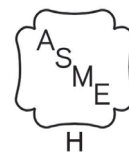




## Condensing Wall Mounted Gas Fired



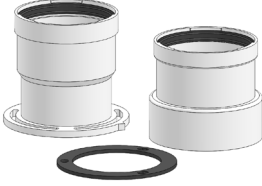
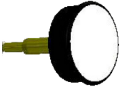

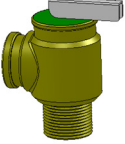
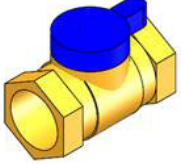


### INSTALLATION, OPERATION & MAINTENANCE MANUAL

**Models**  
**GMHB125**  
**GMHB160**  
**GMCB150**  
**GMCB200**



Manufactured by:  
ECR International Inc.  
2201 Dwyer Avenue, Utica, NY 13501  
Tel. 800 253 7900  
[www.ecrinternational.com](http://www.ecrinternational.com)  
PN 240012363 REV. A [08/31/2018]

**VERIFY CONTENTS RECEIVED**

			
<p><b>Fully Assembled Boiler</b></p>	<p><b>Metal Wall Bracket w/ 4 ea Wall Screws and Plugs</b></p>	<p><b>Concentric to Two Pipe Adapter</b></p>	<p><b>Temperature Pressure Gauge</b></p>
	<p>4 ea - 17x24x2 Gaskets</p>	<p>Includes Essential Documents and Warranty 11x17 Wire Diagrams</p>	
<p><b>5 GPM Flow Restrictor GMCB200 Combi Only</b></p>	<p><b>Used for Valve Connections</b></p>	<p><b>Document Package</b></p>	<p><b>30 PSI Safety Relief Valve</b></p>
			
<p><b>Gas Ball Valve</b></p>	<p><b>1K Ohm Outdoor Reset Sensor</b></p>	<p><b>Drain Valve</b></p>	

Not Shown - Literature Package.

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## PHYSICAL DATA

### Dimensions

DIMENSIONS		125 & 150	160 & 200
<b>A</b>	Height	30" [763 mm]	30 " [763 mm]
<b>B</b>	Width	17 ¾ " [450 mm]	17 ¾ " [450 mm]
<b>C</b>	Depth	14" [356mm]	23" [584 mm]
<b>D</b>	Condensate Trap Connection	3/4" NPT	3/4" NPT
<b>E</b>	System Supply	1" NPT	1" NPT
<b>F</b>	DHW Outlet (GMHB125 Optional)	3/4" NPT	3/4" NPT
<b>G</b>	Gas Connection	3/4" NPT	3/4" NPT
<b>H</b>	DHW (Cold Water) Inlet	3/4" NPT	3/4" NPT
<b>I</b>	System Return	1" NPT	1" NPT
<b>J</b>	Boiler Filling Connection	1/2" [15.9mm]	External to Boiler
Primary Water Content		1 gal [3.60 L]	1¼ gal [4.73 L]

### SYSTEM

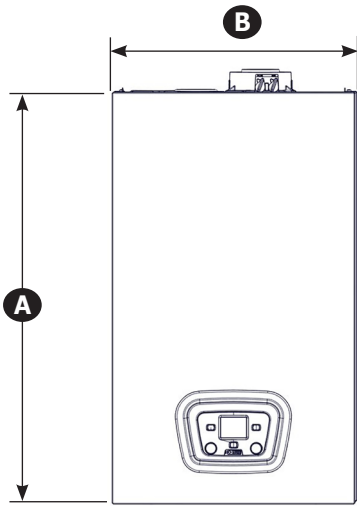
Central Heating (Sealed System)	125 / 150	160 / 200
Heat Exchanger Max Allowable Working Pressure	50 psig [3.45 bar]	50 psig [3.45 bar]
Max System Pressure	43.00 psig [2.96 bar]	43.00 psig [2.96 bar]
Min System Pressure	7.25 psig [ 0.50 bar]	7.25 psig [0.50 bar]
Max System temperature	176°F [80°C]	176°F [80°C]
Pressure Relief Valve Setting	30.00 psig [2.11 bar]	30.00 psig [2.11 bar]
Expansion Tank Minimum Size (pre-charge press.)	2.2 gal at 11.6 psi [10.0 L at 0.8 bar]	2.2 gal at 11.6 psi [10.0 L at 0.8 bar]
Recommended System Pressure (cold)	21.7 psig [1.5 bar]	21.7 psig [1.5 bar]

Domestic Hot Water (Sealed System)	150	200
Max Inlet Water Pressure	116 psig [8 bar]	116 psig [8 bar]
Min Inlet Water Pressure	2.9 psig [ 0.2 bar]	2.9 psig [0.2 bar]
Min DHW Flow Rate	0.55 gpm [2.50 L/min]	0.55 gpm [2.50 L/min]
Max DHW Temperature	140°F [60°C]	140°F [60° C]
DHW Water Content	0.05 gal [0.23 L]	0.10 gal [0.37 L]

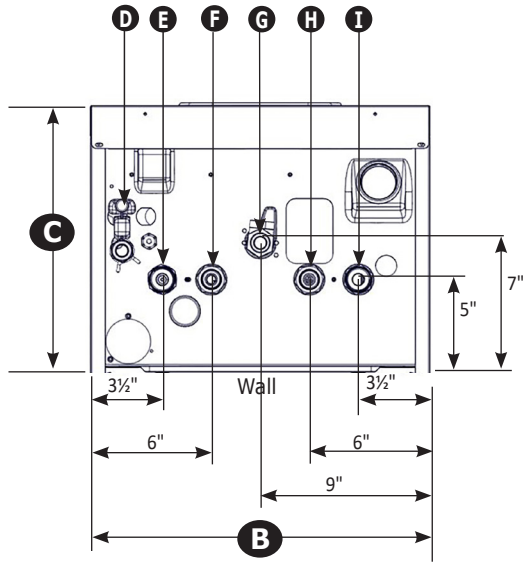
When boiler is operating at maximum operating temperature, providing heating with all heat emitters operating, pressure gauge should not indicate more than 26.11 psi / 1.80 bar. If reading exceeds this figure larger expansion tank is required.

**PHYSICAL DATA**

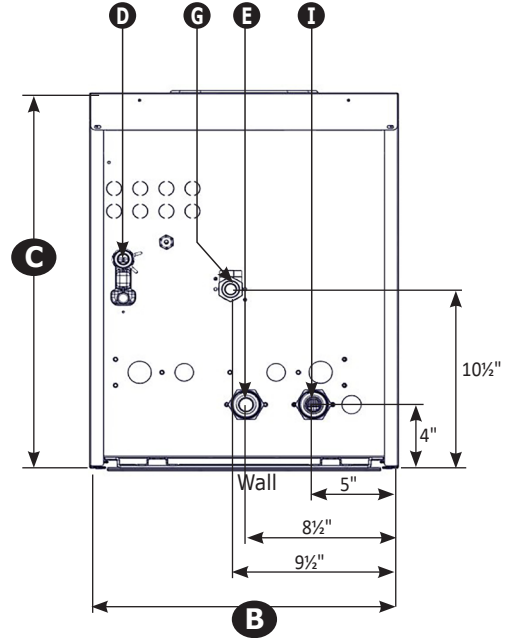
**Front View  
All Models**



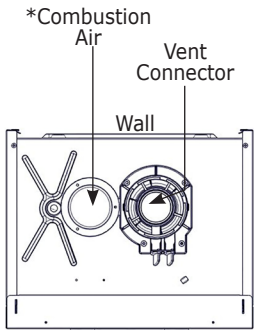
**125 HEAT ONLY  
Bottom View  
Dimensions**



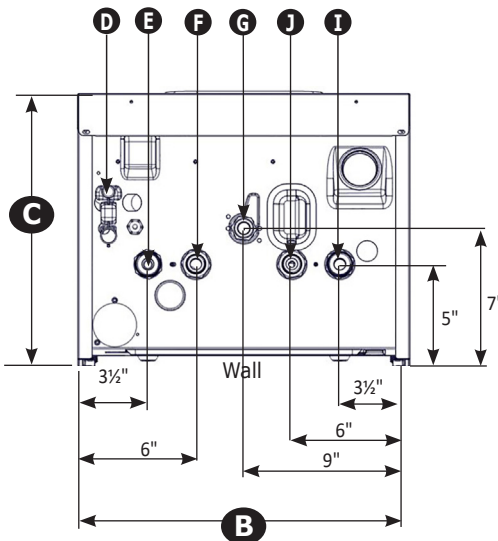
**160 HEAT ONLY  
Bottom View  
Dimensions**



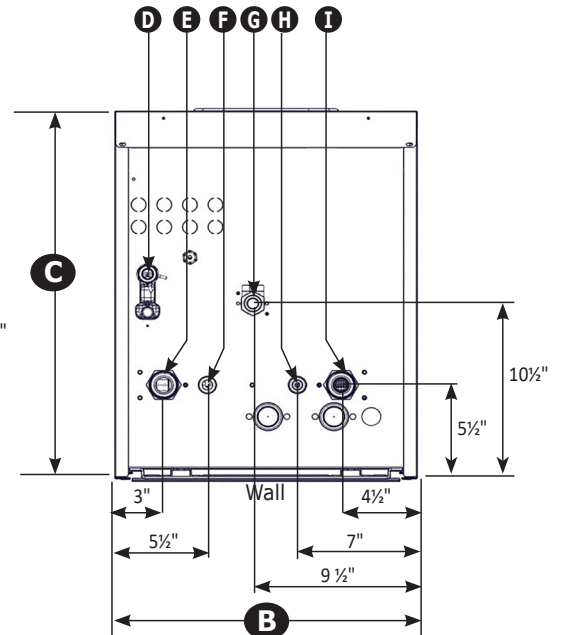
**125/150  
Top View**



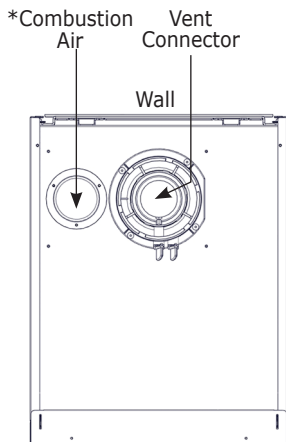
**150 COMBI  
Bottom View  
Dimensions**



**200 COMBI  
Bottom View  
Dimensions**



**160/200  
Top View**



\* For optional 2 pipe venting, otherwise use outside ring of vent connector.

# 1 - IMPORTANT SAFETY INFORMATION

## 1. Safety Information

Boiler installation shall be completed by qualified agency. See glossary for additional information.

### **WARNING**

Fire, explosion, asphyxiation and electrical shock hazard. Improper installation could result in death or serious injury. Read this manual and understand all requirements before beginning installation.

Become familiar with symbols identifying potential hazards.



This is the safety alert symbol. Symbol alerts you to potential personal injury hazards. Obey all safety messages following this symbol to avoid possible injury or death.

### **DANGER**

Indicates a hazardous situation which, if not avoided, WILL result in death or serious injury.

### **WARNING**

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

### **CAUTION**

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

### **NOTICE**

Used to address practices not related to personal injury.

### **DANGER**

Fire, explosion, asphyxiation hazard. This boiler is set operate with Natural Gas. A conversion kit is included with this boiler for use with Propane. Do not operate this boiler before identifying the type of fuel to be used and conversion to propane if necessary. Failure to follow these instructions WILL result in death or serious injury.

### **WARNING**

Do not tamper with or use this boiler for any purpose other than its intended use. Failure to follow these instructions could result in death or serious injury. Use only manufacturer recommended parts and accessories.

### **CAUTION**

Laceration, burn hazard. Metal edges and parts may have sharp edges and/or may be hot. Use appropriate personal protection equipment to include safety glasses and gloves when installing or servicing this boiler. Failure to follow these instructions could result in minor or moderate injury.

### 2 - Introduction

#### 2.1 Installation shall conform to requirements of authority having jurisdiction or in absence of such requirements:

##### UNITED STATES

- National Fuel Gas Code, ANSI Z223.1/NFPA 54.
- National Electrical Code, NFPA 70.

#### 2.2 Where required by authority having jurisdiction, installation shall conform to Standard for Controls and Safety Devices for Automatically Fired Boilers, ANSI/ASME CSD-1.

Additional manual reset low water cutoff may be required.

#### 2.3 Requirements for Commonwealth of Massachusetts:

Boiler installation must conform to Commonwealth of Massachusetts code 248 CMR which includes but is not limited to:

Installation by licensed plumber or gas fitter.

#### 2.4 Manufacturer recommends the use of a carbon monoxide detector for all installations.

##### 2.4.1 A carbon monoxide detector may be required by local code, follow all local codes.

#### 2.5 Designated Use

- GMCB150 and GMCB200 provide both central heating and domestic hot water.
- GMHB125 and GMHB160 central heating only.
- Indoor installation.
- Closet or alcove installation. Direct Vent Boiler does not require air vents when installed in closet or room.
- Direct vent boiler.
- For use with natural gas or liquefied petroleum gases (LP/propane).

#### 2.6 The unit **MUST NOT**:

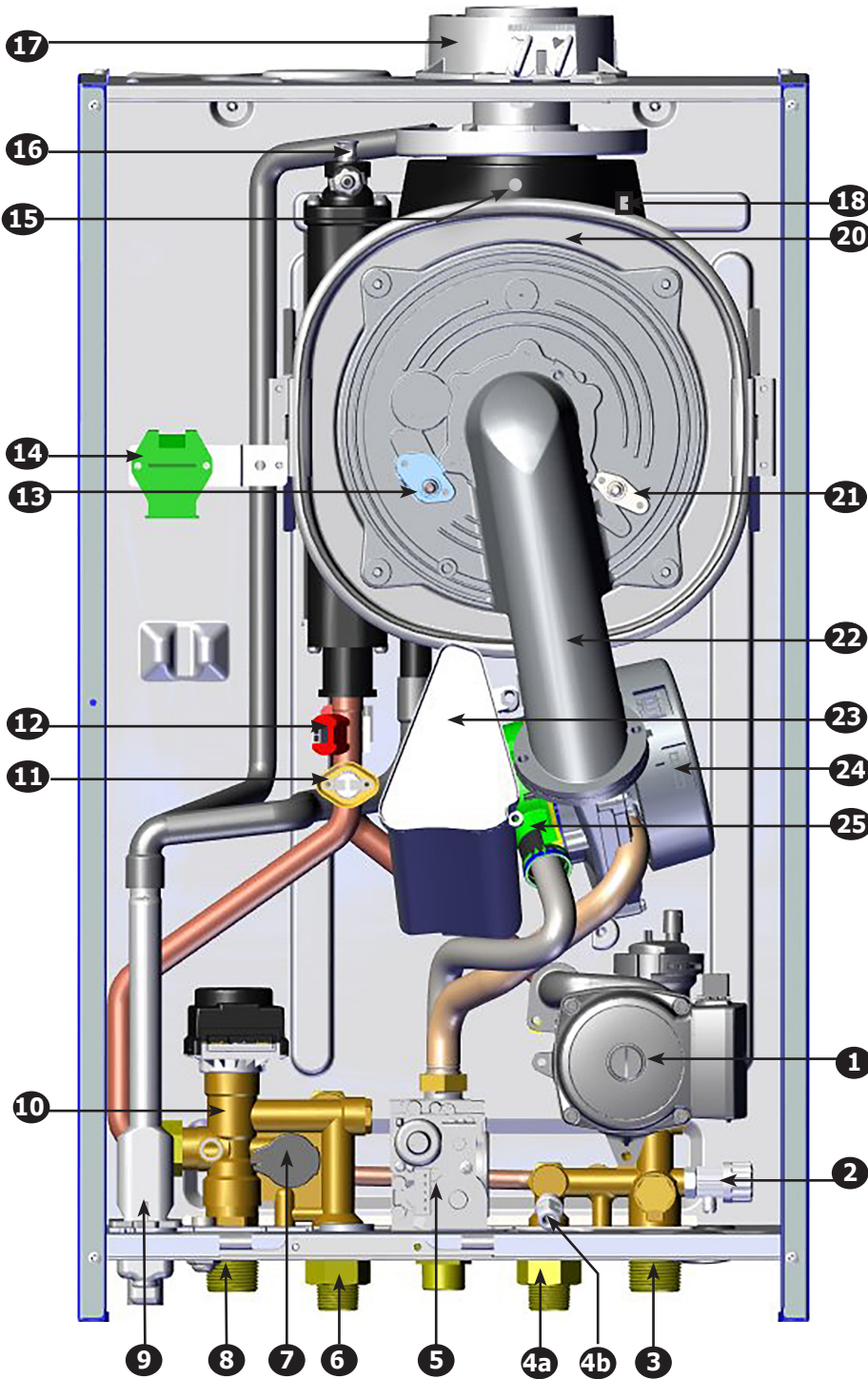
- Directly heat potable water. Indirect heating is acceptable.
- Heat water with non-hydronic heating system chemicals present (example, swimming pool water).
- Toxic chemicals, such as those used for boiler treatment, shall not be introduced into potable water used for space heating.
- Exceed 43 psig (2.96 bar) maximum allowable working pressure, or drop below minimum system pressure 7.25 psig (.50 bar)
- Exceed 176°F (80°C) system design temperature.
- Shall not be installed on carpeting.

#### 2.7 Operational Features

- Modulates to provide CH Turndown 5:1, DHW Turndown 6:1.
- Maximum output available for domestic hot water:  
**GMCB125**- 133,000 btu/h (39 kW), capable of providing 3.4 (U.S.) gpm (13.2 liters/min) with a temperature rise of 70°F/39°C.  
**GMCB200** - 176,000 btu/h (52 kW), capable of providing 4.9 (U.S.) gpm (18.9 liters/min) with temperature rise of 70°F/39°C.
- Integral Low Water Pressure Cutoff.
- Outdoor Temperature Reset included.
- Heat exchanger over heat protection.
- Boiler operating at maximum operating temperature, providing heat, pressure gauge should not indicate more than 26.11 psig / 1.80 bar. If reading exceeds this figure larger expansion tank is required.
- Boiler requires field supplied and installed system pump(s) and relay/zone control board.

**Information and specifications outlined in this manual in effect at the time of printing of this manual. Manufacturer reserves the right to discontinue, change specifications or system design at any time without notice and without incurring any obligation, whatsoever.**

# GMHB125 Heat Only



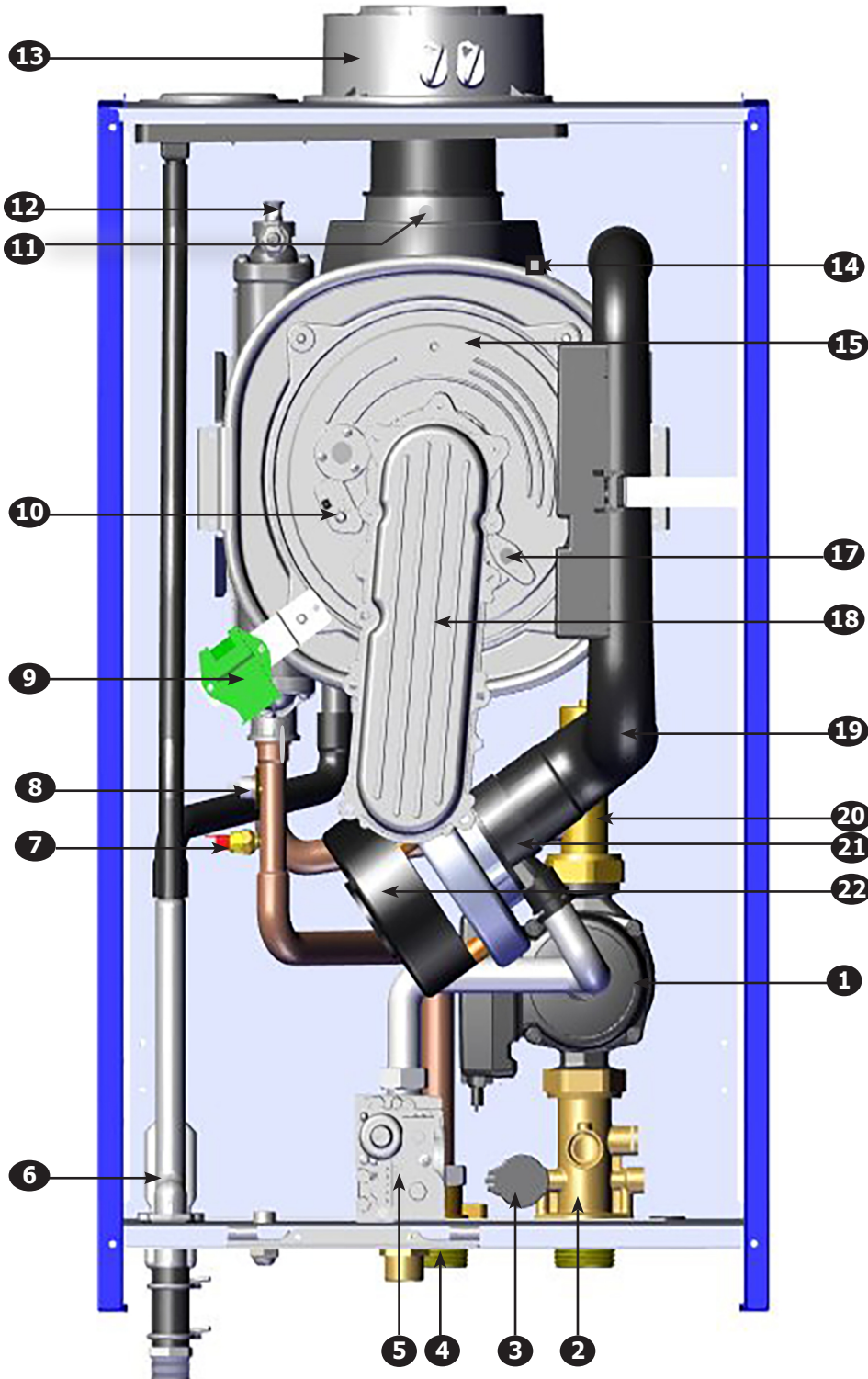
ITEM NO.	GMHB125
1	Pump with Air Separator
2	Boiler Drain Tap
3	System Return
4a	DHW Indirect Tank Return
4b	DHW Indirect Tank Supply
5	Gas Valve
6	DHW Indirect Tank Supply
7	Low Water Pressure Cutoff
8	System Supply
9	Condensate Trap
10	3-Way Valve with Motor
11	Water Safety Thermostat
12	NTC Heating sensor (Supply / Return) QTY 2, (1 Shown for clarity)
13	Ignition electrode
14	Spark Generator
15	Flue Sensor
16	Aerator
17	Coaxial Flue Connector
18	Heat Exchanger Temperature Sensor
19	Heat Exchanger
20	Burner (not shown)
21	Flame Detection Electrode
22	Air/Gas Blend Manifold
23	Acoustic Silencer
24	Fan
25	Venturi

Illustrations are a depiction of the boiler for general location of parts and may vary depending on model.



### 3 - COMPONENT LISTING

## GMHB160 Heat Only

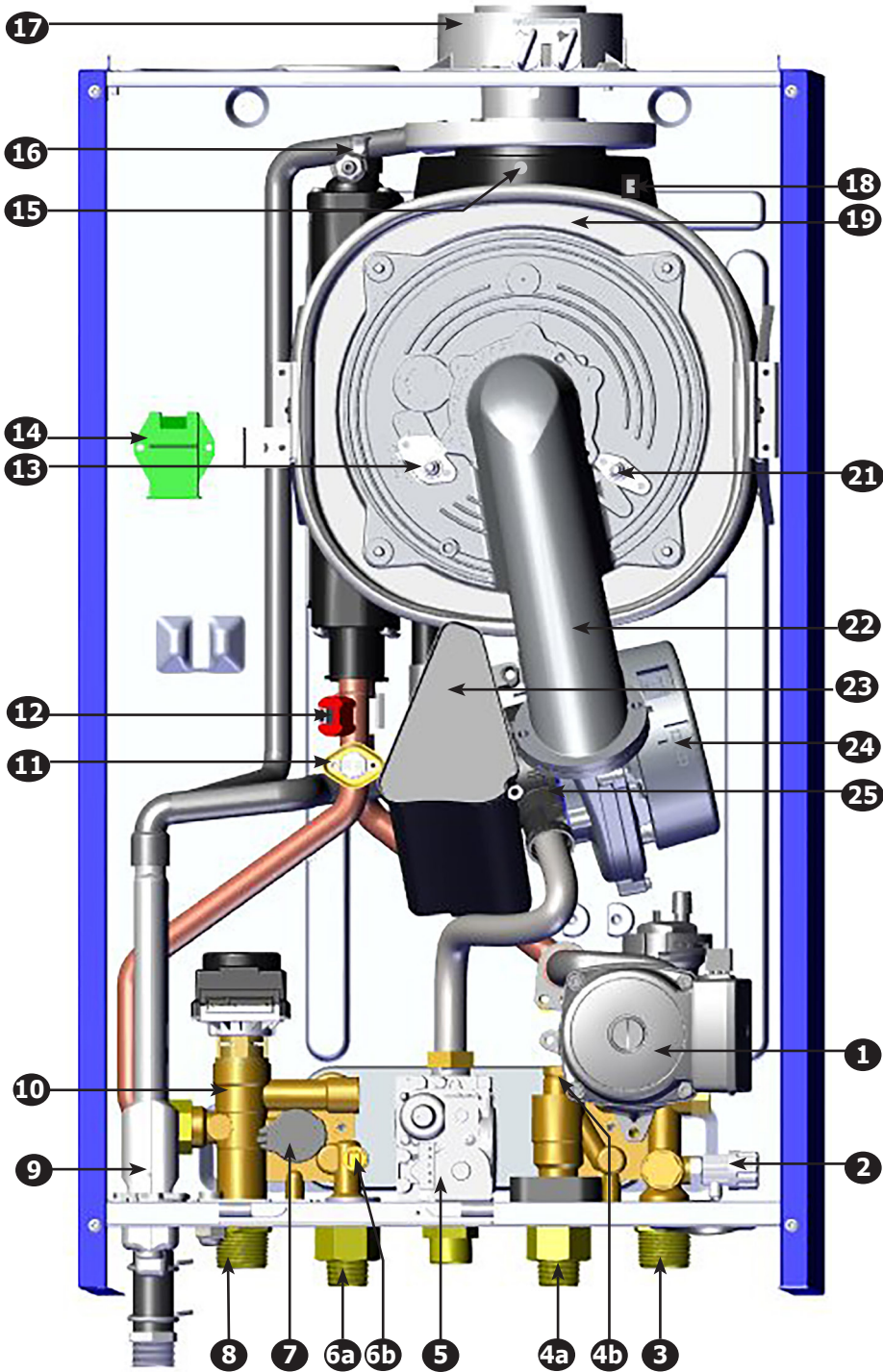


ITEM NO.	GMHB160
1	Pump
2	System Return
3	Low Water Pressure Cutoff
4	System Supply
5	Gas Valve
6	Condensate Trap
7	NTC Heating sensor (Supply/Return) QTY 2, (1 Shown for clarity)
8	Water Safety Thermostat
9	Spark Generator
10	Ignition Electrode
11	Flue Sensor
12	Aerator
13	Coaxial Connector
14	Heat Exchanger Temperature Sensor
15	Heat Exchanger
16	Burner (not shown)
17	Flame Detection Electrode
18	Air/Gas Blend Manifold
19	Acoustic Silencer
20	Air Purge
21	Venturi
22	Fan

Illustrations are a depiction of the boiler for general location of parts and may vary depending on model.

### 3 - COMPONENT LISTING

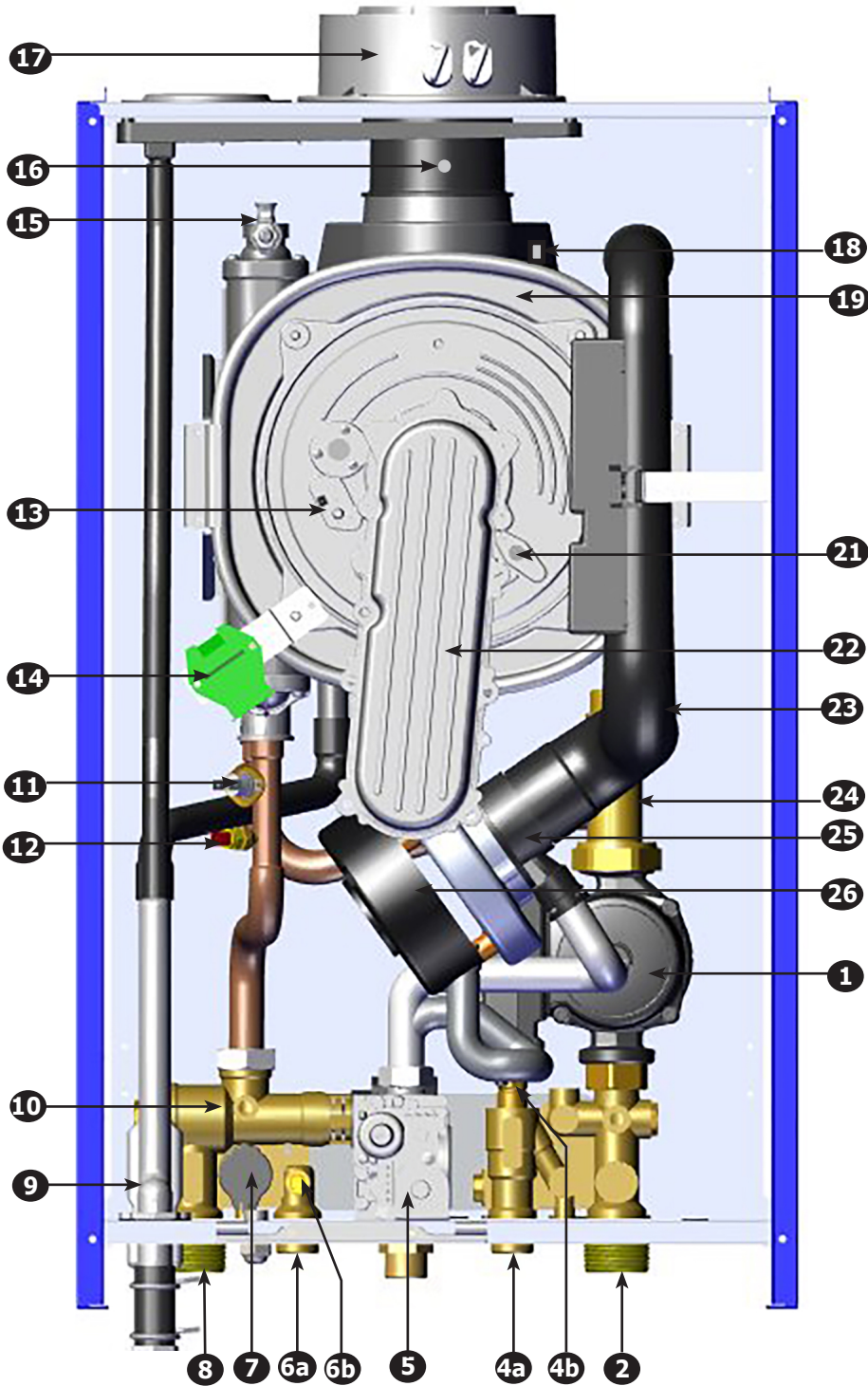
## GMCB150 Combi



ITEM NO.	GMCB150
1	Pump with Air Separator
2	Boiler Drain Tap
3	System Return
4a	DHW Indirect Tank supply
4b	Flow Sensor with Water Filter and Flow Restrictor
5	Gas Valve
6a	DHW (Hot Water) Outlet
6b	NTC DHW Sensor
7	Low Water Pressure Cutoff
8	System Supply
9	Condensate Trap
10	3-Way Valve with Motor
11	Water Safety Thermostat
12	NTC Heating sensor (Supply/Return) QTY 2, (1 Shown for clarity)
13	Ignition electrode
14	Spark Generator
15	Flue Sensor
16	Aerator
17	Coaxial Flue Connector
18	Heat Exchanger Temperature Sensor
19	Heat Exchanger
20	Burner (not shown)
21	Flame Detection Electrode
22	Air/Gas Manifold
23	Acoustic Silencer
24	Fan
25	Venturi

Illustrations are a depiction of the boiler for general location of parts and may vary depending on model.

# GMCB200



ITEM NO.	GMCB200
1	Pump with Air Separator
2	System Return
4a	DHW (Cold Water ) Inlet
4b	Flow Sensor with Water Filter and Flow Restrictor
5	Gas Valve
6a	DHW (Hot Water) Outlet
6b	NTC DHW Sensor
7	Low Water Pressure Cutoff
8	System Supply
9	Condensate Trap
10	3-Way Valve with Motor
11	Water Safety Thermostat
12	NTC Heating sensor (Supply/Return) QTY 2, (1 Shown for clarity)
13	Ignition electrode
14	Spark Generator
15	Aerator
16	Flue Sensor
17	Coaxial Flue Connector
18	Heat Exchanger Temperature Sensor
19	Heat Exchanger
20	Burner (not shown)
21	Flame Detection Electrode
22	Air/Gas Manifold
23	Acoustic Silencer
24	Air Purge
25	Venturi
26	Fan

Illustrations are a depiction of the boiler for general location of parts and may vary depending on model.

## 4 - LOCATING BOILER

### **WARNING**

Fire Hazard! Do not install on carpeting. Failure to follow these instructions could result in death or serious injury.

#### 4.1 Boiler Location Considerations

**Installation shall conform to requirements of authority having jurisdiction or in absence of such requirements:**

National Fuel Gas Code, ANSI Z223.1/NFPA 54.

National Electrical Code, NFPA 70.

- Ambient room temperature always above 32°F (0°C) to prevent freezing of liquid condensate.
- Approved for installation in closets or alcove provided it is correctly designed for that purpose and minimum clearances are met.
- Protect gas ignition system components from water (dripping, spraying, rain, etc.) during operation and service (circulator replacement, condensate trap, control replacement, etc.).
- Access to outdoors to meet minimum and maximum pipe lengths for combustion air and vent piping. See section 6.
- Disposal of condensate. See section 6.
- Drainage of water (or water - antifreeze solution) during boiler service or from safety relief valve discharge. See section 5.
- Access to system water piping, gas supply, and electrical service. See sections 5, 7 and 8.
- Clearances to combustible materials and service clearances. See Table 1 and Figures pg. 13.
- Boiler shall be installed on flat vertical wall which is capable of supporting the weight of the boiler.
- Boiler installed in a room containing bath or shower shall be installed so person using bath or shower cannot touch any electrical switch or boiler control utilizing line voltage electricity.
- Multiple Boilers can be wall mounted, placed side by side, or back to back, (common venting is not permitted).
- Consider service clearances in all installations.
- For Direct Vent installations, air vents are not required in room boiler is installed in, or when installed in closet or compartment (direct vent is required).

**TABLE 1: BOILER CLEARANCES**

Dimension	Combustible Materials <sup>(1)</sup>	Manufacturer Recommended for Service <sup>(1)(2)</sup>
Top (A)	0" (0 cm)	8-5/8" (2160 mm)
Left Side (B)	1-3/4" (45 mm)	1-3/4" (45 mm)
Right Side (C)	1-3/4" (45 mm)	1-3/4" (45 mm)
Front (D)	1-9/16" (40 mm)	17-3/4"(450mm)
Back (E)	0" (0 cm)	0" (0 cm)
Bottom (F)	0" (0 cm)	*9-13/16" (250 mm)
Combustion Air/ Vent piping	0" (0 cm)	6" (160 mm)

<sup>(1)</sup> Required distances measured from boiler jacket.

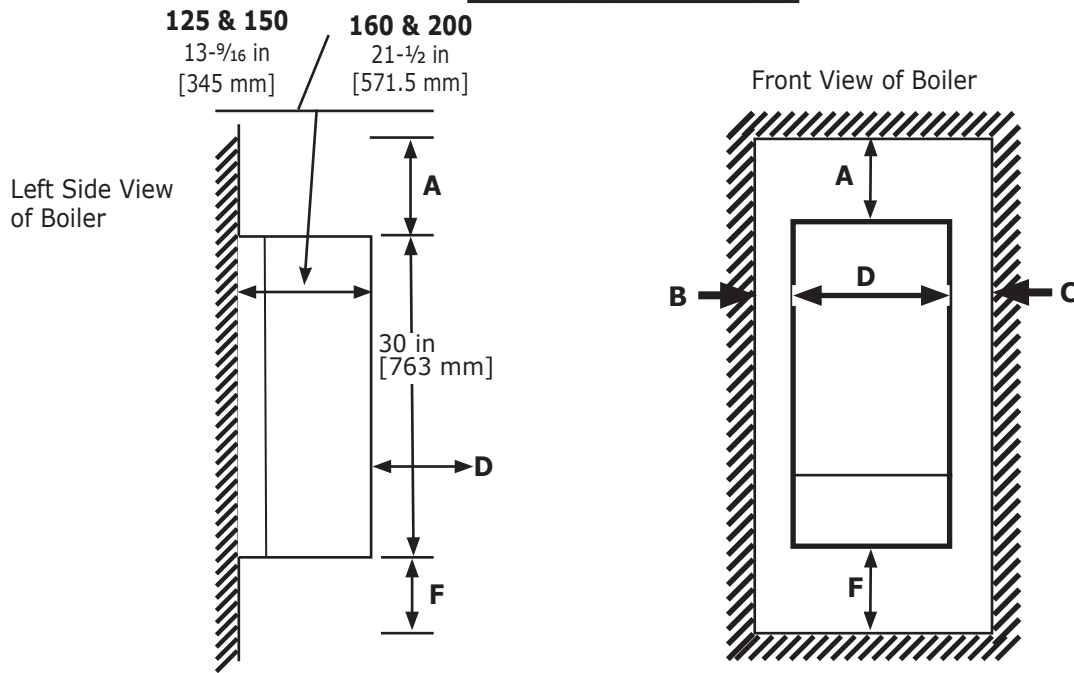
<sup>(2)</sup> Service, proper operation clearance recommendation.

