



Crossover

Residential Hybrid Floor Mounted Water Heaters

Installation

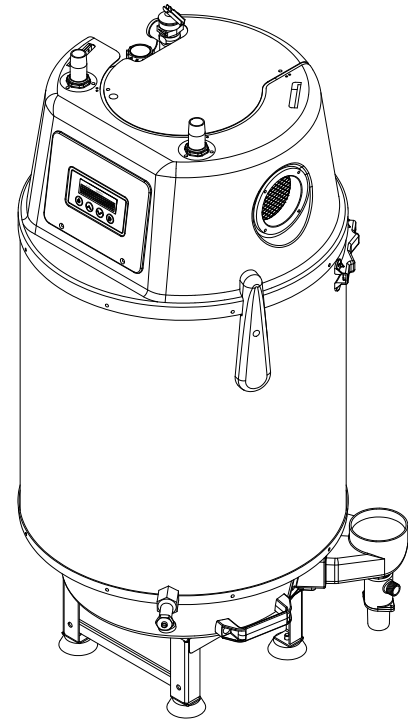
Start-Up

Maintenance

Parts

Warranty

Model RGH20-100F



This Manual For Use With Water Heaters Manufactured On or After October 21, 2019



⚠ DANGER

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

⚠ WARNING

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

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

NOTICE

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

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

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

WARNING

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


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

WHAT TO DO IF YOU SMELL GAS

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



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

FOR YOUR SAFETY READ BEFORE OPERATING

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

- A. This appliance does not have a pilot. It is equipped with an ignition device which automatically lights the burner. Do not try to light the burner by hand.
- B. **BEFORE OPERATING** smell all around the appliance area for gas. Be sure to smell next to the floor because some gas is heavier than air and will settle on the floor.
- WHAT TO DO IF YOU SMELL GAS**
- Do not touch any electric switch; do not use any phone in your building.
 - Do not try to light any appliance.
 - 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.
- C. Use only your hand to push in or turn the gas control knob. Never use tools. If the knob will not push in or turn by hand, don't try to repair it, call a qualified technician. Force or attempted repair may result in a fire or explosion.
- D. Do not use this appliance if any part has been under water. Immediately call a qualified technician to inspect the appliance and to replace any part of the control system and any gas control which has been under water.

OPERATING INSTRUCTIONS

1. STOP! Read the safety information above on this label.
2. Set the thermostat to lowest setting.
(Never use Water Heater unless it is completely filled with water.)
3. Turn OFF electrical power supply to the Water Heater.
4. Don't try to light the burner by hand.
5. Turn gas shut-off valve clockwise  to "OFF" position. Do not force.
6. Wait five (5) minutes to clear out any gas. If you then smell gas, STOP! Follow step "B" above on this label. If you don't smell gas, go to the next step.
7. Turn manual gas shut-off valve counterclockwise  to "ON" position.
8. Turn ON electrical power to the appliance.
9. Wait until default temperature (125°F) is displayed. Set desired water temperature. Turn on hot water faucet.
10. Set thermostat to desired setting.
11. If the appliance will not operate, follow the instructions "To Turn Off Gas To Appliance" and call your service technician or gas supplier.

TO TURN OFF GAS TO APPLIANCE

1. Set the thermostat to lowest setting.
2. Turn off all electric power to the appliance if service is to be performed.
3. Turn manual gas shutoff valve to "OFF".

SPECIAL ATTENTION BOXES

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

DANGER

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

WARNING

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

CAUTION

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


CAUTION

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

NOTICE

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

⚠ DANGER



Flammable Vapors

⚠ Vapors from flammable liquids will explode and catch fire causing death or severe burns.
Do not use or store flammable products such as gasoline, solvents or adhesives in the same room or area near the water heater.

Keep flammable products:

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

Water heater has a main burner and pilot flame.
The pilot flame:

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

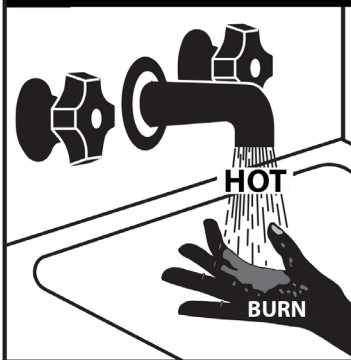
Vapors:

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

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

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

⚠ DANGER



HOT
BURN

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.

Foreword

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

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

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

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

For the Installer

This water heater must be installed by qualified and licensed personnel. The installer should be guided by the instructions furnished with the water heater, and by local codes and utility company requirements. In the absence of local codes, preference should be given to the *National Fuel Gas Code - ANSI Z223.1* in the United States and the *Natural Gas and Propane Installation Code - B149.1* in Canada (latest versions).

Installations Must Comply With:

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

In the United States - 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.

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

In Canada - The latest versions of the *Natural Gas and Propane Installation Code, CSA B149.1*, and the *Canadian Electrical Code, C22.1*, from CSA Group, 178 Rexdale Blvd, Toronto, Ontario, Canada M9W 1R3.

NOTE: The gas manifold and controls met safe lighting and other performance criteria when undergoing tests specified in *ANSI Z21.13* - latest edition.

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WARNING

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

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

Part 1 - General Safety Information

This water heater is approved for indoor installations only and is not intended for use as a pool heater. Clearance to combustible materials: 0" top, bottom, sides, and back. Heater must have room for service: 2" front, 2" left and 3" right sides, 12" top, 2" back are minimum recommended service clearances. (A combustible door or removable panel is acceptable front clearance. A 3" minimum clearance must be provided from the appliance front cover to the removable panel or combustible door.) This water heater has been approved for closet installation and installation on combustible flooring. Install the water heater in a location where temperature and pressure relief valve discharge or a leak will not result in damage to the surrounding area. If such a location is not available install an auxiliary catch pan.

This appliance is rated Category IV (pressurized vent, likely to form condensate in the vent) and requires a special vent system designed for pressurized venting. **Use only Category IV vent systems.**

WARNING

NOTE: Obey all local codes. Obtain all applicable permits before installing the water heater.

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

⚠ WARNING

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

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

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

A. Operation and Installation Warnings

To avoid serious injury or death, read, understand, and follow all of the precautions listed here.

⚠ DANGER

Vapors from flammable liquids will explode and can cause a fire, resulting in personal injury or death. The water heater has a burner that can come on at any time and ignite vapors. DO NOT use or store flammable liquids around the water heater.

Improper venting can cause a build-up of carbon monoxide. Breathing carbon monoxide can result in brain damage or death. DO NOT operate the water heater unless it is properly vented to the outside and has an adequate fresh air supply for safe operation. Inspect the exterior exhaust gas outlet port and fresh air inlet port on a regular basis to ensure they are functioning properly.

A concentration of carbon monoxide as small as .04% (400 parts per million) in the air can be fatal. When making high fire or low fire adjustments, CO levels must be monitored using a calibrated combustion analyzer such that a CO level of no more than 150 ppm is exceeded at any time during operation.

Adjusting the "low fire offset" or the "main flow restrictor" in small increments can result in a significant increase in CO concentration. To avoid serious injury or death, DO NOT make any adjustments to the gas valve without monitoring the exhaust gases with a fully functional and calibrated combustion analyzer.

The internal computer controlled regulator is preset by the manufacturer and should not be adjusted by the installer.

⚠ WARNING

This water heater must be installed by a licensed plumber, licensed gas fitter, and/or professional service technician. Improper installation and/or operation can cause a potentially hazardous situation, which, if not avoided, could result in serious injury or death, and will void the warranty.

The manufacturer cannot anticipate every circumstance that might involve a potential hazard. Each installation has its own specialized characteristics, requirements, and possible hazards. Therefore, all possible incidents are not included in these warnings. Proper and safe installation, operation, and service are the responsibility of the professional service technician.

Proper care of the water heater is the user's responsibility. Ensure the user carefully reads and understands the User's Information Manual before operating and maintaining the water heater.

Make sure the user knows the location of the gas shut-off valve and how to operate it. Immediately close the gas shut-off valve if the water heater is subjected to fire, overheating, flood, physical damage, or any other damaging condition that might affect the operation of the unit. Have the water heater checked by a qualified technician before resuming operation.

Do not power up the unit unless the gas and water supply valves are fully opened. Make sure the fresh air intake port and exhaust gas port are open and functional.

⚠ WARNING

This water heater is certified for indoor installations only. The water heater consists of gas ignition system components which must be protected from water (dripping, spraying, etc.) during operation and service. Carefully consider installation location and the placement of critical components (circulators, condensate neutralizers, etc.) before installing the water heater.

DO NOT allow children to operate this unit. DO NOT use this unit if it does not appear to be operating correctly. A qualified technician should service and inspect the water heater annually.

The water heater temperature is factory set to 120°F (49°C). To avoid scalding, always check the temperature of the hot water before bathing, showering, washing, etc. DO NOT adjust the water temperature while the water heater is being used by other persons.

No one but a professional service technician should attempt to install, service, or repair this water heater. There are no serviceable parts which can be changed by the user / owner. User / Owner: Contact the original professional service technician if the water heater needs repair or maintenance. If the original technician is unavailable, ask your gas supplier for a list of qualified service providers.

Keep the area around the water heater clean and free of all materials that can burn. DO NOT store or place gasoline, oils, spray paint, or other flammable products near the water heater.

DO NOT use spray paint, hair spray, or any other flammable spray near the water heater or near the exterior fresh air intake port. DO NOT place any items in or around the exterior exhaust gas outlet port and/or fresh air inlet port that could restrict or block the flow in or out of the vent system.

DO NOT store or place newspapers, laundry, or other combustible items near the water heater or the exterior exhaust gas outlet and/or fresh air inlet port.

The owner should inspect the system monthly for damage, water stains, signs of rust, corrosion, and exhaust vent and air intake blockage. If inspection of the unit shows signs of damage, the water heater should be shut off until the problem is repaired by a qualified technician.

After installation, all water heater safety devices should be tested.

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

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

NOTICE

This water heater is equipped with a three prong plug. It should only be plugged directly into a properly grounded three prong receptacle. DO NOT remove the ground plug from the plug.

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

This water heater provides a overheat shutdown limit. In the event the water heater water exceeds the set point of the control limit, the cutoff will trip and the water heater will shut down. Certain local codes require additional temperature limits. In addition, certain types of systems may operate at temperatures below the minimum set point of the limit provided with the water heater. Contact the manufacturer for additional overheat controls.

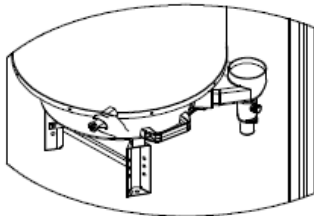
WARNING

DO NOT alter or modify the water heater or water heater controls. Altering any HTP water heater with parts not manufactured by HTP WILL INSTANTLY VOID the water heater warranty and could result in property damage, personal injury, or death.

This water heater has been designed to heat potable water ONLY. Using this water heater to heat non-potable fluid WILL VOID product warranty, and could result in property damage, personal injury, or death.

CAUTION

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



When installing the drain valve take care not to overtighten it. Doing so could result in damage to the water heater and property damage due to leaks. Such damages ARE NOT covered by warranty.

B. Improper Combustion

WARNING

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

C. Gas

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

D. When Servicing the Water Heating System

WARNING

Be sure to disconnect electrical power before opening water heater cabinet or performing service. Label all wires while performing service to ensure proper re-wiring of the water heater. Wiring errors can cause improper or dangerous operation. Failure to do so could result in an electrical shock, improper water heater operation, property damage, serious personal injury, or death.

- To avoid electric shock, disconnect electrical supply before performing maintenance.
- To avoid severe burns, allow water heater and associated equipment to cool before servicing.
- Do not use petroleum-based cleaning or sealing compounds in a water heating system. Gaskets and seals in the system may be damaged. This can result in substantial property damage.
- Do not use "homemade cures" or "patent medicines". Damage to the water heater, substantial property damage, and/or serious personal injury may result.
- Always verify proper operation after servicing the water heater.

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

E. Water Chemistry Requirements

CAUTION

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

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

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

Contaminant	Maximum Allowable Level
Total Hardness (Residential Use - Below 140°F water temperature)	200 mg/l (12 grains/gallon)
Total Hardness (Commercial Use - Above 140°F water temperature)	120 mg/l (7 grains/gallon)
Aluminum	0.05 to 0.2 mg/l or PPM
Chloride	100 mg/l or PPM
Copper	1 mg/l or PPM
Iron	0.3 mg/l or PPM
Manganese	0.05 mg/l or PPM
pH	6.5 - 8.5
Sulfate	205 mg/l or PPM
Total Dissolved Solids (TDS)	500 mg/l or PPM
Zinc	5 mg/l or PPM
Dissolved Carbon Dioxide (CO ₂)	15 mg/l or PPM

Table 1 - Water Quality Specifications

F. Anode Rod

This water heater is equipped with an aluminum anode rod. Anode rods are sacrificial components that counteract water chemistry to minimize or eliminate tank corrosion.

The anode rod should be inspected annually and replaced as necessary to prolong tank life. Have the supply water quality professionally analyzed, as local water conditions will influence the duration for inspection and replacement of the anode rod.

The use of a water softener may increase the speed of anode consumption. More frequent inspection of the anode is needed when using softened or treated water.

Water with high sulfate and/or mineral content can produce a rotten egg odor in heated water. Chlorinating the water supply may minimize this problem.

NOTE: Failure of a heat exchanger due to lime scale build-up on the heating surface, low pH, or other imbalance IS NOT covered by the warranty.

NOTE: Do not remove the anode rod from an operating water heater. Operating the water heater without the anode rod will shorten the life of the tank and VOID the warranty.

G. Freeze Protection

CAUTION

Consider piping and installation when determining heater location. Damages resulting from incorrect installation or from use of products not approved by HTP ARE NOT covered by warranty.

WARNING

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

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

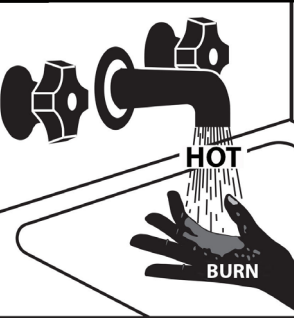
H. Water Temperature Adjustment and Scalding

This water 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 temperatures. 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, install a mixing valve in the water system. This valve will reduce point of use discharge temperatures by mixing cold and hot water in branch supply lines. Such valves are available from your local plumbing supplier.

Table 2 details the relationship¹ 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.

! DANGER



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

WARNING

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

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

Table 2 - Time and Temperature Relationship in Scalds

WARNING

An ASSE 1017 or ASSE 1070 temperature limiting or mixing valve is recommended in installations servicing disabled or elderly persons, or children. Mixing valves do not eliminate the risk of scalding. To avoid scalding:

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

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

I. High Elevation Installations

This water heater is designed to operate at its maximum listed capacity in installations located at 0 - 2000 ft above Sea Level. Since the density of air decreases as elevation increases, maximum specified capacity should be de-rated for elevations above 2000 ft (610 m) in accordance with the table below.

Elevations	2001 ft (610 m)	3000 ft (914 m)	4000 ft (1219 m)	4500 ft (1372 m)	5000 ft (1524 m)
In Canada¹, de-rate by:	10%	10%	10%	10%	may vary
In USA², de-rate by:	-	12%	16%	18%	20%

NOTES:

¹Canada: Elevations between 2000 - 4500 ft (610 - 1372 m), de-rate by 10%. Consult local authorities for de-rating for elevations above 4500 ft (1372 m).

²USA: If elevation is above 2000 ft (610 m), de-rate capacity by 4% for every 1000 ft (305 m).

Table 3 - De-Rate % for High Elevations

WARNING

Combustion - At elevations above 2000 ft, the combustion of the water heater must be checked with a calibrated combustion analyzer to ensure safe and reliable operation. **It is the Installer's responsibility to check and adjust the combustion in accordance with this manual.** Failure to follow these instructions may result in property damage, serious personal injury, or death.

Part 2 - Before You Start

Remove the water heater from the packaging. Take care to place the water heater and accessories in a safe location prior to installation to prevent damage to the mechanical connections.

NOTICE

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

A. What's in the Box

Components included with the water heater:








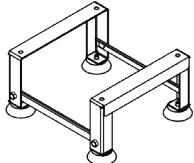


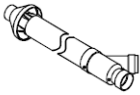

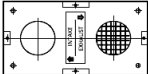
Item	Description	Quantity
User and Installation Manuals		1 each
3" Mesh Vent Screens		2 screens
3/4" X 1/2" Gas Adaptor		1
Drain Valve Assembly		1
LP Conversion Kit		1
3" Pipe Clamp	 Philips Head Screw M5x12 : 2pcs	1
Condensate Trap Assembly		1
Water Heater Stand Assembly	 5/16" Carriage Bolt x 4 pcs 5/16" Nut x 4 pcs	1

Table 4 - Included with the Water Heater

B. Optional Equipment

Optional equipment available from HTP (and Part #):

Optional Parts		
3" Power Vent Exhaust Termination (8100P-029)		1
3" Exhaust Extension Adapter w/ Combustion Test Port (8100P-030)		1
Concentric Vent Termination Kit 3" - Part # KGAVT0601CVT		1
Condensate Neutralizer Kit (7450P-212)		1
Stainless Steel Vent Termination Kit 3" - Part # V1000		1

Optional Parts		
Temperature and Pressure Relief Valve (TP1700)		1
Heating Application Kit (8100P-049)	Required for heating application (air handler) use.	1

Table 5 - Optional Equipment

Part 3 - Prepare the Water Heater Installation

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

CAUTION

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

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

A. Locating the Water Heater

WARNING

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

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

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

1. Installation Area (Mechanical Room) Operating Conditions

- Ensure ambient temperatures are higher than 32°F / 0°C and lower than 114°F / 46°C
- Prevent the air from becoming contaminated by the products, places, and conditions listed in this manual
- Avoid continuously high levels of humidity
- Never close existing ventilation openings
- Ensure a minimum 1" clearance around hot water and exhaust vent pipes
- **NOTE:** To prevent condensing in the fan, it is recommended to avoid prolonged exposure to temperatures below 45°F

WARNING

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

CAUTION

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

2. Check for nearby connections to:

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

CAUTION

All water heaters eventually leak. Locate the water heater where any leakage from the relief valve, related piping, tank, or connections will not result in damage to surrounding areas or lower floors of the building. Any water heater should be installed in such a manner that if it should leak the resulting flow of water will not cause damage to the area in which it is installed. National Plumbing codes require a drain pan for any water heater installation. Such a drain pan must have a clearance of at least 1.0" (2.5 cm) greater than any point on the water heater's outer jacket and must be piped to an adequate drain. Leakage damages ARE NOT covered by warranty. Failure to install a drain pan is the sole responsibility of the owner and/or installer. Reference UPC 2000 (Uniform Plumbing Code) Section 510 - Protection from Damage or IPC 200 (International Plumbing code) Section 504 - Safety Devices. Leakage damages ARE NOT covered by warranty.

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

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

WARNING

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

Do not connect the water heater to any heating systems or components that have been previously used for non-potable applications.

Do not introduce toxic chemicals, such as antifreeze or water heater treatments, into the water heater or any piping meant for potable water purposes.

Ensure that all piping and components connected to the water heater are suitable for potable water applications.

Do not use this water heater for space heating applications.

Failure to follow these instructions could result in serious personal injury or death.

4. Gas control system components must be protected from dripping water during operation and service.
5. If the heater is to replace an existing heater, check for and correct any existing system problems, such as:
 - System leaks
 - Location that could cause the system and heater to freeze and leak
 - Incorrectly sized expansion tank
6. Clean and flush system when reinstalling a heater.

CAUTION

Circulators suitable for DHW applications must be used.

7. When the appliance is installed directly on carpeting, the appliance shall be installed on a metal or wood panel extending beyond the full width and depth of the appliance by at least 3" (76.2 mm) in any direction or, if the appliance is installed in an alcove or closet, the entire floor shall be covered by the panel. The panel must be strong enough to carry the weight of the heater when full of water.

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

See Figure 1 and Table 6 for recommended service clearances. If these minimum clearances are not provided, it may not be possible to service the water 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.

CAUTION

Always take future maintenance into consideration when locating the water heater. If the water heater is located in an installation location with limited clearances, it may be necessary to remove the water heater from the space to perform maintenance. Failure to consider maintenance when determining installation location could result in property damage.

Minimum Clearances	
Installation Clearances from Non-Combustibles / Combustibles	Recommended Service and Proper Operation Clearances
Top	18" (45.7 cm)
Back	0" (0 cm)
Bottom	12" (30.45 cm)
Front	24" (60.9 cm)
Right Side	3" (7.6 cm)
Left Side	

Table 6 - Minimum Installation and Service Clearances

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

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

MINIMUM CLEARANCES FROM COMBUSTIBLE MATERIALS

- Hot water pipes – at least 1" from combustible materials.
- Exhaust vent pipe – at least 1" from combustible materials.

NOTE: For closet installations, a combustible door or removable panel is acceptable front clearance. A 3" minimum clearance must be provided from the appliance front cover to the removable panel or combustible door.

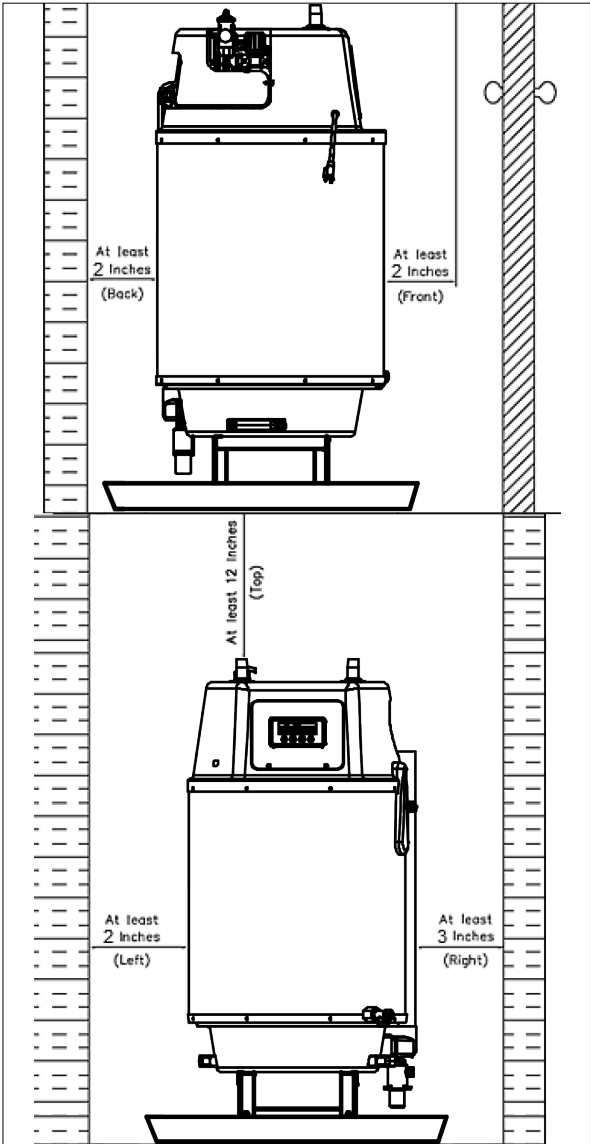



Figure 1 - Minimum Clearances

Appliance Area Ventilation Air Openings - Closet Installations

If the appliance is installed in a closet or alcove the appliance area/room must be ventilated.

EXCEPTION: If the appliance area/room has a volume of 150 ft³ or greater, ventilation of the appliance area/room is not required.

Each ventilation air opening must meet the minimum requirements of 1 in² per 1000 BTU/hr., but not less than 100 in². The lower ventilation opening must be located within 6 in. of the floor, while the upper opening must be located 6 in. from the top of the space.

 WARNING
If the appliance area has a volume less than 150 ft ³ , it is considered a Closet or Alcove. In the US/Canada, PVC vent pipe and fittings SHALL NOT BE USED within the closet or alcove. Only approved CPVC, Polypropylene, or Stainless Steel vent pipe and fittings may be used. See Table 9 for a list of approved materials. Under all circumstances proper ventilation must be provided.
The space must be provided with correctly sized combustion/ventilation air openings for all other appliances located in the space with the appliance. For power venting installations using room air for combustion, refer to the appliance venting section, this manual, for descriptions of confined and unconfined spaces. Do not install the appliance in an attic. The appliance cover must be securely fastened to prevent the appliance from drawing air from the appliance room. This is particularly important if the appliance is in a room with other appliances. Failure to comply with the above warnings could result in substantial property damage, severe personal injury, or death.

Alcove Installations


Alcove installations have the same minimum dimensions as closet installations, except the installation must be completely open to the room at a distance no greater than 18 in. (457 mm) from the front of the appliance and the room must be at least three (3) times the size of the alcove. Provided these conditions are met, the appliance requires no extra ventilation air openings to the space. If these conditions are not met, follow the requirements for Closet Installations.

D. Residential Garage and Closet Installations

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

Precautions



- If the heater is located in a residential garage, per ANSI Z223.1:
- Mount the bottom of the water heater a minimum of 18" above the floor of the garage to ensure the burner and ignition devices are well off the floor.
 - Locate or protect the water heater so it cannot be damaged by a moving vehicle.

