



• *Installation* • *Operation* • *Maintenance*



HeatTransfer
Advanced Heating and
Hot Water Systems



⚠ 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 or use gasoline or other flammable vapors and liquids in the vicinity of this or any other appliance.

WHAT TO DO IF YOU SMELL GAS

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

CONTENTS

Part 1 – Product and Safety Information	3
Part 2 – How The Phoenix Operates	4-5
Part 3 – Prepare Water Heater Location	5-16
A. Installations Must Comply With:	
B. Before Locating the Phoenix	
C. Clearances for Service Access	
D. Residential Garage Installation	
E. Exhaust Vent and Intake Air Vent	
F. Prevent Combustion Air Contamination	
G. When Removing a Water Heater from an Existing Common Vent System	
H. Water Chemistry	
I. Temperature and Pressure Relief Valve	
J. Expansion Tank	
K. Piping	
L. Auxiliary Connection	
Part 4 – Prepare Water Heater	17-19
A. Electrical Connection	
B. Gas Connection	
C. Gas Piping	
D. Gas Table	
E. Dungs Gas Valve	
Part 5 – Venting Combustion Air And Condensate Removal	19-27
A. Installing Exhaust Vent and Intake Air Vent	
B. General	
C. Approved Materials for Exhaust Vent and Intake Air Vent	
D. Exhaust Vent and Intake Air Vent Pipe Location	
E. Exhaust Vent and Intake Air Vent Sizing	
F. Longer Vent Runs	
G. Exhaust Vent and Intake Air Pipe Installation	
H. Water Heater Removal from a Common Vent System	
I. Condensate Removal System	
J. Diagrams for Venting	
Part 6 – Start-up Procedure	28-31
A. Operating Instructions	
B. Overall Appliance and Control Operation	
C. Status Menu	
D. Test Mode	
E. Maintenance	
F. Internal Wiring	
Part 7 – Shutdown	32
A. Shutdown Procedure	
B. Vacation Procedure	
C. Failure to Operate	
Part 8 – Troubleshooting	32-42
A. Phoenix Error Code	
B. Phoenix Error	
C. Phoenix Fault	

PART 1: PRODUCT AND SAFETY INFORMATION

WARNING

Installer — Read all instructions in this manual, and the Venting section, 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.

User — Have this water heater serviced/inspected by a qualified service technician annually.

Failure to comply with the above could result in severe personal injury, death or substantial property damage.

WARNING

Failure to adhere to the guidelines on this page can result in severe personal injury, death or substantial property damage.

WARNING

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.

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 information concerning the product.

DEFINITIONS

DANGER

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

CAUTION

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

WARNING

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

CAUTION

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

PART 2: HOW THE PHOENIX OPERATES

Phoenix 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.

1. **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, the combustion gases heat the combustion chamber walls, transferring the heat directly into the surrounding water. The hot gases are blown into the secondary heat exchanger coils, where even more heat is transferred into the water, wringing even more heat from the gases.

2. **Modulating Combustion System**

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

3. **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.

4. **Upper Supply Tank Sensor**

This sensor monitors water heater upper portion water temperature (system supply). The control module adjusts the burner firing rate so the outlet temperature is correct.

5. **Lower Return Tank Sensor**

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

6. **Control**

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

7. **Burner**

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

8. **Condensate drain connection**

This is a condensing high efficiency appliance, therefore this unit has a condensate removal system. Condensate is nothing more than water vapor, derived from the combustion products, similar to an automobile when it is initially started. It is very important that the condensate line is sloped away from the water heater and down to a suitable inside drain. If the condensate outlet on the Phoenix is lower than the drain, you must use a condensate removal pump (kit p/n 554200 available from Heat Transfer Products, Inc.) A condensate neutralizer, if required by local authorities can be made up of lime crystals, marble or phosphate chips and will neutralize the condensate. This can be done in the field by the installer or you may purchase one from Heat Transfer Products, Inc. (P/N N1100). It is also very important that the condensate line is not exposed to freezing temperatures or any other type of blockage. Plastic tubing must be the only material used for the condensate line. Steel, brass, copper or others will be subject to corrosion or deterioration. A second vent may be necessary to prevent condensate line vacuum lock if a long horizontal run is used. Also, an increase in pipe size may be necessary to drain properly. Support of the condensation line may be necessary to avoid blockage of the condensate flow.

PART 2: HOW THE PHOENIX OPERATES (CONTINUED)

9. Spark ignition

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

THE PHOENIX SOLAR HOT WATER HEATER

The Phoenix Solar Hot Water Heater has an internal Solar Heat Exchanger for use with solar panels. The Phoenix Solar will transfer energy from the sun and will provide hot water through the gas fired back-up when there is not sufficient solar energy. (refer to solar piping details in this manual for suggested piping application.)

SOLAR PIPING CONNECTION

When making a connection to the heat exchangers, use Teflon tape and joint compound to prevent leaks. The connections to the heat exchanger are 1" NPT. Do not apply heat directly to heat exchanger thread connection when sweating fittings.

The freeze protection fluid must be rated as non-toxic if used to protect the system from freezing. Anti-freeze will turn acidic when exposed to prolonged high temperature.

Regular scheduled maintenance must be established to monitor and maintain the proper PH level of the heat transfer fluid in the system to protect the heat exchanger and other components of the system.

WARNING

Many heat transfer fluids are classified as toxic. Do not introduce heat transfer fluids into any fittings on the heater except those clearly marked for that purpose.

DANGER



Water temperature over 125 degrees 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.



PART 3: PREPARE WATER HEATER LOCATION

A. INSTALLATIONS MUST COMPLY WITH:

- Local, state, provincial, and national codes, laws, regulations and ordinances.
- National Fuel Gas Code, ANSI Z223.1 – latest edition.
- National Electrical Code.
- For Canada only: B149.1 or B149.2 Installation Code, CSA C22.1 Canadian Electrical Code Part 1 and any local codes.

NOTICE

The Phoenix gas manifold and controls met safe lighting and other performance criteria when undergoing tests specified in ANSI Z21.10.3 — latest edition.

PART 3: PREPARE WATER HEATER LOCATION (CONTINUED)

B. BEFORE LOCATING THE PHOENIX

1. Check for nearby connection to:
 - System water piping
 - Venting connections
 - Gas supply piping
 - Electrical power
2. Check area around water heater. Remove any combustible materials, gasoline and other flammable liquids.

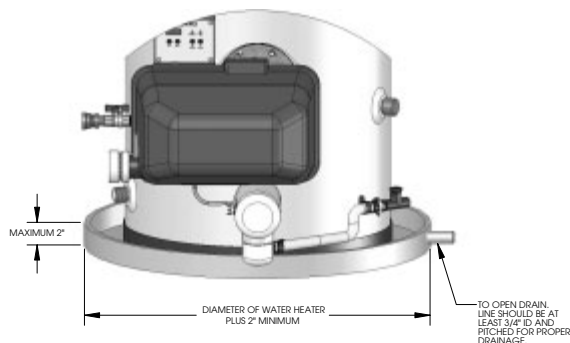
⚠ WARNING

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

3. The Phoenix gas control system components are protected from dripping or spraying water or rain during operation or service.
4. If the Phoenix Water Heater is to replace an existing water heater, check for and correct any *existing* system problems such as:
 - System leaks.
 - Incorrectly-sized expansion tank.

C. CLEARANCES FOR SERVICE ACCESS

1. If you do not provide minimum clearances, it might not be possible to service the water heater without removing it from the space. (See Fig. 3-1 at right)



LP-179-W
07/11/07

RECOMMENDED SERVICE CLEARANCE

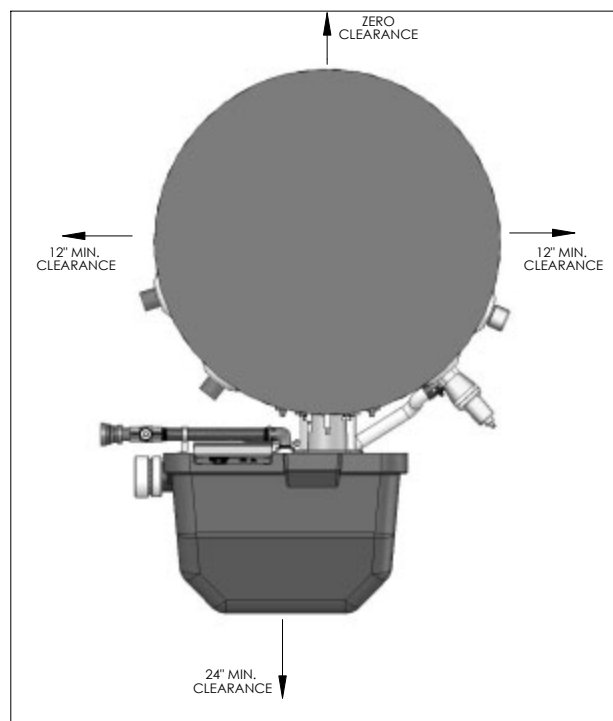


Fig. 3-1

Phoenix Top View

LP-179-T
03/22/07

⚠ WARNING

The space must be provided with combustion/ventilation air openings correctly sized for all other appliances located in the same space as the Phoenix. Failure to comply with the above warnings could result in severe personal injury, death or substantial property damage.

PART 3: PREPARE WATER HEATER LOCATION (CONTINUED)

D. RESIDENTIAL GARAGE INSTALLATION

Precautions

Take the following special precautions when installing the water heater in a residential garage. If the heater is located in a residential garage, per ANSI Z223.1, paragraph 5.1.9:

- Place the Phoenix with a minimum of 18 inches above the floor of the garage to the bottom of the heater to ensure the burner and ignition devices will be no less than 18 inches above the floor.
- Locate or protect the water heater so it cannot be damaged by a moving vehicle.

E. EXHAUST VENT AND INTAKE AIR VENT

The Phoenix requires a special vent system, designed for pressurized venting. Phoenix Water Heaters are rated ANSI Z21.10.3 Category IV (pressurized vent, likely to condense in the vent).

You must also install air intake piping from outside to the water heater flue adaptor. The resultant installation is categorized as direct vent (sealed combustion). **Note: To prevent combustion air contamination see Table 3-2 in this section for examples of areas to avoid when considering exhaust vent and intake air vent termination.**

Intake and exhaust must terminate near each other and may be vented vertically through the roof or through a side wall. The intake and exhaust venting methods are detailed in the Venting Section. Do not attempt to install the Phoenix Water Heater using any other venting means. Be sure to locate the Phoenix such that the air intake and exhaust vent piping can be routed through the building and properly terminated outdoors. The air intake and exhaust vent piping lengths, routing and termination method must all comply with the methods and limits given in the Venting section.

F. PREVENT COMBUSTION AIR CONTAMINATION

Install intake air piping for the Phoenix Water Heater as described in the Venting section. Do not terminate exhaust in locations that can allow contamination of intake air.

WARNING

You must pipe outside air to the water heater air intake. Ensure that the intake air will not contain any of the contaminants below. Contaminated air will damage the water heater, resulting in possible severe personal injury, death or substantial property damage. For example, do not pipe intake air vent near a swimming pool. Also avoid areas subject to exhaust fumes from laundry facilities. These areas will always contain contaminants.

Table 3-2: Corrosive contaminants and sources

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 acid/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, detergents, and cleaning solvents found in household laundry rooms	Garages and workshops
Adhesives used to fasten building products and other similar products	

PART 3: PREPARE WATER HEATER LOCATION (CONTINUED)

DANGER

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

WARNING

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

G. WHEN REMOVING A WATER HEATER FROM AN EXISTING COMMON VENT SYSTEM

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

- a. Seal any unused openings in the common venting system.
- b. Visually inspect the venting system for proper size and horizontal pitch and determine there is no blockage or restriction, leakage, corrosion and other deficiencies which could cause an unsafe condition.
- c. Insofar as is practical, close all building doors and windows and all doors between the space in which the appliances remaining connected to the common venting system are located and other spaces of the building. Turn on clothes dryers and any appliance not connected to the common venting system. Turn on any exhaust fans, such as range hoods and bathroom exhausts, so they will operate at maximum speed. Do not operate a summer exhaust fan. Close fireplace dampers.
- d. Place in operation the appliance being inspected. Follow the lighting instructions. Adjust thermostat so appliance will operate continuously.
- e. Test for spillage after 5 minutes of main burner operation. Use the flame of a match or candle, or smoke from a cigarette, cigar, or pipe.
- f. After it has been determined that each appliance remaining connected to the common venting system properly vents when tested as outlined herein, return doors, windows, exhaust fans, fireplace dampers, and any other gas-burning appliance to their previous conditions of use.
- g. Any improper operation of common venting system should be corrected so the installation conforms with the National Fuel Gas Code, ANSI Z223.1 — latest edition. Correct by resizing to approach the minimum size as determined using the appropriate tables in Table 13 of NFPA54 ANSI Z223.1 2006 of that code. Canadian installations must comply with B149.1 or B149.2 Installation Code.

H. WATER CHEMISTRY

CAUTION

Chemical imbalance of your water can cause severe damage to your water heater and associated equipment and may also affect the efficiency. You may have to have your water quality professionally analyzed to determine whether you need to install a water softener. Failure of a heat exchanger due to lime scale build-up on the heating surface, low pH or other chemical imbalance is non-warrantable.

PART 3: PREPARE WATER HEATER LOCATION (CONTINUED)

1. Water Hardness

Water hardness is mainly due to the presence of calcium and magnesium salts dissolved in the water. The concentration of these salts is expressed in mg/L, ppm or grains per gallon, as a measure of relative hardness of water. 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 will precipitate out when the water is heated and will cause accelerated lime and scale accumulation on a heat transfer surface.