\* Allowance for piping at the bottom of boiler not included.

NOTE: Greater clearances for access should supersede fire protection clearances.

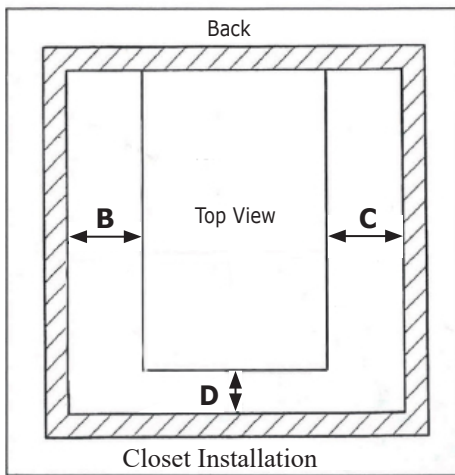
4.2 Service and Combustible Clearances

**SERVICE CLEARANCES**



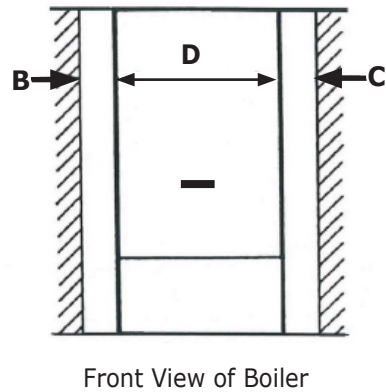
**CLEARANCES FOR COMBUSTIBLE MATERIALS**

**CLEARANCES REQUIRED FOR CLOSET INSTALLATION**



0 in / 0 mm between Back of Unit and wall

**CLEARANCES FOR COMBUSTIBLES**



## 4 - LOCATING BOILER

### **CAUTION**

Boiler weight exceeds 100 pounds (45.3 kg). Do not lift boiler onto wall without assistance.

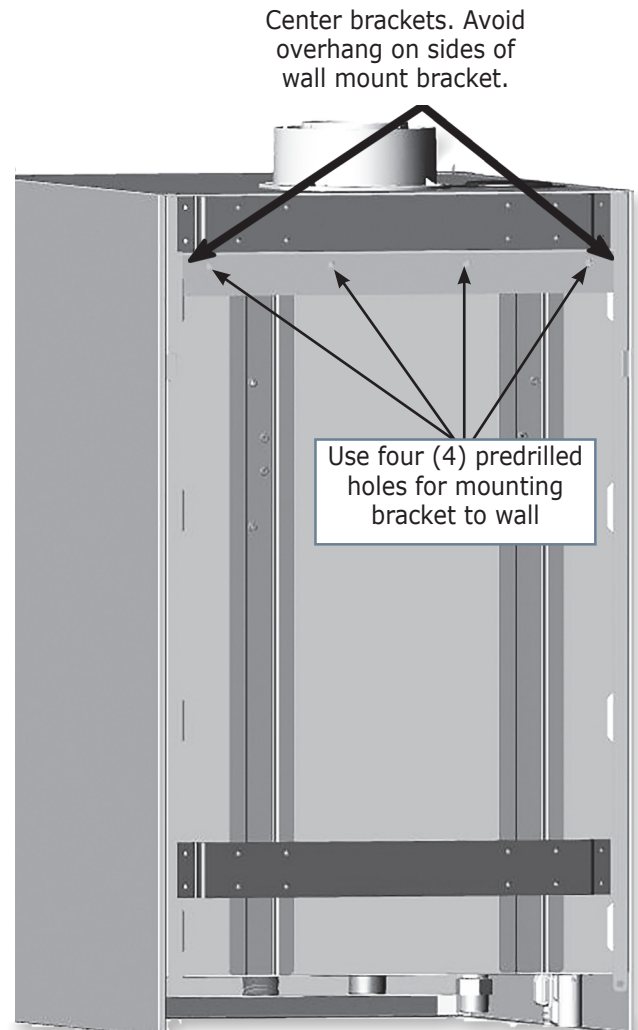
**Note** Lift boiler using chassis. Do not use front jacket, vent piping, water or gas fittings to lift boiler as it may cause damage to the boiler.

**Note** Use two (2) wrenches when tightening and fitting to pipe boiler's threaded fittings. Boiler's internal piping can be damaged if subjected to excessive torque.

### 4.3 Wall Mounting

1. Decide position of boiler on the wall allowing for all required clearances and flue terminal position.
2. Mount boiler on wall using wall mounting bracket included with unit. See Figure 4.1
3. Adjust the position of the boiler verify it is level.
4. Rear exit flue - mark position of hole for flue.
5. Side exit flue - mark horizontal center line of flue across the wall to side wall, then along side wall (ensure lines are parallel and sloped properly towards the boiler, refer to section 6. This will give position of center of hole for flue.
6. Required hole size for coaxial flue:
  - GMHB125 & GMCB150 - 4 3/8" [110 mm] diameter
  - GMBH160 & GMCB200 - 5 5/16" [135 mm] diameter

**FIGURE 4-1 WALL MOUNT BRACKET (INCLUDED)**



**Note** Boiler rated at 50 psig (345 kPa) maximum allowable working pressure. Boiler provided with 30 psig (206 kPa) safety relief valve.

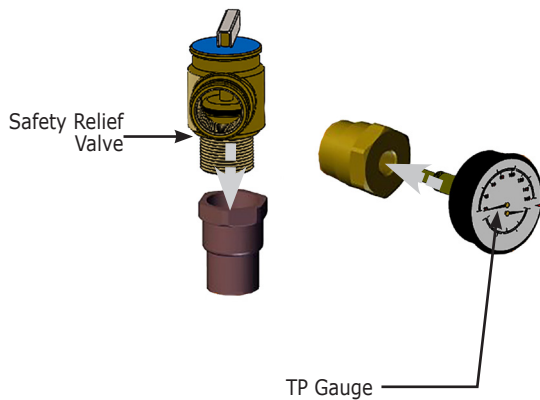
**Note** When installing safety relief valve it must be installed in a vertical position with spindle at top.

**Note** System pressure above 43 psi [2.96 bar] **WILL** result in boiler shutting down.

### ⚠ WARNING

Boiler and its individual shutoff valve shall be disconnected from gas supply piping system during any pressure testing of that system at test pressures in excess of 1/2 psi (3.40 kPa - 34.47 mbar). Boiler shall be isolated from the gas supply piping system by closing its individual manual shutoff valve during any pressure testing of gas supply piping system at test pressures equal to or less than 1/2 psi (3.5 kPa). Install boiler so that gas ignition system components are protected from water (dripping, spraying, rain, etc.) during appliance operation and service (circulator replacement, condensate trap, control replacement, etc.).

**FIGURE 5-1 SAFETY RELIEF VALVE**



### 5.1 General

- Primary/Secondary piping required.
- Install piping in accordance with authority having jurisdiction.
- Support system piping and safety relief valve discharge piping. Boiler's internal piping and wall mount bracket can be damaged if subjected to excessive weight.

### NOTICE

The intended use of the internal heat exchanger pump is a boiler loop. Do not use as a primary system pump.

### ⚠ WARNING

- Poison hazard. Ethylene glycol is toxic. Do not use ethylene glycol.
- Never use automotive or standard glycol antifreeze, even ethylene glycol made for hydronic systems.
- Ethylene glycol can attack gaskets and seals used in hydronic systems.
- Do not use petroleum based cleaning or sealing compounds boiler system.
- Do not fill boiler or boiler system with softened water.
- Use only inhibited propylene glycol solutions certified by fluid manufacturer as acceptable for use with closed water heating system.
- Thoroughly clean and flush any system that used glycol before installing new Boiler.
- Provide user with Material Safety Data Sheet (MSDS) on fluid used.

- A micro bubble air elimination device is manufacturer required.
- Size central heating pump (and domestic hot water pump, if used) for system requirements only. Internal heat exchanger pump compensates for pressure drop through boiler internal piping and heat exchanger.
- Thoroughly clean and flush system before connecting to boiler.
- If oil is present in system water, use approved detergent to wash system.
- It is necessary to semi-annually check the water quality of central heating systems.
- Flush system to remove any solid objects such as metal chips, fibers, or Teflon tape, etc.
- Flush system until water runs clean and piping is free of sediment.
- Use purge valve to flush zoned systems, each zone separately. If purge valves and isolation valves are not installed, install them to properly clean the system.

- When purging installations that include standing iron radiators and systems with manual vents at high points, start with nearest manual air vent. Open the vent until water flows out, then close vent. Repeat this procedure, working toward furthest air vent.
- Install a basket strainer if large amounts of sediment is present. Keep basket clear of sediment build up.
- Manufacturer recommends a water treatment product be used for sediment removal.
- Install a magnetic dirt separator in the hydronic system where there are cast iron or steel components, or where the previous boiler was a cast iron heat exchanger. The abrasive, extremely fine sediment is difficult to remove and can deposit onto heat exchange surfaces and accumulate in pump cavities causing reduced efficiency and premature wear.
- Ensure piping in the heating system has an oxygen barrier.
- If using antifreeze solution do not exceed 50% glycol.

### 5.2 Special Conditions

**Note**

Do not expose boiler and condensate piping to freezing temperatures.

- System piping exposed to freezing conditions: Use inhibited propylene glycol solutions certified by fluid manufacturer for use with closed water heating system. Do not use automotive or ethylene glycol.
- Boiler installed above radiation level (or as required by authority having jurisdiction). Integral low water pressure switch is provided in boiler.
- Boiler used in connection with refrigeration system. Install piping in parallel with boiler, with appropriate valves to prevent chilled medium from entering boiler.
- System piping connected to heating coils located in air handling unit exposed to refrigerated air circulation. Install flow control valves or other automatic means to prevent gravity circulation of boiler water during cooling cycle.



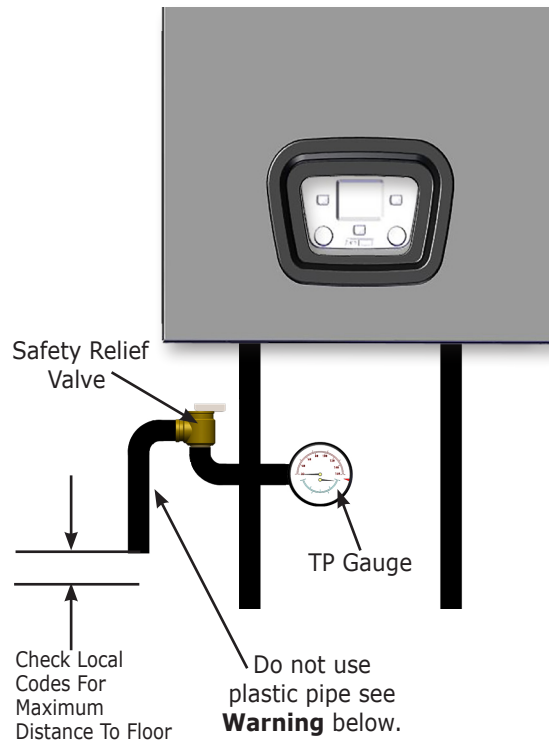
### ⚠ WARNING

Burn and scald hazard. Safety relief valve could discharge steam or hot water during operation. Install discharge piping per these instructions.

### 5.3 Safety Relief Valve and Air Vent

- Install safety relief valve. See Figure 5-2.
- Install safety relief valve with spindle in vertical position.
- Do not install shutoff valve between boiler and safety relief valve.
- Install discharge piping from safety relief valve. Do not use plastic pipe.
- Use ¾" or larger pipe.
- Use pipe suitable for temperatures of 375°F (191°C) or greater. Do not use plastic pipe on safety relief valve.
- Individual boiler discharge piping shall be independent of other discharge piping.
- Size and arrange discharge piping to avoid reducing safety relief valve relieving capacity below minimum relief valve capacity stated on rating plate.
- Run pipe as short and straight as possible to location protecting user from scalding and properly drain piping.
- Install union, if used, close to safety relief valve outlet.
- Install elbow(s), if used, close to safety relief valve outlet and downstream of union (if used).
- Terminate pipe with plain end (not threaded).

**FIGURE 5-2 SAFETY RELIEF VALVE DISCHARGE PIPING**



### ⚠ WARNING

Burn and scald hazard. Safety relief valve could discharge steam or hot water during operation. Use pipe suitable for temperatures of 375°F (191°C) or greater. **DO NOT** use plastic pipe.

### 5.4 Trim Piping

- Temperature - Pressure Gauge. Install temperature pressure gauge. See Figures 5-1 and 5-2.
- Some boiler models may have integral drain valve located inside jacket directly underneath pump. Install provided external drain valve as required.

### 5.5 System Piping

- Ensure caps are removed from boiler water connections.
- See Figure 5-6 for a basic system piping configuration.
- Systems with automatic fill valves require back flow prevention device.
- Single boiler system. See Figure 5-6 for general guidance. Additional considerations:
  - Boiler control does not accommodate central heating pump. Installer is responsible for integration of central heating pumps with field sourced control.
  - Boiler control allows domestic hot water prioritization. Function could be lost if central heating pump is not directly connected to zone control system.
- Multiple boiler system. Considerations:
  - Field sourced control system logic may require equivalent water temperatures entering each boiler to properly sequence and adjust system supply temperature.

#### **WARNING**

Burn and scald hazard. Verify all plastic caps are removed from boiler connections. Failure to follow these instructions could result in death or serious injury.

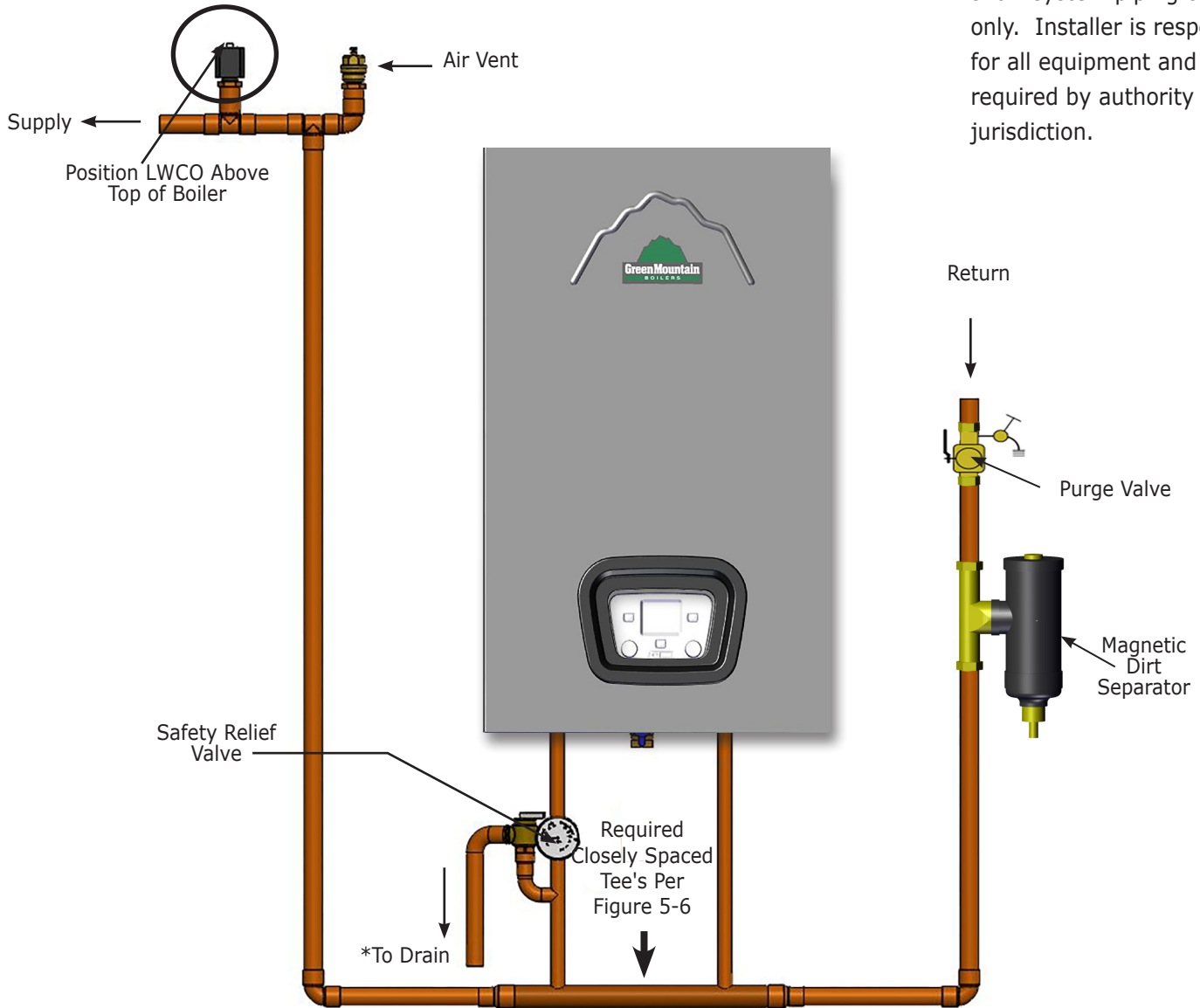
- **Thoroughly flush all hydronic piping.** Flush system (wash) clean after installing all piping. Debris or cutting oils, etc., left inside system will reduce heat transfer in heat exchanger. Small pieces of Teflon tape are eventually trapped in the water pump impeller and reduce water flow rate. Non-flushed systems have low energy efficiency and potential boiling noise due to ineffective heat transfer and reduced water flow rate. Flush all zones one by one, when flushing the system.
- Secure all valves/fittings to boiler.
- Connect system valve pipe work to the boiler.
- Route pressure relief valve discharge piping to the floor. Follow local code with respect to necessary distance to the floor. See Figure 5-2.
- Verify all valves are closed.

**FIGURE 5-3 - PIPING DIAGRAM - LWCO LOCATION**

**Low Water Cutoff (LWCO)**

Installation if required by the Authority Having Jurisdiction

(See Figure 5-5 for detail)



**Note** Arrange piping to prevent water dripping onto boiler.

**Note** Illustrations are meant to show system piping concept only. Installer is responsible for all equipment and detailing required by authority having jurisdiction.

\* Check Local Codes for Maximum Distance to Floor.

**Note** DO NOT PLACE ISOLATION VALVE BEFORE TEE OR LWCO.

## 5.6 External Optional Low Water Cut Off

These guidelines are supplied when necessary to install an additional Low Water Cut Off (LWCO), for sensing a low water level condition in a boiler, as required by the Authority Having Jurisdiction.

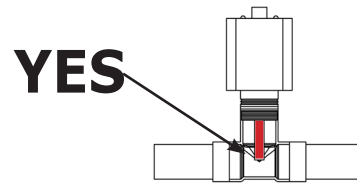
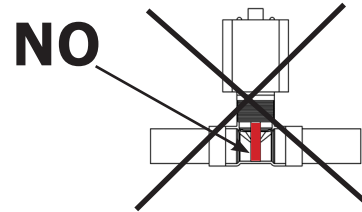
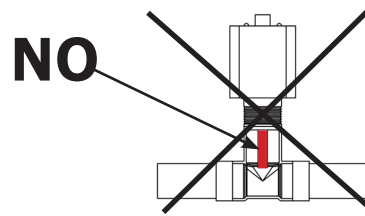
Follow LWCO manufacturer installation instructions for type of LWCO selected in addition to these instructions.

LWCO shall be 120V/60HZ control and dry contacts sized for load being connected. Wire control to boiler. See Figure 5-4.

Connect LWCO device to the system ground. Ground in accordance with the requirements of the authority having jurisdiction or, in the absence of such requirements, with the National Electrical Code (NEC) or Canadian Electrical Code CEC.

- Locate LWCO sensing device in the supply piping, or in a stand pipe off the boiler supply, above the minimum height of boiler. See Figure 5-3, Piping Diagram.
- Position control in HORIZONTAL piping to assure proper boiler protection (upright or 90° rotation).
- For proper operation, sensing element of the LWCO control shall be positioned in the tee to sense the main water stream. Maintain minimum 1/4" spacing from pipe walls. Element shall NOT contact the rear, or side walls of the tee. See Figure 5-5.
- Install an air vent using a tee to avoid nuisance shutdowns.
- Apply small amount of pipe sealant to threaded connections.
- Arrange piping to prevent water dripping onto boiler.
- DO NOT install water shutoff valve between boiler and LWCO sensing device.

**FIGURE 5-5 - LOW WATER CUTOFF - DETAIL**



**FIGURE 5-4 - LWCO WIRING DIAGRAM**

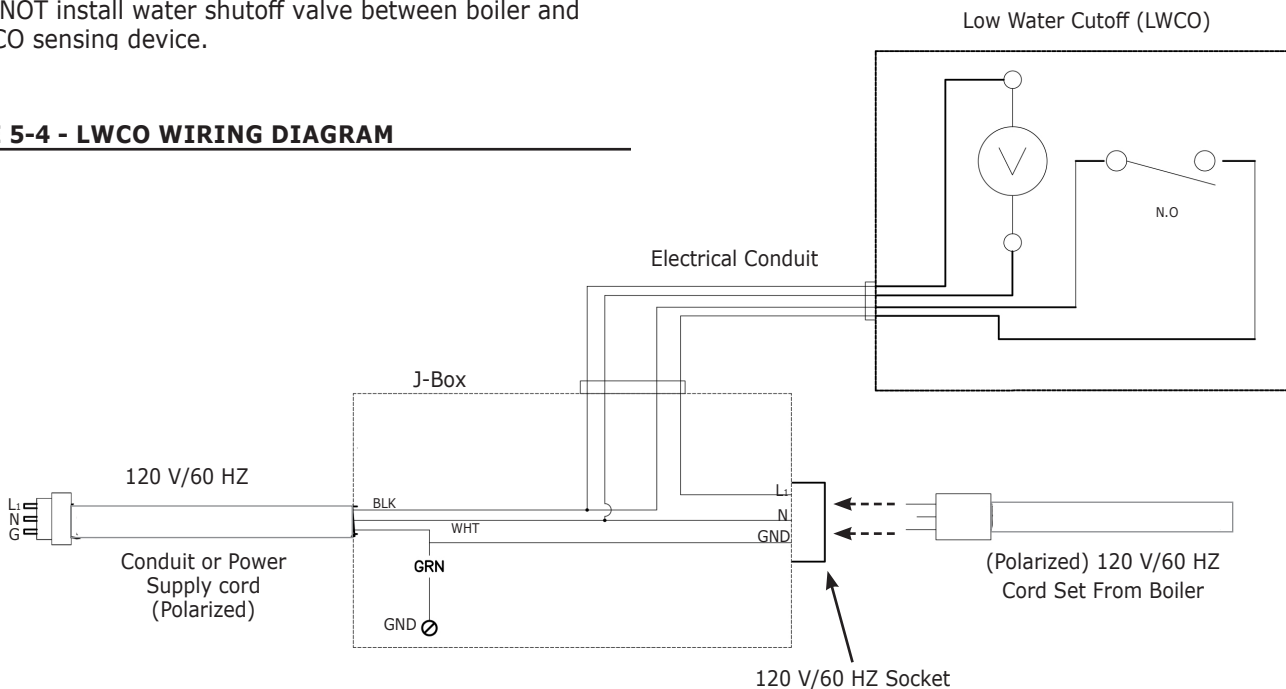
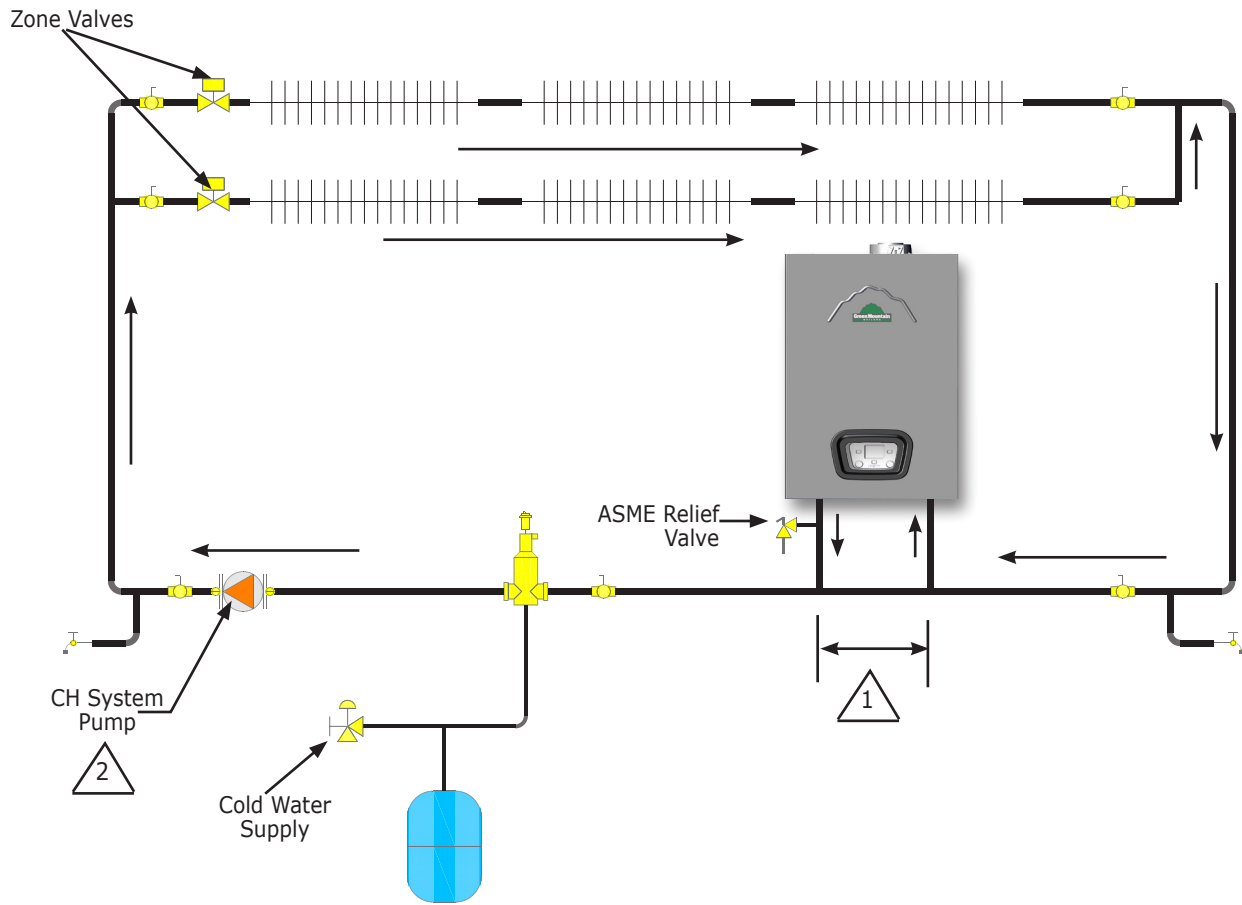


FIGURE 5-6 MULTI ZONE SYSTEM WITH ZONE VALVES

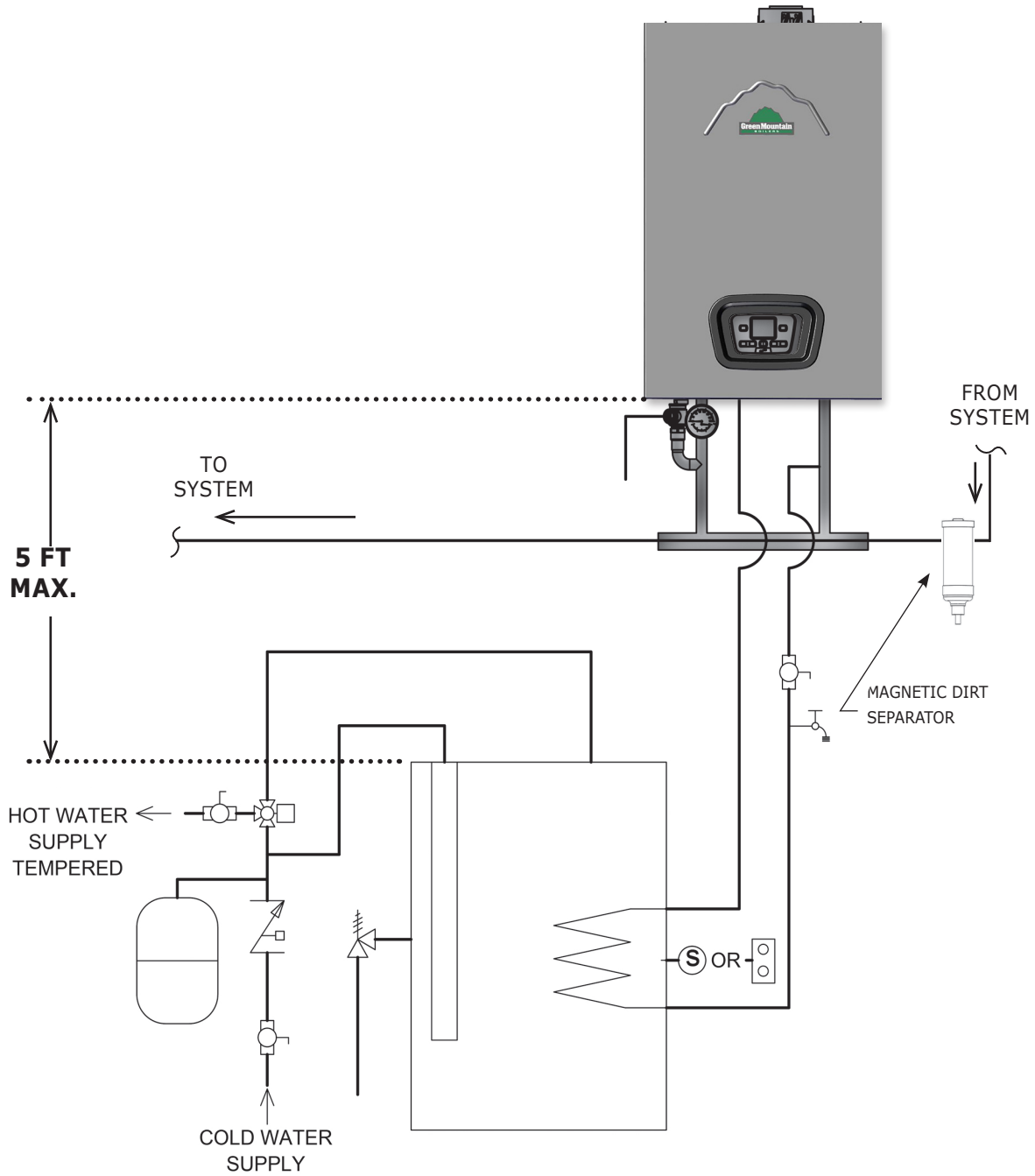


**Note** 1 12" (305MM) MAXIMUM SEPARATION

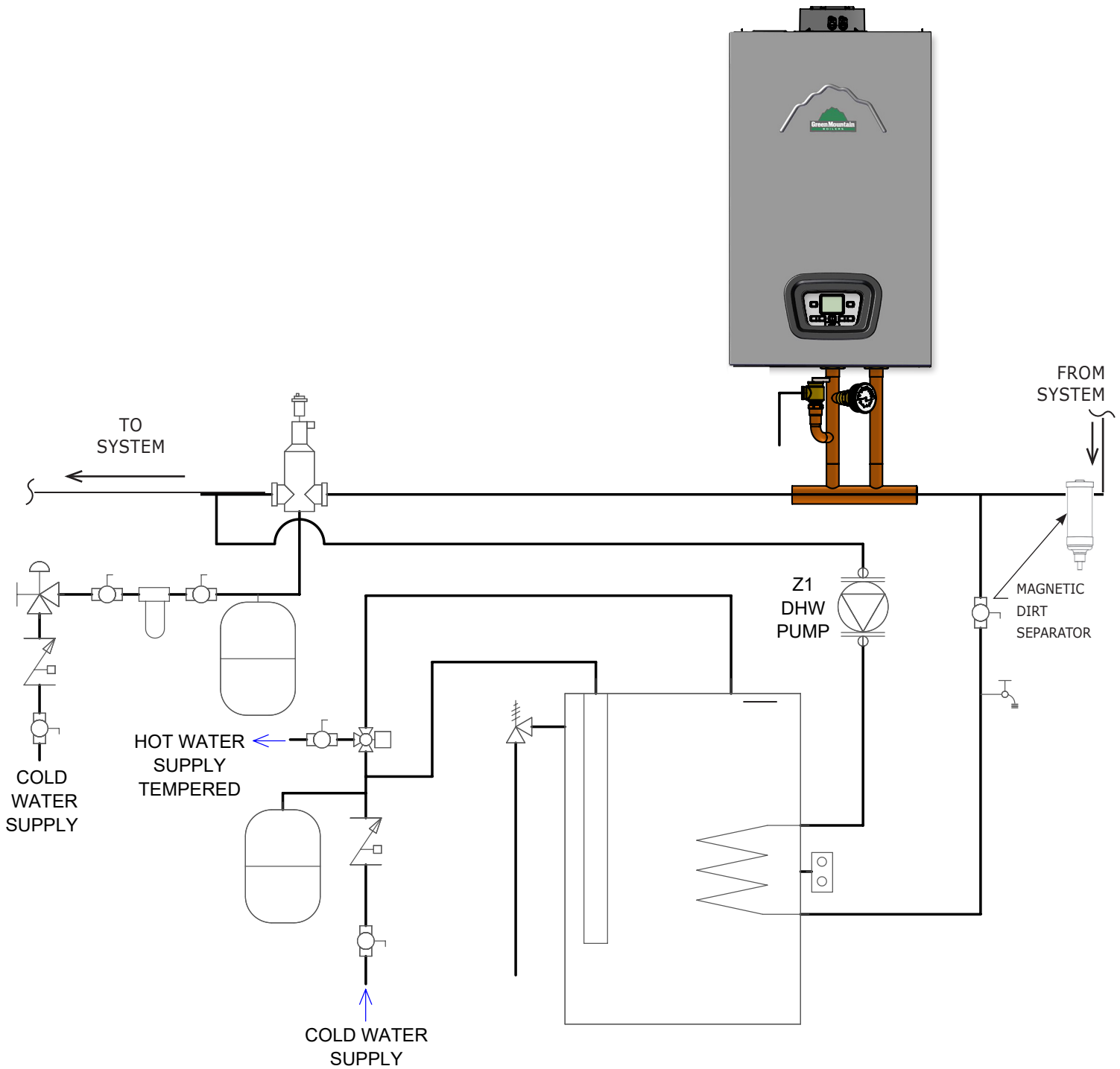
**Note** 2 BOILER DOES NOT INCLUDE EXTERNAL PUMP RELAY

125 with Zone Circulator Pumps

USE ONLY IF TANK IS WITHIN 5FT OF BOILER



160 with Zone Circulator Pumps



### 5.7 Central Heating System

Boiler is designed for use in a sealed central heating system. Design the system to operate with flow temperatures of up to 176°F (80° C), take pump head, expansion tank size, mean baseboard temperature, etc. into account.

Boiler is supplied with the following components: Pressure relief valve - 30.0 psi (2.1 bar). Boiler internal pressure switch will shut boiler off at 43.5 psi /3.0 bar.

**Pressure gauge** - to indicate the system pressure to be maintained.

**By-pass** - Boiler incorporates an automatic by-pass, However, where all radiators are fitted with thermostatic radiator valves, an external by-pass must be fitted.

### 5.8 Frost Protection Mode

Frost protection mode is integrated into the appliance when left in domestic hot water or central heating position. If the temperature falls below 41°F / 5° C boiler will fire on its minimum setting until flow temperature of 86°F / 30° C is reached.

### 5.9 Pump Protection (Automatic pump exercise)

Pump will automatically operate for 1 minute in every 24 hours to prevent seizing.

### 5.10 Domestic Hot Water Mode

#### GMCB150 & GMCB200 and GMHB125 with Indirect Tank

#### **WARNING**

Burn, Scald Hazard! Water temperature over 120°F (49°C) can cause severe burns and scalding. See User's Manual before setting water temperature. Failure to follow these instructions could result in death or serious injury.

