This water heater complies with ANSI Z21.10.1-current edition regarding the accidental or unintended ignition of flammable vapors, such as those emitted by gasoline.

**WARNING**

Read and understand instruction manual and safety messages before installing, operating or servicing this water heater. Failure to follow instructions and safety messages could result in death or serious injury. Instruction manual must remain with water heater.

- Safety Instructions
- Installation
- Operation
- Care and Maintenance
- Troubleshooting
- Parts List

**INSTALLER:**

- AFFIX THESE INSTRUCTIONS TO OR ADJACENT TO THE WATER HEATER.

**OWNER:**

- RETAIN THESE INSTRUCTIONS AND WARRANTY FOR FUTURE REFERENCE. RETAIN THE ORIGINAL RECEIPT AS PROOF OF PURCHASE.

**WARNING:** Gas leaks can not always be detected by smell. Gas suppliers recommend that you use a gas detector approved by UL or CSA.

For more information, contact the your gas supplier.

If a gas leak is detected, follow the “WHAT TO DO IF YOU SMELL GAS” instructions.

**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.

---

**HIGH EFFICIENCY ATMOSPHERIC VENT GAS WATER HEATER**

(FLAMMABLE VAPOR IGNITION RESISTANT)

FOR SPACE HEATING AND POTABLE WATER HEATING ONLY.

NOT FOR USE IN MOBILE HOMES.

For Your Safety

AN ODORANT IS ADDED TO THE GAS USED BY THIS WATER HEATER.

---

ALL TECHNICAL AND WARRANTY QUESTIONS: SHOULD BE DIRECTED TO THE LOCAL DEALER FROM WHOM THE WATER HEATER WAS PURCHASED. IF YOU ARE UNSUCCESSFUL, CONTACT RESIDENTIAL TECHNICAL ASSISTANCE AT 1-800-999-9515 OR WWW.AMERICANWATERHEATER.COM.

PRINTED IN THE U.S.A 0410

PART NO. 317994-002
# TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>Section</th>
<th>Pages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water Heater Safety</td>
<td>1-4</td>
</tr>
<tr>
<td>Safe Installation, Use and Service</td>
<td>3</td>
</tr>
<tr>
<td>Safety Precautions</td>
<td>3-4</td>
</tr>
<tr>
<td>Typical Installation</td>
<td>5</td>
</tr>
<tr>
<td>Installing Your Gas Water Heater</td>
<td>6-8</td>
</tr>
<tr>
<td>Important Information About this Water Heater</td>
<td>6</td>
</tr>
<tr>
<td>Consumer Information</td>
<td>6</td>
</tr>
<tr>
<td>Consumer Responsibilities</td>
<td>6</td>
</tr>
<tr>
<td>Unpacking the Water Heater</td>
<td>6</td>
</tr>
<tr>
<td>Location Requirements</td>
<td>7</td>
</tr>
<tr>
<td>Site Locations</td>
<td>7</td>
</tr>
<tr>
<td>Clearances and Accessibility</td>
<td>8</td>
</tr>
<tr>
<td>State of California</td>
<td>8</td>
</tr>
<tr>
<td>Gas Supply</td>
<td>9-10</td>
</tr>
<tr>
<td>Gas Requirements</td>
<td>9</td>
</tr>
<tr>
<td>Gas Piping</td>
<td>9</td>
</tr>
<tr>
<td>Gas Pressure</td>
<td>9</td>
</tr>
<tr>
<td>Gas Pressure Testing</td>
<td>9</td>
</tr>
<tr>
<td>Gas Pipe Capacity Table</td>
<td>10</td>
</tr>
<tr>
<td>Combustion Air and Ventilation</td>
<td>11-15</td>
</tr>
<tr>
<td>Unconfined Space</td>
<td>11</td>
</tr>
<tr>
<td>Confined Space</td>
<td>11</td>
</tr>
<tr>
<td>All Air from Inside the Building</td>
<td>12</td>
</tr>
<tr>
<td>All Air from Outdoors</td>
<td>12</td>
</tr>
<tr>
<td>Louvers and Grilles</td>
<td>12-13</td>
</tr>
<tr>
<td>Vent Pipe System</td>
<td>13</td>
</tr>
<tr>
<td>Draft Hood Installation</td>
<td>13-14</td>
</tr>
<tr>
<td>Vent Pipe Size</td>
<td>14</td>
</tr>
<tr>
<td>Vent Connectors</td>
<td>14</td>
</tr>
<tr>
<td>Chimney Connection</td>
<td>14</td>
</tr>
<tr>
<td>Vertical Exhaust Gas Vent</td>
<td>14-15</td>
</tr>
<tr>
<td>Water System Piping</td>
<td>15-18</td>
</tr>
<tr>
<td>Piping Installation</td>
<td>15-16</td>
</tr>
<tr>
<td>Closed System/Thermal Expansion</td>
<td>16</td>
</tr>
<tr>
<td>Temperature &amp; Pressure Relief Valve</td>
<td>16-17</td>
</tr>
<tr>
<td>T&amp;P Relief Valve and Pipe Installation</td>
<td>17</td>
</tr>
<tr>
<td>Combination Space Heating/Potable Water System</td>
<td>17-18</td>
</tr>
<tr>
<td>Solar Installation</td>
<td>18</td>
</tr>
<tr>
<td>Electrical Connections and Wiring Diagram</td>
<td>18</td>
</tr>
<tr>
<td>Important Information About this Water Heater</td>
<td>19</td>
</tr>
<tr>
<td>Operating Your Water Heater</td>
<td>20-25</td>
</tr>
<tr>
<td>Gas Valve/Thermostat - Lighting Instructions</td>
<td>20</td>
</tr>
<tr>
<td>Checking the Draft</td>
<td>21</td>
</tr>
<tr>
<td>Burner Flames</td>
<td>22</td>
</tr>
<tr>
<td>Emergency Shutdown</td>
<td>22</td>
</tr>
<tr>
<td>Water Temperature Regulation</td>
<td>22-23</td>
</tr>
<tr>
<td>Operational Conditions</td>
<td>23-24</td>
</tr>
<tr>
<td>Routine Preventive Maintenance</td>
<td>24</td>
</tr>
<tr>
<td>Temperature and Pressure Relief Valve</td>
<td>25</td>
</tr>
<tr>
<td>Maintenance of Your Water Heater</td>
<td>25-27</td>
</tr>
<tr>
<td>Replacement Parts</td>
<td>25</td>
</tr>
<tr>
<td>Removing the Burner from the Manifold/Burner Assembly</td>
<td>25</td>
</tr>
<tr>
<td>Replacing the Flame Sense/Hot Surface Igniter Assembly</td>
<td>26</td>
</tr>
<tr>
<td>External Inspection &amp; Cleaning of the Air Intake Chamber Louvers</td>
<td>26</td>
</tr>
<tr>
<td>Cleaning the Combustion Chamber and Air Diverter Assembly</td>
<td>26</td>
</tr>
<tr>
<td>Replacing the Manifold Burner/Assembly</td>
<td>26-27</td>
</tr>
<tr>
<td>Removing and Replacing the Gas Control Valve/Thermostat</td>
<td>27</td>
</tr>
<tr>
<td>FVIR System Operational Checklist</td>
<td>28</td>
</tr>
<tr>
<td>Troubleshooting Chart</td>
<td>28-29</td>
</tr>
<tr>
<td>Control Display Troubleshooting</td>
<td>30-33</td>
</tr>
<tr>
<td>Repair Parts Illustration</td>
<td>34</td>
</tr>
<tr>
<td>Listed Parts Kits and Illustrations</td>
<td>35</td>
</tr>
</tbody>
</table>
SAFETY INSTALLATION, USE AND SERVICE

Your safety and the safety of others is extremely important in the installation, use and servicing of this water heater. Many safety-related messages and instructions have been provided in this manual and on your water heater to warn you and others of a potential hazard. Read and obey all safety messages and instructions throughout this manual. It is very important that the meaning of each safety message is understood by you and others who install, use or service this water heater.

This is the safety alert symbol. It is used to alert you to potential personal injury hazards. Obey all safety messages that follow this symbol to avoid possible injury or death.

**DANGER**

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

**WARNING**

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

**CAUTION**

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

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

All safety messages will generally tell you about the type of hazard, what can happen if you do not follow the safety message and how to avoid the risk of injury.

The California Safe Drinking Water and Toxic Enforcement Act requires the Governor of California to publish a list of substances known to the State of California to cause cancer, birth defects, or other reproductive harm, and requires businesses to warn of potential exposure to such substances.

**WARNING:** This product contains a chemical known to the State of California to cause cancer, birth defects, or other reproductive harm.

This appliance can cause low-level exposure to some of the substances included in the Act.

**IMPORTANT DEFINITIONS**

- **Qualified Technician:** A qualified technician must have ability equivalent to a licensed tradesman in the fields of plumbing, air supply, venting, and gas supply, including a thorough understanding of the requirements of the National Fuel Gas Code as it relates to the installation of gas fired water heaters. The qualified technician must also be familiar with the design features and use of flammable vapor ignition resistant water heaters, and have a thorough understanding of this instruction manual.

- **Service Agency:** A service agency also must have ability equivalent to a licensed tradesman in the fields of plumbing, air supply, venting and gas supply, including a thorough understanding of the requirements of the National Fuel Gas Code as it relates to the installation of gas fired water heaters. The service agency must also have a thorough understanding of this instruction manual, and be able to perform repairs strictly in accordance with the service guidelines provided by the manufacturer.

- **Gas Supplier:** The Natural Gas or Propane Utility or service who supplies gas for utilization by the gas burning appliances within this application. The gas supplier typically has responsibility for the inspection and code approval of gas piping up to and including the Natural Gas meter or Propane storage tank of a building. Many gas suppliers also offer service and inspection of appliances within the building.

**SAFETY PRECAUTIONS**

**WARNING**

**FIRE AND EXPLOSION HAZARD**

Can result in serious injury or death

Do not store or use gasoline or other flammable vapors and liquids in the vicinity of this or any other appliance. Storage of or use of gasoline or other flammable vapors or liquids in the vicinity of this or any other appliance can result in serious injury or death.

Read and follow water heater warnings and instructions.
Fire or Explosion Hazard

- Do not store or use gasoline or other flammable vapors and liquids in the vicinity of this or any other appliance.
- Avoid all ignition sources if you smell Natural or LP gas.
- Do not expose water heater control to excessive gas pressure.
- Use only gas shown on rating plate.
- Maintain required clearances to combustibles.
- Keep ignition sources away from faucets after extended period of non-use.

**Read instruction manual before installing, using or servicing water heater.**

Explosion Hazard

- Overheated water can cause watertank explosion.
- Properly sized temperature and pressure relief valve must be installed in opening provided.

Breathing Hazard - Carbon Monoxide Gas

- Install vent system in accordance with codes.
- Do not operate water heater if flood damaged.
- High altitude office must be installed for operation above 5,400 feet (1,646m).
- Do not operate if scot is present.
- Do not obstruct water heater air intake with insulating jacket.
- Do not place chemical vapor emitting products near water heater.
- Gas and carbon monoxide detectors are available.

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

**WARNING**

Fire Hazard

For continued protection against risk of fire:
- Do not install water heater on carpeted floor.
- Do not operate water heater if flood damaged.

**WARNING**

Water temperature over 125°F (52°C) can cause severe burns instantly resulting in severe injury or death.

Children, the elderly, and the physically or mentally disabled are at highest risk for scald injury.

Feel water before bathing or showering.

Temperature limiting valves are available.

Read instruction manual for safe temperature setting.

**WARNING**

Improper installation and use may result in property damage.

