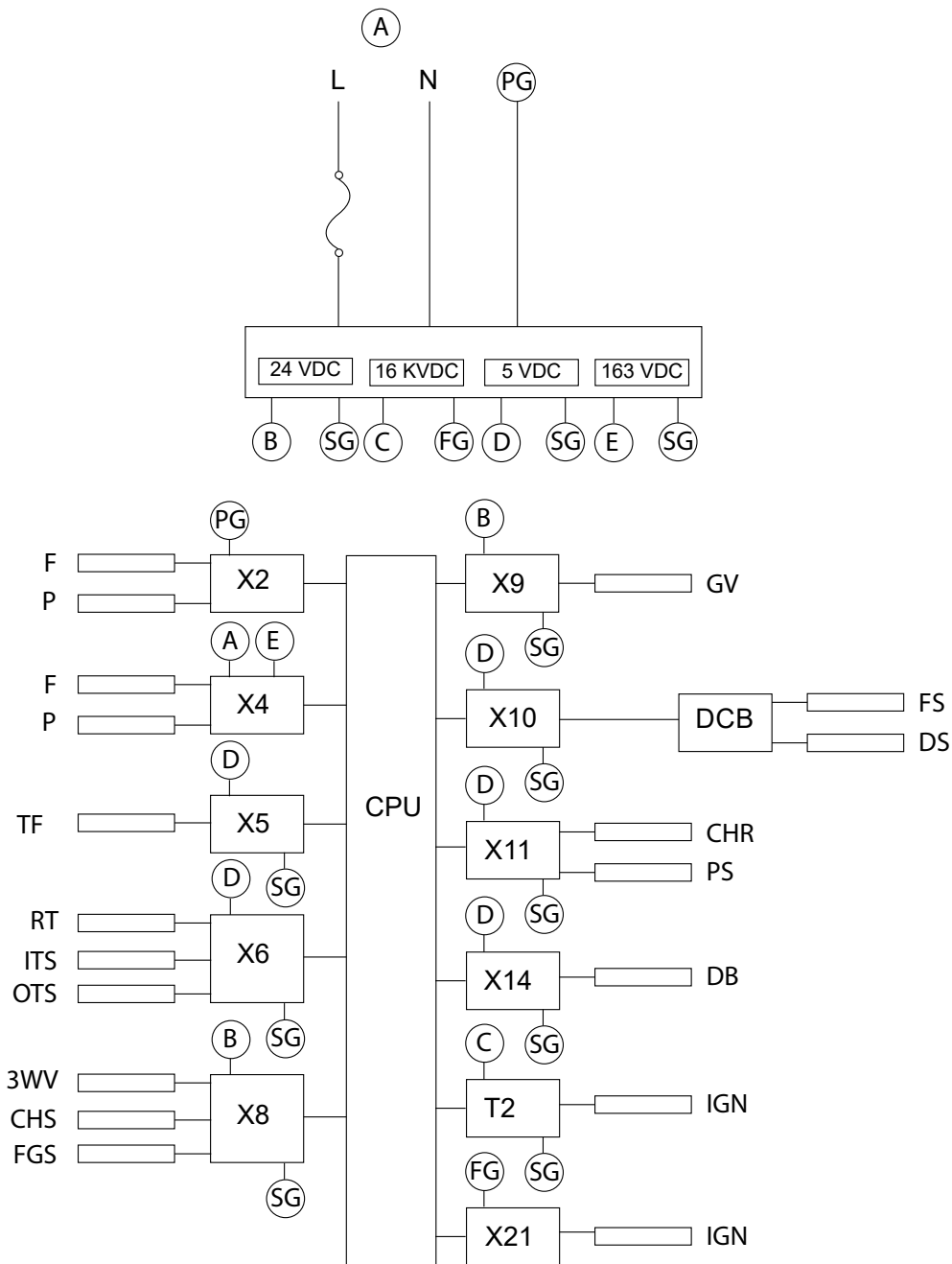


Figure 9.3 Printed circuit board main connections

9.5 Ladder Diagram

If any of the original wire as supplied with the appliance must be replaced, it must be replaced with only OEM Eco-King wiring harnesses. Do not splice wires.



A - 120 VAC
B - 24 VDC
C - 16 KVDC
D - 5 VDC
E - 163 VDC
PG - Primary Ground
SG - Secondary Ground
FG - Dedicated Flame
Detection Ground
CPU - Main Control Board

F - Fan w/ PWM & Hall Sensor
P - Pump
RT - Room Thermostat
ITS - Indirect Tank Sensor
OTS - Outdoor Temperature Sensor
FGS - Flue Gas Temp Sensor
3WV - 3-Way Valve
DCB - Domestic Control Board
DB - Display Board

CHS - CH Supply Temp Sensor
/ High Limit
GV - Gas Valve
FS - DHW Flow Sensor
DS - DHW Temp Sensor
PS - CH Pressure Sensor
CHR - CH Return Sensor
IGN - Igniter/ Flame Sensor
TF - Heat Exchanger Thermal Fuse

Figure 9.4 Ladder Diagram

Section 10 - Lighting & Shutting Down the Appliance/ Commissioning

DANGER

Operating any Eco-King boiler with a fuel type other than what is specified on its rating plate is strictly prohibited. Failure to follow the instructions for converting to an alternate fuel can lead to fire or explosion, potentially causing death, severe injury or property damage.

Always check the appliance's rating plate to ensure it is configured for the fuel you intend to use. If the appliance is not compatible with your fuel. Not performing the necessary fuel conversion creates an immediate safety hazard.

Conversion to LPG can be performed following the procedure in Section 7.3 Converting to Propane (LPG)

WARNING

The initial lighting of the appliance must be performed by a licensed Gas Technician. Failure to follow these instructions may result in property damage, serious injury or death.

Use of electrical connections to the boiler other than described might result in unpredictable behavior, or malfunction of the boiler. **DO NOT WIRE ANY VOLTAGE, ONLY DRY CONTACTS TO CONTROL BOARD.**

The boiler must be manually bled of air using the manual air bleed on top of the heat exchanger. Before commissioning turn the manual air bleed until water pours out. Make sure to perform this action before the boiler is turned on in order to prevent hot water scalding.

Prior to turning the gas supply on and lighting the appliance, ensure all aspects of the installation are complete and conform with the instructions provided in this manual, including the Section 8 - Venting and the manuals delivered with the vent system, Condensate Drain, and System Water Piping. Failure to precisely follow these instructions will cause a fire or explosion resulting in property damage, serious injury or death.

Do not store or use gasoline or other flammable vapors & liquids in the vicinity of this or any other appliance. Failure to follow instructions could result in explosion causing property damage, serious injury or death.

If you do not follow these instructions exactly, a fire or explosion may result causing property damage, serious injury or death.

Should overheating occur or the gas supply fail to shut off, **turn off the manual gas control valve to the appliance.** Failure to follow instructions could result in explosion causing property damage, serious injury or death.

After the appliance has been fully installed—including hydraulic connections with the system purged of air, gas line connected, exhaust vent and combustion air intake installed, and wiring completed in accordance with the preliminary installation instructions—it may be plugged into a grounded wall electrical receptacle.

NOTICE

The grounded power cord and receptacle must remain accessible at all times for service purposes.

Ensure the appliance is wired in accordance with this manual (section 9).

Ensure the system is completely filled with water, and that ALL the air is purged out.

The automatic air vent cycle takes approximately 6 minutes (see Section 10.2: Filling the Central Heating System). Ensure the gas shut-off valve is turned on (only after ALL air is purged out), and that the gas system has been fully tested for leaks.

10.1 Lighting the Appliance

FOR YOUR SAFETY READ BEFORE OPERATING

WARNING: If you do not follow these instructions exactly, a fire or explosion may result causing property damage, personal injury or loss of life.

This appliance does not have a pilot. It is equipped with an ignition device which automatically lights the burner. Do not try to light the burner by hand.

BEFORE OPERATING smell all around the appliance area for gas. Be sure to smell next to the floor because some gas is heavier than air and will settle on the floor.

WHAT DO YOU DO IF YOU SMELL GAS

- Do not try to light the appliance.
- Do not touch any electric switch; do not use any phone in your building.
- Immediately call your gas supplier from a neighbor's phone. Follow the gas supplier's instructions.

- If you cannot reach your gas supplier call the fire department.

C. Use only your hand to push in or turn the gas control knob. Never use tools. If the knob will not push in or turn by hand, don't try to repair it, call a qualified service technician. Force or attempted repair may result in a fire or explosion.

D. Do not use this appliance if any part has been under water. Immediately call a qualified service technician to inspect the appliance and to replace any part of the control system and any gas control which has been under water

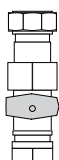
OPERATING INSTRUCTIONS

STOP! Read the safety information above very carefully.

Turn off all electric power to the appliance.
Set the thermostat to lowest setting.

Do not try to light the burner by hand.

The main gas cock is situated directly underneath the boiler in the gas supply line and below the gas valve. Turn the main gas cock counterclockwise to open the gas supply.



Turn Counterclockwise
to Open Gas Shut off
Valve

Ensure the central heating system is filled with water and all air has been purged. Also, confirm that the gas line has been properly purged of air. Wait five (5) minutes to allow any residual gas in the room to dissipate. After waiting, check for the smell of gas, especially near the floor. If you detect the smell of gas, **STOP IMMEDIATELY** and follow step "B" in the safety instructions above. If no gas is detected, proceed to the next step.

Turn on all electric power to the appliance and start the calibration procedure of the boiler (at first start-up)

Set thermostat to desired setting.

The appliance should begin its operating sequence for central heating.

TO TURN OFF GAS TO APPLIANCE

Set the thermostat to lowest setting.
Turn off all electric power to the appliance if service is to be performed.

Turn the external gas cock clockwise  to the off position.

10.2 Filling the Central Heating System

The appliance continuously checks pressure in the central heating system. If the pressure is too low (below 11.6 psi/ 0.8 bar) the refill notification on the front of the boiler lights up orange. The display shows the system pressure. A Means to fill the system shall be piped externally to the central heating return of the boiler as shown below. To manually fill the system open the manual fill valve on the pressure reducing valve.

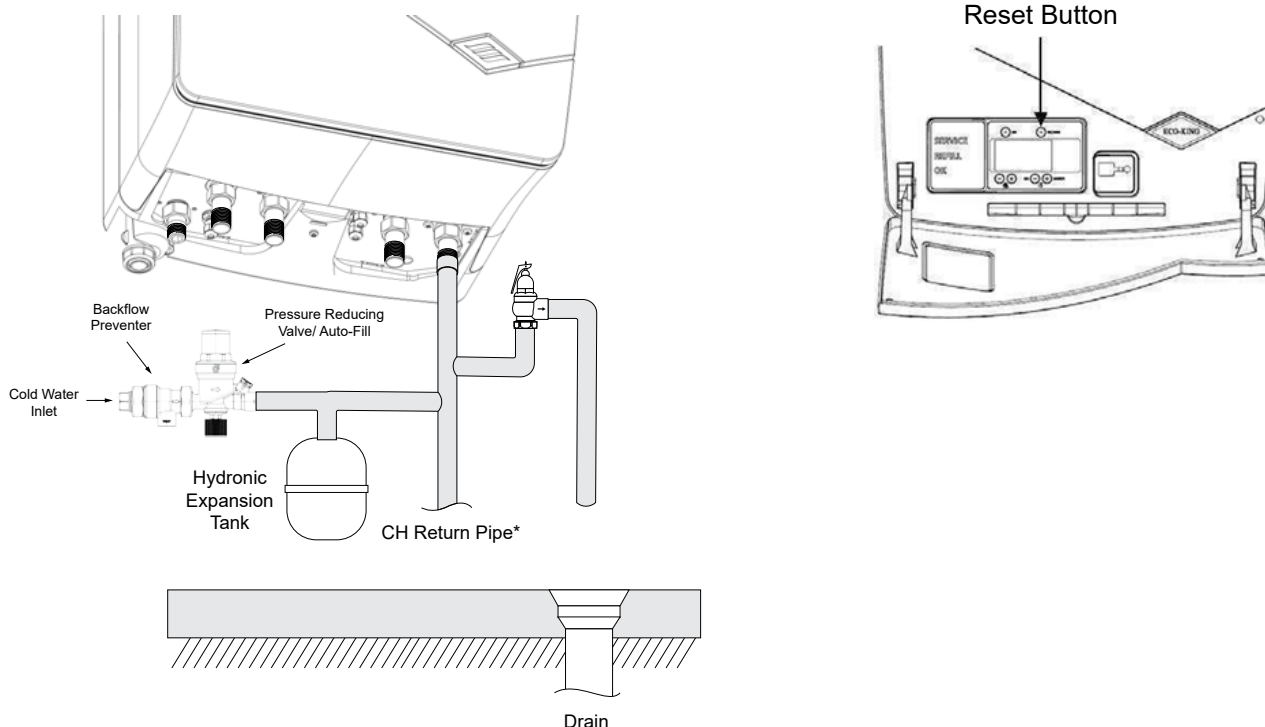


Figure 10.1 Fill valve location

NOTICE

The LED 'REFILL' lights up when the water pressure is too low below 11.6 psi (0.8 bar). If the pressure is below 10 psi (0.7 bar) the unit stops functioning.