- This boiler has domestic hot water priority. Demand at tap or shower will override any central heating requirement.
- Flow of water will operate the DHW flow switch which requests the 3 way valve to change position. This will allow the pump to circulate the primary water through the DHW plate heat exchanger. (GMCB150 & GMCB200 Combi Boilers only)
- Combustion fan will then come on and begin to run at ignition speed.
- Once the fan reaches ignition speed the control board will allow power to flow to the spark generator and gas valve creating ignition in the combustion chamber. The flame sensor will acknowledge the presence of the flame in the combustion chamber and send a signal to the control board.
- Temperature sensors will send a signal to the control board allowing the control board to increase/ decrease the speed of the fan. The combustion fan will in turn modulate the gas rate accordingly.
- When the domestic hot water demand ceases the burner will extinguish, unless there is a demand for central heating.
- Install (field supplied) domestic water pressure relief valve as required by authority having jurisdiction.





### Hot Water Can Scald!

Water heated to temperature for clothes washing, dish washing and other sanitizing needs can scald and cause permanent injury.

Children, elderly, and infirm or physically handicapped persons are more likely to be permanently injured by hot water. Never leave them unattended in bathtub or shower. Never allow small children to use a hot water tap or draw their own bath.

If anyone using hot water in the building fits the above description, or if state laws or local codes require certain water temperatures at hot water taps, you must take special precautions:

- Use lowest possible temperature setting.
- Install some type of tempering device, such as an automatic mixing valve, at hot water tap or water heater. Automatic mixing valve must be selected and installed according to manufacturer's recommendations and instructions.

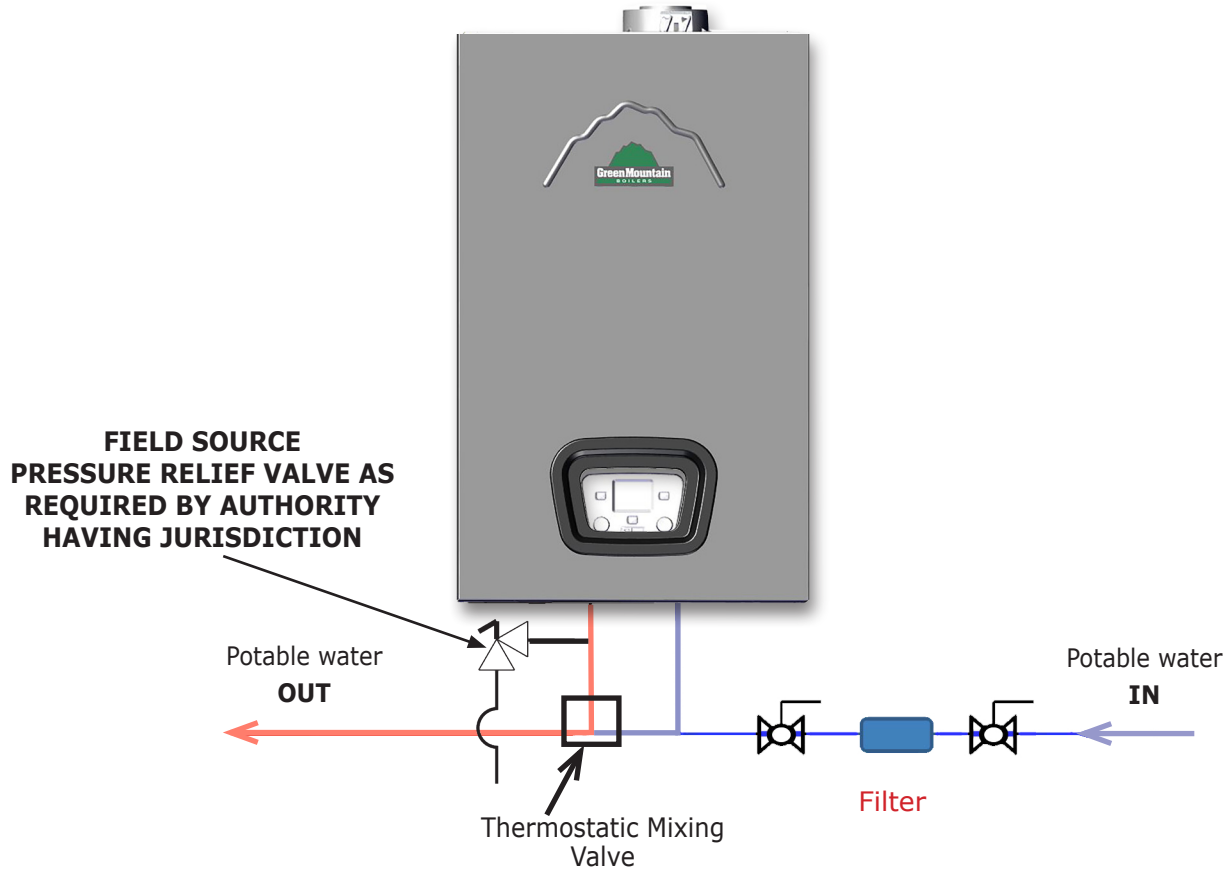
Water passing out of drain valves may be extremely hot. To avoid injury:

- Make sure all connections are tight.
- Direct water flow away from any person.

Water Temperature Setting	1st Degree Burn Exposure Time For An Adult	2nd and 3rd Degree Burn Exposure Time For An Adult
120° F	1 minute	5 minutes
130° F	5 seconds	30 seconds
140° F	2 seconds	5 seconds
150° F	1 second	1.5 seconds
160° F	Instantaneous	0.5 seconds

**Note:** Warning for Infants, Children, and the Elderly: Great care must be taken when exposing the aforementioned groups to warm or hot water as they can be badly burned in exposure times less than half of the time for an adult.

### 5.11 Manufacturer Recommendation - Filter (Combi Models - DHW Piping)



### Manufacturer Recommendation

A water sediment filter for potable water before entering the boiler is highly recommended to prevent errors and lockouts. The filter prevents any sediment and debris from your water supply piping from entering the boiler. Debris carried from the water supply will clog DHW water flow sensor resulting in error codes and causing boiler to lockout.

Locate the filter as close to the boiler as possible and place on DHW (domestic hot water) inlet connection located at bottom of the boiler.

### DANGER


Scald Burn Hazard! Manufacturer recommends thermostatic mixing valve required on potable water supply to avoid potential scalding. Failure to follow these instructions will result in death or serious injury.

### **WARNING**

Fire, explosion, and asphyxiation hazard. Improper installation could result in death or serious injury. Read these instructions and understand all requirements before beginning installation.

### **WARNING**

All types of PVC venting for flue gases are prohibited for use with this boiler. ABS venting shall not be used this product.  
Use of DWV plumbing pipes to vent this boiler shall be prohibited.  
Use of cellular core PVC (ASTM F891), cellular core CPVC, or Radel® (polyphenolsulfone) in venting systems shall be prohibited.  
Covering non-metallic vent pipe and fittings with thermal insulation shall be prohibited.  
Failure to follow these instructions could result in death or serious injury.

**Note**  Follow venting manufacturer's equivalent lengths for specialty fittings.

#### 6.1 General

- Installations shall comply with Authority having jurisdiction and in absence of such with:
  - » U.S. ANSI Z223.1 /NFPA 54 in the United States
  - » CSA B149.1 in Canada.
- This boiler requires a dedicated direct vent system only.
- Vent connections serving appliances vented by natural draft shall not be connected into any portion of mechanical draft systems operating under positive pressure.
- Materials used in the U.S. shall comply with Authority having jurisdiction and in absence of such with: ANSI/ASTM D1785, ANSI/ASTM F441, ANSI/ASTF493, UL1738 or ULS636.
- Venting system must be free to expand and contract.
- Vent system must have unrestricted movement through walls, ceilings and roof penetrations.
- Check for proper joint construction when joining pipe to fittings.
- If vent is penetrating ceilings and floors, openings must have means of fire stopping in joist areas and proper firestop spacer assemblies installed.
- Standard roof flashing methods must be used to install roof flashing.
- Frame wall and roof openings to provide support for attachment of termination assemblies.
- Support piping in accordance with pipe manufacturer's instruction and authority having jurisdiction. In absence of manufacturer's instruction use pipe hooks, pipe straps, brackets, or hangers of adequate strength located at intervals of 4 ft (1.2m) or less. Allow for expansion/contraction of pipe.
- Support horizontal sections of vent pipe to prevent sags capable of accumulating condensate per vent manufacturer guide lines. (39" or 1 meter for Natalini).

- Assemble vent materials in accordance with venting manufacturer's instructions.
- Slope exhaust pipe minimum of 1/4" per foot, or vent manufacturer's recommendation, whichever is greater; back toward the boiler.
- Any "in line" elbows in flue system must be taken into consideration. First elbow on the top of the boiler is included in equivalent length calculations.
- Use U.V. stabilized polypropylene when it will be exposed to sunlight, wind, or prone to freeze ups.

#### 6.2 Removal of Existing Boiler From Common Vent System

When existing boiler is removed from common venting system, common venting system is likely to be too large for proper venting of appliances remaining connected to it. After removal of existing boiler, following steps shall be followed with each appliance remaining connected to common venting system placed in operation, while other appliances remaining connected to common venting system are not in operation:

- Seal any unused openings in common venting system.
- Visually inspect venting system for proper size and horizontal pitch. Determine there is no blockage or restrictions, leakage, corrosion and other deficiencies which could cause an unsafe condition.
- When practical, close all building doors, windows, and all doors between space in which appliances remaining connected to common venting system are located and other spaces of building. Turn on clothes dryer and any appliance not connected to common venting system. Turn on exhaust fans, such as range hoods and bathroom exhaust so they will operate at maximum speed. Do not operate summer exhaust fan. Close fireplace dampers.
- Turn on appliance being inspected. Follow lighting instructions. Adjust thermostat so appliances will operate continuously.
- Test for spillage at draft hood relief opening after 5 minutes of main burner operation. Use flame of match or candle, smoke from cigarette, cigar or pipe.
- Determine each appliance remaining connected to common venting system properly vents when tested as outlined above. Then return doors, windows, exhaust fans and any other gas-burning appliance to their previous condition of use.
- Any improper operation of common venting system should be corrected so installation conforms with National Fuel Code, ANSI Z223.1/NFPA 54 and/or Natural Gas and Propane Installation Code, CAN/CSA B149.1. When re-sizing any portion of common venting system, common venting system should be re-sized to approach minimum size as determined using appropriate tables in Chapter 13 of the National Fuel Gas Code, ANSI Z223.1/NFPA 54 and/or Natural Gas and Propane Installation Code, CAN/CSA B149.1.

### 6.3 Fill Condensate Trap with Water

#### **WARNING**

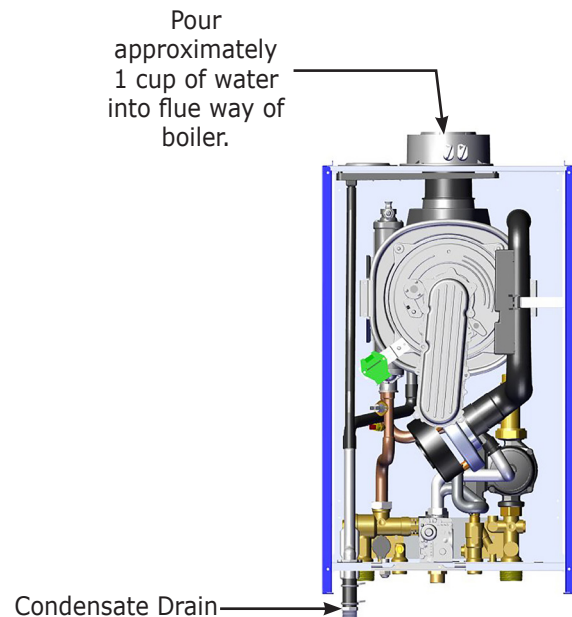
Asphyxiation hazard! Fill condensate trap before installing venting to avoid combustion products escaping boiler. Failure to follow these instructions could result in death or serious injury.

- Before venting installation the condensate trap must be filled with water.
- To fill the condensate trap pour water into exhaust vent until water begins to flow through the siphon.
- Visually inspect the siphon to ensure it is full with clean water.
- During operation check condensate trap to ensure it is draining properly.

**Note** Condensate trap must be manually filled with water at initial start up.

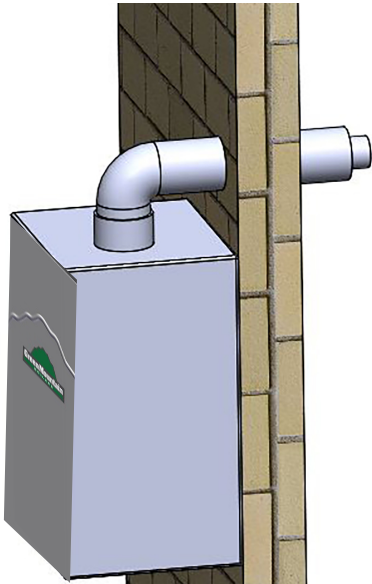
**FIGURE 6-1 CONDENSATE DRAIN ASSEMBLY**

MODEL GMCB200 SHOWN (LOCATION SIMILAR IN ALL SIZES)



### 6.4 Definitions

1. **Coaxial piping** – **Figure 6-2** exhaust and air intake pipe have a common axis.



### 6.5 Securing Twin Pipe Polypropylene Venting

#### Note

Venting manufacturer's use a device to secure single wall twin pipe polypropylene vent pieces to each other. Proper application of the securing mechanism is necessary for any use of twin pipe polypropylene venting on exhaust or air intake. Securing mechanism is for indoor use only and should not be used in outdoor applications. Follow venting manufacturer's instructions for applying the securing mechanism on twin pipe polypropylene venting.

#### Example for Fixed Natalini venting system.

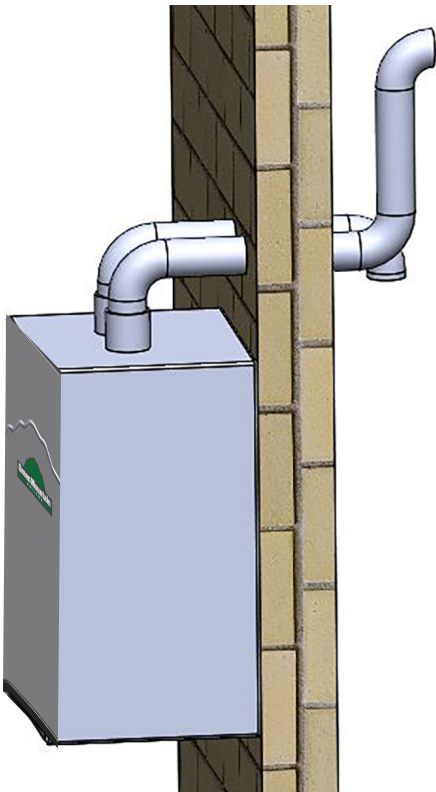
(For other venting system suppliers see their instructions.)

1. Place clamp so etched "UP" is facing up.
2. Open clamp slightly by separating circular areas from each other.
3. Slide male end of first pipe through open clamp so the shoulder of the female end of the pipe stops the clamp from sliding off the pipe.
4. Insert the male end of the second pipe into the clamp on the "up" etched side. Force the two pipes together.
5. Verify the two pipes are secure together with clamp in place.

**FIGURE 6-4 - (NATALINI) CLAMP EXAMPLE**



2. **Twin Pipe** – **Figure 6-3** Exhaust and intake air are separate pipes, can be terminated using single wall terminals from the vent manufacturer or field built configuration using elbows or tees.



### 6.6 Vent Termination

- Terminate combustion air and vent pipes with fittings or coaxial vent kit.

Use horizontal pipe for vent and 90° elbow for combustion air termination when using fittings.

- Separate vent terminal from air inlet terminal to prevent flue gas recirculation. If T-Terminal is used on flue pipe at sidewall, air inlet terminal shall be at least 36" or more away from vent terminal.
- Locate combustion air termination as far as possible from swimming pool, swimming pool pump house, and other sources of airborne chlorine.
- Locate combustion air and vent terminals as required by authority having jurisdiction.
- Refer to Figures 6-5 through 6-18 for approved vent termination schemes.

### 6.7 Approved Venting Materials

#### **WARNING**

Manufacturer recommends this condensing boiler be vented with approved polypropylene venting material. Use only materials listed below for vent pipe, intake air pipe, and fittings. Failure to comply could result in death or serious injury.

#### **WARNING**

- Covering non-metallic vent pipe and fittings with thermal insulation shall be prohibited.
- Use of cellular core PVC for venting flue gas could result in death, or serious injury.
- Coaxial venting shall be fastened with screws. Dual flue venting is NOT fastened with screws.

#### **WARNING**

Do not use cellular core pipe. Only specified sized pipes are to be used. When using venting material other than boiler manufacturer's venting, note the correct installation procedure. Failure to follow these instructions could result in death, or serious injury.

Installation shall conform to requirements of authority having jurisdiction or in absence of such requirements:

- USA - National Fuel Gas Code, ANSI Z223.1/NFPA 54.
1. Venting shall be properly supported.
  2. Boiler shall not support any type of vent system.
  3. All piping, glue, solvents, cleaners, fittings and components must conform to ASTM and ANSI standards. In Canada ULC S636 and in the USA UL 1738 schedule 40 CPVC are the only approved vent system to be used as an alternative to polypropylene venting for the exhaust pipe
  4. Manufacturer requires use of a spring clamp at every push-fit gasket connection when using a single wall polypropylene vent system.

## 6 - COMBUSTION AIR AND VENT PIPING

### 6.8 Approved Polypropylene Manufacturers

Note: Maximum equivalent length may vary between manufacturers.

#### ⚠ WARNING

Use of cellular core PVC for venting flue gas could result in death, or serious injury.

#### ⚠ WARNING

Covering non-metallic vent pipe and fittings with thermal insulation shall be prohibited.

<b>Combustion Air And Vent Pipe Fittings Must Conform With The Following:</b>		
Item	Material	Standards
Vent Pipe and Fittings	CPVC schedule 40	ANSI/ASTM D1784/F441
	PP (Polypropylene) Pipe and Components	UL 1738* ULC S636-08
Pipe Cement/Primer	PVC	ANSI/ASTM D2564
	CPVC	ANSI/ASTM F493
Use of cellular core PVC (ASTM F891), cellular core CPVC, or Radel <sup>®</sup> , (Polyphenolsulfone) in venting systems shall be prohibited.		

\* Natalini - Evaluated and approved for use with this boiler.

<b>Vent Material Options</b>			
<b>GMHB125 &amp; GMCB150</b>		<b>GMBH160 &amp; GMCB200</b>	
1	4" / 2" [100 mm / 50 mm] polypropylene coaxial.	1	5"/3" [125mm/80m] polypropylene coaxial.
2	3" [80mm] polypropylene twin pipe. Shall be polypropylene on BOTH intake and exhaust.	2	3" [80mm] polypropylene twin pipe. Shall be polypropylene on BOTH intake and exhaust.
3	3" [80mm] flexible polypropylene for chimney exhaust vent, shall have rigid 3" [80mm] polypropylene on air intake.	3	3" [80mm] flexible polypropylene for chimney exhaust vent, shall have rigid 3" [80mm] polypropylene on air intake.
4	3" [80mm] Twin pipe CPVC. PVC optional on intake ONLY.	4	3" [80mm] Twin pipe CPVC. PVC optional on intake ONLY.
* Note: Adapters and fittings used with all vent systems shall be from same manufacturer and compatible with the vent pipe. See list for approved Manufacturers.			

Direct vent terminations are designed to work with any standard wall thickness. Installation guidelines for min/max wall thickness are as follows: Min = 1" [25mm], Max. = 24" [60cm].

### 6.9 Coaxial Venting Instructions

Maximum equivalent flue lengths for Coaxial venting are:

Coaxial Pipe Maximum Vent Lengths		
Boiler Size	125/150	160/200
Vent Size	4"/2" [100mm/60mm]	5"/3" [128mm/80mm]
Natalini	32.80 ft [10m]	32.80 ft [10m]
DuraVent®	32.80 ft [10m]	32.80 ft [10m]
Centrotherm	32.80 ft [10m]	32.80 ft [10m]

Coaxial Elbows - Equivalent length	
4"/2" [100mm/60mm]	
45°	1.64 ft. [0.5m]
90°	3.28 ft. [1.0m]
5" / 3" [128mm/80mm]	
45°	1.64 ft. [0.5m]
90°	3.28 ft. [1.0m]

NOTE: Coaxial venting can run horizontal or vertical.

- Connect flue elbow to top of boiler and adjust direction of elbow to desired orientation (rear, right or left).
- Measure distance from outside wall face to elbow, this dimension will be known as 'X', add distance "Y" + 2" (50mm) to "X" this is the total dimension of the vents. See Figure 6.6.
- Mark dimension from above on outer intake vent. Measure length of waste material, and transfer dimension to inner grey flue pipe.
- Remove waste from both vents (flue and air). Verify cut ends are square and free from burrs. Insert flue back into intake air vent and pass them through hole in wall.
- Check all measurements before cutting. Clearance to combustible materials is zero when using coaxial vent system.
- After installing venting use calibrated analyzer to verify there is no recirculation of combustion.
- Ensure termination is positioned with slots at the bottom.

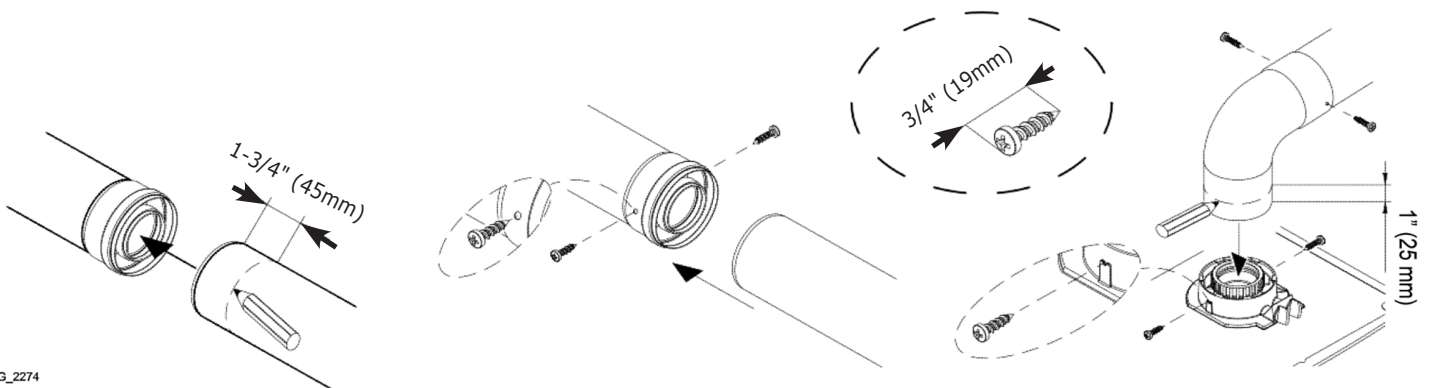
### ⚠ WARNING

Asphyxiation hazard. Before securing the screws ensure the pipe has been pushed in a minimum of 1-3/4" (45mm) into the gasketed end of the other pipe. Failure to follow these instructions could result in death or serious injury.

### 6.10 Coaxial Vent Screw Placement - See Figure 6-5

Two (2) screws shall be fastened through the outer intake pipe behind the gaskets at equal distances, approximately 180° apart. Note the screws used must be no larger than No. 8-1/2 sheet metal screws and must be zinc coated. The length of the screws must be 3/4" (19.00mm).

**FIGURE 6-5 - COAXIAL SCREW PLACEMENT**

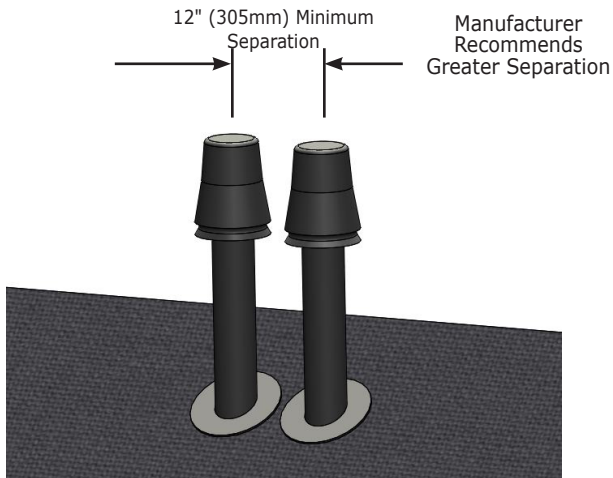


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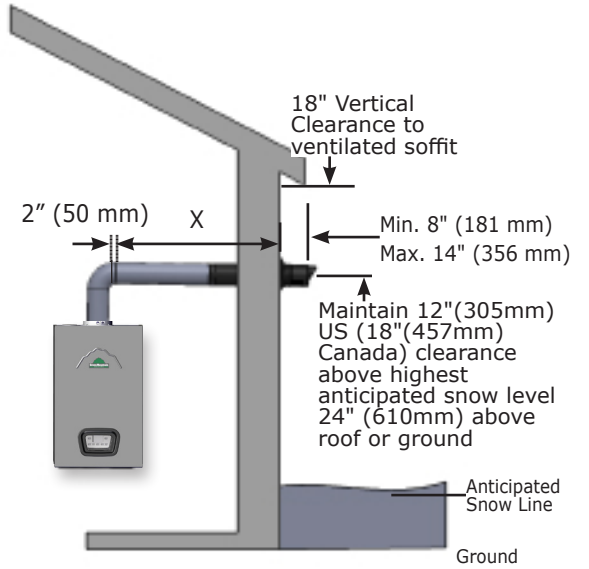


## 6 - COMBUSTION AIR AND VENT PIPING

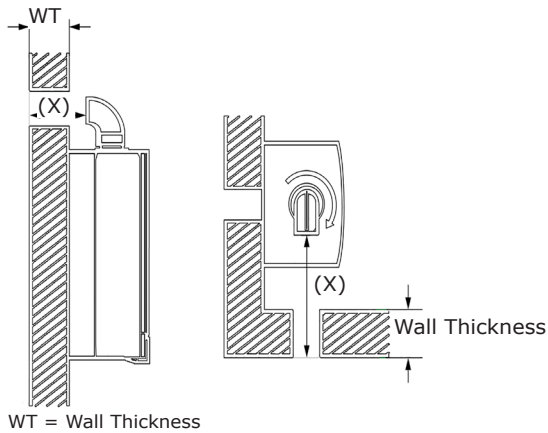
**FIGURE 6-6 - COAXIAL VERTICAL EXHAUST**



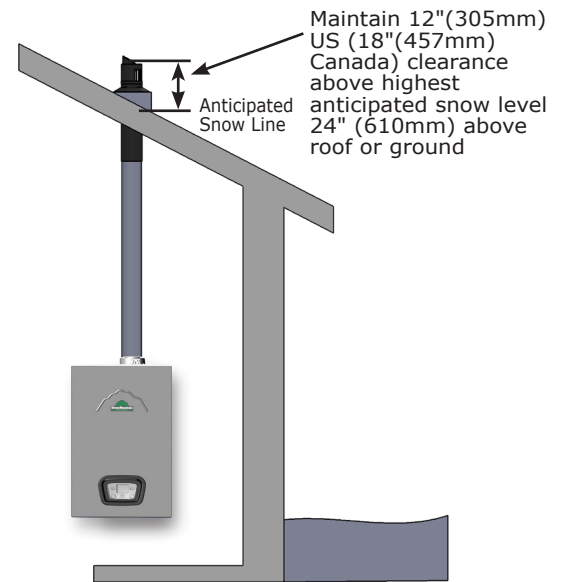
**FIGURE 6-8 SIDE WALL COAXIAL VENTING**



**FIGURE 6-7 - COAXIAL VENTING HORIZONTAL OR VERTICAL**



**FIGURE 6-9 ROOF MOUNT COAXIAL VENTING**



## 6 - COMBUSTION AIR AND VENT PIPING

### 6.11 Twin Pipe Systems

Twin pipe venting allows exhaust flue and intake flue to be separated from each other. Fresh air is drawn in at a different area from the flue terminal location.

#### A. Twin Pipe CPVC System

CPVC is approved for boiler exhaust. CPVC or PVC are both approved for air intake.

To transition from Coaxial at the top of the boiler to Twin Pipe CPVC/PVC a kit is available (see parts list).

#### B. Twin Pipe Polypropylene System

Single wall polypropylene is used for both exhaust and air intake piping.

To transition from Coaxial at the top of the boiler to Twin Pipe polypropylene venting an adapter kit is provided with the boiler.

#### C. Twin Pipe Separated Flue

Exhaust and combustion air intake are not located in same general location.

#### D. Twin Pipe - Common Atmospheric Zone Termination

#### Twin Pipe Maximum Equivalent Vent Lengths

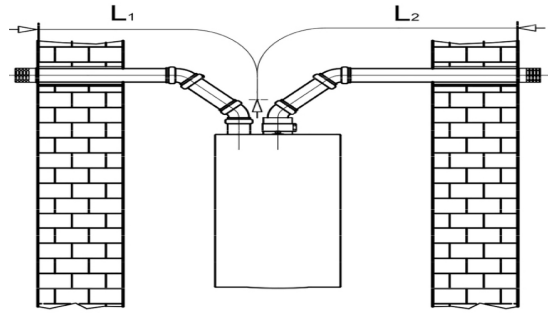
		125/150	160/200
		3" [80 mm]	3" [80 mm]
Intake Vent	L1	100 ft	100 ft
Exhaust Vent	L2	100 ft	100 ft

#### Single Wall Polypropylene Elbows - Equivalent Length

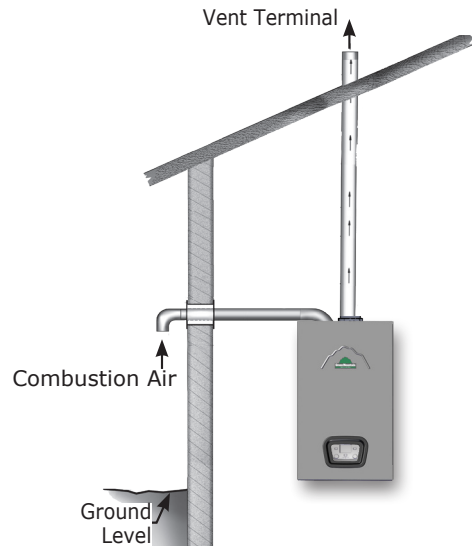
		3"
45° bend		0.82 ft [0.25 m]
90° bend		1.64 ft [0.50 m]

NOTE: Two pipe separated flue can run horizontal or vertical.

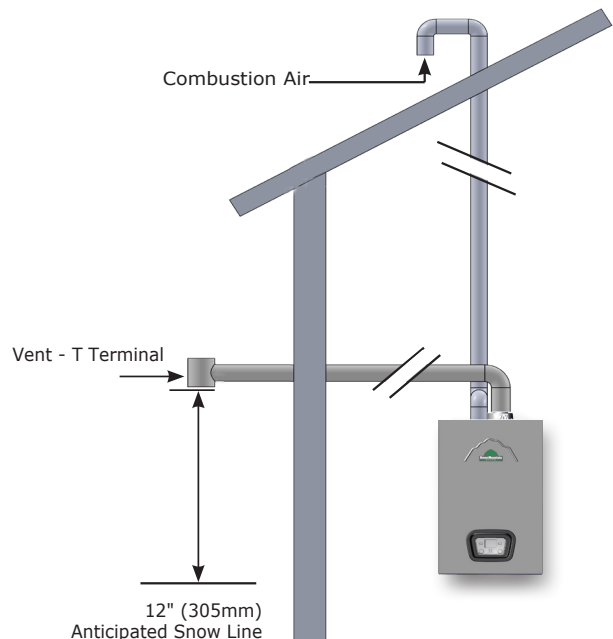
**FIGURE 6-10 - TWIN PIPE SEPARATED HORIZONTAL FLUE TERMINATION**



**FIGURE 6-11 - TWIN PIPE ON ROOF COMBUSTION AIR ON SIDEWALL**



**FIGURE 6-12 - TWIN PIPE FLUE ON SIDEWALL, COMBUSTION AIR ON ROOF**



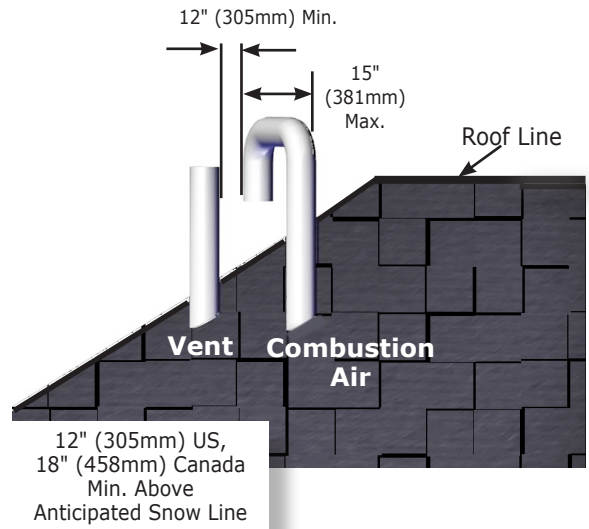
## 6 - COMBUSTION AIR AND VENT PIPING

Exhaust and combustion air intake are located in same general location and are of equal length.

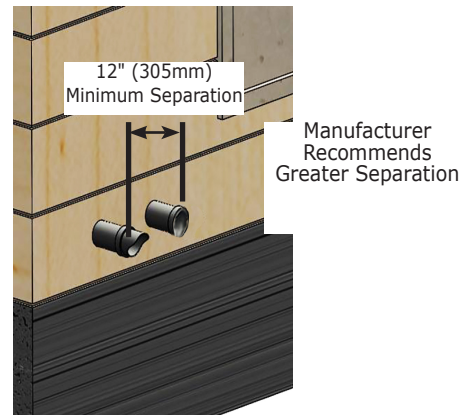
**FIGURE 6-13-TWIN PIPE ROOF VENT**

Twin Pipe Maximum Vent Equivalent Lengths Terminating in same location	
125/150	160/200
3" [80 mm]	3" [80 mm]
100 ft	100 ft

Note: Twin Pipe Common Atmospheric Zone termination can be run horizontal or vertical

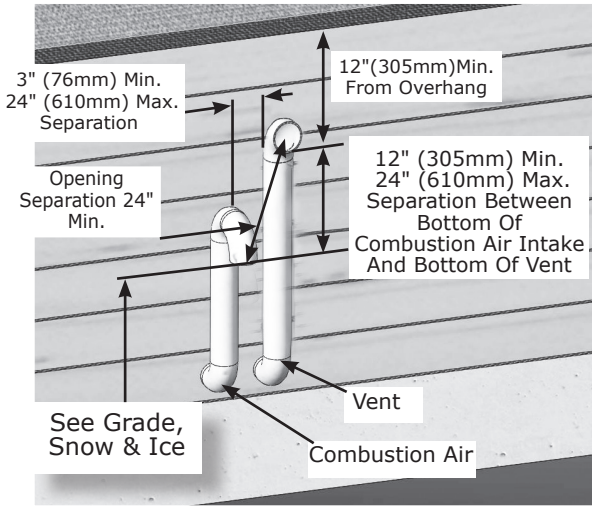


**FIGURE 6-14 - HORIZONTAL TWIN PIPE, EXHAUST AND INTAKE**



## 6 - COMBUSTION AIR AND VENT PIPING

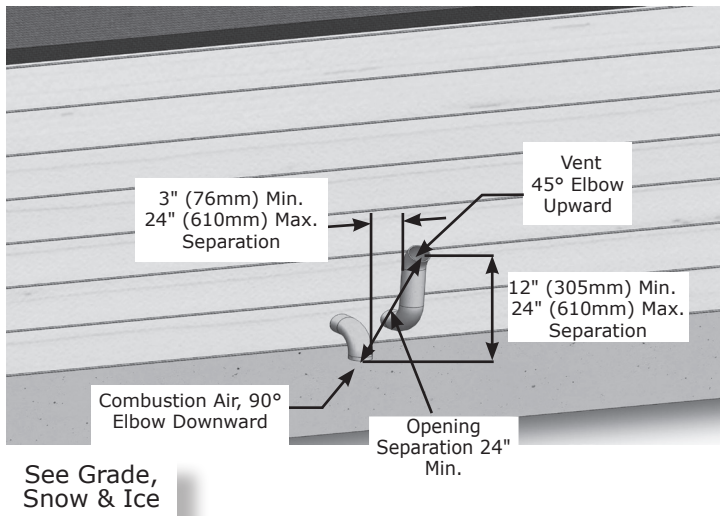
**FIGURE 6-15 - TWIN PIPE SIDE WALL VENT (S-TYPE TERMINATION)**



### Roof Terminations

- 12" (305mm) Min. horizontal separation between combustion air intake and vent of same appliance.
- 12" (305mm) Min. 84" (2.2m) Max. vertical separation between combustion air intake and vent of different appliances.
- 15" (381mm) Max. horizontal length of vent.
- Min. vent/intake between different appliances 12" (305mm).
- Max. allowable total vertical vent length with outside exposure is 10 ft. (3.05m).
- Abandoned unused masonry chimney may be used as chaseway for combustion air and vent. Both combustion air and vent pipe must exit above top of chimney with clearances same as shown in Figure 6-12.