- Do not operate water heater if flood damaged.
- Inspect and replace anode.
- Install in location with drainage.
- Fill tank with water before operation.
- Be alert for thermal expansion.

Refer to instruction manual for installation and service.
TYPICAL INSTALLATION

GET TO KNOW YOUR WATER HEATER - GAS MODELS

A Vent Pipe  
B Draft hood  
C Anode (Not Shown)  
D Hot Water Outlet  
E Insulation  
F Gas Supply Piping  
G Manual Gas Shut-off Valve  
H Ground Joint Union  
I Drip Leg (Sediment Trap)  
J Inner Door  
K Outer door  
L Union  
M Inlet Water Shut-off Valve  
N Cold Water Inlet  
O Inlet Dip Tube  
P Temperature & Pressure Relief Valve  
Q Rating Plate  
R Flue Baffle  
S Gas Control Valve/Thermostat  
T Drain Valve  
U Main Burner  
V Flue  
W Suitable Metal Drain Pan  
X Control Display  
Y Power Supply Transformer  
YY Pressure Switch  
ZZ FV Sensor (Shown without Bracket)

* INSTALL IN ACCORDANCE WITH LOCAL CODES.

* DRIP LEG AS REQUIRED BY LOCAL CODES.

* ALL PIPING MATERIALS TO BE SUPPLIED BY CUSTOMERS.

TO VENT TERMINATION ON ROOF

INSTALL THERMAL EXPANSION TANK IF WATER HEATER IS INSTALLED IN A CLOSED WATER SYSTEM

IMPORTANT:
WHEN BRUSHING ON AN APPROVED NONCORROSIVE LEAK DETECTION SOLUTION, DO NOT SPLASH SOLUTION ONTO ELECTRICAL CONNECTIONS (SEE PAGE 27).

IMPORTANT: DO NOT USE AN EXTENSION CORD TO CONNECT THE WATER HEATER TO AN ELECTRICAL OUTLET.

FIGURE 1.
Important Information About This Water Heater

This gas water heater was manufactured to voluntary safety standards to reduce the likelihood of a flammable vapor ignition incident. New technology used in meeting these standards makes this product more sensitive to installation errors or improper installation environments. Please review the Installation Checklist found at the end of the installation instructions section and make any required installation upgrades or changes.

Consumer Information

This water heater is design-certified by CSA International as a Category I, 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 Agency
1 Batterymarch Park
Quincy, MA 02269
Check your phone listings for the local authorities having jurisdiction over your installation.

Consumer Responsibilities

This manual has been prepared to acquaint you with the installation, operation, and maintenance of your gas water heater and provide important safety information in these areas.
Read all of the instructions thoroughly before attempting the installation or operation of this water heater.
Do not discard this manual. You or future users of this water heater will need it for future reference.
Service to the FVIR System should only be performed by a qualified technician.
Examples of a qualified technician include: licensed plumbers, authorized gas company personnel, and authorized service personnel.
IMPORTANT: The manufacturer and seller of this water heater will not be liable for any damages, injuries, or deaths caused by failure to comply with the installation and operating instructions outlined in this manual.
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 technician perform the installation of this water heater.
Massachusetts code requires this water heater to be installed in accordance with Massachusetts Plumbing and Fuel Gas Code 248 CMR Section 2.00 and 5.00.
A rating plate identifying your water heater can be found on the front of your water heater. When referring to your water heater, always have the information listed on the rating plate readily available. Retain your original receipt as proof of purchase.
Location Requirements

**WARNING**

Carbon Monoxide Poisoning Hazard

Do not install in a mobile home.
Doing so can result in carbon monoxide poisoning and death.

The FVIR System is designed to reduce the risk of flammable vapor-related fires. Flammable liquids (such as gasoline, solvents, propane, etc.) emit flammable vapors which can be ignited by a gas water heater’s hot surface igniter or main burner. The resulting flashback and fire can cause death or serious burns to anyone in the area.

**WARNING**

Flammable Vapors

Do not store or use gasoline or other flammable vapors and liquids in the vicinity of this or any other appliance. Storage of or use of gasoline or other flammable vapors or liquids in the vicinity of this or any other appliance can result in serious injury or death.

**WARNING**

FIRE AND EXPLOSION HAZARD

Can result in serious injury or death

Do not store or use gasoline or other flammable vapors and liquids in the vicinity of this or any other appliance. Storage of or use of gasoline or other flammable vapors or liquids in the vicinity of this or any other appliance can result in serious injury or death.

Read and follow water heater warnings and instructions

Do not use or store flammable products such as gasoline, solvents, or adhesives in the same room or area near the water heater. If such flammables must be used, all gas burning appliances in the vicinity must be shut off and their pilot lights extinguished. Open the doors and windows for ventilation while flammable substances are in use.

If flammable liquids or vapors have spilled or leaked in the area of the water heater, leave the area immediately and call the fire department from a neighbor’s home. Do not attempt to clean the spill until all ignition sources have been extinguished.

**WARNING**

Fire or Explosion Hazard

- Read instruction manual before installing, using or servicing water heater.
- Improper use may result in fire or explosion.
- Maintain required clearances to combustibles.

Keep combustibles such as boxes, magazines, clothes, etc. away from the water heater area.

**Site Location**

- Select a location near the center of the water piping system. The water heater must be installed indoors and in a vertical position on a level surface. DO NOT install in bathrooms, bedrooms, or any occupied room normally kept closed.
- Locate the water heater as close to the chimney or gas vent as practical. Consider the vent system piping and combustion air supply requirements when selecting the water heater location. The venting system must be able to run from the water heater to termination with minimal length and elbows.
- Locate the water heater near the existing gas piping. If installing a new gas line, locate the water heater to minimize the pipe length and elbows.
- The water heater should be located in an area not subject to freezing temperatures. Water heaters located in unconditioned spaces (i.e., attics, basements, etc.) may require insulation of the water piping and drain piping to protect against freezing. The drain and controls must be easily accessible for operation and service. Maintain proper clearances as specified on the water heater.
- Do not locate the water heater near an air-moving device. The operation of air-moving devices such as exhaust fans, ventilation systems, clothes dryers, fireplaces, etc., can affect the proper operation of the water heater. Special attention must be given to conditions these devices may create. Flow reversal of flue gases may cause an increase of carbon monoxide inside of the dwelling (Figure 1).
- The water heater is to be located as close as possible to a 120VAC outlet. NOTE: all electrical wiring should be in accordance to the NEC and all local/state electrical codes (extension cord is not allowed).

NOTE: 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 and the “National Electrical Code”, ANSI/NFPA 70 current edition.
**CAUTION**

Property Damage Hazard

- All water heaters eventually leak
- Do not install without adequate drainage.

IMPORTANT: The water heater should be located in an area where leakage of the tank or connections will not result in damage to the area adjacent to the water heater or to lower floors of the structure. Due to the normal corrosive action of water, the tank will eventually leak after an extended period of time. Also any external plumbing leak, including those from improper installation, may cause early failure of the tank due to corrosion if not repaired. If the homeowner is uncomfortable with making the repair a qualified technician should be contacted. A suitable metal drain pan should be installed under the water heater as shown below, to help protect the property from damage which may occur from condensate formation or leaks in the piping connections or tank. The pan must limit the water level to a maximum depth of 1-3/4" and be two inches wider than the heater and piped to an adequate drain. Locate the water heater near a suitable indoor drain. Outside drains are subject to freezing temperatures which can obstruct the drain line. The piping should be at least 3/4" ID and pitched for proper drainage.

Water heater life depends upon water quality, water usage, water temperature and the environment in which the water heater is installed. Water heaters are sometimes installed in locations where leakage may result in property damage, even with the use of a metal drain pan piped to a drain. However, unanticipated damage can be reduced or prevented by a leak detector or water shut-off device used in conjunction with a piped metal drain pan. These devices are available from some plumbing supply wholesalers and retailers, and detect and react to leakage in various ways:

- Sensors mounted in the metal drain pan that trigger an alarm or turn off the incoming water to the water heater when water is detected.
- Sensors mounted in the metal drain pan that turn off the water supply to the entire home when water is detected in the metal drain pan.
- Water supply shut-off devices that activate based on the water pressure differential between the cold water and hot water pipes connected to the water heater.
- Devices that will turn off the gas supply to a gas water heater while at the same time shutting off its water supply.

**Clearances and Accessibility**

NOTE: Minimum clearances from combustible materials are stated on the label on the front of the heater adjacent to the gas control valve/thermostat of the water heater. The water heater is certified for installation on a combustible floor.

- IMPORTANT: If installing over carpeting, the carpeting must be protected by a metal or wood panel beneath the water heater. The protective panel must extend beyond the full width and depth of the water heater by at least five inches (127mm) in any direction; or if in an alcove or closet installation, the entire floor must be covered by the panel.
- Figure 2A may be used as a reference guide to locate the specific clearance locations. A minimum of 5 inches of front clearance should be provided for inspection and service.

**State of California**

NOTE: The water heater must be braced, anchored, or strapped to avoid 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.
GAS SUPPLY

WARNING

Explosion Hazard

- Use a new CSA approved gas supply line.
- Install a shut-off valve.
- 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.
- Failure to follow these instructions can result in death, explosion, or carbon monoxide poisoning.

Gas Requirements

IMPORTANT: Read the rating plate to be sure the water heater is made for the type of gas you will be using in your home. This information will be found on the rating plate located near the gas control valve/thermostat. If the information does not agree with the type of gas available, do not install or light. Call your dealer.

NOTE: 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.

Gas Piping

The gas piping 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.

Tables 1 and 2 on the following page provide a sizing reference for commonly used gas pipe materials. Consult the "National Fuel Gas Code" for the recommended gas pipe size of other materials.

NOTE: Use pipe joint compound or teflon tape marked as being resistant to the action of petroleum [Propane (L.P.)] gases (See Figure 3.)

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 drip leg (if not already incorporated as part of the water heater) as shown. The drip leg 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/thermostat and the manual shut-off valve. This is to allow easy removal of the gas control valve/thermostat.
4. Turn the gas supply on and check for leaks. Test all connections by brushing on an approved noncorrosive leak-detection solution. Bubbles will show a leak. Correct any leak found.

Gas Pressure

WARNING

Explosion Hazard

- Gas leaks can not always be detected by smell.
- Gas suppliers recommend that you use a gas detector approved by UL or CSA.
- For more information, contact your gas supplier.
- If a gas leak is detected, follow the “What to do if you smell gas” instructions on the cover of this manual.

IMPORTANT: 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.

Gas Pressure Testing

IMPORTANT: This water heater and its gas connection must be leak tested before placing the appliance in operation.

- If the code requires the gas lines to be tested at a pressure exceeding 14” W.C., the water heater and its manual shut-off valve must be disconnected from the gas supply piping system and the line capped.
- If the gas lines are to be tested at a pressure less than 14” W.C., the water heater must be isolated from the gas supply piping system by closing its manual shut-off valve.

NOTE: Air may be present in the gas lines and could prevent the burner from lighting on initial start-up. The gas lines should be purged of air by a qualified technician after installation of the gas piping system. While purging the gas piping system of air, insure that the fuel is not spilled in the area of the water heater installation, or any source of ignition (NOTE: spilled fuel may trip the FV Sensor preventing heater from starting). If the fuel is spilled while purging the piping system of air follow the “WHAT TO DO IF YOU SMELL GAS” instructions on the cover of this manual.
## Gas Pipe Capacity Table

### WARNING

**Explosion Hazard**

- Use a new CSA approved gas supply line.
- Install a shut-off valve.
- 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.
- Failure to follow these instructions can result in death, explosion, or carbon monoxide poisoning.

