



Pioneer

Heating Appliance

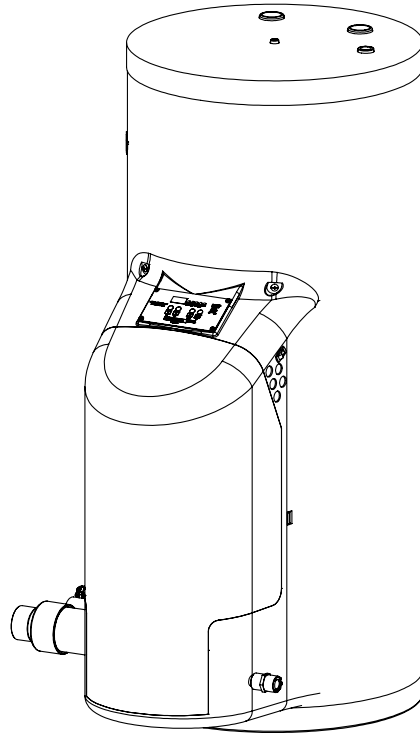
Installation

Start-Up

Maintenance

Parts

Warranty



PHR100 / 130 / 160 / 199 Models*

*"LP" Denotes Propane Gas Operation

**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

HTP 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

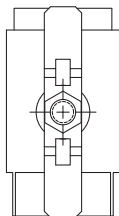
WARNING: If you do not follow these instructions exactly, a fire or explosion may result, causing property damage, personal injury or loss of life.

- A. 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.
- 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.
- 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.
- 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.

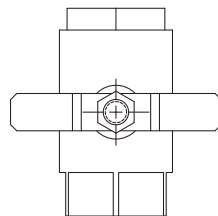
OPERATING INSTRUCTIONS

1. STOP! Read the safety information above.
2. Set the thermostat to lowest setting.
3. Turn off all electric power to the appliance.
4. This appliance is equipped with an ignition device which automatically lights the burner. Do not try to light the burner by hand.
5. Remove front cover.
6. Turn gas shutoff valve to "off". Handle will be across the piping, do not force.
7. 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.
8. Turn gas shutoff valve to "on". Handle will be in line with piping.
9. Install Front Cover.
10. Turn on all electric power to appliance.
11. Set thermostat to desired setting.
12. If the appliance will not operate, follow the instructions "To Turn Off Gas To Appliance" and call your service technician or gas supplier.

GAS VALVE
ON






GAS VALVE
OFF



TO TURN OFF GAS TO APPLIANCE

1. Set the thermostat to lowest setting.
2. Turn off all electric power to the appliance if service is to be performed.
3. Remove Front Cover.
4. Turn gas shutoff valve to "off". Handle will be across the piping. Do not force.
5. Install Front Cover.

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: HTP, Inc. 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**




⚠ 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.

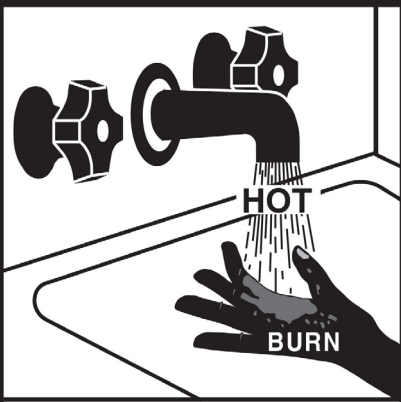
Installation:
Do not install water heater where flammable products will be stored or used unless the main burner and pilot flames

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.

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.

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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, 24" top, and 5" left side 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. 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 installer / service technician.

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

▲ WARNING

NOTE: If the appliance is exposed to the following, do not operate. Immediately call a qualified installer / 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 installer / 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.

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

The hydronic supply and return connections of this product are for installation in closed loop systems **ONLY!** Use of this product in any manner other than described in this manual may result in premature product failure, substantial property damage, personal injury, or death. Damage or failure of this product (or the system in which it is installed) due to unauthorized use IS NOT COVERED BY 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.

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.

NOTICE

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

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 System

Thoroughly flush the system (without the appliance connected) to remove sediment. The appliance can be damaged by build-up or corrosion due to sediment. HTP recommends a suction strainer in all systems.

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.

Continual fresh make-up water will reduce appliance life. Mineral build-up in the heat exchanger reduces heat transfer, overheats the stainless steel heat exchanger, and causes failure. Addition of oxygen from make-up water can cause internal corrosion of system components. Leaks in the appliance or piping must be repaired at once.

E. Freeze Protection and Winterizing

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.

To winterize the appliance, drain the entire system. Pump two gallons of non-toxic, NSF food grade, FDA rated GRAS (Generally Recognized As Safe) propylene glycol into the tank. Consult the glycol manufacturer for specific instructions on concentration percentage as well as freeze and burst protection methods. Check the concentration to assure protection is adequate to protect the bottom of the appliance from freezing.

NOTE: Damages resulting from incorrect installation or from use of products not approved by HTP, Inc. ARE NOT covered by warranty.

F. Water Temperature Adjustment

If an indirect water heater 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

G. 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.

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
- 30 PSI Temperature and Pressure Relief Valve
- Installation Manual and Warranty
- User's Information Manual
- Pressure and Temperature Gauge
- Outdoor Sensor (Part # 7250P-319)

B. How the Appliance Operates

Condensing Technology maximizes efficiency by measuring the needs of your heating system through the use of sensors and a control unit. The appliance uses data gathered by these sensors to intelligently deliver highly efficient hydronic heating.

Heat Exchanger

Exhaust gas flows through the primary section of the highly efficient combustion heat exchanger into the secondary heat exchanger section, where the coldest water on the bottom of the tank extracts the last residual amount of heat energy from the gas.

Modulating Combustion System

The combustion system modulates the output of the burner during operation to match system demand and achieve the control set point while in operation. The set point can change by internal or external signals to enhance the overall performance of the system.

Gas Valve

The gas valve senses suction from the blower, allowing gas to flow only if combustion air is flowing.

Swirl Plate System

The swirl plate on the gas valve controls air and gas flow into the burner, assuring better mixing for improved combustion.

Combination Top High Temperature Sensor

The control module adjusts appliance firing rate based on the supply temperature monitored by this sensor.

Bottom Water Temperature Sensor

The control module reduces or increases appliance input according to the return water temperature measured by this sensor.

Temperature and Pressure Gauge

Allows the user to monitor system temperature and pressure.

Control

The integrated control system monitors return and supply water temperature and regulates the unit's BTU output by controlling fan

speed, delivering only the amount of heated energy required.

Burner

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

Electrical Field Connections with Terminal Strips

The cabinet allows easy access to the clearly marked line voltage and low voltage terminal strips to facilitate wiring to the appliance.

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 ignites by applying high voltage to the system spark electrode. This causes a spark from electrode to ground.

Outdoor Sensor

When equipped, the outdoor sensor monitors outdoor temperature and adjusts the set point to provide greater efficiency.

(Optional) Indirect Tank Sensor – Indirect Priority

WARNING

To control the temperature of low temperature heating circuits when using an indirect fired water appliance, a thermostatic mixing valve is required. Failure to install a thermostatic mixing valve could result in property damage, severe personal injury, or death.

The indirect sensor allows the installer to operate the appliance to satisfy two temperatures: one for central heating and the other for a domestic hot water heater. This allows the user to increase water temperature supplied to the appliance to recover faster by prioritizing flow at a higher rate than may be needed for central heating. **NOTE:** This application requires two separate circulators.

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)
- Indirect Tank Sensor (7250P-325)
- Alarm System (7350P-602) to monitor any failure
- Outdoor Sensor (7250P-319)
- PC Connection Kit (7250P-320)
- Condensate Neutralizer (7450P-212)
- UL 353 Compliant Low Water Cut-Off Interface Kit with Manual Reset (7350P-601)

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.

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

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.

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

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.

CAUTION

All appliances eventually leak. Locate the tank 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 drain back tank 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 water heater installation. This drain pan should be sized with a maximum depth of 2", and a minimum diameter 2" greater than the diameter of the water heater. 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 DRAIN BACK TANK INSTALLATION WHERE A LEAKAGE OF WATER COULD RESULT IN PROPERTY DAMAGES.

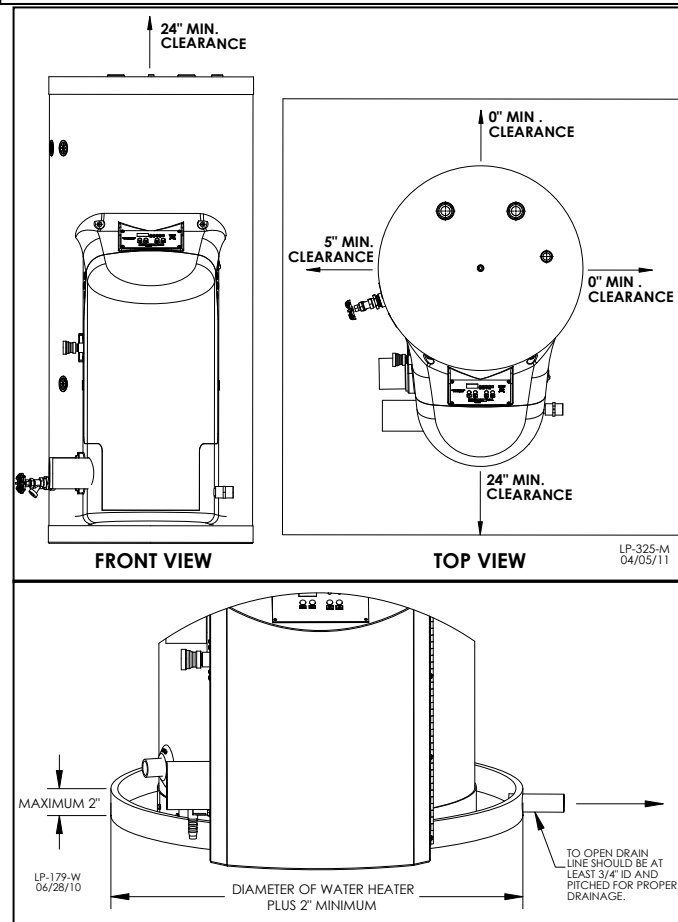


Figure 1 - Recommended Service Clearances and Drain Pan Dimensions

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.

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 appliance 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.

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.

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.

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

pipng 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 (22cm²/kW) of the total input of all appliances in the space, but not less than 100 square inches (645cm²).

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

- 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.

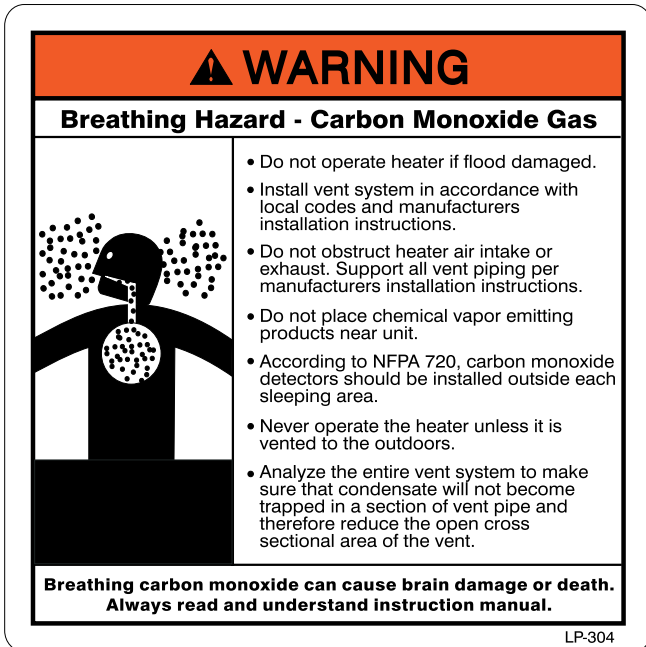


Figure 2 - CO Warning Label

I. Water Chemistry Requirements

CAUTION
<p>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.</p>

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 qualified installer / service 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 7 grains (120 mg/L) (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.

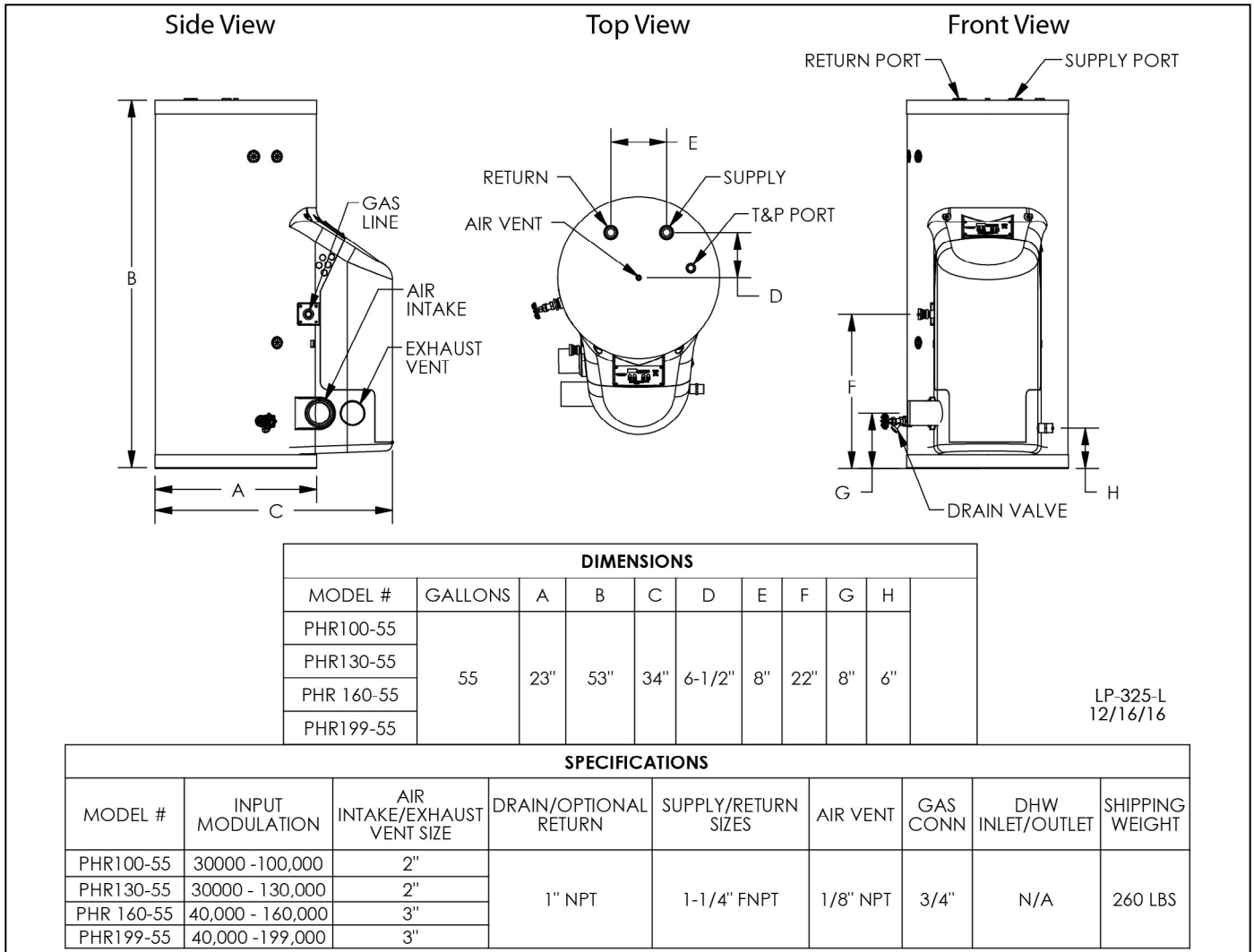


Figure 3 - Appliance Dimensions - NOTE: All Dimensions Are Approximate

Part 4 - 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.

Plumbing of this appliance should only be done by a qualified, licensed plumber in accordance with all local and national plumbing codes or any applicable prevailing standards. The appliance may be connected to an indirect storage tank to supply domestic hot water. HTP offers 30/45/60/80/119 gallon size indirect storage tanks in Stainless Steel or 50/80/119 in Glass Lined construction. These indirect storage tanks will be directly connected to the supply and return connections.

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.

A. Hydronic Plumbing

CAUTION

The building piping system must meet or exceed the piping requirements in this manual.

The appliance control module uses temperature sensors to provide both high limit protection and modulating temperature control. The control module also provides low water protection by sensing the water level in the appliance. Some codes/jurisdictions may require additional external controls.

This appliance is designed to function in a closed loop 15 PSI System. A factory installed low water cut off will ensure that you have adequate water in the system. We have also included a T&P gauge which allows the user to monitor system pressure and outlet temperature from the appliance.

Install the appliance so the gas ignition system components are protected from water (dripping, spraying, etc.) allowing clearance for basic service of circulator replacement, valves and other parts. Observe minimum 1" clearance around all hot water pipes not protected by non-combustible materials.

