



REVOLUTION WATER HEATER

Installation Manual

Model

! VRP-150 VRP-199

! VRS-150 VRS-199

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



Certified to NSF/ANSI 5 & 372



* Lead Free

* The wetted surface of this product contacted by consumable water contains less than one quarter of one percent (0.25%) of lead by weight.

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 electrical 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.

- The installation must conform with local codes or, in the absence of local codes, the National Fuel Gas Code, ANSI Z223.1/NFPA 54 and/or CSA B149.1, Natural Gas and Propane Installation Code.
- When applicable, the installation must conform with the Manufactured Home Construction and Safety Standard, Title 24 CFR, Part 3280 and/or CAN/CSA Z240 MH Series, Mobile Homes.

Safety Information

The following safety symbols are used in this manual for user's safety. Read this manual carefully and follow all instructions to avoid property damage, fire, explosion, personal injury, or death.

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

 **Warning** Indicates a potentially hazardous situation which, if not avoided, will result in injury or death.

 **Caution** Indicates a potentially hazardous situation which, if not avoided, could result in property damage.

 **Danger**

If you smell gas:

- Do not try to light any appliance.
- Do not touch any electrical switches or use landline phones.
- From a neighbor's phone, call your gas provider and follow their instructions.
- If you cannot reach your gas provider, call the fire department.

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

- Vapors from flammable liquids can explode and/or catch fire causing death or severe burns.
- Keep flammable products far away from the water heater and store them in approved containers. Keep the containers tightly closed and out of the reach of children.
- The Water heater has a main burner flame that can come on at any time and will ignite flammable vapors.
- Vapors cannot be seen and are heavier than air. Vapors travel a long way on the floor and can be carried from other rooms to the main burner flame by air currents.

Avoid using hot water over 125°F.

- Water temperature over 125°F can cause severe burns or death from scalding.
- Children, the disabled and the elderly are at highest risk of being scalded.
- Test water before bathing or showering.

Temperature	Time to Produce Serious Burn	Temperature	Time to Produce Serious Burn
120 °F (48 °C)	More than 5 minutes	140 °F (60 °C)	Less than 5 seconds
125 °F (51 °C)	1.5 to 2 minutes	145 °F (62 °C)	Less than 3 seconds
130 °F (54 °C)	Approx. 30 seconds	150 °F (65 °C)	Approx. 1.5 seconds
135 °F (57 °C)	Approx. 10 seconds	155 °F (68 °C)	Approx. 1 second



Warning

- **Do not store combustibles, such as papers or laundry, near the water heater or venting system.**
Failure to do so may result in fire or explosion.
- **Do not store or use gasoline or other flammable liquids near this water heater.**
Failure to do so may result in fire or explosion.
- **Do not store or use compressed gases, such as hair sprays or spray paints, near the water heater or venting system, including the vent termination.**
Failure to do so may result in fire or explosion.
- **Do not remove the front cover unless the power to the water heater is turned off or disconnected.**
Failure to do so may result in electric shock.
- **Do not touch the internal components of the water heater or the power cord with wet hands.**
Failure to do so may result in electric shock.
- **Do not operate the water heater with the front cover opened.**
Failure to do so may result in fire or carbon monoxide (CO) poisoning, which may result in property damage, personal injury, or death.
- **Do not operate the water heater without proper venting.**
Failure to do so may result in fire or carbon monoxide (CO) poisoning, which may result in property damage, personal injury, or death.



Caution

- **Do not use the water heater for anything other than its intended purpose, as described in this manual.**
Failure to do so may result in property damage, personal injury, or death.
- **Do not turn on the water heater unless the water and gas supplies are fully opened.**
Failure to do so may damage the water heater.
- **Do not use unapproved replacement or accessory parts.**
Failure to do so may result in improper or dangerous operation and will void the manufacturer's warranty.
- **Label all wires prior to disconnection when servicing controls.**
Wiring errors can cause improper and dangerous operation. Verify proper operation after servicing.
- **Do not place anything in or around the vent terminals that could obstruct the air flow in or out of the water heater.**
Failure to do so may result in fire or carbon monoxide (CO) poisoning, which may result in property damage, personal injury, or death.
- **This water heater has been approved for use in the USA and Canada only.**
Using the water heater in any other country will void the manufacturer's warranty.

Important Note for the State of Massachusetts

From Massachusetts Rules and Regulations 248 CMR 5.08:

- (a) For all side wall horizontally vented gas fueled equipment installed in every dwelling, building or structure used in whole or in part for residential purposes, including those owned or operated by the Commonwealth and where the side wall exhaust vent termination is less than seven (7) feet above finished grade in the area of the venting, including but not limited to decks and porches, the following requirements shall be satisfied.
 - 1. **INSTALLATION OF CARBON MONOXIDE DETECTORS.** At the time of installation of the side wall horizontal vented gas fuelled equipment, the installing plumber or gas fitter shall observe that a hard wired carbon monoxide detector with an alarm and battery back-up is installed on the floor level where the gas equipment is to be installed, in addition, the installing plumber or gas fitter shall observe that a battery operated or hard-wired carbon monoxide detector with an alarm is installed on each additional level of the dwelling, building or structure served by the side wall horizontal vented gas fueled equipment. It shall be the responsibility of the property owner to secure the services of qualified licensed professionals for the installation of hard-wired carbon monoxide detectors.
 - a. In the event that the side wall horizontally vented gas fueled equipment is installed in a crawl space or an attic, the hard-wired carbon monoxide detector with alarm and battery back-up may be installed on the next adjacent floor level.
 - b. In the event that the requirements of this subdivision cannot be met at the time of completion of installation, the owner shall have a period of thirty (30) days to comply with the above requirements; provided, however, that during said thirty (30) day period, a battery operated carbon monoxide detector with an alarm shall be installed.
 - 2. **APPROVED CARBON MONOXIDE DETECTORS.** Each carbon monoxide detector as required in accordance with the above provisions shall comply with NFPA 720 and be ANSI/UL 2034 listed as IAS certified.
 - 3. **SIGNAGE.** A metal or plastic identification plate shall be permanently mounted to the exterior of the building at a minimum height of eight (8) feet above grade directly in line with the exhaust vent terminal for the horizontally vented gas fuelled heating appliance or equipment. The sign shall read, in print size no less than one-half (1/2) inch in size, "GAS VENT DIRECTLY BELOW. KEEP CLEAR OF ALL OBSTRUCTIONS".
 - 4. **INSPECTION.** The state or local gas inspector of the side wall horizontally vented gas fueled equipment shall not approve the installation unless, upon inspection, the inspector observes carbon monoxide detectors and signage installed in accordance with the provisions of 248 CMR 5.089(2)(a) 1 through 4.
- (b) **EXEMPTIONS.** The following equipment is exempt from 248 CMR 5.089(2)(a) 1 through 4.
 - 1. The equipment listed in Chapter 10 entitled "Equipment Not Required To Be Vented" in the most current edition of NFPA 54 as adopted by the Board; and
 - 2. Product Approved side wall horizontal vented gas fueled equipment installed in a room or structure separate from the dwelling, building or structure used in whole or in part for residential purposes.
- (c) **MANUFACTURER REQUIREMENTS – GAS EQUIPMENT VENTING SYSTEM PROVIDED.** When the manufacturer of Product Approved side wall horizontally vented gas equipment provides a venting system design or venting system components with the equipment, the instructions provided by the manufacturer for installation of the equipment and the venting system shall include:
 - 1. Detailed instructions for the installation of the venting system design or the venting system components; and
 - 2. A complete parts list for the venting system design or venting system.
- (d) **MANUFACTURER REQUIREMENTS – GAS EQUIPMENT VENTING SYSTEM NOT PROVIDED.** When the manufacturer of a Product Approved side wall horizontally vented gas fueled equipment does not provide the parts for venting the fuel gases, but identifies "special venting systems", the following requirements shall be satisfied by the manufacturer.
 - 1. The referenced "special venting system" instructions shall be included with the appliance or equipment installation instructions; and
 - 2. The "special venting systems" shall be Product Approved by the Board, and the instructions for that system shall include a parts list and detailed installation instructions.
- (e) A copy of all installation instructions for all Product Approved side wall horizontally vented gas fueled equipment, all venting instructions, all parts lists for venting instructions, and/or all venting design instructions shall remain with the appliance or equipment at the completion of the installation.

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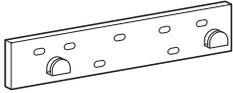
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General Information

Included Items

The following items are included with the water heater. Check each of the following items before installation.



Wall mounting bracket

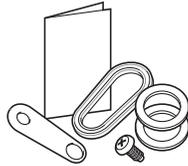


Ø5 x 46 Tapping Screw
Part No. 3100201

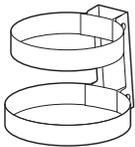
Tapping screws & anchors



Installation and
User manual



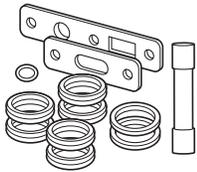
Gas conversion kit



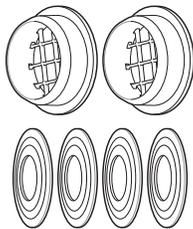
Vent clip



Quick installation manual



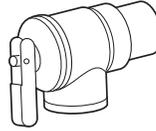
Spare parts



2" Vent termination cap &
Wall flange

Optional Accessories

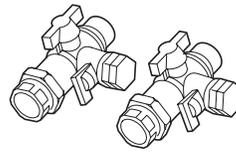
The following optional accessories are not included with the water heater, but may be necessary for the installation. Check the need for any of the following optional accessories before installation.



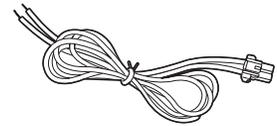
Pressure relief valve



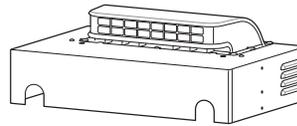
Remote controller



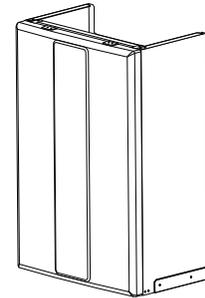
Plumb easy valve set



Cascade communication
cable



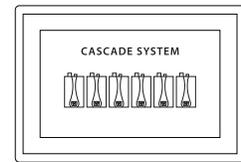
Outdoor Vent Kit



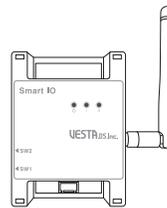
Pipe Cover



VESTA Wi-Fi



Cascade controller



Part No. 42110341
Backflue damper kit

Notice

If there is a missing item, please contact Technical Support at 1-800-761-0053.

Specifications

The following table shows the specifications for the water heater. Additional specifications about water, gas, electric, and air supplies (venting) appear in each installation section.

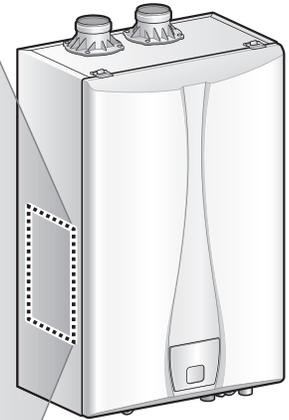
item		VRP-150	VRS-150	VRP-199	VRS-199
Heat Capacity (Input)	Natural Gas	19,900–150,000 BTU/H		19,900–199,000 BTU/H	
	Propane Gas	19,900–150,000 BTU/H		19,900–199,000 BTU/H	
Uniform Energy Factor	Natural Gas	0.95	0.95	0.95	0.96
	Propane Gas	0.95	0.95	0.95	0.96
Flow Rate (DHW)	35°F (19°C) Temp Rise	8.4 GPM (32 LPM)		11.2 GPM (42 LPM)	
	45°F (25°C) Temp Rise	6.5 GPM (25 LPM)		8.7 GPM (33 LPM)	
	77°F (43°C) Temp Rise	3.8 GPM (14 LPM)		5.1 GPM (19 LPM)	
Dimensions (W x D x H)		18.1" x 11.6" x 27.6" (460 mm x 295 mm x 700 mm)			
Weight		75 lbs (34 kg)	67 lbs (30 kg)	75 lbs (34 kg)	67 lbs (30 kg)
Installation Type		Indoor wall-hung			
Venting Type		Forced draft direct vent			
Ignition		Electronic ignition			
Water Pressure		15–150 psi			
Natural Gas Supply Pressure		3.5"–10.5" WC			
Propane Gas Supply Pressure		8"–13" WC			
Natural Gas Manifold Pressure (Min. – Max.)		0.01" WC – -0.35" WC		0.01" WC – -0.59" WC	
High Altitude Manifold pressure		0.01" WC – -0.30" WC		0.01" WC – -0.55" WC	
Propane Gas Manifold Pressure (Min. – Max.)		0.01" WC – -0.30" WC		0.01" WC – -0.56" WC	
High Altitude Manifold pressure		0.01" WC – -0.26" WC		0.01" WC – -0.50" WC	
Minimum Flow Rate		0.1 GPM (0.4 LPM) for VRP models / 0.5 GPM (1.9 LPM) for VRS models			
Connection Sizes	Cold Water Inlet	3/4" NPT			
	Hot Water Outlet	3/4" NPT			
	Recirculation Water Inlet	3/4" NPT (Only VRP models)			
	Gas Inlet	3/4" NPT			
Power Supply	Main Supply	120V AC, 60 Hz / use less than 5 AMP			
Materials	Primary Heat Exchanger	Stainless steel			
	Secondary Heat Exchanger				
Venting	Exhaust	2" or 3" PVC, CPVC, Polypropylene 2" or 3" Special gas vent type BH (Class II, A/B/C)			
	Intake	2" or 3" PVC, CPVC, Polypropylene 2" or 3" Special gas vent type BH (Class II, A/B/C)			
	Vent Clearances	0" to combustibles			
Safety Devices		Flame rod, APS, Over heat preventer, Exhaust temperature high limit sensor, Power surge fuse			
Power Consumption		135 W	75 W	165 W	105 W

Rating Plate



The gas type and electricity voltage must match the rating plate. Using a different gas type and electricity voltage will cause the water heater to malfunction.

Before the installation, check the rating plate located on the side of the water heater to ensure that the water heater matches the gas type, gas pressure, water pressure, and electrical supply available in the installation location. If the water heater does not match each of these ratings, do not install the water heater. If the gas conversion is required, the included gas conversion kit must be used.



Vent Automatic Instantaneous Water Heater
/ *Chauffe-eau Automatique Instantané*
For Outdoor Installation only / *Pour l'installation extérieure seulement*

VESTA. DS. INC.
401 South Dupont Ave, Ontario, CA 91761
Tel / *Tel* : 1-800-761-0053
Model / *Modèle* :
Type of Gas / *Type de gaz* : Natural Gas / *Gaz naturel*
BTU/h Input / *Entrée BTU/h* : Min. ~ Max.
Inlet Gas Pressure : Min. 3.5 ~ Max. 10.5 inches w.c.
/ *Pression des gaz dans l'orifice*
Manifold Gas Pressure : Min + ~ Max. - inches w.c.
/ *Pression des gaz dans le collecteur*
Orifice Size / *dimension des injecteurs* : 0.224" / 0.177" for NG, 0.154" / 0.122" for LP
Electrical Rating : AC 120 Volts 60Hz Less than 5 Ampere
/ *Caractéristiques électriques*
Max. Water pressure : Min 15 psi ~ Max. 150psi
/ *Pression d'eau maximale*
Min. Ambient air temp for normal operation : 2 °C (35.6 °F)
/ *Min. Température de l'air ambiant pour un fonctionnement normal*
Suitable for water(potable) heating only. / *Convient seulement à l'eau chaude.*
Orifices necessary for LP conversion are provided
/ *Les orifices nécessaires pour la conversion LP sont fournis*

CSA/ANSI Z21.10.3/CSA 4.3-2019

FOR YOUR SAFETY / Pour votre sécurité
Do Not Store Or Use Gasoline Or Other Flammable vapors and liquids in the vicinity of this or any other appliances
/ *Ne pas stocker ni utiliser d'essence ou d'autres vapeurs ou liqui des inflammables autour de cet appareil ou autres appareils similaires*

This appliance must be installed in accordance with local codes or, in the absence of local codes, the National Fuel Gas Code, ANSI Z223.1/NFPA 54 or the CSA B149.1, Natural Gas and Propane Installation Code.
/ *Cet appareil doit être installé conformément aux codes locaux ou, en l'absence de codes locaux au National Fuel Gas Code ANSI Z223.1/NFPA 54 ou au Code d'installation du gaz naturel et du propane CSA B149.1.*
This appliance must be installed in accordance with the Manufactured Home Construction and Safety Standard, Title 24 CFR, Part 3280 or the Canadian standard CSA Z240 MH Series, Manufactured Homes.
/ *Cet appareil doit être installé conformément à la norme Manufactured Home Construction and Safety Standard, Title 24 CFR, Part 3280 ou à la norme canadienne CSAZ240 Série MH, Maisons préfabriquées.*

-If the appliance is installed without air intake pipe, the category is IV.
-*"This water heater requires a special venting system, Refer to the installation instructions for parts list and method of installation."*
-*"This appliance is certified for use at altitudes up to 4,500ft (1,370m) in accordance to the latestest CAN/CSA 2.17 High Altitude Installation procedures at normal manifold pressure. For installation instructions at altitudes up to 10,100ft (3,078m), please see the Installation manual."*
-*Cet appareil est certifié pour une utilisation à des altitudes allant jusqu'à 4 500 pi (1,370 m) conformément aux dernières procédures d'installation à haute altitude CAN / CSA 2.17 à pression d'admission normale. Pour les instructions d'installation à des altitudes allant jusqu'à 10 100 pi (3,078 m), veuillez consulter le manuel d'installation.*

REQUIRED CLEARANCES TO COMBUSTIBLES
Distance requise par rapport aux matériaux combustibles

Clearance / <i>Distance</i>	Indoor Install <i>Installation intérieure</i>
Top of heater / <i>Haut du chauffe-eau</i>	12 inches
Back of heater / <i>Arrière du chauffe-eau</i>	0,6 inches
Front of heater / <i>Avant du chauffe-eau</i>	6 inches
Side of heater / <i>Côtés du chauffe-eau</i>	3 inches
Bottom of heater / <i>Fond du chauffe-eau</i>	12 inches

[Outdoor rating plate]

Vent Automatic Instantaneous Water Heater
/ *Chauffe-eau Automatique Instantané*
For either direct vent installation or for installation using indoor combustion air
(See manufacturer's installation instructions)
/ *Pour une installation à évent direct ou une installation à air de combustion intérieur (voir les instructions d'installation du fabricant.)*
For Indoor or Manufactured Home (Mobile Home) Installation
/ *Pour l'installation à l'intérieur ou dans des maisons préfabriquées(maisons mobiles)*
VESTA. DS. INC.
401 South Dupont Ave, Ontario, CA 91761
Tel / *Tel* : 1-800-761-0053
Model / *Modèle* :
Type of Gas / *Type de gaz* : Natural Gas / *Gaz naturel*
BTU/h Input / *Entrée BTU/h* : Min. ~ Max.
Inlet Gas Pressure : Min. 3.5 ~ Max. 10.5 inches w.c.
/ *Pression des gaz dans l'orifice*
Manifold Gas Pressure : Min + ~ Max. - inches w.c.
/ *Pression des gaz dans le collecteur*
Orifice Size / *dimension des injecteurs* : 0.224" / 0.177" for NG, 0.154" / 0.122" for LP
Electrical Rating : AC 120 Volts 60Hz Less than 5 Ampere
/ *Caractéristiques électriques*
Max. Water pressure : Min 15 psi ~ Max. 150psi
/ *Pression d'eau maximale*
Suitable for water(potable) heating only. / *Convient seulement à l'eau chaude.*
Orifices necessary for LP conversion are provided
/ *Les orifices nécessaires pour la conversion LP sont fournis*

CSA/ANSI Z21.10.3/CSA 4.3-2019

FOR YOUR SAFETY / Pour votre sécurité
Do Not Store Or Use Gasoline Or Other Flammable vapors and liquids in the vicinity of this or any other appliances
/ *Ne pas stocker ni utiliser d'essence ou d'autres vapeurs ou liqui des inflammables autour de cet appareil ou autres appareils similaires*

This appliance must be installed in accordance with local codes or, in the absence of local codes, the National Fuel Gas Code, ANSI Z223.1/NFPA 54 or the CSA B149.1, Natural Gas and Propane Installation Code.
/ *Cet appareil doit être installé conformément aux codes locaux ou, en l'absence de codes locaux au National Fuel Gas Code ANSI Z223.1/NFPA 54 ou au Code d'installation du gaz naturel et du propane CSA B149.1.*
This appliance must be installed in accordance with the Manufactured Home Construction and Safety Standard, Title 24 CFR, Part 3280 or the Canadian standard CSA Z240 MH Series, Manufactured Homes.
/ *Cet appareil doit être installé conformément à la norme Manufactured Home Construction and Safety Standard, Title 24 CFR, Part 3280 ou à la norme canadienne CSAZ240 Série MH, Maisons préfabriquées.*

-If the appliance is installed without air intake pipe, the category is IV.
-*"This water heater requires a special venting system, Refer to the installation instructions for parts list and method of installation."*
-*"This appliance is certified for use at altitudes up to 4,500ft (1,370m) in accordance to the latestest CAN/CSA 2.17 High Altitude Installation procedures at normal manifold pressure. For installation instructions at altitudes up to 10,100ft (3,078m), please see the Installation manual."*
-*Cet appareil est certifié pour une utilisation à des altitudes allant jusqu'à 4 500 pi (1,370 m) conformément aux dernières procédures d'installation à haute altitude CAN / CSA 2.17 à pression d'admission normale. Pour les instructions d'installation à des altitudes allant jusqu'à 10 100 pi (3,078 m), veuillez consulter le manuel d'installation.*

REQUIRED CLEARANCES TO COMBUSTIBLES
Distance requise par rapport aux matériaux combustibles

Minimum Clearances from Combustible or Non-combustible Construction <i>Distance minimum entre tout matériau combustible et la construction non-combustible</i>	Indoor Install <i>Installation intérieure</i>
Top of heater / <i>Haut du chauffe-eau</i>	12 inches
Back of heater / <i>Arrière du chauffe-eau</i>	0,6 inches
Front of heater / <i>Avant du chauffe-eau</i>	6 inches
Side of heater / <i>Côtés du chauffe-eau</i>	3 inches
Bottom of heater / <i>Fond du chauffe-eau</i>	12 inches

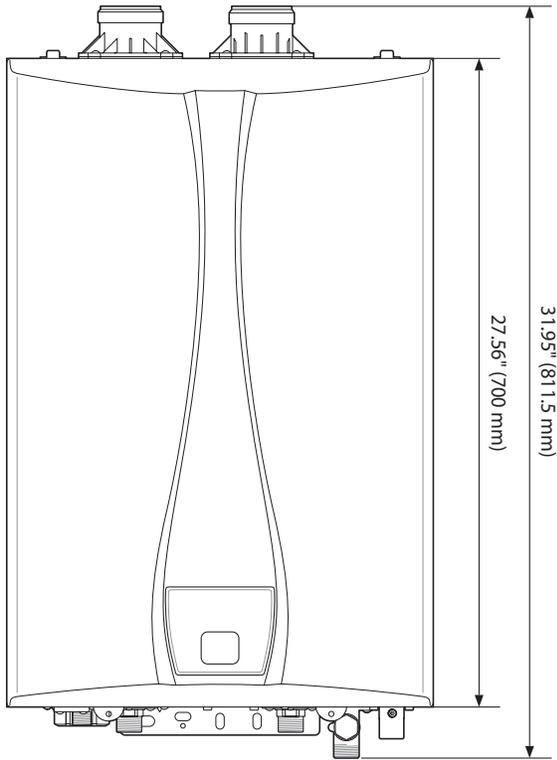
PRODUCT NUMBER / *Numéro de produit* :
SERIAL NUMBER / *Numéro de série* :
Made in KOREA
/ *Fabriquée en Corée*

[Indoor rating plate]

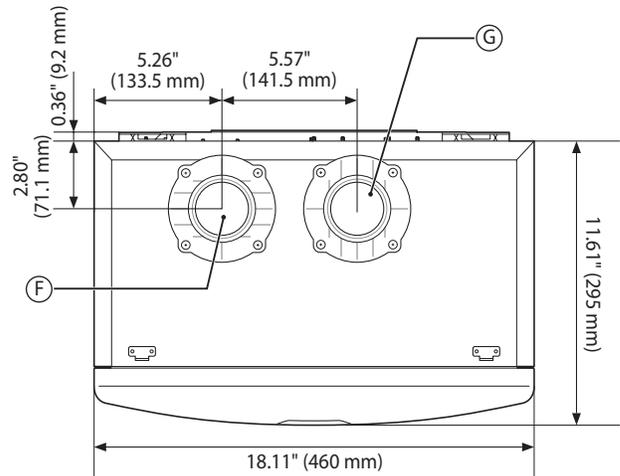
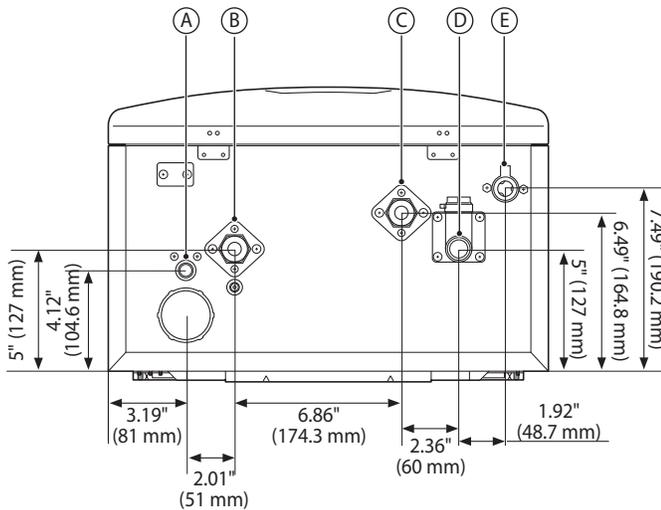
* When installing the outdoor model, attach the rating plate in the outdoor kit over the red marking.

