On-Demand Water Heater
Installation Manual and Owner's Guide

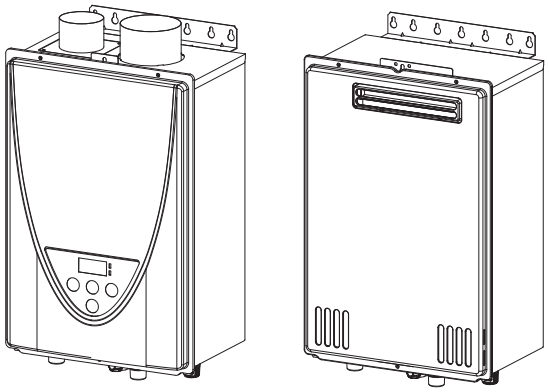
ANSI Z21.10.3 • CSA 4.3

510U only

Models

- **110U Indoor**
- **310U Indoor**
- **510U Indoor**
- **110U Outdoor**
- **310U Outdoor**
- **510U Outdoor**

Series 200



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
- Complies with SCAQMD Rule 1146.2 for NOx emissions requirement of 14 ng/J or 20 ppm
- FIELD GAS CONVERTIBLE
- EASY-LINK SYSTEM AND MULTI-UNIT SYSTEM *(510U only)*

WARNING

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

- Do not store or use gasoline or other flammable vapors and liquids in the vicinity of this or any other appliance.
- WHAT TO DO IF YOU SMELL GAS
  - Do not try to light any appliance.
  - Do not touch any 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:
500 Tennessee Waltz Parkway
Ashland City, TN 37015
Toll Free: 1-877-737-2840

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

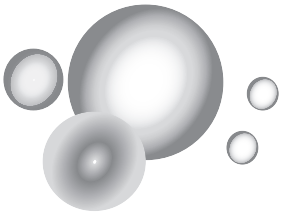
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Installation Manual

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.

SPECIFICATIONS

Model			110U Indoor	110U Outdoor	310U Indoor	310U Outdoor	510U Indoor	510U Outdoor
Natural Gas Input (Operating Range)		BTU/h	Min.: 15,000 Max.: 140,000		Min.: 15,000 Max.: 190,000		Min.: 15,000 Max.: 199,000	
Gas Connection			3/4" NPT					
Water Connections			3/4" NPT					
Water Pressure*		psi (Mpa)	15 - 150 (0.1 - 1)					
Natural gas Inlet Pressure		" W.C. (kPa)	Min. 4.0 (1.00) Max. 10.5 (2.61)					
Weight		lbs. (kg)	37.5 (17.0)				39.7 (18.0)	
Dimensions		Indoor	H 20.5 x W 13.8 x D 9.1 (Inch) H 520 x W 351 x D 231 (mm)					
		Outdoor	H 20.5 x W 13.8 x D 8.5 (Inch) H 520 x W 351 x D 216 (mm)					
Ignition			Electric Ignition					
Electric	Supply	VAC / Hz	120 / 60					
	Consumption Operation	W / A	54 / 0.64		79 / 0.99		82 / 1.02	
	Consumption Standby	W / A	2 / 0.06		2 / 0.06		3 / 0.07	
	Consumption Freeze-Protection	W / A	96 / 0.82		96 / 0.82		97 / 0.82	
Water heater category**			Category III	N/A	Category III	N/A	Category III	N/A

*40 psi 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.

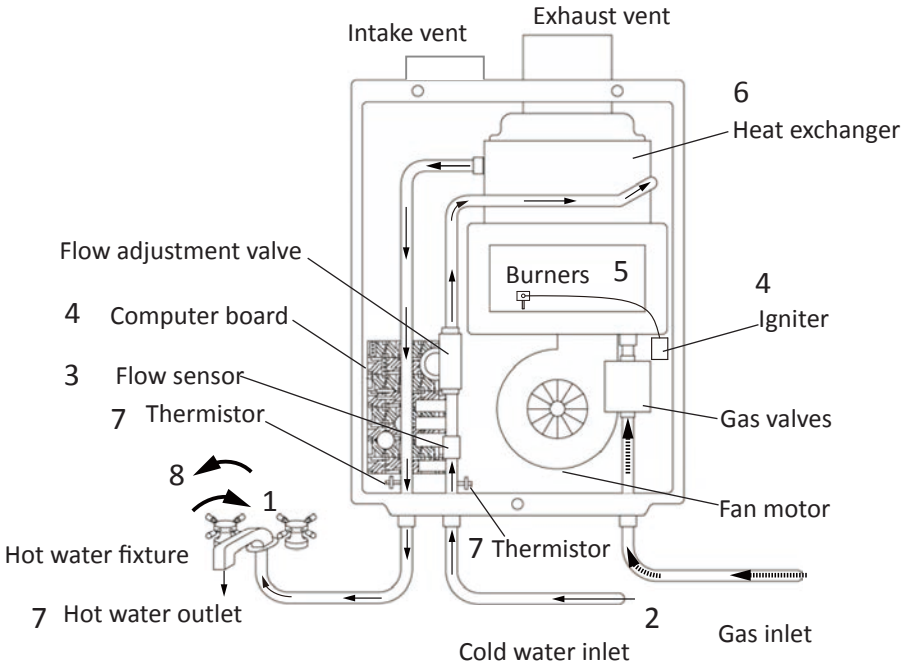
***These are equivalent lengths that include head loss for elbows, tees, unions, etc.

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.**

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 (Indoor models) or the front cover (Outdoor models) of the water heater.
- 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 110U Indoor, 310U Indoor, and 510U Indoor models are only to be installed indoors. The 110U Outdoor, 310U Outdoor, and 510U Outdoor models are only to be installed outdoors.
- 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.

SAFETY GUIDELINES

SAFETY DEFINITION

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

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

CAUTION 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**. The water heater is configured only for use with Natural Gas at the factory. If the appliance is used with propane gas, conversion to propane gas with an included conversion kit **(LP Conversion Kit: 100270585)** is required. The conversion must be done by a qualified service agent or a gas utility service person in accordance with this instruction and all codes and requirements of the authority having jurisdiction. Failure to follow instructions could result in property damage, serious personal injury, or death. The agent performing this work assumes responsibility for this conversion. (Refer to the gas conversion leaflet.)
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.

WARNING

- 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. 28 when installing your water heater.
- The conversion to propane must be done by a qualified service agent or a gas utility serviceman in accordance with the gas conversion instructions and all codes and requirements of the authority having jurisdiction. Failure to follow instructions could result in serious injury or property damage. The qualified agent performing this work assumes responsibility for this conversion.
- 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. 45.
- 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 set by code, including minimum clearances from doorways or openings. (Refer to pp.23 to 25.)

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.

9. For 110U Indoor, 310U Indoor, and 510U Indoor models:
- If the water heater is used as a direct-vent appliance, the unit requires a 3 in. (76 mm) combustible air supply pipe. The intake pipe must be sealed airtight. Refer to "VENTING INSTRUCTIONS" on p.13 for more detail.
- Terminating the venting through a sidewall is recommended for the direct-vent system.
- Running the exhaust vent and the intake pipe parallel is recommended.
- 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.
- Only install the water heater in a heated area where below freezing temperatures cannot occur. The warranty does not cover damage caused by freezing.
- The water heater must be securely mounted to a wall or other suitable structure.

10. The 110U Outdoor, 310U Outdoor, and 510U Outdoor models are only to be installed outdoors and only in an area with mild, temperate climates. The Outdoor model shall be wall mounted, mounted on a stand, or installed in an approved recess box. Locate the Outdoor model in a open, unroofed area and maintain the minimum clearances. (Refer to p.11.)

WARNING

- **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 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.
  - Place the unit where it will allow 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.

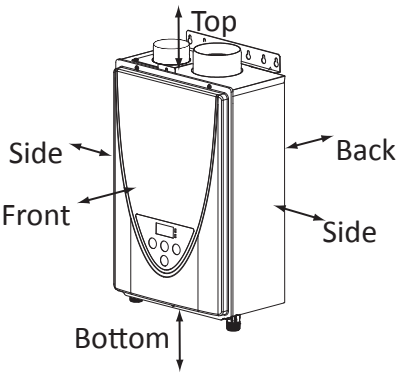
CAUTION

- **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.
- Do not install the unit where water, debris, or flammable vapors may get into the flue terminal.
- **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

WARNING

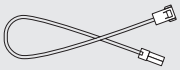
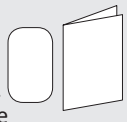
Maintain all clearances around the water heater. Failure to do so could create a fire hazard, potentially leading to death, serious injury, and/or property damage.



Model	Top	Bottom	Front	Back	Sides
110U Indoor* 310U Indoor* 510U Indoor*	12 in. (305 mm)	12 in. (305 mm)	4 in.** (102 mm)	1.0 in. (25 mm)	3 in. (76 mm)
110U Outdoor*** 310U Outdoor*** 510U Outdoor***	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

Installation manual and Owner's guide	Temperature remote controller kit (Outdoor model only)	Communication cable 510U only	LP Conversion Kit (100270585)
 Qty: 1	100209924 (TM-RE42)  Qty: 1	 Qty: 1 (100076516)	(100281157)    Manifold attachments : 2 Small / 1 Large Manifold gasket (100281157): 1 Gas conversion sticker : 1 Gas conversion instruction : 1 Spare Screw : 2

OPTIONAL ITEMS

#	Model	110U Indoor	110U Outdoor	310U Indoor	310U Outdoor	510U Indoor	510U Outdoor
1.	4" Backflow preventer and F-F adaptor	✓		✓		✓	
	4" Universal Appliance Adaptor, F-F adaptor, backflow preventer, condensate drain trap	✓		✓		✓	
2.	Pipe cover	✓	✓	✓	✓	✓	✓
3.	Recess box (Retrofit)		✓		✓		✓
	Recess box (New construction)		✓		✓		✓
4.	Sidewall vent terminator (Hood) and Wall thimble	✓		✓		✓	
	Sidewall vent terminator (Round) and Wall thimble	✓		✓		✓	
5.	Direct-vent concentric termination	✓		✓		✓	
6.	Remote controller	✓	Included	✓	Included	✓	Included

1. 4” Backflow preventer and Female-female adaptor



100112416



100112585

It prevents the backflow of air through the exhaust vent. This helps prevent harmful exhaust gases from entering the home, as well as helping to prevent the unit from freezing in areas where cold air can be blown or drawn into the exhaust system.
Install this adaptor in accordance with the installation instructions that are packaged with the adaptor and any applicable codes.

100112416 (4” Backflow preventer and F-F adaptor): Must be installed in the vertical position.
100112585 (4" Universal Appliance Adaptor, F-F adaptor, backflow preventer, condensate drain trap): Must be installed in the vertical position on the heater's flue collar.

2. Pipe cover: 100112187 (TK-PC01)



The pipe cover protects the plumbing pipes to the water heater. It is fixed to the bottom of the water heater, so it hides the plumbing and improves the appearance of the installation.

3. Recess box: It allows for “clean” installations. The water heater fits inside the recess box, which hides and protects the whole water heater and plumbing. The recess box will fit between most wall studs.



100266729

Outdoor recess box for retrofic applications-no flange



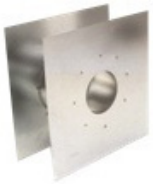
100266730

Outdoor recess box for new construction applications-with flange

4. Sidewall vent terminator (Hood) and Wall thimble:



Terminator Hood



Wall Thimble

Covering wall thicknesses	Part#
Terminator Hood	100112419
Wall Thimble 4 - 7 in.	100112732
Wall Thimble 5 - 10 in.	100112733
Termination + Thimble 4 - 7 in.	100112424
Termination + Thimble 5 - 10 in.	100112425

The terminator hood and wall thimble can be used to vent through a wall. These terminations are special stainless steel vents for gas appliances and are 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.

Sidewall vent termination (Round) and Wall thimble:

Covering wall thicknesses	Part#
Termination	100187853
Wall Thimble	100187852
Termination + Thimble	100187154



100187853 (Termination)



100187852 (Wall Thimble)

100187154 (Termination + Thimble)

Refer to p. 21 regarding the DIP switch settings for the termination.

5. Direct-vent concentric termination:



Covering wall thicknesses	Part#
5.0 – 10.0 in.	100112550
12.0 – 18.0 in.	100112551

This component is used to terminate direct-vent (sealed combustion) systems with indoor models that require a 3 in. intake and a 4 in. 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. This sidewall termination is available in two different sizes to cover a wide range of wall thicknesses. (Refer to the venting manufacturer's specifications for details.)

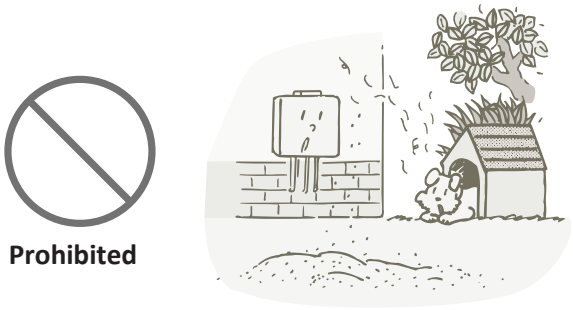
6. Remote controller: 100209924 (TM-RE42)



WARNING FOR INSTALLATIONS

FOR YOUR SAFETY, READ BEFORE INSTALLATION:

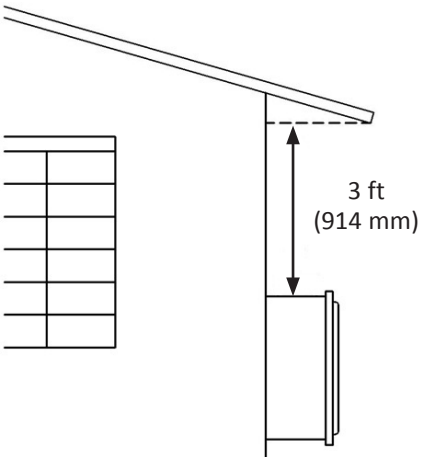
Do not install the heater where water, debris or flammable vapors may get into the flue terminal. This may cause damage to the heater and void the warranty.



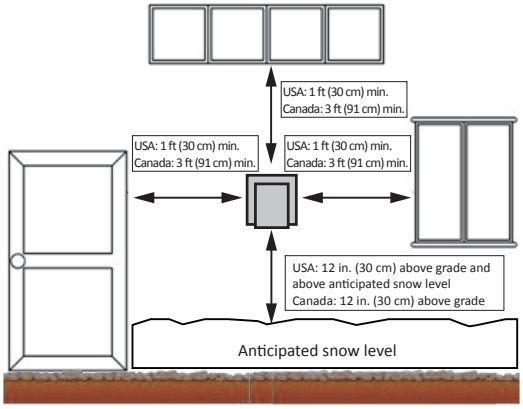
Do not have the vent terminal pointing toward any opening into a building. Do not locate your water heater in a pit or location where gas and water can accumulate.



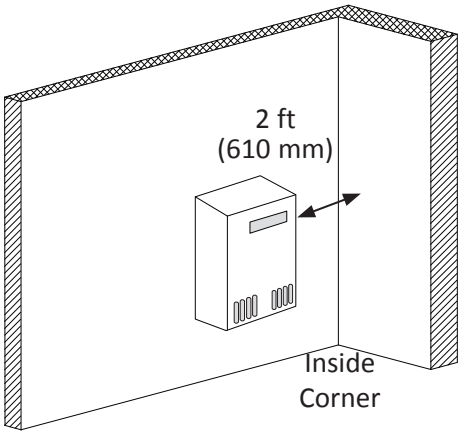
Do not install this water heater under an overhang less than 3 ft (914 mm) from its top or eaves. The area under an overhang must be open to three sides (Outdoor models only).



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.



HIGH-ALTITUDE INSTALLATIONS

Check the elevation where your water heater is installed. Set your DIP switches according to altitude as shown below.

WARNING

- **Adjust the appropriate DIP switches according to model and elevation 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.**

Indoor models

DIP switches \ Altitude	0 to 2,000 ft (0 to 610 m) (DEFAULT)	2,001 to 3,000 ft (611 to 914 m)	3,001 to 5,000 ft (915 to 1,524 m)	5,001 to 7,500 ft (1,525 to 2,286 m)	7,501 to 10,100 ft (2,287 to 3,078 m)
110U and 310U models	 No. 3 : OFF No. 4 : OFF No. 5 : OFF	 No. 3 : OFF No. 4 : ON No. 5 : OFF	 No. 3 : OFF No. 4 : OFF No. 5 : ON	 No. 3 : OFF No. 4 : ON No. 5 : ON	 No. 3 : ON No. 4 : ON No. 5 : ON
510U model **(Lower bank of DIP switches)**	 No. 2 : OFF No. 3 : OFF No. 4 : OFF	 No. 2 : OFF No. 3 : ON No. 4 : OFF	 No. 2 : OFF No. 3 : OFF No. 4 : ON	 No. 2 : OFF No. 3 : ON No. 4 : ON	 No. 2 : ON No. 3 : ON No. 4 : ON

Outdoor models

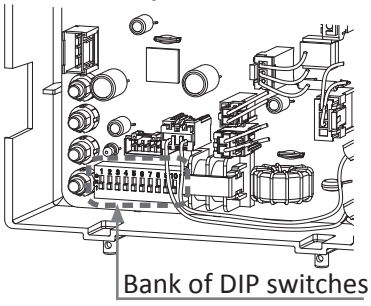
DIP switches \ Altitude	0 to 2,000 ft (0 to 610 m) (DEFAULT)	2,001 to 4,000 ft (611 to 1,219 m)	4,001 to 6,000 ft (1,220 to 1,829 m)
110U and 310U models	 No. 3 : OFF No. 4 : OFF No. 5 : OFF	 No. 3 : OFF No. 4 : OFF No. 5 : ON	 No. 3 : ON No. 4 : OFF No. 5 : ON
510U model **(Lower bank of DIP switches)**	 No. 2 : OFF No. 3 : OFF No. 4 : OFF	 No. 2 : OFF No. 3 : OFF No. 4 : ON	 No. 2 : ON No. 3 : OFF No. 4 : ON

Installation altitude

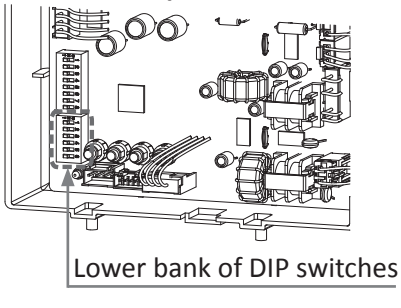
The maximum certified or allowable installed altitude is 10,100 ft (3,078 m) for indoor models and 6,000 ft (1,829 m) for outdoor models.