If the hardness of the water exceeds the maximum level of 25 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.

2. pH of Water

pH is a measure of relative acidity, neutrality or alkalinity. Dissolved minerals and gases affect water's 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 with a 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 non-warrantable. The ideal pH range for water used in a storage tank or a water heater system is 7.2 to 7.8.

3. Total Dissolved Solids

Total dissolved solids (TDS) is a measure of all minerals and solids that are dissolved in the water. The concentration of total dissolved solids is usually expressed in parts per million (ppm) as measured in a water sample. Water with a high TDS concentration will greatly accelerate lime and scale formation in the hot water system. Most high TDS concentrations will 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 that is damaged or blocked by lime/scale accumulation must be replaced. Failure of a water heater due to lime scale build up on the heating surface is non-warrantable. The manufacturer of the water heater has no control of the water quality, especially the 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.

CAUTION

Failure of a heat exchanger due to lime scale build-up on the heating surface, low pH or other chemical imbalance is non-warrantable.

PART 3: PREPARE WATER HEATER LOCATION (CONTINUED)

I. TEMPERATURE AND PRESSURE RELIEF VALVE

WARNING

Following installation of the T & P Relief Valve, the valve lever MUST be operated AT LEAST ONCE A YEAR by the water heater owner to ensure that waterways are clear. Certain naturally occurring mineral deposits may adhere to the valve, blocking waterways, rendering it inoperative. When the lever is operated, hot water will discharge if the waterways are clear. PRECAUTIONS MUST BE TAKEN TO AVOID PERSONAL INJURY FROM CONTACT WITH HOT WATER AND TO AVOID PROPERTY DAMAGE. BEFORE operating lever, check to see that a discharge line is connected to the valve, directing the flow of hot water from the valve to a proper place of disposal. If no water flows when the lever is operated, replacement of the valve is required. **TURN THE WATER HEATER "OFF" AND CALL A PLUMBER IMMEDIATELY.**

This device is designed for emergency safety relief and shall not be used as an operating control. A relief valve functions, in an emergency, by discharging water. Therefore, it is essential that a discharge line be piped from the valve in order to carry the overflow to a safe place of disposal. The discharge line must be same size as the valve outlet must pitch downward from the valve and terminate at least 6" above a drain where any discharge will be clearly visible.

A temperature and pressure relief valve is installed into the marked port (upper right). We recommend a WATTS 100XL-4 valve or equivalent for 100,000 BTU models, 40XL5 valve or equivalent for 130,000 BTU models or above input, meeting the requirements for relief valves for hot water heaters as per ANSI Z21.22B by a nationally recognized lab that maintains a periodic inspection of production of such listed safety device. The pressure rating of the valve must not exceed the listed working pressure of this appliance, and must be rated to the proper BTU/hr capacity of the water heater. Do not, under any circumstances, thread a cap or plug into the relief valve! Explosion, serious injury or death may result! Relief valve piping must be directed to the floor or to an open drain, but not connected directly. There must be a 6" space between the outlet of relief valve piping and drain or floor. Do not hook up to drain system directly without an air space. The relief valve must be periodically checked for proper operation.

J. POTABLE EXPANSION TANK

A potable hot water expansion tank is required to offset the water expansion as the water is heated. 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 back 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.

CAUTION

The expansion tank must be suitable for hot potable water.

PART 3: PREPARE WATER HEATER LOCATION (CONTINUED)

K. WATER PIPING

CAUTION

NEVER USE DIELECTRIC UNIONS OR GALVANIZED STEEL FITTINGS ON ANY DOMESTIC WATER CONNECTIONS OR AUXILIARY CONNECTIONS. USE ONLY COPPER OR BRASS FITTINGS. TEFLON 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 of the Phoenix are 1" on 55 gallon models. On the 80 and 119 gallon models, the inlet and outlet ports are 1 ½". On the cold inlet, (bottom left), 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 with pipe sealant compound, a 1" brass drain cock or equivalent. Into 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 servicing in the future. If there is a back flow preventer, or any type of a no return valve in the system, then you must install an additional tee here for a suitable potable hot water expansion tank. In the hot outlet, (top left), 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.

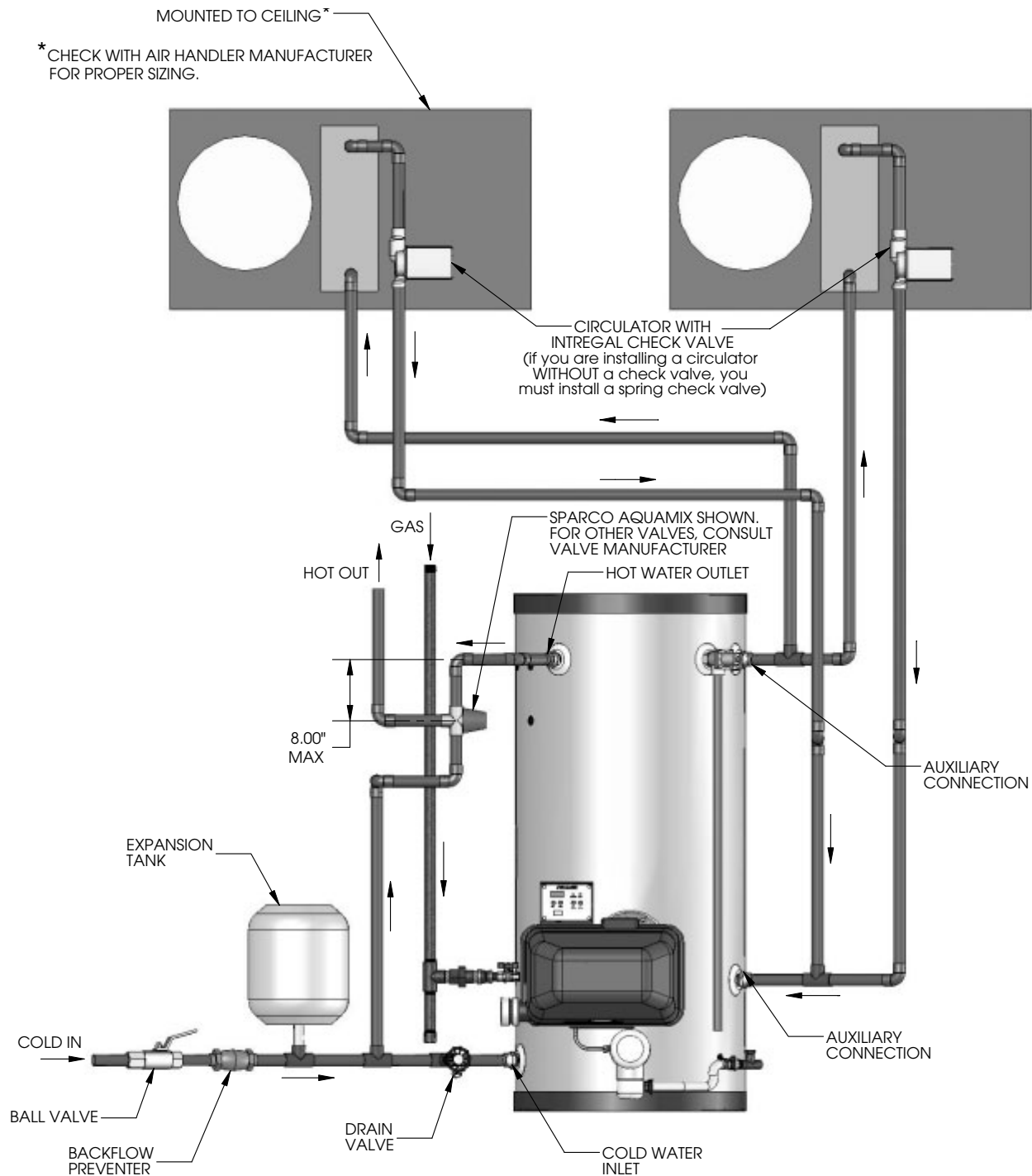
L. AUXILIARY CONNECTIONS

The auxiliary connections are additional connections for an 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. The auxiliary connections are 1" on all Phoenix Models. Never use dielectric unions or galvanized steel fittings. Use only copper or brass fittings. Teflon 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 death or serious injury.

PHOENIX WITH AIR HANDLERS ABOVE



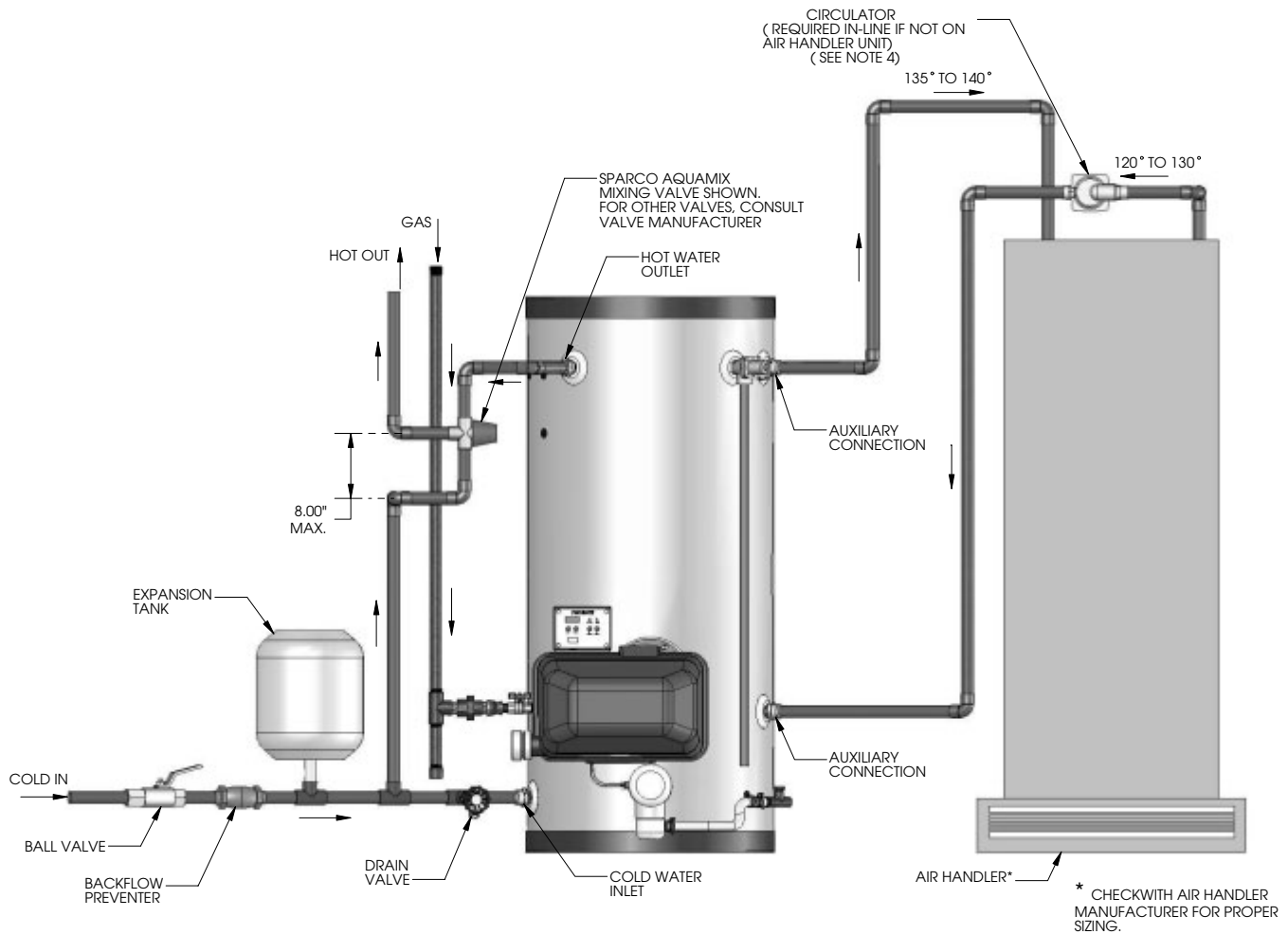
NOTES:

1. Minimum pipe size should match connection size on Phoenix. If you require greater flow, upsize the pipe accordingly.
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 of the Phoenix.
3. Gas line must be rated to the maximum input capacity of the unit. Unit must have 10 feet of pipe after gas regulator.
4. All circulators shall have an integral flow check.

LP-179-L
7/13/07

NOTE: This drawing is meant to show system piping only. The installer is responsible for all equipment and detailing required by local codes.

