These Gas-Fired Water boilers are low pressure, Design Certified by CSA (Canadian Standards Association) for use with Natural and Propane Gases. They are constructed and hydrostatically tested for a maximum working pressure of 50 psi (pounds per square inch) in accordance with A.S.M.E. (American Society of Mechanical Engineers) Boiler and Pressure Vessel Code Section IV Standards for Heating Boilers.
<table>
<thead>
<tr>
<th>Fully Assembled Boiler</th>
<th>30 PSI Safety Relief Valve</th>
<th>Temperature Pressure Gauge (2&quot; Shank)</th>
<th>G3/4 NPT Ball Gas Shutoff Valve</th>
</tr>
</thead>
<tbody>
<tr>
<td>DHW Optional Pipe Heat Only Boiler</td>
<td>Copper Flush Bushing 1/2&quot; x 1/4&quot; NPT</td>
<td>Copper Tee 1-1/24&quot; x 1-1/4 &quot;x 1/2&quot;</td>
<td>Used for Valve Connections</td>
</tr>
</tbody>
</table>

Includes Essential Documents and Warranty 11x17 Wire Diagrams

**Document Package**

**NOTICE**

Using proper brazing or soldering technique, insert copper flush bushing into copper tee with threading up and non-threaded end down. If the threaded end is not UP the TP gauge cannot engage the threads in the bushing.

For Parts lists see manual 240013001 included with your boiler literature package.
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Dimensions

<table>
<thead>
<tr>
<th>DIMENSIONS</th>
<th>150</th>
</tr>
</thead>
<tbody>
<tr>
<td>Height (Bottom of boiler top of safety Valve)</td>
<td>43.65” [1.09 m]</td>
</tr>
<tr>
<td>Overall Width with Manifold</td>
<td>24.70” [628 mm]</td>
</tr>
<tr>
<td>Depth</td>
<td>17.46” [444 mm]</td>
</tr>
<tr>
<td>Condensate Trap Connection</td>
<td>3/4” NPT</td>
</tr>
<tr>
<td>System Supply</td>
<td>*1 1/4” Sweat Connection</td>
</tr>
<tr>
<td>DHW Outlet</td>
<td>*1/2” Sweat Connection</td>
</tr>
<tr>
<td>Gas Connection</td>
<td>3/4” NPT</td>
</tr>
<tr>
<td>DHW (Cold Water) Inlet</td>
<td>*1/2” Sweat Connection</td>
</tr>
<tr>
<td>System Return</td>
<td>*1 1/4” Sweat Connection</td>
</tr>
<tr>
<td>Boiler Filling Connection</td>
<td>External to Boiler</td>
</tr>
<tr>
<td>Primary Water Content</td>
<td>1 gal [3.60 L]</td>
</tr>
</tbody>
</table>

* Or use Propress® for sweat connections

SYSTEM

<table>
<thead>
<tr>
<th>Central Heating (Sealed System)</th>
<th>150</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heat Exchanger Max Allowable Working Pressure</td>
<td>50 psi [3.45 bar]</td>
</tr>
<tr>
<td>Max System Pressure</td>
<td>30.00 psi [2.11 bar]</td>
</tr>
<tr>
<td>Min System Pressure</td>
<td>7.25 psi [0.50 bar]</td>
</tr>
<tr>
<td>Max System temperature</td>
<td>176°F [80°C]</td>
</tr>
<tr>
<td>Pressure Relief Valve Setting</td>
<td>30.00 psi [2.11 bar]</td>
</tr>
<tr>
<td>Expansion Tank Minimum Size (pre-charge press.)</td>
<td>2.2 gal at 11.6 psi [10.0 L at 0.8 bar]</td>
</tr>
<tr>
<td>Recommended System Pressure (cold)</td>
<td>21.7 psi [1.5 bar]</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Domestic Hot Water (Sealed System)</th>
<th>150</th>
</tr>
</thead>
<tbody>
<tr>
<td>Max Inlet Water Pressure</td>
<td>116 psi [8 bar]</td>
</tr>
<tr>
<td>Min Inlet Water Pressure</td>
<td>2.9 psi [0.2 bar]</td>
</tr>
<tr>
<td>Min DHW Water Pressure</td>
<td>2.9 psi [0.2 bar]</td>
</tr>
<tr>
<td>Max DHW Flow Rate</td>
<td>0.55 gpm [2.50 L/min]</td>
</tr>
<tr>
<td>Max DHW Temperature</td>
<td>140°F [60°C]</td>
</tr>
<tr>
<td>DHW Water Content</td>
<td>0.05 gal [0.23 L]</td>
</tr>
</tbody>
</table>

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. If the system pressure increases more than 2 psi at maximum temperature or if continued relief valve operation is witnessed, then a larger expansion tank is needed.
PHYSICAL DATA

Top View
All Models

Left Side View
All Models

Front View
All Models

Right Side View
All Models

[Dimensions and measurements are shown in the diagram, including lengths and widths.]

10.44 in. [266 mm]
6.87 in. [175 mm]
18.56 in. [472 mm]
20.50 in. [521 mm]
24.70 in. [628 mm]
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.

**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.

**WARNING**

Fire, Explosion, Asphyxiation, Electrical shock hazard! Flooding will result in damages such as electrical problems, corrosion, inoperative parts, mold and other unforeseen issues which can occur over time. Any equipment determined by a professional as damaged by a flood, defined as excess of water or other liquid, shall be replaced. Failure to follow these directions will result in a Hazardous Situation.

**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.

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.

**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.

**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.

---

**FOR YOUR SAFETY READ BEFORE OPERATING**

---

**DANGER**

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.

<table>
<thead>
<tr>
<th>Water Temperature Setting</th>
<th>1st Degree Burn Exposure Time For An Adult</th>
<th>2nd and 3rd Degree Burn Exposure Time For An Adult</th>
</tr>
</thead>
<tbody>
<tr>
<td>120° F</td>
<td>1 minute</td>
<td>5 minutes</td>
</tr>
<tr>
<td>130° F</td>
<td>5 seconds</td>
<td>30 seconds</td>
</tr>
<tr>
<td>140° F</td>
<td>2 seconds</td>
<td>5 seconds</td>
</tr>
<tr>
<td>150° F</td>
<td>1 second</td>
<td>1.5 seconds</td>
</tr>
<tr>
<td>160° F</td>
<td>Instantaneous</td>
<td>0.5 seconds</td>
</tr>
</tbody>
</table>

**Note:** Warning for Infants, Children, and 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.
2 - Introduction

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

**UNITED STATES**
- National Electrical Code, NFPA 70.

**CANADA**
- Natural Gas and Propane Installation Code, CAN/CSA B149.1.
- Canadian Electrical Code, Part I, Safety Standard for Electrical Installations, CSA C22.1

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 use of Carbon Monoxide monitor may be requirement of local jurisdiction.

2.5 Designated Use
- **GCWB95F-150** provides both central heating and domestic hot water.
- Indoor installation.
- Closet or alcove installation. Direct Vent Boiler does not require air vents when installed in closet or room.
- Direct vent boiler, requires fresh air intake piped from outdoors.
- 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 system pressure, or drop below minimum system pressure 7.25 psig (.50 bar)
- Exceed 176°F (80°C) system design temperature.

2.7 Operational Features
- **GCWB95F-150** - Modulates input to provide CH Turndown 5.7:1, DHW Turndown 7:1.

- Maximum output available for domestic hot water:
  - **GCWB95F-150** - 136,000 btu/h (40 kW), capable of providing 3.5 (U.S.) gpm (13.2 liters/min) with a temperature rise of 70°F/39°C.
- Integral Low Water Pressure Cutoff.
- Optional Outdoor Temperature Reset.
- Heat exchanger over heat protection.
- Boiler operating at maximum operating temperature, providing heat, pressure gauge should not indicate more than 26.11 psi / 1.80 bar. If reading exceeds this figure larger expansion tank is required.
3 - COMPONENT LISTING

UTICA BOILER GCWB95F-150

<table>
<thead>
<tr>
<th>ITEM NO.</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Coaxial Connector</td>
</tr>
<tr>
<td>2</td>
<td>Flue Sensor</td>
</tr>
<tr>
<td>3</td>
<td>Heat Exchanger</td>
</tr>
<tr>
<td>4</td>
<td>Burner (not shown)</td>
</tr>
<tr>
<td>5</td>
<td>Flame Detection Electrode</td>
</tr>
<tr>
<td>6</td>
<td>Air/Gas Blend Manifold</td>
</tr>
<tr>
<td>7</td>
<td>Venturi</td>
</tr>
<tr>
<td>8</td>
<td>Fan</td>
</tr>
<tr>
<td>9</td>
<td>Pump with Air Separator</td>
</tr>
<tr>
<td>10</td>
<td>DHW Priority Sensor</td>
</tr>
<tr>
<td>11</td>
<td>Flow Sensor with Water Filter and Flow Restrictor</td>
</tr>
<tr>
<td>12</td>
<td>Boiler Drain Tap</td>
</tr>
<tr>
<td>13</td>
<td>Heating Return</td>
</tr>
<tr>
<td>14</td>
<td>Cold Water DHW Inlet Tap</td>
</tr>
<tr>
<td>15</td>
<td>Gas Inlet</td>
</tr>
<tr>
<td>16</td>
<td>DHW Outlet</td>
</tr>
<tr>
<td>17</td>
<td>Heating Supply Connection</td>
</tr>
<tr>
<td>18</td>
<td>Condensate Connection</td>
</tr>
<tr>
<td>19</td>
<td>DHW Heat Exchanger</td>
</tr>
<tr>
<td>20</td>
<td>NTC DHW Sensor</td>
</tr>
<tr>
<td>21</td>
<td>Low Water Pressure Cutoff</td>
</tr>
<tr>
<td>22</td>
<td>3-Way Valve with Motor</td>
</tr>
<tr>
<td>23</td>
<td>Gas Valve</td>
</tr>
<tr>
<td>24</td>
<td>Water Safety Thermostat</td>
</tr>
<tr>
<td>25</td>
<td>NTC Heating sensor (Flow/Return) QTY 2, (1 Shown for clarity)</td>
</tr>
<tr>
<td>26</td>
<td>Ignition Electrode</td>
</tr>
<tr>
<td>27</td>
<td>Pressure Switch</td>
</tr>
<tr>
<td>28</td>
<td>Pressure Relief Valve</td>
</tr>
</tbody>
</table>

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

- 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. 10.
- Room-sealed 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 placed side by side, or back to back.
- Observe 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.
- Requires fresh air intake piped from outdoors.