CAUTION

The display shows the water pressure. Make sure that the water pressure is always between 14.5 - 29 psi (1.0 - 2.0 bar). If the system needs to be refilled more than 3 times a year, contact a qualified service technician. Continuous low water may lead to premature failure of components.

When filling the system do not exceed the rating of the pressure relief valve causing it to open. If this occurs water will escape the pressure relief valve and may be hot causing personal injury or property damage.

10.3 Commissioning

10.3.1 Step 1: Turn Power on and Air Vent Cycle

Ensure that the system is properly purged of air. This will avoid noise and comfort problems. The CH pump has an automatic air vent and does not need to be purged.

CAUTION

Be careful when purging air from the system. The water can be hot causing severe injury. Use a cloth to soak up spilled water.

To purge the system sufficiently, both the automatic air vent cycle of the appliance and separate bleeding of the radiators must be performed using the following steps.

1. Ensure all zones have been fully purged of air. Then plug in the Eco-King boiler to start the automatic air vent cycle. It is 5 minutes long and the LCD screen will start a countdown from 5 minutes. During this time you will hear the pump moving and the three way valve moving position in order to get as much air out of the boiler as possible.

The boiler must be manually bled of air using the manual air vent at top left of the heat exchanger. Before commissioning and during the 5 minute air vent cycle, connect a silicone tube to the manual air vent. Lead it into a bucket and turn the air vent until water pours out (3-4 full turns). Then flush the system with the air vent open for about 2 minutes, you will need to simultaneously add water to the system to account for the water and air being removed via the air vent. The automatic air vent cycle can be activated by unplugging the appliance, wait 30 seconds, and then plugging the power cord back in.

After approximately 5 minutes the air vent cycle is finished. Disconnect your tube and close the manual air vent. To be sure all air is purged out of the entire system subsequently bleed air in all zones in the system separately.

2. Repeat the automatic air vent cycle as described in step 1 if lots of air remains in the system.

NOTICE

Check the water pressure in the appliance during and after purging. Refill the system when the water pressure is below 14.5 psi (1 bar).

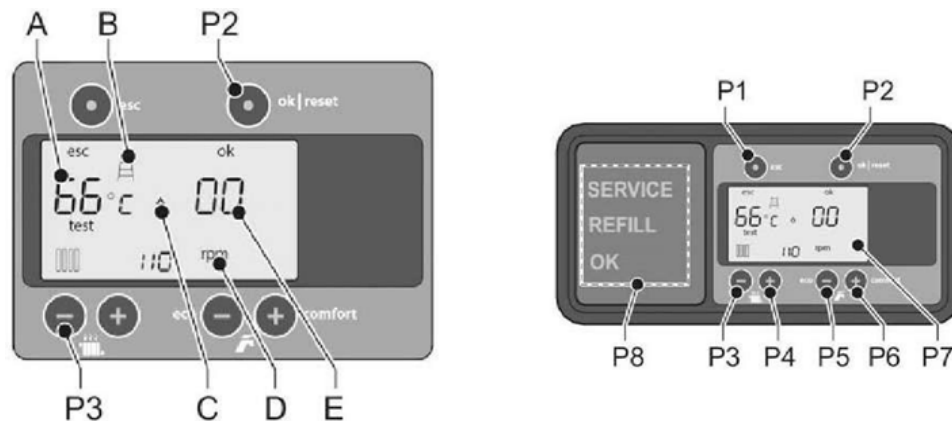
Always purge the system after installation or maintenance activities on the central heating system.

If an air handler is installed in the central heating system, installation of a secondary air vent between the air handler and the appliance is strongly recommended.

10.3.2 Step 2: Perform Calibration on the Boiler via Auto or Manual Calibration

Before the first start up of the appliance (before calibration) check the gas type setting is set correct (parameter 15, Table 10.1 Setting parameters). The Eco-King boiler is gas-adaptive, which means that the combination ionization electrode and the burner pneumatically and electronically control the CO₂ percentage.

During calibration, the start current and proper CO₂ percentage settings are established. In manual calibration, the CO₂ percentage can be adjusted if needed. At elevations above 2000 ft, manual calibration is recommended; at lower elevations, automatic calibration is generally sufficient. For maximum accuracy, use manual calibration. Both methods are described below.



- A: Flame impedance and temperature value
- B: Ladder symbol: calibration menu
- C: Flame symbol: ignition. The appliance is lit.
- D: Fan speed (rpm/10)
- E: Boiler capacity (%)
- P2: ok | reset
- P3: CH lower temperature

Figure 10.2: Controller Overview

NOTICE

Once automatic calibration is started by installer, starting ignition current is adjusted automatically

10.3.2.1 Manual Calibration

1. Start the system.
2. Connect the combustion analyzer to the appliance by inserting it in the exhaust gas test port on the top of the boiler. The combustion analyzer probe sampling tip should be in the center of the exhaust vent.

It's recommended to measure the combustion gases with front cover on.

NOTICE

Before starting calibration make sure the boiler can transport the produced energy into the system. For an H model boiler it will dissipate heat ONLY in the heating circuit during calibration so you must turn on all thermostats and open all zones/pumps before performing auto or manual calibration. With a C model you can do the same OR run dhw demand with a MINIMUM 2.1 gpm (8L/min) flow on the screen of the boiler before starting calibration.

The combustion analyzer must be calibrated and accurate prior to testing and adjusting the boiler. Place the probe into the flue pipe ONLY AFTER the boiler has fired and has been running for at least 1 minute.

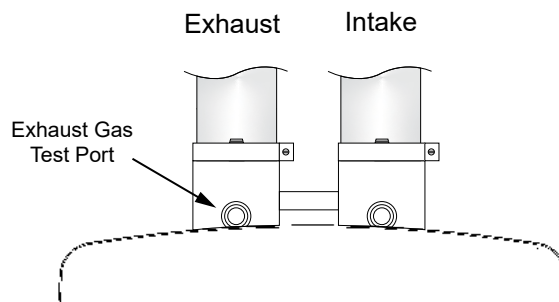


Figure 10.3: Exhaust Gas Test Port

3. Simultaneously press [P2] and [P3] buttons until the text 'test' appears in the display.
 - The 'ladder' symbol flashes on the display.
 - The fan speed (rpm) increases until the ignition speed is reached. The display shows the speed of the fan.
 - The capacity 100% flashes on the right in the display. 1 and 00 appear alternately in the display.
 - The starting current is determined and the boiler ignites. The 'flame' symbol and the text 'ok' appear when the flame is stable.
4. The appliance is in high-fire, check the CO₂ percentage on the combustion analyzer. The percentage must be 9.0% (+/- 0.3%) for natural gas and 10.0% (+/-0.3%) for LPG.
 - a) If the CO₂ value is not within range, the value must be adjusted. By pressing the [P3] or [P4] buttons the flame impedance is shown. Use the [P3] button for increasing the CO₂ value. Use the [P4] button for decreasing the CO₂ value.
 - b) When the CO₂ value is within range confirm the value with the [P2] button.
5. The fan adjusts to ignition speed.
 - CO₂ setting natural gas 9.0% (+/- 0.3%)
 - CO₂ setting LPG 10.5% (+/-0.3%)
 - a) Repeat step 4.
6. The appliance goes to the third and last step low-fire (Modulation is 0%).
 - CO₂ setting natural gas 9.0% (+/- 0.3%)
 - CO₂ setting LPG 10.0% (+/-0.3%)
 - a) Repeat step 4.
7. After accepting the third and last calibration step, the fan of the boiler will continue to run for 10 minutes without firing. This is the final step of the calibration process. During this time the boiler will not respond to any heat request, but parameters and settings can be changed. When "test" leaves the screen, calibration is finished.

During this time the combustion analyzer can be removed and the exhaust gas test port cap can be put back in place.

DANGER

Ensure the exhaust gas test port cap is put back in place after the calibration is performed. Failure to do so will result in death or serious injury.

NOTICE

If the 10 minute fan calibration period is disrupted by disconnection of main power supply, the 10 minutes calibration time will continue as soon as power is restored.

10.3.2.2 Automatic calibration

The automatic calibration function enables you to calibrate the boiler without a combustion analyzer to make sure that the Eco- King boiler burns safely. This function performs the same procedure as the manual calibration, but here the flame impedance values go to pre-set values from the data key.

NOTICE

Before starting calibration make sure the boiler can transport the produced energy into the system. For an H model boiler it will dissipate heat ONLY in the heating circuit during calibration so you must turn on all thermostats and open all zones/pumps before performing auto or manual calibration. With a C model you can do the same OR run dhw demand with a MINIMUM 2.1 gpm (8L/min) flow on the screen of the boiler before starting calibration.

It's recommended to measure the combustion gases with front cover on.

1. Simultaneously press the [P1] and [P3] buttons for 5 seconds until the text 'test' appears in the display.
 - The 'ladder' symbol flashes in the display.
 - The fan speed (rpm) increases until the start speed is reached. The display shows the speed of the fan.
 - The capacity of 100% flashes on the right in the display. 1 and 00 appear alternately in the display.
 - The starting current is determined and the boiler ignites. The 'flame' symbol and the text 'ok' appear when the flame is stable.
 - When the fan speed and the CO₂ percentage are stable and the output capacity is 100% (high-fire), the boiler will set the CO₂ percentages. It will then proceed to set the CO₂ percentages for ignition and finally the CO₂ percentages for 0% modulation (low-fire).
 - During this part of calibration a flame will be flashing in middle of the screen and its size will depend on boiler output capacity.
2. After the last calibration step the fan of the boiler will continue to run for 10 minutes without firing the boiler. During this time the boiler will not respond to any heat or domestic hot water requests. Installer settings can be adjusted during this time. When this procedure is completed, "test" leaves the screen and the boiler goes to the default menu and is ready for use.

NOTICE

If the 10 minute fan calibration period is disrupted by disconnection of main power supply, the 10 minutes calibration time will continue as soon as power is restored.

