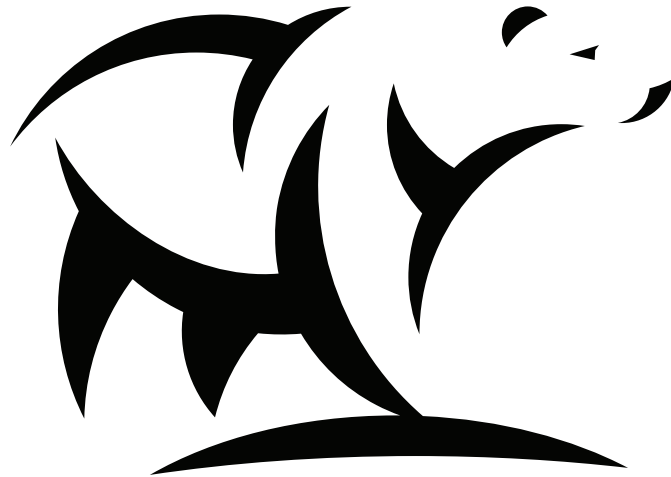


Please read this manual carefully before installation and keep it for future reference.

Installation Manual



MRCOOL®

COMFORT MADE SIMPLE

Tankless Water Heater

Model - MHWH199NC*U

Due to updates and constantly improving performance, the information and instructions within this manual are subject to change without notice. Please visit www.mrcool.com/documentation to ensure you have the latest version of this manual.

Version Date: 9-02-22

Thank you for choosing MRCOOL®. Please read this manual carefully before installation and keep it for future reference.

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NOTE ON WARRANTY VALIDITY PERIOD:

This water heater is for domestic use only. Residential heating refers to sanitary water heating of a single family house. The residence must meet the following classifications:

- a.) Owned and resided in.
- b.) A residential rental property providing services.
- c.) Warranty only applies to original buyers of the product and is non-transferrable.

The product warranty duration is 15 years for the heat exchanger, 5 year parts warranty, and a 5 year limited labor warranty .

Read Before Installation!

Incorrect installation may cause serious damage or injury!

The seriousness of potential damage or injuries is classified as either a **WARNING** or **CAUTION**.



This symbol indicates ignoring instructions may cause death or serious injury.



This symbol indicates that ignoring instructions may cause moderate personal injury, damage to the unit, or other property.



This symbol indicates that you should **NEVER** perform the indicated action.

WARNING

INSTALLATION & SERVICE MUST BE PERFORMED BY A QUALIFIED INSTALLER, SERVICE AGENCY, OR GAS SUPPLIER!

Please read the manual in its entirety before installing, operating, or repairing.

NOTE: The installation must conform to local codes or, in the absence of local codes, the National Fuel Gas Code, ANSI Z223.1/NFPA 54 and/or CSA B149.1, Natural Gas & Propane Installation Code.

California Proposition 65 Warning:

The products referred to in this manual contain chemicals which are known to the State of California to cause cancer, birth defects, or other reproductive harm.

BEFORE OPERATING, smell all around the area near the appliance for the scent of gas. Be sure to smell next to the floor as some gas is heavier than air and will settle there.

- ⊘ ***DO NOT*** try to light the burner by hand. This appliance does **NOT** have a pilot light. It is equipped with an ignition device which automatically lights the burner.
- ⊘ ***DO NOT*** store or use gasoline or other flammable substances (vapors or liquids) in the vicinity of this water heater or any other appliance. This could create a hazard that may result in personal injury, fire, and/or an explosion.
- ⊘ ***DO NOT*** place newspapers or laundry near the water heater or venting system (including vent termination outlet), as these could create a fire hazard, which could result in personal injury and property damage.
- ⊘ ***DO NOT*** use or store aerosol products (such as hair sprays, spray paints etc.) or any other compressed gases near the water heater or venting system (including the vent termination outlet), as this could result in personal injury, fire, and/or an explosion.
- ⊘ ***DO NOT*** use this appliance if any part has been submerged in water. Immediately call a qualified service technician to inspect the appliance and to replace any parts which have been under water.
- ⊘ ***DO NOT*** use tools to push in or turn the gas control knob. Use only your hand to perform this action. In the event the knob will not push in or turn, **DO NOT** attempt to repair it. Using too much force or attempting to repair the gas control knob could result in personal injury, fire, and/or an explosion. Call a qualified service technician to perform any repairs.
- Have your installer or plumber show the location of the gas shut-off valve and demonstrate how to properly use it.

Safety Precautions

WARNING

OPERATION:

- ⊘ ***DO NOT*** operate the water heater with the front cover open. Doing this could cause a fire or carbon monoxide (CO) poisoning, which could result in property damage, personal injury, death, and/or an explosion.
- ⊘ ***DO NOT*** operate water heater without a proper venting system. Operating the unit without a vent could cause fire and/or carbon monoxide poisoning, which could result in property damage, personal injury, or death. Inspect the vent termination and air intake supply annually to ensure proper operation of the water heater. If any of the vent pipes, vent elbows, or intake pipes are damaged in any way (separated at a joint or show signs corrosion, rusting, or melting), turn off the water heater and discontinue use.
- ⊘ ***DO NOT*** touch the power cord or internal components of the water heater with wet hands. Doing so could result in electric shock and personal injury.
 - If the water is damaged for any reason shut off the gas supply.
 - If the water heater is damaged as a result of overheating, fire, flood, or any other reason, close the manual shut-off valve and **DO NOT** operate the unit again until it has been repaired and inspected by a qualified technician.

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 within the building where you smell gas.
 - **EXIT** the building **IMMEDIATELY** and **CALL** your **GAS SUPPLIER**. Follow the gas supplier's instructions. If you **CANNOT** reach the gas supplier, **CALL** the **FIRE DEPARTMENT**.

TO PREVENT BURNS:

- ⊘ ***DO NOT*** change or adjust the temperature setting of the water heater before reading all of the instructions in this manual carefully.
 - Use the lowest operating temperature setting to provide comfortably-hot water.
 - If your household has children, elderly, or disabled residents, consider using a lower temperature setting.
 - Feel the temperature of the hot water before allowing children, the elderly, or disabled to be exposed to it.

IMPORTANT: This water heater is set to a default temperature setting of 117°F (47°C) by the factory for your safety and comfort. Increasing the temperature above this increases the risk of accidental scalding. Water temperatures at or above 125°F (52°C) can cause instant scalding, severe burns, or death. If it is necessary to set the temperature of the water heater 125°F (52°C), have a temperature-limiting valve or mixing valve installed on the water heater. Before changing the temperature setting, read & review the chart below carefully.

Water Temperature	Time in which a child can suffer a 3rd degree burn.
160°F (70°C)	Less than 1 second
140°F (60°C)	1 second
130°F (55°C)	10 seconds
120°F (49°C)	10 minutes
100°F (37°C)	Very low scalding risk

Safety Precautions



WARNING

FREEZE PROTECTION:

The water heater is equipped with an antifreeze protection function that activates based on internal water temperature. If the system detects the water temperature is 41°F (5°C) or below, it will activate a ceramic heater to ensure the water meets the target temperature and maintain the preset temperature level. **NOTE:** If a power failure occurs during cold weather, the antifreeze protection system of the water heater will not operate and may allow freezing within the heat exchanger and waterway to occur. Please note the following information and guidelines regarding the antifreeze protection function:

- If the water heater is not going to be used in cold weather, please drain the water within the waterway.
- The freeze protection function will only operate when the temperature of the water circuit inside the water heater is 41°F (5°C) or lower. However, it cannot be guaranteed that it will provide protection to water pipes connected at a long distance that could be damaged by freezing.
- The antifreeze protection of the water heater only applies to waterways. Damage of electrical components caused by a low ambient temperature is not covered by the warranty.
- In the event the water heater is not operating, be sure to drain any condensate water completely. If this is not done, when the ambient temperature drops below 32°F (0°C), the condensate will freeze and could cause damage to the internal condensation system of the water heater.

ALTITUDE ADJUSTMENT:

The parameter setting of the water heater may need to be adjusted depending on the altitude of the location it is being installed. Please refer to the table below for the proper setting based on altitude. This adjustment can be made through the water heater control panel. Instructions on how to perform this adjustment can be found in the operating instructions section of this manual. However, this adjustment should only be performed by a qualified technician. If this adjustment is not made, or performed incorrectly, it could cause improper operation of the unit. Improper operation could cause gas leakage, fire, and/or an explosion that can put you at risk of personal injury or death.

Units: feet (meters)

Program data	Altitude setting	
Altitude	2000 ft - 6500 ft (609.6 m - 1981.2 m)	6500 ft - 9800 ft (1981.2 m - 2987.0 m)
L2	05	06

Safety Precautions


! CAUTION

For service or repair, contact an authorized technician or licensed professional. Improper installation, adjustment, alteration, service, or maintenance can cause unit failure or damage, property damage, personal injury, or death, and will void the manufacturer's warranty. If you need assistance or further information, please consult the manufacturer or a qualified professional.

- ⊘ **DO NOT** attempt to repair or replace any part of the water heater, unless it is specifically recommended in this manual.
- ⊘ **DO NOT** operate the water heater if it shows any signs of damage or any part of it has been submerged in water. Doing so could result in personal injury, product failure, and/or property damage. If any part of the unit has been damaged or has been submerged in water, immediately contact a qualified service technician to inspect the unit and replace any parts that are damaged or have been under water.
- ⊘ **DO NOT** allow children to operate or access the water heater. Doing so could result in personal injury, product failure, and/or property damage.
- ⊘ **DO NOT** attempt to adjust or change the temperature setting while the water heater is in use, as this could result in personal injury.
- ⊘ **DO NOT** turn on the water heater unless the water and gas supplies are properly connected and fully opened. Operating the unit without the water and gas connected and flowing could cause damage to the water heater.
- ⊘ **DO NOT** turn on the water heater if the cold water supply shut-off valve is closed, as this could cause damage to the unit.
- ⊘ **DO NOT** use this water heater for anything other than its intended purpose, as described within this manual.
- ⊘ **DO NOT** remove the front cover unless the power to the water heater is turned off or disconnected. Failure to follow this warning could result in electric shock.
- ⊘ **DO NOT** use unapproved replacement parts or accessories, as this could cause the unit to operate improperly or fail and void the manufacturer's warranty.
- ⊘ **DO NOT** place anything in or around the vent terminals that could obstruct airflow in or out of the water heater (ex: clothes line).
 - Should overheating occur, or the gas supply fails to shut off, turn off the manual gas valve to the appliance.

IMPORTANT: This water heater has been approved for use only in the USA and Canada. Installing and operating this water heater in any other country will void the manufacturer's warranty.

⚠ DANGER



⚠ Vapors from flammable liquids will explode and catch fire, causing death or severe burns.
DO NOT use or store flammable products such as gasoline, solvents, or adhesives in the same room or any area near the water heater.
Keep flammable products:
1. Far away from the unit.
2. In approved containers.
3. Tightly closed.
4. Away from children.

The water heater has a main burner and pilot flame.
The pilot flame can:
1. Come on at any time.
2. Will ignite flammable vapors.
Vapors:
1. Cannot be seen.
2. Are heavier than air.
3. Can travel a long distance near the floor.
4. Can be carried from other rooms to the pilot flame by air currents.

DO NOT install the water heater where flammable products will be stored or used unless the main burner and pilot flames are at least 18 inches above the floor. This will reduce, but not eliminate, the risk of vapors being ignited by the main burner or pilot flame.

Read and follow all water heater warnings and instructions. If the owner's manual is missing, contact the retailer, or manufacturer.

This manual covers the following models: MHW199NCNU & MHW199NCLU

Model		MHW199NCNU	MHW199NCLU
Input Rate		199,000 BTU/h (58.3 kW)	
Min. rating		16,000 BTU/h (4.7 kW)	16,000 BTU/h (4.7 kW)
Heat exchanger		Primary and secondary stainless steel heat exchanger	
Max. temperature setting		140°F (60°C)	
Min. temperature setting		95°F (35°C)	
Factory temperature setting		120°F (49°C)	
Min. actuation water flow		0.5 GPM (1.9 L/min)	
Efficiency	UEF (US)	>0.91	>0.91
	EF (CAN)	>0.92	>0.92
Max. Flow Rate	34°F (19°C) rise	11.1 GPM (42 L/min)	
	45°F (25°C) rise	8.5 GPM (32 L/min)	
	67°F (37°C) rise	5.7 GPM (22 L/min)	
Min. Inlet Gas Pressure		3.5 in. WC (870 Pa)	8 in. WC (1990 Pa)
Max. Inlet Gas Pressure		10.5 in. WC (2610 Pa)	13 in. WC (3230 Pa)
Manifold pressure		-0.9 in. WC (-0.218 kPa)	-0.5 in. WC (-0.132 kPa)
Max. water pressure		150 psi (1.0 MPa)	
Min. water pressure		15 psi (0.1 MPa)	
Appliance Dimension (L x W x H)		26.8 in x 17.3 in x 10.6 in* (680 mm x 440 mm x 270 mm)*	
Net weight		66.1 lbs. (30 kg)	
Water inlet connection		3/4 in NPT	
Water outlet connection		3/4 in NPT	
Gas connection		3/4 in NPT	
Condensate drain connection		1/2 in NPT	
Venting pipe		2 in. or 3 in. or concentric PVC, CPVC, approved Polypropylene	
Venting type		Direct Vent	
Installation type		Indoor	
Ignition		Direct Electric Ignition	
Power supply		120V, 60Hz	
Power consumption		150 W (+114 W when anti-freeze module is on)	
General Operating Conditions		Ambient Temperature Range: 33°F ~ 120°F (0.6°C ~ 49°C)	
		Operating Relative Humidity: Up to 90% at 140°F (60°C)	
		Shipping & Storage Temperature Range: -4°F ~ 176°F (-20°C ~ 80°C)	
Safety Devices		<ul style="list-style-type: none"> • Flue High Limit Switch (158°F / 70°C) • Water Temperature High Limit Switch (185°F / 85°C) • Freeze Protection Ceramic Heater (Turns on at 41°F / 5°C & Turns off at 59°F / 15°C) 	

*Connector size not included

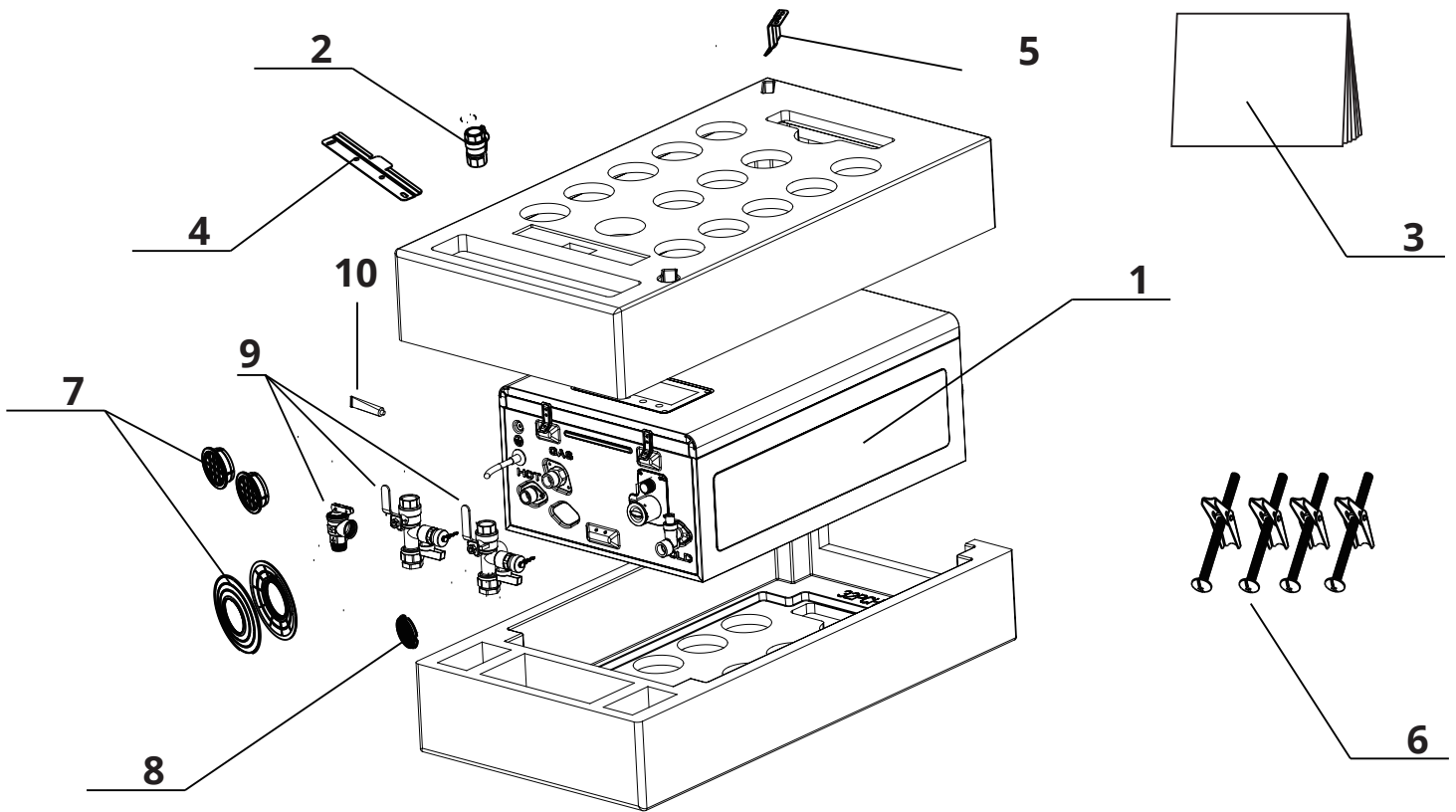
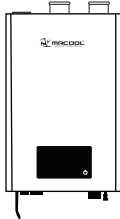


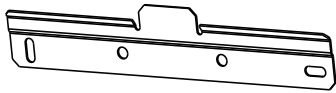
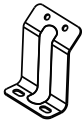
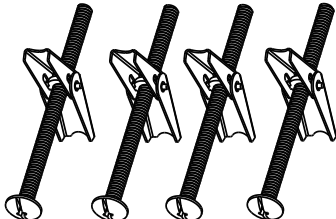


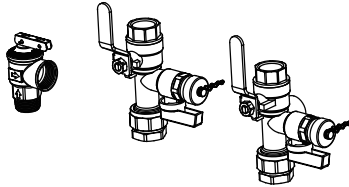
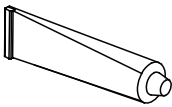
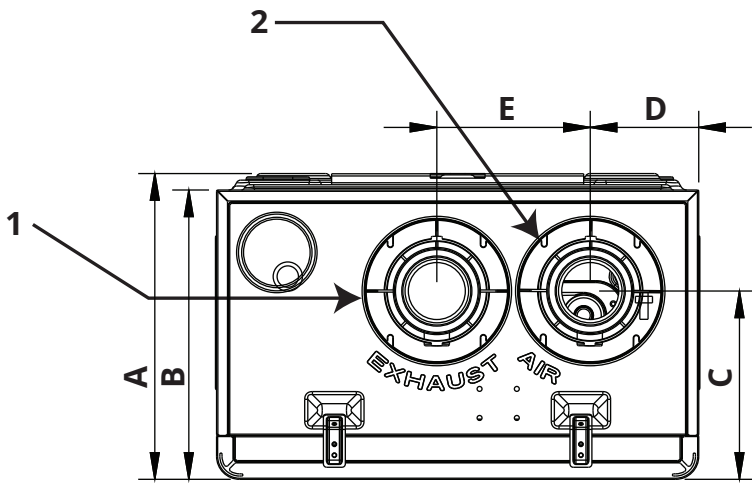


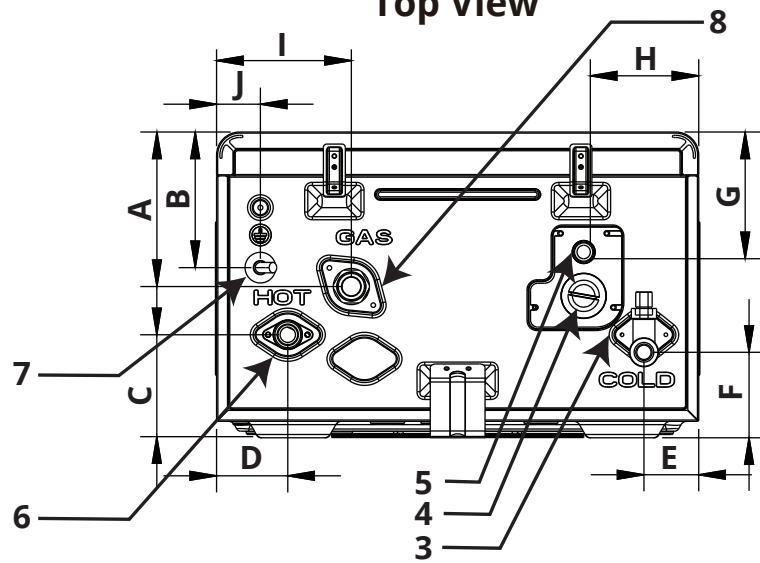
Fig. 3.1

Product Overview & Accessories

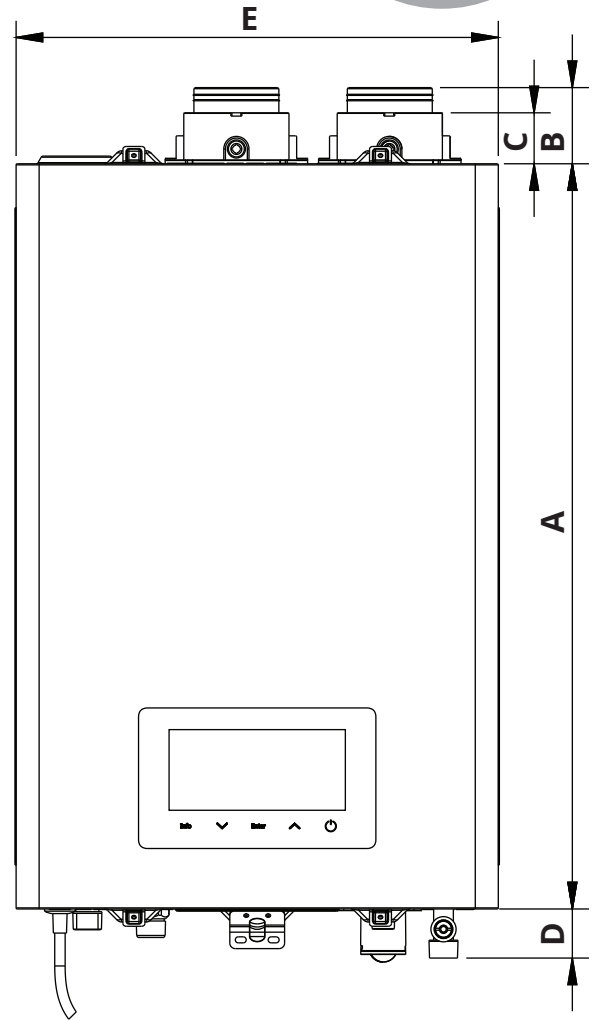
No	Name	Figure	Quantity
1	Tankless Gas Water Heater		1
2	Gas Shut-Off Valve		1
3	User's & Installation Manual		2
4	Wall-Mounting Bracket (upper)		1
5	Wall-Mounting Bracket (lower/bottom)		1
6	Wall-Mounting Screw Kit		1
7	Bird Screens		2 (2 pieces each)
8	Flue Gas Flow Limiting Ring		1 (For 3 inch pipe only)
9	Inlet Valve Assembly		1
10	Silicone		1



Top View



Bottom View



Front View

Appliance Components

Units: inch (millimeter)

No.	Description	Size
1	Exhaust Vent	2 in (50.8 mm)
2	Air Intake	2 in (50.8 mm)
3	Cold Water Inlet	3/4 in (19.1 mm)
4	Condensate Clean	N/A
5	Condensate Drain	1/2 in (12.7 mm)
6	Hot Water Outlet	3/4 in (19.1 mm)
7	Power Cable	120V/60Hz
8	Gas Inlet	3/4 in (19.1 mm)

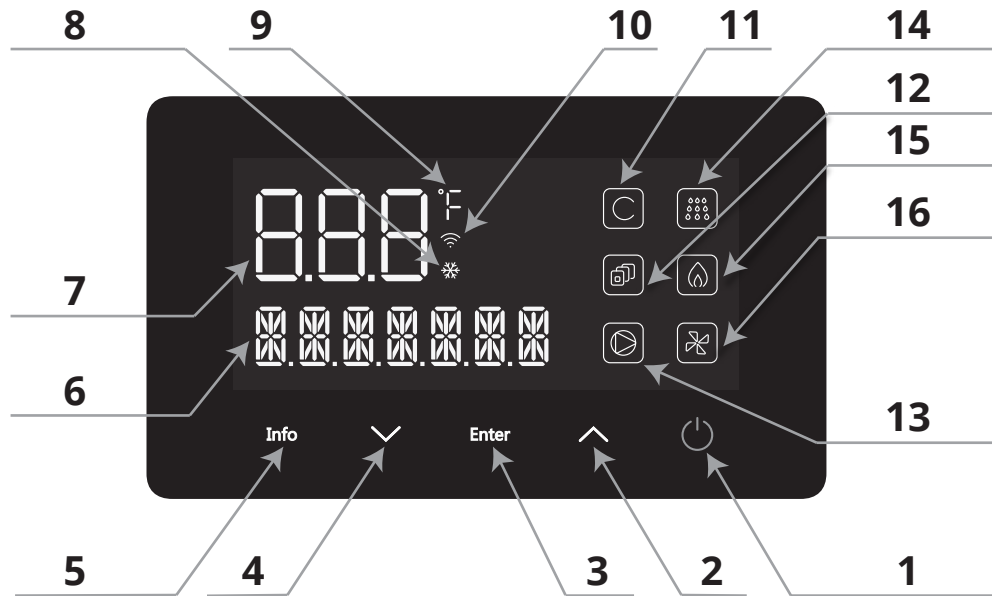
Appliance Dimensions

Units: inch (millimeter)

Item	Top View	Front View	Bottom View
A	10.87 in (280 mm)	26.77 in (680 mm)	5.59 in (142 mm)
B	10.40 in (264 mm)	2.74 in (69.5 mm)	4.92 in (125 mm)
C	6.77 in (172 mm)	1.83 in (46.5 mm)	3.11 in (79 mm)
D	3.90 in (99 mm)	1.77 in (45 mm)	2.56 in (65 mm)
E	5.51 in (140 mm)	17.32 in (440 mm)	1.97 in (50 mm)
F			2.48 in (63 mm)
G			4.35 in (110.5 mm)
H			4.13 in (105 mm)
I			4.84 in (123 mm)
J			1.57 in (40 mm)

Display Panel Overview

5



No.	Symbol	Description	Function	Note
1		Power	Power on/off	
2		Up	<ul style="list-style-type: none"> Increase temperature setting. Switch the information displayed when Info button is pressed. (Refer to Chapter 17) 	
3		Enter	(Refer to Chapter 17)	
4		Down	<ul style="list-style-type: none"> Decrease temperature setting. Switch the information displayed when Info button is pressed. (Refer to Chapter 17) 	
5		Information	Display more operation information. (Refer to Chapter 17)	
6		Error Display	Show error description.	
7		Temperature	Display temperature value.	
8		Anti-Freeze	Indicates anti-freeze function is on.	
9		Units	Displays the temperature unit type.	
10		Wi-Fi	Indicates Wi-Fi function is on.	Preserved
11		Common Chimney	Indicates Common Chimney is on.	Preserved
12		Cascade Mode	Indicates Cascade Mode is on.	Preserved
13		Recirculation	Indicates recirculation pump is working.	Preserved
14		Water Flow	Indicates water flow signal is detected.	
15		Flame	Indicates flame signal is detected.	
16		Blower	Indicates blower is operating.	

