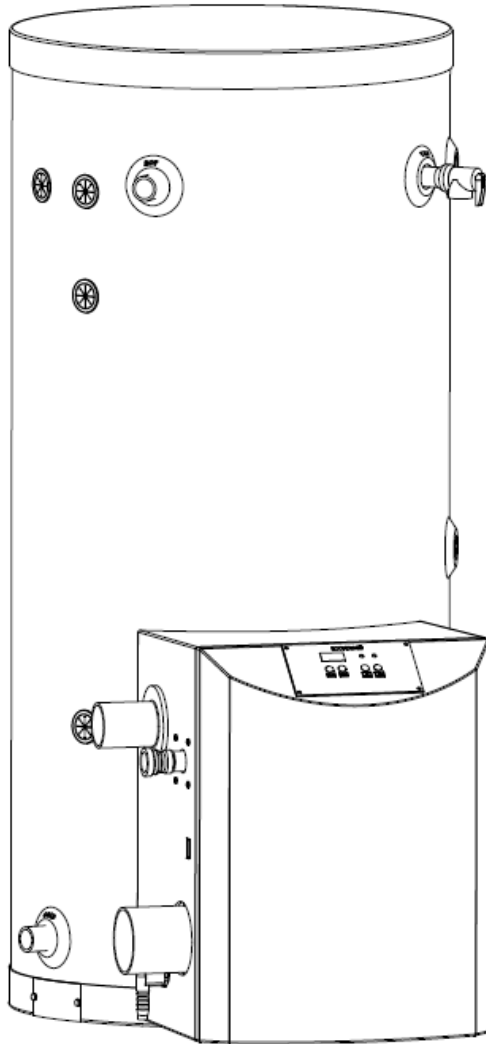




Phoenix



INSTALLATION

START-UP

MAINTENANCE

PARTS

Phoenix Water Heater Models*
PH100-55 / 130-55 / 160-55 / 199-55
PH100-80 / 130-80 / 160-80 / 199-80
PH100-119 / 130-119 / 160-119 / 199-119

Phoenix Sanitizer Booster Models*
130-55SA / 199-55SA

*A suffix of "LP" denotes propane gas
*A suffix of "S" denotes solar model



⚠ WARNING

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

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

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

⚠ WARNING

IF THE INFORMATION IN THIS MANUAL IS NOT FOLLOWED EXACTLY, A FIRE OR EXPLOSION MAY RESULT, CAUSING PROPERTY DAMAGE, PERSONAL INJURY, OR LOSS OF LIFE. DO NOT STORE 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.

FOR YOUR SAFETY READ BEFORE OPERATING

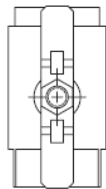
WARNING: If you do not follow these instructions exactly, a fire or explosion may result, causing property damage, personal injury or loss of life.

- | | |
|--|--|
| <p>A. This appliance does not have a pilot. It is equipped with an ignition device which automatically lights the burner. Do <u>not</u> try to light the burner by hand.</p> <p>B. BEFORE OPERATING smell all around the appliance area for gas. Be sure to smell next to the floor because some gas is heavier than air and will settle on the floor.</p> <p>WHAT TO DO IF YOU SMELL GAS</p> <ul style="list-style-type: none"> • 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. | <ul style="list-style-type: none"> • If you cannot reach your gas supplier, call the fire department. <p>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.</p> <p>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.</p> |
|--|--|

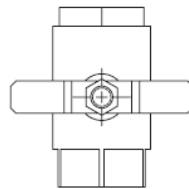
OPERATING INSTRUCTIONS

- | | |
|---|---|
| <ol style="list-style-type: none"> 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. | <ol style="list-style-type: none"> 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

- | | |
|--|--|
| <ol style="list-style-type: none"> 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. | <ol style="list-style-type: none"> 4. Turn gas shutoff valve to "off". Handle will be across the piping. Do not force. 5. Install Front Cover. |
|--|--|

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 death or serious injury.

WARNING

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

CAUTION

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

CAUTION

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

FOREWORD

This manual is intended to be used in conjunction with other literature provided with the Phoenix Gas-Fired Water Heater. This includes all related control information. It is important that this manual, all other documents included with this system, and additional publications including the National Fuel Gas Code, ANSI Z223.1-2002, be reviewed in their entirety before beginning any work.

Installation should be made in accordance with the regulations of the local code authorities and utility companies which pertain to this type of water heating equipment.

FOR THE INSTALLER

WARNING

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

This appliance must be installed by qualified and licensed personnel. The installer should be guided by the instructions furnished with the boiler, and with local codes and utility company requirements. In the absence of local codes, preference should be given to the National Fuel Gas Code, ANSI Z223.1-2002.

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.

Code for the installation of Heat Producing Appliances (latest version), from American Insurance Association, 85 John Street, New York, NY 11038.

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.

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PART 1 – GENERAL SAFETY INFORMATION

A. PRECAUTIONS

This appliance is for indoor installations only. Clearance to combustible materials: 0" top, bottom, sides and back. Unit must have room for service: 24" front and 12" sides are minimum recommended service clearances. (A combustible door or removable panel is acceptable front clearance.) This appliance has been approved for closet installation, and installation on combustible flooring. Do not install this appliance directly on carpeting. Use only Category IV vent systems.

WARNING

INSTALLER – Read all instructions in this manual before installing. Perform steps in the order given.

USER – This manual is for use only by a qualified heating installer/service technician. Refer to user's information manual for your reference. Have this heater serviced/inspected by a qualified service technician annually.

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

WARNING

If the heater is exposed to the following, do not operate until all corrective steps have been made by a qualified serviceman:

1. FIRE
2. DAMAGE
3. WATER

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

DO NOT USE THIS APPLIANCE IF ANY PART HAS BEEN UNDERWATER. Immediately call a qualified service technician. Replace any part of the control unit that has been under water.

B. IMPROPER COMBUSTION

WARNING

Do not obstruct the flow of combustion and ventilating air. Adequate air is necessary for safe operation.

C. GAS



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

D. WHEN SERVICING THE HEATER

- To avoid electric shock, disconnect electrical supply before performing maintenance.
- To avoid severe burns, allow heater to cool.

E. HEATER WATER

- Do not use petroleum-based cleaning or sealing compounds in a heater system. Gaskets and seals in the system may be damaged. This can result in substantial property damage.
- Do not use “homemade cures” or “heater patent medicines”. Substantial property damage, damage to heater, and/or serious personal injury may result.

⚠ DANGER	
 <p>FLAMMABLES Flammable Vapors</p>	 <p>HOT BURN</p>
<p>⚠ 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:</p> <ol style="list-style-type: none"> 1. far away from heater, 2. in approved containers, 3. tightly closed and 4. out of children's reach. 	<p>Water heater has a main burner and pilot flame. The pilot flame:</p> <ol style="list-style-type: none"> 1. which can come on at any time and 2. will ignite flammable vapors. <p>Vapors:</p> <ol style="list-style-type: none"> 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.
<p>Installation: Do not install water heater where flammable products will be stored or used unless the main burner and pilot flames</p>	<p>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.</p>
<p>Read and follow water heater warnings and instructions. If owners manual is missing, contact the retailer or manufacturer.</p>	
<p>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.</p>	

PART 2 – BEFORE YOU START

A. WHAT'S IN THE BOX

Also included with the heater:

- Intake PVC Tee with Screens
- Exhaust PVC Coupling with Screens
- Temperature and Pressure Relief Valve
- Installation Manual
- Warranty
- Solar Addendum (Solar Models Only)
- LP Conversion Kit (Natural Gas Models Only)

B. HOW THE HEATER OPERATES

Modulation Condensing Technology is an intelligent system that delivers highly efficient water heating, while maximizing efficiency by measuring the data parameters of your water heating system. Some of its features are:

Stainless Steel Water Storage Tank

The stainless steel water storage tank has a combustion chamber submerged into the tank water. When the water heater is fired, combustion gases heat the combustion chamber walls, transferring heat directly into the surrounding water. These hot gases are blown into secondary heat exchanger coils, where more heat is transferred into the water, removing even more heat from the gases.

Modulating Combustion System

Modulation during water heating operation is based on tank temperature. The control monitors the system to regulate burner output during operation to match system demand. This increase in efficiency allows for substantial fuel savings.

Gas Valve

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

Upper Supply Tank Sensor

This sensor monitors the upper portion water temperature (system supply) of the water heater. The control module adjusts the burner firing rate so the outlet water temperature meets the set point.

Lower Return Tank Sensor

This sensor monitors the lower portion of the water heater inlet water temperature (system return). The control module reduces or increases input, depending on how close the water temperature is to the outlet water temperature set point.

Control

The integrated control system monitors upper and lower water temperature and regulates fan speed to regulate the unit's energy output. This allows the unit to deliver the required amount of heated energy and nothing more.

Burner

Constructed of high grade stainless steel, the burner uses pre-mixed air and gas and provides a wide range of firing rates.

Condensate Drain Connection

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

If the condensate outlet on the heater is lower than the drain, you must use a condensate removal pump (kit p/n 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 (p/n 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 condensation line may be necessary to avoid blockage of the condensate flow.

Spark Ignition

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

DANGER

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

C. OPTIONAL EQUIPMENT

Below is a list of optional equipment available from HTP:

- 3" Stainless Steel Outside Termination Vent Kit (V1000)
- 4" Stainless Steel Outside Termination Vent Kit (V2000)
- 2" PVC Concentric Vent Kit (Part # KGAVT0501CVT)
- 3" PVC Concentric Vent Kit (Part # KGAVT0601CVT)
- 3" Polypro Vent Kit (Part # 8400P-001)
- 3" Polypro Pipe (33' length Part # 8400P-002, 49.5' length Part # 8400P-003)
- PC Connection Kit (Part # 7250P-320)
- Condensate Neutralizer (Part # 7450P-212)
- Outdoor Sensor (Part # 7250P-319)
- Sanitizer Booster Kit (Part # VSBK-1200)

PART 3 – PREPARE WATER HEATER LOCATION

Before considering location, many factors need to be addressed. Piping, Venting, and Condensation Removal are just a few of the issues that need attention prior to the installation of the heater. Please read the entire manual, as it could save time and money.

A. BEFORE LOCATING THE HEATER

Check for nearby connections to:

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

Check area around heater. Remove any combustible materials, gasoline, and other flammable liquids.

WARNING

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

The heater gas control system components must be protected from dripping water during operation and service.

If replacing an existing heater, check for and correct any existing system problems, such as:

- System leaks
- Heater is located in a condition that could cause the system to freeze and leak.
- Incorrectly-sized expansion tank
- Clean and flush existing system when reinstalling a heater.

B. LEVELING

⚠ CAUTION

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

C. CLEARANCES FOR SERVICE ACCESS

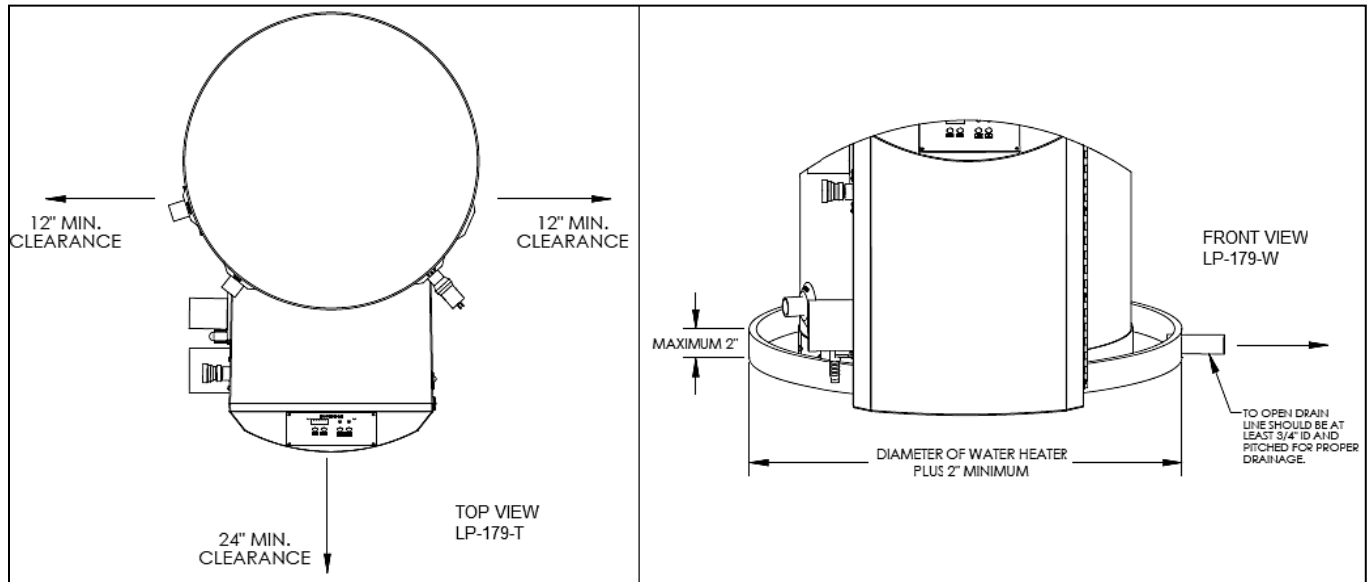


Figure 1 – Minimum Service Clearances

If you do not provide the minimum clearances shown in Figure 1, it might not be possible to service the heater without removing it from the space.

⚠ WARNING

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

D. RESIDENTIAL GARAGE INSTALLATION

PRECAUTIONS

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

- Mount the bottom of the heater a minimum of 18" above the floor of the garage, to ensure the burner and ignition devices are well off the floor.
- When raising the heater, fully support the entire bottom of the appliance.
- Locate or protect the heater so it cannot be damaged by a moving vehicle.

E. EXHAUST VENT AND INTAKE AIR VENT

The heater 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 Venting, Part 8 in this manual) are the lone venting options approved for this water heater. Failure to vent the water heater in accordance with the provided venting instructions will void the warranty.

DANGER

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

WARNING

Vents must be properly supported. Heater intake and exhaust connections are not designed to carry heavy weight. Vent support brackets must be within 1' of the heater and the balance at 4' intervals. Heater must be readily accessible for visual inspection for the first 3' from the heater.

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 heater such that the air intake and exhaust vent piping can be routed through the building and properly terminated. Different vent terminals can be used to simplify and eliminate multiple penetrations in the building structure (see Optional Equipment in Venting Section). The air intake and exhaust vent piping lengths, routing and termination methods must all comply with the methods and limits given in the Venting section, Part 8 of 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 1 – Contaminant Table.**

2. INDOOR COMBUSTION AIR INSTALLATION IN CONFINED OR UNCONFINED SPACE

This heater 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 1 – Contaminant Table.**

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 1) 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. See **Figure 21**, p. 41 for details.

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, Part 8 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

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.

⚠ WARNING

Failure to provide an adequate supply of fresh combustion air can cause poisonous flue gases to enter living space, resulting in severe personal injury or death. To prevent combustion air contamination, see Table 1.

F. PREVENT COMBUSTION AIR CONTAMINATION

Install intake air piping for the heater as described in the Venting Section. 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 below. Contaminated air will damage the heater, resulting in possible substantial property damage, severe personal injury, or death. For example, do not pipe intake air vent near a swimming pool. Also, avoid areas subject to exhaust fumes from 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 1 – Contaminant Table

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

G. REMOVING A HEATER FROM A COMMON VENT SYSTEM**⚠ DANGER**

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

⚠ WARNING

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

When removing an existing heater, 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.

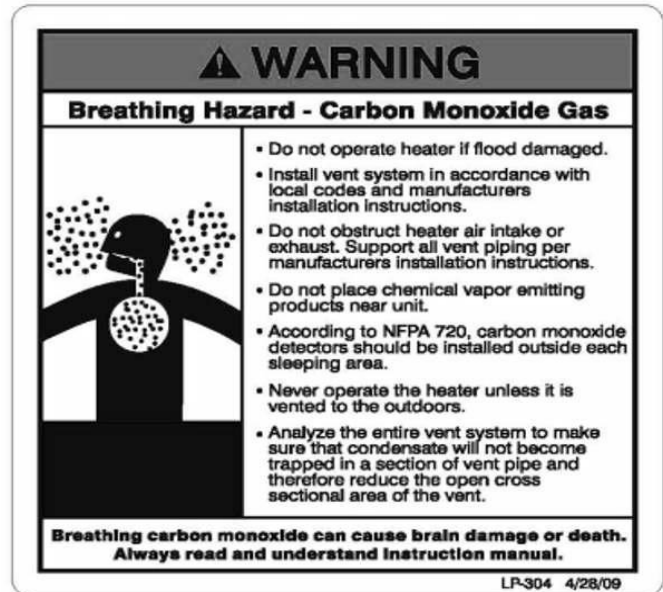


Figure 2 - CO Warning Label

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 common venting system properly vents when tested as outlined, return doors, windows, exhaust fans, fireplace dampers and any other gas burning appliance 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 in the National Fuel Gas Code, ANSI Z 223.1.

H. WATER CHEMISTRY

CAUTION

Chemical imbalance of the water supply may affect efficiency and cause severe damage to the water heater and associated equipment. HTP recommends having water quality professionally analyzed to determine whether it is necessary 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 water heater, as water quality will affect the reliability of the system. Failure of a heat exchanger due to lime scale build-up on the heating surface, low pH, or other chemical imbalance IS NOT covered by the warranty.

CAUTION

Operating temperatures above 135°F will further accelerate the build-up of lime scale on the heating surface and may shorten the service life of the appliance. Failure of a heat exchanger due to lime scale build-up on the heating surface, low pH, or other chemical imbalance IS NOT covered by the warranty.

Outlined below are water quality parameters which need to be met in order for the system to operate efficiently for many years.

Water Hardness

Water hardness is mainly due to the presence of calcium and magnesium salts dissolved in water. The concentration of these salts is expressed in mg/L, ppm, or grains per gallon as a measure of relative water hardness. Grains per gallon is the common reference measurement used in the U.S. water heater industry. Hardness expressed as mg/L or ppm may be divided by 17.1 to convert to grains per gallon. Water may be classified as very soft, slightly hard, moderately hard, or hard based on its hardness number. The minerals in the water precipitate out as the water is heated and cause accelerated lime scale accumulation on a heat transfer surface. This lime scale build-up may result in premature failure of the heat exchanger. Operating temperatures above 135°F will further accelerate the build-up of lime scale on the heating surface and may shorten the service life of the appliance.

Water that is classified as hard and very hard must be softened to avoid heat exchanger failure. See below for further information about water hardness.

CLASSIFICATION	MG/L OR PPM	GRAINS/GAL
Soft	0 – 17.1	0 - 1
Slightly Hard	17.1 – 60	1 – 3.5
Moderately Hard	60 – 120	3.5 – 7.0
Hard	120 – 180	7.0 – 10.5
Very Hard	180 and over	10.5 and over

If the hardness of the water exceeds the maximum level of 7 grains per gallon, water should be softened to a hardness level no lower than 5 grains per gallon. Water softened as low as 0 to 1 grain per gallon may be under-saturated with respect to calcium carbonate, resulting in water that is aggressive and corrosive.

pH of Water

pH is a measure of relative acidity, neutrality or alkalinity. Dissolved minerals and gases affect water pH. The pH scale ranges from 0 to 14. Water with a pH of 7.0 is considered neutral. Water with a pH lower than 7 is considered acidic. Water pH higher than 7 is considered alkaline. A neutral pH (around 7) is desirable for most potable water applications. **Corrosion damage and heater failures resulting from water pH levels of lower than 6 or higher than 8 ARE NOT covered by the warranty.** The ideal pH range for water used in a storage tank or a water heater system is 7.2 to 7.8.