On an appliance installed above radiation level, some states and local codes require a low water cut off device at the time of installation. If the appliance supplies hot water to heating coils in air handler units, flow control valves or other devices must be installed to prevent gravity circulation of appliance water in the coils during the cooling cycle.

Chilled water medium must be piped in parallel with the appliance. Basic steps are listed below which will guide you through the installation of the appliance.

1. Connect the system return marked "Return".
2. Connect the system supply marked "Supply".
3. Install purge and balance valve or shut off valve and drain on system return to purge air out of each zone.
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 nominal on the system return). Check temperature and pressure gauge which should read minimum pressure of 12 PSI.
6. Install a circulator as shown in piping details (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 manufacturer instructions for specific information relating to expansion tank installation. Size the expansion tank for the required system volume and capacity.
8. Install supply air vent to remove air when commissioning the appliance.
9. The safety relief valve is supplied with the appliance, and must be installed on the top 3/4" NPT fitting marked "T&P". Pipe the discharge of the safety relief valve to prevent injury in the event of pressure relief. Discharge 6" above the drain. Provide piping that is the same size as the safety relief valve outlet. Never block the outlet of safety relief valve.

B. Circulator Pumps

CAUTION

DO NOT install automatic air vents on closed type expansion tank systems. Air must remain in the system and return to the tank to provide an air cushion. An automatic air vent would cause air to leave the system, resulting in improper operation of the expansion tank.

Sizing Space Heat System Piping

1. See piping details in this manual. Special attention must be paid when connecting an indirect storage tank, as temperature delivered to low temperature circuits may be higher than desired. The use of thermostatic mixing valves is required to protect these circuits.

CAUTION

To control the temperature of low temperature heating circuits when using an indirect fired water heater, a thermostatic mixing valve is required. Failure to install a thermostatic mixing valve when using an indirect fired water heater could result in damage the heating circuits. Such damage IS NOT covered by warranty.

2. Size the piping and components in the space heating system using recognized design methods.

C. Backflow Preventer

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

D. Expansion Tank

Expansion Tank and Make-Up Water

1. Ensure that the expansion tank is sized to correctly handle appliance and system water volume and temperature. The appliance volume is 55 gallons.

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.**

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.

3. Connect the expansion tank on the suction side of the circulator. Always install the system fill connection at the same point as the expansion tank connection to the system.

4. Most chilled water systems are piped using a closed type expansion tank.

WARNING

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

E. Relief Valve

Install supplied temperature and pressure relief valve. Connect discharge piping to a safe disposal location, following the guidelines on the next page. Replacement relief valves are available. See parts list.

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.

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.

⚠ WARNING

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 installer / 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.

F. Zoning with Zone Valves

1. Connect appliance to system as shown in the Applications diagrams. Properly size circulators for friction loss of zone valves and piping for proper operation.
2. Connect DHW (domestic hot water) piping to indirect storage water appliance as shown.

G. Zoning with Circulators

1. Connect appliance to system as shown in the Applications diagrams. Properly size each zone circulator for friction loss of each zone for proper operation.
2. Install a separate circulator for each zone.
3. Connect DHW piping to indirect storage water appliance as shown.

H. Multiple Appliances

1. All piping shown is reverse return to assure balanced flow through the connected appliances.
2. Connect DHW piping to indirect storage water appliance as shown.

I. Indirect Water Heater 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.

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

⚠ 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.

J. Fill and Purge Heating System

⚠ 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.

- Attach the hose to either balance or purge hose connector or drain valve and run hose to nearest drain.
- Close the other side of the balance and purge valve or the shut off valve after the drain.
- Open first zone balance and purge or drain valve to let water flow out the hose. If zone valves are used, open the valves one at a time manually. (NOTE: You should check valve manufacturer instruction prior to opening valves manually, so as not to damage any valves.)
- Manually operate fill valve regulator. When water runs out of the hose, while it's connected to the balance and purge valve or drain you will see a steady stream of water (without bubbles). Close balance and purge valve or drain to stop the water from flowing. Disconnect the hose and connect it to next zone to be purged.
- Repeat this procedure for additional zones (one at a time).

CAUTION

For installation that incorporates standing iron radiation and systems with manual vents at high points, follow above section and, starting with the nearest manual air vent, open until water flows out. Then close vent. Repeat procedure, working your way toward furthest air vent.

NOTE: It may be necessary to install a basket strainer in an older system where larger amounts of sediment may be present. Annual cleaning of strainer may be necessary.

Upon completion, make sure that the fill valve is in automatic position and each zone balance and purge or shut off is in an open position and zone valves are set for automatic operation.

⚠ WARNING

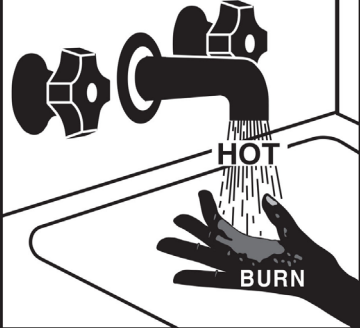
Use only inhibited propylene glycol solutions which are FDA RATED AS GRAS and specifically formulated for hydronic systems. Ethylene glycol is toxic and can attack gaskets and seals used in hydronic systems. Failure to follow the instructions in this section WILL VOID the warranty and may result in property damage, severe personal injury, or death.

Glycol in hydronic applications includes inhibitors that prevent it from attacking metallic system components. Make certain that system fluid is checked for the correct glycol concentration and inhibitor level.

The glycol solution should be tested at least once a year, or as recommended by the glycol manufacturer. Anti-freeze solutions expand more than water. For example: A 50% by volume glycol solution expands 4.8% in volume during a temperature increase from 32 to 180°F, while water expands 3% over the same temperature rise. Allowances must be made for expansion in system design.

A 30% mixture of glycol results in a BTU output loss of 15% with a 5% increase in head against the system circulator. A 50% glycol mixture results in a BTU output loss of 30% with a 50% increase in head against the system circulator.

! 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.

CAUTION

It is highly recommended that you carefully follow glycol manufacturer recommended concentrations, expansion requirements, and maintenance recommendations (pH additive break down, inhibitor reduction, etc.) You must carefully figure the additional friction loss in the system as well as the reduction in heat transfer coefficients.

K. Central Heating Applications

NOTES:

1. This drawing is meant to show system piping concept only. Installer is responsible for all equipment & detailing required by local codes.
2. The minimum pipe size for connecting a SuperStor Ultra Indirect Water Appliance is 1-inch.
3. The minimum pipe size for connecting the appliance is 1.25-inch
4. Circulators are shown with isolation flanges and integral check valves. The alternative is standard flanges with full port ball valves and a separate flow check valve. Purge valves can be used with the circulator flanges as an alternative.
5. The anti-scald mixing valve is recommended if the DHW temperature is set above the factory setting of 119°F.
6. Install a minimum of 12 diameters of straight pipe upstream of all circulators.
7. Winterization: When winterizing, put a drain valve on both the supply and return between the union and the shut-off connection.
8. If a backflow preventer or no return valve is installed, a thermal expansion tank is required on the cold water inlet between the water heating appliance and the backflow preventer.

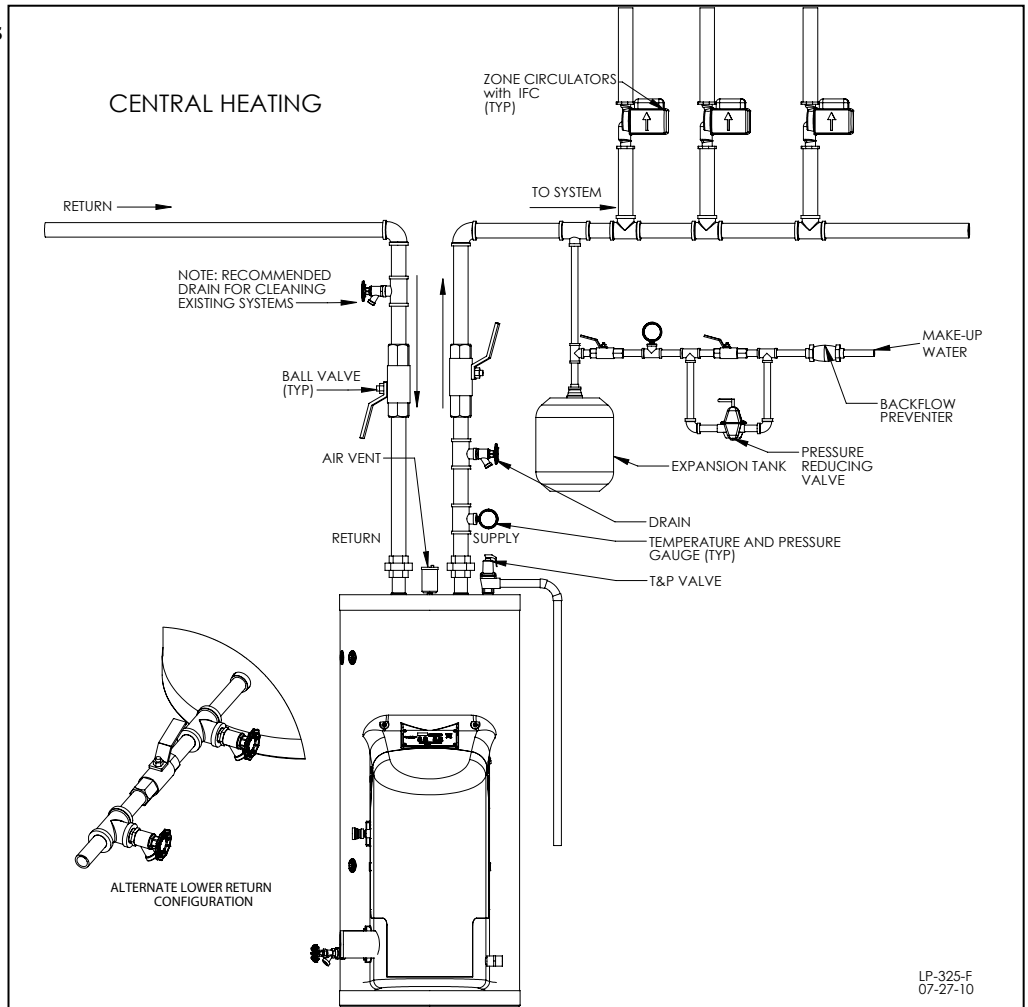


Figure 4 - Central Heating

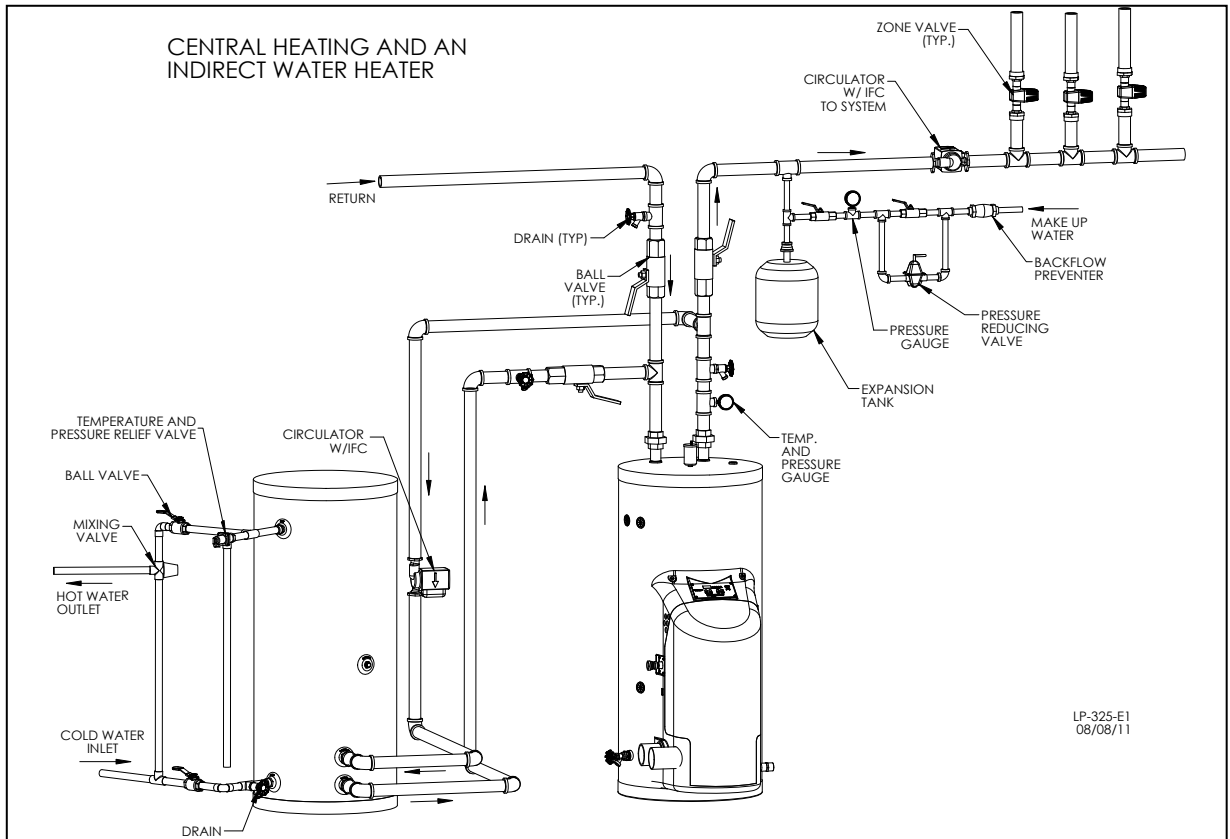


Figure 5 - Appliance with Indirect Water Heater

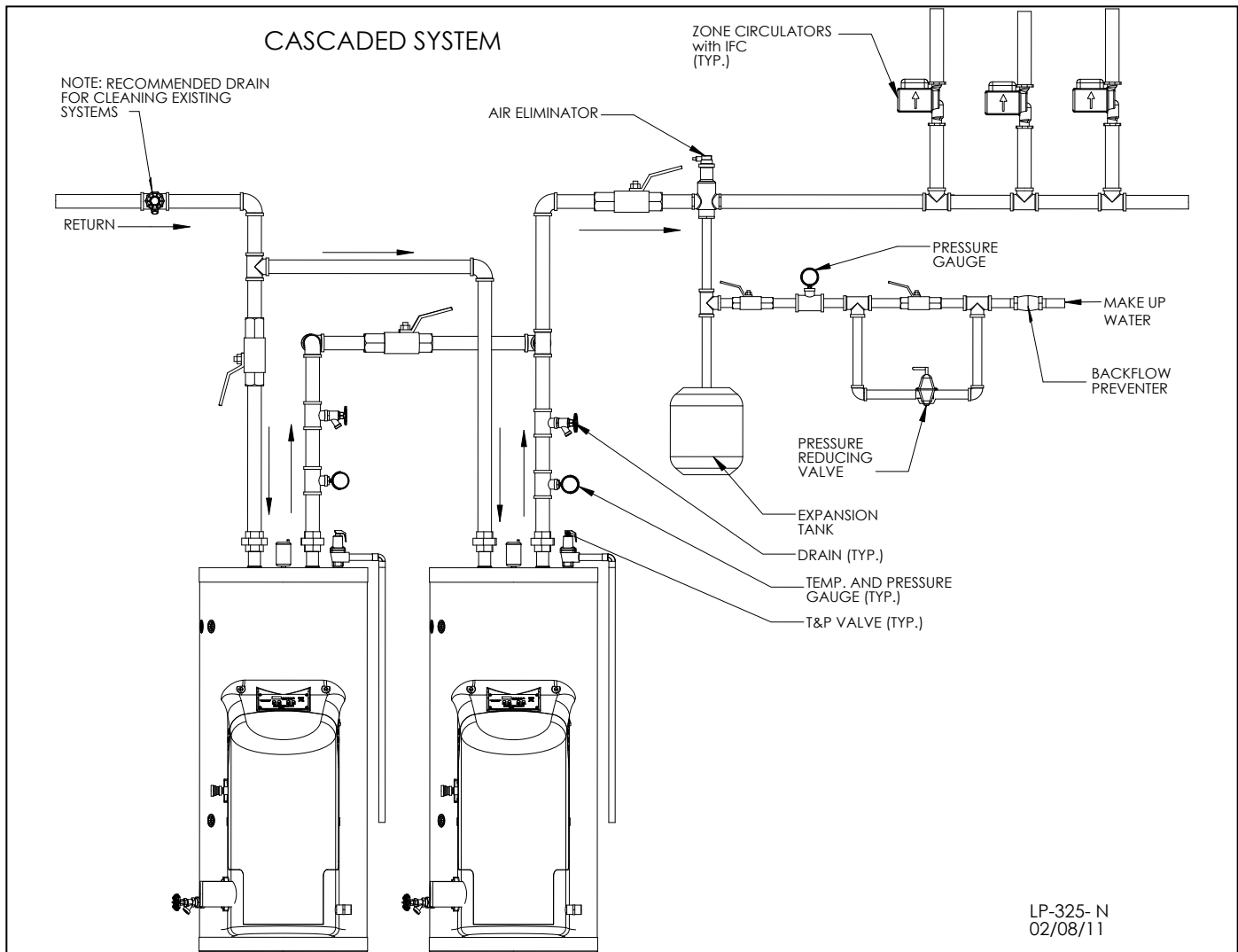


Figure 6 - Cascaded System

NOTES:

1. This drawing is meant to show system piping concept only. Installer is responsible for all equipment & detailing required by local codes.
2. The minimum pipe size for connecting a SuperStor Ultra Indirect Water Appliance is 1-inch.
3. The minimum pipe size for connecting the appliance is 1.25-inch
4. Circulators are shown with isolation flanges and integral check valves. The alternative is standard flanges with full port ball valves and a separate flow check valve. Purge valves can be used with the circulator flanges as an alternative.
5. The anti-scald mixing valve is recommended if the DHW temperature is set above the factory setting of 119°F.
6. Install a minimum of 12 diameters of straight pipe upstream of all circulators.
7. Winterization: When winterizing, put a drain valve on both the supply and return between the union and the shut-off connection.
8. If a backflow preventer or no return valve is installed, a thermal expansion tank is required on the cold water inlet between the water heating appliance and the backflow preventer.