NOTE: The dark squares indicate the correct DIP switch positions.

110U and 310U Computer board



510U Computer board



VENTING INSTRUCTIONS

For indoor models

-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, 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 page 14.

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 3" 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 or refer to the Combustion Air Supply section below.

Direct venting installation:

- The maximum length of intake air piping must not exceed 60 ft (18.3 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. 19.
- When the horizontal air intake exceeds more then 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.

Combustion air from the room:

- Install a 3" elbow into the air intake collar.

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.

- A condensate collector is required for horizontal and/or vertical vent runs exceeding 5 ft of equivalent length (not including sidewall terminatons).
- 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™	Z-VENT™
4" Straight pipe - 6" length	100112407	2NVP4.5	2SVEPWCF0406
4" Straight pipe - 12" length	100112406	2NVP41	2SVEPWCF0401
4" Straight pipe - 24" length	100112404	2NVP42	2SVEPWCF0402
4" Straight pipe - 36" length	100112403	2NVP43	2SVEPWCF0403
4" Straight pipe - 48" length	100112402	2NVP44	2SVEPWCF0404
4" Adjustable straight pipe - 10"-18" adjustability	100112405	2NVAL4	2SVSPA04
4" 45 degree elbow	100112401	2NVE445	2SVEEWCF0445
4" 90 degree elbow	100112400	2NVE490	2SVEEWCF0490
4" Sidewall termination (4"Termination Hood)	100112419	2NVHTX4	2SVSHTX04
4" Vent termination tee	100112547	2NVTT4	2SVSTTF04
4" Rain Cap	100112415	2NVRC4	2SVSRCF04
4" Extreme weather rain cap	100112548	2NVWC4	2SVSHRC04
4" Horizontal drain tee	100112414	2NVHD4	2SVEDWCF04
4" Vertical drain tee	100112413	2NVVD4	2SVEVDP04
4" wall thimble length 4"-7" wall thickness	100112732	2NVWT4	2SVSWTF04
4" wall thimble length 5"-10" wall thickness	100112733	2NVWT4L	2SVSWTEF04
4" 3-in-1 adaptor (F-F adaptor, condensate drain, & back-flow preventer)	100112585	2NVBFA4	2SVBFDPA04
4" F-F adaptor	100112399	2NVAFF4	2SVEEWCF0445
4" Backflow preventer w/ F-F adaptor	100112416	2NVBFU4	2ZVB04
4" exhaust / 3" intake DV concentric termination - 5"-10" adjustability	100112550	2NVHTC43S	2SVSHTC43S
4" exhaust / 3" intake DV concentric termination - 12"-18" adjustability	100112551	2NVHTC43	2SVSHTC43
4" Sidewall termination, adjustable pipe	100187853	2NVBV4	n/a
4" Wall Thimble, 3"-6" wall thickness	100187852	2NVBT4	n/a

-Combustion Air Supply-

WARNING

- This gas water heater requires an adequate source of clean air for combustion and ventilation. Without sufficient air, your water heater may not operate properly and may emit excessive and abnormal amounts of carbon monoxide which may result in carbon monoxide poisoning or death.

Before installing the water heater, you must determine the amount of air needed to supply this water heater and any other gas appliances in the same area and provide adequate air for combustion and ventilation. Consult a qualified person if you're unsure of the proper way to supply air to your water heater.

Before beginning

Calculate total BTU/h rating of all appliances.
To calculate the combustion air and ventilation required, add up the total BTU/h ratings of all gas burning appliances (e.g., water heaters, furnaces, clothes dryers) in the same area. Do not include appliances that are direct vented. Refer to the following example.

Your water heater's BTU/h rating is on the rating plate. The BTU/h ratings should be on the other appliances' rating plates. If you have trouble determining the BTU/h ratings, contact the manufacturer or have a qualified person determine the ventilation requirements.

NOTICE: If you are replacing your old water heater with one that has a higher BTU/h rating, the amount of ventilation required may be greater.

Example:

Gas Burning Appliance	BTU/h Rating
Gas Water Heater	140,000
Furnace	75,000
Dryer	20,000
Total	235,000

Your appliances:

Gas Burning Appliance	BTU/h Rating
Gas Water Heater	
Total	

Does your installation space have sufficient combustion air?

Ventilation with outside air is recommended for all installations. Even if the water heater is installed in a large, open room inside the house, outdoor air is usually needed because modern homes are very tightly sealed and often do not supply enough air to the water heater. However, when installed in a large indoor space, it may be possible to provide enough air without outside ventilation. If you are unsure if your installation location has enough ventilation, contact your local gas utility company or code officials for a safety inspection or direct vent.
The following instructions will help determine if it may be possible to install the water heater without outside ventilation.
Check for Chemicals:
Installations where corrosive chemicals may be present require the water heater to be direct vented. Air for combustion and ventilation must be clean and free of corrosive or acid-forming chemicals such as sulfur, fluorine, and chlorine. Ventilation with outside air will reduce these chemicals, but it may not completely eliminate them. Failure due to corrosive chemicals is not covered by the warranty. Examples of locations that require outside air due to chemicals include:

- Beauty salons
- Photo processing labs
- Indoor pools
- Laundry, hobby, or craft rooms
- Chemical storage areas

Products such as aerosol sprays, detergents, bleaches, cleaning solvents, gasoline, air fresheners, paint and varnish removers, and refrigerants should not be stored or used near the water heater.

Calculate the air volume of the room

Air requirements depend on the size of the room.

Room Volume (ft^3) = Floor Area (ft^2) X Ceiling Height (ft)

If there are large objects in the room (e.g., refrigerator, furnace, car), subtract their volume from the volume of the room to get a better estimate of the air available.

Air Volume = Room Volume - Object Volume

NOTE: Adjoining rooms with permanently opened doorways can be counted as part of the calculation.

Calculate required air volume

A water heater installed in an unconfined attic, garage, or space requires that the space be at least 50 cubic feet per 1,000 BTU/h of the total input for all gas burning appliances in the same area.

Required Air Volume (ft^3) =Total Appliance Energy Rating (btu/h) X 50 ft^3 / 1000 (btu/h)

Example:

(235,000 / 1000) x 50 = 11,750

If the air volume of the room is less than the required air volume, you must direct vent the water heater or provide permanent outside air openings that draw in sufficient air. Go to “Install with outside ventilation” if you want to provide combustion air with outside ventilation.

If the air volume of the room is greater than the required air volume, it may be possible to install the water heater without outside ventilation. However, be sure to consider the effects of exhaust fans. Exhaust fans can affect the amount of combustion air that is available in your home. Appliances such as furnaces, whole house fans, and clothes dryers draw air out of your home. If they draw air out faster than it can be replaced, your water heater may not have enough oxygen to fire properly. Back-drafting may also result, which is when negative air pressure pulls air backwards through chimneys or appliance vents. These events can cause unsatisfactory water heater performance. The best solution is to direct vent the water heater or install an adequate number of make-up air vents. (See “Install with outside ventilation.) For more information, consult a qualified technician or your local gas utility.

Install with outside ventilation

Ventilation with outside air is recommended, and, for most installations, is needed. There may be existing ventilation that is adequate, or you may need to add more ventilation.

Supplying outside air to the water heater typically requires two openings. One opening must be within 12 inches from the floor and the second opening must be within 12 inches from the ceiling. Although a single opening is not preferred, you may use a single opening to outside air if the minimum free area is sized according to **Table 1**. Two openings must be used when ventilating with air from another room.
The outside air can be taken from a crawl space or attic open to the outdoors and adequately ventilated. You may use vertical or horizontal ducts.

Determine type of ventilation

There are several types of ventilation that can be used :

1. Direct to outdoors
2. Vertical ducts
3. Horizontal ducts
4. Single opening (not recommended; must be at least 100 square inches. Not appropriate for confined spaces smaller than 50 cubic feet per 1,000 BTU/h or when getting air from another room.)
5. From a larger room inside the house (not recommended – refer to "Calculate the air volume of the room" above to determine if the combined volume of the rooms may be adequate).

Determine minimum free area required for each vent opening

The size of the vent openings depends on the total BTU/h rating of all appliances in the space (use your calculation from “Before beginning”) and the type of vent used. **Table 1** provides the minimum free area for each vent opening depending on the type of ventilation.

Calculate minimum size of vent openings and ducts

The vent cross-sectional area needed to provide the free area depends on the covering on the vent openings. Typical vents use louvers or grilles to protect the opening. The louver or grill itself blocks some of the free area, so the opening may need to be larger to meet the minimum free area requirements.
Use the following formula to calculate the required cross-sectional area:

Cross-sectional area = minimum free area required ÷ percent free area of covering (in decimals – e.g., 60% = 0.6)

For example, an installation area that requires openings with 100 square inches of free area would need 134 square inch openings if using metal louvers rated at 75% free area (100 sq. in. ÷ 0.75 = 134 sq. in.).
If you do not know the % free area for your louver or grill, use the following values:

- For wood louvers or grilles: 25%
- For metal louvers or grilles: 75%

Follow these rules to ensure that vents and ducts provide adequate air flow:

- Each vent opening must be no smaller than 100 square inches .
- Ducts must have the same cross-sectional area as free area of the opening.
- Rectangular ducts must have a minimum dimension of no less than three inches .
- All screens must have mesh ¼" or larger.
- Moveable louvers must be locked open or interconnected with the equipment so that they open automatically during operation.
- Keep louvers and grills clean and free of debris or other obstructions.

Check that air source is clean and free of chemicals

Air for combustion and ventilation must be clean and free of corrosive or flammable chemicals. A failure due to corrosive chemicals in the air is not covered by the warranty. Combustion air must be free of acid-forming chemicals such as sulfur, fluorine, and chlorine. Be sure that air at the vent inlets is free of such chemicals.

Table 1
Minimum Free Area of Permanent Openings for Ventilation and Combustion Air Supply – Air from outdoor or indoor spaces.
Based on the total BTU/h input rating for all gas burning appliances within a confined space.

Opening Source	Minimum Free Area
Direct to outdoors*	1 sq. in. per 4,000 BTU/hr (see Figure **1, 2**)
Vertical ducts	1 sq. in. per 4,000 BTU/hr (see Figure **3**)
Horizontal ducts	1 sq. in. per 2,000 BTU/hr (see Figure **4**)
Single Opening	1 sq. in. per 3,000 BTU/hr (see Figure **5**)
Two permanent openings to another room**	1 sq. in. per 1,000 Btu/hr (see Figure **6**) Opening: 100 $in.^2$ MIN. Minimum dimension of air openings: no less than 3 in.

*These openings connect directly with the outdoors through a ventilated attic, a ventilated crawl space, or through an outside wall.
** For direction on combining spaces in different stories within the structure, refer to the current edition of the National Fuel Gas Code ANSI Z223.1/NFPA 54.

See graphics on next page.

Combustion Air Supply Options

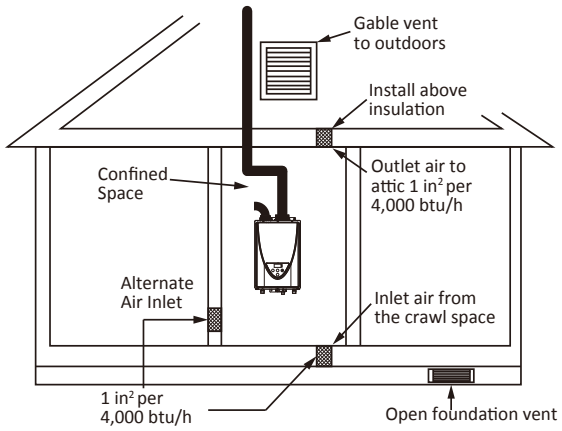


Figure 1 - Direct to outdoors openings

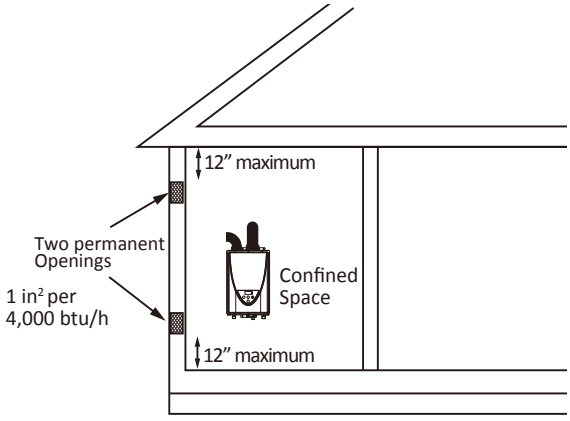


Figure 2 - Direct to outdoors openings
Two permanent openings

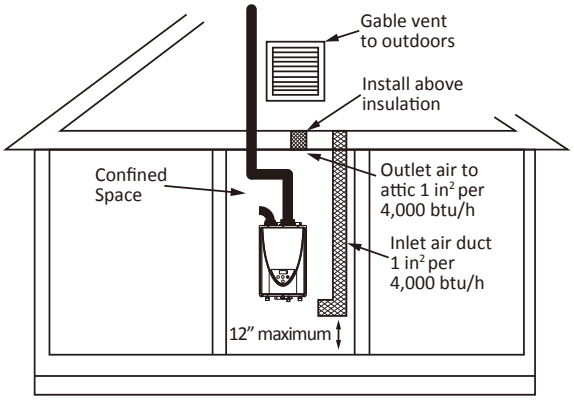


Figure 3 - Vertical duct openings

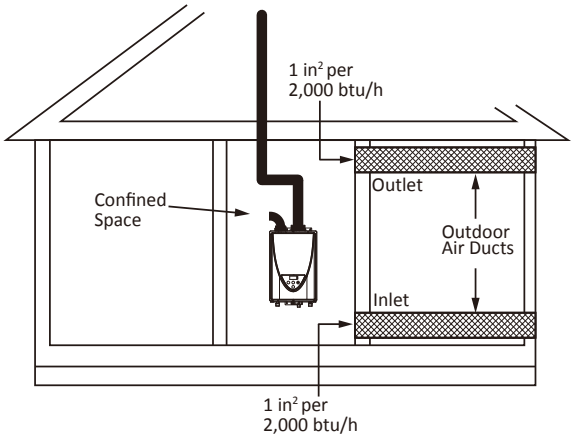


Figure 4 - Horizontal duct openings

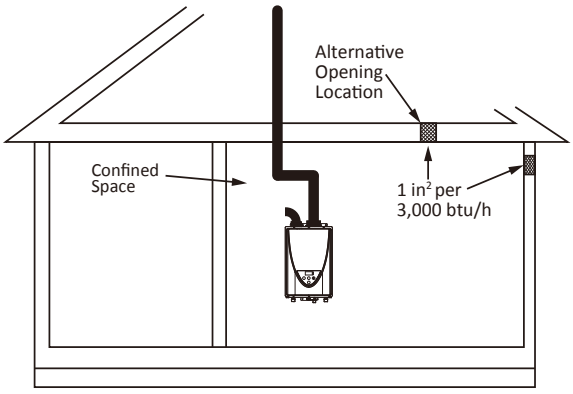


Figure 5 - SIngle opening

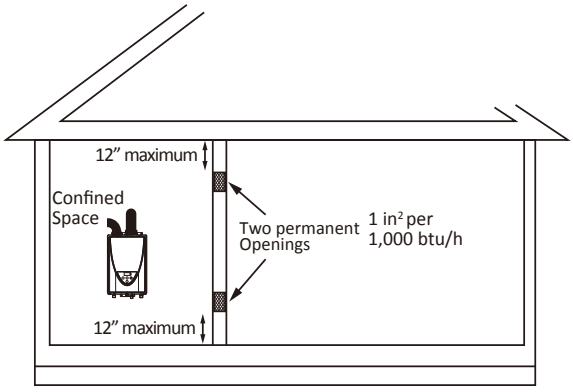


Figure 6 - Two permanent openings

-Vent length and No. of Elbows-

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 4 in. (102 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 **60 ft (18.3 m)**.* Deduct 5 ft (1.5 m) for each 90° elbow used in the venting system. Do not use more than **6 elbows**. A 45° elbow is equivalent to 2.5 ft of vent length.

*If vent termination kit **100187154** is used in the installation, the maximun length of **exhaust** vent pipe must not exceed **55 ft (16.8 m)** , and the vent run must not exceed 5 elbows. Vent termination kit 100187154 also has specific DIP switch settings. Refer to p. 22.

Standard Vent Terminations (See the next table for vent termination 100187154.)

Vent type	Diameter	Max. No. of Elbows	Max. Vertical and Horizontal (Total) Vent Length
Intake	3 in. (76 mm)	6	60 ft (18.3 m)*
Exhaust	4 in. (102 mm)	6	60 ft (18.3 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	60 ft (18.3m)	4	40 ft (12.2 m)
1	55 ft (16.8 m)	5	35 ft (10.7 m)
2	50 ft (15.2 m)	6	30 ft (9.1 m)
3	45 ft (13.7 m)		

Excludes elbow termination, rain caps, or the 4 in. (102 mm) Concentric termination.

Installation with vent termination kit 100187154

Vent type	Diameter	Max. No. of Elbows	Max. Vertical and Horizontal (Total) Vent Length
Intake**	3 in. (76 mm)	6**	60 ft (18.3 m)*
Exhaust	4 in. (102 mm)	5	55 ft (16.8 m)*

***For each 90° elbow added, deduct 5 ft (1.5m) from max. vent length.**
****For Intake vent, refer to the above table of the installation of 6 elbows and 60 ft.**

No. of Elbows	Max. Vertical or Horizontal Vent Length	No. of Elbows	Max. Vertical or Horizontal Vent Length
0	55 ft (16.8 m)	3	40 ft (12.2 m)
1	50 ft (15.2 m)	4	35 ft (10.7 m)
2	45 ft (13.7 m)	5	30 ft (9.1 m)

Excludes sidewall termination.