**FIGURE 6-16 - TWIN PIPE SIDE WALL WITH 45° VENT**

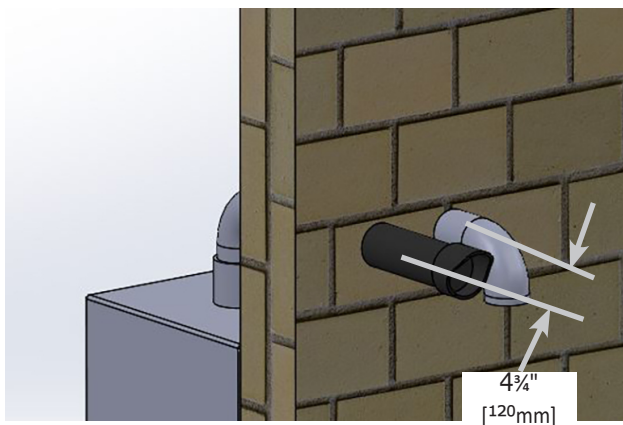


### Grade, Snow & Ice

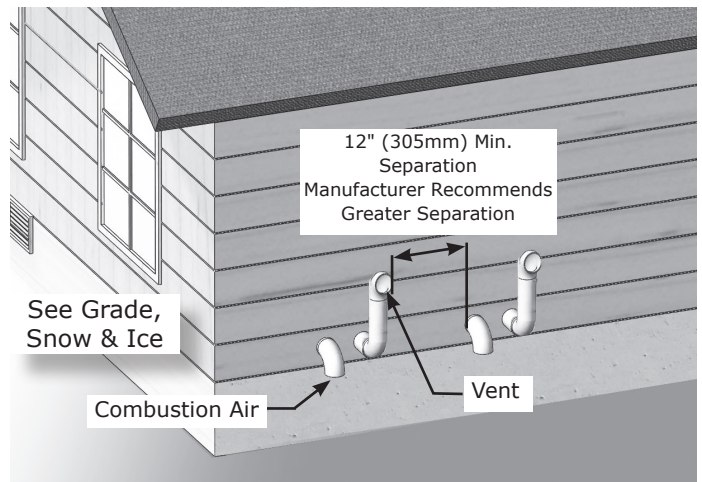
Maintain 12" (305mm) US, 18" (457mm) Canada clearance above highest anticipated snow level, 24" (610mm) above roof.

Avoid locations where snow may drift and block vent and combustion air. Ice or snow may cause boiler to shut down if vent or combustion air becomes obstructed.

**FIGURE 6-17- SINGLE WALL EXHAUST KIT AND AIR INTAKE MINIMUM DISTANCE CENTER TO CENTER WITH 45° ON COMBUSTION AIR**



**FIGURE 6-18 - TWIN PIPE SIDE WALL VENT (MULTIPLE APPLIANCES)**



## 6.12 Flexible Vent System

**FIGURE 6-19 - FLEXIBLE VENTING SYSTEM**

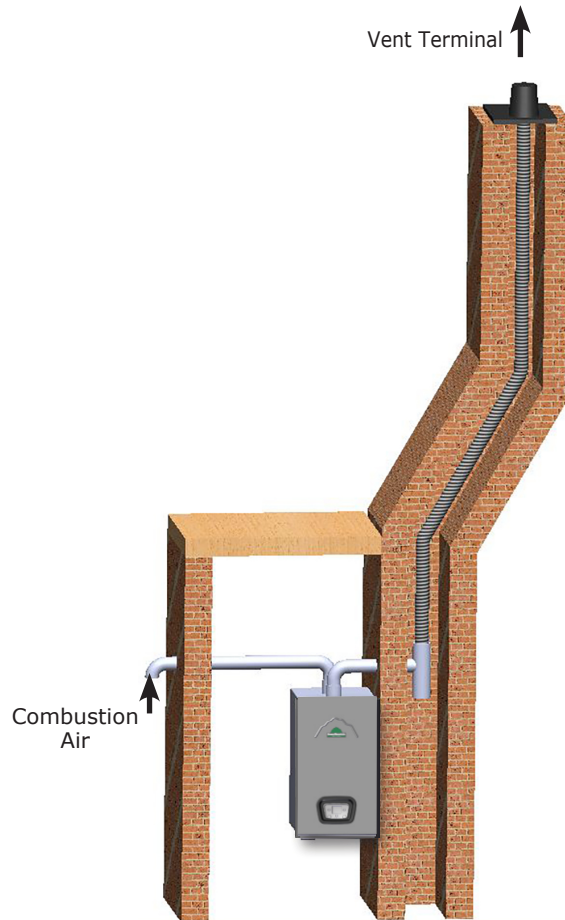
Flexible Pipe Maximum Vent Lengths			
3" [80 mm] Diameter Pipe		125/150	160/200
<b>Natalini</b>	Exhaust	50 ft [15.2m]	50 ft [15.2m]
	Intake	50 ft [15.2m]	50 ft [15.2m]
<b>DuraVent®</b>	Exhaust	50 ft [15.2m]	50 ft [15.2m]
	Intake	50 ft [15.2m]	50 ft [15.2m]
<b>Centrotherm</b>	Exhaust	52 ft [15.8m]	50 ft [15.2m]
	Intake	50 ft [15.2m]	50 ft [15.2m]
<b>Z-Dens</b>	Exhaust	NA	50 ft [15.2m]
	Intake		50 ft [15.2m]

### Single Wall Elbows - Equivalent Length

	3" [80 mm]
<b>45° bend</b>	0.82 ft [0.25 m]
<b>90° bend</b>	1.64 ft [0.50 m]

**Note** *Flexible vent systems shall only be run vertical. Horizontal runs before adapting to flexible must be rigid pipe.*

- Maximum vent lengths based on equivalent straight runs only. Include rigid pipe and fittings in overall equivalent length calculations.
- Flexible venting installations use single wall polypropylene to pass flue gasses to base of chimney, then flexible venting to get them to termination at the top.
- Combustion air is not supplied through masonry chimney. Combustion air must be from outside using 3" [80 mm] single wall polypropylene.
- Position boiler to use minimum length possible of rigid single wall polypropylene venting to the chimney.
- Follow venting manufacturer's instructions on assembly and clearances to maintain.
- Avoid sharp bends in flexible venting.



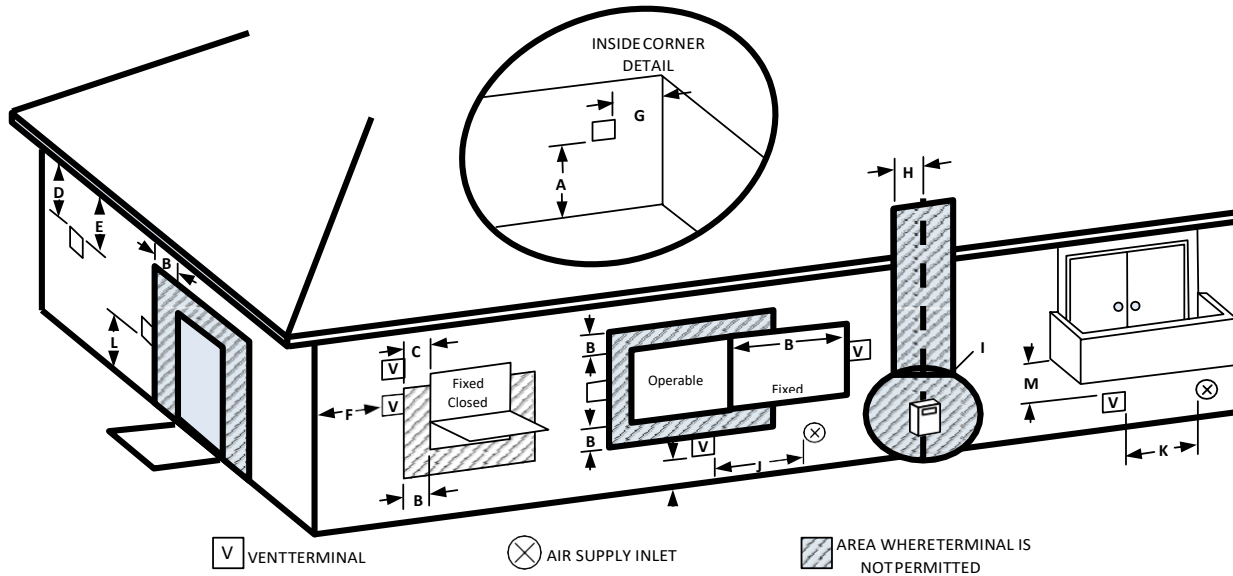
## 6 - COMBUSTION AIR AND VENT PIPING

**FIGURE 6-20 - FLUE TERMINAL LOCATION**

All vent pipe and combustion air pipe and fittings shall comply with the following:

Materials used in the U.S. must comply with the following standards:

ANSI/ASTM D1785, ANSI/ASTMD2661, ANSI/ ASTM F441.

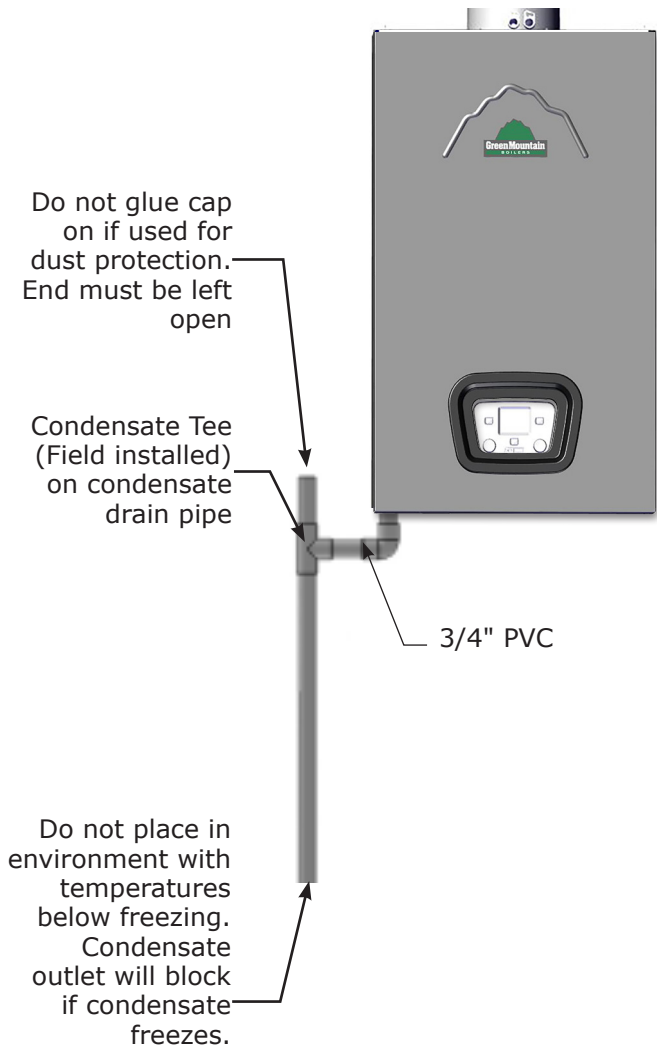


**Vent Termination Minimum Clearances**

		US Installations	Canadian Installations
<b>A</b>	Clearance above grade, veranda, porch, deck, or balcony	12" (305mm)	12" (305mm)
<b>B</b>	Clearance to window or door that may be opened	12" (305mm)	3 ft. (0.9m)
<b>C</b>	Clearance to permanently closed window	*12" (305mm)	*12" (305mm)
<b>D</b>	Vertical Clearance to ventilated soffit located above the terminal within a horizontal distance of 2 feet (610 mm) from the center line of the terminal	18" (457mm)	18" (457mm)
<b>E</b>	Clearance to unventilated soffit	18" (457mm)	18" (457mm)
<b>F</b>	Clearance to outside corner	9" (229mm)	9" (229mm)
<b>G</b>	Clearance to inside corner	36" (456mm)	36" (456mm)
<b>H</b>	Clearance to each side of center line extended above meter/ regulator assembly	3 ft. (0.9m) within a height of 15 ft. (4.5m) above the meter/ regulator assembly	3 ft. (0.9m)
<b>I</b>	Clearance to service regulator vent outlet	3 ft. (0.9m)	3 ft. (0.9m)
<b>J</b>	Clearance to non-mechanical air supply inlet to building or the combustion air inlet to any other appliance	12" (305mm)	3 ft. (0.9m)
<b>K</b>	Clearance to mechanical air supply inlet	*3 ft. (0.9m)	6 ft. (1.8m)
<b>L</b>	Clearance above paved sidewalk or paved driveway located on public property	*7 ft. (2.1m)	7 ft. (2.1m) †
<b>M</b>	Clearance under veranda, porch, deck or balcony	*12" (305mm) ‡	12" (305mm)‡
† A vent shall not terminate directly above a sidewalk or paved driveway that is located between two single family dwellings and serves both dwellings.		*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.	
‡ Permitted only if veranda, porch, deck or balcony is fully open on a minimum of one side beneath the floor.			

**Note:** Local Codes or Regulations may require different clearances. Flue terminal must be exposed to external air and position must allow the free passage of air across it at all times. In certain weather conditions the terminal may emit a plume of steam. Avoid positioning terminal where this may cause a nuisance.

**FIGURE 6-21 CONDENSATE DRAIN**



### 6.13 Condensate Piping

- Use materials acceptable to authority having jurisdiction. In absence of such authority:
  - USA - PVC or CPVC per ASTM D1785/D2845 Cement or primer per ASME D2564 or F493.
- No external trap needed if the drain line is connected to an open drain or condensate pump. If the boiler is plumbed directly to a drain line in the building follow local code on the installation of an external trap.
- Connect condensate piping to 3/4" PVC for 160/200 or 1/2" PVC for 125/150 as shown.
- Slope condensate drain pipe minimum 1/4" per foot (21mm/m) away from boiler.
- Support condensate pipe to eliminate any sagging.
- Use field source condensate pump, designated for use with condensing boiler, if boiler located below disposal point.
- Condensate pump should have overflow switch. Condensate from Boiler is slightly acidic and may cause property damage if overflow.
- Manufacturer recommends the installation of a condensate neutralizer for all installations. Follow local code when to determine if a condensate neutralizer is required.

### ***NOTICE***

Manufacturer requires an air vent be used to prevent condensate line vacuum lock.

### ⚠ DANGER

Fire Hazard. Do not use matches, candles, open flames, or other methods providing ignition source. Failure to comply will result in death or serious injury.

### ⚠ WARNING

Fire, explosion, asphyxiation and burn hazard. Boiler piping and gas connections shall be leak tested before placing boiler in operation. Failure to follow these instructions and or improper installation could result in death or serious injury.

### ⚠ WARNING

If overheating occurs or gas supply fails to shut off, do not turn off or disconnect the electrical supply to the pump. Shut off gas supply at a location external to the appliance. Do not use this boiler if any part has been under water. Call a qualified service technician before use.

### ⚠ WARNING

Boiler and its individual shutoff valve must be disconnected from gas supply piping system during any pressure testing of that system at test pressures in excess of 1/2 psi (3.40 kPa - 34.47 mbar). Boiler must be isolated from the gas supply piping system by closing its individual manual shutoff valve during any pressure testing of gas supply piping system at test pressures equal to or less than 1/2 psi (3.5 kPa).

### ⚠ CAUTION

#### 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 gas supplier's instructions.
- If you cannot reach your gas supplier, call the fire department.

### NOTICE

If overheating occurs or gas supply fails to shut off, do not turn off or disconnect electrical supply to pump. Shut off gas supply at location external to the boiler.

### 7.1 General

- Use piping materials and joining methods acceptable to authority having jurisdiction. In absence of such requirements:
  - USA - National Fuel Gas Code, ANSI Z223.1/NFPA 54
- Install manual main shutoff valve before the gas valve accordance with state and local requirements.
- Size and install gas piping system to provide sufficient gas supply to meet maximum input at not less than minimum supply pressure.
- Gas meter and supply pipes must be capable of delivering the listed quantity of gas in addition to demand from any other appliances in the house. Boiler requires a 3/4" (19.5 mm) gas supply pipe.

Required Gas Line Pressures:

Models	Gas	Manifold*	Minimum Supply	Maximum Supply
All Models	Natural Gas	0 inches w.c. (0.0 kPa)	3.0 inches w.c. (0.7 kPa)	10.5 inches w.c. (3.3 kPa)
All Models	Propane Gas	0 inches w.c. (0.0 kPa)	5 inches w.c. (1.2 kPa)	13.5 inches w.c. (3.3 kPa)

\*REFERENCE ONLY.

Model	Gas Rate FT <sup>3</sup> /H (M <sup>3</sup> /H)	
	Nat.	LP
GMHB125	119.6 (3.38)	48.0 (1.35)
GMCB150	144.0 (4.08)	57.8 (1.64)
GMBH160	156.9 (4.44)	63.0 (1.78)
GMCB200	196.0 (5.55)	78.7 (2.22)

- Support piping with hooks straps, bands, brackets, hangers, or building structure components to prevent or dampen excessive vibrations and prevent strain on gas connection. Boiler will not support piping weight.
- Use thread (joint) compound (pipe dope) suitable for liquefied petroleum gas.
- Install external manual main gas shutoff valve and field supplied ground joint union, and sediment trap upstream of gas controls. See Figure 7-1.
- Install boiler so gas ignition system components are protected from water dripping, spraying, rain, etc. During appliance operation and service.
- Leak test boiler and gas line connections before placing boiler into operation.



### NOTICE

Sediment trap shall be located upstream of gas controls.

**FIGURE 7-1 GAS LINE CONNECTION WITH MANUAL MAIN SHUTOFF VALVE WITH UNION AND SEDIMENT TRAP**

Illustration shown (GMCB150)



**Supplied external manual main gas shutoff valve (shown in open position) with field supplied union, and sediment trap**

### 7.2 Leak Check Gas Piping

Pressure test boiler and gas connection before placing boiler in operation.

- Pressure test over 1/2 psig (3.5 kPa). Disconnect boiler and its individual gas shutoff valve from gas supply system.
- Pressure test at 1/2 psig (3.5 kPa) or less. Isolate boiler from gas supply system by closing manual gas shutoff valve.
- Locate leakage using gas detector, noncorrosive detection fluid, or other leak detection method acceptable to authority having jurisdiction. Do not use matches, candles, open flames, or other methods that can provide ignition source.
- Correct leaks immediately and retest.

## 8 - ELECTRICAL CONNECTIONS

### ⚠ DANGER

Electrocution Hazard! HIGH VOLTAGE - Connections in terminal block M1 are high voltage (120V / 60Hz). Before making connections, verify appliance is disconnected from power supply. Respect the input polarity on terminal block M1: L (LINE) - N (NEUTRAL). Failure to follow these instructions WILL result in death or serious injury.

### ⚠ WARNING

Electrical shock hazard. Turn OFF electrical power supply at service panel before making electrical connections. Failure to do so could result in death or serious injury.

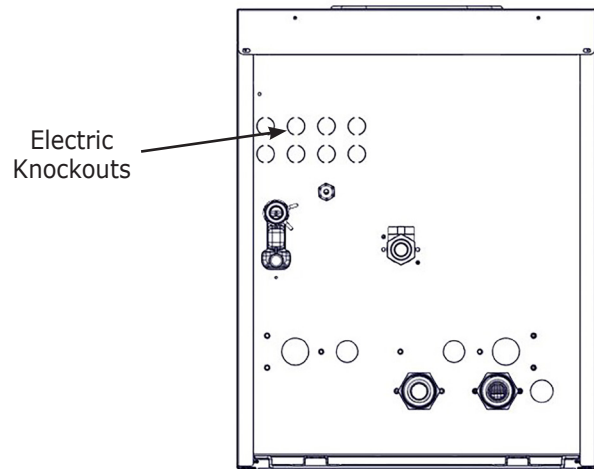
Model Size	125	150	160	200
Power Supply	120V - 60Hz			
Power Consumption	133 W	142 W	173 W	182 W
Internal Fuse (Qty. 2)	F3.15 A			
Electrode Spark Gap	1/8" to 3/16" [3.1mm to 4.7mm]			

#### Note

Wiring diagrams can be found in Appendix A of this Manual. Minimum breaker sizing 15 Amp.

#### FIGURE 8-1 ELECTRIC KNOCKOUTS BOTTOM OF BOILER

Illustration shown (size 200), illustration is for location purposes, wiring knockouts found same general location on all sizes.



### 8.1 General

Electrically bond boiler to ground in accordance with requirements of authority having jurisdiction. Refer to:

- USA- National Electrical Code, ANSI/NFPA 70.
- Install all wiring in accordance with requirements of National Electrical Code and any additional national, state, or local code requirements having jurisdiction. All wiring shall be N.E.C. Class 1.
- Boiler shall be electrically grounded in accordance with the National Electrical Code, ANSI/NFPA No. 70-latest edition.
- Boiler requires a 120V 60Hz power supply. Ensure electrical supply is polarized.
- There shall only be one common circuit breaker, providing complete electrical isolation, for boiler and any external controls. Using PVC insulated cable with a minimum 12 AWG x 3C 221°F (105 °C). Always follow local electrical code when installing the boiler.

### 8.2 Electrical Connections

- Boiler requires 120V 60Hz power supply. Verify electrical supply is polarized.
- Boiler shall be grounded and on dedicated circuit.
- All wiring must be installed in accordance with requirements of the National Electrical Code and any additional national, state, or local code requirements having jurisdiction. All wiring must be N.E.C. Class 1.
- Canada, installation must conform to CSA C22.1 Canadian Electrical Code Part 1 and any local codes.
- If replacing original boiler wiring use only TEW 105°C or equivalent.
- If appliance is connected to in floor system, install limit thermostat to prevent latter from overheating.
- Use PVC insulated cable, follow all local codes for wire sizing.

## ⚠ DANGER

Electrocution Hazard! HIGH VOLTAGE - Connections in terminal block M1 are high voltage (120V / 60Hz). Before making connections, verify appliance is disconnected from power supply. Respect the input polarity on terminal block M1: L (LINE) - N (NEUTRAL). Failure to follow these instructions WILL result in death or serious injury.

### 8.3 Access To Connection Block

1. Ensure there is no line voltage (electrical power) at boiler.
2. Unscrew two screws located under front panel. Remove front cover.
3. Guide controller or thermostat wire through round rubber grommet(s) on left side of boiler's bottom plate right.
4. Tilt control box forward by opening the holding clip located on left side of boiler.
5. Expose M1 and M2 terminal blocks by removing the two (2) screws from plastic cover on left. See Figure 8-3.
6. Remove plastic from channel in plastic cover. Run the wires through the new opening.
7. Connect the wires to appropriate terminals on connection block.
8. Tilt control box back to original position. Ensure clip on left side is fully engaged.
9. Replace front cover and screws under front panel.
10. Turn power to boiler on.

Various thermostats and controllers can be connected to standard control PCB.

### 8.4 Main Supply Connection

Main supply is connected to terminal block **M1** which is high voltage (120V / 60Hz).

Fuses, 3.15 A, are incorporated in the power supply terminal block. To check or replace fuse pull out black fuse carrier.

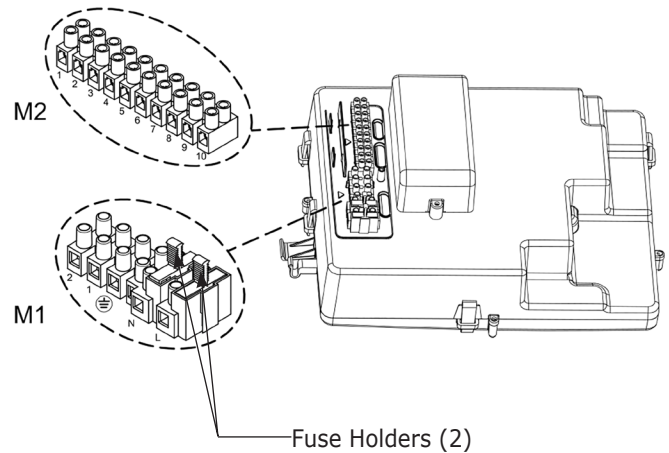
#### TERMINAL BLOCK M1

- (L) = Live (brown)
- (N) = Neutral (light blue).
- = Ground (yellow-green).

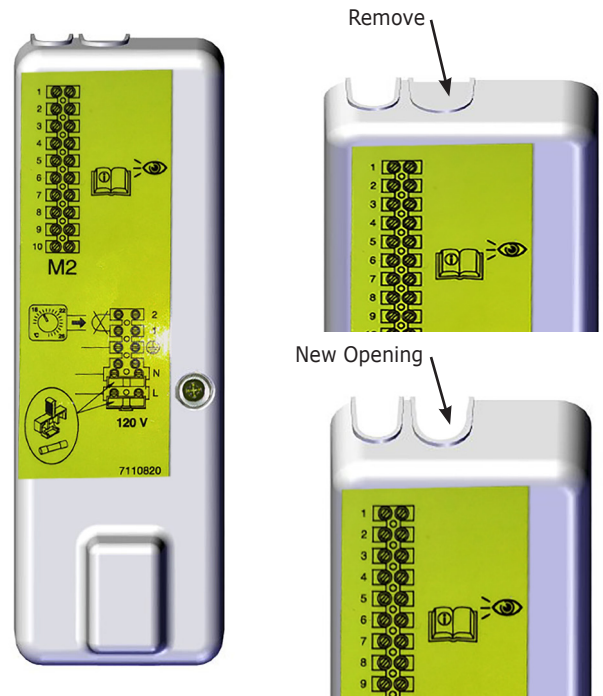
#### TERMINAL BLOCK M2

- Terminals 1 - 2:** Not used
- Terminals 4 - 5:** outdoor temperature sensor connection (supplied as accessory)
- Terminal 3 :** Not Used
- Terminals 6 - 7 - 8:** see section 8.5 for 24V T-Stat.
- Terminals 9 - 10:** Indirect storage tank sensor connection for GMHB125 & GMHB160 models.

**FIGURE 8-2 TERMINAL BLOCK LOCATIONS**



**FIGURE 8-3 TERMINAL PLASTIC COVER WITH KNOCKOUTS**



# 8 - ELECTRICAL CONNECTIONS

## 8.5 Install Room Thermostat

Install room thermostat on inside wall. Do not install where it will be influenced by drafts, hot or cold water pipes, lighting fixtures, television, sun rays or near a fireplace.

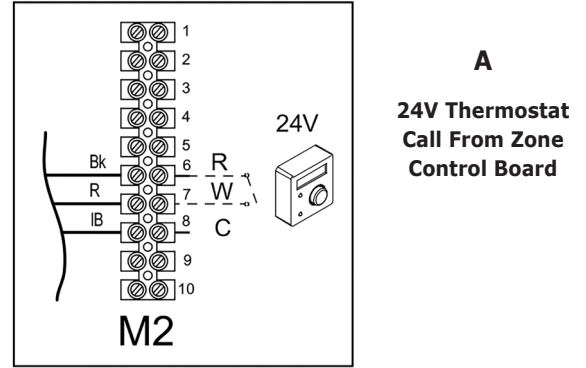
**Dry contact only - do not apply 24 volts between 6 and 7.**

### A. Connect 24V Heat Call

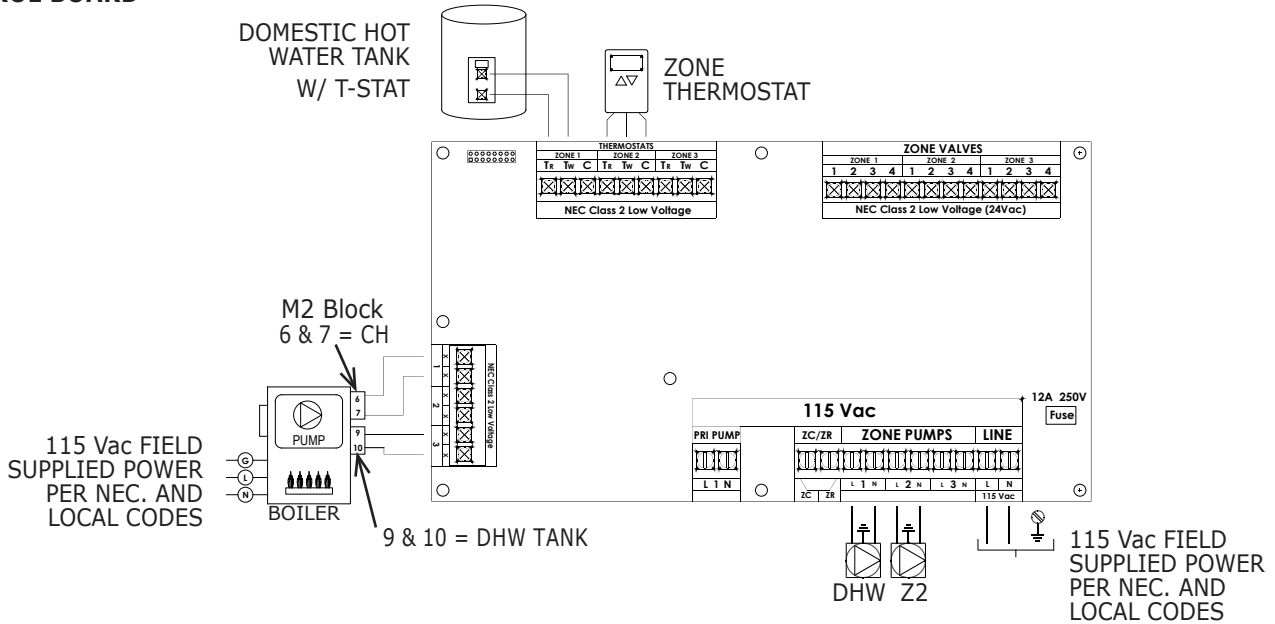
- turn power off to boiler;
- access terminal block **M2**;
- Dry contact 6(R)-7(W)-8(C) heat call connection.
- turn boiler power on;
- verify room thermostat operates per thermostat manufacturer instructions.

**NOTE:** maximum load allowed is 10 mA

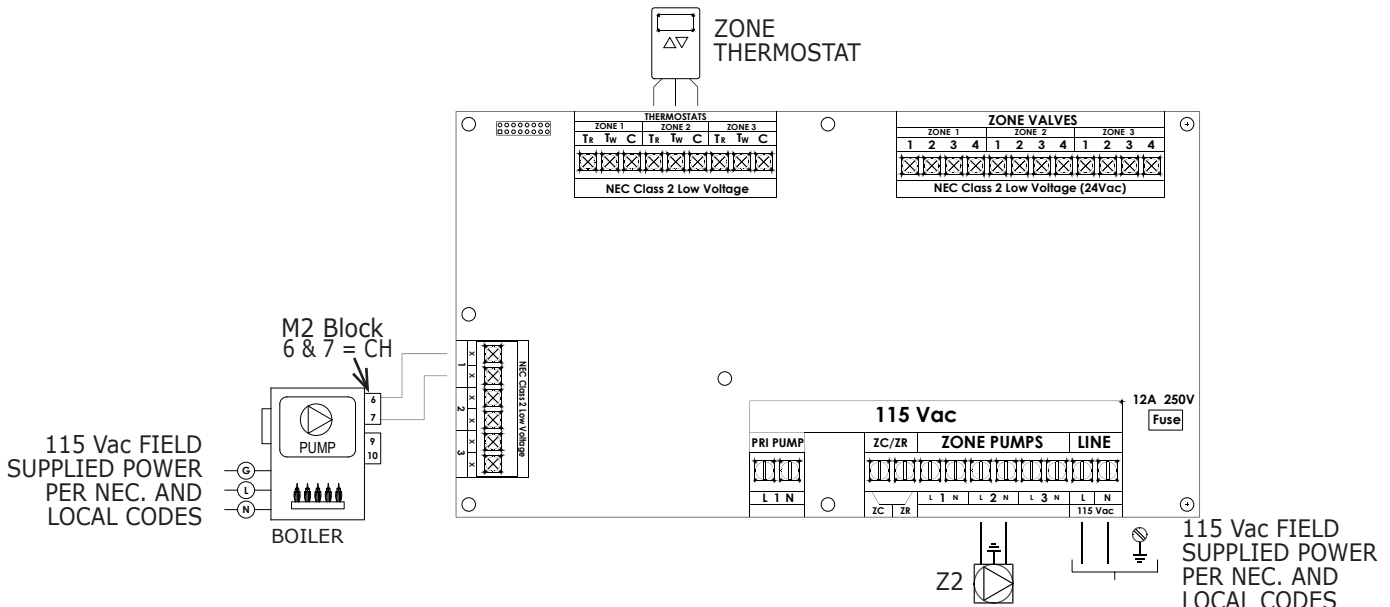
**FIGURE 8-4 THERMOSTAT CONNECTIONS**



**FIGURE 8-5 HEAT ONLY BOILER WITH INDIRECT ZONE PUMP, DHW TANK, TANK T-STAT W/ TYPICAL ZONE CONTROL BOARD**



**FIGURE 8-6 COMBI BOILER WITH TYPICAL ZONE CONTROL**



## 8.6 Optional Electrical Connections

### A. 1K OHM Outdoor Temperature Sensor

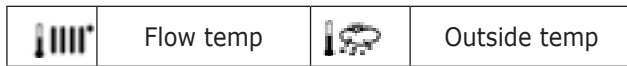
To connect this accessory, see Figure 8-7, terminals 4-5, and instructions supplied with sensor. See Chart 1 - 1K  $\Omega$  Outdoor Air Sensor Data.

- a. Boiler automatically recognizes sensor when used.
- b. See Chart 1 for sensor data. Sensor part number BD710487302V
- c. Locate outdoor sensor to protect against wind and direct sunlight. Mounting instructions provided with sensor.
- d. Maximum wire length is 100 ft (30m) for 22 ga. wire, or 150 ft (45m) for 18 ga. wire.
- e. Connect wires to M2 OUTDOOR SENSOR terminals 4 & 5. Wires are interchangeable. See Accessories.

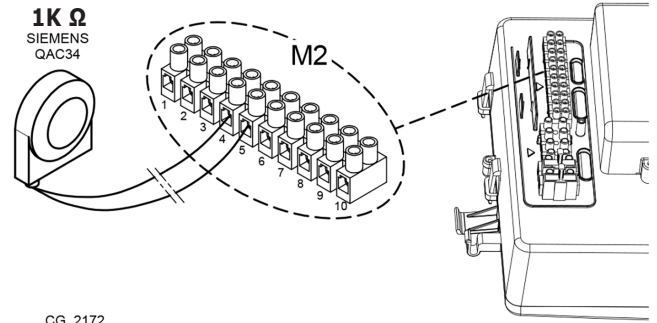
### B. Setting "Kt" Climate Curve

When external sensor is connected to boiler, the electronic board adjusts the flow temperature calculated according to set **Kt** coefficient.

Select required curve by rotating right knob as indicated in chart below for selecting the appropriate curve (00 to 90).



**FIGURE 8-7 1K  $\Omega$  OUTDOOR SENSOR CONNECTIONS**

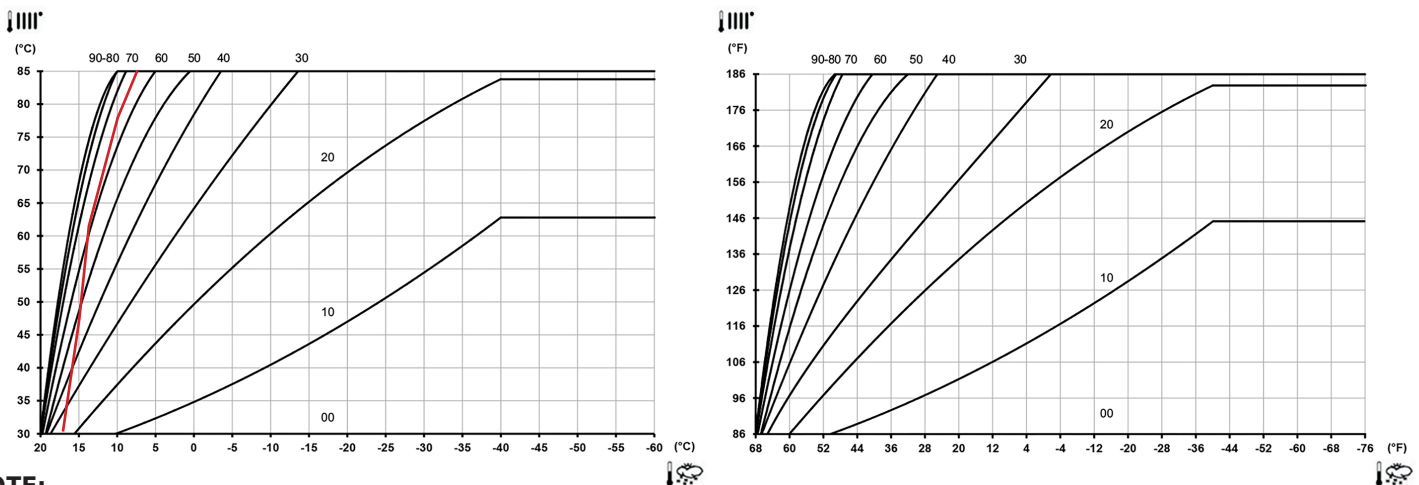


CG\_2172

### C. Optional 10K $\Omega$ Indirect Tank Sensor Resistance - See chart 2

**FIGURE 8-8 KT CLIMATE CURVES**

(Factory Default = 80)



**NOTE:**

Temperatures below -40 °F (-40 °C), maximum heating flow temperature set point no longer increases, curves shown on graph become horizontal.

