

# Commercial Gas Water Heater Installation Instructions and Use & Care Guide

for models with prefix DCG and ADCG



**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.

To obtain technical, warranty or service assistance during or after the installation of this water heater, call toll free:

1-800-456-9805

When calling for assistance, please have the following information ready:

1. Model number
2. 7 digit product number
3. Serial number
4. Date of installation
5. Place of purchase



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## Your safety and the safety of others is very important.

We have provided many important safety messages in this manual and on your appliance. Always read and obey all safety messages.



This is the safety alert symbol.

This symbol alerts you to potential hazards that can kill or hurt you and others.

All safety messages will follow the safety alert symbol and either the word “DANGER” or “WARNING”.



**DANGER** You can be killed or seriously injured if you don't immediately follow instructions.



**WARNING** You can be killed or seriously injured if you don't follow instructions.

All safety messages will tell you what the potential hazard is, tell you how to reduce the chance of injury, and tell you what can happen if the instructions are not followed.

- Do not use this appliance if any part has been under water. Immediately call a qualified service technician. Water heaters subjected to flood conditions or any time the gas controls, main burner or electrical components have been submerged in water require replacement of the entire water heater.
- Hydrogen gas can be produced in a hot water system that has not been used for a long period of time (generally two weeks or more). Hydrogen gas is extremely flammable and can ignite when exposed to a spark or flame. To prevent the possibility of injury under these conditions, we recommend the hot water faucet be opened for several minutes at the kitchen sink before using any electrical appliance which is connected to the hot water system. If hydrogen is present there will probably be an unusual sound such as air escaping through the faucet as water begins to flow. Do not smoke or have an open flame near the faucet at the time it is open.

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 listed, including formaldehyde, carbon monoxide, and soot.

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## I) INTRODUCTION

### **Thank you for purchasing a Commercial Water Heater.**

Properly installed and maintained, it will provide years of trouble free service.

This gas-fired water heater has been developed to produce potable hot water for commercial demands and may also be used in combination with space heating applications. Any deviation from these applications could affect your warranty.

### User Responsibilities

This manual has been prepared to acquaint you with the installation, operation and maintenance of your gas fired water heater and provide important safety information in these areas. It is your responsibility to ensure that your water heater is properly installed and cared for.

**FAILURE TO FOLLOW THE INSTRUCTIONS IN THIS MANUAL MAY RESULT IN SERIOUS BODILY INJURY AND/OR PROPERTY DAMAGE. THOROUGHLY READ AND UNDERSTAND ALL INSTRUCTIONS BEFORE YOU ATTEMPT TO INSTALL, OPERATE OR MAINTAIN THIS HEATER.**

Installation and service requires trade knowledge in the areas of plumbing, electricity, venting, air supply and gas supply. If you lack these skills or have difficulty understanding these instructions, you should not proceed. Enlist the help of a qualified service technician to install this water heater.

Examples of qualified service technicians include those trained in the plumbing and heating industry, local gas utility personnel or an authorized service person.

Service to the Power Vent System should only be performed by a qualified service technician.

The manufacturer and seller of this water heater will not assume any liability for any property damage, personal injury or death resulting from improper sizing, installation or failure to comply with these instructions.

The warranty on this water heater is in effect only when the water heater is installed and operated in accordance with these instructions. A data plate identifying your water heater can be found at the front of the water heater near the integrated control. When referring to your water heater, always have the information listed on the data plate readily available.

**Protect your warranty:** Regularly service your water heater as directed in the "Maintenance" section of this manual.

Retain your original receipt as proof of purchase.

**Do not discard this manual. You or future users of this water heater will need it for reference.**

## II) SAFETY

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.

In addition to the installation instructions found in this manual, the water heater must be installed in accordance with all local or state codes and with the latest editions of:

“National Fuel Gas Code” ANSI Z223.1 (NFPA 54) and “National Electrical Code” (NFPA 70)” available from:

American National Standards Institute,  
25 West 43rd Street,  
New York, NY 10036

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.



Check your phone listings for the local authorities having jurisdiction over your installation.

### Safety Warning (Flammable Vapours)



There is a risk of property damage, personal injury or death from the by-products of combustion (e.g., flue gases), in using fuel-burning appliances such as water heaters. Areas that may not be suitable for water heater installation include those where flammable liquids, gasoline, solvents, adhesives etc. are stored, or where engine-driven equipment or vehicles are stored, operated or repaired. These, and similar products, should not be stored or used near the water heater or air intake. Due to the nature of air movement, flammable vapours can be carried some distance from the point of storage. The gas-fired water heater igniter or burner flame can ignite these vapours causing a flashback, fire or explosion, which may result in severe property damage, serious personal injury or death. If flammable liquids or vapours 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**



**Flammable Vapours**

**WARNING** Vapours from flammable liquids will explode and catch fire causing death or severe burns.

**Do not use or store flammable products such as gasoline, solvents or adhesives in the same room or area near the water heater.**

**Keep flammable products:**

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

**This water heater has a main burner and an automatic ignition system. The ignition system:**

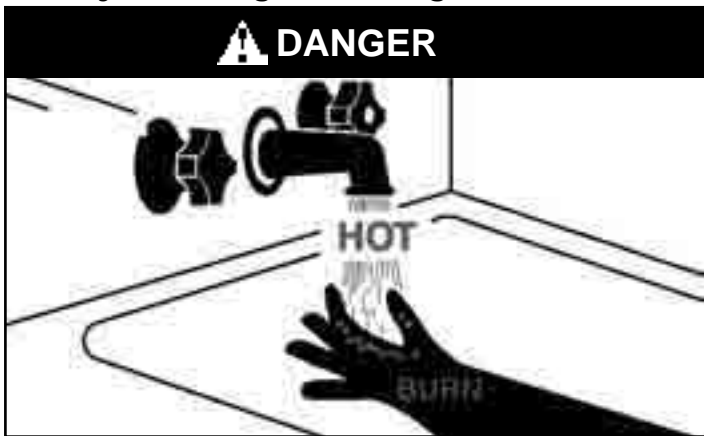
1. can come on at any time; and
2. will ignite flammable vapours.

**Vapours:**

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

**Do not install this water heater where flammable products will be stored.**

## Safety Warning (Scalding)



Hot water produced by this appliance can cause severe burns due to scalding. The hazard is increased for young children, the aged or the disabled when water temperatures exceed 52°C (125°F). Use tempering valves, also known as mixing valves, in the hot water system to reduce the risk of scalding at point-of-use such as lavatories, sinks and bathing facilities. Such precautions must be followed when this heater is operated in combination with dishwashing or space heating applications.

## Safety Warning (Carbon Monoxide)



### Carbon Monoxide Warning

- **Follow all vent system requirements by the local authorities having jurisdiction over your installation.**
- **Failure to do so can result in death, explosion or carbon monoxide poisoning.**

As with all fuel burning equipment, this heater requires an adequate supply of air for combustion and ventilation. An insufficient air supply can result in poor combustion or the re-circulation of the flue gases. Such a condition can cause soot build-up and present a fire hazard. Flow reversal of flue gases can cause an increase of carbon monoxide inside of the dwelling that could result in serious bodily harm or death from asphyxiation.

**MAKE SURE THE FLOW OF COMBUSTION AND VENTILATION AIR IS NOT RESTRICTED.**

## Relief Valve Requirements (T&P)

All water heaters must be fitted with a proper temperature and pressure relief valve. These valves must be certified as meeting the requirements of the “**Standard For Relief Valves For Hot Water Supply Systems, ANSI Z21.22/CSA 4.4**”.

### CAUTION

Hydrogen gas can be produced in a hot water system served by this heater that has not been used for a long period of time (generally two (2) weeks or more). **Hydrogen gas is extremely flammable and can ignite when exposed to a spark or flame.** To reduce the risk of injury under these conditions, it is recommended that the hot water faucet be opened for several minutes at the kitchen sink before using any electrical appliance connected to the hot water system. Use caution in opening faucets. If hydrogen is present, there will probably be an unusual sound such as air escaping through the pipe as the water begins to flow. There should be no smoking or open flame near the faucet at the time it is open.

If this water heater has been exposed to flooding, freezing, fire or any unusual condition, do not put it into operation until it has been inspected and approved by a qualified service technician.

**THESE CONDITIONS CAN RESULT IN UNSEEN INTERNAL DAMAGE** and are not subject to warranty coverage.

### III) INSTALLATION

#### Unpacking the Water Heater

**WARNING**  
**Excessive Weight Hazard**

**Use two or more people to move and install water heater. Failure to do so can result in back or other injury.**

**Important:** Do not remove any permanent instructions, labels, or the data label from outside of the water heater or on the inside of panels.

- Remove exterior packaging and place installation components aside.
- Inspect all parts for damage prior to installation and start-up.
- Completely read all instructions before attempting to assemble and install this product.

If you observe damage to the water heater or any of its components, **DO NOT ASSEMBLE OR INSTALL IT OR MAKE ANY ATTEMPT TO FIX THE DAMAGED PART(S)**. Contact the place of purchase for further instructions.

- After installation, dispose of packaging material in the proper manner.

#### Location Requirements

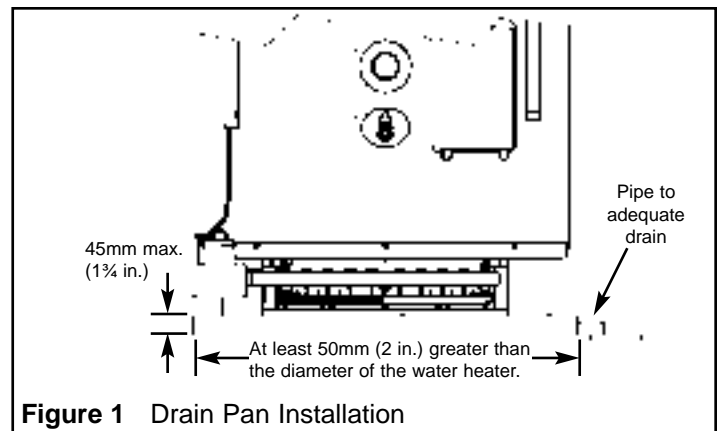
- Select a location near the center of the water piping system. The water heater must be installed indoors and in a vertical position on a level surface. **DO NOT** install in bathrooms, bedrooms, or any occupied room normally kept closed.
- Locate the water heater as close to the gas vent as practical. 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 data plate.
- The operation of air-moving devices such as exhaust fans, ventilation systems, clothes-dryers, fire-places, etc., can affect the proper operation of the water heater. **Note:** Special attention must be given to the location of these devices and the conditions they may create. Flow reversal of flue gases may cause an increase of carbon monoxide inside of the dwelling.

#### In Earthquake Zones

**Note:** The water heater must be braced, anchored, or

#### IMPORTANT:

This water heater must be installed strictly in accordance with the instructions enclosed, and local electrical, fuel and building codes. It is possible that connections to the water heater, or the water heater itself, may develop leaks. **IT IS THEREFORE IMPERATIVE** that the water heater be installed so that any leakage of the tank or related water piping is directed to an adequate drain in such a manner that it cannot damage the building, furniture, floor covering, adjacent areas, lower floors of the structure or other property subject to water damage. This is particularly important if the water heater is installed in a multi-story building, on finished flooring or carpeted surfaces. **GSW WILL NOT ASSUME ANY LIABILITY** for damage caused by water leaking from the water heater, pressure relief valve, or related fittings. Select a location as centralized within the piping system as possible. In any location selected, it is recommended that a suitable drain pan be installed under the water heater. This pan must limit the water level to a **MAXIMUM** depth of 45mm (1 3/4 in.) and have a diameter that is a minimum of 50mm (2 in.) greater than the diameter of the water heater. Suitable piping shall connect the drain pan to a properly operating floor drain. When used with a fuel-fired heater, this drain pan must not restrict combustion air flow.



**Figure 1** Drain Pan Installation

strapped to avoid moving during an earthquake. Contact local utilities for code requirements in your area.

**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 76mm (3 in.) in any direction, or if in an alcove the entire floor must be covered by the panel. The panel must be strong enough to carry the weight of the water heater when full of water.