PHOENIX WITH AIR HANDLER ON SIDE



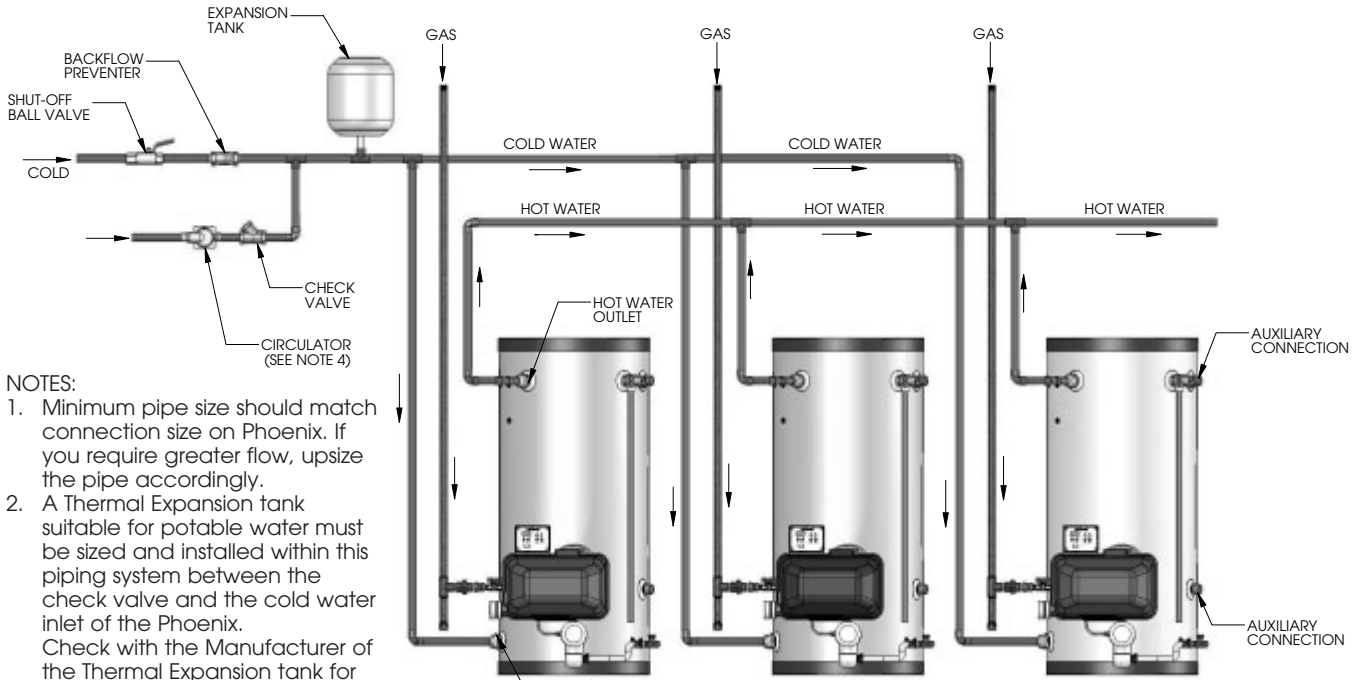
NOTES:

1. Minimum pipe size should match connection size on Phoenix. If you require greater flow, upsize the pipe accordingly.
2. A Thermal Expansion tank suitable for potable water must be sized and installed within this piping system between the check valve and the cold water inlet of the Phoenix.
3. Gas line must be rated to the maximum input capacity of the unit. Unit must have 10 feet of pipe after gas regulator.
4. All circulators shall have an integral flow check.

LP-179-M
4/13/07

NOTE: This drawing is meant to show system piping only. The installer is responsible for all equipment and detailing required by local codes.

REVERSE MANIFOLD AND PIPING DIAGRAM FOR PHOENIX



NOTES:

1. Minimum pipe size should match connection size on Phoenix. If you require greater flow, upsize the pipe accordingly.
2. A Thermal Expansion tank suitable for potable water must be sized and installed within this piping system between the check valve and the cold water inlet of the Phoenix. Check with the Manufacturer of the Thermal Expansion tank for proper sizing.
3. Gas Line must be rated to the maximum input capacity of the unit. Unit must have 10 feet of pipe after gas regulator.
4. All circulators shall have an integral flow check.

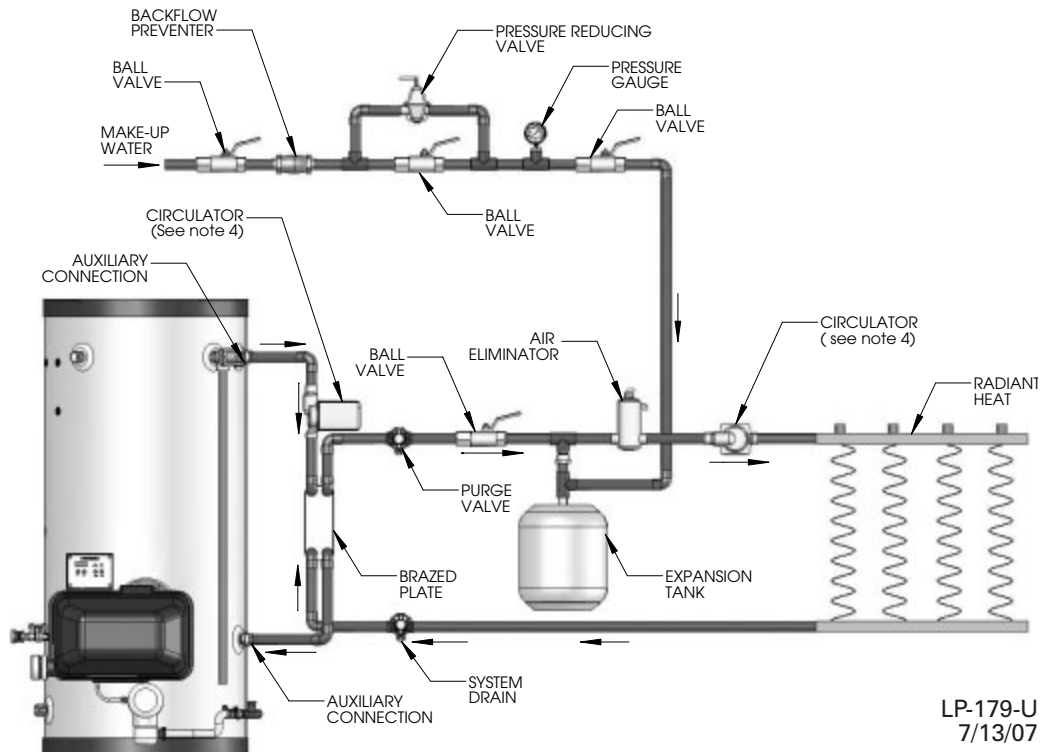
NOTE: This drawing is meant to show system piping only. The installer is responsible for all equipment and detailing required by local codes.

LP-179-N
7/16/07

CLOSED LOOP RADIANT HEATING

NOTES:

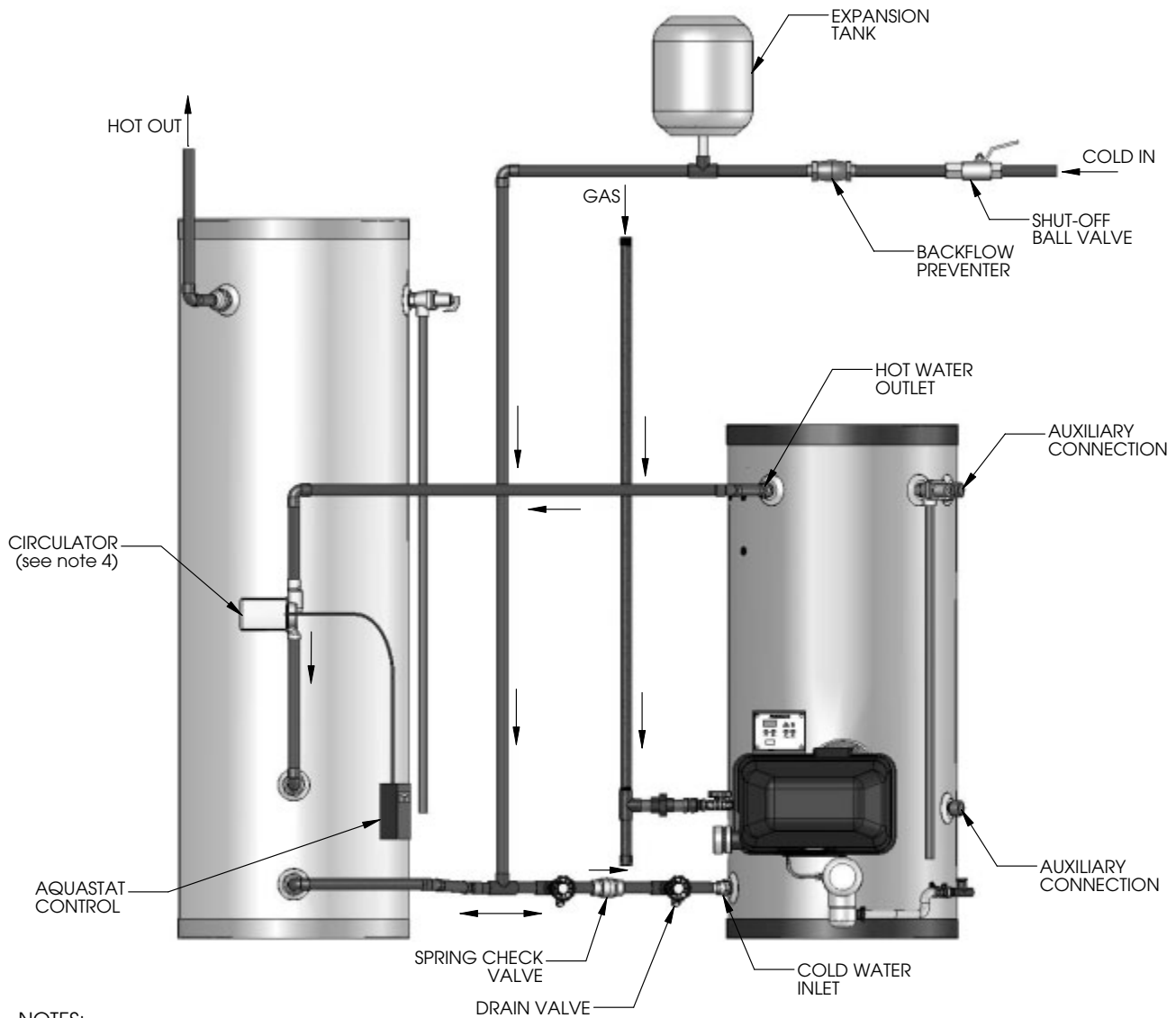
1. Minimum pipe size should match connection size on Phoenix. If you require greater flow, upsize the pipe accordingly.
2. A Thermal Expansion tank suitable for potable water must be sized and installed within this piping system between the check valve and the cold water inlet of the Phoenix.
3. Gas Line must be rated to the maximum input capacity of the unit. Unit must have 10 feet of pipe after gas regulator.
4. All circulators shall have an integral flow check.



NOTE: This drawing is meant to show system piping only. The installer is responsible for all equipment and detailing required by local codes.

LP-179-U
7/13/07

PHOENIX WITH STORAGE TANK



NOTES:

1. Minimum pipe size should match connection size on Phoenix. If you require greater flow, upsize the pipe accordingly.
2. A Thermal Expansion tank suitable for potable water must be sized and installed within this piping system between the check valve and the cold water inlet of the Phoenix.
Check with the Manufacturer of the Thermal Expansion Tank for proper sizing.
3. Gas line must be rated to the maximum input capacity of the unit. Unit must have 10 feet of pipe after gas regulator.
4. All circulators shall have an integral flow check

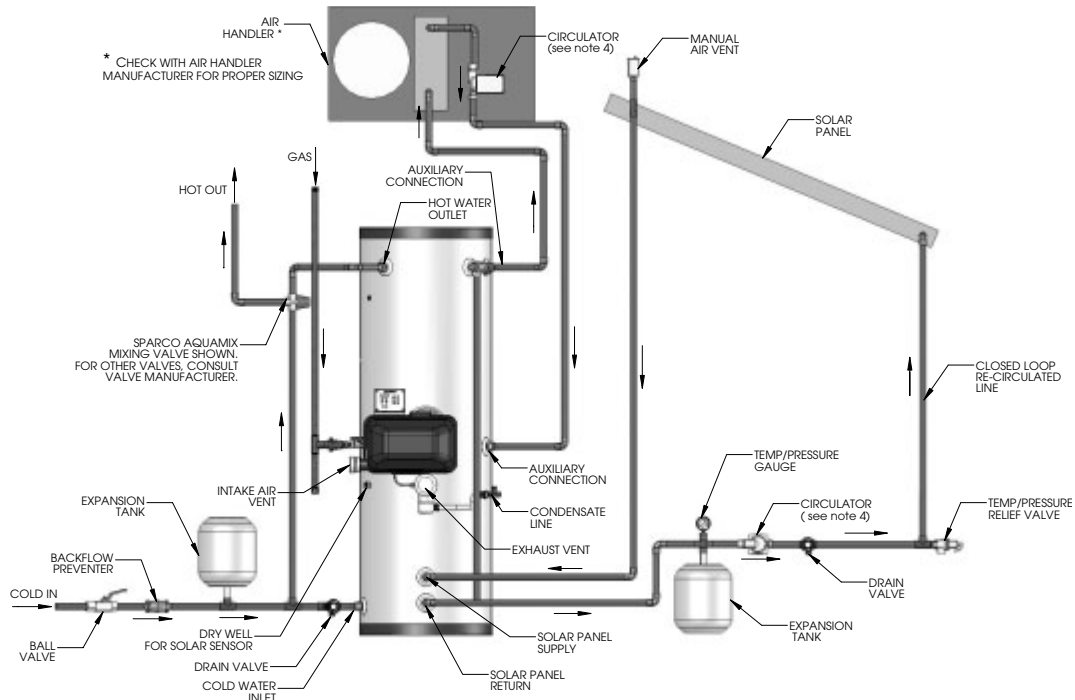
SPECIAL NOTE:

Drains and Check valve connected between the Phoenix and the Storage Tank will assist in purging air from system.

LP-179-O
7/13/07

NOTE: This drawing is meant to show system piping only. The installer is responsible for all equipment and detailing required by local codes.