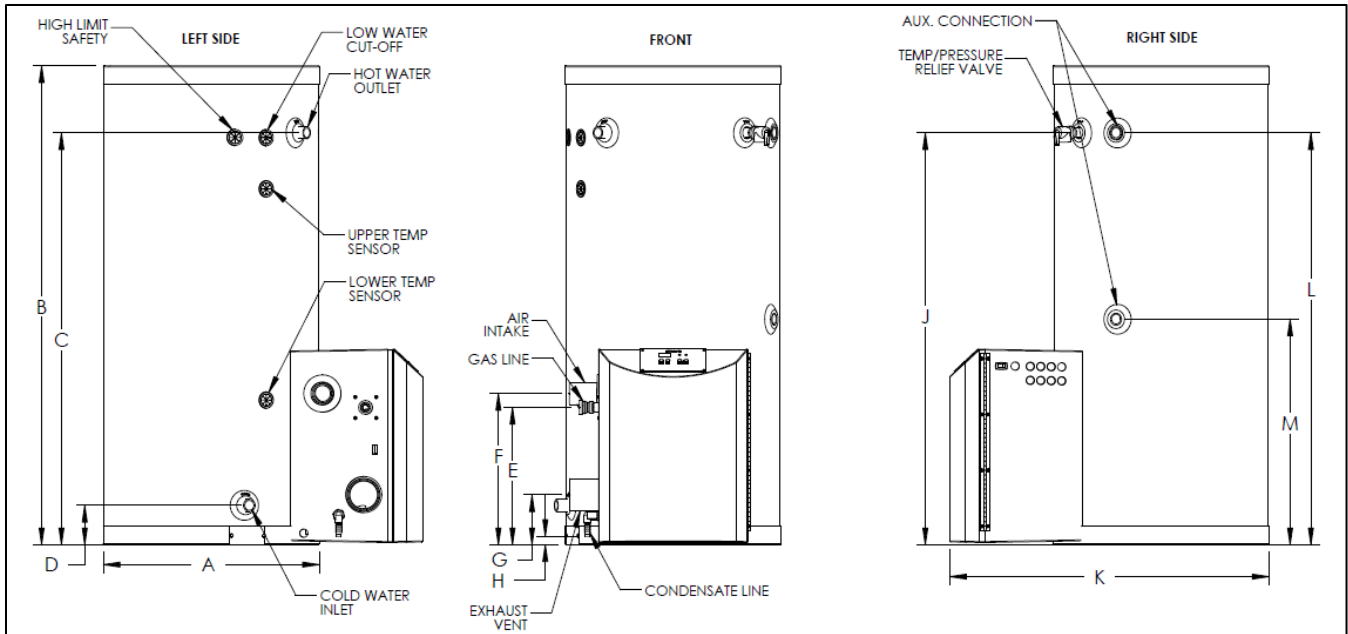
Total Dissolved Solids

Total Dissolved Solids (TDS) is a measurement of all minerals and solids dissolved in a water sample. The concentration of total dissolved solids is usually expressed in parts per million (ppm).

Water with a high TDS concentration will greatly accelerate lime and scale formation in the hot water system. Most high TDS concentrations precipitate out of the water when heated. This can generate a scale accumulation on the heat transfer surface that will greatly reduce the service life of a water heater. This scale accumulation can also impede the ability of the heat exchanger to transfer heat into the water. A heat exchanger damaged or blocked by lime/scale accumulation must be replaced.

The manufacturer of the water heater has no control of water quality, especially TDS levels in your system. Total dissolved solids in excess of 2,000 ppm will accelerate lime and scale formation in the heat exchanger. Heat exchanger failure due to total dissolved solids in excess of 2,000 ppm is a non-warrantable condition. **Failure of a water heater due to lime scale build up on the heating surface IS NOT covered by the warranty.**

Hardness: 7 grains
Chloride levels: 100
pH levels: 6-8
TDS: 2000



PHOENIX WATER HEATER AND SANITIZER BOOSTER DIMENSIONS													
MODEL*	GAL.	A	B	C	D	E	F	G	H	J	K	L	M
PH100-55/130-55/160-55/199-55	55	23"	52"	45"	5"	14-3/4"	16-1/4"	5-1/4"	1"	45"	34-1/4"	45"	27-1/2"
PH100-80/130-80/160-80/199-80	80	23"	72"	64"	5-3/4"	17"	181-1/2"	7-3/4"	3-1/4"	64"	34-1/4"	64"	29-3/4"
PH100-119/130-119/160-119/199-119	119	27"	74"	66-1/4"	7-1/2"	18-3/4"	21-1/2"	10-1/2"	5"	66-1/2"	38-1/2"	66-1/2"	31"
PH130-55SA / PH199-55SA	55	23"	52"	45"	5"	14-3/4"	16-1/4"	5-1/4"	1"	45"	34-1/4"	45"	27-1/2"

PHOENIX WATER HEATER SPECIFICATIONS								
MODEL*	INPUT MODULATION	AIR INTAKE/ EXHAUST VENT SIZE	INLET/ OUTLET SIZE	AUXILIARY CONN.	GAS LINE CONN.	SYSTEM RELIEF PIPE SIZE	SHIPPING WEIGHT	MAX. TEMPERATURE LIMIT
PH100-55	35,000 - 100,000	2"	1" NPT	1" FNPT	3/4"	3/4"	175 LBS.	160°
PH130-55	35,000 - 130,000	2"	1" NPT	1" FNPT	3/4"	3/4"	175 LBS	160°
PH160-55	40,000 - 160,000	3"	1" NPT	1" FNPT	3/4"	3/4"	175 LBS.	160°
PH199-55	40,000 - 199,000	3"	1" NPT	1" FNPT	3/4"	3/4"	175 LBS	160°
PH100-80	35,000 - 100,000	2"	1-1/2" NPT	1" FNPT	3/4"	3/4"	235 LBS.	160°
PH130-80	35,000 - 130,000	2"	1-1/2" NPT	1" FNPT	3/4"	3/4"	235 LBS	160°
PH160-80	40,000 - 160,000	3"	1-1/2" NPT	1" FNPT	3/4"	3/4"	235 LBS.	160°
PH199-80	40,000 - 199,000	3"	1-1/2" NPT	1" FNPT	3/4"	3/4"	235 LBS.	160°
PH100-119	35,000 - 100,000	2"	1-1/2" NPT	1" FNPT	3/4"	3/4"	405 LBS.	160°
PH130-119	35,000 - 130,000	2"	1-1/2" NPT	1" FNPT	3/4"	3/4"	405 LBS.	160°
PH160-119	40,000 - 160,000	3"	1-1/2" NPT	1" FNPT	3/4"	3/4"	405 LBS.	160°
PH199-119	40,000 - 199,000	3"	1-1/2" NPT	1" FNPT	3/4"	3/4"	405 LBS.	160°
PHOENIX SANITIZER BOOSTER SPECIFICATIONS								
PH130-55SA	35,000 - 130,000	2"	1" NPT	1" FNPT	3/4"	3/4	175 LBS	184°
PH-199-55SA	40,000 - 199,000	3"	1"	1" FNPT	3/4"	3/4	175 LBS	184°

Figure 3 – *ALL DIMENSIONS ARE APPROXIMATE – A SUFFIX OF “LP” DENOTES PROPANE GAS - LP-179-B

PART 4 – PREPARE THE HEATER

WARNING

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

CAUTION

COLD WEATHER HANDLING – If the heater has been stored in a very cold location (BELOW 0°F) before installation, handle with care until the plastic components come to room temperature.

Remove all sides of the shipping crate to allow the heater to be lifted into its installation location.

PERFORMANCE SPECIFICATIONS FOR PHOENIX MODELS

MODEL	GALLON CAPACITY	BTU/HR INPUT		TEMPERATURE RISE IN DEGREES FAHRENHEIT										
				40	50	60	70	80	90	100	110	120	130	140
PH100-55	55	100,000	GPH	288	230	192	165	144	128	115	105	96	n/a	n/a
PH100-80	80			GPM	4.8	3.8	3.2	2.75	2.4	2.1	1.9	1.75	1.6	n/a
PH100-119	119													
PH130-55	55	130,000	GPH	354	283	236	202	177	157	141	128	118	109	101
PH130-80	80			GPM	5.9	4.7	3.9	3.9	2.9	2.6	2.3	2.1	1.9	1.8
PH130-119	119													
PH160-55	55	160,000	GPH	436	349	290	249	218	193	174	158	145	134	124
PH160-80	80			GPM	7	5.8	4.8	4	3.6	3.2	2.9	2.6	2.4	2.2
PH160-119	119													
PH199-55	55	199,000	GPH	545	436	363	311	272	242	218	198	181	167	155
PH199-80	80			GPM	9	7	6	5	4.5	4	3.5	3.3	3	2.7
PH199-119	119													

Table 2 – Recovery on rating plate is based at 94% thermal efficiency at 70° Fahrenheit rise, as required by ANSI

PERFORMANCE EQUATIONS

$$\text{GPM} = \frac{\text{Rated Input} \times .9}{\text{Temp Rise (}^{\circ}\text{F)} \times 500}$$

$$\text{GPH} = \text{GPM} \times 60$$

PART 5 – HEATER PIPING

⚠ CAUTION

Never use dielectric unions or galvanized steel fittings when connecting to a stainless steel storage tank or heater. Use only copper or brass fittings. Teflon thread sealant must be used on all connections.

A. GENERAL PIPING INFORMATION

CAUTION

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

CAUTION

The heater 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 tank. Some codes/jurisdictions may require additional external controls.

B. SCALDING

APPROXIMATE TIME / TEMPERATURE RELATIONSHIPS IN SCALDS

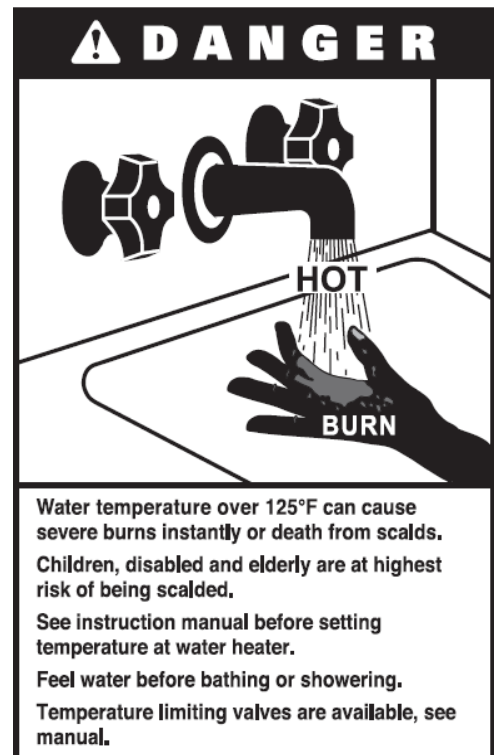
120°F	More than 5 minutes
125°F	1 ½ to 2 minutes
130°F	About 30 seconds
135°F	About 10 seconds
140°F	Less than 5 seconds
145°F	Less than 3 seconds
150°F	About 1 ½ seconds
155°F	About 1 second

Table 3

This heater 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 temperature. By setting the thermostat on this heater to obtain the increased water temperature required by these appliances, you may create the potential for scald injury.

To protect against injury, you should install a mixing valve in the water system. This valve will reduce point of discharge temperature by mixing cold and hot water in branch supply lines. Such valves are available from your local plumbing supplier.

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.



C. TEMPERATURE AND PRESSURE RELIEF VALVE

WARNING

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

- Discharge line must be connected to relief valve outlet and run to a safe place of disposal. Terminate the discharge line in a manner that will prevent possibility of severe burns or property damage should the relief valve discharge.
- Discharge line must be as short as possible and the same size as the valve discharge connection throughout its entire length.
- Discharge line must pitch downward from the valve and terminate at least 6" above the floor drain, making discharge clearly visible.
- The discharge line shall terminate plain, not threaded, with a material serviceable for temperatures of 375°F or greater.
- Do not pipe discharge to any location where freezing could occur.
- No shutoff valve may be installed between the relief valve and heater 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 heater "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

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

D. BACKFLOW PREVENTER

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

E. POTABLE EXPANSION TANK

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

EXPANSION TANK AND MAKE-UP WATER

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

CAUTION

Undersized expansion tanks cause system water to be lost from the relief valve, causing make-up water to be added. Eventual heater 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 the Heater Piping Details, or following recognized design methods. See expansion tank manufacturer's instructions for details.

⚠ CAUTION

The expansion tank must be suitable for hot potable water.

F. WATER PIPING

⚠ CAUTION

Never use dielectric unions or galvanized steel fittings on any domestic water or auxiliary connections. Use only copper or brass fittings. Thread sealant must be used on all connections.

The domestic water connections must be installed in accordance to all local and national plumbing codes, or any applicable standard which prevails. The inlet and outlet ports are 1" on 55 gallon models, and 1 ½" on 80 and 119 gallon models.

On the cold inlet, install a 1" brass tee on 55 gallon models, or a 1 ½" tee on 80 and 119 gallon models. On the run of the 1" brass tee, install a 1" brass drain cock or equivalent with pipe sealant compound. In the branch of the 1" or a 1 ½" brass tee, install a copper male adapter to match your copper plumbing system. For convenience, you may install a sweat shut off valve and a union in the cold inlet piping to ease future servicing. If there is a back flow preventer or any type of a no return valve in the system, you must install an additional tee here, suitable for a potable hot water expansion tank.

In the hot outlet, install a suitable adapter to match the copper tubing of the plumbing system. A thermal trap or heat trap loop may be installed here to provide additional energy savings and prevent the thermal siphoning of domestic hot water.

G. AUXILIARY CONNECTIONS

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

⚠ WARNING

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

H. PIPING DIAGRAMS

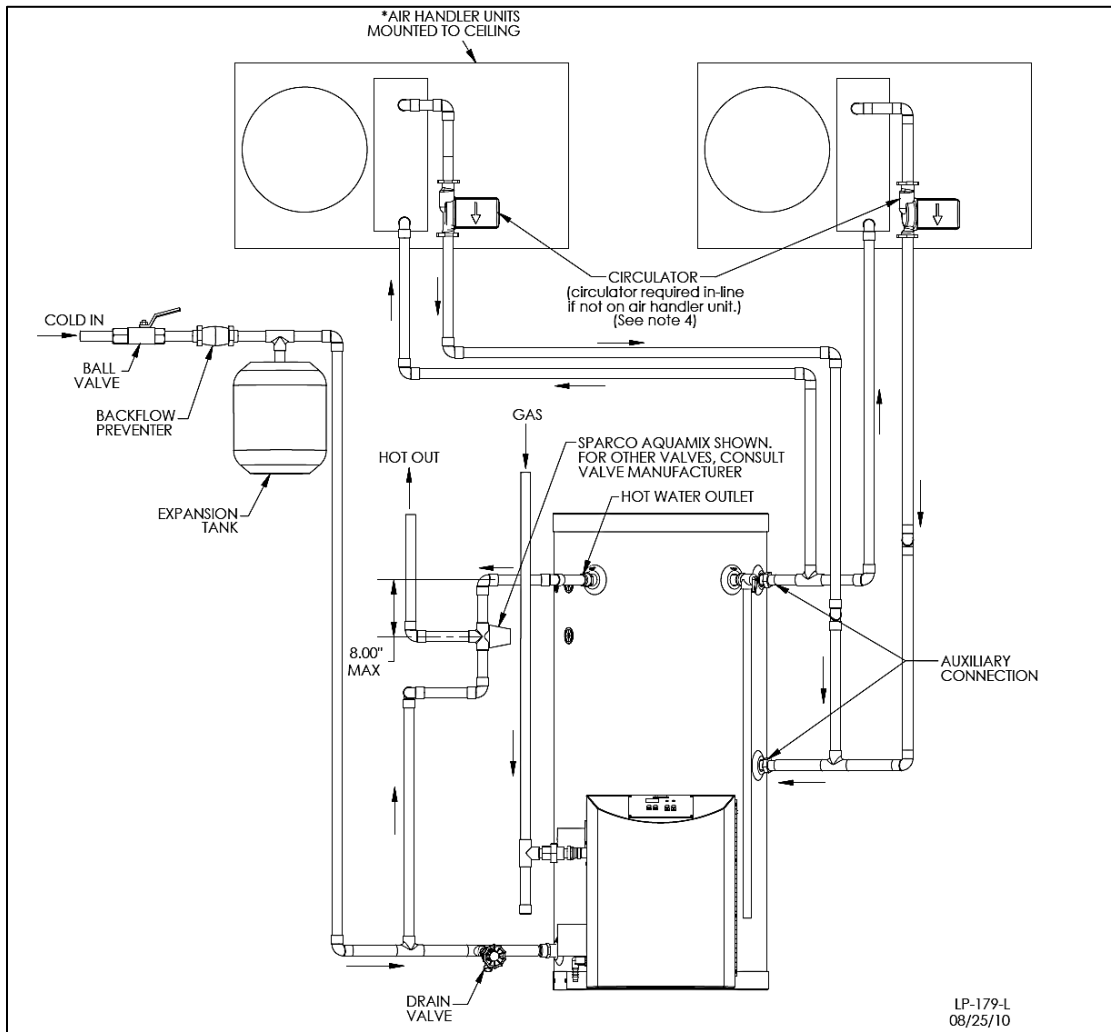


Figure 4 – LP-179-L – Phoenix With Air Handler - NOTES:

1. Minimum pipe size should match unit connection size. Upsize pipe accordingly if greater flow is required.
2. A thermal expansion tank suitable for potable water must be sized and installed within this piping system between the backflow preventer and the cold water inlet.
3. Gas line must be rated to the unit maximum input capacity. Unit must have 10 feet of pipe after gas regulator.
4. All circulators should have an integral flow check.
5. Check with air handler manufacturer for proper sizing.
6. This drawing is meant to demonstrate system piping only. The installer is responsible for all equipment and detailing required by local codes.

NOTES FOR AIR HANDLER APPLICATION:

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

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

⚠ DANGER

An ASSE 1017 thermostatic mixing valve **MUST** be installed when using outdoor reset. Failure to do so could result in substantial property damage, serious injury, or death.