### WARNING

**Explosion Hazard**

- Gas leaks can not always be detected by smell.
- Gas suppliers recommend that you use a gas detector approved by UL or CSA.
- For more information, contact your gas supplier.
- If a gas leak is detected, follow the “What to do if you smell gas” instructions on the cover of this manual.

### Table 1: Natural Gas Pipe Capacity Table (Cu. Ft./Hr.)

Capacity of gas pipe of different diameters and lengths in cu. ft. per hr. with pressure drop of 0.3 in. and specific gravity of 0.60 (natural gas).

<table>
<thead>
<tr>
<th>Nominal Iron Pipe Size, in.</th>
<th>10</th>
<th>20</th>
<th>30</th>
<th>40</th>
<th>50</th>
<th>60</th>
<th>70</th>
<th>80</th>
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<th>175</th>
<th>200</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/2</td>
<td>132</td>
<td>92</td>
<td>73</td>
<td>63</td>
<td>56</td>
<td>50</td>
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<td>40</td>
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<td>31</td>
<td>28</td>
<td>26</td>
</tr>
<tr>
<td>3/4</td>
<td>278</td>
<td>190</td>
<td>152</td>
<td>130</td>
<td>115</td>
<td>105</td>
<td>96</td>
<td>90</td>
<td>84</td>
<td>79</td>
<td>72</td>
<td>64</td>
<td>59</td>
<td>55</td>
</tr>
<tr>
<td>1</td>
<td>520</td>
<td>350</td>
<td>285</td>
<td>245</td>
<td>215</td>
<td>195</td>
<td>180</td>
<td>170</td>
<td>160</td>
<td>150</td>
<td>130</td>
<td>120</td>
<td>110</td>
<td>100</td>
</tr>
<tr>
<td>1-1/4</td>
<td>1050</td>
<td>720</td>
<td>590</td>
<td>500</td>
<td>440</td>
<td>400</td>
<td>370</td>
<td>350</td>
<td>320</td>
<td>305</td>
<td>275</td>
<td>250</td>
<td>225</td>
<td>210</td>
</tr>
<tr>
<td>1-1/2</td>
<td>1600</td>
<td>1100</td>
<td>890</td>
<td>760</td>
<td>670</td>
<td>610</td>
<td>560</td>
<td>530</td>
<td>490</td>
<td>460</td>
<td>410</td>
<td>380</td>
<td>350</td>
<td>320</td>
</tr>
</tbody>
</table>

After the length of pipe has been determined, select the pipe size which will provide the minimum cubic feet per hour required for the gas input rating of the water heater. By formula:

\[
\text{Min. Cu. Ft. Per Hr. Required} = \frac{\text{Gas Input of Water Heater (BTU/HR)}}{\text{Heating Value of Gas (BTU/FT³)}}
\]

The gas input of the water heater is marked on the water heater data plate. The heating value of the gas (BTU/FT³) may be determined by consulting the local natural gas utility.

### Table 2: LP Gas Capacity Table

Maximum capacity of pipe in thousands of BTU per hour of undiluted liquefied petroleum gases (at 11 inches water column pressure.) Based on a pressure drop of 0.5 inch water column.

<table>
<thead>
<tr>
<th>Nominal Iron Pipe Size, in.</th>
<th>10</th>
<th>20</th>
<th>30</th>
<th>40</th>
<th>50</th>
<th>60</th>
<th>70</th>
<th>80</th>
<th>90</th>
<th>100</th>
<th>125</th>
<th>150</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/2</td>
<td>275</td>
<td>189</td>
<td>152</td>
<td>129</td>
<td>114</td>
<td>103</td>
<td>96</td>
<td>89</td>
<td>83</td>
<td>78</td>
<td>69</td>
<td>63</td>
</tr>
<tr>
<td>3/4</td>
<td>576</td>
<td>393</td>
<td>315</td>
<td>267</td>
<td>237</td>
<td>217</td>
<td>196</td>
<td>185</td>
<td>173</td>
<td>162</td>
<td>146</td>
<td>132</td>
</tr>
<tr>
<td>1</td>
<td>1071</td>
<td>732</td>
<td>590</td>
<td>504</td>
<td>448</td>
<td>409</td>
<td>378</td>
<td>346</td>
<td>322</td>
<td>307</td>
<td>275</td>
<td>252</td>
</tr>
<tr>
<td>1-1/4</td>
<td>2205</td>
<td>1496</td>
<td>1212</td>
<td>1039</td>
<td>913</td>
<td>834</td>
<td>771</td>
<td>724</td>
<td>677</td>
<td>630</td>
<td>567</td>
<td>511</td>
</tr>
</tbody>
</table>

Example: Input BTU requirement of the water heater 100,000 BTUH. Total pipe length, 80 feet = 3/4” IPS required.

**TABLE 3**

<table>
<thead>
<tr>
<th>BTUH Input</th>
<th>Minimum Square Feet with 8’ Ceiling</th>
<th>Typical Room with 8’ Ceiling</th>
</tr>
</thead>
<tbody>
<tr>
<td>30,000</td>
<td>188</td>
<td>9 x 21</td>
</tr>
<tr>
<td>45,000</td>
<td>281</td>
<td>14 x 20</td>
</tr>
<tr>
<td>60,000</td>
<td>375</td>
<td>15 x 25</td>
</tr>
<tr>
<td>75,000</td>
<td>469</td>
<td>15 x 31</td>
</tr>
<tr>
<td>90,000</td>
<td>563</td>
<td>20 x 28</td>
</tr>
<tr>
<td>105,000</td>
<td>657</td>
<td>20 x 33</td>
</tr>
<tr>
<td>120,000</td>
<td>750</td>
<td>25 x 30</td>
</tr>
<tr>
<td>135,000</td>
<td>844</td>
<td>28 x 30</td>
</tr>
</tbody>
</table>

**IMPORTANT:**
- The area must be open and be able to provide the proper air requirements to the water heater. Areas that are being used for storage or contain large objects may not be suitable for water heater installation.
- Modern home construction usually requires supplying outdoor air into the water heater area.

**Unconfined Space**
A water heater in an unconfined space uses indoor air for combustion and requires at least 50 cubic feet for each 1,000 BTUH of the total input for all gas appliances. The table below shows a few examples of the minimum square footage (area) required for various BTUH inputs.

**Confined Space**
For the correct and proper operation of this water heater, ample air must be supplied for the combustion, ventilation, and dilution of flue gases. Small enclosures and confined areas must have two permanent openings so that sufficient fresh air can be drawn from outside of the enclosure. One opening shall be within 12 inches of the top and one within 12 inches of the bottom of the enclosure as shown in Figure 4.

The size of each opening (free area) is determined by the total BTUH input of all gas utilization equipment (i.e., water heaters, furnaces, clothes dryers, etc.) and the method by which the air is provided. The BTUH input can be found on the water heater rating plate. Additional air can be provided by two methods:

1. All air from inside the building.
2. All air from outdoors.
Attic or crawl spaces cannot be closed and must be properly ventilated to the outside.

Ductwork must be of the same cross-sectional area as the free area of the opening to which they connect. The minimum dimension of rectangular air ducts cannot be less than three inches.

The size of each of the two openings is determined by the method in which the air is to be provided. Refer to Table 4 to calculate the minimum free area for each opening. Figures 6, 7, 8A and 8B are typical examples of each method.

**Louvers and Grilles**

In calculating free area for ventilation and combustion air supply openings, consideration must be given to the blocking effect of protection louvers, grilles, and screens. These devices can reduce airflow, which in turn may require larger openings to achieve the required minimum free area. Screens must not be smaller than 1/4” mesh. If the free area through a particular design of louver or grille is known, it should be used in calculating the specified free area of the opening. If the design and free area are not known, it can be assumed that most wood louvers will allow 20 - 25% of free area while metal louvers and grilles will allow 60 - 75% of free area.

Louvers and grilles must be locked open or interconnected with the equipment so that they are opened automatically during equipment operation.

Keep louvers and grilles clean and free of debris or other obstructions.

**TABLE 4**

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

Based on total BTUH input rating for all utilizing equipment within the confined space.

<table>
<thead>
<tr>
<th>Opening Source</th>
<th>Minimum Free Area Per Opening (sq. in.)</th>
<th>Reference Drawing</th>
</tr>
</thead>
<tbody>
<tr>
<td>*Direct to outdoors</td>
<td>1 sq. in, per 4000 BTUH</td>
<td>Figure 6</td>
</tr>
<tr>
<td>Vertical Ducts</td>
<td>1 sq. in, per 4000 BTUH</td>
<td>Figure 7</td>
</tr>
<tr>
<td>Horizontal Ducts</td>
<td>1 sq. in, per 2000 BTUH</td>
<td>Figure 8A</td>
</tr>
<tr>
<td>Single Opening</td>
<td>1 sq. in, per 3000 BTUH</td>
<td>Figure 8B</td>
</tr>
</tbody>
</table>

Example: A water heater with an input rating of 50,000 BTUH using horizontal ducts would require each opening to have a minimum free area of 25 square inches.

Minimum free area = 50,000 BTUH x 1 sq. in. / 2000 BTUH = 25 sq. in.

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

Consult the local codes of your area for specific ventilation and combustion air requirements.
**FIGURE 8B.** Vent Pipe System

This water heater uses a non-direct, single-pipe vent system to remove exhaust gases created by the burning of fossil fuels. Air for combustion is taken from the immediate water heater location or is ducted in from the outside (see "Combustion Air Supply and Ventilation").

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

The vent pipe 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. The vent pipe installation must not be obstructed so as to prevent the removal of exhaust gases to the outside atmosphere.

**IMPORTANT:** The use of vent dampers is not recommended by the manufacturer of this water heater. Although some vent dampers are certified by CSA International, this certification applies to the vent damper device only and does not mean they are certified for use on this water heater.

U.L. recognized fuel gas and carbon monoxide (CO) detectors are recommended in all applications and should be installed using the manufacturer’s instructions and local codes, rules, or regulations.

**IMPORTANT:** If you lack the necessary skills required to properly install this venting system, you should not proceed, but get help from a qualified technician.

**Draft Hood Installation**

Install The Draft Hood With The Four Screws Provided.
Align the legs of the draft hood with the slots provided. Insert the legs and secure the draft hood to the water heater’s top with the four screws provided as shown in Figure 9. Do not alter the draft hood in any way. If you are replacing an existing water heater, be sure to use the draft hood supplied with this water heater.

**Vent Pipe Size**

It is important that you follow the guidelines in these instructions for sizing a vent pipe system. If a transition to a larger vent size is required, the vent transition connection must be made at the draft hood outlet.

**Vent Connectors**

1. **Type B, Double wall, U.L. Listed Vent Pipe.**
2. **Single wall Vent Pipe.**

Maintain the manufacturer’s specified minimum clearance from combustible materials when using type B double wall vent pipe. Vent connectors made of type B, double wall vent pipe material may pass through walls or partitions constructed of combustible material if the minimum listed clearance is maintained.

Maintain a six inch minimum clearance from all combustible materials when using single wall vent pipe. IMPORTANT: Single wall vent pipe cannot be used for water heaters located in attics and may not pass through attic spaces, crawl spaces or any confined or inaccessible location. A single wall metal vent connector cannot pass through any interior wall.