-DIP Switch Settings for Vent Length-

WARNING

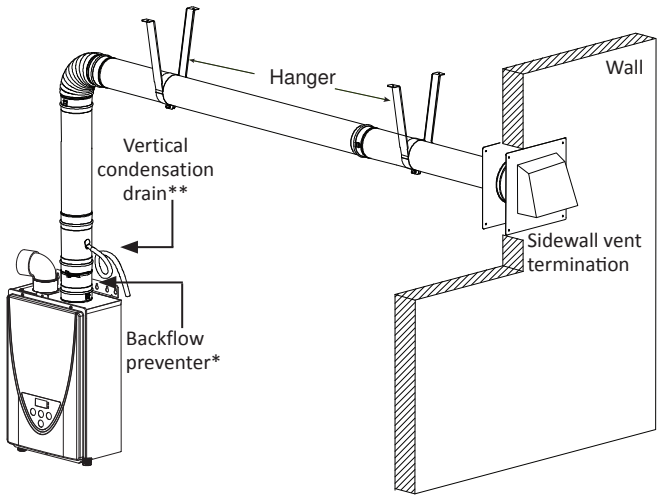
- Improper venting of this appliance can result in excessive levels of carbon monoxide which can result in severe personal injury or death.
- Improper installation can cause nausea or asphyxiation, severe injury or death from carbon monoxide and flue gases poisoning. Improper installation will void product warranty.
- Specific DIP switch settings are required depending on the length of your vent run and the type of vent installation. Refer to the following sections for details:
    - Single Pipe with Room Air (page 20)
    - Two-pipe Direct Vent (page 21)
    - Vent kit of 100187154 (page 22)
    - Outdoor Installation (page 22)

Single Pipe with Room-Air Intake

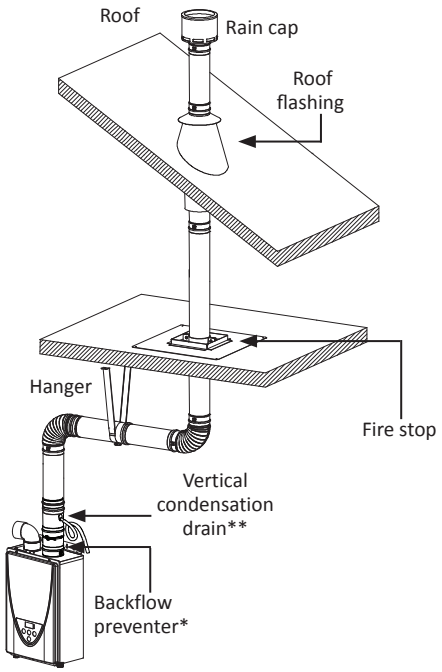
DIP switch settings for single pipe with room-air intake

110U Indoor 310U Indoor	510U Indoor (Upper bank of DIP switches)	Vent length
ON 1 2 3 4 5 6 7 8 9 10 OFF No. 6 : O N No. 7 : OFF No. 8 : OFF	ON 1 2 3 4 5 6 7 8 OFF No. 3 : O N No. 4 : OFF No. 5 : OFF	**0 to 60 ft (0 to 18.3 m)**

Horizontal Installation



Vertical Installation

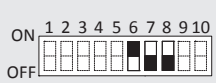
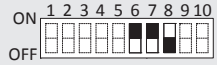


*Backflow preventer (Recommended for freezing weather conditions: 36 °F (2 °C) and below).

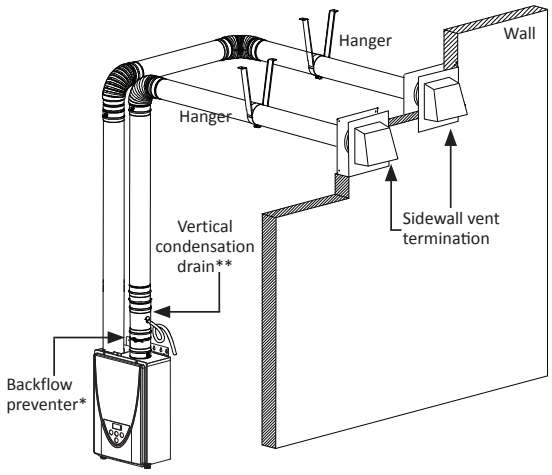
**Vertical condensation drain must be installed in accordance with local codes. It is required to be installed in the venting system when there is more than 5 ft (1.5 m) of equivalent vent length, not including the sidewall termination. 90° elbow is equivalent to 5 ft (1.5 m) of vent length.

Two-Pipe, Direct-Vent Installation Examples

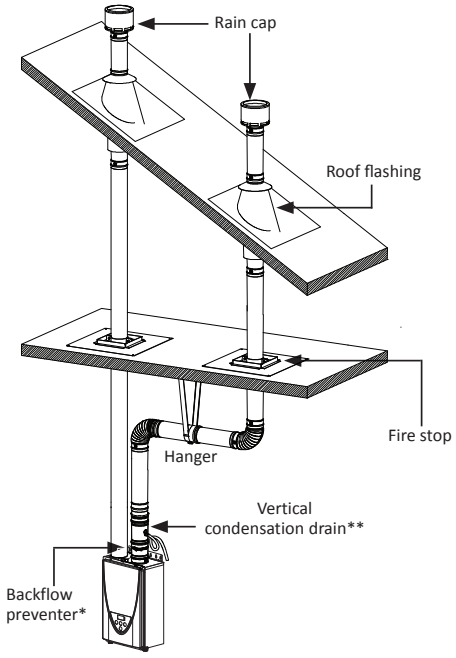
DIP switch settings for direct vent installation

110U Indoor 310U Indoor	510U Indoor (Upper bank of DIP switches)	Vent length
 No. 6 : O N No. 7 : OFF No. 8 : OFF	 No. 3 : O N No. 4 : OFF No. 5 : OFF	**0 to 20 ft (0 to 6.1 m)**
 No. 6 : OFF No. 7 : OFF No. 8 : OFF	 No. 3 : OFF No. 4 : OFF No. 5 : OFF	**21 to 40 ft (DEFAULT) (6.2 to 12.2 m)**
 No. 6 : O N No. 7 : O N No. 8 : OFF	 No. 3 : ON No. 4 : ON No. 5 : OFF	**41 to 60 ft (12.3 to 18.3 m)**

Horizontal Installation

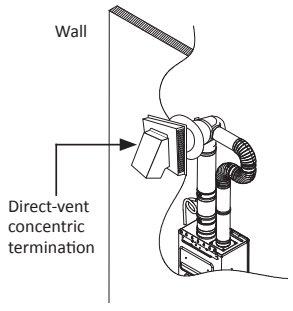


Vertical Installation

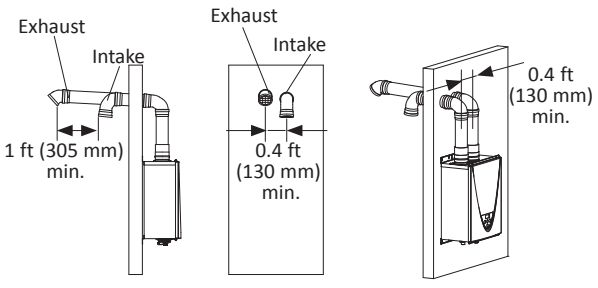


*Backflow preventer (Recommended for freezing weather conditions: 36 °F (2 °C) and below).
**Vertical condensation drain must be installed in accordance with local codes. It is required to be installed in the venting system when there is more than 5 ft (1.5 m) of equivalent vent length, not including the sidewall termination. 90° elbow is equivalent to 5 ft (1.5 m) of vent length.

Horizontal Installation with direct-vent concentric termination
(Refer to p.10)



Direct-vent sidewall Installation
(Refer to p.23)

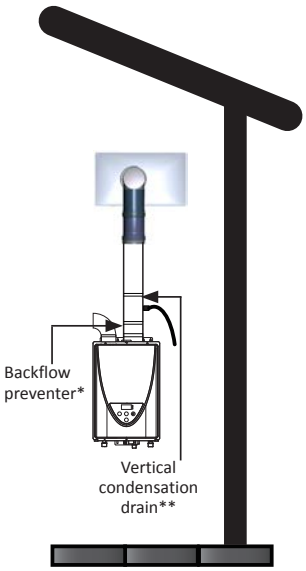


Horizontal Installation with the 100187154 vent kit

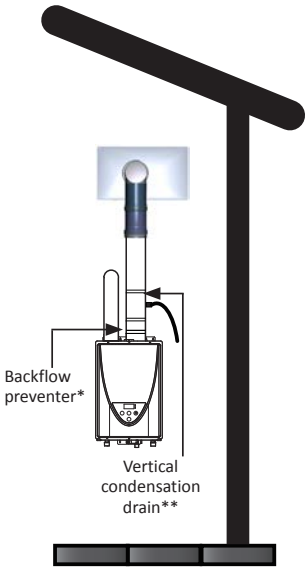
For the Direct vent kit of 100187154, set the following DIP switch settings.

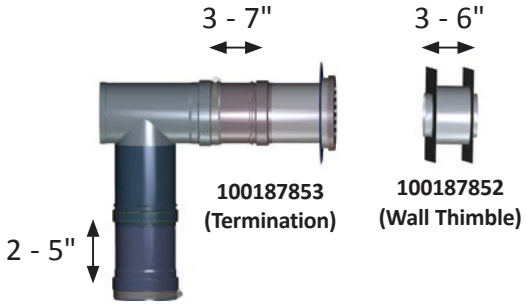
110U Indoor 310U Indoor	510U Indoor (Upper bank of DIP switches)	Vent length
ON 1 2 3 4 5 6 7 8 9 10 OFF No. 6 : O N No. 7 : O N No. 8 : OFF	ON 1 2 3 4 5 6 7 8 OFF No. 3 : ON No. 4 : ON No. 5 : OFF	**0 to 55 ft (0 to 16.8 m)**

Single Pipe with Room-Air Intake



Two-Pipe, Direct-vent sidewall Installation





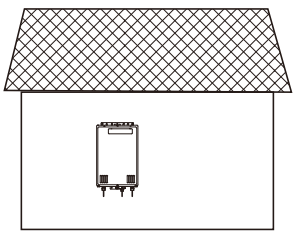
Covering wall thicknesses	Part#
Termination	100187853
Wall Thimble	100187852
Termination + Thimble	100187154

*Backflow preventer (Recommended for freezing weather conditions: 36 °F (2 °C) and below.)
**Vertical condensation drain must be installed in accordance with local codes. It is required to be installed in the venting system when there is more than 5 ft (1.5 m) of equivalent vent length, not including the sidewall termination. 90° elbow is equivalent to 5 ft (1.5 m) of vent length.

Outdoor Installation DIP switch settings

Outdoor installation

110U Outdoor 310U Outdoor	510U Outdoor (Upper bank of DIP switches)
ON 1 2 3 4 5 6 7 8 9 10 OFF No. 6 : OFF No. 7 : O N No. 8 : OFF	ON 1 2 3 4 5 6 7 8 OFF No. 3 : OFF No. 4 : O N No. 5 : OFF

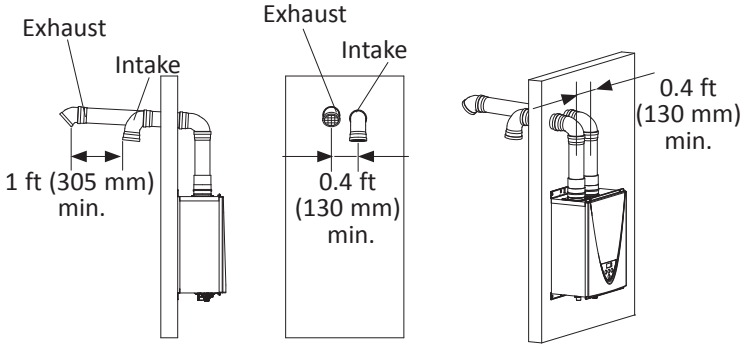


-Clearances for sidewall terminations-

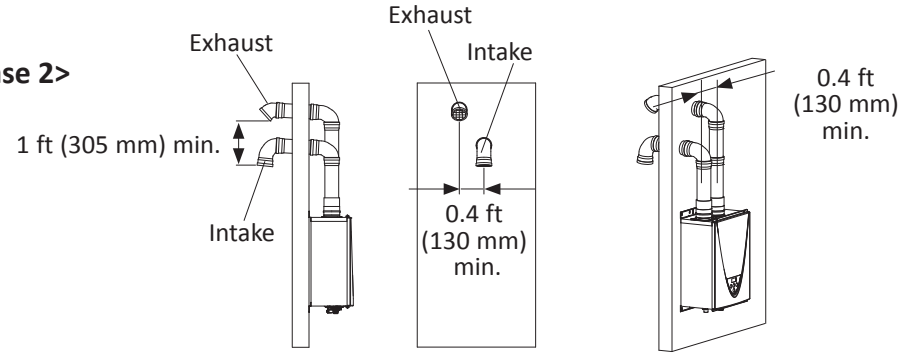
WARNING Improper installation can result in carbon monoxide poisoning or death. Follow all local and national codes in regards to proper termination clearances. In the absence of such codes, the clearances below must be met. Local codes supersede these clearances. Failure to observe this warning may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

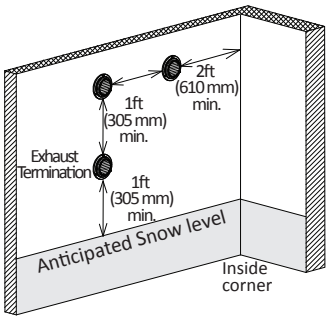
For direct-vent sidewall terminations that use two separate penetrations for the intake and exhaust, comply with the minimum clearances shown in the diagrams below.

<Case 1>

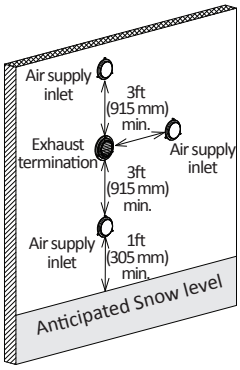


<Case 2>

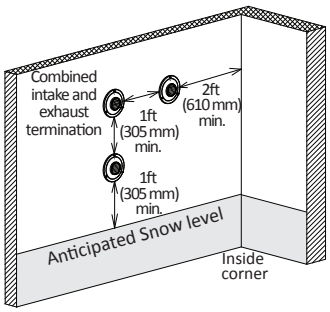




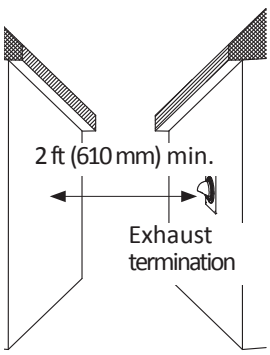
Multiple Sidewall Terminations
An exhaust termination must be at least 1 ft (305mm) away from another exhaust termination. An exhaust termination must also be at least 2 ft (610 mm) away from an inside corner. (If the adjacent wall is less than 2 ft (610 mm) of length, the minimum required distance away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



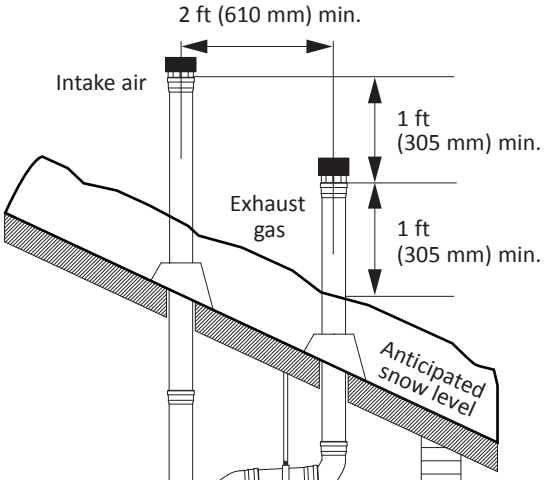
Exhaust and/ or direct vent sidewall terminations
should be at least 2 ft (610 mm) away from an opposite surface/wall. Do not place the termination directly in front of an opening into a building.

-Clearances for rooftop terminations-

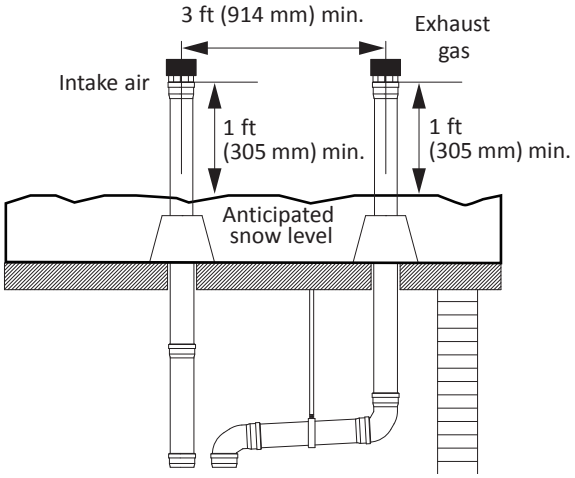
WARNING

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.