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.

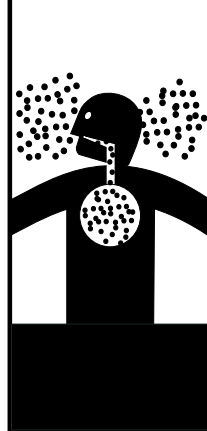
▲ WARNING

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.

▲ 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.

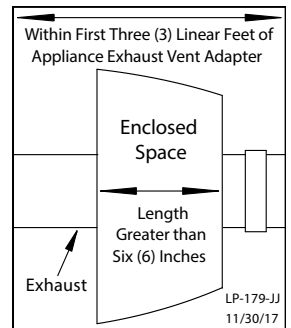
LP-304

▲ 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.

▲ WARNING

- 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.
- 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.



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.
 - DO NOT use Foam Core Pipe in any portion of the exhaust piping from this appliance.
 - 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 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

 WARNING
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.
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.

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.

 WARNING
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.
 DANGER
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

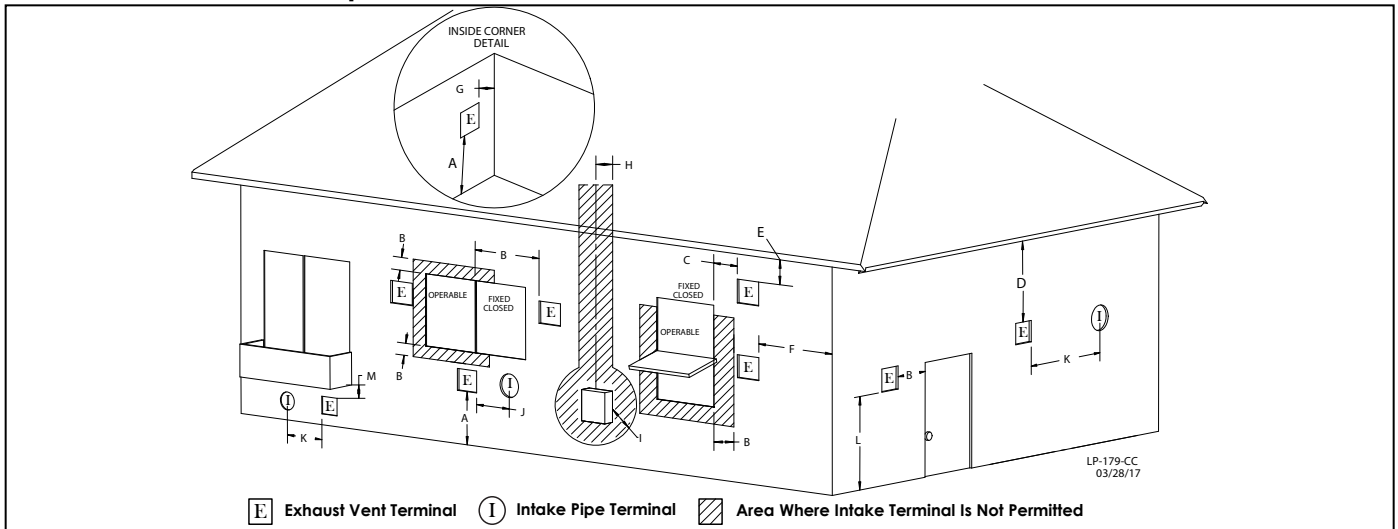


Figure 7 - Exit Terminals for Direct Vent Systems - ANSI Z223.1 / NFPA 54 for US and CAN/CSA B149.1 for Canada

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
		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
		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	*
		Power Vent	7 feet (2.13 m)
M	Clearance under veranda, porch deck, or balcony	*	

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 100 and 130kBTU models and 3" for 160 and 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 = (2x5) + 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 = (2x5) + 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. **FOAM CORE PIPING IS NOT APPROVED FOR EXHAUST VENT APPLICATIONS.** Foam core piping 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.

8. 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 water heater 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 water heater in a chimney flue serving a separate appliance designed to burn solid fuel. The water heater 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.

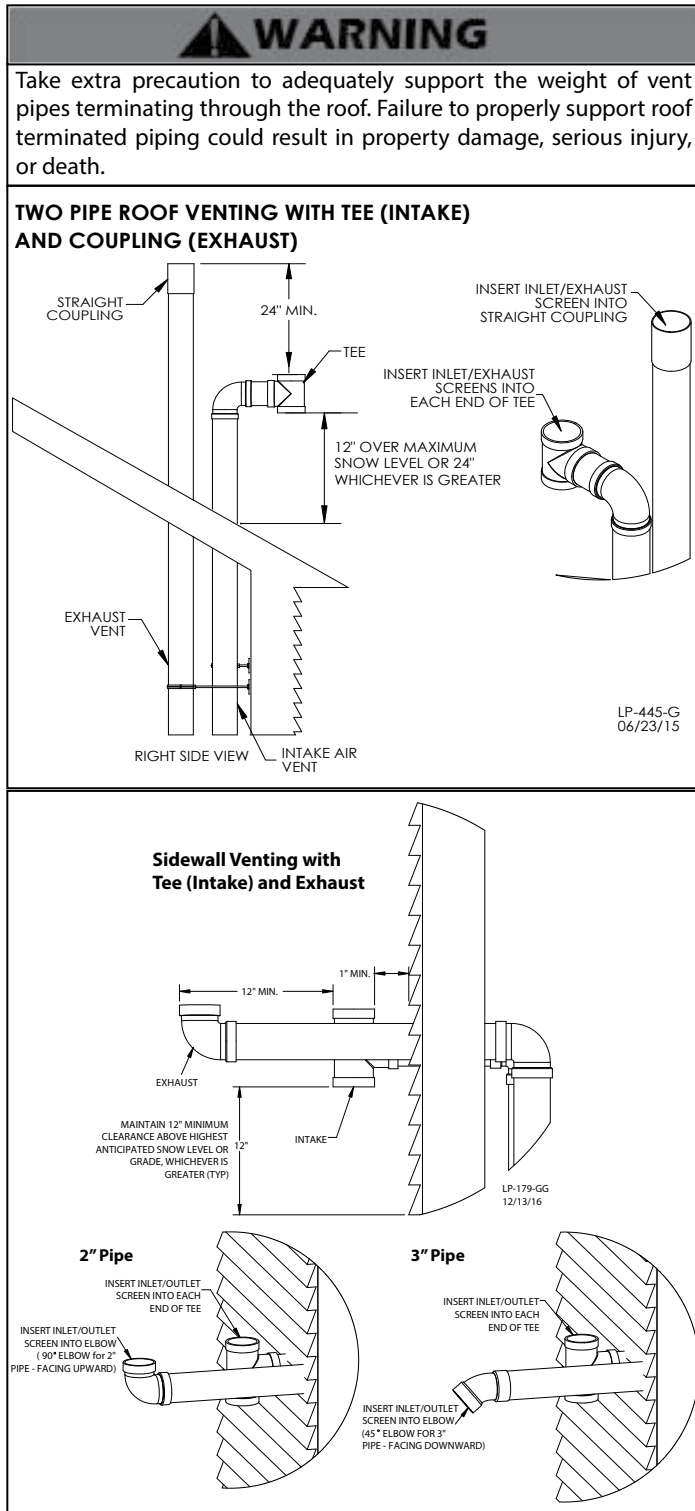


Figure 8 - Two Pipe Roof and Sidewall Venting with Included Equipment (Tee and Coupling)

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.

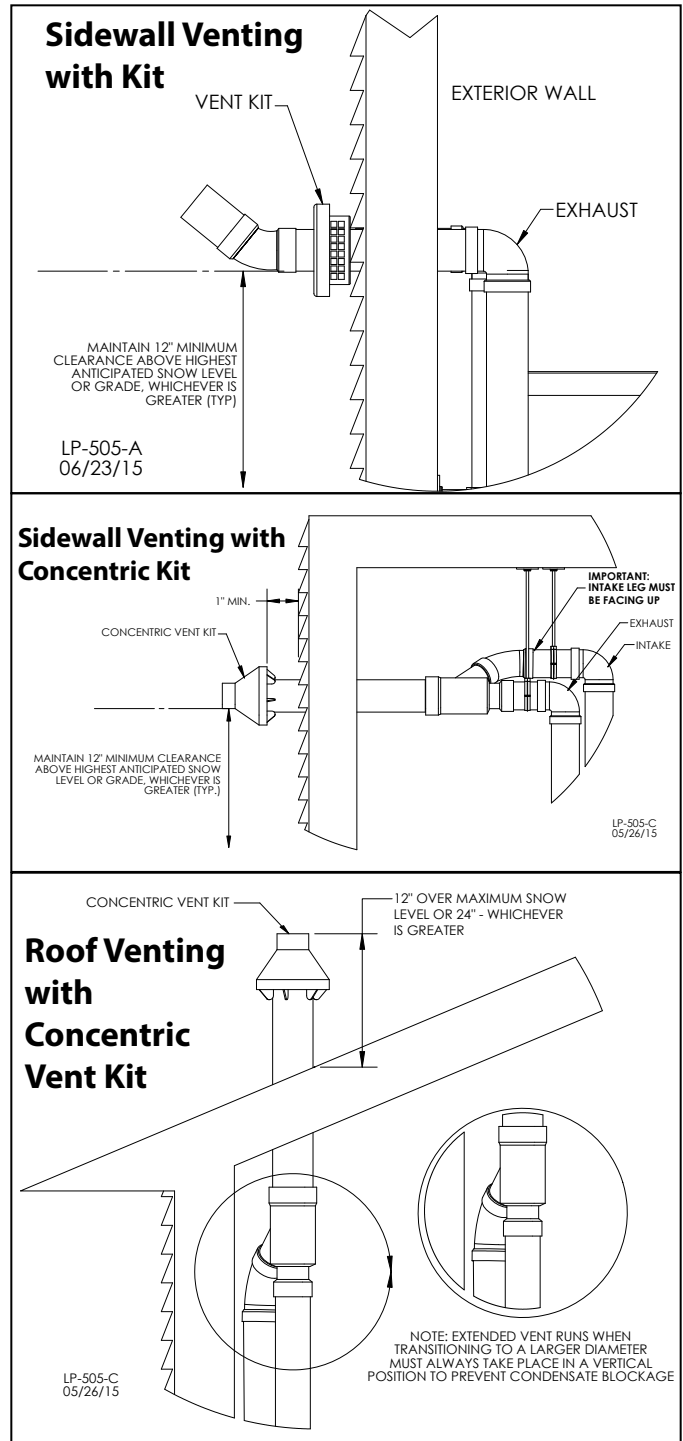


Figure 9 - Venting with Optional Kits (NOT INCLUDED WITH THE APPLIANCE)

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

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.

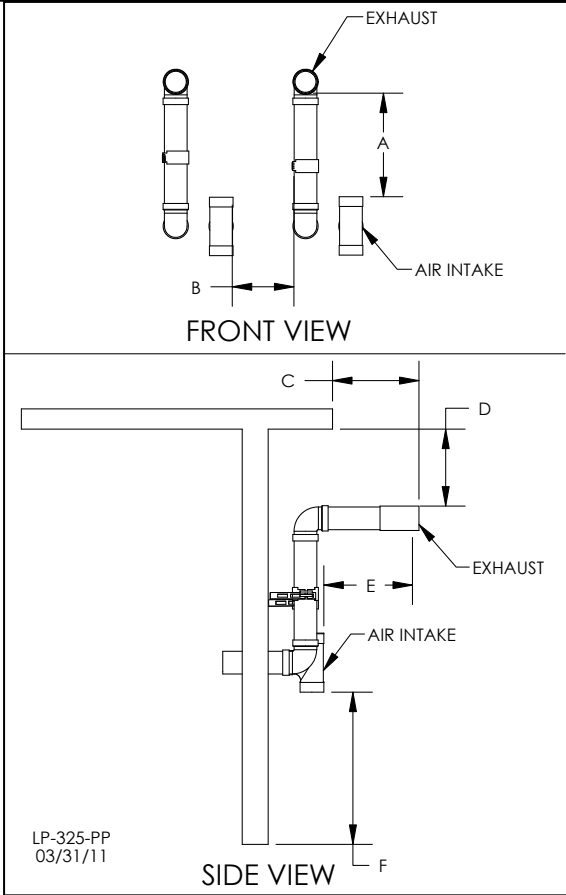
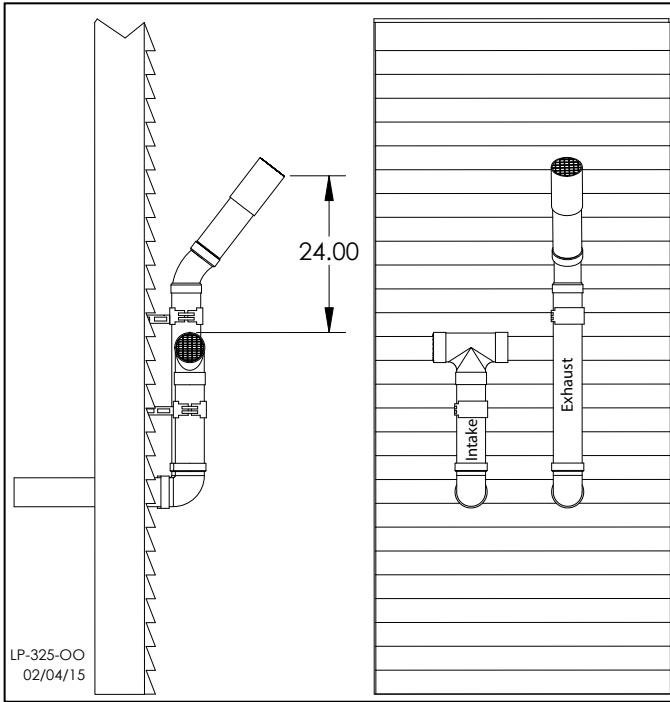


Figure 10 - Horizontal (Snorkel) Venting

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.

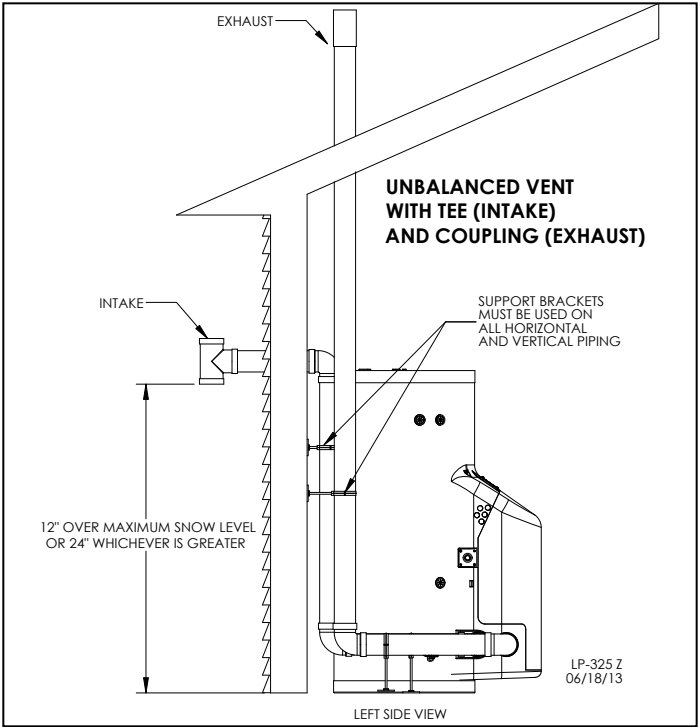


Figure 11 - Unbalanced Venting - Roof Exhaust and Sidewall Intake

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 12-1 and 12-2 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 12-3 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 13) 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 (22cm²/kW) of the total input of all appliances in the space, but not less than 100 square inches (645cm²).

