



# Versa Hydro

## Combined Appliances

**Installation**

**Start-Up**

**Maintenance**

**Parts**

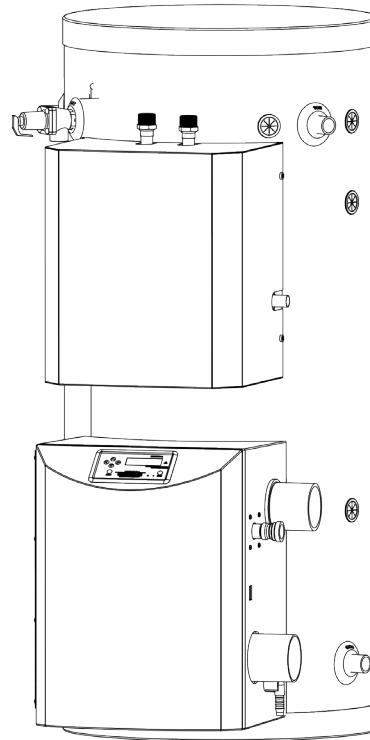
**Warranty**

**PHE130 / PHE199 Models\***

\* "LP" Denotes Propane Gas Operation

"S" Denotes Solar Models

"SNHX" Denotes Solar Models without Heat Exchanger



**This Manual For Use With Appliances  
Manufactured After  
April 10, 2017**



### **DANGER**

This manual must only be used by a qualified installer / service technician. Read all instructions in this manual before installing. Perform steps in the given order. Failure to do so could result in substantial property damage, severe personal injury, or death.

### **WARNING**

Improper installation, adjustment, alteration, service, or maintenance could void product warranty and cause property damage, severe personal injury, or death.

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

### **NOTICE**

The manufacturer reserves the right to make product changes or updates without notice and will not be held liable for typographical errors in literature.

The surfaces of these products contacted by potable (consumable) water contain less than 0.25% lead by weight as required by the Safe Drinking Water Act, Section 1417.

**NOTE TO CONSUMER: PLEASE KEEP ALL INSTRUCTIONS FOR FUTURE REFERENCE.**

## ! WARNING

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

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

### WHAT TO DO IF YOU SMELL GAS

- Do not try to light any appliance.
- Do not touch any electrical switch; do not use any phone in your building.
- Immediately call your gas supplier from a neighbor's phone. Follow the gas supplier's instructions.
- If you cannot reach your gas supplier, call the fire department.
- Installation and service must be provided by a qualified installer, service agency or the gas supplier.

**Improper installation, adjustment, alteration, service, or maintenance can cause injury, property damage, or death. Refer to this manual. Installation and service must be performed by a qualified installer, service agency, or gas supplier.**

## FOR YOUR SAFETY READ BEFORE OPERATING

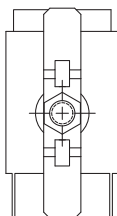
**WARNING:** If you do not follow these instructions exactly, a fire or explosion may result, causing property damage, personal injury or loss of life.

- |  |  |
|--|--|
| <p><b>A.</b> This appliance does not have a pilot. It is equipped with an ignition device which automatically lights the burner. Do <u>not</u> try to light the burner by hand.</p> <p><b>B.</b> BEFORE OPERATING smell all around the appliance area for gas. Be sure to smell next to the floor because some gas is heavier than air and will settle on the floor.</p> | <ul style="list-style-type: none"> <li>If you cannot reach your gas supplier, call the fire department.</li> </ul> |
|--|--|
- WHAT TO DO IF YOU SMELL GAS**
- Do not try to light any appliance
  - Do not touch any electric switch; do not use any phone in your building
  - Immediately call your gas supplier from a neighbor's phone. Follow the gas suppliers' instructions.
- C.** Use only your hand to turn the gas control knob. Never use tools. If the handle will not turn by hand, don't try to repair it, call a qualified service technician. Force or attempted repair may result in a fire or explosion.
- D.** Do not use this appliance if any part has been under water. Immediately call a qualified service technician to inspect the appliance and to replace any part of the control system and any gas control which has been under water.

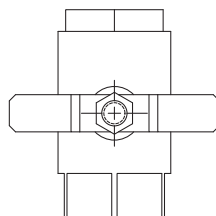
## OPERATING INSTRUCTIONS

- |   |  |
|---|--|
| <ol style="list-style-type: none"> <li>STOP! Read the safety information above.</li> <li>Set the thermostat to lowest setting.</li> <li>Turn off all electric power to the appliance.</li> <li>This appliance is equipped with an ignition device which automatically lights the burner. Do not try to light the burner by hand.</li> </ol> | <ol style="list-style-type: none"> <li>Remove front cover.</li> <li>Turn gas shutoff valve to "off". Handle will be across the piping, do not force.</li> <li>Wait five (5) minutes to clear out any gas. If you then smell gas, STOP! Follow "B" in the safety information above on this label. If you don't smell gas, go to next step.</li> <li>Turn gas shutoff valve to "on". Handle will be in line with piping.</li> <li>Install Front Cover.</li> <li>Turn on all electric power to appliance.</li> <li>Set thermostat to desired setting.</li> <li>If the appliance will not operate, follow the instructions "To Turn Off Gas To Appliance" and call your service technician or gas supplier.</li> </ol> |
|---|--|

**GAS VALVE  
ON**



**GAS VALVE  
OFF**



## TO TURN OFF GAS TO APPLIANCE

- |   |  |
|---|--|
| <ol style="list-style-type: none"> <li>Set the thermostat to lowest setting.</li> <li>Turn off all electric power to the appliance if service is to be performed.</li> <li>Remove Front Cover.</li> </ol> | <ol style="list-style-type: none"> <li>Turn gas shutoff valve to "off". Handle will be across the piping. Do not force.</li> <li>Install Front Cover.</li> </ol> |
|---|--|

LP-175 Rev. 4 3-11-08

## SPECIAL ATTENTION BOXES

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

### DANGER

**DANGER** indicates an imminently hazardous situation which, if not avoided, will result in serious personal injury or death.

### WARNING

**WARNING** indicates a potentially hazardous situation which, if not avoided, could result in personal injury or death.

### CAUTION

**CAUTION** indicates a potentially hazardous situation which, if not avoided, may result in moderate or minor personal injury.

### CAUTION

**CAUTION used without the safety alert symbol** indicates a potentially hazardous situation which, if not avoided, may result in property damage.

### NOTICE

**NOTICE** is used to address practices not related to personal injury.

## Foreword

This manual is intended to be used in conjunction with other literature provided with the appliance. This includes all related control information. It is important that this manual, all other documents included in this system, and additional publications including the *National Fuel Gas Code - ANSI Z223.1* (latest versions), be reviewed in their entirety before beginning any work.

Installation should be made in accordance with the regulations of the Authority Having Jurisdiction, local code authorities, and utility

companies which pertain to this type of water heating equipment.

Authority Having Jurisdiction (AHJ) – The AHJ may be a federal, state, local government, or individual such as a fire chief, fire marshal, chief of a fire prevention bureau, labor department or health department, building official or electrical inspector, or others having statutory authority. In some circumstances, the property owner or his/her agent assumes the role, and at government installations, the commanding officer or departmental official may be the AHJ.

**NOTE:** The manufacturer reserves the right to modify product technical specifications and components without prior notice.

## For the Installer

This appliance must be installed by qualified and licensed personnel. The installer should be guided by the instructions furnished with the appliance, and by local codes and utility company requirements. In the absence of local codes, preference should be given to the *National Fuel Gas Code - ANSI Z223.1*, latest version.

### Installations Must Comply With:


Local, state, provincial, and national codes, laws, regulations, and ordinances.


The latest version of the *National Fuel Gas Code, ANSI Z223.1*, from American Gas Association Laboratories, 8501 East Pleasant Valley Road, Cleveland, OH 44131.


In Canada - *CGA No. B149* (latest version), from Canadian Gas Association Laboratories, 55 Scarsdale Road, Don Mills, Ontario, Canada M3B 2R3. Also, *Canadian Electrical Code, C 22.1*, from Canadian Standards Association, 5060 Spectrum Way, Suite 100, Mississauga, Ontario, Canada L4W 5N6.

The latest version of the *National Electrical Code, NFPA No. 70*.


**NOTE:** The gas manifold and controls met safe lighting and other performance criteria when undergoing tests specified in *ANSI Z21.10.3* - latest edition.

 **DANGER**





Flammable Vapors

 **Vapors from flammable liquids will explode and catch fire causing death or severe burns.**

Do not use or store flammable products such as gasoline, solvents or adhesives in the same room or area near the water heater.

Keep flammable products:

1. far away from heater,
2. in approved containers,
3. tightly closed and
4. out of children's reach.

Water heater has a main burner and pilot flame.

The pilot flame:

1. which can come on at any time and
2. will ignite flammable vapors.


Vapors:

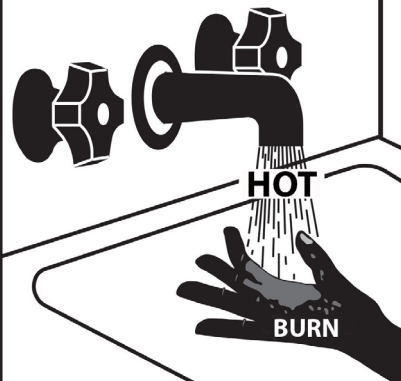
1. cannot be seen,
2. are heavier than air,
3. go a long way on the floor and
4. can be carried from other rooms to the pilot flame by air currents.

**Installation:**

Do not install water heater where flammable products will be stored or used unless the main burner and pilot flames are at least 18" above the floor. This will reduce, but not eliminate, the risk of vapors being ignited by the main burner or pilot flame.

Read and follow water heater warnings and instructions. If owners manual is missing, contact the retailer or manufacturer.

 **DANGER**



Water temperature over 125°F can cause severe burns instantly or death from scalds. Children, disabled and elderly are at highest risk of being scalded. See instruction manual before setting temperature at water heater. Feel water before bathing or showering. Temperature limiting valves are available, see manual.

## **WARNING**

### **From the Uniform Plumbing Code 2000 - Section 510 - Protection From Damage**

1. Appliances generating a glow, spark or flame capable of igniting flammable vapors may be installed in a garage, provided the pilots, burners or heating elements and switches are at least eighteen (18) inches (457 mm) above the floor level.
2. Where such appliances installed within a garage are enclosed in a separate, approved compartment having access only from outside of the garage, such appliances may be installed at floor level provided the required combustion air is also taken from the exterior of the garage. Fuel burning appliances having sealed combustion chambers need not be elevated.
3. All appliances installed in areas where they may be subjected to mechanical damage shall be suitably guarded against such damage by being installed behind adequate barriers or by being elevated or located out of the normal path of a vehicle using any such garage.
4. In seismic zones 3 and 4, appliances shall be anchored or strapped to resist horizontal displacement due to earthquake motion. Strapping shall be at points within the upper one-third (1/3) and lower one-third (1/3) of its vertical dimensions. At the lower point, a minimum distance of four (4) inches (102 mm) shall be maintained above the controls with the strapping.
5. An appliance supported from the ground shall rest on level concrete or other approved base extending not less than three (3) inches (76 mm) above the adjoining ground level.
6. When an appliance is located in an attic, attic-ceiling assembly, floor-ceiling assembly, or floor-subfloor assembly where damage may result from a leaking appliance, a watertight pan of corrosion resistant materials shall be installed beneath the appliance with a minimum three-quarter (3/4) inch (20 mm) diameter drain to an approved location.

### **Table of Contents**

#### **Part 1 - General Safety Information**

- A. Improper Combustion
- B. Gas
- C. When Servicing the Appliance
- D. Appliance Water
- E. Freeze Protection
- F. High Elevation Installations
- G. Water Temperature Adjustment

#### **Part 2 - Before You Start**

- A. What's in the Box
- B. How the Appliance Operates
- C. Optional Equipment

#### **Part 3 - Prepare the Appliance**

- A. Locating the Appliance
- B. Leveling
- C. Clearances for Service Access
- D. Residential Garage and Closet Installations
- E. Exhaust Vent and Intake Pipe
  - 1. Direct Vent of Exhaust and Intake
  - 2. Power Venting, Indoor Combustion Air in Confined or Unconfined Space
- F. Carbon Monoxide Detectors
- G. Prevent Combustion Air Contamination
- H. Removing an Appliance from a Common Vent System
- I. Water Chemistry Requirements

#### **Part 4 - Domestic Hot Water and Hydronic Piping**

- A. Plumbing
  - 1. System Domestic Water Piping
  - 2. Appliance Domestic Water Piping
- B. Scalding
- C. Mixing Valve Installation

- D. Auxiliary Connections
- E. Temperature and Pressure Relief Valve for DHW
- F. Backflow Preventer
- G. Potable Expansion Tank
- H. Hydronic Heating Module Piping
- I. Pressure Relief Valve for the Hydronic System
- J. Hydronic Expansion Tank and Make-Up Water
- K. Hydronic Heating Module System Piping
- L. Hydronic Heating Module Output
- M. Applications
- N. Filling the Appliance

#### **Part 5 - Venting**

- A. General
- B. Approved Materials for Exhaust Vent and Intake Pipe
- C. Additional Requirements for Installation in Canada
- D. Exhaust Vent and Intake Pipe Location
- E. Exhaust Vent and Intake Pipe Sizing
- F. Longer Vent Runs
- G. Exhaust Vent and Intake Pipe Installation
- H. Applications
  - 1. Direct Vent Installation of Exhaust and Intake
  - 2. Venting Through an Existing System
  - 3. Power Venting, Indoor Combustion Air in Confined or Unconfined Space

#### **Part 6 - Condensate Removal**

#### **Part 7 - Wiring**

- A. Field Wiring
- B. Line Voltage Wiring
- C. Low Voltage Wiring
- D. Alarm Connections
- E. Optional 0-10 Volt Building Control Signal
- F. Customer Connection Board
- G. Internal Wiring Diagram

#### **Part 8 - Gas Connections**

- A. Gas Pipe Sizing Tables
  - 1. Gas Pipe Sizing
  - 2. Natural Gas Pipe Sizing
  - 3. LP (Liquid Propane) Gas Pipe Sizing
- B. Gas Piping Requirements
- C. Gas Valve
- D. Checking Gas Pressure at the Appliance for Proper Operation

#### **Part 9 - Start-Up Preparation**

- A. Fill and Purge DHW
- B. Fill and Purge Hydronic Heating Loop
- C. Purge Air from Hydronic Heating Module
- D. Using the Control to Assist in Purging System Loops
- E. Programming the Total System Control

#### **Part 10 - Start-Up Procedures for the Installer**

- A. Navigation of the Display
- B. Programming the Control
- C. Programming the System Setting
- D. System Setting Program Navigation
- E. Control Status Menu
- F. Resetting the Maintenance Schedule
- G. Test Mode

#### **Part 11 - Troubleshooting**

- A. Error and Fault Codes
- B. Appliance Error
- C. Appliance Fault
- D. User Interface Display

#### **Part 12 - Maintenance**

#### **Part 13 - Shutdown**


- A. Shutdown Procedure
- B. Vacation Procedure
- C. Failure to Operate
- D. Important Notice



<b>Part 14 - Installation Checklist</b>	<b>48</b>
<b>Part 15 - Maintenance Report</b>	<b>49</b>
<b>Part 16 - Replacement Parts</b>	<b>51</b>
Limited Warranty	54
Maintenance Notes	56
Customer Installation Record Form	57

**Part 1 - General Safety Information**

This appliance is approved for indoor installations only and is not intended for use as a pool heater. Clearance to combustible materials: 0" top, bottom, sides, and back. Appliance must have room for service: 24" front and 12" sides are minimum recommended service clearances. (A combustible door or removable panel is acceptable front clearance.) This appliance has been approved for closet installation and installation on combustible flooring. Do not install directly on carpeting. Install the appliance in a location where temperature and pressure relief valve discharge or a leak will not result in damage to the surrounding area. If such a location is not available, install an auxiliary catch pan. Use only Category IV vent systems.

 **WARNING**

**Installer** - Read all instructions in this manual before installing. Perform steps in the given order.

**User** - This manual is for use only by a qualified heating installer / service technician. Have this appliance serviced / inspected annually by a qualified service technician.

**FAILURE TO ADHERE TO THE GUIDELINES ON THIS PAGE CAN RESULT IN SUBSTANTIAL PROPERTY DAMAGE, SEVERE PERSONAL INJURY, OR DEATH.**

**NOTE:** Obey all local codes. Obtain all applicable permits before installing the appliance.

**NOTE:** Install all system components and piping in such a manner that does not reduce the performance of any fire rated assembly.

Altering any HTP, Inc. appliance with parts not manufactured by HTP, Inc. WILL INSTANTLY VOID the appliance warranty and could result in property damage, personal injury, or death.


**NOTE:** If the appliance is exposed to the following, do not operate. Immediately call a qualified service technician.

- 1. Fire
- 2. Damage
- 3. Water


Failure to follow this information could result in property damage, severe personal injury, or death.

**DO NOT USE THIS APPLIANCE IF ANY PART HAS BEEN SUBMERGED IN WATER.** Immediately call a qualified service technician. The appliance MUST BE replaced if it has been submerged. Attempting to operate a appliance that has been submerged could create numerous harmful conditions, such as a potential gas leakage causing a fire and/or explosion, or the release of mold, bacteria, or other harmful particulates into the air. Operating a previously submerged appliance could result in property damage, severe personal injury, or death.

**NOTE:** Appliance damage due to flood or submersion is considered an Act of God, and IS NOT covered under product warranty.


 **CAUTION**

Do not use this appliance for anything other than its intended purpose (as described in this manual). Doing so could result in property damage and WILL VOID product warranty.

 **CAUTION**

High heat sources (sources generating heat 100°F / 37°C or greater, such as stove pipes, space heaters, etc.) may damage plastic components of the appliance as well as plastic vent pipe materials. Such damages ARE NOT covered by warranty. It is recommended to keep a minimum clearance of 8" from high heat sources. Observe heat source manufacturer instructions, as well as local, state, provincial, and national codes, laws, regulations and ordinances when installing this appliance and related components near high heat sources.

**A. Improper Combustion**


 **WARNING**

Do not obstruct the flow of combustion and ventilating air. Adequate air is necessary for safe operation. Failure to keep the exhaust vent and combustion air intake clear of ice, snow, or other debris could result in property damage, serious personal injury, or death.

**B. Gas**

Should overheating or gas supply fail to shut off, turn off the manual gas control valve to the appliance.

**C. When Servicing the Appliance**

 **WARNING**

Be sure to disconnect electrical power before performing service. Failure to do so could result in electrical shock, property damage, serious personal injury, or death.

To avoid electric shock, disconnect electrical supply before performing maintenance.

**NOTE:** When inquiring about service or troubleshooting, reference the model and serial numbers from the appliance rating label.

To avoid severe burns, allow appliance and associated equipment to cool before servicing.


**D. Appliance Water**

Do not use petroleum-based cleaning or sealing compounds in a water heating system. Gaskets and seals in the system may be damaged. This can result in substantial property damage.


Do not use "homemade cures" or "patent medicines". Damage to the appliance, substantial property damage, and/or serious personal injury may result.

**E. Freeze Protection**


**NOTE:** Consider piping and installation when determining appliance location.

 **CAUTION**

Failure of the appliance due to freeze related damage IS NOT covered by product warranty.

 **WARNING**

NEVER use any toxic chemical, including automotive, standard glycol antifreeze, or ethylene glycol made for hydronic (non-potable) systems. These chemicals can attack gaskets and seals in water systems, are poisonous if consumed, and can cause personal injury or death.

 **NOTICE**

**UNCRATING THE APPLIANCE** - Any claims for damage or shortage in shipment must be filed immediately against the transportation company by the consignee.

## F. High Elevation Installations

### **WARNING**

Natural gas at high elevation might contain less heating value than typical 1,000 BTU/cu ft and therefore can cause improper air / gas mix leading to improper combustion. For natural gas installations above 3,000 ft, call your gas provider to determine the heating value of the supplied natural gas.

## G. Water Temperature Adjustment

If the appliance is going to have a set temperature above 120°F, you must use an ASSE 1017 rated mixing valve to avoid severe burns or death from scalding temperatures.

### **WARNING**

Households with small children, disabled, or elderly persons may require a 120°F or lower temperature setting to prevent severe personal injury or death due to scalding.

#### Approximate Time / Temperature Relationships in Scalds

120°F	More than 5 minutes
125°F	1 1/2 to 2 minutes
130°F	About 30 seconds
135°F	About 10 seconds
140°F	Less than 5 seconds
145°F	Less than 3 seconds
150°F	About 1 1/2 seconds
155°F	About 1 second

**Table 1 - Approximate Time / Temperature Relationships in Scalds**

## Part 2 - Before You Start

Remove all sides of the shipping crate of the appliance.

### A. What's in the Box

Components included with the appliance:

- Intake PVC Tee with Screens
- Exhaust PVC Coupling with Screens
- Temperature and Pressure Relief Valve
- Installation Manual and Warranty
- User's Information Manual
- Solar Addendum (S Models Only)
- Outdoor Sensor (Part # 7250P-319)
- Mixing Valve (7100P-315)

### B. How the Appliance Operates

The **Versa Hydro with Total System Control** provides high efficiency central heating and domestic hot water from one appliance. Total System Control manages system needs, ensuring maximum comfort and efficient operation. Some features of the appliance are:

#### **Stainless Steel Water Storage Tank**

The storage tank is constructed of 316L stainless steel to provide maximum corrosion resistance. Water blown foam insulation and a plastic jacket provide superior insulation, allowing no more than 1/2 degree heat loss per hour.

#### **High Efficiency Heat Exchanger**

The 90/10 copper nickel heat exchanger provides highly efficient energy transfer. Hot gases from the primary circuit heat the combustion walls. The walls transfer heat directly into the domestic water. The secondary circuit then transfers the last bit of energy to the bottom of the tank, where hot gases are converted to water vapor, giving the appliance a combustion efficiency of 98% and thermal efficiency of up to 96%.

### **Modulating Combustion System**

The modulating combustion system regulates firing rate based on heat demand. Total System Control monitors tank operation, system parameters, and controls the firing rate of the burner, providing only the energy required to satisfy both domestic hot water and central heating needs.

#### **Total System Control**

Total System Control automatically manages the central heating and domestic hot water systems through the use of sensors. These sensors monitor inputs (such as outdoor temperature, tank temperature, and heating module outlet temperature) providing data that allows accurate control of the entire system. You may choose to use the control's factory default settings or reprogram system parameters to provide design flexibility.

#### **Hydronic Heating Module**

The hydronic heating module connects to the storage tank through two dip tubes. The first dip tube draws heated water from the top of the storage tank and circulates it through a brazed plate heat exchanger to transfer the water's stored energy to the hydronic side of the plate. Once the energy is transferred, the water returns through the second dip tube to a lower section of the storage tank to continue circulating. A stainless steel circulator pump modulates output, varying flow through the brazed plate heat exchanger to meet domestic hot water and central heating demand. An outlet sensor provides feedback to the control to assure accurate temperature control.

#### **Venting System**

This appliance must be exhausted to the outdoors. Use only the approved venting materials outlined in the Venting section of this manual. Vent size can vary from 2" to 3" depending on the appliance input rate. Special attention should be taken when selecting vent location. Vents can run horizontally or vertically, depending on system design, and should be supported as shown in the Venting section of this manual.

#### **Burner**

The burner is constructed of high grade stainless steel and uses pre-mixed air and gas to provide a wide range of firing rates.

#### **Condensate Drain Connection**

This is a condensing high efficiency appliance with a condensate removal system. Condensate is nothing more than water vapor derived from combustion products, similar to that of an automobile when it is initially started. It is very important that the condensate line slopes away from the appliance and down to a suitable inside drain.

If the appliance condensate outlet is lower than the drain, use a condensate removal pump (Part # 554200, available from HTP). In addition, local authorities may require a condensate neutralizer to neutralize the condensate. Condensate neutralizers are made up of lime crystals, marble, or phosphate chips. Neutralizers can be installed in the field by the installer and purchased from HTP (7450P-212).

It is also very important not to expose the condensate line to freezing temperatures or any type of blockage. Plastic tubing must be the only material used for the condensate line. Steel, brass, copper, or other materials will be subject to corrosion or deterioration. A second vent may be necessary to prevent condensate line vacuum lock on a long horizontal run. Also, an increase in pipe size may be necessary to allow condensate to drain properly. Support of the condensate line may be necessary to avoid blockage of the condensate flow.

#### **Spark Ignition**

The burner flame is ignited by applying high voltage to the system spark electrode. This causes a spark from electrode to ground.

#### **Outdoor Sensor**

Monitors outdoor temperature and adjusts the set point to provide greater efficiency.

### C. Optional Equipment

Optional equipment available from HTP (and Part #):

- 3" Stainless Steel Vent Termination Kit (V1000)
- 4" Stainless Steel Vent Termination Kit (V2000)
- 2" PVC Concentric Vent Kit (KGAVT0501CVT)
- 3" PVC Concentric Vent Kit (KGAVT0601CVT)
- 3" Polypro Vent Kit (8400P-001)
- 3" Polypro Pipe  
(33' length # 8400P-002, 49.5' length # 8400P-003)
- System Sensor (7250P-324)
- Alarm System (7350P-602) to monitor any failure
- Outdoor Sensor (7250P-319)
- PC Connection Kit (7250P-320)
- Condensate Neutralizer (7450P-212)
- Solar Kit (7100P-220) applies to Solar models only

**NOTE:** When using an optional system sensor, pipe insulation must be wrapped around it to improve temperature measurement accuracy and increase overall system efficiency.

### Part 3 - Prepare the Appliance

Remove all sides of the shipping crate to allow the appliance to be moved into its installation location.

#### CAUTION

**COLD WEATHER HANDLING** - If the appliance has been stored in a very cold location (BELOW 0°F) before installation, handle with care until the components come to room temperature. Failure to do so could result in damage to the appliance.

Carefully consider installation when determining appliance location. Please read the entire manual before attempting installation. Failure to properly take factors such as appliance venting, piping, condensate removal, and wiring into account before installation could result in wasted time, money, and possible property damage and personal injury.

### A. Locating the Appliance

#### WARNING

This appliance is certified for indoor use only. DO NOT INSTALL OUTDOORS. Outdoor installations ARE NOT covered by warranty. Failure to install the appliance indoors could result in property damage, severe personal injury, or death.

Incorrect ambient conditions can lead to damage to the heating system and put safe operation at risk. Ensure that the installation location adheres to the information included in this manual. Failure to do so could result in property damage, serious personal injury, or death. Failure of an appliance or components due to incorrect operating conditions IS NOT covered by product warranty.

This appliance must be installed upright in the vertical position as described in this manual. DO NOT attempt to install this appliance in any other orientation. Doing so will result in improper appliance operation and property damage, and could result in serious personal injury or death.

#### 1. Installation Area (Mechanical Room) Operating Conditions

- Ensure ambient temperatures are higher than 32°F / 0°C and lower than 104°F / 40°C
- Prevent the air from becoming contaminated by the products, places, and conditions listed in this manual
- Avoid continuously high levels of humidity
- Never close existing ventilation openings
- Ensure a minimum 1" clearance around hot water and exhaust vent pipes

- **NOTE:** To prevent condensing in the fan, it is recommended to avoid prolonged exposure to temperatures below 45°F

#### WARNING

This appliance has a condensate disposal system that may freeze if exposed to sustained temperatures below 32°F. Precautions should be taken to protect the condensate trap and drain lines from sustained freezing conditions. Failure to take precautions could result in property damage, severe personal injury, or death.

#### 2. Check for nearby connections to:

- System water piping
- Venting connections
- Gas supply piping
- Electrical power
- Condensate drain

#### 3. Check area around appliance. Remove any combustible materials, gasoline, and other flammable liquids.

#### WARNING

Failure to keep the appliance area clear and free of combustible materials, liquids, and vapors can result in substantial property damage, severe personal injury, or death.

#### CAUTION

The service life of the appliance's exposed metallic surfaces, such as the casing, as well as internal surfaces, such as the heat exchanger, are directly influenced by proximity to damp and salty marine environments. In such areas higher concentration levels of chlorides from sea spray coupled with relative humidity can lead to degradation of appliance components. In these environments, appliances must not be installed using direct vent systems which draw outdoor air for combustion. Such appliances must be installed using room air for combustion. Indoor air will have a much lower relative humidity, and hence potential corrosion will be minimized.

All appliances eventually leak. Locate the appliance where any leakage from the relief valve, related piping, tank, or connections will not result in damage to surrounding areas or lower floors of the building. Any appliance should be installed in such a manner that if it should leak the resulting flow of water will not cause damage to the area in which it is installed. National Plumbing codes require a drain pan for any appliance installation. This drain pan should be sized with a maximum depth of 2", and a minimum diameter 2" greater than the diameter of the appliance. The drain pan should empty into an open drain line. This drain line should be 3/4" ID minimum, piped to an open drain. Leakage damages ARE NOT covered by warranty. Failure to install a drain pan is the sole responsibility of the owner and/or installer. Reference UPC 2000 (Uniform Plumbing Code) Section 510 - Protection from Damage or IPC 200 (International Plumbing code) Section 504 - Safety Devices. Leakage damages ARE NOT covered by warranty.

In addition, water leak detection devices and automatic water shutoff valves are readily available at plumbing supply houses. IT IS HIGHLY RECOMMENDED BY THE MANUFACTURER TO INSTALL WATER LEAK DETECTION DEVICES AND AUTOMATIC SHUTOFF VALVES IN ANY APPLIANCE INSTALLATION WHERE A LEAKAGE OF WATER COULD RESULT IN PROPERTY DAMAGES.

## CAUTION

High heat sources (generating heat 100°F / 37°C or greater, such as boiler flue pipes, space heaters, etc.) may damage plastic components of the appliance as well as plastic vent pipe materials. Such damages ARE NOT covered by warranty. It is recommended to keep a minimum clearance of 8" from high heat sources. Observe heat source manufacturer instructions, as well as local, state, provincial, and national codes, laws, regulations, and ordinances when installing this appliance and related components near high heat sources.

Failure of the appliance or components due to incorrect operating conditions IS NOT covered by product warranty.

4. Gas control system components must be protected from dripping water during operation and service.

5. If the appliance is to replace an existing appliance, check for and correct any existing system problems, such as:

- System leaks
- Location that could cause the system and appliance to freeze and leak
- Incorrectly sized expansion tank

6. Clean and flush system when reinstalling a appliance.

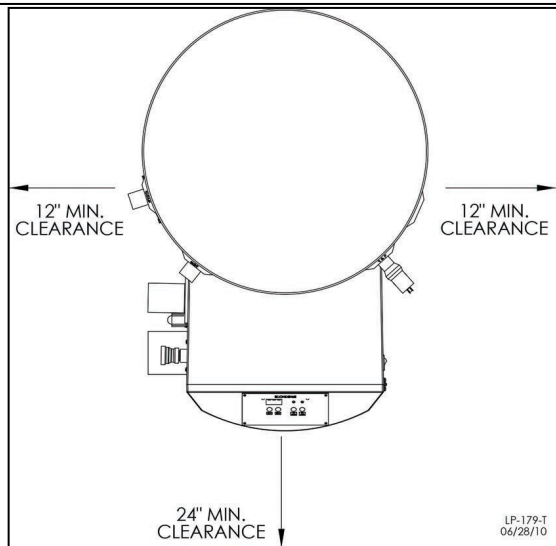
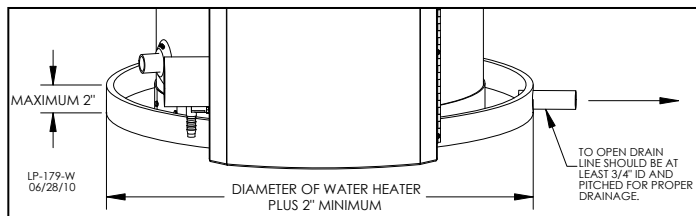
**NOTE:** When installing in a zero clearance location, it may not be possible to read or view some product labeling. It is recommended to make note of the appliance model and serial number.

### B. Leveling

## CAUTION

In order for the condensate to properly flow out of the collection system, the area where you locate the appliance must be level. Location must also fully support the weight of the filled appliance.

### C. Clearances for Service Access



**Figure 1 - Drain Pan Dimensions and Recommended Service Clearances**

**NOTE:** If you do not provide the minimum clearances shown in Figure 1 it might not be possible to service the appliance without removing it from the space.

**NOTE:** A combustible door or removable panel is acceptable front clearance.

## WARNING

The space must be provided with combustion / ventilation air openings correctly sized for all other appliances located in the same space as the appliance. The appliance cover must be securely fastened to prevent the appliance from drawing air from the appliance room. This is particularly important if the appliance is in a room with other appliances. Failure to comply with the above warnings could result in substantial property damage, severe personal injury, or death.

### D. Residential Garage and Closet Installations

## CAUTION

Check with your local Authority Having Jurisdiction for requirements when installing the appliance in a garage or closet. Please read the entire manual before attempting installation. Failure to properly take factors such as venting, piping, condensate removal, and wiring into account before installation could result in wasted time, money, and possible property damage and personal injury.

