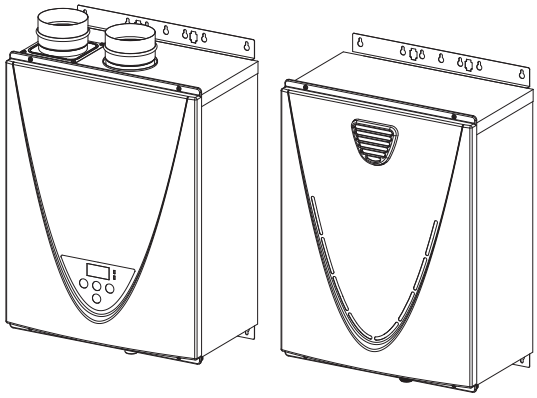
On-Demand Water Heater
Installation Manual and Owner's Guide

ANSI Z21.10.3 • CSA 4.3

540
model only

Models

- **240 Indoor**
- **240 Outdoor (USA Only)**
- **340 Indoor**
- **340 Outdoor (USA Only)**
- **540 Indoor**
- **540 Outdoor (USA only)**



Gas Tankless Water Heater™

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

FEATURING

- ENDLESS HOT WATER
- ON-DEMAND USAGE
- COMPACT, SPACE SAVING
- ENERGY CONSERVATION
- COMPUTERIZED SAFETY
- NO PILOT LIGHT
- Complies with SCAQMD Rule 1146.2 for natural gas Low NOx Emissions of 14 ng/J or 20 ppm.
- EASY-LINK SYSTEM
- MULTI-UNIT SYSTEM *(540 model 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:

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

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

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

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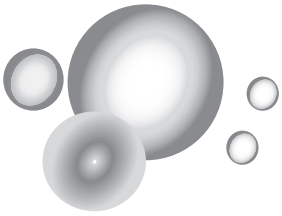
Installation Manual

Owner's Guide



Installation Manual

CONGRATULATIONS

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

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

SPECIFICATIONS

Model			240 Indoor	240 Outdoor	340 Indoor	340 Outdoor	540 Indoor	540 Outdoor
Natural Gas Input (Operating Range)		BTU/h	Min.: 15,000 Max.: 160,000		Min.: 15,000 Max.: 180,000		Min.: 15,000 Max.: 199,000	
Propane Input (Operating Range)		BTU/h	Min.: 13,000 Max.: 160,000		Min.: 13,000 Max.: 180,000		Min.: 13,000 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)					
Propane Inlet Pressure		" W.C. (kPa)	Min. 8.0 (1.99) Max. 14.0 (3.48)					
Weight		lbs. (kg)	58 (26.3)	58 (26.2)	58 (26.3)	58 (26.2)	59 (26.8)	59 (26.9)
Dimensions		inch	H 22.4 x W 17.7 x D 10.7					
		mm	H 570 x W 450 x D 272					
Ignition			Electric Ignition					
Electric	Supply	VAC/Hz	120/60					
	Consumption – Operation	W/A	72.7 / 0.61		78.2 / 0.65		89.0 / 0.74	
	Consumption – Standby	W/A	3.1 / 0.03		3.1 / 0.03		4.2 / 0.04	
	Consumption – Freeze-Protection	W/A	174 / 1.5		174 / 1.5		175 / 1.5	
Water heater category**			Category IV	N/A	Category IV	N/A	Category IV	N/A

*40 psi or above is recommended for maximum flow.

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

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

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

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

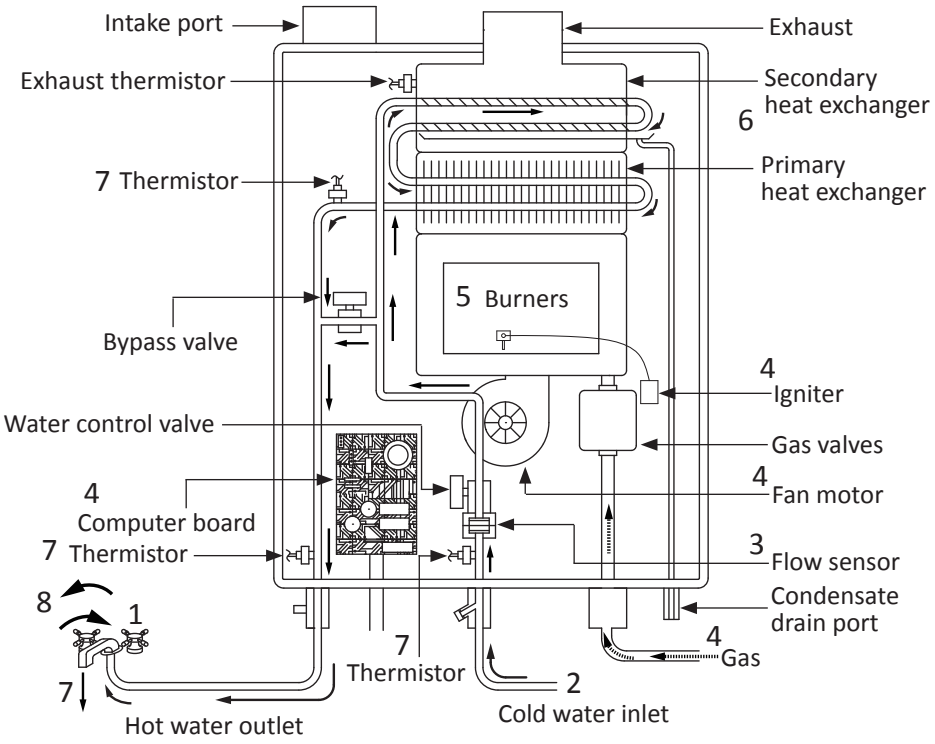
Category IV - a water heater that operates with a positive vent static pressure and with a vent gas temperature that may cause excessive condensate production in the vent.

NOTE:

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

INTRODUCTION

- This manual provides information necessary for the installation, operation, and maintenance of the water heater.
- The model description is listed on the rating plate which is attached to the side panel of the water heater.
- Please read all installation instructions completely before installing this product.
- If you have any problems or questions regarding this equipment, consult the manufacturer or its local representative.
- This equipment is an on-demand, tankless water heater designed to efficiently supply endless hot water for your needs when properly sized and installed.
- These **high efficiency models** have a built-in secondary heat exchanger that absorbs latent heat from the exhaust gas.
- The 240 Indoor, 340 Indoor, and 540 Indoor models are only to be installed indoors. The 240 Outdoor, 340 Outdoor, and 540 Outdoor models are only to be installed outdoors.
- The principle behind tankless water heaters is simple:



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

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

SAFETY GUIDELINES

SAFETY DEFINITION

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

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

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

NOTICE Indicates information considered important but not hazard related.

GENERAL

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

WARNING

- Water temperatures over 125 °F (52 °C) can cause severe burns instantly or death from scalding. The water temperature is set at 120 °F (50 °C) from the factory to minimize any scalding risk. Before bathing or showering always check the water temperature.
- Do not store or use gasoline or other flammables, vapors, or liquids in the vicinity of this appliance.
- Do not reverse the water and/or gas connections as this will damage the gas valves and can cause severe injury or death. Follow the diagram on p. 31 when installing your water heater.
- Should overheating occur or the gas supply fails to shut off, turn off the manual gas control valve to the appliance.
- Do not use this appliance if any part has been in contact with or been immersed in water. Immediately call a qualified installer or service agency to replace a flooded water heater. Do not attempt to repair the unit. It must be replaced.
- Do not disconnect the electrical supply if the ambient temperature will drop below freezing. The Freeze Protection System only works if the unit has electrical power. The warranty will not be covered if the heat exchanger is damaged due to freezing. Refer to the section on the Freeze Protection System on p. 50 for more information.
- Failure to observe these warnings could result in severe personal injury or death.

INSTALLATION

GENERAL

1. Follow all local codes, or in the absence of local codes, follow the current edition of the National Fuel Gas Code: ANSI Z223.1/NFPA 54 in the USA or B149.1 Natural Gas, Propane Installation Code in Canada.
2. All gas water heaters require careful and correct installation to ensure safe and efficient operation. This manual must be followed exactly. Read the “Safety Guidelines” Section.
3. The manifold gas pressure is preset at the factory. It is computer controlled and should not need adjustment.
4. Maintain proper space for servicing. Install the unit so that it can be connected or removed easily. Refer to the "Clearances" Section on p. 9 for proper clearances.
5. The water heater must be installed in a location where the proper amount of combustion air will be available to it at all times without obstructions, or the indoor heater may be direct vented.
6. Electrical service to the water heater requires a means of disconnection. This will allow power to the water heater to be shut off for servicing and safety purposes.
7. Do not install the unit where the exhaust vent is pointing into any opening in a building or where the noise may disturb your neighbors. Make sure the vent termination meets the required clearance from any doorway or opening to prevent exhaust from entering a building. (Refer to pp. 11, 26 and 27.) Check local code requirements prior to installation.
8. Carefully plan the installation location of the heater and vent terminations. Contaminants such as aerosols, lint, and fine powders (including flour) can clog the air intake and reduce the operation of the fan. This, in turn, can cause improper combustion and reduce the life of the water heater. Regularly ensure that the area around the water heater, vent termination, and air intake is free of dust, debris, and other contaminants. In environments with a high level of contaminants (laundry facilities, hair salons, pet salons, chemical plants, commercial kitchens, etc.), direct venting is required.
9. The 240 Indoor, 340 Indoor, and 540 Indoor are to be installed indoors only. These units are equipped with a thermistor and hi-limit switch for the exhaust gas, detecting excess temperatures within the flue and enabling the unit to safely stop operations if needed. These components are always monitoring exhaust gas conditions in order to prevent heat damage to ABS, PVC, CPVC, or polypropylene (Plastic) venting if ABS, PVC, CPVC, or polypropylene is used. If the exhaust gas temperature exceeds 140 °F (60 °C), these components will enable the unit to safely stop operations. These components are not installed on the outdoor models since the exhaust vent is built-in.
    - If the water heater is used as a direct-vent appliance, the unit requires 3 in (76 mm) or 4 in (102 mm) combustion air supply pipe. The intake pipe must be sealed airtight. Refer to pp. 13 to 28 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 240 Outdoor, 340 Outdoor, and 540 Outdoor models must only be installed outdoors and only in an area with mild, temperate climates. The Outdoor model shall be wall-mounted or mounted on a stand. Locate the Outdoor model in an open, unroofed area and maintain the following minimum clearances: There is a 3 in. (76 mm) clearance from the left and right sides of the unit to combustible and non-combustible surfaces.

WARNING

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

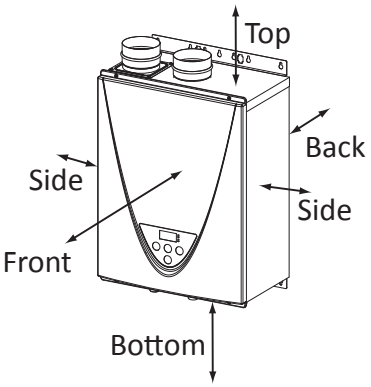
NOTICE

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

CLEARANCES

WARNING

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

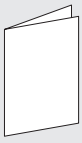
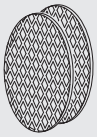


Model	Top	Bottom	Front	Back	Sides
240 Indoor 340 Indoor 540 Indoor	12 in. (305 mm)	12 in. (305 mm)	4 in.* (102 mm)	0.5 in. (13 mm)	3 in. (76 mm)
240 Outdoor 340 Outdoor 540 Outdoor	36 in. (914 mm)	12 in. (305 mm)	24 in. (610 mm)	0.5 in. (13 mm)	3 in. (76 mm)

*24 inches recommended for maintenance.

INCLUDED ACCESSORIES

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

Installation manual and owner's guide	Temperature remote controller kit* Outdoor models only	Bird screen Indoor models only	Communication cable 540 model only
 Qty: 1	 **100209924 (TM-RE42)** Qty: 1	 Qty: 2	 Qty: 1

*Refer to p. 10 and 35.

OPTIONAL ITEMS

#	Model	240 Indoor	240 Outdoor	340 Indoor	340 Outdoor	540 Indoor	540 Outdoor
1.	Temperature remote controller	✓		✓		✓	
2.	Pipe cover	✓	✓	✓	✓	✓	✓
3.	Neutralizer kit	✓	✓	✓	✓	✓	✓
4.	Sidewall vent terminator (Hood) and Wall thimble	✓		✓		✓	
5.	3" PVC concentric termination	✓		✓		✓	
6.	Non-return valve	✓		✓		✓	
7.	PVC Adapter	✓		✓		✓	

1. Temperature remote controller: 100209924 (TM-RE42)

The temperature remote controllers have three functions. It allows the output temperature from the water heater to be adjusted and it also works as a diagnostic tool and it provides a concise error code whenever there is a problem with the unit. See the Troubleshooting Section (pp.53 to 56) for information on possible error codes.

2. Pipe cover: 100112718 (TH-PC03)

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

3. Neutralizer kit: 100112159 (TH-NT01)

The neutralizer assembly neutralizes the condensate (acidic water) that forms in the secondary heat exchanger of the water heater.
It connects to the condensate drain port of the water heater by using connectors included with the neutralizer kit. (Refer to pp. 32 and 33.)

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

Terminator Hood

Wall Thimble

Covering wall thicknesses	Part#
Terminator Hood	100112419
Wall Thimble 4 - 7 in (102 - 178 mm)	100112732
Wall Thimble 5 - 10 in (123 - 254 mm)	100112733
Termination + Thimble 4 - 7 in (102 - 178 mm)	100112424
Termination + Thimble 5 - 10 in (123 - 254 mm)	100112425

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

5. 3" PVC concentric termination: 100112163 (TH-CVPVC33)

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

6. Non-return valve: 100113130

It is a must-have item for common venting system. It prevents the escape of combustion gas through non-operating appliances. (Refer to p. 24 and 25.)

7. PVC Adapter: 100113129

This adapter transitions from the Non-return valve outlet to 4" schedule 40 PVC pipe.

WARNING FOR INSTALLATIONS

FOR YOUR SAFETY, READ BEFORE INSTALLATION:

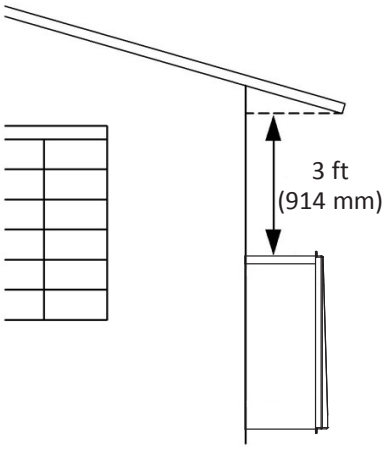
Do not install the heater where water, debris or flammable vapors may get into the flue terminal. This may cause damage to the heater and void the warranty.