10.3.3 Step 3: Adjusting settings

General use of the control panel

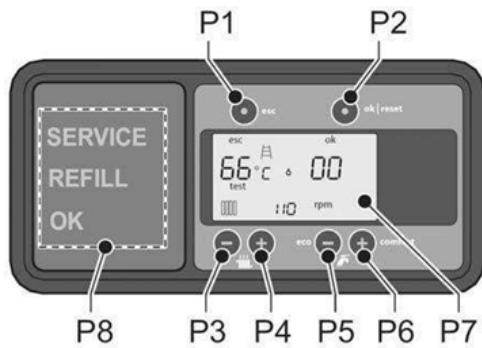


Figure 10.4: General Use of the Control Panel

Setting of parameters

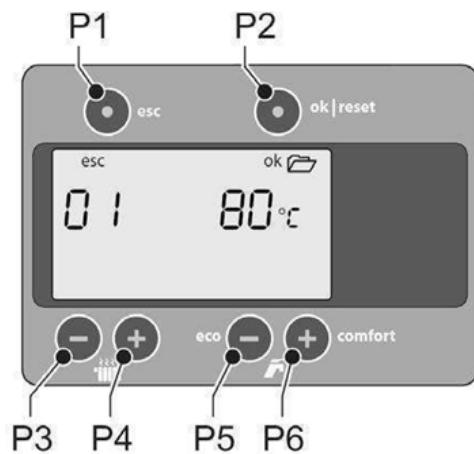


Figure 10.5: Setting of Parameters

- P1: esc: escape / cancel
- P2: ok (confirm) | reset
- P3: CH temperature down
- P4: CH temperature up
- P5: eco (tap symbol).
- P6: comfort up (tap symbol)
- P7: Display
- P8: LEDs: Displays the general status of the appliance.

1. Go to the installer level:
 - a) Simultaneously press the [P1] and [P2] buttons for 5 seconds.
 - b) Put the number on the left side of the display to '08' by scrolling up or down using button(s) [P3] or [P4].
 - c) Press the [P2] button to confirm. You have accessed the installer level.
2. Press [P3] or [P4] to select the required parameter (index number). The index number is shown on the left side in the display (see the list below). The set value is shown on the right side in the display.
3. Press the [P5] and [P6] buttons to adjust the value.
4. Press the [P2] button to confirm.

NOTICE

Moving to the next parameter without confirmation will not store the parameter change made.

10.3.3.1 Parameters

The table below contains the parameters that can be set via the display or using a hand terminal (palm).

Parameter no.	Description	Units	Default	Min.	Max.	Note
0	Maximum CH temperature setting	°F (°C)	176 (80)	68 (20)	185 (85)	
1	Maximum CH power	%	100	0	100	
2	Maximum time for modulation to full power	Minutes	10	0	60	
3	Pump overrun time CH	Minutes	1	0.5	C (continues)	Time max. 30 min. C= Pump continuously
4	Maximum flow pump for CH operation	%	100	50	100	
5	Minimum flow pump for CH operation	%	50	40	100	
6	dT Supply/Return CH operation	°F (°C)	28 (15)	9 (5)	54 (30)	K = displayed on old boilers AQM17.. °F = shown on new boilers serial AQM20..and later
7	Outside sensor present		0	0	1	0=no outside sensor 1=outside sensor present / weather dependent control activated
8	K factor for weather-dependent control		4	0.5	6	
9	K factor for weather-dependent control night mode		2	0.5	6	
10	Offset outside sensor set point	°F (°C)	0 (0)	-27 (-15)	+27 (15)	K = displayed on old boilers AQM17.. °F = shown on new boilers serial AQM20..and later
11	Tap water configuration		0/1	0	2	0 = Hxx default (No DHW) 1 = Cxx default (Combi) 2 = Hxx storage tank operation
12	Required tap water temperature	°F (°C)	142 (61)	101 (40)	158 (70)	
14	Gas sensor type		2	0	2	0= High limit switch 1=NTC 2=High limit switch and NTC
15*	Gas type		1	1	2	1 = Natural gas G20 2 = LPG*.
16	Option print configuration		0	0	99	
17	Anti fast-cycle time	Minutes	2.5	0	10	
18	Maximum power DHW	%	100	0	100	
19			0	0	1	Not used. Do not change.
20	Pressure sensor de-activated		0	0	1	0 = activated 1 = deactivated
21	Reset to default values		0	0	255	111 = reset to factory defaults (requires manual calibration)
22	°F & PSI Setting		1	1	2	1=LCD screen displays PSI and °F
23	2023/older or 2024/newer version boiler		1	0	1	0= 2023 or older boilers 1= 2024 or newer boilers

Table 10.1: Setting Parameters

*FOR PROPANE usage. On C100A, C140A, H100A, and H140A units, the Eco-King boiler does not require a gas pipe change, only a setting change on 15 from 1 to 2. When using propane on a H200A or C200A the gas pipe in the boiler MUST BE CHANGED. It is a separate part NOT included in the box and needs to be ordered from your supplier. Part number EK 204-1231

10.3.3.2 Outdoor Temperature Sensor Setup

In weather dependent control operation with an outside temperature sensor, the boiler central heating setpoint depends on the outside temperature and a pre-set weather compensation setting. There must still be a thermostat or end switch connected to RT on the boiler.

If an outdoor temperature sensor and an on/off thermostat have been installed, the next steps need to be performed to pre-set weather dependent control:

- 1) Change parameter 7 to 1 in the installers menu when using an outdoor temperature sensor;
- 2) Connect a thermostat or control (switching relay, zone controller) to the 'RT' contact on the appliances PCB for weather dependent control.

The lower the outdoor temperature, the higher the central heating (CH) supply temperature will be. When it becomes warmer outside, the CH supply temperature will decrease. The relationship between the outdoor temperature and the CH supply temperature can be visualized with a weather compensation graph (Figure 10.6 Weather Compensation Setting Graph). The graph shows the relationship between the desired CH supply temperature at a certain outside temperature.

- 3) When needed, adapt the weather compensation setting using parameter 8 in the installers menu.
- 4) When needed, shift the weather compensation setting using parameter 10 in the installers menu.

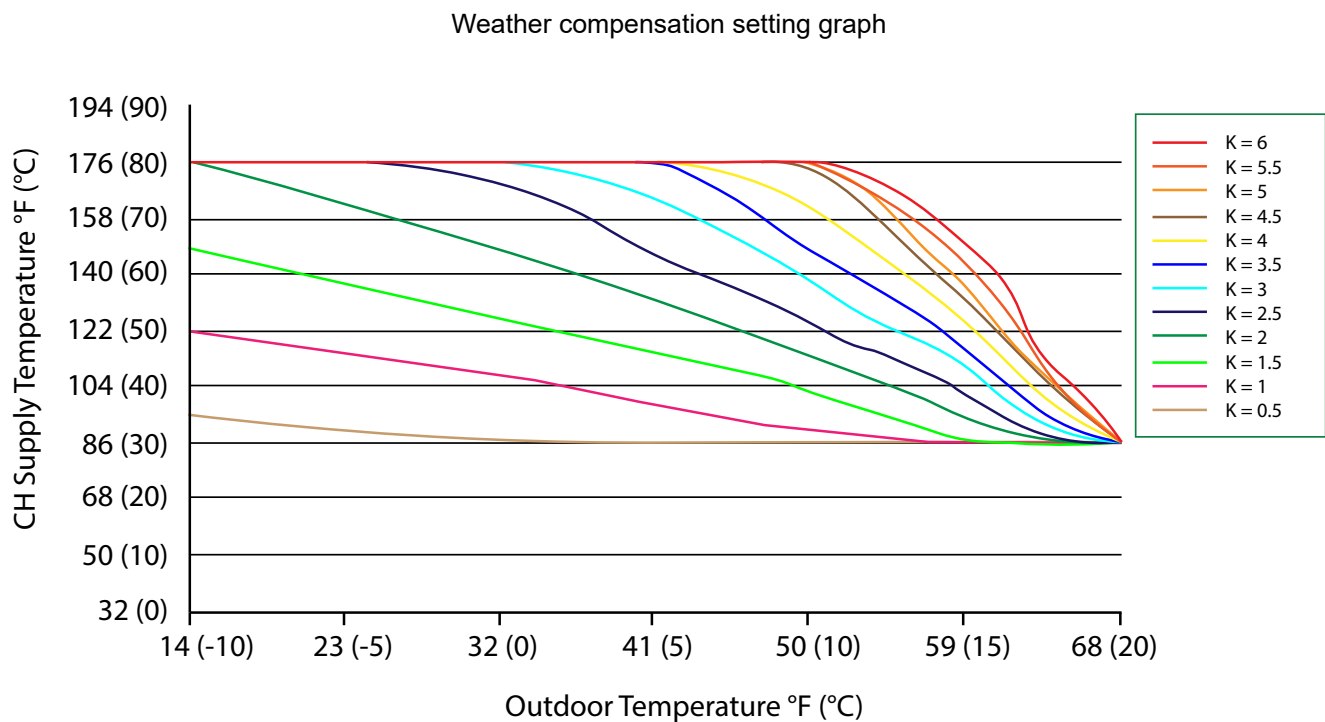
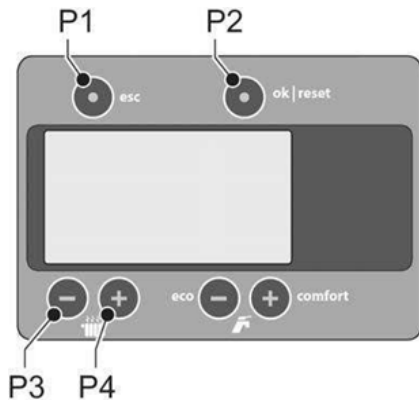


Figure 10.6 Weather Compensation Setting Graph

10.3.4 Step 4: Setting the Central Heating & Domestic Hot Water Supply Temperatures

10.3.4.1 Setting the Central Heating Supply Temperatures



1. Press the [P3] or [P4] button. The maximum CH temperature is shown and the 'radiator' symbol is flashing.
2. To change the CH temperature:
 - a) Decrease the maximum CH temperature using the [P3] button.
 - b) Increase the maximum CH temperature using the [P4] button.
3. Press the [P2] button within 30 seconds to confirm the change.

Figure 10.7: Setting the CH Temperature

NOTICE

If you wait longer than 30 seconds or if you press the [P1] button, the adjusted setting will be canceled.

10.3.4.2 Setting the Domestic Hot Water Supply Temperature

⚠ WARNING

The appliance is set to a default temperature setting of 142°F (61°C) which can cause scalds or burns with exposures of 4 seconds. If a lower temperature is desired to prevent scalds or burns follow the instructions below:

The hot water can be set to two comfort types:

Eco mode:

In C model boilers, hot water is only heated when there is a hot water demand. To save energy the temperature of the DHW heat exchanger is not maintained.

In H model boilers, the boiler turns on to heat an indirect hot water tank when the temperature of the indirect tank drops 7°F (4°C) below the indirect tank temperature setpoint (Setting 12).

Comfort mode:

In C model boilers, the temperature of the DHW heat exchanger is maintained once an hour perpetually. This uses energy, but creates a slightly faster reaction time for hot water at faucets.

In H model boilers, the boiler turns on to heat an indirect hot water tank when the temperature of the indirect tank drops 4°F (2.2°C) below the indirect tank temperature setpoint (Setting 12).

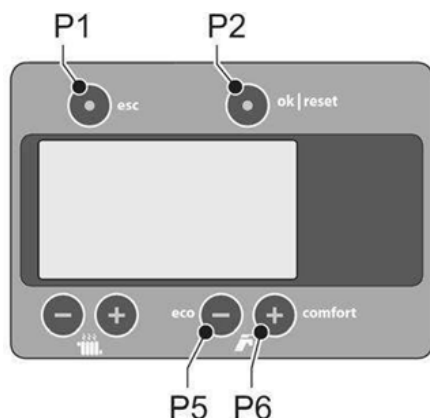


Figure 10.8: Setting the DHW Temperature

1. Press the [P5] or [P6] button to open the domestic hot water menu. The 'tap' symbol on the display should be flashing.
2. Select the hot water mode:
 - Press the [P5] button to select 'eco'.
 - Press the [P6] button to select 'comfort'.
3. Press the [P2] button within 30 seconds to confirm the change.

NOTICE

If you wait longer than 30 seconds or if you press the [P1] button, the adjusted setting will be canceled.

10.3.5 Diagnosis Menu

The diagnosis menu is for read outs of the boiler's operation and does not to change parameter settings. Parameter settings can be found in Table 10.1 Setting Parameters. Follow the steps below to access the diagnosis menu:.