When installing a vent connector, please note the following (See Figures 10-12):

- Install the vent connector avoiding unnecessary bends, which create resistance to the flow of vent gases.
- Install without dips or sags with an upward slope of at least 1/4-inch per foot.
- Joints must be fastened by sheet metal screws or other approved means. It must be supported to maintain clearances and prevent separation of joints and damage.
- The length of the vent connector cannot exceed 75% of the vertical vent height.
- The vent connector must be accessible for cleaning, inspection, and replacement.
- Vent connectors cannot pass through any ceiling, floor, firewall, or fire partition.
- It is recommended (but not mandatory) that a minimum 12 inches of vertical vent pipe be installed on the draft hood prior to any elbow in the vent system.

**Chimney Connection**

IMPORTANT: Before connecting a vent to a chimney, make sure the chimney passageway is clear and free of obstructions. The chimney must be cleaned if previously used for venting solid fuel appliances or fireplaces. Also consult local and state codes for proper chimney sizing and application or, in the absence of local and state codes, the “National Fuel Gas Code”, ANSI Z223.1(NFPA 54)-current edition.

- The connector must be installed above the extreme bottom of the chimney to prevent potentially blocking the flue gases.
- The connector must be firmly attached and sealed to prevent it from falling out.
- To aid in removing the connector, a thimble or slip joint may be used.
- The connector must not extend beyond the inner edge of the chimney as it may restrict the space between it and the opposite wall of the chimney (Figure 10).

**Vertical Exhaust Gas Vent**

Vertical exhaust gas vents must be installed with U.L. listed type B vent pipe according to the vent manufacturer’s instructions and the terms of its listing. It must be connected to the water heater’s draft hood by a listed vent connector or by directly originating at the draft hood opening.

Vertical gas vents must terminate with a listed cap or other roof assembly and be installed according to their manufacturer’s instructions. Gas vents must be supported to prevent damage, joint separation, and maintain clearances to combustible materials (Figures 11 and 12).

IMPORTANT: This gas vent must be terminated in a vertical position to facilitate the removal of the burnt gases. An unused chimney flue or masonry enclosure may be used as a passageway for the installation of a gas vent (Figure 12). Common (combined) venting is allowable with vertical type B vent systems and lined masonry chimneys as long as proper draft for the water heater is established under all conditions of operation. CAUTION: DO NOT common vent this water heater with any power vented appliance.

Figures 10-12 are examples of vent pipe system installations and may or may not be typical for your specific application. Consult the “National Fuel Gas Code”, NFPA 54, ANSI Z223.1-current edition and the guidelines set forth by prevailing local codes.
**WATER SYSTEM PIPING**

**Piping Installation**

Piping, fittings, and valves should be installed according to the installation drawing (Figure 13). If the indoor installation area is subject to freezing temperatures, the water piping must be protected by insulation.

The water supply pressure should not exceed 80 psi. If this occurs, a pressure reducing valve with a bypass may need to be installed in the cold water inlet line. This should be placed on the supply to the entire house in order to maintain equal hot and cold water pressures.

**IMPORTANT:** Heat cannot be applied to the water fittings on the heater as they may contain nonmetallic parts. If solder connections are used, solder the pipe to the adapter before attaching the adapter to the hot and cold water fittings.

**IMPORTANT:** Always use a good grade of joint compound and be certain that all fittings are drawn up tight.

1. Install the water piping and fittings as shown in Figure 13. Connect the cold water supply (3/4" NPT) to the cold water inlet fitting. Connect the hot water piping (3/4" NPT) to the hot water outlet fitting.

**IMPORTANT:** Some models may contain energy saving heat traps to prevent the circulation of hot water within the pipes. Do not remove the inserts within the heat traps.

2. The installation of unions in both the hot and cold water supply lines is recommended for ease of removing the water heater for service or replacement.

3. The manufacturer of this water heater recommends installing a mixing valve or an anti-scald device in the domestic hot water line as shown in Figure 14. These valves reduce the point-of-use temperature of the water by mixing cold and hot water and are readily available for use.

4. If installing the water heater in a closed water system, install an expansion tank in the cold water line as specified under Closed System/Thermal Expansion.

5. Install a shut-off valve in the cold water inlet line. It should be located close to the water heater and be easily accessible. Know the location of this valve and how to shut off the water to the heater.

6. A temperature and pressure relief valve must be installed in the opening marked “Temperature and Pressure (T & P) Relief Valve” on the water heater. A discharge line must be added to the opening of the T&P Relief Valve. Follow the instructions under Temperature and Pressure Relief Valve.

7. After piping has been properly connected to the water heater, remove the aerator at the nearest hot water faucet. Open the hot water faucet and allow the tank to completely fill with water. To purge the lines of any excess air, keep the hot water faucet open for 3 minutes after a constant flow of water is obtained. Close the faucet and check all connections for leaks.
Closed System/Thermal Expansion

As water is heated, it expands (thermal expansion). In a closed system, the volume of water will grow. As the volume of water grows, there will be a corresponding increase in water pressure due to thermal expansion. Thermal expansion can cause premature tank failure (leakage). This type of failure is not covered under the limited warranty. Thermal expansion can also cause intermittent temperature-pressure relief valve operation: water discharged from the valve due to excessive pressure buildup. The temperature-pressure relief valve is not intended for the constant relief of thermal expansion. This condition is not covered under the limited warranty.

A properly-sized thermal expansion tank should be installed on all closed systems to control the harmful effects of thermal expansion. Contact a plumbing service agency or your retail supplier regarding the installation of a thermal expansion tank.

Temperature and Pressure Relief Valve

Please note the following:

- The system should be installed only with piping that is suitable for potable (drinkable) water such as copper, CPVC, or polybutylene. This water heater must not be installed using iron piping or PVC water piping.

- Use only pumps, valves, or fittings that are compatible with potable water.

- It is recommend that only full flow ball or gate valves are used in water piping installations. The use of valves that may cause excessive restriction to water flow is not recommended.

- Use only 95/5 tin-antimony or other equivalent solder. Any lead based solder must not be used.

- Piping that has been treated with chromates, boiler seal, or other chemicals must not be used.

- Chemicals that may contaminate the potable water supply must not be added to the piping system.
For protection against excessive pressures and temperatures, a temperature and pressure relief valve must be installed in the opening marked “T & P RELIEF VALVE” (see Figure 15A). This valve must be design certified by a nationally recognized testing laboratory that maintains periodic inspection of the production of listed equipment or materials as meeting the requirements for Relief Valves for Hot Water Supply Systems, ANSI Z21.22. The function of the temperature and pressure relief valve is to discharge water in large quantities in the event of excessive temperature or pressure developing in the water heater. The valve’s relief pressure must not exceed the working pressure of the water heater as stated on the rating plate.

IMPORTANT: Only a new temperature and pressure relief valve should be used with your water heater. Do not use an old or existing valve as it may be damaged or not adequate for the working pressure of the new water heater. Do not place any valve between the relief valve and the tank.

**The Temperature & Pressure Relief Valve:**
- Must not be in contact with any electrical part.
- Must be connected to an adequate drainage line.
- Must not be rated higher than the working pressure shown on the rating plate of the water heater.

**The Discharge Line:**
- Must not be smaller than the pipe size of the relief valve or have any reducing coupling installed in the discharge line.
- Must not be capped, blocked, plugged or contain any valve between the relief valve and the end of the discharge line.
- Must terminate a maximum of six inches above a floor drain or external to the building. In cold climates, it is recommended that the discharge pipe be terminated at an adequate drain inside the building.
- Must be capable of withstanding 250°F (121°C) without distortion.
- Must be installed to allow complete drainage of both the valve and discharge line.

**T&P Relief Valve and Pipe Insulation**

1. Locate the temperature and relief valve on the water heater (also known as a T&P Relief Valve, Figure 15B).
2. Locate the slit running the length of the insulation.
3. Spread this slit open and slip it up under the T&P Relief Valve. See Figure 15B. Apply gentle pressure to the insulation to ensure it is fully seated on the T&P Relief Valve. Once seated secure the insulation with a section of duct tape, electrical tape, or equivalent. IMPORTANT: The insulation or tape must not block the discharge opening or hinder access to the manual relief lever. Ensure a discharge pipe is installed into the T&P valve discharge opening per the instruction manual.
4. Locate the hot water (outlet) & cold water (inlet) pipes to the water heater.
5. Locate the slit running the length of a section of pipe insulation.
6. Spread the slit open and slip the insulation over the cold water (inlet) pipe. Apply gentle pressure along the length of the insulation to ensure it is fully seated around the pipe. Also ensure that the base of insulation is flush with the water heater. Once seated, secure the insulation with duct tape, electrical tape, or equivalent.
7. Repeat steps 5 through 6 for the hot water (outlet) pipe.
8. Add additional sections of pipe insulation as needed.

**FIGURE 15B.**

**Combination Space Heating/Potable Water System**

Some water heater models are equipped with inlet/outlet connections for use with space heating applications. If this water heater is to be used to supply both space heating and domestic potable (drinking) water, the instructions listed below must be followed.

- Be sure to follow the manual(s) shipped with the air handler system.
- This water heater is not to be used as a replacement for an existing boiler installation.
- Do not use with piping that has been treated with chromates, boiler seal or other chemicals and do not add any chemicals to the water heater piping.
- If the space heating system requires water temperatures in excess of 120°F, a mixing valve or an anti-scald device should be installed per its manufacturer’s instructions in the domestic (potable) hot water supply to limit the risk of scald injury.
- Pumps, valves, piping and fittings must be compatible with potable water.
- A properly installed flow control valve is required to prevent thermosiphoning. Thermosiphoning is the result of a continuous flow of water through the air handler circuit during the off cycle. Weeping (blow off) of the temperature and pressure relief valve (T & P) or higher than normal water temperatures are the first signs of thermosiphoning.
- The domestic hot water line from the water heater should be vertical past any mixing valve or supply line to the air handler to remove air bubbles from the system. Otherwise, these bubbles will be trapped in the air handler heat exchanger coil, reducing the efficiency.
- Do not connect the water heater to any system or components previously used with non-potable water heating appliances when used to supply potable water. Some jurisdictions may require a backflow preventer in the incoming cold water line. This may cause the temperature and pressure relief valve on the water heater to discharge or weep due to expansion of the heated water.
A diaphragm-type expansion tank suitable for potable water will normally eliminate this weeping condition. Please read and follow the manufacturer’s instructions for the installation of such tanks.

**WARNING**

Electric Shock Hazard

Disconnect power before servicing.

Replace all parts and panels before operating.

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.
- The electrical outlet has the proper overload fuse or breaker protection.
- Unit is to connect to a 120VAC electrical supply outlet (extension cord is not allowed).

IMPORTANT: 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/NFPS 70 current edition.

Completely fill the tank with water and check all connections for leaks. Open the nearest hot water faucet and let it run for three (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.

**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 mixing valve or other temperature limiting valve must be installed in the water supply line to limit the supply temperature to 120°F.

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

**Wiring Diagram**
IMPORTANT INFORMATION ABOUT THIS WATER HEATER

This gas water heater was manufactured to voluntary safety standards to reduce the likelihood of a flammable vapor ignition incident. The new technology used in meeting these standards makes this product more sensitive to installation errors. Please review the following checklist and make any required installation upgrades or changes.

Questions? Contact Residential Technical Assistance by referencing the phone number on the front of the Installation Instructions and Use & Care Guide.

Installation Checklist

Water Heater Location

Water heater location is important and can affect system performance. Please check the following:

- Installation area free of corrosive elements and flammable materials.
- Centrally located with the water piping system (For new installations). Located as close to the gas piping, vent pipe system and 120VAC outlet as possible.
- Located indoors and in a vertical position. Protected from freezing temperatures.
- Proper clearances from combustible surfaces maintained and not installed directly on a carpeted floor.
- Provisions made to protect the area from water damage. Metal drain pan installed and piped to an adequate drain.
- Sufficient room to service the water heater. See Clearances and Accessibility section of this manual.
- Water heater not located near an air moving device.
- Is the installed environment dirty (excessive amounts of lint, dirt, dust, etc.)? If so, the air intake chamber louvers located on the side of the water heater will need to be cleaned periodically. Refer to the maintenance section of your water heater’s manual for information on cleaning the “Air Intake Chamber Louvers”.

