

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



ANSI Z21.10.3 • CSA 4.3



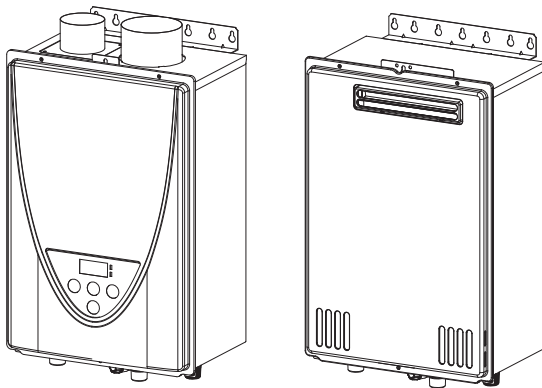
510U (AT-D3U-IN/OS)
only



Models

- 110U Indoor (AT-KJr3U-IN)
- 310U Indoor (AT-K5U-IN)
- 510U Indoor (AT-D3U-IN)
- 110U Outdoor (AT-KJr3U-OS)
- 310U Outdoor (AT-K5U-OS)
- 510U Outdoor (AT-D3U-OS)

Series 200



Gas Tankless Water Heater™

*Suitable for combination potable water heating
and space-heating*

Please refer to local codes for space-heating compliance.

FEATURING

- ENDLESS HOT WATER
- ON-DEMAND USAGE
- COMPACT, SPACE SAVING
- ENERGY CONSERVATION
- COMPUTERIZED SAFETY
- NO PILOT LIGHT
- Complies with SCAQMD Rule 1146.2 for NOx emissions requirement of 14 ng/J or 20 ppm
- FIELD GAS CONVERTIBLE
- EASY-LINK SYSTEM AND MULTI-UNIT SYSTEM
(510U (AT-D3U-IN/OS) only)



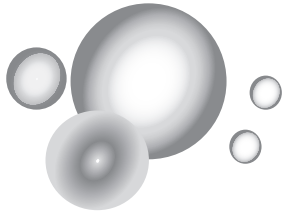
WARNING

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

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

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

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



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. Please refer to the back of the manual for details about the warranty. Keep this manual for future reference.

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

SPECIFICATIONS

Model			110U Indoor (AT-KJr3U-IN)	110U Outdoor (AT-KJr3U-OS)	310U Indoor (AT-K5U-IN)	310U Outdoor (AT-K5U-OS)	510U Indoor (AT-D3U-IN)	510U Outdoor (AT-D3U-OS)	
Natural Gas Input (Operating Range)		BTU/h	Min.: 15,000 Max.: 140,000		Min.: 15,000 Max.: 190,000		Min.: 15,000 Max.: 199,000		
Gas Connection			3/4" NPT						
Water Connections			3/4" NPT						
Water Pressure*	psi (Mpa)	15 - 150 (0.1 - 1)							
Natural gas Inlet Pressure	" W.C. (kPa)	Min. 4.0 (1.00) Max. 10.5 (2.61)							
Weight	lbs. (kg)	37.5 (17.0)					39.7 (18.0)		
Dimensions		Indoor	H 20.5 x W 13.8 x D 9.1 (Inch) H 520 x W 351 x D 231 (mm)						
		Outdoor	H 20.5 x W 13.8 x D 8.5 (Inch) H 520 x W 351 x D 216 (mm)						
Ignition			Electric Ignition						
Electric	Supply		VAC / Hz	120 / 60					
	Consumption	Operation	W / A	54 / 0.64		79 / 0.99		82 / 1.02	
		Standby	W / A	2 / 0.06		2 / 0.06		3 / 0.07	
		Freeze-Protection	W / A	96 / 0.82		96 / 0.82		97 / 0.82	

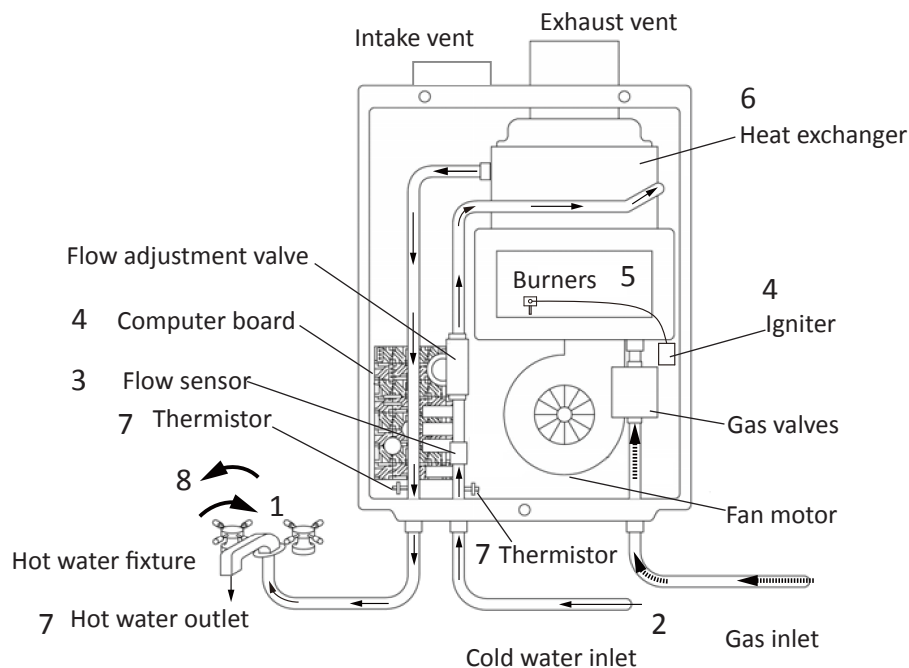
*Maximum flow may need water pressure equal to or above 40 psi.

NOTE:

- Check the rating plate to ensure 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 obligations.**

INTRODUCTION

- This manual provides information necessary for the installation, operation, and maintenance of the water heater.
- The model description is listed on the rating plate which is attached to the side panel of the water heater.
- Please read all installation instructions completely before installing this product.
- If you have any problems or questions regarding this equipment, consult the manufacturer or its local representative.
- This appliance is an on-demand, tankless water heater. It is designed to efficiently supply endless hot water for your needs.
- The 110U Indoor (AT-KJr3U-IN), 310U Indoor (AT-K5U-IN) and 510U Indoor (AT-D3U-IN) models are only to be installed indoors. The 110U Outdoor (AT-KJr3U-OS), 310U Outdoor (AT-K5U-OS) and 510U Outdoor (AT-D3U-OS) models are only to be installed outdoors.
- The principle behind tankless water heaters is simple:



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

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

SAFETY GUIDELINES

SAFETY DEFINITION



DANGER

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



WARNING

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



CAUTION

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

NOTICE

Indicates information considered important but not hazard related.

GENERAL

1. Follow all local codes, or in the absence of local codes, follow the current edition of the National Fuel Gas Code: ANSI Z223.1/NFPA 54 in the USA or B149.1 Natural Gas and Propane Installation code in Canada.
2. Properly ground the unit in accordance with all local codes, or in the absence of local codes, with the current edition of the National Electrical Code: ANSI/NFPA 70 in the USA or CSA standard C22.1 Canadian Electrical Code Part 1 in Canada.
3. Carefully plan where you intend to install the water heater. Please ensure:
 - Your water heater will have enough combustion air and proper ventilation.
 - Locate your heater where water leakage will not damage surrounding areas. (Please refer to p. 8.)
4. Check the rating plate for the correct **GAS TYPE, GAS PRESSURE, WATER PRESSURE and ELECTRIC RATING**. If this unit does not match your requirements, **do not install and consult with the manufacturer**. The water heater is configured only for use with Natural Gas at the factory. If the appliance is used with propane gas, conversion to propane gas with an included conversion kit (**LP Conversion Kit: 100270585**) is required. The conversion must be done by a qualified service agent or a gas utility serviceman in accordance with this instruction and all codes and requirements of the authority having jurisdiction. Failure to follow instructions could result in serious injury or property damage. The agent performing this work assumes responsibility for this conversion. (Refer to the gas conversion leaflet.)
5. If any problem should occur, turn off all hot water fixtures and turn off the gas. Then call a trained technician or the Gas Company or the manufacturer.



WARNING

- Water temperatures over 125 °F (52 °C) can cause severe burns instantly or death from scalding. The water temperature is set at 120 °F (50 °C) from the factory to minimize any scalding risk. Before bathing or showering, always check the water temperature.
- Do not store or use gasoline or other flammables, vapors, or liquids in the vicinity of this appliance.
- Do not reverse the water and/or gas connections as this will damage the gas valves and can cause severe injury or death. Follow the diagram on p. 28 when installing your water heater.
- The conversion to propane must be done by a qualified service agent or a gas utility serviceman in accordance with the gas conversion instructions and all codes and requirements of the authority having jurisdiction. Failure to follow instructions could result in serious injury or property damage. The qualified agent performing this work assumes responsibility for this conversion.
- Do not use this appliance if any part has been under water. Immediately contact a qualified installer or service agency to replace a flooded water heater. Do not attempt to repair the unit! It must be replaced!
- Do not disconnect the electrical supply if the ambient temperature will drop below freezing. The Freeze Protection System only works if the unit has electrical power. The warranty will not be covered if the heat exchanger is damaged due to freezing. For more information, refer to Freeze Protection System on p. 45.

INSTALLATION

GENERAL

1. Follow all local codes, or in the absence of local codes, follow the current edition of the National Fuel Gas Code: ANSI Z223.1/NFPA 54 in the USA or B149.1 Natural Gas and Propane Installation Code in Canada.
2. All gas water heaters require careful and correct installation to ensure safe and efficient operation. This manual must be followed exactly. Read the "Safety Guidelines" section.
3. The manifold gas pressure is preset at the factory. It is computer controlled and should not need adjustment.
4. Maintain proper space for servicing. Install the unit so that it can be connected or removed easily. Refer to the "Clearances" section on p. 9 for proper clearances.
5. The water heater must be installed in a location where the proper amount of combustible air will be available to it at all times without obstructions.
6. The electrical connection requires a means of disconnection, to terminate power to the water heater. This is necessary for servicing and safety purposes.
7. Do not install the unit where the exhaust vent is pointing into any opening in a building or where the noise may disturb your neighbors. Ensure that the vent termination meets the minimum distance requirements set by code, including minimum clearances from doorways or openings. (Refer to pp.24 and 25.)
8. Particles from flour, aerosols, and other contaminants may clog the air vent, build up and reduce the functions of the rotating fan, cause improper burning of the gas, or cause damage to the water heater. Regularly ensure that the area around the unit is dust- or debris-free. Regular maintenance is recommended for these types of environments. Direct Venting is recommended.
9. For 110U Indoor (AT-KJr3U-IN), 310U Indoor (AT-K5U-IN) and 510U Indoor (AT-D3U-IN) models:
 - If the water heater is used as a direct-vent appliance, the unit requires a 3 in. (76 mm) combustible air supply pipe. The intake pipe must be sealed airtight. Refer to "VENTING INSTRUCTIONS" on p.13 for more detail.
 - Terminating the venting through a sidewall is recommended for the direct-vent system.
 - Running the exhaust vent and the intake pipe parallel is recommended.
 - Terminating the exhaust and intake on the same wall/surface is recommended. Terminating in the same pressure zone allows for pressure balancing, which prevents nuisance shutdowns.
 - Only install the water heater in a heated area where below freezing temperatures cannot occur. The warranty does not cover damage caused by freezing.
 - The water heater must be securely mounted to a wall or other suitable structure.
10. The 110U Outdoor (AT-KJr3U-OS), 310U Outdoor (AT-K5U-OS) and 510U Outdoor (AT-D3U-OS) models are only to be installed outdoors and only in an area with mild, temperate climates. The Outdoor model shall be wall mounted, mounted on a stand, or installed in an approved recess box. Locate the Outdoor model in a open, unroofed area and maintain the minimum clearances. (Refer to p.11.)