#### Precautions

If the heater is located in a residential garage, per ANSI Z223.1:

- Install the appliance burner and ignition devices a minimum of 18" above the floor of the garage. This will ensure the burner and ignition devices are well off the floor.
- When raising the appliance ensure the entire bottom and fully filled weight of the appliance are fully supported.
- Locate or protect the appliance so it cannot be damaged by a moving vehicle.

## WARNING

The space must be provided with correctly sized combustion/ventilation air openings for all other appliances located in the space with the appliance. For power venting installations using room air for combustion, refer to the venting section, this manual, for descriptions of confined and unconfined spaces. Do not install the appliance in an attic. Failure to comply with these warnings could result in substantial property damage, severe personal injury, or death.

### E. Exhaust Vent and Intake Pipe

The appliance is rated ANSI Z21.10.3 Category IV (pressurized vent, likely to form condensate in the vent) and requires a special vent system designed for pressurized venting.

**NOTE: The venting options described here (and further detailed in the Venting section, this manual) are the lone venting options approved for this appliance. Failure to vent the appliance in accordance with the provided venting instructions will void the warranty.**

## DANGER

Failure to vent the appliance properly will result in serious personal injury or death.

## WARNING

Do not attempt to vent this appliance by any means other than those described in this manual. Doing so will void the warranty and may result in severe personal injury or death.

The exhaust discharged by this appliance may be very hot. Avoid touching or other direct contact with the exhaust gases of the vent termination assembly. Doing so could result in severe personal injury or death.



## ⚠ WARNING

Vents must be properly supported. Appliance exhaust and intake connections are not designed to carry heavy weight. Vent support brackets must be within 1' of the appliance and the balance at 4' intervals. Appliance must be readily accessible for visual inspection for first 3' from the appliance. Failure to properly support vents could result in property damage, severe personal injury, or death.

### 1. Direct Vent of Exhaust and Intake

If installing a direct vent option, combustion air must be drawn from the outdoors directly into the appliance intake and exhaust must terminate outdoors. There are three basic direct vent options detailed in this manual: 1. Side Wall Venting, 2. Roof Venting, and 3. Unbalanced Venting.

Be sure to locate the appliance such that the exhaust vent and intake piping can be routed through the building and properly terminated. Different vent terminals can be used to simplify and eliminate multiple penetrations in the building structure (see Optional Equipment in Venting Section). The exhaust vent and intake piping lengths, routing, and termination methods must all comply with the methods and limits given in the Venting Section, this manual.

When installing a combustion air intake from outdoors, care must be taken to utilize uncontaminated combustion air. **To prevent combustion air contamination, see Table 2.**

### 2. Power Venting, Indoor Combustion Air in Confined or Unconfined Space

This appliance requires fresh, uncontaminated air for safe operation and must be installed in a mechanical room where there is adequate combustion and ventilating air. **NOTE: To prevent combustion air contamination, see Table 2.**

Combustion air from the indoor space can be used if the space has adequate area or when air is provided through a duct or louver to supply sufficient combustion air based on the appliance input. Never obstruct the supply of combustion air to the appliance. If the appliance is installed in areas where indoor air is contaminated (see Table 2) it is imperative that the appliance be installed as direct vent so that all combustion air is taken directly from the outdoors into the appliance intake connection.

**Unconfined space** is space with volume greater than 50 cubic feet per 1,000 BTU/hr (4.8 cubic meters per kW) of the total input rating of all fuel-burning appliances installed in that space. Rooms connected directly to this space through openings not furnished with doors are considered part of the space. See Venting Section for details.

**Confined space** is space with volume less than 50 cubic feet per 1,000 BTU/hr (4.8 cubic meters per kW) of the total input rating of all fuel-burning appliances installed in that space. Rooms connected directly to this space through openings not furnished with doors are considered part of the space.

When drawing combustion air from inside a conventionally constructed building to a confined space, such space should be provided with two permanent openings: one located 6" (15 cm) below the space ceiling, the other 6" (15cm) above the space floor. Each opening should have a free area of one square inch per 1,000 BTU/hr (22cm<sup>2</sup>/kW) of the total input of all appliances in the space, but not less than 100 square inches (645cm<sup>2</sup>).

If the confined space is within a building of tight construction, air for combustion must be obtained from the outdoors as outlined in the Venting section of this manual.

## CAUTION

When drawing combustion air from the outside into the mechanical room, care must be taken to provide adequate freeze protection.

## ⚠ WARNING

Failure to provide an adequate supply of fresh combustion air can cause poisonous flue gases to enter the living space, resulting in severe personal injury or death. To prevent combustion air contamination, see Table 2.

### F. Carbon Monoxide Detectors

#### In the Commonwealth of Massachusetts and As Required by State and Local Codes:

Installation of Carbon Monoxide Detectors: At the time of installation or replacement of the vented gas fueled appliance, the installing plumber or gas fitter shall observe that a hard wired carbon monoxide detector with an alarm and battery back-up is installed on the floor level where the gas appliance is installed, unless the appliance is located in a detached, uninhabitable structure separate from the dwelling, building, or structure used in whole or in part for residential purposes.

In addition, the installing plumber or gas fitter shall observe that a hard wired carbon monoxide detector with an alarm and battery back-up is installed on each additional level of the dwelling, building, or structure served by the vented gas appliance. It shall be the responsibility of the property owner to secure the service of qualified licensed professionals for the installation of hard wired carbon monoxide detectors.

a. In the event that the vented gas fueled appliance is installed in a crawl space or attic, the hard wired carbon monoxide detector with alarm and battery back-up shall be installed on the next adjacent floor level.

b. In the event that these requirements cannot be met at the time of completion of installation, the owner shall have a period of thirty (30) days to comply with the above requirements; provided, however, that during said thirty (30) day period, a battery operated carbon monoxide detector with an alarm shall be installed.

## ⚠ WARNING

Do not attempt to vent this appliance by any means other than those described in this manual. Doing so will void the warranty and may result in severe personal injury or death.

Approved Carbon Monoxide Detectors: Each carbon monoxide detector as required in accordance with the above provisions shall comply with NFPA 70 and be ANSI/UL 2034 listed and IAS certified.

### G. Prevent Combustion Air Contamination

Install intake air piping for the appliance as described in the Venting Section, this manual. Do not terminate exhaust in locations that can allow contamination of intake air.

## ⚠ WARNING


Ensure that the intake air will not contain any of the contaminants in Table 2. Contaminated air will damage the appliance, resulting in possible substantial property damage, severe personal injury, or death. For example, do not pipe intake air near a swimming pool or laundry facilities. These areas always contain contaminants.

Products to Avoid	Areas Likely to Have Contaminants
Spray cans containing fluorocarbons	Dry cleaning / laundry areas and establishments
Permanent wave solutions	Swimming pools
Chlorinated waxes / cleaners	Metal fabrication plants
Chlorine-based swimming pool chemicals	Beauty shops
Calcium chloride used for thawing	Refrigeration repair shops
Sodium chloride used for water softening	Photo processing plants
Refrigerant leaks	Auto body shops
Paint or varnish removers	Plastic manufacturing plants
Hydrochloric or Muriatic acid	Furniture refinishing areas and establishments
Cements and glues	New building construction
Antistatic fabric softeners used in clothes dryers	Remodeling areas
Chlorine-type bleaches, laundry detergents, and cleaning solvents	Garages and workshops
Adhesives used to fasten building products	


**Table 2 - Products and Areas Likely to Have Contaminants**

**NOTE: DAMAGE TO THE APPLIANCE CAUSED BY EXPOSURE TO CORROSIVE VAPORS IS NOT COVERED BY WARRANTY.** (Refer to the limited warranty for complete terms and conditions.)

## H. Removing an Appliance from a Common Vent System

 **DANGER**

Do not install the appliance into a common vent with any other appliance. This will cause flue gas spillage or appliance malfunction, resulting in possible substantial property damage, severe personal injury, or death.


 **WARNING**

Failure to follow all instructions can result in flue gas spillage and carbon monoxide emissions, causing severe personal injury or death.

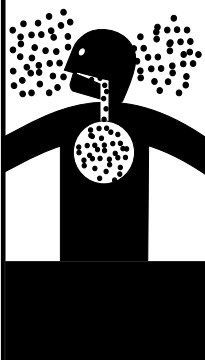
When removing an existing appliance, follow the steps below.

1. Seal any unused openings in the common venting system.
2. Visually inspect the venting system for proper size and horizontal pitch to determine if there is blockage, leakage, corrosion, or other deficiencies that could cause an unsafe condition.
3. If practical, close all building doors, windows, and doors between the space in which the appliance remains connected to the common venting system and other spaces in the building. Turn on clothes dryers and any appliances not connected to the common venting system. Turn on any exhaust fans, such as range hoods and bathroom exhausts, at maximum speed. Do not operate a summer exhaust fan. Close all fireplace dampers.
4. Place in operation the appliance being inspected. Follow the lighting instructions. Adjust the thermostat so the 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.
6. After it has been determined that each appliance remaining connected to the common venting system properly vents when tested as outlined, return doors, windows, exhaust fans, fireplace dampers, and any other gas burning appliances to their previous condition of use.

7. Any improper operation of the common venting system should be corrected to conform to the National Fuel Gas Code, ANSI Z223.1. When resizing any portion of the common venting system, the system should approach the minimum size as determined using the appropriate tables in Appendix G of ANSI Z223.1.

 **WARNING**

**Breathing Hazard - Carbon Monoxide Gas**



- Do not operate heater if flood damaged.
- Install vent system in accordance with local codes and manufacturers installation instructions.
- Do not obstruct heater air intake or exhaust. Support all vent piping per manufacturers installation instructions.
- Do not place chemical vapor emitting products near unit.
- According to NFPA 720, carbon monoxide detectors should be installed outside each sleeping area.
- Never operate the heater unless it is vented to the outdoors.
- Analyze the entire vent system to make sure that condensate will not become trapped in a section of vent pipe and therefore reduce the open cross sectional area of the vent.

**Breathing carbon monoxide can cause brain damage or death. Always read and understand instruction manual.**

LP-304

**Figure 2 - CO Warning Label**

## I. Water Chemistry Requirements

**CAUTION**

Chemical imbalance of the water supply may affect efficiency and cause severe damage to the appliance and associated equipment. Water quality must be professionally analyzed to determine whether it is necessary to treat the water. Various solutions are available to adjust water quality. Adverse water quality will affect the reliability of the system. In addition, operating temperatures above 135°F will accelerate the build-up of lime scale and possibly shorten appliance service life. Failure of an appliance due to lime scale build-up, low pH, or other chemical imbalance IS NOT covered by the warranty.

The water must be potable, free of corrosive chemicals, sand, dirt, and other contaminants. It is up to the installer to ensure the water does not contain corrosive chemicals or elements that can damage the heat exchanger. Potable water is defined as drinkable water supplied from utility or well water in compliance with EPA secondary maximum contaminant levels (40 CFR Part 143.3). If the water contains contaminants higher than outlined by the EPA, water treatment is recommended and additional, more frequent maintenance may be required.

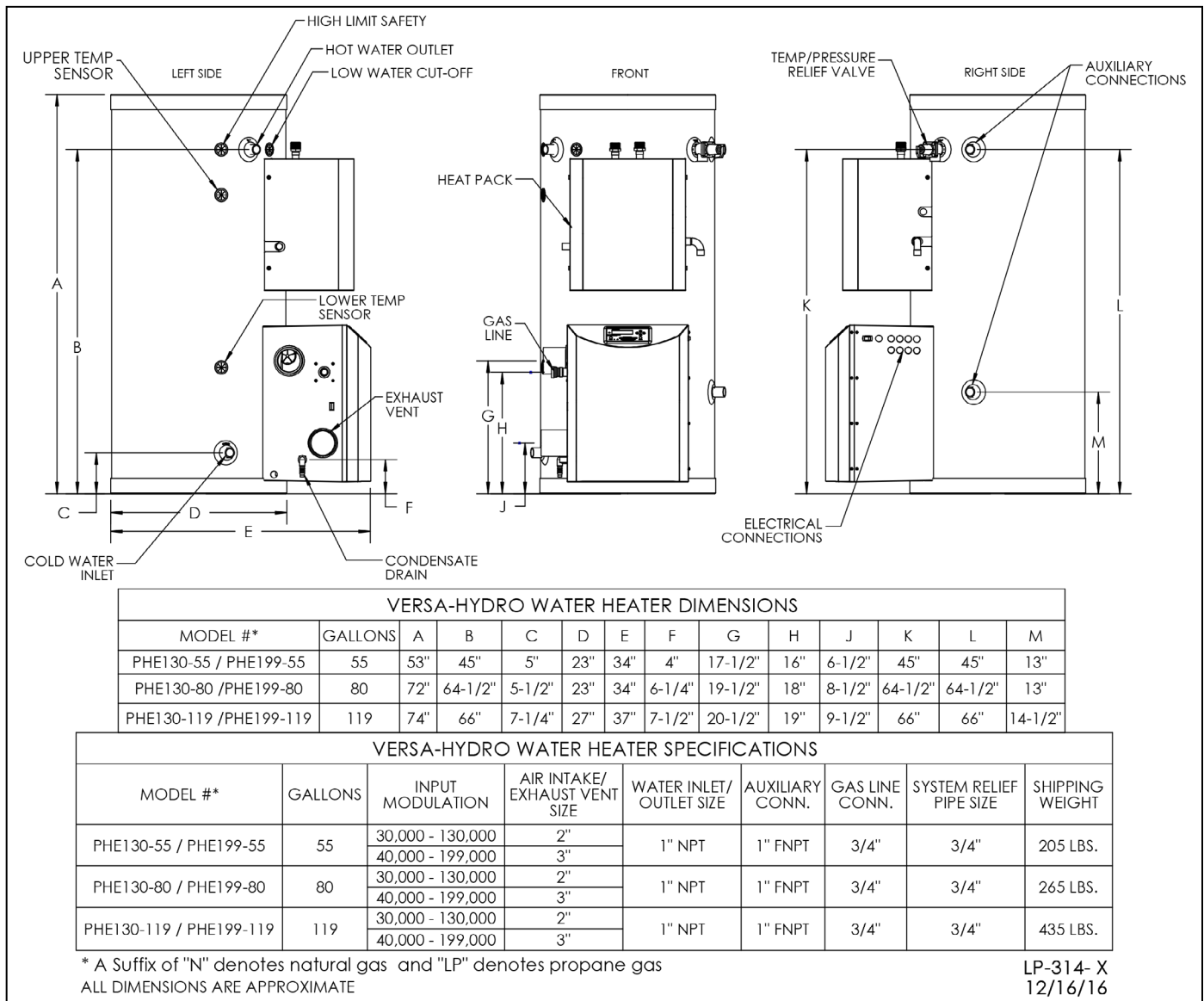
If you suspect that your water is contaminated in any way, discontinue use of the appliance and contact an authorized technician or licensed professional.

### • Water pH between 6.5 and 8.5

- pH levels below 6.5 can cause an increase in the rate of corrosion. pH of 8.5 or higher can potentially cause lime scale build-up
- Maintain water pH between 6.5 and 8.5. Check with litmus paper or have it chemically analyzed by a local water treatment company.
- If the pH is not between 6.5 and 8.5, consult a local water treatment company for solutions.

- **Hardness less than 12 grains (200 mg/L) (Residential Use - water temperatures below 140°F)**
- **Hardness less than 7 grains (120 mg/L) (Commercial Use - water temperatures of 140°F and greater)**
  - Hardness levels above the required amounts can lead to lime scale build-up throughout the system. Water below 5 grains/gallon (85 mg/L) may be over softened.
  - Consult local water treatment companies for unusually hard water areas (above the required amounts) or for other treatment solutions if water is being over softened (below 5 grains/gallon [85 mg/L]).
- **Chloride concentration less than 100 ppm (mg/L)**
  - Do not fill appliance or operate with water containing chlorides in excess of 100 ppm (mg/L).
  - Using chlorinated fresh water should be acceptable as levels are typically less than 5 ppm (mg/L).
  - Do not connect the appliance to directly heat swimming pool or spa water.
- **Total Dissolved Solids (TDS) less than 500 ppm (mg/L)**
  - Total dissolved solids are minerals, salts, metals, and charged particles that are dissolved in water.
  - The greater the amounts of TDS present, the higher the corrosion potential due to increased conductivity in the water.
  - If using softened water to fill the appliance, it is still possible to have high TDS. This water can be corrosive. Consult local water treatment companies for other treatment solutions to reduce this effect.

**\*NOTE:** To promote appliance service life, it is strongly recommended to follow the maintenance procedures in this manual.



**Figure 3 - Appliance Dimensions - NOTE: All Dimensions Are Approximate**

## Part 4 - Domestic Hot Water and Hydronic Piping

### **WARNING**

Failure to follow the instructions in this section WILL VOID the warranty and may result in property damage, severe personal injury, or death.

### **CAUTION**

Dielectric unions or galvanized steel fittings must not be used in a system with this appliance. Doing so WILL VOID the warranty. Use only copper, brass, or stainless steel fittings. Teflon thread sealant must be used on all connections.

DO NOT pipe the water heating side of this appliance with black iron, galvanized steel, steel, or lead pipe. Doing so will result in premature product failure and property damage, and WILL VOID the warranty.

## A. Plumbing

### **CAUTION**

Use two wrenches when tightening water piping at appliance. Use one wrench to prevent the appliance return or supply line from turning. Failure to prevent piping connections from turning could cause damage to appliance components.

### 1. System Domestic Water Piping

Domestic water connections must be installed in accordance with all local and national plumbing codes or any applicable prevailing standards. The appliance is supplied with a rated mixing valve certified to ASSE 1017. You must completely follow the instructions included with the mixing valve for proper installation. This mixing valve must be installed on the domestic outlet to assure that hot water temperature does not vary more than  $\pm 5^\circ\text{F}$ , as the unit adjusts its stored water automatic set point to meet the requirements of the hydronic heating module. The valve MUST NOT be allowed to freeze. If the mixing valve is installed in a potentially freezing situation, suitable insulation must be fitted to prevent damage. DO NOT use excess thread sealant (in liquid, tape or other form) as this may cause the mixing valve to fail. Toxic chemicals shall not be introduced into the mixing valve system.

**NOTE:** Recommend to the user that the mixing valve be checked annually to ensure its continued function.

### 2. Appliance Domestic Water Piping

The domestic inlet and outlet ports on the appliance are 1" NPT connections. We recommend the installation of shut-off valves and unions on both the inlet and outlet ports to isolate the appliance for future service.

It is important that the connections on the inlet and outlet are brass or copper. Never use dielectric unions or galvanized steel fittings. Teflon thread sealant must be used to seal all tank connections. An approved ASSE 1017 mixing valve is provided with every appliance and must be installed on the outlet to protect the user from scalding temperatures. This valve reduces the point of discharge temperature by mixing the hot and cold water from the discharge outlet or mixed outlet port. This device alone will not protect the user from scalding temperature. To install and set up the mixing valve, follow the pre-installation steps in this manual and also follow the enclosed instructions included with the mixing valve.

## B. Scalding

This appliance can deliver scalding water. Be careful whenever using hot water to avoid scalding injury. Certain appliances such as dishwashers and automatic clothes washers may require increased water temperatures. By setting the thermostat on this appliance to obtain the increased water temperature required by these appliances you may create the potential for scald injury.

To protect against injury, install the mixing valve included with this

appliance. This valve will reduce point of use discharge temperatures by mixing cold and hot water in the branch supply lines.

Table 3 details the relationship of water temperature and time with regard to scald injury and may be used as a guide in determining the safest water temperature for your applications.

### **WARNING**

ASSE 1017 or ASSE 1070 temperature limiting or mixing valves do not eliminate the risk of scalding.

To avoid scalding:

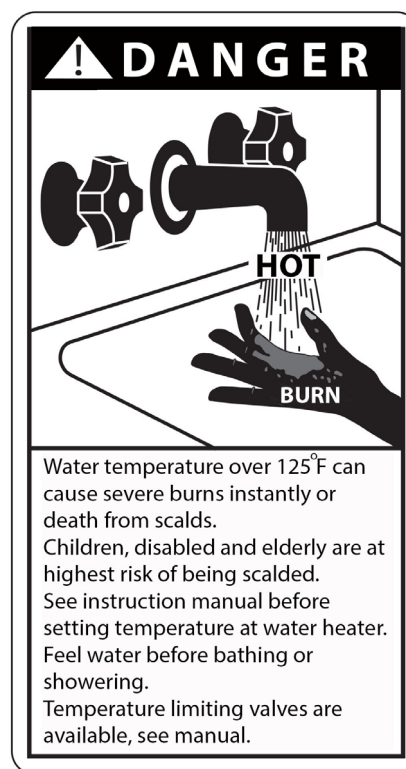
- Set the appliance set point temperature as low as possible.
- Feel water before bathing or showering.
- If thermostatic valves are required, use devices specifically designed for such purpose. Install these devices in accordance with instructions provided by the manufacturer.

Failure to install a temperature limiting or mixing valve and follow these instructions could result in property damage, severe personal injury, or death due to scalds.

**Approximate Time / Temperature Relationships in Scalds**

120°F	More than 5 minutes
125°F	1 1/2 to 2 minutes
130°F	About 30 seconds
135°F	About 10 seconds
140°F	Less than 5 seconds
145°F	Less than 3 seconds
150°F	About 1 1/2 seconds
155°F	About 1 second

**Table 3 - Approximate Time / Temperature Relationships in Scalds**





### C. Mixing Valve Installation

#### ⚠ WARNING

This appliance can deliver scalding temperature water at any faucet in the system. Be careful whenever using hot water to avoid scalding injury. By setting the thermostat on this appliance to obtain increased water temperature, you may create a higher potential for scald injury. To protect against injury, you should install the ASSE approved thermostatic mixing valve (a device to limit the temperature of water to protect against scald injury by mixing hot and cold water supply) shipped with appliance in the system. This valve will reduce point of discharge temperature in branch supply lines. Install this valve according to the directions in the mixing device packaging. **DO NOT OPERATE THIS APPLIANCE WITHOUT AN ASSE APPROVED THERMOSTATIC MIXING DEVICE.** If this appliance was shipped without an ASSE approved thermostatic mixing valve, contact the manufacturer. Failure to install the mixing valve could result in substantial property damage, severe personal injury, or death.

1. All installations must be carried out by licensed professionals.
2. The installer must ensure compatibility of all installations. Example: Temperature of hot water – marked “H”, cold water inlet – marked “C”, and mixed outlet – marked with directional arrow.
3. The mixing valve may be installed in any position.
4. Local codes shall take priority over any inconsistency in these instructions.
5. During startup, you must ensure that the valve is set to the desired temperature (the mixing valve preset is 120°F). If the valve temperature needs to be adjusted, please refer to the mixing valve instructions and/or the following settings.

#### CAUTION

The mixing valve is certified to ASSE 1017. It is not to be used to provide anti-scald service resulting from system pressure fluctuations, and should not be used where more sophisticated compensating temperature controls are required.

#### Mixing Valve Specifications

Min. – Max. Hot Water Inlet Temperature	120-180°F (49 - 82°C)
Min. – Max. Cold Water Inlet Temperature	39 - 80°F (4 - 27°C)
Max. Working Pressure	200 PSI
Min. Flow Rate	1 GPM
Outlet Water Temperature Range	85–130°F (29–54°C)
Min. Temperature Differential (Between Hot Supply and Outlet)	27°F (15°C)
Factory Set Locking Ring	120°F Max. <sup>1</sup>
Allowable Supply Pressure Variation	+/- 20% <sup>2</sup>
Accuracy of Outlet Temperature	+/- 3°F (3.4°C)
Performance –	
CV	1.8
Max Flow – 1”	14 gpm

#### Notes:

<sup>1</sup>Maximum permissible temperature in accordance with ASSE 1070. The limit locking ring may be adjusted for applications not requiring ASSE 1070 valves.

<sup>2</sup>Maximum allowable variation in either supply pressure in order to control the outlet temperature to within +/- 3°F. **Warning: Pressure variations outside of this range may cause changes in the outlet temperature.**

**NOTE:** At low flow operation, the outlet temperature may vary slightly more.

Differential pressure at the valve inlet should be within a 2 to 1 ratio under normal flow conditions.

Inline fittings, pipe work, layout and sizing must be taken into consideration. In installations where the valve is supplied with unbalanced hot cold pressures greater than a 2 to 1 ratio, please call the HTP Technical Support Department.

#### Installation of the Mixing Valve

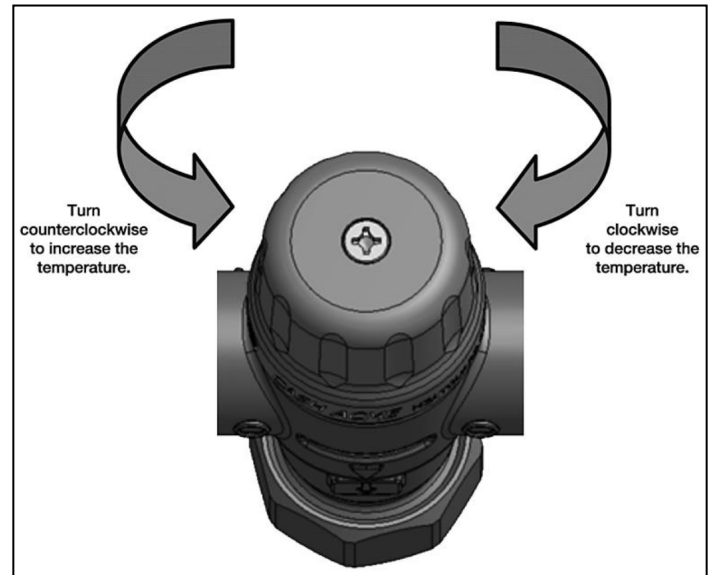
1. Flush all pipe work thoroughly (with water only) before installing the mixing valve.
2. The mixing valve comes complete with union type connections for ease of installation and service.
3. The mixing valve must be removed from the pipe work prior to soldering the end connections. It is recommended to use a spacer piece while soldering.

#### ⚠ WARNING

Do not solder unions while attached to the valve body. Solder connections prior to connecting unions to the valve body to avoid damaging the valve and its function. Failure to follow this instruction could result in property damage, serious personal injury, or death.

#### Setting the Mixing Valve Outlet Temperature

1. Turn both the hot and cold water supplies on. Open an outlet, preferably a sink or basin faucet rather than a shower. To calibrate, let water run for 2 minutes and measure the outlet temperature with a thermometer. Adjust the green cap counter clockwise to increase and clockwise to decrease temperature, as shown in the following image.



**Figure 4 - Adjusting the Mixing Valve**

2. Once the desired outlet temperature has been achieved, refit the green top so that it snaps onto the body of the mixing valve.

**NOTE:** See the instruction sheet included with the mixing valve to adjust the maximum temperature of the mixing valve greater than 120°F.

#### ⚠ WARNING

Hotter water increases the risk of scald injury. Scalding may occur within 5 seconds at a setting of 140°F (60°C). Water temperature over 125°F can instantly cause severe burns, or death, from scalds. Children, disabled, and elderly are at the highest risk of being scalded. See instruction manual before setting temperature at appliance. Feel water before bathing or showering!

### Mixing Valve Maintenance and Service

- It is recommended to check the mixing valve annually to ensure proper system capabilities. More frequent checks are recommended in adverse water conditions.
- When checking the mixed water supply temperature, use the same faucet used in the initial installation temperature adjustment.
- There may be some variation in the water temperature from the mixing valve due to seasonal temperature variations in the cold water supply.

**If the water supply is of poor quality, the internal components may jam, requiring an additional filter or strainer to be fitted to the system. Contact a plumbing professional for appropriate materials and installation.**

### D. Auxiliary Connections

The auxiliary connections are additional connections for a recirculation connection, air handlers, plate exchangers, or other devices that supply hot water. These connections must be installed in accordance with all local and national codes or any applicable standard that prevails. Auxiliary connections are 1" on all models. Never use dielectric unions or galvanized steel fittings. Use only copper or brass fittings. Sealant must be used on all connections. The top port is the outlet and the bottom port is the inlet.

#### WARNING

Never connect auxiliary connections to any system that uses glycol or other solutions formulated for hydronic systems. These auxiliary connections are to be used only in a potable water system. Failure to follow this warning could result in serious injury or death.

### E. Temperature and Pressure Relief Valve for DHW

Install a temperature and pressure relief valve into the marked port (upper right). We recommend a WATTS 40XL5 valve or equivalent for 130,000 BTU models or above input. The valve must meet the ANSI Z21.22B requirements for relief valves for hot water heaters as per a nationally recognized lab that maintains a periodic inspection of production of such listed safety device. The pressure rating of the valve must not exceed the listed working pressure of this appliance, and must be rated to the proper BTU/hr capacity of the appliance.

#### WARNING

Overheated water and high pressures can cause water tank explosion. A properly sized temperature and pressure relief valve must be installed in the opening provided on the appliance. Failure to install a properly sized temperature and pressure relief valve could result in explosion and property damage, serious injury, or death.

Do not thread a cap or plug into the relief valve or relief valve line under any circumstances! Explosion and property damage, serious injury, or death may result.

**RE-INSPECTION OF T&P RELIEF VALVES: T&P valves should be inspected AT LEAST ONCE EVERY THREE YEARS, and replaced if necessary,** by a licensed plumbing contractor or qualified service technician to ensure that the product has not been affected by corrosive water conditions and to ensure that the valve and discharge line have not been altered or tampered with illegally. Certain naturally occurring conditions may corrode the valve and its components over time, rendering the valve inoperative. Such conditions can only be detected if the valve and its components are physically removed and inspected. **Do not attempt to conduct an inspection on your own.** Contact your plumbing contractor for a re-inspection to assure continued safety.

**FAILURE TO RE-INSPECT THE T&P VALVE AS DIRECTED COULD RESULT IN UNSAFE TEMPERATURE AND/OR PRESSURE BUILD-UP WHICH CAN RESULT IN PROPERTY DAMAGE, SERIOUS PERSONAL INJURY, OR DEATH.**

#### WARNING

To avoid water damage or scalding due to relief valve operation:

- Discharge line must be connected to relief valve outlet and run to a safe place of disposal. Terminate the discharge line in a manner that will prevent possibility of severe burns or property damage should the relief valve discharge.
- Discharge line must be as short as possible and the same size as the valve discharge connection throughout its entire length.
- Discharge line must pitch downward from the valve and terminate at least 6" above the floor drain, making discharge clearly visible.
- The discharge line shall terminate plain, not threaded, with a material serviceable for temperatures of 375°F or greater.
- Do not pipe discharge to any location where freezing could occur.
- No valve may be installed between the relief valve and appliance or in the discharge line. Do not plug or place any obstruction in the discharge line.
- Test the operation of the relief valve after filling and pressurizing the system by lifting the lever. Make sure the valve discharges freely. If the valve fails to operate correctly, immediately replace with a new properly rated relief valve.
- Test T&P valve at least once annually to ensure the waterway is clear. If valve does not operate, turn the appliance "off" and call a plumber immediately.
- Take care whenever operating relief valve to avoid scalding injury or property damage.

**FAILURE TO COMPLY WITH THE ABOVE GUIDELINES COULD RESULT IN FAILURE OF RELIEF VALVE OPERATION, RESULTING IN POSSIBILITY OF SUBSTANTIAL PROPERTY DAMAGE, SEVERE PERSONAL INJURY, OR DEATH.**

### F. Backflow Preventer

Use a backflow preventer specifically designed for water heater installations. This valve should be installed on the cold water fill supply line per local codes.

### G. Potable Expansion Tank

A potable hot water expansion tank is required to offset heated water expansion. In most city plumbing systems, the water meter has a no return or back flow device built into the system to prevent back flowing of water into city mains. Some local codes require back flow preventers on all incoming water supplies. The hot water expansion tank must be listed for potable water use. The expansion tank should be located on the cold inlet piping close to the appliance.

#### Expansion Tank and Make-Up Water

1. Ensure that the expansion tank is sized to correctly handle appliance and system water volume and temperature.

#### CAUTION

Undersized expansion tanks cause system water to be lost from the relief valve, causing make-up water to be added. Eventual appliance failure can result due to excessive make-up water addition. **SUCH FAILURE IS NOT COVERED BY WARRANTY.**

The expansion tank must be suitable for hot potable water systems.

2. The expansion tank must be located as shown in Applications, this manual, or following recognized design methods. See expansion tank manufacturer's instructions for details.

#### WARNING

Failure to follow the instructions in this section WILL VOID the warranty and may result in property damage, serious personal injury, or death.

## H. Hydronic Heating Module Piping

The hydronic heating module comes pre-plumbed and connected directly to the storage tank. The heated water inside the tank will be circulated through one side of the brazed plate heat exchanger while the heating system water flows through the other side. The heating system piping is connected to the return and supply pipes located on the top of the hydronic heating module (see Figure 5). Piping of the module to the system is not complex and does not require any of the primary or secondary piping normally used on high efficiency low mass boilers.

**NOTE:** Do not connect hydronic heating module to air handler units. This module may not be applied to air handler applications.

