

# Installation Instructions and Use & Care Guide

## Residential Gas Water Heater

Power Vented Ultra Low Nox Gas Water Heater with the Flammable Vapor Ignition Resistant Safety System



Read this manual and the labels on the water heater before you install, operate, or service it. If you have difficulty following the directions, or aren't sure you can safely and properly do any of this work yourself:

- Call our Technical Assistance Hotline which is listed on your warranty. We can help you with installation, operations, troubleshooting, or maintenance. Before you call, write down the model and serial number from the water heater's rating plate.
- Incorrect installation, operation, or service can damage the water heater, your house and other property, and present risks including fire, scalding, electric shock, and explosion, causing serious injury or death.

**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 performed by a qualified installer, service agency or the gas supplier.**

### Table of Contents

### Page

IMPORTANT SAFETY INFORMATION .....	3-6
GETTING STARTED .....	7-15
INSTALLATION .....	16-26
OPERATION .....	27-28
TROUBLESHOOTING .....	29-34
MAINTENANCE .....	35-37
ELECTRICAL CONNECTIONS .....	38
REPAIR PARTS .....	39-40



LOW LEAD CONTENT



Keep this manual in the pocket on heater for future reference whenever maintenance, adjustment or service is required.

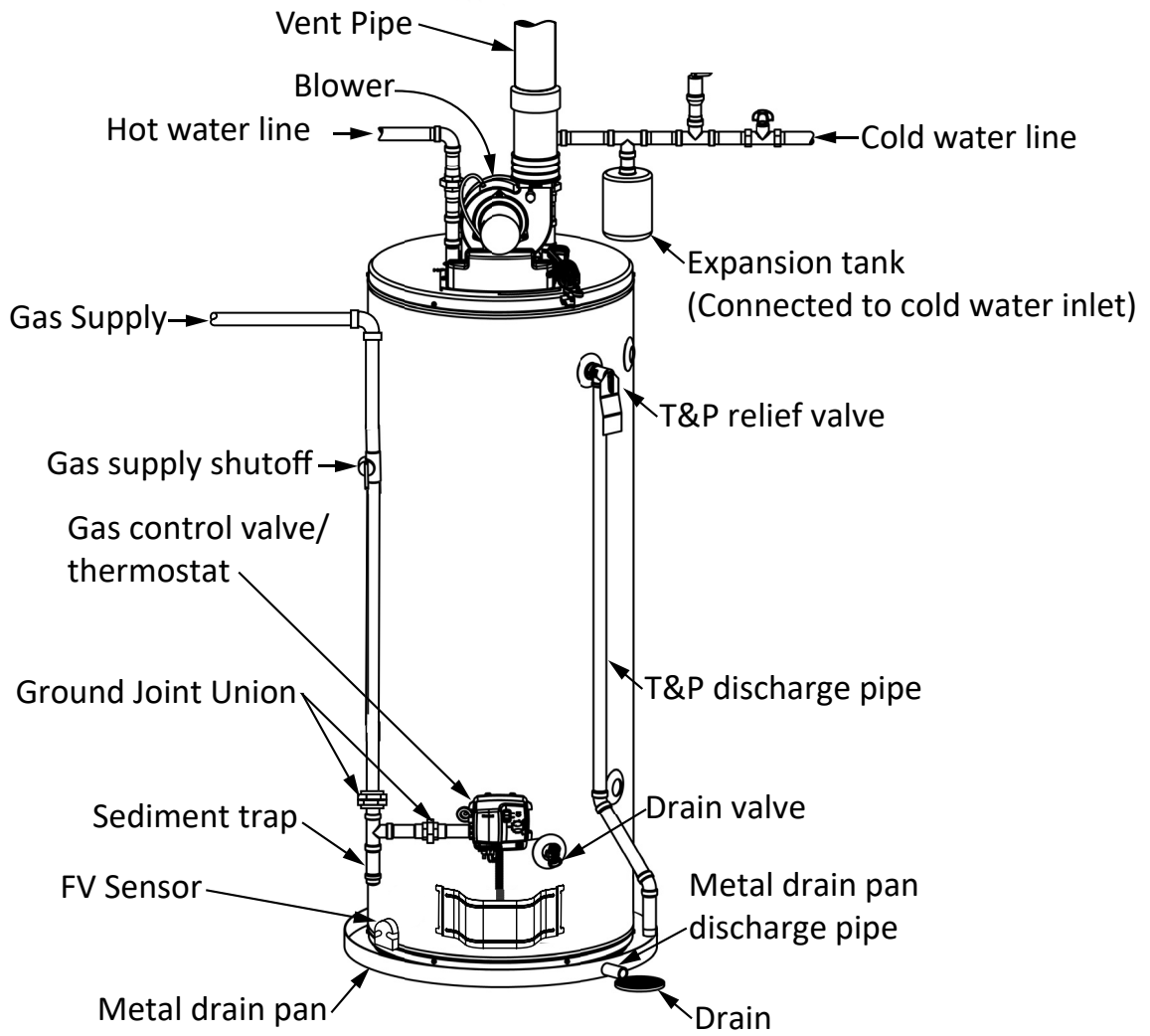
Retain your original receipt as proof of purchase.

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# COMPLETED INSTALLATION (TYPICAL)







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# IMPORTANT SAFETY INFORMATION

Read and follow all safety messages and instructions in this manual.

	<p>This is the safety alert symbol. It is used to alert you to potential physical injury hazards. Obey all safety messages that follow this symbol to avoid possible property damage, serious injury or death. Do not remove any permanent instructions, labels, or the rating plate from either the outside of the water heater or on the inside of the access panels. Keep this manual near the water heater.</p>
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	<p><b>DANGER</b> indicates hazardous situation that, if not avoided, will result in death or serious injury.</p>
	<p><b>WARNING</b> indicates a hazardous situation that, if not avoided, could result in death or serious injury.</p>
	<p><b>CAUTION</b> indicates a hazardous situation that, if not avoided, could result in minor or moderate injury.</p>
	<p><b>NOTICE</b> indicates practices not related to physical injury.</p>

**▲ 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.

An odorant is added by the gas supplier to the gas used by this water heater. This odorant may fade over an extended period of time. Do not depend upon this odorant as an indication of leaking gas. We recommend installing a fuel gas and carbon monoxide detector.

This product is certified to comply with a maximum weighted average of 0.25% lead content as required in some areas.

## Important information to keep

Fill out this section and keep this manual in the pocket of the water heater for reference.

Date Installed:

\_\_\_\_\_

Model number:

\_\_\_\_\_

Serial number:

\_\_\_\_\_

Maintenance performed:*	Date:
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

\*Drain and flush tank and remove and inspect anode rod after first six months of operation and at least annually thereafter. Operate the Temperature and Pressure Relief Valve (T&P) annually and inspect T&P valve every 2-4 years (see the label on the T&P valve for maintenance schedule). See the Maintenance section for more information about maintaining this water heater.



# IMPORTANT SAFETY INFORMATION

To reduce the risk of property damage, serious injury or death, read and follow the precautions below, all labels on the water heater, and the safety messages and instructions throughout this manual.

## RISKS DURING INSTALLATION AND MAINTENANCE

### Lifting Risk



**▲ WARNING!** The water heater is heavy. Follow these precautions to reduce the

risk of property damage, injuries from lifting or impact injuries from dropping the water heater.

- Use at least two people to lift the water heater.
- Be sure you both have a good grip before lifting.
- Use an appliance dolly or hand truck to move the water heater.



### Explosion Risk

**▲ WARNING!** Read the water heater's rating plate to determine the type of gas required. Failure to follow these instructions can result in serious injury or death from explosion, fire or carbon monoxide poisoning.

- Do not connect a natural gas water heater to an L.P. gas supply.
- Do not connect an L.P. gas water heater to a natural gas supply.
- Use a new CSA approved gas supply line.
- Install a shut-off valve on the gas supply line.

### Gas Pressure

**▲ WARNING!** The gas supply pressure must not exceed the maximum supply pressure as stated on the water heater's rating plate. The minimum supply pressure is for the purpose of input adjustment.

## RISKS DURING OPERATION



### Scalding Risk

This water heater can make water hot enough to cause severe burns instantly, resulting in severe injury or death.

- Feel water before bathing or showering.
- To reduce the risk of scalding, install Thermostatic Mixing Valves (temperature limiting valves) at each point-of-use. These valves automatically mix hot and cold water to limit the temperature at the tap. Mixing valves are available from your local plumbing supplier. Follow manufacturer's instructions for installation and adjustment of the valves.
- The gas control valve on this water heater has been factory set to its lowest setting to reduce the risk of scalding. Higher temperatures increase the risk of scalding, but even at 120°F, hot water can scald. If you choose a higher temperature setting, Thermostatic Mixing Valves located at each point-of-use are particularly important to help avoid scalding.

Table 1

Temperature	Time to Produce a Serious Burn
120°F (49°C)	More than 5 minutes
125°F (52°C)	1½ to 2 minutes
130°F (54°C)	About 30 seconds
135°F (57°C)	About 10 seconds
140°F (60°C)	Less than 5 seconds
145°F (63°C)	Less than 3 seconds
150°F (66°C)	About 1½ seconds
155°F (68°C)	About 1 second

For information about changing the factory temperature setting, refer to "Adjusting the Temperature" on page 28.

Even if you set the water heater's gas control valve to a low setting, higher water temperatures may occur in certain circumstances:

- In some cases, repeated small draws of water can cause the hot and cold water in the tank to "stack" in layers. If this happens, the water can be as much as thirty degrees hotter than the gas control valve setting. This temperature variation is the result of your usage pattern and is not a malfunction.
- Water temperature will be hotter if someone adjusted the gas control valve to a higher setting.
- Problems with the gas control valve or other malfunctions may result in higher than expected water temperatures.
- If the water heater is in a hot environment, the water in the tank can become as hot as the surrounding air, regardless of the temperature setting.

- If the water supplied to the water heater is pre-heated (for example, by a solar system) the temperature in the tank may be higher than the water heater's temperature setting.
- Should overheating occur or the burner fail to shut off, turn off the manual gas supply valve to the water heater and call a qualified person.

**To reduce the risk of unusually hot water reaching the fixtures in the house, install Thermostatic Mixing Valves at each point-of-use.**

If anyone in your home is at particular risk of scalding (for example, the elderly, children, or people with disabilities), or if there is a local code or state law requiring a certain water temperature at the hot water tap, these precautions are particularly important.

According to a national standard (ASSE 1070) and many local plumbing codes, the water heater's gas control valve should not be used as the sole means to regulate water temperature and avoid scalds.

Properly adjusted Thermostatic Mixing Valves installed at each point-of-use allow you to set the tank temperature to a higher setting without increasing risk of scalds. A higher temperature setting allows the tank to provide much more hot water and can help provide proper water temperatures for appliances such as dishwashers and washing machines. Higher tank temperatures (140°F) also kill bacteria that cause a condition known as "smelly water" and can reduce the levels of bacteria that cause water-borne diseases.

**Water Contamination Risk**

Do not use chemicals that could contaminate the potable water supply. Do not use piping that has been treated with chromates, boiler seal, or other chemicals.

**Fire Risk**



This water heater is equipped with a Flammable Vapor Ignition Resistance (FVIR) system.

FVIR is designed to reduce the risk of flammable vapor-related fires. FVIR makes this product more sensitive to installation errors or improper installation environments. The FVIR system will not prevent a possible fire/explosion if the hot surface igniter ignites and flammable vapors have accumulated in the combustion chamber.

Do not attempt to light this appliance if you suspect flammable vapors have accumulated inside or outside the appliance. Immediately call a qualified person to inspect the appliance. Water heaters subjected to a flammable vapors incident will show a discoloration on the flame arrestor and require replacement of the entire water heater. Improper installation or an inadequate air supply can also cause the FVIR system to disable the water heater.

To reduce the risk of a fire that could destroy your home and seriously injure or kill people:

- Do not store things that can burn easily such as paper or clothes next to the water heater.
- Do not store or use gasoline or other flammable substances in the vicinity of this or any other appliance.
- Keep the water heater from becoming wet. Immediately shut the water heater off and have it inspected by a qualified person if you find that the wiring, thermostat(s) or surrounding insulation have been exposed to water in any way (e.g., leaks from plumbing, leaks from the water heater itself can damage property

and could cause a fire risk). If the water heater is subjected to flood conditions or the thermostat(s) have been submerged in water, the entire water heater must be replaced.

- Replace the water heater's viewport if glass is missing or damaged. Repair the combustion chamber door seals if damaged.



**Explosion Risk**

High temperatures and pressures in the water

heater tank can cause an explosion resulting in property damage, serious injury or death. A new Temperature and Pressure (T&P) Relief Valve is included with your water heater to reduce risk of explosion by discharging hot water. Additional temperature and pressure protective equipment may be required by local codes.

A nationally recognized testing laboratory maintains periodic inspection of the valve production process and certifies that it meets the requirements for Relief Valves for Hot Water Supply Systems, ANSI Z21.22. The T&P Relief Valve's relief pressure must not exceed the working pressure rating of the water heater as stated on the rating plate.

Maintain the T&P Relief Valve properly. Follow the maintenance instructions provided by the manufacturer of the T&P Relief Valve (label attached to T&P Relief Valve). An explosion could occur if the T&P Relief Valve or discharge pipe is blocked. Do not cap or plug the T&P Relief Valve or discharge pipe.

**Fire and Explosion Risk if Hot Water is Not Used for Two Weeks or More.**

**▲ WARNING! Hydrogen gas builds up in a hot water system when it is not**



# IMPORTANT SAFETY INFORMATION

used for a long period (two weeks or more). Hydrogen gas is extremely flammable. If the hot water system has not been used for two weeks or more, open a hot water faucet for several minutes at the kitchen sink before using any electrical appliances connected to the hot water system. If hydrogen is present there will probably be an unusual sound such as “air” escaping through the pipe as hot water begins to flow. Do not smoke or have an open flame or other ignition source near the faucet while it is open.

## Carbon Monoxide Risk

**▲ WARNING!** This water heater operates by burning gas. Carbon monoxide is a colorless, odorless gas that is a by-product of burning of fuels such as coal, wood, charcoal, oil, kerosene, propane, and natural gas. Breathing excessive and abnormal amounts of carbon monoxide can cause carbon monoxide poisoning, resulting in serious injury or death. This water heater must be supplied with adequate combustion air and



must be properly vented to the outdoors. Have a qualified person (licensed plumber, authorized gas

company personnel, or authorized service technician) install the venting system using these installation instructions.

- Install a fuel gas and carbon monoxide detector in the living areas of your home.
- Do not install this water heater in a mobile home or manufactured housing.

- Failure to follow these instructions can result in serious injury or death from carbon monoxide poisoning.

## Installation Accessories



Figure 1 - Gas Water Heater Hook-Up Kit

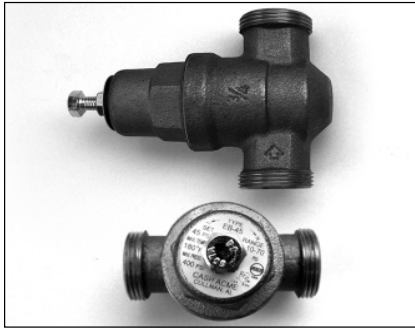


Figure 2 - Install a Pressure Reducing Valve set to 50 to 60 PSI.

**1** Review all of the instructions before you begin work. **(If you aren't sure that you can safely and properly do this work yourself, call a qualified person, such as a licensed plumber, to have the work done).** Improper installation can damage the water heater, your home and other property, and can present risks of serious injury or death.