## 8 - ELECTRICAL CONNECTIONS

### Optional Equipment

**IMPORTANT:** Sensors supplied with this boiler are proprietary to the manufacturer. Use of alternate market sensors *WILL* diminish boiler performance.

CHART 1 - 1k Ω OUTDOOR AIR SENSOR DATA			
T [°F]	R [Ohm]	T [°F]	R [Ohm]
-4.0	7,578	53.6	1,690
-2.2	7,193	55.4	1,621
-0.4	6,831	57.2	1,555
1.4	6,489	59.0	1,492
3.2	6,166	60.8	1,433
5.0	5,861	62.6	1,375
6.8	5,574	64.4	1,321
8.6	5,303	66.2	1,268
10.4	5,046	68.0	1,218
12.2	4,804	69.8	1,170
14.0	4,574	71.6	1,125
15.8	4,358	73.4	1,081
17.6	4,152	75.2	1,040
19.4	3,958	77.0	1,000
21.2	3,774	78.8	962
23.0	3,600	80.6	926
24.8	3,435	82.4	892
26.6	3,279	84.2	858
28.4	3,131	86.0	827
30.2	2,990	87.8	796
32.0	2,857	89.6	767
33.8	2,730	91.4	740
35.6	2,610	93.2	713
37.4	2,496	95.0	687
39.2	2,387	96.8	663
41.0	2,284	98.6	640
42.8	2,186	100.4	617
44.6	2,093	102.2	595
46.4	2,004	100.4	617
48.2	1,920	102.2	595
50.0	1,840	104.0	575
51.8	1,763	106.0	556

CHART 2 - 10k Ω INDIRECT TANK SENSOR DATA			
T [°F]	R [Ohm]	T [°F]	R [Ohm]
32.0	32,505	86.0	8,060
33.8	30,898	87.8	7,726
35.6	29,381	89.6	7,407
37.4	27,946	91.4	7,103
39.2	26,590	93.2	6,813
41.0	25,308	95.0	6,537
42.8	24,094	96.8	6,273
44.6	22,946	98.6	6,021
46.4	21,859	100.4	5,781
48.2	20,829	102.2	5,551
50.0	19,854	104.0	5,332
51.8	18,930	105.8	5,123
53.6	18,054	107.6	4,923
55.4	17,223	109.4	4,732
57.2	16,436	111.2	4,549
59.0	15,689	113.0	4,374
60.8	14,980	114.8	4,207
62.6	14,306	116.6	4,047
64.4	13,667	118.4	3,894
66.2	13,060	120.2	3,748
68.0	12,483	122.0	3,608
69.8	11,935	123.8	3,473
71.6	11,414	125.6	3,345
73.4	10,919	127.4	3,222
75.2	10,447	129.2	3,104
77.0	9,999	131.0	2,991
78.8	9,572	132.8	2,882
80.6	9,166	134.6	2,778
82.4	8,779	136.4	2,679
84.2	8,411	138.2	2,583

## 8.7 Indirect Storage Tank

Boiler GMHB125 can be electrically connected to indirect storage tank as follows:

- Connect DHW priority sensor **10k Ω** NTC to terminals **9-10** on terminal block **M2**.
- Insert **10k Ω** NTC sensor element in the sensor well of indirect storage tank.
- Verify exchange capacity of the storage boiler coil is appropriate for boiler power.
- Adjust DHW temperature +95 °F...+140 °F (+35 °C...+60 °C) by rotating left knob on boiler Control.

**IMPORTANT: set parameter P03 as described in: "PARAMETER SETTINGS".**

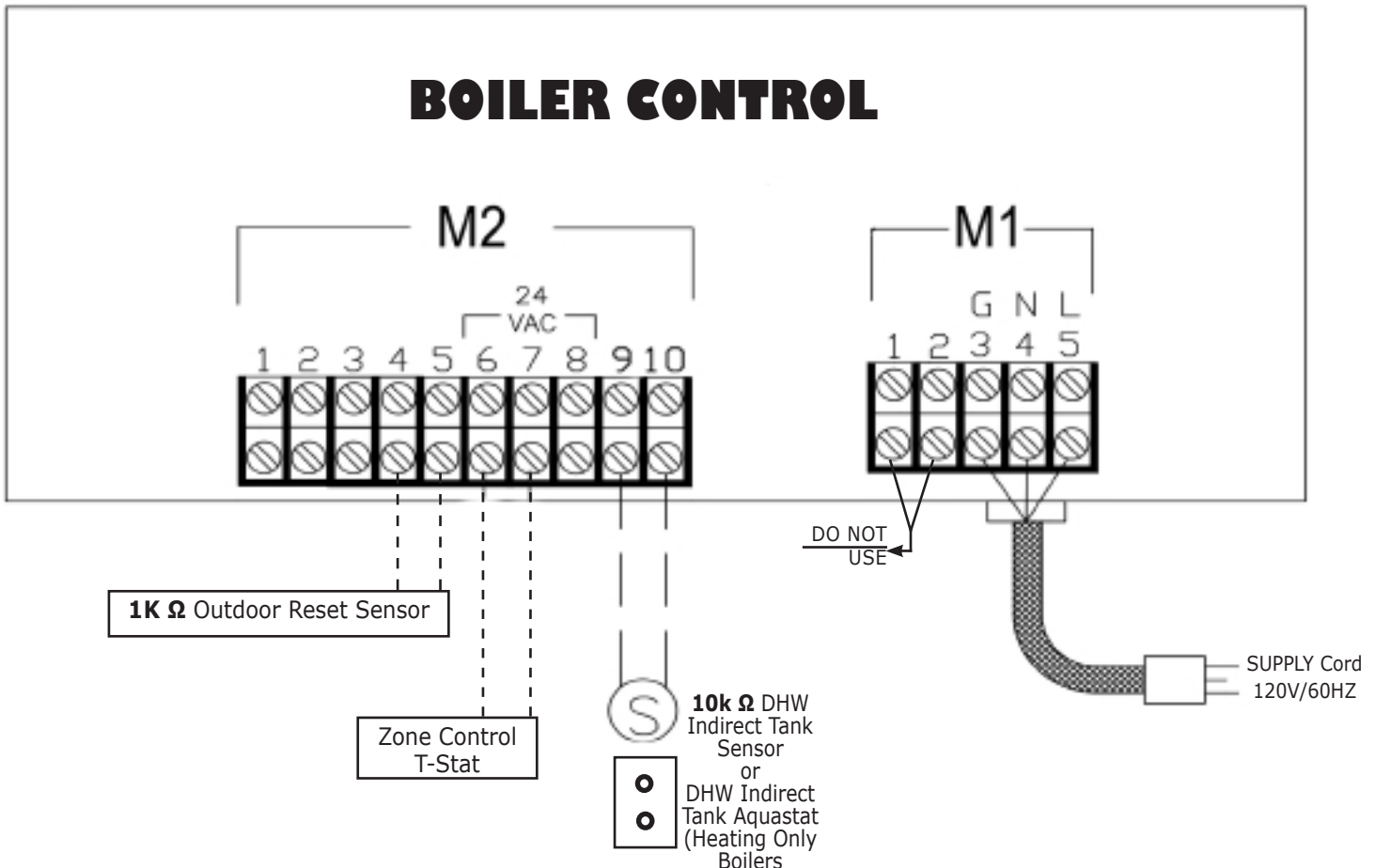
<b>A</b>	Heating system
<b>B</b>	Three way diverter valve
<b>C</b>	Heating water flow
<b>D</b>	Heating supply to DHW indirect storage tank coil
<b>E</b>	Heating water return
<b>F</b>	Tank
<b>G</b>	Optional DHW priority sensor tank

**Note**

Sensors supplied with this boiler are proprietary to the manufacturer. Use of alternate sensors *WILL* diminish boiler performance.

### Use of Indirect Storage Tank (DHW):

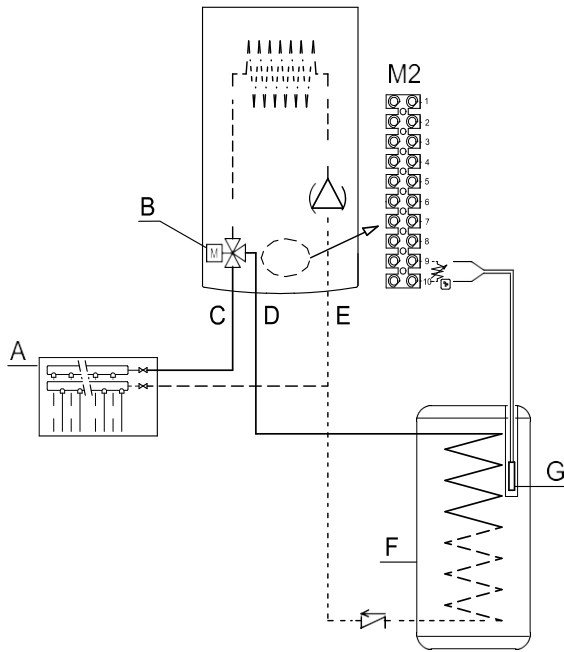
- Use either **10k Ω** DHW sensor or Indirect Tank Thermostat to interface with boiler. Wire to M2 terminals #9 and #10.
- Use of booster pump to increase flow rate to indirect tank is not recommended by manufacturer. (125 only)
- Locate tank as close to boiler as possible.
- Size DHW tank, piping, and system to use only internal boiler pump.
- Change P03 on boiler for application as specified on the wire diagram and Boiler Control section of Installation, Operation & Maintenance Manual supplied with the boiler.



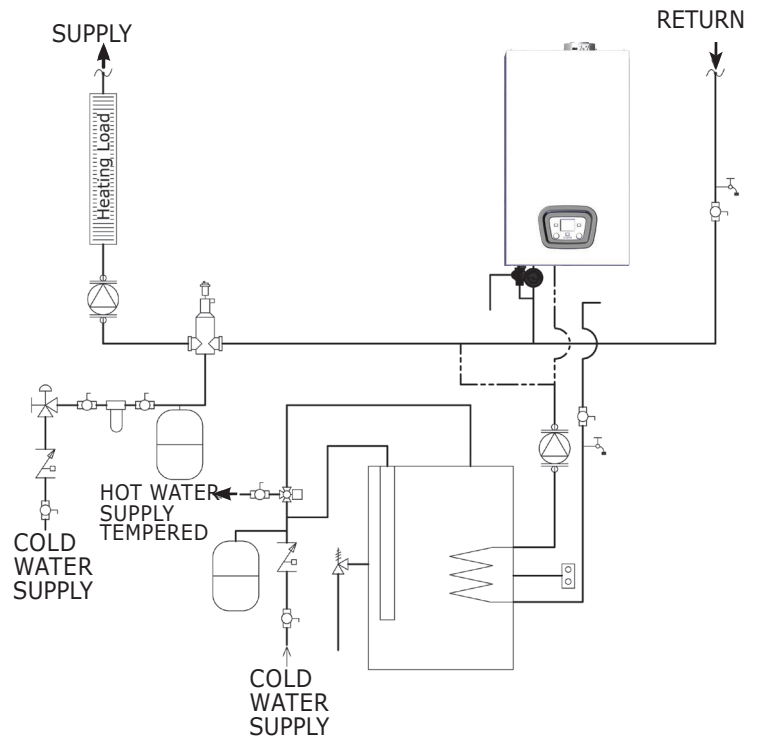
## 8 - ELECTRICAL CONNECTIONS

**FIGURE 8-9 KT INDIRECT STORAGE TANK (MODEL GMHB125)**

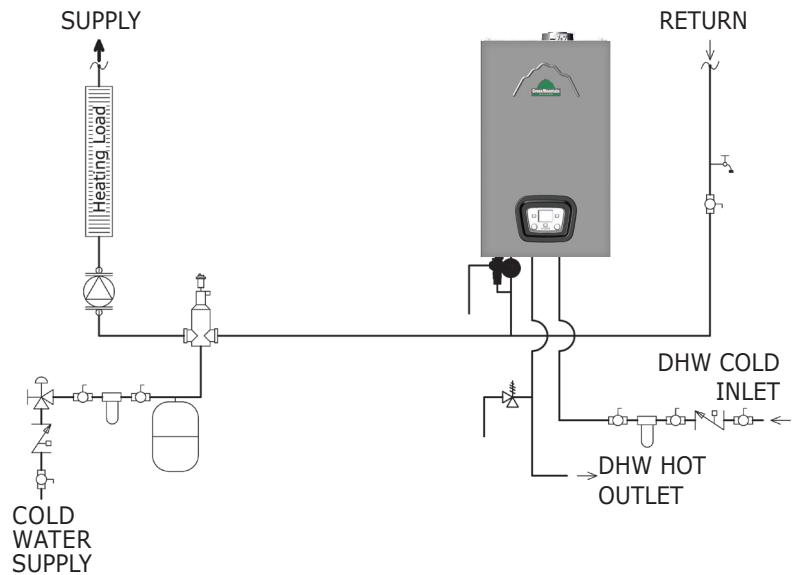
\*GMHB125 Model shown -



**FIGURE 8-10 HEAT ONLY BOILER WITH ZONE CIRCULATOR PUMPS & INDIRECT TANK (160 ONLY)**



**FIGURE 8-11 COMBI BOILER WITH ZONE CIRCULATOR PUMP**



### PIPING LEGEND

	BALL VALVE		INDIRECT DHW TANK AQUASTAT		TEMPERATURE & PRESSURE
	AIR SEPERATOR		FLOW CHECK VALVE		EXPANSION TANK
	CIRCULATOR		BYPASS VALVE		FLAT PLATE HEAT EXCHANGE (COMBI ONLY)
	DRAIN		DIVERTER VALVE		STRAINER
	COMBINATION FILL		T&P or RELIEF VALVE		INDIRECT DHW TANK
			THERMOSTATIC MIXING		

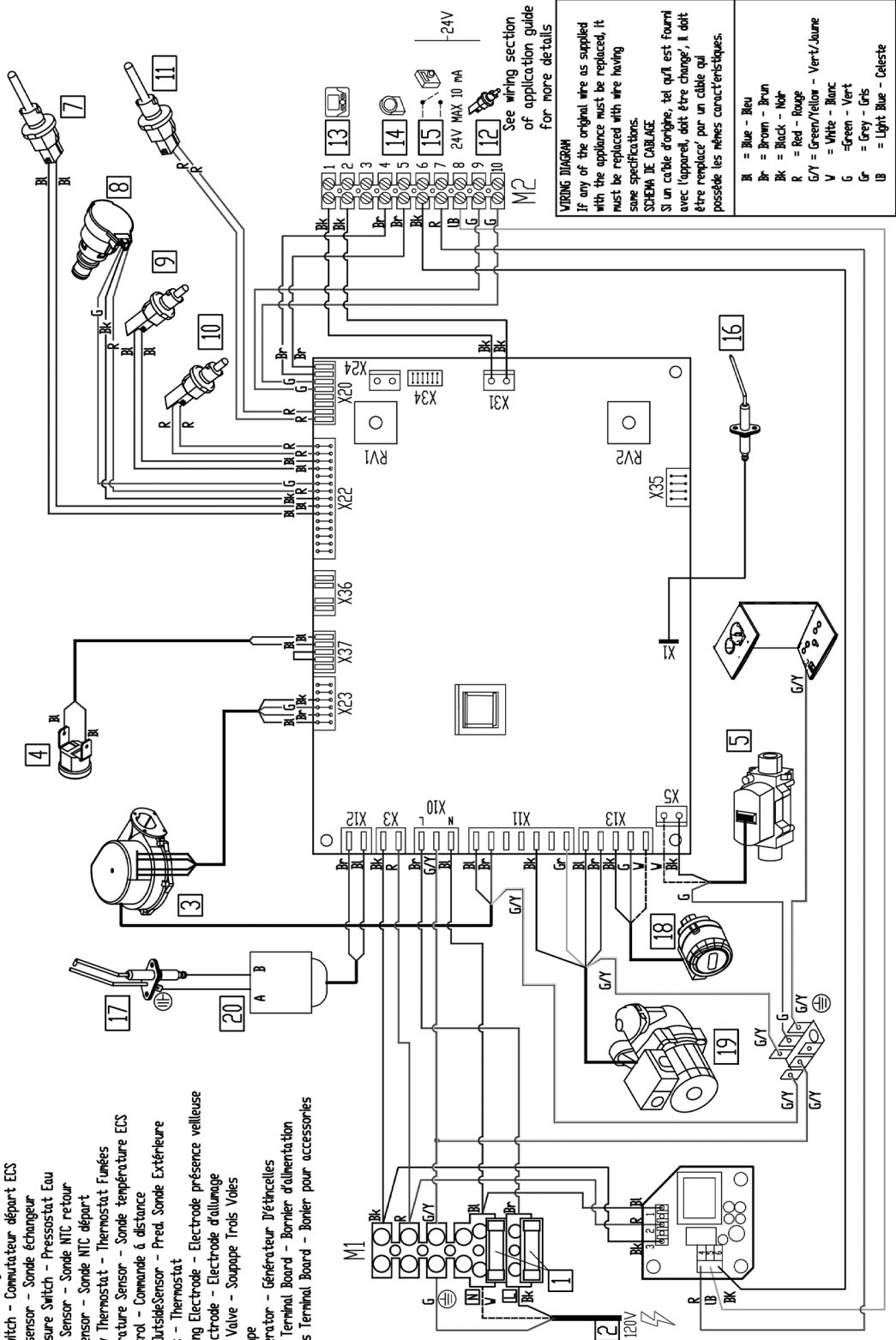


FIGURE 8-12A

**WIRE DIAGRAM  
GMHB125 CENTRAL HEAT BOILER**

LEGEND - LEGENDE:

- 1-FUSES 2, 15 A - Fusibles 2, 15 A
- 2-Supply 120V - 60Hz - Alimentation
- 3-Fan - Ventilator
- 4-Safety Thermostat - Thermostat de Sécurité
- 5-Gas Valve - Vanne à gaz
- 6-10HV Flow Switch - Commutateur départ ECS
- 7-Exchanger sensor - Sonde échangeur
- 8-Water Pressure Switch - Pressostat Eau
- 9-NTC return Sensor - Sonde NTC retour
- 10-NTC flow sensor - Sonde NTC départ
- 11-Flue Safety Thermostat - Thermostat Fumées
- 12-10HV temperature Sensor - Sonde température ECS
- 13-Remotecontrol - Commande à distance
- 14-Prov. for DrivisideSensor - Pred. Sonde Extérieure
- 15-Thermostat - Thermostat
- 16-Flame Sensing Electrode - Electrode présence veilleuse
- 17-Ignition Electrode - Electrode d'allumage
- 18-Three Way Valve - Soupape Trois Voles
- 19-Pump - Pompe
- 20-Spark Generator - Générateur d'étincelles
- M1-Hub Power Terminal Board - Bornier d'alimentation
- M2-Accessories Terminal Board - Bornier pour accessoires



**WIRING DIAGRAM**  
If any of the original wire as supplied with the appliance must be replaced, it must be replaced with wire having same specifications.  
**SCHEMA DE CABLAGE**  
Si un câble d'origine, tel qu'il est fourni avec l'appareil, doit être changé, il doit être remplacé par un câble qui possède les mêmes caractéristiques.

B	= Blue - Bleu
Br	= Brown - Brun
Bk	= Black - Noir
R	= Red - Rouge
G/Y	= Green/Yellow - Vert/Jaune
V	= White - Blanc
G	= Green - Vert
Gr	= Grey - Gris
LB	= Light Blue - Céleste

P/N: 240012240  
REVISION: B

FIGURE 8-12B

# LADDER DIAGRAM GMHB125 CENTRAL HEAT BOILER

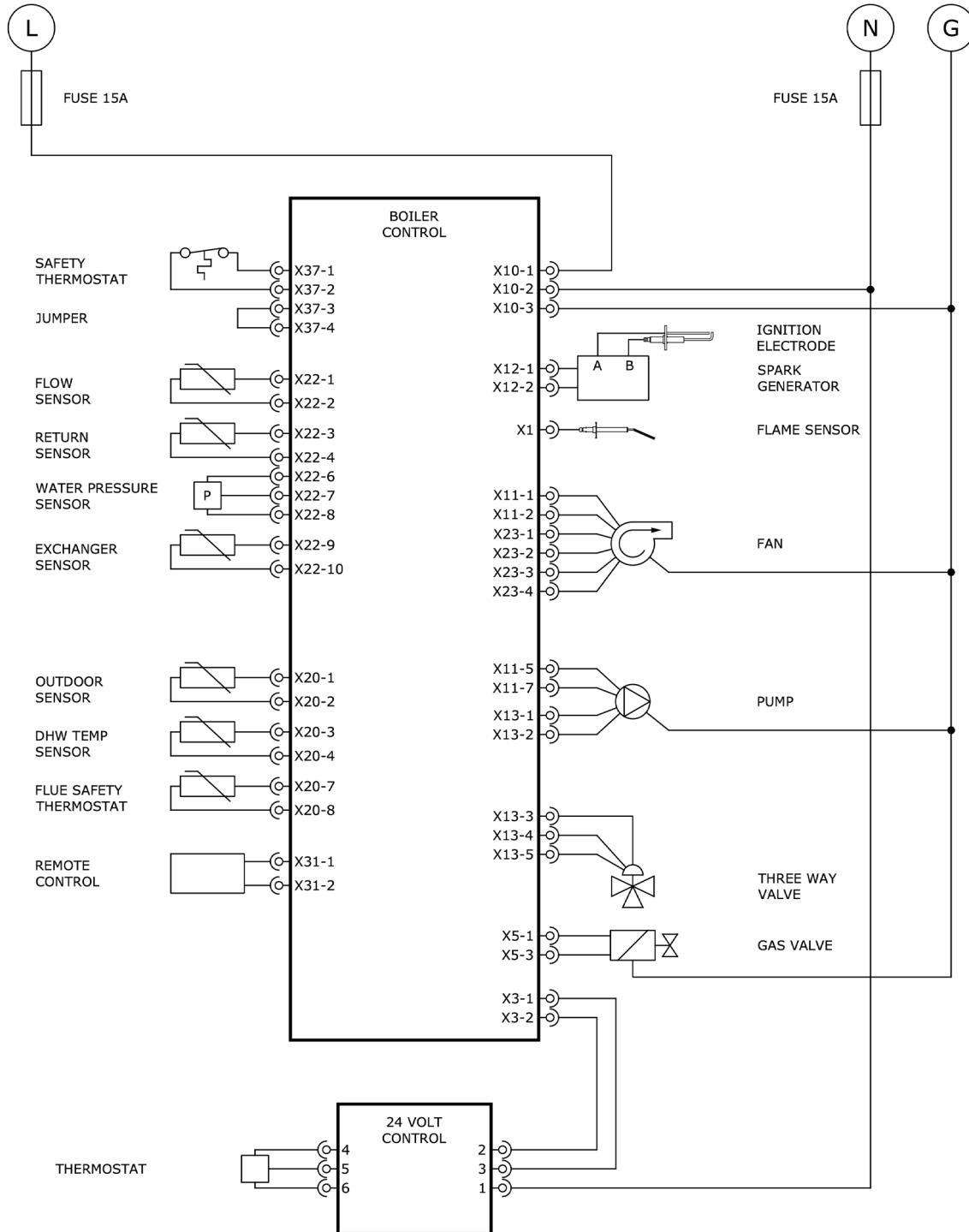
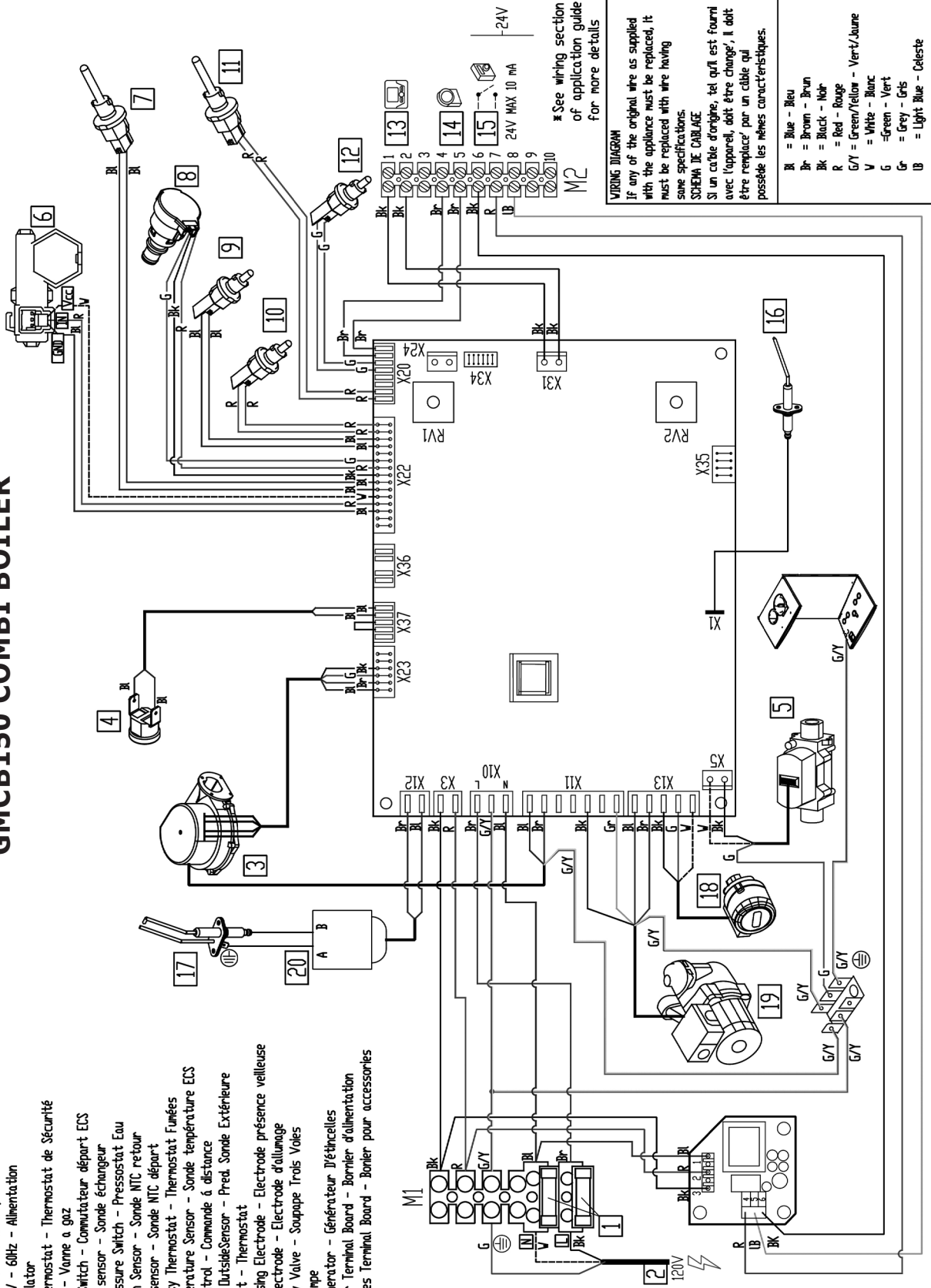


FIGURE 8-13A

**WIRE DIAGRAM  
GMCB150 COMBI BOILER**

**LEGEND - LEGENDE**

- 1-FUSES 2, 15 A - Fusibles 2, 15 A
- 2-Supply 120V - 60Hz - Alimentation
- 3-Fan - Ventilator
- 4-Safety Thermostat - Thermostat de Sécurité
- 5-Gas Valve - Vanne a gaz
- 6-JHM Flow Switch - Commutateur départ ECS
- 7-Exchanger sensor - Sonde échangeur
- 8-Water Pressure Switch - Pressostat Eau
- 9-NTC return Sensor - Sonde NTC retour
- 10-NTC flow sensor - Sonde NTC départ
- 11-Flue Safety Thermostat - Thermostat Fumées
- 12-JHM temperature Sensor - Sonde température ECS
- 13-Remotecontrol - Commande à distance
- 14-Prev. for OutsideSensor - Pred. Sonde Extérieure
- 15-Thermostat - Thermostat
- 16-Flame Sensing Electrode - Electrode présence veilleuse
- 17-Ignition Electrode - Electrode d'allumage
- 18-Three Way Valve - Soupape Trois Voies
- 19-Pump - Pompe
- 20-Spark Generator - Générateur d'étincelles
- M1-Main Power Terminal Board - Bornier d'alimentation
- M2-Accessories Terminal Board - Bornier pour accessoires



\* See wiring section of application guide for more details.

**WIRING DIAGRAM**  
If any of the original wire as supplied with the appliance must be replaced, it must be replaced with wire having same specifications.  
**SCHEMA DE CÂBLAGE**  
Si un câble d'origine, tel qu'il est fourni avec l'appareil, doit être changé, il doit être remplacé par un câble qui possède les mêmes caractéristiques.

Bk	= Blue - Bleu
Br	= Brown - Brun
Bk	= Black - Noir
R	= Red - Rouge
G/Y	= Green/Yellow - Vert/Jaune
V	= White - Blanc
G	= Green - Vert
Gr	= Grey - Gris
IB	= Light Blue - Céleste

FIGURE 8-13B

# LADDER DIAGRAM GMCB150 COMBI BOILER

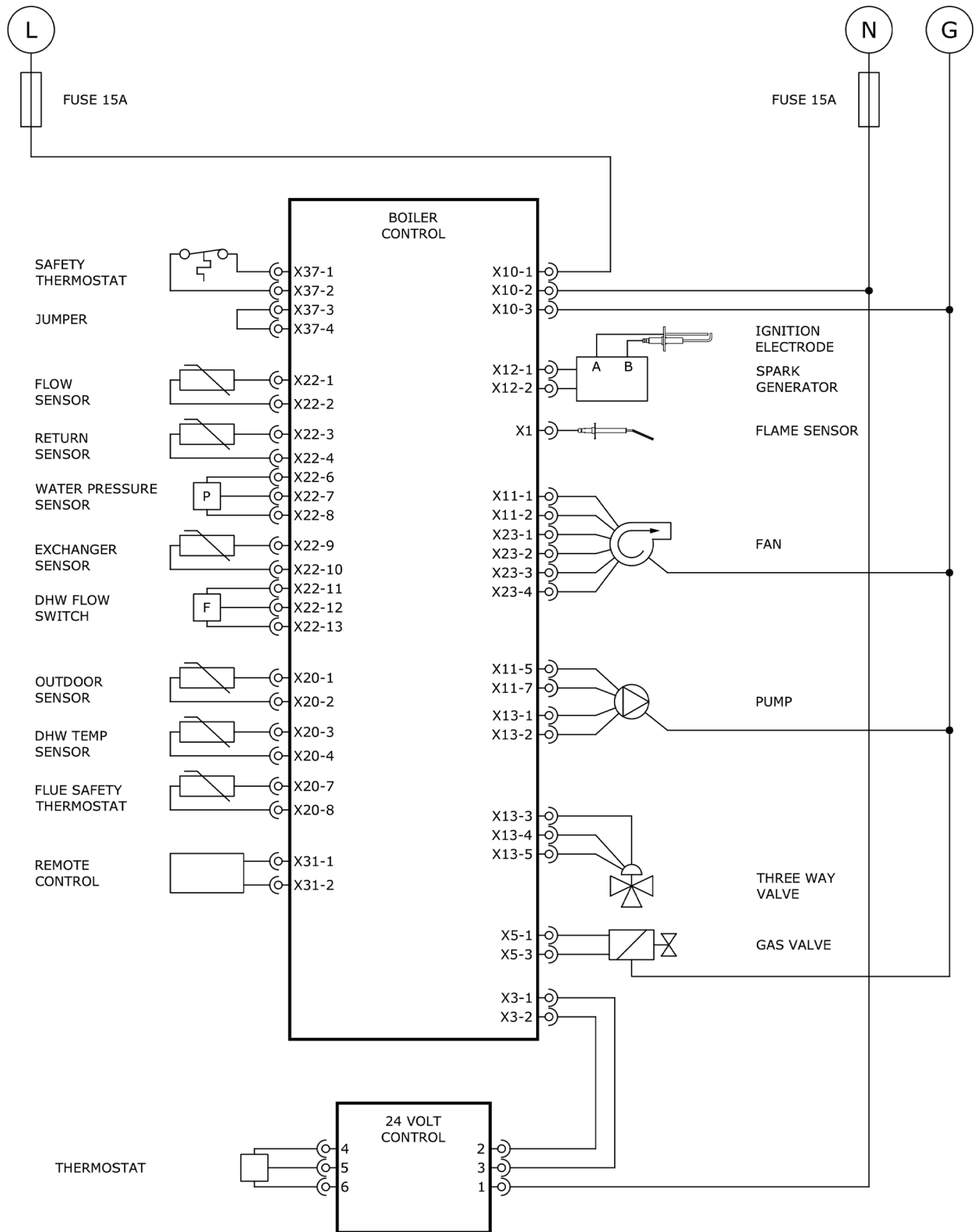
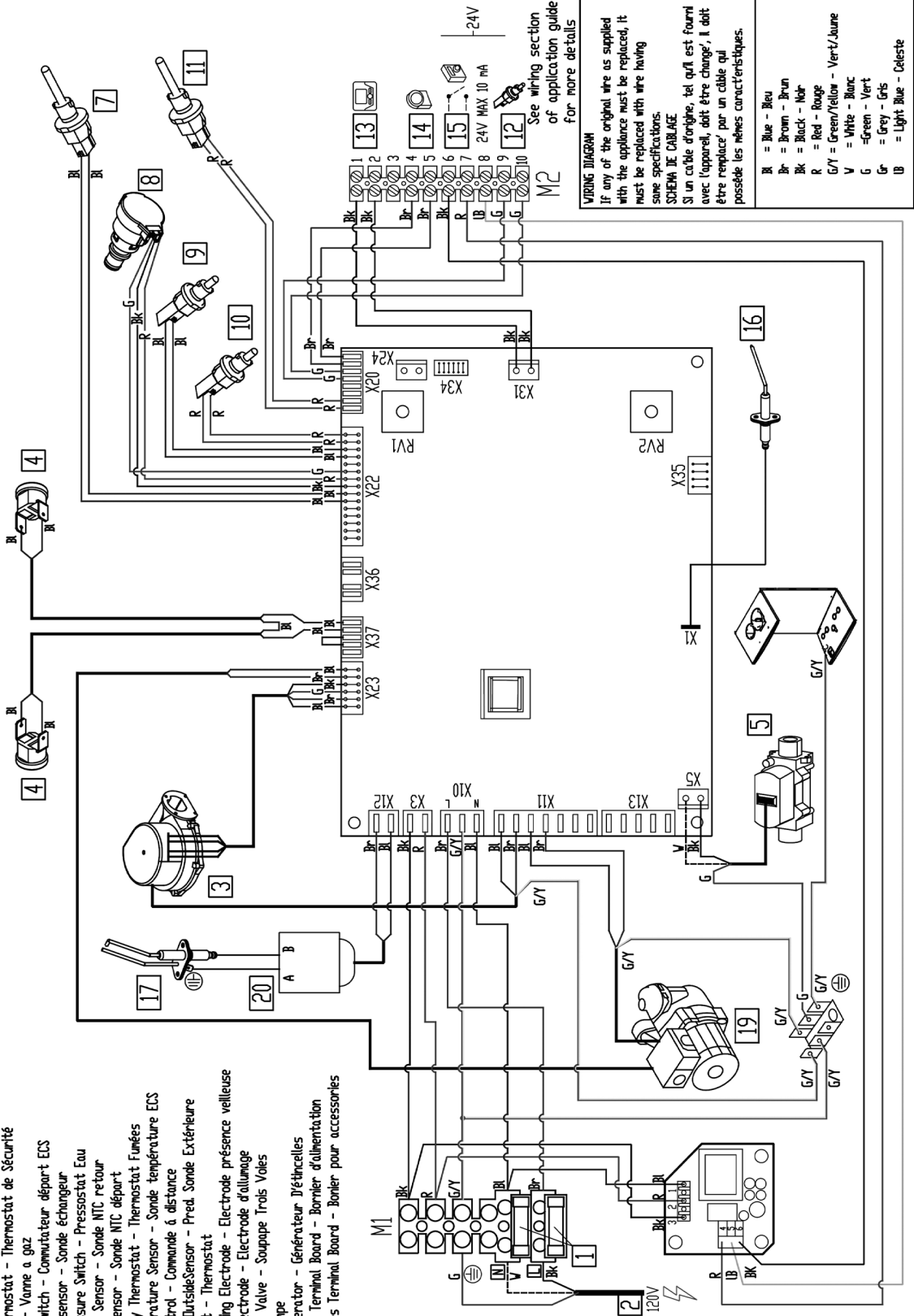


FIGURE 8A-14A

**WIRE DIAGRAM  
GMHB160 CENTRAL HEAT BOILER**

**LEGEND - LEGENDE:**

- 1-FUSES 2, 15 A - Fusibles 2, 15 A
- 2-Supply 120V - 60Hz - Alimentation
- 3-Fan - Ventilator
- 4-Safety Thermostat - Thermostat de Sécurité
- 5-Gas Valve - Vanne a gaz
- 6-JHM Flow Switch - Commutateur départ ECS
- 7-Exchanger sensor - Sonde échangeur
- 8-Water Pressure Switch - Pressostat Eau
- 9-NTC return Sensor - Sonde NTC retour
- 10-NTC flow sensor - Sonde NTC départ
- 11-Flue Safety Thermostat - Thermostat Fumées
- 12-JHM temperature Sensor - Sonde température ECS
- 13-Remotcontrol - Commande à distance
- 14-Prov. for DutsideSensor - Pred. Sonde Extérieure
- 15-Thermostat - Thermostat
- 16-Flame Sensing Electrode - Electrode présence veilleuse
- 17-Ignition Electrode - Electrode d'allumage
- 18-Three Way Valve - Soupape Trois Voies
- 19-Pump - Pompe
- 20-Spark Generator - Générateur d'étincelles
- M1-Main Power Terminal Board - Bornier d'alimentation
- M2-Accessories Terminal Board - Bornier pour accessoires



**WIRING DIAGRAM**  
If any of the original wire as supplied with the appliance must be replaced, it must be replaced with wire having same specifications.  
**SCHEMA DE CABLAGE**  
Si un câble d'origine, tel qu'il est fourni avec l'appareil, doit être changé, il doit être remplacé par un câble qui possède les mêmes caractéristiques.

