To the Installer:
Please read these instructions and deliver to consumer when installation is complete.

To the Consumer:
Please read these instructions and keep for future reference.

Installation and Operation Instructions Manual

GAS-FIRED UL LISTED

BOCK® WATER HEATERS

Outdoor Commercial Gas Water Heater

Models: ODOT200, ODOT250, ODOT299, ODOT300*2, ODOT400*2, ODOT500*2

Warranty, Registration Card and Parts List are included.
Owner: Please remember to return the Registration Card!

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 vicintiy 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 perfomred by a qualified installer, service agency or the gas supplier.

⚠WARNING
Improper installation, adjustment, alteration, service or maintenance can cause serious injury or property damage. Refer to this manual. For assistance or additional information, consult a qualified installer or service agency.

⚠WARNING
Install in accordance with all local codes. In the absence of local codes, refer to NFPA 54

⚠CAUTION
The recommended temperature for normal residential use is 120°F. The dial on the aquastat does not always reflect the out-coming water temperature and it could occasionally exceed 120°F. Variation in out-coming temperature could be based on factors including but not limited to usage patterns and type of installation. Test water at the tap nearest to the water heater. See page 37 for measuring the out-coming water temperature.

⚠WARNING
Hotter water increases the risk of scald injury. Before adjusting the water temperature setting, read this instruction manual. Temperatures at which injury occurs vary with the person's age and the length of exposure. The slower reaction time of children, elderly or physically or mentally challenged persons increases the scalding hazard to them. It is recommended that lower water temperatures be used where these exposure hazards exist. Households with small children or invalids may require a temperature setting less than 120°F to prevent accidental contact with hot water.
To produce less than 120°F, use point-of-use temperature limiting devices.

If higher water temperature is needed in part of the water system, automatic temperature limiting devices must be used on all lines to water taps.

⚠WARNING
Water heater blankets may restrict air flow to the water heater and cause fire, asphyxiation, personal injury or death.

THIS MANUAL HAS BEEN PREPARED TO ACQUAINT YOU WITH THE INSTALLATION, OPERATION, AND MAINTENANCE OF YOUR WATER HEATER AND TO PROVIDE IMPORTANT SAFETY INFORMATION.

Read all instructions thoroughly before attempting installation or operation of your water heater. Keep these instructions for future reference.

Local plumbing and electrical codes must be followed in the installation of this water heater. In the absence of a local code use the UNIFORM PLUMBING CODE and the NFPA Code. Local codes may supersede instructions in this installation manual.

These instructions are a guide for the correct installation of the water heater. The manufacturer will not be liable for damages caused by failure to comply with the installation and operating instructions outlined on the following pages.

FAILURE TO FOLLOW THESE INSTRUCTIONS OR ALL APPLICABLE BUILDING CODES AND REGULATIONS VOIDS THE WARRANTY ON THIS WATER HEATER.

IMPORTANT SAFETY INSTRUCTIONS

The proper installation, use and servicing of this water heater is very important to your safety and the safety of others.

⚠ This is the safety alert symbol. Statements following this symbol contain important safety information. Obey all safety messages that follow this symbol to avoid possible injury or death.

Important safety information will be preceded by the safety alert symbol and the words **DANGER, WARNING, CAUTION, OR NOTICE.**

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

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

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

NOTICE calls attention to observe a specified procedure.

⚠ DANGER

Water heaters utilizing Liquefied Petroleum gas (LP) are different from natural gas models. A natural gas heater will not function safely on LP gas and vice versa. To avoid possible equipment damage, personal injury or fire: DO NOT connect this water heater to a fuel type not in accordance with the rating label. These units are only certified for a single fuel type.

⚠ DANGER

Failure to properly install the vent and combustion air intake system as outlined in this manual can result in unsafe operation of the water heater. To avoid the risk of fire, explosion, or asphyxiation from carbon monoxide, never operate this water heater unless it is properly vented and has adequate air supply for combustion and dilution of flue gas. Be sure to inspect the system for proper installation at initial start-up; and at least annually thereafter. See the Maintenance section for more information.

SAVE THESE INSTRUCTIONS

TABLE OF CONTENTS

SECTION I: SPECIFICATIONS

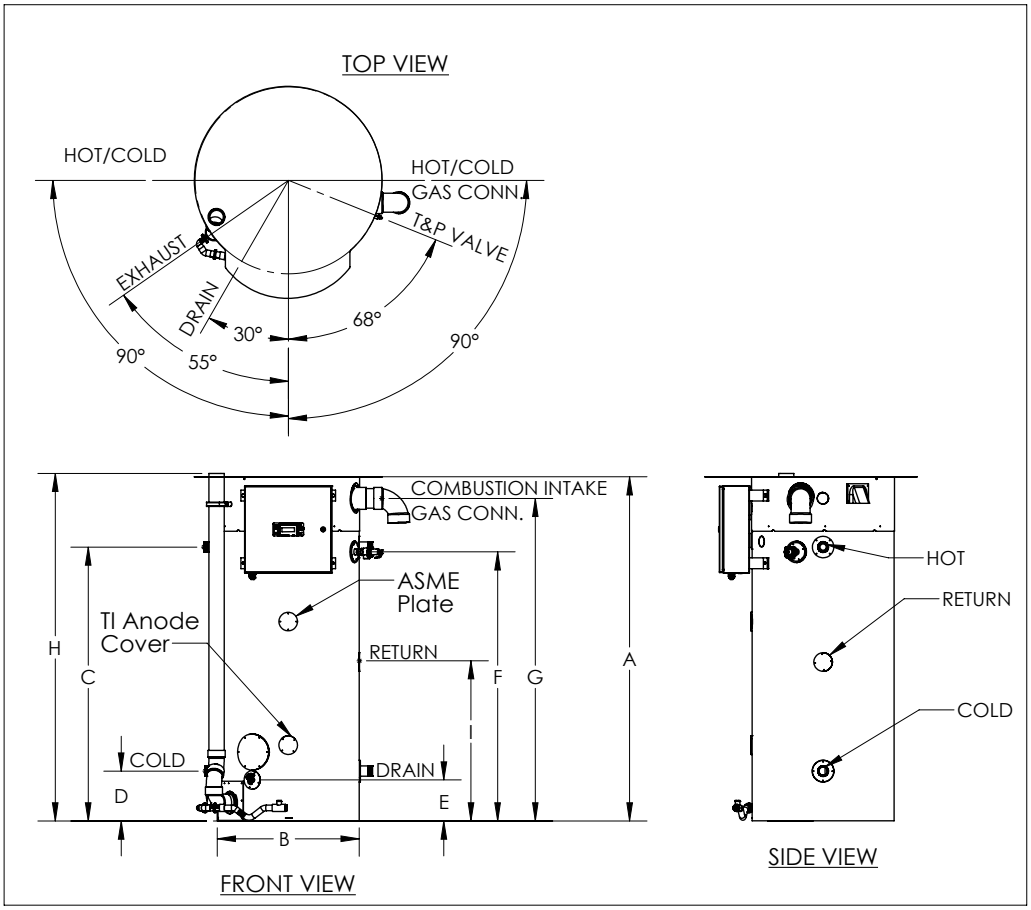


Figure 1: All Models

Table 1: Dimensions

Model	Rated Storage Capacity, GAL (L)	Rated Maximum Input, Btu/hr (kW)	Rated Minimum Input, Btu/hr (kW)	Thermal Efficiency (%) @ Max. Input	Thermal Efficiency (%) @ Min. Input	Recovery @ 100°F rise, GAL/HR (L/HR)	1st Hr. Delivery @ 100°F rise, GAL (L)	DIMENSIONS, INCHES (cm) A	B	C	D	E	F	G	H	I	CONNECTION SIZES COLD (NPT)	HOT (NPT)	RECIRC (NPT)	Gas (NPT)	Shipping Weight, LBS (kg)
ODOT200*(-A)	100 (378)	199,999 (58.6)	76,000 (22.3)	95	98	228 (863)	298 (1,128)	67.25 (171)	32.00 (81)	51.53 (131)	11.43 (29)	9.43 (24)	50.18 (127)	62.75 (159)	69.50 (177)	N/A	2"	2"	NA	1	1,195 (542)
ODOT250*(-A)	100 (378)	250,000 (73.3)	76,000 (22.3)	94	98	282 (1,067)	352 (1,332)	67.25 (171)	32.00 (81)	51.53 (131)	11.43 (29)	9.43 (24)	50.18 (127)	62.75 (159)	69.50 (177)	N/A	2"	2"	N/A	1"	1,195 (542)
ODOT299*(-A)	100 (378)	299,999 (87.9)	76,000 (22.3)	93	98	334 (1,264)	404 (1,529)	67.25 (171)	32.00 (81)	51.53 (131)	11.43 (29)	9.43 (24)	50.18 (127)	62.75 (159)	69.50 (177)	N/A	2"	2"	N/A	1"	1,195 (542)
ODOT300*2(-A)	125 (473)	300,000 (87.9)	80,000 (23.4)	99	99	357 (1,351)	480 (1,817)	78.8 (200)	32.5 (82)	62.75 (159)	11.4 (29)	9.4 (24)	61.7 (156)	74.0 (188)	80.75" (205)	36.3" (92)	2"	2"	1"	1-1/2"	1,185 (539)
ODOT400*2(-A)	125 (473)	399,999 (117.2)	80,000 (23.4)	97	99	465 (1,760)	587 (2,222)	78.8 (200)	32.5 (82)	62.75 (159)	11.4 (29)	9.4 (24)	61.7 (156)	74.0 (188)	80.75" (205)	36.3" (92)	2"	2"	1"	1-1/2"	1,185 (539)
ODOT500*2(-A)	125 (473)	500,000 (146.5)	80,000 (23.4)	96	99	576 (2,180)	696 (2,635)	78.8 (200)	32.5 (82)	62.75 (159)	11.4 (29)	9.4 (24)	61.7 (156)	74.0 (188)	80.75" (205)	36.3" (92)	2"	2"	1"	1-1/2"	1,185 (539)

*NOTE: * denotes fuel type, N or LP, and suffix "-A" denotes ASME version.*

*Replace * in Model with fuel type abbreviation. Natural Gas (N) or Propane Gas (LP).*
For HIGH ALTITUDE models, the following additional suffixes are defined as:
"-H25" = Approved for altitudes greater than 2,000 up to 5,400 FT

For natural gas:
MINIMUM GAS SUPPLY PRESSURE *(at gas control) = 3.5" W.C. (dynamic)*
MAXIMUM GAS SUPPLY PRESSURE *(at gas control) = 14" W.C. (static or dynamic)*

For LP gas:
MINIMUM GAS SUPPLY PRESSURE *(at gas control) = 8" W.C. (dynamic)*
MAXIMUM GAS SUPPLY PRESSURE *(at gas control) = 14" W.C. (static or dynamic)*
Note: Dynamic pressure is measured while gas is flowing and static pressure is measured while gas is not flowing.

All Bock products meet or exceed current ASHRAE standards
These products are design certified by UL (Underwriters Laboratories) and meet ANSI Z21.10.3/CSA 4.3 requirements for operation up to 180°F (82°C) as a Category IV water heater.
Approved as an outdoor automatic storage water heater.

SECTION II: GENERAL INFORMATION

WHEN YOU RECEIVE YOUR NEW WATER HEATER

Check the new equipment to see if all components are in good condition. If damage is observed or parts appear to be missing, contact your wholesaler.

WATER TREATMENT/FILTRATION

In areas where poor water conditions are suspected (i.e. lime, iron, and other minerals), it is essential that the water be tested and appropriate action taken to prevent damage to the water heater and ensure the quality of the water.

TEMPERATURE CONTROL

The water heater is equipped with a main operating control that manages the temperature regulating and limiting functionality. For domestic hot water, the proper temperature setpoint is 120°F. For commercial applications, the maximum approved temperature setpoint is 180°F. Sensors in the top of the tank measure water temperature. The control constantly compares the sensor values to the temperature setpoint and controls the burner power (on/off) and modulation accordingly.

The manual reset, temperature limiting safety function is managed by the main operating control. In the event that the tank temperature sensor reads 190°F the control will shut off all gas to the water heater. Manually reset the control to allow the heater to resume normal operation. Should over heating occur, and the gas supply fails to automatically lockout, manually turn off the power switch.

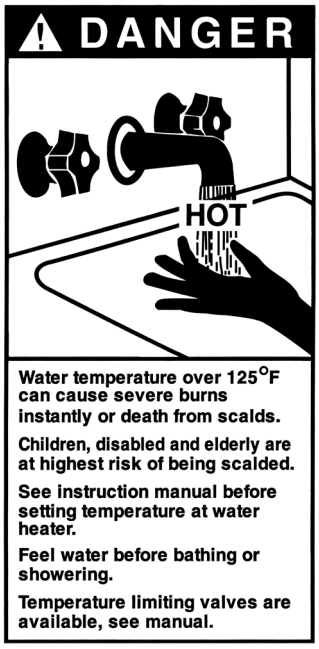
The temperature setpoint is factory set at 120°F. If hotter water is required a tempering device or anti-scald device must be installed at the domestic hot water outlet of the heater or at the point of use. Table 2 details the approximate relationship of water temperature and time with regard to scald injury. It is important for the user to understand the necessity of tempering or anti-scald devices when using hotter water in domestic water heating systems.

⚠ CAUTION: Hot water in excess of 120°F can cause scalding!

Bock recommends a tempering valve or anti-scald valve be installed and used according to the manufacturer's directions to prevent scalding. Many state and local codes now require installation of these devices. Point of use temperature may be hotter than the setting on the water heater thermostat. The tempering valve or anti-scald valve will ensure potable water temperatures at the desired set point with a higher degree of accuracy.

Table 2: Scald Temperature/Time Relationships

APPROXIMATE TEMPERATURE/TIME RELATIONSHIPS TO SCALDING	
120°F (49°C)	More than 5 minutes
125°F (52°C)	1 ½ to 2 minutes
130°F (54°C)	About 30 seconds
135°F (57°C)	About 10 seconds
140°F (60°C)	Less than 5 seconds
145°F (63°C)	Less than 3 seconds
150°F (66°C)	About 1 ½ seconds
155°F (68°C)	About 1 second



ANODE RODS

The water heater is supplied with a factory installed powered anode system to prevent corrosion of internal tank components. Specifically, the type of anode system that is used is an impressed-current anode system. This system uses a power supply that regulates the protective current output based on actual conditions inside the tank. The anode rods in the tank are not consumed over time and, therefore, do not need to be removed and inspected. Refer to the Maintenance section of this manual for periodic inspection instructions for the powered anode system.

NOTICE TO THE OWNER: The water heater must be connected to the power supply for the powered anode system to operate. DO NOT DISCONNECT THE WATER HEATER FROM THE POWER SUPPLY FOR AN EXTENDED PERIOD OF TIME. WITHOUT POWER, THE ANODE SYSTEM WILL NOT BE CAPABLE OF PROVIDING CORROSION PROTECTION. When the power switch to the right of the display is OFF and there is a connection to the power supply, the powered anode system will still function. If the water heater must be disconnected from the power supply for an extended period, the tank must be drained. Refill the tank prior to reconnecting the water heater to the power supply.

⚠ CAUTION

Hydrogen gas is produced in a hot water system served by the heater that has not been used for a long period of time (2 weeks or more). Hydrogen gas is extremely flammable. To reduce the risk of injury under these conditions, it is recommended that a hot water faucet be opened for several minutes before using any electrical appliance connected to the hot water system. When 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.

TEMPERATURE AND PRESSURE RELIEF VALVE (T&P)

⚠ CAUTION

To reduce the risk of excessive pressures and temperatures in this water heater, install temperature and pressure protective equipment required by local codes and no less than a combination temperature and pressure relief valve certified by a nationally recognized testing laboratory that maintains periodic inspection of production of listed equipment or materials, as meeting the requirements for Relief Valves and Automatic Gas Shutoff Devices for Hot Water Supply Systems, ANSI Z21.22. This valve must be marked with a maximum set pressure not to exceed the marked maximum working pressure of the water heater. Install the valve in an opening provided and marked for this purpose in the water heater, and orient it or provide tubing so that any discharge from the valve exits only within 6 inches above, or at any distance below, the structural floor, and does not contact any live electrical part. The discharge opening must not be blocked or reduced in size under any circumstances. No valve is to be added between the relief valve and tank.

