GAS FIRED BOILER

INSTALLATION INSTRUCTIONS

These Gas-Fired Water boilers are low pressure, sectional cast iron boilers 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 100 psi with A.S.M.E. (American Society of Mechanical Engineers) Boiler and Pressure Vessel Code Section IV Standards for Cast Iron Heating Boilers.

WARNING

Improper installation, adjustment, alteration, service, or maintenance could result in death or serious injury. Refer to this manual for assistance. For additional information consult a qualified installer, service agency, or the gas supplier.

GAS-FIRED HOT WATER BOILERS

These Gas-Fired Water boilers are low pressure, sectional cast iron boilers 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 100 psi with A.S.M.E. (American Society of Mechanical Engineers) Boiler and Pressure Vessel Code Section IV Standards for Cast Iron Heating Boilers.
<table>
<thead>
<tr>
<th>Fully Assembled Boiler</th>
<th>Vent Damper</th>
<th>Draft Hood</th>
<th>Pump (Optional)</th>
</tr>
</thead>
<tbody>
<tr>
<td>*Drain Valve</td>
<td>*ASME Safety Relief Valve</td>
<td>*Tridicator</td>
<td>*Black Iron Fittings (see parts list for sizes and use)</td>
</tr>
</tbody>
</table>

Includes Essential Documents and Warranty 11x17 Wire Diagrams

| Document Package | *Junction Box | *Circulator Harness |

* Items found in parts box included with your boiler.

For Parts lists see manual 240012891 included with your boiler literature package.

**KEEP THIS MANUAL NEAR BOILER**
**RETAIN FOR FUTURE REFERENCE**

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

1 - Physical Data .................................................................................................................. 4

2 - Safety Symbols And Warnings.......................................................................................... 5

3 - Locating The Boiler .......................................................................................................... 7
   3.1 Installation Requirements .............................................................................................. 7
   3.2 Clearance And Service Requirements ........................................................................... 7
   3.3 Boiler Location Considerations ...................................................................................... 8

4 - Connecting Supply And Return Piping .......................................................................... 9
   4.1 Connection Locations .................................................................................................... 9
   4.2 Safety Relief Valve Installation ...................................................................................... 9
   4.3 Flush And Rinse System ................................................................................................ 10
   4.4 Water Treatment ........................................................................................................... 11
   4.5 Supply And Return Requirements ................................................................................. 11
   4.6 Special Conditions ......................................................................................................... 12

5- Ventilation & Combustion Air ............................................................................................ 19

6 - Vent System Modification ................................................................................................. 20

7 - Vent Installation ................................................................................................................ 21
   7.1 Check Your Chimney ....................................................................................................... 21
   7.2 Requirements .................................................................................................................. 21
   7.3 Chimney Inspection ........................................................................................................ 21
   7.4 Vent Pipe ........................................................................................................................ 21

8 - Vent Damper Installation & Instructions ......................................................................... 22
   8.1 Vent Damper .................................................................................................................. 22

9 - Connecting Gas Service ..................................................................................................... 24
   9.1 General .......................................................................................................................... 24
   9.2 Leak Check Gas Piping ................................................................................................... 24

10 - Electrical ......................................................................................................................... 25
   10.1 Electrical Wiring ............................................................................................................ 25
   10.2 Thermostat Installation ................................................................................................. 25

11 - Wiring Diagrams .............................................................................................................. 26

12 - Lighting Instructions ......................................................................................................... 28
   12.1 Lighting Procedure For Boiler With Intermittent Pilot System .................................. 28
   12.2 Operating Instructions For Intermittent Pilot System ............................................... 28
   12.3 TO TURN OFF GAS TO THE APPLIANCE .............................................................. 28

13 - Normal Sequence Of Operation ...................................................................................... 29
   13.1 General ........................................................................................................................ 29

14 - General Maintenance And Care Instructions .................................................................. 30
   14.1 Seasonal Startup .......................................................................................................... 30
   14.2 Clean Flue Gas Passageways ....................................................................................... 30
   14.3 General Maintenance ................................................................................................... 31
   14.4 Adjusting Gas Input ...................................................................................................... 32

15 - Ratings And Capacities .................................................................................................... 33

Appendix A - Control Function .............................................................................................. 34
   A-1. Intermittent Pilot .......................................................................................................... 34

Appendix B-1 - Vent Damper Installation ............................................................................. 38

Appendix B-2 - Vent Damper Harness .................................................................................. 38

Appendix B-3 - Vent Damper Troubleshooting ................................................................... 39
## 1 - PHYSICAL DATA

<table>
<thead>
<tr>
<th>Model</th>
<th>GW84-060E</th>
<th>GW84-095E</th>
<th>GW84-120E</th>
<th>GW84-150E</th>
<th>GW84-175E</th>
<th>GW84-205E</th>
<th>GW84-235E</th>
</tr>
</thead>
<tbody>
<tr>
<td># Sections</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
<td>8</td>
<td>9</td>
</tr>
<tr>
<td><strong>A</strong> Width with Jacket</td>
<td>13-3/8&quot;</td>
<td>13-1/2&quot;</td>
<td>16-1/2&quot;</td>
<td>19&quot;</td>
<td>21-1/2&quot;</td>
<td>27-1/2&quot;</td>
<td>27-1/2&quot;</td>
</tr>
<tr>
<td></td>
<td>340 mm</td>
<td>340 mm</td>
<td>411 mm</td>
<td>483 mm</td>
<td>555 mm</td>
<td>700 mm</td>
<td>700 mm</td>
</tr>
<tr>
<td><strong>B</strong> Vent Location (Half Width)</td>
<td>6-3/4&quot;</td>
<td>6-3/4&quot;</td>
<td>8-1/2&quot;</td>
<td>9-1/2&quot;</td>
<td>10-1/4&quot;</td>
<td>13-3/4&quot;</td>
<td>13-3/4&quot;</td>
</tr>
<tr>
<td></td>
<td>171 mm</td>
<td>171 mm</td>
<td>206 mm</td>
<td>241 mm</td>
<td>278 mm</td>
<td>349 mm</td>
<td>349 mm</td>
</tr>
<tr>
<td><strong>C</strong> Height</td>
<td>32-3/4&quot;</td>
<td>32-3/4&quot;</td>
<td>32-1/2&quot;</td>
<td>32-1/2&quot;</td>
<td>32-1/2&quot;</td>
<td>32-1/2&quot;</td>
<td>32-1/2&quot;</td>
</tr>
<tr>
<td></td>
<td>816 mm</td>
<td>816 mm</td>
<td>816 mm</td>
<td>816 mm</td>
<td>816 mm</td>
<td>816 mm</td>
<td>816 mm</td>
</tr>
<tr>
<td><strong>D</strong> Damper Height</td>
<td>6&quot;</td>
<td>6&quot;</td>
<td>6-1/2&quot;</td>
<td>6-1/2&quot;</td>
<td>7&quot;</td>
<td>7&quot;</td>
<td>7&quot;</td>
</tr>
<tr>
<td></td>
<td>153 mm</td>
<td>153 mm</td>
<td>165 mm</td>
<td>165 mm</td>
<td>178 mm</td>
<td>178 mm</td>
<td>178 mm</td>
</tr>
<tr>
<td><strong>E</strong> Depth w/o Draft Hood Installed</td>
<td>22&quot;</td>
<td>22&quot;</td>
<td>22&quot;</td>
<td>22&quot;</td>
<td>22&quot;</td>
<td>22&quot;</td>
<td>22&quot;</td>
</tr>
<tr>
<td></td>
<td>559 mm</td>
<td>559 mm</td>
<td>559 mm</td>
<td>559 mm</td>
<td>559 mm</td>
<td>559 mm</td>
<td>559 mm</td>
</tr>
<tr>
<td><strong>F</strong> Depth W/ Draft Hood Installed</td>
<td>26&quot;</td>
<td>26&quot;</td>
<td>26&quot;</td>
<td>26&quot;</td>
<td>26&quot;</td>
<td>26&quot;</td>
<td>26&quot;</td>
</tr>
<tr>
<td></td>
<td>660 mm</td>
<td>660 mm</td>
<td>660 mm</td>
<td>660 mm</td>
<td>660 mm</td>
<td>660 mm</td>
<td>660 mm</td>
</tr>
<tr>
<td><strong>G</strong> Flue Diameter</td>
<td>4&quot;</td>
<td>5&quot;</td>
<td>6&quot;</td>
<td>6&quot;</td>
<td>7&quot;</td>
<td>7&quot;</td>
<td>7&quot;</td>
</tr>
<tr>
<td></td>
<td>102 mm</td>
<td>127 mm</td>
<td>152 mm</td>
<td>152 mm</td>
<td>178 mm</td>
<td>178 mm</td>
<td>178 mm</td>
</tr>
</tbody>
</table>

### Supply & Return Tappings
- 1-1/4" NPT
- 1-1/4" NPT
- 1-1/4" NPT
- 1-1/4" NPT
- 1-1/4" NPT
- 1-1/4" NPT

### Natural Gas Inlet
- 1/2" NPT
- 1/2" NPT
- 1/2" NPT
- 1/2" NPT
- 1/2" NPT
- 1/2" NPT
- 3/4" NPT

### Relief Valve NPT
- 3/4" NPT
- 3/4" NPT
- 3/4" NPT
- 3/4" NPT
- 3/4" NPT
- 3/4" NPT
- 3/4" NPT

### Drain Valve NPT
- 3/4" NPT
- 3/4" NPT
- 3/4" NPT
- 3/4" NPT
- 3/4" NPT
- 3/4" NPT
- 3/4" NPT

### Heating Water Content, Gal (Liters)
- 1.9 (7.2)
- 2.3 (8.8)
- 2.8 (10.5)
- 3.2 (12.2)
- 3.7 (13.9)
- 4.1 (15.6)
- 4.6 (17.3)

### Air Cushion Tank, Gal (Liters)
- 15 (27)
- 30 (114)
- 30 (114)
- 30 (114)
- 30 (114)
- 30 (114)
- 30 (114)

### Boiler Weight, less pkg - Lbs (KG)
- 170 (77)
- 210 (96)
- 250 (114)
- 280 (128)
- 320 (145)
- 350 (159)
- 390 (177)

### Shipping Weight, lbs (KG)
- 215 (98)
- 250 (114)
- 295 (134)
- 335 (152)
- 385 (175)
- 420 (191)
- 465 (211)

---

**Figure 1 - Dimensions**

[Diagram of front and side views of the boiler]
2.1. Safety Information

Boiler installation shall be completed by qualified agency.