Installation Location

When choosing an installation location, you must ensure that the location will provide adequate clearance for the water heater, as well as adequate options for venting and drainage, and sufficient access to gas, water, and electrical supplies. Carefully consider the following factors when choosing an installation location:

CAUTION

- Review all of the installation information in this manual before starting installation. Consider all the requirements for venting, piping, condensate removal, and wiring.
- The installation location of the water heater should have a minimum clearance of 8 ft. (2.4 m) from any high heat sources (producing temperatures greater than 158°F (70°C); some examples include: boiler ventilation pipe, space heater, etc.), as these will cause deformation of plastic parts or plastic pipe fittings of the unit. Also abide by any heat source manufacturer instructions, as well as any local, state, provincial, and national codes, laws, regulations, and ordinances when installing this unit near any high heat sources. If this guideline is not followed, and damage from a high heat source occurs to the unit, it ***WILL NOT*** be covered by the warranty.
- The unit must be installed in a fire retardant area away from all combustible materials. The minimum clearances from combustible construction are 6 in (152.4 mm) on the sides, 0 in (0 mm) from the back, and 12 in (304.8 mm) from the top.
- The location chosen and installation ***MUST*** comply with the Uniform Plumbing Code (latest version). If the installation or location violates this code, the warranty will be voided.

About Water Quality

Proper maintenance of the water heater is required when water quality does not meet EPA standards. Damage caused by poor water quality IS NOT covered under the manufacturer's warranty. The following table shows the maximum contaminant levels allowed, based on the EPA National Secondary Drinking Water Regulations (40 CFR Part 143.3). If you suspect that your water is contaminated in any way, discontinue use of the water heater and contact an authorized technician or licensed professional to investigate further.

Contaminant	Max. Allowable Level	Contaminant	Max. Allowable Level
Total Hardness	Up to 200 mg/l*	Iron	Up to 0.3 mg/l
Aluminum	0.05 to 0.2 mg/l	Manganese	Up to 0.5 mg/l
Chloride	Up to 250 mg/l	pH	6.5 to 8.5 mg/l
Copper	Up to 1.0 mg/l	Sulfate	Up to 250 mg/l
Total Dissolved Solids	Up to 500 mg/l	Zinc	Up to 5 mg/l
Chlorine	Up to 4 mg/l		

*12 grains/gallon

If your local water is hard, please review the following recommended treatment and flushing guidelines. However, first check your local codes for any restrictions on the use of softeners before choosing and purchasing a softener.

Hardness Level		Treatment Method	Flush Frequency*
Soft	0-4 grains/gallon (0-60 mg/l)	None	None
Moderately Hard	4-7 grains/gallon (61-120 mg/l)	Water Softener is Recommended	Once a Year
Hard	7-9 grains/gallon (121-160 mg/l)		
Very Hard	9-12 grains/gallon (161-200 mg/l)	Water Softener is HIGHLY Recommended	
Extremely Hard	>12 grains/gallon (200 mg/l)		

Installation

Access to Utilities

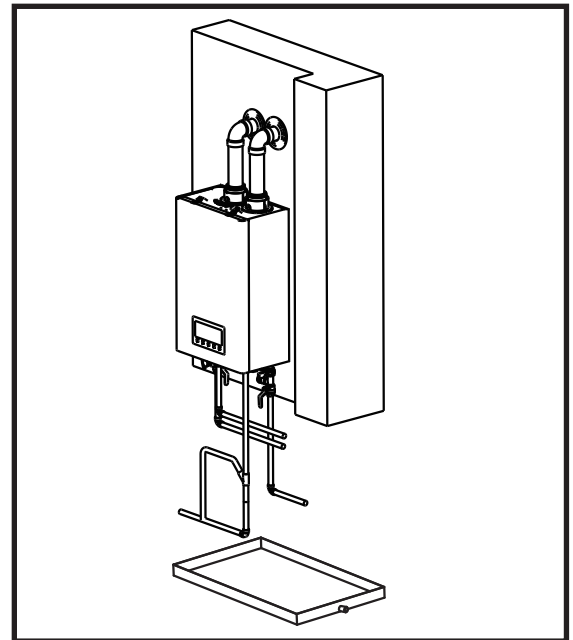
- **Water** - The installation location should be near where the domestic water supply enters the building.
- **Gas** - The installation location should be near where the gas supply enters the building.
- **Electricity** - the installation location should be near where the electrical supply enters the building.

Adequate Drainage

The water heater produces a significant amount of condensate during operation. The water heater should be located near a suitable drain and where damage from a possible leak will be minimal. Installation of the water heater in a location without a suitable drain will void the warranty and the manufacturer will not be liable or responsible for any damages that occur as a result. For further information about condensate drainage, please refer to Chapter 12.

The water heater must be located in an area where leakage of the unit or its connections will not result in damage to the area adjacent to the unit, or to lower floors of the building or structure. When such a location cannot be found, it is highly recommended that a drain pan that can drain adequately be installed beneath the unit (refer to Fig. 6.1). When installing the drain pan, ensure that it will not restrict combustion airflow in any way.

Fig. 6.1



Adequate Venting and Ventilation

Select an installation location that will also require minimal venting. Consider venting restrictions caused by windows, doors, air intakes, gas meters, foliage, and other buildings. For more information regarding venting, please refer to Chapters 13-17.

To ensure adequate venting and ventilation, follow these guidelines and restrictions:

- ⊘ ***DO NOT*** install the water heater in bathrooms, bedrooms, or any other occupied rooms that are normally kept closed or are not adequately ventilated.
- ⊘ ***DO NOT*** install the water heater where moisture from the exhaust could discolor or damage walls.
- ⊘ ***DO NOT*** enclose the vent termination.
 - Maintain proper clearances from any openings in the building.
 - Install the water heater with a minimum clearance of 12 in. (300 mm) above an exterior grade or as required by local codes.
 - Maintain a minimum clearance of 4 ft. (1.2 m) from heating and cooling vents.
 - Install the exhaust vent in an area that is free from obstructions and does not allow the exiting exhaust to accumulate.

Installation

Proximity to Fixtures and Appliances

Install the water heater near fixtures that deliver or use hot water, such as the bathroom, kitchen, and laundry room faucets. Select a location that will minimize the amount of water piping required between the major fixtures. Insulate as much of the hot water supply as possible. For more information regarding the water supply, refer to Chapter 10.

Install the water heater in an area that will allow for service & maintenance as well as access to the utility connections, piping, filters, and traps. Based on the installation location, ensure the clearances listed in the table below are maintained.

Minimum Clearance	Top	Bottom	Front	Back	Sides
Inches (Millimeters)	9 in (229 mm)	12 in (305 mm)	4 in (102 mm)	0	3 in (76 mm)

Clean, Debris and Chemical-Free Combustion Air

Follow the installation guidelines listed below regarding the air surrounding the unit and storage of potentially dangerous items in the vicinity of the unit.

- ⊘ **DO NOT** install the water heater in areas where dust and debris may accumulate.
- ⊘ **DO NOT** install the unit where hair sprays, spray detergents, chlorine, or similar chemicals are used.
- ⊘ **DO NOT** install the water heater in areas where gasoline or other flammables are used or stored.
- ⊘ **DO NOT** allow hanging laundry or any similar items to obstruct access to the water heater or its venting system.
 - Ensure that any combustible materials are properly and securely stored away from the water heater.

NOTE

The combustion air must be free of flammable vapors or corrosive chemical fumes. Common corrosive chemical fumes to avoid include: fluorocarbons, other halogenated compounds such as freon, trichloroethylene, perchloroethylene, and chlorine, all of which can be found in refrigerants or solvents. When these chemicals burn, they produce acids that can corrode the stainless steel heat exchanger, gaskets, and the flue & venting system.

Coastal Installations

For installations in sea or marine environments, the salty air can cause corrosion to the water heater. The water heater should be protected and enclosed to minimize exposure to the corrosive atmosphere. Damage caused by a corrosive environment is not covered under the warranty.

Operating Temperature

The ambient temperature at the installation location must be above freezing. Steps should be taken to ensure the water supply pipe line will not freeze.

NOTE

The operation temperature is -22°F~140°F (-30°C~60°C), the anti-freeze module activates when the ambient temperature is below 25°F (-4°C).

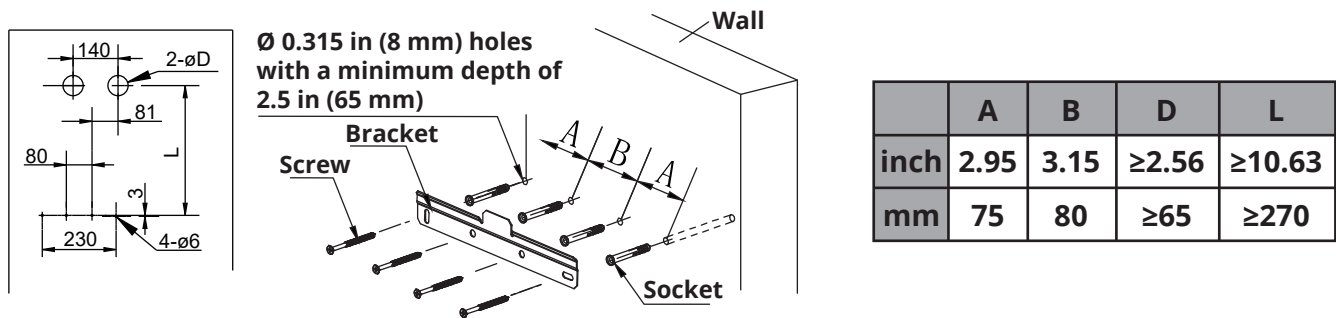
Installation

Mounting the Water Heater to the Wall

Water heaters referenced in this manual come with an upper mounting bracket that is pre-drilled for easy installation on standard wall studs. If the strength of the wall is insufficient or if the framing is non-standard or uneven, reinforce the area before installing the water heater. Avoid installation on common walls as the unit will make some operational noises while operating.

To mount the water heater to the wall:

1. Make 4 holes in the wall with the drill. Affix the upper bracket securely to the wall with the expanded screws, ensure that it is level, and ensure that it can support the weight of the water heater. **(See Fig. 6.2)**



- Step 1: remove the nuts. **OR** Step 2: fix the hanging plate on the wall with screw components.

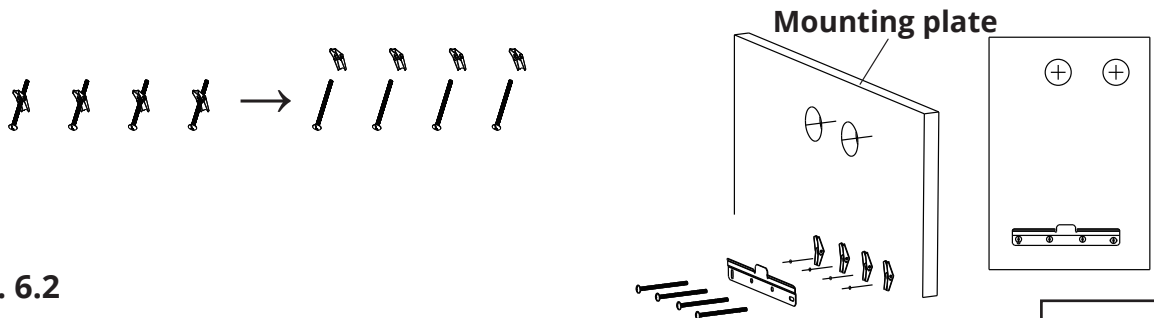


Fig. 6.2

2. Use the screws in the package to secure the lower bracket to the bottom of the water heater. **(See Fig. 6.3)**

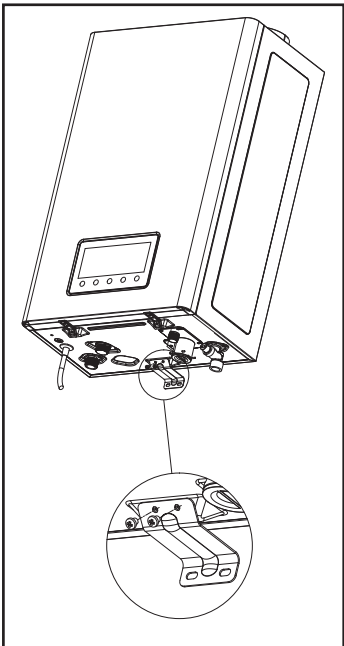


Fig. 6.3

Installation

3. Align the grooves on the back of the water heater with the convex on the upper bracket. Then, hang the unit on the bracket. (See Fig. 6.4)

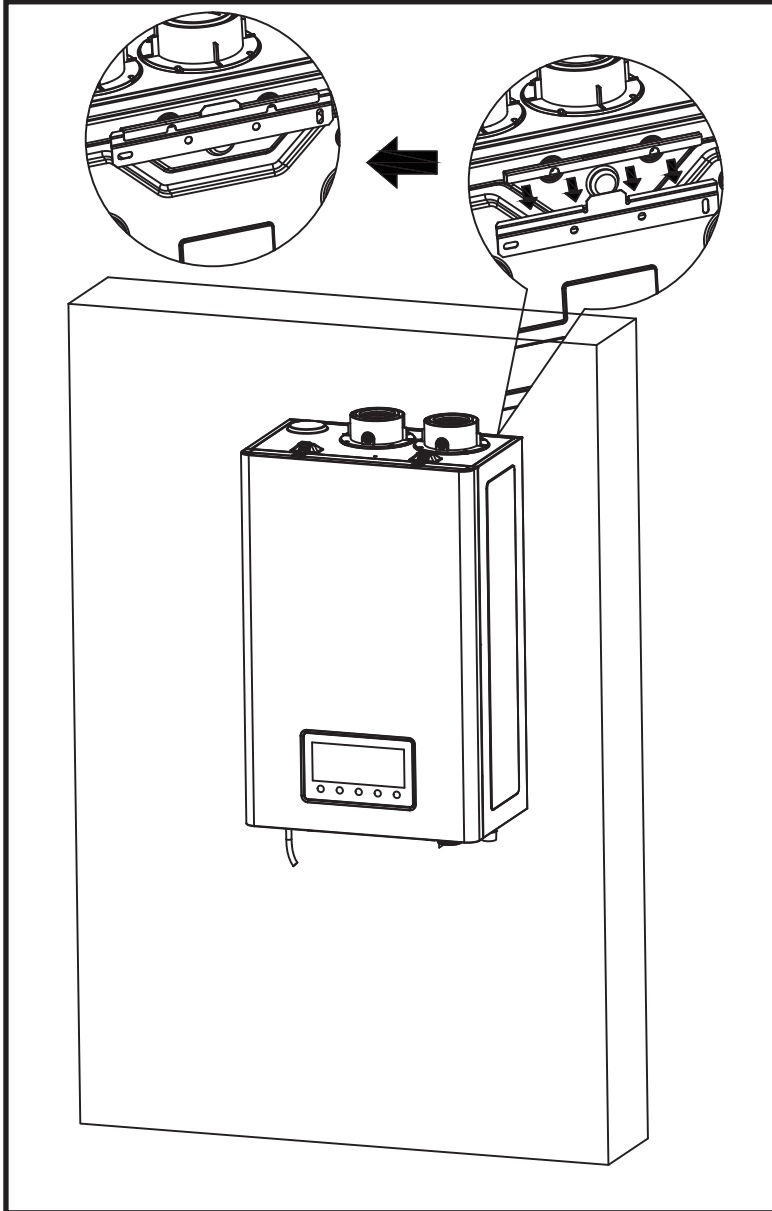


Fig. 6.4

4. Secure the lower bracket, installed on the water heater in a previous step, to the wall with screws. (See Fig. 6.5)

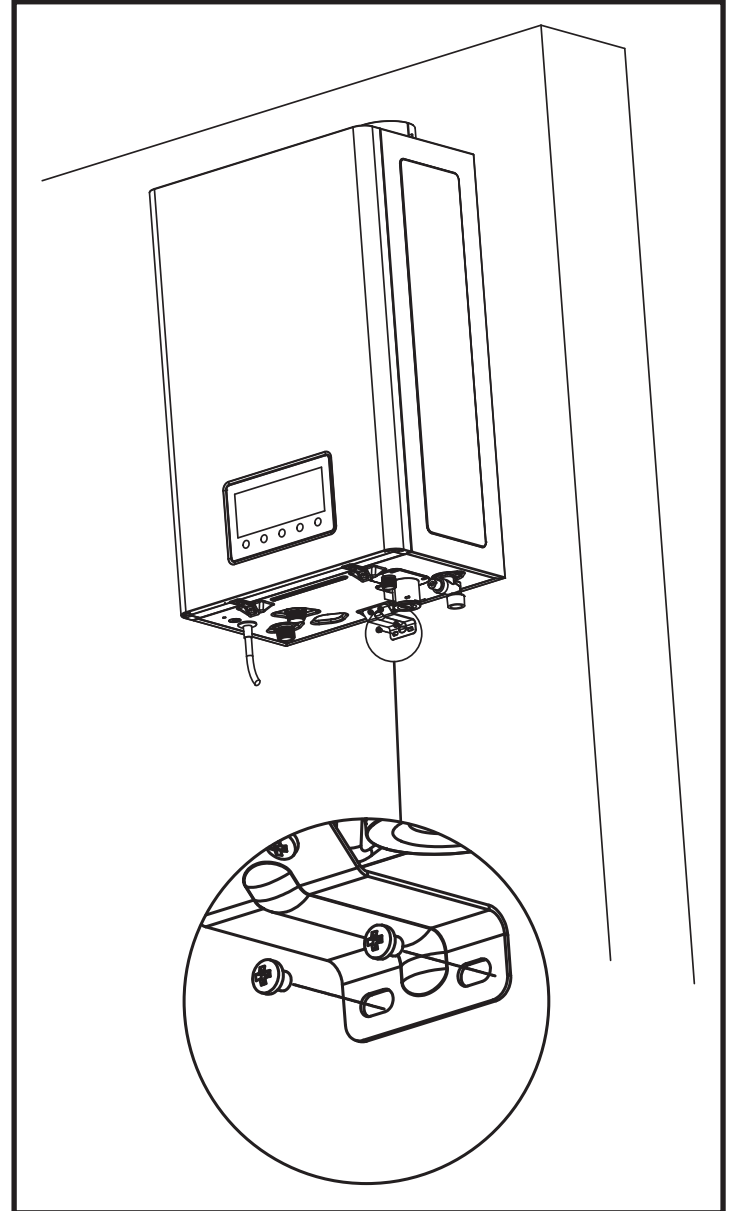


Fig. 6.5

Connecting the Gas Supply

The manufacturer recommends connecting the water heater as the first gas appliance to the meter to ensure a sufficient gas supply. (See Fig. 7.1 & 7.2)

WARNING

Before connecting the gas supply, determine the gas type and pressure for the water heater by referring to the rating plate. Use the same gas type indicated on the rating plate. Using a different gas type could result in abnormal combustion and water heater malfunction. Gas supplies should be connected by a licensed professional only.

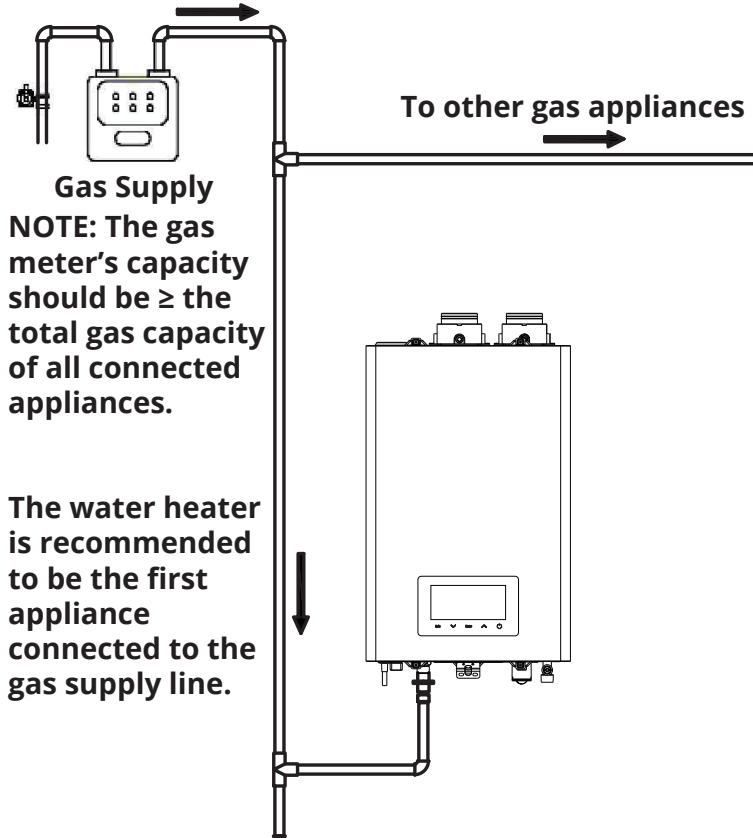
- ⊘ ***DO NOT*** use flame to check for gas leakage. Perform a bubble test on the joints to check for gas leaks. If a leak exists, bubbles will form at the leaking joint. A gas leak could result in substantial property damage, severe personal injury, or death.
- ⊘ ***DO NOT*** attempt a field conversion of this water heater from natural gas to propane or vice versa. This water heater ***CANNOT*** be converted from one type to another. Doing so will result in dangerous operating conditions and will void the warranty.
- ⊘ ***DO NOT*** allow the piping to be supported by the water heater or its accessories. Properly support the piping with hangers.
 - To avoid damaging the connectors on the water heater, use two wrenches when tightening piping to the water heater. Use one wrench to prevent the connector at the water heater from turning, and the other wrench to tighten the connection. Damaged connectors may result in system leaks.
 - Ensure that the gas piping is protected from physical damage and freezing. Failure to follow these instructions could result in gas leakage, which can result in fire, explosion, property damage, severe personal injury, or death.
 - The appliance and its gas connection must be leak tested before placing the appliance in operation.
 - The inlet gas pressure must be within the range specified in Chapter 2: Product Specifications of this manual (Refer to Max. Inlet Gas Pressure & Min. Inlet Gas Pressure).

To connect the gas supply:

1. Determine the gas type and pressure for the water heater by referring to the rating plate.
2. Perform a pressure test on the main gas supply line.
3. Purge the gas line of any debris.
4. Determine the proper size and type of piping for the gas line. Refer to the diagrams and tables on the following pages.
5. Install certified, full port valves on the gas supply line and water heater.
6. Connect the gas supply line.
7. Test the supply line, all connection points, and the water heater for gas leaks.

Connecting the Gas Supply

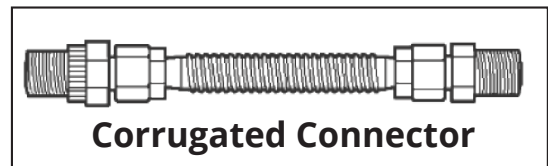
Fig 7.1 Gas Supply Line



Tighten the water heater connection valves with care to avoid damaging them.