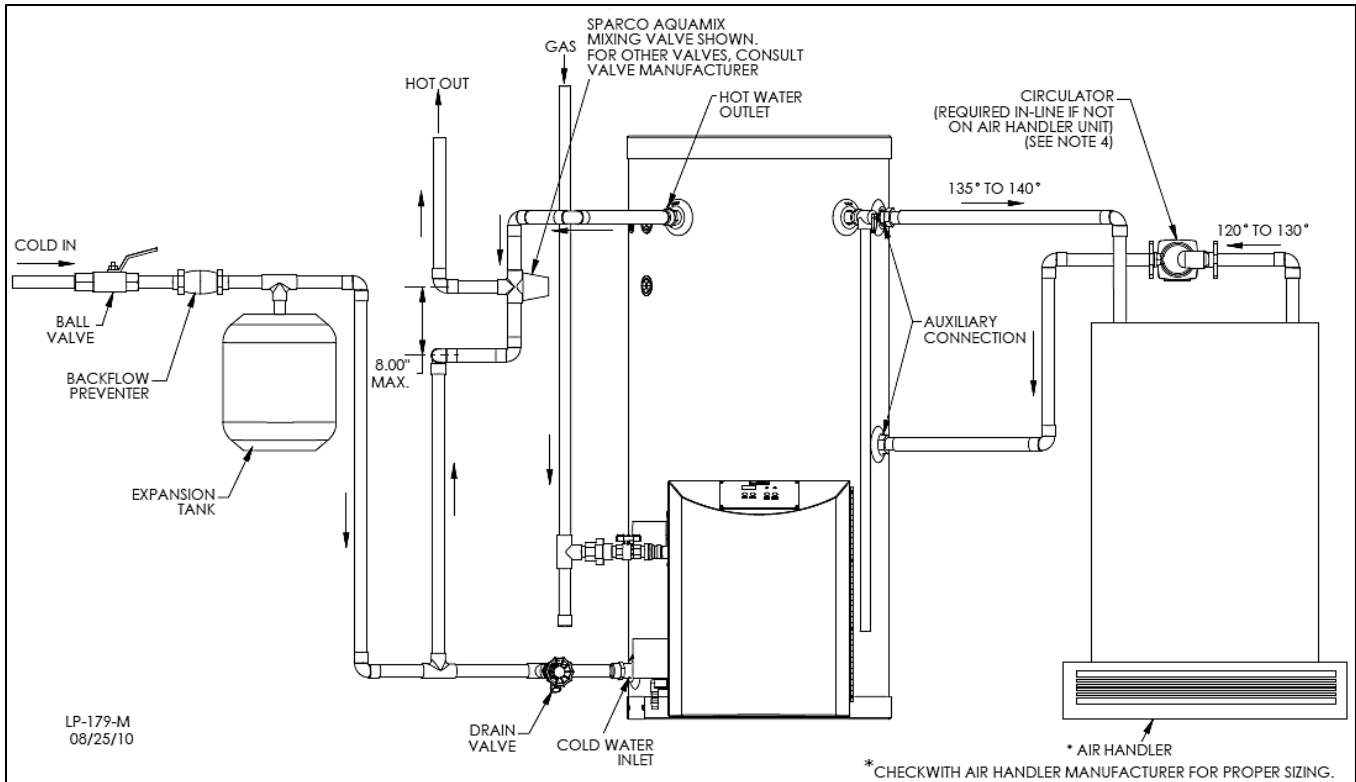


Figure 5 – Phoenix with Air Handler on Side - LP-179-M

NOTES:

1. Minimum pipe size should match unit connection size. Upsize pipe accordingly if greater flow is required.
2. A thermal expansion tank suitable for potable water must be sized and installed within this piping system between the backflow preventer and the cold water inlet.
3. Gas line must be rated to the unit maximum input capacity. Unit must have 10 feet of pipe after gas regulator.
4. All circulators should have an integral flow check.
5. Check with air handler manufacturer for proper sizing.
6. This drawing is meant to demonstrate system piping only. The installer is responsible for all equipment and detailing required by local codes. In Massachusetts, you must install a vacuum relief valve per 248 CMR. With air handlers, outdoor reset is available with an outdoor sensor. See Part 9, Section D.

NOTES FOR AIR HANDLER APPLICATION:

1. MASSACHUSETTS STATE PLUMBING CODE REQUIRES A DISTANCE NO GREATER THAN 50 FEET FROM THE WATER HEATER TO THE FAN COIL IN THE AIR HANDLER.
2. MASSACHUSETTS STATE PLUMBING CODE REQUIRES AN ELECTRONICALLY TIMED CIRCULATOR PUMP TO ACTIVATE EVERY SIX HOURS FOR 60 SECONDS. THIS CIRCULATOR IS REQUIRED TO BE BRONZE OR STAINLESS.
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NOTE: THIS DRAWING IS MEANT TO DEMONSTRATE SYSTEM PIPING ONLY. THE INSTALLER IS RESPONSIBLE FOR ALL EQUIPMENT AND DETAILING REQUIRED BY LOCAL CODES.

⚠ DANGER

An ASSE 1017 thermostatic mixing valve **MUST** be installed when using outdoor reset. Failure to do so could result in substantial property damage, serious injury, or death.

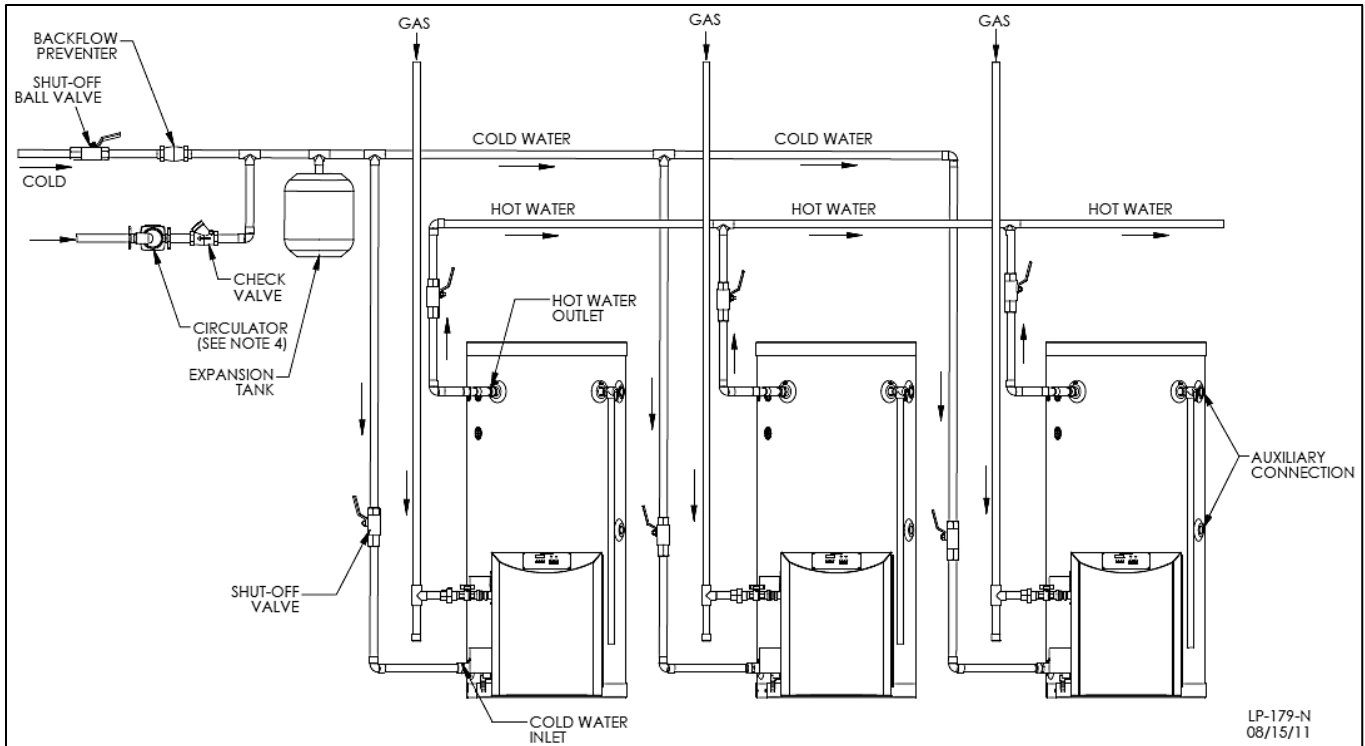


Figure 6 – Reverse Manifold and Piping Diagram for Phoenix - LP-179-N

NOTES:

1. Minimum pipe size should match unit connection size. Upsize pipe accordingly if greater flow is required.
2. A thermal expansion tank suitable for potable water must be sized and installed within this piping system between the backflow preventer and the cold water inlet.
3. Gas line must be rated to the unit maximum input capacity. Unit must have 10 feet of pipe after gas regulator.
4. All circulators should have an integral flow check.
5. Check with air handler manufacturer for proper sizing.
6. This drawing is meant to demonstrate system piping only. The installer is responsible for all equipment and detailing required by local codes. In Massachusetts, you must install a vacuum relief valve per 248 CMR. With air handlers, outdoor reset is available with an outdoor sensor. See Part 9, Section D.

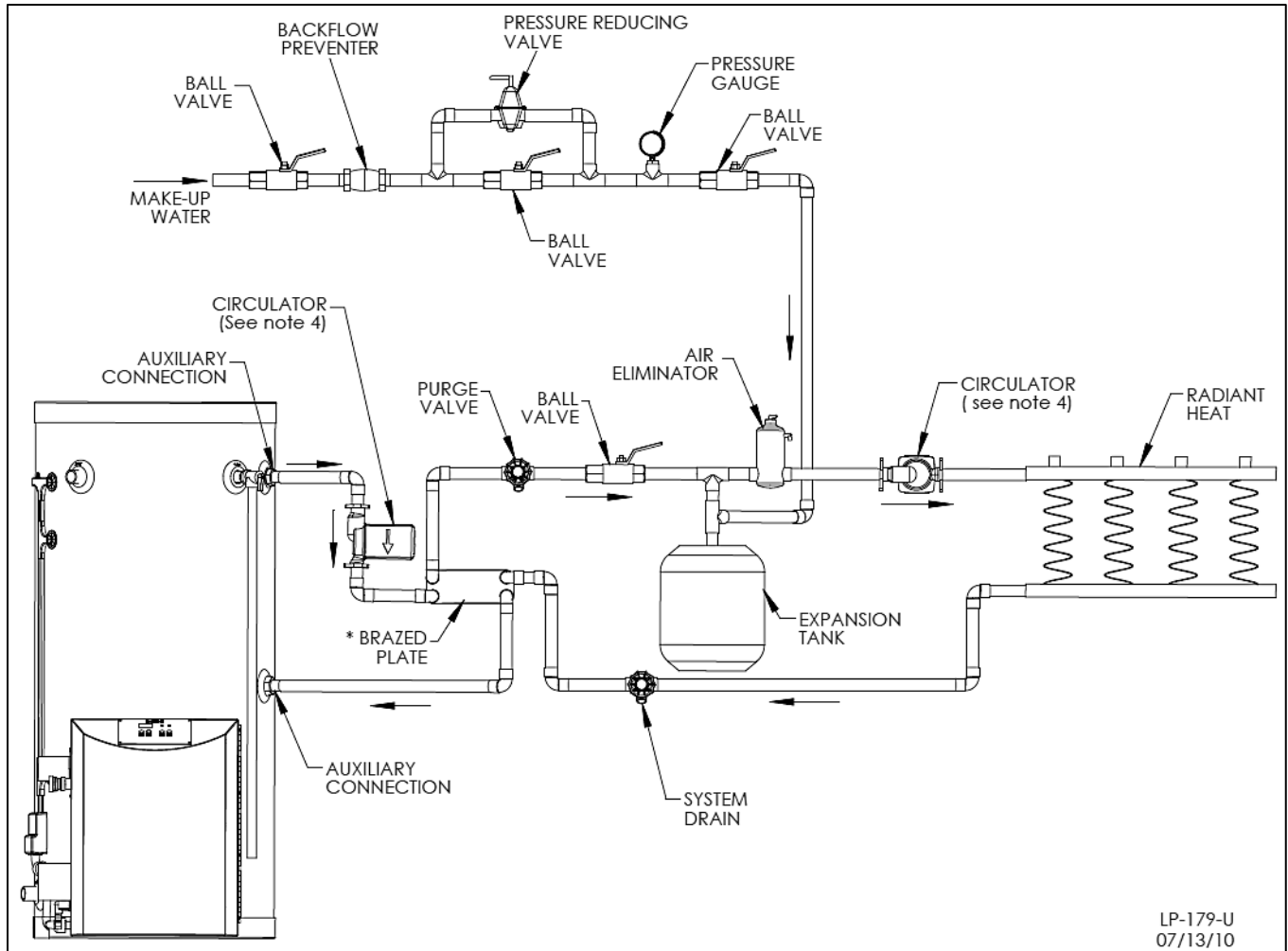


Figure 7 –Closed Loop with Radiant Heating - LP-179-U

NOTES:

1. Minimum pipe size should match unit connection size. Upsize pipe accordingly if greater flow is required.
2. A thermal expansion tank suitable for potable water must be sized and installed within this piping system between the backflow preventer and the cold water inlet.
3. Gas line must be rated to the unit maximum input capacity. Unit must have 10 feet of pipe after gas regulator.
4. All circulators should have an integral flow check.
5. Check with brazed plate manufacturer for correct plate connections and orientation.
6. This drawing is meant to demonstrate system piping only. The installer is responsible for all equipment and detailing required by local codes. In Massachusetts, you must install a vacuum relief valve per 248 CMR. With air handlers, outdoor reset is available with an outdoor sensor. See Part 9, Section D.

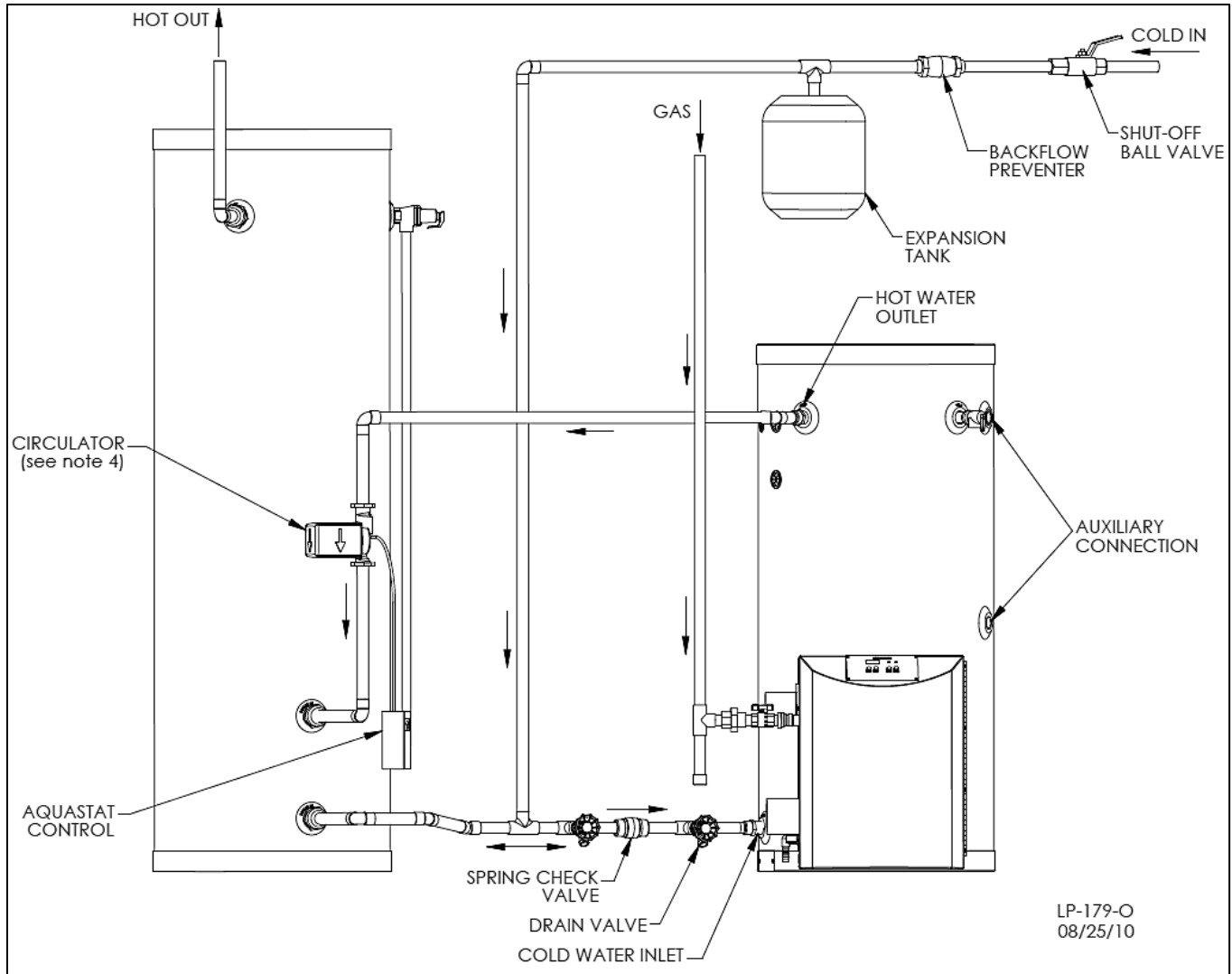


Figure 8 – Phoenix With Storage Tank - LP-179-O

NOTES:

1. Minimum pipe size should match unit connection size. Upsize pipe accordingly if greater flow is required.
2. A thermal expansion tank suitable for potable water must be sized and installed within this piping system between the backflow preventer and the cold water inlet.
3. Gas line must be rated to the unit maximum input capacity. Unit must have 10 feet of pipe after gas regulator.
4. All circulators should have an integral flow check.
5. Drains and check valve between unit and storage tank will assist in purging air from system.
6. This drawing is meant to demonstrate system piping only. The installer is responsible for all equipment and detailing required by local codes. In Massachusetts, you must install a vacuum relief valve per 248 CMR.