- Installation and service must be performed by a qualified installer (for example, a licensed plumber or gas fitter). Otherwise, the warranty will be void.
- The installer (licensed professional) is responsible for the correct installation of the water heater and for compliance with all national, state / provincial, and local codes.
- The manufacturer does not recommend installing the water heater in a pit or location where gas and water can accumulate.
- Do not have the vent terminal pointing toward any operating window, door, or opening into a building.
- Do not install next to any source of airborne debris, such as a clothes dryer, that can cause debris to be trapped inside the combustion chamber, unless the system is direct-vented.
- **The manufacturer does not suggest installing the water heater in an attic due to safety issues.** If you install the water heater in an attic:
 - Make sure the unit will have enough combustion air and proper ventilation.
 - Keep the area around the water heater and its termination clean. When dust collects on the flame sensor, the water heater will shut down and produce an error code.
 - Place the unit for easy access for service and maintenance.
 - A drain pan, or other means of protection against water damage, is recommended to be installed under the water heater in case of leaks. The manufacturer is not responsible for damage due to water leaks.

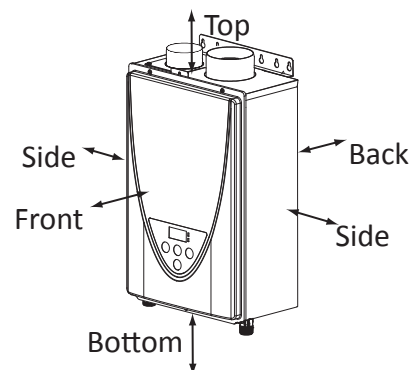


- **The warranty will not cover damage caused by water quality.**
 - Only potable water can be used with this water heater. Do not introduce pool or spa water, or any chemically treated water into the water heater.
 - Water hardness levels must not exceed 7 grains per gallon (120 ppm) for single family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

CLEARANCES



Maintain all clearances around the water heater.



Model	Top	Bottom	Front	Back	Sides
110U Indoor (AT-KJr3U-IN)* 310U Indoor (AT-K5U-IN)* 510U Indoor (AT-D3U-IN)*	12 in. (305 mm)	12 in. (305 mm)	4 in.** (102 mm)	1.0 in. (25 mm)	3 in. (76 mm)
110U Outdoor (AT-KJr3U-OS)*** 310U Outdoor (AT-K5U-OS)*** 510U Outdoor (AT-D3U-OS)***	36 in. (914 mm)	12 in. (305 mm)	24 in. (610 mm)	1.0 in. (25 mm)	3 in. (76 mm)

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

**24 inches recommended for maintenance.

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

INCLUDED ACCESSORIES

Installation manual and Owner's guide	Temperature remote controller kit (Outdoor model only)	Communication cable 510U (AT-D3U-IN/OS) only	LP Conversion Kit (100270585)
 Qty: 1	9009069005 (TM-RE42) Qty: 1	 Qty: 1 (320273-585)	(319143-581) Manifold attachment : 2 Small / 1 Large Manifold gasket (319143-581): 1 Gas conversion sticker : 1 Gas conversion instruction : 1 Spare Screw : 2

OPTIONAL ITEMS

#	Model	110U Indoor (AT-KJr3U-IN)	110U Outdoor (AT-KJr3U-OS)	310U Indoor (AT-K5U-IN)	310U Outdoor (AT-K5U-OS)	510U Indoor (AT-D3U-IN)	510U Outdoor (AT-D3U-OS)
1.	4" Backflow preventer and F-F adaptor	✓		✓		✓	
	4" Universal Appliance Adaptor, F-F adaptor, backflow preventer, condensate drain trap	✓		✓		✓	
2.	Pipe cover	✓	✓	✓	✓	✓	✓
3.	Recess box (Retrofit)		✓		✓		✓
	Recess box (New construction)		✓		✓		✓
4.	Sidewall vent terminator (Hood) and Wall thimble	✓		✓		✓	
	Sidewall vent terminator (Round) and Wall thimble	✓		✓		✓	
5.	Direct-vent concentric termination	✓		✓		✓	
6.	Remote controller	✓	Included	✓	Included	✓	Included

1. 4" Backflow preventer and Female-female adaptor



9007996005



9008146004

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

9007996005 (4" Backflow preventer and F-F adaptor): Must be installed in the vertical position.

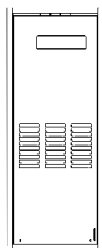
9008146005 (4" Universal Appliance Adaptor, F-F adaptor, backflow preventer, condensate drain trap): Must be installed in the vertical position on the heater's flue collar.

2. Pipe cover: 9007670005 (TK-PC01)



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

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



100266729

Outdoor recess box for retrofit applications-no flange



100266730

Outdoor recess box for new construction applications-with flange

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



Terminator Hood



Wall Thimble

Covering wall thicknesses	Part#
Terminator Hood	9007999005
Wall Thimble 4 - 7 in.	9008345005
Wall Thimble 5 - 10 in.	9008346005
Termination + Thimble 4 - 7 in.	9008004005
Termination + Thimble 5 - 10 in.	9008005005

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

Sidewall vent termination (Round) and Wall thimble:

Covering wall thicknesses	Part#
Termination	9008899005
Wall Thimble	9008898005
Termination + Thimble	9008900005



9008899005
(Termination)



9008898005
(Wall Thimble)

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

9008900005 (Termination + Thimble)

5. Direct-vent concentric termination:



Covering wall thicknesses	Part#
5.0 – 10.0 in.	9008147005
12.0 – 18.0 in.	9008148005

This component is used to terminate direct-vent (sealed combustion) systems with indoor models that require a 3 in. intake and a 4 in. exhaust. This concentric termination provides the convenience of only having to make one penetration through a sidewall instead of two separate penetrations for the intake and exhaust piping. The termination includes a bird screen, restricting small animals, pests, and foreign objects from entering into the vent system. This sidewall termination is available in two different sizes to cover a wide range of wall thicknesses. For different wall thicknesses, there are two ranges of lengths available. (Refer to the venting manufacturer's specifications for details.)

6. Remote controller: 9009069005 (TM-RE42)



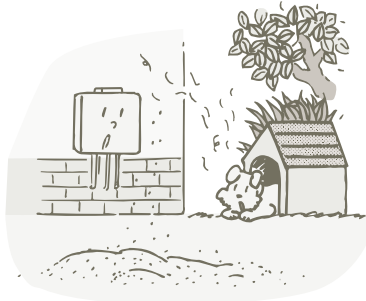
WARNING FOR INSTALLATIONS

FOR YOUR SAFETY, READ BEFORE INSTALLATION:

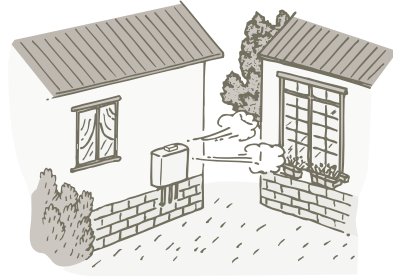
Do not install the heater where water, debris or flammable vapors may get into the flue terminal. This may cause damage to the heater and void the warranty.



Prohibited

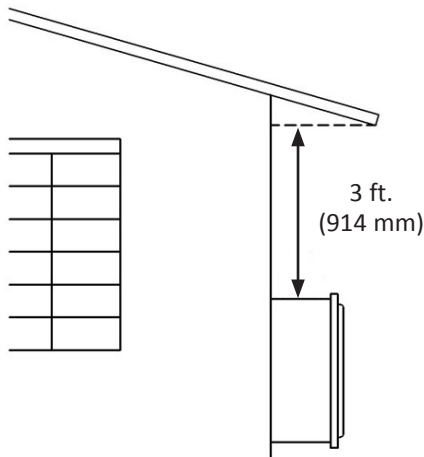


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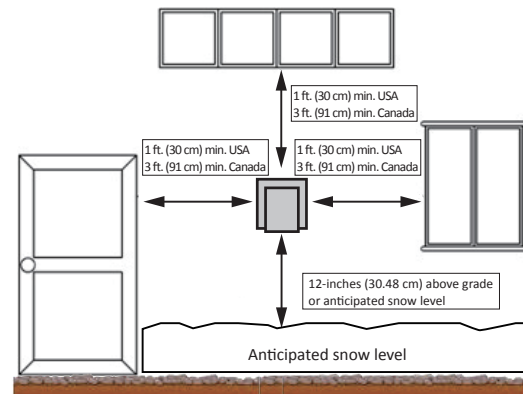


Do not have the vent terminal pointing toward any opening into a building. Do not locate your water heater in a pit or location where gas and water can accumulate.

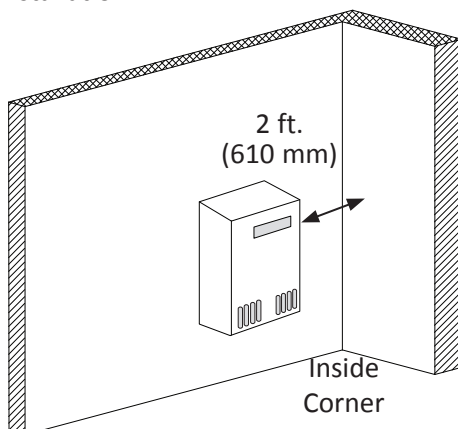
Do not install this water heater under an overhang less than 3 ft. (914 mm) from its top or eaves. The area under an overhang must be open to three sides (Outdoor models only).



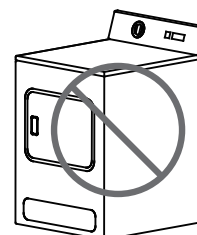
Do not install the water heater direct vent terminator within 1 ft. (30 cm) in the USA or within 3 ft. (91 cm) in Canada of any air intake or building opening, and within 3 ft. (91 cm) in Canada of any air intake or building opening (Refer to pp. 24 and 25.).



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




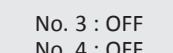

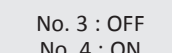

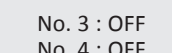

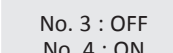

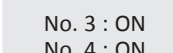










Do not install next to a dryer or any source of airborne debris that can be trapped inside the combustion chamber, unless the system is direct-vented. The air intake must maintain a safe distance from the dryer's exhaust vent. This will help to prevent lint from being drawn into the water heater's air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




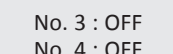

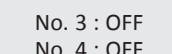

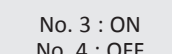






HIGH-ALTITUDE INSTALLATIONS

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

Indoor models

Altitude DIP switches	0 to 2,000 ft. (0 to 610 m) (DEFAULT)	2,001 to 3,000 ft. (611 to 914 m)	3,001 to 5,000 ft. (915 to 1,524 m)	5,001 to 7,500 ft. (1,525 to 2,286 m)	7,501 to 10,100 ft. (2,287 to 3,078 m)
110U (AT-KJr3U) and 310U (AT-K5U) models	ON  OFF  No. 3 : OFF No. 4 : OFF No. 5 : OFF	ON  OFF  No. 3 : OFF No. 4 : ON No. 5 : OFF	ON  OFF  No. 3 : OFF No. 4 : OFF No. 5 : ON	ON  OFF  No. 3 : OFF No. 4 : ON No. 5 : ON	ON  OFF  No. 3 : ON No. 4 : ON No. 5 : ON
510U (AT-D3U) model (Lower bank of DIP switches)	ON  OFF  No. 2 : OFF No. 3 : OFF No. 4 : OFF	ON  OFF  No. 2 : OFF No. 3 : ON No. 4 : OFF	ON  OFF  No. 2 : OFF No. 3 : OFF No. 4 : ON	ON  OFF  No. 2 : OFF No. 3 : ON No. 4 : ON	ON  OFF  No. 2 : ON No. 3 : ON No. 4 : ON

Outdoor models

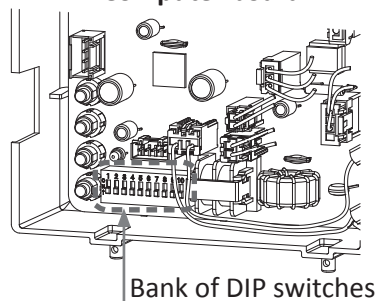
Altitude DIP switches	0 to 2,000 ft. (0 to 610 m) (DEFAULT)	2,001 to 4,000 ft. (611 to 1,219 m)	4,001 to 6,000 ft. (1,220 to 1,829 m)
110U (AT-KJr3U) and 310U (AT-K5U) models	ON  OFF  No. 3 : OFF No. 4 : OFF No. 5 : OFF	ON  OFF  No. 3 : OFF No. 4 : OFF No. 5 : ON	ON  OFF  No. 3 : ON No. 4 : OFF No. 5 : ON
510U (AT-D3U) model (Lower bank of DIP switches)	ON  OFF  No. 2 : OFF No. 3 : OFF No. 4 : OFF	ON  OFF  No. 2 : OFF No. 3 : OFF No. 4 : ON	ON  OFF  No. 2 : ON No. 3 : OFF No. 4 : ON

Installation altitude

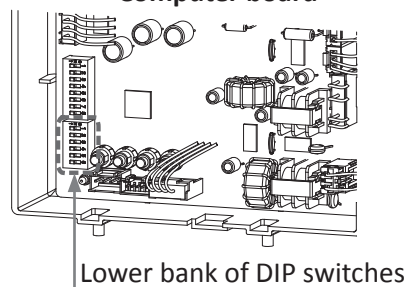
The maximum certified or allowable installed altitude is 10,100 ft. (3,078 m) for indoor models and 6,000 ft. (1,829 m) for outdoor models.