**Color Code:**  
 Bk = Blue - Bleu  
 Br = Brown - Brun  
 Bk = Black - Noir  
 R = Red - Rouge  
 G/Y = Green/Yellow - Vert/Jaune  
 V = White - Blanc  
 G = Green - Vert  
 Gr = Grey - Gris  
 LB = Light Blue - Céleste

FIGURE 8-14B

### LADDER DIAGRAM GMHB160 CENTRAL HEAT BOILER

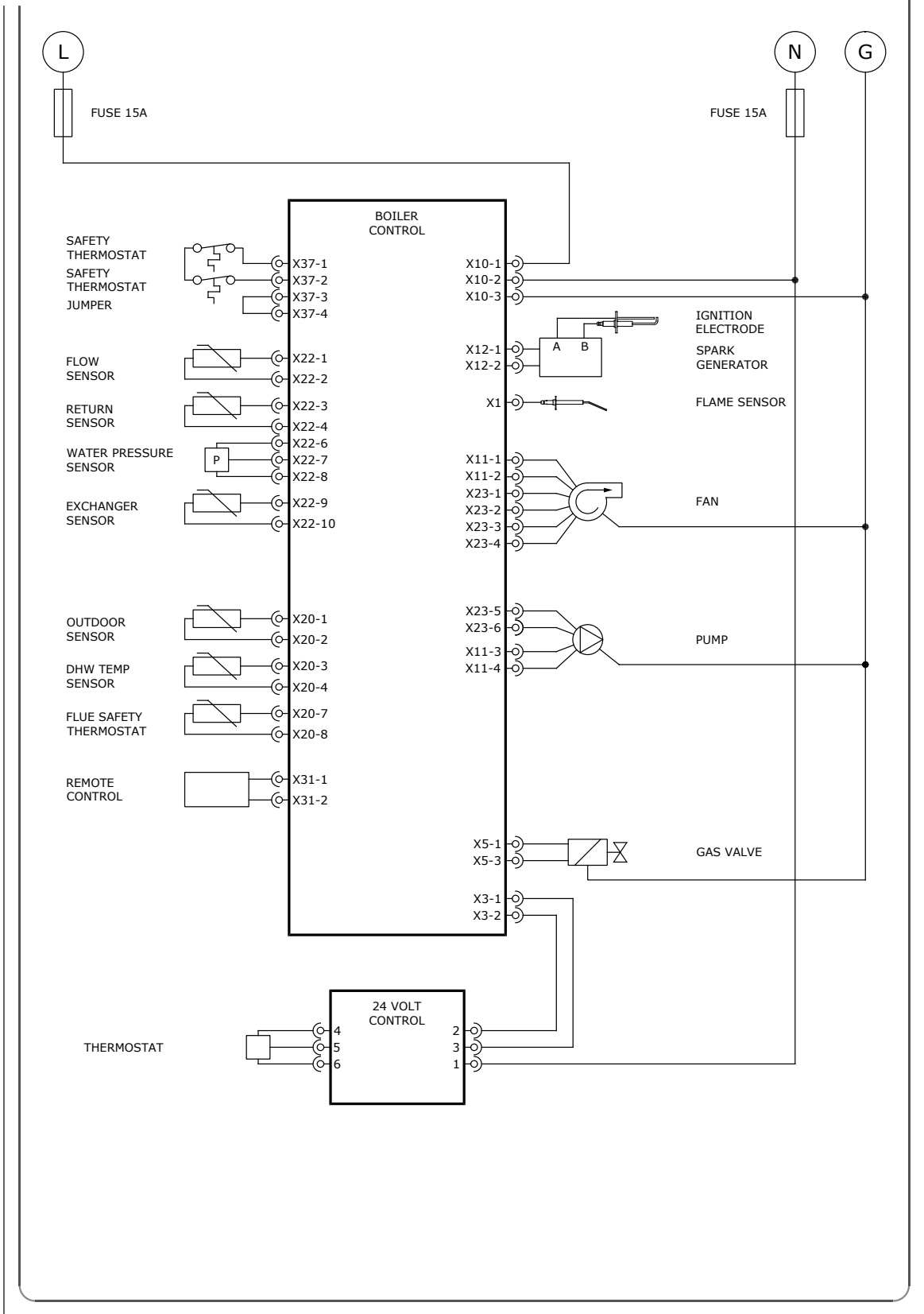
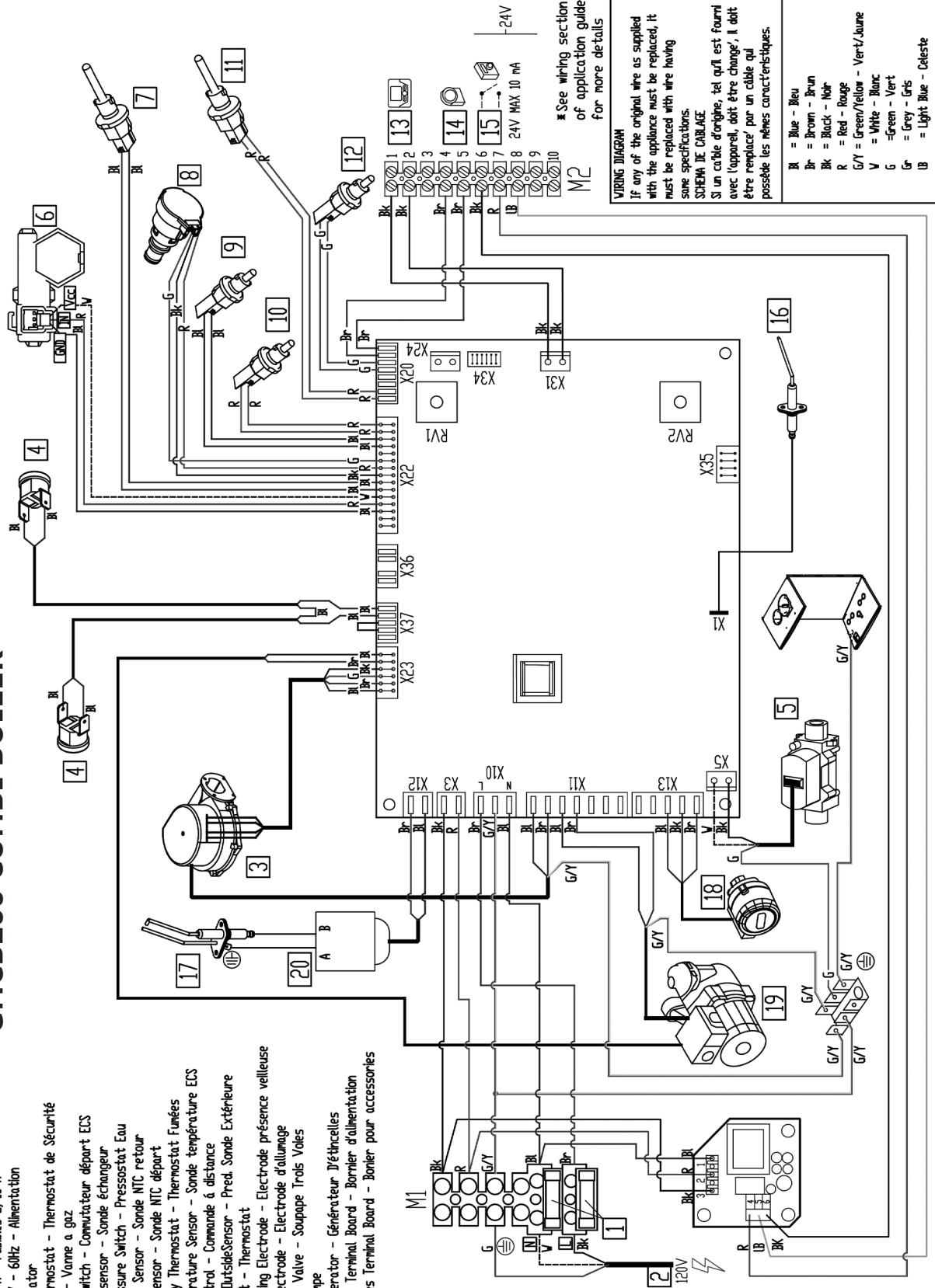


FIGURE 8-15A

**WIRE DIAGRAM  
GMCB200 COMBI BOILER**

**LEGEND - LEGENDE:**

- 1-FUSES 2, 15 A - Fusibles 2, 15 A
  - 2-Supply 120V - 60Hz - Alimentation
  - 3-Fan - Ventilator
  - 4-Safety Thermostat - Thermostat de Sécurité
  - 5-Gas Valve - Vanne à gaz
  - 6-JMW Flow Switch - Commutateur départ ECS
  - 7-Exchanger sensor - Sonde échangeur
  - 8-Water Pressure Switch - Pressostat Eau
  - 9-NTC return Sensor - Sonde NTC retour
  - 10-NTC flow sensor - Sonde NTC départ
  - 11-Flue Safety Thermostat - Thermostat Fumées
  - 12-JMW Temperature Sensor - Sonde température ECS
  - 13-Remoticontrol - Commande à distance
  - 14-Prov. for Outside Sensor - Pred. Sonde Extérieure
  - 15-Thermostat - Thermostat
  - 16-Flame Sensing Electrode - Electrode présence veilleuse
  - 17-Ignition Electrode - Electrode d'allumage
  - 18-Three Way Valve - Soupape Trois Voies
  - 19-Pump - Pompe
  - 20-Spark Generator - Générateur Diélectriques
- M1 - Main Power Terminal Board - Bornier d'alimentation  
M2 - Accessories Terminal Board - Bornier pour accessoires



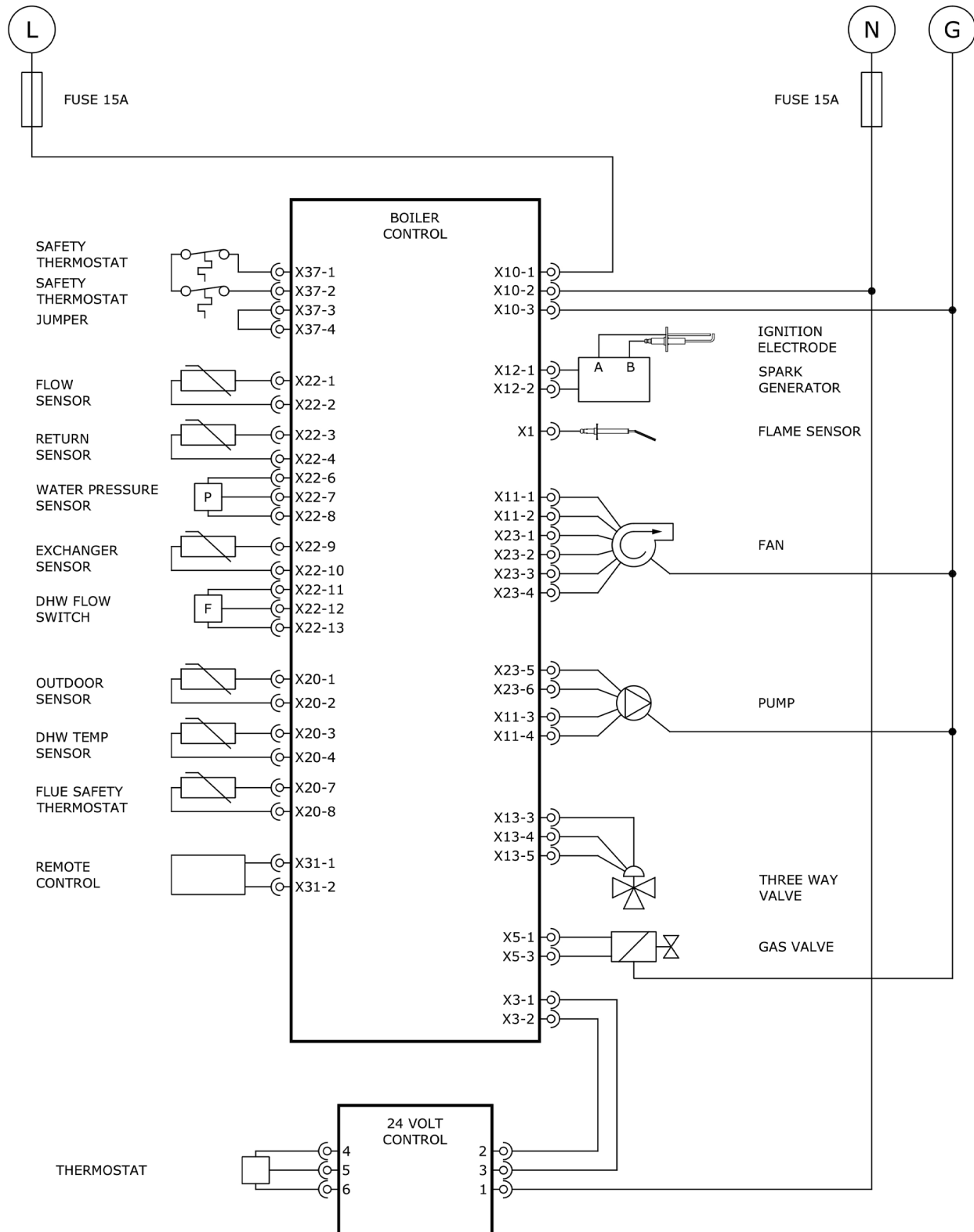
\* See wiring section of application guide for more details

**WIRING DIAGRAM**  
If any of the original wire as supplied with the appliance must be replaced, it must be replaced with wire having same specifications.  
SCHEMA DE CÂBLAGE  
Si un câble d'origine, tel qu'il est fourni avec l'appareil, doit être changé, il doit être remplacé par un câble qui possède les mêmes caractéristiques.

Bk	= Blue - Bleu
Br	= Brown - Brun
Bk	= Black - Noir
R	= Red - Rouge
G/Y	= Green/Yellow - Vert/Jaune
V	= White - Blanc
G	= Green - Vert
Gr	= Grey - Gris
LB	= Light Blue - Céleste

FIGURE 8-15B

# LADDER DIAGRAM GMCB150 COMBI BOILER

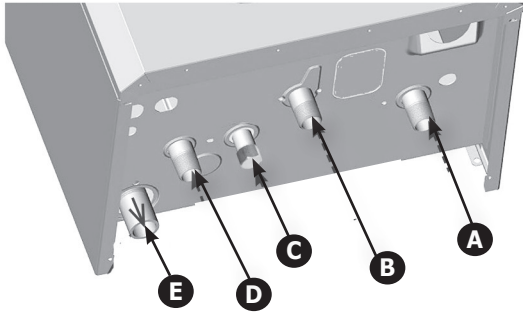




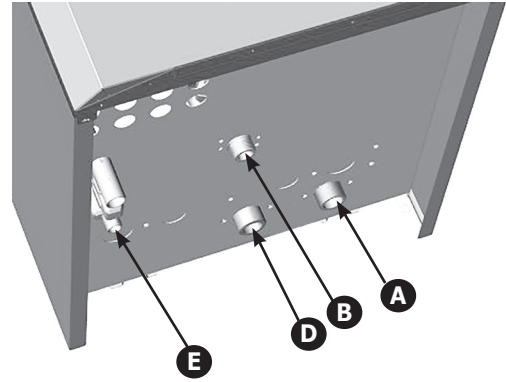
## 9 - START UP PROCEDURE

### 9.1 Central Heating System Connections - HEAT ONLY

#### GMHB125 HEATING ONLY WITH OPTIONAL INDIRECT DHW CONNECTION



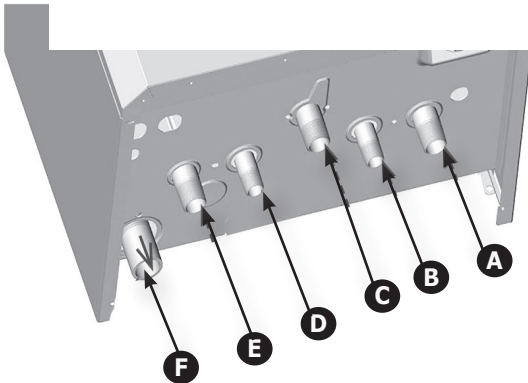
#### GMHB160 HEATING ONLY



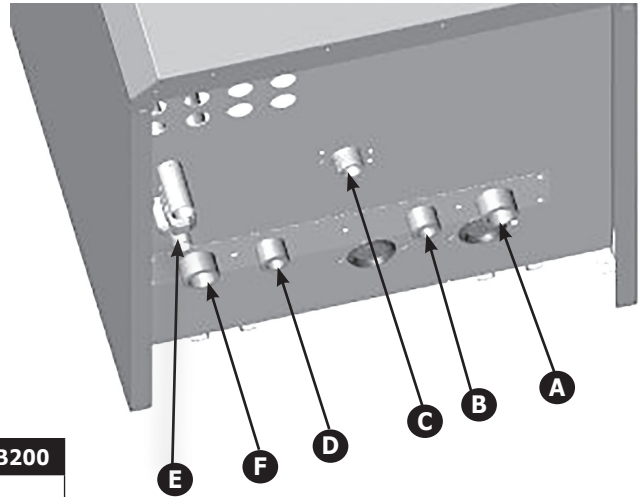
LEGEND		125B	160B
A	Heating return connection	1" NPT	
B	Gas shutoff connection	3/4" NPT	
C	Indirect tank supply connection	3/4" NPT	na
D	Heating supply connection	1" NPT	
E	Drain connection for condensate	3/4 NPT	3/4 NPT

### 9.2 Central Heating System Connections - COMBI

#### GMCB150 COMBI



#### GMCB200 COMBI



LEGEND		GMCB150	GMCB200
A	Heating return connection	1" NPT	
B	Cold DHW inlet tap / system filling connection for Combi	3/4 NPT	3/4" NPT
C	Gas shutoff connection	3/4" [22.2mm]	
D	DHW outlet/indirect storage tank connection	3/4 NPT	3/4" NPT
E	Drain connection for condensate	3/4 NPT	3/4 NPT
F	Heating supply connection	1" NPT	
G	5 gpm DHW flow restrictor (Factory installed) (160C only)	na	3/4" NPT

## 9.3 Gas Conversion

- When converting from natural gas (A) to propane gas (E), before calibrating gas valve, replace orifice assembly (B) as indicated in Figure 9-3. Follow gas conversion instructions included in supplied kit for details.

Size	Natural Gas	Propane
	Nozzle	Nozzle
	mm	mm
GMHB125	6.0	4.6
GMCB150	6.0	4.6
GMHB160	7.4	5.0
GMCB200	7.4	5.4

- Disconnect gas tube by loosening nut. See Figure 9-3
- Carefully separate gas valve.
- Remove existing orifice and replace with LP orifice as shown in Figure 9-3. See Table above for orifice size. Rounded edge faces the gas valve.
- Reinstall tube, verify gasket is seated correctly and tighten nut.
- Place "Natural to LP" and "Converted by" labels onto boiler.
- Verify there are no gas leaks.
- Change PO2 to "01"
- Modify fan speeds using parameters **P70**, **P71** and **P72** as needed. See Section 10-3. **Note:** changing P01 does not change P70, P71 and P72; each must be adjusted separately.
- Set air/gas ratio (O<sub>2</sub> /CO<sub>2</sub> %): Full load and Part load as described in section 9.11.

## 9.4 System Start Up

Follow all codes and regulations when filling the boiler.

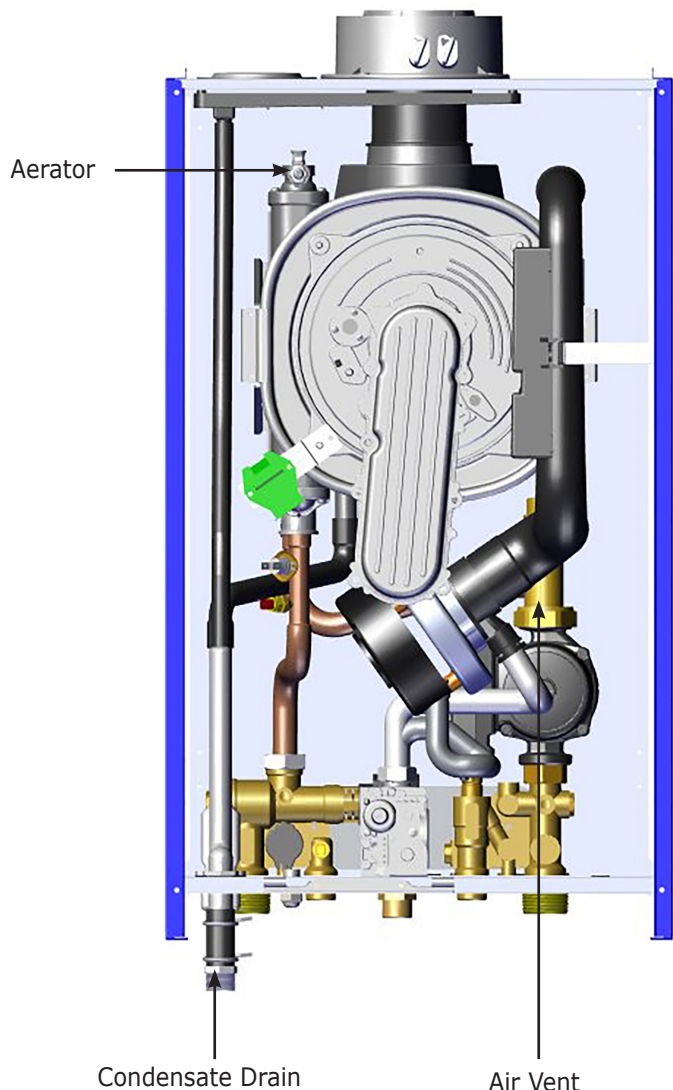
Use drain taps to allow system to completely drain.

Thoroughly flush the heating system before boiler is connected and again after first heating.

- It is manufacturer recommended that when replacing a cast iron boiler the system be flushed until the water is clean.
- Boiler is fitted with automatic air vent positioned on pump Vent and is fitted with adjustable sealing cap. See Figure 9-1.
- Open Aerator Valve located on Heat Exchanger. See Figure 9-1.
- Open central heating supply and return isolation valves.
- Open system fill valve. To aid venting boiler drain may be open until water flows out. Close drain as soon as water appears.
- To remove air from radiator systems - Vent each radiator in turn, starting with lowest in the system.

- It is important the pump is properly vented to avoid running it dry and damaging its bearings. Unscrew and remove cap from center of pump. Use screwdriver. Rotate exposed spindle about half turn clockwise, replace cap.
- Check operation of heating pressure relief valve. Pull lever on top of valve upwards lifting the seat. This will allow water to escape from system. Check if water is draining from relief valve.
- For Combi models, open cold water supply inlet valve. Turn on all hot water taps. Allow water to flow until no air is present. Turn off taps. See page 7- Physical Data and section 2.7 Operational Features.
- Recommended system pressure 21.7 psig.

**FIGURE 9-1 CONDENSATE DRAIN , AIR VENT AND AERATOR** MODEL GMCB200 SHOWN (LOCATION SIMILAR IN ALL SIZES)



## 9 - START UP PROCEDURE

### 9.5 Commission Setup (Electric)

1. Check electrical connections to thermostat and other external controls. Check any other connections to boiler.
2. Check electrical connections, particularly the ground connection.
3. Test system pumps - verify each pump is operational using vibration, noise and amp draw.

### 9.6 Control Panel

**Refer to section 10.3 for Control Operation.**

Control display will light immediately when power is applied.

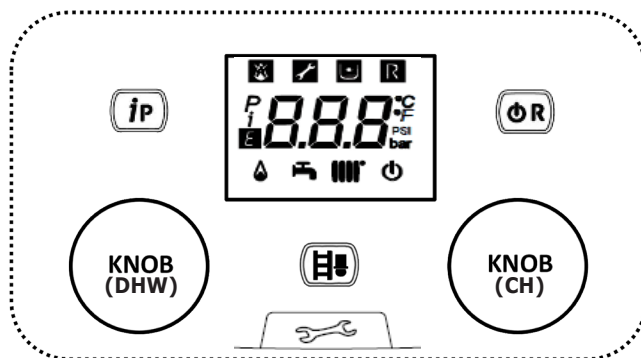
Press and hold **(iP)** for 6 seconds, to display information as shown in the table below.

Press **(iP)** (long push) to exit.

<b>i</b>	DESCRIPTION	<b>i</b>	DESCRIPTION
<b>00</b>	Secondary fault internal code	<b>09</b>	Setpoint Central Heating (°F/°C)
<b>01</b>	Heating flow temperature (°F/°C)	<b>10/11</b>	Manufacturing information
<b>02</b>	Outdoor temperature (°F/°C)	<b>12</b>	Flue sensor temperature (°F/°C)
<b>03</b>	Indirect Tank DHW temperature (boiler CH only)	<b>13</b>	Manufacturing information
<b>04</b>	Domestic hot water temperature (boiler with plate exchanger)	<b>14</b>	Identification Open Therm communication
<b>05</b>	Water pressure in heating system (PSI/bar)	<b>15</b>	Manufacturing information
<b>06</b>	Heating return temperature (°F/°C)	<b>16</b>	Manufacturing information
<b>07</b>	Thermo fuse status (000/001)	<b>17</b>	Fan speed ("17"x100)
<b>08</b>	Not used	<b>18</b>	Manufacturing information

### BUTTONS Key

LEFT KNOB	DHW temperature adjustment (CW to increase the temperature and CCW to decrease it)
RIGHT KNOB	Heating water temperature adjustment (CW to increase the temperature and CCW to decrease it)
<b>(iP)</b>	Boiler operating information
<b>(H)</b>	Deaeration (Long Push) Comfort function (Short Push)
<b>(OR)</b>	Off - Reset - Exit menu/functions Operating mode: DHW - DHW & Heating - Heating Only



### SYMBOL Key

	Off: heating and DHW disabled (only boiler frost protection is active)		Burner lit
	Ignition fault		DHW operating mode enabled
	Boiler/system water pressure low		Heating mode enabled
	Call a qualified service technician	<b>P</b>	Programming menu
<b>R</b>	Manual reset fault ( <b>(OR)</b> )	<b>i</b>	Boiler information menu
<b>E</b>	Fault in progress	°C, °F, bar, PSI	Set unit of measurement (SI/US)

### ⚠ WARNING

Fire, explosion, and asphyxiation hazard! Boiler is set for natural gas from the factory. If propane is to be used the gas valve must be adjusted before turning boiler on. Failure to follow these instructions could result in death or serious injury.

### NOTICE

During initial ignition, burner may not ignite. This may cause boiler to shut down until any air in gas pipes is vented. Repeat ignition procedure until gas reaches the burner. To reset boiler operation, press **(O/R)** for at least 2 seconds.

### NOTICE

All connections shall be made and water added before performing this function.

#### 9.7 Commission Setup (Gas)

1. Check gas type supplied matches data shown on boiler's rating plate. (or conversion label)
2. Check gas piping to ensure it is sized and installed correctly.
3. Visually inspect gas piping to determine there are no open fittings or ends, and all valves at unused outlets are closed and plugged/capped.
4. Ensure all gas connections are tight.
5. Pressure test the gas line:
  - a. Test pressure must not exceed 15" w.c./37 mbar.
  - b. Purge gas supply pipe within boiler by unscrewing pressure outlet on gas valve.
  - c. Tighten the port when pipe has been sufficiently purged.
  - d. Check piping and connections for leaks immediately after gas is turned on. Shut off gas supply and make necessary repairs if leaks are found.
6. Open main gas supply.
7. Purge air from piping. Confirm there is a steady gas supply to the boiler.
8. Open gas shutoff valve on boiler.
9. Tilt control box forward by opening holding clip located on side of the control housing.
10. Check gas supply pressure at pressure outlet "Pi" on gas valve unit. See Figure 9-5.

#### 9.8 De-Aeration Function (See Figure 9-2)

Used to eliminate air inside the heating circuit when boiler is installed or after maintenance when water is drained from primary circuit.

1. Follow chart in Figure 9-2 to turn power to boiler on. Code "000" appears on the display. Appliance is ready for "commissioning" procedure.
2. Press **(H)** and hold for 6 seconds. "On" appears on the display for 2 seconds followed by code "312" indicating "de-aeration" function is active. This function lasts 10 minutes.
3. Open aeration valve to allow complete de-aeration.
4. To manually exit this function, press **(iP)** button and hold for 6 seconds.
5. Close aeration valve.

6. If venting function is interrupted by power blackout, start function again when power is restored. Press **(iP)** and **(H)** together and hold at same time for at least 6 seconds.
7. If display shows fault **E118** (low pressure in hydraulic circuit) during de-aeration function, open filling tap on appliance and restore correct pressure.

#### 9.9 Commissioning

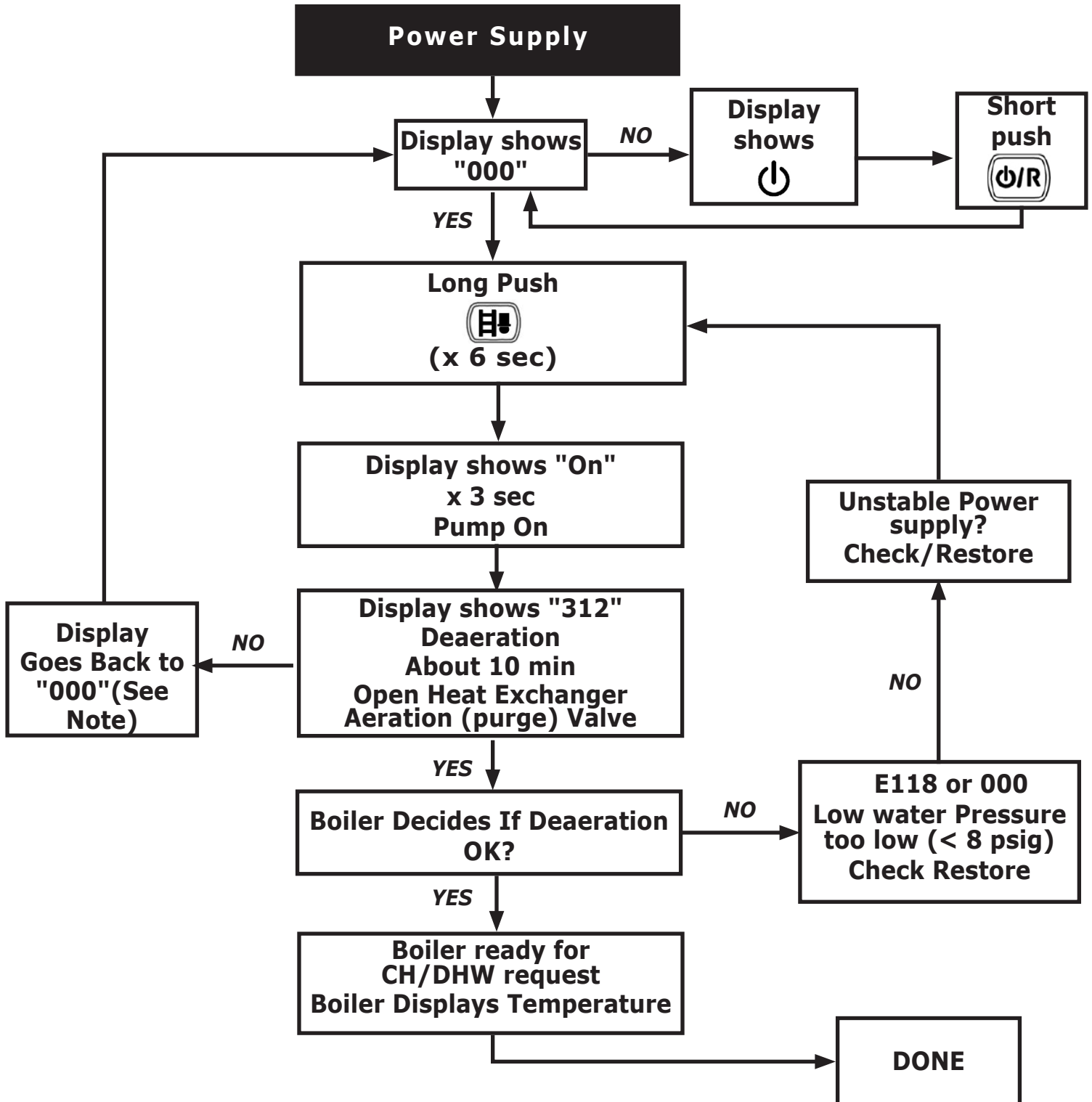
When lighting the boiler for the first time perform the following procedure:

1. See Figure 9.5 for location of Throttle and Offset Screws on modulating gas valve.
2. Set boiler to High Power using 9.11 Chimney Sweep.
3. Perform combustion test on HIGH fire using calibrated combustion analyzer. Adjust CO<sub>2</sub> to within specifications by rotating the Throttle Screw, counter-clockwise ↺ to increase CO<sub>2</sub> level, clockwise ↻ to decrease CO<sub>2</sub> level. See Figure 9-5. After adjusting CO<sub>2</sub> to correct level, verify:
  - (1) CO PPM level is in specified range
  - (2) flame signal is in specified range (> 1 Micro-Amp)
 CO<sub>2</sub> level, for HIGH fire are given in the Combustion Table. Switch to LOW fire in boiler System Test. Turn right knob counter-clockwise ↺ until power level is 0%. Adjust Offset Screw slowly and in small steps, no more than 1/8 of a turn each time.
4. Perform combustion test on LOW fire using calibrated combustion analyzer. Adjust CO<sub>2</sub> to within specifications by turning Offset Screw, clockwise ↻ to increase CO<sub>2</sub> level, counter-clockwise ↺ to decrease CO<sub>2</sub> level. After adjusting CO<sub>2</sub> to correct level, verify
  - (1) CO PPM level is in specified range and
  - (2) flame signal is in specified range (> 1 Micro-Amp).
 CO<sub>2</sub> level, CO PPM level, and flame signal for LOW fire see tables page 56 and 57.
5. Exit System Test mode by pressing both **(H)** and **(O/R)** buttons for 6 seconds.
6. Check ignition quality 4 times with front jacket off. Close manual gas valve for 5 seconds and then re-open it. Boiler will go through post purge – prepurge – ignition sequence. Reset boiler if boiler goes into lockout.

FIGURE 9-2 - COMMISSIONING FUNCTION FLOW CHART

To complete the function check:

- Power supply (120V; 60Hz + T-fuse)
- Heat exchanger (Central Heating or Domestic Hot Water)



9.10 Combustion Adjustment

To measure combustion efficiency and emissions of products of combustion, boiler has two dedicated built in test ports. See Figure 9-4.

Use combustion analyzer to properly set gas valve.

Allow time between adjustments for your combustion analyzer to sense adjusted CO<sub>2</sub> /O<sub>2</sub> level. This function is interrupted if the central heating supply temperature reaches its MAX. SETPOINT, or 25 minute timeout.

One connection port is connected to exhaust flue (A), and allows monitoring of the quality of combustion products and combustion efficiency.

Other port is connected to combustion air intake (B\*), used to check for recycling products for combustion.

The following can be measured at the exhaust flue test port:

- temperature of combustion products
- oxygen (O<sub>2</sub>) or carbon dioxide (CO<sub>2</sub>) concentration;
- carbon monoxide (CO) concentration.

The temperature of combustion air must be measured on the air intake test port (B\*) by inserting the measurement sensor approximately 3-3/16" (80.00 mm) (C).

\* (B) Port is blocked off on 160 Models if using a 2 pipe vent conversion kit. Field source a test port.