Prohibited

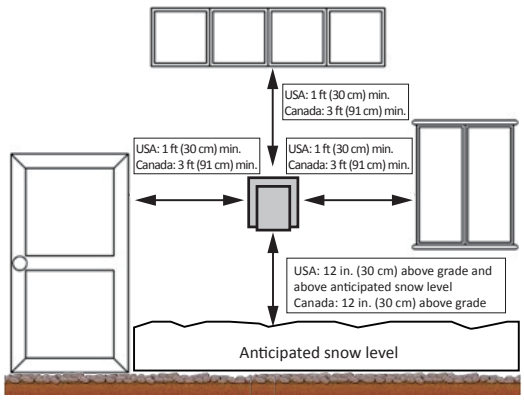
Do not have the vent terminal pointing toward any opening into a building. Do not locate your heater in a pit or location where gas and water can accumulate.

Prohibited

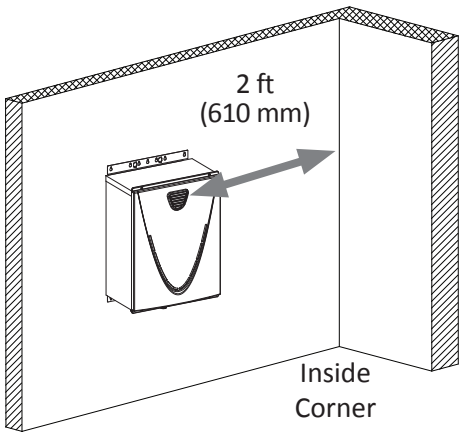
Do not install this water heater under an overhang less than 3 ft (914 mm) from its top or eaves. The area under an overhang must be open to three sides (Outdoor model only).



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



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



Do not install next to a dryer or any source of airborne debris that can be trapped inside the combustion chamber, unless the system is direct-vented.

HIGH-ALTITUDE INSTALLATIONS

WARNING

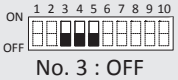
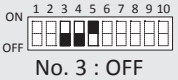
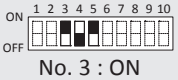
- **Adjust the appropriate DIP switches according to model and elevation as shown below. DO NOT adjust the other DIP switches.**
- **Turn off the power supply to the water heater before changing the DIP switch settings.**
- **Failure to observe these warnings could lead to carbon monoxide poisoning or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

Check the elevation where your water heater is installed. Set DIP switches shown in the table below depending on the altitude.

Indoor models

DIP switches \ Altitude	0 to 2,000 ft (0 to 610 m) (DEFAULT)	2,000 to 3,000 ft (611 to 914 m)	3,000 to 5,000 ft (915 to 1,524 m)	5,000 to 7,500 ft (1,525 to 2,286 m	7,500 to 10,100 ft (2,287 to 3,078 m)
240 and 340 models	 No. 3 : OFF No. 4 : OFF No. 5 : OFF	 No. 3 : OFF No. 4 : ON No. 5 : OFF	 No. 3 : OFF No. 4 : OFF No. 5 : ON	 No. 3 : OFF No. 4 : ON No. 5 : ON	 No. 3 : ON No. 4 : ON No. 5 : ON
540 model **(Lower bank of DIP switches)**	 No. 2 : OFF No. 3 : OFF No. 4 : OFF	 No. 2 : OFF No. 3 : ON No. 4 : OFF	 No. 2 : OFF No. 3 : OFF No. 4 : ON	 No. 2 : OFF No. 3 : ON No. 4 : ON	 No. 2 : ON No. 3 : ON No. 4 : ON

Outdoor models

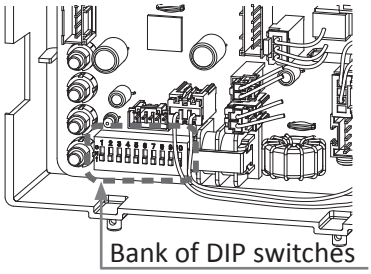
DIP switches \ Altitude	0 to 2,000 ft (0 to 610 m) (DEFAULT)	2,000 to 4,000 ft (611 to 1,219 m)	4,000 to 6,000 ft (1,220 to 1,829 m)
240 and 340 models	 No. 3 : OFF No. 4 : OFF No. 5 : OFF	 No. 3 : OFF No. 4 : OFF No. 5 : ON	 No. 3 : ON No. 4 : OFF No. 5 : ON
540 model **(Lower bank of DIP switches)**	 No. 2 : OFF No. 3 : OFF No. 4 : OFF	 No. 2 : OFF No. 3 : OFF No. 4 : ON	 No. 2 : ON No. 3 : OFF No. 4 : ON

Installation altitude

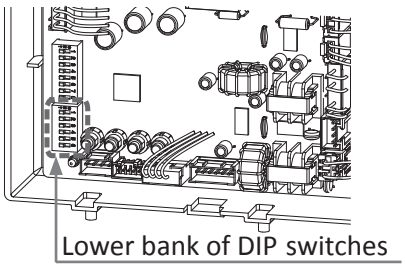
The maximum certified or allowable installed altitude is 10,100 ft (3,078 m) for indoor models and 6,000 ft (1,829 m) for outdoor models.

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

240 and 340 models computer board



540 model computer board



VENTING INSTRUCTIONS

Indoor models

-General-

WARNING

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

The Indoor model must be vented in accordance with “Venting of Equipment" in the current edition of the National Fuel Gas Code: ANSI Z223.1/NFPA 54 in the United States and/or Section 8 of the B149.1 Natural Gas and Propane Installation Code in Canada, as well as applicable local building codes.
The use of venting materials approved for Category III/IV appliances is recommended whenever possible. However, the Indoor model may also be vented with plastic pipe materials such as ABS, PVC (solid core), CPVC (solid core), or polypropylene. **For details, please refer to the Exhaust Vent (ABS, PVC, CPVC, or Polypropylene Vent) Section on p. 18.** Vent installations in Canada which utilize plastic vent systems must use venting that complies with ULC S636.

General rules for venting water heaters:

- Place the water heater as close as possible to the vent termination.
- The vent collar of the water heater must be fastened directly to an unobstructed vent pipe.
- Do not weld the vent pipe to the water heater’s vent collar.
- Do not cut or alter 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.
- The water heater vent must not be connected to any other gas appliance or vent stack except an approved common-venting system. Refer to pp. 24 and 25.
- Avoid using an oversized vent pipe or using extremely long runs of the pipe unless it is part of an approved common vent system.
- Air supply pipe can be made of ABS, PVC (solid core), CPVC (solid core), polypropylene, corrugated stainless steel, or Category lll / IV stainless steel. Regarding exhaust pipe, refer to pp.18 to 23.
- Use of cellular core PVC (ASTM F891), cellular core CPVC, or Radel® (polyphenylsulfone) in nonmetallic venting systems is prohibited. Covering non-metallic vent pipe and fittings with thermal insulation is prohibited.
- Sidewall venting is recommended for the Indoor model. Vertical venting (roof termination) is acceptable.
- The manufacturer recommends running the exhaust vent and the intake pipe as parallel as possible.
- 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 terminate vent into a chimney. If the vent must go through the chimney, the vent must run all the way through the chimney with approved vent pipe.
- The water heater shall not be connected to a chimney flue serving a separate appliance, designed to burn solid fuel.

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 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 recommended when the water heater is vented through a sidewall.
- Regarding the clearances from the exhaust termination to the air inlet or opening, refer to pp. 26 to 28.

-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.

NOTICE

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

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

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

WARNING!
In all cases, ensure that corrosive chemicals are not present at the air intake. Presence of such chemicals at the air intake could result in death, personal injury, or property damage. Examples of locations that require outside air due to chemicals include:

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

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

Does your installation space have sufficient combustion air?

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

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

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

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

Example:

Gas Burning Appliance	BTU/h Rating
Gas Water Heater	199,000
Furnace	75,000
Dryer	20,000
Total	294,000

Your appliances:

Gas Burning Appliance	BTU/h Rating
Gas Water Heater	
Total	

Calculate the air volume of the room

Air requirements depend on the size of the room.

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

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

Air Volume = Room Volume - Object Volume

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

Calculate required air volume

A water heater installed in an unconfined attic, garage, or space requires that the space be at least 50 ft^3 (1.42 m^3) per 1,000 BTU/h of the total input for all gas burning appliances in the same area.

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

Example:

(294,000 / 1000) x 50 = 14,700 ft^3

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

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

Install with outside ventilation

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

Supplying outside air to the water heater typically requires two openings. One opening must be within 12 in (305 mm) from the floor and the second opening must be within 12 in (305 mm) from the ceiling. Although a single opening is not preferred, you may use a single opening to outside air if the minimum free area is sized according to **Table 1**. Two openings must be used when ventilating with air from another room.
The outside air can be taken from a crawl space or attic open to the outdoors and adequately ventilated. You may use vertical or horizontal ducts.

Determine type of ventilation

There are several types of ventilation that can be used. The various options are listed below. See also the illustrations on the next page.

1. Direct to outdoors
2. Vertical ducts
3. Horizontal ducts
4. Single opening (not recommended; must be at least 100 in^2 (6.5 cm^2) . Not appropriate for confined spaces smaller than 50 ft^3 (1.42 m^3) 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 in^2 (645 cm^2) of free area would need 134 in^2 (865 cm^2) openings if using metal louvers rated at 75% free area (100 in^2 ÷ 0.75 = 134 in^2).
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 in^2 (645 cm^2).
- Ducts must have the same cross-sectional area as free area of the opening.
- Rectangular ducts must have a minimum dimension of no less than 3 in (76 mm).
- All screens must have mesh ¼” or larger.
- Moveable louvers must be locked open or interconnected with the equipment so that they open automatically during operation.
- Keep louvers and grills clean and free of debris or other obstructions.

Check that air source is clean and free of chemicals

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

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

Opening Source	Minimum Free Area
Direct to outdoors*	1 in^2 (6.5 cm^2) per 4,000 BTU/hr (see Figure **1, 2**)
Vertical ducts	1 in^2 (6.5 cm^2) per 4,000 BTU/hr (see Figure **3**)
Horizontal ducts	1 in^2 (6.5 cm^2) per 2,000 BTU/hr (see Figure **4**)
Single Opening	1 in^2 (6.5 cm^2) per 3,000 BTU/hr (see Figure **5**)
Two permanent openings to another room**	1 in^2 (6.5 cm^2) per 1,000 Btu/hr (see Figure **6**) Opening: 100 in^2 (645 cm^2) MIn Minimum dimension of air openings: no less than 3 in (76 mm)

*These openings connect directly with the outdoors through a ventilated attic, a ventilated crawl space, or through an outside wall.
**United States: For direction on combining spaces in different stories within the structure, refer to the current edition of the National Fuel Gas Code ANSI Z223.1/NFPA 54. In Canada, contact your local code enforcement agency for direction.

See graphics on next page.

Combustion air supply options

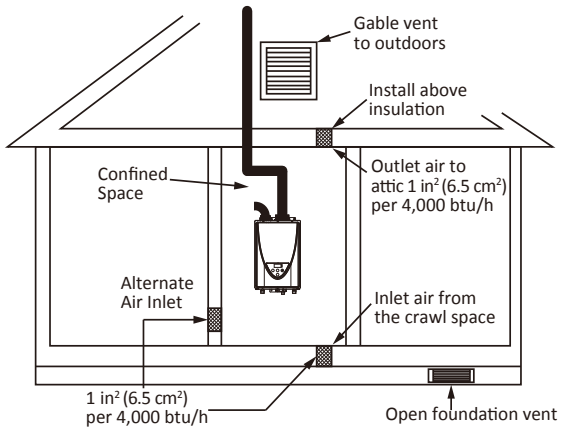


Figure 1 - Direct to outdoors openings

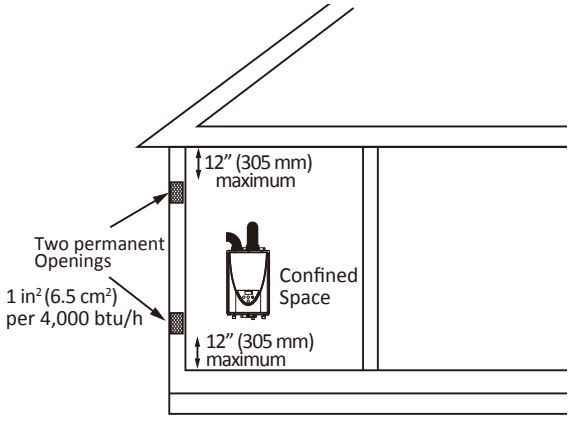


Figure 2 - Direct to outdoors openings
Two permanent openings

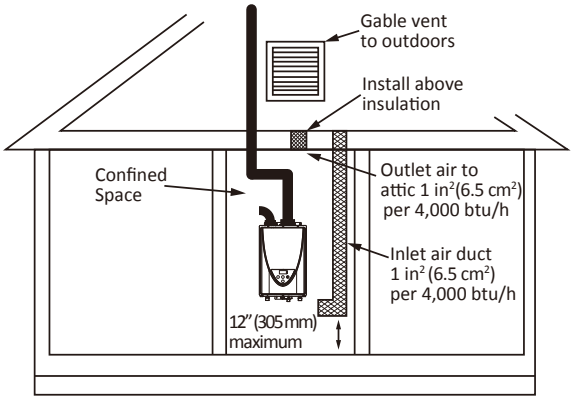


Figure 3 - Vertical duct openings

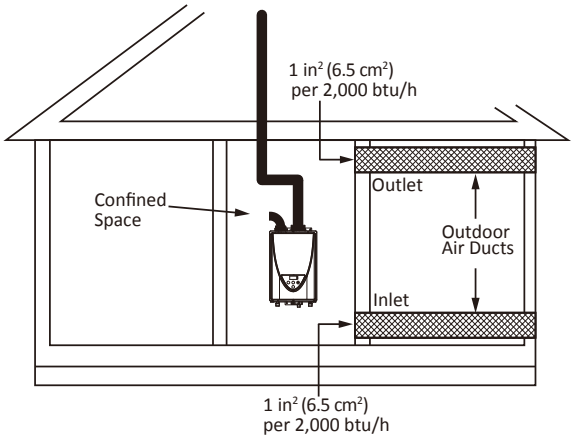


Figure 4 - Horizontal duct openings

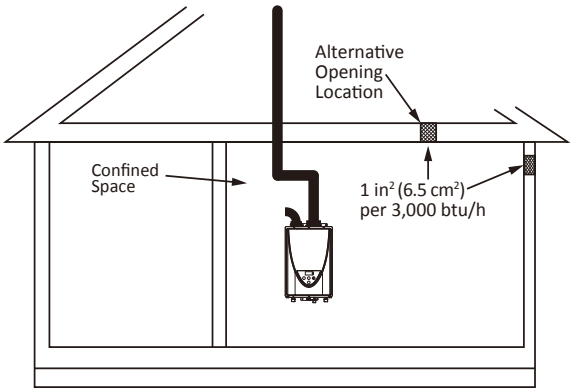


Figure 5 - SIngle opening

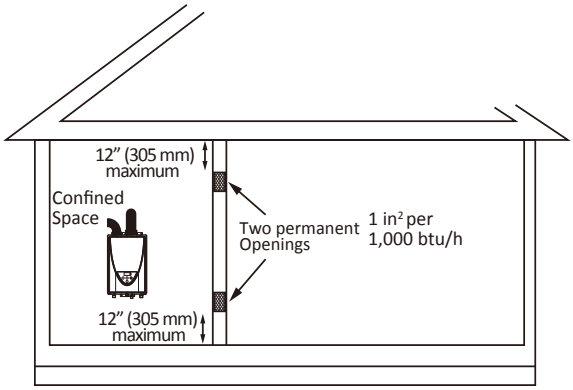


Figure 6 - Two permanent openings

-Exhaust vent (ABS, PVC, CPVC, or polypropylene vent)-

The Indoor models can be vented with ABS, PVC, CPVC, or polypropylene (temperature rated up to 149 °F). Vent material certified to ULC S636 standards is recommended in the USA. In Canada, plastic venting must be certified to ULC S636 standards.