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

110U (AT-KJr3U-IN/OS) and 310U (AT-K5U-IN/OS)
Computer board



510U (AT-D3U-IN/OS)
Computer board



VENTING INSTRUCTIONS

For indoor models -General-



- 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 the section "Venting of Equipment" of the current edition of the National Fuel Gas Code: ANSI Z223.1/NFPA 54, as well as applicable local building codes.

The manufacturer recommends NovaVENT™ or Z-Vent® category III, single wall, stainless steel venting. See "Approved Category III, Single Wall, Stainless Steel Venting Suppliers and Part Numbers" on page 14.

General rules for air intake:

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

- The air intake can use 3" PVC (solid core), CPVC (solid core), ABS, or category III vent.
- Use of cellular core PVC (ASTM F891), cellular core CPVC, or Radel® (polyphenylsulfone) in non-metallic venting systems is prohibited. Covering non-metallic vent pipe and fittings with thermal insulation is prohibited.
- Ensure that the installation location has sufficient, clean combustion air. If unsure, direct vent the heater or refer to the Combustion Air Supply section below.

Direct venting installation:

- The maximum length of intake air piping must not exceed 60 ft. (18.3 m). Deduct 5 ft. (1.5 m) for each 90° elbow or 2.5 ft (0.76 m) for each 45° elbow used in the venting system. Two 45° elbows when connected together are equivalent to one 90° elbow. Refer to the tables on p. 19.
- When the horizontal air intake exceeds more than 5 ft., support the pipe every 3 ft. with pipe hangers.
- Vertical air intake pipe must be supported with pipe hangers. Ensure that the weight of the pipe is not carried by the water heater.

Combustion air from the room:

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

General rules for venting water heaters are:

- Place the water heater as close as possible to the vent termination.
- The vent collar of the water heater must be fastened directly to an unobstructed vent pipe.
- Do not weld the vent pipe to the water heater's vent collar.
- Do not cut or alter the shape of the vent collar of the unit.
- The vent must be easily removable from the top of the water heater for normal service and inspection of the unit and vent system.
- The water heater vent must not be connected to any other gas appliance or vent stack.
- Avoid using an oversized vent pipe or using extremely long runs of pipe.
- For rooftop venting, a rain cap or other form of termination that prevents rain water from entering into the water heater must be installed.
- Do not common vent or connect any vent from other appliances to the water heater vent.

- A condensate collector is required for horizontal and/or vertical vent runs exceeding 5 ft. of equivalent length (not including sidewall terminations).
- A backflow preventor should be installed in the exhaust when the heater is installed in climates subject to freezing temperatures.

General rules for vent terminations:

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

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

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

Description	Heater Vent Kits	Z-FLEX®	
		NovaVENT™	Z-VENT™
4" Straight pipe - 6" length	9007987005	2NVP4.5	2SVEPWCF0406
4" Straight pipe - 12" length	9007986005	2NVP41	2SVEPWCF0401
4" Straight pipe - 24" length	9007984005	2NVP42	2SVEPWCF0402
4" Straight pipe - 36" length	9007983005	2NVP43	2SVEPWCF0403
4" Straight pipe - 48" length	9007982005	2NVP44	2SVEPWCF0404
4" Adjustable straight pipe - 10"-18" adjustability	9007985005	2NVAL4	2SVSPA04
4" 45 degree elbow	9007981005	2NVE445	2SVEEWCF0445
4" 90 degree elbow	9007980005	2NVE490	2SVEEWCF0490
4" Sidewall termination (4" Termination Hood)	9007999005	2NVHTX4	2SVSHTX04
4" Vent termination tee	9008144005	2NVTT4	2SVSTTF04
4" Rain Cap	9007995005	2NVRC4	2SVSRCF04
4" Extreme weather rain cap	9008145005	2NVWC4	2SVSHRC04
4" Horizontal drain tee	9007994005	2NVHD4	2SVEDWCF04
4" Vertical drain tee	9007993005	2NVVD4	2SVEVDP04
4" wall thimble length 4"-7" wall thickness	9008345005	2NVWT4	2SVSWTF04
4" wall thimble length 5"-10" wall thickness	9008346005	2NVWT4L	2SVSWTEF04
4" 3-in-1 adaptor (F-F adaptor, condensate drain, & back-flow preventer)	9008146005	2NVBFA4	2SVBFDPA04
4" F-F adaptor	9007979005	2NVAFF4	2SVEEWCF0445
4" Backflow preventer w/ F-F adaptor	9007996005	2NVBFU4	2ZVB04
4" exhaust / 3" intake DV concentric termination - 5"-10" adjustability	9008147005	2NVHTC43S	2SVSHTC43S
4" exhaust / 3" intake DV concentric termination - 12"-18" adjustability	9008148005	2NVHTC43	2SVSHTC43
4" Sidewall termination, adjustable pipe	9008899005	2NVBV4	n/a
4" Wall Thimble, 3"-6" wall thickness	9008898005	2NVBT4	n/a

-Combustion Air Supply-



WARNING

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

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

Before beginning

Calculate total BTU/h rating of all appliances.

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

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

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

Example:

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

Your appliances:

Gas Burning Appliance	BTU/h Rating
Gas Water Heater	
Total	

Does your installation space have sufficient combustion air?

Ventilation with outside air is recommended for all installations. Even if the water heater is installed in a large, open room inside the house, outdoor air is usually needed because modern homes are very tightly sealed and often do not supply enough air to the water heater. However, when installed in a large indoor space, it may be possible to provide enough air without outside ventilation. If you are unsure if your installation location has enough ventilation, contact your local gas utility company or code officials for a safety inspection or direct vent.

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

Check for Chemicals:

Installations where corrosive chemicals may be present require the water heater to be direct vented. Air for combustion and ventilation must be clean and free of corrosive or acid-forming chemicals such as sulfur, fluorine, and chlorine. Ventilation with outside air will reduce these chemicals, but it may not completely eliminate them. Failure due to corrosive chemicals is not covered by the warranty. Examples of locations that require outside air due to chemicals include:

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

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

Calculate the air volume of the room

Air requirements depend on the size of the room.

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

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 cubic feet 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:

$$(235,000 / 1000) \times 50 = 11,750$$

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

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

Install with outside ventilation

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

Supplying outside air to the water heater typically requires two openings. One opening must be within 12 inches from the floor and the second opening must be within 12 inches from the ceiling. Although a single opening is not preferred, you may use a single opening to outside air if the minimum free area is sized according to **Table 1**. Two openings must be used when ventilating with air from another room.

The outside air can be taken from a crawl space or attic open to the outdoors and adequately ventilated. You may use vertical or horizontal ducts.

Determine type of ventilation

There are several types of ventilation that can be used :

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

Determine minimum free area required for each vent opening

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

Calculate minimum size of vent openings and ducts

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

Use the following formula to calculate the required cross-sectional area:

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

For example, an installation area that requires openings with 100 square inches of free area would need 134 square inch openings if using metal louvers rated at 75% free area (100 sq. in. ÷ 0.75 = 134 sq. in.).

If you do not know the % free area for your louver or grill, use the following values:

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

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

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

Check that air source is clean and free of chemicals

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

Table 1 Minimum Free Area of Permanent Openings for Ventilation and Combustion Air Supply – Air from outdoor or indoor spaces. Based on the total BTU/h input rating for all gas burning appliances within a confined space.	
Opening Source	Minimum Free Area
Direct to outdoors*	1 sq. in. per 4,000 BTU/hr (see Figure 1, 2)
Vertical ducts	1 sq. in. per 4,000 BTU/hr (see Figure 3)
Horizontal ducts	1 sq. in. per 2,000 BTU/hr (see Figure 4)
Single Opening	1 sq. in. per 3,000 BTU/hr (see Figure 5)
Two permanent openings to another room**	1 sq. in. per 1,000 Btu/hr (see Figure 6) Opening: 100 in. ² MIN. Minimum dimension of air openings: no less than 3 in.
*These openings connect directly with the outdoors through a ventilated attic, a ventilated crawl space, or through an outside wall.	
** For direction on combining spaces in different stories within the structure, refer to the current edition of the National Fuel Gas Code ANSI Z223.1/NFPA 54.	

See graphics on next page.

