

COMMERCIAL GAS WATER HEATERS



500 Tennessee Waltz Parkway
Ashland City, TN 37015
www.hotwater.com

AHRI CERTIFIED[®]
www.ahridirectory.org



MODELS XWH 150 - 800
INSTALLATION - OPERATION - SERVICE
- MAINTENANCE - LIMITED WARRANTY



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.

Thank you for buying this energy efficient water heater.
We appreciate your confidence in our products.



WARNING

Read and understand this instruction manual and the safety messages herein before installing, operating or servicing this water heater.

Failure to follow these instructions and safety messages could result in death or serious injury.

This manual must remain with the water heater.

PLACE THESE INSTRUCTIONS ADJACENT TO HEATER AND NOTIFY OWNER TO KEEP FOR FUTURE REFERENCE.


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SAFE INSTALLATION, USE AND SERVICE

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

	<p>This is the safety alert symbol. It is used to alert you to potential personal injury hazards. Obey all safety messages that follow this symbol to avoid possible injury or death.</p>
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	<p>DANGER indicates an imminently hazardous situation which, if not avoided, will result in injury or death.</p>
	<p>WARNING indicates a potentially hazardous situation which, if not avoided, could result in injury or death.</p>
	<p>CAUTION indicates a potentially hazardous situation which, if not avoided, could result in minor or moderate injury.</p>
	<p>CAUTION used without the safety alert symbol indicates a potentially hazardous situation which, if not avoided, could result in property damage.</p>

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

APPROVALS



GENERAL SAFETY INFORMATION

PRECAUTIONS

DO NOT USE THIS WATER HEATER IF ANY PART HAS BEEN EXPOSED TO FLOODING OR WATER DAMAGE. Immediately call a qualified service agency to inspect the water heater and to make a determination on what steps should be taken next.

If the unit is exposed to the following, do not operate heater until all corrective steps have been made by a qualified service agency.

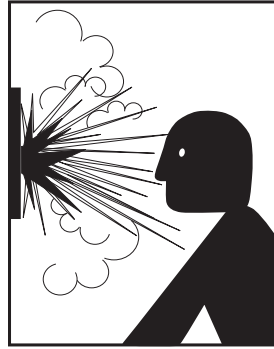
1. External fire.
2. Damage.
3. Firing without water.

GROUNDING INSTRUCTIONS

This water heater must be grounded in accordance with the National Electrical Code and/or local codes. These must be followed in all cases. Failure to ground this water heater properly may also cause erratic control system operation.

This water heater must be connected to a grounded metal, permanent wiring system; or an equipment grounding conductor must be run with the circuit conductors and connected to the equipment grounding terminal or lead on the water heater.

HYDROGEN GAS FLAMMABLE



⚠️ WARNING

Explosion Hazard

- Flammable hydrogen gases may be present.
- Keep all ignition sources away from faucet when turning on hot water.

Hydrogen gas can be produced in a hot water system served by this water heater that has not been used for a long period of time (generally two 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 served by this water heater be opened for several minutes before using any electrical appliance connected to the hot water system. If hydrogen is present there will probably be an unusual sound such as air escaping through the pipe as the water begins to flow. THERE SHOULD BE NO SMOKING OR OPEN FLAME NEAR THE FAUCET AT THE TIME IT IS OPEN.

Verify the power to the water heater is turned off before performing any service procedures. The Enable /Disable switch on front panel disables the 24 volt gas valve. Electrical supply must be turned off at circuit breaker serving water heater.

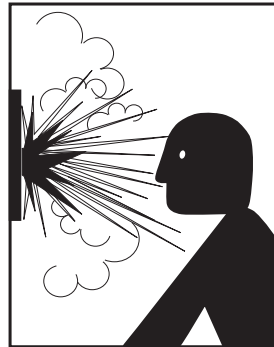


⚠️ WARNING

Read and understand this instruction manual and the safety messages herein before installing, operating or servicing this water heater.

Failure to follow these instructions and safety messages could result in death or serious injury.

This manual must remain with the water heater.



⚠️ WARNING

Explosion Hazard

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

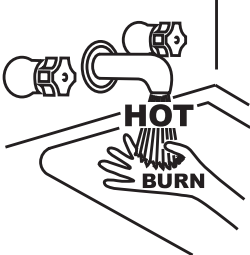
⚠️ DANGER

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

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

Feel water before bathing or showering.

Temperature limiting devices such as mixing valves must be installed when required by codes and to ensure safe temperatures at fixtures.



CAUTION

Improper installation, use and service may result in property damage.

- Do not operate water heater if exposed to flooding or water damage.
- Install in location with drainage.
- Properly sized thermal expansion tanks are required on all closed water systems.



Refer to this manual for installation and service.

GENERAL SAFETY INFORMATION

⚠️ WARNING

Fire or Explosion Hazard

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

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

⚠️ WARNING

Fire Hazard

For continued protection against risk of fire:


- Do not install water heater on carpeted floor.
- Do not operate water heater if exposed to flooding or water damage.



⚠️ WARNING


Fire and Explosion Hazard

- Use joint compound or Teflon tape compatible with propane gas.
- Leak test gas connections before placing water heater in operation.
- Disconnect gas piping at main gas shutoff valve before leak testing heater.
- Install sediment trap in accordance with NFPA 54 or CAN/CSA B149.1.



⚠️ WARNING

Breathing Hazard - Carbon Monoxide Gas




- Do not obstruct water heater air intake with insulating blanket.
- Gas and carbon monoxide detectors are available.
- Install water heater in accordance with the instruction manual.

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

⚠️ WARNING

Fire and Explosion Hazard

- Do not use water heater with any gas other than the gas shown on the rating label.
- Excessive gas pressure to gas valve can cause serious injury or death.
- Turn off gas lines during installation.
- Contact a qualified installer or service agency for installation and service.




CAUTION

Property Damage Hazard

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

⚠️ WARNING

Electrical Shock Hazard





- Turn off power at the branch circuit breaker serving the water heater before performing any service.
- Label all wires prior to disconnecting when performing service. Wiring errors can cause improper and dangerous operation.
- Verify proper operation after servicing.
- Failure to follow these instructions can result in personal injury or death.

⚠️ WARNING

Jumping out control circuits or components can result in property damage, personal injury or death.

- Service should only be performed by a qualified service technician using proper test equipment.
- Altering the water heater controls and/or wiring in any way could result in permanent damage to the controls or water heater and is not covered under the limited warranty.

Any bypass or alteration of the water heater controls and/or wiring will result in voiding the appliance warranty.

INTRODUCTION

Thank You for purchasing this water heater. Properly installed and maintained, it should give you years of trouble free service.

ABBREVIATIONS USED

Abbreviations found in this Instruction Manual include :

- ANSI - American National Standards Institute
- ASME - American Society of Mechanical Engineers
- AHRI - Air Conditioning, Heating and Refrigeration Institute
- NEC - National Electrical Code
- NFPA - National Fire Protection Association
- UL - Underwriters Laboratory

QUALIFICATIONS

QUALIFIED INSTALLER OR SERVICE AGENCY

Installation and service of this water heater requires ability equivalent to that of a Qualified Agency (as defined by ANSI below) in the field involved. Installation skills such as plumbing, air supply, venting, gas supply and electrical supply are required in addition to electrical testing skills when performing service.

ANSI Z223.1 2006 Sec. 3.3.83: “Qualified Agency” - “Any individual, firm, corporation or company that either in person or through a representative is engaged in and is responsible for (a) the installation, testing or replacement of gas piping or (b) the connection, installation, testing, repair or servicing of appliances and equipment; that is experienced in such work; that is familiar with all precautions required; and that has complied with all the requirements of the authority having jurisdiction.”

If you are not qualified (as defined by ANSI above) and licensed or certified as required by the authority having jurisdiction to perform a given task do not attempt to perform any of the procedures described in this manual. If you do not understand the instructions given in this manual do not attempt to perform any procedures outlined in this manual.

PREPARING FOR THE INSTALLATION

1. Read the entire manual before attempting to install or operate the water heater. Pay close attention to the General Safety Information on Page 4 and 5. If you don't follow the safety rules, the water heater may not operate safely. It could cause property damage, injury and/or death.

This manual contains instructions for the installation, operation, and maintenance of the water heater. It also contains warnings throughout the manual that you must read and be aware of. All warnings and all instructions are essential to the proper operation of the water heater and your safety.

Detailed installation diagrams are also found in this manual. These diagrams will serve to provide the installer with a reference. It is essential that all venting, water piping, gas piping and wiring be installed as shown.

Particular attention should be given to the installation of thermometers at the locations indicated in the piping diagrams as these are necessary for checking the operation of the water heater.

The principal components of the water heater are identified in Features and Components section on Page 7 in this manual. Use this reference to locate and identify various components on the water heater.

Service and diagnostic procedures should only be performed by a Qualified Service Agency.

NOTE: Costs to correct installation errors are not covered under the limited warranty.

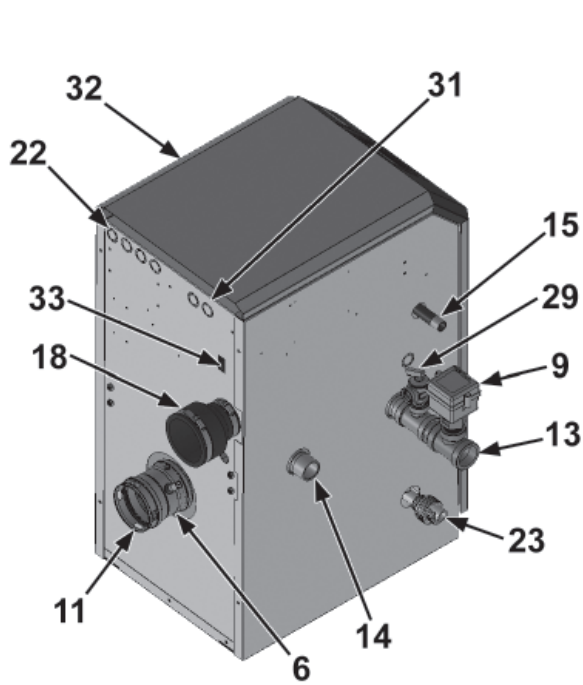
2. Be sure to turn off power when working on or near the electrical system of the water heater. Never touch electrical components with wet hands or when standing in water.
3. The installation must conform to all instructions contained in this manual and the local code authority having jurisdiction. These shall be carefully followed in all cases. Authorities having jurisdiction should be consulted before installation begins if there are any questions regarding compliance with local, state or national codes.

In the absence of local codes, the installation must comply with the current editions of the National Fuel Gas Code, ANSI Z223.1/NFPA 54 and the National Electrical Code, NFPA 70, the Natural Gas and Propane Installation Code. NFPA documents are also available from the National Fire Protection Association, 1 Batterymarch Park, Quincy, MA 02269.

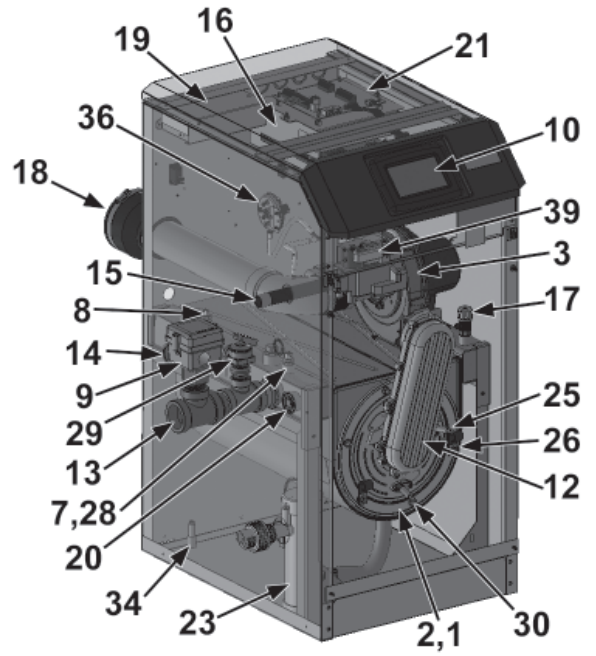
4. If after reading this manual you have any questions or do not understand any portion of the instructions, call the toll free number on the back cover of this manual for technical assistance. In order to expedite your request, please have the full Model, Serial and Series number of the water heater you are working with available for the technician. This information is located on the water heater's rating label.
5. Carefully plan the placement of the water heater. Examine the location to ensure that it complies with the requirements in Determine Water Heater Location on Page 11 and the Rough in Dimensions on Page 10.
6. For installation in California this water heater must be braced or anchored to avoid falling or moving during an earthquake. See instructions for correct installation procedures. Instructions may be obtained from California Office of the State Architect, 1102 Q Street, Suite 5100, Sacramento, CA 95811.

FEATURES AND COMPONENTS

MODELS 150 - 200

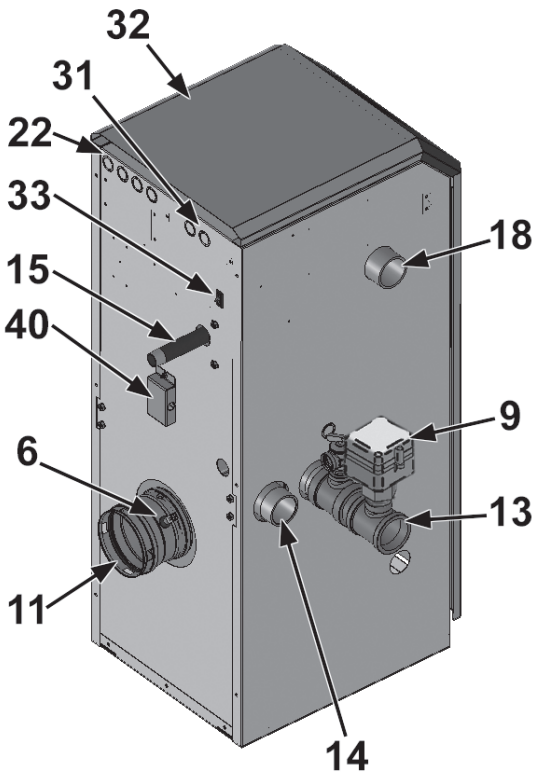


Rear View - Models 150 - 200

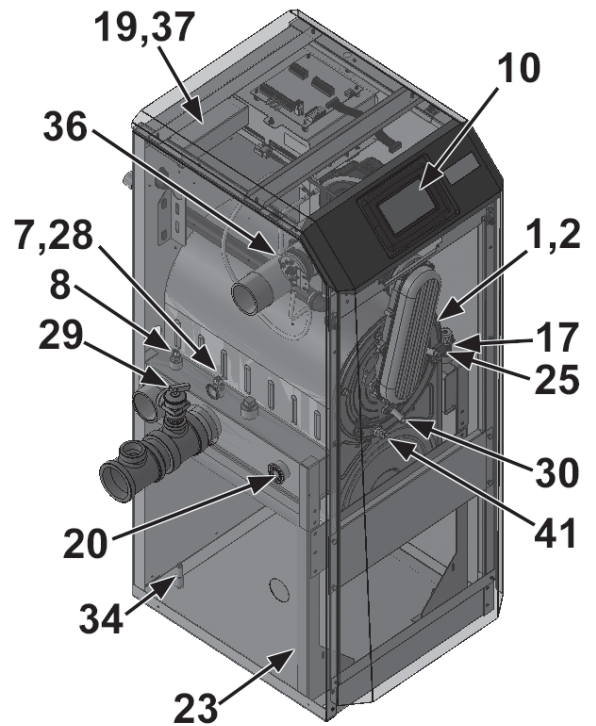


Left Side (Inside Out): Models 150 - 200

MODEL 285



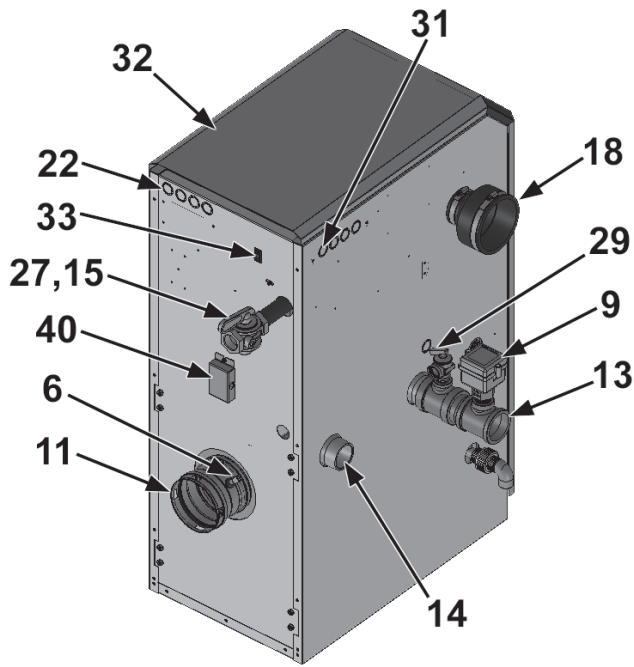
Rear View - Models 285



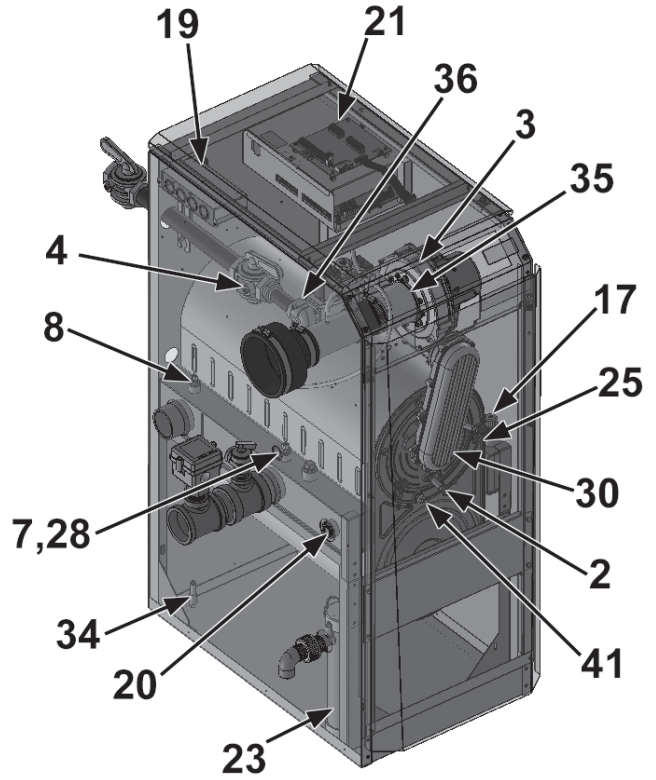
Left Side (Inside Out): Models 285



MODELS 400 - 500

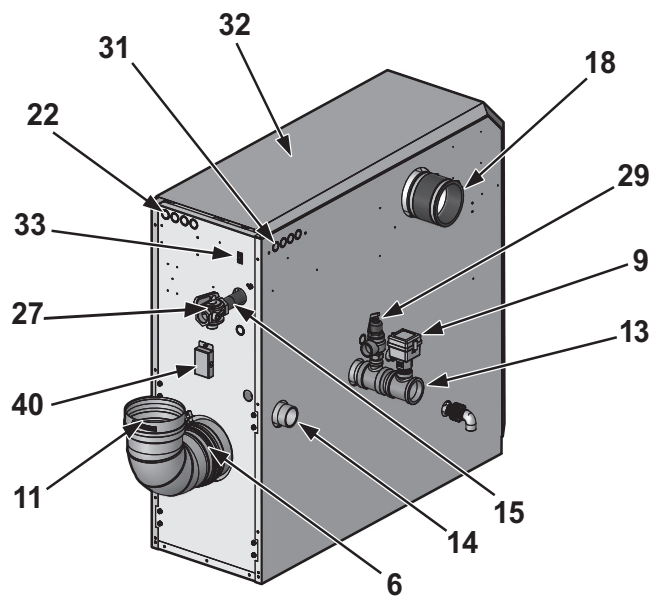


Rear View - Models 400 - 500

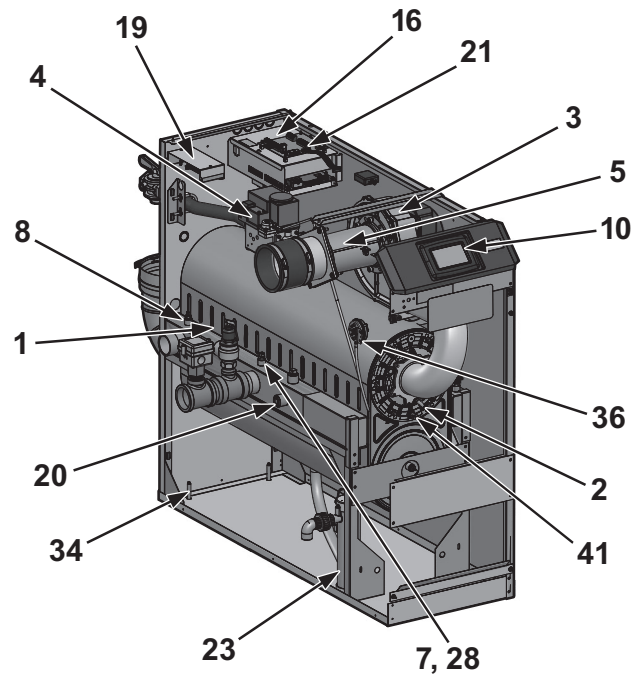


Left Side (Inside Out): Models 400 - 500

MODELS 600 - 800



Rear View - Models 600 - 800



Left Side (Inside Out): Models 600 - 800

COMPONENTS

- 1. Stainless Steel Heat Exchanger:** Allows water to flow through specially designed coils for maximum heat transfer, while providing protection against flue gas corrosion. The coils are encased in a jacket that contains the combustion process.
- 2. Combustion Chamber Access Cover:** Allows access to the combustion side of the heat exchanger coils.
- 3. Blower:** The blower pulls in air and gas through the venturi (item 5). Air and gas mix inside the blower and are pushed into the burner, where they burn inside the combustion chamber.
- 4. Gas Valve:** The gas valve monitors the negative pressure created by the blower, allowing gas to flow only if the gas valve is powered and combustion air is flowing.
- 5. Venturi:** The venturi controls air and gas flow into the burner.
- 6. Flue Gas (limit rated):** This sensor monitors the flue gas exit temperature. The control module will modulate and shut down the water heater if the flue gas temperature gets too hot. This protects the flue pipe from overheating.
- 7. Water Heater Outlet Temperature Sensor (Housed with the High Limit Sensor):** This sensor monitors water heater outlet water temperature (system supply). If selected as the controlling sensor, the control module adjusts the water heater firing rate so the outlet temperature is correct.
- 8. Water Heater Inlet Temperature Sensor:** This sensor monitors return water temperature (system return). If selected as the controlling sensor, the control module adjusts the water heater firing rate so the inlet temperature meets system setpoint.
- 9. Flow Switch:** The flow switch is a safety device that ensures flow through the heat exchanger during operation. This appliance is low mass and should never be operated without flow. The flow switch makes contact when flow is detected and allows the unit to operate. If flow is discontinued during operation for any reason the flow switch will break the control circuit and the unit will shut down.
- 10. Touch Screen Display:** The electronic display is a Touch Screen Display consisting of Main Menu, Help and Enable/Disable buttons.
- 11. Flue Pipe Adapter:** Allows for the connection of the PVC vent pipe system to the water heater.
- 12. Burner (not shown):** Made with metal fiber and stainless steel construction, the burner uses pre-mixed air and gas and provides a wide range of firing rates.
- 13. Water Outlet:** NPT water connection that supplies hot water to the tank.
- 14. Water Inlet:** NPT water connection that returns water from the tank to the heat exchanger.
- 15. Gas Connection Pipe:** Threaded pipe connection. This pipe should be connected to the incoming gas supply for the purpose of delivering gas to the water heater.
- 16. Control Module:** The Control Module responds to internal and external signals and controls the blower, gas valve, and pumps to meet the demand.
- 17. Manual Air Vent:** Designed to remove trapped air from the heat exchanger coils.
- 18. Air Intake Adapter:** Allows for the connection of the PVC air intake pipe to the water heater.
- 19. High Voltage Junction Box:** The junction box contains the connection points for the line voltage power and the pump.
- 20. Water Heater Drain Port:** Location from which the heat exchanger can be drained.
- 21. Low Voltage Connection Board:** The connection board is used to connect external low voltage devices.
- 22. Low Voltage Wiring Connections (Knockouts):** Conduit connection points for the low voltage connection board.
- 23. Condensate Drain Connection:** Connects the condensate drain line to a 1/2" PVC union.
- 24. Access Cover - Front (not shown):** Provides access to the gas train and the heat exchanger.
- 25. Ignition Electrode:** Provides direct spark for igniting the burner.
- 26. Flame Inspection Window:** The quartz glass window provides a view of the burner surface and flame.
- 27. Gas Shutoff Valve:** Manual valve used to isolate the gas valve from the gas supply.
- 28. High limit sensor (housed with the Outlet Temperature Sensor):** Device that monitors the outlet water temperature. If the temperature exceeds its setting, the integrated control will break the control circuit, shutting the water heater down.
- 29. Temperature & Pressure Relief Valve:** Protects the heat exchanger from over pressure and temperature conditions. The T & P Relief Valve is set at 150 PSI.
- 30. Flame Sensor:** Used by the control module to detect the presence of burner flame.
- 31. Line Voltage Wiring Connections (Knockouts):** Conduit connection points for the high voltage junction box.
- 32. Top Panel:** Removable panel to gain access to the internal components.
- 33. Power Switch:** Turns 120 VAC ON/OFF to the water heater.
- 34. Leveling Legs:** Used to allow the heat exchanger to be leveled. This is needed for the proper draining of the condensate from the combustion chamber.
- 35. Air Shroud (500 Model Only):** The air shroud directs air and gas flow into the burner.
- 36. Air Pressure Switch:** The air pressure switch detects blocked inlet or outlet conditions.
- 37. Pump Relay (not shown):** The pump relay is used to control the circulation pump.
- 38. Transformer:** The transformer provides 24V power to the integrated control.
- 39. Gas Shutoff Switch:** An electrical switch designed to cut power to the gas valve to prevent releasing any gas.
- 40. Over-Temp Switch (Models 285 - 800) (located underneath access cover):** An electrical switch designed to shut down water heater operation in the event the outer back of the heat exchanger, directly above the flue connection exceeds 604°F (318°C). This is a one time switch and could warrant a heat exchanger replacement. Check the integrity of the rear refractory at the back of the upper coil if the switch opens.
- 41. Burner Door Temperature Switch (Models 285 - 800 Only):** An electrical switch designed to shut down water heater operation in the event the combustion chamber access cover exceeds 500°F (260°C). This switch may only be reset by a qualified service technician AFTER the underlying cause has been identified and corrected. Check the integrity of the front refractory on the inside of the combustion chamber access cover if the switch opens.

INSTALLATION CONSIDERATIONS

ROUGH IN DIMENSIONS

TABLE 1

MODEL	DIMENSIONS		
	HEIGHT	WIDTH	DEPTH
	INCHES (CM)	INCHES (CM)	INCHES (CM)
XWH 150	33-1/4" (84.5)	15-1/2" (39.4)	18" (45.72)
XWH 200	33-1/4" (84.5)	15-1/2" (39.4)	22-1/4" (56.5)
XWH 285	42-1/2" (107.95)	15-1/2" (39.4)	19-3/4" (50.2)
XWH 400	42-1/2" (107.95)	15-1/2" (39.4)	27" (68.6)
XWH 500	42-1/2" (107.95)	15-1/2" (39.4)	31-1/4" (79.4)
XWH 600	42-1/2" (107.95)	15-1/2" (39.4)	36-1/4" (92.1)
XWH 700	42-1/2" (107.95)	15-1/2" (39.4)	40-1/4" (102.2)
XWH 800	42-1/2" (107.95)	15-1/2" (39.4)	42-1/4" (107.3)

GAS LINE CONNECTION SIZE

TABLE 2

† MODEL	SERIES	NATURAL GAS NPT	PROPANE GAS NPT
XWH 150	100	1/2"	1/2"
XWH 200	100	1/2"	1/2"
XWH 285	100	3/4"	3/4"
XWH 400	100	1"	1"
XWH 500	100	1"	1"
XWH 600	100	1"	1"
XWH 700	100	1"	1"
XWH 800	100	1"	1"

† Depending on the installed equivalent length, and/or the number of appliances connected, the supply gas line size may have to be increased beyond the minimum required sizes - see Table 23 on Page 44.

STORAGE CAPACITIES

TABLE 3

MODEL	U. S. GALLONS	LITERS
XWH 150	1.3	4.9
XWH 200	1.7	6.4
XWH 285	2.4	9.1
XWH 400	3.4	12.9
XWH 500	4.2	15.9
XWH 600	4.2	15.9
XWH 700	5.0	18.9
XWH 800	5.7	21.6

GAS PRESSURE REQUIREMENTS

TABLE 4

MODEL	*MANIFOLD PRESSURE		MINIMUM SUPPLY PRESSURE		MAXIMUM SUPPLY PRESSURE	
	NATURAL GAS	PROPANE GAS	NATURAL GAS	PROPANE GAS	NATURAL GAS	PROPANE GAS
XWH 150	-0.22" W.C. (-0.054 kPa)	-0.23" W.C. (-0.057 kPa)	4" W. C. (1 kPa)	8" W. C. (2 kPa)	14" W. C. (3.49 kPa)	14" W. C. (3.49 kPa)
XWH 200	-0.39" W.C. (-0.09 kPa)	-0.39" W.C. (-0.09 kPa)	4" W. C. (1 kPa)	8" W. C. (2 kPa)	14" W. C. (3.49 kPa)	14" W. C. (3.49 kPa)
XWH 285	-0.68" W.C. (-0.17 kPa)	-0.71" W.C. (-0.18 kPa)	4" W. C. (1 kPa)	8" W. C. (2 kPa)	14" W. C. (3.49 kPa)	14" W. C. (3.49 kPa)
XWH 400	-1.45" W.C. (-0.36 kPa)	-1.40" W.C. (-0.35 kPa)	4" W. C. (1 kPa)	8" W. C. (2 kPa)	14" W. C. (3.49 kPa)	14" W. C. (3.49 kPa)
XWH 500	-0.20" W.C. (-0.05 kPa)	-0.20" W.C. (-0.05 kPa)	4" W. C. (1 kPa)	8" W. C. (2 kPa)	14" W. C. (3.49 kPa)	14" W. C. (3.49 kPa)
XWH 600	-2.17" W.C. (-0.54 kPa)	-2.72" W.C. (-0.67 kPa)	4" W. C. (1 kPa)	8" W. C. (2 kPa)	14" W. C. (3.49 kPa)	14" W. C. (3.49 kPa)
XWH 700	-2.97" W.C. (-0.74 kPa)	-3.58" W.C. (-0.89 kPa)	4" W. C. (1 kPa)	8" W. C. (2 kPa)	14" W. C. (3.49 kPa)	14" W. C. (3.49 kPa)
XWH 800	-3.50" W.C. (-0.88 kPa)	-4.30" W.C. (-1.1 kPa)	4" W. C. (1 kPa)	8" W. C. (2 kPa)	14" W. C. (3.49 kPa)	14" W. C. (3.49 kPa)

* The manifold pressure is the factory setting and is not adjustable. A negative pressure will be seen with just the blower running without the Gas Control Valve open.

ELECTRICAL REQUIREMENTS

TABLE 5

Model	Voltage/ Heater	Voltage/ Pump	Voltage/ Control	Total AMPS W/ Pump	# Of Electrical Connections
XWH 150	120	120	24	3.0	1
XWH 200	120	120	24	3.2	1
XWH 285	120	120	24	4.5	1
XWH 400	120	120	24	6.5	1
XWH 500	120	120	24	5.7	1
XWH 600	120	120	24	5.7	1
XWH 700	120	120	24	12.8	1
XWH 800	120	120	24	12.8	1

RATINGS

TABLE 6

MODEL NUMBER	CSA INPUT MODULATION BTU/HR (NOTE 2, 3)	WATER CONTENT GALLONS	WATER CONNECTIONS	GAS CONNECTIONS	VENT/AIR SIZE (NOTE 1, 5)
XWH 150	30,000 - 150,000	1.3	1-1/4" NPT	1/2"	3"/3"
XWH 200	39,800 - 199,000	1.7	1-1/4" NPT	1/2"	3"/3"
XWH 285	57,000 - 285,000	2.4	2" NPT	3/4"	4"/4"
XWH 400	79,800 - 399,000	3.4	2" NPT	1"	4"/4"
XWH 500	100,000 - 500,000	4.2	2" NPT	1"	4"/4"
XWH 600	120,000 - 600,000	4.2	2" NPT	1"	4"/4"
XWH 700	140,000 - 700,000	5.0	2" NPT	1"	6"/4"
XWH 800	160,000 - 800,000	5.7	2" NPT	1"	6"/4"

Notice: Maximum allowed working pressure is located on the rating plate.

- All XP water heaters require special exhaust venting. Use only the vent materials and methods specified in this Instruction Manual.
- Standard XP water heaters are equipped to operate from sea level to 4,500 feet only with no adjustments. The water heater will de-rate by 4% for each 1,000 feet above sea level up to 4,500 feet.
- High altitude XP water heaters are equipped to operate from 3,000 to 12,000 feet only. The water heater will de-rate by 2% for each 1,000 feet above sea level. High altitude models are manufactured with a different control module for altitude operation, but the operation given in this manual remains the same as the standard models. A high altitude label (as shown in Figure 1) is also affixed to the unit.

Derate values are based on proper combustion calibration and CO₂'s adjusted to the recommended levels.
- The manual reset high limit provided with the XP is listed to UL353. The auto reset high limit is listed to ANSI Z21.87.
- The XWH 285 model can be alternatively vented using a 3" vent/air size. If the 3" vent/air size is used, the maximum vent/air pipe lengths are limited to 60 equivalent feet each.

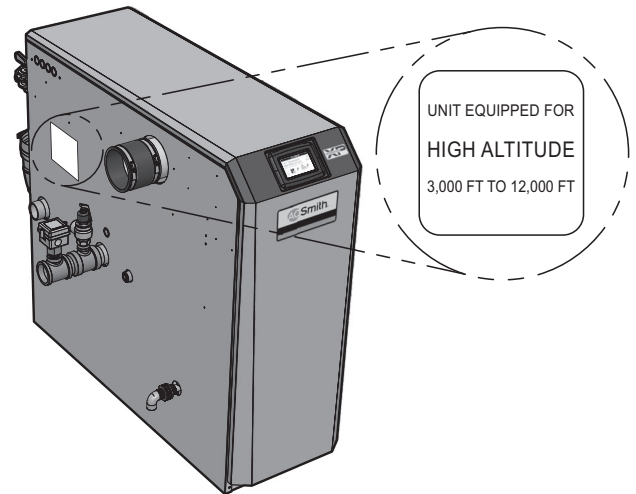


Figure 1. High Altitude Label Location

DETERMINE WATER HEATER LOCATION

INSTALLATION MUST COMPLY WITH:

- Local, state, provincial, and national codes, laws, regulations, and ordinances.
- National Fuel Gas Code, ANSI Z223.1 – latest edition.
- National Electrical Code.

NOTE: The XP water heater gas manifold and controls met safe lighting and other performance under tests specified in ANSI Z21.10.3 – latest edition.