Item	Material	United States	Canada
Exhaust pipe and Fittings	Schedule 40 PVC	ANSI/ASTM D1785	ULC S636 Certified Materials Only
	PVC-DWV	ANSI/ASTM D2665	
	Schedule 40 CPVC	ANSI/ASTM F441	
	Schedule 40 ABS-DWV	ANSI/ASTM D2661	
	Polypropylene	UL-1738	
Pipe Cement/Primer	PVC	ANSI/ASTM D2564	
	CPVC	ANSI/ASTM F493	
	ABS	ANSI/ASTM D2235	
Use of cellular core PVC (ASTM F891), cellular core CPVC, or Radel® (polyphenylsulfone) in non-metallic venting systems is prohibited. Covering non-metallic vent pipe and fittings with thermal insulation is prohibited.			

- The maximum length of exhaust vent piping must not exceed 70 ft (21.3 m) for 3" venting, which depends on the elevation where the water heater is installed, and 100 ft (30.5 m) for 4" venting (deducting 5 ft (1.5 m) for each elbow used in the venting system). Do not use more than 5 elbows. See the table below.
- 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.

Diameter	Max. No. of Elbows	Max. Vertical and Horizontal (Total) Vent Length
3 in. (76 mm)	5	70 ft (21.3 m)
4 in. (102 mm)	5	100 ft (30.5 m)

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

No. of Elbows	Max. Vertical or Horizontal (Total) Vent Length			
	3" (76 mm) venting			4" (102 mm) venting
	0 to 3,000 ft (0 to 914 m)	3,001 to 6,000 ft (915 to 1,829 m)	6,001 to 10,100 ft (1,830 to 3,078 m)	0 to 10,100 ft (0 to 3,078 m)
0	70 ft (21.3 m)	40 ft (12.2 m)	25 ft (7.6 m)	100 ft (30.5 m)
1	65 ft (19.8 m)	35 ft (10.7 m)	20 ft (6.1 m)	95 ft (29.0 m)
2	60 ft (18.3 m)	30 ft (9.1 m)	15 ft (4.6 m)	90 ft (27.4 m)
3	55 ft (16.8 m)	25 ft (7.6 m)	10 ft (3.0 m)	85 ft (25.9 m)
4	50 ft (15.2 m)	20 ft (6.1 m)	N/A	80 ft (24.4 m)
5	45 ft (13.7 m)	N/A	N/A	75 ft (22.9 m)

Excludes vent terminators, termination elbows, or rain caps.

For details on the vent connection, refer to pp. 20 and p. 21.

-DIP switch settings for vent length-

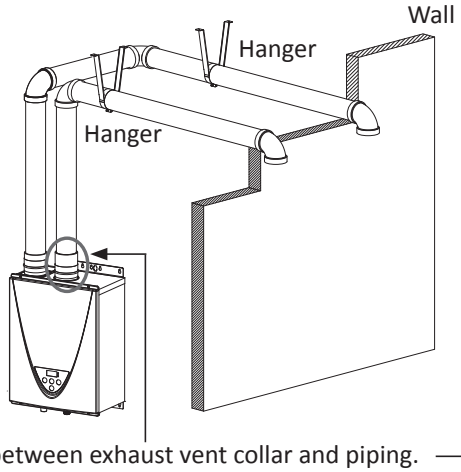
Typical installations using <u>PVC, CPVC, ABS, or polypropylene vent</u>

WARNING

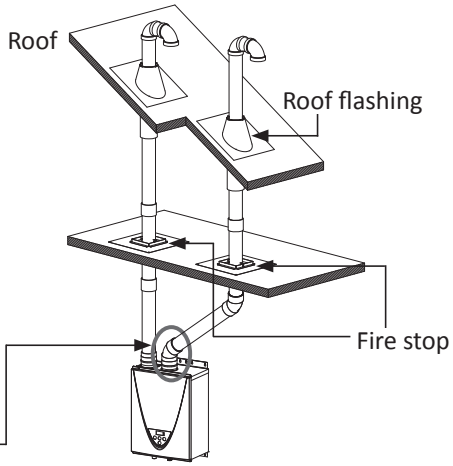
- **Adjust the appropriate DIP switches according to model and vent length as shown below. DO NOT adjust the other DIP switches.**
- **Turn off the power supply to the water heater before changing the DIP switch settings.**
- **Failure to observe these warnings could lead to carbon monoxide poisoning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

<Two-pipe, direct-vent installation>

Horizontal Installation

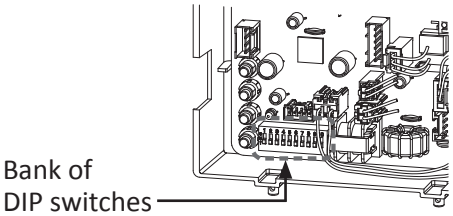


Vertical Installation

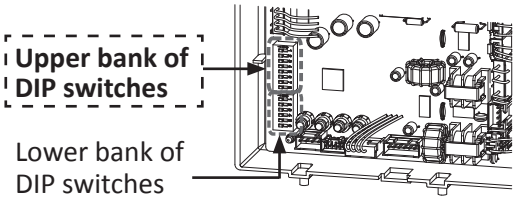


For details of the optional items, refer to the Installation manual for each optional item.

240 340 Computer board



540 Computer board



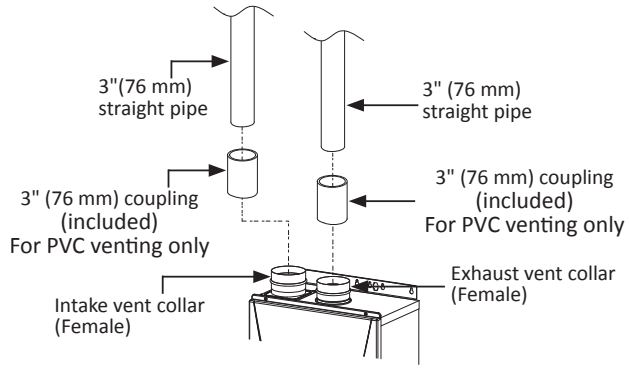
Set DIP switches shown in the table below depending on the vent diameter and length.

DIP switch settings : Two-pipe, Direct vent installations					
Vent diameter	3" (76 mm) venting*			4" (102 mm) venting	
Vent length / Model	5 to 20 ft (1.5 to 6.1m) (DEFAULT)	21 to 40 ft (6.2 to 12.2 m)	41 to 70 ft (12.3 to 21.3 m)	5 to 50 ft (1.5 to 15.2m) (DEFAULT)	51 to 100 ft (15.3 to 30.5 m)
240/340 Indoor	ON 1 2 3 4 5 6 7 8 9 10 OFF No. 6 : O N No. 7 : OFF	ON 1 2 3 4 5 6 7 8 9 10 OFF No. 6 : OFF No. 7 : OFF	ON 1 2 3 4 5 6 7 8 9 10 OFF No. 6 : O N No. 7 : O N	ON 1 2 3 4 5 6 7 8 9 10 OFF No. 6 : O N No. 7 : OFF	ON 1 2 3 4 5 6 7 8 9 10 OFF No. 6 : OFF No. 7 : OFF
540 Indoor (Upper bank of DIP switches)	ON 1 2 3 4 5 6 7 8 OFF No. 3 : O N No. 4 : OFF	ON 1 2 3 4 5 6 7 8 OFF No. 3 : OFF No. 4 : OFF	ON 1 2 3 4 5 6 7 8 OFF No. 3 : O N No. 4 : O N	ON 1 2 3 4 5 6 7 8 OFF No. 3 : O N No. 4 : OFF	ON 1 2 3 4 5 6 7 8 OFF No. 3 : OFF No. 4 : OFF

***PVC concentric termination (100112163)** installation is applied to the DIP switch settings of 3" (76 mm) venting. (Refer to p. 10.)

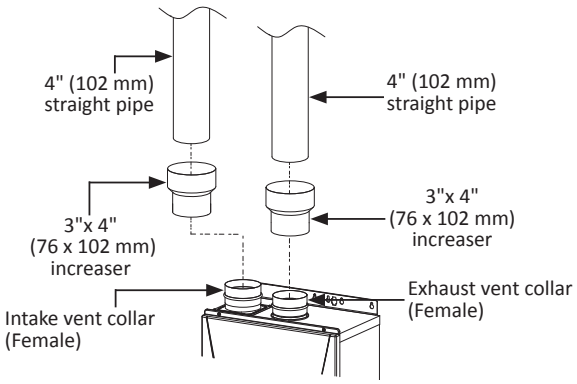
<How to install intake and exhaust venting (two-pipe, direct-vent) with the indoor models>

3" (76 mm) vent connection



1. Connect 3" (76 mm) couplings directly on the exhaust and intake vent collar of the water heater.
2. Connect 3" (76 mm) straight pipes to the couplings.

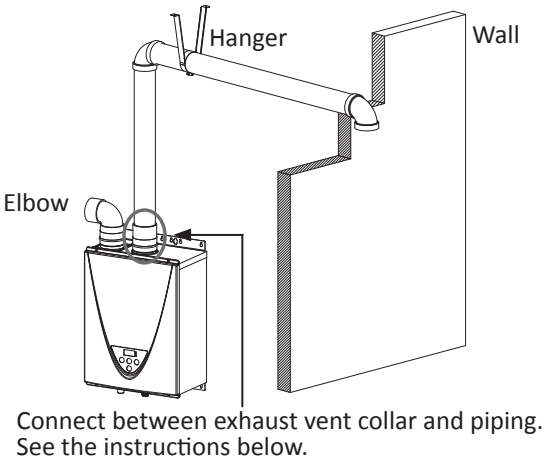
4" (102 mm) vent connection



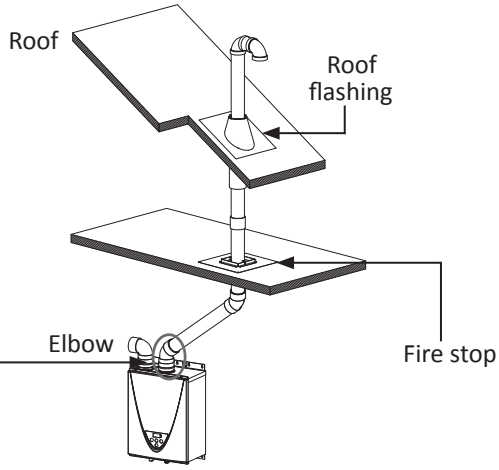
1. Connect 3"x 4" (76 x 102 mm) increasers directly on the exhaust and intake vent collar of the water heater.
2. Connect 4" (102 mm) straight pipes to the increasers.

<Single-pipe with room-air intake installation>

Horizontal Installation



Vertical Installation



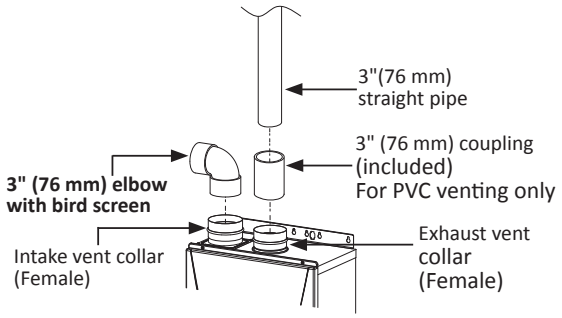
For details of the optional items, refer to the Installation manual for each optional item.

Set DIP switches shown in the table below depending on the vent diameter and length.

DIP switch settings : Single vent pipe installations				
Vent diameter	3" (76 mm) venting*		4" (102 mm) venting	
Vent length / Model	5 to 45 ft (1.5 to 13.7 m) (DEFAULT)	46 to 70 ft (13.8 to 21.3 m)	5 to 50 ft (1.5 to 15.2 m) (DEFAULT)	51 to 100 ft (15.3 to 30.5 m)
240/340 Indoor	 No. 6 : O N No. 7 : OFF	 No. 6 : OFF No. 7 : OFF	 No. 6 : O N No. 7 : OFF	 No. 6 : OFF No. 7 : OFF
540 Indoor (Upper bank of DIP switches)	 No. 3 : O N No. 4 : OFF	 No. 3 : OFF No. 4 : OFF	 No. 3 : O N No. 4 : OFF	 No. 3 : OFF No. 4 : OFF

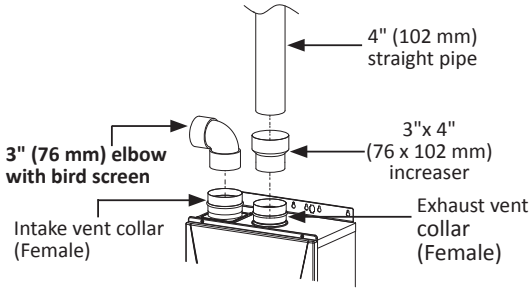
<How to install single vent with the indoor models>

3" (76 mm) vent connection



1. Connect a 3" (76 mm) elbow directly on the intake vent collar of the water heater.
2. Connect a 3" (76 mm) coupling directly on the exhaust vent collar of the water heater.
3. Connect a 3" (76 mm) straight pipe to the coupling.