Combustion Air Supply and Ventilation

Check for sufficient combustion air supply. Insufficient air for the combustion of gas will result in a inferior burner flame “yellow-lazy”, thereby allowing smoking and carbon formation (sooting) to build up in the combustion chamber. Is the water heater installed in a closet or other small, enclosed space? If so:

- Are there openings for make-up air to enter and exit the room/area?
- Are the openings of sufficient size? Remember, if there are other gas-fired or air-consuming appliances in the same room, you need more make-up air. Refer to the Location Requirements section of this water heater manual for specific requirements.

Fresh air not taken from areas that contain negative pressure producing devices such as exhaust fans, dryers, fireplaces, etc.

- Is there a furnace/air handler in the same room space as the water heater? If so, has a return air duct system been attached that exits the room? If so, check for leaks on the air duct system. If no air duct system is present, correct immediately by contacting a local Heating, Ventilation, Air-Conditioning & Refrigeration (HVAC-R) authorized service provider.
- Fresh air supply free of corrosive elements and flammable vapors.

- Ductwork is the same cross-sectional area as the openings.

Vent Pipe System

Check for proper drafting at the water heater draft hood. Refer to the “Checking the Draft” section of this manual for the test procedure. If the procedure shows insufficient draft is present, please check the following:

- Draft hood properly installed.
- Vent connectors securely fastened with screws and supported properly to maintain six inch clearance.
- Vent connector made of approved material and sized correctly.
- Vent pipe system 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.
- Flue baffle properly positioned in the flue tube.
- Check the vent system for restrictions/obstructions and check the vent termination height. Refer to the “Combustion Air and Ventilation” section of this water heater manual for specific requirements.
- Recheck for sufficient combustion air supply.

Water System Piping

- Temperature and pressure relief valve properly installed with a discharge line run to an open drain and protected from freezing.
- All piping properly installed and free of leaks.
- Heater completely filled with water.
- Closed system pressure build-up devices installed.
- Mixing valve (when applicable) installed per manufacturer’s instructions (See Water Temperature Regulation section).

Gas Supply and Piping

- Gas type is the same as that listed on the water heater rating plate.
- Gas line equipped with shut-off valve, union, and drip leg.
- Use pipe joint compound or teflon tape marked as being resistant to the action of petroleum gases.
- Adequate pipe size and approved pipe material.
- An approved noncorrosive leak detection solution used to check all connections and fittings for possible gas leaks. Correct any leak found.

Electrical Supply

- Water heater to be located as close as possible to a 120VAC outlet (extension cord is not allowed).
- Electrical supply installed according to all local and state codes or, in the absence of local and state codes, the “National Electrical Code”, ANSI/NFPS 70 current edition.
Operating Instructions

Read and understand these directions thoroughly before attempting to operate the water heater. Make sure the view port is not missing or damaged (See Figure 25). Make sure the tank is completely filled with water before operating the water heater. The gas control valve/thermostat has an “On/Off Switch” and needs to be turned on before water heater is operational. Check the label on the front of heater near the gas control valve/thermostat for the correct gas. Do not use this water heater with any gas other than the one listed on the label. If you have any questions or doubts, consult your gas supplier or gas utility company.

FOR YOUR SAFETY READ BEFORE OPERATING

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

BEFORE OPERATING: ENTIRE SYSTEM MUST BE FILLED WITH WATER AND AIR PURGED FROM ALL LINES.

A. This appliance does not have a pilot. It is equipped with an ignition device that will automatically light the burner. Do not try to light the burner by hand.

B. BEFORE OPERATING smell all around the appliance area for gas. Be sure to smell next to the floor because some gas is heavier than air and will settle on the floor.

WHAT TO DO IF YOU SMELL GAS:

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

NOTE: If you do not smell gas, go to the next step.

BEFORE OPERATING

1. STOP! Read the safety information above on the label.
2. Turn on all electrical power to the appliance.
3. Set the ON/OFF switch on the gas control to the “ON” position.
4. Set the Electronic Display to the lowest setting by first pressing the COOLER and HOTTER buttons together and holding for 1 second. Then press the COOLER button to the lowest setting.
5. Set the ON/OFF switch on the gas control to the “OFF” position.
6. This appliance is equipped with a device which automatically lights the burner.
7. Wait five (5) minutes to clear out any gas. If you then smell gas, STOP! Follow “B” in the safety information above on this label. If you don’t smell gas, go to the next step.
8. Set the ON/OFF switch on the gas control to the “ON” position.
9. Set the Electronic Display to the desired setting by first pressing the COOLER and HOTTER buttons together and holding for 1 second. Then press the HOTTER button until the desired setting is reached.

DANGER: Hotter water increases the risk of scald injury. Consult the instruction manual before changing temperature.

TO TURN OFF GAS TO APPLIANCE

1. Set the Electronic Display to the lowest setting by first pressing the COOLER and HOTTER buttons together and holding for 1 second. Then press the COOLER button to the lowest setting.
2. Set the ON/OFF switch on the gas control to the “OFF” position.
3. Turn off all electrical power to the appliance if service is to be performed.
Water Heater Operation

Figure 17 below shows the water heater’s sequence of operation when a call for heat is initiated. The ignition control module will attempt to light the burner three times. If the ignition control does not detect ignition it will enter lockout mode, indicated by display flashing status code (see status code 3 page 30 and/or status code 9 page 31).

Checking the Draft

**WARNING**

**Burn Hazard**

Do not touch vent.
Doing so can result in burns.

After successfully lighting the water heater, allow the unit to operate for 15 minutes and check the draft hood relief opening for proper draft (Figure 18). Make sure all other appliances in the area are operating and all doors are closed when performing the draft test. Pass a match flame around the relief opening of the draft hood. A steady flame drawn into the opening indicates proper draft.

If the flame flutters or is blown out, combustion products are escaping from the relief opening. If this occurs, do not operate the water heater until proper adjustments or repairs are made to the vent pipe system and/or air supply requirements.

**FIGURE 17.**

Sequence of Operation

- **CALL FOR HEAT INDICATED BY FLASHING OF DISPLAY SCREEN STATUS CODES**
- **CONTROL CHECKS TO ENSURE PRESSURE SWITCH IS OPEN**
- **DRAFT BLOWER IS ENERGIZED**
- **CONTROL CHECKS TO ENSURE PRESSURE SWITCH IS CLOSED, INDICATING BLOWER OPERATING AND THERE ARE NO VENTING BLOCKAGES (INLET OR OUTLET)**
- **CONTROL ENERGIZES HOT SURFACE IGNITER (HSI)**
- **MAIN VALVE ENERGIZES ALLOWING THE BURNER TO BE LIT BY HSI, DRAFT BLOWER ENERGIZES**
- **FLAME SENSE ROD DETECTS FLAME OF MAIN BURNER**
- **WATER IN TANK IS HEATED BY MAIN BURNER AND TEMPERATURE REACHES THERMOSTAT SETTING**
- **MAIN VALVE DE-ENERGIZES AND DRAFT BLOWER CONTINUES FOR A POST PURGE TIME OF APPROX. 30 SECONDS**
- **MAIN VALVE DE-ENERGIZES AND BLOWER CONTINUES FOR A POST PURGE TIME**
- **HEATER RETURNS TO STANDBY MODE**

**FIGURE 18.**

DRAFT HOOD

MATCH

RELIEF OPENING

If the flame flutters or is blown out, combustion products are escaping from the relief opening. If this occurs, do not operate the water heater until proper adjustments or repairs are made to the vent pipe system and/or air supply requirements.
Burner Flames

Inspect the burner flames through the viewport and compare them to the drawings in Figure 19. A properly operating burner should produce a soft blue flame. Blue tips with yellow inner cones are satisfactory. The tips of the flame may have a slight yellow tint. The flame should not be all yellow or have a sharp blue-orange color. Contaminated air may cause an orange colored flame. Contact a qualified technician if the flame is not satisfactory.

![Burner Flames](image)

FIGURE 19.

Emergency Shut Down

IMPORTANT: Should overheating occur or the gas supply fails to shut off, turn off the heater’s manual gas control valve and the electrical power. Call a qualified technician.

Water Temperature Regulation

<table>
<thead>
<tr>
<th>Water Temperature °F</th>
<th>Time for 1st Degree Burn (Less Severe Burns)</th>
<th>Time for Permanent Burns 2nd &amp; 3rd Degree (Most Severe Burns)</th>
</tr>
</thead>
<tbody>
<tr>
<td>110</td>
<td>(normal shower temp.)</td>
<td></td>
</tr>
<tr>
<td>116</td>
<td>(pain threshold)</td>
<td></td>
</tr>
<tr>
<td>116</td>
<td>35 minutes</td>
<td>45 minutes</td>
</tr>
<tr>
<td>122</td>
<td>1 minute</td>
<td>5 minutes</td>
</tr>
<tr>
<td>131</td>
<td>5 seconds</td>
<td>25 seconds</td>
</tr>
<tr>
<td>140</td>
<td>2 seconds</td>
<td>5 seconds</td>
</tr>
<tr>
<td>149</td>
<td>1 second</td>
<td>2 seconds</td>
</tr>
<tr>
<td>154</td>
<td>instantaneous</td>
<td>1 second</td>
</tr>
</tbody>
</table>


Press the “COOLER” button decreases temperature and pressing the “HOTTER” button increases the temperature.

To avoid any unintentional changes in water temperature settings, the control has a tamper resistant feature for changing the temperature setting. To change the temperature setting follow these instructions:

1. “Wake Up” the temperature indicators by holding down both “COOLER” and “HOTTER” temperature adjustment buttons at the same time for one second (See Figure 21). The display will light up. The display will only remain on for 30 seconds if no further buttons are pressed. After 30 seconds the control will go back to “Sleep” mode.

2. Release both of the temperature adjustment buttons.
   A. To decrease the temperature press and release the “COOLER” button until the desired setting is reached.
   B. To increase the temperature press and release the “HOTTER” button until the desired setting is reached.

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

NOTE: During low demand periods when hot water is not being used, a lower thermostat setting will reduce energy
losses and may satisfy your normal hot water needs. If hot water use is expected to be more than normal, a higher thermostat setting may be required to meet the increased demand. When leaving your home for extended periods (vacations, etc.) Set the electronic control display temperature “COOLER” button to its lowest setting. This will maintain the water at low temperatures with minimum energy losses and prevent the tank from freezing during cold weather.

Good venting is essential for a gas fired water heater to operate properly as well as to carry away products of combustion and water vapor.

**CAUTION**

Property Damage Hazard

- All water heaters eventually leak
- Do not install without adequate drainage.

It is always recommended that a suitable metal drain pan be installed under the water heater to protect the area from water damage resulting from normal condensation production, a leaking tank or piping connections. Refer to the “Location Requirements” section.

**Water Heater Sounds**

During the normal operation of the water heater, sounds or noises may be heard. These noises are common and may result from the following:

1. Normal expansion and contraction of metal parts during periods of heat-up and cool-down.

2. Condensation causes sizzling and popping within the burner area and should be considered normal.

3. Sediment buildup in the tank bottom will create varying amounts of noise and may cause premature tank failure. Drain and flush the tank as directed under the “Draining and Flushing” section.

