

On-Demand Water Heater

Installation Manual and Owner's Guide



ANSI Z21.10.3 • CSA 4.3

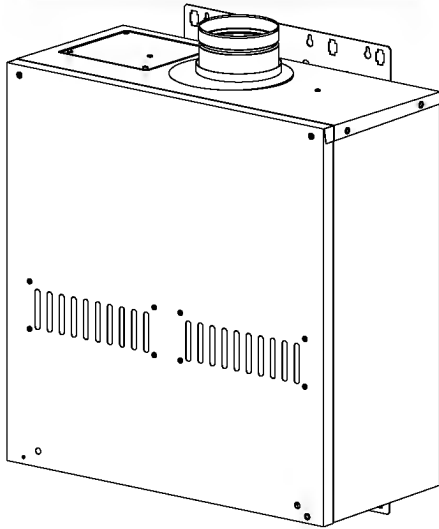


For supplying potable hot water

ASME model ONLY

Models

910/910 ASME



Gas Tankless Water Heater™

Suitable for combination potable water heating and space-heating

Please refer to local codes for space-heating compliance.

FEATURING

- ENDLESS HOT WATER
- ON-DEMAND USAGE
- COMPACT, SPACE SAVING
- ENERGY CONSERVATION
- COMPUTERIZED SAFETY
- NO PILOT LIGHT
- EASY-LINK SYSTEM AND MULTI-UNIT SYSTEM



If the information in these instructions is not followed exactly, a fire or explosion may result causing property damage, personal injury or death.

- Do not store or use gasoline or other flammable vapors and liquids in the vicinity of this or any other appliance.
- WHAT TO DO IF YOU SMELL GAS
 - Do not try to light any appliance.
 - Do not touch any electric switch, do not use any phone in your building.
 - Immediately call your gas supplier from a neighbor's phone. Follow the gas supplier's instructions.
 - If you cannot reach your gas supplier, call the fire department.
- Installation and service must be performed by a qualified installer, service agency or the gas supplier.

If you have any questions, please call or write to:

In the United States
500 Tennessee Waltz Parkway
Ashland City, TN 37015
Toll Free: 1-877-737-2840

In Canada
599 Hill Street West
Fergus, ON N1M 2X1
1-888-479-8324

Keep this manual near the water heater for future reference whenever maintenance, adjustment, or service is required.

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SPECIFICATION

Natural Gas Input (Operating Range)	BTU/H	Min: 15,000 BTU/h Max: 380,000 BTU/h
Propane Input (Operating Range)	BTU/H	Min: 15,000 BTU/h Max: 380,000 BTU/h
Gas Connection		1" NPT
Water Connections		1" NPT
Water Pressure*	psi (Mpa)	15 - 150 psi* (0.1 - 1.0 Mpa)
Natural Gas Inlet pressure	" W.C. (kPa)	Min.: 4" W.C.(1.00 kPa) Max.: 10.5" W.C.(2.61 kPa)
Propane Gas Inlet pressure	" W.C. (kPa)	Min.: 8" W.C.(1.99 kPa) Max.: 14" W.C.(3.48 kPa)
Weight	lbs. (kg)	102 lbs. (46.3Kg)
Dimensions	Inch (mm)	H 25.3 in. (643mm) × W 24.8 in. (630mm) × D 11.8 in. (300mm)
Ignition		Electric Ignition
Supply	VAC/Hz	120 VAC/60 Hz
Electric Consumption	Operation	W/A 178 W (1.48 A)
	Standby	W/A 16 W (0.13 A)
	Freeze- Protection	W/A 271 W (2.26 A)
Category		Category III

*40 psi (0.28 Mpa) or above is recommended for maximum flow.

****Water heater Category** — water heaters of other than direct vent type, for outdoor installation, are divided into four categories based on static pressure produced in the vent and flue loss.

Category I - a water heater that operates with a non-positive vent static pressure and with a vent gas temperature that avoids excessive condensate production in the vent.

Category II - a water heater that operates with a non-positive vent static pressure and with a vent gas temperature that may cause excessive condensate production in the vent.

Category III - a water heater that operates with a positive vent static pressure and with a vent gas temperature that avoids excessive condensate production in the vent.

Category IV - a water heater that operates with a positive vent static pressure and with a vent gas temperature that may cause excessive condensate production in the vent.

***These are equivalent lengths that include head loss for elbows, tees, unions, etc.

NOTE:

- Check the rating plate to ensure that this product matches your specifications.
- **The manufacturer reserves the right to discontinue, or change at any time, specifications or designs without notice and without incurring obligation.**



Installation Manual

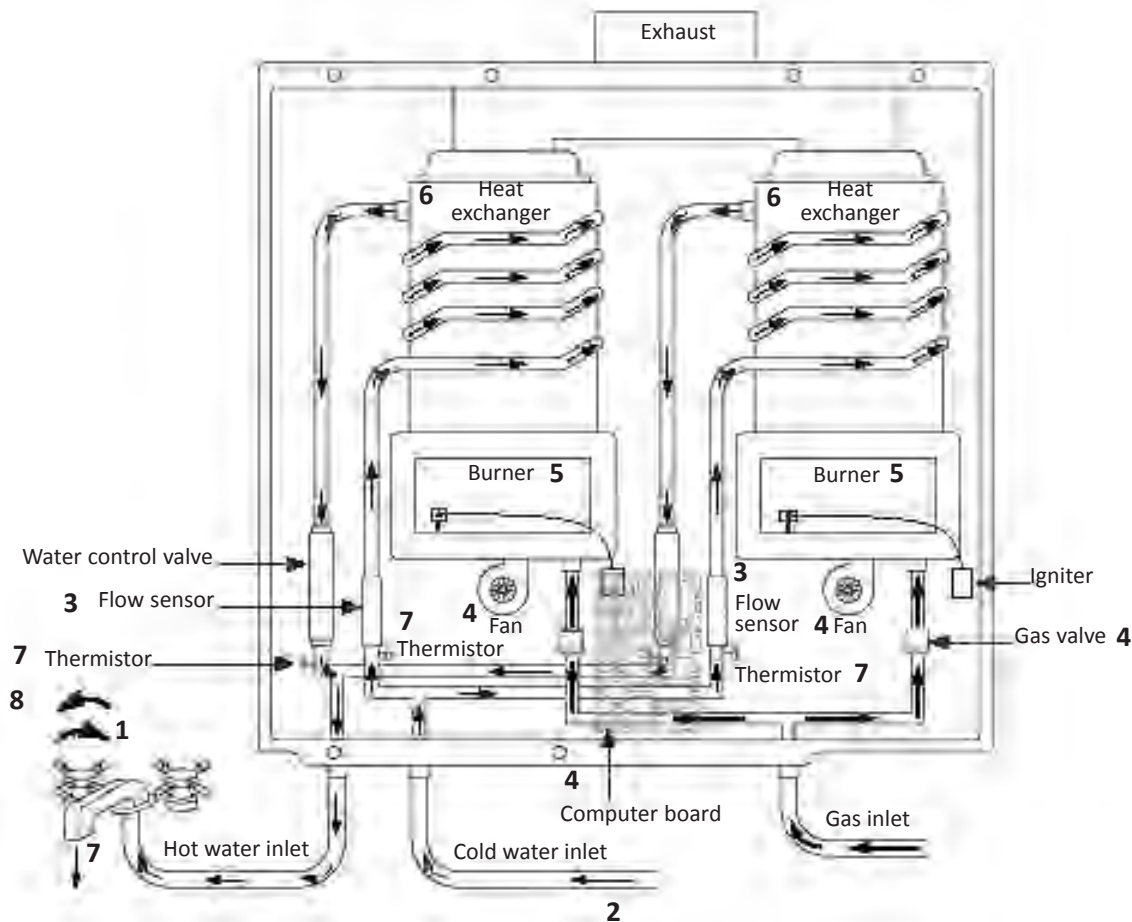
CONGRATULATIONS

Congratulations and thank you for choosing our tankless water heater. Before use, we recommend that you read through this installation manual carefully. Keep this manual for future reference.

If you need an additional manual, contact the manufacturer or your local distributor. When you call, please tell us the product name and the serial number of your unit written on the rating plate of the water heater.

INTRODUCTION

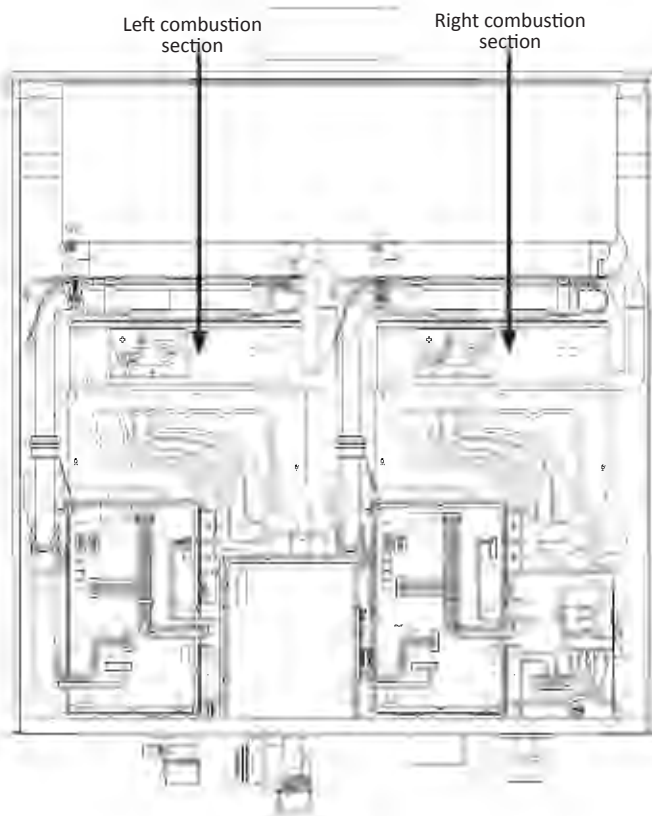
- This manual provides information necessary for the installation, operation, and maintenance of the water heater.
- The model description is listed on the rating plate which is attached to the side panel.
- Please read all installation instructions completely before installing this product.
- If you have any problems or questions regarding this equipment, consult the manufacturer or its local representative.
- This appliance is an on-demand, tankless water heater. It is designed to efficiently supply endless hot water for your needs.
- The 910 has two heat exchangers. The primary and secondary heat exchangers alternate roles, extending the life of the 910. (See p. 5.)
- The principle behind tankless water heaters is simple:



*This diagram illustrates tankless water heater design concepts only and does not accurately represent the water heater's physical description.

1. A hot water fixture is turned on.
2. Water flows through the heater.
3. The water flow sensor detects the water flow.
4. The computer initiates the fan motor and gas valve to let gas flow through the heater and sends a signal to the igniter to create an ignition spark.
5. The gas ignites and flames appear within the burner chamber.
6. Water is heated as it flows through the heat exchanger.
7. Using thermistors to measure temperatures throughout the water heater, the computer modulates the gas and water valves to ensure proper output water temperature and hot water outflows.
8. When the fixture is turned off, the unit shuts down.

Combustion sections



The 910 has two combustion sections. The combustion section that turns on first is the primary section. The secondary section will activate when the flow rate through the primary section meets the flow listed in the table below.

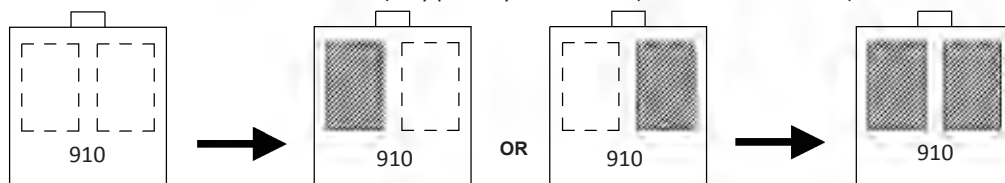
Set temperature °F (°C)	Flow rate at which the secondary section activates GPM (L/min)
100-120 (38-49)	3.2 (12)
125,130 (52,54)	2.9 (11)
140 (60)	2.6 (9.8)
145,150 (63,65.5)	2.4 (9)
155-185 (68-85)	2.1 (8)

Example:

If the set temperature is 120 °F (49 °C):

The section(s) in operation is indicated by the black square(s).*

Total Flow < 0.5 GPM (1.9 L/min.) (standby) 0.5 GPM (1.9 L/min.) < Total Flow < 3.2 GPM (12 L/min.) (only primary section fires) Total Flow > 3.2 GPM (12 L/min.) (both sections fire)



Depending on which side is the primary section

*The primary and secondary combustion sections will alternate every 100 firing cycles or every 12 hours of operation.

SAFETY GUIDELINES

SAFETY DEFINITION



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



Indicates an imminently hazardous situation which, if not avoided, could result in death or serious injury.



Indicates an imminently hazardous situation which, if not avoided, could result in minor or moderate injury.

NOTICE

Indicates information considered important but not hazard related.

GENERAL

1. Follow all local codes, or in the absence of local codes, follow the current edition of the National Fuel Gas Code: ANSI Z223.1/NFPA 54 in the USA or B149.1 Natural Gas and Propane Installation code in Canada.
2. Properly ground the unit in accordance with all local codes, or in the absence of local codes, with the current edition of the National Electrical Code: ANSI/NFPA 70 in the USA or CSA standard C22.1 Canadian Electrical Code Part 1 in Canada.
3. Carefully plan where you intend to install the water heater. Please ensure:
 - Your water heater will have enough combustion air and proper ventilation.
 - Locate your heater where water leakage will not damage surrounding areas. (Please refer to p. 8.)
4. Check the rating plate for the correct **GAS TYPE, GAS PRESSURE, WATER PRESSURE and ELECTRIC RATING**. If this unit does not match your requirements, **do not install and consult with the manufacturer**.
5. If any problem should occur, turn off all hot water fixtures and turn off the gas. Then call a trained technician, the gas company, or the manufacturer.



- Water temperatures over 125 °F (52 °C) can cause severe burns instantly or death from scalding. The water temperature is set at 120 °F (50 °C) from the factory to minimize any scalding risk. Before bathing or showering, always check the water temperature.
- Do not store or use gasoline or other flammables, vapors, or liquids in the vicinity of this appliance.
- Do not reverse the water and/or gas connections as this will damage the gas valves and can cause severe injury or death. Follow the diagram on p. 23 when installing your water heater.
- Do not use this appliance if any part has been under water. Immediately contact a qualified installer or service agency to replace a flooded water heater. Do not attempt to repair the unit! It must be replaced!
- Do not disconnect the electrical supply if the ambient temperature will drop below freezing. The Freeze Protection System only works if the unit has electrical power. The warranty will not be covered if the heat exchanger is damaged due to freezing. For more information, refer to Freeze Protection System on p. 39.
- Failure to observe these warnings can result in serious personal injury or death.

INSTALLATION

GENERAL

1. Follow all local codes, or in the absence of local codes, follow the current edition of the National Fuel Gas Code: ANSI Z223.1/NFPA 54 in the USA or B149.1 Natural Gas and Propane Installation Code in Canada.
2. All gas water heaters require careful and correct installation to ensure safe and efficient operation. This manual must be followed exactly. Read the "Safety Guidelines" section.
3. The manifold gas pressure is preset at the factory. It is computer controlled and should not need adjustment.
4. Maintain proper space for servicing. Install the unit so that it can be connected or removed easily. Refer to the "Clearances" section on p. 9 for proper clearances.
5. The water heater must be installed in a location where the proper amount of combustible air will be available to it at all times without obstructions.
6. Electrical service to the water heater requires a means of disconnection. This will allow power to the water heater to be shut off for servicing and safety purposes.
7. Do not install the unit where the exhaust vent is pointing into any opening in a building or where the noise may disturb your neighbors. Ensure that the vent termination meets the minimum distance requirements, including minimum clearances from doorways or openings. (Refer to pp. 18 to 20.) Check local code requirements prior to installation.
8. Carefully plan the installation location of the heater and vent terminations. Contaminants such as aerosols, lint, and fine powders (including flour) can clog the air intake and reduce the operation of the fan. This, in turn, can cause improper combustion and reduce the life of the water heater. Regularly ensure that the area around the water heater, vent termination, and air intake is free of dust, debris, and other contaminants. In environments with a high level of contaminants (laundry facilities, hair salons, pet salons, chemical plants, commercial kitchens, etc.), direct venting is required. Refer to "Direct Vent Intake" section on pp. 14.
9. If the water heater is used as a direct-vent appliance, the unit requires a 5 in. (127 mm) combustible air supply pipe. The intake pipe must be sealed airtight. Refer to "Venting instructions" on pp. 15 to 20 for more detail.
10. Terminating the venting through a sidewall is recommended for the direct-vent system.
11. Running the exhaust vent and the intake pipe parallel is recommended.
12. Terminating the exhaust and intake on the same wall/surface is recommended. Terminating in the same pressure zone allows for pressure balancing, which prevents nuisance shutdowns.
13. Only install the water heater in a heated area where below freezing temperatures cannot occur. The warranty does not cover damage caused by freezing.
14. The water heater must be securely mounted to a wall or other suitable structure.



WARNING

- The 910 model weighs 102 lbs. (46.3 kg). Ensure that any and all support structures (whether it is installed on a wall, on a support stand, etc.) have enough strength to support and hold the water heater.
- When handling the 910, do not place your hands inside the flue collar. Injury may result.
- Installation and service must be performed by a qualified installer (for example, a licensed plumber or gas fitter). Otherwise, the warranty will be void.
- The installer (licensed professional) is responsible for the correct installation of the water heater and for compliance with all national, state / provincial, and local codes.
- The manufacturer does not recommend installing the water heater in a pit or location where gas and water can accumulate.
- Do not have the vent terminal pointing toward any operating window, door, or opening into a building.
- Do not install the unit where water, debris, or flammable vapors may get into the flue terminal.
- Do not install next to any source of airborne debris, such as a clothes dryer, that can cause debris to be trapped inside the combustion chamber, unless the system is direct-vented.
- **The manufacturer does not suggest installing the water heater in an attic due to safety issues.** If you install the water heater in an attic:
 - Make sure the unit will have enough combustion air and proper ventilation.
 - Keep the area around the water heater and its termination clean. When dust collects on the flame sensor, the water heater will shut down and produce an error code.
 - If the above conditions cannot be met, use the direct-vent conversion kit 100112186 (TM-DV50).
 - Place the unit for easy access for service and maintenance.
 - A drain pan, or other means of protection against water damage, is recommended to be installed under the water heater in case of leaks. The manufacturer is not responsible for damage due to water leaks.
- Failure to observe these warnings could result in severe personal injury, death, and/or property damage.

NOTICE

- **The warranty will not cover damage caused by water quality.**
 - Only potable water can be used with this water heater. Do not introduce pool or spa water, or any chemically treated water into the water heater.
 - Water hardness levels must not exceed 7 grains per gallon (120 ppm) for single family domestic applications or more than 4 grains per gallon (70 ppm) for all other types of applications. Water hardness leads to scale formation and may affect / damage the water heater. Hard water scaling must be avoided or controlled by proper water treatment.
 - Water pH levels must be between 6.5 and 8.5.
 - Well water must be treated.
- **The manufacturer recommends direct venting when the water heater is installed in beauty salons, dry cleaners or any other locations in which such chemicals are present in the air.** Some chemicals used in beauty salons or dry cleaners may affect the flame sensor. In such cases, the water heater may not work properly.
- Although the water heater is designed to operate with minimal sound, **the manufacturer does not recommend installing the unit on a wall adjacent to a bedroom, or a room that is intended for quiet study or meditation, etc.**
- Locate your heater close to a drain where water leakage will not do damage to surrounding areas. As with any water heating appliance, the potential for leakage at some time in the life of the product does exist. The manufacturer will not be responsible for any water damage that may occur. If you install a drain pan under the unit, ensure that it will not restrict the combustion air flow.

CLEARANCES



Maintain all clearances around the water heater.
Failure to do so could create a fire hazard, potentially leading to death, serious injury, and/or property damage.