⚠️ 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.

⚠️ 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.

⚠️ 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

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 - SAFETY SYMBOLS AND WARNINGS

WARNING

Combustion chamber insulation in this product contains ceramic fiber material. Ceramic fibers can be converted to cristobalite in very high temperature applications. The International Agency for Research on Cancer (IARC) has concluded, Crystalline silica inhaled in the form of quartz or cristobalite from occupational sources is carcinogenic to humans (Group 1). Avoid breathing dust and contact with skin and eyes. Use NIOSH certified dust respirator (N95). This type of respirator is based on the OSHA requirements for cristobalite at the time this document was written. Other types of respirators may be needed depending on the job site conditions. Current NIOSH recommendations can be found on the NIOSH website [https://www.cdc.gov/niosh/topics/silica/](https://www.cdc.gov/niosh/topics/silica/). NIOSH approved respirators, manufacturers, and phone numbers are also listed on this website.

Wear long-sleeved, loose-fitting clothing, gloves, and eye protection. Apply enough water to the combustion chamber lining to prevent dust. Wash potentially contaminated clothes separately from other clothing. Rinse clothes washer thoroughly.


---

WARNING

Keep boiler area clear and free from combustible materials, gasoline and other flammable vapors and liquids.

DO NOT obstruct air openings to the boiler room. Modification, substitution or elimination of factory equipped, supplied or specified components may result in personal injury or loss of life.

Installation and service of this boiler shall be performed by a qualified installer.

When this product is installed in the Commonwealth of Massachusetts the installation shall be performed by a Licensed Plumber or Licensed Gas Fitter.

2.2 For Your Safety

Manufacturer recommends a carbon monoxide detector located on each floor of your home. Follow your detector’s instructions for operation and verification. Some jurisdictions may, by law, require.
3.1 Installation Requirements

1. Installation shall conform to the requirements of the authority having jurisdiction or, in the absence of such requirements, to the National Fuel Gas Code, ANSI Z223.1/NFPA 54, and/or Natural Gas and Propane Installation Code, CAN/CSA B149. Where required by the authority having jurisdiction, the installation must conform to the Standard for Controls and Safety Devices for Automatically fired Boilers, ANSI/ASME CSD-1.

2. Boiler series is classified as a Category I. Vent installation shall be in accordance with "Venting of Equipment", of the National Fuel Gas Code, ANSI Z223.1/NFPA 54, or "Venting Systems and Air Supply for Appliances," of the Natural Gas and Propane Installation Code, CAN/CSA B149.1, or applicable provisions of the local building codes.

3. Boiler has met safe lighting and other performance criteria with the gas manifold and control assembly on the boiler per the latest revision of ANSI Z21.13/CGA 4.9.

4. Install boiler such 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.).

5. Locate boiler on level, solid base as near chimney as possible and centrally located with respect to heat distribution system as practical.

6. Horizontal vent run to chimney shall be as short as practicable. Refer to NFPA 54 to determine maximum permissible horizontal run for chimney type and height.

7. Verify floor will support weight of boiler, water and equipment.

8. Boiler may be installed on combustible floor. Do not install boiler on carpeting.

9. Do not install where gasoline or other flammable liquids or vapors will be stored or used. See Table 3-1, Contaminants.

10. Chimney shall be lined in a manner acceptable to the authority having jurisdiction.

11. Garage installation boiler shall be 18" above floor.

3.2 Clearance and Service Requirements

1. Allow 24 inches (610 mm) at front and one side for servicing and cleaning.

2. When installed in utility room, door should be wide enough to allow largest boiler part to enter, or to permit replacement of another appliance such as water heater.

3. Minimum clearances to combustible construction are:

<table>
<thead>
<tr>
<th>Top</th>
<th>Front</th>
<th>Alcove</th>
<th>Rear</th>
<th>Both Sides</th>
<th>Hot Water Piping</th>
</tr>
</thead>
<tbody>
<tr>
<td>10 IN. (254 MM)</td>
<td>ALCOVE</td>
<td></td>
<td>6 IN. (152 MM)</td>
<td>6 IN. (152 MM)</td>
<td>PER LOCAL CODE</td>
</tr>
</tbody>
</table>

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

* Definition of Alcove is three sided space with no wall in front of boiler. ANSI standard for alcove is 18 inches from front of appliance to leading edge of side walls as shown below.

Minimum Clearances to Combustible Construction
(as seen from above)
3.3 Boiler Location Considerations

- Ambient room temperature always above 32°F (0°C) to prevent the potential of freezing.

- Drainage of water (or water/antifreeze solution) during boiler service or from safety relief valve discharge.

- Access to system water piping, gas supply, and electrical service.

- Boiler shall be installed on flat level surface which is capable of supporting the weight of the boiler, water, and equipment.

- Raise boiler above the floor on blocks if floor may get wet.

- Water, gas, and electrical may connect to either side of boiler as desired.

- Horizontal run to chimney shall be as short as possible.

- System piping exposed to freezing conditions: Use inhibited propylene glycol solutions certified by fluid manufacturer for use with closed water heating system. Do not use automotive or ethylene glycol.

Table 3-1: CONTAMINANTS

<table>
<thead>
<tr>
<th>Items to Avoid</th>
<th>Products Which May Contain These Items</th>
<th>Areas Where These Items May Be Found</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chlorine, Fluorine, and Compounds</td>
<td>Spray cans containing chlorofluorocarbons, Chlorinated waxes/cleaners, Chlorine-based swimming pool chemicals, Calcium chloride used for thawing, Sodium chloride used for water softening, Swimming pool or spa chemicals, De-icing salts or chemicals, Carbon Tetrachloride</td>
<td>Swimming pools and pool storage areas, Laundry room (Note 2), Confined storage areas</td>
</tr>
<tr>
<td>Airborne Particulates</td>
<td>Drywall dust, Road or gravel dust, Dryer lint, Cat litter</td>
<td>Construction or remodelling areas (Note 1), Laundry room (Note 2)</td>
</tr>
<tr>
<td>Acids, Solvents, etc.</td>
<td>Paint, Varnish, Turpentine, etc., Cleaning Solvents, Hydrochloric acid/muriatic acid, Cements, adhesives and glues</td>
<td>Photo processing plants, Garages with workshops, Furniture refinishing areas and establishments</td>
</tr>
<tr>
<td>Laundry Chemicals</td>
<td>Laundry detergents, bleaches, fabric softeners, etc., Antistatic fabric softeners (dryer sheets)</td>
<td>Dry cleaning/laundry areas and establishments</td>
</tr>
<tr>
<td>Other</td>
<td>Permanent wave solutions, Refrigerants (Freon, etc.) (only where the refrigerant may be leaking from the appliance)</td>
<td>Beauty shops, Refrigeration repair shops</td>
</tr>
</tbody>
</table>

Notes:

1. It is recommended the boiler be isolated and not operated during construction/renovation. Excessive particles ingested by the boiler may accumulate in the flueway passages possibly resulting in unsafe operation. In this case, unit servicing shall include cleaning of flueway passages and burner ports.

2. If locating boiler in laundry room is unavoidable, it is manufacturer recommended the room be generously ventilated (well in excess of combustible air requirements), and homeowner seal laundry supply containers, and minimize room vapors.

3. Piping allowing fresh air in should also be considered. See Section 5-1.
4 - CONNECTING SUPPLY AND RETURN PIPING

**WARNING**
Burn and scald hazard! Supply and return shall be piped on the same side. Do not pipe supply on one side and return on the otherside. Failure to follow these instructions could result in death or serious injury.

**WARNING**
Burn and scald hazard. Boiler supplied with dust caps on supply and return tappings (4). Shall remove all four (4) caps and plumb before filling boiler with water. Failure to follow these instructions could result in death or serious injury.

**WARNING**
Burn and scald hazard. Safety relief valve shall be installed with spindle in **upright position only**, following ASME BPV code. Failure to follow these instructions could result in death or serious injury.

4.1 Connection Locations
- Boiler has one supply and one return tapping on each side (4 total). Boiler supplied with dust caps only. Remove all four (4) caps and plumb before filling boiler with water.
- Supply and return may be piped to either side of boiler, as desired.
- Drain valve may be located off of unused return tapping, as desired.
- **ASME relief valve may be located off unused supply tapping IN UPRIGHT POSITION ONLY.**
- Unused supply and return tappings may be capped, as desired. Relief valve and drain valve may be located on near boiler piping using contractor supplied tees with no valves.