**Smoke/Odor**

The water heater may give off a small amount of smoke and odor during the initial start-up of the unit. This is due to the burning off of oil from metal parts of a new unit and will disappear after a brief period of operation.

**Safety Shut-off**

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

1. The burner flame is extinguished for any reason.

2. The water temperature exceeds 195°F (91°C).

3. Excessive build up of dust on the louvers of the air intake chamber. See Maintenance of your Water Heater Section.

This unit is also equipped with a flammable vapor sensor (FV Sensor), designed to shut off the gas supply in the event the water heater has been exposed to flammable vapors (e.g., spilled gasoline).

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 195°F (91°C). The ECO is a single-use switch, which, if activated, requires complete replacement of the entire gas control valve/thermostat. If the ECO should activate, the water heater cannot be used until the gas control valve/thermostat is replaced by a qualified technician. Contact your local dealer for service information.
Powered Anode Operation

To protect the glass-lined water tank from corrosion through electrolysis, this water heater is equipped with a non sacrificial powered anode rod. The powered anode rod is non sacrificial and should not need to be replaced unless damaged.

If the powered anode rod has been damaged then the powered anode rod should be removed and replaced from the water heater tank. IMPORTANT: If the damaged powered anode rod has not been replaced but has been remove permanently, this will void any warranties.

If the powered anode rod has been damaged then the powered anode rod should be removed and replaced from the water heater tank. IMPORTANT: If the damaged powered anode rod has not been replaced but has been remove permanently, this will void any warranties.

**FIGURE 22.**

**NOTE:** Whether re-installing or replacing the powered anode rod, check for any leaks and immediately correct if found.

In replacing the power anode:

1. Turn off electrical supply and gas supply to the water heater.
2. Shut off the water supply and open a nearby hot water faucet to depressurize the water tank.
3. Drain approximately 5 gallons of water from tank (Refer to the “Draining and Flushing” section for proper procedures). Close drain valve.
4. Remove the wiring connection on the top of the powered anode rod and remove the old powered anode rod (Figure 22).
5. Use Teflon® tape or approved pipe sealant on threads and install new anode rod.
6. Turn on water supply and open nearby hot water faucet to purge air from water system. Check for any leaks and immediately correct any if found.
7. Turn on electrical and gas supplies. Restart the water heater as directed under the “Operating Your Water Heater.” See the “Repair Parts Illustration” section for anode rod location.

**DRAINING AND FLUSHING**

It is recommended that the tank be drained and flushed every 6 months to remove sediment which may build up during operation. The water heater should be drained if being shut down during freezing temperatures. To drain the tank, perform the following steps:

1. Turn off the gas to the water heater at the manual gas shut-off valve and turn off the electrical power to the gas control/thermostat valve.
2. Open a nearby hot water faucet until the water is not longer hot.
3. Close the cold water inlet valve.
4. Connect a hose to the drain valve and terminate it to an adequate drain or external to the building.
5. Open the water heater drain valve and allow all the water to drain from the tank. Flush the tank with water as needed to remove sediment.
6. Close the drain valve, refill the tank, and restart the heater as directed in this manual.

If the water heater is going to be shut down for an extended period, the drain valve should be left open.

**IMPORTANT:** Condensation may occur when refilling the tank and should not be confused with a tank leak.

**ROUTINE PREVENTIVE MAINTENANCE**

At least annually, a visual inspection should be made of the venting and air supply system, piping systems, and main burner. 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.
- Clean any dust or debris from the louvers of the air intake chamber.
- Soot and/or carbon on the main burner. Contact a qualified technician.
- Leaking or damaged water and gas piping.
- Presence of flammable or corrosive materials in the installation area.
- Presence of combustible materials near the water heater.
- After servicing this water heater, check to make sure it is working properly. (See “Operating Your Water Heater” section of this manual.)

**IMPORTANT:** If you lack the necessary skills required to properly perform this visual inspection, you should not proceed, but get help from a qualified technician.

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Temperature and Pressure Relief Valve

**WARNING**

**Explosion Hazard**

- Temperature-pressure relief valve must comply with ANSI Z21.22-CSA 4.4 and ASME code.
- Properly sized temperature-pressure relief valve must be installed in opening provided.
- Can result in overheating and excessive tank pressure.
- Can cause serious injury or death.

Manually operate the temperature and pressure relief valve at least once a year to make sure it is working properly. To prevent water damage, the valve must be properly connected to a discharge line which terminates at an adequate drain. Standing clear of the outlet (discharged water may be hot), slowly lift and release the lever handle on the temperature and pressure relief valve to allow the valve to operate freely and return to its closed position. See Figure 23. If the valve fails to completely reset and continues to release water, immediately shut off the manual gas control valve and the cold water inlet valve and call a qualified technician.

**MAINTENANCE OF YOUR WATER HEATER**

Replacement Parts

**IMPORTANT:** The following maintenance procedures are for the FVIR System components and should be performed by a qualified technician.

Replacement parts may be ordered through your plumber or the local distributor. Parts will be shipped at prevailing prices and billed accordingly. When ordering replacement parts, always have the following information ready:

1. model, serial, and product number
2. type of gas
3. item number
4. parts description

See Repair Parts Section for a list of available repair parts.

Removing the Manifold/Burner Assembly

1. Turn off the gas supply to the water heater at the manual gas shut-off valve. This valve is typically located beside the water heater. Note the position of the shut-off valve in the open/on position then proceed to turn it off (Figure 3).
2. Disconnect power supply to the heater.
3. Remove the outer door. Remove the 2 screw securing the manifold door assembly to the skirt.
4. Disconnect all wiring connectors from the gas control valve/thermostat (Figure 24). Disconnect the manifold tube at the gas control valve/thermostat.
5. Grasp the manifold tube and push down slightly to free the manifold from the gas control valve/thermostat.
6. Carefully remove the manifold assembly from the burner compartment. NOTE: Be sure not to damage internal parts (Figure 28).
7. Check the burner to see if it is dirty or clogged. The burner may be cleaned with soap and hot water.

Removing the Burner from the Manifold/Burner Assembly

**Natural Gas Burner**

1. Take off the burner by removing the two (2) screws located underneath the burner.
2. Check the burner to see if it is dirty or clogged. The burner may be cleaned with soap and hot water (Figure 25).
Replacing the Flame Sense/Hot Surface igniter Assembly

1. Remove the manifold/burner assembly. See Removing the Manifold/Burner Assembly.
2. Lift the retainer clip straight up from the back of the manifold component block (using a flat-blade screwdriver), then remove the manifold component block from the manifold door (Figure 26.)
3. Remove and keep the screw securing the flame sense/hot surface igniter assembly (Figure 26)
4. Remove and discard the old flame sense/hot surface igniter assembly.
5. Route the new flame sense/hot surface igniter connector wire through manifold/burner door opening as shown in figure 26. Secure assembly to bracket using screw removed earlier.
6. Reposition the manifold component block in the manifold door opening and secure it with the retainer clip.
7. See Replacing the Manifold/Burner Assembly.

External Inspection & Cleaning of the Air Intake Chamber Screen

1. At least twice annually inspect the air intake chamber screen (Figure 27) for any dust or debris that may have accumulated on the louvers. NOTE: If the water heater is located in an area that is subjected to lint and dirt, it may be necessary to check the air intake chamber screen more frequently.
2. Use a vacuum cleaner with a hose attachment to remove any dust or debris that may have accumulated on the screen.

Cleaning the Combustion Chamber and Air Diverter Assembly

1. Follow procedure outlined in “Removing the Manifold/Burner Assembly”.
2. Use a vacuum cleaner/shop vac to remove all loose debris in the combustion chamber (Figure 28). Use compressed air to clear any dust or debris that may have accumulated on the air diverter assembly.
3. Reassemble following the procedure under “Replacing the Manifold/Burner Assembly”.

Replacing the Manifold/Burner Assembly

**WARNING**

- Remove any fiberglass between gasket and combustion chamber.
- Replace viewport if glass is missing or damaged.
- Replace two piece wire connector if missing or removed.
- Replace door gasket if damaged.
- Tighten both manifold door screws securely.
- Failure to follow these instructions can result in death, explosion, or fire.

1. Check the door gasket for damage or imbedded debris prior to installation.
2. Inspect the view port for damage and replace as required.
3. Insert the manifold/burner assembly into the burner compartment making sure that the tip of the manifold tube engages in the slot of the bracket inside the combustion chamber (Figure 29).
4. Inspect the door gasket and make sure there is no fiberglass insulation between the gasket and the combustion chamber.
5. Replace the two screws, which secure the manifold/burner assembly door to the combustion chamber and tighten securely. Once the manifold/burner assembly door is tightened, visually inspect the door gasket between the manifold/burner assembly door and the combustion chamber for spaces or gaps that would prevent a seal. IMPORTANT: Do not operate the water heater if the door gasket does not create a seal between the manifold door and the combustion chamber.
6. During the following procedure, do not cross-thread or apply any thread sealant to any of the fittings listed below. First, reconnect the manifold tubing to the gas control valve/thermostat.
7. Reconnect the flame sense/hot surface igniter wire to the gas control valve/thermostat (Figure 24).
8. Turn gas supply on and refer to the Lighting Instructions.
9. With the burner lit, check the gas control valve/thermostat supply line, two piece wire connector, and manifold tube connections for leaks. Check for leaks by brushing on an approved noncorrosive leak detection solution. IMPORTANT: Do Not splash solution onto the electrical connections. Bubbles forming indicate a leak. Correct any leak found. All leaks must be fixed immediately.
10. Replace the outer door (see item K page 5).

Removing and Replacing the Gas Control Valve/Thermostat

IMPORTANT: Use only factory authorized replacement parts.

Removing the Gas Control Valve/Thermostat:
1. Set the gas control valve/thermostat to its lowest setting by first depressing the COOLER  and HOTTER buttons together and hold for 1 second. Then press the COOLER  button until the lowest setting appears (Figure 21).
2. Unplug the electrical transformer from the wall outlet.
3. Turn off the gas supply to the water heater at the manual gas shut-off valve. This valve is typically located beside the water heater. Note the position of the shut-off valve in the open/on position then proceed to turn it off (Figure 3).
4. Drain the water heater. Refer to the section of “Draining and Flushing” section and follow the procedure.
5. Disconnect the flame sense/hot surface igniter wire, power supply transformer, pressure switch/ fan and display connector wires from the thermostat (Figure 24). Disconnect the manifold tube at the thermostat (Figure 24).
6. Refer to “Gas Piping” section (Figure 3) and disconnect the ground joint union in the gas piping. Disconnect the remaining pipe from the gas control valve/thermostat.
7. To remove the gas control valve/thermostat, thread a correctly sized pipe into the inlet and use it to turn the gas control valve/thermostat (counterclockwise.) Do not use 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 the Gas Valve:
1. To replace the gas control valve/thermostat, reassemble in reverse order. When replacing the gas control valve/thermostat, thread a correctly sized pipe into the inlet and use it to turn the gas valve (clockwise.) DO NOT OVER TIGHTEN or damage may result. NOTE: Use an approved Teflon tape or pipe compound only on the threaded section of the gas control valve/thermostat that screws into the tank.
2. Reconnect the gas piping to the gas control valve/thermostat. NOTE: Use an approved Teflon or pipe compound on the gas piping connections.
3. Reconnect the manifold tube, flame sense/hot surface igniter wire, power supply transformer, pressure switch/ fan and display connector wires (Figure 24).
4. Fill the tank completely with water. NOTE: To purge the lines of any excess air, keep the hot water faucet open for 3 minutes after a constant flow of water is obtained.
5. Turn on the gas supply and test the gas supply connections by brushing on an approved noncorrosive leak detection solution. IMPORTANT: Do Not splash solution onto the electrical connections. Bubbles forming indicate a leak. Correct any leak found.
6. Check the operation of the burner by following the lighting instructions on the front of the water heater. With the burner lit, check the gas control valve/thermostat supply line, manifold tube connections for leaks.
7. Verify proper operation and then replace the outer door.
8. If additional information is required, contact Residential Technical Assistance by referencing the phone number on the water heater or on the front cover of this manual.