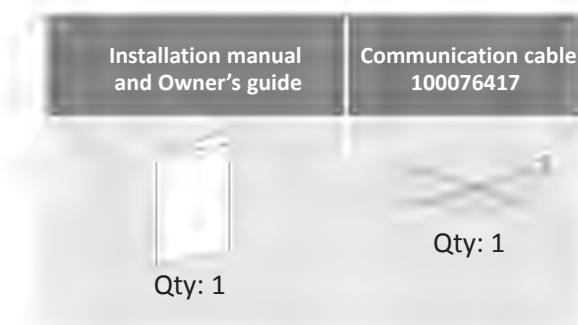
Installation	Top	Bottom	Front	Back	Sides
Indoor installation	12 in. (305 mm)	12 in. (305 mm)	4 in.** (102 mm)	1.0 in. (25 mm)	3 in. (76 mm)
Outdoor installation	36 in. (914 mm)	12 in. (305 mm)	24 in. (610 mm)	1.0 in. (25 mm)	3 in. (76 mm)

*Standard indoor installations and direct-vent indoor installations have the same clearances.

**24 inches recommended for maintenance.

***For the multiple installation of outdoor models, refer to the above clearances.

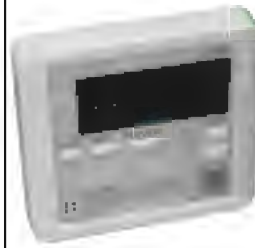
INCLUDED ACCESSORIES



OPTIONAL ITEMS

#	Model	Indoor Installation	Outdoor Installation
1.	Remote controller: 100112155 (TM-RE30)	✓	✓ (Remote should be installed indoors.)
2.	Multi-unit Controller: 100112691 (TM-MC02)	✓	✓
	5" (127 mm) Backflow preventer and F-F adaptor 100112598	✓	
3.	5" (127 mm) Universal Appliance Adaptor, F-F adaptor, backflow preventer, condensate drain trap 2SVBFDPA05	✓	
4.	Vent cap: 100112194 (TM-VC50)		✓
5.	Direct-vent conversion kit: 100112186 (TM-DV50)	✓	
6.	Pipe cover: 100112190 (TM-PC50)	✓	✓
	5" Sidewall vent termination (Hood) 100112594/2NVTH5	✓	
7.	5" Wall thimble (Refer to the next page.)	✓	
8.	Direct-vent concentric termination (Refer to the next page.)	✓	

**1. Temperature remote controller
100112155 (TM-RE30)**



The remote controller has the following functions:

- adjusts the output temperature of hot water.
- provides informations of the flow rate, output temperature, and so on.
- provides error code when the water heater has some trouble.

**2. Multi-unit controller
100112691(TM-MC02)**



The multi-unit controller can control a maximum of 10 water heaters, from 15,000 BTU to 3,800,000 BTU. It also works as a diagnostic tool that will give an error code whenever there is a problem with the water heater system.

Each multi-unit controller comes with a remote controller.

**3. 5" Backflow preventer
100112598 2SVBFDPA05**



They prevent air backflow from a vent system of Nova Vent line. Install in accordance with the installation instructions that are packed with the preventer.

4. Vent cap:100112194(TM-VC50)

The cap installed on the top of the water heater for outdoor installation. It will prevent any debris from entering the unit and causing damage or a fire hazard, as well as rain.



5. Direct-vent conversion kit: 100112186 (TM-DV50)



The kit can be used to convert to a direct venting system or sealed combustion system. Install in accordance with the manufacturer's installation instructions and any applicable codes.

6. Pipe cover: 100112190(TM-PC50)



The pipe cover protects the plumbing pipes from unexpected adjustments. It is fixed to the bottom of the water heater and hides the plumbing and improves the visual aspects of the whole installation of the heater.

7. Sidewall vent termination (Hood) and Wall thimble:

They are used when venting out through the wall. These terminations are special stainless steel vents for gas appliances and are UL listed as Category II, III and IV. For different wall thicknesses, there are two ranges of lengths available. (Refer to the NovaVent brochure for details.) Install these vent terminations in accordance with their installation instructions and any applicable local codes.



Wall thimble

Termination Hood

Covering wall thicknesses	Part#	Part#
5" Termination Hood	100112594	2NVTH5
5" Wall Thimble 4 - 7 in. (102 - 178 mm)	100112734	2NVWT5
5" Wall Thimble 5 - 10 in. (127 - 254 mm)	100112735	2NVWT5L

8. Concentric Vent Kit:



Used when terminating direct-vent (sealed combustion) systems, with indoor models that require a 5 in. (125 mm) intake and a 5 in. (125 mm) exhaust. This concentric termination provides the convenience of only having to make one penetration through a sidewall instead of two separate penetrations for the intake and exhaust piping. The termination includes a bird screen, restricting small animals, pests, and foreign objects from entering into the vent system. There are two kits for the 5 in. (125 mm) where the difference is the wall thickness adjustment:

5.0" - 10.0" (127 - 254 mm): **100112606**

12.0" - 18.0" (305 - 457 mm): **100112601**

(Refer to the Flexmaster brochure for details.)

WARNING FOR INSTALLATIONS

FOR YOUR SAFETY, READ BEFORE INSTALLATION:

Do not install the heater where water, debris or flammable vapors may get into the flue terminal. This may cause damage to the heater and void the warranty.



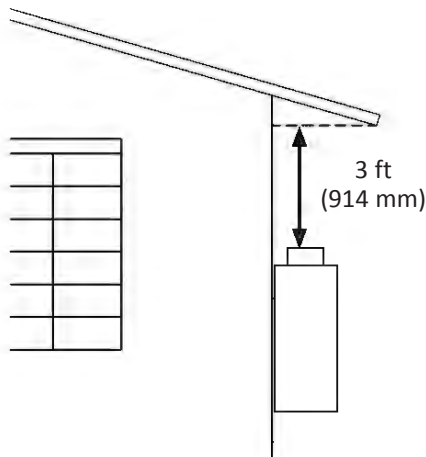
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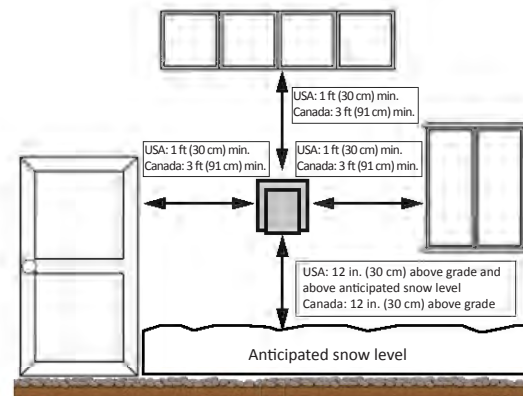
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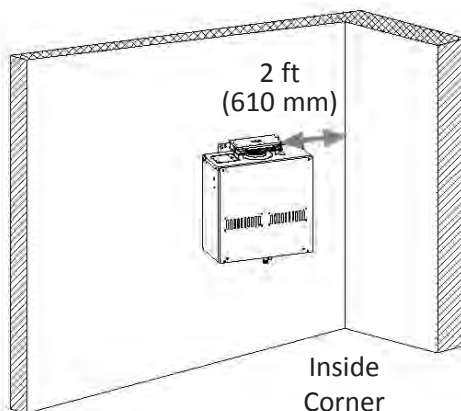
Do not install this water heater under an overhang less than 3 ft (914 mm) from its top or eaves. The area under an overhang must be open to three sides (Outdoor models only).



Ensure that you meet the minimum clearances shown below for a direct vent termination:



Water heater vent terminator must be at least 2 ft (610 mm) away from an inside corner for both outdoor installation, indoor single vent, or direct-vent installation.



Do not install next to a dryer or any source of airborne debris that can be trapped inside the combustion chamber, unless the system is direct-vented. The air intake must maintain a safe distance from the dryer's exhaust vent. This will help to prevent lint from being drawn into the water heater's air intake.



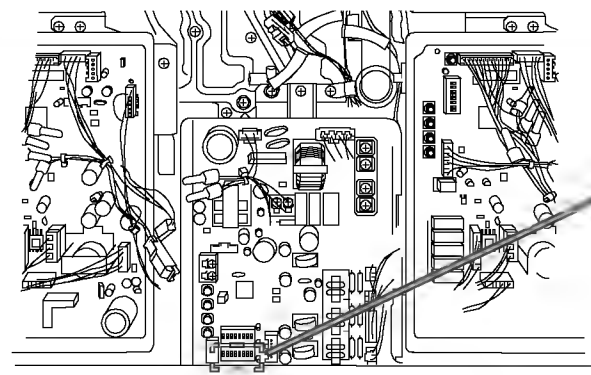
OUTDOOR INSTALLATION

1. Follow all local codes, or in the absence of local codes, follow the current edition of the National Fuel Gas Code: ANSI Z223.1/NFPA 54 in the USA or B149.1 Natural Gas, Propane Installation Code in Canada.
2. Install outdoors only in areas with mild, temperate climates.
3. Change the DIP switch for outdoor installation. Locate the lower banks of DIP switches on the right of the 7-Seg. LED on the center computer board. (See the graphic below.) The No. 6 ("OUT") DIP switch on that bank must be switched to its **ON** position and the No. 5 ("DIRE") DIP switch must be in the **OFF** position. (Do not adjust the upper bank of DIP switches).
4. The outdoor vent cap must be used when unit is installed outdoor. The manufacturer requires the use of its part No. 100112194 (TM-VC50).
5. When installed outdoors, the water heater shall be wall-mounted or mounted on a stand. Locate the water heater in an open, unroofed area and maintain the minimum clearances that are listed at the bottom of this page.



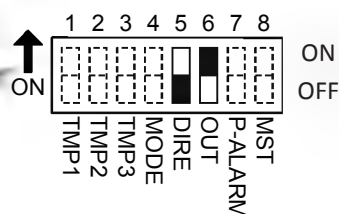
WARNING

- To change the DIP switch settings for outdoor installation, locate the lower bank of DIP switches at the bottom of the center computer board as shown below.
- Only adjust the appropriate DIP switches as shown below.
- Turn off the power supply to the water heater before changing the DIP switch settings.
- Failure to observe this warning could result in carbon monoxide poisoning or death.



The lower bank of DIP switches

The dark squares indicate the correct positions of DIP switches.

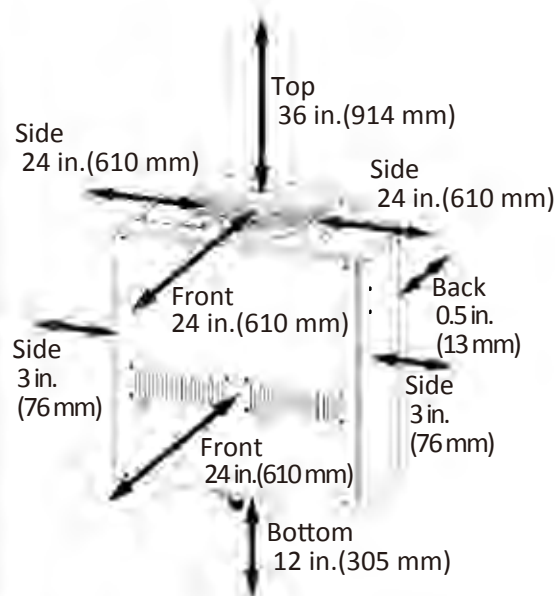


-Clearances-



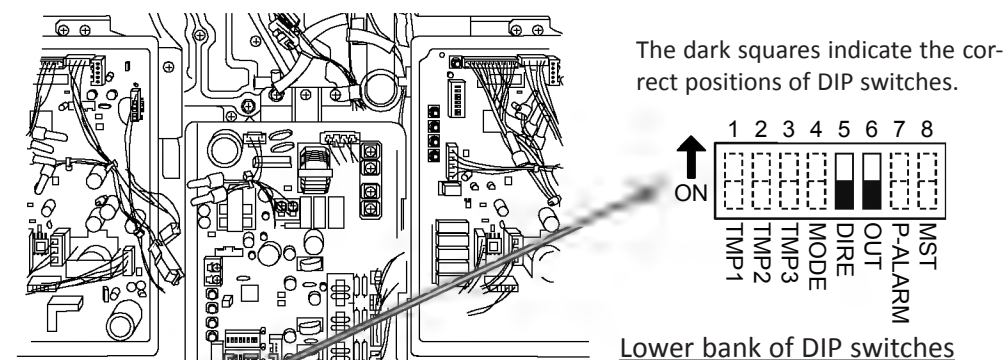
WARNING

- Maintain all clearances around the water heater. Failure to do so could create a fire hazard, potentially leading to death, serious injury, and/or property damage.
- There is a 3 inch (76 mm) clearance from the left and right sides of the unit to combustible and non-combustible surfaces. However, if any portion or area of the surface is exposed to the exhaust fumes (i.e. directly to the sides of the vent cap), that surface must be at least 24 inch (610 mm) away.



INDOOR INSTALLATION

1. Follow all local codes, or in the absence of local codes, follow the current edition of the National Fuel Gas Code: ANSI Z223.1/NFPA 54 in the USA or B149.1 Natural Gas, Propane Installation Code in Canada.
2. Do not change the DIP switch settings for indoor installations. The DIP switch settings were already set at the factory. Make sure the No. 5 ("DIRE") and No. 6 ("OUT") DIP switches are in the OFF position. (These switches are located on the lower bank of DIP switches as shown below.)
3. For venting instructions for indoor installations, refer to pp. 15 to 20.

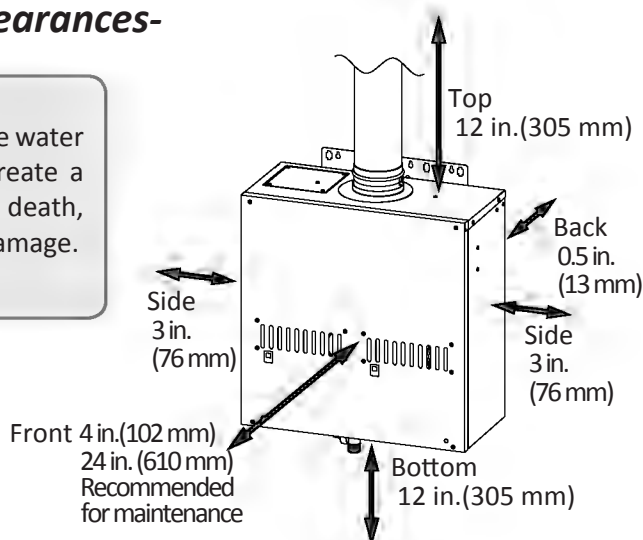


-Clearances-



WARNING

Maintain all clearances around the water heater. Failure to do so could create a fire hazard, potentially leading to death, serious injury, and/or property damage.



-Combustion air supply-

The water heater location must provide enough air for proper combustion and ventilation of the surrounding area. See the current edition of ANSI Standard Z223.1 or any applicable local codes. In general, these requirements specify that if the unit is installed in a confined space, there must be a permanent air supply opening.

Minimum recommended air supply opening size for water heater:

Water heater size	When drawing make-up air from outside the building	When drawing make-up air from inside the building (from other rooms within)
Max. 380,000 BTU/h	25.3 in ² (163.2 cm ²)	380 in ² (2451.6 cm ²)
	When combustion air is supplied from outside the building, an opening communicating directly with the outside should have a minimum free area of one square inch per 15,000 BTUH input of the total input rating of water heater in the enclosed area.	When combustion air is supplied from inside the building, an opening communicating with the rest of the dwelling should have a minimum free area of one square inch per 1,000 BTUH input of the total input rating of water heater in the enclosed area. This opening should never be less than 199 in ² (1283.9 cm ²).

Combustible air supplied by mechanical fan or make up air device

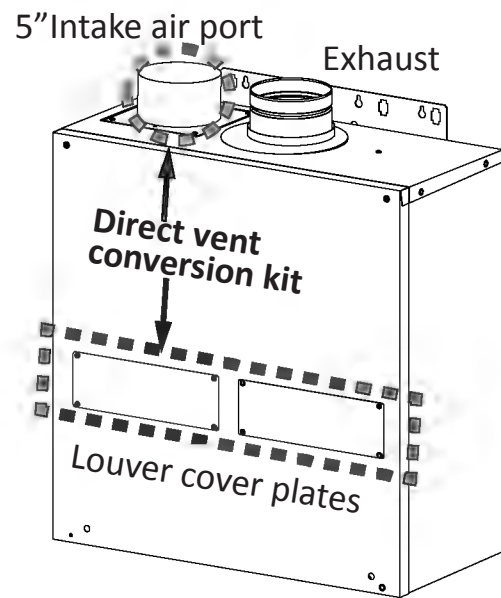
The water heater is equipped with a combustible air sensor that will shut off the unit when inadequate combustible air supply to unit is detected.

- If a mechanical fan or make up air device is used to supply air to the water heater or utility room, the installer should make sure it does not create drafts which could cause nuisance shutdowns.
- If a blower is necessary to provide adequate combustion air to the water heater, the blower and water heater must be set up so that the water heater cannot fire unless the blower is operating. Possible methods include the use of the water heater internal fan control port or the use of external flow sensors/transmitters and relays.

-Direct intake vent system-

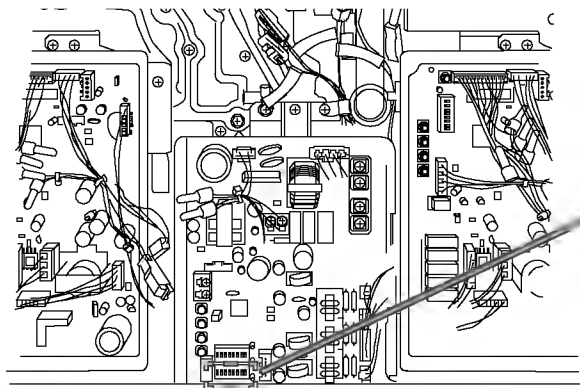
This water heater may be converted to a direct-vent (sealed combustion) appliance by installing an adapter 100112186 (TM-DV50) which will bring all required combustible air from outside the building. When installing the direct-vent conversion kit, please follow all instructions included with the kit.

- The water heater must be installed in a location where the proper amount of combustible air will be available to it at all times without obstructions.
- If used as a direct-vent appliance, the water heater requires a 5" (127 mm) combustible air supply pipe. The intake pipe must be sealed airtight.
- Air supply pipe can be made of ABS, PVC (solid core), CPVC (solid core), galvanized steel, corrugated aluminum, corrugated stainless steel or Category III stainless steel.
- Use of cellular core PVC (ASTM F891), cellular core CPVC, or Radel® (polyphenylsulfone) in non-metallic venting systems is prohibited. Covering non-metallic vent pipe and fittings with thermal insulation is prohibited.
- Change the DIP switch settings to the direct-vent system. (See diagram below.)
- Sidewall venting is recommended for the direct-vent system.
- The manufacturer recommends running the exhaust vent and the intake pipe parallel.
- For the venting instructions for direct intake vent installations, refer to pp. 15 to 20.



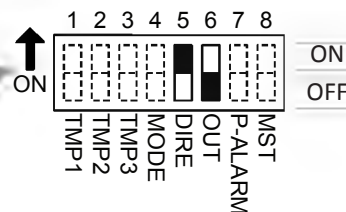
WARNING

- To change the DIP switch settings for direct vent installation, locate the lower bank of DIP switches at the bottom of the center computer board as shown below.
- Only adjust the appropriate DIP switches as shown below.
- Turn off the power supply to the water heater before changing the DIP switch settings.
- Failure to observe this warning could result in carbon monoxide poisoning or death.



The lower bank of DIP switches

The dark squares indicate the correct positions of the DIP switches.



VENTING INSTRUCTIONS

For indoor installations

-General-



WARNING

- Improper venting of this appliance can result in excessive levels of carbon monoxide which can result in severe personal injury or death.
- Improper installation can cause nausea or asphyxiation, severe injury or death from carbon monoxide and flue gases poisoning. Improper installation will void product warranty.
- When installing the vent system, all applicable national and local codes must be followed. If you install thimbles, fire stops or other protective devices and they penetrate any combustible or noncombustible construction, be sure to follow all applicable national and local codes.

The water heater must be vented in accordance with "Venting of Equipment" in the current edition of the National Fuel Gas Code: ANSI Z223.1/NFPA 54, and Section 8 of B149.1 Natural Gas in Canada, Propane Installation Code in Canada, as well as applicable local building codes.