**2** This water heater is design-certified by CSA International as a Category IV, non-direct vented water heater which takes its combustion air either from the installation area or from air ducted to the unit from the outside. This water heater must be installed according to all local and state codes or, in the absence of local and state codes, the "National Fuel Gas Code", ANSI Z223.1 (NFPA 54)-current edition. This is available from the following:

CSA America, Inc.  
8501 East Pleasant Valley Road  
Cleveland, OH 44131

National Fire Protection Association  
1 Batterymarch Park  
Quincy, MA 02269

Check with local code officials about codes governing this installation. Have your installation inspected by a code official to ensure the installation meets all local codes.

**NOTICE:** If you lack the necessary skills required to properly install this water heater, or you have difficulty following the instructions, you should not proceed but have a qualified person perform the installation of this water heater.

Massachusetts code requires this water heater to be installed in accordance

with Massachusetts 248-CMR 2.00 and 248-CMR 5.00: State Plumbing Code. Other local and state authorities may have similar requirements or other codes applicable to the installation of this water heater.

**3** Before you start, be sure you have the following tools and supplies:

- Common plumbing tools (depending on what type of water pipes you have).
- Thread sealant tape or pipe joint compound approved for potable water.
- For homes with copper pipes, and where allowed by local codes, you may purchase a gas water heater hook-up kit (available from your plumbing supplier) with compression fittings that don't require soldering. **NOTE:** Where allowed by local codes.
- For homes with plastic pipe, use threaded connectors suitable for the specific type of plastic pipe used: CPVC or PEX (cross-linked polyethylene). Do not use PVC pipe.
- Non-corrosive gas leak detection solution made from hand dish-washing soap mixed with water (1 part soap to 15 parts water) or children's soap bubbles and a small, soft-bristled brush.
- An appliance dolly or hand truck to move the water heater.

**Recommended Accessories:**

- A metal drain pan.
- Automatic water leak detection and shut-off device.
- Pressure Reducing Valve.
- Thermal Expansion Tank.
- Thermostatic Mixing Valves at each point-of-use.
- Fuel gas and carbon monoxide detector.

## Combustion and Ventilation Air Supply

Before installing the water heater, you must determine the amount of air needed to supply this water heater and any other gas appliances in the same area and provide adequate air for combustion and ventilation. Consult a qualified person if you're unsure of the proper way to supply air to your water heater.

**▲ WARNING! This gas water heater requires an adequate source of clean air for combustion and ventilation. Without sufficient air, your water heater may emit excessive and abnormal amounts of carbon monoxide.**

**Before beginning:**

Calculate total BTU/HR rating of all appliances.

To calculate the combustion air and ventilation required, add up the total BTU/HR ratings of all gas burning appliances (e.g., water heaters, furnaces, clothes dryers) in the same area.

Your water heater's BTU/HR rating is on the rating plate, located next to the gas control valve/thermostat. The BTU/HR ratings should be on the other appliances' rating plates. If you have trouble determining the BTU/HR ratings, contact the manufacturer or have a qualified person determine the ventilation requirements. **NOTICE:** If you are replacing your old water heater with one that has a higher BTU/HR rating, the amount of ventilation required may be greater.

# GETTING STARTED

Example:

Gas Burning Appliance	BTU/HR Rating
Gas Water Heater	40,000
Furnace	75,000
Dryer	20,000
Total	135,000

Your Appliances:

Gas Burning Appliance	BTU/HR Rating
Gas Water Heater	
Total	

Table 2 provides examples of minimum square footage (area) required for various BTU/HR totals. Areas used for storage or which contain large objects containing less air than is assumed for the room sizes in Table 2 – see Option A for more specific calculations.

## Option A: Installation without outside ventilation (not recommended)

Ventilation with outside air is recommended for all installations. Even if the water heater is installed in a large, open room inside the house, outdoor air is usually needed because modern homes are very tightly sealed and often do not supply enough air to the water heater. However, when installed in a large indoor space, it may be possible to provide enough air without outside ventilation. If you are unsure if your installation location has enough ventilation, contact your local gas utility company or code officials for a safety inspection.

The following instructions will help determine if it may be possible to install without outside ventilation. If there is not enough ventilation, you will need to ventilate with outside air.

### Check for Chemicals:

Air for combustion and ventilation

must be clean and free of corrosive or acid-forming chemicals such as sulfur, fluorine, and chlorine. Ventilation with outside air will reduce these chemicals, but it may not completely eliminate them. Failure due to corrosive chemicals is not covered by the warranty. Examples of locations that require outside air due to chemicals include:

- Beauty salons
- Photo processing labs
- Indoor pools
- Laundry, hobby, or craft rooms
- Chemical storage areas

Products such as aerosol sprays, detergents, bleaches, cleaning solvents, gasoline, air fresheners, paint and varnish removers, and refrigerants should not be stored or used near the water heater.

### A1: Calculate the air volume of the room

Air requirements depend on the size of the room.

Floor Area (Square feet) X Ceiling Height (feet) = Room Volume (cubic feet)

If there are large objects in the room (e.g., refrigerator, furnace, car), subtract their volume from the volume of the room to get a better estimate of the air available.

Room Volume – Object Volume = Air Volume

BTU/HR Input	Minimum Square Feet with 8' Ceiling	Typical Room with 8' Ceiling
30,000	188	9 x 21
45,000	281	14 x 20
60,000	375	15 x 25
75,000	469	15 x 31
90,000	563	20 x 28
105,000	657	20 x 33
120,000	750	25 x 30
135,000	844	28 x 30



## A2: Calculate required air volume

A water heater installed in an unconfined attic or garage requires that the space be at least 50 cubic feet per 1,000 BTU/HR of the total input for all gas burning appliances in the same area.

$[Total\ BTU/HR/1000] \times 50 = \text{Cubic feet of air required.}$

Example:

$$(135,000 / 1000) \times 50 = 6,750$$

If the air volume of the room is less than the required air volume, you must provide two permanent outside air openings that draw in sufficient air. Use Option B.

If the air volume of the room is greater than the required air volume, it may be possible to install the water heater without outside ventilation.

## A3: Verify that combustion ventilation is adequate

Because modern homes are often well-sealed to prevent drafts, even a large room may not provide enough combustion air without ventilation. However, your power-vented system could identify inadequate ventilation by triggering an error code (See page 32). Still, you must follow all instructions in this section to ensure adequate ventilation.

### Option B: Install with outside ventilation

Ventilation with outside air is recommended, and, for most installations, is needed. There may be existing ventilation that is adequate, or you may need to add more ventilation.

Supplying outside air typically requires two openings. One opening must be within 12 inches from the floor and the second opening must be within 12 inches from the ceiling. Although a single opening is not preferred, you may use a

single opening to outside air if the minimum free area is sized according to Table 3. Two openings must be used when ventilating with air from another room.

The outside air can be taken from a crawl space or attic open to the outdoors and adequately ventilated. You may use vertical or horizontal ducts.

## B2: Determine type of ventilation

There are several types of ventilation that can be used :

1. Direct to outdoors
2. Vertical ducts
3. Horizontal ducts
4. Single opening (not recommended; must be at least 100 square inches. Not appropriate for confined spaces smaller than 50 cubic feet per 1,000 BTU/HR as calculated in section A or when getting air from another room.)
5. From a larger room inside the house (not recommended – refer to section A above to determine if the combined volume of the rooms may be adequate).

## B3: Determine minimum free area required for each vent opening

The size of the vent openings depends on the total BTU/HR rating of all appliances in the space (use your calculation from “Before beginning”) and the type of vent used. Table 3 provides the minimum free area for each vent opening depending on the type of ventilation.

## B4: Calculate minimum size of vent openings and ducts

The vent cross-sectional area needed to provide the free area depends on the covering on the vent openings. Typical vents use louvers or grilles to protect the opening. The louver or grill itself blocks some of the free area, so the opening may need to be larger to meet the minimum free area requirements.

Use the following formula to calculate the required cross-sectional area:

Table 3

Minimum Free Area of Permanent Openings for Ventilation and Combustion Air Supply – All Air from Outdoors Only.

Based on the total BTU/HR input rating for all gas burning appliances within a confined space.

Opening Source	Minimum Free Area Per Opening (sq. in.)
*Direct to outdoors	1 sq. in. per 4,000 BTU/HR (see figure on page 10)
Vertical ducts	1 sq. in. per 4,000 BTU/HR (see figure on page 10)
Horizontal ducts	1 sq. in. per 2,000 BTU/HR (see figure on page 10)
Single Opening	1 sq. in. per 3,000 BTU/HR (see figure on page 10)

\*These openings connect directly with the outdoors through a ventilated attic, a ventilated crawl space, or through an outside wall.



# GETTING STARTED

Cross-sectional area = minimum free area required ÷ percent free area of covering (in decimals – e.g., 60% = .6)

For example, an installation area that requires openings with 100 square inches of free area would need 134 square inch openings if using metal louvers rated at 75% free area (100 sq. in. ÷ .75 = 134 sq. in.).

If you do not know the % free area for your louver or grill, use the following values:

- For wood louvers or grilles: 20%
- For metal louvers or grilles: 60%

Follow these rules to ensure that vents and ducts provide adequate air flow:

- Each vent opening must be no smaller than 100 square inches .
- Ducts must have the same cross-sectional area as free area of the opening.
- All dimensions for rectangular ducts must be no less than three inches.
- All screens must have mesh ¼" or larger.
- Moveable louvers must be locked open or interconnected with the equipment so that they open automatically during operation.
- Keep louvers and grilles clean and free of debris or other obstructions.

## B5: Check that air source is clean and free of chemicals

Air for combustion and ventilation must be clean and free of corrosive or flammable chemicals. A failure due to corrosive chemicals in the air is not covered by the warranty. Combustion air must be free of acid-forming chemicals such as sulfur, fluorine, and chlorine. Be sure that air at the vent inlets is free of such chemicals.

## B6: Verify that combustion ventilation is adequate

Your power-vented system could trigger an error code (page 32) if there is insufficient combustion air. However, you must also ensure that adequate combustion air is available by following all instructions in this section. Please verify your calculations before you proceed.

### Combustion Air Supply Options

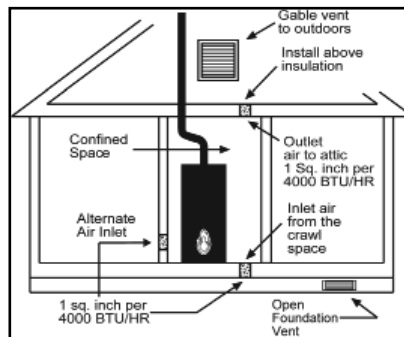


Figure 3 - Direct to outdoors openings

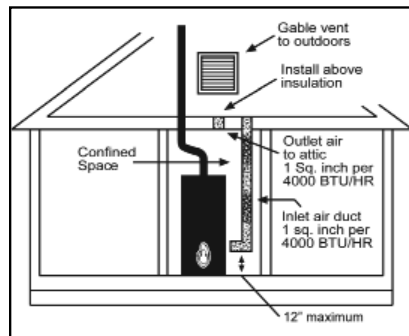


Figure 4 - Vertical duct openings

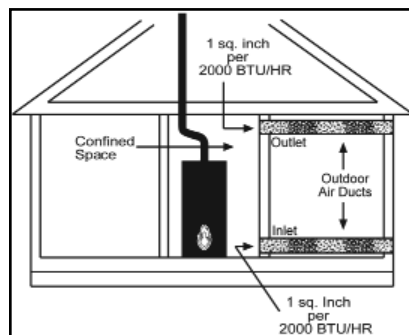


Figure 5 - Horizontal duct openings

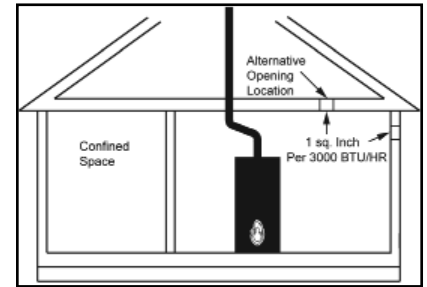


Figure 6 - Single opening

## Venting

### ▲ WARNING!

- **Carbon Monoxide Hazard.** This water heater must be supplied with adequate air and vented to the outdoors. The vent system must be installed by a qualified person. Examples of a qualified person include gas technicians, authorized gas company personnel, and authorized service technicians.
- **Check to make sure the vent pipe is not blocked in any way. Do not common vent this water heater with any other appliance. Do not install in the same chase or chimney with a metal or high-temperature plastic from another gas or fuel burning appliance.**
- **Failure to properly vent the water heater can result in severe injury or death from carbon monoxide poisoning.**
- **Do not use Schedule 40 PVC venting if used in areas with ambient temperatures above 110°F.**

This water heater must be properly vented for removal of exhaust gases to the outside atmosphere. Correct installation of the vent pipe system is mandatory for the safe and efficient operation of this water heater and is an important factor in the life of the unit.

The vent pipe must be installed in accordance with state and local codes, or in the absence of such, the National Fuel Gas Code, NFPA 54, ANSI Z223.1-current edition.

To reduce the risk of carbon monoxide poisoning, install a fuel gas and carbon monoxide detector. Install and maintain the detector in accordance with the manufacturer's instructions and local codes.

## Vent Pipe Material

The following plastic materials may be used for exhaust outlet piping subject to state and local codes.

- 2 or 3 inch Schedule 40 PVC, CPVC, ABS, and polypropylene
- 2 or 3 inch Schedule 40 or PVC, CPVC, ABS, and polypropylene
- DWV Pipe is acceptable

Reference Table 5 for more information.

Use of cellular core PVC (ASTM F891), cellular core CPVC, or Radel® (polyphenolsulfone) in non-metallic venting systems is prohibited.

Plastic pipe and fittings are available through most plumbing suppliers. Always check the marking on the pipe to make sure you are using the correct material. See also "Connect Vent Pipe to Blower" on page 23.

## Vent Pipe Installation

The following guidelines should be followed when installing the exhaust outlet piping:

- Venting should be as direct as possible with a minimum number of pipe fittings.
- Vent diameter must not be reduced unless specifically noted in the installation instructions.
- Support all horizontal pipe runs every four feet and all vertical pipe runs every six feet or according to local codes.
- Vents run through unconditioned spaces where below freezing temperatures are expected should be properly insulated to prevent freezing. For horizontal runs, wrap the vent pipe with self-regulating 3 or 5 watt heat tape. The heat tape must be U.L. listed and installed per the manufacturer's instructions.

- Do not connect this venting system with an existing vent or chimney.
- Do not common vent with the vent pipe of any other water heater or appliance.

The exhaust outlet piping and termination may be installed in one of the following type terminations:

- 1.) Standard Horizontal;
- 2.) Vertical.

All pipe, fittings, pipe cement, primers and procedures must conform to American National Standard Institute and American Society for Testing and Materials (ANSI/ASTM) standards in the United States. This water heater has been design certified by CSA International for use with the listed plastic vent pipe material.

**DO NOT use vent elbows in this vent pipe installation.** See "Incorrect Fittings" in Figure 8.

All joints in the outlet piping must be properly cemented. Size and cut all piping before cementing.

1. Cut the pipe end square and remove all ragged edges and burrs. Make sure the inside of the pipe is clean and free of cuttings and loose dirt. Chamfer the end and apply primer to the fitting and pipe.
2. Using a suitable grade of pipe cement, apply a moderate, even coat inside the fitting. Apply a liberal amount of cement to the outside of the pipe to socket depth. NOTICE: It is important to select the proper pipe cement for the type plastic pipe being used.
3. Assemble the parts quickly while the cement is still wet. Twist the pipe 1/4 turn during insertion and hold for 30 seconds.