BEFORE LOCATING THE WATER HEATER, CHECK:

- Check for nearby connection to:
 - Water piping
 - Venting connections
 - Gas supply piping
 - Electrical power
- Locate the appliance so that if water connections should leak, water damage will not occur. When such locations cannot be avoided, it is recommended that a suitable drain pan, adequately drained, be installed under the appliance. The pan must not restrict combustion air flow. Under no circumstances is the manufacturer to be held responsible for water damage in connection with this appliance, or any of its components.
- Check area around the water heater. Remove any combustible materials, gasoline and other flammable liquids.

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

- The XP water heater must be installed so that gas control system components are protected from dripping or spraying water or rain during operation or service.
- If a new water heater will replace an existing water heater, check for and correct system problems, such as:
 - System leaks causing oxygen corrosion or heat exchanger cracks from hard water deposits.
- Check around the water heater for any potential air contaminants that could risk corrosion to the water heater or the water heater combustion air supply (refer to the list on Page 14). Prevent combustion air contamination. Remove any of these contaminants from the water heater area.

This appliance is certified as an indoor appliance. Do not install the appliance outdoors or locate where the appliance will be exposed to freezing temperatures or to temperatures that exceed 100°F.

Do not install the appliance where the relative humidity may exceed 93%. Do not install the appliance where condensation may form on the inside or outside of the appliance, or where condensation may fall onto the appliance. Failure to install the appliance indoors could result in severe personal injury, death, or substantial property damage.

This appliance requires a special venting system. If using PVC the vent connection to the appliance must be made with the starter CPVC pipe section provided with the appliance. The field provided vent fittings must be cemented to the CPVC pipe section. Use only the vent materials, primer and cement specified in this manual to make the vent connections. Failure to follow this warning could result in fire, personal injury, or death.

CLOSET AND ALCOVE INSTALLATIONS

A closet is any room the water heater is installed in which is less than 86 cubic feet for XWH 150 models, 106 cubic feet for XWH 200 models, 120 cubic feet for XWH 285 models, 165 cubic feet for XWH 400 models, 191 cubic feet for XWH 500 models, 223 cubic feet for XWH 600 models, 247 cubic feet for XWH 700 models and 278 cubic feet for XWH 800 models. An alcove is any room which meets the criteria for a closet with the exception that it does not have a door. For closet and alcove installations as shown in below Figures 2 & 3, CPVC vent material must be used inside the structure. The ventilating air openings shown in Figures 2 & 3 are required for this arrangement. Failure to follow this warning could result in fire, personal injury, or death.

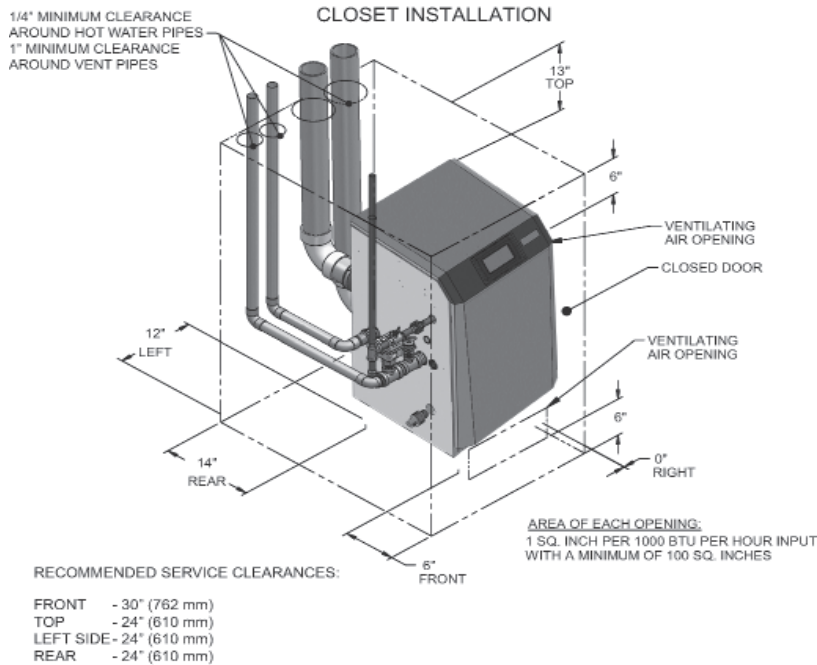
PROVIDE CLEARANCES:

Clearances from combustible materials

1. Hot water pipes—at least 1/4" from combustible materials.
2. Vent pipe – at least 1" from combustible materials.
3. See Figure's 2 and 3 below for other clearance minimums.

Clearances for service access

1. See Figure's 2 and 3 below for recommended service clearances. If you do not provide the minimum clearances shown, it may not be possible to service the water heater without removing it from the space.



For closet installations, CPVC, polypropylene or stainless steel vent material **MUST BE** used in a closet structure due to elevated temperatures. Failure to follow this warning could result in fire, personal injury, or death.

Figure 2. Closet Installation - Minimum Required Clearances

For alcove installations, CPVC, polypropylene or stainless steel vent material **MUST BE** used in a closet structure due to elevated temperatures. Failure to follow this warning could result in fire, personal injury, or death.

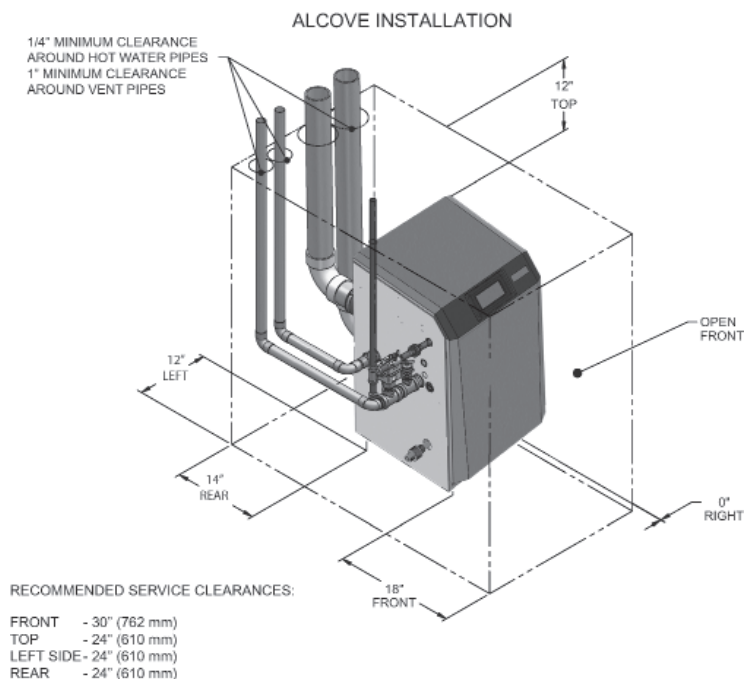


Figure 3. Alcove Installation - Minimum Required Clearances

PROVIDE AIR OPENINGS TO ROOM:

XP water heater alone in equipment room

1. No air ventilation openings into the equipment room are needed when clearances around the XP water heater are at least equal to the SERVICE clearances shown in Figure's 2 and 3. For spaces that do NOT supply this clearance, provide two openings as shown in Figure 2. Each opening must provide one square inch free area per 1,000 Btu/hr of water heater input.

XP water heater in same space with other gas or oil-fired appliances

1. Follow the National Fuel Gas Code (U.S.) to size/verify size of the combustion/ventilation air openings into the space.

The space must be provided with combustion/ ventilation air openings correctly sized for all other appliances located in the same space as the XP water heater.

Do not install the water heater in an attic.

Failure to comply with the above warnings could result in severe personal injury, death, or substantial property damage.

2. Size openings only on the basis of the other appliances in the space. No additional air opening free area is needed for the XP water heater because it takes its combustion air from outside (direct vent installation).

FLOORING AND FOUNDATION

Flooring

The XP water heater is approved for installation on combustible flooring, but must never be installed on carpeting.

Do not install the water heater on carpeting even if foundation is used. Fire can result, causing severe personal injury, death, or substantial property damage.

If flooding is possible, elevate the water heater sufficiently to prevent water from reaching the water heater.

RESIDENTIAL GARAGE INSTALLATION

Precautions

Take the following precautions when installing the appliance in a residential garage. If the appliance is located in a residential garage, it should be installed in compliance with the latest edition of the National Fuel Gas Code, ANSI Z223.1 and/or CAN/CGA-B149 Installation Code.

- Appliances located in residential garages and in adjacent spaces that open to the garage and are not part of the living space of a dwelling shall be installed so that all burners and burner ignition devices are located not less than 18 inches (46 cm) above the floor.
- The appliance shall be located or protected so that it is not subject to physical damage by a moving vehicle.

VENT AND AIR PIPING

The XP water heater requires a special vent system, designed for pressurized venting.

The water heater is to be used for either direct vent installation or for installation using indoor combustion air. When room air is considered, see the Venting Installation section. Note prevention of combustion air contamination below when considering vent/air termination.

Exhaust vent and combustion air pipes must terminate near one another and may be vented vertically through the roof or out a side wall, unless otherwise specified. You may use any of the vent/air piping methods covered in this manual. Do not attempt to install the XP water heater using any other means.

Be sure to locate the water heater such that the vent and air piping can be routed through the building and properly terminated. The vent/air piping lengths, routing and termination method must all comply with the methods and limits given in this manual.

PREVENT COMBUSTION AIR CONTAMINATION

Install air inlet piping for the XP water heater as described in this manual. Do not terminate vent/air in locations that can allow contamination of combustion air. Refer to the list on Page 14 for products and areas which may cause contaminated combustion air. In case, if any of these contaminants are stored in the same room, the water heater must be installed in a direct vent application.

You must pipe combustion air to the water heater air intake. Ensure that the combustion air will not contain any of the contaminants listed on Page 14. Contaminated combustion air will damage the water heater, resulting in possible severe personal injury, death or substantial property damage. Do not pipe combustion air near a swimming pool, for example. Also avoid areas subject to exhaust fumes from laundry facilities. These areas will always contain contaminants.

CORROSIVE MATERIALS AND CONTAMINATION SOURCES

Products to avoid:

- Spray cans containing chloro/fluorocarbons
- Permanent wave solutions
- Chlorinated waxes/cleaners
- Chlorine-based swimming pool chemicals
- Calcium chloride used for thawing
- Sodium chloride used for water softening
- Refrigerant leaks
- Paint or varnish removers
- Hydrochloric acid/muriatic acid
- Cements and glues
- Antistatic fabric softeners used in clothes dryers
- Chlorine-type bleaches, detergents, and cleaning solvents found in household laundry rooms
- Adhesives used to fasten building products and other similar products

Areas likely to have contaminants:

- Dry cleaning/laundry areas and establishments
- Swimming pools
- Metal fabrication plants
- Beauty shops
- Refrigeration repair shops
- Photo processing plants
- Auto body shops
- Plastic manufacturing plants
- Furniture refinishing areas and establishments
- New building construction
- Remodeling areas
- Garages with workshops

WHEN USING AN EXISTING VENT SYSTEM TO INSTALL A NEW WATER HEATER

Check the following venting components before installing:

- **Material** - For materials listed for use with this appliance, see Venting Installation section on Page 17. For polypropylene or stainless steel venting, an adapter of the same manufacturer must be used at the flue collar connection.
- **Size** - To ensure proper pipe size is in place, see Table 8. Check to see that this size is used throughout the vent system.
- **Manufacturer** - For a stainless steel or polypropylene application, you must use only the listed manufacturers and their type product listed in Tables 12 and 14 for CAT IV positive pressure venting with flue producing condensate.
- **Supports** - Non-combustible supports must be in place allowing a minimum 1/4" rise per foot. The supports should adequately prevent sagging and vertical slippage, by distributing the vent system weight. For additional information, consult the vent manufacturer's instructions for installation.
- **Terminations** - Carefully review Venting Installation section to ensure requirements for the location of the vent and air terminations are met and orientation of these fit the appropriate image from the Horizontal or Vertical options listed in the Venting Installation section. For stainless steel vent, only use terminations listed in Table 16 for the manufacturer of the installed vent.

- **Seal** - With prior requirements met, the system should be tested to the procedure listed in parts (3) through (6) of the Removal of an Existing Water Heater section mentioned below.

With polypropylene and stainless steel vent, seal and connect all pipe and components as specified by the vent manufacturer used; with PVC/CPVC vent, see the Installing Vent and Air Piping section on Page 20. If any of these conditions are not met, the existing system must be updated or replaced for that concern. Failure to follow all instructions can result in flue gas spillage and carbon monoxide emissions, causing severe personal injury or death.

WHEN REMOVING A WATER HEATER FROM EXISTING COMMON VENT SYSTEM

Do not install this water heater into a common vent with any other appliance. This will cause flue gas spillage or appliance malfunction, resulting in possible severe personal injury, death, or substantial property damage. Failure to follow all instructions can result in flue gas spillage and carbon monoxide emissions, causing severe personal injury or death.

At the time of removal of an existing water heater, the following steps shall be followed with each appliance remaining connected to the common venting system placed in operation, while the other appliances remaining connected to the common venting system are not in operation.

1. Seal any unused openings in the common venting system.
2. Visually inspect the venting system for proper size and horizontal pitch and determine there is no blockage or restriction, leakage, corrosion, or other deficiencies, which could cause an unsafe condition.
3. Test vent system – Insofar as is practical, close all building doors and windows and all doors between the space in which the appliances remaining connected to the common venting system are located and other spaces of the building. Turn on clothes dryers and any appliance not connected to the common venting system. Turn on any exhaust fans, such as range hoods and bathroom exhausts, so they will operate at maximum speed. Do not operate a summer exhaust fan. Close fireplace dampers.
4. Place in operation the appliance being inspected. Follow the lighting instructions. Adjust thermostat so appliance will operate continuously.
5. Test for spillage at the draft hood relief opening after 5 minutes of main burner operation. Use the flame of a match or candle, or smoke from a cigarette, cigar, or pipe.
6. After it has been determined that each appliance remaining connected to the common venting system properly vents when tested as outlined herein, return doors, windows, exhaust fans, fireplace dampers, and any other gas-burning appliance to their previous conditions of use.
7. Any improper operation of the common venting system should be corrected so the installation conforms with the National Fuel Gas Code, ANSI Z223.1/NFPA 54 and/or CAN/CSA B149.1, Natural Gas and Propane Installation Code. When resizing any portion of the common venting system, the common venting system should be resized to approach the minimum size as determined using the appropriate tables in Part 11 of the National Fuel Gas Code, ANSI Z223.1/NFPA and/or CAN/CSA B149.1, Natural Gas and Propane Installation Code.

REMOVING A WATER HEATER FROM WOOD PALLET

1. After removing the outer shipping carton from the water heater, remove the parts box.
2. Remove the front door to access the lag bolts in front of the unit (see Figure below).
3. To remove the water heater from the pallet (after removing the front door):
 - Remove the two lag bolts from the wood pallet inside the water heater. See Figure below.
 - Detach the water heater from the lag bolts in the rear of the unit, see Figure below.

Do not drop the water heater or bump the jacket on the floor or pallet. Damage to the water heater can result.

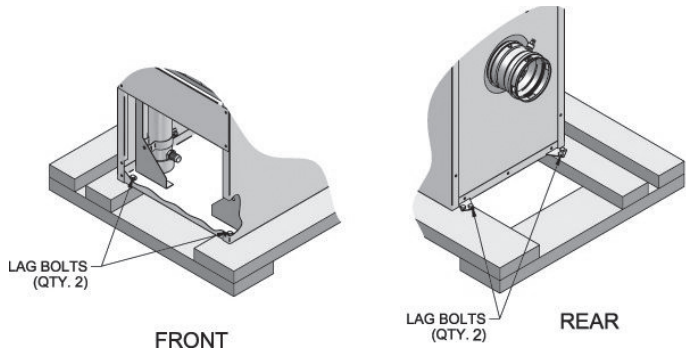


Figure 4. Water Heater Mounting on Shipping Pallet

GAS CONVERSIONS

NOTE: The gas conversions for all the units must only be performed by a qualified service technician.

The use of double-wall vent or insulated material for the For a water heater already installed, you must turn off gas supply, turn off power and allow the water heater to cool before proceeding. You must also completely test the water heater after conversion to verify performance as described under Start Up section of this manual. Failure to comply could result in severe personal injury, death, or substantial property damage.

For Models 150 - 400 you must install a propane orifice to operate the XP water heater on propane gas. Verify when installing that the orifice size marking matches water heater size (Models 150-400, See Table below). The 500 - 800 Models do not require an orifice installation for propane operation, but they will require a valve adjustment.

TABLE 7

Propane (LP) Conversion Table	
Model	Propane (LP) Orifice Stamping
150	150
200	210/ W150
285	285
400	8.0

Models 150 - 285:

1. Remove the top and front access covers from the unit (no tools required for removal).
2. Remove the three screws securing the gas valve to the venturi. See Figure 5.
3. Locate the propane orifice disk from the conversion kit bag. Verify that the stamping on the orifice disk matches the water heater size (150 – 285) (see Table above).

Place the orifice into the black rubber grommet in the side of the gas valve and secure in the valve (See Figure 5).

4. Reposition the gas valve against the venturi and replace the screws (See Figure 5) securing the valve to the venturi.
5. After installation is complete, attach the propane conversion label (in the conversion kit bag) next to the water heater rating plate. Attach the Propane (LP) caution label (in the conversion kit bag) to the left side of the unit in the lower left corner.
6. Replace the top and front access covers.

After converting to Propane (LP), check combustion per the Start-up procedure on Page 50 of this manual. Failure to check and verify combustion could result in severe personal injury, death, or substantial property damage.

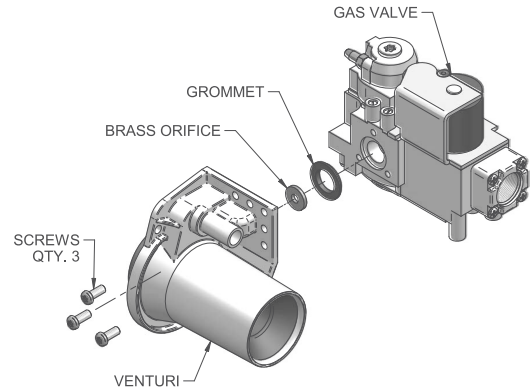


Figure 5. Installing Propane Orifice - Models 150-285

Model 400:

1. Remove the top and front access covers from the unit (no tools required for removal).
2. Remove the three screws securing the venturi to the blower.

Note: When separating the venturi from the blower, take care not to damage the O-ring inside the blower (see Figure 6).

3. Remove the four screws securing the gas valve to the venturi (see Figure below).
4. Locate the propane orifice disk from the conversion kit bag. Verify that the stamping on the orifice disk matches the water heater size (see Table 7).
5. Remove the existing orifice from the O-ring in the side of the gas valve and replace it with the orifice from the kit. Position and secure the orifice in the valve as shown in Figure below.
6. Reposition the gas valve against the venturi and replace the screws (see Figure below) securing the valve to the venturi.
7. Inspect the O-ring inside the blower. Handle the O-ring with care, do not damage. Reposition the venturi against the blower and replace the screws securing the venturi to the blower (see Figure below).

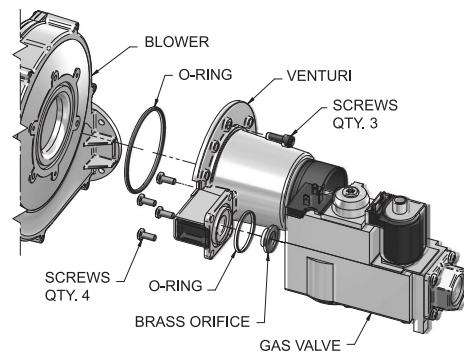


Figure 6. Installing Propane Orifice - Model 400

- After installation is complete, attach the propane conversion label (in the conversion kit bag) next to the water heater rating plate. Attach the Propane (LP) caution label (in the conversion kit bag) to the left side of the unit in the lower left corner.
- Replace the top and front access covers.

After converting to Propane (LP), check combustion per the Start Up section on Page 50 of this manual. Failure to check and verify combustion could result in severe personal injury, death, or substantial property damage.

For XWH 400: Inspect the O-ring when the blower is disassembled. The O-ring must be in good condition and must be installed. Failure to comply will cause a gas leak, resulting in severe personal injury or death.

Model 500:

- Remove the top access covers from the unit (no tools required for removal).
- Turn the adjustment screw on the gas valve clockwise until it stops. Then turn the adjustment screw counterclockwise four and three quarter (4-3/4) turns (see Figure below).
- Use a combustion analyzer to verify CO₂ is within the range of 9.6 – 10.5%. If not, adjust the screw counterclockwise incrementally to raise CO₂ and clockwise to lower CO₂ (see Figure below).
- After adjustment is complete, attach the propane conversion label (in the conversion kit bag) next to the water heater rating plate. Attach the Propane (LP) caution label (in the conversion kit bag) to the left side of the unit in the lower left corner.
- Replace the top access cover.

After converting to Propane (LP), check combustion per the Start Up section of this manual. Failure to check and verify combustion could result in severe personal injury, death, or substantial property damage.

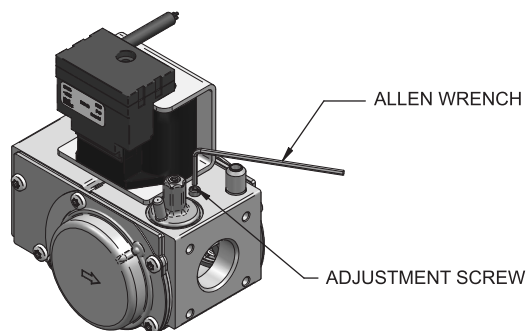


Figure 7. Gas Valve Adjustment - Model 500

Model 600 - 800:

- Remove the top access covers from the unit (no tools required for removal).
- Remove the cover on top of the gas valve (see Figure 8).
- Turn the adjustment screw on top of the gas valve clockwise one and three quarter (1 3/4) turns on the 600 Model, one and a half (1 1/2) turns on the 700 Model, and one turn on the 800 Model (see Figure 8).
- Use a combustion analyzer to verify CO₂ is within the range of 9.6 – 10.5%. If not, adjust the screw counterclockwise incrementally to raise CO₂ and clockwise to lower CO₂ (see Figure 8).

- After adjustment is complete, attach the propane conversion label (in the conversion kit bag) next to the water heater rating plate. Attach the Propane (LP) caution label (in the conversion kit bag) to the left side of the unit in the lower left corner.
- Replace the gas valve cover along with the top access cover.

After converting to Propane (LP), check combustion per the Start-up procedure on Page 50 of this manual. Failure to check and verify combustion could result in severe personal injury, death, or substantial property damage.

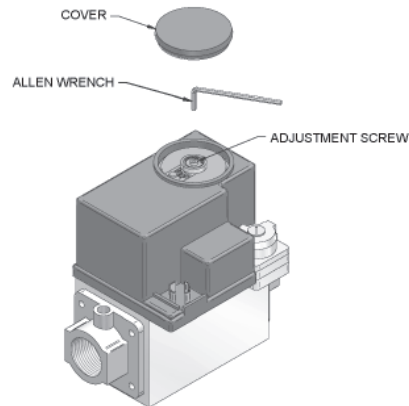


Figure 8. Gas Valve Adjustment - Model 600-800

LEVELING THE WATER HEATER

- Set the water heater in place and check level.
 - Adjust legs if necessary to level the water heater, see Figure below.

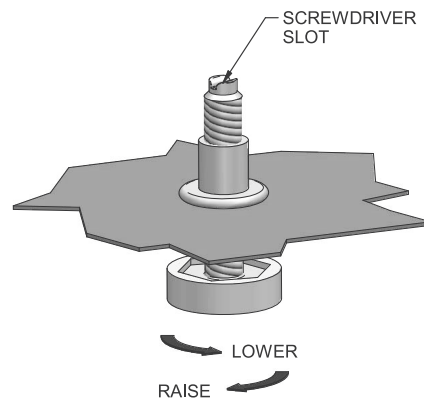


Figure 9. Leveling Legs on the Water Heater

VENTING INSTALLATION

DIRECT VENTING OPTIONS - SIDEWALL VENT

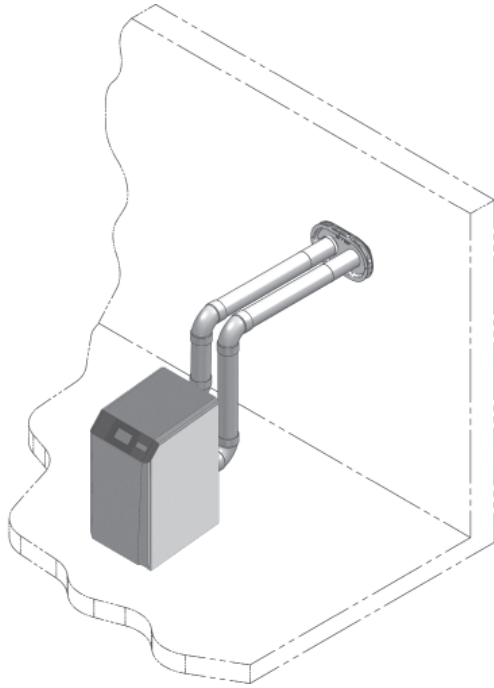


Figure 10. Two-Pipe Sidewall Termination - See page 24 for more details

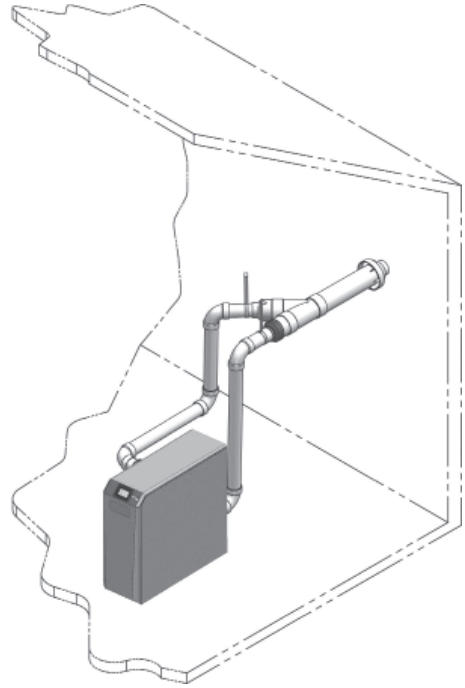


Figure 11. PVC/CPVC Concentric Sidewall Termination (Models 150 - 600 Only) - See Page 28 for more details

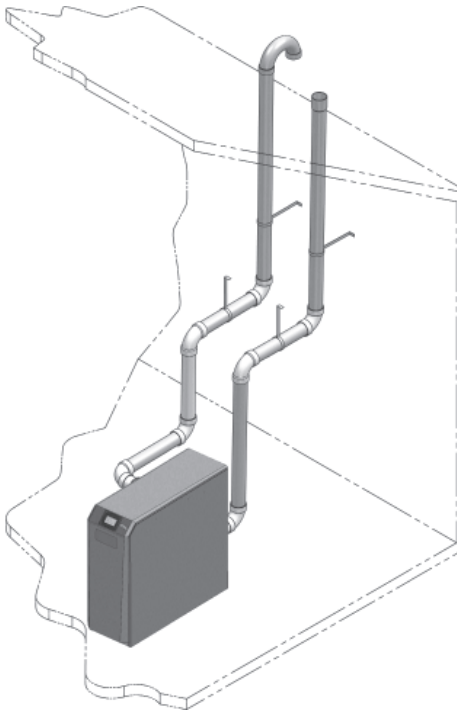


Figure 12. Two-Pipe Vertical Termination - See Page 31 for more details

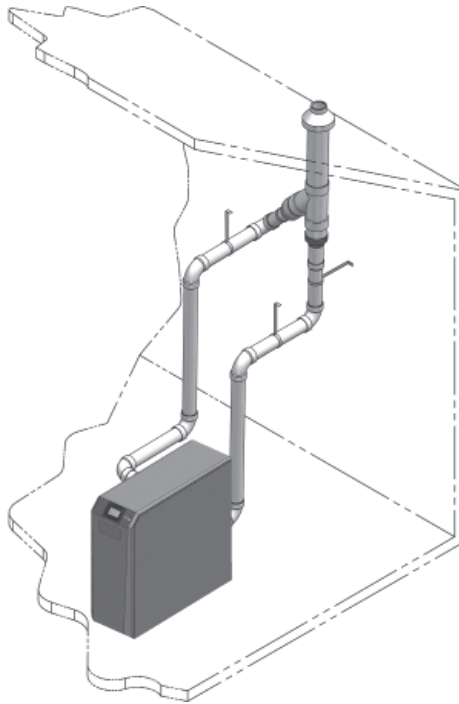


Figure 13. PVC/CPVC Concentric Vertical Termination (Models 150 - 600 Only) - See Page 33 for more details

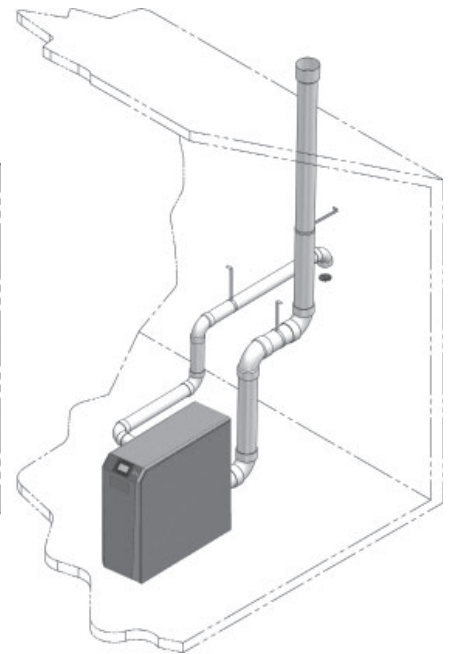
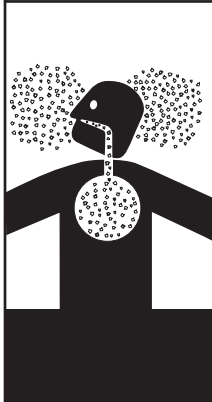


Figure 14. Vertical Vent, Sidewall Air

! WARNING

Breathing Hazard - Carbon Monoxide Gas



- Install vent system in accordance with codes.
- Do not operate water heater if exposed to flooding or water damage
- Special consideration must be taken with installations above 10,000 feet (3,048 m) refer to high altitude section of this manual.
- Do not operate if soot buildup.
- Do not obstruct water heater air intake with insulating jacket or blanket.
- Do not place chemical vapor emitting products near water heater.
- Gas and carbon monoxide detectors are available.
- Never operate the heater unless it is vented to the outdoors and has adequate air supply to avoid risks of improper operation, fire, explosion or asphyxiation.
- Analyze the entire vent system to make sure that condensate will not become trapped in a section of vent pipe and therefore reduce the open cross sectional area of the vent.

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

INSTALL VENT AND COMBUSTION AIR PIPING

This water heater must be vented and supplied with combustion and Category IV ventilation air as described in this section. Ensure the vent and air piping and the combustion air supply comply with these instructions regarding vent system, air system, and combustion air quality.

Inspect finished vent and air piping thoroughly to ensure all are airtight and comply with the instructions provided and with all requirements of applicable codes. Failure to provide a properly installed vent and air system will cause severe personal injury or death.

This appliance requires a special venting system. Use only approved stainless steel, PVC, CPVC or polypropylene pipe and fittings listed in Tables 11, 12, and 14 for vent pipe, and fittings. Failure to comply could result in severe personal injury, death, or substantial property damage.

DO NOT mix components from different systems. The vent system could fail, causing leakage of flue products into the living space. Mixing of venting materials will void the warranty and certification of the appliance.

Installation must comply with the National Fuel Gas Code, ANSI Z223.1/NFPA 54 (Current Edition); CSA B149.1, Natural Gas and Propane Installation Code (Current Edition); or applicable provisions of the local building code for U.S. installations.

For closet and alcove installations, CPVC, polypropylene or stainless steel material MUST BE used in a closet/alcove structure. Failure to follow this warning could result in fire, personal injury, or death.

Improper installation of venting systems may result in injury or death.

Follow the instructions on Page 14 of this manual when removing a water heater from an existing vent system.

Do not connect any other appliance to the vent pipe or multiple water heaters to a common vent pipe. Failure to comply could result in severe personal injury, death, or substantial property damage. Do not connect this appliance to a chimney flue serving an appliance designed to burn solid fuel.

This water heater vent and air piping can be installed through the roof or through a sidewall. Follow the procedures in this manual for the method chosen. Refer to the information in this manual to determine acceptable vent and air piping length.

You may use any of the vent/air piping methods covered in this manual. Do not attempt to install this water heater using any other means.

You must also install air piping from outside to the water heater air intake adapter unless following the Optional Room Air instructions on Page 20 of this manual. The resultant installation is direct vent (sealed combustion).

AIR INTAKE/ VENT CONNECTIONS

1. Combustion Air Intake Connector (Figures 15 and 16) - Used to provide combustion air directly to the unit from outdoors. A fitting is provided on the unit for final connection. Combustion air piping must be supported per guidelines listed in the National Mechanical Code, Section 305, Table 305.4 or as local codes dictate.
2. Vent Connector (Figure's 17 thru 21) - Used to provide a passageway for conveying combustion gases to the outside. A transition fitting is provided on the unit for final connection. Vent piping must be supported per the National Building Code, Section 305, Table 305.4 or as local codes dictate.

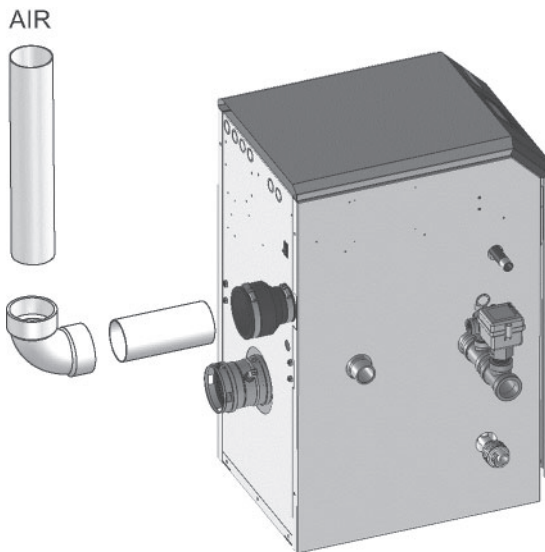


Figure 15. Near Water Heater Air Piping Models 150-200

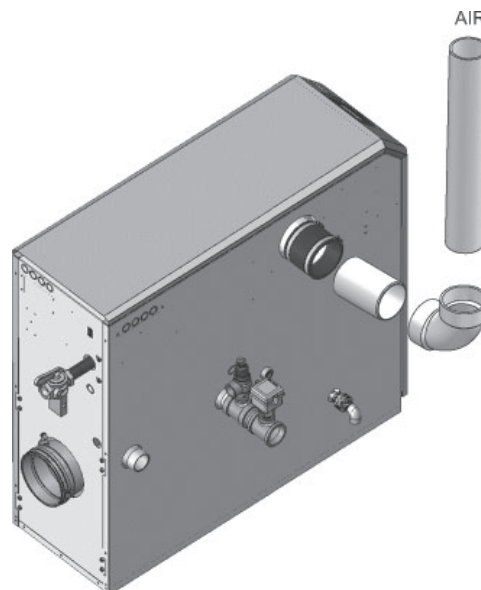


Figure 16. Near Water Heater Air Piping Models 285-600

SIZING

This water heater uses model specific combustion air intake and vent piping sizes as detailed in Table below.