4" (102 mm) vent connection



1. Connect a 3" (76 mm) elbow directly on the intake vent collar of the water heater.
2. Connect a 3" x 4" (76 x 102 mm) increaser directly on the exhaust vent collar of the water heater.
3. Connect a 4" (102 mm) straight pipe to the increaser.

CENTROTHERM PP VENTING (Polypropylene)

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	Centrotherm Part Number (Trade Name InnoFlue)
4''/6'' (102 mm/152 mm) x 39" (990 mm) Concentric Wall	ICWS4639
4'' (102 mm) Twin Pipe to 4''/6'' (102 mm/152 mm) Concentric Adaptor	ICTC0446
4" (102 mm) x 87° Elbow	ISEL0487
100 mm to 4" (102 mm) Increaser	ISIA10004
4" (102 mm) x 12" (305 mm) Vent Length	ISVL041
4" (102 mm) x 24" (610 mm) Vent Length	ISVL042
4'' (102 mm) x 36'' (914 mm) Vent Length	ISVL043
4" (102 mm)x 72" (1,829 mm) Vent Length	ISVL046
4" (102 mm) Horizontal Drain Tee	ISHDT04
3''/5'' (76 mm/127 mm) x 13'' (330 mm) Concentric Wall Termination SS	ICWS3513
3'' (76 mm) Twin Pipe to 3''/5'' (76 mm/127 mm) Concentric Adaptor	ICTC0335
3" (76 mm) x 87 Elbow	ISEL0387
3" (76 mm) x 12" (305 mm) Vent Length	ISVL031
3" (76 mm) x 24" (610 mm) Vent Length	ISVL032
3" (76 mm) x 36'' (914 mm) Vent Length	ISVL033
3" (76 mm) x 72'' (1,829 mm) Vent Length	ISVL036
100 mm to 4" (102 mm) 110 mm	ISRA1003
3" (76 mm) Horizontal Drain Tee	ISHDT03

-Exhaust vent (Stainless steel vent)-

This is a Category IV 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 160 °F (71 °C). For best results, a vent system should be as short and straight as possible.

- The Indoor models are a Category IV appliance and must be vented accordingly with any 4" vent approved for use with Category III/IV or Special BH type gas vent.
- **The manufacturer recommends the NovaVent line**. However, the following are also UL listed manufacturers: ProTech Systems Inc. (FasNSeal), Metal-Fab Inc., and Heat-Fab Inc. (Saf-T Vent).
- **Follow the vent pipe manufacturer's instructions when installing the vent pipe.**
- The maximum length of exhaust vent piping must not exceed 100 ft (30.5 m) (deducting 5 ft (1.5 m) for each elbow used in the venting system). Do not use more than 5 elbows.
- 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.

Diameter	Max. No. of Elbows	Max. Vertical and Horizontal (Total) Vent Length*
4 in. (102 mm)	5	100 ft (30.5 m)

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

No. of Elbows	Max. Vertical or Horizontal Vent Length	No. of Elbows	Max. Vertical or Horizontal Vent Length
0	100 ft (30.5 m)	3	85 ft (25.9 m)
1	95 ft (29.0 m)	4	80 ft (24.4 m)
2	90 ft (27.4 m)	5	75 ft (22.9 m)

Excludes vent terminators, termination elbows, or rain caps.

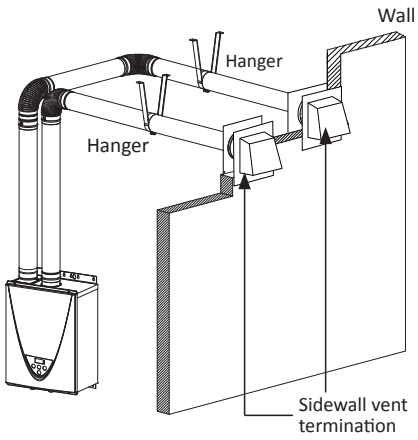
-DIP switch settings for vent length-

Typical installations using <u>stainless steel vents</u>

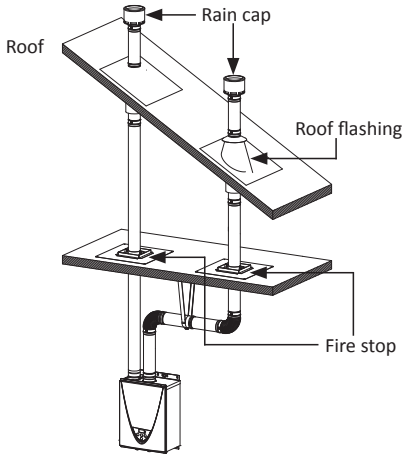
WARNING

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

Horizontal Installation



Vertical Installation

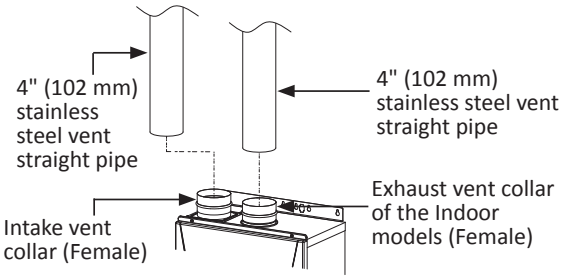


For details of the optional items, refer to the Installation manual for each optional item.

DIP switch settings : Single pipe and Direct vent installations / Vent diameter : 4" (102 mm) venting			
240 /340 Indoor		540 Indoor (Upper bank of DIP switches)	
Vent length			
5 to 50 ft (1.5 to 15.2m) (DEFAULT)	51 to 100 ft (15.3 to 30.5 m)	5 to 50 ft (1.5 to 15.2m) (DEFAULT)	51 to 100 ft (15.3 to 30.5 m)
ON 1 2 3 4 5 6 7 8 9 10 OFF No. 6 : O N No. 7 : OFF	ON 1 2 3 4 5 6 7 8 9 10 OFF No. 6 : OFF No. 7 : OFF	ON 1 2 3 4 5 6 7 8 OFF No. 3 : O N No. 4 : OFF	ON 1 2 3 4 5 6 7 8 OFF No. 3 : OFF No. 4 : OFF

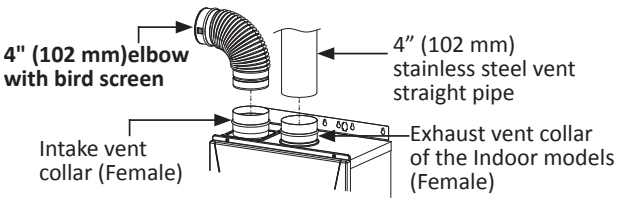
<How to install stainless steel vent with the indoor models>

4" vent connection for direct-vent installation



- Connect 4" (102 mm) stainless steel vent straight pipes directly on the exhaust/intake vent collar of the water heater.

4" vent connectionfor single vent installation



1. Connect a 4" (102 mm) stainless steel vent straight pipes directly on the exhaust vent collar of the water heater.
2. Connect a 4" (102 mm) elbow directly on the intake vent collar of the water heater.

WARNING

- Regarding the clearances from the exhaust terminal to the air inlet or opening, refer to pp. 26 to 28.
- Follow all vent system manufacturer’s instructions and all local codes.
- Use 4" (102 mm) Category III/IV approved or Special BH, single or double wall stainless steel vent pipe.
- **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.**

Approved Category IV, Single Wall, Venting Suppliers and Part Numbers

Description	Heater Vent Kits	Z-FLEX®		Description	Heater Vent Kits	Z-FLEX®	
		Nova VENT™	Z-VENT™			Nova VENT™	Z-VENT™
4" (102 mm) Straight pipe - 6" (152 mm) length	100112407	2NVP4.5	2SVEPWCF0406	4" (102 mm) 3-in-1 adaptor (F-F adaptor, condensate drain, & back-flow preventer)	100112585	2NVBFA4	2SVBFDPA04
4" (102 mm) Straight pipe - 12" (305 mm) length	100112406	2NVP41	2SVEPWCF0401	4" (102 mm) F-F adaptor	100112399	2NVAFF4	2SVEEWCF0445
4" (102 mm) Straight pipe - 24" (610 mm) length	100112404	2NVP42	2SVEPWCF0402	4" (102 mm) Backflow preventer w/ F-F adaptor	100112416	2NVBFU4	2ZVB04
4" (102 mm) Straight pipe - 36" (914 mm) length	100112403	2NVP43	2SVEPWCF0403	4" (102 mm) exhaust / 3" (76 mm) intake DV concentric termination - 5"-10" (127 - 254 mm) adjustability	100112550	2NVHTC43S	2SVSHTC43S
4" (102 mm)Straight pipe - 48" (1,219 mm) length	100112402	2NVP44	2SVEPWCF0404	4" (102 mm)exhaust / 3" (76 mm) intake DV concentric termination - 12"-18" (305 - 457 mm) adjustability	100112551	2NVHTC43	2SVSHTC43
4" (102 mm) Adjustable straight pipe - 10"-18" (254 - 457 mm) adjustability	100112405	2NVAL4	2SVSPA04	4" (102 mm) Sidewall termination, adjustable pipe	100187853	2NVBV4	n/a
4" (102 mm) 45 degree elbow	100112401	2NVE445	2SVEEWCF0445	4" (102 mm) Wall Thimble, 3"-6"(76 - 152 mm) wall thickness	100187852	2NVBT4	n/a
4" (102 mm) 90 degree elbow	100112400	2NVE490	2SVEEWCF0490	4" (102 mm) exhaust / 3" (76 mm) intake concentric termination - 5" to 10" (127 - 254 mm) adjustability	100112550	2NVHTC43S	2SVSHTC43S
4" (102 mm) Sidewall termination (4" (102 mm)Termination Hood)	100112419	2NVTH4	2SVSHTX04	4" (102 mm) exhaust / 3" (76 mm) intake concentric termination - 12" to 18" (305 - 457 mm) adjustability	100112551	2NVHTC43	2SVSHTC43
4" (102 mm) Vent termination tee	100112547	2NVTT4	2SVSTTF04	4" (102 mm) exhaust / 4" (102 mm) intake concentric termination - 5" to 10" (127 - 254 mm) adjustability	100112552	2NVHTC44S	2SVSHTC04S
4" (102 mm) Rain Cap	100112415	2NVRC4	2SVSRCF04	4" (102 mm) exhaust / 4" (102 mm) intake concentric termination - 12" to 18" (305 - 457 mm) adjustability	100112553	2NVHTC44S	2SVSHTC04
4" (102 mm) Extreme weather rain cap	100112548	2NVWC4	2SVSHRC04	4" (102 mm) Flat roof flashing	100112412	2NVFF4	2SVSSCF04
4" (102 mm) Horizontal drain tee	100112414	2NVHD4	2SVEDWCF04	4" (102 mm) Angled roof flashing	100112411	2NVAF4	2SVSADJF04
4" (102 mm) Vertical drain tee	100112413	2NVVD4	2SVEVDP04	Storm collar	100112410	2NVSC4	2SVSLSF04
4" (102 mm) wall thimble length 4"-7" (102 - 178 mm) wall thickness	100112732	2NVWT4	2SVSWTF04	Wall support	100112409	2NVSS41	2SVSWS04
4" (102 mm) wall thimble length 5"-10" (127 - 254 mm) wall thickness	100112733	2NVWT4L	2SVSWTEF04	Firestop support	100112408	2NVFS4	2SVSFSSF04

-Common-venting system-

The Indoor model can be vented together using the same exhaust and intake venting.

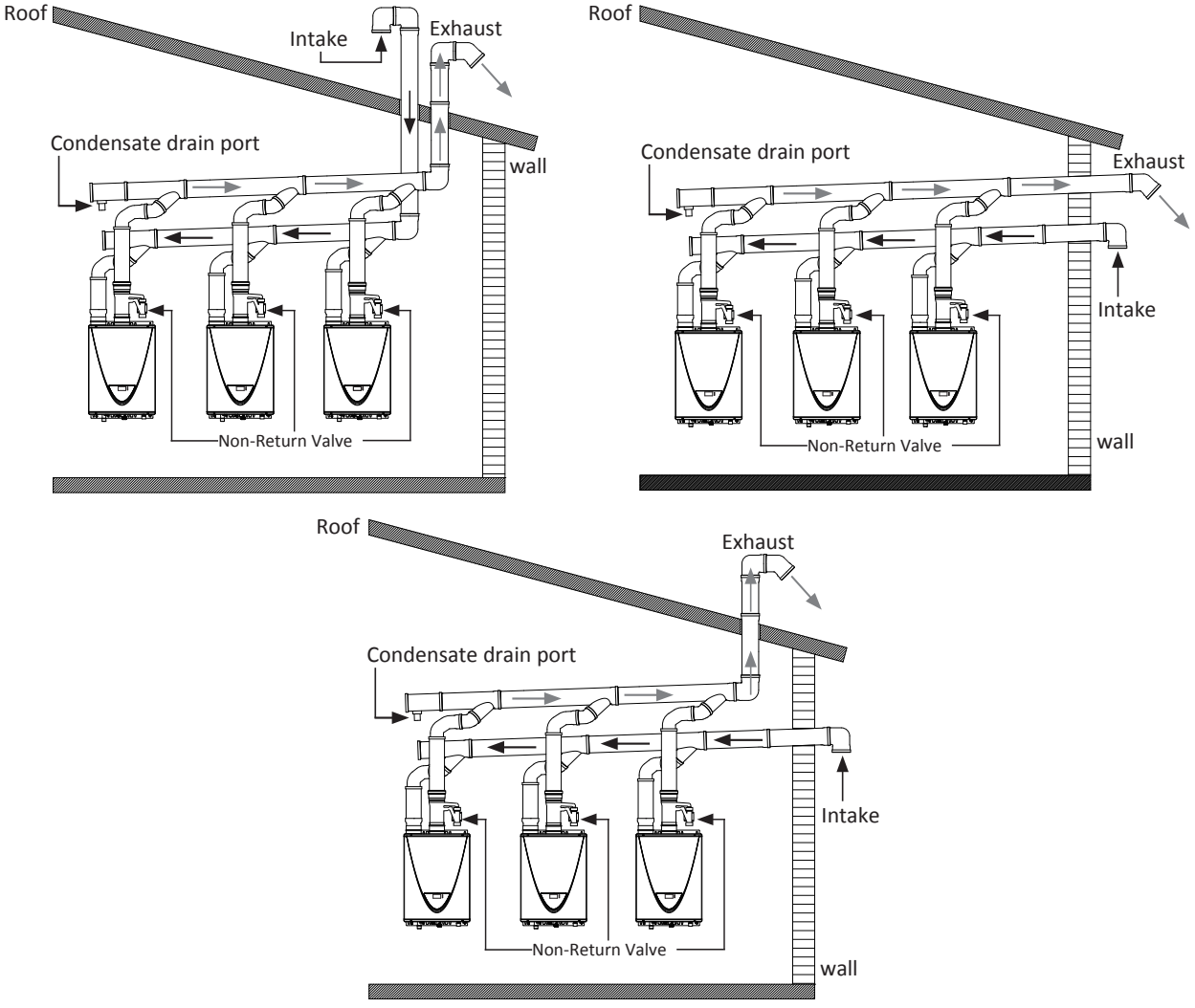
- Up to 8 water heaters can be common-vented together.
- A non-return valve (100113130) must be used for each water heater that is part of the system.
- The water heaters must all be direct-vented.
- The common-venting system shall be in accordance with the National Fuel Gas Code, ANSI Z223.1/NFPA 54 and/or B149.1, Natural Gas and Propane Installation Code (Current Editions), local codes, and the following manufacturer's instructions.
- For common-venting pieces and components, the manufacturer recommends Centrotherm's vent line.