# GETTING STARTED

## Vent Pipe Length

Size the exhaust outlet as specified in Table 4, page 12. This table lists

the maximum allowable length in feet of the exhaust outlet pipe as related to the number of required elbows and the termination. The specified

maximum lengths are for exhaust pipe systems. Minimum pipe length is 3 feet with one elbow.

Table 4: Vent Pipe Lengths

WATER HEATER MODEL	HEATER INPUT (Btu/hr)	VENT SIZE (Inside Diam.)	PRESSURE SWITCH SETTING	MAX. EQUIVALENT VENT LENGTH	MIN. EQUIVALENT VENT LENGTH
40 & 50 gal.	42,000	2"	- 0.27 in. w.c.	50 ft. + termination elbow	7 ft. + termination elbow
40 & 50 gal.	42,000	3"	- 0.27 in. w.c.	125 ft. + termination elbow	50 ft. + termination elbow

Equivalent lengths of straight pipe for various elbows using Schedule 40 PVC, CPVC and polypropylene.

Vent Pipe Size	Elbow Type	Short Sweep/Short Radius	Long Sweep/Long Radius
2" or 3"	90°	8 ft.	5 ft.
2" or 3"	45°	4 ft.	2.5 ft.

### Notes:

1. Use long radius elbows where possible. Minimum distance between 90° elbows should be 6" wherever possible.
2. Venting systems may use a maximum of five (5) 90° elbows.
3. Use proper screen termination (see Figure 8).

## High Ambient Temperature

**▲ WARNING! Do not install in environments above 140°F.**

This heater requires room air to lower the flue gas temperatures before the gases pass through the vent system. The dilution air inlets are located on the rear of the blower assembly.

As the room temperature rises, the ability to lower the flue gases temperature lessens so special attention to the choice of venting material is required. Establishing the ambient temperatures where the heater and the venting is installed is very important, especially in regions with warmer climates or any region that experiences hot summers. Ambient conditions between 105°F and 140°F require that the venting material be either CPVC or polypropylene. Areas that can experience high ambient environments include closets, alcoves, areas under staircases, attics—especially in metal roofed buildings, areas with restricted air movement, rooms with large solar gains, metal sheds, industrial or commercial enter-

prises and venting systems exposed to direct sunlight. For high temperature environments (105°F - 140°F), obtain high limit switch upgrade Kit #100112696 and use the higher rated

venting piping. Use of cellularcore PVC (ASTM F891), cellular core CPVC, or Radel® (polyphenylsulfone) in non-metallic venting systems is prohibited.

Vent Pipe Material	Pipe and fitting nomenclature	Applicable Standard
PVC	DWV	ASTM D2665 or CSA B181.2
PVC	Sch 40	ASTM D1785 or CSA B137.3
PVC	SDR series	ASTM D2241 or CSA B137.3
PVC	BH	ULC S636‡, UL 1738§
CPVC	CPVC 41	ASTM D2846 or CSA B137.6
CPVC	Sch 40	ASTM F441 or CSA B137.6
CPVC	SDR series	ASTM-F442
CPVC	BH	ULC S636‡, UL 1738§
ABS	Sch 40 DWV	ASTM D2661§, CSA B181.1§ or ULC S636‡
Polypropylene	n/a	ULC S636‡, UL 1738§

‡ Applicable to Canada only.  
 § Applicable to the United States only.  
 Note: Use of cellular core PVC (ASTM F891), cellular core CPVC, or Radel®(polyphenylsulfone) in non-metallic venting systems is prohibited.



Table 6:	
PVC pipe materials (solid pipe)	DWV ASTM-D2665 Schedule 40 ASTM-D1785, SDR Series ASTM-D2241
CPVC pipe materials	CPVC 41 ASTM-D2846 Schedule 40 ASTM-F441 SDR Series ASTM-F442,
ABS pipe materials	DWV ASTM-D2661 Schedule 40
Polypropylene vent system	UL-1738

Note: If local codes require venting to be marked suitable for use as gas venting, type BH venting may be used.

The fittings, other than the Termination should be equivalent to:

Table 7:	
PVC pipe	PVC DWV ASTM D-2665
CPVC pipe	CPVC ASTM F-438
ABS pipe	ABS ASTM D-2661/3311
Polypropylene vent system	UL-1738

If CPVC or ABS pipe and fittings are used, the proper cement must be used for all joints, including joining the pipe to Termination (PVC Material). If local codes do not allow the use of the PVC termination when a material other than PVC is used for venting, an equivalent fitting of that material may be substituted if the screen in the PVC terminal is removed and inserted into the new fitting.

This water heater is supplied with the applicable vent screens. A 90° termination elbow is optional.

ASTM D-2564 Grade Cement should be used on PVC Materials and ASTM F-493 Grade Cement on CPVC Materials.

**Note:** Polypropylene vent systems require separate adaptor, termination, and elbows (field supplied). It is recommended to use InnoFlue® SW Residential products from Centrotherm (www.centrotherm.us.com).

## Vent Terminations

The exhaust outlet must be installed with the minimum clearances shown in Figure 9.

In addition to maintaining the minimum clearances, the vent should terminate according to the following guidelines:

- Do not expose any reducers or bushings to outdoor ambient temperatures.
- The vent for this appliance shall **not** terminate:
  - Over public walkways;
  - Near soffit vents or crawl space vents or other areas where condensate or vapor could create a nuisance, hazard, or cause property damage;
  - Where condensate vapor could cause damage or could be detrimental to the operation of regulators, relief valves, or other equipment;
  - Where condensate may cause hazardous frost or ice accumulations on adjacent property surfaces;
  - Where children or animals could block pipes;
  - Too close to shrubs or bushes.

- Caulk all cracks, seams and joints within 6 feet horizontally above and below the vent.

## Vertical Termination

The vertical exhaust outlet requires a return bend or two medium or long sweep radius 90° elbows to keep the exhaust outlet downward and prevent entry of rain. Do not include these elbows when calculating the maximum allowable vent pipe because they have already been considered in the vent tables. The vertical exhaust outlet termination is a 2 inch or 3 inch pipe which must be at least 12 inches above the roof line or anticipated snow levels. See Figure 7. Follow all applicable code requirements.

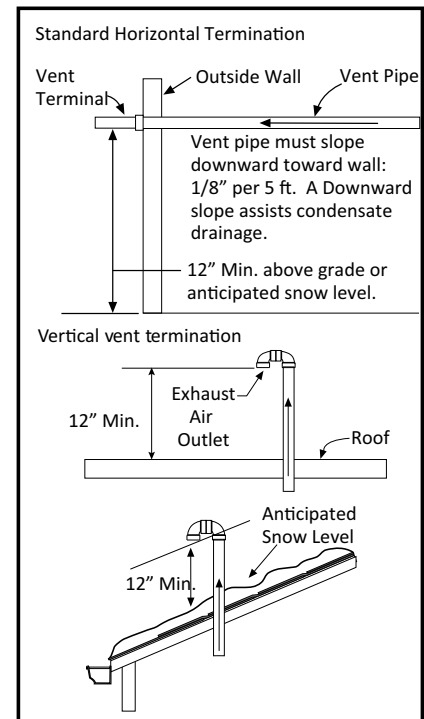


Figure 7 - Vent Terminations



# GETTING STARTED

## Standard Horizontal Termination

The standard horizontal exhaust outlet termination is a 2 inch or 3 inch pipe which terminates at least 12 inches above grade or anticipated snow levels. To prevent potential condensate from collecting in the venting system, slope the vent at a downward pitch of 1/8" per 5 ft. away from the water heater.

Install the correct size coupling at the outside wall on the exhaust to prevent the termination from being pushed inward. Follow all applicable code requirements.

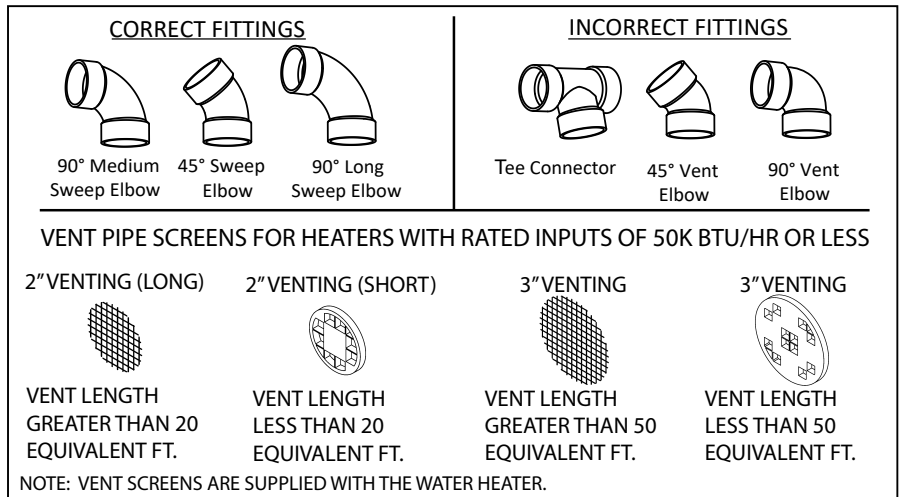


Figure 8 - Vent Termination Fittings

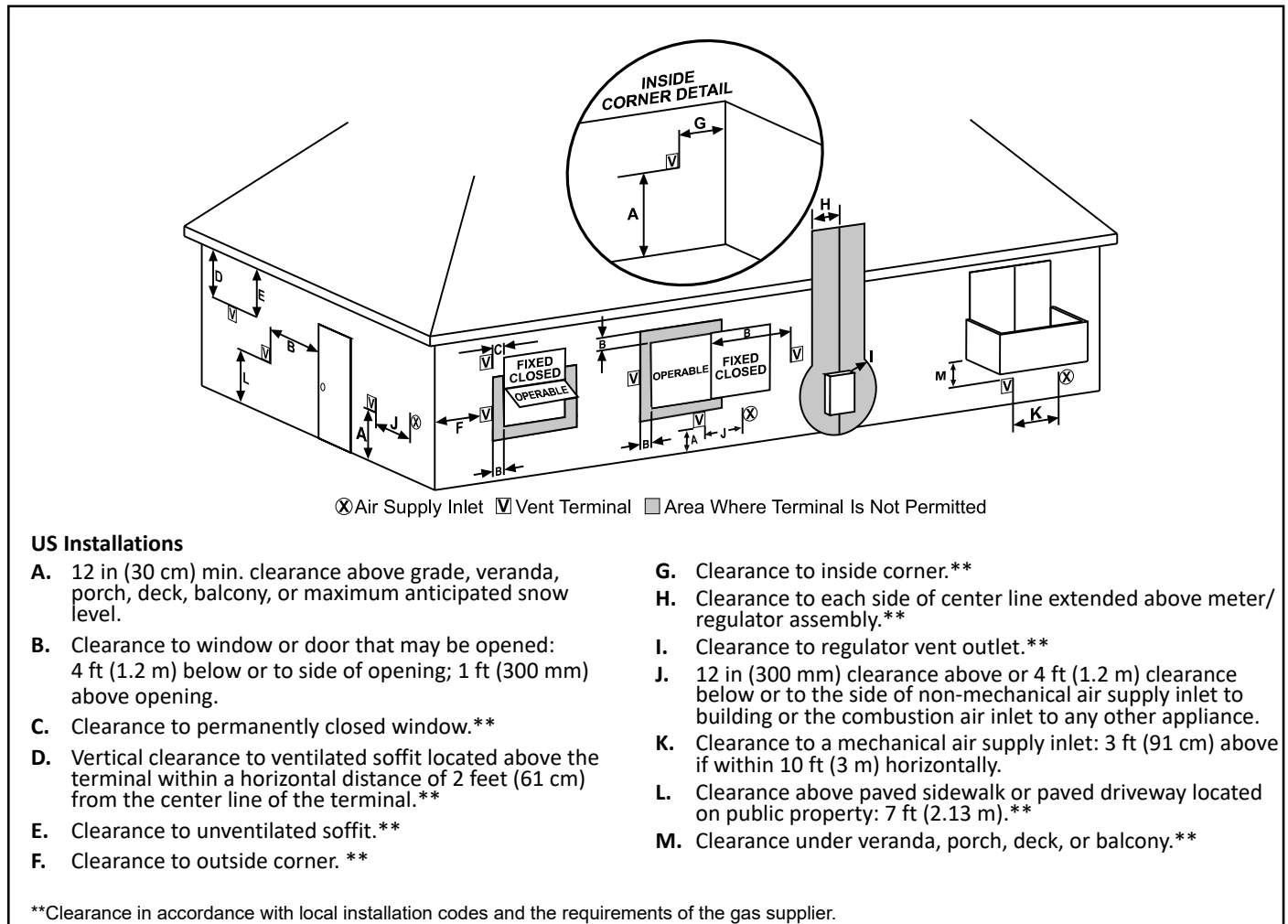


Figure 9 - Minimum Termination Clearance for Outlet Vent



## Gas Piping

Gas piping must be installed according to local and state codes or, in the absence of local and state codes, the “National Fuel Gas Code”, ANSI Z223.1(NFPA 54)-current edition.

**NOTICE:** When installing gas piping, apply pipe joint compound or thread sealant tape approved for fuel gases.

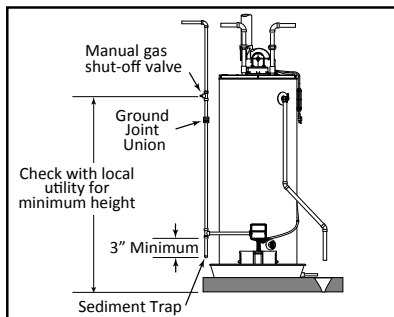


Figure 10 - Gas Piping

1. Install a readily accessible manual shut-off valve in the gas supply line as recommended by the local utility. Know the location of this valve and how to turn off the gas to this unit.
2. Install a Sediment Trap as shown in the Gas Piping figure (Figure 10). The Sediment Trap must be no less than three inches long for the accumulation of dirt, foreign material, and water droplets.
3. Install a ground joint union between the gas control valve and the manual gas shut-off valve. This is to allow easy removal of the gas control valve.
4. Turn the gas supply on and check for leaks. Use a small, soft-bristled brush to apply a hand dishwashing soap and water mixture (1 part soap to 15 parts water) or children’s soap bubbles to all connection points of the gas piping. Saturate all the connections and check for gas leaks

(which will appear as small bubbles). If any leaks are detected, tighten the appropriate connection(s) and re-check.

## Gas Pressure

**NOTICE:** When testing gas pipes with a test pressure of more than ½ psi (3.5 kPa), disconnect the gas line at the manual shut off valve and cap the gas line. Do not subject the water heater’s gas control valve or manual shut off valve to more than ½ psi (3.5 kPa) pressure for any reason. If you are pressure testing the gas line with test pressure of ½ psi (3.5 kPa) or less, you may isolate the water heater from the gas line by closing the manual shut off valve.

## Solar Installation

If this water heater is used as a solar storage heater or as a backup for the solar system, the water supply temperatures to the water heater tank may be in excess of 120°F. A Thermostatic Mixing Valve or other temperature limiting valve must be installed in the water supply line to limit the supply temperature to 120°F. The unit must be set to Standard Mode. (See “Operating Modes” on page 28).

**NOTICE:** Solar water heating systems can often supply water with temperatures exceeding 180°F and may result in water heater malfunction.