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

E. Exhaust Vent and Intake Pipe

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

NOTE: The venting options described here (and further detailed in the Venting section, this manual) are the lone venting options approved for this 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
Do not attempt to vent this water heater by any means other than those described in this manual. Doing so will void the warranty and may result in severe personal injury or death.
Vents must be properly supported. Heater exhaust and intake 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 first 3' from the water heater. Failure to properly support vents could result in property damage, severe personal injury, or death.
The exhaust discharged by this water heater may be very hot. Avoid touching or other direct contact with the exhaust gases of the vent termination assembly. Doing so could result in severe personal injury or death.

1. Direct Vent of Exhaust and Intake

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

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

When installing a combustion air intake from outdoors, care must be taken to utilize uncontaminated combustion air. **To prevent combustion air contamination, see Table 7.**

2. Power Venting, Indoor Combustion Air 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 7.**

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 water heater input. Never obstruct the supply of combustion air to the water heater. If the water heater is installed in areas where indoor air is contaminated (see Table 7) it is imperative that the water heater be installed as direct vent so that all combustion air is taken directly from the outdoors into the water heater intake connection.

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

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

When drawing combustion air from inside a conventionally constructed building to a confined space, such space should be provided with two permanent openings: one located 6" (15cm) below the space ceiling, the other 6" (15cm) above the space floor. Each opening should have a free area of one square inch per 1,000 BTU/hr (22cm²/kW) of the total input of all appliances in the space, but not less than 100 square inches (645cm²).

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

CAUTION
When drawing combustion air from the outside into the mechanical room, care must be taken to provide adequate freeze protection.
WARNING
Failure to provide an adequate supply of fresh combustion air can cause poisonous flue gases to enter the living space, resulting in severe personal injury or death. To prevent combustion air contamination, see Table 7.

**F. Carbon Monoxide Detectors
In the Commonwealth of Massachusetts and As Required by State and Local Codes:**

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

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

- a. In the event that the vented gas fueled appliance is installed in a crawl space or attic, the hard wired carbon monoxide detector with alarm and battery back-up shall be installed on the next adjacent floor level.
- b. In the event that these requirements cannot be met at the time of completion of installation, the owner shall have a period of thirty (30) days to comply with the above requirements; provided, however, that during said thirty (30) day period, a battery operated carbon monoxide detector with an alarm shall be installed.

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

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

G. Prevent Combustion Air Contamination

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

WARNING	
Ensure that the intake air will not contain any of the contaminants in Table 7. Contaminated air will damage the heater, resulting in possible substantial property damage, severe personal injury, or death. For example, do not pipe intake air near a swimming pool or laundry facilities. These areas always contain contaminants.	
Products to Avoid	Areas Likely to Have Contaminants
Spray cans containing fluorocarbons	Dry cleaning / laundry areas and establishments
Permanent wave solutions	Swimming pools
Chlorinated waxes / cleaners	Metal fabrication plants
Chlorine-based swimming pool chemicals	Beauty shops
Calcium chloride used for thawing	Refrigeration repair shops
Sodium chloride used for water softening	Photo processing plants
Refrigerant leaks	Auto body shops
Paint or varnish removers	Plastic manufacturing plants
Hydrochloric or Muriatic acid	Furniture refinishing areas and establishments
Cements and glues	New building construction
Antistatic fabric softeners used in clothes dryers	Remodeling areas
Chlorine-type bleaches, laundry detergents, and cleaning solvents	Garages and workshops
Adhesives used to fasten building products	

Table 7 - Products and Areas Likely to Have Contaminants

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


WARNING	
Breathing Hazard - Carbon Monoxide Gas	
	<ul style="list-style-type: none"> • Do not operate heater if flood damaged. • Install vent system in accordance with local codes and manufacturers installation instructions. • Do not obstruct heater air intake or exhaust. Support all vent piping per manufacturers installation instructions. • Do not place chemical vapor emitting products near unit. • According to NFPA 720, carbon monoxide detectors should be installed outside each sleeping area. • Never operate the heater unless it is vented to the outdoors. • Analyze the entire vent system to make sure that condensate will not become trapped in a section of vent pipe and therefore reduce the open cross sectional area of the vent.
Breathing carbon monoxide can cause brain damage or death. Always read and understand instruction manual.	

Figure 2 - CO Warning Label

LP-304

H. 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.

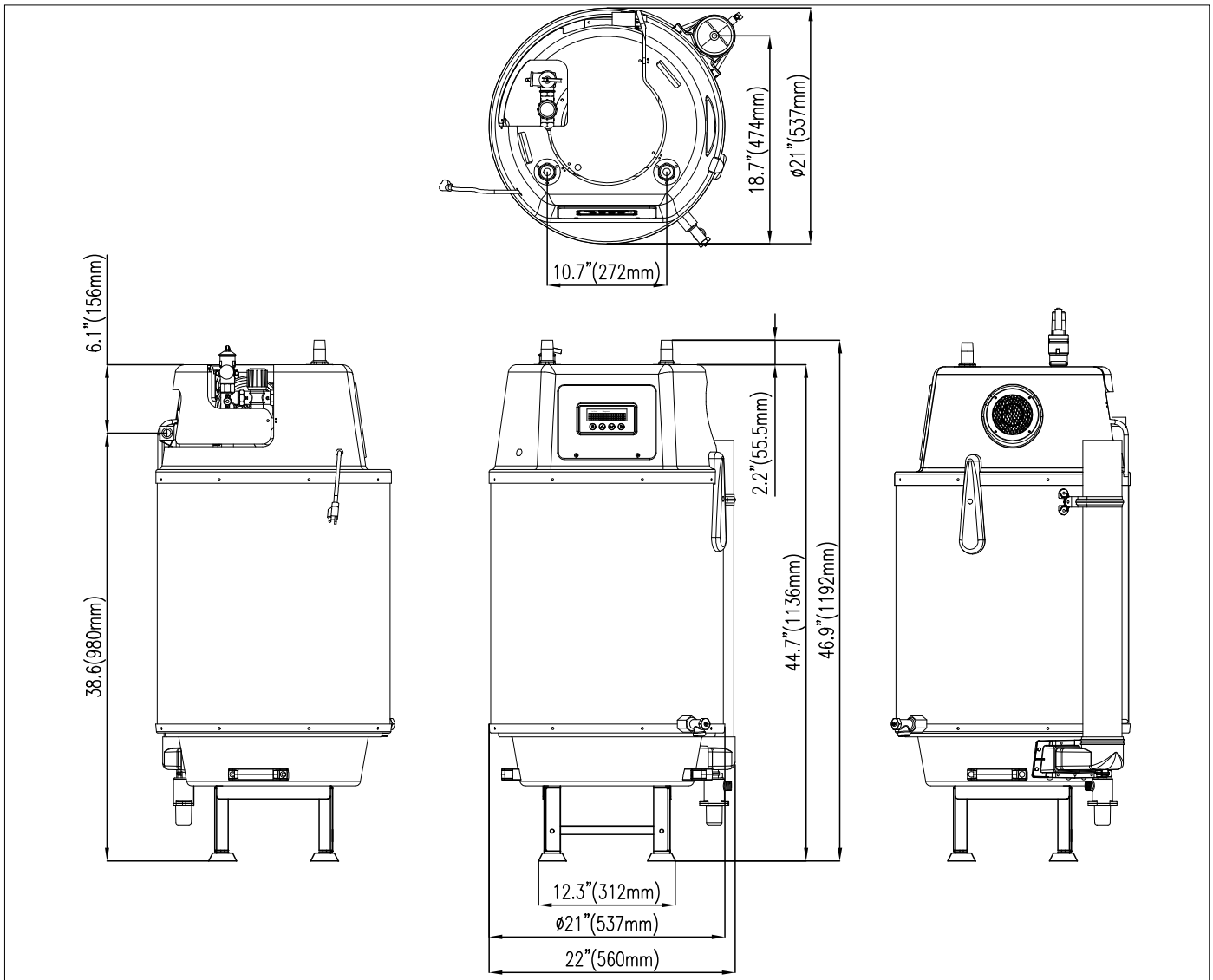
When removing an existing heater, follow the steps below.

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 water heater remains connected to the common venting system and other spaces in the building. Turn on clothes dryers and any appliances not connected to the common venting system. Turn on any exhaust fans, such as range hoods and bathroom exhausts, at maximum speed. Do not operate a summer exhaust fan. Close all fireplace dampers.
4. Place in operation the appliance being inspected. Follow the lighting instructions. Adjust the thermostat so the appliance will operate continuously.
5. Test for spillage at the draft hood relief opening after 5 minutes of main burner operation. Use the flame of a match or candle or smoke from a cigarette.
6. After it has been determined that each appliance remaining connected to the common venting system properly vents when tested as outlined, return doors, windows, exhaust fans, fireplace dampers, and any other gas burning appliances to their previous condition of use.
7. Any improper operation of the common venting system should be corrected to conform to the National Fuel Gas Code, ANSI Z223.1. When resizing any portion of the common venting system, the system should approach the minimum size as determined using the appropriate tables in Appendix G of ANSI Z223.1.

I. Technical Specifications

Model		100F
Energy Factor (EF)* / Uniform Energy Factor (UEF)* / Thermal Efficiency (TE)*		95 TE
Minimum to Maximum Input (Btu/Hr)		50,000 to 100,000
Condensate pH Level		4 pH
Flue System		Sealed Combustion Direct Vent, Power Vent
3" Vent Run		100 feet, 8 elbows max, 5 ft. deduction per 90° elbow
Vent Materials		Schedule 40 PVC, CPVC, PP, Stainless Steel
Weight		110 lbs.
Orifice Size	NG	5.3 mm (0.208")
	LP	3.5 mm (0.137")
Gas Supply Pressure	NG	3.5" to 14" WC
	LP	
Manifold Pressure	Min (3")	NG: -0.15" / LP: -0.10" WC
	Max (3")	
Power Supply	Main Supply	Dedicated 120VAC 60 Hz with 3 Pronged Power Cord
	Maximum Power Consumption	53W
Ignition System		Direct Electronic Spark Ignition with Automatic Flame Sensing
Burner System		Single Orifice Premixed Fuel Injection Metal Fiber Premix Burner
Gas Valve System		Dual Stage Air Ratio Negative Pressure
Minimum Flow Rate		Zero Activation
Internal Pipe Material		Copper
Dimensions		21" Diameter - 47" Height
Reserve Tank		20 Gallons
First Hour Rating at 90°F Rise		130 Gallons
Water Pressure		Min 12 - Max 150 PSI
DHW Setpoint Temperature Range		Mechanical Tempering Valve from 70 - 145°F (21 - 63°C) Factory Preset to 120°F (48.9°C)
Activation Sensing		Tank Temperature
Temperature Control		Thermistor Starts with Heating Cycle
Connection Sizes	Cold Inlet / Hot Outlet	3/4" Male NPT
	Gas Inlet	1/2", 3/4" Female NPT
Materials	Cabinet	Cold Rolled Carbon Steel
	Heat Exchanger	Stainless Steel
Safety Devices		T&P Valve, Flame Rod, Remaining Flame Detection, Fan RPM Check, Vent Blockage Detection, ECO Burner Plate (305°F), ECO Hot Water Cutoff (185°F), 1 x 5A Fuse, Intake Blockage Detection

Table 8 - Technical Specifications - *Independent DOE tested



	Description	Diameter		Description	Diameter
A	Cold Water Inlet	3/4" Male NPT	G	Gas Connection	1/2" or 3/4" Female NPT
B	Hot Water Outlet		H	Drain Valve	N/A
C	Exhaust	3"	I	Condensate System	1/2" Male NPT
D	Electric Cord	N/A	J	Tank Sensor	N/A
E	T&P Valve	N/A	K	Display Control	N/A
F	Thermostatic Mixing Valve	N/A	L	Air Intake	3"

Figure 3 - 20 Gallon Model Dimensions and Specifications

J. Installing the Water Heater Stand, Exhaust Pipe Clamp, and Condensate Trap

! DANGER

The factory supplied water heater stand and condensate trap must be installed with the water heater. Failure to do so will result in property damage, serious personal injury, or death.

! WARNING

The water heater must be installed on a surface that can bear its weight (more than 120 lbs. when fully plumbed and full of water). Installing the water heater on a surface which cannot support its weight could result in property damage, personal injury, or death.

This water heater is too heavy for one person to lift. It is highly recommended to install the water heater with two people. Use caution as to not drop the water heater, which could damage the water heater and cause property damage and/or severe personal injury. Verify that the water heater is properly and securely mounted before leaving unsupervised. Failure to comply with the above and properly mount the water heater could result in substantial property damage, severe personal injury, or death.

This stand assembly is not seismic rated and should not be applied as such. Failure to comply with the above and properly mount the water heater could result in substantial property damage, severe personal injury, or death.

1. Assembling the Water Heater Stand

NOTE: Ensure the Water Heater Stand Assembly has shipped with all included components. See Figure 4.

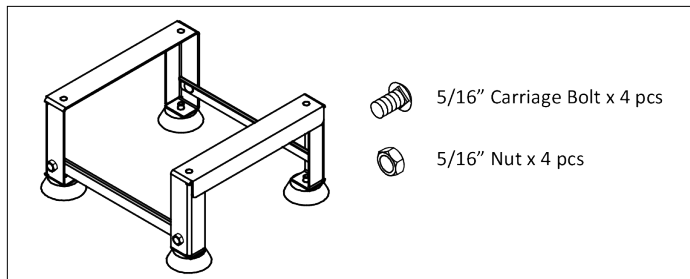


Figure 4 - Water Heater Stand and Components

1. Use a 5/16" socket and two (2) carriage bolts and nuts to connect a cross beam to two legs. See Figure 5, Step 1.
2. Use a 5/16" socket and two (2) carriage bolts and nuts to connect a cross beam to the other legs. See Figure 5, Step 2.
3. Lower the assembled stand onto the feet. See Figure 5, Step 3.
4. After the stand is assembled, it is highly recommended that two people lift and gently lower the water heater onto the water heater stand. See Figure 6.

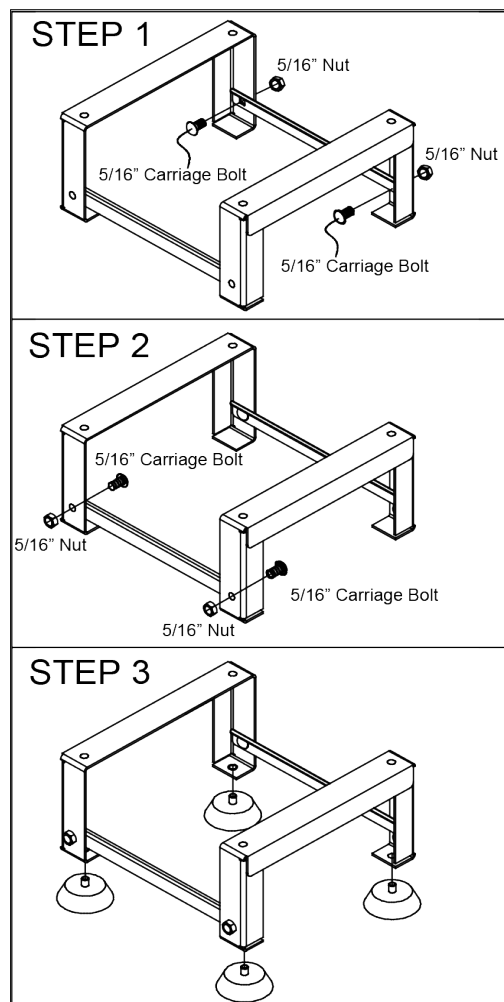


Figure 5 - Assembling the Water Heater Stand

2. Floor Mounting the Water Heater For Installations in the State of California

For installation in California this water heater must be braced or anchored to avoid falling or moving during an earthquake. See instructions for correct installation procedures. Instructions may be obtained from California Office of the State Architect, 1102 Q Street, Suite 5100, Sacramento, CA 95811.

3. Installing the Exhaust Pipe Clamp and Condensate Trap

WARNING

The factory supplied water heater stand and condensate trap must be installed with the water heater. Failure to properly install condensate trap will allow dangerous gas to contaminate the structure and result in property damage, serious personal injury, or death. **DO NOT** operate the water heater for any amount of time for any reason until the condensate trap is installed.

1. Insert the Condensate Trap into the Exhaust Adaptor. Install the Condensate Trap Clamp to hold it in place.
2. Place the exhaust pipe inside the Exhaust Adaptor. While holding the exhaust pipe in place, attach the pipe clamp to the pipe support with a screw driver and two (2) M5 screws.

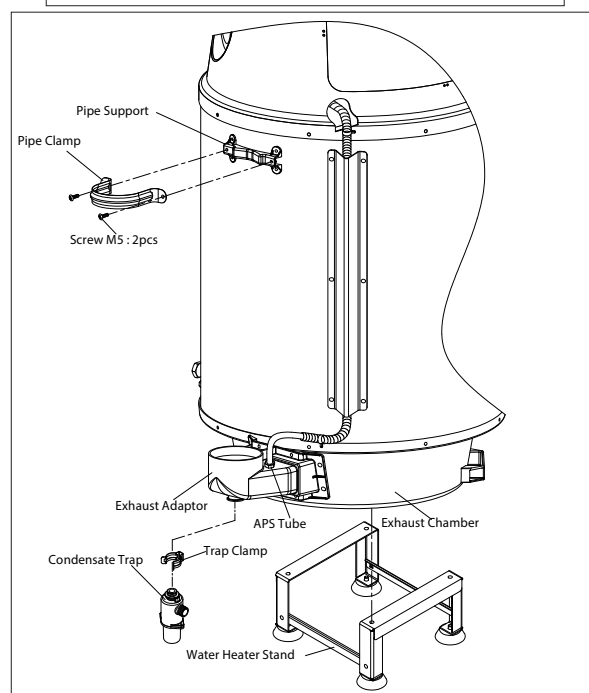
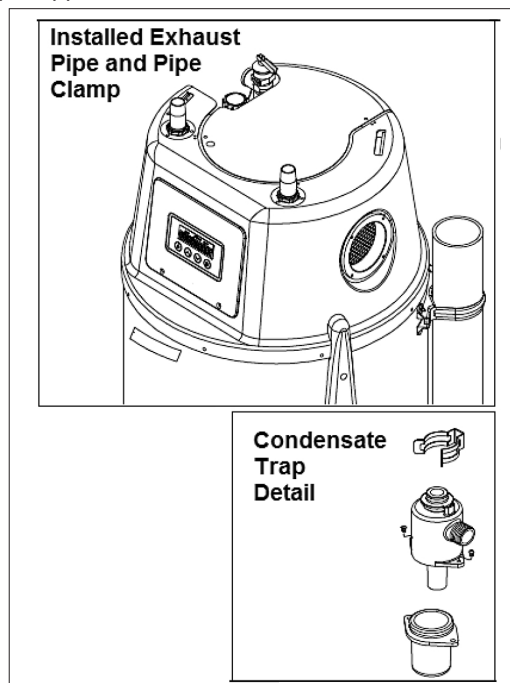


Figure 6 - Installing the Water Heater Exhaust Pipe Clamp, Condensate Trap, and Setting the Water Heater on the Stand

Part 4 - Water Piping

⚠ WARNING

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

CAUTION

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

Do not apply a torch within 12" of the water heater. If sweat connections are used, sweat tubing to the adapter before fitting adapter to the water connections on the heater. Damages due to improper installation practices ARE NOT covered by warranty.

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

Plumbing of this water heater should only be done by a qualified, licensed plumber in accordance with all local plumbing codes.

A. General Plumbing Guidelines

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.

The heater control module uses a temperature sensor to provide high limit protection. Some codes / jurisdictions may require additional external controls.

The domestic water connections must be installed in accordance with all local and national plumbing codes, or any applicable standard which prevails. The inlet (cold) and outlet (hot) ports are 3/4" on all models.

- Pipe material must be suitable to meet local codes and industry standards.
- It is recommended to use brass, stainless steel, or copper unions / nipples in the water heater system.
- When installing more than one water heater to supply higher volumes of hot water in residential applications, the number of water heaters required and the header pipe sizing needs to be properly sized to meet the total hot water demand.
- The pipe must be cleaned and without blemish before any connections are made.
- Isolation (shutoff valves) should be used to ease future servicing.
- All water piping should be insulated.

It is recommended to install a sweat shut-off valve and a union in the cold inlet piping and hot outlet to ease future servicing. If there is a backflow preventer or any type of a no return valve in the system, install an additional tee here, suitable for a potable hot water expansion tank.

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

CAUTION

Ensure the cold water inlet and hot water outlet pipes are not reversed. Doing so will cause the water heater to operate improperly and void warranty. Ensure the hot and cold lines are connected properly.

B. 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.

C. 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.

⚠ WARNING

Expansion tanks must be sized according to total system volume. This includes all length of pipe, all fixtures, heaters, etc. Failure to properly size for system expansion could result in wasted time, money, possible property damage, serious personal injury, or death.

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.**

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

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

D. Piping the Water Heater

CAUTION

Use at least the MINIMUM pipe size for all water heater loop piping. This is to avoid the possibility of inadequate flow through the water heater. Using less than the required minimum pipe size and piping could result in system problems, property damage, and premature water heater failure. Such problems ARE NOT covered by product warranty.

Use both thread tape and pipe dope to connect to the 3/4" domestic water inlet and outlet. Tankless isolation valves between the city water supply and tank inlet are recommended for ease of service.