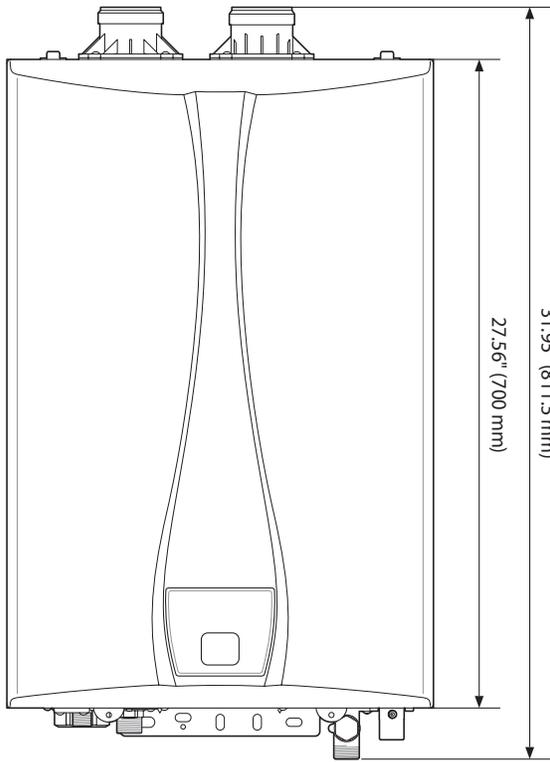
Dimensions

VRP

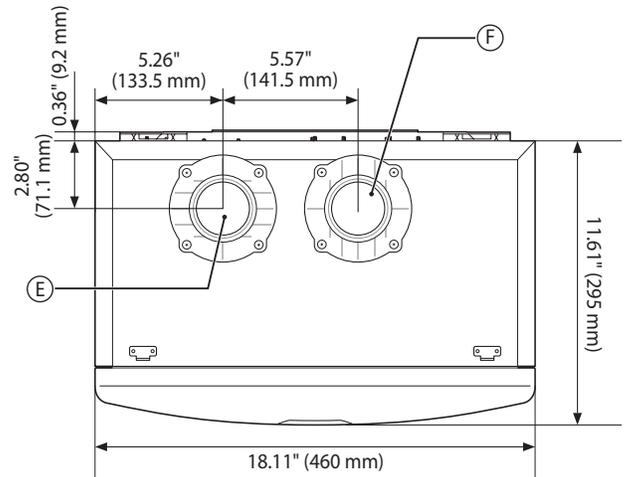
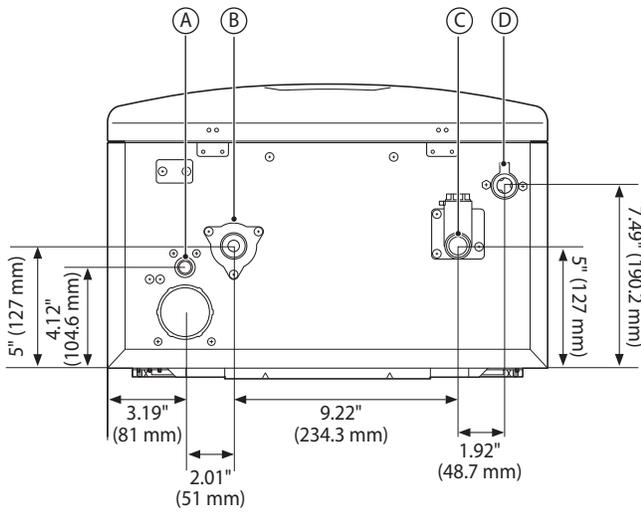


	Description	Diameter
(A)	Condensate outlet	1/2"
(B)	Hot water outlet	3/4"
(C)	Recirculation inlet	3/4"
(D)	Cold inlet	3/4"
(E)	Gas inlet	3/4"
(F)	Exhaust vent	2"
(G)	Air inlet	2"



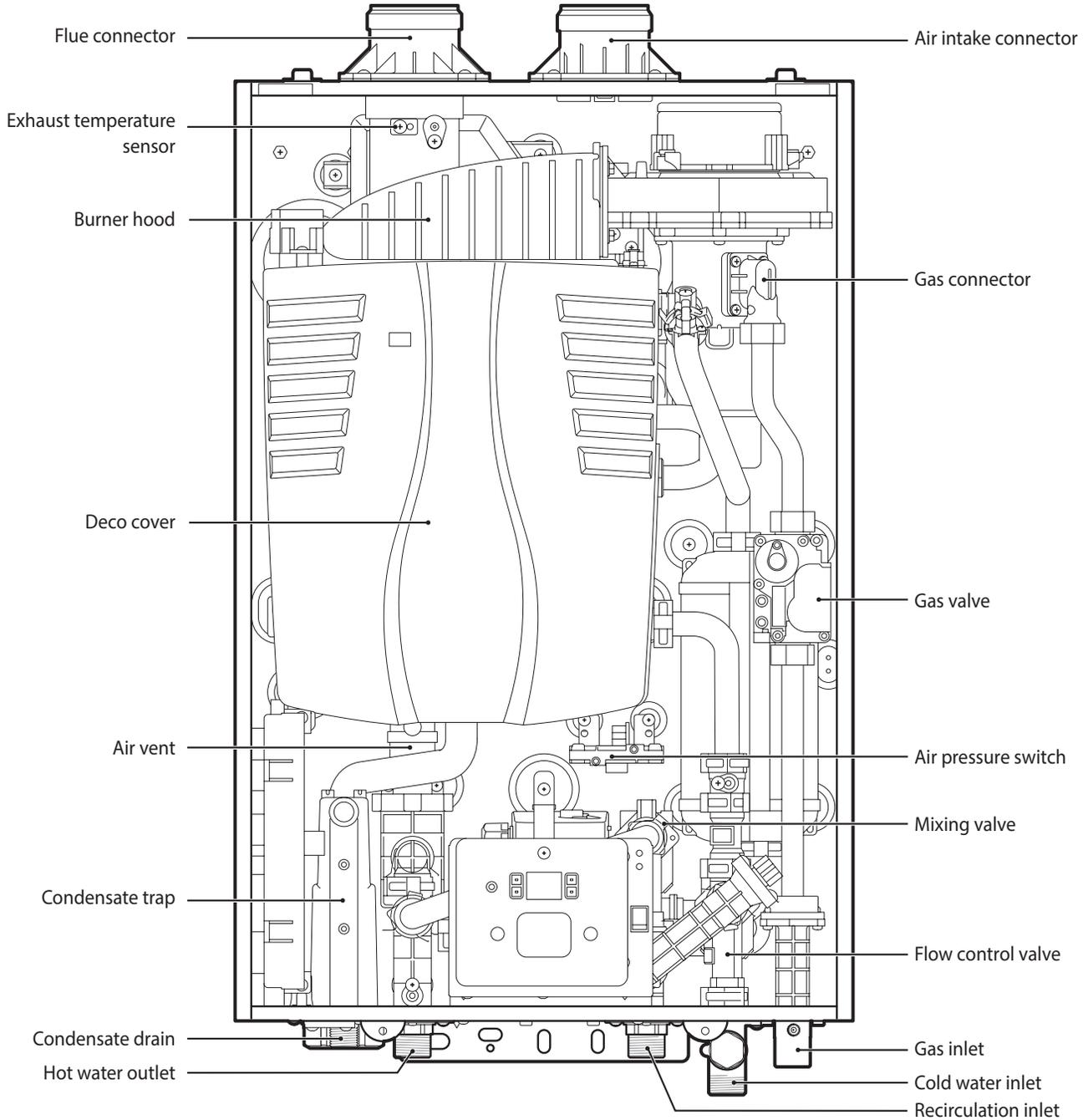


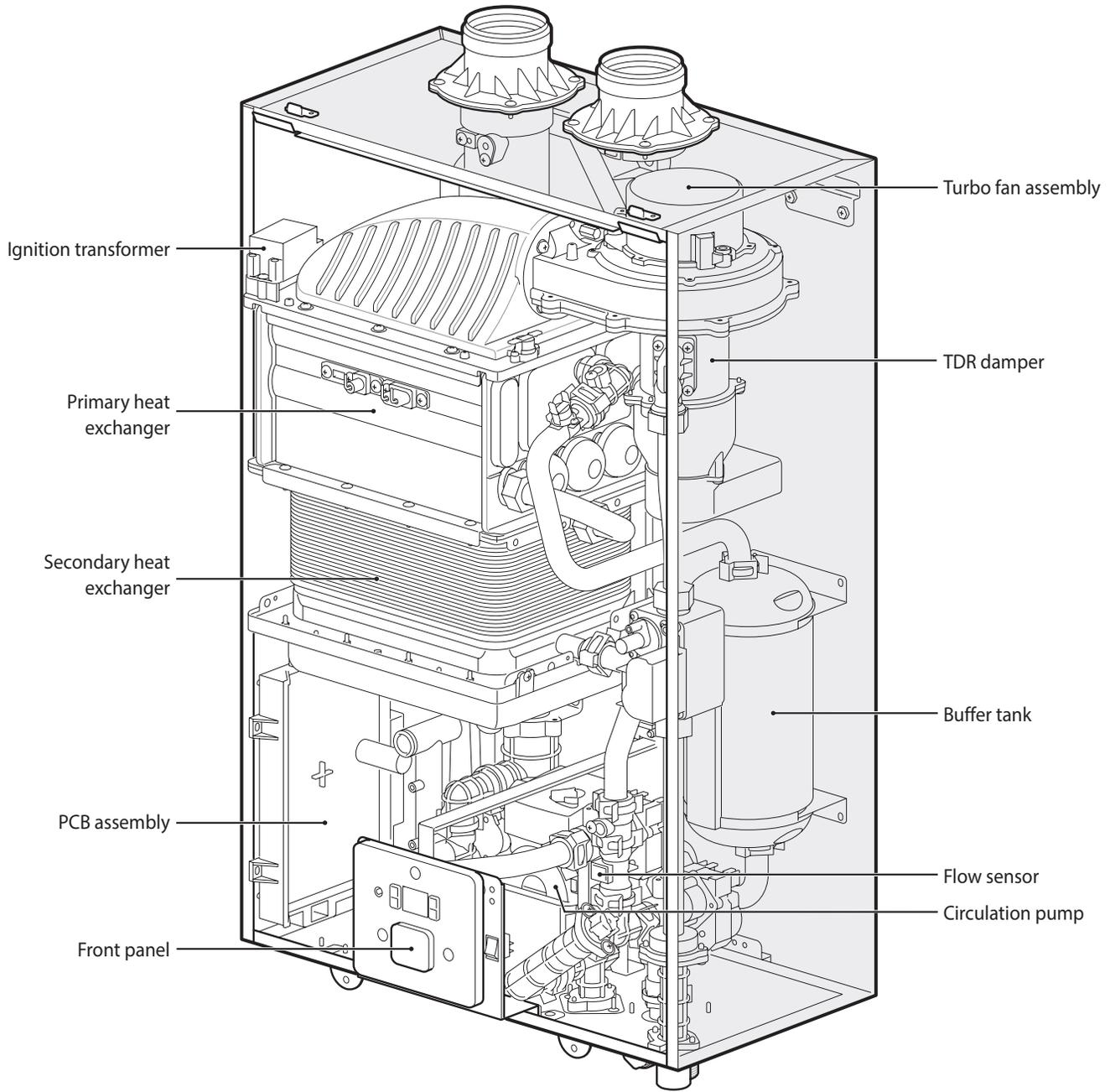
	Description	Diameter
(A)	Condensate outlet	1/2"
(B)	Hot water outlet	3/4"
(C)	Cold inlet	3/4"
(D)	Gas inlet	3/4"
(E)	Exhaust vent	2"
(F)	Air inlet	2"

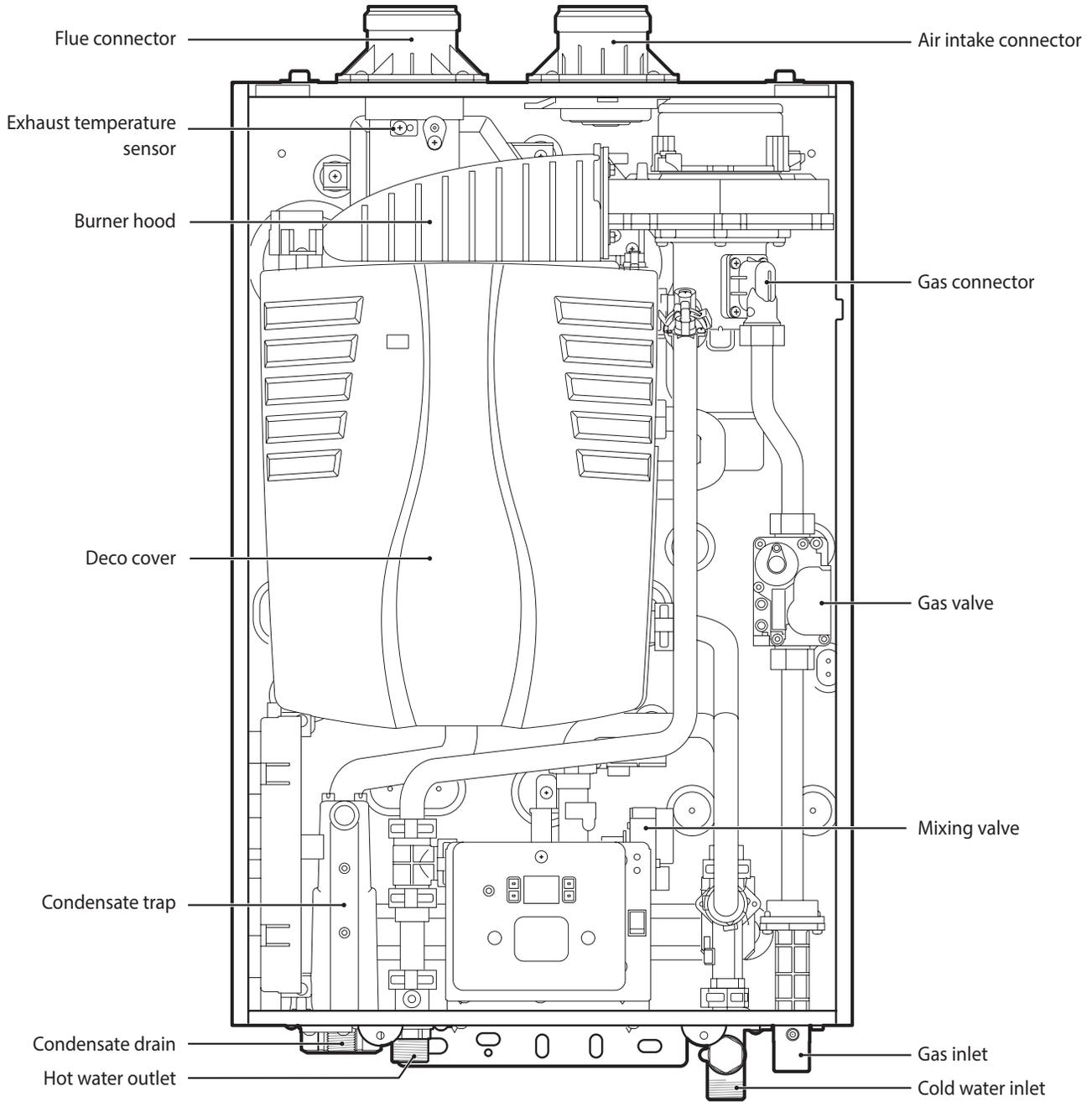


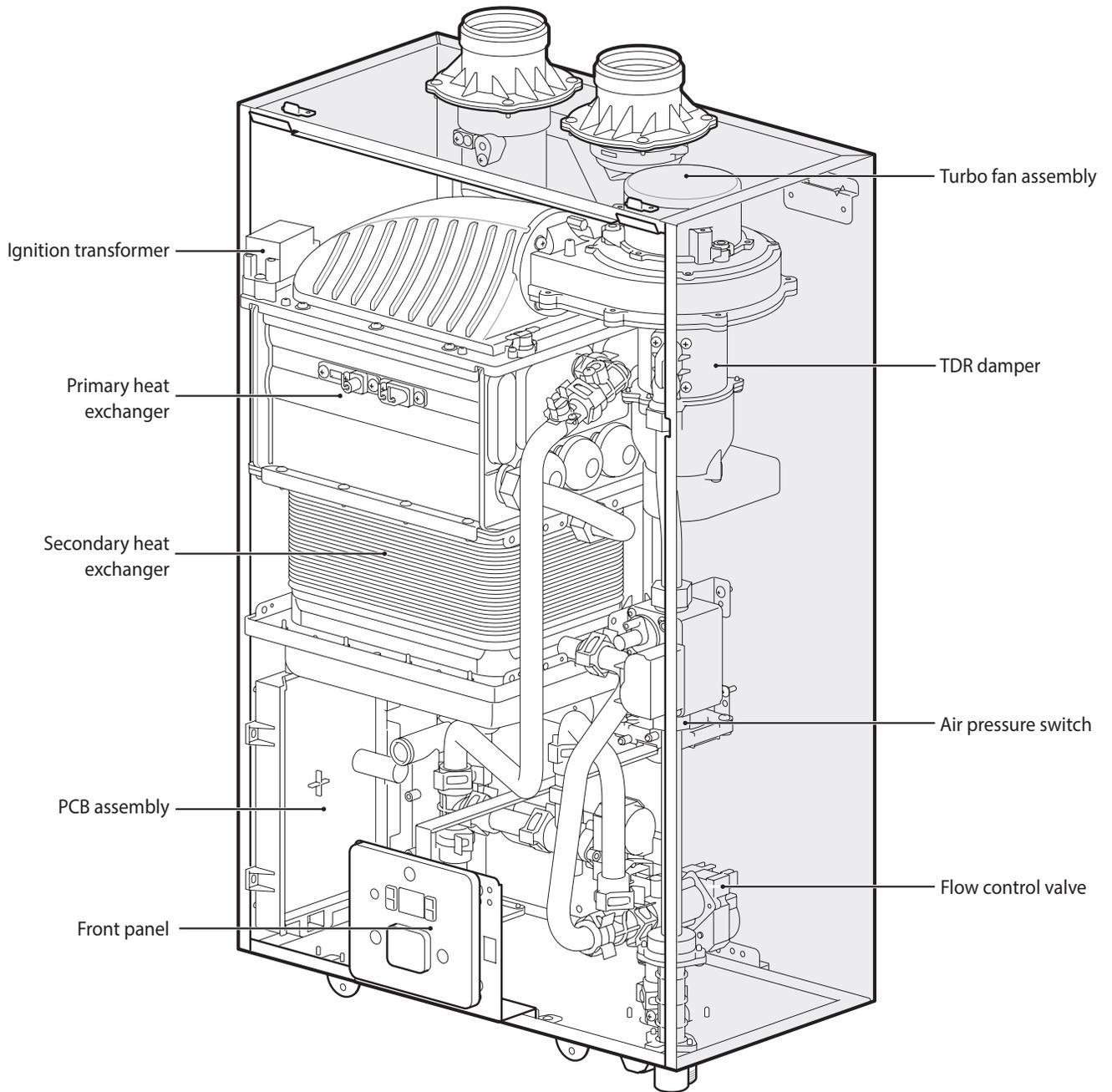
Components

VRP









Installing the Water Heater

■ Installer Qualifications

A licensed professional must install and inspect the appliance. A licensed professional is a person who is licensed for the following:

- Connecting gas lines, water lines, valves, electricity
- Vent installation through walls and roofs
- Applicable of local, state, and national codes

■ Compliance Requirements

- National electrical code.
- National fuel gas code, ANSI Z223.1/NFPA 54 and/or CSA B149.1, natural gas and propane installation codes.
- Local, state, provincial, and national codes, laws, regulations, and ordinances.

■ Location

When considering a location for installation, the installer, must ensure the following:

- Access to utilities
- Humidity and contact with water
- Water quality
- Drainage
- Venting and ventilation
- Proximity to fixtures and appliances
- Clearances
- Clean, debris and chemical-free combustion air
- High elevation Installations

● Access to utilities

- Electricity – Close to where the electrical supply enters the building
- Water – Close to where the domestic water supply enters the building
- Gas – Close to where the gas supply enters the building

● Humidity and contact with water

Avoid places with excessive humidity. The water heater has electric gas ignition components. If water gets inside the water heater, the ignition system can be damaged. The water heater must be installed in such a way as to ensure that the gas ignition system components are protected from water (dripping, spraying, rain, etc.) during operation and service.

● Water quality

Water quality can have an impact on appliance longevity and may void the manufacturer's warranty.

To maintain the water heater properly, ensure that your water meets EPA quality standards. The following table shows the maximum contaminant levels allowed, based on the EPA National Secondary Drinking Water Regulations (40 CFR Part 143.3). If you suspect that your water is contaminated in any way, stop using the water heater and contact an authorized technician or licensed professional.

Contaminant	Maximum Allowable Level
Total Hardness	200 mg/l (12 grains/gallon)
Aluminum	0.05 – 0.2 mg/l
Chloride	250 mg/l
Copper	1.0 mg/l
Iron	0.3 mg/l
Manganese	0.05 mg/l
pH	6.5 – 8.5
Sulfate	250 mg/l
Total Dissolved Solids (TDS)	500 mg/l
Zinc	5 mg/l

● Drainage

A significant amount of condensate is produced during the water heater operation. Install the water heater near a suitable drain and where damage from a possible leak will be minimal. Installing the water heater without a drain will void the warranty. For more information about condensate drainage, refer to "Condensate Drain" on page 25.

The water heater must be located in an area where leakage of the unit or connections will not result in damage to the area adjacent to the appliance or to lower floors of the structure. When such locations cannot be found, installation of an adequately-draining drain pan under the water heater is highly recommended. When installing the drain pan, ensure that the installation does not restrict combustion air flow.

● Venting and ventilation

Consider venting restrictions caused by windows, doors, air intakes, gas meters, foliage and other buildings, and select a location that requires minimal venting.

When considering an adequate venting and ventilation, ensure the following:

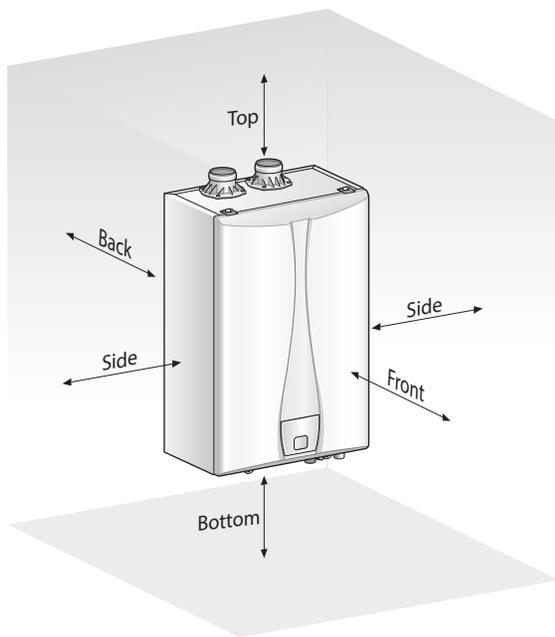
- Maintain a minimum clearance of 4 feet (1.2 meters) from heating and cooling vents.
- Maintain proper clearances from any openings in the building.

- Install the water heater with a minimum clearance of 12 inches (300 mm) above an exterior grade or as required by local codes.
- Install the exhaust vent in an area that is free from obstructions and does not allow the exhaust to accumulate.
- Do not enclose the vent termination.
- Do not install the water heater where moisture from the exhaust may discolor or damage walls.
- Do not install the water heater in bathrooms, bedrooms, or any other occupied rooms that is normally kept closed or that is not adequately ventilated.

For more information about venting, refer to "Installing a Vent (For indoor installation only)" on page 27.