4.2 Floor Location

- Place crated boiler as close to selected location as possible and uncrate boiler. Boiler may be moved into position with appliance dolly or (2) two wheel hand truck. Insert dolly or hand truck under left hand side of boiler. It is possible to slide boiler for short distance on smooth floor or surface.
- Adjust the position of the boiler verify it is level and plumb.
- Select level location central to piping systems served and as close to vent and air intake terminals as possible.
- Accessibility clearances, if more stringent (i.e. larger clearances) than required fire protection clearances, must be used for boiler installation. Accessibility clearances may be achieved with the use of removable walls or partitions.
- Boiler is approved for installation in closets and on combustible floors. This boiler shall NOT be installed on carpeting.
- Install equipment in location which facilitates operation of venting and combustion air intake piping systems as described in this manual.
- Advise owner to keep venting and combustion air intake passages free of obstructions. Both venting and combustion air intake piping systems connected to outdoors must permit flow through piping systems without restrictions for boiler operation.
- Keep boiler area clean of debris and free of flammable and combustible materials, vapors and liquids.
**4.3 Clearances**

<table>
<thead>
<tr>
<th>Dimension</th>
<th>Combustible Materials (1)</th>
<th>Manufacturer Recommended for Service(1)(2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Top</td>
<td>0&quot; (0 cm)</td>
<td>8-5/8&quot; (220 mm)</td>
</tr>
<tr>
<td>Left Side</td>
<td>1-3/4&quot; (45 mm)</td>
<td>12&quot; (305 mm)</td>
</tr>
<tr>
<td>Right Side</td>
<td>1-3/4&quot; (45 mm)</td>
<td>1-3/4&quot; (45 mm)</td>
</tr>
<tr>
<td>Front</td>
<td>0&quot; (0 mm)</td>
<td>17-3/4&quot;(450 mm)</td>
</tr>
<tr>
<td>Back</td>
<td>0&quot; (0 mm)</td>
<td>0&quot; (0 mm)</td>
</tr>
<tr>
<td>Bottom</td>
<td>0&quot; (0 mm)</td>
<td>0&quot;(0 mm)</td>
</tr>
<tr>
<td>Combustion Air/Vent piping</td>
<td>0&quot; (0 mm)</td>
<td>6&quot; (160 mm)</td>
</tr>
</tbody>
</table>

(1) Required distances measured from boiler jacket.
(2) Service, proper operation clearance recommendation.
* Allowance for piping and venting not included.

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

**Service Clearances**

**Combustible Clearances**

0 in /0 mm between Back of Unit and wall
5.1 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.
- Vent connections serving appliances vented by natural draft shall not be connected into any portion of mechanical draft systems operating under positive pressure.
- Use only manufacturer approved venting materials or venting materials primer and glue approved to: ULC S636 in Canada, or UL 1738 in the U.S.
- 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/ASTM F493.
- 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 fire-stop 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 and strength located at intervals of 3 ft (1 m) or less. Allow for expansion/contraction of pipe.
- Venting shall be supported adjacent to each joint using steel strapping or equivalent. See Figure 5-1.

- Support horizontal sections of vent pipe to prevent sags capable of accumulating condensate.
- 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.
- Manufacturer requires use of an approved mechanical fastener, which may vary per vent pipe manufacturer, at every push-fit gasket connection when using a single wall polypropylene vent system.

5.2 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 fans. 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.
5.3 Definitions

1. **Coaxial piping** – Exhaust and air intake pipe have a common axis.
2. **Twin Pipe** – 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.
5.4 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.

<table>
<thead>
<tr>
<th>Vent Material Options</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>150</strong></td>
</tr>
<tr>
<td>1 4&quot; / 2&quot; [100 mm / 60 mm] polypropylene coaxial.</td>
</tr>
<tr>
<td>2 3&quot; [80 mm] polypropylene twin pipe. Shall be polypropylene on BOTH intake and exhaust.</td>
</tr>
<tr>
<td>3 2&quot; [60 mm] polypropylene twin pipe. Shall be polypropylene on BOTH intake and exhaust.</td>
</tr>
<tr>
<td>4 3&quot; [80 mm] flexible polypropylene for chimney exhaust vent, shall have rigid 3&quot; [80 mm] polypropylene on air intake.</td>
</tr>
<tr>
<td>5 3&quot; [80 mm] Twin pipe CPVC. PVC optional on intake ONLY.</td>
</tr>
</tbody>
</table>

* 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.

**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:
- Canada - Natural Gas and Propane Installation Code, CAN/CSA B149.1

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 mechanical fastener at every push-fit gasket connection when using a single wall polypropylene vent system.

5.5 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 or other airborne chemicals or pollutants.
- Locate combustion air and vent terminals as required by authority having jurisdiction.

Approved Polypropylene Manufacturers

* Natalini
* DuraVent®
* Centrotherm
* Z-Flex®

Note: Maximum equivalent length may vary between manufacturers.

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Approved Polypropylene Manufacturers

* Natalini
* DuraVent®
* Centrotherm
* Z-Flex®

Note: Maximum equivalent length may vary between manufacturers.
5.6 Coaxial Venting Instructions

Maximum equivalent flue lengths for Coaxial venting are:

<table>
<thead>
<tr>
<th>Boiler Size</th>
<th>Coaxial Pipe Vent Lengths</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(Includes first elbow and termination)</td>
</tr>
<tr>
<td>Vent Size</td>
<td>4”/2” [100 mm/60 mm]</td>
</tr>
<tr>
<td>Natalini</td>
<td>Maximum Minimum</td>
</tr>
<tr>
<td>150</td>
<td>32.80 ft [10 m] 6 ft [1.8 m]</td>
</tr>
<tr>
<td>DuraVent®</td>
<td>27.88 ft [8.5 m]</td>
</tr>
<tr>
<td>Centrotherm</td>
<td>24.60 ft [7.5 m]</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Coaxial Elbows - Equivalent length</th>
</tr>
</thead>
<tbody>
<tr>
<td>4”/2” [100 mm/60 mm]</td>
</tr>
<tr>
<td>45°</td>
</tr>
<tr>
<td>90°</td>
</tr>
<tr>
<td>Coaxial Termination - Equivalent length 3 ft (0.9 m)</td>
</tr>
</tbody>
</table>

NOTE: Coaxial venting can run horizontal or vertical.
The following instructions are for Natalini pipe, if using another approved manufacturer follow their venting instructions.

• 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" (60 mm) to "X" this is the total dimension of the vents. See Figure 5-4.
• Mark dimension from above on outer aluminum 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.

Figure 5-2 - Coaxial Screw Placement

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

Figure 5-3 - Coaxial Venting Horizontal or Vertical

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. 8-3/4 sheet metal screws and must be zinc coated.
FIGURE 5-4 Roof Mount Coaxial Venting

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

FIGURE 5-6 Side Wall Coaxial Venting

18” Vertical Clearance to ventilated soffit

Min. 8” (181 mm)
Max. 14” (356 mm)

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

FIGURE 5-5 - Coaxial Vertical Exhaust - Multiple Appliances

12” (305 mm) Minimum Separation

Manufacturer Recommends Greater Separation

FIGURE 5-7 - Coaxial Horizontal Exhaust - Multiple Appliances

24” (610 mm) Min. Separation Manufacturer Recommends Greater Separation
5.8 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, adapter kit is available.

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 available.

C. Twin Pipe Separated Flue
Exhaust and combustion air intake are not located in same general location.

D. Twin Pipe - Common Atmospheric Zone Termination
Exhaust and combustion air intake are located in same general location and are of equal length.

When using charts below
See Vent Material Options - page 13

### Twin Pipe Vent Lengths
(Includes first elbow and termination)

<table>
<thead>
<tr>
<th>Boiler Size</th>
<th>150</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vent Size</td>
<td></td>
</tr>
<tr>
<td>3” [80 mm]</td>
<td>2” [60 mm]</td>
</tr>
<tr>
<td>Maximum</td>
<td>Minimum</td>
</tr>
<tr>
<td>Intake Vent</td>
<td>L1</td>
</tr>
<tr>
<td>Exhaust Vent</td>
<td>L2</td>
</tr>
<tr>
<td>Combined Vent</td>
<td>L1+L2</td>
</tr>
</tbody>
</table>

### Single Wall Elbows - Equivalent Length

<table>
<thead>
<tr>
<th>Elbow</th>
<th>3” [80 mm]</th>
<th>2” [60 mm]</th>
</tr>
</thead>
<tbody>
<tr>
<td>45° bend</td>
<td>0.82 ft [0.25 m]</td>
<td>3 ft [0.91 m]</td>
</tr>
<tr>
<td>90° bend</td>
<td>1.64 ft [0.50 m]</td>
<td>5 ft [1.5 m]</td>
</tr>
</tbody>
</table>

NOTE: Two pipe can be installed horizontally or vertically.

### Grade, Snow & Ice
Maintain 12” (305 mm) US, 18” (457 mm) Canada clearance above highest anticipated snow level, 24” (610 mm) 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.


**WARNING**

Asphyxiation hazard! Improper installation could result in death or serious injury. Read Twin Pipe Installation Instructions completely and understand all requirements before beginning installation.

---

**NOTICE**

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.

---

5.9 Securing Twin Pipe Polypropylene Venting

*Example for 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 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 5-11 - Natalini Clamp*
### FIGURE 5-14 - (2" / 60 mm & 3" / 80 mm) Twin Pipe Roof Vent

- 12" (305 mm) Min. horizontal separation between combustion air intake and vent of same appliance.
- 12" (305 mm) Min. 84" (2.2 m) Max. vertical separation between combustion air intake and vent of different appliances.
- 15" (381 mm) Max. horizontal length of vent.
- Min. vent/intake between different appliances 12" (305 mm).
- Max. allowable total vertical vent length with outside exposure is 10 ft. (3.05 m).
- 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 as shown in Figure 5-14.

### FIGURE 5-12 - Twin Pipe on Roof Combustion Air On Sidewall

### FIGURE 5-13 - Twin Pipe Flue On Sidewall, Combustion Air On Roof CAN BE USED ON ALL SIZES

### FIGURE 5-15 - (3" / 80 mm ONLY) Single Wall Exhaust Kit and Air Intake Minimum Distance Center to Center

- 12" (305 mm) US, 18" (458 mm) Canada Min. Above Anticipated Snow Line

### FIGURE 5-16 - (3" / 80 mm ONLY) Horizontal Twin Pipe, Exhaust and Intake

- 12" (305 mm) Minimum Separation
- Manufacturer Recommends Greater Separation

- See Grade, Snow & Ice

**5 - COMBUSTION AIR AND VENT PIPING**
5 - COMBUSTION AIR AND VENT PIPING

FIGURE 5-17 - (3" / 80 mm ONLY) Twin Pipe Side Wall Vent (Multiple Appliances)

Note: 3" shown for clarity. 12" between vent and combustion air of other boilers required in all multiple boiler installations.