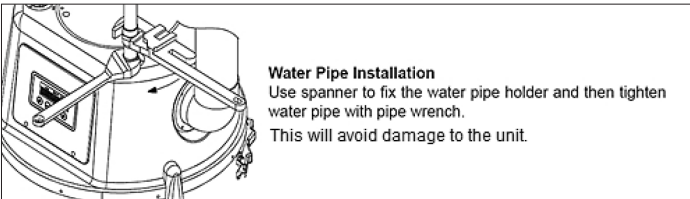


Figure 7 - Installing the Water Pipes

E. Applications

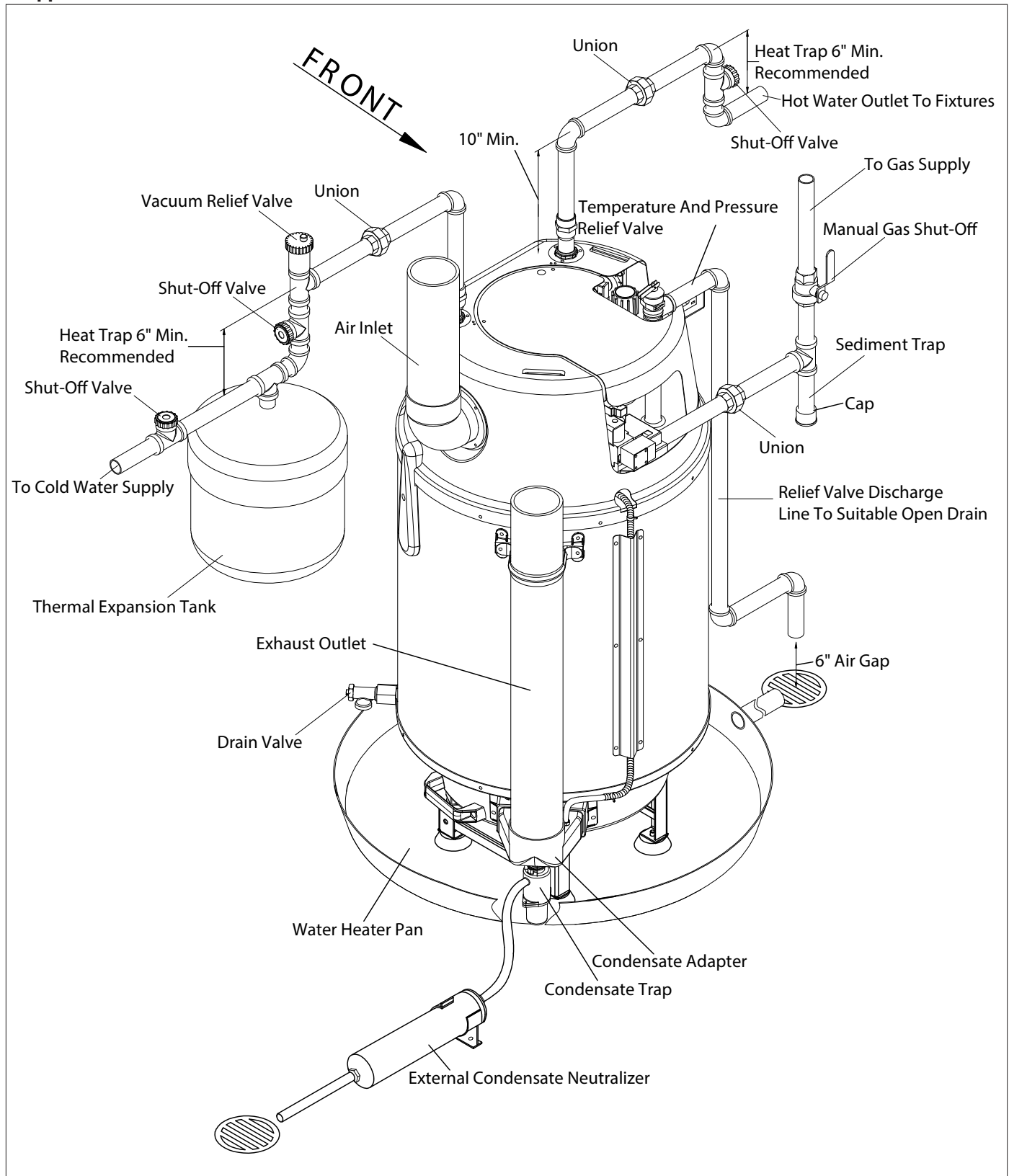


Figure 8 - Typical Installation

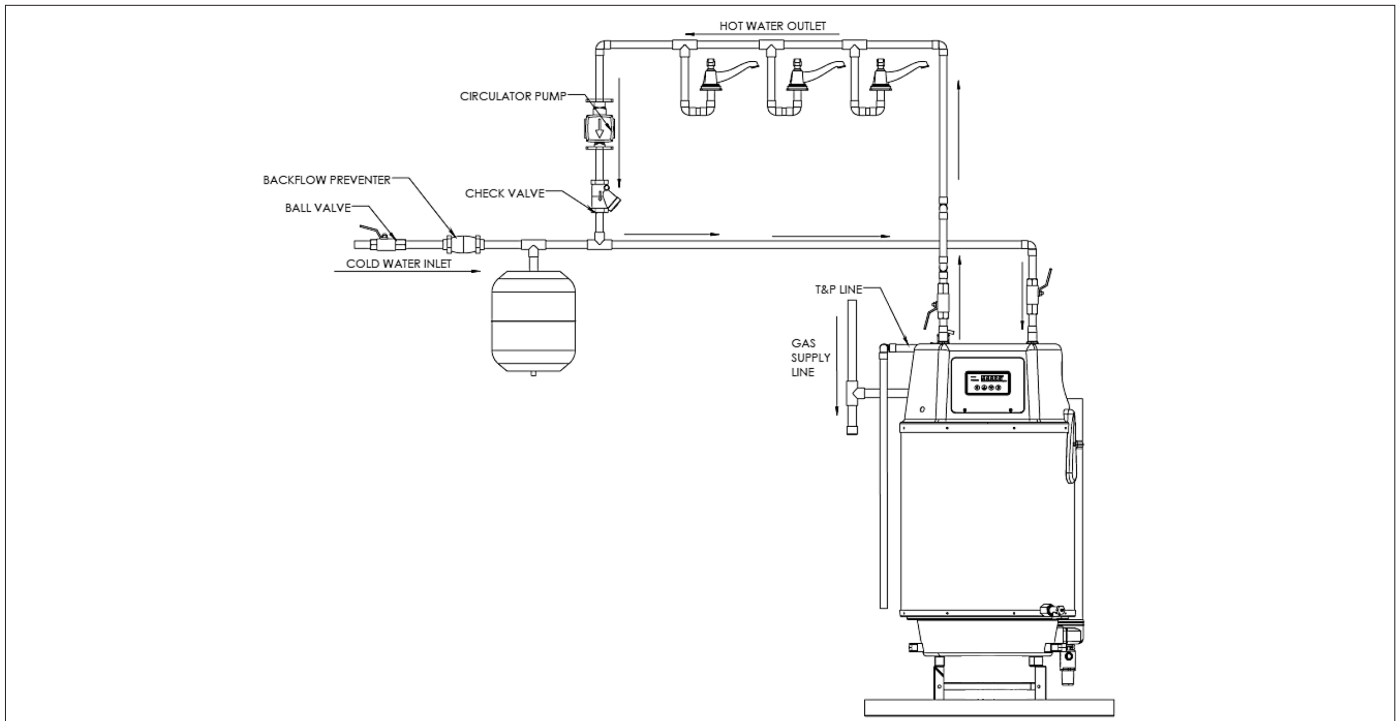


Figure 9 - Single Water Heater with Recirculation

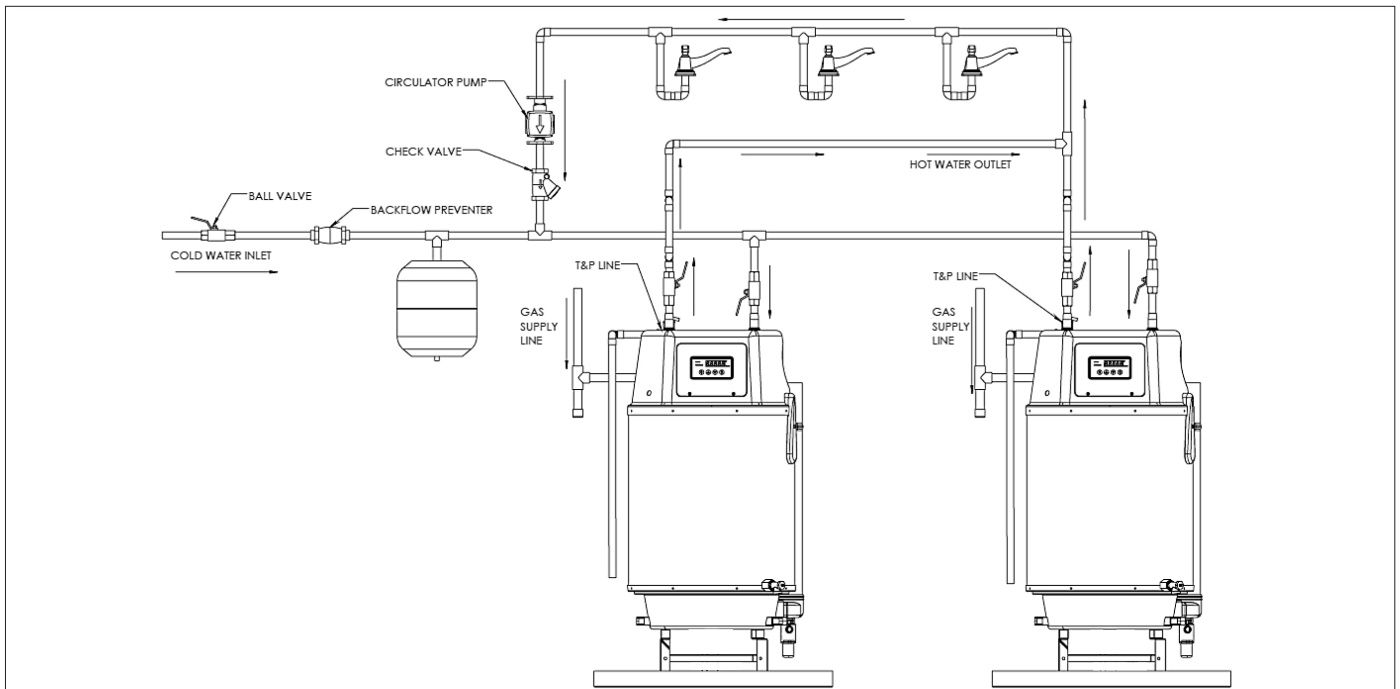


Figure 10 - Two Water Heaters with Recirculation

NOTES:

1. Minimum pipe size should match 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. All circulators should have an integral flow check.
4. Drains and check valve between water heater and piping will assist in purging air from system.
5. These drawings are 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 breaker per 248 CMR.
6. Always shut off power to the water heater or isolate the heater from the system if ANY plumbing work is to be done. Running the water heater without water will result in dry-firing.
7. Thermostatic mixing valve should be set 5°F below the maximum stored tank temperature setpoint. For example: 125°F stored tank temperature setpoint = 120°F thermostatic mixing valve setpoint.

NOTE: These drawings are meant to show system piping concept only. Installer is responsible for all equipment and detailing required by local codes.

WARNING

Pump control such as aquastat or timer must be used in recirculation applications or long burner runtime will occur and cause premature failure. Daily usage should not exceed 6 hours of burner runtime. Failure to comply WILL VOID product warranty.

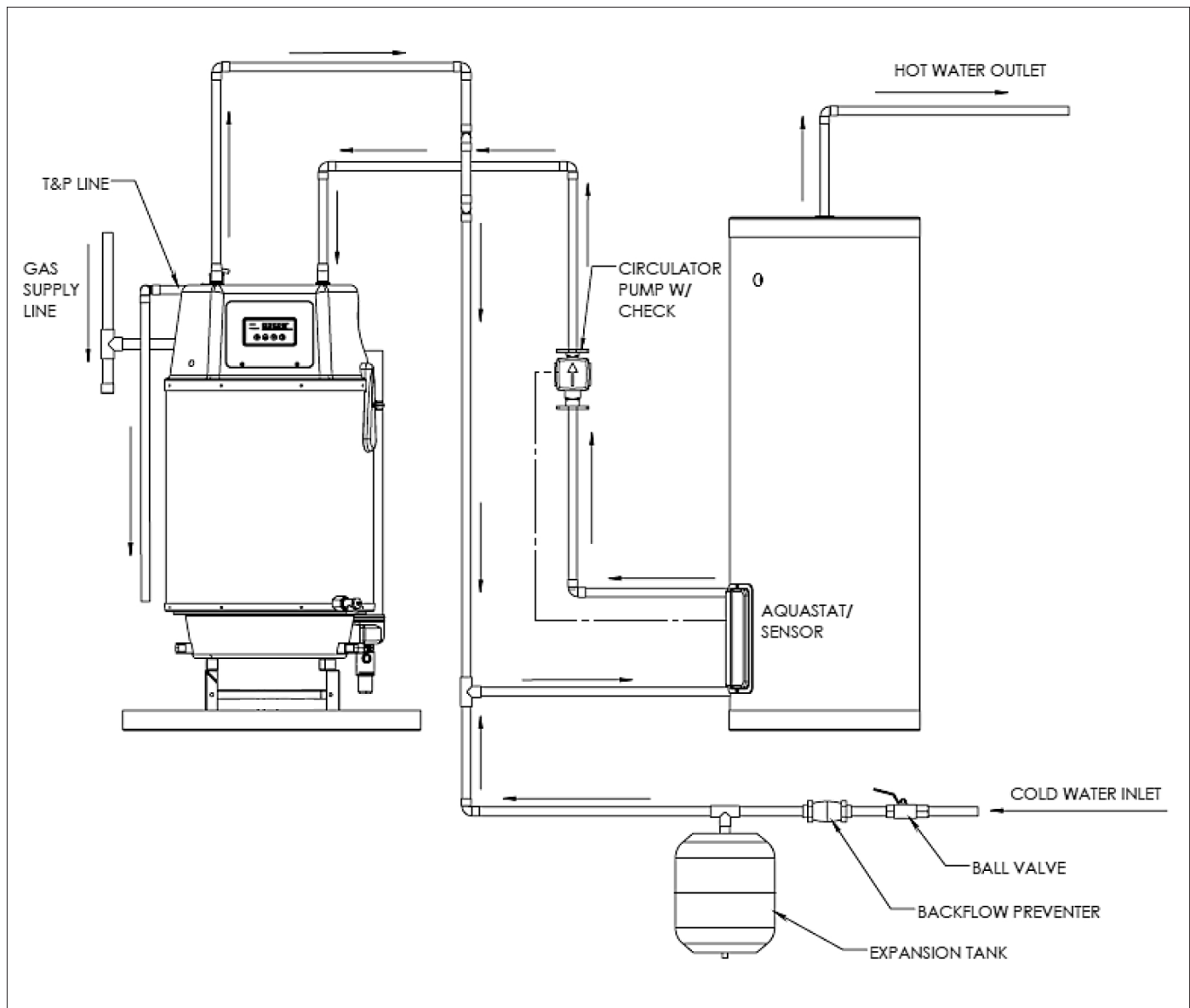


Figure 11 - Water Heater with Storage Tank

NOTES:

1. Minimum pipe size should match 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. All circulators should have an integral flow check.
4. Drains and check valve between water heater and piping will assist in purging air from system.
5. These drawings are 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 breaker per 248 CMR.
6. Always shut off power to the water heater or isolate the heater from the system if ANY plumbing work is to be done. Running the water heater without water will result in dry-firing.
7. Thermostatic mixing valve should be set 5°F below the maximum stored tank temperature setpoint. For example: 125°F stored tank temperature setpoint = 120°F thermostatic mixing valve setpoint.

NOTE: These drawings are meant to show system piping concept only. Installer is responsible for all equipment and detailing required by local codes.

NOTES:

1. The Heating Application Kit (Part # 8100P-049, not included with the water heater) MUST BE installed when using an air handler. Failure to install the Heating Application Kit when using the water heater for heating applications WILL VOID product warranty.
2. Minimum pipe size should match connection size. Upsize pipe accordingly if greater flow is required.
3. 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.
4. All circulators should have an integral flow check.
5. Drains and check valve between water heater and piping will assist in purging air from system.
6. These drawings are 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 breaker per 248 CMR.
7. Always shut off power to the water heater or isolate the heater from the system if ANY plumbing work is to be done. Running the water heater without water will result in dry-firing.
8. Thermostatic mixing valve should be set 5°F below the maximum stored tank temperature setpoint. For example: 125°F stored tank temperature setpoint = 120°F thermostatic mixing valve setpoint.
9. When using a Recirculation Pump, ensure the pump is controlled by a timer or wall type aquastat to prevent scalding.

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: THESE DRAWINGS ARE MEANT TO DEMONSTRATE SYSTEM PIPING ONLY. THE INSTALLER IS RESPONSIBLE FOR ALL EQUIPMENT AND DETAILING REQUIRED BY LOCAL CODES.

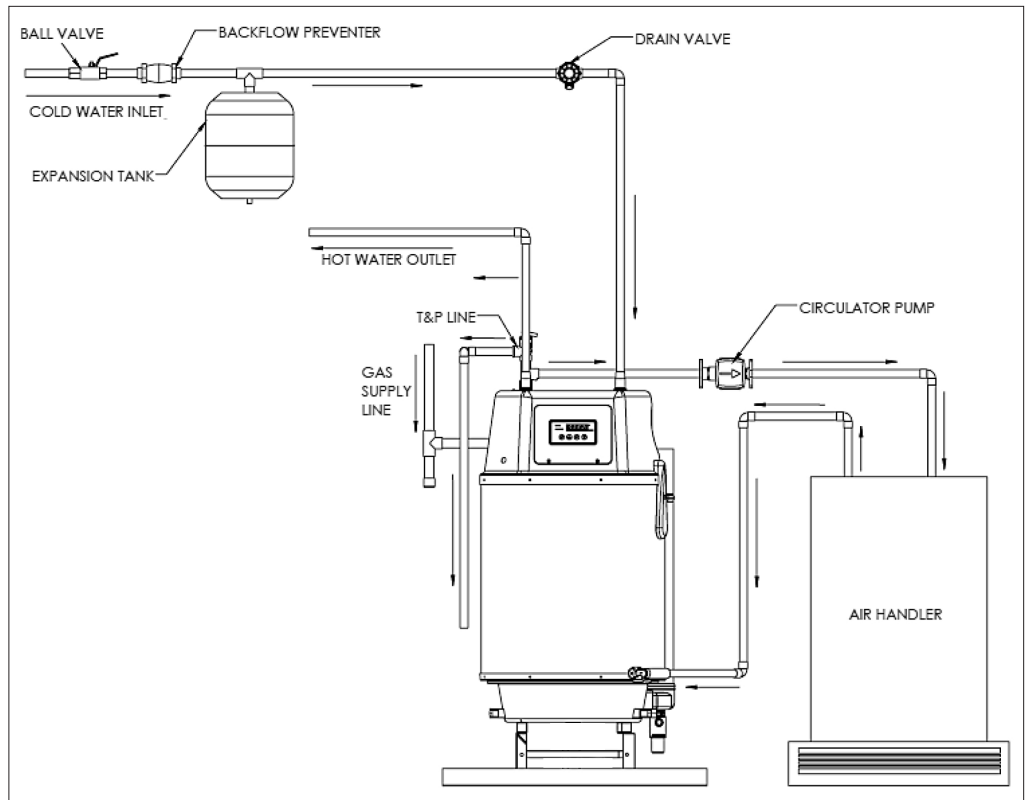


Figure 12 - Water Heater with Air Handler without Internal or External Recirculation – NOTE: There is a Built-In Flow Check in the Internal Recirculation Pump Loop

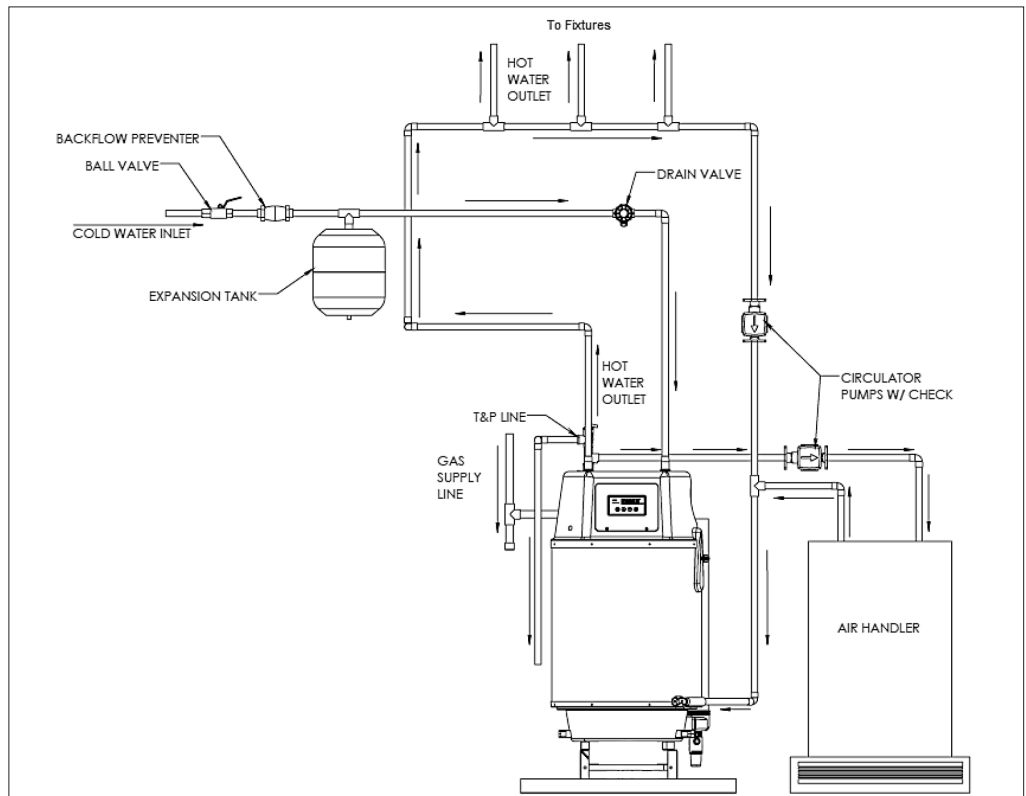


Figure 13 - Water Heater with Air Handler and Recirculation – NOTE: There is a Built-In Flow Check in the Internal Recirculation Pump Loop; NOTE: The recirculation pump needs to be controlled by a timer or wall type aquastat to prevent scalding.

F. Temperature and Pressure Relief Valve

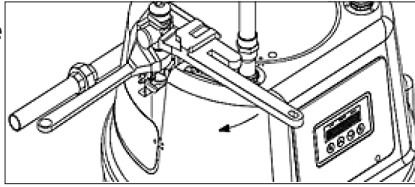
An external pressure relief valve must be installed on this water heater. When installing, observe the following guidelines. Failure to comply with these guidelines can result in substantial property damage, personal injury, or death.

This water heater must be provided with an approved 150 psi, 3/4" ASME HV Valve that must be installed on the DHW outlet line (See Figure 14). The 150 psi Pressure Relief Valve must be installed on the DHW supply line to ensure a compliant installation and safe operation.

This water heater has a high-temperature shut-off switch built in as a standard safety feature. Therefore, a "pressure only" relief valve is required. DO NOT operate this water heater before the supplied pressure relief valve is installed with sufficient relieving capacity in accordance with the ASME rating plate on the water heater.

Pressure relief valves must be installed as close to the water heater as possible. No other valves should be placed between the pressure relief valve and the appliance. DO NOT install a relief valve with a pressure rating greater than 150 psi. This is the maximum allowable relief valve setting for this water heater.

After installing the relief valve and filling and pressurizing the system, test the operation of the valve by lifting the lever. Make sure the valve discharges freely. If the valve fails to operate correctly, replace it with a new relief valve. Ensure that the maximum BTU/H rating on the pressure relief valve is equal to or greater than the maximum input BTU/H rating of the combination water heater.



T&P Relief Valve Installation (Factory Installed)

Use spanner to fix valve and then tighten T&P valve with pipe wrench.
This will avoid damage to the unit.

Figure 14 - Relief Valve Installation Details

WARNING

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

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

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

WARNING

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

- Discharge line must be connected to relief valve outlet and run to a safe place of disposal. Terminate the discharge line in a manner that will prevent possibility of severe burns or property damage should the relief valve discharge.
- Discharge line must be as short as possible and the same size as the valve discharge connection throughout its entire length.
- Discharge line must pitch downward from the valve and terminate at least 6" above the floor drain, making discharge clearly visible.
- 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 water 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, replace it with a new relief valve.
- Test relief valve at least once annually to ensure the waterway is clear. If valve does not operate, turn the water heater "off" **and call a plumber immediately.**
- Take care whenever operating relief valve to avoid scalding injury or property damage.
- For water heaters installed with only a pressure relief valve, the separate storage vessel must have a temperature and pressure relief valve installed. This relief valve shall comply with Relief Valves for Hot Water Supply Systems, ANSI Z21.22 CSA4.4.

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.

G. Filling the Heater

WARNING

The water heater must be full of water and the system fully purged BEFORE powering the water heater. When filling the water heater, open a hot water tap to release air in the water heater and piping. All air has been purged from the system when water runs freely from the faucets.

Applying power to the water heater when it is not full of water will damage the heat exchanger, and could result in property damage, serious personal injury, or death. Such damages ARE NOT covered by water heater warranty.

- Ensure any drain valves are completely closed.
- Open the shut-off valve in the cold water supply line.
- Open the hot water faucets to allow air to vent from the heater and piping.
- Allow sufficient time for the heater to completely fill with water.

Part 5 - Venting

⚠ DANGER

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

A. General

⚠ DANGER

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

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

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

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

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

⚠ WARNING

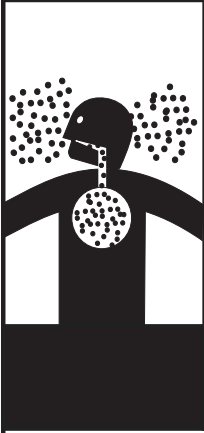
Exhaust vent adaptors are not designed as load-bearing devices, and must not be used to support exhaust vent piping. All vent pipes must be properly connected, supported, and the exhaust vent must be pitched a minimum of 1/4" per foot back to the heater to allow drainage of condensate. Failure to properly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

It is required to insert the provided exhaust and intake screens into the vent terminations to prevent blockage caused by debris or birds. Failure to keep terminations clear could result in property damage, severe personal injury, or death.

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

⚠ WARNING

Breathing Hazard - Carbon Monoxide Gas



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

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

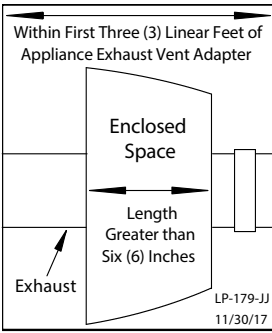
LP-304

⚠ DANGER

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

⚠ WARNING

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



*This rule applies when the exhaust vent passes through the enclosed space into another interior space, i.e. through a floor or wall from the mechanical room into another room. This rule DOES NOT apply when the exhaust vent passes through the enclosed space immediately to the exterior of the building.

B. Approved Materials for Exhaust Vent and Intake Pipe

Item	Material	Standards for Installation In:	
		United States	Canada
Pipe and Fittings Approved for Intake ONLY	ABS*	ANSI/ASTM D2661	ANSI/ASTM D2661
Pipe Approved for Intake OR Exhaust Vent	PVC Schedule 40/80	UL-1738 or ANSI/ASTM D1785	UL-1738 or ULC-S636
	PVC-DWV Schedule 40/80	UL-1738 or ANSI/ASTM D2665	
	CPVC Schedule 40/80	UL-1738 or ANSI/ASTM F441	
	Polypropylene	UL-1738 or ULC-S636	
	Stainless Steel AL29-4C	Certified for Category IV and Direct Vent Appliance Venting	
Pipe Fittings	PVC Schedule 40	UL-1738, ANSI/ASTM D2466 or D2665	UL-1738 or ULC-S636
	PVC Schedule 80	UL-1738, ANSI/ASTM D2467 or D2665	
	CPVC Schedule 40	UL-1738 or ANSI/ASTM F438	
	CPVC Schedule 80	UL-1738 or ANSI/ASTM F439	
Pipe Cement	ABS*	ANSI/ASTM D2235	ANSI/ASTM D2235
	PVC	ANSI/ASTM D2564	ULC-S636 Approved Cements and Primers
	CPVC	ANSI/ASTM F493	
Pipe Primer	PVC / CPVC	ASTM F656	

DANGER

- The exhaust and intake components installed with this appliance must be used for near appliance piping BEFORE transitioning to the approved materials listed above. DO NOT REMOVE these installed components. Doing so WILL VOID appliance warranty.
- In the US/Canada, PVC vent pipe and fittings SHALL NOT BE USED within the closet or alcove. Only approved CPVC, Polypropylene, or Stainless Steel vent pipe and fittings may be used.
- PVC / CPVC pipe and fittings of the same diameter are considered interchangeable.
- The use of cellular core PVC (ASTM F891), cellular core CPVC, or Radel® (polyphenolsulfone) in exhaust venting systems is prohibited.
- Covering non-metallic vent pipe and fittings with thermal insulation is prohibited.
- When installing AL29-4C vent piping, DO NOT mix AL29-4C piping from different manufacturers unless using adapters specifically designed for the purpose by the manufacturer.
- DO NOT mix components from different venting systems without proper adapters. The vent system could fail, causing leakage of flue products into the living space. Use only the approved pipe and fitting materials, and primer and cement specifically designed for the material used, as listed in the above table.
- A double wall vent or insulated material may be used when using stainless steel vent material in a freezing climate.
- *ABS may be used for air intake applications ONLY.
- Contact the venting material manufacturer if there is any question about the applicability of the proposed venting material.