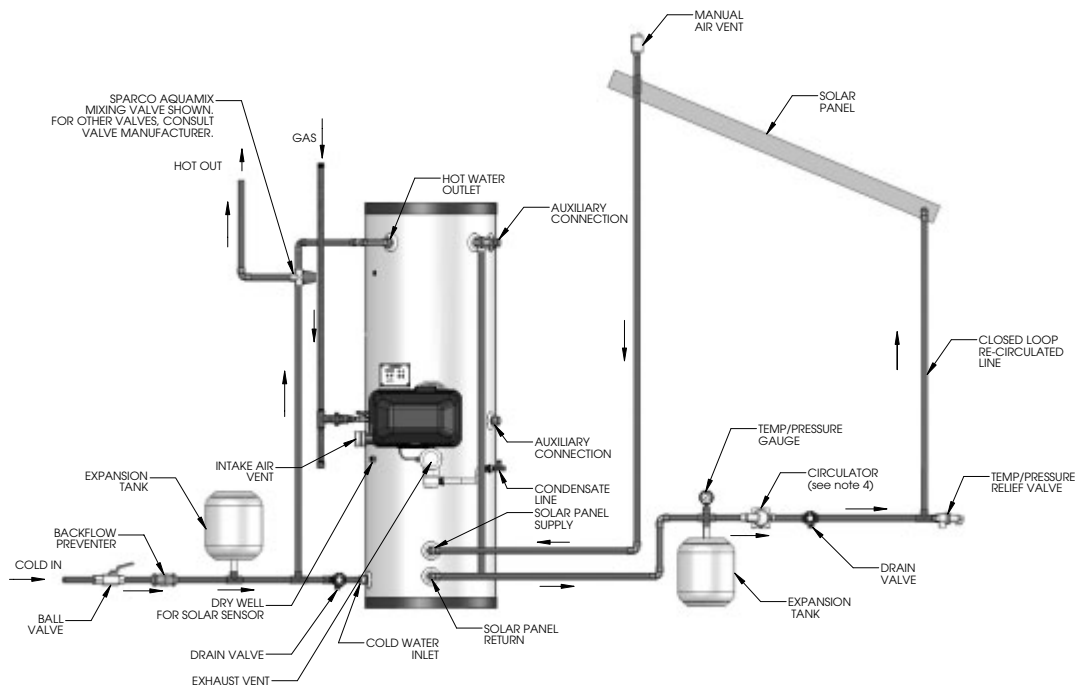
PHOENIX SOLAR PIPING WITH AIR HANDLER



NOTES:

1. Minimum pipe size should match connection size on Phoenix. If you require greater flow, upsize the pipe accordingly.
2. A Thermal Expansion tank suitable for potable water must be sized and installed within this piping system between the check valve and the cold water inlet of the Phoenix.
3. Gas Line must be rated to the maximum input capacity of the unit. Unit must have 10 feet of pipe after gas regulator. LP-179-R
4. All circulators shall have an integral flow check. 7/16/07

PHOENIX SOLAR PIPING



NOTES:

1. Minimum pipe size should match connection size on Phoenix. If you require greater flow, upsize the pipe accordingly.
2. A Thermal Expansion tank suitable for potable water must be sized and installed within this piping system between the check valve and the cold water inlet of the Phoenix.
3. Gas Line must be rated to the maximum input capacity of the unit. Unit must have 10 feet of pipe after gas regulator. LP-201-A
4. All circulators shall have an integral flow check. 7/16/07

PART 4: PREPARE WATER HEATER

A. ELECTRICAL CONNECTION

The electrical connection for the Phoenix is on the right side of the combustion shroud with a line cord for electrical connection. All electrical wiring must be performed by a qualified licensed electrician and in accordance with National Electrical Code or to the applicable local codes and standards. The electrical requirements are for standard 120 volts, 60 Hz 15 amp dedicated service.

! 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. It is very important that the electrical power is only turned on when the Phoenix is completely filled with cold water.

B. GAS CONNECTION

! WARNING

Failure to follow all precautions could result in fire, explosion 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" 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 this adaptor! It is mandatory that this fitting is used for connection to a field fabricated drip leg as shown in the illustration at right per the National Fuel Gas Code.** You must ensure that the entire gas line to the connection at the Phoenix Water Heater is no smaller than ¾". Once all the 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 Phoenix from the gas line to continue leak testing. In order to do this, you must turn off the factory and field-installed gas cocks. This will minimize the possibility of damaging the Phoenix 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.

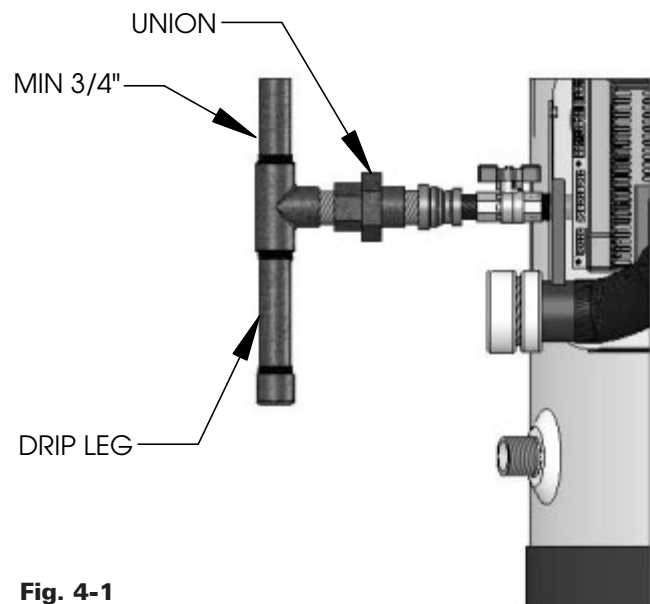


Fig. 4-1

C. GAS PIPING

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

PART 4: PREPARE WATER HEATER (CONTINUED)

D. GAS TABLE

Refer to the below table 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 0.5 psi or Less and a Pressure Drop of 0.3 Inch water Column

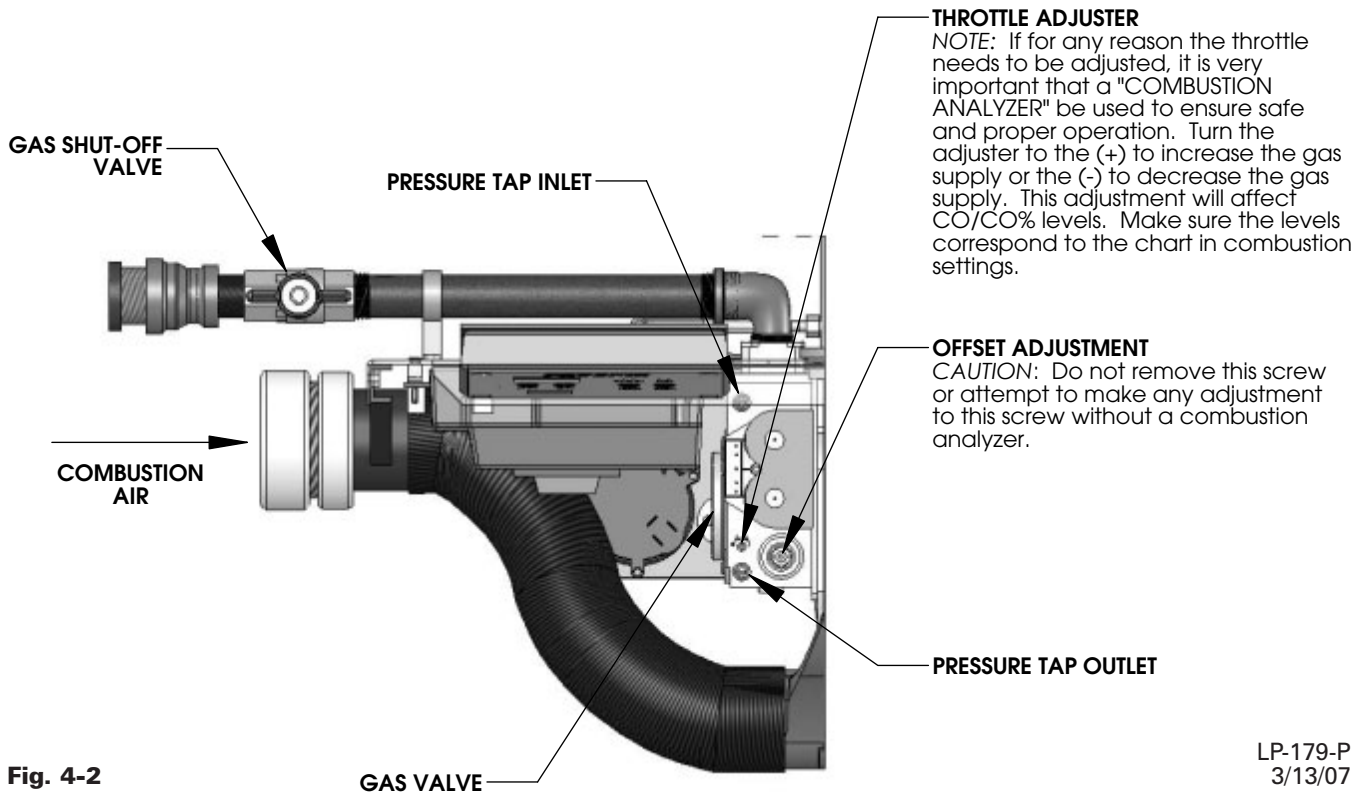
Gas Table

(Nominal Iron Pipe Size (inches)	Internal Diameter (inches)	Length of Pipe (Feet)														BTU'S PER HOUR x1,000
		10	20	30	40	50	60	70	80	90	100	125	150	175	200	
3/4	.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 1/4	1.380	1,050	730	590	500	440	400	370	350	320	305	275	250	225	210	
1 1/2	1.610	1,600	1,100	890	760	670	610	560	530	490	460	410	380	350	320	

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 the 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 and installing the manometer. 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 Phoenix. 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 in the Phoenix water heater, the gas valve in this appliance has a flanged connection to the swirl plate and blower.

PART 4: PREPARE WATER HEATER (CONTINUED)

E. DUNGS GAS VALVE



⚠ WARNING

Do not do a gas conversion on this water heater without an officially approved conversion kit and instructions supplied by Heat Transfer Products, Inc.

PART 5: VENTING, COMBUSTION AIR & CONDENSATE REMOVAL

A. INSTALLING EXHAUST VENT AND INTAKE AIR VENT

⚠ DANGER

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

PART 5: VENTING, COMBUSTION AIR & CONDENSATE REMOVAL (CONTINUED)

B. GENERAL

WARNING

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 severe personal injury, death, or substantial property damage.

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

C. APPROVED MATERIALS FOR EXHAUST VENT AND INTAKE AIR VENT

1. Use only Non Foam Core venting material. The following materials are approved for use as vent pipe for this water heater:
 - a. Non Foam Core PVC (Polyvinyl Chloride) Pipe conforming to ASTM D-1785.
 - b. Non Foam Core CPVC (Chlorinated Polyvinyl Chloride) Pipe conforming to ASTM D-1785.
 - c. Non Foam Core ABS (Acrylonitrile-Butadiene- Styrene) Pipe conforming to ASTM D3965 Class 3-2-2-2.

WARNING

Do not use Foam Core Pipe in any portion of the exhaust piping from this water heater. Use of Foam Core Pipe may result in severe personal injury, death, or substantial property damage.

D. EXHAUST VENT AND INTAKE AIR VENT PIPE LOCATION

1. Determine exhaust vent location:

WARNING

Both exhaust and intake air vents must exit from the same side of the building to assure correct appliance operation.

- 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

PART 5: VENTING, COMBUSTION AIR & CONDENSATE REMOVAL (CONTINUED)

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 8" (0.2 m) center-to-center. Minimum distance between exhaust vents and intake air vents on multiple water heaters is 8" (0.2 m) center-to-center.

PART 5: VENTING, COMBUSTION AIR & CONDENSATE REMOVAL (CONTINUED)

Location of exit terminals of mechanical draft and direct-vent venting systems.

(Reference: National Fuel Gas Code ANSI Z223.1/NFPA 54 2002).