Angled roof termination

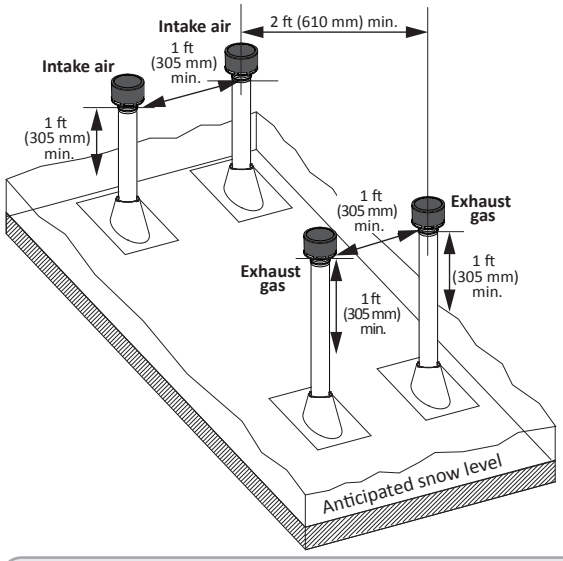


Flat roof termination

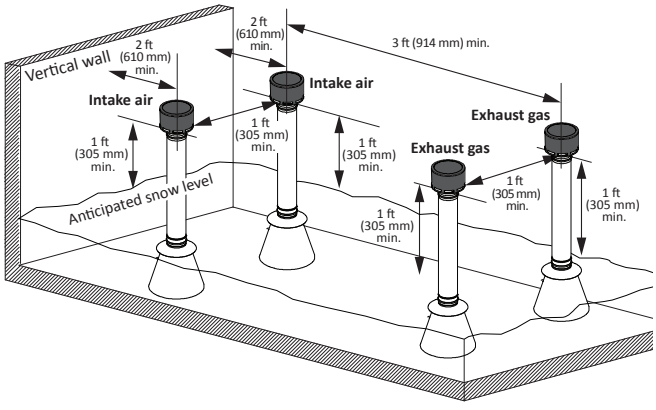


- Exhaust terminations must be at least 1 ft (305 mm) away from any obstructions.
- In lieu of using roof caps, a 90 degree elbow and 45 degree elbow can be used for the exhaust, and two 90 degree elbows can be used for the air intake.

Multiple angled roof terminations



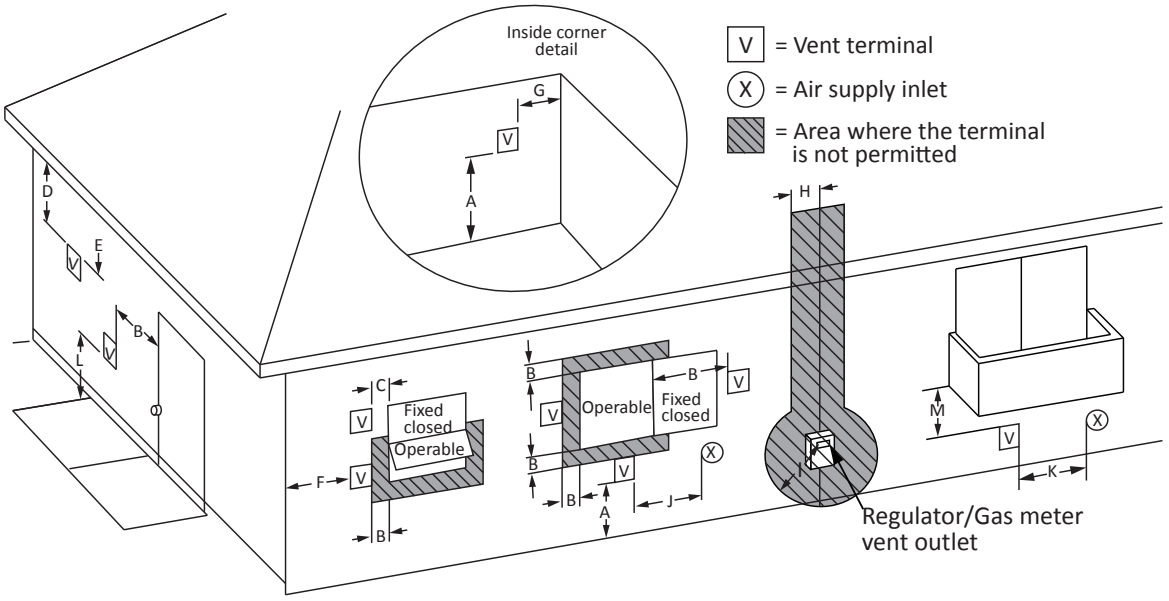
Multiple flat roof terminations



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 directdvent
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 unless the water heater has been properly converted.**
- **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.**
- **If your water heater needs a gas conversion, refer to the instructions supplied with the water heater and included with the conversion components.**

- 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 stanby.
- 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 there is at least 3 ft (1 m) of piping between the regulator outlet and 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, it is necessary to 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 140 Cubic ft/hr for the 110U, 190 Cubic ft /hr for 310U, and 199 Cubic ft/hr for the 510U model.

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

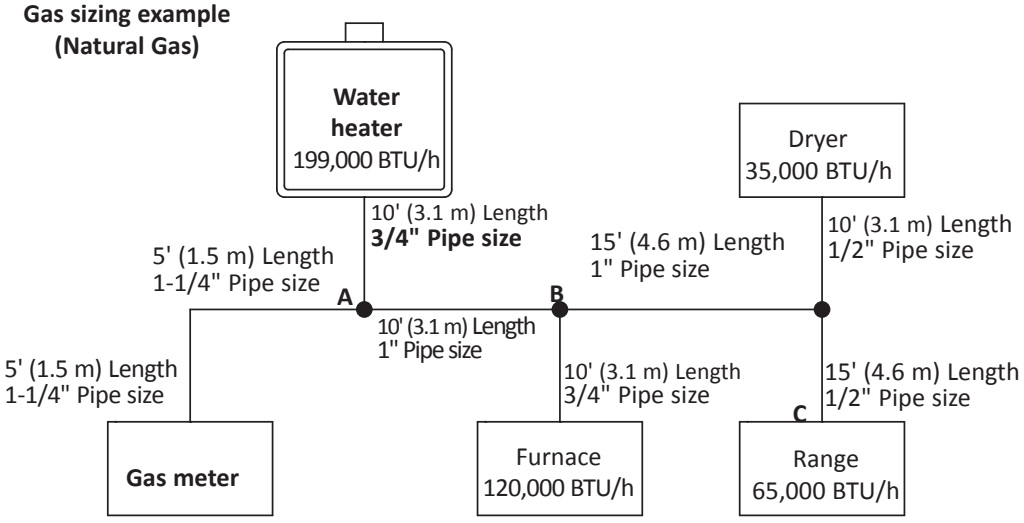
-Propane (LP) Supply Piping-

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/ft^3 to get the appliance's ft^3/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 50 ft (15.2 m) away from the meter. According to the chart above, the 50-ft (15.2 m) column shows that Section A to B must be 1" in order to supply 220 cubic ft per hour.

WATER CONNECTIONS

WARNING

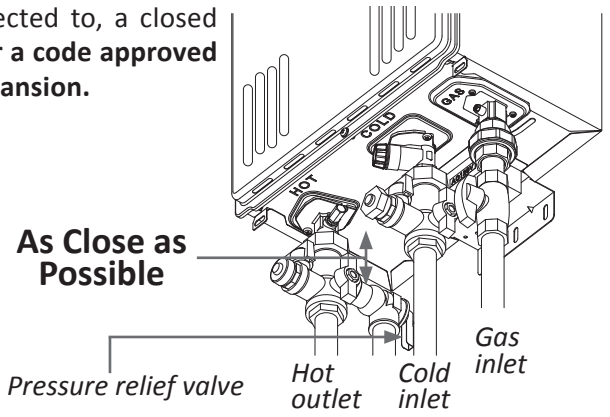
Do not use this appliance if any part has been under water. Immediately contact a qualified installer or service agency to replace a flooded water heater. Do not attempt to repair the unit! It must be replaced!

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 also recommended on the hot water outlet of the unit. **Isolation valves** are recommended as shown in the picture at right.
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 must be installed to handle thermal expansion.**
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. 46.)



-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 140,000 BTU/h for the 110U model, 190,000 BTU/h for the 310U model, and 199,000 BTU/h for the 510U model.
- 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.

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

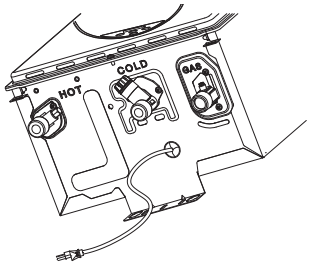
WARNING

- 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.

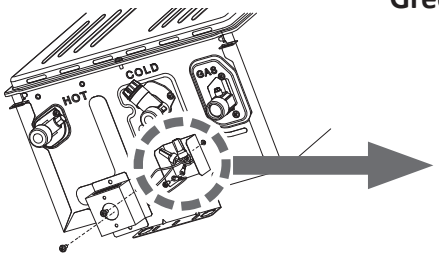
All indoor models come with a power plug instead of a junction box. The following procedure is for outdoor models only.

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.

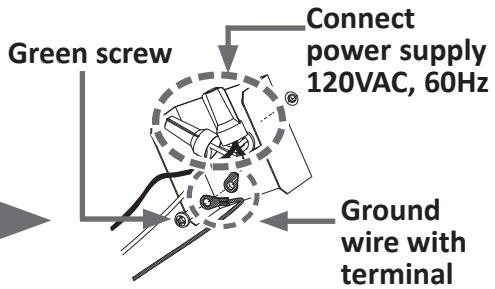
Indoor models only



Outdoor models only



Bottom view of water heater



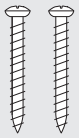
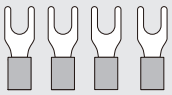
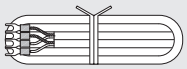
View of electrical connections of water heater

TEMPERATURE REMOTE CONTROLLER

-Included accessories-Outdoor models only

- The remote control is an optional accessory that can be installed in a hall, closet, etc., to allow for temperature adjustment without having to go to the heater.
- When installed, the remote will take priority over the built-in controller of indoor models.

Verify that the items listed below are included with the remote controller.

Temperature remote controller	Screws	Fork terminals	Manual	Remote controller cable*
 Qty: 1	 Qty: 2	 Qty: 4	 Qty: 1	 Qty: 1

100209924 (TM-RE42)
It is also an optional accessory as a second remote for the indoor models. Refer to pp. 9 and 10.
***The optional remote controller (sold separately) has no remote controller cable.**

-Installation-

WARNING

- **<u>This remote controller is NOT waterproof.</u>**
- **The water heater can only have one remote controller.**
- Do not install in high temperature environments, high humidity conditions 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 personal injury or 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

<Mounting and Wiring the Remote Controller>

1. Take off the **Back plate** from the remote controller with a flat head screwdriver. **(Fig. A and B)**
2. Attach the **Back plate** on the wall with the two provided screws. **(Fig. B)**
3. If you use another cable, crimp the **Fork terminals** to the wires. (**Fig. C)**

Fig. A

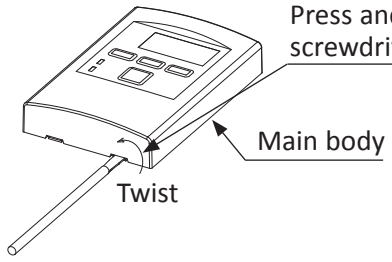


Fig. B

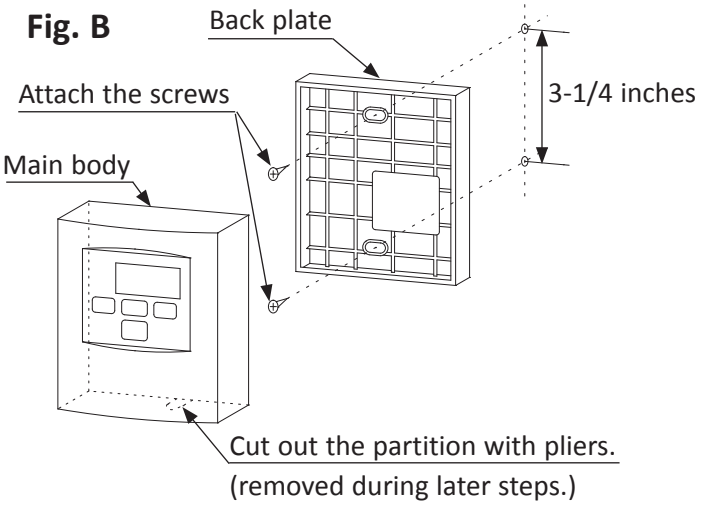
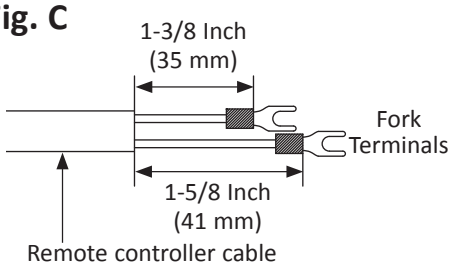


Fig. C



4. Tighten the two **"Fork terminals"** beneath the two **"Remote controller terminal"** screws on the back of the main body. **(Fig. D-1)**
5. Cut out the inlet for the remote controller cable from the bottom of the main body. **(Fig. D-2)**
6. Place the **"Main body"** back on the **"Back plate"**, with the **"Remote controller cable"** running out of the bottom inlet.

Fig. D-1

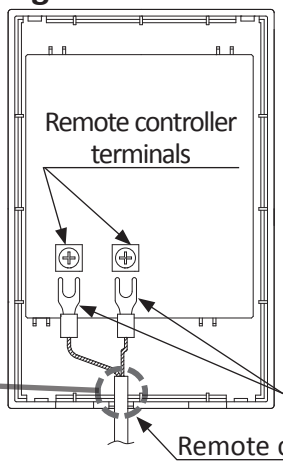
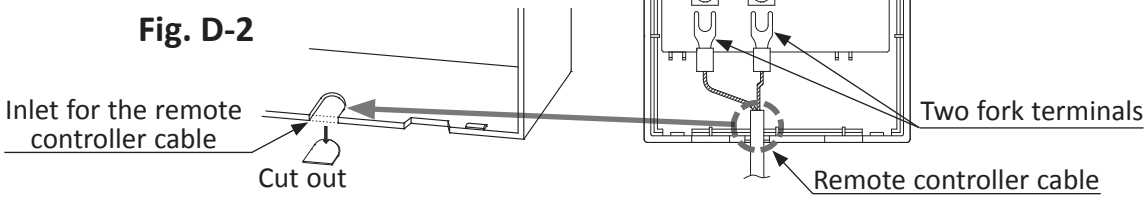


Fig. D-2



Connecting the remote controller to the water heater

1. Disconnect power supply from the water heater.
2. Take off the water heater's front cover.
3. Locate the two terminals for the remote controller in the water heater. (Refer to the **Fig. E-1** and **E-2**.)
4. Put the remote controller cable through the hole at the bottom of the water heater's casing from outside.
5. Secure both terminals on the controller cable to the terminals in the cabinet as shown below. (Secure them underneath the screw terminals. No polarity.) See Figures E-1 and E-2.
   *** Do NOT jump or short-circuit the wires, or the computer will be damaged.**
6. Replace the water heater's front cover securely.

Fig. E-1

110U and 310U

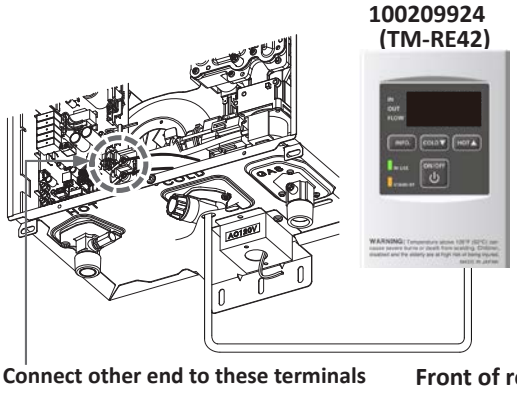
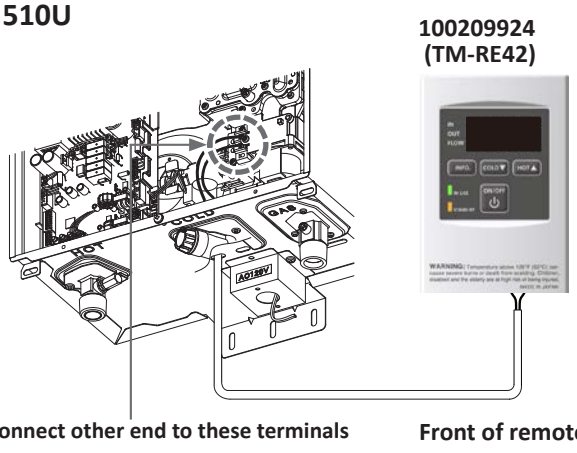


Fig. E-2

510U



EASY-LINK SYSTEM

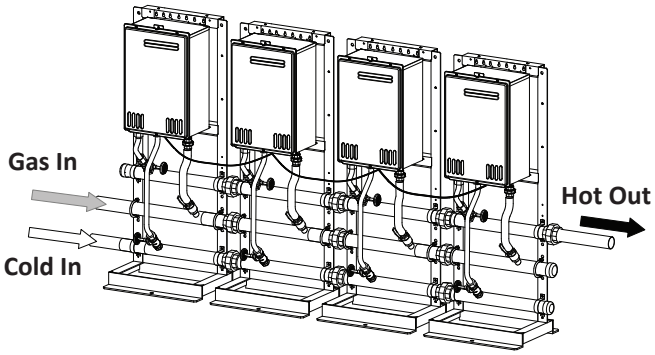
510U model only

The 510U model water heaters can be connected with other allowable heaters (see the table below) with communication cables to work as a multiple-unit manifold system.

- The built-in Easy-Link System allows up to 4 units to manifold together.
- A communication cable (gray color) comes with each 510U model.

You can manifold from 2 to 4 units without the need for a multi-unit controller. A 4-unit system has full automatic modulation between 15,000 BTU/h and 796,000 BTU/h.

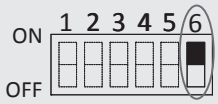
-General-



Easy-Link connection with allowable heaters
T-K3
T-K3-Pro
510 model
510U model (AT-D2U-IN/OS)*
510U model (AT-D3U-IN/OS)*
200 series

NOTICE

- ***If the 510U (AT-D2U-IN/OS) models and the 510U (AT-D3U-IN/OS) models are incorporated in an Easy-Link Sytem with the other models in the table above, change DIP switch No. 6 on the lower bank of all the 510U (AT-D2U-IN/OS) and 510U (AT-D3U-IN/OS) computer boards to the "ON" position.**



DIP switch setting on the 510U (AT-D2U-IN/OS) and 510U (AT-D3U-IN/OS) (Lower bank of DIP switches)
The dark square indicates the correct DIP switch position.