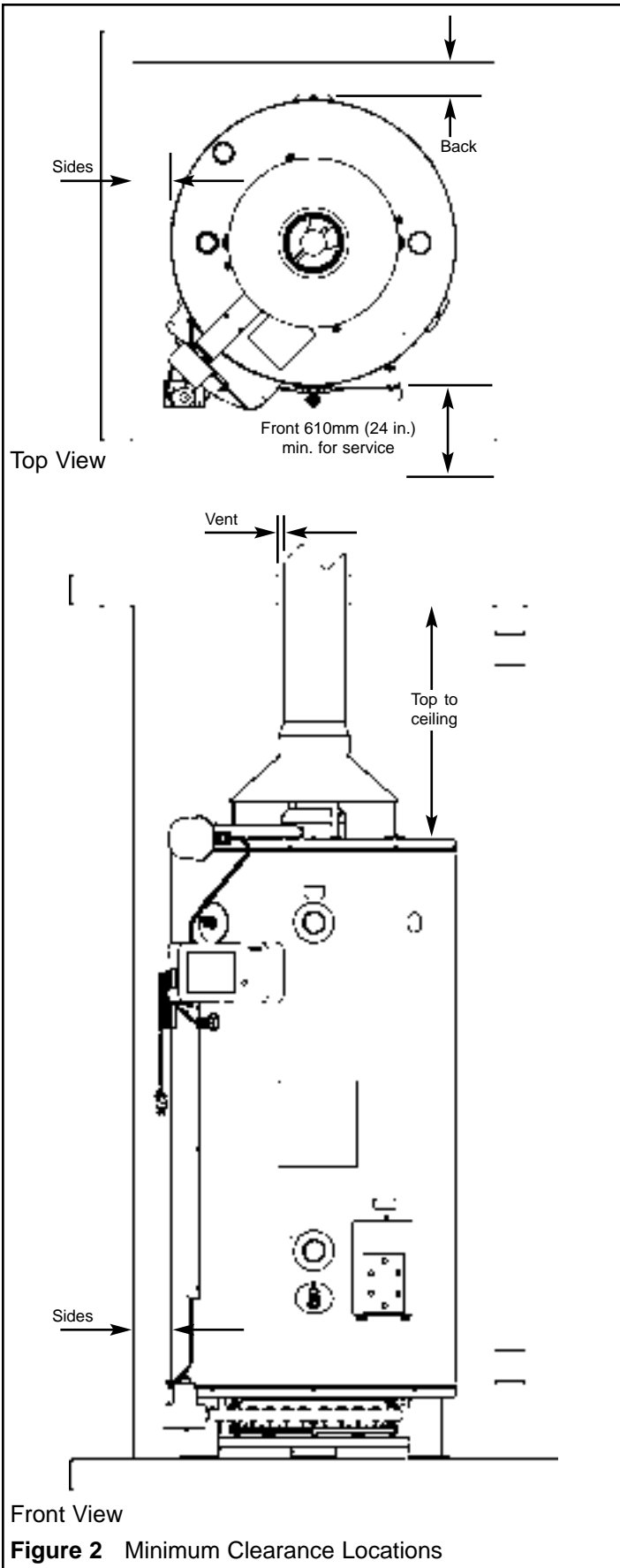
Figure 2 may be used as a reference guide to locate the specific clearance locations. A minimum of 610mm (24 in.) of front clearance and 102mm (4 in.) on each side should be provided for inspection and service.

#### Clearances and Accessibility

**Notice:** Minimum clearances from combustible materials are stated on the data plate located on the front of the water heater.

- If the water heater is installed in a restaurant or food service location where the floor is cleaned frequently, NSF International requires the water heater to maintain 152mm (6 in.) of clearance above the floor. To comply

- with the NSF International requirement, install leg extension kit. For availability contact 1-800-456-9805
- The water heater is certified for installation on a combustible floor.



## GAS SUPPLY

**⚠ DANGER**



### Explosion Hazard

- Use a new CSA or AGA approved gas supply line.
- Install a gas supply shut-off valve.
- Do not connect a natural gas water heater to a L.P. gas supply.
- Do not connect a L.P. gas water heater to a natural gas supply
- Failure to follow these instructions can result in death, an explosion or carbon monoxide poisoning.

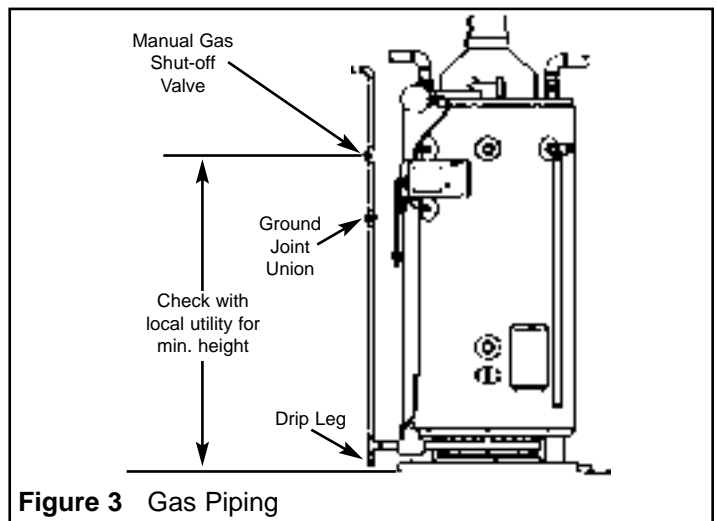
**Read the data plate to be sure the water heater is made for the type of gas you will be using in your application.**

This information will be found on the data plate located near the integrated control. If the information does not agree with the type of gas available, do not install or attempt to start. Call your dealer.

**Note:** An odourant is added by the gas supplier to the gas used by this water heater. This odourant may fade over an extended period of time. Do not depend upon this odourant as an indication of leaking gas.

## Gas Piping

This gas piping must be installed in accordance with all local and provincial or state codes or, in the absence of such, the latest edition of “National Fuel Gas Code” ANSI Z223.1 (NFPA 54).



**Note:** If using a flexible gas connector, make sure its rating tag matches or exceeds the input of the water heater.

Tables 1, 2, and 3 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. Follow the instructions below and reference Figure 3 for gas piping installation.

**Note:** When installing gas piping, apply sealing compounds approved for use with natural and propane gas.

1. Install a readily accessible manual shut-off valve in the gas supply line as recommended by the local utility. The owner/operator must be shown the location of this valve and be given instructions on how to use it to shut off the gas to the heater.

2. Install a drip leg (if not already incorporated as part of the water heater) as shown (see Figure 3). The drip leg must be no less than 76mm (3 in.) long for the accumulation of dirt, foreign material, and water droplets.
3. Install a ground joint union between the gas valve and the manual shut-off valve. This is to allow easy removal of the gas valve.
4. Turn the gas supply on and check for leaks. Use a chloride-free soap and water solution (bubbles forming indicate a leak) or other approved method.

### Gas Pressure

**Important:** The gas supply pressure must not exceed the maximum supply pressure as stated on the water heater’s data plate. Minimum supply pressure should also be maintained per the data plate.

#### Natural Gas Pipe Capacity (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).

Nominal Iron Pipe Size, in.	Length of Pipe, Feet													
	10	20	30	40	50	60	70	80	90	100	125	150	175	200
1/2	132	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
3/4	278	190	152	130	115	105	96	n/a	n/a	n/a	n/a	n/a	n/a	n/a
1	520	350	285	245	215	195	180	170	160	150	130	120	110	100
1-1/4	1050	730	590	500	440	400	370	350	320	305	275	250	225	210
1-1/2	1600	1100	890	760	670	610	560	530	490	460	410	380	350	320

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

$$\text{Cu. Ft. Per Hr. Required} = \frac{\text{Gas Input of Water Heater (BTU/HR)}}{\text{Heating Value of Gas (BTU/ft}^3\text{)}}$$

The gas input of the water heater is marked on the water heater data plate. The heating value of the gas (BTU/ft<sup>3</sup>) may be determined by consulting the local natural gas utility.

**Table 1**

#### L.P. Gas Capacity

Maximum capacity of gas pipe in thousands of BTU per hour of undiluted liquified petroleum gasses (at 11 inches water column pressure). Based on a Pressure Drop of 0.5 Inch Water Column.

Nominal Iron Pipe Size, (in)	Length of pipe, Feet												
	10	20	30	40	50	60	70	80	90	100	125	150	
1/2	275	189	152	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	
3/4	576	393	315	267	237	217	196	185	173	162	146	132	
1	1071	732	590	504	448	409	378	346	322	307	275	252	
1-1/4	2205	1496	1212	1039	913	834	771	724	677	630	567	511	

Example: Input BTU requirements of the water heater, 199,000 BTUH

Total pipe length, 80 feet - 1" IPS required.

**Table 2**

#### L.P. Gas Capacity

Maximum capacity of gas pipe in thousands of BTU per hour of undiluted liquified petroleum gasses (at 11 inches water column pressure). Based on a Pressure Drop of 0.5 Inch Water Column.

Copper Tubing OD Size, (in)	Length of pipe, Feet									
	10	20	30	40	50	60	80	100	125	
5/8	206	141	n/a	n/a	n/a	n/a	n/a	n/a	n/a	
3/4	348	239	192	164	146	132	n/a	n/a	n/a	
7/8	536	368	296	253	224	203	174	154	137	

Example: Input BTU requirements of the water heater, 199,000 BTUH

Total pipe length, 50 feet = 7/8" IPS required.

**Table 3**



**⚠️ WARNING**  
**Exposure to a higher gas supply pressure may cause damage to the gas valve, resulting in explosion or fire. Consult your local gas supplier and gas authorities. DO NOT PUT INTO SERVICE IF OVER-PRESSURIZATION HAS OCCURRED.**

**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 in. w.c. (3.5 kPa), 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 in. w.c. (3.5 kPa), the water heater must be isolated from the gas supply piping system by closing its manual shut-off valve.

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

**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 service technician after installation of the gas piping system.

**⚠️ WARNING**



**Explosion Hazard**  
**Have a qualified service technician make sure L.P. gas pressure does not exceed 13 in. w.c. (3.24 kPa). Failure to do so can result in death, explosion, or fire.**

**⚠️ WARNING**  
**An adequate air supply shall be provided for combustion and ventilation of this water heater.**  
**An insufficient supply can result in poor combustion and possible sooting of the burner, combustion chamber, or flue passageway. This may present a potential fire hazard or create a serious health hazard by producing carbon monoxide.**

## Air Requirements

**Important:** Air for combustion and ventilation must not come from a corrosive atmosphere. Any failure due to corrosive elements in the atmosphere is excluded from warranty coverage.

Installations in or for certain places including, but not limited to, those listed below will require outdoor air for combustion to reduce the risk of chemical exposure:

- Beauty shops
- Photo processing labs
- Buildings with indoor pools
- Water heaters installed in laundry, hobby or craft rooms
- Water heaters installed near chemical storage areas

Combustion air must be free of acid-forming chemicals. These chemicals are found in aerosol sprays, detergents, bleaches, cleaning solvents, air freshener, paint and varnish removers, refrigerant, and many other commercial products. When burned, vapours from these products form highly corrosive acid compounds. These products should not be stored or used near the water heater or air inlet.

The area in which the heater is located is classified as either “an **unconfined space**” or “a **confined space**”.

An **unconfined space** is defined as a space having a volume not less than 50 cubic feet per 1000 BTU/hour (4.8 cubic meters per kilowatt) of combined input rating of all appliances using the space. Adjacent open rooms may be included as part of the unconfined space **provided there are no closeable doors between these rooms**. An example of this is an open basement.

A **confined space** is one smaller than described above. Air shall be supplied through permanent openings as described in Figure 4. **At no time shall an air opening have a dimension of less than 76mm (3 in.)** and at no time shall any top opening be lower than the top of the water heater.

For buildings that are not well sealed (do not have tight fitting doors and windows) natural air infiltration may provide sufficient air required for combustion and ventilation. For buildings using tight construction (newer and renovated structures), the air supply shall be introduced from the outdoors, regardless of whether the space is confined or unconfined.

Where an exhaust fan or any other air consuming appliance (e.g. clothes dryer, furnace, etc.) is installed in the same space as the water heater, sufficient air openings must be available to provide fresh air when all appliances are operating simultaneously.

## Combustion Air “Supply” Ducts

Air supply ducts shall be of galvanized steel or equivalent corrosion resistant material. A single air duct may not be substituted when required for upper and lower air openings. Horizontal upper combustion air ducts shall not slope downward toward the air inlet.

## Louvers and Grilles

Openings for air supply ducts must provide free unobstructed air movement. Louver and grille openings must be sized to ensure that the FREE OPEN AREA is never less than the area of the air duct.

### LOCATION:

The locations for top and bottom openings are as follows: The top opening shall commence within 305mm (12 in.) of the top of space and the bottom opening shall commence within 305mm (12 in.) of the bottom of the enclosure.

## Air Opening Requirements

(a) Equipment located in confined spaces; all air from inside the building.

Two permanent openings (top and bottom) shall be provided connecting the confined space (e.g., closet/small room) with the unconfined space. Each opening shall have a free area of one square inch per 1,000 BTU/hour (22 cm<sup>2</sup>/kW) input of all appliances in the confined space, but not less than 100 square inches (645 cm<sup>2</sup>).

(b) Basement installation, equipment located in confined spaces; all air from outdoors.