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

Table 9 - Approved Materials for Exhaust Vent and Intake Pipe

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

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

DANGER

You must not use "B" vent in an exhaust application. "B" vent is for intake applications ONLY. Using "B" vent in an exhaust application will result in serious injury or death.

C. Additional Requirements for Installation in Canada

1. Installations must be made with a vent pipe system certified to ULC-S636.
2. The first three (3) feet of vent pipe from the appliance flue outlet must be readily accessible for visual inspection.
3. The components of the certified vent system must not be interchanged with other vent systems or unlisted pipe / fittings.

D. Exhaust Vent and Intake Pipe Location

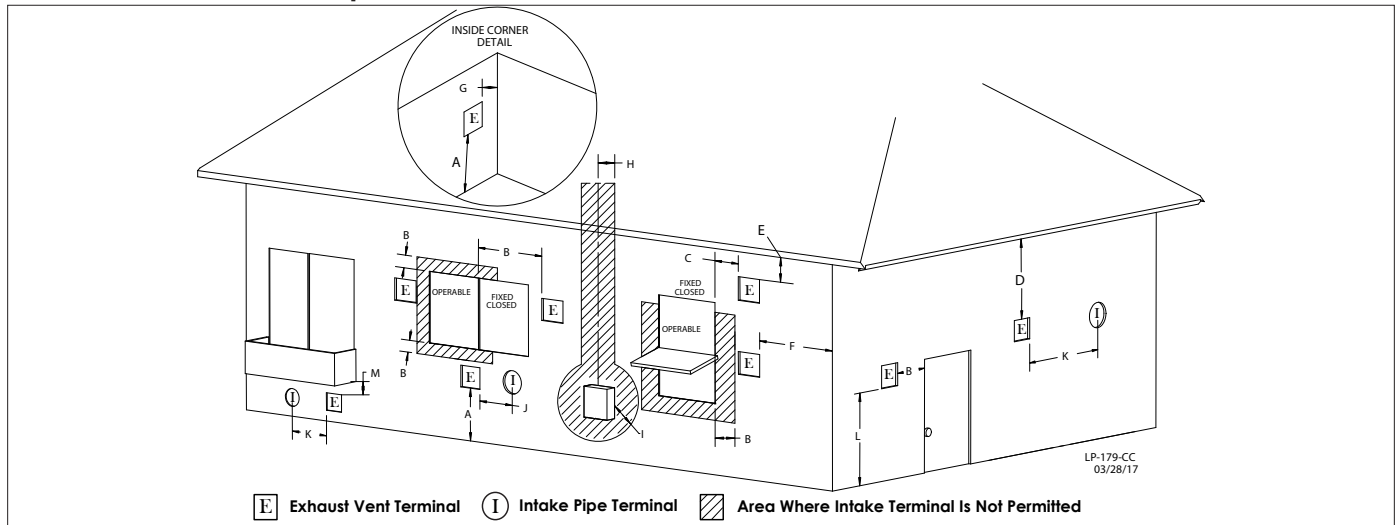


Figure 15 - Exit Terminals for Direct Vent Systems - ANSI Z223.1 / NFPA 54 for US and CAN/CSA B149.1 for Canada

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

Table 10 - Vent Termination Clearances - *NOTE: For clearances not specified in ANSI Z223.1 / NFPA 54 for US and CAN/CSA B149.1 for Canada, please use clearances in accordance with local installation codes and the requirements of the gas supplier.

⚠ WARNING

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

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

E. Exhaust Vent and Intake Pipe Sizing

1. The exhaust vent and intake pipe adapters are 3".
 2. The total equivalent length of 3" exhaust vent and intake pipe **should not exceed one hundred (100) feet (30m).**

a. The equivalent length of elbows, tees, and other fittings are listed in the Friction Loss Table.

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

Exhaust Vent Equivalent Length = (2x5) + 10 = 20 feet.

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

Intake Pipe Equivalent Length = (2x5) + 3 + 10 = 23 feet.

Finally, if a concentric kit is used we find:

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

The total equivalent length is 46 feet, well below the maximum of 150 feet.

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

3. The minimum total equivalent length is 7 feet (2.1m).

NOTE: The intake pipe and exhaust vent lengths do not have to be of equal length. There is no balancing requirement between intake and exhaust.

It is important to ensure an airtight seal from the water heater collar to the vent terminations. It is EXTREMELY IMPORTANT that the maximum allowed combined venting lengths are not exceeded. See Table 9 for a list of Approved Vent Materials and Table 12 for Approved Vent Lengths.

3" Combined Vent Length	
Minimum	Maximum
7' (2.1M)	100' (30M)
Maximum # of 90° Elbows	
3"	
8	

Table 12 - Approved Vent Lengths

WARNING

Vent adaptors are not designed as load-bearing devices, and must not be used to support exhaust vent piping. All vent pipes must be properly connected, supported, and the exhaust must be pitched a minimum of ¼" per foot back to the water heater 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.

Failure to install the appliance within the minimum and maximum vent length requirements could result in improper product operation and property damage, serious personal injury, or death.

Friction Loss Equivalent in Piping and Fittings	
Fittings or Piping	Equivalent Feet
90 Degree Elbow	5' (1.5m)
45 Degree Elbow	3' (0.9m)
Coupling	0'
Air Inlet Tee	0'
Straight Pipe	1' (0.3m)
Concentric Kit	3' (0.9m)
V1000 3" Kit	1' (0.3m)

Table 11 - NOTE: Consult Polypropylene venting instructions for friction loss and pressure drop equivalents.

F. Exhaust Vent and Intake Pipe Installation

WARNING

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

1. Use only solid PVC, CPVC, or stainless steel pipe or a Polypropylene vent system approved for use with Category IV appliances. ABS pipe material may be used on air inlet piping **only**.
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. Ensure the vent is located where it will not be exposed to prevailing winds.
5. In all roof venting applications, exhaust discharge must point away from the pitch of the roof.
6. If the exhaust vent is to be terminated in a walled off area (such as a roof with a parapet wall), ensure the exhaust vent terminates a minimum of 10' from nearest wall and extends level with or above the top of the wall. This will ensure flue gas does not get trapped and possibly recirculated into the intake air pipe, which could contaminate the combustion air.
7. To prevent water leakage, install adequate roof flashing where the pipe enters the roof.
8. If it can be avoided do not locate vent directly over public walkways, driveways, or parking lots in climates where freezing conditions are possible. Condensate could drip and freeze, resulting in a slip hazard or damage to vehicles or machinery.
9. Due to potential moisture build-up, sidewall venting may not be the preferred venting option. To save time and cost, carefully consider venting installation and location.
10. Horizontal lengths of exhaust vent must slope back towards the appliance not less than ¼" per foot to allow condensate to drain from the vent pipe.
11. Do not terminate vent where vapors can accumulate and harm people or pets.
12. When it can be avoided, do not terminate vent where vapors can damage shrubs or plants. Such damages are not covered by product warranty.
13. Moisture in the exhaust gas will condense as it leaves the vent terminal. In cold weather this condensate can freeze on the exterior wall, under the eaves, and on surrounding objects, including shrubs. Some discoloration to the exterior of the building is to be expected. However, improper location or installation can result in severe damage to the structure or exterior finish of the building, and increase the opportunity for vent blockages and nuisance

shutdowns.

14. In vacant chimney applications, install and seal a rain cap over existing chimney openings.

15. 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.

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

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

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

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

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

In addition:

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

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

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

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

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

- a. Throughout the entire developed length:
 - i. Labels must be placed every ten feet for exposed/visible piping; or
 - ii. Labels must be placed every three feet for concealed piping.
- b. At all changes of direction;
- c. On each side of a penetration through a partition, wall or ceiling; and
- d. The labels shall be black lettering that:
 - i. Indicates that the piping is used for ventilation, make-up, or combustion air intake, and
 - ii. The letters shall be sized equal to a minimum of the pipe diameter. However, for piping with a diameter exceeding two inches, said lettering does not need to be larger than two inches.

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

Description	Stock Code
3" PVC Concentric Termination Kit	KGAVT0601CVT
3" Stainless Steel Termination Kit	V1000
3" Polypro Vent Kit	8400P-001

Table 13 - Optional Vent Kits


G. Applications

1. Direct Vent Installation of Exhaust and Intake

If installing a direct vent option, combustion air must be drawn from the outdoors directly into the water heater 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 exhaust vent and intake pipe can be routed through the building and properly terminated. Different vent terminals can be used to simplify and eliminate multiple penetrations in the building structure (see Optional Equipment in Venting Section). The exhaust vent and intake pipe lengths, routing and termination methods must all comply with the methods and limits given in the Venting section of this manual.

When installing a combustion air intake from outdoors, care must be taken to utilize uncontaminated combustion air. **NOTE:** To prevent combustion air contamination, see Table 7.

 WARNING
<p>All vent pipes must be glued, properly supported, and the exhaust pitched a minimum of 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 water heater and the balance of 4 foot intervals on the vent pipe. Venting must be readily accessible for visual inspection from the first three feet from the heater.</p>
<p>Take extra precaution to adequately support the weight of vent pipes terminating through the roof. Failure to properly support roof terminated piping could result in property damage, serious injury, or death.</p>

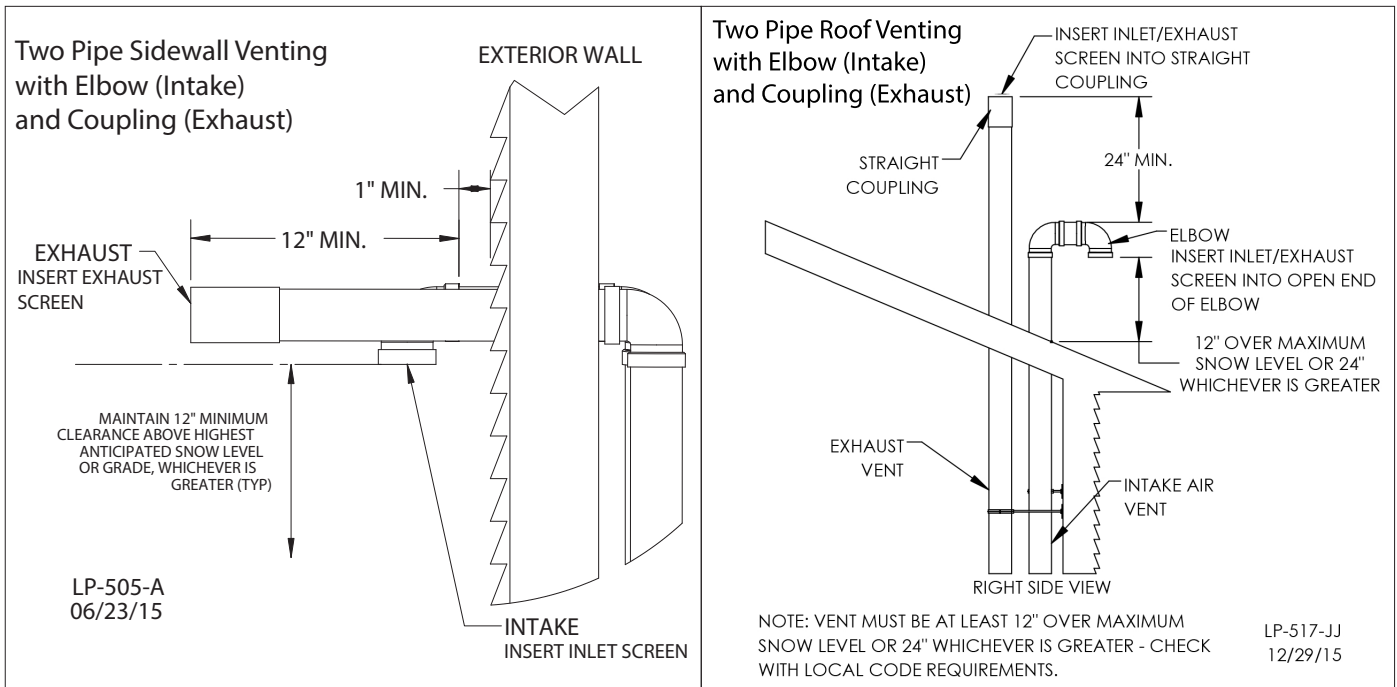


Figure 16 - Direct Vent, Roof and Sidewall Vent Terminations

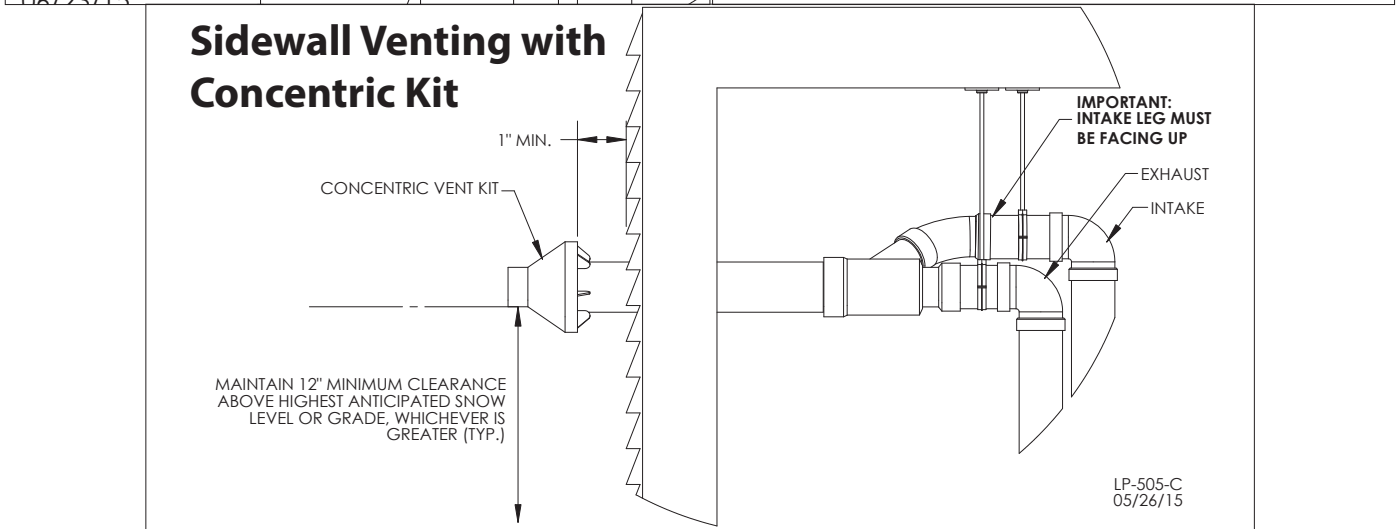
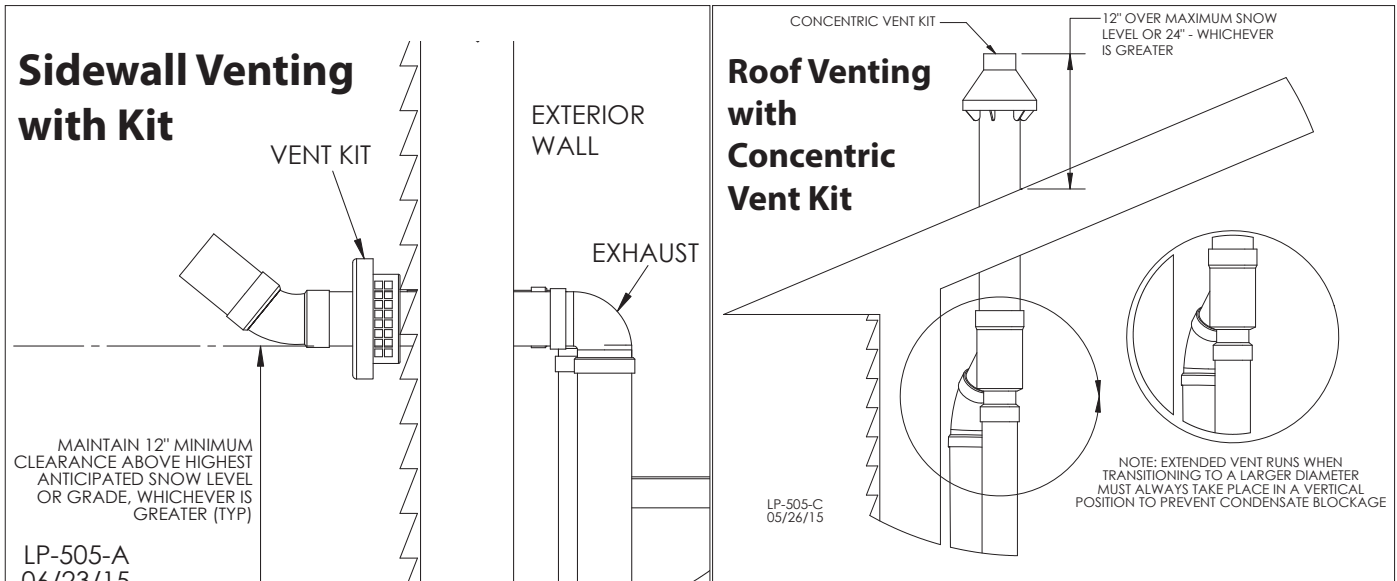


Figure 17 - Direct Vent, Vent Terminations with Optional Kits (NOT INCLUDED WITH THE APPLIANCE)

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

Snorkel Venting (Two Pipe Sidewall Venting Terminations Beneath an Overhang)

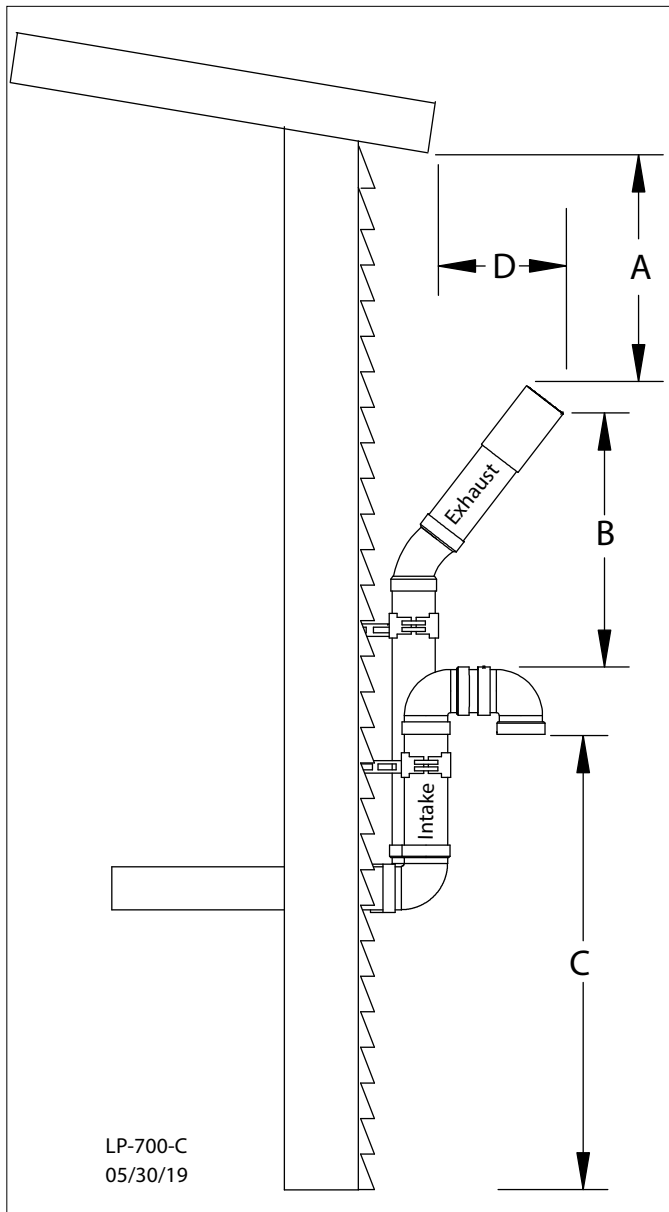


Figure 18 - Two Pipe Sidewall (Horizontal Snorkel) Venting

NOTES:

- For every 1" of overhang, the exhaust vent must be located 1" vertical below the overhang (12" minimum). Overhang means top of building structure (roof) and not two adjacent walls (corner of building).
- Maintain minimum separation between exhaust vent and air intake sidewall terminations, as required by local codes.
- Maintain 12" minimum clearance above highest anticipated snow level or grade (whichever is greater).
- The exhaust vent must extend a minimum of 12" to a maximum of 24" beyond the building.

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

Venting Below Grade

For installations that exit the wall below grade:

- Excavate the site to a point where the pipes are to exit as shown in Figure 19.
- Ensure the wall is fully sealed where the pipes penetrate.
- The exhaust vent / air intake piping **MUST** be secured to the side of the building above grade, as shown, to provide rigidity.
- Ensure that the exhaust vent / air intake clearances are maintained.

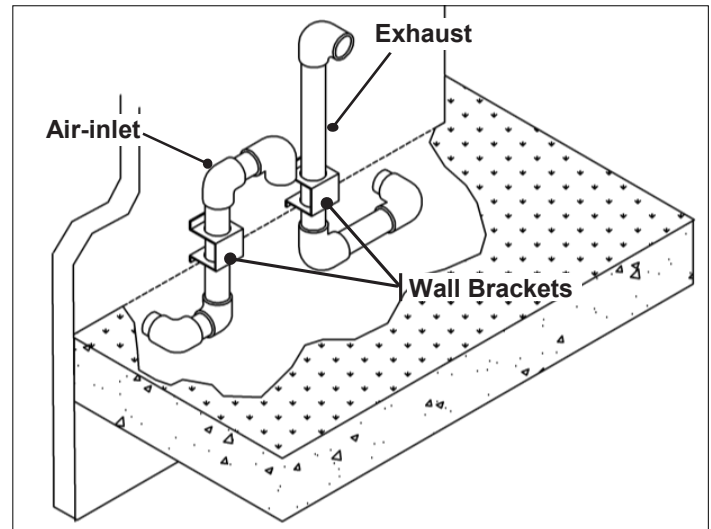


Figure 19 - Venting Below Grade

Outdoor Venting

Vent piping outside the building is permitted under the following conditions:

- The maximum length outside the building is 20 feet (6.1 m). Note that outdoor length must be included in the overall vent length calculation.
- All normal termination clearances are maintained.
- The pipe is supported every 24" (610 mm).
- The exhaust and air intake are sloped back to the appliance 1/2" elevation for every linear foot (13 mm for every linear 305 mm).

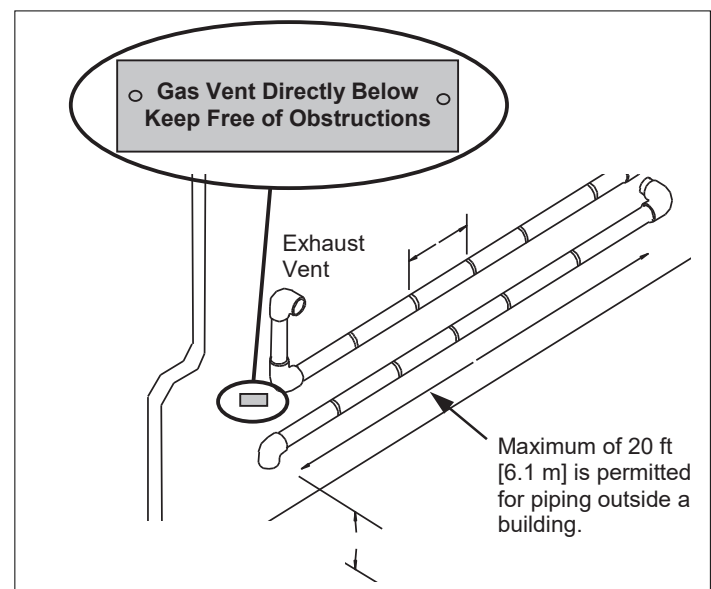


Figure 20 - Outdoor Venting

Screen Installation

After connecting the intake air and exhaust vent pipes, it is required to install the included screens into the exhaust vent and intake pipe terminations to prevent damages to the unit due to blockages. See Figure 21 for installation detail.

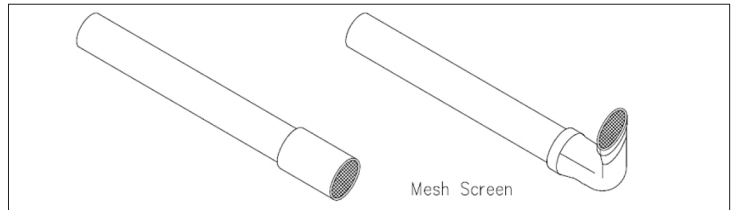


Figure 21 - Screen Installation - NOTE: Vent termination elbow is meant to be installed open end facing the ground. Orientation in Figure 21 is meant to demonstrate proper Vent Screen installation ONLY.

WARNING

Do not connect any other appliance vents to the water heater exhaust vent or intake pipes. Failure to do so could result in property damage, severe personal injury, or death.