## I. Pressure Relief Valve for the Hydronic System

The pressure relief valve supplied with the appliance is designed to relieve pressure greater than 30 psi. The hydronic heating module is designed to withstand pressure up to 150 psi. If you are changing the pressure relief valve for a higher pressure rating, you must make sure that the system components are designed for the higher pressure. The relief valve must be rated for the 135,000 Btu maximum capacity of the brazed plate heat exchanger. Pipe the discharge line in copper piping to a drain. Provide 6" clearance from the floor drain.

## J. Hydronic Expansion Tank and Make-Up Water

Ensure that the expansion tank is sized to the system volume, brazed plate capacity, and related piping for the hydronic heating module. The capacity of the module and brazed plate is ½ gallon. Most chilled water systems are piped using a closed type expansion tank. Connect the expansion tank to the air separator only if the separator is on the suction side of the circulator. The hydronic heating module has a water line connection of ½" NPT to connect into the pressure reducing valve and back flow preventer. Normal system pressure is 15 psi.

## K. Hydronic Heating Module System Piping

The hydronic heating module is designed to function in a closed loop hydronic system. The included temperature and pressure gauge allows the user to monitor the system pressure and temperature from the hydronic heating module. The gauge should be installed on the supply outlet piping from the heating module. The installation of an air elimination device will remove air from the system which is necessary to avoid an air lock in the central heating circulator. It is recommended that all the piping is insulated to improve on the system's overall efficiency. In the system piping, heating coils in air handler, flow control valves, or other devices must be installed to prevent gravity circulation of heated water from the heating module. Freeze protection for new or existing systems must be composed of glycol that is specifically formulated to include inhibitors that will prevent the glycol from attacking the metallic system components. Make certain that the system fluid is checked for the correct glycol concentration and inhibitor level. The system should be tested at least once a year or as recommended by the producer of the glycol solution. Allowance should be made for the expansion of the glycol solution in the system piping. Example: 50% by volume glycol solution expands 4.8% in volume for the temperature increase from 32°F to 180°F, while water expands 3% with the same temperature rise.

Listed below are the basic steps that will help guide you through the installation of the hydronic heating module to the system piping.

1. Connect the system return marked "Return".
2. Connect the system supply marked "Supply".
3. Install a balance and purge valve (or shut off drain valve) on the system return to purge air out of the zone at start-up.
4. Install a back flow preventer on the cold feed make-up water line.
5. Install a pressure reducing valve on the cold feed make up water line (15 psi operating pressure). Check temperature and pressure gauge when operating. It should read minimum pressure of 15 psi.

6. Install the system circulator as shown in the piping details in this section. Make sure the circulator is properly sized for the system and friction loss.

7. Install an expansion tank on the system supply. Consult the expansion tank manufacturer's instructions for specific information related to expansion for the required system volume and capacity.

8. Install an air elimination device on the system supply.

9. Install a drain valve at the lowest point of system to blow out the system if needed. **NOTE:** The hydronic heating module cannot be drained completely of water without purging the unit with an air pressure greater than 15 psi but not exceeding 40 psi. If winterizing the unit it is recommended, use glycol on the closed loop hydronic side only.

10. The relief valve is installed at the factory. A pipe discharge line should be installed to release 6" above a drain, so discharge will be visible when pressure is relieved. The pipe size must be the same size as the relief valve outlet.

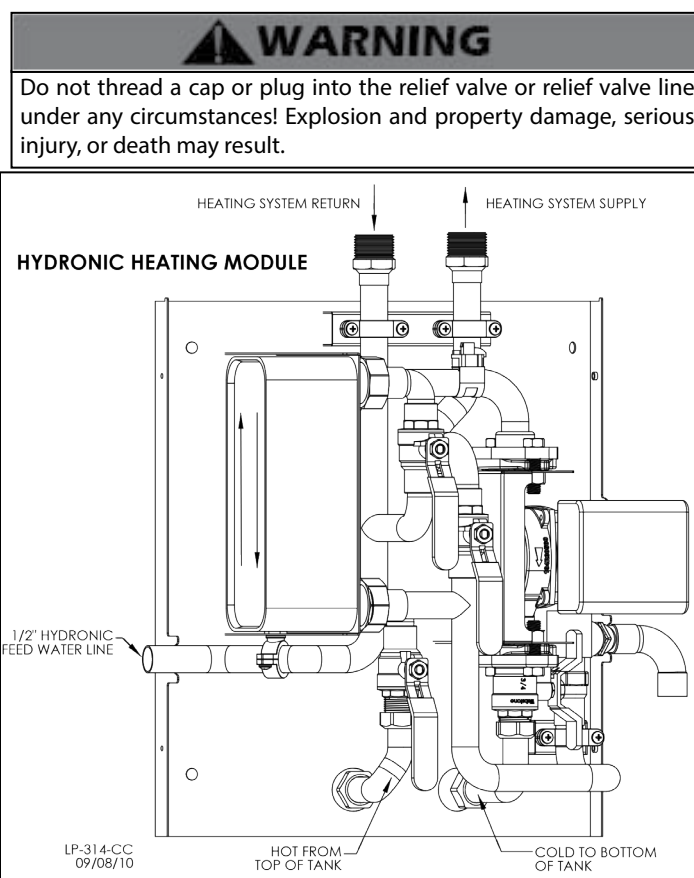


Figure 5 - Hydronic Heating Module

## L. Hydronic Heating Module Output

Hydronic heating module output is based on the burner input and the flow rate supplied by the selected system circulator through the closed loop side of the brazed plate exchanger. Included in this section are graphs that will help you size the appropriate circulator and output needed to meet your system design requirements. Below is an example on the steps needed to determine the correct circulator for the system.

**Example: System design requires 120,000 Btu at 20 Delta**

### Step 1

Using the graphs, select the input rate of the appliance. In this example, we would have to select a minimum input of 199K (the 130K max. output is 100,000 Btu, which falls below our operating point).

### Step 2

Next, go to the chart for the 199K burner input and select the point of operation where the Btu and Delta T line intersect. Mark the point on the chart and go to bottom of the chart to determine flow rate needed to achieve the rated output from the module. This example is 12 GPM.

**Step 3**

Select the correct circulator to meet the flow and resistance requirements for the system design. To calculate this, you must determine the flow and resistance through the system and heating module. The heating module requires 12 GPM at 10 feet of head. The system requires 12 GPM at 5 feet of head. To select a circulator, add the resistance 10 feet of head (module) + 5 feet of head (system) at 12 GPM. This system requires a circulator that operates at a resistance of 15 feet at 12 GPM (See examples in Figures 6, 7, and 8).

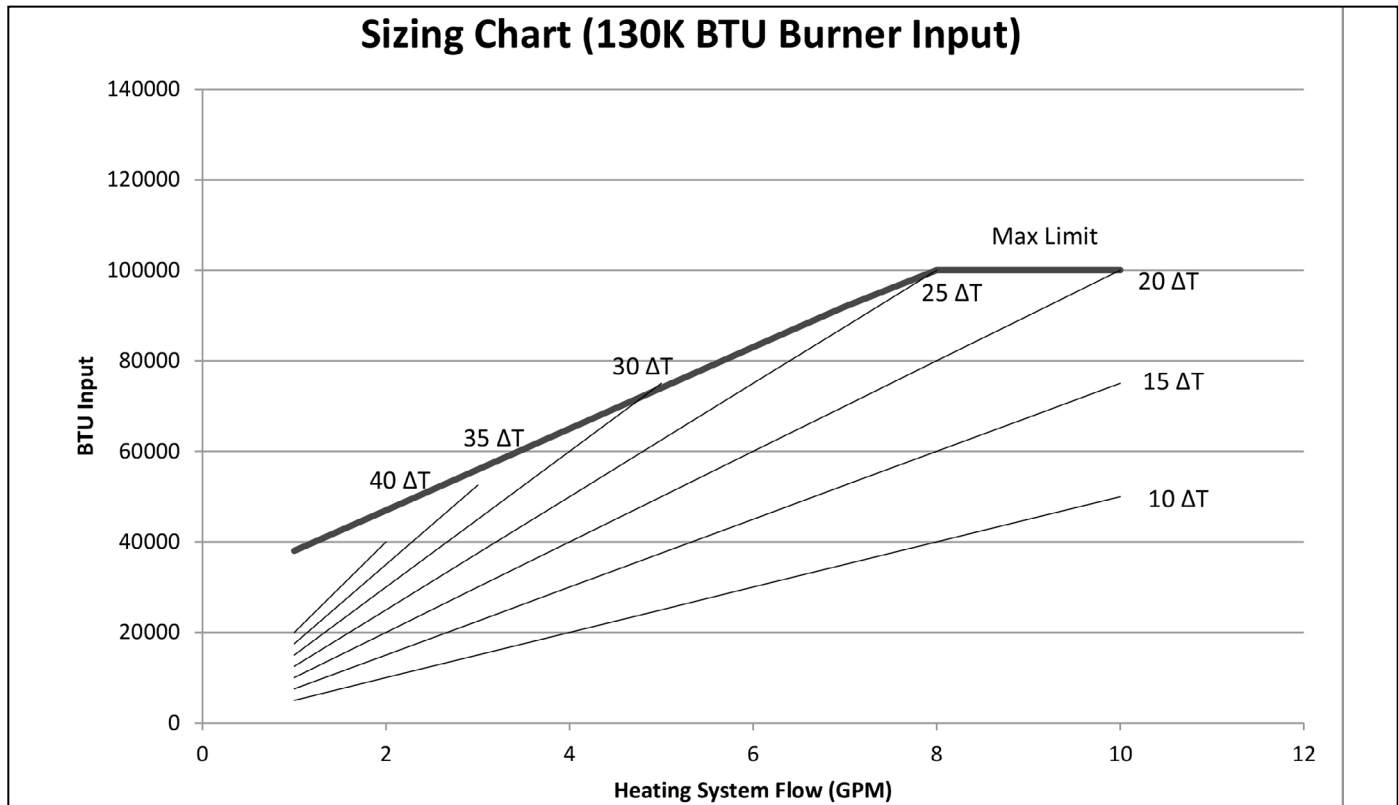


Figure 6 - Sizing Chart for 130kBTU Model

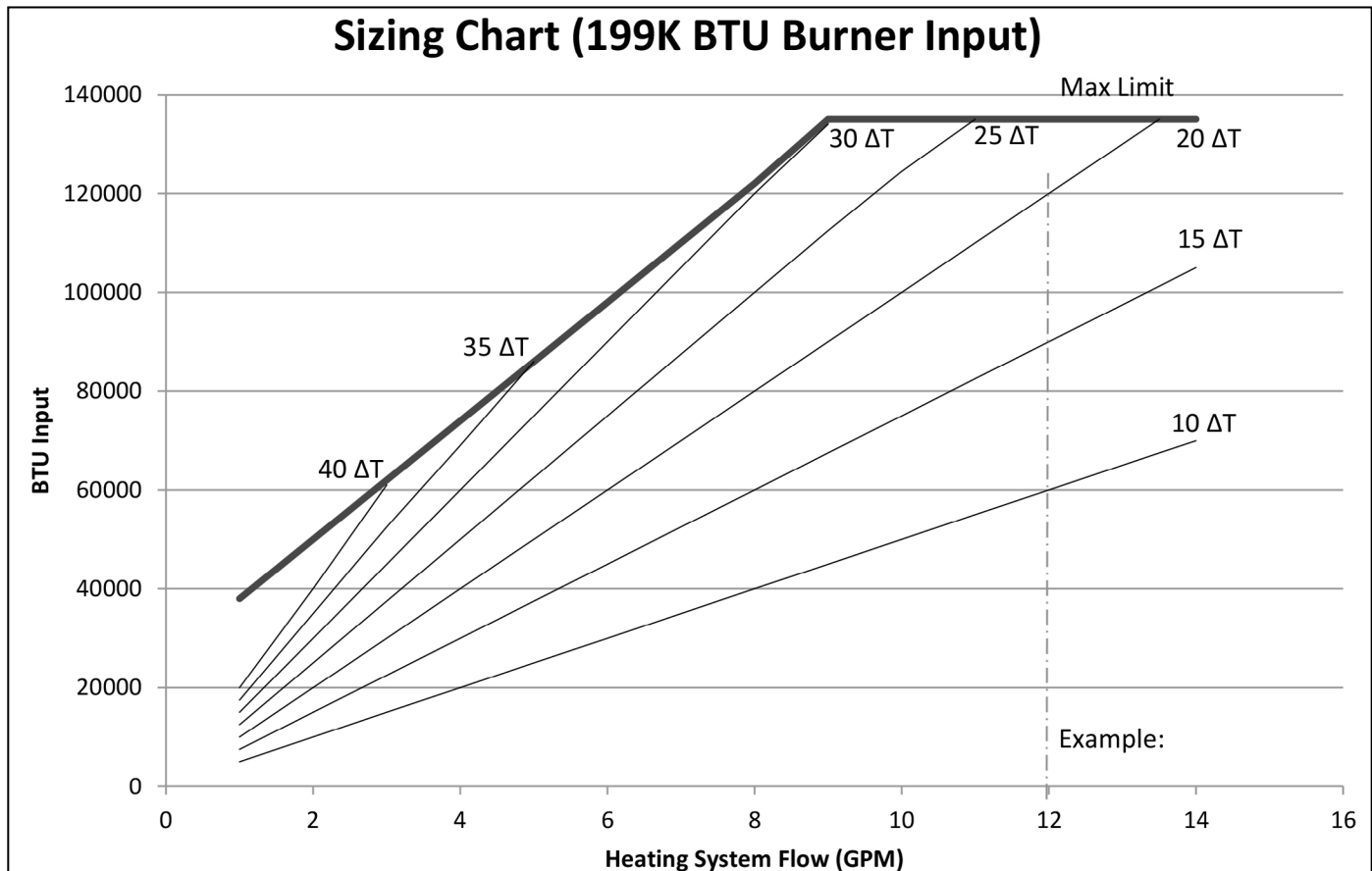


Figure 7 - Sizing Chart for 199kBTU Model



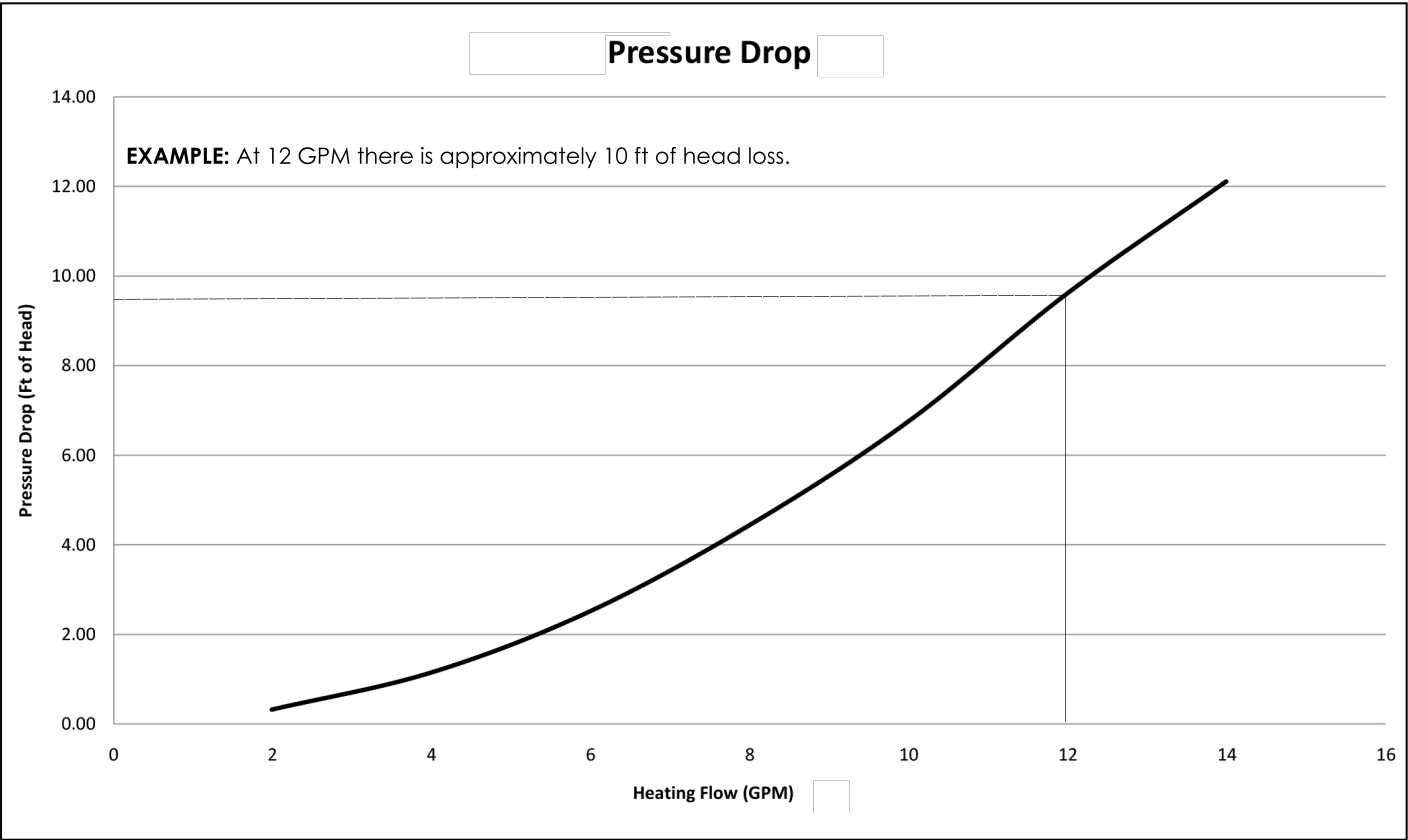


Figure 8 - Pressure Drop

## M. Applications

### NOTES:

1. Minimum pipe size should match connection size on appliance. Upsize pipe accordingly if greater flow is required.

2. A thermal expansion tank suitable for potable water must be sized and installed within the piping system between the check valve and cold water inlet of the appliance.

3. Gas line must be rated to the maximum capacity of the unit. Unit must have 10 feet of pipe after gas regulator.

4. All circulators shall have an integral flow check.

### NOTES FOR AIR HANDLER APPLICATION (APPLIES TO DOMESTIC WATER OUTLET CONNECTIONS ONLY):

1. MASSACHUSETTS STATE PLUMBING CODE REQUIRES A DISTANCE NO GREATER THAN 50 FEET FROM THE APPLIANCE TO THE FAN COIL IN THE AIR HANDLER.

2. MASSACHUSETTS STATE PLUMBING CODE REQUIRES AN ELECTRONICALLY TIMED CIRCULATOR PUMP TO ACTIVATE EVERY SIX HOURS FOR 60 SECONDS. THIS CIRCULATOR IS REQUIRED TO BE BRONZE OR STAINLESS.

3. ALL WATER PIPING MUST BE INSULATED.

4. YOU MUST INSTALL A VACUUM RELIEF VALVE PER 248 CMR.

**NOTE: THIS DRAWING IS MEANT TO DEMONSTRATE SYSTEM PIPING CONCEPT ONLY. THE INSTALLER IS RESPONSIBLE FOR ALL EQUIPMENT AND DETAILING REQUIRED BY LOCAL CODES.**

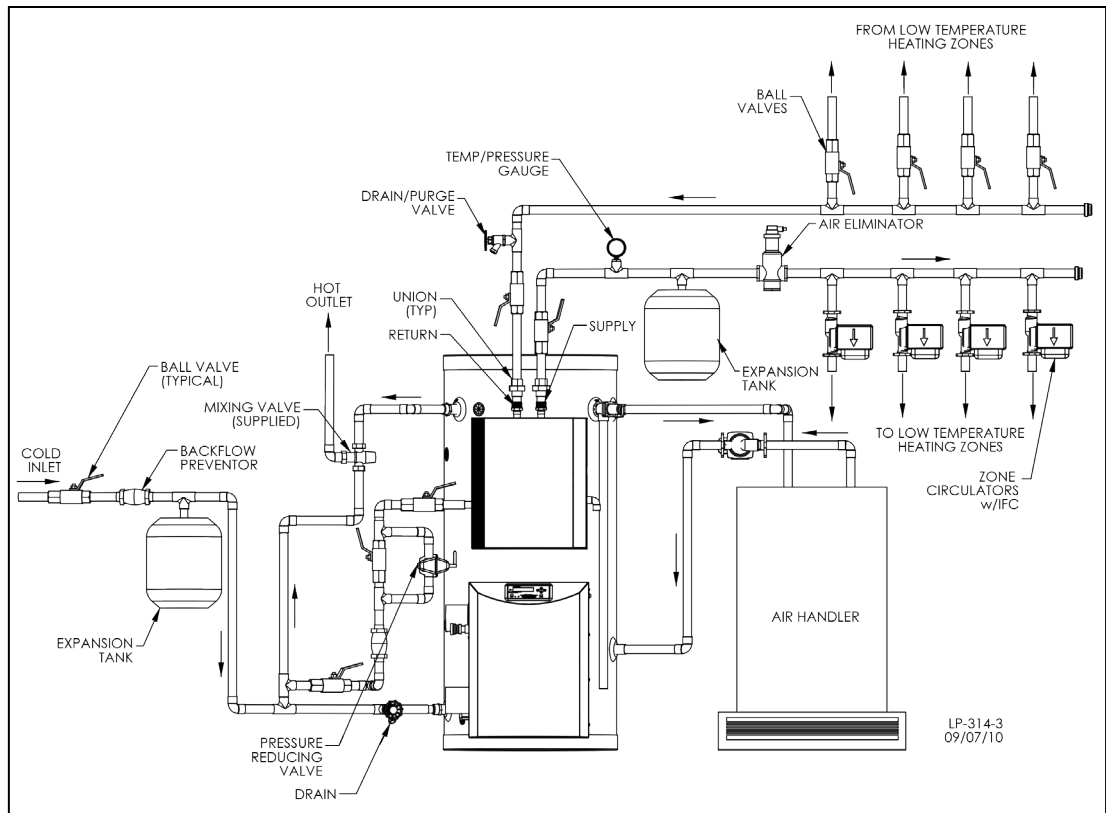


Figure 9 - Piping with Air Handler Application

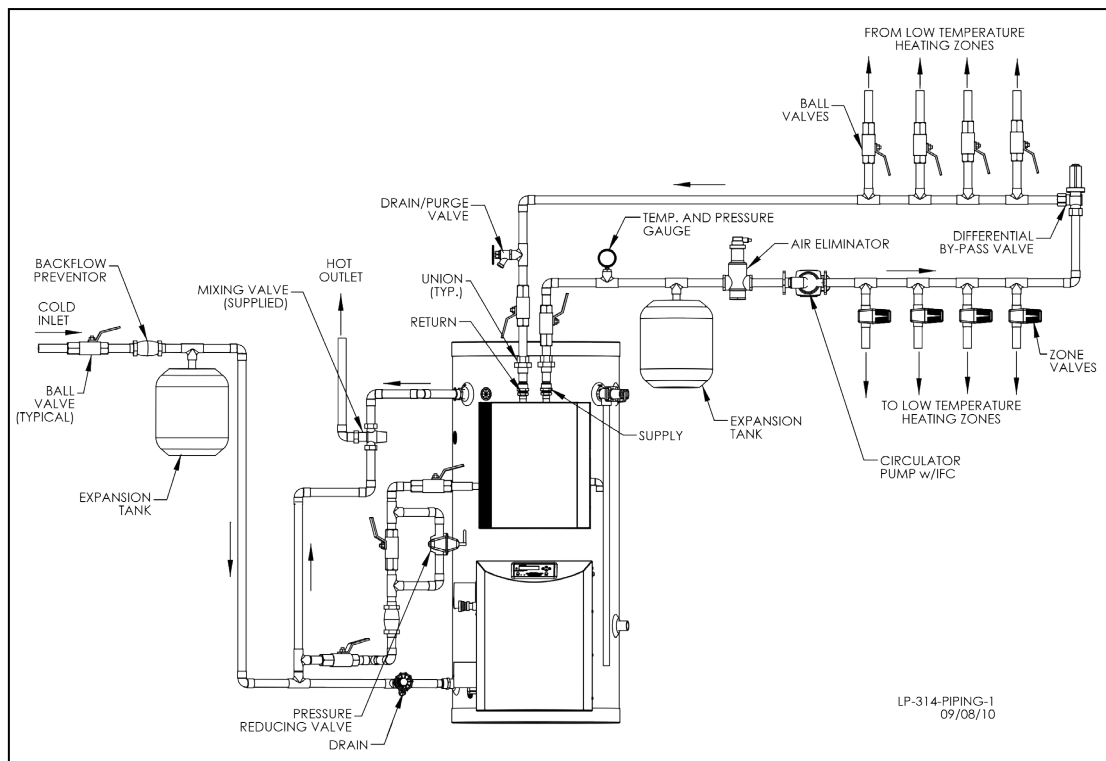


Figure 10 - Piping with Zone Valves

## CAUTION

DO NOT use the heat pack for high temperature (over 160°F) applications. Failure to comply will result in substantial overworking of the appliance, and possibly lead to early appliance failure. Use of the heat pack for high temperature applications WILL VOID the warranty.

## WARNING

The piping will not support the weight of the appliance circulator pump. Refer to the pump manufacturer's installation instructions to properly support the circulator pump. Failure to comply with these instructions could result in substantial property damage, severe personal injury, or death.

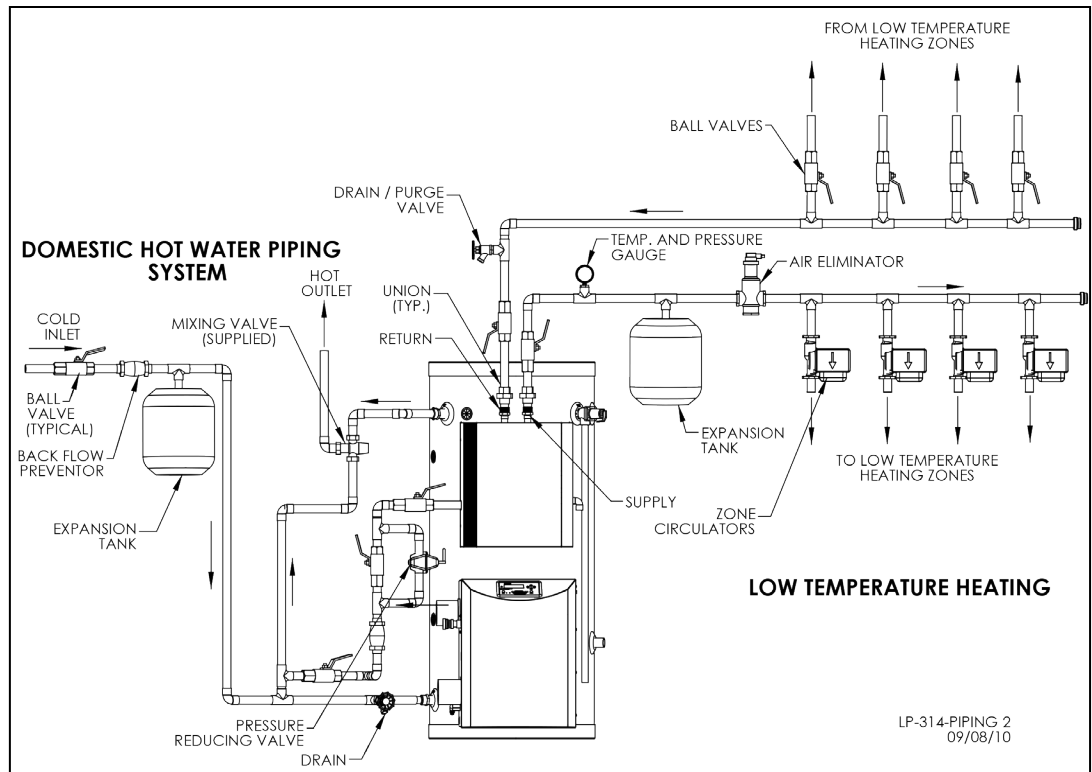
**NOTES:**

1. Minimum pipe size should match connection size on appliance. Upsize pipe accordingly if greater flow is required.
2. A thermal expansion tank suitable for potable water must be sized and installed within the piping system between the check valve and cold water inlet of the appliance.
3. Gas line must be rated to the maximum capacity of the unit. Unit must have 10 feet of pipe after gas regulator.
4. All circulators shall have an integral flow check.

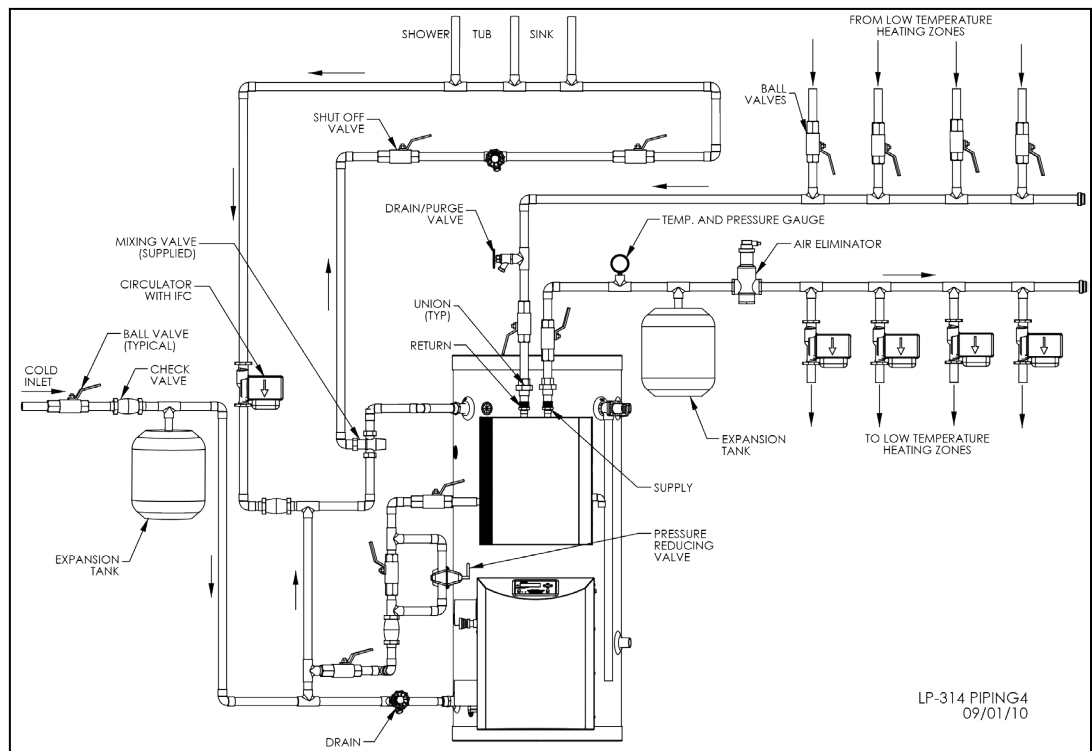
**NOTES FOR AIR HANDLER APPLICATION (APPLIES TO DOMESTIC WATER OUTLET CONNECTIONS ONLY):**

1. MASSACHUSETTS STATE PLUMBING CODE REQUIRES A DISTANCE NO GREATER THAN 50 FEET FROM THE APPLIANCE TO THE FAN COIL IN THE AIR HANDLER.
2. MASSACHUSETTS STATE PLUMBING CODE REQUIRES AN ELECTRONICALLY TIMED CIRCULATOR PUMP TO ACTIVATE EVERY SIX HOURS FOR 60 SECONDS. THIS CIRCULATOR IS REQUIRED TO BE BRONZE OR STAINLESS.
3. ALL WATER PIPING MUST BE INSULATED.
4. YOU MUST INSTALL A VACUUM RELIEF VALVE PER 248 CMR.

**NOTE: THIS DRAWING IS MEANT TO DEMONSTRATE SYSTEM PIPING CONCEPT ONLY. THE INSTALLER IS RESPONSIBLE FOR ALL EQUIPMENT AND DETAILING REQUIRED BY LOCAL CODES.**



**Figure 11 - Piping with Zone Circulators**



**Figure 12 - Piping with Recirculation**

## CAUTION

DO NOT use the heat pack for high temperature (over 160°F) applications. Failure to comply will result in substantial overworking of the appliance, and possibly lead to early appliance failure. Use of the heat pack for high temperature applications WILL VOID the warranty.

## WARNING

The piping will not support the weight of the appliance circulator pump. Refer to the pump manufacturer's installation instructions to properly support the circulator pump. Failure to comply with these instructions could result in substantial property damage, severe personal injury, or death.

## N. Filling the Appliance

### WARNING

The appliance must be full of water and the system fully purged BEFORE powering the appliance. When filling the appliance, open a hot water tap to release air in the tank and piping. All air has been purged from the system when water runs freely from the faucets. Applying power to the appliance when it is not full of water will damage the heat exchanger, and could result in property damage, serious personal injury, or death. Such damages ARE NOT covered by appliance warranty.

- Make certain the drain valve is completely closed.
- Open the shut-off valve in the cold water supply line.
- Open the hot water faucets to allow air to vent from the appliance and piping.
- Allow sufficient time for the appliance to completely fill with water.