**WARNING**
Burn and scald hazard. Safety relief valve could discharge steam or hot water during operation. Install discharge piping per these instructions. Failure to follow these instructions could result in death or serious injury.

4.2 Safety Relief Valve Installation
See Figure 4-1
Discharge line shall be installed to relief valve outlet connection to avoid burns, scalding, or water damage due to discharge of steam and/or hot water during operation. Discharge line shall:

A. connect to relief valve outlet and piped down to safe point of disposal. Check local codes for maximum distance from floor or allowable safe point of discharge.
B. be of pipe size equal to or greater than that of the relief valve outlet over the entire length of discharge line;
C. have no intervening shutoff valve between safety relief valve and discharge to atmosphere (do not plug or place any obstruction in discharge line).
D. terminate freely to atmosphere where any discharge will be clearly visible and at no risk of freezing;
E. allow complete drainage of the valve and the discharge line;
F. be independently supported and securely anchored to avoid applied stress on the relief valve;
G. be as short and straight as possible;
H. terminate with plain end (not threaded);
I. be constructed of material suitable for exposure to temperatures of 375° F (191°C); or greater.

Refer to local codes and appropriate ASME Boiler and Pressure Vessel Code for additional installation requirements.

**Figure 4-1 - Safety Relief Valve**

Discharge line shall:
- be connected to the relief valve outlet and piped down to the safe point of disposal.
- be of pipe size equal to or greater than that of the relief valve outlet over the entire length of the discharge line.
- have no intervening shutoff valve between the safety relief valve and the discharge to atmosphere (do not plug or place any obstruction in the discharge line).
- terminate freely to the atmosphere where any discharge will be clearly visible and at no risk of freezing.
- allow complete drainage of the valve and the discharge line.
- be independently supported and securely anchored to avoid applied stress on the relief valve.
- be as short and straight as possible.
- terminate with a plain end (not threaded).
- be constructed of material suitable for exposure to temperatures of 375° F (191°C); or greater.

Check local codes for maximum distance from floor or allowable safe point of discharge.
4 - CONNECTING SUPPLY AND RETURN PIPING

4.3 Flush and Rinse System
Flush the entire system and rinse thoroughly to ensure no sludge will be introduced into the heating body of the boiler. Install a low water cutoff device when the boiler is connected to the high point of the heating system.

4.4 Water Treatment
Manufacturer recommends a water analysis be done on water used to fill the system. Treatment may be required based on the analysis results. For extremely hard water or pH below 7.0 consult your local water treatment company.

Manufacturer recommends a water analysis be done on water used to fill the system. Treatment may be required based on the analysis results.

For extremely hard water or pH below 7.0 consult your local water treatment company.

- If CH water is very hard or full of impurities, it must be adequately filtered and treated, otherwise damage and/or malfunction could be caused. Recommended water quality is:
  - Hardness Less than 150 mg/L
  - Acidity level 7-8 pH
  - Sediments Particle size less than 50 micron

- If the water quality is outside these ranges, consult a local water treatment specialist for recommendations.

- If the water is treated, do not use petroleum based products or products containing mineral oil or hydrocarbons in order to avoid likely damage to parts made from rubber compounds (o-rings).

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

**NOTICE**
If damage due to frozen pipes is a possibility, install appropriate safeguards and alarms on the heating system to prevent property damage due to frozen and burst pipes should the boiler heating system become inoperative due to a power outage, safety lockout or component failure.
4.5 Supply and Return Requirements

1. Boiler used in connection with refrigeration system, install so chilled medium is piped in parallel with boiler with appropriate valves to prevent chilled medium from entering boiler. See Figure 4-2.

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

3. Hot water boilers installed above radiation level or as required by authority having jurisdiction shall be provided with low water cut-off device.

4. Boiler connected to heating system utilizing multiple zoned circulators, each circulator must be supplied with flow control valve to prevent gravity circulation.

5. Hot water boilers and system must be filled with water and maintained to minimum pressure of 12 psi.

4.6 Special Conditions

- System piping exposed to freezing conditions: Use inhibited propylene glycol solutions certified by fluid manufacturer for use with closed water heating system. Do not use automotive or ethylene glycol.
- Boiler installed above radiation level (or as required by authority having jurisdiction). Integral low water pressure switch is provided in boiler.
- Boiler used in connection with refrigeration system. Install flow control valves or other automatic means to prevent gravity circulation of boiler water during cooling cycle.
- Do not expose boiler and piping to freezing temperatures.

6. Bypass piping gives ability to adjust boiler water temperature to fit system or condition of installation. This method of piping, however, is not typically required for baseboard heating systems. Typical installations where bypass piping is required are as follows:

   A. This method is used to protect boilers from condensation forming due to low temperature return water (Below 130°F). Generally noticed in large converted gravity systems other large water volume systems, and in-floor heating systems. Figures 4-3 and 4-4 page 13-14.

   B. These methods are used to protect systems using radiant panels and material they are encased in from high temperature supply water from boiler and protect boiler from condensation.

**NOTE#1:** When using bypass piping, adjust valves V1 & V2 until desired system temperature is obtained.

**NOTE#2:** Bypass loop must be same size piping as supply and return piping.

7. Installation using circulators and zone valves are shown in Figures 4-2 through 4-7. For further piping information refer to AHRI Installation and Piping Guide.

8. Install discharge piping from safety relief valve. See Warning, Page 9 and Figure 4-1.
Circulators in following illustrations are mounted on system supply side, mounting on system return side is also acceptable practice.

Figure 4-2 - Circulators Mounted on Supply System, Boiler Used In Configuration with Chiller System. See Special Conditions, Below
Figure 4-3 - Bypass Piping With Automatic Mixing Valve
**Figure 4-4 - Bypass Piping - Fixed Low Temp Only With Zone Valve**

* Manually adjust until proper system temperature is reached.
Figure 4-5 - Bypass Piping (4-Way Valve Option With Circulator On Supply side)
Figure 4-6 - Single Zone System With DHW Priority
Figure 4-7 - Multi Zone System With Zone Valves And DHW Priority (With Zone Valve)

* Manufacturer requires all domestic hot water (DHW) installations use an anti-scald valve. Local codes may require additional equipment (expansion tank, relief valves, etc.) Select and size equipment to suit installation and meet code requirements.

Note

12" (305mm) Maximum Separation

Refer to pump manufacturer literature for proper pump sizing.
5.1 Requirements

**WARNING**

Asphyxiation Hazard! Provide enough air openings to boiler/combustion area to dilute flue gases and allow for consistent, quality combustion. Do not obstruct air openings. Follow instructions below, to maintain adequate combustion air. Failure to follow these instructions good result in ignition failure, overheating, carbon monoxide, and accumulation of flue gases.

Provide combustion air and ventilation air in accordance with the section "Air for Combustion and Ventilation," of the National Fuel Gas Code, ANSI Z223.1/NFPA 54, or Sections 8.2, 8.3 or 8.4 of Natural Gas and Propane Installation Code, CAN/CSA B149.1, or applicable provisions of local building codes.

Provide make-up air where exhaust fans, clothes dryers, and kitchen ventilation equipment interfere with proper operation. If inadequate makeup air is suspected it is always acceptable to add additional ventilation.

National Fuel Gas Code recognizes several methods of obtaining adequate ventilation and combustion air. Requirements of the authority having jurisdiction may override these methods.

- Engineered Installations. Must be approved by authority having jurisdiction.
- Mechanical Air Supply. Provide minimum of 0.35 cfm per \([\text{BTU/HR}/1,000]\) for all appliances located within space. Additional requirements where exhaust fans installed. Interlock each appliance to mechanical air supply system to prevent main burner operation when mechanical air supply system not operating.
- All Indoor Air. Calculate minimum volume for all appliances in space. Use a different method if minimum volume not available.
  - A. Standard Method. Cannot be used if known air infiltration rate is 0.40 air changes per hour. See Table 3 for space with boiler only. Use equation for multiple appliances.
    \[\text{Volume} \geq 50 \text{ ft}^3 \times \text{Total Input} \left\{\left(\text{BTU/HR}\right)/1,000\right\}\]
  - B. Known Air Infiltration Rate. See Table 5-1 for space with boiler only. Use equation for multiple appliances. Do not use an air infiltration rate (ACH) greater than 0.60.
    \[\text{Volume} \geq 21 \text{ ft}^3/\text{ACH} \times \text{Total Input} \left\{\left(\text{BTU/HR}\right)/1,000\right\}\]
    Refer to National Fuel Gas Code for opening requirements between connected indoor spaces.

- All Outdoor Air. Provide permanent opening(s) communicating directly or by ducts with outdoors.
  - A. Two Permanent Opening Method. Provide opening commencing within 12 inches of top and second opening commencing within 12 inches of bottom of enclosure.
    - Direct communication with outdoors or communicating through vertical ducts. Provide minimum free area of 1 in² per 4 \([\text{BTU/HR}/1,000]\) of total input rating of all appliances in enclosure.
    - Communicating through horizontal ducts. Provide minimum free area of 1 in² per 2 \([\text{BTU/HR}/1,000]\) of total input rating of all appliances in enclosure.
  - B. One Permanent Opening Method. Provide opening commencing within 12 inches of top of enclosure. Provide minimum clearance of 1 inch on sides/back and 6 inches on front of boiler (does not supersede clearance to combustible materials).
    - Refer to National Fuel Gas Code for additional requirements for louvers, grilles, screens and air ducts.
  - Combination Indoor and Outdoor Air. Refer to National Fuel Gas Code for application information.