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 14.

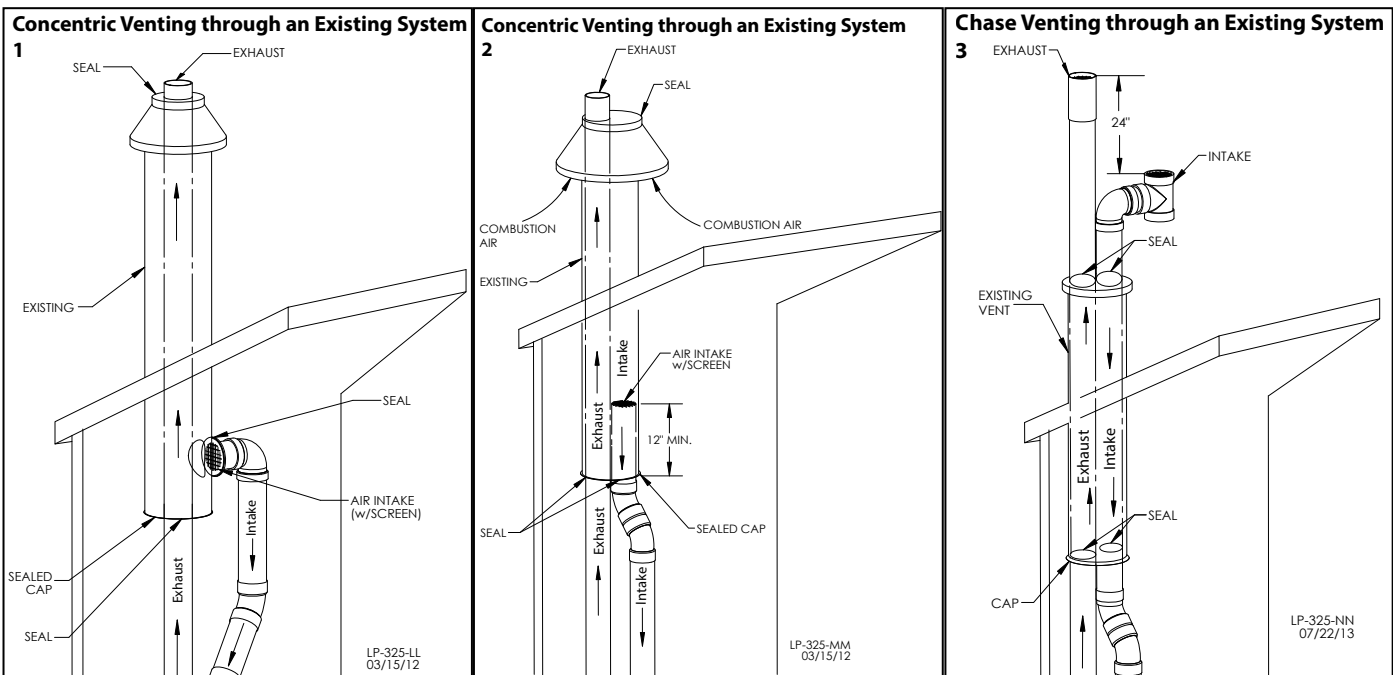


Figure 12 - 1, 2 - Concentric Venting Through an Existing System, 3, Chase Venting Through an Existing System

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

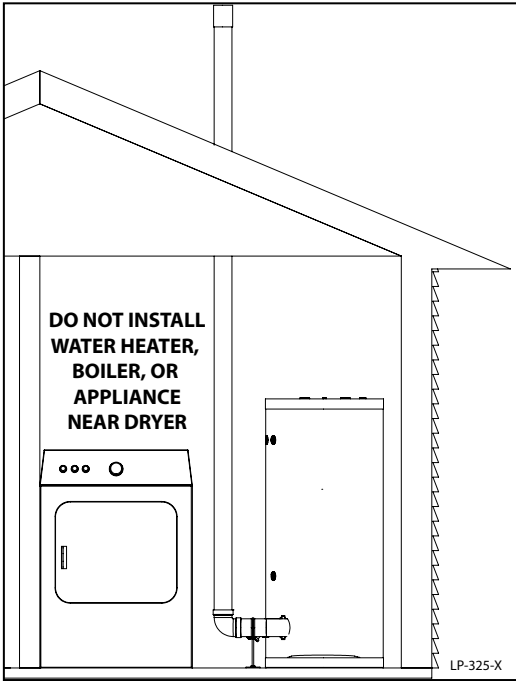


Figure 13 - Do Not Place Appliance Near Dryer

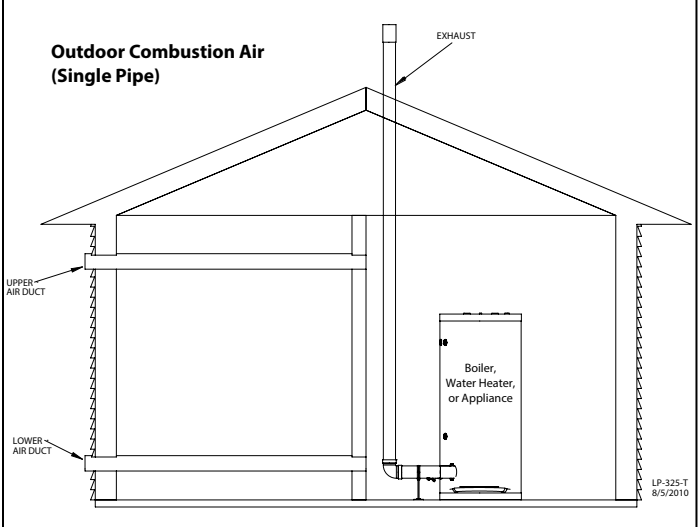
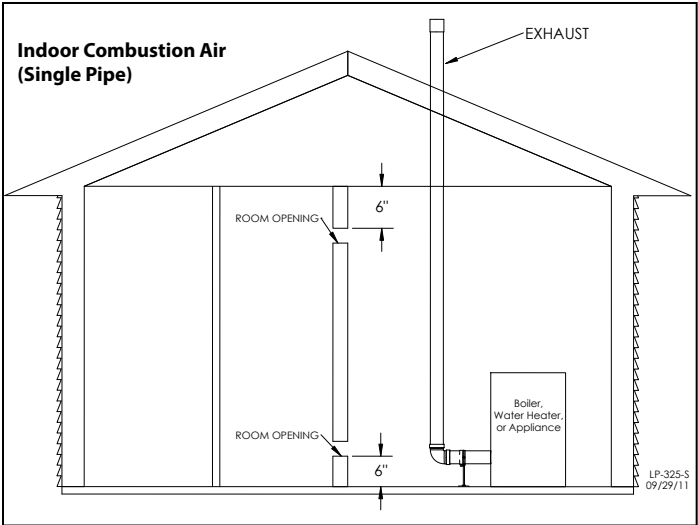
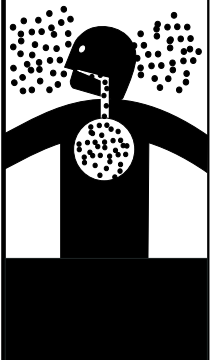


Figure 14 - Indoor and Outdoor Combustion Air - Single Pipe

⚠ 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.

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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.

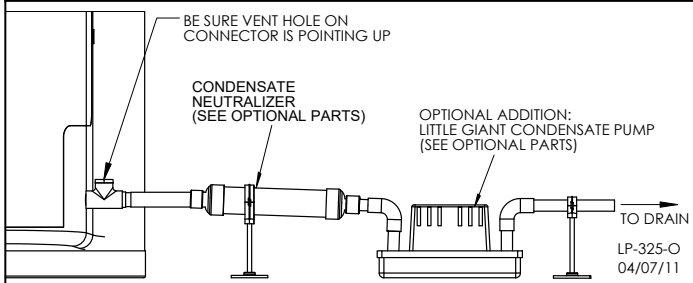


Figure 15 - Condensate Piping

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.

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 **MUST** be installed when using 0-10V or outdoor reset. Failure to do so could result in substantial property damage, serious 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.

A. Field Wiring

All connections made to the appliance in the field are done on the field connection board located on the top left side of the cabinet. Multiple knockout locations are available to route field wires into and out of the cabinet.

The appliance is capable of directly controlling 2 pumps when in standard mode and 3 pumps when configured as a cascade master appliance. When configured as a standard unit, each pump output can provide a maximum of 3 amps at 120 volts. If pumps require more than this amount of power, an external contactor or motor starter is needed.

If the appliance is configured as a cascade master, the appliance pump output is a dry contact output capable of switching 5 amps at 120 volts in addition to the system pump and DHW pump outputs sourcing 3 amps each.

An alarm bell or light can be connected to the alarm connection of the appliance. The alarm connection may be used to power a 120V device, and is rated 3 amps at 120 VAC.

The field connection board has separate, clearly marked terminal strips for line voltage and low voltage wiring. Special jacks are provided for trouble-free cascade system wiring using standard CAT3 or CAT5 patch cables.

B. Line Voltage Wiring for Standard Appliance

1. Connect the incoming power wiring to the line voltage terminal strip in the field connection board at terminals 120V, Neutral, Ground. A line voltage fused disconnect switch may be required to be externally mounted and connected according to local codes that may apply.
2. Connect the central heating pump to the terminals marked 8 (HOT), 2 (NEUT), 3 (GND) in Figure 16. The connections shown are suitable for a maximum continuous pump draw of 5 amps at 120 volts. If the pump requires more current or voltage other than 120

volts, an external motor starter or contactor will be required.

3. If using DHW, connect the domestic hot water pump as shown to the terminals marked 4 (HOT), 5 (NEUT), 6 (GND). The connections shown are suitable for a maximum continuous pump draw of 3 amps at 120 volts.

4. If a pump requires more current or voltage other than 120 volts, an external motor starter or contactor will be required.

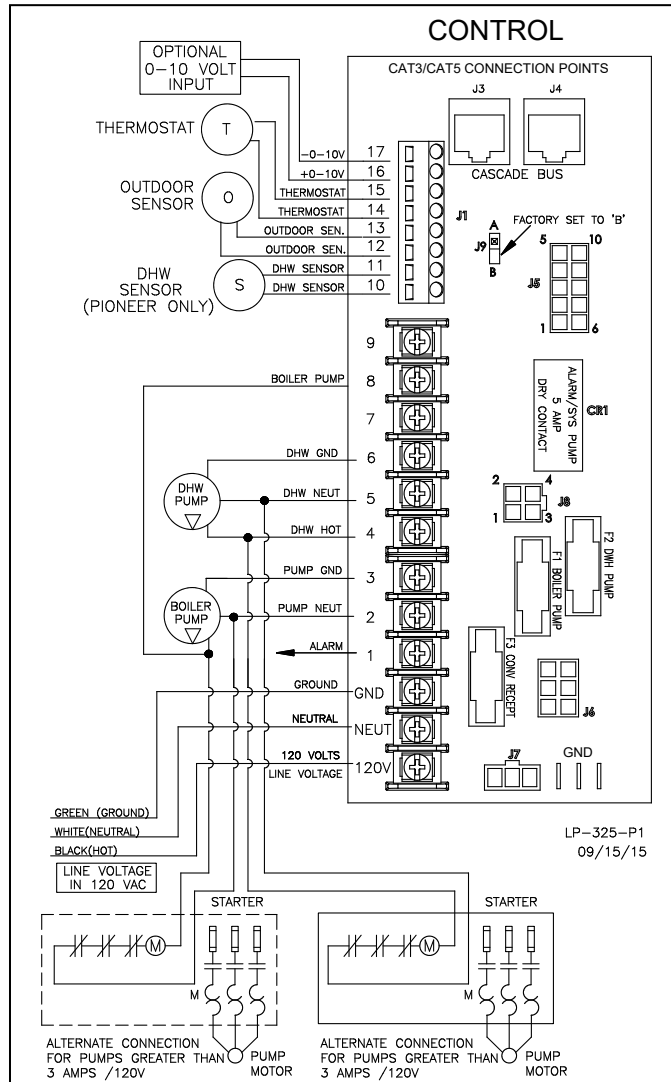


Figure 16 - Standard Appliance Customer Connection Board Detail

C. Thermostat

1. Connect the room thermostat to the terminals marked 14 and 15 on the field connection board. Any dry contact closure across these terminals will cause the appliance to run. Take caution to ensure neither of the terminals connects to the ground.

2. Mount the thermostat on an inside wall as centrally to the area being heated as possible, but away from drafts or heat producing devices such as television sets that could influence the ability of the thermostat to measure room temperature.

3. If the thermostat is equipped with an anticipator and it is connected directly to the appliance, 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 devices. See the instruction manual of connected devices for further information.

D. Outdoor Sensor (Optional)

1. If an HTP 7250P-319 outdoor sensor is not used in this installation, move on.

2. Use a minimum 22 AWG wire for runs of 100 feet or less and minimum 18 AWG wire for runs of up to 150 feet.

3. Mount the outdoor sensor on an exterior surface of the building, preferably on the north side in an area that will not be affected by direct sunlight and will be exposed to varying weather conditions.

NOTE: Follow instructions provided with the sensor for detailed mounting instructions.

4. When correctly mounted, connect sensor to terminals marked 12 and 13.

E. Indirect Sensor (Optional)

1. If an indirect water heater is not used in the installation, move on.

2. The appliance will operate an indirect fired water heater with either a thermostat type aquastat or an HTP 7250P-325 tank sensor installed in the water heater. When a tank sensor is used, the appliance control will automatically detect its presence and a demand for heat from the water heater will be generated when the tank temperature falls below the user set point by more than the user selectable offset. Demand will continue until the indirect water heater temperature is above the set point.

Connect the indirect sensor or mechanical aquastat to the terminals marked 10 and 11 on the field connection board.

CAUTION

To control the temperature of low temperature heating circuits when using an indirect fired water heater, a thermostatic mixing valve is required. Failure to install a thermostatic mixing valve when using an indirect fired water heater could result in damage the heating circuits. Such damage IS NOT covered by warranty.

F. Optional 0-10 Volt Building Control Signal

1. If a 0-10 volt building management system is not used in the installation, move on.

2. 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.

3. When this input is enabled using the installer menu, a building control system can be used to control either the set point temperature or the heat output 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 standby mode, not firing. When the signal rises above 1.5 volts, a demand for heat is started. As the signal continues to rise towards its maximum of 10 volts, the appliance will increase either its set point temperature or firing rate depending on the setting of function 17 in the installer menu. See Part 10 for details on the setting of functions 16 and 17 for this option.

4. Connect a building management system or other auxiliary control signal to the terminals marked 16 (0-10 VOLT +) and 17 (0-10 VOLT -) in the electrical junction box caution should be used to ensure that the 16 (0-10 VOLT +) connection does not become connected to ground.

G. UL353 Low Water Cut-Off Kit (Optional)

1. If an HTP 7450P-255 UL353 Low Water Cut-Off (LWCO) Kit is not used, move on to Section I.

2. The control box of the kit should be mounted to the left side of the appliance near the low water cut-off probe, which is located near the outlet nipple of the appliance.

3. Follow the complete instructions included in the kit for proper installation.

H. Wiring of an Appliance Alarm (Optional)

An alarm bell or light can be connected to the alarm connection of the appliance. In the event of an alarm, the alarm connection may be used to power a 120V device. The alarm connections are rated 3 amps at 120 VAC. Connect to terminal 1 (HOT), 2 (NEUT), and 3 (GND).

I. Wiring of the Cascade System Communication Bus

1. Use standard CAT3 or CAT5 computer network patch cables to connect the communication bus to each of the appliances. These cables are readily available at any office supply, computer, electronic, department or discount home supply store in varying lengths. If you possess the skills you can also construct custom length cables.

2. It is recommended to use the shortest length cable that will reach between the appliances and create a neat installation. Do not run unprotected cables across the floor where they may become wet or damaged. Avoid running communication cables parallel and close to or against high voltage (120 volt or greater) wiring. HTP recommends the maximum length of communication bus cables not exceed 200 feet.

3. Route the communication cables through one of the knockouts in the cabinet.

4. Connect the appliances in a daisy chain configuration. It is best to wire the appliances using the shortest wire runs rather than trying to wire them in the order that they are addressed. The communication bus jacks on the customer connection panel are interchangeable so you can use either one or both in any order to connect the cable. If you have connected the appliances to each other properly, two of the appliances will have single open connection ports.