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### TROUBLESHOOTING CHART

<table>
<thead>
<tr>
<th>PROBLEM</th>
<th>POSSIBLE CAUSE(S)</th>
<th>CORRECTIVE ACTION</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>NO HOT WATER</strong></td>
<td>1. Transformer unplugged.</td>
<td>1. Plug transformer back into 120 VAC. outlet.</td>
</tr>
<tr>
<td></td>
<td>2. No power at outlet.</td>
<td>2. Repair service to outlet.</td>
</tr>
<tr>
<td></td>
<td>3. Thermostat defective.</td>
<td>3. Replace Thermostat.</td>
</tr>
<tr>
<td></td>
<td>4. Air Intake Chamber Fan defective.</td>
<td>4. Replace Air Intake Chamber Fan Assembly.</td>
</tr>
<tr>
<td></td>
<td>5. Pressure Switch defective.</td>
<td>5. Replace Pressure Switch Assembly.</td>
</tr>
<tr>
<td><strong>INSUFFICIENT HOT WATER</strong></td>
<td>1. Thermostat set too low.</td>
<td>1. Set temperature control higher.</td>
</tr>
<tr>
<td></td>
<td>2. Thermostat defective.</td>
<td>2. Replace thermostat.</td>
</tr>
<tr>
<td></td>
<td>3. Heater undersized.</td>
<td>3. Reduce hot water use.</td>
</tr>
<tr>
<td></td>
<td>4. Low gas pressure.</td>
<td>4. Contact dealer.</td>
</tr>
<tr>
<td></td>
<td>5. Incoming water is unusually cold.</td>
<td>5. Allow more time for heater to reheat.</td>
</tr>
<tr>
<td></td>
<td>6. Leaking hot water pipes or fixtures.</td>
<td>6. Have plumber check and repair leaks.</td>
</tr>
<tr>
<td><strong>SLOW HOT WATER RECOVERY</strong></td>
<td>1. Insufficient secondary air.</td>
<td>1. Provide ventilation to water heater. Check flue way, flue baffle, and burner.</td>
</tr>
<tr>
<td></td>
<td>2. Water heater flue or vent system blocked.</td>
<td>2. Clean flue, locate source and correct.</td>
</tr>
<tr>
<td></td>
<td>3. Low gas pressure.</td>
<td>3. Check with gas utility company.</td>
</tr>
<tr>
<td></td>
<td>4. Improper calibration.</td>
<td>4. Replace thermostat.</td>
</tr>
<tr>
<td></td>
<td>5. Thermostat set too low.</td>
<td>5. Turn temperature dial to desired setting.</td>
</tr>
<tr>
<td></td>
<td>7. Wrong piping connections.</td>
<td>7. Correct piping-dip tube must be in cold inlet.</td>
</tr>
<tr>
<td><strong>WATER TOO HOT</strong></td>
<td>1. Thermostat set too high.</td>
<td>1. Set temperature control lower.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>see, “WATER TEMPERATURE REGULATION”, section.</td>
</tr>
<tr>
<td><strong>VENT PIPE TOO HOT(ABOVE 170°F)</strong></td>
<td>1. Defective air flow restrictor.</td>
<td>1. Take unit out of service immediately, call a qualified person to service the unit.</td>
</tr>
<tr>
<td></td>
<td>2. Not enough dilution air to mix with flue gases in inlet elbow.</td>
<td>2. Proper dilution air must be provided for combustion and dilution of flue temp. See “COMBUSTION AIR SUPPLY/VENT PIPE SYSTEM”, section.</td>
</tr>
<tr>
<td></td>
<td>3. Dilution air too hot for mixing with flue gases.</td>
<td>3. Supply air is too hot, check for heat sources around intake terminal and blockage of dilution air leg.</td>
</tr>
<tr>
<td></td>
<td>4. Wrong burner orifice.</td>
<td>4. Install correct orifice.</td>
</tr>
<tr>
<td><strong>BURNER FLAME YELLOW - LAZY</strong></td>
<td>1. Dirt in burner ports.</td>
<td>1. Turn off heater and gas, clean burner head.</td>
</tr>
<tr>
<td></td>
<td>2. Combustion air path restricted.</td>
<td>2. Check intake venting arrangements for obstructions.</td>
</tr>
<tr>
<td></td>
<td>3. Not enough dilution air for proper combustion.</td>
<td>3. Check intake venting arrangements for obstructions.</td>
</tr>
<tr>
<td></td>
<td>4. Main burner line clogged.</td>
<td>4. Clean, locate source and correct.</td>
</tr>
<tr>
<td></td>
<td>5. Obstruction in main burner orifice.</td>
<td>5. Clean or replace orifice.</td>
</tr>
<tr>
<td></td>
<td>7. Flame burns at orifice/thermostat not functioning properly.</td>
<td>7. Replace thermostat.</td>
</tr>
<tr>
<td></td>
<td>8. Low gas pressure.</td>
<td>8. Check with gas utility company.</td>
</tr>
<tr>
<td><strong>BURNER FLAME FLOATS AND LIFTS OFF PORTS</strong></td>
<td>1. Orifice too large.</td>
<td>1. Replace with correct-orifice.</td>
</tr>
<tr>
<td></td>
<td>2. High gas pressure.</td>
<td>2. Check with gas utility company.</td>
</tr>
<tr>
<td></td>
<td>3. Water heater flue or vent system blocked.</td>
<td>3. Clean flue and burner-locate source and correct.</td>
</tr>
<tr>
<td></td>
<td>4. Cold drafts.</td>
<td>4. Locate source and correct.</td>
</tr>
</tbody>
</table>

**Pressurized Combustion Chamber System Operational Checklist**

1. Manifold gasket properly sealed.
2. Viewport not damaged or cracked.
3. Combustion chamber free of debris and undamaged.
4. Manifold component block properly installed.
5. No leaks at manifold connection.
6. Manifold door screws securely tightened.
<table>
<thead>
<tr>
<th>PROBLEM</th>
<th>POSSIBLE CAUSE(S)</th>
<th>CORRECTIVE ACTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>COMBUSTION ODORS</td>
<td>1. Insufficient secondary air.</td>
<td>1. Provide ventilation to water heater. Check flue.</td>
</tr>
<tr>
<td></td>
<td>2. Water heater flue or vent system blocked.</td>
<td>2. Clean, located source and correct.</td>
</tr>
<tr>
<td></td>
<td>3. Heater installed in a confined area.</td>
<td>3. Provide fresh air ventilation.</td>
</tr>
<tr>
<td></td>
<td></td>
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</tr>
<tr>
<td>WATER LEAKS</td>
<td>1. Improperly sealed, hot or cold supply connections, relief valve, drain valve or thermostat threads.</td>
<td>1. Tighten threaded connections.</td>
</tr>
<tr>
<td></td>
<td>2. Leakage from other appliances or water lines.</td>
<td>2. Inspect other appliances near water heater.</td>
</tr>
<tr>
<td></td>
<td>3. Condensation of flue products.</td>
<td>3. See “OPERATIONAL CONDITIONS”, section.</td>
</tr>
<tr>
<td></td>
<td>4. Excessive water pressure.</td>
<td>4. Use a pressure reducing valve and relief valve.</td>
</tr>
<tr>
<td></td>
<td>5. Heater stacking.</td>
<td>5. Lower the thermostat setting.</td>
</tr>
<tr>
<td></td>
<td>6. Closed water system.</td>
<td>6. See “Closed System/Thermal Expansion”.</td>
</tr>
<tr>
<td>LEAKING T&amp;P</td>
<td>1. Thermal expansion in closed water system.</td>
<td>1. Install thermal expansion tank (DO NOT plug T&amp;P valve).</td>
</tr>
<tr>
<td></td>
<td>2. Improperly seated valve.</td>
<td>2. Check relief valve for proper operation (DO NOT plug T&amp;P valve.</td>
</tr>
<tr>
<td>HOT WATER ODORS</td>
<td>1. High sulfate or mineral content in water supply.</td>
<td>1. Drain and flush heater thoroughly then refill.</td>
</tr>
<tr>
<td></td>
<td>2. Bacteria in water supply.</td>
<td>2. Chlorinate water supply.</td>
</tr>
<tr>
<td></td>
<td>2. Sediment at bottom of heater tank.</td>
<td>2. See “MAINTENANCE OF YOUR WATER HEATER”, section.</td>
</tr>
<tr>
<td>SMOKING AND CARBON FORMATION (SOOTING)</td>
<td>1. Insufficient secondary air.</td>
<td>1. Provide ventilation to water heater. Check flue way, flue baffle, burner.</td>
</tr>
<tr>
<td></td>
<td>2. Low gas pressure.</td>
<td>2. Check with gas utility company.</td>
</tr>
<tr>
<td></td>
<td>3. Water heater flue or vent system blocked.</td>
<td>3. Clean, locate source and correct.</td>
</tr>
<tr>
<td></td>
<td>4. Thermostat not functioning properly.</td>
<td>4. Replace thermostat.</td>
</tr>
<tr>
<td></td>
<td>5. Heater installed in a confined area.</td>
<td>5. Provide fresh air ventilation.</td>
</tr>
<tr>
<td>HEATING LIGHTS BUT GOES OUT IN 4-5 SECONDS</td>
<td>1. Outlet polarity is reversed.</td>
<td>1. Test polarity and correct.</td>
</tr>
<tr>
<td>HIGH OPERATION COSTS</td>
<td>1. Thermostat set too high.</td>
<td>1. Set temperature dial to lower setting.</td>
</tr>
<tr>
<td></td>
<td>2. Sediment or lime in tank.</td>
<td>2. Drain/flush-provide water treatment if needed.</td>
</tr>
<tr>
<td></td>
<td>3. Water heater too small for job.</td>
<td>3. Install adequate heater.</td>
</tr>
<tr>
<td></td>
<td>4. Wrong piping connections.</td>
<td>4. Correct piping-dip tube must be in cold inlet.</td>
</tr>
<tr>
<td></td>
<td>5. Leaking faucets.</td>
<td>5. Repair faucets.</td>
</tr>
<tr>
<td>THERMOSTAT FAILS TO SHUT-OFF</td>
<td>1. Thermostat not functioning properly.</td>
<td>1. Replace thermostat.</td>
</tr>
<tr>
<td></td>
<td>2. Improper calibration.</td>
<td>2. Replace thermostat.</td>
</tr>
<tr>
<td>CONDENSATION</td>
<td>1. Thermostat set too high.</td>
<td>1. See “OPERATIONAL CONDITIONS” section.</td>
</tr>
<tr>
<td></td>
<td>2. Water dripping from draft hood.</td>
<td>2. Provide drip “TEE” to catch condensation from horizontal section of exhaust vent close to draft hood.</td>
</tr>
<tr>
<td>DRIP FROM RELIEF VALVE</td>
<td>1. Excessive water pressure.</td>
<td>1. Use a pressure reducing valve and relief valve.</td>
</tr>
<tr>
<td></td>
<td>2. Heater stacking.</td>
<td>2. Lower the thermostat setting.</td>
</tr>
<tr>
<td></td>
<td>3. Closed water system.</td>
<td>3. See “CLOSED SYSTEM/Thermal Expansion”, section.</td>
</tr>
</tbody>
</table>
CONTROL DISPLAY TROUBLESHOOTING

Please check guidelines below. For your safety, water heater service should be performed only by a qualified service person. Read the GENERAL SAFETY INFORMATION supplied by the water heater manufacturer.