# INSTALLATION

## Step 1:

### ✓ Verify that your home is equipped and up-to-date for proper operation

Installing a new water heater is the perfect time to examine your home's plumbing system and make sure the system is up to current code standards. There have likely been plumbing code changes since the old water heater was installed. We recommend installing the following accessories and any other needed changes to bring your home up to the latest code requirements. Updating your plumbing system can help extend the life of your water heater, avoid damage to your home and property, and reduce the risk of serious injuries or death. Inspect your home and install any devices you need to comply with current codes and assure that your new water heater performs at its best. Check with your local plumbing official for more information.

### ✓ Water pressure

Most codes allow a maximum incoming water pressure of 80 psi (we recommend a working pressure no higher than 50-60 psi). Check your home's water pressure with a pressure gauge and adjust if necessary. High water pressure can damage the water heater, piping, and other appliances.

**HOW:** Purchase an inexpensive water pressure gauge. Connect the water

pressure gauge to an outside faucet and measure the maximum water pressure experienced throughout a 24-hour period (highest water pressures often occur at night).

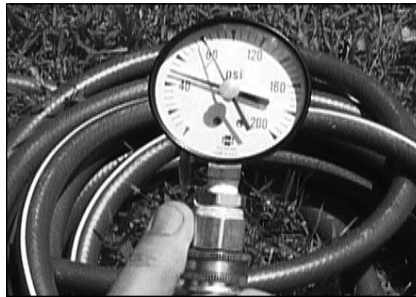


Figure 11 - Use a Water Pressure Gauge to make sure your home's water pressure is not too high.

To adjust your home's water pressure: Locate your home's **Pressure Reducing Valve (PRV)** on the main incoming (cold) water supply line and adjust the water pressure control to between 50 and 60 psi. If your home does not have a PRV, install one on the home's main water supply line and set it to between 50 and 60 psi. Pressure Reducing Valves are available from your local plumbing supplier.

**BACKGROUND:** Over the years, many utilities have increased water supply pressures so they can serve more homes. In some homes today, pressures can exceed 100 psi. High water pressures can damage water heaters, causing premature leaks. If you have replaced toilet valves, had a water heater leak, or had to repair appliances connected to the plumbing system, pay particular attention to your home's water pressure. When purchasing a PRV, make sure the PRV has a built-in bypass.

### ✓ Water pressure increase caused by thermal expansion

Verify that you have a properly sized Thermal Expansion Tank. We recommend installing an expansion tank if your home does not have one. Plumbing codes require a properly pressurized, properly sized Thermal Expansion Tank in almost all homes.



Figure 12 - A Thermal Expansion Tank helps protect the home's plumbing system from pressure spikes.

**HOW:** Connect the Thermal Expansion Tank (available from your local plumbing supplier) to the cold water supply line near the water heater. The expansion tank contains a bladder and an air charge. To work properly, the Thermal Expansion Tank must be sized according to the water heater's tank capacity and pressurized to match the home's incoming water pressure before applying water pressure to the expansion tank. Refer to the instructions provided with the Thermal Expansion Tank for installation details.

**BACKGROUND:** Water expands when heated, and the increased volume of water must have a place to go, or

thermal expansion will cause large increases in water pressure (despite the use of a Pressure Reducing Valve in the home's main water supply line). The Safe Drinking Water Act of 1974 requires the use of backflow preventers and check valves to restrict water from your home reentering the public water system. Backflow preventers are often installed in water meters and may not be readily visible. As a result, most plumbing systems today are now "closed," and almost all homes now need a Thermal Expansion Tank.

A Thermal Expansion Tank is a practical and inexpensive way to help avoid damage to the water heater, washing machine, dishwasher, ice maker, and even toilet valves. If your toilet occasionally runs for no apparent reason (usually briefly at night), that may be due to thermal expansion increasing the water pressure temporarily.

## Water Pipe and Tank Leaks

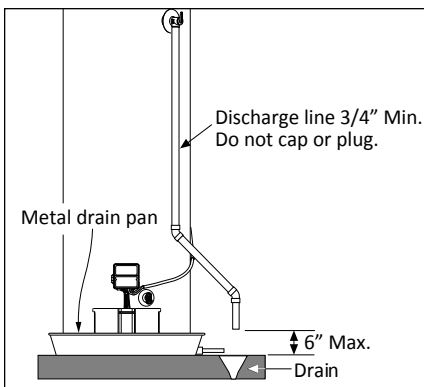


Figure 13 - A metal drain pan piped to an adequate drain can help protect flooring from leaks and drips.

Leaks from plumbing pipes or from the water heater itself can damage prop-

erty and could cause a fire risk.

- Install an automatic leak detection and shutoff device (available from your local plumbing supplier). These devices can detect water leaks and can shut off the water heater's water supply if a leak occurs.
- Install a metal drain pan (available from your local plumbing supplier) under the water heater to catch condensation or leaks from the piping connections or tank. Most codes require, and we recommend, installing the water heater in a metal drain pan that is piped to an adequate drain. The drain pan must be at least two inches wider than the diameter of the water heater. Install the drain pan so the water level would be limited to a maximum depth of 1-3/4". The pan must not restrict air flow to the burner.

## Water Temperature Regulation

Install Thermostatic Mixing Valves to regulate the temperature of the water supplied to each point-of-use (for example, kitchen sink, bathroom sink, bath, shower). Install and adjust the mixing valve according to its manufacturer's instructions.

**▲ WARNING!** Even if the water heater's thermostat is set to a relatively low temperature, hot water can scald. Install Thermostatic Mixing Valves at each point-of-use to reduce the risk of scalding.



Figure 14 - Thermostatic Mixing Valves installed at each point-of-use can help avoid scalding

**BACKGROUND:** A Thermostatic Mixing Valve, installed at each point-of-use, mixes hot water from the water heater with cold water to more precisely regulate the temperature of hot water supplied to fixtures. If you aren't sure if your plumbing system is equipped with properly installed and adjusted Thermostatic Mixing Valves at each point where hot water is used, contact a qualified person.

# INSTALLATION

## Step 2:



### Verify that the location is appropriate

**▲ WARNING! Do not store or use flammable materials, vapors, or liquids in the same location where this water heater is installed.**

Before installing your water heater, ensure that it will be located:

- Indoors in an area with adequate air supply.
- In an area that will not freeze.
- In a metal drain pan piped to an adequate drain.
- In an area with adequate space (clearances) for periodic servicing (there must be a minimum of 24 inches of front clearance).
- In an area that allows a minimum clearance from combustible surfaces as stated on the rating plate. **Refer to the minimum clearances listed on the rating plate on the water heater.**
- On a floor that can support the weight of a water heater full of water.

You will also want to follow these guidelines while considering an appropriate location:

- Do not install near air-moving devices such as exhaust fans, ventilation systems, or clothes dryers.
- Do not obtain ventilating air for the furnace/air handler from the same space as the water heater. Ensure that any return air ducts near the water heater are sealed.
- If the water heater is located in an area subject to lint, dust, or oily vapors, at least annually

check and clean the air filter. See Maintenance section for steps on cleaning the air filter.

- Do not install in a bathroom, bedroom, or any occupied room normally kept closed.
- If the water heater is installed directly on carpeting, it shall be installed on a metal or wood panel extending beyond the full width and depth of the water heater by at least 3 in (76.2mm) in any direction. If the water heater is installed in an alcove or closet, the entire floor shall be covered by the panel.
- If your area is prone to earthquakes, use special straps as required by local building codes.

**NOTICE:** The state of California requires bracing, anchoring, or strapping the water heater to avoid its moving during an earthquake. Contact local utilities for code requirements in your area, visit <http://www.dsa.dgs.ca.gov>, or call 1-916-445-8100 and request instructions. Other locations may have similar requirements. Check with your local and state authorities.

- Do not install in a location prone to physical damage by vehicles, flooding, or other risks.

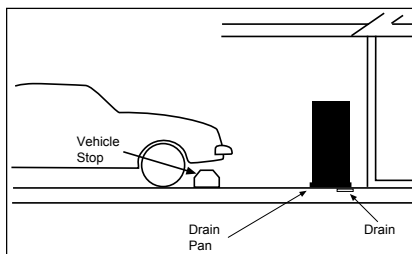


Figure 15 - In a garage, install a vehicle stop to avoid water heater damage.

- Avoid locations such as attics, upper floors, or where a leak might damage the structure or furnishings. Due to the normal corrosive

action of water, the tank will eventually leak. To minimize property damage from leaks, inspect and maintain your water heater in accordance with this manual's instructions. Install a metal drain pan under the water heater piped to an adequate drain. Inspect the drain pan, pipes, and surrounding area regularly and fix any leaks found.

## Step 3:



### Removing the old water heater

1

Read each installation step and decide if you have the necessary skills to install the water heater. Only proceed if you are comfortable you can safely perform the work. If you are not sure, have a qualified person perform the installation.

*Continued on the next page...*

- On the old water heater, turn the control knob on the gas control valve to the OFF position.

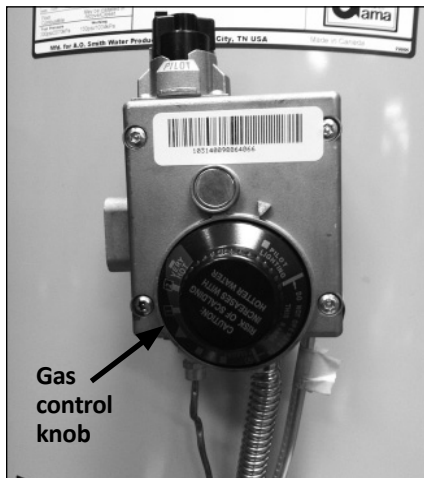


Figure 16 - Turn gas control/temperature knob OFF.

- Turn the manual gas valve for the water heater's supply line OFF.
- Open a hot water faucet and let the hot water run until it is cool (This may take 10 minutes or longer).



Figure 17 - Let the hot water run until it is cool.

**▲ WARNING! Be sure the water runs cool before draining the tank to reduce the risk of scalding.**

- Connect a garden hose to the drain valve and place the other end of the hose in a

drain, outside, or in buckets. (Sediment in the bottom of the tank may clog the valve and prevent it from draining. If you can't get the tank to drain, contact a qualified person.)

- Turn the cold water supply valve OFF.

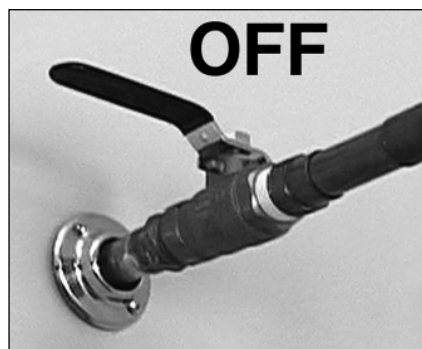


Figure 18 - Cold water supply in off position.

- Using a standard flat-blade screwdriver, open the drain valve. Sediment build up in the bottom of the water heater may hinder or prevent draining.



Figure 19 - Draining the old water heater.

- Also open a hot water faucet to help the water in the tank drain faster.
- When the tank is empty, disconnect the Temperature & Pressure (T&P) Relief Valve discharge pipe. You may be able to reuse the discharge pipe, but do not reuse the old T&P Relief Valve. A new T&P Relief Valve comes with your new water heater.

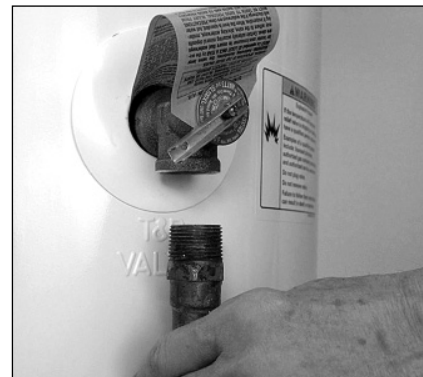


Figure 20 - Removing the T&P Relief Valve discharge pipe.

- Allow the venting system to cool. Once it is cooled, disconnect the vent pipe from the water heater. You may need to support the vent pipe until the new water heater is in place.

- Disconnect the water pipes. Many water pipes are connected by a threaded union which can be disconnected with wrenches. If you must cut the water pipes, cut the pipes close to the water heater's inlet and outlet connections, leaving the water pipes as long as possible. If necessary, you can make them shorter later when you install the new water heater.

- Confirm the manual gas valve for the water heater's supply line is turned off. Disconnect the gas line from the water heater's gas control valve and cap it.

- Remove the old water heater. Use an appliance dolly or hand truck to move the water heater.

**▲ WARNING! Use two or more people to remove or install a water heater. Failure to do so can result in back or other injury.**

# INSTALLATION

## Step 4:

### ✓ Installing the New Water Heater

**1** Read all instructions completely before beginning. If you are not sure you can safely complete the installation, seek assistance from any of the following sources:

- Schedule an appointment with a qualified person to install your water heater.
- Call Technical Assistance at the telephone number listed on your warranty.

**2** Install a metal drain pan that is piped to an adequate drain.

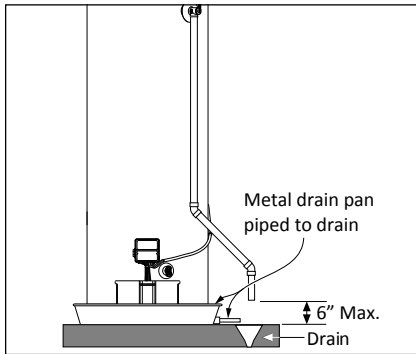


Figure 21 - Metal drain pan piped to drain.

**3** Set the water heater in place, taking care not to damage the drain pan. When installing directly on carpet, the water heater must be installed on a wood or metal base that extends beyond the dimensions of the water heater (width and depth) by at least 3 inches (76.2 mm) in any direction. If the water heater is installed on carpet in an alcove or closet, the entire floor must be covered by a wood or metal panel.

**NOTICE:** Most codes require setting the water heater in a metal drain pan piped to an adequate drain. The drain pan helps avoid property damage which may occur from condensation or leaks in the piping connections or tank. The drain pan must be at least two inches wider than the diameter of the water heater. Install the drain pan so the water level is limited to a maximum depth of 1-3/4".

**4** Verify that the water heater is set in place properly. Check that:

- There is adequate space to install the T&P Relief Valve discharge pipe and that it can be piped to a separate drain (and not into the drain pan).
- There is adequate access and space around the water heater for future maintenance.
- The water heater is installed vertically.

## Step 5:

### Air Filter Inspection

This water heater is equipped with a base-ring air filter. Before proceeding to the next step, visually check the filter to ensure it is properly seated in the base-ring. Do not operate the water heater without the a clean air filter in place.

## Step 6:



### Connect the Temperature and Pressure (T&P) Relief Valve/Pipe

Most T&P Relief Valves are pre-installed at the factory. In some cases, they are shipped in the carton and must be installed in the opening marked “T&P Relief Valve” and according to local codes.



Figure 22 - Temperature and Pressure Relief Valve

**▲ WARNING! To avoid serious injury or death from explosion, install a T&P Relief Valve according to the following instructions:**

- 1 If the T&P Relief Valve was not factory installed, install the new T&P Relief Valve that came with your water heater. Do not reuse an old T&P Relief Valve.
  - The discharge pipe should be at least 3/4" inside diameter and sloped for proper drainage. Install it to allow complete drainage of both the T&P Relief Valve and the discharge pipe.