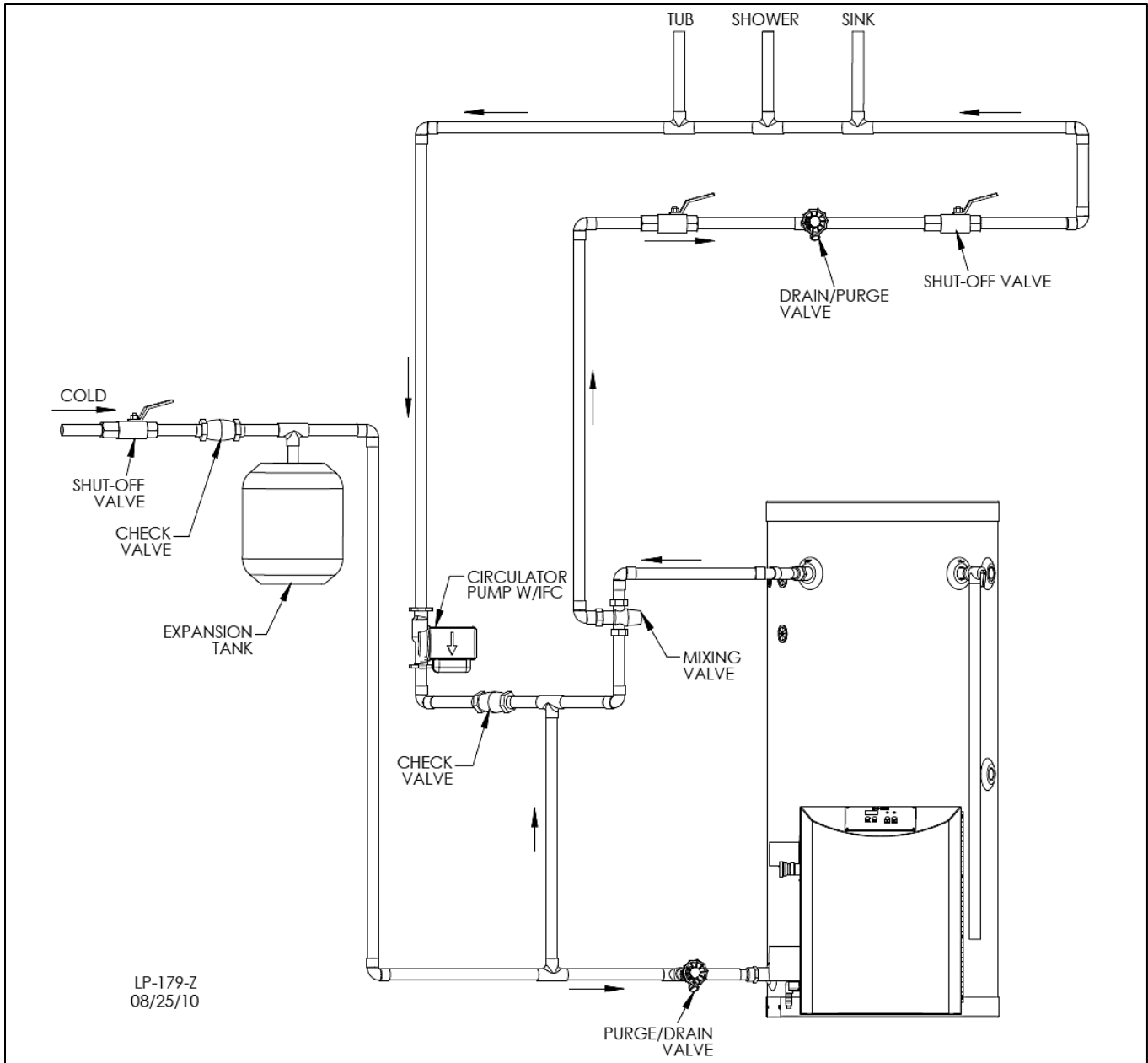


Figure 9 – Phoenix with Recirculation Line and Thermostatic Mixing Valve Piping - LP-179-Z

NOTES:

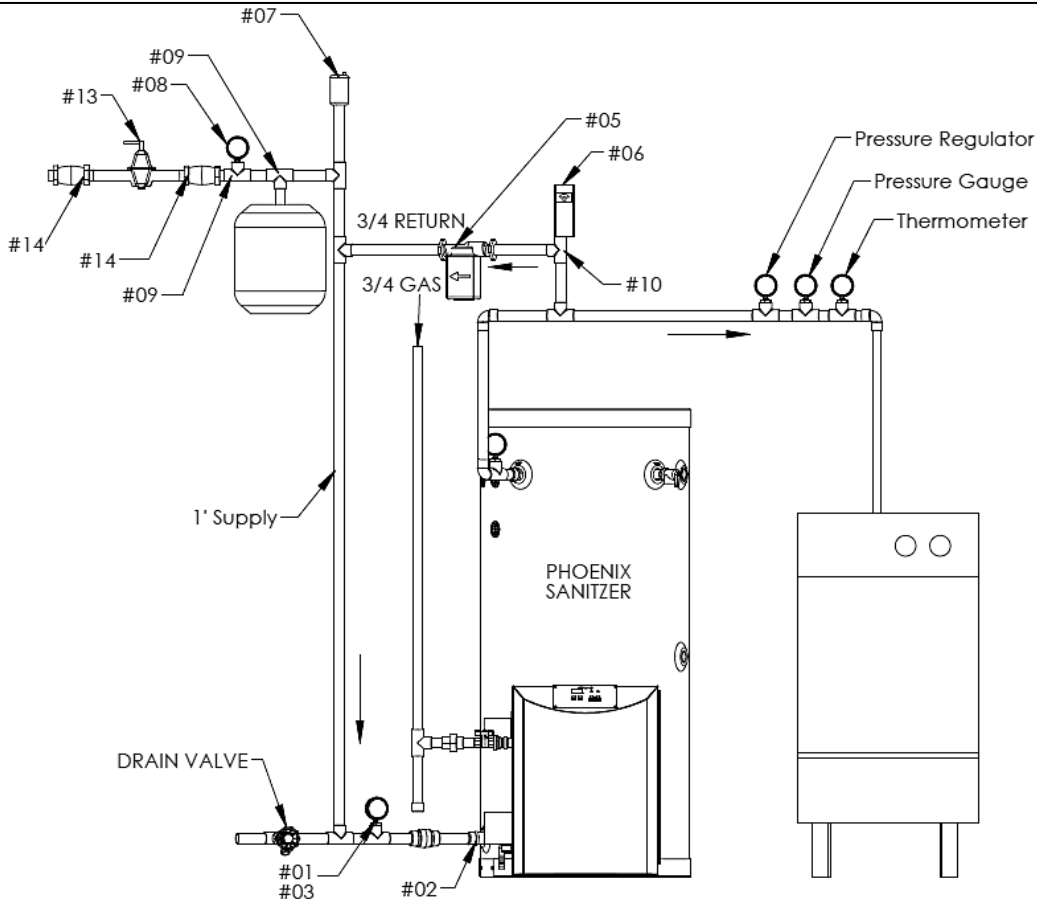
1. Minimum pipe size should match unit connection size. Upsize pipe accordingly if greater flow is required.
2. A thermal expansion tank suitable for potable water must be sized and installed within this piping system between the backflow preventer and the cold water inlet.
3. Gas line must be rated to the unit maximum input capacity. Unit must have 10 feet of pipe after gas regulator.
4. All circulators should have an integral flow check.
5. Drains and check valve between unit and storage tank will assist in purging air from system.
6. This drawing is meant to demonstrate system piping only. The installer is responsible for all equipment and detailing required by local codes. In Massachusetts, you must install a vacuum relief valve per 248 CMR.

⚠ DANGER

An ASSE 1017 thermostatic mixing valve **MUST** be installed when using outdoor reset. Failure to do so could result in substantial property damage, serious injury, or death.

CAUTION

The standard unit does not meet the required temperature settings for sanitizer booster applications. Use only the Phoenix Sanitizer Booster that delivers temperatures of 184°F. Inlet water to the booster must be supplied at 140°F.



LP-179-SA
7-26-10

WARNING; INCOMING SUPPLY MUST BE NO FURTHER THAN 5' FROM THE SANITIZER
VERY IMPORTANT: INSULATE ALL PIPES ON RECIRCULATION LINE TO AND FROM SANITIZER
 THE ITEMS LISTED BELOW ARE THE ITEMS AND PART NUMBERS IN THE VSBK-1200 SANITIZER BOOSTER KIT

ITEM	PART	DESCRIPTION	PART NUMBER	ITEM	PART	DESCRIPTION	PART NUMBER
#01	NIBCO TEE	1"X1"X 1/2"	7000-708	#08	PRESSURE GAUGE		7000-716
#02	FEMALE ADAPTER	1"	7000-709	#09	NIBCO TEE	1" X 1" X 3/4" 712R	7000-728
#03	DIAL THERMOMETER		7000-710	#10	NIBCO TEE	1" X 1/2" X 1" COPPER	7000-739
#04	EXPANSION TANK	4.5 GAL	7000-711	#11	NIBCO TEE	1" X 1/2" X 1"R	7000-730
#05	GRUNDFOS 3 SPEED PUMP	W/ CHECK VALVE	7000-712	#12	REDUCING COUPLING		7000-732
#06	NIBCO TEE	1/2" X 1/2" FITTING AIR CHAMBER	7000-737	#13	PRESSURE REDUCING VALVE		7000-733
#07	VACUUM RELIEF VALVE		7000-714	#14	NIBCO MALE ADAPTERS		7000-736

Figure 10 Phoenix Sanitizer Booster Installation – PH130-55SA / PH199-55SA - LP-179-SA

NOTES:

1. Minimum pipe size should match unit connection size. Upsize pipe accordingly if greater flow is required.
2. A thermal expansion tank suitable for potable water must be sized and installed within this piping system between the backflow preventer and the cold water inlet.
3. Gas line must be rated to the unit maximum input capacity. Unit must have 10 feet of pipe after gas regulator.
4. All circulators should have an integral flow check.
5. Drains and check valve between unit and storage tank will assist in purging air from system.
6. This drawing is meant to demonstrate system piping only. The installer is responsible for all equipment and detailing required by local codes. In Massachusetts, you must install a vacuum relief valve per 248 CMR.
7. For further energy savings, install the Phoenix Sanitizer Booster on the same electrical circuit as the dishwasher.

PART 6 – WIRING

A. LINE VOLTAGE INPUT

The heater must be wired to a 120 volt circuit by a qualified electrician. It is recommended that the heater be wired on its own circuit to minimize the possibility of circuit failure due to outside causes. The heater requires a maximum of 8 amps at 120 volts in use.

B. LINE VOLTAGE CONDENSATE OUTPUT

The heater has the capability of supplying power to a condensate pump. The connection is 120 VAC +/- 10% at a max of 2 amps. Power is supplied to the pump only when the heater is connected to power, and the power switch is in the on position.

C. LOW VOLTAGE OUTDOOR SENSOR INPUT

The heater has the capability of an outdoor reset. Connecting an outdoor sensor allows the heater to operate at optimum efficiency. HTP offers an outdoor sensor, p/n 7250P-319

The outdoor sensor must be a 12K NTC sensor. Use a minimum 22 AWG wire for runs of 100 feet or less and minimum 18 AWG wire for runs up to 150 feet. Instructions are included with the outdoor sensor to correctly mount the sensor on the exterior surface of the building. It is preferable to mount the sensor on the north side in an area that will not be affected by direct sunlight but will be exposed to varying weather conditions. Connect the outdoor sensor to terminals marked "Outdoor".

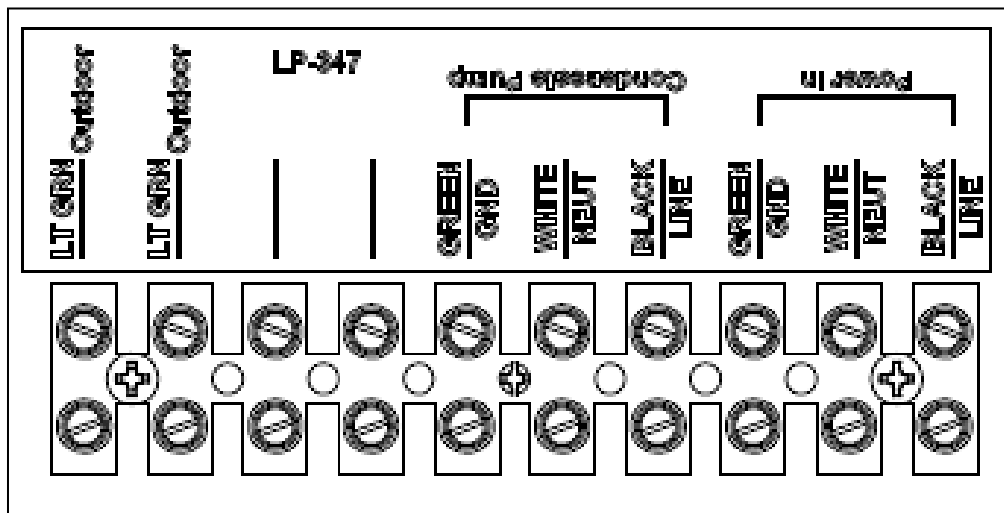


Figure 11 – LP-179-Y

⚠ WARNING

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 heater is completely filled with cold water.

D. INTERNAL WIRING DIAGRAM

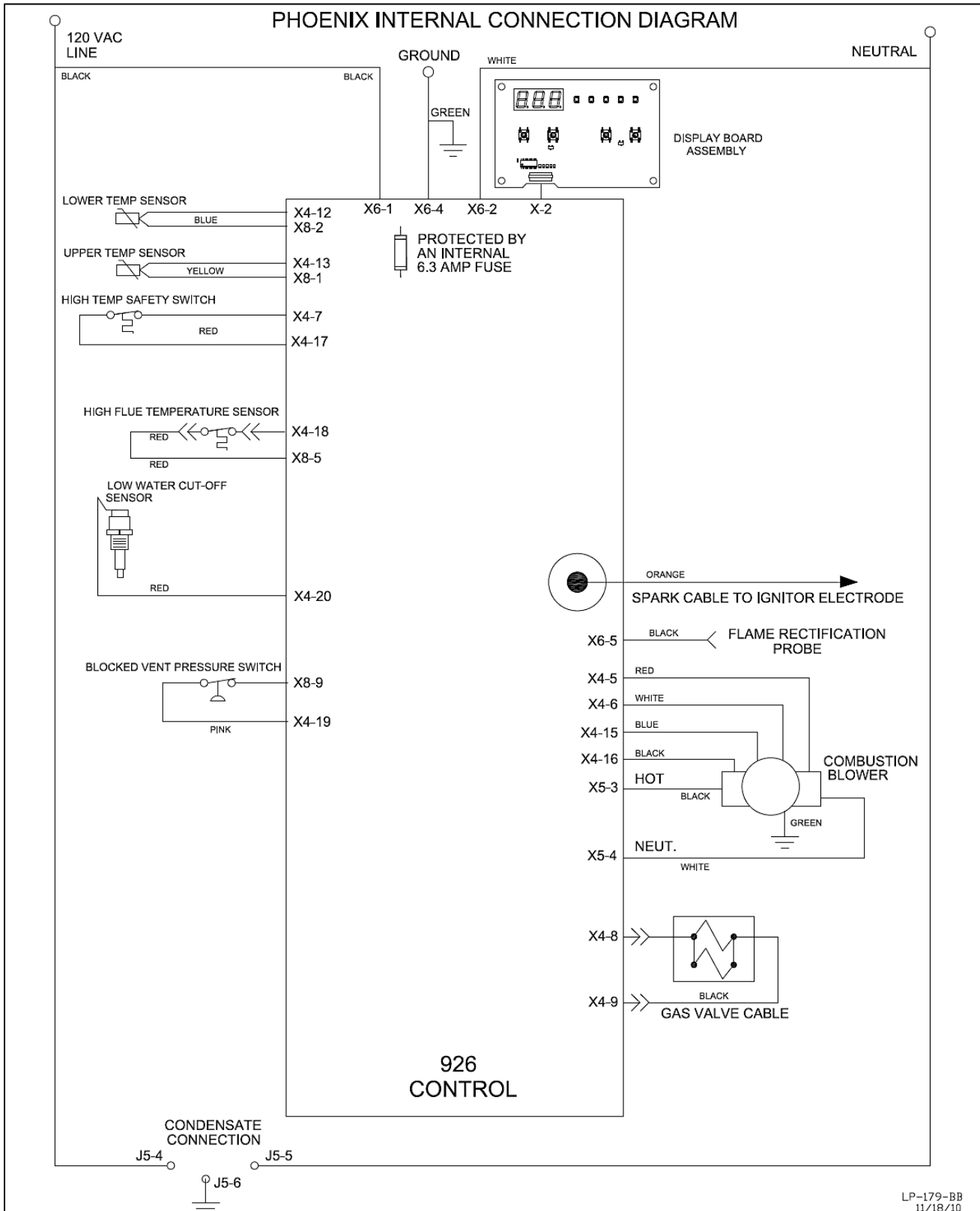


Figure 12 – Wiring Diagram

PART 7 – GAS CONNECTIONS

⚠ WARNING

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

The gas supply shall have a maximum inlet pressure of less than 14" water column (350 mm), ½ pound pressure (3.5 kPa), and a minimum of 3.5" water column. The entire piping system, gas meter and regulator must be sized properly to prevent 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 you are connected to the type of gas as 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 13! 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 water heater is no smaller than ¾".

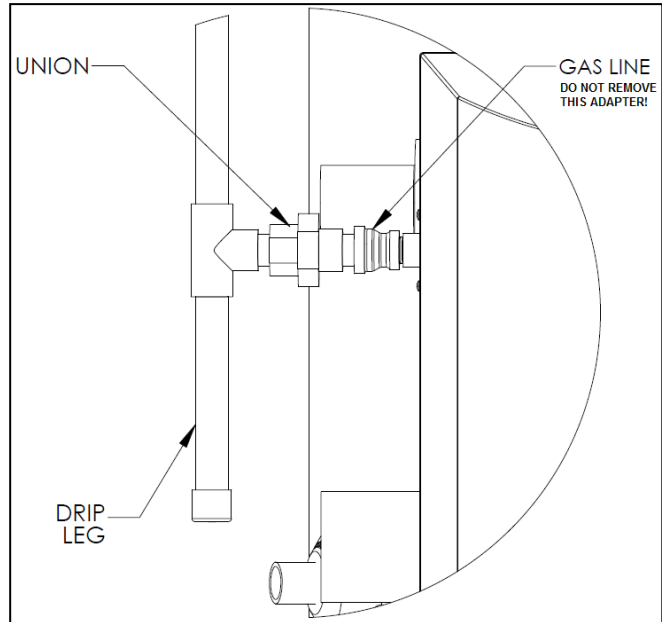


Figure 13 – Phoenix Gas Connection - LP-179-Q

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, you must isolate the heater from the gas line to continue leak testing. To do this, you must turn off the factory and field-installed gas cocks. This will minimize the possibility of damaging the gas valve. Failure to do so may damage the gas valve. In the event the gas valve is exposed to a pressure greater than ½ PSI, 14" water column, the gas valve must be replaced. Never use an open flame (match, lighter, etc.) to check gas connections.

A. GAS PIPING

Run the gas supply line in accordance with all applicable codes. Locate and install manual shutoff valves in accordance with local and state requirements.

B. GAS TABLE

Refer to the table below to size the supply piping to minimize pressure drop between meter or regulator and unit.

Maximum capacity of pipe in cubic feet of gas per hour for gas pressures of .5 psi or less and a pressure drop of .3 inch water column.

Nominal Iron Pipe Size (In.)	Internal Dia. (In.)	Length of Pipe (Feet)														BTU's Per Hour x 1,000
		10	20	30	40	50	60	70	80	90	100	125	150	175	200	
¾	.824	278	190	152	130	115	105	96	90	84	79	72	64	59	55	
1	1.049	520	350	285	245	215	195	180	170	160	150	130	120	110	100	
1 ¼	1.380	1,050	730	590	500	440	400	370	350	320	305	275	250	225	210	
1 ½	1.610	1,600	1,100	890	760	670	610	560	530	490	460	410	380	350	320	

Table 4 – Source – ANSI Z223.1

It is recommended that a soapy solution be used to detect leaks. Bubbles will appear on the pipe to indicate a leak is present. The gas piping must be sized for proper flow and length of pipe to avoid excessive pressure drop. Both the gas meter and the gas regulator must be properly sized for the total gas load. If you experience a pressure drop greater than 1" WC, the meter, regulator or gas line is undersized or in need of service. You can attach a manometer to the incoming gas drip leg by removing the cap. The gas pressure must remain between 3.5" WC 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 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. Failure to properly purge the lines or improper line sizing will result in ignition failure. This problem is especially noticeable in NEW LP installations and also in empty tank situations. This can also occur when a utility company shuts off service to an area to provide maintenance to their lines. The gas valve must not be replaced with a conventional gas valve under any circumstances. As an additional safety feature, the gas valve in this appliance has a flanged connection to the swirl plate and blower.