## Part 5 - Venting

### DANGER

The appliance must be vented as detailed in this section. Ensure exhaust vent and intake piping complies with these instructions regarding vent system. Inspect finished exhaust vent and intake piping thoroughly to ensure all joints are well secured, airtight, and comply with all applicable code requirements, as well as the instructions provided in this manual. Failure to properly install the vent system will result in severe personal injury or death.

### A. General

### DANGER

This appliance is certified as a "Category IV" appliance and requires a special venting system. The vent system will operate with a positive pressure in the pipe. Exhaust gases must be piped directly outdoors using the vent materials and rules outlined in these instructions. Do not connect vent connectors serving appliances vented by natural draft into any portion of mechanical draft systems operating under positive pressure. Follow the venting instructions carefully. Failure to do so will result in substantial property damage, severe personal injury, or death.

1. Installation should be made in accordance with the regulations of the Authority Having Jurisdiction, local code authorities, and utility companies which pertain to this type of water heating equipment.
2. Install the venting system in accordance with these instructions and with the National Fuel Gas Code, ANSI Z223.1/NFPA 54, CAN/CGA B149, and / or applicable provisions of local building codes.
3. This appliance must be vented with materials, components, and systems listed and approved for Category IV appliances.

### DANGER

Exhaust and intake are to be piped separately. This appliance cannot share a common exhaust or intake with multiple appliances. Failure to follow these instructions will result in substantial property damage, severe personal injury, or death.

**NOTE:** To avoid contamination often contained in indoor air, it is best to pipe all intake combustion air directly to the outdoors.

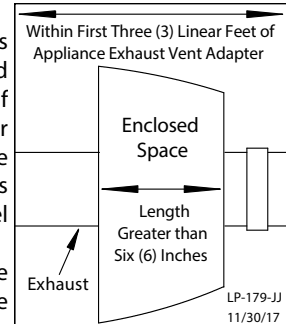
**NOTE:** Care must be taken to prevent condensate freezing in the exhaust vent pipe system. See local, state, provincial, and national codes for best practices to prevent condensate freezing in the exhaust vent pipe system.

### WARNING

Improper seating of vent pipe gaskets can cause eventual gasket failure and exhaust gas leakage. Ensure the exhaust vent pipe is properly beveled and seated before insertion into the flue adapter. Failure to do so could result in property damage, severe personal injury, or death.

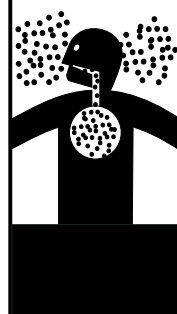
Exhaust vent adaptors are not designed as load-bearing devices, and must not be used to support exhaust vent piping. All vent pipes must be properly connected, supported, and the exhaust vent must be pitched a minimum of 1/4" per foot back to the appliance to allow drainage of condensate. Failure to properly support vent piping and follow the information in this statement could result in product damage, severe personal injury, or death.

- DO NOT insulate the first three (3) linear feet of the exhaust vent run.
- CPVC, Polypropylene, or Stainless Steel pipe material MUST be used if the first three (3) linear feet of the exhaust vent run is insulated or passes through an enclosed space greater than 6" in length, such as a wall. **NOTE:** Only Stainless Steel pipe material may be insulated.
- If CPVC is used to meet these requirements, the balance may be installed with approved PVC pipe.
- If Polypropylene or Stainless Steel is used to meet these requirements, the balance of the vent run must be installed with the same material.
- Failure to comply with this warning could result in property damage, severe personal injury, or death.



### WARNING

#### Breathing Hazard - Carbon Monoxide Gas



- Do not operate heater if flood damaged.
- Install vent system in accordance with local codes and manufacturers installation instructions.
- Do not obstruct heater air intake or exhaust. Support all vent piping per manufacturers installation instructions.
- Do not place chemical vapor emitting products near unit.
- According to NFPA 720, carbon monoxide detectors should be installed outside each sleeping area.
- Never operate the heater unless it is vented to the outdoors.
- Analyze the entire vent system to make sure that condensate will not become trapped in a section of vent pipe and therefore reduce the open cross sectional area of the vent.

**Breathing carbon monoxide can cause brain damage or death. Always read and understand instruction manual.**

LP-304

### DANGER

Due to the extreme flammability of most glues, cements, solvents, and primers used to join plastic exhaust vent and intake pipes, explosive solvent vapors must be cleared from all vent piping before start-up. Avoid using excess cement or primer, as this may pool in the vent pipes. Vent assemblies should be allowed to cure for a period of at least 8 hours before powering a connected appliance. Failure to follow these instructions will result in substantial property damage, severe personal injury, or death. It is the installers' responsibility to understand the hazards associated with explosive solvents and take the necessary precautions to avoid these risks.



## B. Approved Materials for Exhaust Vent and Intake Pipe


Item	Material	Standards for Installation In:	
		United States	Canada
Pipe and Fittings Approved for Intake ONLY	ABS*	ANSI/ASTM D2661	NOT PERMITTED
Pipe Approved for Intake OR Exhaust Vent	PVC Schedule 40/80	ANSI/ASTM D1785	PVC, CPVC, and PP Venting Must be ULC-S636 Certified. IPEX is an approved manufacturer in Canada.
	PVC-DWV Schedule 40/80	ANSI/ASTM D2665	
	CPVC Schedule 40/80	ANSI/ASTM F441	
	Polypropylene	UL-1738 or ULC-S636	
	Stainless Steel AL29-4C	Certified for Category IV and Direct Vent Appliance Venting	
Pipe Fittings	PVC Schedule 40	ANSI/ASTM D2466 or D2665	PVC, CPVC, and PP Venting Must be ULC-S636 Certified. IPEX is an approved manufacturer in Canada.
	PVC Schedule 80	ANSI/ASTM D2467 or D2665	
	CPVC Schedule 40	ANSI/ASTM F438	
	CPVC Schedule 80	ANSI/ASTM F439	
Pipe Cement	ABS*	ANSI/ASTM D2235	NOT PERMITTED
	PVC	ANSI/ASTM D2564	IPEX System 636 Cements and Primers
	CPVC	ANSI/ASTM F493	
Pipe Primer	PVC / CPVC	ASTM F656	

### **DANGER**



- The exhaust and intake components installed with this appliance must be used for near appliance piping BEFORE transitioning to the approved materials listed above. DO NOT REMOVE these installed components. Doing so WILL VOID appliance warranty.
- PVC / CPVC pipe and fittings of the same diameter are considered interchangeable.
- The use of cellular core PVC (ASTM F891), cellular core CPVC, or Radel® (polyphenolsulfone) in non-metallic venting systems is prohibited.
- Covering non-metallic vent pipe and fittings with thermal insulation is prohibited.
- DO NOT connect PVC/CPVC to Polypropylene without an approved vent connector.
- Any transition to Polypropylene MUST be done in the vertical within five (5) feet of the appliance.
- When installing AL29-4C vent piping, install a PVC-to-stainless adapter at the appliance vent connection, and at the termination when using a PVC termination kit. DO NOT mix AL29-4C piping from different manufacturers unless using adapters specifically designed for the purpose by the manufacturer.
- A double wall vent or insulated material may be used when using stainless steel vent material in a freezing climate.
- \*ABS may be used for air intake applications ONLY. ABS is NOT PERMITTED for use in Canada.
- Contact the venting material manufacturer if there is any question about the applicability of the proposed venting material.

Failure to follow these directions will result in substantial property damage, severe personal injury, or death.

**Table 4 - Approved Materials for Exhaust Vent and Intake Pipe**

 <b>WARNING</b>
DO NOT mix components from different venting systems. The vent system could fail, causing leakage of flue products into the living space. Use only the approved pipe and fitting materials, and primer and cement specifically designed for the material used, as listed in the above table. Failure to do so could result in property damage, serious injury, or death.
<b>CAUTION</b>
High heat sources (generating heat 100°F / 37°C or greater, such as boiler flue pipes, space heaters, etc.) may damage plastic components of the appliance as well as plastic vent pipe materials. Such damages ARE NOT covered by warranty. It is recommended to keep a minimum clearance of 8" from high heat sources. Observe heat source manufacturer instructions, as well as local, state, provincial, and national codes, laws, regulations, and ordinances when installing this appliance and related components near high heat sources.

**NOTE:** The use of double-wall vent or insulated material for the combustion air intake pipe is recommended in cold climates to prevent the condensation of airborne moisture in the incoming combustion air.

 <b>WARNING</b>
It is required to insert the provided exhaust and intake screens into the vent terminations to prevent blockage caused by debris or birds. Failure to keep terminations clear could result in property damage, severe personal injury, or death.
 <b>DANGER</b>
You must not use "B" vent in an exhaust application. "B" vent is for intake applications ONLY. Using "B" vent in an exhaust application will result in serious injury or death.

### C. Additional Requirements for Installation in Canada

1. Installations must be made with a vent pipe system certified to ULC-S636. IPEX is an approved vent manufacturer in Canada supplying vent material listed to ULC-S636. Additionally, you may use AL29-4C stainless steel venting to comply with Canadian requirements.
2. The first three (3) feet of vent pipe from the appliance flue outlet must be readily accessible for visual inspection.
3. The components of the certified vent system must not be interchanged with other vent systems or unlisted pipe / fittings.

## D. Exhaust Vent and Intake Pipe Location

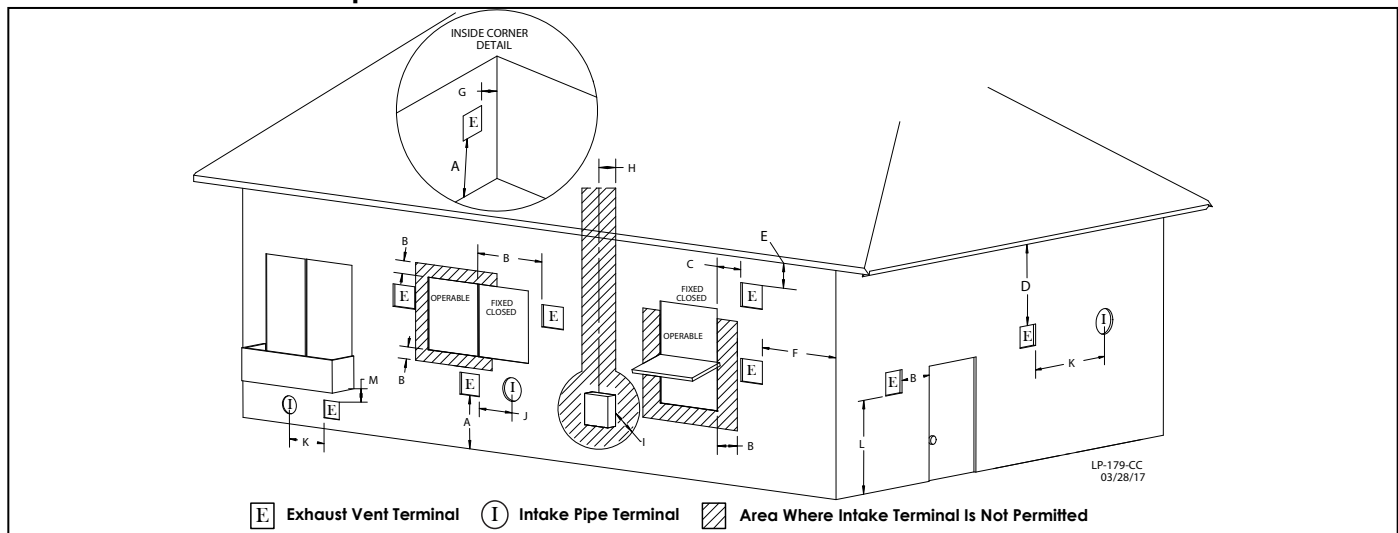


Figure 13 - Exit Terminals for Direct Vent Systems - ANSI Z223.1 / NFPA 54 for US and CAN/CSA B149.1 for Canada

	DESCRIPTION		US	CANADA
A	Clearance above grade, veranda, porch, deck, or balcony		1 foot (30 cm)	
B	Clearance to window or door that may be opened	Direct Vent	1 foot	3 feet (91 cm)
		Power Vent	4 ft below or to side of opening; 1 ft above opening	
C	Clearance to permanently closed window		*	
D	Vertical clearance to ventilated soffit located above the terminal within a horizontal distance 2 feet (61 cm) from the center line of the terminal		*	
E	Clearance to unventilated soffit		*	
F	Clearance to outside corner		*	
G	Clearance to inside corner		*	
H	Clearance to each side of center line extended above meter / regulator assembly		*	
I	Clearance to service regulator vent outlet		*	Above a regulator within 3 feet (91 cm) horizontally of the vertical center line of the regulator vent outlet to a maximum vertical distance of 15 ft (4.5 m)
J	Clearance to nonmechanical air supply inlet to building or the combustion air inlet to any other appliance	Direct Vent	1 foot	3 feet (91 cm)
		Power Vent	4 ft below or to side of opening; 1 ft above opening	
K	Clearance to mechanical air supply inlet		3 feet above if within 10 feet horizontally	6 feet (1.83 m)
L	Clearance above paved sidewalk or paved driveway located on public property	Direct Vent	*	7 feet (2.13 m)
		Power Vent	7 feet (2.13 m)	
M	Clearance under veranda, porch deck, or balcony		*	1 foot (30 cm)

Table 5 - Vent Termination Clearances - \*NOTE: For clearances not specified in ANSI Z223.1 / NFPA 54 for US and CAN/CSA B149.1 for Canada, please use clearances in accordance with local installation codes and the requirements of the gas supplier.

### WARNING

The building owner is responsible for keeping the exhaust and intake terminations free of snow, ice, or other potential blockages, as well as scheduling routing maintenance. Failure to keep the vent piping terminations clear and properly maintain the heater could result in property damage, severe personal injury, or death.

### WARNING

For each floor containing bedroom(s), a carbon monoxide detector and alarm shall be placed in the living area outside the bedrooms, as well as in the room that houses the heater. Detectors and alarms shall comply with NFPA 720 (latest edition). Failure to comply with these requirements could result in product damage, severe personal injury, or death.

## E. Exhaust Vent and Intake Pipe Sizing

- The exhaust vent and intake pipe size is 2" for 130kBTU models and 3" for 199kBTU models.
- The maximum total equivalent length of 2" exhaust vent and intake pipe **should not exceed 85 feet**. The maximum total equivalent length of 3" exhaust vent and intake pipe **should not exceed 200 feet**.
  - The equivalent length of elbows, tees, and other fittings are listed in the Friction Loss Table.

Friction Loss Equivalent in Piping and Fittings			
Fittings or Piping	Equivalent Feet		
	2"	3"	4"
90 Degree Elbow*	5'	5'	3'
45 Degree Elbow	3'	3'	1'
Coupling	0'	0'	0'
Air Inlet Tee	0'	0'	0'
Straight Pipe	1'	1'	1'
Concentric Kit	3'	3'	N/A
V500 2" Kit	1'	N/A	N/A
V1000 3" Kit	N/A	1'	1'
V2000 4" Kit	N/A	1'	1'

**Table 6 - \*Friction loss for long radius elbow is 1 foot less. NOTE: Consult Polypropylene venting instructions for friction loss and pressure drop equivalents.**

- For example: If the exhaust vent has two 90° elbows and 10 feet of PVC pipe we will calculate:

Exhaust Vent Equivalent Length =  $(2 \times 5) + 10 = 20$  feet.

Further, if the intake pipe has two 90° elbows, one 45° elbow, and 10 feet of PVC pipe, the following calculation applies:

Intake Pipe Equivalent Length =  $(2 \times 5) + 3 + 10 = 23$  feet.

Finally, if a concentric kit is used we find:

Total Equivalent Length =  $20 + 23 + 3 = 46$  feet.

The total equivalent length is 46 feet, well below the maximum of 85 feet for 2" pipe.

- Effort should be made to keep a minimum difference in equivalent length between the exhaust vent and intake pipe.

- The minimum total equivalent length is 16 feet.

CAUTION
Do not exceed the maximum lengths for vent pipes. Excessive length could result in appliance shutdown and property damage.
Failure to provide a minimum total vent length of 16 equivalent feet could result in property damage and improper product operation.

## F. Longer Vent Runs

The maximum total equivalent length can be extended by increasing the diameter of both the exhaust vent and intake pipes equally. However, the transitions should begin a minimum of 15 equivalent feet from the appliance.

- The maximum total equivalent length for increased diameter vent pipes is 125 feet for 2" transitioning to 3" pipe (this length includes the minimum 15 total equivalent feet necessary for transition).


**NOTE:** 3" vent pipe can be increased in diameter, but total equivalent length cannot be increased beyond 200 feet.

- Transitions should always be made in vertical sections of pipe to prevent the condensate from pooling in the vent pipe.

Standard Vent Connection and Maximum Total Equivalent Length	Reducing Coupling	Increased Vent Size and Maximum Total Equivalent Length
2" (85')	3" x 2"	3" (125')
3" (200')	4" x 3"	4" (200')

**Table 7 - Vent Run Transition**


- If transition occurs at a distance greater than 15 equivalent feet from the appliance, the maximum equivalent length will be reduced.

 DANGER
Total maximum equivalent length of increased diameter exhaust vent and intake pipe must not exceed the lengths defined in this manual. 125 maximum total equivalent feet for 2" increased to 3" vent pipe; 200 maximum total equivalent feet for any increase to 3" vent pipe diameter. Failure to keep the total equivalent length below the maximum lengths determined in this manual will result in faulty appliance operation, substantial property damage, serious personal injury, or death.

Transition Point (Ft. from Appliance)	TEL of Oversized Vent Pipe (Ft.)*	Maximum TEL of all Vent Pipe (Ft.)
15	95	125
20	77 1/2	117 1/2
25	60 1/2	110 1/2
30	43	103
35	26	96
40	8 1/2	88 1/2
NONE	0	85

**Table 8 - TEL = Total Equivalent Length \*Oversized vent pipe diameter is 1" or greater than factory supplied connection.**

## G. Exhaust Vent and Intake Pipe Installation

 WARNING
All joints of positive pressure vent systems must be sealed completely to prevent leakage of flue products into the living space. Failure to do so could result in property damage, serious injury, or death.

- Use only solid PVC, CPVC, or stainless steel pipe or a Polypropylene vent system approved for use with Category IV appliances. ABS pipe material may be used on air inlet piping **only**.
- Remove all burrs and debris from joints and fittings.
- When using PVC or CPVC pipe, all joints must be properly cleaned, primed, and cemented. Use only cement and primer approved for use with the pipe material. Cement must conform to ASTM D2564 for PVC and ASTM F493 for CPVC pipe. **NOTE: DO NOT CEMENT POLYPROPYLENE PIPE.**
- Ensure the vent is located where it will not be exposed to prevailing winds.
- In all roof venting applications, exhaust discharge must point away from the pitch of the roof.
- If the exhaust vent is to be terminated in a walled off area (such as a roof with a parapet wall), ensure the exhaust vent terminates a minimum of 10' from nearest wall and extends level with or above the top of the wall. This will ensure flue gas does not get trapped and possibly recirculated into the intake air pipe, which could contaminate the combustion air.
- To prevent water leakage, install adequate roof flashing where the pipe enters the roof.
- Do not locate vent over public walkways, driveways, or parking

lots. Condensate could drip and freeze, resulting in a slip hazard or damage to vehicles and machinery.

9. Due to potential moisture build-up, sidewall venting may not be the preferred venting option. To save time and cost, carefully consider venting installation and location.

10. Horizontal lengths of exhaust vent must slope back towards the appliance not less than ¼" per foot to allow condensate to drain from the vent pipe.

11. The exhaust vent must terminate where vapors cannot make accidental contact with people or pets, or damage air conditioners, shrubs, or other plants or objects.

12. DO NOT vent the appliance in a chimney flue serving a separate appliance designed to burn solid fuel. The appliance may only be vented in vacant chimneys. In vacant chimney applications, install and seal a rain cap over existing chimney openings.

13. All piping must be fully supported. Use pipe hangers at a minimum of 4 foot intervals to prevent sagging of the pipe where condensate may form.

14. Do not use the heater to support any piping.

15. A screened straight coupling is provided with the heater for use as an outside exhaust termination.

16. A screened inlet air tee is provided with the heater to be used as an outside intake termination.

17. Maximum Snow Level Determination: These installation instructions reference snow levels in establishing a minimum height for the installation of exhaust vent or air intake terminations. Snow levels shall be determined as follows:

- a. The installation location may, by ordinance, designate how snow levels are calculated in that location; or
- b. In the absence of specific ordinances, snow levels shall be calculated from the average monthly maximum depth of snow accumulation as indicated by the National Weather Service's 10 year statistics for the installation location/geographical area.

In addition:

- Total length of vent piping shall not exceed the limits specified in this manual.
- The vent piping for this direct vented appliance is approved for zero clearance to combustible construction.
- The flue products coming from the exhaust vent will create a large plume when the heater is in operation. Avoid venting in areas that will affect neighboring buildings or be considered objectionable.
- DO NOT locate exhaust vent or intake pipe in a parking area where machinery may damage the pipe.
- DO NOT vent near soffit vents, crawl space vents, or other areas where condensate or vapor could create a nuisance or hazard or cause property damage.
- DO NOT vent where condensate vapor could cause damage or could be detrimental to the operation of regulators, relief valve, or other equipment.

#### **In the Commonwealth of Massachusetts and as Required by State and Local Codes:**

The vented gas fueled appliance shall not be installed so its combustion, ventilation, or dilution air is obtained from a bedroom or bathroom.

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

Marking of Exhaust Vent and Intake Pipe: Piping used for ventilation, make-up, or combustion air intake shall be labeled as follows:

- a. Throughout the entire developed length:
  - i. Labels must be placed every ten feet for exposed/visible piping; or
  - ii. Labels must be placed every three feet for concealed piping.
- b. At all changes of direction;

c. On each side of a penetration through a partition, wall or ceiling; and

d. The labels shall be black lettering that:

- i. Indicates that the piping is used for ventilation, make-up, or combustion air intake, and
- ii. The letters shall be sized equal to a minimum of the pipe diameter. However, for piping with a diameter exceeding two inches, said lettering does not need to be larger than two inches.

The following table lists optional exhaust/intake terminations available from HTP:

Description	Stock Code
2" PVC Concentric Termination Kit	KGAVT0501CVT
3" PVC Concentric Termination Kit	KGAVT0601CVT
2" Stainless Steel Termination Kit	V500
3" Stainless Steel Termination Kit	V1000
4" Stainless Steel Termination Kit	V2000
3" Polypro Vent Kit	8400P-001

**Table 9 - Optional Vent Kits**

## **H. Applications**

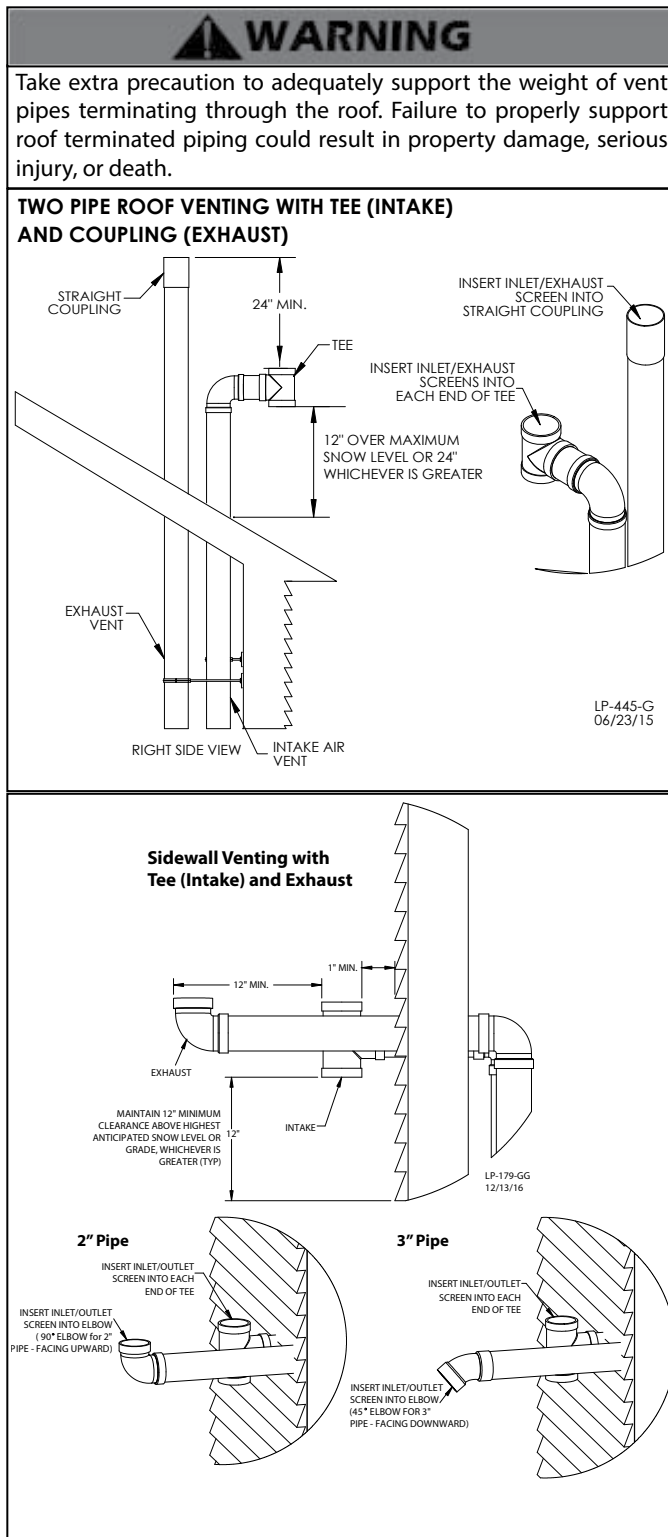
### **1. Direct Vent Installation of Exhaust and Intake**

If installing a direct vent option, combustion air must be drawn from the outdoors directly into the appliance intake, and exhaust must terminate outside. There are three basic direct vent options detailed in this manual: 1. Side Wall Venting, 2. Roof Venting, and 3. Unbalanced Venting.

Be sure to locate the appliance such that the exhaust vent and intake pipe can be routed through the building and properly terminated. Different vent terminals can be used to simplify and eliminate multiple penetrations in the building structure (see Optional Equipment in Venting Section). The exhaust vent and intake pipe lengths, routing and termination methods must all comply with the methods and limits given in the Venting section of this manual.

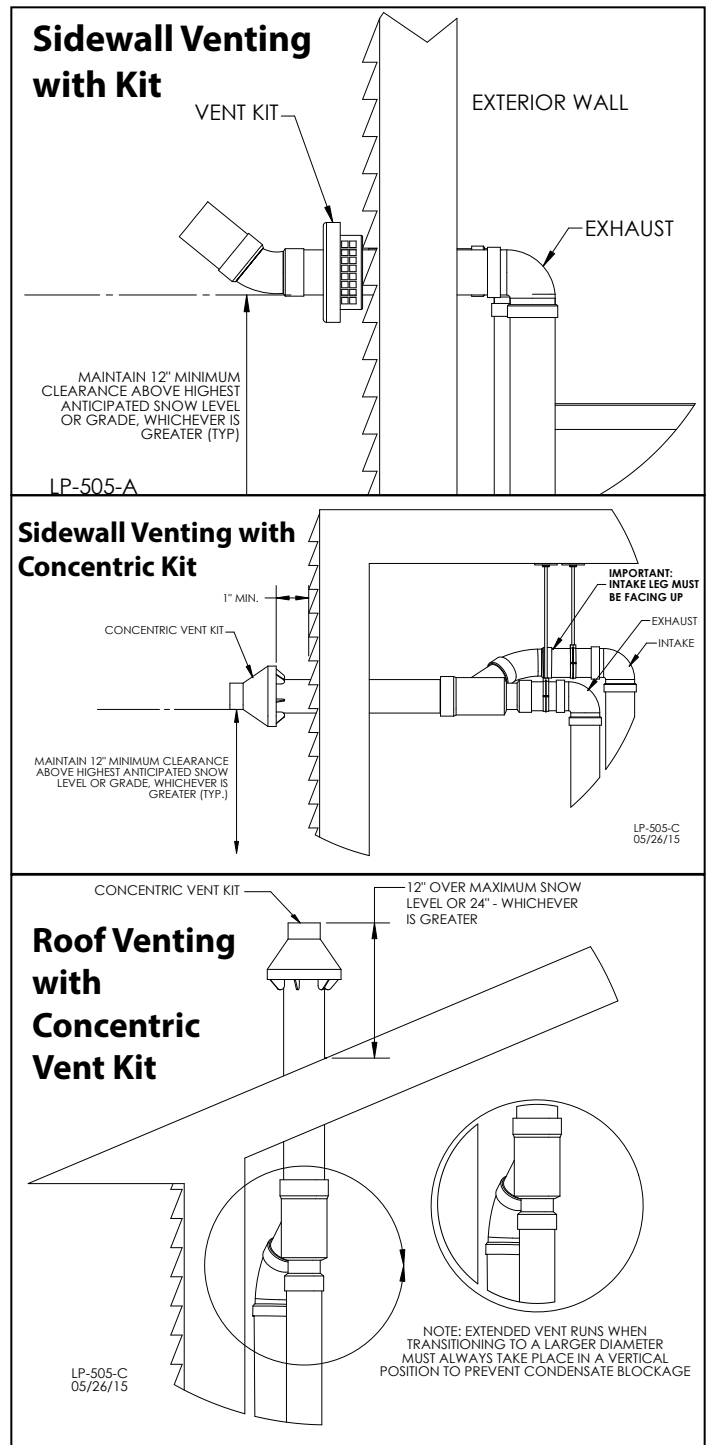
When installing a combustion air intake from outdoors, care must be taken to utilize uncontaminated combustion air. **NOTE:** To prevent combustion air contamination, see Table 2.





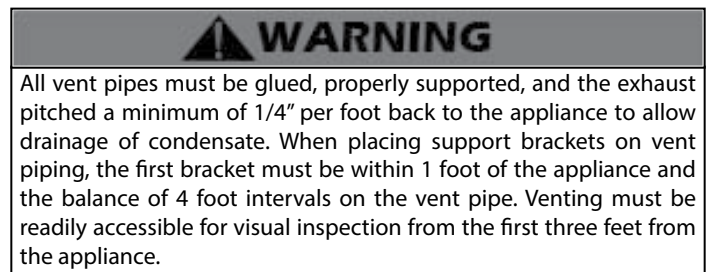
**Figure 14 - Two Pipe Roof and Sidewall Venting with Included Equipment (Tee and Coupling)**

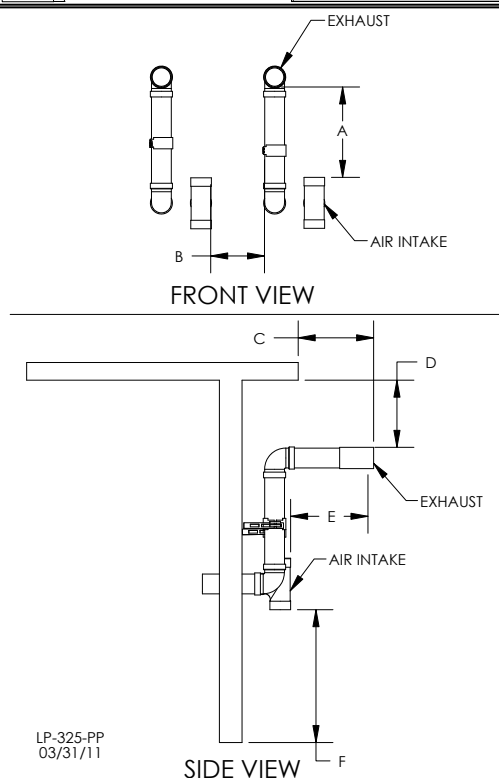
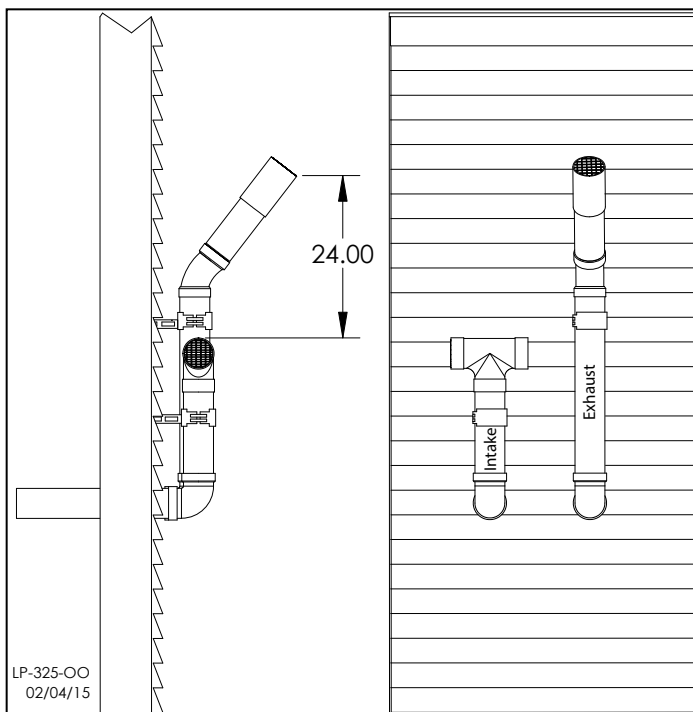
**NOTE:** When installing two pipe sidewall venting, terminate 2" exhaust vent pipe with a 90° elbow, and 3" exhaust vent pipe with a 45° elbow. Failure to do so will result in improper appliance operation.