Allowable models for common-venting
240 Indoor, 340 Indoor, 540 Indoor, 540P Indoor

WARNING

Only the models listed in the table above can be common-vented together. Different models cannot be common-vented.
Failure to observe these warnings could lead to carbon monoxide poisoning or death.

Typical common-vent installation examples

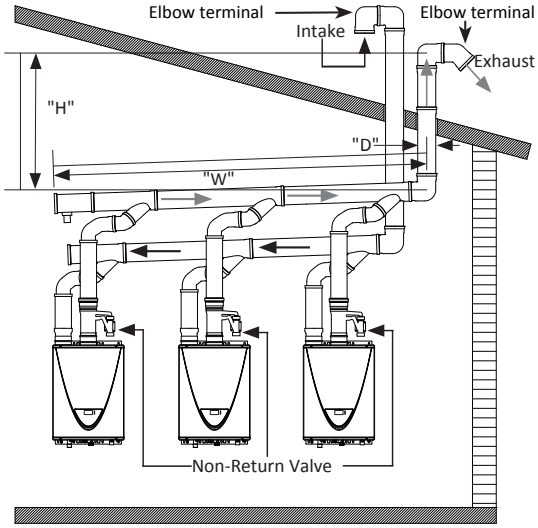


NOTICE For details on the installation of a common-vent system, please refer to "Common Venting Tankless Gas Water Heaters." It is a manual which is available on the water heater manufacturer's website.

To determine the dimension of a common-venting system

Determine the vent diameter (D) and the total vent length based on the number of water heaters installed. The total vent length (L) consists of the horizontal width (W) and the vertical height (H). See the table below.

- **Total vent length (L)="H"+"W" + (Number of Elbows x 5)**
- **Vent diameter="D"**

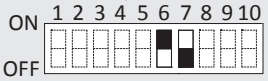
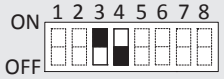


NOTICE

- Regarding the clearances between the exhaust termination and the intake termination, refer to pp. 26 to 28.
- Insert bird screen in elbow terminals.

WARNING

- **A Non-Return Valve must be installed for each water heater.** This prevents the escape of combustion gas through non-operating appliances.
- For detailed instructions on the common-venting system, refer to the instructions that are packaged with the vent parts or web site.

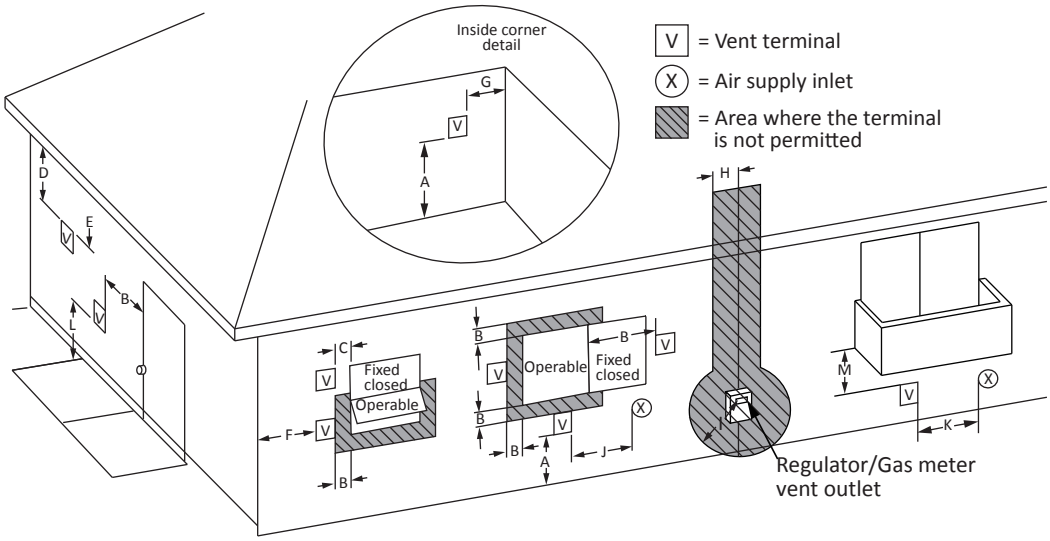
Common-venting system			
Vent Diameter* (D)	**Max. No. of water heaters**	**Max. Vertical and Horizontal (Total) Vent Length** (L)**	**DIP switch settings**
4 in. (110 mm)	2	25 ft (7.6 m)	**240 Indoor/340 Indoor**  No. 6 : ON / No. 7: OFF
5 in. (125 mm)	2	50 ft (15.2 m)	
	3	20 ft (6.1 m)	
6 in. (160 mm)	2	100 ft (30.5 m)	
	3	75 ft (22.9 m)	
	4	50 ft (15.2 m	
	5	25 ft (7.6 m)	
	6	20 ft (6.1 m)	
8 in. (200 mm)	3	100 ft (30.5 m)	**540 Indoor (Upper bank of DIP switches)**  No. 3 : ON / No. 4: OFF
	4	100 ft (30.5 m)	
	5	85 ft (25.9 m)	
	6	65 ft (19.8 m)	
	7	50 ft (15.2 m)	
	8	41 ft (12.5 m)	
10 in. (250 mm)	5	100 ft (30.5 m)	
	6	100 ft (30.5 m)	
	7	100 ft (30.5 m)	
	8	100 ft. (30.5 m)	

*Diameters of pipes are in accordance with Centrotherm's specifications.
**One elbow is equivalent to 5 ft (1.5 m) linear length, and the maximum number of elbows is 5.

WARNING

- **Adjust the appropriate DIP switches according to model as shown in the left table. DO NOT adjust the other DIP switches. (Refer to p. 19 for the location of the DIP switches.)**
- **Turn off the power supply to the water heater before changing the DIP switch settings.**
- **Failure to observe these warnings could lead to carbon monoxide poisoning or death.**

-Vent termination clearances-



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

*Clearance in accordance with local installation codes and the requirements of the gas supplier.
**A vent shall not terminate directly above a sidewalk or paved driveway that is located between two single family dwellings and serves both dwellings.
***Permitted only if veranda, porch, deck, or balcony is fully open on a minimum of two sides beneath the floor.

The vent for condensing water heaters shall not terminate:

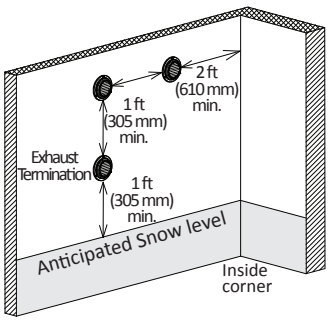
1) over public walkways; or
2) near soffit vents or crawl space vents or other areas where condensate or vapor could create a nuisance or hazard or cause property damage; or
3) where condensate vapor could cause damage or could be detrimental to the operation of regulators, relief valves, or other equipment.

Notes:

1) *In accordance with the current CSA B149.1,* Natural Gas and Propane Installation Code
2) *In accordance with the current ANSI Z223.1/NFPA 54*, National Fuel Gas Code

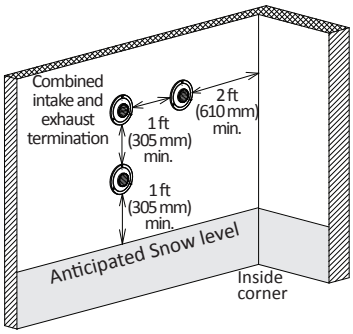
-Clearances for sidewall terminations-

WARNING Improper installation can result in carbon monoxide poisoning or death. Follow all local and national codes in regards to proper termination clearances. In the absence of such codes, the clearances below can be used as guidelines. Local codes supersede these guidelines.



Multiple Sidewall Terminations

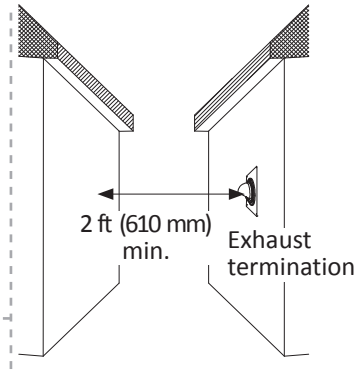
An exhaust termination must be at least 1 ft (305mm) away from another exhaust termination. An exhaust termination must also be at least 2 ft (610 mm) away from an inside corner. (If the adjacent wall is less than 2 ft (610 mm) of length, the minimum required distance away from the inside corner will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



Multiple DV Sidewall Terminations

A direct vent (DV) termination must be at least 1 ft (305 mm) away from other direct vent terminations.

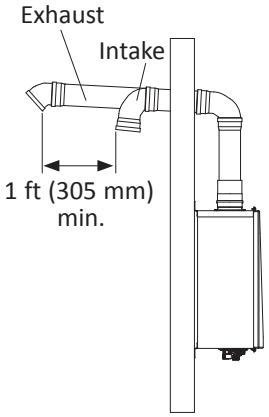
A direct vent termination must also be at least 2 ft (610 mm) away from an inside corner. (If the adjacent wall is less than 2 ft (610 mm) of length, the minimum required distance away from the inside corner will be equal to the length of that adjacent wall.)

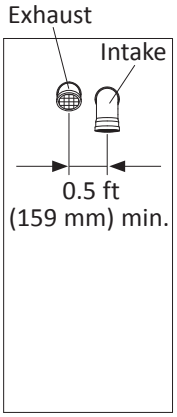


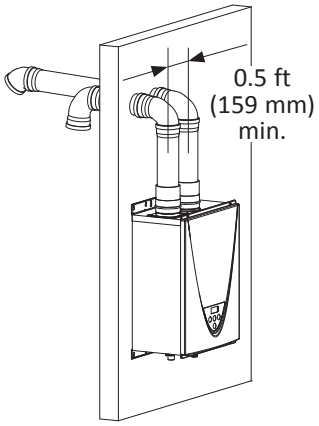
Exhaust and/or direct vent sidewall terminations should be at least 2 ft (610 mm) away from an opposite surface/wall. Do not place the termination directly in front of an opening into a building.

<Case 1>

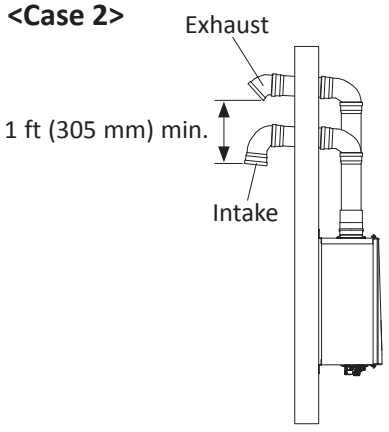
For direct vent sidewall terminations that use two separate penetrations for the intake and exhaust, keep the termination clearances shown in the diagrams on the right.

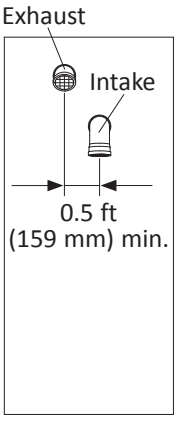


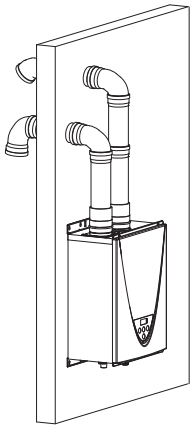




<Case 2>







-Clearances for rooftop terminations-

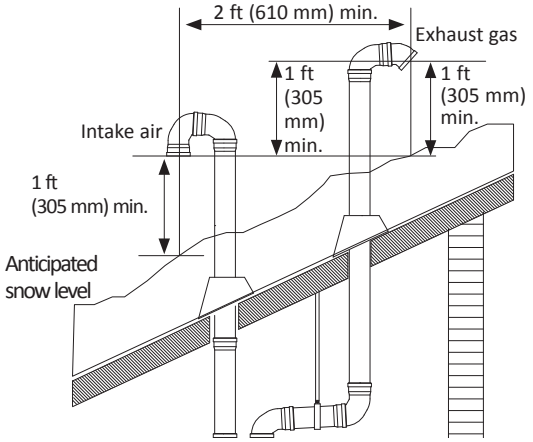
WARNING

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

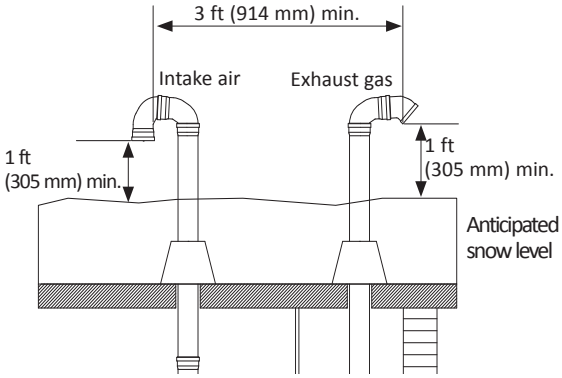
NOTICE

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

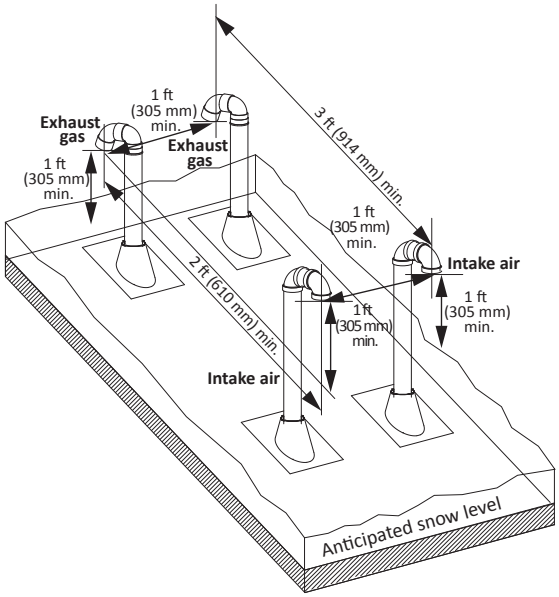
Angled roof termination



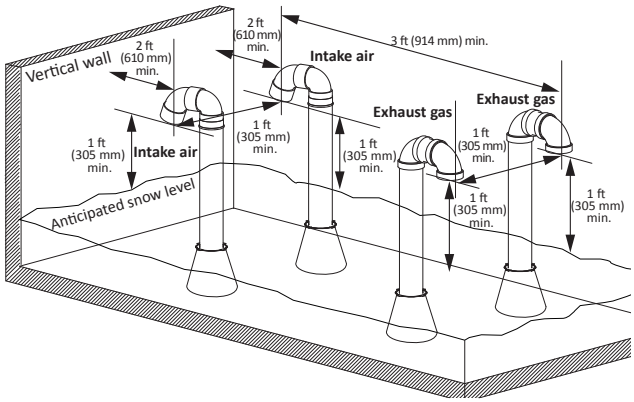
Flat roof termination



Multiple angled roof terminations



Multiple flat roof terminations



WARNING

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

GAS SUPPLY AND GAS PIPE SIZING

-General-

WARNING

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

- The minimum and maximum inlet gas pressures are:

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

- Inlet gas pressures that fall outside the range of values listed above may adversely affect the performance of the water heater. These pressures are measured when the water heater is in full operation and in stanby.
- Inlet gas pressure must not exceed the above maximum values; gas pressure above the specified range will cause dangerous operating conditions and damage to the unit.
- Until testing of the main gas line supply pressure is completed, ensure the gas line to the water heater is disconnected to avoid any damage to the water heater.
- If the gas supply pressure to the heater is greater than the specified maximum, a field-supplied regulator is required. The regulator must lower the gas pressure within the approved range.
- Install the gas regulator according to the manufacturer's instructions.
- The regulator must be sized for the water heater input and provide the specified pressures that are listed on the rating plate.
- In the absence of minimum install distance, it is recommended that there is at least 3 ft (1 m) of piping between the regulator outlet and the water heater's inlet gas connection.

-Gas connections-

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

NOTICE Size the gas pipe appropriately to supply the necessary volume of gas required for the water heater using ANSI Z223.1/NFPA 54 in the USA or B149.1 in Canada or local codes. Otherwise, flow capabilities and output temperatures will be limited.

-Natural gas supply piping-

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

Based on Energy Content of 1,000 BTU/Cubic ft: The water heater requires 160 Cubic ft/hr for the 240 model, 180 Cubic ft/hr for the 340 model, and 199 Cubic ft/hr for the 540 model.

The following tables are from NFPA 54.

Unit: Cubic feet per hour

Pipe Size	Length												
Diameter	10' (3 .0 m)	20' (6.1 m)	30' (9.1 m)	40' (12.2 m)	50' (15.2 m)	60' (18.3 m)	70' (21.3 m)	80' (24.4 m)	90' (27.4 m)	100' (30.5 m)	125' (38.1 m)	150' (45.7 m)	200' (61.0 m)
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"	1,390	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

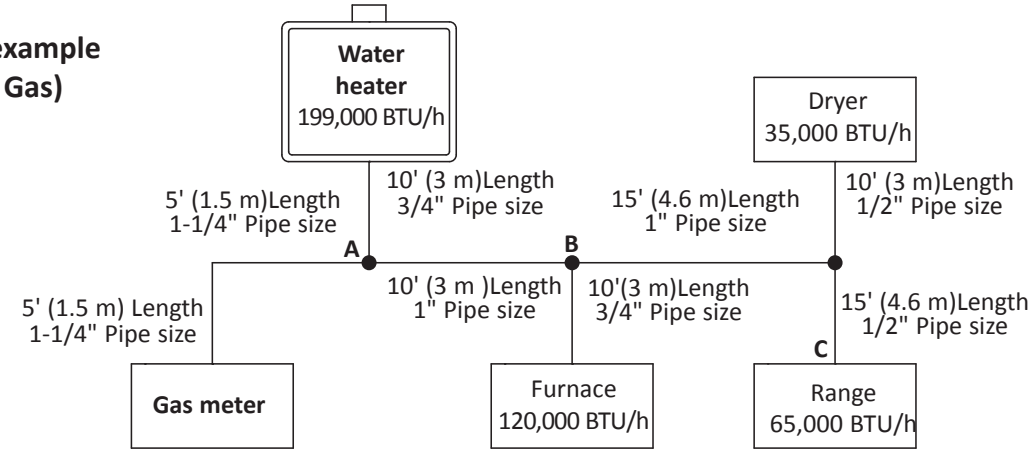
-Propane (LP) supply piping-

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												
Diameter	10' (3 .0 m)	20' (6.1 m)	30' (9.1 m)	40' (12.2 m)	50' (15.2 m)	60' (18.3 m)	70' (21.3 m)	80' (24.4 m)	90' (27.4 m)	100' (30.5 m)	125' (38.1 m)	150' (45.7 m)	200' (61.0 m)
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, 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 away from the meter. Looking at the above chart, and under the column of 50 ft, Section A to B needs to be 1" in order to supply 220 cubic ft.

WATER CONNECTIONS

WARNING

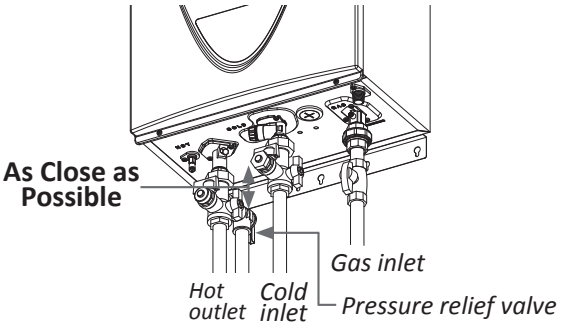
Do not use this appliance if any part has been under water. Immediately contact a qualified installer or service agency to replace a flooded water heater. Do not attempt to repair the unit! It must be replaced!

NOTICE

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

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

1. A manual shutoff valve must be installed on the cold water inlet to the water heater between the main water supply line and the water heater.
2. In addition, a manual shutoff valve is also recommended on the hot water outlet of the unit. If the water heater is installed within, or subjected to, a closed loop water system, a thermal expansion tank or code approved device to handle thermal expansion must be installed.



3. 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 heater.
4. 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. 51.)

-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 **ANSI Z21.22** or **CAN 1-4.4** and installation must follow local codes.
- The discharge capacity must be at least 160,000 BTU/h for the 240 model, 180,000 BTU/h for the 340 model, and 199,000 BTU/h for the 540 model.
- The pressure relief valve needs to be rated for a maximum of 150 psi (1 MPa).
- The discharge piping for the pressure relief valve must be directed so that the hot water cannot splash outward and cause damage or personal injury.
- Attach the discharge tube to the pressure relief valve and run the end of the tube to within 6 in (152 mm) from the floor. This discharge tube must allow free and complete drainage without any restrictions.
- If the pressure relief valve discharges periodically, this may be due to thermal expansion in a closed water supply system. Contact the water supplier or a local plumbing professional on how to correct this situation. Do not plug the pressure relief valve.
- The pressure relief valve must be manually operated periodically to check for correct operation. Before operating the valve manually, check that it will discharge in a place for secure disposal.
- No valve must be placed between the relief valve and the water heater.

WARNING

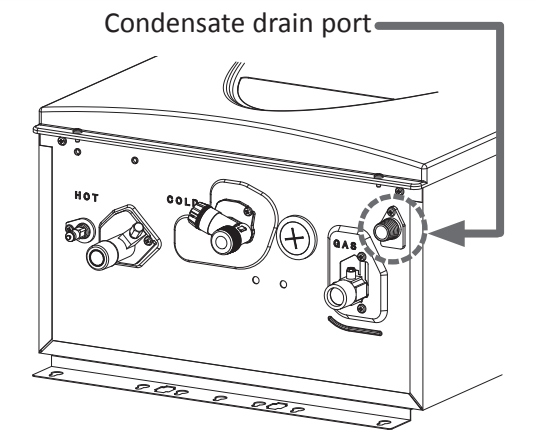
Hot water could be released when the pressure relief valve is opened. This could result in severe personal injury. Before operating the pressure relief valve manually, check that it will discharge in a safe place. If water does not flow freely from the end of the discharge pipe, turn the gas supply and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

CONDENSATE DRAIN

- The water heater does not include a built-in condensate neutralizer cartridge for reducing the pH level of condensate water. If local codes dictate that condensate must be neutralized prior to drainage, a condensate neutralizer must be installed. An accessory Neutralizer assembly (100112159/TH-NT01) is sold separately. (Refer to p. 10.)
- In the absence of applicable local codes and regulations, the manufacturer recommends that condensate be disposed of into a drain. Connect a drain tube from the condensate drain port (shown below) located on the bottom of the water heater to a standard drain.

NOTICE

Follow all code requirements of the local authority for condensate neutralizers and whether or not they are required for the installation.



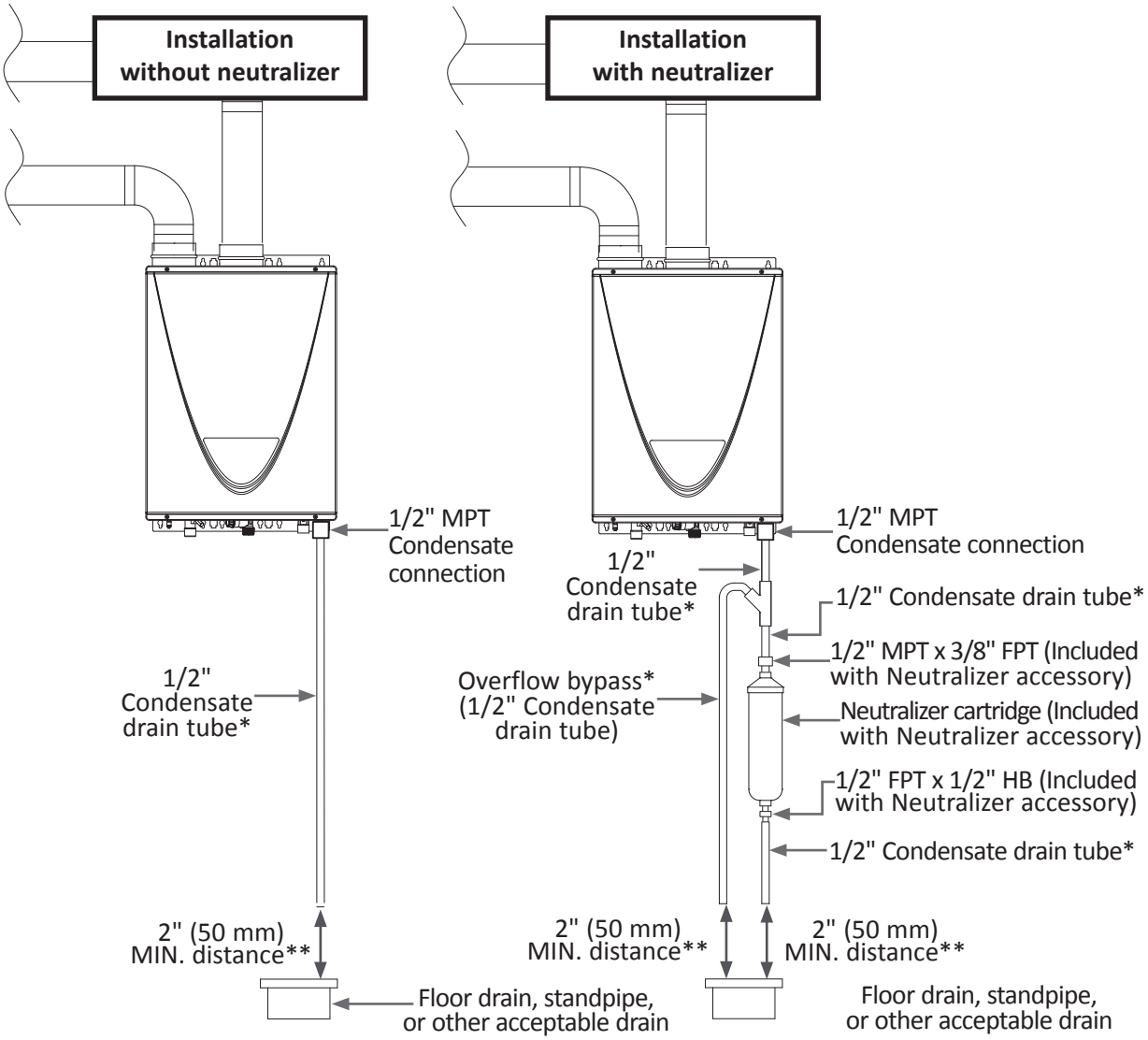
-Condensate drain connections-

NOTICE

- **Discharge condensate (acidic water) in accordance with all local codes and common safety practices.**
- **Use corrosion resistant pipe, such as PVC, for the condensate drain line. Do not use metal pipe.**
- **The condensate drain does not require a trap.**
- **Maintain a downward slope on the drain line(s), including installations in which the drain is not directly below the water heater.**
- **A field-supplied bypass is required if a neutralizer is installed.**
- **Do not connect the condensate drain line directly to a condensate pump.**
- **If the drain line is required to have bends, ensure that there are no kinks that will restrict the flow of condensation.**

The water heater is a high efficiency condensing water heater that produces condensate (acidic water). The acidic condensate generated in the secondary heat exchanger can be neutralized by the neutralizer accessory (100112159/TH-NT01).

Although a neutralizer is not required, a condensate drain must be installed as described on the next page.



*Maintain downward slope, including installations in which the drain is not directly below the heater.
**A 2" (50 mm) minimum distance must be maintained between the condensate line and drain to allow full flow of the condensation.