Outside air inlets shall be a minimum of 305mm (12 in.) above the grade (snow) line. When supplying air directly from the outdoors:

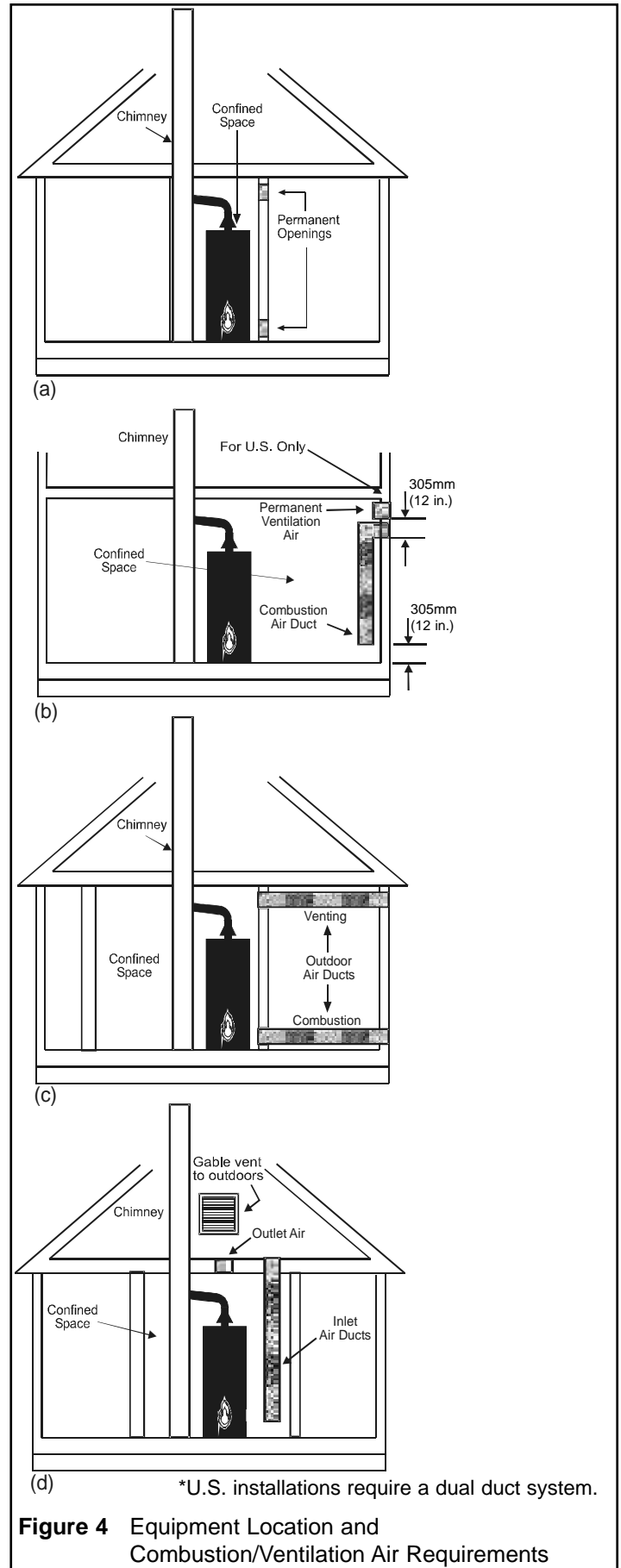
Two openings (top and bottom) shall be provided with each opening having a minimum free area of one square inch per 4,000 BTU/hour input (5.5 cm<sup>2</sup>/kW) of total input rating of all appliances in the confined space.

(c) Equipment located in confined spaces; all air from outdoors.

When supplying air directly from the outdoors using horizontal ducting, each opening shall have a free minimum area of one square inch per 2,000 BTU/hour (11 cm<sup>2</sup>/kW) of total input rating of all appliances in the confined space.

(d) Equipment located in confined spaces; all air from outdoors through ventilated attic.

When supplying air directly through vertical ducting, each opening shall have a free minimum area of one square inch per 4,000 BTU/hour (5.5 cm<sup>2</sup>/kW) of total input rating of all appliances in the confined space.



**Figure 4** Equipment Location and Combustion/Ventilation Air Requirements

Combined input of all appliances in confined space	Required free area of duct	Acceptable equivalent duct diameter	
		A <sub>1</sub>	B <sub>2</sub>
BTU/h (kW)	mm <sup>2</sup> (in <sup>2</sup> )	mm (in)	mm (in)
75,000 (23)	7,000 (11)	100 (4)	125 (5)
100,000 (30)	9,000 (14)	100 (4)	125 (5)
125,000 (37)	12,000 (18)	125 (5)	150 (6)
150,000 (45)	14,000 (22)	125 (5)	150 (6)
175,000 (53)	16,000 (25)	150 (6)	175 (7)
200,000 (60)	19,000 (29)	150 (6)	175 (7)
225,000 (68)	21,000 (32)	150 (6)	175 (7)
250,000 (75)	23,000 (36)	175 (7)	200 (8)
275,000 (83)	26,000 (40)	175 (7)	200 (8)
300,000 (90)	28,000 (43)	175 (7)	200 (8)
325,000 (98)	30,000 (47)	200 (8)	225 (9)
350,000 (105)	32,000 (50)	200 (8)	225 (9)
375,000 (113)	35,000 (54)	200 (8)	225 (9)
400,000 (120)	37,000 (58)	225 (9)	250 (10)

Notes:

1. Maximum length of ducts in column A is 6.1 equivalent metres (20 ft).
2. Maximum length of ducts in column B is 15.2 equivalent metres (50 ft).

**Table 4**

## Venting

It is the responsibility of the installing contractor to provide a vent adequate in capacity and in good usable condition. Btu/hr capacity limitations are governed by the style and height of the vent/chimney. Vent piping must be installed in accordance with all local and state codes or, in the absence of such, the latest edition of “**National Fuel Gas Code**” **ANSI Z223.1 (NFPA 54)**.

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:** Check to make sure the vent pipe is not blocked in any way.

- Venting should be as direct as possible with a minimum number of pipe fittings.
- 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.
- Single wall vent connectors must have 152mm (6 in.) of clearance from unprotected combustible surfaces.
- If sidewall venting is necessary, a power vent kit is required. For availability contact 1-800-456-9805.
- Vents that run through unconditioned spaces where below freezing temperatures are expected should be properly insulated to prevent freezing.
- Existing vent systems must be inspected for obstructions, corrosion and proper installation.
- Vents must be connected to the water heater’s draft hood by a certified vent connector or by directly originating at the draft hood opening.

- Some models are shipped with a vent reducer. The vent reducer can be installed directly to the draft hood if the existing vent system is adequately sized to support the exhaust gases.
- Vertical gas vents must terminate with a listed cap or other roof assembly and be installed according to their manufacturer’s instructions.
- Horizontal vent connections must have an upward slope of at least 21mm per metre (1/4 in per foot).
- Gas vents must be supported to prevent damage, joint separation, and maintain clearances to combustible materials.
- Vent connection joints should be fastened by sheet metal screws or by other approved methods.
- Vent and vent connectors should have adequate support to keep weight off the draft hood.

All pipe, fittings, and procedures must conform to American National Standard Institute and American Society for Testing and Materials (ANSI/ASTM) standards in the United States.

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

## Draft Hood/Damper Installation

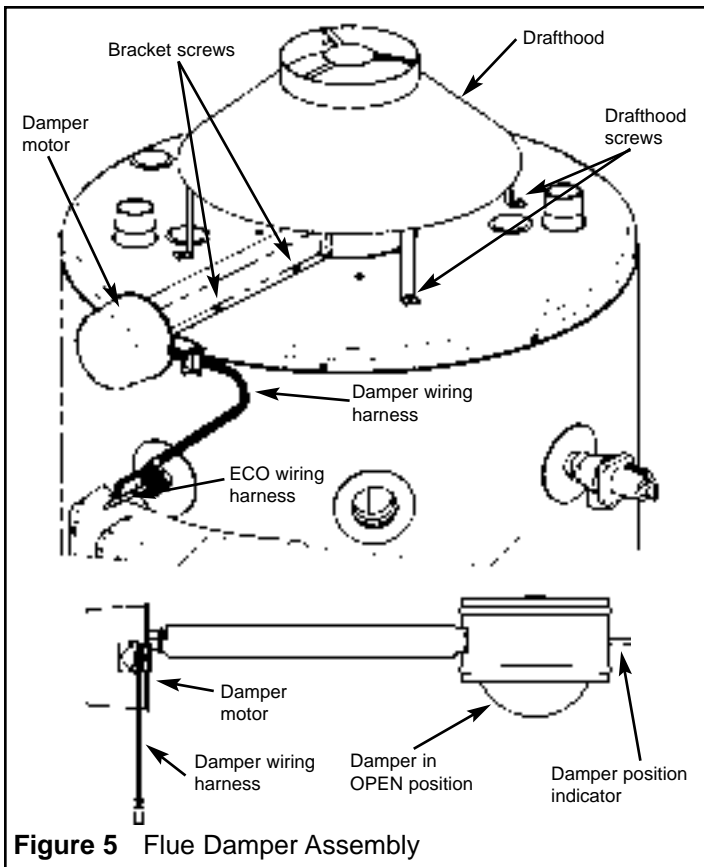
### **WARNING**

**Do not operate heater with damper in closed position, it must be in the open position during water heater operation. Do not negate the action of any existing safety or operational controls.**

Install the supplied draft hood and damper on the flue outlet collar. Use only the supplied draft hood and damper, DO NOT use any substitute or alter the components in any way. Place the damper on the water heater (see Figure 5). Align the four pilot holes on top of the water heater with the 4 corresponding holes on the damper bracket and secure with the supplied screws. Next, align the draft hood legs with the 4 corresponding pilot holes on top of the water heater and attach securely with the supplied screws. Locate the wiring from the ECO, and attach it to the wiring harness on the damper (see Figure 5). Once damper is installed, ensure that the damper position indicator is visible (See Figure 5).

## Flue Outlet Reducer

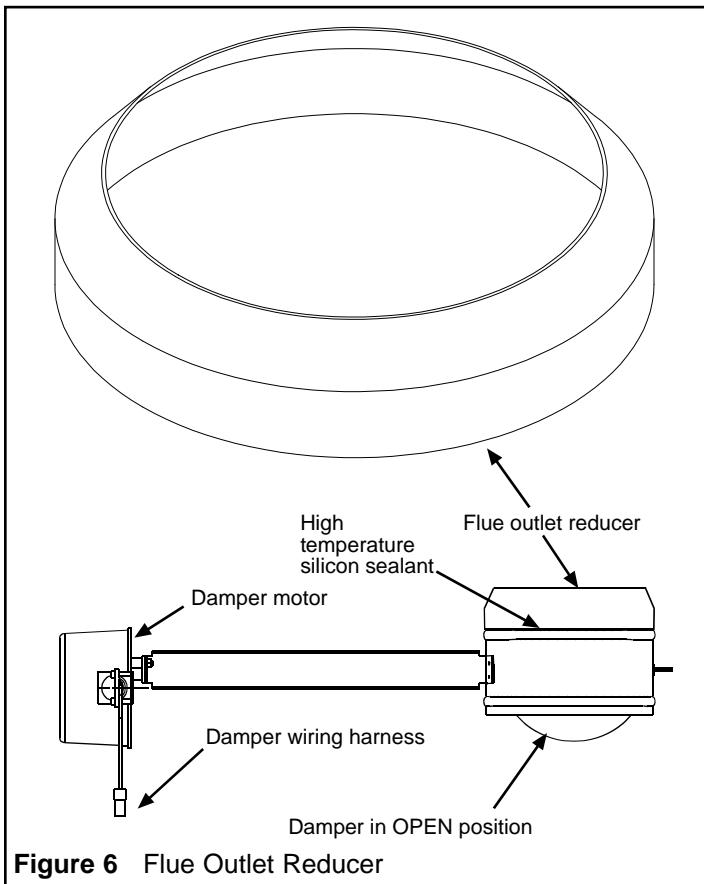
Some units are shipped with a flue outlet reducer (See Figure 6). Use only the flue outlet reducer supplied with this unit. The flue outlet reducer should be connected to the top of the flue damper and sealed by high temperature silicon. The vent piping must be installed in accordance with all local and state codes or, in the absence of such, the latest edition of “**National Fuel Gas Code**” **ANSI Z223.1 (NFPA 54)**.



**Figure 5** Flue Damper Assembly

## WATER SUPPLY Piping Installation

Piping, fittings, and valves should be installed according to the installation drawing (Figure 7). If the indoor installation



**Figure 6** Flue Outlet Reducer

Water Heater Model Base #	Dip Tube	Inlet Tube (Optional Front)	Inlet Tube (Optional Back)
75-125	60238	60239	60239
80-199	60053	60057	60057
80-250	60053	60057	60057
100-199	71325	75085	75086
100-270	71325	75085	60023
75-300	60053	60057	60057
75-360	N/A	60194	60195
75-399	N/A	60194	60195
75-300NO <sub>x</sub>	N/A	60194	60195
75-350NO <sub>x</sub>	N/A	60194	60195

**Table 5** Dip Tube Usage

area is subject to freezing temperatures, the water piping must be protected by insulation. Water supply pressure should not exceed 80% of the working pressure of the water heater. The working pressure is stated on the water heater's data plate. If this occurs, a pressure reducing valve with a bypass should be installed in the cold water inlet line to the entire system. This should be placed on the supply to the entire structure in order to maintain equal hot and cold water pressures.

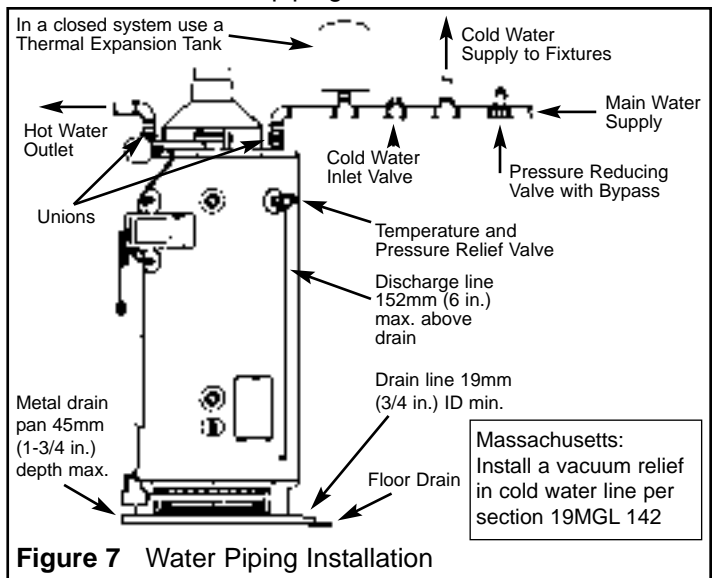
**Note:** Water supplied to the unit that exceeds 12 grains (205 mg/l) total hardness may reduce the life and performance of the water heater. Depending on the degree of hardness, it is recommended that either a water pre-treatment system or a water softener be installed and properly maintained.