The manufacturer recommends NovaVENT™ or Z-Vent® category III, single wall, stainless steel venting. See "Approved Category III, Single Wall, Stainless Steel Venting Suppliers and Part Numbers" on p. 16.

General rules for air intake:

The water heater can obtain its combustion air from the space that it is installed in or it can be direct vented.

- The air intake can use 5" PVC (solid core), CPVC (solid core), ABS, or category III vent.
- Use of cellular core PVC (ASTM F891), cellular core CPVC, or Radel® (polyphenylsulfone) in non-metallic venting systems is prohibited. Covering non-metallic vent pipe and fittings with thermal insulation is prohibited.
- Ensure that the installation location has sufficient, clean combustion air. If unsure, direct vent the heater with the direct vent conversion kit 100112186 (TM-DV50).

Direct venting installation:

- The maximum length of intake air piping must not exceed 50 ft (15.2 m). Deduct 5 ft (1.5 m) for each 90° elbow or 2.5 ft (0.76 m) for each 45° elbow used in the venting system. Two 45° elbows when connected together are equivalent to one 90° elbow. Refer to the tables on p. 17.
- When the horizontal air intake exceeds more than 5 ft, support the pipe every 3 ft with pipe hangers.
- Vertical air intake pipe must be supported with pipe hangers. Ensure that the weight of the pipe is not carried by the water heater.

General rules for venting water heaters are:

- Place the water heater as close as possible to the vent termination.
- The vent collar of the water heater must be fastened directly to an unobstructed vent pipe.
- Do not weld the vent pipe to the water heater's vent collar.
- Do not cut or alter the shape of the vent collar of the unit.
- The vent must be easily removable from the top of the water heater for normal service and inspection of the unit and vent system.
- The water heater vent must not be connected to any other gas appliance or vent stack.
- Avoid using an oversized vent pipe or using extremely long runs of pipe.
- For rooftop venting, a rain cap or other form of termination that prevents rain water from entering into the water heater must be installed.
- Do not common vent or connect any vent from other appliances to the water heater vent.
- The manufacturer will not be responsible for any damage to the water heater caused by condensation from the vent. For horizontal runs, slope the vent run downwards toward the vent terminal at a rate of ¼" per foot (6.4mm per 305mm). For horizontal runs that do not slope

downward and for vertical runs, installing a condensate drain is recommended. Please refer to pp. 17 and 18 for the diagrams.

- A backflow preventor should be installed in the exhaust when the heater is installed in climates subject to freezing temperatures.

General rules for vent terminations:

- Avoid locating the water heater vent termination near **any air intake devices**. These fans can pick up the exhaust flue products from the water heater and return them to the building. This can create a health hazard.
- Locate the vent termination so that it cannot be blocked by any debris, at any time. Most codes require that the termination must be at least 12 in. (305 mm) above grade and anticipated snow level, but the installer may determine if it should be higher depending on the job site condition and applicable codes.
- A proper sidewall termination is required when the water heater is vented through a sidewall.
- Refer to the following pages for exhaust termination and air inlet clearances.

Approved Category III, Single Wall, Stainless Steel Venting Suppliers and Part Numbers

WARNING! Do not mix parts or fittings of different material types, and do not mix pipe, fittings, or joining methods from different manufacturers. Combustion exhaust can contain carbon monoxide and must be properly vented outside. Breathing abnormal amounts of carbon monoxide can result in serious injury or death.

Description	Heater Vent Kits	Z-FLEX®
		NovaVENT™
5" Air intake hood	100112579	2FAIGAL05
5" Gear clamp	N/A	7HS84X
5" Straight pipe - 6" length	100112580	2NVP5.5
5" Straight pipe - 1' length	100112581	2NVP51
5" Straight pipe - 2' length	100112582	2NVP52
5" Straight pipe - 3' length	100112583	2NVP53
5" Straight pipe - 4' length	100112584	2NVP54
5" Adjustable straight - 10"-18" length	100112585	2NVALS5
5" 45 degree elbow	100112586	2NVE545
5" 90 degree elbow	100112587	2NVE590
5" Wall thimble (4"-7")	100112734	2NVWT5
5" Wall thimble (5"-10")	100112735	2NVWT5L
5" Horizontal drain pipe	100112588	2NVHD5
5" Vertical drain pipe	100112589	2NVVD5
5" Storm collar	100112590	2NVSC5
5" Firestop	100112591	2NVF55
5" Flat roof flashing	100112592	2NVFF5
5" Angled roof flashing	100112593	2NVAF5
5" Termination hood	100112594	2NVTH5
5" Termination tee	100112595	2NVTT5
5" Extreme weather rain cap	100112596	2NVWC5
5" Universal appliance adaptor - 3-in-1 (F-F adaptor, condensate drain, & back-flow preventer	100112597	2NVBFA5
5" Back-flow preventor & F-F adaptor	100112598	2NVBFU5
5" F-F adaptor	100112599	2NVAFF5
5" Support strap	100112600	2NVSS51

-Vent length and No. of Elbows-

This is a Category III appliance and must be vented accordingly. The vent system must be sealed airtight. All seams and joints **without gaskets** must be sealed with high heat resistant silicone sealant or UL listed aluminum adhesive tape having a minimum temperature rating of 350 °F (177 °C). For best results, a vent system should be as short and straight as possible.

- This water heater is a Category III appliance and must be vented accordingly with any 5 in. (127 mm) vent approved for use with Category III or Special BH type gas vent.
- **Follow the vent pipe manufacturer's instructions when installing the vent pipe.**
- **Do not common vent this appliance with any other vented appliance.** (Do not terminate vent into a chimney. If the vent must go through the chimney, the vent must run all the way through the chimney with Category III approved or Special BH vent pipe.)
- When the horizontal vent run exceeds 5 ft. (1.5 m), support the vent run at 3 ft. (0.9 m) intervals with overhead hangers.
- The maximum length of exhaust vent piping must not exceed **50 ft (15.2 m)***. Deduct 5 ft (1.5 m) for each 90° elbow used in the venting system. Do not use more than **5 elbows**. A 45° elbow is equivalent to 2.5 ft. of vent length.

Standard Vent Terminations

Vent type	Diameter	Max. No. of Elbows	Max. Vertical and Horizontal (Total) Vent Length
Intake	5 in. (127 mm)	5	50 ft (15.2 m)*
Exhaust	5 in. (127 mm)	5	50 ft (15.2 m)*

***For each 90° elbow added, deduct 5 ft. (1.5m) from max. vent length.**

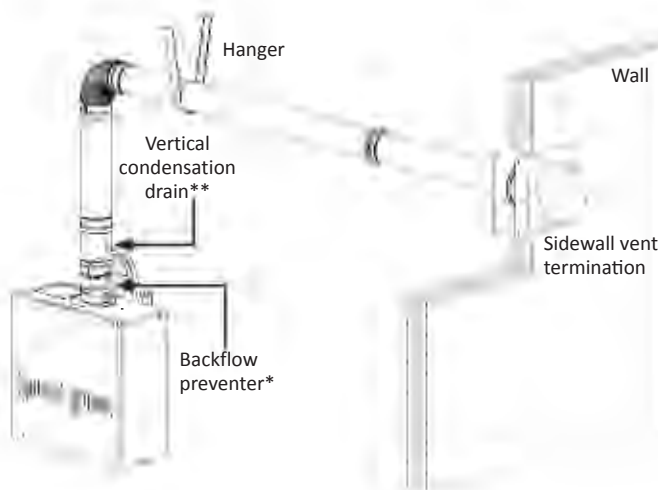
No. of Elbows	Max. Vertical or Horizontal Vent Length	No. of Elbows	Max. Vertical or Horizontal Vent Length
0	50 ft (15.2 m)	3	35 ft (10.7 m)
1	45 ft (13.7 m)	4	30 ft (9.1 m)
2	40 ft (12.2 m)	5	25 ft (7.6 m)

Excludes elbow termination, rain caps, or the 5 in. (127 mm) Concentric termination.

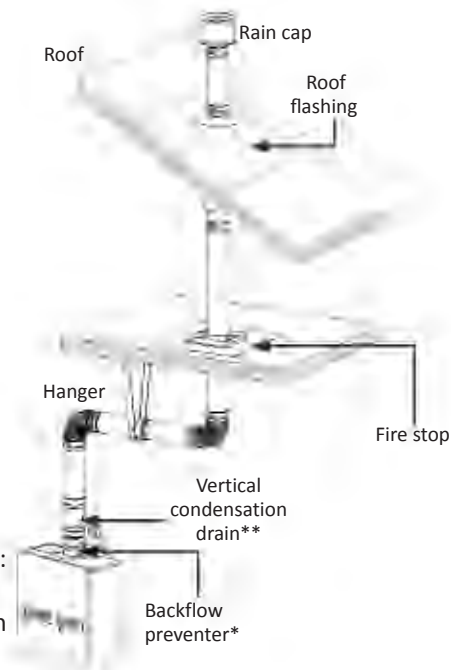
-Indoor installation diagrams-

Single Pipe with Room-Air Intake

Horizontal Installation



Vertical Installation

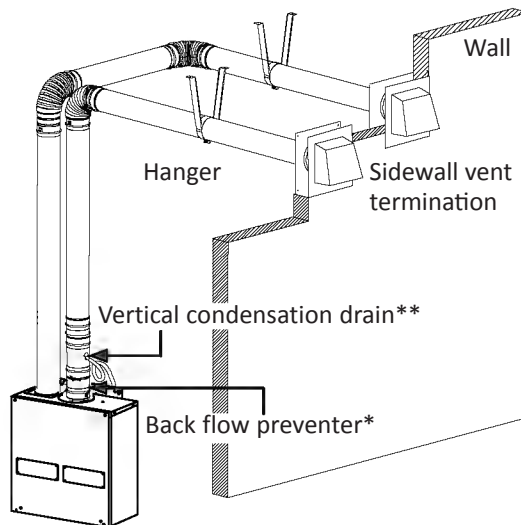


*Backflow preventer (Recommended for freezing weather conditions: 36 °F (2 °C) and below).

**Vertical condensation drain must be installed in accordance with local codes.

Direct vent installations

Horizontal Installation

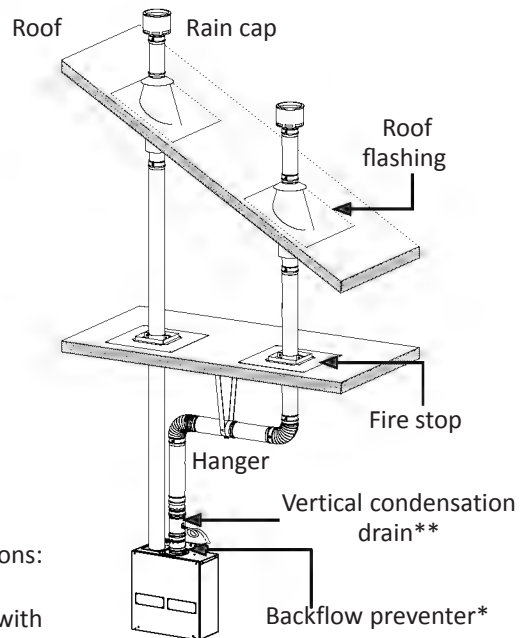


*Backflow preventer (Recommended for freezing weather conditions: 36 °F (2 °C) and below).

**Vertical condensation drain must be installed in accordance with local codes.

NOTE: Refer to page 14 for the correct DIP switch settings.

Vertical Installation

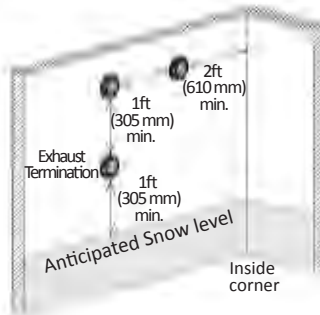


-Clearances for sidewall terminations-



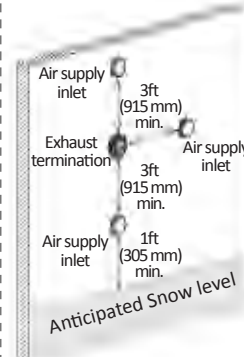
WARNING

Improper installation can result in carbon monoxide poisoning or death. Follow all local and national codes in regards to proper termination clearances. In the absence of such codes, the clearances below must be met. Local codes supersede these clearances. Failure to observe this warning may result in severe personal injury or death.



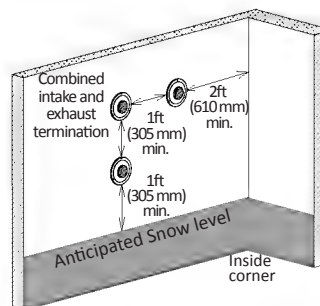
Multiple Sidewall Terminations

An exhaust termination must be at least 1 ft (305mm) away from another exhaust termination. An exhaust termination must also be at least 2 ft (610 mm) away from an inside corner. (If the adjacent wall is less than 2 ft (610 mm) of length, the minimum required distance away from the inside corner will be equal to the length of that adjacent wall.)



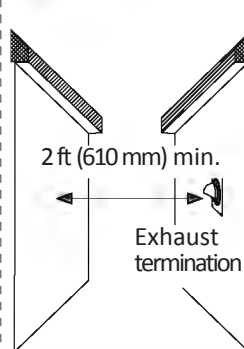
Direct vent sidewall terminations

that use two separate penetrations for the intake and exhaust, distance the intake and exhaust terminations at least 3 ft (915 mm) away from each other, no matter the orientation.



Multiple DV Sidewall Terminations

A direct vent (DV) termination must be at least 1 ft (305 mm) away from other direct vent terminations. A direct vent termination must also be at least 2 ft (610 mm) away from an inside corner. (If the adjacent wall is less than 2 ft (610 mm) of length, the minimum required distance away from the inside corner will be equal to the length of that adjacent wall.)



Exhaust and/or direct vent sidewall terminations

should be at least 2 ft (610 mm) away from an opposite surface/wall. Do not place the termination directly in front of an opening into a building.

-Clearances for rooftop terminations-



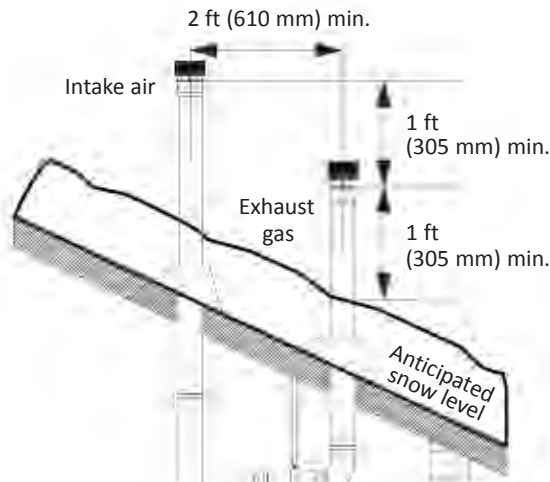
WARNING

Improper installation can result in carbon monoxide poisoning or death. Follow all local and national codes in regards to proper termination clearances. In the absence of such codes, the clearances below must be met. Local codes supersede these clearances. Failure to observe this warning may result in severe personal injury or death.

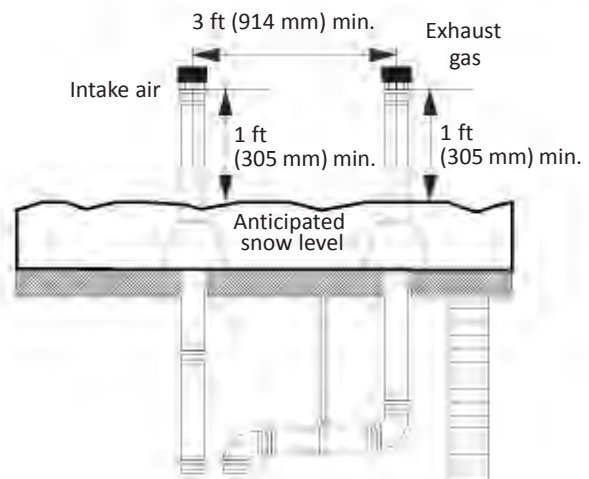
NOTICE

Canadian requirements differ from the guidelines in this section. In Canada, follow the requirements of B149.1 (Natural Gas and Propane Installation Code, current edition) as well as local and provincial codes. Contact your local code enforcement agency for direction.

Angled roof termination

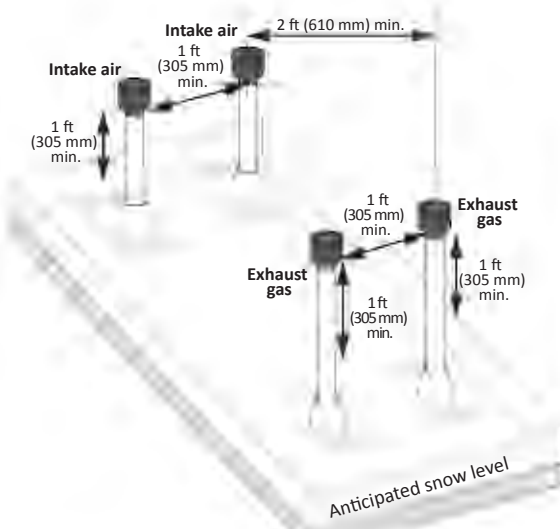


Flat roof termination

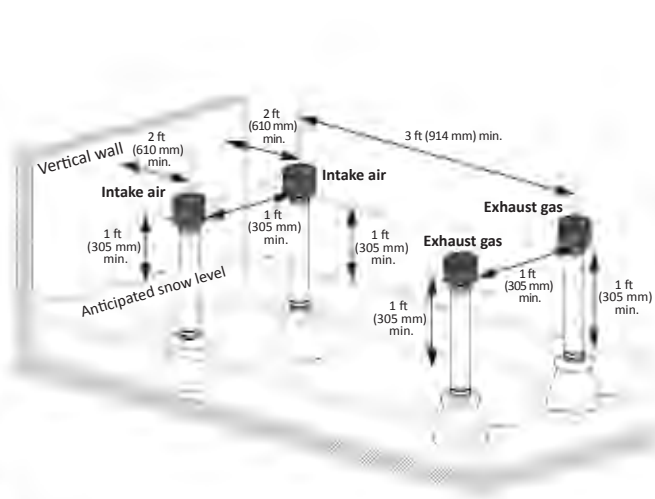


- In lieu of using roof caps, a 90 degree elbow and 45 degree elbow can be used for the exhaust, and two 90 degree elbows can be used for the air intake.

Multiple angled roof terminations



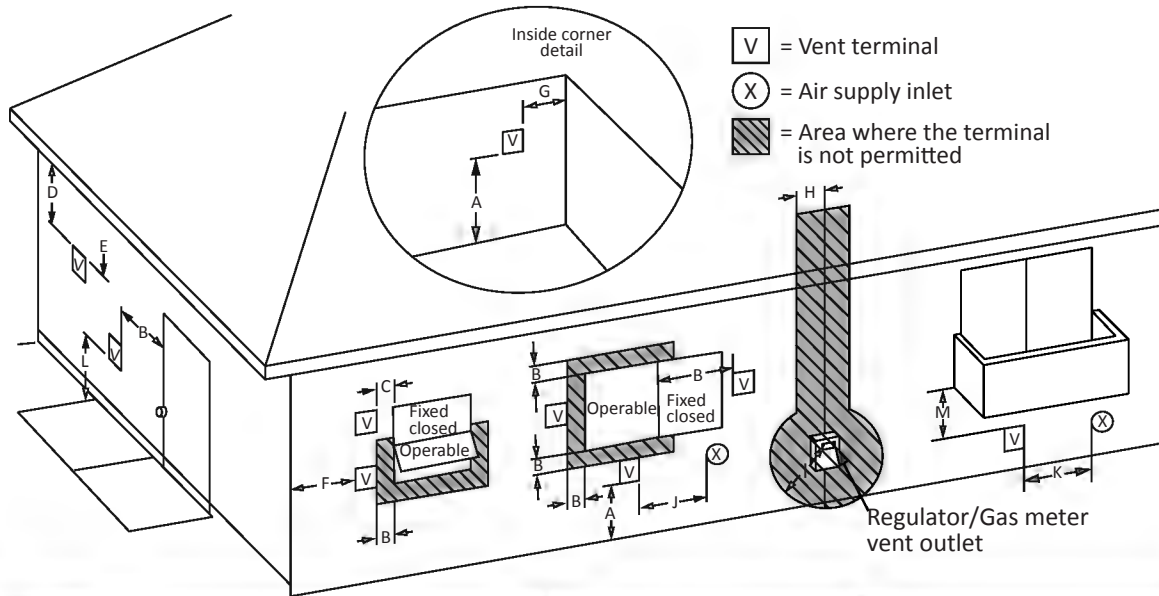
Multiple flat roof terminations



WARNING

- Exhaust terminations must be at least 1 ft (305 mm) away from any obstructions.
- Minimum spacing between multiple terminals:
 - intake terminals: 1 ft (305 mm) spacing between each
 - exhaust terminals: 1 ft (305 mm) spacing between each
- The exhaust termination must be a horizontal distance of at least 2 ft (610 mm) from a wall or surface unless specified differently by local code.
- Failure to observe this warning may result in severe personal injury or death.