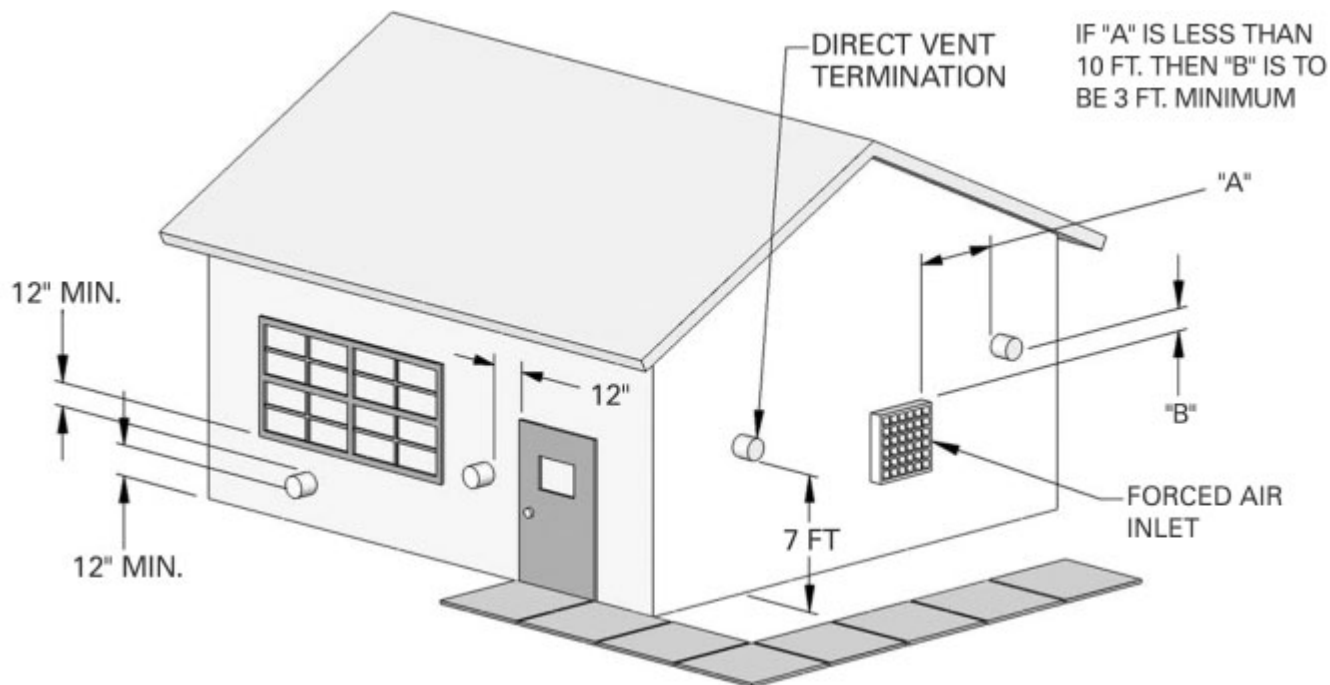


Fig. 5-1

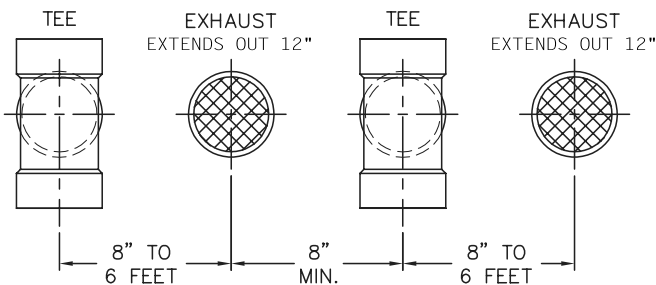


Fig. 5-2 Multiple Vent Spacing*

*Note: Exhaust must extend out 1 foot

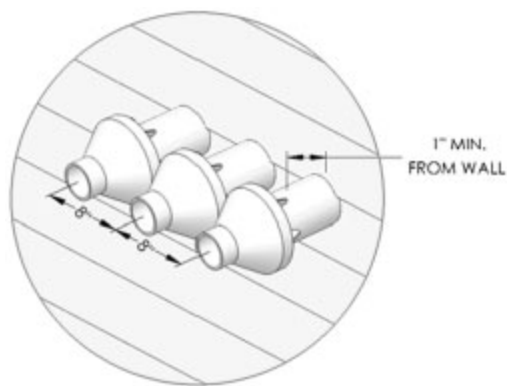


Figure 5-4 Multiple Water Heater Installations

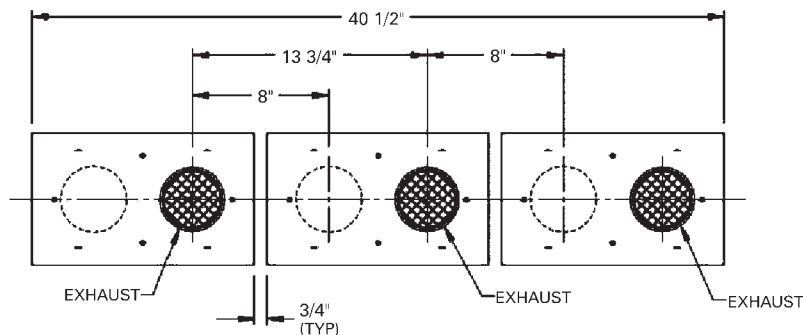


Fig. 5-3 Multiple Stainless Steel Horizontal Vent Kit Installation – Front View

PART 5: VENTING, COMBUSTION AIR & CONDENSATE REMOVAL (CONTINUED)

E. EXHAUST VENT AND INTAKE AIR VENT SIZING

1. The exhaust and intake vent size is 2" for the PH100 and PH130 and 3" for the 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 5-5.

Table 5-5

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'

*Friction loss for long radius elbow is 1 foot less.

- 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.

F. 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 the increased diameter vent pipes is 125 feet.

PART 5: VENTING, COMBUSTION AIR & CONDENSATE REMOVAL (CONTINUED)

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

Table 5-6: Vent Run Transition

Vent Connection	Reducing Coupling	Vent Transition
2"	3" x 2"	3"
3"	4" x 3"	4"

- c. If the transition occurs at a distance greater than 15 equivalent feet from the water heater, the maximum equivalent length will be reduced. See Table 5-7.

Table 5-7: Vent Termination Kits

Transition Point (ft from water heater)	TEL of Standard 2" Vent Pipe (ft)	TEL of Oversized 2", 3" or 4" Vent Pipe (ft)	Maximum TEL of all Vent Pipe (ft)
15	30	95	125
20	40	77-1/2	117-1/2
25	50	60-1/2	110-1/2
30	60	43	103
35	70	26	96
40	80	8-1/2	88-1/2
None	85	0	85

TEL = Total Equivalent Length

G. EXHAUST VENT AND INTAKE AIR PIPE INSTALLATION

1. Use only solid PVC, CPVC, or ABS schedule 40 or 80 pipe. FOAM CORE PIPING IS NOT APPROVED.
2. Remove all burrs and debris from joints and fittings.
3. 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 or CPVC pipe and ASTM D2235 for ABS pipe.

WARNING

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

4. Horizontal lengths of exhaust vent must slope back towards the water heater not less than 1/4" per foot to allow condensate to drain from the vent pipe. If the exhaust pipe must be piped around an obstacle that results in the creation of a low point, condensate will collect in this low point and form a blockage. This condensate must be drained away using a field-installed condensate drain assembly as shown. (See Fig. 1 Section 5)
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 water heater to support any piping.
7. A screened straight coupling is provided with the water heater for use as an outside exhaust termination.

PART 5: VENTING, COMBUSTION AIR & CONDENSATE REMOVAL (CONTINUED)

8. A screened inlet air tee is provided with the water heater to be used as an outside intake termination.
9. The following information on Table 5-8 lists optional intake air/exhaust vent terminations available from Heat Transfer Products, Inc.

Table 5-8: Vent Termination Kits

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

H. WATER HEATER REMOVAL FROM A COMMON VENT SYSTEM

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

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 all doors between the space in which the appliance remains connected to the common venting system located and other spaces in the building. Turn on clothes dryers and any appliances not connected to the common venting system. Turn on any exhaust fans, such as range hoods and bathroom exhausts, at maximum speed. Do not operate a summer exhaust fan. Close all fireplace dampers.
4. Place in operation the appliance being inspected. Follow the lighting instructions. Adjust the thermostat so the appliance will operate continuously.
5. Test for spillage at the draft hood relief opening after 5 minutes of main burner operation. Use the flame of a match or candle or smoke from a cigarette.
6. After it has been determined that each appliance remaining connected to 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 so the installation conforms with the National Fuel Gas Code, ANSI Z223.1. When resizing any portion of the common venting system, the common venting system should be resized to approach the minimum size as determined using the appropriate tables in Appendix G in the National Fuel Gas Code, ANSI Z 223.1

I. CONDENSATE REMOVAL SYSTEM

This is a condensing high efficiency appliance, therefore this unit has a condensate removal system. Condensate is water vapor derived from the combustion products, similar to an automobile when it is initially started. It is very important that the condensate line is sloped away from the boiler and down to a suitable inside drain, if the condensate outlet on the water heater is lower than the drain, you must use a condensate removal pump (kit P/N 554200 available from Heat Transfer Products, Inc.) A condensate filter, if required by local authorities can be made up of lime crystals, marble or phosphate chips that will neutralize the condensate. This can be done in the field by the installer or you may purchase one from Heat Transfer Products, Inc. (P/N N1100) It is also very important that

PART 5: VENTING, COMBUSTION AIR & CONDENSATE REMOVAL (CONTINUED)

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

CAUTION

The condensate line must remain unobstructed, allowing free flow of condensate. If condensate is allowed to freeze in the line or if the line is obstructed in any other manner, condensate can exit from the water heater tee, resulting in potential water damage to property.

NOTICE

Use materials approved by the authority having jurisdiction. In the absence of other authority, PVC and CPVC pipe must comply with ASTM D1785, F441 or D2665. Cement and primer must comply with ASTM D2564 or F493. For Canada, use CSA or ULC certified PVC or CPVC pipe, fittings and cement.

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

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

INSTALLATION OF CONDENSATE NEUTRALIZER/PUMP

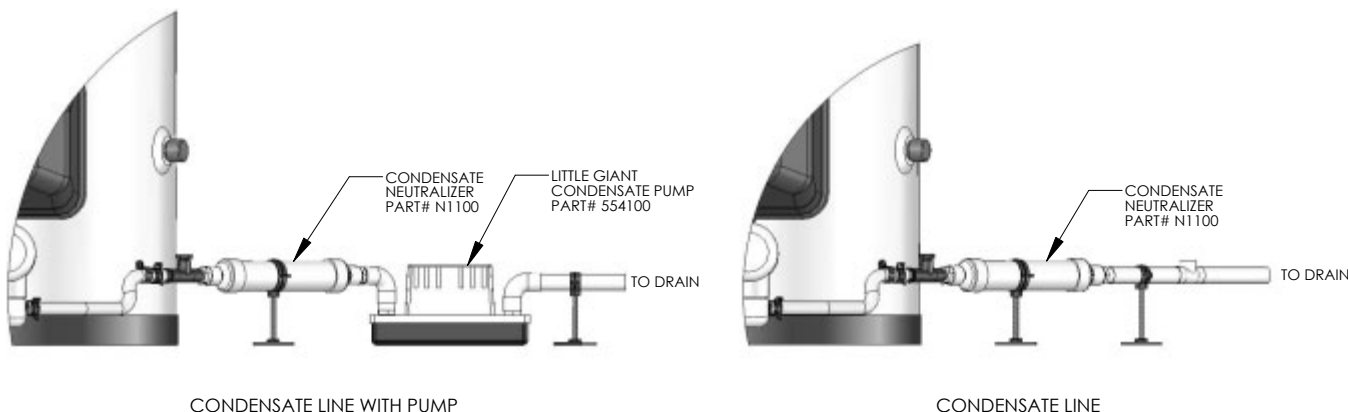


Fig. 1

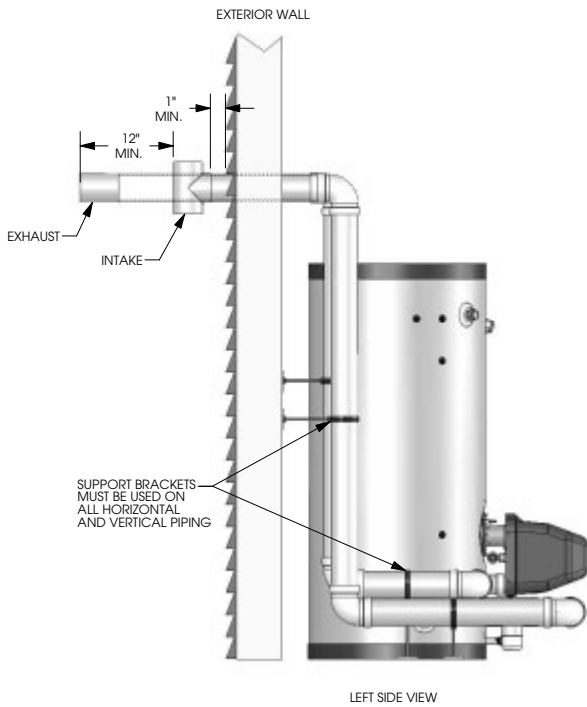
NOTES:

- CONDENSATE LINE MUST BE PITCHED AT LEAST 1/4" PER FOOT TO PROPERLY DRAIN. IF THIS CANNOT BE DONE OR A VERY LONG LENGTH OF CONDENSATE HOSE IS USED YOU MUST 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.
- PLASTIC PIPE SHOULD BE THE ONLY MATERIAL USED FOR THE CONDENSATE LINE. STEEL, BRASS, COPPER OR OTHERS WILL BE SUBJECT TO CORROSION OR DETERIORATION.
- IT IS ALSO VERY IMPORTANT THAT THE CONDENSATE LINE IS NOT EXPOSED TO FREEZING TEMPERATURES, OR ANY OTHER TYPE OF BLOCKAGE.