2. Venting Through an Existing System

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

DANGER

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

CAUTION

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

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

Concentric Venting Through an Existing System

NOTE: The following instructions refer only to venting through an existing vent system, and not to venting with HTP's optional concentric vent kits. Refer to Concentric Vent Kit installation manual (LP-166) for further information on venting with the optional concentric vent kits. Concentric venting through an existing system must run vertically through the roof. See Table 14 for proper minimum vent sizing. Use only the approved venting materials specified in Table 9 for piping the system. All instructions listed in this Venting section apply. See Figures 22-1 and 22-2 for venting demonstrations.

Vent / Air Inlet Size	Minimum Existing Vent / Chase Size
3"	5"

Table 14 - Minimum Existing Vent / Chase Sizing

DANGER

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

Chase Venting Through an Existing System

When venting as a chase, follow all instructions included in this Venting section, including those in the previous Concentric Venting Through an Existing System section. See Figure 22-3 for chase venting demonstration.

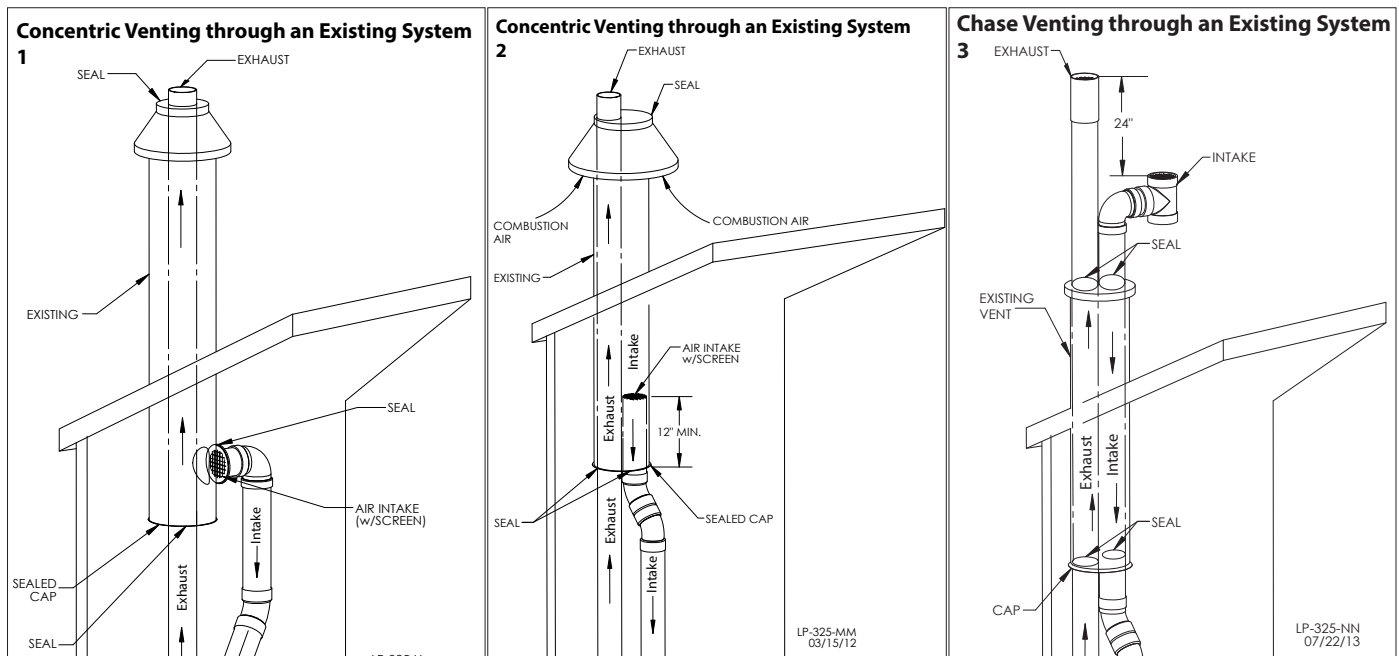


Figure 22 - 1, 2 - Concentric Venting Through an Existing System, 3, Chase Venting Through an Existing System

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

3. Power Venting, Indoor Combustion Air 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 7.**

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 water heater input. **Never obstruct the supply of combustion air to the water heater.** If the water heater is installed in areas where indoor air is contaminated (see Figure 23) it is imperative that the water heater be installed as direct vent so that all combustion air is taken directly from the outdoors into the water heater intake connection.

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

Confined space is space with volume less than 50 cubic feet per 1,000 Btu/hour (4.8 cubic meters per kW) of the total input rating of all fuel-burning appliances installed in that space. Rooms connected

directly to this space, through openings not furnished with doors, are considered part of the space.

When drawing combustion air from inside a conventionally constructed building to a confined space, such space should be provided with two permanent openings: one located 6" (15 cm) below the space ceiling, the other 6" (15cm) above the space floor. Each opening should have a free area of one square inch per 1,000 Btu/hr (22cm²/kW) of the total input of all appliances in the space, but not less than 100 square inches (645cm²).

If the confined space is within a building of tight construction, air for combustion must be obtained from the outdoors as outlined in the Venting section of this manual. See Figures 24 and 25.

WARNING	
Insufficient air supply used with a Power Vented appliance may cause the building to experience negative pressure inside. Negative pressure is not allowable by most building codes and can cause back drafting of cold air from outside through the unit, potentially freezing the heat exchanger / tank.	

Model	Water Heater Capacity	Outside Air Area	Inside Air Area	Minimum Required Air Volume
100F	Max. 100,000 Btu/Hr.	25 sq. in.	100 sq. in.	5,000 cu. ft.

Table 15 - Minimum Air Supply to Water Heater

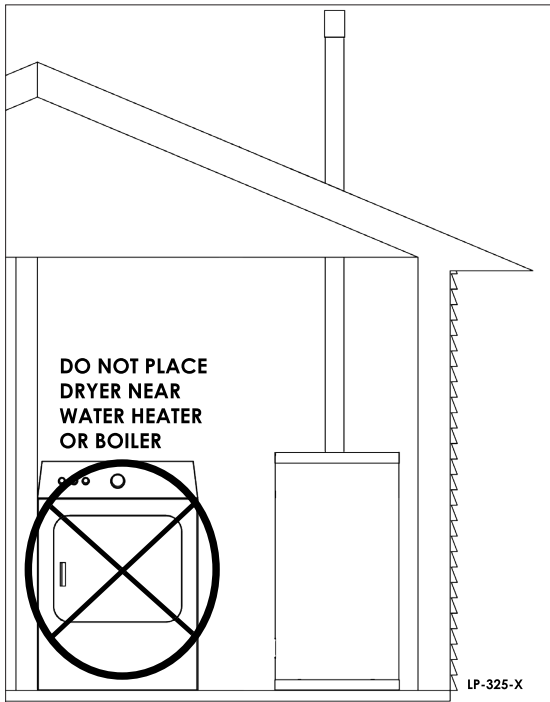
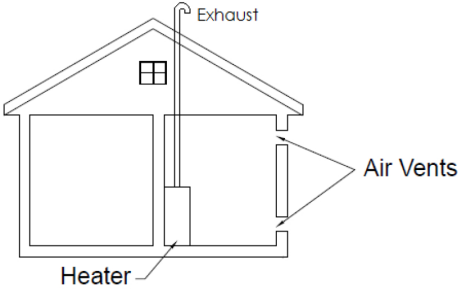


Figure 23 - Do Not Place Appliance Near Dryer

WARNING	
Breathing Hazard - Carbon Monoxide Gas	
	<ul style="list-style-type: none"> • Do not operate heater if flood damaged. • Install vent system in accordance with local codes and manufacturers installation instructions. • Do not obstruct heater air intake or exhaust. Support all vent piping per manufacturers installation instructions. • Do not place chemical vapor emitting products near unit. • According to NFPA 720, carbon monoxide detectors should be installed outside each sleeping area. • Never operate the heater unless it is vented to the outdoors. • Analyze the entire vent system to make sure that condensate will not become trapped in a section of vent pipe and therefore reduce the open cross sectional area of the vent.
Breathing carbon monoxide can cause brain damage or death. Always read and understand instruction manual.	
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<p>Air Supply from Outside Building</p>	
<p>When combustion air is supplied directly through an outside wall, such as intake louver openings into the dwelling, each opening should give a minimum free area of one square inch per 4,000 BTU/hour on the total input ratings of all appliances in the enclosed area.</p>	 <p>The diagram shows a cross-section of a house with a gabled roof. A heater is located inside, with an exhaust pipe extending through the roof. On the right side of the house, there are two air vents in the wall. Labels include 'Exhaust' pointing to the roof pipe, 'Heater' pointing to the unit inside, and 'Air Vents' pointing to the wall openings.</p> <p style="text-align: center;">Figure 24 - Air Supply from Outside Building</p>

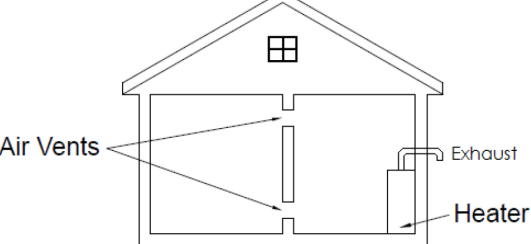
<p>Air Supply from Inside Building</p>	
<p>When combustion air is supplied from inside the building, each opening should give a minimum free area of one square inch per 1,000 BTU/hr on the total input ratings of all appliances in the enclosed area. These openings should never be less than 40 sq. in. NOTE: The minimum required total space volume without air vents is 50 cu. ft. per every 1,000 BTU/hr.</p>	 <p>The diagram shows a cross-section of a house with a gabled roof. A heater is located inside, with an exhaust pipe extending through the roof. On the left side of the house, there are two air vents in the wall. Labels include 'Exhaust' pointing to the roof pipe, 'Heater' pointing to the unit inside, and 'Air Vents' pointing to the wall openings.</p> <p style="text-align: center;">Figure 25 - Air Supply from Inside Building</p>

Table 16 - Power Venting Installation Details

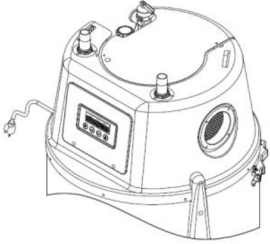
<p>How to Configure the Unit for Power Venting</p>	
<p>Leave the air intake open to configure the water heater for power vent.</p>	 <p>The image shows a cylindrical water heater unit with a control panel on the front. The panel has several knobs and a digital display. A power cord is plugged into the side of the unit. Labels include 'Exhaust' pointing to the top vent pipe and 'Heater' pointing to the unit.</p> <p style="text-align: center;">Figure 26 - Configuring the Unit for Power Venting</p>

Table 17 - Configuring the Unit for Power Venting

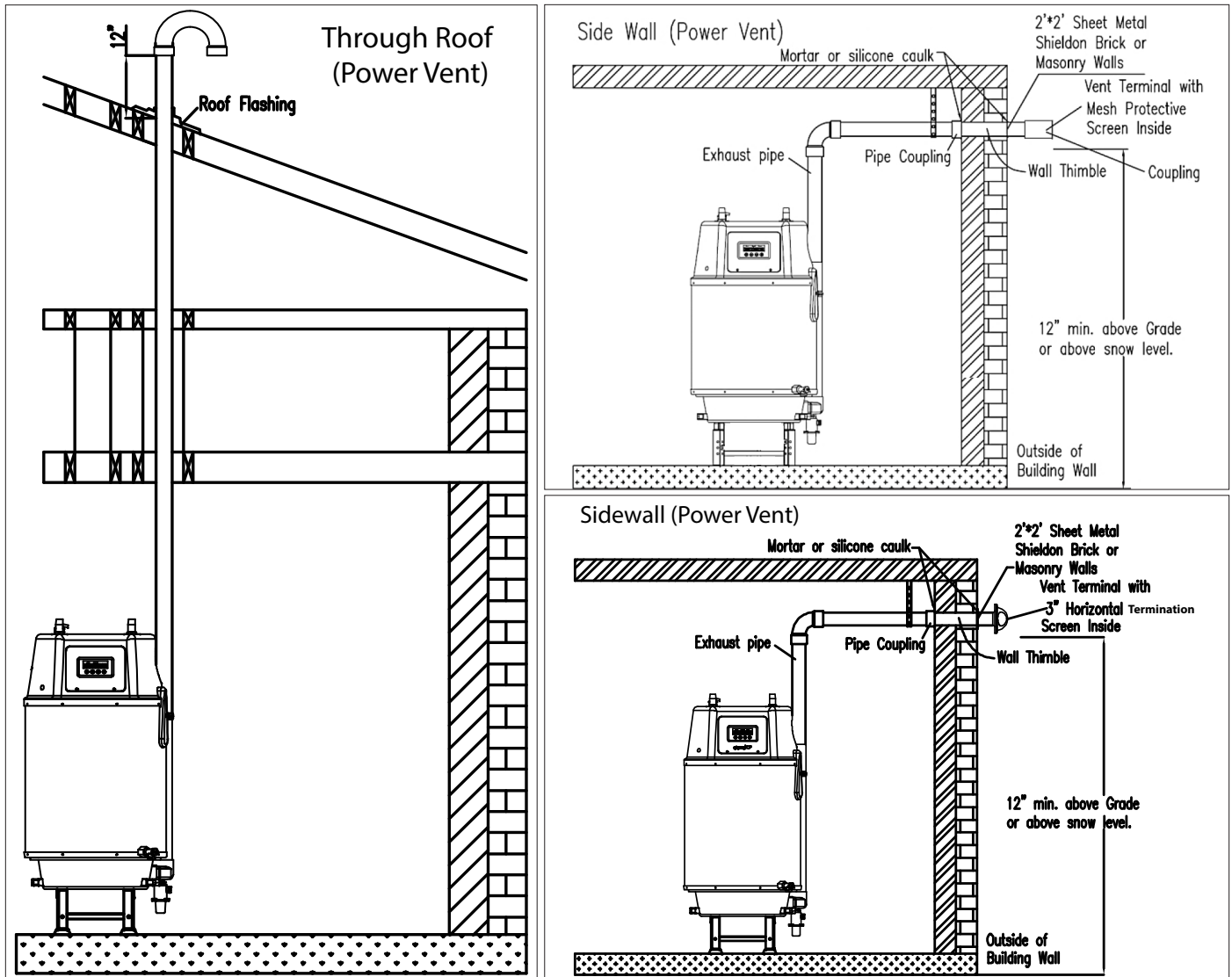


Figure 27 - Power Vent Terminations

Part 6 - Installing the Condensate Drain

CAUTION

This condensing high efficiency water heater has a condensate removal system. Condensate is water vapor derived from combustion products, similar to that produced by an automobile when it is initially started. It is very important that the condensate line is sloped down away from the heater and to a suitable drain. 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). Check with your local gas company to determine if combustion condensate disposal is permitted in your area. Install a neutralizing filter if required by local codes.

NOTES:

1. Due to its efficient design, the appliance produces condensate (water) as a normal by-product. This condensate is acidic, with a pH level between 2 and 4.5. This condensate must be drained away from the appliance and disposed in accordance with all local regulations.
2. The condensate line should be as short as possible and must be

pitched at least $\frac{1}{4}$ " per foot to properly drain. If this cannot be done, increase the condensate line and place a tee in the line to properly reduce vacuum lock in the drain line. Tees should be placed after the condensate neutralizer (if used).

3. Use corrosion-resistant materials to drain condensate. Use flexible plastic hose or tube, PVC, or CPVC pipe. PVC or CPVC pipe must comply with ASTM D1785, F441, or D2665. Cement must comply with ASTM D2564 for PVC pipe or F493 for CPVC pipe. For Canadian applications, use CSA or ULC certified flexible tube, PVC or CPVC pipe, fittings, and cement.

4. If using flexible tube, place an overflow tee in the tube line to prevent condensate backing up into the appliance if the tube should kink. Ensure the overflow tee is positioned near a drain or in a location that will not damage the surrounding area.

5. Do not reduce the size of the condensate line. The line must at minimum equal the diameter of the line included with the appliance.

6. A frozen condensate line could result in a blocked vent condition. It is very important to protect the condensate line from freezing temperatures or any type of blockage. In installations that may encounter sustained freezing conditions, the use of heat tape is recommended to avoid freezing of the condensate line. Longer condensate runs are more prone to freezing.

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

8. Local building codes may require an in-line neutralizer to be installed

(not included) to treat the condensate. See Figure 30. If required by local authorities, a condensate filter of lime crystals, marble, or phosphate chips will neutralize slightly acidic condensate (p/n 7450P-212 available from HTP). Follow all the installation instructions included with the neutralizer. If a neutralizer is installed, periodic replacement of the limestone (or neutralizing agent) will be required. The rate of depletion of the limestone varies with usage of the appliance. During the first year of appliance operation, check the neutralizer every few months for depletion.

9. Route the drain line to a nearby floor drain, laundry tub, or condensate pump. If the appliance condensate outlet is lower than the drain, you must use a condensate removal pump (kit p/n 554200 available from HTP).

NOTE: If a nearby laundry tub is used as a disposal for waste water from the washing machine, draining the condensate into this tub allows the soapy water discharge to neutralize the acidic condensate.

10. An error will appear on the appliance display if condensate line is blocked. The appliance will not operate with a blocked condensate line. It is extremely important to have this condition repaired by a qualified service technician.

11. Damages due to frozen or blocked condensate lines or leaks ARE NOT covered by warranty.

CAUTION

The condensate trap must be filled and unobstructed to allow unrestricted flow of condensate. The condensate should not be subject to freezing conditions. If the condensate is subjected to freezing or obstruction, it will result in potential water damage to the water heater and surrounding area, and possible personal injury. Such damages are not covered under warranty.

The condensate trap must be filled with water prior to using the water heater. Pour water into the exhaust adaptor until it flows out of the condensate drain before using the water heater to fill the trap. See Figure 28.

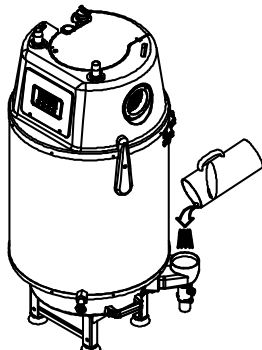


Figure 28 - Filling the Condensate Trap

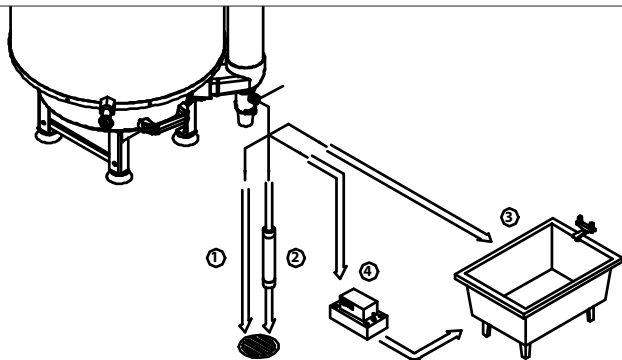



Figure 29 - Terminating the Condensate Line

CAUTION

The end of the condensate drain pipe must not be submerged in water or blocked in any way. Take measures to prevent the condensate drain lines from freezing (insulation, heat tape, etc.)

WARNING

Breathing Hazard - Carbon Monoxide Gas

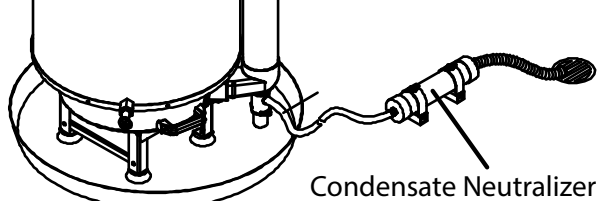


- Do not operate heater if flood damaged.
- Install vent system in accordance with local codes and manufacturers installation instructions.
- Do not obstruct heater air intake or exhaust. Support all vent piping per manufacturers installation instructions.
- Do not place chemical vapor emitting products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

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

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Condensate Piping to Floor Drain



Condensate Neutralizer

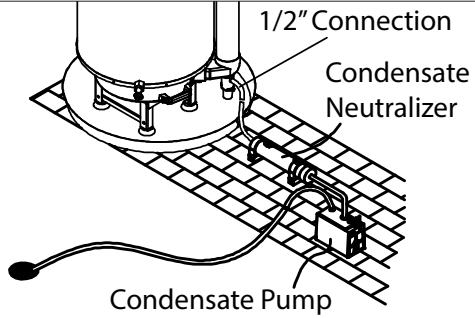
1/2" CPVC Pipe (Condensate)

Slope pipe downwards 1/4" per foot.

Floor drain

The end of the drain pipe must have an air gap.

Condensate Piping to Pump



Condensate Pump

1/2" Connection

Condensate Neutralizer

1/2" CPVC Pipe (Condensate)

Slope pipe downwards 1/4" per foot.

1/2" ID tubing*

Condensate pump

The end of the drain pipe must have an air gap.

*** Install tubing according to pump manufacturer's instructions.**

Figure 30 - Condensate Piping Details

Part 7 - Connecting Electrical Service

WARNING

Install wiring and electrically ground water heater in accordance with the authority having jurisdiction or, in the absence of such an authority, follow the National Electrical Code, NFPA 70, and/or CSA C22.1 Electrical Code-Part 1 in Canada. Failure to follow all applicable local, state, and national regulations, mandates, and building supply codes for guidelines to install the electrical power supply could result in property damage, serious personal injury, or death.

ELECTRICAL SHOCK HAZARD – To ensure safety, turn off electrical power supply at service entrance panel before making any electrical connections to avoid possible electric shock hazard. Failure to do so could result in property damage, serious personal injury, or death.

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

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. Failure to follow these instructions could result in component or product failure, serious injury, or death.

CAUTION

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

A. Wiring

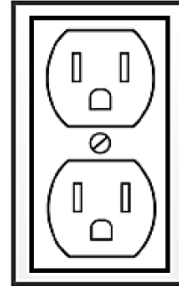
- Do not plug electrical power to the unit until all plumbing and gas piping is complete and the water heater has been filled with water.
 - The use of a surge protector is recommended to protect from power surges.
 - This water heater requires a power supply of 120 VAC/60 Hz. Do not connect 220-240 VAC to this unit. It will damage the water heater and void the warranty.
 - A means for switching off the 120 VAC power supply must be provided (circuit breaker).
 - Do not disconnect the power supply when the unit is in normal operation.
 - A battery back-up may be used to supply hot water during periods of power outages. It is recommended to install a computer grade UPS (uninterruptable power supply; true sine wave) with at least 600 VA rating for extended coverage.
1. This water heater must be properly grounded. Ensure the electrical receptacle that the water heater will be plugged into is properly grounded.
 2. Do not attach the ground wire to either the gas or water piping.
 3. The wiring diagrams in this manual are to be used for reference purposes only.
 4. Refer to these diagrams and the wiring diagrams of any external controls used with the installation when wiring the water heater. Read, understand, and follow all wiring instructions supplied with the controls.
 5. Do not disconnect the power supply when the water heater is in normal operation.

NOTE: For additional electrical protection, the use of a whole house surge protector is recommended. Damage caused by power surges is not covered by the warranty.

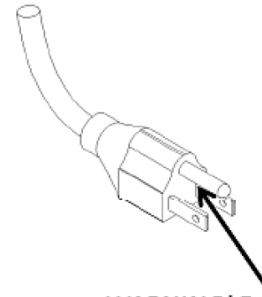
CAUTION

All units come with a factory installed 3-pronged power (grounded) plug. It is required to run a dedicated electrical line to the water heater to prevent electrical interference.

Ensure the Appliance is Properly Grounded



Grounded Electrical Outlet



WARNING! DO NOT REMOVE THIS GROUNDING PRONG FROM THE APPLIANCE PLUG!

Figure 31 - Proper Grounding - Internal Manual Power Switch

NOTICE

If the water heater display does not turn on, first check the plug. Then check the electrical panel circuit breaker and reset if necessary. If the circuit breaker trips again, do not reset. Disconnect the plug and have a qualified technician diagnose the problem.

B. Dip Switches

There are two DIP switches.