⚠ CAUTION

Scalding injury and/or water damage can occur from either the manual lifting of the lever or the normal operation of the T&P valve if it is not piped to a proper drain. If the valve fails to flow water or reseat, call your plumber.

The T&P valve is factory installed. A discharge drain tube must be installed (responsibility of the installer) and shall terminate plain, not threaded, 6 inches above the floor drain. The drain tube material must be approved for temperatures of 120°F or greater and a pressure of 150 PSI or greater.

SECTION II: GENERAL INFORMATION

BACKFLOW PREVENTER (CLOSED SYSTEM)

Some local municipal codes and ordinances require the use of these devices on potable (domestic) water lines. Where backflow preventers, check valves, or pressure regulating valves are required, it will be necessary to install a **thermal expansion tank** (designed for use with potable water) in order to prevent pressure build up in the water heater and associated piping, which could cause the T&P valve to discharge. Follow the expansion tank manufacturer's recommendations when selecting a tank for your hot water system. The expansion tank pressure shall equal the water heater system pressure prior to initial warm up.

Periodic relieve valve discharges may be a result of thermal expansion in a closed water supply system. Contact the water supplier or local plumbing inspector for information about thermal expansion tanks.

Note: Working pressure of the water heater is 150 PSI. Do not exceed 150 PSI.

CONDENSATION

Condensation of flue gases will occur in the exhaust vent and portions of the heat exchanger during burner operation. Condensate is considered acidic based on its typical pH range of 3.5 to 3.8 on a scale of 0 to 14 (a pH of 7 is neutral). Some installations may require the use of a condensate neutralizer kit to reduce the acidity of the condensate prior to it entering the building's drainage system. When possible, locate a drain in close proximity to the water heater to minimize the length of the drain line. The water heater is supplied with a condensate elbow assembly that must be installed to the water heater before the exhaust vent is connected.

HIGH ALTITUDE

The water heaters covered in this manual are approved for altitudes up to 5,400 feet. For high altitude applications (i.e. installations at altitudes greater than 2,000 feet), models that are designated with a suffix "-H25" must be used.

Following installation at high altitudes, verify that O_2 readings and CO levels in the exhaust vent are within the specified ranges given in Section VI: Maintenance, *"Check the Combustion System"*.

Due to the natural reduction in input rate at higher altitudes, the actual hot water output of the heater is gradually reduced as altitude is increased. Expect a 2.8% input rate reduction per 1,000 feet altitude. However, all high altitude models are factory adjusted to maintain the rated sea-level minimum input at minimum fan speed.

SEISMIC RESTRAINT

Regions of the United States that are considered earthquake zones require that the water heater(s) is properly braced to avoid movement or falling during a seismic event. Bock recommends the Holdrite Quick Strap® QS-120 or equivalent strapping system. The Holdrite QS-120 is approved by the California Division State Architect and is UPC/IPC/IAPMO listed. Figure 2 shows the water heater strapped to a (field supplied) support frame. The frame can be positioned on the front/right/back of the water heater. If the water heater must be located adjacent to an outside wall, the straps may be installed to the wall if spacers (standoffs) are located between the wall and the water heater. The standoffs may be field supplied or a kit may be purchased from Bock Water Heaters, Inc. One kit per water heater is required. Figure 3 shows the seismic strapping secured to an outside wall.

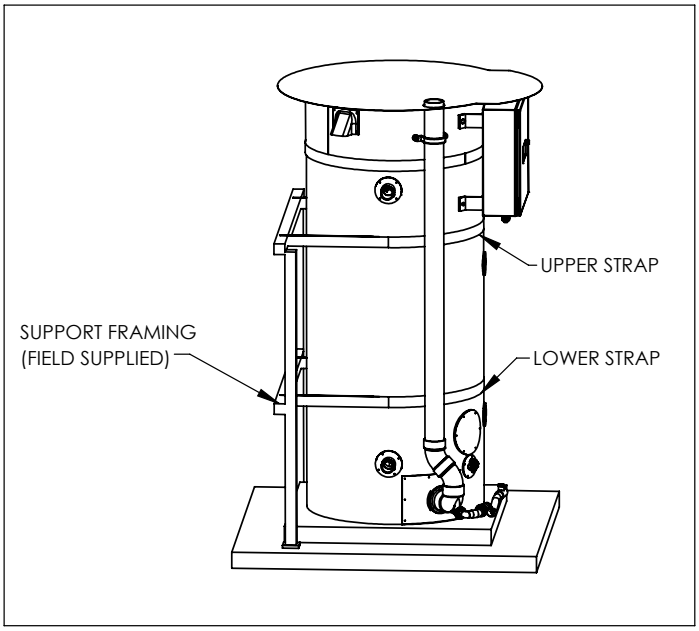


Figure 2: Seismic Restraints to Support Frame

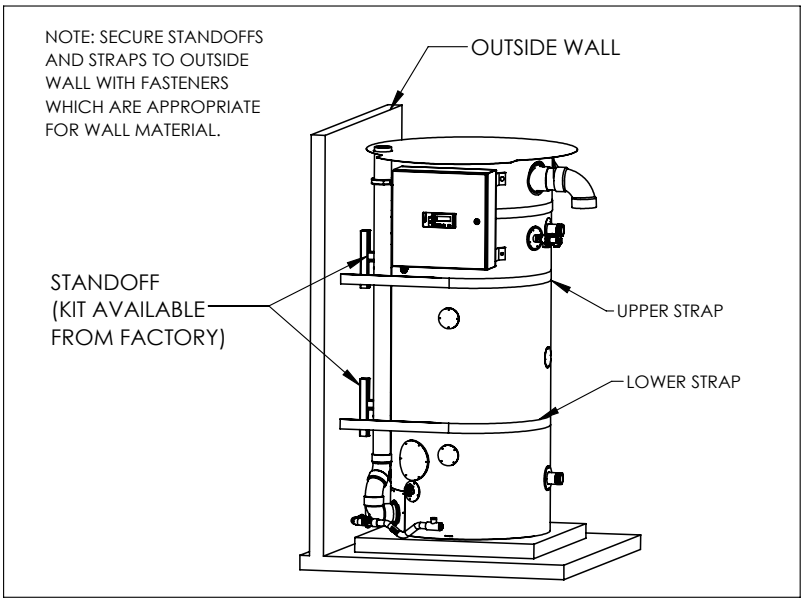


Figure 3: Seismic Restraints to Wall

SECTION III: PRE-INSTALLATION

LOCATION

⚠ WARNING

This water heater must be installed outdoors and shall use the venting configuration as supplied by the manufacturer. All supplied parts, such as cover plates, doors, and the top pan must be properly installed for proper operation and to prevent a hazardous condition.

⚠ WARNING

Do not install this water heater under a deck or in a well, stairwell, alcove or other recessed area.

⚠ WARNING

This water heater is only approved for installation in areas that experience sustained temperatures above 32°F and below 120°F. An overnight low or daytime high temperature can only temporarily (<2 hours) be outside of this range. Personal injury or product damage could result under other conditions.

⚠ CAUTION

Avoid locating the unit where it is subjected to rain from building runoff drains or water spraying out of hoses or sprinklers. Water may enter vents and damage electrical components.

⚠ WARNING

Locate the heater so it is not subject to physical damage from moving vehicles or flooding.

⚠ CAUTION

This water heater cannot be installed directly on the ground. A level platform, made from concrete, brick, or treated wood shall be used underneath this water heater.

⚠ CAUTION

Do not install this water heater in an enclosed area that prohibits wind movement around the unit. Wind around the water heater allows combustion exhaust to be carried away and provides fresh combustion air. Avoid installations in corners where an eddy may develop. Eddies can lead to cross-contamination of combustion air and lead to nuisance lockouts and increase maintenance on parts.

SECTION III: PRE-INSTALLATION

⚠ CAUTION

To avoid cross-contamination of combustion air, do not locate the water heater in close proximity to other fuel burning equipment exhaust vent terminals. Maintain at least 2 feet of separation between any exhaust vert terminal and the air intake on the water heater. If an exhaust vent terminal is within 10 feet of the water heater, it shall be raised to an equal or greater height than the combustion air intake on the water heater. In addition to maintaining minimum spacing from fuel burning equipment exhaust it is necessary to confirm that no cross-contamination is occurring due to various other conditions that may be present.

NOTICE

If possible, in climates of consistent extreme heat (ambient temperature > 100°F), select a location that minimizes extensive exposure to the sun.

NOTICE

If a condensate line must be routed to a drain, locate the heater to minimize the distance to the drain. Adequate downward pitch is required on the condensate line for proper flow.

⚠ CAUTION

This water heater must be located in an area where leakage of the tank, water line connections, or the temperature and pressure relief valve will not result in damage to the area adjacent to the water heater or to lower floors of the structure. When such location cannot be avoided, a suitable drain pan must be installed under the water heater. The drain pan depth must be suitable for draining and collecting water. The drain pan can be purchased from your plumbing professional. The drain pan must be piped to an adequate drain and all drain piping must be at least 0.75" in diameter and pitched for proper drainage.

⚠ CAUTION

DO NOT store or use gasoline or other flammable, combustible, or corrosive vapors and/or liquids in the vicinity of the water heater or any other appliance.

IF YOU SMELL GAS:
- **DO NOT try to light any appliance.**
- **DO NOT touch any electric switch; do not use any telephone in your building.**
- **Immediately call your gas supplier from a telephone in another building. Follow your gas supplier's instructions.**
- **If you cannot reach your gas supplier, call the fire department.**

DO NOT OPERATE THE APPLIANCE UNTIL THE LEAKAGE IS CORRECTED!

⚠ *CAUTION*

Do not drop water heater or lay heater down on its side. Move the water heater into position by sliding or using an appropriately sized hand truck.

SECTION III: PRE-INSTALLATION

LOCATION

> **⚠ *CAUTION***
>
> **Do not install this water heater under an overhang less than 3 ft (91.4 cm) from its top. The top of the water heater is defined as the highest point of the exhaust vent termination. The area under the overhang must be open on 3 sides.**

This water heater is approved for installation on combustible flooring with 0" clearances to combustibles at the rear and sides. Maintain a 24" clearance at the front of the unit for access to the control panel. For maintenance and troubleshooting, maintain enough sufficient clearance at the sides to access the T&P valve and condensate drain clean out port. Clearance from the top of the exhaust terminal to any overhang above the water heater must be at least 3 feet. Maintain clearances specified in this manual and in accordance with the National Fuel Gas Code (NFPA 54, ANSI Z223.1) unless otherwise directed by state and local code requirements.

The vent pipe supplied with the water heater shall be installed as specified in this manual. Due to the close proximity of the exhaust vent and intake air terminations to the unit itself, attention must be given to clearances to other exhaust terminals, air supply inlets, and other features around the building when locating this water heater. All clearances must comply with local codes or the latest edition of NFPA 54 / ANSI Z223.1. See Figure 4 and Table 3 for terminal clearance.

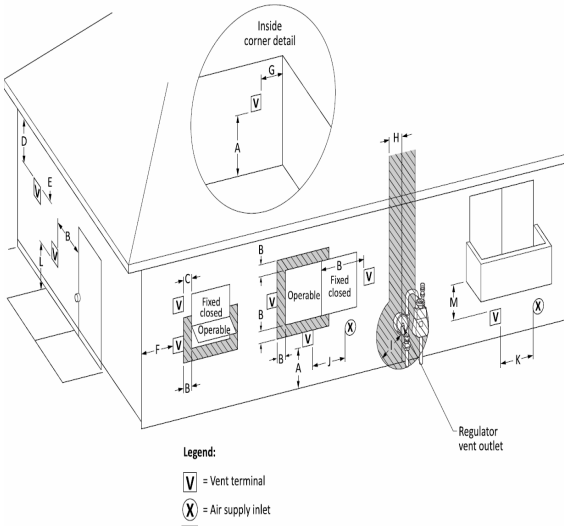


Figure 4: Vent Terminal Clearances

Table 3: Vent Terminal Clearances

		US Installations
A=	Clearance above grade, veranda, porch, deck, or balcony	12 in (30 cm)
B=	Clearance to window or door that may be opened	6 in (15 cm) for appliances ≤ 10,000 Btuh (3 kW), 9 in (23 cm) for appliances > 10,000 Btuh (3 kW) and ≤ 50,000 Btuh (15 kW), 12 in (30 cm) for appliances > 50,000 Btuh (15 kW)
C=	Clearance to Permanently closed window	12 in (30 cm)*
D=	Vertical Clearance to ventilated soffit located above the terminal within a horizontal distance of 2 ft (61 cm) from the center line of the terminal.	12 in (30 cm)*
E=	Clearance to unventilated soffit	12 in (30 cm)*
F=	Clearance to outside corner	2 ft (60 cm)*
G=	Clearance to inside corner	18 in (45 cm)*
H=	Clearance to each side of center line extended above meter/regulator assembly	Clearance in accordance with local installation codes and the requirements of the gas supplier.
I=	Clearance to service regulator vent outlet	Clearance in accordance with local installation codes and the requirements of the gas supplier.
J=	Clearance to nonmechanical air supply inlet to building or the combustion air inlet to any other appliance	- 6 in (15 cm) for appliances ≤ 10,000 Btuh (3kW), - 9 in (23 cm) for appliances > 10,000 Btuh (3kW) and ≤ 500,000 Btuh (15 kW), -12 in (30 cm) for appliances > 500,000 Btuh (15 kW)
K=	Clearance to a mechanical air supply inlet	3 ft (91 cm) above if within 10 ft (3 m) horizontally
L=	Clearance above paved sidewalk or paved driveway located on public property	Canot be located above public walkways or other areas where condensate or vapor can cause a nusisance or hazard
M=	Clearance under veranda, porch deck, or balcony	12 in (30 cm)‡

1 In accordance with with the current CSA B149.1 Natural Gas and Propane Installation Code.
2 In accordance with the current ANSI Z223.1 / NFPA 54 National Fuel Gas Code.
3 If locally adopted installation codes specify clearances different than those illustrated, then the most stringent clearance shall prevail.
†A vent shall not terminate directly above a sidewalk or paved driveway that is located between two single family dwellings and serves both dwellings.
‡Permitted only if veranda, porch, deck, or balcony is fully open on a minimum of two sides beneath the floor.

In addition to the clearances specified, the following items shall be accounted for during installation:

- The minimum distance from adjacent public walkways, adjacent buildings, openable windows, and building openings shall not be less than those values specified in the National Fuel Gas Code, ANSI Z223.1/NFPA 54, and/or the National Gas and Propane Installation Code, CSA B149.1.
- Do not terminate near soffit vents or crawl space or other area where condensate or vapor could create a nuisance hazard or cause property damage.
- Do not locate the exhaust vent terminal where condensate or vapor could cause damage or could be detrimental to the operation of regulators, relief valves, or other equipment.
- Do not locate the exhaust vent terminal over public area or walkways where condensate or vapor can cause nuisance or hazard.
- Do not locate the vent terminal in proximity to plants/shrubs.

GAS SUPPLY LINE

Prior to installation, contact your local gas utility to confirm that sufficient gas service is available for the water heater. The gas meter must have adequate capacity to supply the rated maximum gas input of the water heater in addition to other gas fired equipment connected to the meter.

Minimum Gas Supply Pressure

The gas supply must be capable of maintaining a minimum pressure at the inlet of the gas control during water heater operation at maximum input. The pressure will be lowest at the gas control during water heater operation (i.e. gas is flowing) at maximum input. For natural gas models, during operation at maximum input, the supply pressure at the gas control must be at least 3.5" W.C. For LP gas models, during operation at maximum input, the supply pressure at the gas control must be at least 8" W.C.

Refer to Table 4 for gas supply line sizing. The table shows maximum input in thousands of BTU's per hour for various pipe sizes and lengths. The table assumes gas supply pressures of 14" W.C. or less and a pressure drop of 0.3" W.C.