Combustion Air Supply Options

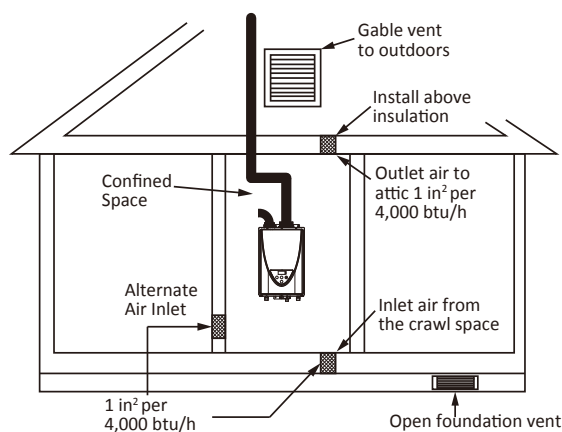


Figure 1 - Direct to outdoors openings

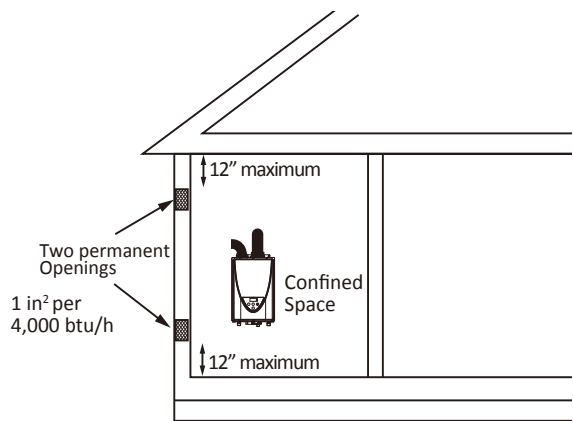


Figure 2 - Direct to outdoors openings
Two permanent openings

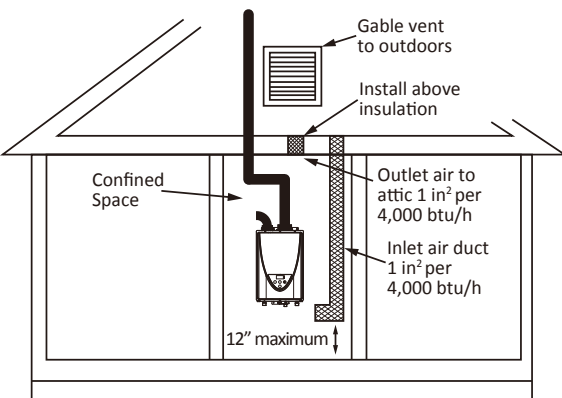


Figure 3 - Vertical duct openings

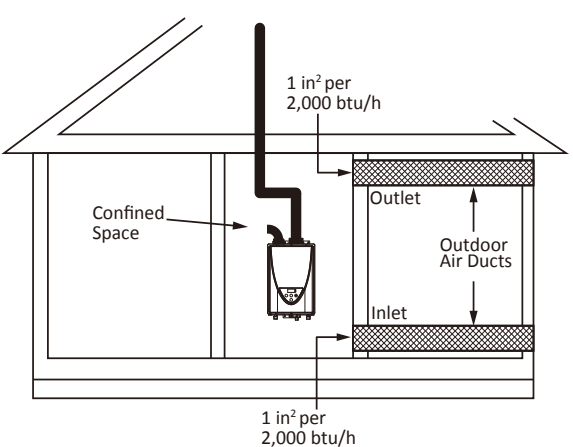


Figure 4 - Horizontal duct openings

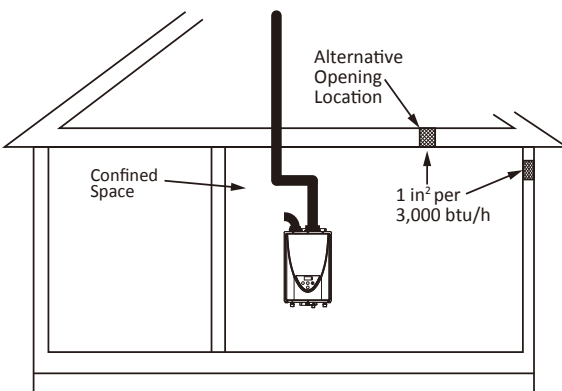


Figure 5 - Single opening

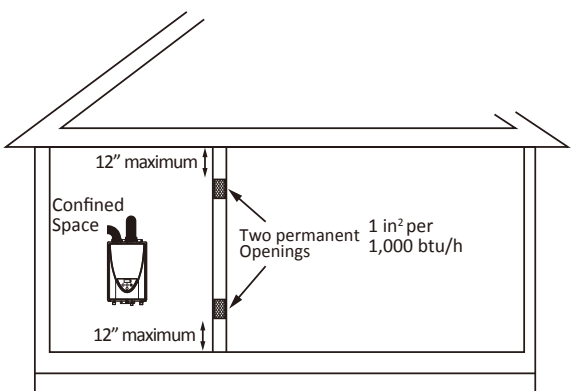


Figure 6 - Two permanent openings

-Vent length and No. of Elbows-

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

- This water heater is a Category III appliance and must be vented accordingly with any 4 in. (102 mm) vent approved for use with Category III or Special BH type gas vent.
- **Follow the vent pipe manufacturer's instructions when installing the vent pipe.**
- **Do not common vent this appliance with any other vented appliance.** (Do not terminate vent into a chimney. If the vent must go through the chimney, the vent must run all the way through the chimney with Category III approved or Special BH vent pipe.)
- When the horizontal vent run exceeds 5 ft. (1.5 m), support the vent run at 3 ft. (0.9 m) intervals with overhead hangers.
- The maximum length of exhaust vent piping must not exceed **60 ft. (18.3 m)***. Deduct 5 ft. (1.5 m) for each 90° elbow used in the venting system. Do not use more than **6 elbows**. A 45° elbow is equivalent to 2.5 ft. of vent length.

*If vent termination kit **9008900005** is used in the installation, the maximum length of **exhaust** vent pipe must not exceed **55 ft. (16.8 m)**, and the vent run must not exceed 5 elbows. Vent termination kit 9008900005 also has specific DIP switch settings. Refer to p. 22.

Standard Vent Terminations (See the next table for vent termination 9008900005.)

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

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

No. of Elbows	Max. Vertical or Horizontal Vent Length	No. of Elbows	Max. Vertical or Horizontal Vent Length
0	60 ft. (18.3m)	4	40 ft. (12.2 m)
1	55 ft. (16.8 m)	5	35 ft. (10.7 m)
2	50 ft. (15.2 m)	6	30 ft. (9.1 m)
3	45 ft. (13.7 m)		

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

Installation with vent termination kit 9008900005

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

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

****For Intake vent, refer to the above table of the installation of 6 elbows and 60 ft.**

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

Excludes sidewall termination.

-DIP Switch Settings for Vent Length-



DANGER

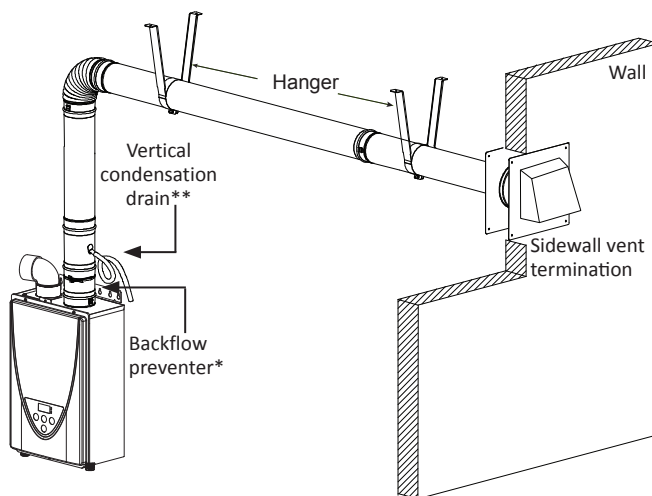
- Improper venting of this appliance can result in excessive levels of carbon monoxide which can result in severe personal injury or death.
- Improper installation can cause nausea or asphyxiation, severe injury or death from carbon monoxide and flue gases poisoning. Improper installation will void product warranty.
- Specific DIP switch settings are required depending on the length of your vent run and the type of vent installation. Refer to the following sections for details:
 - Single Pipe with Room Air (page 20)
 - Two-pipe Direct Vent (page 21)
 - Vent kit of 9008900005 (page 22)
 - Outdoor Installation (page 22)

Single Pipe with Room-Air Intake

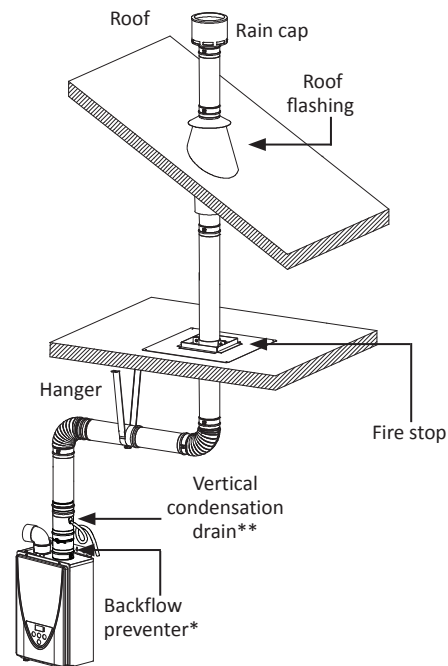
DIP switch settings for single pipe with room-air intake

110U Indoor (AT-KJr3U-IN) 310U Indoor (AT-K5U-IN)	510U Indoor (AT-D3U-IN) (Upper bank of DIP switches)	Vent length
ON 1 2 3 4 5 6 7 8 9 10 OFF	ON 1 2 3 4 5 6 7 8 OFF	No. 6 : O N No. 7 : OFF No. 8 : OFF
No. 3 : O N No. 4 : OFF No. 5 : OFF	No. 3 : O N No. 4 : OFF No. 5 : OFF	0 to 60 ft. (0 to 18.3 m)

Horizontal Installation



Vertical Installation









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

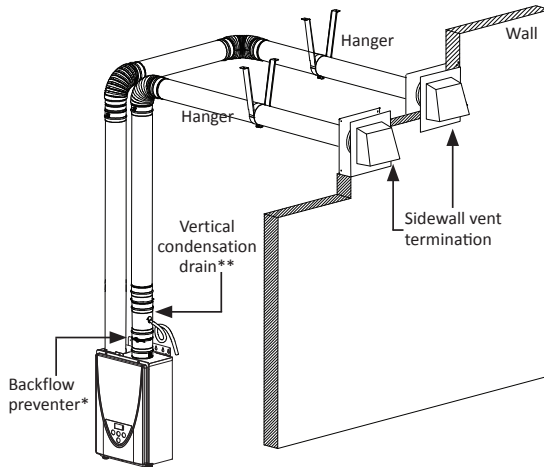
**Vertical condensation drain must be installed in accordance with local codes. It is required to be installed in the venting system when there is more than 5 ft. (1.5 m) of equivalent vent length, not including the sidewall termination. 90° elbow is equivalent to 5 ft. (1.5 m) of vent length.

Two-Pipe, Direct-Vent Installation Examples

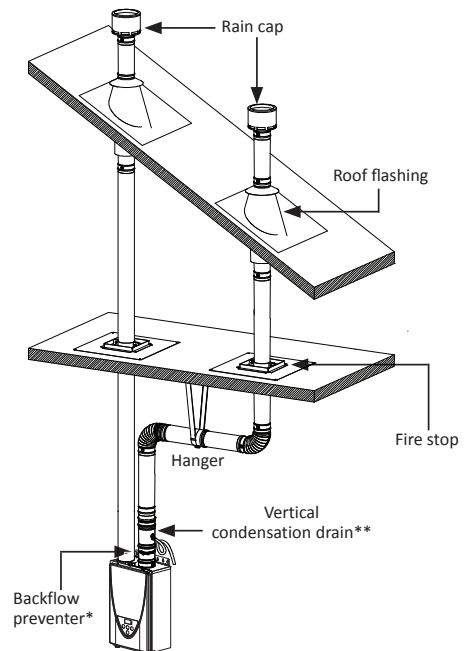
DIP switch settings for direct vent installation

110U Indoor (AT-KJr3U-IN) 310U Indoor (AT-K5U-IN)	510U Indoor (AT-D3U-IN) (Upper bank of DIP switches)	Vent length
ON 1 2 3 4 5 6 7 8 9 10 OFF  No. 6 : ON No. 7 : OFF No. 8 : OFF	ON 1 2 3 4 5 6 7 8 OFF  No. 3 : ON No. 4 : OFF No. 5 : OFF	0 to 20 ft. (0 to 6.1 m)
ON 1 2 3 4 5 6 7 8 9 10 OFF  No. 6 : OFF No. 7 : OFF No. 8 : OFF	ON 1 2 3 4 5 6 7 8 OFF  No. 3 : OFF No. 4 : OFF No. 5 : OFF	21 to 40 ft. (DEFAULT) (6.2 to 12.2 m)
ON 1 2 3 4 5 6 7 8 9 10 OFF  No. 6 : ON No. 7 : ON No. 8 : OFF	ON 1 2 3 4 5 6 7 8 OFF  No. 3 : ON No. 4 : ON No. 5 : OFF	41 to 60 ft. (12.3 to 18.3 m)

Horizontal Installation



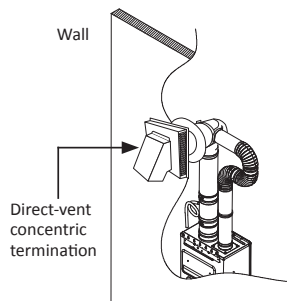
Vertical Installation



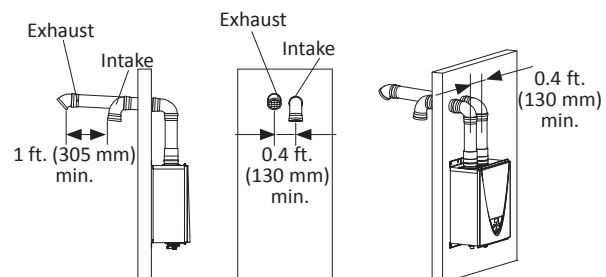
*Backflow preventer (Recommended for freezing weather conditions: 36 °F (2 °C) and below).