- The connection fitting on all water heaters is 3/4 in (19.1 mm).
- 1/2 in (12.7 mm) rigid pipe can be used. Refer to the gas pipe sizing tables in Chapter 8 for limitations.

⊘ **DO NOT** use 1/2 in (12.7 mm) corrugated tubing or connectors as these could cause excessive noise to occur.



- When using flexible gas lines, ensure that the inner diameter of the pipe and connector are sufficient to supply the required amount of BTUs. Also, ensure the flexible line has no crimps or tight bends in it, as these will restrict gas flow.
- When using rigid pipe, the manufacturer recommends the installation of a union on the gas supply line close to the water heater. This will facilitate any future maintenance or service required.
- Check with the local jurisdiction to verify the use of 1/2 in (12.7 mm) gas pipe is allowed/approved in the area where the water heater is being installed

Gas Supply Line

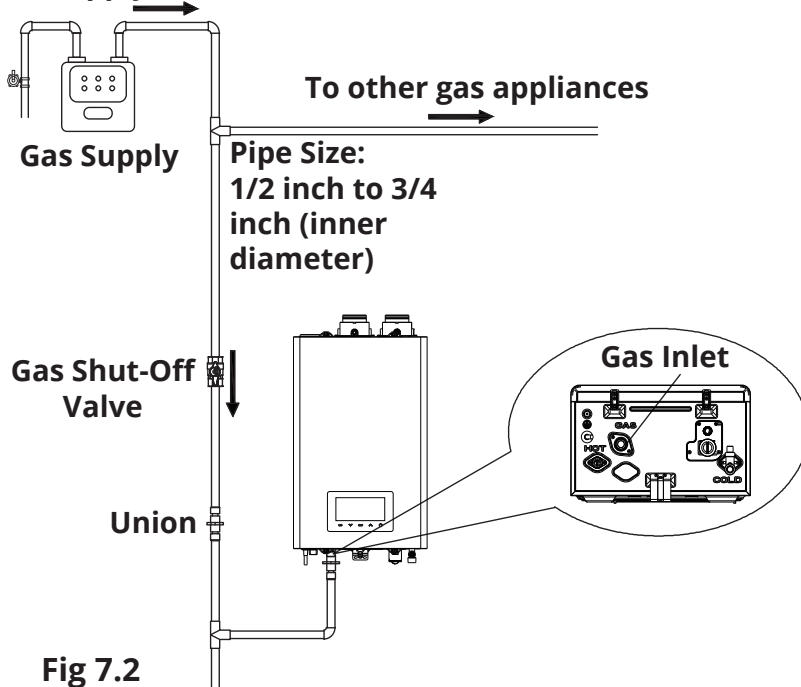


Fig 7.2

! CAUTION

Prior to using an Excess Flow Valve (EFV) in the gas line, check the manufacturer's minimum and maximum flow capacity rating. An improperly sized EFV will not allow for full gas flow to the water heater. If this occurs, it could cause improper operation of the water heater.



Connecting the Gas Supply

Typical LP Gas Piping Example 1: 2 Stage System with Multiple Regulators (Recommended)

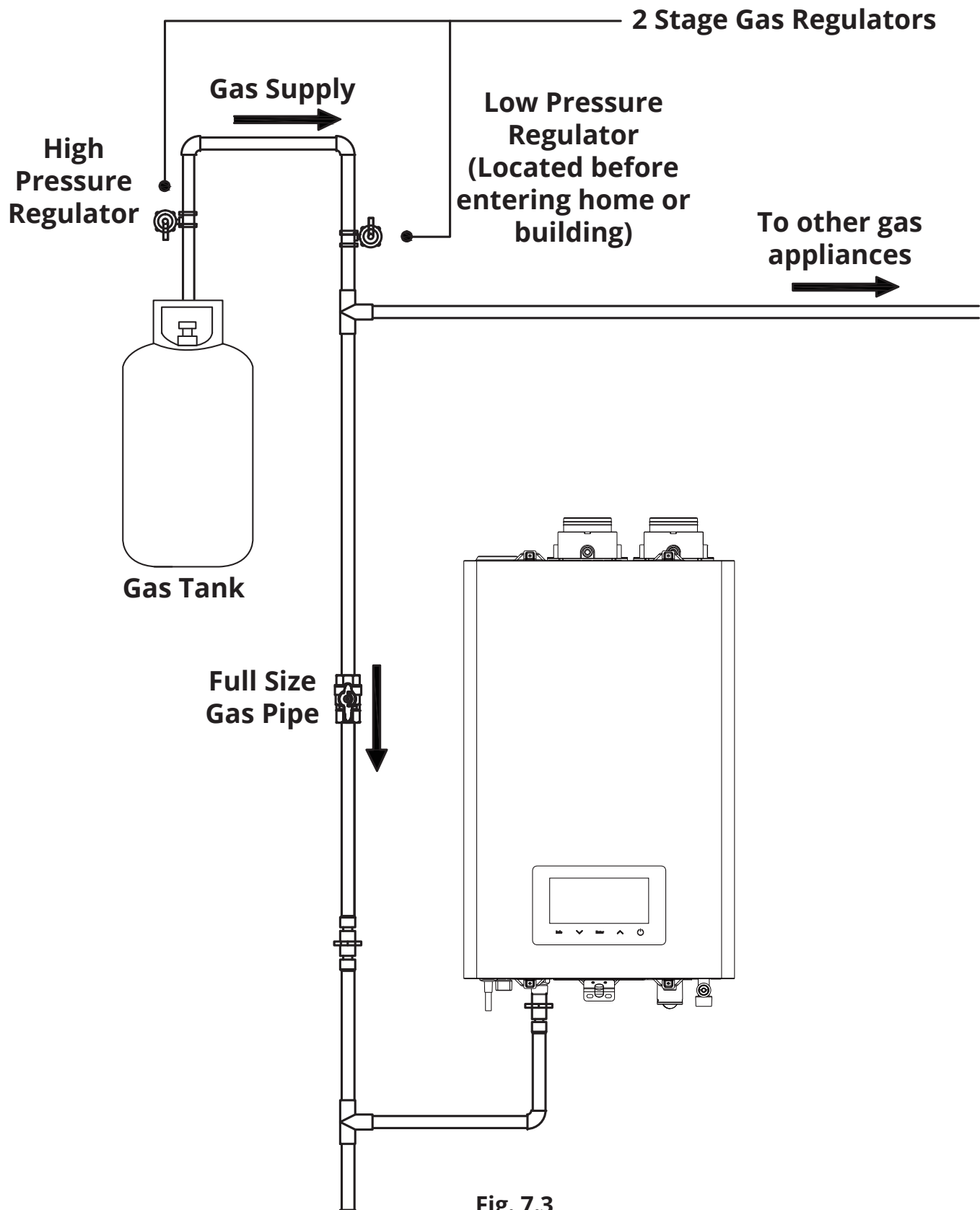


Fig. 7.3

Connecting the Gas Supply

Typical Gas Piping Example 2: Single Regulator System

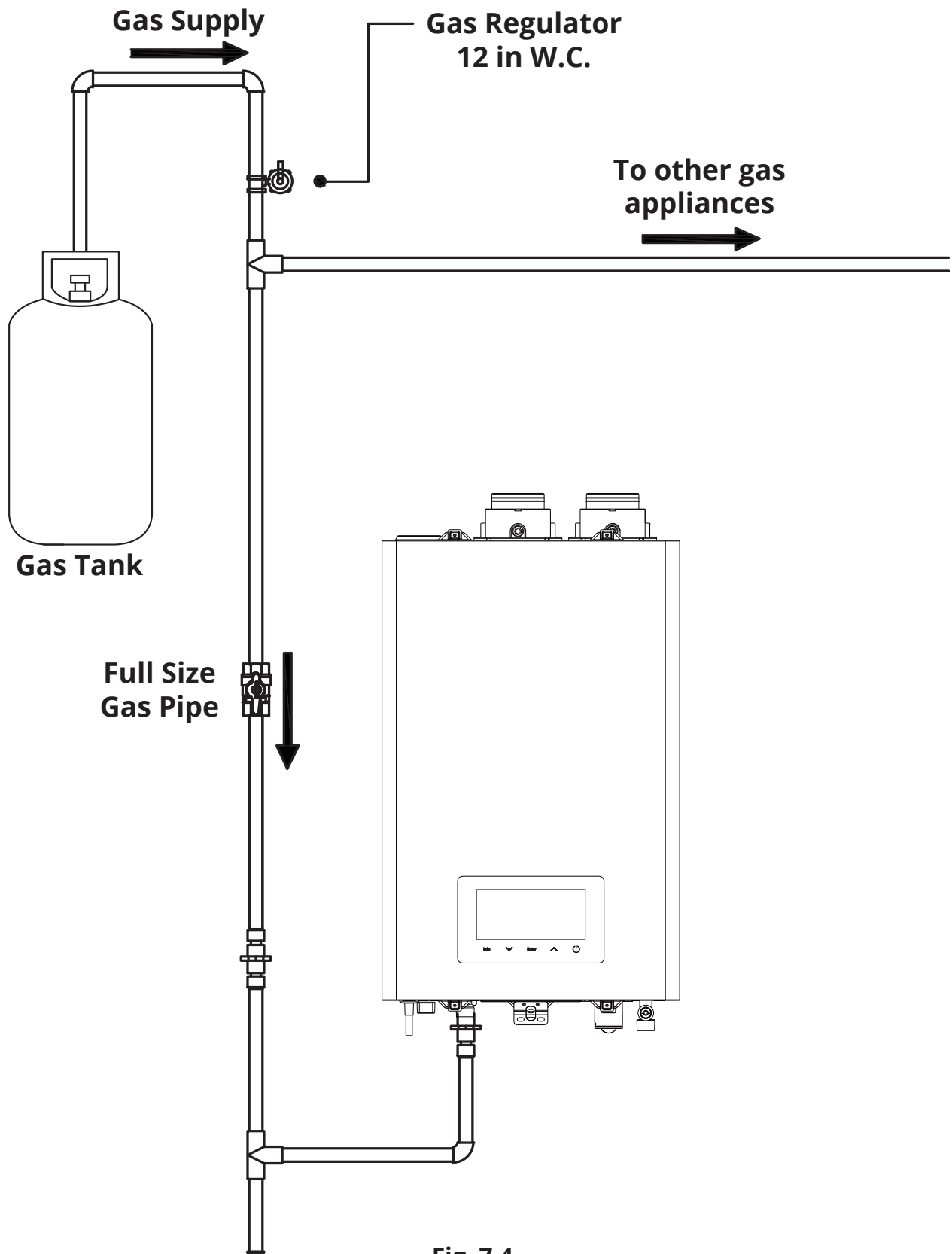


Fig. 7.4

NOTE: The tables below are for reference only. Please consult the gas pipe manufacturer for actual pipe capacities. The tables below are referenced from the 2012 National Fuel Gas Code.

Maximum Natural Gas Delivery Capacity

In Cubic Feet (ft³) per hour (0.60 Specific Gravity; 0.5 in WC Pressure Drop). Contact your gas supplier for BTU/ft³ ratings. Use 1,000 BTU/ft³ for simplified calculations. This table is recommended for supply pressures less than 6 in WC.

Pipe Size	Length (including fittings)										
	10 ft (3 m)	20 ft (6 m)	30 ft (9 m)	40 ft (12 m)	50 ft (15 m)	60 ft (18 m)	70 ft (21 m)	80 ft (24 m)	90 ft (27 m)	100 ft (30 m)	125 ft (38 m)
3/4 in	360	247	199	170	151	137	126	117	110	104	92
1 in	678	466	374	320	284	257	237	220	207	195	173
1-1/4 in	1,390	957	768	657	583	528	486	452	424	400	355
1-1/2 in	2,090	1,430	1,150	985	873	791	728	677	635	600	532
2 in	4,020	2,760	2,220	1,900	1,680	1,520	1,400	1,300	1,220	1,160	1,020
2-1/2 in	6,400	4,400	3,530	3,020	2,680	2,430	2,230	2,080	1,950	1,840	1,630
3 in	11,300	7,780	6,250	5,350	4,740	4,290	3,950	3,670	3,450	3,260	2,890
4 in	23,100	15,900	12,700	10,900	9,660	8,760	8,050	7,490	7,030	6,640	5,890

In Cubic Feet (ft³) per hour (0.60 Specific Gravity; 3.0 in WC Pressure Drop). Contact your gas supplier for BTU/ft³ ratings. Use 1,000 BTU/ft³ for simplified calculations. This table is recommended for supply pressures less than 6 in WC.

Pipe Size	Length (including fittings)										
	10 ft (3 m)	20 ft (6 m)	30 ft (9 m)	40 ft (12 m)	50 ft (15 m)	60 ft (18 m)	70 ft (21 m)	80 ft (24 m)	90 ft (27 m)	100 ft (30 m)	125 ft (38 m)
1/2 in	454	312	250	214	190	172	158	147	138	131	116
3/4 in	949	652	524	448	397	360	331	308	289	273	242
1 in	1,790	1,230	986	844	748	678	624	580	544	514	456
1-1/4 in	3,670	2,520	2,030	1,730	1,540	1,390	1,280	1,190	1,120	1,060	936
1-1/2 in	5,500	3,780	3,030	2,600	2,300	2,090	1,920	1,790	1,670	1,580	1,400
2 in	10,600	7,280	5,840	5,000	4,430	4,020	3,690	3,440	3,230	3,050	2,700
2-1/2 in	16,900	11,600	9,310	7,970	7,060	6,400	5,890	5,480	5,140	4,860	4,300
3 in	29,800	20,500	16,500	14,100	12,500	11,300	10,400	9,690	9,090	8,580	7,610
4 in	60,800	41,800	33,600	28,700	25,500	23,100	21,200	19,800	18,500	17,500	15,500

Gas Pipe Sizing Tables

Maximum Liquefied Propane Delivery Capacity in Thousands or BTU/H (0.5 in W.C. Pressure Drop).

Pipe Size	Length (including fittings)												
	10 ft (3 m)	20 ft (6 m)	30 ft (9 m)	40 ft (12 m)	50 ft (15 m)	60 ft (18 m)	80 ft (24 m)	100 ft (30 m)	125 ft (38 m)	150 ft (45 m)	175 ft (53 m)	200 ft (60 m)	250 ft (76 m)
1/2 in	291	200	160	137	122	110	101	94	89	84	74	67	62
3/4 in	608	418	336	287	255	231	212	197	185	175	155	140	129
1 in	1,150	787	632	541	480	434	400	372	349	330	292	265	243
1-1/4 in	2,350	1,620	1,300	1,110	985	892	821	763	716	677	600	543	500
1-1/2 in	3,520	2,420	1,940	1,660	1,480	1,340	1,230	1,140	1,070	1,010	899	814	749
2 in	6,790	4,660	3,750	3,210	2,840	2,570	2,370	2,200	2,070	1,950	1,730	1,570	1,440

WARNING

The water heater cannot function properly without sufficient inlet gas pressure (refer to the name plate of the unit for gas pressure rating). Measuring the inlet gas pressure should ***ONLY*** be performed by a licensed professional.

- The inlet gas pressure must be maintained between 3.5 in and 10.5 in W.C. for natural gas and between 8.0 in and 13 in W.C. for liquefied propane.
- The appliance and its individual shut-off valve must be disconnected from the gas supply piping system during any pressure testing of that system when test pressures are in excess of 1/2 psi (3.5 kPa). The appliance must be isolated from the gas supply piping system by closing its individual manual shut-off valve during any pressure testing of the gas supply piping system at test pressures equal to or less than 1/2 psi (3.5 kPa).

NOTE

If gas pressure is out of the acceptable range or an excessive pressure drop is observed, contact the gas supplier or a qualified installer to supply proper gas pressure to the unit.

To measure the inlet gas pressure:

1. Shut off the manual gas valve on the gas supply line. **(See Fig. 9.1)**
2. Open a hot water faucet. The water heater should turn on and the gas in the gas supply line will be purged.
3. Leave the faucet on until the water heater shuts down due to a lack of gas supply, and then turn off the hot water faucet.
4. Loosen the 4 Phillips head screws at the bump of the casing (two on the top and two on the bottom). **(See Fig. 9.2)**
5. Carefully raise the front cover approximately 2 inches.
6. Find the control panel cable and unplug it from the main control board.
7. Remove the front cover. **(See Fig. 9.3)**
8. Loosen the screw indicated in Fig 9.4 and connect a manometer to the pressure port. Reset the manometer to zero before use. **(See Fig. 9.4)**
9. Re-open the manual gas valve and check for leaks.
10. Open multiple fixtures that have high flow rates, such as bathtub and shower faucets, to ramp the water heater up to its maximum firing rate.
11. When the water heater reaches its maximum firing rate, check the inlet gas pressure reading on the manometer. The gas pressure must fall within the ranges specified in Chapter 2. **(See Fig. 9.5)**
12. After checking the intake pressure, tighten the screw again.

CAUTION

Before removing the front cover, you must unplug the control panel cable first. Failing to do so will damage the water heater.

Measuring The Inlet Gas Pressure

Fig. 9.1

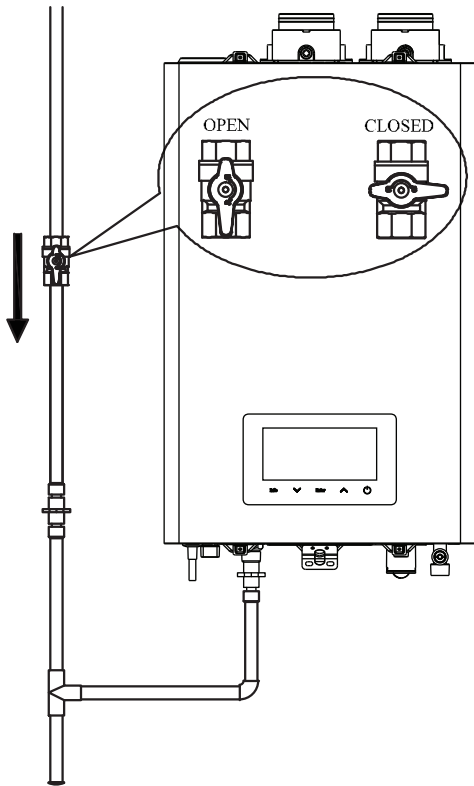


Fig. 9.2

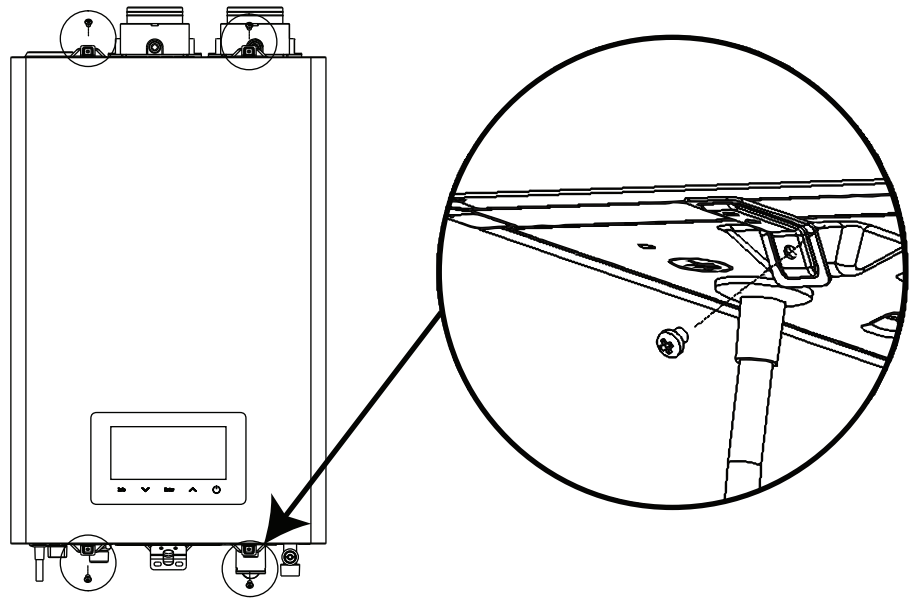


Fig. 9.3

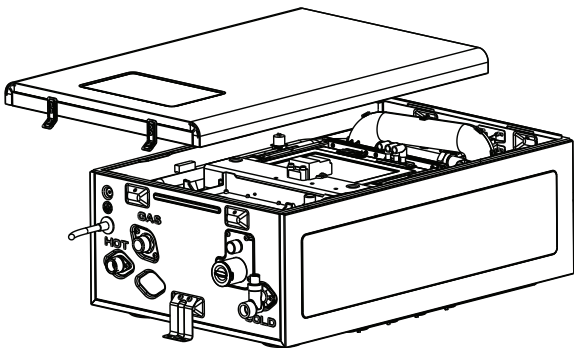


Fig. 9.4

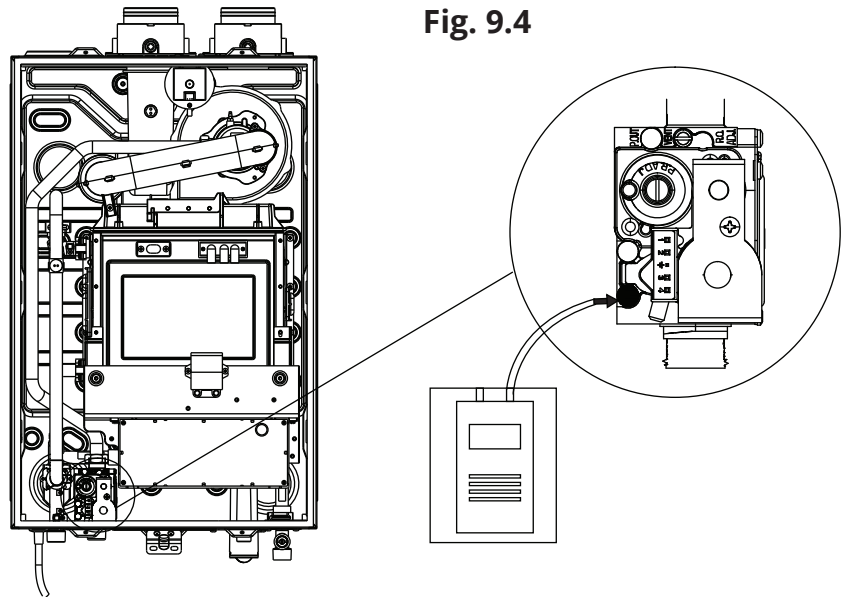
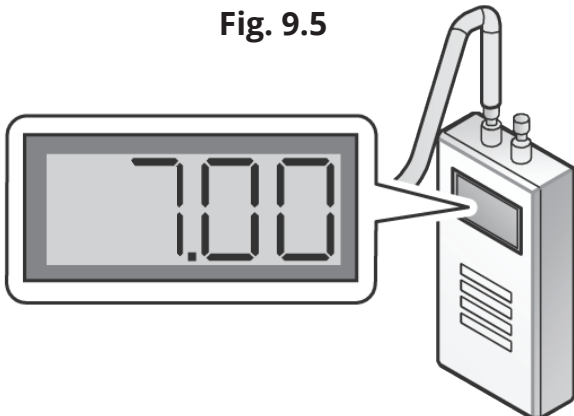


Fig. 9.5



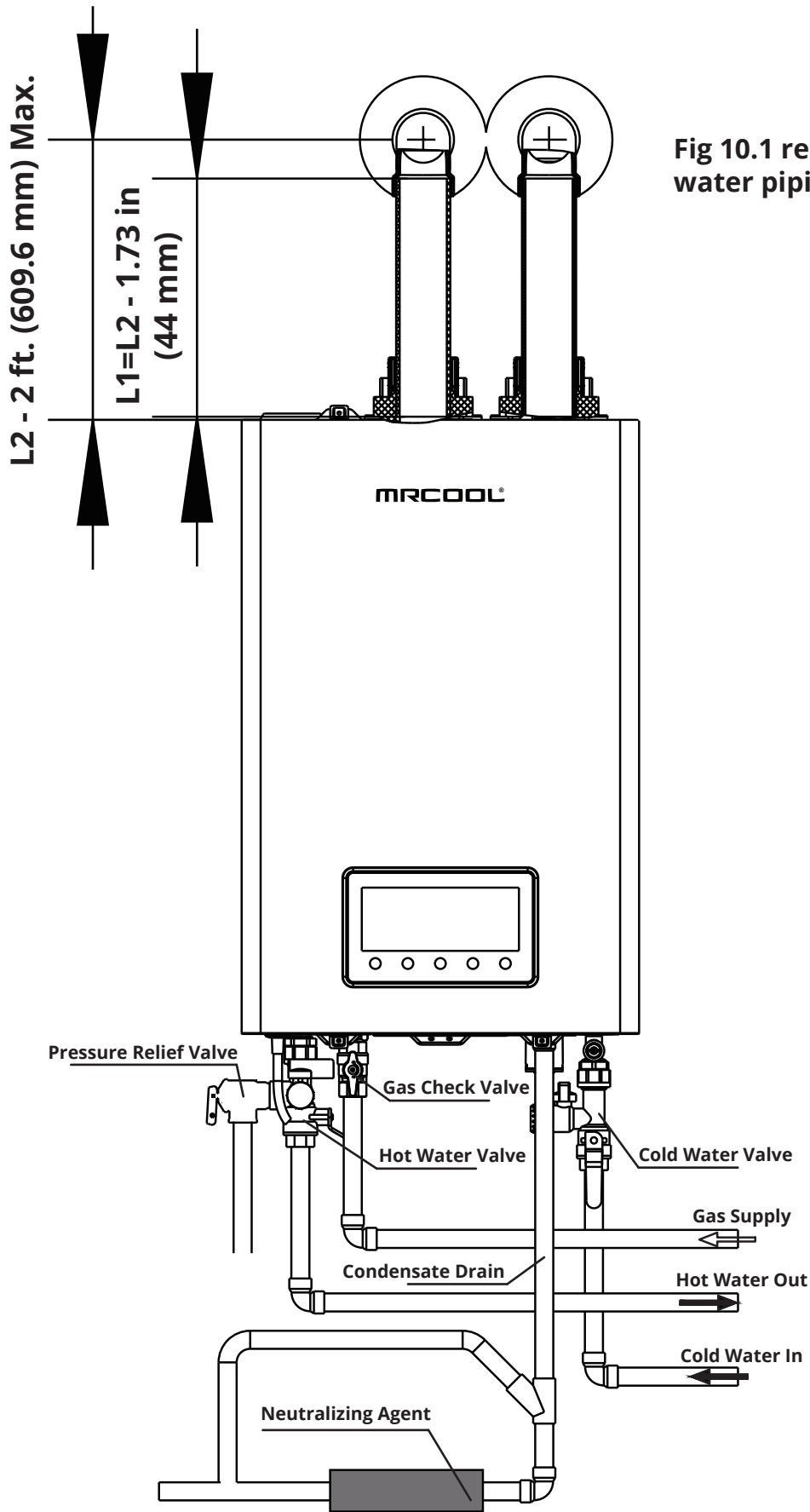


Fig 10.1 represents a typical water piping example

Fig 10.1

Connecting the Water Supply

Connecting the Water Supply

The water fittings on the water heater are 3/4 in. If the installation site only has 1/2 in. plumbing throughout, it is not necessary to up-size the water lines to 3/4 in., if you are installing a single water heater.