Table 4: Gas Supply Line Capacity

Nominal Iron Pipe Size (inches)	Internal Diameter (inches)	Length of Pipe (feet)													
		10	20	30	40	50	60	70	80	90	100	125	150	175	200
3/4	0.824	278	190	152	130	115	105	96	90	84	79	72	64	59	55
1	1.049	520	350	285	245	215	195	180	170	160	15	130	120	110	100
1-1/4	1.380	1,050	730	590	500	440	400	370	350	320	305	275	250	225	210
1 1/2	1.610	1,600	1,100	890	760	670	610	560	530	490	460	410	380	350	320
2	2.067	3,050	2,100	1,650	1,450	1,270	1,150	1,050	990	930	870	780	710	650	610
2 1/2	2.469	4,800	3,300	2,700	2,300	2,000	1,850	1,700	1,600	1,500	1,400	1,250	1,130	1,050	980
3	3.068	8,500	5,900	4,700	4,100	3,600	3,250	3,000	2,800	2,600	2,500	2,200	2,000	1,850	1,700
4	4.026	17,500	12,000	9,700	8,300	7,400	6,800	6,200	5,800	5,400	5,100	4,500	4,100	3,800	3,500

Minimum gas supply pipe sizes: for models ODOT200 & 250 - 3/4"; model ODOT299 - 1"; models ODOT300*2 & 400*2 - 1-1/4"; model ODOT500*2 - 1-1/2".

Maximum Gas Supply Pressure

The gas supply pressure shall never be greater than 14" W.C. Pressures greater than 14" W.C. may damage the gas control which could cause a fire or explosion.

Refer to Section IV: Installation / Gas Connections for further installation instructions

SECTION IV: INSTALLATION

VENT & COMBUSTION AIR INTAKE

⚠ DANGER

Failure to properly install the vent and combustion air intake system as outlined in this manual can result in unsafe operation of the water heater. To avoid the risk of fire, explosion, or asphyxiation from carbon monoxide, never operate this water heater unless it is properly vented and has adequate air supply for combustion. Be sure to inspect the system for proper installation at initial start-up; and at least annually thereafter. See the Maintenance section for more information.

All of the vent pipe and fittings supplied with this water heater must be used. The exhaust vent is factory supplied and installed. No additional vent pipes or fittings shall be installed. Connect the supplied elbow to the combustion air intake as shown in Figure 5. Cementing this connection is not required.

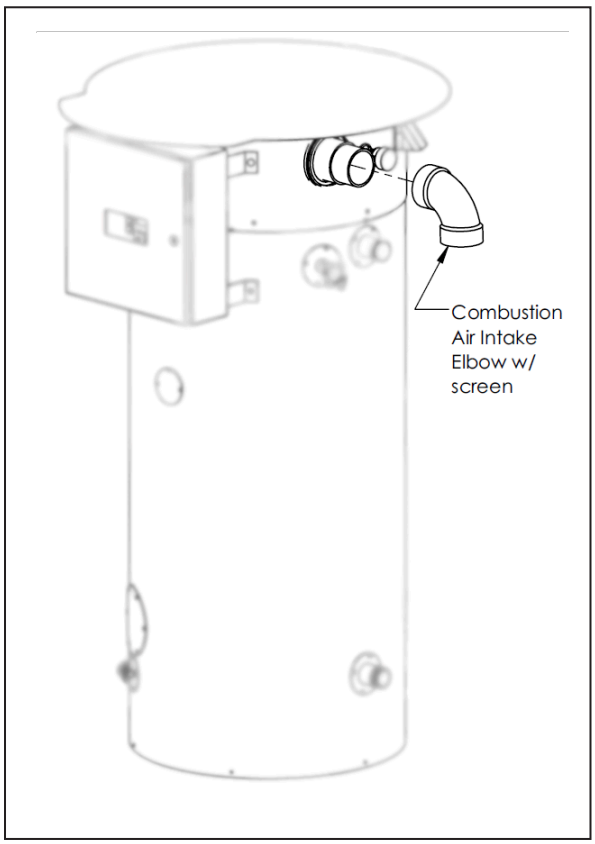


Figure 5: Vent Assembly

CONDENSATE TRAP AND DRAIN

This heater comes with the exhaust vent factory installed. Before operation the condensate trap and drain must be installed along with a suitable drain line.

The condensate trap is made up of three parts and connected by two unions, labeled 'A' and 'B'. The drain elbow is factory installed. There are two orienters included; one with an angle of 135° and another with an angle of 90°, choose whichever one minimizes the number of fittings required for proper drainage. Figure 6 shows the difference between the two options. Install the orienter of your choice by connecting the union portions labeled 'A'.

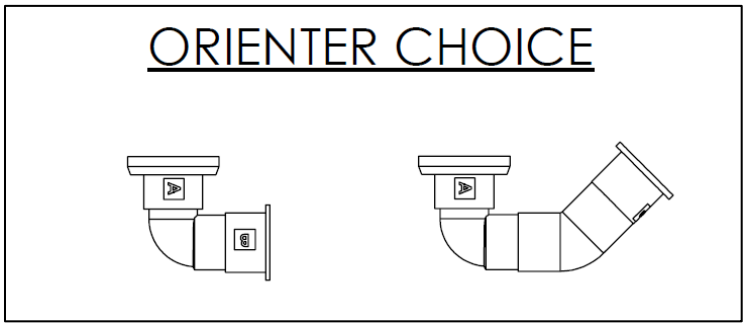


Figure 6: 90° and 135° Orienter

Determine which direction minimizes the length of the condensate drain line, and point the orienter in that direction. Install the trap portion by connecting the union parts labeled 'B' so that it is pointing in the proper direction. See Figure 7 for the top view of both orientation options.

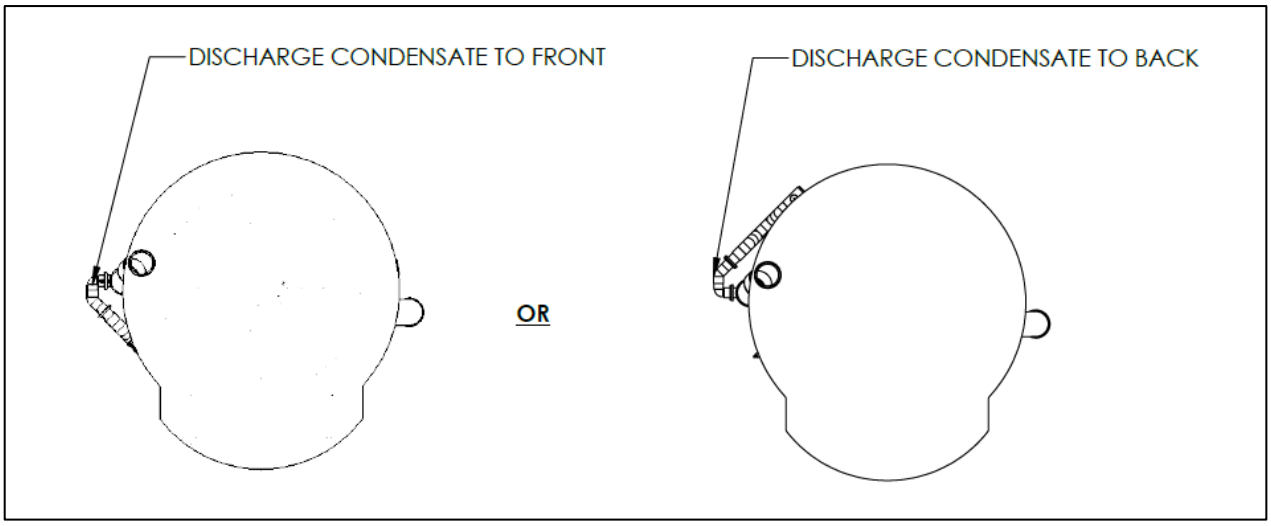


Figure 7: Orientation of the Condensate Trap

The orientation of the trap portion of the drain is critical for proper venting of gas and drainage of condensate. This portion must be level after both unions are fully tightened. See Figure 8 for proper final orientation of the assembly.

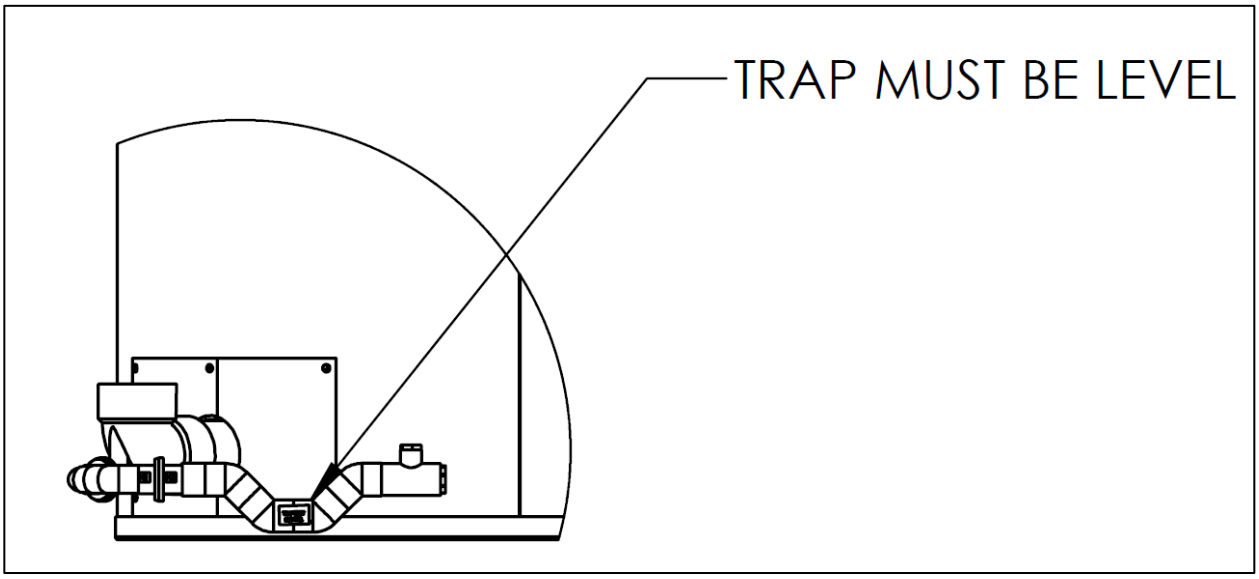


Figure 8: Levelness of Trap

A detailed view of the condensate trap is shown in Figure 9. The discharge portion of the trap is designed with a vent and threaded 3/4" female NPT connection. The trap may be cleaned by disconnecting union B and the threaded connection, then running water through the trap. Use rigid PVC pipe for the condensate drain line. The line must slope down, 1/8" per foot, away from the point of connection towards the drain. If there is insufficient clearance between the connection point and the floor to maintain slope, the heater should be installed on a concrete slab or use a low-profile condensate pump.

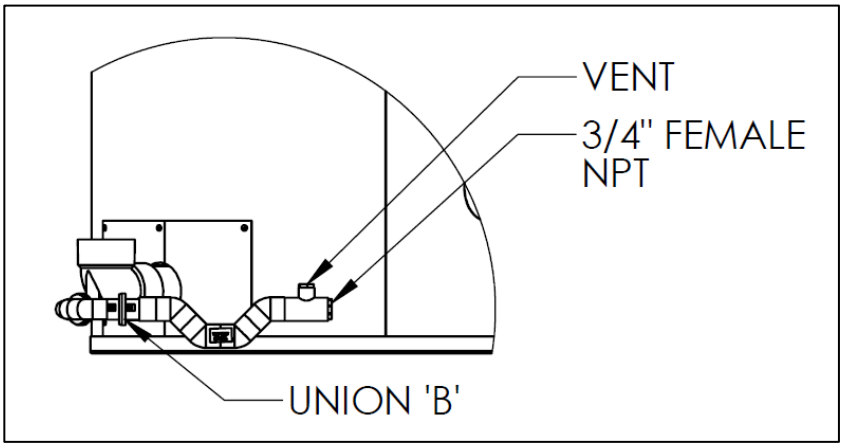


Figure 9: Detailed View

CONDENSATE TRAP AND DRAIN

Some installations require the use of a condensate neutralizer to reduce the acidity of the condensate prior to reaching the drain. Figure 10 shows the connection of a condensate line to a neutralizer. It is recommended that a low profile condensate pump is installed between the heater and neutralizer to facilitate flow through the neutralizer. For further details, refer to the instructions provided with the pump and neutralizer.

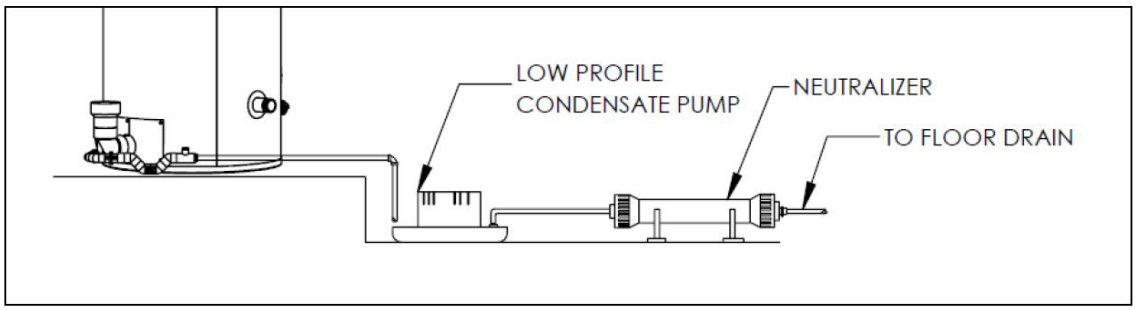


Figure 10: Pump and Neutralizer

SECTION IV: INSTALLATION

WATER CONNECTIONS

⚠ CAUTION

This water heater incorporates fittings that contain a nonmetallic lining. DO NOT apply heat to these fittings when making sweat connections to the heater. Sweat tubing to an adapter before securing adapter to any fittings on water heaters.

ALL PIPING SHOULD CONFORM TO LOCAL CODES AND ORDINANCES. It is highly recommended that unions and shut-off valves are installed at the potable water connections to allow for isolation and/or movement during service. All piping should be adequately insulated with an approved material to minimize heat loss.

Piping diagrams are provided in Figures 12-15 for a variety of configurations.

POTABLE WATER CONNECTIONS

IMPORTANT: THE WATER HEATER MUST BE FILLED WITH WATER BEFORE CONNECTING ELECTRIC POWER.

1) Close the main water supply valve before continuing with the installation. After the main water supply is shut-off, relieve the water line pressure by opening a faucet. Once the pressure has been relieved, close the faucet. The "Cold" and "Hot" potable water connections are labeled on the water heater. Install a union and shut-off valve at both potable water connections. A tempering valve or anti-scald valve should be installed at the potable water outlet and used according to the manufacturer's specifications to prevent scalding.

IMPORTANT: The water heater contains factory installed pipe nipples at the hot outlet connections. These pipes were tightened to proper orientation at the factory. DO NOT ROTATE THESE PIPES WHEN CONNECTING FITTINGS IN THE FIELD. The black indicator line on the side of the factory installed pipe nipple must be in line with the arrow on the label shown in Figure 11. If orientation is not correct there will be a reduction in water heater performance.

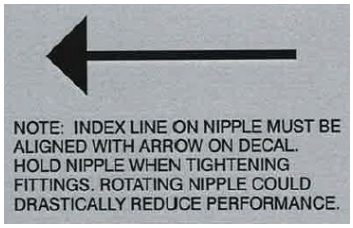


Figure 11: Hot Outlet Pipe Nipple Orientation

2) If a backflow preventer, check valve, or pressure regulating valve is required in the cold water supply, a properly sized expansion tank must be installed to control thermal expansion. Do not operate the water heater in a closed system without installing a thermal expansion tank. Follow the expansion tank manufacturer's recommendations when selecting a tank for your system.

3) Following installation of the water lines, open the main water supply valve and fill the water heater. Open several hot water faucets to relieve air from the system. After water is flowing through the faucets and the system is void of air, close the faucets and check for water leaks in the system.

Note: Do not try to heat hard water as this will drastically reduce heater life. Install a water softener or other scale reducing water treatment system if the water heater is being installed in a hard water area (water hardness higher than seven grains).