-Vent termination clearances-



	Canada Installations ¹		US Installations ²	
	Direct vent and other than direct vent		Direct vent	Other than direct vent
A Clearance above grade, veranda, porch, deck, or balcony	1 ft (30 cm)		1 ft (30 cm)	
B Clearance to window or door that may be opened	3 ft (91 cm)		1 ft (30 cm)	4 ft (1.2 m) below or to side of opening; 1 ft (30 cm) above opening
C Clearance to permanently closed window	0		0	0
D Vertical clearance to ventilated soffit located above the vent terminator within a horizontal distance of 2 feet (61cm) from the center line of the terminator	3 ft (91 cm)		3 ft (91 cm)	3 ft (91 cm)
E Clearance to unventilated soffit	3 ft (91 cm)		3 ft (91 cm)	3 ft (91 cm)
F Clearance to outside corner	2 ft (61 cm)		2 ft (61 cm)	2 ft (61 cm)
G Clearance to inside corner	2 ft (61 cm)		2 ft (61 cm)	2 ft (61 cm)
H Clearance to each side of center line extended above meter/regulator assembly	3 ft (91 cm)		*	*
I Clearance to service regulator vent outlet	Above a regulator within 3 ft (91 cm) horizontally of the vertical center line of the regulator vent outlet to a maximum vertical distance of 15 ft (4.5 m)		*	*
J Clearance to non-mechanical air supply inlet to building or the combustion air inlet to any other appliance.	3 ft (91 cm)		1 ft (30 cm)	4 ft (1.2 m) below or to side of opening; 1 ft (30 cm) above opening
K Clearance to mechanical air supply inlet	6 ft (183 cm)		3 ft (91 cm) above if within 10 ft (3 m) horizontally.	
L Clearance above paved sidewalk or paved driveway located on public property	7 ft (213 cm)**		7 ft (213 cm)	7 ft (213 cm)
M Clearance under veranda, porch, deck, or balcony	1 ft (30 cm)***		1 ft (30 cm)***	1 ft (30 cm)***

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

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

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

Notes:

1) In accordance with the current CSA B149.1, Natural Gas and Propane Installation Code

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

GAS SUPPLY AND GAS PIPE SIZING

-General-



WARNING

- Do not use this water heater with any gas other than the one listed on the rating plate.
- Ensure that any and all gas regulators used are operating properly and providing gas pressures within the specified range shown below. Excess gas inlet pressure may cause serious accidents.
- Conversion of this unit from natural gas to propane or vice versa will void all warranty. Contact your local distributor to get the correct unit for your gas type. **The manufacturer is not liable for any property and/or personal damage resulting from gas conversions.**
- Failure to observe these warnings could result in severe personal injury, carbon monoxide poisoning, or death.

- Minimum and maximum inlet gas pressures:

Gas type	Inlet gas pressure
Natural Gas	Min. 4.0" W.C. (1.00 kPa) – Max. 10.5" W.C. (2.61 kPa)
Propane	Min. 8.0" W.C. (1.99 kPa) – Max. 14.0" W.C. (3.48 kPa)

- Inlet gas pressures that fall outside the range of values listed above may adversely affect the performance of the water heater. These pressures are measured when the water heater is in full operation and when it is in standby.
- Inlet gas pressure must not exceed the above maximum values; gas pressure above the specified range will cause dangerous operating conditions and damage to the unit.
- Until testing of the main gas line supply pressure is completed, ensure the gas line to the water heater is disconnected to avoid any damage to the water heater.
- If the gas supply pressure to the heater is greater than the specified maximum, a field-supplied regulator is required. The regulator must lower the gas pressure within the approved range.
 - Install the gas regulator according to the manufacturer's instructions.
 - The regulator must be sized for the water heater input and provide the specified pressures that are listed on the rating plate.
 - In the absence of minimum install distance, it is recommended that the gas regulator be installed no closer than 3 ft (1 m) from the water heater's inlet gas connection.

-Gas connections-

1. Install a full port, manual gas shutoff valve between the water heater and the gas supply line.
2. When the gas connections are completed, perform a gas leak test either by applying soapy water to all gas fittings and observing for bubbles or by using a gas leak detection device.
 - The water heater and its individual shutoff valve must be disconnected from the gas supply piping system during any pressure testing of that system at test pressures in excess of 1/2 psi (3.5 kPa).
 - The water heater must be isolated from the gas supply piping system by closing its individual manual shutoff 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).
3. Always purge the gas line of any inert gas, debris, and/or water before connecting to the gas inlet.

NOTICE

Size the gas pipe to supply the necessary volume of gas for the water heater. Refer to and follow the requirements listed in the current edition of ANSI Z223.1/NFPA 54 (USA), B149.1 (Canada), or local codes. Otherwise, flow capabilities and output temperatures will be limited.

-Natural gas supply piping-

Maximum delivery Capacity in Cubic Feet of Gas per Hour (based on IPS Pipe carrying Natural Gas with 0.60 Specific Gravity with a Pressure Drop of 0.5" W.C.).

Based on Energy Content of 1,000 BTU/Cubic ft; The water heater requires 380 Cubic ft/hr.

The following tables are from NFPA 54.

Unit: Cubic feet per hour

Pipe Size	Length: ft (m)												
Diameter: in.	10' (3.0)	20' (6.1)	30' (9.1)	40' (12.2)	50' (15.2)	60' (18.3)	70' (21.3)	80' (24.4)	90' (27.4)	100' (30.5)	125' (38.1)	150' (45.7)	200' (61.0)
1/2"	172	118	95	81	72	65	60	56	52	50	44	40	34
3/4"	360	247	199	170	151	137	126	117	110	104	92	83	71
1"	678	466	374	320	284	257	237	220	207	195	173	157	134
1 1/4"	1,309	957	768	657	583	528	486	452	424	400	355	322	275
1 1/2"	2,090	1,430	1,150	985	873	791	728	677	635	600	532	482	412
2"	4,020	2,760	2,220	1,900	1,680	1,520	1,400	1,300	1,220	1,160	1,020	928	794

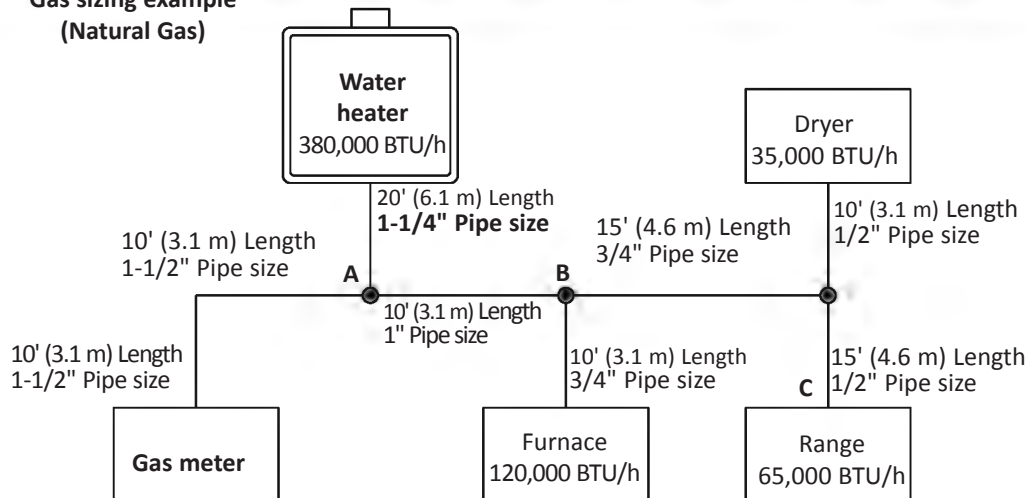
-Propane (LP) supply piping-

Maximum Capacity of Propane (LP) Based on 11" W.C. supply pressure at a 0.5" W.C. pressure drop

Unit: kBTU per hour

Pipe Size	Length: ft (m)												
Diameter	10' (3.0)	20' (6.1)	30' (9.1)	40' (12.2)	50' (15.2)	60' (18.3)	70' (21.3)	80' (24.4)	90' (27.4)	100' (30.5)	125' (38.1)	150' (45.7)	200' (61.0)
1/2"	268	184	148	126	112	101	93	87	82	77	68	62	53
3/4"	567	393	315	267	237	217	196	185	173	162	146	132	112
1"	1,071	732	590	504	448	409	378	346	322	307	275	252	213
1 1/4"	2,205	1,496	1,212	1,039	913	834	771	724	677	630	567	511	440
1 1/2"	3,307	2,299	1,858	1,559	1,417	1,275	1,181	1,086	1,023	976	866	787	675
2"	6,221	4,331	3,465	2,992	2,646	2,394	2,205	2,047	1,921	1,811	1,606	1,496	1,260

Gas sizing example (Natural Gas)



Based on Energy Content of 1,000 BTU/Cubic ft: Divide each appliance's BTU/h requirement by 1,000 BTU/ft³ to get the appliance's ft³/h requirement. Take into account the distance the appliance is from the gas meter, then look in the above gas chart to properly size the line.

For sections of the gas line supplying gas to more than one appliance (Ex: Point A to Point B), add up the cubic ft per hour requirements of the appliances that are being supplied by that section, and size to the farthest appliance. For Example: The section from A to B supplies gas to the furnace, range and dryer. Adding up the BTU/h requirements and dividing by 1,000 yields a cubic ft per hour requirement of 220 cubic ft of gas per hour. The farthest appliance is the range, which is 60 ft (18.3 m) away from the meter. According to the chart above, the 60-ft (18.3 m) column shows that Section A to B must be 1" in order to supply 220 cubic ft per hour.

WATER CONNECTIONS



WARNING

Do not use this appliance if any part has been under water. Immediately contact a qualified installer or service agency to replace a flooded water heater. Do not attempt to repair the unit! It must be replaced! Failure to follow these instructions could lead to property damage, personal injury, or loss of life.

NOTICE

Do not reverse the hot outlet and cold inlet connections to the water heater. This will prevent the water heater from activating properly.

All pipes, pipe fittings, valves and other components, including soldering materials, must be suitable for potable water systems.

1. A manual shutoff valve must be installed on the cold water inlet to the water heater between the main water supply line and the water heater.
2. In addition, a **manual shutoff valve** is recommended on the hot water outlet of the unit. **Isolation valves** are recommended.
3. If the water heater is installed within, or subjected to, a closed loop water system, a **thermal expansion tank or a code approved device to handle thermal expansion** must be installed.
4. Before installing the water heater, flush the water line to remove all debris, and after installation is complete, purge the air from the line. Failure to do so may cause damage to the water heater.
5. There is a wire mesh filter within the cold inlet to trap debris from entering your heater. This will need to be cleaned periodically to maintain optimum flow. (Refer to p. 40.)

As Close as Possible

Pressure relief valve

Hot outlet

Cold inlet

Gas inlet

-Pressure relief valve-

The water heater has a high-temperature shutoff switch built in as a standard safety feature (called a Hi-Limit switch). Therefore, a **"pressure only"** relief valve is required.

- This unit does not come with an approved pressure relief valve.
- An approved pressure relief valve must be installed on the hot water outlet.
- The pressure relief valve must conform to the current edition of **ANSI Z21.22** or **CAN 1-4.4** and installation must follow local codes.
- The discharge capacity must be at least 380,000 BTU/h.
- The pressure relief valve must be rated for a maximum of 150 psi (1 MPa).
- The discharge piping for the pressure relief valve must be directed so that the hot water cannot splash outward and cause damage or personal injury.
- Attach the discharge tube to the pressure relief valve and run the end of the tube to within 6 in. (152 mm) from the floor. This discharge tube must allow free and complete drainage without any restrictions.
- If the pressure relief valve installed on the water heater discharges periodically, this may be due to a defective thermal expansion tank or defective pressure relief valve.
- The pressure relief valve must be manually operated periodically to check for correct operation.
- No valve shall be placed between the relief valve and the water heater.
- For the ASME model, the pressure relief valve must conform to and be installed in accordance with ASME code.



WARNING

Hot water could be released when the pressure relief valve is opened. This could result in severe personal injury. Contact with discharge may cause property damage and/or bodily harm. Before operating the pressure relief valve manually, check that it will discharge in a safe place. If water does not flow freely from the end of the discharge pipe, turn the gas supply and power OFF and call a qualified person to determine the cause. Refer to the pressure relief valve manufacturer's instructions for inspection and maintenance requirements.

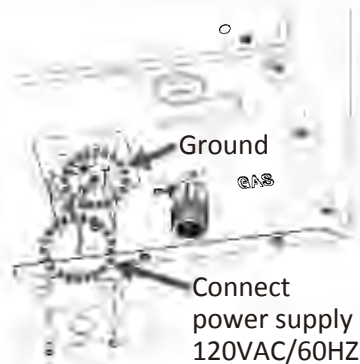
ELECTRICAL CONNECTIONS



WARNING

- Ensure that circuit power is turned OFF before you complete the following steps.
- Follow the electrical code requirements of the local authority having jurisdiction. In the absence of such requirements, follow the current edition of the National Electrical Code ANSI/NFPA 70 in the U.S. or the current edition of CSA C22.1 Canadian Electrical Code Part 1 in Canada
- When servicing or replacing parts within the water heater, label all wires prior to disconnection to facilitate an easy and error-free reconnection. Wiring errors can cause improper and dangerous operation. Verify proper operation after servicing.
- Failure to follow these instructions can result in fire, electrical shock, or death.

1. The water heater must be electrically grounded. Do not attach the ground wire to either the gas or the water piping.
2. The water heater requires a **120 VAC, 60 Hz electrical power supply that is properly grounded.**
 - A proper disconnect (i.e. on/off switch, power plug, etc.) controlling the main power to the water heater must be provided for service reasons. (Must comply with local codes.)
 - Connect the power supply to the water heater exactly as shown in the wiring diagram.
3. A green screw is provided in the junction box to ground the connection.
4. Can be hardwired or wired to a plug-in.
5. The use of a surge protector is recommended in order to protect the unit from power surges.



REMOTE CONTROLLER CONNECTION

This water heater can be connected to a remote controller 100112155 (TM-RE30). Refer to the instructions attached to the remote controller for details.



WARNING

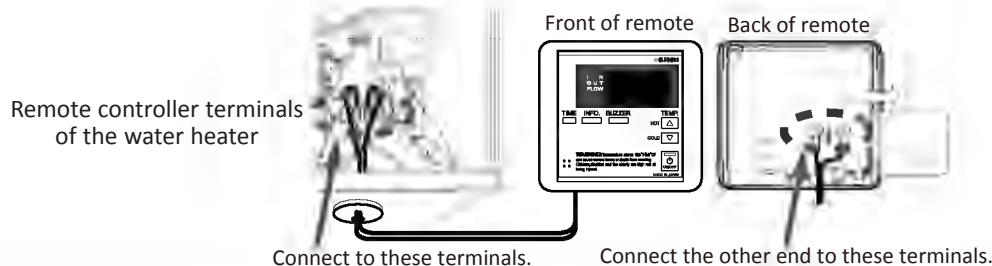
- **This remote controller is NOT waterproof.**
- **The water heater can only have one remote controller.**
- Do not install in high temperature environments, steamy conditions (such as a bathroom), outdoors, in direct sunlight, or within the reach of children.
- Make sure the remote controller does not come into contact with water or oil.
- Failure to observe these warnings could result in electrical shock.

NOTICE

- Do not place the remote controller cable close to other wires from other products.
- Cables used for the remote controller connection must be:
 - Minimum 20 gauge wire (No polarity)
 - **Maximum 400 ft (122 m) long**

Connecting the remote controller to the water heater

1. Disconnect the power supply from the water heater.
 2. Take off the water heater's front cover.
 3. Locate the two terminals for the remote controller inside the water heater.
 4. Put the remote controller cable through the hole at the bottom of the water heater's casing from outside.
 5. Connect the two terminals attached to the end of the remote control cables to the terminals near the computer board as shown below. (No polarity)
- * Do NOT jump or short-circuit the wires, or the computer will be damaged.**
6. Replace the water heater's front cover securely.



EXTERNAL FAN MOTOR CONNECTION

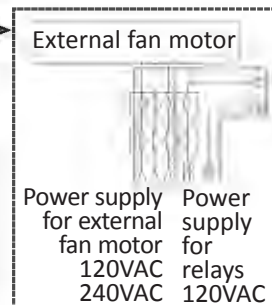
This water heater can be connected to a external fan motor so that it can activate when the water heater requires more combustion air. Refer to the following diagram and the instructions of the fan motor manufacturer. Disconnect the power supply from the water heater.

These components are NOT included with the 910 model and are external to the unit. They must be purchased seperately.



Disconnect the power supply from the water heater. Failure to do so can result in electrical shock.

Center computer board



Pump control terminals*

Fan motor control terminals*

Connect to these terminals located on the center computer board
In an Easy-Link System, this connection must be made on the parent unit.

*Max voltage allowed on these terminals: 240VAC

PUMP CONTROL CONNECTIONS

The 910 can be used to control a recirculation pump. Proper pump control helps to preserve the life of the system and saves energy as well. The water heater pump control port is a "normally-open" dry contact, and therefore needs additional components to properly control a recirculation pump. To control the recirculation pump, connect the pump via a field supplied relay to the "pump terminal" on the 910 center computer board as shown in the diagram below. (The pump terminal is essentially only a dry contact. An external power supply and relays are required to operate the pump.) Please make sure the relays are properly rated for the recirculation pump.

Using the 910 internal thermistors as a temperature control, the recirculation pump will only turn on when recirculation is needed, depending on the control mode selected. See the next section.

NOTICE

In an Easy-Link System, the pump must be connected only to the Pump terminal in the PARENT unit. If the pump is connected to any of the CHILD units, the pump will not work. These components are NOT included with water heaters and are external to the unit. They must be acquired separately.

-Pump control mode-

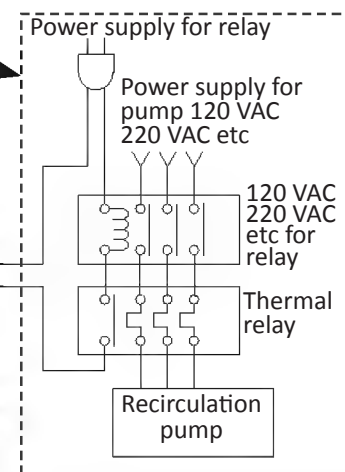
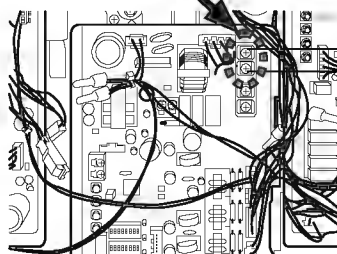
The 910 provides the four types of the pump control modes. The pump control modes are selected by changing the Dip switches located on the **upper bank** of the **center** computer board. (See the following diagrams.)

A) Recirculation Control: DIP SW No. 4 ON

Five minutes after the heater goes into standby, the heater will activate the recirculation pump. It will run the pump for one minute, monitoring the water temperature. The pump will stop if the water in the circulation line has not cooled more than 9 °F (5 °C) from the set temperature. The heater will repeat this process 30 minutes later. The pump will continue to run if the water has cooled more than 9 °F (5 °C) from the set temperature until the line has reheated. If the inlet thermistor detects the water temperature has cooled more than 9 °F (5 °C) from the set temperature during the standby period, it will activate the pump to reheat the circulation loop.