National Gas and Propane Installation Code Requires providing air supply in accordance with:

- Section 8.2 and 8.3 when combination of appliances has a total input of up to and including 400 \([\text{BTU/HR}]/1,000\) (120 kW).
- Section 8.4 when combination of appliances has total input exceeding 400 \([\text{BTU/HR}]/1,000\) (120 kW).
- Refer to Natural Gas and Propane Installation Code for specific air supply requirements for enclosure or structure where boiler is installed, including air supply openings and ducts.

---

Table 5-1 - Space With Boiler Only

<table>
<thead>
<tr>
<th># Sections</th>
<th>Input BTU/HR</th>
<th>Standard Method</th>
<th>Known Air Infiltration Rate Method (ACH - Air Changes Per Hour)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>0.1</td>
</tr>
<tr>
<td>3</td>
<td>59,000</td>
<td>2950</td>
<td>12390</td>
</tr>
<tr>
<td>4</td>
<td>92,500</td>
<td>4625</td>
<td>19425</td>
</tr>
<tr>
<td>5</td>
<td>120,000</td>
<td>6000</td>
<td>25200</td>
</tr>
<tr>
<td>6</td>
<td>149,000</td>
<td>7450</td>
<td>31290</td>
</tr>
<tr>
<td>7</td>
<td>175,000</td>
<td>8800</td>
<td>36960</td>
</tr>
<tr>
<td>8</td>
<td>205,000</td>
<td>10250</td>
<td>43050</td>
</tr>
<tr>
<td>9</td>
<td>235,000</td>
<td>11750</td>
<td>49350</td>
</tr>
</tbody>
</table>

---

WARNING

Asphyxiation Hazard! Provide enough air openings to boiler/combustion area to dilute flue gases and allow for consistent, quality combustion. Do not obstruct air openings. Follow instructions below, to maintain adequate combustion air. Failure to follow these instructions good result in ignition failure, overheating, carbon monoxide, and accumulation of flue gases.

Provide combustion air and ventilation air in accordance with the section "Air for Combustion and Ventilation," of the National Fuel Gas Code, ANSI Z223.1/NFPA 54, or Sections 8.2, 8.3 or 8.4 of Natural Gas and Propane Installation Code, CAN/CSA B149.1, or applicable provisions of local building codes.

Provide make-up air where exhaust fans, clothes dryers, and kitchen ventilation equipment interfere with proper operation. If inadequate makeup air is suspected it is always acceptable to add additional ventilation.

National Fuel Gas Code recognizes several methods of obtaining adequate ventilation and combustion air. Requirements of the authority having jurisdiction may override these methods.

- Engineered Installations. Must be approved by authority having jurisdiction.
- Mechanical Air Supply. Provide minimum of 0.35 cfm per \([\text{BTU/HR}]/1,000\) for all appliances located within space. Additional requirements where exhaust fans installed. Interlock each appliance to mechanical air supply system to prevent main burner operation when mechanical air supply system not operating.
- All Indoor Air. Calculate minimum volume for all appliances in space. Use a different method if minimum volume not available.
  - A. Standard Method. Cannot be used if known air infiltration rate is 0.40 air changes per hour. See Table 3 for space with boiler only. Use equation for multiple appliances.
    \[\text{Volume} \geq 50 \text{ ft}^3 \times \text{Total Input} \left\{\left(\text{BTU/HR}\right)/1,000\right\}\]
  - B. Known Air Infiltration Rate. See Table 5-1 for space with boiler only. Use equation for multiple appliances. Do not use an air infiltration rate (ACH) greater than 0.60.
    \[\text{Volume} \geq 21 \text{ ft}^3/\text{ACH} \times \text{Total Input} \left\{\left(\text{BTU/HR}\right)/1,000\right\}\]
    Refer to National Fuel Gas Code for opening requirements between connected indoor spaces.

- All Outdoor Air. Provide permanent opening(s) communicating directly or by ducts with outdoors.
  - A. Two Permanent Opening Method. Provide opening commencing within 12 inches of top and second opening commencing within 12 inches of bottom of enclosure.
    - Direct communication with outdoors or communicating through vertical ducts. Provide minimum free area of 1 in² per 4 \([\text{BTU/HR}]/1,000\) of total input rating of all appliances in enclosure.
    - Communicating through horizontal ducts. Provide minimum free area of 1 in² per 2 \([\text{BTU/HR}]/1,000\) of total input rating of all appliances in enclosure.
  - B. One Permanent Opening Method. Provide opening commencing within 12 inches of top of enclosure. Provide minimum clearance of 1 inch on sides/back and 6 inches on front of boiler (does not supersede clearance to combustible materials).
    - Refer to National Fuel Gas Code for additional requirements for louvers, grilles, screens and air ducts.
  - Combination Indoor and Outdoor Air. Refer to National Fuel Gas Code for application information.

National Gas and Propane Installation Code Requires providing air supply in accordance with:

- Section 8.2 and 8.3 when combination of appliances has a total input of up to and including 400 \([\text{BTU/HR}]/1,000\) (120 kW).
- Section 8.4 when combination of appliances has total input exceeding 400 \([\text{BTU/HR}]/1,000\) (120 kW).
- Refer to Natural Gas and Propane Installation Code for specific air supply requirements for enclosure or structure where boiler is installed, including air supply openings and ducts.

---

WARNING

Asphyxiation Hazard! Provide enough air openings to boiler/combustion area to dilute flue gases and allow for consistent, quality combustion. Do not obstruct air openings. Follow instructions below, to maintain adequate combustion air. Failure to follow these instructions good result in ignition failure, overheating, carbon monoxide, and accumulation of flue gases. Do not obstruct air openings. Follow instructions below, to maintain adequate combustion air. Failure to follow these instructions good result in ignition failure, overheating, carbon monoxide, and accumulation of flue gases.
6.1 Removal Of Existing Boiler From Venting System

When an existing boiler is removed from a common venting system, the system is likely too large for proper venting of appliances still connected to it. If this occurs, follow this test procedure:

At time of removal of an existing boiler, the following steps shall be followed with each appliance remaining connected to the common venting system placed in operation, while the other appliances remaining connected to the common venting system are not in operation.

1. Seal an unused opening in the common venting system.
2. Visually inspect the venting system for proper size and horizontal pitch and determine there is no blockage or restriction, leakage, corrosion and other deficiencies which could cause an unsafe condition.
3. Insofar as is practical, close all building doors and windows and all doors between the space in which the appliances remaining connected to the common venting system are located and other spaces of the building. Turn on clothes dryers and any other appliance not connected to the common venting system. Turn on any exhaust fans, such as range hoods and bathroom exhausts, so they operate at maximum speed. Do not operate a summer exhaust fan. Close fireplace dampers.
4. Place in operation the appliance being inspected. Follow the lighting instructions. Adjust thermostat so appliance will operate continuously.
5. Test for spillage at the draft hood relief opening after 5 minutes of main burner operation. Use the flame of a match or candle, or smoke from a cigarette, cigar or pipe.
6. Minimum draft should be -.02" w.c.
7. After it has been determined that each appliance remaining connected to a common venting system properly vents when tested as outlined above, return doors, windows, exhaust fans, fireplace dampers and any other gas burning appliances to their previous condition of use.
8. Any improper operation of the common venting system should be corrected so the installation conforms with the National Fuel gas Code, ANSI Z223.1/NFPA 54, and/or the Natural Gas and Propane Installation Code, CAN/CSA B149.1. When re-sizing any portion of the common venting system, the common venting system should be re-sized to approach the minimum size determined using the appropriate tables in Chapter 13 of the National Fuel Gas Code, ANSI Z223.1/NFPA 54, and/or the Natural Gas and Propane Installation Code, CAN/CSA B149.1.
9. Draft pressure must be negative under all conditions with all appliances operating.
Boiler and venting installations shall be performed by a qualified expert and in accordance with the appropriate manual. Installing or venting boiler or other gas appliance with improper methods or materials may result in serious injury or death due to fire or to asphyxiation from poisonous gases such as carbon monoxide which is odorless and invisible.

**WARNING**

Do not connect boiler to any portion of mechanical draft system operating under positive pressure.

### 7.1 Check Your Chimney

It must be clean, the right size, properly constructed and in good condition. A chimney shall be lined in a manner acceptable to the authority having jurisdiction.

**Chimney Sizing**

Chimney sizing, and vent installation must be in accordance with The National Fuel Gas Code, ANSI Z223.1/NFPA 54 or CAN/CSA B149.1, or applicable provisions of local building codes.

This is a high efficiency boiler with low stack temperature. Following recommendations are in addition to requirements of the National Fuel Gas Code.

1. **Type B** double wall vent pipe is recommended for vent connector. Single wall vent connectors should not be used unless following conditions are true:
   a. Except for basement, boiler is not installed in unheated space.
   b. Total horizontal portion of vent connector, not including elbows is less than 5 feet in length.

2. Outside chimneys (i.e. chimneys exposed to outdoors below roof line on one or more sides) do not use unless they are:
   a. enclosed in a chase, or
   b. lined with Type B vent pipe, or listed flexible vent liner, or other certified chimney lining system.

3. Where possible it is recommended to common vent boiler and water heater.

4. For multiple Category I boiler installations, consult boiler manufacturer for venting recommendations.

5. Minimize horizontal vent length.

### 7.2 Requirements

1. Vent pipe must slope upward from the boiler not less than ¼ inch for every 1 foot (21 mm/m) to vertical vent terminal.

2. Horizontal portions of venting system shall be supported rigidly every 5 feet and at the elbows. No portion of vent pipe should have any dips or sags.