When connecting the water supply, follow these guidelines:

- Use only pipes, fittings, valves, and components (ex: solder) that are approved for use in potable water systems.
- Tighten the water heater connection valves with care to avoid damage.
- It is recommended to use unions and manual shut-off valves on the cold water inlet and hot water outlet.
- Make the hot water piping system as short as possible to deliver hot water to the fixtures quickly.
- To conserve water and energy, insulate all water piping, especially the hot water lines. ***DO NOT*** cover the drain or pressure relief valve.
- After installing the water heater, clean the inlet water filter that is located inside the cold water inlet, and then test the water heater for proper flow and inspect for leaks. Instruct the water heater owner that the filter must be cleaned periodically to maintain proper water flow.



WARNING

Failure to follow the instructions in this section and the warnings listed below will not only void the warranty but could also result in property damage, severe personal injury, or death.

- ⊘ ***DO NOT*** pipe the water heater with black iron, steel, galvanized steel, lead, or aluminum water pipe, as it could result in premature product failure.
- ⊘ ***DO NOT*** apply a torch within 1 ft. of the water heater. If sweat connections are used, sweat tubing to the adapter before fitting the adapter to the water connections of the heater.
- ⊘ ***DO NOT*** use dielectric unions or galvanized steel fittings in a system with this unit. Use only copper, brass, or stainless steel fittings. Teflon thread sealant must be used on all connections.

Connecting a Pressure Relief Valve

To complete the installation of the water heater, you must install an approved 3/4 in, maximum 150 PSI pressure relief valve on the hot water outlet. The water heater has a built-in, high temperature shut-off switch, so install a “pressure only” relief valve. This valve is not supplied, but is required. The pressure relief valve should be placed as close to the water heater as possible. No other valve should be placed between the pressure relief valve and the water heater. **Figure 10.1** on the previous pages represents a typical water heater with a pressure relief valve.

WARNING

Improper installation of the pressure relief valve may result in property damage, personal injury, or death. Follow all instructions and guidelines when installing the pressure relief valve.

- The valve should **ONLY** be installed by a licensed professional.
- To avoid water damage or scalding, direct the discharge line to a safe place for disposal.

When installing the pressure relief valve, follow these guidelines:

- ⊗ **DO NOT** plug the relief valve. If the relief valve discharges periodically, this may be due to thermal expansion in a closed water supply system. Contact the water supplier or local plumbing inspector on how to correct this situation.
- ⊗ **DO NOT** direct the discharge line to a location where freezing could occur.
- ⊗ **DO NOT** install a reducing coupling or other restriction on the discharge line.
 - Ensure that the discharge capacity of the pressure relief valve is equal to or greater than the maximum pressure rating of the water heater.
 - Ensure that the maximum BTU/H rating on the pressure relief valve is equal to or greater than the maximum input BTU/H rating of the water heater.
 - Direct the discharge piping of the pressure relief valve so that hot water will not splash on anyone or any nearby equipment.
 - Attach the discharge line to the pressure relief valve and run the end of the line to within 6-12 in. (150-300 mm) of the floor drain, making discharge clearly visible.
 - Ensure that the discharge line will allow free and complete drainage without restriction.
 - Ensure that the discharge line is not plugged or obstructed.
 - After filling and pressurizing the system, test the relief valve operation by lifting the lever. If the valve fails to operate correctly, immediately replace the relief valve.

CAUTION

- To avoid potential property damage or personal injury, check the pressure relief valve at least once every three years by manually operating the valve to ensure proper operation.
- Before manually operating the valve, check the discharge line and make sure that the hot discharge water will not cause personal injury or property damages. Contact with the discharge water may result in severe personal injury.

Connecting the Condensate Drain - Overview

This water heater creates condensation as part of its normal operation. The condensation produced is acidic and generally ranges from 3-5 on the pH scale. Be sure to follow all local codes and regulations when disposing of condensate from the water heater. Check local codes for suitable waste drain locations, if applicable.

! CAUTION

- ⚠ **DO NOT** cap or plug the integrated condensate line. If the condensate line is obstructed, impeding its ability to drain, it could damage the water heater.
- ⚠ **DO NOT** allow people or animals to drink the condensate water.
 - The condensate line must have a negative slope to drain properly.
 - Once the condensate drain pipe has been installed, fill the condensate trap with water to ensure it flows through the drain pipe freely.

Condensate Drainage Options (Fig. 12.1):

- A** From the water heater directly into an external drain.
- B** From the water heater, through a neutralizing agent, and then into an external drain.
- C** From the water heater into a laundry tub.
- D** From the water heater into a condensate pump, and then into a laundry tub.

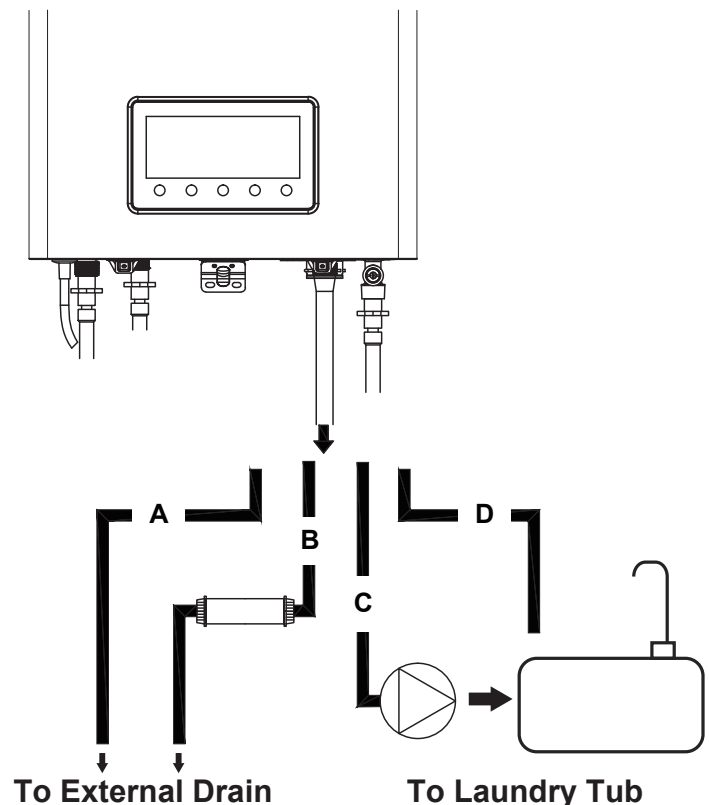


Fig 12.1

NOTE

If you choose option B, the neutralizing agent must be replaced periodically. Depletion of the neutralizing agent will vary, based on the usage rate of the water heater. During the first year of operation, the neutralizer should be checked every few months for depletion and replaced as needed.

If you choose option C, a pump can be used when there is a long distance between the water heater and the laundry tub, or when the bottom of the water heater is lower than the top of the laundry tub.

If you choose option D, the bottom of the water heater must be higher than the top of the laundry tub. The condensate line must have a negative slope to drain properly.

Connecting the Condensate Drain

Connecting the Condensate Drain

1. Locate the condensate drain on the bottom of the water heater and remove the drain cap. (See Fig. 12.2)
2. Connect a drain line to the 1/2 in. fitting at the bottom of the unit. **NOTE: Use only corrosion-resistant material for the drain line, such as PVC or CPVC.**

⚠ **DO NOT** reduce the size of this fitting or the drain line to less than 1/2 in.

3. Place the free end of the drain line into an appropriate drain.
4. Fill the condensate trap inside the water heater by pouring water through the exhaust vent on top of the unit until water flows through the condensate drain. Ensure the water flows through the condensate drain line smoothly. (See Fig. 12.3)

NOTE

- If you are using a condensate pump, ensure that the pump allows for up to 2 GPH of drainage for each water heater in the system.
- If you are not using a condensate pump, ensure that the drain line is pitched downward at a minimum slope of 1/4 in per foot.

! CAUTION

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

Condensate Neutralizer Kit

! WARNING

- ⚠ **DO NOT** allow exhaust flue gases to vent through the neutralizer. Leakage can cause injury or death from carbon monoxide.
- ⚠ **DO NOT** connect more than one appliance to the neutralizer.
- To avoid damaging the appliance, the neutralizer inlet and discharge must be lower than the condensate drain.
- The connection between the appliance and the neutralizer must be installed to prevent the back flow of condensate into the appliance.

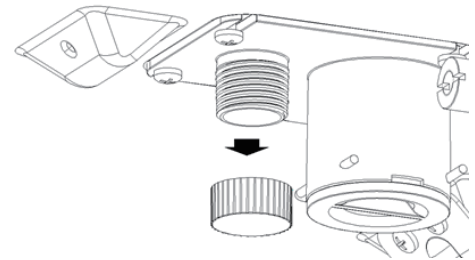
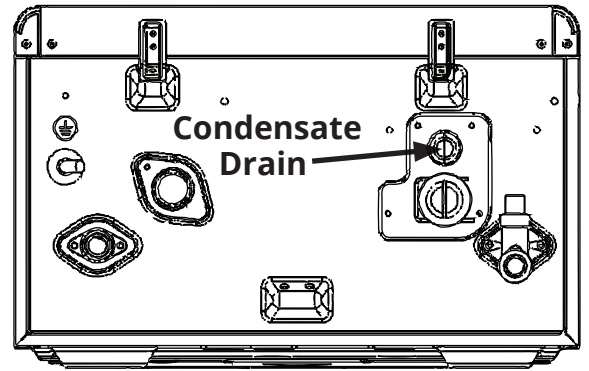


Fig 12.2

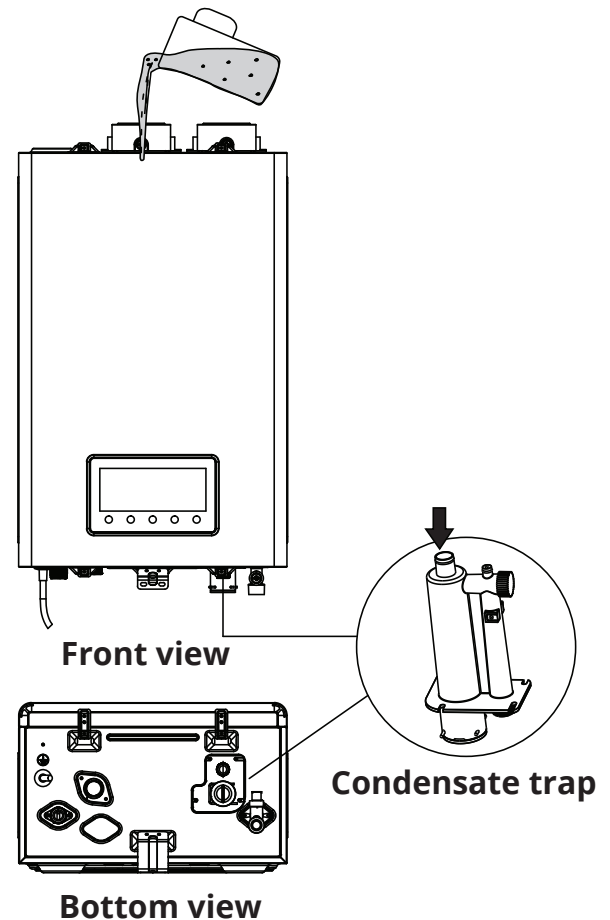


Fig 12.3

Connecting the Condensate Drain

If option B is selected for condensate disposal (condensate flows through the neutralizer and directly into an external drain), the condensate will flow through the neutralizing media and its pH level will increase. An increased pH level will prevent corrosion of the installation's drainage system and the public sewer system.

Neutralizer Installation Guidelines:

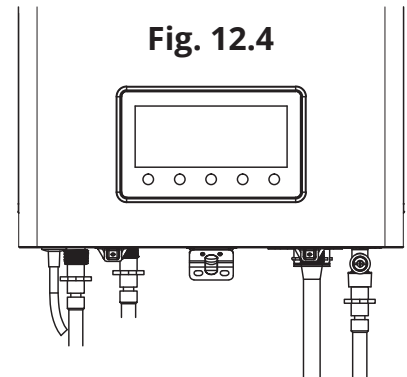
- The inlet of the neutralizer has a center connection point and the outlet will have an offset connection point.
- Install the neutralizer on the wall or the floor and secure it using the brackets supplied with the kit.
- **If the neutralizer is installed horizontally**, rotate the neutralizer to position the outlet at the highest point. (Refer to Fig. 12.4)
- **If the neutralizer is mounted vertically**, ensure that the outlet is higher than the inlet. (Refer to Fig. 12.5)
- Ensure that the condensate runs freely to the drain.
- Ensure all connections are made to prevent the back-flow of condensate.
- Use corrosion resistant piping and secure it to prevent movement.
- For increased safety, in the event there is a blockage in the condensate drain, install a Y fitting. Connect the Y fitting (as shown in the diagrams to the right) and ensure condensate can run freely to the drain.
- Ensure that the discharge connection is accessible, as access is required for maintenance and pH testing.
- If there is an insufficient gradient for drainage, install a drainage pump designed for water heater & boiler condensate removal.

NOTE

- ⚠ **DO NOT** install condensate piping in areas where the temperature drops below the freezing point.
- **Protect piping in high pedestrian areas from damage and vibration.**

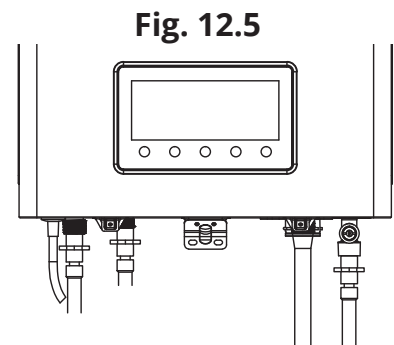
Maintenance of Neutralizer

Periodically monitor the level of media in the neutralizer and test the pH level at the condensate drain outlet. We recommend an annual pH test using recognized test strips or an electronic pH meter to obtain precise measurements. Replace the neutralizing media when the pH drops below the minimum level required by the local water authority. If the pH level is not specified, replace the neutralizing media when the pH is below 6.0. For replacement media, contact the local service.



Optional
Overflow
Bypass

To external drain



Optional
Overflow
Bypass

To external drain

Venting the Water Heater

WARNING

This appliance is certified as a “Category IV” appliance and requires a special venting system. The vent system will operate with a positive pressure in the pipe. Exhaust gases must be piped directly outdoors using the vent materials and rules outlined in these instructions. Follow the venting instructions carefully. Failure to follow these instructions will result in substantial property damage, severe personal injury, or death.

- ⊘ **DO NOT** connect vent connectors serving appliances vented by natural draft into any portion of mechanical draft systems operating under positive pressure.
- Improper venting of the water heater can result in excessive levels of carbon monoxide, which can lead to severe personal injury or death. This water heater must be vented in accordance with the “Venting of Equipment” section of the latest edition of the ANSI Z223.1/NFPA 54 Natural Fuel Gas Code in the USA and/or the “Venting Systems and Air Supply for Water Heaters” section of the latest version of the CAN/CGA B149.1 Natural Gas & Propane Installation Code in Canada, as well as all applicable local building codes and regulations. Follow all instructions and guidelines when venting the water heater. Installation of a venting system should ONLY be performed by a licensed professional.
- The venting system must be sealed airtight to prevent flue gas spillage and carbon monoxide emissions, which will result in severe personal injury or death.
- The building owner is responsible for keeping the air intake and exhaust termination free of snow, ice, or other potential obstructions, as well as scheduling routine maintenance. Blocked or obstructed vent piping terminations could result in property damage, severe personal injury, or death.

The water heater must be properly vented to ensure a constant supply of clean intake air and to ensure that exhaust air is properly removed from living areas. When venting the water heater, follow these guidelines:

- ⊘ **DO NOT** install the water heater in areas with contaminated air (high levels of sawdust, dust, sand, flour, aerosols, or any other airborne contaminants), as this could cause the unit to have operational issues. Damage that is caused as a result of the unit being operated and installed in an area with contaminated air **WILL NOT** be covered by the warranty. If you must install the water heater in an area with contaminated air, use direct venting to supply air from outside of the building. It is recommended that regular intervals of maintenance and filter cleaning be performed when installed in these areas.
- ⊘ **DO NOT** connect the water heater vent to a vent for any other gas water heater or vent stack.
- ⊘ **DO NOT** obstruct heater air intake or exhaust. Support all vent piping per manufacturer’s installation instructions.
- ⊘ **DO NOT** place chemical vapor emitting products near the unit.
- ⊘ **DO NOT** operate the heater unless it is vented to the outdoors.
 - Install the water heater as close as possible to the vent termination.
 - For horizontal runs, slope the horizontal section upward toward the vent termination at a rate of 1/4 in. per foot (2% slope).
 - Create an airtight seal at each joint in the exhaust and intake air pipes from the water heater collar to the vent termination connecting the pipe to the vent collar.
 - Analyze the entire vent system to make sure that condensate will become trapped in a section of vent pipe and reduce the open cross-sectional area of the vent.
 - According to NFPA 720, carbon monoxide detectors should be installed outside each sleeping area.

Venting the Water Heater - Overview

Connecting the Pipe to the Vent Collar

NOTE

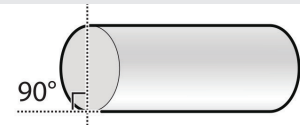
- ⊘ **DO NOT** use primer or cement on the appliance connection.
- The products covered in this manual are designed for 2 in. vent pipes. Both vent pipes can be installed without an external adapter. When installing the vent pipe, please refer to the following pages for selection & installation of the correct vent piping for your application.
- Covering non-metallic vent pipe and fittings with thermal insulation is prohibited.

⚠ WARNING

Ensure the ends of the vent pipe are properly beveled to 90° prior to installation. Also ensure the pipe is fully connected to the exhaust gas vent fitting. Failure to properly bevel and install the pipe correctly could lead to gasket failure and flue gas leakage, which could result in serious injury or death.

Vent Pipe Installation

1. Measure 1.8 in (45 mm) from the end of the vent pipe and then draw a mark at that distance.
2. Insert the pipe into the vent collar to start the vent run. Make sure to completely slide the vent into the collar until the end makes contact with the bottom of the socket. (See Fig. 13.1)
3. Verify that 1.8 inches of the pipe has been completely inserted into the collar and that the mark is no longer visible. The pipe will be tightened and sealed by the rubber gasket.



⚠ CAUTION

- ⊘ **DO NOT** start the vent run with a street elbow at the vent collar. Using an elbow directly at the collar will not allow for a tight seal between the appliance and the vent pipe. A section of straight pipe must be used when starting the vent run.

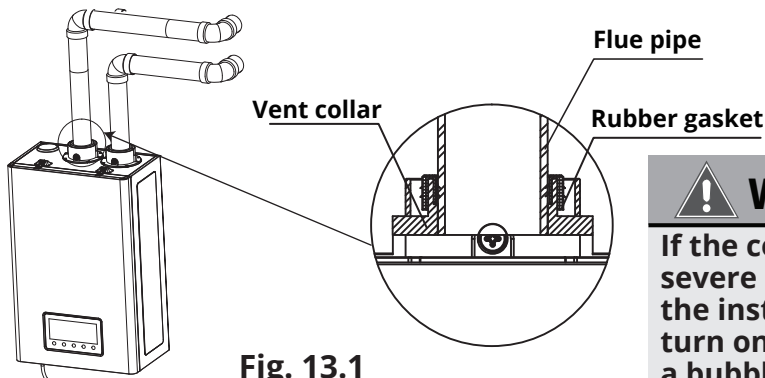


Fig. 13.1

⚠ WARNING

If the connections leak, harmful gas could cause severe personal injury or death. After completing the installation, and the unit is filled with water, turn on the water heater and test it for leaks using a bubble test kit. After applying the soap solution, bubbles will form on the connections if leaks exist.

Vent Termination Guidelines:

- ⊘ **DO NOT** store hazardous material or flammable substances near the vent termination.
- To avoid moisture and frost build-up and to maintain clearances on adjacent homes, 45° & 90° elbows and tees may be attached to the end of the termination vent pipe to direct the exhaust plumes away from buildings. However, the total allowable vent lengths, maximum number of elbows, and distances to air intake restrictions must be observed.
- If this water heater will be installed in areas where snow is known to accumulate, protect the vent termination blockage.
- Ensure that the vent termination is at least 12 in (305 mm) above the highest anticipated snow line, or as required by local codes, whichever is greater.
- Support the vent pipe with hangers at regular intervals, or as required by local codes.
- Exhaust and intake air pipes must be supported at least every 4 ft (1.2 m).
- The vent for this appliance shall not terminate over public walkways, near soffit vents or crawlspace vents, where condensate or vapor could create a nuisance, hazard, or cause property damage. Nor where condensate or vapor could cause damage or could be detrimental to the operation of regulators, relief valves, or other equipment.

The water heaters referenced in this manual are classified as Category IV appliances and are prepared at the factory to be direct vent (sealed combustion) appliances that draw all of their required combustion air directly from the outdoors. The manufacturer recommends direct air vent installations whenever possible to avoid the back-drafting of cold air through the water heater. If you cannot use a direct vent, ensure that there is an ample supply of usable air available in the installation location.

The manufacturer also recommends installing a new vent system with this appliance. In the event an existing vent system is reused, ensure it is thoroughly inspected for punctures, cracks, or blockages before it is connected to the water heater.

Direct Venting

The water heater uses 2 in. diameter exhaust and 2 in. diameter intake air ducts. To ensure the draw of air directly from and exhaust of air directly to the outside of the building, create an airtight seal from the water heater collar to the vent termination.

Intake materials can be made of ABS, PVC, CPVC, PP, galvanized steel, corrugated aluminum or any other such materials. If you use a corrugated material, ensure that there is not crimping or damage to the intake air pipe.