**Figure 15 - Venting with Optional Kits (NOT INCLUDED WITH THE APPLIANCE)**

**NOTE:** These drawings are meant to demonstrate system venting only. The installer is responsible for all equipment and detailing required by local codes.

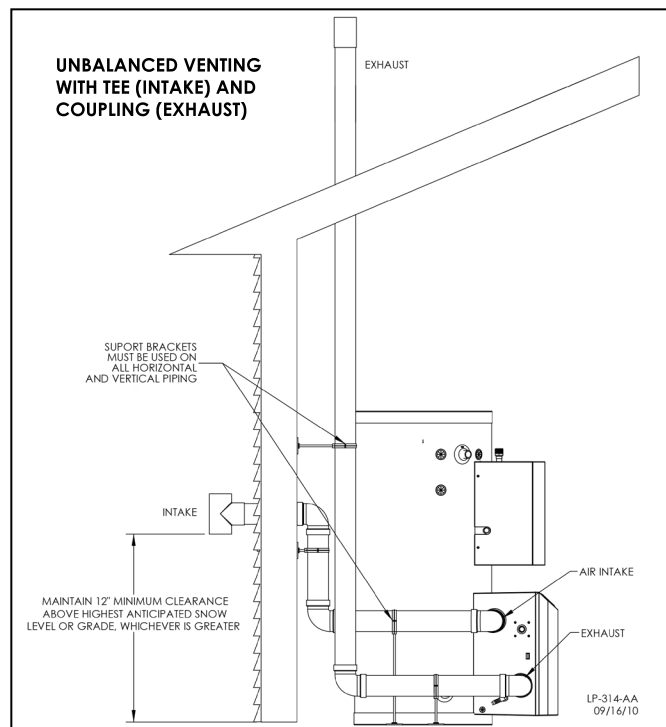




**Figure 16 - Horizontal (Snorkel) Venting**

**NOTES:**

- A. For every 1" of overhang, the exhaust vent must be located 1" vertical below overhang (overhang means top of building structure and not two adjacent walls [corner of building]).
- B. Typical installations require 12" minimum separation between bottom of exhaust outlet and top of air intake.
- C. Maintain 12" minimum clearance above highest anticipated snow level or grade (whichever is greater).
- D. Minimum 12" between vents when installing multiple vents.
- E. 12" minimum beyond air intake.



**Figure 17 - Unbalanced Venting - Roof Exhaust and Sidewall Intake**

**NOTE:** These drawings are meant to demonstrate system venting only. The installer is responsible for all equipment and detailing required by local codes.

## WARNING

All vent pipes must be glued, properly supported, and the exhaust pitched a minimum of 1/4" per foot back to the appliance to allow drainage of condensate. When placing support brackets on vent piping, the first bracket must be within 1 foot of the appliance and the balance of 4 foot intervals on the vent pipe. Venting must be readily accessible for visual inspection from the first three feet from the appliance.

## 2. Venting Through an Existing System

This appliance may be vented through an existing unused vent system. The inner diameter of the existing vent system is utilized for the combustion air source. Two methods have been approved for such venting: Concentric Venting Through an Existing System and Venting as a Chase.

Vent / Air Inlet Size	Minimum Existing Vent / Chase Size
2"	4"
3"	5"
4"	7"

**Table 10 - Minimum Existing Vent / Chase Sizing**

## DANGER

Do not install the appliance into a common existing vent with any other appliance. This will cause flue gas spillage or appliance malfunction, resulting in substantial property damage, serious personal injury, or death.

## CAUTION

Contractors must check state and local codes before installing through an existing vent opening. State and local codes always take precedence over manufacturer's instructions. Failure to check state and local codes before installing through an existing opening could result in property damage and add significantly to installation costs.

If an existing venting system is converted for use with this appliance, the installer must ensure that the existing venting system is clean and free from particulate contamination that could damage the appliance. Failure to do so could result in property damage and appliance failure. Such failure IS NOT covered under warranty.

### Concentric Venting Through an Existing System

NOTE: The following instructions refer only to venting through an existing vent system, and not to venting with HTP's optional concentric vent kits. Refer to Concentric Vent Kit installation manual (LP-166) for further information on venting with the optional concentric vent kits.

Concentric venting through an existing system must run vertically through the roof. Use only the approved venting materials specified in Table 4 for piping the system. All instructions listed in this Venting section apply. See Figures 18-1 and 18-2 for venting demonstrations.



## DANGER

The upper and lower vent terminations as well as all joints in the venting system must be properly sealed to ensure that all combustion air is drawn properly and exhaust does not leak from the system. Failure to properly seal the venting system will result in property damage, serious personal injury, or death.

### Chase Venting Through an Existing System

When venting as a chase, follow all instructions included in this Venting section, including those in the previous Concentric Venting Through an Existing System section. See Figure 18-3 for chase

venting demonstration.

### 3. Power Venting, Indoor Combustion Air in Confined or Unconfined Space

This appliance requires fresh, uncontaminated air for safe operation and must be installed in a mechanical room where there is adequate combustion and ventilating air. **NOTE: To prevent combustion air contamination, see Table 2.**

Combustion air from the indoor space can be used if the space has adequate area or when air is provided through a duct or louver to supply sufficient combustion air based on the appliance input. **Never obstruct the supply of combustion air to the appliance.** If the appliance is installed in areas where indoor air is contaminated (see Figure 19) it is imperative that the appliance be installed as direct vent so that all combustion air is taken directly from the outdoors into the appliance intake connection.

**Unconfined space** is space with volume greater than 50 cubic feet per 1,000 Btu/hour (4.8 cubic meters per kW) of the total input rating of all fuel-burning appliances installed in that space. Rooms connected directly to this space, through openings not furnished with doors, are considered part of the space.

**Confined space** is space with volume less than 50 cubic feet per 1,000 Btu/hour (4.8 cubic meters per kW) of the total input rating of all fuel-burning appliances installed in that space. Rooms connected directly to this space, through openings not furnished with doors, are considered part of the space.

When drawing combustion air from inside a conventionally constructed building to a confined space, such space should be provided with two permanent openings: one located 6" (15 cm) below the space ceiling, the other 6" (15cm) above the space floor. Each opening should have a free area of one square inch per 1,000 Btu/hr (22cm<sup>2</sup>/kW) of the total input of all appliances in the space, but not less than 100 square inches (645cm<sup>2</sup>).

If the confined space is within a building of tight construction, air for combustion must be obtained from the outdoors as outlined in the Venting section of this manual. See Figure 20.

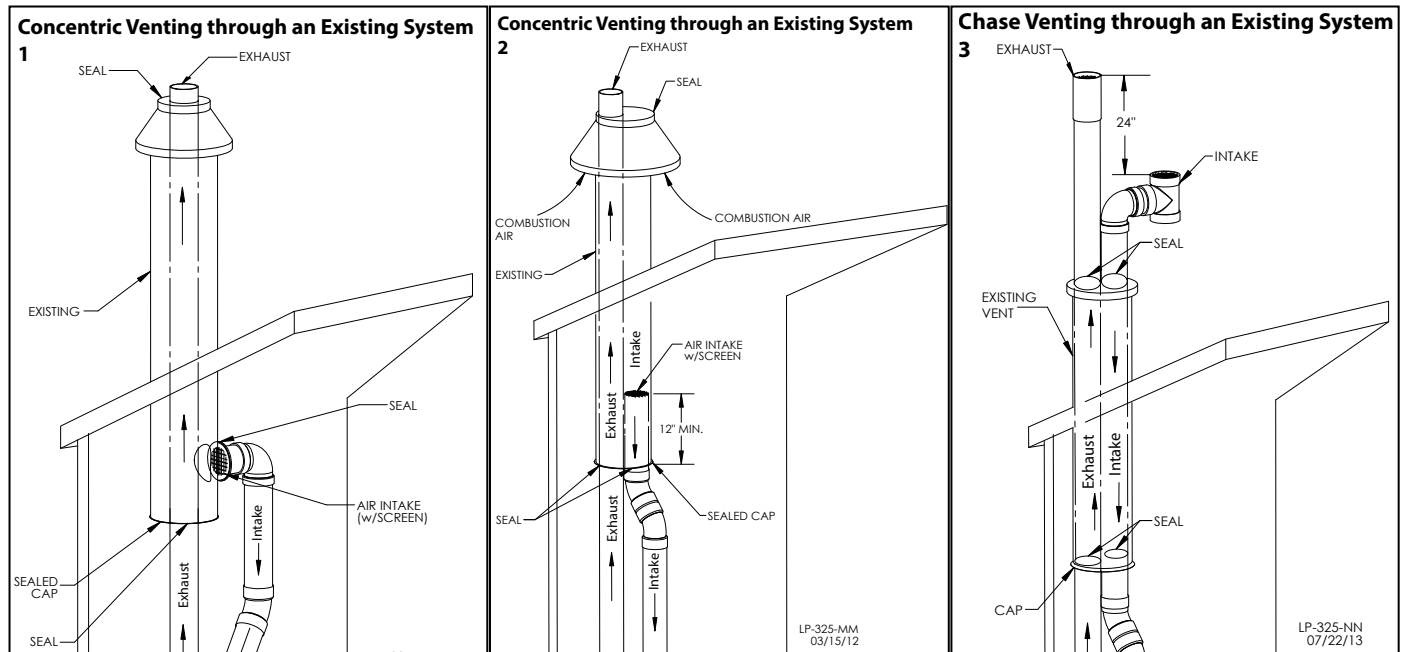


Figure 18 - 1, 2 - Concentric Venting Through an Existing System, 3, Chase Venting Through an Existing System

**NOTE:** These drawings are meant to demonstrate system venting only. The installer is responsible for all equipment and detailing required by local codes.

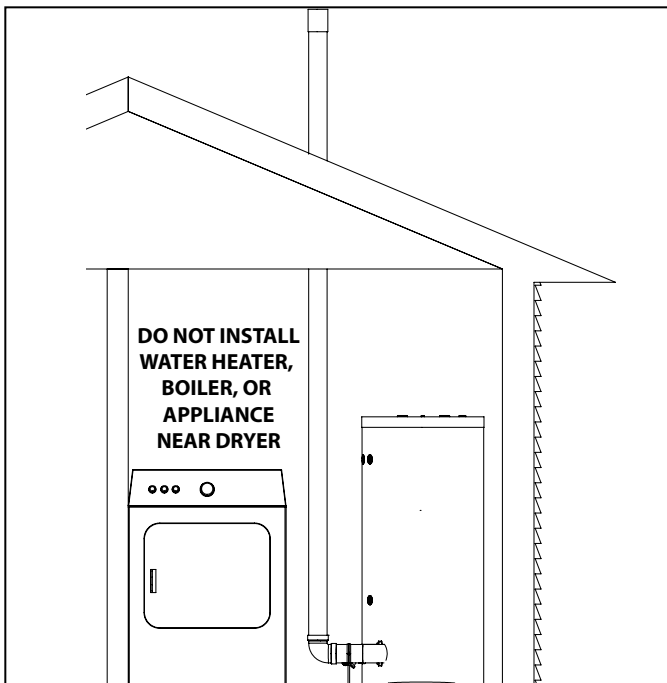
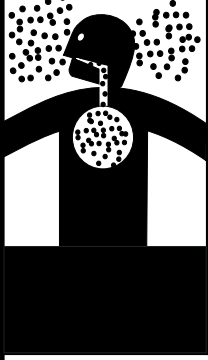


Figure 19 - Do Not Place Appliance Near Dryer

**⚠ WARNING**

**Breathing Hazard - Carbon Monoxide Gas**



- Do not operate heater if flood damaged.
- Install vent system in accordance with local codes and manufacturers installation instructions.
- Do not obstruct heater air intake or exhaust. Support all vent piping per manufacturers installation instructions.
- Do not place chemical vapor emitting products near unit.
- According to NFPA 720, carbon monoxide detectors should be installed outside each sleeping area.
- Never operate the heater unless it is vented to the outdoors.
- Analyze the entire vent system to make sure that condensate will not become trapped in a section of vent pipe and therefore reduce the open cross sectional area of the vent.

**Breathing carbon monoxide can cause brain damage or death. Always read and understand instruction manual.**

LP-304

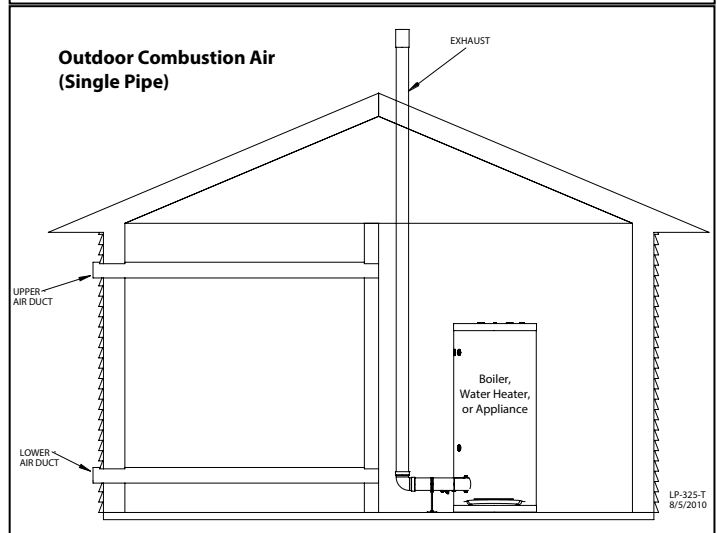
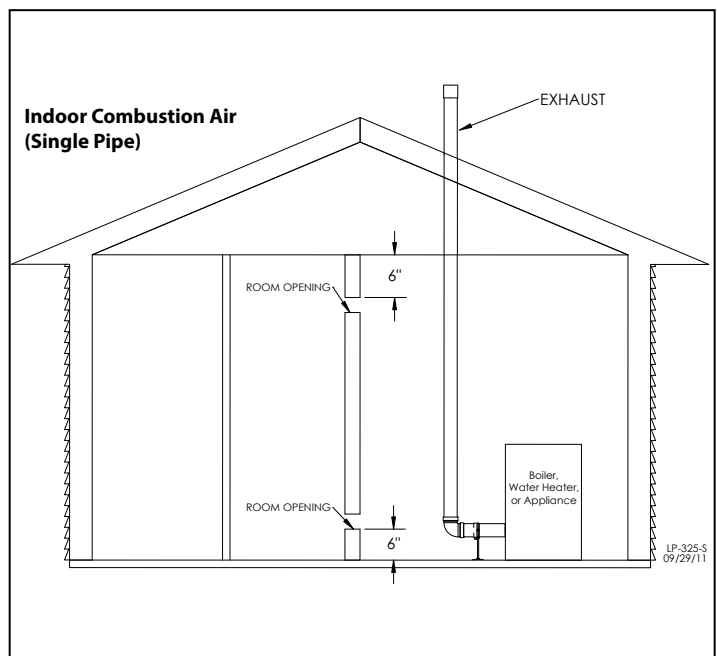


Figure 20 - Indoor and Outdoor Combustion Air - Single Pipe



## Part 6 - Condensate Removal

**NOTE:** Check with your local gas company to determine if combustion condensate disposal is permitted in your area. In the state of Massachusetts, condensate must be neutralized before entering a drain.

This condensing high efficiency appliance has a condensate removal system. Condensate is water vapor derived from combustion products, similar to that produced by an automobile when it is initially started. It is very important that the condensate line is sloped down away from the appliance and to a suitable drain.

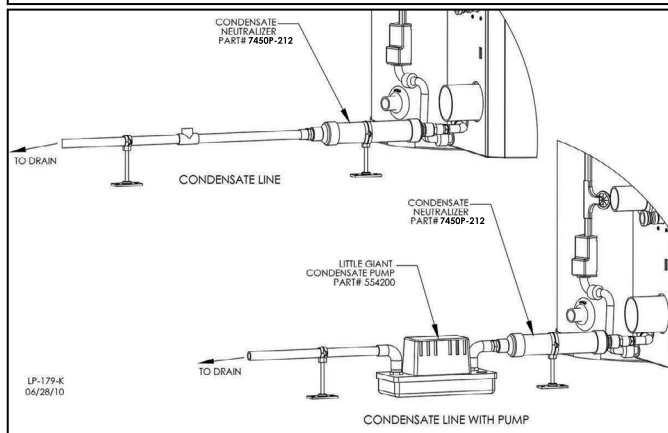
If the appliance condensate outlet is lower than the drain, you must use a condensate removal pump (kit p/n 554200 available from HTP). If required by local authorities, a condensate filter of lime crystals, marble, or phosphate chips will neutralize slightly acidic condensate. This can be installed in the field and purchased from HTP (p/n 7450P-212).

### CAUTION

The condensate line must remain unobstructed. If allowed to freeze in the line or obstructed in any other manner, condensate can exit from the appliance tee, resulting in potential water damage to property. When installing a condensate pump, select one approved for use with condensing appliances and furnaces. The condensate pump should have an overflow switch to prevent property damage from spillage. Condensate from the appliance will be slightly acidic (pH from 3.2 to 4.5). Install a neutralizing filter if required by local codes.

### WARNING

Power to the optional condensate pump is continuous. When the appliance is powered off the condensate pump will remain on. It is important to remember to turn off the condensate pump when powering down the appliance. Failure to do so could result in property damage, severe personal injury, or death.



**Figure 21 - Condensate Piping**

#### NOTES:

1. Condensate line must be pitched at least  $\frac{1}{4}$ " per foot to properly drain. If this cannot be done, or a very long length of condensate hose is used, increase the condensate line to a minimum of 1" ID and place a tee in the line after the condensate neutralizer to properly reduce vacuum lock in the drain line.
2. PVC or CPVC pipe should be the only material used for condensate line. Steel, brass, copper, and other metals will be subject to corrosion or deterioration.
3. A frozen condensate line could result in a blocked vent condition. It is very important to protect the condensate line from freezing temperatures or any type of blockage. In installations that may encounter sustained freezing conditions, the use of heat tape is recommended to avoid freezing of the condensate line. It is also recommended to bush up the condensate line size to 1" and

terminate condensate discharge as close to the unit as possible. Longer condensate runs are more prone to freezing. Damages due to frozen or blocked condensate lines ARE NOT covered by warranty.

4. Support of the condensate line may be necessary to avoid blockage of the condensate flow.

## Part 7 - Wiring

### WARNING

To avoid electrical shock, turn off all power to the appliance prior to opening an electrical box within the unit. Ensure the power remains off while any wiring connections are being made. Failure to follow these instructions could result in component or product failure, serious injury, or death. Such product failure IS NOT covered by warranty.

Jumping out control circuits or components WILL VOID product warranty and can result in property damage, personal injury, or death.

**NOTE:** Wiring must be N.E.C. Class 1. If original wiring as supplied with appliance must be replaced, use only TEW 105 °C wire or equivalent. Appliance must be electrically grounded as required by National Electrical Code ANSI/NFPA 70 – latest edition.

### A. Field Wiring

All the wiring connections made to the appliance in the field are done on the field connection board located on the right side of the cabinet. The cabinet has multiple knockouts available to route field wiring into and out of the field connection board. The control provides a pump output thermostat and outdoor sensor inputs to operate the central heating system.



### B. Line Voltage Wiring

1. Connect the normal **incoming power** to the terminals marked as shown in Figure 22. A line voltage fused disconnect switch may be required to be externally mounted and connected according to local codes and standards.
2. Connect the **central heating pump** as shown in the terminals marked CH/DHW PUMP (see Figure 22). The connections shown are suitable for a maximum continuous pump draw of 3 amps at 120 volts. If the pump requires more current or voltage than the 120 volts supplied, an external motor starter will be required.
3. Connect the **NHX pump (if applicable)** as shown in the terminals marked NHX PUMP (see Figure 22). The connections shown are suitable for a maximum continuous pump draw of 3 amps at 120 volts. If the pump requires more current or voltage than the 120 volts supplied, an external motor starter will be required.

### C. Low Voltage Wiring

1. Make all low voltage connections to the terminal strip located on the field connection board (shown in Figure 22) as outlined below.
2. The **room thermostat** should be connected to the terminals marked T STAT (shown in Figure 22). Alternately, any dry contact closure across these terminals will cause the unit to operate the hydronic heating module. **NOTE:** Caution must be used to ensure neither of the terminals becomes connected to ground. Mount the thermostat on an inside wall as central as possible to the area being heated, away from drafts or heat producing devices such as a television, which could influence the ability of the thermostat to measure room temperature accurately. **NOTE:** If the thermostat is equipped with a directly connected anticipator, the anticipator should be set at .1 amps. If the thermostat is connected to other devices, the anticipator should be set to match the power requirements of those connected devices. Refer to the instruction manuals of the connected devices for further information.
3. The **outdoor sensor** must be connected for the unit to operate at optimum efficiency. Use a minimum 22 AWG wire for runs of 100 feet or less and minimum 18 AWG wire for runs up to 150 feet. Instructions are included with the outdoor sensor to correctly mount the sensor

on the exterior surface of the building. It is preferable to mount the sensor on the north side in an area that will not be affected by direct sunlight but will be exposed to varying weather conditions. Connect the outdoor sensor to terminals marked "Outdoor" in Figure 22.

 <b>WARNING</b>
It is of extreme importance that this unit be properly grounded. It is very important that the building system ground is inspected by a qualified electrician prior to making this connection. Electrical power must only be turned on when the appliance is completely filled with cold water. Failure to follow these instructions could result in component or product failure, serious injury, or death.
An ASSE 1017 thermostatic mixing valve <b>MUST</b> be installed when using 0-10V or outdoor reset. Failure to do so could result in substantial property damage, serious injury, or death.
 <b>CAUTION</b>
Label all wires prior to disconnecting them when servicing the appliance. Wiring errors can cause improper and dangerous operation. Failure to follow these instructions may result in property damage or personal injury.

#### D. Alarm Connections

The control includes an alarm output. This circuit is rated at 3 amps at 120 volts. This contact can be used to activate an alarm light or bell or notify a building management system if the appliance goes into a lockout condition.

#### E. Optional 0-10 Volt Building Control Signal

A signal from a building management system may be connected to the appliance to enable remote control. This signal should be a 0-10 volt positive-going DC signal. When this input is enabled using the installer menu, a building control system can be used to control the set point temperature of the appliance. The control interprets the 0-10 volt signal as follows; when the signal is between 0 and 1.5 volts, the appliance will be in stand-by mode, not firing. When the signal rises above 1.5 volts, the appliance will ignite. As the signal continues to rise towards its maximum of 10 volts, the appliance will increase in set point temperature. See Part 10 for details on the setting of Function 16.

**NOTE:** During 0-10V operation, the minimum tank temperature set point Function 9 (default 68°F) will be at the activation input of 1.5 volts. The maximum tank temperature set point value will be at the input voltage of 10 volts. The maximum tank temperature set point can be changed by increasing or decreasing Function 2 (Range: 95°F – 160°F / Default 119°F). Once programmed, the 0-10V feature will change the set point temperature automatically.

1. Connect a building management system or other auxiliary control signal to the terminals marked 0-10 VOLT + and 0-10 VOLT – in the electronics assembly (shown in Figure 22). Caution should be used to ensure that the 0-10 VOLT + connection does not become connected to ground.

2. Configuring the appliance for 0-10 volt operation (change only the functions in the descriptions below):

- a. Press and hold **ENTER** for 5 seconds
- b. Use **^** and **v** to adjust flashing **000** to code **975**. Press **ENTER** to enter the menu.
- c. Use **>** to scroll to Function 16 to enable/disable 0-10 volt operation. Press **ENTER**. Use **^** and **v** to adjust display to desired setting (Range: 0 = Off, 2 = On / Default Off).
- d. Press and hold **RESET** to save and exit the menu.

## F. Customer Connection Board

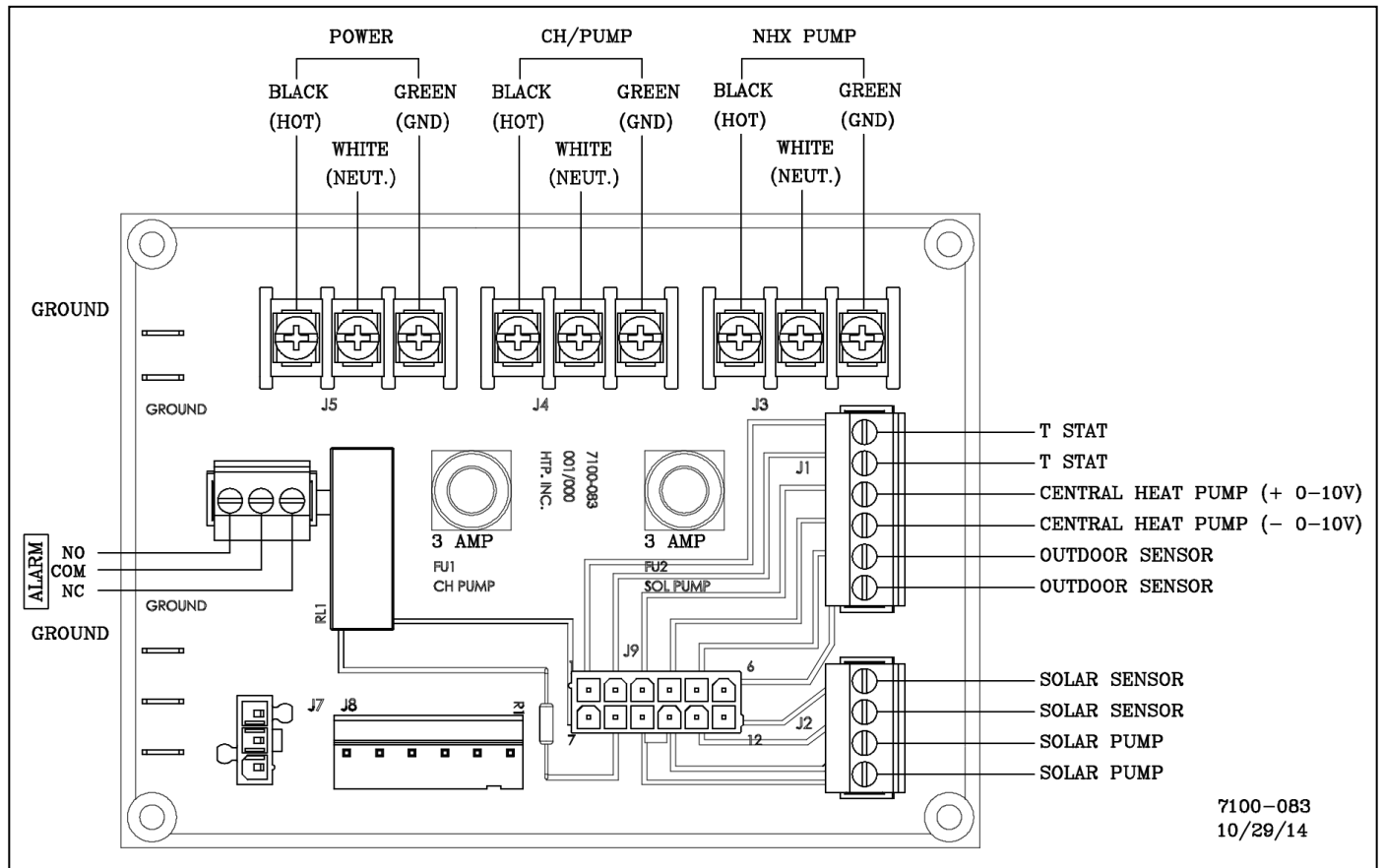


Figure 22 - Customer Connection Board

## G. Internal Wiring Diagram

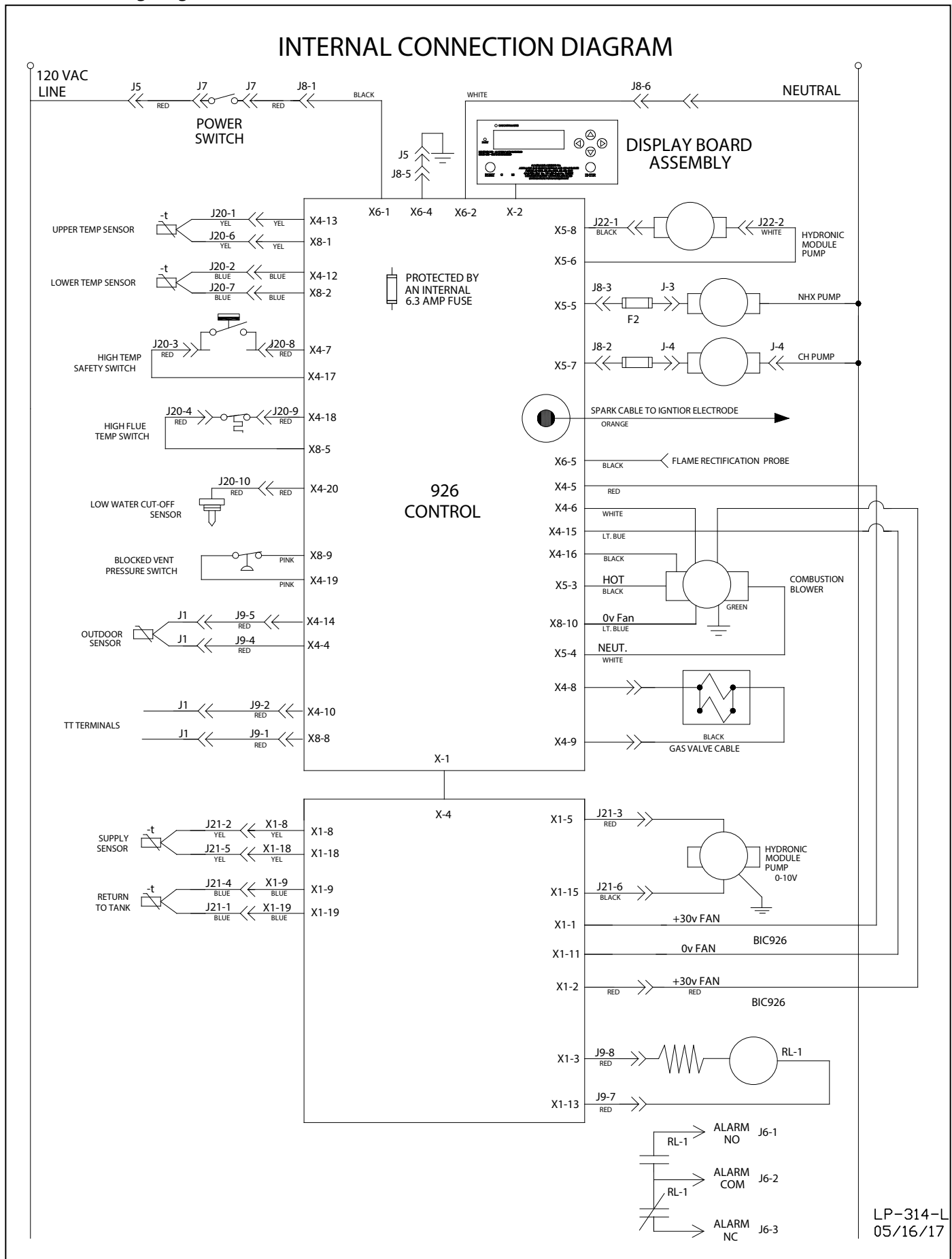


Figure 23 - Internal Wiring Diagram



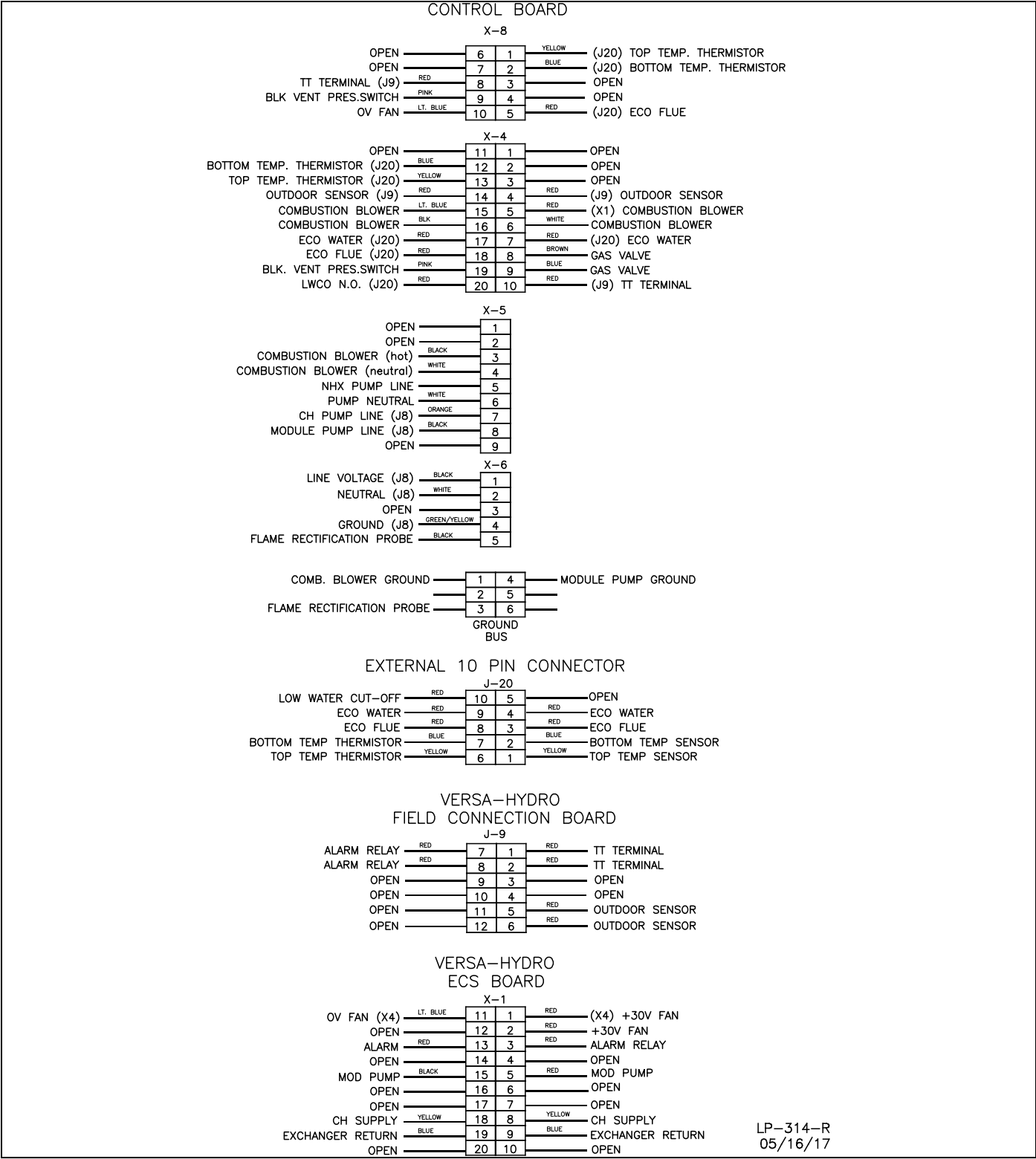


Figure 24 - Control Board Wiring

## Part 8 - Gas Connections

### WARNING

Failure to follow all precautions could result in fire, explosion, severe injury, or death.