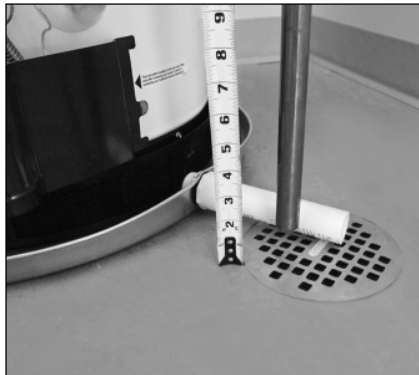


Figure 23 - Temperature and Pressure Relief Valve Pipe

- The discharge pipe must not be smaller than the pipe size of the T&P Relief Valve. The pipe must also be able to withstand 250°F (121°C) without distortion. Use only copper or CPVC pipe. Do not use any other type of pipe, such as PVC, iron, flexible plastic pipe, or any type of hose.
- Terminate the discharge pipe a maximum of six inches above a floor drain or outside the building. Do not drain the discharge pipe into the drain pan; instead pipe it separately to an adequate drain. In cold climates, terminate the discharge pipe inside the building to an adequate drain. Outside drains could freeze and obstruct the drain line—protect the discharge pipe from freezing.
- Do not place any valve or other restriction between the tank and T&P Relief Valve. Do not cap, block, plug, or insert any valve between the T&P Relief Valve and the end of the discharge pipe. Do not insert or install any reducer in the discharge pipe.

# INSTALLATION

## Step 7:

### ✓ Install Shutoff and Thermostatic Mixing Valves

**1** If one is not already installed, install a manual shutoff valve in the cold water line that supplies the water heater. Install the shutoff valve near the water heater so that it is readily accessible. Only use a full-flow ball or gate valve compatible with potable water.

**2** Install a Thermostatic Mixing Valve at each point-of-use (for example, kitchen sink, bathroom sink, bath, shower) per the valve manufacturer's instructions.



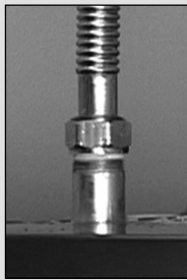
Figure 24 - Install Thermostatic Mixing Valves at each point where hot water will be used.

**▲ WARNING! Even if the water heater's thermostat is set to a relatively low temperature, hot water can scald. Install Thermostatic Mixing Valves at each point-of-use to reduce the risk of scalding.**

**3** For water heaters that are fed by a solar water heating system (or any other pre-heating system), always install a Thermostatic Mixing Valve or other temperature limiting device in the inlet water supply line to limit water

### IF YOU HAVE COPPER PIPES:

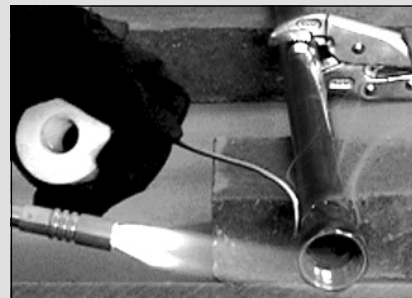
If your home has copper water pipes, you can solder the water pipe connections or use compression fittings which don't require soldering. Compression fittings are easier to install than soldering pipe. Check with local plumbing officials to determine what types of pipe materials are suitable for your location. Do not use lead-based solder.



Compression fittings don't require soldering.

**NOTICE:** Do not solder pipes while they are attached to the water heater. The water heater's inlet and outlet

connections contain non-metallic parts which could be damaged. The proper way to connect the water heater to copper water pipes is as follows:



Solder a short length of pipe (about a foot or so) to a threaded adapter using only 95/5 tin-antimony or equivalent solder. Attach the threaded adapters to the water heater's connections (using thread sealant tape or pipe joint compound). Connect the home's water pipes by soldering, keeping the connections at the water heater cool with wet rags.

supply inlet temperature to 120°F. Solar water heating systems can supply water with temperatures exceeding 180°F and may result in water heater malfunction.

**▲ WARNING! Hot water provided by solar heating systems can cause severe burns instantly, resulting in severe injury or death.**

## Step 8:

### Connect the Water Supply

Note that all piping and components connected to the water heater must be suitable for use with potable water.

**1** Determine the type of water pipes in your home. Most homes use copper water pipes, but some use CPVC or cross-linked polyethylene (PEX). Use fittings appropriate for the type of pipe in your home. Do not use iron or PVC pipe.

**2** Connect the cold water supply using 3/4 inch National Pipe Thread "NPT" to the fitting marked "COLD".

For ease of removing the water heater for service or replacement, connect the water pipes with a coupling called a union. We recommend using a dielectric-type union (available from your local plumbing supplier). Dielectric unions can help prevent corrosion

caused by tiny electric currents common in copper water pipes and can help extend the life of the water heater.

**NOTICE:** Most water heater models contain energy saving heat traps in the inlet and outlet connections. Do not remove the heat traps.

- 3 Connect the hot water supply using 3/4 inch NPT to the fitting marked "HOT".
- 4 Install insulation (or heat tape) on the water pipes especially if the indoor installation area is subject to freezing temperatures. Insulating the hot water pipes can increase energy efficiency.
- 5 Adjust (or install) the home's Pressure Reducing Valve to 50-60 psi and install a Thermal Expansion Tank.



Figure 25 - A Pressure Reducing Valve is required if your home's water pressure is above 80 psi.

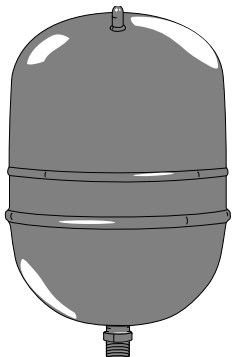


Figure 26 - The Thermal Expansion Tank should be pressurized with air, using a hand pump, to match the home's incoming water pressure.

## Step 9:

### Verify Connections and Completely Fill Tank

To remove air from the tank and allow the tank to fill completely with water, follow these steps:

- 1 Remove the aerator at the nearest hot water faucet. This allows debris in plumbing system to be washed out of the pipes.
- 2 Turn the cold water supply back on and fill the tank.
- 3 Open a hot water faucet and allow the water to run until it flows with a full stream.
- 4 Let the water run full stream for three minutes.
- 5 Close the hot water faucet and replace the aerator.
- 6 Check inlet and outlet connections and water pipes for leaks. Dry pipe connections so that any drips or leaks will be apparent. Repair any leaks. Almost all leaks occur at connections and are not a tank leak.

## Step 10:

### Connect Vent Pipe to Blower

Make sure your home's venting system complies with the instructions in this manual and is in good condition. A 3"x 2" condensate drain coupler is supplied to connect 2" venting to the blower. The initial connection must be made with 2" vent pipe. However, after the initial connection, you may use either 2" or 3" vent pipe. See

Figure 27. See also "Table 4: Vent Pipe Lengths" on page 12

These connections must be properly sealed to prevent the leakage of the products of combustion into the living area.

Before installing, clean and lightly sand the end of the PVC/CPVC plastic vent piping that will connect into the rubber coupling. For polypropylene vent systems follow manufacturer's instructions. Polypropylene vent systems require separate adaptor

**NOTICE:** Some installations may require a condensate drain line. See below.

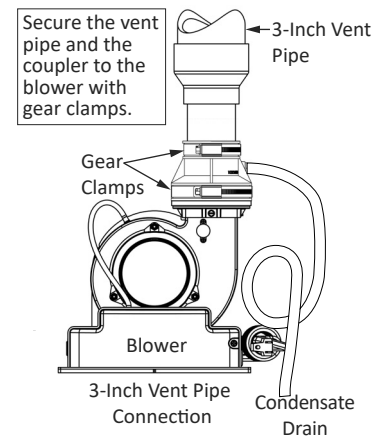
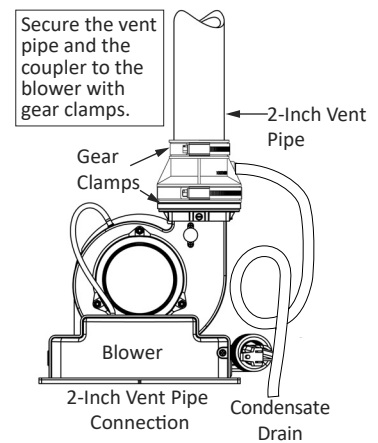


Figure 27 - Vent Pipe/Blower Connection

# INSTALLATION

## Condensate Drain:

Condensate formation does not occur in all installations of power vented water heaters, but should be drained on installations where it can form in the venting system. The vent pipe should be sloped upwards away from the blower assembly, then adequate means for draining and disposing of the condensate needs to be made by the installer. If installation conditions cause condensation, install a condensate trap loop approximately 8" in diameter using 3/8" plastic hose. Connect the hose to the built-in drain port of the rubber coupling of the blower assembly (see Figure 27). Loop the hose in a vertical position as shown. The tube loop must be filled with water at least half way prior to operating the heater. Ensure the end of the tube has access to a drain as condensate will flow from the end.

Note: The removable cap must remain in place if a drain hose is not installed.

## Step 11:

### Make Gas Connections

The Gas Water Heater Hook-Up Kit (available at your local plumbing supplier) includes a flexible gas connector with compression fittings to connect the home's gas line to the water heater's gas control valve. Follow the kit's installation instructions to attach the flexible gas connector.



Figure 28 - Flexible gas line connector.

Once you've made the gas connections, use a small, soft-bristled brush to apply a hand dishwashing soap and water mixture or children's soap bubbles (1 part soap to 15 parts water) to all connection points of the gas line and flexible gas connector (if used). Make sure to generously coat all the connections and check for gas leaks (which will appear as small bubbles). If any leaks are detected, turn the gas supply off, tighten the leaking connection and re-check.

## BEFORE LIGHTING THE WATER HEATER...

Make sure all checklist items have been completed.

### Water Heater Location

- ✓ Installation area free of corrosive or flammable materials, liquids or vapors.
- ✓ Proper clearances from combustible surfaces maintained and sufficient room to service the water heater.
- ✓ Not installed directly on a carpeted floor.
- ✓ Metal drain pan installed and piped to an adequate drain.
- ✓ Water heater not located near an air moving device (fan, clothes dryer).
- ✓ Not in a location with large amounts of lint, dust, etc. (If so, the air filter or flame arrestor located on the bottom of the water heater will need to be cleaned more often.)

### Combustion Air Supply and Ventilation

- ✓ Adequate air supply for water heater and any other nearby gas appliances.
- If the water heater is installed in a closet or other small, enclosed space or within the living space of the house, air supply openings needed.
- ✓ Are the openings of sufficient size?
  - ✓ Ductwork is the same cross-sectional area as the openings?
  - ✓ Outside air openings are preferred and may be required in tightly built homes.

- ✓ Sufficient fresh air supply for proper water heater operation.
- ✓ Fresh air not taken from areas that contain negative pressure producing devices such as exhaust fans, fireplaces, etc.
- ✓ Fresh air supply free of corrosive elements and flammable vapors.
- ✓ Fresh air openings sized correctly with consideration given to the blocking effect of louvers and grilles.
- ✓ Ductwork is the same cross-sectional area as the openings.

## Vent Pipe System

- ✓ Vent pipe and fittings of approved material.
- ✓ Acceptable size, length, and number of elbows on exhaust outlet pipe.
- ✓ Installed in accordance with prevailing provisions of local codes, or in the absence of such, National Fuel Gas Code, NFPA 54, ANSI Z223.1-Current edition.
- ✓ Slope 2" & 3" horizontal piping at a downward pitch of 1/8" per 5 ft. away from the water heater.
- ✓ Not obstructed in any way.

NOTICE: Venting requirements are listed in the "Venting" section on page 11.

## Vent Termination

### Horizontal Vent Termination

- ✓ 12" Min. above grade/snow level.
- ✓ Slope 2" & 3" horizontal piping at a downward pitch of 1/8" per 5ft. away from the water heater.
- ✓ Away from corners, other vents, windows, etc.

### Vertical Vent Termination

- ✓ Outlet - 12" Min. above roof/snow level.

NOTICE: Vent termination requirements are listed in the "Vent Terminations" section on page 13.

## Water System Piping

- ✓ Temperature and pressure relief valve properly installed with a discharge line run to an adequate drain and protected from freezing.
- ✓ Water pipes free of leaks.
- ✓ Water heater completely filled with water.
- ✓ Thermal Expansion Tank installed
- ✓ Water Pressure Reducing Valve installed and adjusted to 50-60 psi.
- ✓ Thermostatic Mixing Valves installed at each point-of-use.

## Gas Supply and Piping

- ✓ Gas type is the same as that listed on the water heater's rating plate.
- ✓ Gas line equipped with shut-off valve.
- ✓ Adequate gas pipe size and approved gas pipe material.
- ✓ All gas connections and fittings leak checked and any leaks corrected.

## Electrical Connections

- ✓ Unit connected to a 120V electrical supply. (Do not use an extension cord.)
  - ✓ A dedicated circuit is preferred.
  - ✓ Proper polarity.
  - ✓ Electrically grounded in accordance with local codes, or in the absence of such, the current edition of the National Electric Code, ANSI/NFPA 70.
- See page 38 for specific information about the electrical system.

# INSTALLATION

## INSTALLATION REQUIREMENTS FOR THE COMMONWEALTH OF MASSACHUSETTS

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

**INSTALLATION OF CARBON MONOXIDE DETECTORS** At the time of installation of the side wall horizontal vented gas fueled equipment, the installing plumber or gasfitter shall observe that a hard wired carbon monoxide detector with an alarm and battery back-up is installed on the floor level where the gas equipment is to be installed. In addition, the installing plumber or gasfitter shall observe that a battery operated or hard wired carbon monoxide detector with an alarm is installed on each additional level of the dwelling, building or structure served by the sidewall horizontal vented gas fueled equipment. It shall be the responsibility of the property owner to secure the services of qualified licensed professionals for the installation of hard wired carbon monoxide detectors.

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

In the event that the requirements of this subdivision can not 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 that during said thirty (30) day period, a battery operated carbon monoxide detector with an alarm shall be installed.

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

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

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

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

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

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

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

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

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

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



## Lighting Instructions

### ▲ WARNING! Explosion Hazard –

- If you smell gas at any point during this process, STOP! Turn off the gas supply and follow the safety steps on your water heater's lighting label (titled FOR YOUR SAFETY, READ BEFORE LIGHTING).
- Replace viewport if glass is missing or damaged.
- Failure to do so can result in death, explosion or fire.

### ▲ WARNING! Electrical Shock Hazard –

- Disconnect electrical power to the water heater if service is to be performed.
- Failure to do so can result in death or electrical shock.

Read and understand these directions thoroughly before attempting put your water heater into service. Make sure the viewport is not missing or damaged. Make sure the tank is completely filled with water before lighting and activating the water heater. Check the rating plate near the gas control valve to ensure the correct gas type. Do not use this water heater with any gas other than the one listed on the rating plate. If you have any questions or doubts, consult your gas supplier or gas utility company.

**NOTICE!** A newly installed water heater will have air in the gas line. It may take several lighting attempts to clear all the air from the gas line.

### Follow these steps to light the water heater:

- 1 Disconnect the water heater's power plug from the grounded 110/120 volt power supply.
- 2 Make sure the manual gas valve for the water heater's supply line is OFF. See Figure 29.



Figure 29 - Gas valve in "on" position

- 3 Set the thermostat to the lowest setting by turning the knob to "VAC". See Figure 30.

**DO NOT try to light the burner by hand.**

- 4 Set the switch to the OFF position.
- 5 Wait five minutes to clear out any gas.

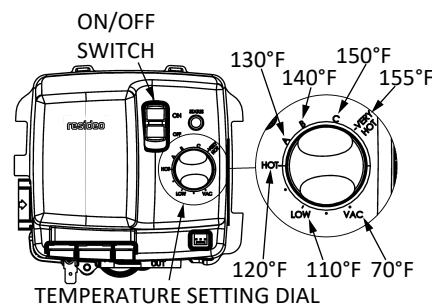


Figure 30 - Gas control valve.