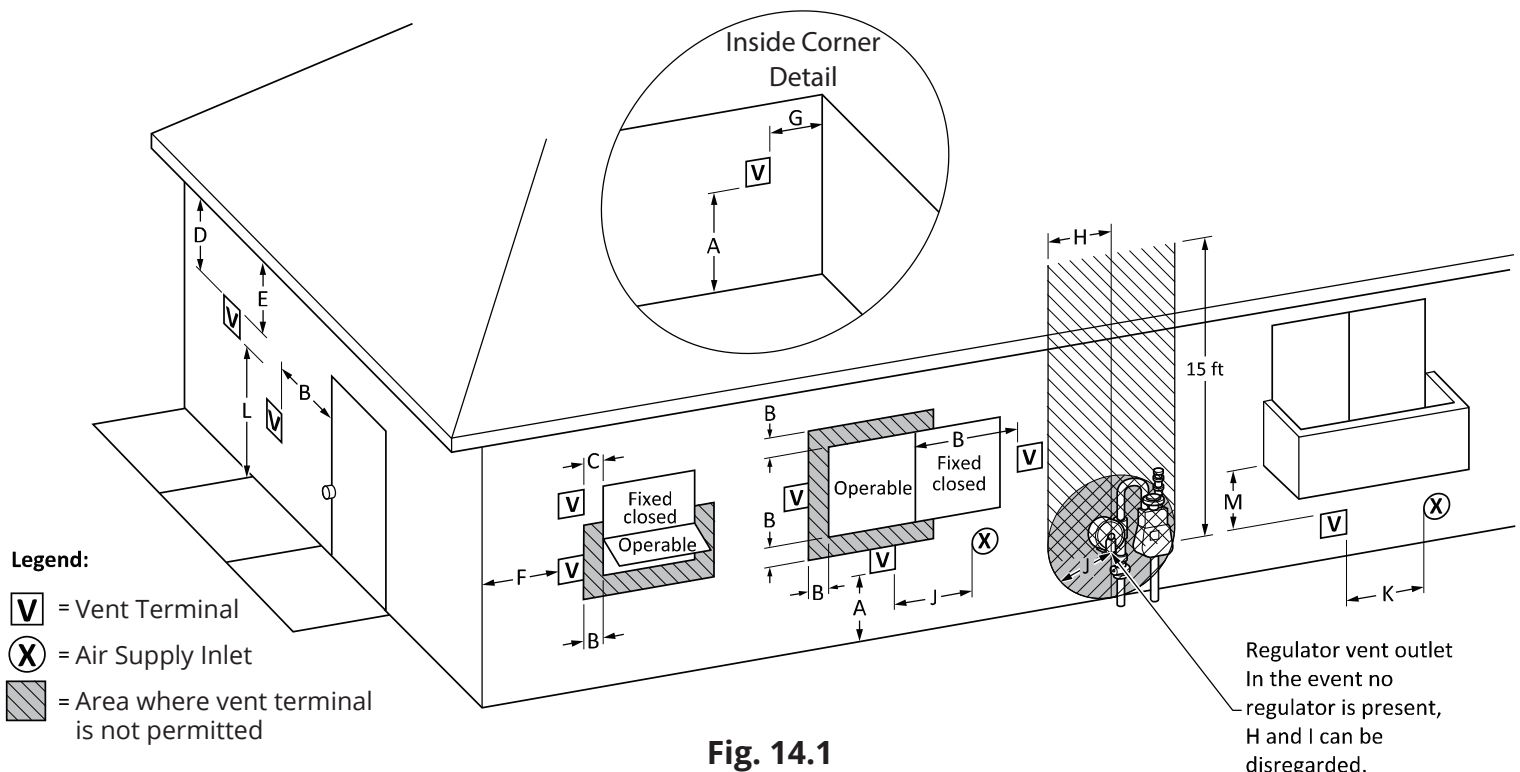
When using direct venting, maintain the following venting clearances, as required by ANSI Z21.10.3 and the National Fuel Gas Code, ANSI Z223.1/NFPA 54, and CAN/CGA B149.1 Natural Gas and Propane Installation Code:

Failure to provide a properly installed vent and air system will cause personal injury or death!

NOTE

These installation instructions reference snow levels in establishing a minimum height for the installation of the exhaust vent or air intake terminations. Snow levels are determined as follows:

- a.) The installation location, by ordinance, designate the calculation of the snow levels in that location.
- b.) In the absence of specific ordinances, snow levels should be calculated from the average of monthly maximum depth of snow accumulation as indicated by the 10 year statistics for the installation/geographical area by the National Weather Service.



Selecting a Vent Type

	Description	Canadian Direct Vent	US Direct Vent
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.	36 in (91 cm)	12 in (30 cm)
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.	3 ft (91 cm) within a height of 15 ft (4.6 m) above the meter/regulator assembly	*
I	Clearance to service regulator vent outlet.	36 in (91 cm)	*
J	Clearance to non-mechanical air supply inlet to building or the combustion air inlet to any other appliance.	36 in (91 cm)	12 in (30 cm)
K	Clearance to a mechanical air supply inlet.	6 ft (1.8 m)	36 in (91 cm) above if within 10 ft
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)‡	*

1. In accordance with the current with the current CSA B149.1 Natural Gas & Propane Installation Code.

2. In accordance with the current ANSI Z223.1/NFPA 54 National Fuel Gas Code.

† A vent shall not terminate directly above a sidewalk or paved driveway that is located between two single-family dwellings and serves both of those dwellings.

‡ Permitted only if veranda, porch deck, or balcony is fully open on a minimum of two sides beneath the floor.

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

Selecting Vent Pipe Materials

15

Venting requirements differ in the U.S. and Canada. Consult the following chart, or the most recent edition of ANSI Z223.1/NFPA 54 or CAN/CGA B149.1, as well as all applicable local codes and regulations when selecting vent pipe materials.

- ⊘ **DO NOT** use cellular core PVC (ASTM F891), cellular core CPVC, or Radel (polyphenolsulfone) for the exhaust vent.

WARNING

- ⊘ **DO NOT** mix components from different systems. The vent system could fail and harmful elements from the flue could leak into the living space. In the event this occurs, it could cause serious personal injury or death.
 - Mixing of vent materials **WILL VOID THE WARRANTY** and certification of the appliance.

Location	Recommended Vent Materials
USA	<ul style="list-style-type: none">• PVC/CPVC Schedule 40 or 80 (Solid Core)• Approved Polypropylene (PP)
Canada*	<ul style="list-style-type: none">• Type BH Special Gas Vent Class IIA (PVC)• Type BH Special Gas Vent Class IIB (CPVC)• Type BH Special Gas Vent Class IIC (Polypropylene/Stainless Steel)

*For Installation in Canada, field-supplied plastic vent piping must comply with CAN/CGA B149.1 (latest edition) and be certified to the Standard for Type BH Gas Venting Systems, ULC-S636. Components of this listed system must not be interchanged with other vent systems or unlisted pipes or fittings. All plastic components and specified primers & glues of the certified vent system must be from a single system manufacturer and must not be intermixed with another system manufacturer's parts.

NOTE: The supplied vent connector and vent termination are certified as part of the water heater.

The maximum vent length when using 2 in. exhaust ducts is 60 ft (18 m). The intake duct length may be identical to the exhaust duct length. One foot straight pipe and an 90° elbow are not included in the vent length. The maximum vent length is reduced by the number of elbows used, as shown in the table below:

Vent Size	Max. Length	Equivalent Lengths
2 in	60 ft (18 m)	Reduce the maximum vent length accordingly for each elbow used: <ul style="list-style-type: none">• Each 90° elbow equates to 5 linear ft. (1.5 m) of vent length.• Each 45° elbow equates to 2.5 linear ft. (0.8 m) of vent length.• The number of 90° elbows cannot exceed 7.• The number of 45° elbows cannot exceed 14.

NOTE: The use of a PVC or polypropylene concentric termination counts as 5 linear feet (1.5 m) of vent.

NOTE

When the exhaust pipe is too long, the gas load will be reduced due to the influence of air resistance.

- ⚠ **DO NOT** exceed the maximum length of the vent. Excessive length may result in heater shutdown and property loss.
- ⚠ **DO NOT** make the exhaust pipe shorter than the minimum length allowed. If the length of the pipe is too short, the exhaust gas generated by gas combustion could enter into the air inlet of the machine, which could lead to incomplete combustion, and result in heater failure, property loss, personal injury, or death.

Before installing the water heater, determine what type of vent termination is appropriate for the installation location and materials. The following sections describe some typical venting configurations, but do not include all possible options. The examples shown below and the following pages are possible indoor venting options.

The following PVC terminals listed in the table below have been approved to be adequate for the units mentioned in this manual.

Brand	Model	Type	Part #	Note
DiversTech	DiversTechH	Low profile	HVENT-2	2 in (51 mm)

NOTE

- Only the termination models listed in this manual are approved for use with this appliance
- Only terminations produced by the same manufacturer as the vent system must be used.
- Refer to the vent manufacturer's instructions for detailed installation procedures and guidelines.

(A) Two-Pipe Sidewall Venting



WARNING

The vent system must be installed by an authorized technician or licensed professional. Improper installation may cause appliance failure, property damage, severe personal injury, or death. Improper installation will also void the warranty of the water heater.

If the distance between the air inlet and exhaust vent terminations is less than 7 ft. (2.1 m), the water heater will draw in exhaust gases through the intake. This creates a risk of inadequate combustion air for the water heater, which can increase the amount of Carbon Monoxide (CO) emissions and noise due to vibration.

- Termination elbows must be oriented vertically, ensuring they point directly downward. Attempt to prevent exhaust air from entering the air inlet by angling termination elbows in directions other than directly downward will increase the risk of freezing.
- Reversing the air intake and exhaust pipes is not allowed. Carbon Monoxide (CO) emissions and noise due to vibration will increase.

In case of severe weather, such as an earthquake, tornado, or other natural disasters, have a trained professional check the vent pipe for any damage, that the exhaust flows normally, and the unit functions properly.

NOTE

- Install the bird screen at the end of the terminal elbow when a two-pipe sidewall venting method is applied.
- If glue and other solvent cement are used during the installation, please follow the manufacturer's instructions when using.
- Please refer to the illustrations on the following page for the dimension requirements when using this method of venting.

Terminating the Vent

Two-Pipe Sidewall Venting Example 1:

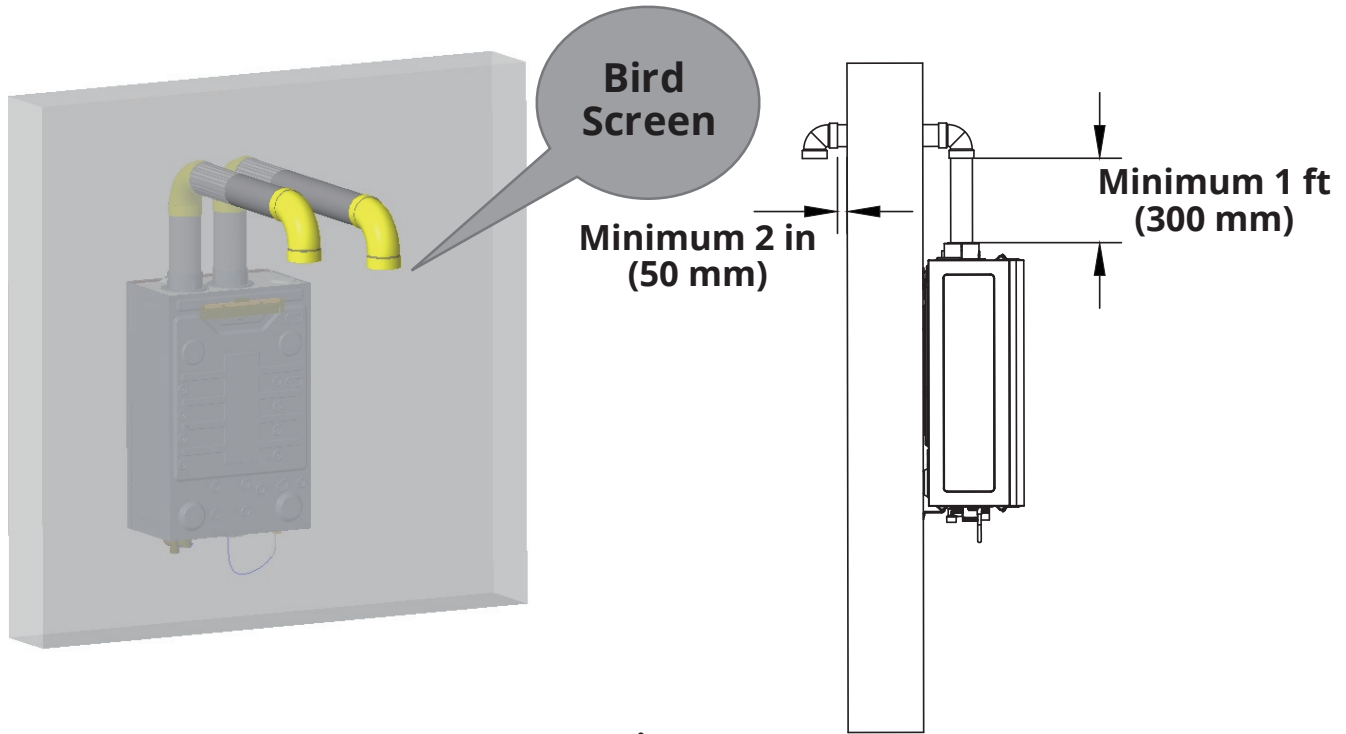


Fig. 17.1

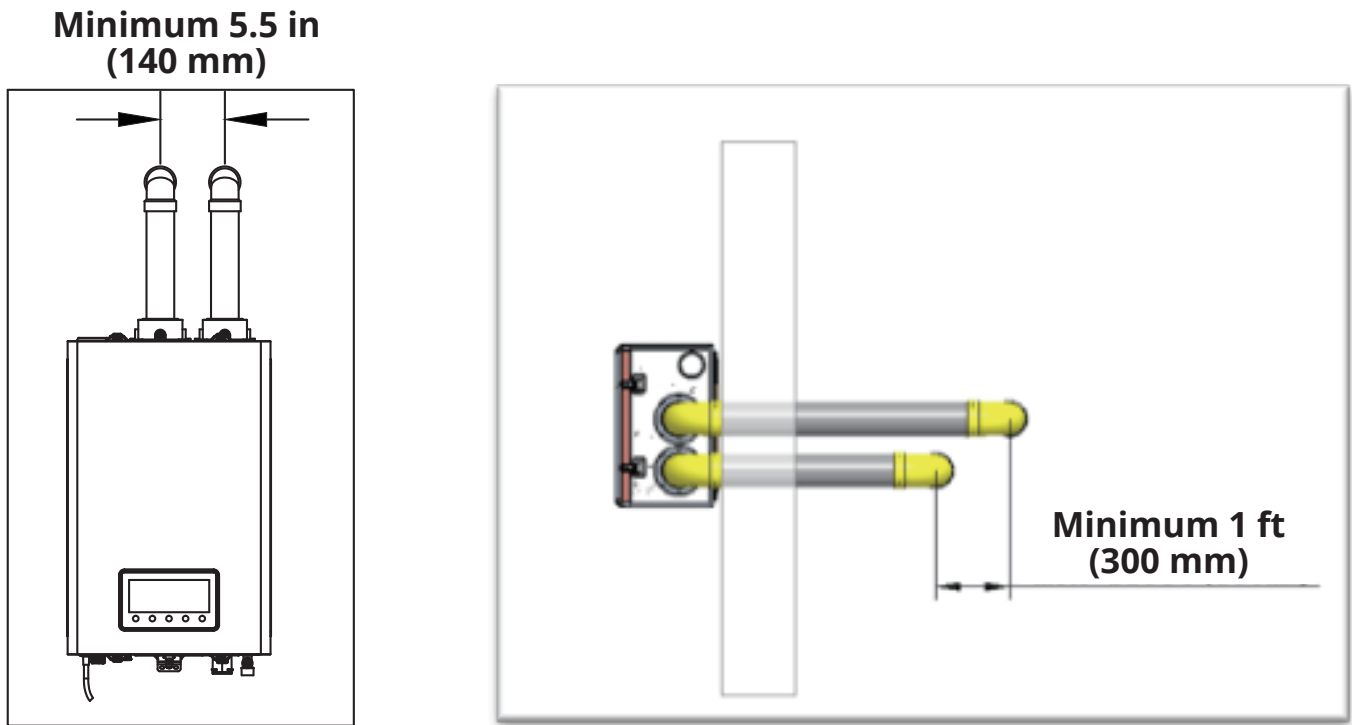


Fig. 17.2

Terminating the Vent

Two-Pipe Sidewall Venting Example 2:

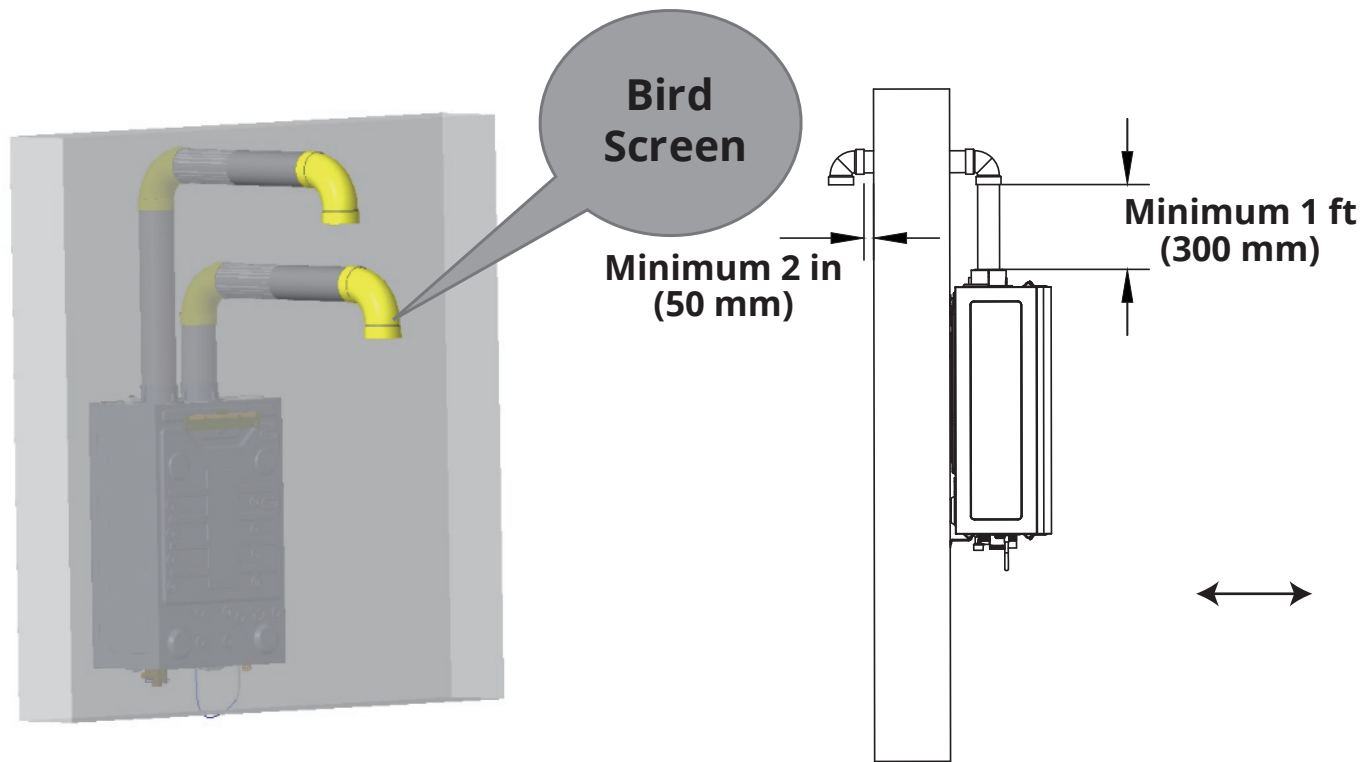


Fig. 17.3

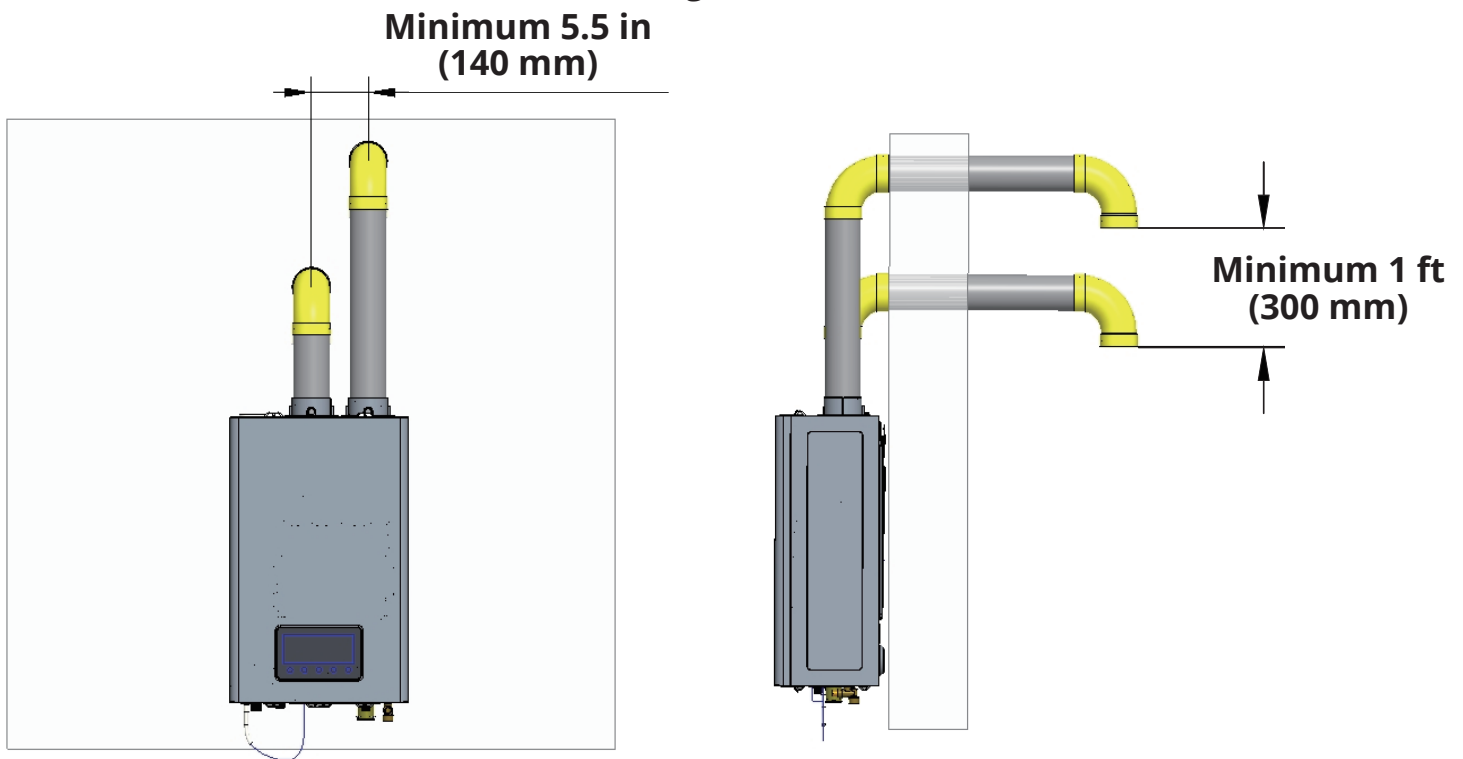


Fig. 17.4

Terminating the Vent

(B) Low Profile Two-Pipe Sidewall Venting*:

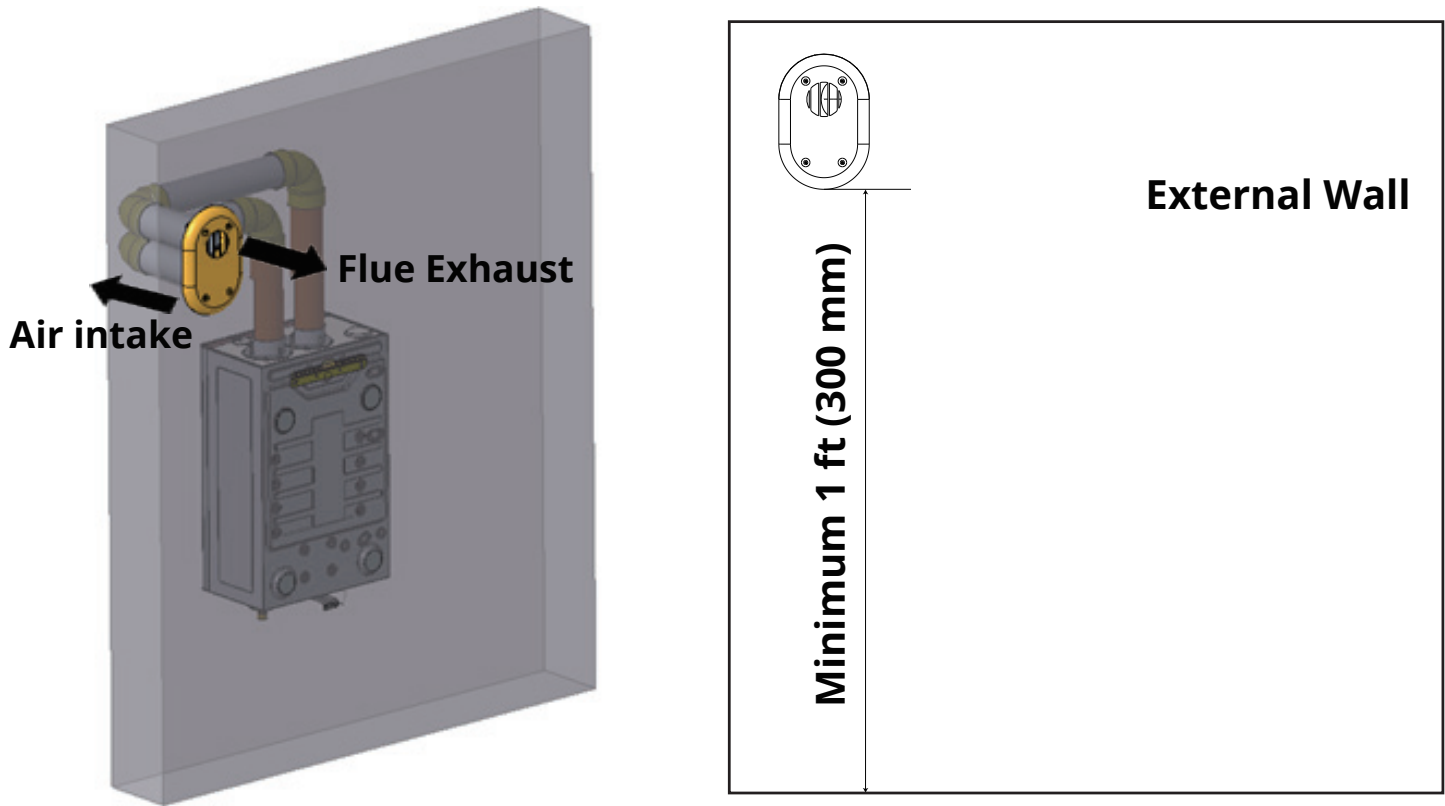


Fig. 17.5

***IPEX and Centrotherm Low Profile terminations ONLY.**
Clearance above the highest anticipated snow level or grade,
or as required by local codes, whichever is greater.