**Important:** Heat cannot be applied to the water fittings on the water 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.

1. The water heater may have three water piping connection points. The top and front are 1-1/2" NPT and the connections on the back of some heaters are 2" NPT. When using front or back connections a combination nipple inlet tube is required (top entry uses a dip tube). Any one of the options listed in Table 5 may be used.

For availability contact 1-800-456-9805.

**Note:** Inlet and outlet piping connections cannot be mixed.



**Figure 7** Water Piping Installation

For example, a top inlet connection must use a top outlet connection.

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. Since most commercial installations utilize higher temperatures, **the use of a tempering valve is strongly recommended in all domestic hot water lines (i.e. public restroom sinks, etc).**
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. The owner/operator must be shown the location of this valve and be given instructions on how to use it to shut off the water to the heater.
6. The water heater is shipped with a factory-installed Temperature and Pressure Relief Valve. Install a discharge line in the opening in the T&P 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.

**DO NOT** tamper with the integrated control, gas valve, igniter or temperature and pressure relief valve. Tampering voids all warranties. Only qualified service technicians should service these components.

**DO NOT** use with piping that has been treated with chromates, boiler seal, or other chemicals.

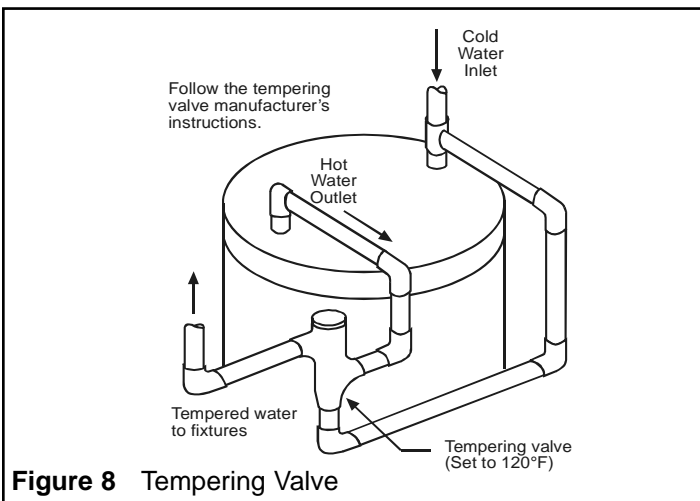
**DO NOT** add any chemicals to the system piping which will contaminate the potable water supply.

### Closed System/Thermal Expansion

Periodic discharge of the temperature and pressure relief valve may be due to thermal expansion in a closed water supply system. The water utility supply meter may contain a check valve, backflow preventer or water pressure reducing valve. This will create a closed water system. During the heating cycle of the water heater, the water expands causing pressure inside the water heater to increase. This may cause the temperature and pressure relief valve to discharge small quantities of hot water. To prevent this, it is recommended that a diaphragm-type expansion tank (suitable for potable water) be installed on the cold water supply line. The expansion tank must be properly sized for the application. Contact the local water supplier or plumbing inspector for information on other methods to control this situation.

**Important: Do not plug or remove the temperature and pressure relief valve.**

### Tempering Valve Installation



A Tempering Valve should be installed per the manufacturer's instructions in the hot water line. See Figure 8 for sample tempering valve installation.

Please note the following:

**DO NOT** install this water heater with iron piping. The system should be installed only with piping that is suitable for potable (drinkable) water such as copper, CPVC, or polybutylene. **DO NOT** use PVC water piping.

**DO NOT** use any pumps, valves, or fittings that are not compatible with potable water.

**DO NOT** use valves that may cause excessive restriction to water flow. Use full flow ball or gate valves only.

**DO NOT** use any lead based solder on potable water lines. Use appropriate tin-antimony or other equivalent material.

### Temperature and Pressure (T&P) Relief Valve

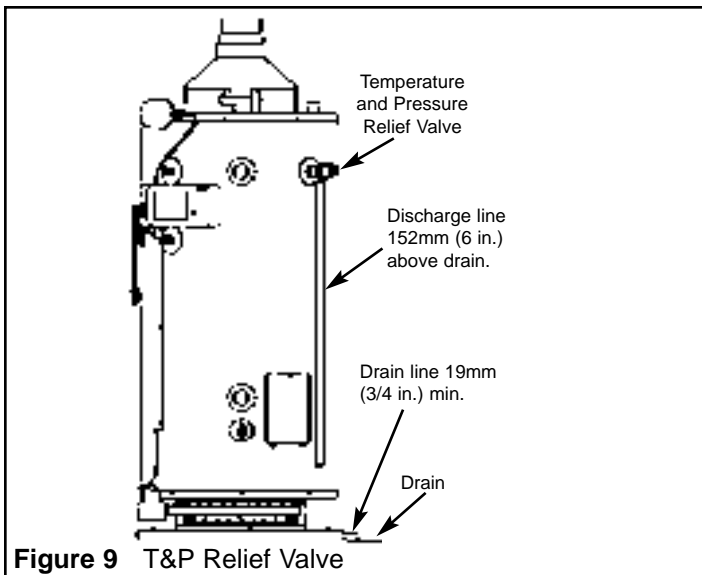
For protection against excessive pressures and temperatures, a temperature and pressure relief valve must be installed in the opening marked "T&P RELIEF VALVE" (see Figure 9). This valve must be design certified by a nationally recognized testing laboratory that maintains periodic inspection of the production of listed equipment or materials as meeting the requirements of the "Standard For Relief Valves For Hot Water Supply Systems", ANSI Z21.22/CSA 4.4". 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 data plate.

### WARNING



#### Explosion Hazard

- **If the temperature and pressure relief valve is dripping or leaking, have a licensed plumber repair it.**
- **Do not plug valve.**
- **Do not remove valve.**
- **Failure to follow these instructions can result in death or an explosion.**



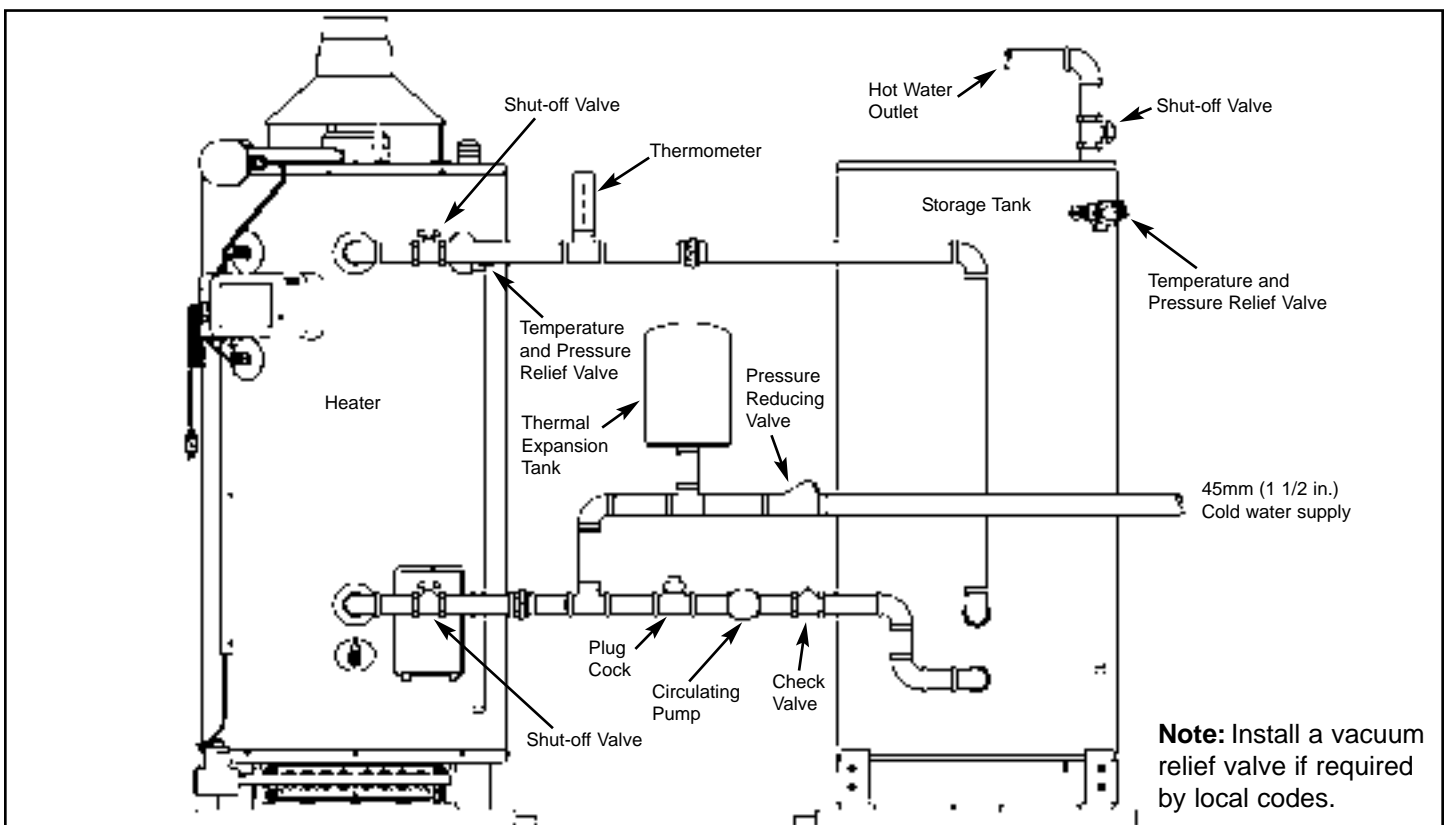
**The Discharge Line:**

- 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 152mm (6 in.) above a floor drain or external to the building.
- Must be capable of withstanding 121°C (250°F) without distortion.
- Must be installed to allow complete drainage of both the valve and discharge line.

**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.

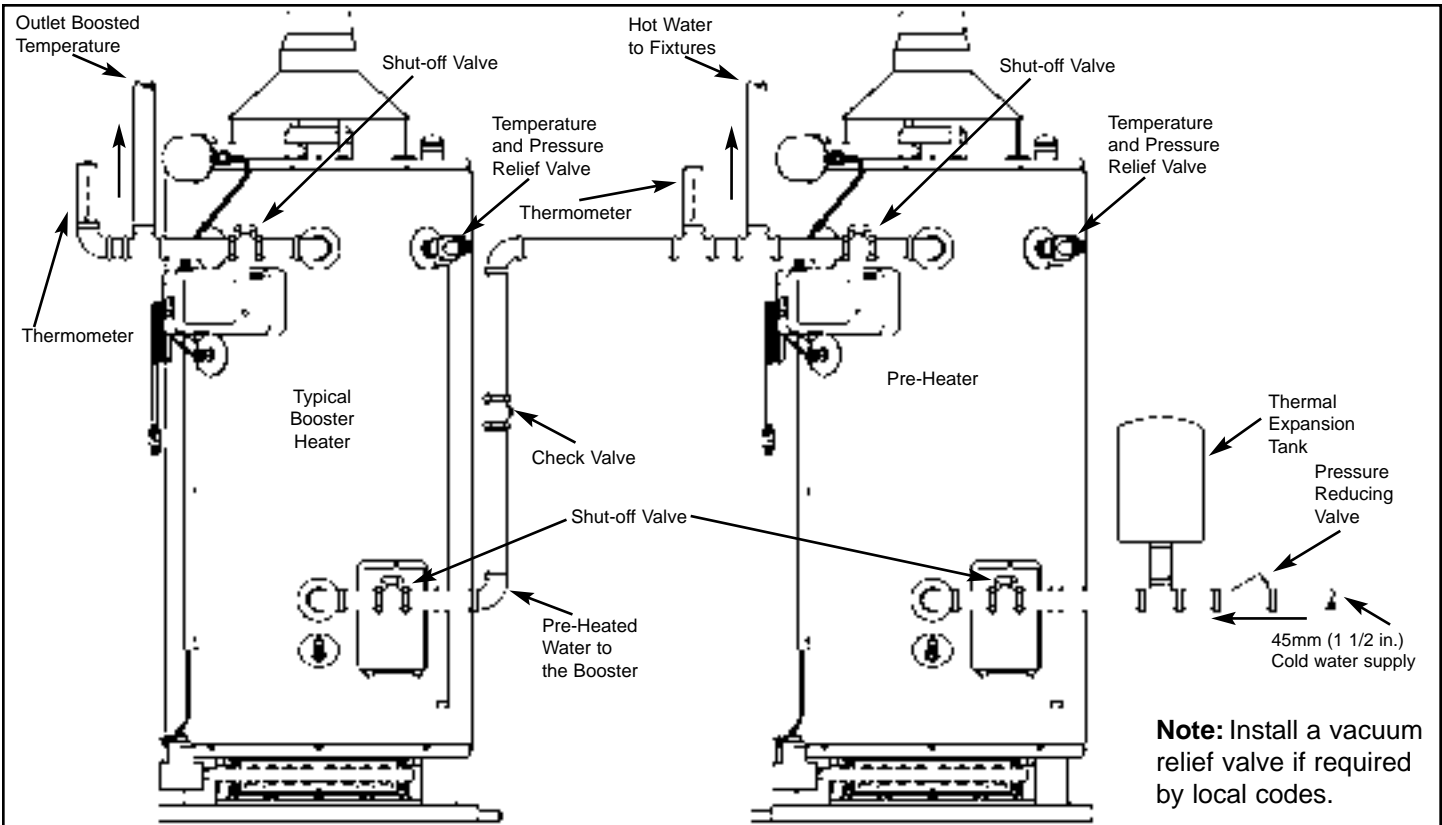
**The Temperature & Pressure Relief Valve:**

- Must not be in contact with any electrical part.
- Must be connected to an adequate discharge line.
- Must not be rated higher than the working pressure shown on the data plate of the water heater.
- The BTUH rating of the T&P valve must be greater than, or equal to, the input rating of the water heater.