12" (305 mm) Min.
Separation
Manufacturer Recommends Greater Separation

Combustion Air

FIGURE 5-18 - (3" / 80 mm ONLY) Twin Pipe Side Wall with 45° Vent

This termination used on 3" / 80 mm vent pipe only

3" (76 mm) Min.
24" (610 mm) Max.
Separation
Vent 45° Elbow Upward

Combustion Air, 90° Elbow Downward

Opening Separation 24"
Min.

FIGURE 5-19 - (3" / 80 mm ONLY) Twin Pipe Side Wall Vent

3" (76 mm) Min.
24" (610 mm) Max.
Separation
Opening Separation 24"
Min.

See Grade, Snow & Ice

FIGURE 5-20 - 2" / 60 mm & 3" / 80 mm Vent Pipe with T

3" (77 mm) Min.
24" (610 mm) Max.
Separation

See Grade, Snow & Ice

FIGURE 5-21 - 2" / 60 mm & 3" / 80 mm Vent Pipe with Tee

6" (153 mm) Min.
24" (610 mm) Max.
Separation

See Grade, Snow & Ice

FIGURE 5-22 - 2" / 60 mm & 3" / 80 mm Twin Pipe Side Wall Vent

3" (77 mm) Min.
24" (610 mm) Max.
Separation

See Grade, Snow & Ice

FIGURE 5-23 - 2" / 60 mm & 3" / 80 mm Twin Pipe Side Wall Vent

3" (77 mm) Min.
24" (610 mm) Max.
Separation

See Grade, Snow & Ice
5.10 (3” / 80 mm Only) Flexible Vent System

<table>
<thead>
<tr>
<th>Flexible Pipe Vent Lengths</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Boiler Size</strong></td>
</tr>
<tr>
<td><strong>Vent Size</strong></td>
</tr>
<tr>
<td><strong>Minimum</strong></td>
</tr>
<tr>
<td><strong>Natalini</strong></td>
</tr>
<tr>
<td><strong>Exhaust</strong></td>
</tr>
<tr>
<td><strong>Intake</strong></td>
</tr>
<tr>
<td><strong>DuraVent®</strong></td>
</tr>
<tr>
<td><strong>Exhaust</strong></td>
</tr>
<tr>
<td><strong>Intake</strong></td>
</tr>
<tr>
<td><strong>Centrotherm</strong></td>
</tr>
<tr>
<td><strong>Exhaust</strong></td>
</tr>
<tr>
<td><strong>Intake</strong></td>
</tr>
<tr>
<td><strong>Z-Dens</strong></td>
</tr>
<tr>
<td><strong>Exhaust</strong></td>
</tr>
<tr>
<td><strong>Intake</strong></td>
</tr>
</tbody>
</table>

Single Wall Elbows - Equivalent Length

<table>
<thead>
<tr>
<th><strong>3” [80 mm]</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>45° bend</strong></td>
</tr>
<tr>
<td><strong>90° bend</strong></td>
</tr>
</tbody>
</table>

**NOTICE**

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 gases 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 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.

**Note** Prime trap before final assembly of vent
All vent pipe and combustion air pipe and fittings shall comply with the following:

Use only manufacturer approved venting materials or venting materials primer and glue approved to: ULC S636 in Canada, or UL 1738 in the U.S.

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/ASTM F493.

**Vent Termination Minimum Clearances**

<table>
<thead>
<tr>
<th></th>
<th>US Installations</th>
<th>Canadian Installations</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Clearance above grade, veranda, porch, deck, or balcony</td>
<td>12&quot; (305 mm)</td>
</tr>
<tr>
<td>B</td>
<td>Clearance to window or door that may be opened</td>
<td>12&quot; (305 mm)</td>
</tr>
<tr>
<td>C</td>
<td>Clearance to permanently closed window</td>
<td>&quot;12&quot; (305 mm)</td>
</tr>
<tr>
<td>D</td>
<td>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</td>
<td>18&quot; (457 mm)</td>
</tr>
<tr>
<td>E</td>
<td>Clearance to unventilated soffit</td>
<td>18&quot; (457 mm)</td>
</tr>
<tr>
<td>F</td>
<td>Clearance to outside corner</td>
<td>9&quot; (229 mm)</td>
</tr>
<tr>
<td>G</td>
<td>Clearance to inside corner</td>
<td>36&quot; (456 mm)</td>
</tr>
<tr>
<td>H</td>
<td>Clearance to each side of center line extended above meter/ regulator assembly</td>
<td>3 ft. (0.9 m) within a height of 15 ft. (4.5 m) above the meter/ regulator assembly</td>
</tr>
<tr>
<td>I</td>
<td>Clearance to service regulator vent outlet</td>
<td>3 ft. (0.9 m)</td>
</tr>
<tr>
<td>J</td>
<td>Clearance to non-mechanical air supply inlet to building or the combustion air inlet to any other appliance</td>
<td>12&quot; (305 mm)</td>
</tr>
<tr>
<td>K</td>
<td>Clearance to mechanical air supply inlet</td>
<td>*3 ft. (0.9 m)</td>
</tr>
<tr>
<td>L</td>
<td>Clearance above paved sidewalk or paved driveway located on public property</td>
<td>*7 ft. (2.1 m)</td>
</tr>
<tr>
<td>M</td>
<td>Clearance under veranda, porch, deck or balcony</td>
<td>*12&quot; (305 mm)‡</td>
</tr>
</tbody>
</table>

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

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

*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.

**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.
5.11 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.
  - Canada - CSA or ULC certified PVC/CPVC pipe, fittings and cement.
- No external trap needed.
- Connect condensate hose, hose clamps, and coupling to boiler drain trap as shown in figure 5-26.
- Connect condensate piping to 3/4" PVC for as shown.
- Slope condensate drain pipe minimum 1/4" per foot (21 mm/m) away from boiler.
- Support condensate pipe to eliminate any sages.
- 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.
- Field source condensate neutralizing kit as required by authority having jurisdiction or for environmentally friendly condensate disposal.

**NOTICE**

Manufacturer requires an air vent be used to prevent condensate line vacuum lock.
6 - HYDRONIC PIPING

6.1 General

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

- 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.
- 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.
- Manufacturer recommends installation of 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.
- 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.
- Ensure piping in the heating system has an oxygen barrier.

- System piping exposed to freezing conditions: Use

- 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.

CENTRAL HEATING PIPING

NOTICE

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

NOTICE

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

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

6.2 Special Conditions

- System piping exposed to freezing conditions: Use

- Do not expose boiler and condensate piping to freezing temperatures.

- Manufacturer recommends installation of 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.

- 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.
6.3 Safety Relief Valve and Air Vent

- Install safety relief valve using pipe fitting provided with boiler. See Figure 6-1.
- 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).

6.4 Trim Piping

- Temperature - Pressure Gauge. Install temperature pressure gauge in near boiler piping on supply side.
- Some boiler models may have integral drain valve located inside jacket directly underneath pump. Install external drain valve as required.

6.5 System Piping

- See Figure 6-6 for basic system piping configurations.
- Systems with automatic fill valves require back flow prevention device.
- Single boiler system. See Figures 6-5, 6-6, for general guidance. Additional considerations:
  - Boiler control only supports integrated pump. Installer responsible for integration of multiple central heating pumps using field supplied external control.
  - Boiler control allows domestic hot water prioritization.
- Thoroughly flush all hydronic piping.
- Secure all valves/fittings to boiler.
- Route pressure relief valve discharge piping to the floor. Follow local code with respect to necessary distance to the floor. See Figure 6-1.
- Verify all drain valves are closed.
Low Water Cutoff (LWCO)
(See Figure 6-5 for detail)

Supply

Air Vent

Safety Relief Valve

Return

Purge Valve

Magnetic Dirt Separator

Position LWCO Above Top of Boiler

Position Temperature/Pressure Gauge on CH System Supply Side of Boiler.

* Check Local Codes for Maximum Distance to Floor.

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.

Note

DO NOT PLACE ISOLATION VALVE BEFORE TEE OR LWCO.
6.6 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 6-4.

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, above the minimum height of boiler. See Figure 6-2, 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 6-3.
- 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 6-4 - LWCO Wiring Diagram
Manufacturer Recommendation

Manufacturer strongly recommends the use of a strainer filtering potable water before entering the boiler. The strainer prevents any sedimentation and debris from your water supply piping from entering the boiler. Debris carried from the water supply will clog DHW water flow sensor, potentially resulting in significant operation issues.

Locate the strainer as close to the boiler as possible and place on DHW (domestic hot water) inlet connection located at bottom of the boiler.
6.7 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 radiator 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 below 7.5 psi / 0.5 bar and above 43.5 psi /3.0 bar.

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

6.8 Domestic Hot Water Mode

• 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.

6.9 Frost Protection Mode

Frost protection mode is integrated into the appliance when electricity is connected to the boiler, regardless if power is "on" or "off". If temperature falls below 41°F / 5° C boiler will fire on its minimum setting until flow temperature of 86°F / 30° C is reached.

6.10 Pump Protection

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

---

**WARNING**

Burn, Scald Hazard! Water temperature over 125°F (51°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.

- Priority is given to the domestic hot water supply. 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.

**FIGURE 6-6**
### 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.

### NOTICE
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.

### 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.

### Gas Supply Required

<table>
<thead>
<tr>
<th>Model</th>
<th>Natural Gas (A)</th>
<th>Liquid Propane (E)</th>
</tr>
</thead>
<tbody>
<tr>
<td>GCWB95F-150</td>
<td>143 ft³/h (4.00 m³/h)</td>
<td>61.15 ft³/h (1.72 m³/h)</td>
</tr>
</tbody>
</table>

- Boiler shall be isolated from the gas supply piping system by closing its individual manual shutoff valve during any pressure testing of the 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.).
- 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.
- 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 field sourced manual main gas shutoff valve, 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.

### Required Gas Supply Pressure

<table>
<thead>
<tr>
<th></th>
<th>Natural Gas</th>
<th></th>
<th>Liquid Propane</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Min.</td>
<td>Max.</td>
<td>Min.</td>
<td>Max.</td>
</tr>
<tr>
<td>3.5&quot; w.c.</td>
<td>0.87 kPa</td>
<td>10.5&quot; w.c.</td>
<td>8.0&quot; w.c.</td>
<td>13.0&quot; w.c.</td>
</tr>
<tr>
<td>(2.61 kPa)</td>
<td>(1.99 kPa)</td>
<td>(3.23 kPa)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
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.

7.3 Gas Orifice - See Figure 7-2
Model 150 - = 5.8 mm (Natural & LP)

---

**NOTICE**

Sediment trap shall be located upstream of gas controls.

**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.
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.

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.

8.1 General
Electrically bond boiler to ground in accordance with requirements of authority having jurisdiction or in absence of such requirements 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.
- In Canada, installation must conform to CSA C22.1 Canadian Electrical Code Part 1 and any local codes.