- 6 Connect the water heater's power plug to a grounded 110/120 volt power supply.
- 7 Make sure the manual gas valve for the water heater's supply line is ON. See Figure 29.
- 8 Set the switch to the ON position.
- 9 Set the thermostat to the desired setting

**▲ WARNING! Higher temperatures increase the risk of scalding, but even at 120°F, hot water can scald. (See Table 1 on page 4.). Install Thermostatic Mixing Valve(s) at each point-of-use to reduce the risk of**

scalding. The HOT on the gas control valve indicates the preferred 120°F set point.

- 10 **IF** the water heater will not operate, follow these steps:
  - A. Set the thermostat to the lowest setting by turning the knob to "VAC". See Figure 30 - Gas control valve.
  - B. Set the switch to the OFF position.
  - C. Unplug electrical service to the water heater.
  - D. Turn off the gas at the manual gas supply shutoff valve.
  - E. Call the technical assistance hot line which is listed on your warranty.

**11** When a gas water heater is first lit and the tank is cold, condensation often forms inside the water heater. You may hear drips or a sizzling sound when the water heater is first lit or, you may see a small puddle on the floor. Condensation is not a leak and will go away once the tank reaches normal operating temperature.

**12** The air filter at the bottom of the water heater must be cleaned from time to time. See the Maintenance section for steps on cleaning the air filter.

## Shut down Instructions

- A. Set the thermostat to the lowest setting by turning the knob to "VAC". See Figure 30.
- B. Set the switch to the OFF position.
- C. Disconnect the water heater's power plug from the grounded 110/120 volt power supply.

## Emergency Shut down

Should overheating occur or the gas supply fail to shut off, turn off the water heater's manual gas control valve and call a qualified person.

# OPERATION

**NOTICE:** This water heater is designed to automatically shut off in the event of the following:

1. The water temperature exceeds 180°F (83°C.)
2. A blockage occurs in the combustion chamber air inlet, the flue gas exhaust outlet, or both the inlet and outlet.
3. The blower fails to operate or operates improperly.
4. The ignition of flammable vapors.

A high temperature limit switch or ECO (Energy Cut Off) in the tank is used to shut off the unit if the water temperature exceeds 180°F (83°C.)

## Temperature Control System

### Adjusting the Temperature

You may adjust the water heater's temperature setting, if desired. Using the lowest hot water temperature that meets your needs will also provide energy efficient operation of the water heater.

**1** Set the gas valve to the desired temperature. HOT on the gas control valve/thermostat indicates a set point of approximately 120°F, reducing the risk of scald injury. It is the preferred starting point for setting the temperature control.

You may wish to set a higher temperature to provide hot water for automatic dishwashers or laundry machines, to provide more hot water capacity, and to reduce bacterial growth. Higher tank temperatures (140°F) kill bacteria that cause a condition known as "smelly water" and can reduce the levels of bacteria that cause water-borne diseases.

Water usage patterns, as well as heat from sources such as solar collectors

and ambient air can result in temperatures higher than the thermostat set point.

**▲ WARNING! Higher temperatures increase the risk of scalding, but even at 120°F, hot water can scald. (See Table 1 on page 4.) Install Thermostatic Mixing Valve(s) at each point-of-use to reduce the risk of scalding.**

**2** To adjust the water heater's turn the temperature setting dial to the desired temperature.

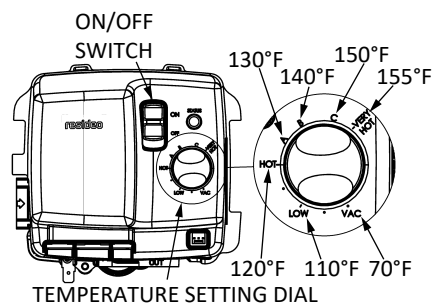


Figure 31 - Temperature settings.

**3** Wait for the water to heat up. If you have no hot water after two hours, refer to the Troubleshooting Section (see page 29).

**NOTICE:** If the tank is full of cold water, condensation may form inside the water heater. This condensation may drop on the burner causing a sizzling sound. In some cases, you may see a small puddle on the floor. Condensation is normal and should go away once the tank reaches its normal operating procedure.

**▲ WARNING! If you have increased the temperature setting and the Thermostatic Mixing Valves are not set properly (or not installed) you could scald yourself while checking the temperature.**

**4** Check water temperature at several points of use in your home (for example, bathtub faucet, shower, or lavatory sink) and

adjust the Thermostatic Mixing Valves as needed. If you aren't sure how to adjust the Thermostatic Mixing Valve settings, or aren't sure if you have Thermostatic Mixing Valves, contact a qualified person.

### Operating Modes

The gas control valve has two different operating modes: Standard and Vacation. The Standard mode allows you to adjust the water temperature to your desired setting. The Vacation (WARM) mode sets the thermostat at approximately 70°F and is recommended when not using hot water for an extended period of time. The WARM setting also reduces energy losses and keeps the tank from freezing during cold weather but can cause a hydrogen gas build up. See warning regarding hydrogen gas on page 5.

## NOTICE

If the LEDs on your gas control valve/thermostat indicate an error code, refer to the chart on pages 32.

### Water Heater Operation

The figure below shows the water heater's sequence of operation when a call for heat is initiated. (This is when the water heater begins to heat water based on the thermostat setting.) The ignition control will try to light the burner three times. If the ignition control does not detect ignition, it will enter lock-out mode, indicated by a three flash error code.

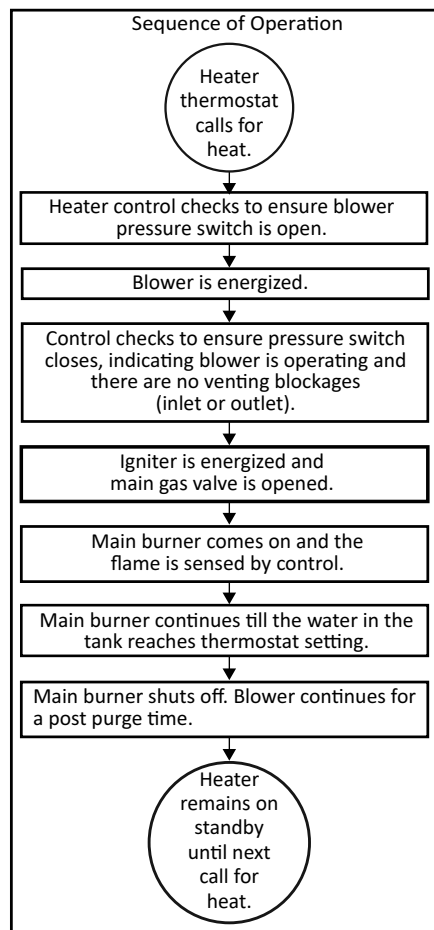


Figure 32 - Sequence of Operation

### No Hot Water

If your water heater is not producing hot water, refer to “TROUBLESHOOTING” on page 29.

### Insufficient Hot Water or Slow Hot Water Recovery

**▲ WARNING! Because of the increased risk from scalding, if you set the water heater’s gas control knob higher than 120°F, install Thermostatic Mixing Valves at each point-of-use. Due to the increased risk of scalding, do not set the temperature of the Thermostatic Mixing Valves above 120°F.**

If the hot water is simply not warm enough, there are several possible causes:

- Faulty Thermostatic Mixing Valve in a faucet or shower control (check other faucets in the house for hot water).
- Water heater’s capacity too small (or usage too high).
- Reversed plumbing connections or melted dip tube (usually found soon after new installation).
- Plumbing leak.
- Sediment or lime build up in the bottom of the tank.
- Defective thermostat or ECO (energy cut-off switch)
- For other potential causes, refer to “TROUBLESHOOTING” on page 29.

**Thermostatic Mixing Valves.** If the hot water is simply not warm enough, make sure the faucet you are checking doesn’t have a defective Thermostatic Mixing Valve. Many shower controls now have built-in mixing valves. If

these devices fail, they can reduce the amount of hot water the shower or faucet delivers even though there is plenty of hot water in the tank. Always check the water temperature at several faucets to make sure the problem is not in a faucet or shower control.

**Undersized Water Heater.** If your water heater runs out of hot water quickly, it may be too small for your needs. If the water heater is old, consider replacing it with a larger model. If the water heater is in good condition, you may be able to meet your family’s hot water needs with the existing water heater by installing Thermostatic Mixing Valves at each point-of-use and then turning the gas control knob to a higher setting.

You can also reduce your home’s hot water needs by washing clothes in cold water, installing flow restrictors on shower heads, repairing leaky faucets, and taking other conservation steps.

**Reversed Connections or Melted Dip Tube.** Check the hot and cold water connections and make sure your home’s hot water pipe is connected to the hot water outlet on the water heater. Usually, reversed connections are found soon after the installation of a new unit. If copper pipes were soldered while they were attached to the water heater, the dip tube may have melted. The dip tube is a long, plastic tube inside the tank attached to the cold water inlet. If the dip tube is melted, the nipple dip tube assembly can be removed, and replaced with a new one.

**Plumbing Leak.** Even a small leak in the hot water side of the home’s plumbing system can make it appear that the water heater is producing little to no hot water. In this case, the burner will be on all or almost all the



# TROUBLESHOOTING

time, yet you will have very little hot water. Locate and repair the leak.

**Sediment or Lime in Tank.** With an existing water heater, if you have some hot water but not as much as you're used to, there may be a build up of sediment or lime on the bottom of the tank. Sediment or lime build up can reduce the efficiency of your water heater. Heavy deposits can damage the water heater. See the Maintenance section for steps on draining and flushing the water heater.

**Failure of the thermostat or ECO (energy cut-off switch).** If either component failed, the water will not be heated as expected. Replace the thermostat/ECO as required.

## Temperature Too High

Adjust the thermostat on the water heater to a lower setting. Install or adjust Thermostatic Mixing Valves for each point-of-use (see the valve manufacturer's instructions).

## Low Water Pressure

Check both the cold and hot water at a sink to determine if the lower pressure is only on the hot water side. If both hot and cold faucets have low pressure, call your local water utility. If the low pressure is only on the hot water side, the primary causes are:

- Melted heat traps or dip tube. Soldering copper pipes while they are connected to the water heater can melt the heat traps inside the hot and cold water connections or the dip tube (cold water side). Melted heat traps or a melted dip tube can restrict the flow of hot water. If that's the case, replace the heat traps or dip tube.
- Partially closed supply valve. Open the water heater's supply valve fully.

## Drips from T&P Relief Valve Discharge Pipe

A small amount of water dripping from the Temperature and Pressure (T&P) Relief Valve usually means the home's water pressure is too high and/or you need a Thermal Expansion Tank. See page 16 for more information.

A large amount of hot water coming from the T&P discharge pipe may be due to the tank overheating. If the T&P relief valve is discharging large amounts of very hot water, turn the gas supply valve off and call a qualified person.

**▲ WARNING! Do not cap or plug the T&P Relief Valve or discharge pipe, and do not operate the water heater without a functioning T&P Relief Valve—this could cause an explosion.**

**Water Pressure too High.** High water pressure can cause the T&P Relief Valve to drip. Install a Pressure Reducing Valve (PRV) on the main cold water supply line. Adjust the PRV to between 50 and 60 psi.

**Thermal Expansion Tank.** Install a Thermal Expansion Tank. If a Thermal Expansion Tank is already installed and the T&P Relief Valve discharge pipe drips, the home's water pressure may be too high or the Thermal Expansion Tank may be defective. Refer to the instructions that came with the Thermal Expansion Tank for more information.

**Debris.** In rare cases, debris can stick inside the T&P Relief Valve, preventing the valve from sealing fully. In that case, the T&P Relief Valve discharge pipe will drip. You may be able to clear debris from the T&P Relief Valve by manually operating the valve, allowing small quantities of water to flush out the debris. See the label on

the T&P Relief Valve for instructions.

**▲ WARNING! When manually operating the temperature-pressure relief valve, make sure that no one is in front of or around the discharge outlet. The water may be extremely hot and could cause severe burns. Also ensure that the water discharge will not cause property damage.**

If the water pressure is between 50 and 60 psi, a Thermal Expansion Tank is installed and properly pressurized, and the valve has been cleared of any debris, but it still drips, the valve may be broken. Have a qualified person replace the T&P Relief Valve.

## Water Odor

Harmless bacteria normally present in tap water can multiply in water heaters and give off a "rotten egg" smell. Although eliminating the bacteria that causes "smelly water" is the only sure treatment, in some cases, the standard anode rod that came with your water heater can be replaced with a special zinc anode rod which may help reduce or eliminate the odor. Contact a qualified person.

**NOTICE:** To protect the tank, an anode rod must be installed in the water heater at all times or the warranty is void.

In cases where the "rotten egg" smell is very strong, you could increase the tank temperature to 140°F in order to reduce bacterial growth in the tank.

**▲ WARNING! Because higher temperatures increase the risk of scalding, if you set the thermostat(s) higher than 120°F, Thermostatic Mixing Valves at each point-of-use are particularly important.**

## Sooting

Is the result of improper combustion. Check venting to ensure no blockages are present. Confirm all exhaust piping is properly sized, see “Combustion and Ventilation Air Supply” section on page 7. A wrong gas type may also cause sooting, see “Gas Piping” on page 15.

## Heater Lights But Goes out in 4-5 Seconds

Make sure the correct vent restrictor is installed. Follow the instructions in the “Venting” section on page 11. If the issue continues have a qualified person check the outlet polarity. Improperly sized gas piping may also cause this issue, see “Gas Piping” on page 15.

## Hot Surface Igniter Not Glowing Following Warm-Up Period

The hot surface igniter should glow when during the warm-up period if it fails to do so follow the instructions on page 27-28 to turn off your water heater and contact a qualified person to check the system.

These guidelines should be utilized by a qualified service agent.

## LOCKOUTS

### Soft Lockout

- Occurs when a system safety device trips to break the sequence of operation. The control will try to start the system in a timed basis but will not reinstate operation until the failure is corrected.

### Hard Lockout

- Occurs when the main controller fails and must be replaced.

## RESETTING THE HEATER CONTROL

- Soft lockouts as diagnosed by the system error codes require the gas control to be reset.
- To reset the control, slide the “ON/OFF” switch to the “OFF” position. Wait for 10 seconds and move the switch back to the “ON” position.
- If the problem that caused the control to lock out has not been corrected, the control will remain locked out, or again go into lock out.

IGNITION STATE	TIMING
Pre-purge	5 Seconds
Hot Surface igniter (HSI) Warm-up	10 Seconds
Ignition Activation Period (IAP)	3.5 Seconds
Flame Recognition Period (FRP)	0.5 Seconds
Trial For Ignition	IAP + FRP
Purge when flame not sensed.	30 seconds
Flame Failure Response Time	2 seconds max (@ 1uA flame current)
Post-purge	30 seconds
Pressure Switch (PS) Prove Period	2 minutes
Pressure Switch (PS) Fault Delay (failed open/closed)	2 minutes
Soft Lockout	20 minutes (Ignition reattempt)
Energy Cut Off (ECO) Limit Lockout	Indefinite (clear fault to restart in 15 seconds or less)
Flammable Vapor (FV) Sensor Lockout	Indefinite (see “Resetting The Heater Control”)



# TROUBLESHOOTING

## SYSTEM STATUS AND ERROR CODES

The micro-controller inside the gas control monitors the ignition sequence, temperature settings, and overall operation of the heater. If any of these parameters does not operate properly the controller will shut down the water heater, diagnose the failure and flash an error code. The table below lists the System Status Codes for the Honeywell control. Refer to it and to the "Ignition State And Timing" to diagnose the problem before attempting corrective action.