FIGURE 9-3 - GAS INLET AND NOZZLE

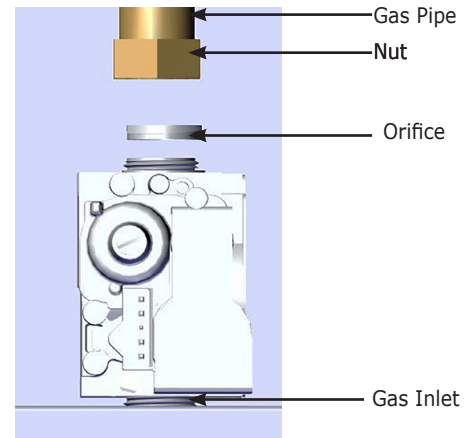


FIGURE 9-4 COMBUSTION AIR TEMPERATURE PORTS

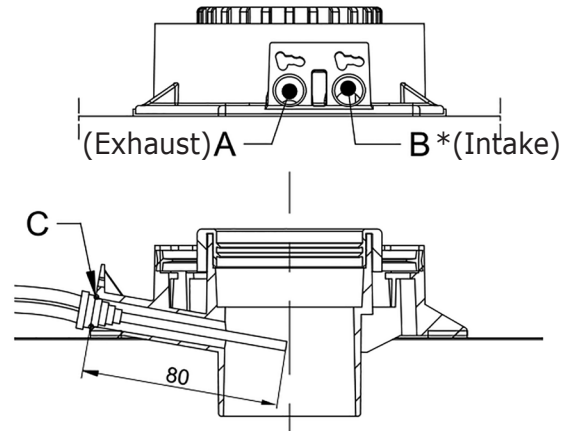
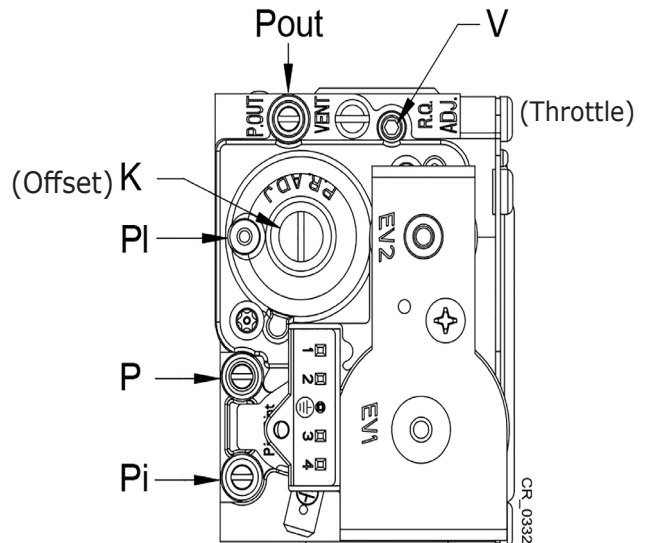


FIGURE 9-5 GAS VALVE



- P:** OFFSET measurement pressure tap
- Pi:** Gas supply tap
- Pout:** Burner gas pressure tap
- V:** Gas flow adjustment screw
- K:** OFFSET adjustment screw

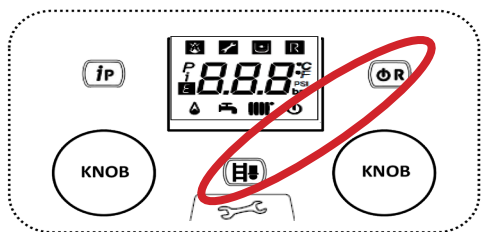
**9.11 Gas Valve Calibration and CO<sub>2</sub> Adjustment:**

Chimney Sweep Function = Manual CO<sub>2</sub> adjustment. CO<sub>2</sub> values shall be checked and adjusted if outside the required range.

**Enable Chimney Function/CSF (Service):**

- To enter Chimney function press and simultaneously with a long push.
- To enter CSF the Right Knob has to be moved.

When CSF is active the display shows "ON" (2 seconds) and code **304** with boiler power in %:



**NOTICE**

- Press to display instantaneous flow temperature for 15 seconds.
- Use a regularly calibrated combustion analyzer for combustion analysis.

Turn Right Knob clockwise and increase power of the boiler at 100%.

**1. Calibrating MAXIMUM heat output**

Check CO<sub>2</sub> measured at the flue test port, with boiler operating at maximum heat capacity, matches that indicated in Combustion Table below. If it does not, turn adjustment screw (V-Throttle) on gas valve. Turn the screw clockwise to decrease level of CO<sub>2</sub> and counter-clockwise to increase it.

Turn Right knob counter-clockwise and decrease power of boiler at 0%.

**2. Calibrating REDUCED heat output**

Check the CO<sub>2</sub> measured at the flue test port, with boiler operating at minimum heat capacity, matches that indicated in Combustion Table below. If it does not, turn the adjustment screw (K-OFFSET) on the gas valve. Turn the screw clockwise to increase the level of CO<sub>2</sub> and counter-clockwise to decrease it.

To exit Chimney/CSF function press and simultaneously with a long push, or it will automatically time out after 25 minutes.

COMBUSTION TABLE		Gas A (Natural Gas) GMHB125		Gas A (Natural Gas) GMCB150		Gas A (Natural Gas) GMHB160		Gas A (Natural Gas) GMCB200		Gas E (LPG)	
		CO <sub>2</sub> %	O <sub>2</sub> %	CO <sub>2</sub> %	O <sub>2</sub> %	CO <sub>2</sub> %	O <sub>2</sub> %	CO <sub>2</sub> %	O <sub>2</sub> %	CO <sub>2</sub> %	O <sub>2</sub> %
Maximum power (100%)	Nominal value	8.7	5.4	9.0	4.9	9.0	4.9	9.0	4.9	10.0	6.0
	Permitted value	8.2 – 9.3	6.3 – 4.3	8.5 – 9.5	5.7 – 4.0	8.7 – 9.3	5.4 – 4.3	8.7 – 9.3	5.4 – 4.3	9.5 – 10.5	6.8 – 5.2
Minimum power (0%)	Nominal value	8.8	5.2	8.8	5.2	9.0	4.9	9.0	4.9	10.0	6.0
	Permitted value	8.2 – 9.3	6.3 – 4.3	8.2 – 9.3	6.3 – 4.3	8.7 – 9.3	5.4 – 4.3	8.7 – 9.3	5.4 – 4.3	9.5 – 10.5	6.8 – 5.2

**9.12 Check Firing Rate**

1. Measure input, if a gas meter is installed in the system.
  - Turn off gas to all other appliances.
  - Activate all heating zones to dissipate heat.
  - Set boiler on high fire using Chimney Sweep Function.
  - Use ½, 1 or 2 cu ft dial on gas meter. Measure time required for two or more complete revolutions. Measure time for one or more minutes.
  - Calculate input.

**For Natural Gas :**

$$\text{Input (MBH)} = \frac{3600 \times \text{___ cu ft}}{\text{___ seconds}}$$

Example: Natural Gas - Gas flow from Meter = 2 cu ft

Measured time = 72 seconds

$$\text{Input Rate (MBH)} = \frac{3600 \times 2 \text{ cu ft}}{72 \text{ seconds}} = 100 \text{ MBH}$$

**For Propane (LP):**

$$\text{Input (MBH)} = \frac{9160 \times \text{___ cu ft}}{\text{___ seconds}}$$

For Metric formulas- See Glossary

2. Compare measured input to Table 9.2. If calculated input is not in range given in Table 9.2, check firing rate again after setting the combustion following steps in section 9.11.

**Table 9-2 Input Rate @ High Fire (MBH)**

Approximate Rate @ 100% Fire (MBH)	
Size	
GMHB125	122
GMCB150	122
GMHB160	160
GMCB200	160

**9.13 Adjusting Maximum Heating Power**

Maximum boiler heating power can be reduced to suit requirements of heating system it serves.

Table showing parameter **P13** values according to desired maximum power model is shown for each single boiler.

To access and edit **P13** values, proceed as described in Parameter Settings.

**Boiler Model - PARAMETER P13 (%)/ Heating Output**

Btu/hr Output	Kw	CH GMHB125 GMCB150 P13
		4
26,460	7.8	4
32,420	9.5	11
38,380	11.3	18
44,340	13.0	25
50,300	14.8	31
56,260	16.5	38
62,220	18.2	45
68,180	20.0	52
74,140	21.7	59
80,100	23.5	66
86,060	25.2	73
92,020	27.0	79
97,980	28.7	86
103,940	30.5	93
109,900	32.2	100

Btu/hr Output	Kw	CH GMHB160 GMCB200 P13
		4
35,440	10.4	4
43,480	12.8	11
51,520	15.1	18
59,560	17.5	24
67,600	19.8	31
75,640	22.2	38
83,680	24.5	45
91,720	26.9	52
99,760	29.3	59
107,800	31.6	66
115,840	34.0	73
123,880	36.3	79
131,920	38.7	86
139,960	41.0	93
148,000	43.4	100



## 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 is equipped with an ignition device which automatically lights burner. **Do NOT try to light this burner by hand.**
- Before operating smell all around appliance area for gas. Be sure to smell next to floor because some gas is heavier than air and will settle to the floor.
- **Use only your hand to turn the gas shutoff valve.** Never use tools. If valve will not turn by hand, do not try to repair it, call a qualified service technician. Force or attempted repair may result in fire or explosion.
- **Do not use this appliance if any part has been under water.** Immediately call a qualified service technician to inspect appliance and to replace any part of control system and any gas control which has been under water.

### ⚠️ CAUTION

#### 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 your gas supplier, call the fire department.

### 10.2 Testing For Gas Leaks And Purging The Gas Supply


- With boiler gas service cock closed (spindle flats at right angles to valve). Pressure test gas supply and inlet pipe work connection to boiler gas service cock for soundness.
- Loosen screw of pressure inlet gas test port on gas valve. See Figure 9-5 Gas Valve. Verify gas supply is ON. Open boiler service cock to purge.
- Retighten test port screw and test for gas leaks. Close boiler gas shutoff device.

### 10.1 Boiler Sequence Of Operation




- With demand for heating, pump circulates water through the primary circuit.
- Combustion fan will come on and begin to run at ignition speed.
- Once fan reaches ignition speed control board will allow power to flow to spark generator and gas valve creating ignition in combustion chamber. Flame sensor will acknowledge presence of flame in combustion chamber and send signal to control board.
- Temperature sensor will send signal to control board allowing control board to increase / decrease fan speed. Combustion fan will in turn modulate gas rate accordingly.
- Once central heating loop temperature exceeds central heating loop setpoint the unit will shutdown and go through 3 minute time delay (burner pause time) before another call for heat.
- During this time the pump will run for additional three minutes to dissipate any residual heat.

## 10.3 Boiler Controls

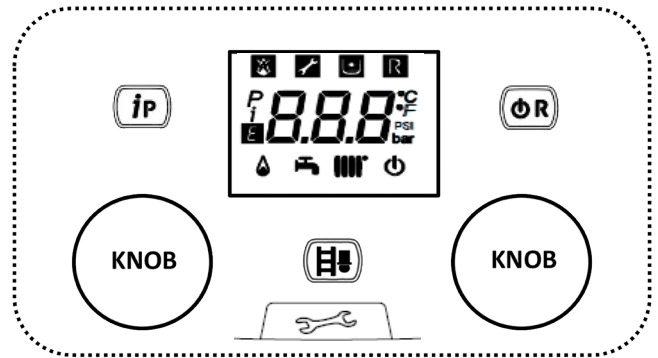
For correct boiler ignition, proceed as follows:

- Check system pressure is correct;
- Power boiler;
- Open manual gas shut off valve (positioned under boiler);
- Select required heating mode. Push  to select operating mode. See page 60 - Operating Modes.














### BUTTON Key


LEFT KNOB	DHW temperature adjustment (CW to increase the temperature and CCW to decrease it)
RIGHT KNOB	Heating water temperature adjustment (CW to increase the temperature and CCW to decrease it)
	Boiler operating information
	De-aeration (Long Push)/ Comfort Function (Short Push) <sup>†</sup>
	Off - Reset - Exit menu/functions - Mode Selections (Combi) DHW- DHW & Heating - Heating Only




<sup>†</sup> Comfort Function (Combi Models) - Boiler cycles on as required to maintain heat exchanger temperature; DHW to tap is available sooner.



### SYMBOL Key

	Off: Heating and DHW disabled (only boiler frost protection is active)		Burner lit
	Ignition fault		DHW operating mode enabled
	Boiler/system water pressure low		Heating mode enabled
	Call a qualified service technician		Programming menu
	Manual reset fault  *		Boiler information menu
	Fault in progress*		Set unit of measurement

\*Note: If  is displayed without , boiler will resume operation once fault is corrected.

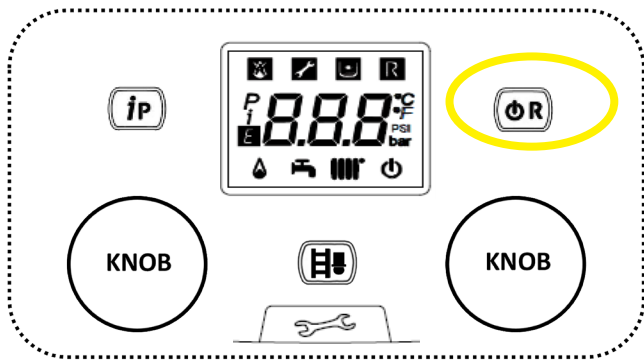
If  and  are displayed, fault must be corrected and  pushed to reset the boiler to resume operation.

### PUSH DURATION:

Push type	Time
Very short push	0.5 Second
Short push	1 Second to 4 Seconds
Long push	6 Seconds or More

# 10 - OPERATING INSTRUCTIONS

## 10.3.1 Boiler Operating Mode

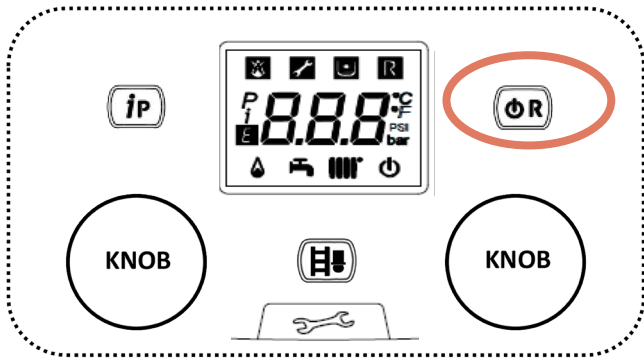


To change the boiler *MODE* press **OR** with a very short push. The mode changes are as follows:

Boiler Start Mode	Boiler Mode After Pressing <b>OR</b>
OFF	DHW only ( <i>COMBI</i> only)
DHW only	CH and DHW ( <i>COMBI</i> only)
CH and DHW	CH only ( <i>COMBI</i> only)
CH only	OFF (All Models)

## 10.3.2 Reset

If **R** Manual Reset fault is displayed.



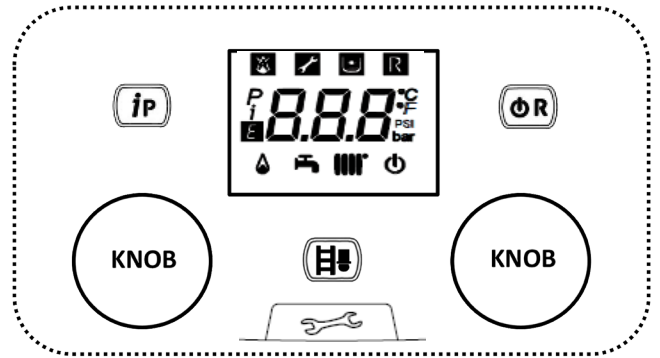
To reset the boiler press **OR** with a short push (1 to 3 seconds).

SYMBOL DISPLAYED	OPERATING MODE
	DHW
	DHW & HEATING
	HEATING ONLY
	FROST PROTECTION

To enable the appliance in DHW - Heating or Heating only press **OR** repeatedly and choose one of three available modes.

To disable the boiler operating modes and keep the frost protection function enabled, press **OR** for at least 3 seconds. Just the symbol appears on the display (the display backlighting flashes if the boiler is blocked).

## 10.3.3 Control Function



### Knobs

Left and Right Knobs: main use is to adjust respectively the DHW and CH SetPoints.

Left Knob is also called **Address/Page** Knob

Right one is also called **Data** Knob for their functionality in the settings menu (see below).

### Push Buttons

Three push buttons:

1. "Info parameter" **iP** button, in upper-left position
2. Comfort/De-aeration/Enter **Enter** button in the center position
3. Operating mode/Reset **OR** button in upper-right position

### Quick Reference Tables

Control functionality is described in the following table:

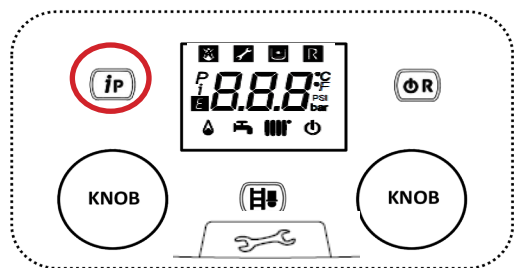
Main Functions	Buttons
Boiler mode selection	<b>OR</b> very short push
RESET	<b>OR</b> short push
Comfort function	<b>Enter</b> short push
De-aeration	<b>Enter</b> long push
Chimney (CSF)	<b>Enter</b> + <b>OR</b> long push (enters Chimney, becomes CSF moving Right Knob CH)

## 10 - OPERATING INSTRUCTIONS

Special functions	Buttons/Knobs
INFO menu	long push
↳ Next page	↳  short push
Previous page	short push
Scroll within a page*	Address/Page Knob (Left Knob DHW)
Escape	long push
Parameter setting menu	+  long push
↳ Next page	↳  short push
Previous page	short push
Scroll within a page	Address/Page Knob (Left Knob DHW)
Enter in value setting menu	short push
↳ Value +10	↳  short push
Value -10	short push
Scroll within the values *	Data Knob (Right Knob CH)
Enter (to save)	short push
Escape (without saving)	Address/Page Knob (Left Knob DHW)
Exit	+  long push
Command menu	+  long push
↳ Next page	↳  short push
Previous page	short push
Scroll within a page	Address/Page Knob (Left Knob DHW)
Enter	short push

\* Knob design does not change scrolling position when pressing the buttons to turn pages. Thus, if display was on P19, pushing will advance to P29. Rotate knob counter clockwise (↺) to view P20-P28.

### 10.3.4 INFO MENU (User/Service)



To enter in INFO menu press with a long push.  
This functions ends after 3 minutes, or by pressing with a long push.

The INFO menu is divided in pages, each with 10 parameters (i.e. Ax0 – Ax9).

While in the INFO menu:

: short push to go to the next page (e.g. from A10-A19 page to A20-A29 page)

: short push to go to the previous page (e.g. from A20-A29 page to A10-A19)

**Address/Page Knob:** turning Left Knob permits scrolling between the parameters within the current selected page.\*

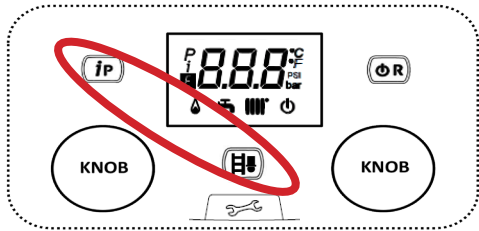
- A00: Error subcode
- A01: CH temperature
- A02: External temperature (if present)
- A03: DHW temperature
- A04: DHW temperature
- A05: Water pressure
- A06: Return temperature
- A07: Thermofuse state 0/1 (0 = open, 1 = closed)
- A09: CH setpoint elaboration
- A10: Combustion version
- A11: Application version

- A14: OT Communication setting (0=Plug & Play, 1=OT B&P, 2=OT Std, 4=if board do not receive ID2 from master)(\*)
- A16: LTU36 counter
- A17: Fan speed (rpm/100)
- A19: Software Version

**NOTE:** Parameter numbers not listed are not present on this model.

## 10.3.5 Parameter Setting Menu

To set PCB parameters proceed as follows:



1. Press **[H]** and **[i/P]** together for about 6 seconds, the display shows "P01" alternating with its value (01);
2. The parameter setting menu is divided in pages, each with 10 parameters (ie Px0-Px9).
3. **[O/R]**: short push to go to the next page (e.g. from P10-P19 page to P20-P19 page). See Note.
4. **[i/P]**: short push to go to the previous page (e.g. from P20-P19 page to P10-P19 page). See Note.
5. **Address/Page Knob**: turning Left Knob permits scrolling between the parameter within the current selected page. See Note.
6. If **Data Knob** (Right Knob) is moved, "NOP" is seen on the display to inform the user that moving the Data Knob has no consequences → **NOP= No OPeration**.
7. **[H]** short push: parameter visualized in display is selected and the board goes in the Value setting menu.
8. **[O/R]**: short push to go to next page (e.g. from values 10-19 page to 20-29 page)
9. **[i/P]**: short push to go to previous page (e.g. from values 20-29 page to 10-19 page)
10. **Data Knob**: turning Right Knob permits scrolling the values in the current selected page.
11. **[H]**: short push to save the value visualized on the display and return to parameter setting menu.
12. **Address/Page Knob**: returns to Parameter setting menu without saving the current value (escape function).

This function always ends after 3 minutes, or sooner by pressing **[i/P]** and **[H]** simultaneously with a long push.

**Note** → Knob design does not change scrolling position when moving back and forth between pages. If display was on P07, a short push of **[O/R]** will result in P17 display. Rotate knob to reach P11 through P16.

## 10.3.6 Description Of Parameters

- P70** Ignition fan speed setting: Fan Speed = **P70** \* 100 rpm
- P71** Maximum fan speed: Fan speed = 3500 + **P71** \* 25 rpm
- P72** Minimum fan speed: Fan speed = 750 + **P72** \* 10rpm

Example

- To set ignition speed at 3000 rpm     **P70** = 30
- To set max fan speed at 5800 rpm     **P71** = 92
- To set min fan speed at 1100 rpm     **P72** = 35

**Note:**

Parameters in Grey are not visible unless **P22** is set at 22.

10.3.6 Parameter	Description Of Parameters Parameter Description	Range	HEAT ONLY		COMBI		HEAT ONLY		COMBI	
			GMHB 125	GMHB 125	GMCB 150	GMCB 150	GMHB 160	GMHB 160	GMCB 200	GMCB 200
			NG 0	LPG 0	NG 0	LPG 0	NG 0	LPG 0	NG 0	LPG 0
P01	DHW Modulation	(0..1)	0	0	0	0	0	0	0	0
P02	Gas Type Selection	(0: natural gas; 1: LPG)	0	1	0	1	0	1	0	1
P03	Boiler setting 00= instantaneous combi boiler 02= instantaneous combi boiler with DHW micro tank 03= instantaneous combi boiler with pre heat 04= only heating boiler with DHW thermostat (system boiler 1) 05= only heating boiler for external DHW tank 06= boiler with DHW storage tank 07 = Heating only 08 = only heating boiler 09 = storage tank 3 (simple solar) 10 = instantaneous boiler for solar application 11 = instantaneous boiler for solar application with DHW micro-tank 13 = instantaneous boiler with pre-heat for solar application 15= only heating boiler with DHW pump for external tank 16= boiler with DHW storage tank and DHW pump with plate to plate DHW heat exchanger 17 = System boiler 2 (04 without pump) 18 = only heating boiler with DHW pump for external tank 19= System boiler 3	(0..19)	8	8	0	0	8	8	0	0
P04	Manufacturer information. Shall be set to 02. Ignore all other options.	(0..15)	2	2	2	2	2	2	2	2
P05	Manufacturer information. Shall be set to 04. Ignore all other options.	(0..15)	4	4	4	4	4	4	4	4
P06	Outdoor reset input configuration 00= with an outdoor sensor connected, the outdoor temperature value helps to calculate the supply temperature setpoint 01= with an outdoor sensor connected, the display shows the outdoor temperature value (no influence on supply temperature) 02= (Reserved, not used) 03= heating request input (e.g. telephonic trigger) 04 = Low temperature safety thermostat 05 = (Reserved, not used)	(0..5)	0	0	0	0	0	0	0	0

10.3.6 Description Of Parameters- Continued

Parameter	Parameter Description	Range	HEAT ONLY		COMBI		HEAT ONLY		COMBI	
			GMHB 125 NG	GMHB 125 LPG	GMCB 150 NG	GMCB 150 LPG	GMHB 160 NG	GMHB 160 LPG	GMCB 200 NG	GMCB 200 LPG
P07	Manufacturer information. Set to 0. Ignore other options.	(0..4)	0	0	0	0	0	0	0	0
P08	Manufacturer information. Set to 0. Ignore other options.	(0..2)	0	0	0	0	0	0	0	0
P09	Manufacturer information. Set to 1. Ignore other options.	(0..3)	1	1	1	1	0	0	0	0
P10	Manufacturer information. Set to 0. Ignore other options.	(0..3)	0	0	0	0	0	0	0	0
P11	Manufacturer information. Shall be set to 02. Ignore all other options.		2	2	2	2	2	2	2	2
P12	Manufacturer information. Shall be set to 0. Ignore all other options.	(0 disable)	0	0	0	0	0	0	0	0
P13	Max CH power setting	(0–100%)	100	100	80	80	100	100	100	82
P14	Max DHW power setting	(0–100%)	100	100	100	100	100	100	100	100
P15	Min CH power setting	(0–100%)	0	0	0	0	0	0	0	0
P16	Maximum Central Heating setpoint (°C) 00= 176° F (80°C) 01= 113°F (45°C)	Hi temperature (0) / low temperature (1)	0	0	0	0	0	0	0	0
P17	Pump overrun time in heating mode (min)	(1..240min)	3	3	3	3	3	3	3	3
P18	Maximum overrun time before a new relight of burner in heating mode (min)	(0..10min)	3	3	3	3	3	3	3	3
P19	Manufacturer information. Shall be set to 7. Ignore all other options.	(1..15min)	7	7	7	7	7	7	7	7
P20	Pump overrun time in DHW Mode (0...255 seconds)	(0..255sec)	30	30	30	30	30	30	30	30
P21	Anti-legionella function setpoint setting 00= disabled 55...67 = enabled (setpoint value °C)	(0: disable, 55..67°C temperature setpoint)	0	0	0	0	0	0	0	0

10.3.6 Description Of Parameters- Continued

Parameter	Parameter Description	Range	HEAT ONLY			COMBI			HEAT ONLY			COMBI		
			GMHB 125 NG	GMHB 125 LPG	GMCB 150 NG	GMCB 150 LPG	GMHB 160 NG	GMHB 160 LPG	GMCB 200 NG	GMCB 200 LPG				
P22	Set at "22" to display and edit parameters from P42 onward.	(0..40) 0 = hide >P42 22=display >P42	0	0	0	0	0	0	0	0	0	0	0	
P23	Maximum DHW setpoint (°C) (55°C ...60°C) (131°F - 140°F)	(55..65°C)	60	60	60	60	60	60	60	60	60	60	60	
P24	DHW start delay (sec)	(0..255 * 0.02s)	35	35	35	35	35	35	35	35	35	35	35	
P25	Manufacturer information. Set to 0. Ignore other options.	(0, 1)	0	0	0	0	0	0	0	0	0	0	0	
P26	Manufacturer information. Set to 9. Ignore other options.	(read only)	9	9	9	9	9	9	9	9	9	9	9	
P27	Manufacturer information. Set to 26. Ignore other options.	(read only)	26	26	26	26	26	26	26	26	26	26	26	
P28	Manufacturer information. Set to 0. Ignore other options.	(read only)	0	0	0	0	0	0	0	0	0	0	0	
P29	Manufacturer information. Set to 7. Ignore other options.	(read only)	7	7	7	7	7	7	7	7	7	7	7	
P30	Manufacturer information. Set to 10. Ignore other options.	(0..15°C)	10	10	10	10	10	10	10	10	10	10	10	
P31	Manufacturer information. Set to 20. Ignore other options.	(30..85°C)	20	20	20	20	20	20	20	20	20	20	20	
C00 (P32)	Fault History C00	(read only)												
C01 (P33)	Fault History C1	(read only)												
C02 (P34)	Fault History C2	(read only)												
C03 (P35)	Fault History C3	(read only)												



10.3.6 Description Of Parameters- Continued

Parameter	Parameter Description	Range	HEAT ONLY			COMBI			HEAT ONLY			COMBI		
			GMHB 125 NG	GMHB 125 LPG	GMCB 150	GMHB 150 NG	GMCB 150 LPG	GMHB 160 NG	GMHB 160 LPG	GMCB 200	GMHB 200 NG	GMCB 200 LPG		
C04 (P36)	Fault History C4	(read only)												
C05 (P37)	Fault History C5	(read only)												
C06 (P38)	Fault History C6	(read only)												
C07 (P39)	Fault History (lock-out) C07	(read only)												
C08 (P40)	Fault History (lock-out) C08	(read only)												
C09 (P41)	Fault History (lock-out) C09	(read only)												
P42	Manufacturer information. Set to 0. Ignore other options.	enable 0 / disable 1	0	0	0	0	0	0	0	0	0	0	0	0
P43	Manufacturer information. Set to 1. Ignore other options.	(0: 50Hz, 1: 60Hz)	1	1	1	1	1	1	1	1	1	1	1	1
*P44	°C/°F selection (also changes pressure to bar/psig)	(0 - °C; 1 - °F)	1	1	1	1	1	1	1	1	1	1	1	1
P45	Manufacturer information. Set to 1. Ignore other options.	(0..2)	1	1	1	1	1	1	1	1	1	1	1	1
P46	Manufacturer information. Set to 63. Ignore other options.		63	63	63	63	63	63	63	63	63	63	63	63
P47	Manufacturer information. Set to 0. Ignore other options.		0	0	0	0	0	0	0	0	0	0	0	0
P48	Manufacturer information. Shall be set to 1. Ignore other options.	(0..2)	1	1	1	1	1	1	1	1	1	1	1	1
P49	Manufacturer information. Set to 0. Ignore other options.	(0..100; default 50)	0	0	0	0	0	0	0	0	0	0	0	0
P50	Manufacturer information. Set to 25. Ignore other options.	(6..25 25 disable service due)	25	25	25	25	25	25	25	25	25	25	25	25

## 10 - OPERATING INSTRUCTIONS

### 10.3.6 Description Of Parameters- Continued

Parameter	Parameter Description	Range	HEAT ONLY			COMBI			HEAT ONLY			COMBI		
			GMHB 125 NG	GMHB 125 LPG	GMCB 150	GMCB 150 NG	GMCB 150 LPG	GMHB 160	GMHB 160 NG	GMCB 200	GMCB 200 NG	GMHB 160 LPG	GMCB 200 LPG	
P51	Manufacturer information. Set to 25. Ignore other options.		25	25	25	25	25	25	25	25	25	25	25	
P52	Manufacturer information. Set to 90. Ignore other options.	(80..90°C)	90	90	90	90	90	90	90	90	90	90	90	
P53	Manufacturer information. Set to 0. Ignore other options.	(-20..20°C)	0	0	0	0	0	0	0	0	0	0	0	
P54	Manufacturer information. Set to 20. Ignore other options.	(0..255)	20	20	20	20	20	20	20	20	20	20	20	
P55	Manufacturer information. Set to 0. Ignore other options.	(0..1)	0	0	0	0	0	0	0	0	0	0	0	
P56	DHW Frost protection enable/disable	(0: enable, 1 disable)	0	0	0	0	0	0	0	0	0	0	0	
P57	Manufacturer information. Set to 0. Ignore other options.	(0..2)	0	0	0	0	0	0	0	0	0	0	0	
P58	Manufacturer information. Set to 0. Ignore other options.	(0..1)	0	0	0	0	0	0	0	0	0	0	0	
P59	Manufacturer information. Set to 3. Ignore other options.	(0..15sec)	3	3	3	3	3	3	3	3	3	3	3	
P60	Manufacturer information. Set to 1. Ignore other options.	(0..4)	1	1	1	1	1	1	1	1	1	1	1	
P61	Manufacturer information. Set to 36. Ignore other options.	(6:60)	36	36	36	36	36	36	36	36	36	36	36	
P62	Manufacturer information. Set to 9. Ignore other options.	(3:15)	9	9	9	9	9	9	9	9	9	9	9	
P63	Manufacturer information. Set to 8. Ignore other options.	(0..20sec)	8	8	8	8	8	8	8	8	8	8	8	
P64	Manufacturer information. Set to 0. Ignore other options.	(0..1)	0	0	0	0	0	0	0	0	0	0	0	
P65	Manufacturer information. Set to 0. Ignore other options.	(0..60min)	0	0	0	0	0	0	0	0	0	0	0	

10.3.6 Description Of Parameters- Continued

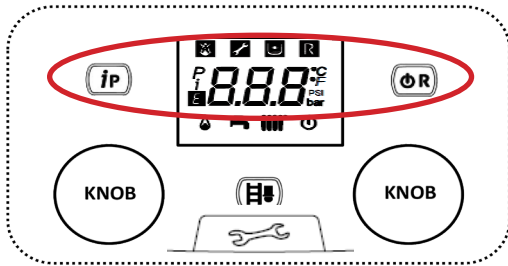
Parameter	Parameter Description	Range	HEAT ONLY			COMBI			HEAT ONLY			COMBI		
			GMHB 125 NG	GMHB 125 LPG	GMCB 150 NG	GMCB 150 LPG	GMCB 150 NG	GMCB 150 LPG	GMHB 160 NG	GMHB 160 LPG	GMCB 200 NG	GMCB 200 LPG		
P66	Manufacturer information. Set to 98. Ignore other options.	(reserved)	98	98	98	98	98	98	98	98	98	98	98	
P67	Manufacturer information. Set to 0. Ignore other options.	(0..2)	0	0	0	0	0	0	0	0	0	0	0	
P68	Manufacturer information. Set to 0. Ignore other options.	(0..60sec)	0	0	0	0	0	0	0	0	0	0	0	
P69	Manufacturer information. Set to 0. Ignore other options.	(0..5)	0	0	0	0	0	0	0	0	0	0	0	
*P70	Ignition fan speed (Fan speed = F70*100rpm) (Consult factory before adjusting) (See Pg. 62)	(0..255)	33	33	32	32	32	33	33	33	33	33	33	
*P71	Maximum fan speed(Fan speed = 5000+F71*10 rpm) (See Pg. 62)	(0..255)	85	85	115	125	115	80	80	100	100	130	130	
*P72	Minimum fan speed (Fan speed = 750+F71*10 rpm) (See Pg. 62)	(0..255)	55	60	55	55	55	52	55	60	60	60	60	
P73	Manufacturer information. Shall be set to indicated value. Ignore other options.	(1..10)	1	1	2	2	2	3	3	4	4	4	4	
P74	Manufacturer information. Set to 0. Ignore other options.	(0.255sec)	0	0	0	0	0	0	0	0	0	0	0	
P75	Not Used	-	-	-	-	-	-	-	-	-	-	-	-	
P76	Manufacturer information. Set to 0. Ignore other options.		0	0	0	0	0	0	0	0	0	0	0	
P77	Manufacturer information. Set to 0. Ignore other options.	(0..1)	0	0	0	0	0	0	0	0	0	0	0	
P78	Manufacturer information. Set to 0. Ignore other options.	(0..2)	0	0	0	0	0	0	0	0	0	0	0	
P79	DWH switch off offset (0..15°C; 0: fixed Off value; 1..15 Off=DHW setpoint+F79)	(0..15)	0	0	0	0	0	0	0	0	0	0	0	
P80	Manufacturer information. Set to 0. Ignore other options.	(0..4) (Default 0)	0	0	0	0	0	0	0	0	0	0	0	

10.3.6 Description Of Parameters- Continued

Parameter	Parameter Description	Range	HEAT ONLY			COMBI			HEAT ONLY			COMBI		
			GMHB 125 NG	GMHB 125 LPG	GMCB 150 NG	GMCB 150 LPG	GMHB 160 NG	GMHB 160 LPG	GMCB 200 NG	GMCB 200 LPG				
P81	Manufacturer information. Set to 1. Ignore other options.	(0..4) (Default 1)	1	1	1	1	1	1	1	1	1	1	1	
P82	Manufacturer information. Set to 4. Ignore other options.	(0..4) (Default 4)	4	4	4	4	4	4	4	4	4	4	4	
P83	Manufacturer information. Set to 25. Ignore other options.	(default 25)	25	25	25	25	25	25	25	25	25	25	25	
P84	Manufacturer information. Set to 0. Ignore other options.	(default 0)	0	0	0	0	0	0	0	0	0	0	0	
P85	Manufacturer information. Set to 0. Ignore other options.	(default 0)	0	0	0	0	0	0	0	0	0	0	0	
P86	Manufacturer information. Set to 1. Ignore other options.	(default 25)	1	1	1	1	1	1	1	1	1	1	1	

\* P22 must be set = 22 to view these parameters.

## 10.3.7 Command Functions (Service)



To enter the Command functions menu press **iP** and **OR** with a long push.

This function ends after 3 minutes or by pressing **iP** and **OR** simultaneously with a long push.

After accessing the Special functions menu "F00" is displayed.

Address/Page Knob is used to scroll between **FXX** parameters.

FXXX VALUE	FUNCTION
<b>F00</b>	No function related.
<b>F01</b>	De-aeration (same function can be started also pushing <b>H</b> with a long push)
<b>F02</b>	Manual control function
<b>F03</b>	(Reserved for future use)

When a parameter is selected, by pressing **H**, the board exits from the Command functions menu and the related function starts.

### 10.4 Boiler Operation

Domestic hot water supply always takes priority over central heating.

Demand for hot water required during central heating period, boiler automatically switches to hot water mode until demand is satisfied i.e. storage water is to required temperature.

This interruption in central heating is only when demand for hot water is present and should not be noticed by the User.