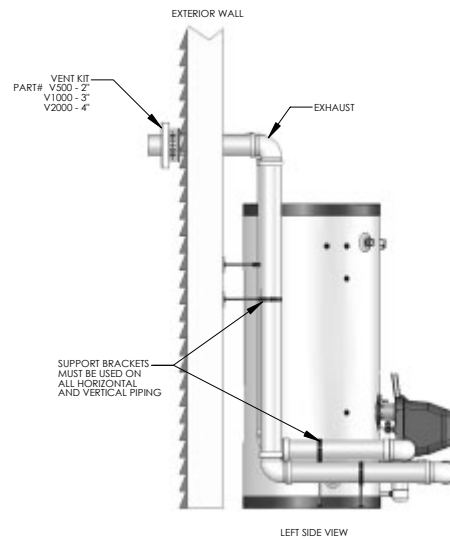
LP-179-K
4/13/07

J. DIAGRAMS FOR VENTING

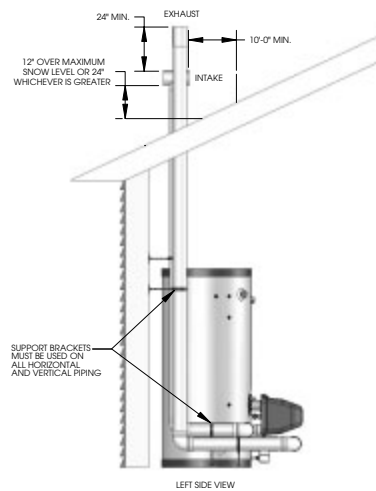
SIDEWALL VENTING WITH TEE (INTAKE) AND COUPLING (EXHAUST)



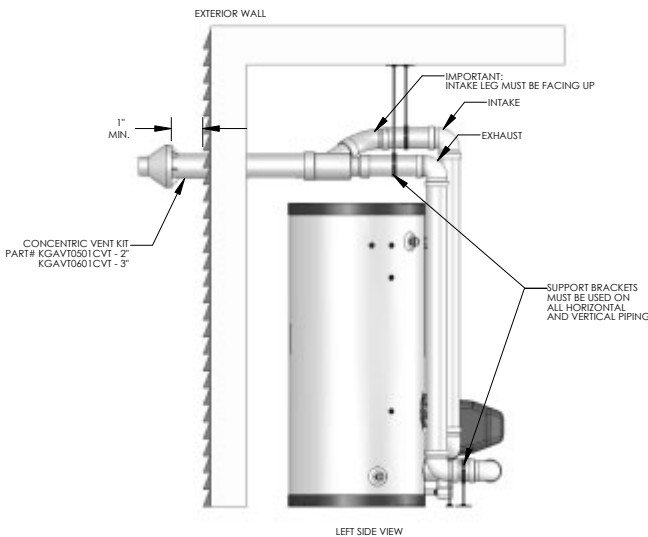
SIDEWALL VENTING WITH KIT



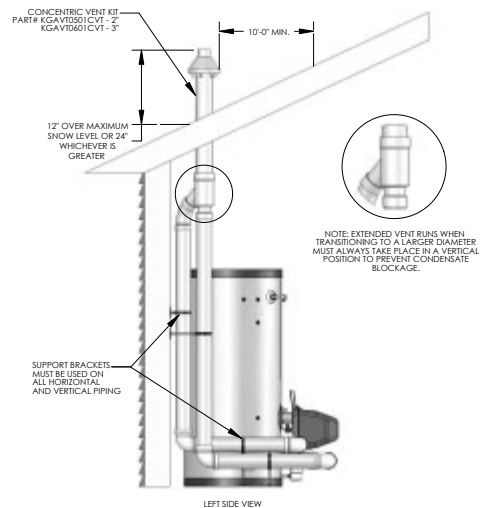
ROOF VENT WITH TEE (INTAKE) AND COUPLING (EXHAUST)



SIDEWALL VENTING WITH CONCENTRIC VENT KIT



ROOF VENT WITH CONCENTRIC VENT KIT



NOTE: EXTENDED VENT RUNS WHEN TRANSITIONING TO A LARGER DIAMETER MUST ALWAYS TAKE PLACE IN A VERTICAL POSITION TO PREVENT CONDENSATE BLOCKAGE.

NOTE: 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.

PART 6. START-UP PROCEDURE

FOR YOUR OWN SAFETY READ BEFORE OPERATING

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

WHAT TO DO IF YOU SMELL GAS

- Do not try to light any appliance.
 - Do not touch any electric switch; do not use any phone in your building.
 - Immediately call your gas supplier from a neighbor's phone. Follow the gas suppliers' instructions.
 - If you cannot reach your gas supplier, call the fire department.
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 Phoenix 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 setpoint of the Phoenix if desired. The factory default setting is 119°. 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.

DANGER



Water temperature over 125 degrees 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.



B. OVERALL APPLIANCE AND CONTROL OPERATION

To adjust temperature of the stored water press and hold **S3** for 2 seconds. The first item is: DU: Water Temperature Set Point – factory set at 119°F, adjustable down by pressing S1 key to 70°F and adjustable up by pressing the **S2** key up to 159°F. The **S3** key is then pressed again momentarily to display DH, the differential which is factory set at 7°F and adjustable down to 1°F by pressing the **S1** key and up to 18°F by pressing the **S2** key. The **S3** key is then pressed again momentarily to display the choice of Fahrenheit "F" factory default or Celsius by pressing the **S1** key. When finished, press

PART 6. START-UP PROCEDURE (CONTINUED)

the **S3** key 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 Phoenix parameters by pressing **S4/RESET** key 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 the **S/4** key 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, simply press **S3/Program** key to resume normal operation.

Function Value

- d1 — Actual Temperature from upper tank sensor
- d2 — Actual Temperature from lower tank sensor
- d3 — **0** (Not used)
- d4 — **303** (Not used)

Function Value

- d5 — **nc** (Not used)
- 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 bus communication
co = connected, **nc** = not connected
- d11 — **32** (Not used)
- d12 — Power On Hours (Example: Hours x 1000 Ex. 0.1 = 100 hrs. or 1.0 = 1000 hrs.)
- d13 — Total Water Heating Hours (TW – Hrs. x 1000)
- d14 — **0** (Not used)
- d15 — Passed Ignition Attempts (Passed ignition x 1000)

D. TEST MODE

This function is intended to simplify the gas valve adjustment if needed. Listed below are the recommended limits on each Phoenix Water Heater and the Combustion Settings. Automatic modulation does not take place when the controller is in Test mode, only temperature limitation based on the Phoenix 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/Program** 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. After 10 minutes, the Test mode stops automatically. To exit Test Mode press **S1/–** and **S2/+** key together for 1 second.

WARNING

Do not do a gas conversion on this water heater without an officially approved conversion kit and instructions supplied by Heat Transfer Products, Inc.

PART 6. START-UP PROCEDURE (CONTINUED)

Fig. 6-1

COMBUSTION SETTINGS HIGH FIRING RATES and LOW FIRING RATES ON ALL MODELS				
	Natural Gas		Propane LP	
	low	high	low	high
Carbon Monoxide (CO%)	0–20 ppm	20 ppm–30 ppm	0–20 ppm	40 ppm–60 ppm
Carbon Dioxide (CO₂%)	8½% – 9½%	8½% – 9½%	9½% – 10½%	9½% – 10½%

Fig. 6-2

FAN SPEEDS			
BTU	IGNITION	MIN	MAX
100,000	3000	2000	5400
130,000	3000	2000	6950
199,000	3000	2000	8500

E. 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, construction sites, building constructions, care must be taken to keep the appliance burner cover in place and drywall or saw dust away from appliance.

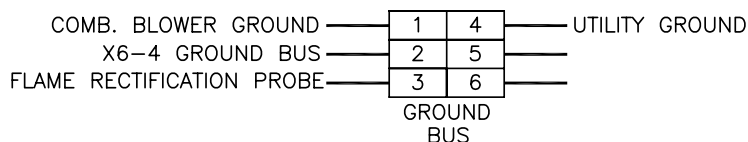
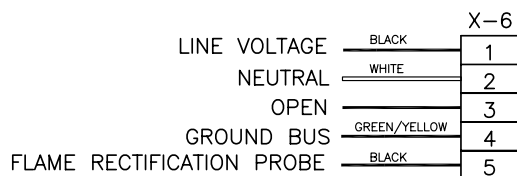
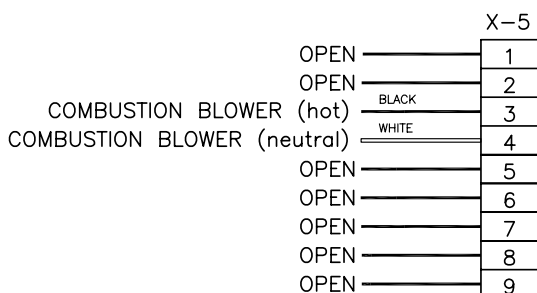
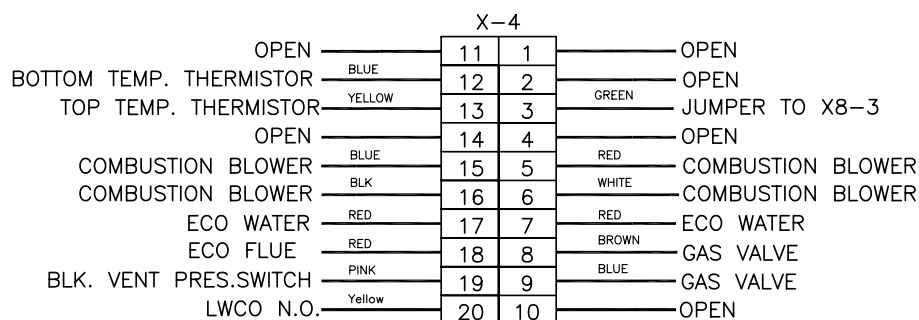
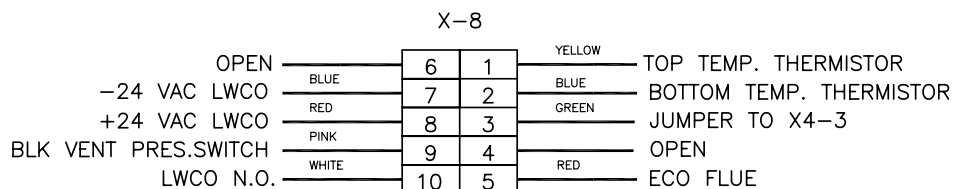
CAUTION

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

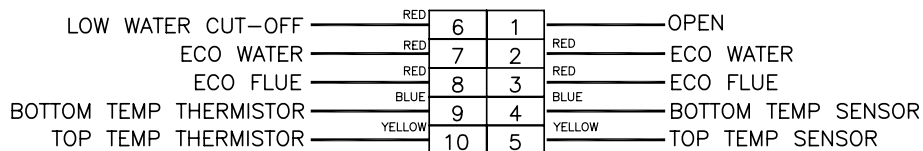
PART 6. START-UP PROCEDURE (CONTINUED)

F. INTERNAL WIRING

Phoenix Connector Diagram



External 10 Pin Connector



PART 7: SHUTDOWN

A. SHUTDOWN PROCEDURE

If the burner is operating, lower the set point value to 70 degrees 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. Disconnect the electrical supply. If the burner is not operating, disconnect the electrical supply.

B. VACATION PROCEDURE

If there is danger of freezing, change the set point to 70 degrees F. DO NOT turn off electrical power. If there is no danger of freezing, follow the "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 on page 4. 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 either 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/RESET** 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 8: TROUBLESHOOTING

A. PHOENIX ERROR CODE

An error code may occur in the installation of the Phoenix. This condition may lead to a lock out condition of the controller, which will need to be manually reset through the **S4/RESET** button. These temporary codes will help the installer correct the problem before going into a lock out condition, which will require a manual reset.

B. PHOENIX ERROR

1. When an error condition occurs the controller will display an error code on the display module.
2. These error codes and several suggested corrective actions are included in Table 8-2.
3. In the case of **E00**, **E13**, and **E14** this error, if uncorrected, will go into a fault condition as described in Paragraph C.

C. PHOENIX FAULT

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 8-3 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.

PART 8: TROUBLESHOOTING (CONTINUED)** 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 the heater water, be certain that:

- There is no pressure in the heater. (Pull the release on the relief valve to relieve pressure in the water heater.)
- The 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 of the water heater which has been under water.

 CAUTION

This 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.

PART 8: TROUBLESHOOTING (CONTINUED)

Table 8-1: Phoenix Resistance Table for Supply Temperature Sensor

Phoenix 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

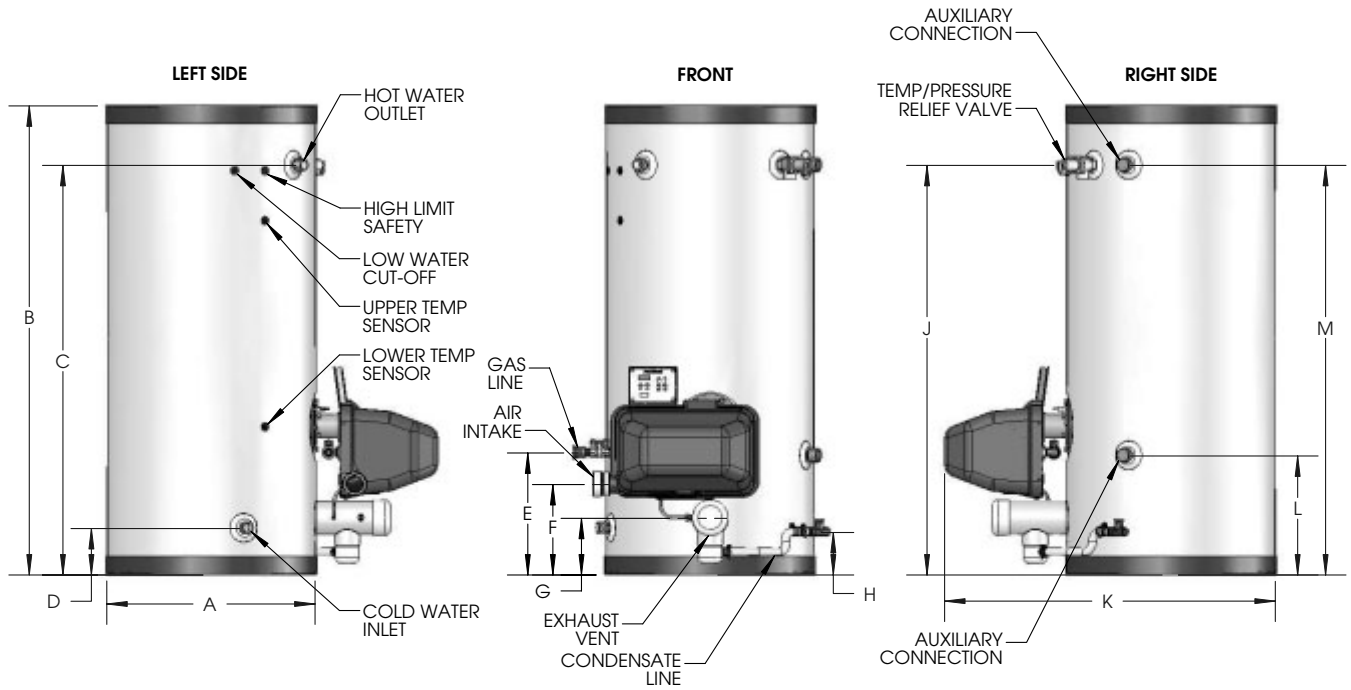
Table 8-2: 925 Control Board Error Codes