ERROR CODES		
LED Flash Sequence	Control Status	Corrective Action Number
Short flash once every four seconds	IDLE (no call for heat, no fault conditions)	1
"Heartbeat", alternates bright/dim	Call For Heat (no fault conditions)	2
One Flash, three second pause	Low Flame Signal (control continues to operate)	3
Two Flash, three second pause	Pressure Switch Failed Closed	4
Three Flash, three second pause	Pressure Switch Failed Open	5
Four Flash, three second pause	ECO (Energy Cut Off) Limit Lockout thermostat temperature limit was exceeded.	6
Five Flash, three second pause	Flame Out Of Sequence	7
Six-One Flash, three second pause	Soft Lockout - Retry Limit - Failed Trial For Ignition	8
Six-Two Flash, three second pause	Soft Lockout - Recycle Limit - Pressure Switch/High Limit opened	9
Six-Three Flash, three second pause	Soft Lockout - Recycle Limit - Flame Lost	10
Six-Four Flash, three second pause	Soft Lockout - Flame out of Sequence Sensed	11
Seven Flash, three second pause	Flammable Vapor Sensor (FVS) Lockout	12
Eight-One Flash, three second pause	Flammable Vapor Sensor FVS Fault Detected	13
Eight-Two Flash, three second pause	Temperature Sensor Fault Detected	14
Eight-Three Flash, three second pause	Electronics Fault Detected	15
Eight-Four Flash, three second pause	Valve Fault Detected	16
Hardware Fault Lockout	Indefinite	17

### READING THE LED FLASH SEQUENCE.

The LED indicator light is active when the gas valve/thermostat is in operation. The light will normally show a flash sequence of a short flash once every four seconds or a "Heartbeat" of alternating bright/dim. Multiple flash codes indicate an error and can be read as follows: Example: Corrective Action Number 9, Six-Two Flash, three second pause. For this code, the LED indicator light will make six bright flashes, pause for one second and then make two more bright flashes. The LED will pause for three seconds and repeat the six-two cycle of flashes.

# TROUBLESHOOTING

## CORRECTIVE ACTIONS

See the table below for corrective actions corresponding to the Corrective Action Number in the "System Status And Error Codes" section above. If following those corrective actions does not resolve the error, refer to "Other Symptoms" table later in this manual.

Corrective Action Number	Corrective Action
1	Normal operation, no action necessary.
2	Normal operation, no action necessary.
3	<ol style="list-style-type: none"> <li>1. Flame rod not properly seated in flame, reposition rod.</li> <li>2. Clean flame sensor rod with fine steel wool to remove any buildup which may prevent flame sensing</li> </ol>
4	<ol style="list-style-type: none"> <li>1. Check that blower operates and does not have any blockages.</li> <li>2. Check that all wiring is correct.</li> <li>3. Ensure the air pressure sensing tubes are properly connected and not kinked or damaged.</li> <li>4. Ensure the air pressure switch is correct and the air pressure switch (N.O.) is not bypassed (jumpered).</li> <li>5. Turn power to the unit "OFF" – check for continuity of the air pressure switch (N.O.) with wires disconnected;               <ol style="list-style-type: none"> <li>a. If the pressure switch contacts show continuity (closed circuit), replace the pressure switch,</li> <li>b. If the pressure switch contacts are open and all wiring is correct, replace the Gas Control.</li> </ol> </li> </ol>
5	<ol style="list-style-type: none"> <li>1. If the blower does not run after resetting the heater, check for 120 VAC to the blower when the heating cycle begins.               <ol style="list-style-type: none"> <li>a. If the Gas Control does not energize the blower - replace the Gas Control.</li> <li>b. If the blower fails to start when energized:                   <ol style="list-style-type: none"> <li>i. Turn power to the heater "OFF" – check if the capacitor is connected;</li> <li>ii. Turn power to the heater "OFF" – check the capacitor rating (3uF +/-5%);</li> <li>iii. Turn power to the heater "OFF" - replace the blower assembly.</li> </ol> </li> </ol> </li> <li>2. Ensure the air pressure sensing tubes are properly connected and not kinked or damaged;</li> <li>3. Check continuity of the vent temperature limit switch – replace switch if contact remain open.</li> <li>4. With the blower running, check continuity of the air pressure switch (N.C.) – replace switch if contact remain open.</li> <li>5. Ensure the correct size of exhaust and air intake pipes were used per the instruction manual for vent length. Ensure maximum number of elbows or equivalent feet of both pipes was not exceeded.</li> <li>6. Ensure there are no obstructions in the exhaust and air intake pipes.</li> <li>7. If there are excessive restrictions in the air intake pipe the air pressure switch (N.C.) will open.</li> <li>8. Check air pressure switch performance - Check blower vacuum with a manometer - Compare with air pressure switch (N.O.) setting. If the air pressure switch proves defective – replace the air pressure switch (N.O.).</li> <li>9. If the air pressure switch (N.O.) performance test results prove the air pressure switch is working properly, and all other steps are followed, and fault code persist – replace the control.</li> </ol>
6	<p>Resetting the ECO (Energy Cut-Out) requires manual intervention. It cannot be reset by cycling power to the control.</p> <p>Reset Procedure:</p> <ol style="list-style-type: none"> <li>1. Manual reset is performed by turning the set point knob to lowest set point position for a minimum of 10 seconds and then return it to the desired set point.</li> <li>2. The manual reset of the ECO can only be performed 2 times, after the ECO trips a third time, the gas valve will enter a hard lock out where the gas control will need to be replaced.</li> </ol>
7	<ol style="list-style-type: none"> <li>1. Turn the power "OFF" for 10-20 seconds then "ON" again to clear the fault code.</li> <li>2. Clean flame sensor rod with fine steel wool to remove any buildup which may prevent flame sensing.</li> <li>3. Flame rod not properly seated in flame, reposition rod.</li> <li>4. Replace the control if the fault code persists.</li> </ol>
8	<ol style="list-style-type: none"> <li>1. Gas supply is turned off or gas pressure is too low. Ensure supply pressure and manifold gas pressures are within requirements. Manifold pressure is nonadjustable, if gas supply pressure proves correct and manifold pressure is off by more than 0.3" WC replace the control.</li> <li>2. Low supply voltage - should be 115 - 125 VAC</li> <li>3. Ensure flame sensor is making good contact with the burner flame and flame is steady.</li> <li>4. Ensure flame sensor is clean, use ultra- fine steel wool to clean flame sensor.</li> <li>5. Ensure the Hot Surface Igniter is positioned properly to provide consistent ignition.</li> <li>6. Check for any cracks in igniter assembly ceramic insulators - replace igniter assembly if damaged.</li> <li>7. Check resistance of igniter at room temperature (at the plug). Replace the igniter if resistance is not within 42-76 ohms at room temperature.</li> <li>8. Ensure correct size of exhaust and air intake pipes were used per the instruction manual for vent length. Ensure maximum number of elbows or equivalent feet of both pipes was not exceeded.</li> </ol>



# TROUBLESHOOTING

Corrective Action Number	Corrective Action
9	<ol style="list-style-type: none"> <li>1. If the blower does not run after resetting the heater, check for 120 VAC to the blower when the heating cycle begins.               <ol style="list-style-type: none"> <li>a. If the Gas Control does not energize the blower - replace the Gas Control.</li> <li>b. If the blower fails to start when energized:                   <ol style="list-style-type: none"> <li>i. Turn power to the unit "OFF" – check if the capacitor is connected;</li> <li>ii. Turn power to the unit "OFF" – check the capacitor rating (3uF +/-5%);</li> <li>iii. Turn power to the unit "OFF" - replace the blower assembly.</li> </ol> </li> </ol> </li> <li>2. Ensure the air pressure sensing tubes are properly connected and not kinked or damaged;</li> <li>3. Check continuity of the vent temperature limit switch – replace switch if contacts remain open.</li> <li>4. With the blower running, check continuity of the air pressure switch (N.C.) – replace switch if contact remain open.</li> <li>5. Check continuity of the High Limit switch (N.C.) – replace switch if contact remain open.</li> <li>6. Ensure correct size of exhaust and air intake pipes were used per the instruction manual for vent length. Ensure maximum number of elbows or equivalent feet of both pipes was not exceeded.</li> <li>7. Ensure there are no obstructions in the exhaust and air intake pipes.</li> <li>8. If there are excessive restrictions in the air intake pipe the air pressure switch (N.C.) will open.</li> <li>9. Check air pressure switch performance - Check blower vacuum with a manometer - Compare with air pressure switch (N.O.) setting. If the air pressure switch proves defective – replace the air pressure switch (N.O.).</li> <li>10. If the air pressure switch (N.O.) performance test results prove the air pressure switch is working properly, and all other steps are followed, and fault code persist – replace the gas control valve.</li> </ol>
10	<ol style="list-style-type: none"> <li>1. Gas supply is turned "OFF" or gas pressure is too low. Ensure supply pressure and manifold gas pressures are within requirements. Manifold pressure is nonadjustable. If supply pressure proves correct and manifold, pressure is off by more than 0.3" WC replace the control.</li> <li>2. Low supply voltage - should be 115 - 125 VAC</li> <li>3. Ensure flame sensor is making good contact with the burner flame and flame is steady.</li> <li>4. Ensure the flame sensor is clean, use ultra-fine steel wool to clean flame sensor.</li> <li>5. Ensure the Hot Surface Igniter is positioned properly to provide consistent ignition.</li> <li>6. Check for any cracks in igniter assembly ceramic insulators - replace igniter assembly if damaged.</li> <li>7. Check resistance of igniter at room temperature (at the plug). Replace the igniter if resistance is not within 42-76 ohms at room temperature.</li> <li>8. Ensure correct size of exhaust and air intake pipes were used per the instruction manual for vent length. Ensure maximum number of elbows or equivalent feet of both pipes was not exceeded.</li> <li>9. Ensure vent termination restrictor/fitting is installed, and is correct in accordance with venting tables.</li> </ol>
11	<ol style="list-style-type: none"> <li>1. Turn the power "OFF" for 10-20 seconds then "ON" again to clear the fault code.</li> <li>2. Replace the gas control valve if fault code persists.</li> </ol>
12	<ol style="list-style-type: none"> <li>1. Flammable vapor sensed indicates the presence of flammable vapors, or other chemicals which have activated the flammable vapor sensor. Ensure no flammable vapors, chemicals or littler boxes which release ammonia are near the water heater, and replace the flammable vapor sensor. Once replaced, reset the control using the "RESETTING THE HEATER CONTROL" procedure on page 31.</li> </ol>
13	<ol style="list-style-type: none"> <li>1. Flammable Vapor Sensor (FVS) Fault Detected means the signal to and from the FVS has been interrupted, or the FVS has been jumped/ bypassed. Physical damage including exposure to water will damage the FVS, requiring replacement. If the FVS has not been exposed to water, and is not damaged, ensure the FVS connections are secure. If fault continues, replace the FVS. Once replaced, reset the control using the "RESETTING THE HEATER CONTROL" procedure on page 31.</li> </ol>
14	<ol style="list-style-type: none"> <li>1. Turn the power "OFF" for 10-20 seconds then "ON" again to clear the fault code.</li> <li>2. Replace the control if the fault code persist.</li> </ol>
15	<ol style="list-style-type: none"> <li>1. Turn the power "OFF" for 10-20 seconds then "ON" again to clear the fault code.</li> <li>2. Replace the control if the fault code persist.</li> </ol>
16	<ol style="list-style-type: none"> <li>1. Turn the power "OFF" for 10-20 seconds then "ON" again to clear the fault code.</li> <li>2. Replace the control if the fault code persist.</li> </ol>
17	<ol style="list-style-type: none"> <li>1. Control has failed. If resetting the control does not clear the fault code, replace the control.</li> </ol>

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**TROUBLESHOOTING**



## Routine Maintenance

Routine maintenance will help your water heater last longer and work better. If you can't perform these routine maintenance tasks yourself, contact a qualified person.

## Draining and Flushing the Water Heater

Tap water contains minerals that can form sediment in the bottom of the tank. The amount of sediment formed depends on the hardness of your tap water, the temperature settings, and other variables. We recommend draining and flushing the water heater after the first six months of operation to determine the amount of sediment build up. If there is little sediment, drain and flush the tank annually. If there is a lot of sediment, drain and flush the tank more often. Draining sediment extends the life of the water heater.

### To Drain and Flush the Tank:

- 1 Turn off the gas to the water heater at the manual gas supply shut-off valve. (See Figure 40 on page 37.)
- 2 Turn off the electrical supply to the water heater.
- 3 Open a hot water faucet and let the hot water run until it is cool. This may take 10 minutes or longer.



Figure 33 - Let the hot water run until it is cool.

**▲ WARNING!** Be sure the water runs cool before draining the tank to reduce the risk of scalding.

- 4 Connect a garden hose to the drain valve and place the other end of the hose in a drain, outside, or in buckets. Note that sediment in the bottom of the tank may clog the valve and prevent it from draining. If you can't get the tank to drain, contact a qualified person.

- 5 Turn the cold water supply valve OFF.

- 6 Open the drain valve on the water heater.



Figure 34 - Draining the water heater.

- 7 Open a hot water faucet to help the water in the tank drain faster.

- 8 Remove and inspect the anode rod and replace if depleted. The anode rod requires a 1-1/16" socket.

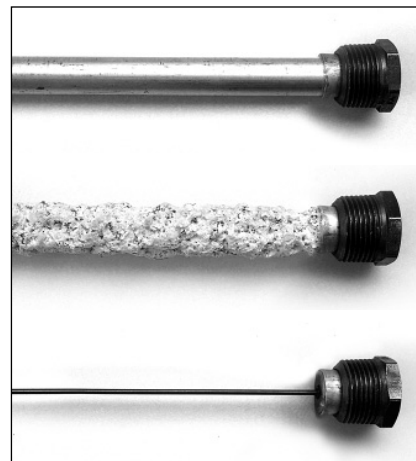


Figure 35 - Anode rods from new (top) to partially depleted (middle) to fully depleted stage (bottom).

**Anode Rod.** The anode rod is a sacrificial metal rod that helps avoid corrosion and premature failure (leaks) in the tank. The anode rod is a consumable item. Inspect the anode rod after the first six months of operation when you drain and flush the tank. Replace the anode rod if it is substantially worn out or depleted. Thereafter, inspect the anode rod annually or more frequently if needed. If you use a water softener, your anode rod will deplete faster than normal. Inspect the anode rod more frequently, replacing the anode rod if it is depleted. Obtain a new anode rod or have a qualified person replace it. (Anode rods are a consumable item and are not covered under warranty.)

- 9 If a large amount of sediment was present when the tank was drained, flush the tank by opening the cold water supply valve and letting the water run until no more sediment drains from the tank. Close the drain valve when you are done.

# MAINTENANCE

**10** Refill the tank by opening the cold water supply valve. Make sure a hot water faucet is open and the drain valve is closed. Allow a hot water faucet to run full for at least three minutes to make sure the tank has all the air removed and is completely full of water. Once you are certain the tank is completely full of water, close the hot water faucet.

**11** Put the water heater into service using the instructions on page 27 and set the thermostat to the desired temperature. It may take an hour or more for the tank of cold water to heat up.

## Visual Inspection

On an annual basis, visually inspect the venting and air supply system, piping systems, main burner, flame sense rod, and air filter.