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

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


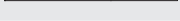

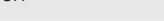


Direct-vent sidewall Installation (Refer to p.23)

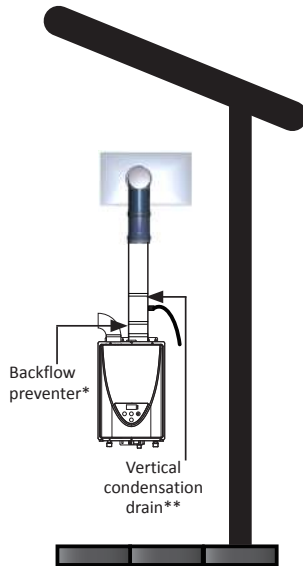


Horizontal Installation with the 9008900005 vent kit

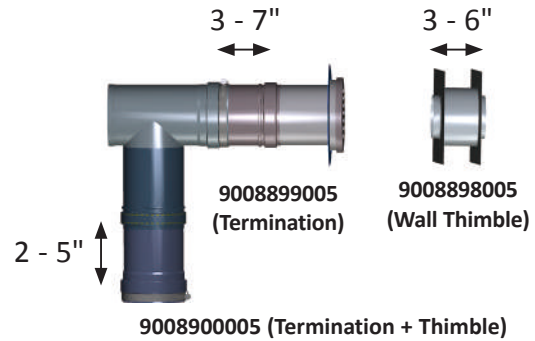
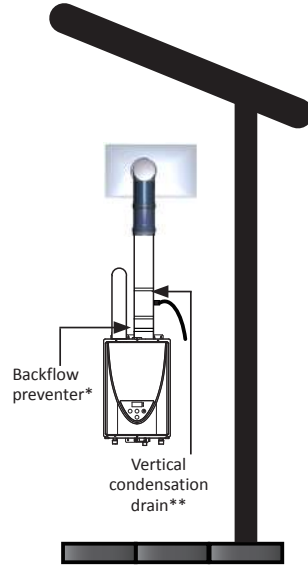
For the Direct vent kit of 9008900005, set the following DIP switch settings.

110U Indoor (AT-KJr3U-IN) 310U Indoor (AT-K5U-IN)	510U Indoor (AT-D3U-IN) (Upper bank of DIP switches)	Vent length
ON  OFF 	ON  OFF 	0 to 55 ft. (0 to 16.8 m)

**Single Pipe
with Room-Air Intake**



**Two-Pipe, Direct-vent
sidewall Installation**




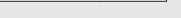

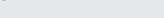
Covering wall thicknesses	Part#
Termination	9008899005
Wall Thimble	9008898005
Termination + Thimble	9008900005

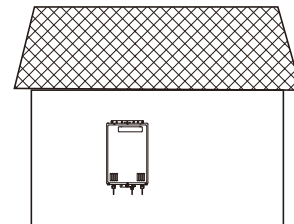
*Backflow preventer (Recommended for freezing weather conditions: 36 °F (2 °C) and below.)

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

Outdoor Installation DIP switch settings

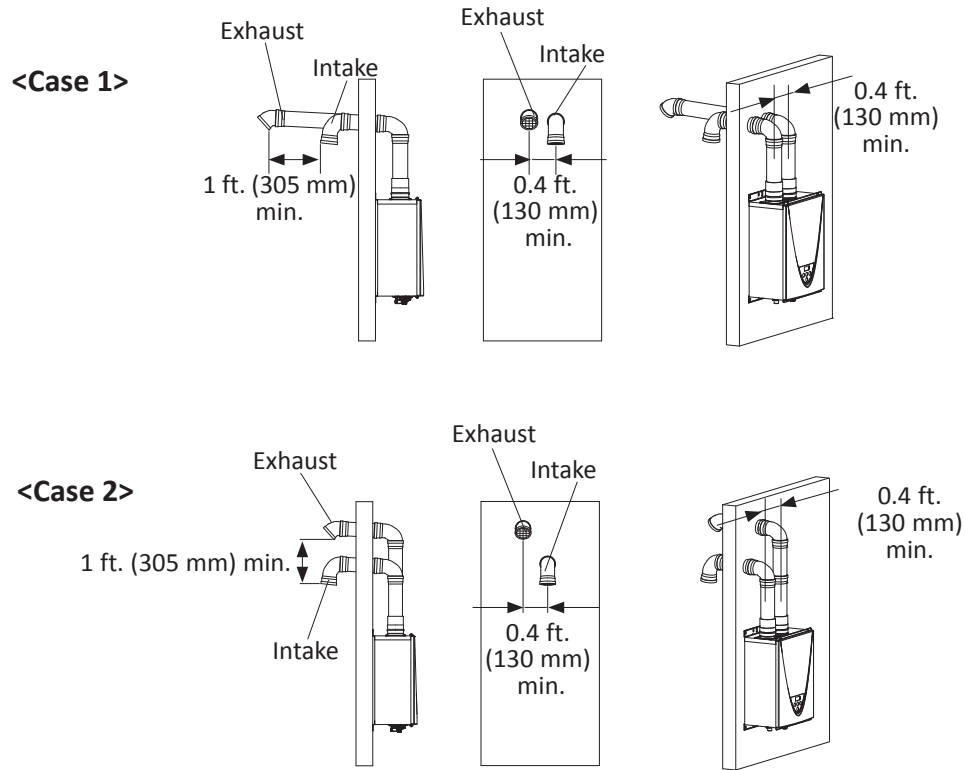
Outdoor installation

110U Outdoor (AT-KJr3U-OS) 310U Outdoor (AT-K5U-OS)	510U Outdoor (AT-D3U-OS) (Upper bank of DIP switches)
ON  OFF 	ON  OFF 

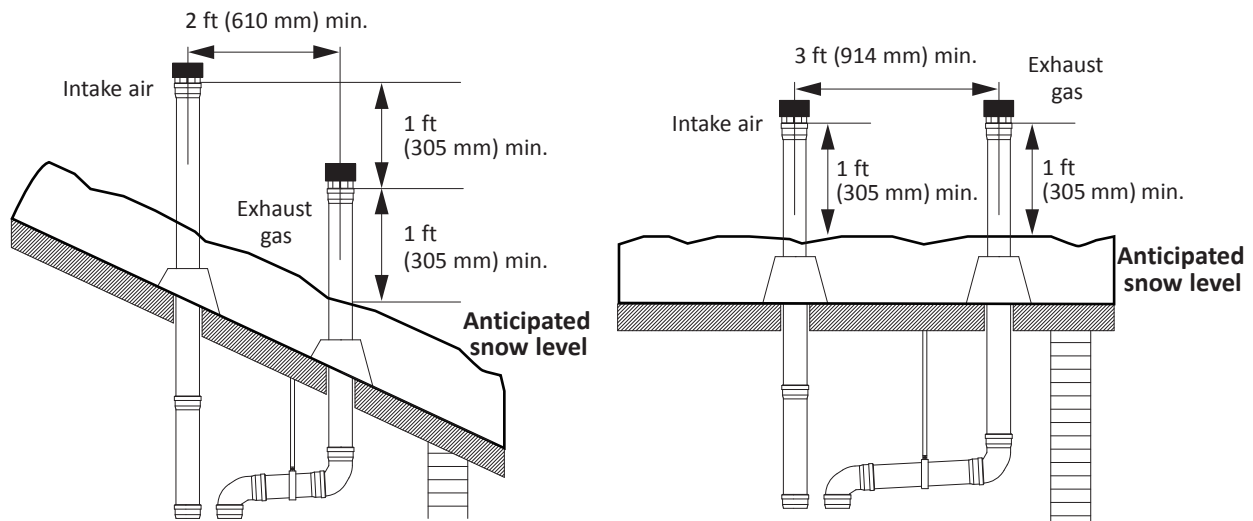


-Clearances for sidewall terminations-

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

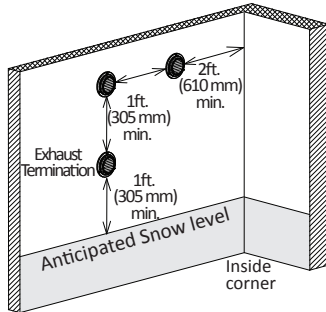


-Clearances for rooftop terminations-

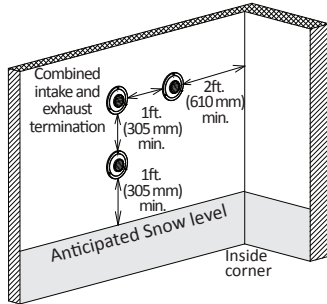


- Exhaust terminations must be at least 1 ft. (305 mm) away from any obstructions.
- In lieu of using roof caps, a 90 degree elbow and 45 degree elbow can be used for the exhaust, and two 90 degree elbows can be used for the air intake.

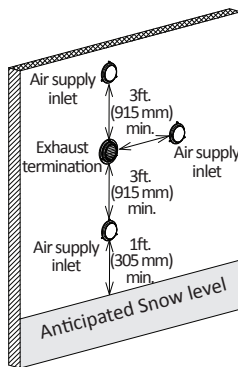
-Clearances for multiple sidewall terminations-



For multiple sidewall exhaust terminations (e.g. multi-unit systems), 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.

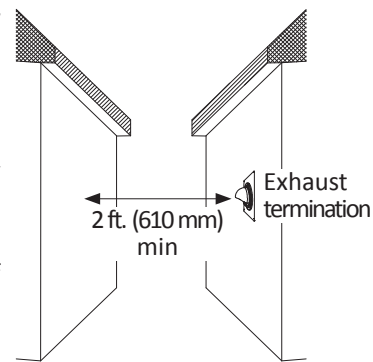


For multiple-unit, direct-vent sidewall terminations that combine the intake and exhaust into a single penetration, space each direct-vent termination at least 1 ft. (305 mm) away from each other, no matter the orientation. A direct-vent termination must also be at least 2 ft. (610 mm) away from an inside 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.

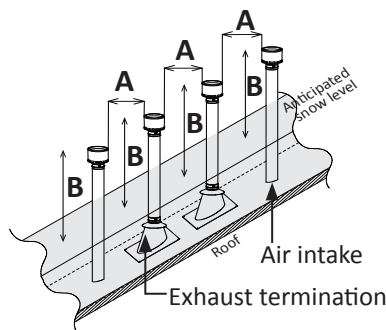


For direct-vent sidewall terminations that use two separate penetrations for the intake and exhaust, distance the intake and exhaust terminations at least 3 ft. (915 mm) away from each other, no matter the orientation unless they follow case 1 and 2 on p. 23.

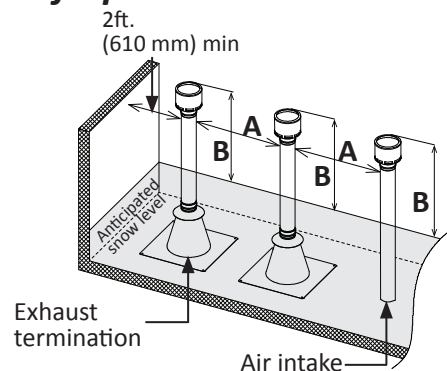
Exhaust and/or direct-vent sidewall terminations should be at least 2 ft. (610 mm) away from an opposite surface/wall. Do not place the termination directly in front of an opening into a building.