Table 8. Air Intake/Vent Piping Sizes

MODEL	AIR INTAKE	VENT
150 - 200	3 inches	3 inches
285 - 600	4 inches	4 inches
700 - 800	4 inches	6 inches

NOTE: Increasing or decreasing combustion air or vent piping sizes is not authorized.

MINIMUM/ MAXIMUM ALLOWABLE COMBUSTION AIR AND VENT PIPING LENGTHS ARE AS FOLLOWS

Combustion Air = 12 equivalent feet minimum / 100 equivalent feet maximum.

Vent = 12 equivalent feet minimum / 100 equivalent feet maximum.

NOTE: When using the alternative 3" vent and combustion air piping with an XWH 285 model, the maximum allowable combustion air and vent piping lengths are limited to 60 equivalent feet each. The minimum allowable combustion air and vent pipe lengths remain 12 equivalent feet each.

When determining equivalent combustion air and vent length, add 5 feet for each 90° elbow and 3 feet for each 45° elbow.

EXAMPLE: 20 feet of PVC pipe + (4) 90° elbows + (2) 45° elbows + (1) concentric vent kit (100274637) = 49 equivalent feet of piping.

NOTE: The appliance output rating will reduce by up to 1.5% for each 25 feet of vent length, except when using the alternative 3" vent for the XWH 285 model which may de-rate by up to 4% for each 25 feet of vent length.

Table 9. Concentric Vent Kit Equivalent Vent Lengths

MODEL	KIT NUMBER	EQUIVALENT VENT LENGTH
150 - 200	100274637	3 feet
285	100274638	3 feet
400	100274638	5 feet
500 - 600	100274638	30 feet

AIR INLET PIPE MATERIALS

The air inlet pipe(s) must be sealed. Choose acceptable combustion air inlet pipe materials from the following list:

- PVC, CPVC, Polypropylene or ABS
- Galvanized steel vent pipe with joints and seams sealed as specified in this section.
- Type "B" double-wall vent with joints and seams sealed as specified in this section.
- AL29-4C, stainless steel material to be sealed to specification of its manufacturer.

*Plastic pipe may require an adapter (not provided) to transition between the air inlet connection on the appliance and the plastic air inlet pipe.

Using air intake materials other than those specified can result in personal injury, death or property damage.

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

Sealing of Type "B" double-wall vent material or galvanized vent pipe material used for air inlet piping on a sidewall or vertical rooftop Combustion Air Supply System:

- Seal all joints and seams of the air inlet pipe using either Aluminum Foil Duct Tape meeting UL Standard 723 or 181A-P or a high quality UL Listed silicone sealant such as those manufactured by Dow Corning or General Electric.
- Do not install seams of vent pipe on the bottom of horizontal runs.
- Secure all joints with a minimum of three (3) sheet metal screws or pop rivets. Apply Aluminum Foil Duct Tape or silicone sealant to all screws or rivets installed in the vent pipe.
- Ensure that the air inlet pipes are properly supported.

The PVC, CPVC, or ABS air inlet pipe should be cleaned and sealed with the pipe manufacturer's recommended solvents and standard commercial pipe cement for the material used. The PVC, CPVC, ABS, Dryer Vent or Flex Duct air inlet pipe should use a silicone sealant to ensure a proper seal at the appliance connection and the air inlet cap connection. Dryer vent or flex duct should use a screw type clamp to seal the vent to the appliance air inlet and the air inlet cap. Proper sealing of the air inlet pipe ensures that combustion air will be free of contaminants and supplied in proper volume.

Follow the polypropylene manufacturer's instructions when using polypropylene material as an inlet pipe.

When a sidewall or vertical rooftop combustion air supply system is disconnected for any reason, the air inlet pipe must be resealed to ensure that combustion air will be free of contaminants and supplied in proper volume.

Failure to properly seal all joints and seams as required in the air inlet piping may result in flue gas recirculation, spillage of flue products and carbon monoxide emissions causing severe personal injury or death.

VENT, AIR PIPING AND TERMINATION

This water heater vent and air piping can be installed through the roof or through a sidewall. Follow the procedures in this manual for the method chosen. Refer to the information in this manual to determine acceptable vent and air piping length.

OPTIONAL ROOM AIR

Optional room air is intended for commercial applications. Combustion air piping to the outside is recommended for residential applications.

Commercial applications utilizing this water heater may be installed with a single pipe carrying the flue products to the outside while using combustion air from the equipment room. In order to use the room air venting option the following conditions and considerations must be followed.

- The unit **MUST** be installed with the appropriate room air kit (Table 10).
- The equipment room **MUST** be provided with properly sized openings to assure adequate combustion air. Refer to the instructions provided with the room air kit.
- There will be a noticeable increase in the noise level during normal operation from the inlet air opening.
- Using the room air kit makes the unit vulnerable to combustion air contamination from within the building. Please review Prevent Combustion Air Contamination section on Page 13, to ensure proper installation.
- Vent system and terminations must comply with the standard venting instructions set forth in this manual.

When utilizing the single pipe method, provisions for combustion and ventilation air must be in accordance with Air for Combustion and Ventilation, of the latest edition of the National Fuel Gas Code, ANSI Z223.1.

Table 10. Optional Room Air Kit

MODEL	KIT NUMBER	DESCRIPTION
150 - 200	100274659	Room Air Kit
285 - 800	100274661	Room Air Kit
400 - 800	100274662	Room Air Filter Kit

AIR CONTAMINATION

Pool and laundry products and common household and hobby products often contain fluorine or chlorine compounds. When these chemicals pass through the water heater, they can form strong acids. The acid can eat through the water heater wall, causing serious damage and presenting a possible threat of flue gas spillage or appliance water leakage into the building.

Please read the information given on Page 14, listing contaminants and areas likely to contain them. If contaminating chemicals will be present near the location of the water heater combustion air inlet, have your installer pipe the water heater combustion air and vent to another location, per this manual.

If the water heater combustion air inlet is located in a laundry room or pool facility, for example, these areas will always contain hazardous contaminants.

To prevent the potential of severe personal injury or death, check for areas and products listed on Page 14 before installing the water heater or air inlet piping.

If contaminants are found, you **MUST**:

- Remove contaminants permanently. —OR—
- Relocate air inlet and vent terminations to other areas.

PVC/ CPVC

This product has been approved for use with the PVC/CPVC vent materials listed in Table 11.

INSTALLING VENT AND AIR PIPING

The vent connection to the appliance must be made with the starter CPVC pipe section provided with the appliance if PVC/CPVC vent is to be used. The field provided vent fittings must be cemented to the CPVC pipe section using an "All Purpose Cement" suitable for PVC and CPVC pipe. Use only the vent materials, primer, and cement specified in Table 11 to make the vent connections. Failure to follow this warning could result in fire, personal injury, or death.

Use only cleaners, primers, and solvents that are approved for the materials which are joined together.

All PVC vent pipes must be glued, properly supported, and the exhaust must be pitched a minimum of a 1/4 inch per foot back to the water heater (to allow drainage of condensate).

Insulation should not be used on PVC or CPVC venting materials. The use of insulation will cause increased vent wall temperatures, which could result in vent pipe failure.

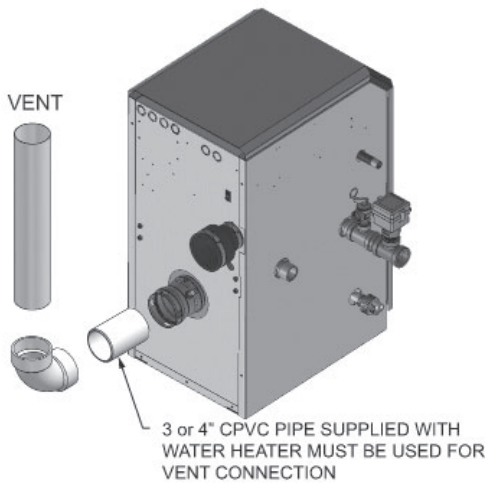
Table 11. PVC/CPVC Vent Pipe, and Fittings

APPROVED PVC/CPVC VENT PIPE AND FITTINGS		
ITEM	MATERIAL	STANDARD
Vent Pipe	PVC Schedule 40, 80	ANSI/ASTM D1785
	PVC - DWV	ANSI/ASTM D2665
	CPVC Schedule 40, 80	ANSI/ASTM F441
Vent Fittings	PVC Schedule 40	ANSI/ASTM D2466
	PVC Schedule 80	ANSI/ASTM D2467
	CPVC Schedule 40	ANSI/ASTM F438
	CPVC Schedule 80	ANSI/ASTM F439
	PVC - DMV	ANSI/ASTM D2665
Pipe Cement/ Primer	PVC	ANSI/ASTM D2564
	CPVC	ANSI/ASTM F493
NOTICE: DO NOT USE CELLULAR (FOAM) CORE PIPE		

1. Work from the water heater to vent or air termination. Do not exceed the lengths given in this manual for the air or vent piping.
2. Cut pipe to the required lengths and deburr the inside and outside of the pipe ends.
3. Clean all pipe ends and fittings using a clean dry rag. (Moisture will retard curing and dirt or grease will prevent adhesion.)
4. Chamfer outside of each pipe end to ensure even cement distribution when joining.
5. Make sure shavings from plastic material are removed to prevent them from entering the burner.
6. Dry fit vent or air piping to ensure proper fit up before assembling any joint. The pipe should go a third to two-thirds into the fitting to ensure proper sealing after cement is applied.

7. Priming and Cementing:

- Handle fittings and pipes carefully to prevent contamination of surfaces.
- Apply a liberal even coat of primer to the fitting socket and to the pipe end to approximately 1/2" beyond the socket depth.
- Apply a second primer coat to the fitting socket.
- While primer is still wet, apply an even coat of approved cement to the pipe equal to the depth of the fitting socket along with an even coat of approved cement to the fitting socket.
- Apply a second coat of cement to the pipe.
- While the cement is still wet, insert the pipe into the fitting, if possible twist the pipe a 1/4 turn as you insert it. NOTE: If voids are present, sufficient cement was not applied and joint could be defective.
- Wipe excess cement from the joint removing ring or beads as it will needlessly soften the pipe.



NOTE: CPVC VENT PIPE AND VENT FITTINGS MUST BE USED IN CLOSET AND ALCOVE INSTALLATIONS.

Figure 17. Near Water Heater PVC/CPVC Venting Models 150-600

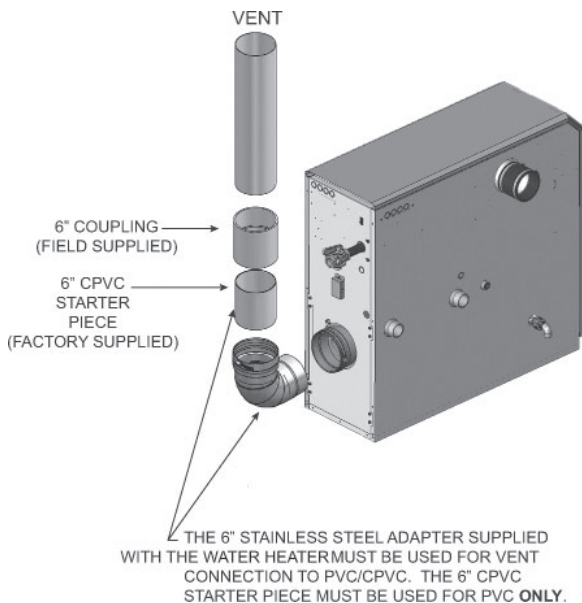


Figure 18. Near Water Heater PVC/CPVC Venting Models 700-800

POLYPROPYLENE

This product has been approved for use with the Polypropylene vent with the manufacturers listed in Table 12.

All terminations must comply with listed options in this manual and be a single-wall vent offering.

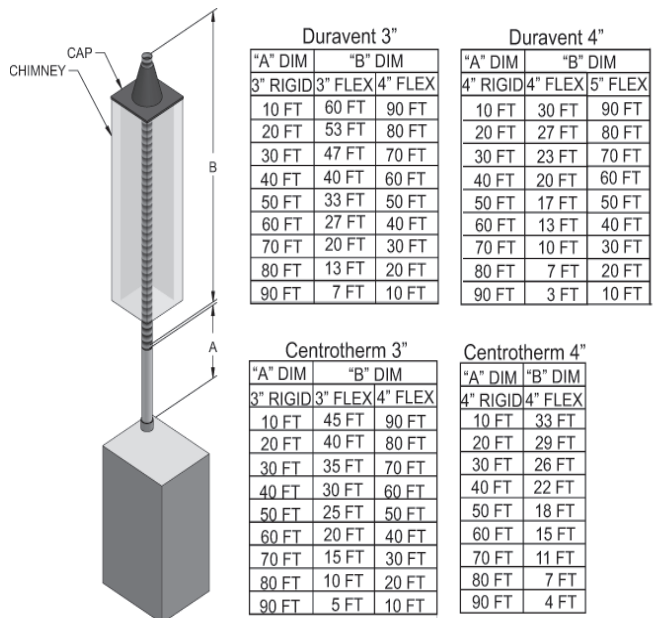
For support and special connections required, see the manufacturer's instructions. All vent is to conform to standard diameter and equivalent length requirements established.

When determining equivalent combustion air and vent length for polypropylene single-wall piping:

- 1 foot of Duravent 4 inch single-wall pipe is equivalent to 1.6 feet of piping.

FLEXIBLE POLYPROPYLENE

For use of flex pipe, it is recommended to have the vent material in 32°F or higher ambient space before bending at installation. No bends should be made to greater than 45° and ONLY installed in vertical or near vertical installations (Figure 19).



*NOTES: 1) FLEX PIPE MAY ONLY BE RUN IN A VERTICAL ORIENTATION
 2) ALL VENT LENGTHS REPRESENTED IN ABOVE CHARTS ARE EQUIVALENT LENGTHS.
 3) SECTION A IS EQUIVALENT FEET OF RIGID PIPE, WHICH MAY INCLUDE 45 AND 90° ELBOWS. PLEASE SEE SIZING SECTION FOR DETERMINING EQUIVALENT FEET.

Figure 19. Near Water Heater Flexible Polypropylene Venting

Table 12. Polypropylene Vent Pipe and Fittings

APPROVED POLYPROPYLENE VENT MANUFACTURERS	
MAKE	MODEL
Centrotherm Eco Systems	InnoFlue SW/Flex
Duravent (M & G Group)	PolyPro Single-Wall / PolyPro Flex



The installer must use a specific vent starter adapter at the flue collar connection. This adapter is supplied by the vent manufacturer to adapt to its vent system. See Table 13 for approved vent adapters. Do not use CPVC starter piece.

All vent connections MUST be secured by the vent manufacturer's joint connector (Figure 20).

Insulation should not be used on polypropylene venting materials. The use of insulation will cause increased vent wall temperatures, which could result in vent pipe failure.

Use only the adapters and vent system listed in Tables 12 and 13. DO NOT mix vent systems of different types or manufacturers. Failure to comply could result in severe personal injury, death, or substantial property damage.

Installations must comply with applicable national, state, and local codes.

Installation of a polypropylene vent system should adhere to the vent manufacturer's installation instructions supplied with the vent system.

All terminations must comply with listed options in this manual and be a single-wall vent offering.

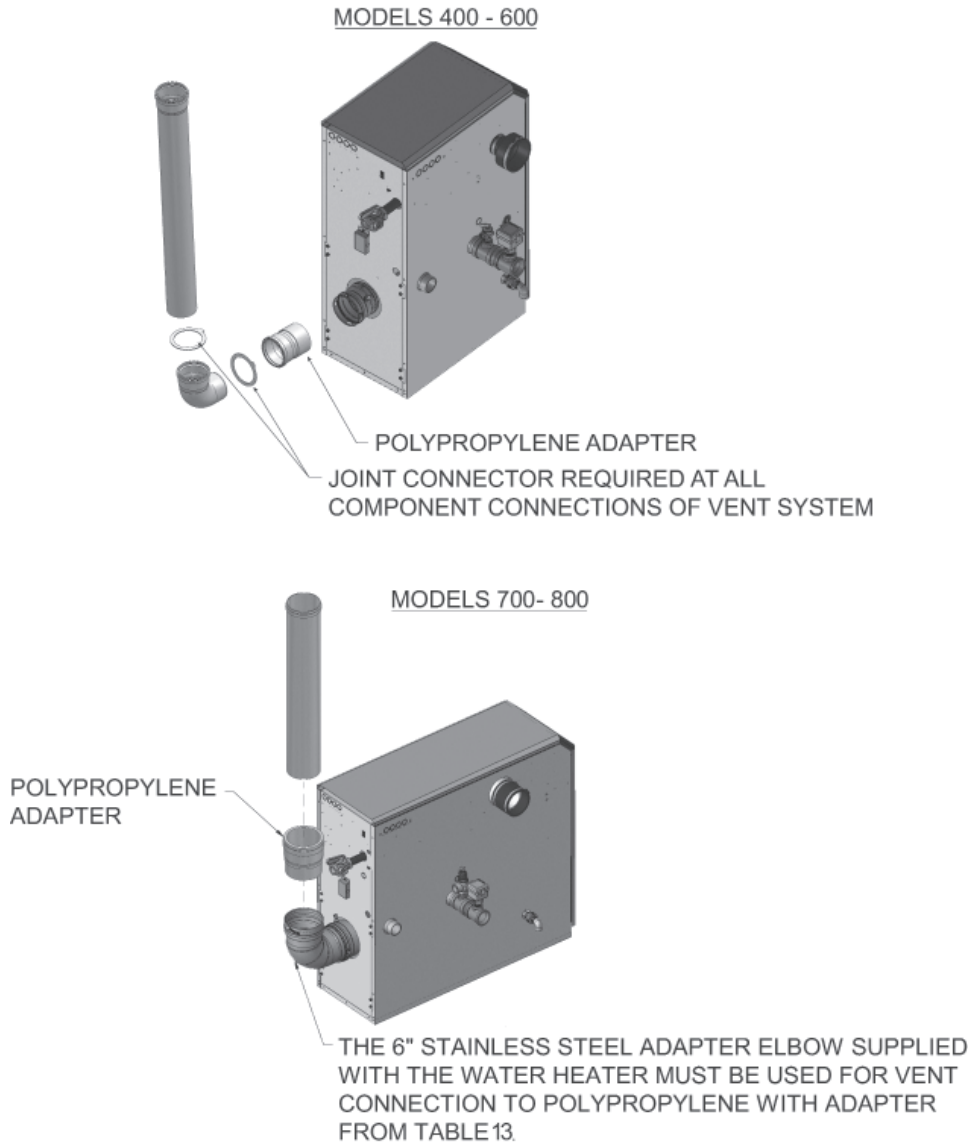


Figure 20. Near Water Heater Polypropylene Venting

Table 13. Approved Polypropylene Terminations

MODEL	CENTROTHERM INNOFLUE SW				DURAVENT POLYPRO		
	POLYPROPYLENE ADAPTER	JOINT CONNECTOR	SIDEWALL RETAINING BRACKET*	SIDEWALL ADAPTER*	POLYPROPYLENE ADAPTER	JOINT CONNECTOR	SIDEWALL KIT*
150 - 200	ISAAL0303	IANS03	IATP0303	ISTAGL0303	3PPS-AD	3PPS-LB	3PPS-HLK
400 - 600	ISAAL0404	IANS04	IATP0404	ISTAGL0404	4PPS-AD	4PPS-LB	4PPS-HLK
700 - 800	ISAAL0606	Not Required	IATP0606	ISTAGL0606	FSA-6PVCM-6PPS	Not Required	6PPK-HLK

* These parts are only needed if the sidewall termination assembly is used (see Figure 31 on Page 27).

STAINLESS STEEL VENT

This product has been approved for use with stainless steel using the manufacturers listed in Table 14.

Use only the materials, vent systems, and terminations listed in Tables 14 and 16. DO NOT mix vent systems of different types or manufacturers. Failure to comply could result in severe personal injury, death, or substantial property damage.

The installer must use a specific vent starter adapter at the flue collar connection, supplied by the vent manufacturer to adapt to its vent system. See Table 16 for approved vent adapters. Do not use CPVC starter piece.

Installations must comply with applicable national, state, and local codes. Stainless steel vent systems must be listed as a UL-1738 approved system for the United States.

Installation of a stainless steel vent system should adhere to the stainless steel vent manufacturer's installation instructions supplied with the vent system.

Table 14. Stainless Steel Vent Pipe and Fittings

APPROVED STAINLESS STEEL VENT MANUFACTURERS	
MAKE	MODEL
Dura Vent (M & G Group)	FasNSeal Vent / FasNSeal Flex* Vent
Z-Flex (Nova Flex Group)	Z-Vent
Heat Fab (Selkirk Corporation)	Saf-T Vent
Metal Fab	Corr/Guard
Security Chimney	Secure Seal
ICC	VIC

*Use of FasNSeal Flex smooth inner wall vent is to be used in vertical or near vertical sections only, taking precaution to ensure no sagging occurs of the vent system. Connect to the FasNSeal rigid vent using specially designed adapters and sealing method, see manufacturer's instructions.

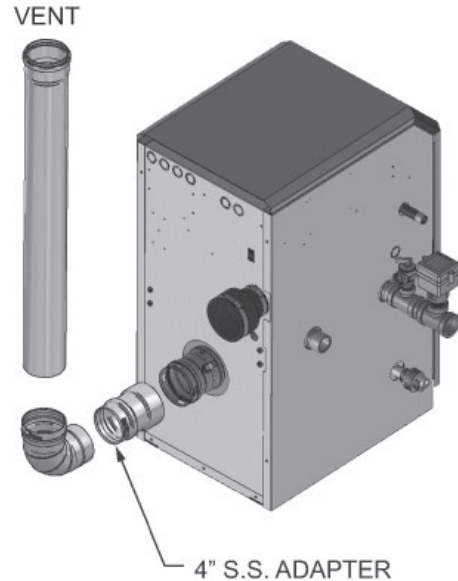


Figure 21. Near Water Heater Stainless Steel Venting Models 285 - 600

Table 15. Stainless Steel Sidewall Vent Termination Kit(s)

MODEL	KIT NUMBER
700 - 800	100274668

Table 16. Approved Stainless Steel (S.S) Terminations and Adapters

MODEL	PROTECH			HEAT FAB			Z FLEX		
	FASNSEAL			SAF-T VENT			Z-VENT		
	S.S Adapter	Flue Termination	Intake Air Termination	S.S. Adapter	Flue Termination	Intake Air Termination	S.S. Adapter	Flue Termination	Intake Air Termination
150 - 200	300715	FSBS3 FSRC3	303889	9301PVC	9392 5300CI	9314TERM	2SVSLA03	2SVSTP03 2SVSRXC03	2SVSTEX0390
400 - 600	F303759	FSBS4 FSRC4	FSAIH04 303888	9401PVC	9492 5400CI	9414TERM	2SVSLA04	2SVSTP04 2SVSRXC04	2SVSTEX0490
700 - 800	F303759 (Intake Only)	FSBS6	FSAIH04 303888	9601MAD	9690 9692	9614TERM			
	METAL FAB			SECURITY CHIMNEY			ICC		
	Corr/Guard			Secure Seal			VIC		
150 - 200	3CGPVCA	3CGSWHT 3CGSWC	3CGSW90LT	--	--	--	--	--	--
400 - 600	4CGPVCA	4CGSWHT 4CGSWC	4CGSW90LT	SS4PVCU	SS4STU SS4RCBU	SS4ST90AU	--	--	--
700 - 800	6FCGPVCA	6FCGSWMC 6FCGSWC	6FCGSW90L	SS6PVCU	SS6STU SS6RCBU	SS6ST90AU	HE-6DSA-F	HE-6MC-F HE-6RC-F	HE-6E90-F HE-6SCR-F

VENT/ AIR TERMINATION - SIDEWALL

Follow instructions below when determining vent location to avoid possibility of severe personal injury, death, or substantial property damage.

A exhaust vent extending through an exterior wall shall not terminate adjacent to a wall or below building extensions such as eaves, parapets, balconies, or decks. Failure to comply could result in severe personal injury, death, or substantial property damage.

DETERMINE LOCATION

Locate the vent/air terminations using the following guidelines:

1. The total length of piping for vent or air must not exceed the limits given on Table 9 of this manual.
 2. You must consider the surroundings when terminating the vent and air:
 - a. Position the vent termination where vapors will not damage nearby shrubs, plants or air conditioning equipment or be objectionable.
 - b. The flue products will form a noticeable plume as they condense in cold air. Avoid areas where the plume could obstruct window views.
 - c. Prevailing winds could cause freezing of condensate and water/ice buildup where flue products impinge on building surfaces or plants.
 - d. Avoid possibility of accidental contact of flue products with people or pets.
 - e. Do not locate the terminations where wind eddies could affect performance or cause recirculation, such as inside building corners, near adjacent buildings or surfaces, window wells, stairwells, alcoves, courtyards, or other recessed areas.
- Sidewall vent and air inlet terminations must terminate in the same pressure zone.
- f. Do not terminate above any door or window. Condensate can freeze, causing ice formations.
 - g. Locate or guard vent to prevent condensate damage to exterior finishes.

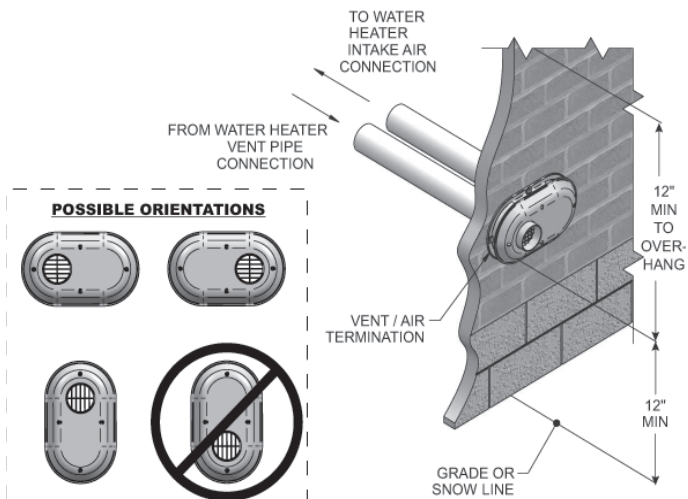


Figure 22. PVC/CPVC/Polypropylene Sidewall Termination of Air and Vent

Table 17. Sidewall Vent Kits

MODEL	KIT NUMBER	VENT SIZE
150 - 200	100274669	3 inch vent
285 - 600	100274670	4 inch vent
700 - 800	100274671	6 inch vent

If using the alternate sidewall termination:

3. The air piping must terminate in a down-turned elbow as shown in Figure 23. This arrangement avoids recirculation of flue products into the combustion air stream.
4. The vent piping must terminate in an elbow pointed outward or away from the air inlet, as shown in Figure 23.

Do not exceed the maximum lengths of the outside vent piping shown in Figure 23. Excessive length exposed to the outside could cause freezing of condensate in the vent pipe, resulting in potential water heater shutdown.

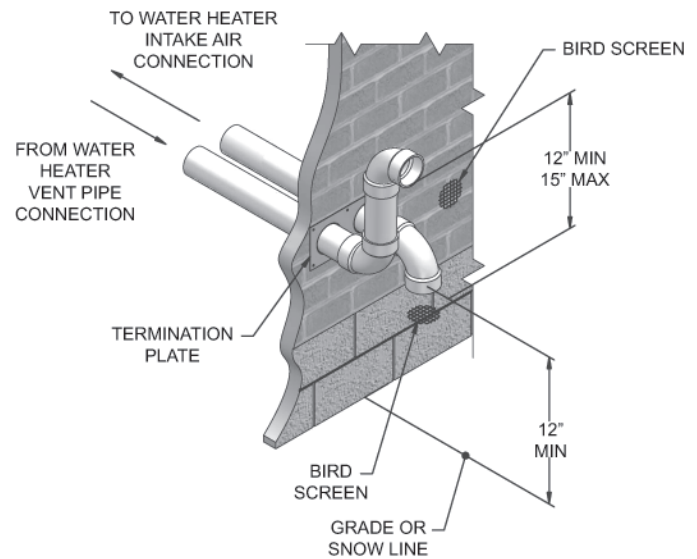


Figure 23. Alternate PVC/CPVC Sidewall Termination of Air and Vent w/Field Supplied Fittings

VENT/ AIR TERMINATION - SIDEWALL

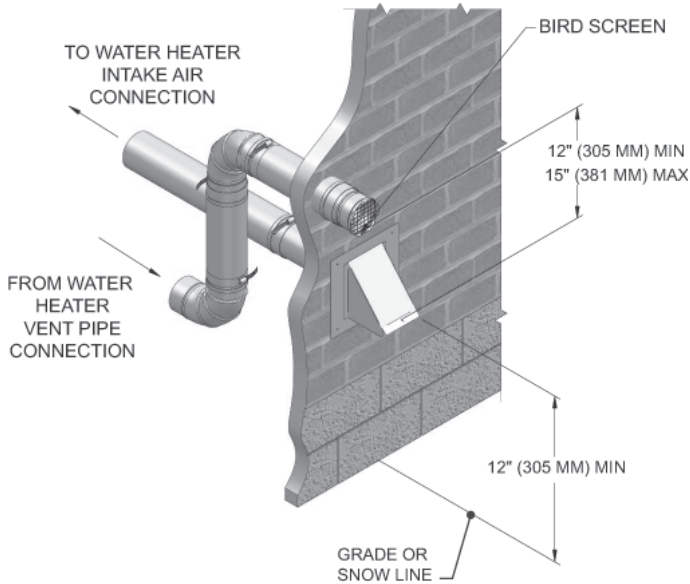


Figure 24. Alternate PVC/CPVC/SS Vent Termination - Typical Stainless Steel Sidewall Termination of Air and Vent Models 150 - 800 w/Field Supplied Fittings

NOTE: PVC/CPVC or ABS is acceptable air inlet pipe material.

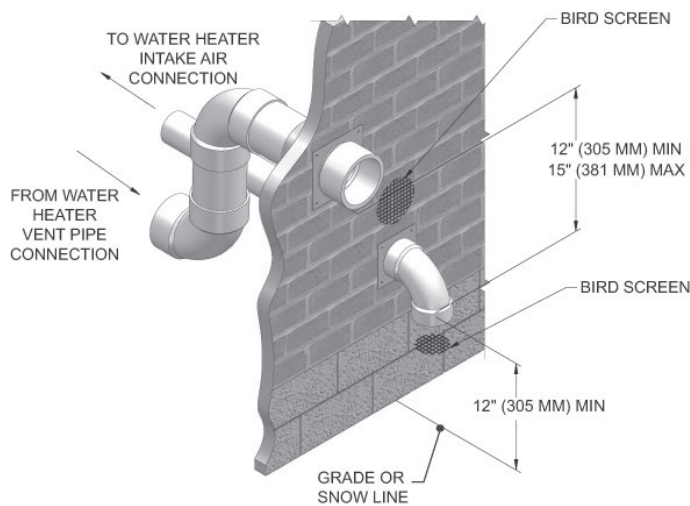


Figure 25. Alternate PVC/CPVC/SS/ Polypropylene Sidewall Termination Models 150 - 800 w/Field Supplied Fittings

5. Maintain clearances as shown in Figure's 22 thru 27, pages 24 and 25. Also maintain the following:
 - a. Vent must terminate:
 - At least 6 feet from adjacent walls.
 - No closer than 12 inches below roof overhang.
 - b. Air inlet must terminate at least 12 inches above grade or snow line; at least 12 inches below the vent termination; and the vent pipe must not extend more than 24 inches vertically outside the building as shown in Figure 23:
 - c. Do not terminate closer than 4 feet horizontally from any electric meter, gas meter, regulator, T & P Relief Valve, or other equipment. Never terminate above or below any of these within 4 feet horizontally.
6. Locate terminations so they are not likely to be damaged by foreign objects, such as stones or balls, or subject to buildup of leaves or sediment.

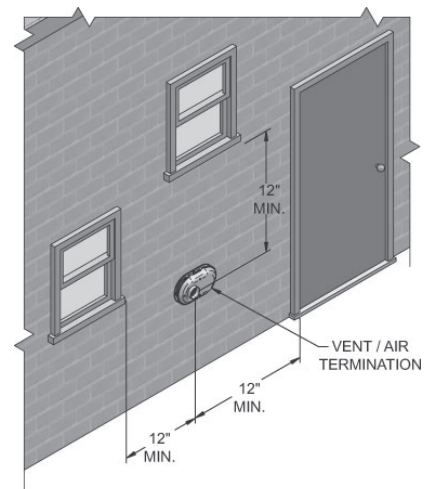


Figure 26. Clearance to Gravity Air Inlets

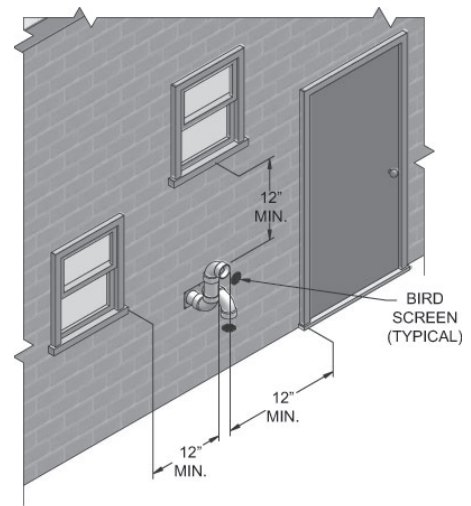


Figure 27. Alternate Clearance to Gravity Air Inlets w/Field Supplied Fittings

Figure 28. Direct Vent Terminal Clearances

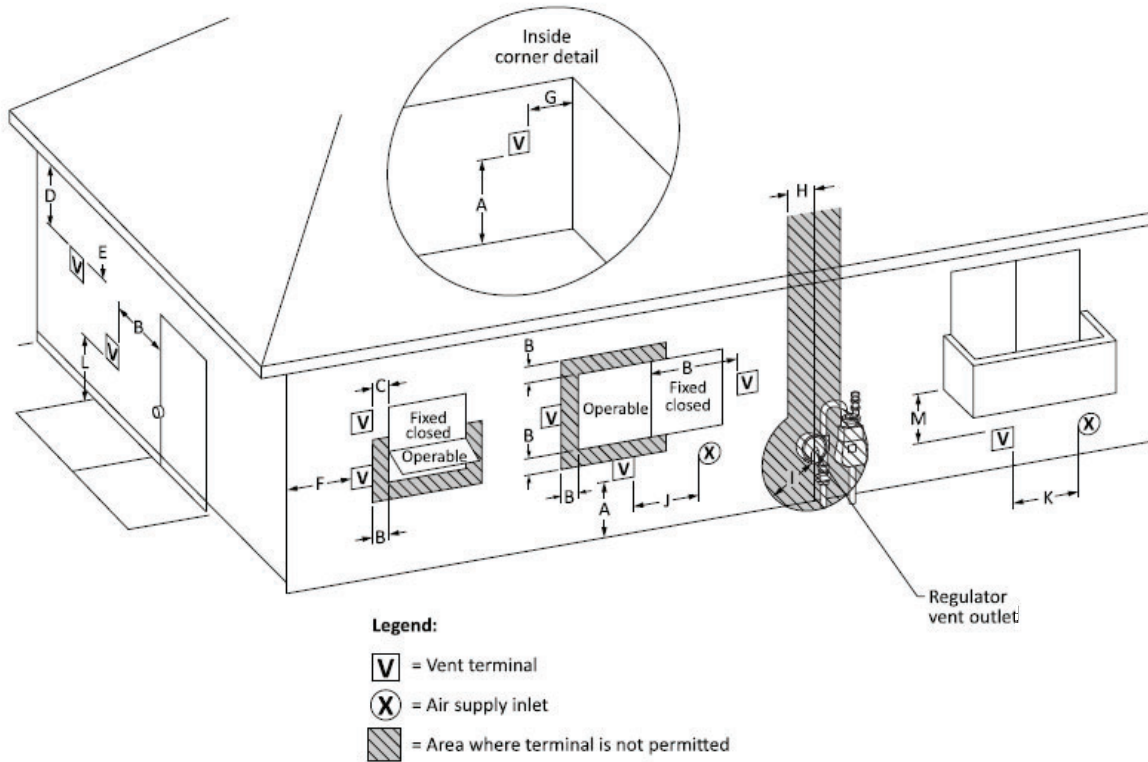


Table 18. Direct Vent Terminal Clearances

		Canadian Installations¹	US Installations²
A =	Clearance above grade, veranda, porch, deck, or balcony	12 in (30 cm)	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), 12 in (30 cm) for appliances > 10,000 Btuh (3 kW) and ≤ 100,000 Btuh (30 kW), 36 in (91 cm) for appliances > 100,000 Btuh (30 kW)	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	*	*
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.	*	*
E =	Clearance to unventilated soffit	*	*
F =	Clearance to outside corner	*	*
G =	Clearance to inside corner	*	*
H =	Clearance to each side of center line extended above meter / regulator assembly	*	*
I =	Clearance to service regulator vent outlet	Above a regulator within 3 ft (91 cm) horizontally of the vertical center line of the regulator vent outlet to a maximum vertical distance of 15 ft (4.5 m)	*



Table 18. Direct Vent Terminal Clearances (continued)

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), 12 in (30 cm) for appliances > 10,000 Btuh (3 kW) and ≤ 100,000 Btuh (30 kW), 36 in (91 cm) for appliances > 100,000 Btuh (30 kW)	6 in (15 cm) for appliances ≤ 10,000 Btuh (3kW), 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)
K =	Clearance to a mechanical air supply inlet	6 ft (1.83 m)	3 ft (91 cm) above if within 10 ft (3 m) horizontally
L =	Clearance above paved sidewalk or paved driveway located on public property	7 ft (2.13 m)†	*
M =	Clearance under veranda, porch, deck, or balcony	12 in (30 cm)‡	*

* Clearance in accordance with local installation codes and the requirements of the gas supplier.
 † 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.