C. GAS VALVE

⚠ WARNING

Do not do a gas conversion on this water heater without an officially approved conversion kit and instructions supplied by HTP.

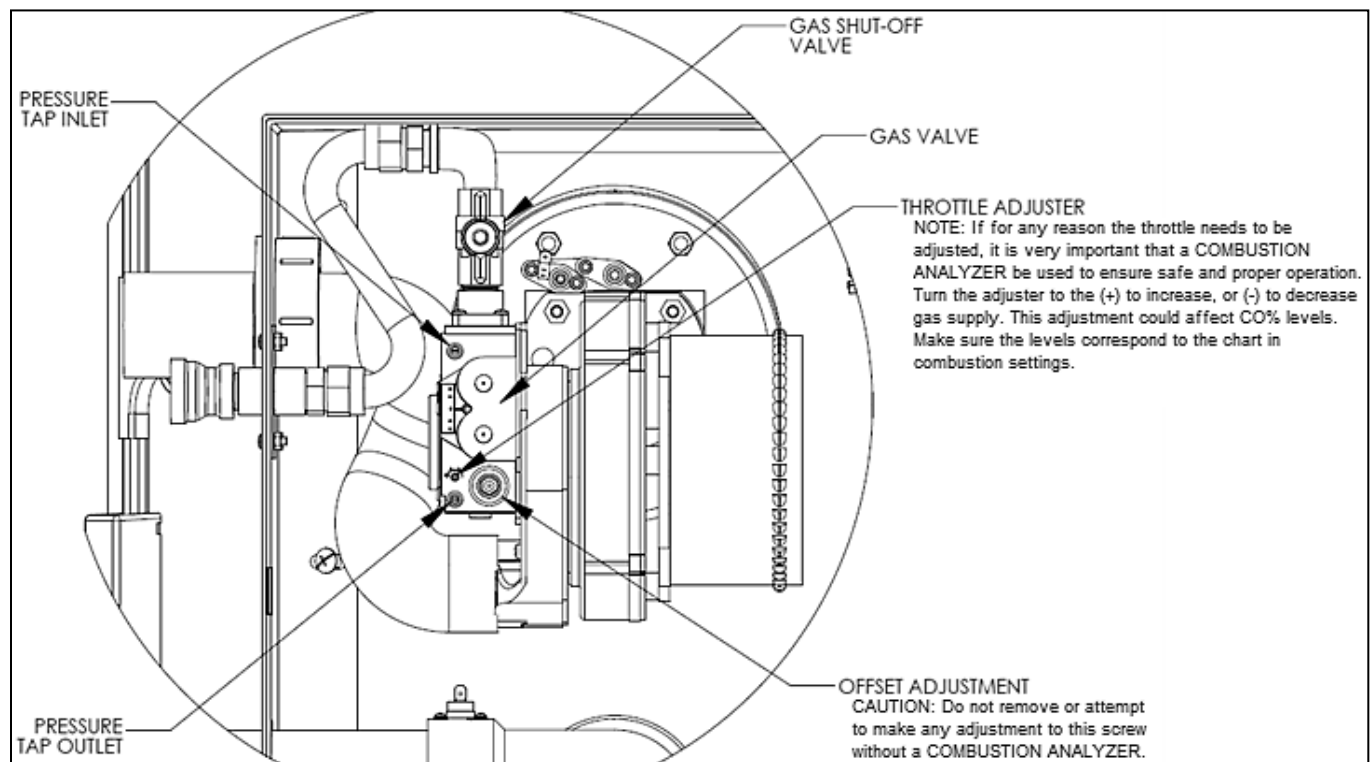


Figure 14 – Gas Valve LP-179-P

PART 8 – VENTING, COMBUSTION AIR AND CONDENSATE REMOVAL

DANGER

The heater must be vented as detailed in this Venting Section. Ensure exhaust and intake piping complies with these instructions regarding vent system. Inspect finished combustion air intake and exhaust piping thoroughly to ensure all joints are well secured, airtight, and comply with all applicable code requirements, as well as with 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 vent system will operate with a positive pressure in the pipe. 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 below carefully. Failure to do so may result in substantial property damage, severe personal injury, or death.

1. Install the water heater 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.
2. This water heater is a direct vent appliance and is listed as a Category IV appliance with Underwriters Laboratories, Inc. VENT AND INTAKE AIR VENT.
3. This water heater must be vented with materials, components, and systems listed and approved for Category IV appliances.

B. APPROVED MATERIALS FOR EXHAUST AND INTAKE AIR VENTS

APPROVED EXHAUST VENTING AND AIR INLET MATERIAL			
Item	Material	Standards for Installation in:	
		United States	Canada
Exhaust vent or air inlet pipe and fittings	PVC schedule 40/80	ANSI/ASTM D1785	CPVC and PVC venting must be ULC-S636 Certified. IPEX is an approved manufacturer in Canada, supplying vent material listed to ULC-S636.
	PVC-DWV	ANSI/ASTM D2665	
	CPVC schedule 40/80	ANSI/ASTM F441	
	Polypropylene	ULCS636	
	Stainless Steel AL29-4C	Certified for Category IV and direct vent appliance venting	Certified for Category IV and direct vent appliance venting
Pipe cement/primer	PVC	ANSI/ASTM D2564	IPEX System 636 Cements & Primers
	CPVC	ANSI/ASTM F493	

DANGER

- Do NOT use Foam Core Pipe in any portion of the exhaust piping from this water heating appliance.
- DO NOT connect different types of plastic piping together.
- When installing AL29-4C vent piping, install a PVC-to-stainless adapter at the boiler vent connection, and at the termination when using an HTP PVC termination kit. DO NOT mix piping from different manufacturers unless using adapters specifically designed for the purpose by the manufacturer.

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

Table 5 - NOTES:

WARNING

DO NOT mix components from different 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 Table 8. Failure to do so could result in property damage, severe personal injury, or death.

WARNING

The exhaust vent adaptors included with these products are not designed as load-bearing devices, and must not be used to support exhaust vent piping. All vent pipes must be glued, properly supported, and the exhaust must be pitched a minimum of ¼" per foot back to the boiler 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.

C. EXHAUST AND INTAKE AIR VENT PIPE LOCATION

1. DETERMINE EXHAUST VENT LOCATION

- a. The vent piping for this water heater is approved for zero clearance to combustible construction.
- b. See illustration within this section of clearances for location of exit terminals of direct-vent venting systems.
- c. This water heater vent system shall terminate at least 3 feet (0.9 m) above any forced air intake located within 10 ft (3 m). Note: this does not apply to the combustion air intake of a direct-vent appliance.
- d. Provide a minimum of 1 foot distance from any door, operable window, or gravity intake into any building.
- e. Provide a minimum of 1 foot clearance from the bottom of the exhaust above the expected snow accumulation level. Snow removal may be necessary to maintain clearance.
- f. Provide 4 feet horizontal clearance from electrical meters, gas meters, gas regulators, relief equipment, exhaust fans and inlets. In no case shall the exit terminal be above or below the aforementioned equipment unless the 4 foot horizontal distance is maintained.
- g. When adjacent to a public walkway, locate exit terminal at least 7 feet above grade.
- h. Do not locate the exhaust directly under roof overhangs to prevent icicles from forming.
- i. Provide 4 feet clearance from the inside corner of vertical walls, chimneys, etc., as well as horizontal corners created by roof overhangs.

2. DETERMINE AIR INTAKE VENT LOCATION

- a. Provide 1 foot clearance from the bottom of the intake air vent and the level of maximum snow accumulation. Snow removal may be necessary to maintain clearances.
- b. Do not locate intake air vent in a parking area where machinery may damage the pipe.
- c. When venting with a two pipe system, maximum distance between intake air vent and exhaust vent is 6 feet (1.8 m). Minimum distance between exhaust vent and intake air vent on single water heater is 10" (0.255 m) center-to-center. Minimum distance between exhaust vents and intake air vents on multiple water heaters is 10" (0.255 m) center-to-center.

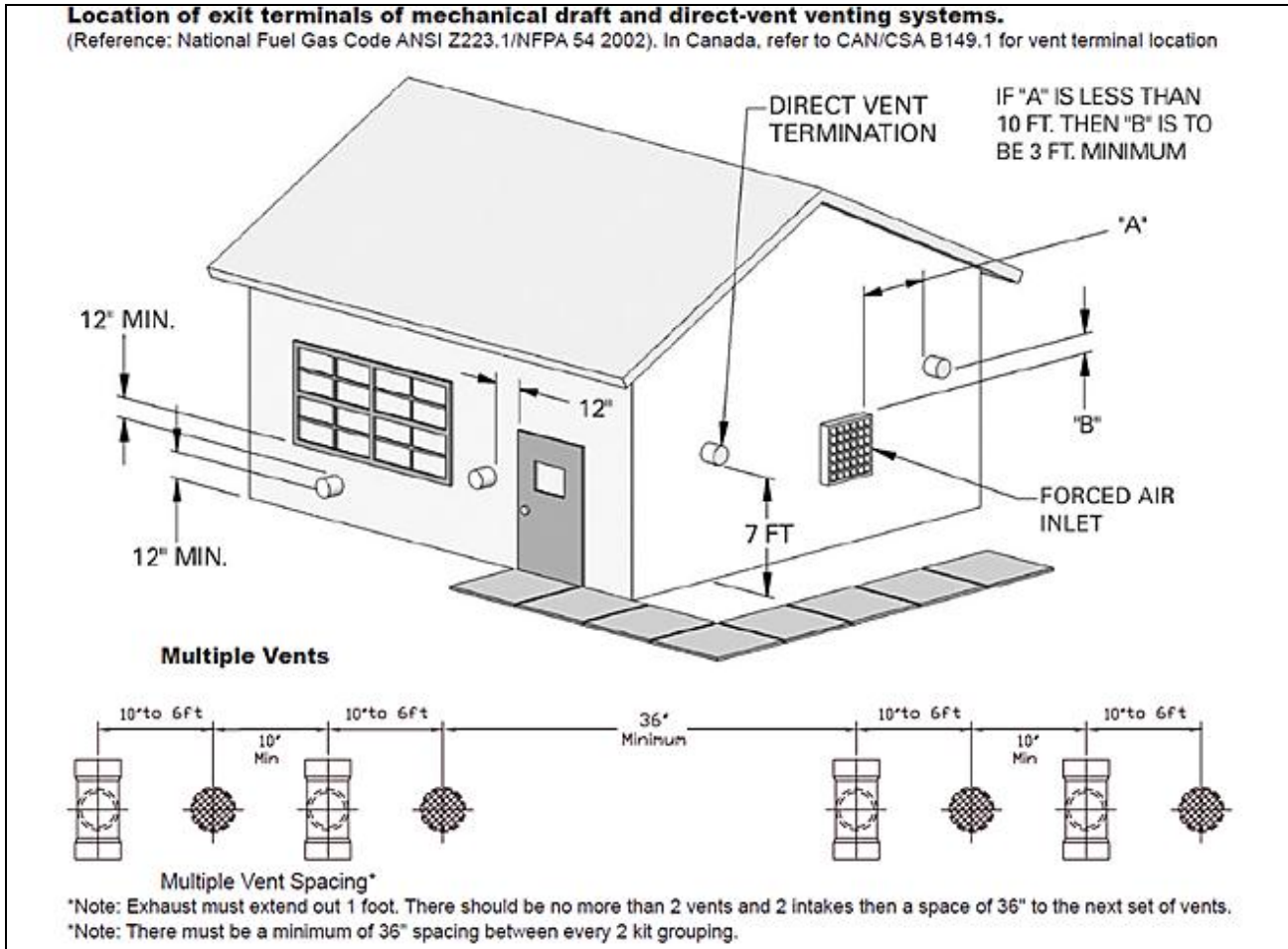


Figure 15 – Venting

D. EXHAUST AND INTAKE AIR VENT SIZING

1. The exhaust and intake vent size is 2" for the PH100 and PH130 and 3" for the PH160 and PH199.
2. The total combined equivalent length of exhaust vent and intake air pipe should **not exceed 85 feet**.
 - a. The equivalent length of elbows, tees, and other fittings are listed in the Friction Loss Table below:

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 VENT KIT	3'	3'	N/A
V500 2" VENT KIT	1'	N/A	N/A
V1000 3" VENT KIT	N/A	1'	1'
V2000 4" VENT 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.

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

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

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

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

Finally, if a concentric vent kit is used we find:

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

Therefore, the total combined equivalent length is 46 feet which is well below the maximum of 85 feet.

c. The intake air vent pipe and the exhaust vent are intended to penetrate the same wall or roof of the building.

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

3. The minimum combined equivalent length is 16 equivalent feet.

E. LONGER VENT RUNS

1. The maximum combined equivalent length can be extended by increasing the diameter of both exhaust vent and intake air vent pipe equally. However, the transitions should begin a minimum of 15 equivalent feet from the water heater.

a. **The maximum equivalent length for increased diameter vent pipes is 125 feet.**

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

VENT CONNECTION	REDUCING COUPLING	VENT TRANSITION
2"	3" X 2"	3"
3"	4" X 3"	4"

Table 7 – Vent Run Transition

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

TRANSITION POINT (FT. FROM WATER HEATER)	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

F. EXHAUST VENT AND INTAKE AIR PIPE INSTALLATION

WARNING

All joints of positive pressure vent systems must be sealed completely to prevent leakage of flue products into living space.

1. Use only solid PVC or CPVC 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**.

2. Remove all burrs and debris from joints and fittings.
3. 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.**
4. 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.
5. 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.
6. Do not use the heater to support any piping.
7. A screened straight coupling is provided with the heater for use as an outside exhaust termination.
8. A screened inlet air tee is provided with the heater to be used as an outside intake termination.

The following information on Table 9 lists optional intake air/exhaust vent terminations available from HTP:

DESCRIPTION	STOCK CODE
2" PVC CONCENTRIC VENT TERMINATION KIT	KGAVT0501CVT
3" PVC CONCENTRIC VENT TERMINATION KIT	KGAVT0601CVT
2" STAINLESS STEEL VENT TERMINATION KIT	V500
3" STAINLESS STEEL VENT TERMINATION KIT	V1000
4" STAINLESS STEEL VENT TERMINATION KIT	V2000
3" POLYPRO VENT KIT	8400P-001

Table 9

G. VENTING DRAWINGS

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 heater such that the air intake and exhaust vent piping can be routed through the building and properly terminated. Different vent terminals can be used to simplify and eliminate multiple penetrations in the building structure (see Optional Equipment in Venting Section). The air intake and exhaust vent piping lengths, routing and termination methods must all comply with the methods and limits given in the Venting section, Part 8 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 1 – Contaminant Table.**

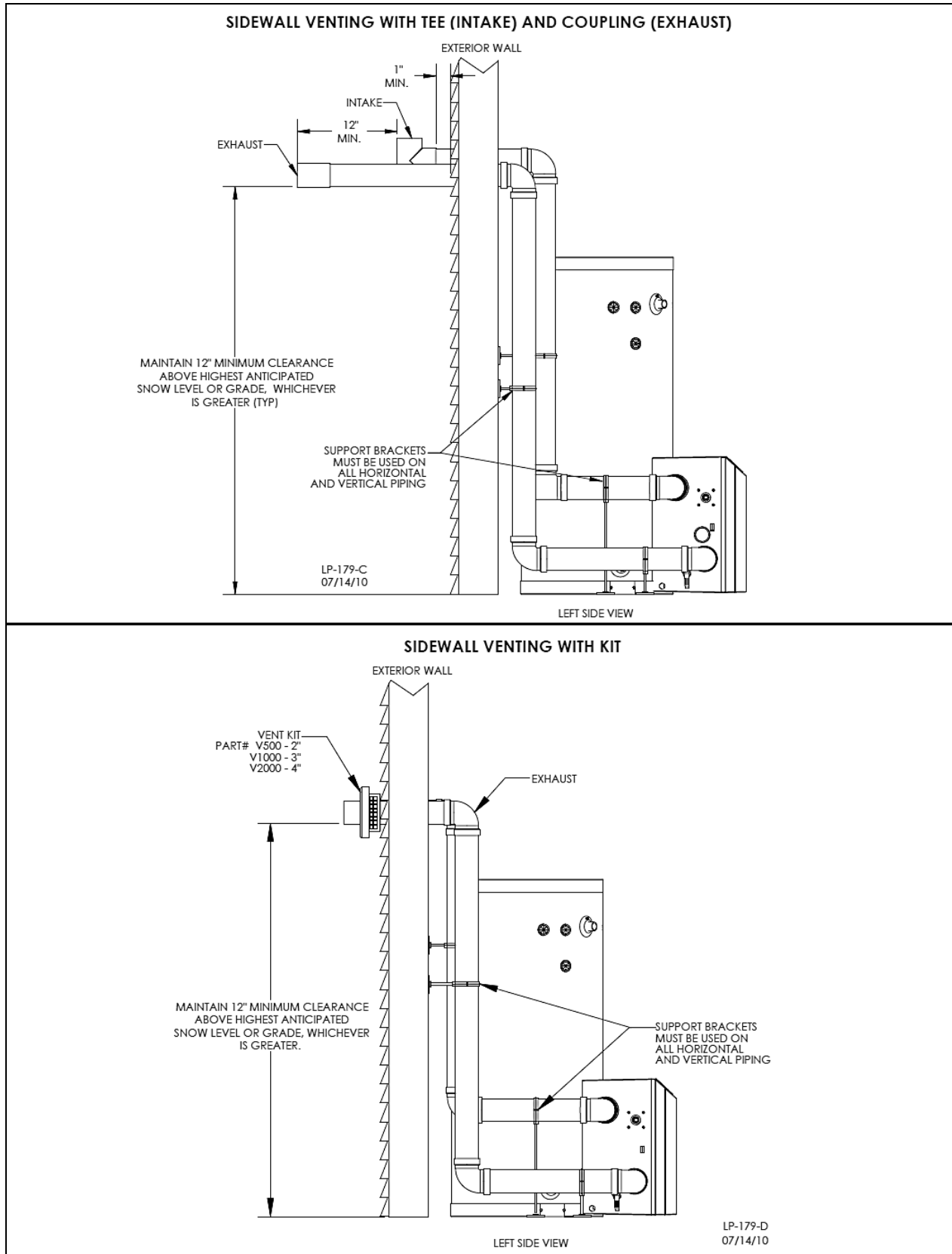


Figure 16 – Sidewall Venting - NOTE: This drawing is meant to demonstrate system venting only. The installer is responsible for all equipment and detailing required by local codes.