-Clearances for multiple rooftop terminations-



A & B- In accordance with local codes

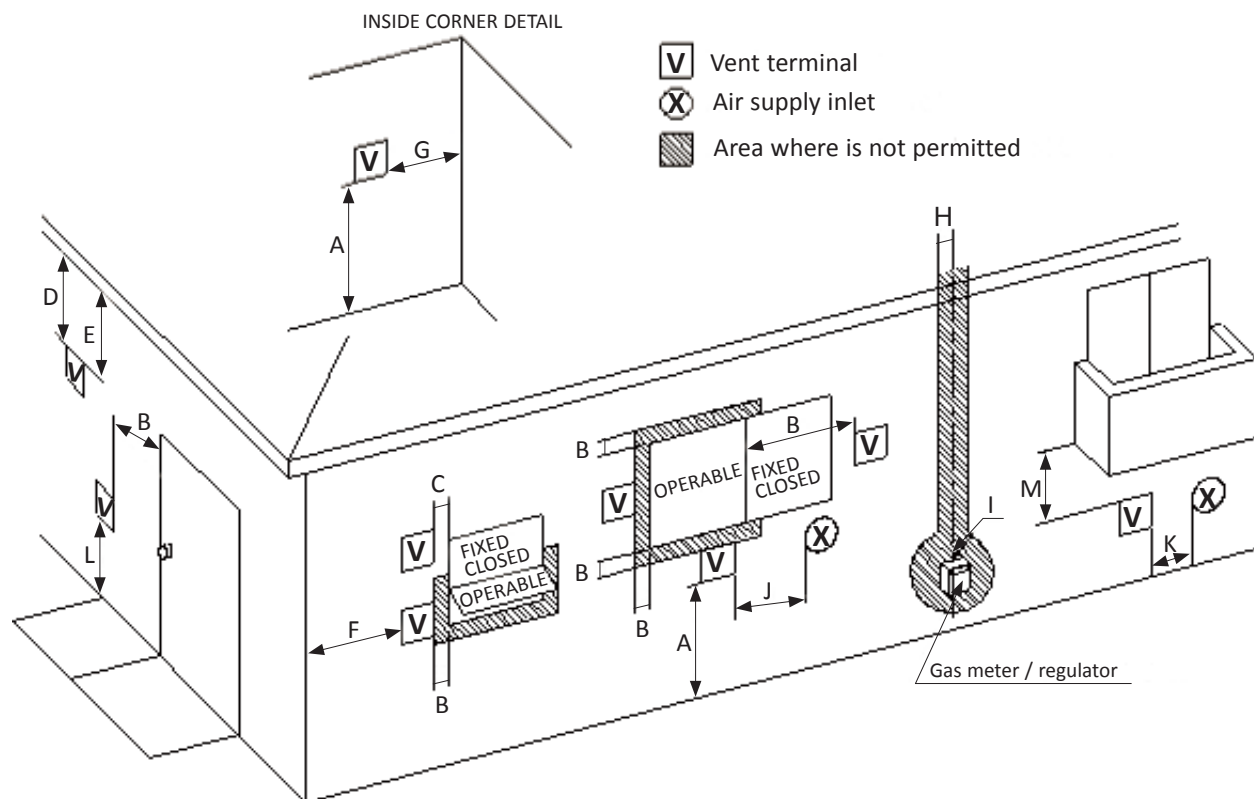


For multiple-unit rooftop terminations (whether for standard or direct-vent installations) space all exhaust and intake terminations in accordance with local codes. An exhaust termination must be spaced from a wall or surface in accordance with local codes as well. In the absence of such a code, an exhaust termination must be a horizontal distance of at least 2 ft. (610 mm) away from a wall or surface.



Please follow all local and national codes in regards to proper termination clearances. In the absence of such codes, the above clearances can be used as guidelines. Local codes supersede these guidelines.

-Vent termination clearances-



		Canada	U.S.A	
		Direct-vent and other than Direct-vent	Direct-vent	Other than Direct-vent
A	Clearance above grade, veranda, porch, deck, or balcony	1 foot (30 cm)	1 foot (30 cm)	1 foot (30 cm)
B	Clearance to window or door that may be opened	3 feet (91 cm)	1 foot (30 cm)	4 feet (122 cm) from below or side opening. 1 foot (30 cm) from above opening.
C	Clearance to permanently closed window	*	*	*
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	*	*	*
E	Clearance to unventilated soffit	*	*	*
F	Clearance to outside corner	*	*	*
G	Clearance to inside corner	2 feet (61 cm)	2 feet (61 cm)	*
H	Clearance to each side of center line extended above meter/regulator assembly	3 feet (91 cm)	*	*
I	Clearance to service regulator vent outlet	3 feet (91 cm)	*	*
J	Clearance to non-mechanical air supply inlet to building or the combustion air inlet to any other application	3 feet (91 cm)	1 foot (30 cm)	4 feet (122 cm) from below or side opening. 1 foot (30 cm) from above opening.
K	Clearance to mechanical air supply inlet.	6 feet (1.83 m)	3 feet (91 cm)	3 feet (91 cm)
L	Clearance above paved sidewalk or paved driveway located on public property	7 feet (2.13 m)	*	7 feet (2.13 m)
M	Clearance under veranda, porch deck, or balcony	1 foot (30 cm)	*	*

*For clearances not specified in ANSI Z223.1 / NFPA 54 (USA) or B149.1 (Canada), please use clearances in accordance with local installation codes and the requirements of the gas supplier.

GAS SUPPLY AND GAS PIPE SIZING

-General-



WARNING

- Do not use this water heater with any gas other than the one listed on the rating plate unless the water heater has been properly converted.
- Ensure that any and all gas regulators used are operating properly and providing gas pressures within the specified range shown below. Excess gas inlet pressure may cause serious accidents.
- If your water heater needs a gas conversion, refer to the instructions supplied with the water heater and included with the conversion components.

- Minimum and maximum inlet gas pressures:

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

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

-Gas connections-

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

NOTICE

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

-Natural Gas Supply Piping-

Maximum delivery Capacity 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 110U, 190 Cubic ft./hr for 310U, and 199 Cubic ft./hr for the 510U model.

The following tables are from NFPA 54

Unit: Cubic feet per hour

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

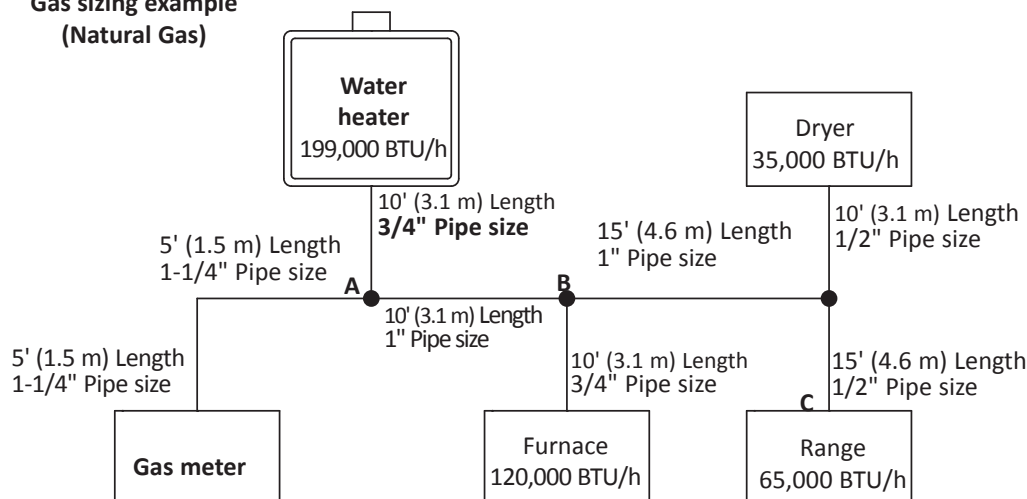
-Propane (LP) Supply Piping-

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

Unit: kBTU per hour

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

Gas sizing example (Natural Gas)



Based on Energy Content of 1,000 BTU/Cubic ft:
Divide each appliance's BTU/h requirement by 1,000 BTU/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.

-Measuring inlet gas pressure-

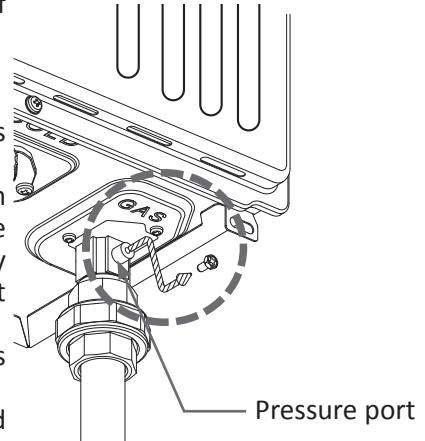


WARNING

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.

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

1. Shut off the manual gas valve on the gas supply line.
2. Remove the screw for the pressure port located on the gas inlet of the water heater shown in the diagram on the right.
3. Connect the manometer to the pressure port.
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.
6. Measure gas supply pressure at maximum heater operation: Open up water faucets to create maximum flow. Press and hold the MAX button on the computer board. Take a reading of the supply dynamic gas pressure with all gas burning equipment running at maximum rate.
7. The static and dynamic pressures should be within the ranges specified on the heater's rating plate and the table on p. 26.
8. The difference of static to dynamic pressure should not exceed 1.5" W.C. Pressure drops that exceed 1.5" W.C. can indicate restricted gas flow, undersized gas lines, and/or undersized supply regulators.



WATER CONNECTIONS



WARNING

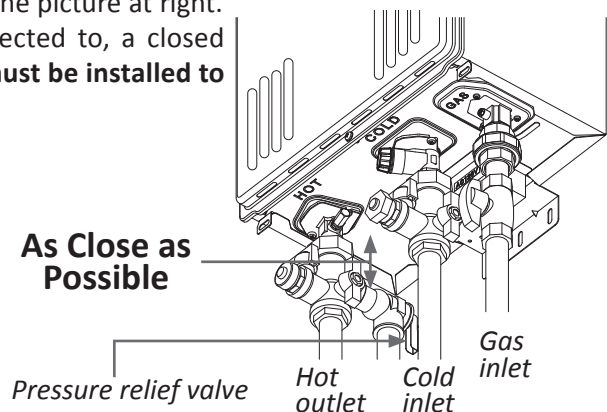
- Do not use this water heater if any part has been submersed under water. Do not attempt to repair the unit. It must be replaced. Failure to follow these instructions could lead to property damage, personal injury, or loss of life.

NOTICE

- Do not reverse the hot outlet and cold inlet connections to the water heater. This will not activate the water heater properly.

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

1. A manual shutoff valve must be installed on the cold water inlet to the water heater between the main water supply line and the water heater.
2. In addition, a **manual shutoff valve** is also recommended on the hot water outlet of the unit. **Isolation valves** are recommended as shown in the picture at right.
3. If the water heater is installed within, or subjected to, a closed loop water system, a **thermal expansion tank must be installed to handle thermal expansion.**
4. Before installing the water heater, flush the water line to remove all debris, and after installation is complete, purge the air from the line. Failure to do so may cause damage to the water heater.
5. There is a wire mesh filter within the cold inlet to trap debris from entering your heater. This will need to be cleaned periodically to maintain optimum flow. (Refer to p. 46.)



-Pressure relief valve-

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

- This unit does not come with an approved pressure relief valve.
- An approved pressure relief valve must be installed on the hot water outlet.
- The pressure relief valve must conform to the current edition of **ANSI Z21.22** or **CAN 1-4.4** and installation must follow local codes.
- The discharge capacity must be at least 140,000 BTU/h for the 110U model, 190,000 BTU/h for the 310U model, and 199,000 BTU/h for the 510U model.
- The pressure relief valve must be rated for a maximum of 150 psi (1 MPa).
- The discharge piping for the pressure relief valve must be directed so that the hot water cannot splash on anyone or on nearby equipment.
- 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.
WARNING! Hot water will be released. The contact of 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 OFF and call a qualified person to determine the cause.
- No valve shall be placed between the relief valve and the water heater.

ELECTRICAL CONNECTIONS



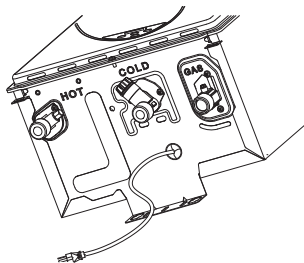
WARNING

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

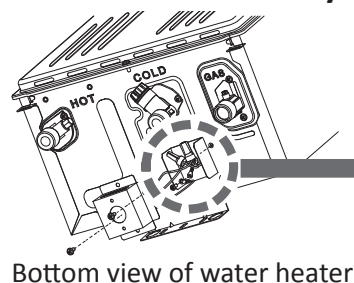
All indoor models come with a power plug instead of a junction box. The following procedure is for outdoor models only.