NOTES:
 1) In accordance 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

Figure 29. Other than Direct Vent Terminal Clearances

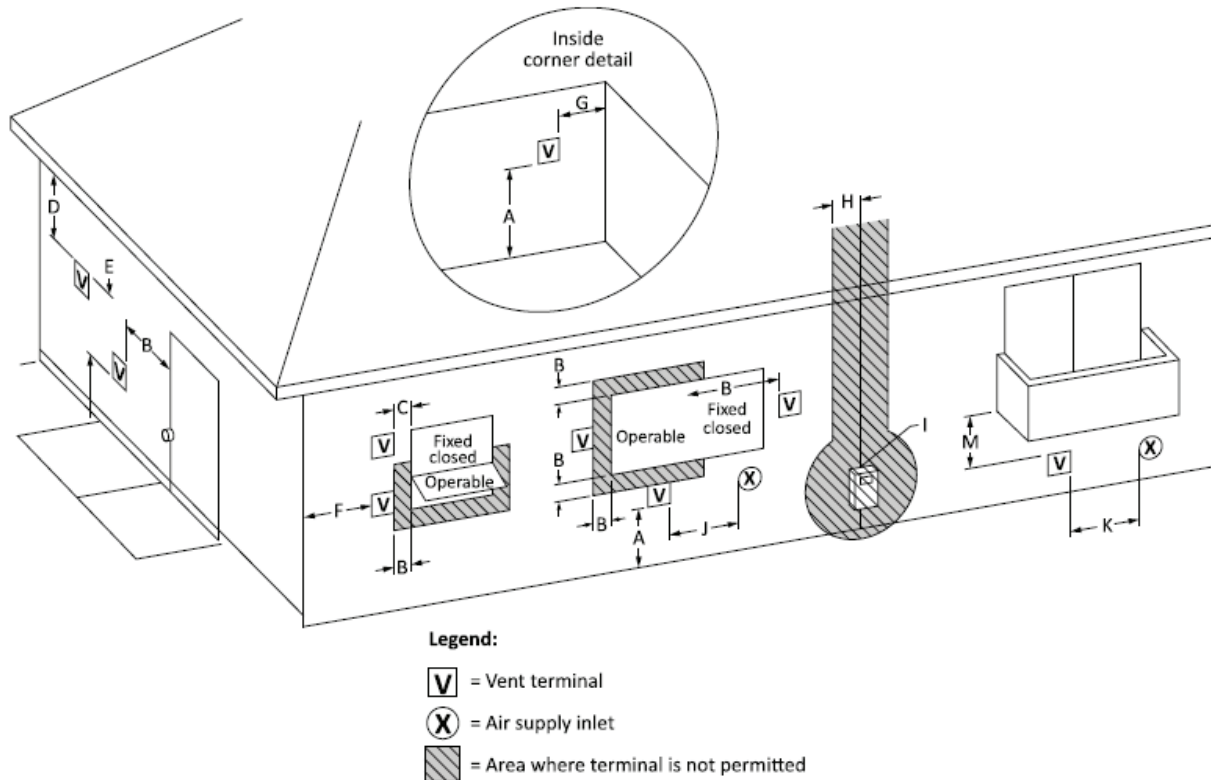


Table 19. Other than Direct Vent Terminal Clearances

		Canadian Installations¹	US Installations²
A =	Clearance above grade, veranda, porch, deck, or balcony	12 in (30 cm)	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), 12 in (30 cm) for appliances > 10,000 Btuh (3 kW) and ≤ 100,000 Btuh (30 kW), 36 in (91 cm) for appliances > 100,000 Btuh (30 kW)	4 ft (1.2 m) below or to side of opening; 1 ft (300 mm) above opening
C =	Clearance to permanently closed window	*	*
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.	*	*
E =	Clearance to unventilated soffit	*	*
F =	Clearance to outside corner	*	*
G =	Clearance to inside corner	*	*
H =	Clearance to each side of center line extended above meter / regulator assembly	*	*
I =	Clearance to service regulator vent outlet	Above a regulator within 3 ft (91 cm) horizontally of the vertical center line of the regulator vent outlet to a maximum vertical distance of 15 ft (4.5 m)	*
J =	Clearance to nonmechanical air supply inlet to building or the combustion air inlet to any other appliance	6 in (15 cm) for appliances ≤ 10,000 Btuh (3kW), 12 in (30 cm) for appliances > 10,000 Btuh (3 kW) and ≤ 100,000 Btuh (30 kW), 36 in (91 cm) for appliances > 100,000 Btuh (30 kW)	4 ft (1.2 m) below or to side of opening; 1 ft (300 mm) above opening
K =	Clearance to a mechanical air supply inlet	6 ft (1.83 m)	3 ft (91 cm) above if within 10 ft (3 m) horizontally
L =	Clearance above paved sidewalk or paved driveway located on public property	7 ft (2.13 m)†	7 ft (2.13 m)
M =	Clearance under veranda, porch, deck, or balcony	12 in (30 cm)‡	*

* Clearance in accordance with local installation codes and the requirements of the gas supplier.
† 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.

NOTES:

- 1) In accordance 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



SIDEWALL DIRECT VENTING

PREPARE WALL PENETRATIONS

1. Use the factory supplied wall plate as a template to locate the vent and air intake holes and mounting holes.

Air pipe penetration:

- a. Cut a hole for the air pipe. Size the air pipe hole as close as desired to the air pipe outside diameter.

Vent pipe penetration:

- a. Cut a hole for the vent pipe. For either combustible or noncombustible construction, size the vent pipe hole with at least a 1/2 inch clearance around the vent pipe outer diameter:

- 4½ inch hole for 3 inch vent pipe.
- 5½ inch hole for 4 inch vent pipe.
- 7½ inch hole (191 mm) hole for 6 inch (152 mm) vent pipe

Drill 3/16" diameter holes for inserting the plastic anchors into the wall.

2. For Polypropylene Only: Install the vent and air intake sidewall adapters from Table 13 on Page 22 into the vent plate. Slide the sidewall retaining bracket down the sidewall adapters flush to the vent plate.
3. For PVC/CPVC Only: Install the vent and air intake piping through the wall into the vent plate openings. Use RTV silicone sealant to seal the air pipe. Use the cement/primer listed in Table 11 on Page 20 to seal the vent pipe.
4. Mount and secure the vent plate to the wall using stainless steel screws. Seal around the plate to the wall assuring no air gaps.
5. Seal all gaps between the pipes and wall. Seal around the plate to the wall assuring no air gaps.
6. Assemble the vent cap to the vent plate (see Figure 30). Insert the stainless steel screws into the vent cap screw hole openings and securely attach the vent cap to the vent plate.
7. Seal all wall cavities.
8. PVC/CPVC terminations are designed to accommodate any wall thickness of standard constructions per the directions found in this manual.
9. Stainless steel terminations are designed to penetrate walls with a thickness up to 9.25 inches of standard construction.

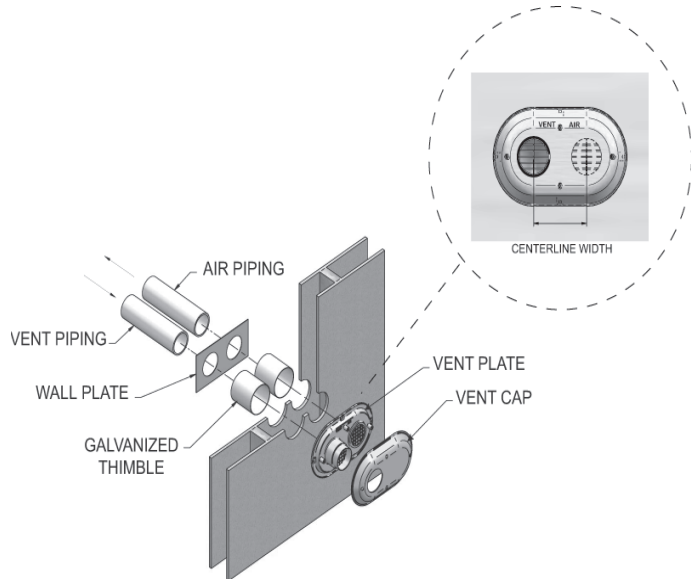


Figure 30. Sidewall Termination Assembly

Table 18. Sidewall Vent Centerline Dimensions

MODEL	AIR	VENT	CENTERLINE WIDTH
150 - 200	3"	3"	5 5/8"
285 - 600	4"	4"	5 5/8"
700 - 800	4"	6"	7 3/4"

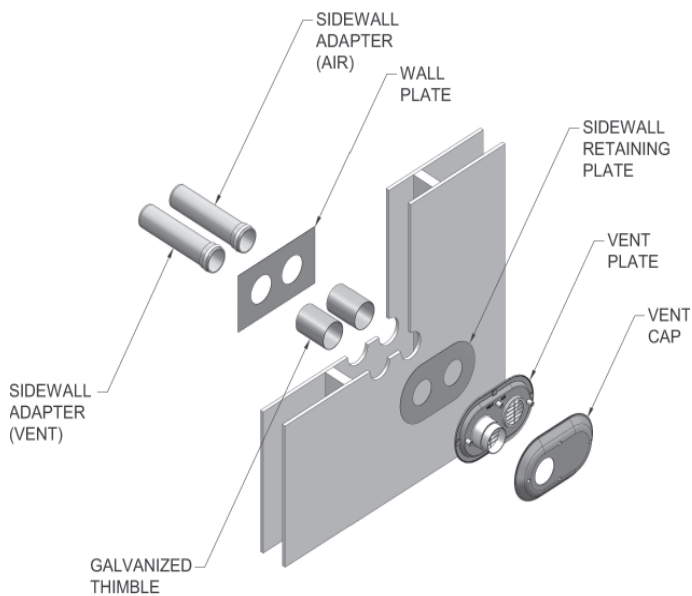


Figure 31. Polypropylene Sidewall Termination Assembly

PREPARE WALL PENETRATIONS (ALTERNATE - FIELD SUPPLIED OPTION)

1. Air pipe penetration:
 - a. Cut a hole for the air pipe. Size the air pipe hole as close as desired to the air pipe outside diameter.
2. Vent pipe penetration:
 - a. Cut a hole for the vent pipe. For either combustible or noncombustible construction, size the vent pipe hole with at least a 1/2 inch clearance around the vent pipe outer diameter:
 - 4½ inch hole for 3 inch vent pipe.
 - 5½ inch hole for 4 inch vent pipe.
 - 7½ inch hole (191 mm) hole for 6 inch (152 mm) vent pipe.
 - a. Insert a galvanized metal thimble in the vent pipe hole as shown in Figure 32.
3. Use a sidewall termination plate as a template for correct location of hole centers.
4. Follow all local codes for isolation of vent pipe when passing through floors or walls.
5. Seal exterior openings thoroughly with exterior caulk.

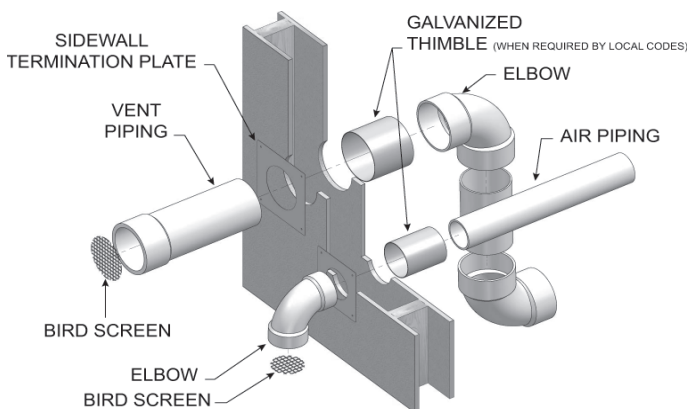


Figure 32. A Typical Sidewall Termination Assembly - Models 150 - 800 PVC/CPVC or Stainless Steel

MULTIPLE VENT/ AIR TERMINATIONS

1. When terminating multiple XP water heaters terminate each vent/air connection as described in this manual (Figure 33).
- All vent pipes and air inlets must terminate at the same height to avoid possibility of severe personal injury, death, or substantial property damage.
2. Place wall penetrations to obtain minimum clearance of 12 inches between edge of air inlet and adjacent vent outlet, as shown in Figure 33 for U.S. installations.
 3. The air inlet of a XP water heater is part of a direct vent connection. It is not classified as a forced air intake with regard to spacing from adjacent water heater vents.

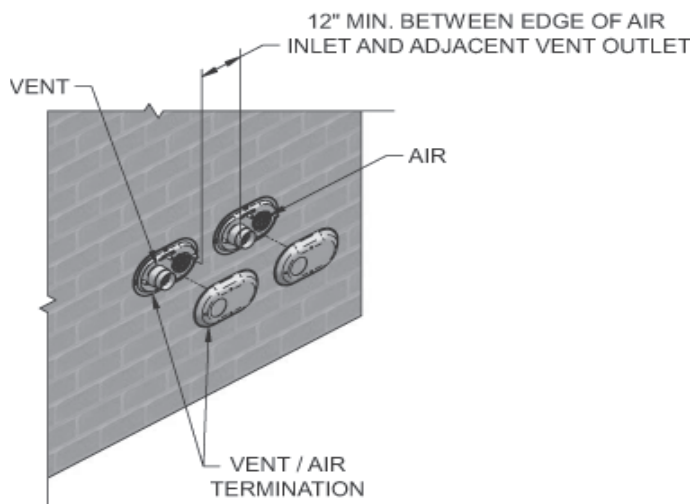


Figure 33. Multiple Vent Terminations (must also comply with Figure 22)

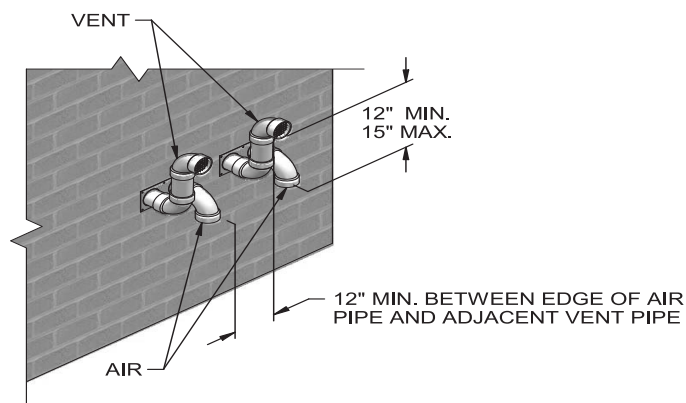


Figure 34. Alternate Multiple Vent Terminations w/Field Supplied Fittings (must also comply with Figure 23)



SIDEWALL TERMINATION – OPTIONAL CONCENTRIC VENT: MODELS 150 - 600

DESCRIPTION AND USAGE

A. O. Smith offers optional concentric combustion air and vent pipe termination kits (Factory Kit #100274637 for 3” diameter - Models 150 - 200 and #100274638 for 4” diameter - Models 285 - 600). Both combustion air and vent pipes must attach to the termination kit. The termination kits must terminate outside the structure and must be installed as shown below in Figure 35.

The required combustion vent pipe materials are listed in Table 11, on Page 20 of this manual.

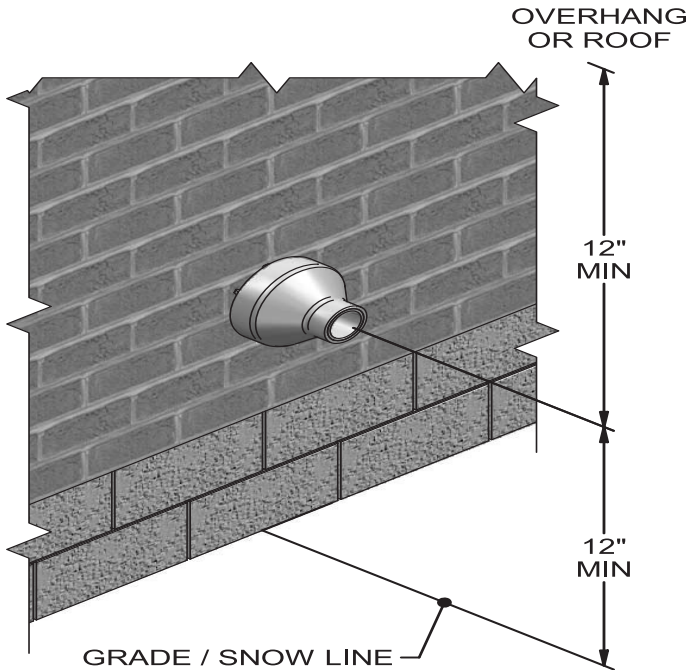


Figure 35. Concentric Sidewall Termination

PREPARE WALL PENETRATIONS

1. Determine the best location for the termination kit (see Figure above).
2. Reference the Determine Location section on Page 24 of this manual for general termination considerations.
3. Cut one (1) hole (5 inch diameter for #100274637 installations or 7 inch diameter for #100274638 installations) into the structure to install the termination kit.
4. Partially assemble the concentric vent termination kit. Clean and cement using the procedures found in these instructions.
 - a. Cement the Y concentric fitting to the larger kit pipe (Figure’s 36 and 37).
 - b. Cement the rain cap to the smaller diameter kit pipe (Figure’s 36 and 37).

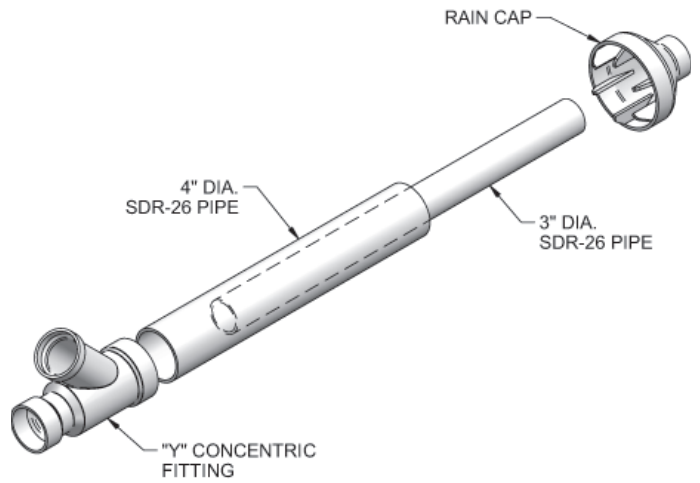


Figure 36. Kit Contents_100274637 - Models 150 - 200

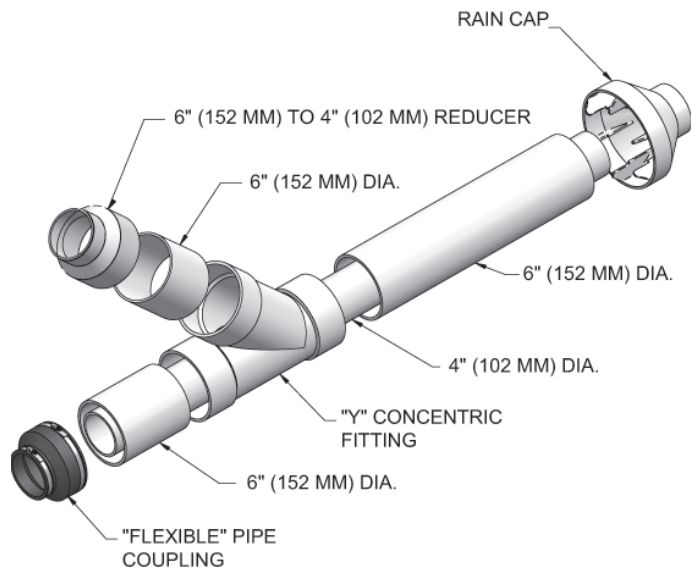
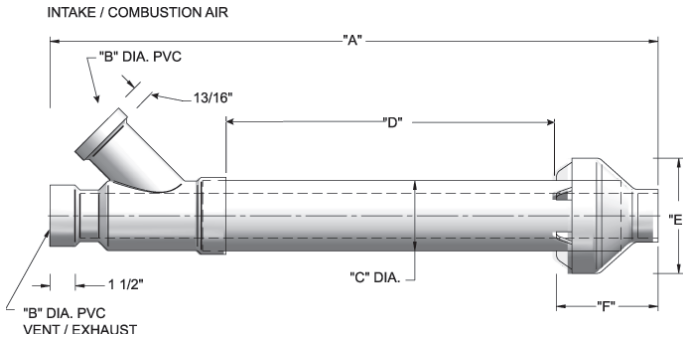


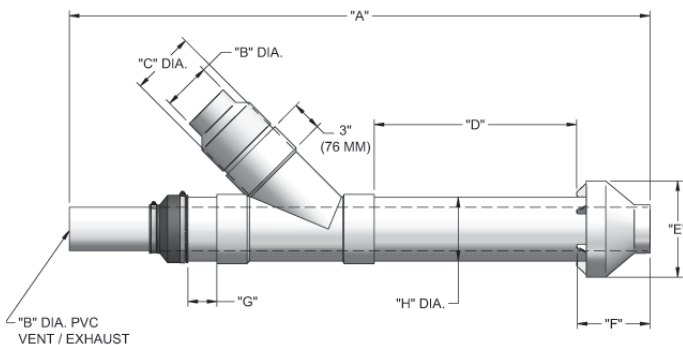
Figure 37. Kit Contents_100274638 - Models 285 - 600





A	B	C	D*	E	F
38 7/8"	3"	4 1/2"	21 1/8"	7 3/8"	6 1/2"

Figure 38. Concentric Vent Dimensional Drawing - Models 150 - 200



A	B	C	D	E	F	G	H
60"	4"	6"	21 1/8"	10"	7 5/8"	3"	6 5/8"

Figure 39. Concentric Vent Dimensional Drawing - Models 285 - 500

NOTE: Instead of cementing the smaller pipe to the rain cap, a field-supplied stainless steel screw may be used to secure the two (2) components together when field disassembly is desired for cleaning (see Figure 40).

When using the alternate screw assembly method, drill a clearance hole in the rain cap and a pilot hole in the vent pipe for the screw size being used. Failure to drill adequate holes may cause cracking of PVC components, allowing combustion products to be recirculated. Failure to follow this warning could result in personal injury or death.

Do not operate the appliance with the rain cap removed or recirculation of combustion products may occur. Water may also collect inside the larger combustion air pipe and flow to the burner enclosure. Failure to follow this warning could result in product damage or improper operation, personal injury, or death.

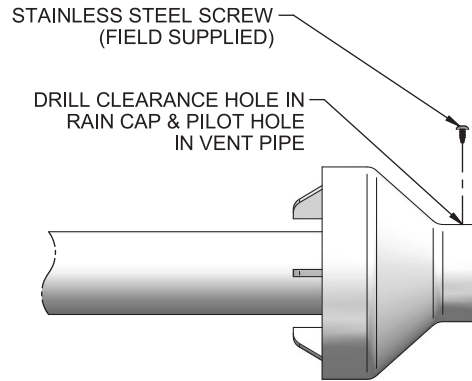


Figure 40. Rain Cap to Vent Pipe Alternate Assembly

5. Install the Y concentric fitting and pipe assembly through the structure's hole.

NOTE: Do not allow insulation or other materials to accumulate inside the pipe assembly when installing through the hole.

6. Install the rain cap and small diameter pipe assembly into the Y concentric fitting and large pipe assembly. Ensure small diameter pipe is bottomed and cemented in the Y concentric fitting for #100274637 installations and fastened tightly into the rubber adapter for #100274638 installations.
7. Secure the assembly to the structure as shown in Figure 41 using field-supplied metal strapping or equivalent support material.

NOTE: Ensure termination location clearance dimensions are as shown in Figure 35.

If assembly needs to be extended to allow sidewall thickness requirement, the two (2) pipes supplied in the kit may be replaced by using the same diameter, field-supplied SDR-26 PVC (D2241) pipe for 100274637 and standard schedule 40 PVC for 100274638. Do not extend dimension D* more than 60 inches (see Figures 38 and 39).

If assembly depth needs to be reduced, dimension D can be as short as possible.



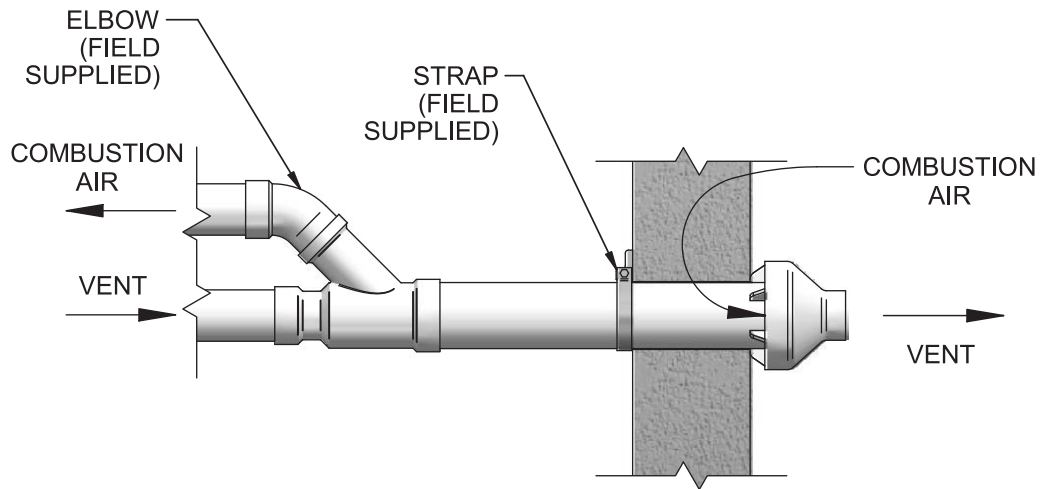


Figure 41. Concentric Vent Sidewall Attachment

DO NOT use field-supplied couplings to extend pipes. Airflow restriction will occur and may cause intermittent operation.

8. Cement appliance combustion air and vent pipes to the concentric vent termination assembly. See Figure 41 for proper pipe attachment.
9. Operate the appliance one (1) heat cycle to ensure combustion air and vent pipes are properly connected to the concentric vent termination connections.

MULTIVENTING SIDEWALL TERMINATIONS

When two (2) or more direct vent appliances are vented near each other, each appliance must be individually vented (see Figure 42). NEVER common vent or breach vent this appliance. When two (2) or more direct vent appliances are vented near each other, two (2) vent terminations may be installed as shown in Figure 42. It is important that vent terminations be made as shown to avoid recirculation of flue gases.

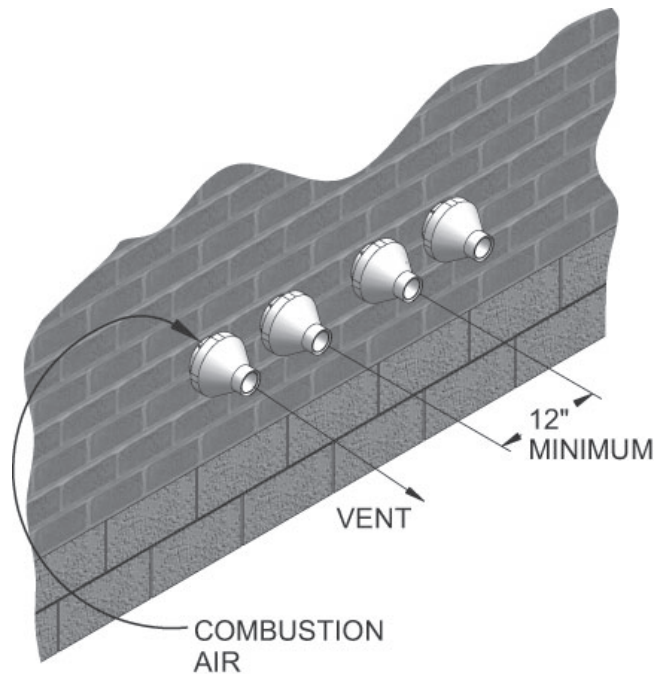


Figure 42. Concentric Vent and Combustion Air Termination

VERTICAL DIRECT VENTING

VENT/ AIR TERMINATION - VERTICAL

Follow instructions below when determining vent location to avoid possibility of severe personal injury, death or substantial property damage.

DETERMINE LOCATION

Locate the vent/air terminations using the following guidelines:

1. The total length of piping for vent or air must not exceed the limits given on Table 9 of this manual.
2. Prepare the vent termination and the air termination elbow (Figure 43) by inserting bird screens. Bird screens should be obtained locally.
3. The vent must terminate at least 3 feet above the highest place in which the vent penetrates the roof and at least 2 feet above any part of a building within 10 horizontal feet.
4. The air piping must terminate in a down-turned 180° return pipe no further than 2 feet from the center of the vent pipe. This placement avoids recirculation of flue products into the combustion air stream.
5. The vent piping must terminate in an up-turned coupling as shown in Figure 43. The top of the coupling must be at least 1 foot above the air intake. When the vent termination uses a rain cap as illustrated in Figure 44 maintain at least 36" (914 mm) above the air inlet. The air inlet pipe and vent pipe can be located in any desired position on the roof, but must always be no further than 2 feet (.6 m) apart and with the vent termination at least 1 foot for PVC and 3 feet for stainless steel, above the air intake.
6. Maintain the required dimensions of the finished termination piping as shown in Figure 43.
7. Do not extend exposed vent pipe outside of building more than shown in this document. Condensate could freeze and block vent pipe.

Rooftop vent and air inlet terminations must terminate in the same pressure zone, unless vertical vent sidewall air is set up as shown in the Vertical Vent, Sidewall Air section.

8. Locate terminations so they are not likely to be damaged by foreign objects, such as stones or balls, or subject to buildup of leaves or sediment.

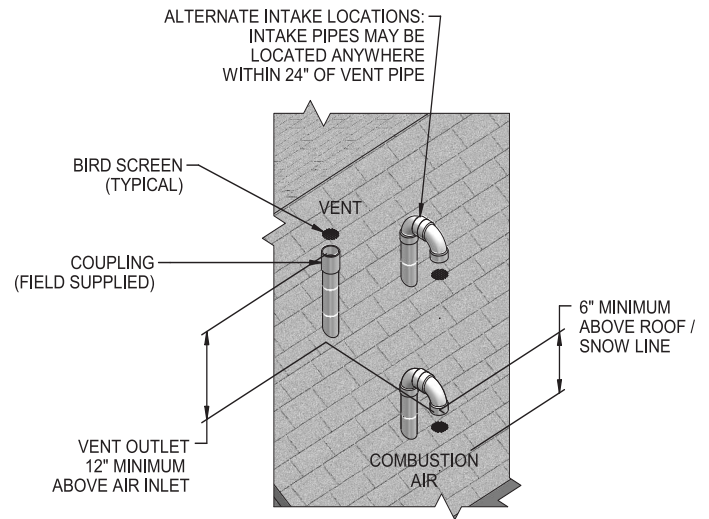


Figure 43. PVC/CPVC Vertical Termination of Air and Vent

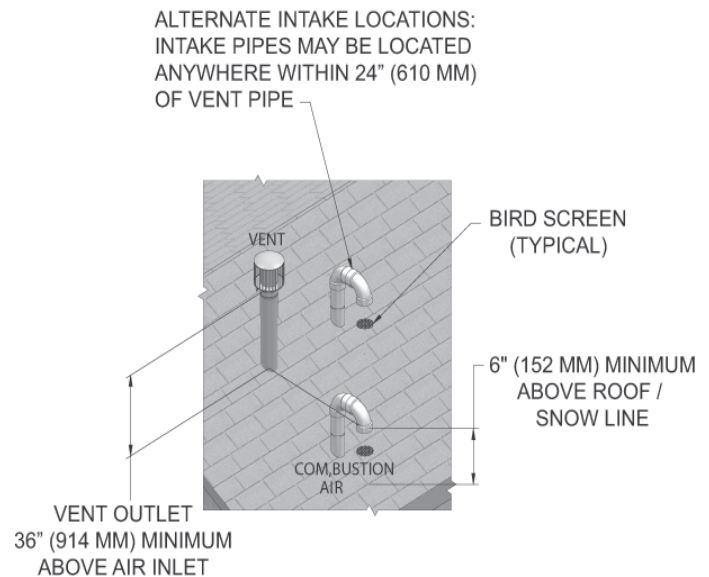


Figure 44. Stainless Steel Vertical Termination of Air and Vent

PREPARE ROOF PENETRATIONS

1. Air pipe penetration:
 - a. Cut a hole for the air pipe. Size the air pipe hole as close as desired to the air pipe outside diameter.
2. Vent pipe penetration:
 - a. Cut a hole for the vent pipe. For either combustible or noncombustible construction, size the vent pipe hole with at least a 1/2 inch clearance around the vent pipe outer diameter:
 - 4½ inch hole for 3 inch vent pipe.
 - 5½ inch hole for 4 inch vent pipe.
 - 7½ inch hole for 6 inch vent pipe.
 - b. Insert a galvanized metal thimble in the vent pipe hole.
3. Space the air and vent holes to provide the minimum spacing shown in Figure 43 on Page 31.
4. Follow all local codes for isolation of vent pipe when passing through floors, ceilings, and roofs.
5. Provide flashing and sealing boots sized for the vent pipe and air pipe.