These components are NOT included with water heaters and are external to the unit. They must be acquired separately.

Connect to the pump control terminals*.



*Max voltage allowed on these terminals: 240VAC

B) Storage Tank Circulation Control: DIP SW No. 5 ON

The 910 will heat the water 5.4 °F (3 °C) higher than its set temperature unless it is set at 185°F (85°C). This is to ensure a higher rate of recovery for storage tank applications. The circulation pump (from storage tank to 910) will always remain running.

C) Energy Conserving Recirculation: DIP SW No. 4 and No. 5 ON

This pump control mode is similar to the Recirculation Control mode. It will run the pump for one minute, monitoring the water temperature. The pump will stop if the water in the circulation line has not cooled below 95 °F (35 °C). The heater will repeat this process 20 minutes later. The pump will continue to run if the water has cooled below 95 °F (35 °C) until the line has reheated. If the outlet thermistor detects the water temperature has cooled below 95 °F (35 °C) during the standby period, it will activate the pump to reheat the circulation loop. If operating the pump in this mode, insulation is recommended on the water piping.

D) Normal Control (Default setting): DIP SW No. 4 and No. 5 OFF

The pump runs continuously and will not provide pump control. This will reduce the heater's warranty unless the pump is controlled by an aqua stat. Refer to your product warranty for details.

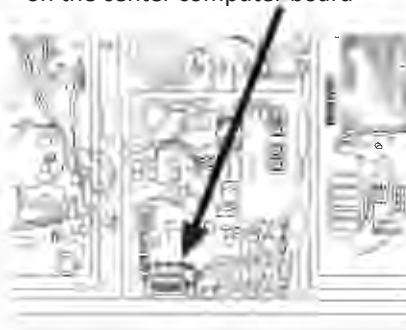


WARNING

- Adjust the appropriate DIP switches as shown below. **DO NOT** adjust the other DIP switches.
- Turn off the power supply to the water heater before changing the DIP switch settings.
- Failure to observe these warnings could lead to carbon monoxide poisoning or death.

Pump Control Modes	
A) Recirculation Control	
B) Storage Tank Circulation Control	
C) Energy Conserving Recirculation	
D) Normal Control Recirculation (DEFAULT)	

Upper bank of DIP switches on the center computer board



TWO UNIT PRIORITY

Both combustion sections will activate with demand when the **two unit priority** DIP switch is set to ON. The minimum activation flow rate requirement will increase from 0.5 gpm (1.9 L/M) to 1.0 gpm (3.8 L/M) in this mode. This mode is useful for applications requiring high demands. Adjust the following DIP switch on the **upper bank** on the **center** computer board after disconnecting power-supply. **Refer to the Warning above and the DIP switch location diagram above.**

Combustion priority			
Two unit priority		Standard operating mode (DEFAULT)	

EASY-LINK SYSTEM

The water heater can be connected with other heaters of the **same model** with communication cables to work as a multiple manifold system.

- The Easy-Link System can connect up to 4 units.
- A communication cable (gray color) comes with each unit. The cables use 18 gage wire and can be up to 250 ft (76.2 m) long all together.

You can manifold from 2 units to 4 units without a multi-unit controller. A 4-unit system has full automatic modulation between 15,000 BTU/h and 1,520,000 BTU/h.



NOTICE

- The Easy-Link System is limited to up to **4 units**. If you connect more than 4 units, only the first 4 units will work as a part of the Easy-Link System. The other additional units will not work.
- A remote controller is not required for an Easy-Link System. However, it does provide for more temperature options and ease of maintenance.
- If a remote controller is used, the temperature on all the units in the system will automatically be set to the same temperature that is set on the remote.
- When a remote is used in an Easy-Link System, it must be connected to the parent unit.

-Easy-Link Connection Procedures-

1. Make sure the power to the heaters is turned off.
2. Verify the DIP switch set temperatures of all units within the system. Every water heater must be set to the same set temperature. **If an optional remote controller 100112155 (TM-RE30) is used, it shall be installed to the PARENT unit.** (See the diagram on the next page.) The remote will set the temperature for the entire system.
3. Select one unit to be the **PARENT** unit. The **PARENT** unit should be one of the end units.
4. **PARENT** unit:
Locate the lower bank of DIP switches at the bottom left of the center computer board. Change DIP switch No. 8 on the **lower bank of DIP switches to the ON position**. See the computer board diagram shown on the next page. Do not change any DIP switches on any of the **CHILD** units.
5. Between the **PARENT** and the **CHILD-1** units:
Connect the **PARENT** connector of the **PARENT** unit to the **1** connector of the **CHILD-1** unit using the supplied linking cable.
6. Between the **CHILD-1** and the **CHILD-2** units:
Connect the **2** connector of the **CHILD-1** unit to the **1** connector of the **CHILD-2** unit.
7. Between the **CHILD-2** and the **CHILD-3** units:
Connect the **2** connector of the **CHILD-2** unit to the **1** connector of the **CHILD-3** unit.
8. Verify that all cables are connected like the diagram (B).
9. Turn on power to the **PARENT** unit. When the 7-seg. LED of the center computer board of the **PARENT** unit displays a number, turn on **CHILD-1**. When the 7-seg. LED of the center computer board of the **CHILD-1** unit displays a number, turn on **CHILD-2**. When the 7-seg. LED of the center computer board of the **CHILD-2** unit displays a number, turn on **CHILD-3**. Make sure the 7-seg. LEDs of all the center computer board of each unit displays each unit number. The numbering system automatically allocates the unit number to each water heater in the Easy-Link System, in accordance with the table shown below.
10. Set the desired temperature on the controller attached to the **PARENT** unit. If a controller is not installed, set the temperature DIP switches on each heater as shown in the table located at the bottom of page 38.

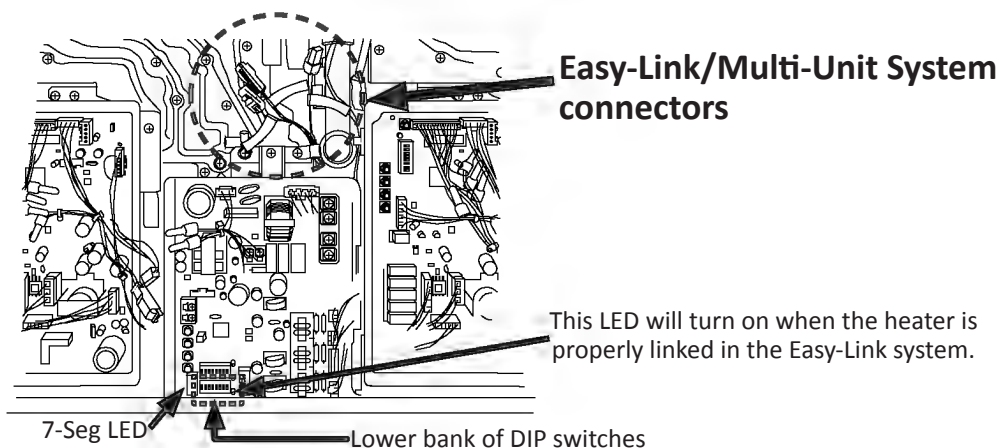
Type of unit	Unit # of easy-link
Parent	1
Child	2, 3, or 4



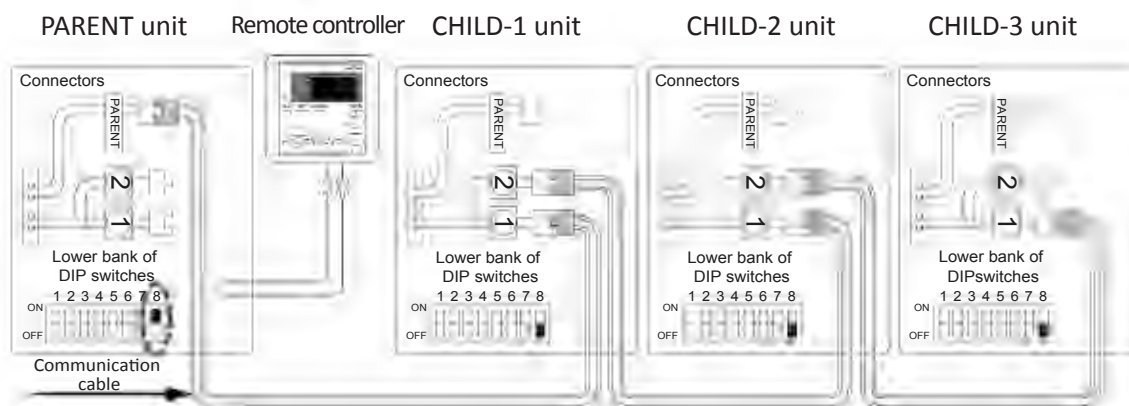
WARNING

- To change the DIP switch settings for an Easy-Link System, locate the lower bank of DIP switches at the bottom, left of the center computer board.
- DO NOT adjust any other DIP switches .
- Turn off the power supply to the water heater before changing the DIP switch settings.
- Failure to observe this warning could result in carbon monoxide poisoning or death.

(A) 910 model Computer board and connection



(B) Basic diagram of connections between units in an Easy-Link System



NOTE: The black squares indicates the correct DIP switch positions.

NOTICE

- A remote controller is not required for an Easy-Link System. However, it does provide for more temperature options and ease of maintenance.
- If a remote controller is used, the temperature on all units in the system will automatically be set to the same temperature that is set on the remote.

MULTI-UNIT SYSTEM

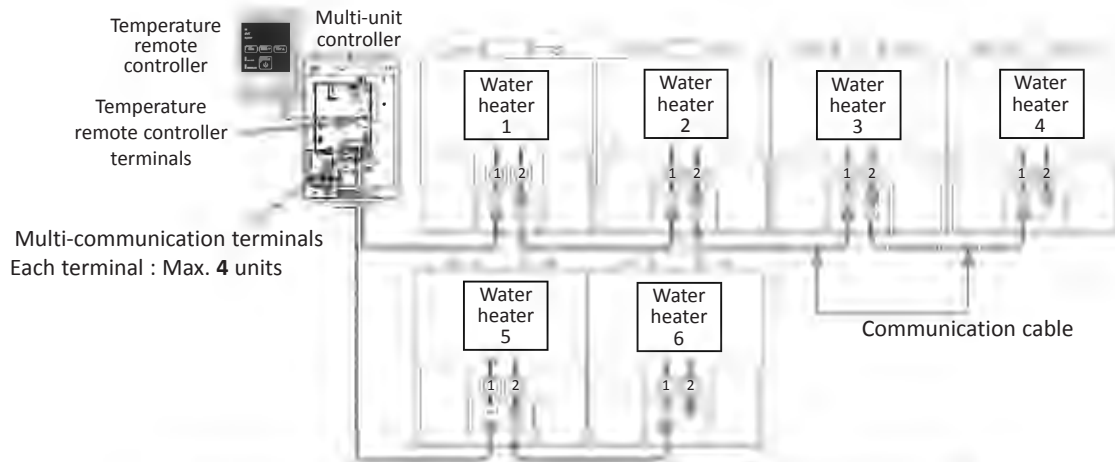
Multiple 910 models can be combined for a Multi-Unit System, along with the multi-unit controller **100112691(TM-MC02)**. Each multi-unit controller can control from 2 to 10 units for commercial or residential applications. For a 10-unit system, the computer can modulate from 15,000 BTU/h to 3.8 million BTU/h.

An individual cut-off switch is recommended for each unit in a Multi-Unit System for the purpose of maintenance.



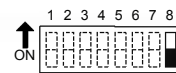
Multi-Unit System connection diagram

Multi-unit controller and temperature remote controller wiring:



DIP switch settings for Multi-Unit System

Lower bank of DIP switches
NO.8: OFF
(Default)



- Each heater's No.8 DIP switch, located on the center computer board's lower bank of DIP switches, should be in the OFF position.
- The diagram above shows an example of a Multi-Unit controller connected to six water heaters.
- The multi-unit controller automatically allocates the unit number (1-10) to each water heater that is part of the Multi-Unit System. Make sure each 7-Seg LED of all the units' center computer boards displays the unit number. The lower LED will illuminate when the heater has linked to the controller.
- In a Multi-Unit System, connect the "[1]" connector and the "[2]" connector with the communication cable (refer to p. 9) or 18 gauge wire cables. The total cable length can be up to 250 ft (76.2 m) long.

NOTICE

For detailed instructions on the multi-unit controller, refer to the instructions that are packaged with the multi-unit controller.

APPLICATIONS

SPACE-HEATING APPLICATIONS



WARNING

- This water heater is suitable for combination water (potable) heating and space heating and not suitable for space heating applications only.
- In order to purge air in water pipes within a closed-loop system, an air vent and air separator should be installed in the system. Required circulation flow rates are labeled next to each application diagram. These flow rate requirements must be followed.
- Toxic chemicals used in boiler treatments such as alcohol, glycerol and glycol groups must not be introduced into the system.
- The water heater can be used to supply combination potable water and space heating and shall not be connected to any heating system or component(s) previously used with non-potable water where any chemicals were added to the water heating appliances.
- When the system requires water for space heating at temperatures higher than required for other uses, a means such as a mixing valve shall be installed to temper the water for those other uses in order to reduce scald hazard potential.
- Water temperature over 125 °F (52 °C) can cause severe burns instantly or death from scalding.

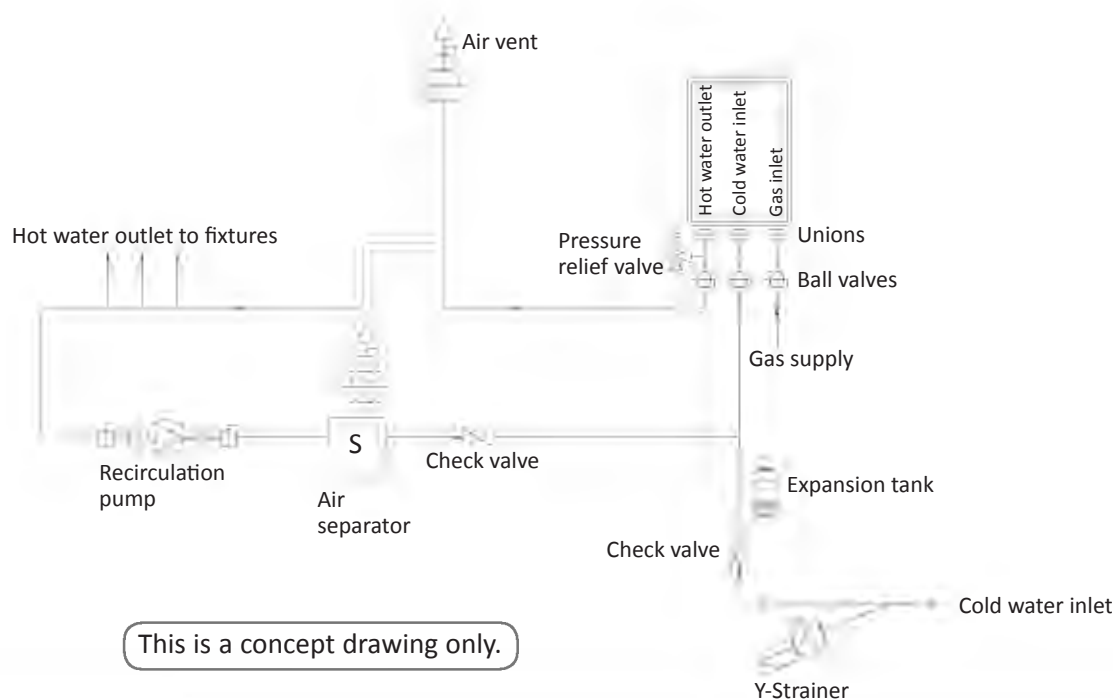
RECIRCULATION

**The recirculation pump is to be controlled by:*

-Dual-set aquastat (recommended w/timer)

- *The aquastat's differential should be a minimum of 10 °F (5 °C).*

**The recirculation pump is to provide no less than 2 GPM (7.5 L/min) and no more than 4 GPM (15 L/min) through each activated unit in the system. Refer to the heaters specification sheet on the manufacturer's website for pressure drop information.*



DUAL-PURPOSE HOT WATER HEATING (Domestic and Space Heating):

Diagrammatic layout of radiant heating and domestic water heater.

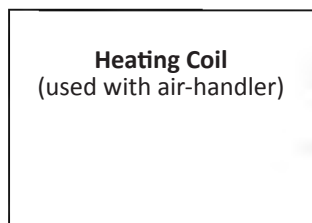
All water piping should be insulated in accordance with 780 CMR (Massachusetts energy code)

Automatic tempering device must be installed below the top of the water heater as per manufacturer's recommendations

Piping loop between water heater and fan coil shall be in compliance with 248 CMR

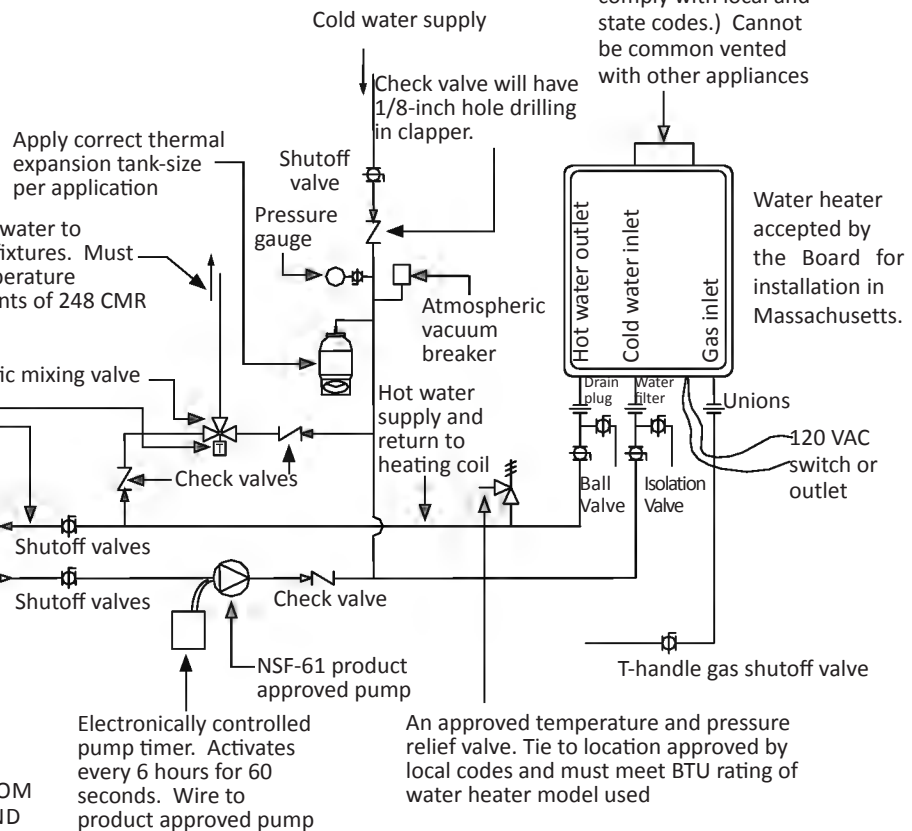
Apply correct thermal expansion tank-size per application
Tempered water to plumbing fixtures. Must meet temperature requirements of 248 CMR

Thermostatic mixing valve



System installed with reverse acting aquastat to shut off fan. Suggested but not required by 248 CMR

50'-0" MAXIMUM DISTANCE FROM WATER HEATER TO FAN COIL AND BACK (DEVELOPED LENGTH) NOT INCLUDING COIL IN HEATING UNIT.



The recirculation pump is to provide no less than 2 GPM (7.5 L/min) and no more than 4 GPM (15 L/min) through each activated unit in the system

NOTICE

- **Priority Control Devices** such as a flow switch, an Aquastat or other electronic controller can be used to prioritize the domestic water system over the heating system.
- Follow all local codes, or in the absence of local codes, follow the current edition of the National Standard Code, ANSI Z21.10.3 • CSA 4.3.
- This illustration is a concept design only. The reference to the 1/8-inch hole in the check valve is only required in the State of Massachusetts. There are a wide variety of variations to the application of controls and equipment presented. Designers must add all necessary safety and auxiliary equipment to conform to code requirements and design practice. For more details, contact the manufacturer or local code authority.