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

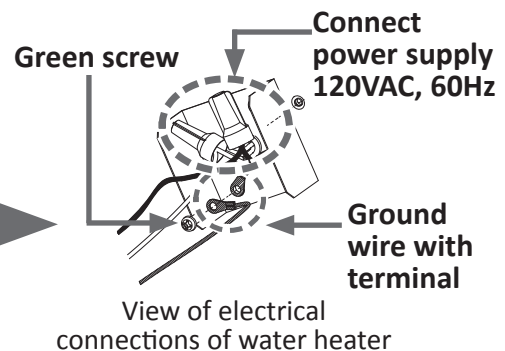
Indoor models only



Outdoor models only




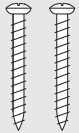

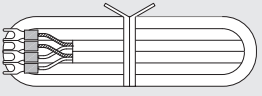
Bottom view of water heater



TEMPERATURE REMOTE CONTROLLER

-Included Accessories-Outdoor models only-

Check that these items below are included with the remote controller.

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

***9009069005 (TM-RE42)**

It is also an optional accessory as a second remote for the indoor models. The optional remote controller doesn't come with the remote cable. Refer to p. 9.

-Installation-



CAUTION

This remote controller is NOT waterproof.

The water heater can only have one remote controller at a time.

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.

- Do not place the remote control wiring close to other wires from other products.
- Do not extend the remote control wiring more than 400 ft. (122 m.)

Mounting and wiring the remote controller

1. Take off the “**Back plate**” from the remote controller with a flat head screwdriver. **(Fig. A and B)**
2. Attach the “**Back plate**” on the wall with the two provided screws. **(Fig. B)**

Fig. A

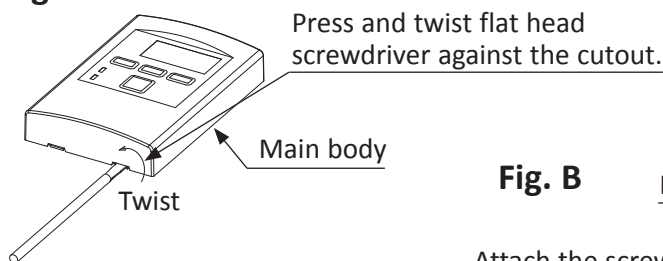
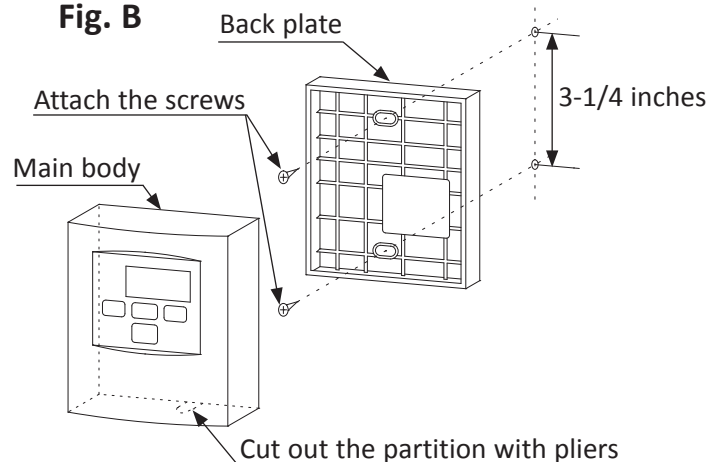


Fig. B



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

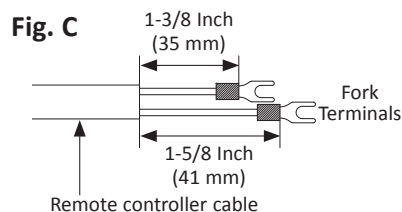


Fig. D-1

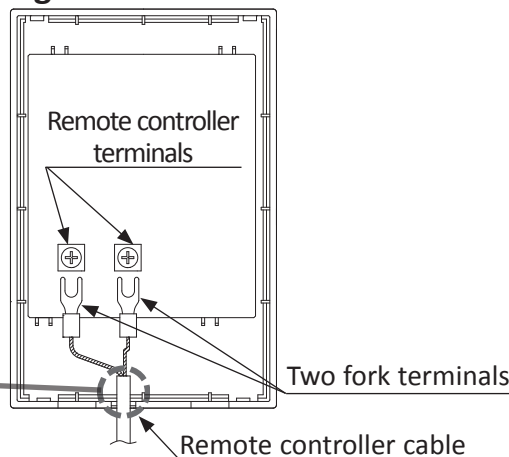
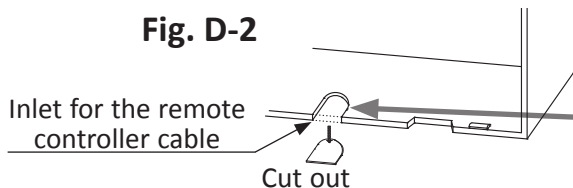


Fig. D-2



Wires used for the remote controller connection must be:

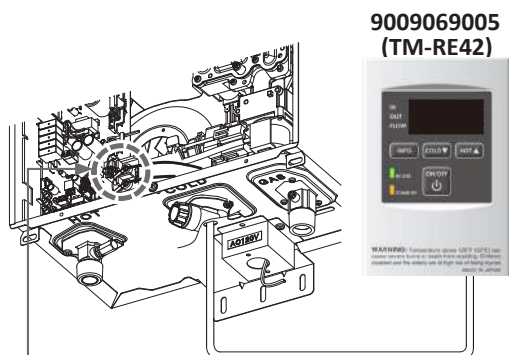
- Minimum 20 gauge wire (No polarity)
- Maximum 400 ft. (122 m) long

Connecting the remote controller to the water heater

1. Disconnect power supply from the water heater.
2. Take off the water heater's front cover.
3. Locate the two terminals for the remote controller in the water heater. (Refer to the Fig. E-1 and E-2.)
4. Put the remote controller cable through the hole at the bottom of the water heater's casing from outside.
5. Properly connect the two terminals attached to the end of the remote control wires to the terminals for the remote controller on or near the computer board with the screws. (No polarity)
- * **Do NOT jump or short-circuit the wires, or the computer will be damaged.**
6. Replace the water heater's front cover securely.

Fig. E-1

110U (AT-KJr3U-IN/OS) and 310U (AT-K5U-IN/OS)

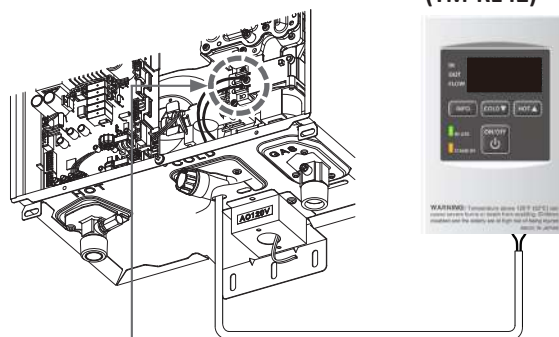


Connect other end to these terminals

Front of remote

Fig. E-2

510U (AT-D3U-IN/OS)



Connect other end to these terminals

Front of remote

EASY-LINK SYSTEM

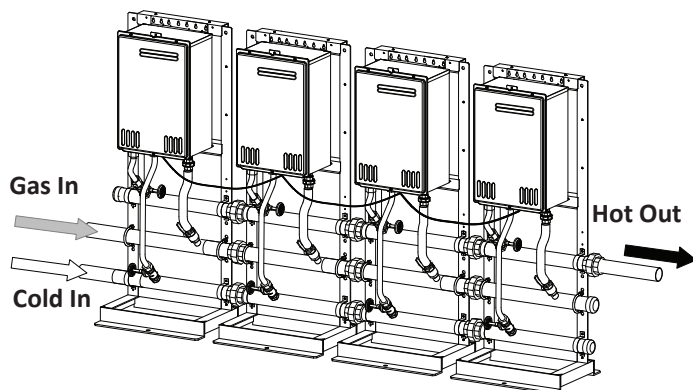
Available on the 510U (AT-D3U-IN/OS) model only

-General-

The 510U (AT-D3U-IN/OS) 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.

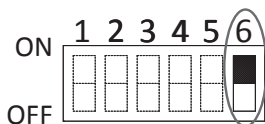
- The Easy-Link System allows up to 4 units to manifold together.
- A communication cable (gray color) comes with each 510U (AT-D3U-IN/OS) model.

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



Easy-Link connection with allowable heaters
T-K3
T-K3-Pro
510 model (AT-D2-IN/OS)
510U model (AT-D2U-IN/OS)*
510U model (AT-D3U-IN/OS)*
200 series

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



DIP switch setting on the 510U (AT-D2U-IN/OS) and 510U (AT-D3U-IN/OS) (Lower bank of DIP switches)

The dark square indicates the correct DIP switch position.



CAUTION

- The Easy-Link System is limited to up to **4 units**. If you connect more than 4 units, only the first 4 units will work as a part of the Easy-Link System. The other additional units will not work as part of the system.
- **Only listed models on the table above can be combined together as an Easy-Link System. These models cannot be combined together with other models not listed on the table above.**

-Easy-Link Connection Procedures-

1. Make sure the power to the heaters is turned off.
2. Verify the DIP switch set temperatures of all units within the system. Every water heater must be set to the same set temperature. **If an optional remote controller (9009069005/TM-RE42) is used, it should be installed to the "PARENT" unit.** (See section B on the next page.) The remote will set the temperature for the entire system.
3. Select one unit to be the "PARENT" unit. The "PARENT" unit should be one of the end units.
4. "PARENT" unit:
Locate the two banks of DIP switches at the bottom left of the computer board of the unit that you select to be the "PARENT" unit. Change DIP switch No. 1 on the **lower bank of DIP switches to the ON position**. See the computer board diagram as shown on the next page. Do not change any DIP switches on any of the "CHILD" units.
5. Between the "PARENT" and the "CHILD-1" units:
Connect the "PARENT" connector of the "PARENT" unit to the "1" connector of the "CHILD-1" unit using the supplied linking cable.
6. Between the "CHILD-1" and the "CHILD-2" units:
Connect the "2" connector of the "CHILD-1" unit to the "1" connector of the "CHILD-2" unit.

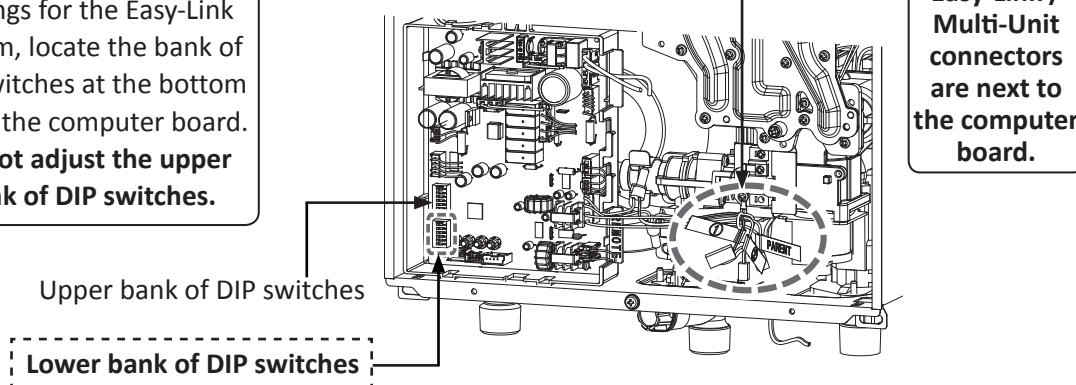
7. Between the “CHILD-2” and the “CHILD-3” units:
Connect the “2” connector of the “CHILD-2” unit to the “1” connector of the “CHILD-3” unit.
8. Verify that all cables are connected like the diagram (B).
9. Turn on power to the “PARENT” unit.
Next, turn on “CHILD-1”. When the controller* installed in “CHILD-1” unit displays a number, turn on “CHILD-2”.
When the controller* installed in the “CHILD-2” unit displays a number, turn on “CHILD-3”.
Make sure the controller* installed in each child unit displays each unit number. (Refer to p. 48.)
The numbering system automatically allocates the unit number to each water heater in the Easy-Link System, in accordance with the table on the right.
10. Set the water temperature using the controller* installed in the “PARENT” unit. It will set the temperature for the Easy-Link System. If a remote controller is installed to the “PARENT” heater of 510 U Indoor (AT-D3U-IN), it will override the built-in controller.