- **Turn off the power supply to the water heater before changing the DIP switch settings.**
- 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 as part of the system.
- **Only listed models on the table above can be combined together as an Easy-Link System**. **These models cannot be combined together with other models not listed on the table above.**
- 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 (100209924/TM-RE42) is used, it should be installed to the "PARENT" unit.** (See section B 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 two banks of DIP switches at the bottom left of the computer board of the unit that you select to be the **"PARENT"** unit. Change DIP switch No. 1 on the **lower bank of DIP switches to the ON position**. See the computer board diagram as 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.
   Next, turn on **"CHILD-1"**. When the controller* installed in **"CHILD-1"** unit displays a number, turn on **"CHILD-2"**.
   When the controller* installed in the **"CHILD-2"** unit displays a number, turn on **"CHILD-3"**.
   Make sure the controller* installed in each child unit displays each unit number. (Refer to p. 48.) The numbering system automatically allocates the unit number to each water heater in the Easy-Link System, in accordance with the table on the right.

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

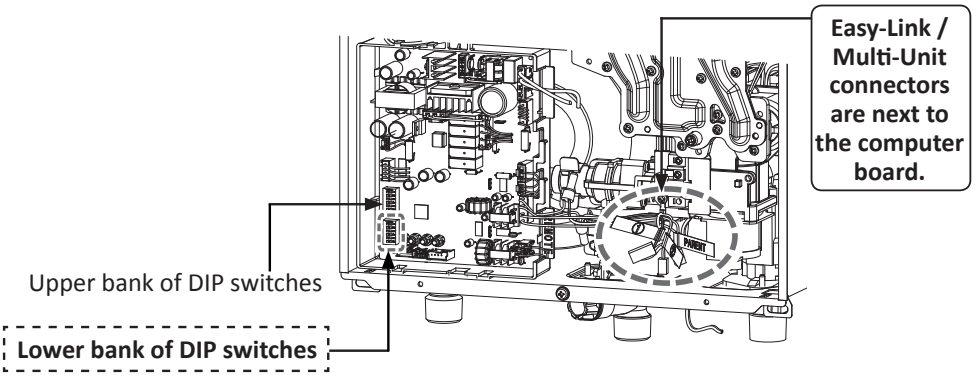
10. Set the water temperature using the controller* installed in the **"PARENT"** unit. It will set the temperature for the Easy-Link System. If a remote controller is installed to the **"PARENT"** heater of 510 U Indoor, it will override the built-in controller.

*Built-in controller for indoor models, remote controller for outdoor models.

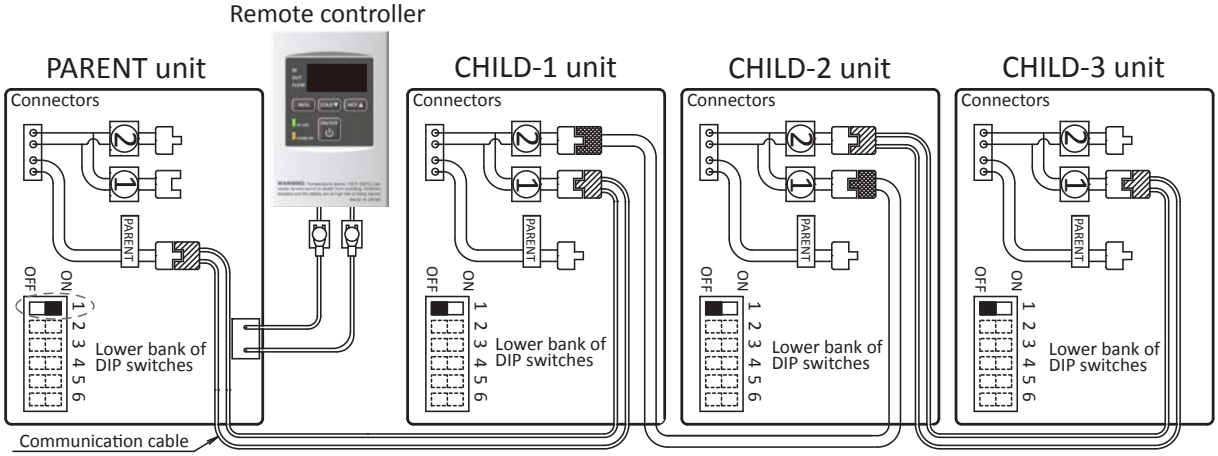
(A) 510U model Computer board

WARNING

- **To change the DIP switch settings for the Easy-Link System, locate the lower bank of DIP switches at the bottom, left of the 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.**



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

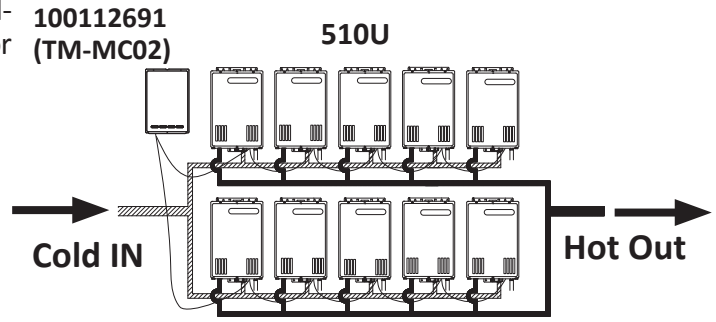


NOTE: The dark square indicates the correct DIP switch position.

MULTI-UNIT SYSTEM

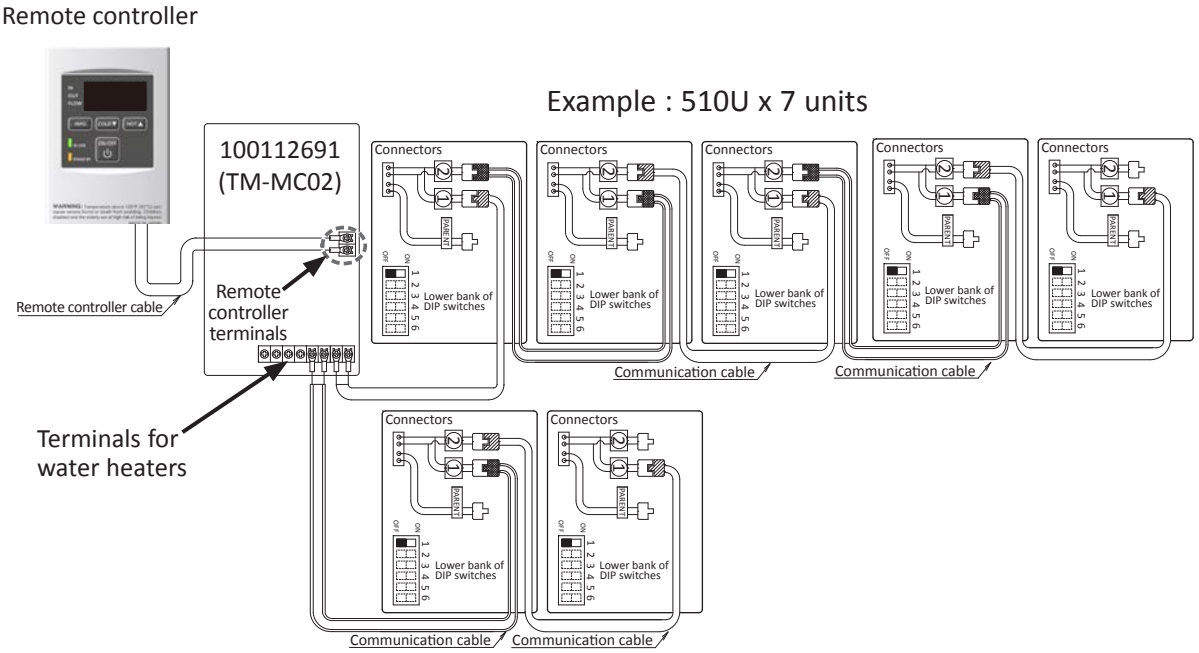
Multiple 510U models can be combined for a Multi-Unit System, along with the multi-unit controller (Part 100112691 (TM-MC02)). Each multi-unit controller can control from 2 to 20 units for commercial or residential applications. For a 20-unit system, the computer can modulate from 15,000 BTU/h to 3.98 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:



- The parent/child DIP switch, No.1 on the lower bank of DIP switches, should be in the OFF position.
- This is the connection diagram between 510U and multi-unit controller for 2 to 20 water heaters. Above is an example showing seven water heaters.
- The multi-unit controller automatically allocates the unit number (1-20) to each water heater that is part of the Multi-Unit System.
- 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.
- The multi-unit controller allocates random numbering. See the controller instructions to learn how to renumber the system units sequentially.

APPLICATIONS

SPACE-HEATING APPLICATIONS

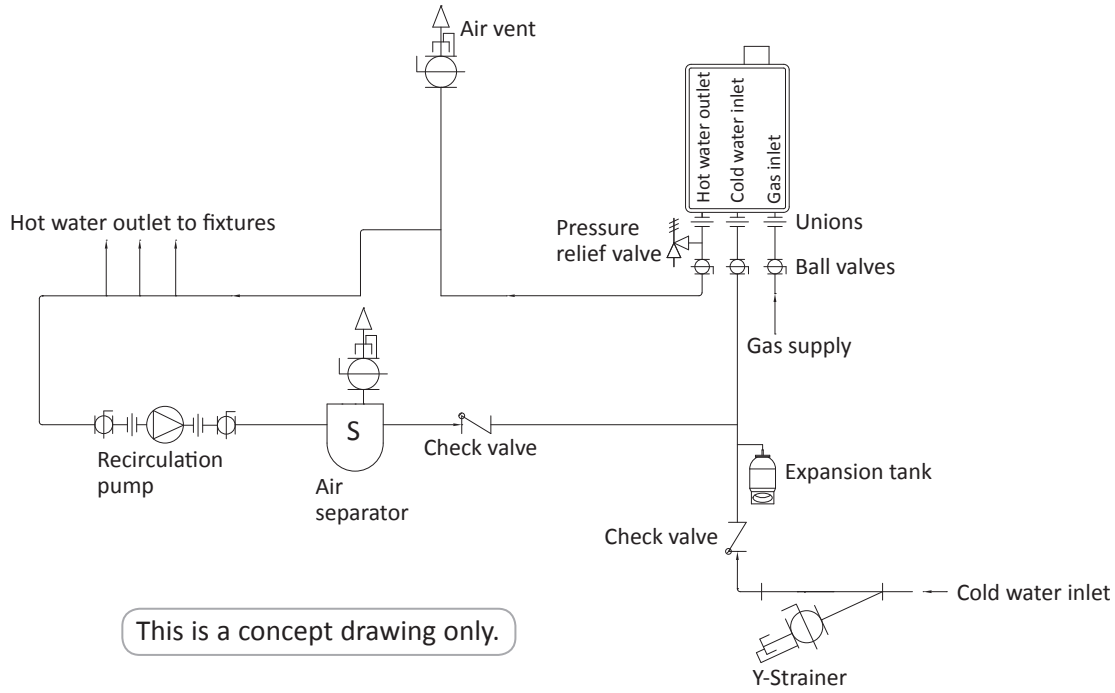
WARNING

- **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.*

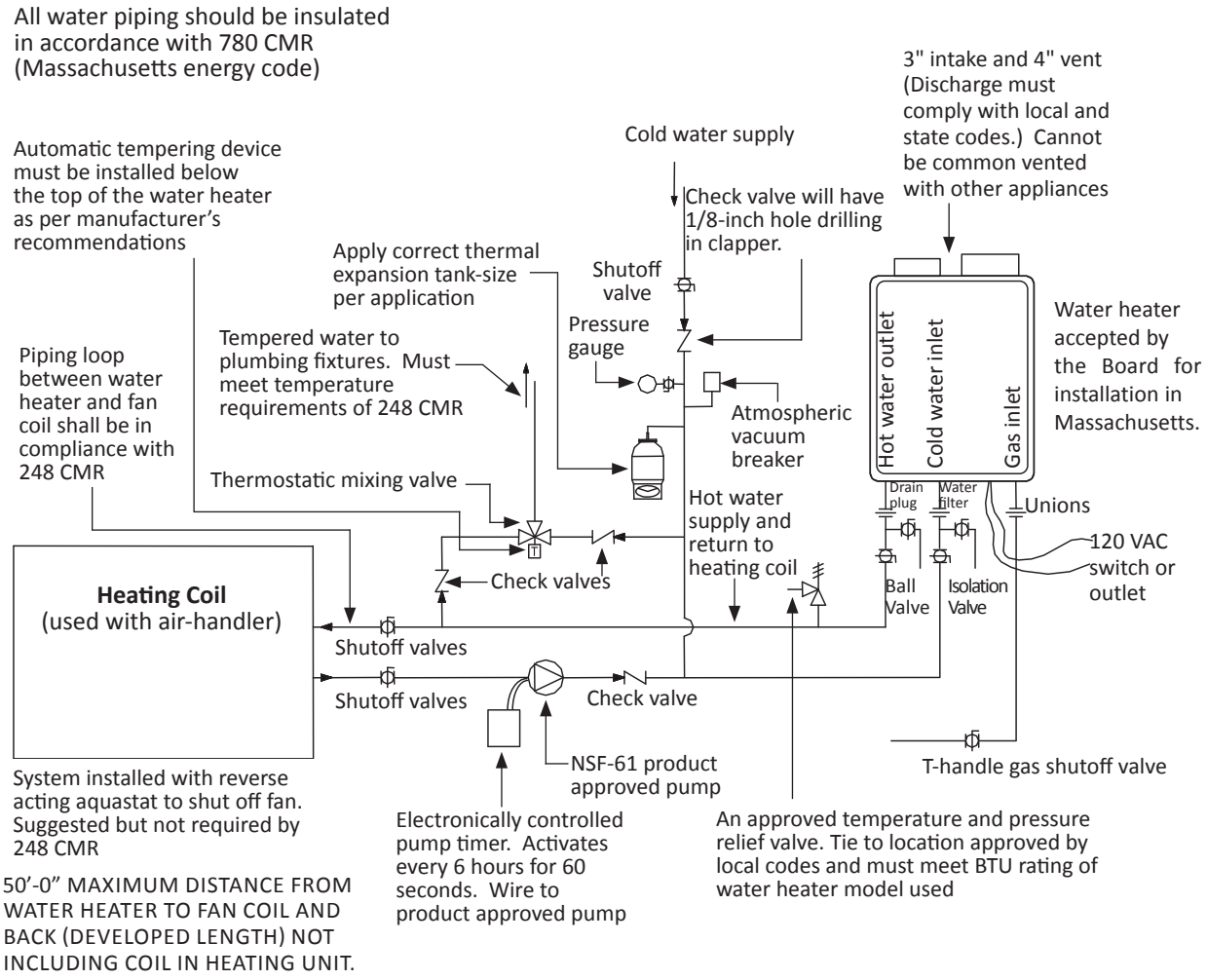


This is a concept drawing only.

DUAL-PURPOSE HOT WATER HEATING

(Domestic and Space Heating):

Diagrammatic layout of radiant heating and domestic water heater.



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

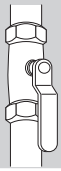
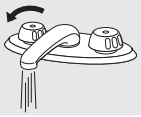
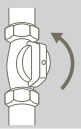
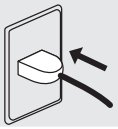
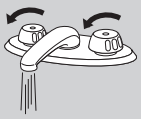
FOR YOUR SAFETY, READ BEFORE OPERATING

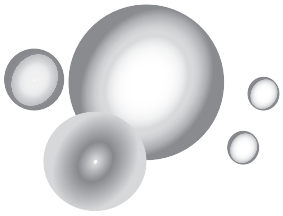
- **Check the GAS and WATER CONNECTIONS** for leaks before firing the unit for the first time.
- Open the main gas supply valve to the unit using only your hand to avoid any spark. Never use tools. If the knob will not turn by hand, do not try to force it; call a qualified service technician. Forced 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. 26 and 46.
- 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. 46 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



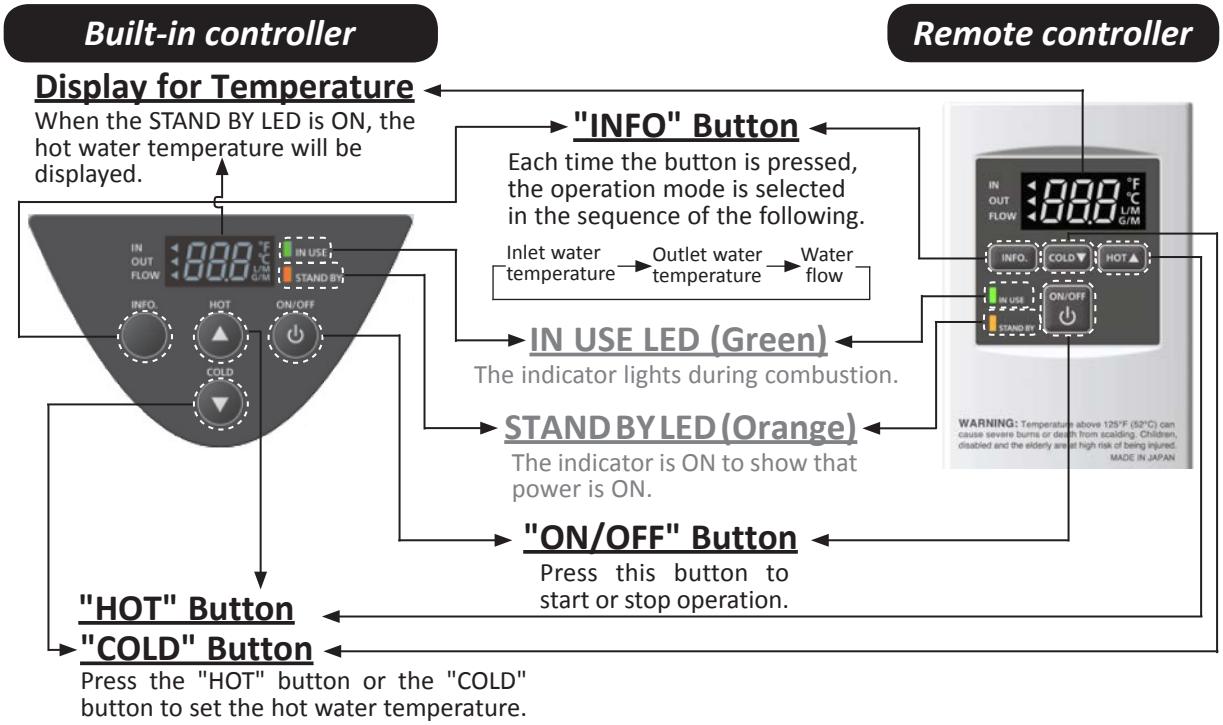
1. Water temperature over 125°F (52°C) can cause severe burns instantly or death from scalds.
2. Children, disabled and elderly are at highest risk of being scalded.
3. Feel water before bathing or showering.
4. Temperature limiting valves are available. See manual.
5. The outlet temperature of the water 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

BUILT-IN CONTROLLER AND REMOTE CONTROLLER

The illustration below shows an example of the controllers. The exact display may differ from examples.