Clearances

The water heater should be installed in an area that allows for service and maintenance access to utility connections, piping, filters, and traps. Ensure the following clearances are maintained:



Clearance From	Wall Mounting
Top	12 inches (305 mm) min.
Back	0.6 inches (15 mm) min.
Front	6 inches (152 mm) min.
Sides	3 inches (76 mm) min.
Bottom	12 inches (300 mm) min.

Clean, debris and chemical-free combustion air

- Do not install the water heater in areas where dust and debris may accumulate or where combustion air can be contaminated.
- Do not install the water heater in areas with greasy fumes or heavy amounts of steam, if necessary, take measures to prevent fumes and steam from entering the water heater.
- Chemicals that are corrosive in nature should not be stored or used near the water heater.

Calibration mode

The installation circumstances can be changed depending on the elevation and pipe length. To maintain constant heat capacity, run the Calibration Mode after installing the water heater. For more information about Calibration Mode, refer to "Self Calibration Mode" on page 51.

Position



Do not mount the water heater to unsubstantial flooring or unreinforced dry wall.

The water heater can be mounted to the wall. For easy installation, use the mounting bracket to mount the water heater to standard wall studs. If the strength of the wall is insufficient and or if the framing is non-standard or uneven, reinforce the area before installation. Avoid installation in unstable locations as the water heater will make some operational noises while it is running.



Notice

Consider vent length and surrounding circumstances when mounting the water heater.



The appliance should be located in an area where leakage of the tank or connections will not result in damage to the area adjacent to the appliance or to lower floors of the structure. When such locations can not be avoided, it is recommended that a suitable drain pan, adequately drained, be installed under the appliance. The pan must not restrict combustion air flow.

High Altitude

The instructions shall address derating at altitudes above 2000 ft (610 m); e.g., water heater input ratings are based on sea level operation and need not be changed for operation up to 2000 ft (610 m) elevation.

Notice

This water heater may be installed at elevations up to 10,100ft (3,078 m) for use with Natural Gas and Propane. To use the water heater at a specific altitude, the Program data should be set as described below.

Program data	Altitude setting			
P6	0 ~ 1,999 ft	2,000 ~ 5,399 ft	5,400 ~ 7,799 ft	7,800 ~ 10,100 ft
	50	55	5A	5F

*Refer to the Setting the program data.

Lime Alarm

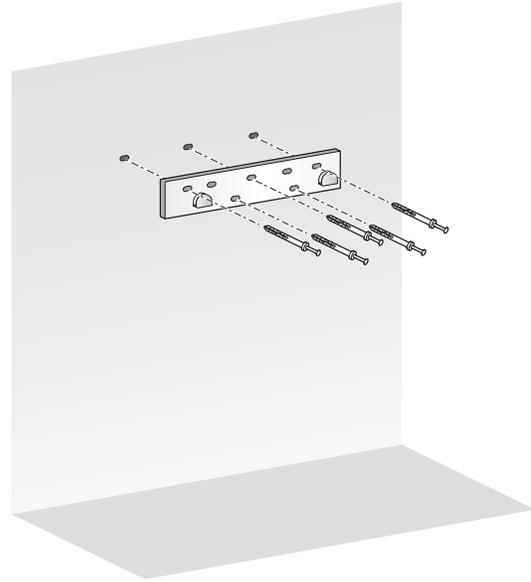
Displays a "E1" error when the set time period has been reached to clean heat exchanger. The Program data should be set as described below.

"P2" Code	Function
0	Disable
1	6 months
2	12 months
3	24 months

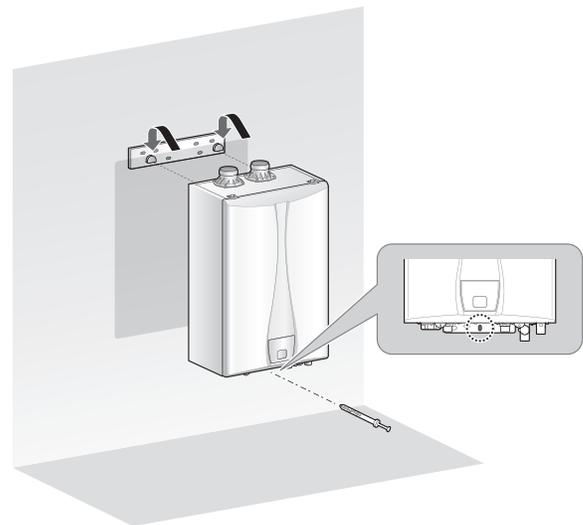
Mounting to the wall

To mount the water heater to the wall:

- 1 Check that the wall is level and can support the weight of the water heater.
- 2 Affix the mounting bracket securely to the wall.



- 3 Align the grooves on the back of the water heater with the tongues on the mounting bracket and hang the water heater from the bracket.



Connecting the Gas Supply

Gas Pipe Sizing Tables

Gas pipe sizing is based on the gas type, supplied gas pressure, pressure drop in the system, and gas line type. The tables below are for reference only (when the gas supply is piping straight to the water heater with no connections to any other gas appliances). For gas pipe sizing, refer to the latest National Fuel Gas code, NFPA 54 and consult the gas pipe manufacturer for actual gas pipe capacities.

Natural gas

Table 1. For less than 6" WC supply pressure.

Maximum Capacity of Natural Gas Based on a 0.60 specific gravity at a 0.5" WC pressure drop.

Pipe Size	kBTU/H of Natural Gas												
Length	10'	20'	30'	40'	50'	60'	70'	80'	90'	100'	125'	150'	200'
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"	1390	957	768	657	583	528	486	452	424	400	355	322	275
1 1/2"	2090	1430	1150	985	873	791	728	677	635	600	532	482	412
2"	4020	2760	2220	1900	1680	1520	1400	1300	1220	1160	1020	928	794
2 1/2"	6400	4400	3530	3020	2680	2430	2230	2080	1950	1840	1630	1480	1270
3"	11300	7780	6250	5350	4740	4290	3950	3670	3450	3260	2890	2610	2240
4"	23100	15900	12700	10900	9660	8760	8050	7490	7030	6640	5890	5330	4560

Table 2. For 6" WC or greater supply pressure.

Maximum Capacity of Natural Gas Based on a 0.60 specific gravity at a 3.0" WC pressure drop.

Pipe Size	kBTU/H of Natural Gas												
Length	10'	20'	30'	40'	50'	60'	70'	80'	90'	100'	125'	150'	200'
1/2"	454	312	250	214	190	172	158	147	138	131	116	105	90
3/4"	949	652	524	448	397	360	331	308	289	273	242	219	188
1"	1790	1230	986	844	748	678	624	580	544	514	456	413	353
1 1/4"	3670	2520	2030	1730	1540	1390	1280	1190	1120	1060	936	848	726
1 1/2"	5500	3780	3030	2600	2300	2090	1920	1790	1670	1580	1400	1270	1090
2"	10600	7280	5840	5000	4430	4020	3690	3440	3230	3050	2700	2450	2090
2 1/2"	16900	11600	9310	7970	7060	6400	5890	5480	5140	4860	4300	3900	3340
3"	29800	20500	16500	14100	12500	11300	10400	9690	9090	8580	7610	6890	5900
4"	60800	41800	33600	28700	25500	23100	21200	19800	18500	17500	15500	14100	12000

Liquid propane gas

Maximum Capacity of propane (LP) Gas Based on 11" WC supply pressure at a 0.5" WC pressure drop.

Pipe Size	kBTU/H of Propane Gas												
Length	10'	20'	30'	40'	50'	60'	80'	100'	125'	150'	175'	200'	250'
1/2"	291	200	160	137	122	110	101	94	89	84	74	67	62
3/4"	608	418	336	287	255	231	212	197	185	175	155	140	129
1"	1150	787	632	541	480	434	400	372	349	330	292	265	243
1 1/4"	2350	1620	1300	1110	985	892	821	763	716	677	600	543	500
1 1/2"	3520	2420	1940	1660	1480	1340	1230	1140	1070	1010	899	814	749
2"	6790	4660	3750	3210	2840	2570	2370	2200	2070	1950	1730	1570	1440

Gas Piping



- Do not connect to an unregulated or high pressure propane line or to a high pressure commercial natural gas line.
- The water heater must be isolated from the gas supply piping system during any pressure testing of that system at test pressures equal to or more than 0.5 psig.



- Only a licensed professional should connect the gas supplies.
- Before connecting the gas supply, determine the gas type and pressure for the water heater by referring to the rating plate. Using a different gas type will result in abnormal combustion and malfunction of the water heater causing fire or explosion.
- Leak test the appliance and its gas connection before operating the water heater.
- Do not attempt a field conversion without a VST conversion kit. Use the VST conversion kit to convert from natural gas to propane or vice versa. Failure to do so may result in dangerous operating conditions and will void the warranty.

In the United States: The installation must conform with local codes or, in the absence of local codes, the National Fuel Gas Code ANSI Z223.1/NFPA 54.

In Canada: The Installation must conform to CGA B149 INSTALLATION CODES and/or local installation codes.

To ensure a sufficient gas supply, it is recommended that the water heater be the first appliance to be connected to the gas supply line.

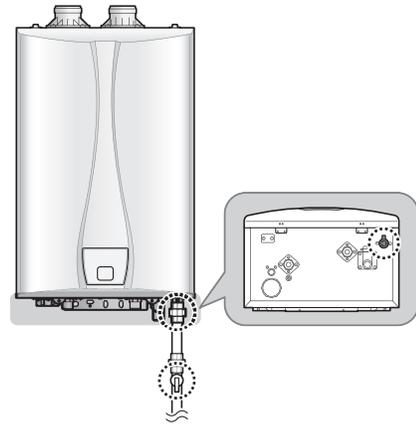
To connect the gas supply:

- 1 Determine the gas type and pressure by referring to the rating plate.
- 2 Perform a pressure test on the main gas supply line.
- 3 Purge the gas line of any debris.
- 4 Determine the proper type and size for the gas line. Refer to the gas pipe sizing tables on page 19.
- 5 Install a union.
- 6 Install a manual gas shut off valve on the gas supply line within easy reach of the appliance.



- Improper installation of the manual gas shut-off valve may result in property damage, personal injury or death.
- Only a licensed professional, in accordance with the ANSI Z21.1/CSA 9.1, should install the manual gas shut-off valve.

7 Connect the gas supply line.



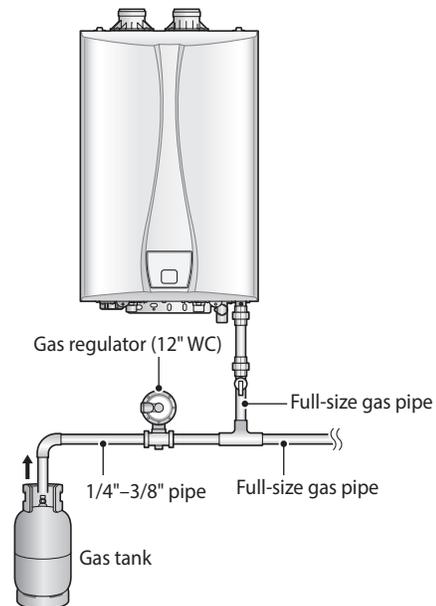
8 Check for gas leaks at all joints.



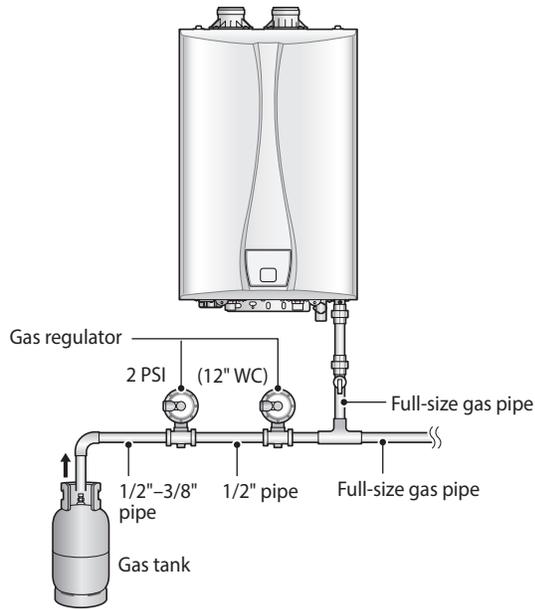
Notice

- Tighten the water heater connection valves with care to avoid damage.
- Apply gas leak detection solution to all gas fittings.
- The minimum internal diameter required for any appliance connector is $\frac{3}{4}$ ".
- When using flexible gas lines, ensure that the pipe's inner diameter and connector is sufficient to supply the required BTUs. Also, ensure that the flexible line has no crimps or tight bends in it, as this will restrict gas flow.
- To facilitate any future maintenance or service, the installation of a union on the gas supply line close to the water heater is recommended.

- The following is a LP gas piping example for the single regulator system



- The following is an LP gas piping example for the 2-lb. system with multiple regulators.



Inlet Gas Pressure

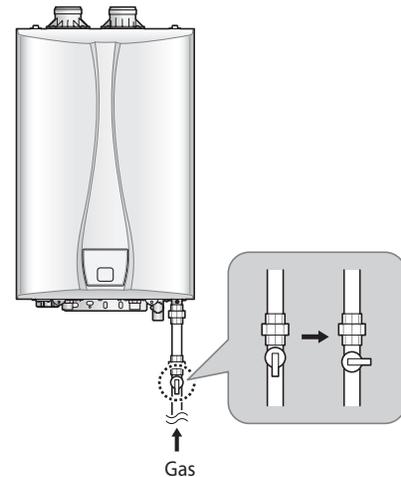


Warning Inlet gas pressure should be measured by a licensed professional only. The water heater cannot function properly without sufficient inlet gas pressure.

- The appliance and its individual shut off valve must be disconnected from the gas supply piping system during any pressure testing of that system at test pressures in excess of $\frac{1}{2}$ psi (3.5kPa).
- The appliance must be isolated from the gas supply piping system by closing its individual manual shut off valve during any pressure testing of the gas supply piping system at test pressures equal to or less than $\frac{1}{2}$ psi (3.5kPa)
- The inlet gas pressure must be maintained between 3.5" and 10.5" WC for natural gas and between 8" and 13" WC for liquefied propane.

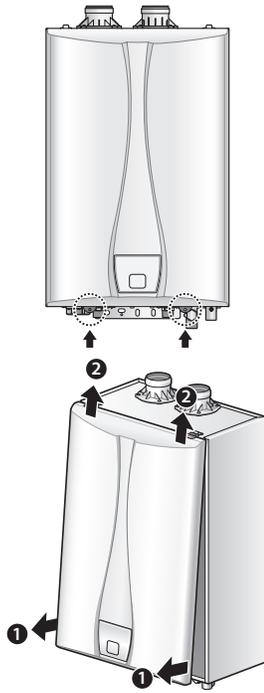
To measure the inlet gas pressure:

- 1 Shut off the manual gas valve on the gas supply line.

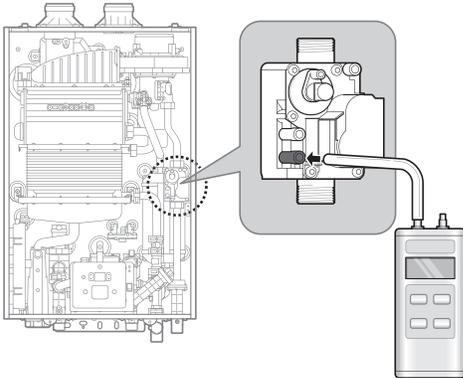


- 2 Open a hot water faucet. The water heater should turn on and the gas in the gas supply line will be purged.
- 3 Leave the faucet on until the water heater shuts down due to a lack of gas supply, and then turn off the hot water faucet.

- 4** Remove the water heater front cover by loosening the 2 Phillips screws securing it to the case.

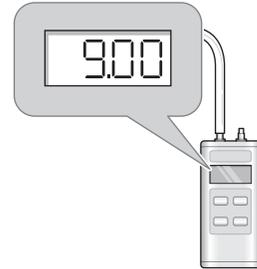


- 5** Loosen the screw indicated in the figure below and connect a manometer to the inlet pressure port. Reset the manometer to zero before use.



- 6** Re-open the manual gas shut-off valve and check for leaks.

- 7** Open multiple fixtures that have high flow rates, such as bathtub and shower faucets, to ramp up the water heater to its maximum firing rate.
- 8** When the water heater reaches its maximum firing rate, check the inlet gas pressure reading on the manometer. The gas pressure must fall within the ranges specified in "Inlet Gas Pressure" on page 21.



- 9** Tighten the inlet gas pressure screw.
- 10** Replace the front cover and tighten the 2 Phillips screws to secure it to the case.

Connecting the Water Supply

Water Piping



Warning

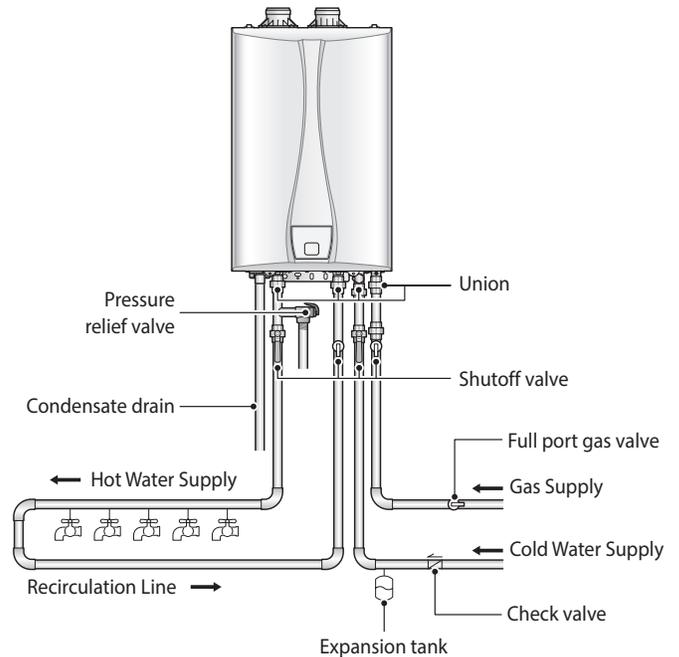
- Before installing the water heater, flush the water line to remove all debris, and after installation is complete, purge the air from the line. Failure to do so may cause damage to the water heater.
- Do not use lead, PVC, iron or any piping which has been treated with chromates or other chemicals.
- Do not use this appliance if any part has been under water. Immediately call a qualified service technician to inspect the appliance and to replace any part of the control system and any gas control which has been under water.
- Do not reverse the hot outlet and cold inlet connections to the water heater. This will cause the water heater to not operate properly.
- Make sure to install a mixing/tempering valve in your water system in order to protect against injury. When it is required by your local plumbing code or regulation, you must install a mixing/tempering valve accordingly.

The water fittings on the water heater are 3/4". If the installation site has only 1/2" plumbing throughout, it is not necessary to upsize the water lines to 3/4", if you are installing a single water heater. When installing multiple water heaters, the number of water heaters and pipe sizing required will depend on the total hot water demand. For information about pipe sizing for multiple water heaters, refer to "Piping sizes" on page 60.

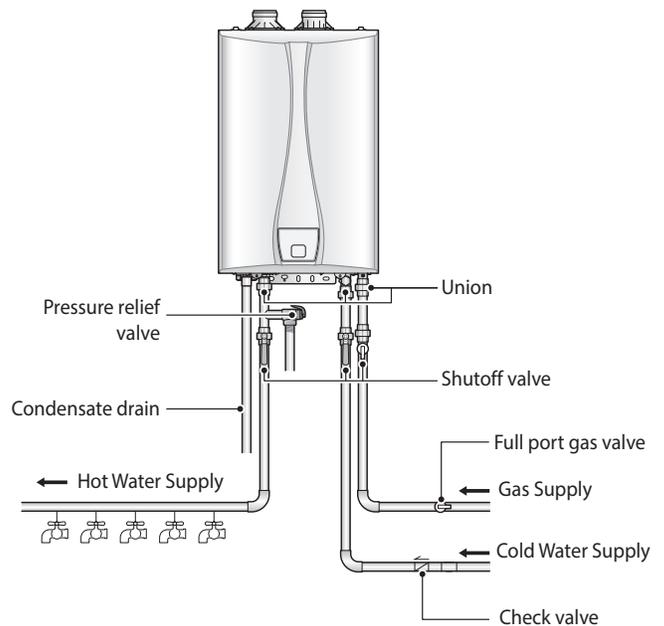
When connecting the water supply, follow these guidelines:

- Do not remove the factory installed recirculation inlet cap unless a return line is connected to this fitting. Water leakage will occur if this cap is loose or missing ("VRP" model only).
- Use only pipes, fittings, valves, and other components (such as solder), that are approved for use in potable water systems.
- Tighten the water heater connection valves with care to avoid damage.
- Use unions and manual shut-off valves on the cold water inlet, DHW outlet, and recirculation water inlet.
- Strive to make the hot water piping system as short as possible, so as to deliver hot water to the fixtures more quickly and reduce heat loss.
- To conserve water and energy, insulate all water piping—especially the hot and recirculation water lines. Never cover the drain or pressure relief valve. If the water heater is installed in a closed water supply system, such as one having a backflow preventer in the cold water supply line, means shall be provided to control thermal expansion. Contact the water supplier or local plumbing inspector for information about how to control this situation.
- After installing the water heater, clean the inlet water filter that is located inside the cold water inlet, and then test the water heater for proper flow and inspect for leaks. Instruct the water heater owner that the filter must be cleaned periodically to maintain proper water flow.
- When all plumbing work is completed, check for leaks and take corrective action before proceeding.

- The following is a water piping example for the water heater:



[VRP]



[VRS]

Internal recirculation mode ("VRP" model only)

- Set the DIP switches to internal recirculation mode:

Notice

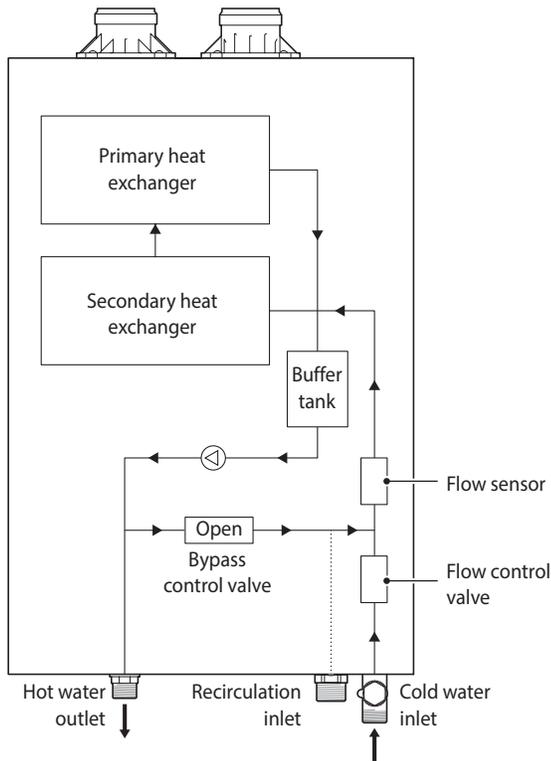
For more information about setting the DIP switches, refer to "Setting the DIP Switches" on page 47.



Caution

Do not remove recirculation cap.

- The following diagram shows the internal recirculation flow:



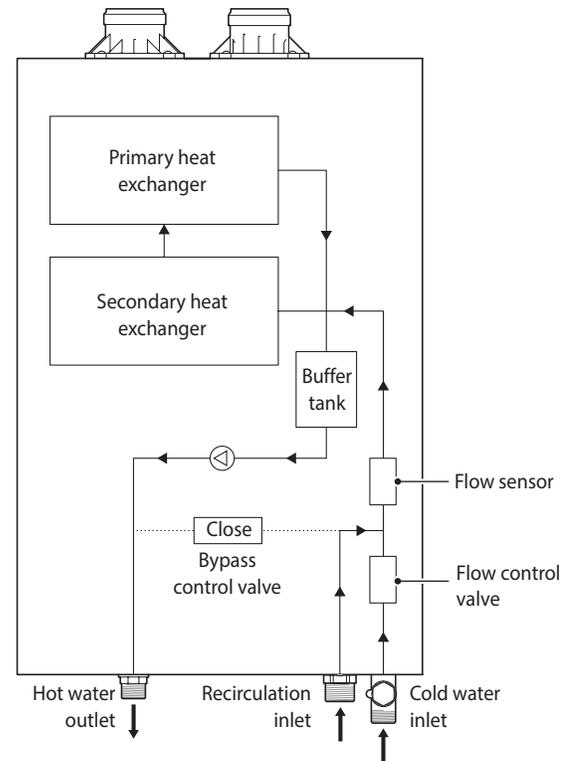
External recirculation mode ("VRP" model only)

- Set the DIP switches to external recirculation mode:

Notice

For more information about setting the DIP switches, refer to "Setting the DIP Switches" on page 47.

- The following diagram shows the external recirculation flow:



Notice

When using a recirculation mode, by keeping the water in the hot water supply pipe hot, you can get instant hot water when you turn the tap on. On the other hand, there will be some minor efficiency loss, as a result of the water heater maintaining a steady temperature within the circulation loop, although in many cases, higher gas usage will be compensated for by lower water usage.