### 10.5 Central Heating Mode

1. Call for heat. Pump will start to circulate central heating water.
2. Fan will run. Once fan speed is reached burner will light.
3. Burner output automatically adjusts to suit system demand; as temperature of water in boiler approaches that set by adjustable temperature selector, burner output is reduced.
4. When set temperature is reached, burner is turned off and fan stops. Pump continues to run for three minutes to remove residual heat build up in boiler. Burner will not relight for 3 minutes.
5. If CH sensor has not registered pre-set temperature but room thermostat is satisfied the burner is turned off. Fan stops. Pump continues to run for three minutes. In this instance there is no 3 minute delay before burner relights.
6. If there is demand for DHW during 3 minute burner delay, boiler will operate to provide DHW until tap is closed. Boiler will immediately revert to provide CH if there is demand.

### 10.6 Combi Domestic Hot Water Mode

- Flow switch senses demand for hot water (opening a hot water tap, etc.). The pump starts and burner lights at its ignition output, increasing to the output determined by the faucet (tap).
- Water in the boiler is diverted from central heating system to domestic hot water heat exchanger, heating the incoming supply water.
- Burner output is varied to maintain temperature of hot water as set by the adjustable temperature selector.
- When flow switch senses hot water is no longer required burner is turned off. Boiler immediately returns to central heating mode.

### 10.7 Frost Protection

Boiler has a built in frost thermostat which automatically turns boiler and pump on.

If water in boiler falls below 41°F (5°C), providing the display is switched on, boiler will operate until water temperature in the system reaches approximately 86°F (30°C).

Frost protection is for the boiler only and not for complete Central Heating System.

### 10.8 Pump

If display is switched on and boiler has not operated for 24 hours for heating or hot water, pump will operate automatically for one minute every 24 hours.

### 10.9 Low Water Pressure Sensor (Internal)


This device protects the primary exchanger from damage. It will not allow the boiler to run in a LOW water pressure situation. Low water condition occurs when water pressure drops below 7.0 psi (0.5 bar), approximately.


### **DANGER**

Before servicing, turn off electrical power to boiler at service switch. Close manual gas valve to turn gas supply OFF to boiler. Failure to comply will result in death or serious injury.

### **CAUTION**

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

 **Note** Verify proper operation after servicing.

 **Note** Perform regular service and maintenance by qualified service agency at least once every 12 months to assure safe, trouble free operation and maximum efficiency.

- Check following components are operating properly and are free of blockages or obstructions:
  - air vent;
  - check venturi air inlet for blockage and clean as required;
  - verify pressure test port cap and combustion test port are in place;
  - return temperature sensor clip (if equipped) must be securely seated on pipe; Check boiler for any sign of leaks.
- Check external low water cutoff operation (if installed).
  - Check operation by pressing test button on low water cutoff.
    - "Low Water" LED on the external LWCO should illuminate and boiler should shut down.
  - Every 5 years remove low water cutoff. Reinstall after cleaning.
  - Every 10 years replace low water cutoff.
- Visual inspection of flame through sight glass. Burner should be fully illuminated.
- Check heating system expansion tank.

### 11.1 Beginning of Each Heating Season

- Check boiler area is free from combustible materials, gasoline, and other flammable vapors and liquids.
- Visually inspect combustion air and vent piping for proper operation. Check for and remove any obstruction to flow of combustion air or vent gases. Immediately repair or replace pipe showing deterioration or leakage. Reassemble per instructions in section 6. Ensure proper reassembly and resealing of system.
- Visually inspect condensate drain line for proper operation. Checking for deteriorated or plugged condensate drain line. Verify condensate trap drains freely and clean as required.
- Test safety relief valve for proper operation. Refer to valve manufacturer's instructions packaged with relief valve.
- Examine heat exchanger, burner, condensate lines, and clean (if necessary) by following instructions in section 11.3 - Component Replacement And Cleaning.
- Check CO<sub>2</sub> and CO at high fire and low fire. Adjust if required. See Combustion Table section 9-1 for proper values.
- Circulator pump and combustion air blower motor furnished with boiler are permanently lubricated from factory and require no further lubrication. Lubricate field sourced pumps and/or motors according to pump and/or motor manufacturer's instruction.
- After opening any part of the combustion chamber for maintenance the gaskets must be replaced. Refer to parts list for correct gasket kit.

### **WARNING**

Following service procedures must be performed by qualified service agent. Boiler owner shall not attempt these steps. Failure to do so could result in death or serious injury.

### **WARNING**

Combustion chamber insulation in this product contains ceramic fiber material. Ceramic fibers can be converted to cristobalite in very high temperature applications. The International Agency for Research on Cancer (IARC) has concluded, Crystalline silica inhaled in the form of quartz or cristobalite from occupational sources is carcinogenic to humans (Group1). Avoid breathing dust and contact with skin and eyes. Use NIOSH certified dust respirator (N95). This type of respirator is based on the OSHA requirements for cristobalite at the time this document was written. Other types of respirators may be needed depending on the job site conditions. Current NIOSH recommendations can be found on the NIOSH website <http://www.cdc.gov/niosh/homepage.html>. NIOSH approved respirators, manufacturers, and phone numbers are also listed on this website. Wear long-sleeved, loose fitting clothing, gloves, and eye protection. Apply enough water to the combustion chamber lining to prevent dust. Wash potentially contaminated clothes separately from other clothing. Rinse clothes washer thoroughly. NIOSH stated First Aid. Eye: Irrigate immediately. Breathing: Fresh air.

### **WARNING**

Before servicing, turn off electrical power to boiler at service switch. Close manual gas valve to turn gas supply OFF to boiler. Test for gas leaks on any gas carrying components after servicing. Service not complete until appliance operation verified per Installation, Operation & Maintenance Manual provided with boiler.

### **CAUTION**

Label all wires prior to disconnection when servicing controls. Wiring errors can cause improper and dangerous operation. Failure to follow these instructions could result in minor or moderate injury.

### **NOTICE**

Perform regular service and maintenance by qualified service agency at least once every 12 months to assure safe, trouble free operation and maximum efficiency.

#### **11.2 Maintenance And Routine Servicing**

Check and service boiler as necessary.

Frequency of servicing will depend upon installation conditions and usage, manufacturer recommends minimum of annual inspection or more if required.

- Check flue terminal outside and ensure it is not blocked.
- Operate boiler. Check operation of boiler's controls.
- Ensure all system connections and fittings are sound. Correct any joints and fittings that maybe leaking.
- Follow safety valve manufacturer recommendations for service.

To ensure boiler operates at peak efficiency, following checks must be performed every year:

- check the appearance and tightness of the gas and combustion circuit gaskets
- check the condition and position of the ignition and flame sensing electrodes
- check the condition of the burner and its connection to the aluminum front plate
- check for dirt in the combustion chamber, clean if necessary. Use the vacuum cleaner for this cleaning operation
- check the gas valve is calibrated correctly
- check that there is no dirt in condensate trap
- check the central heating system pressure
- check the expansion tank pressure
- check the vent system, clean if necessary
- if using glycol mixture, check glycol pH, replace if out of range
- Check water cleanliness
- Clean dirt separator if used.

Record details and maintain a service history. Leave the service records with the boiler and the homeowner.



## ⚠ DANGER

Before servicing, turn off electrical power to boiler at service switch. Close manual gas valve to turn gas supply OFF to boiler. Failure to comply will result in death or serious injury.

### 11.3 Component Replacement And Cleaning

1. Remove any deposits from heat exchanger using suitable soft brush. *Do not* use brush with metallic bristles.
2. Check the condition of the combustion chamber insulation panels. Any damaged panels must be replaced.
3. Check the condition of the burner on the manifold, carefully clean it with a soft brush if necessary. *Do not* use a brush with metallic bristles this might damage the burner.
4. Remove any fallen deposits from bottom of inner case.
5. Clean the burner with soft brush and check the flame ports are clear. Blockages may be removed with stiffer brush or air compressor.
6. Check the condition of the electrodes.
7. Check the spark gap, positioning and height of electrodes. See Figure 11-1.
8. Check the fan impeller is clean and free to rotate.
9. Replace used gaskets with new gaskets. See Parts list for correct gasket kit number.

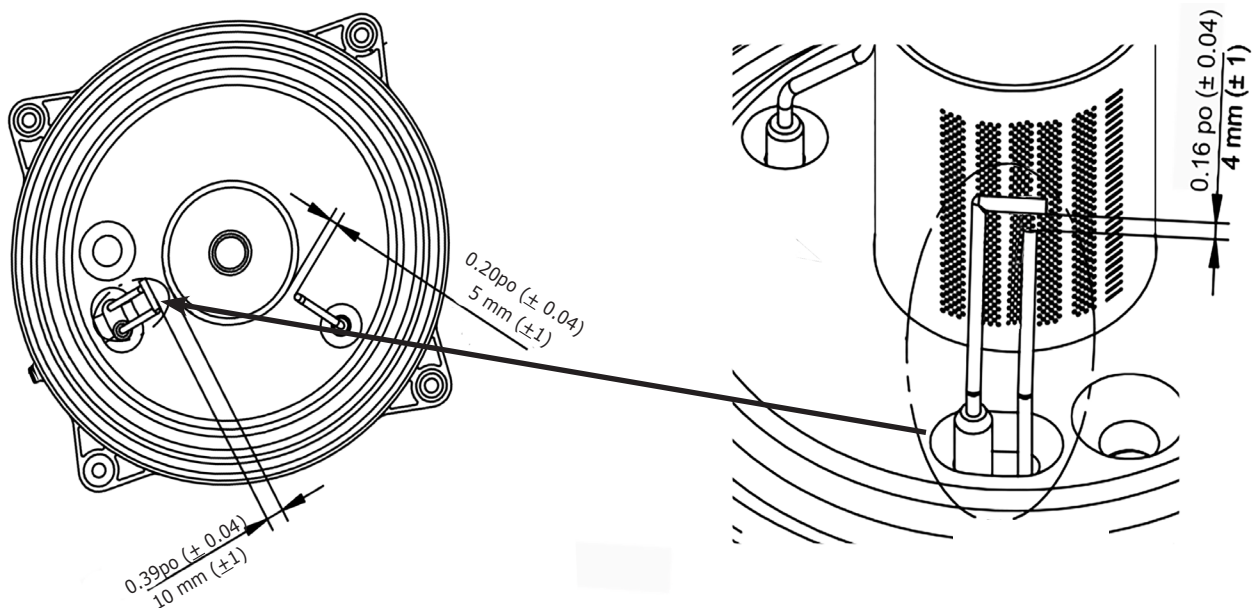
### 11.4 Draining the Boiler

- turn boiler off
- isolate electrical supply
- close boiler gas service cock
- allow boiler to cool
- drain boiler through onboard drain if available or external drain valve.

### 11.5 Draining the Heating Circuit

- Follow all steps in Section 11.4.
- Close central heating flow and return valves.
- Connect suitable pipe or hose to drain valve.
- Route it to suitable container or plumbing drain.
- Open drain tap.

**Figure - 11-1 Electrodes**



## 11 - GENERAL MAINTENANCE AND CLEANING

### 11.6 Combi (DHW)

Install an appropriate water treatment system compliant with current regulations.

For installations using well water or areas with sediment in the water supply, a sediment filter is manufacturer recommended.

### 11.7 The Cold Water Filter

Boiler is fitted with a cold water filter located on DHW hydraulic assembly (**B**). To clean:

- Drain domestic hot water system. Drain is field supplied/installed.
- Remove nut on DHW priority sensor unit using 18mm wrench. (B)
- Remove flow sensor and filter.
- Remove any debris.
- Replace nut and filter.

### NOTICE

When replacing and/or cleaning "O-rings" on hydraulic assembly (DHW), use only a food grade lubricant, not oil or grease.

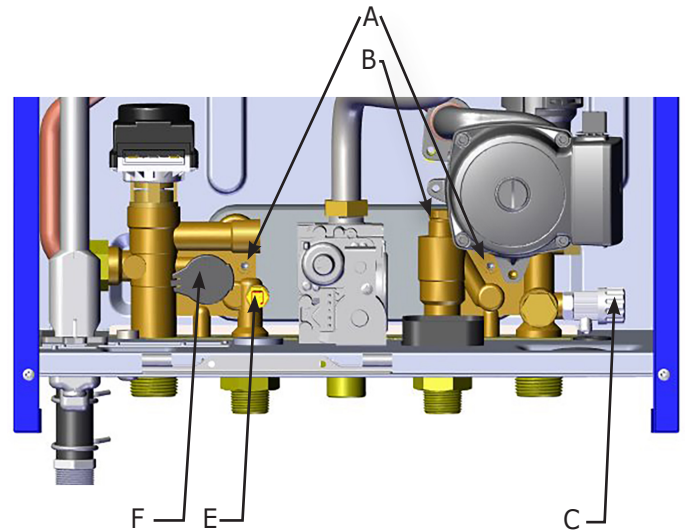
### 11.7 Maintenance

- Allow heating system to heat. Balance the system to achieve temperature difference across heating supply and return pipes at the boiler.
- Check system for proper pressure. See page 4 for acceptable pressure.
- Turn off boiler.
- Check water and flush if necessary. Clean filters in heating return and supply water isolating valves.
- Repressurize the system.

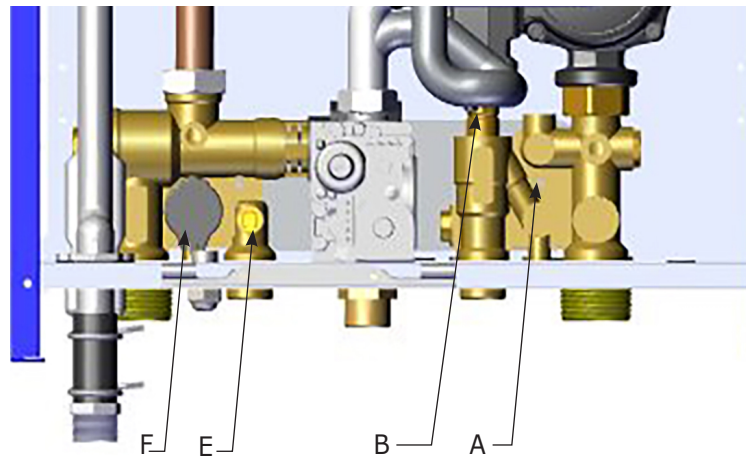
### 11.8 Final Assembly

- If boiler is to be left in service with the User, set controls and room thermostat.
- If boiler is not to be handed over immediately, close boiler gas service valve and turn off electrical supply.
- If there is possibility of boiler being left during frost conditions drain boiler and system. See section 11.3 - Component Replacement Or Periodic Cleaning. Manufacturer recommends attaching a label to the boiler drawing attention to the fact that the system has been drained.

### Model GMCB150



### Model GMCB200



### LEGEND

Hydraulic Assembly (B)

<b>A</b>	DHW exchanger retaining screw
<b>B</b>	DHW priority sensor with filter
<b>C</b>	Boiler/system drain tap (125C unit only)
<b>E</b>	DHW temperature NTC probe
<b>F</b>	Low water pressure sensor


### 11.9 User Information

Advise and demonstrate to User the following important information:

- a. Turn Boiler on and off. How to operate system controls.
- b. Importance of annual servicing of boiler to ensure safe and efficient operation.
- c. Servicing or replacement of parts shall be carried out by a qualified personnel.
- d. Ensure boiler controls and room thermostat, if fitted, are set to User's requirements.
- e. Tell User about sealed system pressure.
- f. Tell User if display is active and boiler has not operated for 24 hours for heating or hot water, the pump will automatically operate for 1 minute.
- g. Explain to User an internal frost thermostat is fitted in boiler, and electrical supply to boiler must be left on for thermostat to operate. Frost protection protects the boiler, not the system.
- h. Show User position of pressure relief valve discharge pipe.
- i. Leave this Installation, Operation and Maintenance Manual with User for use on future calls.

**11.10 Safety Flue Thermostat - DO NOT** disable this safety device.

Safety Flue Thermostat found on the flue inside the boiler, interrupts flow of gas to the burner if the temperature overheats.

After verifying the cause of the trip, press  for about 2 seconds.

### NOTICE

When servicing the appliance, check the condition and position of flame sensing electrode and replace it if necessary.

### 11.11 Replacement Parts

Perform Combustion Check procedure described in this manual if one or more of the following components are replaced. Check and adjust CO<sub>2</sub>% value as indicated in the Combustion Table.

Components replaced:


- Primary heat exchanger
- Fan
- Gas valve
- Gas nozzle
- Burner
- Flame sensing electrode

### 11.12 Gasket Kit

Before beginning service on the boiler ensure that a maintenance service kit is on hand to replace gaskets that have been opened.

## 12 TECHNICAL DATA

### 12 Ratings and Capacity

					
Model Number	CH Input, MBH <sup>(1)</sup>		<sup>(1)(2)</sup> Heating Capacity, MBH *	<sup>(1)(3)</sup> Net AHRI Rating Water, MBH	<sup>(2)</sup> AFUE%
	Maximum	Minimum			
GMHB125	122	24.5	112	97	95.0
GMCB150	122	24.5	112	97	95.0
GMHB160	160	32.0	148	129	95.0
GMCB200	160	32.0	148	129	95.0

(1) 1000 Btu/hr (British Thermal Units Per Hour)  
 (2) Heating Capacity and AFUE (Annual Fuel Utilization Efficiency) are based on DOE (Department of Energy) test procedures.  
 (3) Net AHRI Ratings based on piping and pickup allowance of 1.15. Contact Technical Support before selecting boiler for installations having unusual piping and pickup requirements, such as intermittent system operation, extensive piping systems, etc.

\*Max CH Supply temp 176° F (80°C)

#### 12.1 Ratings and Capacities

- Constructed and hydrostatically tested for maximum allowable working pressure of 50 psig (pounds per square inch gauge) (115 kPa) in accordance with ASME Boiler and Pressure Vessel Code, Section IV, Rules for Construction of Heating Boilers.
- **In USA**, for elevations beyond 2,000-ft reduce input by 4% for each 1,000-ft above sea level in accordance with National Installation Code ANSI Z223.1
- **In Canada**, input rate is reduced by 10% for elevations 2,000-ft to 4,500-ft. Contact Provincial Authority having jurisdiction for Installations above 4500-ft (1350m) above sea level.

#### 12.2 Domestic Hot Water Specifications

Item		GMCB150	GMCB200
Input Ratings (MBH)	Min	24.5	32
	Max	147	200
Output Ratings (MBH)	Min	21	28
	Max	133	175
Domestic Water Pressure		2.9 psi (0.2 bar) - 116 psi (8.0 bar)	
Minimum Flow Rate		0.50 GPM	
Maximum Flow Rate		3.5 gpm	5.0 GPM
Flow Rate 77°F (43°C) Temp. Rise		3.2 GPM	4.5 GPM
DHW Supply Connection Size		3/4"NPT	3/4"NPT
Cold Water Input Connection Size		3/4"	3/4"

\*Max DHW temp 140° F (60° C)

## 12 - RATINGS AND CAPACITIES

<b>GMHB125 (Heat Only Boiler)</b>	<b>Natural gas (A) 17.4 mbar 7.0 in w.c.</b>	<b>LP gas (E) 27.4 mbar 11.0 in w.c.</b>
		0 - 2000 Ft 0 - 610 m
Parameter P71 * Fan Speed (rpm)	85 5625	85 5625
Parameter P72 * Fan Speed (rpm)	55 1,300	60 1350
CO Limit (ppm)	<400	

<b>GMCB150 (Combi Boiler)</b>	<b>Natural gas (A) 17.4 mbar 7.0 in w.c.</b>	<b>LP gas (E) 29.8 mbar 12.0 in w.c.</b>
		0 - 2000 Ft 0 - 610 m
Parameter P71 * Fan Speed (rpm)	115 6375	125 6625
Parameter P72 * Fan Speed (rpm)	55 1,300	55 1,300
CO Limit (ppm)	<400	

\* To modify the fan speed see section 10.3.

<b>GMHB160 (Heat Only Boiler)</b>	<b>Natural gas (A) 17.4 mbar 7.0 in w.c.</b>	<b>LP gas (E) c27.4 mbar 11.0 in w.c.</b>
		0 - 2000 Ft 0 - 610 m
Parameter P71 * Fan Speed (rpm)	80 5500	80 5500
Parameter P72 * Fan Speed (rpm)	52 1,270	55 1300
CO Limit (ppm)	<400	

<b>GMCB200 (Combi Boiler)</b>	<b>Natural gas (A) 17.4 mbar 7.0 in w.c.</b>	<b>LP gas (E) 29.8 mbar 12.0 in w.c.</b>
		0 - 2000 Ft 0 - 610 m
Parameter P71 * Fan Speed (rpm)	100 6000	130 6000
Parameter P72 * Fan Speed (rpm)	60 1350	60 1350
CO Limit (ppm)	<400	

\* To modify the fan speed see section 10.3.

## 13.1 Initial Fault Finding Checks

1. Check gas, water and electrical supplies are available at the boiler.
2. Electrical supply = 120V ~ 60 Hz.
3. See Section 7.1 for nominal gas pressure ranges.
4. Carry out electrical system checks, i.e. Grounding, Resistance to Earth, Short Circuit and Polarity with a suitable meter.

**NOTE:** These checks must be repeated after any servicing or fault finding.

5. Ensure all external controls are calling for heat and check all external and internal fuses. Before any servicing or replacement of parts, ensure gas and electrical supplies are isolated.

### Example of Fault Listings:

1. If fault occurs on the boiler an error code may be shown by the display.

**E** 20, **E** 28, **E** 40, **E** 50, **E** 160, indicate possible faulty components.

**E** 53 shows possible obstruction in the flue duct.

**E** 110 shows overheat of the primary.

**E** 117 is displayed when the primary water pressure is more than 43 psig (2.7 bar).

**E** 118 is displayed when the primary water pressure is less than 7.5 psig (0.5 bar).

- E** 125 is displayed in either of two situations:-
- a. If within a time between 15..30 seconds of the burner lighting the boiler temperature has not changed by 1°C.
  - b. If within 10 minutes of the burner lighting the boiler temperature twice exceeds the selected temperature by 30°C. In these instances poor primary circulation is indicated.

**E** 128 is displayed if there has been a flame failure during normal burner operation.

**E** 133 , **E** 134 and **E** 135 indicate the gas supply has been interrupted, ignition has failed or flame has not been detected.

2. By pressing the 'Reset' button for between 1-3 seconds when **E** 110, **E** 125, **E** 133, **E** 134, **E** 135 , **E** 09, **E** 15, **E** 128 and **E** 384 are displayed it is possible to relight the boiler.

3. If this does not have any effect, or error codes are displayed regularly further investigation is required.

## 13.2 Error Diagnostics

The PCB allows the display to list errors accrued in the boiler. PCB has a counter which increases itself only if the anomaly is consecutive repetition. Non consecutive errors do not increase the counter.

To display all information for each error scroll through the parameter list until P32 parameter. See Section 10.3 for scrolling instructions.

Parameters from P32 to P38 (C00 to C06) are referred to errors which do not need to be reset (e.g. DHW sensor fault); Parameters from P39 to P41 (C07 to C09) are referred to errors which require reset (e.g. safety thermostat).

PCB has another counter which displays how long ago the error occurred. The range of this counter is from 0 (the day in which the error occurred) to 99 (up to 3 months).

E.g. 45 indicates the error occurred 45 days before.

The history of errors of each parameter (**Pxx**-see the error table) are displayed in the following order:

- Error number (C00 is the latest error)
- Error code
- Consecutive counter for the same error
- Number of days elapsed from the error event
- System Status
- Phase Status
- CH flow temperature value during the error event

See the following table for error codes:

The **system status** is the operating mode before the error.

<b>00</b>	Stand-by
<b>01</b>	DHW request
<b>02</b>	Controller stop function active
<b>03</b>	CH request
<b>04</b>	Preheat function active
<b>05</b>	CH frost protection function active
<b>06</b>	DHW frost protection function active
<b>07</b>	Post-circulation pump active
<b>08</b>	Overheating circulation pump function active

## 13 - TROUBLE SHOOTING

The **phase status** is a special sub-operating mode before the error.

- 00** Stand-by
- 01** Pre-purging function active
- 03** Ignition load purging between the first attempt and second one.
- 04** Ignition load first attempt
- 05** Operation active
- 06** Lock out
- 08** Second ignition load attempt
- 11** Ignition load purging between the second attempt and the third one
- 14** Third ignition load attempt
- 15** Post-purging function
- 16** Overheating post-purging function active

Error diagnostics are displayed in the following sequence.

### Diagnostic Error Display Example:

<b>C00</b>
<b>E133</b>
<b>=02</b>
<b>000</b>
<b>03</b>
<b>F05</b>
<b>75°C</b>
In event of no error, historical error values are = <b>00</b>

### 13.3 Error Table for Installer

Use this table for error reporting:

		ERROR NUMBER	ERROR CODE	CONSECUTIVE COUNTER FOR SAME ERROR	NUMBER OF DAYS ELAPSED FROM ERROR EVENT	SYSTEM STATUS	PHASE STATUS	CH FLOW TEMPERATURE VALUE DURING ERROR EVENT
<b>NO RESET ERROR</b>	<b>P32</b>	<b>C00</b>						
	<b>P33</b>	<b>C01</b>						
	<b>P34</b>	<b>C02</b>						
	<b>P35</b>	<b>C03</b>						
	<b>P36</b>	<b>C04</b>						
	<b>P37</b>	<b>C05</b>						
	<b>P38</b>	<b>C06</b>						
<b>RESET ERROR</b>	<b>P39</b>	<b>C07</b>						
	<b>P40</b>	<b>C08</b>						
	<b>P41</b>	<b>C09</b>						

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### 13.4 Errors Codes

ERROR-CODE	INTERNAL CODE	ERROR	ACTION
E09		Gas valve connection fault	Check the cable pcb/gas valve and gas valve plug
E10		External probe fault	Check the outdoor sensor
E11		External RF probe fault	Check the sensor
E12		Differential water flow switch fault (still open)	Check the water flow switch
E13		Differential water flow switch (still close)	Check the water flow switch
E15		Gas valve command fault	Check the cable pcb/gas valve, replace pcb if it necessary
E18		Water refill activated	Function active message
E19		Maximum time of water refill	Check the refill hydraulic
E20	1	Central heating NTC sensor fault (short)	Check the sensor
E20	2	Central heating NTC sensor fault (open)	Check the sensor
E40	1	Return central heating NTC sensor fault (short)	Check the sensor
E40	2	Return central heating NTC sensor fault (open)	Check the sensor
E28	001/539	Flue NTC sensor fault (short)	Check the sensor
E28	002/540	Flue NTC sensor fault (open)	Check the sensor
E50	1	DHW NTC sensor fault (tank boiler) (short)	Check the sensor
E50	2	DHW NTC sensor fault (tank boiler) (open)	Check the sensor
E83/84/ E85/86/87		No communication	Check cable between room unit and pcb or RF link.
E109		Pre-circulation alarm	Check the correct circulation of the water and the pump
E110/ <b>R</b>	437	Boiler max temperature exceeded for gradient (probable pump jammed or air in the circuit)	Check the correct circulation of the water and the pump
E110/ <b>R</b>	438	Boiler max temperature exceeded for over-temperature (probable pump jammed or air in the circuit)	Check the correct circulation of the water and the pump
E110		Safety thermostat sensor tripped	Check the sensor
E117	566	Water pressure HIGH (>43 psig) (> 2.9 bar)	Check the water pressure
E118		Water pressure LOW (<7 psig) (< 0.5 bar)	Check the water pressure
E124		Condensate pump alarm	Check the external condensate pump
E125/ <b>R</b>	500	Water circulation fault (overtemperature)	Check the correct circulation of the water and the pump
E125/ <b>R</b>	501	Water circulation fault (flatness on the flow)	Check the correct circulation of the water and the pump
E125/ <b>R</b>	502	Water circulation fault (flatness on the return)	Check the correct circulation of the water and the pump
E127		Temperature Anti-legionella not reached	

**R** = REQUIRES RESET



## 13 - TROUBLE SHOOTING

ERROR-CODE	INTERNAL CODE	ERROR	ACTION
<b>E128/R</b>		Safety error for frequent loss of flame	Check the sensing electrode and the cable, flue recirculation and CO <sub>2</sub> setting.
<b>E129</b>		Safety error for frequently loss of flame with max correction during the ignition	Check the sensing electrode and the cable, flue recirculation, enable the automatic calibration function before to replace components.
<b>E130/R</b>	<b>528</b>	Flue NTC sensor tripped (warning or lockout)	Check the thermostat, the correct circulation of the water and the pump. Check the status of the primary exchanger
<b>E131</b>		Flue thermostat sensor tripped (lockout)	Check the sensor and wire harness connection and continuity, correct circulation of the water and the pump. Check the status of the primary exchanger.
<b>E132</b>		Ignition failure (<35 tries)	Boiler will continue ignition attempts. Check gas supply pressure.
<b>E133/R</b>	<b>0</b>	Gas supply fault (no ignition)	Check the power supply, sensing electrode, spark electrode and cable. Check gas supply pressure, flue circulation, continuity between burner and ground.
<b>E133/R</b>	<b>1</b>	No ignition (frozen / obstruction condensate trap)	Check the correct operation of the condensate trap
<b>E134/R</b>		Gas valve open without gas	Check the gas pressure, sensing electrode, spark electrode and cable, replace the pcb if it necessary
<b>E135</b>		Internal error	Verify cables; Replace pcb
<b>E154</b>		Plausibility test (flow/return)	Check the correct circulation of the water and the pump, check the correct position of the sensors
<b>E160</b>		Fan fault	Check the fan and the cable
<b>E169</b>		Air pressure switch closed	Check obstruction on the flue pipe
<b>E178</b>		Low temperature safety thermostat	Check the sensor and the correct circulation of the water and the pump
<b>E317/162</b>		Wrong power supply electrical frequency (Hz)	Check the frequency (Hz) and the power supply
<b>E384/164/R</b>		Fault flame - flame signal where there should be none	Check the correct operation of the gas valve, humidity on the pcb and on the detection electrode
<b>E385/165</b>		Under voltage	Check the power supply (V~)

**R** = REQUIRES RESET

### 13.5 Errors In Fault History Only (Does not affect boiler operation).

ERROR-CODE	INTERNAL CODE	ERROR	ACTION
<b>E62</b>		Anti-wind activation with increase of the minimum fan speed	Check the position of the terminal of the flue duct. No other action to do
<b>E66</b>		Obstruction of the flue duct at minimum power	Check obstruction on the flue duct.
<b>E67</b>		Antiwind activation at maximum power	Check the position of the terminal of the flue duct.

- **APPLIANCE** - Device to convert gas into energy; term includes any component, control, wiring, piping or tubing required to be part of the device.
- **ANSI** - American National Standards Institute, Inc. oversees the creation and maintenance of voluntary consensus standards, including ANSI Z21.13/CSA 4.9: Gas-Fired Low Pressure Steam and Hot Water Boilers.
- **ASME - Association of Mechanical Engineers**  
Establishes rules of safety governing the design, fabrication, and inspection of boilers and pressure vessels, determining the MAWP of such vessels.
- **ASTM** - American Society for Testing and Materials. ASTM International is one of the largest voluntary standards development organizations in the world, a trusted source for technical standards for materials, products, systems, and services. Known for their high technical quality and market relevancy, ASTM International standards have an important role in information infrastructure that guides design, manufacturing and trade in the global economy.
- **AUTHORITY HAVING JURISDICTION** - Individual or organization adopting and enforcing codes, rules, and by-laws governing various concerns of a community. Commonly referred to as "final authority" for any matters relating to LIFE SAFETY and BUILDING CONSTRUCTION within a community.
- **BOILER** - Appliance intended to supply hot liquid for space-heating, processing or power purposes.
- **BTU** - Abbreviation for British Thermal Unit. Quantity of heat required to raise the temperature of 1 pound of water 1°F.
- **BURNER** - Device for the final conveyance of gas or mixture of gas and air, to the combustion zone.
- **CALIBRATE** - Make fine adjustments or divide into marked intervals for optimal measuring.
- **COAXIAL VENTING** - Sharing the same center line.
- **COMBUSTION** - Rapid oxidation of fuel gases accompanied by the production of heat and light. Complete combustion of fuel is possible only in the presence of an adequate supply of oxygen.
- **COMBUSTIBLE MATERIAL** - Materials made of or surfaced with wood, compressed paper, plant fibers, or other materials capable of being ignited and burned. Such material shall be considered combustible even though flame-proofed, fire-retardant treated, or plastered.
- **COMBUSTION AIR** - Air that is drawn into an appliance to mix with fuel and support combustion.
- **CONDENSATE** - Liquid separated from flue gas due to a reduction in temperature.
- **DIRECT VENT BOILER** - Boiler constructed and installed so that all combustion air is derived directly from outdoors and all vent gases are discharged to outdoors.
- **DOMESTIC** - Relating to household usage as opposed to commercial usage.
- **DOMESTIC WATER** - Potable drinking water - tap water.
- **DRAFT** - Pressure difference causes gases or air to flow through a chimney, vent, flue or appliance.
- **FLA** - Full load amps.
- **FLUE** - Enclosed passageway for conveying combustion gases.
- **FLUE GASES** - Products of combustion plus excess air in appliance flues or heat exchangers.
- **GAS SUPPLIER** - Party that sells the commodity of Natural Gas (Gas A) or LPG (Gas E).
- **HIGH-VOLTAGE** - Circuit involving a potential of not more than 600 volts and having circuit characteristics in excess of those of a low-voltage circuit.
- **HYSTERESIS (DIFFERENTIAL)** - Difference between the temperature at which the thermostat switches off - and the temperature at which it switches on again.
- **IGNITER** - Device utilizing electrical energy to ignite gas at the main burner.
- **LEAK CHECK** - Operation performed on a gas piping system to verify the system does not leak.
- **LICENSED QUALIFIED INSTALLER / SERVICE TECHNICIAN** - Any individual, firm, corporation or company that either directly or through a representative is engaged in the installation, replacement, repair or servicing of gas piping, venting systems, appliances, components, accessories, or equipment, and whose representative is experienced and trained in such work and has complied with the requirements of the authority having jurisdiction.
- **LOW WATER CUTOFF** - Device constructed to automatically cut off fuel supply when the surface of water in the boiler falls to the lowest safe water level.
- **LOW-VOLTAGE** - Circuit involving a potential of not more than 30 volts.

● **METRIC GAS METERS**

**Natural Gas**

$$\text{MBH} = \frac{127,116 \times \text{cu meters}}{\text{Seconds}}$$

For example: Gas Meter measures 0.1 cubic Meters in 100 seconds

$$\text{MBH} = \frac{127,116 \times 0.1}{100} = 127 \text{ MBH}$$

**Propane Gas (LP)**

$$\text{MBH} = \frac{383,482 \times \text{cu meters}}{\text{Seconds}}$$

● **NATIONAL BOARD OF BOILER AND PRESSURE VESSEL INSPECTORS**

- Group composed of boiler and pressure vessel inspectors representing states, cities and provinces enforcing pressure equipment laws and regulations.

● **PRESSURE TEST** - Operation performed to verify gas tight integrity of gas piping following its installation or modification.

● **PURGE** - To free gas conduit of air or gas, or mixture of gas and air.

● **PURGE TIME** - Period of time intended to allow for dissipation of any unburned gas or residual products of combustion.

● **QUALIFIED AGENCY** - Any individual, firm, corporation, or company engaged in and responsible for:

- Installation, testing, or replacement of gas piping, or connection, installation, testing, repair or servicing of appliances and equipment.
- Experienced in such work.
- Familiar with all precautions required.
- Complies with all requirements of authority having jurisdiction.

● **SAFETY RELIEF VALVE** - Valve designed to relieve pressure in hot water supply system when pressure exceeds pressure capability of equipment.

● **SAFETY SHUTOFF DEVICE** - Device that will shut off gas supply to controlled burner in event source of ignition fails.

● **SEDIMENT TRAP** - Gas piping arrangement designed to collect any liquid or solid contaminant before reaching gas valve.

● **SERVICE** -Supply, installation, or maintenance of goods carried out by a Qualified Installer / Service Technician.

● **TWO PIPE SYSTEM** - Type of venting that allows for exhaust flue and intake air piping to be separated from each other. Fresh air may be drawn in at a different area from where flue terminal is located.

● **VENT** - Passageway used to convey flue gases from appliance vent connector to outdoors.

● **VENTING SYSTEM** - Continuous open passageway from of appliance vent connector to outdoors for purpose of removing flue or vent gases.

## **IMPORTANT**

In accordance with Section 325 (f) (3) of the Energy Policy and Conservation Act, this boiler is equipped with a feature that saves energy by reducing the boiler water temperature as the heating load decreases. This feature is equipped with an override which is provided primarily to permit the use of an external energy management system that serves the same function.

**THIS OVERRIDE MUST NOT BE USED UNLESS AT LEAST ONE OF THE FOLLOWING CONDITIONS IS TRUE:**

- An external energy management system is installed that reduces the boiler water temperature as the heating load decreases.
- This boiler is not used for any space heating
- This boiler is part of a modular or multiple boiler system having a total input of 300,000 BTU/hr or greater.
- This boiler is equipped with a tankless coil.



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All specifications subject to change without notice.

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