NOTICE

- When the remote controller is installed, it will take priority over the built-in controller.
- 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.

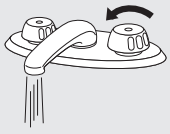
GENERAL

WARNING

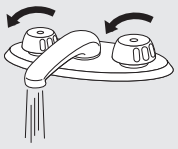
Temperatures above 125 °F (52 °C) can cause severe burns or death from scalding. Children, disabled and the elderly are at high risk of being injured.

°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.

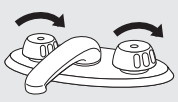
1. Open a cold water fixture.



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



3. When finished, close the water fixtures.

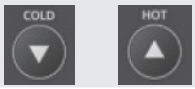
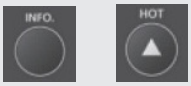


NOTICE

- 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).

TEMPERATURE SETTINGS

-Set temperature-

	Operation	Screen on the controller	
		Built-in controller	Remote controller
1.	Turn on the 120 VAC power supply to the unit (the water heater or the multi-unit controller).		
2.	Press the **"ON/OFF"** button on the controller in order to turn the controller on.		
3.	When ON, the STAND BY LED is lit.		
4.	It shows the set temperature on its display as shown in the picture on the right. (EX.: 120 °F)	 (EX.: 120 °F)	
5.	Press the **"HOT"** button or the **"COLD"** button to set the temperature setting of the unit.		
	Increasing temperature from 120 °F (50 °C) to 125 °F (52 °C) : 1. The water heater must be in Stand By to increase the temperature. 2. Press the "HOT" button to set 120 °F (50 °C). 3. 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). 4. To increase the set temperature further, press the "HOT" button. You can increase the temperature setting up to 140 °F (60 °C).		
	Increasing temperature above 140 °F (60 °C) **-510U model only-:** 1. The water heater must be in Stand By to increase the temperature. 2. Press the "HOT" button to set 140 °F (60 °C). 3. 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). 4. To increase the set temperature further, press the "HOT" button. You can increase the temperature setting up to 160 °F (70 °C).		

-Temperature table of controller-

Following are the temperature set points that are available with your built-in controller or remote controller:

a) For 110U and 310U

°F	100	105	110	115	120*	125	130	135	140
°C	38	40	43	45	50*	52	55	57	60

b) For 510U

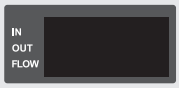
°F	100	105	110	115	120*	125	130	135	140	145	150	155	160
°C	38	40	43	45	50*	52	55	57	60	63	65	68	70

*Factory setting (Default): 120 °F

-Additional features-

Information mode

You can get some information about the water heater's condition by pressing the **"INFO"** button. For more information, follow the procedures below:

INFO Button	Operation	Screen on the controller	
		Built-in controller	Remote controller
1st. press	Inlet water temperature will be displayed on the remote controller by pressing the **"INFO"** button.	 Inlet water temperature	
2nd. press	Outlet water temperature will be displayed on the remote controller by pressing the **"INFO"** button.	 Outlet water temperature	
3rd. press	Water flow will be displayed on the remote controller by pressing the **"INFO"** button.	 Water flow	
4th. press	Press the **"INFO"** button to finish information mode.		

Unit conversion mode

Units of measure can be changed from Imperial to Metric and vice versa. For example, temperature can be changed from °F to °C. Flow rate will also change from gallons per minute to liters per minute when this setting is changed. Follow this procedure to change this setting:

	Operation	Screen on the controller	
		Built-in controller	Remote controller
1.	Press the **"ON/OFF"** button on the controller in order to turn the controller on.		
2.	When ON, the orange LED is lit.		
3.	The previous set temperature will be displayed on the screen.	 (EX.: 100 °F)	
4.	Press the **"INFO"** button for at least 3 seconds.		
5.	The set temperature should now be displayed in the alternate unit of measurement.	 (EX.: 38 °C)	

TEMPERATURE SETTINGS ON THE PCB WITHOUT CONTROLLER

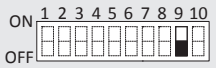
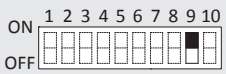
WARNING

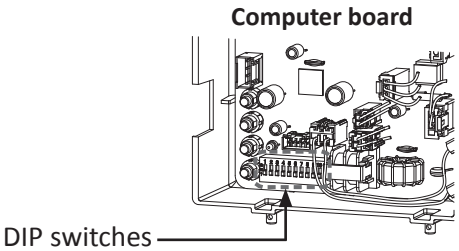
- **Adjust the appropriate DIP switches according to model and temperature as shown below. DO NOT adjust the other DIP switches.**
- **Turn off the power supply to the water heater before changing the DIP switch settings.**
- **Failure to observe these warnings could lead to carbon monoxide poisoning,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

There are two preset temperatures, 120 °F (50 °C) and 140 °F (60 °C), that you can select by changing the DIP switch settings on the computer board without the controller. See below.
When the controller is in normal operation, the set temperature of the controller is given priority over the set temperature of the DIP switch settings.

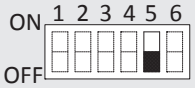
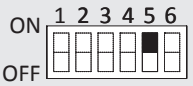
- The temperature has been preset at the factory to 120 °F (50 °C).

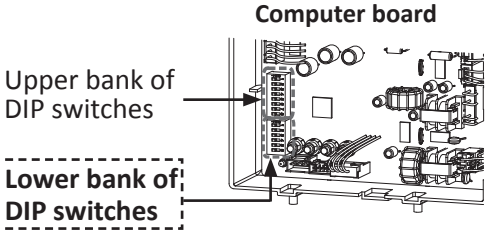
110U and 310U

120 °F (50 °C) DEFAULT	140 °F (60 °C)
	
No. 9 : OFF	No. 9 : ON



510U
(Lower bank of DIP switches)

120 °F (50 °C) DEFAULT	140 °F (60 °C)
	
No. 5 : OFF	No. 5 : ON



NOTE: The tables above show the correct DIP switch position for each temperature setting. (Each black square represents a switch.) For the 110U and 310U, only adjust DIP switch No. 9. For the 510U, only adjust DIP switch No. 5 on the lower bank. Do not adjust the other DIP switches for temperature adjustment.

FLOW

- The flow rate through the water heater is limited to a maximum of 6.6 GPM (25 L/min) for the 110U model, 8.0 GPM (30 L/min) for the 310U model, and 10.0 GPM (38 L/min) for the 510U model.
- 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. 60 to determine the likely flow rates based on your local ground water temperature and your desired outlet water temperature.

Household Flow Rates

Appliance/Use	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

- Refer to the table to the top right for typical household plumbing fixture flow rates to determine what the water heater can do in a household application.

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. 46.
  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.

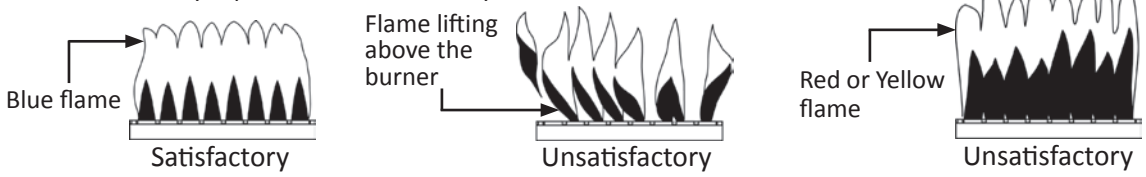
MAINTENANCE AND SERVICE

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 this 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 below) 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.

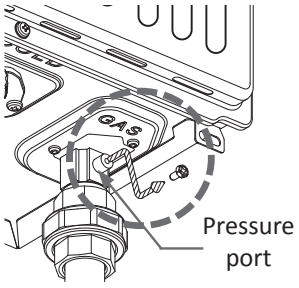


-Measuring inlet gas pressure-

WARNING

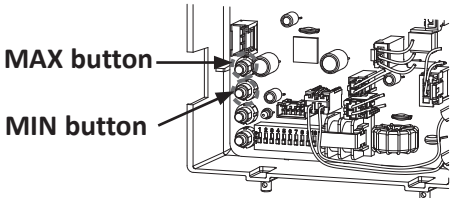
1. Turn off all electric power to the water heater if service is to be performed.
2. Turn the manual gas valve located on the outside of the unit to the OFF position.
3. Failure to follow these steps could lead to fire or explosion, resulting in personal injury or death.

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**.

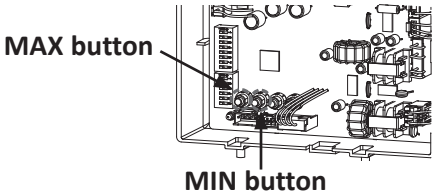


1. Shut off the manual gas valve on the gas supply line.
2. Remove the screw from the pressure port which is located on the gas inlet of the water heater shown in the diagram on the right.
3. Connect the manometer to the pressure port and zero the manometer.
4. Re-open the manual gas valve. Verify that 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 hot water faucets to create maximum flow. Press and hold the MAX button on the computer board. 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. 26.
8. The difference of static to dynamic pressure should not exceed 1.5" W.C. Pressure drops that exceed 1.5" W.C. can indicate restricted gas flow, undersized gas lines, and/or undersized supply regulators. (NOTICE: In Canada, the pressure drops cannot exceed those specified in CSA B149.1.)
9. Measure gas supply pressure at minimum heater operation: While water is flowing through the heater, press the MIN button on the computer board. (Refer to the diagram below.) Take a supply gas pressure reading and verify that it is within the specified inlet gas pressure range.

110U / 310U
Computer board

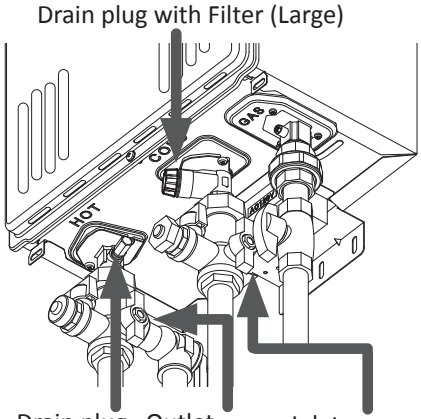


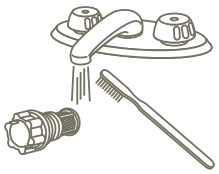
510U
Computer board



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.

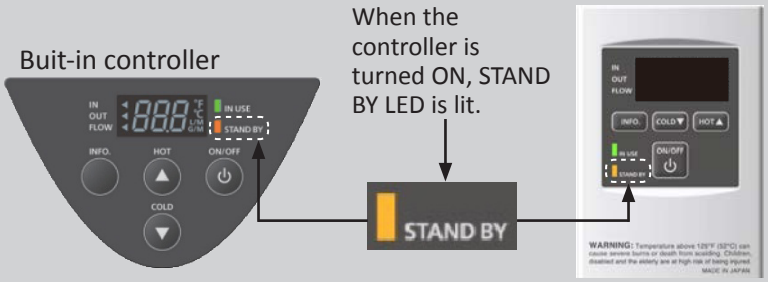
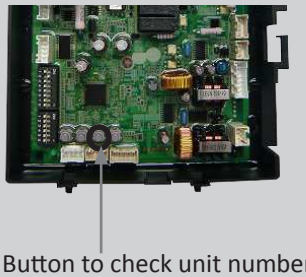




TROUBLESHOOTING

GENERAL

	PROBLEM	SOLUTIONS
TEMPERATURE and AMOUNT OF HOT WATER	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. 35)
	The water is not hot enough.	• Compare the flow and temperature. See the charts on p. 60. • Check cross plumbing between cold water lines and hot water lines. • Is the gas supply valve open fully? (p. 37) • Is the gas line sized properly? (pp. 26 and 27) • Is the gas supply pressure within specified limits? (pp. 26 and 46) • Is the set temperature set too low? (pp. 42 and 44) • Is the Easy Link or Multi-Unit system set up correctly?
	The water is too hot.	• Is the set temperature set too high? (pp. 42 and 44)
	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.37) • Is the water supply valve open fully? (p. 37) • Is the filter on the cold water inlet clean? (p. 46) • Is the hot water fixture sufficiently open to draw at least 0.5 GPM (1.9 L/min) through the water heater? (p. 41) • Is the unit frozen? (p. 45) • Check for cross plumbing between the hot and cold water lines. • Is the Easy Link or Multi-Unit system set up correctly?
	The hot water turns cold and stays cold.	• Is the flow rate enough to keep the water heater running? (p. 41) • If there is a recirculation system installed, does the recirculation line have enough check valves? (p. 35) • Is the gas supply valve open fully? (p. 37) • Is the filter on the cold water inlet clean? (p. 46) • Are the fixtures clean of debris and obstructions?
	Fluctuation in hot water temperature.	• Is the filter on the cold water inlet clean? (p. 46) • Is the gas line sized properly? (pp. 26 and 27) • Is the supply gas pressure within specified limits? (pp. 26 and 46) • Check for cross connection between cold water lines and hot water lines. • Is the Easy Link or Multi-Unit system set up correctly?

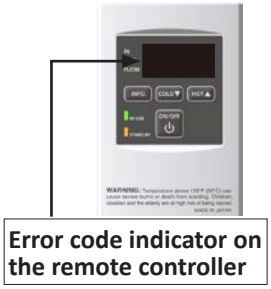
	PROBLEM	SOLUTIONS
WATER HEATER	Unit does not ignite when water goes through the unit.	• Is the flow rate over 0.5 GPM (1.9 L/min)? (p. 41) • Check the filter on the cold water inlet. (p. 46) • Check for reverse connection and cross connection. • If you use the remote controller, is the power button turned 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 1-877-737-2840.
Buit-in controller and remote controller	Built-in and remote controller do 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. (pp. 30 and 31)  • When the unit has not operated for five minutes or more, the display turns off to conserve energy. • Although the controller of the parent unit will display the set temperature at the Easy-Link System, the controller of the child unit will not display the set temperature.
	An ERROR code is displayed.	• Please see pp. 49 to 52.
EASY-LINK SYSTEM 510U model only	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 button on the 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. 33.) 

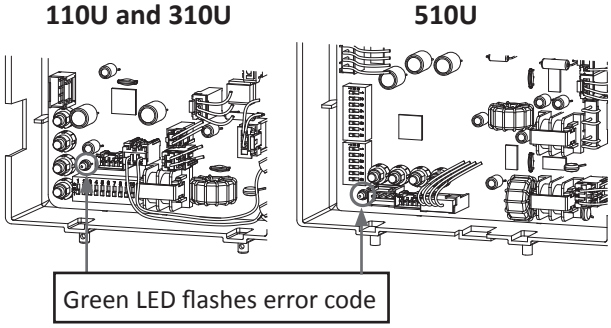
ERROR CODES

-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 built-in controller or remote controller.
- Consult the table on the following pages for the description of each error code.







-Single unit Installations-

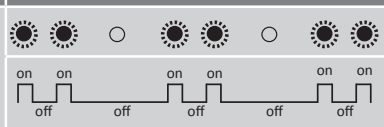
Example: If your unit has the "321" error code (which signifies an inlet thermistor failure)

- **Indicator on the built-in controller and/or remote controller:** "321" will be displayed on the screen.

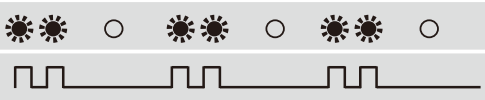
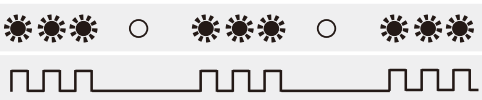
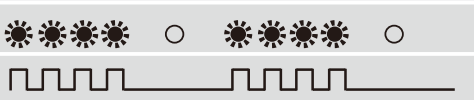
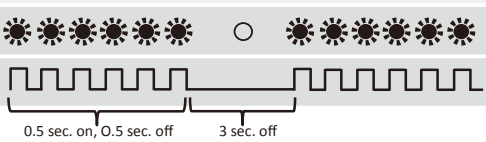


Error code

- **Green LED on the computer board:** The green LED on the computer board will indicate this code with two flashes every 1/2 second. The pattern will repeat with a three second delay between patterns.

Error code	Green LED
321	

Error Indication

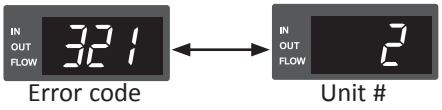
Error Code on the temperature controller	Green LED	
	The number of flashes	Flash pattern
031 701 711	One	
311 321 331 391 441	Two	
111 121	Three	
611 651 661	Four	
101 991	Five	
510 551 721	Six	

-For the 510U model in an Easy-Link System-

Error codes will be displayed differently with units installed within an Easy-Link System, not only to show what the error code is, but to also indicate which unit within the system has the error code. Below is a sample of how the error code of "321" is displayed in an Easy-Link System.