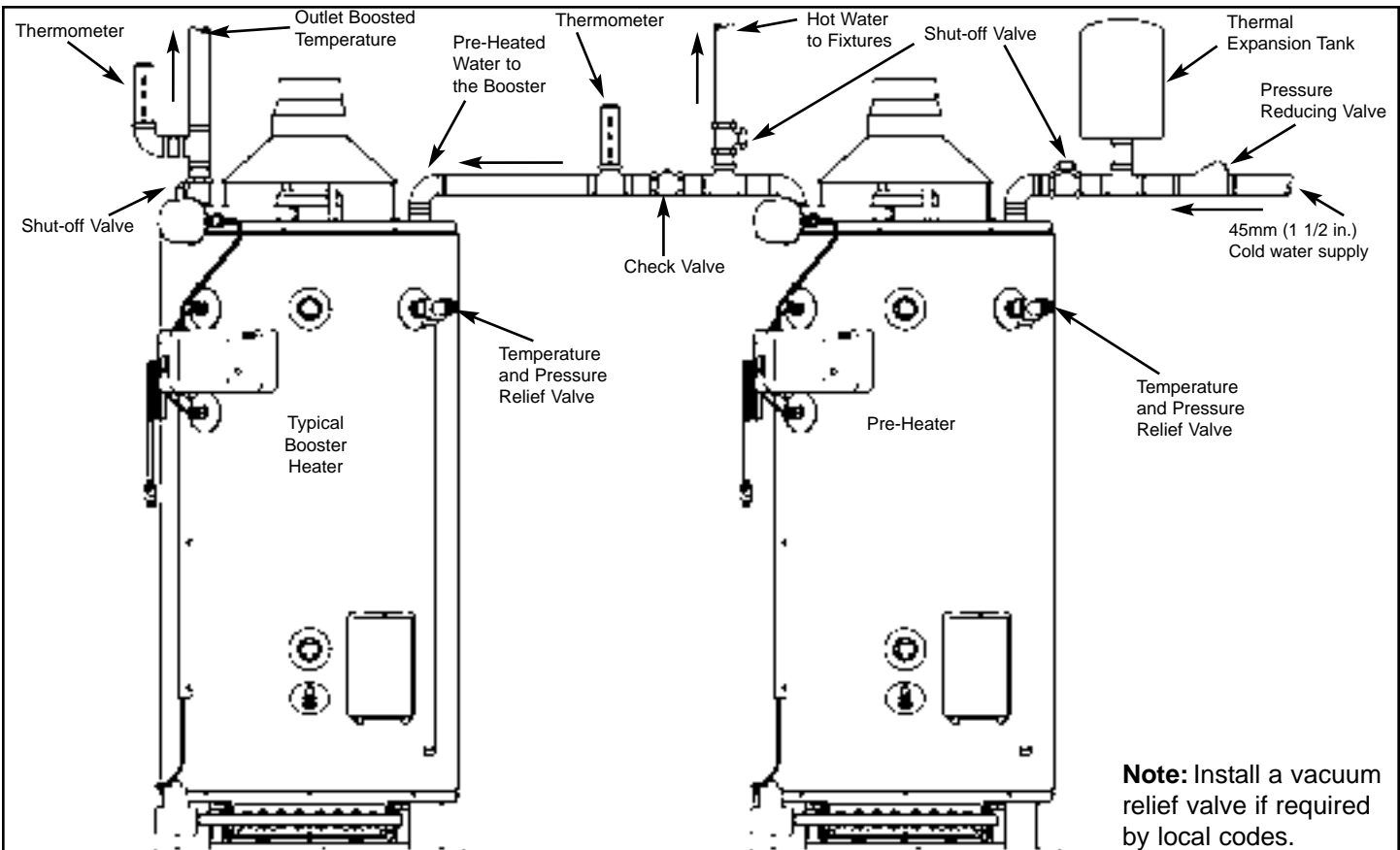
**Note:** Install a vacuum relief valve if required by local codes.

**Figure 10** Commercial Unit with Auxiliary Storage Heater - Forced Circulation With or Without Building Recirculation - Front Inlet/Outlet Connections



**Note:** Install a vacuum relief valve if required by local codes.

**Figure 11** Commercial Unit with Auxiliary Booster Heater - Two Temperature (With or Without Building Recirculation)



**Note:** Install a vacuum relief valve if required by local codes.

**Figure 12** Commercial Unit with Auxiliary Storage Heater - Forced Circulation With or Without Building Recirculation - Top Inlet/Outlet Connections

# ELECTRICAL SUPPLY

**⚠ WARNING**

Electrical Shock Hazard



- **Disconnect power before servicing.**
- **Replace all parts and panels before operating.**
- **Failure to do so can result in death or electrical shock.**

If you lack the necessary skills required to properly install the electrical wiring to this water heater, do not proceed but have a qualified service technician perform the installation.

When making the electrical connections, always make sure:

- The voltage and frequency correspond to that specified on the water heater data plate on the front of the water heater.
- The electrical supply has the proper overload fuse or

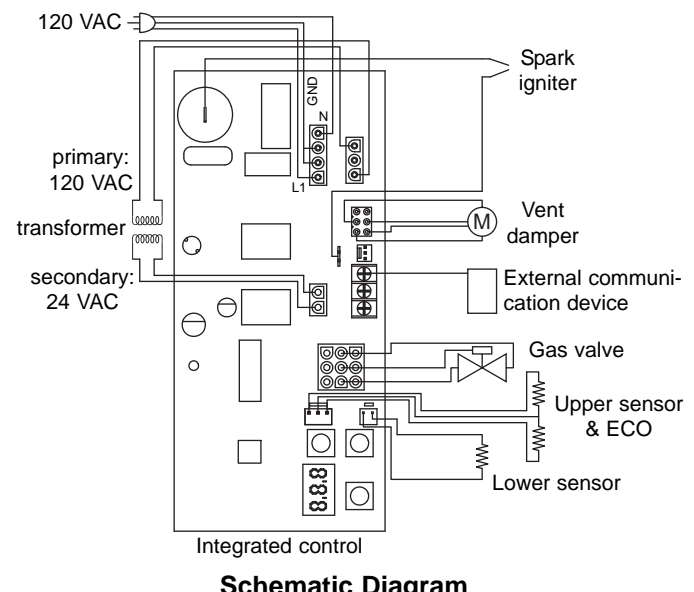
breaker protection. The water heater draws less than 7 amps.

- Wire sizes and connections comply with all applicable codes.
- Wiring is enclosed in approved conduit (if required by local codes).
- The water heater and electrical supply are properly grounded.
- The water heater must be connected to a branch circuit that is dedicated to the water heater only.
- This water heater must be connected directly to a dedicated branch circuit outlet. Do not use an extension cord to supply electrical power to this water heater.

## Wiring Diagram

The wiring diagrams can be found in Figure 13. Always reference the wiring diagram(s) for the correct electrical connections.

**Caution:** Label all wires prior to disconnection when servicing controls. Wiring errors can cause improper and dangerous operation. Verify proper operation after servicing.



**Schematic Diagram**

### Honeywell Integrated Water Heater Control S9631B for Commercial Gas Water Heaters.

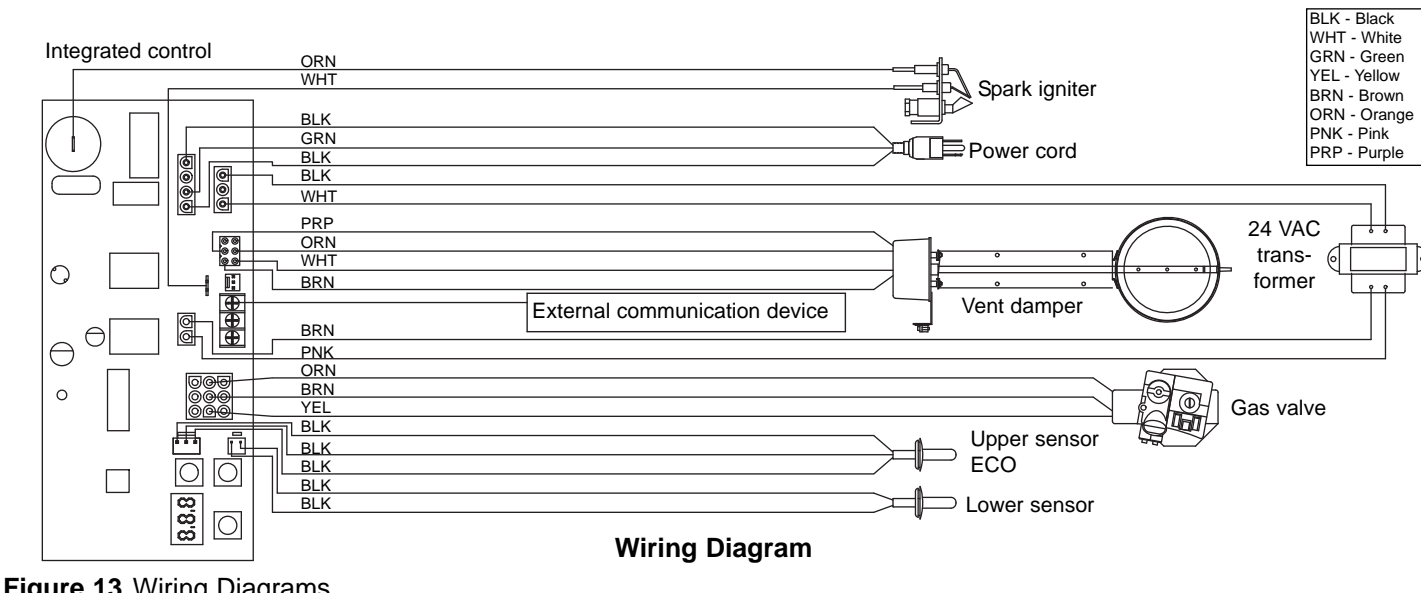
**Electrical Ratings:**

Line Voltage: 120 Vac, 60 Hz.  
 Transformer: 24 Vac Nom. (30 Vac Max., 8 Vac Min.)  
 5.0 VA plus external loads (gas valve, vent damper, etc.)

Main Valve: Full Load 2A at 24 Vac (0.5 to 0.6 PF).  
 In Rush 6A at 24 Vac (0.5 to 0.6 PF)

Vent Damper (Optional)  
 Full Load: 0.5A at 24 Vac.  
 In Rush: 1A at 24 Vac.

Pilot Valve (Optional)  
 Full Load: 2A at 24 Vac (0.5 to 0.6 PF).  
 In Rush: 6A at 24 Vac (0.5 to 0.6 PF).



**Wiring Diagram**

**Figure 13** Wiring Diagrams



# INSTALLATION CHECKLIST

Check Here

Check Here

## Water Heater Location

- 1. Centrally located with the water piping system. Located as close to the gas piping and vent pipe system as possible.
- 2. Located indoors and in a vertical position. Protected from freezing temperatures.
- 3. Proper clearances from combustible surfaces maintained and not installed directly on a carpeted floor.
- 4. Sufficient room to service the water heater.
- 5. Provisions made to protect the area from water damage. Properly sized drain pan installed and piped to an adequate drain.
- 6. Installation area free of corrosive elements and flammable materials.

## Gas Supply and Piping

- 1. Gas supply is the same type as listed on the water heater data plate.
- 2. Gas line equipped with full opening shut-off valve, union and drip leg.
- 3. Approved pipe joint compound used.
- 4. Adequate pipe size and of approved material.
- 5. Chloride-free soap and water solution or other approved means used to check all connections and fittings for possible gas leaks.
- 6. Rating tag of flexible gas connector (if used), matches or exceeds the input of the water heater.

## Vent Pipe System

- 1. Vent pipe and fittings of approved material.
- 2. Acceptable size, length, and number of elbows on exhaust outlet pipe.
- 3. Installed in accordance with prevailing provisions of local codes, or in the absence of such, the latest edition of **“National Fuel Gas Code” ANSI Z223.1 (NFPA 54)**.
- 4. Vent connectors securely fastened with screws and supported properly to maintain 152mm (6 in.) clearance.
- 5. Drafthood and damper properly installed.
- 6. Drafthood or vent pipe not obstructed in any way.

## Vent Termination

- Vertical
- 1. Vertical gas vents terminated with a listed cap or other roof assembly and installed according to their manufacturer’s instructions.

## Water System Piping

- 1. Temperature and pressure relief valve properly installed with a discharge line run to an open drain and protected from freezing.
- 2. All piping properly installed and free of leaks.
- 3. Water heater completely filled with water.
- 4. A properly sized expansion tank installed on closed system.
- 5. A tempering valve installed as per the manufacturer’s instructions.