Pressure Relief Valve



Warning

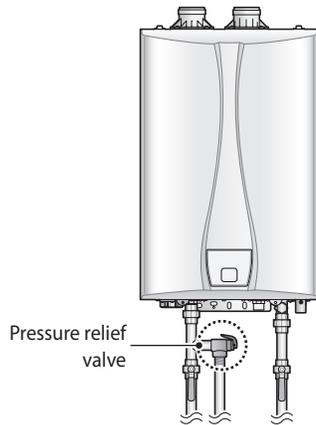
Improper installation of the pressure relief valve may result in property damage, personal injury, or death. Follow all instructions and guidelines when installing the pressure relief valve. Only a licensed professional should install the valve.



Caution

The pressure relief valve must conform to the current edition of ANSI Z21.22 or CAN 1-4.4 and installation must follow local codes.

This water heater does not come with an approved pressure relief valve. To complete the installation of the water heater, you must install an approved ASME HV relief valve on the pressure relief valve connector. (Size 3/4", maximum 150 PSI)



Notice

The pressure relief valve should be placed as close to the water heater outlet as possible. No other valve should be placed between the pressure relief valve and the water heater.

When installing the valve, follow these guidelines:

- Ensure that the discharge capacity of the pressure relief valve is equal to or greater than the maximum pressure rating of the water heater.
- Ensure that the maximum BTU/H rating on the pressure relief valve is equal to or greater than the maximum input BTU/H rating of the water heater.
- Direct the discharge piping of the pressure relief valve so that hot water will not splash on any person or equipment near by.
- Attach the discharge line to the pressure relief valve and run the end of the line to within 6-12" (150-300mm) of the floor.
- Ensure that the discharge line will allow free and complete drainage with no restriction. Do not install a reducing coupling or other restriction on the discharge line.
- If the relief valve discharges periodically, this may be due to thermal expansion in a closed water supply system. Contact the water supplier or local plumbing inspector on how to correct this situation. Do not plug the relief valve.
- The pressure relief valve must be manually operated periodically to check for correct operation.
- Be carefully to avoid contact with hot water coming out of the pressure relief valve and to prevent water damage when you operate the relief valve.

Condensate Drain

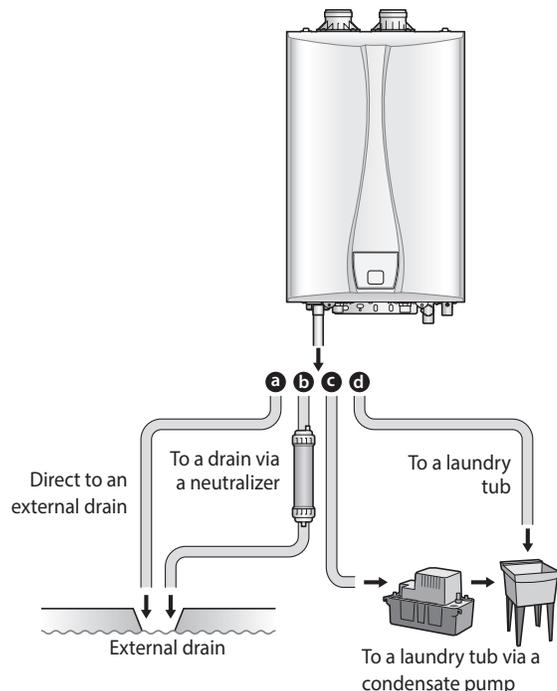


Caution

- All condensate must drain and be disposed of according to local codes.
- Do not cap or plug the integrated condensate line. If prevented from draining, condensate can damage the water heater.
- The condensate line must have a negative slope to drain properly.
- Do not run drain outdoors. Freezing of condensate can cause property damage.
- Do not connect the condensate drain line directly to the rain sewer.
- Do not connect the condensate drain line with an air conditioning evaporator coil drain.
- Use only corrosion resistant materials for the condensate drain lines such as PVC pipe or plastic hose.
- The end of the condensate drain pipe should be open to the atmosphere. The end should not be under water or other substances.

The VST water heater creates condensation when it operates. This condensation has an acidic pH of 3-5. Follow all local codes and regulations when disposing of condensate from the water heater. We recommend draining the condensate into a laundry tub, as the alkali in laundry detergent will neutralize the acid in the condensate. However, other suitable waste drain locations may be used according to local codes.

Before connecting the condensate drain, choose one of the following disposal options:



- From the water heater directly into an external drain.
- From the water heater, through a neutralizing agent, and then into an external drain.

 **Notice**

- If you choose this option, the neutralizing agent must be replaced periodically. Depletion of the neutralizing agent will vary, based on the usage rate of the water heater. During the first year of operation, the neutralizer should be checked every few months for depletion and replaced as needed.

- (c) From the water heater into a condensate pump, and then into a laundry tub.

 **Notice**

A pump can be used when there is a long distance between the water heater and the laundry tub or when the bottom of the water heater is lower than the top of the laundry tub.

- (d) From the water heater into a laundry tub.

 **Notice**

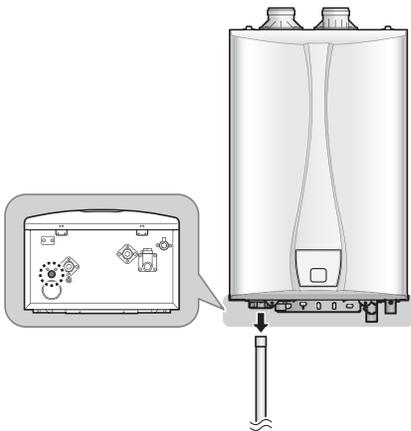
The bottom of the water heater must be higher than the top of the laundry tub to use this option. The condensate line must have a negative slope to drain properly.

To connect the condensate drain:

- 1** Connect a drain line to the water heater.

 **Notice**

Use only corrosion-resistant material for the drain line, such as PVC or CPVC. Do not reduce the size of this fitting or the drain line to less than 1/2".



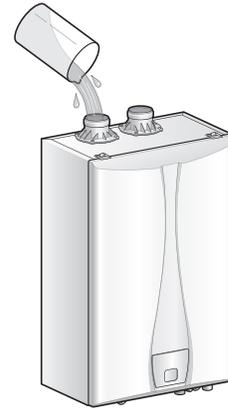
- 2** Place the free end of the drain line into an appropriate drain.

 **Notice**

- If you are using a condensate pump, ensure that the pump allows for up to 2 GPH of drainage for each water heater in the system.
- If you are not using a condensate pump, ensure that the drain line is pitched downward at a minimum slope of 1/4" per foot.

Condensate Trap

Before operating the water heater, fill the condensate trap with water through the flue connector. The water heater may be severely damaged unless filled with water prior to operation. Pour more than 0.1 gallon (400 ml) of water into the exhaust duct. Deflate air sufficiently or equip the air vent with an outlet pipe prior to filling the condensate trap with water (there must be no air inside the heat exchanger).



Installing a Vent (For indoor installation only)

* If the exhaust temperature exceed 149°F (65°C), it must be vented schedule 40 or 80 CPVC or approved polypropylene.

* For outdoor installation, please see the outdoor manual in the outdoor vent kit.



- Improper venting of the water heater can result in excessive levels of carbon monoxide, which can lead to severe personal injury or death. This water heater must be vented in accordance with the "Venting of Equipment" section of the latest edition of the ANSI Z223.1/NFPA 54 Natural Fuel Gas Code in the USA and/or the "Venting systems and air supply for water heaters" section of the latest version of the CAN/CGA B149.1 Natural Gas and Propane Installation Code in Canada, as well as all applicable local building codes and regulations. Follow all instructions and guidelines when venting the water heater. Venting should be performed only by a licensed professional.
- A water heater shall not be connected to a chimney flue serving a separate appliance, designed to burn solid fuel. When installed in a manufactured home (mobile home), all combustion air shall not be supplied from occupied spaces.
- Support the vent pipe with hangers at regular intervals or as required by local codes.
- Exhaust and intake air pipes must be supported at least every 4 feet (1.2m).
- The vent for this appliance shall not terminate over public walkways; or near soffit vents or crawl space vents or where condensate or vapor could create a nuisance or hazard or cause property damage; or where condensate or vapor could cause damage or could be detrimental to the operation of regulators, relief valves, or other equipment.

The water heater must be properly vented to ensure a constant supply of clean intake air and to ensure that exhaust air is properly removed from living areas. When venting the water heater, follow these guidelines:

- Do not install the water heater in areas with contaminated air (containing a high level of dust, sawdust, sand, flour aerosols, or any other such airborne contaminants), as contaminants can cause operational problems. The warranty does not cover damage caused by contaminants in the installation area. If you must install the water heater in an area with contaminated air, use direct venting to supply air from outside the building. We recommend regular filter cleaning and maintenance in these areas.
- For best results, keep the venting system as short and straight as possible.
- Locate the water heater as close as possible to the vent termination.
- Do not connect the water heater vent to a vent for any other gas water heater or vent stack.
- For horizontal runs, slope the horizontal section upward toward the vent termination at a rate of 1/4" per foot (2% slope).
- Create an airtight seal at each joint in the exhaust and intake air pipes from the water heater collar to the vent termination.
- To avoid moisture and frost build-up and to maintain clearances to openings on adjacent homes, 45° elbows, 90° elbows, or tees may be attached to the end of the termination vent pipe to direct the exhaust fumes away from buildings, as long as the restrictions on total allowable vent lengths, maximum number of elbows, and distances to air intake are observed.
- Do not store hazardous or flammable substances near the vent termination.
- If this water heater is to be installed in an area where snow is known to accumulate, protect the vent termination from blockage.
- Ensure that the vent termination is at least 12" (305mm) above ground, or as required by local codes.

Vent Type

All water heaters are prepared at the factory to be direct vent (sealed combustion) water heaters that draw all of their required combustion air directly from outside the building. VST recommends direct air vent installations whenever possible to avoid back drafting cold air through the water heater. VST recommends direct air vent installations when installing the water heater in your attic to get fresh air into the water heater. If you cannot use a direct vent, ensure that an ample supply of make-up air is available in the installation location. VST also recommends installing a new vent system with this appliance. If reusing an existing vent system, thoroughly inspect it for punctures, cracks, or blockages prior to connecting it to the water heater. When using non-direct venting, must provide two openings as specified in the table on page 28.

Direct

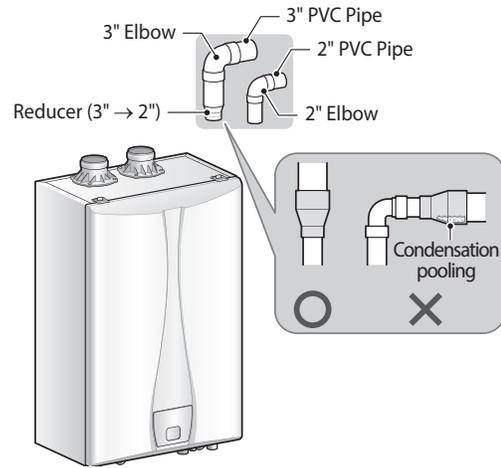
The water heater uses 2" or 3" diameter exhaust and 2" or 3" diameter intake air ducts. To ensure the draw of air directly from and exhaust of air directly to the outside of the building, create an airtight seal from the water heater collar to the vent termination. Intake materials can be made of ABS, PVC, CPVC, PP, galvanized steel, corrugated aluminum or any other similar materials. If you use a corrugated material, ensure that there is not inadvertent crimping of, or damage to, the intake air pipe.

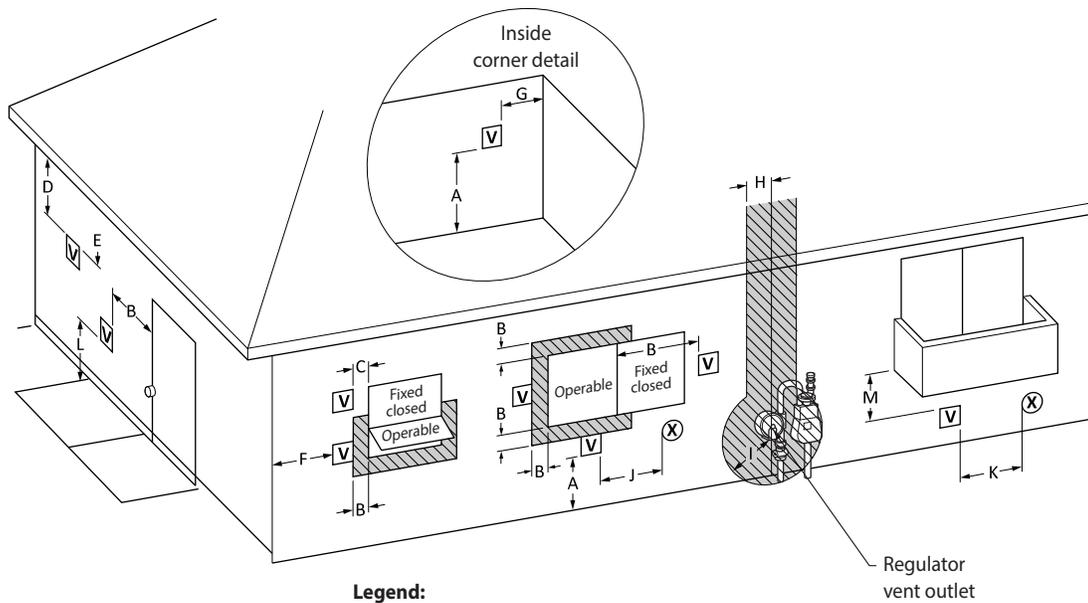
When using direct venting, maintain the following venting clearances, as required by ANSI Z21.10.3 and the National Fuel Gas Code, ANSI Z223.1/NFPA 54, and CAN/CGA B149.1 Natural Gas and Propane Installation Code.

VRP/VRS water heater have back flue damper in the appliance. Then, Common venting is only US permitted. Common venting systems shall be in accordance with the National Fuel Gas Code, ANSI Z223.1/NFPA 54 and/or the CSA B149.1, Natural Gas and Propane Installation Code(Current Editions), local codes, and this instructions.

To use direct venting for the water heater:

- Install the 2" vent directly. Ensure the vent is properly seated.
- To install the 3" vent, reducer (3" to 2") must be used.
- Install the reducer (3" to 2") vertically. If installed horizontally, water may stagnate.





Legend:

- V = Vent terminal
- X = Air supply inlet
- = Area where terminal is not permitted

		Canadian Direct Vent Installation ¹⁾	U.S. Direct Vent Installation ²⁾
A	Clearance above grade, veranda, porch, deck or balcony	12 in. (30 cm)	12 in. (30 cm)
B	Clearance to window or door that may be opened	36 in. (91 cm)	12 in. (30 cm)
C	Clearance to permanently closed window	*	*
D	Vertical clearance to ventilated soffit located above the vent termination within a horizontal distance of 2 feet (61 cm) from the center line of the termination	*	*
E	Clearance to unventilated soffit	*	*
F	Clearance to outside corner	*	*
G	Clearance to inside corner	*	*
H	Clearance to each side of center line extended above meter/regulator assembly	36 in. (91 cm) within a height of 15 ft(4.6m)	*
I	Clearance to service regulator vent outlet	36 in. (91 cm)	*
J	Clearance to non-mechanical air supply inlet to building or the combustion air inlet to any other application	36 in. (91 cm)	12 in. (30 cm)
K	Clearance to mechanical air supply inlet	72 in. (183 cm)	36 in. (91 cm) above if within 10 ft(3m) horizontally
L	Clearance above paved sidewalk or paved driveway located on public property	84 in. (213 cm) †	Vents for Category II and IV appliances cannot be located above public walkways or other areas where condensate or vapor can cause a nuisance or hazard*
M	Clearance under veranda, porch deck or balcony	12 in. (30 cm) ‡	*

[*] The minimum distance from adjacent public walkways, adjacent buildings, openable windows, and building openings shall not be less than those values specified in the National Fuel Gas Code, ANSI Z223.1/NFPA 54, and/or the Natural Gas and Propane Installation Code, CSA B149.1;

a) Clearance in accordance with local installation codes and the requirements of the gas supplier.

b) The minimum height from the ground shall not be lower than the snowfall to prevent blockage by snow. And there shall be sufficient clearance from the building material to protect from degradation by flue gases.

NOTE

- 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.
- 3) If locally adopted installation codes specify clearances different than those illustrated, then the most stringent clearance shall prevail.
- † 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.

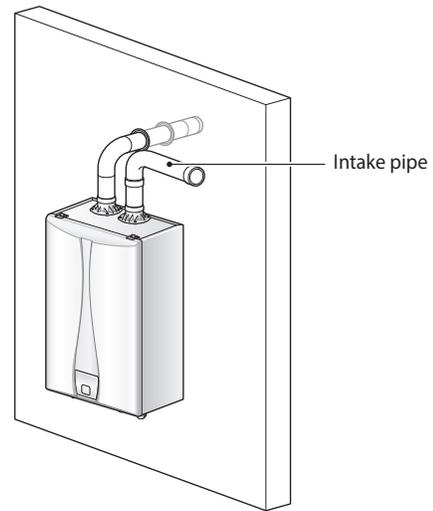
● Non-direct

If, at any time, the installation location could experience negative pressure, there is a possibility of back-drafting cold air through the water heater's heat exchanger. This situation could lead to the freezing of the heat exchanger and malfunction of the water heater. However, building codes in most jurisdictions disallow negative pressures in residences. In a home with a well-balanced air supply, the heat exchanger should not be in danger of freezing. Because the cause of back-drafting is not considered a manufacturing problem, any freezing damage which occurs from back-drafting will not be covered by the VST warranty. If there is any question about the possibility of back-drafting in the installation location, use a direct venting system for the water heater. When installed in a manufactured home (mobile home), all combustion air must be supplied from the outdoors as described on page 27. When using non-direct venting, maintain non-direct vent clearances shown on page 29 as required by ANSI Z21.10.3 and the National Fuel Gas Code, ANSI Z223.1/NFPA 54, and CAN/CSA B149.1 Natural Gas and Propane Installation Code.

For other than a direct vent appliance, the appliance must be located as close as practicable to a chimney or gas vent. If the appliance is installed without air intake pipe, the category is IV. "This water heater requires a special venting system. Refer to the installation instructions for parts list and method of installation." When installed in a manufactured home (mobile home), the screen for openings specified shall be of metal with no less than ¼ in (6.4 mm) mesh.

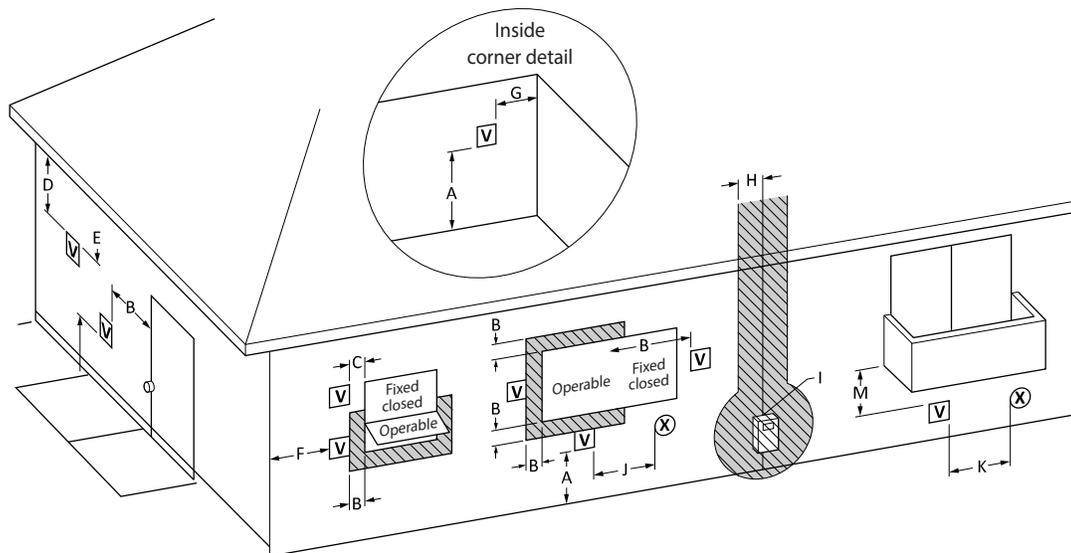
To use non-direct venting for the water heater:

- Insert the elbow into the intake air duct.



- Provide two openings to allow for circulation of combustion air as specified by ANSI Z223.1/NFPA 54 or CAN/CGA B-149.1:

	VRP-150 VRS-150	VRP-199 VRS-199
Maximum Input (BTU/H)	150,000	199,000
If outdoor make up air is provided, a minimum free area of 1 in ² , per 4,000 BTU/H	40 in ² 10"(W) x 4"(H) or 7" round	50 in ² 10" (W) x 5" (H) or 8" round
If indoor make up air is provided, a minimum free area of 1 in ² per 1,000 BTU/H	150 in ² 12 1/4" (W) x 12 1/4" (H)	199 in ² 14 1/4" (W) x 14 1/4" (H)



Legend:

- V** = Vent terminal
- X** = Air supply inlet
- = Area where terminal is not permitted

		Canadian Non-Direct Vent Installation ¹⁾	U.S. Non-Direct Vent Installation ²⁾
A	Clearance above grade, veranda, porch, deck or balcony	12 in. (30 cm)	12 in. (30 cm)
B	Clearance to window or door that may be opened	36 in. (91 cm)	4 ft (1.2m) below or to side of opening; 1ft (300mm) above opening
C	Clearance to permanently closed window	*	*
D	Vertical clearance to ventilated soffit located above the vent termination within a horizontal distance of 2 feet (61cm) from the center line of the termination	*	*
E	Clearance to unventilated soffit	*	*
F	Clearance to outside corner	*	*
G	Clearance to inside corner	*	*
H	Clearance to each side of center line extended above meter/regulator assembly	36 in (91 cm) within a height 15 ft(4.6m)	*
I	Clearance to service regulator vent outlet	36 in. (91 cm)	*
J	Clearance to non-mechanical air supply inlet to building or the combustion air inlet to any other application	36 in. (91 cm)	4 ft (1.2m) below or to side of opening; 1ft (300mm) above opening
K	Clearance to mechanical air supply inlet	72 in. (183 cm)	36 in. (91 cm) above if within 10 ft(3m) horizontally
L	Clearance above paved sidewalk or paved driveway located on public property	84 in. (213 cm) †	Vents for Category II and IV appliances cannot be located above public walkways or other areas where condensate or vapor can cause a nuisance or hazard
M	Clearance under veranda, porch deck or balcony	12 in. (30 cm) ‡	*

[*] The minimum distance from adjacent public walkways, adjacent buildings, openable windows, and building openings shall not be less than those values specified in the National Fuel Gas Code, ANSI Z223.1/NFPA 54, and/or the Natural Gas and Propane Installation Code, CSA B149.1;

a) Clearance in accordance with local installation codes and the requirements of the gas supplier.

b) The minimum height from the ground shall not be lower than the snowfall to prevent blockage by snow. And there shall be sufficient clearance from the building material to protect from degradation by flue gases.

NOTE

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.

3) If locally adopted installation codes specify clearances different than those illustrated, then the most stringent clearance shall prevail.

† 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.

Vent Pipe Materials



Venting requirements differ in the US and Canada. Consult the following chart or the most recent edition of ANSI Z223.1/ NFPA 54 or CAN/CGA B149.1, as well as all applicable local codes and regulations when selecting vent pipe materials. Do not use cellular core PVC (ASTM F891), cellular core CPVC, Radel® (polyphenolsulfone) for the exhaust vent.

Locale	Recommended Vent Materials
USA	<ul style="list-style-type: none"> PVC Schedule 40 (solid core) CPVC Schedule 40 or 80 (solid core) Approved Polypropylene*
Canada*	<ul style="list-style-type: none"> Type BH Special Gas Vent Class IIA (PVC) Type BH Special Gas Vent Class IIB (CPVC) Type BH Special Gas Vent Class IIC (Polypropylene)

* Approved polypropylene systems include:
 Duravent Polypro (Single Wall): 2PPS-xxx (2 in), 3PPS-xxx (3 in)
 Centrotherm InnoFlue SW: ISxx02xx (2 in), ISxx03xx (3 in)
 Centrotherm InnoFlue Flex: IFVL02XXX (2 in)

Refer to the manufacturer's literature for detailed information.

* For installation in Canada, field-supplied plastic vent piping must comply with CAN/CGA B149.1 (latest edition) and be certified to the Standard For Type BH Gas Venting Systems, ULC-S636. Components of this listed system must not be interchanged with other vent systems or unlisted pipes or fittings. All plastic components and specified primers and glues of the certified vent system must be from a single system manufacturer and must not be intermixed with another system manufacturer's parts. The supplied vent connector and vent termination are certified as part of the water heater.