Code	Description	Duration	Corrective Action
E00	High Limit Exceeded	50 Sec.	<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° test upper and lower temperature sensor with an ohmmeter. (Refer to resistance chart, this section.) Replace bad sensor. If water is below 194° test high limit safety switch (see #15) pg. 37 and wiring with ohmmeter. Switch should be closed at this point, if not, replace switch. 2. If unit did reset successfully, let the PHOENIX 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.
E13	Combustion Fan Speed Low. The combustion air fan speed less than 70% of expected.	60 Sec.	<ol style="list-style-type: none"> 1. Check the combustion air fan wiring. 2. Replace the combustion air fan. 3. Replace the control board.
E14	Combustion Fan Speed High. The combustion air fan speed is more than 130% of expected.	60 Sec.	<ol style="list-style-type: none"> 1. Check the combustion air fan wiring. 2. Replace the combustion air fan. 3. Replace the control board.
PRO	Low Water Cut-Off	Until Corrected	<ol style="list-style-type: none"> 1. Assure that the system pressure is above 10 psig. 2. Check for leaks in the system piping.
FLU	Blocked Vent Pressure Switch Open	Until Corrected	<ol style="list-style-type: none"> 1. Assure that the vent is not blocked 2. Check the blocked vent pressure switch operation by applying a jumper. (If the switch is not functioning properly, replace it.)

PART 8: TROUBLESHOOTING (CONTINUED)

Table 8-3: 925 Control Board FAULT Codes

Code	Description	Remedy
F00	High temperature switch limit exceeded (194°)	<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° test upper and lower temperature sensor with an ohmmeter. (Refer to resistance chart, this section.) Replace bad sensor. If water is below 194° 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 PHOENIX 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.
F02	Interrupted or shorted upper temperature sensor	Check the electrical connection to the appropriate temperature sensor, if connection is okay, replace bad sensor.
F03	Interrupted or shorted lower temperature sensor	
F05	Upper temperature sensor exceeds 194°F	If water in tank is not greater than 194°F, check wiring and repair if faulty. If the wiring is okay, check appropriate sensor with ohmmeter and compare to reading in resistance chart. If reading does not agree with water temperature, replace bad sensor.
F06	Lower temperature sensor exceeds 194°F	
F09	No flame detected – The Phoenix will make three attempts at ignition before the control goes into this lockout condition.	<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 1/4" 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 water 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 Phoenix will relight 3 times before the control goes into this lockout condition.	<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 water 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 boiler 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 Low – The boiler 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.
F14	Combustion Fan Speed High – The water heater will lock out if the fan speed is more than 130% 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.
F18	Gas Valve Error	<ol style="list-style-type: none"> 1. Make sure the connector is correctly connected to the gas valve. 2. Check the electrical wiring from the valve to the control board. 3. Replace the low voltage wiring harness assembly. 4. Replace control board.
F30	Watchdog	Call factory for further assistance.
F31	Parameter Memory	Call factory for further assistance.
F32	Parameter Memory Write Error	Call factory for further assistance.
F33	Programming Error	Call factory for further assistance.



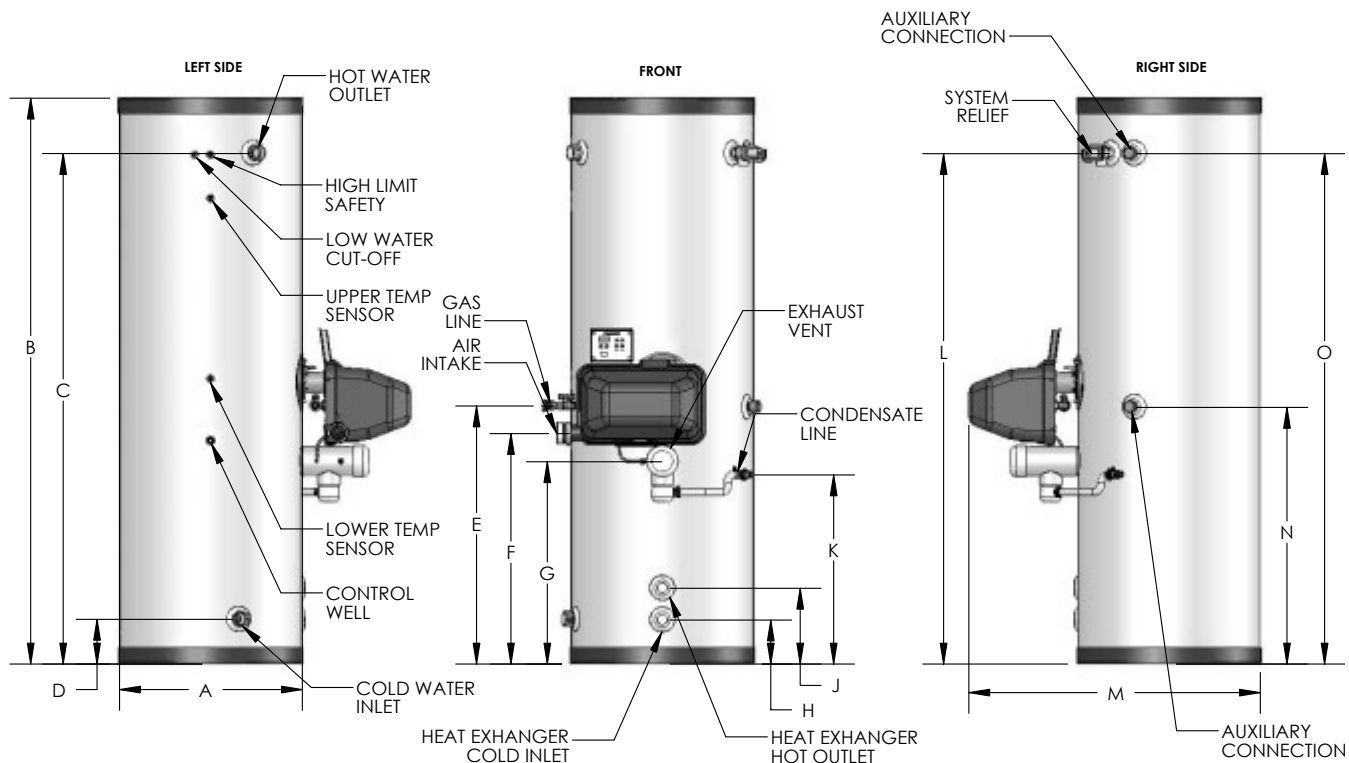
PHOENIX WATER HEATER DIMENSIONS

MODEL #	GALLONS	A	B	C	D	E	F	G	H	J	K	L	M
PH-55	55	23"	52"	45"	5"	13-1/4"	9-3/4"	6"	3-7/8"	45"	36"	13"	45"
PH-80	80	23"	72"	64"	5-3/4"	15-1/4"	11-3/4"	6"	5-7/8"	64"	36"	13"	64"
PH-119	119	27"	74"	65"	7-1/2"	17"	13-1/2"	10-1/8"	7-1/2"	66"	40"	14-1/4"	66"

ALL DIMENSIONS ARE APPROXIMATE

PHOENIX WATER HEATER SPECIFICATIONS

MODEL #	GALLONS	BTU'S	AIR INTAKE/ EXHAUST VENT SIZE	WATER INLET/ OUTLET SIZE	AUXILIARY CONN.	GAS LINE CONN.	SYSTEM RELIEF PIPE SIZE	SHIPPING WEIGHT	SOLAR SHIPPING WEIGHT
PH-55	55	100,000 & 130,000	2"	1" NPT	1"	3/4"	3/4"	175 LBS.	N/A
		199,000	3"						
PH-80	80	100,000 & 130,000	2"	1-1/2" NPT	1"	3/4"	3/4"	235 LBS.	245 lbs
		199,000	3"						
PH-119	119	100,000 & 130,000	2"	1-1/2" NPT	1"	3/4"	3/4"	405 LBS.	415 lbs
		199,000	3"						



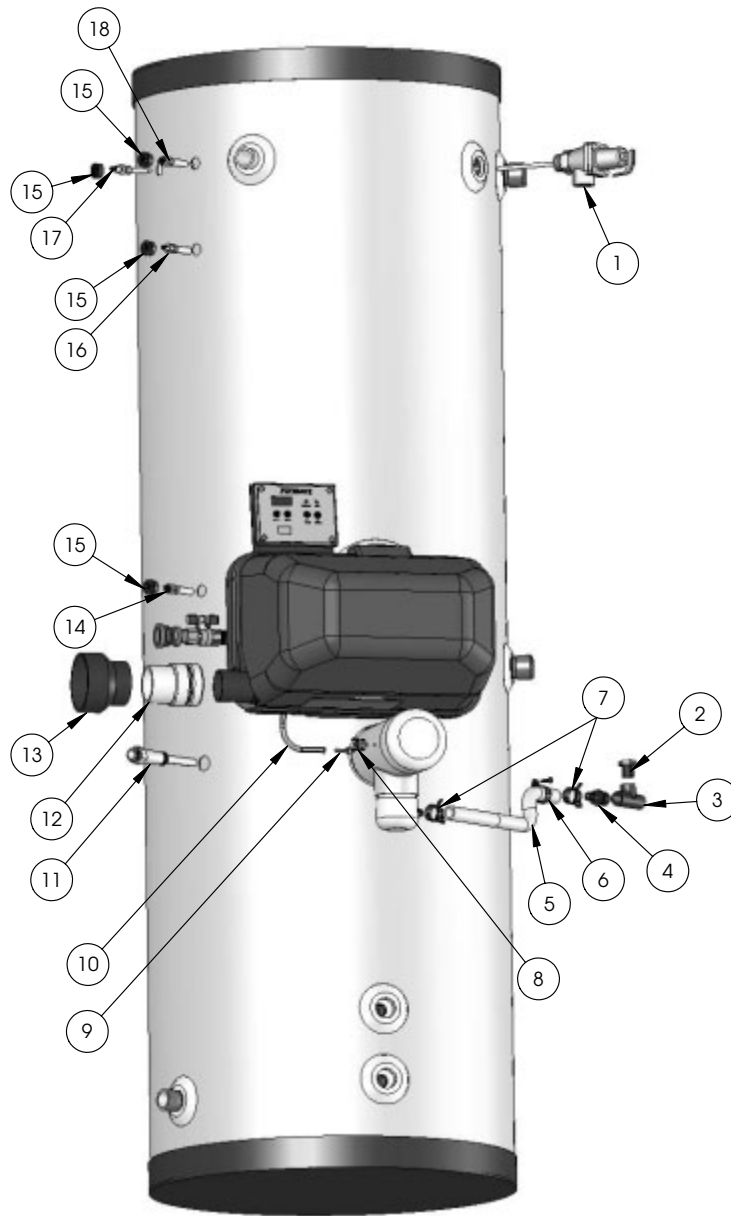
PHOENIX SOLAR WATER HEATER DIMENSIONS

MODEL #	GALLONS	A	B	C	D	E	F	G	H	J	K	L	M	N	O
PH-80S	80	23"	72"	64"	5-1/4"	32"	29"	25-1/2"	5-3/4"	9-3/4"	27-3/4"	64"	36"	32"	64"
PH-119S	119	27"	74"	66"	7-1/4"	34"	31"	27-1/2"	7-1/2"	11-1/2"	25-3/4"	66"	40"	34"	66"