## Electrical Connections

- 1. Unit “hard-wired” to a dedicated 120V power supply.
- 2. Proper polarity.
- 3. Water heater properly grounded.
- 4. Installed in accordance with prevailing provisions of local codes, or in the absence of such, the latest edition of **“National Electrical Code” (NFPA 70)**.

**If the answer to all of the questions above is “Yes”, proceed with lighting the heater.**

## IV) LIGHTING & OPERATING INSTRUCTIONS

### FOR YOUR SAFETY READ BEFORE OPERATING



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

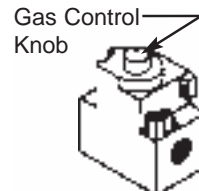
- A. This appliance is equipped with an ignition device which automatically lights the pilot. Do not try to light the pilot by hand.
- B. BEFORE OPERATING smell all around the appliance area for gas. Be sure to smell next to the floor because some gases are heavier than air and will settle on the floor.

#### WHAT TO DO IF YOU SMELL GAS

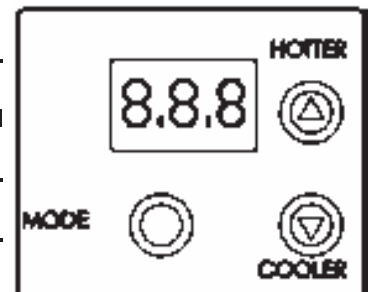
- Do not try to light any appliance.
  - Do not touch any electric switch; do not use any phone in your building.
  - Immediately call your gas supplier from a neighbour's phone. Follow the gas supplier's instructions.
  - If you cannot reach your gas supplier, call fire department.
- C. Use only your hand to press the integrated control buttons. Never use tools. If the control buttons will not push in by hand, don't try to repair them, call a qualified service technician. Force or attempted repair may result in a fire or explosion.
- D. Do not use this appliance if any part has been under water. Immediately call a qualified service technician to inspect the appliance and to replace any part of the control system and any gas control which has been under water.

### OPERATING INSTRUCTIONS

1. STOP! Read the safety information above on this label.
2. Set the integrated control to the lowest temperature by:
  - holding down the "COOLER" and "HOTTER" and "MODE" buttons simultaneously for about three (3) seconds and release to enter "Installer mode" to allow parameters to be adjusted,
  - press the "MODE" button to cycle through the available parameters until "SP\_" shows on the display,
  - press the "COOLER" button repeatedly until the lowest temperature is indicated on the display,
  - holding down the "COOLER" and "HOTTER" and "MODE" buttons simultaneously for about three (3) seconds and release to exit "Installer mode".
3. Turn off all electric power to the appliance.
4. This appliance is equipped with an ignition device which automatically lights the pilot. Do not try to light the pilot by hand.
5. Turn the gas control knob clockwise  to the "OFF" position. Do not force.
6. Wait ten (10) minutes to clear out any gas. Then smell for gas, including near the floor. If you smell gas, STOP! Follow "B" in the safety information above on this label. If you don't smell gas, go to the next step.
7. Make sure the water heater is filled with water.
8. Turn gas control knob counterclockwise  to "ON".
9. Turn on all electric power to the appliance.
10. Set the integrated control to the desired temperature by:
  - holding down the "COOLER" and "HOTTER" and "MODE" buttons simultaneously for about three (3) seconds and release to enter "Installer mode",
  - press the "MODE" button to cycle through the available parameters until "SP\_" shows on the display,
  - press the "COOLER" or "HOTTER" button repeatedly until the desired temperature is indicated on the display,
  - holding down the "COOLER" and "HOTTER" and "MODE" buttons simultaneously for about three (3) seconds and release to exit "Installer mode".
11. If the appliance will not operate after three automatic tries, follow these instructions once more. If the appliance still refuses to light, follow the instructions "To Turn Off Gas To Appliance" and call a qualified service technician or gas supplier.



Honeywell Gas Valve



### TO TURN OFF GAS TO APPLIANCE

1. Set the integrated control to lowest setting.
2. Turn off all electric power to the appliance if service is to be performed.
3. Turn the gas control knob clockwise  to the "OFF" position. Do not force.

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## V) OPERATION

### Safety Shut-off

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

1. The pilot flame is extinguished for any reason.
2. The water temperature exceeds 96°C (205°F).

Read and understand these directions thoroughly before attempting to operate the water heater ("Lighting & Operating Instructions"). Check the data plate on the front of the water heater for the correct gas. Do not use this water heater with any gas other than the one listed on the data plate. If you have any questions or doubts, consult your gas supplier or gas utility company.

### L.P. (Propane) Models

Propane gas is heavier than air and in the occurrence of a leak in the system, the gas will settle on the floor level. Basements, crawl spaces, skirted areas under mobile homes (even when ventilated), closets and areas below ground level will serve as pockets for the accumulation of gas. Before lighting a propane gas water heater, smell all around the appliance at floor level. If you smell gas, follow the instructions as given in the warning on the front page. When your propane tank runs out of fuel, turn off the gas at all gas appliances including pilot lights. After the tank is refilled, all appliances must be re-lit according to their manufacturer's instructions.

### Checking the Draft

<b>⚠ WARNING</b>	
	<b>Burn Hazard</b> <b>Do not touch vent.</b> <b>Doing so can result in burns.</b>

After successfully lighting the water heater, allow the unit to operate for 15 minutes and check the drafthood relief opening for proper draft. Pass a match flame around the relief opening of the drafthood (See Figure 14). 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

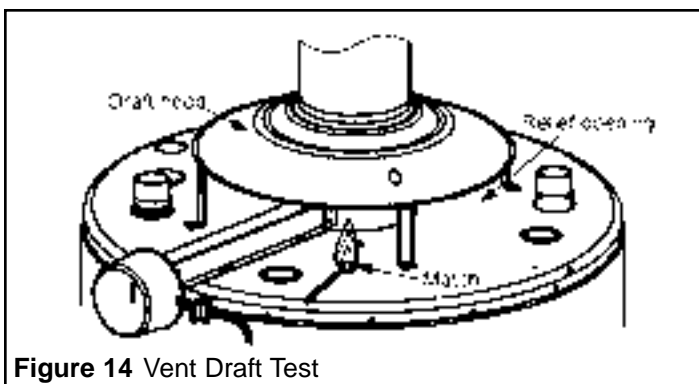


Figure 14 Vent Draft Test

water heater until proper adjustments or repairs are made to the vent pipe system.

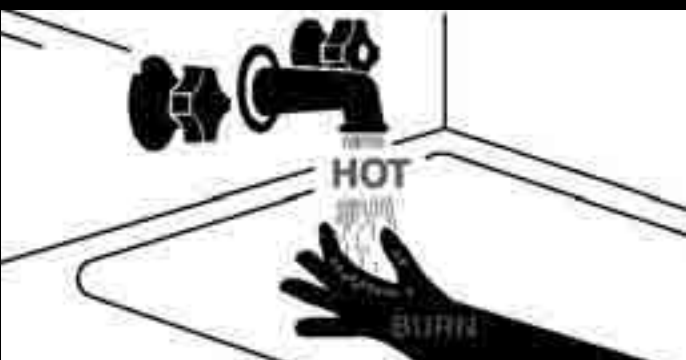
### Water Temperature Regulation

<b>⚠ WARNING:</b> <b>Risk of scalding</b> <b>Hot water can produce third degree burns</b> <b>in 6 seconds at . . . . .60°C (140°F)</b> <b>in 30 seconds at . . . . .54°C (130°F)</b> <b>in 5 minutes at . . . . .49°C (120°F)</b>
--

The integrated control is adjusted to a temperature setting of 49°C (120°F) when it is shipped from the factory. To make a change to this setting, use the buttons on the front of the integrated control to select the desired water temperature.

**Important:** Since most commercial installations utilize higher temperatures, the use of a tempering valve is strongly recommended in all domestic hot water lines (i.e. public restroom sinks, etc). Auxiliary commercial equipment (i.e. dishwashers, laundry equipment, etc.) may require higher temperature settings. Refer to instruction manuals supplied with this type equipment for recommended temperature settings.

**Important:** Adjusting the integrated control past the 49°C (120°F) setting will increase the risk of scald injury.

<b>⚠ DANGER</b>


**Water temperature over 52°C (125°F) can cause severe burns instantly or death from scalds.**  
**Children, disabled and elderly are at highest risk of being scalded.**  
**Feel water before bathing or showering.**  
**Temperature limiting valves are recommended.**

### Water Heater Operation

When the integrated control calls for heat, it will signal the damper to open. Once the damper fully opens, it will signal the igniter to light the pilot. The pilot will then ignite the main burners. The water heater will operate until the call for heat ends. At this time the main burners and pilot will shut-off and the damper will close. See Figure 22 for a sequence of operation flowchart.

## Burner Flames

Inspect the burner flames through the viewport and compare them to the drawings in Figure 15. A properly operating burner should produce a soft blue flame and be about 50mm (2 in.) to 64mm (2 1/2 in.) in height. 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 colour. Contaminated air may cause an orange coloured flame. Contact a qualified service technician if the flame is not satisfactory.

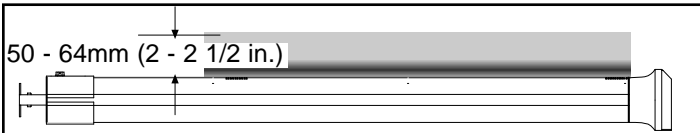


Figure 15 Pilot/Burner Flame

## Stacking

Stacking occurs when a series of short draws of hot water are taken from the water heater tank. This causes increased cycling of the burner and can result in increased water temperatures at the hot water outlet. A tempering valve should be installed in the hot water supply line to reduce the risk of scald injury.

## Emergency Shut Down

**Important:** If overheating occurs or the gas supply fails to shut off, close the manual gas supply shut-off valve and turn the gas valve knob to the “OFF” position. Turn off the electrical supply to the unit and close the cold water supply valve. Do not operate the water heater again until it has been thoroughly checked by a qualified service technician.

## Operational Conditions

### Condensation

Moisture from the products of combustion condenses on the tank surface and the outside jacket of the water heater and forms drops of water which may fall onto the burner or other hot surfaces. This will produce a “sizzling” or “frying” noise. **This condensation is normal and should not be confused with a leaking tank.** Condensation may increase or decrease at different times of the year.

High efficient energy saver water heaters will produce larger amounts of condensation on initial start up or when a large amount of hot water is being used. **Do not confuse this with a “tank leak”.** Once the water reaches a temperature of 49°C (120°F) and the tank warms up (usually 1-2 hours), the condensation will stop.

**Important:** It is always recommended that a suitable 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. Under no circumstances is the manufacturer to be held responsible for any water damage in connection with this water heater.

## 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 “Draining and Flushing”.

## Smoke/Odour

The water heater may give off a small amount of smoke and odour 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 few minutes of operation.

## VI) INTEGRATED CONTROL

### High Humidity or Dripping Water

Over time, dripping water or high ambient humidity can create unwanted electrical paths on the circuit board, causing the integrated control to fail. Never install an appliance where water can drip on the controls. In addition, high ambient humidity can cause the gas valve to corrode and finally fail. Where the appliance may be installed in a humid

### WARNING



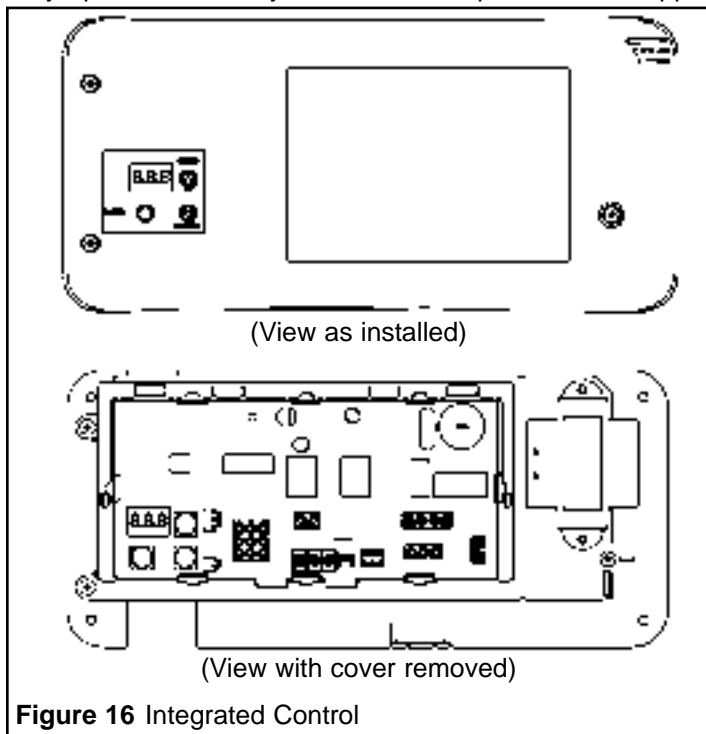
Fire or Explosion Hazard  
Can cause severe injury, death or property damage.