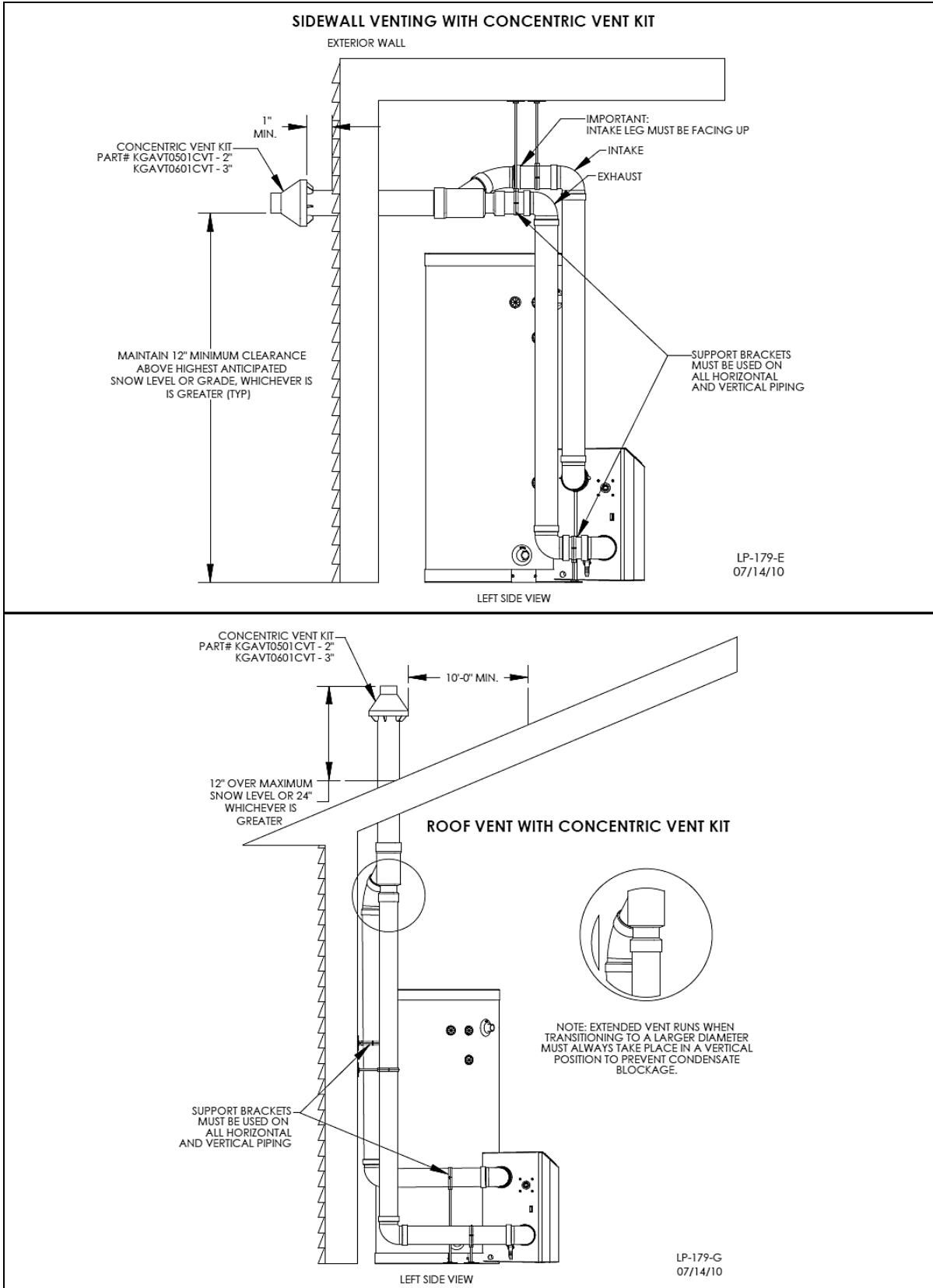


Figure 17 – Concentric Venting - NOTE: This drawing is meant to demonstrate system venting only. The installer is responsible for all equipment and detailing required by local codes.

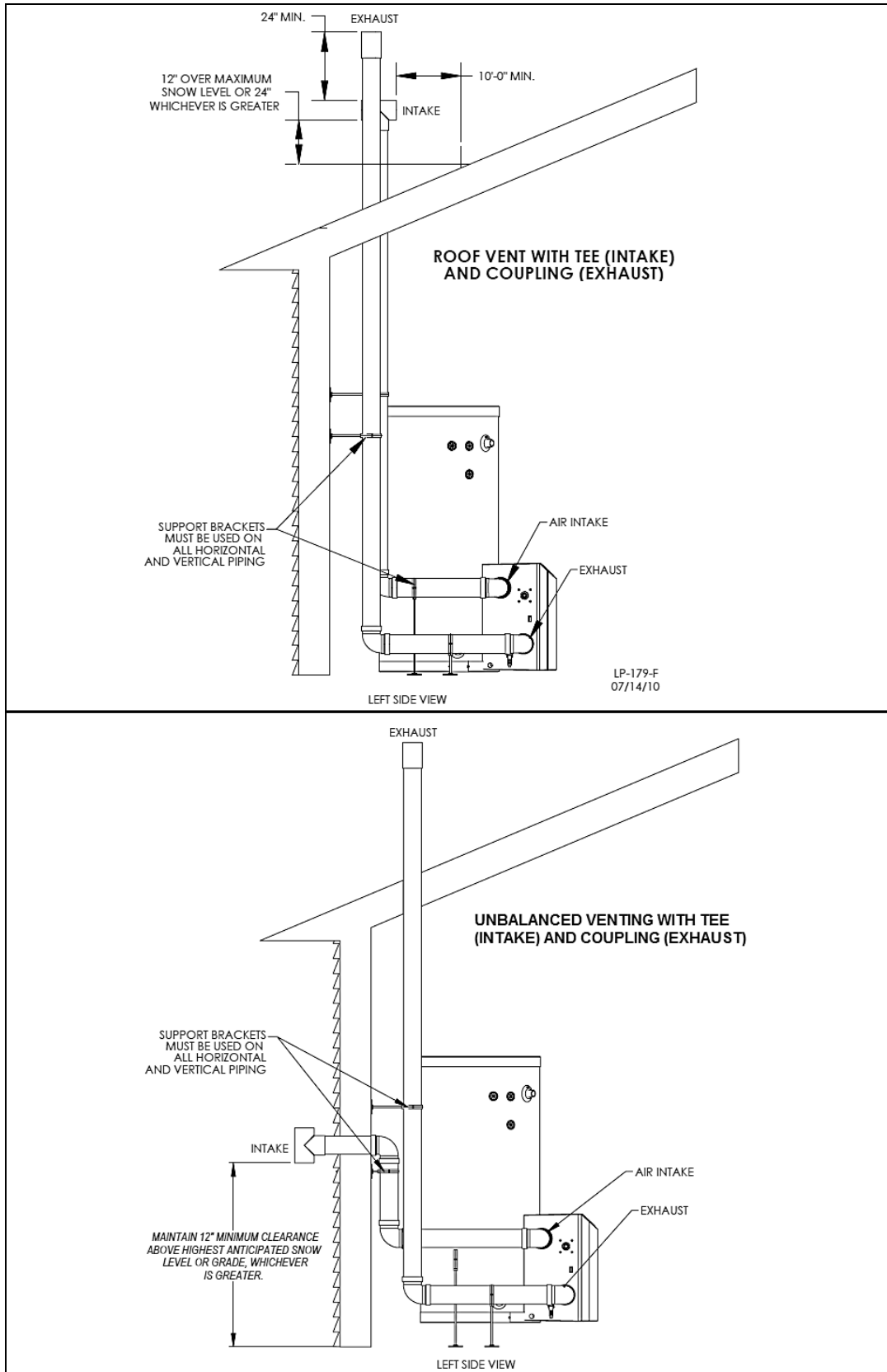


Figure 18 – LP-179-F - NOTE: This drawing is meant to demonstrate system venting only. The installer is responsible for all equipment and detailing required by local codes.

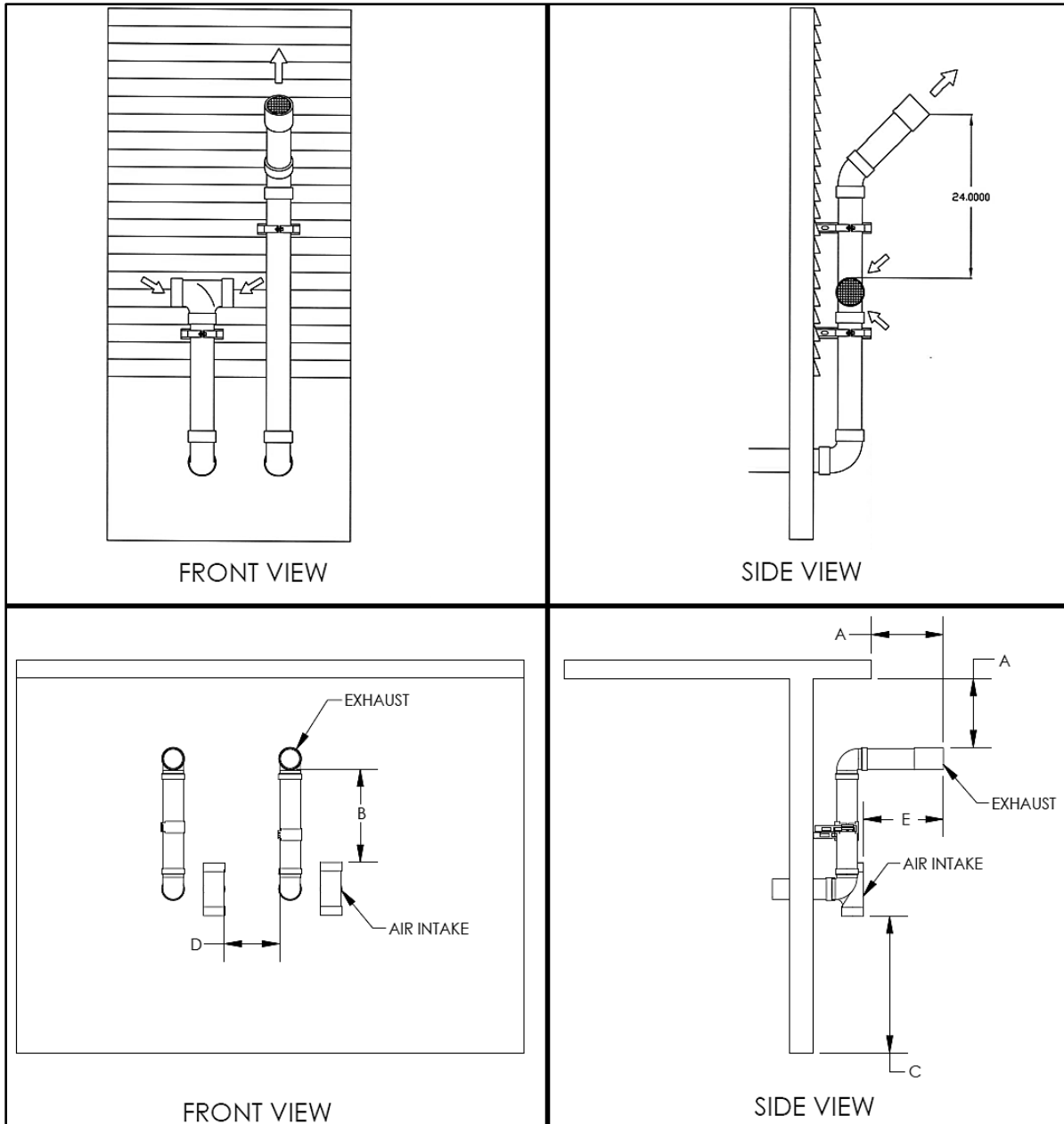


Figure 19 – Horizontal Venting - NOTE: Drawing is meant to demonstrate system venting ONLY.

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.

⚠ WARNING

All vent pipes must be glued, properly supported, and the exhaust must be pitched a minimum of $\frac{1}{4}$ " per foot back to the heater 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 at 4 foot intervals on the vent pipe. Boiler venting must be readily accessible for visual inspection for the first three feet from the boiler.

2. INDOOR COMBUSTION AIR INSTALLATION IN CONFINED OR UNCONFINED SPACE

This heater 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 1 – Contaminant Table on page 12.**

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 20) 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.

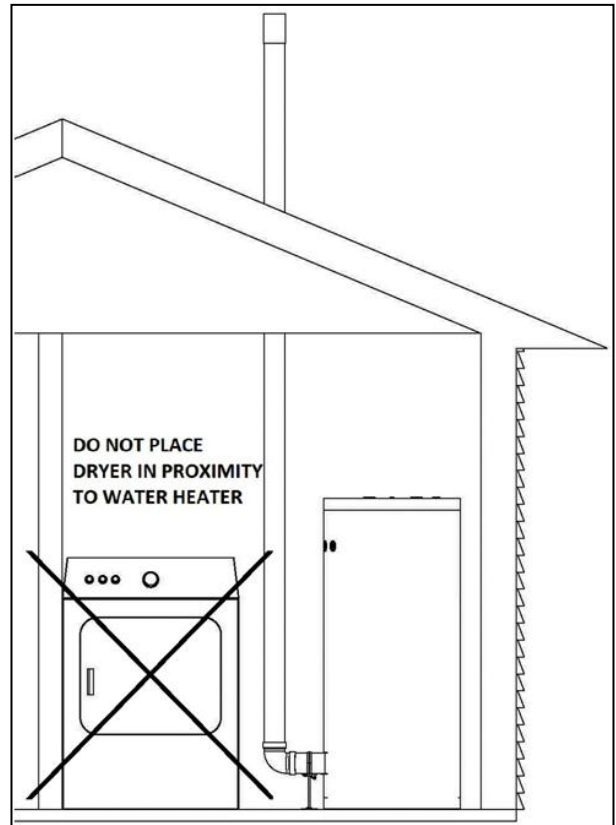


Figure 20 – LP-325-X

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 21.

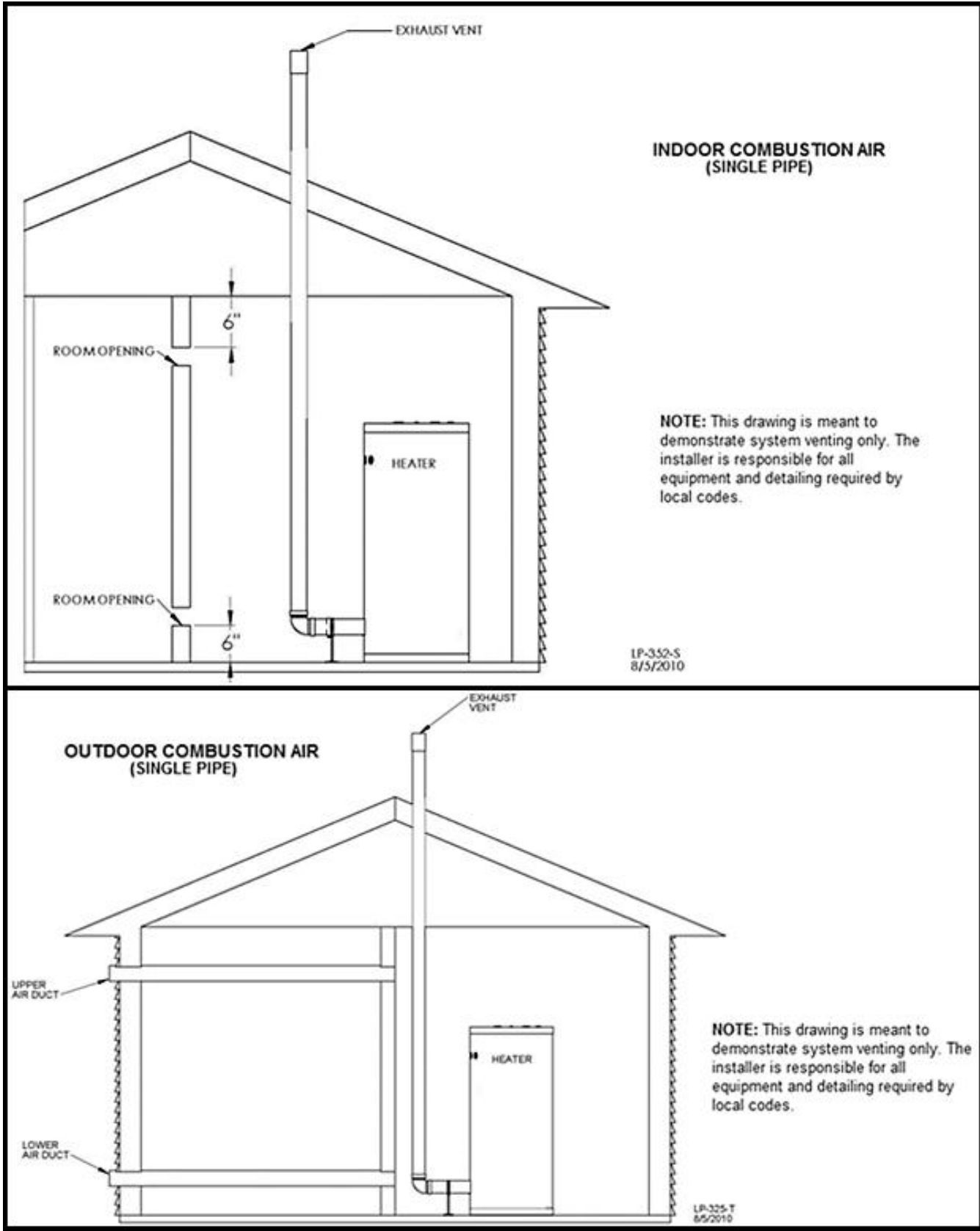


Figure 21

H. CONDENSATE REMOVAL SYSTEM

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

If the heater 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 water heater tee, resulting in potential water damage to property.

When installing a condensate pump, select one approved for use with condensing heaters and furnaces. The condensate pump should have an overflow switch to prevent property damage from spillage.

Condensate from the heater will be slightly acidic (pH from 3.2 to 4.5). Install a neutralizing filter if required by local codes.