- This water heater has a built-in control to limit the exhaust temperature to 149°F (65°C). As a result, the VST water heater can be vented with Schedule 40 PVC.
- However, if you set the water heater at a temperature above 150°F (66°C) for commercial use and you are also incorporating either an external recirculation loop or a combination heating system, the exhaust temperature can exceed 149°F (65°C). In that case, you must use Schedule 40 or 80 CPVC or Approved Polypropylene in the USA or Type BH Special Gas Vent Class IIB (CPCV) or Class IIC (Polypropylene) that conforms to ULC-S636 in Canada.

Vent Length

The maximum vent length when using 2" exhaust ducts is 60'. The maximum vent length when using 3" vent ducts is 150'. The intake duct length can be of equal length to the exhaust duct length. Both maximum lengths are reduced by the number of elbows, as shown in the following table:

Vent Size	Maximum Length	Maximum # of Elbows	Equivalent Lengths
2"	60' (18 m)	6	Reduce the maximum vent length accordingly for each elbow used: <ul style="list-style-type: none"> Each 90° elbow equates to 8 linear feet (2.4 m) of vent Each 45° elbow equates to 4 linear feet (1.2 m) of vent
3"	150' (45 m)	8	Reduce the maximum vent length accordingly for each elbow used: <ul style="list-style-type: none"> Each 90° elbow equates to 5 linear feet (1.5 m) of vent Each 45° elbow equates to 3 linear feet (0.9 m) of vent



Notice

- The maximum length does not include any elbows.
- If using a concentric termination as shown on pages 34, count this as 8 linear feet (2.4 m) of vent.

Connecting the Vent Clip



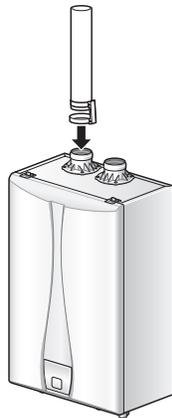
To connect the exhaust vent firmly, must use the vent clip included with water heater.

To connect the vent clip:

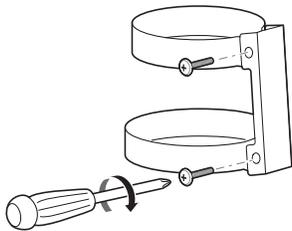
- 1 Connect the vent clip to the exhaust vent.



- 2 Connect the exhaust vent and the vent clip to the flue connector.



- 3 Tighten the screws and fix the vent clip.



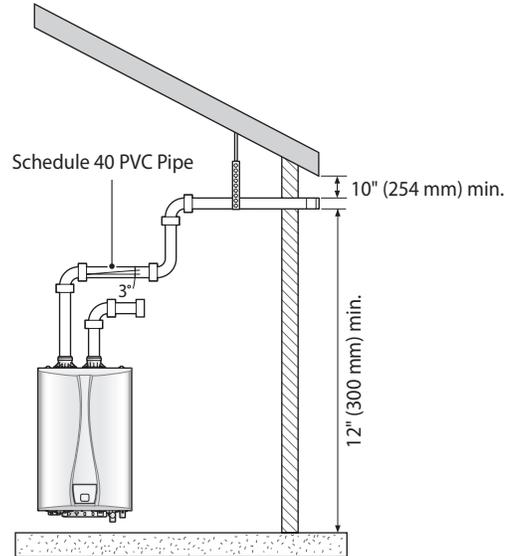
Vent Termination



- Air intake must be protected from any debris.
- When connecting to the air intake connector and exhaust flue connector, all connecting parts must be installed properly.
- Maintain 12" (300 mm) min. (18" (450 mm) min. for Canada) clearance above highest-anticipated snow level. Maximum of 24" (600 mm) above roof.
- Install a bird screen at the end of the intake air pipe and exhaust pipe.

Determine what type of vent termination is appropriate for the installation location and situation before installing the water heater. The following subsections describe some venting configurations, but do not include all possible options.

Single-pipe sidewall venting



- Maintain 12" (300 mm) min. (18" (450 mm) min. for Canada) clearance above highest-anticipated snow level. Maximum of 24" (600 mm) above roof.
- Install a bird screen at the end of the intake air pipe and exhaust pipe.

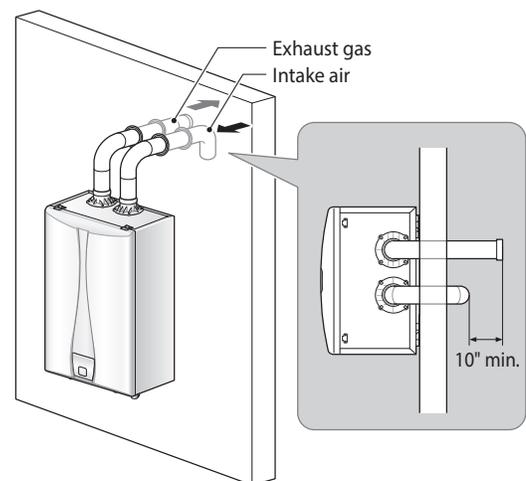


Notice

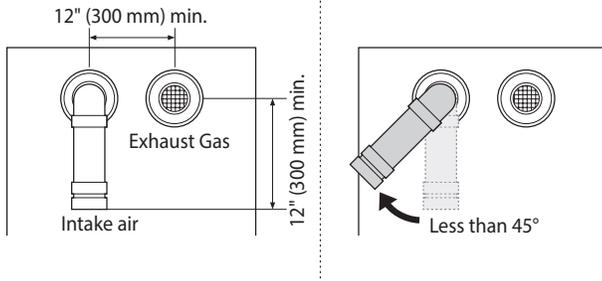
Single-pipe venting requires that adequate combustion air be provided in end-use installations per NFPA 54 C.9.3.2.

Two-pipe sidewall venting

Internal view



External view



Caution

- Maintain 12" (300 mm) min. (18" (450 mm) min. for Canada) clearance above highest-anticipated snow level. Maximum of 24" (600 mm) above roof.
- Install a bird screen at the end of the intake air pipe and exhaust pipe.



Notice

It is recommended to install the intake air vent terminal as far from the exhaust gas vent terminal as possible.



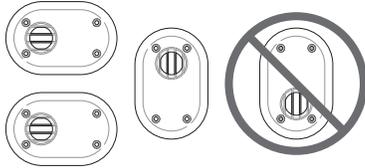
Caution

If the side wall vent termination kit is used, refer to the figure below for the orientation of the vent.

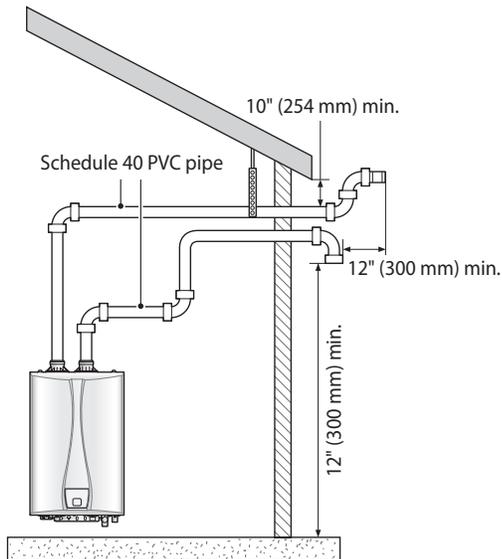
The following terminations can also be used:

IPEX Low Profile Termination Kits:

- 2 in Low Profile Vent Kit #196984
- 3 in Low Profile Vent Kit #196985



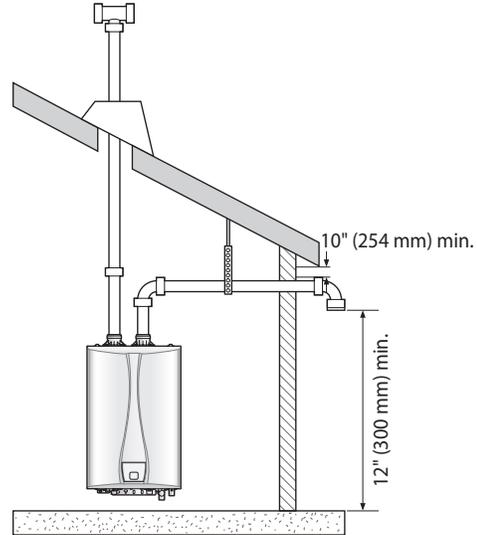
Snorkel flue



Caution

- Maintain 12" (300 mm) min. (18" (450 mm) min. for Canada) clearance above highest-anticipated snow level. Maximum of 24" (600 mm) above roof.
- Install a bird screen at the end of the intake air pipe and exhaust pipe.

Non-concentric sidewall venting



Caution

- Maintain 12" (300 mm) min. (18" (450 mm) min. for Canada) clearance above highest-anticipated snow level. Maximum of 24" (600 mm) above roof.
- Install a bird screen at the end of the intake air pipe and exhaust pipe.



Notice

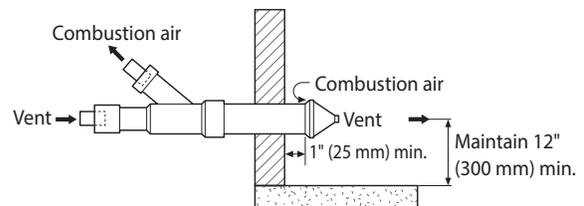
Air is drawn from a different location at a minimum of 12" (300mm) from the exhaust termination. Try to minimize the length of the intake air pipe with this venting.

Concentric sidewall venting

The following terminations can also be used:

DuraVent PolyPro Horizontal Concentric Termination Kit.

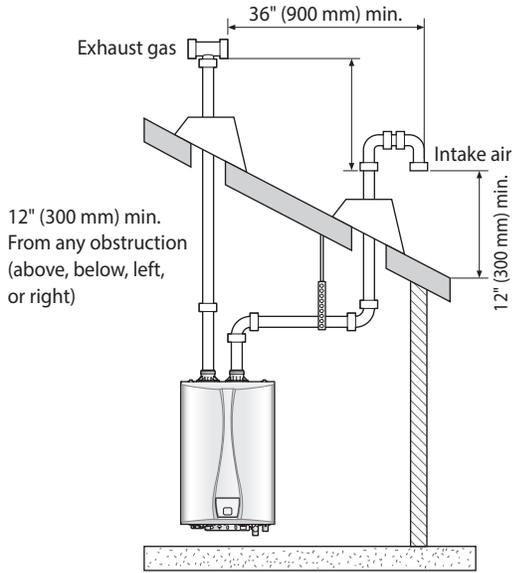
- 2 in x 4 in Concentric Vent Kit #2PPS-HK
- 3 in x 5 in Concentric Vent Kit #3PPS-HK



Caution

- Maintain 12" (300 mm) min. (18" (450 mm) min. for Canada) clearance above highest-anticipated snow level. Maximum of 24" (600 mm) above roof.

Two-pipe vertical venting



Caution

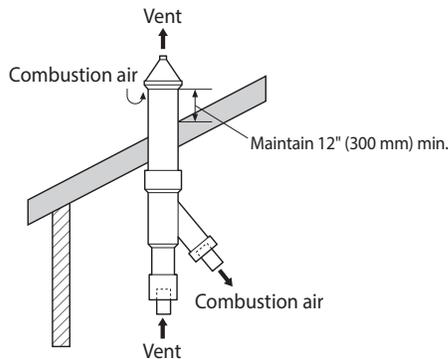
- Maintain 12" (300 mm) min. (18" (450 mm) min. for Canada) clearance above highest-anticipated snow level. Maximum of 24" (600 mm) above roof.
- Install a bird screen at the end of the intake air pipe and exhaust pipe.



Notice

Intake and exhaust pipes do not have to terminate in the same area.

Concentric roof venting

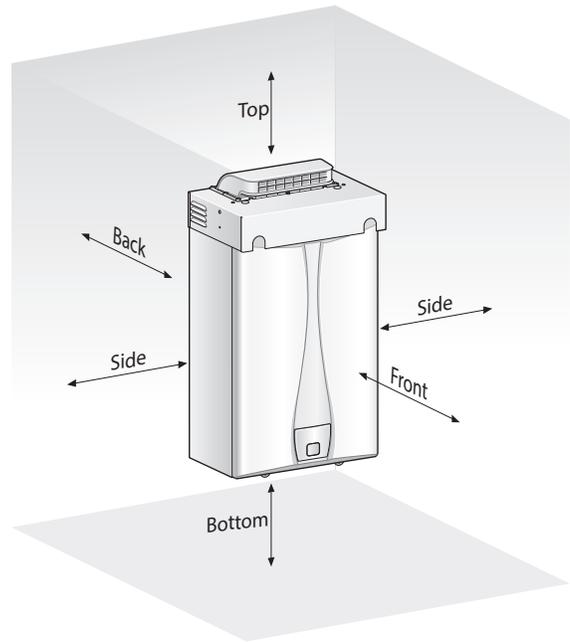


Caution

- Maintain 12" (300 mm) min. (18" (450 mm) min. for Canada) clearance above highest-anticipated snow level. Maximum of 24" (600 mm) above roof.

Outdoor Installation

Outdoor installation should only be considered in mild climates. Freezing temperatures or contaminated air can damage the water heater. When installing the water heater outdoor, maintain clearance from building openings, as described in the "Non-Direct" section on page 28. Outdoor installation areas should be in an open, unroofed area and should allow for the following minimum clearances from the water.



Clearance From	Wall Mounting
Top	36 inches (900 mm) min.
Back	0.6 inches (15 mm) min.
Front	24 inches (600 mm) min.
Sides	60 inches (1524 mm) min.
Bottom	12 inches (300 mm) min.

When installing a water heater outdoors, follow these guidelines;

- The VST's outdoor Vent Kit must be used to ensure proper operation of the water heater. (Item No. : 2070723S)
- Ensure that there is plenty of clearance around the air intake and that it is adequately protected to prevent any debris, liquids, or flammable gases from entering the air intake.
- Please refer to page 8 for the rating plate enclosed with the outdoor kit.

Common Vent System Information (Optional)

About the Common Vent System

Common Vent System allows multiple VST water heaters to share the same vent system, which means fewer wall or roof cuts, less labor, and longer vent lengths than with single-unit water heater venting.

- VRP - 199
- VRS - 199



Danger

- Category IV appliances require a special venting system. The vent system will operate with a positive pressure in the pipe.
- Exhaust gases must be piped directly outdoors using the vent materials and rules outlined in these instructions. Do not connect vent connectors serving appliances vented by natural draft into any portion of mechanical draft systems operating under positive pressure. Follow the venting instructions carefully. Failure to do so will result in substantial property damage, severe personal injury or death.



Warning

- Improper venting of the water heater units can result in excessive levels of carbon monoxide, which can lead to severe personal injury or death. The water heaters units must be vented in accordance with the "Venting of Equipment" section of the latest edition of the ANSI Z223.1/NFPA 54 Natural Fuel Gas Code in the USA, as well as all applicable local building codes and regulations. Follow all instructions and guidelines when venting the water heater units. Venting should be performed only by a licensed professional.
- Venting system must be sealed gastight to prevent flue gas spillage and carbon monoxide emissions, which will result in severe personal injury or death.
- The building owner is responsible for keeping the exhaust and intake terminations free of snow, ice, or other potential blockages, as well as scheduling routing maintenance. Blocked or obstructed vent piping terminations could result in property damage, severe personal injury, or death.

Guideline for a Common Vent System



Caution

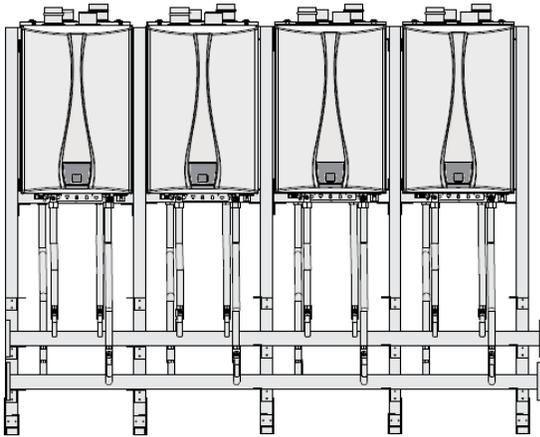
- To ensure the correct operation of the common vent system,
 - A cascade communication cable must be installed between all units in the common vent system by the installer.
 - Backflow dampers must be installed in the exhaust duct of each water heater unit.
- This manual covers the installation of a common vent system for VR water heaters only.

To ensure the safe and correct installation of the common vent system, carefully follow the instructions and guidelines.

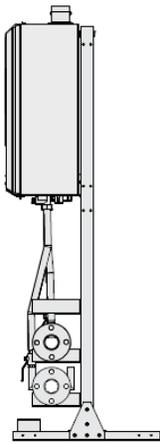
- A maximum of 8 VR water heaters may be connected to one common vent system. In a system that has more than 8 VR water heaters, use 2 common vent systems or consult VST.
- Position the water heaters units as close as possible to the vent termination.
- Do not use cellular core PVC (ASTM F891), cellular core CPVC, Radel® (polyphenolsulfone), ABS, or galvanized material for the exhaust vent.
- Support horizontal vent runs a minimum of every four feet and all vertical vent runs a minimum of every six feet..
- Venting should be as direct as possible with a minimum number of pipe fittings.
- Vent connections must be attached together so that they form an air tight seal.
- If the water heater units will be installed in areas where snow is known to accumulate, protect the vent termination from blockage. Provide a minimum of 1 foot (30 cm) clearance from the bottom of the exhaust of the expected snow accumulation level. Snow removal may be necessary to maintain clearance.
- Set the temperature setting on all water heaters being common vented to the same temperature.

Clearances Between Multiple Units

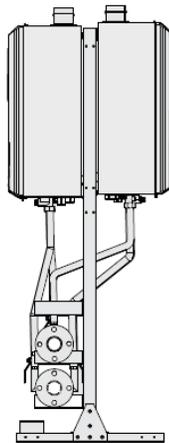
- Ensure that the installed water heaters satisfy all installation clearances provided in the manual. It is essential that there is sufficient clearance space for the common vent system to work properly.
- The water heater units can be mounted either IN-LINE or BACK TO BACK.



VST Modular Configuration with Rack System



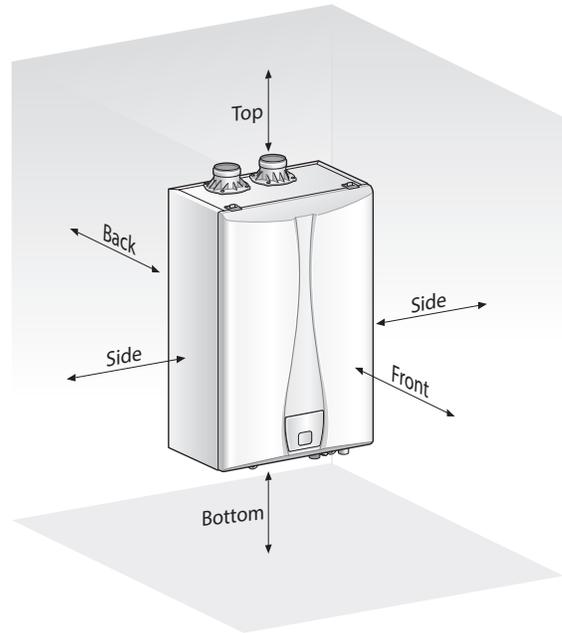
IN-line Setup



Back to Back Setup

Clearances Chart for Common Vent Application

- The water heaters should be installed in an area that allows for service and maintenance access to utility connections, piping, filters, and traps. Ensure the following clearances are maintained:



Clearance From	Wall Mounting
Top	36 inches (914 mm) min.
Back	0.6 inches (15 mm) min.
Front	24 inches (609 mm) min.
Sides	3 inches (76 mm) min.
Bottom	12 inches (300 mm) min.



Do not install the water heaters on carpeting.

Local	Recommended Vent Materials
Bottom	12 inches (300 mm) min.

Selecting Vent Pipe Materials

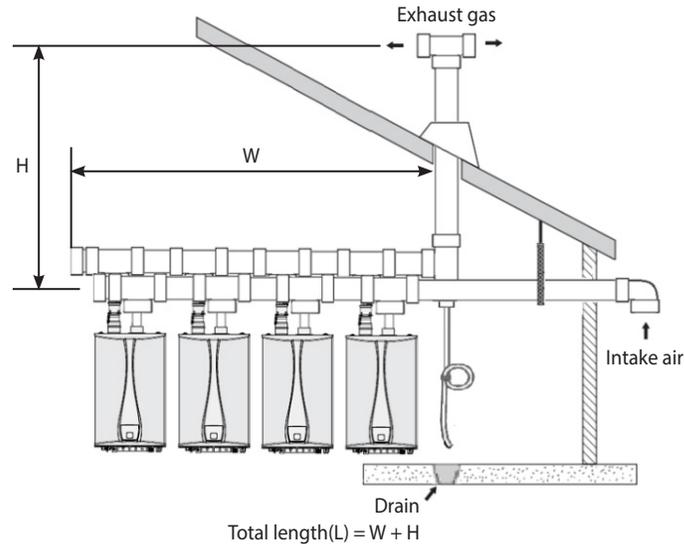
- Consult the following chart or the most recent edition of ANSI Z223.1/NFPA 54, as well as all applicable local codes and regulations when selecting vent pipe materials. This appliance should be vented with materials approved for category IV gas appliances.

Determining the Length of Common Vent System

When selecting an installation location, you must ensure that clearances will be met and the vent length will be within required limits.

Requirements

- Intake and exhaust terminations must vent outside the building.
Add the BTU/H input ratings for each unit in the common vent system to determine the total BTU/H rating.



Vent Length for VRP/VRS Water Heater

Qty	Required Load (BTU/H)	Total Length (ft)							
		D=3"		D=4"		D=6"		D=8"	
		Min	Max	Min	Max	Min	Max	Min	Max
2	398,000	13.1	43	13.1	70				
3	597,000	20	28	20	50	20	112		
4	796,000	20	21	20	38	20	84		
5	995,000					21.7	67	21.7	120
6	1,194,000					21.7	56	21.7	100
7	1,393,000					23.5	48	23.5	85
8	1,592,000					25.2	42	25.2	75

Notice

- Every 90° elbow used is equivalent to 8 linear feet (2.4 m) of vent length.

Installing a Vent (For common vent installation only)

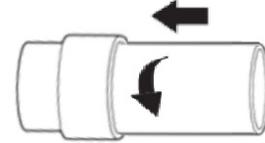
Install the Venting

Venting installation Sequence

- Listed below is the sequence for installing PVC/CPVC common venting.

- 1 Choose the Installation Location.
- 2 Install the Backflow damper
- 3 Assemble the Header
- 4 Connect the Venting
- 5 Terminate the Venting
- 6 Set DIP Switches
- 7 Connect the Cables
- 8 Post Installation Checklist

- 2 Align the pipe with the pipe fitting and twist the pipe a quarter turn as you insert it into the fitting. Twisting the pipe spreads the solvent cement evenly to ensure a solid joint.



- 3 Hold the pipe and pipe fitting together for about 15 seconds until the cement sets.

Notice

- Use approved solvent type cement for the proper vent materials.
- Use solvent type cement only.
- Check the date of manufacture before using the cement. Ensure that cement was not manufactured more than 2 years prior to using it.
- Ensure that the inside of the pipe fitting and the outside of the pipe, where cement will be applied, is clean.
- Apply an even layer of cement over all mating surfaces.
- Use solvent cement in room temperatures higher than 32°F.
- Installing vent pipe with cement in cold ambient temperatures can result in longer cure times.

Connecting Pipes with Cement



Warning

Do not mix components from different systems. The vent system may fail and harmful flue products may leak into the living space. Mixing of venting materials will void the warranty and certification of the appliance.

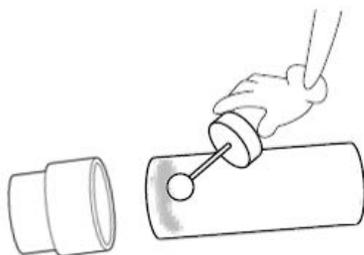


Caution

The vapors from primers and solvent cements can make you dizzy and are dangerous to your health. Ensure that the work area is well ventilated, or wear an approved organic vapour respirator when working with primers and solvent cements.

- Listed below is the sequence for installing PVC/CPVC common venting.

- 1 Spread an even layer of solvent cement on the inside of the pipe fitting and the outside of the pipe.



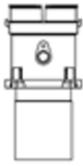
Danger

Be careful not to apply force or impact to pipes after making connections. An may break the bond and harmful gas might leak inside the room.

Install the Venting

Open the package and verify the following contents are included.

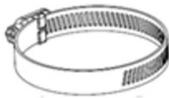
Kit Name	Backflow Damper Kit
Kit No.	42110341



Backflow Damper



Installation Manual



Vent clip

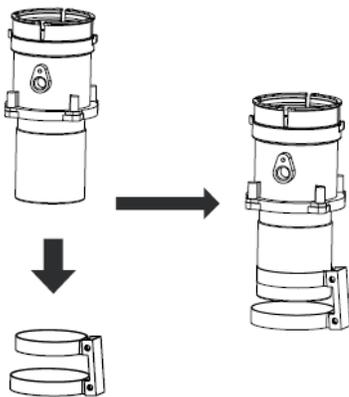
Notice

If there is a missing item, please contact Technical Support at 1-800-761-0053.