J. Cascade Master Pump and Sensor Wiring

1. Connect the system pump hot wire to the terminal marked 1.
2. Connect the system pump neutral to the terminal 2 and the pump ground wire to terminal 3.
3. Connect a jumper wire from the 120 VOLT terminal to terminal 9.
4. Connect the appliance pump to the terminals marked 8, 2, and 3.
5. Connect the system pipe sensor to the terminals marked 10 and 11.
6. Connect the outdoor sensor (if used) to the terminals marked 12 and 13.
7. Connect the signal to start the system to the terminals marked 14 and 15.

NOTE: This signal can come from a room thermostat or a dry contact closure. No power of any voltage should be fed into either of these terminals.

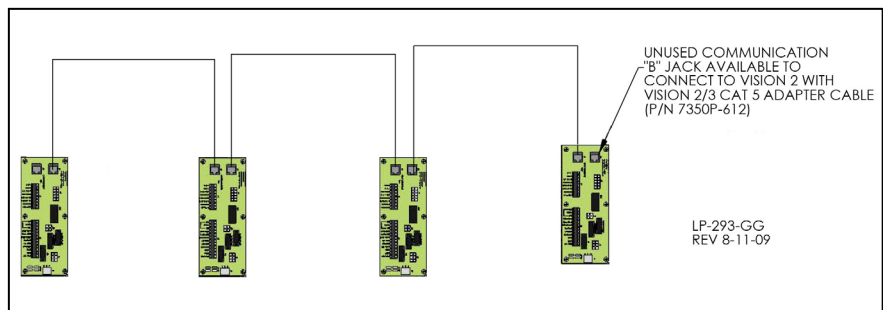


Figure 17 - Cascade Wiring

K. Cascade Follower Pump and Sensor Wiring

1. Connect the appliance pump to the terminals labeled 8, 2, and 3.
3. If you are using an indirect fired water tank connected directly to the follower appliance connect the pump for it to the 4, 5, and 6 terminals.

2. An alarm bell or light can be connected to the alarm contacts of the follower appliance. In the event of an alarm, the normally open alarm contact may be used to turn a device on. The normally closed alarm contact may be used to turn a device off if the appliance goes into lockout mode. The alarm contacts are rated 3 amps at 120 VAC.

3. To connect an alarm device, connect the power for the device to terminal 1. Connect the neutral or return of the alarm device to the neutral terminal on the customer connection board.

NOTE: In a cascade system the alarm output of the appliance addressed as #1 will also be active if the master appliance has a lockout condition. The alarm output of appliances addressed as 2-7 will only activate an alarm if a lockout condition occurs on that specific appliance.

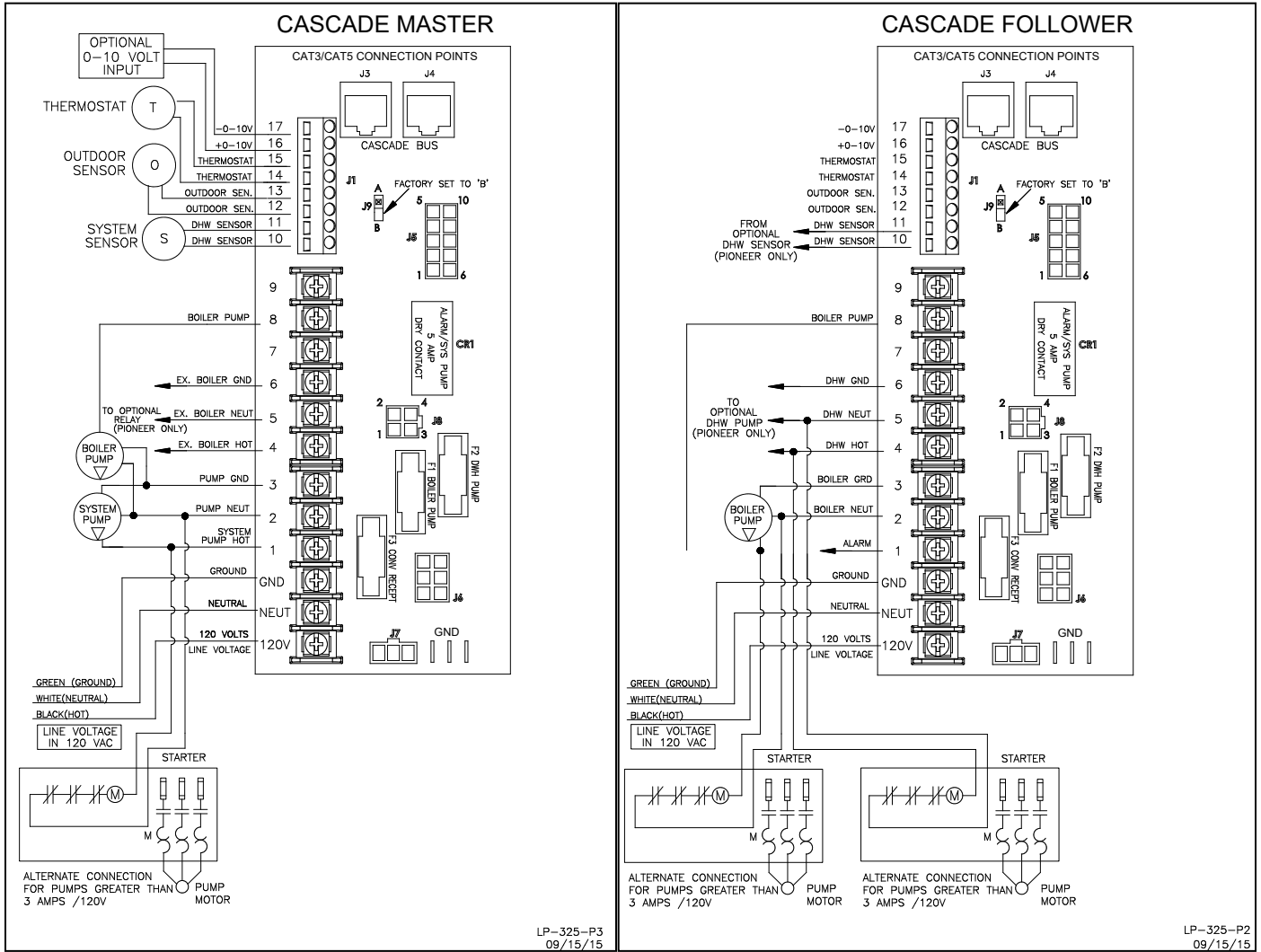
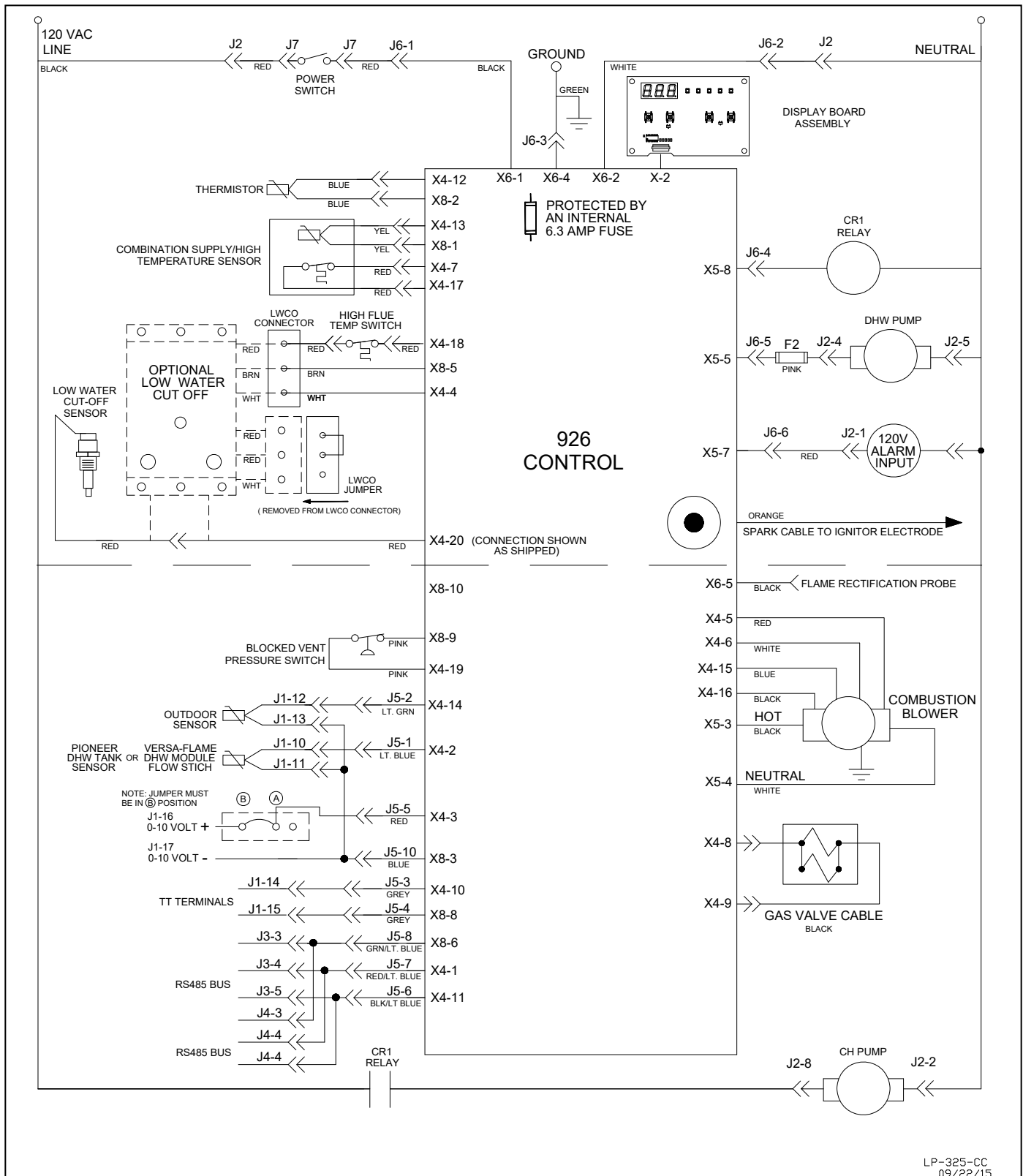


Figure 18 - Cascade Master and Cascade Follower Wiring

L. Internal Wiring Diagram



LP-325-CC
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Figure 19 - Internal Wiring Diagram

Part 8 - Gas Connections



WARNING

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



WARNING

Ensure the gas on which the water heater will operate is the same type specified on the rating plate. Failure to do so could result in water heater 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 1/2 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 water heater 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 20! 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 water heater 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 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 1/2 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 water heater has a flanged connection to the swirl plate and blower.

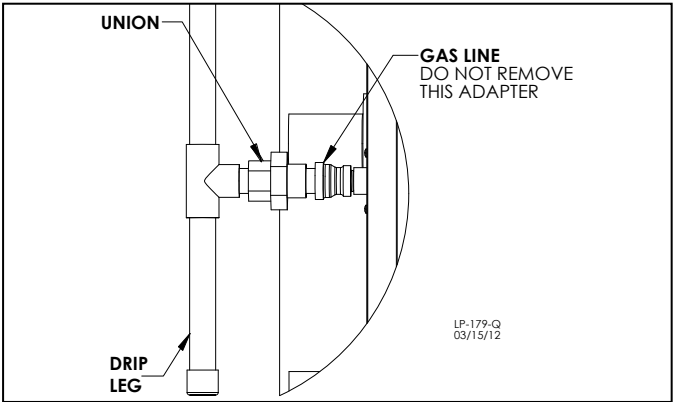


Figure 20 - Gas Connection

⚠ 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.

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⚠ 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.

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/ft³. Contact the local gas supplier for actual BTU/ft³ 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.


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.

Pipe Size (in.)	Length of Pipe (Feet)										BTU's Per Hour x 1,000 Schedule 40 Metallic Pipe (0.60 Specific Gravity, 0.5 WC Pressure Drop)
	10	20	30	40	50	60	80	100	150	200	
3/4	360	247	199	170	151	137	117	104	83	71	
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



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.

- The gas adapter fitting on the water heater is 3/4" NPT. **NOTE:** The gas supply pipe size must not be less than 3/4".
- The supply line must be sized for the maximum output of the water heater 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.
- Measure the length of the gas supply line from the gas meter to the water heater. The water heater must be installed downstream of the gas meter to ensure adequate gas supply.
- 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.
- 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 21.
- A manual gas shut-off valve should be installed in the gas supply line close to the water heater. Locate and install manual shutoff valves in accordance with local and state requirements.

- 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 water heater.
- 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 water heater.
- Leak test the gas line pipe before placing the water heater 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 CO2 and CO. Failure to follow this instruction could result in fire, explosion, property damage, severe personal injury, or death.

D. Checking Gas Pressure at the Water Heater for Proper Operation

NOTE: Refer to Figure 21 when checking gas pressure.

- The water heater 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 1/2 psi (3.5 kPa).
- The water heater must be isolated from the gas supply piping system by closing its individual manual shutoff valve during any pressure testing of the gas supply piping system at test pressures equal to or less than 1/2 psi (3.5 kPa). Loosen the screw on the pressure tap inlet to attach a manometer and check the gas inlet pressure.

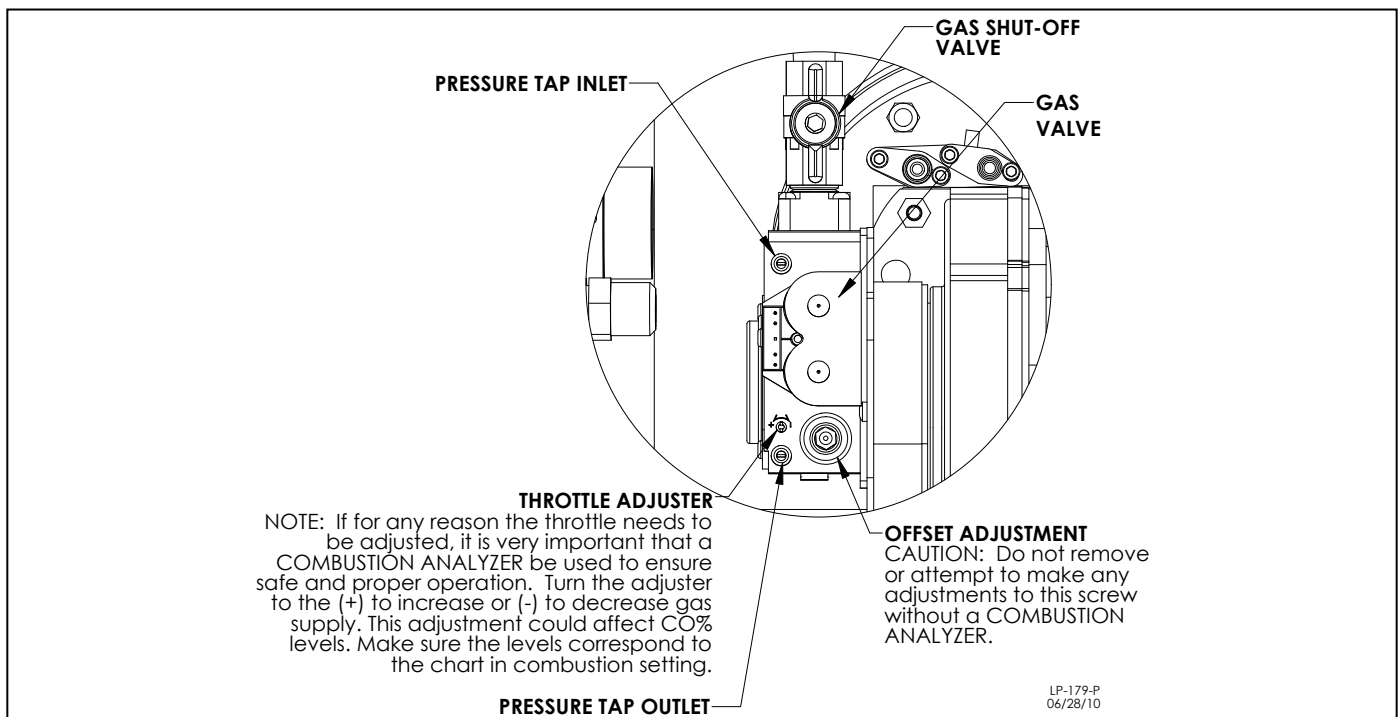


Figure 21 - Gas Valve


The minimum and maximum inlet gas line pressures must meet the requirements shown in Table 12.

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

Table 12 - Gas Pressure Requirements

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

Part 9 - Start-Up Preparation

 WARNING
Thoroughly clean and flush any system that has used glycol before installing the appliance. Provide the customer with a material safety data sheet (MSDS) on the fluid used.