8.2 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.

8.3 Electrical Connections
- Boiler requires 120V 60Hz power supply. Verify electrical supply is polarized.
- Boiler shall be grounded and on dedicated circuit.
- Shall be one common isolator, providing electrical isolation for boiler and any external controls. Using PVC insulated cable 18 AWGx3C 221°F (105°C).
- 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.

<table>
<thead>
<tr>
<th>Model</th>
<th>Size</th>
<th>150</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power Supply</td>
<td>120V - 60Hz</td>
<td></td>
</tr>
<tr>
<td>Power Consumption</td>
<td>142 W</td>
<td></td>
</tr>
<tr>
<td>Internal Fuse (Qty. 2)</td>
<td>3.15 A (3.1 A, 250 V, Fast Acting)</td>
<td></td>
</tr>
<tr>
<td>Electrode Spark Gap</td>
<td>1/8&quot; to 3/16&quot; (3.1 mm to 4.7 mm)</td>
<td></td>
</tr>
</tbody>
</table>

Wiring diagrams can be found in Appendix A of this Manual.
8.4 Access To Connection Block
1. Ensure there is no line voltage at boiler.
2. Lift and remove front cover. Remove screws (2) from cover on junction box located on boiler’s left side. Remove junction box cover.
3. Guide controller or thermostat wire through round grommet(s) located in the junction box on boiler’s left side.
4. Tilt control box forward by opening holding clip located on left side of control housing.
5. Expose M1 and M2 terminal blocks by removing screw from plastic cover on left. See Figure 8-3.
6. Remove plastic from channel in plastic cover. Run wires through new opening.
7. Connect wires to appropriate terminals on connection block.
8. Reinstall electrical cover plate.
9. Tilt control box back to original position. Ensure clip on left side of control box is fully engaged.
10. Replace front cover and cover to junction box.
11. Turn power to boiler on.

Dry contact end switches from various manufacturers can be attached to boiler control PCB.

8.5 Main Supply Connection
Main supply is connected to terminal block M1 which is high voltage (120V / 60Hz).
Fuses, 3.15 A, 250 V, Fast Acting 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).
(1) (2) = contact for 120V Room Thermostat.
Place jumper back on terminals 1-2 of boiler terminal block M1 if room thermostat is not used or if Remote Control is not installed.

TERMINAL BLOCK M2
Terminals 1 - 2: bus connection for Argo communication thermostat (supplied as an accessory)
Terminal 4 - 5: outdoor temperature sensor connection (supplied as an accessory)
Terminals 6 - 7 - 8: Dry Contact End Switch
Terminals 9 - 10: 0 - 10V connection
8.6 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 Room End Switch

- turn power off to boiler;
- access terminal block M2;
- connect room end switch to terminals 6(R)-7(W)-8(C); Do not apply volt between 2 terminals. Dry contact only.
- turn boiler power on;
- verify room end switch operates per end switch manufacturer's instructions.

NOTE: maximum load allowed is 10 mA

Dry contact end switches from various manufacturers can be attached to boiler control PCB.

8.7 Optional Electrical Connections

A. 1K Ohm (1K Ω) Outdoor Temperature Sensor

To connect this accessory, see figure 8-5, terminals 4-5, and instructions supplied with 1K Ω sensor.

B. Setting "Kt" Climate Curve

When external 1K Ω sensor is connected to boiler, the electronic board adjusts the flow temperature calculated according to set Kt coefficient.

Select required curve by pressing + as indicated in chart below for selecting the appropriate curve (00 to 90).

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

Boiler setpoint will override sensor setpoint.

FIGURE 8-4 Thermostat Connections

FIGURE 8-5 Outdoor Sensor Connections

FIGURE 8-6 Kt Climate Curves

NOTICE

Sensors used for this boiler are proprietary to the manufacturer. Use of after market sensors will diminish boiler performance.
8.8 Management of 0-10V Input

The functions with 0...10V regulator are activated by means of their parameters. When the function is enabled (P82=3) and P78=1, the input manages the heating set point temperature directly; when P78=2, the input manages the heating power input directly. Demand is activated above 3V and the heating setpoint is calculated in proportion to deviation from 3 to 10 V DC, to give a setpoint that goes from minimum to maximum.

<table>
<thead>
<tr>
<th>0-10V DC Electrical Signal Input</th>
<th>P78=1 (150)</th>
<th>P78 = 2 (150)</th>
</tr>
</thead>
<tbody>
<tr>
<td>(V)</td>
<td>(°F)</td>
<td>(°C)</td>
</tr>
<tr>
<td>0...3</td>
<td>OFF</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>77</td>
<td>25</td>
</tr>
<tr>
<td>4</td>
<td>95</td>
<td>35</td>
</tr>
<tr>
<td>5</td>
<td>108</td>
<td>42</td>
</tr>
<tr>
<td>6</td>
<td>124</td>
<td>51</td>
</tr>
<tr>
<td>7</td>
<td>140</td>
<td>60</td>
</tr>
<tr>
<td>8</td>
<td>154</td>
<td>68</td>
</tr>
<tr>
<td>9</td>
<td>167</td>
<td>75</td>
</tr>
<tr>
<td>10</td>
<td>176</td>
<td>80</td>
</tr>
</tbody>
</table>
9.1 Central Heating System Connections - Combi

**LEGEND**

<table>
<thead>
<tr>
<th></th>
<th>Description</th>
<th>Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Heating supply connection</td>
<td>1¼&quot; sweat</td>
</tr>
<tr>
<td>B</td>
<td>DHW outlet</td>
<td>1/2&quot; sweat</td>
</tr>
<tr>
<td>C</td>
<td>Drain connection for condensate</td>
<td>3/4&quot; NPT</td>
</tr>
<tr>
<td>D</td>
<td>Gas shutoff connection</td>
<td>3/4&quot; NPT</td>
</tr>
<tr>
<td>E</td>
<td>Cold DHW inlet tap</td>
<td>1/2&quot; sweat</td>
</tr>
<tr>
<td>F</td>
<td>Heating return connection</td>
<td>1¼&quot; sweat</td>
</tr>
</tbody>
</table>
9.2 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 season.

- Boiler is fitted with automatic air vent positioned on pump Vent and is fitted with adjustable sealing cap. See Figure 9-1.
- Open central heating flow and return valves. Spindle is flat in-line with valve.
- Open fill point valve on filling system until water begins to flow. To aid venting boiler drain may be open until water flows out. Close drain as soon as water appears.
- During initial system air purge open valve connected to top left of heat exchanger, see figure 9-1. Open 4 full turns counter clockwise until steady stream of water is witnessed. Close fully by turning clockwise with no tools required.
- Systems using radiators to remove air - 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, 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 water is escaping from the system.
- Open cold water supply inlet valve. Turn on all domestic hot water taps. Allow water to flow until no air is present. Turn off domestic hot water taps. See page 4- Physical Data and section 2.7 Operational Features.

9.3 Fill Condensate Trap with Water

**WARNING**

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

- 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 draining properly.

**Note**

Condensate trap must be manually filled with water at initial start up.
9.4 Control Panel

Press and hold [\textit{iip}] for 1 second, to display information as shown in the table below.

Press [\textit{iip}] to exit.

<table>
<thead>
<tr>
<th>j</th>
<th>DESCRIPTION</th>
<th>j</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>00</td>
<td>Secondary fault internal code</td>
<td>09</td>
<td>Setpoint Central Heating (°F/°C)</td>
</tr>
<tr>
<td>01</td>
<td>Heating flow temperature (°F/°C)</td>
<td>10/11</td>
<td>Manufacturing information</td>
</tr>
<tr>
<td>02</td>
<td>Outdoor temperature (°F/°C)</td>
<td>12</td>
<td>Flue sensor temperature (°F/°C)</td>
</tr>
<tr>
<td>03</td>
<td>Indirect Tank DHW temperature (boiler CH only)</td>
<td>13</td>
<td>Manufacturing information</td>
</tr>
<tr>
<td>04</td>
<td>Domestic hot water temperature (boiler with plate exchanger)</td>
<td>14</td>
<td>Identification Open Therm communication</td>
</tr>
<tr>
<td>05</td>
<td>Water pressure in heating system (PSI/bar)</td>
<td>15</td>
<td>Manufacturing information</td>
</tr>
<tr>
<td>06</td>
<td>Heating return temperature (°F/°C)</td>
<td>16</td>
<td>Manufacturing information</td>
</tr>
<tr>
<td>07</td>
<td>Thermo fuse status (000/001)</td>
<td>17</td>
<td>Fan speed (&quot;i17&quot;x100)</td>
</tr>
<tr>
<td>08</td>
<td>Not used</td>
<td>18</td>
<td>Manufacturing information</td>
</tr>
</tbody>
</table>

**BUTTONS Key**

DHW temperature adjustment
(+ to increase the temperature and – to decrease it)

Heating water temperature adjustment
(+ to increase the temperature and – to decrease it)

Boiler operating information

Operating mode:
DHW – DHW & Heating – Heating Only

ON/Off – Reset – Exit menu/function

**SYMBOL Key**

\textbf{\textbullet} Off: heating and DHW disabled (only boiler frost protection is active)

\textbf{\textbullet} Burner lit

\textbf{\textbullet} Ignition fault

\textbf{\textbullet} DHW operating mode enabled

\textbf{\textbullet} Boiler/system water pressure low

\textbf{\textbullet} Heating mode enabled

\textbf{\textbullet} Call a qualified service technician

\textbf{\textbullet} Programming menu

\textbf{\textbullet} Manually resettable fault (\textit{iip})

\textbf{\textbullet} Boiler information menu

\textbf{\textbullet} Fault in progress

\textbf{\textbullet} °C, °F, bar, PSI

Set unit of measurement (SI/US)
9 - START UP PROCEDURE

9.5 Prior to Commissioning:
- Check system pressure is correct;
- Power boiler;
- Open gas tap (positioned under boiler);
- Select required heating mode. See section 10.4 Operating Modes.