INITIAL OPERATION

FOR YOUR SAFETY, READ BEFORE OPERATING

- **Check the GAS and WATER CONNECTIONS** for leaks before firing the unit for the first time.
- Open the main gas supply valve to the unit using only your hand to avoid any spark. Never use tools. If the knob will not turn by hand, do not try to force it; call a qualified service technician. Forced repair may result in a fire or explosion due to gas leaks.
- Be sure to check for the presence of leaking gas toward the bottom of the unit because some gases are heavier than air and may settle toward the floor.
- **Check the GAS PRESSURE.** Refer to pp. 21 and 40.
- Do not try to light the burner manually. It is equipped with an electronic ignition device which automatically lights the burner.
- **Check for PROPER VENTING and COMBUSTIBLE AIR** to the water heater.
- **Purge the GAS and WATER LINES** to remove any air pockets.
- Do not use this water heater if any part has been submersed under water. Do not attempt to repair the unit. It must be replaced. Failure to follow these instructions could lead to property damage, personal injury, or loss of life.

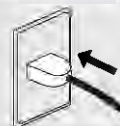


WARNING

IF YOU SMELL GAS:

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

Operation	
1.	Once the above checks have been completed, please clean the filter of any debris. Refer to p. 40 for instructions.
2.	Fully open the manual water control valve on the water supply line.
3.	Open a hot water tap to verify that water is flowing to that tap, then close the hot water tap.
4.	Fully open the manual gas control valve.
5.	Turn on the 120 VAC, 60 Hz power supply to the water heater.
6.	Now you are ready to enjoy hours of endless hot water.





Owner's Guide

CONGRATULATIONS

Congratulations and thank you for choosing our tankless water heater. Before use, we recommend that you read through this owner's guide carefully. Keep this manual for future reference.

If you need an additional manual, contact the manufacturer or your local distributor. When you call, please tell us the product name and the serial number of your unit written on the rating plate of the water heater.

OPERATING SAFETY

FOR YOUR SAFETY READ BEFORE OPERATING

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

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

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

WHAT TO DO IF YOU SMELL GAS

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

C. Use only your hand to turn the gas shutoff valve. Never use tools. If the valve will not turn by hand, don't try to repair it, call a qualified service technician. Force or attempted repair may result in a fire or explosion.

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

OPERATING INSTRUCTIONS

1. STOP! Read the safety information above on this label.
2. Turn off all electric power to the appliance.
3. Do not attempt to light the burner by hand.
4. Turn the gas shutoff valve located on the outside of the unit to the closed position.
5. Wait five (5) minutes to clear out any gas. If you then smell gas, STOP! Follow "B" in the safety information above on this label. If you don't smell gas, go to the next step.
6. Turn the gas shutoff valve located on the outside of the unit to the open position.
7. Turn on all electrical power to the appliance.
8. If the appliance will not operate, follow the instructions in "To Turn Off Gas to Appliance," and call your service technician or gas supplier.

TO TURN OFF GAS TO APPLIANCE

1. Turn off all electric power to the appliance if service is to be performed.
2. Turn the gas shutoff valve located on the outside of the unit to the closed position.

⚠ 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 area near the water heater.



Do not install water heater where flammable products will be stored or used unless the main burner is at least 18" above the floor. This will reduce, but not eliminate the risk of vapors being ignited by the main burner.

FLAMMABLES

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

Keep flammable products:

1. Far away from heater.
2. In approved containers.
3. Tightly closed and out of reach of children.
4. Water heater has a main burner, which may come on at any time and will ignite flammable vapors.

Vapors:

1. Cannot be seen.
2. Are heavier than air.
3. Go a long way on the floor.
4. Can be carried from other rooms to the main burner by air currents.

⚠ DANGER

1. Water temperature over 125°F (52°C) can cause severe burns instantly or death from scalds.
2. Children, disabled and elderly are at highest risk of being scalded.
3. Feel water before bathing or showering.
4. Temperature limiting valves are available. See manual.
5. The outlet temperature of the water heater is set at 120°F (50°C). If you require water temperatures below this setting, follow the instruction manual.
6. Use this heater at your own risk. Test the water before bathing or showering. Do not leave children or an infirm person unsupervised. See your local water supply company [plumbing hardware retailer] for temperature limiting valves that are available.



A pressure relief valve listed as complying with the standard for Relief Valve and Automatic Gas Shutoff Devices for Hot Water Supply System, ANSI Z21.22 • CSA 4.4, shall be installed at the time of installation of the water heater in the location specified by the manufacturer. Local codes shall govern the installation of relief devices for safety operation of the water heater. The relief valve must not be removed or plugged.

No valve shall be placed between the relief valve and the water heater. The relief from the discharge of the pressure relief valve shall be disposed of in a suitable place where it will cause no damage. Also, there shall be no other reducing coupling or other restrictions installed on the discharge line to restrict flow.

See Installation Manual heading "PRESSURE RELIEF VALVES" for installation and maintenance of relief valve discharge line and other safety precautions.

NORMAL OPERATION

GENERAL



WARNING

Temperatures above 125 °F (52 °C) can cause severe burns or death from scalding. Children, disabled and the elderly are at high risk of being injured.

°F	120	125	130	135	140	145	150	155
°C	49	52	54	57	60	63	66	68
Time to produce serious burn	more than 5 min.	1½ to 2 min.	about 30 sec.	about 10 sec.	less than 5 sec.	less than 3 sec.	about 1½ sec.	about 1 sec.

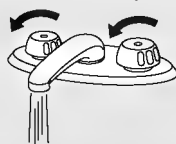
NOTICE

- Flow rate to activate the water heater: 0.5 gallon per minute at the default set temperature (1.9 L/min).
- Flow rate to keep the water heater running: 0.4 gallon per minute (1.5 L/min).

1. Open a cold water fixture.



2. Mix hot water with the cold water to get the correct temperature water.

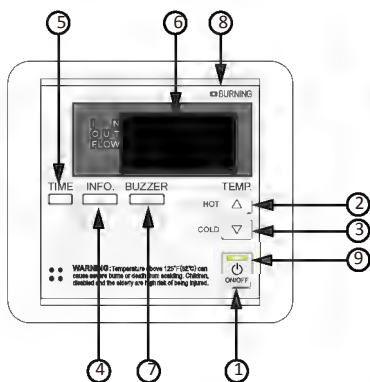


3. When finished, close the water fixtures.



WITH REMOTE CONTROLLER

100112155(TM-RE30)-Optional accessory



NOTICE

- Please read the instructions carefully before installing the remote.
- The controller has an energy saving mode. Five minutes after the water heater stops operating, the backlight of the controller turns off.
- The backlight of the remote will turn back on once the water heater begins firing again.

No.	Description	Note	No.	Description	Note
1	"ON/OFF" Button	Press this button to start or stop operation.	5	"TIME" Button	Press this button to set the current time.
2	"HOT" Button	Press the "HOT" button or the "COLD" button to set the outlet water temperature, the current time, and PUMP TIMER.	6	LCD	The current time, set temperature, error code and other information are displayed.
3	"COLD" Button		7	"BUZZER" Button	Press this button to set and control the buzzer function.
4	"INFO." Button	Press the "INFO." button to display the inlet & outlet water temperature and water flow and set the outlet temperature, pump selection, and unit conversion.	8	BURNING	The LED lights during combustion.
			9	STAND BY LED	The LED lights when power is on.

-Set temperature-

1. Turn on the 120 VAC power supply to the unit.
2. Press the **"ON/OFF"** button on the controller in order to turn the controller on.
When ON, the **STAND BY LED** is lit. The set temperature of the output water appears on its display.
3. Press the **"HOT"** button or the **"COLD"** button to set the temperature setting of the unit.
To increase the temperature from 120 °F (50 °C) to 140 °F (60 °C):
Press the **"HOT"** button to set 120 °F (50 °C).
Press and hold the **"INFO"** button and the **"HOT"** button for at least 3 seconds.
The remote will emit a beep and change to 125 °F (52 °C).
Press the **"HOT"** button to set up to 140 °F (60 °C).
To increase the temperature above 140 °F (60 °C):
Press the **"HOT"** button to set 140 °F (60 °C).
Press and hold the **"INFO"** button and the **"HOT"** button for at least 3 seconds.
The remote will emit a beep and change to 145 °F (63 °C).
Press the **"HOT"** button to set up to 175 °F (80 °C) or 185 °F (85 °C) -must be set to High Temperature Mode. See the high temperature mode procedure below.



-Temperature tables of controller-

a) Default mode

°F	100	105	110	115	120*	125	130	135	140	145	150	155	160	165	170	175
°C	38	40	43	45	50*	52	55	57	60	63	65	68	70	75	77	80

b) High temperature mode

°F	110	115	120*	125	130	135	140	145	150	155	160	165	170	175	180	185
°C	43	45	50*	52	55	57	60	63	65	68	70	75	77	80	82	85

*Factory setting (Default): 120 °F (50 °C)

To change the remote controller's mode from Default mode to High Temperature mode:

1. Turn off power to the remote controller by pressing the **"ON/OFF"** button.
 2. Simultaneously press and hold both the **"HOT"** and **"COLD"** buttons for at least 5 seconds. Make sure that **"1"** (or **"0"** for Easy-Link System or Multi-Unit System) is displayed on remote controller.
 3. Press the **"TIME"** button. Make sure that **"OFF"** and **"F1"** are displayed on remote controller.
 4. Press the **"INFO"** button and make sure that **"OFF"** blinks.
 5. Press the **"HOT"** button or the **"COLD"** button to set display to **"on"**.
 6. Simultaneously press both the **"BUZZER"** button and the **"INFO"** button to approve the setting.
 7. Make sure that the display is no longer blinking.
 8. Press the **"ON/OFF"** button to finish the setting.
 9. Turn on power to the remote controller by pressing the **"ON/OFF"** button again.
- These images show the procedure's results on the display (listed in sequential order).



- DO NOT set temperature above 180°F (82°C) if you use your water heater in a recirculation system. This will cause damage to the heater and void the warranty.
- Water temperatures over 125 °F (52 °C) can cause severe burns instantly or death from scalding.

-Other functions-

<Set the time>

1. Press the **"TIME"** button, then press the **"HOT"** or **"COLD"** button to set the clock time.
2. Press the **"TIME"** button again to save and exit.

NOTE: If you want to hide the clock time, press and hold the **"TIME"** button for 3 seconds or longer.

<Buzzer operation and Error code>

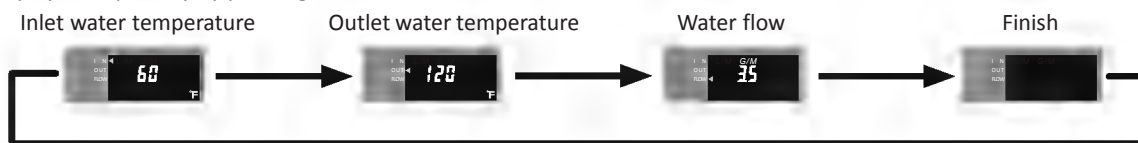
If there is a problem with the unit, the remote controller will sound a buzzer and display the error code to inform you the source of the problem.

You can stop the buzzer by pressing the **"BUZZER"** button. Refer to pp.44 and 45 for error codes.

NOTE: If you want to disable the buzzer operation, press and hold the **"BUZZER"** button for 3 seconds or longer.

<Information mode>

You can get some information about the water heater condition by pressing the "INFO" button. The following information will be displayed sequentially by pressing the "INFO" button.



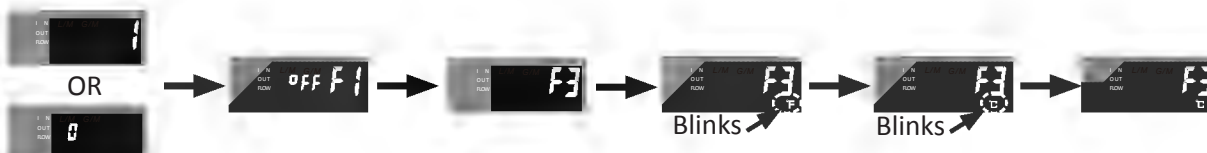
<Unit conversion mode>

The remote controller has a function that can change units of temperature and flow rate from "°F and GPM" to "°C and Liter/min".

To change the remote controller's unit mode

1. Turn off power to the remote controller by pressing the "ON/OFF" button.
2. Simultaneously press and hold both the "HOT" and "COLD" buttons for at least 5 seconds. Then make sure "1" (or "0" for Easy-Link System or Multi-Unit System) is displayed on remote controller.
3. Press the "TIME" button. Make sure "OFF" and "F1" are displayed on remote controller.
4. Press the "HOT" button or the "COLD" button to set display to "F3".
5. Press the "INFO" button and make sure "°F" blinks.
6. Press the "HOT" button or the "COLD" button to set display to "°C".
7. Simultaneously press both the "BUZZER" button and the "INFO" button to fix the setting.
8. Make sure that the display is no longer blinking.
9. Press the "ON/OFF" button to finish the setting.
10. Turn on power to the remote controller by pressing the "ON/OFF" button again.

These images show the procedure's results on the display (listed in sequential order).



TEMPERATURE SETTINGS ON THE COMPUTER BOARD

- There are eight preset temperatures that you can select by changing the DIP switch settings on the computer board.
- The temperature has been preset at the factory to 120 °F (50 °C).
- If you desire to change the set temperature with DIP switches on the computer board, refer to the diagram below and observe the warnings.
- If you desire a hot water temperature other than the eight preset settings, purchase the optional temperature remote controller 100112155 (TM-RE30).
- With this optional remote controller, you can set the temperature from 100 °F to 185 °F (38 °C to 85 °C) in various increments.



WARNING

- To change the DIP switch settings for set temperature, locate the lower bank of DIP switches at the bottom of the center computer board.
- DO NOT adjust any other DIP switches.
- Turn off the power supply to the water heater before changing the DIP switch settings.
- Failure to observe this warning could result in carbon monoxide poisoning or death.

Temperature settings (Lower bank of DIP switches)			
100 °F (38 °C)	↑ ON 1 2 3 4 5 6 7 8	145 °F (63 °C)	↑ ON 1 2 3 4 5 6 7 8
115 °F (46 °C)	↑ ON 1 2 3 4 5 6 7 8	155 °F (68 °C)	↑ ON 1 2 3 4 5 6 7 8
120 °F (50 °C) DEFAULT	↑ ON 1 2 3 4 5 6 7 8	165 °F (74 °C)	↑ ON 1 2 3 4 5 6 7 8
135 °F (57 °C)	↑ ON 1 2 3 4 5 6 7 8	185 °F (85 °C)	↑ ON 1 2 3 4 5 6 7 8

Lower bank of DIP switches
on the center computer board



FLOW

- The flow rate through the water heater is limited to a maximum of 14.5 GPM (54.9 L/min).
- The temperature setting, along with the supply temperature of the water, will determine the flow rate output of the unit.
- Please refer to the temperature vs. gallons per minute charts on p. 52 to determine the likely flow rates based on your local ground water temperature and your desired outlet water temperature.
- Refer to the table on the right for typical household plumbing fixture flow rates to determine what the water heater can do in a household application.

Appliance/Use	Household Flow Rates	
	Flow rate	
	GPM (US)	L/min
Lavatory Faucet	1.0	3.8
Bath Tub	4.0 – 10.0	15.2 - 37.8
Shower	2.0	7.5
Kitchen Sink	1.5	5.6
Dishwasher	1.5	5.6
Washing machine	4.0	15.2

Taken from UPC 2006

FREEZE PROTECTION SYSTEM

- This unit comes equipped with heating blocks to protect it from damage associated with freezing.
- For this freeze protection system to operate, there has to be electrical power to the unit. Damage to the heat exchanger caused by freezing temperatures due to power loss is not covered under the warranty. In cases where power losses can occur, consider the use of a backup power supply.
- The freeze protection system will activate when the air temperature inside the case or water in the heat exchanger is less than 36.5 °F (2.5 °C).
- In any areas subject to freezing temperatures, the manufacturer highly recommends an indoor installation with an indoor model. In such an installation, freezing issues can occur if cold air enters through the venting into the heat exchanger, whether by negative pressures within the installation location or by strong outside winds.
- The manufacturer also highly recommends the use of a backflow preventer (sold separately) to minimize the amount of cold air entering through the exhaust venting when the water heater is off.
- It is the installer's responsibility to be aware of freezing issues and take all preventative measures. The manufacturer will not be responsible for any damage to the heat exchanger as a result of freezing.
- If you will not be using your heater for a long period of time:
 1. Completely drain the water out of the unit. Refer to p. 40.
 2. Disconnect power to your heater.
 This will keep your unit from freezing and being damaged.

NOTICE

Only pipes within the water heater are protected by the freeze protection system. Any water pipes (hot or cold) located outside the unit will not be protected. Properly protect and insulate these pipes from freezing.

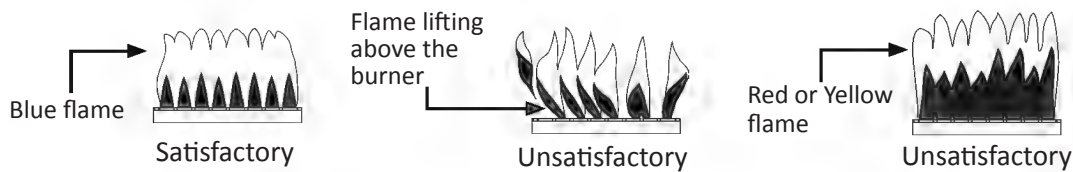
MAINTENANCE AND SERVICE



WARNING

Turn off the electrical power supply and close the manual gas shutoff valve and the manual water control valve before servicing. Failure to do so could result in serious personal injury or death.

- Clean the cold-water inlet filter. (Refer to "Unit Draining and Filter Cleaning" on the following page.)
- Be sure that all openings for combustion and ventilation air are not blocked.
- The venting system should be checked annually for any leaks, corrosion, blockages or damage.
- The burner should be checked annually for dust, lint, grease or dirt.
- Keep the area around the water heater and terminations clear. Remove any combustible materials, gasoline, flammable vapors, and liquids.
- If the relief valve discharges periodically, it 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.
- Visually check the burner flames (see the following page) through the burner window in the burner assembly located at the middle of the water heater.



The manufacturer recommends having the unit checked once a year or as necessary by a licensed technician. If repairs are needed, any repairs should be done by a licensed technician.

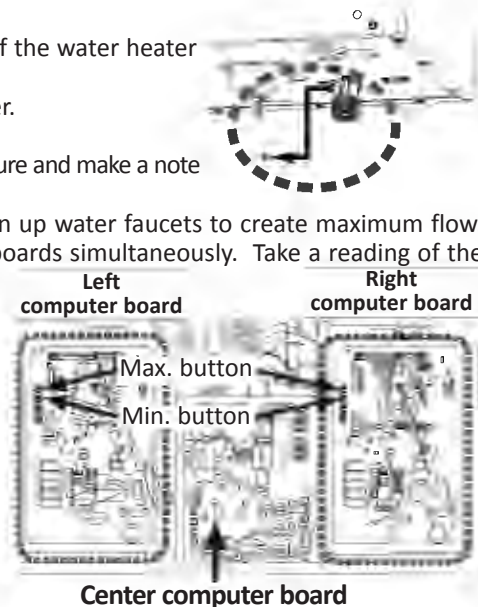
-Measuring inlet gas pressure-



1. Turn off all electric power to the water heater if service is to be performed.
2. Turn the manual gas valve located on the outside of the unit to the OFF position.
3. Failure to follow these steps could lead to fire or explosion, resulting in personal injury or death.