Ensure the gas on which the appliance will operate is the same type specified on the rating plate. Failure to do so could result in appliance malfunction, property damage, personal injury, or death.

The gas supply shall have a minimum of no less than 3.5" water column, a maximum inlet pressure of no greater than 14" water column (350 mm), and ½ pound pressure (3.5 kPa). The entire piping system, gas meter, and regulator must be sized properly to prevent excessive pressure drop (greater than 0.5" WC) as stated in the National Fuel Gas Code. This information is listed on the rating plate.

It is very important that the appliance is connected to the gas type noted on the rating plate: "LP" for liquefied petroleum, propane gas, or "Nat" for natural or city gas. All gas connections must be approved by the local gas supplier or utility, in addition to the governing authority, prior to turning the gas supply on.

Do not remove the adaptor in Figure 25! It is mandatory that this fitting is used for connection to a field fabricated drip leg per the National Fuel Gas Code. You must ensure that the entire gas line to the connection at the appliance is no smaller than 3/4".

If the appliance experiences a pressure drop greater than 1" WC, the meter, regulator, or gas line is undersized or in need of service. A manometer can be attached to the incoming gas drip leg by removing the cap. The gas pressure must remain between 3.5" and 14" WC during stand-by (static) mode and while in operating (dynamic) mode at full output.

If an in-line regulator is used, it must be installed a minimum of 10 feet from the heater. It is very important that the gas line is properly purged by the gas supplier or utility. Improper line sizing or failure to properly purge the lines will result in ignition failure. This problem is especially noticeable in NEW LP installations, in empty tank situations, or when a

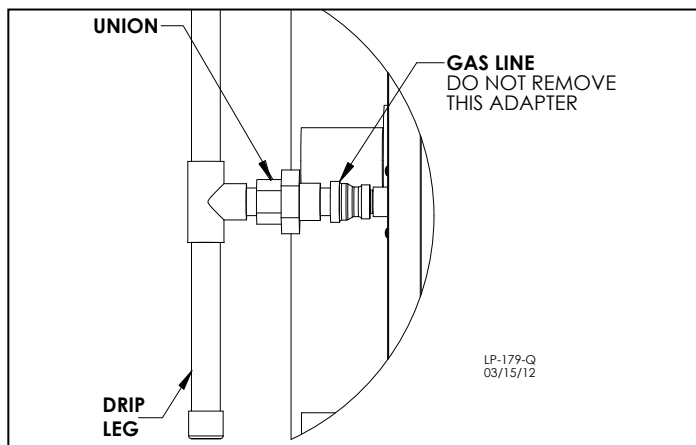


Figure 25 - Gas Connection

utility company shuts off service to an area to maintain supply lines. Once all inspections have been performed, the piping must be leak tested. If the leak test requirement is a higher test pressure than the maximum gas inlet pressure, isolate the heater from the gas line to continue leak testing. To do this, turn off the factory and field-installed gas cocks. Failure to do so may damage the gas valve.

In the event the gas valve is exposed to a pressure greater than ½ PSI, 14" water column, the gas valve must be replaced. The gas valve must not be replaced with a conventional gas valve under any circumstances. As an additional safety feature, the gas valve in this appliance has a flanged connection to the swirl plate and blower.

### WARNING

UL recognized fuel gas detectors are recommended in all enclosed propane and natural gas applications where there is a potential for an explosive mixture of fuel gas to accumulate. The installation of these detectors should be made in accordance with the detector manufacturer's recommendations, and/or local laws. Failure to install fuel gas detectors in these applications could result in fire, explosion, property damage, severe personal injury, or death.

### WARNING

**Breathing Hazard - Carbon Monoxide Gas**

- Do not operate heater if flood damaged.
- Install vent system in accordance with local codes and manufacturers installation instructions.
- Do not obstruct heater air intake or exhaust. Support all vent piping per manufacturers installation instructions.
- Do not place chemical vapor emitting products near unit.
- According to NFPA 720, carbon monoxide detectors should be installed outside each sleeping area.
- Never operate the heater unless it is vented to the outdoors.
- Analyze the entire vent system to make sure that condensate will not become trapped in a section of vent pipe and therefore reduce the open cross sectional area of the vent.

**Breathing carbon monoxide can cause brain damage or death. Always read and understand instruction manual.**

LP-304

## A. Gas Pipe Sizing Tables

### 1. Gas Pipe Sizing

This information is for reference use only. Refer to gas pipe manufacturer specifications for actual delivery capacity. The DOE standard for Natural Gas is 1100 BTU/ft<sup>3</sup>. Contact the local gas supplier for actual BTU/ft<sup>3</sup> rating.

### 2. Natural Gas Pipe Sizing

The following table lists maximum capacity of pipe in cubic feet of gas per hour for gas pressures of 14" or less and a pressure drop of 0.5 inches water column, based on a 0.60 specific gravity for natural gas.

Pipe Size (in.)	Length of Pipe (Feet)										BTU's Per Hour x 1,000
	10	20	30	40	50	60	80	100	150	200	
3/4	360	247	199	170	151	137					Schedule 40 Metallic Pipe  (0.60 Specific Gravity, 0.5 WC Pressure Drop)
1	678	466	374	320	284	257	220	195	157	134	
1 1/4	1390	957	768	657	583	528	452	400	322	275	
1 1/2	2090	1430	1150	985	873	791	677	600	482	412	
2	4020	2760	2220	1900	1680	1520	1300	1160	928	794	
3	11300	7780	6250	5350	4740	4290	3670	3260	2610	2240	
4	23100	15900	12700	10900	9660	8760	7490	6640	5330	4560	

Table 11 - Natural Gas Delivery Capacity - Refer to ANSI Z223.1 - National Fuel Gas Code, Latest Edition

### 3. LP (Liquid Propane) Gas Pipe Sizing

Contact gas supplier to size pipes, tanks, and 100% lockup gas pressure regulator. Adjust propane supply regulator provided by the gas supplier for 14 inches w.c. maximum pressure.

## B. Gas Piping Requirements

### ⚠ WARNING

Support gas supply piping with hangers, not by the heater or its accessories. The heater gas valve and blower will not support the weight of the piping. Make sure the gas piping is protected from physical damage and freezing, where required. Failure to follow these instructions could result in gas leakage, fire, explosion, property damage, severe personal injury, or death.

Do not use Teflon tape on gas line pipe thread. Use a pipe compound rated for use with natural and propane gases. Apply sparingly on male pipe ends, leaving the two end threads bare. Failure to follow these instructions could result in gas leakage, fire, explosion, property damage, severe personal injury, or death.

1. The gas adapter fitting on the appliance is 3/4" NPT. **NOTE:** The gas supply pipe size must not be less than 3/4".
2. The supply line must be sized for the maximum output of the appliance being installed. If there are additional gas appliances on the main supply line, size the supply line for the maximum total COMBINED BTU/Hr draw of the appliances. This will ensure the supply line is sized to allow all the appliances to operate at the same time.
3. Measure the length of the gas supply line from the gas meter to the appliance. The appliance must be installed downstream of the gas meter to ensure adequate gas supply.
4. Use the table in this manual or refer to the gas line manufacturer's sizing information to determine the correct supply pipe size. Run the gas supply line in accordance with all applicable codes.

5. The National Fuel Gas Code (NFPA 54) requires that a sediment trap (drip leg) be installed in the gas line on appliances not so equipped. The drip leg must be accessible, a minimum of 3" in length, and not subject to freezing conditions. See Figure 37.
6. A manual gas shut-off valve should be installed in the gas supply line close to the appliance. See Figure 37 for detail. Locate and install manual shutoff valves in accordance with local and state requirements.
7. To facilitate any future maintenance, it is also recommended that an approved gas union fitting be installed in the supply line between the shut-off valve and the 1/2" NPT connection on the appliance.
8. Use a manometer to test the gas pressure to make sure it meets the minimum standards and does not exceed the maximum standards of the appliance.
9. Leak test the gas line pipe before placing the appliance in operation. Only use approved leak detector liquid solutions to check for leaks. Never use an open flame to check for leaks.

## C. Gas Valve

### ⚠ DANGER

Do not do a gas conversion on this appliance without an officially approved conversion kit and instructions supplied by HTP. Failure to use a conversion kit when converting the appliance to fire on Natural or Propane gas will result in extremely dangerous burner operation, leading to fire, explosion, severe personal injury, or death.

### ⚠ WARNING

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

Adjustments to the throttle screw or offset may only be made by a qualified gas technician using a calibrated combustion analyzer capable of measuring CO<sub>2</sub> and CO. Failure to follow this instruction could result in fire, explosion, property damage, severe personal injury, or death.

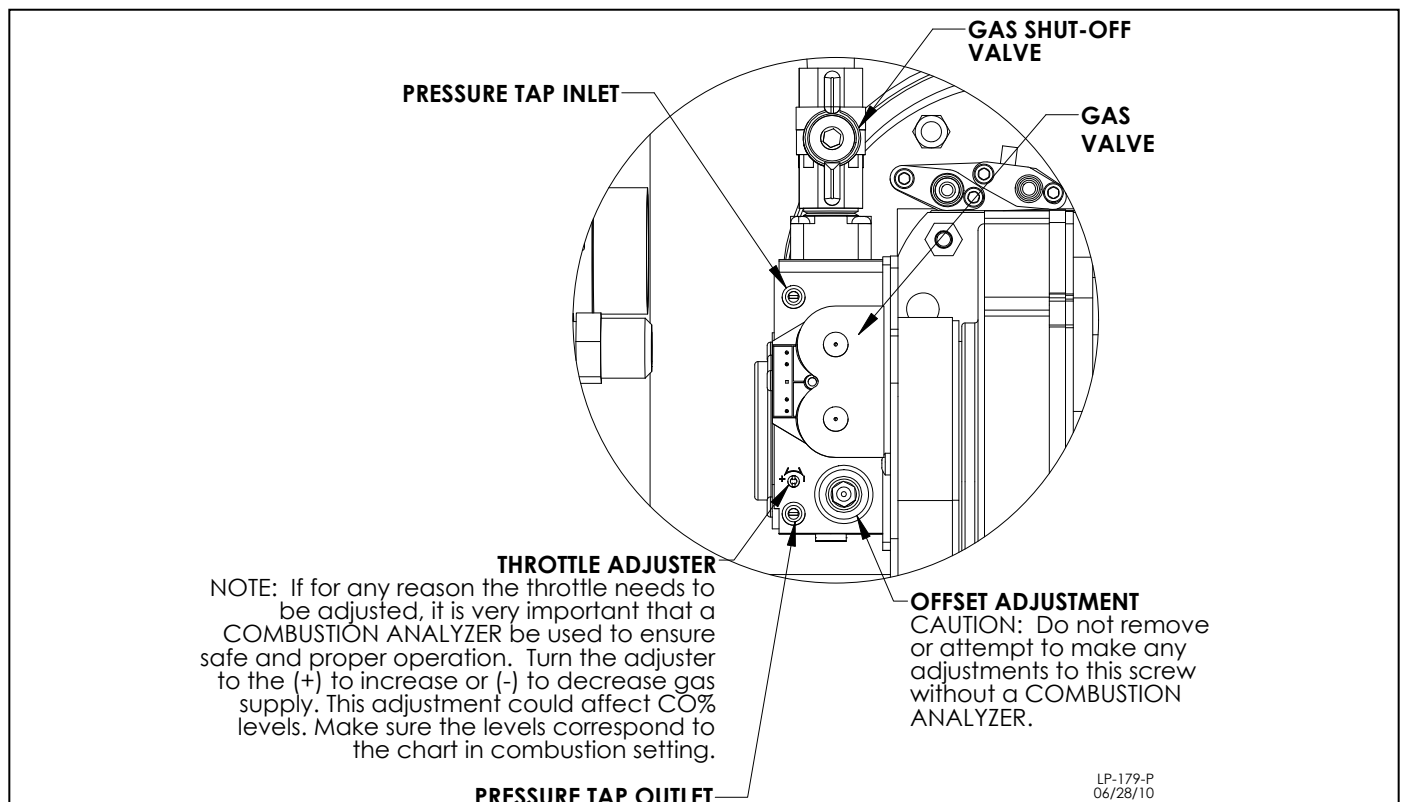


Figure 26 - Gas Valve

## D. Checking Gas Pressure at the Appliance for Proper Operation

**NOTE:** Refer to Figure 39 when checking gas pressure.

1. The appliance and its individual shutoff valve must be disconnected from the gas supply piping system during any pressure testing of the system at pressures greater than ½ psi (3.5 kPa).
  2. The appliance must be isolated from the gas supply piping system by closing its individual manual shutoff valve during any pressure testing of the gas supply piping system at test pressures equal to or less than ½ psi (3.5 kPa). Loosen the screw on the pressure tap inlet to attach a manometer and check the gas inlet pressure.
- The minimum and maximum inlet gas line pressures must meet the requirements shown in Table 22.

Natural or LP Gas	
Minimum Pressure	3.5" WC
Maximum Pressure	14" WC

**Table 12 - Gas Pressure Requirements**

## NOTICE

Do not fire (operate) the appliance until all connections have been completed and the heat exchanger is filled with water. Doing so will damage the appliance and void the warranty.

## Part 9 - Start-Up Preparation

### WARNING

#### FOR YOUR OWN SAFETY READ BEFORE OPERATING

1. This appliance does not have a pilot. It is equipped with an ignition device which automatically lights the burner. Do not try to light the burner by hand.
2. BEFORE OPERATING: Smell all around the appliance area for gas. Be sure to smell next to the floor because some gas is heavier than air and will settle on the floor.

#### WHAT TO DO IF YOU SMELL GAS

- Do not try to light any appliance.
  - Do not touch any electric switch, do not use any phone in your building.
  - Immediately call your gas supplier from a neighbor's phone. Follow the gas suppliers' instructions.
  - If you cannot reach your gas supplier, call the fire department.
  - Turn off the gas shutoff valve (located outside the appliance) so that the handle is crosswise to the gas pipe. If the handle will not turn by hand, don't try to force or repair it, call a qualified service technician. Force or attempted repair may result in a fire or explosion.
4. Do not use this appliance if any part has been under water. Immediately call a qualified service technician to inspect the appliance and to replace any part of the control system and any gas control that has been damaged.
  5. The appliance shall be installed so the gas ignition system components are protected from water (dripping, spraying, rain, etc.) during appliance operation and service (circulator replacement, condensate trap, control replacement, etc.)
- Failure to follow these instructions could result in property damage, serious personal injury, or death.

## A. Fill and Purge DHW

The power must remain off until the potable water side of the appliance is fully purged of air. To purge the tank, turn on the cold water feed and open a faucet at the highest point of the system. Observe filling of the tank and inspect for any leaks in the system which may occur and need to be repaired. Shut off faucet once all evidence of air is purged from the water stream.

### WARNING

Ensure the appliance is full of water before firing the burner. Failure to do so will damage the appliance. Such damage IS NOT covered by warranty, and could result in property damage, serious personal injury, or death.

## B. Fill and Purge Hydronic Heating Loop

### WARNING

Never use automotive or standard glycol antifreeze, or ethylene glycol made for hydronic systems. Use only freeze-prevention fluids certified by fluid manufacturer as specified for use with stainless steel hydronic heating module heat exchanger and verified in fluid manufacturer's literature. Thoroughly clean and flush any system that has used glycol before connecting to the stainless steel hydronic heating module heat exchanger. Provide MSDS material data safety sheet on fluid used to owner.

1. Local codes may require back flow preventer or actual disconnect from city water supply.
2. The power must remain off until the hydronic heating loop is fully purged of air.
3. Determine freeze protection fluid quantity using total system water content of 1/2 gallon. Remember to include expansion tank water content and follow fluid manufacturer's instructions.
4. When using freeze protection fluid with automatic fill, install a water meter to monitor water make-up. Freeze protection fluid may leak before the water begins to leak, causing concentration to drop, reducing the freeze protection level.
5. Manually close any automatic air vents and any drain valves in the hydronic system loop.
6. Fill the system to correct pressure after ensuring the water quality meets the water quality standards outlined within this manual. The correct pressure will vary with each application.
  - a. Typical system pressure is 15 PSI.
  - b. Pressure will rise when the hydronic module starts to heat with the heated water from the domestic side of the system. Operating pressure must never exceed the relief valve pressure setting of 30 psi.
  - c. At initial fill and during start-up and testing, check system thoroughly for any leaks. Repair all leaks before proceeding further.

### CAUTION

Eliminate all system leaks. Continual fresh make-up water will reduce the hydronic heating module heat exchanger ability to effectively transfer heat and reduce performance.

7. The system may have residual substances that could affect water chemistry. After the system has been filled and leak tested, verify that water pH and chloride concentrations are acceptable by sample testing.

### CAUTION

It is important that you purge the system of air to avoid damage to the modulating pump.

## C. Purge Air from Hydronic Heating Module

1. Connect to a purge and drain valve location (shown in piping details) and route hose to an area where water can drain and be seen.
2. Close the ball valves below the purge and drain valve.
3. Close zone isolation valves.
4. Open quick-fill valve on make-up water line.
5. Open purge valve.
6. Open the isolation valves one zone at a time. Allow water to run through the zone and push out air. Run until no noticeable air flow



is present. Close the zone isolation valves and proceed with the next zone. Follow this procedure until all zones are purged.

7. Close the quick-fill valve and purge valve and remove the hose. Open all isolation valves. Watch the system pressure rise to correct cold-fill pressure. It is recommended that you put the pumps into manual operation to assist in purging the circuits.

#### D. Using the Control to Assist in Purging System Loops

Before powering up the control assure the thermostat connection is disconnected on the field connection board. Apply power to the appliance (Note: The appliance will fire the burner and heat the water inside the storage tank to the domestic hot water temperature set point). Press >. The display can show the temperature set point of the appliance. Press the **v** and ENTER keys simultaneously and hold for 1 second. The display will read:

SERVICE PUMP	CH
PUMP ON	TIME

The central heating pump will come on. Run pump until all the air has been purged through each circuit. If you press the **^ v** keys simultaneously, the central heating pump will shut off. The display will read:

READY	
PUMP OFF	12:42

Once the system has been purged of air, the installer can now proceed to program the control and system design parameters.

#### E. Programming the Total System Control

Before programming the Total System Control to the specific needs of the system, verify that the system is ready for operation. Be certain that:

- The Domestic Hot Water system is filled with water that meets the qualifications and all air is purged.
- The mixing valve supplied is properly installed.
- The Hydronic Heating System is filled with water and meets all qualifications and all air is purged.
- The outdoor reset sensor is installed in a proper location.
- The electrical power supply is installed by a licensed professional.
- Turn down thermostats, making sure that they are set so there is no call for heat while programming.

**This following discusses how to program a few of the major sections of the control parameters for optimum system performance. See Start-Up Procedures for the Installer for more detailed information on the operation of the display and other parameters.**

1. Turn on the main power switch on the top right of the burner cabinet. NOTE: At first startup, the water in the tank is cold and the burner will ignite. This is normal operation. You can continue to adjust settings while the burner is running.

2. Press and hold **ENTER** for 4 seconds until you see the screen to enter the log in access code shown below.

ENTER MENU CODE
000

3. Use the < key to move the blinking zero to the left most zero. Next, use **^** and **v** to log in 600, the access code. Press **ENTER** confirm the code and access Appliance Setting Program Navigation menu.

4. Once the code is confirmed, you can begin to set the Appliance Settings. Use the arrow keys to navigate. To change a setting, press **ENTER**. Appliance settings can be increased by pressing **^** and decreased by pressing **v** on the display. Once a new value has been selected, press **ENTER** to store the new value.

5. The first screen is the "Central Heating" value. Enter the value for your designed hydronic heating supply temperature. The

factory default is 140°F. NOTE: Values are determined based on program settings.

CENTRAL HEATING
140°F

6. After you have entered and stored the "Central Heating" value, press > once. The second screen adjusts the heating system "Heating Delta T" value. The factory default is 20°F.

HEATING DELTA T
20°F

7. After you have entered and stored the "Heating Delta T" value, press > once. The third screen adjusts the "DHW Set Point". Adjust the value to the desired Domestic Hot Water temperature. The factory default is 119°F. IMPORTANT NOTE: This value sets the tank temperature when the appliance is in warm weather shutdown. A mixing valve must be properly installed and adjusted to a proper outlet value for safe operation.

DHW SETPOINT
119°F

8. After you have entered and stored the "DHW Set Point" value, press **RESET** to return to the home screen on the display. This completes the essential programming in Appliance Setting Programs. If other values need to be changed in this section, such as the display time, refer to Control Overview, this manual.

9. A proper outdoor reset curve should be set to further optimize system performance and efficiency. The following chart shows how each function will affect system performance. The values in the chart show the system default.

10. Press and hold **ENTER** for 4 seconds until you see the Enter Menu Code screen.

11. Use the < and > arrow keys to move the blinking zero to the left and right. Next, use the **^** and **v** arrow keys on to log in the access code of 925. Press **ENTER** to access the **System Setting Program Navigation** menu. Once the code is confirmed, you can set the **System Settings**. Use < and > to navigate through the **System Setting Program**.

12. Press > 3 times to scroll to Function 4 - "WARM WEATHER OFF". This is the warm weather shutdown. This function determines the outdoor temperature that will turn off the hydronic heating module and operate the appliance only as an appliance for the warmer weather. To adjust this value, press **ENTER** and the factory default of 68°F starts to blink. Use **^** and **v** to adjust this value to your system needs. To store the new value press **ENTER**.

13. Next, press > once to scroll to Function 5 - "MIN OUTDOOR TEMP". This function is the first step to setting the outdoor reset curve. Enter your system's minimum outdoor temperature value. To adjust the value, press **ENTER** and the factory default of 5°F starts to blink. Use **^** and **v** to adjust to your designed temperature. To store the new value press **ENTER**.

14. Press > once to scroll to Function 6 - "MAX SUPPLY TEMP". This function is the second step to setting your outdoor reset curve. Enter your system's hydronic heating module maximum supply temperature value. To adjust the value, press **ENTER** and the factory default of 140°F will start to blink. Use **^** and **v** to adjust to your designed temperature. To store the new value press **ENTER**.

**NOTE:** This should be the same value entered in step 5.

15. Press > once to scroll to Function 7 - "MAX OUTDOOR TEMP". This function is the third step to setting your outdoor reset curve. Enter your system's maximum outdoor temperature value. To adjust the value, press **ENTER** and the factory default of 68°F will start to blink. Use **^** and **v** to adjust to your designed temperature. To store the new value press **ENTER**.

16. Press > once to scroll to Function 8 - "MIN SUPPLY TEMP". This function is the final step to setting your outdoor reset curve. Enter your system's hydronic heating module minimum supply temperature value. To adjust the value, press **ENTER** and the factory default of 120°F

will start to blink. Use **^** and **v** to adjust to your designed temperature. To store the new value press **ENTER**.

17. The major Total System Control values are now programmed. Press **RESET** to return to the main screen. To adjust other system values, refer to Control Overview, this manual.

18. Ensure that there is no air lock or blockage in the tank side loop of the hydronic heating module. To do this, press and hold **v** and **ENTER**. This will bring you into the pump service mode. Press **^** 3 times until "SERVICE PUMP RS 5" is on the screen. This puts the hydronic heating module pump at 5 volts (50%). Press **>** until the value is increased to 10, putting the pump at full speed. Once flow is confirmed, press **^** and **v** at the same time to return you to the main screen.

19. Allow the temperature in the tank to reach its value. Once the tank is up to temperature the burner will shut off.

20. Once the temperature in the tank is up to its set point, the DHW mixing valve must be set correctly. Turn on the hot water faucet at a nearby source. Use a temperature measuring device to measure the water temperature. **DO NOT USE YOUR HANDS!** Any skin contact at this point could cause serious injury. Adjust mixing valve to desired hot water outlet following Mixing Valve Instructions in this manual.

21. Once a safe DHW outlet temperature is set with the supplied mixing valve, the system is ready to run. Adjust thermostats to the desired value. Total System Control will now modulate and control the system.

## Part 10 - Start-Up Procedures for the Installer

The control monitors the safety sensors of the appliance to assure safe and efficient operation. It has many features to address configurations associated with hydronic design.

This section addresses the programming features of the control. It is important to fully understand its capabilities. This section addresses the adjustment of Appliance Settings / System Settings / Maintenance Settings and System Diagnostics to help customize your control.

However, the control is programmed with factory defaults that may already fit your hydronic design and may not require any adjustment at all.

### A. Navigation of the Display

The display includes a two-line backlit LCD readout that provides informative messages about appliance operation. Many operating parameters can be viewed and adjusted by using the six buttons on the display. The function of each button is described below.

**RESET** – The **RESET** button has two functions:

- Reset any lockout error code.
- Return the user to the default display screen.

**ENTER** – The **ENTER** key is used to enter the parameter programming mode. To enter this mode, hold down the **ENTER** key for more than 4 seconds. The readout will change to:

ENTER MENU CODE 000
------------------------

One of the zeroes will be blinking. Use the **^** and **v** arrow keys to change the blinking digit to the correct value. Use the **<** and **>** arrow keys to select the next digit to change and again use the **^** and **v** keys to change the value. Repeat until the correct code is entered. Press the **ENTER** key to accept the code. If the code is correct, the readout will change to the appropriate screen. If the programming code is not accepted the readout will continue to display as shown above.

The **ENTER** key is also used to enable a parameter for editing. After navigating to the desired parameter, hold down the **ENTER** key for one second. When the **ENTER** key is released, the parameter value will begin to blink. The parameter can now be changed using the **^** and **v** keys. After the new value is selected, presses the **ENTER** key for 1 second to lock in the new parameter value. The value will then stop blinking.

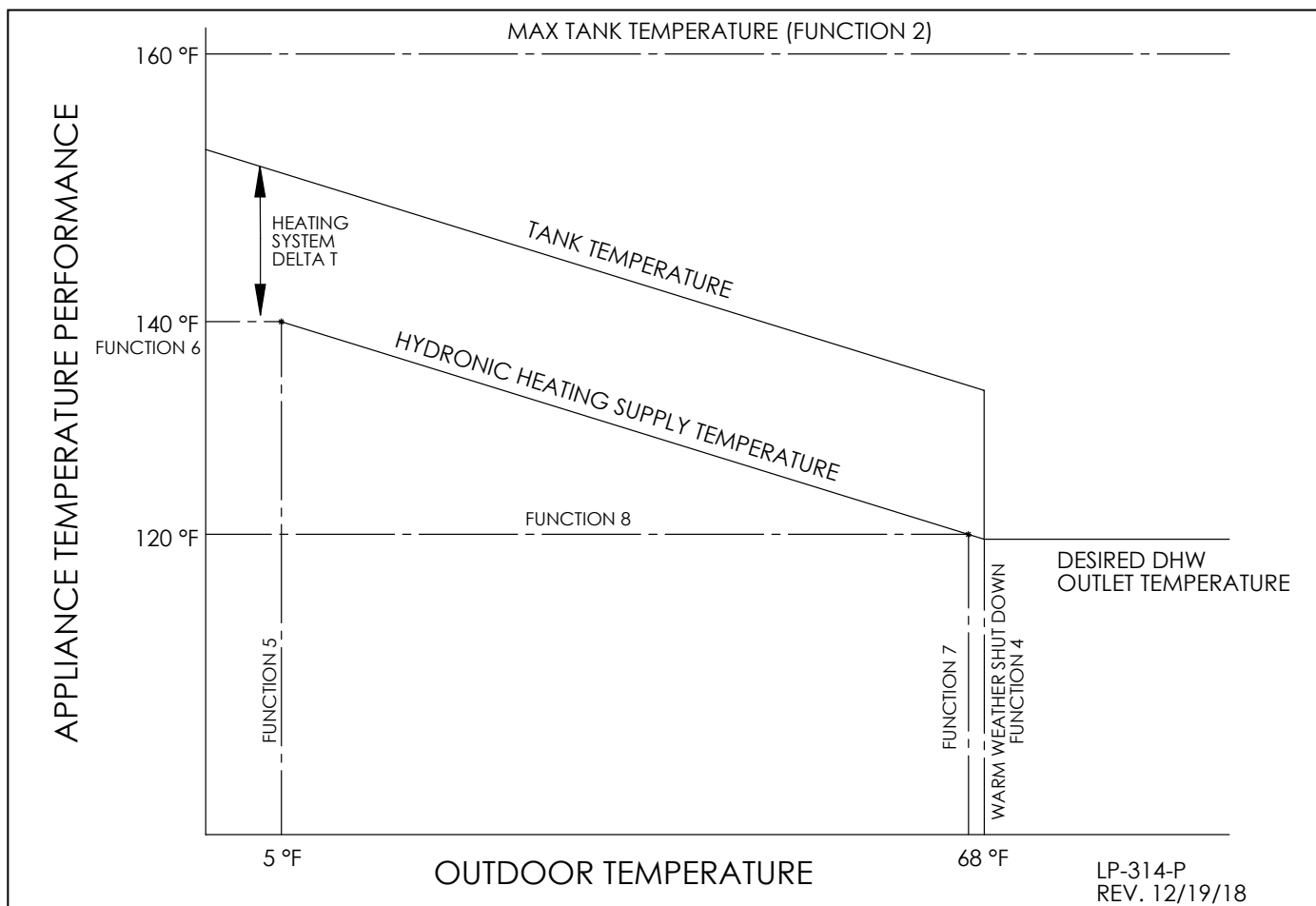


Figure 27 - Outdoor Reset

**Left < and Right > ARROW Keys** – The right and left arrow keys (< and >) are used to navigate between the default Display and Status Display. The < and > keys are also used in programming modes to change between programmable parameters. It is recommended you use the Menu Maps in the back of this manual and the detailed menu instructions printed in this section to help in menu navigation.

**Up ^ and Down v ARROW Keys** – The up and down (^ and v) arrow keys are used to navigate between the various parameters displayed in the menu. After the parameter is enabled for editing by pushing the **ENTER** key, the ^ and v keys are used to adjust the parameter upward or downward to the desired value.

## B. Programming the Control

### Program Access

Note: Programming the control is not possible when the appliance is firing. Make sure any input which can create a demand on the appliance, such as the thermostat, is turned off, so the appliance will remain idle to allow programming.

Screen	Description
ENTER MENU CODE 000	To access the setting program, press and hold <b>ENTER</b> for 4 seconds until the display shows the screen at left.
ENTER MENU CODE 600	Use the arrow keys to log in the <b>Access Code - 600</b> . Press <b>ENTER</b> to confirm the code and access the <b>Program</b> navigation menu.

**Table 13 - Program Setting Access**

### Appliance Setting Program Navigation

Once the code is confirmed, the user can start to set the **Appliance Settings**. Use the arrow keys on the display to navigate through the **Appliance Settings**. A blinking setting indicates the setting can be changed. To change a setting, press **ENTER**. Appliance settings can be increased by pressing ^ and decreased by pressing v on the display. When done, press **ENTER**. The setting will stop blinking and the user can move on to next setting by pressing the < or > arrow keys. Press **RESET** to exit programming and store settings. Listed below are the settings that can be programmed into the control.