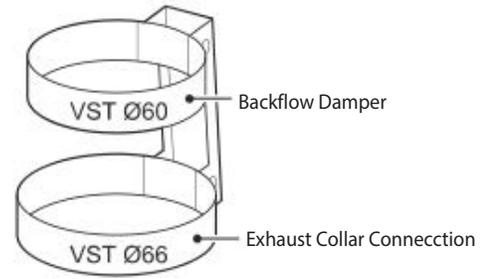
Backflow Damper Assembly

- Follow the instructions below to assemble the backflow damper on the VR water heater units:

1 Connect the vent clip and the Backflow Damper.



To connect the exhaust vent firmly onto unit use the provided Vent Clip Connection. Check vent clip size and adjust accordingly before installation.



Vent Clip Connection

2 Connect the Backflow Damper with the vent clip to the exhaust collar connection, check diagram for proper position

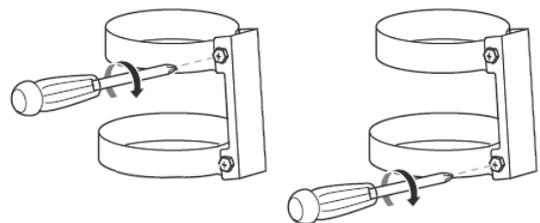


* VR series

Notice

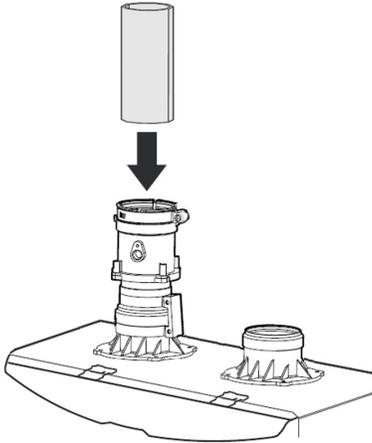
- VR series Exhaust vent is on the LEFT side.

3 Tighten vent clip to exhaust pipe. Ensure band on vent clip is labeled VST Ø60.

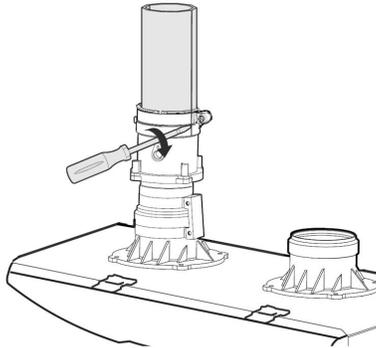


Connecting the Pipe to the Damper

- 1 Insert vent pipe to the backflow damper to start the vent run.

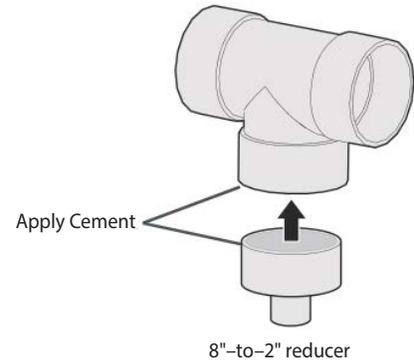


- 2 Completely slide the vent pipe ends into the transition fitting. Tighten the clamp with a screwdriver to properly seal the joint.



Assembling the T joint

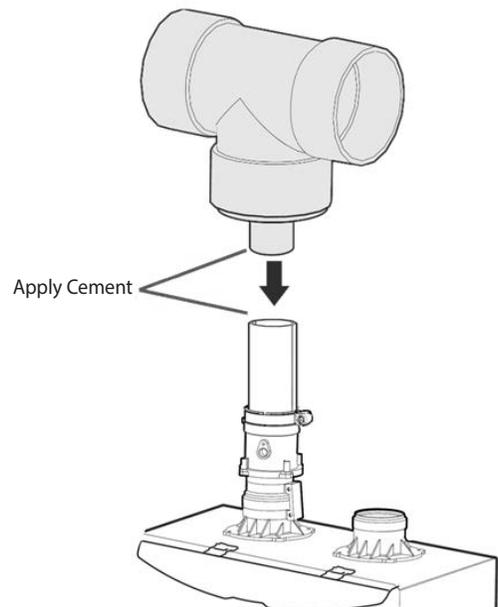
- 1 Connect an 8"-to-2" reducer to the T. Apply solvent cement to the mating surfaces.



Notice

Multiple reducers can be used to allow proper connection of 2" vent pipe to the common vent system.

- 2 Assemble the T joint assembly to the vent pipe. Apply solvent cement to the mating surfaces.

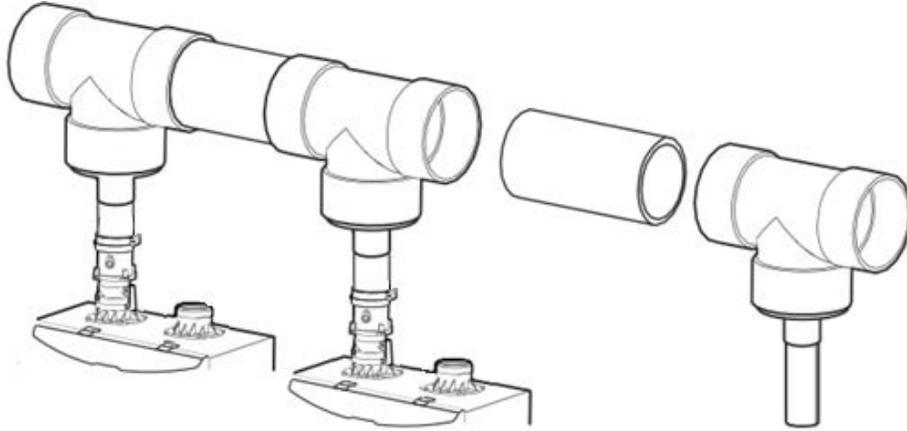


● Connecting and Terminating the Vent Pipe

Refer to the following example to install the common vent system. The installation area should be measured to ensure that sufficient space is available to install the water heater units and the common vent system. Ensure that the common vent system is installed near the water heater units while satisfying all clearance requirements that are specified in this manual as well as the installation Manuals supplied with the water heater units.

● Connecting the Main Pipe Runs to T joint

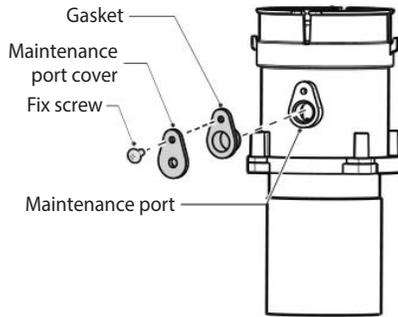
After connecting the T joint to the 8"-to-2" reducer, connect the main trunk pipe to each side of the T. Each trunk pipe is connected to the other T joint. Refer to "Connecting Pipes with Cement" on page 39 for more information.



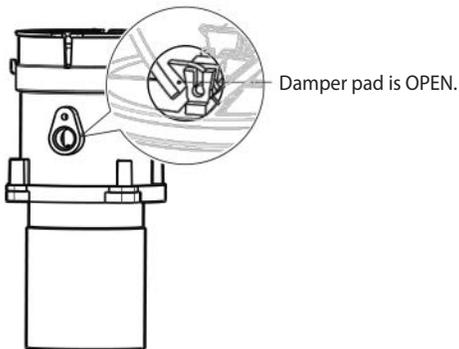
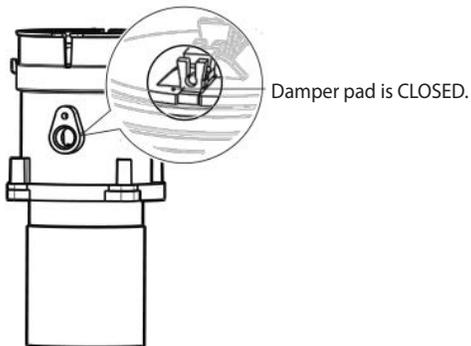
Maintenance

Periodically check the damper condition inside the backflow damper through the maintenance port to ensure optimal performance of the system. Follow the instructions to check the damper condition and replace the backflow damper if necessary.

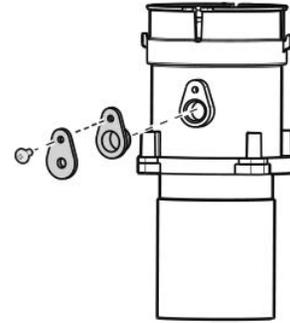
- 1 Remove the screw that fixes the maintenance port cover to the backflow damper, and then remove the gasket and the maintenance port cover.



- 2 Through the maintenance port, check the operating condition of the damper plate inside the backflow damper.



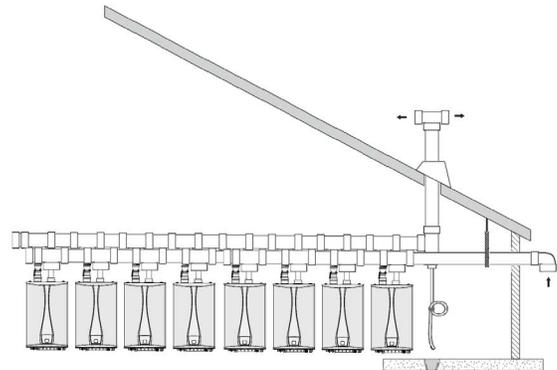
- 3 Reinstall the gasket and maintenance port cover, and then fix them with a set screw.



- 4 Visually inspect the maintenance port to ensure that the gasket is properly installed between the maintenance port and the maintenance port cover.

Example of a Typical Installation

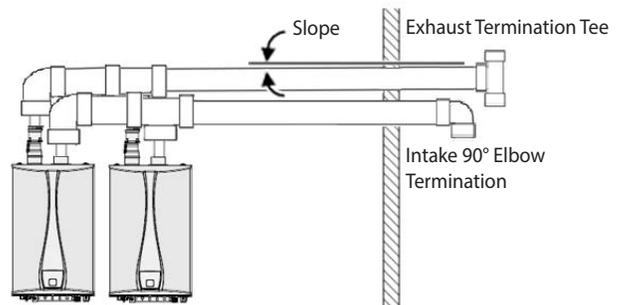
The following illustration depicts an example of a common vent system installed for a cascade system of 8 VR Water heater units.



Notice

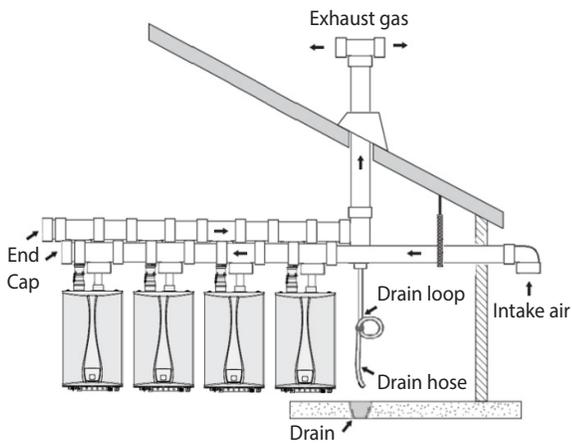
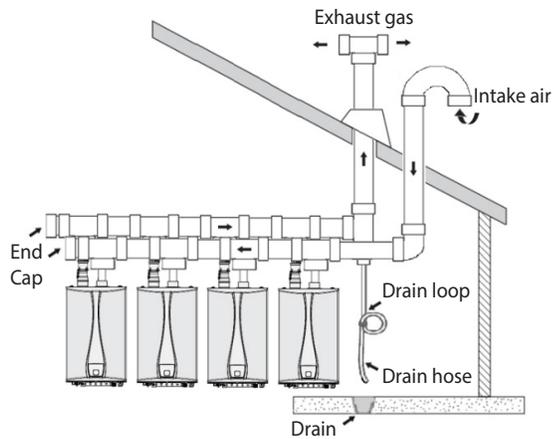
The illustration is intended for reference purpose only.

Drain hose installation is not required if there is slope in the horizontal exhaust.

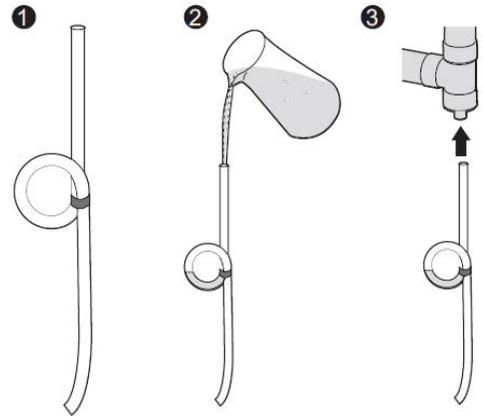


● Installing a Condensate Drain

Refer to the following examples to install a condensate drain hose (field supplied) to the common vent system. The condensate drain hose prevents condensate or rain from entering the exhaust system and gatering above the backflow damper.



- 2 Prime the loop using tap water.
- 3 Install the hose to the cascade system and direct the end of the hose to a drain.



Warning

After installing the condensate drain hose, check the loop again to ensure that the prime water is not spilled. The loop (siphon) must be primed with water before running the system to prevent toxic exhaust gas from leaking into the installation site.

To install a condensate drain to the cascade system:

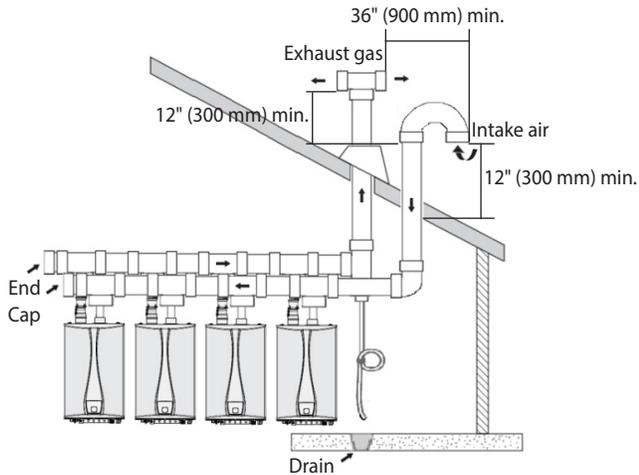
- 1 Form a loop with a drain hose and fix it with a tie.

Notice

- While shaping the hose, do not bend the hose excessively. The hose will be deformed and the flow will be restricted if the hose is bent in sharp angles.
- Do not fix the hose too tight when tying the hose to form the loop. The hose will be deformed and the flow will be restricted if the tie is too tight.

Common Vent Clearances

Direct Vent Application – Vertical Installation



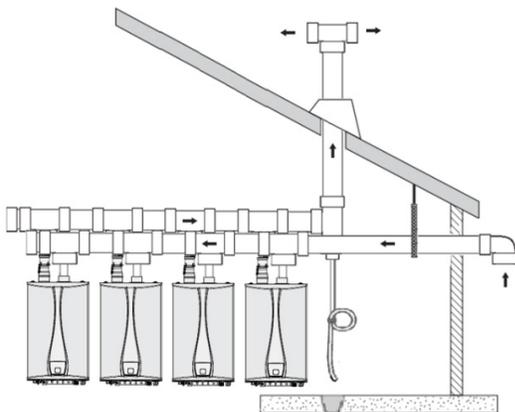
Caution

- Maintain 12" (300 mm) min. clearance above highest anticipated snow level. Maximum of 24" (600 mm) above roof.
- Install a bird screen at the end of the intake air pipe and exhaust pipe.

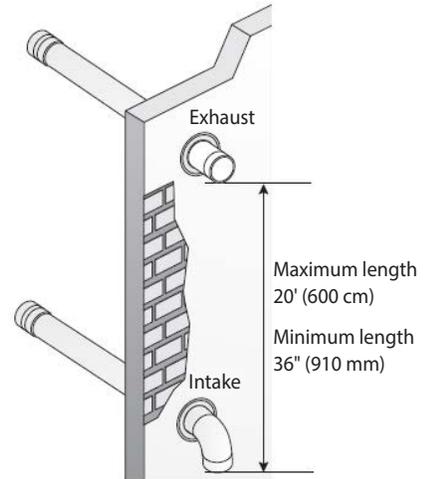
Notice

- Intake and exhaust pipes do not have to terminate in the same area.

Venting Intake and Exhaust to Different Locations



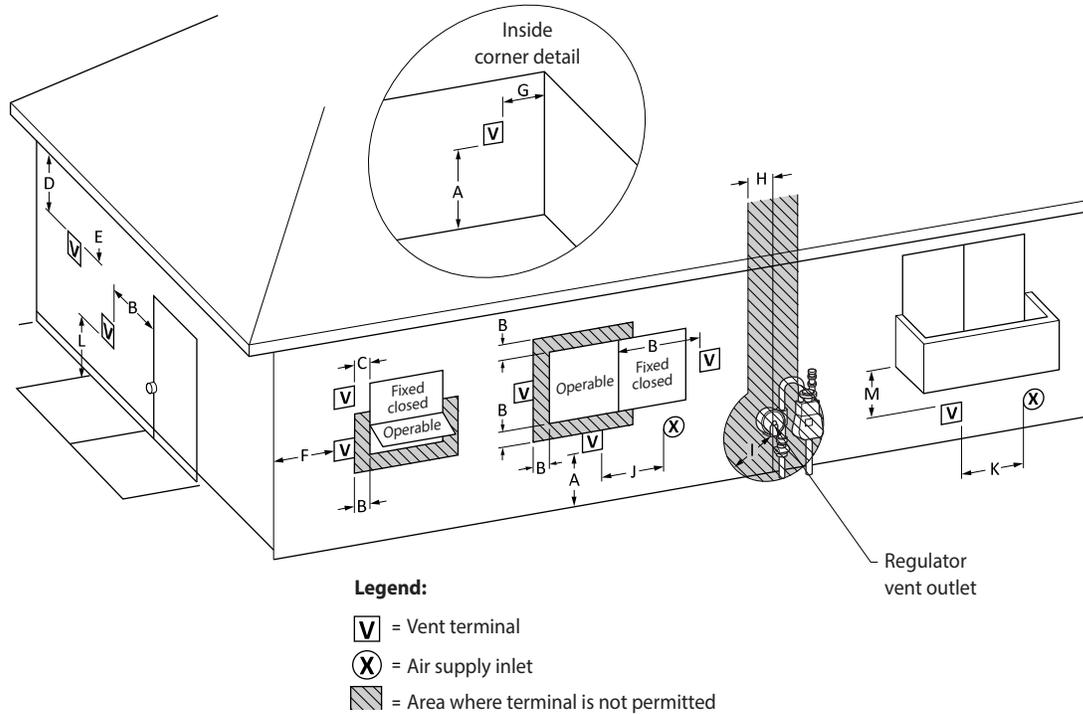
Direct Vent Application – Horizontal Installation



Notice

- The illustration is intended for reference purposes only.
- Direct the exhaust away from any building openings.
- During cold weather situations, the temperature of the exhaust will be much warmer than the ambient air. Therefore, you will see water vapor being produced at the termination.

Exhaust Vent Termination Clearances



		Canadian Direct Vent Installation ¹⁾	U.S. Direct Vent Installation ²⁾
A	Clearance above grade, veranda, porch, deck or balcony	12 in. (30 cm)	12 in. (30 cm)
B	Clearance to window or door that may be opened	36 in. (91 cm)	12 in. (30 cm)
C	Clearance to permanently closed window	*	*
D	Vertical clearance to ventilated soffit located above the vent termination within a horizontal distance of 2 feet (61 cm) from the center line of the termination	*	*
E	Clearance to unventilated soffit	*	*
F	Clearance to outside corner	*	*
G	Clearance to inside corner	*	*
H	Clearance to each side of center line extended above meter/regulator assembly	36 in. (91 cm) within a height of 15 ft(4.6m)	*
I	Clearance to service regulator vent outlet	36 in. (91 cm)	*
J	Clearance to non-mechanical air supply inlet to building or the combustion air inlet to any other application	36 in. (91 cm)	12 in. (30 cm)
K	Clearance to mechanical air supply inlet	72 in. (183 cm)	36 in. (91 cm) above if within 10 ft(3m) horizontally
L	Clearance above paved sidewalk or paved driveway located on public property	84 in. (213 cm) †	Vents for Category II and IV appliances cannot be located above public walkways or other areas where condensate or vapor can cause a nuisance or hazard*
M	Clearance under veranda, porch deck or balcony	12 in. (30 cm) ‡	*

[*] The minimum distance from adjacent public walkways, adjacent buildings, openable windows, and building openings shall not be less than those values specified in the National Fuel Gas Code, ANSI Z223.1/NFPA 54, and/or the Natural Gas and Propane Installation Code, CSA B149.1;

a) Clearance in accordance with local installation codes and the requirements of the gas supplier.

b) The minimum height from the ground shall not be lower than the snowfall to prevent blockage by snow. And there shall be sufficient clearance from the building material to protect from degradation by flue gases.

NOTE

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.

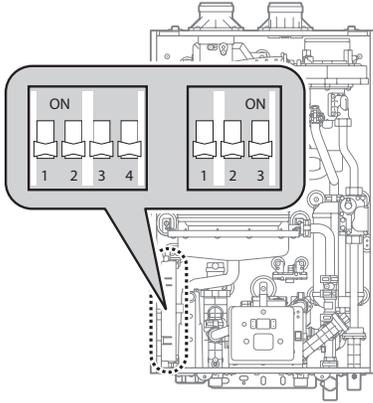
3) If locally adopted installation codes specify clearances different than those illustrated, then the most stringent clearance shall prevail.

† 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.

Setting the DIP Switches

The water heater has a DIP switch on the main circuit board (PCB). There are two sets of DIP switches that control the cascade system of the water heater. Set the DIP switches appropriately, depending on the installation environment.



4-switch panel (SW1)

Switch	Function
	Recirculation mode for VD-100
	Internal recirculation mode ("VRP" model only)
	External recirculation mode ("VRP" model only)
	Cascade operation

3-switch panel (SW2): Cascade operation Off

Switch	Function
	Minimum heat capacity operation.
	Maximum heat capacity operation

3-switch panel (SW2): Cascade operation On

Switch	Function
	One water heater is in use for the cascade system (only when cascade system is set in SW1).
	Two water heaters are in use for the cascade system (only when cascade system is set in SW1).
	Three water heaters are in use for the cascade system (only when cascade system is set in SW1).
	Four water heaters are in use for the cascade system (only when cascade system is set in SW1).
	Five water heaters are in use for the cascade system (only when cascade system is set in SW1).
	Six water heaters are in use for the cascade system (only when cascade system is set in SW1).
	Seven water heaters are in use for the cascade system (only when cascade system is set in SW1).
	Eight water heaters are in use for the cascade system (only when cascade system is set in SW1).

Connecting the Power Supply



Warning

Improperly connecting the power supply can result in electrical shock and electrocution. Follow all applicable electrical codes of the local authority having jurisdiction. In the absence of such requirements, follow the latest edition of the National Electrical Code (NFPA 70) in the USA or the latest edition of CSA C22.1 Canadian Electrical Code Part 1 in Canada. Connecting the power supply should be performed only by a licensed professional.

When connecting the power supply, follow these guidelines:

- Do not connect the electric supply until all plumbing and gas piping is complete and the water heater has been filled with water.
- Do not connect the water heater to a 220-240V AC power supply. Doing so will damage the water heater and void the warranty.
- All water heaters come with a factory-installed, 3-pronged (grounded) plug. The water heater can be plugged into any grounded electrical outlet nearby, as it requires only 5A. It is not necessary to run a dedicated electrical line to the water heater.
- If local codes require the water heater to be wired directly, remove and discard the factory-installed plug. Install a power switch between the breaker and the water heater to facilitate end-user maintenance and servicing. Connect the water heater to a 110-120V AC at 60 Hz with a maximum of 5A rating electrical supply.
- The water heater must be electrically grounded. If using the power plug, ensure that the electrical outlet you connect the water heater to is properly grounded. If wiring the water heater directly to a power supply, do not attach the ground wire to either the gas or the water piping as plastic pipe or dielectric unions may prevent proper grounding.
- We recommend using a surge protector to protect the water heater from power surges.
- If there is a power failure in cold weather areas, the freeze prevention system in the water heater will not operate and may result in freezing of the heat exchanger. In cold weather areas where power failures are common, you must completely drain the water heater to prevent damage if the power is expected to be off for any extended period of time. A battery back-up (available at most computer retailers) may be used to supply hot water during periods of power outages. Damage caused by freezing is not covered under warranty.

Setting the Program data

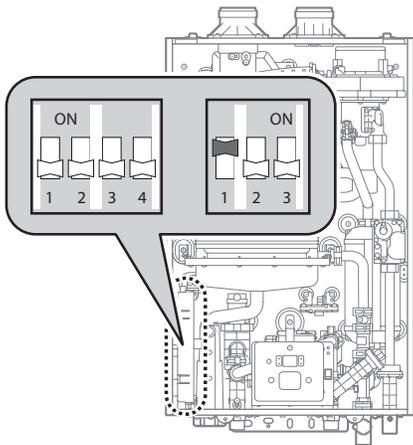
Program data can be changed for Lime Alarm, High altitude area, Cascade.