NOTICE

- The condensate drain is at atmospheric pressure (non-pressurized) and therefore must be allowed to drain freely with gravity only. Ensure that the condensate drain tube is not plugged or blocked, and ensure that it slopes downward to allow condensate to flow freely. **All portions of the condensate drain (neutralizer and drain tube) must be at a lower elevation than the water heater to prevent condensate water from building up inside the heat exchanger.**
- Condensate cannot be effectively neutralized if the neutralizer elements inside the Neutralizer accessory have been completely consumed. If this happens, condensate will remain acidic and can possibly cause damage to items such as pipes, concrete, etc., if drained improperly.
- The actual life of the neutralizer may vary, depending on the application and usage. Replace the cartridge when the condensate pH goes below 6.0.
- Please ensure that the cartridge is properly replaced before the neutralizer elements have been completely consumed.
- All preventative measures and safety practices must be adhered to when draining condensate. The manufacturer will not be responsible for any damage caused by condensate.
- A drain pan, or other means of protection against water damage, is recommended to be installed under the water heater in case of leaks.

ELECTRICAL CONNECTIONS

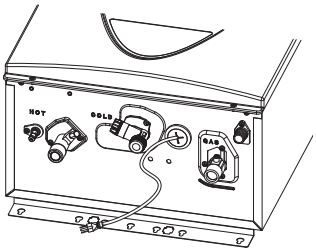
WARNING

- Follow the electrical code requirements of the local authority having jurisdiction. In the absence of such requirements, follow the current edition of the National Electrical Code ANSI/NFPA 70 in the U.S. or the current edition of CSA C22.1 Canadian Electrical Code Part 1 in Canada.
- When servicing or replacing parts within the water heater, label all wires prior to disconnection to facilitate an easy and error-free reconnection. Wiring errors can cause improper and dangerous operation. Verify proper operation after servicing.
- Failure to observe these warnings could result in personal injury or death.

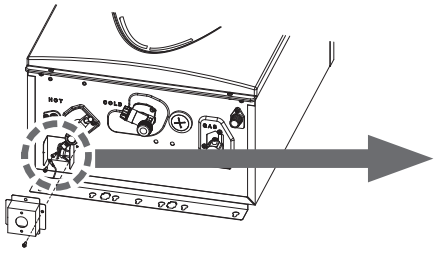
All Indoor models come with a power plug instead of a junction box. The following procedure is for outdoor model only.

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

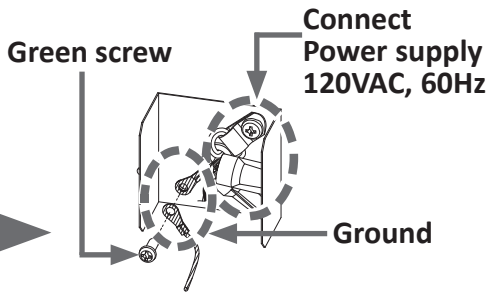
Indoor models



Outdoor models



Bottom view of water heater



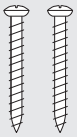
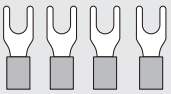
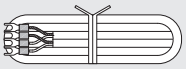
View of electrical connections of water heater

TEMPERATURE REMOTE CONTROLLER

-Included accessories-Outdoor models only

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

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

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

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

-Installation-

WARNING

- **<u>This remote controller is NOT waterproof.</u>**
- **The water heater can only have one remote controller.**
- Do not install in high temperature environments, high humidity conditions outdoors, in direct sunlight, or within the reach of children.
- Make sure the remote controller does not come into contact with water or oil.
- Failure to observe these warnings could result in personal injury or electrical shock.

NOTICE

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

<Mounting and Wiring the Remote Controller>

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

Fig. A

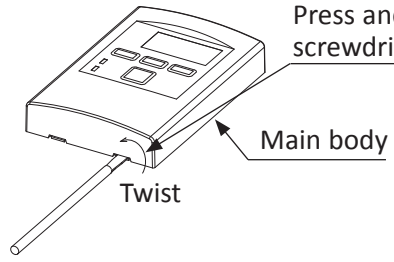


Fig. B

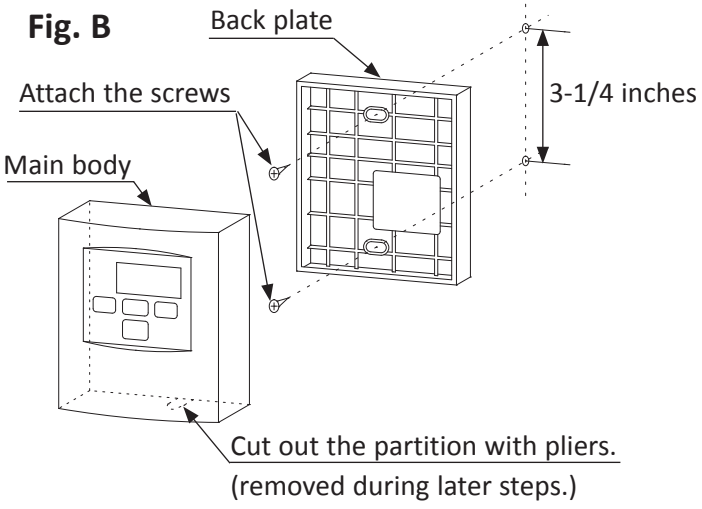
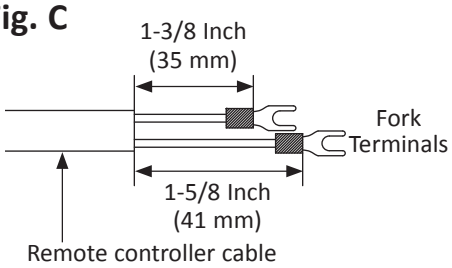


Fig. C



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

Fig. D-1

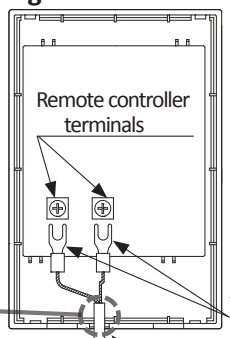
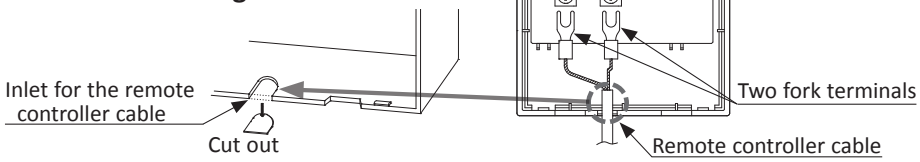


Fig. D-2



<How to connect 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. Take off the back plate from the remote controller, and then attach the two fork terminals to the connector base on the back side of the remote controller with two screws. Make sure the terminals are firmly fixed. (See the above instructions for installation of the remote controller.)
5. Pull the remote controller cable through the hole at the bottom of the water heater's casing.
6. Secure both controller cable terminals to the terminals on the computer board as shown below. (Secure them underneath the screw terminals. No polarity.)
   * Do NOT jump or short-circuit the cables, or computer will be damaged.
7. Replace the front cover securely.

Fig. E-1

240 and 340 models

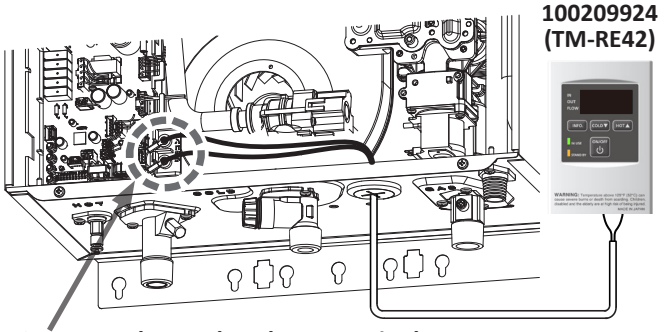
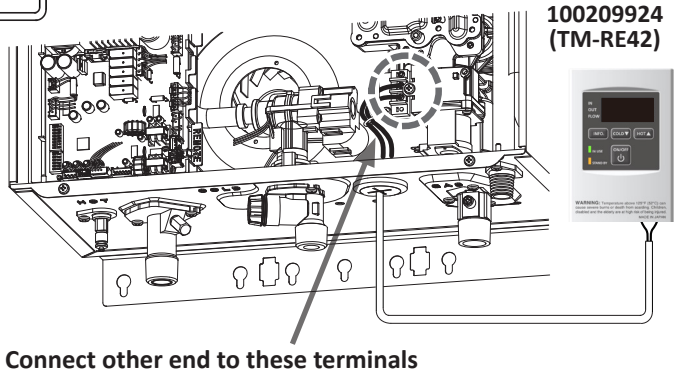


Fig. E-2

540 model



EASY-LINK SYSTEM

(540 model only)

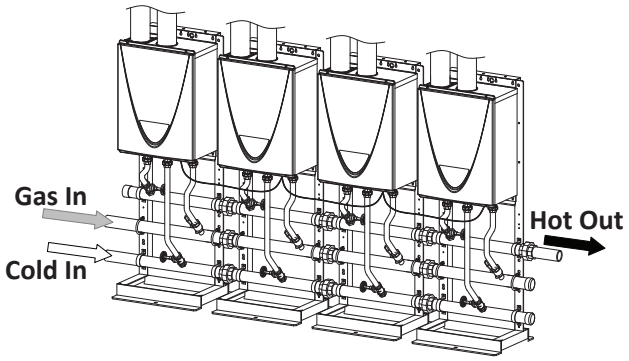
The 540 model water heaters can combine with the following approved heaters with communication cables to work as a multiple-unit manifold system.

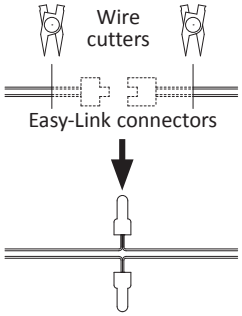
- The built-in Easy-Link System allows up to 4 units to manifold together.
- A communication cable (gray color) comes with each 540 model.

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 13,000 BTU/h (Propane) or 15,000 BTU/h (Natural gas) to 796,000 BTU/h.

Approved heaters that can be combined with 540 model in an Easy-Link System
710 model /710 ASME
520 model
540 model
540P model (Only when 540P is a PARENT unit in the system.)

Due to the difference in the connector type for the Easy-Link System between the 710 and 540, cut out the connectors for the Easy-Link System and then splice the wires directly together when connecting the 710 and 540 in the Easy-Link System.





NOTICE

- The Easy-Link System is limited to up to **4 units**. If you connect more than 4 units, only the first 4 units will work as a part of the Easy-Link System. The other additional units will not work.
- **The 540 model cannot be combined together with other models not listed on the table above.**
- **A 540P model only can be connected to 540 models where the 540P is the PARENT unit in the system.**
- **When a 540 model is connected to other models listed above in an Easy-Link System, contact the manufacturer.**
- **When a 710 and 540 are connected together in an Easy-Link System, change DIP switch No.6 on the lower bank of DIP switches on the 540 model computer board to the "ON" position. (See the following page for detail.)**
- A remote controller is not required for an Easy-Link System. However, it does provide for more temperature options and ease of maintenance.
- If a remote controller is used, the temperature on all the units in the system will automatically be set to the same temperature that is set on the remote.
- When a remote is used in an Easy-Link System, it must be connected to the parent unit.
- Only one remote can be connected.

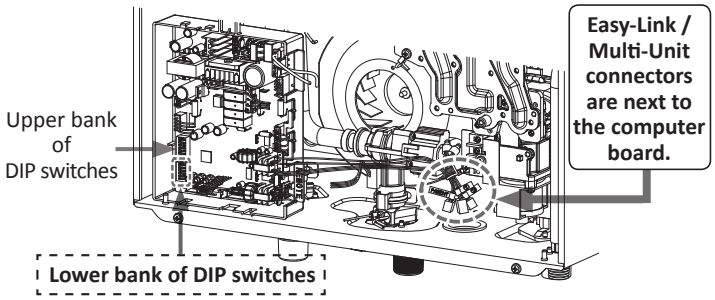
-Easy-Link connection procedures-

1. Make sure the power to the heaters are off.
2. Verify the DIP switch set temperatures of all units within the system. Every single water heater must be set to the same set temperature. If a remote controller is used, it should be installed to the **"PARENT"** unit. The controller will set the temperature for the entire system. NOTICE: Only a remote approved for use with the "PARENT" model may be installed.
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**. Refer to the following page. Do not change any DIP switches on any of the **"CHILD"** units.

5. Between the **"PARENT"** and the **"CHILD-1"** units:
   Connect the **"PARENT"** connector of the **"PARENT"** unit to the **"1"** connector of the **"CHILD-1"** unit using the supplied linking cable.
6. Between the **"CHILD-1"** and the **"CHILD-2"** units:
   Connect the **"2"** connector of the **"CHILD-1"** unit to the **"1"** connector of the **"CHILD-2"** unit.
7. Between the **"CHILD-2"** and the **"CHILD-3"** units:
   Connect the **"2"** connector of the **"CHILD-2"** unit to the **"1"** connector of the **"CHILD-3"** unit.
8. Verify that all cables are connected like the diagram below (B).
9. Turn on power to the **"PARENT"** unit. Turn on **"CHILD-1"**. When the (remote and/or temperature) controller displays a number, turn on **"CHILD-2"**.
   When the (remote and/or built-in temperature) controller displays a number, turn on **"CHILD-3"**.
   Make sure the (remote and/or built-in temperature) controllers display the unit #. The numbering system automatically allocates the unit # to each water heater in the Easy-Link System, in accordance with the table at right.
   (Refer to p.53.)