9.6 Commissioning For The First Time:
1. Turn power to boiler on. Code "000" appears on the display. Appliance is ready for "commissioning" procedure.
2. Press [Esc] at the same time. 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. Boiler will turn on after deaeration function is complete. Display will show code "000" alternating with % of ignition power and temperature value (°F / °C).
- During this gas recognition function phase which lasts about 7 minutes, type of gas being used is analyzed.
- During this function, assure maximum heat exchange to heating or DHW system (domestic hot water demand) by having all heating zones open or all domestic hot water taps open, in order to prevent boiler from switching off due to overheating.
- If boiler operates on Gas A (Natural Gas), display shows NG (Natural Gas) for about 10 seconds. Boiler is now ready for normal operation.
- If display shows LPG (Gas E), press [Esc] and [Inp] together and hold down for at least 4 seconds to exit without changing factory setting. Boiler will stay set to Natural Gas.
- If boiler operates on Gas E (LPG) display shows LPG (Gas E). Press [Inp] for at least 6 seconds to confirm gas used.
- If display shows NG (Gas A) and does not recognize the type of gas used, press [Esc] and [Inp] together and hold down for at least 4 seconds to exit the function. Change parameter P02=01 as described in section 9.11 Parameter Settings of boiler Installation, Operation and Maintenance Manual. Perform Automatic Calibration Function. Manual Calibration may be necessary if combustion is not within specified range.
- After fuel type is detected, confirm P02 is set for the desired fuel type by checking the parameter in following section 9.12.

9.7 Automatic Calibration Function
Before performing this function verify there are no heat demands in progress.
During this function ensure there is maximum heat exchange to the system in Heating or DHW mode (DHW request) to avoid boiler shutting off due to overheating.

NOTICE

IMPORTANT: If Calibration function does not complete, verify unit did not shut down for over-temperature. Repeat Automatic Calibration. Replace KEY if Automatic calibration does not complete after second try.

NOTICE

Boiler must not shut off during calibration. Open all heating zones in heating or DHW mode to ensure boiler does not shut off.

9.8 Commissioning For The Second Time:
1. When function is enabled, [Esc] and [Inp] will flash on the display.
2. After ignition sequence, which can also take place after few attempts, boiler performs three operations. Each operation lasts about 2 minutes:
   - maximum power
   - ignition power
   - minimum power

3. Before moving to the next combustion point, the [P] and [A] appear on the display as the control is setting values.
4. During this phase, power level reached by boiler and delivery temperature alternate on the display.
5. When [Esc] and [Inp] flash together on the display, automatic calibration function has completed.
6. Press [Off] to exit the function. Display will show ESC.
7. Verify combustion is within specified range. If not, perform Automatic and then Manual Calibration. (See Section 9.8)
9.8 Manual Calibration Function:

The Display shows the boiler power and adjustment of the CO2 value (parameter setting) during Manual Calibration sequence.

The process begins at minimum power.
A. After Automatic Calibration sequence with flashing together on the display, you can adjust minimum power combustion by pressing to lower % CO2, and to raise % CO2.
B. When minimum power combustion is in the specified range, press and then to reach ignition power.
C. Press to adjust ignition power combustion. Press to lower % CO2, and to raise % CO2.
D. When ignition power combustion is in the specified range, press and then to reach maximum power.
E. Press to adjust maximum power combustion. Press to lower % CO2, and to raise % CO2.
F. When maximum power combustion is in the specified range, press to exit Manual Calibration Function, ESC is displayed on the screen.

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

1. Press buttons together and hold for 6 seconds. appears on display for a few seconds, followed by program row 312.
2. The electronic board will activate pump on/off cycle for 10 minutes. Function will automatically stop at end of cycle.
3. To manually exit this function, press buttons together and hold for 6 seconds.

FIGURE 9-3 - Gas Inlet Tap - Pi

PI = Gas Supply Inlet Pressure Tap

9.10 Commission Set Up (Gas) - Changing The Type Of Gas
During the first installation boiler carries out an automatic commissioning function.

The system is able to detect the gas type present (gas recognition function) in the network.

Correct gas type setting, is made by pressing two buttons at the same time, see section 9.7 Commissioning.

Change of gas type is made after the first installation:
- Change parameter P02. See section 9.6 Commissioning and section 9.12 Parameter Settings.
- Check minimum gas pressure is suitable for selected gas: minimum gas pressure is determined with boiler operating at high fire and any other appliances connected to same fuel source operational as well (whole house load).
  - Gas A (NG) = 3.5” (8.7 mbar)
  - Gas E (LPG) = 8.0” (19.9 mbar)
- Place supplied label with indication of gas type close to the data plate of boiler replacing the original.
- Perform Automatic Calibration Function - Section 9.7.
- Manufacturer recommends verification of CO2 concentration on the flue.
9.11 Chimney Sweep Function (CO₂ Adjust)
For correct boiler operation, content of \( \text{CO}_2 - \text{O}_2 \) in the combustion flue must be within tolerances indicated in table below.

<table>
<thead>
<tr>
<th></th>
<th>Gas A (Natural Gas)</th>
<th>Gas E (LPG)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>CO₂ %</td>
<td>O₂ %</td>
</tr>
<tr>
<td>Maximum power (100%)</td>
<td>Nominal value</td>
<td>9.0</td>
</tr>
<tr>
<td></td>
<td>Permitted value</td>
<td>8.5 – 9.5</td>
</tr>
<tr>
<td>Ignition power (*)</td>
<td>Nominal value</td>
<td>8.7</td>
</tr>
<tr>
<td></td>
<td>Permitted value</td>
<td>8.2 – 9.3</td>
</tr>
<tr>
<td>Minimum power (0%)</td>
<td>Nominal value</td>
<td>8.8</td>
</tr>
<tr>
<td></td>
<td>Permitted value</td>
<td>8.2 – 9.3</td>
</tr>
</tbody>
</table>

(*) Automatically calculated from the PCB

Chimney Sweep Function enables boiler to generate maximum heating power.
After activation, boiler power % can be adjusted from minimum (0%) to maximum (100%) in DHW mode.

A. Press and hold [holding button] and [holding button] at the same time for 6 seconds. When the function is enabled, displays shows “On” for a few seconds followed by program row “303” alternating with % of boiler power.
B. Press [holding button] to gradually adjust power (increments of 1%).
C. To exit press both buttons together for at least 6 seconds.

If value of \( \text{CO}_2 - \text{O}_2 \) is different, check the electrodes and their relative distances. See Figure 11-1.
If necessary, replace electrodes and position them correctly.
If problem persists, use “COMBUSTION ADJUSTMENT FUNCTION (CO₂%)”. See Section 11 General Maintenance, Figure 11-1 Electrodes. If problem persists, use Section 9.7 Automatic Calibration Function, and Section 9.8 Manual Calibration Function.

2. After burner is lit, boiler reverts to maximum DHW power (100). When display shows "100" it is possible to partially adjust value of CO₂ %;
3. Press [holding button] and [holding button]. Display shows "00" alternating with function number "304" (flashes);
4. Press [holding button] to raise or lower the amount of CO₂ (from -0.3% to +0.3%);
5. Press [holding button] to save new value. Power value "100" will show on display again. Boiler continues operating at maximum DHW power.

This procedure can be used to adjust CO₂ to ignition power and minimum power by pressing [holding button] after performing step 5 above.

6. After saving the new value (step 5 above), press [holding button] to set boiler to ignition power. Wait for value of CO₂ to stabilize. Adjust as described in step 4 of procedure (power value is a number <> 100 and <> 0). Repeat step 5 to save.
7. Press [holding button] to adjust boiler to minimum power. Wait for value of CO₂ to stabilize. Go to step 4 to adjust (power value = 00);
8. Exit function by pressing [holding button] and [holding button] together for at least 6 seconds, see step 1.
If proper combustion cannot be reached see Automatic and Manual Calibration sections 9.7 and 9.8.

9.12 Combustion Adjustment Function (CO₂%)
This function sets out to partially adjust the value of CO₂%. Use the following procedure:

1. Press buttons [holding button] and [holding button] together for at least 6 seconds.
2. When the function is enabled, displays shows "On" for a few seconds followed by program row "304" alternated with the % of boiler power;
3. After burner is lit, boiler reverts to maximum DHW power (100). When display shows "100" it is possible to partially adjust value of CO₂ %;
4. Press [holding button] and [holding button]. Display shows "00" alternating with function number "304" (flashes);
5. Press [holding button] to raise or lower the amount of CO₂ (from -0.3% to +0.3%);
6. Press [holding button] to save new value. Power value "100" will show on display again. Boiler continues operating at maximum DHW power.

This procedure can be used to adjust CO₂ to ignition power and minimum power by pressing [holding button] after performing step 5 above.

6. After saving the new value (step 5 above), press [holding button] to set boiler to ignition power. Wait for value of CO₂ to stabilize. Adjust as described in step 4 of procedure (power value is a number <> 100 and <> 0). Repeat step 5 to save.
7. Press [holding button] to adjust boiler to minimum power. Wait for value of CO₂ to stabilize. Go to step 4 to adjust (power value = 00);
8. Exit function by pressing [holding button] and [holding button] together for at least 6 seconds, see step 1.
If proper combustion cannot be reached see Automatic and Manual Calibration sections 9.7 and 9.8.

9.13 Check Firing Rate
1. Measure input, if a gas meter is installed in the system.
   • Turn off gas to all other appliances.
   • Activate some 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.

NOTICE
• Press [holding button] to display instantaneous flow temperature for 15 seconds.
• Use a regularly calibrated combustion analyzer for combustion analysis.
• During normal operation boiler performs combustion control cycles. In this phase CO values higher than 400 ppm can occur for brief periods of time.
9.14 Parameter Settings

Program boiler electronic board parameters as follows:

- Press **增加和减少** together, hold them down for 6 seconds until program “P01” appears on the display alternated with the set value;
- Press **增加或减少** to scroll the list of parameters;
- Press **加** or **减** to change the value;
- Press **确认** to confirm the value or press **退出** to exit without saving.

Further information in regards to parameters listed in the following table are supplied together with required accessories if necessary.