A. Check / Control Water Chemistry

CAUTION
Chemical imbalance of your water can cause severe damage to your appliance and associated equipment, and may also affect efficiency. You may have to have your water quality professionally analyzed to determine whether you need to install a water softener. It is important that the water chemistry on both the domestic hot water and central heating sides are checked before installing the appliance, as water quality will affect the reliability of the system. Outlined below are those water quality parameters which need to be met in order for the system to operate efficiently for many years. Failure of a heat exchanger due to lime scale buildup on the heating surface, low pH or other imbalance IS NOT covered by the warranty.

To assure extended service life, it is recommended to test water quality prior to installation. Listed below are some guidelines.

CAUTION
Do not use petroleum-based cleaning or sealing compounds in the appliance system. Damage to elastomer seals and gaskets in the system could occur, resulting in substantial property damage.

Water pH between 6.5 and 8.5

- Maintain appliance water pH between 6.5 and 8.5. Check with litmus paper or have it chemically analyzed by a water treatment company.
- If the pH differs from above, consult local water treatment company for treatment needed.

Hardness less than 7 grains (120 mg/L)

Consult local water treatment companies for unusually hard water areas (above 7 grains hardness).

Chloride concentration less than 100 ppm (mg/L)

- Using chlorinated fresh water should be acceptable since drinking water chloride levels are typically less than 5 ppm.
- Do not connect the appliance to directly heat a swimming pool or spa water.
- Do not fill appliance or operate with water containing chloride in excess of 100 ppm.

Total Dissolved Solids (TDS) less than 500 ppm (mg/L) 1. 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.

Hardness: Less than 7 grains (120 mg/L)

Chloride levels: Less than 100 ppm (mg/L)

pH levels: 6.5 - 8.5

TDS: 500 ppm / mg/L

Clean system to remove sediment*

- You must thoroughly flush the system (without appliance connected) to remove sediment. The high-efficiency heat exchanger can be damaged by buildup or corrosion due to sediment.
- For zoned systems, flush each zone separately through a purge valve. (If purge valves and isolation valves are not already installed, install them to properly clean the system.)
- Flush system until water runs clean and you are sure piping is free of sediment.


*NOTE: It is recommended you clean heat exchanger at least once a year to prevent lime scale buildup. Follow the maintenance procedure to clean the heat exchanger in the Maintenance Section of this manual.

Test/replace freeze protection fluid


- For systems using freeze protection fluids, follow fluid manufacturer's instructions to verify inhibitor level and that other fluid characteristics are satisfactory.
- Freeze protection fluid must be replaced periodically due to degradation of inhibitors over time. Follow all fluid manufacturer instructions.

NOTE: Appliance failure due to improper water chemistry is not covered by warranty.

B. Check for Gas Leaks

 WARNING
Before starting the appliance, and during initial operation, smell near the floor and around the appliance for gas odorant or any unusual odor. Remove appliance front door and smell interior of appliance enclosure. Do not proceed with startup if there is any indication of a gas leak. Repair any leaks at once.
PROPANE ONLY – The propane supplier mixes an odorant with the propane to make its presence detectable. In some instances the odorant can fade, and the gas may no longer have an odor. Before startup (and periodically thereafter), have the propane supplier verify the correct odorant level in the gas.

C. Freeze Protection (When Used)

 WARNING
NEVER use automotive or standard glycol antifreeze. Do not use ethylene glycol made for hydronic systems. Use only freeze-protection fluids certified by fluid manufacturer as suitable for use with stainless steel boilers, verified in the fluid manufacturer's literature. Thoroughly clean and flush any system that has used glycol before installing the new appliance. Provide the appliance owner with a material safety data sheet (MSDS) on the fluid used.

- Determine the freeze protection fluid quantity using total system water content following the fluid manufacturer's instructions. Remember to include expansion tank water content.
- Local codes may require back flow preventer or actual disconnect from city water supply.
- When using freeze protection fluid with automatic fill, install a water meter to monitor water makeup. Freeze protection fluid may leak before the water begins to leak, causing concentration to drop, reducing the freeze protection level.

Test / Replace Freeze Protection Fluid

- Follow fluid manufacturer instructions to verify inhibitor level and other fluid characteristics are satisfactory.
- Freeze protection fluid must be replaced periodically due to degradation of inhibitors over time. Follow all fluid manufacturer instructions.

D. Fill and Test Water System

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, severe personal injury, or death.

1. Fill the system only after ensuring water chemistry meets the requirements listed in this manual.
2. Close the manual and automatic air vents and appliance drain valve.
3. Fill to the correct system pressure. Correct pressure will vary with each application.
 - a. Typical cold water fill pressure for a residential system is 12 psi.
 - b. Pressure will rise when appliance is turned on and system water temperature increases. Operating pressure must never exceed the relief valve pressure setting.
4. At initial fill and during appliance startup and testing, check system thoroughly for leaks. Repair all leaks before proceeding further.

WARNING

Eliminate all system leaks. Continual fresh make-up water will reduce appliance life. Minerals can build up in the heat exchanger, reducing heat transfer, overheating the heat exchanger and causing heat exchanger failure.

5. 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.

E. Purge Air from the Hydronic System

CAUTION

It is important to purge the system of air to avoid damage to the appliance.

IMPORTANT! While commissioning the system, the air vent on top of the appliance must remain fully open to allow the appliance to properly fill. Failure to keep the air vent open could lead to improper appliance and system operation.

1. Connect a hose to the purge valve and route hose to an area where water can drain and be seen.
2. Close the appliance or system isolation valve between the purge valve and fill connection to the system.
3. Close zone isolation valves.
4. Open quick-fill valve on cold water makeup line.
5. Open purge valve.
6. One zone at a time, open the isolation valves. Allow water to run through the zone, pushing out the 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. Refill to correct pressure.

F. Check Thermostat Circuit(s)

1. Disconnect the two external wires connected to the appliance thermostat terminals (low voltage terminal strip).
2. Connect a voltmeter across these two incoming wires with power applied to thermostat circuits. Close each thermostat, zone valve and relay in the external circuit one at a time and check the voltmeter reading across the incoming wires.
3. There should NEVER be a voltage reading.
4. If a voltage does occur under any condition, check and correct the external wiring. (This is a common problem when using 3-wire zone valves).
5. Once the external thermostat circuit wiring is checked and corrected if necessary, reconnect the external thermostat circuit wires to appliance low voltage terminal strip.

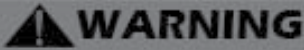
G. Final Checks Before Starting Appliance

1. Read Startup Procedures within this manual for proper steps to start appliance. (See Startup Report to record steps for future reference).
2. Verify appliance and system are full of water and all system components are correctly set for operation.
3. Fill condensate trap with water.
4. Verify electrical connections are correct and securely attached.
5. Inspect exhaust vent and intake piping for signs of deterioration from corrosion, physical damage or sagging. Verify exhaust vent and intake piping are intact and correctly installed per Venting section and local code.

H. Condensate Removal

1. The appliance is a high efficiency condensing appliance. Therefore, the unit has a condensate drain. Condensate fluid is nothing more than water vapor, derived from combustion products, similar to that produced by an automobile when it is initially started. Condensation is slightly acidic (typically with a pH of 3 to 5) and must be piped with the correct materials. Never pipe the condensate using steel, copper, brass or other materials that will be subject to corrosion. Plastic PVC or CPVC pipe are the only approved materials. A condensate neutralizer, if required by local authorities, can be made up of lime crystals, marble or phosphate chips that will neutralize the condensate. This may be done by the installer or you may purchase a condensate neutralizer from HTP (7450P-212).
2. The appliance is equipped with a 3/4 female socket weld fitting connection that must be piped to a local drain. It is very important that the condensate line is sloped downward away from the appliance to a suitable inside drain. If the condensate outlet on the appliance is lower than the drain, you must use a condensate removal pump, available from HTP (554200). This pump is equipped with two leads that can be connected to an alarm or another type of warning device to alert the user of a condensate overflow, which, if not corrected, could cause property damage.
3. If a long horizontal run is used, it may be necessary to create a vent in the horizontal run to prevent a vacuum lock in the condensate line.
4. Do not expose the condensate to freezing temperatures.
5. It is very important you support the condensation line to assure proper drainage.

Part 10 - Start-Up Procedure



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.

3. 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 installer / 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 installer / 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.

If you discover any evidence of a gas leak, shut down the appliance at once. Find the leak source with a bubble test and repair immediately. Do not start the appliance again until the leak is repaired. Failure to comply could result in substantial property damage, severe personal injury, or death.

A. Operating Instructions

If you smell gas, STOP. Follow listed safety instructions. If you do not smell gas, follow the next steps.

1. Turn on all electrical power to the appliance.
2. Adjust the temperature set point of the appliance if desired. The factory default setting is 180°F. If changes are necessary, follow, "Adjusting the Setpoint", below.
3. Set the thermostat to create a demand for heat.
4. If the appliance fails to start, refer to the Troubleshooting section in the back of this manual.

B. Cascade System

1. If the appliance is used alone, skip this section.
2. Programming the Master Appliance
 - a. Make sure there is no demand for heat being supplied to the appliance.
 - b. Apply power to the appliance.
 - c. Enter the Installer Menu following instructions in this manual.
 - d. Verify that parameter 15 is set to 0. This makes the Master Appliance address 0.

NOTE: The Master Appliance MUST be addressed as 0.
 - e. Set parameter 23 from 0 to 1.
 - f. Exit the Installer Menu.

These settings designate this appliance as the Master Appliance.

3. Follower Appliances

NOTE: Read the notes below before programming follower appliances.

- The appliance addressed as 1 will share its alarm output with the Master Appliance.
- If one of the follower appliances has an indirect fired water appliance connected to it, the address of this appliance must be 2 or greater.
- It is recommended but not necessary to address appliances in the order that they are wired.
- No two appliances can have the same address.
- It is not required to use all consecutive address numbers. Example: In a 2 appliance system with an indirect tank connected to the follower, the follower address could be 2 (address 1 not used).

4. To program follower appliance(s):

- a. Make sure there is no demand for heat being supplied to the Master Appliance.
- b. Apply power to the follower appliance you are working on.
- c. Enter the installer Menu following instructions in Part 10 of this manual.
- d. Set parameter 15 to 1 for the desired appliance address after reading the notes above.
- e. Set parameter 23 to 1 for cascade operation.
- f. Exit the Installer Menu.

C. Adjusting the Setpoint

Before you change the temperature from the factory setting of 180°F, make sure that none of the thermostats are calling for heat. The controller will not memorize a program setting while in a heating cycle.

To access and scroll through additional setting options, press **{S3}**.

1. Press **{S3}** once to access **[C]**, Appliance Temperature Set Point. To adjust the temperature of the appliance, simply press in the **{S3}** key for three seconds until you see a flashing (C) then an alternating value of (180). This number is the factory set point of 180°F.

To change the temperature, push either **{S1}** or **{S2}** on the display. The **{S1}** button decreases and **{S2}** increases the set point temperature. The set point temperature can be set as low as 50°F or as high 185°F. Changes are directly stored and the display returns to normal mode after one minute.

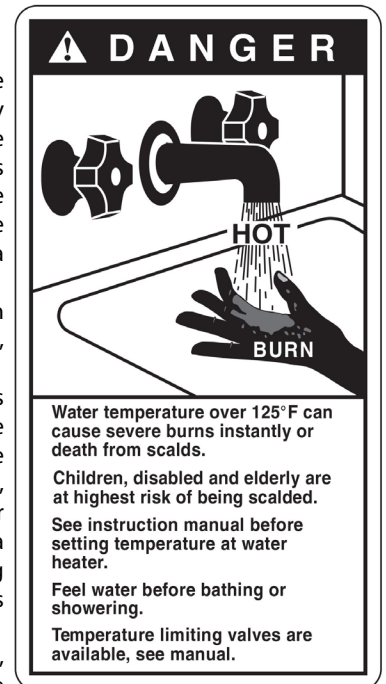
2. Press **{S3}** a second time. The appliance will now display **[Ch]** and an alternating value of 15. This is the Appliance Differential Set Point. This function allows the installer to adjust the activation of the burner based on the differential temperature setting of the appliance. The burner will not start until the outlet water temperature reaches a temperature equal to the setting for the appliance, minus the differential.

EXAMPLE: The appliance is set to heat at 180°F and the differential is set at 15°F. The burner will not start until the outlet temperature of the system reaches 164°F (180° - 15° = 165°).

To adjust, press either **{S1}** (Decrease Value) or **{S2}** (Increase Value). Ranges 5° F to 30° F.

3. Press **{S3}** a third time and you will see the Indirect Temperature Set Point **[de]** and an alternating value of 119. **NOTE:** Only in use if using an indirect storage tank. Range 95 - 180. To adjust, press either **{S1}** (Decrease Value) or **{S2}** (Increase Value).

4. Press **{S3}** a fourth time to access **[dh]**, the Indirect Differential Set Point. This function allows the installer to adjust the activation of the



DHW call based on the differential temperature setting for the indirect tank. The pump will not start until the indirect water temperature reaches a temperature equal to the setting for the indirect, minus the indirect differential. Range 1 – 18. Default 7.

EXAMPLE: The indirect is set to heat at 130°F and the differential is set to 10°F. The DHW pump will not start until the outlet temperature of the system reaches 119°F (130 – 10 = 120).

D. Status Menu

Installers are also able to check the current status of the appliance parameters by pressing {S4} for 3 seconds. Once activated, the display will show |d1| alternating value of the actual outlet temperature. Actual values are displayed for each function. To view the next value, simply press the {S4} key.

Listed below are the values which can be displayed. These values cannot be changed. To exit this menu, simply press {S3} to resume normal operation.

Function – Value

To toggle between values press {S1} to go down and {S4} to go up. The first function you will see is:

- |d1| — Actual temperature from top sensor
- |d2| — Actual temperature from bottom sensor
- |d3| — Actual tank temperature if an indirect sensor is used.
- |d4| — Not used
- |d5| — Actual temperature from the outdoor sensor |NC|.
- |d6| — Actual fan speed multiplied by 10 (Example: If fan speed displayed is |410| RPM x 10 = 4100 actual fan speed)
- |d7| — Actual ionization current read from flame rectification probe
- |d8| — Actual status of the central heating circulator Off = |0|, On = |1|.
- |d9| — Actual status of the indirect fired circulator Off = |0|, On = |1|.
- |d10| — Actual status of bus communication |co| = connected, |nc| = not connected
- |d11| — Central heating set point
- |d12| — Power on hours in thousands (display will not read until 100 hrs.)
- |d13| — Total central heat hours in thousands (display will not read until 100 hrs.)
- |d14| — Total indirect/dhw hours in thousands (display will not read until 100 hrs.)
- |d15| — Passed ignition attempts in thousands
- |d16| — This function only becomes active when appliance is set as the Master. It allows the user to monitor the System Pump connected to the Master Appliance (0 = Off, 1 = On) in a multiple appliance installation. Each appliance firing output percent is displayed.
- |P0| - Master Appliance - Alternating (0-100 Percentage firing rate)
- |P1| - Follower Appliance #1 – Alternating (0-100 Percentage firing rate)
- |P2| - Follower Appliance #2 – Alternating (0-100 Percentage firing rate)
- |P3| - Follower Appliance #3 – Alternating (0-100 Percentage firing rate)
- |P4| - Follower Appliance #4 – Alternating (0-100 Percentage firing rate)
- |P5| - Follower Appliance #5 – Alternating (0-100 Percentage firing rate)
- |P6| - Follower Appliance #6 – Alternating (0-100 Percentage firing rate)
- |P7| - Follower Appliance #7 – Alternating (0-100 Percentage firing rate)

NOTE: If you toggle beyond parameters of connected appliances, the display will go into the next function value.

E. Purge Air from System

Manually Operating CH/DHW Pumps to Commission System

Disconnect wires connected to the THERMOSTAT terminals on the field connection board. Power the appliance. The display will show the appliance water temperature. Press the {S1} and {S3} keys simultaneously and hold for 1 second. The display will begin alternating between SEP and CH, and the central heating pump will come on. If you press {S2} again, the central heating pump will shut off, the display will begin alternating between SEP and DH, and the DHW pump will come on. If the appliance is a cascade master and you press {S2} again, the DHW pump will shut off, the display will begin alternating between SEP and Sh, and the system pump will come on. You can use the {S1} and {S2} keys to toggle between running each pump in the system as required to help bleed out all trapped air. Some good indicators that air is removed include the absence of gurgling noises in the pipes and quiet pump operation. Press {S1} and {S2} together at any time to return the control to normal operation.

Part 11 - Start-Up Procedures for the Installer

The control allows the installer to set limits and program the appliance heat curve. These system limits should not be changed by the user. It is important to document the settings within this manual after programming the system parameters for future reference.