MULTIPLE VENT/AIR TERMINATIONS

1. When terminating multiple XP water heaters, terminate each vent/air connection as described in this manual (Figure 45).

Terminate all vent pipes at the same height and all air pipes at the same height to avoid possibility of severe personal injury, death, or substantial property damage.
2. Place roof penetrations to obtain minimum clearance of 12 inches between edge of air intake elbow and adjacent vent pipe of another water heater for U.S. installations (see Figure 45).
3. The air inlet of an XP water heater is part of a direct vent connection. It is not classified as a forced air intake with regard to spacing from adjacent water heater vents.

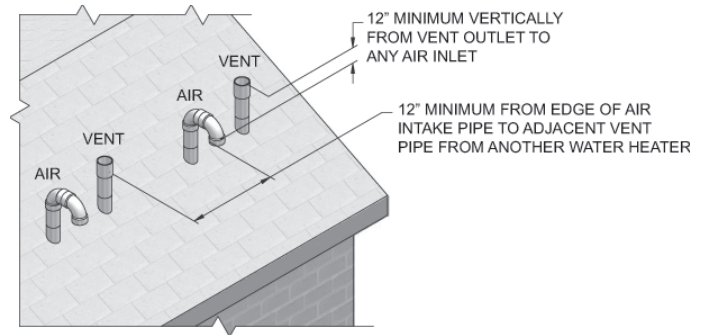


Figure 45. Vertical Terminations with Multiple Water Heaters

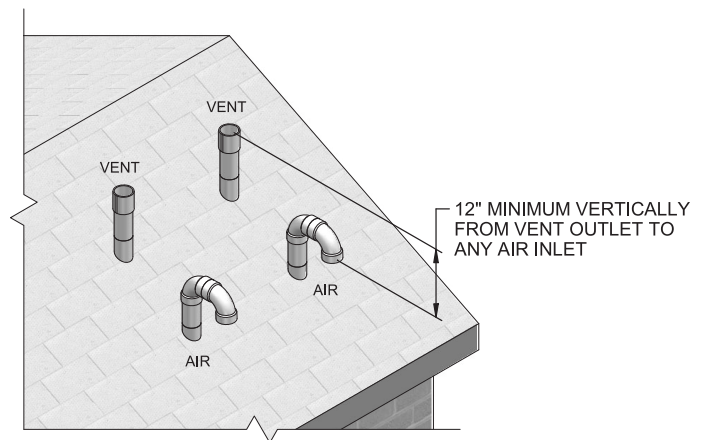


Figure 46. Alternate Vertical Terminations with Multiple Water Heaters

VERTICAL TERMINATION - OPTIONAL CONCENTRIC VENT: MODELS 150 - 600

DESCRIPTION AND USAGE

A. O. Smith offers an optional concentric combustion air and vent pipe termination kit. Both combustion air and vent pipes must attach to the termination kit. The termination kit must terminate outside the structure and must be installed as shown in Figure 47.

Field supplied pipe and fittings are required to complete the installation.

The required combustion vent pipe and fittings are listed in Table 8, on Page 19 of this manual.

VERTICAL TERMINATION INSTALLATION

1. See Vertical Direct Venting - Determine Location (where applicable).

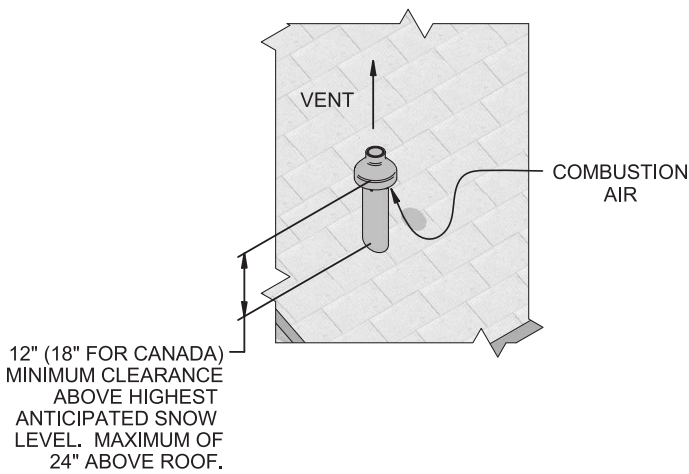


Figure 47. Concentric Vertical Termination



Figure 48. Do Not Install U-Bend to Rain Cap

2. Cut one (1) hole (5 inch diameter for #100274637 installations or 7 inch diameter for #100274638 installations) into the structure to install the termination kit.
3. Partially assemble the concentric vent termination kit. Clean and cement following the cleaning procedures in these instructions.
 - a. Cement the Y concentric fitting to the larger diameter kit pipe (see Figure's 36 and 37 on Page 28).
 - b. Cement rain cap to the smaller diameter kit pipe (see Figure's 36 and 37 on Page 28).
 - c. **Do not attach a U-Bend to the rain cap. Doing so could cause recirculation (see Figure 48).**

NOTE: Instead of cementing the smaller pipe to the rain cap, a field supplied stainless steel screw may be used to secure the two (2) components together when field disassembly is desired for cleaning (see Figure 40 on Page 29).

When using the alternate screw assembly method, drill a clearance hole in the rain cap and a pilot hole in the vent pipe for the screw size being used. Failure to drill adequate holes may cause cracking of PVC components, allowing combustion products to be recirculated. Failure to follow this warning could result in personal injury or death.

Do not operate the appliance with the rain cap removed or recirculation of combustion products may occur. Water may also collect inside the larger combustion air pipe and flow to the burner enclosure. Failure to follow this warning could result in product damage or improper operation, personal injury, or death.

4. Install the Y concentric fitting pipe assembly up through the structure's hole and field supplied roof boot/flashing.

NOTE: Do not allow insulation or other materials to accumulate inside the pipe assembly when installing through the hole.

5. Secure the assembly to the roof structure as shown below in Figure 49 using field supplied metal strapping or equivalent support material.

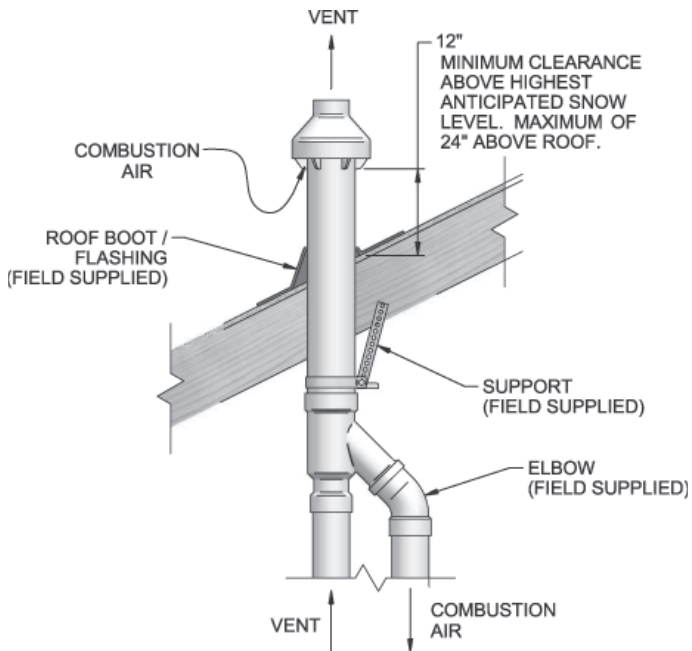


Figure 49. Concentric Vent Roof Installation

NOTE: Ensure termination height is above the roof surface or anticipated snow level (12 inches in U.S.A.) as shown in Figure 47 on Page 33.

If assembly is too short to meet height requirement, the two (2) pipes supplied in the kit may be replaced by using the same diameter, field supplied SDR-26 PVC (D2241) pipe for 100274637 and standard schedule 40 PVC for 100274638. Do not extend dimension D* more than 60 inches (see Figure's 36 and 37 on Page 29).

DO NOT use field-supplied couplings to extend pipes. Airflow restriction will occur.

6. Install the rain cap and the small diameter pipe assembly into the roof penetration assembly. Ensure the small diameter pipe is cemented and bottomed in the Y concentric fitting for #100274637 installations and fastened tightly into the rubber adapter for #100274638 installations.
7. Cement the appliance combustion air and vent pipes to the concentric vent termination assembly. See Figure 49 for proper pipe attachment.
8. Operate the appliance through one (1) heat cycle to ensure combustion air and vent pipes are properly connected to the concentric vent termination connections.

MULTIPLE VERTICAL TERMINATIONS

When two (2) or more direct vent appliances are vented near each other, each appliance must be individually vented (see Figure 50). NEVER common vent or breach vent this appliance. When two (2) or more direct vent appliances are vented near each other, two (2) vent terminations may be installed as shown in Figure 50. It is important that vent terminations be made as shown to avoid recirculation of flue gases.

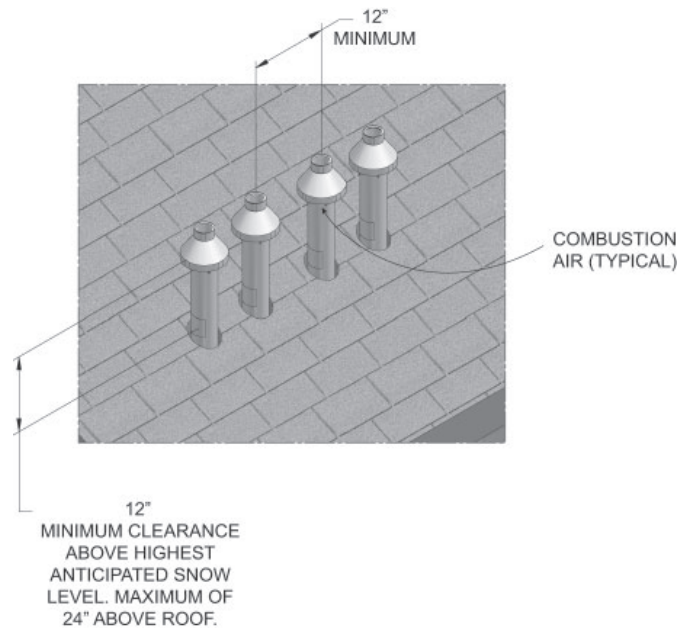


Figure 50. Concentric Vent and Combustion Air Vertical Termination



ALTERNATE VERTICAL CONCENTRIC VENTING

This appliance may be installed with a concentric vent arrangement where the vent pipe is routed through an existing unused venting system; or by using the existing unused venting system as a chase for vent and combustion air routing.

CONCENTRIC VENTING ARRANGEMENT

The venting is to be vertical through the roof. The annular space between the O.D. of the vent pipe and the I.D. of the existing unused venting system is utilized for the combustion air source.

The minimum size of the existing vent system required to achieve enough annular space for combustion air can be found in Table 19 below.

The upper and lower termination as well as any other unsealed joints in the existing vent system must be sealed to ensure that all combustion air is drawn from under the vent cap as shown in Figure's 51 and 52.

Approved venting materials must be used as specified in Table 8 on Page 19.

Follow all vent / air termination and clearance requirements per this section to the appropriate example. Installation must comply with local requirements and with the National Fuel Gas Code.

The maximum allowable equivalent vent and air intake lengths for this venting arrangement are to be determined from the Venting Installation section.

If an existing unused venting system is converted for use with this method of concentric venting, the installer must ensure that the existing venting system is clean and free from particulate contamination that will harm this appliance and cause increased nuisance calls or maintenance. Refer to Page 11 for a list of corrosive contaminants and sources.

Two example scenarios of a concentric venting arrangement are shown for illustrative purposes in Figure's 51 and 52.

Table 19. Alternate Vertical Concentric Vent / Chase Sizes

MODEL	VENT/ AIR INLET SIZE	MINIMUM EXISTING VENT / CHASE SIZE
150 - 200	3"	5"
285 - 600	4"	7"
700 - 800	6"	10"

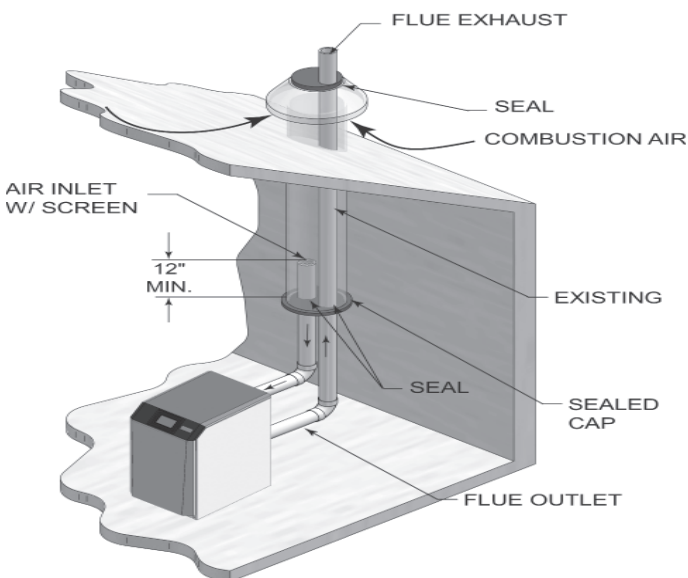


Figure 51. Concentric Vent Example 1

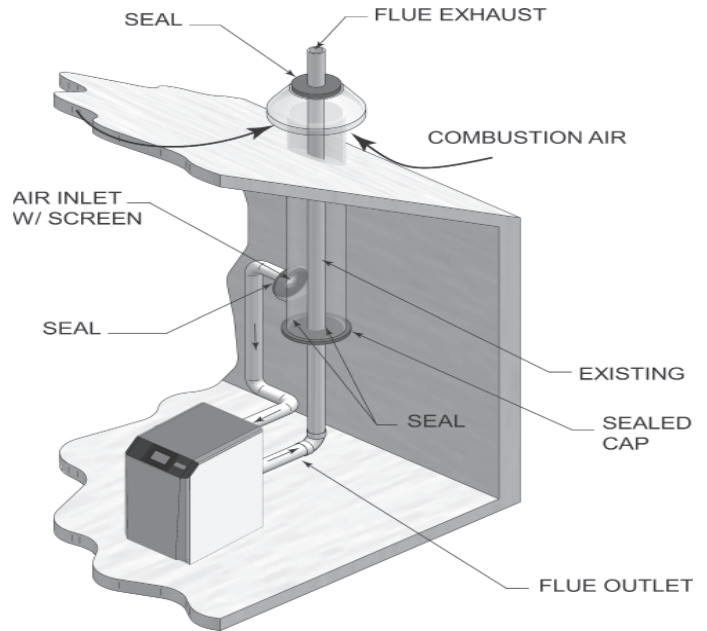


Figure 52. Concentric Vent Example 2

EXISTING VENT AS A CHASE

Follow all existing termination and clearance requirements and allowable pipe lengths. Use only approved venting materials listed in the Venting Installation section of this manual.

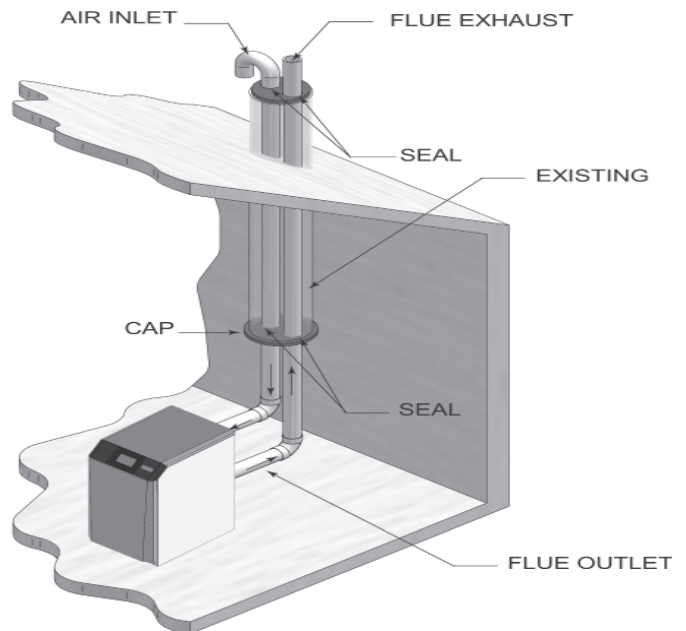


Figure 53. Existing Vent as a Chase

WATER HEATER INSTALLATION

SYSTEM PIPING

Observe a minimum of 1/4 inch clearance around all un-insulated hot water pipes when openings around the pipes are not protected by non-combustible materials.

GENERAL PIPING INFORMATION

Basic steps are listed below along with illustrations on the following pages (Figure's 57 thru 60), which will guide you through the installation of the XP water heater.

1. Connect the cold water supply to the inlet side of the water heater.
2. Connect the hot water supply to the outlet side of the water heater.
3. Install a backflow preventer or check valve on the cold feed make-up water line.
4. Install the factory supplied pump as shown in Figure's 57 thru 60.
5. Install an expansion tank on the system supply. Consult the tank manufacturer's instruction for specific information relating to tank installation. Size the expansion tank for the required system volume and capacity.
6. Install a drain valve at the lowest point of the system.
7. This appliance is supplied with a Temperature & Pressure Relief Valve sized in accordance with ASME Boiler and Pressure Vessel Code, Section IV ("Heating Boilers"). Pipe the discharge of the safety T & P Relief Valve to a suitable drain to prevent injury in the event of pressure relief. Pipe the discharge to a drain. Provide piping that is the same size as the safety T & P Relief Valve outlet. Never block the outlet of the safety T & P Relief Valve.

The T & P Relief Valve, tee and other necessary fittings are shipped in the install kit with the water heater and are to be field installed. See the piping illustrations included in this section, Figure 57 thru Figure 60 for suggested guidelines in piping the XP water heater.

NOTE: *Please note that these illustrations are meant to show system piping concept only, the installer is responsible for all equipment and detailing required by local codes.

FLOW SWITCH AND TEMPERATURE & PRESSURE RELIEF VALVE (T & P RELIEF VALVE) INSTALLATION

Basic steps are listed below to guide you through the installation of the flow switch and T & P Relief Valve provided with the unit.

1. Install the tee with the 3/4 inch fitting positioned vertically and on the top as shown in Figure 54.
2. Install the T & P Relief Valve into the 3/4 inch fitting of the tee installed in Step 1 (Figure 54).
3. Install the close nipple on the downstream side of the temperature and pressure relief valve tee (Figure 54).
4. Install the tee with the 1 inch fitting positioned vertically and on the top (Figure 54).
5. Attach the paddle to the flow switch per the manufacturer's instructions. Reference Table 20 to select the correct paddle for the pipe size used (consult the manufacturer's instructions for a detailed explanation). For Example: If using a 1 1/4 inch pipe size (Models XWH 150 - XWH 200) select paddle #1.
6. Install the assembled flow switch into the 1 inch fitting of the tee installed in Step 4 (see Figure 54).

NOTE: Be sure to install flow switch so that the arrow on the flow switch is pointing in the direction of the flow (see Figure 55).

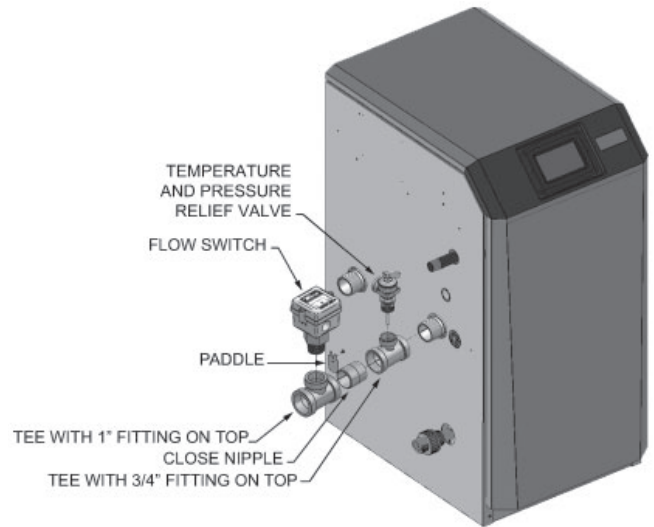


Figure 54. Flow Switch and T & P Relief Valve Installation

FLOW SWITCH ADJUSTMENT

Refer to Table 20 for the proper setting of the sensitivity screw. For reference, the position of the screw prior to setting should be turned clockwise with a Phillips driver until it stops (Figure 55). Proceed to turn the screw counterclockwise the amount of turns listed in Table 20 based on the model.

Consult the manufacturer's instructions for wiring the flow switch to your system.

Table 20. Paddle Size / Sensitivity Screw Adjustment

MODEL	PADDLE SIZE	SENSITIVITY SCREW ADJUSTMENT
Note: Paddles are included with the flow switch.		
150	#1	9 turns
200	#1	6 turns
285	#3	8¾ turns
400	#1	8 turns
500	#1	7½ turns
600	#1	7 turns
700	#1	6½ turns
800	#1	5½ turns

NOTE: Turn the sensitivity screw clockwise to increase the flow rate required to activate the switch. Turn the sensitivity screw counterclockwise to decrease the flow rate required to activate the switch.

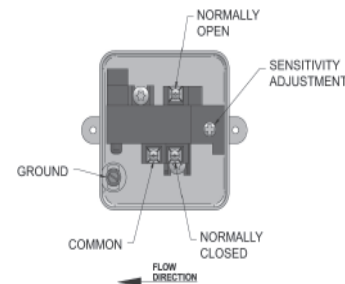


Figure 55. Flow Switch Adjustment

SCALDING

This water heater can deliver scalding temperature water at any faucet in the system. Be careful whenever using hot water to avoid scalding injury. Certain appliances such as dishwashers and automatic clothes washers may require increased temperature water. By setting the thermostat on this water heater to obtain the increased temperature water required by these appliances, you may create the potential for scald injury. To protect against injury, you should install a mixing valve in the water system. This valve will reduce point of discharge temperature by mixing cold and hot water in branch supply lines. Such valves are available from the local plumbing supplier.

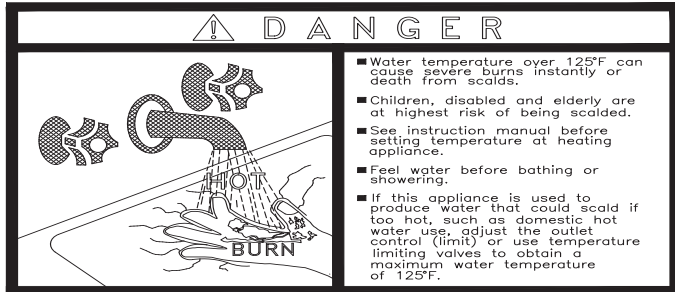


Figure 56. Scald Warning Label Located on the Appliance

The following chart (Table 21) details the relationship of water temperature and time with regard to scald injury and may be used as a guide in determining the safest water temperature for your applications.

Table 21. Approximate Time / Temperature Scald Chart

APPROXIMATE TIME / TEMPERATURE RELATIONSHIPS IN SCALDS	
120°F	More than 5 minutes
125°F	1 1/2 to 2 minutes
130°F	About 30 seconds
135°F	About 10 seconds
140°F	Less than 5 seconds
145°F	Less than 3 seconds
150°F	About 1 1/2 seconds
155°F	About 1 second

WATER CHEMISTRY

NOTE: The temperature rises and circulating pumps shown in Table 22 are sized based on the heating of potable water with a specified water chemistry. See Table 24 in Start Up Section for recommendations. Heating of high hardness and/or high total dissolved solids water may require a larger circulating pump, and a revised temperature rise specification based on the water chemistry of the water to be heated. See Table 24 in Start Up Section for recommendations.

Water with a hardness of less than 5 grains per gallon will usually have a pH which can be aggressive and corrosive causing non-warrantable damage to the pump, and associated piping. Corrosion due to water chemistry generally shows up first in the hot water system because heated water increases the rate of corrosive chemical reactions.

PIPING COMPONENTS

WATER HEATER SYSTEM PIPING

Water heater system piping **MUST** be sized per the pipe requirements listed in Table 22. Reducing the pipe size can restrict the flow rate through the water heater, causing inadvertent high limit shutdowns and poor system performance.

CHECK VALVES:

Field supplied. Check valves are recommended for installation as shown in Figure's 57 thru 60.

WATER HEATER ISOLATION VALVES:

Field supplied. Full port ball valves are required. Failure to use full port ball valves could result in a restricted flow rate through the water heater.

ANTI-SCALD MIXING VALVE:

Field supplied. An anti-scald mixing valve is recommended when storing domestic hot water above 115°F.

UNIONS:

Field supplied. Recommended for unit serviceability.

TEMPERATURE AND PRESSURE RELIEF VALVE:

Factory supplied on water heaters. The T & P relief valve is sized to ASME specifications. Storage tanks may require additional valves depending on local codes.

TANK SENSOR:

A. O. Smith supplies a tank sensor. The tank sensor must be installed in the tapping provided in the lower 25% of the storage tank to achieve proper operation. As shipped from the factory, the tank sensor is in the literature package shipped with the unit. Placing the sensor in the tapping provided on the storage tank will improve temperature response and prevent short cycles of operation.

STRAINER:

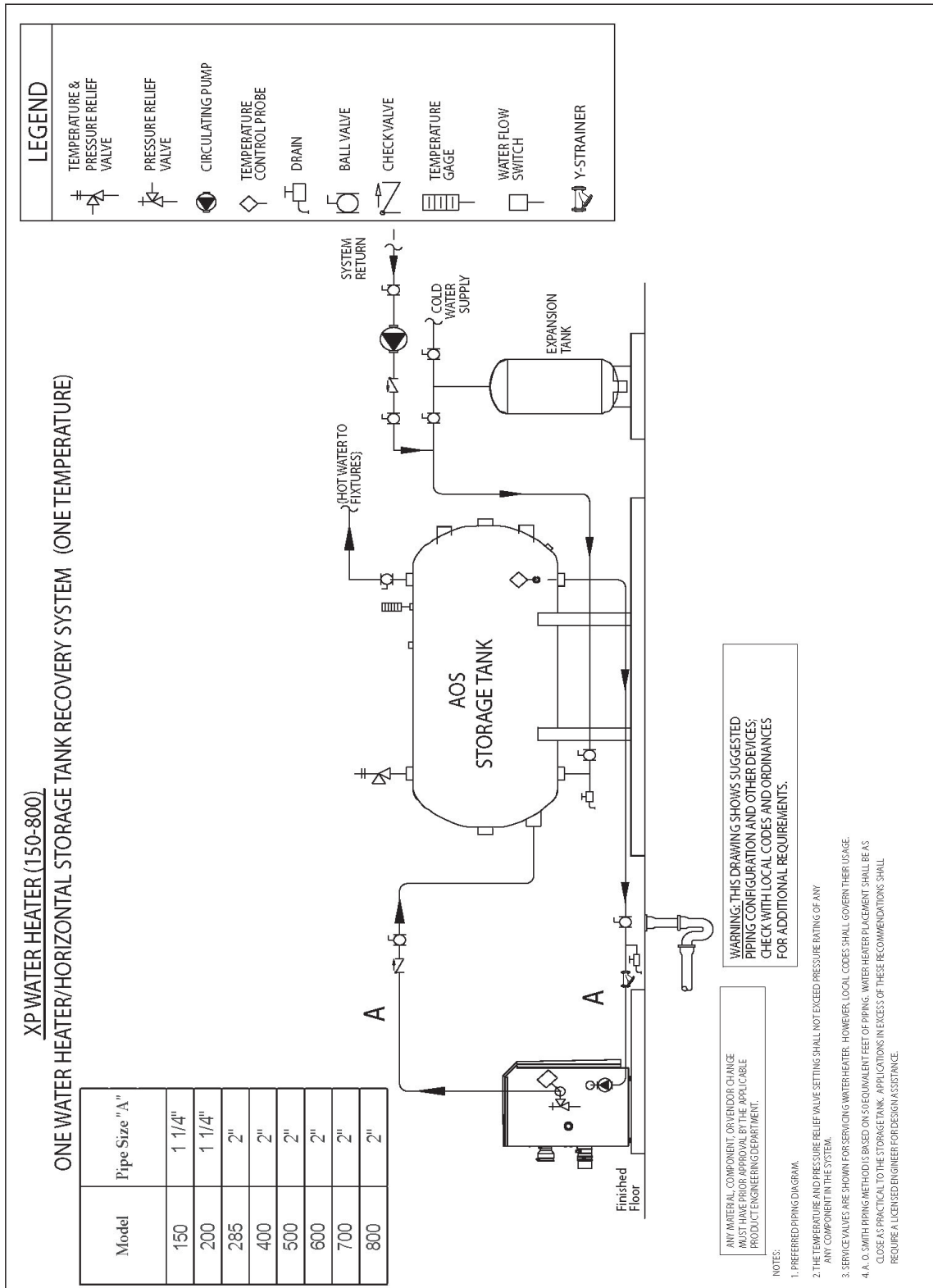
Field supplied. Required to help eliminate debris from causing damage to the heat exchanger. When installing in a pre-existing system, it is recommended to install a filter in the recirculation line capable of removing debris left in the system.

Table 22. Water Heater Pump Applications / Typical Temperature Rise

Water Heater Pump Applications						
Model	Pipe Size	Water Hardness	*Grundfos	Flow Rate (GPM)	Loss (FT/HD)	Temp. Rise
150	1-1/4"	5 to 12 gpg	*UP 43-100 SF	16	20	18°F
		12 to 15 gpg	TP 40-160	24	41	12°F
200	1-1/4"	5 to 12 gpg	*UP 43-100 SF	21	22	18°F
		12 to 15 gpg	TP 40-160	28	38	13°F
285	2"	5 to 12 gpg	*UP 43-100 SF	30	23	18°F
		12 to 15 gpg	TP 40-160	38	36	14°F
400	2"	5 to 12 gpg	*UP 43-110 SF	42	31	18°F
		12 to 15 gpg	TP 40-240	56	48	13°F
500	2"	5 to 12 gpg	*UP 43-110 SF	53	26	18°F
		12 to 15 gpg	TP 40-240	66	43	14°F
600	2"	5 to 12 gpg	*UP 43-110 SF	53	26	22°F
		12 to 15 gpg	TP 40-240	66	43	17°F
700	2"	5 to 12 gpg	*TP 40-160	63	32	22°F
		12 to 15 gpg	TP 50-160/2B	75	46	17°F
800	2"	5 to 12 gpg	*TP 40-160	67	31	24°F
		12 to 15 gpg	TP 50-160/2B	85	43	18°F

*Denotes standard pump supplied with unit.

NOTE: Pump selections and flow shown above are based on 45 feet of piping, 4 - 90° elbows, and 2 - fully ported ball valves.

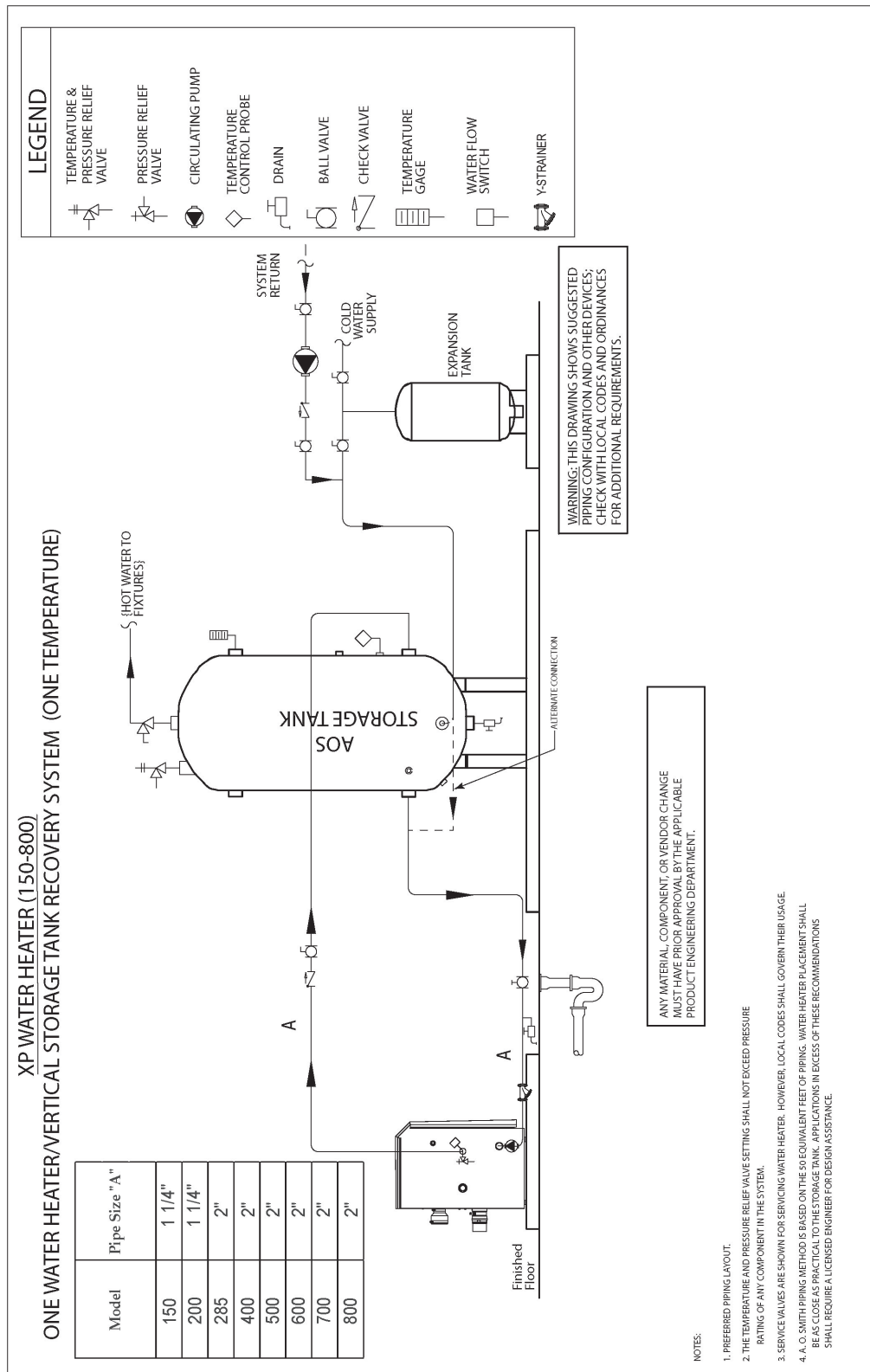


The piping will not support the weight of the water heater circulator pump. Do not attempt to support the weight of the water heater circulator pump with the piping or its accessories. Refer to the pump manufacturer's installation instructions. Failure to comply could result in severe personal injury, death, or substantial property damage.

NOTE: Please note that these illustrations are meant to show system piping concept only, the installer is responsible for all equipment. The installer must follow all manufacturer's instructions for each system component. The installer is responsible for compliance with local codes.