The water heater cannot perform properly without sufficient inlet gas pressure. Below are instructions on how to check the inlet gas pressure. **THIS IS ONLY TO BE DONE BY A LICENSED PROFESSIONAL.**

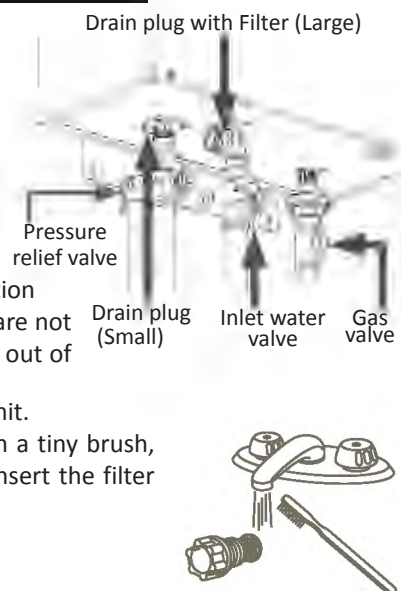
1. Shut off the manual gas valve on the gas supply line.
2. Remove the screw for the pressure port located on the gas inlet of the water heater shown in the diagram on the right.
3. Connect the manometer to the pressure port and zero manometer.
4. Re-open the manual gas valve. Verify that there are no gas leaks.
5. With all gas burning equipment off, take a reading of the static gas pressure and make a note of it.
6. Measure gas supply pressure at maximum heater operation: Open up water faucets to create maximum flow. Press and hold the MAX buttons on the left and right computer boards simultaneously. Take a reading of the supply dynamic gas pressure with all gas burning equipment running at maximum rate.
7. The static and dynamic pressures should be within the ranges specified on the heater's rating plate and the table on p. 21.
8. The difference of static to dynamic pressure should not exceed 1.5" W.C. (0.374 kPa). Pressure drops that exceed 1.5" W.C. (0.374 kPa) can indicate restricted gas flow, undersized gas lines, and/or undersized supply regulators. In Canada, refer to B149.1 for allowable pressure drops.
9. Measure gas supply pressure at minimum heater operation: Reduce water flow so the heater is running at minimal operation. Press the MIN button on the right or left computer board in combustion operation. (Refer to the right diagram.) Take a supply gas pressure reading and verify that it is within the specified inlet gas pressure range.



UNIT DRAINING and FILTER CLEANING

1. Close the manual gas shutoff valve.
2. Turn off power to the unit and wait a couple of seconds. Turn on again.
3. Wait 30 seconds, and then turn off power to the unit.
4. Close the inlet water valve.
 - If the heater is part of an Easy-Link or Multi-Unit System, close the inlet and outlet water valves to isolate the heater. Then proceed to step 6.
5. Open all hot water taps in the house. When the residual water flow has ceased, close all hot water taps.
6. Have a bucket or pan to catch the water from the unit's drain plugs. If isolation valves are installed, open the drains to drain the water. If isolation valves are not installed, **unscrew** the two drain plugs (large and small) to drain the water out of the unit. Do not lose the o-rings that will be on the two drain plugs.
7. Wait a few minutes to ensure all water has completely drained from the unit.
8. **Clean the filter:** Check the water filter located within the cold inlet. With a tiny brush, clean the water filter of any debris which may have accumulated and reinsert the filter back into the cold water inlet.
9. Securely screw the drain plugs back into place.

Hand-tighten only.

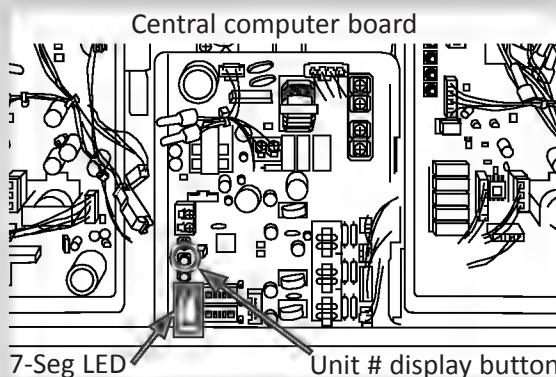


TROUBLESHOOTING

GENERAL

TEMPERATURE and AMOUNT OF HOT WATER	PROBLEM	SOLUTIONS
	It takes a long time to get hot water at the fixtures.	- The time it takes to deliver hot water from the water heater to your fixtures depends on the length of piping between the two. The longer the distance or the bigger the pipes, the longer it will take to get hot water. - If you would like to receive hot water to your fixtures more quickly, you may want to consider a hot water recirculation system. (p. 30)
	The water is not hot enough.	- Compare the flow and temperature. See the charts on p. 52. - Check cross plumbing between cold water lines and hot water lines. - Is the gas supply valve open fully? (p. 32) - Is the gas line sized properly? (pp. 21 and 22) - Is the gas supply pressure within specified limits? (pp. 21 and 40) - Is the set temperature set too low? (pp. 37 and 38) - Is the Easy Link or Multi-Unit system set up correctly?
	The water is too hot.	Is the set temperature set too high? (pp. 37 and 38)
	The hot water is not available when a fixture is opened.	- Make sure the unit has 120 VAC, 60 Hz power supply. - Is the power button on the controller or inside the water heater turned on? - Is the gas supply valve open fully? (p.32) - Is the water supply valve open fully? (p. 32) - Is the filter on the cold water inlet clean? (p. 40) - Is the hot water fixture sufficiently open to draw at least 0.5 GPM (1.9 L/min) through the water heater? (p. 36) - Is the unit frozen? (p. 39) - Check for cross plumbing between the hot and cold water lines. - Is the Easy Link or Multi-Unit system set up correctly? - Is there enough gas in its tank? (for propane)
	The hot water turns cold and stays cold.	- Is the flow rate enough to keep the water heater running? (p. 36) - If there is a recirculation system installed, does the recirculation line have enough check valves? (p. 30) - Is the gas supply valve open fully? (p. 32) - Is the filter on the cold water inlet clean? (p. 40) - Are the fixtures clean of debris and obstructions?
	Fluctuation in hot water temperature.	- Is the filter on the cold water inlet clean? (p. 40) - Is the gas line sized properly? (pp. 21 and 22) - Is the supply gas pressure within specified limits? (pp. 21 and 40) - Check for cross connection between cold water lines and hot water lines. - Is the Easy Link or Multi-Unit system set up correctly?

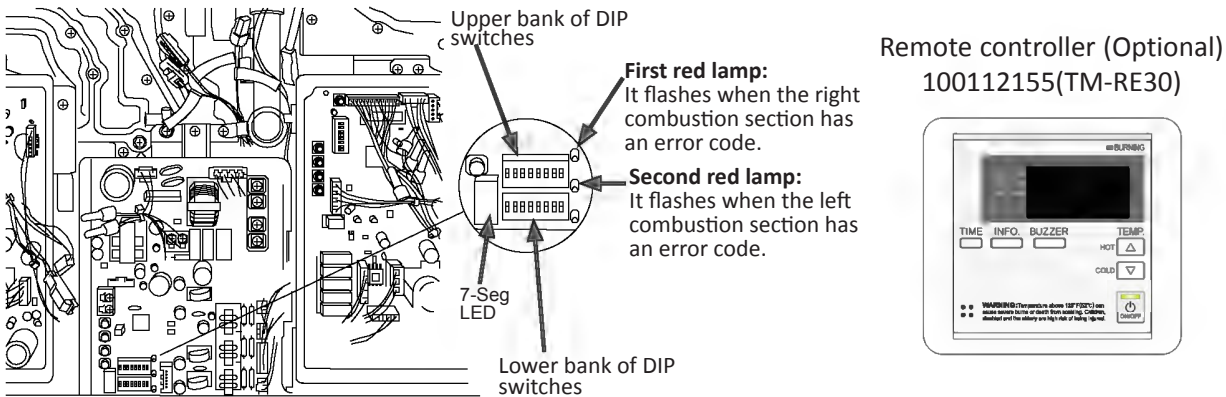
	PROBLEM	SOLUTIONS
WATER HEATER	Unit does not ignite when water goes through the unit.	• Is the flow rate over 0.5 GPM (1.9 L/min)? (p. 36) • Check the filter on the cold water inlet. (p. 40) • Check for reverse connection and cross connection. • If you use the remote controller, is the power button turned on? • Check if the inlet water temperature is too high. If it is too close to the set temperature, the water heater will not activate. • Is the gas supply turned on? • Is power available to the unit? If so, is the power button on the controller or inside the water heater turned on?
	The fan motor is still spinning after operation has stopped.	• This is normal. After operation has stopped, the fan motor keeps running from 15 to 70 seconds in order to re-ignite quickly, as well as purge all the exhaust gas out of the flue.
	Unit sounds abnormal while in operation	• Contact the manufacturer at (USA) 1-877-737-2840. (Canada) 1-888-479-8324.
REMOTE CONTROLLER	Remote controller does not display anything when the power button is turned on.	• Make sure the unit is supplied with power. • For the remote controller: Make sure the connection to the unit is correct. (p. 24) • When the unit has not operated for five minutes or more, the display turns off to conserve energy.
	An ERROR code is displayed.	• Please see pp. 43 to 45.
EASY-LINK SYSTEM	How are the unit numbers assigned?	• For an Easy-Link System, the Parent unit is always labeled #1 and all other subsequent Child units are numbered randomly. • To check which numbers are assigned to which Child units, push the Unit # display button on the center computer board of any Child unit as shown below. The unit number will be displayed on the controller of each Child unit. (Refer to p. 27.) • You can renumber water heaters so they are numbered any way you like. Press and hold the Unit # display button on all Child units for at least 5 seconds. Zero will be displayed on all Child units. Press the Unit number display button again in the order you want them numbered. New unit number will be assigned in order as you proceed through every unit.



ERROR CODES

-General-

- The units have self-diagnostic functions for safety and convenience when troubleshooting.
- If there is a problem with the installation or the unit, the error code will be displayed on the 7-Seg LED on the center computer board and remote controller (if it is installed.)
- Consult the table on the following pages for the description of each error code.



-Error code display-

- **7-Seg LED on the center computer board:**
A three digit error code will be displayed on the 7-Seg LED one number at a time.
- **Remote controller:**
A three digit error code will be displayed on the screen.

When the right and/or left combustion section has an error code, the red LED next to the 7-Seg LED on the center computer board will flash to indicate which combustion section has the error code. Refer to the graphics above.

Example: If your unit has the "321" error code (which signifies an inlet thermistor failure):

7-Seg LED



Remote

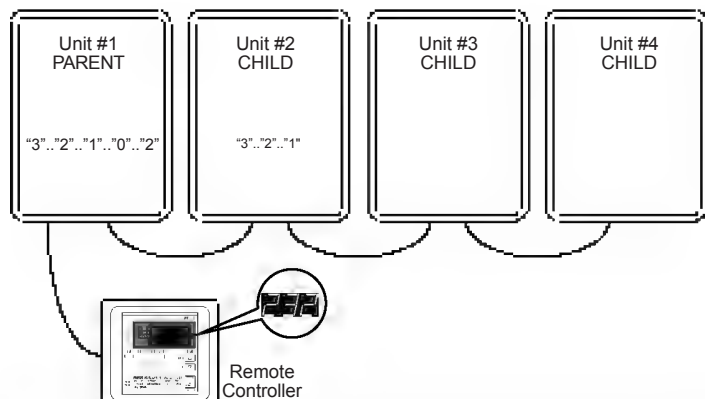


-Easy-Link System-

The 7-Seg LED on the PARENT unit displays a 5-digit number to signify which unit in the Easy-Link system has the error, and what the error code is. The 7-Seg LED displays the number one digit at a time. The remote controller 100112155 (TM-RE30) (if installed) displays a 3-digit number which also signifies which unit has the error, and what the error code is. The unit that has the error in an Easy-Link system will display the error code on its 7-Seg LED in exactly the same way as if it were only a Single Unit. When the right and/or left combustion section has an error code, the red lamp next to the 7-Seg LED on the center computer board will flash to indicate which combustion section has the error code. Refer to the diagram below.

Example: If Unit #2 has the "321" error code (inlet thermistor)

- The 7-Seg LED on the PARENT unit will display "3".."2" "1" "0" "2", displaying only one digit at a time. The first 3 numbers indicate the error code. The last two numbers indicate that Unit #2 has the error.
- The remote controller, however, will display "232" on its screen. The first "2" indicates that Unit #2 has the error. The "32" indicates the first two digits of the "321" error code.
- The 7-Seg LED on Unit #2 will display "3". "2". "1", just like in the Single Unit example.



-Fault Analysis of Error Codes-

If the error code is displayed on the computer board of the water heater or the controller, please check the following. After checking, **consult with the manufacturer**.

Error code	Malfunction description	Diagnosis
031	Incorrect DIP switch setting	Check the DIP switches settings on the PCB (Part #701).
101	Warning for the "991" error code	- Check the gas type of the water heater matches the gas supplied to it. - Check if there is any blockage in the intake air and/or exhaust. - If the water heater is installed as a direct-vent system, check whether there is enough distance between the intake air terminal and the exhaust terminal. - Check if there is grease and/or dirt in the burner (Part #101) and the fan motor (Part #416), especially if the water heater has been installed in a contaminated area. - Check the DIP switches match gas type of unit. - Check the manifold pressure at Max. and Min. - Check the proportional gas valve hose.
111*	Ignition failure	- Check if the Hi-limit switch (Part #403) is properly functioning. - Check for connection/breakage of wires, burn marks on the computer board (Part #701), and/or soot on the flame rod (Part #103). - Check if there is a buzzing spark ignition sound coming from the burner (Part #101) when the water heater prepares for combustion. - Listen for the double "clunk" sound coming from gas valve assembly (Part#114) when the water heater goes into combustion. - Check if there is leaking from the heat exchanger (Part #401). - Check that the gas is turned on. - Check the gas supply.
121*	Loss of flame	- Check if the Hi-limit switch (Part #403) is functioning properly. - Check for connection/breakage of wires, burn marks on the computer board (Part #701), and/or soot on the flame rod (Part #103). - Check if there is leaking from the heat exchanger (Part #401). - Check gas supply
311*	Outlet thermistor failure	
321*	Inlet thermistor failure	- Check for connection/breakage of wires and/or debris on thermistor. - Check the resistance.
331*	Mixing thermistor failure	
391*	Air-fuel ratio rod failure	Check for connection/breakage of wires and/or soot on the AFR rod.
441*	Flow sensor failure (Easy-Link System only)	- Check for connection/breakage of wires and/or debris on the flow sensor impeller. - Check that the water isolation valves are open. - Check inlet water filter for debris.
510	Abnormal main gas valve	- Check for connection/breakage of wires and/or burn marks on the computer board. - Check for signs of vent corrosion. - Check gas valve contacts and gas valve wire harness connections for signs of rust or corrosion.
551	Abnormal gas solenoid valve	- Check for connection/breakage of wires and/or burn marks on the computer board. - Check gas valve contacts and gas valve wire harness connections for signs of rust or corrosion.

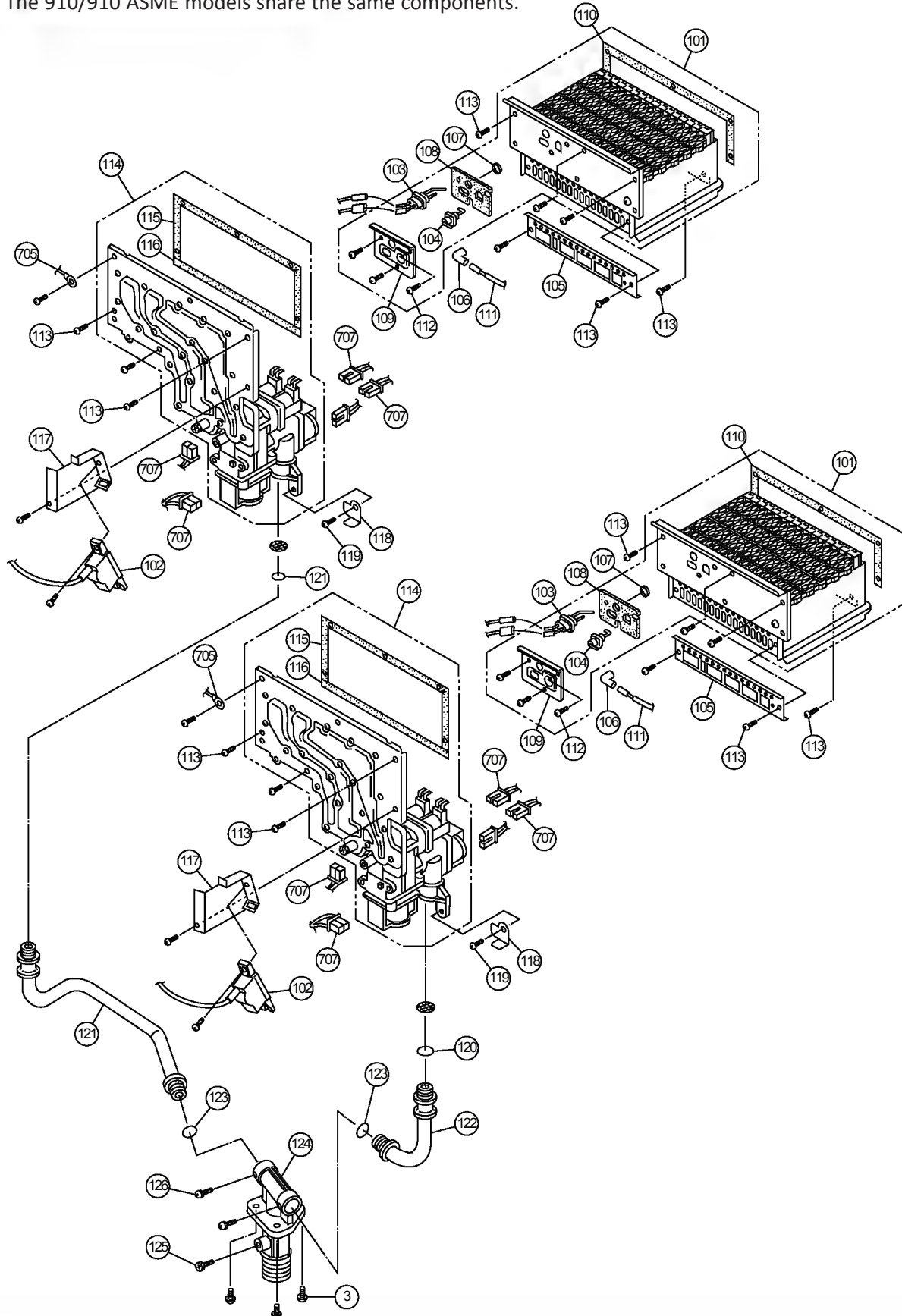
***These error codes will be cleared when water flow stops.**

Error code	Malfunction description	Diagnosis
611*	Fan motor fault	• Check for connection/breakage of wires, dust buildup in the fan motor (Part #416) and/or burn marks on the computer board (Part #701). • Check for frozen/corrosion of connectors.
631	Abnormal external pump	• Check whether the pump connected to center computer board works properly.
651*	Flow adjustment valve fault	• Inspect the flow adjustment valve for connection/breakage of wires, locked motor drive due to scale buildup, and/or water leakage. • Visual inspection of PCB: connection/breakage of wires and/or burn marks on the computer board.
661*	Water control valve fault (Bypass function)	• Inspect the flow adjustment valve, for connection/breakage of wires, locked motor drive due to scale buildup, and/or water leakage. • Visual inspection of PCB: connection/breakage of wires and/or burn marks on the computer board.
681	Abnormal external fan motor	• Check whether the external fan motor connected to center computer board works properly.
701*	Computer board fault	• Check for connection/breakage of wires and/or burn marks on the computer board. • Check the power supply of the water heater.
721*	False flame detection	• For indoor models, check if condensate drain is installed on the vent collar of the water heater. • Check if there is leaking from the heat exchanger (Part #401).
741	Miscommunication between water heater and remote controller	• Check the model type of the remote controller. • Inspect the connections between the water heater and remote controller. • Check the power supply of the water heater.
761	Miscommunication in Easy-Link System	• Check if the connections between the parent unit and the Child units are correct. Refer to p. 28. • Check that the power is on to all Child units.
991*	Imperfect combustion	• Make sure that the gas type of the water heater matches the gas supplied to it. • Inspect the environment around the water heater. Determine how long the unit has been installed. • Check if there is any blockage in the intake air and/or exhaust. • If the water heater is installed as a direct-vent system, check whether there is enough distance between the intake air terminal and the exhaust terminal. • Check if there is grease and/or dirt in the burner (Part #101) and the fan motor (Part #416), especially if the water heater has been installed in a contaminated area. • Make sure that the DIP switches match the gas type of unit. • Check the manifold pressure at Max. and Min. • Check the proportional gas valve hose.