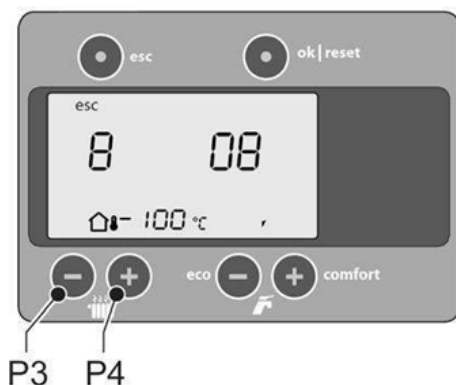


Figure 10.9: Diagnosis Menu

1. Simultaneously press buttons [P3] and [P4] for 5 seconds. The first code is displayed.
2. Scroll through the codes (left side of display) using buttons [P3] and [P4]. The readings are shown right in the display. These readings cannot be changed. For an overview of the measured values refer to table 10.2.

Code	Description		Extra information (on the right)
0		-	So
1			Heat exchanger mode: 0 rest 2 start fan 3 pre ventilation 4 ignition 5 CH operation 6 DHW operation 7 heat up tap exchanger 8 anti-swing waiting time
2	Modulation level flame + %	Flame + %	-
3	CH pressure	PSI/ BAR	P1
4	CH supply temperature	°F/ °C	t1
5	Set point supply temperature CH	°F/ °C	t1 < > SP
6	CH return temperature	°F/ °C	t2
7	DHW flow sensor	l/ min	F1
8	DHW temperature	°F/ °C	t3
9	Setpoint DHW temperature	°F/ °C	t3 < > SP
10	Exhaust gas temperature	°F/ °C	t4
11	Outside temperature	°F/ °C	t5
12	Indirect tank temperature	°F/ °C	t6
21	Room temperature (of OpenTherm® thermostat)	°F/ °C	rt
22	Setpoint room temperature (of OpenTherm® thermostat)	°F/ °C	rt < > SP
24	Modulation pump	%	bP
29	Gas valve modulation current	mA	I = current
30	Flame resistance (actual value)	kOhm	FL = flame
31	Fan speed	rpm	-
32	Calibration done	-	CAL = calibration completed --- = calibration not completed, Do calibration
33	Flame resistance setpoint 0%	kOhm	FL
34	Flame resistance setpoint ignition speed	kOhm	FL
35	Flame resistance setpoint 100%	kOhm	FL

°C/ °F = °C is for older boilers that have LCD screen with SKU sticker CP37.02

°F is for new boilers that have LCD screen with SKU sticker CP37.03

Table 10.2 Diagnostic menu

10.4 After Commissioning

After placing the boiler in operation, the ignition safety shutoff device must be tested by:

1. With the boiler off, turn the boiler gas supply shutoff valve to the off position by turning the valve clockwise.
2. Turn the boiler on and create a call for heating by creating a demand on a thermostat.
3. The boiler should begin it's sequence of operation and go through 5 trials for ignition. Once completed the boiler should lock out on ignition failure.

Section 11 - Installation Checklist

Installation

Checkbox

Select a location for the appliance in accordance with Section 4 - Appliance Location of this manual.

☐

Connect the condensate drain in accordance with Section 5 - Condensate Drain of this manual.

☐

Connect the water supply according to Section 6 -Central Heating (CH) and Domestic Hot Water (DHW) circuit of this manual.

☐

Connect the gas supply in accordance with Section 7 - Installing the Gas Piping of this manual. Flush/clean the internals of the heating system.

☐

Install the Exhaust Venting/ Combustion Air-Intake piping in accordance with Section 8 - Venting of this manual. Ensure all joints are secured, sealed and supported properly. The venting and combustion air must terminate outdoors. Perform the 'Mandatory Pre-commissioning Procedure for Plastic Venting' in Section 8 - Venting.

☐

Connect field wiring in accordance with Section 9 - Electrical Connections of this manual.

☐

WARNING

The installer must verify that at least one carbon monoxide alarm has been installed within a residential living space or home following the alarm manufacturer's instructions and applicable local codes before putting the appliance into operation. Failure to do so may result in severe injury or death.

☐

Advise home/building owner of their responsibilities with respect to using and maintaining the appliance.

☐

WARNING

Inform the home/building owner that:

- The carbon monoxide detector must be tested for proper operation in accordance with the carbon monoxide detector's manufacturers instructions and local .
- The building owner is responsible for keeping the exhaust vent/ combustion air-Intake terminal free of snow, ice, or other potential blockages and for scheduling routine maintenance on the appliance (see Section 12 - Service & Maintenance).
- Keep boiler area clear and free from combustible materials, gasoline and other flammables, vapors and liquids
- Do not obstruct the flow of combustion and ventilation air.
- Periodically visually inspect the condition of the boiler and check for leaks.
- Periodically visually inspect the venting is supported and secure and that there are no cracks in the venting. Inform the home/building owner not to touch or attempt to repair the venting themselves and to shut the appliance down and call a qualified service technician immediately to repair if anything is found to be abnormal.
- To review the User Responsibilities section and Periodic Inspection for the User section in the User manual

Failure to comply with the above may result in death, severe injury or property damage.

Start-up

Checkbox

Test the ignition safety shutoff device per the instructions in Section 10.4: After Commissioning

☐

Complete the Start-Up Review form in Appendix B of the installation manual.

☐

Operational Review

System is free of gas leaks. Ensure gas line pressure is in accordance with Section 7 - Installing the Gas Piping of this manual.

☐

System is free of water leaks. Water pressure is maintained above 14.5 psi (1 bar). All air is purged from the heating system piping. Ensure proper water flow rate; unit must not kettle, bang, hiss.

☐

System is free of combustion leaks. Unit must operate smoothly.

Water quality is within the ranges as noted in Sections 6.1 Central Heating (CH) Water Quality and 6.2 Domestic Water Quality.

☐

Ensure the combustion readings are within the range, system is calibrated and each ignition is be smooth.

☐

Verify that all condensate lines are clean and drain freely.

☐

Flow for combustion and ventilation air is not obstructed and the user is informed.

☐

Before Leaving

The gas pressure regulator test port connection must be closed and sealed.

☐

Exhaust gas test port and combustion air test port must be closed after a combustion analysis.

☐

Always verify proper operation after servicing.

☐

All air must be purged out of the system using the air vent cycle Section 10.3.1 Step 1: Turn Power on and Air Vent Cycle

☐

Allow the appliance to complete at least one heating cycle, or to operate for at least 15 minutes. Check cover is attached properly: locked in place by the latches and secured with a screw at the top side.

☐

Instructions to Installing Contractor

Ensure that the customer receives the documentation with regards to installation / use.

Leave the manual with the customer so it's known to the customer when to call for Periodic maintenance and inspection.

☐

WARNING

This appliance must have water flowing through it whenever the burner is firing. Failure to comply may damage the unit, void the warranty, and cause severe injury or death.

Allowing the appliance to operate with a dirty combustion chamber will adversely affect its operation and void the warranty. Failure to clean the heat exchanger on a frequency that matches the need of the application may result in fire, property damage, or death.

Section 12 - Service & Maintenance

This appliance must be inspected at the beginning of every heating season, and at least every 12 months, by a Qualified Technician. In some situations more frequent inspections may be required. It shall also be inspected by a Qualified Technician if the appliance experiences a hard lockout or generates a series of similar faults.

Annual Inspection Review

Ask the user if there are any problems with the central appliance or any other remarks. The remarks or complaints of the customer about the operation of the appliance may indicate hidden problems.

WARNING

Personal Protective Equipment Recommended - Read the following warnings and handling instructions carefully before commencing any service work in the combustion chamber. The insulating material on the inside of the burner door and at the back of the combustion chamber can contain Refractory Ceramic Fibers and should not be handled without personal protective equipment.

Potential Carcinogen - Use of Refractory Ceramic Fibers in high temperature applications (above 1000 oC / 1832 oF) can result in the formation of Crystalline Silica (cristobalite), a respirable silica dust. Repeated airborne exposure to crystalline silica dust may result in chronic lung infections, acute respiratory illness, or death. Crystalline silica is listed as a (potential) occupational carcinogen by the following regulatory organizations: International Agency for Research on Cancer (IARC), Canadian Center for Occupational Health and Safety (CCOHS), Occupational Safety and Health Administration (OSHA), and National Institute for Occupational Safety and Health (NIOSH). Failure to comply with handling instructions in the table below may result in serious injury or death.

Crystalline Silica - Certain components confined in the combustion chamber may contain this potential carcinogen. Improper installation, adjustment, alteration, service or maintenance can cause property damage, serious injury (exposure to hazardous materials) or death. Refer to the table below for handling instruction and recommended personal protective equipment. Installation and service must be performed by a qualified installer, service agency or the gas supplier (who must read and follow the supplied instructions before installing, servicing, or removing this appliance. This appliance contains materials that have been identified as carcinogenic, or possibly carcinogenic, to humans).

Reduce the Risk of Exposure	Precautions and recommended Personal Protective Equipment
Avoid contact with skin and eyes	Wear long-sleeved clothing, gloves, and safety goggles or glasses.
Avoid breathing in silica dust	Wear a respirator with a N95-rated filter efficiency or better. ¹ Use water to reduce airborne dust levels when cleaning the combustion chamber. Do not dry sweep silica dust. Pre-wet or use a vacuum with a high efficiency filter.
Avoid transferring contamination	When installing or removing RFCs, place the material in a sealable plastic bag. Remove contaminated clothing after use. Store in sealable container until cleaned. Wash contaminated clothing separately from other laundry.
First Aid Measures	If irritation persists after implementing first aid measures consult a physician. Skin - Wash with soap and water. Eyes - Do not rub eyes; flush with water immediately. Inhalation – Breathe in fresh air; drink water, sneeze or cough to clear irritated passage ways.

Notes:

¹Respirator recommendations based on CCOHS and OSHA requirements at the time this document was written. Consult your local regulatory authority regarding current requirements for respirators, personal protective equipment, handling, and disposal of RFCs.

For more information on Refractory Ceramic Fibers, the risks, recommended handling procedures and acceptable disposal practices contact the organization below:

Canada (CCOHS): Telephone directory listing under Government Blue Pages Canada—Health and Safety—Canadian Center for Occupational Health and Safety; or website <http://www.ccohs.ca>.

⚠ WARNING

Keep the boiler area clear and free from combustible materials, gasoline and other flammable vapors and liquids. Failure to do so may result in a fire or explosion resulting in death, severe injury or property damage.

Remove the front cover from the appliance and check all pipes and connections for traces of water and/or water leakage. Any leaks must be repaired. Check the top side of the housing and/or the top side of the appliance for water leakage or traces of water from the air supply pipe or the vent. Find the cause when water is leaking from the air supply pipe. This may be found in the roof surface.

Turn the gas valve off, make sure any gas is cleared from the combustion chamber. Then, remove the burner:

1. Remove the igniter cable and igniter ground wire. Also remove the wiring harness plug and ground wire from the combustion blower.
2. Disconnect the gas pipe at the outlet of the gas valve and remove the gas tube.
Note: Do not lose the gasket at the outlet of the gas valve.
3. Remove the four M6 nuts at the front plate of the combustion chamber.
4. Pull forward the burner unit including the fan.

Pull the burner forward halfway from the heat exchanger and remove the fan wiring harness plug from the fan. Check the burner plate for signs of leaking.

When cleaning the inside of the heat exchanger,

1. Remove and clean the condensate trap then re-install the condensate trap.
2. Vacuum the interior of the heat exchanger.
3. Use a heat exchanger cleaning tool to clean in between the tubes inside the heat exchanger. The tool must be able to be inserted between the tubes to a depth of approximately 1 ¼" (32 mm).
4. Rinse the heat exchanger (slowly pour water into the heat exchanger from a bottle). Use about 1-2 gallons (3.78-7.5 L) of water in total. **Note:** Ensure the refractory does not get wet.
5. Remove and clean the condensate trap after the heat exchanger then re-install the condensate trap.
Note: Protect the refractory and the controls from getting wet.