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

(A) 540 model computer board

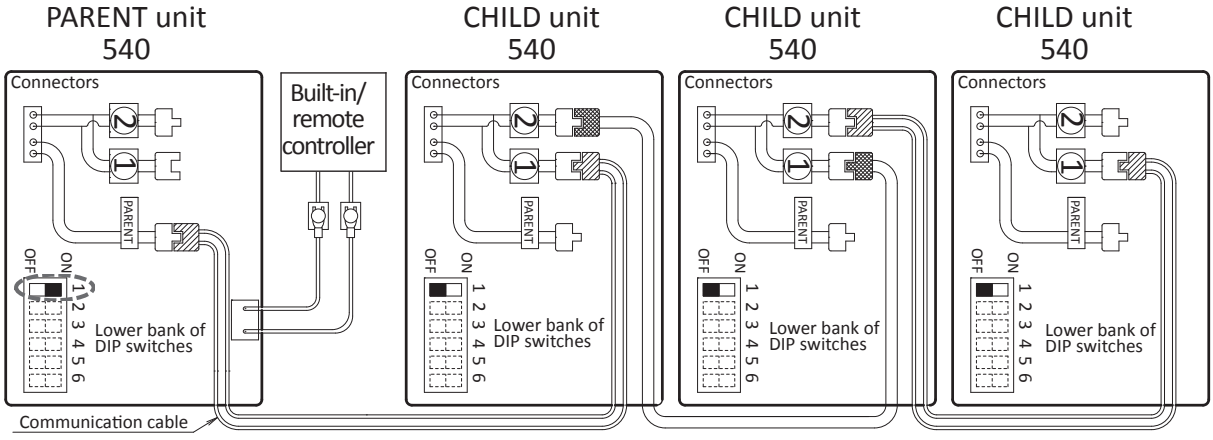


540 DIP switch settings for Easy-Link System		
Lower bank of DIP switches		
PARENT	CHILD	Connection with 710
		
No. 1 ON	No. 1 OFF	No. 6 ON

WARNING

- **To change the DIP switch settings for the Easy-Link System, locate the lower bank of DIP switches at the bottom left of the computer board of 540.**
- **DO NOT adjust any other DIP switches .**
- **Turn off the power supply to the water heater before changing the DIP switch settings.**
- **Failure to observe this warning could result in carbon monoxide poisoning or death.**

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

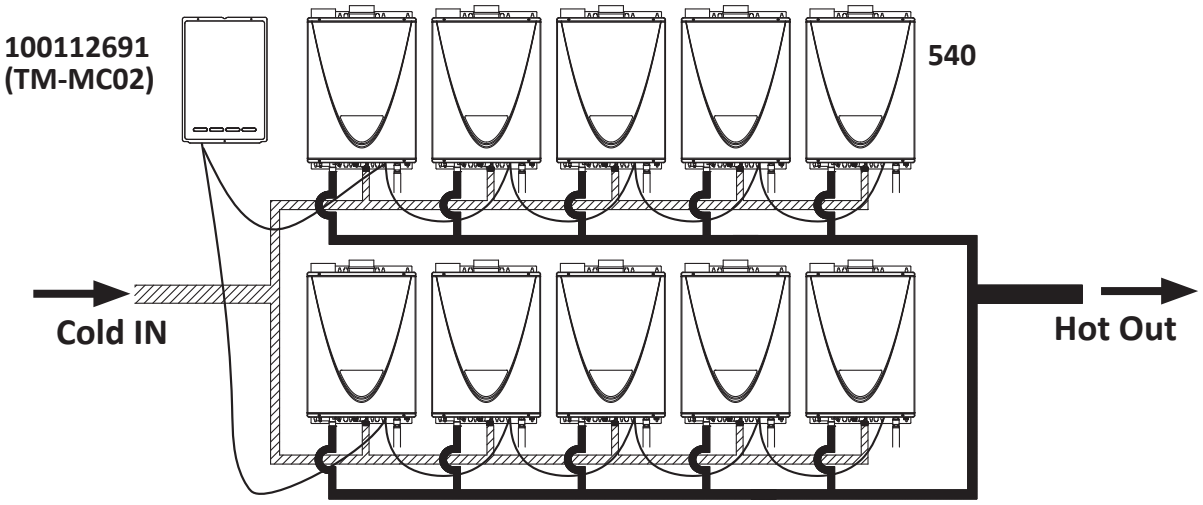


NOTICE

- The dark squares indicate the correct position of the DIP switch.
- When the 540P, 710, or 520 is a PARENT unit in an Easy-Link System, refer to the respective manual for DIP switch settings.
- Either a built-in controller or a remote controller is required for the Easy-Link System for ease of usage and maintenance.

MULTI-UNIT SYSTEM

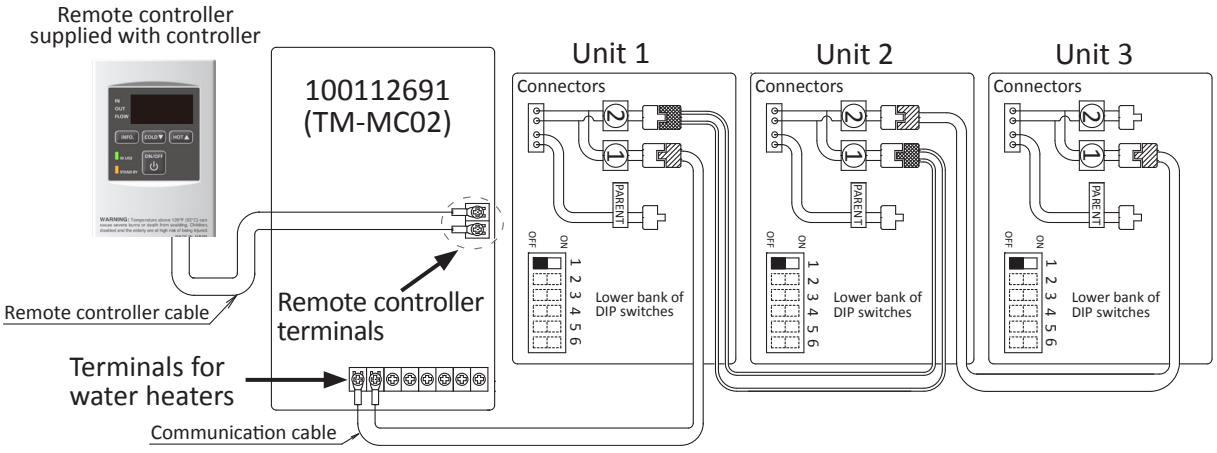
Multiple 540 models can be combined for a Multi-Unit System, along with the multi-unit controller (Part 100112691 (TM-MC02)). The multi-unit controller can control from 2 units to 20 units for commercial or residential applications. For a 20-unit system, the computer can modulate between the usages of 13,000 BTU/h (Propane) or 15,000 BTU/h (Natural gas) 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 with the remote controller wiring:



- DIP switch settings: Default position (It does not need adjustment.)
- This is the connection diagram for a 540 model and a multi-unit controller in the Multi-Unit System. The example above shows three water heaters.
- The multi-unit controller automatically allocates the unit # (1-20) to each water heater in 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.
- In a Multi-Unit System, 540 models can only be connected with other 540 models or 710 models.
- The multi-unit controller allocates random numbering. See the controller instructions to learn how to renumber the system units sequentially.

NOTICE

- For detailed instructions on the multi-unit controller, refer to the instructions that are packaged with the multi-unit controller.
- If 710 and 540 models are to be connected together in a Multi-Unit System, refer to the installation manual of the multi-unit controller for more details.

APPLICATIONS

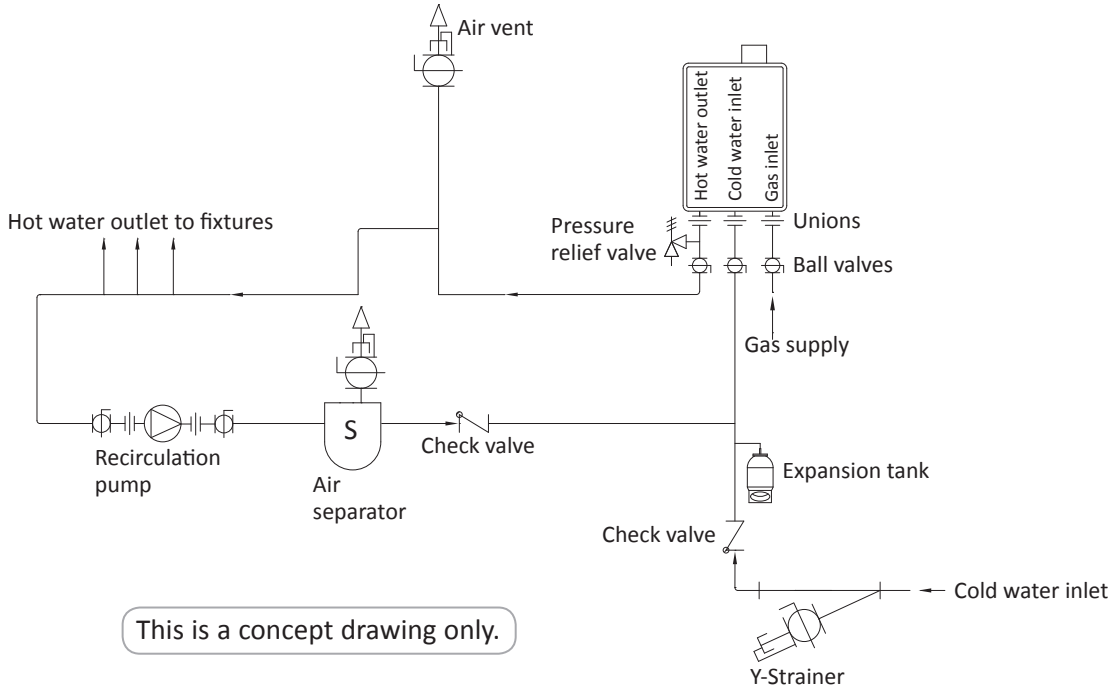
-Space-heating applications-

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 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.
- Failure to observe these warnings could result in severe personal injury or death.

-Recirculation-

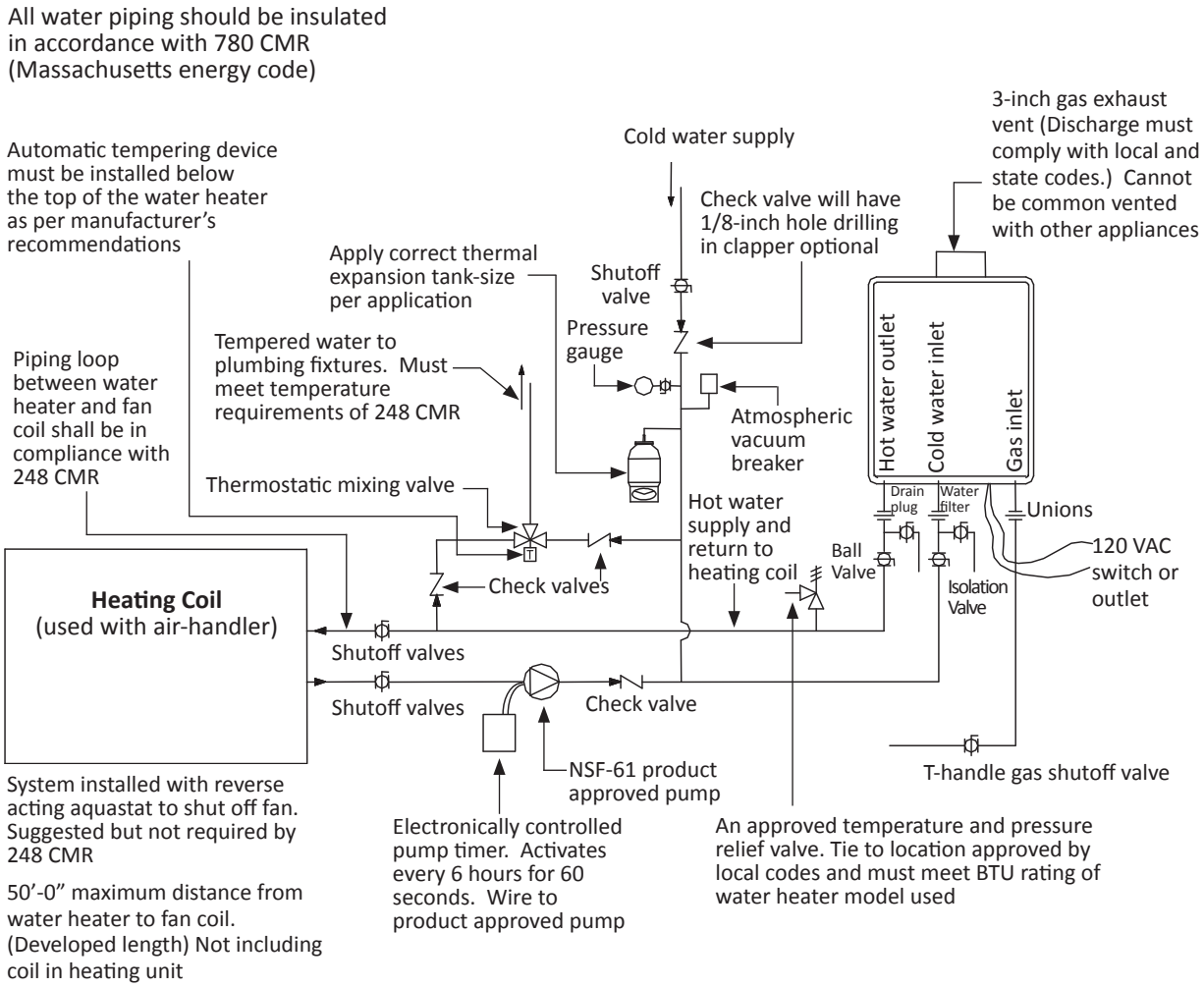
**The recirculation pump is to be controlled by:*
-Dual-set aquastat (recommended w/timer)
**The recirculation pump is to provide no less than 2 GPM (7.5 L/min) and no more than 4 GPM (15 L/min) through each activated unit in the system.*



This is a concept drawing only.

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

Diagrammatic layout of radiant heating and domestic water heater.



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

NOTICE

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

INITIAL OPERATION

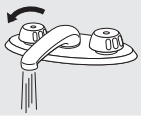
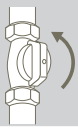
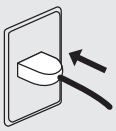
FOR YOUR SAFETY, READ BEFORE OPERATING

- **Check the GAS and WATER CONNECTIONS** for leaks before firing unit for the first time.
- Open the main gas supply valve to the unit using only your hand to avoid any spark. Never use tools. If the knob will not turn by hand, do not try to force it; call a qualified service technician. Forced repair may result in a fire or explosion due to gas leaks.
- Be sure to check for the presence of leaking gas toward the bottom of the unit because some gases are heavier than air and may settle towards the floor.
- **Check the GAS PRESSURE**. Refer to pp. 29 and 51.
- 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 COMBUSTION AIR** to the water heater.
- **Purge the GAS and WATER LINES** to remove any air pockets.
- Do not use this appliance if any part has been under water. Immediately contact a qualified installer or service agency to replace a flooded water heater. Do not attempt to repair the unit! It must be replaced!

WARNING

IF YOU SMELL GAS:

- Do not try to start the water heater.
- Do not touch any electric switches; do not use any phone in your building.
- Immediately call your gas supplier from a neighbor's phone. Follow the gas supplier's instructions.
- If you cannot reach your gas supplier, call the fire department.
- Failure to observe these warnings could lead to fire or an explosion, resulting in severe injury or death.

	Operation	
1.	Once the above checks have been completed, please clean filter of any debris. Refer to p. 51 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 installed.	
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.