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

<table>
<thead>
<tr>
<th>Approximate Rate @ 100% Fire (MBH)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Size</td>
</tr>
</tbody>
</table>

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

\[
= \frac{3600 \times 2 \text{ cu ft}}{72 \text{ seconds}} = 100 \text{ MBH}
\]

For Propane (LP):

\[
\text{Input (MBH)} = \frac{9160 \times \text{cu ft}}{\text{seconds}}
\]

9.15 Description Of Parameters: Factory Settings

<table>
<thead>
<tr>
<th>P01</th>
<th>Manufacturer information</th>
<th>FACTORY SETTINGS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>150</td>
</tr>
<tr>
<td>P02</td>
<td>Gas used</td>
<td></td>
</tr>
<tr>
<td></td>
<td>00 = Gas A (Natural Gas)</td>
<td>01</td>
</tr>
<tr>
<td></td>
<td>01 = Gas E (LPG Gas)</td>
<td></td>
</tr>
<tr>
<td>P03</td>
<td>Hydraulic system</td>
<td></td>
</tr>
<tr>
<td></td>
<td>00 = instantaneous appliance</td>
<td></td>
</tr>
<tr>
<td></td>
<td>03 = instantaneous appliance with pre-heat function</td>
<td></td>
</tr>
<tr>
<td></td>
<td>04 = heating only appliance with DHW thermostat</td>
<td></td>
</tr>
<tr>
<td></td>
<td>05 = appliance with external storage indirect tank</td>
<td></td>
</tr>
<tr>
<td></td>
<td>08 = heating only appliance</td>
<td></td>
</tr>
<tr>
<td></td>
<td>13 = instantaneous appliance with pre-heat function for solar application</td>
<td></td>
</tr>
<tr>
<td>P04</td>
<td>Programmable relay 1 setting (optional):</td>
<td></td>
</tr>
<tr>
<td></td>
<td>00 = no function is associated</td>
<td></td>
</tr>
<tr>
<td></td>
<td>01 = close contact with a room thermostat request (other than ECR thermostat)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>02 = close contact with an ECR room thermostat request</td>
<td></td>
</tr>
<tr>
<td></td>
<td>03 = relay for indicating low water pressure</td>
<td></td>
</tr>
<tr>
<td></td>
<td>04 = relay for error code display</td>
<td></td>
</tr>
<tr>
<td></td>
<td>05 = relay for kitchen fan function</td>
<td></td>
</tr>
<tr>
<td></td>
<td>07 = relay for post circulation pump</td>
<td></td>
</tr>
<tr>
<td></td>
<td>09 = DHW relay on with DHW program setting</td>
<td></td>
</tr>
<tr>
<td></td>
<td>10 = DHW relay on with DHW request; if P64 = 1 relay on with CH and DHW request</td>
<td></td>
</tr>
<tr>
<td></td>
<td>13 = relay for Cooling function</td>
<td></td>
</tr>
<tr>
<td></td>
<td>14 = close contact with room thermostat request (120V~) with post circulation</td>
<td></td>
</tr>
<tr>
<td></td>
<td>15 = close contact with open therm remote control request with post circulation</td>
<td></td>
</tr>
<tr>
<td>P05</td>
<td>Programmable relay 2 setting (optional):</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(Same configurations as Relay 1-P04)</td>
<td>04</td>
</tr>
</tbody>
</table>

Parameters continued on next page.
### 9.15 Description Of Parameters: Factory Settings conti.

<table>
<thead>
<tr>
<th>Parameter (P)</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>P06</strong></td>
<td>Outdoor temperature sensor input configuration</td>
</tr>
<tr>
<td>00 = with outdoor temperature sensor connected, external temperature value has influence to calculate heating flow temperature set-point</td>
<td></td>
</tr>
<tr>
<td>01 = with outdoor temperature sensor connected, display shows external temperature value (no influence)</td>
<td></td>
</tr>
<tr>
<td>02...05 = no function is associated</td>
<td></td>
</tr>
<tr>
<td><strong>P07</strong></td>
<td>00...02 = No function is associated</td>
</tr>
<tr>
<td>03 = This is an input contact for CH request (e.g. trigger phone).</td>
<td></td>
</tr>
<tr>
<td>When contact CN2 is closed and Room Thermostat (RT) requiring heat switches burner on.</td>
<td></td>
</tr>
<tr>
<td><strong>Note:</strong> verifying heating mode is enabled (winter or heat only mode)</td>
<td></td>
</tr>
<tr>
<td>04 = This is an input contact for Low Temperature Thermostat (e.g. floor heating system).</td>
<td></td>
</tr>
<tr>
<td>When Low Temperature Thermostat connected on CN2 cuts out, burner switches off and display shows E178 anomaly.</td>
<td></td>
</tr>
<tr>
<td><strong>Note:</strong> verifying heating mode is enabled (winter or heat only mode)</td>
<td></td>
</tr>
<tr>
<td>05 = This is an input contact for external DHW recirculation pump. When contact CN2 is closed the pump runs for a specific period.</td>
<td></td>
</tr>
<tr>
<td>To enable input it is necessary to set parameter P04 or P05 = 08 and P69 = 05.</td>
<td></td>
</tr>
<tr>
<td>Pump will run at P19 minutes (Summer/Winter mode or Only Winter mode) or P19/2 minutes (only Summer mode).</td>
<td></td>
</tr>
<tr>
<td><strong>P09</strong></td>
<td>Manufacturer information</td>
</tr>
<tr>
<td><strong>P10</strong></td>
<td>Heating set-point setting OT / RT (Open Therm / Room Thermostat 120V~)</td>
</tr>
<tr>
<td>00 = with Remote Control (RC) connected, temperature request is RC set-point</td>
<td></td>
</tr>
<tr>
<td>01 = Temperature Request is highest set point between RC and PCB</td>
<td></td>
</tr>
<tr>
<td>02 = Temperature request is RU setpoint. The RT enable the gas boiler operates</td>
<td></td>
</tr>
<tr>
<td><strong>P11..P12</strong></td>
<td>Manufacturer information</td>
</tr>
<tr>
<td><strong>P13</strong></td>
<td>Max. heating output (0-100%)</td>
</tr>
<tr>
<td><strong>P14</strong></td>
<td>DHW max. output (0-100%)</td>
</tr>
<tr>
<td><strong>P15</strong></td>
<td>Min. heating output (0-100%)</td>
</tr>
<tr>
<td><strong>P16</strong></td>
<td>Maximum CH set-point (°C)</td>
</tr>
<tr>
<td>00 = 176°F (80°C)</td>
<td></td>
</tr>
<tr>
<td>01 = 113°F (45°C)</td>
<td></td>
</tr>
<tr>
<td><strong>P17</strong></td>
<td>Pump overrun time in heating mode (01-240 minutes)</td>
</tr>
<tr>
<td><strong>P18</strong></td>
<td>Burner ignition delay in CH mode (00-10 minutes) - 00=10 seconds</td>
</tr>
<tr>
<td><strong>P19</strong></td>
<td>Manufacturer information</td>
</tr>
<tr>
<td><strong>P20</strong></td>
<td>Pump overrun time in DHW mode (seconds)</td>
</tr>
<tr>
<td><strong>P21</strong></td>
<td>Anti-legionellosis function</td>
</tr>
<tr>
<td>00 = Disabled -</td>
<td></td>
</tr>
<tr>
<td>01 = Enabled</td>
<td></td>
</tr>
<tr>
<td><strong>P22</strong></td>
<td>Manufacturer information</td>
</tr>
<tr>
<td>(set &quot;22&quot; to display parameters 42 and above)</td>
<td></td>
</tr>
<tr>
<td><strong>P23</strong></td>
<td>Maximum DHW set-point temperature 113°-140°F (45°-60°C), Default 49 = 120°F</td>
</tr>
<tr>
<td><strong>P24</strong></td>
<td>Manufacturer information</td>
</tr>
<tr>
<td><strong>P25</strong></td>
<td>No water safety device</td>
</tr>
<tr>
<td><strong>P26..P31</strong></td>
<td>Manufacturer information</td>
</tr>
<tr>
<td><strong>P32..P41</strong></td>
<td>Diagnostics (See SERVICE Instructions)</td>
</tr>
<tr>
<td><strong>P44</strong></td>
<td>Temperature unit setting</td>
</tr>
<tr>
<td>00 = °C</td>
<td></td>
</tr>
<tr>
<td>01 = °F</td>
<td></td>
</tr>
<tr>
<td><strong>P71</strong></td>
<td>Maximum Fan Speed</td>
</tr>
<tr>
<td>Setting</td>
<td></td>
</tr>
<tr>
<td>RPM</td>
<td></td>
</tr>
<tr>
<td><strong>P72</strong></td>
<td>Minimum Fan Speed</td>
</tr>
<tr>
<td>Setting</td>
<td></td>
</tr>
<tr>
<td>RPM</td>
<td></td>
</tr>
<tr>
<td><strong>P78</strong></td>
<td>0-10V Input</td>
</tr>
<tr>
<td>0 = Disabled</td>
<td></td>
</tr>
<tr>
<td>1 = Temperature Setpoint (3V = minimum setpoint, 10V = maximum setpoint)</td>
<td></td>
</tr>
<tr>
<td>2 = Power Setpoint (3V = minimum power, 10V = maximum power)</td>
<td></td>
</tr>
</tbody>
</table>

**FACTORY SETTINGS**

<table>
<thead>
<tr>
<th></th>
<th>150</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>P06</strong></td>
<td>00</td>
</tr>
<tr>
<td><strong>P07</strong></td>
<td>00</td>
</tr>
<tr>
<td><strong>P09</strong></td>
<td>--</td>
</tr>
<tr>
<td><strong>P10</strong></td>
<td>00</td>
</tr>
<tr>
<td><strong>P11..P12</strong></td>
<td>--</td>
</tr>
<tr>
<td><strong>P13</strong></td>
<td>80</td>
</tr>
<tr>
<td><strong>P14</strong></td>
<td>100</td>
</tr>
<tr>
<td><strong>P15</strong></td>
<td>00</td>
</tr>
<tr>
<td><strong>P16</strong></td>
<td>00</td>
</tr>
<tr>
<td><strong>P17</strong></td>
<td>03</td>
</tr>
<tr>
<td><strong>P18</strong></td>
<td>03</td>
</tr>
<tr>
<td><strong>P19</strong></td>
<td>07</td>
</tr>
<tr>
<td><strong>P20</strong></td>
<td>30</td>
</tr>
<tr>
<td><strong>P21</strong></td>
<td>00</td>
</tr>
<tr>
<td><strong>P22</strong></td>
<td>00</td>
</tr>
<tr>
<td><strong>P23</strong></td>
<td>49</td>
</tr>
<tr>
<td><strong>P24</strong></td>
<td>35</td>
</tr>
<tr>
<td><strong>P25</strong></td>
<td>00</td>
</tr>
<tr>
<td><strong>P26..P31</strong></td>
<td>--</td>
</tr>
<tr>
<td><strong>P32..P41</strong></td>
<td>--</td>
</tr>
<tr>
<td><strong>P44</strong></td>
<td>01</td>
</tr>
<tr>
<td><strong>P71</strong></td>
<td>Setting</td>
</tr>
<tr>
<td>Setting</td>
<td>220</td>
</tr>
<tr>
<td>RPM</td>
<td>7200</td>
</tr>
<tr>
<td><strong>P72</strong></td>
<td>Setting</td>
</tr>
<tr>
<td>Setting</td>
<td>40</td>
</tr>
<tr>
<td>RPM</td>
<td>1150</td>
</tr>
<tr>
<td><strong>P78</strong></td>
<td>0</td>
</tr>
</tbody>
</table>
9.16 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 Section 9.15 Parameter Settings.