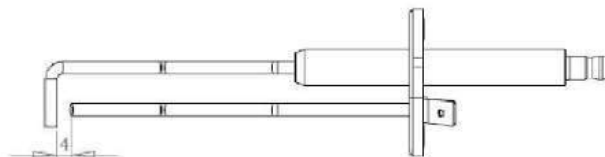
NOTICE

Do not use a wire brush for cleaning.

Disconnect the plastic air suction box on the suction side of the fan. Check the blades of the fan. If the blades of the fan are covered with dirt, carefully clean every blade. If this is not done regularly, the fan will not evenly rotate and get out of balance.

Check the distance between the electrode and the burner. This must run parallel with the burner at a distance of approximately 7/32" (5.5 mm).

An ignition/ionization electrode is used to measure the flame signal by detecting the electrical conductivity (μA) of the flame to the burner. See below



The distance between the ignition rod and the grounding rod must not exceed 5/32" (4 mm). If this is the case, replace the ignition rod with a new one as the metal becomes brittle over time and will break when bent.

Re-install the ignition pin, ignition cable, gas pipe and the burner door. Check for gas leaks.

CAUTION

Electrodes may become brittle over time due to high temperatures in the combustion chamber, this may cause the rods to break when trying to bend them and the igniter/flame sensor may need to be replaced.

Open the condensate trap and remove any dirt present. Flush if the condensed water coming from the condensate trap is heavily contaminated. If the burner has already been removed, let water flow into the heat exchanger through a filling hose. This will reach the condensate trap.

If using a condensate neutralizer follow the condensate neutralizer's manufacturer's guidelines for periodic maintenance.

Check the water pressure of the system. It must be between 14.5 - 22 psi (1 - 1.5 bar). Bring the pressure of the installation between 14.5 - 22 psi (1 - 1.5 bar), find any leaks in the installation and have this repaired by a registered installer or service center if necessary.

Ensure the pressure relief valve and air vents are not weeping. The pressure relief valve should be exercised to ensure it operating properly by pulling on the manual lever.

WARNING

Water may be hot when exercising the pressure relief valve(s). Take precautions to avoid contact with hot water to avoid burned or scalded and prevent water damage to any objects in the vicinity. Failure to comply may result in severe injury or property damage.

If a relief valve discharges periodically, this may be due to thermal expansion in a closed water supply system. Contact the water supplier or local plumbing inspector on how to correct this situation. Do not plug the relief valve

WARNING

Do not plug the relief valve. If pressure builds up in a system it can result in an explosion causing death, severe injury or property damage.

The external low water cut off shall be flushed (if applicable).

The venting system shall be checked once a year by a Qualified Technician to ensure it is in good working order, sealed, free from leaks, secured and installed in accordance with this manual, the venting system's manufacturer's installation instructions and the local authorities having jurisdiction, Special attention should be paid to the presence of debris and for signs of leakage.

Ensure vent screens are cleaned and clear of debris.

Normal operation of the Eco-King boiler does not result in deposits of combustible soot in venting systems. However, a poorly adjusted or malfunctioning boiler can deposit soot and other debris which can enter the vent system. Any such accumulation should be removed and the boiler adjusted to eliminate future accumulation. Use only a soft brush for cleaning the sections and fittings. If any leakage is found at joints the Eco-King boiler should be turned off and the leaks repaired.

WARNING

If venting is taken apart ensure it is put back together in accordance with Section 8 - Venting of this installation manual and the venting system's manufacturer's instructions. Ensuring it is sealed, secured and supported properly. Failure to comply may cause carbon monoxide poisoning, fire or explosion resulting in death, severe injury or property damage.

Do not obstruct the flow of combustion and ventilation air. Failure to do so may result death, severe injury or property damage.

Ensure venting terminates a minimum of 12" above the anticipated snow level and the home/building owners is aware to keep snow away from the terminals.

WARNING

Replace any gaskets or refractory that show any signs of damage and do not re-use. Failure to follow these instructions may result in fire causing death severe injury or property damage.

Once the appliance has been put back together properly operate the system and check the combustion:

Let the appliance burn at maximum power and measure the boiler output and the CO2 percentage using Section 10.3.2.1 Manual Calibration. If necessary, adjust the gas setting for the maximum load at the gas valve.

Let the appliance burn at minimum power and measure the boiler output and the CO2 percentage using Section 10.3.2.1 Manual Calibration. If necessary, adjust the gas setting for the minimum output at the gas valve.

Listen to the operation of the central heating pump and the fan. If either component produces unusual noise, preventive replacement is recommended.

WARNING

Domestic Hot Water Circuit Only - Boiler system cleansers and corrosion inhibitors must not be used to flush contaminants from water heaters or potable water systems. Some of these cleansers and corrosion inhibitors may be poisonous if consumed and could cause death or severe injury.

Listen for water flow noises indicating a drop in appliance water flow rate.

If the tap water flow rate is too low (Cxxx types), first check the flow restricter cold water supply filter for dirt. If the flow restricter and filter are clean, descale or replace the domestic hot water heat exchanger.

Check if the supply to the central heating installation does not get warm when heating the tap water. If the temperature of the supply water increases while using the domestic hot water, this means that the 3-way valve on the inside has been contaminated and needs cleaning or replacement.

Perform the procedure and fill out the checklist detailed in Appendix C - Maintenance Review.

DANGER

Ensure the appliance and it's venting system have been put back in together and are working as intended in accordance with this installation manual, the venting system's manufacturer's installation instructions, local codes and the authorities having jurisdiction. Failure to do so will cause death, severe injury or property damage.

Section 13 - Troubleshooting

⚠ WARNING

The following precautions when servicing the appliance must be complied with. Failure to comply with these may result in fire, property damage, serious injury or death.

Servicing the Appliance

Disconnect or shut off all energy sources to the appliance: 120VAC power, water and gas.

Identify and mark wires before disconnecting or removing them. Wiring errors can cause improper and dangerous operation.

Never bypass electrical fuses or limit devices.

Use proper personal protective equipment (PPE) i.e. eye protection, safety footwear. Verify proper operation after servicing.

These procedures should only be performed by qualified service personnel, when abnormal operation of the appliance is suspected. The appliance incorporates a sophisticated electronic automatic control system which normally responds appropriately to varying conditions. If the appliance operation appears to be incorrect, or it is not responding at all to a demand for heat, the following is suggested to determine and correct the problem.

Displaying faults

LED indicators show the main operational status of the appliance.

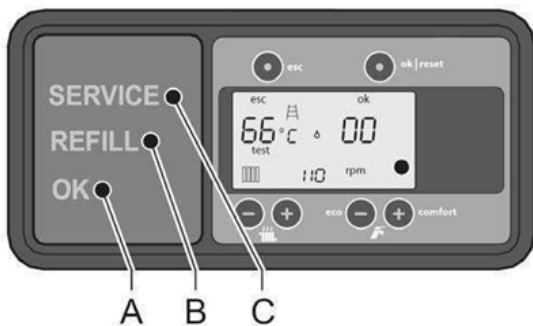


Figure 13.1: Displaying Faults

- A:** OK: the system is functioning properly.
- B:** REFILL: the central heating circuit pressure is low and the system needs to be filled.
- C:** SERVICE: a fault has occurred. See table 13.1 Fault codes.

13.1 Fault history

To view the 8 most recent faults simultaneously press buttons [P5] and [P6] to read out the 8 most recent fault codes. Subsequently Press buttons [P3] or [P4] to go through the list. Refer to table 13.1 for description of the fault belonging to the code and the proper corrective action that needs to be performed.

To erase these 8 errors, you must first enter the installer menu of the boiler system: see Step 3: adjust settings. Then return to main menu, enter the fault history and “reset” will be on the LCD screen below the ok/reset button. Press the “reset” button firmly and let go. The error codes will now be erased and any new error code will be stored.

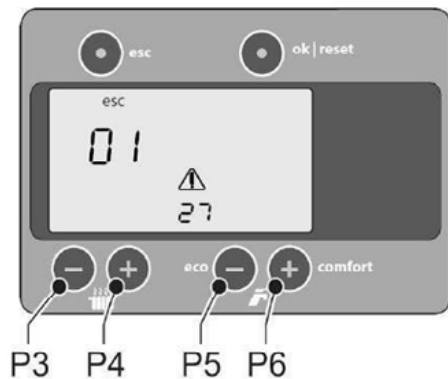


Figure 13.1: Fault History

13.2 Fault codes

Locking faults that block system operation appear in the display with a fault code. A warning symbol is placed above each fault code. The led beside 'SERVICE' lights up.



Figure 13.2: Fault Codes

13.3 Reset fault

In a number of occasions in which a fault has occurred, the user can reset the fault and restart the system. In those cases, the text 'reset' is shown in the display. If a fault occurs the system can be restarted by pressing the [P2] button firmly and letting go. If this does not solve the problem, a Qualified Service Technician must be contacted.

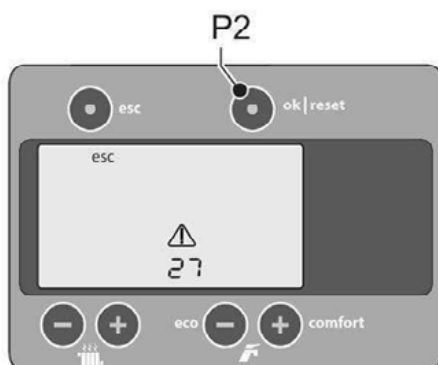


Figure 13.3: Reset Fault

13.4 Error Codes

Code - 01

Description - Lock-out- No Ignition

Cause	Solution
Calibration not completed correctly	Perform a calibration
Distance/ gap electrode not correct	Check ignition electrode gap and distance to burner
Ignition electrode damaged	Replace ignition electrode
Gas shut-off valve closed	Open gas shut-off valve
No gas supply	Gas pressure regulator stuck or broken, gas valve closed, check grid pressure
Ignition cable broken or not connected	Check ignition cable
Ignition cable cap damaged	Check for cracks. Replace when required
Ignition transformer damaged	Check if the unit sparks and check the distance and gap of the electrode. If all OK replace burner controller
Dirt in gas valve	Check if valve fully closes when power is unplugged
Condensate trap blocked	Clean condensate trap
Gas valve broken	Check gas valve and replace when required
Gas/ air mixture incorrect	Check fan air intake for cracks and secure placement of the air intake sticker
Burner control broken	Replace

Code - 02

Description - Lock-out ionization problem - Ignitor sensing flame when no flame should be present

Cause	Solution
Ignition cable cap damaged	Check for cracks. Replace when required
Water in ionization circuit	Check for water (humidity), dry and check operation. Replace when required
Dirt in gas valve	Check if valve fully closes when power is unplugged

Code - 03

Description - Lock-out high limit temperature protection

Cause	Solution
Pump speed too low	Check speed in diagnose menu (24) and check parameter 4 and 5
Boiler is not able to distribute generated heat	Check installation for sufficient flow
Air in CH circuit	Purge the central heating circuit
Main heat exchanger dirty	Clean heat exchanger
CH pressure too low	Re-fill installation
3-way valve dirty	Check and clean 3-way valve when required
3-way valve does not change position	Check valve actuator and wires. Replace when required
Exhaust gas sensor damaged	Exchange sensor and check parameter 14 (Parameter 14 default = 2)
Wrong setting of temperature limit configuration	Check parameter 14 (Parameter 14 default = 2)
Maximum power too high	Check boiler power and adjust parameter 1 when required
Pump does not run is stuck	Replace pump or try to turn pump shaft.
Sensors switched	Check sensor positions and connections
Supply sensor broken	Check sensor in diagnose menu (4) and replace when required
Magnetite filter dirty	Check and clean filter
CH return strainer dirty	Clean hydro block CH return connection

Table 13.2 Trouble shooting list

Code - 05**Description** - Lock-out primary temperature too high (>203 °F/ 95° C)