NOTE

Only the following orientations are allowed for twin pipe terminations.



Fig. 17.6

WARNING

The products referred to in this manual utilize an external electrical source. When installed, the unit must be electrically grounded in accordance with local codes or, in the absence of local codes, with the National Electrical Code, ANSI/NFPA 70, and/or the CSA C22.1, Canadian Electrical Code, Part 1.

Improperly connecting the power supply could result in personal injury, electrical shock, and/or death!

When connecting the power supply, follow these guidelines:

- ⊘ ***DO NOT*** connect the electrical supply until all plumbing and gas piping is complete and the water heater has been filled with water.
- ⊘ ***DO NOT*** connect the water heater to a 220-240V AC power supply. Doing this will damage the water heater and void the warranty.
- ⊘ ***DO NOT*** run a dedicated electrical line to the water heater. All water heaters come with a 3-pronged (grounded) plug. The water heater can be plugged into any grounded electrical outlet nearby to the installation location, as the unit only requires 2-4 Amps to operate.
- ⊘ ***DO NOT*** use a broken or modified power cord.
- ⊘ ***DO NOT*** bind, bend, or stretch power cords.
 - Keep power cord free of dust.
 - If local codes require the water heater to be wired directly, remove and discard the factory-installed plug. Install a power switch between the breaker and the water heater to facilitate any end-user maintenance and servicing. Connect the water heater to a 110-120V AC, 60 Hz rated electrical supply that has a maximum of 2 Amps (4 Amps if an external pump is connected).
 - The water heater must be electrically grounded. If using the power plug, ensure the electrical outlet that the water heater will be connected to is properly grounded. If wiring the water heater directly to a power supply, ***DO NOT*** attach the ground wire to the gas or water piping, as plastic piping or dielectric unions could prevent proper grounding.
 - It is recommended to use a surge protector to protect the water heater from power surges.
 - If there is a power failure in cold weather areas, the freeze protection system in the water heater will not operate and could result in freezing of the heat exchanger. In cold weather areas, where power failures are common, the water heater must be completely drained to prevent damage if the power will be off for an extended period of time. A battery back-up, which is available at most computer retailers, can be used to supply hot water during power outages. Damage caused by freezing temperatures due to a power loss is ***NOT*** covered by the warranty.

If the water heater will not be used for an extended period of time, follow these steps:

1. Completely drain the water out of the water heater.
2. Disconnect the power supply to the water heater. This will prevent the water heater from freezing and becoming damaged.

CAUTION

Label all wires before disconnecting them when you work on the controls. Wiring errors can cause improper and dangerous operation. Verify proper operation after servicing.

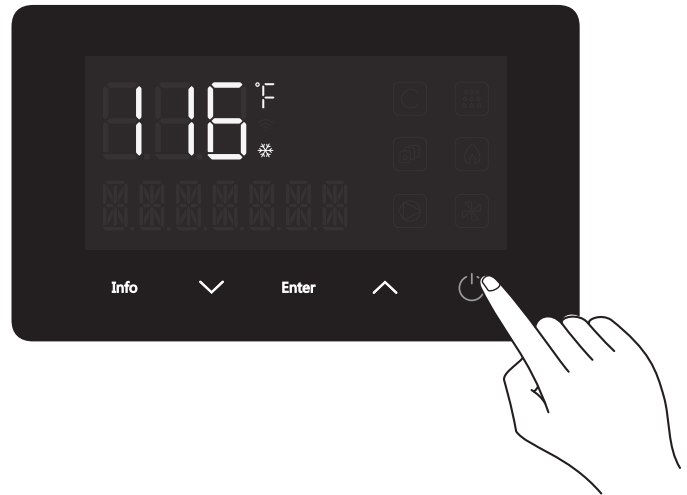
WARNING

Follow the instructions below to avoid unsafe operating conditions that could cause property damage or severe personal injury or death.

- Ensure the water heater is filled with water before using the water heater. If the water heater's gas valve cannot shut off the gas supply, shut off the gas supply to the water heater at the manual gas valve and call a qualified technician.
- If any part of the water heater has been submerged in water, do not use this appliance, immediately cut off the power supply, and call a qualified technician.

Power On/Off

Press the **POWER** button to turn on/off, the temperature setting will show on the display, and the buzzer will sound once when the power is turned on.



Temperature setting

WARNING

Before adjusting the temperature, pay attention to whether the water heater is functioning. Water temperatures above 122°F (50°C) can cause skin to scald instantly, severe burns, or death.

The default temperature setting is 116°F (47°C). To adjust the temperature while the power is on, press the \downarrow or \uparrow buttons. Pressing the button quickly will change the temperature setting in small increments and the buzzer will sound with each press. Holding the button will down will rapidly adjust the temperature setting.

Decrease Temperature Setting



Increase Temperature Setting



Operation

Range of temperature setting	Accuracy
95°F ~ 140°F	1°F
35°C ~ 60°C	1°C

NOTE

- The temperature setting is from 95 to 140° (35-60°C) when burner is off. When burner is on, temperature setting is from 95 to 122° (35~50°C) if current set temperature is below 122°F;
- The temperature setting is from 95 to 140° (35-60°C) if current set temperature is above 122°F. If set temperature is adjusted to a value that is lower than 122°F (50°C), the range becomes 95-122°F (35~50°C).

Set or reset default setting temperature

To reset the default setting temperature, press the **ENTER** button for 3 seconds until the set temperature on the display flashes while the power is on. Then, press the \vee or \wedge keys to reset the default temperature setting.

To switch from current temperature to the default temperature, press the **ENTER** button while the burner is on. The buzzer will beep if successful.



NOTE

If you try to switch the default temperature by pressing ENTER while the burner is on, the system will not allow this and the buzzer will sound twice.

Operation

Information Query

To view unit basic information

1. Press the info button to enter the information query interface while the power is on, **IT** displays as default.
2. Press the **∨** or **∧** buttons to select the information item.
3. Press **ENTER** to show details.

Contents	Description	Units
IT	Inlet Water Temperature	°Fahrenheit/°Celsius
WF	Water Flow Rate	Gallons Per Minute/Liters Per Minute

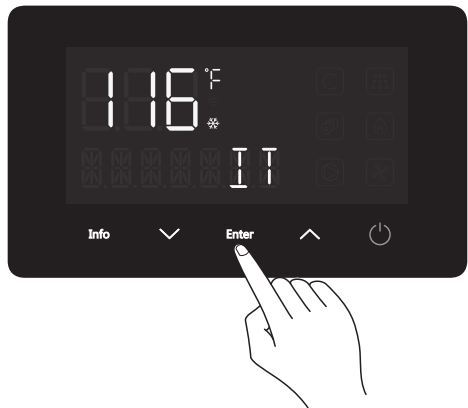
Step 1: Display effect after pressing **INFO** key



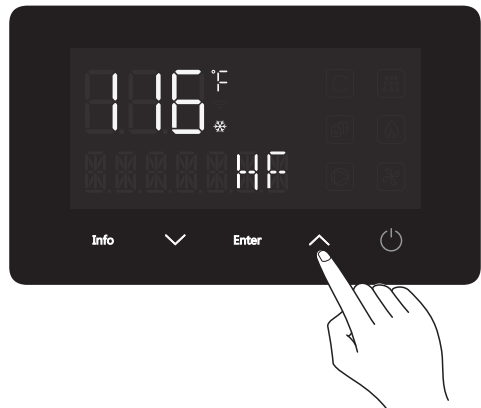
Step 2: Then, press **ENTER** to see the actual effect of IT:



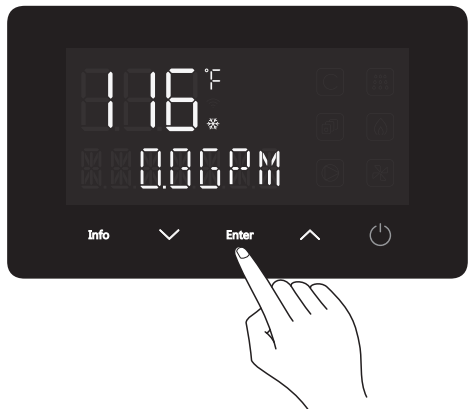
Step 3: Press **ENTER** again to return to the display effect screen.



Step 4: Press the **∧** key to display the effect.



Step 5: Press **ENTER** again to view the WF display effect screen.



Operation

Adjusting Parameters for a High Altitude Area

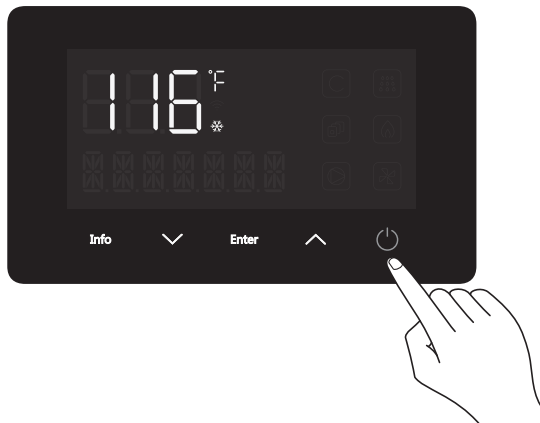
! CAUTION

This operation **MUST ONLY** be performed by licensed professionals.

To change program data:

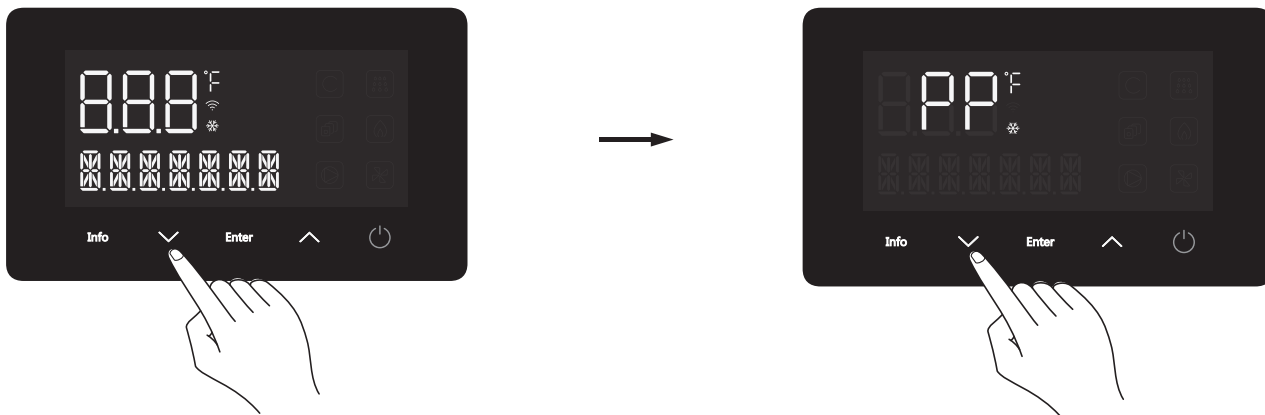
Step 1: Connect the power supply.

Step 2: Turn off the water heater by pressing the **POWER** button.

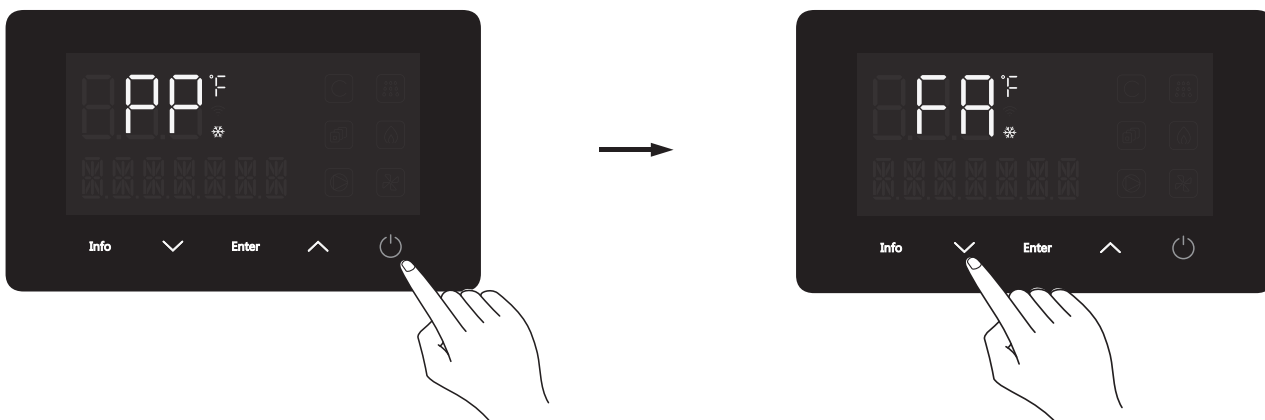


Step 3: Cut off the power supply.

Step 4: Connect the power supply and press the **∨** button for at least 5 seconds until PP is displayed on the screen.

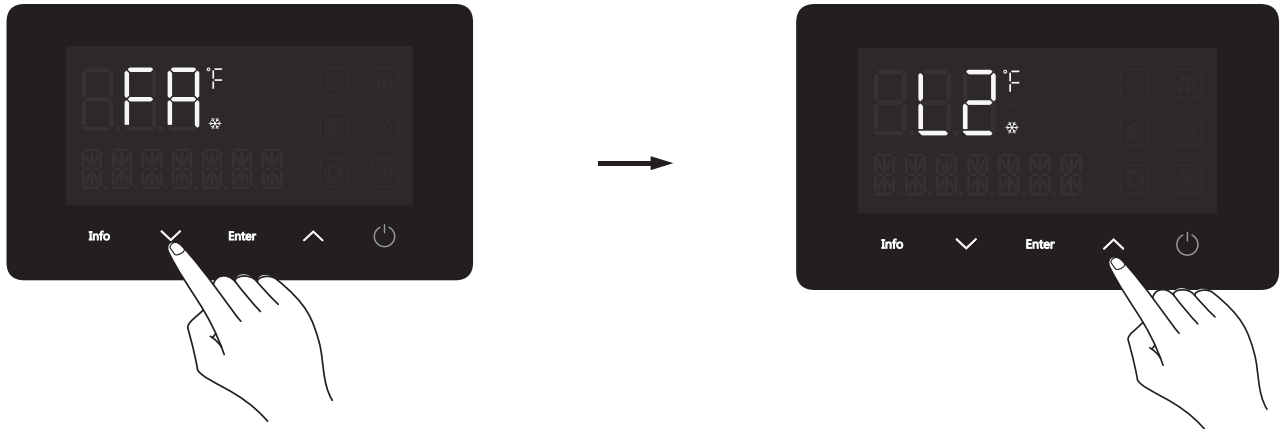


Step 5: Press the **POWER** button and FA will display on the screen.

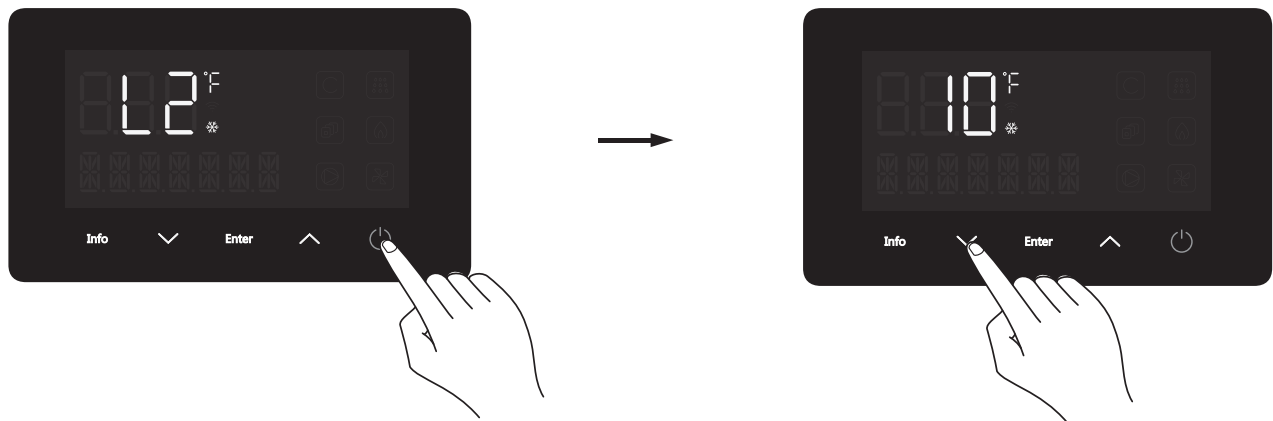


Operation

Step 6: Use the ∇ & \wedge buttons to scroll through the parameter codes until L2 is displayed on the screen.



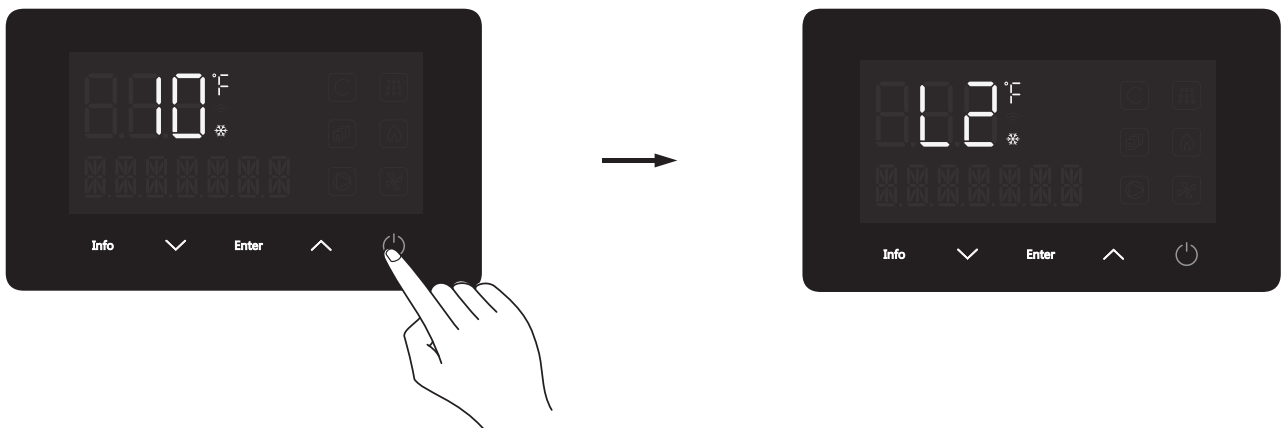
Step 7: Press the **POWER** button, and then press the ∇ & \wedge buttons to adjust the L2 value according to the table below.



Units: feet (meters)

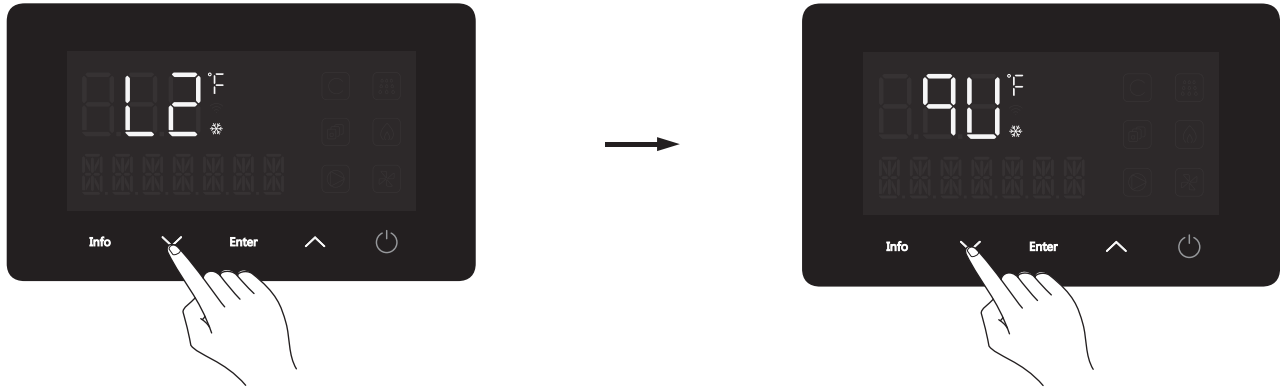
Program data	Altitude setting	
Altitude	2000 ft - 6500 ft (609.6 m - 1981.2 m)	6500 ft - 9800 ft (1981.2 m - 2987.0 m)
L2	05	06

Step 8: Press the **POWER** button again to exit the parameter code adjustment mode.

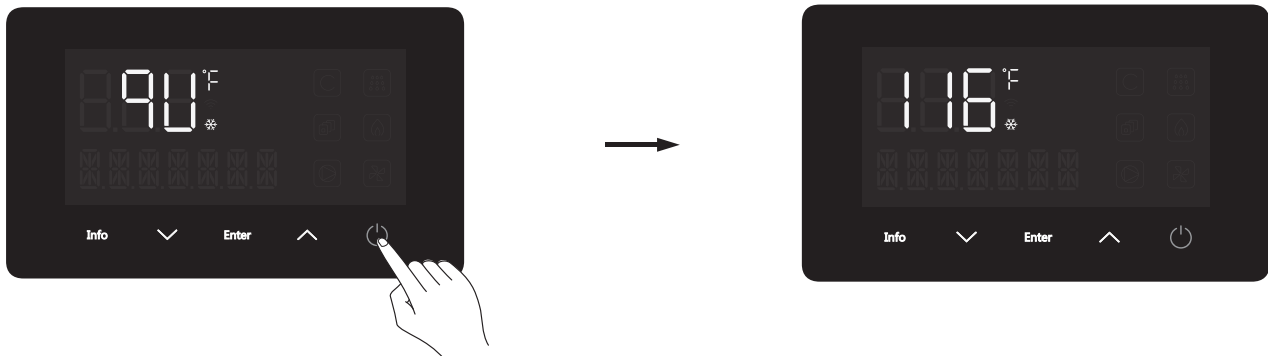


Operation

Step 9: Use the ∇ & \wedge buttons until Qu is displayed on the screen.



Step 10: Press the **POWER** button to save the L2 code and exit the adjustment mode.

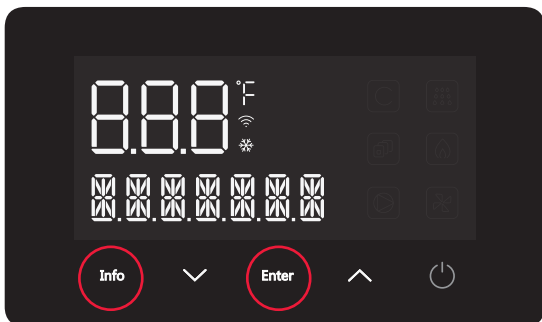


Information Interface for After-Sales

! CAUTION

This operation **MUST** be performed by licensed professionals.

Press and hold the **ENTER** & **INFO** buttons together for 3 seconds to enter the after-sales information interface (OT displays as default). Press the ∇ & \wedge to scroll through the information fields listed below. Once the desired field is selected, press **ENTER** to show more details.



*HE: The most recent 10 error codes can be selected from the list.

**TUW: Total water consumption, displayed in Liter/Gallons (e.g., 1 HL/G means 100L/G-200L/G, 0 HL/G means less than 100 L/G.

***IS: Number of times of Ignition success (e.g., 1H means 100-200 times, 0H means less than 100 times.

Contents	Description	Units
OT	Outlet Temperature	°F/°C
EGT	Exhaust Gas Temperature	°F/°C
HET	Heat Exchanger Temperature	°F/°C
FS	Fan Speed	RPM
BWF	Bypass Water Flow Rate	LPM/GPM
AP	Air Pressure	PA
HE*	Historical Error	N/A
TUW**	Total Water Consumption	HL/G
IS***	Ignition Success Times	H
UA	Version Number of Main Board	N/A
UB	Version Number of Display Board	N/A

Content of the Error code

	ERROR	CODE	DISPLAY	DISPLAY CONTENT
a.)	Hot water outlet Temperature Sensor Failure	E0	E0 Flash	OT SENSOR ERROR
b.)	Accidental Flame Lost	E1	E1 Flash	FLAME LOST ERROR
c.)	Fake Flame	E2	E2 Flash	FAKE FLAME ERROR
d.)	Thermistor Failure	E3	E3 Flash	THERMOSTAT ERROR
e.)	Outlet Temperature Too High	E4	E4 Flash	OT OVERHEAT ERROR
f.)	Fan Failure	E5	E5 Flash	FAN ERROR
g.)	Gas Valve Failure	E6	E6 Flash	GAS VALVE ERROR
h.)	Main Water Valve Failure*	E9	N/A	MAIN WATER VALVE ERROR
i.)	Overtime Failure	EE	EE Flash	HEATING OVERTIME ERROR
j.)	Inlet Temperature Failure	F2	F2 Flash	IT SENSOR ERROR
k.)	Ignition Fail	C0	C0 Flash	IGNITION FAILURE ERROR
l.)	Residual Flame	C1	C1 Flash	FLAME LEFT ERROR
m.)	Vent Blockage	C4	C4 Flash	VENT BLOCK ERROR
n.)	Exhaust gas Temperature Sensor Failure	C9	C9 Flash	EGT SENSOR ERROR
o.)	Exhaust Gas Temperature Too High	CA	CA Flash	EXHAUST GAS OVERHEAT ERROR
p.)	Bypass Water Valve Failure*	CB	N/A	BYPASS WATER VALVE ERROR
q.)	Heat Exchanger Outlet Temperature Sensor Failure	CF	CF Flash	HET SENSOR ERROR
r.)	Watch Dog Circuit Failure	A0	A0 Flash	WATCH DOG ERROR
s.)	MCU PC Command Failure	A1	A1 Flash	MCU CMD ERROR
t.)	Instruction Compilation & Execution Failure	A2	A2 Flash	CMD RUN ERROR
u.)	MCU RAM DC Failure	A3	A3 Flash	MCU RAM DC ERROR
v.)	MCU ROM Failure	A4	A4 Flash	MCU ROM ERROR
w.)	MCU Register DC	A5	A5 Flash	MCU REGISTER ERROR

* These error codes will not display on the screen, however, they can be accessed in the after-sales mode. Please refer to the previous page for more information.