<u>Example</u>: If Unit #2 has the "321" error code (inlet thermistor failure)

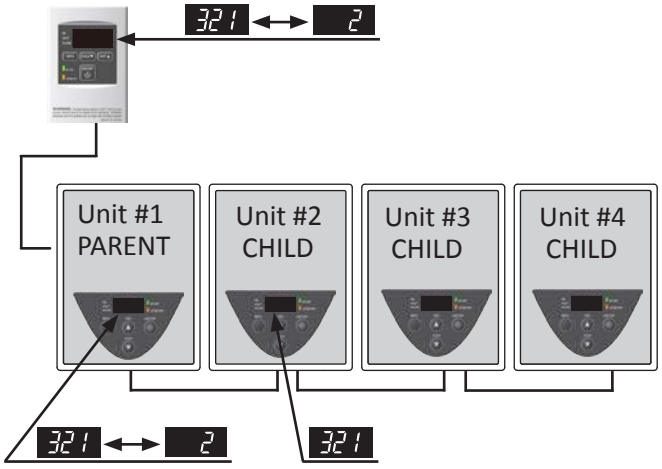
- **Indicator on the built-in controller and/or remote controller of Parent unit:** "321" and "2" will intermittently flash on the display.



100209924 (TM-RE42)

Indoor model installation

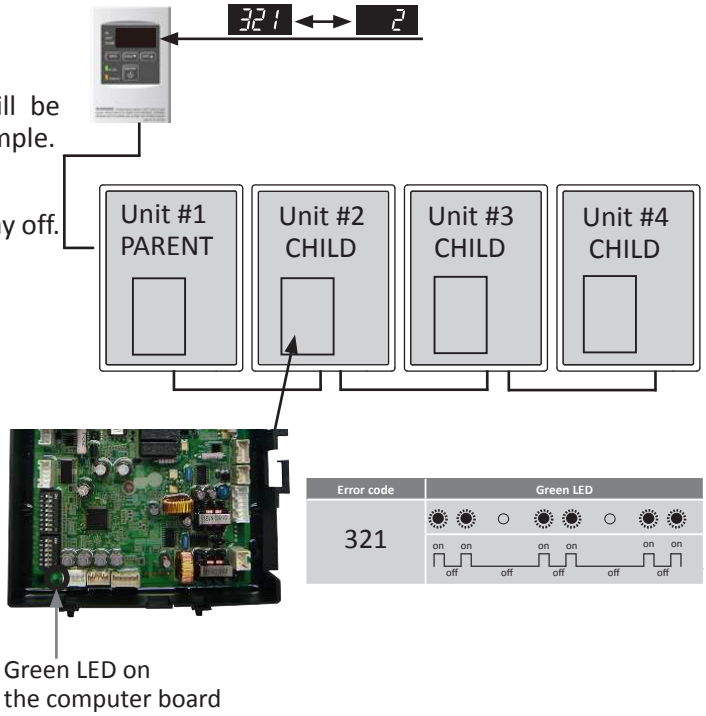
- **Unit #2:** "321" will intermittently flash on the display. The green LED on the computer board will be flashing twice, just like in the single unit example.
- **Unit #3 and #4:** These units will not display anything, as the error code does not pertain to them.



100209924 (TM-RE42)

Outdoor model installation

- **Unit #2:** The green LED on the computer board will be flashing twice, just like in the single unit example.
- **Unit #3 and #4:** The green LED on the computer board will stay off.



-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**.

Remote	Green LED	Malfunction description	Diagnosis
031	One Flash	Incorrect DIP switch setting	• Check the DIP switch settings on the PCB (Part #701).
101	Five Flashes	Warning for the "991" error code	• Check the gas type of the water heater. • Check if there is any blockage in the intake air and/or exhaust. • Check if there is enough distance between the exhaust and air intake terminals. • Check the altitude/elevation of area of where the water heater is installed. • Check if there is grease and/or dirt in the burner (Part #101) and the fan motor (Part #103), especially if the water heater has been installed in a contaminated area.
111*	Three Flashes	Ignition failure	• Check if the Hi-limit switch (Part #412) is properly functioning. • Check for connection/breakage of wires (Part #008, 413, 708, 709), burn marks on the computer board (Part #701), and/or soot on the flame rod (Part #107) and the ignitor (Part #108). • Ensure that the gas supply is turned on. If your water heater has been properly converted to use propane, ensure that the tank is not empty. • Check if there is a buzzing spark ignition sound coming from the burner (Part #101) when water heater prepares for combustion. • Listen for the double "clunk" sound coming from the gas valve assembly (Part #102) when the water heater goes into combustion. • Check if there is leaking from heat exchanger (Part #401).
121*	Three Flashes	Loss of flame	• Check if the Hi-limit switch (Part #412) is functioning properly. • Check for connection/breakage of wires (Part #008, 413, 708, 709), burn marks on the computer board (Part #701), and/or soot on the flame rod (Part #107) and the ignitor (Part #108). • Ensure that the gas supply is turned on. If your water heater has been properly converted to use propane, ensure that the tank is not empty. • Check if there is leaking from the heat exchanger (Part #401).
311*	Two Flashes	110U & 310U: Outlet thermistor failure 510U: Heat exchanger thermistor failure	• Check for connection/breakage of wires and/or debris on the thermistor (Part #407, 408, 411, 713).
321*	Two Flashes	Inlet thermistor failure	
331*	Two Flashes	Outlet thermistor failure (510U model only)	
391	Two Flashes	Air-fuel ratio rod failure	• Check for connection/breakage of wires (Part #709) and/or soot on the AFR rod (Part #107).
441	Two Flashes	Flow sensor failure (Only Easy-Link & Multi-Unit System)	• Check for connection/breakage of wires and/or debris on the flow sensor impeller (Part #402). • Check water filter. Ensure isolation valves are open.

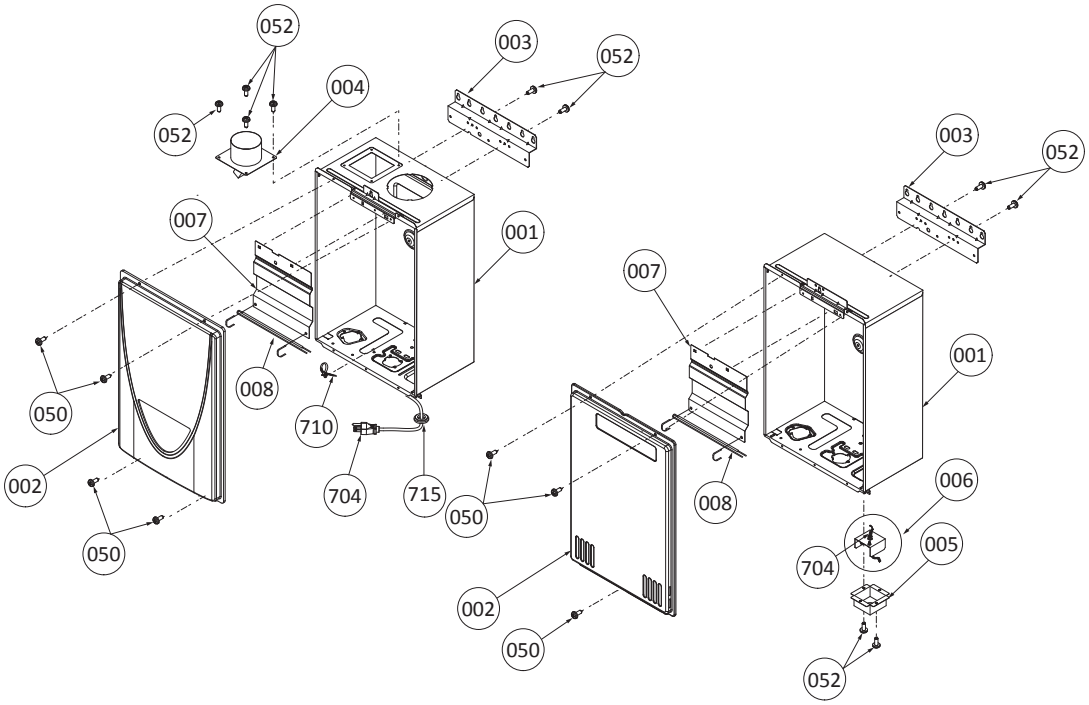
***These error codes will be cleared when water flow stops.**

Remote	Green LED	Malfunction description	Diagnosis
510	Six Flashes	Abnormal main gas solenoid valve	• Check for connection/breakage of wires (Part #708) and/or burn marks on the computer board (Part #701).
551	Six Flashes	Abnormal gas solenoid valve	• Check for connection/breakage of wires (Part #714) and/or burn marks on the computer board (Part #701).
611*	Four Flashes	Fan motor fault	• Check for connection/breakage of wires, dust buildup in the fan motor (Part #103) and/or burn marks on the computer board (Part #701). • Check for frozen/corrosion of connectors (Part #103).
651	Four Flashes	Flow adjustment valve fault (Only Easy-Link & Multi-Unit System)	• Inspect the flow adjustment valve (Part #402), for connection/breakage of wires, locked motor drive due to scale buildup, and/or water leakage.
661*	Four Flashes	Bypass valve fault (510U model only)	• Inspect the bypass valve (Part #403), for connection/breakage of wires, locked motor drive due to scale buildup, and/or water leakage.
701*	One Flash	Computer board fault	• Check the outlet thermistor (Part #408) as it may need to be cleaned. • Check for connection/breakage of wires (Part #714).
711*	One Flash	Gas solenoid valve drive circuit failure	• Refer to the 111 and 121 error codes.
721*	Six Flashes	False flame detection	• Check if condensate drain is installed on the vent collar of the water heater. • Check if there is leaking from heat exchanger (Part #401).
741	N/A	Miscommunication between water heater and remote controller	• Inspect the connections between the water heater and remote controller. • Check the power supply of the water heater.
751	N/A	Miscommunication between water heater and built-in controller	• Inspect the connections between the water heater and built-in controller. • Check the power supply of the water heater.
761	N/A	Miscommunication in Easy-Link system	• Check if the connections between the parent unit and the child units are correct. Refer to p. 33. • Verify that each unit has power and that its power switch above the computer board is in the ON position.
991	Five Flashes	Imperfect combustion	• Check the gas type of the water heater. • Inspect the environment around the water heater. Determine how long the unit has been installed. • Check the altitude/elevation of the area of where the water heater is installed. • Check if there is any blockage in the intake air and/or exhaust. • Check to make sure that there is enough distance between the exhaust and air intake terminals. • Check if there is grease and/or dirt in the burner (Part #101) and the fan motor (Part #103), especially if the water heater has been installed in a contaminated area.

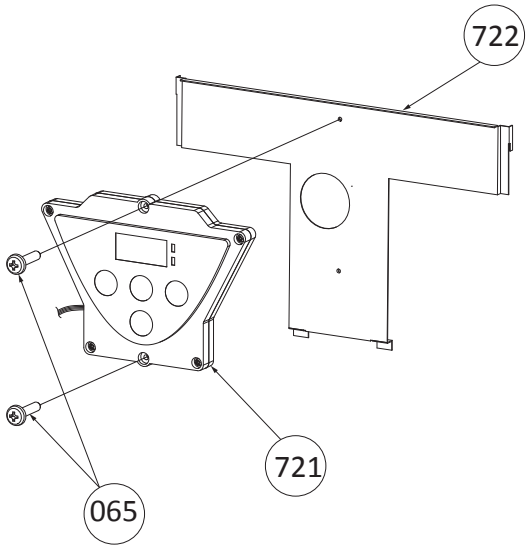
***These error codes will be cleared when water flow stops.**