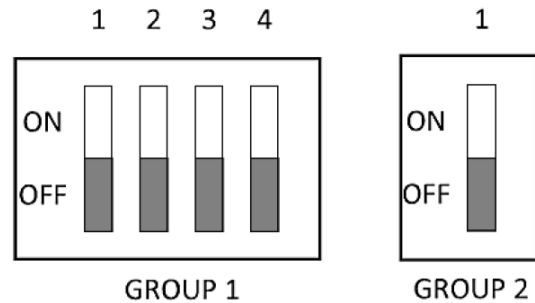


Figure 32 - DIP Switch Details

DIP Switch Group 1		
	ON	OFF (Default Position)
Switch 1		NOTE: Switches 1 - 4 are set as OFF at the Factory. These switches must remain OFF and not be changed.
Switch 2		
Switch 3		
Switch 4		
DIP Switch Group 2		
	ON	OFF (Default Position)
Switch 1	High Elevation Operation On (Above 4500 Feet)	Normal Elevation Operation On (Below 4500 Feet)

Table 18 - DIP Switch Groups - **NOTE: The Default setting for all DIP Switches is OFF.**

Maximum Flame Detecting Voltage	AC200V
Minimum Flame Detecting Voltage	AC150V
Pre-Purge Time (Tp)	5 - 10 seconds
Safety Time (Igniting Time) (Ts)	<5 seconds
Igniting Interval Time	<10 seconds
Post-Purge Time (Tip)	20 seconds
Over-Heating 1, 2, 3, Protection Detection Time	<1 second
Temperature Sensor Fault Detection Time	<10 seconds
# of Ignition Attempts (Ntl)	5
Stored Tank Temperature Setting	Three (3) Settings - Normal, Hot, Hotter
Burner Off Stored Tank Temperature	Normal - 127°F, Hot - 137°F, Hotter - 147°F
Burner On Stored Tank Temperature	Normal - 120°F, Hot - 130°F, Hotter - 140°F
High Fire Activation - Water Flow Rate	Greater than 2.0 gallons (7.57 liters)*
Low Fire Activation - Water Flow Rate	Less than 1.9 gallons (7.2 liters)*

Table 19 - System Control Settings - *NOTE: Zero Activation with Water Heater Storage Tank Capacity

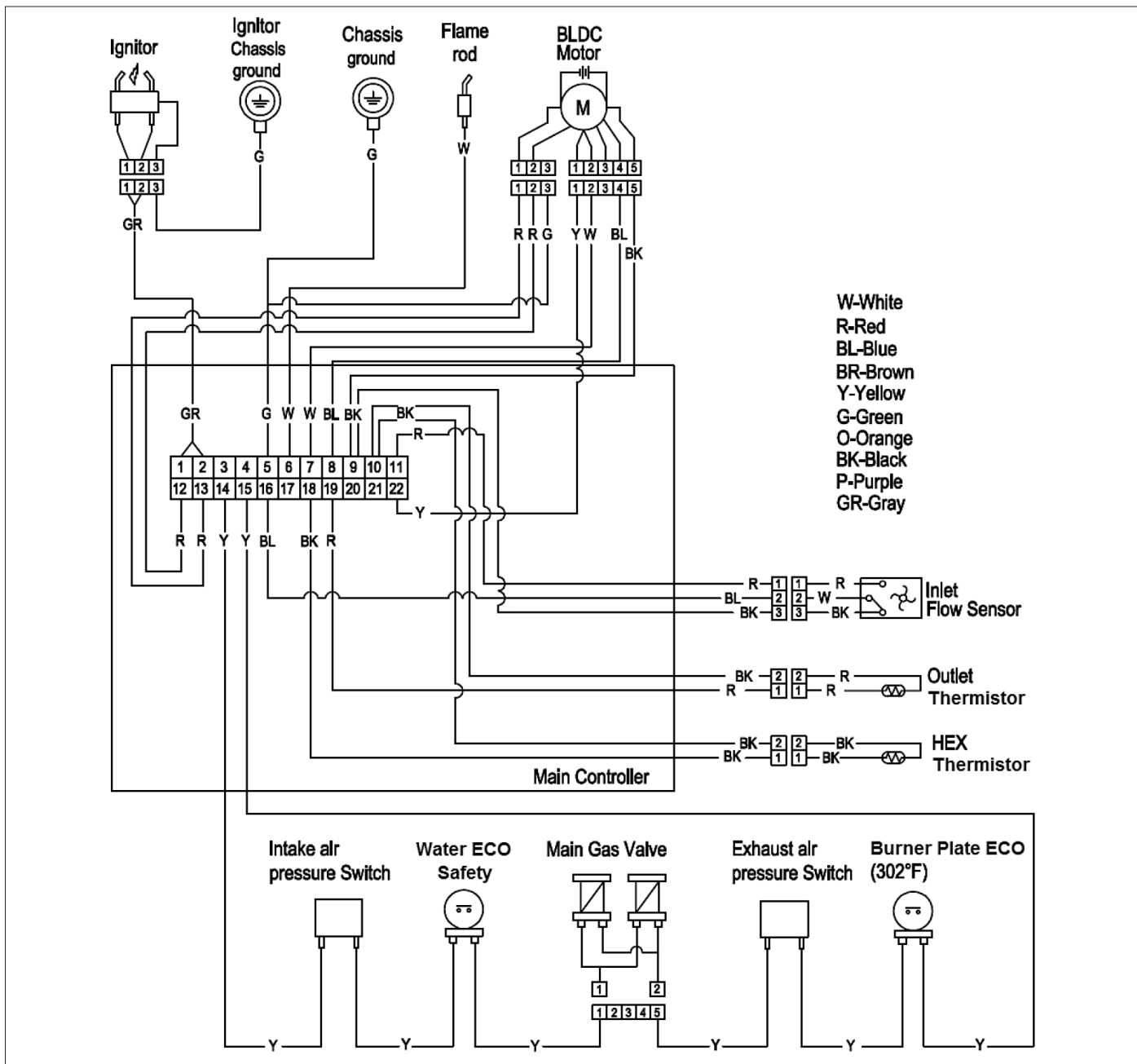


Figure 33 - Electrical Wiring Diagram

Part 8 - Gas Connections

WARNING

FIRE AND/OR EXPLOSION HAZARD

To avoid serious injury or death, the gas line installation and the gas line inlet pressure test must be done by a licensed professional.

Ensure the gas on which the water heater will operate is the same type specified on the rating plate (natural gas or LP gas). This water heater must be converted into propane operation unless specifically manufactured for use with propane. Follow LP Gas Conversion instructions (this document). Propane ready water heaters have the suffix "LP" after the model serial number. Failure to follow these instructions could result in property damage, personal injury, or death.

Make sure the gas line pressures are within normal limits. Pressures outside normal limits can result in poor performance and hazardous operating conditions.

A manual gas control valve (shut-off valve) must be connected to the unit before the gas line.

Check the gas inlet pressure and make sure your gas meter is capable of supplying sufficient BTU load to all appliances. Insufficient gas pressure and volume will cause your water heater to be deficient in performance and operation.

When connections are completed check for gas leaks by applying soapy water to all gas fittings and connections. Presence of soap bubbles foaming is a sign of a gas leak.

This water heater and its individual shut-off valve must be isolated from the gas supply piping system by unplugging the unit and turning off the main gas valve during any pressure testing of the gas supply piping system at test pressures equal to or less than ½ PSI.

Failure to follow these instructions could result in property damage, personal injury, or death.

NOTICE

Do not operate the boiler on Natural Gas or LP gas with average sulfur rates greater than 30 mg/m³. Doing so could result in improper product operation and failure, and WILL VOID the boiler warranty.

A. Gas Pipe Sizing Tables

1. Gas Pipe Sizing

This information is for reference use only. Refer to gas pipe manufacturer specifications for actual delivery capacity. The DOE standard for Natural Gas is 1100 BTU/ft³. Contact the local gas supplier for actual BTU/ft³ rating. Size gas piping system by following ANSI Z223.1/NFPA 54 or local codes.

- When measuring the inlet supply pressure, the water heater and all other gas appliances sharing the gas supply line must be firing at maximum capacity.
- Maximum gas pressure must not exceed listed value.
- Low gas pressure could be caused by an undersized gas pipe. This will cause the water heater's performance to diminish, limiting the ability to reach maximum performance.

NOTE: DO NOT USE 1/2" quick flex gas lines! Doing so will result in improper appliance operation.

2. Natural Gas Pipe Sizing

The following tables list maximum capacity of pipe in cubic feet of gas per hour for gas pressures of 11" or less and a pressure drop of 0.5 inches water column, based on a 0.60 specific gravity for natural gas.

Pipe Size (in.)	Length of Pipe (Feet)										BTU's Per Hour x 1,000 (0.60 Specific Gravity, 0.5 WC Pressure Drop)
	10	20	30	40	50	60	80	100	150	200	
1/2	82	58	47	41	37	37	29	26	20	18	
3/4	192	137	112	97	87	80	69	62	48	44	
1	383	269	218	188	168	153	132	118	91	82	
1 1/4	639	456	374	325	292	267	232	208	171	148	
1 1/2	1260	888	723	625	559	509	440	393	320	277	
2	2930	2080	1700	1470	1320	1200	1040	933	762	661	

Table 20 - Natural Gas Delivery Capacity - Corrugated Stainless Steel Pipe - Refer to ANSI Z223.1 - National Fuel Gas Code, Latest Edition

Pipe Size (in.)	Length of Pipe (Feet)										BTU's Per Hour x 1,000 (0.60 Specific Gravity, 0.5 WC Pressure Drop)
	10	20	30	40	50	60	80	100	150	200	
1/2	172	118	95	81	72	65	56	50	40	34	
3/4	360	247	199	170	151	137	117	104	83	71	
1	678	466	374	320	284	257	220	195	157	134	
1 1/4	1390	957	768	657	583	528	452	400	322	275	
1 1/2	2090	1430	1150	985	873	791	677	600	482	412	
2	4020	2760	2220	1900	1680	1520	1300	1160	928	794	

Table 21 - Natural Gas Delivery Capacity - Black Iron Pipe - Refer to ANSI Z223.1 - National Fuel Gas Code, Latest Edition

3. LP (Liquid Propane) Gas Pipe Sizing

The following is intended for use for piping between a Single or Second Stage (Low Pressure) Regulator and the water heater. The following tables list maximum capacity of pipe in cubic feet of gas per hour for an inlet pressure of 14 inches water column and specific pressure drop of 0.5 inches water column based on 1.5 specific gravity for liquid propane.

Pipe Size (in.)	Length of Pipe (Feet)										BTU's Per Hour x 1,000 (0.60 Specific Gravity, 0.5 WC Pressure Drop)
	10	20	30	40	50	60	80	100	150	200	
1/2	129	91	74	64	58	53	45	41	31	28	
3/4	303	216	177	153	137	126	109	98	75	69	
1	605	425	344	297	265	241	208	186	143	129	
1 1/4	971	661	528	449	397	359	307	270	217	183	
1 1/2	1990	1400	1140	988	884	805	696	621	506	438	
2	4640	3290	2680	2330	2080	1900	1650	1480	1210	1050	

Table 22 - Liquid Propane Delivery Capacity - Corrugated Stainless Steel Pipe - Refer to ANSI Z223.1 - National Fuel Gas Code, Latest Edition

Pipe Size (in.)	Length of Pipe (Feet)										BTU's Per Hour x 1,000 (0.60 Specific Gravity, 0.5 WC Pressure Drop)
	10	20	30	40	50	60	80	100	150	200	
1/2	291	200	160	137	122	110	101	94	84	67	
3/4	608	418	336	287	255	231	212	197	175	140	
1	1150	787	632	541	480	434	400	372	330	265	
1 1/4	2350	1620	1300	1110	985	892	821	763	677	543	
1 1/2	3520	2420	1940	1660	1480	1340	1230	1140	1010	814	
2	6790	4660	3750	3210	2840	2570	2370	2200	1950	1570	

Table 23 - Liquid Propane Delivery Capacity - Black Iron Pipe - Refer to ANSI Z223.1 - National Fuel Gas Code, Latest Edition

B. LP Gas Conversion

WARNING

The following instructions MUST BE FOLLOWED when converting the water heater from Natural Gas to Propane. Improper fuel conversions could result in property damage, severe personal injury, or death.

Contact the local propane gas supplier for recommended sizing of piping, tanks, and 100% gas regulator. Adjust the propane supply regulator provided by the gas supplier for 13" w.c. maximum pressure.

It is required to use a calibrated combustion analyzer to verify final adjustment according to the combustion chart (Table 25).

An LP Gas Conversion Kit is included in the accessory box. Conversion can only be completed by a qualified licensed professional.

Failure to follow the above instructions could result in property damage, severe personal injury, or death.

How to Convert the Water Heater to LP Gas Operation

1. Remove top service panel by loosening five (5) screws.

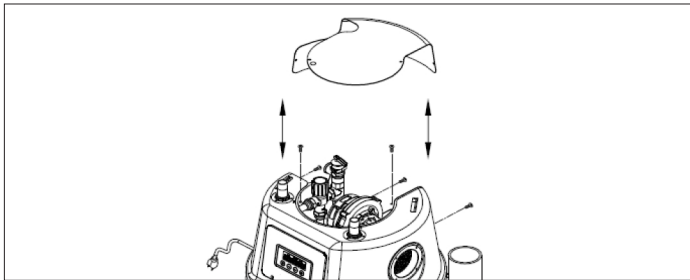


Figure 34 - Removing the Top Service Panel

2. Locate the gas valve towards the lower left of the unit.

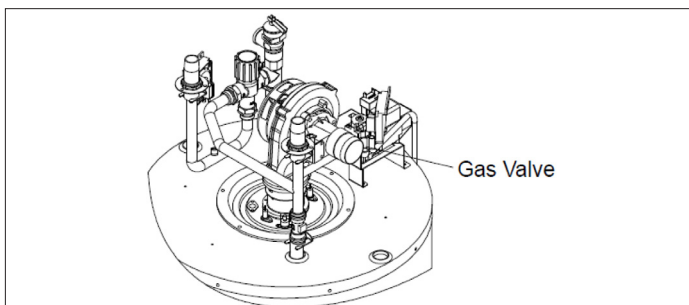


Figure 35 - Locating the Gas Valve

3. Loosen the two nuts connecting the gas tube to the gas valve.

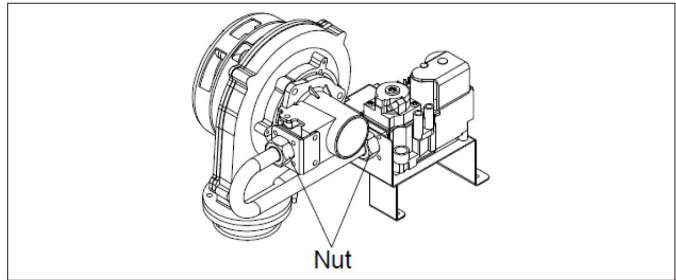


Figure 36 - Gas Valve Nut Locations

4. Insert the LP orifice into the nozzle. Retighten the gas tube and ensure there are no gas leaks.

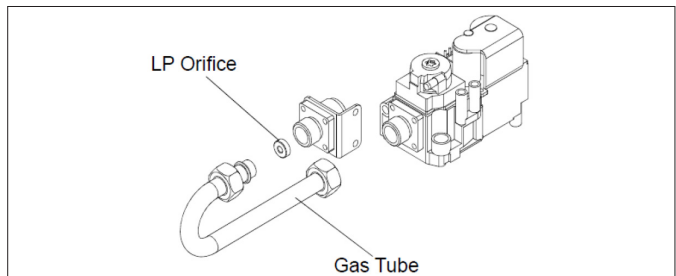


Figure 37 - Inserting the LP Orifice

5. Reassemble the top service panel and apply the LP label which is in the accessory kit.

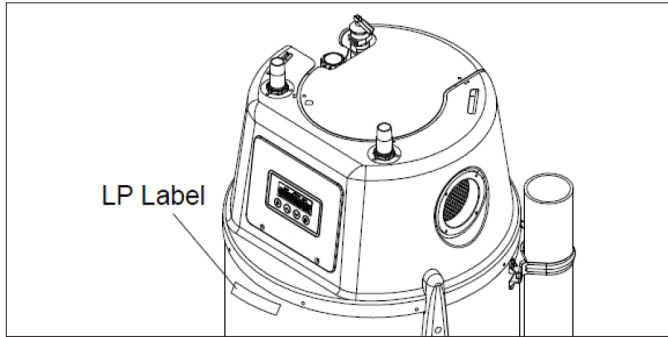


Figure 38 - Reassembled Top Service Panel and Applied LP Label

WARNING

Prior to start-up, ensure the unit is set to fire on propane. Check the rating label for the type of fuel. Use a calibrated combustion analyzer to ensure the CO / CO2 limits are within the limits listed in Table 25. If there is a conflict or doubt on the setup, remove the gas tube and check for the propane orifice. Failure to ensure proper setup could result in property damage, severe personal injury, or death.

C. Gas Connection Requirements

1. The gas connection fitting on the water heater is 3/4" female NPT. **NOTE:** A 3/4" X 1/2" reducer is provided with the water heater for connection to 1/2" gas lines. It is important to review the gas table to ensure that the gas line is properly sized for the BTU output of the water heater. **NOTE:** DO NOT USE 1/2" quick flex gas lines! Doing so will result in improper appliance operation.
2. The supply line must be sized for the maximum output of the water heater being installed. If there are additional gas appliances from the main supply line, measure the size of the supply line according to the COMBINED total maximum BTUH draw for the appliances as if they were operating at the same time.
3. Measure the length of the gas supply line from the gas meter to the water heater. Water heater must be installed downstream of the gas meter to ensure adequate gas supply. Use the tables in this manual or refer to the gas line manufacturer's sizing information to determine the correct supply pipe size.
4. A manual gas shut-off valve should be installed in the gas supply line close to the water heater.
5. To facilitate any future maintenance, it is also recommended that an approved gas union fitting be installed in the supply line between the shut-off valve and the connection on the water heater.
6. Test the gas pressure to make sure it meets the minimum standards and does not exceed the maximum standards of the water heater.
7. Leak test the gas line pipe before placing the water heater in operation. Only use approved leak detector liquid solutions to check for leaks.
8. Do not operate the water heater until all connections have been completed and the heat exchanger is filled with water.

D. Additional Precaution for Excess Flow Valve (EFV)

If an excess flow valve (EFV) is in the gas line, check the manufacturer's minimum and maximum flow capacity ratings. An improperly sized EFV will not allow for a full flow of gas to the water heater and will cause the water heater to malfunction. See Figure 40.

WARNING

Breathing Hazard - Carbon Monoxide Gas

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

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

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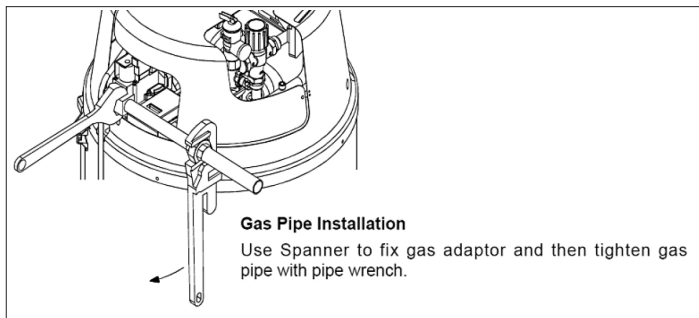


Figure 39 - Installing the Gas Line to the Water Heater

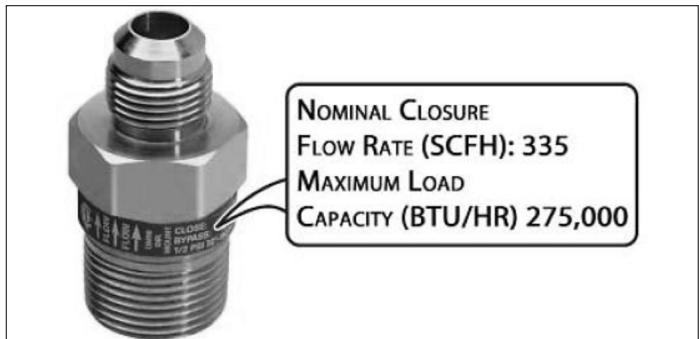


Figure 40 - Excess Flow Valve (EFV)

E. Checking Gas Pressure at the Water Heater

NOTE: Refer Figure 41 when checking gas pressure. Loosen the bolts before checking the gas inlet pressure.

1. The water heater and its individual shutoff valve must be disconnected from the gas supply piping system during any pressure testing of the system at test pressures greater than 1/2 psi (3.5 kPa).
2. The water heater must be isolated from the gas supply piping system by closing its individual manual shutoff valve during any pressure testing of the gas supply piping system at test pressures equal to or less than 1/2 psi (3.5 kPa).

The minimum and maximum inlet gas line pressures must meet the requirements shown in Table 24.

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

Table 24 - Gas Pressure Requirements

NOTICE

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

F. Setting and Verifying the Combustion Setting

1. After the water heater has fired, flip DIP switch three (3) in Group 1 to the ON position (low fire). Proceed to check heater combustion values. **NOTE:** Use a calibrated combustion analyzer to ensure CO and CO₂ values are within the range shown in Table 25.

WARNING

It is required to use a calibrated combustion analyzer to verify final adjustment according to the combustion chart (Table 25). Failure to do so could result in serious personal injury or death.

If the readings obtained are lower or higher than the combustion readings in Table 25, use a T40 Torx screwdriver to adjust the offset screw in a clockwise (positive) or counterclockwise (negative) direction (approximately 1/4 turn). See Figure 41. Check your combustion values. Repeat this procedure until the values obtained on the calibrated combustion analyzer agree with those stated in Table 25.

NOTE: If the heater makes a whistling sound (harmonics) at low fire, adjust the offset screw in a clockwise (positive) direction (approximately 1/8 turn). Check your combustion values and ensure they agree with those stated in Table 25 before proceeding.

WARNING

It is very important that the combustion system be set within the recommended CO measurements listed in Table 25. Visually looking at the burner does not determine combustion quality. Failure to measure combustion with a calibrated combustion analyzer and set the throttle within the recommended CO measurements could result in property damage, severe personal injury, or death.

	Natural Gas		LP Gas	
	Low	High	Low	High
Fan Speed				
CO PPM	≤30	≤50	≤50	≤100
CO₂ (%)	8 - 9 1/2	8 1/2 - 10	9 - 10 1/2	9 1/2 - 11

Table 25 - Combustion Settings

2. When low fire settings have been obtained, flip DIP switch three (3) in Group 1 to its original (OFF) position. This will return the heater to normal operation.

3. Open a hot water faucet or faucets and run hot water at more than 2 gpm to put the water heater into high fire. Again check combustion readings with a calibrated combustion analyzer.

NOTE: DO NOT adjust the gas valve offset screw at high fire. The offset screw is only used to adjust combustion values at low fire.

4. When complete, turn off the hot water faucet(s). Allow water heater to operate normal. Ensure it is operating properly.

5. Use a Phillips Head screwdriver to reinstall the heater top cover.

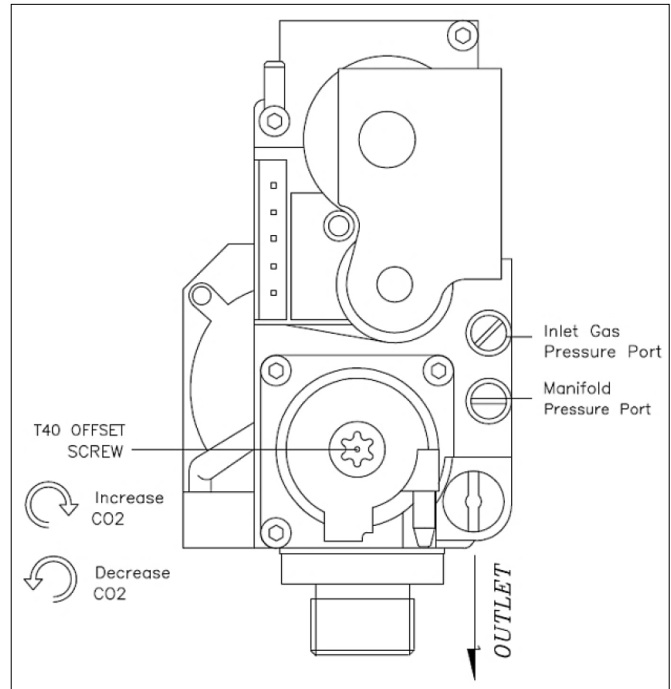


Figure 41 - Gas Valve Detail

WARNING

Breathing Hazard - Carbon Monoxide Gas



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

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

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Part 9 - Controls

A. Start-Up





Once the unit has been properly installed, check the gas and water connections for leaks. Check for proper ventilation and combustible air supply to the water heater. Purge the gas and water lines to remove debris. Then follow the steps below to power on the water heater.

1. Close the manual gas shut-off valve located on the gas line.
2. Fully open the manual water shut-off valve on the water supply line.
3. To ensure complete filling of the tank, allow air to exit by opening the nearest hot water faucet. Allow water to run until a constant flow is obtained. This will let air out of the water heater and piping.
4. Open each hot water tap to ensure that water will flow. Then close the hot water tap.
5. Fully open the manual shut-off gas valve.
6. Plug in the 120 VAC / 60 Hz power supply to the water heater and turn on the unit.

CAUTION

DO NOT use this water heater unless it is completely filled with water. Water must flow from the hot water faucet before turning "ON" gas to the water heater. The water heater will be damaged if it is operated while empty. Such damages ARE NOT covered by product warranty.

B. How to Use the Control Interface

1. To turn the Water Heater LCD Display from ON to OFF, press the  Button. The current stored water temperature setting will display. NORMAL is the default setting. Press the  or  buttons to select your temperature setting.
2. When tank water temperature is lower than setting temperature, the water heater will start the burner automatically and LCD monitor will display IN USE.
3. To turn the water heater display OFF press .

NOTE: The temperature on the LCD display does not control the output temperature of the water heater. To adjust hot water output temperature, see Section C.

C. Temperature Setting Procedure

The water heater is shipped ready to operate at NORMAL 127°F (52.7°C), and can be field adjusted to operate at HOT (137°F [58.3°C]) and HOTTER (147°F [63.8°C]) temperatures.

After turning on the water heater and selecting the temperature setting, let it operate and come to temperature.

After the water heater comes to temperature, open a hot water faucet. The water heater mixing valve is factory set to operate at 120°F (48.9°C). The mixing valve setpoint temperature can be adjusted from 70 – 145°F (21.1 - 62.8°C).

To adjust the mixing valve:

1. Ensure the water heater is filled with water and powered on.
2. Loosen the knob screw. Lift knob.
3. Turn knob clockwise or counter clockwise to adjust temperature. The temperature will change on the water heater display. Adjust to the desired temperature.
4. Reposition knob to lock position.
5. Retighten screw.