General Maintenance

- Check frequently to see whether the gas supply pipelines (rubber hose) are in good condition without aging or cracks. Pay attention to periodic replacement of rubber hoses. In order to prevent gas leakage, check the joints of pipelines frequently by using suds to see if there are bubbles that form. If bubbles form, there is a leak.
- A water heater must be examined and cleaned after it has been used for a period of time (generally about half a year) to guarantee normal operation of the heater.
- Clean the casing of the unit with water and any neutral cleaner other than harsh chemical cleaner or volatile solvent, otherwise the casing will fade and lose luster.
- Clean the inlet water filter regularly.

! CAUTION

Before performing any maintenance, please follow these steps:

- 1.) Disconnect the power supply and close the gas valve.
- 2.) After the power is turned off, drain the hot water from the faucet until it runs cold. Then, close the water supply valve of the water heater.

Flush the heat exchanger

Scale may build up inside the heat exchanger and block the passage due to the hardness of the water. Periodic flushing is necessary in order to ensure smooth water flow. **It is recommended the heat exchanger be flushed once a year. Damage to the water heater which results from water scale deposited WILL NOT be covered under warranty.**

Please follow these steps when you wish to flush and descale the heat exchanger. It is recommended that you contact a licensed professional to carry out this procedure. (See Fig. 20.1)

1. Connect the empty connection of the isolation valve on the cold water side to the outlet of the circulation pump.
2. Connect the empty connection of the isolation valve on the hot water side to the solution tank.
3. Connect the inlet of the circulation pump to the solution tank.
4. Make sure there's no leakage in any of the connectors.
5. Fill the solution tank with descaling solution. (It's recommended to use white vinegar as a descaling solution. However, if using commercial descaler, please properly follow the instruction of the descaler manufacturer.)
6. Turn the isolation valves and make sure the water loop is switched to the circulation loop.
7. Run the circulation pump until the solution that comes out from the hot water side is clean.
8. Drain the solution from the unit.
9. Disconnect the pipes/tubes for flushing and close the empty connectors of the isolation valves.
10. Turn the isolation valve and switch to the normal water flow.
11. Restore the power supply, gas supply and the water supply.
12. Run the water heater for several minutes to make sure there's no solution remaining in the unit.

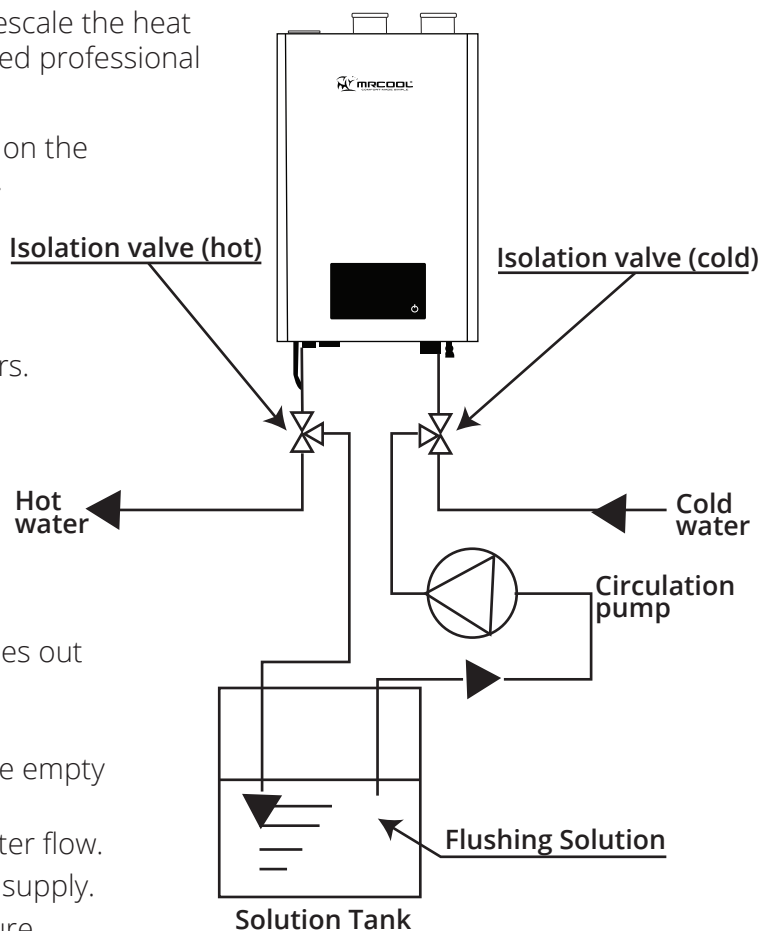


Fig 20.1

General Maintenance

Clean the Inlet Water Filter:

1. Drain the water heater
2. Take out the filter by turning it counterclockwise. **(See Fig. 20.2)**
3. Rinse the filter with clean water, brush or wipe it when necessary.
4. Insert the cleaned filter and tighten it by turning clockwise.

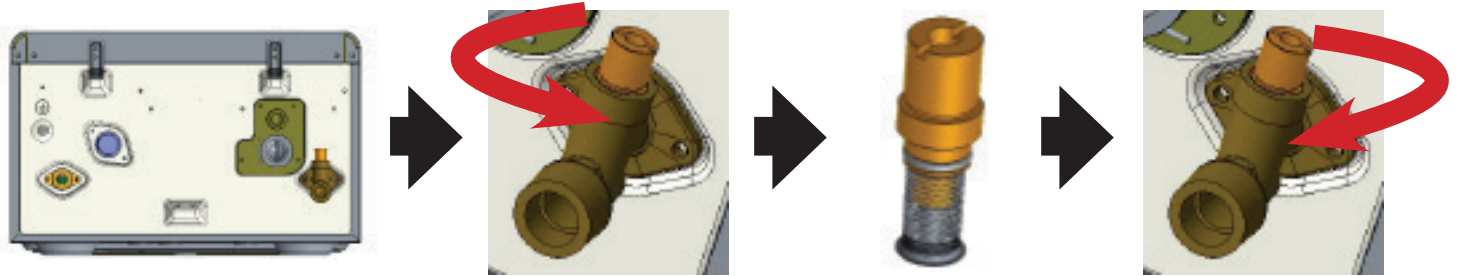


Fig 20.2

Error Codes and Solutions

If you should experience a problem with the water heater, please refer to the following chart for possible remedies. Error codes that appear on the front panel display are explained in the following section. For minor problems or issues, resetting the water heater may resolve the issue. To reset the water heater, press the **POWER** button on the front panel, or turn off the faucet and then back on.

Error Code	Description	Cause	Solution
E0	E0 Displayed	Outlet water temperature sensor open or has short-circuited.	Ensure temperature sensor is properly connected. If connection is good, change the sensor.
			If error still occurs change the MAIN CONTROL BOARD.
E1	Accidental Flame Lost	Gas has run out during combustion or no pressure in the pipeline.	Increase the gas supply pressure to the required value.
		Gas valve operation is unstable.	Replace the gas valve.
E2	Flame Signal Detected Before Ignition	Open circuit formed between flame sensor and the burner or the heat exchanger before ignition.	Unplug the flame sensor from the MAIN CONTROL BOARD, with the power on, but burner off. <ul style="list-style-type: none"> • If E2 persists, change the MAIN CONTROL BOARD. • If E2 does not exist, change the flame sensor.
E3	Thermistor Open Circuit*	Heat exchanger outlet water overheated.	<ol style="list-style-type: none"> 1. Check if there's debris or dirt on the filter of the water inlet. If so, clean the filter (refer to the Clean the inlet water filter section). 2. Check the BWF value (refer to the section regarding the Information interface for after-sales), if it exceeds 0.4 GPM, check the HE, if the CB error can be searched from HE, change the bypass water valve.
		Thermistor failure.	Turn off the unit, use a multi-meter to check if the thermistor is conducting. If E3 exists while the thermistor is conducting, change the MAIN CONTROL BOARD.
E4	Outlet Water Temperature Exceeds 185°F (85°C) For Over 3 Seconds	Outlet hot water overheated.	<ol style="list-style-type: none"> 1. Check if there's debris or dirt on the filter of the water inlet. If so, clean the filter (refer to the Clean the inlet water filter section). 2. Check the BWF value (refer to the section regarding the Information interface for after-sales), if it exceeds 0.4 GPM, check the HE, if the CB error can be searched from HE, change the bypass water valve.
		Temperature sensor failure.	Replace the sensor.

* The unit will not automatically restore while this error code is displayed. Press power off and then on to manually restore the unit.

Troubleshooting

E5	Fan Failure	Cables not connected.	<ul style="list-style-type: none"> • Connect the cables. • If E5 persists, replace the fan.
		Fan controller failure.	
E6	Gas Valve Failure	Cables not connected.	<ul style="list-style-type: none"> • Connect the cables. • If E6 persists, replace the gas valve.
		Solenoid Failure.	
E9**	Fan Failure	Main water valve jam.	Clean the main water valve.
		Main water valve failure.	Replace the main water valve.
EE	Overtime	Operation time exceeds 40 minutes.	Close & open the faucet to restart combustion operation.
F2	Inlet Water Temperature Sensor Failure	Inlet water temperature sensor open or has short-circuited.	<ul style="list-style-type: none"> • Ensure the sensor is connected. • If the sensor is connected & F2 persists, change the sensor. • If F2 persists with a new sensor, change the MAIN CONTROL BOARD.
C0	Ignition Failure	Gas valve not open.	Replace the gas valve.
		Air in the gas supply line.	Attempt to ignite several times to discharge the air.
		Gas supply pressure too low.	Ensure gas supply pressure is within range.
		Nozzle blockage.	Clean the nozzle.
		No signal from flame sensor.	Change the flame sensor, if C0 persists, change the MAIN CONTROL BOARD.
C1	Residual Flame	Gas valve leakage.	Replace the gas valve.
C4	Vent Blockage	Vent pipe blockage.	Clean & remove debris from the vent pipe.
		Ambient wind pressure too high.	Change the terminal to resist higher wind pressure.
		Air pressure sensor failure.	Replace air pressure sensor module.
		Fan failure.	Replace the fan.
C9	Exhaust Gas Temperature Sensor Failure	Exhaust gas temperature sensor is open or has short-circuited.	<ul style="list-style-type: none"> • Ensure the sensor is connected • If the sensor is connected & C9 persists, change the sensor. • If C9 persists with a new sensor, change the MAIN CONTROL BOARD .
CA	Exhaust Gas Temperature Too High	Heat exchanger failure.	Change the heat exchanger.
		Exhaust gas temperature failure.	Refer to C9 above.
CB	Bypass Water Valve Failure	Bypass water valve jam.	Clean the bypass water valve.
		Bypass water valve failure.	Replace the bypass water valve.
CF	Heat Exchanger Outlet Temperature Sensor Failure	Heat exchanger outlet temperature sensor is open or has short-circuited.	<ul style="list-style-type: none"> • Ensure the sensor is connected • If the sensor is connected & CF persists, change the sensor. • If CF persists with a new sensor, change the MAIN CONTROL BOARD .

** These error codes will not display on the screen, but can be accessed in the after-sales mode.



WARNING

This water heater is equipped with a blocked vent shut-off system. Should error codes E5 or C4 occur, turn off the gas valve at the manual shut-off point. Then, check the vent terminations for obstructions. If none are found, press the power button to reset the water heater. If the error code persists, call a qualified service technician or the gas supplier to check the water heater. Failure to follow these instructions could result in property damage, personal injury or death.

Troubleshooting

A0	Watch Dog Circuit Failure	MCU internal failure.	Change the controller.
A1	MCU PC Command Failure	MCU internal failure.	Change the controller.
A2	Instruction Compilation & Execution Failure	MCU internal failure.	Change the controller.
A3	MCU RAM Failure	MCU internal failure.	Change the controller.
A4	MCU ROM Failure	MCU internal failure.	Change the controller.
A5	MCU Register DC	MCU internal failure.	Change the controller.

Corrective Action Recommendations

Issue	Possible Causes	Possible Remedies
No electrical power to the water heater.	Is the plug on the power supply cord unplugged from the electrical outlet?	Reset the plug.
	Has the electrical panel's 10 Amp circuit breaker been tripped?	Reset the circuit breaker.
	Is the fuse on the circuit board good?	If the display panel is blank, unplug the unit & contact a qualified installer or service technician.
	Is there a power outage?	Contact the power company.
No water is available when the faucet is turned on or opened.	Is the water supply valve shut off at the meter (are the cold water faucets still working)?	Open the closed supply valve.
	Is the water supply valve near the unit opened?	Open the water valve.
	Is the water pipe frozen?	Turn OFF the unit, close all water valves and the gas valve. Then, contact a qualified installer or service technician.
	Is the main water valve jammed?	Check to see if an E9 code has been triggered in the error code history of the after-sales mode. If the water supply is OK, and there is no water flow at the hot water outlet, change the main water valve.
Hot water is not available when the faucet is turned on or opened.	Does the water heater have power (is it plugged in)?	Restore electrical power to the unit.
	Is the water heater turned on?	Press & hold the power button to turn the unit on.
	Is an error code flashing on the display panel?	Refer to the error codes & solutions section on the previous pages.
	Is the gas supply valve shut off at the meter (are other gas devices operating)?	Open the gas supply valve.

Troubleshooting

Issue	Possible Causes	Possible Remedies
The water temperature is not hot enough or turns cold during operation.	Is the faucet open enough to draw at least 0.66 gallons (2.5 liters) per minute through the water heater?	Open the faucet to allow more water flow.
	Is an error code flashing on the display panel?	Refer to the error codes & solutions section on the previous pages.
	Is the outlet water temperature set too low?	Adjust the outlet water temperature.
The water is not hot enough.	Is the water temperature set too low?	Adjust the temperature setting.
The water at the faucet is too hot.	Is the water temperature set too high?	Adjust the temperature setting.
A fan can be heard even when the unit is not operating.	The fan continues to operate after the burner shuts off to clear the exhaust vent of combustion gases.	This is a normal pre-purge or post-purge operation, no action is required.
White smoke can be seen coming out of the exterior exhaust gas vent.	Depending on the outside temperature, water vapor can be produced as the exhaust is vented.	This is a normal operation, no action is required.

Diagnosics and Suggested Corrective Actions

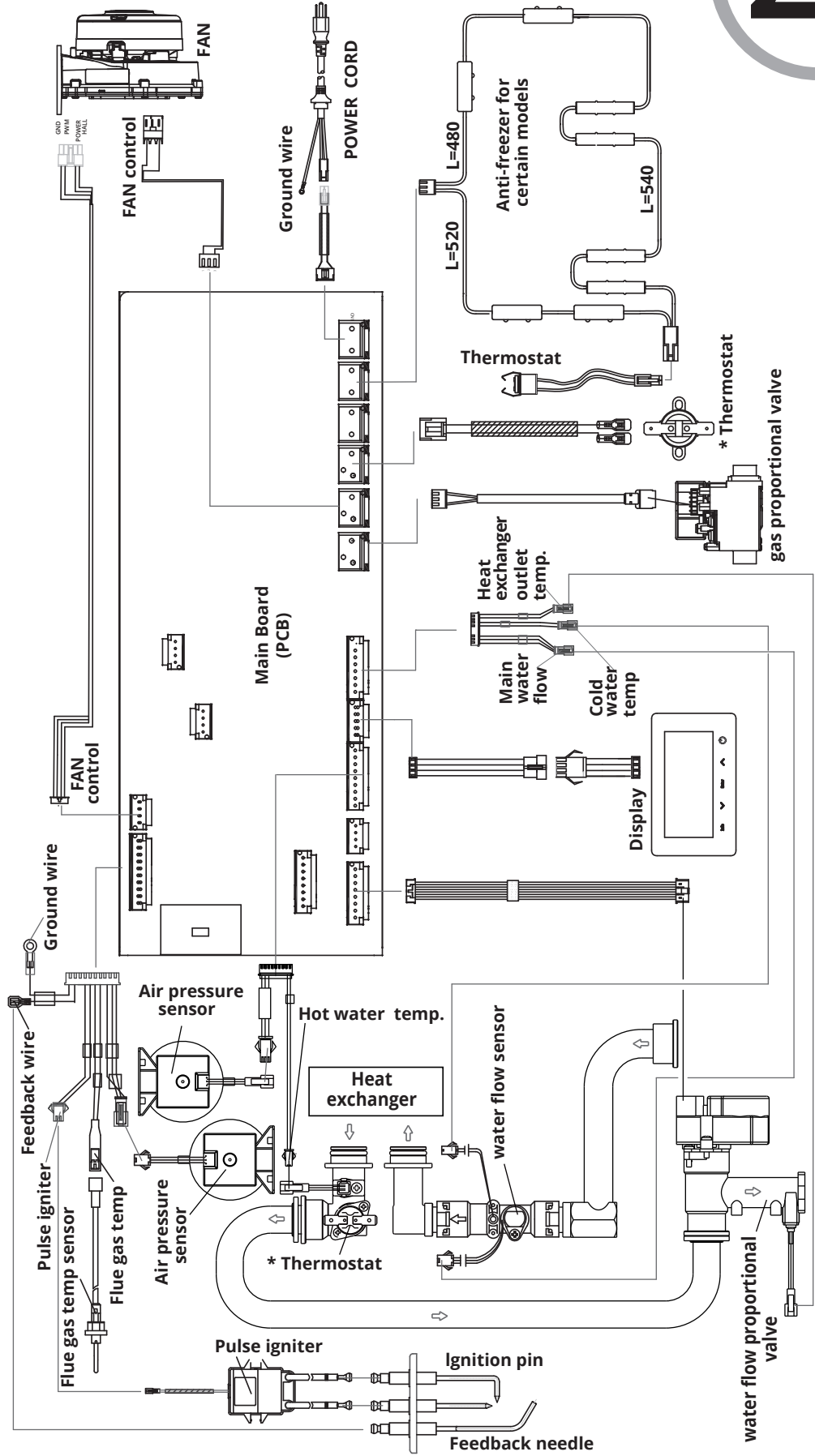
The water heater control panel is able to record information about the water heater's operating condition at the time of the ten most recent faults or errors. This information is available to view in the error code history when accessed in the After-Sales Mode. The following screens will be displayed when reviewing the water heater history. The table below also includes diagnostic information and possible corrective actions.

Display	Condition	Diagnostic	Possible Corrective Actions
Nothing appears on the display panel but the unit beeps.	Main control board is not receiving commands.	Check the wiring to ensure it is correct and there are no short-circuits.	Correct wiring per wiring diagram, including the connection of the transformer to the control.
Nothing appears on the display panel and no other components are operating.	No 120V power supply is being received.	Ensure the power button on the display panel is turned ON.	Turn on the power button on the display panel.
		Is there 120V at the distribution box?	Troubleshoot and correct the power supply to the distribution box.
		Is the power connector on the MAIN CONTROL BOARD disconnected?	Properly connect the power cable to the MAIN CONTROL BOARD.
		Inspect the fuse.	Replace the MAIN CONTROL BOARD.
Display repeatedly goes through initialization sequence.	Occurs when power supply is abnormal.	Power supply voltage too low.	Turn on the power button on the display panel.
		Switching power is malfunctioning.	Replace the MAIN CONTROL BOARD.

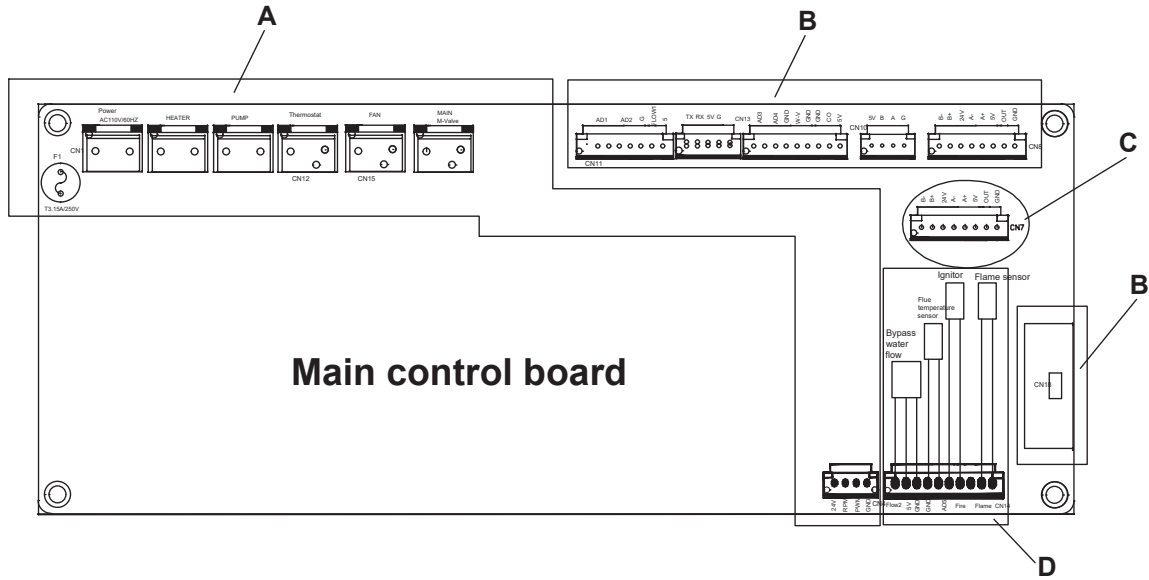
Troubleshooting

Display	Condition	Diagnostic	Possible Corrective Actions
Nothing appears on the display control panel, but the water heater is operating.	This occurs when communications are lost from the control to the display.	Check for loose connections and proper pin alignment/engagement on the control's connector.	Correct wiring per wiring diagram, including the connection of the transformer to the control.
		Power the water heater off and on using the power button on the display board and check for operation.	Replace the display module.