COMPONENTS DIAGRAM

Case assembly

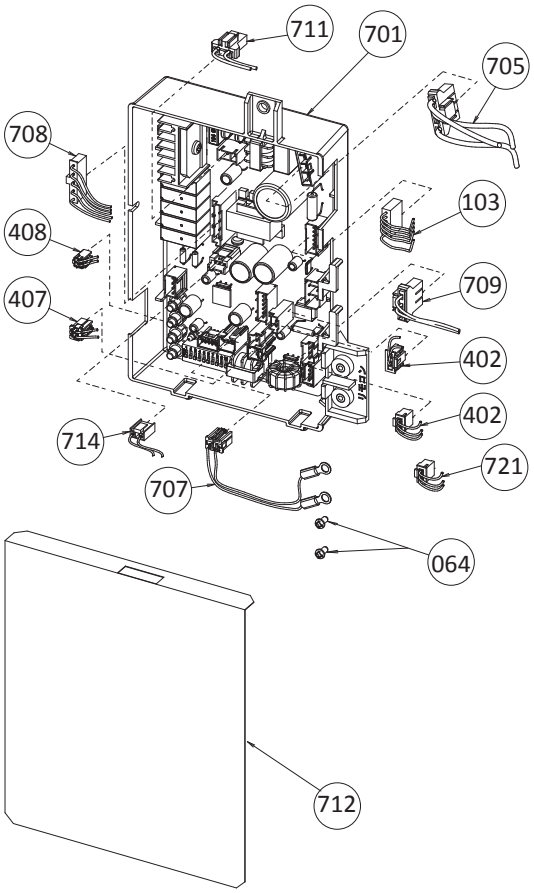


Built-in temperature controller

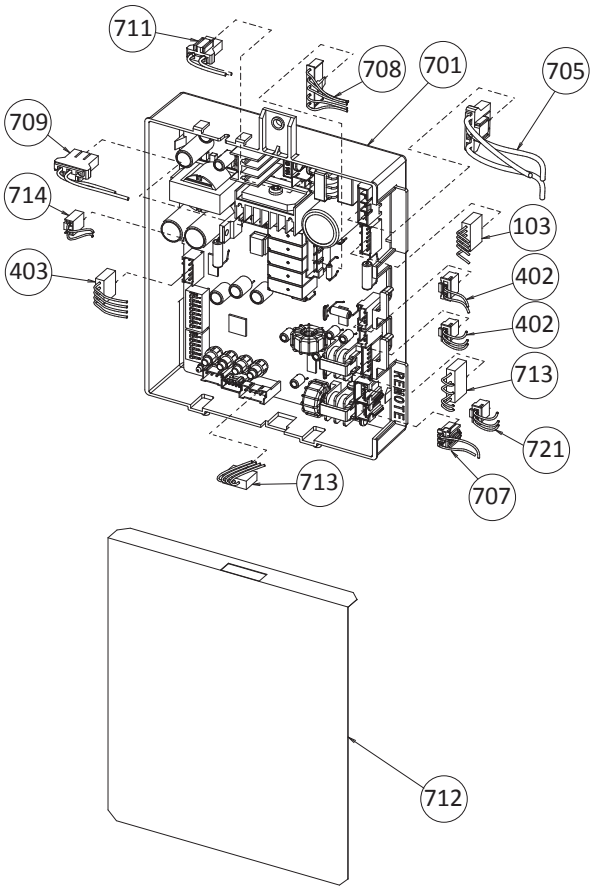


Computer board assembly

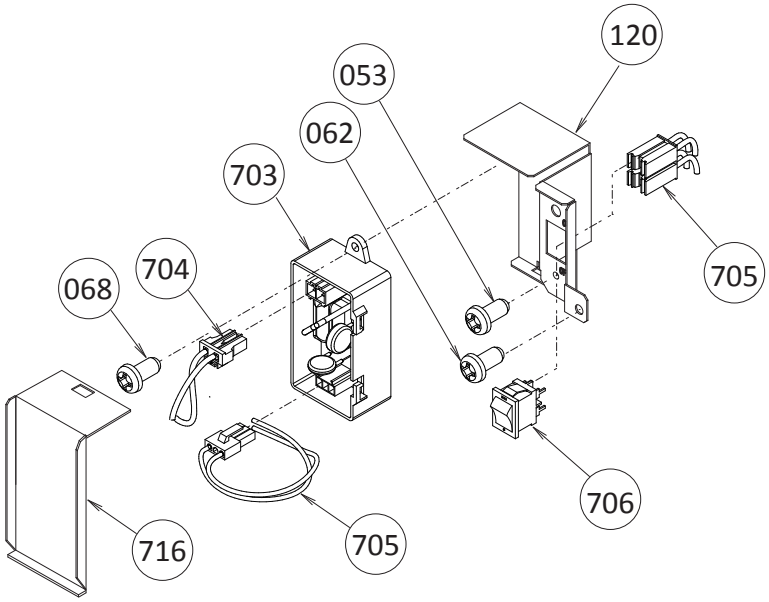
110U and 310U



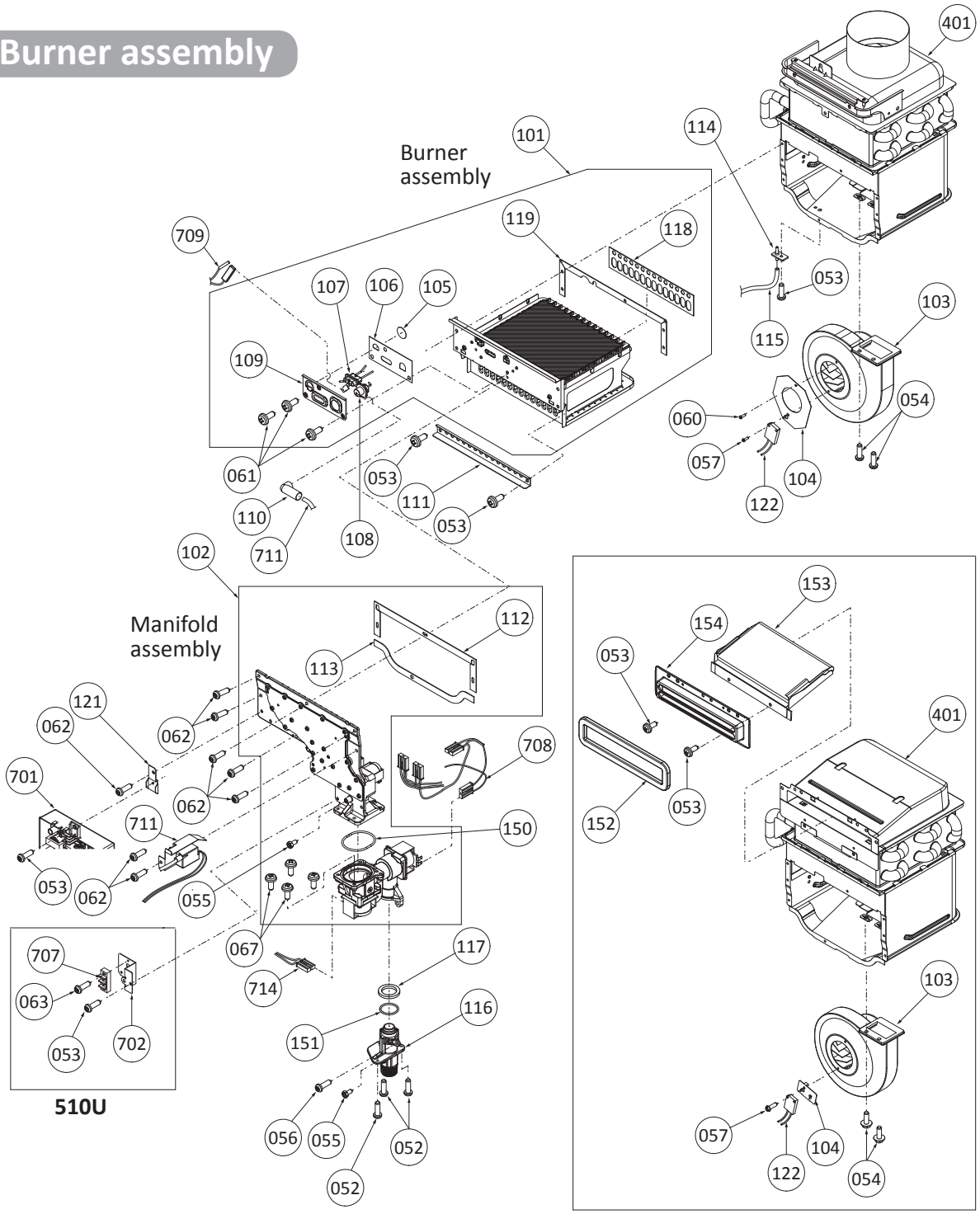
510U



Surge box assembly



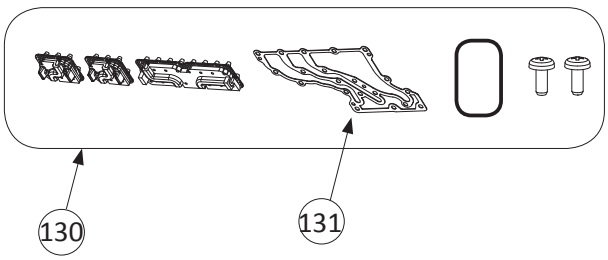
Burner assembly



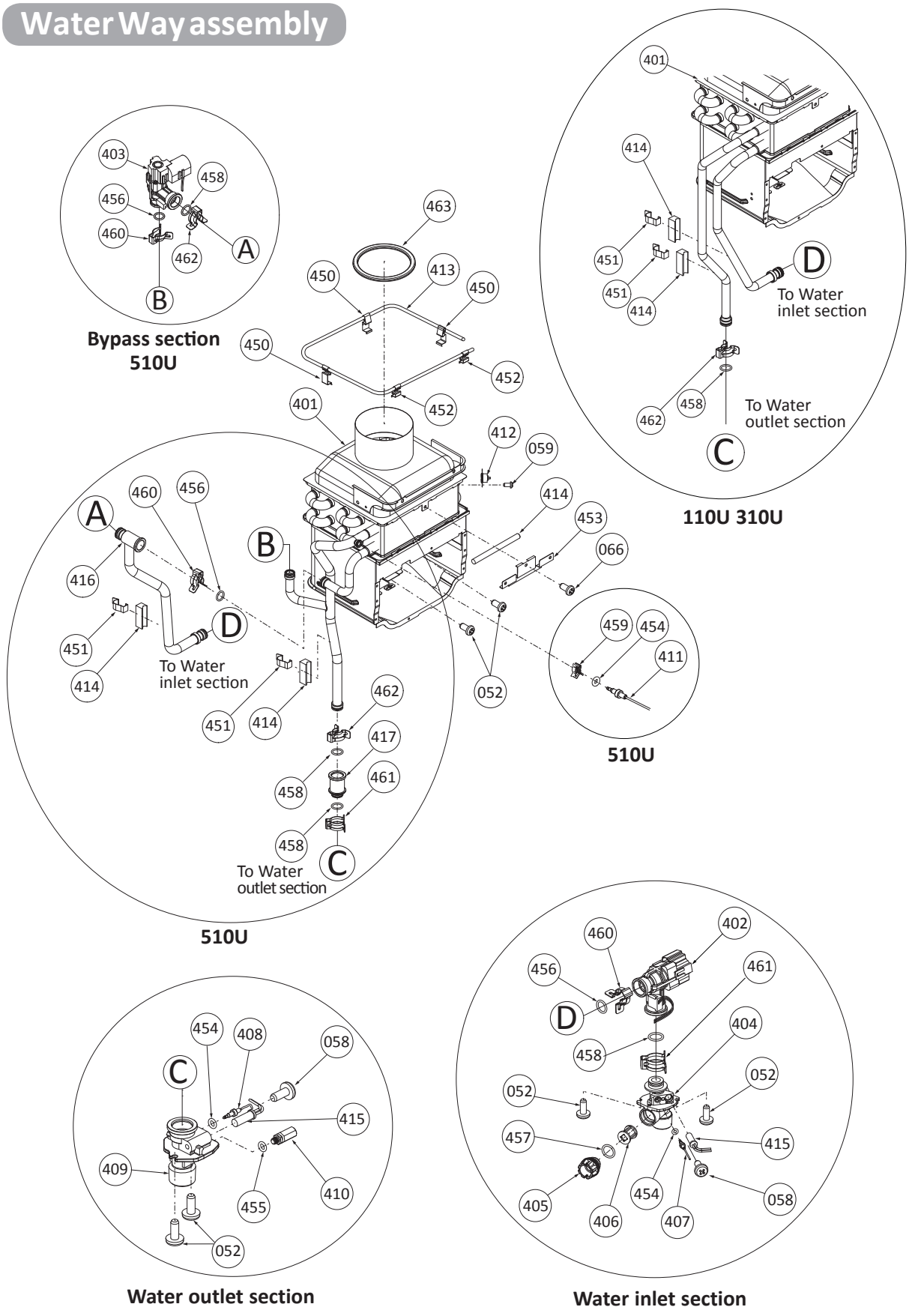
510U

Exhaust section (Outdoor model)

LP Conversion Kit



Water Way assembly



PARTS LIST

Item #	Description	Part #	
		110U, 310U and 510U models	AT-KJr3U-IN/OS, AT-K5U-IN/OS and AT-D3U-IN/OS
001	Case assembly for Indoor models	N/A	EK596
	for Outdoor models	N/A	EK597
002	Front cover for Indoor models	N/A	EK598
	for Outdoor models	N/A	EK599
003	Bracket	N/A	EK455
004	Intake air port assembly	N/A	EK600
005	Junction box	100074668	EK190
006	Power supply cord assembly	100074603	EKK4D
007	Back guard panel	N/A	EK601
008	Overheat-cut-off fuse for combustion chamber	100074201	EM484
050	Truss screw M4×12 (W/Washer) SUS410	100074210	EW000
051	Truss screw M4×10 (W/Washer) SUS410	100074509	EW001
052	Truss screw M4×10 (Coated) SUS3	100074211	EW002
053	Truss screw M4x10 SUS	100074245	EW003
054	Hex head screw M4×12 (W/Washer) SUS3	100074510	EW004
055	Hex head screw M4x8 FEZN	100074248	EW005
056	Pan screw M4x10 FEZN	100074247	EW006
057	Pan Screw M3x10 SUS	100074511	EW008
058	Tapping screw M4x6 SUS3 Truss head	100074512	EW009
059	Tapping screw M3x6 SUS3 Pan head	100074272	EW00A
060	Screw M3x6 SUS3 Binding head	100074514	EW00B
061	Pan screw M4x8 MFZN	100074244	EW00D
062	Tapping screw M4x14 SUS410 Truss head	100076450	EW00E
063	Screw M3x12 BSNI Raised counter sunk head	100074515	EW00X
064	Screw M3x6 BSNI Binding head	N/A	EW016
065	Pan screw M4x20 SUS410	N/A	EW018
066	Truss screw M4x8 SUS3	N/A	EW02A
067	Tap tight screw M4x12 FEZN	100074385	EKK31
068	Truss screw M4x10 MFZN3	N/A	EX014
101	Burner assembly	100224092	EK554
102	Manifold with gas valve assembly NA	100224093	EK555
103	Fan motor for Indoor models	100074606	EK109
	Fan motor for Outdoor models	100074228	EKK25
104	Fan motor plate for Indoor models	100074466	EM381
	Fan motor plate for Outdoor models	N/A	EK140
105	Burner window	100076535	EKN58
106	Rod holder gasket	100224097	EK559
107	Flame rod with AFR function	100224098	EK560
108	Igniter rod	100224099	EK561
109	Rod holder	100224100	EK562
110	Rod cap	100076319	EK462
111	Burner damper	100270556	EK602
112	Manifold gasket A	100224102	EK564
113	Manifold gasket B	100224103	EK565
114	Pressure port	100074227	EKK2D
115	Combustion chamber tube	100074528	EX019
116	Gas inlet	100074235	EKK1E
117	Gas inlet ring	100074234	EKK2Z

Item #	Description	Part #	
		110U, 310U and 510U models	AT-KJr3U-IN/OS, AT-K5U-IN/OS and AT-D3U-IN/OS
118	Burner gasket	100224105	EK567
119	Burner holder gasket	100224106	EK568
120	Surge box plate	100074360	EK436
121	PCB fixing plate	N/A	EK603
122	Thermostat	100074369	EKJ59
130	LP Conversion kit	100270585	EK604
131	Manifold gasket	100281157	EK592
150	O-ring P18 NBR (Manifold)	N/A	EK570
151	O-ring P20 NBR (Black)	100074242	EK042
152	Silicon ring for Outdoor models	100074390	EKK3G
153	Rain protection plate in Exhaust chamber for Outdoor models	100074400	EKK53
154	Exhaust port for Outdoor models	100074403	EKK56
401	Heat exchanger assembly for 110U and 310U Indoor	100270557	EK605
	for 110U and 310U Outdoor	100270558	EK606
	for 510U Indoor	100270559	EK607
	for 510U Outdoor	100270560	EK608
402	Flow adjustment valve / Flow sensor	100074624	EK129
403	Bypass valve for 510U model	100074625	EKD58
404	Water inlet	100074377	EKK1U
405	Inlet drain plug	100074381	EKK2B
406	Inlet water filter	100074382	EKK2C
407	Inlet thermistor for 110U and 310U	100074398	EKK4J
	Inlet thermistor for 510U	100224109	EK573
408	Outlet thermistor for 110U and 310U	100074680	EK207
	Outlet thermistor for 510U	100224110	EK574
409	Water outlet	100074627	EK104
410	Outlet drain plug	100074264	EK239
411	Heat exchanger thermistor for 510U model	100224111	EK575
412	Hi-Limit switch for 110U and 310U	100074412	EM212
	Hi-Limit switch for 510U model	100074280	EKN34
413	Overheat-cut-off fuse for heat exchanger	100074252	EX02A
414	Pipe heater	100074682	EK209
415	Inlet heater	100074629	EK105
416	Pipe inlet	100270581	EK609
417	Joint outlet	100224113	EK577
450	Fuse fixing plate 40	N/A	EK616
451	Heater fixing plate 16	100074310	EK031
452	Fuse fixing plate 18	N/A	EK476
453	Pipe heater fixing plate	N/A	EK610
454	O-ring P4 FKM	100076303	EZM04
455	O-ring P6 FKM	100076305	EZM06
456	O-ring P14 FKM	100076306	EZM14
457	O-ring P15 FKM	100076307	EZM15
458	O-ring P16 FKM	100076308	EZM16
459	Fastener “4-11” for 510U model	100074282	EKH30
460	Fastener “14-22”	100074290	EKK24
461	Fastener “16A”	100074410	EM192
462	Fastener “16-25A”	100074389	EKK39
463	Silicon ring for Indoor models	100074250	EKN50

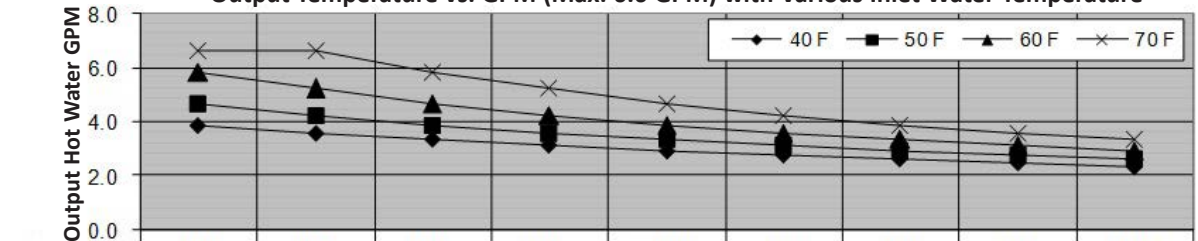
Item #	Description	Part #	
		110U, 310U and 510U models	AT-KJr3U-IN/OS, AT-K5U-IN/OS and AT-D3U-IN/OS
701	Computer board for 110U model	100270582	EK611
	for 310U model	100270583	EK612
	for 510U model	100270584	EK613
702	Remote fixing plate for 510U	100074644	EK152
703	Surge box	100076100	EK280
704	120 VAC wire for Indoor models	100074601	EK146
	for Outdoor models	100074323	EKK3C
705	Switch wire	N/A	EK614
706	120 VAC Power ON-OFF switch	N/A	EK590
707	Remote controller wire for 110U and 310U	100074649	EK189
	for 510U	100074650	EK165
708	Gas valve wire	N/A	EK585
709	Flame rod wire	N/A	EK586
710	Cable strap	N/A	EW022
711	Igniter assembly	100074640	EK153
712	Computer board cover	100074458	EM329
713	24V cables for 510U	N/A	EK587
714	Proportional gas valve wire	100074642	EK112
715	Rubber grommet for Indoor models	100074655	EK184
716	Surge box cover	N/A	EK615
721	Temperature controller	100074660	EK173
722	Controller fixing plate	N/A	EK588
N/A	Communication cable for linking	100076516	EKK0J

OUTPUT TEMPERATURE CHART

Chart is based on properly sized gas line

110U

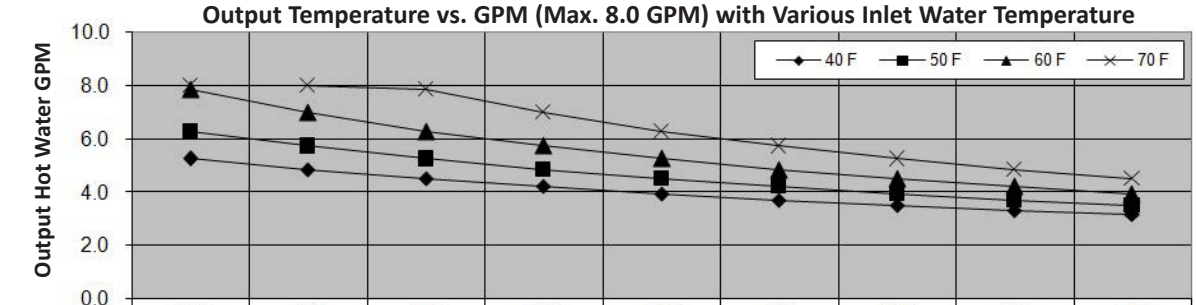
Output Temperature vs. GPM (Max. 6.6 GPM) with Various Inlet Water Temperature



Incoming Temp. (°F) \ Set Temp. (°F)	100	105	110	115	120	125	130	135	140
40 F	3.9	3.6	3.3	3.1	2.9	2.7	2.6	2.4	2.3
50 F	4.6	4.2	3.9	3.6	3.3	3.1	2.9	2.7	2.6
60 F	5.8	5.2	4.6	4.2	3.9	3.6	3.3	3.1	2.9
70 F	6.6	6.6	5.8	5.2	4.6	4.2	3.9	3.6	3.3

310U

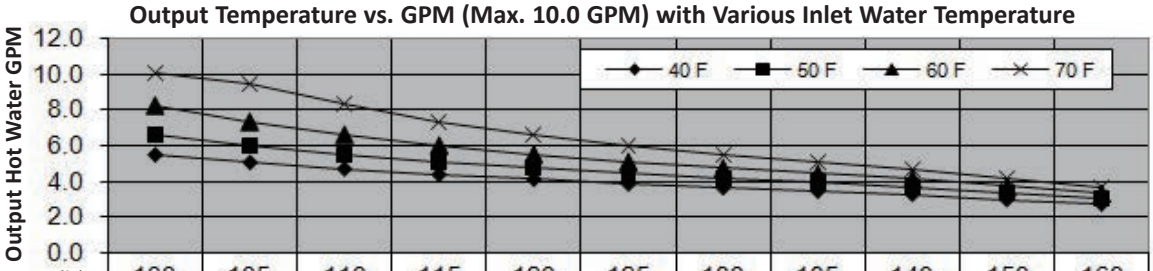
Output Temperature vs. GPM (Max. 8.0 GPM) with Various Inlet Water Temperature



Incoming Temp. (°F) \ Set Temp. (°F)	100	105	110	115	120	125	130	135	140
40 F	5.2	4.8	4.5	4.2	3.9	3.7	3.5	3.3	3.1
50 F	6.3	5.7	5.2	4.8	4.5	4.2	3.9	3.7	3.5
60 F	7.9	7.0	6.3	5.7	5.2	4.8	4.5	4.2	3.9
70 F	8.0	8.0	7.9	7.0	6.3	5.7	5.2	4.8	4.5

510U

Output Temperature vs. GPM (Max. 10.0 GPM) with Various Inlet Water Temperature



Incoming Temp. (°F) \ Set Temp. (°F)	100	105	110	115	120	125	130	135	140	150	160
40 F	5.5	5.1	4.7	4.4	4.1	3.9	3.7	3.5	3.3	3.0	2.7
50 F	6.6	6.0	5.5	5.1	4.7	4.4	4.1	3.9	3.7	3.3	3.0
60 F	8.2	7.3	6.6	6.0	5.5	5.1	4.7	4.4	4.1	3.7	3.3
70 F	10.0	9.4	8.2	7.3	6.6	6.0	5.5	5.1	4.7	4.1	3.7

*When the set temperature is 130 °F (55 °C) or higher, maximum flow rate is limited to 8.0 GPM.