Check the water heater for the following:

- Obstructions, damage, or deterioration in the venting system. Make sure the ventilation and combustion air supplies are not obstructed. Check the air filter for dust or other debris and clean if needed.
- Build up of soot and carbon on the main burner and flame sense rod. The burner may be cleaned with soap and hot water. The flame sense rod on the hot surface igniter assembly may be cleaned with steel wool.
- Inspect the burner flames through the viewport and compare them to Figure 36 - Burner Flames. Flames should be very small with a blue haze and small amounts of yellow or orange at the edges. After several minutes of operation, the burner screen may glow red. If large flames are observed at any time, shut-off unit and call a qualified person.

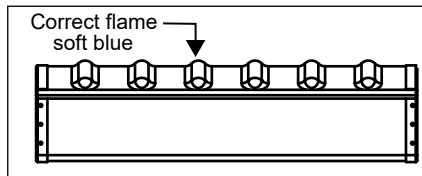


Figure 36 - Burner Flames

- Leaking or damaged water and gas piping.
- Remove any flammable, corrosive or combustible materials near the water heater.

If you lack the necessary skills required to properly perform this visual inspection or if the burner and/or hot surface igniter assembly need to be cleaned, get help from a qualified person.

## T&P Relief Valve Maintenance

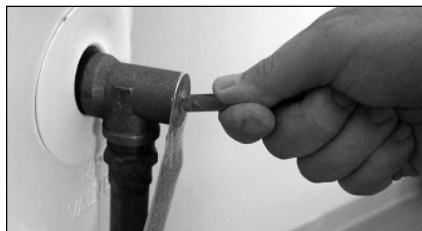


Figure 37 - T&P Relief Valve.

Read and follow the operating and annual maintenance instructions provided by the manufacturer of the T&P Relief Valve (yellow label attached to T&P Relief Valve). Minerals in the water can form deposits that cause the valve to stick or create blocked passages, making the T&P Relief Valve inoperative. Follow these guidelines:

- At least annually, operate the T&P Relief Valve manually to ensure the waterways are clear and the valve mechanism moves freely (above). Before operating the valve manually, check that it will discharge in a place for secure disposal.

**▲ WARNING! Hot water will be released. Before operating the T&P relief valve manually, check that it will discharge in a safe place. If water does**

**not flow freely from the end of the discharge pipe, turn the gas control knob to the OFF position and call a qualified person to determine the cause.**

- At least every five years, have a qualified person inspect the T&P Relief Valve and discharge pipe. Damage caused by corrosive water conditions, mineral deposits, or other problems can only be determined when a qualified person removes and inspects the valve and its components.

A dripping T&P Relief Valve is usually caused by the home's water pressure being too high or the lack of a Thermal Expansion Tank. If your T&P Relief Valve drips, see "Drips from T&P Relief Valve Discharge Pipe" on page 30.

A T&P relief valve that has been allowed to drip for an appreciable period of time should be inspected for mineral buildup. See T&P relief valve tag for more information.

## Inspect and Clean the Air Filter



Figure 38 - Clean air filter periodically.

An air filter should be installed around the base of the water heater. At least annually inspect the air filter and check for a build-up of dust or debris. Vacuum the filter to remove any dust or debris. If an oily residue is present on the filter, wash it in soap and water, then dry the filter.

## Removing and Replacing the Gas Control Valve/Thermostat

### Removing the Gas Control Valve/Thermostat:

- 1 Set the Switch to the "OFF" position.

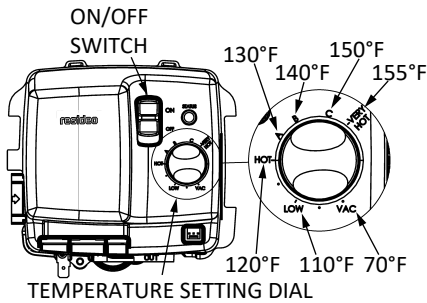


Figure 39 - Switch and temperature controls.

- 2 Disconnect the water heater's power plug from the grounded 110/120 volt power supply.
- 3 Make sure the manual gas valve for the water heater's supply line is OFF.

See Figure 40.



Figure 40 - Gas valve in "off" position

- 4 Set the thermostat to the lowest setting by turning the knob to "VAC". See Figure 40.
- 5 Drain the water heater. Refer to the "Draining and Flushing the Water Heater" section on page 36.

- 6 Disconnect (A) (B) and (C) from the thermostat (See Figure 41).
- 7 Disconnect the manifold tube at the gas control valve/ thermostat (D) (Figure 41).

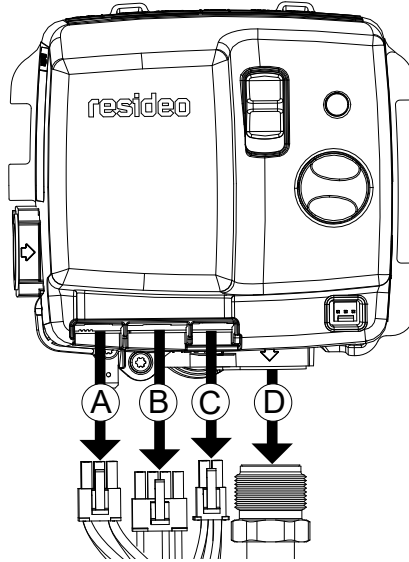


Figure 41 - Gas valve connections at thermostat.

- 8 Disconnect the ground joint union in the gas piping. Disconnect the remaining pipe from the gas control valve/thermostat. (Refer to "COMPLETED INSTALLATION" on page 2.)
- 9 To remove the gas control valve/thermostat, thread a 4" section of gas pipe into the inlet and use it to turn the gas control valve/thermostat (counterclockwise). Do not use a pipe wrench or equivalent to grip body. Damage may result, causing leaks. Do not insert any sharp objects into the inlet or outlet connections. Damage to the gas control valve/thermostat may result.

### Replacing Gas Control Valve/Thermostat:

To replace the gas control valve/thermostat, reassemble in reverse order. When replacing the gas control valve/thermostat, thread a 4" section of gas pipe into the inlet and use it to turn the gas control valve/thermostat (clockwise). DO NOT OVER TIGHTEN; damage may result.

- Be sure to use approved thread sealant tape or pipe joint compound on the gas piping connections and fitting on the back of the gas control valve that screws into the tank.



Figure 42 - Gas valve in "on" position.

- Turn the gas supply on and check for leaks. Test the water heater **with the main burner on** by brushing on an approved noncorrosive leak detection solution. Bubbles forming indicate a leak. Correct any leak found.
- Be sure tank is completely filled with water before lighting and activating the water heater. Follow the "Lighting Instructions" section on page 27.
- If additional information is required, contact the Service Department at the number listed on your warranty.

# ELECTRICAL CONNECTIONS

## ▲ WARNING! Electrical Shock Hazard –

- Disconnect electrical power to the water heater if service is to be performed.
- Failure to do so can result in death or electrical shock.

Before plugging in the water heater, always make sure:

- The voltage and frequency correspond to that specified on the water heater wiring diagram.
- The electrical outlet has the proper overload fuse or breaker protection.
- **Do not** use an extension cord to connect the water heater to an electrical outlet.
- The water heater and the outlet are properly grounded.
- Installed in accordance with prevailing provisions of local codes, or in the absence of such, National Electric Code, ANSI/NFPA 70.
- Always reference the wiring diagram for the correct electrical connections.
- This water heater is a polarity sensitive appliance and will not operate properly if the power supply polarity is reversed. Power to this water heater must be wired properly (correct polarity).

After making all electrical connections, completely fill the tank with water and check all connections for leaks. Open the nearest hot water faucet and let it run for 3 minutes to purge the water lines of air and sediment and to ensure complete filling of the tank. The electrical power may then be turned on. Verify proper operation after servicing.

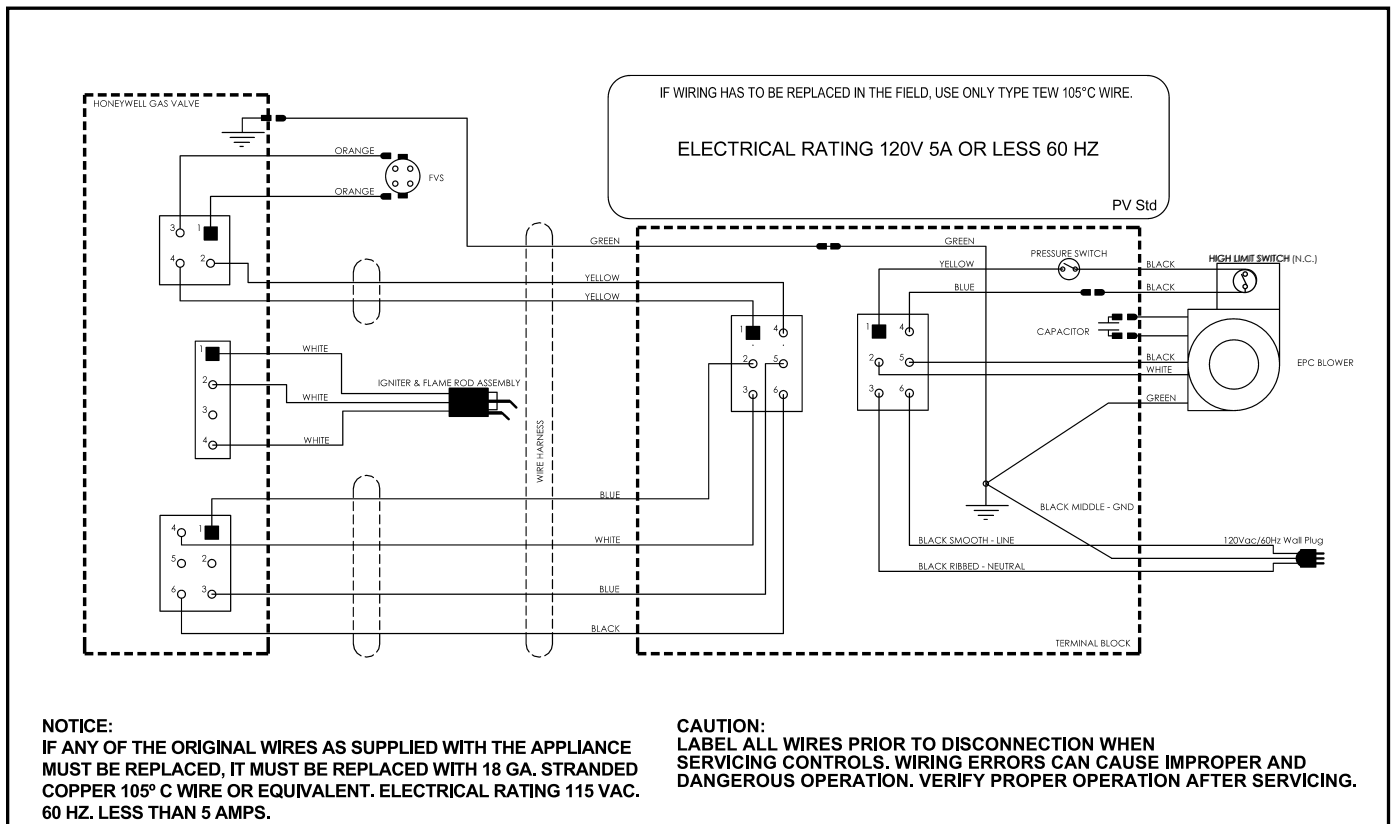


Figure 43 - Wiring Diagram

Replacement parts may be ordered through your plumber or the local distributor. You may also call the Technical Assistance Hotline which is listed on your warranty. Parts will be shipped at prevailing prices and billed accordingly.

NOTICE: When ordering replacement parts, have the following information ready:

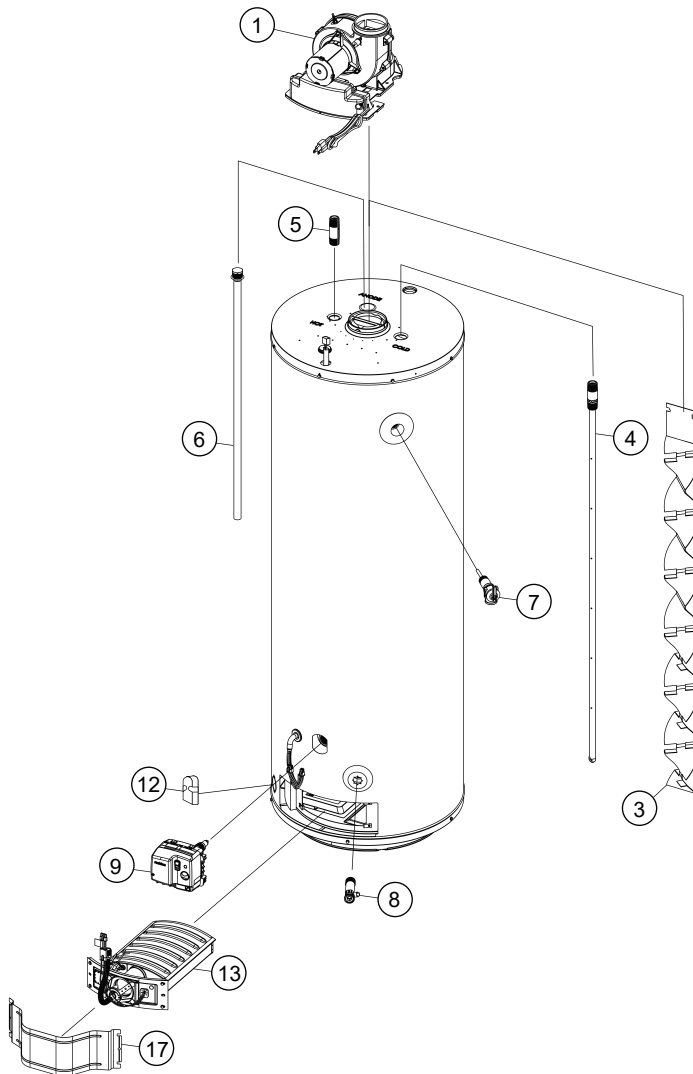
- Model and serial numbers
- Type of gas used
- Item number
- Parts description

## REPAIR PARTS LIST

Item No.	Parts Description
1	Blower
2	Pressure Switch (Not Pictured)
3	Flue Baffle
4	Combination Dip Tube/Heat Trap Nipple
5	Heat Trap/Nipple
6	Anode Rod*
7	Temperature and Pressure Relief Valve
8	Drain Valve
9	Gas Control Valve/Thermostat
10	Flame Sensor/Hot Surface Igniter (HSI)**
11	FV Sensor**
12	FV Sensor Bracket**
13	Burner Door Assembly - Natural Gas / Ultra Low Nox**
14	Manifold Component Block w/Retainer Clip**
15	Viewport Assembly**
16	Burner Door Gasket**
17	Outer Door
18	Flexible Manifold Tube**
19	High Limit Switch**

\* Special anode rod available. See "Water Odor" on page 30.

\*\* Pictured on next page.



# REPAIR PARTS

## LISTED PARTS KITS AND ILLUSTRATIONS

- Item 10: Flame Sense/Hot Surface Igniter Assembly.
- Item 11: FV Sensor
- Item 12: FV Sensor Bracket
- Item 13: Burner door assembly (contains the manifold tube, gasket, manifold door, manifold component block with retainer clip, and flame sensor/hot surface igniter assembly). Natural Gas.
- Item 14: Manifold component block with retainer clip.
- Item 15: Viewport.
- Item 16: Burner door gasket.
- Item 18: Flexible manifold tube.