A. Program Access

To start, press and hold {S3} and {S4} simultaneously for three seconds. You will notice the display change to |000|. Then press and hold {S1} until you see |925|. (If you go past |925|, you can use {S2} to increase the number.) This is the pass code. To confirm that the pass code is correct, press and hold the {S3} key for 1 second. If the pass code is entered incorrectly, the controller program function will cancel and return to normal operation. If the code is entered correctly, the control will switch off the gas valve and purge fan while showing a solid - - - in the display. The display will show |1| alternating to |de|. This first function verifies that the control will function with the SuperStor Indirect Fired Water Heater.

B. Program System Settings

Press the {S3} key to move through each function. Press either {S1} to decrease or {S2} to increase the values. If there is no key action for 1 minute, the display returns to normal operation. Changes are effective immediately but not stored. To store changes, press the {S4} key for 3 seconds. The following table lists the functions that the installer can program.

Function	Default Value	Description
1	de	N/A
2	149°F	N/A
3	180°F	Maximum setpoint for indirect water heater (NOTE: Does not apply if used with a mechanical control) Range: 95 - 185°F
4	36°F	N/A
5	7°F	Change indirect water heater differential Range: 1 - 18°F
6	0	Changes the indirect circulator post purge time once the sensor is satisfied. (NOTE: Post purge time should be set no greater than 5 minutes.) Range: 0 - 10 Minutes
7	68°F	Warm weather shutoff Range: 41 - 122°F

Function	Default Value	Description
8	5°F	Changes the minimum outside design temperature Range: -49 - 32°F
9	180°F	Changes design supply water temperature based on minimum outside design temperature. Range: 77 - 180°F
10	68°F	Changes maximum outside design temperature for central heating Range: 32 - 95°F
11	95°F	Changes design supply water temperature based on maximum outside design temperature. Range: 32 - 185°F
12	68°F	Sets the lowest temperature on the appliance for central heating. Range: 32 - 185°F
13	0	Changes central heating circulator post purge time once thermostat is satisfied. Range: 0 - 10 minutes
14	30	Sets maximum run time for the indirect water appliance and minimum run time for central heating. Range: 0 - 60 minutes
15	0	Bus address Range: (0 = cascade master, 1 – 8 = cascade follower)
16	0	Programs a 0-10 volt directly from a Building Management System. To activate, change value to 2. WARNING: Values 1 and 3 are not to be programmed into the board. Range: 0 - 3
17	0	Controls the 0-10 volt input Range: 0 = Appliance Temperature, 1 – Appliance Power
18	1	Step Modulation – Regulates burner output in 6 steps in 1 minute intervals. Reduces short cycling. Range: 1 = On, 0 = Off
19	180°F	Indirect Water Heater Setpoint (flow) Range: 95 - 185°F
20	3	N/A
21	0	Displays the FOU error. If outdoor sensor is open or shorted, FOU error does not prevent the appliance from running. Range: 0 = FOU is not displayed, 1 = FOU displays if the outdoor sensor is shorted or open
22	100	Maximum appliance output percentage. Default = 100%. This parameter can be adjusted to lower maximum appliance output if necessary. Range: 50 – 100%
23	0	Cascade configuration (Default 0). Leave as 0 if this is a standalone unit or if the unit is cascaded using the Vision 3 module. Change to 1 if the appliance is part of a cascaded system not using the Vision 3 module.
24	24	Power on hours for cascade priority change over. This sets how many power on hours will go by before the priority appliance will be rotated in the cascade system.
25	0	N/A, must be 0
26	---	System Pump Freeze Protection (Default --- [Disabled]) On a cascade master, this function activates the system pump if the outdoor temperature drops below the set value. Use the {S2} key to increase from the default disabled to the desired temperature. Range: (--- [disabled] - 104°F)
27	0	0 = E03 will be displayed if system sensor fails. 1 = no code will display if system sensor fails. Range: 0 = E03, 1 = no code displayed
28	0	0 = Frost protection active 1 = Frost protection disabled
29	0	0 = Normal DHW modulation. 1 = DHW will modulate on low fire rather than high fire
30	0	0 = There will be no extra appliance on the Cascade Master. 1 = Extra appliance is connected to the Cascade Master.
31	0	N/A, Do not change.
37	0	Activates control for use with HTP Modbus Board 0 = Modbus Disabled (Default) 1 = Modbus Enabled 2 = Modbus Auto (enables automatic detection of a PC or Adapter)

Figure 22 - System Settings

* The Differential Set Point is variable based on the |dh| setting (also used for indirect differential).

Central Heating Curve Function

Central heating demand is detected when the room thermostat closes. When an outside sensor is also connected, the supply temperature will depend on the factory default central heating curve.

To set your heat curve, you will have to set the following parameters:

1. Minimum outside design temperature: Function 8.
2. Design supply water temperature at the minimum design outside temperature: Function 9.
3. Maximum outside design temperature: Function 10.
4. Design supply water temperature at the maximum outside temperature: Function 11.

NOTE: The homeowner can adjust the heat curve down by adjusting the central heating and/or DHW temperature to a lower setting.

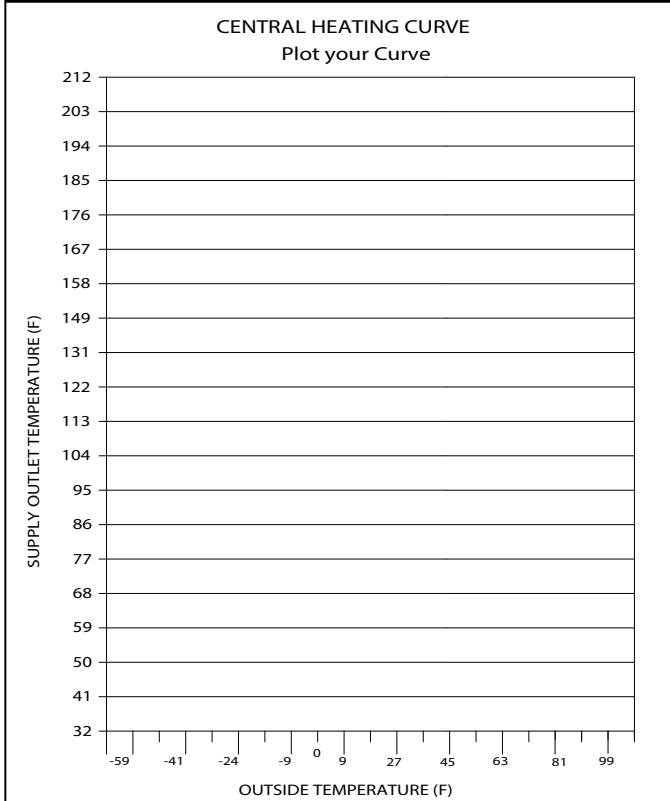
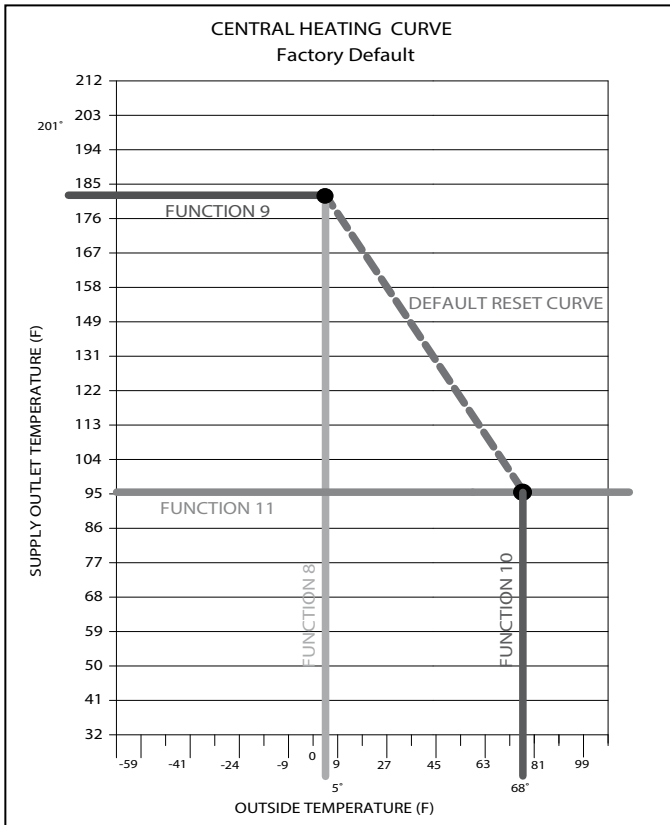


Table 13 - Heating Curve - NOTE: The user can adjust the heat curve down by lowering the central heating temperature.

Control Program Reference Chart		
Function	Default Setting	Programmed Setting
1	de	Do Not Change
2	149°F	Do Not Change
3	160°F	
4	36°F	Do Not Change
5	7°F	
6	0	
7	68°F	
8	5°F	
9	180°F	
10	68°F	
11	95°F	
12	68°F	
13	0	
14	30	
15	0	
16	0	
17	0	
18	1	
19	180°F or 150°F	
20	3	Do Not Change
21	0	
22	100	
23	0	
24	24	
25	0	
26	---	
27	0	
28	0	
29	0	
30	0	
31	N/A	
37	0	
48	0 or 1	
49	150°F	

Table 14 - Program Reference Chart

C. Combustion System Test Mode

This function is intended to simplify the gas valve adjustment if needed. Listed in the following tables are the recommended limits on the appliance and Combustion Settings. Automatic modulation does not take place when the controller is in Test mode, only temperature limitation based on the Central Heating set point. The user may decrease or increase fan speed by pressing {S1} or {S2}. Press {S2} and {S3} together for 1 second to activate Test Mode. Once activated, you will see in the display {Ser} and the actual fan speed. Measurement of combustion levels should always be taken at the highest and lowest fan speed. After 20 minutes, Test mode stops automatically. Press {S1} and {S2} together for 1 second to exit Test Mode manually.

WARNING						
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.						
	Natural Gas			Propane (LP)		
Fan Speed	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 ₂) %	8 - 10%			8 1/2 - 10 1/2%		9 - 11%

Table 15 - Combustion Settings on All Models

Fan Speeds			
BTU	Ignition	Min	Max
100,000	3000	2000	5500
130,000			7300
160,000		2100	9100
199,000			

Table 16 - Fan Speeds

Part 12 - Troubleshooting

A. Error and Fault Codes

An error or fault code may occur in the appliance. Fault codes lead to a lock out condition of the controller, which will need to be manually reset by pressing the {S4} button.

B. Appliance Error

These temporary error codes help the installer correct a problem before the appliance goes into a lock out fault condition, which will require a manual reset.

1. When an error condition occurs the controller will display an error code on the display module.
2. These error codes and several suggested corrective actions are included in the Table 17.

C. Appliance Fault

1. When a lockout fault condition occurs the controller will illuminate the red "fault" indication light and display a fault code (Example: |F00|) on the display module.
2. Note the fault code and refer to Table 18 for an explanation of the code along with several suggestions for corrective actions.
3. Press {S4} to clear the fault and resume operation. Be sure to observe the operation of the unit to prevent a recurrence of the fault.

WARNING
When servicing or replacing components that are in direct contact with appliance water, be certain that: <ul style="list-style-type: none"> • 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.
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.
DO NOT USE THIS APPLIANCE IF ANY PART HAS BEEN SUBMERGED IN WATER. Immediately call a qualified installer / 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
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. Displayed Error and Fault Codes

Error Codes		
Code	Description	Corrective Action
Fou	Outdoor sensor shorted or temperature less than -40°F	Inspect wiring from outdoor sensor for damage or shorted connections and repair as necessary. Measure resistance of outdoor sensor and compare to resistance chart. If not within range on chart, shorted, or open, replace sensor.
E19	Line voltage frequency out of range	Inspect power wiring to appliance and repair as necessary. If connected to line voltage, notify power company. If connected to an alternate power source, such as a generator or inverter, make sure line voltage frequency supplied by the device is 60 Hz.
FLU	Blocked Vent Pressure Switch open, Condensate cup Full, Condensate Cup not present	1. Check the flue vent to ensure it is not blocked or damaged. 2. Check blocked vent pressure switch operation by applying a jumper. If the switch is not functioning properly, replace it.
LEO	Water Level in Tank is Low	1. Be sure all air is bled from system. 2. Inspect low level switch and wiring for damage and repair if necessary.
LOU	24 Volt Low	1. Check line voltage. Must be between 100 – 128 volts. 2. If available, connect a PC and, using HTP service software, 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 greater than 250. Use this as a troubleshooting guide as you follow the steps below. 3. Remove 10 pin Molex connector from customer connection board. If LOU clears, then the problem is with external sensor wiring. Examine external sensor wiring for shorts to ground, repairing as necessary. If LOU code is still present and the appliance is so equipped, disconnect high gas pressure switch, then low gas pressure switch, then UL 353 low water cutoff in this order, one at a time, to see if LOU code clears. Replace faulty part. Check low voltage wire harness in appliance for shorts to ground. 4. If LOU only occurs when burner tries to light, check gas valve for excessive current draw. 5. If LOU is present with the low voltage harness disconnected from the 926 control board, replace the 926 control board.
E03	System sensor failure (Cascade Master only)	1. Check wiring to system sensor. Repair as necessary. 2. Check sensor resistance. Compare to the resistance table in this manual. Replace if not correct.
The following Fault Codes will lockout operation until the control determines the situation safe for appliance operation.		
Code	Description	Corrective Action
F00	High temperature switch limit exceeded 194°F	1. Try reset. If F00 repeats, create a demand for hot water. (DANGER: Take caution to prevent scald injury.) If water is above 194°F, test upper and lower temperature sensor with an ohmmeter. (Refer to resistance chart, this section.) Replace bad sensor. If water is below 194°F, test high temperature switch and wiring with ohmmeter. Switch should be closed at this point. If not, replace switch. 2. If unit reset successfully, let the appliance run and go into the status menu to check the upper and lower temperature sensor. If either display reading does not make sense, check appropriate sensor with ohmmeter. (Refer to resistance chart, this section.) Replace bad sensor. Do an OHMs reading on both sensors to check continuity.

Code	Description	Corrective Action
F01	Vent temperature limit exceeded	<ol style="list-style-type: none"> 1. Inspect all flue piping. If the flue is damaged or shows signs of overheating, repair or replace the flue parts as necessary before proceeding. 2. If the flue piping system is intact and there is no sign of the flue overheating (such as discoloration or melting), push the red reset button on the flue switch. 3. Be sure the appliance is connected to a water supply and full of water. 4. Push the {S4} button on the appliance control panel. The appliance should light. If the appliance lights, proceed to step 5. If the appliance does not light and the display again flashes F01, inspect the wiring to the flue switch, repairing or replacing as necessary. If the wiring is intact, replace the flue switch, using care to mount the new flue switch in the same position and mounting holes as the old one. If the display flashes a code other than F01, follow the troubleshooting guide for that code. 5. Observe operation for 5 minutes. Place the probe of a calibrated combustion analyzer into the flue system within 6 feet of the appliance. The exhaust temperature should not rise above 190°F after several minutes of operation. 6. If the flue temperature is below 190°F and the appliance again goes into lockout displaying F01, replace the flue switch, using care to mount the new flue switch in the same position and mounting holes as the old one. If the display flashes a code other than F01, follow the troubleshooting guide for that code. 7. If the flue temperature increases to over 190°F, consult HTP for further assistance.
F02	Interrupted or shorted upper (supply) temperature sensor	<ol style="list-style-type: none"> 1. Check the electrical connection to the appropriate temperature sensor. 2. If connection is okay, replace bad sensor.
F03	Interrupted or shorted lower (return) temperature sensor	
F05	Upper (supply) temperature sensor exceeds 210°F	<ol style="list-style-type: none"> 1. If water in tank is not greater than 210°F, check wiring. Repair if faulty. 2. If wiring is okay, check appropriate sensor with ohmmeter and compare to reading in resistance chart above. If reading does not agree with water temperature, replace bad sensor.
F06	Lower (return) temperature sensor exceeds 210°F	
F09	No flame detected – Appliance will make three attempts at ignition before the control goes into this lockout condition. Will reset in 1 hour.	<ol style="list-style-type: none"> 1. Watch the igniter through the observation window provided. 2. If there is no spark, check the spark electrode for the proper ¼" gap. 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 any flue blockage or condensate blocks.
F10	Loss of flame signal – The appliance will relight 4 times before the control goes into this lockout condition. Will reset in 1 hour.	<ol style="list-style-type: none"> 1. Monitor the gas pressure to the unit while in operation. 2. Assure that the flame is stable when lit. 3. Check to see if the green light on the display module is out while the appliance is running. 4. If the green light doesn't come on or goes off during operation check the flame signal on the status menu. 5. If the signal reads less than 1 microampere, clean the flame rectifier probe. 6. If the flame rectifier probe continues to read low, replace it.
F11	False flame signal – The appliance will lock out if it senses a flame signal when there should be none present.	<ol style="list-style-type: none"> 1. Turn the gas off to the unit at the service valve. 2. If the flame signal is still present replace the igniter. 3. If the flame signal is not present after turning off the gas supply, check the gas valve electrical connection. 4. If there is no power to the gas valve, remove the valve and check for obstruction in the valve seat or replace the gas valve. 5. Turn the gas on at the service valve after corrective action is taken.
F13	Combustion fan speed incorrect – The appliance will lock out if it senses that the fan speed is less than 70% of expected rate for more than 60 seconds.	<ol style="list-style-type: none"> 1. Check the combustion air fan wiring. 2. Replace the combustion air fan. 3. Replace the control board.
pp	Parameters programmed	Press {S4} reset for at least 1 second.
F31	Program parameter error	Control must be re-programmed. If programming does not solve problem, control must be replaced.