### 7.3 Chimney Inspection

Chimney must be clean, right size, properly constructed and in good condition. Installation must conform to requirements of the authority having jurisdiction or, in absence of such requirements, to The National Fuel Gas Code, ANSI Z223.1/NFPA 54.

1. Connect flue pipe from draft hood to chimney. Bolt or screw joints together to avoid sags. Flue pipe should not extend beyond inside wall of chimney more than 1/4 inch. Do not install manual damper in flue pipe or reduce size of flue outlet except as provided by the latest revision of National Fuel Gas Code, ANSI ANSI Z223.1/NFPA 54 or CAN/CSA B149.1. Protect combustible ceiling and walls near flue pipe as required by National Fuel Gas Code. Where two or more appliances vent into a common flue, the area of the common flue must be at least equal to the area of the largest flue plus 50 percent of the area of each additional flue.

### 7.4 Vent Pipe

- Fasten sections of vent pipe with 3 sheet metal screws at each joint to make piping rigid.
- Support horizontal portions of vent system to prevent sagging.
- Use stove pipe wires or metal strapping every 5’ to support pipe from above.
- Vent pipe through crawl space, use double wall vent pipe.
- Vent pipe passing through combustible wall or partition, use ventilated metal thimble. Thimble should be 4” larger in diameter than vent pipe.

### NOTICE

Minimum Vent Pipe Clearance - Wood and other combustible materials must not be closer than 6” from any surface of single wall metal vent pipe. Listed Type B vent pipe or other listed venting systems shall be installed in accordance with their listing.
8.1 Vent Damper

Connecting The Vent Damper And Vent Connector
Refer to page 4 for size and location of vent (flue opening).

**NOTICE**

Damper blade on furnished vent damper has 1/2 square inch hole (approximately 3/4” diameter). Boilers equipped with intermittent ignition, hole should be plugged by using plug supplied with vent damper.

1. Follow damper installation instructions provided with damper.
2. Position furnished vent damper on top of flue outlet collar. Fasten damper securely to flue outlet collar with sheet metal screws. Verify damper blade has clearance to operate inside of diverter. Do not modify either draft diverter or vent damper during installation.

**As An Option**

Damper may be installed in horizontal or vertical position, closer to flue outlet collar preferred. See Figures 8-1, 8-2, 8-3 and enclosed vent damper instructions.

3. Install vent damper to service only single boiler for which it is intended. Damper position indicator shall be in visible location following installation. Locate damper so it is accessible for servicing. See Figure 8-2.
4. Damper must be in the open position when appliance main burners are operating.
5. Boiler is equipped with factory wired harness that plugs into vent damper.
6. Slope pipe up from boiler to chimney not less than 1/4” per foot.
7. Run pipe as directly as possible with as few elbows as possible.
8. Do not connect to fireplace flue.
9. End of vent pipe must be flush with inside face of chimney flue. Use a sealed-in thimble for chimney connection.
10. Clearance of not less than 6 inches (152mm) between Vent Damper and combustible material must be maintained. Additional clearance should be allowed for service of Vent Damper.
11. Vent Damper position indicator must be in visible location following installation.

Fasten sections of vent pipe with sheet metal screws to make piping rigid. Support horizontal portions of vent system to prevent sagging. Use stovepipe wires every 5’ to support pipe from above. Use double wall vent pipe if vent pipe must go through crawl space. Where vent pipe passes through combustible wall or partition, use ventilated metal thimble. Thimble should be 4 inches larger in diameter than vent pipe.

**Figure 8-1 - Vent Damper Installation**
Figure 8-2 - Vent Damper Placement

Figure 8-3 - Vent Damper Position Indicator

DAMPER CLOSED

SHOWING OPEN AND CLOSED POSITION

DAMPER OPEN
**9 - CONNECTING GAS SERVICE**

### 9.1 General

- Use piping materials and joining methods acceptable to authority having jurisdiction. In absence of such requirements: USA - *National Fuel gas Code*, ANSI Z223.1/NFPA 54
- Canada - *Natural Gas and Propane Installation Code*, CAN/CSA B149.1
- Size and install gas piping system to provide sufficient gas supply to meet maximum input at not less than minimum supply pressure. See Table 9-1.
- 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 field sourced manual main shutoff valve, ground joint union, and sediment trap upstream of gas valve. See Figure 10-1.

#### Table 9-1

<table>
<thead>
<tr>
<th></th>
<th>Natural Gas</th>
<th>Propane</th>
</tr>
</thead>
<tbody>
<tr>
<td>Min. Supply Pressure</td>
<td>5&quot; w.c.</td>
<td>11&quot; w.c.</td>
</tr>
<tr>
<td>Max. Supply Pressure</td>
<td>13.5&quot; w.c.</td>
<td>13.5&quot; w.c</td>
</tr>
<tr>
<td>Manifold Pressure</td>
<td>3.5&quot; w.c.</td>
<td>10&quot; w.c. (4 sec. only)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>10.5&quot; w.c.</td>
</tr>
</tbody>
</table>

### 9.2 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, non-corrosive detection fluid, or other leak detection method acceptable to authority having jurisdiction. Do not use matches, candles, open flames, or other methods providing ignition source.
- Correct leaks immediately and retest.

#### Figure 10-1 - Gas Piping

- Install manual valve within 6 ft. (183 cm) of boiler and 5 ft. (152 cm) above the floor where required by local codes.
- 3" (8 cm) Minimum Sediment Trap
- To Gas Control Inlet

- **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.

- **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.

- **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**
  - Use of CSA approved corrugated, semi-rigid stainless steel tubing with polyethylene jacketing is approved for use with boilers following tubing manufacturer’s instructions.
  - Use of flexible appliance gas tubing also known as a "whip" is not allowed per NFPA 54.

*For additional information refer to the National Fuel Gas Code Handbook.*

---

**Table 9-2**

<table>
<thead>
<tr>
<th>Length of Pipe (Feet)</th>
<th>½&quot;</th>
<th>¾&quot;</th>
<th>1&quot;</th>
<th>1¼&quot;</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>175</td>
<td>360</td>
<td>680</td>
<td>1400</td>
</tr>
<tr>
<td>20</td>
<td>120</td>
<td>250</td>
<td>465</td>
<td>950</td>
</tr>
<tr>
<td>30</td>
<td>97</td>
<td>200</td>
<td>375</td>
<td>770</td>
</tr>
<tr>
<td>40</td>
<td>82</td>
<td>170</td>
<td>320</td>
<td>660</td>
</tr>
<tr>
<td>60</td>
<td>66</td>
<td>138</td>
<td>260</td>
<td>530</td>
</tr>
<tr>
<td>80</td>
<td>57</td>
<td>118</td>
<td>220</td>
<td>460</td>
</tr>
<tr>
<td>100</td>
<td>50</td>
<td>103</td>
<td>195</td>
<td>400</td>
</tr>
</tbody>
</table>

*PN 240012889 Rev. A [07/31/2020]*
### 10.1 Electrical Wiring

If an external electrical source is utilized, the boiler, when installed, must be electrically bonded to ground in accordance with the requirements of the authority having jurisdiction or, in the absence of such requirements, with the National Electrical Code, ANSI/NFPA 70, and/or the Canadian Electrical Code Part I, CSA C22.1, Electrical Code.

See wiring diagrams on the following pages for details.
- J-box and circulator harness are shipped in parts box, and may be wired on either side of boiler as desired.
- Electrically bond boiler to ground in accordance with requirements of authority having jurisdiction.
  
Refer to: USA - National Electrical Code, ANSI/NFPA 70.

### 10.2 Thermostat Installation

1. Use a thermostat with dry contacts which does not pull any load from the control. Use a separate transformer for zone valve wiring.

2. Thermostat should be installed on inside wall about four feet above floor.

3. NEVER install thermostat on outside wall.

4. Do not install thermostat where it will be affected by drafts, hot or cold pipes, sunlight, lighting fixtures, televisions, fireplace, or chimney.

5. Check thermostat operation by raising and lowering thermostat setting as required to start and stop burners.

6. Instructions for final adjustment of thermostat are packaged with thermostat (adjusting heating anticipator, calibration, etc.)

7. Thermostat's heat anticipator must be adjusted to match total current draw of all controls associated with boiler during heating cycle.
**WARNING**

Modification, substitution or elimination of factory equipped, supplied or specified components may result in personal injury or loss of life.

---

**Figure 11-1 - 3200 Plus Fuel Smart Hydrostat Control**

![Wiring Diagram](image)
Figure 11-2 - 3200 Plus Fuel Smart Hydrostat Control - Ladder

WIRING SCHEMATIC
12.2 Operating Instructions For Intermittent Pilot System

1. STOP! Read and follow all safety information.
2. Set the thermostat to lowest setting.
3. Turn off all electric power to the appliance.
4. This appliance is equipped with an ignition device which automatically lights the pilot. Do not try to light the pilot by hand.
5. Lift and remove front panel.

Figure 12-1 - Intermittent Pilot

6. Turn gas control knob clockwise to “OFF.”
7. Wait (5) minutes to clear out any gas. If you then smell gas, STOP! Follow “What To Do If You Smell Gas” in the safety information to the left. If you don’t smell gas, go on to the next step.
8. Turn gas control knob counterclockwise to “ON.”
9. Turn on all electric power to the appliance.
10. Set thermostat to desired setting.
11. If the appliance will not operate, follow the instructions “To Turn Off Gas To Appliance”, and call qualified service technician or your gas supplier.
12. Replace front panel

12.3 TO TURN OFF GAS TO THE APPLIANCE

1. Set the thermostat to lowest setting.
2. Turn off all electric power to the appliance if service is to be performed.
3. Lift and remove front panel.
4. Push in gas control knob slightly and turn clockwise to “OFF.” DO NOT FORCE.
5. Call qualified service technician.
### 13.1 General

1. Thermostat actuates on call for heat, completing circuit to control.
   - A. Completed circuit to control will first activate damper which will close the end switch inside damper.
   - B. Completes the circuit to ignition system, ignition takes place.
   - C. Circulator will activate if temperature is 125°F or more.