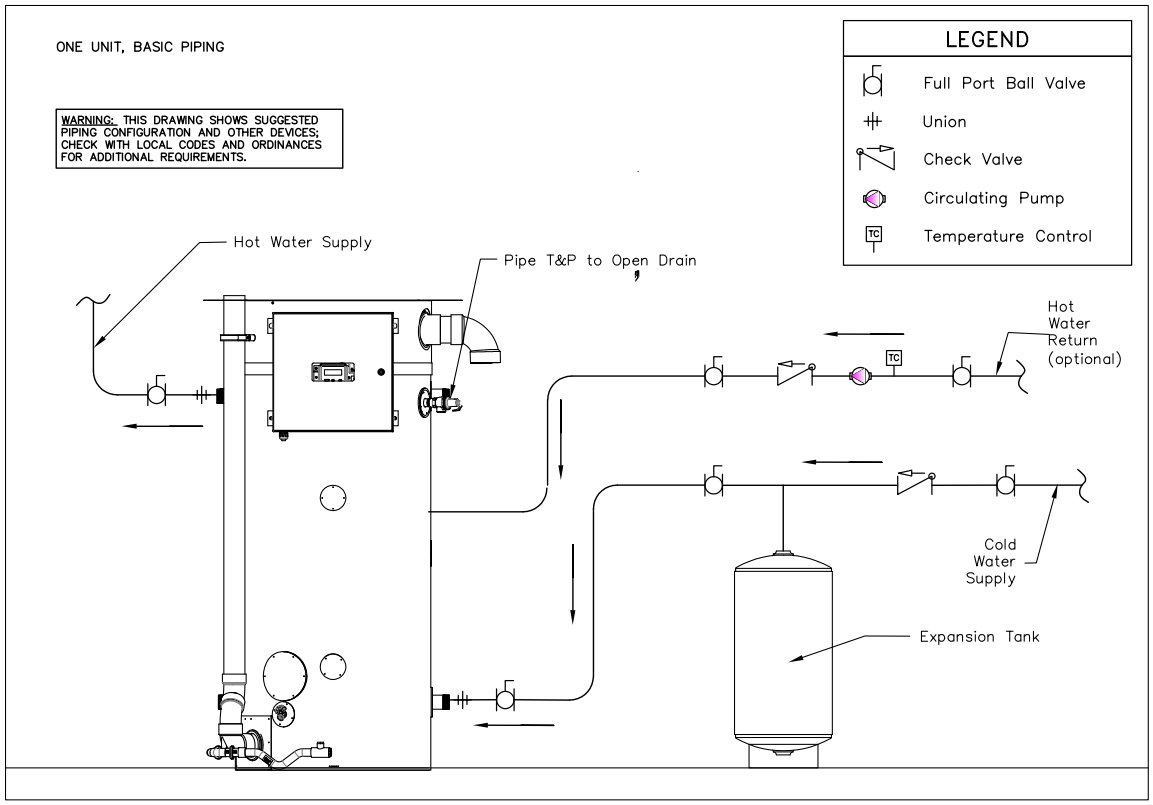


Figure 12: Piping Diagram One Unit

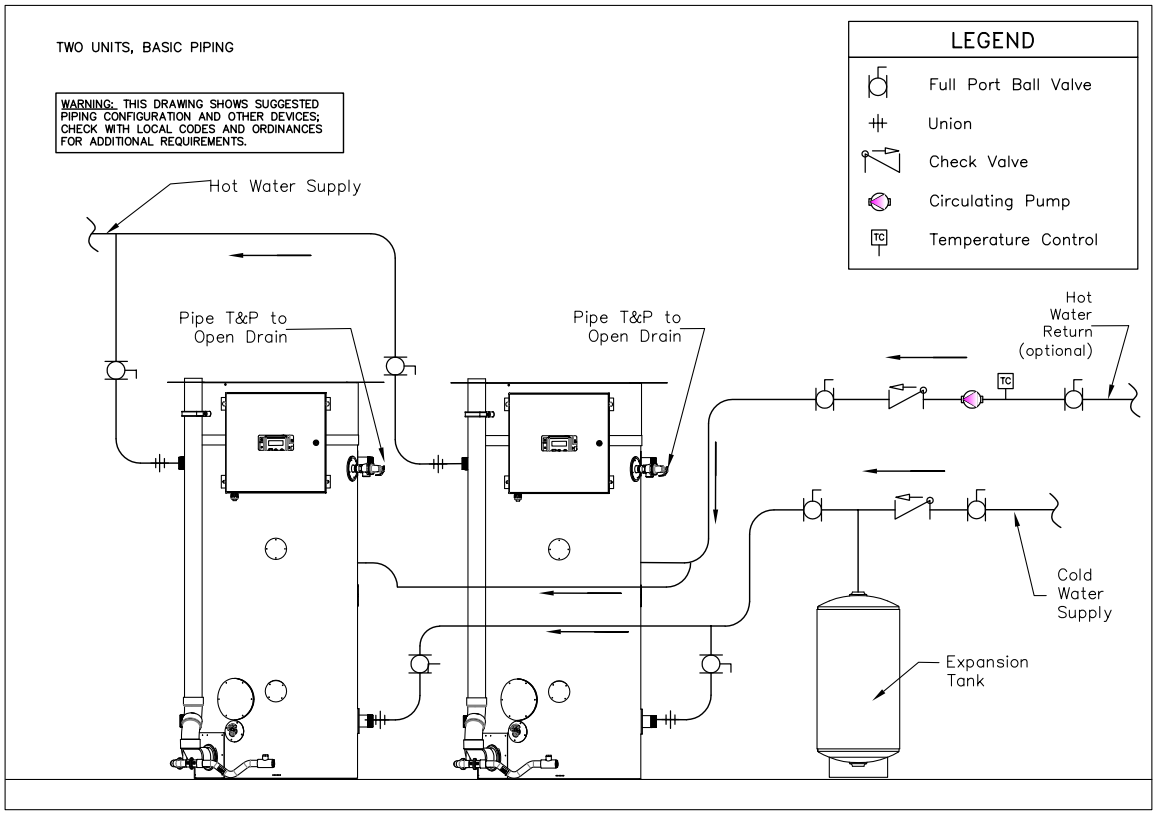


Figure 13: Piping Diagram Two Units

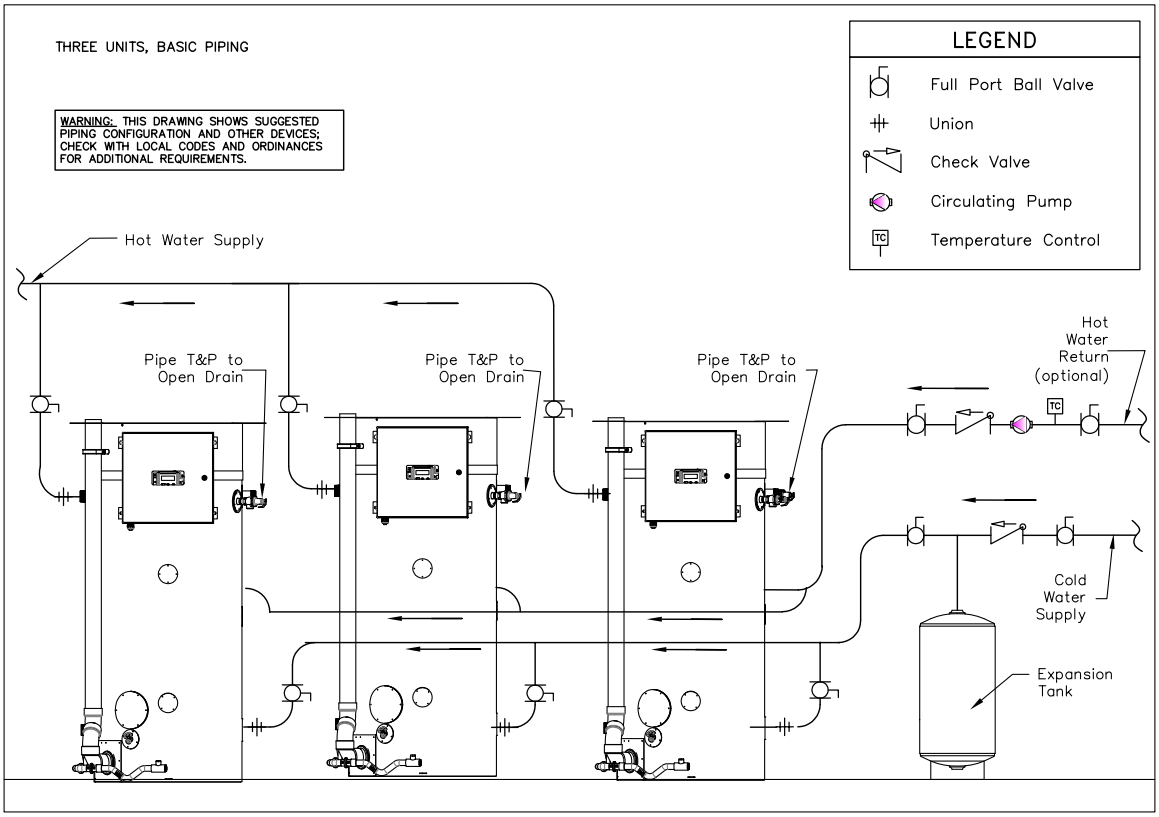


Figure 14: Piping Diagram Three Units

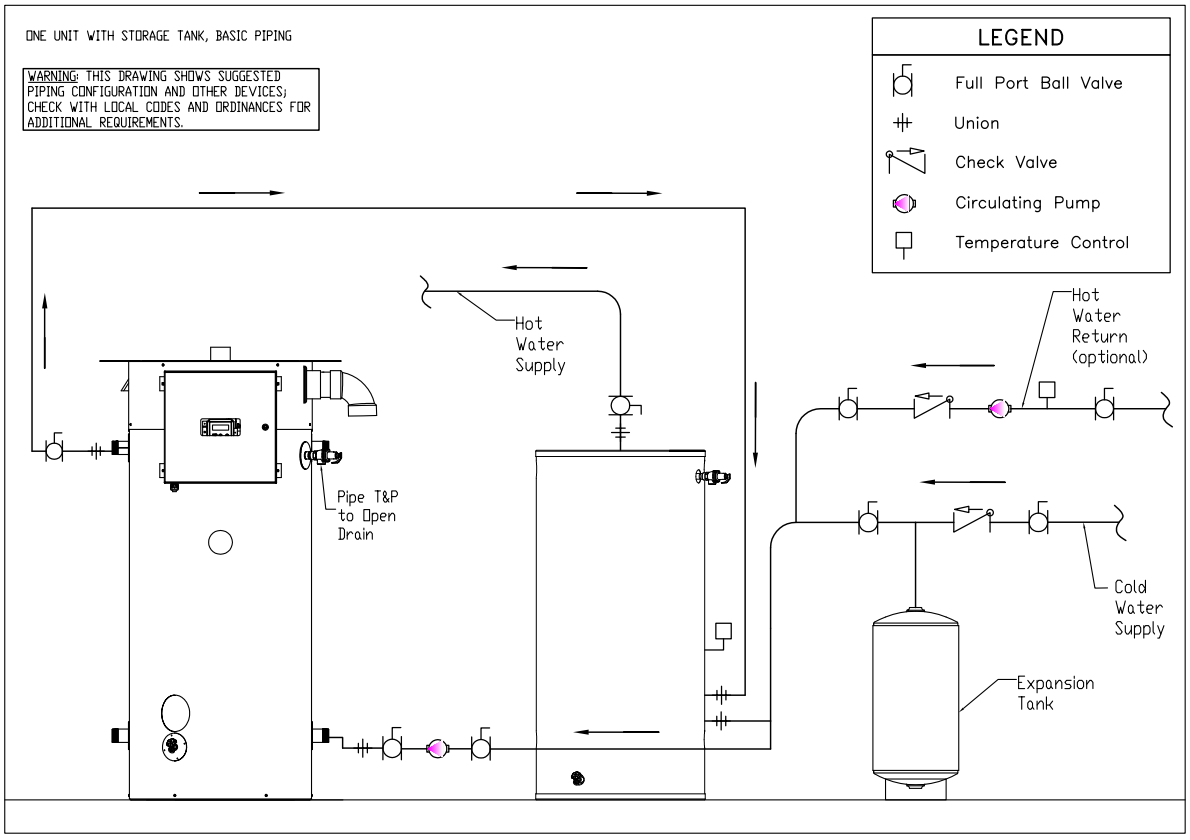


Figure 15: Piping Diagram One Unit with Storage Tank

SECTION IV: INSTALLATION

GAS CONNECTIONS

⚠ CAUTION

Do not use this water heater with any gas other than the type listed on the rating label. Check the rating label on the front of the water heater and make sure the gas to be used matches the gas stated on the rating label. Consult your local gas company or Bock Water Heaters with any questions.

A manual valve, union, and a sediment trap shall be provided in front of the gas valve. All gas piping must conform to local codes and/or the National Fuel Gas Code ANSI 223.1/NFPA 54 or CSA B149.1. Figure 16 shows the installation of a sediment trap to the gas piping on the water heater.

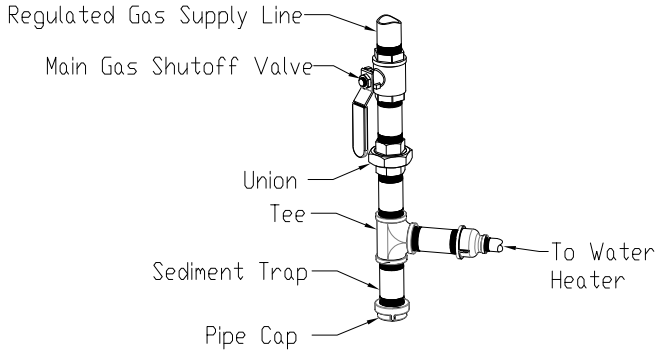


Figure 16: Gas Piping with Sediment Trap

The gas supply piping to the heater must be sized such that the pressure at the valve is sufficient when all other appliances are operating. Undersized gas piping will reduce water heater performance and result in nuisance lockouts. Refer to Section III: Pre-Installation / Gas Supply Line for pipe size requirements.

Verify that the gas service and meter are sized properly for the total load. If the gas supply pressure is greater than 14" W.C., the water heater must have a supply gas regulator installed in the gas supply line for each water heater. The regulator must be rated at or above the input rating (Btu/hr) of the water heater that it serves. Inlet and outlet connections on the regulator shall not be less than the minimum gas supply line size for the water heater. The Maxitrol 325-7 series of regulators with 1-1/4" or 1-1/2" connections is recommended.

For ease of measurement, install a tee with a pipe fitting and a manual shutoff valve between the main manual shut-off valve to the water heater and the pressure regulator. The pipe fitting should be adaptable to a pressure gauge for measuring incoming gas pressure. If further measurement of gas pressure is required due to lack of adequate pressure, measurement at the inlet of the gas control is recommended. Refer to Section III: Pre-Installation / Gas Supply Line for minimum pressure requirements.

During pressure testing of the gas supply piping, close the manual gas shut-off valve to the water heater. Test pressure shall **not exceed** ½ PSIG (14" W.C). The gas control is only rated for ½ PSIG. To test at a pressure greater than ½ PSIG, close the manual shut-off valve and disconnect the gas control. Turn on gas and inspect piping for leaks by "painting" each joint with a soapy water solution and check for bubbles.

⚠ WARNING

DO NOT use an open flame to check for leaks. Serious injury or death could result from fire or explosion.

The pipe thread compound that is used on gas piping must be of the type resistant to propane gas. Do not use teflon tape on gas piping.

WIRING

All electrical wiring and connections must be in accordance with local codes. In the absence of local codes, wiring must conform to the National Electric Code ANSI/NFPA No. 70 or the Canadian Electrical Code C22.1. This water heater must be electrically grounded. Electrical power should be supplied through a fused disconnect switch located near the water heater. A 1/2" trade size, push-in conduit fitting is provided at the bottom of the control enclosure to secure the power supply conduit. A harness, located at the terminal block, contains three wires (BK, W, and G) for field connection of hot, neutral, and ground.

The water heater draws less than 5 amps (maximum). Check for proper polarity at the main power connection prior to operating the water heater.

⚠ CAUTION

Turn off or disconnect the electrical power supply to the water heater before servicing. Label all wires prior to disconnection when servicing controls. Wiring errors can cause improper and dangerous operation. Verify proper operation (including limits and safeties) after servicing.