Cause	Solution
Pump speed too low	Check speed in diagnose menu (24) and check parameter 4 and 5
Boiler is not able to distribute generated heat	Check installation for sufficient flow
Air in CH circuit	Purge the central heating circuit
Main heat exchanger dirty	Clean heat exchanger
CH pressure too low	Re-fill installation
3-way valve dirty	Check and clean 3-way valve when required
3-way valve does not change position	Check valve actuator and wires. Replace when required
Maximum power too high	Check boiler power and adjust parameter 1 when required
Pump does not run is stuck	Replace pump or try to turn pump shaft.
Refill valve is open	Close refill valve
Sensors switched	Check sensor positions and connections
Supply sensor broken	Check sensor in diagnose menu (4) and replace when required
Magnetite filter dirty	Check and clean filter
CH return strainer dirty	Clean hydro block CH return connection

Code - 06**Description** - 40 min lock- Insufficient temp. gradient on supply sensor

Cause	Solution
Pump speed too low	Check speed in diagnose menu (24) and check parameter 4 and 5
Boiler is not able to distribute generated heat	Check installation for sufficient flow
Air in CH circuit	Purge the central heating circuit
Main heat exchanger dirty	Clean heat exchanger
Pump does not run is stuck	Replace pump or try to turn pump shaft.
Cable damaged	Check wires for damage and friction free routing
Sensors switched	Check sensor positions and connections
Supply sensor broken	Check sensor in diagnose menu (4) and replace when required
No temperature rise detected within 1 minute after ignition or sensor broken	Check position of supply sensor and exhaust gas temperature sensor. Check sensor readings via diagnose menu and replace sensor(s) when required
CH return sensor broken	Check reading via diagnostics menu (6) and replace sensor when required

Code - 07**Description** - Too long in legionella mode

Cause	Solution
Too high circulation losses or demand	Boiler is not able to heat tank to a temperature above 70C within 3 hours. Check recirculation losses and heat exchanger tank

Code - 08**Description** - Lock-out flame lost for 6 times

Cause	Solution
Calibration not completed correctly	Perform a calibration
Ignition electrode damaged	Replace ignition electrode
Ignition cable broken or not connected	Check ignition cable
Ignition cable cap damaged	Check for cracks. Replace when required
Condensate Trap Blocked	Clean Condensate Trap
Gas valve broken	Check gas valve and replace when required.
Resistance in gas supply pipe too high	Check pressure drop over gas supply system too boiler. Contact grid owner when required
Gas / air mixture incorrect	Check fan air intake for cracks and secure placement of the air intake sticker.

Code - 09**Description** - Lock-out gas valve fault

Cause	Solution
Gas valve wires damaged	Check wires and replace when required.
Gas valve broken	Check gas valve and replace when required.
Burner control broken	Replace

Code - 15**Description** - Lock-out gas valve does not close

Cause	Solution
Gas valve wires damaged	Check wires and replace when required.
Gas valve broken	Check gas valve and replace when required.
Burner control broken	Replace

Code - 16**Description** - Gas pressure too low

Cause	Solution
Gas valve broken	Check gas valve and replace when required.
Resistance in gas supply pipe too high	Check pressure drop over gas supply system too boiler. Contact grid owner when required
Gas / air mixture incorrect	Check fan air intake for cracks and secure placement of the air intake sticker.

Code - 20**Description** - Water pressure too low

Cause	Solution
CH pressure too low	Re-fill installation
Leak in CH circuit	Change leaking installation parts and refill
CH pressure sensor broken	Check reading via diagnostics menu (3) and replace when required
CH pressure sensor broken	Replace sensor. When required sensor can be deactivated temporarily. Parameter 20.

Code - 21**Description** - Water pressure too high

Cause	Solution
Refill valve is open	Close refill valve
CH pressure too high	Decrease pressure using the drain valve
Expansion tank broken	Check expansion tank
CH pressure sensor broken	Check reading via diagnostics menu (3) and replace when required
CH pressure sensor broken	Replace sensor. When required sensor can be deactivated temporarily. Parameter 20.

Code - 25**Description** - Supply sensor fault

Cause	Solution
Cable damaged	Check wires for damage and friction free routing
Supply sensor broken	Check sensor in diagnose menu (4) and replace when required

Code - 26**Description** - Exhaust gas temperature too high

Cause	Solution
Pump speed too low	Check speed in diagnose menu (24) and check parameter 4 and 5
Boiler is not able to distribute generated heat	Check installation for sufficient flow
Air in CH circuit	Purge the central heating circuit
Main heat exchanger cluttered	Clean heat exchanger
CH pressure too low	Re-fill installation
3-way valve dirty	Check and clean 3-way valve when required
3-way valve does not change position	Check valve actuator and wires. Replace when required
Exhaust gas sensor damaged	Exchange sensor and check parameter 14
Wrong setting of temperature limit configuration	Check parameter 14
Maximum power too high	Check boiler power and adjust parameter 1 when required
Pump does not run is stuck	Replace pump or try to turn pump shaft.
Cable damaged	Check wires for damage and friction free routing
Sensors switched	Check sensor positions and connections
Supply sensor broken	Check sensor in diagnose menu (4) and replace when required

Code - 27**Description** - Exhaust gas sensor fault

Cause	Solution
Exhaust gas sensor damaged	Exchange sensor and check parameter 14
Cable damaged	Check wires for damage and friction free routing
No temperature rise detected within 1 minute after ignition or sensor broken	Check position of supply sensor and exhaust gas temperature sensor. Check sensor readings via diagnose menu and replace sensor(s) when required
Burner control broken	Replace

Code - 28**Description** - DHW sensor fault

Cause	Solution
DHW sensor damaged	Check DHW temperature via diagnose menu (8) and replace sensor when required
Cable damaged	Check wires for damage and friction free routing
Burner control broken	Replace

Code - 29**Description** - Outdoor sensor fault

Cause	Solution
Cable damaged	Check wires for damage and friction free routing
No outdoor sensor connected	Check parameter 7
Outdoor sensor broken	Check reading via diagnostics menu (11) and replace sensor when required

Code - 30**Description** - Return temperature sensor fault

Cause	Solution
Cable damaged	Check wires for damage and friction free routing
CH return sensor broken	Check reading via diagnostics menu (6) and replace sensor when required

Code - 31**Description** - Expansion fault

Cause	Solution
Refill valve is open	Close refill valve
CH pressure too high	Decrease pressure using the drain valve
Expansion tank broken	Check expansion tank
CH pressure sensor broken	Check reading via diagnostics menu (3) and replace when required

Code - 32**Description** - Supply temperature too high during DHW operation

Cause	Solution
Pump speed too low	Check speed in diagnose menu (24) and check parameter 4 and 5
Air in CH circuit	Purge the central heating circuit
Main heat exchanger dirty	Clean heat exchanger
CH pressure too low	Re-fill installation
3-way valve cluttered	Check and clean 3-way valve when required
3-way valve does not change position	Check valve actuator and wires. Replace when required
Wrong setting of temperature limit configuration	Check parameter 14
Maximum power too high	Check boiler power and adjust parameter 1 when required
Pump does not run is stuck	Replace pump or try to turn pump shaft.
Cable damaged	Check wires for damage and friction free routing
Sensors switched	Check sensor positions and connections
Supply sensor broken	Check sensor in diagnose menu (4) and replace when required

Code - 37**Description** - Supply voltage too low

Cause	Solution
Supply voltage too low	Check supply voltage in standby and operation
Power cord damaged	Replace power cord

Code - 40**Description** - Fan feedback signal fault

Cause	Solution
Cable damaged	Check wires for damage and friction free routing
Fan not connected	Check fan connection to burner control
Too much dust/dirt in fan	Check and clean fan
Fan broken	Replace fan
Water on fan connection	Check fan and connection and make dry when required
Burner control broken	Replace

Code - 41**Description** - CH pressure sensor deactivated

Cause	Solution
CH pressure sensor broken	Replace sensor. When required, the sensor can be deactivated temporarily, using Parameter 20, if an external secondary safety such as a low water cutoff or flowswitch is being utilized.

 WARNING

Do not deactivate the CH pressure sensor unless a secondary safety such as a low water cutoff or flow switch is installed in the system. Failure to comply may cause the boiler to run without water in it causing fire resulting in death, severe injury or property damage.

Code - 42**Description** - CH pressure sensor fault

Cause	Solution
Cable damaged	Check wires for damage and friction free routing
CH pressure sensor broken	Check reading via diagnostics menu (3) and replace when required
CH pressure sensor broken	Replace sensor. When required sensor can be deactivated temporarily. Parameter 20.

Code - 43**Description** - DHW flow sensor fault

Cause	Solution
Cable damaged	Check wires for damage and friction free routing
DHW sensor broken	Check reading via diagnostics menu (7) and replace when required
Incorrect connection to ground	Check the appliances ground wire and ground and power connections

Code - 44**Description** - Tank sensor fault

Cause	Solution
Cable damaged	Check wires for damage and friction free routing
No tank or tank sensor present	Check parameter 11
Tank sensor broken	Check reading via diagnostics menu (12) and replace when required

Code - 46**Description** - Code key fault

Cause	Solution
No code key or faulty connection	Install code key and or check connections
Code key broken	Replace code key

Code - 50**Description** - Fault during calibration (cause of fault is shown in display of boiler as well)

Cause	Solution
Air in CH circuit	Purge the central heating circuit
Pump does not run is stuck	Replace pump or try to turn pump shaft.
Boiler cannot distribute heat due to high system temperatures	C models ONLY: Perform a calibration with a DHW demand over 2.1 gpm or 8L/min to be able to distribute generated heat C & H models: Perform a calibration with a CH demand by having all zones/thermostats call for heat to distribute the generated heat

Code - 53**Description** - Exhaust vent blockage

Cause	Solution
Change in combustion after calibration	Perform calibration
Calibration not successfully completed	Perform calibration and check line 32 of the diagnostics menu displays "CAL" indicating there is a saved calibration.
Fan broken	Replace fan
Blocked vent	Check Air Intake and Exhaust vent pipe for blockages

13.5 Recalibrating After a Software Update**⚠ WARNING**

When the appliance has been provided with a software update ALWAYS recalibrate the appliance by performing either a manual or automatic calibration following the procedures in section 10.3.2 Step 2: Perform Calibration on the Boiler via Auto or Manual Calibration. Failure to do so may cause improper combustion resulting in death, severe injury or property damage.

13.4 Service Operation

The boiler can be put into service operation mode for diagnostic purposes which allows the service technician to adjust the boiler to the minimum and maximum power. This can be done by following the steps below:

1. Press the [P1] and [P2] buttons simultaneously to access the service menu at installer level.
2. Adjust the value on the left side of the display to '08' using the [P3] or [P4] buttons to scroll up and down.
3. Confirm the value with the [P2] button.
4. Press the [P1] and [P2] buttons simultaneously for 5 seconds. The boiler starts in service mode. 'Test' appears on the display at the bottom left hand corner.
5. Use the [P3] button to set the appliance to minimum power.
6. Use the [P4] button to set the appliance to maximum power.

Appendices

Appendix A - Spare Parts

Eco-King Spare parts are available through our local distributors. Contact us at sales@ecokingheating.com or at 1(604)385-3265 to find a distributor near you.