2. In event the boiler water temperature exceeds high limit setting on the boiler mounted high limit control, power is interrupted between control system and ignition system.

3. In event the flow of combustion products through the boiler venting system becomes blocked:
   - A. Blocked vent safety switch shuts main burner gas off.
   - B. If boiler flue-way becomes blocked: flame rollout safety switch shuts main burner gas off. Figure 13-1.

If either of these condition A or B exist:
Do not attempt to place boiler back into operation. Contact certified service agency. Do Not jumper safety switch(s).
14.1 Seasonal Startup

- Before seasonal start-up, have a certified service agency check boiler for soot and scale in flues, clean burners and check gas input rate to maintain high operating efficiency.
- Verify proper operation after servicing.
- Service agency will verify system is filled with water to minimum pressure and open air vents, if used, to expel any air accumulated in the system. Check entire piping system and, if any leaks appear, have them repaired.
- Circulators need to be checked and maintained. Refer to circulator manufacturer's instructions.
- Inspect venting system at the start of each heating season.
  ◊ Check vent pipe from boiler to chimney for signs of deterioration by rust or sagging joints. Repair if necessary.
  ◊ Remove vent pipe at base of chimney or flue and using a mirror, check vent for obstruction and verify vent is in good working order.
- Boiler flue gas passageways may be inspected by a light and mirror.
  ◊ Remove burner door. See Figure 13-1 page 28.
  ◊ Place trouble lamp in flue collector through draft relief opening or clean out cover.
  ◊ With mirror positioned above burners, flue gas passageways can be checked for soot or scale.

14.2 Clean Flue Gas Passageways

Follow this procedure to clean flue gas passageways:

1. Remove burner tray from heat exchanger by disconnecting gas valve, remove two (2) nuts and pull out the assembly.
2. Remove top jacket panel.
3. Remove inspection/cleaning cover.
4. Place sheet of heavy paper or similar material over bottom of base and brush down flue passageways. Soot and scale will collect on paper and is easily removed with the paper.
5. With paper still in place in base, clean top of boiler castings of boiler putty or silicone used to seal between castings and flue collector. Verify chips are not lodged in flue passageways.

When cleaning process is complete, restore boiler components to their original position. Use IS-808 GE silicone (available from distributor) to seal around flue collector, and inspection cover if required.
14.3 General Maintenance

- Visually inspect main burner and pilot flames at start of heating season and again in mid-season.
  - Main burner flame should have well defined inner blue mantel with lighter blue outer mantel.
  - Check burner throats and burner orifices for lint or dust obstruction. Figures 14-1 and 14-3.

- Pilot flame should envelop ¾ to ½ inch of tip of ignition/sensing electrode. See Figure 14-2.

- To adjust pilot flame: remove pilot adjustment cover screw and turn inner adjustment screw counterclockwise to increase or clockwise to decrease pilot flame. Replace cover screw after adjustment to prevent possible gas leakage. See Figure 12-1, Page 27.

- Check burners and pilot for signs of corrosion, rust or scale buildup.

- Area around boiler shall be clear and free of combustible materials, gasoline and other flammable vapors and liquids.

- Free flow of combustion and ventilating air to boiler and boiler room shall not be restricted or blocked.

- Inspect factory supplied and field sourced low water cutoffs annually, or as recommended by low water cutoff manufacturer. Flush float type low water cutoffs per manufacturer’s instructions.

- Contact a Qualified Service Agency to make annual inspection of boiler and heating system. This should include:
  1. Check casting and vent for signs of corrosion from condensate.
  2. Examine pilot lint screen and clean if needed.
  3. Check venting for any signs of corrosion, rust, damage or deterioration. Contact a Qualified Service Agency immediately if you observe any of these conditions.
14.4 Adjusting Gas Input

1. Adjust gas input to boiler by removing protective cap on pressure regulator, and turning screw clockwise to increase input and counterclockwise to decrease input. See Figure 12-1 page 27.

2. Manifold pressures are taken at outlet side of gas valve. See Pg 23 for proper pressure recommendations.

3. To check for proper flow of natural gas to boiler, divide input rate shown on rating plate by heating value of gas obtained from local gas company. This determines number of cubic feet of gas required per hour.

4. Determine flow of gas through meter for two minutes and multiply by 30 to get hourly rate with all other gas appliances off.

5. Make minor adjustments to gas input as described above. See Figure 12-1 page 27.

6. Change burner orifices if final manifold pressure varies more than plus or minus 0.3 inches water column from specified pressure listed on boiler rating plate.

7. Primary air adjustment is not necessary, therefore air shutters are not furnished.

CHECK SAFETY CONTROL CIRCUIT. Test ignition system safety shutoff device after placing boiler in operation. Figure 13-1 page 28.

8. **Intermittent Pilot:** With main burner operating, turn pilot gas adjusting screw clockwise until pilot gas is turned off. Within 90 seconds main gas control closes, shutting off gas to main burner.

9. **High Limit Control:** Remove front cover and note temperature setting. Refer to appendix A for adjustment procedure. Decrease setting to minimum and operate boiler. When boiler water temperature exceeds control temperature setting, control will open circuit, closing automatic main gas valve.
# 15 - RATINGS AND CAPACITIES

## EXPLANATORY NOTES

-- All boilers are design certified for installation on noncombustible floor.

-- FOR INSTALLATION ON NON-COMBUSTIBLE FLOORS ONLY - For installation on combustible flooring special base must be used. (See Combustible Floor Addendum). Do NOT install boiler on carpeting.

-- Recommended chimney height 20 feet. In special cases where conditions permit, chimney height may be reduced to 10 feet. Refer to the latest revision of *National Fuel Gas Code ANSI Z223.13/NFPA 54* part 11.

-- Electric service to be 120 Volts, 15 Amps, 60 Hz.

-- The MEA number for the this boiler is 19-79-E.

(1) Input rating for sea level to 2,000 ft. (610m) above sea level.

**United States**, over 2000 ft (610m) above sea level. Reduce input rate 4% for every 1000 ft (304m) above sea level.

**Canada**, 2000 ft (610m) to 4500 (1350m) above sea level reduce input per table. Over 4500 ft (1350m) above sea level. Contact Provincial authority having jurisdiction.

(2) Net AHRI Water Ratings shown based on piping and pickup allowance of 1.15. Consult manufacturer before selecting boiler for installations having unusual piping and pickup requirements, such as intermittent system operation, extensive piping systems, etc.

For forced hot water systems where boiler and all piping within area to be heated, boiler may be selected on basis of its heating capacity.

(3) Tank sized for non-ferrous baseboard or radiant panel systems. Increase size for cast iron baseboard and radiation.

## STANDARD EQUIPMENT:


---

### Table 15-1 - Ratings and Capacities

<table>
<thead>
<tr>
<th>Boiler Model</th>
<th>Number of Sections</th>
<th>(1) Input Btu/hr</th>
<th>(1) Heating Capacity Btu/hr</th>
<th>(2) Net AHRI Rating Water Btu/hr</th>
<th>AFUE</th>
<th>Flue Diameter Inches</th>
<th>(1) High Altitude Input Btu/hr</th>
<th>(3) Recommended Air Cushion Tank</th>
</tr>
</thead>
<tbody>
<tr>
<td>GWB84-060E</td>
<td>3</td>
<td>59,000</td>
<td>50,000</td>
<td>43,000</td>
<td>84.0</td>
<td>4</td>
<td>53,100</td>
<td>15</td>
</tr>
<tr>
<td>GWB84-090E</td>
<td>4</td>
<td>92,500</td>
<td>78,000</td>
<td>68,000</td>
<td>84.0</td>
<td>5</td>
<td>83,200</td>
<td>30</td>
</tr>
<tr>
<td>GWB84-120E</td>
<td>5</td>
<td>120,000</td>
<td>101,000</td>
<td>88,000</td>
<td>84.0</td>
<td>6</td>
<td>108,000</td>
<td>30</td>
</tr>
<tr>
<td>GWB84-150E</td>
<td>6</td>
<td>149,000</td>
<td>125,000</td>
<td>109,000</td>
<td>84.0</td>
<td>6</td>
<td>134,100</td>
<td>30</td>
</tr>
<tr>
<td>GWB84-175E</td>
<td>7</td>
<td>175,000</td>
<td>148,000</td>
<td>129,000</td>
<td>84.0</td>
<td>7</td>
<td>157,500</td>
<td>30</td>
</tr>
<tr>
<td>GWB84-205E</td>
<td>8</td>
<td>205,000</td>
<td>172,000</td>
<td>150,000</td>
<td>84.0</td>
<td>7</td>
<td>184,500</td>
<td>30</td>
</tr>
<tr>
<td>GWB84-235E</td>
<td>9</td>
<td>235,000</td>
<td>197,000</td>
<td>172,000</td>
<td>84.0</td>
<td>7</td>
<td>211,500</td>
<td>30</td>
</tr>
</tbody>
</table>
APPENDIX A - CONTROL FUNCTION

**WARNING**
Burn and scald hazard. Do not add water until boiler has fully cooled. Failure to follow these instructions could result in death or serious injury.