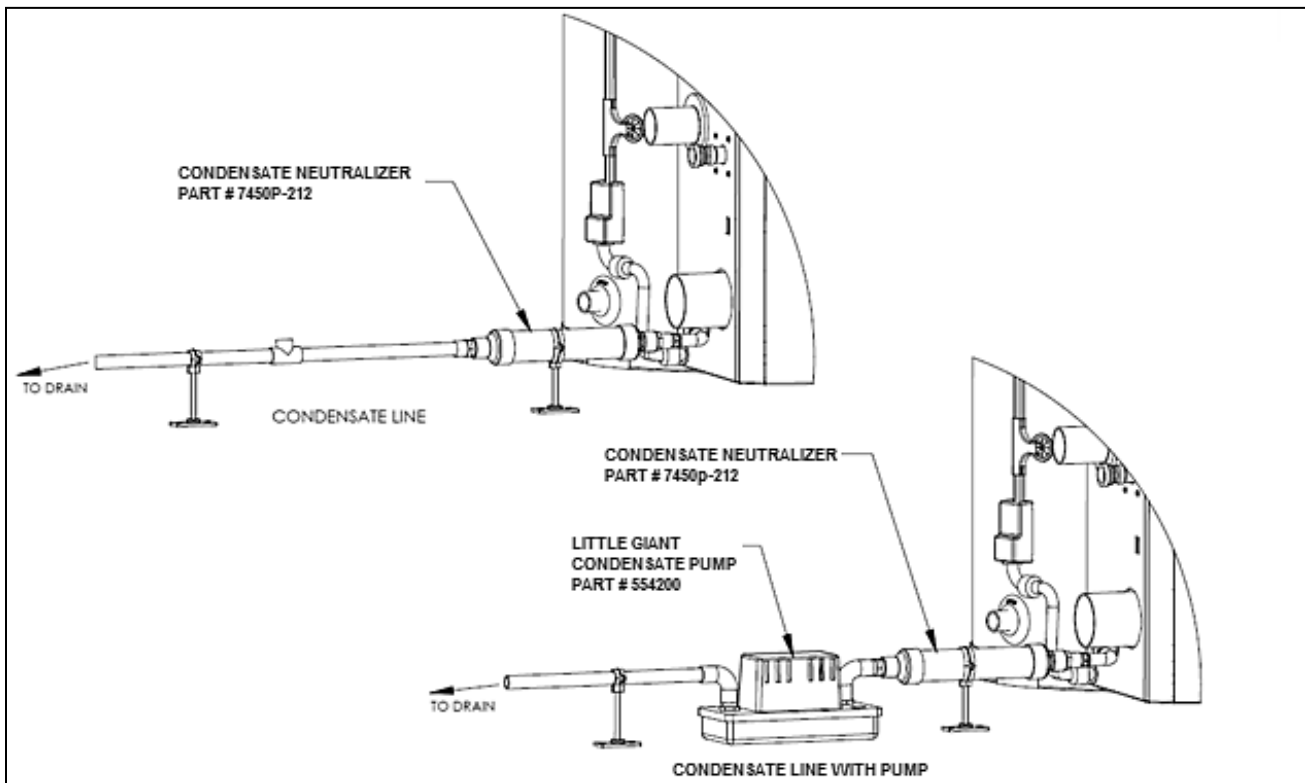


Figure 22 – LP-179-K

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. Plastic pipe should be the only material used for condensate line. Steel, brass, copper, and other metals will be subject to corrosion or deterioration.
3. It is also very important that the condensate line is not exposed to freezing temperatures or any type of blockage.
4. Support of the condensate line may be necessary to avoid blockage of the condensate flow.

PART 9 – START-UP PROCEDURE

FOR YOUR OWN SAFETY READ BEFORE OPERATING

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

WHAT TO DO IF YOU SMELL GAS

- Do not try to light any appliance.
- Do not touch any electric switch; do not use any phone in your building.
- Immediately call your gas supplier from a neighbor's phone. Follow the gas suppliers' instructions.
- If you cannot reach your gas supplier, call the fire department.

3. Turn on gas shutoff valve (located inside of the down near burner) so that the handle is aligned with the gas pipe. 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.
4. Do not use this appliance if any part has been under water. Immediately call a qualified service technician to inspect the appliance and to replace any part of the control system and any gas control which has been under water.
5. The heater 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.)

A. OPERATING INSTRUCTIONS

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

1. Turn on all electric power to appliance. Make sure tank is full with cold water and purge all piping. To assure adequate purging, open all hot water faucets.
2. Adjust the temperature set point of the heater to the desired level. The factory default setting is 119°F. If changes are necessary, follow "Overall Appliance and Control Operation" in this section.
3. If the appliance fails to start, refer to the Troubleshooting section in the back of this manual.

B. OVERALL APPLIANCE AND CONTROL OPERATION

To adjust the temperature of stored water, press and hold **[S3]** for 2 seconds. The first item is: **DU**: Water Temperature Set Point – factory set at 119°F. Adjust down by pressing **[S1]** to a temperature as low as 95°F. Adjust up as high as 160°F by pressing the **[S2]**. Press **[S3]** again to display **DH**, the differential which is factory set at 7°F and adjustable down to 1°F by pressing **[S1]** and up to 18°F by pressing **[S2]**. Note: Due to the highly advanced control on this appliance, which compensates for varying inlet water temperature, the actual differential temperature may vary slightly from your setting. Press **[S3]** again to display the factory default temperature measurement in Fahrenheit. Change the default to Celsius by pressing **[S1]**. When finished, press **[S3]** one final time to place unit back into operation. The control automatically re-starts if no key is pressed for 2 minutes.

C. STATUS MENU

Installers are also able to check the current status of the heater parameters by pressing **[S4]** for 3 seconds. Once activated, the display will show **[d1]** alternating value of the actual upper supply tank temperature. Actual values

are displayed for each function. To view the next value, simply press **[S/4]** to go to the next displayed value. Listed below are the values which can be displayed. These values cannot be changed. To exit this menu, press **[S3]** to resume normal operation.

Function	Value
----------	-------

d1	— Actual temperature from upper tank sensor
----	---

d2	— Actual temperature from lower sensor
----	--

d3	— [0] (Not used)
----	-------------------------

d4	— [303] (Not used)
----	---------------------------

d5	— Outdoor sensor
----	------------------

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	— [0] (Not used)
----	-------------------------

d9	— [1] (Not used)
----	-------------------------

d10	— Actual status of bus communication [co] = connected, [nc] = not connected
-----	---

d11	— [32] (Not used)
-----	--------------------------

d12	— Power on hours in thousands (display will not read until 100 hrs.)
-----	--

d13	— Total water heating hours in thousands (display will not read until 100 hrs.)
-----	---

d14	— [0] (Not used)
-----	-------------------------

d15	— Passed ignition attempts in thousands
-----	---

D. OUTDOOR RESET

This unit is supplied with outdoor reset wire connection terminals. **When an outdoor sensor (p/n 7250P-319) is connected, operation of the unit immediately changes.** Refer to the following steps to properly set up the unit with an outdoor sensor.

⚠ DANGER

An ASSE 1017 thermostatic mixing valve **MUST** be installed when using outdoor reset. Failure to do so could result in substantial property damage, serious injury, or death.

1. Connect the outdoor sensor to the terminals marked “outdoor”.
2. Press and hold **[S3]**. You will see a flashing **du** and a temperature value. Set **du** to the maximum desired tank temperature (default 119°F). After you set the temperature; press **[S3]** until you exit the menu.
3. Setting the outdoor reset curve (change only the functions in the descriptions below):
 - a. Press and hold **[S3]** and **[S4]** together for 5 seconds
 - b. Use **[S1]** and **[S2]** to adjust flashing **[000]** to code **[975]**. Press **[S3]** until you enter the menu.

- c. Use **[S3]** to scroll to Function 8 to adjust minimum outdoor temperature. Use **[S1]** and **[S2]** to adjust temperature to desired setting (Range: -49°F – 32°F / Default 5°F).
- d. Use **[S3]** to scroll to Function 9 to adjust maximum supply temperature. Use **[S1]** and **[S2]** to adjust temperature to desired setting (Range: 77°F – 160°F / Default 119°F). It is recommended that the **du** setting matches Function 9.
- e. Use **[S3]** to scroll to Function 10 to adjust maximum outdoor temperature. Use **[S1]** and **[S2]** to adjust temperature to desired setting (Range: 32°F – 95°F / Default 68°F).
- f. Use **[S3]** to scroll to Function 11 to adjust minimum supply temperature. From the appliance, use **[S1]** and **[S2]** to adjust temperature to desired setting. It is recommended that this temperature is set to the minimum desired DHW temperature (Range: 32°F – 160°F / Default 120°F).
- g. Use **[S3]** to scroll to Function 12 to adjust desired DHW temperature (minimum tank temperature). Use **[S1]** and **[S2]** to adjust temperature to desired setting. It is recommended that this is the same temperature set in Function 11 (Range: 32°F – 160°F / Default 120°F).
- h. Press and hold **[S4]** to exit the menu.

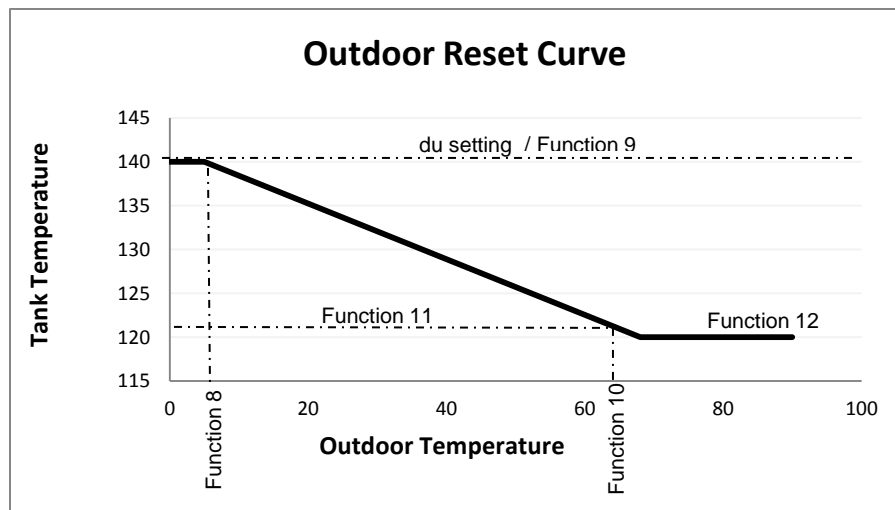
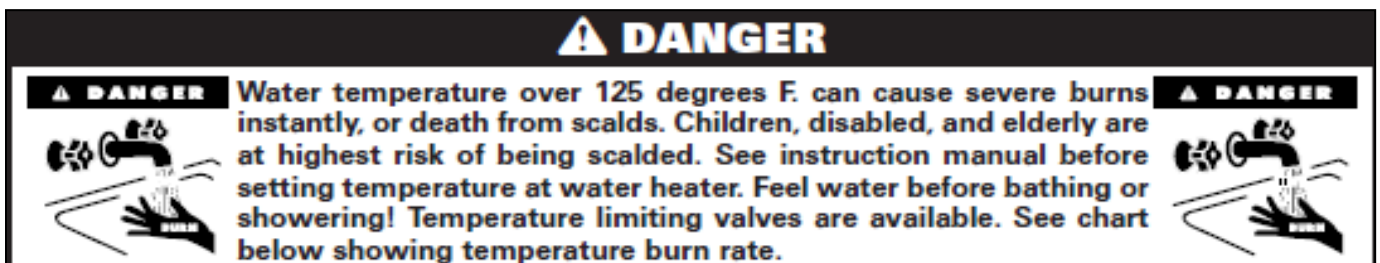


Figure 23 - NOTE: The maximum tank temperature is 160°F , independent of all settings described above.



E. TEST MODE

This function is intended to simplify the gas valve adjustment if needed. Listed below are the recommended limits on each heater and the combustion settings. Automatic modulation does not take place when the controller is in Test mode, only temperature limitation based on the heater set point. The user will be allowed to increase or decrease the fan speed by pressing in either the **[S1]** or **[S2]** keys.

To activate the Test Mode simply press the **[S2]** and **[S3]** key together for 1 second. Once activated, you will see in the display **[Ser]** and the actual fan speed. The measurement of the combustion levels should always be taken at the highest and lowest fan speed. When in Test Mode, the heater's limit will shut down the burner if temperature limit is exceeded. It is recommended to draw water out of the tank to lower temperature so tests can be performed.

After 10 minutes, Test Mode stops automatically. To exit Test Mode manually, press **[S1]** and **[S2]** key together for 1 second.

COMBUSTION SETTINGS				
HIGH FIRING RATES and LOW FIRING RATES ON ALL MODELS				
	NATURAL GAS		PROPANE LP	
	Low	High	Low	High
Carbon Monoxide (CO%)	0 – 10 ppm	0 – 20 ppm	0 – 10 ppm	0 – 20 ppm
Carbon Dioxide (CO₂%)	9 – 10.5%	9 – 10.5%	9.5 – 11%	9.5 – 11%

Table 10

FAN SPEEDS			
BTU	IGNITION	MIN	MAX
100,000	3000	2000	5800
130,000	3000	2000	7500
160,000	3000	2000	7800
199,000	3000	2000	9100

Table 11

F. MAINTENANCE

The control system requires no 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. In dirty environments, such as construction sites, care must be taken to keep the appliance burner cover in place and drywall or saw dust away from appliance.

CAUTION

In unusually dirty or dusty conditions, care must be taken to keep appliance burner door in place. **Failure to do so VOIDS WARRANTY!**

G. INTERNAL WIRING

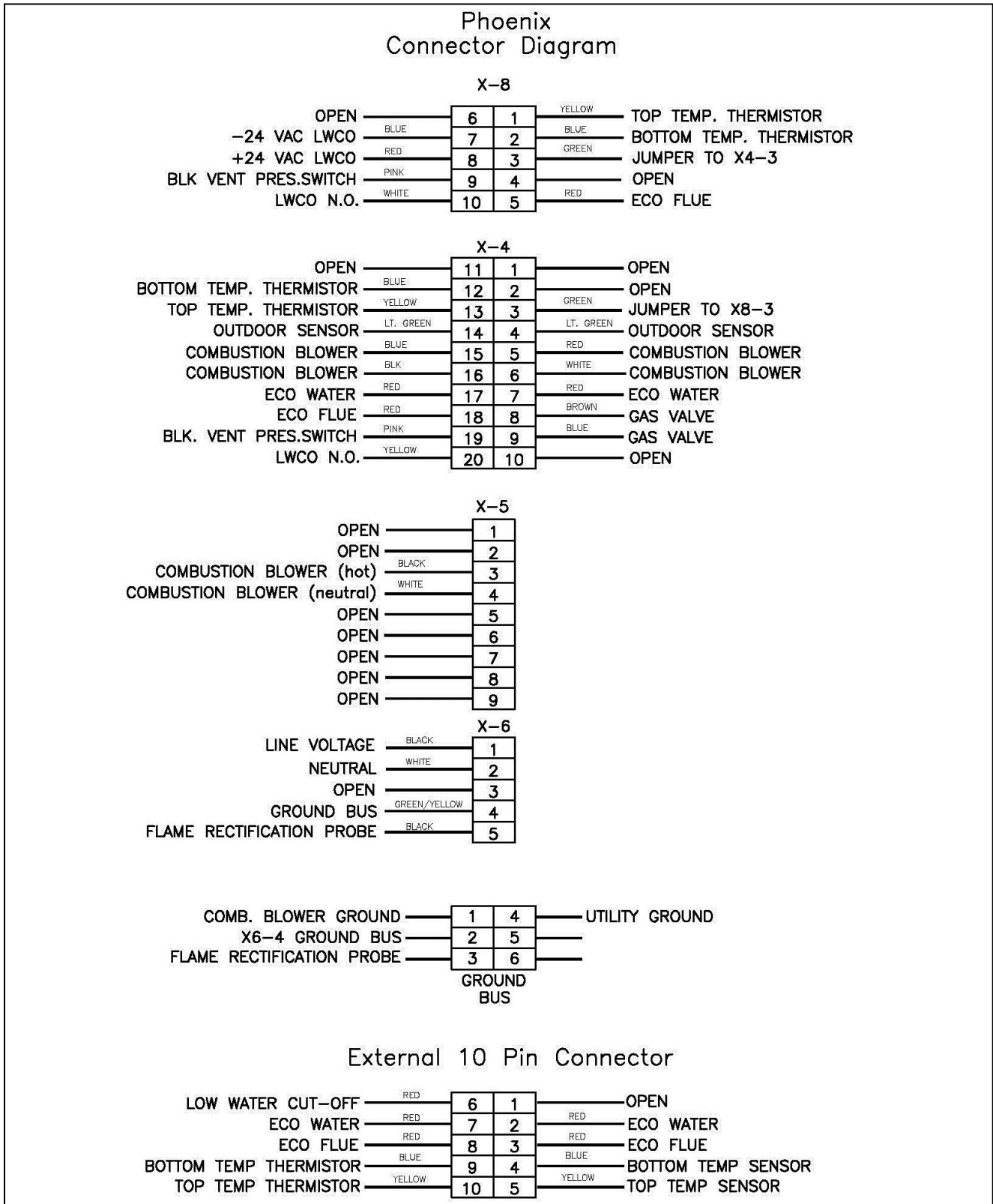


Figure 24 – LP-179-L

PART 10 – 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.

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 trails, 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.

If the burner does not light after the third ignition trial, the control will enter a lockout state. This lockout state indicates that a problem exists with the appliance, the controls, or the gas supply. Under such circumstances, a qualified service technician should be contacted immediately to properly service the appliance and correct the problem. If a technician is not available, depressing the **[S4]** button once will remove the lockout state so additional trials for ignition can be performed. The unit will try to re-light once every 6 minutes.

PART 11 – TROUBLESHOOTING

A. ERROR CODE

An error code may occur during installation of the heater. This condition may lead to a lock out condition of the controller, which will need to be manually reset by pressing the **[S4]** button. These following will help the installer correct the problem before going into a lock out condition, which will require a manual reset.

B. HEATER ERROR

- When an error condition occurs the controller will display an error code on the display module.
- These error codes and several suggested corrective actions are included in Table 13.
- In the case of **[E00]**, **[E13]**, and **[E14]** this error, if uncorrected, will go into a fault condition as described in Paragraph C.

RESISTANCE TABLE FOR SUPPLY TEMPERATURE SENSOR	
HIGH/LOW TEMP. SENSOR TEMP. (°F)	RESISTANCE (ohms)
32	32550
41	25340
50	19870
59	15700
68	12490
77	10000
86	8059
95	6535
104	5330
113	4372
122	3605
131	2989
140	2490
149	2084
158	1753
167	1481
176	1256
185	1070
194	915
202	786
212	667

Table 12

C. LOCKOUT

1. When a fault condition occurs the controller will illuminate the red “fault” indication light and display a fault code in the format (Example: **F00**) on the display module.
2. Note the fault code and refer to Table 14 for an explanation of the fault code along with several suggestions for corrective actions.
3. Press the reset key 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 any components of this water heater be certain that:

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

⚠ DANGER

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

- There is no pressure in the heater. Pull the release on the relief valve to relieve pressure in the heater.
- Heater water is not hot.
- The electrical power is off.

⚠ WARNING

Do not use this appliance if any part has been under water. Improper or dangerous operation may result. Contact a qualified service technician immediately to inspect the heater and repair or replace any part that has been under water.

⚠ 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.

926 CONTROL BOARD ERROR CODES			
CODE	DESCRIPTION	DURATION	CORRECTIVE ACTION
E13	Heater combustion air fan speed less than 70% of expected.	60 Sec.	1. Check the combustion air fan wiring. 2. Replace the combustion air fan. 3. Replace the control board.
E14	Heater combustion air fan speed is more than 130% of expected.	60 Sec.	1. Check the combustion air fan wiring. 2. Replace the combustion air fan. 3. Replace the control board.
LEO	Water Level in Tank is Low	Until Corrected	1. Be sure all air is bled from system. 2. Inspect low level switch and wiring for damage and repair if necessary.
FLU	Blocked Vent, Pressure Switch open, Condensate cup Full, Condensate Cup not present	Until Corrected	1. Check the flue vent to be sure it is not blocked or damaged. 2. Check the blocked vent pressure switch operation by applying a jumper. (If the switch is not functioning properly, replace it.