Part 13- Boiler Parts List			
Exploded View No.	Category	Part Name	Part Number
1	Heat Exchanger	Heat Exchanger HE ISO 3+1 C/H100A	202-1314
1	Heat Exchanger	Heat Exchanger HE ISO 4+1 C/H140A	202-1315
1	Heat Exchanger	Heat Exchanger HE ISO 5+2 C/H200A	202-1317
1.2	Heat Exchanger	Bayonet Clixon (green sensor)	106-1150
1.3	Heat Exchanger	NTC SENSOR FOR ISOTHERMIC HE (blue sensor)	106-1241
1.4	Heat Exchanger	Heat Exchanger Support Bracket C/H 100	202-1021
1.4	Heat Exchanger	Heat Exchanger Support Bracket C/H 140	202-1033
1.4	Heat Exchanger	Heat Exchanger Support Bracket C/H 200	202-1208
2	Burner Door	Burner Door Iso	202-1143
2.1	Refractory	Firewall Refractory Insulation	106-1163
2.2	Refractory	Insulation Burner Door Iso	106-1162
3	Burner	Burner C/H100A	202-1147
3	Burner	Burner C/H140A	202-1148
3	Burner	Burner C/H200A	202-1189
4	Burner	Burner Door Gasket	106-1091
5	Burner	Inlet Pipe	202-1059
6	Backplate	Backplate Uni	202-1305
7	Exhaust Pipe	Exhaust Pipe	202-1011
8	Combustion	Spark Ignitor	106-1039
9	Condensate hose	Condensate Hose (202-0519)	106-1067
9	Condensate Cup	Condensate Cup (202-1001)	
9	Condensate O-ring	Rubber Sealing Siphon (202-0522)	
9	Condensate Nut	Nut for Condensate Cup (202-0521)	
9.1	Condensate Siphon Tube with clip	Heat Exchanger Condensate Drain Tube	01-01618
10	Gas Pipe Adapter	C/H100A	204-12274
10	Gas Pipe Adapter	C/H140A	204-13424
10	Gas Pipe Adapter	C/H200A	204-13434
10	Gas Pipe Adapter	C/H200A LP	204-1344
11	Plate Exchanger	C100A	204-1020
11	Plate Exchanger	C140A/C200A	204-1021
12	Fan	Inducer Fan Blower	106-1242
13	Fan	Air Inlet Sealing Gasket Hole Restrictor-C/H100A	202-1194
13	Fan	Air Inlet Sealing Gasket Hole Restrictor-C/H140A	202-1192
13	Fan	Air Inlet Sealing Gasket Hole Restrictor-C/H200A	202-1341
13	Fan	Plastic Air Inlet Mixer for Inducer Fan	202-1025
14	Gas Valve	Gas Valve	106-1040
14.1	Gas Valve	Gas Valve Gasket	202-0135
15	Pump	Universal Boiler Pump 15-78 for C/H100A-200A	106-1260

Table 14.1: Spare Parts Exploded View

Exploded View No.	Category	Part Name	Part Number
16	Hydro Block	Universal Hydroblock for H100A-H200A	ECO H100A-H200A
16	Hydro Block	Hydroblock for C100A	ECO C100A
16	Hydro Block	Hydroblock for C140A	ECO C140A
16	Hydro Block	Hydroblock for C200A	ECO C200A
17	Sensor	CH Supply Sensor (bigger red sensor clip-on)	204-0196
17.1	CH Supply	Supply Pipe C/H100A / C/H140A	204-1123
17.1	CH Supply	Supply Pipe C/H200A	204-1129
17.3	Suply/Return O-Ring	O-rings for Heat Exchanger connections	202-0133
17.4	O-Ring	O-rings into Hydroblock (thicker)	202-0130
17.5	Silver Clip	Silver clip 18mm to connect supply pipe into Heat Echanger	202-0197
17.6	Silver Clip	Silver clip 18mm to connect supply pipe into Hydroblock from Heat Exchanger	204-0909
18	Burner Control	Main PCB/ Motherboard	204-12332
18	Burner Control	Cable Main PCB to LCD screen	204-1044
18	Burner Control	LCD Display	106-1048
19	Exterior Housing	Front Housing	106-1288
20	Cable Tree	Cable Tree 1 Sensor & Stepper Motor	204-1325
20	Cable Tree	Cable Tree 2 Gas Valve	204-1214
20	Cable Tree	Pressure & Temp Wire Sensor	204-1221
20	Cable Tree	Interface to DHW Control Board Wire	204-1222
20	Cable Tree	DHW Flow Sensor Wire	204-1223
20	Cable Tree	DHW Temp Sensor Wire	204-1224
20	Cable Tree	Cable Tree 6 Spark Plug	202-1216
20	Cable Tree	Cable Tree 8 Ignition Ground Cable	202-1218
20	Cable Tree	Cable Tree 5 Fan & Pump	204-1219
20	Cable Tree	Cable Tree 9 Ground Plumbing	204-1212
20	Cable Tree	POWER Cable UL	202-1220
21	Expansion Tank	Internal Expansion Tank	204-10124
21.1	Expansion Tank	Fiber Washer	204-1226
21.2	Expansion Tank	Expansion Tank Bracket	204-0905
21.2	Expansion Tank	Expansion Tank Bracket	204-0906
21.2	Expansion Tank	Expansion Tank Bracket	204-0907
22	Valve	¾" Pressure Relief 45lbs	202-1246
23	Connectors	¾" Green Fiber Gasket	202-0135
23	Connectors	¾" Transtion Inlet/ Outlet Brass NPT	204-0908
23	Connectors	¾" Brass Nut	202-1156
24	Gasket	Gasket for Fan to Air Inlet Pipe	202-1128
25	Burner Tube Seal Gas- ket	Burner Gasket from Inlet Pipe to Burner Tube	202-0635
26	Return Pipe	Return Pipe for C/H140A / C/H200A	204-10184
26	Return Pipe	Return Pipe for C/H100A	204-101842
26.1	Green Fiber Gasket	Green Fiber Gasket for the Return Pipe (Top of the Pump)	204-1225

Table 14.2: Spare Parts Exploded View Continued

BOILER EXPLODED SPARE PARTS VIEW (for description refer Tables 14.1 & 14.2)

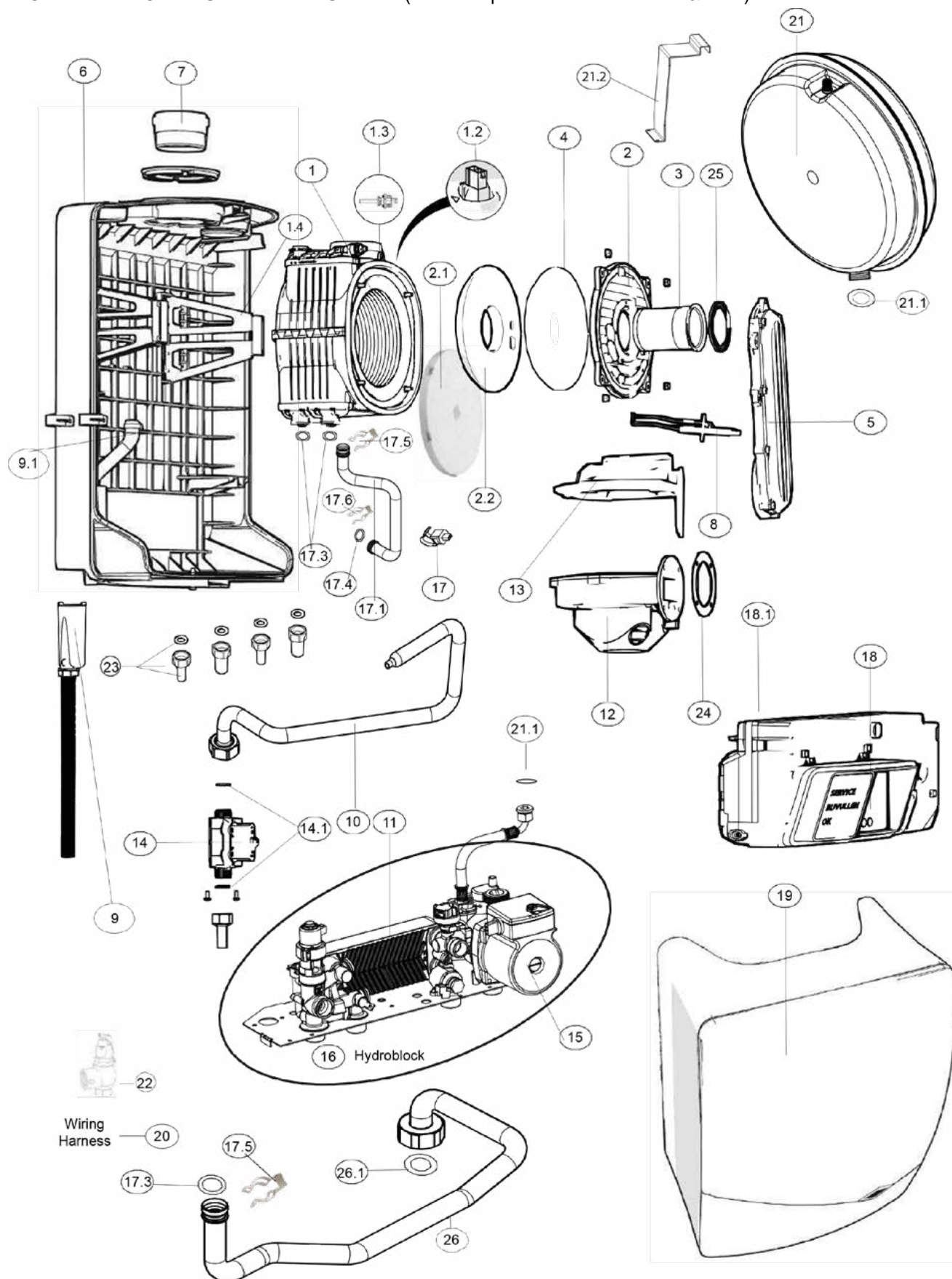
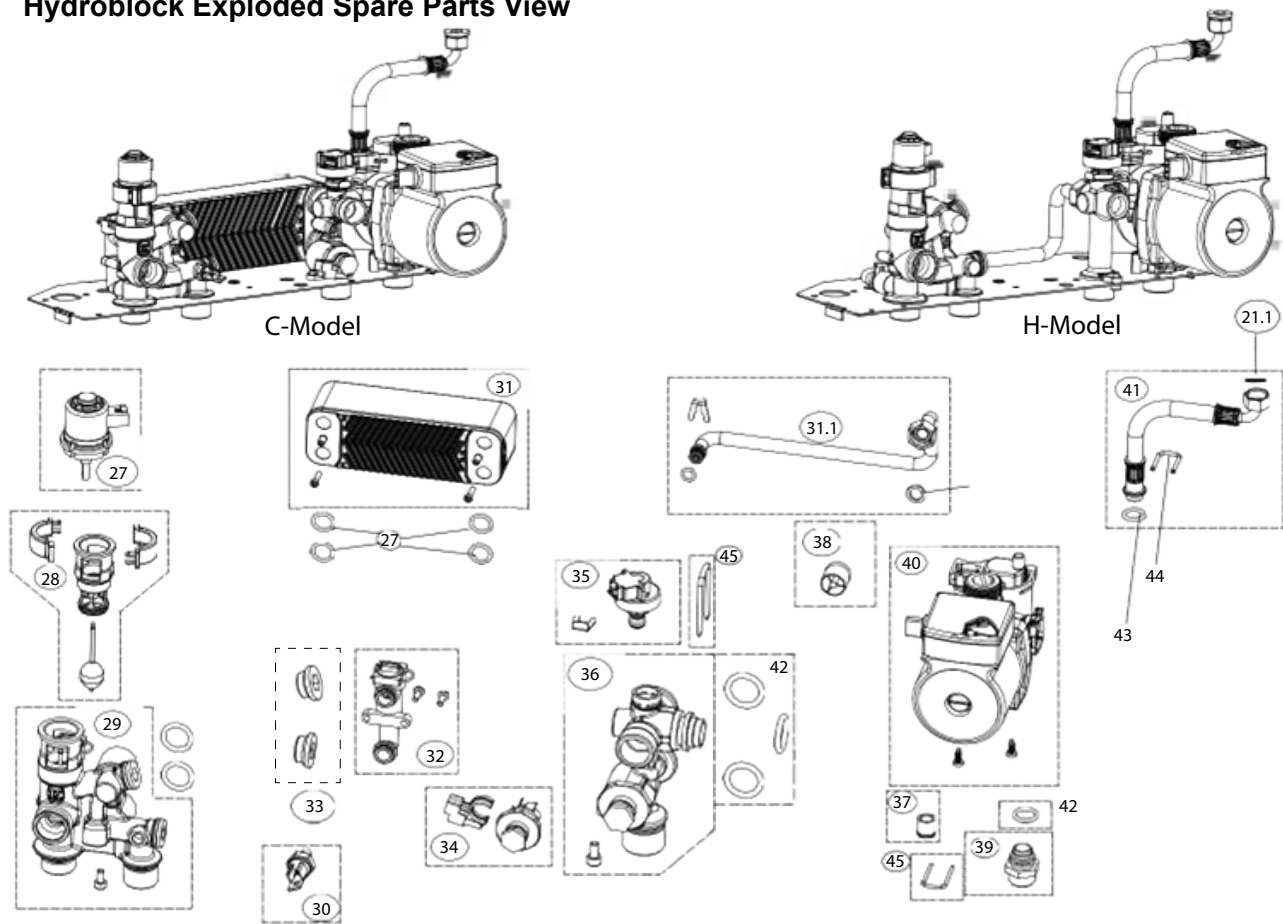