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

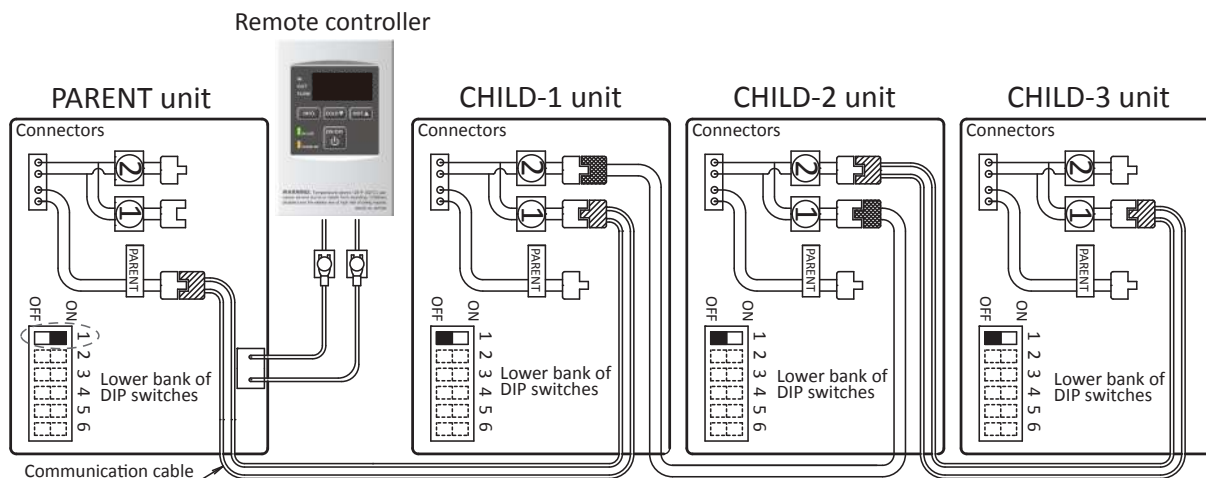
*Built-in controller for indoor models, remote controller for outdoor models.

(A) 510U (AT-D3U-IN/OS) model Computer board

To change the DIP switch settings for the Easy-Link System, locate the bank of DIP switches at the bottom left of the computer board.
Do not adjust the upper bank of DIP switches.



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



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

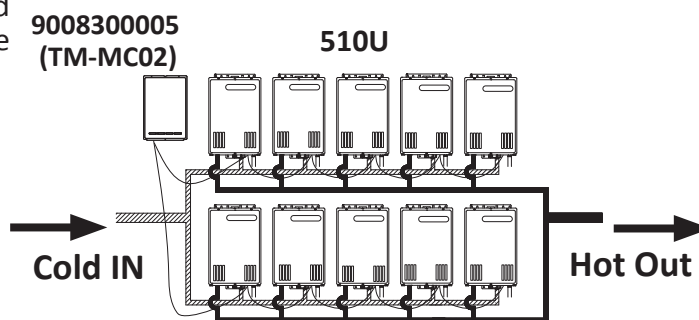
NOTICE

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

MULTI-UNIT SYSTEM

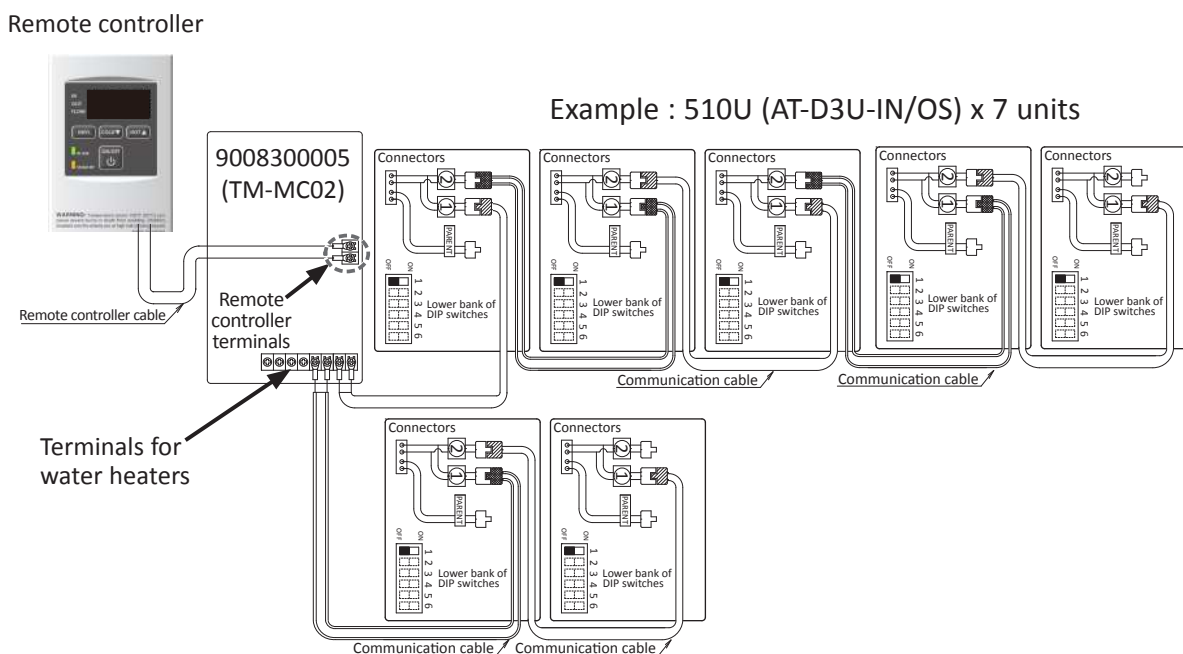
Multiple 510U (AT-D3U-IN/OS) models can be combined for a Multi-Unit System, along with the multi-unit controller (Part 9008300005 (TM-MC02)). Each multi-unit controller can control from 2 to 20 units for commercial or residential applications. For a 20-unit system, the computer can modulate from 15,000 BTU/h to 3.98 million BTU/h.

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



Multi-Unit System connection diagram

Multi-unit controller and temperature remote controller wiring:



- The parent/child DIP switch, No.1 on the lower bank of DIP switches, should be in the OFF position.
- This is the connection diagram between 510U (AT-D3U-IN/OS) and multi-unit controller for 2 to 20 water heaters. Above is an example showing seven water heaters.
- The multi-unit controller automatically allocates the unit number (1-20) to each water heater that is part of the Multi-Unit System.
- In a Multi-Unit System, connect the "[1]" connector and the "[2]" connector with the communication cable (refer to p. 9) or 18 gauge wire cables. The total cable length can be up to 250 ft. (76.2 m) long.



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

APPLICATIONS

SPACE-HEATING APPLICATIONS



WARNING

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

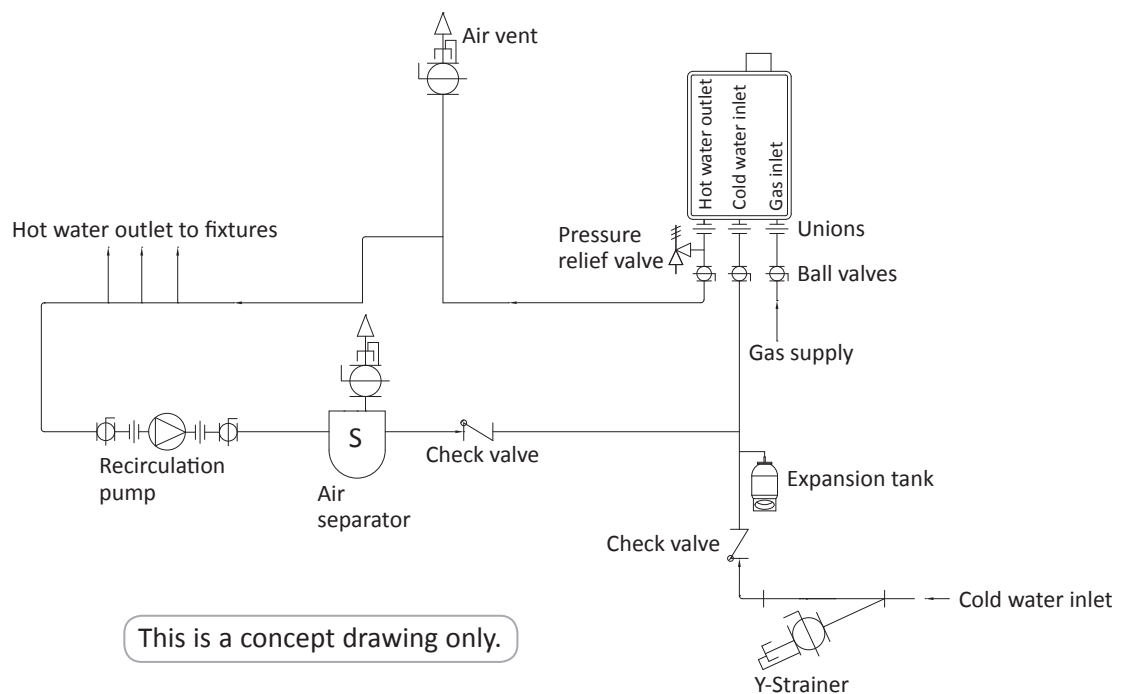
RECIRCULATION

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

-Dual-set aquastat (recommended w/timer)

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

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



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

Diagrammatic layout of radiant heating and domestic water heater per Massachusetts code.

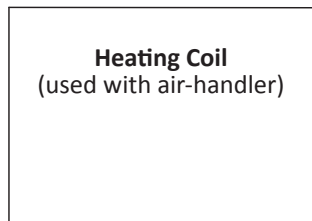
All water piping should be insulated in accordance with 780 CMR (Massachusetts energy code)

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

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

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

Thermostatic mixing valve



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

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

Electronically controlled pump timer. Activates every 6 hours for 60 seconds. Wire to product approved pump

An approved temperature and pressure relief valve. Tie to location approved by local codes and must meet BTU rating of water heater model used

3" intake and 4" vent (Discharge must comply with local and state codes.) Cannot be common vented with other appliances

Water heater accepted by the Board for installation in Massachusetts.

NOTICE

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

INITIAL OPERATION

FOR YOUR SAFETY, READ BEFORE OPERATING


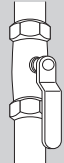

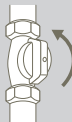
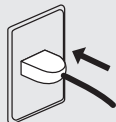
- **Check the GAS and WATER CONNECTIONS** for leaks before firing the unit for the first time.
- Open the main gas supply valve to the unit using only your hand to avoid any spark. Never use tools. If the knob will not turn by hand, do not try to force it; call a qualified service technician. Forced repair may result in a fire or explosion due to gas leaks.
- Be sure to check for the presence of leaking gas toward the bottom of the unit because some gases are heavier than air and may settle toward the floor.
- **Check the GAS PRESSURE.** Refer to p. 26.
- Do not try to light the burner manually. It is equipped with an electronic ignition device which automatically lights the burner.
- **Check for PROPER VENTING and COMBUSTIBLE AIR** to the water heater.
- **Purge the GAS and WATER LINES** to remove any air pockets.
- Do not use this water heater if any part has been submersed under water. Do not attempt to repair the unit. It must be replaced. Failure to follow these instructions could lead to property damage, personal injury, or loss of life.



WARNING

IF YOU SMELL GAS:

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

	Operation	
1.	Once the above checks have been completed, please clean the filter of any debris. Refer to p. 46 for instructions.	
2.	Fully open the manual water control valve on the water supply line.	
3.	Open a hot water tap to verify that water is flowing to that tap. Then close the hot water tap.	
4.	Fully open the manual gas control valve.	
5.	Turn on the 120 VAC, 60 Hz power supply to the water heater.	
6.	Now you are ready to enjoy hours of endless hot water.	