**Control - LED legend**

1. **TEMP ACTIVE** Indicates the Fuel Smart HydroStat control is powered and the temperature function is active.

2. **TEMP HI TEMP** Illuminates when the boiler water temperature reaches the high limit setting. It will remain lit until the water temperature falls 10°. The Fuel Smart HydroStat prevents burner operation while this LED is on. See Differential explanation on page 6 of Hydrolevel Manual.

3. **LWCO ACTIVE** Indicates the low water cut-off (LWCO) function of the Fuel Smart HydroStat is active. When the control is installed with a Hydrolevel Electro-Well, this LED will be on at all times when the control is powered. **IMPORTANT:** If the control is installed with a well other than the Electro-Well, this LED will not illuminate indicating the control is not providing low water cut-off functionality.

4. **LWCO LOW WATER** Indicates the boiler is in a low water condition. The HydroStat control will prevent burner operation during this condition. If the LOW WATER light is blinking, the control has been programmed to provide lockout protection in the event a low water condition is detected. (see Manual Reset Low Water Cut-Off on page 8 of Hydrolevel manual). Pressing the TEST/SETTINGS button will reset the control. **IMPORTANT:** The system must be checked by a qualified heating professional prior to resuming operation.

5. **ECONOMY ACTIVE** Indicates the Thermal Targeting function is active and the Fuel Smart HydroStat will reduce boiler temperature to conserve fuel. The Economy feature is activated using the ECONOMY dial.

6. **ECONOMY TARGET** When the Economy feature is active, the Fuel Smart HydroStat continually sets target temperatures below the high limit setting to maximize fuel efficiency. When the boiler water reaches the target temperature, the LED illuminates and the burner will shut down. The boiler water will continue to circulate and heat the house as long as the thermostat call continues. The LED will stay lit until the boiler temperature drops below the differential set point at which point the boiler will be allowed to fire again. See Differential explanation on page 6 of Hydrolevel Manual. **NOTE:** This LED illuminates regularly during normal boiler operation.

7. **TEST/SETTINGS Button**
To Test Low Water Cut-Off: Press and hold the Test/Settings button for 5 seconds. The display will read LCO. **LWCO TEST LCO**
The red Low Water light should illuminate and the burner circuit (B1 and B2) should de-energize. **NOTE:** The control must be installed with a Hydrolevel Electro-Well for low water cut-off functionality (see page 2 of Hydrolevel manual for more details).

To View Current Settings: Press and release the Test/Settings Button in short intervals to sequentially display the following settings:

- **HIGH LIMIT SETTING HL**
- **LOW LIMIT SETTING LL**
- **ECONOMY SETTING ECO**
- **CURRENT TARGET TEMPERATURE**

The display will return to boiler temperature (default) if Test/Settings Button in not pressed for 5 seconds.

8. **DAMPER POWER LED**
Indicates the control is energizing the vent damper. For applications where the vent damper is not plugged into the HydroStat, the LED indicates the burner circuit (B1 - B2) is powered. LED will blink when power is sent to the Vent Damper and will turn solid when power returns from the end switch.
### A-1. Intermittent Pilot Ignition System Checks

#### STEP 1:
1. Check ignition cable.
   - Verify ignition cable does not make contact with metal surfaces.
   - Verify only factory supplied Ignition cable (or approved replacement) is used.
   - Verify connections to ignition module and igniter or igniter-sensor are clean and tight.
   - Verify ignition cable provides good electrical continuity.

2. Verify ignition system grounding. Nuisance shutdowns are often caused by poor or erratic grounding. Common ground is required for module and pilot burner/igniter sensor.
   - Check for good metal-to-metal contact between pilot burner bracket and the main burner.
   - Check ground lead from GND (BURNER) terminal on module to pilot burner. Verify connections are clean and tight. If wire is damaged or deteriorated, replace with No. 14-18 gauge, moisture-resistant, thermoplastic insulated wire with 105°C [221°F] minimum rating.
   - Check ceramic flame rod insulator for cracks or evidence of exposure to extreme heat, which can permit leakage to ground. Replace pilot burner/igniter sensor and provide shield if necessary.
   - If flame rod or bracket is bent out of position, restore to correct position.

#### Carbon Monoxide Hazard:
If the burner fires when the vent damper is not fully opened or there is any other blockage in the flue, dangerous flue products, such as carbon monoxide, will escape into the living space causing severe personal injury or death. The flue as well as the vent damper must be checked for proper operation before allowing the system to operate.

#### Circ Delay LED
The blue “circ delay” LED lights to indicate the heating circulator (terminal C1) is being held off. See Circulator Hold Off (option 5) top of page 9 of the Hydrolevel manual for more information.

#### APPENDIX A - CONTROL FUNCTION

**Circ Delay LED**

The blue “circ delay” LED lights to indicate the heating circulator (terminal C1) is being held off. See Circulator Hold Off (option 5) top of page 9 of the Hydrolevel manual for more information.
**STEP 3:** Check spark ignition circuit.

Disconnect ignition cable at SPARK terminal on module.

**WARNING**

Electrical shock hazard. Ignition circuit generates over 10,000 volts. Turn OFF electrical power supply at service panel before making electrical connections. Failure to do so could result in death or serious injury.

Energize module and listen for audible sparking noise. When operating normally, there should be a buzzing noise that turns on and off twice per second for duration of 1–7 seconds depending on model. Reconnect ignition cable.

**STEP 4:** Verify pilot and main burner light-off.

1. Initiate call for heat. Turn thermostat above room temperature. Ignition sequence may be delayed by thermal purge up to 2 minutes.

2. Watch pilot burner during ignition sequence.
   - Verify ignition spark continues after pilot is lit.
   - Verify pilot lights and spark stops, verify main burner does not light.
   - Check pilot flame. Verify it is blue, steady and envelops 3/8 to 1/2 in. [10 to 13 mm] of flame rod. See Figure A-1 for possible flame problems and causes.
   - If necessary, adjust pilot flame by turning pilot adjustment screw on gas control clockwise to decrease or counterclockwise to increase pilot flame. Following adjustment, always replace pilot adjustment cover screw and tighten firmly to assure proper gas control operation. Figure 12-1, page 23.

3. If so, ensure adequate flame current as follows.
   - Turn off boiler at circuit breaker or fuse box.
   - Clean flame rod with emery cloth.
   - Verify electrical connections are clean and tight. Replace damaged wire.
   - Check for cracked ceramic insulator, which can cause short to ground, and replace pilot if necessary.
   - Set temperature below room set-point to end call for heat.

1. **Recheck ignition sequence as follows:**
   a. Reconnect main valve wire.
   b. Adjust thermostat above room temperature.
   c. Verify ignition sequence at burner.
   d. If spark does not stop after pilot lights, replace module.

**Figure A-1 - Troubleshooting Pilot Flame**

<table>
<thead>
<tr>
<th>APPEARANCE</th>
<th>CAUSE</th>
</tr>
</thead>
<tbody>
<tr>
<td>SMALL BLUE FLAME</td>
<td>CHECK FOR LACK OF GAS FROM:</td>
</tr>
<tr>
<td></td>
<td>• CLOGGED ORIFICE FILTER</td>
</tr>
<tr>
<td></td>
<td>• CLOGGED PILOT FILTER</td>
</tr>
<tr>
<td></td>
<td>• LOW GAS SUPPLY PRESSURE</td>
</tr>
<tr>
<td></td>
<td>• PILOT ADJUSTMENT AT MINIMUM</td>
</tr>
<tr>
<td>LAZY YELLOW FLAME</td>
<td>CHECK FOR LACK OF AIR FROM:</td>
</tr>
<tr>
<td></td>
<td>• DIRTY ORIFICE</td>
</tr>
<tr>
<td></td>
<td>• DIRTY LINT SCREEN, IF USED</td>
</tr>
<tr>
<td></td>
<td>• DIRTY PRIMARY AIR OPENING IF THERE IS ONE</td>
</tr>
<tr>
<td></td>
<td>• PILOT ADJUSTMENT AT MINIMUM</td>
</tr>
<tr>
<td>WAVY BLUE FLAME</td>
<td>CHECK FOR:</td>
</tr>
<tr>
<td></td>
<td>• EXCESSIVE DRAFT AT PILOT LOCATION</td>
</tr>
<tr>
<td></td>
<td>• RECIRCULATING PRODUCTS OF COMBUSTION</td>
</tr>
<tr>
<td>NOISY LIFTING BLOWING</td>
<td>CHECK FOR:</td>
</tr>
<tr>
<td>BLOWING FLAME</td>
<td>• HIGH GAS PRESSURE</td>
</tr>
<tr>
<td>HARD SHARP FLAME</td>
<td>THIS FLAME IS CHARACTERISTIC OF MANUFACTURED GAS</td>
</tr>
<tr>
<td></td>
<td>CHECK FOR:</td>
</tr>
<tr>
<td></td>
<td>• HIGH GAS PRESSURE</td>
</tr>
<tr>
<td></td>
<td>• ORIFICE TOO SMALL</td>
</tr>
</tbody>
</table>

Correct Pilot Flame: 3/8 to 1/2 inch in flame
**WARNING**

Asphyxiation, burn hazard. Improper operation of vent damper may result in serious injury or death due to fire or to asphyxiation from poisonous gases such as carbon monoxide which is odorless and invisible.

**B.1 DAMPER INSTALLATION**

Follow Damper installation instructions provided with damper. See Figure B-1.