Screen	Description
CENTRAL HEAT 140 °F	Allows the user to adjust the central heating set point from 50°F to 140°F (Factory Default 140°F).
HEATING DELTA T 20 °F	Adjusts the central heating delta T set point from 5°F to 30°F (Factory Default 20°F).
DHW SETPOINT 119 °F	Adjusts the DHW set point from 95 to 180°F (Factory default 119°F). <b>NOTE:</b> The appliance is supplied with a thermostatic mixing valve that must be installed on to the domestic hot water system. Any changes in this set point will also require adjustment to the mixing valve. Please refer to the mixing valve section in Domestic Water Piping, this manual, for further setup and operation details.
BURNER RUN OFFSET 5 °F	Adjusts the offset from the current target tank temperature where the control will begin heating water. Range: 1 to 18°F (Factory default 5°F).
TEMP DISPLAY C OR F °F	Adjusts the temperature measurement in F = Fahrenheit to C = Celsius (Default is Fahrenheit).

**Table 14 - Appliance Setting Program Navigation**

### Clock Settings

**(NOTE:** The clock will reset if the appliance is powered off for more than a week.)

Screen	Description
CLOCK MODE (12/24) 08/28/2009 Fr 9:42A	Changes the clock from 12 hour mode (8:45 PM) to 24 hour mode (20:45). To change to 24 hour mode, press <b>ENTER</b> . The letter (A or P) after the time will blink. Press the up or down arrow key once and the letter will disappear. Press <b>ENTER</b> to save the new setting.
CLOCK HOUR 08/28/2009 Fr 10:01A	Allows the user to adjust the hour setting.
CLOCK MINUTE 08/28/2009 Fr 10:01A	Adjusts the minute setting.
CLOCK DAY OF WEEK 08/28/2009 Fr 10:01A	Adjusts the day of the week.
CLOCK DATE MODE 08/28/2009 Fr 10:01A	Allows the user to switch to European date format (2009/08/28) from US format (08/28/2009).
CLOCK YEAR 08/28/2009 Fr 10:01A	Adjusts the year setting.
CLOCK MONTH 08/28/2009 Fr 10:01A	Adjusts the month setting.
CLOCK DATE 08/28/2009 Fr 10:01A	The clock is set.

**Table 15 - Clock Setting Screens**

**NOTE:** The internal clock does not adjust for daylight savings time and requires manual adjustment.

## C. Programming the System Setting

### System Setting Program Access

Note: Programming the control is not possible when the appliance is firing. Make sure any input which can create a demand on the appliance, such as the thermostat, is turned off, so the appliance will remain idle to allow programming.

Screen	Description
ENTER MENU CODE 000	To access the system setting program, press and hold <b>ENTER</b> for 4 seconds until the display shows the screen at left.
ENTER MENU CODE 925	Use the arrow keys to log in the <b>System Menu Access Code - 925</b> . Press <b>ENTER</b> to confirm the code and access the <b>System Setting Program</b> navigation menu.

**Table 16 - System Setting Access**

### D. System Setting Program Navigation

Once the **System Menu Access Code** is confirmed, the user can begin to set the system settings. Use the < > keys on the display to navigate through the System Settings. To change a setting, press **ENTER**. System settings can be **increased** by pressing ^ and **decreased** by pressing v on the display. When done, press **ENTER**. The setting will stop blinking and you can move on to next setting. Press **RESET** to exit programming and store settings. Listed below are the appliance settings that can be programmed into the control.

Screen	Description
<b>Function 1</b>	<b>Factory Program Mode</b>
MODE PHOENIX 1	This indicates that the control is configured correctly. Do not change this setting.

Screen	Description
<b>Function 2</b>	<b>Max Tank Temp</b>
MAX TANK TEMP 160 °F 2	Sets the overall tank temperature maximum limit. Factory Default is 160°F. (Range: 95 to 160°F).
<b>Function 3</b>	<b>DHW Offset Temp</b>
OFFSET 0°F 3	Not used.
<b>Function 4</b>	<b>Warm Weather Shutoff</b>
WARM WEATHER OFF 68°F 4	This setting disables the central heating module so the Total System Control will heat domestic hot water only. Warm Weather Shutoff occurs if the programmed outdoor temperature is exceeded by the current outdoor sensor temperature. Factory default 68°F (Range 41 to 122°F).
<b>Function 5</b>	<b>Min Outdoor Temp</b>
MIN OUTDOOR TEMP 5°F 5	Sets the minimum outdoor design temperature for the system. Factory default 5°F (Range -49 to 32°F).
<b>Function 6</b>	<b>Max Supply Temp</b>
MAX SUPPLY TEMP 140°F 6	Allows the user to set the maximum design supply temperature based on the minimum outdoor design temperature. Factory default 140°F (Range 77 to 140°F).
<b>Function 7</b>	<b>Max Outdoor Temp</b>
MAXOUTDOOR TEMP 68°F 7	Sets the maximum outdoor design temperature for the system. Factory default 68°F (Range 32 to 95°F).
<b>Function 8</b>	<b>Min Supply Temp</b>
MIN SUPPLY TEMP 120°F 8	Allows the user to set the minimum design supply temperature based on the maximum outdoor design temperature. Factory default 120°F (Range 32 to 180°F).
<b>Function 9</b>	<b>Min Tank Temp</b>
MIN TANK TEMP 68°F 9	Allows the user to set the minimum tank temperature. Factory default 68°F (Range 32 to 180°F).
<b>Function 10</b>	<b>CH Post Pump Time</b>
CH POST PUMP TIME 0 MINUTES 10	Allows the user to set the central heating pump post purge time once the thermostat is satisfied. Factory default 0 minutes (Range 0 to 10 minutes).
<b>Function 11</b>	<b>DHW Priority</b>
DHW PRIORITY 30 MINUTES 11	Sets DHW priority time: the amount of time to shut down the central heating module when the system control senses a substantial domestic hot water demand. Factory default 30 minutes (Range 0 to 60 minutes).
<b>Function 12</b>	<b>Error Outdoor Sensor</b>
ERROROUTD SENSOR ON 12	Sets the control to display an error message if an outdoor sensor is open or shorted. NOTE: This error does not stop the appliance from running. Factory default ON (Range: ON / OFF / PHOEN ON).

<b>Function 13</b>	<b>Error System Sensor</b>
ERROR SYSTEM SENS ON 13	Sets the control to display an error message if the system sensor is open or shorted. NOTE: This error does not stop the appliance from running. Factory default ON (Range: ON / OFF).
<b>NOTE: Press ENTER to store system parameters.</b>	
<b>Function 14</b>	<b>Service Schedule</b>
SERVICE SCHEDULE OFF 14	Programs the appliance maintenance schedule by selecting a service date or time based on the appliance run hours. Factory default OFF (Range: DATE or RUN HOURS). NOTE: Without setting this function Functions 15 - 18 will not display.
<b>Function 15</b>	<b>Year</b>
SERVICE SCHEDULE YEAR 00/00/2000 15	Allows the user to set the year of the next service reminder.
<b>Function 15</b>	<b>Hours</b>
SERVICE SCHEDULE 10000's 000000 15	Allows the user to set the left two digits of the amount of run hours (tens of thousands of hours) before next service reminder.
<b>Function 16</b>	<b>Month</b>
SERVICE SCHEDULE MONTH 00/00/2000 16	If the date function was selected, this function programs the month. If you selected the run hour function, you will need to program 10,000 hours, if required.
<b>Function 16</b>	<b>Hours</b>
SERVICE SCHEDULE 10000's 000000 16	Allows the user to set the middle two digits of the amount of run hours (thousands of hours) before next service reminder.
<b>Function 17</b>	<b>Day</b>
SERVICE SCHEDULE DAY 00/00/2000 17	Sets the day of next service reminder.
<b>Function 17</b>	<b>Hours</b>
SERVICE SCHEDULE 10000's 000000 17	Sets the two right digits of the amount of run hours (tens of hours) for the next service reminder.
<b>Function 18</b>	<b>Telephone</b>
TELEPHONE # 000 000 0000 18	Allows the user to input a telephone number that will display when maintenance is required.
<b>Function 37</b>	<b>Modbus Mode</b>
MODBUS MODE OFF 37	Enables Modbus Mode on the appliance. Factory Default: OFF (Range: OFF, ON, AUTO). NOTE: Turning Modbus Mode "ON" will open a number of additional parameters to customize Modbus installation. See Modbus Instructions (lp-372) for details. NOTE: Turning this Mode "ON" without a connected and powered Modbus communication adapter (p/n 7350P-629) will result in improper appliance operation. Service calls associated with this ARE NOT covered by warranty.



Function 52	Solar Mode (Available on Solar Appliances Only)
SOLAR MODE ON 52	When turned ON, this parameter enables solar function of the control. Default: OFF. NOTE: Turning Solar Mode "ON" will open a number of additional parameters to customize the solar installation. See Solar Kit Instructions (lp-420) for details. NOTE: Turning this Mode "ON" without a connected Solar Kit (p/n 7100P-220) will result in improper appliance operation. Service calls associated with this ARE NOT covered by warranty.

Table 17 - System Setting Program Navigation

### E. Control Status Menu

The control also has the ability to review system status. To access the status screens, press >. Once the first value is displayed, press ^ and v to scroll through additional information. At any point press **RESET** to exit the status screens.

Screen	Description
TOP TANK 160°F BOT TANK 123°F	This screen displays the actual temperatures measured by the top and bottom tank sensors.
Press v once.	
CHTARGET 140°F CH SUPPLY 122°F	The current central heating temperature set point is displayed on the top line. <b>NOTE:</b> This temperature set point may vary from what was set in the appliance settings if an outdoor sensor is used. The actual temperature measured by the hydronic heating module supply sensor is displayed on the bottom line.
Press v once.	
CH DEMAND OFF OUTDOOR 55°F	The top line displays the current status of the central heating demand. The bottom line displays the temperature measured by the outdoor sensor (when used). If there is no outdoor sensor connected to the appliance, the bottom line will read "OFF". If the contacts are jumped, this line will display "ON" in place of the temperature. <b>NOTE:</b> To ensure a properly installed outdoor sensor, be sure that this temperature reading is similar to the current outdoor conditions.
Press v once.	
DHW SETING 119°F TANK TARGET 160°F	The top line displays the current domestic hot water temperature set point entered in the Appliance Settings. The bottom line displays the current tank target temperature. <b>NOTE:</b> This target tank temperature set point will vary due to environmental conditions and Total System Control settings.
Press v once.	
FLAME 0.0uA FAN SPEED 3497 RPM	This screen displays appliance flame current on the top line. The second line displays appliance fan speed.
Press v once.	

POWER ON 0h INPUT 0kBTU	The top line indicates the amount of hours the appliance has been powered in its lifetime. The bottom line displays how much energy input (in thousand BTU) from the burner into the storage tank.
Press v once.	
DHW USE 0% CH USE 1%	The top line of this display indicates the percentage of energy used for domestic hot water heating over the appliance lifetime. The bottom line displays the percentage of energy used for central heating over the appliance lifetime.
Press v once.	
GOOD IGNIT 0x CH CYCLE 0x	The top line displays the number of times the burner has been ignited over the appliance lifetime. The bottom line indicates the number of times the heating module has cycled for central heating demand.
Press v once.	
FAULT HISTORY 1 07/27/2009 Mo 5:19A	This screen displays the most recent control lockout fault. The top line will alternate between the words 'FAULT HISTORY' and the fault code encountered. The bottom line displays the date and time the fault occurred.
Press v once.	
FAULT HISTORY 2 08/28/2009 Fr 5:19A	This screen displays the second oldest control lockout fault. The top line will alternate between the words 'FAULT HISTORY' and the actual fault encountered. The bottom line will display the date and time that the fault occurred.
Press v once.	
FAULT HISTORY 3 08/28/2009 Fr 5:19A	This screen displays the third oldest control lockout fault. The top line will alternate between the words 'FAULT HISTORY' and the actual fault encountered. The bottom line will display the date and time that the fault occurred.
Press v once.	
FAULT HISTORY 4 08/28/2009 Fr 5:19A	This screen displays the fourth oldest control lockout fault. The top line will alternate between the words 'FAULT HISTORY' and the actual fault encountered. The bottom line will display the date and time that the fault occurred.
Press v once.	
FAULT HISTORY 5 08/28/2009 Fr 5:19A	This screen displays the fifth oldest control lockout fault. The top line will alternate between the words 'FAULT HISTORY' and the actual fault encountered. The bottom line will display the date and time that the fault occurred.
Press v once.	

FAULT HISTORY 6 08/28/2009 Fr 5:19A	This screen displays the sixth oldest control lockout fault. The top line will alternate between the words 'FAULT HISTORY' and the actual fault encountered. The bottom line will display the date and time that the fault occurred.
Press v once.	
FAULT HISTORY 7 08/28/2009 Fr 5:19A	This screen displays the seventh oldest control lockout fault. The top line will alternate between the words 'FAULT HISTORY' and the actual fault encountered. The bottom line will display the date and time that the fault occurred.
Press v once.	
FAULT HISTORY 8 08/28/2009 Fr 5:19A	This screen displays the eighth oldest control lockout fault. The top line will alternate between the words 'FAULT HISTORY' and the actual fault encountered. The bottom line will display the date and time that the fault occurred.
Press v once.	
FAULT HISTORY 9 08/28/2009 Fr 5:19A	This screen displays the ninth oldest control lockout fault. The top line will alternate between the words 'FAULT HISTORY' and the actual fault encountered. The bottom line will display the date and time that the fault occurred.
FAULT HISTORY 10 08/28/2009 Fr 5:19A	This screen displays the tenth oldest control lockout fault. The top line will alternate between the words 'FAULT HISTORY' and the actual fault encountered. The bottom line will display the date and time that the fault occurred.

Table 20 - System Setting Program Navigation

## F. Resetting the Maintenance Schedule

When the system control flashes MAINTENANCE REQUIRED, it is advisable that you call for service. After the service is performed, reset the schedule for the next required service by using the following steps. Press **ENTER** on the display for 3 seconds. The Menu code will appear as 000. This does not change. Press **ENTER** again. SERVICE SCHEDULE RESET will be displayed. Using the > key scroll to the selection of year or hours. Press **ENTER** to reset the selected Service Schedule. To change a setting, press **ENTER**. Press the **^** and **v** keys to make adjustments. Press **ENTER** when reset is complete.

## G. Test Mode

This function is intended to simplify gas adjustment. The following tables include recommended combustion settings by fuel type and appliance fan speeds. Automatic modulation does not take place while the controller is in Test Mode. However, the appliances will modulate down if the program set point is reached while running in Test Mode. It is recommended to enter Test Mode with the largest load possible to create such a heat demand that Test Mode will not be interrupted. To enter Test Mode press **^** and **ENTER** simultaneously.

SERVICE RUN	3400 RPM
PUMP ON	4:49P

**NOTE:** The appliance will automatically exit Test Mode after 20 minutes of operation.

To leave Test Mode press **^** and **v** simultaneously.


 <b>WARNING</b>						
It is very important that the combustion system be set within the recommended CO measurements listed below. Visually looking at the burner does not determine combustion quality. Failure to measure combustion with a calibrated Combustion Analyzer and set the throttle within the recommended CO measurements could result in property damage, severe personal injury, or death.						
Combustion Settings on All Models						
Fan Speed	Natural Gas (NG)			Propane (LP)		
	Low	Ignition	High	Low	Ignition	High
Carbon Monoxide (CO) PPM	1-10	2-15	2-20	1-10	2-15	2-20
Carbon Dioxide (CO <sub>2</sub> ) %	8-10			8 1/2- 10 1/2		9-11

Table 18 - Combustion Settings - All Models

Fan Speeds			
BTU	Ignition	Min	Max
130,000	3000	2000	7300
199,000		2100	9100

Table 19 - Fan Speeds

## Part 11 - Troubleshooting

### A. Error and Fault Codes

If any of the sensors detect an abnormal condition, or an internal component fails during the operation of the appliance, the display may show an error message and error code. This message and code may be the result of a temporary condition, in which case the display will revert to its normal readout when the condition is corrected, or it may be a condition that the controller has evaluated as not safe to restart the appliance. In this case, the appliance control will be locked out, the red FAULT light will be lit, and the message "LOCKOUT" will be displayed on the readout in the lower line.

The appliance will not start until a qualified technician has repaired the appliance and pressed the RESET button for more than 1 second. If there is an error message displayed on the readout, and the message "LOCKOUT" is not displayed and the FAULT light is not lit, then the message is the result of a temporary condition and will disappear when the problem corrects itself.

**IMPORTANT NOTE:** If you see error messages on your display readout, call a technician immediately, since the message may indicate a more serious problem will occur soon.

### B. Appliance Error

The controller will display an error code and message when an error condition occurs. These error codes, descriptions, and recommended corrective actions are described in Section D.

### C. Appliance Fault

1. The controller will illuminate the red "FAULT" indication light and display a fault code and message when a fault condition occurs. The alarm output will also activate. Most fault conditions cause the CH pump to run in an attempt to cool the appliance.
2. Note the displayed fault code and refer to Section D for an explanation of the message along with several suggestions for corrective actions.
3. Press **RESET** to clear the fault and resume operation. Be sure to observe the operation of the unit for a period of time to assure correct operation and no reoccurrence of fault message.

## ⚠ WARNING

When servicing or replacing components that are in direct contact with appliance water, be certain that:

- There is no pressure in the appliance. (Pull the release on the relief valve. Do not depend on the pressure gauge reading.
- The appliance water is not hot.
- The electrical power is disconnected.
- The gas is shut off.

Failure to make these checks could result in substantial property damage, serious personal injury, or death.

**DO NOT USE THIS APPLIANCE IF ANY PART HAS BEEN SUBMERGED IN WATER.** Immediately call a qualified service technician. The appliance **MUST BE** replaced if it has been submerged. Attempting to operate an appliance that has been submerged could create numerous harmful conditions, such as a potential gas leakage causing a fire and/or explosion, or the release of mold, bacteria, or other harmful particulates into the air. Operating a previously submerged appliance could result in property damage, severe personal injury, or death.

**NOTE:** Appliance damage due to flood or submersion is considered an Act of God, and IS NOT covered under product warranty.

If overheating occurs or the gas supply fails to shut off, do not turn off electrical power to the circulating pump. This may aggravate the problem and increase the likelihood of appliance damage. Instead, shut off the gas supply to the appliance at the gas service valve. Failure to do so may result in property damage, personal injury, or death.

## CAUTION

Label all wires prior to disconnecting them when servicing the appliance. Wiring errors can cause improper and dangerous operation. Failure to follow these instructions may result in property damage or personal injury.

**NOTE:** If system return temperatures are maintained below the dew point, condensation will form on the inside of the appliance cabinet and cause some internal sheet metal components to rust.

### D. User Interface Display

#### Fault Codes

Screen	Description	Possible Remedy
OUTDOOR SENSOR PUMP ON FOU	This indicates that the outdoor sensor is defective, shorted or open, or outdoor temperature is below -40°F. <b>NOTE:</b> The installer must choose YES in Function 12 to enable this feature. The unit will continue to operate when this error is displayed but the control will ignore the outdoor reset feature and run at the programmed temperature. The bottom line indicates the status of the pump.	Inspect wiring from outside sensor for damage or shorted connections and repair as necessary. Measure resistance of the outdoor sensor and compare to resistance chart. If not within range on chart, shorted or open, replace sensor.
CH SENSOR FAIL PUMP ON E07	This indicates that one or both of the clip-on temperature sensors in the hydronic heating module has been disconnected. This error allows the tank portion of the unit to operate, but will not allow the hydronic heating module to operate until the error is cleared. The error will clear if proper sensor connection is restored. The bottom line indicates the status of the pump.	1. Go to the STATUS menu screen that displays "CH Supply" on the bottom line. This will help to determine which sensor has the error. If the temperature displayed is reasonable, the error will be in the return temperature sensor (Horizontal Pipe). If the temperature displayed is not reasonable, the error will be in the supply sensor (Vertical Pipe). 2. Check the electrical connection to the thermistor on the outlet manifold. Check the wiring harness. If both are connected properly, replace the control. <b>NOTE:</b> Verify the thermistor values by referencing the Resistance Tables in this manual. 3. Replace thermistor if necessary.
ECS NOT CONNECTED PUMP OFF	This indicates the main control board and the smaller ECS control board are not communicating properly. This error allows the tank portion of the unit to still operate, but will not allow the hydronic heating module to operate until the error is cleared. The second line indicates the status of the pump.	1. Ensure both ends of the ribbon cable are connected properly and securely in place. 2. Next, check the ribbon cable for damage or wear. If any problems are found, replace the ribbon cable. 3. If problem still occurs with the new ribbon cable, replace the ECS board.
TEMPER BLOCKING PUMP ON 12:31P	This display indicates a temporary hold on the burner. There is a demand on the appliance for heat, the pump is powered on, but the top tank sensor is above the set point and the bottom is substantially cooler than the top. This is a temporary hold on the burner only and all other functions will remain functioning properly.	This error will clear itself when either the top tank temperature drops below the set point or the bottom temperature rises.

LINE VOLTAGE PUMP OFF E19	The line voltage frequency is out of range. This could happen if the unit is being powered from a small gasoline powered generator that is not functioning correctly or overloaded.	Inspect power wiring to unit and repair as necessary. If connected to line voltage, notify electric utility company. If connected to an alternate power source such as generator or inverter, make sure the line voltage frequency supplied by the device is 60 Hz.
HIGH FLUE PRESS FLU PUMP ON	FLU indicates excessive flue pressure. This code resets automatically after the high pressure condition is resolved. The second line indicates pump status.	1. Ensure the flue is not blocked. 2. Check the switch wiring by applying a jumper in place of the switch. If the code clears with the jumper in place, REPLACE the flue switch and connect the wires to the new switch BEFORE running appliance.
<b>WARNING:</b> Do not use jumper to remedy an FLU error. Faulty switch MUST be replaced. Failure to follow this instruction could result in serious personal injury or death.		
LOW WATER LEVEL PUMP OFF LEO	LEO indicates low water level in the main tank. This code will not allow the unit to run until correct water level is restored. The second line indicates the status of the pump. NOTE: While the water level is low, the pump will be off.	1. Ensure there is adequate pressure and flow through the cold water inlet by slightly opening the drain valve near the tank. 2. Ensure the DHW system has all air removed through a high point hot water source, i.e. sink faucet. 3. Check wiring and probes. Replace if necessary.
24 VOLT LOW PUMP ON LOU	LOU indicates the 24 volt power supply on the control is damaged or overloaded. This code will reset automatically if it is the result of an overload and that overload condition is removed. The second line indicates the status of the pump. NOTE: While 24 volt power is low, the pump output will be on.	1. Ensure line voltage is between 100-128 volts. 2. Disconnect TT wiring. If error clears, there is an issue in the thermostat wiring. Review external wiring. 3. If available, connect a PC and use HTP service software to check the 24v supply display in the lower left corner of the screen. The number displayed here must be greater than 128 and should be at least 250. Use this as a troubleshooting guide as you follow the steps below. 4. Remove the 12 pin Molex connector from the field wiring board. If the message clears, then the problem is with external low voltage wiring. Examine the external low voltage sensor wiring for shorts to ground and repair as necessary. If message is still present, disconnect the UL 353 low water cutoff to see if message clears. Replace faulty part. Check low voltage wire harness in appliance for shorts to ground. 5. Remove the 20 pin Molex from the ECS board. If the message clears, examine the wiring to the heating module and fan for shorts or grounds and repair as necessary. 6. If message only occurs when the burner tries to light, check gas valve for excessive current draw. 7. If message is present with the low voltage harness disconnected from the 926 control board, replace the 926 control board.
<b>The following blocking codes will block operation until the control determines the situation safe for appliance operation.</b>		
WATER HIGH TEMP PUMP ON F00	F00 indicates the water in the tank has overheated. This is a serious safety issue, as indicated by the red fault light and the flashing word LOCKOUT on the display. The unit will not restart until it cools sufficiently and a technician repairs the cause of overheating and resets the unit. During this lockout fault, the pump will be on as indicated on the second line of the display in an effort to cool down the appliance.	1. Check central heating pump operation. 2. If the circulator pump is running, ensure there is water in the system and that water is moving through the system as intended. Ensure that all ball valves and or zone valves are open or closed as intended. 3. Observe the temperature/pressure gauge. If the water is not hot and this message is displayed, check the wiring to the water eco sensor and repair if necessary. 4. If the wiring is intact, water is not excessively hot and this code is still present, replace the eco sensor.
FLUE TEMP PUMP ON F01	This display indicates that the flue temperature limit switch of the unit has tripped. This is a serious safety issue, as indicated by the red fault light and LOCKOUT flashing on the display. The unit will not restart until the flue cools sufficiently and a technician repairs the cause of the problem and pushes the <b>RESET</b> button on both the device and the display. During this lockout fault, the pump will be on as indicated on the second line of the display.	1. Check the flue for obstructions or any sign of damage (especially signs of excessive heat). Repair as necessary. 2. Push the red reset button on the flue temperature switch located on CPVC vent elbow. NOTE: Switch temperature must be less than 90°F to reset. 3. Press <b>RESET</b> on the display. Run the unit and check the flue temperature by using an external thermometer in the flue pipe. If the flue temperature is below 190°F and the switch trips, replace the switch. If the flue temperature is excessive, check and adjust the combustion controls on the unit.

TOP TEMP SENSOR PUMP ON F02	F02 indicates the top temperature sensor of the tank has failed. This code indicates a serious safety issue by the red fault light and LOCKOUT flashing on the display. The unit will not restart until a technician replaces the sensor and resets the unit. During this lockout fault, the circulator pump will be on as indicated on the second line of the display.	1. Check the electrical connection to the thermistor on the outlet manifold. Verify 5 VDC by checking the Molex connector. If no 5 VDC, check harness. If harness is OK, replace control. NOTE: Verify thermistor values by referencing chart in this manual. 2. Replace thermistor if necessary.
BOT TEMP SENSOR PUMP ON F03	F03 indicates the bottom temperature sensor of the unit has failed. This code indicates a serious safety issue by the red fault light and LOCKOUT flashing on the display. The unit will not restart until a technician replaces and resets the unit. During this lockout fault, the pump will be on as indicated on the second line of the display.	1. Check the electrical connection to the thermistor. Check the wire harness. If harness is OK, replace control. NOTE: Verify thermistor values by referencing chart in this manual. 2. Replace thermistor if necessary.
TOP TEMP HIGH PUMP ON F05	F05 indicates the top temperature of the tank is excessive. If accompanied by the illuminated red fault light and LOCKOUT flashing on the display, this code indicates the temperature on the top sensor has exceeded 230°F and a serious safety issue exists. The unit will not restart until a technician repairs the cause of excessive temperature and resets the unit. If the red fault light is not illuminated and this message is displayed, the top temperature of the tank is at or above 210°F. The message will clear automatically when the temperature drops below 194°F. While this message or lockout fault is displayed, the pump will be on as indicated on the bottom line.	1. Check the electrical connection to the thermistor on the outlet manifold. Verify 5 VDC by checking in Molex connector. If not 5 VDC, check harness. If harness is OK, replace control. NOTE: Verify thermistor values by referencing the resistance table in this manual. 2. Replace thermistor if necessary.
BOT TEMP HIGH PUMP ON F06	F06 indicates the bottom temperature of the tank is excessive. If this code is accompanied by the illuminated red fault light and LOCKOUT flashing on the display, then the temperature on the bottom sensor has exceeded 230°F and a serious safety issue exists. The appliance will not restart until a technician repairs the cause of the excessive temperature and resets the unit. If the red fault light is not illuminated and this message is displayed the bottom temperature of the tank is at or above 210°F. The message will clear automatically when the temperature drops below 194°F. During the time that this message or lockout fault is displayed, the pump will be on as indicated on the bottom line of the display.	1. Check the electrical connection to the thermistor on the outlet manifold. Verify 5 VDC by checking in Molex connector. If not 5 VDC, check harness. If harness is OK, replace control. NOTE: Verify thermistor values by referencing chart in this manual. 2. Replace thermistor if necessary.
NO FLAME ON IGN PUMP ON F09	The unit tried to ignite four times during a call for heat and failed all four times. F09 indicates a serious safety issue. The unit will not restart until a technician repairs the cause of no ignition and resets the display. The red fault light and LOCKOUT will flash on the display. During this lockout fault, the pump will be on as indicated on the bottom line.	1. Watch the igniter through the observation window. 2. If there is no spark, for natural gas units check the spark electrode for the proper gap. Use 2 quarters together as a gauge to check gap spacing. 3. Remove any corrosion from the spark electrode and flame rectifier probe. 4. If there is a spark but no flame, check the gas supply to the appliance. 5. If there is a flame, check the flame sensor. 6. Check for any flue blockage or condensate blocks.



FLAME LOSS PUMP ON F10	The flame was lost while the unit was lit 3 times during 1 demand call. The red fault light and LOCKOUT flashing on the display indicate a serious safety issue. The unit will not restart until the technician repairs the cause of flame loss and resets the unit. During this lockout fault, the pump will be on as indicated on the bottom line of the display.	<ol style="list-style-type: none"> <li>1. Monitor gas pressure to the unit while in operation.</li> <li>2. Ensure the flame is stable when lit.</li> <li>3. Check to see if the display readout changes from "GAS VALVE ON" to "RUN" a few seconds after the appliance ignites.</li> <li>4. Check the FLAME signal on the status display. It should be above 1.0 when the unit is firing.</li> <li>5. If the signal reads less than 1 microampere, clean the flame rectifier and spark probe.</li> <li>6. If the problem persists and the 'FLAME' signal is still less than 1.0, replace the flame probe and spark igniter probe.</li> <li>7. The flame signal should be steady after the unit has been firing for 1 minute and is normally at 5.0 to 9.0. If not steady, disassemble the burner door and check the burner and its sealing gaskets.</li> </ol>
FALSE FLAME SIG PUMP ON F11	F11 indicates flame when the control is not telling the unit to run. The red fault light and LOCKOUT flashing on the display indicate this code is a serious safety issue. The unit will not restart until a technician repairs the cause of the lockout and resets the unit. During this lockout fault, the pump will be on as indicated on the second line of the display.	<ol style="list-style-type: none"> <li>1. Look into the window. If there is flame, turn the gas off to the unit at the service valve and replace the gas valve.</li> <li>2. If the flame signal on the status menu is greater than 1.0 when the burner is not lit, replace the spark igniter and the flame rectification probe.</li> <li>3. If the flame signal is not present after turning off the gas supply, check the gas valve electrical connection.</li> <li>4. Check for condensate backup. Repair the condensate system as necessary. If condensate has partially filled the combustion chamber, the refractory wall may be damaged and should be replaced.</li> <li>5. Turn the gas on at the service valve after corrective action is taken.</li> </ol>
FAN SPEED ERROR PUMP ON F13	The fan speed had been more than 30% faster or slower than the control commanded speed for more than 10 seconds. The red fault light and flashing LOCKOUT on the display indicate a serious safety issue. The unit will not restart until the technician repairs and resets the unit. During this lockout fault, the pump will be on as indicated on the second line of the display.	<ol style="list-style-type: none"> <li>1. Check the combustion air fan wiring.</li> <li>2. Measure the DC voltage from the red fan wire to ground while it is connected to the fan. It should be between 24 to 40 volts. If it is lower than 24 volts, check for excessive external loads connected to the sensor terminals. Disconnect the 5 pin plug from the fan and check the voltage on the red wire again. If it is now between 24-40 volts, replace the fan. If it is still below 24 volts replace the appliance control board.</li> </ol>
PROGRAM ERROR PUMP OFF F31	There was an error while programming the control. The control's memory could be corrupt. The appliance control will not function in this state and the pump will be off. The only way to recover from this error is to reprogram the control. If this error occurs at any time other than when a technician is servicing the unit, the control has failed and must be replaced.	Control must be reprogrammed. If reprogramming does not solve problem, control must be replaced.
CONTROL PROGRAMED PP	The control has been programmed by a technician or the factory. After programming, the control was left in a locked out mode. Press <b>RESET</b> to begin use of the control.	Press <b>RESET</b> for at least one second.

Table 21 - Fault Codes

## Part 12 - Maintenance

### CAUTION

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

### WARNING

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

### WARNING

Hydrogen gas can build up in a hot water system served by this appliance that has not been used for a long period of time (generally two weeks or more). When opening a hot water faucet in a system that has been out of use for a time, keep all ignition sources (electrical appliances, open flame, etc.) away from the faucet. If hydrogen is present, there will be a sound of air escaping as water begins to flow. Allow the water to run for a few minutes to dissipate built up hydrogen from the system. Failure to follow these instructions can result in property damage, personal injury, or death.

The appliance requires minimal periodic maintenance under normal conditions. However, in unusually dirty or dusty conditions, periodic vacuuming of the cover to maintain visibility of the display and indicators is recommended.

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

## NOTICE

It is extremely important that whenever work is performed on the plumbing system that either:

- The appliance is powered off, or,
- The appliance is valved off and isolated from the plumbing system.