Table 17 - Error and Fault Codes - NOTE: If you replace a part to remedy a fault, it is recommended to cycle the unit at least three or four times to ensure the fault has been resolved.

Part 13 - 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.

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 installer / 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. 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 14 - 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 installer / service technician should be contacted immediately to properly service the appliance and correct the problem.

If a qualified installer / service technician is not available, pressing the {S4} button 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)		Supply Sensor (7100P-192) Return 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 18 - Sensor Temperature Resistance

Part 15 - 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? NOTE: 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?		

Start-Up, Adjust, and Test	Yes	No
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?		
Final Installation Approvals		
Signed by Technician	Date	

Table 19 - Installation Checklist

Part 16 - 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 installer / 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. 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.

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.

WARNING

DO NOT USE THIS APPLIANCE IF ANY PART HAS BEEN SUBMERGED IN WATER. Immediately call a qualified installer / 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

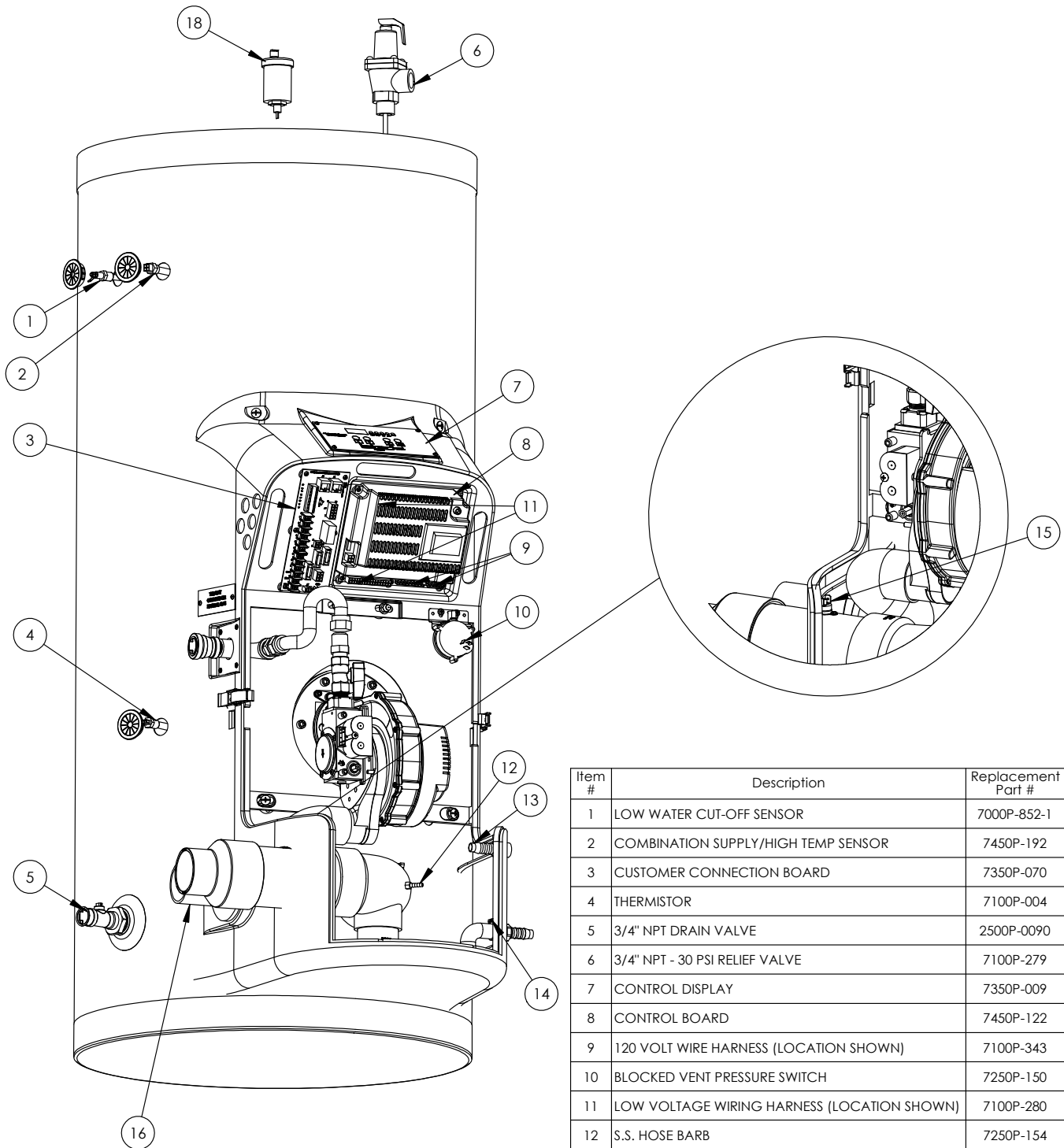
The appliance has wire function labels on all internal wiring. Observe the position of each wire before removing it. Wiring errors may cause improper and dangerous operation. Verify proper operation after servicing.

Inspection Activities		Date Last Completed			
Piping		1st Year	2nd Year	3rd Year	4th Year*
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.				
System		1st Year	2nd Year	3rd Year	4th Year*
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.				
Electrical					
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.				
Chamber / Burner		1st Year	2nd Year	3rd Year	4th Year*
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.				
Condensate		1st Year	2nd Year	3rd Year	4th Year*
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.)				
Gas		1st Year	2nd Year	3rd Year	4th Year*
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.				
Combustion		1st Year	2nd Year	3rd Year	4th Year*
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.				
Safeties		1st Year	2nd Year	3rd Year	4th Year*
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.				
Final Inspection		1st Year	2nd Year	3rd Year	4th Year*
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 20 - *Continue annual maintenance beyond the 4th year as required.

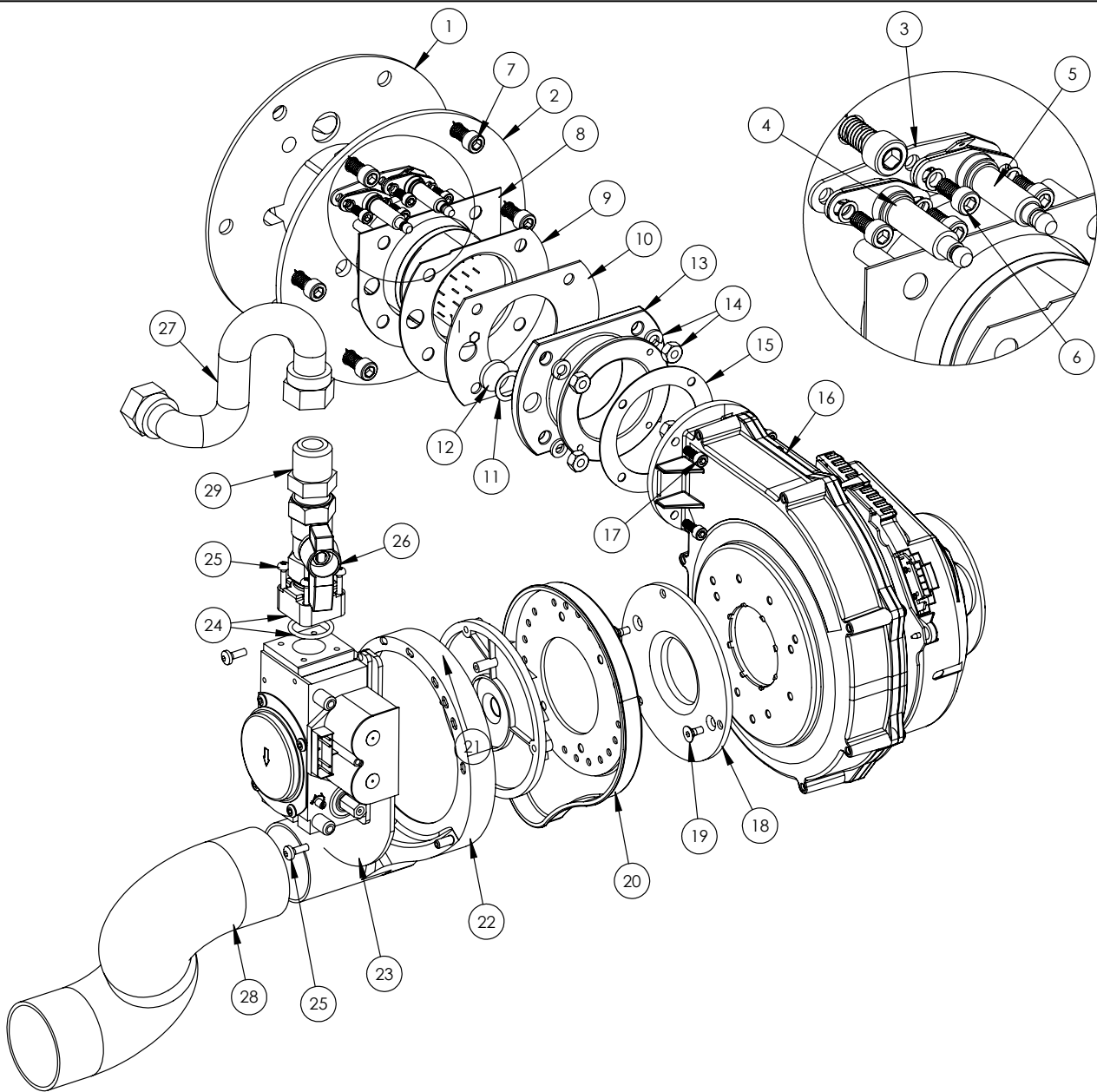
Part 17 - Replacement Parts

LP-325-W
03/23/17



Item #	Description	Replacement Part #
1	LOW WATER CUT-OFF SENSOR	7000P-852-1
2	COMBINATION SUPPLY/HIGH TEMP SENSOR	7450P-192
3	CUSTOMER CONNECTION BOARD	7350P-070
4	THERMISTOR	7100P-004
5	3/4" NPT DRAIN VALVE	2500P-0090
6	3/4" NPT - 30 PSI RELIEF VALVE	7100P-279
7	CONTROL DISPLAY	7350P-009
8	CONTROL BOARD	7450P-122
9	120 VOLT WIRE HARNESS (LOCATION SHOWN)	7100P-343
10	BLOCKED VENT PRESSURE SWITCH	7250P-150
11	LOW VOLTAGE WIRING HARNESS (LOCATION SHOWN)	7100P-280
12	S.S. HOSE BARB	7250P-154
13	CONDENSATE HOSE	7100P-043
14	HOSE CLAMP - CONDENSATE HOSE	7250P-215
15	HIGH FLUE TEMP SWITCH	VS210
16	2" COUPLING (w/NUT) - AIR LINET (100/130K BTU)	7100P-114
	3" COUPLING (w/NUT) AIR INLET (160/199K BTU)	7100P-103
17	SENSOR WIRE HARNESS KIT (NOT SHOWN)	7100P-282
18	AIR VENT	7450P-197

Figure 23 - Replacement Parts - All Models



Item #	Description	Replacement Part #
1	GASKET - MOUNTING PLATE	7100P-139
2	MOUNTING PLATE	7100P-007
3	GASKET - PROBES	7100P-155
4	FLAME RECTIFICATION PROBE	7100P-082
5	IGNITOR ELECTRODE	7100P-124
6	10-32 X 3/8 SCREWS/#10 LOCK WASHERS	N/A
7	SCREWS - 5/16-18	7700P-101
8	GASKET - BURNER MOUNTING FLANGE	7100P-152
9	BURNER - 100-130K BTU	7100P-516
	BURNER - 160-199K BTU	7100P-517
10	GASKET - BURNER OUTLET	7000P-361
11	GASKET - SIGHT GLASS	7100P-105
12	SIGHT GLASS	G2000
13	AIR CHANNEL	7100P-048
14	1/4-20 BRASS NUTS/1/4 LOCK WASHERS	7100P-268
15	GASKET - BLOWER TO AIR CHANNEL	7500P-075

Item #	Description	Replacement Part #
16	COMBUSTION BLOWER	7100P-330
17	SCREWS - 10-32 X 1/2	7700P-094
18	ADAPTER PLATE	7250P-644
19	FLAT HEAD SCREW - ADAPTER PLATE	7100P-045
20	AIR INTAKE ADAPTER - BLOWER SIDE	7500P-185
21	SWIRL PLATE - BLACK (100/130K BTU)	7100P-042
	SWIRL PLATE - WHITE (160/199K BTU)	7500P-092
22	AIR INTAKE ADAPTER - VALVE SIDE	7500P-184
23	GAS VALVE (100/130K BTU)	7000P-862
	GAS VALVE (160/199K BTU)	7000P-863
24	GAS VALVE ADAPTER (w/O-RING)	7250P-454
25	SCREWS - M4 X 20MM - GAS VALVE ADAPTER	7250P-717
26	GAS SHUT-OFF VALVE	7250P-140
27	1/2" FLARE X 1/2" NPT FLEX HOSE	7100P-140
28	TUBE - AIR INLET	7500P-189
29	1/2" FLARE X 1/2" NPT FITTING	7450P-154

Figure 24 - Replacement Parts - Combustion System - All Models

**Pioneer Heating Appliance
Limited Warranty**

Twelve year warranty to assure your complete satisfaction.

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.

COVERAGE

A. During the first year after the date of installation, HTP warrants that it will repair or replace, at its option, any defective or malfunctioning component of the appliance that is found to have failed due to manufacturer's defect. Replacement components will be warranted for ninety (90) days. No other component of the appliance will be replaced after this period (with exception to the blower motor, which will have a limited warranty of three [3] years).

B. During the first through seventh year after the date of installation, should a defect or malfunction result in a leakage of water from the appliance due to defective material or workmanship, malfunction, or failure to comply with the above warranty, with such defect or malfunction having been verified by an authorized HTP representative, HTP will repair or replace, at its option, the defective or malfunctioning appliance. Replacements will be of the nearest comparable model available at the time of replacement. The replacement appliance will be warranted for the unexpired portion of the applicable warranty period of the original appliance.

C. During the eighth through twelfth year after the date of installation, should a defect or malfunction result in a leakage of water from the appliance due to defective material or workmanship, malfunction, or failure to comply with the above warranty, with such defect or malfunction having been verified by an authorized HTP representative, HTP will repair or replace, at its option, the defective or malfunctioning appliance at a cost to the Owner equal to the following percentages of the manufacturer's list price in effect at the date of replacement:

Year of Claim	1-7	8 & 9	10 & 11	12
Percentage to be Paid by Owner	0 %	25 %	50 %	75 %

Replacements will be of the nearest comparable model available at the time of replacement. The replacement appliance will be warranted for the unexpired portion of the applicable warranty period of the original appliance.

D. 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.

E. 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).

F. If at the time of a request for service the Owner 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, and be covered by the unexpired portion of the warranty detailed above.

G. This warranty extends only to appliances utilized in closed loop heating applications that have been properly installed based upon the manufacturer's installation instructions.

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

OWNER'S 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. 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.
3. Maintain all related system components in good operating condition.
4. Check all condensate lines to confirm that all condensate drains properly from the appliance.
5. Use the appliance 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.

WARRANTY EXCLUSIONS

This limited warranty will not cover:

1. Any appliance purchased from an unauthorized dealer.
2. Any appliance not installed by a qualified heating 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 appliance 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 system not manufactured by HTP as part of the appliance.
10. Appliances repaired or altered without the prior written approval of HTP.
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 a closed system with a properly sized and installed thermal expansion tank.
14. Failure or performance problems caused by improper sizing of the appliance, expansion device, piping, or the gas supply line, the venting connection, combustion air openings, electric service voltage, wiring or fusing.
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 – 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.htproducts.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 water heater or component part(s) to a location designated by the manufacturer.

LIMITATIONS OF THIS HTP WARRANTY AND REMEDIES

THE FOREGOING WARRANTIES ARE EXCLUSIVE AND ARE GIVEN AND ACCEPTED TO THE FURTHEST EXTENT UNDER APPLICABLE LAW 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 OWNER 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 OWNER ONLY.

NO OTHER EXPRESS 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.

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.