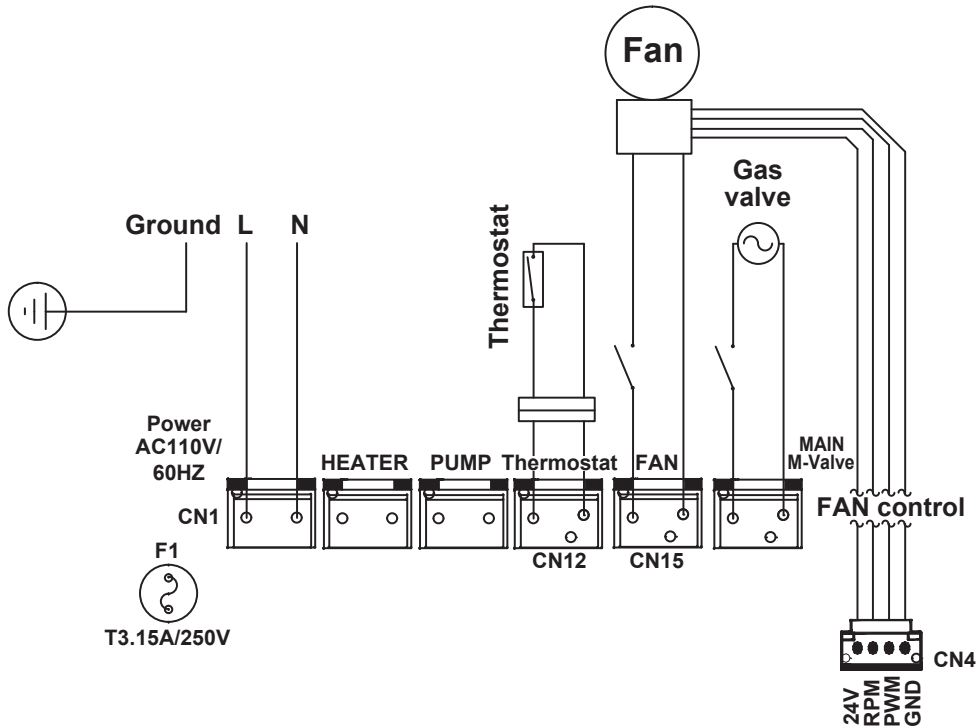
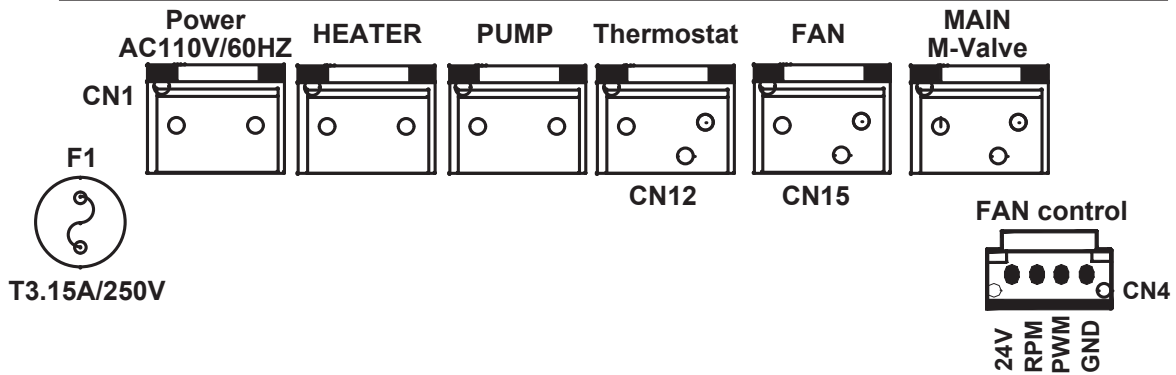
Wiring Diagram



Wiring Connections

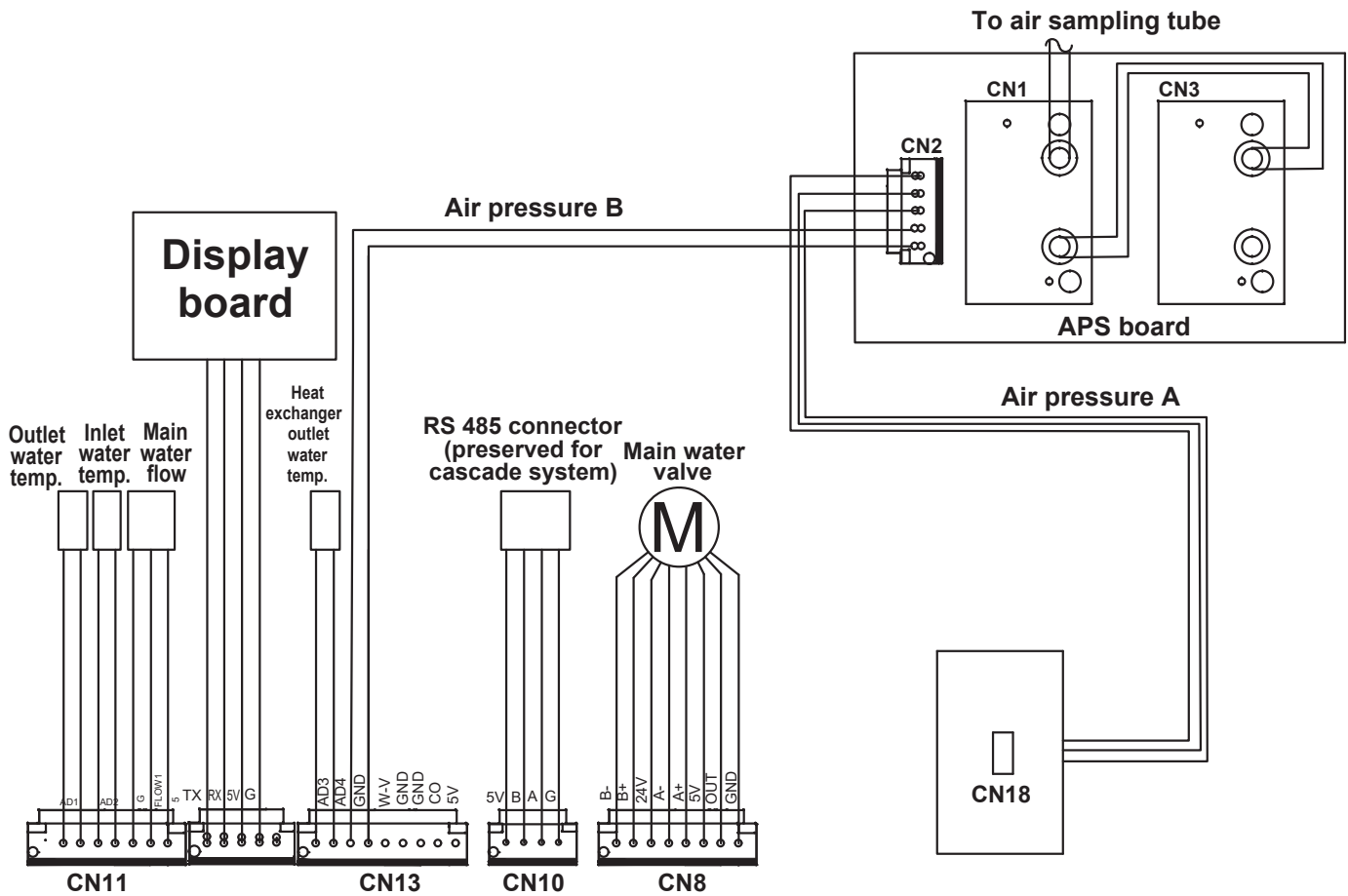
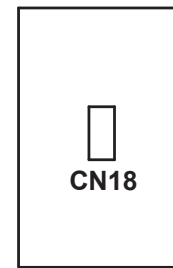
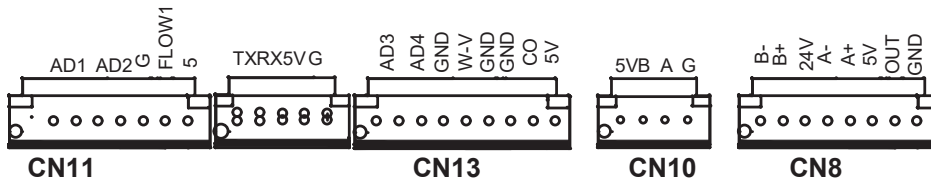
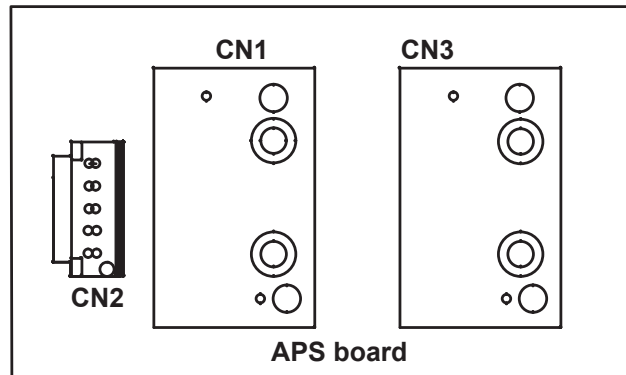


① Area A



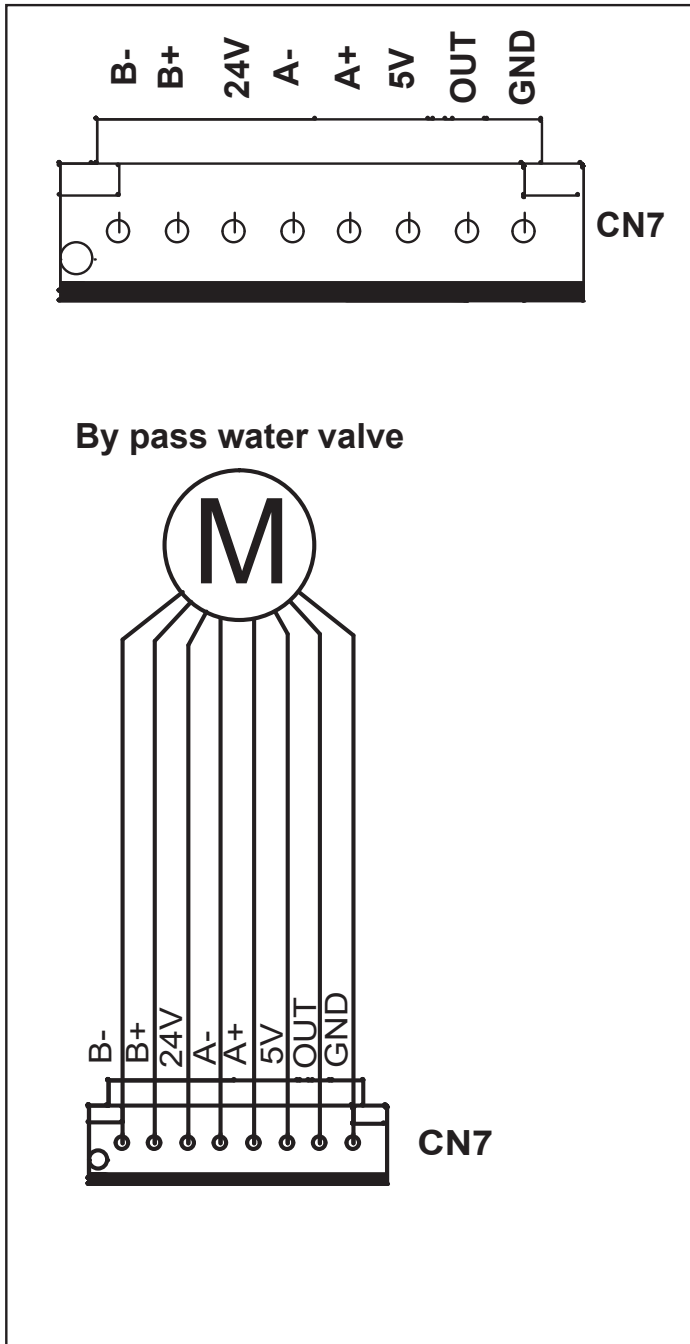
Wiring Connections

② Area B

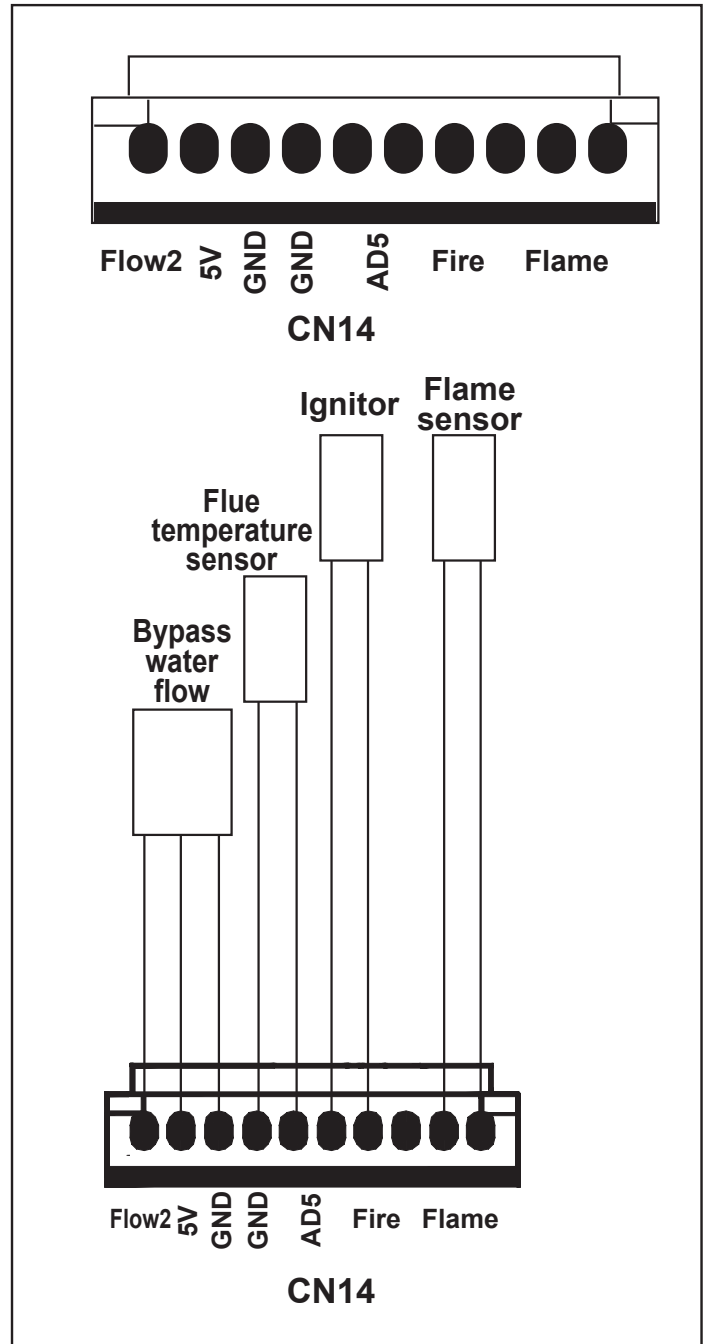


Wiring Connections

③ Area C



④ Area D

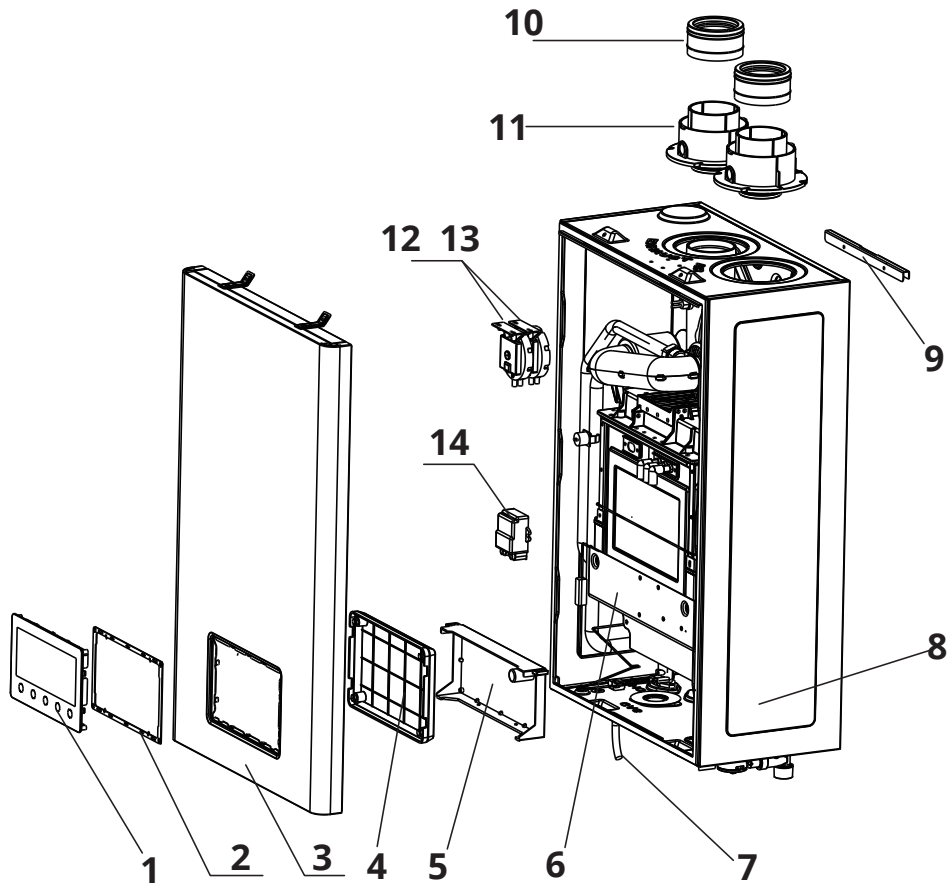


No.	Items	Check box
Water Heater Installation		
1.	Have you maintained the required clearances from building openings and intake air vents?	
2.	Have you minimized the distance between the water heater and the vent termination?	
3.	Have you minimized the distance between the water heater and major fixtures?	
4.	Have you maintained the proper service and maintenance clearances?	
5.	Is the water heater and vent piping clear of combustible materials, including clothing, cleaning materials, and rags?	
Gas Supply Connection		
6.	Does the gas supply match what is specified on the water heater rating plate?	
7.	Is the gas line at least 1/2 or 3/4 in inner diameter?	
8.	Is the gas supply line sufficient in length and diameter to deliver the required BTUs?	
9.	Have you measured the pressure of the gas supply line?	
10.	Is the gas supply pressure within the recommended ranges specified in this manual?	
11.	Is the gas supply line equipped with a manual full port valve?	
12.	Have you tested the gas line pressure and all fittings for leaks?	
13.	Has the gas company inspected the installation, if required?	
Water Supply Connection		
14.	Is the water supply pressure sufficient (greater than 40 PSI)?	
15.	Have you installed shut off valves on the inlet and outlet to facilitate cleaning of the inlet water filter?	
16.	Have you bled the air out at each fixture?	
17.	Have you checked each fixture to ensure hot water is being supplied?	
18.	Have you cleaned the inlet water filter?	
Pressure Relief Valve Connection		
19.	Have you installed an approved pressure relief valve on the water heater?	
20.	Does the rating of the pressure relief valve match or exceed the maximum BTU rating of the water heater?	
21.	Is the pressure relief valve at least 3/4 in. inner diameter?	
22.	Have you installed the pressure relief valve on the hot water outlet pipe near the water heater?	
23.	Have you installed a discharge drain tube from the pressure relief valve to within 6-12 in. (150-300 mm) of the floor?	
Condensate Drain Connection		
24.	Have you installed a condensate drain line from the water heater to a drain or laundry tub?	

Installation Checklist

Venting the Water Heater (continued)		
25.	Have you vented the water heater with 2 in or 3 in PVC, CPVC, Polypropylene, Type BH Special Gas Vent (ULC-S636) for this water heater, or in accordance with all local codes and the guidelines in this manual?	
26.	Have you ensured that PVC solid core pipe has not been used as venting for the water heater?	
27.	Is the vent sloped upward toward the vent termination at a rate of 1/4 inch per foot (2% grade)?	
28.	Are all vent runs properly supported?	
29.	Have you properly supported the vent termination?	
30.	Have you properly sealed all air intake and exhaust joints, from the flue collar to the to the vent termination?	
31.	Have you installed bird screens on the exhaust and intake Terminations?	
32.	Have you checked the venting for leaks?	
33.	Is the vent termination at least 12 in (300 mm) above the exterior grade?	
34.	Is the total vent length within the maximum vent length restriction?	
Power Supply		
35.	Is the supplied voltage 110-120 V AC?	
36.	Is the water heater plugged into a properly grounded outlet?	
37.	Have you checked the polarity of the electrical connection?	
Water Heater in Operation		
38.	Have you shown the owner how to clean the inlet water filter?	
39.	Have you given the Manuals to the owner for future reference?	
40.	Have you shown the owner how to shut off the gas in case of an emergency?	

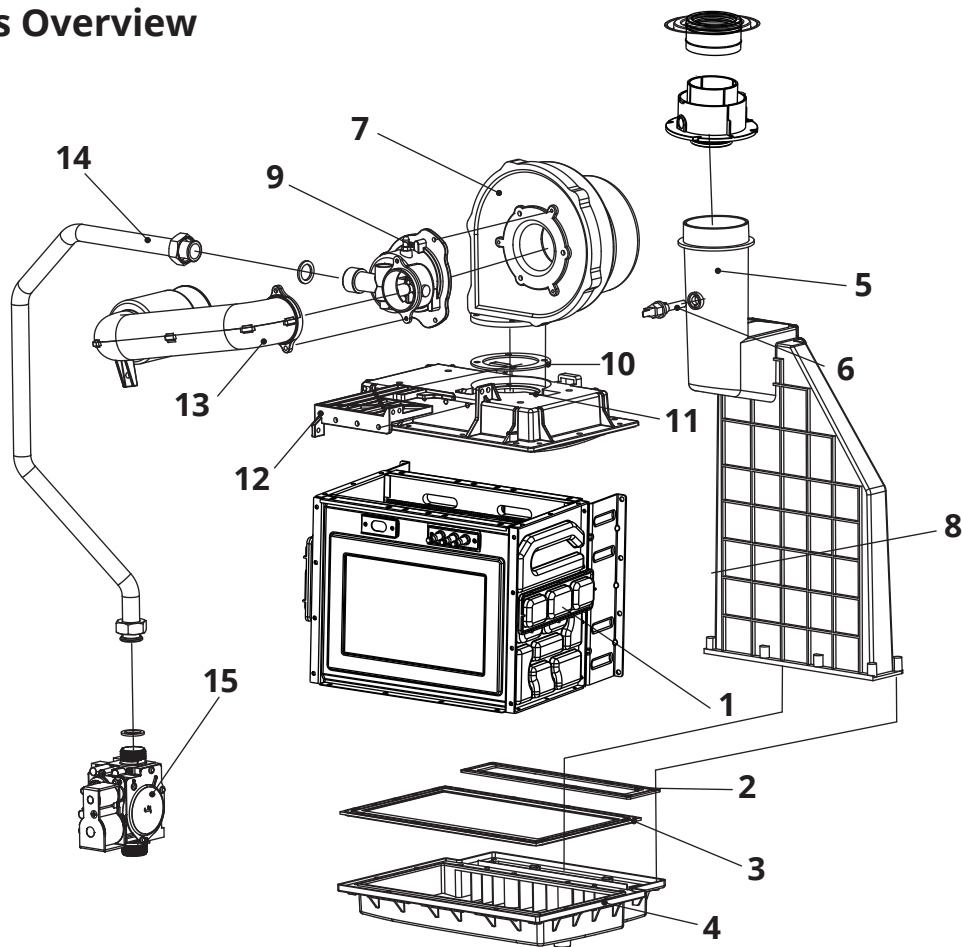
Casing Parts Overview



No.	Description	Notes
1.	Screen Assembly	Control Panel/Display
2.	Sealing Washer	
3.	Front Cover	
4.	Cover Plate	
5.	Control Board Assembly	PCB box included
6.	Controller Support	
7.	Power Cable	
8.	Case	
9.	Mounting Bracket	
10.	Vent Seal	2 inch/3 inch adapted
11.	Vent Collar	
12.	Pressure Sensor (APS)	
13.	Pressure Sensor (APS)	
14.	Ignition Transformer	

Parts List

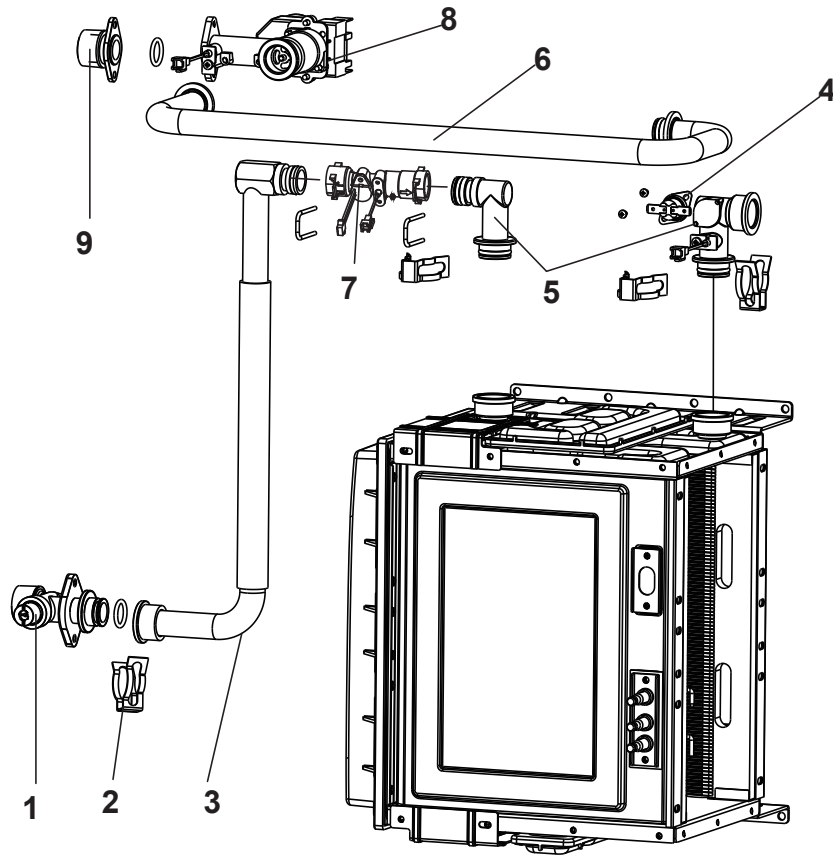
Gas Loop Parts Overview



No.	Description	Notes
1.	Heat exchanger assembly	
2.	Vent gasket	
3.	Condensate collector gasket	
4.	Condensate collector	
5.	Flue Vent	
6.	Flue temperature sensor	
7.	Blower	
8.	Igniter assembly	
9.	Mixer assembly	
10.	Blower gasket	
11.	Burner assembly	
12.	Blower bracket	
13.	Muffler	
14.	Gas pipe	
15.	Gas valve	

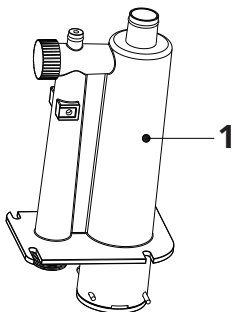
Parts List

Water Loop Parts Overview



No.	Description	Notes
1.	Cold water inlet connector	
2.	Clip	
3.	Cold water pipe	
4.	Thermistor	
5.	Connector of water inlet	
6.	Connecting pipe component	
7.	Water flow sensor	
8.	Water Ratio Valve	
9.	Water outlet connection	

Accessories



No.	Description	Notes
1.	Condensate trap assembly	



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COMFORT MADE SIMPLE

Electrician and/or HVAC Technician:

License #:

Installation Date:

Installation location:

Serial number: