

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



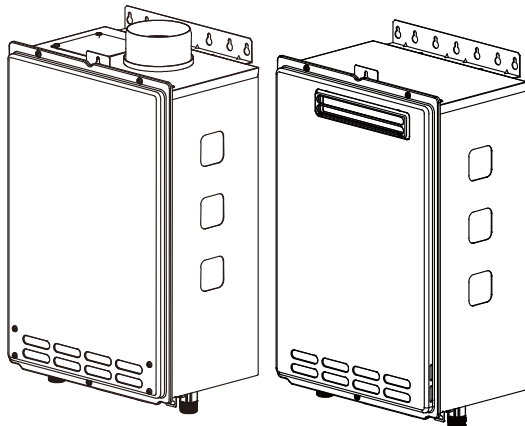
ANSI Z21.10.3 • CSA 4.3



510
model only

Models

- 110 Indoor
- 310 Indoor
- 510 Indoor
- 110 Outdoor (USA Only)
- 310 Outdoor (USA Only)
- 510 Outdoor (USA Only)



Gas Tankless Water Heater™

Suitable for combination potable water heating and space heating. Please refer to local codes for space-heating compliance.

FEATURING

- ENDLESS HOT WATER
- ON-DEMAND USAGE
- COMPACT, SPACE SAVING
- ENERGY CONSERVATION
- COMPUTERIZED SAFETY
- NO PILOT LIGHT
- EASY-LINK SYSTEM
- 510 model only
- Complies with natural gas Low NOx emissions of 40 ng/J or 55 ppm.



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

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

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

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

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

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

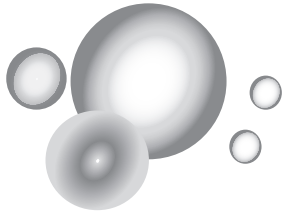
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Installation Manual

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			110 Indoor	110 Outdoor	310 Indoor	310 Outdoor	510 Indoor	510 Outdoor		
Natural Gas Input (Operating Range)		BTU/h	Min.: 19,500 Max.: 140,000		Min.: 11,000 Max.: 190,000		Min.: 11,000 Max.: 199,000			
Propane Gas Input (Operating Range)		BTU/h	Min.: 19,500 Max.: 140,000		Min.: 11,000 Max.: 190,000		Min.: 11,000 Max.: 199,000			
Gas Connection			3/4" NPT							
Water Connections			3/4" NPT							
Water Pressure*		psi (Mpa)	15 - 150* (0.1 - 1.0)							
Natural gas Inlet Pressure		" W.C. (kPa)	Min. 4.0 (1.00) Max. 10.5 (2.61)							
Propane gas Inlet Pressure		" W.C. (kPa)	Min. 8.0 (1.99) Max. 14.0 (3.48)							
Weight		lbs. (kg)	33 (15.0)		38 (17.2)		39 (17.7)			
Dimensions		inch	H 20.5 x W 13.8 x D 6.7		H 20.5 x W 13.8 x D 8.5					
		mm	520 (H) x 351 (W) x 170 (D)		520 (H) x 351 (W) x 216 (D)					
Ignition			Electric Ignition							
Electric	Supply		VAC / Hz		120 / 60					
	Consumption	Operation	W / A		73.1 / 0.61		87.6 / 0.73		89.8 / 0.75	
		Standby	W / A		6.2 / 0.05		6.2 / 0.05		6.2 / 0.05	
		Freeze-Protection	W / A		111 / 0.93		111 / 0.93		111 / 0.93	
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.

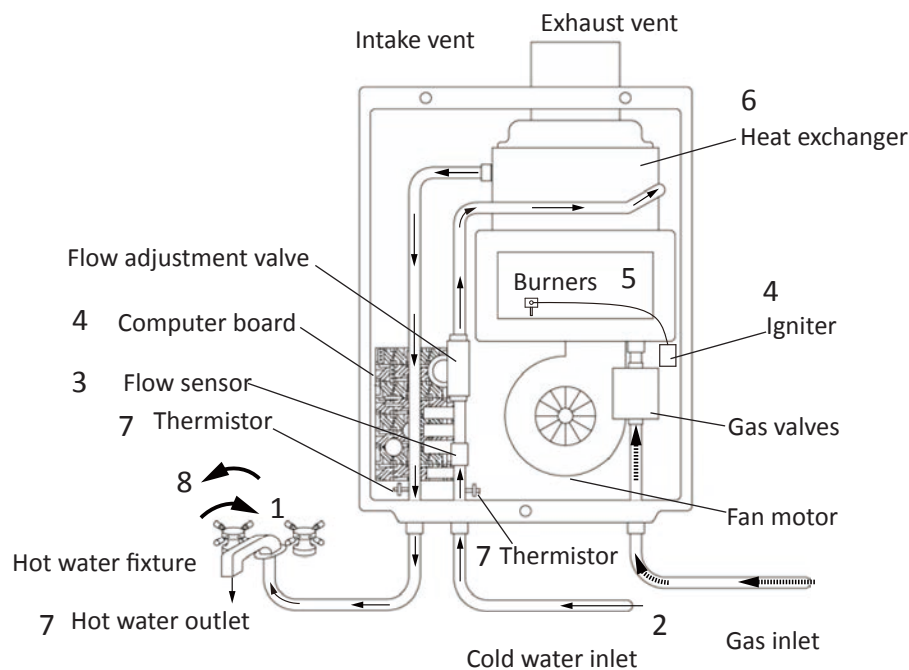
Category IV - a water heater that operates with a positive vent static pressure and with a vent gas temperature that may cause excessive condensate production in the vent.

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/front panel 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 equipment is an on-demand, tankless water heater designed to efficiently supply endless hot water for your needs.
- The 110 Indoor, 310 Indoor, and 510 Indoor models are only to be installed indoors (direct-vent convertible). The 110 Outdoor, 310 Outdoor, and 510 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



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



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



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

NOTICE

Indicates information considered important but not hazard related.

GENERAL

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



- Water temperatures over 125 °F (52 °C) can cause severe burns instantly or death from scalding. The water temperature is set at 122 °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. 25 when installing your water heater.
- Do not use this appliance if any part has been in contact with or been immersed in water. Immediately call a qualified installer or service agency to replace a flooded water heater. Do not attempt to repair the unit. It must be replaced.
- 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. Refer to "Freeze Protection System" on p. 42 for more information.
- Failure to observe these warnings could result in severe 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, 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. Make sure the vent termination meets the required distance from any doorway or opening to prevent exhaust from entering a building. (Refer to pp. 21 and 22.) Check local code requirements to prior to installation.
8. Carefully plan the installation location of the heater and vent terminations. Contaminants such as aerosols, lint, and fine powders (including flour) can clog the air intake and reduce the operation of the fan. This, in turn, can cause improper combustion and reduce the life of the water heater. Regularly ensure that the area around the water heater, vent termination, and air intake is free of dust, debris, and other contaminants. In environments with a high level of contaminants (laundry facilities, hair salons, pet salons, chemical plants, commercial kitchens, etc.), direct venting is required.
9. If you will be installing the water heater in a contaminated area with a high level of dust, sand, flour, aerosols or other contaminants/chemicals, they can become airborne and enter and build up within the fan and burner causing damage to the water heater.
10. 110 Indoor, 310 Indoor, and 510 Indoor models:
 - These units may be converted to a direct-vent (sealed combustion) appliance by installing a direct-vent conversion kit 100112184 (TK-TV10), which will bring in all required combustible air from outside the building. When installing the direct-vent conversion kit, please follow all instructions included with the kit.
 - 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. Air supply pipe can be made of ABS, PVC (solid core), CPVC (solid core), Polypropylene, corrugated stainless steel, or Category III / IV stainless steel.
 - Use of cellular core PVC (ASTM F891), cellular core CPVC, or Radel® (polyphenylsulfone) in non-metallic venting systems is prohibited. Covering non-metallic vent pipe and fittings with thermal insulation is prohibited.
 - 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.
11. 110 Outdoor, 310 Outdoor, and 510 Outdoor models are only to be installed outdoors and only in areas with mild, temperate climates.



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.
- Do not install the unit where water, debris, or flammable vapors may get into the flue terminal or the air intake line.
- **The manufacturer does not recommend 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. Failure to do so could lead to carbon monoxide poisoning or death.
 - Keep the area around the water heater clean. When dust collects on the flame sensor, the water heater will shut down on an error code.
 - If the above conditions cannot be met, use the direct-vent conversion kit Part No. 100112184 (TK-TV10).
 - 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 water heater must be securely mounted to a wall or other suitable structure.**
- **Failure to observe these warnings could result in severe personal injury, death, and/or property damage.**

NOTICE

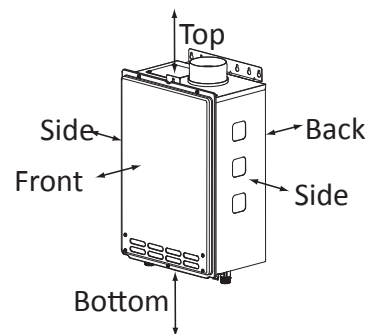
- **The warranty will not cover damage caused by water quality.**
 - Only potable water can be used with this water heater. Do not introduce pool or spa water, or any chemically treated water into the water heater.
 - Water hardness levels must not exceed 7 grains per gallon (120 ppm) for single family domestic applications or more than 4 grains per gallon (70 ppm) for all other types of applications. Water hardness leads to scale formation and may affect/damage the water heater. Hard water scaling must be avoided or controlled by proper water treatment.
 - Water pH levels must be between 6.5 and 8.5.
 - Well water must be treated.
- **The manufacturer recommends direct venting using the direct-vent kit 100112184 (TK-TV-10) 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
110 Indoor 310 Indoor 510 Indoor	12 in. (305 mm)	12 in. (305 mm)	4 in.* (102 mm)	1 in. (25 mm)	3 in. (76 mm)
110 Outdoor 310 Outdoor 510 Outdoor	36 in. (914 mm)	12 in. (305 mm)	24 in. (610 mm)	1 in. (25 mm)	3 in. (76 mm)

*24 inches (610 mm) recommended for maintenance

INCLUDED ACCESSORIES

Check that these items below are included with the water heater.

1. Installation manual and Owner's guide	2. Temperature remote controller	3. Communication cable 510 model only
 Qty: 1	 or  Qty: 1 100112183 (TK-RE02) 100112155 (TM-RE30)	 100076516 Qty: 1

Model	110 Indoor	110 Outdoor	310 Indoor	310 Outdoor	510 Indoor	510 Outdoor
100112183 (TK-RE02)	✓	✓	✓	✓		
100112155 (TM-RE30)					✓	✓

OPTIONAL ITEMS

No.	Model	110 Indoor	110 Outdoor	310 Indoor	310 Outdoor	510 Indoor	510 Outdoor
1	100112416 (4" Backflow preventer and F-F adaptor)	✓		✓		✓	
2	100112184 (Direct-vent conversion kit)	✓		✓		✓	
3	100112187 (Pipe cover)			✓	✓	✓	✓
	100112188 (Pipe cover)	✓	✓				
4	100266729 (Recess box)		✓		✓		✓
	100266730 (Recess box)		✓		✓		✓
5	100112424/100112425 (Termination & Wall thimble kit)	✓		✓		✓	
6	100112550/100112551 (Direct-vent concentric Termination)	✓		✓		✓	

1. 4" Backflow preventer and F-F adaptor: 100112416

There are two functions available for this adaptor, which can be connected with the water heater and NovaVent venting line and 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.



2. Direct-vent conversion kit: 100112184 (TK-TV10)

This kit can be used to convert the water heater from a single vent system to a direct-vent (double vent) (or sealed combustion) system with a 3 in. (76 mm) intake. Install this conversion kit in accordance with the installation instructions and any applicable codes.



3. Pipe cover: 100112187 (TK-PC01) 100112188 (TK-PCJr2)

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



4. Recess box: 100266729 (No flange/retrofit application) 100266730 (With flange/new construction application)

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 retrofit applications - no flange



100266730

Outdoor recess box for new construction applications - with flange

5. Sidewall vent terminator (Hood) and Wall thimble kit: 100112424/100112425



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

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

6. Direct-vent concentric termination:



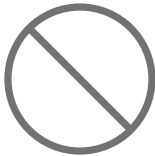
Used when terminating direct-vent (sealed combustion) systems, with indoor models that require a 3 in. (76 mm) intake and a 4 in. (102 mm) exhaust. This concentric termination provides the convenience of only having to make one penetration through a sidewall instead of two separate penetrations for the intake and exhaust piping. The termination includes a bird screen, restricting small animals, pests, and foreign objects from entering into the vent system. 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.)

Covering wall thicknesses	Part#
5.0 – 10.0 in. (127 - 254 mm)	100112550
12.0 – 18.0 in. (305 - 457 mm)	100112551

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.



Prohibited



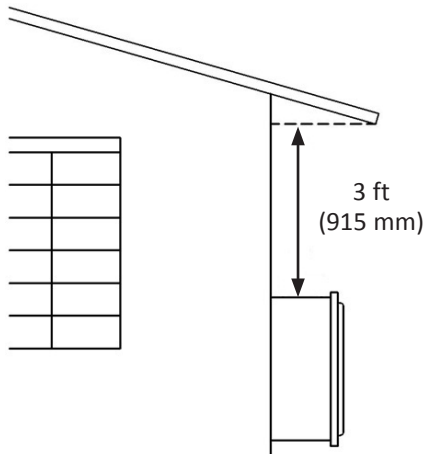
Do not have the vent terminal pointing toward any opening into a building. Do not locate your heater in a pit or location where gas and water can accumulate.



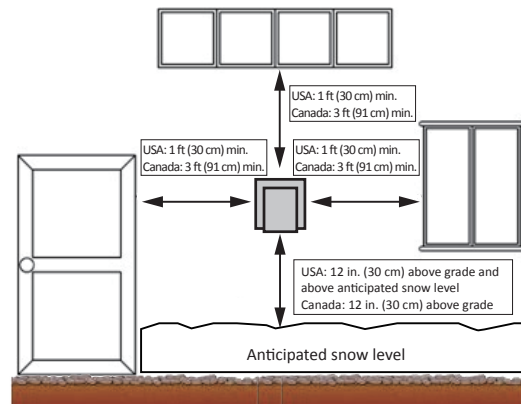
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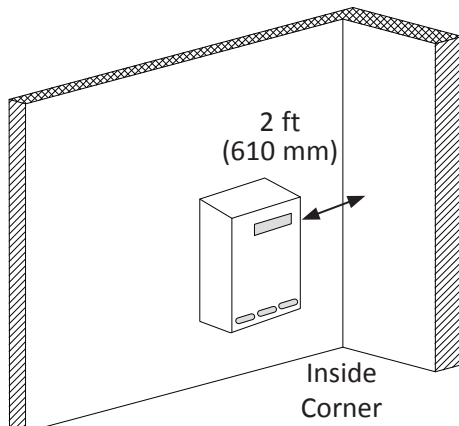
Do not install this water heater under an overhang less than 3 ft (915 mm) from its top or eaves. The area under an overhang must be open to three sides. (Outdoor models only)



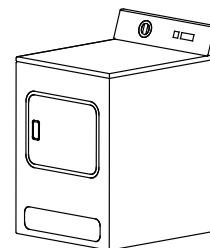
Ensure that you meet the minimum clearances shown below for a direct vent termination:



Water heater vent terminator must be at least 2 ft (610 mm) away from an inside corner for both outdoor installation and 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.



HIGH-ALTITUDE INSTALLATIONS

Check the altitude where your water heater is installed. Set DIP switches shown in the table below. The DIP switch settings depend on the altitude.



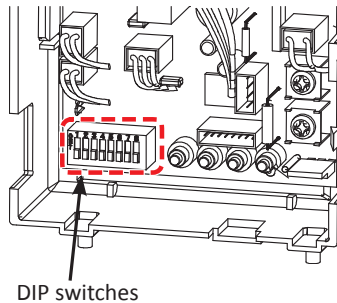
WARNING

- 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.

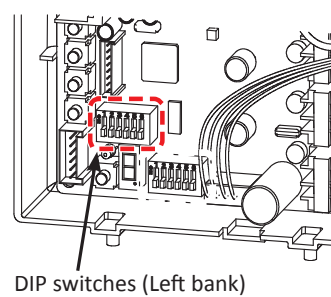
Installation altitude

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

110 and 310 models Computer board



510 model Computer board



110 and 310 models

Altitude	0 to 2,000 ft (0 to 610 m) DEFAULT	2,000 to 4,000 ft (611 to 1,219 m)	4,000 to 6,000 ft (1,220 to 1,829 m)
Switch No. 3	OFF	ON	OFF
Switch No. 4	OFF	OFF	ON

510 model (Left bank of DIP switches)

Altitude	0 to 2,000 ft (0 to 610 m) DEFAULT	2,000 to 4,000 ft (611 to 1,219 m)	4,000 to 6,000 ft (1,220 to 1,829 m)
Switch No. 4	OFF	ON	OFF
Switch No. 5	OFF	OFF	ON

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

VENTING INSTRUCTIONS

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 in the United States and/or Section 8 of the current B149.1 Natural Gas, propane installation code in Canada, as well as applicable local building codes.

The manufacturer recommends NovaVENT™ or Z-Vent® category III, single wall, stainless steel venting. See "Approved Category III, Single Wall, Stainless Steel Venting Suppliers and Part Numbers" on p. 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 using the direct vent conversion kit **100112184(TK-TV10)**.

- 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 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.
- The maximum length of intake air piping must not exceed 50 ft (15.2 m). Deduct 5 ft (1.5 m) for each 90° elbow or 2.5 ft (0.76 m) for each 45° elbow used in the venting system. Two 45° elbows when connected together are equivalent to one 90° elbow. Refer to the tables on p. 19.
- When the horizontal air intake exceeds more than 5 ft (1.5 m), support the pipe every 3 ft (0.9 m) 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:

- Indoor models can obtain its combustion air from the space through an inner intake vent.

General rules for venting water heaters:

- 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 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 the 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.

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 line, 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.
- Regarding the clearances from the exhaust termination to the air inlet or opening, refer to pp. 21 to 23.

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-

NOTICE

- The guidelines in this section apply to installations within the United States. All U.S. installations must conform to the National Fuel Gas Code, ANSI Z223.1/NFPA 54 (current edition) and local codes.
- Canadian requirements differ from the guidelines in this section. In Canada, follow the requirements of B149.1 (Natural Gas and Propane Installation Code, current edition) as well as local and provincial codes. Contact your local code enforcement agency for direction.



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.

Check for Chemicals:

Air for combustion and ventilation must be clean and free of corrosive chemicals. If corrosive chemicals, such as sulfur, fluorine, or chlorine are present, the water heater must be direct vented. Failure due to these corrosive chemicals is not covered by the warranty.

WARNING!

In all cases, ensure that corrosive chemicals are not present at the air intake. Presence of such chemicals at the air intake could result in death, personal injury, or property damage. 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.

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 water heater.

The following instructions will help determine if it may be possible to install the water heater without outside ventilation.

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	199,000
Furnace	75,000
Dryer	20,000
Total	294,000

Your appliances:

Gas Burning Appliance	BTU/h Rating
Gas Water Heater	
Total	

Calculate the air volume of the room

Air requirements depend on the size of the room.

$$\text{Room Volume (ft}^3\text{)} = \text{Floor Area (ft}^2\text{)} \times \text{Ceiling Height (ft)}$$

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.

$$\text{Air Volume} = \text{Room Volume} - \text{Object Volume}$$

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 ft³ (1.42 m³) per 1,000 BTU/h of the total input for all gas burning appliances in the same area.

$$\text{Required Air Volume (ft}^3\text{)} = \text{Total Appliance Energy Rating (btu/h)} \times 50 \text{ ft}^3 / 1000 \text{ (btu/h)}$$

Example:

$$(294,000 / 1000) \times 50 = 14,700 \text{ ft}^3$$

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 in (305 mm) from the floor and the second opening must be within 12 in (305 mm) 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. The various options are listed below. See also the illustrations on the next page.

1. Direct to outdoors
2. Vertical ducts
3. Horizontal ducts
4. Single opening (not recommended; must be at least 100 in² (6.5 cm²) . Not appropriate for confined spaces smaller than 50 ft³ (1.42 m³) 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 in² (645 cm²) of free area would need 134 in² (865 cm²) openings if using metal louvers rated at 75% free area (100 in² ÷ 0.75 = 134 in²).

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 in² (645 cm²).
- 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 3 in (76 mm).
- 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 in ² (6.5 cm ²) per 4,000 BTU/hr (see Figure 1, 2)
Vertical ducts	1 in ² (6.5 cm ²) per 4,000 BTU/hr (see Figure 3)
Horizontal ducts	1 in ² (6.5 cm ²) per 2,000 BTU/hr (see Figure 4)
Single Opening	1 in ² (6.5 cm ²) per 3,000 BTU/hr (see Figure 5)
Two permanent openings to another room**	1 in ² (6.5 cm ²) per 1,000 Btu/hr (see Figure 6) Opening: 100 in ² (645 cm ²) Min Minimum dimension of air openings: no less than 3 in (76 mm)
*These openings connect directly with the outdoors through a ventilated attic, a ventilated crawl space, or through an outside wall. **United States: 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. In Canada, contact your local code enforcement agency for direction.	

See graphics on next page.

Combustion air supply options

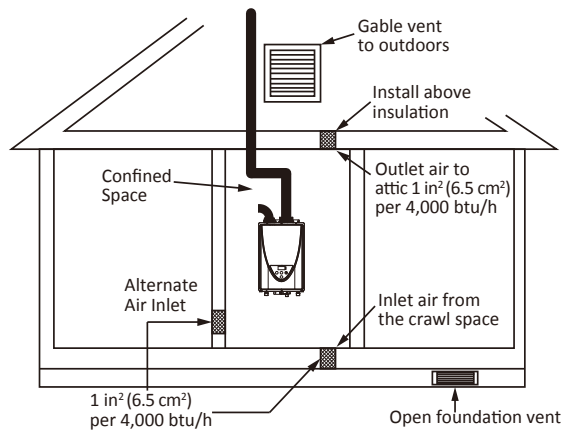


Figure 1 - Direct to outdoors openings

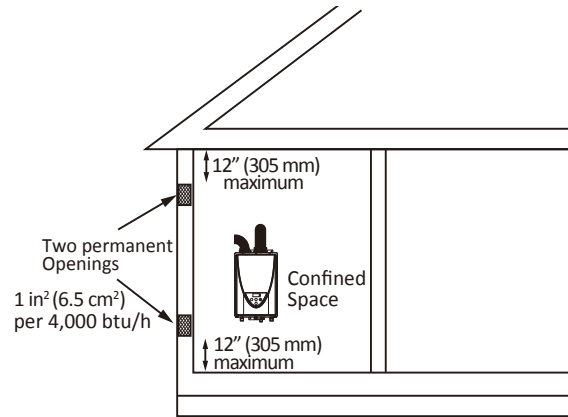


Figure 2 - Direct to outdoors openings
Two permanent openings

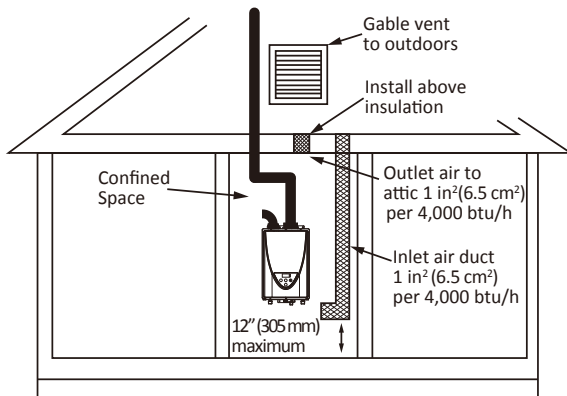


Figure 3 - Vertical duct openings

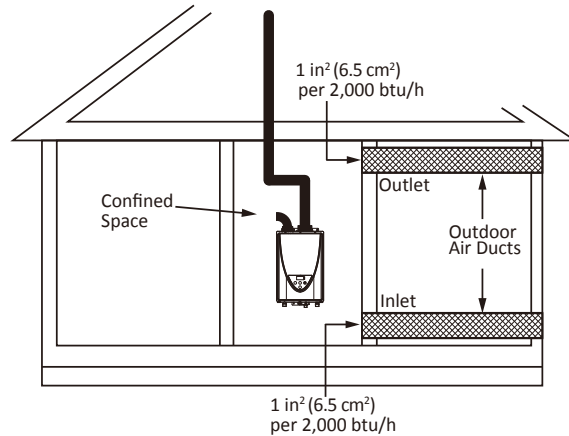


Figure 4 - Horizontal duct openings

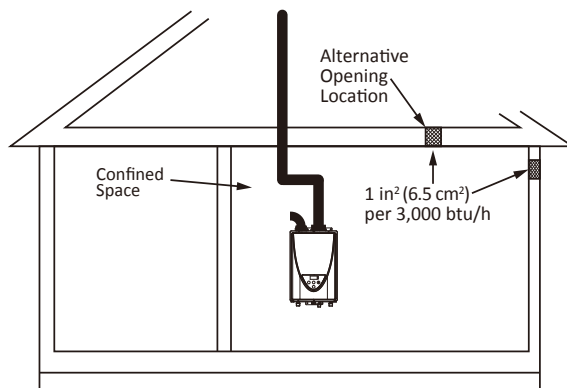


Figure 5 - Single opening

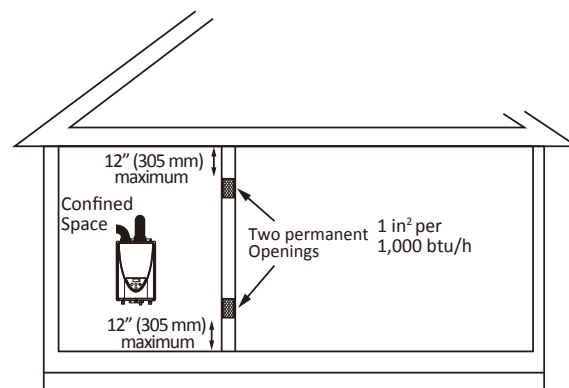


Figure 6 - Two permanent openings

-Exhaust venting-

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.
- When the vent run exceeds 5 ft (1.5 m), a condensate drain is recommended. It should be installed as close to the heater as possible.
- The maximum length of exhaust vent piping must not exceed 50 ft (15.2 m) (deducting 5 ft (1.5 m) for each elbow used in the venting system). Do not use more than 5 elbows.

Diameter	Max. No. of Elbows	Max. Vertical and Horizontal (Total) Vent Length
4 in. (102 mm)	5	50 ft (15.2 m)

Each elbow added, deduct 5 ft. (1.5m) from max. vent length.

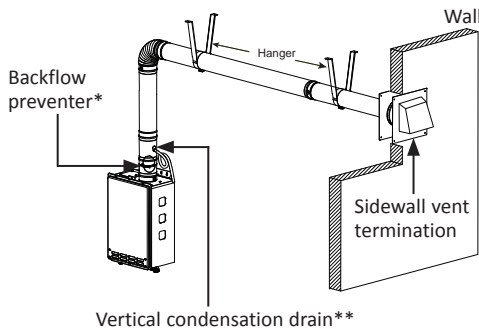
No. of Elbows	Max. Vertical or Horizontal Vent Length
0	50 ft (15.2 m)
1	45 ft (13.7 m)
2	40 ft (12.2 m)
3	35 ft (10.7 m)
4	30 ft (9.1 m)
5	25 ft (7.6 m)

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

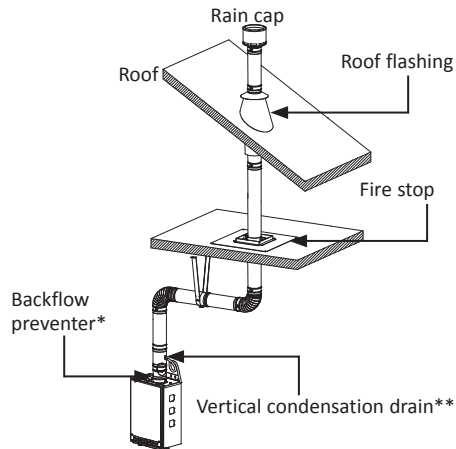
-Venting illustrations- 110 Indoor, 310 Indoor, and 510 Indoor models

For details of the optional items, refer to the Installation manual for each Optional item.

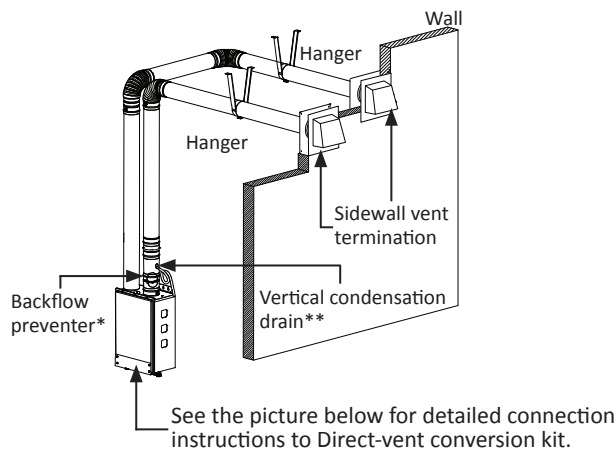
Horizontal Installation



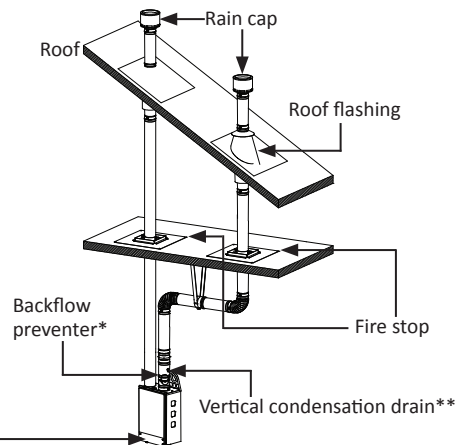
Vertical Installation



Horizontal Installation (With direct-venting)



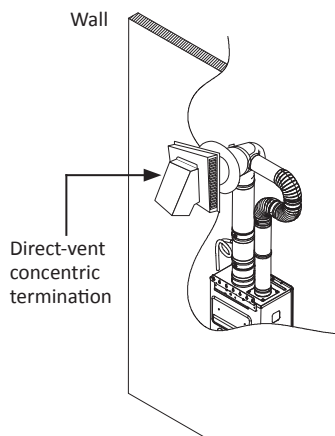
Vertical Installation (With direct-venting)



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

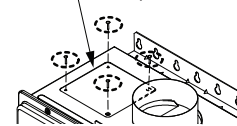
**Vertical condensation drain must be installed in accordance with local codes.

Horizontal Installation with Direct-vent concentric termination

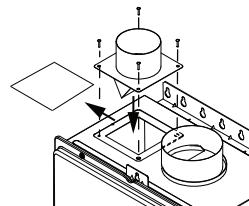


Installation of Direct-vent conversion kit 100112184(TK-TV10) with a water heater

Air intake cover plate

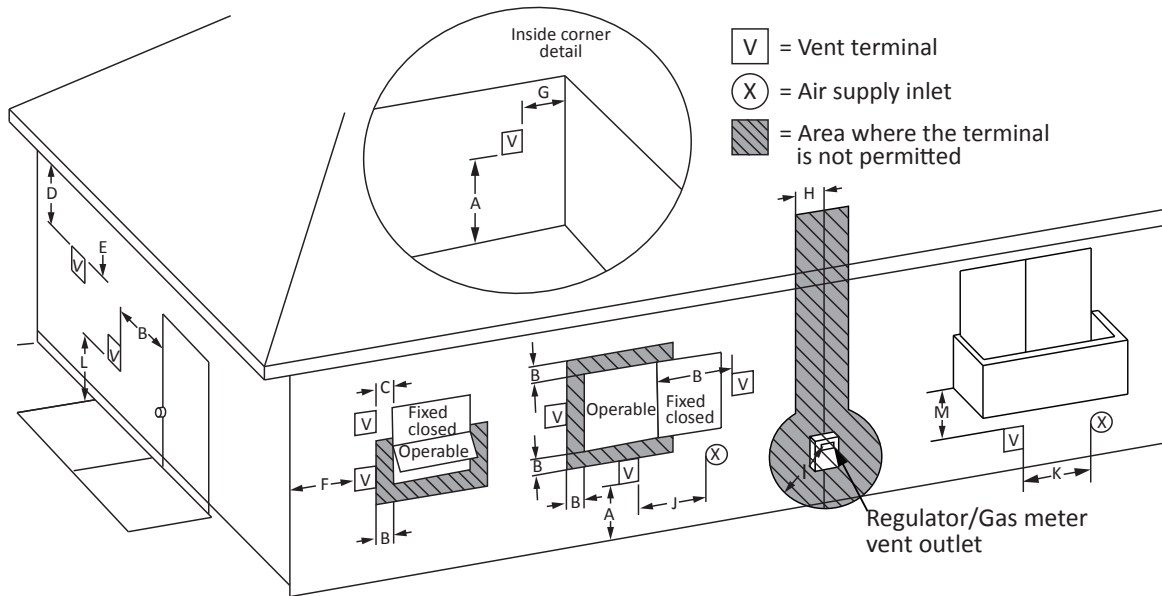


Remove the air intake cover plate to attach the air intake port from the Direct-vent conversion kit into there.



Cover the louver of the water heater with the plate provided in the Direct-vent conversion kit to complete the conversion to sealed combustion.

-Vent termination clearances-



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

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

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

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

Notes:

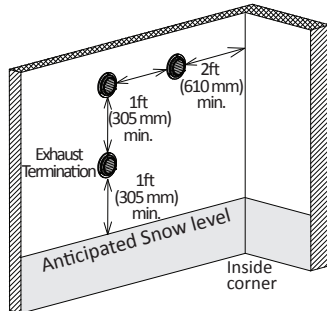
1) In accordance with the current CSA B149.1, Natural Gas and Propane Installation Code

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

-Clearances for sidewall terminations-

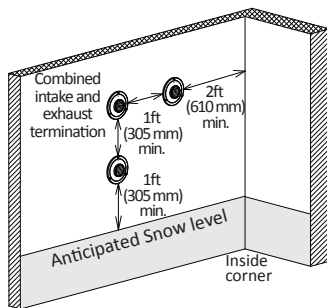


Improper installation can result in carbon monoxide poisoning or death. Follow all local and national codes in regards to proper termination clearances. In the absence of such codes, the clearances below must be met. Local codes supersede these clearances. Failure to observe this warning may result in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



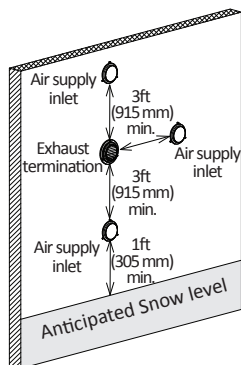
Multiple Sidewall Terminations

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

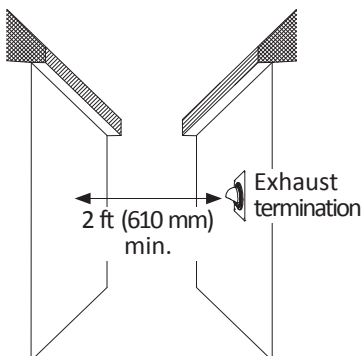


Multiple DV Sidewall Terminations

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.)



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



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

-Clearances for rooftop terminations-



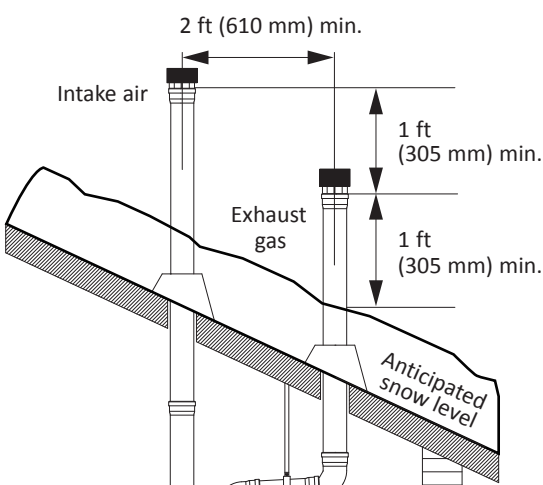
WARNING

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

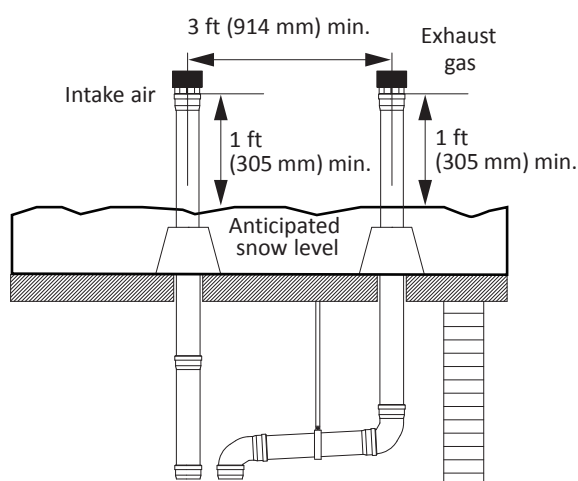
NOTICE

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

Angled roof termination

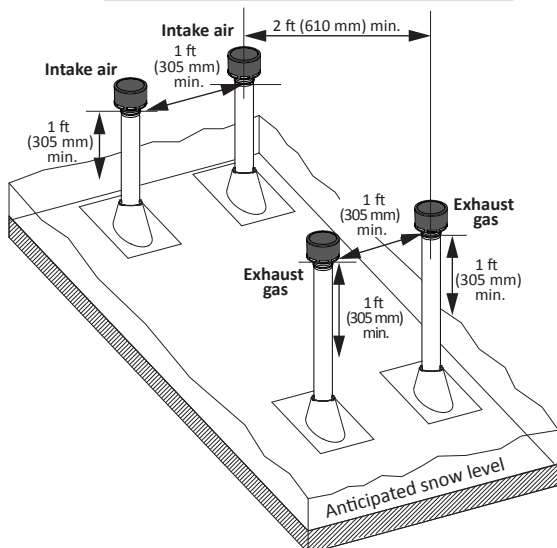


Flat roof termination

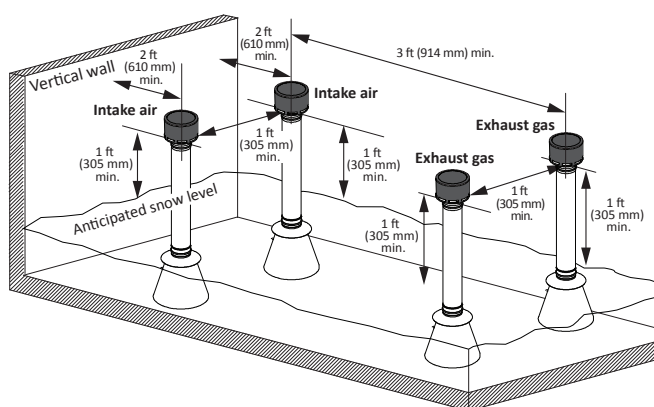


- In lieu of using roof caps, a 90 degree elbow and 45 degree elbow can be used for the exhaust, and two 90 degree elbows can be used for the air intake.

Multiple angled roof terminations



Multiple flat roof terminations



WARNING

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

GAS SUPPLY AND GAS PIPE SIZING

-General-



WARNING

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

- The 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 in standby.
- Inlet gas pressure must not exceed the above maximum values; gas pressure above the specified range will cause dangerous operating conditions and damage to the unit.
- Until testing of the main gas line supply pressure is completed, ensure the gas line to the water heater is disconnected to avoid any damage to the water heater.
- If the gas supply pressure to the heater is greater than the specified maximum, a field-supplied regulator is required. The regulator must lower the gas pressure within the approved range.
 - Install the gas regulator according to the manufacturer's instructions.
 - The regulator must be sized for the water heater input and provide the specified pressures that are listed on the rating plate.
 - In the absence of minimum install distance, it is recommended that 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 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 of Cubic Feet of Gas per Hour of IPS Pipe carrying Natural Gas with 0.60 Specific Gravity Based on 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 110, 190 Cubic ft/hr for 310, and 199 Cubic ft/hr for the 510 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

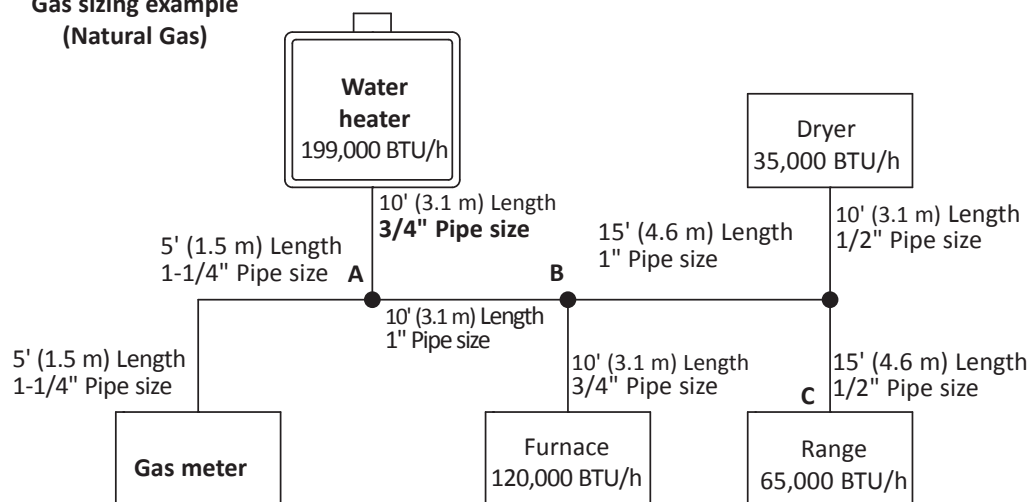
-Propane (LP) supply piping-

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/ft³ to get the appliance's ft³/h requirement.

Take into account the distance the appliance is from the gas meter, then look in the above gas chart to properly size the line.

For sections of the

gas line supplying gas to more than one appliance (Ex: Point A to Point B), add up the cubic ft per hour requirements of the appliances that are being supplied by that section, and size to the farthest appliance.

For Example: The section from A to B supplies gas to the furnace, range and dryer. Adding up the BTU/h requirements and dividing by 1,000 yields a cubic ft per hour requirement of 220 cubic ft of gas per hour. The farthest appliance is the range, which is 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

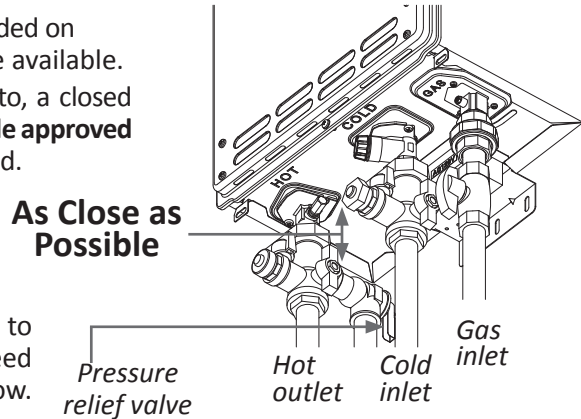
Do not use this appliance if any part has been under water. Immediately contact a qualified installer or service agency to replace a flooded water heater. Do not attempt to repair the unit! It must be replaced!

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 available.
3. If the water heater is installed within, or subjected to, a closed loop water system, a **thermal expansion tank or a code approved device to handle thermal expansion** must be installed.
4. Before installing the water heater, flush the water line to remove all debris, and after installation is complete, purge the air from the line. Failure to do so may cause damage to the water heater.
5. There is a wire mesh filter within the cold inlet to trap debris from entering your heater. This will need to be cleaned periodically to maintain optimum flow. (Refer to p. 56.)



-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 110C model, 190,000 BTU/h for the 310C model, and 199,000 BTU/h for the 510C 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 must 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

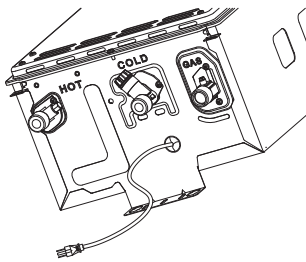


- Ensure that circuit power is turned OFF before you complete the following steps.
- Follow the electrical code requirements of the local authority having jurisdiction. In the absence of such requirements, follow the current edition of the National Electrical Code ANSI/NFPA 70 in the U.S. or the current 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 observe these warnings could result in personal injury or loss of life.

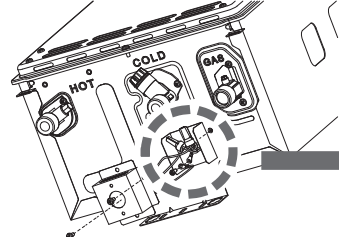
All indoor models come with a power plug instead of a junction box. The following procedure is for outdoor models only.

1. The water heater requires a **120 VAC, 60 Hz electrical power supply that is properly grounded**. Do not attach the ground wire to either the gas or the water piping.
 - 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.
2. A green screw is provided in the junction box to ground the connection.
3. Can be hardwired or wired to a plug-in.
4. The use of a surge protector is recommended in order to protect the unit from power surges.

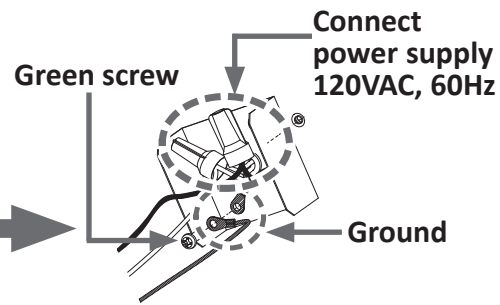
Indoor models only



Outdoor models only



Bottom view of water heater



View of electrical connections of water heater

TEMPERATURE REMOTE CONTROLLER -Installation-



- **This remote controller is NOT waterproof.**
- **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.

NOTICE

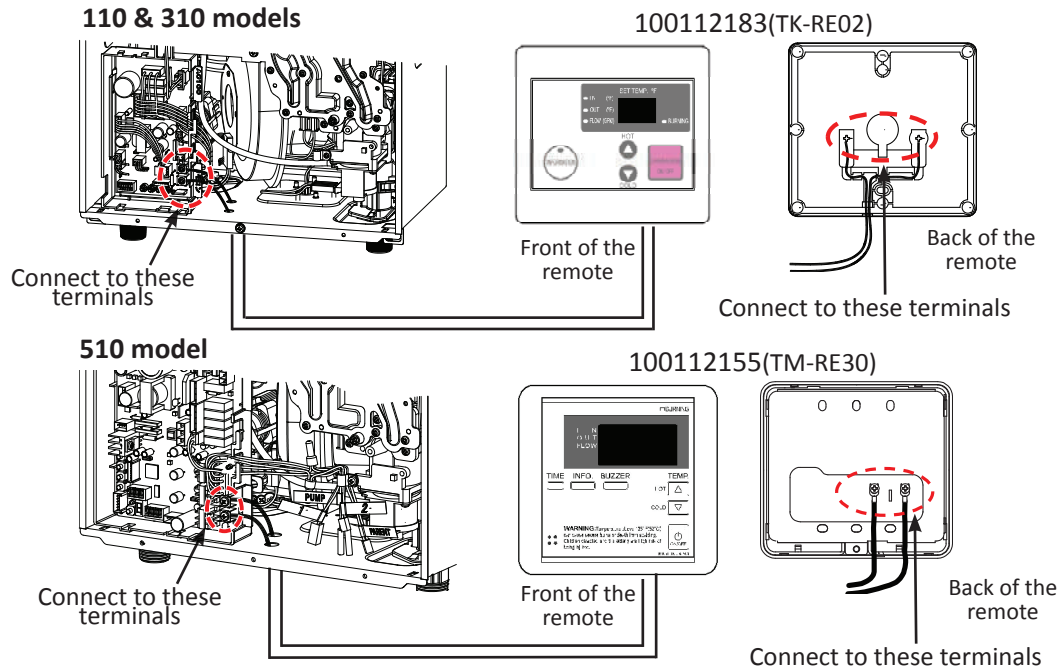
- Do not place the remote controller cable close to other wires from other products.
- Cables used for the remote controller connection must be:
 - Minimum 20 gauge wire (No polarity)
 - 100112183 (TK-RE02) 110 & 310 models: **Maximum 150 ft (46 m) long**
 - 100112155 (TM-RE30) for 510 model: **Maximum 400 ft (122 m) long**

<Mounting and wiring the remote controller>

For detailed connection to the remote controller, refer to the instructions that are packaged with the remote controller.

1. Disconnect power supply from the water heater.
2. Take off the water heater's front cover.
3. Choose a location where you can install the remote controller.
4. Cut the two-pair wire to the correct length.
5. Crimp on supplied fork connectors.

6. Locate the remote controller terminals, pictured below (located around the lower right-hand side of the computer board).
7. Open the plastic cover of the remote controller, then attach the two fork terminals to the connector base on the back of the remote controller. (See below.) Make sure that the terminals are secure.
8. Pull the remote's cables through the hole at the bottom of the water heater's casing.
9. Secure both controller cable terminals to the terminals on the computer board as shown below. (Secure them underneath the screw terminals. No polarity.)
- * **Do NOT jump or short-circuit the cables, or the computer board will be damaged.**
10. Replace the plastic computer board cover, then replace the front cover.



PUMP CONTROL CONNECTIONS

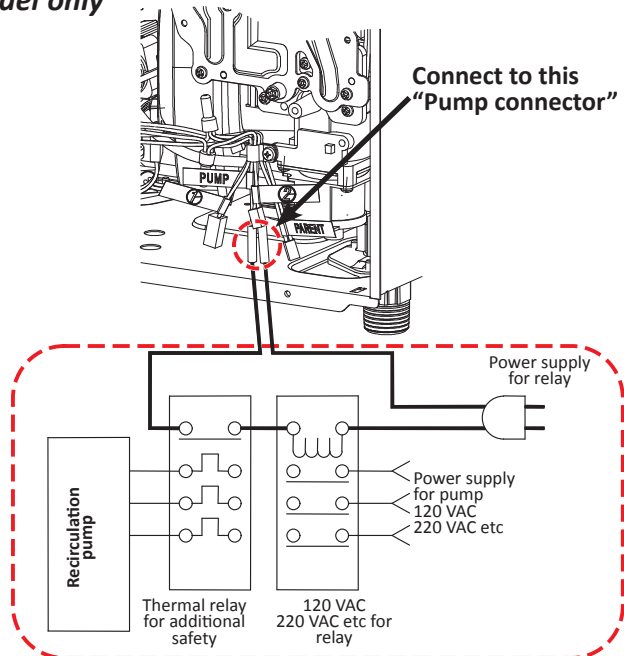
510 model only

The 510 model water heater can be used to control a recirculation pump. **Proper pump control helps to preserve the life of the system and saves energy.**

The water heater pump control port is a **normally-open dry contact**, and therefore needs additional components to properly control a recirculation pump, such as a relay. To control a recirculation pump, connect the pump to a relay, and connect the relay to the **Pump connector** in the water heater as shown in the right diagram. (In an Easy-Link System, connect the pump **ONLY** to the **PARENT** unit.) The pump must be connected using suitable relays as shown in the right diagram.

Please make sure that the relays are properly rated for the recirculation pump.

Using the water heater's internal thermistors as a temperature control, the recirculation pump will only turn on when recirculation is needed.



NOTICE

In an Easy-Link System, the pump must be connected to the Pump connector in the PARENT unit using a suitable relay. If the pump is connected to any of the CHILD units, the pump will not work.

EASY-LINK SYSTEM

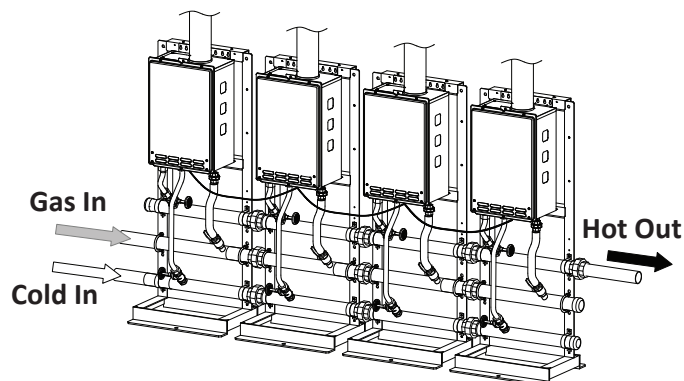
(510 model only)

-General-

The 510 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 510 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 11,000 BTU/h and 796,000 BTU/h.



Easy-Link connection with allowable heaters
T-K3
T-K3-Pro
510 model
510U model *
510U model * 200 series

*If the 510U model or 510U 200 series model is incorporated in an Easy-Link System with the other models in the table above, the DIP switch of all the 510U and the 510U 200 series computer boards must be changed. Please refer to the manual of 510U model or 510U (T-D3U) 200 series model on Easy-Link System for more detail.

NOTICE

- The Easy-Link System is limited to up to **4 units**. If you connect more than 4 units, only the first 4 units will work as a part of the Easy-Link System. The other additional units will not work.
- **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 are off.
2. Verify the DIP switch set temperatures of all units within the system. Every single water heater must be set to the same set temperature. If a remote controller is used, it should be installed to the **"PARENT"** unit. 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 to the right of the 7-seg. LED on the computer board of the unit that you select to be the **"PARENT"** unit. Change DIP switch No. 1 on the **right bank of DIP switches to the ON position**. See the computer board diagram as shown in 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 below (B).
9. Turn on power to the “PARENT” unit. The 7-seg LED will display “1”.
Turn on “CHILD-1”. When the 7-seg LED displays a number, turn on “CHILD-2”.
When the 7-seg LED displays a number, turn on “CHILD-3”.
Make sure the 7-seg LED of all the units' computer boards display the unit #. The numbering system automatically allocates the unit # to each water heater in the Easy-Link System, in accordance with the right table.

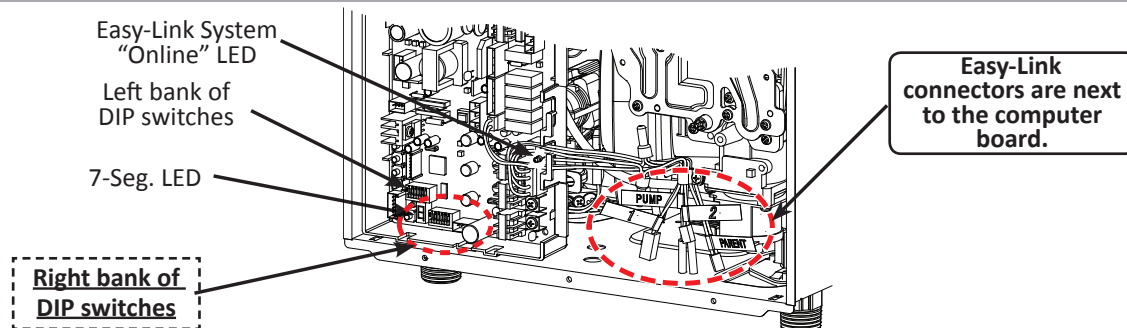
Type of unit	Unit # of easy-link
Parent	1
Child	2, 3 or 4

(A) 510 (T-D2) model Computer board

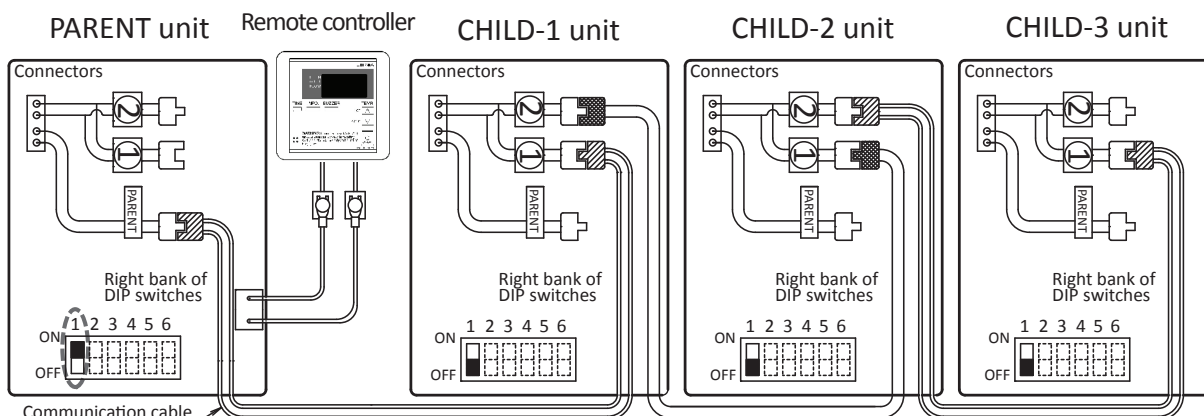


WARNING

- To change the DIP switch settings for the Easy-Link System, locate the right 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 black squares indicate the correct DIP switch positions.

NOTICE

Connecting two “PARENT” connectors together from two separate units **may damage the computer board**. The communication cable has a female end and a male end, so it's impossible to have a PARENT-to-PARENT connection with the communication cable. Do not splice or modify connectors.

APPLICATIONS

-Space-Heating Applications-



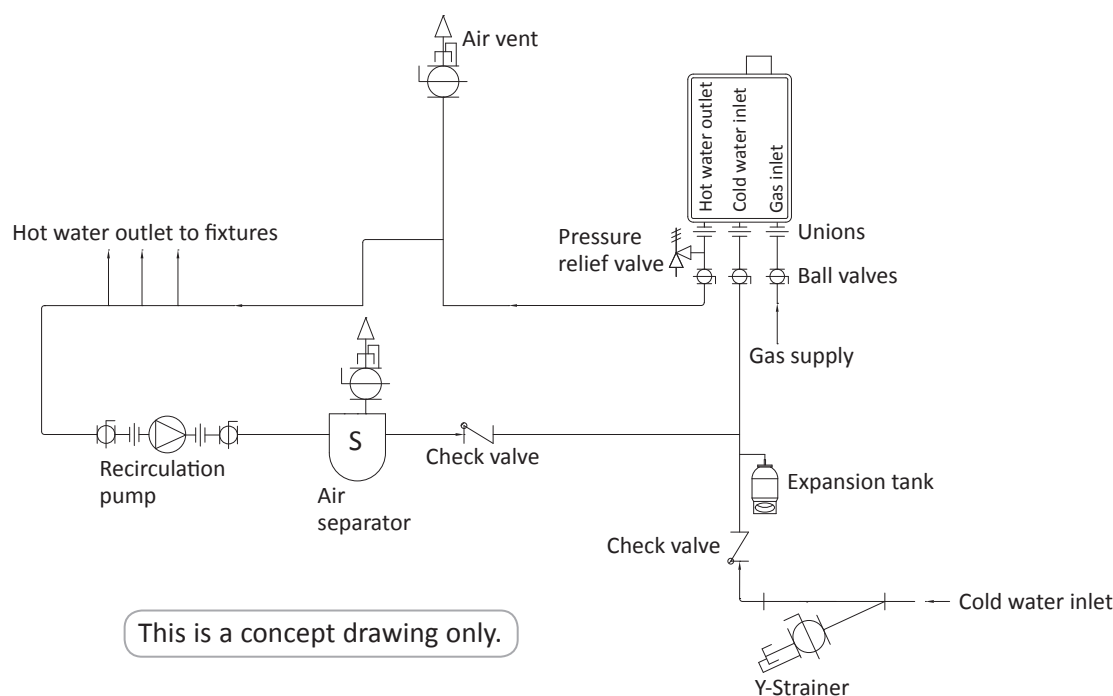
- This water heater is suitable for combination water (potable) heating and space heating and not suitable for space heating applications only.
- In order to purge air in water pipes within a closed-loop system, an air vent and air separator should be installed in the system. Required circulation flow 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 if the system incorporates an open-loop potable water system.
- The water heater can be used to supply 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) or -"Pump Control Connections" 510 model only. (Refer to p.28.)

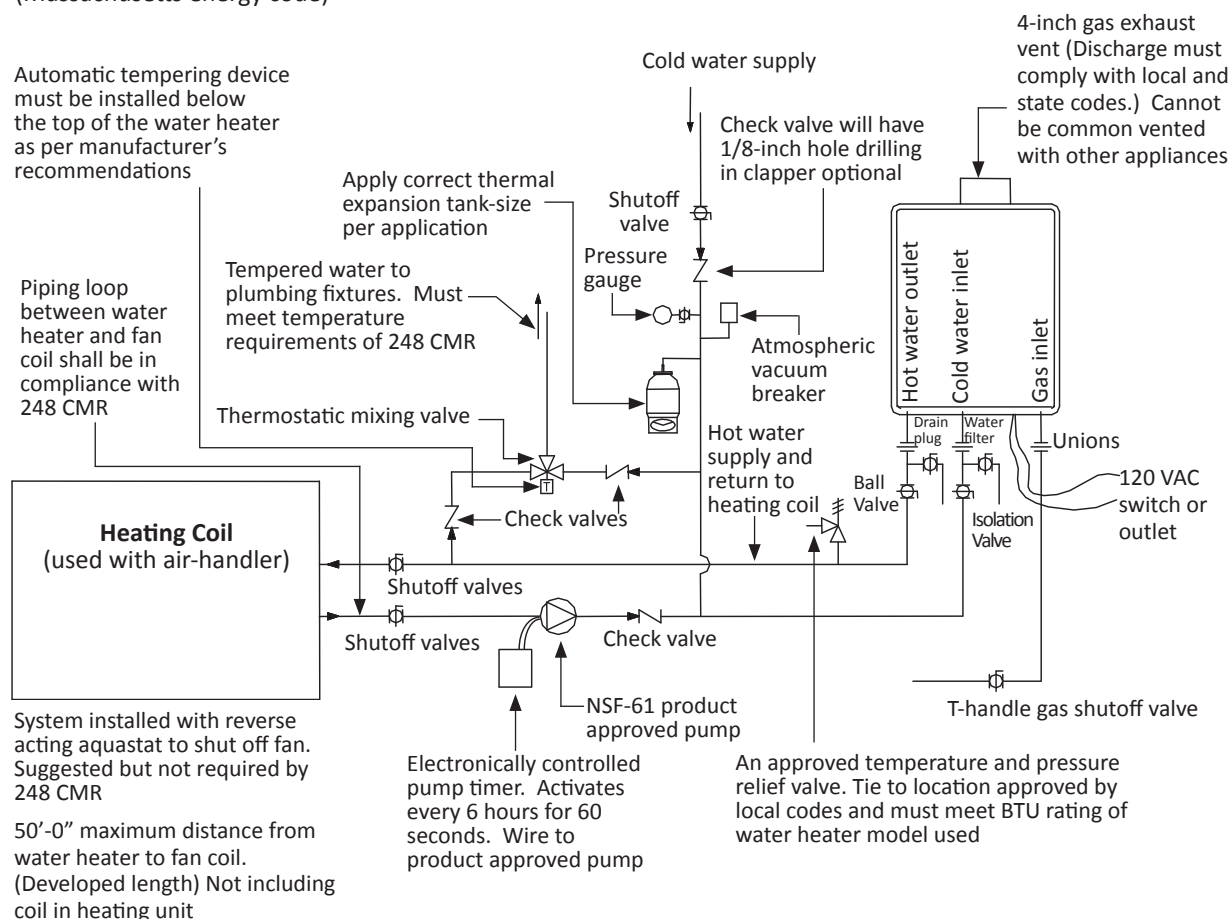
*The recirculation pump is to provide no less than 2 GPM and no more than 4 GPM through each activated unit in the system.



-Dual-purpose hot water heating- (Domestic and Space Heating):

Diagrammatic layout of radiant heating and domestic water heater.

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



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 most recent edition of the National Standard Code, ANSI Z21.10.3.
- This illustration is a concept design only. The reference to the 1/8th hole in check is only for 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.

INITIAL OPERATION

FOR YOUR SAFETY, READ BEFORE OPERATING

- **Check the GAS and WATER CONNECTIONS** for leaks before firing 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 towards the floor.
- **Check the GAS PRESSURE.** Refer to pp. 24 and 43.
- 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 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!

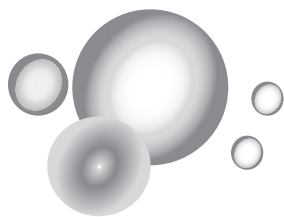


WARNING

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 filter of any debris. Refer to p. 43 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 fixture.	
4.	Open the manual gas control valve fully.	
5.	Turn on the 120 VAC, 60 Hz power supply to the water heater.	
6.	Now you are ready to enjoy hours of endless hot water.	



Owner's Guide

CONGRATULATIONS

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

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

OPERATING SAFETY

FOR YOUR SAFETY READ BEFORE OPERATING

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

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

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

WHAT TO DO IF YOU SMELL GAS

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

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

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

OPERATING INSTRUCTIONS

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

TO TURN OFF GAS TO APPLIANCE

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

⚠ DANGER



Vapors from flammable liquids will explode and catch fire causing death or severe burns.

Do not use or store flammable products such as gasoline, solvents or adhesives in the same room or area near the water heater.



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

FLAMMABLES

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

Keep flammable products:

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

Vapors:

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

⚠ DANGER

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



A pressure relief valve listed as complying with the standard for Relief Valve and Automatic Gas Shutoff Devices for Hot Water Supply System, ANSI Z21.22 • CSA 4.4, shall be installed at the time of installation of the water heater in the location specified by the manufacturer. Local codes shall govern the installation of relief devices for safety operation of the water heater. The relief valve must not be removed or plugged. No valve shall be placed between the relief valve and the water heater. The relief from the discharge of the pressure relief valve shall be disposed of in a suitable place where it will cause no damage. Also, there shall be no other reducing coupling or other restrictions installed on the discharge line to restrict flow. See Installation Manual heading "PRESSURE RELIEF VALVES" for installation and maintenance of relief valve discharge line and other safety precautions.

NORMAL OPERATION

GENERAL

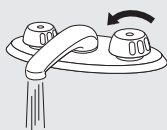


WARNING

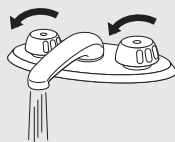
Temperatures above 125 °F (52 °C) can cause severe burns or death from scalding. Children, disabled and the elderly are at high risk of being injured.

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

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

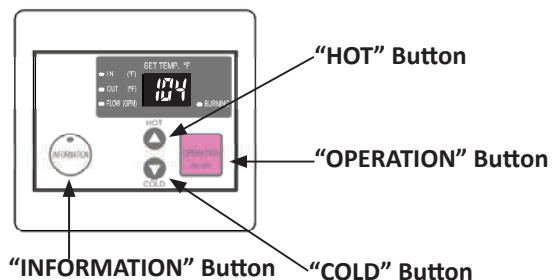
-With remote controller-

110 and 310 models: 100112183 (TK-RE02)

<Set temperature>

1. Turn on the 120 VAC power supply to the water heater.
2. Press the **"OPERATION"** button on the remote in order to turn the remote controller on. It shows the set temperature on its display as shown to the right.
3. Press the **"HOT"** button or the **"COLD"** button to set the temperature setting of the unit.
4. You can set the temperature from 99 °F (38 °C) to 122 °F (50 °C).

100112183 (TK-RE02)



Increasing temperature from 122 °F (50 °C) to 140 °F (60 °C)

- Press the **"HOT"** button to set 122 °F (50 °C).
- Press and hold the **"INFORMATION"** button and the **"HOT"** button for at least 3 seconds. The remote will emit a beep and change to 131 °F (55 °C).
- Press the **"HOT"** button to set up to 140 °F (60 °C).

Increasing temperature above 140 °F (60 °C)

- Press the **"HOT"** button to set 140 °F (60 °C).
- Press and hold the **"INFORMATION"** button and the **"HOT"** button for at least 3 seconds. The remote will emit a beep and change to 158 °F (70 °C).
- Press the **"HOT"** button to set up to 167 °F (75 °C).

The temperature options

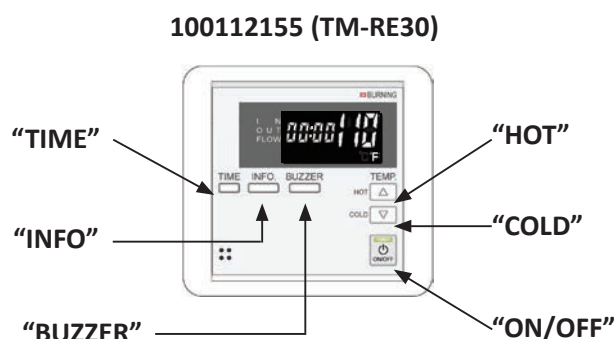
°F*	99	100	102	104	106	108	110	111	113	115	117	122	131	140	158	167
-----	----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----

*The 100112183 (TK-RE02) can only display degrees in Fahrenheit.

510 model: 100112155 (TM-RE30)

<Set temperature>

1. Turn on the 120VAC power supply to the water heater.
2. Press the "ON/OFF" button on the remote to turn the remote controller on. It shows the time and set temperature on the display as shown to the right.
3. Press the "HOT" button or the "COLD" button to set the temperature.
You can set the temperature from 100 °F (37 °C) to 122 °F (50 °C).



Increasing temperature from 122 °F (50 °C) to 140 °F (60 °C)

- Press the "HOT" button to set 122 °F (50 °C).
- Press and hold the "INFO" button and the "HOT" button for at least 3 seconds. The remote will emit a beep and change to 131 °F (55 °C).
- Press the "HOT" button to set up to 140 °F (60 °C).

Increasing temperature above 140 °F (60 °C)

- Press the "HOT" button to set 140°F (60°C).
- Press and hold the "INFO" button and the "HOT" button for at least 3 seconds. The remote will emit a beep and change to 158 °F (70 °C) or 149 °F (65 °C).

NOTE: The 149°F (65 °C) setting is available in high temperature mode. See below.

- Press the "HOT" button to set up to 167 °F (75 °C) or 176 °F (80 °C).

NOTE: The 176 °F (80 °C) setting is available in high temperature mode. See below.

The temperature options

The remote controller has two temperature range options: default mode and high temperature mode.

Default mode

°F	100	100	102	104	106	108	110	111	113	115	117	122	131	140	158	167
°C	37	38	39	40	41	42	43	44	45	46	47	50	55	60	70	75

High temperature mode (See below.)

°F	100	100	102	104	106	108	110	111	113	122	131	140	149	158	167	176
°C	37	38	39	40	41	42	43	44	45	50	55	60	65	70	75	80

<High temperature mode>

To change the remote controller's mode from **default mode** to **high temperature mode**, please follow the procedures on the next page.

How to change to the High temperature mode

1. Turn off power to the remote controller by pressing the **"ON/OFF"** button. (Lamp is OFF to indicate that power is off.)
2. Press and hold both the **"HOT"** and **"COLD"** buttons simultaneously for at least 5 seconds, then make sure that "1" (or "0") is displayed on the remote controller.



"1" is displayed for single unit.



"0" is displayed for Easy-Link System.

3. Press the **"TIME"** button. Make sure that **"OFF"** and **"F1"** are displayed on remote controller.



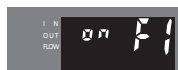
4. Press the **"INFO"** button. Afterward, make sure that **"OFF"** blinks.



5. Press the **"HOT"** button or **"COLD"** button to set display to **"on"**. Make sure that **"on"** is blinking.



6. Press both the **"BUZZER"** button and **"INFO"** button simultaneously to save the setting. Make sure that the display is no longer blinking.



7. Press the **"ON/OFF"** button to exit the edit mode.
8. Turn on power to the remote controller by pressing the **"ON/OFF"** button again. (Lamp is ON to indicate that power is on.)

OTHER FEATURES OF THE REMOTE CONTROLLERS

-Features available on 100112183 (TK-RE02) and 100112155 (TM-RE30)-

<Buzzer operation>

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

You can stop the buzzer by pressing : **"any button"** for **100112183 (TK-RE02)**

"Buzzer button" for **100112155 (TM-RE30)**.

For details on the error code, refer to p. 43.

NOTE: If you want to disable the buzzer operation, press and hold the "BUZZER" button for 3 seconds or longer. (100112155 (TM-RE30) only.)

Information mode>

You can get some information about the water heater condition by pressing :

"INFORMATION" button for **100112183 (TK-RE02)**

"INFO" button for **100112155 (TM-RE30)**

During the information mode, the information will be rotated by pressing the **"INFORMATION"** or **"INFO"** button as follows:



-Features available only on 100112155 (TM-RE30)-

<Set the time>

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

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

<Energy saving mode >

The remote controller has an energy saving mode. The backlight of the LCD in the remote controller will be turned off in five minutes after the water heater stops the operation for energy saving. Once the unit is working, the backlight of the LCD is turned back on during the operation.

<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:

1. Turn off power to the remote controller by pressing the "ON/OFF" button.
(Lamp is OFF to indicate that power is off.)
2. Press and hold both the "HOT" and "COLD" buttons simultaneously for at least 5 seconds, then make sure that "1" (or "0") is displayed on remote controller.



"1" is displayed for single unit. "0" is displayed for Easy-Link System.

3. Press the "TIME" button. Make sure that "OFF" and "F1" are displayed on remote controller.



4. Press the "HOT" button or "COLD" button to set display to "F3".



5. Press the "INFO" button. Afterward, make sure that "°F" blinks.



6. Press the "HOT" button or "COLD" button to set display to "°C".



7. Press both the "BUZZER" button and "INFO" button simultaneously to save the setting. Make sure that the display is no longer blinking.



8. Press the "ON/OFF" button to exit the edit mode.
9. Turn on power to the remote controller by pressing the "ON/OFF" button again. (Lamp is ON to indicate that power is on.)

NOTICE

For more details, refer to the manual that came with your remote controller.

TEMPERATURE SETTINGS ON THE PCB

-WITHOUT REMOTE CONTROLLER-

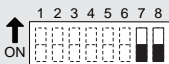
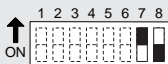
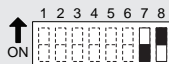
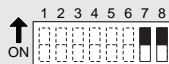
There are four temperatures that you can select by changing the DIP switch settings on the computer board. See the table below.



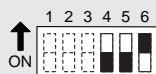
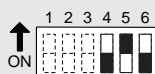
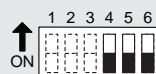
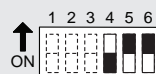
WARNING

- DO NOT adjust any other DIP switches other than the ones that are indicated below.
- Turn off the power supply to the water heater before changing the DIP switch settings.
- Failure to observe these warnings could result in carbon monoxide poisoning, severe personal injury, or death.

110 and 310 models

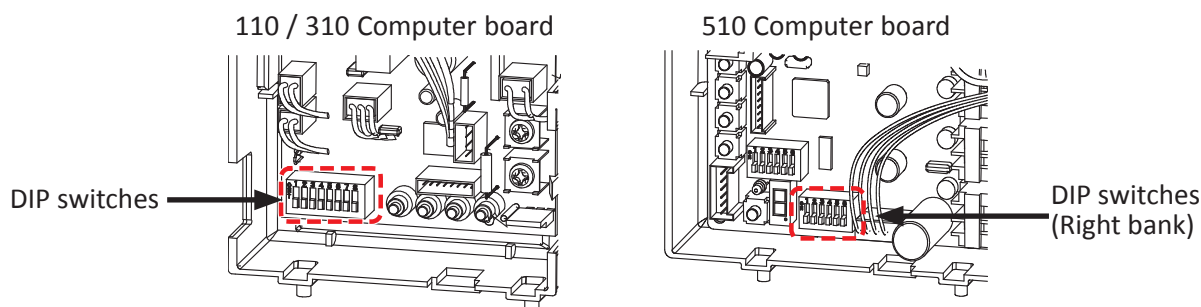
Temperatures settings			
113 °F (45 °C)	122 °F (50 °C) Default	131 °F (55 °C)	140 °F (60 °C)
			

510 model

Temperatures settings <Right bank of DIP switches>			
104 °F (40 °C)	113 °F (45 °C)	122 °F (50 °C) Default	140 °F (60 °C)
			

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

Location of the bank of DIP switches on the computer board



FLOW

- The flow rate through the water heater is limited to a maximum of 6.6 GPM for the 110 model, 8.0 GPM for the 310 model, and 10.0 GPM for the 510 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. 56 to determine the likely flow rates based on your local ground water temperature and your desired outlet water temperature.
- Refer to the right table for typical household plumbing fixture flow rates to determine what the water heater can do in a household application.

Household Flow Rates

Appliance/Use	Flow rate GPM
Lavatory Faucet	1.0 (3.8 L)
Bath Tub	4.0 – 10.0 (15.1 - 37.9 L)
Shower	2.0 (7.6 L)
Kitchen Sink	1.5 (5.7 L)
Dishwasher	1.5 (5.7 L)
Washing machine	4.0 (15.1 L)

Taken from UPC 2006

FREEZE PROTECTION SYSTEM

- This unit comes equipped with heating blocks to protect it from damages 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 freeze protection thermostat senses air temperature below 36.5 °F (2.5 °C).
- For the 110 Indoor, 310 Indoor, and 510 Indoor models:
 - 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 only 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. 43.
 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

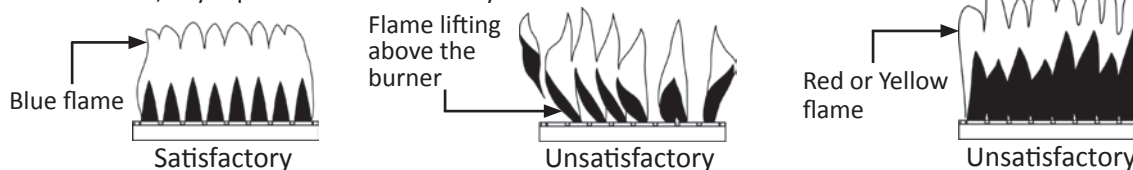


WARNING

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 section 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 or any 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-

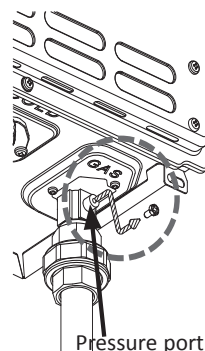


WARNING

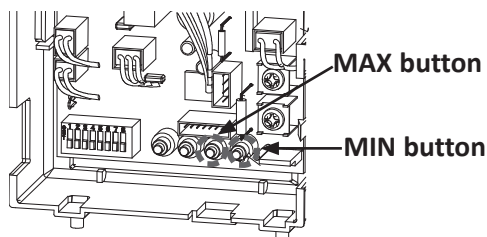
1. Turn off all electric power to the water heater if service is to be performed.
2. Turn the manual gas valve located on the outside of the unit to the off position.
3. Failure to follow these steps could lead to fire or explosion, resulting in personal injury or death.

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.**

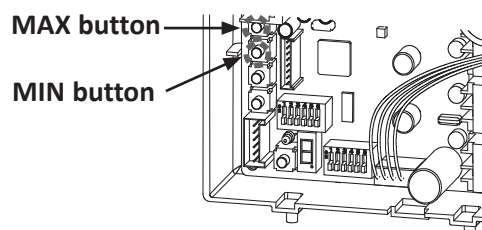
1. Shut off the manual gas valve on the gas supply line.
2. Remove the screw from the pressure port which is located on the gas inlet of the water heater shown in the diagram on the right.
3. Connect the manometer to the pressure port and zero the manometer.
4. Re-open the manual gas valve. Verify that 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 the MAX button on the computer board. (Refer to the diagrams below.) 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. 24.
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: Reduce water flow so the heater is running at minimal operation. Press the MIN button on the computer board. (Refer to the diagrams below.) Take a supply gas pressure reading and verify that it is within the specified inlet gas pressure range.



110 / 310 Computer board



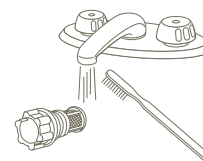
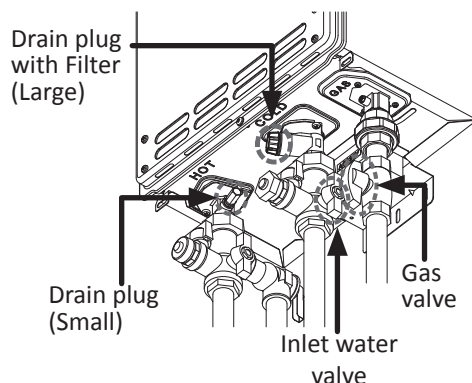
510 Computer board



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, yet again.
4. Close the inlet water shutoff valve.
If the heater is part of an Easy-Link, 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. **Unscrew** the two drain plugs (large and small) to drain all the water out of the unit.
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.

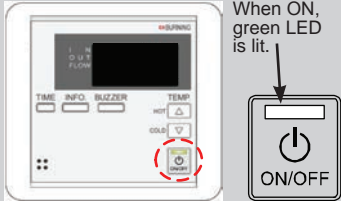
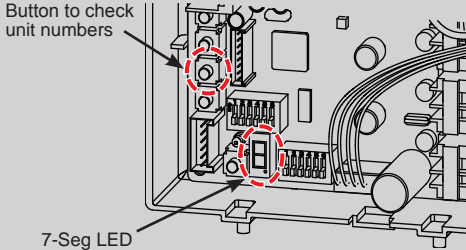
Hand-tighten only.



TROUBLESHOOTING

GENERAL

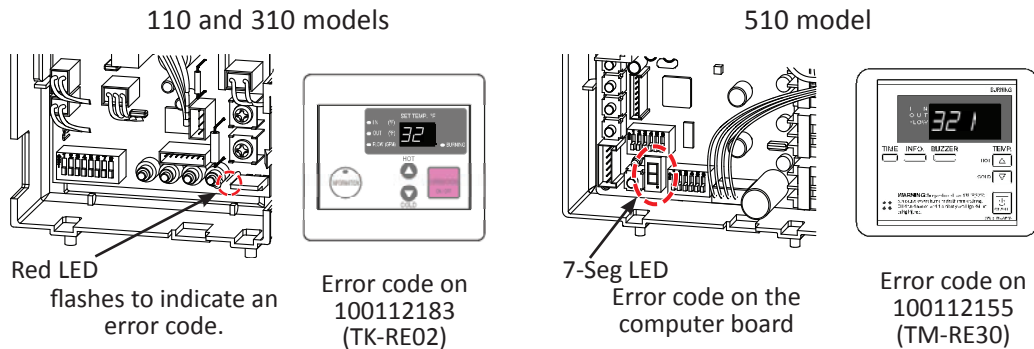
	PROBLEM	SOLUTIONS
TEMPERATURE and AMOUNT OF HOT WATER	It takes a long time to get hot water at the fixtures.	<ul style="list-style-type: none"> The time it takes to deliver hot water from the water heater to your fixtures depends on the length of piping between the two. The longer the distance or the 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. 31)
	The water is not hot enough.	<ul style="list-style-type: none"> Compare the flow and temperature. See the charts on p. 56. Check cross plumbing between cold water lines and hot water lines. Is the gas supply valve open fully? (p. 33) Is the gas line sized properly? (pp. 24 and 25) Is the gas supply pressure within specified limits? (pp. 24 and 43) Is the set temperature set too low? (pp. 37, 38, and 41)
	The water is too hot.	<ul style="list-style-type: none"> Is the set temperature set too high? (pp. 37, 38, and 41)
	The hot water is not available when a fixture is opened.	<ul style="list-style-type: none"> Make sure the unit has 120 VAC, 60 Hz power supply. If you are using the remote controller, is the power button turned on? Is the gas supply valve open fully? (p.33) Is the water supply valve open fully? (p. 33) Is the filter on the cold water inlet clean? (p. 43) Is the hot water fixture sufficiently open to draw at least 0.5 GPM through the water heater? (p. 37) Is the unit frozen? (p. 42) Is there enough gas in the tank / cylinder? (For Propane models)
	The hot water turns cold and stays cold.	<ul style="list-style-type: none"> Is the flow rate enough to keep the water heater running? (p. 37) If there is a recirculation system installed, does the recirculation line have enough check valves? (p. 31) Is the gas supply valve open fully? (p. 33) Is the filter on the cold water inlet clean? (p. 43) Are the fixtures clean of debris and obstructions? Check if the flow rate is too low. (p. 37)
	Fluctuation in hot water temperature	<ul style="list-style-type: none"> Is the filter on the cold water inlet clean? (p. 43) Is the gas line sized properly? (p. 24) Is the supply gas pressure sufficient? (pp. 24 and 43) Check for cross connection between cold water lines and hot water lines.

	PROBLEM	SOLUTIONS
WATER HEATER	Unit does not ignite when water goes through the unit.	<ul style="list-style-type: none"> Is the flow rate over 0.5 GPM? (p. 37) Check for the filter on the cold water inlet. (p. 43) Check for reverse connection and cross connection. If you use the remote controller, is the power button turned on? Check if the inlet temperature is too high. If it is too close to the set temperature, the water heater will not activate.
	The fan motor is still spinning after operation has stopped.	<ul style="list-style-type: none"> 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.	<ul style="list-style-type: none"> Contact the manufacturer at: (USA) 1-877-737-2840. (Canada) 1-888-479-8324
REMOTE CONTROLLER	Remote controller does not display anything when the power button is turned on.	<ul style="list-style-type: none"> Make sure the unit is supplied with power. Make sure the connection to the unit is correct. (p. 27) <p>-100112115 (TM-RE30) only- If the green LED lights up, the remote controller has been turned ON. When the unit has not operated for five minutes or more, the display turns off to conserve energy.</p>  <p>When ON, green LED is lit.</p>
	An ERROR code is displayed.	<ul style="list-style-type: none"> Please see p. 47-48.
EASY-LINK SYSTEM 510 model only	How are the unit numbers assigned?	<ul style="list-style-type: none"> 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 7-Seg LED. (Refer to p. 29.)  <p>Button to check unit numbers</p> <p>7-Seg LED</p>

ERROR CODES

-General-

- The water heaters have self-diagnostic functions for safety and convenience when troubleshooting.
- If there is a problem with the installation or the unit, the 510 model will display a numerical error code on the 7-Seg LED on the computer board, and the 110 and 310 models will flash on a red LED on the computer board. If a remote controller is installed, the error codes will be displayed on the remote controller.
- Consult with the table on the following page 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)

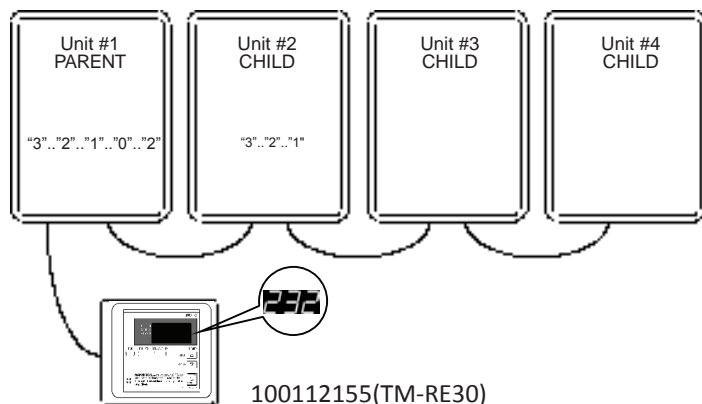
- **110 and 310 models:** The red LED on the computer board will repeat a pattern of two flashes.
- **If the remote controller 100112183 (TK-RE02) is installed:** It will display “32” on the screen.
- **510 model:** The 7-Seg LED on the computer board will display “3”, “2”, “1” in that order, one digit at a time, and it will repeat continually.
- **If the remote controller 100112155 (TM-RE30) is installed:** It will display “321” on the screen .

-Easy-Link System for 510 model only-

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

Example: If Unit #2 has the “321” error code (inlet thermistor failure)

- **Remote controller 100112155 (TM-RE30):** It will display “232” and on the display. The first “2” indicates that Unit #2 has the error. The “32” indicates the first two digits of the “321” error code.
- **Parent unit:** It will display “3”...”2”...”1”...”0”...”2”, one digit at a time on the 7-Seg LED. The first three numbers indicate the error code. The last two numbers indicate that Unit #2 has the error code.
- **Unit #2:** It will display “3”...”2”...”1” on the 7-Seg LED, just like in the Single Unit example.
- **Unit #3 & #4:** These units will not display anything, as the error code does not pertain to them.



-Fault analysis of error codes-

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

110 and 310		510	Malfunction description	Diagnosis
Red LED	Remote	Remote 7 Seg LED		
One Flash	03*	031*	Incorrect DIP switch setting	<ul style="list-style-type: none"> Check the DIP switch settings on the PCB (Part #701).
Five Flashes	10	101	Warning for the "991" error code	<ul style="list-style-type: none"> Check the gas type of the water heater. Check if there is any blockage in the intake air and/or exhaust. If the water heater is installed as a direct-vent system, check whether there is enough distance between the intake air terminal and the exhaust terminal. Check 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.
Three Flashes	11*	111*	Ignition failure	<ul style="list-style-type: none"> Check if the Hi-limit switch (Part #412) is functioning properly. Check for connection/breakage of wires (Part #413, 708, 709, 710, 712), burn marks on the computer board (Part #701), and/or soot on the flame rod (Part #108). 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 gas valve assembly (Part #102) when water heater goes into combustion. Check if there is leaking from heat exchanger (Part #401).
Three Flashes	12*	121*	Loss of flame	<ul style="list-style-type: none"> Check if the Hi-limit switch (Part #412) is functioning properly. Check for connection/breakage of wires (Part #413, 708, 709, 710, 712), burn marks on the computer board (Part #701), and/or soot on the flame rod (Part #108). Check if there is leaking from heat exchanger (Part #401).
Two Flashes	31*	311*	Outlet thermistor failure	<ul style="list-style-type: none"> Check for connection/breakage of wires and/or debris on thermistor (Part #407, 408, 411, 716).
Two Flashes	32*	321*	Inlet thermistor failure	
N/A	N/A	331*	Mixing thermistor failure	

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

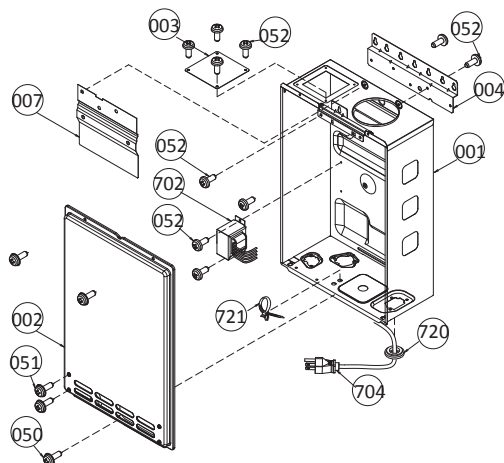
110 and 310		510	Malfunction description	Diagnosis
Red LED	Remote	Remote 7 Seg LED		
Two Flashes	39*	391*	Air-fuel ratio rod failure	<ul style="list-style-type: none"> Check for connection/breakage of wires (Part #709) and/or soot on the AFR rod (Part #108).
N/A	N/A	441	Flow sensor failure (Easy-Link System only)	<ul style="list-style-type: none"> Check for connection/breakage of wires and/or debris on the flow sensor impeller (Part #402, 717).
Six Flashes	51	510	Abnormal gas solenoid valve	<ul style="list-style-type: none"> Check for connection/breakage of wires (Part #708) and/or burn marks on the computer board (Part #701).
Six Flashes	55	N/A	Abnormal main gas valve	<ul style="list-style-type: none"> Check for connection/breakage of wires (Part #708) and/or burn marks on the computer board (Part #701).
Four Flashes	61*	611*	Fan motor fault	<ul style="list-style-type: none"> 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).
N/A	N/A	651*	Flow adjustment valve fault (Easy-Link System only)	<ul style="list-style-type: none"> Inspect the flow adjustment valve (Part #402), for connection/breakage of wires (Part #718), locked motor drive due to scale buildup, and/or water leakage.
One Flash	70*	701*	Computer board fault	<ul style="list-style-type: none"> Check for connection/breakage of wires (Part #714) and/or burn marks on the computer board (Part #701). Check the power supply of the water heater.
Six Flashes	72*	721*	False flame detection	<ul style="list-style-type: none"> For indoor models, check if condensate drain is installed on the vent collar of the water heater. Check if there is leaking from heat exchanger (Part #401).
N/A	74	741	Miscommunication between water heater and remote controller	<ul style="list-style-type: none"> Check the model type of the remote controller. Inspect the connections between the water heater and remote controller. Check the power supply of the water heater.
N/A	N/A	761	Miscommunication in Easy-Link System	<ul style="list-style-type: none"> Check if the connections between the parent unit and the child units are correct. Refer to pp. 29 and 30.
Five Flashes	99*	991*	Imperfect combustion	<ul style="list-style-type: none"> 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. If the water heater is installed as a direct-vent system, check to make sure that there is enough distance between the intake air terminal and the exhaust terminal. Check if there is grease and/or dirt in the burner (Part #101) and the fan motor (Part #104), especially if the water heater has been installed in a contaminated area.

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

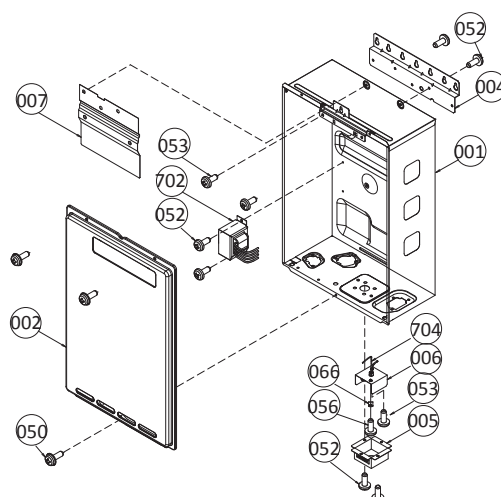
COMPONENTS DIAGRAM

Case assembly

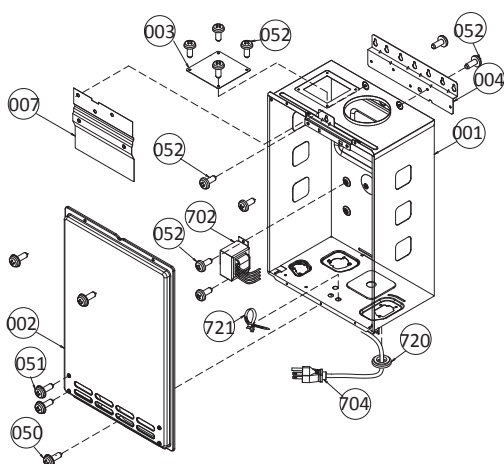
110 Indoor



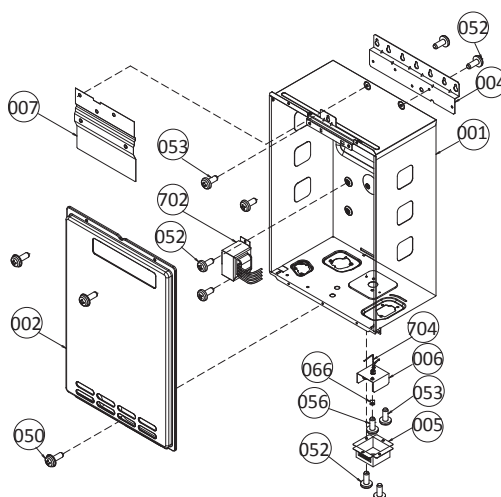
110 Outdoor



310 and 510 Indoor

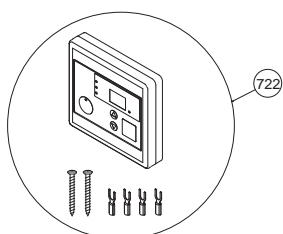


310 and 510 Outdoor

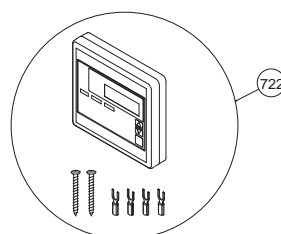


Temperature remote controller

110 and 310 models

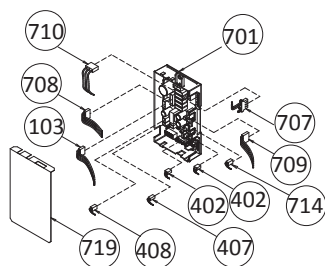


510 model

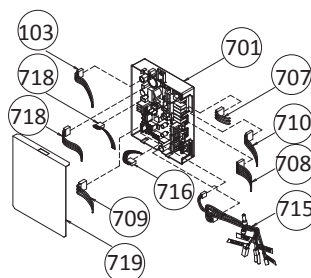


Computer board assembly

110 and 310 models

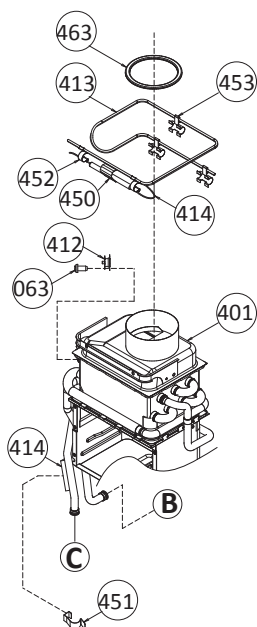


510 model

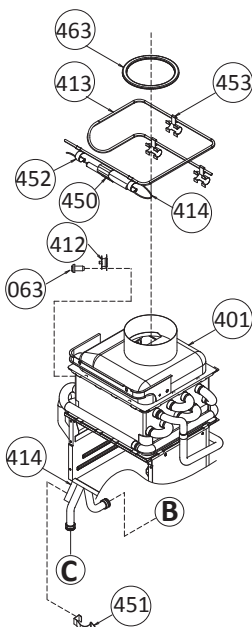


WaterWay assembly

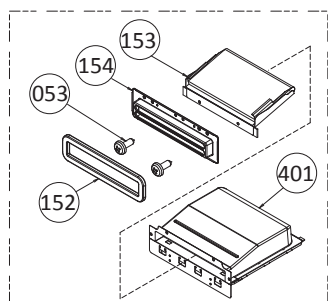
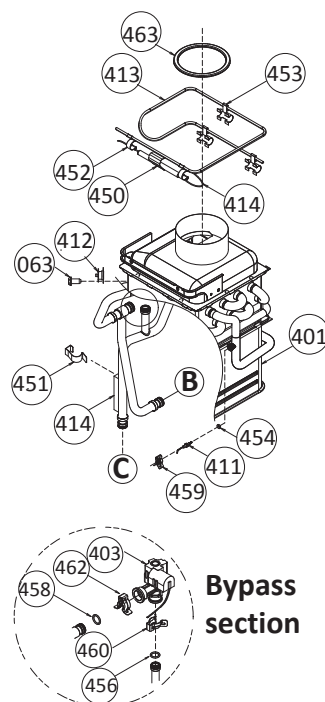
110 model



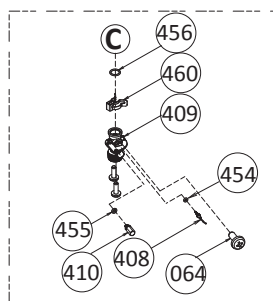
310 model



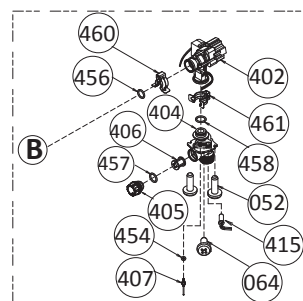
510 model



Exhaust section (Outdoor model)



Water outlet section



Water inlet section

PARTS LIST

Item #	Description	Part #	
		110, 310 and 510 models	T-KJr2, T-K4 and T-D2 models
001	Case assembly for 110 Indoor for 110 Outdoor for 310 and 510 Indoor for 310 and 510 Outdoor	100074343 100074356 100074335 100074395	EK415 EK432 EK402 EKK41
002	Front cover for 110 Indoor for 110 Outdoor for 310 Indoor for 310 Outdoor for 510 Indoor for 510 Outdoor	100074347 100074357 100074336 100074554 100074358 100074359	EK419 EK433 EK403 EK409 EK434 EK435
003	Air blockage plate for 110 Indoor, 310 Indoor, and 510 Indoor	100074602	EK401
004	Bracket	100074368	EKJ09
005	Junction box	100074199	EKJ64
006	Junction box inner plate	100074313	EKJ66
007	Back guard panel for 110 model Back guard panel for 310 and 510 models	100074522 100074405	EX00M EKK5H
050	Truss screw M4x12 (W/Washer) SUS410	100074210	EW000
051	Truss screw M4x10 (W/Washer)	100074509	EW001
052	Truss screw M4x10 (Coated) SUS3	100074211	EW002
053	Truss screw M4x10 SUS	100074245	EW003
054	Hex head screw M4x12 (W/Washer) SUS3	100074510	EW004
055	Hex head screw M4x8 FEZN	100074248	EW005
056	Truss screw M4x10	100074555	EX014
057	Binding head screw M3x6 SUS3	100074514	EW00B
058	Pan head screw M3x10 SUS	100074511	EW008
059	Pan screw M4x12 (W/Washer)	100074246	EW00H
060	Pan screw M4x10 FEZN	100074516	EW024
061	Tap tight screw M4x12 FEZN	100074385	EKK31
062	Pan screw M4x10	100074247	EW006
063	Pan head screw M3x6 SUS3	100074272	EW00A
064	Truss head screw M4x6 SUS3	100074512	EW009
065	Pan screw M4x8 MFZN	100074244	EW00D
066	Nylon clamp	100074328	EC00X
067	Wire clamp 60	100074233	EM167
101	Burner assembly for 110 model Burner assembly for 310 and 510 models	100074345 100074215	EK417 EKK5W
102	Manifold with gas valve assembly LP for 110 model Manifold with gas valve assembly LP for 310 and 510 models Manifold with gas valve assembly NA for 110 model Manifold with gas valve assembly NA for 310 and 510 models	100074353 100074231 100074349 100074551	EK429 EKK6T EK421 EKK5K
103	Fan motor for 110 model Fan motor for 310 Indoor and 510 Indoor Fan motor for 310 Outdoor and 510 Outdoor	100074531 100074228 100074401	EX02E EKK25 EKK54
104	Burner holder gasket for 110 model Burner holder gasket for 310 and 510 models	100074525 100074217	EX00V EKK0G
105	Burner gasket	100074216	EKK2X
106	Burner window	100074218	EKK2V
107	Rod holder gasket	100074219	EKK2W
108	Flame rod for 110 model Flame rod for 310 and 510 models	100074523 100074220	EX00R EKK0E
109	Igniter rod for 110 model Igniter rod for 310 and 510 models	100074556 100074222	EX00S EKK0F

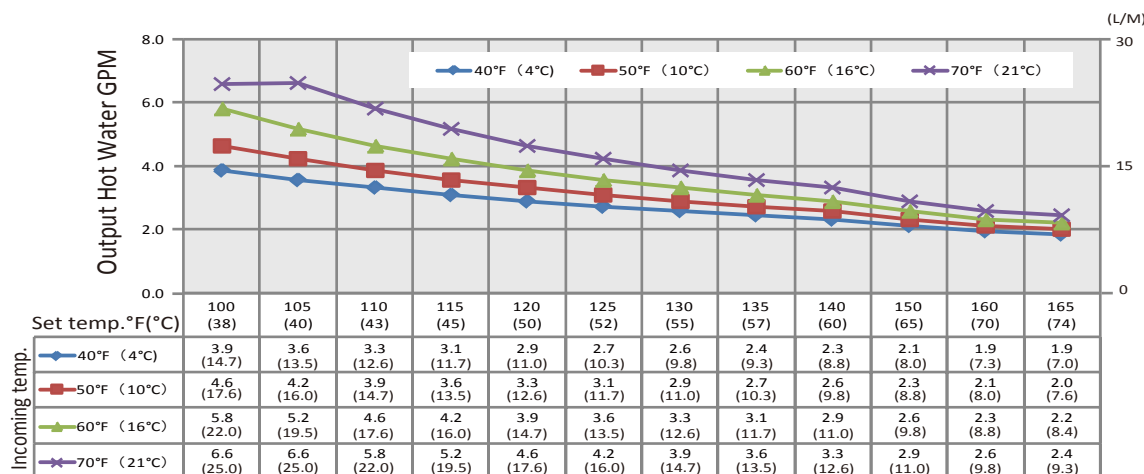
Item #	Description	Part #	
		110, 310 and 510 models	T-KJr2, T-K4 and T-D2 models
110	Rod holder for 110 model	100074524	EX00U
	Rod holder for 310 and 510 models	100074221	EKK32
111	Rod cap	100074223	EKN61
112	Burner damper for 110 model	100074354	EK430
	Burner damper for 310 Indoor and 510 Indoor	100191104	EK2AJ
	Burner damper for 310 Outdoor and 510 Outdoor	100191106	EK492
113	Manifold gasket A	100074229	EKK2Y
114	Manifold gasket B	100074230	EKK2K
115	Fan damper for 110 Indoor	100074344	EK416
	Fan damper for 310 Indoor and 510 Indoor	100074550	TU001
116	Pressure port for 310 and 510 models	100074227	EKK2D
117	Combustion chamber tube for 310 Indoor and 510 Indoor	100074226	EKK2N
	Combustion chamber tube for 310 Outdoor and 510 Outdoor	100074528	EX019
118	Gas inlet	100074235	EKK1E
119	Gas inlet ring	100074234	EKK2Z
120	Igniter plate	100074236	EKK1B
121	Surge box plate for 110 and 310 models	100074397	EKK4H
	Surge box plate for 510 model	100074360	EK436
150	O-ring P18 NBR (Black)	100074533	EZP18
151	O-ring P20 NBR (Black)	100074242	EK042
152	Silicon ring for 110 Outdoor	100074553	EK442
	Silicon ring for 310 Outdoor and 510 Outdoor	100074390	EKK3G
153	Rain protection plate in Exhaust chamber for 110 Outdoor, 310 Outdoor and 510 Outdoor	100074400	EKK53
154	Exhaust port	100074403	EKK56
401	Heat exchanger assembly for 110 Indoor	100074346	EK418
	for 110 Outdoor	100074350	EK426
	for 310 Indoor	100074337	EK406
	for 310 Outdoor	100074341	EK413
	for 510 Indoor	100074552	TU002
	for 510 Outdoor	100074361	EK437
402	Flow adjustment valve/Flow sensor for 110 and 310 models	100074351	EK427
	Flow adjustment valve/Flow sensor for 510 model	100074362	EK438
403	Bypass valve for 510 model	100074370	EKK0U
404	Water inlet	100074377	EKK1U
405	Inlet drain plug	100074381	EKK2B
406	Inlet water filter	100074382	EKK2C
407	Inlet thermistor for 110 and 310 models	100074398	EKK4J
	Inlet thermistor for 510 model	100074270	EKK38
408	Outlet thermistor for 110 and 310 models	100074402	EKK55
	Mixing thermistor for 510 model	100074374	EKK1A
409	Water outlet	100074378	EKK1V
410	Outlet drain plug	100074383	EKK2E
411	Output thermistor for 510 model	100074281	EKK2T
412	Hi-Limit switch for 110 and 310 models	100074412	EM212
	Hi-Limit switch for 510 model	100074280	EKN34
413	Overheat-cut-off fuse	100074334	EK333
414	Heater	100074384	EKK2R
415	Inlet heater	100074263	EKK2P

Item #	Description	Part #	
		110, 310 and 510 models	T-KJr2, T-K4 and T-D2 models
450	Pipe heater fixing plate	100074273	EKK27
451	Heater fixing plate 16	100074310	EK031
452	Fuse fixing plate 18	100074251	EKK26
453	Fuse fixing plate 14	100074331	EK029
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 510 model	100074282	EKH30
460	Fastener "14-22"	100074290	EKK24
461	Fastener "16A"	100074410	EM192
462	Fastener "16-25A" for 510 model	100074389	EKK39
463	Silicon ring	100074250	EKN50
701	Computer board for 110 model for 310 model for 510 model	100074348 100074342 100074363	EK420 EK414 EK439
702	Transformer	100074366	EKH09
703	Surge box	100074352	EK428
704	AC120V wire for Indoor models	100074601	EK146
	AC120V wire for 110 Outdoor	100074406	EKK5M
	AC 120 V wire for 310 Outdoor and 510 Outdoor models	100074323	EKK3C
705	Transformer wire for 110 model	100074339	EK408
	Transformer wire for 310 and 510 models	100074364	EK440
706	AC120V Power ON-OFF switch	100074326	EKK4V
707	Switch wire for 110 model	100074338	EK407
	Switch wire for 310 and 510 models	100074365	EK441
708	Gas valve wire for 110 and 310 models	100074391	EKK3K
	Gas valve wire for 510 model	100074372	EKK10
709	Flame rod wire for 110 model for 310 model for 510 model	100074355 100074392 100074373	EK431 EKK3L EKK11
710	EH-IG wire for 110 Indoor and 310 Indoor	100074393	EKK3R
	EH-IG wire with freeze protection thermostat for 110 Outdoor, 310 Outdoor and 510 Outdoor	100074394	EKK40
	EH-IG wire for 510 Indoor	100074371	EKK0Z
711	Igniter	100074237	EKN74
712	High voltage igniter cable	100074224	EKK2M
713	Freeze protection thermostat for 110 Indoor, 310 Indoor, and 510 Indoor	100074369	EKJ59
714	Proportional gas valve wire for 110 and 310 models	100074404	EKK58
	Proportional gas valve wire for 510 model	100074318	EKK12
715	Pump and multi cable for 510 model	100074388	EKK36
716	Thermistors wire for 510 model	100074379	EKK1Z
718	Water valves wire for 510 model	100074386	EKK33
719	Computer board cover for 110 and 310 models	100074396	EKK49
	Computer board cover for 510 model	100074375	EKK1M
720	Rubber grommet for Indoor models	N/A	EK148
721	Cable strap for Indoor models	N/A	EW022
722	Temperature remote controller for 110 and 310 models	100112183	TK-RE02
	Temperature remote controller for 510 model	100112155	TM-RE30

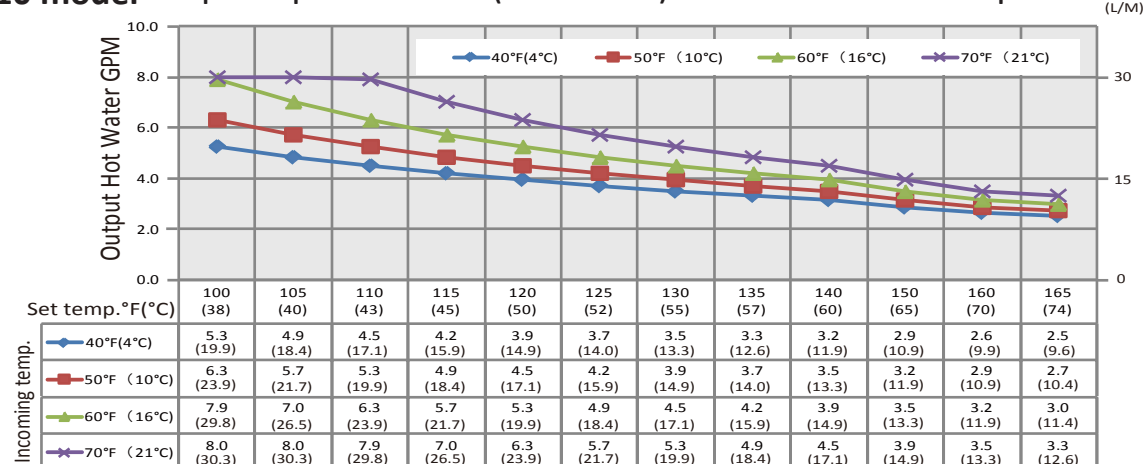
OUTPUT TEMPERATURE CHART

Chart is based on properly sized gas line

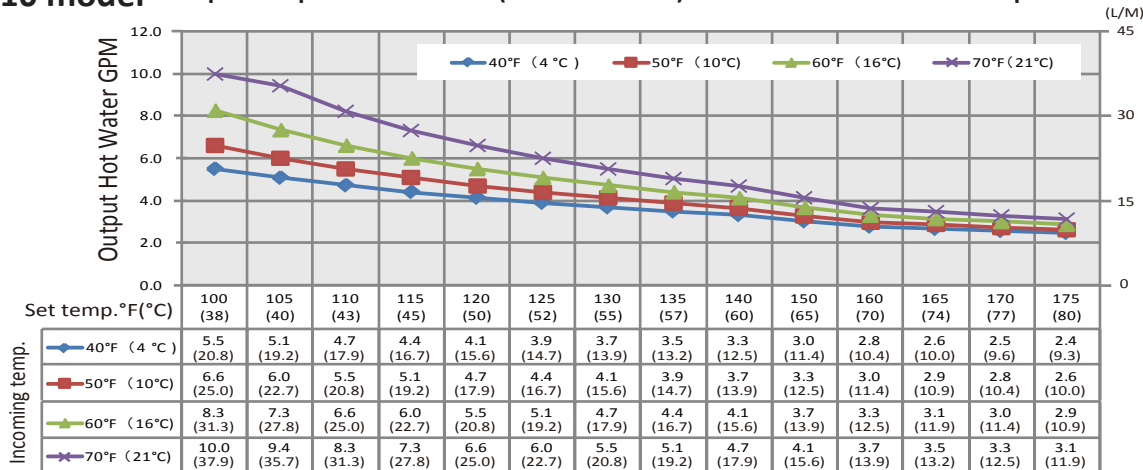
110 model Output Temperature vs. GPM (Max. 6.6 GPM) with Various Inlet Water Temperature



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



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



*When the set temperature is 131 °F (55°C) or higher, maximum flow rate is limited to 8.0 GPM.