Component and schematic wiring diagrams are shown in Figures 17 and 18.

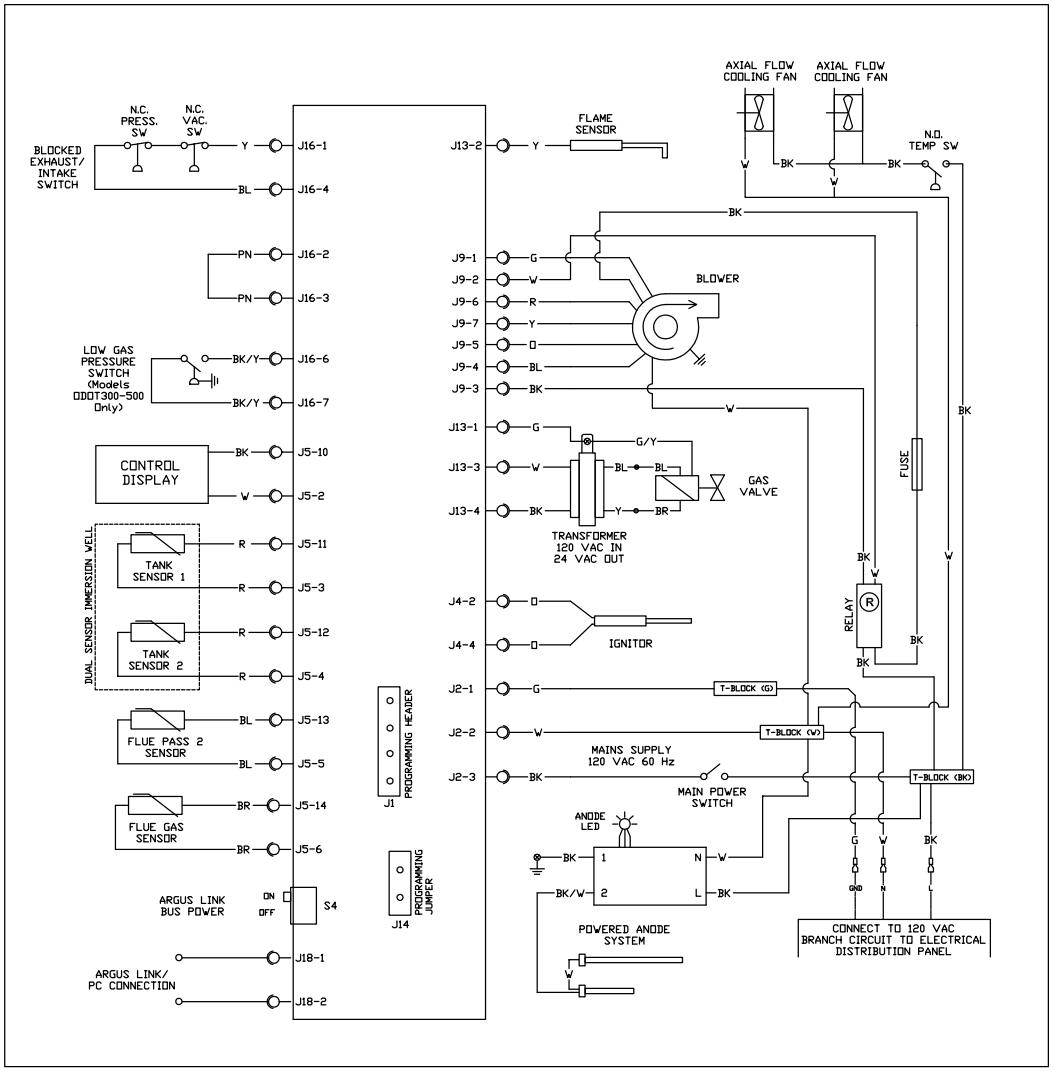


Figure 17: Component Wiring Diagram

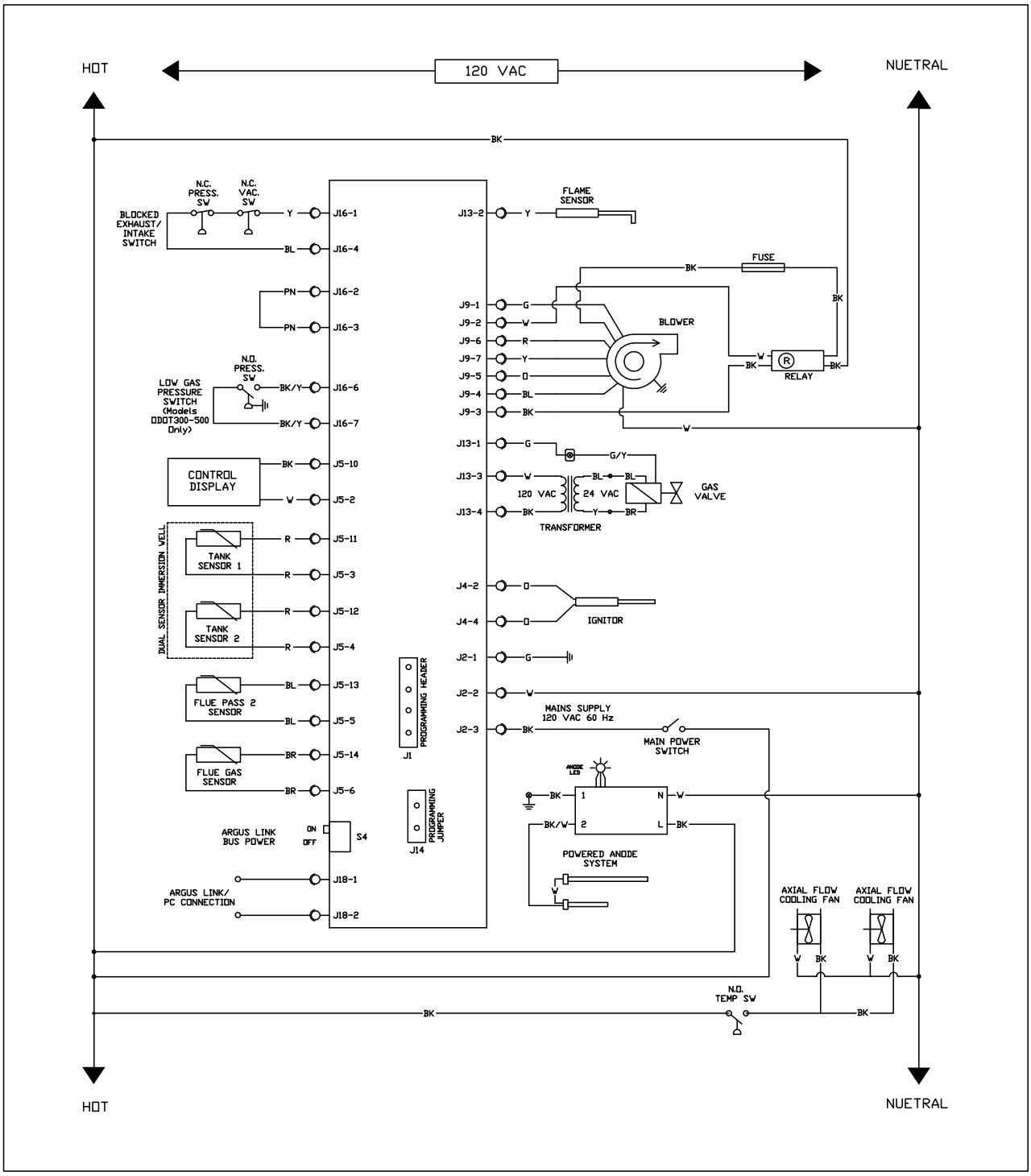


Figure 18: Schematic Wiring Diagram

FOR YOUR SAFETY READ BEFORE OPERATING

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

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

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

WHAT TO DO IF YOU SMELL GAS

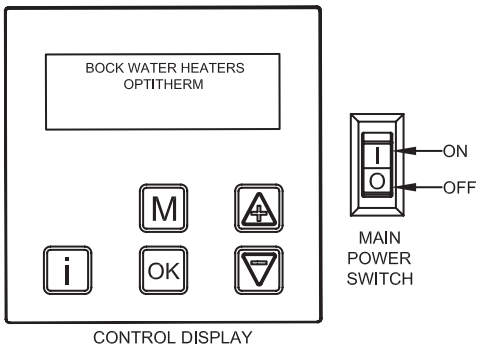
- Do not try to light any appliance.
- Do not touch any electric switch; do not use any phone in your building.
- Immediately call your gas supplier from a neighbor's phone. Follow the gas supplier's instructions.
- If you cannot reach your gas supplier, call the fire department.

C. The gas control on this appliance does not have an "On/Off" knob. Turn off main power to the water heater to disable the gas control.

D. Do not use this appliance if any part has been under water. Immediately call a qualified installer or service agency to replace a flooded water heater. Do not attempt to repair the unit! It must be replaced!

OPERATING INSTRUCTIONS

1. STOP! Read the safety information above on this label.
2. Set the main power switch, located to the right of the control display, to the OFF position.
3. This appliance is equipped with a device which automatically lights the burner. DO NOT TRY TO LIGHT THE BURNER BY HAND.
4. Wait five (5) minutes to clear out any gas. 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.
5. Set the main power switch to the ON position.
6. If the appliance will not operate, follow the instructions "TO TURN OFF GAS TO APPLIANCE" and call your service technician or gas supplier.
7. Set the thermostat to the desired setting. **CAUTION: Hotter water increases the risk of scald injury.** Consult the manual before changing the temperature setting.



TO TURN OFF GAS TO APPLIANCE

1. Set the thermostat to the lowest setting.
2. Set the main power switch to the OFF postion.

Figure 19: Instructions To Put The Water Heater In Operation

SEQUENCE OF OPERATION

Figure 20 gives a step-by-step description of the sequence of operations for this water heater. See Troubleshooting section of this manual for solutions to error codes.

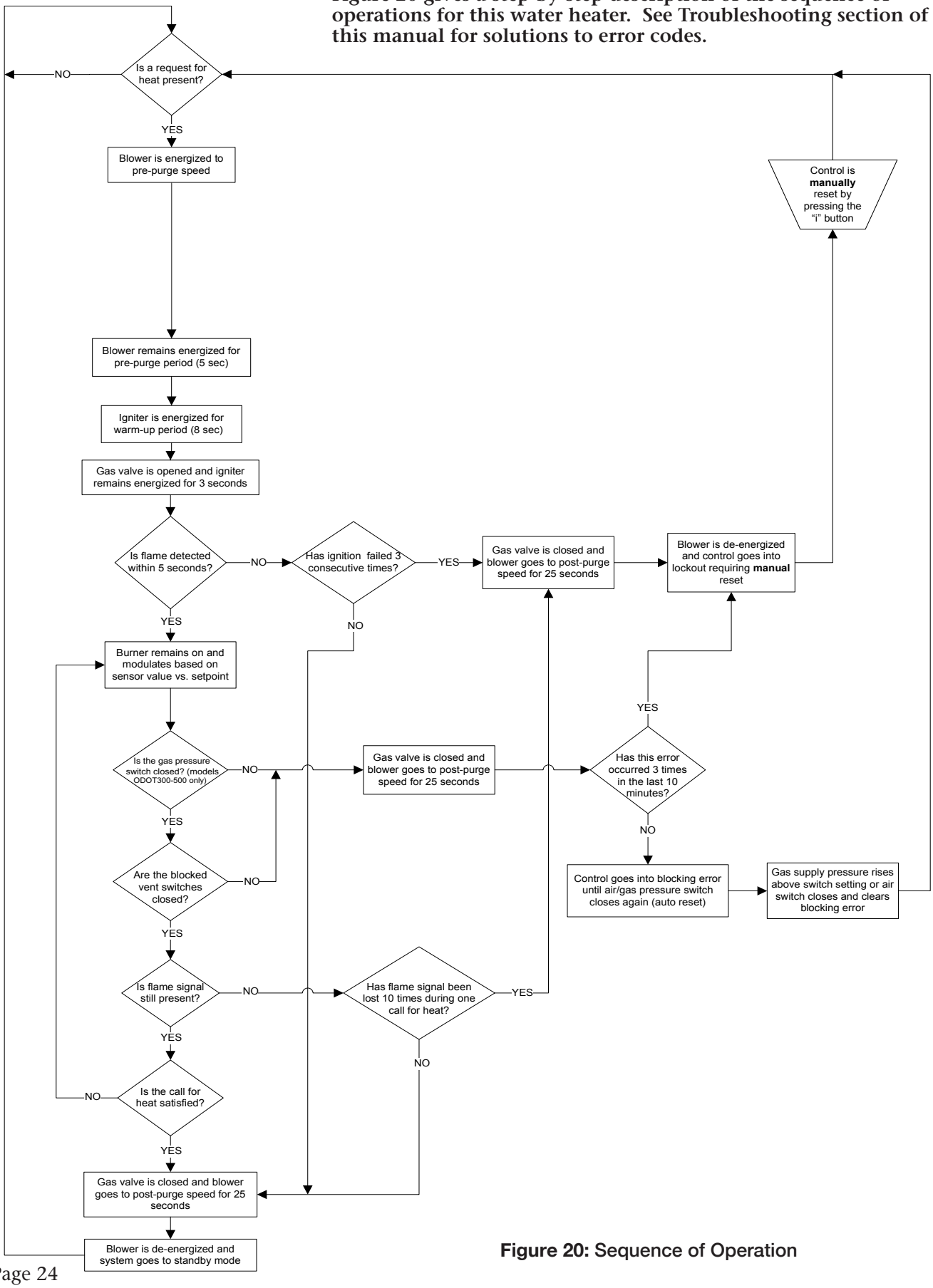
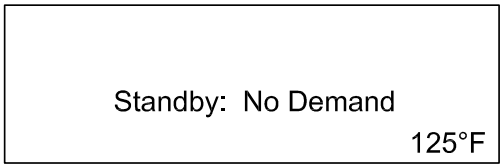


Figure 20: Sequence of Operation

ADJUSTING THE CONTROLS

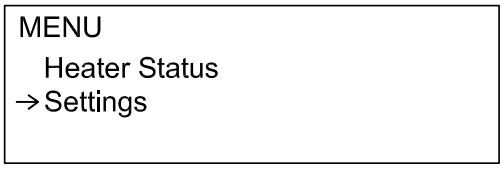
The temperature setpoint has been adjusted to 120°F at the factory. Allow the water heater to warm up to the factory adjusted setpoint and wait until the main operating control has shut off gas to the burner. Wait 30 seconds following shut-off of gas, then adjust the setpoint to a higher temperature.



The home screen displays the current status of the water heater (i.e. demand or no demand for heat).

AT THE HOME SCREEN, THE TEMPERATURE DISPLAYED IN THE LOWER RIGHT CORNER OF THE SCREEN IS THE ACTUAL WATER TEMPERATURE AT THE TOP OF THE TANK.

Press the "M" button to enter the main menu.



In the MENU screen, use the down arrow ("-") button to move the cursor to SETTINGS.

Press the "OK" button to select SETTINGS.

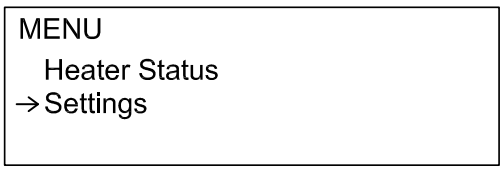
The first screen in the SETTINGS menu displays the setpoint temperature.

To change the setpoint, press the "OK" button. The temperature will start blinking.

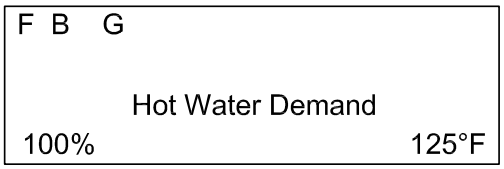
Use the up arrow ("+") button or down arrow ("-") button to adjust the setpoint temperature.

For the purposes of this section of the manual, raise the setpoint temperature to 135°F. Press the "OK" button to save the new setting.

To exit from the SETTINGS menu, press the "M" button.



To exit the MENU screen, press the "M" button.



If the setpoint temperature was increased enough, the home screen will now display the heater status as "Hot Water Demand".

The main control should now be running through the ignition sequence and eventually light the burner.