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

<table>
<thead>
<tr>
<th>Btu/h</th>
<th>KW</th>
<th>150</th>
</tr>
</thead>
<tbody>
<tr>
<td>20,400</td>
<td>6.0</td>
<td>0</td>
</tr>
<tr>
<td>23,800</td>
<td>7.0</td>
<td>3</td>
</tr>
<tr>
<td>27,200</td>
<td>8.0</td>
<td>6</td>
</tr>
<tr>
<td>30,700</td>
<td>9.0</td>
<td>9</td>
</tr>
<tr>
<td>34,100</td>
<td>10.0</td>
<td>12</td>
</tr>
<tr>
<td>40,900</td>
<td>12.0</td>
<td>18</td>
</tr>
<tr>
<td>47,700</td>
<td>14.0</td>
<td>24</td>
</tr>
<tr>
<td>54,500</td>
<td>16.0</td>
<td>29</td>
</tr>
<tr>
<td>61,400</td>
<td>18.0</td>
<td>35</td>
</tr>
<tr>
<td>68,200</td>
<td>20.0</td>
<td>41</td>
</tr>
<tr>
<td>75,100</td>
<td>22.0</td>
<td>47</td>
</tr>
<tr>
<td>81,900</td>
<td>24.0</td>
<td>53</td>
</tr>
<tr>
<td>88,700</td>
<td>26.0</td>
<td>59</td>
</tr>
<tr>
<td>95,500</td>
<td>28.0</td>
<td>65</td>
</tr>
<tr>
<td>102,300</td>
<td>30.0</td>
<td>71</td>
</tr>
<tr>
<td>109,200</td>
<td>32.0</td>
<td>75</td>
</tr>
<tr>
<td>112,600</td>
<td>33.0</td>
<td>80</td>
</tr>
</tbody>
</table>
10.1 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 section 13.4 Gas Valve. Verify gas supply is ON.
• 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.

10.2 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.
This interruption in central heating is only when demand for hot water is present and should not be noticed by the user.

10.3 Central Heating Mode
1. With demand for heating, pump circulates water through the primary circuit.
2. Combustion fan comes on at ignition speed, closing the air pressure switch, allowing power to spark generator and gas valve, creating ignition in the combustion chamber.
3. Flame sensor acknowledges presence of flame in combustion chamber sending a signal to the control board.
4. After initial stabilization period the control board monitors supply and return temperatures and modulates fan speed and gas rate accordingly.
5. Once boiler satisfies CH call for heat, the unit will shutdown and enter 3 minute anti-cycling mode. The boiler pump will operate for 3 minutes to dissipate any residual heat. If there is a subsequent CH call for heat, boiler will wait 3 minutes to operate.

10.4 Domestic Hot Water Mode
• When a tap is opened and water flow is sensed by DHW flow switch, domestic hot water call for heat is initiated.
• Water in the boiler is diverted from central heating system to domestic hot water heat exchanger to heat incoming domestic water.
• Combustion fan will come on at ignition speed, closing the air pressure switch, allowing power to flow to spark generator and gas valve, creating ignition in the combustion chamber.
• Flame sensor will acknowledge presence of flame in combustion chamber and send a signal to the control board.
• After initial stabilization period, the control board monitors supply and return temperatures and modulates fan speed and gas rate accordingly.
• Domestic call for heat ends when tap is closed and DHW flow switch does not see water flow.
• There is no anti-cycling mode after a DHW call for heat if there is demand.

10.5 Frost Protection
Boiler monitors supply and return water temperatures to enable frost protection which automatically turns boiler and pump on.
If water in boiler falls below 41°F (5°C), providing boiler is connected to power, boiler will operate until water temperature in the system reaches approximately 86°F (30°C).
Frost protection is for boiler only and not for complete Central Heating System.

10.6 Pump
If electricity is connected to the boiler, regardless if power is "On" or "Off" and has not operated for 24 hours for heating or hot water, boiler pump will operate automatically for one minute every 24 hours.

10.7 Low Water Pressure Sensor (Internal)
This device protects primary exchanger from damage. It will not allow boiler to run in a LOW water pressure situation. Low water condition occurs when water pressure drops below 7.0 psi (0.5 bar).
11.1 Beginning of Each Heating Season

- Check boiler area is free from combustible materials, gasoline, and other flammable vapors and corrosive 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.
- 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.
- 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 caps are in place;
  - verify supply and return sensors are properly clipped to pipes as close to heat exchanger as possible;
  - 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.

- A Heat Exchanger cleaning kit is available for annual service of the boiler. See repair parts manual for part number.

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.
11.2 Maintenance And Routine Servicing

Check and service boiler as necessary.

Frequency of servicing will depend upon installation conditions and usage, manufacturer recommends annually.

- 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 appearance and tightness of gas and combustion circuit gaskets
- check condition and position of ignition and flame sensing electrodes
- check condition of burner and its connection to aluminum front plate
- check for dirt in combustion chamber. Use vacuum cleaner for this cleaning operation
- Check gas valve is calibrated correctly using combustion analyzer
- check there is no dirt in condensate trap
- check central heating system pressure
- check expansion tank pressure
- check vent system, clean if necessary

Record details and maintain service history.

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 condition of the combustion chamber insulation panels. Any damaged panels must be replaced.
3. Check condition of burner and flame ports. Carefully clean with soft brush if necessary. Blockages may be removed with stiffer non-metallic brush. Do not use a brush with metallic bristles this might damage the burner.
4. Remove any fallen deposits from bottom of inner case.
5. Check condition of electrodes.
6. Check spark gap, positioning and height of electrodes. See Figure 11-1.
7. Check fan impeller is clean and free to rotate.
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 11.4.
- Close central heating flow and return valves.
- Connect suitable pipe to drain point.
- Route it to suitable container.
- Open drain tap.

11-1 ELECTRODES
11.6 Hydraulic Unit (DHW)
For special areas, where water is harder than 200 ppm or 12 grains/gallon, install polyphosphate dispenser or equivalent treatment system, compliant with current regulations.

11.7 Cleaning The Cold Water Filter
Boiler is fitted with cold water filter located on DHW hydraulic assembly (B). To clean:
- Drain domestic hot water system.
- Remove the flow sensor on top of assembly.
- Remove nut on DHW priority sensor unit using 18 mm wrench. (B)
- Pull out flow sensor and its filter.
- Soak in white vinegar or replace as necessary.

### NOTICE
When replacing and/or cleaning “O-rings” on hydraulic assembly (DHW), use only Molykote 111 as a lubricant, not oil or grease.

11.8 Final Commissioning
- Perform Automatic Calibration function as detailed in section 9.8.
- 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 volume and pressure. See page 4 for acceptable volume and pressure.
- Turn off boiler.
- Thoroughly flush water pipe work.
- Repressurize the system.

11.9 Final Assembly
- Place front jacket in position over boiler. Secure in position at top using screws previously removed.
- 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: Component Replacement Or Periodic Cleaning. Manufacturer recommends attaching a label to the boiler drawing attention to the fact that the system has been drained.
11.10 User Information
Advised and demonstrated to User the following important information:
A. How to light and turn off boiler. 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 and three way valve 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 frost protection to operate.
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.

11.13 Replacement Parts
Perform Automatic Calibration procedure described in section 9.8 if one or more of the following components are replaced. Check and adjust CO2% value as indicated in the Combustion Table.
Components replaced:
- Primary heat exchanger
- Fan
- Gas valve
- Gas orifice
- Burner
- Flame sensing electrode
- Spark electrode

11.11 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.

11.12 Flue Pressure Switch
DO NOT disable this safety device.
This device, positioned inside the sealed chamber, interrupts flow of gas to the burner if flue pressure exceeds 1.6 in w.c. (4 mbar).
Verify if vent is blocked before resetting the boiler.

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

12.1 Ratings and Capacity

<table>
<thead>
<tr>
<th>Model Number</th>
<th>CH Input, MBH&lt;sup&gt;(1)&lt;/sup&gt;</th>
<th>[1][2] Heating Capacity, MBH *</th>
<th>[1][3] Net AHRI Rating Water, MBH</th>
<th>AFUE%</th>
</tr>
</thead>
<tbody>
<tr>
<td>GCWB95F-150</td>
<td>125</td>
<td>22</td>
<td>113</td>
<td>98</td>
</tr>
</tbody>
</table>

(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)

12.2 Domestic Hot Water Specifications

<table>
<thead>
<tr>
<th>Item</th>
<th>GCWB95F-150</th>
</tr>
</thead>
<tbody>
<tr>
<td>Input Ratings (MBH)</td>
<td>Min 22</td>
</tr>
<tr>
<td></td>
<td>Max 153</td>
</tr>
<tr>
<td>Output Ratings (MBH)</td>
<td>Min 19</td>
</tr>
<tr>
<td></td>
<td>Max 136</td>
</tr>
<tr>
<td>Domestic Water Pressure</td>
<td>2.9 psi (0.2 bar) - 116 psi (8.0 bar)</td>
</tr>
<tr>
<td>Minimum Flow Rate</td>
<td>0.50 GPM</td>
</tr>
<tr>
<td>Maximum Flow Rate</td>
<td>3.50 gpm</td>
</tr>
<tr>
<td>Flow Rate 77°F (43°C) Temp. Rise</td>
<td>3.25 gpm</td>
</tr>
<tr>
<td>DHW Supply Connection Size</td>
<td>1/2&quot; Sweat</td>
</tr>
<tr>
<td>Cold Water Input Connection Size</td>
<td>1/2&quot; Sweat</td>
</tr>
</tbody>
</table>

*Max DHW Temp 140° F (60° C)
Factory set at 120° F (49° C)

12.3 High Altitude Ratings and Capacity

For elevations between 2000 ft (600 m) and 10,000 ft (3048 m), use the following information:

<table>
<thead>
<tr>
<th>Altitude</th>
<th>Model Number</th>
<th>Input, MBH (KW)</th>
<th>Heating Capacity, MBH*</th>
<th>AFUE, %</th>
<th>Domestic Hot Water (DHW) Circuit**</th>
</tr>
</thead>
<tbody>
<tr>
<td>2,000-4,500 ft</td>
<td>GCWB9F-150</td>
<td>113</td>
<td>22</td>
<td>101</td>
<td>95.0</td>
</tr>
<tr>
<td>(600m-1350m)</td>
<td></td>
<td>Minimum</td>
<td>Maximum</td>
<td></td>
<td>Max Input, MBH</td>
</tr>
<tr>
<td></td>
<td></td>
<td>137</td>
<td>22</td>
<td>122</td>
<td>Min Input, MBH</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Max Output, MBH</td>
<td>Min Output, MBH</td>
<td>19</td>
<td></td>
</tr>
</tbody>
</table>

* Max CH Supply temp 176° F (80° C) for -125 and -150
* Max DHW temp 140° F (60° C)
**-150 Max DHW Flow rate 3.5 gpm (13.2 l/min)