ALL DIMENSIONS ARE APPROXIMATE

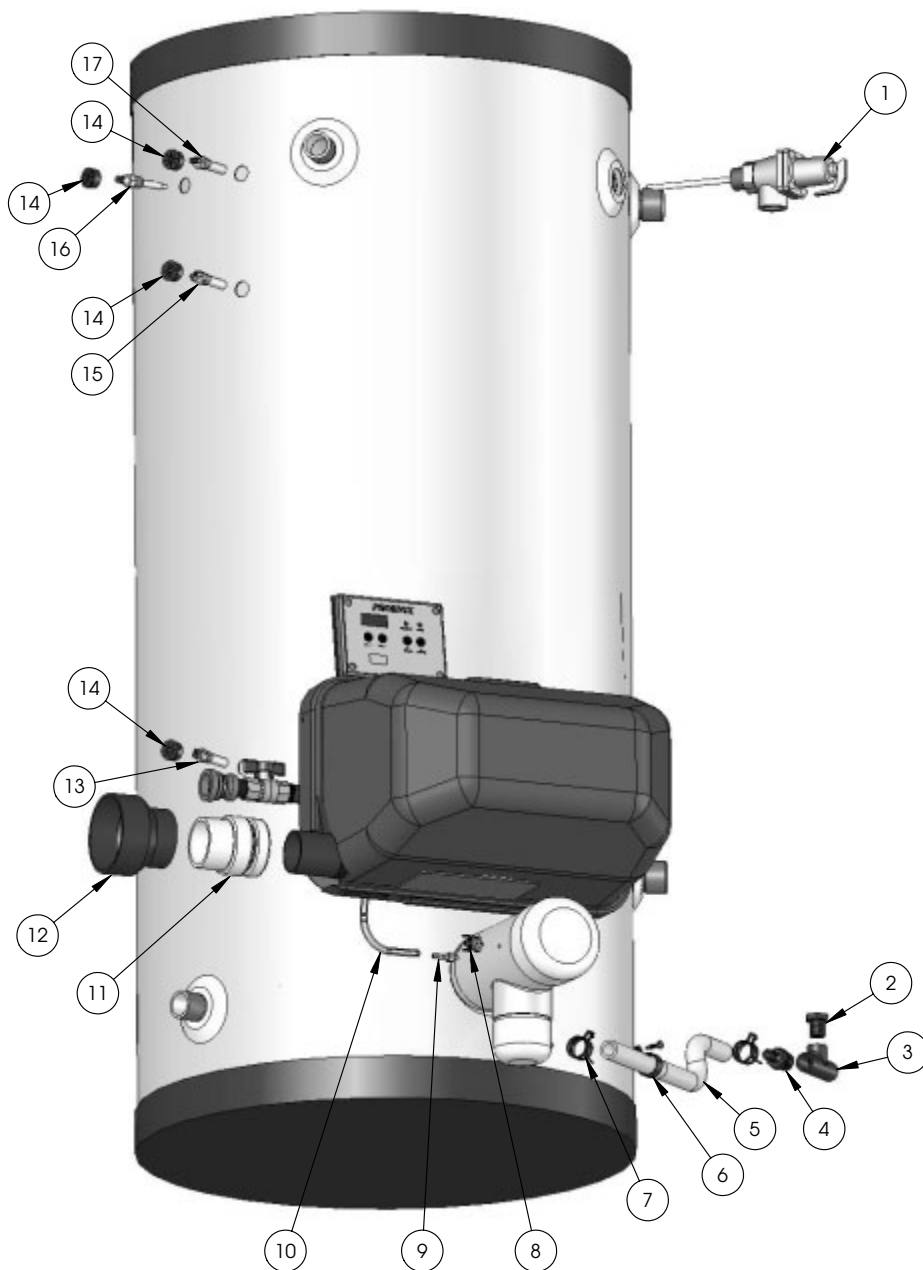
PHOENIX SOLAR WATER HEATER SPECIFICATIONS

MODEL #	GALLONS	BTU'S	AIR INTAKE/ EXHAUST VENT SIZE	WATER INLET/ OUTLET SIZE	HEAT EXCHANGER SIZE	AUXILIARY CONN.	GAS LINE CONN.	SYSTEM RELIEF PIPE SIZE	SHIPPING WEIGHT
PH-80S	80	130,000	2"	1-1/2" NPT	1"	1"	3/4"	3/4"	235 LBS.
		199,000	3"						
PH-119S	119	130,000	2"	1-1/2" NPT	1"	1"	3/4"	3/4"	405 LBS.
		199,000	3"						

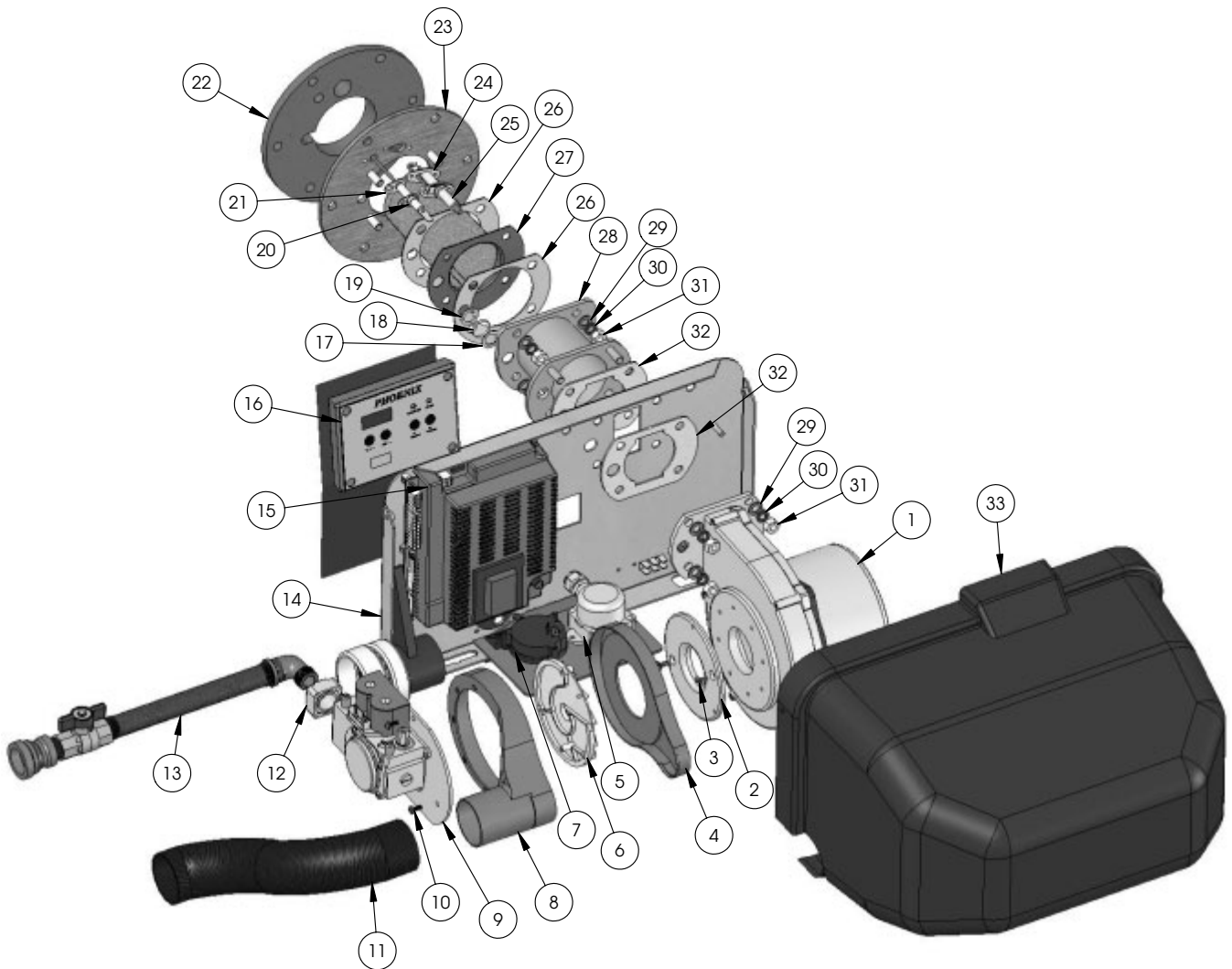


ITEM #	DESCRIPTION	PART #
1	Temperature and Pressure Relief Valve	TP1400
2	PVC 1/2" Plug	7100P-080
3	PVC 1/2" Tee	7100P-079
4	1/2" NPT x 1/2" Hose Barb	7100P-044
5	Condensate Hose	7100P-043
6	Cable Clamp	7250P-649
7	Spring Clamp (Condensate Hose)	7250P-302
8	Thermodisc Flue ECO 210°	7250P-089
9	Hose Barb 1/4 x 10-32 (Blocked Vent Pressure Switch)	7250P-154
10	Plastic Tubing 3/16" ID (Blocked Vent Pressure Switch)	7000P-805
11	Stainless Steel Control Well	PMW-3SENP-1
12	2" Trap Adapter	9500-0025
13	2" - 3" Air Inlet Adapter (199,000 BTU ONLY)	F3000
14	Lower Temperature Sensor	7100P-005
15	Snap Bushing	2500-0057
16	Upper Temperature Sensor	7100P-004
17	Low Water Cut-off Sensor Probe (2 parts)	see item #5 Burner Part List
18	High Limit Safety	7100P-006

LP-179-V
6/29/07



ITEM #	DESCRIPTION	PART #
1	Temperature and Pressure Relief Valve	TP1400
2	PVC 1/2" Plug	7100P-080
3	PVC 1/2" Tee	7100P-079
4	1/2" NPT x 1/2" Hose Barb	7100P-044
5	Condensate Hose	7100P-043
6	Cable Clamp	7250P-649
7	Spring Clamp (Condensate Hose)	7250P-302
8	Thermodisc Flue ECO 210°	7250P-089
9	Hose Barb 1/4 x 10-32 (Blocked Vent Pressure Switch)	7250P-154
10	Plastic Tubing 3/16" ID (Blocked Vent Pressure Switch)	7000P-805
11	2" Trap Adapter	9500-0025
12	2" - 3" Air Inlet Adapter (199,000 BTU ONLY)	F3000
13	Lower Temperature Sensor	7100P-005
14	Snap Bushing	2500-0057
15	Upper Temperature Sensor	7100P-004
16	Low Water Cut-off Sensor Probe (2 parts)	see item # 5 Burner Part List
17	High Limit Safety	7100P-006



ITEM #	DESCRIPTION	PART #	ITEM #	DESCRIPTION	PART #
1	Combustion Blower	7100P-015	16	Control Board Display (w/Ribbon Cable)	7100P-041
2	Gas Valve Adapter Plate	7250P-644	17	Sight Glass Gasket	7100P-021
3	Screws M5 x 10 Slotted Countersunk (Gas Valve Adapter Plate)	7100P-045	18	Sight Glass	7100P-022
4	Housing Cover - Swirl Plate	7100P-016	19	Sight Glass Gasket - Outer	7100P-023
5	Low Water Cut-off Electronic Base (1 of 2)	7000P-852	20	Flame Rectification Probe	7100P-024
6	Swirl Plate	7100P-042 (100/130 BTU) 7500P-092 (199 BTU)	21	Gasket (Flame Rectification Probe)	7100P-025
7	Blocked Vent Pressure Switch	7250P-150	22	Mounting Plate Gasket	7100P-026
8	Housing - Swirl Plate	7100P-017	23	Mounting Plate	7100P-027
9	Gas Valve - DUNGS	7100P-039 (100/130 BTU) 7100P-040 (199 BTU)	24	Gasket (Spark Electrode)	7100P-028
10	Screws M5 x 12 Slotted Countersunk (Gas Valve)	7100P-046	25	Spark Electrode	7100P-029
11	Tube - Air Inlet	7100P-018	26	Gasket (Burner)	7100P-030
12	Gas Valve Inlet Flange	7100P-019	27	Burner	7100P-032 (100/130 BTU) 7100P-031 (199 BTU)
13	Gas Valve Piping Assembly	7100P-020	28	Adapter Manifold	7100P-033
14	Wire Harness	7100P-013 (55 GAL.) 7100P-014 (80/119 GAL.)	29	Washer M8 (Adapter Manifold)	7100P-034
15	Control Board	7250P-317	30	Spring Washer M8 (Adapter Manifold)	7100P-035
			31	Nut Brass M8 (Adapter Manifold)	7100P-036
			32	Gasket (Adapter Manifold)	7100P-037
			33	Burner Cover	7100P-038

WATER HEATER INSPECTION AND MAINTENANCE SCHEDULE

Inspection Activities		Date last completed			
Piping		1st Year	2nd Year	3rd Year	4th Year*
Near Heater Piping	Check heater and system piping for any sign of leakage, verify proper support				
Vent	Check condition of all vent pipe and joints				
Gas	Check gas piping, test for gas leaks and signs of aging, make sure all pipes are supported properly.				
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 water heater or Anti-Scald Valve				
Temperatures	Verify temperature settings programmed				
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 and Burner					
Combustion Chamber	Check burner tube, and combustion chamber coils, clean according to maintenance section of manual, also vacuum combustion chamber				
Spark Electrode	Clean with scotch brite , Set gap at 1/4" (see Fig 14-2 Part 14 in Troubleshooting section)				
Flame Probe	Clean with scotch brite, Check ionization in μA (d7 on status menu in Start-up Procedures) record high fire (3.8 to 4.2) and low fire (3.0 to 3.4)				

* NOTE : CONTINUE MAINTENANCE BEYOND THE 4TH YEAR IS REQUIRED ON A YEARLY BASIS.

WATER HEATER INSPECTION AND MAINTENANCE SCHEDULE (CONTINUED)

Inspection Activities	Date last completed			
	1st Year	2 Year	3 Year	4 Year*
Condensate				
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: you must verify the flow of condensate, making sure that the cup is connected properly during final inspection.)			
Gas				
Pressure	Measure incoming gas pressure (from 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, and verify they are all properly supported			
Combustion				
Check CO/CO2 Levels	Check levels of CO and CO2 in Exhaust (See Fig. 6-1 in Startup Procedure for ranges) record at high and low fire			
Safeties				
ECO (Energy Cut Out)	Check continuity on Flue and Water ECO, replace if corroded			
Water Pressure Switch	Check operation , check for signs of leakage, replace if corroded			
Thermistors	Check wiring, verify through ohms reading			
Final Inspection				
Check List	Verify that you have completed the entire check list WARNING: FAILURE TO DO SO COULD RESULT IN DEATH OR SERIOUS INJURY.			
Homeowner	Review, with the homeowner what you have done			

* NOTE : CONTINUE MAINTENANCE BEYOND THE 4TH YEAR IS REQUIRED ON A YEARLY BASIS.