Figure 57. ONE WATER HEATER/ HORIZONTAL STORAGE TANK RECOVERY SYSTEM



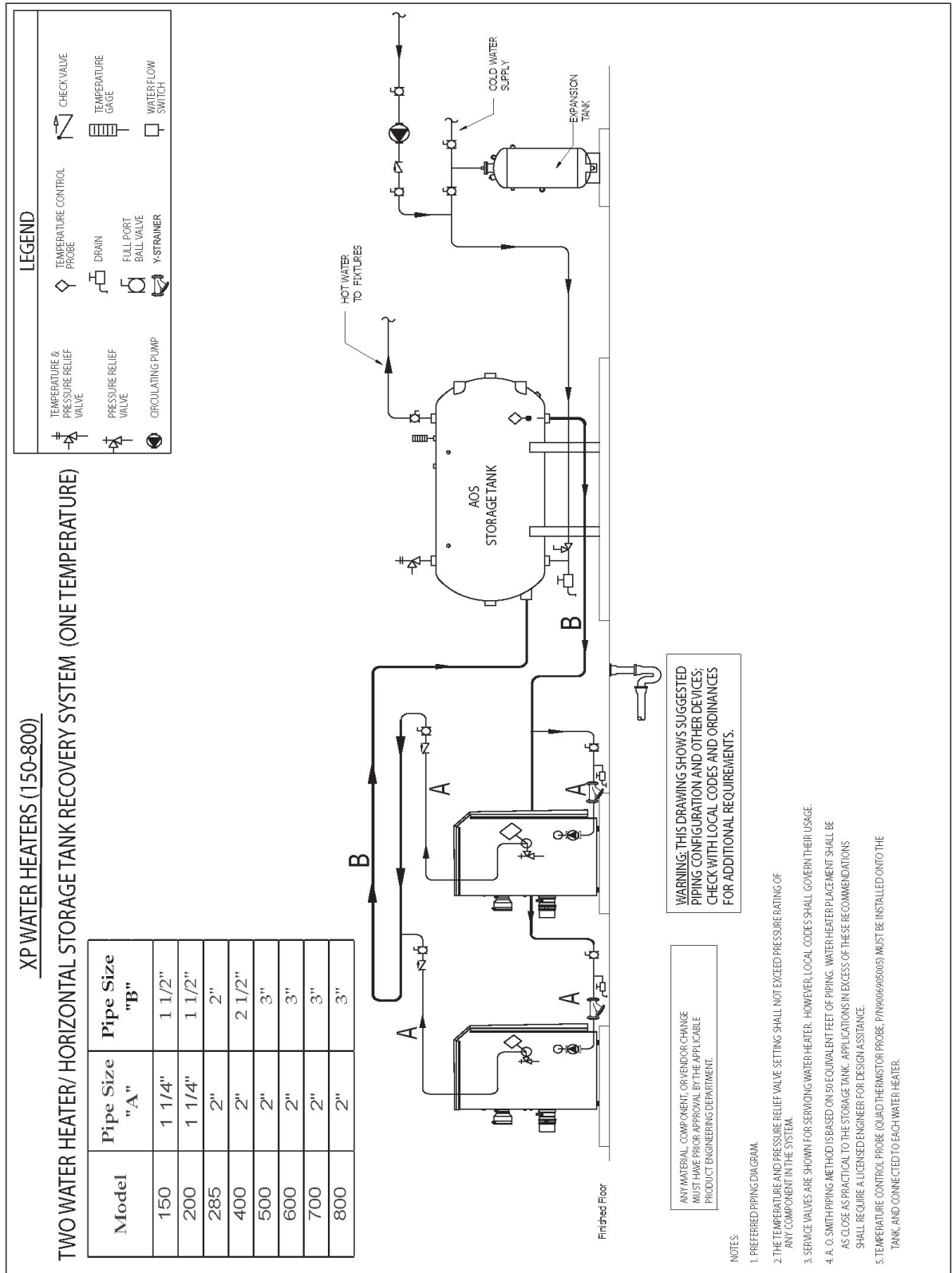


The piping will not support the weight of the water heater circulator pump. Do not attempt to support the weight of the water heater circulator pump with the piping or its accessories. Refer to the pump manufacturer's installation instructions. Failure to comply could result in severe personal injury, death, or substantial property damage.

NOTE: Please note that these illustrations are meant to show system piping concept only, the installer is responsible for all equipment. The installer must follow all manufacturer's instructions for each system component. The installer is responsible for compliance with local codes.

Figure 58. ONE WATER HEATER/ VERTICAL STORAGE TANK RECOVERY SYSTEM



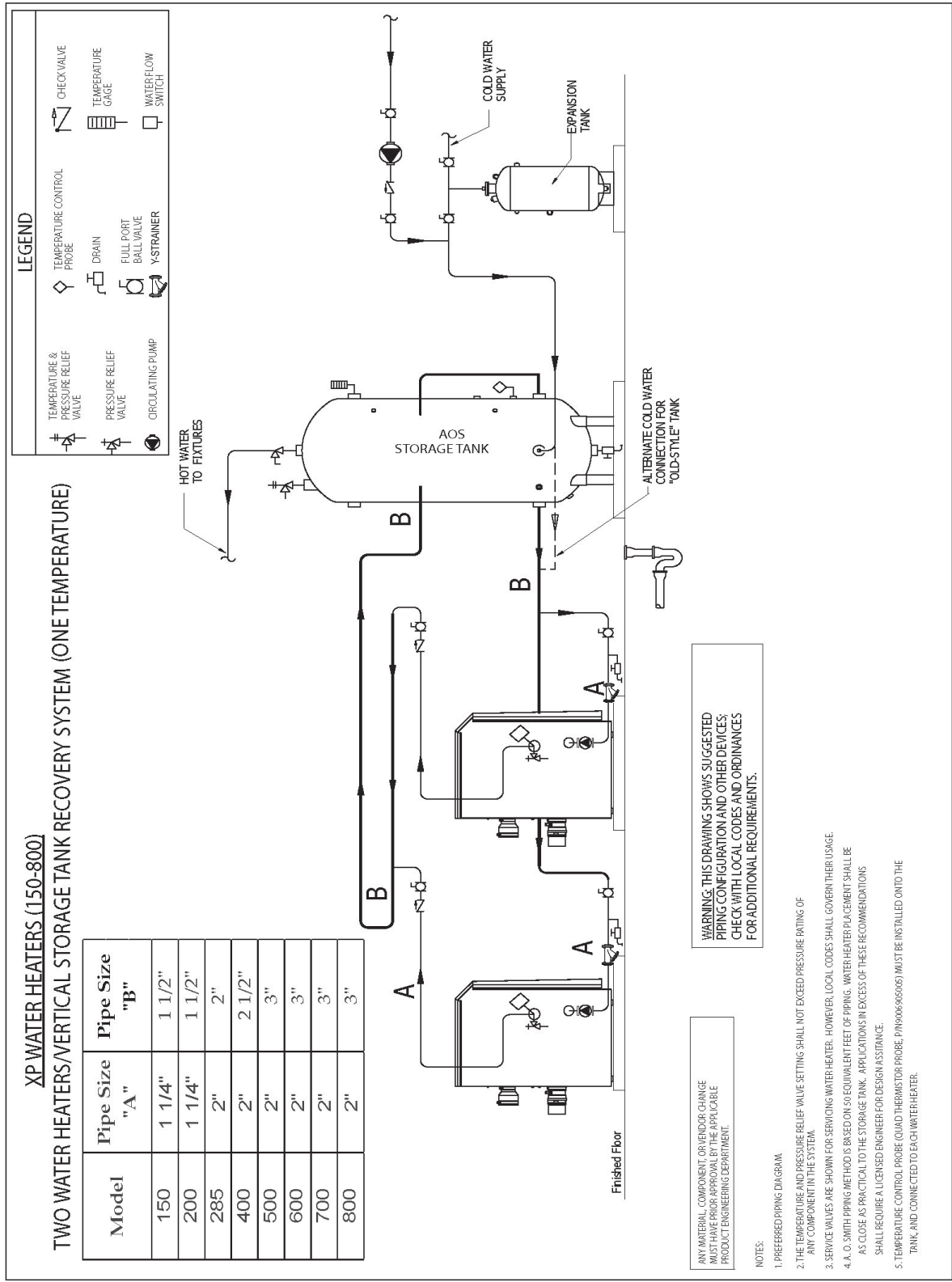


The piping will not support the weight of the water heater circulator pump. Do not attempt to support the weight of the water heater circulator pump with the piping or its accessories. Refer to the pump manufacturer's installation instructions. Failure to comply could result in severe personal injury, death, or substantial property damage.

NOTE: Please note that these illustrations are meant to show system piping concept only, the installer is responsible for all equipment. The installer must follow all manufacturer's instructions for each system component. The installer is responsible for compliance with local codes.

Figure 59. TWO WATER HEATER/ HORIZONTAL STORAGE TANK RECOVERY SYSTEM





The piping will not support the weight of the water heater circulator pump. Do not attempt to support the weight of the water heater circulator pump with the piping or its accessories. Refer to the pump manufacturer's installation instructions. Failure to comply could result in severe personal injury, death, or substantial property damage.

NOTE: Please note that these illustrations are meant to show system piping concept only, the installer is responsible for all equipment. The installer must follow all manufacturer's instructions for each system component. The installer is responsible for compliance with local codes.

Figure 60. TWO WATER HEATER/ VERTICAL STORAGE TANK RECOVERY SYSTEM



GAS CONNECTIONS

CONNECTING GAS SUPPLY PIPING

1. Remove the top access panel and refer to Figure's 61 thru 64 to pipe gas to the water heater.
 - a. Install ground joint union for servicing, when required.
 - b. On Models 150 - 400 install a manual shutoff valve in the gas supply piping outside water heater jacket when required by local codes or utility requirements.
2. Install sediment trap / drip leg.

Water heater system piping MUST be sized per the pipe requirements listed in Table 22. Reducing the pipe size can restrict the flow rate through the water heater, causing inadvertent high limit shutdowns and poor system performance.

3. Support piping with hangers, not by the water heater or its accessories.

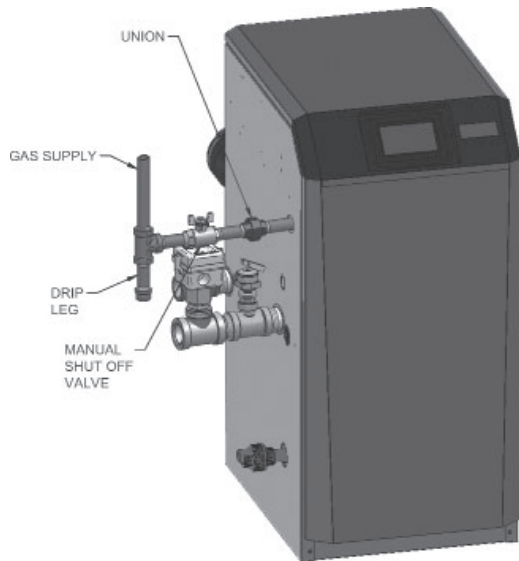


Figure 61. Gas Supply Piping - Models 150 - 200

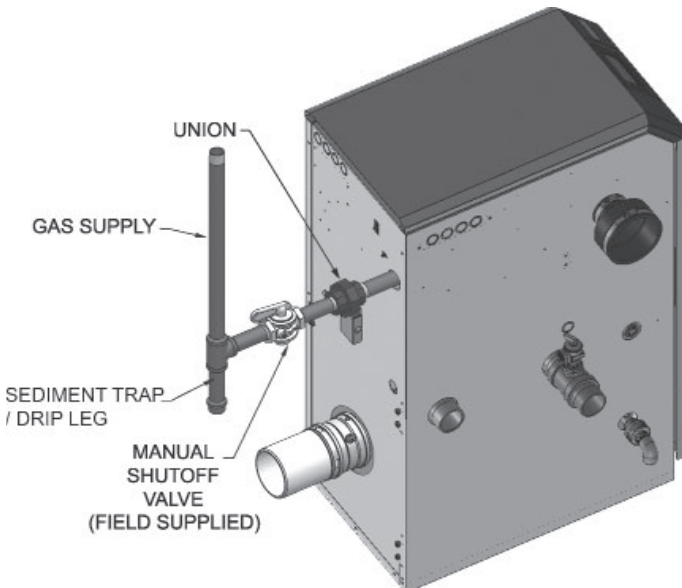


Figure 62. Gas Supply Piping - Models 285 - 400

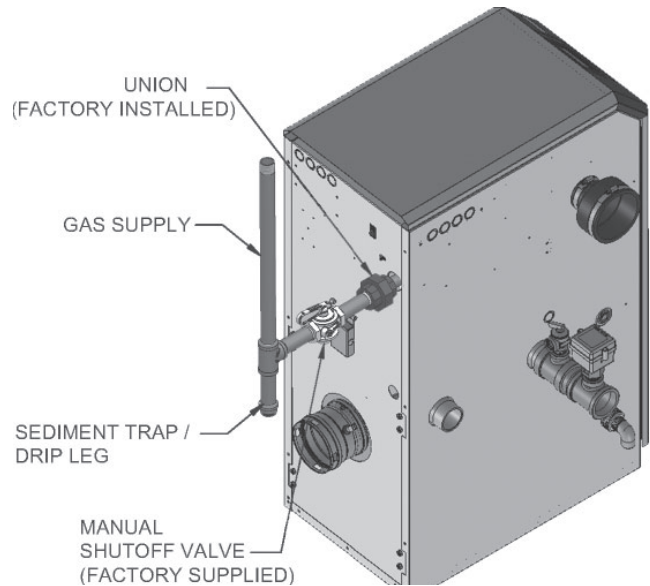


Figure 63. Gas Supply Piping - Models 500

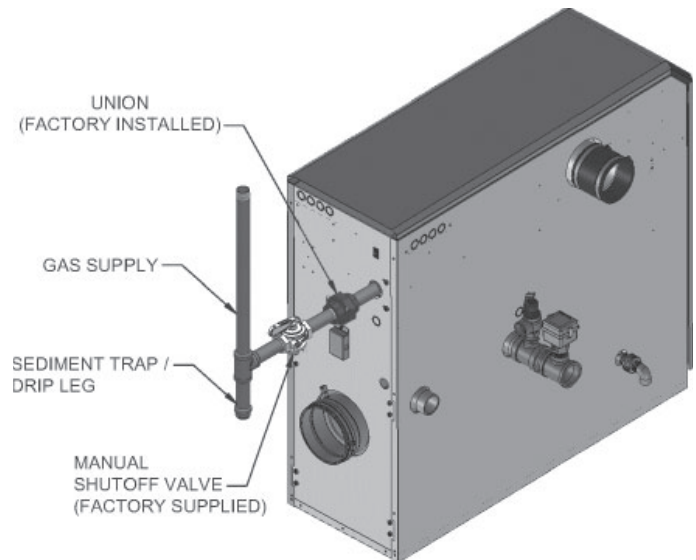


Figure 64. Gas Supply Piping - Models 600 - 800

The gas valve and blower will not support the weight of the piping. Do not attempt to support the weight of the piping with the water heater or its accessories. Failure to comply could result in severe personal injury, death, or substantial property damage.

4. Purge all air from the gas supply piping.
5. Before placing the water heater in operation, check the water heater and its gas connection for leaks.
 - a. The appliance must be disconnected from the gas supply piping system during any pressure testing of that system at a test pressure in excess of 1/2 PSIG (3.5 kPa).
 - b. The appliance must be isolated from the gas supply piping system by closing a manual shutoff valve during any pressure testing of the gas supply piping system at test pressures equal to or less than 1/2 PSIG (3.5 kPa).
 - c. The appliance and its gas connection must be leak tested before placing it in operation.

Do not check for gas leaks with an open flame – use the bubble test. Failure to use the bubble test or check for gas leaks can cause severe personal injury, death, or substantial property damage.

6. Use pipe sealing compound compatible with propane gases. Apply sparingly only to male threads of the pipe joints so that pipe dope does not block gas flow.

Failure to apply pipe sealing compound as detailed in this manual can result in severe personal injury, death, or substantial property damage.

XP water heaters are typically shipped ready to fire on natural gas. Check the water heater rating plate to determine which fuel the water heater is set for. If set to natural gas, it may be converted to Propane (LP) by installing an orifice or by making a gas valve adjustment (see pages 13 thru 15). In order to operate on Propane (LP) gas, an orifice **MUST BE** installed or a gas valve adjustment **MUST BE** made. Failure to comply could result in severe personal injury, death, or substantial property damage.

Use two wrenches when tightening gas piping at water heater (Figure 65), using one wrench to prevent the water heater gas line connection from turning. Failure to support the water heater gas connection pipe to prevent it from turning could damage gas line components.

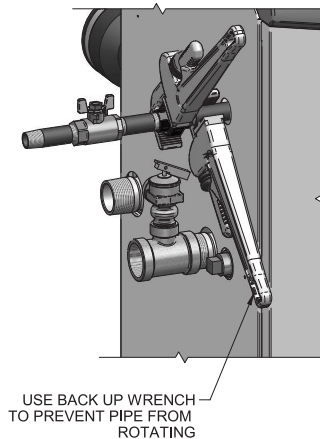


Figure 65. Inlet Pipe with Backup Wrench

NOTE: Maximum inlet gas pressure must not exceed the value specified. Minimum value listed is for the purposes of input adjustment.

NATURAL GAS

PIPE SIZING FOR NATURAL GAS

1. Refer to Table 23 for pipe length and diameter. Based on rated water heater input (divide by 1,000 to obtain cubic feet per hour).
 - a. Table 23 is only for natural gas with specific gravity 0.60 inches, with a pressure drop through the gas piping of 0.30 inches w.c.
 - b. For additional gas pipe sizing information, refer to ANSI Z223.1.

NATURAL GAS SUPPLY PRESSURE REQUIREMENTS

1. Pressure required at the gas valve inlet pressure port:
 - Maximum 14 inches w.c. with no flow (lockup) or with water heater on.
 - Minimum 4 inches w.c. with gas flowing (verify during water heater startup).

2. Install 100% lockup gas pressure regulator in supply line if inlet pressure can exceed 14 inches w.c. at any time. Adjust lockup regulator for 14 inches w.c. maximum.

PROPANE (LP) GAS

XP water heaters are typically shipped ready to fire on natural gas. Check water heater rating plate to determine which fuel the water heater is set for. If set to natural gas, it may be converted to Propane (LP) by installing an orifice or by making a gas valve adjustment (see pages 13 thru 15). In order to operate on Propane (LP) gas, an orifice **MUST BE** installed or a gas valve adjustment **MUST BE** made. Failure to comply could result in severe personal injury, death, or substantial property damage.

PIPE SIZING FOR PROPANE GAS

1. Contact gas supplier to size pipes, tanks, and 100% lockup gas pressure regulator.

PROPANE SUPPLY PRESSURE REQUIREMENTS

1. Adjust propane supply regulator provided by the gas supplier for 14 inches w.c. maximum pressure.
2. Pressure required at gas valve inlet pressure port:
 - Maximum 14 inches w.c. with no flow (lockup) or with water heater on.
 - Minimum 8 inches w.c. with gas flowing (verify during water heater startup).

Ensure that the high gas pressure regulator is at least 6 - 10 feet upstream of the appliance.

Table 23. Natural Gas Pipe Size Chart

CAPACITY OF SCHEDULE 40 METALLIC PIPE IN CUBIC FEET OF NATURAL GAS PER HOUR (BASED ON .60 SPECIFIC GRAVITY, 0.30" W.C. PRESSURE DROP)														
Pipe Size (Inches)	Length of Pipe in Straight Feet													
	10	20	30	40	50	60	70	80	90	100	125	150	175	200
1/2	131	90	72	62	55	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
3/4	273	188	151	129	114	104	95	89	83	79	70	63	58	N/A
1	514	353	284	243	215	195	179	167	157	148	131	119	109	102
1 1/4	1,060	726	583	499	442	400	368	343	322	304	269	244	224	209
1 1/2	1,580	1,090	873	747	662	600	552	514	482	455	403	366	336	313
2	3,050	2,090	1,680	1,440	1,280	1,160	1,060	989	928	877	777	704	648	602
2 1/2	4,860	3,340	2,680	2,290	2,030	1,840	1,690	1,580	1,480	1,400	1,240	1,120	1,030	960
3	8,580	5,900	4,740	4,050	3,590	3,260	3,000	2,790	2,610	2,470	2,190	1,980	1,820	1,700
4	17,500	12,000	9,660	8,270	7,330	6,640	6,110	5,680	5,330	5,040	4,460	4,050	3,720	3,460

XP water heaters are typically shipped ready to fire on natural gas. Check the water heater rating plate to determine which fuel the water heater is set for. If set to natural gas, it may be converted to Propane (LP) by installing an orifice or by making a gas valve adjustment (see pages 15 and 16). In order to operate on Propane (LP) gas, an orifice **MUST BE** installed or a gas valve adjustment **MUST BE** made. Failure to comply could result in severe personal injury, death, or substantial property damage.

CHECK INLET GAS SUPPLY

CSA or UL listed flexible gas connections are acceptable, but you must exercise caution to ensure that the line has adequate capacity to allow your water heater to fire at full rate. Consult with local codes for proper installation or service procedures.

DO NOT adjust or attempt to measure gas valve outlet pressure. The gas valve is factory-set for the correct outlet pressure. This setting is suitable for natural gas and propane, requiring no field adjustment. Attempting to alter or measure the gas valve outlet pressure could result in damage to the valve, causing potential severe personal injury, death, or substantial property damage.

The gas piping must be sized for the proper flow and length of pipe, to avoid excessive pressure drop. Both the gas meter and the gas regulator must be properly sized for the total gas load.

If you experience a pressure drop greater than 1 inch w.c., the meter, regulator, or gas line is undersized or in need of service. Perform the steps below when checking inlet gas supply:

1. Turn the main power switch to the "OFF" position.
2. Shut off gas supply at the manual gas valve in the gas piping to the appliance.
3. On Models 150 - 500 loosen the set screw one (1) full turn from inside the pressure tap on top of the gas valve. On Models 600 - 800 remove the 1/8" (3 mm) pipe plug on the inlet flange to the valve and install a suitable 1/8" (3 mm) fitting (field supplied) for the manometer tubing. Place the tubing of the manometer over the tap once the set screw is loosened or the 1/8" (3 mm) fitting is installed (depending on model) as shown in Figure's 66 thru 69 on Page 45.
4. Slowly turn on the gas supply at the field installed manual gas valve.
5. Turn the power switch to the "ON" position.
6. Adjust the temperature Setpoint on the control panel of the Control Module to call for heat.
7. Observe the gas supply pressure as the burner fires at 100% of rated input. Percent of burner input will be displayed on the control panel.

8. Ensure inlet pressure is within specified range. Minimum and maximum gas supply pressures are specified in this section of the manual.
 9. If gas supply pressure is within normal range and no adjustments are needed, proceed on to Step 11.
 10. If the gas pressure is out of range, contact the gas utility, gas supplier, qualified installer or service agency to determine the necessary steps to provide proper gas pressure to the control.
 11. Turn the power switch to the "OFF" position.
 12. Shut off the gas supply at the manual gas valve in the gas piping to the appliance.
 13. Remove the manometer from the pressure tap on top of the gas valve. On Models 150 - 500 re-tighten the set screw inside the pressure tap. On Models 600 - 800 remove the 1/8" (3 mm) field supplied fitting and reinstall the pipe plug removed in Step 3.
- When re-tightening the set screw, be sure to tighten securely to prevent gas leaks. Do not check for gas leaks with an open flame -- use the bubble test. Failure to use the bubble test or check for gas leaks can cause severe personal injury, death, or substantial property damage.
14. Turn on the gas supply at the manual gas valve.
 15. Turn the power switch to the "ON" position.
 16. Adjust the temperature Setpoint on the control panel of the UIM to the desired water temperature so the appliance will call for heat.
 17. Check burner performance by cycling the system while you observe burner response. The burner should ignite promptly. Flame pattern should be stable. Turn system off and allow burner to cool, then cycle burner again to ensure proper ignition and flame characteristics.



LOOSEN THE SET SCREW ONE (1) FULL TURN AND PLACE THE MANOMETER TUBING OVER THE PRESSURE TAP

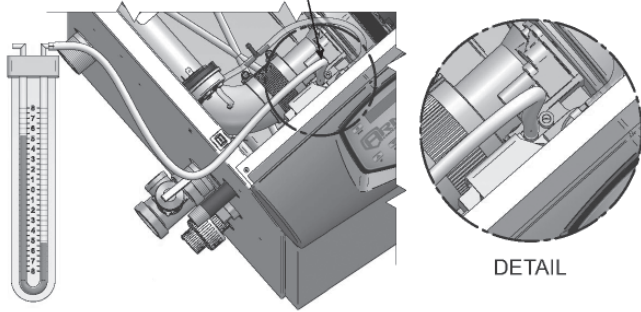


Figure 66. Inlet Gas Supply Check - Models 150 - 285

REMOVE THE 1/8" (3 MM) PIPE PLUG ON THE INLET FLANGE TO THE VALVE AND INSTALL A SUITABLE 1/8" (3 MM) FITTING (FIELD SUPPLIED) FOR THE MANOMETER TUBING.

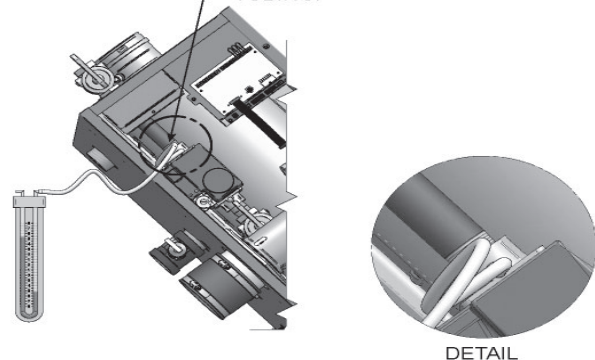


Figure 69. Inlet Gas Supply Check - Models 600 - 800

LOOSEN THE SET SCREW ONE (1) FULL TURN AND PLACE THE MANOMETER TUBING OVER THE PRESSURE TAP

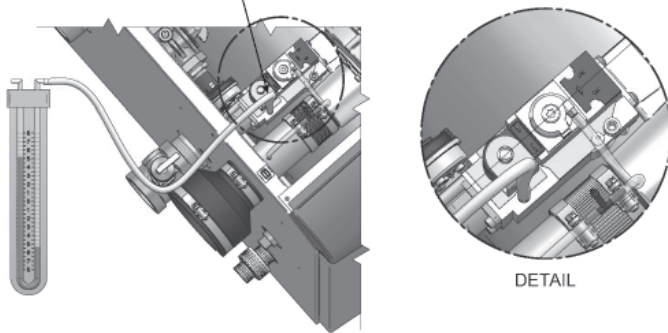


Figure 67. Inlet Gas Supply Check - Model 400

LOOSEN THE SET SCREW ONE (1) FULL TURN AND PLACE THE MANOMETER TUBING OVER THE PRESSURE TAP

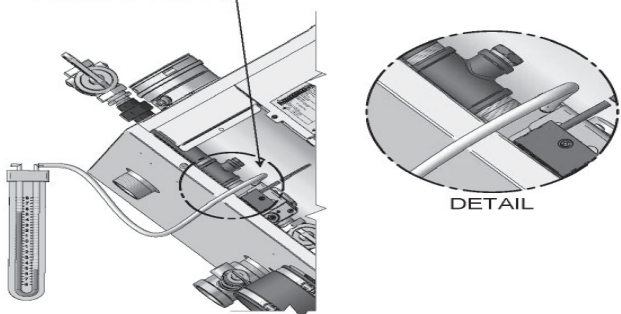


Figure 68. Inlet Gas Supply Check - Model 500

GAS PRESSURE

The gas pressure must remain between 4 inches w.c. (Natural), 8 inches w.c. (Propane (LP)) minimum and 14 inches w.c. (Natural and Propane (LP)) maximum during stand-by (static) mode and while in operating (dynamic) mode. If an in-line regulator is used, it must be a minimum of 10 feet from the XP water heater. It is very important that the gas line is properly purged by the gas supplier or utility company. Failure to properly purge the lines or improper line sizing, will result in ignition failure.

The problem is especially noticeable in NEW Propane (LP) installations and also in empty tank situations. This can also occur when a utility company shuts off service to an area to provide maintenance to their lines.

GAS VALVE REPLACEMENT

The gas valve **MUST NOT** be replaced with a conventional gas valve under any circumstances. As an additional safety feature, this gas valve has a flanged connection to the venturi and blower.

Failure to follow all precautions could result in fire, explosion, or death!

DO NOT adjust gas valve outlet pressure. The gas valve is factory-set for the correct outlet pressure. This setting is suitable for natural gas and propane, requiring no field adjustment. Attempting to alter the gas valve outlet pressure could result in damage to the valve, causing potential severe personal injury, death, or substantial property damage.

FIELD WIRING

ELECTRICAL SHOCK HAZARD – For your safety, turn off electrical power supply before making any electrical connections to avoid possible electric shock hazard. Failure to do so can cause severe personal injury or death.

Wiring must be N.E.C. Class 1.

If original wiring as supplied with the water heater must be replaced, use only type 105°C wire or equivalent.

The water heater must be electrically grounded as required by National Electrical Code ANSI/NFPA 70 – latest edition.

Label all wires prior to disconnection when servicing controls. Wiring errors can cause improper and dangerous operation.

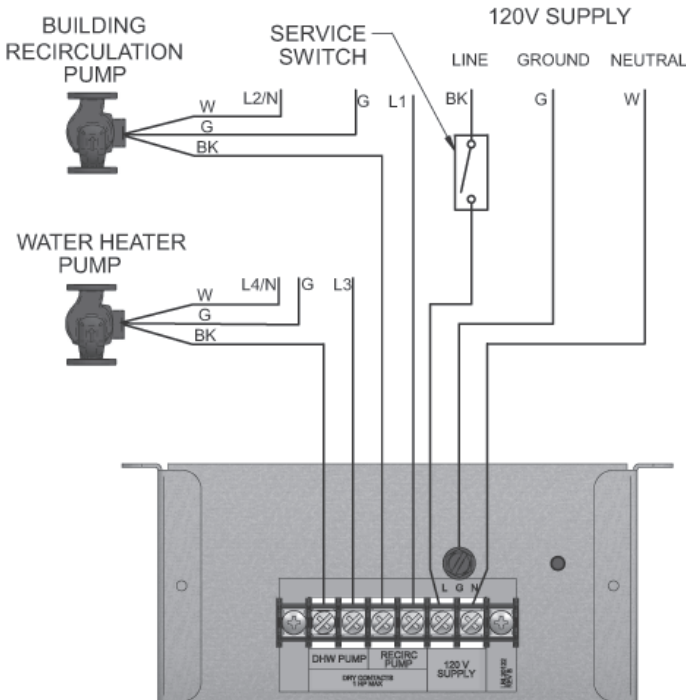


Figure 70. Line Voltage Field Wiring Connections

INSTALLATION MUST COMPLY WITH:

1. National Electrical Code and any other national, state, provincial, or local codes, or regulations.

LINE VOLTAGE CONNECTIONS

1. Connect 120 VAC power wiring to the line voltage terminal strip in the junction box, as shown in Figure 70.
2. Provide and install a fused disconnect or service switch (15 amp recommended) as required by the code (see Figure 70).
3. The DHW (water heater) pump is shipped loose on all XP models. Wire the water heater pump as shown in Figure 70.
4. The XP water heater is capable of controlling a building recirculation pump (field supplied). Wire the building recirculation pump as shown in Figure 70.
5. Dry contacts are sized for 1 hp/120V, 2 hp/240V or 15A/120V, 25A/240V.

LINE VOLTAGE CONNECTIONS

1. Route all low voltage wires through the knockouts in the rear of the water heater, as shown in Figure 71.
2. Connect low voltage wiring to low voltage connection board as shown in Figure 72 on Page 48 of this manual and the water heater wiring diagram.

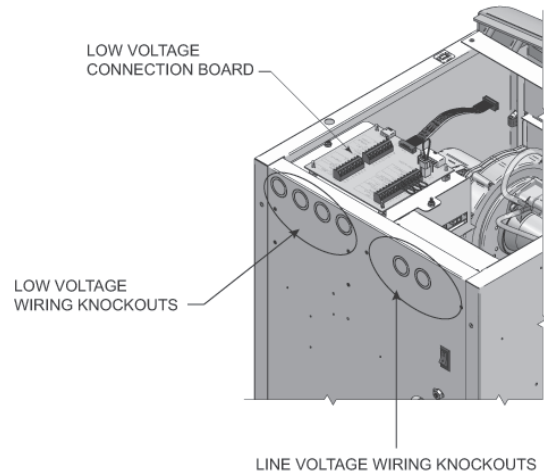


Figure 71. Routing Field Wiring (Models 150 - 285)

TANK THERMOSTAT

1. Connect the tank thermostats (isolated contact only) to the tank thermostat contacts as shown in Figure 72.

TANK SENSOR

NOTE: A tank sensor kit is provided with the unit and is the preferred method of controlling the unit.

1. By installing a tank sensor, the Control Module can perform the tank thermostat function more efficiently with the tank sensor. The Control Module automatically detects the presence of this sensor and generates a DHW call for heat when the tank temperature drops below the programmed differential and finishes the call for heat when the tank temperature reaches above the programmed offset.
2. The tank sensor provided with the kit is the only sensor suitable for use with the Control Module.
3. A 3/4 inch tank brass bulb well is also provided with the kit. The bulb well must be installed so that the shaft of the bulb well is inside the tank. The bulb well must be tightened with a socket to prevent damage. It is also recommended to use a small amount of thermal paste on the tip of the sensor.
4. Once the sensor and remaining components are installed, connect the sensor to the tank sensor contacts as shown in Figure 72.

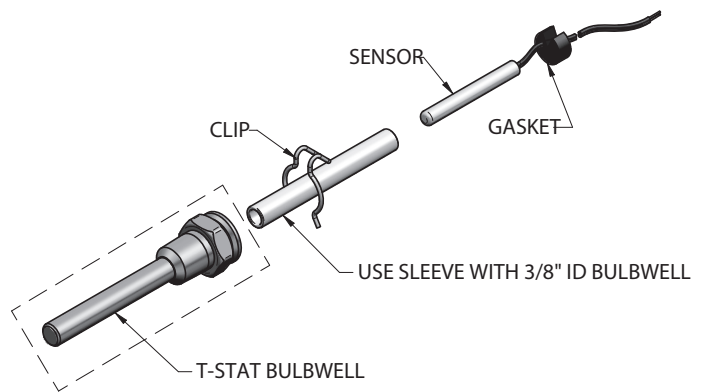


Figure 72. Tank Sensor With Bulbwell

DAMPER RELAY

If dampers need to operate when the water heater fires, they can be controlled by this output. Connect these terminals to a 24 VAC relay coil, which is wired to operate the dampers (Figure 72).

DAMPER PROVING SWITCH

When the operation of the dampers needs to be verified before the water heater fires, remove the jumper wire from these terminals and connect them to the normally open contacts on its proving switch (Figure 72)

HIGH GAS PRESSURE SWITCH

If a switch is provided to detect excessive gas pressure, remove the jumper wire from the terminals on the connection board, and then connect them to its normally closed contacts (Figure 72).

LOW GAS PRESSURE SWITCH

1. If a switch is provided to detect low gas pressure, remove the jumper wire from the terminals on the connection board and connect them to its normally open contacts (Figure 72).
2. If both a high and low gas pressure switch are used, connect their respective contacts in series, and connect them to the terminals on the connection board (Figure 72).

See Gas Connections section on Page 42 for a detailed explanation regarding high and low gas pressure switch operation.

FLOW SWITCH

1. A flow switch is used to guarantee flow through the water heater before allowing it to fire. The flow switch must be installed at the water heater outlet.
2. Connect these terminals to the normally open contacts on the flow switch (Figure 72).