Failure to take these measures could result in a dry-firing condition.

## WARNING

The appliance must be full of water and the system fully purged BEFORE powering the appliance. Performing any work in the plumbing system without either powering off the appliance or isolating the appliance through the use of shut-off valves could result in a condition referred to as "dry-firing". Dry-firing the appliance will damage the heat exchanger, and could result in property damage, serious personal injury, or death. Such damages ARE NOT covered by appliance warranty.

### Part 13 - Shutdown

#### A. Shutdown Procedure

If the burner is not operating, disconnect the electrical supply.

If the burner is operating, lower the set point value to 70°F and wait for the burner to shut off. Continue to wait for the combustion blower to stop, so all latent combustion gases are purged from the system. This should take a maximum of 40 to 90 seconds. After combustion gases are purged turn off electrical power to the appliance.

#### B. Vacation Procedure

If there is danger of freezing, change the set point to 70°F. DO NOT turn off electrical power. If there is no danger of freezing, follow "Shutdown Procedure".

#### C. Failure to Operate

Should the burner fail to light, the control will perform two more ignition trials prior to entering a lockout state. Note that each subsequent ignition trial will not occur immediately. After a failed ignition trial, the blower must run for approximately 10 seconds to purge the system. Therefore, a time period of approximately 40 to 90 seconds will expire between each ignition trial.

If the burner lights during any one of these three ignition trials, normal operation will resume. If the burner lights, but goes off in about 4 seconds, check the polarity of the wiring. See electrical connection section of this manual.

If the burner does not light after the third ignition trial, the control will enter a lockout state. This lockout state indicates that a problem exists with the appliance, the controls, or the gas supply. Under such circumstances, a qualified service technician should be contacted immediately to properly service the appliance and correct the problem.

If a technician is not available, pressing **RESET** will remove the lockout state so additional trials for ignition can be performed. The unit will try to relight once every 6 minutes.

### D. Important Notice

## NOTICE

It is extremely important that whenever work is performed on the plumbing system that either:

- The appliance is powered off, or,
- The appliance is valved off and isolated from the plumbing system.

Failure to take these measures could result in a dry-firing condition.

Outdoor Sensor (7250P-319)		Upper Sensor (7100P-004) Lower Sensor (7100P-005) Clip-On Sensor (7100P-172)	
Outside Temperature (°F)	Resistance (ohms)	High / Low Temp Sensor Temp. (°F)	Resistance (Ohms)
-22	171800	32	32550
-13	129800	41	25340
-4	98930	50	19870
5	76020	59	15700
14	58880	68	12490
23	45950	77	10000
32	36130	86	8059
41	28600	95	6535
50	22800	104	5330
59	18300	113	4372
68	14770	122	3605
77	12000	131	2989
86	9804	140	2490
95	8054	149	2084
104	6652	158	1753
113	5522	167	1481
		176	1256
		185	1070
		194	915
		202	786
		212	667

Table 22 - Sensor Temperature Resistance

## Part 14 - Installation Checklist

Before Installing	Yes	No
Is there enough space to ensure proper installation?		
Does installation location allow for proper service clearances?		
Are water and gas lines properly sized and set at proper pressures for the installation?		
Is appliance location as near the exhaust vent / intake pipe terminations as possible?		
Have combustibile materials been cleared from the installation location?		
Is there a drain close to the appliance?		
Water Piping	Yes	No
Does appliance loop piping meet the minimum sizing requirements listed? <b>NOTE:</b> Smaller piping will cause performance problems.		
Has water chemistry been checked?		
Does water chemistry meet requirements?		
If water chemistry does not meet requirements, have treatment measures been put in place?		
Has the system been cleaned and flushed?		
Install Exhaust Vent and Intake Piping	Yes	No
Has the appliance been vented with the approved materials listed in this manual or to meet local codes?		
Is air supply sufficient for proper appliance operation?		
Is total vent piping length within the maximum vent length restriction listed in this manual?		
Have venting lengths been minimized?		
Are terminations properly spaced from windows, doors, and other intake vents?		
Have all vent terminations been installed at least one foot above exterior grade and one foot above normal snow accumulation level?		
Is vent piping properly supported?		
Has vent piping been checked for leaks?		
Has the exhaust vent line been pitched back to the appliance at a rate of 1/4" per foot?		
Have the exhaust vent and intake pipes been properly installed to the appliance?		
Install Condensate Piping / Tubing and Components	Yes	No
Have all condensate components included with the appliance been installed?		
Is the condensate line piped with approved materials listed in this manual?		
Has the condensate line been routed to a laundry tub or other drain?		
Install Gas Piping	Yes	No
Is the gas supply line a minimum of 3/4" in diameter?		
Is the gas supply line length and diameter adequate to deliver the required BTUs?		
Has gas supply line pressure been measured?		
Does the gas type match the type indicated on the appliance rating plate?		
Has a union and shut-off valve been installed?		
Relief Valve	Yes	No
Is the Temperature and Pressure Relief Valve properly installed and discharge line run to open drain?		
Is the discharge line protected from freezing?		
Wiring	Yes	No
Has the power and control been wired per appliance wiring diagram, this manual?		
Is the electrical connection polarity within appliance requirements?		
Does the power supply voltage agree with the appliance rating plate?		
Is the branch circuit wire and fusing or circuit breaker of proper size?		
Are electrical connections tight and properly grounded?		

<b>Start-Up, Adjust, and Test</b>	<b>Yes</b>	<b>No</b>
Has the appliance been started?		
If necessary, has the appliance gas valve been adjusted?		
Has the installation been customized per installation location requirements?		
Have all customized system parameters been tested?		
Has proper appliance operation been confirmed?		
<b>Final Installation Approvals</b>		
<b>Signed by Technician</b>	<b>Date</b>	

Table 23 - Installation Checklist

## Part 15 - Maintenance Report

### CAUTION

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

The appliance requires minimal periodic maintenance under normal conditions. However, in unusually dirty or dusty conditions, periodic vacuuming of the cover to maintain visibility of the display and indicators is recommended.

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

### WARNING

When servicing or replacing any components of this appliance be certain that:

- The gas is off.
- All electrical power is disconnected.

In addition, when servicing or replacing components of this appliance in direct contact with appliance water:

- There is no pressure in the appliance. Pull the release on the relief valve to relieve pressure in the appliance.
- Appliance water is not hot.

Failure to follow these precautions could result in property damage, serious personal injury, or death. Such damages ARE NOT covered by appliance warranty.

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

### WARNING

The appliance must be full of water and the system fully purged BEFORE powering the appliance. Performing any work in the plumbing system without either powering off the appliance or isolating the appliance through the use of shut-off valves could result in a condition referred to as "dry-firing". Dry-firing the appliance will damage the heat exchanger, and could result in property damage, serious personal injury, or death. Such damages ARE NOT covered by appliance warranty.

**DO NOT USE THIS APPLIANCE IF ANY PART HAS BEEN SUBMERGED IN WATER.** Immediately call a qualified service technician. The appliance MUST BE replaced if it has been submerged. Attempting to operate an appliance that has been submerged could create numerous harmful conditions, such as a potential gas leakage causing a fire and/or explosion, or the release of mold, bacteria, or other harmful particulates into the air. Operating a previously submerged appliance could result in property damage, severe personal injury, or death.

**NOTE:** Appliance damage due to flood or submersion is considered an Act of God, and IS NOT covered under product warranty.

### CAUTION

The appliance has wire function labels on all internal wiring. Observe the position of each wire before removing it. Wiring errors may cause improper and dangerous operation. Verify proper operation after servicing.

Inspection Activities		Date Last Completed			
<b>Piping</b>		<b>1st Year</b>	<b>2nd Year</b>	<b>3rd Year</b>	<b>4th Year*</b>
Near appliance piping	Check appliance and system piping for any sign of leakage; make sure pipes are properly supported.				
Vent	Check condition of all vent pipes and joints. Ensure the vent piping terminations are free of obstructions and blockages.				
Gas	Check gas piping. Test for leaks and signs of aging. Make sure all pipes are properly supported.				
<b>System</b>		<b>1st Year</b>	<b>2nd Year</b>	<b>3rd Year</b>	<b>4th Year*</b>
Visual	Do a full visual inspection of all system components.				
Functional	Test all functions of the system (Heat, Safeties).				
Temperatures	Verify safe settings on appliance or anti-scald valve.				
	Verify programmed temperature settings.				
<b>Electrical</b>					
Connections	Check wire connections. Make sure connections are tight.				
Smoke and CO Detector	Verify devices are installed and working properly. Change batteries if necessary.				
Circuit Breakers	Check to see that the circuit breaker is clearly labeled. Exercise circuit breaker.				
<b>Chamber / Burner</b>		<b>1st Year</b>	<b>2nd Year</b>	<b>3rd Year</b>	<b>4th Year*</b>
Combustion Chamber	Check burner tube and combustion chamber coils. Clean according to maintenance section of manual. Vacuum combustion chamber. Replace any gaskets that show signs of damage.				
Spark Electrode	Clean. Set gap at 1/4" Clean probe with plumbers cloth to remove oxides.				
Flame Probe	Check ionization uA (see Status Menu). Record high fire and low fire. Clean probe with plumbers cloth to remove oxides.				
<b>Condensate</b>		<b>1st Year</b>	<b>2nd Year</b>	<b>3rd Year</b>	<b>4th Year*</b>
Neutralizer	Check condensate neutralizer. Replace if necessary.				
Condensate Pipe	Disconnect condensate pipe. Clean out dirt. Fill with water to level of outlet and reinstall. (NOTE: Verify the flow of condensate, making sure that the hose is properly connected during final inspection.)				
<b>Gas</b>		<b>1st Year</b>	<b>2nd Year</b>	<b>3rd Year</b>	<b>4th Year*</b>
Pressure	Measure incoming gas pressure (3.5" to 10"WC for Natural Gas, 8" to 14"WC for Propane).				
Pressure Drop	Measure drop in pressure on light off (no more than 1"WC).				
Check Gas Pipe for Leaks	Check piping for leaks. Verify that all are properly supported.				
<b>Combustion</b>		<b>1st Year</b>	<b>2nd Year</b>	<b>3rd Year</b>	<b>4th Year*</b>
CO / CO2 Levels	Check CO and CO2 levels in exhaust with a calibrated combustion analyzer. See manual for ranges. Record at high and low fire.				
<b>Safeties</b>		<b>1st Year</b>	<b>2nd Year</b>	<b>3rd Year</b>	<b>4th Year*</b>
ECO (Energy Cut Out)	Check continuity on flue and water ECOs. Replace if corroded.				
Water Pressure Switch	Check operation and for signs of leakage. Replace if corroded.				
Sensors	Check wiring. Verify through ohms reading.				
<b>Final Inspection</b>		<b>1st Year</b>	<b>2nd Year</b>	<b>3rd Year</b>	<b>4th Year*</b>
Check List	Verify that you have completed entire check list. WARNING: FAILURE TO DO SO COULD RESULT IN SERIOUS INJURY OR DEATH.				
Homeowner	Review what you have done with the homeowner.				

Table 24 - \*Continue annual maintenance beyond the 4th year as required.



## Part 16 - Replacement Parts

LP-314-K  
06/13/18

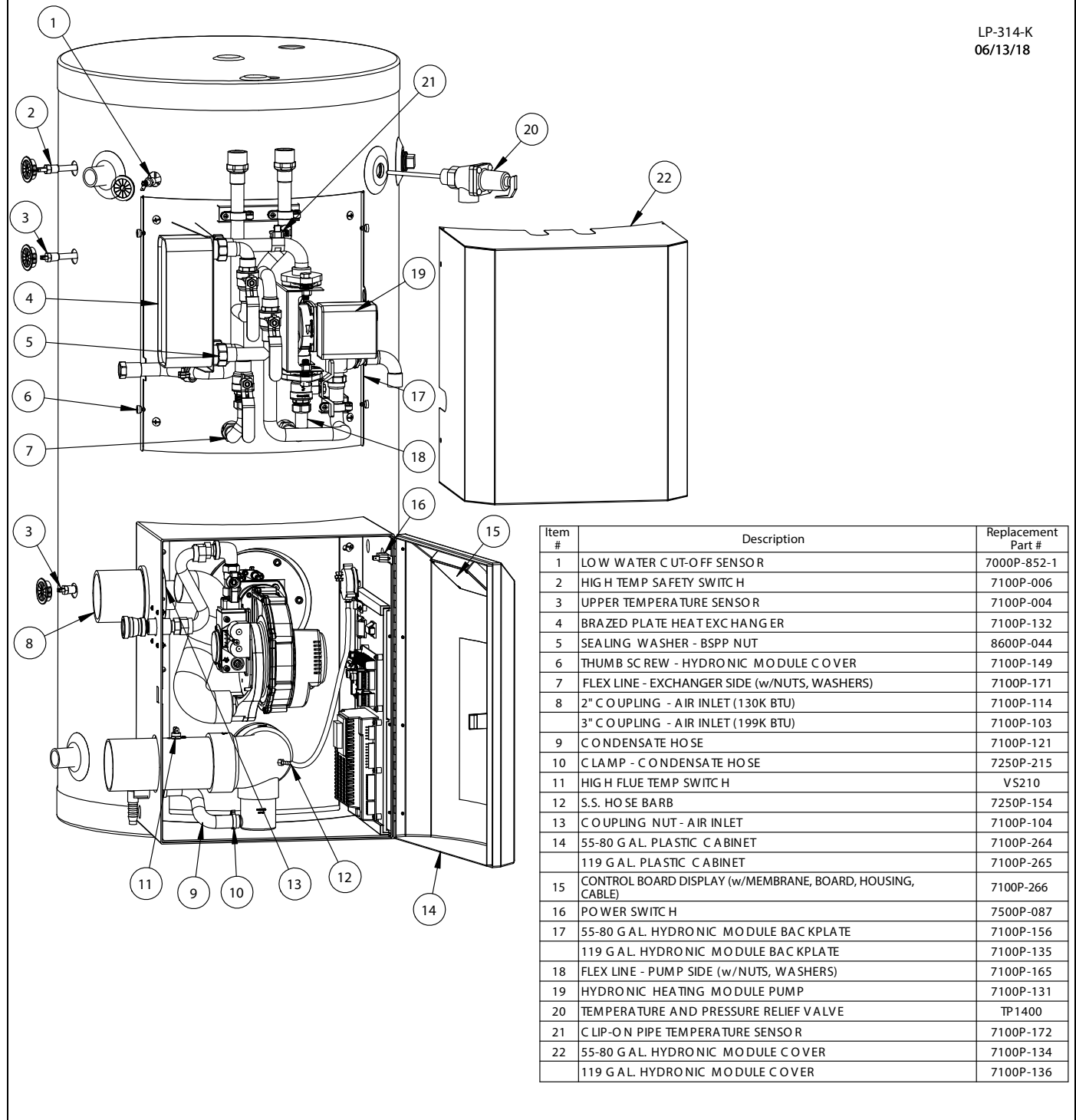


Figure 28 - Replacement Parts

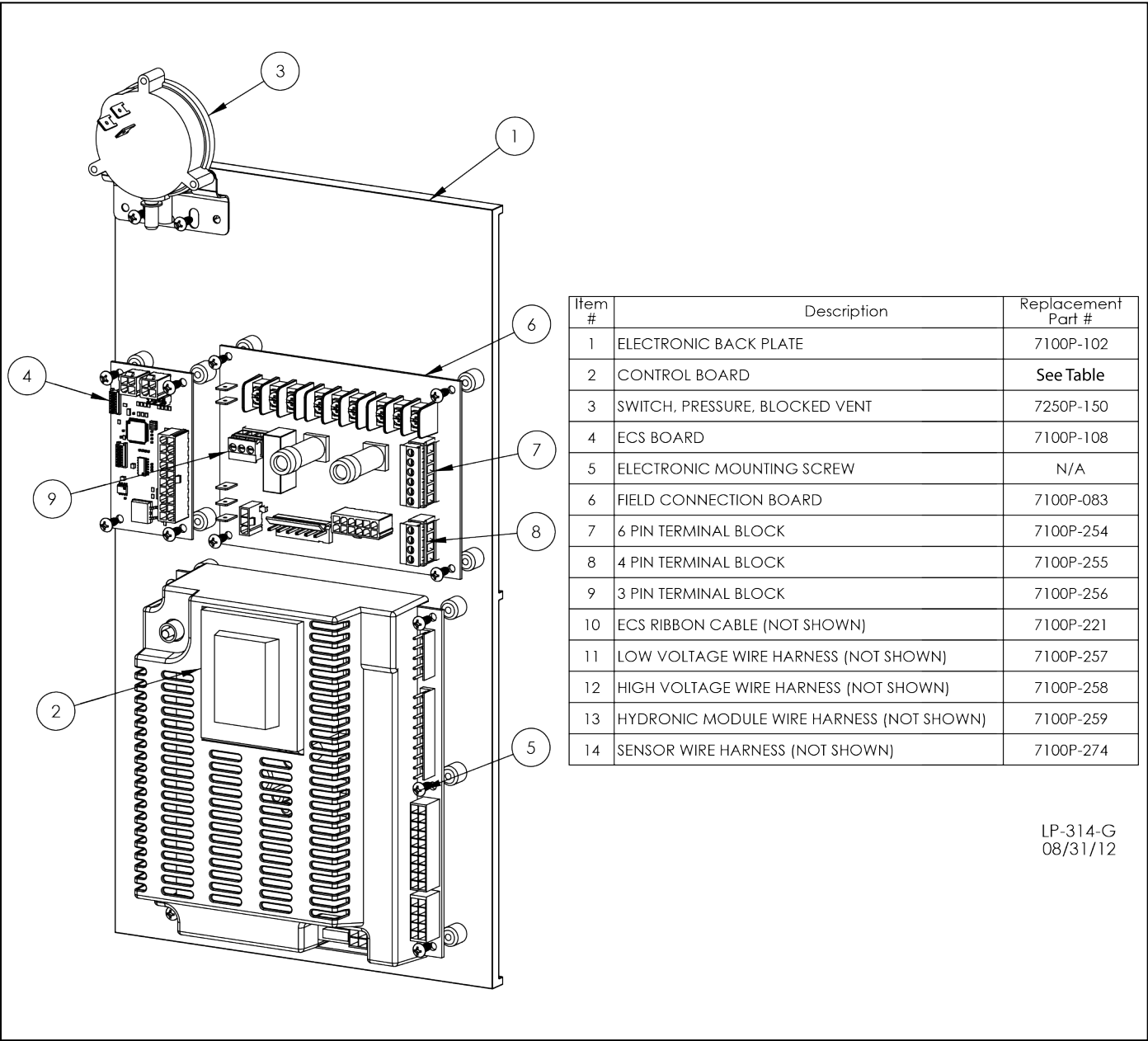


Figure 29 - Control Board Replacement Parts

Model	Control Board Part Numbers	Model	Control Board Part Numbers
130kBTU 55 Gal	7100P-1140	Solar 130kBTU 80 Gal	7100P-1146
130kBTU 80 Gal	7100P-1141	Solar 130kBTU 119 Gal	7100P-1147
130kBTU 119 Gal	7100P-1142	Solar 199kBTU 80 Gal	7100P-1148
199kBTU 55 Gal	7100P-1143	Solar 199kBTU 119 Gal	7100P-1149
199kBTU 80 Gal	7100P-1144		
199kBTU 119 Gal	7100P-1145		

Table 25 - Control Board Replacement Part Numbers



LP-314 Rev. 012 Rel. 003 Date 9.27.19

**Versa Hydro™ Combined Appliance  
Limited Warranty  
For Residential and Commercial Use**

HTP warrants this appliance and its components to be free from defects in material and workmanship according to the following terms, conditions, and time periods. UNLESS OTHERWISE NOTED THESE WARRANTIES COMMENCE ON THE DATE OF INSTALLATION. This limited warranty is only available to the **original consumer purchaser** (hereinafter "Owner") of this appliance, and is non-transferable.

**Residential Use Warranty (1 year – Parts, 12 years – Tank)**

Residential Use shall mean appliance usage in a single family dwelling, or usage in a multiple family dwelling, provided that the appliance services only one (1) dwelling **in which the Owner resides on a permanent basis and domestic hot water operating temperatures do not exceed 140°F.**

**Commercial Use Warranty (1 year – Parts, 5 years – Tank)**

Commercial Use shall mean any usage not falling within the definition of a "residential" setting.

**COVERAGE**

A. During the first year after the original date of installation, HTP warrants that it will repair or replace, at its option, any defective or malfunctioning component of the appliance with a component of equivalent size and current model. Replacement components will be warranted for ninety (90) days.

B. 1. Residential Use - During the first through seventh year after the date of installation, HTP will repair or replace, at its option, any defective Versa Hydro™ found to have failed due to leaking heat exchanger, tank, or brazed plate exchanger.

2. Commercial Use - During the first through fifth year after the date of installation, HTP will repair or replace, at its option, any defective Versa Hydro™ found to have failed due to leaking heat exchanger, tank, or brazed plate exchanger.

C. Residential Use ONLY - During the eighth through twelfth year after the date of installation, HTP will repair or replace, at its option, any defective Versa Hydro™ found to have failed due to leaking heat exchanger, tank, or brazed plate exchanger, at a cost to the purchaser equal to the following percentages of the manufacturer's list price in effect at the date of replacement.

Year of Claim	8 & 9	10 & 11	12
Percentage to be paid by purchaser	25 %	50 %	75 %

D. The replacement appliance will be warranted for the unexpired portion of the applicable warranty period of the original appliance.

E. In the event of a leakage of water of a replacement appliance due to defective material or workmanship, malfunction, or failure to comply with the above warranty, HTP reserves the right to refund to the Owner the published wholesale price available at the date of manufacture of the original appliance.

F. If government regulations, industry certification, or similar standards require the replacement appliance or component(s) to have features not found in the defective appliance or component(s), the Owner will be charged the difference in price represented by those required features. If the Owner pays the price difference for those required features and/or to upgrade the size and/or other features available on a new replacement appliance or component(s), the Owner will also receive a complete new limited warranty for that replacement appliance or component(s).

G. If, at the time of a request for service the purchaser cannot provide a copy of the original sales receipt or the warranty registration, the warranty period for the appliance shall then be deemed to have

commenced thirty (30) days after the date of manufacture of the appliance and NOT the date of installation of the appliance.

H. This warranty extends only to Versa Hydro™ Combined Appliances utilized in heating applications that have been properly installed based upon manufacturer's installation instructions.

I. It is expressly agreed between HTP and the Owner that repair, replacement, or refund are the exclusive remedies of the Owner.

**OWNER RESPONSIBILITIES**

The Owner or Qualified Installer / Service Technician must:

1. Have a relief valve bearing the listing marks of the American Society of Mechanical Engineers (ASME) installed with the appliance assembly in accordance with federal, state, and local codes.
2. Have a vacuum relief valve certified to ANSI Z21.22 - Relief Valves for Hot Water Supply Systems installed with the appliance assembly in accordance with federal, state, and local codes and in installations prone to vacuum related damages.
3. Maintain the appliance in accordance with the maintenance procedure listed in the manufacturer's provided instructions. Preventive maintenance can help avoid any unnecessary breakdown of the appliance and keep it running at optimum efficiency.
4. Maintain all related system components in good operating condition.
5. Use the appliance in an open system, or in a closed system with a properly sized and installed thermal expansion tank.
6. Use the appliance at water pressures not exceeding the working pressure shown on the rating plate.
7. Keep the appliance free of damaging scale deposits.
8. Make provisions so if the appliance or any component or connection thereto should leak, the resulting flow of water will not cause damage to the area in which it is installed.
9. Check condensate lines to confirm that all condensate drains properly from the appliance.

**WARRANTY EXCLUSIONS**

This limited warranty will not cover:

1. Any appliance purchased from an unauthorized dealer.
2. Any appliance not installed by a qualified installer / service technician, or installations that do not conform to ANSI, CSA, and/or UL standards, as well as any applicable national or local building codes.
3. Service trips to teach the Owner how to install, use, maintain, or to bring the appliance installation into compliance with local building codes and regulations.
4. The workmanship of any installer. The manufacturer disclaims and does not assume any liability of any nature caused by improper installation, repair, or maintenance.
5. Electricity or fuel costs, or increased or unrealized savings for same, for any reason whatsoever.
6. Any water damage arising, directly or indirectly, from any defect in the appliance or component part(s) or from its use.
7. Any incidental, consequential, special, or contingent damages or expenses arising, directly or indirectly, from any defect in the appliance or the use of the appliance.
8. Failure to locate the appliance in an area where leakage of the tank or water line connections and the relief valve will not result in damage to the area adjacent to the appliance or lower floors of the structure, as well as failure to install the appliance in or with a properly sized drain pan routed to an approved drainage location.
9. Any failed components of the heat system not manufactured by HTP as part of the appliance.
10. Appliances repaired or altered without prior written approval of HTP so as to affect adversely their reliability.
11. Damages, malfunctions, or failures resulting from failure to install the appliance in accordance with applicable building codes/ordinances or good plumbing and electrical trade practices.
12. Damages, malfunctions, or failures resulting from improper installation, failure to operate the appliance at firing rates or pressures not exceeding those on the rating plate, or failure to operate and maintain the appliance in accordance with the manufacturer's provided

instructions.

13. Failure to operate the appliance in an open system, or in a closed system with a properly sized expansion tank.
14. Failure or performance problems caused by improper sizing of the appliance, expansion device, piping, or the gas supply line, venting connection, combustion air openings, use of the heat pack for high temperature (over 160°F) applications, electric service voltage, wiring, fusing, or inadequately sized expansion device or piping.
15. Damages, malfunctions, or failures caused by improper conversion from natural gas to LP gas or LP gas to natural gas.
16. Damages, malfunctions, or failures caused by operating the appliance with modified, altered, or unapproved components, or any component / attachment not supplied by HTP.
17. Damages, malfunctions, or failures caused by abuse, accident, fire, flood, freeze, lightning, electrochemical reaction, acts of God and the like.
18. Failures (leaks) caused by operating the appliance in a corrosive or contaminated atmosphere.
19. Damages, malfunctions, or failures caused by operating an empty or partially empty appliance ("dry firing"), or failures caused by operating the appliance when it is not supplied with water, free to circulate at all times.
20. Any damage or failure of the appliance due to the accumulation of solid materials or lime deposits.
21. Any damage or failure resulting from improper water chemistry. WATER CHEMISTRY REQUIREMENTS (RESIDENTIAL USE) – Water pH between 6.5 and 8.5. Operating temperatures not exceeding 140°F. Hardness less than 12 grains (200 mg/L). Chloride concentration less than 100 ppm (mg/L). TDS less than 500 ppm (mg/L). (COMMERCIAL USE) - Water pH between 6.5 and 8.5. Hardness less than 7 grains (120 mg/L). Chloride concentration less than 100 ppm (mg/L). TDS less than 500 ppm (mg/L).
22. Any damages, malfunctions, or failures resulting from the use of dielectric unions.
23. Appliances replaced for cosmetic reasons.
24. Components of the appliance that are not defective, but must be replaced during the warranty period as a result of reasonable wear and tear.
25. Components of the appliance that are subject to warranties, if any, given by their manufacturers; HTP does not adopt these warranties.
26. Damages, malfunctions, or failures resulting from the use of any attachment(s) not supplied by HTP.
27. Appliances installed outside the fifty states (and the District of Columbia) of the United States of America and Canada.
28. Appliances moved from the original installation location.
29. Appliances that have had their rating labels removed.

#### PROCEDURES FOR WARRANTY SERVICE REQUESTS

Any claim for warranty assistance must be made immediately upon finding the issue. First, please consult the HTP Warranty Wizard (<http://www.htpproducts.com/Warranty-Wizard.html>) to check warranty eligibility. You may also contact HTP Technical Support at 1-800-323-9651 for questions or assistance. Warranty coverage requires review and approval of the issue with HTP Technical Support or through the Warranty Wizard prior to a full unit replacement. Any claim for warranty reimbursement will be rejected if prior approval from HTP is not obtained in advance of a full unit replacement. Final determination will be made as part of the warranty claim process.

**When submitting a warranty claim the following items are required:**

1. **Proof of purchase or installation of the product** – Typically a copy of the invoice from the installing contractor, the receipt of the purchase of the product, or an original certificate of occupancy for a new home.
2. **Clear pictures (or video) of the following:**
  - a. Serial number tag (sticker)
  - b. The product
  - c. The product issue / failure whenever possible
  - d. A picture of the piping near the product
  - e. For gas fired products, a picture of the venting, including how it exits the building

All claims will be reviewed by HTP within three (3) business days. If additional information is required and requested by the HTP Claims

Department you will have thirty (30) days to provide it. When all requested information is provided HTP will respond within three (3) business days. The claim will be automatically closed if requested information is not provided within thirty (30) days. Claims will not be reopened without HTP Warranty Supervisor approval.

During the claims process a product that must be replaced will be given a designation of either a) field scrap, or b) return to HTP. If the product must be returned to HTP, the returned product must arrive at HTP within thirty (30) days of the date of our request to return the product. After receipt of the returned product HTP may require as many as thirty (30) additional days for product testing. **NOTE: Any components or heaters returned to HTP for warranty analysis will become the property of HTP and will not be returned, even if credit is denied.**

If you have questions about the coverage of this warranty, please contact HTP at the following address or phone number: HTP, 272 Duchaine Blvd., New Bedford, MA, 02745, Attention: Warranty Service Department, 1(800) 323-9651.

#### SERVICE, LABOR, AND SHIPPING COSTS

Except when specifically prohibited by the applicable state law, the Owner, and not the Manufacturer, shall be liable for and shall pay for all charges for labor or other expenses incurred in the removal, repair, or replacement of the appliance or any component part(s) claimed to be defective or any expense incurred to remedy any defect in the product. Such charges include, but are not necessarily limited to:

1. All freight, shipping, handling, and delivery costs of forwarding a new appliance or replacement part(s) to the owner.
2. All costs necessary or incidental in removing the defective appliance or component part(s) and installing a new appliance or replacement part(s).
3. All administrative fees incurred by the Owner, as well as material required to complete, and/or permits required for, installation of a new appliance or replacement part(s), and
4. All costs necessary or incidental in returning the defective appliance or component part(s) to a location designated by the manufacturer.

#### LIMITATIONS OF YOUR HTP WARRANTY AND REMEDIES

**THE FOREGOING WARRANTIES ARE EXCLUSIVE AND ARE GIVEN AND ACCEPTED IN LIEU OF ANY AND ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING WITHOUT LIMITATION THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE AND ANY OBLIGATION, LIABILITY, RIGHT, CLAIM OR REMEDY IN CONTRACT OR TORT, WHETHER OR NOT ARISING FROM HTP'S NEGLIGENCE, ACTUAL OR IMPUTED. THE REMEDIES OF THE PURCHASER SHALL BE LIMITED TO THOSE PROVIDED HEREIN TO THE EXCLUSION OF ANY OTHER REMEDIES INCLUDING WITHOUT LIMITATION, INCIDENTAL OR CONSEQUENTIAL DAMAGES, SAID INCIDENTAL AND CONSEQUENTIAL DAMAGES INCLUDING, BUT NOT LIMITED TO, PROPERTY DAMAGE, LOST PROFIT OR DAMAGES ALLEGED TO HAVE BEEN CAUSED BY ANY FAILURE OF HTP TO MEET ANY OBLIGATION UNDER THIS AGREEMENT INCLUDING THE OBLIGATION TO REPAIR AND REPLACE SET FORTH ABOVE. NO AGREEMENT VARYING OR EXTENDING THE FOREGOING WARRANTIES, REMEDIES OR THIS LIMITATION WILL BE BINDING UPON HTP. UNLESS IN WRITING AND SIGNED BY A DULY AUTHORIZED OFFICER OF HTP. THE WARRANTIES STATED HEREIN ARE NOT TRANSFERABLE AND SHALL BE FOR THE BENEFIT OF THE ORIGINAL PURCHASER OF A VERSA HYDRO™ ONLY.**

#### NO OTHER WARRANTIES

This warranty gives the Owner specific legal rights. The Owner may also have other rights that vary from state to state. Some states do not allow the exclusion or limitation of incidental or consequential damages so this limitation or exclusion may not apply to the Owner.

These are the only written warranties applicable to this appliance manufactured and sold by HTP. HTP neither assumes nor authorizes anyone to assume for it any other obligation or liability in connection with said appliances.

HTP reserves the right to change specifications or discontinue models without notice.



### Maintenance Notes

[illegible]

Customer Installation Record Form	
The following form should be completed by the qualified installer / service technician for you to keep as a record of the installation in case of a warranty claim. After reading the important notes at the bottom of the page, please also sign this document.	
Customer's Name	
Date of Installation	
Installation Address	
Product Name / Serial Number(s)	
Comments	
Installer's Code / Name	
Installers Phone Number	
Signed by Installer	
Signed by Customer	
Installation Notes	

**IMPORTANT**

Customer: Please only sign after the qualified installer / service technician has fully reviewed the installation, safety, proper operation, and maintenance of the system. If the system has any problems please call the qualified installer / service technician. If you are unable to make contact, please call your sales representative.

Distributor / Dealer: Please insert contact details.