Note: The percentage value that is displayed in the lower left corner of the screen is the magnitude of the fan speed within the factory set range. 100% indicates "Hi Power" and 1% indicates "Low Power".

The letters displayed in the upper left corner of the screen are shown when certain components are energized or actions are detected during the heating sequence. F = flame is present; B = blower is running; I = ignitor is energized; G = gas valve is open.

Figure 21: Steps to Adjust the Setpoint Temperature

Following adjustment of the setpoint to a higher temperature (see Figure 21), the main burner should relight. Next, adjust the setpoint to a lower temperature (i.e. back to 120° F) and the gas valve will close, extinguishing the burner flame. The thermostat should be adjusted to the minimum setting that will meet the hot water needs of the application.

> ⚠ CAUTION
>
> There is a scald potential if the thermostat is set too high. The recommended temperature setting for normal residential use is 120°F. If higher temperature settings are needed for combined appliance applications or commercial use, an automatic tempering valve must be installed on all domestic hot water lines.

MEASURING THE POINT-OF-USE WATER TEMPERATURE

The thermostat is factory set at 120°F for domestic use. It is the responsibility of the building owner to verify that the installer follows the recommended quantitative testing for measuring the point-of-use water temperature. To make sure that the system works properly after installation and in the future, it is recommended that the heater's performance be measured and monitored. Run water out of a faucet nearest the heater until it comes out warm. Using a calibrated thermometer, take a measurement. If the water is not at a suitable temperature for the application, adjust the setting on the control or the tempering valve.

This log (or a similar one) should be filled out as follows:

Date	Time	Person running test	Setpoint Temperature °F	Faucet Temperature °F

SECTION VI: MAINTENANCE

NOTICE TO THE OWNER: If you are having a mechanical problem with your water heater, contact your service company or installer.

The required maintenance schedule for this water heater is shown in Table 5. Further detail is given in this section for each component.

Table 5: Maintenace Schedule

Component	Operation	Interval	Required
Water piping	Check for leaks	Annually	Repair when necessary
T&P Relief Valve	Verify operation	Annually	Proper operation
Powered Anode System	Check status LED	3 months	Verify “green” LED status
Tank	Sediment removal	6 months	Flush tank
Vent System	Inspect	Annually	Terminations are clear; vent screens are clean; joints are sealed; proper support
Condensate Neutralizer	Replace Media	Annually	Replace neutralizing media
Condensate Trap	Inspect	6 months	Remove sediment
Combustion System	Measurements	Annually	Check inlet gas pressure; take combustion reading (O2%)

WATER PIPING

On an annual basis, all piping should be checked for leakage at joints, shut-off valves, and unions.

T&P RELIEF VALVE

On an annual basis, the temperature and pressure relief valve should be checked for proper operation. First, attach a drain line to the valve to direct the water discharge to an open drain. This is very important because the temperature of the discharge could be very hot. Second, lift lever at the end of the valve several times. The valve should operate freely and return to its original position properly. If water does not flow out of the valve, remove and inspect for corrosion or obstructions. Replace with a new valve if necessary. Do not repair the faulty valve as this may cause improper operation.

SECTION VI: MAINTENANCE

ANODE RODS

The water heater is supplied with a factory installed powered anode system to prevent corrosion of internal tank components. The anode rods in the tank are made from titanium and are not consumed over time and, therefore, do not need to be removed and inspected.

The powered anode module and status LED are mounted on the control panel underneath the control enclosure cover. The status LED is located on the right side of the panel. When the tank is filled with water and the heater is connected to the power supply, the status LED will be green. If the LED is flashing red, this indicates a system error. Refer to Table 14 in Section VII: Troubleshooting for possible causes and remedies when the LED is flashing red. Check the status LED every three months to ensure proper operation.

NOTICE TO THE OWNER: The water heater must be connected to the power supply for the powered anode system to operate. DO NOT DISCONNECT THE WATER HEATER FROM THE POWER SUPPLY FOR AN EXTENDED PERIOD OF TIME. WITHOUT POWER, THE ANODE SYSTEM WILL NOT BE CAPABLE OF PROVIDING CORROSION PROTECTION. When the power switch to the right of the display is OFF and there is a connection to the power supply, the powered anode system will still function. If the water heater must be disconnected from the power supply for an extended period, the tank must be drained. Refill the tank prior to reconnecting the water heater to the power supply.

FLUSH THE TANK

Elements in the water such as lime and iron may accumulate in the heater. Accumulation of these elements can keep your water heater from operating at peak efficiency and may lead to premature tank failure. It is recommended that the tank is drained and flushed thoroughly twice a year to prevent buildup.

CHECK THE COMBUSTION SYSTEM

On an annual basis, verify that the combustion system is operating within acceptable parameters. Gas pressures and combustion measurements can be used to verify proper operation.

- Check the inlet gas pressure to the gas control. The pressure should be greater than 3.5" W.C. (natural gas) and 8" W.C. (LP gas) when the burner is operating at high fire. Gas pressure shall not exceed 14" W.C. when the burner is off.
- Measure the products of combustion in the exhaust vent. At maximum input, the % O_2 in the exhaust gas should be in the range of 3.0 - 4.5%. CO should be less than 25 ppm. If measurements are not within range, contact Bock Technical Support for adjustment instructions.

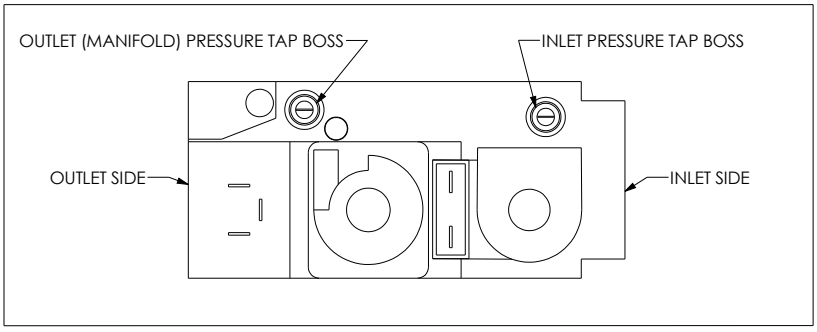


Figure 22: Honeywell Gas Control (Top View)

SECTION VI: MAINTENANCE

INSPECT THE VENTING SYSTEM AND BURNER

The vent and combustion air intake system should be checked at least once a year for damage and blockage. Make sure all joints are secure and that the system is properly supported.

Inspect the condensate elbow assembly for blockage every six months. Disconnect the unions labeled 'B' as well as the threaded connection to the drain line. Run water through the running trap to clean out any debris. When re-installing ensure the condensate trap is level or there may be adverse effects on water heater operation.

> ⚠ CAUTION
>
> For your safety, removal of the blower assembly and the burner must be performed by a qualified service technician. All parts must be replaced to their original position prior to operating the water heater.

The water heater utilizes a forced draft combustion system to draw combustion air to the burner and remove exhaust gas from the vent. The combustion air intake is under a negative pressure which may cause unwanted objects to be pulled into the intake vent pipe. Over time, these objects may collect in the burner and affect burner ignitions and water heater performance. While not required as a periodic maintenance item, inspecting the burner for blockage should be done once all other potential causes for ignition failures have been checked (i.e. the ignitor, flame rod, gas supply pressure, etc.). In order to inspect the burner, a portion of the overall assembly must be removed for access. **Before proceeding, make sure the power switch is OFF and close the main shut-off valve on the gas supply.**

- First, remove the ignitor and flame rod and set aside.
- Second, disconnect the wiring harnesses and the air intake piping from the blower.
- Third, remove the blower, along with other connected components, by removing four screws at the gas control plus four nuts and washers at the burner mounting flange.

Refer to Figure 23 for a visual location of components.

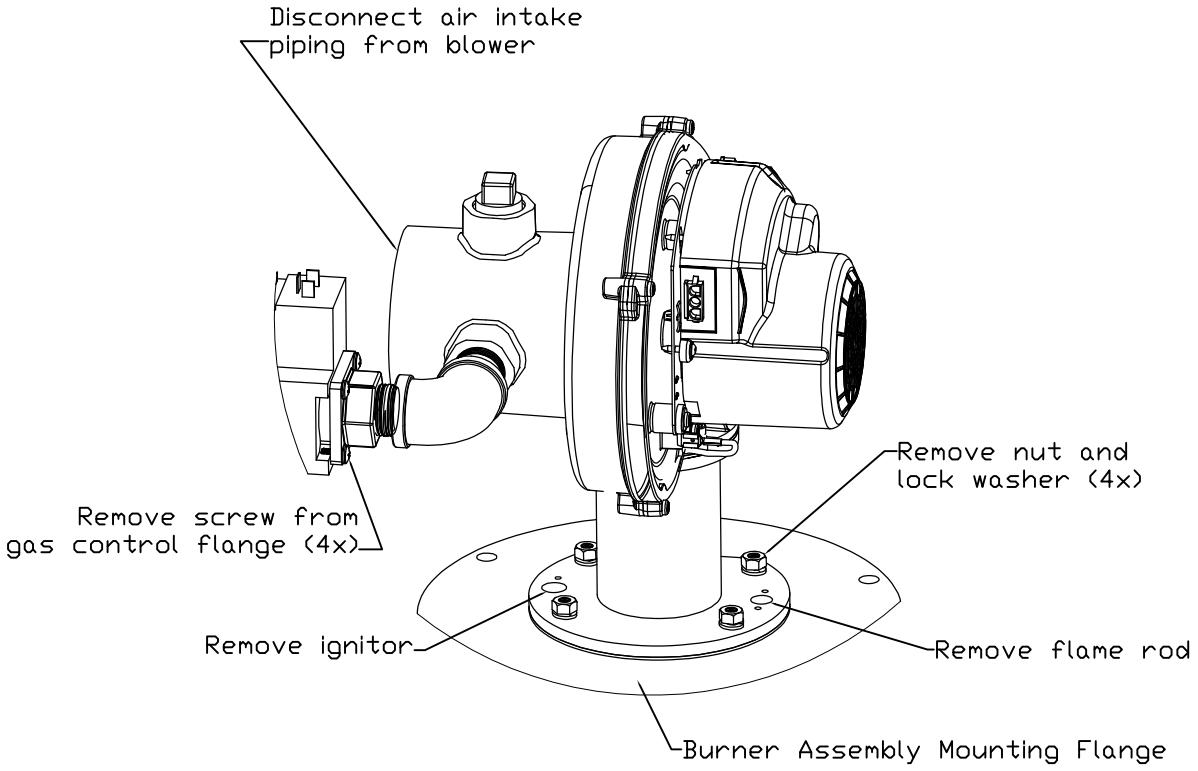


Figure 23: Removing the blower for burner inspection

With the blower disassembled from the burner assembly, lift the burner straight up and through the burner assembly mounting flange. **All gaskets removed when disassembling the burner assembly should be discarded and replaced with new, undamaged, gaskets upon re-assembly.** Inspect the inside of the burner for blockage. The burner is comprised of a perforated stainless steel tube with a woven metal wrapped around the outside. Do not attempt to stick objects into the woven metal for cleaning purposes. This may damage the burner and reduce performance. If blockage cannot easily be removed from inside the burner, compressed air may be used to blow out any buildup.

Reassemble the burner, carefully placing all gaskets back to their original locations. Remount the blower assembly to the mounting flange with the nuts and lock washers. Reconnect the gas control to the flange with the four screws and reattach the air intake piping to the blower. Finally, reinstall the ignitor and flame rod. Connect the wiring harnesses to the blower. Restore power to the water heater and visually inspect the burner ignition through the sight glass at the front of the mounting flange. When the system is working properly, ignition should be smooth with an even flame distribution along the surface of the burner. The flames should be short and blue with some yellow at the tips.

SECTION VII: TROUBLESHOOTING

> **⚠ CAUTION**
>
> **For your safety, the repair and servicing of this equipment shall only be performed by a qualified agency.**

Table 6: General Troubleshooting

Problem	Possible causes	Recommended Action
Unable to light the burner	1) Check display for error code.	1) See Tables 12 and 13.
	2) Air in the gas line.	2) Contact qualified agency to purge the air from the gas line.
	3) Loose wire connection.	3) Contact qualified agency to inspect wiring.
Burner does not stay lit	1) Check display for error code.	1) See Tables 12 and 13.
Rumbling noise in the tank during burner operation	1) Scale or sediment build-up in tank.	1) Drain the water heater to remove scale and sediment.
Insufficient hot water	1) Heater undersized for load	1) Reduce hot water usage rate.
	2) Check display for error code.	2) See Tables 12 and 13.
	3) Temperature setting of control is too low.	3) Adjust setting as required.
Water too hot or not hot enough	1) Control temperature setting is too high or low.	1) Adjust setting as required
T&P relief valve is dripping water.	1) Excessive pressure condition in tank (greater than 150 psi).	1) Contact qualified agency to inspect water piping system. Expansion tanks are required in closed systems.
T&P relief valve is gushing hot water.	1) Excessive temperature condition in tank (greater than 210°F).	1) Lower the temperature setting on the control. See “Section V: Operation” for instructions to adjust the temperature setting.

Table 7 shows a list of lockout error codes. A lockout code will be visible on the control display in the form of a code (letter "A" followed by a number) and a short message. Lockout errors require a manual reset to resume operation after the root cause of the problem has been solved. To manually reset the control, press the "i" button on the user interface.

Table 7: Lockout Error Codes

Code	Error Message	Description & Possible Causes/Actions	
A00	EXTND BLOCKING ERROR	**Description:**	A blocking error has been present for more than 20 hours in a row.
		Causes & Actions:	Investigate the blocking error that caused the lockout.
A01	IGNITION LOCKOUT	**Description:**	There have been three unsuccessful ignition attempts in a row.
		Causes & Actions:	Dirty or faulty flame rod - see manual.
			Damaged or worn hot surface igniter - see manual.
			Faulty or loose wiring - check wiring and connections to flame rod, hot surface igniter, gas valve and blower.
			Improper venting or restricted inlet/outlet - see manual.
A05	GV RELAY ERROR	**Description:**	A failure was detected in the GV Relay in the main operating control.
		Causes & Actions:	Contact a qualified agency to inspect the control.
A06	SAFETY RELAY ERROR	**Description:**	A failure was detected in the Safety Relay in the main operating control.
		Causes & Actions:	Contact a qualified agency to inspect the control.
A08	FAN ERROR	**Description:**	The actual fan speed differs more than 300 RPM from the target fan speed.
		Causes & Actions:	Contact a qualified agency to inspect the control and wiring to blower.
A09, A11, A13, A14	RAM, X-RAM, STATE, OR ROM ERRORS	**Description:**	Various internal software errors.
		Causes & Actions:	Contact a qualified agency to inspect the control.
A10, A12	E2PROM ERRORS	**Description:**	Various errors caused by E2PROM file.
		Causes & Actions:	Contact a qualified agency to inspect the control.
A16	15MS XRL ERROR	**Description:**	Internal software error.
		Causes & Actions:	Contact a qualified agency to inspect the control.
A18	High Limit Lockout	**Description:**	Water temperature higher than 190 degrees F detected when the burner is on.
		Causes & Actions:	Faulty temperature regulation - contact qualified service agency to inspect the control.
A19, A22, A23, A27, A28, A29, A30	various software errors	**Description:**	Internal software error.
		Causes & Actions:	Contact a qualified agency to inspect the control.
A20	FLAME ERROR 2	**Description:**	The flame is still present 10 seconds after closing the gas valve.
		Causes & Actions:	The gas valve is not closing properly - contact a qualified agency.
A21	FLAME ERROR 1	**Description:**	A flame is detected before ignition.
		Causes & Actions:	Contact a qualified agency to inspect the controls.
A24	FLAME FAIL LOCKOUT	**Description:**	Flame signal has been lost ten times during one demand.
		Causes & Actions:	Dirty or faulty flame rod - see manual.
			Faulty or loose wiring to gas valve - check wiring and connections.
A36	BLOCKED VENT	**Description:**	Blocked vent error occurs 3 times in a 10 minute period.
		Causes & Actions:	See blocking error E36.
A38	LOW GAS PRESSURE	**Description:**	Low gas pressure error occurs 3 times in a 10 minute period.
		Causes & Actions:	See blocking error E38.