Figure 14.1: Boiler Exploded Spare Parts View

Hydroblock Exploded Spare Parts View



Continuation of Part 13- Boiler Parts List									
Exploded View No.	Category	Part Name	Part Number	C100A	C140A	C200A	H100A	H140A	H200A
27	Hydroblock	Moon's Stepper Motor	204-1003	X	X	X	X	X	X
28	Hydroblock	3WV Cartridge for Stepper Motor	204-1010	X	X	X	X	X	X
29	Hydroblock	3WV for C100A	204-1001	X	NA	NA	NA	NA	NA
29	Hydroblock	3WV for C140A-C200A	204-10011	NA	X	X	NA	NA	NA
29	Hydroblock	3WV for H99A-H200A	204-10012	NA	NA	NA	X	X	X
30	Hydroblock	DHW Temperature Sensor TSD-00DA-R	204-1007	X	X	X	NA	NA	NA
31	Hydroblock	Secondary Heat Exchanger C100A/C140A	204-1020	X	X	NA	NA	NA	NA
31	Hydroblock	Secondary Heat Exchanger C200A	204-10201	NA	NA	X	NA	NA	NA
31	Hydroblock	By-Pass Pipe for H Model	204-1026	NA	NA	NA	X	X	X
32	Hydroblock	By-Pass AP 0,5 C100A	204-1005	X	NA	NA	NA	NA	NA
32	Hydroblock	By-Pass AP 0,6 C140A-C200A	204-10051	NA	X	X	NA	NA	NA
33	Hydroblock	Closing Cap	204-1004	X	X	X	X	X	X
34	Hydroblock	Flow Meter with Flow Sensor	204-10109	X	X	X	NA	NA	NA
35	Hydroblock	Pressure Transducer TCHBA00-3D	204-1011	X	X	X	X	X	X
36	Hydroblock	Hydroblock Return with Flowmeter	204-1008	X	X	X	NA	NA	NA
36	Hydroblock	Hydroblock Return for H Model	204-10081	NA	NA	NA	X	X	X
37	Hydroblock	2.1 gpm (8 l/min) Flow Limitor with Inlet Filter	204-1024	X	NA	NA	NA	NA	NA
37	Hydroblock	2.6 gpm (10 l/min) Flow Limitor with Inlet Filter	204-10241	NA	X	NA	NA	NA	NA
37	Hydroblock	DHW Inlet Filter	204-10242	NA	NA	X	NA	NA	NA
38	Hydroblock	By-Pass AP 0,55 H Model	204-1025	NA	NA	NA	X	X	X
39	Hydroblock	Pump Connector Fittings	204-1014	X	X	X	X	X	X
40	Hydroblock	Grundfos Pump 15-58	106-1259	X	NA	NA	X	NA	NA
40	Hydroblock	Grundfos Pump 15-78	106-1260	NA	X	X	NA	X	X
41	Hydroblock	Expansion Tank Flexible Pipe	204-1017	X	X	X	X	X	X
42	Hydroblock	O-Ring	106-1093	X	X	X	X	X	X
43	Hydroblock	O-Ring for Flexhose for Expansion Tank	204-1226	X	X	X	X	X	X
44	Hydroblock	Expansion Tank Flexhose Metal Clip		X	X	X	X	X	X
45	Hydroblock	Inlet/ Return C/H Metal Clip	204-10081	X	X	X	X	X	X
46	Hydroblock	Green Fiber Gasket for H Return behind Pressure Transducer	202-0136	NA	NA	NA	X	X	X
X= Available ; NA= Not Applicable									

Table 14.3: Hydroblock Exploded Spare Parts View

Appendix B - Start Up Review

WARNING

Read Section 12 and follow it's instructions in it's entirety to complete the installation. The instructions below are a start-up Review only. Failure to comply may result in death, severe injury or property damage.

Light Up Activities			Date Completed		
1)Verify piping	Verify all piping and gas connections are secure and tight	completed _____			
2) Pressurize boiler and system	Use external fill valve connected to the boiler return, open it until boiler pressure reaches 22 psi (1.5 bar)	completed _____			
3)Check gas pipe	Leak test using approved local methods				
	Check incoming gas pressure. Ideal pressure is 8 to 10"	in. w.c. _____	Static		
	What is the "drop" on light off (no more than 1"wc)	in. w.c. _____	Dynamic		
4)Condensate Trap	Fill the condensate trap per Section 5.2 Priming the Condensate Trap	completed _____			
5)Propane (if using)	See Section 7.3 Converting to Propane (LPG) to change boiler setting from NG to LP. If using H200A or C200A, must change gas pipe on these models ONLY	completed _____			
5)Calibrate the boiler **THIS STEP IS ESSENTIAL**	See 9.3 Commissioning of manual for instructions. If done manually, note flame ionization number used to get appliance to proper CO ₂ %	CO ₂ % _____	High Fire	CO ₂ % _____	Low Fire
6)Record System settings	See 9.3.3 Step 3: Adjusting settings to change boiler settings. Record changed settings				
6.5)Change domestic hot water setting	If using an indirect tank with H model boiler, setting 11 must be changed to "02" to let boiler know tank is present	completed _____			
7)Confirm system operation	Turn up thermostat to verify wiring connections. Ensure boiler fires upon thermostat call for heat	completed _____			
8)Warranty registration	Mail in warranty registration form or register online at www.Eco-Kingheating.com . Navigate to boiler page and follow links				

Table 14.4 Start Up Review

Appendix C - Maintenance Checklist

WARNING

This section is intended as a maintenance checklist to be used in Conjunction with Section 12 - Service & Maintenance. Ensure Section 12 is read and followed in it's entirety. Failure to do so may result in death, personal injury or property damage.

Allowing the appliance to operate with a dirty combustion chamber will hurt operation. Failure to clean the heat exchanger as needed by the installation location could result in appliance failure, death, severe injury or property damage. Such product failures ARE NOT covered under warranty

Periodic maintenance should be performed once a year by a qualified service technician to assure that all the equipment is operating safely and efficiently. The owner should make necessary arrangements with a Qualified Service Technician for periodic maintenance of the appliance. The installer must also inform the owner that the lack of proper care and maintenance of the appliance may result in a hazardous condition.

Maintenance Table

Inspection Activities		Date Last Completed			
		1 st Year	2 nd Year	3 rd Year	4 th Year
Near appliance piping	Check system and appliance piping for any sign of leakage. Take off boiler cover and inspect connections in boiler for any leaks or corrosion				
Vent	Check condition of all vent pipe and joints, Ensure screens are clear of debris.				
Gas	Check gas piping, test for leaks and signs of aging. Confirm gas pressure and note pressure drop upon start-up. Confirm CO ₂ % at high and low fire				
Visual and Temperature	Do visual inspection of all system components and verify programmed temperature settings				
Connections	Check wire connections and make sure they are tight				
Combustion chamber	Check burner tube and combustion chamber coils. Clean with nylon brush and vacuum. Avoid touching white ceramic fiber. Also see maintenance section of manual				
Spark igniter	Ensure spacing of igniter prongs are aligned properly. Also see Section 12 - Service & Maintenance:				
Condensate Trap	Disconnect condensate hose and bottom portion of the trap. Ensure no blockage, rinse and clean out. Fill by pouring water in the open heat exchanger when inspecting it.				
Pressure Relief Valve	Check to make sure it is not weeping				
External LWCO	Flush the low water cutoff and ensure proper operation if installed				
Pump and Fan	Listen to sound of the pump and fan. If either makes noise during operation, it is recommended to replace the part as a precaution.				
Domestic HW in COMBI models	In cases where homeowner complains of too little water supply, check the water filter on cold water inlet for dirt. If it is clean, descale the DHW plate heat exchanger. If still have complaints, replace the DHW heat exchanger.				
Homeowner	Question homeowner before maintenance if they have any issues and after done, confirm activities you performed during maintenance visit				

Table 14.5 Maintenance Checklist

Appendix D - Requirements for the State of Massachusetts

NOTICE BEFORE INSTALLATION

This appliance must be installed by a licensed plumber or gas fitter in accordance with the Massachusetts Plumbing and Fuel Gas Code 248 CMR Sections 4.00 and 5.00.

IMPORTANT: In the State of Massachusetts (248 CMR 4.00 & 5.00)

For all side wall horizontally vented gas fueled equipment installed in every dwelling, building or structure used in whole or in part for residential purposes, including those owned or operated by the Commonwealth and where the side wall exhaust vent termination is less than seven (7) feet above finished grade in the area of the venting, including but not limited to decks and porches, the following requirements shall be satisfied:

INSTALLATION OF CARBON MONOXIDE DETECTORS.

No installation or replacement of a vented gas appliance shall be permitted unless a battery powered or electrically hard wired carbon monoxide detector is present on the same floor as the appliance or on the next adjacent floor when the appliance is located in a crawl space unless the appliance is located in a detached, uninhabitable garage. For all residential dwellings, a carbon monoxide detector must also be present on each habitable level of the dwelling. These requirements shall not be deemed to waive any additional requirements imposed by M.G.L. c. 148 §26F1/2.

APPROVED CARBON MONOXIDE DETECTORS.

Each carbon monoxide detector as required in accordance with the above provisions shall comply with NFPA 720 and be ANSI/UL 2034 listed and IAS certified.

SIGNAGE.

Whenever any through-the-wall vent is installed less than seven feet above the finished grade, a metal or plastic identification plate shall be permanently mounted to the exterior of the building at a minimum height of eight feet above grade directly in line with the exhaust vent terminal. The sign shall read, in print size no less than 0.5 inches in size, "GAS VENT DIRECTLY BELOW. KEEP CLEAR OF ALL OBSTRUCTIONS".

INSPECTION.

The state or local gas inspector of the side wall horizontally vented gas fueled equipment shall not approve the installation unless, upon inspection, the inspector observes carbon monoxide detectors and signage installed in accordance with the provisions of 248 CMR 5.09 and 5.12.

Appendix E - Units of Measure Conversion Tables

Throughout this manual units of measure are often expressed in both imperial and metric units of measure. Note that for absolute temperature indications degrees Fahrenheit (°F) and degrees Celsius (°C) have been used. To convert a certain temperature from °C to °F the following formula has been used: °F = °C × 1.8 + 32.

For your convenience conversion tables for temperature, pressure and volume are listed below.

Pressure	
Bar	PSI
0	0
0.2	2.9
0.4	5.8
0.6	8.7
0.8	11.6
1.0	14.5
1.2	17.4
1.4	20.3
1.6	23.2
1.8	26.1
2	29.0
2.2	31.9
2.4	34.8
2.6	37.7
2.8	40.6
3.0	43.5

Table 14.6: Pressure

Temperature	
Celsius (°C)	Fahrenheit (°F)
-15	5
-10	14
-5	23
0	32
5	41
10	50
15	59
20	68
25	77
30	86
35	95
40	104
45	113
50	122
55	131
60	140
65	149
70	158
75	167
80	176
85	185
90	194
95	203
100	212

Table: 14.7: Temperature

Volume	
Litre	USG
1	0.26
5	1.32
10	2.64
20	5.28
100	26.4
200	52.8
300	79.3

Table 14.8: Volume

Supplier and Manufacturer: Eco-
King Heating Products Inc. Unit
103, 2567-192nd Street Surrey,
BC Canada
V3Z 3X1