NOTE: To ensure proper operation, the mixing valve temperature should be set at least 5°F below that of the tank setpoint temperature.

WARNING

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

DANGER

Hotter water increases the risk of scald injury. Scalding may occur within 5 seconds at a setting of 140°F (60°C). Water temperature over 125°F can instantly cause severe burns, or death, from scalds. Children, disabled, and elderly are at the highest risk of being scalded. Mixing valve temperature settings should be done by a licensed contractor per local requirements. To ensure correct temperature control, check water temperature with a thermometer at a faucet. Feel water before bathing or showering!

It is recommended to inspect the mixing valve annually. Ensure the proper water temperature is being delivered. If not, replace the mixing valve.

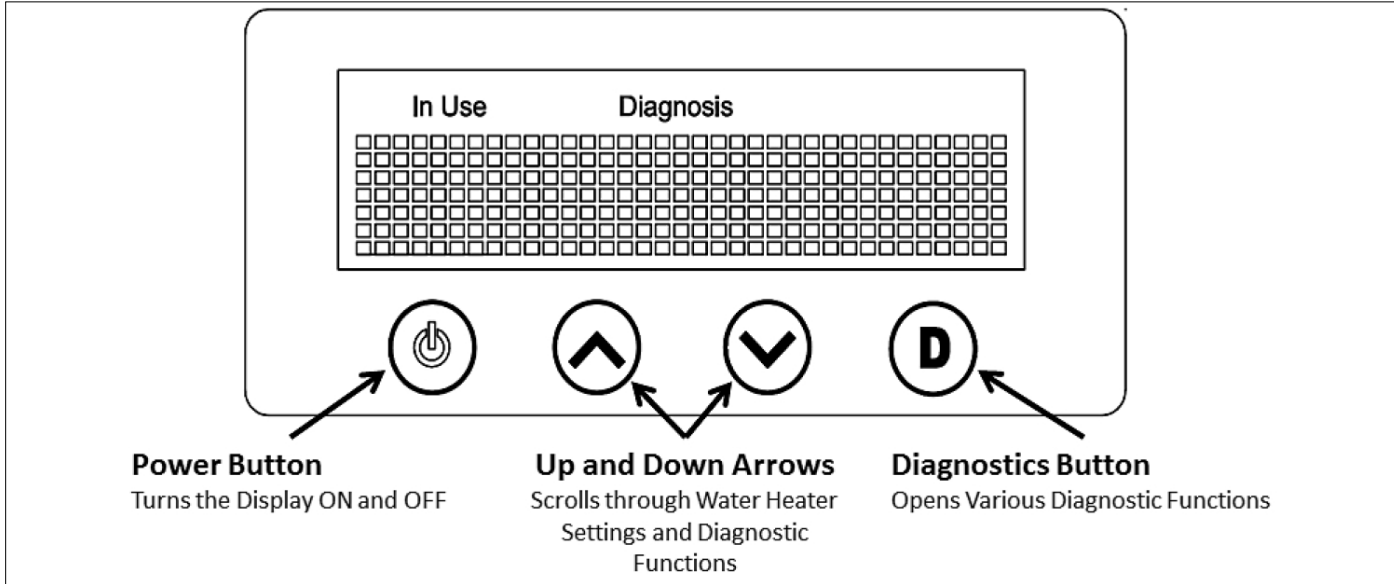


Figure 42 - LCD Display Detail

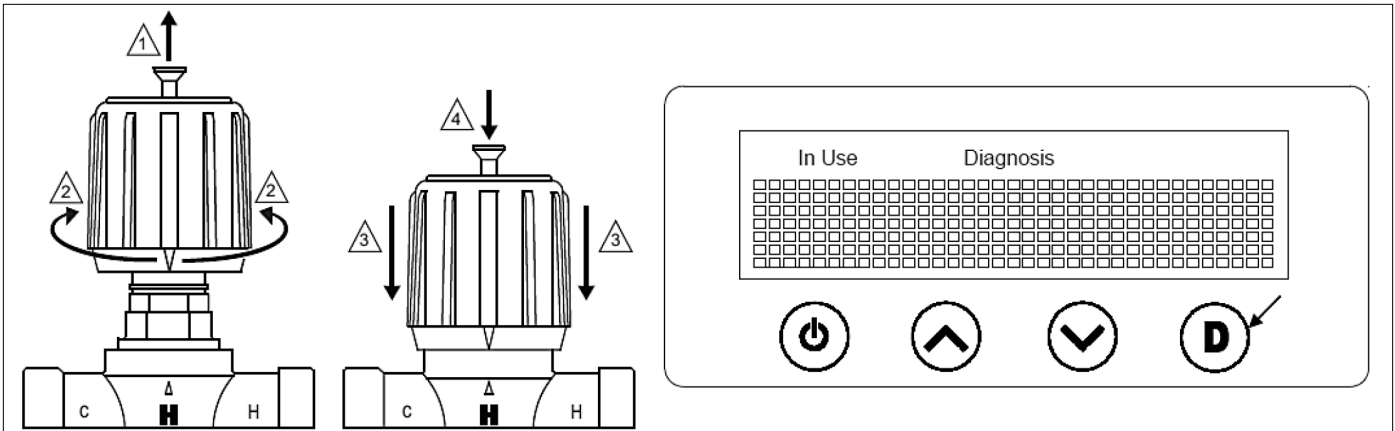


Figure 43 - Adjusting Temperature at the Mixing Valve

D. Water Temperature Adjustment and Scalding

This water 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 temperatures. 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, install a mixing valve in the water system. This valve will reduce point of use discharge temperatures by mixing cold and hot water in branch supply lines. Such valves are available from your local plumbing supplier.

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

Table 26 - Time and Temperature Relationship in Scalds

WARNING

An ASSE 1017 or ASSE 1070 temperature limiting or mixing valve is recommended in installations servicing disabled or elderly persons, or children. Mixing valves do not eliminate the risk of scalding.

To avoid scalding:

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

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

DANGER

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

E. Diagnostic Button Function

The water heater control allows the user to review various diagnostic functions, including: Outlet Temperature, Fan RPM, and Error Code History. Press the **D** button on the display to review various diagnostic functions. Press the **^** or **v** buttons to scroll through the functions.

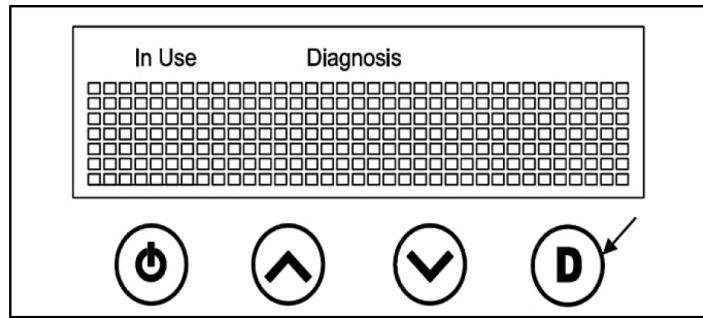


Figure 44 - Press the “D” Button to Review Diagnostic Functions

Display	Detail	Example	Description
Ver	Main CPU Software Version	Ver: 1	Current version of software running on the PCB
Ht	Hot Water Stored / Tank Temperature	Ht: 145	Tank temperature is 145°F
Ot	Outlet Temperature	Ot: 134	Outlet temperature is 134°F
Gpm	Water Flow Rate into Tank	1.2	Current water flow rate into tank is 1.2 gpm
Rpm	Fan RPM	Rp 4500	Fan is spinning at 4500 RPM
H	Burner Time Hours	2h	Total burn time is 2 hours, 10 minutes, and 14 seconds
	Burner Time Minutes and Seconds	10m 14s	
T	Ignition Cycles	7T	Seven total ignition cycles
E1 - E9	Error Code History	E1: E4	The most recent error stored is E1. E9 is the oldest.

Table 27 - Diagnostic Function Screen Descriptions

Part 10 - Troubleshooting

A. Error Code Screens

The water heater continuously monitors its own operation. If an error occurs a message will scroll across the display on the front panel and an error code will display. These error codes assist in troubleshooting system issues, and may enable the user to overcome a problem without calling for service. If calling Technical Support for assistance, please reference the displayed error code to aid in troubleshooting. Press **⏻** to turn the water heater OFF and ON to reset an error code.

Error Code	Description	Cause	Possible Remedies
E1	Abnormal Flame Detected		Call for service. Replace the main controller.
E2	Ignition Failure	Water heater does not detect a flame signal.	1. Check gas line, ignitor, flame rod. 2. Check wire connection of 22p wire and ignitor wire. 3. Check ignition noise. If fuel supply is low ignition will make noise. 4. Check gas type and manifold pressure.
E3	Flame Loss	Abnormal combustion - Flame has been lost after it was detected.	1. Check the gas supply. 2. Check the gas valve. 3. Check wire connection fo 22p wire and ignitor wire. 4. Check gas type and pressure. 5. Check power supply for proper voltage.
E4	Outlet Thermistor Open	Outlet thermistor is open.	1. Check the outlet thermistor. 2. Check wire connection of 22p wire and thermistor wire.
E5	Outlet Thermistor Short	Outlet thermistor has shorted.	
E6	Tank Thermistor Open	The H/E thermistor is open.	1. Check the H/E thermistor. 2. Check wire connection of 22p wire and thermistor wire.
E7	Tank Thermistor Short	The H/E thermistor has shorted.	
E11	Blower Motor	The DC blower motor has failed.	1. Check the DC blower motor. 2. Check wire connection of 22p wire.

Error Code	Description	Cause	Possible Remedies
E28	Gas Valve, ECO Hot Water Outlet, ECO Burner Plate, or Intake / Exhaust Pressure Switch (APS)	The gas valve has lost power.	<ol style="list-style-type: none"> 1. Unplug the water heater. 2. Check wire connections of the gas valve, thermostat, and air pressure switches. 3. Use an ohmmeter to check for continuity of the following items: <ol style="list-style-type: none"> a. The thermostat. b. The intake air pressure switch. c. The exhaust air pressure switch. d. The gas valve. 4. Replace the defective item.
E30	RPM too High	DC blower motor is rotating too fast.	Call for service. Replace the blower motor.
E31	RPM too Low	DC blower motor is rotating too slow.	
E36	Relay Error	Controller failure concerning the gas valve.	Call for service. Replace the main controller.
E37	Communication Problem	Communication failure concerning the subsidiary CPU.	
E38	Sub RAM Failure	Subsidiary RAM failure.	
E39	Sub CPU Hardware Problem	Control failure concerning subsidiary flame signal.	
E40	Main RAM Failure	Main RAM failure.	
E41	Flame Signal Problem	Controller failure concerning flame signal.	
E42	Main ROM Failure	Main ROM failure.	
E43	Main AD MUX Failure	Main MUX failure.	
E54	Gas Valve Leak Detected	Gas valve failure.	

Table 28 - Error Codes and Suggested Corrective Actions

NOTE: In some cases the Error Code may be cleared by pressing the  button to turn the water heater OFF, then ON again. If this does not clear the Error Code, contact your water heater installer for service.

B. Suggested Corrective Actions

Problem	Possible Causes	Possible Remedies
No electrical power to the water heater	<ol style="list-style-type: none"> 1. Is the plug on the power supply cord unplugged from the electrical outlet? 2. Is electrical panel's 10 Amp circuit breaker tripped? 3. Is the fuse on the circuit board good? 4. Is there a power outage to the home? 	<ol style="list-style-type: none"> 1. Reset the plug. 2. Reset the circuit breaker. 3. If the display panel is blank, unplug the unit or contact an authorized service technician. 4. Contact the power company.
No water available when faucet is opened	<ol style="list-style-type: none"> 1. Is the water supply valve shut off at the meter (do cold water faucets work)? 2. Is the water supply valve near the unit open? 3. Is the water pipe frozen? 4. Is an error code flashing on the display panel (leak detected)? 	<ol style="list-style-type: none"> 1. Open the closed supply valve. 2. Open the water supply valve. 3. Turn OFF the unit, close all water valves and the gas valve. Contact an authorized service technician. 4. Refer to error code information and contact an authorized service technician.
Hot water is not available when a faucet is opened	<ol style="list-style-type: none"> 1. Does the water heater have power (plugged in)? 2. Is the water heater turned ON? 3. Is an error code flashing on the display panel? 4. Is the gas supply valve open or shut off at the meter (do other gas devices work)? 	<ol style="list-style-type: none"> 1. Restore electrical power to the unit. 2. Press and hold the Power button to turn the unit ON. 3. Refer to the Diagnostic and Error Codes section in this manual. 4. Open the gas supply valve.
The water temperature is not hot enough or turns cold during use	<ol style="list-style-type: none"> 1. Is an error code flashing on the display panel? 2. Is the water temperature on the thermostatic mixing valve set too low? 	<ol style="list-style-type: none"> 1. Refer to the Diagnostic and Error Codes section in this manual. 2. Adjust the outlet water temperature on the thermostatic mixing valve (refer to the procedure in this manual).

Problem	Possible Causes	Possible Remedies
It takes a long time before hot water flows from the faucet	Is the faucet some distance from the water heater?	1. Allow time for the cold water already in the pipes to flow from the faucet. 2. Have recirculation valves and/or plumbing return line(s) installed and program the unit for recirculation.
The water is not hot enough	Is the water temperature on the thermostatic mixing valve set too low?	Adjust the temperature setting.
The water at the faucet is too hot	Is the water temperature on the thermostatic mixing valve set too high?	
A fan can be heard even when the unit is not operating	1. The fan continues to operate after the burner shuts off to clear the exhaust vent of combustion gases. 2. The fan may run to help prevent freezing.	1. This is normal operation – no action is required. 2. Protect the water heater from freezing temperatures or shut off and drain the unit.
White “smoke” can be seen coming out of the exterior exhaust gas vent	Depending on the outside temperature, water vapor can be produced as the exhaust is vented.	This is normal operation – no action is required.

Table 29 - Troubleshooting Chart

DIAGNOSTICS AND SUGGESTED CORRECTIVE ACTIONS

The water heater control is able to record information about the water heater’s condition at the time of the ten previous faults or errors. This information is available to view in the Installer Mode under the History screen.

The following screens may be displayed when reviewing the water heater history. The table below also includes diagnostic information and possible corrective actions.

Display	Condition	Diagnostic	Possible Corrective Actions
Nothing appears on the display control panel but the fan runs at full speed	Control is not receiving power	Check wiring for short circuit or incorrect wiring	Correct wiring per wiring diagram including connection of transformer to the control.
		Check 5P wire connection to the Fan Motor per wiring diagram	Push the Power button on the control panel
Nothing appears on the display control panel and no other water heater components are operating	Control is not receiving 120V power	Ensure service switch and/or circuit breaker to water heater is turned ON	Turn on service switch or circuit breaker to power water heater
		Is there 120V at the service switch	Troubleshoot and correct the power supply to the manual switch
		Is the ON/OFF switch inside the water heater cabinet is turned on	Turn ON the manual power switch inside the water heater cabinet
		Check for 120V at the line voltage terminal block located inside the water heater cabinet	Correct wiring inside the water heater cabinet using the wiring diagram in the installation manual
		Inspect the fuse. Replace as necessary	Replace the fuse with the proper part found in the replacement part section of this manual. If fuse blows again, recheck the wiring per diagram
Nothing appears on the display control panel, but the water heater is operating	Occurs when communications is lost from the control to the display	Check for loose connections and proper pin alignment / engagement on the control’s plug	Check for continuity on the wire harness from the display to the control. See repair parts section for proper replacement part.
		Cycle power off and on using water heater power switch and check for operation	Replace with new display module. See repair parts section for proper replacement part.
Display repeatedly goes through initialization sequence	Occurs when control does not receive signal from fan	Cycle power off and on using appliance power switch and check for operation	Replace fan

Table 30 - Diagnostics and Suggested Corrective Actions

DHW Outlet (Ot) Temperature Sensor (8100P-016) HX (Ht) Temperature Sensor (8100P-014)	
Temperature (°F)	Resistance (Ω)
-4	61353
5	48126
14	37979
23	30153
32	24085
41	19354
50	15645
59	12721
68	10403
77	8555
86	7075
95	5882
104	4915
113	4129
122	3485
131	2956
140	2518
149	2155
158	1852
167	1599
176	1385
185	1205
194	1052
203	921
212	847

Table 31 - Temperature Sensor Resistance

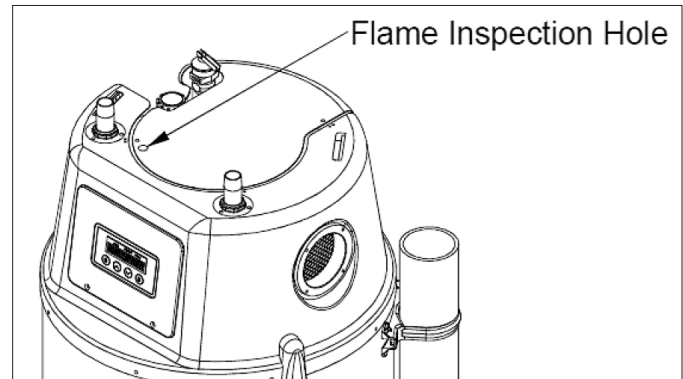


Figure 45 - Flame Sight Glass

Part 11 - Installation Checklist

Before Installing	Yes	No
Is there enough space to ensure proper installation?		
Does installation location allow for proper service clearances?		
Are water and gas lines properly sized and set at proper pressures for the installation?		
Is water heater location as near the exhaust vent / intake pipe terminations as possible?		
Have combustibles materials been cleared from the installation location?		
Is there a drain close to the water heater?		
Water Piping	Yes	No
Does water heater loop piping meet the minimum sizing requirements listed? NOTE: Smaller piping will cause performance problems.		
Has water chemistry been checked?		
Does water chemistry meet requirements?		
If water chemistry does not meet requirements, have treatment measures been put in place?		
Has the system been cleaned and flushed?		
Install Exhaust Vent and Intake Piping	Yes	No
Has the water heater been vented with the approved materials listed in this manual or to meet local codes?		
Is air supply sufficient for proper water heater operation?		
Is total vent piping length within the maximum vent length restriction listed in this manual?		
Have venting lengths been minimized?		
Are terminations properly spaced from windows, doors, and other intake vents?		

Install Exhaust Vent and Intake Piping	Yes	No
Have all vent terminations been installed at least one foot above exterior grade and one foot above normal snow accumulation level?		
Is vent piping properly supported?		
Has vent piping been checked for leaks?		
Has the exhaust vent line been pitched back to the water heater at a rate of 1/4" per foot?		
Have the exhaust vent and intake pipes been properly installed to the water heater?		
Install Condensate Piping / Tubing and Components	Yes	No
Have all condensate components included with the water heater been installed?		
Is the condensate line piped with the approved materials listed in this manual?		
Has the condensate line been routed to a laundry tub or other drain?		
Install Gas Piping	Yes	No
Is the gas supply line a minimum of 1/2" in diameter?		
Is the gas supply line length and diameter adequate to deliver the required BTUs?		
Has gas supply line pressure been measured?		
Does the gas type match the type indicated on the water heater rating plate?		
Has a union and shut-off valve been installed?		
Temperature and Pressure Relief Valve	Yes	No
Is the Temperature and Pressure Relief Valve properly installed and discharge line run to open drain?		
Is the discharge line at least 3/4" in diameter and protected from freezing?		
Wiring	Yes	No
Has the power and control been wired per water heater wiring diagram, this manual?		
Have all DIP switches been set on the main water heater board?		
Is the electrical connection polarity within water heater requirements?		
Does the power supply voltage agree with the water heater rating plate? 120V AC?		
Start-Up, Adjust, and Test	Yes	No
Has the water heater been started?		
If necessary, has the water heater gas valve been adjusted?		
Has the installation been customized per installation location requirements?		
Have all customized system parameters been tested?		
Has proper water heater operation been confirmed?		
Burner Flame	Yes	No
Has the burner flame been checked?		
Have combustion values been verified with a calibrated combustion analyzer?		
If the flame does not appear normal, it may need to be cleaned by a qualified service technician. See Figure 45 for flame sight glass window location.		
Recirculation System	Yes	No
If a recirculation system is installed, check to see that the total runtime per day does not exceed six (6) hours. NOTE: Warranty will be voided if runtimes for recirculation are above six (6) hours.		
Final Installation Approvals		
Signed by Technician	Date	

Table 32 - Installation Checklist

Part 12 - Maintenance

DANGER

The water heater must be inspected and serviced annually, preferably at the start of the heating season, by a qualified service technician. In addition, the maintenance and care of the water heater as outlined in this manual must be performed by the user/owner to ensure maximum efficiency and reliability. Follow the maintenance procedures given throughout this manual. Failure to perform the service and maintenance or follow the directions in this manual could damage the water heater or system components, resulting in substantial property damage, severe personal injury, or death.

Check the Surrounding Area

DANGER

To prevent the potential of substantial property damage, severe personal injury, or death, eliminate all the materials listed in Table 7 from the area surrounding the water heater and the vicinity of the combustion air intake. If contaminants are found:

- Remove products immediately from area.
- If contaminants have been there for an extended period, call a qualified service technician to inspect the water heater for possible damage from acid corrosion.

If products cannot be removed, immediately call a qualified service technician to re-pipe the combustion air intake piping away from the contaminated areas.

Combustible/Flammable Materials

Do not store combustible materials, gasoline, or other flammable vapors or liquids near the water heater. If found, remove these materials immediately.

Air Contaminates

If allowed to contaminate combustion air, products containing chlorine or fluorine will produce acidic condensate that will cause significant damage to the water heater. Read the list of potential contaminants and areas likely to have these contaminants in Table 7. If any of these contaminants are in the room where the water heater is located, or combustion air is taken from one of the areas listed, the contaminants must be removed immediately or the intake pipe must be relocated to another area.

Check the Power Source

Make sure the power cord is properly connected. The main power line is connected to the manual switch box inside the water heater.

Check the Status of the Control Panel

Observe the Control Panel to ensure the water heater is powered on, and to check for any error codes. Clear any debris from the panel.

Check Exhaust Vent and Intake Pipe Terminations

Verify that the water heater exhaust vent and intake pipe terminations are clean and free of obstructions. Remove any debris from the exhaust vent or intake pipe openings. If removing the debris does not allow the water heater to operate correctly, contact your qualified service technician to inspect the water heater and the vent system.

Check Exhaust Vent and Intake Piping

Visually inspect the exhaust vent for any signs of blockage, leakage, or deterioration of the piping. Inspect the exhaust vent bracing. Ensure bracing is undamaged and in good condition. Notify a qualified service technician immediately if any problems are found.

WARNING

Failure to inspect the venting system and have it repaired by a qualified service technician can result in vent system failure, causing severe personal injury or death.

Visually inspect the intake piping for any signs of blockage. Inspect the entire length of the intake pipe to ensure piping is intact and all joints are properly sealed. Inspect the intake pipe bracing. Ensure bracing

is undamaged and in good condition. Notify a qualified service technician if any problems are found.

Check the Condensate Drain System

- While the water heater is running, check the discharge end of the condensate drain tubing. Ensure no flue gas is leaking from the condensate drain tubing by holding your fingers near the opening.

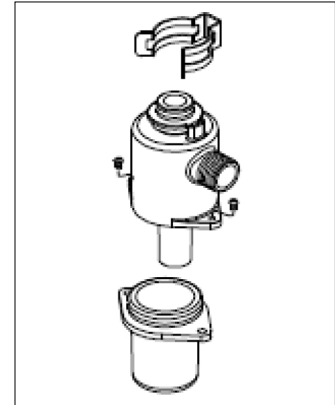


Figure 46 - Condensate Trap Details

- If you notice flue gas leaking from the opening, this indicates a dry condensate drain trap. If problem persists, contact a qualified service technician to inspect the water heater and condensate line and refill the condensate trap.

- If applicable, check the condensate neutralizer and ensure it is full of condensate neutralizing marble chips.

Cleaning the Condensate Trap

Over time, blockage of the trap by debris may occur. When the condensate cannot be released the unit will go into error and shut down. When this occurs the trap must be cleaned.

To Remove Trap

1. Remove clip securing trap to the nipple.
2. Gently pull trap body downwards to remove.

Check Primary and Gas Piping

- Remove the water heater cover and perform a gas leak inspection following Operating Instructions, page 2, this manual. If gas odor or leak is detected, follow procedures on page 2. Call a qualified service technician.
- Visually inspect for leaks around the internal water heater water connections and around the water heater. Visually inspect the external system piping, circulators, and system components and fittings. Immediately call a qualified service technician to repair any leaks.

WARNING

Have leaks fixed at once by a qualified service technician. Failure to comply could result in substantial property damage, severe personal injury, or death.

Check and Operate Pressure Relief Valve

- Visually inspect the primary pressure relief valve and discharge pipe for signs of weeping or leakage.
- If the pressure relief valve often weeps, the expansion tank may not be operating properly. Immediately contact a qualified service technician to inspect the water heater and system.
- Before proceeding, verify that the relief valve outlet has been piped to a safe place of discharge, avoiding any possibility of scalding from hot water.
- Shut power off to the water heater. To avoid scalding, wait for water heater to cool before operating the relief valve.