<table>
<thead>
<tr>
<th>CONTROL DISPLAY STATUS</th>
<th>PROBLEM</th>
<th>SOLUTION</th>
</tr>
</thead>
</table>
| 1. “POWER” Flashing    | Communication Error
The system has detected a communication error between the upper and lower controls. | 1. Check the 5-conductor data cable that runs between the upper and lower controls. Check that the wiring is not broken, and the connectors on both ends are properly seated in the mating connectors.
2. Replace the upper control, if the problem persists.
3. Replace the lower control. |
| 2. “HEATING” and “SHORT” Flashing | The self-diagnostic tests have found a problem with an internal circuit. | 1. Turn the power off for 10 to 20 seconds then on again to clear the error code.
2. If the error code persists or cannot be cleared, replace the lower control. |
| 3. “HEATING” and “OPEN” Flashing | Ignition/flame failure.
The water heater has reached the maximum number of retries and is currently locked out for one hour. Cycle the power to the water heater off and on to reset. | 1. Gas supply is turned off – pressure too low. Ensure supply and manifold gas pressures are within requirements in the installation manual. Manifold gas pressure is non-adjustable, if pressure is off by more than 0.3” W.C. (75 Pa) replace the lower control.
2. Low supply voltage – should be 115 – 125 VAC.
3. Ensure flame sensor is making good contact with the burner flame, ensure flame is steady.
4. Ensure the flame sensor is clean – use ultra fine steel wool or Scotch-Brite™ pad to clean the flame sensor.
5. Ensure the hot surface ignitor is positioned to provide consistent ignition.
6. Check for any cracks in the ignitor assembly ceramic insulators – replace ignitor assembly if damaged.
7. Check resistance of the ignitor at room temperature (77°F – 25°C) at the plug end. Replace ignitor if the resistance is not within 1.38 to 2.31 ohms at room temperature. |
| 4. “HEATING”, “OPEN”, and “SHORT” Flashing | Weak flame sensor current. | 1. Ensure flame sensor is making good contact with the burner flame, ensure flame is steady.
2. Ensure the flame sensor is clean – use ultra fine steel wool or Scotch-Brite™ pad to clean the flame sensor. |
| 5. “ECO” and “OPEN” Flashing | Water temperature in the tank has exceeded 185°F (85°C) and has activated the ECO. | 1. Turn the power off for 10 – 20 seconds then on again to clear this error code.
2. Replace the lower control if the error code persists. |
<table>
<thead>
<tr>
<th>CONTROL DISPLAY STATUS</th>
<th>PROBLEM</th>
<th>SOLUTION</th>
</tr>
</thead>
</table>
| 6. "P-SW", "OPEN", and "CLEAN SCREEN" Flashing | The air pressure switch contacts remain open longer than 5 seconds after the combustion fan is energized. | 1. Clean the screen on the combustion air intake tube. Retest, if the problem persists:
2. Ensure the pressure switch sensing tube is in good condition and securely connected at both ends.
3. Ensure the inner door to the combustion chamber is secure and the gasket is properly sealing.
4. Take a pressure reading from the pressure switch's sensing point on the inner door with a digital manometer.
   A. If actual pressure reaches design "make-point" for the switch check pressure switch contacts continuity with the combustion fan running. If switch contacts remain open replace switch.
   B. If pressure does not reach "make-point" check system for restrictions and cleanliness. |
| 7. "P-SW" and "SHORT" Flashing | The air pressure switch contacts remain closed for more than 5 seconds when they should be open. | 1. Turn off power to the water heater.
2. Locate the pressure switch wiring – ensure pressure switch wiring is correct and not jumped.
3. Remove wires to both terminals on pressure switch.
4. Check pressure switch contacts with an ohmmeter for continuity.
   A. If pressure switch contacts show continuity (closed circuit) replace the pressure switch.
   B. If pressure switch contacts show open circuit and all wiring is correct – replace the lower control. |
| 8. "IGN" Flashing | Open ignitor circuit | 1. Check all wiring to the hot surface ignitor.
2. Check the 3 pin Molex ignitor assembly plug and receptacle on the lower control for a good connection. Repair or replace parts if necessary.
3. Check resistance of the ignitor with an ohmmeter on the ignitor assembly plug. Replace ignitor if resistance is not within 1.38 and 2.31 ohms.
4. If above checks are good – turn off power for 10 seconds and then back on. If this error code will not clear and the ignitor resistance is within specifications – replace the lower control. |
<p>| 9. &quot;FV-SENSE&quot; Flashing | Flammable Vapor Sensor has detected the presence of flammable vapors and is in lockout | 1. Contact a service agency to determine the cause. |
| 10. &quot;LDO-SW&quot;, &quot;OPEN&quot;, and &quot;CLEAN SCREEN&quot; Flashing | The air pressure switch contacts remain open longer than 5 seconds after the combustion fan is energized. | 1. Clean the screen on the combustion air intake tube. Retest, if the problem persists: |</p>
<table>
<thead>
<tr>
<th>CONTROL DISPLAY STATUS</th>
<th>PROBLEM</th>
<th>SOLUTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>11. “FV-SENSE” and “OPEN” Flashing</td>
<td>Flammable Vapor Sensor is open</td>
<td>1. Check all wiring to the flammable vapor sensor.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2. Remove the connectors from the flammable vapor sensor and measure</td>
</tr>
<tr>
<td></td>
<td></td>
<td>the resistance of the sensor with an ohmmeter.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>A. If the reading taken is more than 1.7 million ohms, replace the</td>
</tr>
<tr>
<td></td>
<td></td>
<td>flammable vapor sensor.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>B. If the reading taken is less than 1.7 million ohms, and the wiring</td>
</tr>
<tr>
<td></td>
<td></td>
<td>from the control to the sensor is good, replace the lower control.</td>
</tr>
<tr>
<td>12. “FV-SENSE” and “SHORT” Flashing</td>
<td>Flammable Vapor Sensor is shorted</td>
<td>1. Check all wiring to the flammable vapor sensor.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2. Remove the connectors from the flammable vapor sensor and measure</td>
</tr>
<tr>
<td></td>
<td></td>
<td>the resistance of the sensor with an ohmmeter.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>A. If the reading taken is less than 2000 ohms, replace the flammable</td>
</tr>
<tr>
<td></td>
<td></td>
<td>vapor sensor.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>B. If the reading taken is more than 2000 ohms, and the wiring from</td>
</tr>
<tr>
<td></td>
<td></td>
<td>the control to the sensor is good, replace the lower control.</td>
</tr>
<tr>
<td>13. “THMSTR” and “OPEN” Flashing</td>
<td>The self-diagnostic test has detected the temperature sensor (thermistor) inside the immersion probe is open.</td>
<td>1. Turn power off for 10 to 20 seconds then on again to clear this error code.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2. This part of the control cannot be replaced or serviced. If the error code cannot be cleared, the lower control must be replaced.</td>
</tr>
<tr>
<td>14. “THMSTR” and “SHORT” Flashing</td>
<td>The self-diagnostic test has detected the temperature sensor (thermistor) inside the immersion probe is shorted.</td>
<td>1. Turn power off for 10 to 20 seconds then on again to clear this error code.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2. This part of the control cannot be replaced or serviced. If the error code cannot be cleared, the lower control must be replaced.</td>
</tr>
<tr>
<td>15. All Segments Flashing</td>
<td>The self-diagnostic check has detected one or both of the temperature adjustment buttons are stuck.</td>
<td>1. Press and release each of the temperature adjustment buttons. If the above action does not clear the error, the control will continue to regulate the water temperature at the last setting. However, settings will no longer be adjustable – the upper control should be replaced.</td>
</tr>
<tr>
<td>16. “P-ANODE” and “OPEN” Flashing</td>
<td>No current to Power Anode.</td>
<td>1. Check the wire that runs from the power anode to the upper control. Check the wire for damage, and to ensure that the connectors are fully seated into the mating connectors on both ends.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2. Check that the tank is full of water. Never use this water heater unless it is completely full of water. To prevent damage to the tank, the tank must be filled with water. Water must flow from the hot water faucet before turning “ON” gas to the water heater.</td>
</tr>
<tr>
<td>17. “P-ANODE” Flashing</td>
<td>Power Anode circuit failure.</td>
<td>1. Turn the power off for 10 to 20 seconds then on again to clear the error code.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2. If the error code persists or cannot be cleared, replace the upper control.</td>
</tr>
</tbody>
</table>
Please Note:
The control continually monitors internal circuits and external sensors. Error codes noted above, and those for self-diagnostic faults can be found on pages 30 through 32.
When ordering repair parts always give the following information:
1. Model, serial, and product number
2. Type of gas
3. Item number
4. Parts description

Repair Parts List

<table>
<thead>
<tr>
<th>Item No.</th>
<th>Parts Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Draft Hood</td>
</tr>
<tr>
<td>2</td>
<td>Flue Baffle</td>
</tr>
<tr>
<td>3</td>
<td>Nipple (Hot)</td>
</tr>
<tr>
<td>4</td>
<td>Nipple (Cold)</td>
</tr>
<tr>
<td>5</td>
<td>Anode Rod ▲</td>
</tr>
<tr>
<td>6</td>
<td>Cold Water Inlet Tube</td>
</tr>
<tr>
<td>7</td>
<td>Temperature and Pressure Valve</td>
</tr>
<tr>
<td>8</td>
<td>Control Display ★</td>
</tr>
<tr>
<td>9</td>
<td>Air Intake Chamber ★</td>
</tr>
<tr>
<td>10</td>
<td>Gas Control Valve/Thermostat ★</td>
</tr>
<tr>
<td>11</td>
<td>Drain Valve</td>
</tr>
<tr>
<td>12*</td>
<td>Natural Gas Burner ★</td>
</tr>
<tr>
<td>13*</td>
<td>Hot Surface Igniter (HSI) ★</td>
</tr>
<tr>
<td>14*</td>
<td>Manifold Door Assembly - Natural Gas ★</td>
</tr>
<tr>
<td>15*</td>
<td>Manifold Component Block w/Retainer Clip ★</td>
</tr>
<tr>
<td>16*</td>
<td>Manifold Door Gasket ★</td>
</tr>
<tr>
<td>17*</td>
<td>Viewport Assembly ★</td>
</tr>
<tr>
<td>18</td>
<td>FV Sensor ★</td>
</tr>
<tr>
<td>19</td>
<td>Outer Door ★</td>
</tr>
<tr>
<td>20</td>
<td>Electrical Transformer ★</td>
</tr>
<tr>
<td>21</td>
<td>Pressure Switch ★</td>
</tr>
</tbody>
</table>

*Pictured on next page.

LEGEND
▲ Special anode rod (see Anode Rod/Water Odor section)
■ Temperature and Pressure Relief Valve is required, but may not be factory installed
★ Unique: FVIR System parts
Listed Parts Kits and Illustrations

Item 12: Burner (Natural Gas)
Item 13: Flame Sense/Hot Surface Igniter Assembly.
Item 14: Manifold door assembly which contains the manifold tube, gasket, manifold door, manifold component block with retainer clip, and flame sense/hot surface igniter assembly. (Natural Gas)
Item 15: Contains manifold component block with retainer clip.
Item 16: Contains manifold door gasket.
Item 17: Contains viewport.