1. **The integrated control can malfunction if it gets wet, leading to accumulation of explosive gas.**
  - . Never install where water can flood, drip or condense on the integrated control.
  - . Never try to use an integrated control that has been wet - replace it.
2. **Liquefied petroleum (LP) gas is heavier than air and will not vent upward naturally.**
  - . Do not light pilot or operate electric switches, lights, or appliances until you are sure the appliance area is free of gas.
3. **If a new gas valve is to be installed, turn off gas supply before starting installation. Conduct Gas Leak Test according to gas valve manufacturer’s instructions after the gas valve is installed.**
4. **If the integrated control must be mounted near moisture or water, provide suitable waterproof enclosure.**

atmosphere, make sure air circulation around the integrated control and the gas valve is adequate to prevent condensation. It is also important to regularly check out the system. A NEMA 4 enclosure may be needed.

### Water or Steam Cleaning

Once an integrated control or gas valve has been wet, it may operate unreliably and must be replaced. If the appli-

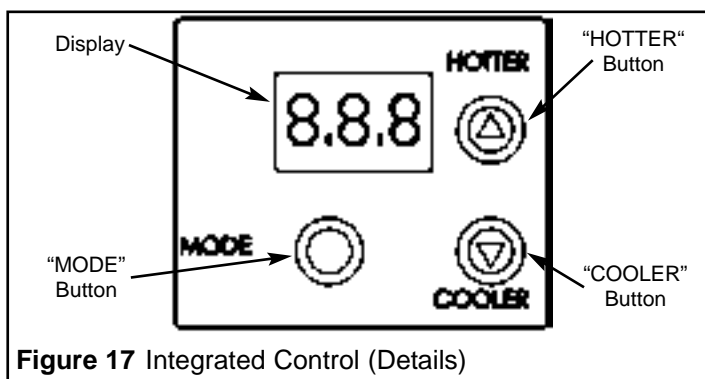


**Figure 16** Integrated Control

ance is likely to be cleaned with water or steam, the controls and associated wiring should be covered so that water or steam cannot reach them. The controls should be high enough above the bottom of the cabinet so they will not be subjected to flooding or splashing during normal cleaning procedures. If necessary, shield the controls to protect them from splashing water. A NEMA 4 enclosure is recommended for the ignition module.

### Operating Instructions

The on-board user interface consists of three push-button switches ("HOTTER", "COOLER" and "MODE") and a three-digit, 7-segment LED display (see Figures 16 & 17). Together these controls can be used to view system settings and status as well as set some control parameters. The integrated control is active only while power is applied and can be set to one of three different modes: "Reading", "Installer" or "Error" (explained below).



**Figure 17** Integrated Control (Details)

### Operational status codes

This mode is used to display the operational status of the integrated control. If an "Err" code is being displayed, press and hold the "COOLER" button for 3 seconds to reset. To reset temperature set point, make sure the heater is not fired on. Press and hold the "HOTTER", "COOLER" and "MODE" buttons simultaneously for 5 seconds until

"SP" is displayed. Press the ▲ (HOTTER) button to increase and ▼ (COOLER) button to decrease the temperature set point. When the set point is reached, press and hold the "HOTTER", "COOLER" and "MODE" buttons again for 5 seconds. The display should now be back to normal showing "StA" and "SP".

Description	Display Shows
Calling for heat	StA 17
Opening damper	StA 18
Pilot igniting (90 seconds)	StA 6
Waiting for ignite (60 seconds)	StA 10
Ignition failed lock out (after 3 trials)	Err 62
Successful sense igniting	StA 7
Open gas valve	StA 8
ECO cut off	Err 65
Thermostat satisfied	StA 1

Description	Display Shows
Valve control disconnect	StA 15
Damper quick connector disconnect	StA 18
Primary disconnect	no display
Secondary disconnect	no display
Line disconnect	no display
Sensor 2 disconnected	Err 31
Sensor 1 disconnected	Err 32
Main gas valve disconnected	StA 8
Pilot gas valve disconnected	StA 6

**Figure 18** Display readout definitions (Operational Status codes)

## Reading mode

The integrated control defaults to Reading mode after a reset. This mode is for information display only and no adjustments can be made to parameter settings. The display characters for each parameter and their definitions are shown in Figure 19. Use the “MODE” button to cycle

through the available parameters. Once a parameter is selected, the ▲ (HOTTER) and ▼ (COOLER) buttons are used to view the value of the selected parameter. If no button is pressed, the display will cycle through the parameter's name, value and unit at one (1) second intervals.

Text	Description	Display Shows	Text	Description	Display Shows
sta	Current State	StA	°F	Temp. Displayed is in Degrees Fahrenheit	°F
fla	Flame Current (Measured)	FLA	°C	Temp. Displayed is in Degrees Celsius	°C
sp	Current Setpoint	SP	uA	Units Displayed are in Micro Amps	uA
s1t	Current Sensor 1 Temperature (Limit)	S1t	off	Input or Output is Off	OFF
s2t	Current Sensor 2 Temperature (2-wire)*	S2t	on	Input or Output is On	On
hr	Heat Request Status	hr			

**Figure 19** Display readout definitions (Reading mode)

## Installer mode

The integrated control must be in installer mode in order for the parameters (see Figure 20) to be adjusted. This mode is entered by pressing and holding all three buttons simultaneously for about three (3) seconds. Repeating this action, or if no key is pressed for 60 seconds, will set the integrated control back to Reading mode. Use the “MODE”

button to cycle through the available parameters. Once a parameter is selected, use the ▲ (HOTTER) and ▼ (COOLER) buttons to adjust the value of the selected parameter. If no key is pressed, the display cycles through parameter name, value and unit at 1 second interval for 60 seconds before returning to Reading mode.

Text	Description	Display Shows	Text	Description	Display Shows
loc	Reset the Hard Lockout Flag	Loc	F-C	Set mode to °F or °C	F-C
rst	Reset the Soft Lockout Timer	rSt	sp_	Set the Setpoint mode	SP_

**Figure 20** Display readout definitions (Installer mode)

## Error mode

When the integrated control detects a failure condition it enters Error mode. In this mode the display alternates between showing “Err” and an error code number, displaying each for one (1) second. The display characters for each

error and their definitions are shown in Figure 21. While in Error mode the functions of the buttons are disabled. The integrated control returns to Reading mode only if all error conditions are cleared.

Description	Display Shows	Description	Display Shows
Flame was sensed out of normal sequence	Err 6	AC line frequency error	Err 58
Flame was sensed during pre-purge	Err 23	AC line voltage error	Err 59
Flame was sensed during post-purge	Err 24	Line volage unstable	Err 61
Temp. sensor(2), interface or A/D conversion failure	Err 31	Soft Lockout - Max number of retries exceeded	Err 62
Temp. sensor(1), interface or A/D conversion failure	Err 32	Soft Lockout - Max number of recycles exceeded	Err 63
Atmospheric Damper End Switch failed to close	Err 55	Soft Lockout - Electronics failure	Err 64
Atmospheric Damper End Switch failed to open	Err 56	Over Temperature error - ECO limit exceeded	Err 65
Flame Rod shorted to burner ground	Err 57		

**Figure 21** Display readout definitions (Error mode)

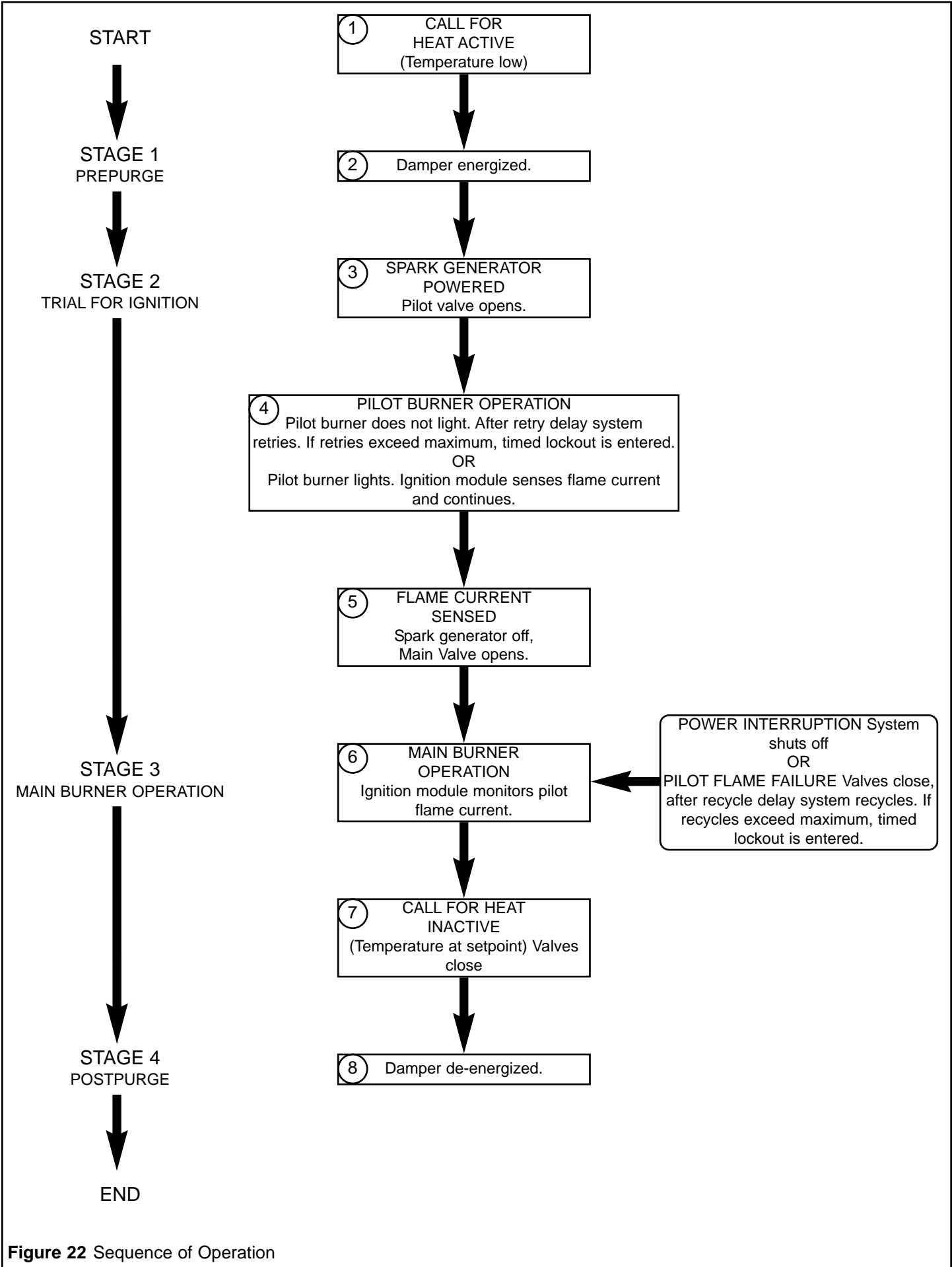


Figure 22 Sequence of Operation

## VII) MAINTENANCE

### Draining and Flushing

It is recommended that the tank be drained and flushed every 6 months to remove sediment which may buildup during operation.

**Note:** Warranty is null and void in the event lime & scale deposits are allowed to exceed two inches in depth.

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 electricity.
2. Close the cold water inlet valve.
3. Open a nearby hot water faucet.
4. Connect a hose to the drain valve and terminate it to an adequate drain.

**Note:** The drain hose should be rated for at least 93°C (200°F). If the drain hose does not have this rating, open the cold water inlet valve and a nearby hot faucet until the water is no longer hot.

5. Open the water heater drain valve and allow all the water to drain from the tank.
6. Remove the screws holding the cleanout plate, then remove the plate for access.
7. Remove any lime, sediment, or scale from the tank. Be careful not to damage the glass lining.
8. Flush the tank with water as needed to remove any remaining sediment.
9. Check gasket on cleanout plate, replace if necessary.
10. Replace the cleanout plate and screws, tighten sufficiently.
11. Close the drain valve, refill the tank, and restart the water heater as directed under "Lighting & Operating Instructions".

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 Preventative Maintenance

At least annually, a visual inspection should be made of the venting and air supply system, piping systems, main burner, and pilot 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.
- Build-up of soot and carbon on the main burner and pilot burner. Check for a soft blue flame.
- 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.
- Verify proper operation after servicing this water heater.

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

## Temperature and Pressure Relief Valve

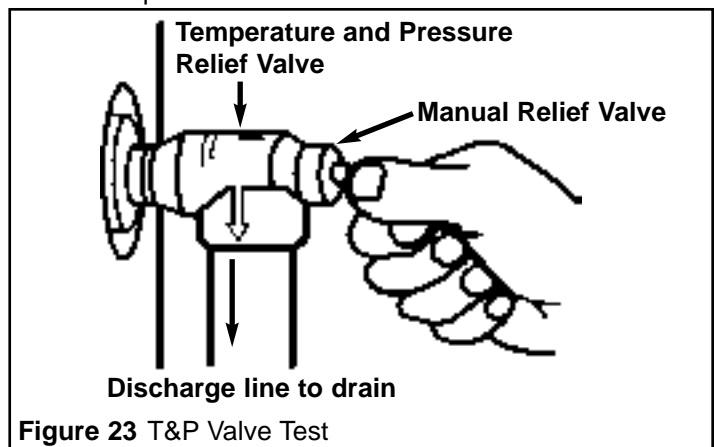
### WARNING



#### Explosion Hazard

- **If the temperature and pressure relief valve is dripping or leaking, have a licensed plumber repair it.**
- **Do not plug valve.**
- **Do not remove valve.**
- **Failure to follow these instructions can result in death or an explosion.**

Manually operate the temperature and pressure relief valve at least once a year to make sure it is working properly (See Figure 23). 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. If the valve fails to completely reset and continues to release water, immediately turn off the gas at the manual gas shut-off valve, the electric power and the cold water inlet valve and call a qualified service technician.