12.4 High Altitude Chart

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Model</th>
<th>Setting RPM</th>
<th>Altitude</th>
</tr>
</thead>
<tbody>
<tr>
<td>P71 High Fire Fan Speed</td>
<td>150</td>
<td>220 7200</td>
<td>0-2,000 ft. [0-610 m]</td>
</tr>
<tr>
<td>P72 Low Fire Fan Speed</td>
<td>150</td>
<td>40 1150</td>
<td>2000-10,000 ft. [610-3,048 m]</td>
</tr>
</tbody>
</table>

CO Limit < 200 ppm
## 13.1 Error Messages And Resetting The Boiler

<table>
<thead>
<tr>
<th>Code</th>
<th>Error Description</th>
<th>Operation</th>
</tr>
</thead>
<tbody>
<tr>
<td>09</td>
<td>Gas valve connection fault</td>
<td>Check cable PCB/gas valve and gas valve plug</td>
</tr>
<tr>
<td>10</td>
<td>Outdoor sensor fault</td>
<td>Check sensor and cable</td>
</tr>
<tr>
<td>15</td>
<td>Gas valve command fault</td>
<td>Verify all cables. Replace PCB. Call authorized SERVICE center</td>
</tr>
<tr>
<td>20</td>
<td>Central Heating NTC sensor fault</td>
<td>Check sensor and cable</td>
</tr>
<tr>
<td>28</td>
<td>Flue NTC heat exchanger sensor fault</td>
<td>Check sensor and cable</td>
</tr>
<tr>
<td>40</td>
<td>Return NTC sensor fault</td>
<td>Check sensor and cable</td>
</tr>
<tr>
<td>50</td>
<td>Domestic Hot Water NTC sensor fault</td>
<td>Check sensor and cable</td>
</tr>
<tr>
<td>53</td>
<td>Obstruction in flue pipe, Recirculation, Poor gas quality</td>
<td>Check for obstruction in flue pipe. Check gas pressure, check gas orifice. Check for recirculation, recalibrate, check gas quality.</td>
</tr>
<tr>
<td>55</td>
<td>PCB not programmed</td>
<td>Call authorized SERVICE center</td>
</tr>
<tr>
<td>E83</td>
<td>OT Communication Failure</td>
<td>Check OT connection, remove power, reconnect OT connections, if problem persists replace service key.</td>
</tr>
<tr>
<td>84-86-87</td>
<td>Communication problem between boiler board and control unit</td>
<td>Probable short circuit on wiring. Check cable between control unit and boiler</td>
</tr>
<tr>
<td>109</td>
<td>Pre-circulation alarm (temporary fault)</td>
<td>Check correct circulation of water and pump. Check supply and return wiring is correct.</td>
</tr>
<tr>
<td>110</td>
<td>Safety thermostat tripped due to over temperature (pump probably blocked or air in heating circuit)</td>
<td>Check safety thermostat and cable; check correct circulation of water and pump</td>
</tr>
<tr>
<td>118</td>
<td>Hydraulic pressure too low.</td>
<td>Refill heating system by opening cold water tap</td>
</tr>
<tr>
<td>117</td>
<td>Hydraulic pressure too high.</td>
<td>Relieve pressure via relief valve or drain. Ensure water feed is operating correctly.</td>
</tr>
<tr>
<td>125</td>
<td>No circulation of water (control performed via temperature sensor)</td>
<td>Check correct circulation of water and pump. Check correct connection of NTC sensor on pipe</td>
</tr>
<tr>
<td>128</td>
<td>Loss of flame</td>
<td>Check sensing electrode and cable, flue recirculation, electrical continuity between burner and ground, gas pressure, gas orifice. Enable automatic calibration. Call authorized SERVICE center.</td>
</tr>
<tr>
<td>130</td>
<td>NTC flue sensor tripped due to over temperature</td>
<td>Check thermostat, correct circulation of water and pump. Check status of primary exchanger.</td>
</tr>
<tr>
<td>131</td>
<td>Thermo fuse tripped due to over temperature or wire harness disconnected from thermo fuse, off the board, or wire harness may be cut.</td>
<td>Check thermo fuse, correct circulation of water and pump. Check status of primary exchanger. Replace heat exchanger. Call authorized SERVICE center. Verify wire harness installation and continuity.</td>
</tr>
<tr>
<td>133</td>
<td>Ignition failure</td>
<td>Check correct operation of condensate trap. Check sensing electrode, spark electrode and cable. Check flue recirculation, electrical continuity between burner and ground. Check gas orifice and gas pressure. Enable automatic calibration function. Call authorized SERVICE center.</td>
</tr>
<tr>
<td>134</td>
<td>Gas supply valve blocked</td>
<td>Check gas pressure, sensing electrode, spark electrode and cable, replace PCB if it necessary. Call authorized SERVICE center</td>
</tr>
<tr>
<td>135</td>
<td>Internal error</td>
<td>Verify all cables. Replace PCB. Call authorized SERVICE center</td>
</tr>
<tr>
<td>160</td>
<td>Fan fault</td>
<td>Check fan and cable</td>
</tr>
<tr>
<td>162/317</td>
<td>Incorrect power supply frequency.</td>
<td>Incorrect power supply frequency.</td>
</tr>
</tbody>
</table>
### 13 - TROUBLE SHOOTING

#### 13.1 Error Messages and Resetting the Boiler - continued

<table>
<thead>
<tr>
<th>Error Code</th>
<th>Error Description</th>
<th>Operation</th>
</tr>
</thead>
<tbody>
<tr>
<td>169</td>
<td>Flue pressure switch (contact open)</td>
<td>Check pressure switch and cable. Check obstruction on flue pipe</td>
</tr>
<tr>
<td>165/385</td>
<td>Input voltage too low.</td>
<td>Check power supply</td>
</tr>
<tr>
<td>E178</td>
<td>Low return water temperature / anti-freeze function active</td>
<td>Check the return water sensor, check the circulator, check the correct circulation of the water. Boiler will exit status when condition is resolved.</td>
</tr>
</tbody>
</table>

To RESET the boiler press ![R] button for at least 2 seconds.

For other error codes not described in table please contact manufacturer at 1-888-9boiler (926-4537).

#### Anomalies Only Displayed in the Fault History

<table>
<thead>
<tr>
<th>Error Code</th>
<th>Error Description</th>
<th>Operation</th>
</tr>
</thead>
<tbody>
<tr>
<td>E62</td>
<td>Anti-wind activation with increase of the minimum fan speed</td>
<td>Check the position of the terminal of the flue duct.</td>
</tr>
<tr>
<td>E63/E65</td>
<td>Combustion level out of range</td>
<td>Check flue recirculation and combustion levels.</td>
</tr>
<tr>
<td>E65</td>
<td>Maximum value of the speed reached / correction of the flame signal</td>
<td>Check flue recirculation on the flue duct.</td>
</tr>
<tr>
<td>E67</td>
<td>Anti-wind activation at maximum power</td>
<td>Check the position of the terminal of the flue duct.</td>
</tr>
<tr>
<td>E69</td>
<td>Combustion level out of range</td>
<td>Check flue recirculation and the combustion levels.</td>
</tr>
<tr>
<td>E70</td>
<td>Flame signal problem/micro interruption of the flame signal</td>
<td>Check cable and integrity of the sensing electrode, verify the continuity between burner and earth.</td>
</tr>
<tr>
<td>E73</td>
<td>Combustion adjustment / modified during operation</td>
<td>Review and monitor other codes such as ![E53] and ![E92]</td>
</tr>
</tbody>
</table>
### 13.2 Anomalies Table for the Installer

Use this table to report the anomaly values.

<table>
<thead>
<tr>
<th>Anomaly Number</th>
<th>Anomaly Code</th>
<th>Consecutive Counter for the Same Anomaly</th>
<th>Number of Days Elapsed From the Anomaly Event</th>
<th>System Status</th>
<th>Phase Status</th>
<th>CH Flow Temperature Value During the Anomaly Event</th>
</tr>
</thead>
<tbody>
<tr>
<td>P32</td>
<td>C00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>P33</td>
<td>C01</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>P34</td>
<td>C02</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>P35</td>
<td>C03</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>P36</td>
<td>C04</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>P37</td>
<td>C05</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>P38</td>
<td>C06</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>P39</td>
<td>C07</td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>P40</td>
<td>C08</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>P41</td>
<td>C09</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- **System Status Codes**
  0: STANDBY
  1: DHW "ON"
  2: CHIMNEY SWEEP ACTIVE
  3: CH "ON"
  4: PREHEAT "ON"
  5: CH NO FROST "ON"
  6: DHW NO FROST "ON"
  8: THERMOSTATIC POST-CIRCULATION

- **Failure Code**
  C00: LAST FAILURE
  C06: FIRST FAILURE
  C07: LAST LOCKOUT
  C09: FIRST LOCKOUT

- **Phase Status Codes**
  0: STANDBY
  1: PREPURGE
  3: INTERPURGE
  4: SAFETY TIME
  5: RUNNING
  6: LOCKOUT
  11: INTERURGE
  15: POST VENTILATION
  16: THERMOSTATIC POST VENTILATION
- **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 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 largest voluntary standards development organizations in the world trusted source for technical standards for materials, products, systems, and services. Known for their high technical quality and market relevancy, ASTM International standards have 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 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 temperature of 1 pound of water 1°F.

- **BURNER** - Device for final conveyance of gas or mixture of gas and air, to combustion zone.

- **CALIBRATE** - Make fine adjustments or divide into marked intervals for optimal measuring.

- **COAXIAL VENTING** - Sharing the same center.

- **COMBUSTION** - Rapid oxidation of fuel gases accompanied by production of heat or heat and light. Complete combustion of fuel is possible only in presence of 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.

- **DIRECT VENT BOILER** - Boiler constructed and installed so 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 exchanger.

- **GAS SUPPLIER** - Party that sells commodity of Natural Gas (Gas A) or LPG (Gas E).

- **HIGH-VOLTAGE** - Circuit involving potential of not more than 600 volts and having circuit characteristics in excess of those of 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 main burner.

- **LEAK CHECK** - Operation performed on gas piping system to verify 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 surface of water in boiler falls to lowest safe water level.

- **LOW-VOLTAGE** - Circuit involving 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.
A-2 MODELS GCWB95F-150 - Combi

APPENDIX A - WIRING DIAGRAMS

If any of the drawings are to be supplied with this equipment, they must be replaced with the wiring diagram of the application guide. For more details.
INSTALLATION AND CHECK-OUT CERTIFICATE

Boiler Model __________ Serial # __________ Date Installed_________

Measured BTU/HR input___________

○ Installation instructions have been followed  
○ Checkout procedure and adjustments performed  
○ Maintenance and Service issues reviewed with owner/ maintenance person  
○ Installation booklet affixed on or adjacent to boiler

Installer (Company) ________________________________

Address ________________________________

Phone ________________________________

Installer’s Name ________________________________

Signature ________________________________
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.