SECTION VII: TROUBLESHOOTING

Table 8 shows a list of blocking error codes. A blocking code will be visible on the control display in the form of a code (letter "E" followed by a number) and a short message. Blocking errors automatically reset once the error is corrected.

Table 8: Blocking Error Codes

BLOCKING ERRORS			
Code	Error Message	Description & Possible Causes/Actions	
E34 - E38	WD INTERNAL ERROR	**Description:**	Internal software error.
		Causes & Actions:	Contact a qualified agency to inspect the control.
E31 - E34	REF HI/LO TOO HI/LO	**Description:**	Internal hardware error.
		Causes & Actions:	Contact a qualified agency to inspect the control.
E35	FALSE FLAME	**Description:**	A flame is detected when no flame is allowed.
		Causes & Actions:	The control and/or gas valve is not working properly - contact a qualified agency.
E36	BLOCKED VENT	**Description:**	The blocked vent circuit is open.
		Causes & Actions:	Intake or exhaust vent is blocked - inspect and clean.
			Faulty or loose wiring to switches - check blue and yellow wires.
			Excessive wind or room draft is creating high pressures.
E38	LOW GAS PRESSURE	**Description:**	The gas supply pressure is too low.
		Causes & Actions:	Low supply pressure or undersized piping - see manual.
			Gas supply is turned off.
			Pressure drop due to other appliances on the same supply line.
			Faulty or loose wiring to switch - check black/yellow wires.
E39	FLUE GAS LIMIT	**Description:**	The exhaust gas temperature has exceeded the high limit.
		Causes & Actions:	
E43, E47	various WD ERRORS	**Description:**	Various WD communication errors.
		Causes & Actions:	Contact a qualified agency to inspect the control.
E44	PHASE ERROR	**Description:**	The polarity at the main power supply is reversed.
		Causes & Actions:	The hot and neutral wires are reversed - Contact a qualified agency to inspect the installation.
E46	EARTH GROUND ERROR	**Description:**	A faulty earth ground connection is detected.
		Causes & Actions:	Improper wiring - check all green wires.
E51 or E52	WATER T SENSOR OPEN	**Description:**	The water temperature sensor is open.
		Causes & Actions:	Faulty or loose wiring - check sensor, wires and connections.
E59 or E60	WATER T SENSOR SHORT	**Description:**	The water temperature sensor is shorted.
		Causes & Actions:	Short in circuit - check sensor, wires and connections.
E65	FLUE SENSOR SHORT	**Description:**	The exhaust gas sensor is shorted.
		Causes & Actions:	Short in circuit - check sensor, wires and connections.
E66	RESET BUTTON ERROR	**Description:**	An error has occurred with the reset button ("i" button)
		Causes & Actions:	Contact a qualified agency to inspect the control display.
E72	APPLIANCE SEL ERROR	**Description:**	An error has occurred due to incorrect applicance selection.
		Causes & Actions:	Contact a qualified agency to inspect the controls.
E76, E77, E79, OR E81	various fan errors	**Description:**	A communication error has occurred with the fan.
		Causes & Actions:	Contact a qualified agency to inspect the control.

Table 9 should be referenced when troubleshooting the powered anode system. If the status LED is off or flashing red, a problem has occurred and service is required. When the LED is a constant green, the system is operating properly. **NOTICE: The tank must be filled with water prior to connecting the water heater to the power supply. The powered anode system will only work properly if the tank is filled with water.**

Table 9: Powered Anode Troubleshooting

LED status	Problem	Solution
OFF	The water heater is not connected to the mains power supply.	Ensure that the water heater is plugged in.
Flashing Red	Error occurred during start-up.	Reset power to the anode power supply by resetting the mains power supply to the water heater.
	The tank is not filled with water.	Disconnect water heater from mains supply and fill tank with water.
	Poor electrical connection between anode power supply and anode rod.	Check the insulation on all connecting harnesses for bare spots. Check the connections at the power supply and anode terminals.
	Polarity is reversed due to incorrect wiring.	Refer to the wiring diagram and correct polarity.
	Defective seal in adode brushing; anode rod is no longer insulated from tank.	With an ohmmeter, check for electrical continuity between the powered anode terminal and the brushing. If there is continuity, replace the anode rod.

SERVICING THE FLAME ROD AND IGNITOR

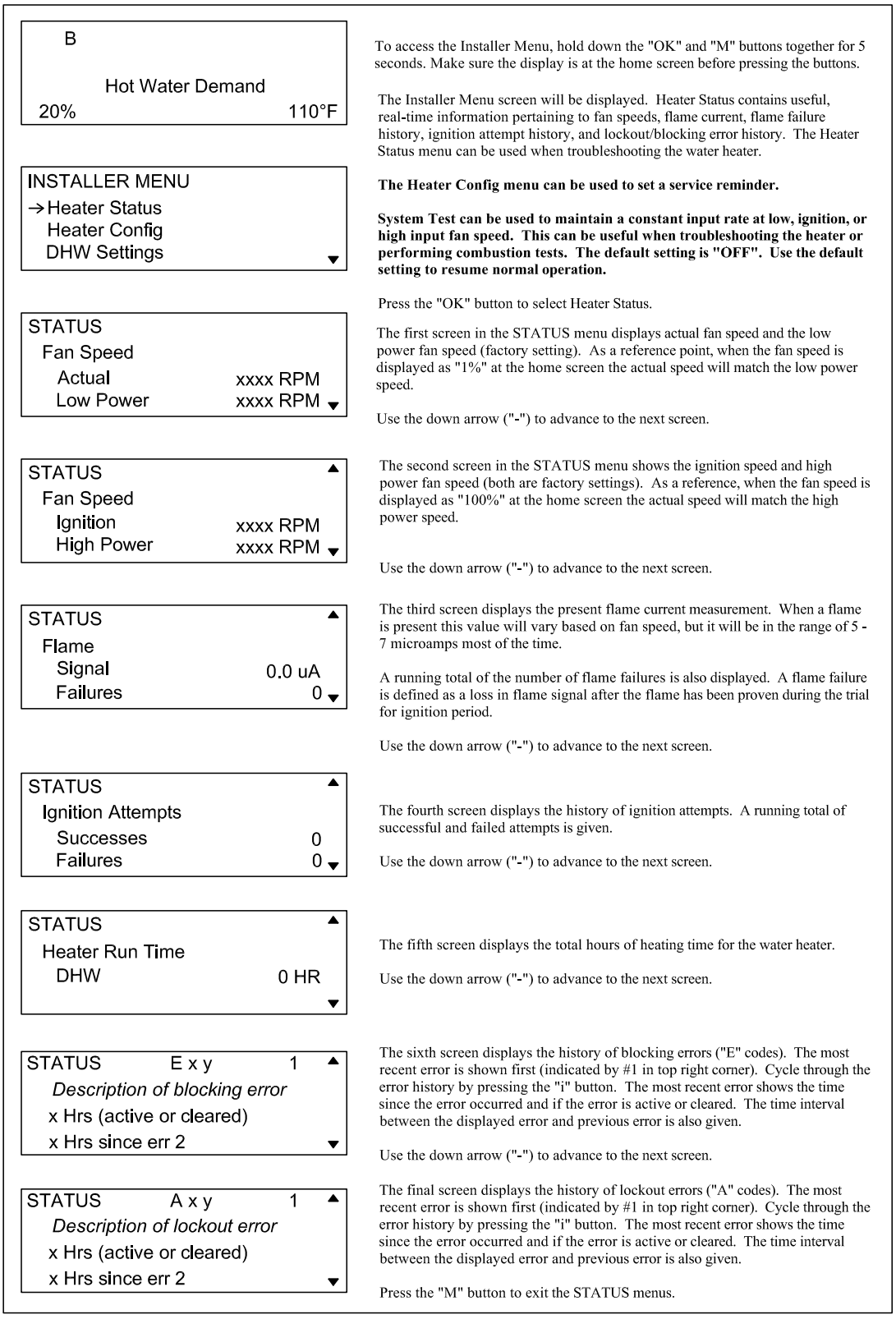
If an A01 lockout error code is present there has been a problem with lighting the burner. Two possible causes for this error are a dirty or faulty flame rod or a faulty ignitor. Each component can be checked for proper operation.

The hot surface ignitor can be checked with a visual inspection through the burner assembly sight glass. Before the gas valve opens in the ignition sequence, the ignitor will warm-up for 8 seconds. During this time, an orange glow will be visible through the sight glass. If accessing the sight glass is not feasible, two simple checks can be made with a multimeter. First, ignitor resistance may be measured at the end of the ignitor wiring terminal. Turn off power to the water heater and disconnect the ignitor wire harness from the wire harness with the two orange wires. Insert the multimeter probes into the ignitor wire harness terminal. At normal room temperature, the ignitor resistance will be approximately 38 ohms. After a heating cycle, the resistance will be in the range of 38 - 80 ohms (depending on when the measurement is taken after the cycle). Besides resistance, the continuity of the ignitor circuit can be checked. With the multimeter probes still in the terminal, switch the meter to check for continuity. If continuity is not indicated, the ignitor must be replaced.

If the ignitor is working properly and the burner lights but goes out right away, check the flame rod. The rod may be dirty or it could be damaged and a replacement will be required. Start by turning off power to the water heater and remove the flame rod. Inspect the ceramic insulator for cracks (replace if cracked). Clean the rod with fine steel wool and reinstall. Turn on power to the water heater and enter the Installer Menu on the control display (see next subsection for instructions). Arrow down until the third screen that displays the flame signal. During the next ignition attempt, a flame signal (in microamps, “uA”) will be displayed. Under normal operation, the flame signal will be between 2 - 5 uA during a successful ignition period. As the fan speed increases the flame signal will become stronger and eventually be in the 5 - 7 uA range. A minimum flame signal of 1.25 uA is required to avoid a flame failure. If the flame signal is 0 uA when a flame is present during the ignition period, the flame rod needs to be replaced.

INSTALLER MENUS

System and troubleshooting information such as fan speeds, flame signal, ignition attempts, and error history is available in the Installer Menu. Refer to Figure 24 for instructions to access this menu and useful tips.



To access the Installer Menu, hold down the "OK" and "M" buttons together for 5 seconds. Make sure the display is at the home screen before pressing the buttons.

The Installer Menu screen will be displayed. Heater Status contains useful, real-time information pertaining to fan speeds, flame current, flame failure history, ignition attempt history, and lockout/blocking error history. The Heater Status menu can be used when troubleshooting the water heater.

The Heater Config menu can be used to set a service reminder.

System Test can be used to maintain a constant input rate at low, ignition, or high input fan speed. This can be useful when troubleshooting the heater or performing combustion tests. The default setting is "OFF". Use the default setting to resume normal operation.

Press the "OK" button to select Heater Status.

The first screen in the STATUS menu displays actual fan speed and the low power fan speed (factory setting). As a reference point, when the fan speed is displayed as "1%" at the home screen the actual speed will match the low power speed.

Use the down arrow ("-") to advance to the next screen.

The second screen in the STATUS menu shows the ignition speed and high power fan speed (both are factory settings). As a reference, when the fan speed is displayed as "100%" at the home screen the actual speed will match the high power speed.

Use the down arrow ("-") to advance to the next screen.

The third screen displays the present flame current measurement. When a flame is present this value will vary based on fan speed, but it will be in the range of 5 - 7 microamps most of the time.

A running total of the number of flame failures is also displayed. A flame failure is defined as a loss in flame signal after the flame has been proven during the trial for ignition period.

Use the down arrow ("-") to advance to the next screen.

The fourth screen displays the history of ignition attempts. A running total of successful and failed attempts is given.

Use the down arrow ("-") to advance to the next screen.

The fifth screen displays the total hours of heating time for the water heater.

Use the down arrow ("-") to advance to the next screen.

The sixth screen displays the history of blocking errors ("E" codes). The most recent error is shown first (indicated by #1 in top right corner). Cycle through the error history by pressing the "i" button. The most recent error shows the time since the error occurred and if the error is active or cleared. The time interval between the displayed error and previous error is also given.

Use the down arrow ("-") to advance to the next screen.

The final screen displays the history of lockout errors ("A" codes). The most recent error is shown first (indicated by #1 in top right corner). Cycle through the error history by pressing the "i" button. The most recent error shows the time since the error occurred and if the error is active or cleared. The time interval between the displayed error and previous error is also given.

Press the "M" button to exit the STATUS menus.

Figure 24: Using the Installer Menu

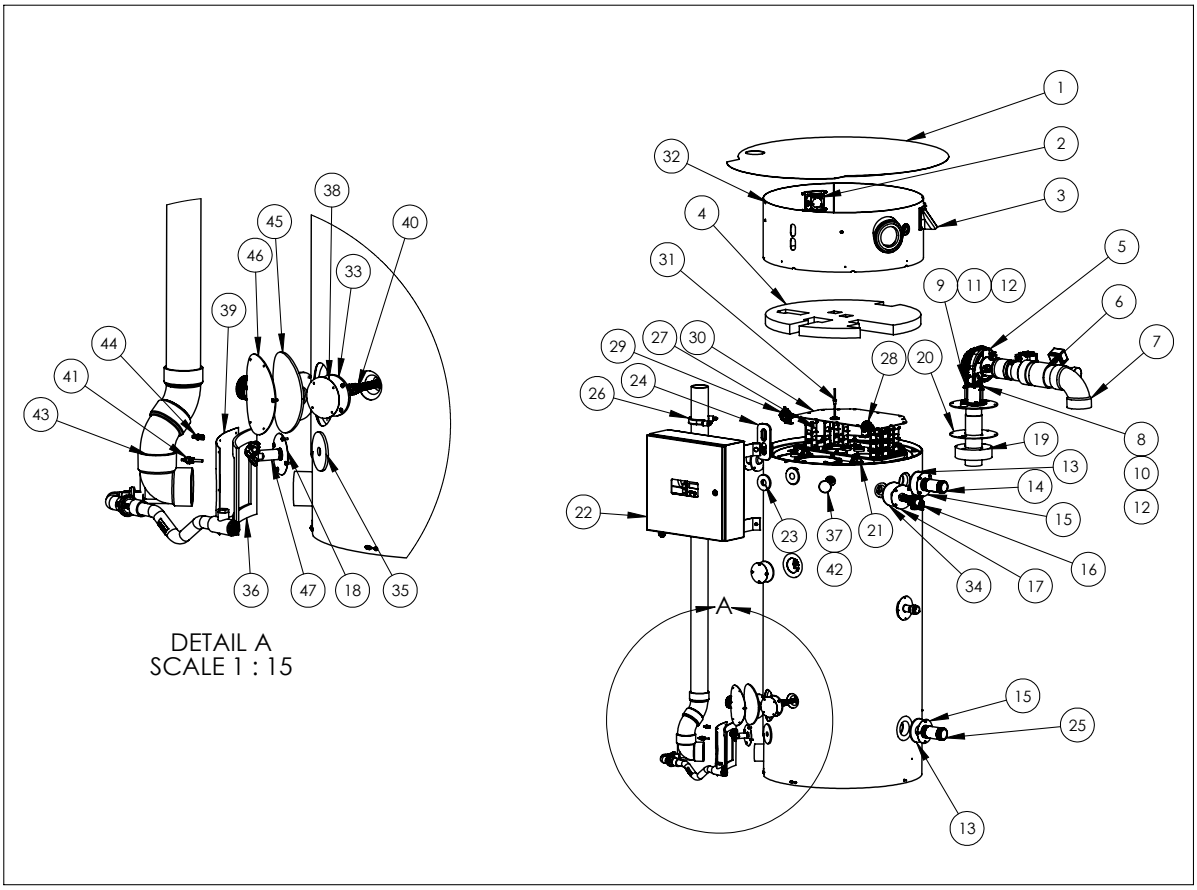


Figure 25: optiTHERM Parts

Table 10: optiTHERM Parts

ITEM NO.	DESCRIPTION	PART NUMBER
1	Top Cover Assembly	19516
2	Fan, 120 VAC	20020
3	Cover, Rain	17128
4	Top Insulation	18153
5	Burner Assembly	See Burner Assembly Parts List
6	Intake Assembly, Gen2, no damper	19983
7	PVC Elbow, 90deg, 4", Sch40	18280
8	Hot Surface Igniter	19945
9	Flame Rod	19853
10	Gasket, optiTHERM HSI	18207
11	Gasket, optiTHERM Flame Rod	18209
12	#8-32 x 0.25in Socket Head Cap Screw	25137
13	Gasket, 2" Pipe	18189
14	Outlet Nipple	15407
15	Trim Ring, 2" Pipe	17143
16	1in T&P Valve 140X-6	21785
17	Trim Ring, 1" Pipe	17144
18	Trim Ring, 3/4" pipe	17145
19	Burner Refractory Disk	18006
20	Gasket, 6 Bracket Flange	18216
21	Plug, 1", Square head	15297
22	Control Panel-Enclosure Assembly ODOT300-500	See Control Panel Assembly Parts List
23	Gasket, Seal Temp Sensor Wire	18178