1. Verify only boiler is serviced by Vent Damper. Figure B-2.

2. Clearance of 6 inches (152 mm) between Vent Damper and combustible material shall be maintained. Allow additional clearance for service of Vent Damper.

3. Vent Damper shall be in the open position when appliance main burners are operating.

4. Vent Damper position indicator must be in visible location following installation.

**B.2 Vent Damper**

Check vent damper and all flue product carrying areas of boiler annually for deterioration from corrosion or other sources. Contact your service agent for repairs.

**Check vent damper operation as follows:**

1. When boiler is off, check vent damper positions indicator points to closed position. See Figure B-3.

2. Turn thermostat or controller up to call for heat and check vent damper indicator points to open position. See Figure B-3.

3. Turn thermostat or controller down again and check damper position indicator returns to closed position.

4. Return thermostat to desired position.

5. Place vent damper in open position to permit burner operation by using “HOLD DAMPER OPEN” switch, located on damper controller.

6. Thermostat controls burner firing as before, while damper remains open.

7. **DO NOT** turn damper open manually, motor damage will result.

8. Set switch to “AUTOMATIC OPERATION” to close vent damper during burner off cycle.

9. For further information, and for vent damper troubleshooting guide, refer to manual packaged with vent damper.
B.1 Vent Damper Harness - Molex Plugs

**WARNING**

Follow all instructions regarding safety operational controls in this manual. Failure to follow these instructions could result in death or serious injury.

When servicing controls, all wires must be labeled prior to disconnection. Wiring errors can cause improper and dangerous operation. Do not turn damper open manually or motor damage will result and affect warranty coverage, use the service switch.

Do not cut plug off of damper motor assembly this will affect warranty coverage.

**Check Molex Plugs on Vent Damper Harness:**

- Damper wiring harness is made up of 4 individual colored wires, Brown, Black, Yellow, and Orange (refer to drawing below).

1. Disconnect thermostat wires.
2. Use the two diagrams below to confirm the Molex plugs on each end of the damper harness are wired and operating properly.

**Damper end of wiring harness:**

A. Hold plug in hand with wiring harness behind Molex with "V" slot on top. Verify wire colors are in proper position.

   i. If boiler does not ignite, replaces damper harness

B. Take reading across brown and black wires in Molex plug, using test meter set for AC volts. 24 volts should be present.

   i. If NOT, source of the problem is not in damper; check line voltage and 24 volt supply.

   ii. If 24 volts is present across brown and black, continue to step iii.

   iii. Reconnect thermostat wires and turn up heat setting.

   iv. Check voltage across black and orange wires in Molex plug. 24 volts AC should be present:

      • If NOT, source problem is not the damper.
      • If 24 volts is present continue on to step v.

   v. Place jumper wire across orange and yellow wires in Molex plug (see Below). This will create bypass of the damper, boiler should then ignite.

      • If NOT, source problem is not the damper. Go to "Aquastat end of wiring harness"

      • If boiler ignites: Go to section A.2 "Vent Damper Troubleshooting Guide".

**NOTE:** Prior to replacing the damper, be sure the problem is not with wire connections between damper and wiring harness.

C. Remove damper harness from control. Jump Molex connector on control board between two center holes using ~18 ga. thermostat wire.

   i. If boiler ignites, replaces damper harness

   ii. If boiler does not light, replace control.

**Control End of wiring harness**

Hold plug in hand with wiring harness behind Molex with "V" slot on top. Verify wires colors are in proper position.
APPENDIX B-3 - VENT DAMPER TROUBLESHOOTING

B.2 Vent Damper Troubleshooting Guide

WARNING

Follow all instructions regarding safety operational controls in this manual. Failure to follow these instructions could result in death or serious injury.

Note

When servicing controls, all wires must be labeled prior to disconnection. Wiring errors can cause improper and dangerous operation. Do not turn damper open manually or motor damage will result and affect warranty coverage, use the service switch.

Do not cut plug off of damper motor assembly this will affect warranty coverage.

Troubleshooting

<table>
<thead>
<tr>
<th>Problem</th>
<th>Possible Cause</th>
<th>Recommended Solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>NO POWER Between 4 &amp; 1</td>
<td>1. Off on limit (120VAC)</td>
<td>1. turn limit on</td>
</tr>
<tr>
<td></td>
<td>2. Bad transformer</td>
<td>2. Replace transformer</td>
</tr>
<tr>
<td></td>
<td>3. Loose or broken connections</td>
<td>3. Tighten, repair, or replace connection</td>
</tr>
<tr>
<td></td>
<td>4. Blown fuse or circuit breaker</td>
<td>4. Replace fuse or reset circuit breaker</td>
</tr>
<tr>
<td></td>
<td>5. Disconnect switch off</td>
<td>5. Turn switch on</td>
</tr>
<tr>
<td></td>
<td>6. Harness not plugged into receptacle</td>
<td>6. Plug harness in</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NO POWER Between 4 &amp; 2</td>
<td>1. Thermostat not calling for heat</td>
<td>1. Turn thermostat up to call for heat</td>
</tr>
<tr>
<td>POWER Between 4 &amp; 1</td>
<td>2. Burned out heat anticipator</td>
<td>2. Replace thermostat</td>
</tr>
<tr>
<td>When calling for heat</td>
<td>3. Loose or broken connections</td>
<td>3. Tighten, repair, or replace connection</td>
</tr>
<tr>
<td></td>
<td>4. Off/On operating limit, pressure control or low</td>
<td>4. Turn operating limit, pressure control, or</td>
</tr>
<tr>
<td></td>
<td>water cutoff</td>
<td>low water cutoff ON</td>
</tr>
<tr>
<td></td>
<td>5. Off/On blocked vent switch or flame roll out</td>
<td>5. Reset or replace switch</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>POWER Between 4 &amp; 1</td>
<td>1. Loose or broken connection</td>
<td>1. Tighten, repair, or replace connection</td>
</tr>
<tr>
<td>DAMPER OPEN</td>
<td>2. Defective damper motor</td>
<td>2. Replace damper motor assembly</td>
</tr>
</tbody>
</table>

Normal Sequence of Operation

<table>
<thead>
<tr>
<th>24 VAC Power</th>
<th>Power ON</th>
<th>Damper Position</th>
</tr>
</thead>
<tbody>
<tr>
<td>4 &amp; 1</td>
<td>All times</td>
<td>Open or Closed</td>
</tr>
<tr>
<td>4 &amp; 2</td>
<td>Calling for Heat</td>
<td>Open or Opening</td>
</tr>
<tr>
<td>4 &amp; 3</td>
<td>During combustion</td>
<td>Damper Open</td>
</tr>
</tbody>
</table>

![Vent Damper Plug]

4 BLK 2 ORG 3 YLW 1 BRN

Troubleshooting

WARNING

Follow all instructions regarding safety operational controls in this manual. Failure to follow these instructions could result in death or serious injury.
For troubleshooting only. Verify damper is in open position. Use service switch to keep damper in open position. Place jumper between 2 & 3. If appliance fires, remove jumper and plug receptacle back into damper controller plug. If appliance does not fire, replace damper motor assembly. Do not replace pipe assembly.

If damper motor assembly is not available, place service switch in hold open position, allowing customer to have automatic heat by keeping damper in open position.

Refer to Damper manufacturer's Instructions received with this boiler for Damper warranty information.

Return or replace the motor assembly at your convenience. Pipe assembly is not warranted.

### Troubleshooting with Jumper Wire In Place

<table>
<thead>
<tr>
<th>Problem</th>
<th>Possible Cause</th>
<th>Recommended Solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>NO POWER Between 4 &amp; 1</td>
<td>1. Is gas turned on</td>
<td>1. Verify gas is on</td>
</tr>
<tr>
<td>Between 4 &amp; 2</td>
<td>2. Operating limit, pressure control, low water cut off not on.</td>
<td>2. Verify operating limit, pressure control or low water cut off is on</td>
</tr>
<tr>
<td>Between 4 &amp; 3</td>
<td>3. Blocked vent switch or flame roll out switch tripped</td>
<td>3. Reset or replace blocked vent switch or flame roll out switch</td>
</tr>
<tr>
<td>Damper OPEN NO COMBUSTION</td>
<td>4. Loose or broken connection</td>
<td>4. Tighten, repair, or replace connection</td>
</tr>
<tr>
<td></td>
<td>5. Defective component in appliance after vent damper</td>
<td>5. Replace defective component in appliance</td>
</tr>
<tr>
<td>Damper Sticks</td>
<td>1. Damper blade obstruction</td>
<td>1. Clear the obstruction</td>
</tr>
<tr>
<td></td>
<td>2. Damper pipe egg shaped, out of round/binding.</td>
<td>2. Restore to damper pipe to round, verify not binding.</td>
</tr>
<tr>
<td></td>
<td>3. Crimped end of vent piece inserted in too far</td>
<td>3. Correct the condition</td>
</tr>
<tr>
<td>Damper Rotates Continuously</td>
<td>1. Defective damper motor assembly</td>
<td>1. Replace damper motor assembly</td>
</tr>
</tbody>
</table>

**NOTICE**

Service Switch: The service switch does not complete the vent damper end switch circuit; it is not a "bypass" for the end switch circuit. It also does not cause the damper to open or close. When the switch is put in the Service position, the vent damper still needs to open by a call to open from the operating control. The Service Switch will lock the vent damper open once it reaches the open position. When the vent damper opens and the end switch closes, completing the burner circuit, the switch will also be locked in the closed or "burner on" position. If the vent damper can not open for any reason (bad motor, bad harness etc.), using the service switch will have no effect.
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.