WARNING

To avoid water damage or scalding due to relief valve operation, a discharge line must be connected to the valve outlet and directed to a safe place of disposal. This discharge line must be installed by a qualified service technician or heating/plumbing installer in accordance with the water heater installation manual. The discharge line must be terminated so as to eliminate possibility of severe burns or property damage should the valve discharge.

- Lift the relief valve lever. If water flows freely, release the lever and allow the valve to seat. Watch the end of the relief valve discharge pipe to ensure that the valve does not weep after the line has had time to drain. If the valve weeps, lift the lever again to attempt to clean the valve seat. If the valve does not properly seat and continues to weep, contact a qualified service technician to inspect the valve and system.
- If water does not flow from the valve when you completely lift the lever, the valve or discharge line may be blocked. Immediately shut the water heater down per instructions on page 2 and call a qualified service technician to inspect the valve and system.
- If relief valve seats properly, restore power to the water heater. Observe operation for five minutes and ensure it operates properly.

Check Burner Flame Quality

This water heater has an automatic ignition system. Once you open a hot water tap, the system electronically ignites the burners. Observe burner flame via the flame inspection hole. See Figure 45 for flame inspection hole location.

WARNING

Turn off the electrical power supply, gas shutoff valve, and cold water shutoff valve before proceeding. Failure to comply could result in substantial property damage, severe personal injury, or death.

Service and Cleaning of the Burner

Only specially trained and authorized personnel are permitted to service the burner.

Sediment Buildup

Over time, sediments from water supply could settle inside the tank and cause the water heater to lose holding capacity and heating efficiency. It is recommended that the water heater be drained down completely once every other year to flush out sediments. Buildup of sediment in faucet aerators, shower heads, and screens could also impair water flow and cause the water heater to deliver less than its full output, or to shut down completely. Check any of these screens or shower heads on your faucets periodically and clean as necessary.

Checking the Water Strainer

The water strainer should be checked at least once annually to ensure it is not blocked. To do this:

1. Connect garden hose to the drain valve located on the lower left side of the unit.
2. Open the valve with a flat heat screwdriver.
3. Drain a few gallons of water from the water heater. If water flows freely, the strainer is clean. If water does not flow freely, follow the steps below to drain the water heater and clean the strainer.

Draining the Water Heater and Cleaning the Water Strainer

1. Close water supply shut-off valve to the water heater.
2. Connect garden hose to the drain valve located on the lower left side of the unit.
3. Open the valve with a flat head screwdriver.
4. After draining the tank, turn the drain valve body clockwise by hand to remove the drain valve from the unit and clean the strainer.

CAUTION

Do not open the drain valve without connecting a hose so that water can be diverted to an area where water damage is not a problem. Use a flat head screwdriver to open and close the drain valve. Do not remove the drain valve from the unit without first draining the water heater. ONLY remove the drain valve by hand. Failure to follow these instructions could result in leakage or property damage. Such damages ARE NOT covered by product warranty.

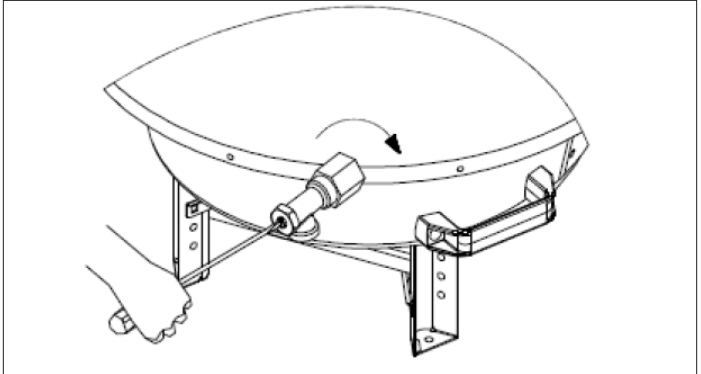


Figure 47 - Closing the Drain Valve

Thermistors

After draining the water heater, remove the HX thermistors from the unit and check for mineral coating. A mineral coating on the thermistor requires cleaning. See Figure 48.

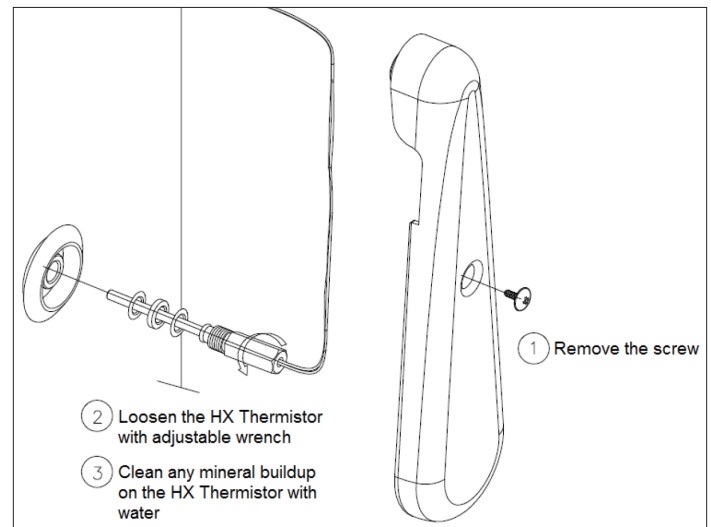


Figure 48 - Cleaning the Thermistor

Maintenance Report

CAUTION

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

WARNING

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

⚠ WARNING

The combustion chamber insulation in this product contains ceramic fiber material. Ceramic fibers can be converted to cristobalite in very high temperature applications. The International Agency for Research on Cancer (IARC) has concluded, "Crystalline silica inhaled in the form of quartz or cristobalite from occupational sources is carcinogenic to humans (Group 1)."

- Avoid breathing dust and contact with skin and eyes.
- Use a NIOSH certified dust respirator (N95). This type of respirator is based on the OSHA requirements for cristobalite at the time this document was written. Other types of respirators may be needed depending on job site conditions. Current NIOSH recommendations can be found on the NIOSH website: <http://www.cdc.gov/niosh/homepage.html>. NIOSH approved respirators, manufacturers, and phone numbers are also listed on this website.
- Wear long-sleeved, loose fitting clothing, gloves, and eye protection.
- Apply enough water to the combustion chamber lining to prevent dust.
- Wash potentially contaminated clothes separately from other clothing. Rinse clothes washer thoroughly.

NIOSH stated First Aid.

- Eye: Irrigate immediately.
- Breathing: Fresh air.

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

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

INSPECTION ACTIVITIES		DATE LAST COMPLETED			
PIPING		1 st YEAR	2 nd YEAR	3 rd YEAR	4 th YEAR*
Near water heater piping	Check water heater and system piping for any sign of leakage. Leaking pipes could cause property damage. Make sure all piping is properly supported. Flush tankless heat exchanger annually (more in hard water conditions). See User's Information manual for instructions.				
Vent	Check condition of all vent pipes and joints. Ensure all vent piping is properly supported. Check for obstructions exhaust and intake termination points.				
Gas	Check Gas piping, test for leaks and signs of aging. Make sure all pipes are properly supported.				
Anode Rod (20 Gallon Models ONLY)	Remove and visually inspect the anode rod. Anode rod should be replaced when more than 6" of core wire is exposed at either end of the rod. See Figure 49.				
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 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.				
Plug	Verify that the power plug is functional and ground prong is intact.				
CONDENSATE					
Condensate Trap	Clean debris from the condensate trap. Fill with clean water.				
Neutralizer	Check condensate neutralizer. Replace if necessary.				
Condensate Pipe	Verify the flow of condensate, making sure that condensate flows properly				

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. Record at high and low fire.				
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.				
TECH SIGN OFF					

Table 33 - *Continue annual maintenance beyond the 4th year as required.

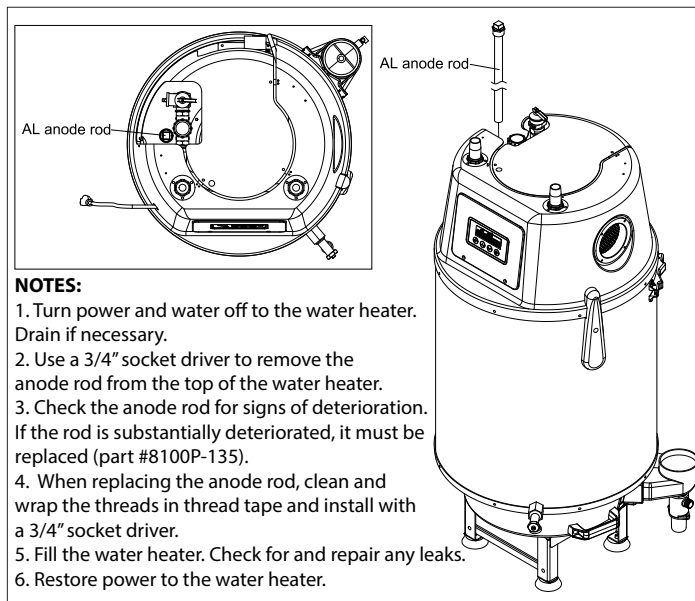


Figure 49 - Removing / Replacing the Anode Rod (20 Gallon Models ONLY)

Part 13 - Replacement Parts

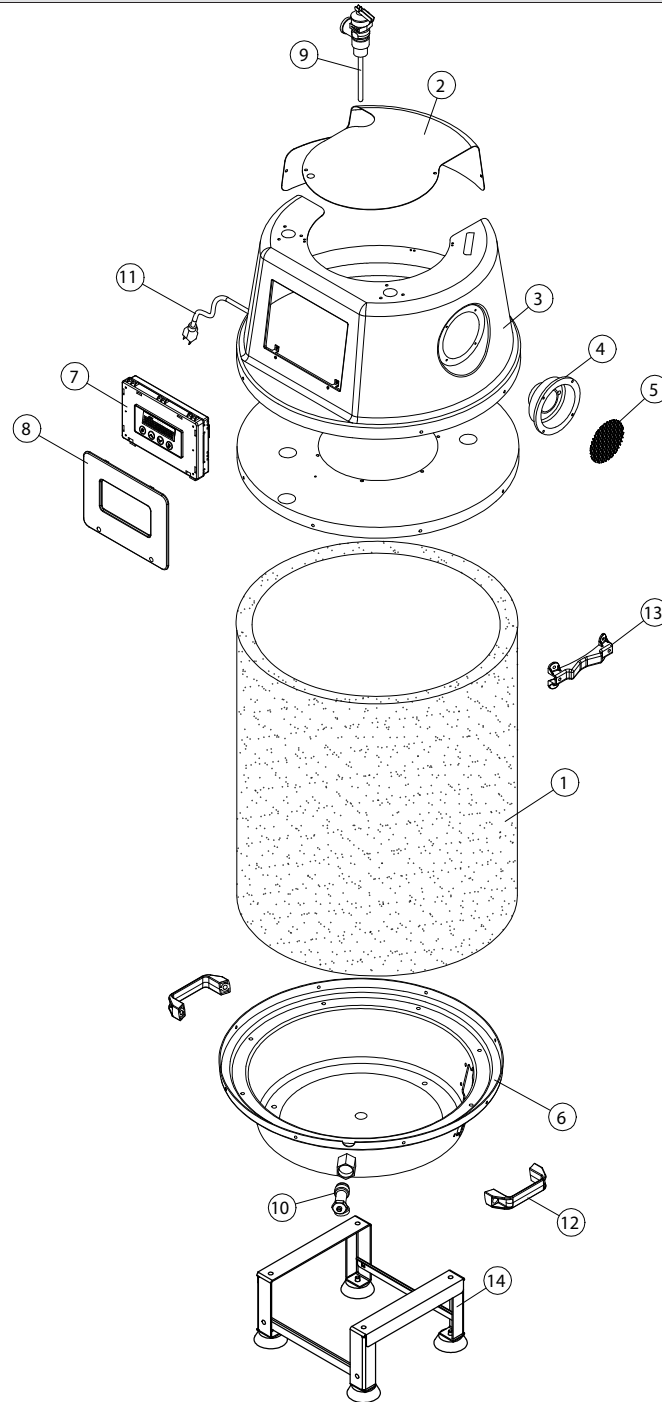


Figure 50 - 20 Gallon Model Cabinet Replacement Parts

NUMBER	DESCRIPTION	PART NUMBER	NUMBER	DESCRIPTION	PART NUMBER
1	Pour Form (PU)	N/A	8	Controller Cover	8100P-034
2	Top Service Panel	8100P-031	9	T&P Relief Valve	8100P-015
3	Top Cover	N/A	10	Drain Valve	8100P-005
4	Air Intake	8100P-032	11	Main Power Cord	8100P-009
5	Mesh Screen	8100P-033	12	Handle	N/A
6	Chassis	N/A	13	Pipe Support	8100P-037
7	Main Controller	8100P-012	14	Water Heater Stand	8100P-064

Table 34 - 20 Gallon Model Cabinet Replacement Parts

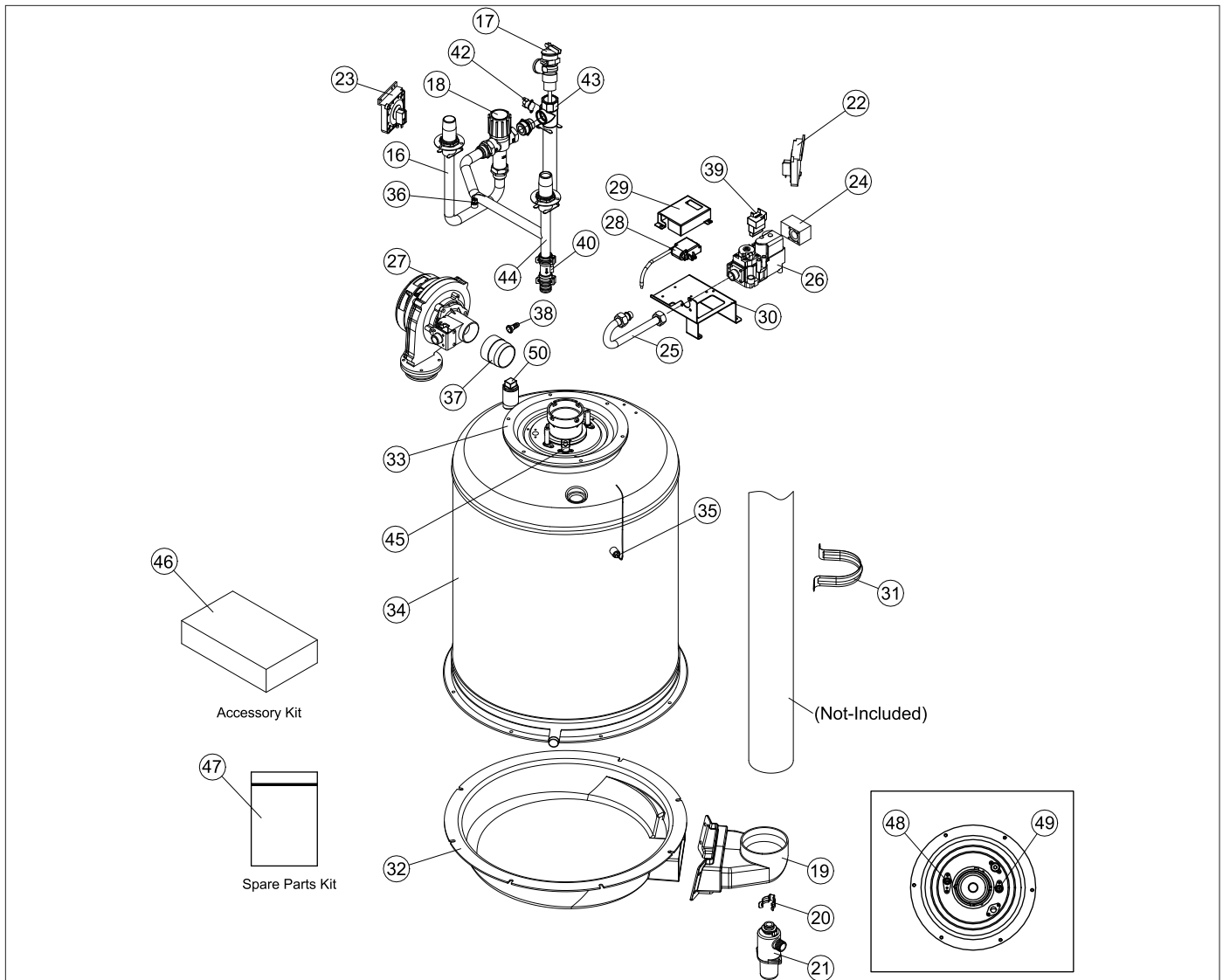


Figure 51 - 20 Gallon Model Combustion System Replacement Parts

NUMBER	DESCRIPTION	PART NUMBER	NUMBER	DESCRIPTION	PART NUMBER
16	Hot Outlet Water Pipe	8100P-021	34	Water Tank	N/A
17	T&P Relief Valve	8100P-015	35	H/E Thermistor	8100P-014
18	Tempering Valve	8100P-018	36	Outlet Thermistor	8100P-016
19	Exhaust Adaptor	8100P-039	37	Radial Blower Adaptor	8100P-046
20	Trap Clamp	8100P-040	38	APS Adaptor	
21	Condensate Trap	8100P-024	39	GV Power Plug	8100P-047
22	Intake Air Pressure Switch	8100P-008	40	Inlet Water Flow Sensor	8100P-023
23	Exhaust Air Pressure Switch	8100P-007	Not Shown	Wire Harness	8100P-013
24	Gas Adaptor	8100P-041	42	ECO Hot Water Outlet (194°F)	8100P-017
25	Gas Tube	8100P-042	43	Outlet Fitting	8100P-019
26	Gas Valve	8100P-001	44	Cold Inlet Water Pipe	8100P-020
27	Blower Assembly with Mixer	8100P-003	45	ECO Burner Plate	8100P-022
28	Ignition Transformer	8100P-010	46	Accessory Kit (See "What's in the Box")	8100P-026
29	Ignitor Box	8100P-043	47	Spare Parts Kit (O-Rings)	8100P-036
30	Gas Valve Support	8100P-044	48	Ignitor	8100P-050
31	Pipe Clamp	8100P-045	49	Flame Sensing Rod	8100P-071
32	Exhaust Chamber	N/A	50	0.75" x 21.6" L Aluminum Anode Rod	8100P-135
33	Burner Assembly	8100P-004			

Table 35 - 20 Gallon Model Combustion System Replacement Parts

Limited Warranty for RGH Floor Mounted Water Heaters

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

<p>Residential Use Warranty Six (6) years – Tank, One (1) year – Components</p>
<p>Commercial Use Warranty Three (3) years – Tank, One (1) year – Components</p>
<p>USE DEFINITIONS - Residential Use means heating in a single family dwelling. This dwelling must be either: a) owned and resided in by the Owner; or b) a residential rental property that services a single dwelling in which the Owner resides on a permanent basis. Commercial Use refers to all other applications.</p>

COVERAGE

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

B. Should a defect or malfunction result in a leakage of water from the water heater within the above-stated warranty periods due to defective material or workmanship, malfunction, or failure to comply with the above warranty, with such defect or malfunction having been verified by an authorized HTP representative, HTP will replace the defective or malfunctioning water heater with a replacement of the nearest comparable model available at the time of replacement. The replacement water heater will be warranted for the unexpired portion of the applicable warranty period of the original water heater.

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

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

E. If at the time of a request for service the Owner cannot provide a copy of the original sales receipt or the warranty registration, the warranty period for the water heater shall then be deemed to have commenced thirty (30) days after the date of manufacture of the water heater and NOT the date of installation of the water heater.

F. This warranty extends only to water heaters utilized in water heating applications that have been properly installed by qualified professionals based upon the manufacturer's installation instructions.

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

OWNER RESPONSIBILITIES

The Owner or Qualified Installer / Service Technician must:

1. Have a relief valve bearing the listing marks of the American Society of Mechanical Engineers (ASME) installed with the water heater assembly in accordance with federal, state, and local codes.
2. Have a vacuum relief valve certified to ANSI Z21.22 - Relief Valves for Hot Water Supply Systems installed with the water heater assembly in accordance with federal, state, and local codes and in installations prone to vacuum related damages.
3. Maintain the water heater in accordance with the maintenance procedure listed in the manufacturer's provided instructions. Preventive maintenance can help avoid any unnecessary breakdown of the water heater and keep it running at optimum efficiency.
4. Maintain all related system components in good operating condition.

5. Use the water heater in an open system, or in a closed system with a properly sized and installed thermal expansion tank.
6. Use the water heater at water pressures not exceeding the working pressure shown on the rating plate.
7. Keep the water heater free of damaging scale deposits.
8. Make provisions so if the water heater or any component or connection thereto should leak, the resulting flow of water will not cause damage to the area in which it is installed.
9. Have the anode checked every two years. Replace the anode if necessary.

WARRANTY EXCLUSIONS

This limited warranty will not cover:

1. Any water heater purchased from an unauthorized dealer.
2. Any water heater not installed by a qualified installer / service technician, or installations that do not conform to ANSI, CSA, and/or UL standards, as well as any applicable national or local building codes.
3. Service trips to teach the Owner how to install, use, maintain, or to bring the water heater installation into compliance with local building codes and regulations.
4. The workmanship of any installer. The manufacturer disclaims and does not assume any liability of any nature caused by improper installation, repair, or maintenance.
5. Electricity or fuel costs, or increased or unrealized savings for same, for any reason whatsoever.
6. Any water damage arising, directly or indirectly, from any defect in the water heater or component part(s) or from its use.
7. Any incidental, consequential, special, or contingent damages or expenses arising, directly or indirectly, from any defect in the water heater or the use of the water heater.
8. Failure to locate the water heater in an area where leakage of the water heater or water line connections and the relief valve will not result in damage to the area adjacent to the water heater or lower floors of the structure, as well as failure to install the water heater in or with a properly sized drain pan routed to an approved drainage location.
9. Any failed components of the system not manufactured by HTP as part of the water heater.
10. Water heaters repaired or altered without the prior written approval of HTP.
11. Damages, malfunctions, or failures resulting from failure to install the water heater in accordance with applicable building codes/ordinances or good plumbing and electrical trade practices.
12. Damages, malfunctions, or failures resulting from improper installation, failure to operate the water heater at firing rates or pressures not exceeding those on the rating plate, or failure to operate and maintain the water heater in accordance with the manufacturer's provided instructions.
13. Failure to operate the water heater in an open system, or in a closed system with a properly sized and installed thermal expansion tank.
14. Failure or performance problems caused by improper sizing of the water heater, expansion device, piping, or the gas supply line, the venting connection, combustion air openings, electric service voltage, wiring or fusing.
15. Damages, malfunctions, or failures caused by improper conversion from natural gas to LP gas or LP gas to natural gas.
16. Damages, malfunctions, or failures caused by operating the water heater with modified, altered, or unapproved components, or any component / attachment not supplied by HTP.
17. Damages, malfunctions, or failures caused by abuse, accident, fire, flood, freeze, lightning, electrochemical reaction, acts of God and the like.
18. Failures (leaks) caused by operating the water heater in a corrosive or contaminated atmosphere.
19. Damages, malfunctions, or failures caused by operating an empty or partially empty water heater ("dry firing"), or failures caused by operating the water heater when it is not supplied with water, free to circulate at all times.
20. Any damage or failure of the water heater due to the accumulation of solid materials or lime deposits.
21. Any damage or failure resulting from improper water chemistry, or heating anything other than potable water. DEFINITION OF POTABLE WATER - Potable water is defined as drinkable water supplied from utility or well water in compliance with EPA secondary maximum contaminant

levels (40 CFR Part 143.3) as shown in the table.

EPA DEFINITION OF POTABLE WATER	
Contaminant	Level
Total Hardness (Residential Use - Below 140°F water temperature)	200 mg/l (12 grains/gallon)
Total Hardness (Commercial Use - 140°F and above water temperature)	120 mg/l (7 grains/gallon)
Aluminum	0.05 to 0.2 mg/l
Chloride	100 mg/l
Color	15 color units
Copper	1.0 mg/l
Corrosivity	Non-corrosive
Fluoride	2.0 mg/l
Foaming Agents	0.5 mg/l
Iron	0.3 mg/l
Manganese	0.05 mg/l
Odor	3 threshold odor number
pH	6.5 – 8.5
Silver	0.1 mg/l
Sulfate	250 mg/l
Total Dissolved Solids (TDS)	500 mg/l
Zinc	5 mg/l
Dissolved Carbon Dioxide (CO ₂)	15 mg/l or ppm

22. Any damages, malfunctions, or failures resulting from the use of dielectric unions.
23. Water heaters replaced for cosmetic reasons.
24. Components of the water heater that are not defective, but must be replaced during the warranty period as a result of reasonable wear and tear.
25. Components of the water heater that are subject to warranties, if any, given by their manufacturers; HTP does not adopt these warranties.
26. Damages, malfunctions, or failures resulting from the use of any attachment(s) not supplied by HTP.
27. Water heaters installed outside the fifty states (and the District of Columbia) of the United States of America and Canada.
28. Water heaters moved from the original installation location.
29. Water heaters that have had their rating labels removed.

PROCEDURES FOR WARRANTY SERVICE REQUESTS

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

When submitting a warranty claim the following items are required:

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

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

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

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

SERVICE, LABOR, AND SHIPPING COSTS

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

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

LIMITATIONS OF YOUR HTP WARRANTY AND REMEDIES

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

NO OTHER WARRANTIES

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

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

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

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

IMPORTANT

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

Distributor / Dealer: Please insert contact details.