To change the program data.

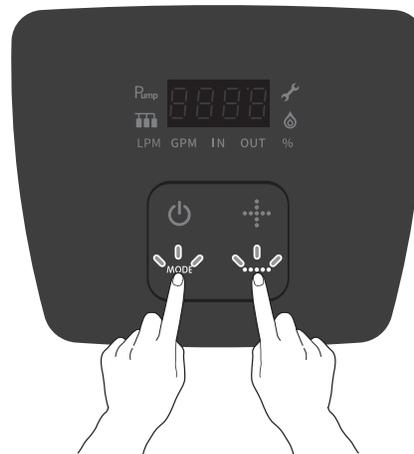
- 1 Connect the power supply.
- 2 To turn the water heater off, press the  button.



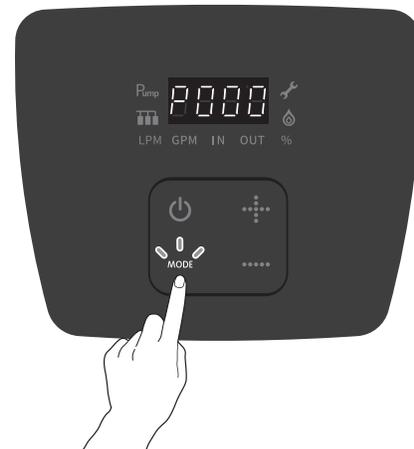
- 3 Turn the dip s/w on.



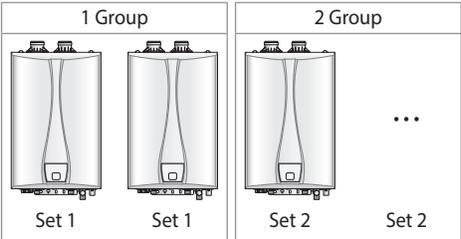
- 4 For Program data Setting, please select and hold MODE,  for 5 seconds. (Dip switch setting required)



- 5 Click MODE button for data selection from P2, P6, PC, PD, LA, LE, LF.



- 6 To change data setting, click  or  button. Select  button for data saving. Please set the dip switch for normal mode.

Data	Function	Setting		Remark
P2	Lime Alarm	0	Disable	Displays a "E1" error when the set time period has been reached to indicate a flush or service is necessary.
		1	6 months	
		2	12 months	
		3	24 months	
P6	High Altitude	50	0–1,999 ft	Above 2,000 ft (610 m), the water heater will de-rate by 4% for each 1,000 ft (305 m) of altitude gain.
		55	2,000–5,399 ft	
		5A	5,400–7,799 ft	
		5F	7,800–10,100 ft	
PC	Cascade Water Flow	20–55	20 (2.0 liter = 0.53 gallon)–55 (5.5 liter = 1.45 gallon)	Stop the combustion when a change in the flow rate 1.5 seconds after the change is detected matches the set flow rate when linked with CASCADE.
PD	Cascade Standby	3	Set 3 stand-by units	Set 3 to 8 stand-by units when connecting 5 or more units. * Set the number of stand-by units from 7" monitor when linked with 7" monitor.
		4	Set 4 stand-by units	
		5	Set 5 stand-by units	
		6	Set 6 stand-by units	
		7	Set 7 stand-by units	
		8	Set 8 stand-by units	
LA	High & Low	LALO	98~140 °F (Residential)	
		LAHI	98~180 °F (Commercial)	
LE	Cascade Group	1	Set 1 Group	 <p>* Each group can make up to 8 units. * Set the group for CASCADE linked with the unit IoT and the 7" monitor controller.</p>
		2	Set 2 Group	
		3	Set 3 Group	
		4	Set 4 Group	
		5	Set 5 Group	
LF	IoT & 7" Monitor	0	Disable	
		1	IoT or 7" monitor	

Self Calibration Mode



After installing the water heater you must proceed to Calibration Mode before using the water heater.

In Calibration Mode, the water heater calculates the load according to the installation circumstances (altitude, vent) and self adjust the heat capacity by itself.

To use the Calibration Mode:

- 1 Connect the power supply.
- 2 Press the  button.
- 3 Hold down the  button for 5 sec to unlock and increase the temperature higher than 140°F (60°C).



Notice

Temperature is set to 98°F (37°C) by default.

- 4 Open more than two faucets and dispense approximately 4 gallons (15 liters) of water.
- 5 Check that the  icon is turned on.



- 6 Touch the  button and turn off the water heater.



- 7 Touch the  button and the MODE button simultaneously for more than 5 seconds. "CAL1" appears on the digital display and start flashing.



- 8 "CAL 1" flashes for about 6 minutes. When "CAL1" is flashing, it means the heat capacity is adjusting.



- 9 After the heat capacity adjustment is finished, "CAL1" disappears from the digital display. Close all faucets.



 **Notice**

After the display goes blank and the faucets turned off, press the power button to turn on the water heater. Adjust the temperature back down to 98°F or to desired temperature.

Installation Checklist

After the water heater installation, examine the following checklist. If you are not able to answer "Yes" to all of the items in the checklist, review the appropriate sections. To troubleshoot any operational problems, refer to "Troubleshooting" in the User's Manual.

If there are additional questions or if you need assistance, contact technical support at 1-800-761-0053.

Location	Check
Is the make-up air supply free from corrosive elements and flammable vapors?	<input type="checkbox"/>
Is the water heater clear of combustible materials?	<input type="checkbox"/>
Is the gas control valve accessible for servicing?	<input type="checkbox"/>
Have you maintained the proper service and maintenance clearances?	<input type="checkbox"/>

Gas connection	Check
Have you tested all the fittings for leaks?	<input type="checkbox"/>
Does the gas supply match the gas type specified on the water heater's rating plate?	<input type="checkbox"/>
Is the gas supply pressure adequate as the gas supply pressure specified in the water heater's rating plate?	<input type="checkbox"/>
Does the installation conform with local codes or, in the absence of local codes, the National Fuel Gas Code ANSI Z223.1/NFPA 54?	<input type="checkbox"/>
Does the gas line have an inner diameter of at least 1/2"?	<input type="checkbox"/>

Water connection	Check
Is the water supply pressure sufficient (greater than 40 PSI)?	<input type="checkbox"/>
Have you verified that the cold water line and the hot water line do not intersect and have you tested for leaks?	<input type="checkbox"/>
Is the approved pressure relief valve installed properly?	<input type="checkbox"/>
Have you verified that there are no products installed which exceeds the maximum pressure specified in the water heater's rating plate?	<input type="checkbox"/>

Venting	Check
Is the distance between the exhaust vent terminal and the intake air vent terminal far enough, and more than the distance specified in the manual?	<input type="checkbox"/>
Are the air intake and exhaust connections on the flue and vent lines correctly sealed?	<input type="checkbox"/>
Have you checked venting for leaks?	<input type="checkbox"/>
Are all vent runs properly supported?	<input type="checkbox"/>
Is the vent termination properly supported?	<input type="checkbox"/>
Have you explained to the owner importance that vent termination not be blocked?	<input type="checkbox"/>
Have you run the "Calibration Mode"?	<input type="checkbox"/>

Others	Check
Is the front panel working properly?	<input type="checkbox"/>
Have you filled the condensate trap with fresh water?	<input type="checkbox"/>
Have you explained how to operate the water heater, safety guidelines, maintenance, and warranty to the owner?	<input type="checkbox"/>
Have you delivered the manuals directly?	<input type="checkbox"/>

Appendix

Gas Conversion

This water heater is configured for Natural Gas from the factory. If conversion to Propane Gas is required, the conversion kit supplied with the water heater must be used.



Danger

Inspect the packing between the gas valve and gas pipe whenever they are disassembled. The packing must be installed and must be in good condition. Failure to comply will cause a gas leak, resulting in severe personal injury or death.



Warning

This conversion kit shall be installed by a qualified service agency* in accordance with VST instructions and all applicable codes and requirements of the authority having jurisdiction. The information in these instructions must be followed to minimize the risk of fire or explosion and/or to prevent property damage, personal injury or death. The qualified service agency is responsible for the proper installation of this kit. The installation is not proper and complete until the operation of the converted appliance is checked as specified in the manufacturer's instructions supplied with the kit.

* A qualified service agency is any individual, firm, corporation or company which either in person or through a representative is engaged in and is responsible for the connection, utilization, repair or servicing of gas utilization equipment or accessories; who is experienced in such work, familiar with all precautions required, and has complied with all of the requirements of the authority having jurisdiction.

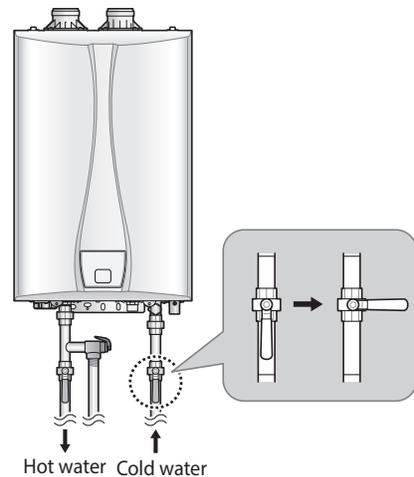
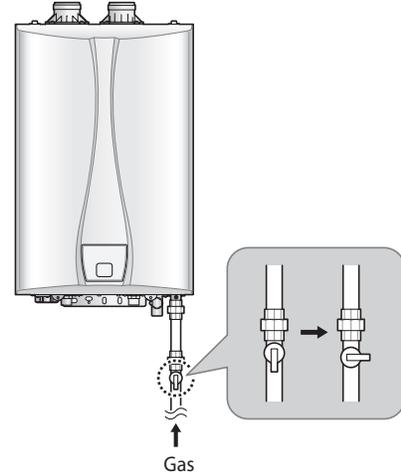
In Canada : THE CONVERSION SHALL BE CARRIED OUT IN ACCORDANCE WITH THE REQUIREMENTS OF THE PROVINCIAL AUTHORITIES HAVING JURISDICTION AND IN ACCORDANCE WITH THE REQUIREMENTS OF CSA B149.1, NATURAL GAS AND PROPANE INSTALLATION CODE.

Included Items :

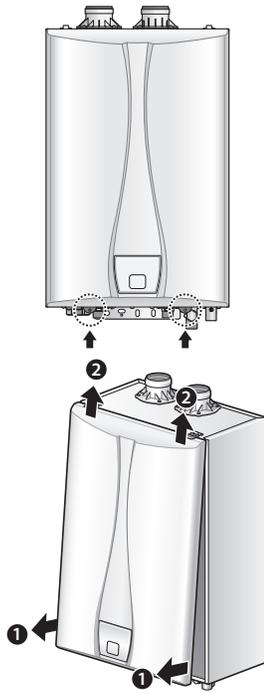
- LP Orifice
- Gas Packing
- 3/4" Packing
- Screws
- Conversion Manual

To convert the gas:

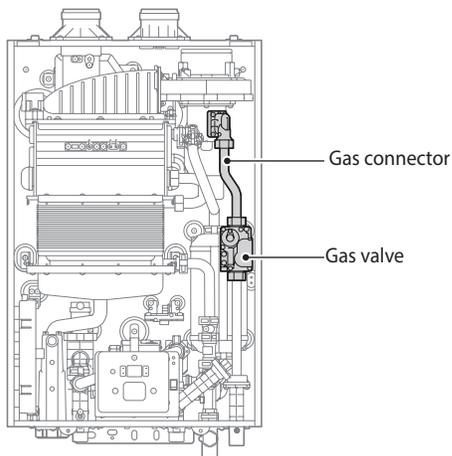
- 1 Disconnect the electrical power. Turn off the manual gas shut off valve and the water supply to the water heater.



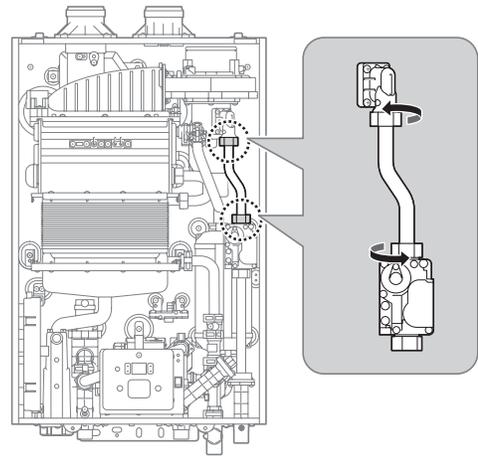
- 2** Remove the water heater front cover by loosening the 2 Phillips screws securing it to the case.



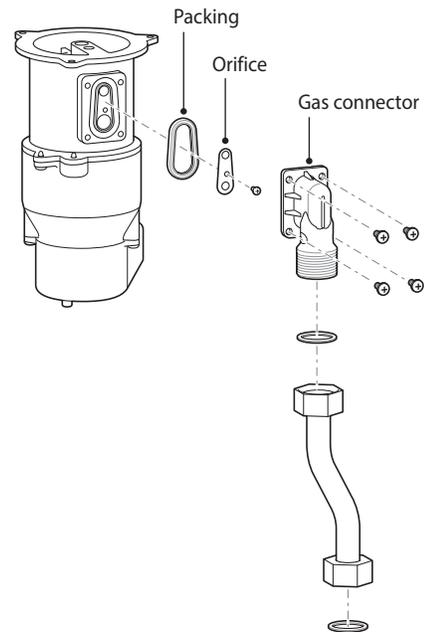
- 3** Once the front cover is removed, place it in a safe location to prevent accidental damage. With the internal components exposed, locate the gas connector and the gas valve.



- 4** Loosen the nut connecting the gas connector and the gas valve. Carefully separate the gas inlet pipe.



- 5** Once the gas inlet pipe is detached, carefully remove the four screws on the gas connector by hand using a Phillips screwdriver and pull the gas connector away from the TDR damper.
- 6** Once the gas orifice is exposed, remove the screw that hold the gas orifice in place and remove the gas orifice from its housing.

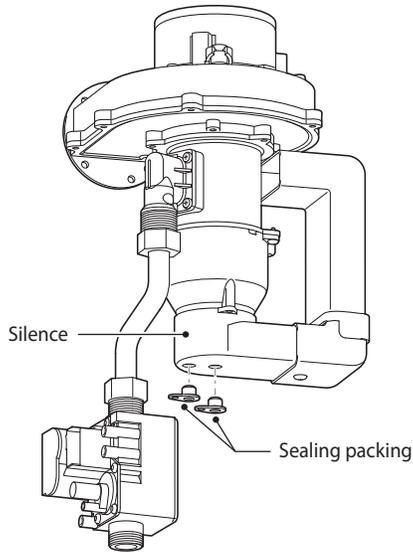


- 7** Replace the old orifice piece and the packing with new part for use with LP gas. Ensure that the orifice is properly seated inside the port.



Inspect the packing whenever they are disassembled. The packing must be in good condition and must be installed. Failure to comply will cause a gas leak, resulting in severe injury or death.

- 8 Remove two sealing packings from the silence.



- 9 Replace the gas connector and the gas inlet pipe to its original position and secure all connections. Check the gas leakage before operating the water heater.

- 10 Turn on the gas and water supply to the water heater.

- 11 Set the DIP switch to minimum heat capacity operation.



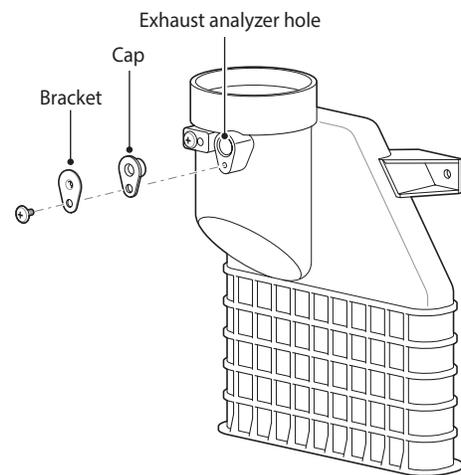
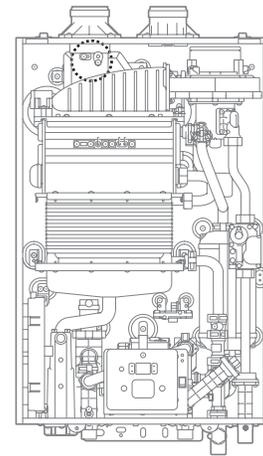
Be sure to turn off the power before changing the DIP switch setting



Notice

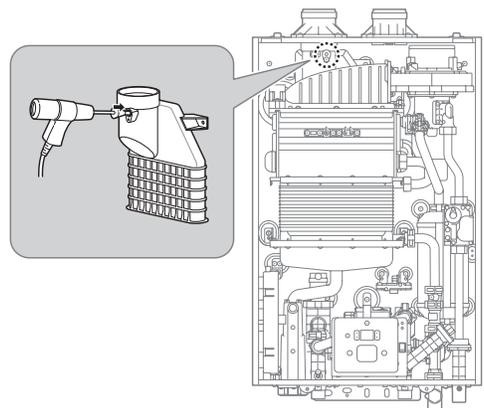
For more information about setting the DIP switches, refer to "Setting the DIP Switches" on page 47.

- 12 Loosen the screw, remove the bracket and the cap to access the exhaust analyzer hole.



- 13 Insert analyzer into the exhaust analyzer hole and measure the gas/air ratio (using combustion analyzer is recommended).

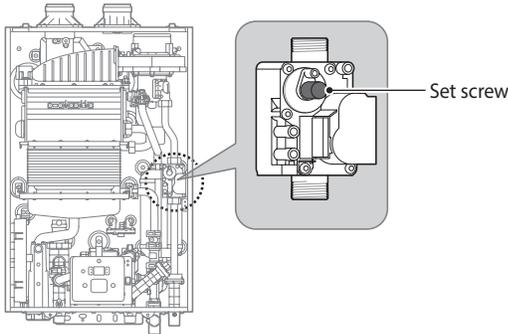
Type	High fire	Low fire
	CO ₂ (%)	CO ₂ (%)
NG	9.5 ± 0.5	9.9 ± 0.5
LPG	9.5 ± 0.5	11.5 ± 0.5



- 14** Fully open several hot water fixtures and if the CO₂ value at low fire is not within 0.5% of the value listed in the table above, the gas valve set screw will need to be adjusted. If adjustment is necessary, locate the set screw. Using a 5/32" or 4mm Allen wrench, turn the set screw no more than 1/4 turn clockwise to raise or counterclockwise to lower the CO₂ value.



Improper gas valve settings can cause severe injury, death or property damage.



- 15** Set the DIP switch to maximum heat capacity operation.



Be sure to turn off the power before changing the DIP switch setting.

 **Notice**

For more information about setting the DIP switches, refer to "Setting the DIP Switches" on page 47.

- 16** Fully open several hot water fixtures and if the CO₂ value at high fire is not within 0.5% of the value listed in the table above, do not adjust the gas valve set screw and check if the gas orifice is properly installed.



Improper gas valve settings can cause severe injury, death or property damage.

 **Notice**

While measuring the gas/air ratio in maximum heat capacity operation, do not adjust the gas valve set screw.

- 17** When the gas conversion is completed, attach the conversion sticker to the top of the rating plate.

This appliance was converted on _____ / _____ / to _____ gas
with Kit No. _____
by _____
(name and address of organization making this conversion, who accepts the responsibility for the correctness of this conversion).

This appliance has been converted to Propane fuel /
Cet appareil a été converti au propane
Orifice Size / injecteur
Min. 3.9mm to Max. 3.1mm
Inlet Gas Pressure / Pression d'entree du gaz
Min. 8.0 to Max. 13.0" WC
Manifold Pressure /
Pression à la tubulure d'alimentation
Min. 0.01 to Max. -0.30(150), -0.56(199)" WC
Input (Btu/hr) / Débit calorifique
Min. 19,900 to Max. 150,000(150), 199,000(199)
Conversion Kit No. 42110399

Conversion Rating Plate

 **Notice**

Please refer to page 7 on this manual for manifold pressure of each model.

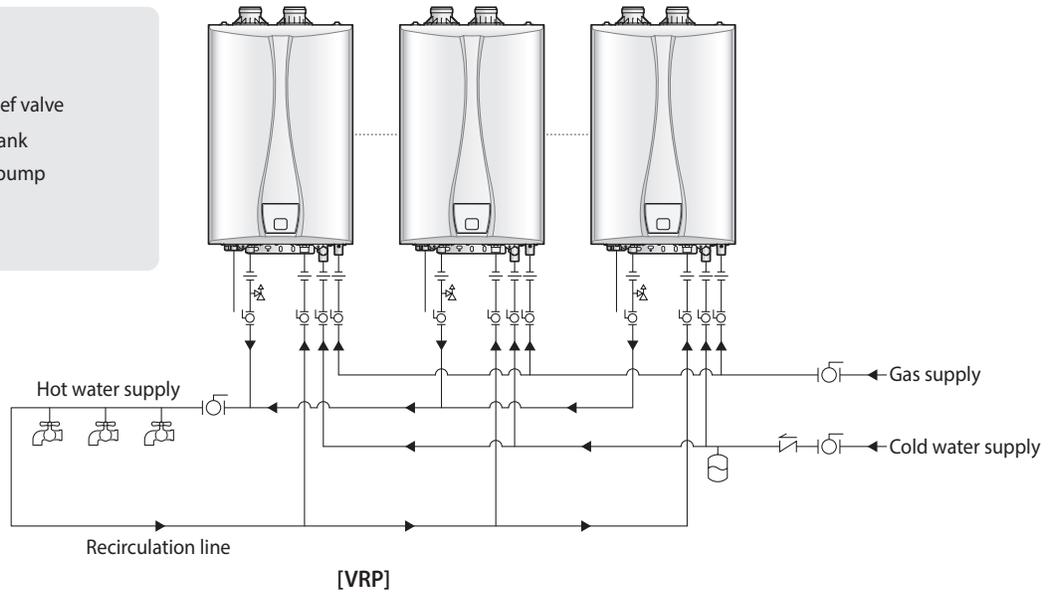
Cascade System

When installing a cascade system, carefully consider the design of the system and the features of the installation location. Follow all local codes and regulations, as well as all guidelines for installing the water heater. The following sections describe additional considerations that are specific to installing a cascade system. Read the following sections carefully before designing or installing the system.

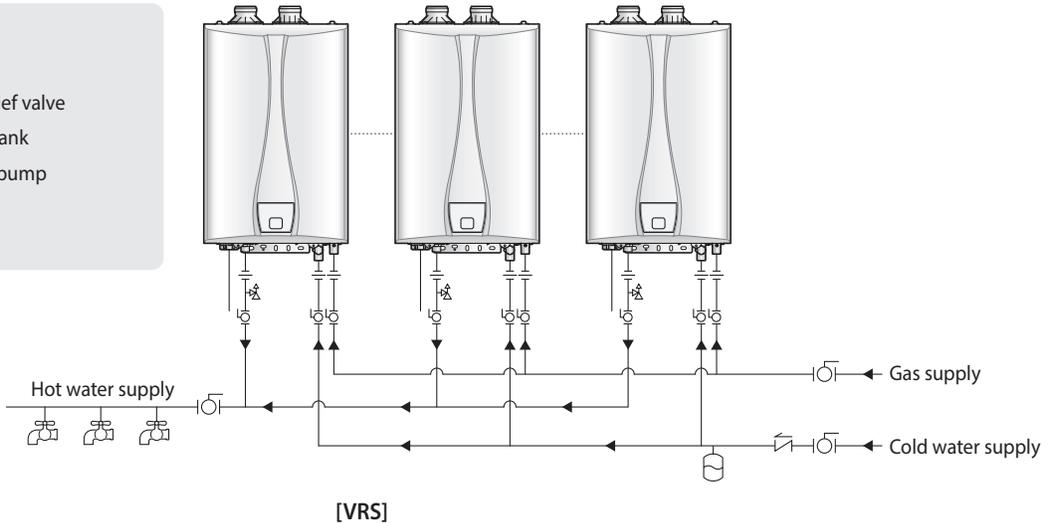
Water supply

Several options are available for plumbing a cascading system of water heaters. The options shown here are examples only. The setup you choose will vary depending on the installation location, local building codes, and other factors. Follow all applicable regulations when installing a cascade system.

-  Ball valve
-  Union
-  Pressure relief valve
-  Expansion tank
-  Circulation pump
-  Check valve
-  Faucet



-  Ball valve
-  Union
-  Pressure relief valve
-  Expansion tank
-  Circulation pump
-  Check valve
-  Faucet



Notice

- The recommended minimum recirculation flow rate for each water heater is 2 GPM.

Piping sizes

When plumbing a cascade system, consider the following pipe diameters and flow rates (note that flow rates above 6.6 ft/s may cause pipe erosion). These specifications may vary depending on installation conditions.