*These error codes will be cleared when water flow stops.

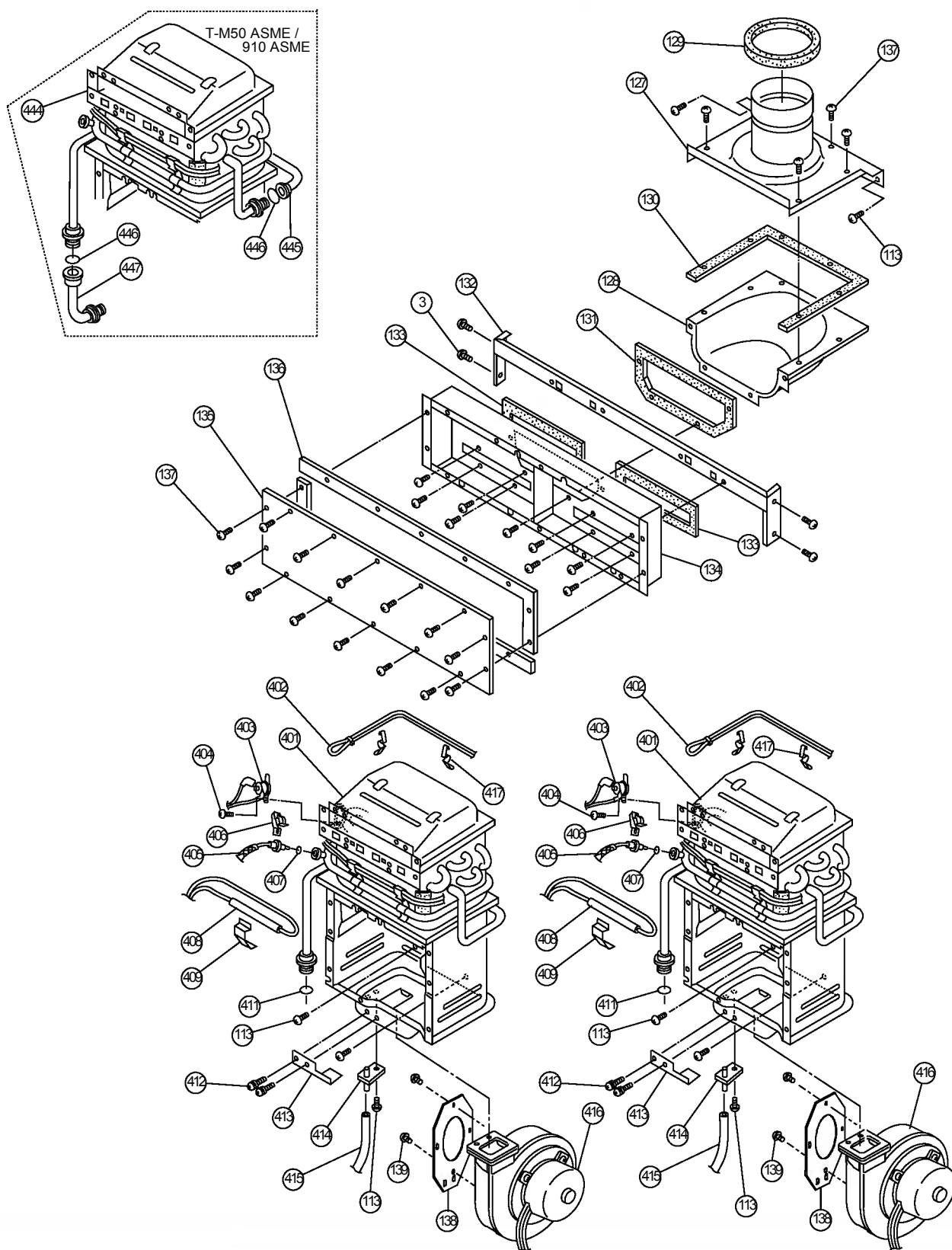
Burner assembly

The 910/910 ASME models share the same components.



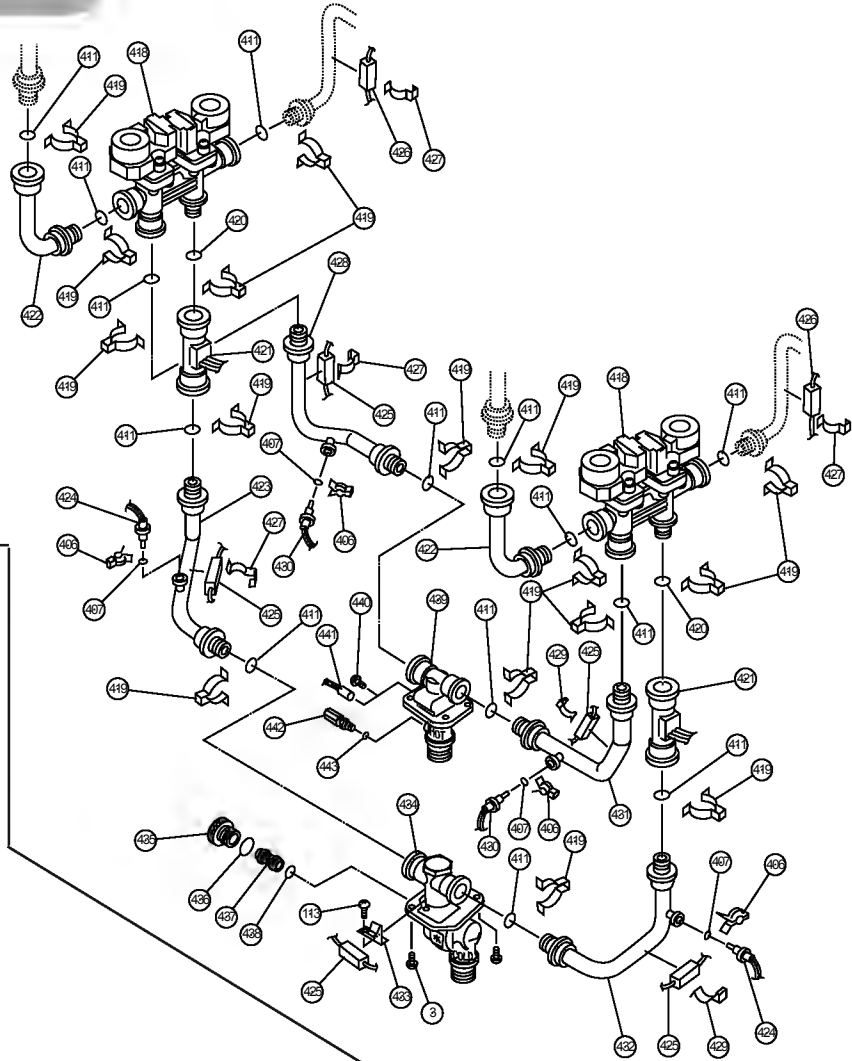
Combustion and Exhaust assembly

Other than Part# 444, Part# 445, Part# 446 and Part# 447, the 910/910 ASME models share the same components.

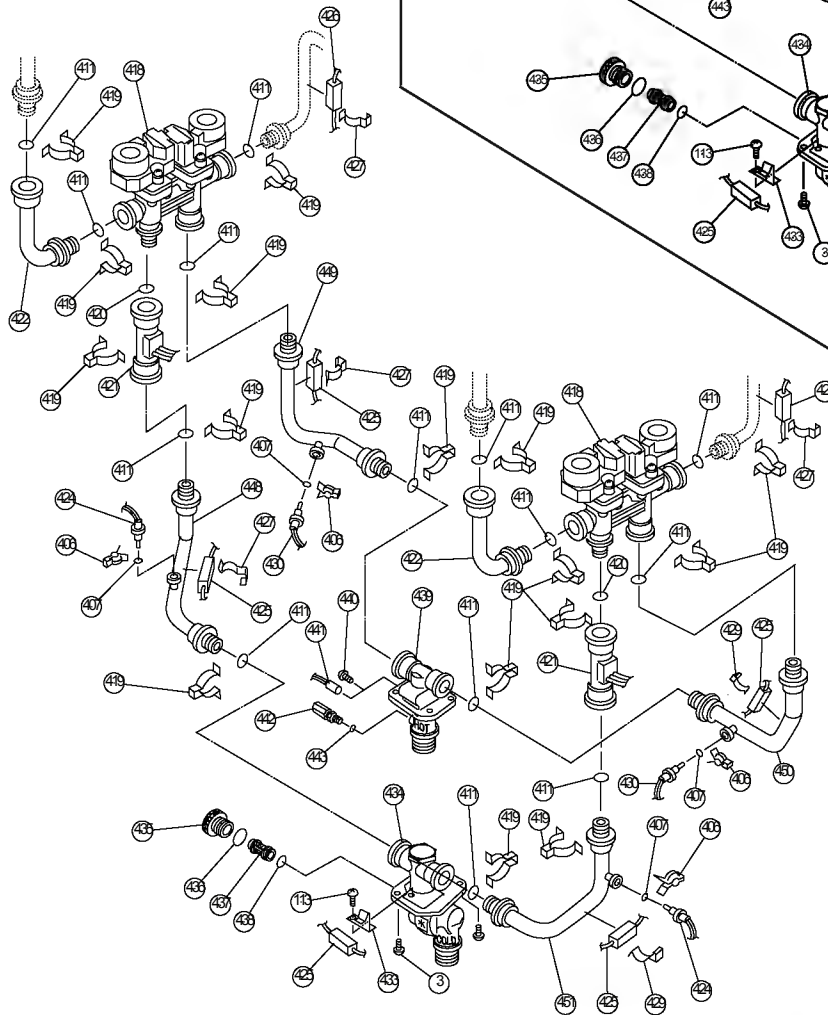


Water Way assembly

910 model



910 ASME model



PARTS LIST

Other than the heat exchanger assembly (No. 444), supply pipe (No. 445), O-ring P18 FKM (No. 446), connection pipe (No. 447), left cold pipe (No. 448), left hot pipe (No. 449), right hot pipe (No. 450) and right cold pipe (No. 451), all of the T-M50 ASME / 910 ASME's components are the same as the T-M50 / 910.

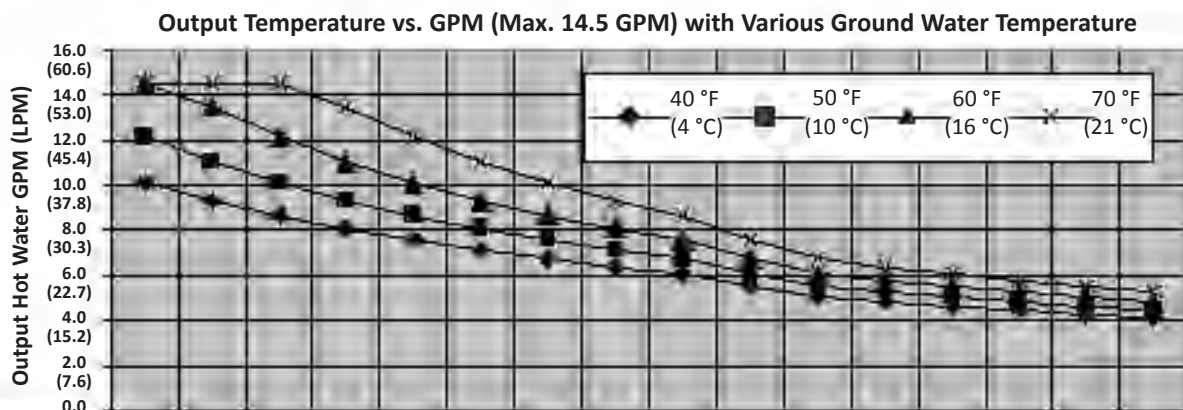
Item #	Description	Parts #	
		910 models	T-M50 models
001	Case assembly	100074449	EM305
002	Brackets	100074197	EM335
003	Truss screw M4X10 (w/Washer) SUS410	100074509	EW001
004	Truss screw M4X10 (Coated) SUS3	100074211	EW002
005	Back guard panel	100074421	EM264
006	Power supply cord assembly	100074461	EM333
007	Junction box	100074199	EKJ64
008	Chamber fixing plate	100074414	EM255
009	Rubber bush	100074518	EX00B
010	Exhaust fixing plate	100074420	EM263
011	Front cover	100074446	EM301
012	Air blockage plate	100074430	EM278
013	Truss screw M4X12 (w/Washer) SUS410	100074210	EW000
101	Burner assembly	100074492	EM445
102	Igniter	100074237	EKN74
103	Flame rod	100074220	EKK0E
104	Igniter rod	100074222	EKK0F
105	Damper	100074376	EKK1P
106	Rod cap	100074223	EKN61
107	Burner window	100074218	EKK2V
108	Rod holder gasket	100074219	EKK2W
109	Rod holder	100074221	EKK32
110	Burner holder gasket	100074217	EKK0G
111	High voltage igniter cable	100074224	EKK2M
112	Pan screw M4X8 MFZN	100074244	EW00D
113	Truss Screw M4X10 SUS	100074245	EW003
114	Manifold assembly with gas valve assembly LP	100074447	EM302
	Manifold assembly with gas valve assembly NA	100074448	EM303
115	Manifold gasket A	100074229	EKK2Y
116	Manifold gasket B	100074230	EKK2K
117	Igniter plate	100074236	EKK1B
118	Gas connection plate	100074521	EX00J
119	Pan screw M4X10 (w/Washer)	100074247	EW006
120	O-ring P20 NBR (Black)	100074242	EK042
121	Gas pipe left	100074441	EM293
122	Gas pipe right	100074437	EM289
123	O-ring P18 NBR (Black)	100074533	EZP18
124	Gas inlet	100074434	EM284
125	Hex head screw M4x8 FEZN	100074248	EW005
126	Pan screw M4X6 (w/Washer)	100074275	EW00L
127	Exhaust connecter	100074445	EM300
128	Exhaust combining box	100074460	EM331
129	Silicon ring	100074390	EKK3G
130	Exhaust gasket A	100074422	EM266
131	Exhaust gasket B	100074423	EM267
132	Case beam	100074433	EM282
133	Exhaust auxiliary plate	100074459	EM330
134	Duct	100074444	EM299
135	Duct cover	100074442	EM294
136	Duct gasket	100074424	EM268
137	Truss screw M4X10 SUS	100074245	EW003
138	Fan damper	100074332	EK270
139	Screw M3X6 SUS3 Binding head	100074514	EW00B
140	Freeze protection thermostat	100074436	EM286

Item #	Description	Parts #	
		910 models	T-M50 models
401	Heat exchanger assembly for 910	100074452	EM308
402	Overheat-cut-off-fuse	100074334	EK333
403	Hi-limit switch	100074280	EKN34
404	Tapping screw M3X6 SUS3 Pan head	100074272	EW00A
405	Output thermistor	100074281	EKK2T
406	Fastener "4-11"	100074282	EKH30
407	O-ring P4 FKM	100076303	EZM04
408	Pipe heater 122	100074408	EKN86
409	Heater fixing plate	100074273	EKK27
411	O-ring P16 FKM	100076308	EZM16
412	Pan Screw M4X12 (w/Washer)	100074246	EW00H
413	Fan motor fixing plate	100074413	EM252
414	Pressure port	100074227	EKK2D
415	Urethane tube	100074528	EX019
416	Fan motor	100074228	EKK25
417	Fuse fixing plate 18	100074251	EKK26
418	Water control valve	100074271	EKH32
419	Fastener "16AG"	100074262	EX01H
420	O-ring P16 FKM	100076308	EZM16
421	Flow sensor	100074277	EKH33
422	Connecting pipe	100074435	EM285
423	Left cold pipe for 910	100074438	EM290
424	Inlet thermistor	100074270	EKK38
425	Heater 502	100074517	EX001
426	Heater 101	100074253	EX002
427	Heater fixing plate 16	100074310	EK031
428	Left hot pipe for 910	100074457	EM328
429	Heater fixing plate 20	100074309	EKH38
430	Mixing thermistor	100074374	EKK1A
431	Right hot pipe for 910	100074440	EM292
432	Right cold pipe for 910	100074439	EM291
433	Heater plate	100074261	EX021
434	Water inlet	100074443	EM295
435	Filter plug	100074255	EM222
436	O-ring P25 FKM	100076551	EZM25
437	Water inlet filter	100074257	EX006
438	O-ring JASO#1021 FKM	100074258	EZN21
439	Water outlet	100074453	EM309
440	Tapping screw SUS3 M4X6 Truss head	100074512	EW009
441	Heater 117	100074407	EKN67
442	Outlet drain plug	100074383	EKK2E
443	O-ring P6 FKM	100076305	EZM06
444	Heat exchanger assembly for 910 ASME	100074454	EM323
445	Connection pipe for 910 ASME	100074455	EM326
446	O-ring P18 FKM	100074532	EZM18
447	Connecting pipe for 910 ASME	100074462	EM370
448	Left cold pipe for 910 ASME	100074494	EM456
449	Left hot pipe for 910 ASME	100074497	EM459
450	Right hot pipe for 910 ASME	100074496	EM458
451	Right cold pipe for 910 ASME	100074495	EM457
701	910 PCB	100074450	EM306
702	MC50 PCB	100074451	EM307
703	PV-FS wire	100074416	EM258
704	Thermistor connecting wire	100074417	EM260
705	Flame rod wire	100074427	EM271
706	Igniter wire	100074415	EM257
707	Gas valve wire	100074432	EM280
708	AC100V wire	100074429	EM277
709	910 PCB cover	100074367	EKH43
710	MC50 PCB cover	100074458	EM329

Item #	Description	Parts #	
		910 models	T-M50 models
711	Multi communication wire	100074431	EM279
712	Left communication wire	100074418	EM261
713	Right communication wire	100074419	EM262
714	Remote controller terminal	100074428	EM273
715	Wire clamp	100074233	EM167
716	Left PCB fixing plate	100074425	EM269
717	Right PCB fixing plate	100074426	EM270
718	Transformer	100074312	EM296
719	Truss screw M4X12 Evatite	100074527	EX013
720	Ground fault circuit interrupter	100074411	EM207
721	Flat head screw M3X12	100074515	EW01A
722	Surge box	100074468	EM385
723	Surge connecting wire	100074399	EKK4U

OUTPUT TEMPERATURE CHART

Chart is based on properly sized gas line



°F	100	105	110	115	120	125	130	135	140	150	160	165	170	175	180	185
GPM (40 °F)	10.1	9.3	8.7	8.1	7.6	7.1	6.7	6.4	6.1	5.5	5.1	4.9	4.7	4.5	4.3	4.2
GPM (50 °F)	12.1	11.0	10.1	9.3	8.7	8.1	7.6	7.1	6.7	6.1	5.5	5.3	5.1	4.9	4.7	4.5
GPM (60 °F)	14.5	13.5	12.1	11.0	10.1	9.3	8.7	8.1	7.6	6.7	6.1	5.8	5.5	5.3	5.1	4.9
GPM (70 °F)	14.5	14.5	14.5	13.5	12.1	11.0	10.1	9.3	8.7	7.6	6.7	6.4	6.1	5.8	5.5	5.3
C°	38	41	43	46	49	52	54	57	60	66	71	74	77	79	82	85
LPM (4 °C)	38.3	35.4	32.8	30.6	28.7	27.0	25.5	24.2	23.0	20.9	19.2	18.4	17.7	17.0	16.4	15.9
LPM (10 °C)	46.0	41.8	38.3	35.4	32.8	30.6	28.7	27.0	25.5	23.0	20.9	20.0	19.2	18.4	17.7	17.0
LPM (16 °C)	54.9	51.1	46.0	41.8	38.3	35.4	32.8	30.6	28.7	25.5	23.0	21.9	20.9	20.0	19.2	18.4
LPM (21 °C)	54.9	54.9	54.9	51.1	46.0	41.8	38.3	35.4	32.8	28.7	25.5	24.2	23.0	21.9	20.9	20.0

*When the set temperature is 150 °F (65.5 °C) or higher, maximum flow rate is limited to 10.6 GPM (40 L/min).