LOU	24 Volt Low	Until Corrected	<ol style="list-style-type: none"> 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 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, 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 boiler 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 heater 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.
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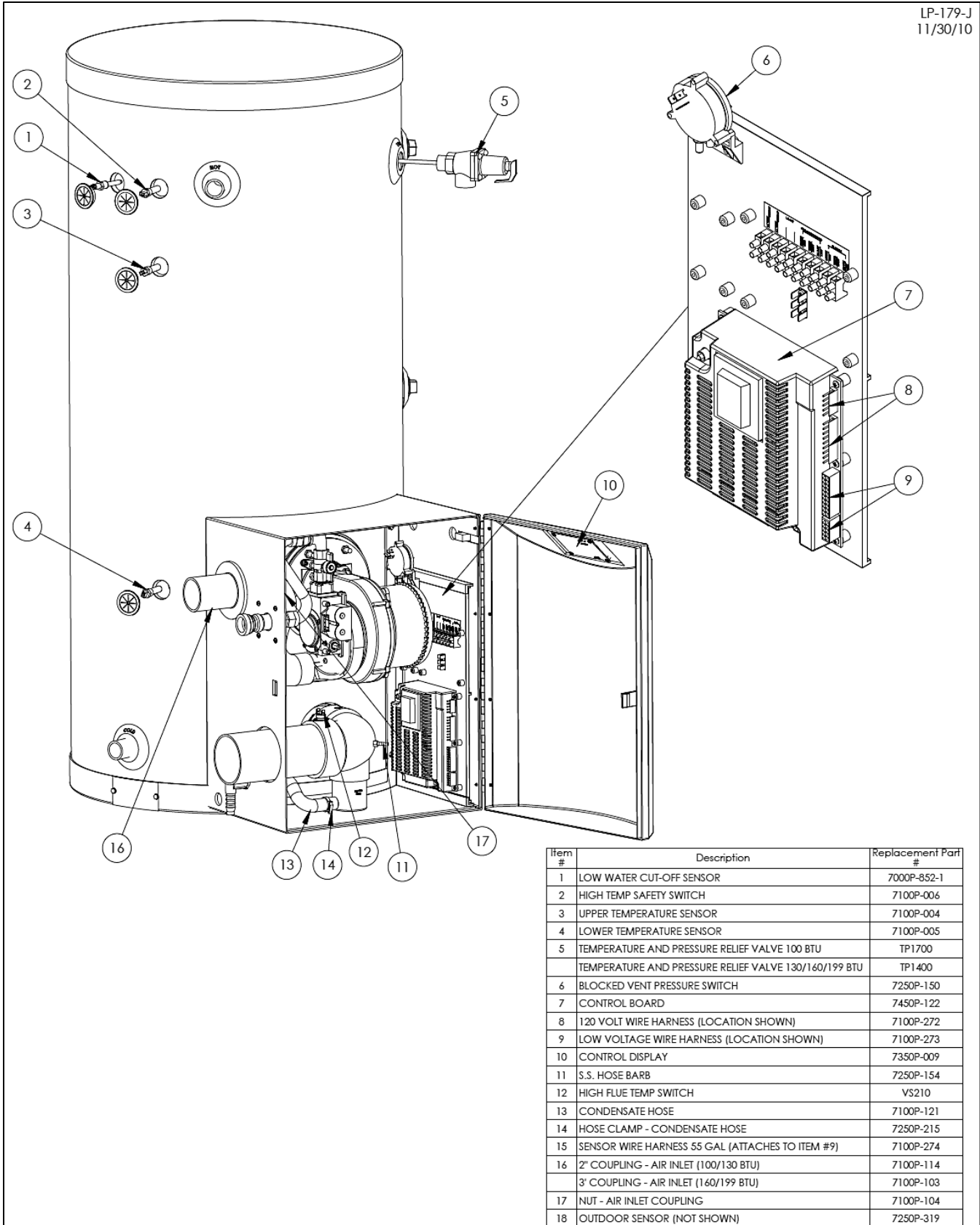
Table 13 – Control Board Error Codes

926 CONTROL BOARD FAULT		
CODE	DESCRIPTION	REMEDY
F00	High temperature switch limit exceeded 194°F.	<ol style="list-style-type: none"> 1. Try reset. If F00 repeats, create a demand for hot water. (DANGER: Use caution to prevent burn 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 did reset successfully, let the heater run and go into the status menu to check the upper and lower temperature sensor. If either reading displayed 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.
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, not damaged 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 heater is connected to a water supply and full of water. 4. Push the RESET button on the heater control panel. The appliance should light. If the appliance lights, proceed to step 5. If the appliance does not light and the display again begins to flash 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 an exhaust analyzer into the flue system within 6 feet of the heater. 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 heater 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 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 temperature sensor.	
F05	Upper temperature sensor exceeds 194°F.	<ol style="list-style-type: none"> 1. If water in tank is not greater than 194°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 temperature sensor exceeds 194°F.	
F09	No flame detected – Heater 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 heater. 5. If there is a flame, check the flame sensor. 6. Check any flue blockage or condensate blocks.
F10	Loss of flame signal – The heater 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 heater 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 heater 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 heater 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.

Table 14 - NOTE: If you replace a part to remedy a fault, it is recommended that you cycle the unit at least three or four times to assure the fault has been resolved.

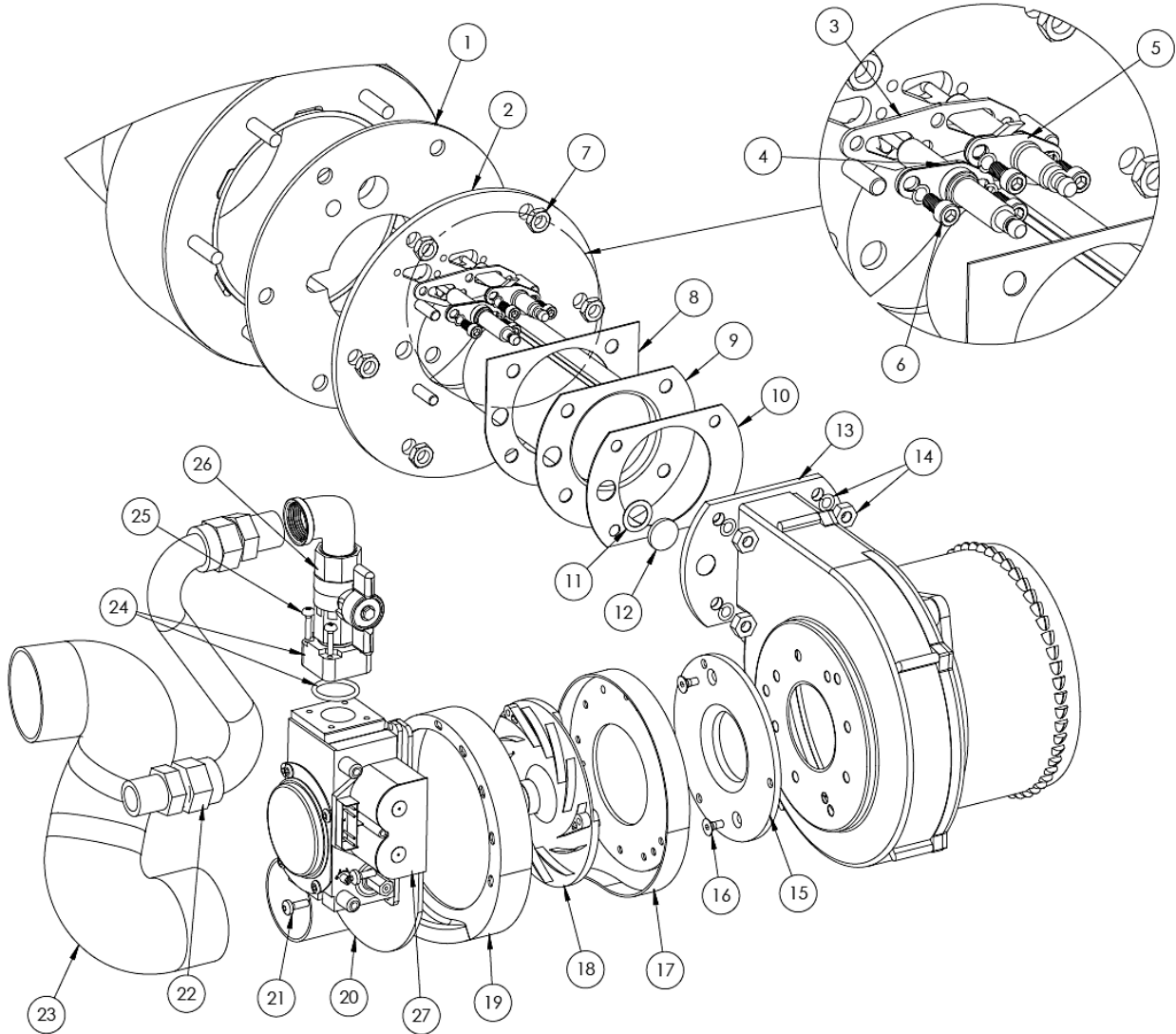
LP-179-J
11/30/10



Item #	Description	Replacement Part #
1	LOW WATER CUT-OFF SENSOR	7000P-852-1
2	HIGH TEMP SAFETY SWITCH	7100P-006
3	UPPER TEMPERATURE SENSOR	7100P-004
4	LOWER TEMPERATURE SENSOR	7100P-005
5	TEMPERATURE AND PRESSURE RELIEF VALVE 100 BTU	TP1700
	TEMPERATURE AND PRESSURE RELIEF VALVE 130/160/199 BTU	TP1400
6	BLOCKED VENT PRESSURE SWITCH	7250P-150
7	CONTROL BOARD	7450P-122
8	120 VOLT WIRE HARNESS (LOCATION SHOWN)	7100P-272
9	LOW VOLTAGE WIRE HARNESS (LOCATION SHOWN)	7100P-273
10	CONTROL DISPLAY	7350P-009
11	S.S. HOSE BARB	7250P-154
12	HIGH FLUE TEMP SWITCH	VS210
13	CONDENSATE HOSE	7100P-121
14	HOSE CLAMP - CONDENSATE HOSE	7250P-215
15	SENSOR WIRE HARNESS 55 GAL (ATTACHES TO ITEM #9)	7100P-274
16	2" COUPLING - AIR INLET (100/130 BTU)	7100P-114
	3" COUPLING - AIR INLET (160/199 BTU)	7100P-103
17	NUT - AIR INLET COUPLING	7100P-104
18	OUTDOOR SENSOR (NOT SHOWN)	7250P-319

Figure 25 – LP-179-J

LP-179-H
02/16/12



Item #	Description	Replacement Part #
1	GASKET - MOUNTING PLATE	7100P-139
2	MOUNTING PLATE	7100P-007
3	GASKET - PROBES	7100P-155
4	FLAME RECTIFICATION PROBE (w/GASKET)	7100P-082
5	IGNITOR ELECTRODE (w/GASKET)	7100P-094
6	10-32 X 3/8 SCREWS/#10 LOCK WASHERS	N/A
7	NUTS - 5/16-18	N/A
8	GASKET - BURNER MOUNTING FLANGE	7100P-152
9	BURNER - 100-130K BTU	7100P-316
	BURNER - 160-199K BTU	7100P-317
10	GASKET - BURNER OUTLET	7000P-361
11	GASKET - SIGHT GLASS	7100P-105
12	SIGHT GLASS	G2000
13	COMBUSTION BLOWER (w/GASKET, SIGHT GLASS)	7100P-015
	COMBUSTION BLOWER (w/GASKET, SIGHT GLASS) 199K BTU ONLY	7100P-350
14	1/4-20 BRASS NUTS/1/4 LOCK WASHERS	7100P-268

Item #	Description	Replacement Part #
15	ADAPTER PLATE	7250P-644
16	FLAT HEAD SCREW - ADAPTER PLATE	7100P-045
17	AIR INTAKE ADAPTER - BLOWER SIDE	7500P-185
18	SWIRL PLATE - BLACK (100/130 BTU)	7100P-042
	SWIRL PLATE - WHITE (160/199 BTU)	7500P-092
19	AIR INTAKE ADAPTER - VALVE SIDE	7500P-184
20	GAS VALVE (100/130 BTU)	7000P-862
	GAS VALVE (160/199 BTU)	7000P-863
21	SCREWS - GAS VALVE	7100P-046
22	1/2" FLARE X 1/2" NPT FLEX HOSE	7100P-140
23	TUBE - AIR INLET	7500P-189
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	24VAC GAS VALVE COIL ONLY - GREY	7350P-624

Figure 26 – LP-179-H

PART 12: MAINTENANCE

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

INSPECTION ACTIVITIES		DATE LAST COMPLETED			
		1 st YEAR	2 nd YEAR	3 rd YEAR	4 th YEAR*
PIPING					
Near heater piping	Check heater and system piping for any sign of leakage; make sure they are properly supported.				
Vent	Check condition of all vent pipes and joints.				
Gas	Check Gas piping, test for leaks and signs of aging. Make sure all pipes are properly supported.				
SYSTEM					
Visual	Do a full visual inspection of all system components.				
Functional	Test all functions of the system (Heat, Safeties)				
Temperatures	Verify safe settings on heater or Anti-Scald Valve				
Temperatures	Verify programmed temperature settings				
ELECTRICAL					
Connections	Check wire connections. Make sure they 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					
Combustion Chamber	Check burner tube and combustion chamber coils. Clean according to maintenance section of manual. Vacuum combustion chamber.				
Spark Electrode	Clean. Set gap at 1/4".				
Flame Probe	Clean. Check ionization in uA (d7 on status menu in Start-up Procedures). Record high fire and low fire.				
CONDENSATE					
Neutralizer	Check condensate neutralizer. Replace if necessary.				
Condensate hose	Disconnect condensate hose. Clean out dirt. Fill with water to level of outlet and re-install. (NOTE: Verify the flow of condensate, making sure that the hose is properly connected during final inspection.)				
GAS					
Pressure	Measure incoming gas pressure (3.5" to 14" W.C.)				
Pressure Drop	Measure drop in pressure on light off (no more than 1" W.C.)				
Check gas pipe for leaks	Check piping for leaks. Verify that all are properly supported.				
COMBUSTION					
CO/CO2 Levels	Check CO and CO2 levels in Exhaust (See Start-up Procedures for ranges). Record at high and low fire.				
SAFETIES					
ECO (Energy Cut Out)	Check continuity on Flue and Water ECO. Replace if corroded.				
Upper/Lower Sensors	Check wiring. Verify through ohms reading.				
FINAL INSPECTION					
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 15 - *Continue annual maintenance beyond the 4th year as required.

ADDITIONAL INSTALLATION REQUIREMENTS FOR THE COMMONWEALTH OF MASSACHUSETTS

In the Commonwealth of Massachusetts, the installer or service agent shall be a plumber or gas fitter licensed by the Commonwealth.

When installed in the Commonwealth of Massachusetts or where applicable state codes may apply; the unit shall be installed with a CO detector per the requirements listed below.

5.08: Modifications to NFPA-54, Chapter 10

(1) Revise NFPA-54 section 10.5.4.2 by adding a second exception as follows:

Existing chimneys shall be permitted to have their use continued when a gas conversion burner is installed, and shall be equipped with a manually reset device that will automatically shut off the gas to the burner in the event of a sustained back-draft.

(2) Revise 10.8.3 by adding the following additional requirements:

(a) For all side wall horizontally vented gas fueled equipment installed in every dwelling, building or structure used in whole or in part for residential purposes, including those owned or operated by the Commonwealth and where the side wall exhaust vent termination is less than seven (7) feet above finished grade in the area of the venting, including but not limited to decks and porches, the following requirements shall be satisfied:

1. INSTALLATION OF CARBON MONOXIDE DETECTORS. At the time of installation of the side wall horizontal vented gas fueled equipment, the installing plumber or gasfitter 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 equipment is to be installed. In addition, the installing plumber or gasfitter shall observe that a battery operated or hard wired carbon monoxide detector with an alarm is installed on each additional level of the dwelling, building or structure served by the side wall horizontal vented gas fueled equipment. 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 side wall horizontally vented gas fueled equipment is installed in a crawl space or an attic, the hard wired carbon monoxide detector with alarm and battery back-up may be installed on the next adjacent floor level.

b. In the event that the requirements of this subdivision 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.

2. APPROVED CARBON MONOXIDE DETECTORS. Each carbon monoxide detector as required in accordance with the above provisions shall comply with NFPA 720 and be ANSI/UL 2034 listed and IAS certified.

3. SIGNAGE. A metal or plastic identification plate shall be permanently mounted to the exterior of the building at a minimum height of eight (8) feet above grade directly in line with the exhaust vent terminal for the horizontally vented gas fueled heating appliance or equipment. The sign shall read, in print size no less than one-half (1/2) inch in size, "GAS VENT DIRECTLY BELOW, KEEP CLEAR OF ALL OBSTRUCTIONS".

4. INSPECTION. The state or local gas inspector of the side wall horizontally vented gas fueled equipment shall not approve the installation unless, upon inspection, the inspector observes carbon monoxide detectors and signage installed in accordance with the provisions of 248 CMR 5.08 (2)(a) 1 through 4.

(b) EXEMPTIONS: the following equipment is exempt from 248 CMR 5.08 (2)(a) 1 through 4:

1. The equipment listed in Chapter 10 entitled "Equipment Not Required to be Vented" in the most current edition of NFPA 54 as adopted by the Board; and
2. Product Approved side wall horizontally vented gas fueled equipment installed in a room or structure separate from the dwelling, building or structure used in whole or in part for residential purposes.

(c) MANUFACTURER REQUIREMENTS – GAS EQUIPMENT VENTING SYSTEM PROVIDED. When the manufacturer of Product Approved side wall horizontally vented gas equipment provides a venting system design or venting system components with the equipment, the instructions provided by the manufacturer for installation of the equipment and the venting system shall include:

1. Detailed instructions for the installation of the venting system design or the venting system components; and
2. A complete parts list for the venting system design or venting system.

(d) MANUFACTURER REQUIREMENTS – GAS EQUIPMENT VENTING SYSTEM NOT PROVIDED. When the manufacturer of a Product Approved side wall horizontally vented gas fueled equipment does not provide the parts for venting the flue gases, but identifies "special venting systems", the following requirements shall be satisfied by the manufacturer:

1. The referenced "special venting system" instructions shall be included with the appliance or equipment installation instructions; and
2. The "special venting systems" shall be Product Approved by the Board, and the instructions for that system shall include a parts list and detailed installation instructions.

(e) A copy of all installation instructions for all Product Approval side wall horizontally vented gas fueled equipment, all venting instructions, all parts lists for venting instructions, and/or all venting design instructions shall remain with the appliance or equipment at the completion of the installation.

HTP CUSTOMER INSTALLATION RECORD FORM

The following form should be completed by the installer 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:	
Installation Address:	
Date of Installation:	
Installer's Code/Name:	
Product Serial Number(s):	
Comments:	
Installer's Phone Number:	
Signed by Installer:	
Signed by Customer:	

IMPORTANT:

Customer: Please only sign after the installer has reviewed the installation, safety, proper operation and maintenance of the system. In the case that the system has any problems, please call the installer. If you are unable to make contact, please contact your HTP Sales Representative.

Distributor/Dealer: Please insert contact details.