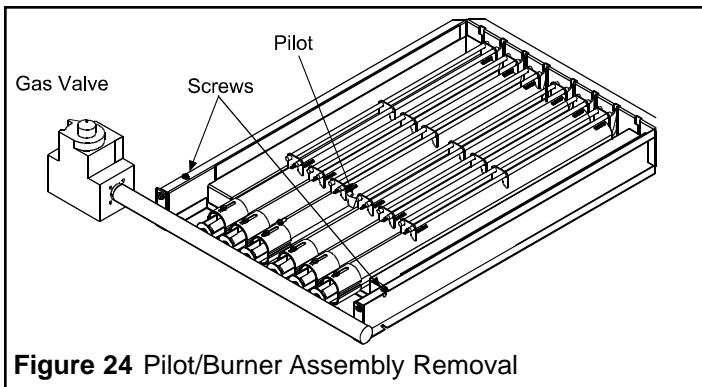
**Figure 23** T&P Valve Test

### Pilot Burner and Main Burner Assembly Inspection

To access the pilot burner and main burner for inspection:

1. Turn off gas at main shutoff valve and turn off electrical power.
2. Disconnect the gas supply line from the gas valve.
3. Remove the 2 screws holding the Pilot & Main Burner Assembly in place. See Figure 24 for location of screws.
4. Carefully slide the assembly out of the water heater.
5. If needed, use a brush or vacuum to clean any soot or debris from the burners.
6. Check for correct alignment of burners before sliding assembly back into the water heater.
7. Carefully slide Pilot/Burner Assembly back into the water heater.





**Figure 24** Pilot/Burner Assembly Removal

8. Replace and sufficiently tighten the two screws holding the Pilot/Burner Assembly in place.
9. Reconnect the gas supply line to the gas valve.
10. Turn on gas at main shutoff valve.
11. Check for gas leaks and proper operation on the unit after servicing.

### Gas Valve Removal and Replacement

It is recommended that this maintenance be performed by a qualified service technician.

1. Turn the integrated control to its lowest setting.
2. Turn off gas at manual gas shut-off valve (see Figure 3 for reference) and disconnect electrical power from water heater.
3. Unplug the 4 wires located on the gas valve. Label wire position for correct reattachment.
4. Disconnect pilot tube from the gas valve.
5. Disconnect the main gas line from the gas valve. Use care not to crack the gas valve housing.
6. Carefully unscrew the gas valve from the burner assembly.

**Important:** When removing gas valve do not use a pipe wrench or vise to grip the body.

7. When replacing the gas valve, use an approved Teflon® or pipe joint compound on the pipe threads.
8. Screw the new gas valve onto the burner assembly.
9. Reconnect the pilot tube to the gas valve.
10. Reconnect the main gas line to the gas valve.
11. Turn the gas supply on and check for leaks. Use a chlorine-free soap and water solution (bubbles forming indicate a leak) or other approved method.
12. Reconnect the 4 wires to their proper location and restore electrical power to the unit.
13. Verify proper operation after servicing this water heater.
14. If additional information is required, contact the Product Service and Support Group at 1-800-456-9805.

### Anode Rod Inspection

Each water heater contains at least one anode rod, which will slowly deplete while protecting the glass-lined tank from corrosion and prolonging the life of the water heater. Certain water conditions will cause a reaction between the rods and the water. Once the anodes are depleted, the tank will start to corrode, eventually developing a leak. The most common complaint associated with the anode rod is a "rotten egg smell" produced from the presence of hydrogen sulfide gas dissolved in the water. Do not remove this rod permanently

as it will void any warranties, stated or implied. A special anode is available for this complaint. This rod may reduce but not eliminate water odour problems. The water supply system may require special filtration equipment from a water conditioning company to successfully eliminate all water odour problems. Artificially softened water is exceedingly corrosive because the process substitutes sodium ions for magnesium and calcium ions. The use of a water softener may decrease the life of the water heater tank. The anode rods should be removed from the water heater tank every 3 years for inspection. If the rods are more than 50% depleted, the anode rods should be replaced.

To replace the anodes:

1. Turn off gas supply and electrical power 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 20l (5 gal) of water from tank (Refer to "Draining and Flushing" for proper procedures). Close drain valve.
4. Remove old anode rods.
5. Use Teflon® tape or approved pipe sealant on threads and install new anode rods.
6. Turn on water supply and open nearby hot water faucet to purge air from water system.
7. Restart the water heater as directed under "Lighting & Operating Instructions". See the "Parts Reference Illustration" for anode rod location.

### Replacement Parts

Replacement parts may be ordered through your plumber or the local distributor. 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 "Parts Reference Illustration" for a list of available repair parts.

## VIII) COMBO HEATING

### Space Heating

If this unit is to be used to supply both space heating and domestic potable (drinking) water then the following instructions must be followed:

1. All piping and components used must be suitable for use with domestic (potable) drinking water.
2. Do not use piping or components that have been connected to a non-potable system or treated with chromates or other toxic chemicals. Do not add any chemicals to the water heater piping.
3. If system requires temperatures in excess of 49°C (120°F) install a tempering valve, per the manufacturer's instructions, in the domestic (potable) hot water line to limit the risk of scalding (See Figure 8).
4. Be sure to follow the manual(s) shipped with the heating system. Also follow any state or local codes.

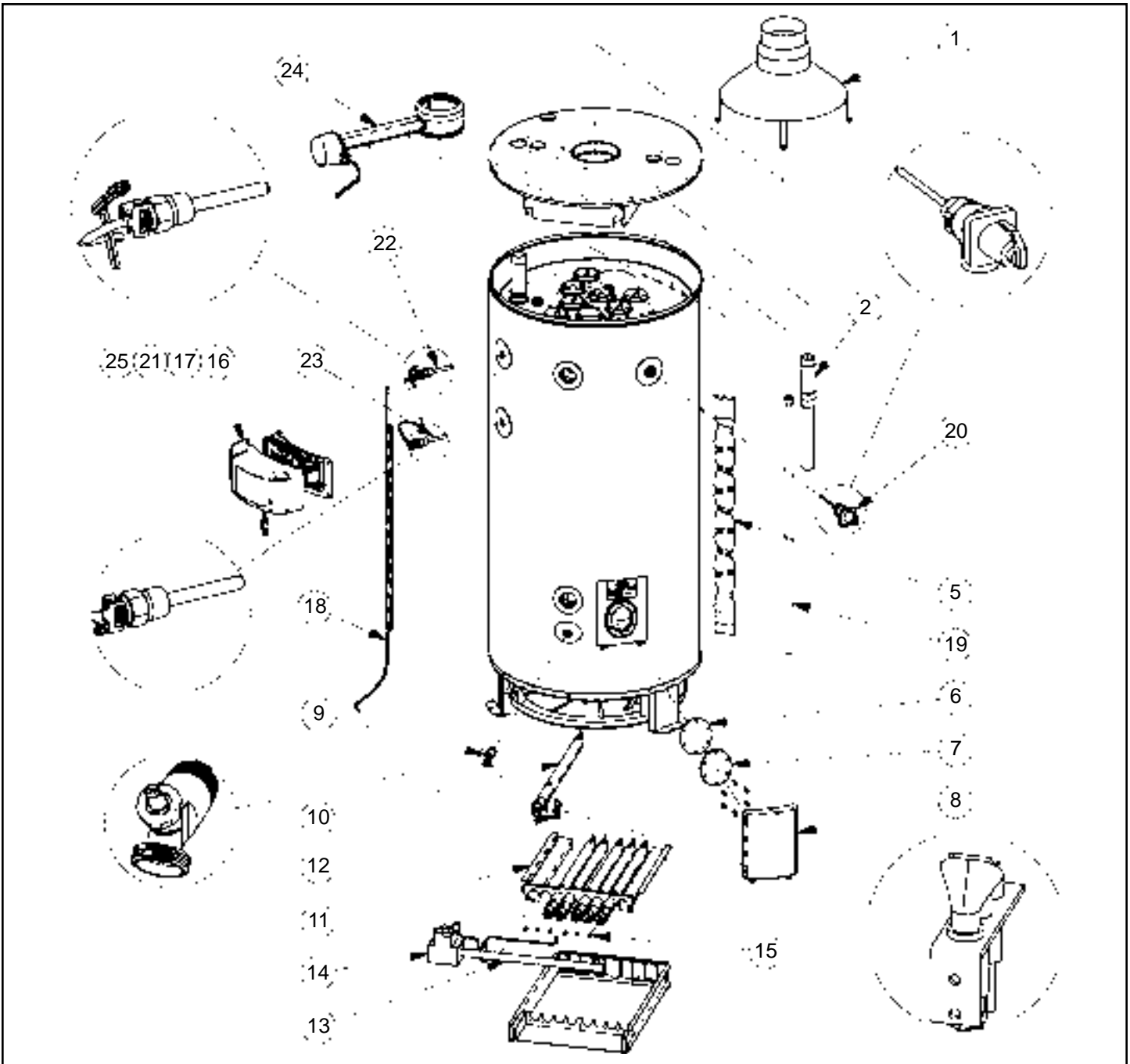
## IX) TROUBLESHOOTING GUIDE

Detect Conditions	Alarm (ERROR) Name	Control Action	Service Suggestion (After Error Matured)	Detection Time	Remote Display
Flame current lower than threshold.	FLAME_CURRENT	Normal.	Clean flame rod.	Flame sensing active.	FlameSenseCurrentLow
Damper END SW failed to close (stuck open).	DAMPER_SW_CLOSE	Wait until closed.	Check END SW.	In an IGN cycle.	alarm #
Damper END SW failed to open (stuck closed).	DAMPER_SW_OPEN	Wait until open.	Check END SW.	In an IGN cycle.	DamperEndSwitchOpen
Flame rod to ground leakage resistance < ~200K (AC voltage dependent).	ROD_SHORT	WaitForRecovery state. Resume normal operation when debounced normal.	Check flame rod.	Flame drive inactive.	alarm #
Line voltage power issues, too noisy, or frequency out of normal range.	ZERO_CROSSING	WaitForRecovery state. Resume normal operation when debounced normal.	Check AC input.	All time.	alarm #
Line voltage low/high.	AC_LINE	WaitForRecovery state. Resume normal operation when debounced normal.	Check AC input.	All time.	alarm #
Sensor 2 (averaging sensor) resistance out of acceptable range	SENSOR2	WaitForRecovery state. Resume normal operation when debounced normal.	Replace optional sensor.	All time.	UpperSensor
Sensor 1 (limit sensor) resistance out of acceptable range	SENSOR1	WaitForRecovery state. Resume normal operation when debounced normal.	Replace limit sensor.	All time.	LowerSensor
DCDC output unstable.	POWER	WaitForRecovery state. Resume normal operation when debounced normal.	Check AC input. If stable, replace control.	When flame sensing active.	alarm #
Retry>max. detected by IGN state machine.	SLO_RETRY	Soft lockout.	Check gas supply, burner and harness.	When heating required.	SoftLockout
Recycle > max. detected by IGN state machine.	SLO_RECYCLE	Soft lockout.	Check gas supply, burner and harness.	When heating required.	SoftLockout

**Table 6** Error Codes

<b>Detect Conditions</b>	<b>Alarm (ERROR) Name</b>	<b>Control Action</b>	<b>Service Suggestion (After Error Matured)</b>	<b>Detection Time</b>	<b>Remote Display</b>
Valve relays shorted/open, other internal electronic failures	SLO_ELECTRONICS	Soft lockout.	Replace control.	All time.	SoftLockout
Flame out of sequence.	SLO_FLAME_SEQ	Soft lockout.	Check gas supply, burner and harness.	During a heating cycle.	SoftLockout
Flame detected before trial.	FLAME_IN_PREPURGE	Soft lockout.	Check gas supply, burner and harness.	Before ignition.	SoftLockout
Flame detected after trial.	FLAME_IN_POSTPURGE	Soft lockout.	Check gas supply, burner and harness.	After a heating cycle.	SoftLockout
Sensor 1 or Sensor 2 reporting greater than 200°F.	OVER_TEMP	Non-volatile Hard Lockout for Europe. Auto-reset for domestic.	Check Appliance operation and limit sensor.	All time.	OverTemp
Valve relays welded 5 times.	ELECTRONICS	Non-volatile Hard Lockout for Europe. Auto-reset for domestic.	Replace control.	During a heating cycle.	Hard Lockout
<b>Table 6 (cont'd)</b> Error Codes					

X) PARTS REFERENCE ILLUSTRATION



No.	Part Name and Description	No.	Part Name and Description
1	Draffhood	14	Gas Valve
2	Dip Tube (Top)	15	Main Burner Orifice(s)
3	Dip Tube (Front) (optional, not shown)	16	Control Box Cover
4	Dip Tube (Back) (optional, not shown)	17	Transformer
5	Flue Baffles	18	Wiring Harness
6	Cleanout Gasket	19	Anode Rod(s)
7	Cleanout Cover	20	T&P Valve
8	Cleanout Cover Jacket	21	Integrated Control CCA
9	Drain Valve	22	Upper Temperature Sensor/ECO
10	Main Burner Tube(s)	23	Lower Temperature Sensor
11	Burner Tray	24	Flue Damper
12	Pilot Burner Assembly	25	Power Cord
13	Main Burner Manifold		

Figure 25 Repair Parts Listing