RATE OUTPUT

This output provides a 0 - 10V signal that is proportional to the firing rate of the water heater. This may be used by a BMS system to monitor the actual rate of the water heater.

MODBUS

When the optional ModBus interface module is installed, the RS-485 ModBus cable is connected to these terminals. Use shielded, 2-wire twisted pair cable. If desired, the shield can be connected to ground by installing a jumper wire between terminals 1 and 3 on connector X5 on the optional ModBus interface module.

WATER HEATER BUILDING MANAGEMENT SYSTEM (BMS)

1. An external control may be connected to control either the firing rate or the set point of the water heater. If the external control uses a set of contacts to enable the water heater, connect the contacts to the Tank Thermostat terminals. Otherwise, the Control Module will be enabled by the 0-10V signal.
2. Make sure the (-) terminal is connected to the (-) or common output terminal of the external control, and the (+) terminal is connected to the (+) or 0 - 10 VDC terminal of the external control. Make sure the (-) voltage is not below ground.

RUNTIME CONTACTS

The Control Module closes a set of dry contacts whenever the burner is running. This is typically used by Building Management Systems to verify that the water heater is responding to a call for heat.

ALARM CONTACTS

The Control Module closes another set of contacts whenever the water heater is locked out or the power is turned off. This can be used to turn on an alarm, or signal a Building Management System that the water heater is down.

WIRING OF THE LEAD/LAG

When wiring the water heaters for Lead/Lag operation, select one water heater as the Leader water heater. The remaining water heaters will be designated as Members. See page 58 "Configuration of the Lead/Lag" for a detailed explanation of this procedure.

Connect the tank sensor to the Leader water heater. For the Lead/Lag system to work properly the tank sensor must be installed. The tank sensor should be wired to the low voltage connection board at the terminals marked for the tank sensor (see Figure 72). The Leader control will use the water temperature at the tank sensor to control the operation of the Lead/Lag.

Communication between the Leader water heater and the Member water heaters is accomplished by using shielded, 2-wire twisted pair communication cable. Connect one of the twisted pair wires to Lead/Lag terminal A on each of the Low Voltage Connection boards, and the other wire of the twisted pair to Lead/Lag terminal B on each of the Low Voltage Connection Boards. Connect the shield wires to one of the shield terminals on the Low Voltage Connection Boards (Figure 72). If more than two water heaters are on the Lead/Lag, daisy chain the wiring from the Lead/Lag terminals on the second water heater to the Lead/Lag terminals on the third water heater, then from the third to the fourth, and so on. The connections between heaters can be made in any order, regardless of the addresses of the water heaters. Try to keep each cable as short as possible.

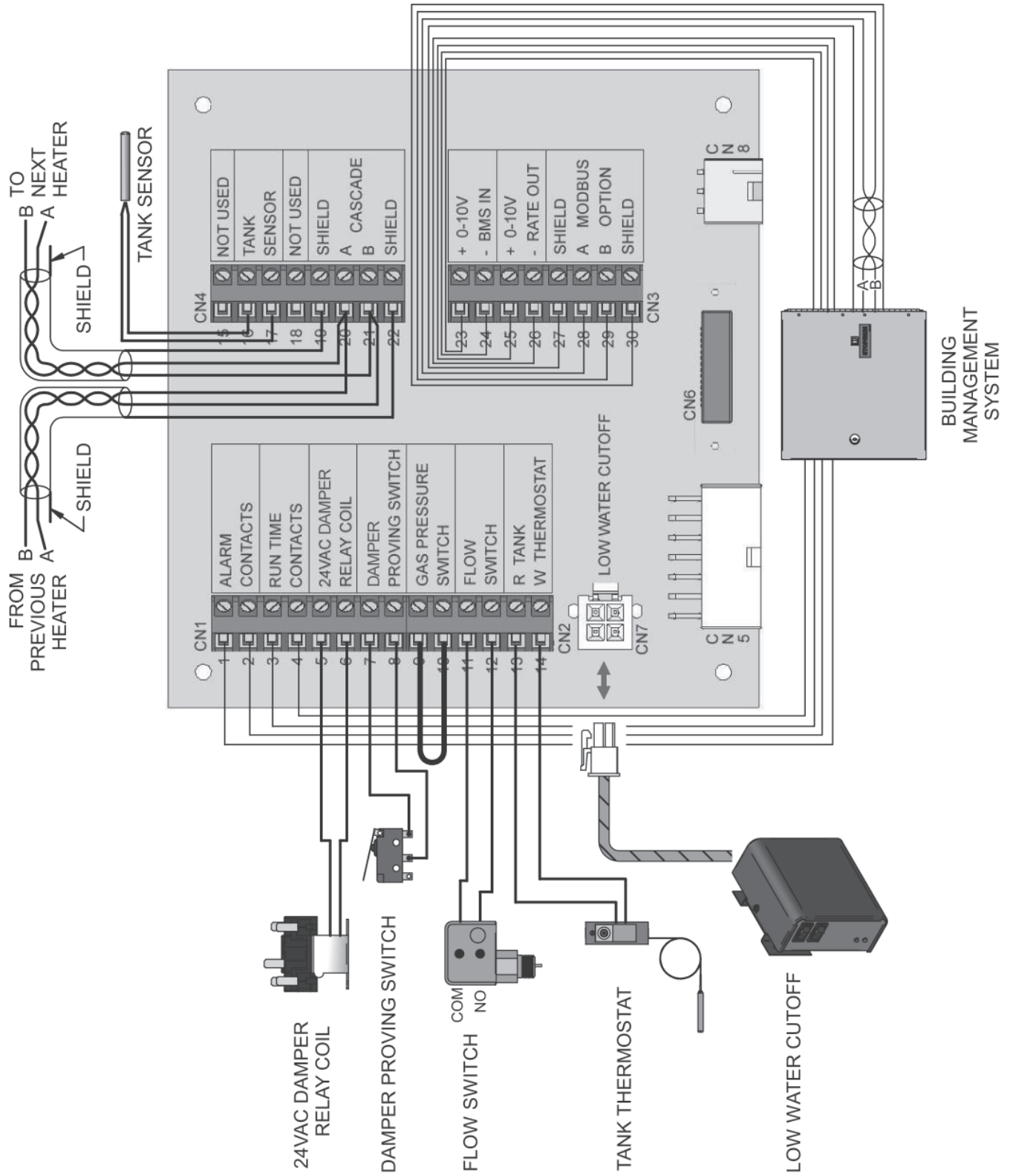


Figure 72. Low Voltage Field Wiring Connections



CONDENSATE DISPOSAL

CONDENSATE DRAIN

1. This water heater is a high efficiency appliance that produces condensate.
2. The side of the water heater has a 1/2 inch PVC union for connection of a 1/2 inch PVC pipe (Figure 73).
3. Slope condensate tubing down and away from the water heater into a drain or condensate neutralizing filter. Condensate from the XP water heater will be slightly acidic (typically with a pH from 3 to 5). Install a neutralizing filter if required by local codes.
A Neutralizer Kit (Figure 73) is available from the factory (100272807 for Models 150 - 500 and 100285867 for Models 600 - 800).
4. Install the 1/2 inch PVC elbow (field supplied) as shown in Figure 73.
5. Do not expose condensate line to freezing temperatures.
6. Use only plastic tubing or piping as a condensate drain line (Figure 73).

NOTE: Use materials approved by the authority having jurisdiction. In the absence of other authority, PVC and CPVC pipe must comply with ASTM D1785 or D2845. Cement and primer must comply with ASME D2564 or F493.

NOTE: To allow for proper drainage on large horizontal runs, a second line vent may be required and tubing size may need to increase to 1 inch.

The condensate line must remain unobstructed, allowing free flow of condensate. If condensate is allowed to freeze in the line or if the line is obstructed in any other manner, condensate can exit from the water heater tee, resulting in potential water damage to property.

NOTE: DO NOT combine condensate drains from multiple condensing appliances.

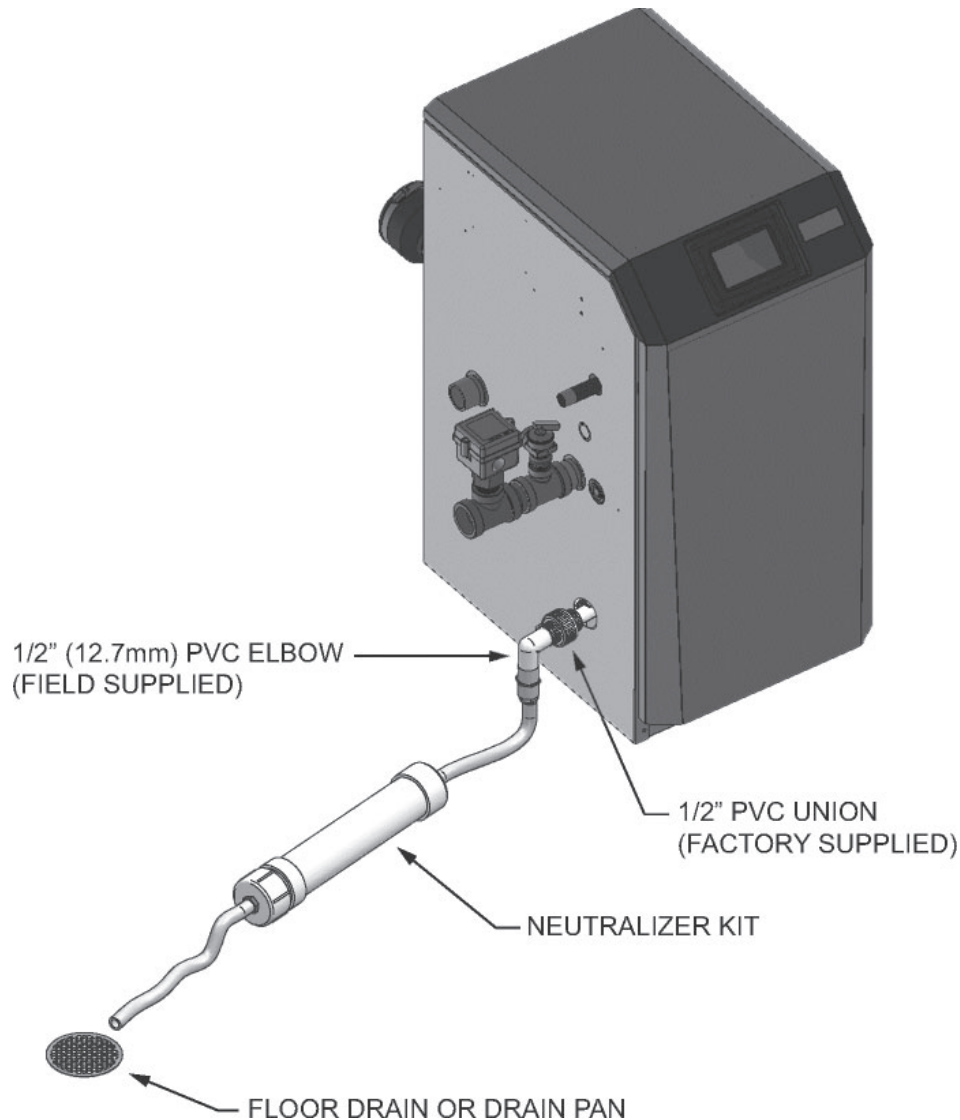


Figure 73. Condensate Disposal

CHECK/CONTROL WATER CHEMISTRY

NOTICE

Conduct water quality testing prior to installing the appliance. Various solutions are available to adjust water quality.

See the following table for properly operating the water heater with the appropriate water chemistry. Good water quality will help extend the life of the appliance by reducing the effects of scale buildup and corrosion.

Table 24. Water Chemistry

WATER CHEMISTRY		
Specification	Range	Requirement
Hardness	< 5 gpg	Water treatment required (See note 3)
	5 to 12 gpg	Use Table 6C for pump recommendation
	12 to 15 gpg	Use Table 6C for pump recommendation
	> 15 gpg	Water softening system required (See note 4)
Dissolved Solids	< 350 ppm	Hardness level must be met
pH Level	6.5 to 8.5	Acceptable range
Chloride	< 150 ppm	Acceptable range

NOTICE

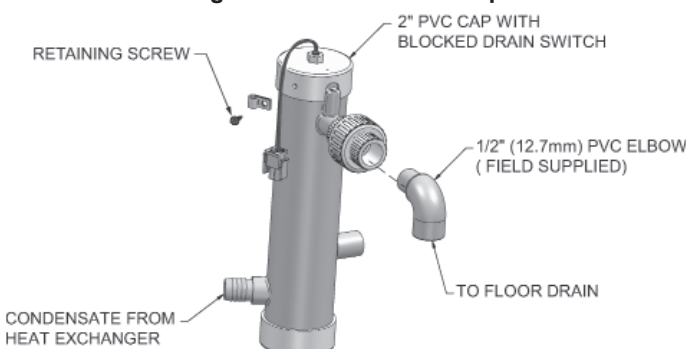
- Do not use the water heater to directly heat swimming pool or spa water.
- At initial fill and during water heater start-up and testing, check system thoroughly for any leaks. Repair all leaks before proceeding further.
- When water treatment is required, contact a commercial potable water treatment specialist for recommendations to protect against system corrosion.
- When water softener is required, a Template Assisted Crystallization system is recommended.

CHECK FOR GAS LEAKS

Before starting the water heater, and during initial operation, smell near the floor and around the water heater for gas odorant or any unusual odor. Remove the top access panel and smell the interior of the water heater enclosure. Do not proceed with startup if there is any indication of a gas leak. Use an approved leak detection solution. Repair any leaks at once.

DO NOT adjust gas valve outlet pressure. The gas valve is factory set for the correct outlet pressure. This setting is suitable for natural gas and propane, requiring no field adjustment. Attempting to alter the gas valve outlet pressure could result in damage to the valve, causing potential severe personal injury, death, or substantial property damage.

Figure 74. Condensate Trap



Propane water heaters only – Your propane supplier mixes an odorant with the propane to make its presence detectable. In some instances, the odorant can fade, and the gas may no longer have an odor. Before startup (and periodically thereafter), have the propane supplier verify the correct odorant level in the gas.

INSPECT/FILL CONDENSATE SYSTEM

Inspect/check condensate lines and fittings

- Inspect the condensate drain line, condensate PVC fittings and condensate trap.

Fill condensate trap with water

- Remove the PVC cap retaining screw from the PVC cap (Figure 74).
- Remove the 2 inch PVC cap with the switch located at the top of the trap (Figure 74).
- Fill with fresh water until the water begins to pour out of the drain.
- Replace the cap. Press the cap onto the trap until the cap makes contact with the drain.
- Replace the retaining screw.

The condensate trap (Figure 74) must be filled with water during all times of water heater operation to avoid flue gas emission from the condensate drain line. Failure to fill the trap could result in severe personal injury or death.

FINAL CHECKS BEFORE STARTING THE WATER HEATER

- Read the XP Water Heater Service Handbook to familiarize with Control Module operation. Read this manual, Pages 52 and 53 for proper steps to start the water heater.
- Verify the water heater and system are full of water and all system components are correctly set for operation.
- Verify the preparation procedures of Pages 50 and 51 have been completed.
- Fill the vent condensate trap with water (removing the retaining screw in order to remove the 2 inch PVC cap with the switch located at the top of the trap). Replace the cap. Press the cap onto the trap until the cap makes contact with the drain. Replace the retaining screw.
- Verify electrical connections are correct and securely attached.
- Inspect vent piping and air piping for signs of deterioration from corrosion, physical damage or sagging. Verify air piping and vent piping are intact and correctly installed per this manual.

START THE WATER HEATER

Read and follow the Operating instructions on Pages 52 and 53.

IF WATER HEATER DOES NOT START CORRECTLY

- Check for loose connections, blown fuse or service switch off?
- Is water heater water temperature above 200°F?
- Is tank thermostat or tank Setpoint set below room temperature?
- Is gas turned on at meter or water heater?
- Is incoming gas pressure less than 4 inches w.c.?

If none of the above corrects the problem, refer to the Troubleshooting section of the XP Water Heater Service Handbook.

CHECK SYSTEM AND WATER HEATER

Check water piping

1. Check system piping for leaks. If found, shut down the water heater and repair immediately. (See WARNINGS on pages 53 and 54 (startup) regarding failure to repair leaks.)
2. Check Delta T. on Page 37 for more information.
3. Vent any remaining air from the system using manual vents. Air in the system will interfere with circulation and cause heat distribution problems and noise.

Check gas piping

1. Check around the water heater for gas odor following the procedure on Page 42 of this manual (Connecting Gas Supply Piping).

If you discover evidence of any gas leak, shut down the water heater at once. Find the leak source with a bubble test and repair immediately. Do not start the water heater again until corrected. Failure to comply could result in severe personal injury, death, or substantial property damage.

Propane water heaters – verify conversion

1. Verify propane conversion has been completed per the Propane Conversion instructions.

DO NOT adjust gas valve outlet pressure. The gas valve is factory-set for the correct outlet pressure. This setting is suitable for natural gas and propane, requiring no field adjustment. Attempting to alter the gas valve outlet pressure could result in damage to the valve, causing potential severe personal injury, death, or substantial property damage.

XP water heaters are typically shipped ready to fire on natural gas. Check water heater rating plate to determine which fuel the water heater is set for. If set to natural gas, it may be converted to Propane (LP) by installing an orifice or by making a gas valve adjustment (see pages 15 and 16). In order to operate on Propane (LP) gas, an orifice **MUST BE** installed or a gas valve adjustment **MUST BE** made. Failure to comply could result in severe personal injury, death, or substantial property damage.

CHECK FLAME AND COMBUSTION

1. Turn the main power off to the water heater by placing the “On/Off” switch in the OFF position.
2. Remove the flue temperature sensor from the flue pipe connection. Note: Combustion measurements will be made at this point.
3. Turn the main power on to the water heater by placing the “On/Off” switch in the ON position.
4. Press the RESET button on the Touch Screen Display. In Service Mode the water heater will fire at ignition speed and will then modulate up to full fire.
5. Insert the probe from a combustion analyzer into the hole left by the removal of the flue temperature sensor.
6. Once the water heater has modulated up to full fire, measure the combustion. The values should be in the range listed in Table 25 below. The CO levels should be less than 150 ppm for a properly installed unit.

If the combustion is not within the specified range, reference the Troubleshooting section of the XP Water Heater Service Handbook for possible causes and corrective actions.

Table 25. Flue Products Chart

NATURAL GAS		PROPANE (LP)	
CO ₂	O ₂	CO ₂	O ₂
8.0% - 10%	3.0% - 6.5%	9.0% - 11%	4.1% - 6.9%

7. Once the combustion analysis is complete, test the safety shutoff device by turning the manual shutoff valve to the OFF position and ensuring that the water heater shuts down and registers an alarm. Open the manual shutoff valve and reset the control, and return to Service Mode.
8. Turn the main power off to the water heater and replace the flue temperature sensor into the flue pipe connection.
9. Place the water heater back into normal operation.

Replace the flue gas temperature sensor to prevent flue gas spillage into the room. Failure to comply could result in severe personal injury, death, or substantial property damage.

SET WATER HEATER OPERATION

Set Operating Setpoint temperature

1. From the Home screen on the Touch Screen Display press the MENU button.
2. Under the MAIN MENU options select TEMPERATURES and then press on 'TANK SETPOINT'.
3. Once the TANK SETPOINT screen appears, adjust the desired MIN and MAX values using the + and – buttons.
4. Once the desired temperature is set, press the ACCEPT button to upload the new temperature.

Verify WHR circulator mode

When the tank thermostat or tank sensor calls for heat, the Control Module will turn on the water heater pump. When the DHW call for heat ends, the water heater pump will continue to run for a period of time. This pump delay is set at the factory to 60 seconds. If a shorter or longer delay is desired, the appropriate parameter in the control must be changed. See the XP Water Heater Service Handbook for a detailed explanation of this procedure.

Set clock

The UIM has a built-in clock that it uses for its Setpoint Adjustment feature and for logging events. This clock must be set when the water heater is installed, and anytime the water heater has been powered off for more than 4 hours. Use the following procedure to set the clock:

1. From the Home screen on the Touch Screen Display press the MENU button.
2. Under the MAIN MENU options select ECONOMY MODE/ CLOCK.
3. Select CURRENT TIME and CURRENT DATE and set the current time and date using the + and – buttons.
4. Press the ACCEPT button to set the current changes.

NOTE: The internal clock does not adjust for Daylight Savings Time and therefore, will require a manual adjustment. The clock is automatically updated whenever a PC is connected and the Win Pro-Installer program is started.

Configuration of the Lead/Lag

When installed in a Lead/Lag system, the individual controls must be programmed for Lead/Lag operation. This is accomplished by accessing the control parameters under Control Modes and Lead/Lag.

Select the parameter “Address” under Lead/Lag. Each appliance in the Lead/Lag system must be programmed with its own address. The water heater designated as the Leader will have an address of 0. The remaining water heaters in the Lead/Lag will be Members and have addresses from 1 - 7. Select the appropriate address and upload the address into the control. Repeat this procedure for all water heaters in the Lead/Lag, designating the Leader control and the Member controls.

NOTE: A tank sensor must be installed when operating XP Water Heaters in Lead/Lag.

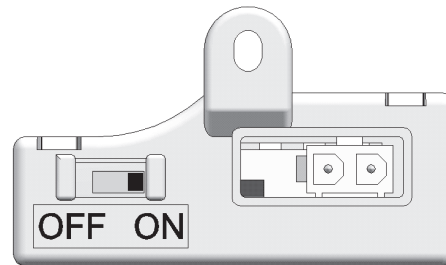
FOR YOUR SAFETY READ BEFORE OPERATING

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. Use only your hand to move the gas control switch. Never use tools. If the switch will not move by hand, don't try to repair it, 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 thermostat to lowest setting.
3. Turn off all electric power to the appliance.
4. This appliance is equipped with an ignition device which automatically lights the burner. Do not try to light the burner by hand.
5. Remove front door.
6. Move switch to the "OFF" position.
7. Wait five (5) minutes to clear out any gas. If you then smell gas, STOP! Follow "B" in the safety information above this label. If you don't smell gas, go to next step.
8. Move the switch to the "ON" position.
9. Install front door.
10. Turn on all electric power to appliance.
11. Set thermostat to desired setting.
12. If the appliance will not operate, follow the instructions "To Turn Off Gas To Appliance" and call your service technician or gas supplier.



TO TURN OFF GAS TO APPLIANCE

1. Set the thermostat to lowest setting.
2. Turn off all electric power to the appliance if service is to be performed.
3. Remove front door.
4. Move the switch to the "OFF" position.
5. Install front door.

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.

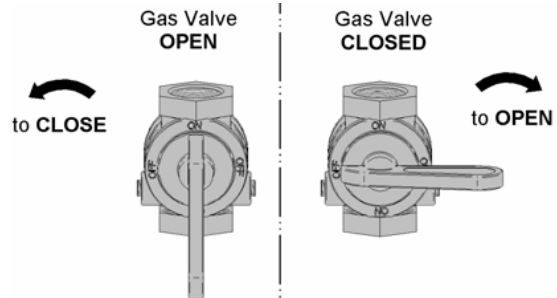
- A. This appliance does not have a pilot. It is equipped with an ignition device which automatically lights the burner. Do not try to light the burner by hand.
- B. BEFORE OPERATING smell all around the appliance area for gas. Be sure to smell next to the floor because some gas is heavier than air and 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. Use only your hand to turn the gas control knob. Never use tools. If the handle will not turn by hand, don't try to repair it, 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 thermostat to lowest setting.
3. Turn off all electric power to the appliance.
4. This appliance is equipped with an ignition device which automatically lights the burner. Do not try to light the burner by hand.
5. Remove top cover.
6. Turn gas shutoff valve counterclockwise to "OFF". Handle will be perpendicular to pipe. Do not force.
7. Wait five (5) minutes to clear out any gas. If you then smell gas, **STOP!** Follow "B" in the safety information above this label. If you don't smell gas, go to next step.
8. Turn gas shutoff valve clockwise to "ON". Handle will be parallel to pipe.
9. Install top cover.
10. Turn on all electric power to appliance.
11. Set thermostat to desired setting.
12. If the appliance will not operate, follow the instructions "To Turn Off Gas To Appliance" and call your service technician or gas supplier.



TO TURN OFF GAS TO APPLIANCE

1. Set the thermostat to lowest setting.
2. Turn off all electric power to the appliance if service is to be performed.
3. Remove top cover.
4. Turn gas shut off valve counterclockwise to "OFF". Handle will be perpendicular to pipe. Do not force
5. Install top cover.

CONTROL SYSTEM OPERATION

GENERAL

HOW THE WATER HEATER OPERATES

The XP water heater uses an advanced stainless steel heat exchanger and electronic control module that allows fully condensing operation. The blower pulls in air and pushes flue products out of the water heater through the heat exchanger and flue piping. The control module regulates blower speed to control the water heater firing rate. The gas valve senses the amount of air flowing into the water heater and allows only the right amount of gas to flow.

CONTROL INPUTS AND OUTPUTS

Tank thermostat / tank sensor

Either of these inputs will tell the water heater to provide heat to the water tank. If a tank sensor is connected, the Control Module will ignore the tank thermostat.

0 - 10VDC input (set point or power)

The XP water heater can be controlled by a Building Management System (BMS) using a 0 - 10 VDC signal. The control can be configured by the installer to use this signal to either control set point or firing rate. This signal can be sent to the heater through ModBus as well.

TEMPERATURE CONTROL

Modulation

The XP water heater is capable of modulating its firing rate from a minimum of 20% to a maximum of 100%. The firing rate is dictated by the hot water draw and various other temperature limitations.

Setpoint Adjustment (Economy Mode/Clock)

The controller may be programmed to reduce the DHW set point during certain times each week. Seven different start and stop times may be programmed for the DHW Setpoint Adjustment.

Flame current support

To prevent nuisance shutdowns when the water heater is firing at minimum rates, the control will increase fan speed when the flame signal drops too low.

PROTECTION FEATURES

Outlet temperature, flue temperature, and temperature rise limiting

The outlet temperature is monitored by the water heater outlet temperature sensor. When the outlet temperature exceeds 185°F, the unit will reduce the fan speed. If the outlet water temperature exceeds 195°F the control will shut the unit down until it cools off.

The control module monitors the flue temperature by a sensor located in the flue exhaust. If the flue temperature exceeds 215°F the control will reduce the maximum fan speed. If the flue temperature exceeds 240°F the control will shut the unit down. The unit will restart automatically once the flue temperature drops 25°F and the minimum off time has expired.

The control monitors the temperature difference between the inlet and the outlet sensor. If the control determines the temperature rise is too high, it will either reduce the firing rate or shut down the unit as appropriate.

The unit will restart automatically once the temperature difference has dropped below the allowable rise and the minimum off time has expired.

Freeze protection

DO NOT install the water heater in a room likely to freeze.

The following integral feature of the Control Module provides some protection for the water heater.

- The Control Module provides freeze-up protection as follows when the water heater water temperature drops below 45°F:
- Below 45°F, the water heater pump operates constantly.
- Below 37°F, the water heater turns on.
- The water heater and pump will turn off if water heater water temperature rises above 45°F.

This feature of the Control Module does not eliminate the possibility of freezing. The installation must still use recognized design, installation and maintenance practice to prevent freeze potential for the water heater.

Monitor external limits

Connections are provided on the connection board for external limits such as flow switch, gas pressure switches, and a damper proving switch. The Control Module will shut off the burner and inhibit relighting whenever any of these external limits open.

Runtime and alarm outputs

The water heater provides dry contacts for indicating when the water heater is running, and when it is unable to operate.

Runtime and cycle counting

The control uses a timer to monitor the total hours of burner operation. The timer monitors the time the water heater is firing.

The control uses two (2) ignition counters to monitor the amount of water heater cycles. The first counter counts all ignitions of the control. The second counter counts only ignition attempts that have failed.

Service

This unit can be programmed to access the Contact Name and Contact Phone parameter for service and maintenance.

WATER HEATER TEMPERATURE REGULATION

Operating temperature (target)

The Control Module senses water temperature and regulates water heater firing and firing rate to achieve a target temperature. The target temperature can be set between 60°F and 190°F.

High limit operations

The XP water heater is equipped with a fixed manual reset high limit and an adjustable manual reset high limit. The automatic reset high limit has a set point of 200°F and the manual reset high limit has a maximum set point of 210°F.

When the outlet temperature exceeds 200°F, the automatic high limit action occurs. The water heater shuts down until the outlet water temperature cools below 190°F, and a 60 second timer has expired. If the outlet temperature continues to increase, the manual reset high limit action will occur at 210°F.

High Limit Test procedure

1. Turn ON the main power to the water heater by placing the ON/OFF switch in the ON position.
2. From the Touch Screen Display, access MENU to reach the Temperatures parameters.
3. Select the Manual Reset High Limit parameter to access the MIN & MAX settings..
4. Using the "-" button, decrease the set point of the MRHL to below the current outlet temperature (or to its minimum setting, whichever is higher).
5. Press the ACCEPT button to upload the new values to the control.
6. If the current outlet temperature is above the new MRHL set point, the MRHL will function causing water heater lockout. If this occurs, skip to Step 9.
7. If the current outlet temperature is below the new MRHL place the water heater into Service Mode. In Service Mode, the water heater will fire at ignition speed and will then modulate up to full fire.
8. Once the outlet temperature rises up to the MRHL set point, the MRHL will function, causing the water heater to shut down and lock out.
9. Repeat Steps 2 and 3.
10. Set the MRHL to the appropriate set point by using the "+" or "-" buttons and then press ACCEPT..
11. Press the RESET button to clear the lockout.
12. If needed, exit Service Mode.

Low water cutoff protection

1. The Control Module uses temperature sensing of both supply and return areas of the heat exchanger. If the flow rate is too low or the outlet temperature too high, the control module modulates and shuts the water heater down. This ensures water heater shutdown in the event of low water or low flow conditions.
2. Some codes and jurisdiction may accept these integral features of the control in lieu of requiring an additional limit control or low water cutoff. Consult local jurisdiction to determine. A low water cutoff is available from the factory (100173646).

LEAD/LAG

When multiple water heaters are installed, they can be wired together in a Lead/Lag sequence. A maximum of eight water heaters can be controlled from a single control. In this application one water heater would be designated as the Leader control and all others would be designated as Member controls. The Leader control can be programmed to use Lead/Lag or Efficiency Optimization control methods.

Once the Leader water heater receives a call for heat from a tank sensor, BMS or Modbus, the control will determine what the set point will be. A fixed temperature set point can be programmed into the control. See page 57 of this manual to program the set point. If the water temperature at the tank is less than the set point - differential, then the control will initiate a call for heat on the Lead/Lag (see the XP Water Heater Service Handbook for an explanation of the differential). The Leader will energize the lead water heater on the Lead/Lag. For a new startup this will be the Leader water heater.

Sequence of the Lead/Lag

To equalize the runtime of all water heaters on the Lead/Lag, the firing sequence will automatically be changed at set intervals. For the first 24 hours after initializing the Lead/Lag, the sequence will be changed every hour. After that the sequence will be changed once every 24 hours. The switching on/off sequence will be as follows:

Table 26. Sequence of the Lead/Lag

TIME	SWITCHING ON SEQUENCE
Start	L-M1-M2-M3-M4-M5-M6-M7
+ 1 hour	M1-M2-M3-M4-M5-M6-M7-L
+ 2 hours	M2-M3-M4-M5-M6-M7-L-M1

If a water heater locks out, it will automatically be given the lowest priority for the rest of that 24 hour period.

Setpoint Adjustment operation with Lead/Lag

Setpoint Adjustment operation of the water heaters within the Lead/Lag is available. Programming of the Setpoint Adjustment will be done through the Leader water heater. Refer to the XP Water Heater Service Handbook for information regarding Setpoint Adjustment.

ACCESS MODES

User

The user can adjust tank target temperatures by touching the MENU and accessing the Temperature Settings parameters on the UIM. The date and time, and the temperature units can also be changed.

Installer

Most parameters are available only to the installer, accessible by entering the installer password, see the XP Water Heater Service Handbook.

SAVING PARAMETERS

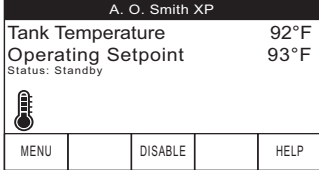
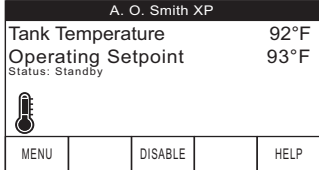
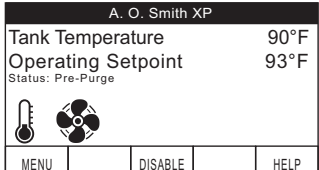
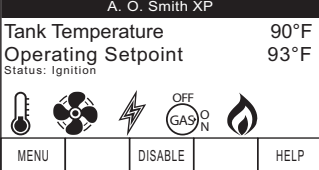
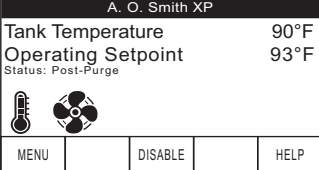
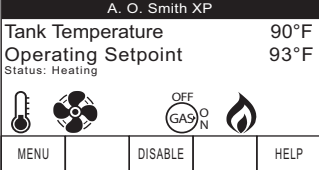
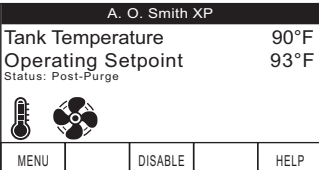
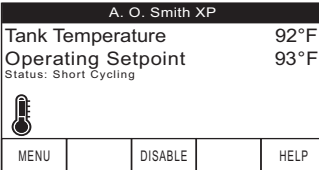
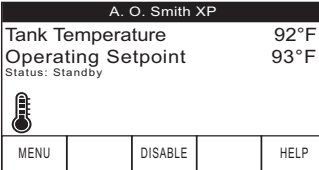
To save parameters and exit programming:

Press ACCEPT on the display after parameter settings.

To enter a parameter and continue programming:

Press ACCEPT after entering the values and return to the parameter listings. Press BACK to return to the MENU listings. See the XP Water Heater Service Handbook for a detailed description of parameters and access modes.