ITEM NO.	DESCRIPTION	PART NUMBER
24	Gasket, EPDM, Ctrl Encl to Upr Jacket	18182
25	Nipple, Inlet	15340
26	Strap, 3" Exhaust, PVC	17203
27	Baffle, 2in Tube	16604
28	Switch, Blocked Intake, NC, -2.1"	20012
29	Switch, Blocked Exhaust, NC	20014
30	Transition Chamber Cover	Contact Bock
31	Sensor, 10K, NTC, 300C	21599
32	Jacket, Upper	19298
33	Gasket, ASME Cover Plate	18188
34	Gasket, 1" Pipe, SCE42B, ODOT	18193
35	Gasket, 3/4" Pipe, SCE42B	18168
36	Gasket, Exh Trim Plate	18164
37	Cap, Plastic BLK	17565
38	Cover Plate, ASME, ODOT	17177
39	Exhaust Cover	19426
40	Powered Anode 20"	15153
41	Exhaust Temp Sensor	21596
42	Tasseron Duplex Sensor, 0.25NPT, Brass	21594
43	Vent Assembly	25587
44	HB Fitting, 1/4"NPT x 1/4" Hose Barb	17277
45	Gasket, Hand Hole Cover	18171
46	Cover Plate, 8", Hand Hole ODOT	17176
47	Drain Valve	15590
48	Temp Switch Bracket	17168
49	Handhole Gasket, 2" OTV2	18202

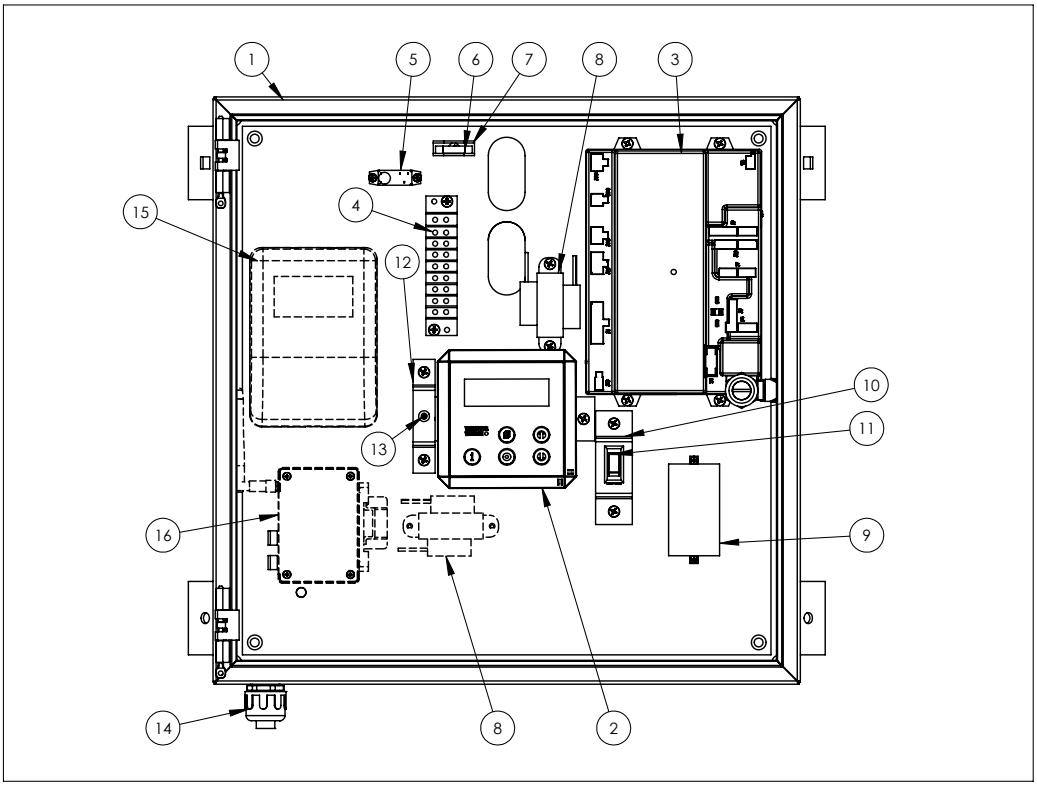


Figure 26: optiTHERM Control Panel Parts

Table 11: optiTHERM Control Panel Parts

ITEM NO.	DESCRIPTION	PART NUMBER
1	Control Enclosure	17202
2	Control Display	Varies
3	Main Operating Control	Varies
4	Terminal Block	19855
5	Relay, SPDT, 120V, 5 TRM	19857
6	Fuse, Delay, 5A	19861
7	Fuse BLK, 300V 30A	19860
8	Transformer 24V WHT. Rogers (Second transformer optional)	21621
9	Powered Anode Supply	15157
10	Bracket, Power Switch, OptiTherm	17117

ITEM NO.	DESCRIPTION	PART NUMBER
11	Switch, Rocker, 125V 20A	19858
12	Bracket, LED Bracket	17119
13	Correx Potentiostat LED	15157
14	Conduit Fitting, Liquid Tight, Heyco 8402	19856
15	Control, Argus, 850IF (Optional)	21680
16	Control, ProtoAir, FPA-W44 BACnet (Optional)	20257

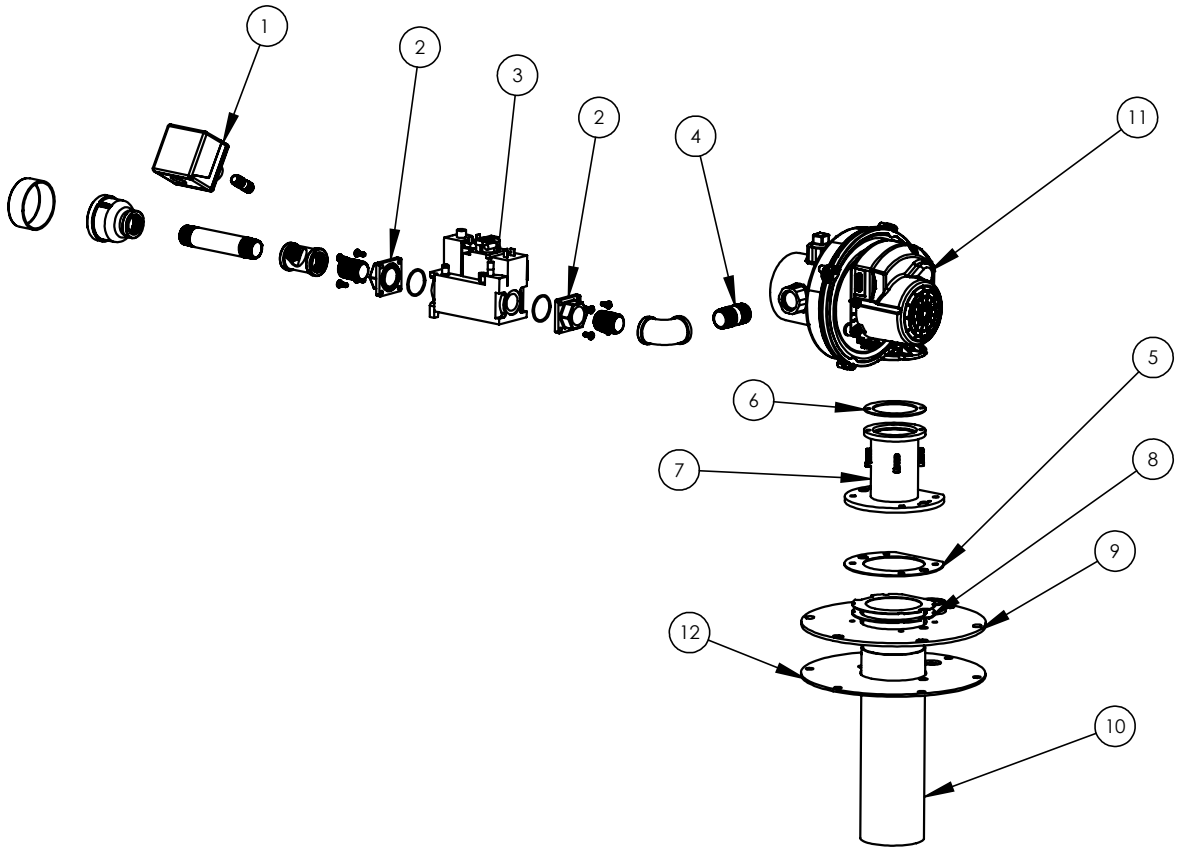


Figure 27: optiTHERM Burner Assembly Parts

Table 12: optiTHERM Burner Assembly Parts

#	Description	#	Description
1	Gas Pressure Switch [Part# 20008]	6	Gasket (blower to transition tube) [Part# 18210]
2	Gas Control Flange (w/ gasket) [Part# 20007]	7	Transition Tube [Part# 17057]
3	Gas Control (NAT GAS_0-2,000 FT ALT) [Part# 20006]	8	Gasket (Burner to Mounting Flange) [Part# 18214]
3	Gas Control (LP GAS_0-7,800 FT ALT; NAT GAS_2,000-7,800 FT ALT) [Part# 20013]	9	Mounting Flange [Part# 17053]
		10	Burner [Part# 19848]
4	Pipe Nipple (NAT GAS models) [Part# 15205]	11	Blower [Part# 19900]
4	Pipe Nipple w/0.391" Orifice (LP GAS models) [Part# 19880]	12	Gasket (Mounting Flange to Bracket) [Part# 18216]
5	Gasket (Burner to Transition tube) [Part# 18212]		

Table 13: optiTHERM Wiring Harnesses

Part #	Description	Connections	
		From	To
21650	Blower Power Supply & PWM	Main Control (J9) & Fuse Block	Blower (2 connections)
21652	Transformer & Flame Rod	Main Control (J13)	24V Transformer & Flame Rod
21655	Tank Temperature Sensor, Display,Flue Pass 2 Sensor	Main Control (J5)	Tank Temp. Sensors, Display, Flue Pass 2 Sensor, Harness #21671
21657	Hot Surface Ignitor	Main Control (J4)	Hot Surface Ignitor
21660	Main Power Supply	Main Control (J2)	Terminal Block & Power Switch
21664	Safety Switches	Main Control (J16)	Air Proving Switch, Blocked Intake Switch, Harness #21671 & Harness #21669
21680	Gas Control	Gas Control	24V Transformer & Ground
21677	J-Box to Terminal Block	Junction Box	Terminal Block
21665	Plug-in Power Cord	Junction Box	Standard 3-Prong 120VAC Plug
21667	Power Switch	Power Switch	Terminal Block
21669	Gas Pressure Switch	Gas Pressure Switch	Harness #21664 & Ground
21673	Blower Relay (2 req'd)	Relay	Terminal Block
		Relay	Fuse Block
21675	Power to Anode Controller	Terminal Block	Anode Power Supply
21671	Flue Gas Temperature Sensor & Safety Switch	Harness #21655 & Harness #21664	Flue Gas Sensor & Blocked Exhaust Switch
15155	Anode Rods	Anode Power Supply	Anode Rods

SECTION IX: WARRANTY

LIMITED WARRANTY FOR GAS-FIRED WATER HEATER

Bock Water Heaters, Inc.

110 S. Dickinson Street

Madison, WI 53703

Phone: 608-257-2225

WHAT DOES THIS LIMITED WARRANTY COVER?

This limited warranty applies only to the original consumer purchaser.

General Defects and Malfunctions: This warranty covers defections and malfunctions in your new water heater for a period of one year from the original installation date. We will repair or replace, at our option, any defective or malfunctioning component of the water heater. This limited warranty will terminate if you sell or otherwise transfer the water heater, or the water heater is installed at a location different from its original installation location.

Tank and Heat Exchanger: We also warrant that the tank and heat exchanger will not leak due to defective materials or workmanship for five years from the date of original installation or from date of manufacture in the event the Limited Warranty Registration Card was not completed and returned to manufacturer. If the tank and heat exchanger is leaking and we have verified that the leak is due to a defect in materials and workmanship, we will replace the tank with a tank that is the nearest Bock model available at the time of replacement. If a replacement tank is provided, it will remain warranted under this section as if it were the original tank. For example, if we send you a replacement tank under this limited warranty two years after the original installation date, then the replacement tank will remain warranted for the remaining three years after the original installation date.

HOW DO YOU GET SERVICE UNDER THE LIMITED WARRANTY?

In order for the warranty period to begin on the date of installation, you must return the warranty registration card attached below within 30 days of purchasing the water heater. You may also register your water heater online at www.bockwaterheaters.com. You must have a copy of the original sales receipt at the time you request service. Failure to return the warranty registration card and provide a copy of the sales receipt will result in the warranty period beginning from the date of manufacture.

To get service under this limited warranty you should contact either the dealer or installer. If dealer or installer is unknown you can contact us via e-mail at warranty@bockwaterheaters.com or call us Monday through Friday between the hours of 8 o'clock a.m. to 5 o'clock p.m. Central Time at the following number: 1-608-257-2225.

You can also write us at the following address:

Bock Water Heaters, Inc.

Warranty Support Group

110 S. Dickinson Street

Madison, WI 53703

We will respond not later than ten days after we have received your request for service.

SECTION IX: WARRANTY

WHAT DOES THIS LIMITED WARRANTY NOT COVER?

This limited warranty does not cover water heaters that are or were:

- Incorrectly installed, especially where the installation violates state or local plumbing, housing or building codes.
- Operated at inappropriate settings, excessive pressures or temperatures.
- Exposed to adverse local conditions and specifically sediment or lime precipitation in the tank or corrosive elements in the atmosphere or unacceptable water quality.
- Installed outside the United States or Canada.
- Accidentally damaged.

Also, we will not cover the following charges, costs and losses:

- Any freight or delivery charges.
- Any removal or installation charges.
- Charges to return the water heater or part to the manufacturer.
- Water damage, loss or damage to property, inconvenience or loss of use.

WHAT WILL VOID THE LIMITED WARRANTY?

If you do any of the following, you will void this limited warranty:

- Fail to retain an original copy of your sales receipt.
- Fail to retain the actual rating plate from the water heater.
- Alter or remove the serial number.
- Transfer or sell the water heater.
- Remove the water heater from its original location and install it somewhere else.
- Fail to follow the care and maintenance instructions provided with the water heater.
- Alter, disable or in any way cause the Impressed Current Cathodic Protection system to be inoperable.
- Fail to maintain in continuous good working condition the Impressed Current Cathodic Protection system.

HOW DOES STATE LAW RELATE TO THIS LIMITED WARRANTY?

This is a limited warranty. WE MAKE NO OTHER EXPRESS WARRANTIES WITH RESPECT TO THIS WATER HEATER. We will not assume, nor authorize any person to assume for us any other liability in connection with the sale or operation of this water heater. ANY IMPLIED WARRANTIES, INCLUDING MECHANTABILITY OR FITNESS FOR A PARTICULAR APPLICATION, IMPOSED ON THIS SALE UNDER THE LAWS OF THE STATE OF SALE ARE LIMITED TO ONE YEAR. This warranty gives you specific legal rights, and you may also have other rights which vary from state to state. Some states do not allow limitations on how long an implied warranty lasts, so the above limitation may not apply to you.

WE WILL NOT BE RESPONSIBLE FOR WATER DAMAGE, LOSS OF USE OF THE UNIT, INCONVENIENCE, LOSS OR DAMAGE TO PERSONAL PROPERTY, WHETHER DIRECT OR INDIRECT, AND WHETHER ARISING IN CONTACT OR TORT. Some states do not allow the exclusion of incidental or consequential damages, so the above exclusion may not apply to you.