SEQUENCE OF OPERATION

OPERATION	TOUCH SCREEN DISPLAY
1. The control will turn on the water heater pump (always ON except in Setpoint Adjustment). The flow switch and/or LWCO must close.	 <p>A. O. Smith XP Tank Temperature 92°F Operating Setpoint 93°F Status: Standby MENU DISABLE HELP</p>
2. The control turns on power to the damper relay. The damper proving switch, air pressure switch, and blocked drain switch must close.	 <p>A. O. Smith XP Tank Temperature 92°F Operating Setpoint 93°F Status: Standby MENU DISABLE HELP</p>
3. The control starts the prepurge cycle.	 <p>A. O. Smith XP Tank Temperature 90°F Operating Setpoint 93°F Status: Pre-Purge MENU DISABLE HELP</p>
4. The control starts the trial for ignition by energizing the spark electrode and opening the gas valve.	 <p>A. O. Smith XP Tank Temperature 90°F Operating Setpoint 93°F Status: Ignition MENU DISABLE HELP</p>
5. If flame is not detected after the sparking ends, the control will perform a postpurge, then start another prepurge cycle and try to light the burner again. On the 500 and larger models, the control will lock out if this second attempt fails. On the 400 and smaller models, the control will perform a total of 4 attempts before locking out.	 <p>A. O. Smith XP Tank Temperature 90°F Operating Setpoint 93°F Status: Post-Purge MENU DISABLE HELP</p>
6. If flame is detected, it holds the firing rate steady for a few seconds to let the flame stabilize, then it begins to modulate the firing rate based on a set point or some other command (such as a 0-10V BMS signal).	 <p>A. O. Smith XP Tank Temperature 90°F Operating Setpoint 93°F Status: Heating MENU DISABLE HELP</p>
7. Once the call for heat is satisfied, the control will de-energize the gas valve. The blower will continue to run during the postpurge.	 <p>A. O. Smith XP Tank Temperature 90°F Operating Setpoint 93°F Status: Post-Purge MENU DISABLE HELP</p>
8. The water heater pump will continue to run for its respective pump delay time before turning off. A 60 second anti-cycle period will start, which will delay any new call for heat until it times out.	 <p>A. O. Smith XP Tank Temperature 92°F Operating Setpoint 93°F Status: Short Cycling MENU DISABLE HELP</p>
9. In Standby, ready to start a new cycle.	 <p>A. O. Smith XP Tank Temperature 92°F Operating Setpoint 93°F Status: Standby MENU DISABLE HELP</p>

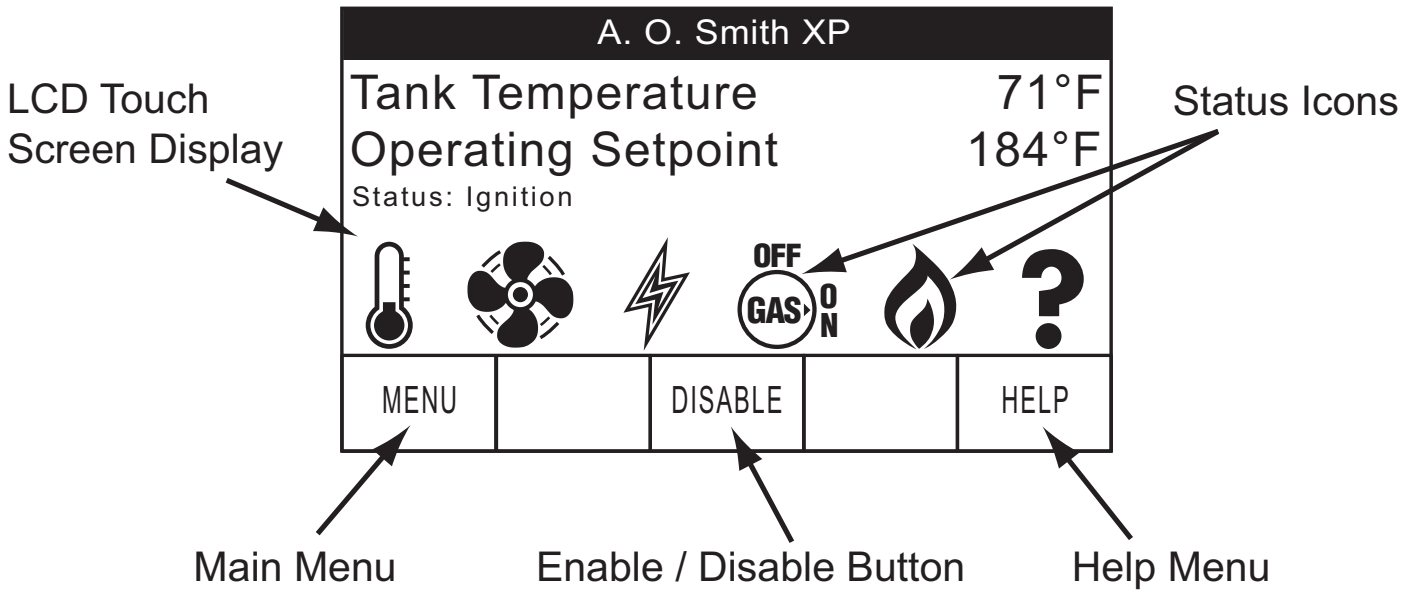











Figure 75. User Interface Module (UIM)/ Touch Screen Display



STATUS ICONS

The Status Icons are displayed on the Desktop screen and convey operational and diagnostic information. The icons are described in the table below. Ensure the water heater is properly grounded. Flame sensing requires an adequate earth ground. If the water heater is not properly grounded it will cause ignition failure.

TABLE 27

Icon	Description
	Water temperature in the tank has fallen. 'Mercury' increases as tank temperature rises. Shaded area of the animated thermometer icon will rise and fall in response to water temperature in the storage tank as sensed from the Upper and Lower Temperature Probes..
	Water temperature in the tank has reached the Operating Setpoint. The control system enters the Standby mode.
	The control system is unable to initiate a heating cycle. When 'shutdown', the display will read 'Status: Water Heating Disabled'. This will happen whenever a Fault condition is detected by the control system or when the Enable/Disable switch on the display is in Disable position or Building Management system Enable/Disable circuit is an open circuit. Display will read "Status: Water Heating Disabled".
	The Combustion Blower is being energized.
	The Spark Igniter is being energized.
	The 24VAC gas valve has been energized.
	The control system has sensed flame at the burner from the flame sensor. See the Sequence of Operation on Page 56.
	The control system has declared a Fault condition. The control system must be inspected/serviced by a Qualified Service Technician. Fault message details can be viewed in the Current Fault menu. Heating operation is disabled (lock out) until the condition that caused the Fault is corrected. Power to the water heater must be cycled off and on at the breaker to reset the control system. NOTE: Cycling power will not reset the control system if the condition that caused the Fault has not been corrected.
	The control system has declared an Alert condition. The control system must be inspected/serviced by a Qualified Service Technician. The water heater will continue to operate during an Alert condition.

OPERATING STATES

The current operational state of the water heater is displayed on the User Interface Module (UIM) screen as the "Status." The common operational states are described in the table below. Ensure the water heater is properly grounded. Flame sensing requires an adequate earth ground. If the water heater is not properly grounded it will cause ignition failure.

TABLE 28

State	Description
Standby	The unit has not received a call for heat from a remote thermostat nor has it received a call for heat from a DHW thermostat.
Input Verification	The unit has begun a burn cycle and is checking all safety circuits.
Pre-Purge	The unit has initiated a pre-purge period on a call for heat.
Inter-purge	The combustion chamber is energized to flush residual flue gas from the combustion chamber after a failed ignition attempt.
Heating	The unit has fired and is running.
Post-purge	The call for heat has been satisfied and the unit runs the blower for an additional post-purge period to clear the combustion chamber and vent system of residual flue products.
Enable/ Disable	The unit is in On/Off position.
Setpoint Met	The controlled temperature has exceeded its set point and its offset.
Fault	The main control board has detected an internal fault.
Alert	The unit has detected a condition that has temporarily interrupted the current call for heat.

CONTROL SYSTEM MENUS

From the UIM screen touching the "Menu" on the display will show the "Main Menu". This is where all control system menus are located. The table below describes the control system menus.

TABLE 29

Menu	Description
Temperatures	Most commonly accessed menu. Contains the Operating Setpoint and Differential user settings.
Heater Status	This menu displays the current state of all pressure switches and the ECO (open/closed). The on/off status of the Combustion Blower, gas valve, Spark Igniter, flame sensor and other monitored water heater components are displayed in this menu.
Display Settings	Temperature units (°F or °C), the LCD appearance (brightness/contrast) and backlight delay user adjustable settings are located in this menu.
Heater Information	Elapsed time of operation, total heating cycle time, heating cycle count, heating on time along with UIM and CCB software revisions can be viewed in this menu.
Current Fault	Displays any current Alert or Fault messages.
Fault History	This control system menu retains a list of the last nine (9) Fault and Alert messages with a time stamp. The newest event will replace the oldest. Faults will clear after 30 days.
Fault Occurrence	This control system menu retains a running total of how many times each Fault condition has occurred since the water heater was first installed. The data does not clear and cannot be reset.
Service	The Service Menu displays service & maintenance parameters such as the last service date, contact information in case of any service procedures and also the gives access to Service Mode operation.
Circulation Pumps	The Circulation Pumps menu contains settings for the DHW Pump Delay, Freeze Protection, and Anti-Seize parameters.
Building Management	The Building Management menu contains parameters for operating the unit with 0 – 10V signal.
Lead/ Lag	The Lead/Lag menu contains parameters used to connect multiple hot water heaters together.
Economy Mode/ Clock	The Economy Mode/Clock menu allows the user to set the time and date on the hot water heater, as well as schedule periods to run at lower temperatures.
Short Cycling	The Short Cycling menu contains parameters that prevent the heater from starting a cycle too quickly after it has finished a previous call for heat.
Restore Factory Defaults	This control system feature allows the user to restore control system user settings to their factory default settings. Display Settings preferences ARE NOT changed when factory defaults are restored.
Help Screens	Text based operational and user information explaining how to change user settings, navigate the control system menus and icon descriptions.

MAINTENANCE

MAINTENANCE SCHEDULES

Table 30. Service and Maintenance Schedules

SERVICE TECHNICIAN (SEE THE FOLLOWING PAGES FOR INSTRUCTIONS)		OWNER MAINTENANCE	
ANNUAL	<p>General:</p> <ul style="list-style-type: none"> • Address reported problems • Inspect interior; clean and vacuum if necessary; • Clean condensate trap and fill with fresh water • Check for leaks (water, gas, flue, condensate) • Verify flue and air lines in good condition and sealed tight • Check system water pressure system piping/expansion tank • Check control settings • Check ignition and flame sense electrodes (clean off any deposits; clean and reposition) • Check wiring and connections • Perform start-up checkout and performance verification per Start Up section of this manual. • Flame inspection (stable, uniform) • Flame signal (at least 10 microamps at high fire) • Clean the heat exchanger if flue temperature is more than 54°F above return water temperature. • Check Delta T (Temperature Rise). Refer to Table 22 on Page 37. <p>If combustion or performance indicate need:</p> <ul style="list-style-type: none"> • Clean heat exchanger • Remove and clean burner using compressed air only • Clean the blower wheel 	DAILY	<ul style="list-style-type: none"> • Check water heater area
	MONTHLY	<ul style="list-style-type: none"> • Check vent piping • Check air piping • Check air and vent termination screens • Check T & P Relief Valve • Check condensate drain system • Check automatic air vents • Check Delta T (Temperature Rise) • Remove debris from Y-strainer per manufacturer's instructions 	
	EVERY 6 MONTHS	<ul style="list-style-type: none"> • Check water heater piping (gas and water) for leaks • Operate T & P Relief Valve • Check water chemistry 	



MAINTENANCE

Follow the service and maintenance procedures given throughout this manual and in component literature shipped with the water heater. Failure to perform the service and maintenance could result in damage to the water heater or system. Failure to follow the directions in this manual and component literature could result in severe personal injury, death, or substantial property damage.

The water heater should be inspected annually only by a qualified service technician. In addition, the maintenance and care of the water heater designated in Table 30 and explained on the following pages must be performed to assure maximum water heater efficiency and reliability. Failure to service and maintain the water heater and system could result in equipment failure.

Electrical shock hazard – Turn off power to the water heater before any service operation on the water heater except as noted otherwise in this instruction manual. Failure to turn off electrical power could result in electrical shock, causing severe personal injury or death.

REVIEW WITH OWNER

1. Emphasize the need to perform the maintenance schedule specified in this manual.
2. Remind the owner of the need to call a qualified service technician should the water heater or system exhibit any unusual behavior.
3. Remind the owner to follow the proper shutdown procedure and to schedule an annual maintenance
4. Inspect any problems reported by the owner and correct before proceeding.

INSPECT WATER HEATER AREA

1. Verify that water heater area is free of any combustible materials, gasoline and other flammable vapors and liquids.
2. Verify that air intake area is free of any of the contaminants listed on Page 14. If any of these are present in the water heater intake air vicinity, they must be removed. If they cannot be removed, reinstall the air and vent lines per this manual and the XP water heater Service Handbook.

INSPECT WATER HEATER INTERIOR

1. Remove the front access cover and inspect the interior of the water heater.
2. Vacuum any sediment from inside the water heater and components. Remove any obstructions.

CLEAN CONDENSATE TRAP

1. Inspect the condensate drain line, condensate PVC fittings, and condensate trap.
2. Remove the PVC cap retaining screw from the PVC cap (Figure 76).
3. Remove the 2 inch PVC cap with the switch located at the top of the trap (Figure 76).
4. Remove any sediment in the trap.
5. Fill with fresh water until the water begins to pour out of the drain.
6. Replace the cap. Press the cap onto the trap until the cap makes contact with the drain.
7. Replace the retaining screw.

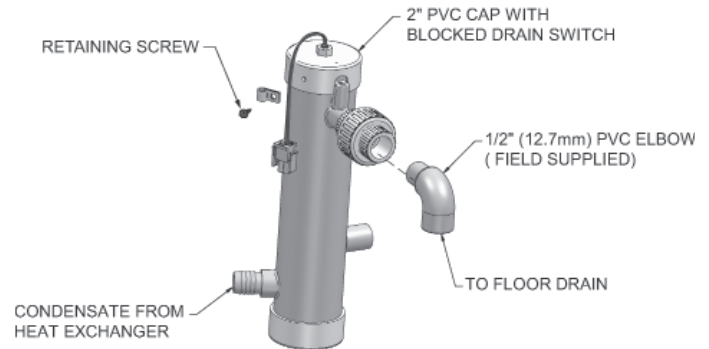


Figure 76. Condensate Trap

The condensate trap must be filled with water during all times of water heater operation to avoid flue gas emission from the condensate drain line. Failure to fill the trap could result in severe personal injury or death.

CHECK ALL PIPING FOR LEAKS

Eliminate all system or water heater leaks. Leaking water may cause severe property damage.

1. Inspect all water and gas piping and verify to be leak free.
2. Look for signs of leaking lines and correct any problems found.
3. Check gas line using the procedure found in Gas Connections section on Page 42.

FLUE VENT SYSTEM AND AIR PIPING

1. Visually inspect the entire flue gas venting system and air piping for blockage, deterioration or leakage. Repair any joints that show signs of leakage. Verify that air inlet pipe is connected and properly sealed.
2. Verify that water heater vent discharge and air intake are clean and free of obstructions.

Failure to inspect for the above conditions and have them repaired can result in severe personal injury or death.

CHECK WATER SYSTEM

1. Verify all system components are correctly installed and operational.
2. Watch the system pressure as the water heater heats up (during testing) to ensure pressure does not rise too high. Excessive pressure rise indicates expansion tank sizing or performance problem.

CHECK EXPANSION TANK

1. Expansion tanks provide space for water to move in and out as the heating system water expands due to temperature increase or contracts as the water cools. Tanks may be open, closed or diaphragm or bladder type. See Water Heater Installation section on Page 36 for suggested best location of expansion tanks and air eliminators.

CHECK WATER HEATER T & P RELIEF VALVE

1. Inspect the T & P Relief Valve and lift the lever to verify flow. Before operating any T & P Relief Valve, ensure that it is piped with its discharge in a safe area to avoid severe scald potential. Read System Piping section on Page 36 before proceeding further.

Safety T & P Relief Valves should be re-inspected AT LEAST ONCE EVERY THREE YEARS, by a licensed plumbing contractor or authorized inspection agency, to ensure that the product has not been affected by corrosive water conditions and to ensure that the valve and discharge line have not been altered or tampered with illegally. Certain naturally occurring conditions may corrode the valve or its components over time, rendering the valve inoperative. Such conditions are not detectable unless the valve and its components are physically removed and inspected. This inspection must only be conducted by a qualified service technician. Failure to re-inspect the water heater T & P Relief Valve as directed could result in unsafe pressure buildup, which can result in severe personal injury, death, or substantial property damage.

Following installation, the valve lever must be operated AT LEAST ONCE A YEAR to ensure that waterways are clear. Certain naturally occurring mineral deposits may adhere to the valve, rendering it inoperative. When manually operating the lever, water will discharge and precautions must be taken to avoid contact with hot water and to avoid water damage. Before operating lever, check to see that a discharge line is connected to this valve directing the flow of hot water from the valve to a proper place of disposal. Otherwise severe personal injury may result. If no water flows, valve is inoperative. Shut down the water heater until a new T & P Relief Valve has been installed.

2. After following the above warning directions, if the T & P Relief Valve weeps or will not seat properly, replace the T & P Relief Valve. Ensure that the reason for T & P Relief Valve weeping is the valve and not over-pressurization of the system due to the lack of a thermal expansion tank waterlogging or undersizing.

INSPECT IGNITION AND FLAME SENSE ELECTRODES

1. Remove the ignition and flame sense electrodes from the water heater heat exchanger access cover.
2. Remove any deposits accumulated on the ignition/flame sense electrode. If the electrodes cannot be cleaned satisfactorily, replace with new ones.
3. Replace ignition/flame sense electrode, making sure gasket is in good condition and correctly positioned.

CHECK IGNITION GROUND WIRING

1. Inspect water heater ground wire from the heat exchanger access cover to ground terminal strip.
2. Verify all wiring is in good condition and securely attached.
3. Check ground continuity of wiring using continuity meter.
4. Replace ground wires if ground continuity is not satisfactory.

CHECK ALL WATER HEATER WIRING

1. Inspect all water heater wiring, making sure wires are in good condition and securely attached.

CHECK CONTROL SETTINGS

1. Use the UIM control display to access MENU and check all parameter settings. Adjust settings if necessary. Refer to the XP Water Heater Service Handbook for adjustment procedures.
2. Check settings of external limit controls (if any) and adjust if necessary.

PERFORM START-UP AND CHECKS

1. Start water heater and perform checks and tests specified in Start Up section of this manual.

CHECK BURNER FLAME

1. Inspect flame through observation window.
2. If the flame is unsatisfactory at either high fire or low fire, turn off water heater and allow water heater to cool down. Remove the burner (see Figure 77 below) and clean it thoroughly using a vacuum cleaner or compressed air. Do not use compressed air to clean burner if performed inside a building.
3. When replacing the burner, ensure gasket is in good condition and positioned correctly (Figure 77).

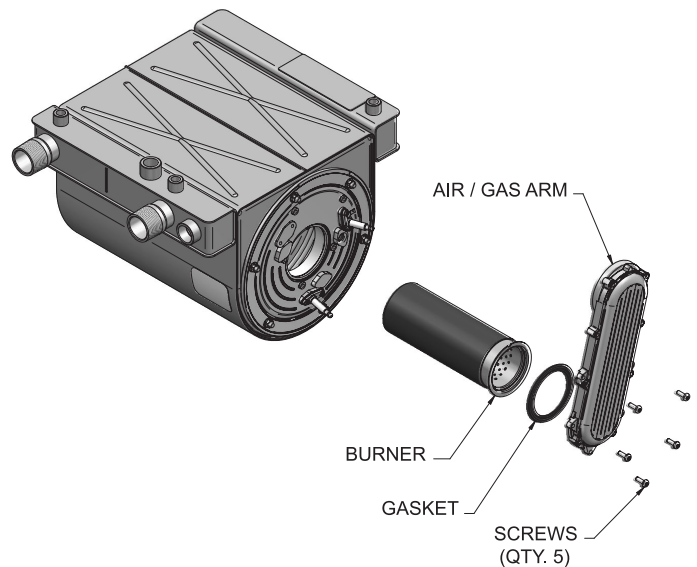


Figure 77. Burner Assembly

CHECK FLAME SIGNAL

1. At high fire the flame signal shown on the display should be at least 10 microamps.
2. A lower flame signal may indicate a fouled or damaged flame sense electrode. If cleaning the flame sense electrode does not improve, ground wiring is in good condition, and ground continuity is satisfactory, replace the flame sense electrode.
3. See Troubleshooting section in the XP Water Heater Service Handbook for other procedures to deal with low flame signal..

CLEANING HEAT EXCHANGER

For recommended materials; including brush, appropriate extension(s), refractory cover, and detailed instructions see Table 31 - Heat Exchanger Cleaning Kits.

- Shut down water heater:
 - Follow the "To Turn Off Gas to Appliance" instructions for the water heater in Start Up section.
 - Do not drain the water heater unless it will be exposed to freezing temperatures. If using freeze prevention fluid in system, do not drain.
- Allow time for the water heater to cool to room temperature if it has been firing.
- Remove the nuts securing the heat exchanger access cover to the heat exchanger and set aside.
- Remove the heat exchanger access cover, burner, and gas/air arm assembly.

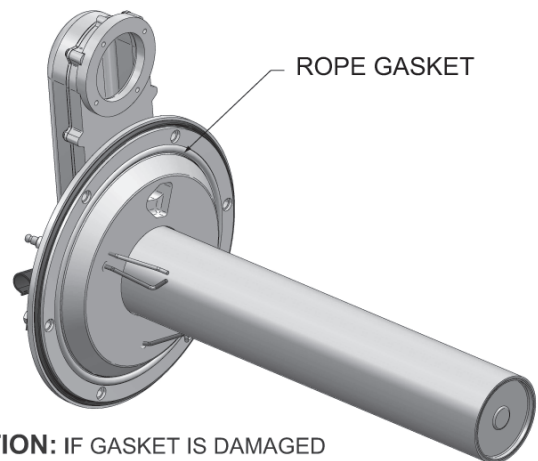
The water heater contains ceramic fiber materials. Use care when handling these materials per instructions in the Service Handbook. Failure to comply could result in severe personal injury.

- Remove the condensate hose from the heat exchanger end. Connect a field supplied 3/4" diameter hose to a drain pan. Using field supplied means, cover the refractory in the back of the combustion chamber of the heat exchanger.
- Use a vacuum cleaner to remove any accumulation on the water heater heating surfaces. Do not use any solvent.
- Brush the heat exchanger while dry using a nylon bristle brush. Caution: DO NOT use a metal brush. Re-vacuum the heat exchanger after cleaning.
- Finish cleaning using a clean cloth dampened with warm water. Rinse out debris with a low pressure water supply.
- Allow the heat exchanger to thoroughly dry.
- Remove the field supplied rear refractory cover from the back of the combustion chamber of the heat exchanger and reassemble.
- Close isolation valves on piping to isolate water heater from system. Attach a hose to the water heater drain and flush water heater thoroughly with clean water by using purging valves to allow water to flow through the water make-up line to the water heater.
- Perform start-up and check-out procedures in the Check Flame and Combustion - on Pages 50 and 51 of this manual.
- Replace the access cover and restore water heater to operation.

. Heat Exchanger Cleaning Kits

MODEL	KIT NUMBER	PART NUMBER	COMPONENT DESCRIPTION
150 - 400	100274672	100140243	Rear Refractory Cover
		100162565*	Nylon 4" Wheel Brush*
		100162566	3mm Allen Wrench
		100162568	1/4" x 24" Drill Extension
500 - 800	100274673	100140243	Rear Refractory Cover
		100162565*	Nylon 4" Wheel Brush*
		100162567	1/4" x 12" Drill Extension
		100162568	1/4" x 24" Drill Extension

NOTE: * Do NOT use a metal brush. Only use the kit provided brush or an equivalent replacement nylon brush.



CAUTION: IF GASKET IS DAMAGED DO NOT REUSE, THE HEAT EXCHANGER DOOR MUST BE REPLACED.

Figure 78. Rope Gasket - Heat Exchanger Door

NOTE: Rope gasket is intended for sealing combustion (see Figure 78). If gasket is damaged DO NOT reuse, the heat exchanger door must be replaced. Consult factory for replacement heat exchanger door (Kit 100274674 and 100274675).

CHECK DELTA T

- Check Table 22 on Page 37 for Delta T reference.

OILED BEARING CIRCULATORS

- The circulator shipped with the XP water heater is water-lubricated. No oiling is required.
- Check other circulators in the system. Oil any circulators requiring oil, following circulator manufacturer's instructions. Over-oiling will damage the circulator.

WIRING DIAGRAMS

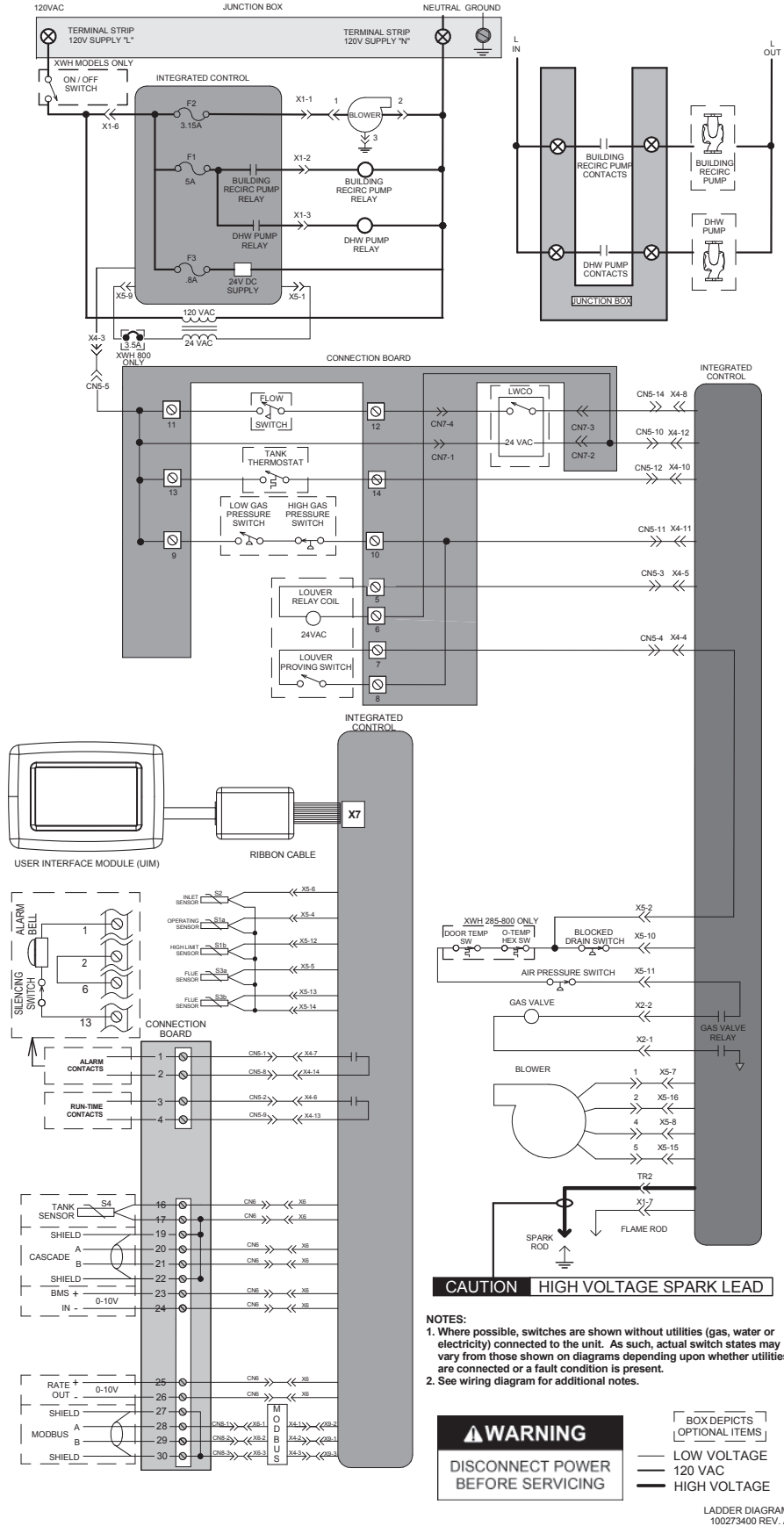
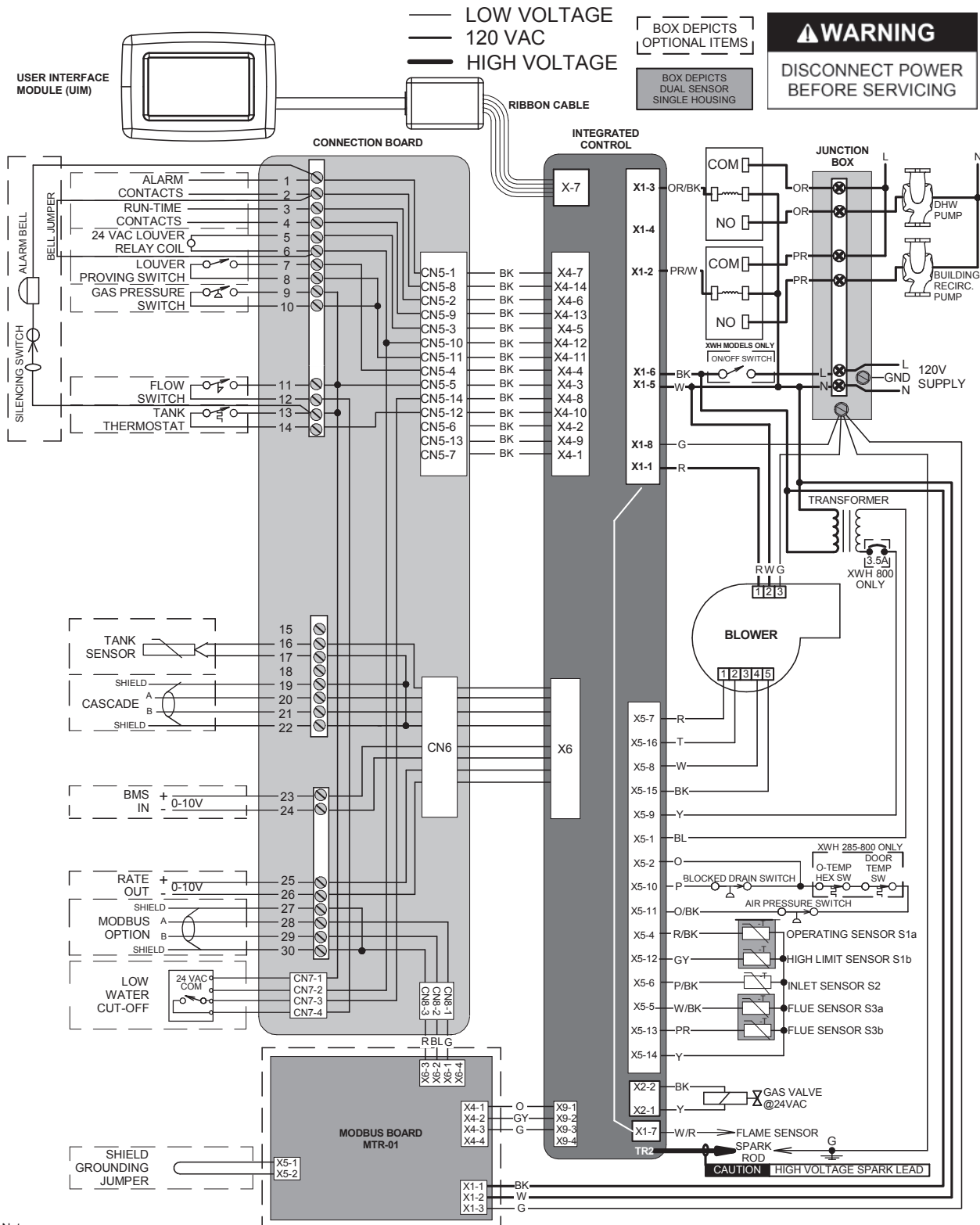


Figure 79. Ladder Diagram





Notes:
 1. All wiring must be installed in accordance with: local, state, provincial and national code requirements per either N.E.C. in USA or C.S.A. in Canada.
 2. If any original equipment wire as supplied with the appliance must be replaced, it must be replaced with wire having same wire gauge (AWG) and rated for a minimum of 105°C. Exceptions: Replacement high voltage spark lead and ribbon cables must be purchased from the factory. Use of a non-approved spark lead or ribbon cables can lead to operational problems which could result in non-repairable damage to the integrated controller or other components.
 3. Actual connector block locations may vary from those shown on diagrams. Refer to actual components for proper connector block locations when using diagrams to troubleshoot unit.

WIRING DIAGRAM
 100273395 REV. A

Figure 80. Wiring Diagram



NOTES

NOTES

LIMITED WARRANTY

COMMERCIAL CIRCULATING WATER HEATER LIMITED WARRANTY



EFFECTIVE

If within FIVE years after initial installation of the water heater, a heat exchanger or gas burner shall prove upon examination by the warrantor to be defective in material or workmanship, the warrantor, at his option will exchange or repair such part or portion.

For 1 Year, in the event of part failure, we will repair or, at our discretion, replace the defective part.

We warrant this product against defects in materials or workmanship as described in this document if installed within the United States and provided the product remains at its original place of installation.

Warranty coverage begins the date of installation OR the date of manufacture if installation cannot be verified.

WHAT'S COVERED

Subject to these terms, in the event of defect in materials and/or workmanship resulting in a **heat exchanger leak** during the **first five years**, we will:

- Replace or repair the heat exchanger.

Subject to these terms, in the event of a defect in materials and/or workmanship appearing during the **first year**, we will:

- Repair or, at our discretion, replace any part of the water heater covered under this limited warranty excluding parts subject to normal maintenance (Example: non-electronic anode rod, filter, etc)

Service / labor, shipping, delivery, installation, handling or any other costs are not covered at any time under this warranty.

Any replacement part or product will be warranted only for the unexpired portion of the original water heater's limited warranty period.

WHAT'S NOT COVERED

- Problems caused by improper: gas supply line sizing, gas type, venting, connections, combustion air, voltage, wiring, or fusing
- Failure to follow applicable codes
- Failure to follow printed instructions
- Abuse, misuse, accident, fire, flood, Acts of God
- Improper installation, sizing, delivery, or maintenance
- Claims related to rust, noise, smell, or taste of water
- Failure to conduct authorized factory start up if required
- Alterations to the water heater
- Non-outdoor heaters installed outdoors
- Damages due to a failure to allow for thermal expansion
- Heat exchanger failure due to lack of adequate / proper supply of water
- Heaters moved from their original location
- Service trips to explain proper installation, use, or maintenance of the product/unit or to describe compliance requirements under applicable codes and regulations
- Charges related to accessing your heater including but not limited to door/wall removal, equipment rental, etc.
- Replacement parts after expiration of this warranty

LIMITATIONS

NOTWITHSTANDING ANYTHING ELSE TO THE CONTRARY, THIS IS YOUR SOLE AND EXCLUSIVE WARRANTY. ALL OTHER WARRANTIES INCLUDING A WARRANTY OF MERCHANTABILITY OR FITNESS FOR PARTICULAR PURPOSE ARE EXPRESSLY DISCLAIMED. SELLER SHALL NOT BE LIABLE FOR ANY CONSEQUENTIAL, INCIDENTAL, SPECIAL, PUNITIVE OR OTHER INDIRECT DAMAGES. TOTAL LIABILITY ARISING AT ANY TIME SHALL NOT EXCEED THE PURCHASE PRICE PAID WHETHER BASED ON CONTRACT, TORT, STRICT LIABILITY OR ANY OTHER LEGAL THEORY.

SERVICE INQUIRIES:

For service inquiries call the telephone number listed below. Be prepared to provide the following information: name, address, and telephone number; the model and serial number of the water heater; proof of installation; and a clear description of the problem.

For your records, fill in the product:

Serial: _____

Model: _____

A. O. Smith Corporation
500 Tennessee Waltz Parkway
Ashland City, Tennessee 37015
800-527-1953
www.hotwater.com





500 Tennessee Waltz Parkway, Ashland City, TN 37015
Technical Support: 800-527-1953 • Parts: 800-433-2545
www.hotwater.com

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