Qty	$\Delta T=54^{\circ}\text{F}$ Flow Rate (GPM)	Water Velocity (ft/s)	Pipe Diameter (mm/in)	
1	7.07	4.71	20A	3/4"
2	14.13	5.52	25A	1"
3	21.20	5.44	32A	1 1/4"
4	28.26	5.12	40A	1 1/2"
5	35.33	6.40	40A	1 1/2"
6	42.39	4.42	50A	2"
7	49.46	5.15	50A	2"
8	56.52	5.89	50A	2"
9	63.59	4.30	65A	2 1/2"
10	70.65	4.77	65A	2 1/2"
11	77.72	5.25	65A	2 1/2"
12	84.78	5.73	65A	2 1/2"
13	91.85	6.20	65A	2 1/2"
14	98.91	6.68	65A	2 1/2"
15	105.98	5.02	80A	3"
16	113.04	5.35	80A	3"
17	120.11	5.69	80A	3"
18	127.18	6.02	80A	3"
19	134.24	6.36	80A	3"
20	141.31	6.69	80A	3"
21	148.37	3.99	100A	4"
22	155.44	4.18	100A	4"
23	162.50	4.37	100A	4"
24	169.57	4.56	100A	4"

Notice

- The table above is based on model VRP-199.
- When installing more than twenty four water heaters for a cascade system, please call 1-800-761-0053.

Communication cables



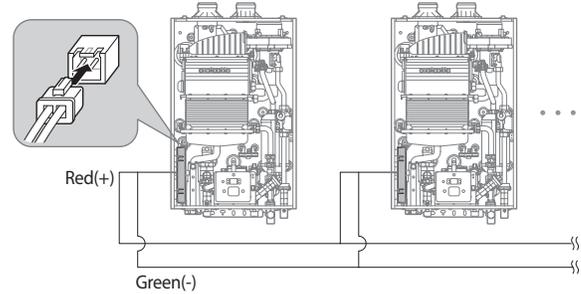
Caution

To avoid electric shock, turn off the water heater while connecting the wires.

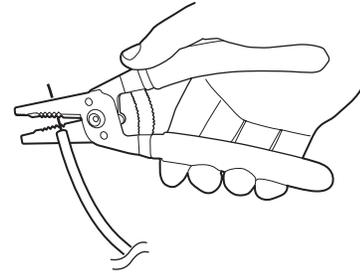
Up to 8 water heaters can be connected with cascade communication cables.

To connect the cascade communication cables:

- 1 Connect the cascade communication cable connector to the connector socket on the PCB assembly.



- 2 Remove the plastic insulation from opposite ends of the cascade communication cable.



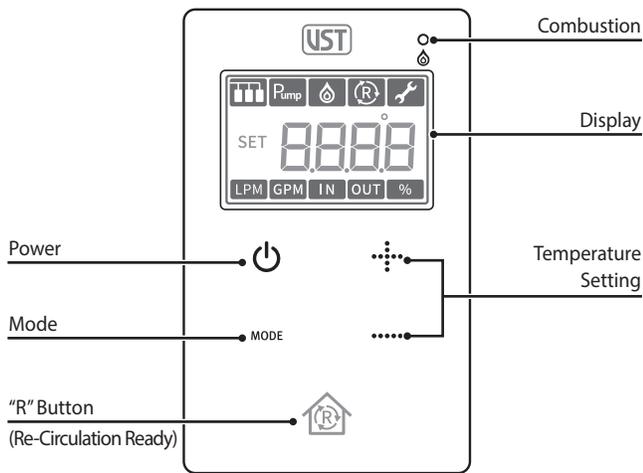
- 3 Connect the cascade communication cables by matching the colors (red, green).



Notice

Set the DIP switches after connecting the cascade communication cables. For more information about setting the DIP switches, refer to "Setting the DIP Switches" on page 47.

Remote Controller - VD-100 (optional)



Icon	Purpose	Icon	Purpose
	Cascade	LPM	Liter per Minute
	Pump operation	GPM	Gallon per Minute
	Combustion	IN	Cold water Temperature
	Re-Circulation	OUT	Hot water Temperature
	Maintenance	%	Load Capacity

Operation Instruction

Turning the Water Heater On or Off

- To turn the water heater on or off, press the button.
- When the water heater is on, the most recent temperature setting is displayed.

Setting the Water Temperature

- To set the water temperature, press the (Up) or (Down) button for the desired temperature setting.
- 98 °F(37 °C)–120 °F (50 °C), Temperature can be set in increments of 2 °F.
- 120 °F(50 °C)–140 °F (60 °C), Temperature can be set in increments of 5 °F.
- 140 °F(60 °C)–180 °F (80 °C), Temperature can be set in increments of 10 °F.
(For additional temperature setting refer to the operation/installation manual.)
- Temperature range (Residential)

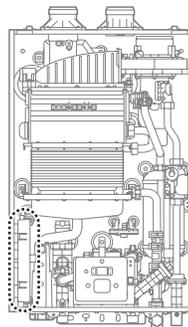
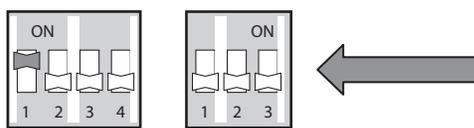
°F	98	100	102	104	106	108	110	112	114	116	118	120	125	130	135	140
°C	37	38	39	40	41	42	43	44	45	46	48	50	52	55	57	60

- Temperature range (Commercial)

°F	98	100	102	104	106	108	110	112	114	116	118	120	125	130	135	140	150	160	170	180
°C	37	38	39	40	41	42	43	44	45	46	48	50	52	55	57	60	65	70	75	80

"R" Button

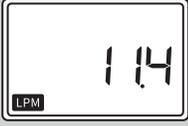
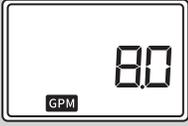
- Applicable for VRP models Only
- ※ Re-Circulation Piping must be installed.
- ※ Proper Dip Switch Setting is required.



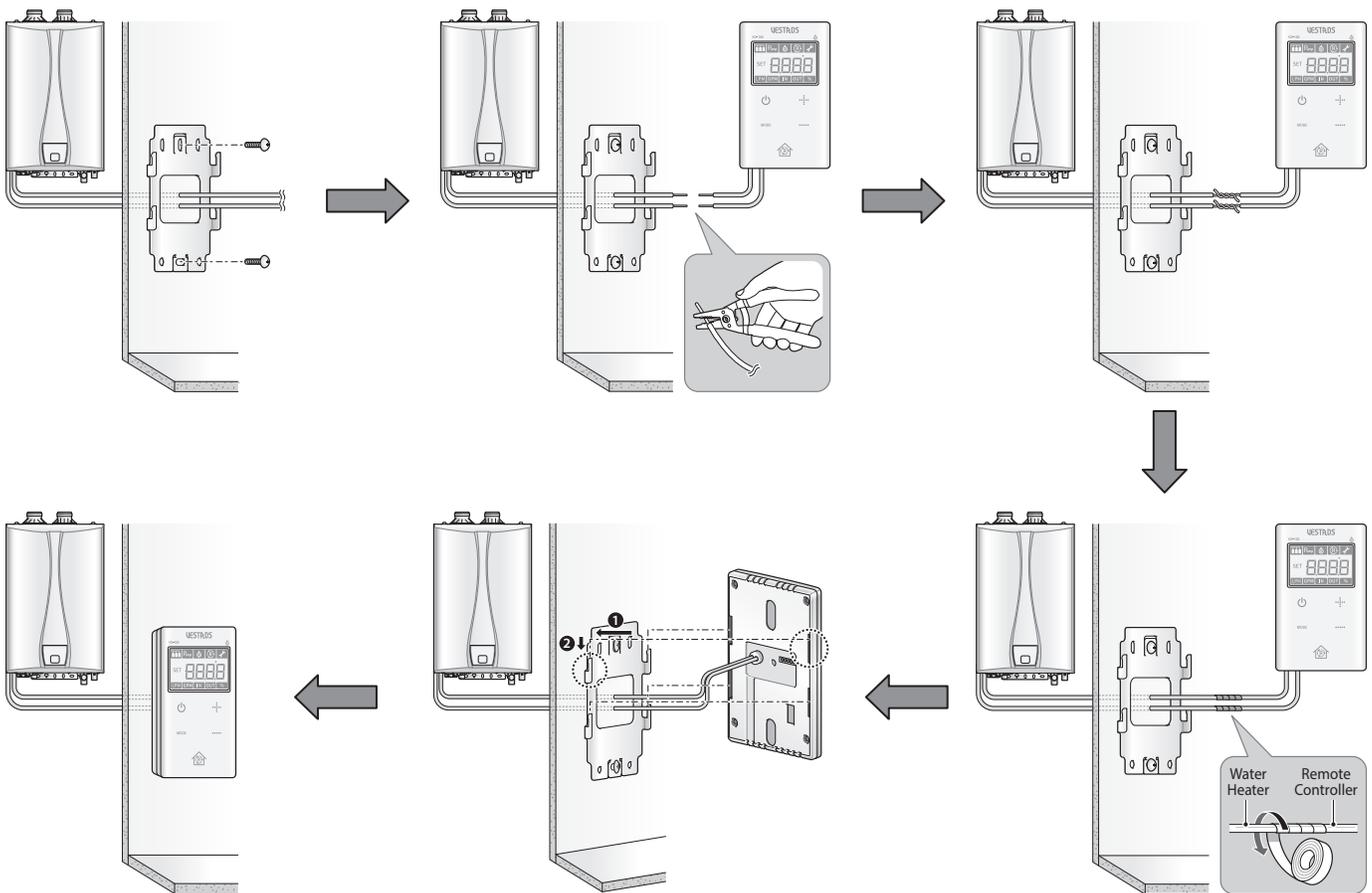
- To initiate re-circulation mode, Press Button.
- During operation of re-circulation, Pump can be manually stopped by pressing Button.

• **Mode**

- To view information press the **MODE** button.
- To scroll through additional information, press **MODE** button.

LPM (Liter Per Minute)		OUT (Out temperature)	
	Indicates flow rate (LPM)		Indicates Hot water temperature.
GPM (Gallon Per Minute)		% (Combustion load)	
	Indicates flow rate (GPM)		Indicate combustion load percent.
IN (In temperature)			
	Indicates cold water temperature.		

• **Installation**



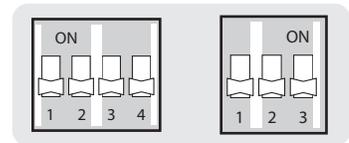
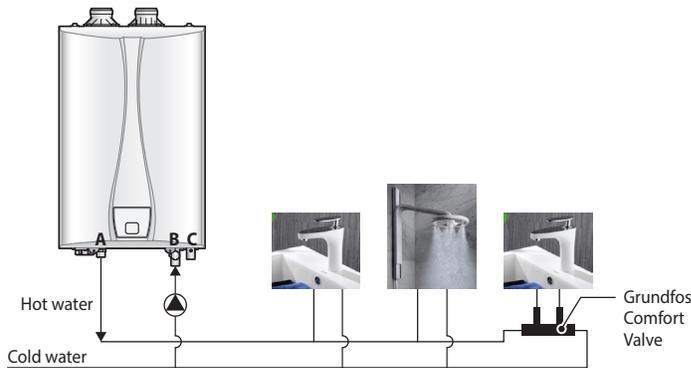
• **This manual can be changed or modified without notice for improvement or changes in the products**

■ Grundfos Comfort System

Valve should be installed at a faucet with the longest piping distance from the hot water heater.

● VRS (No Pump inside of unit)

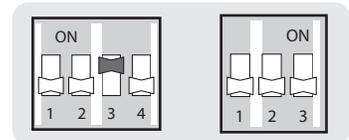
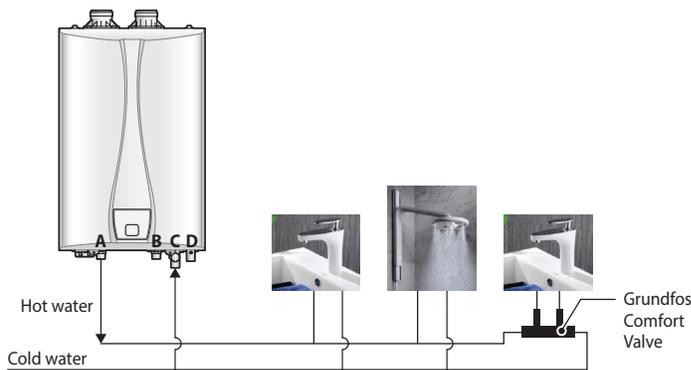
● Grundfos Comfort Valve (With external pump installation)



Dip Switch Setting:
No Dip S/W setting required
(Normal Mode)

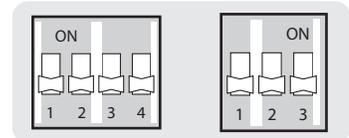
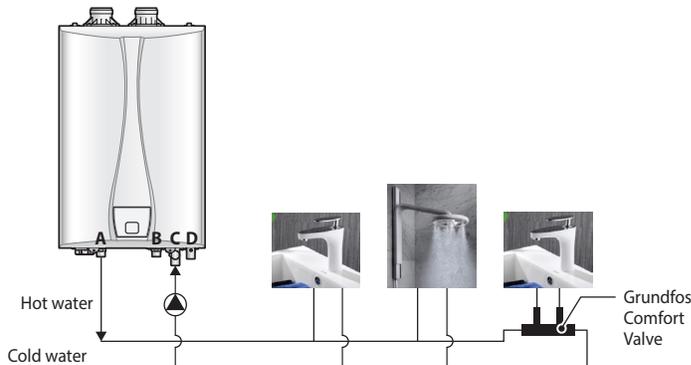
● VRP (Pump included unit)

● Grundfos Comfort Valve (Without external pump installation)



Dip Switch Setting:
Flip the Dip S/W #3 in the 4-switch
panel (External Re-circulation Mode)

● Grundfos Comfort Valve (With external pump installation)

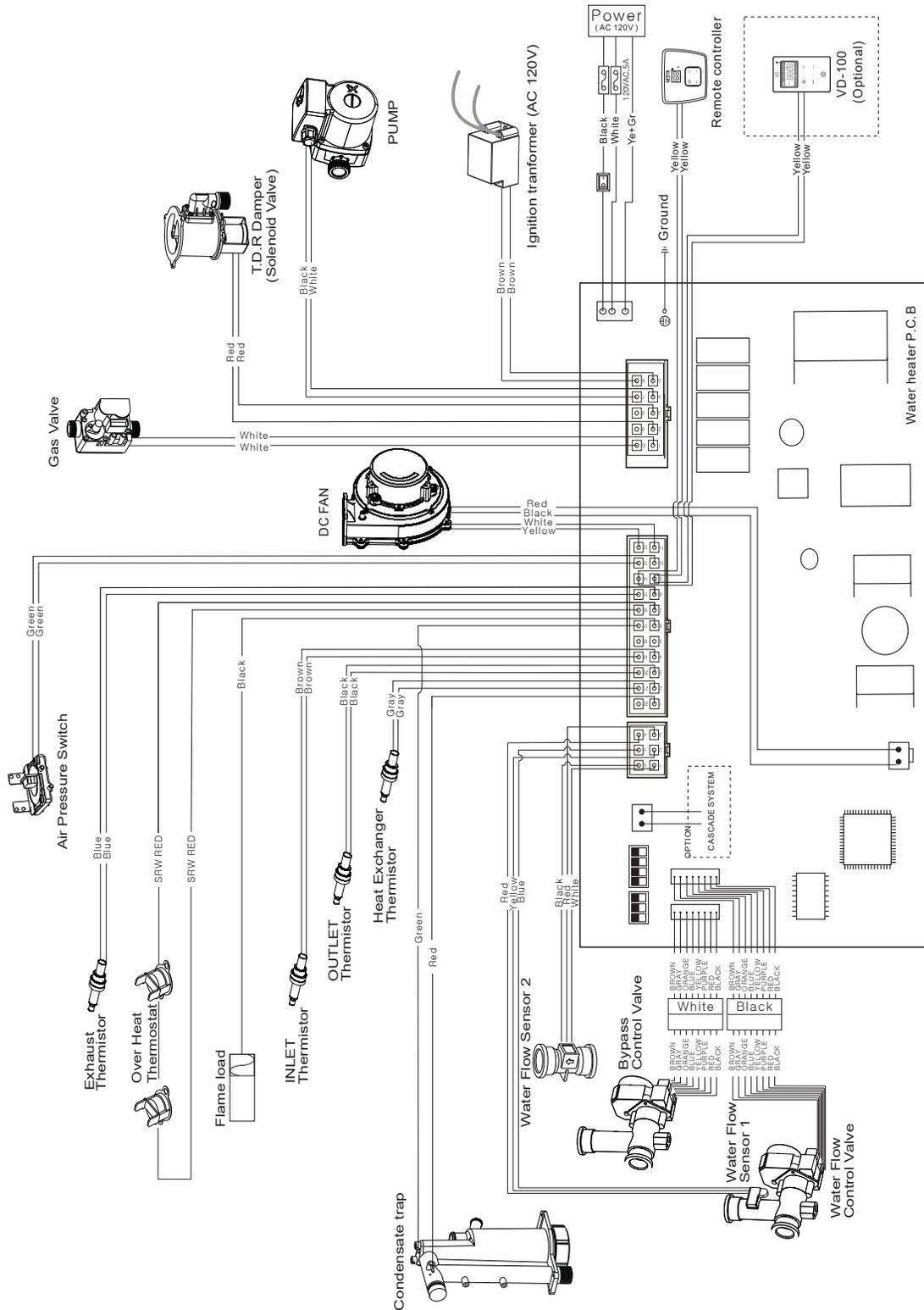


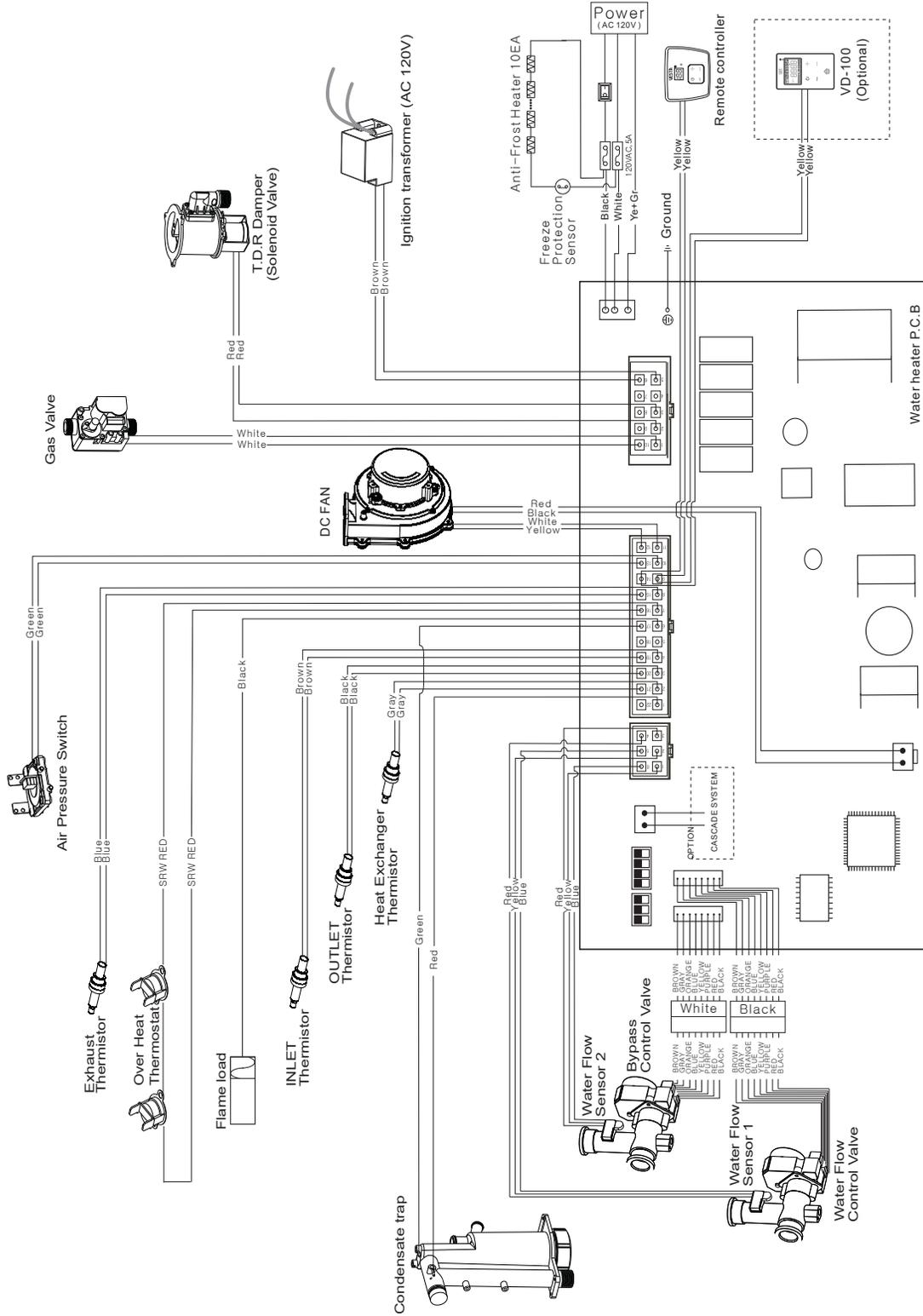
Dip Switch Setting:
No Dip S/W setting required
(Normal Mode)



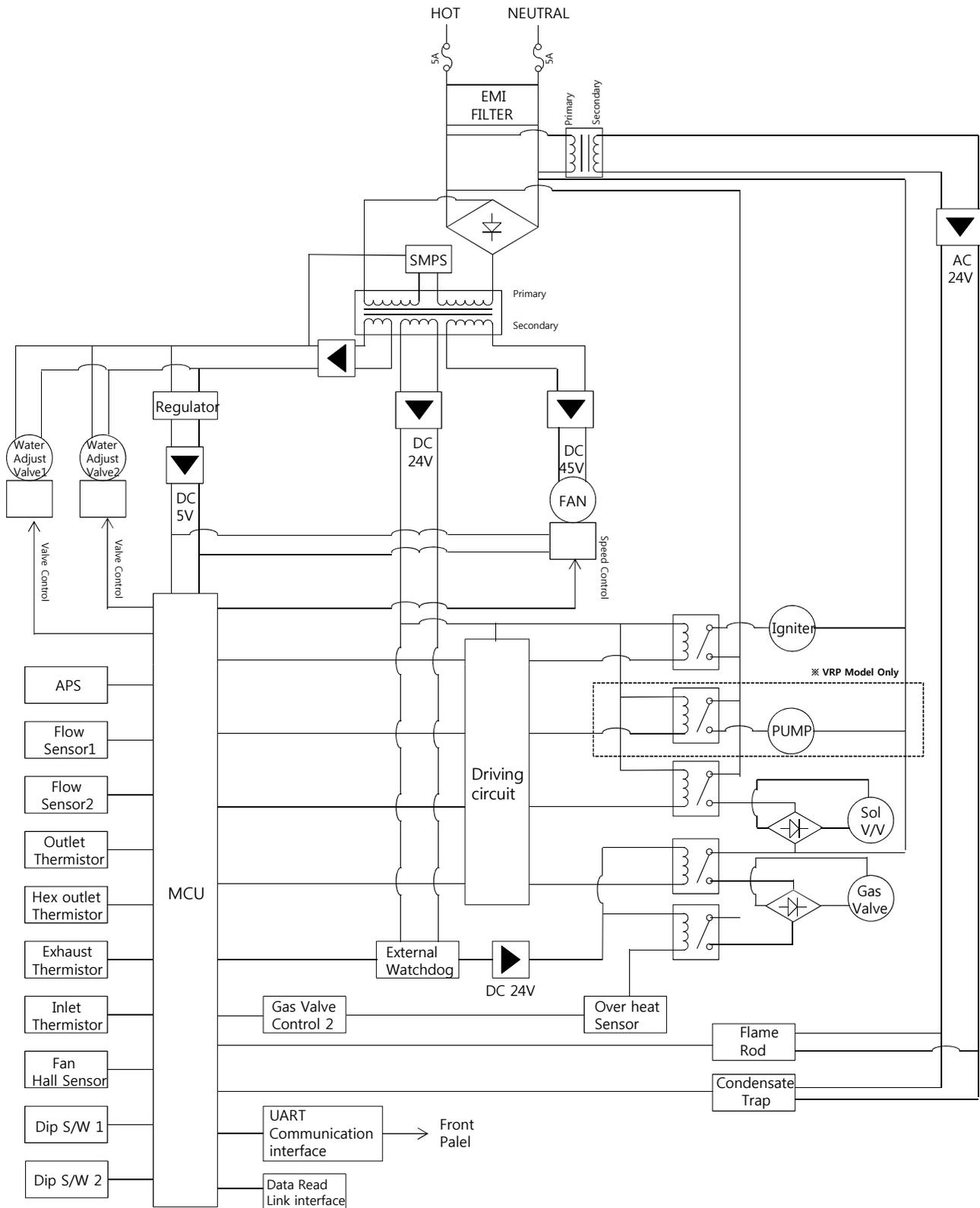
You may find some warm water in the cold water line at the sink where the valve is installed. Once the cold water line is opened, the water will dissipate in a very short time.

Wiring Diagram



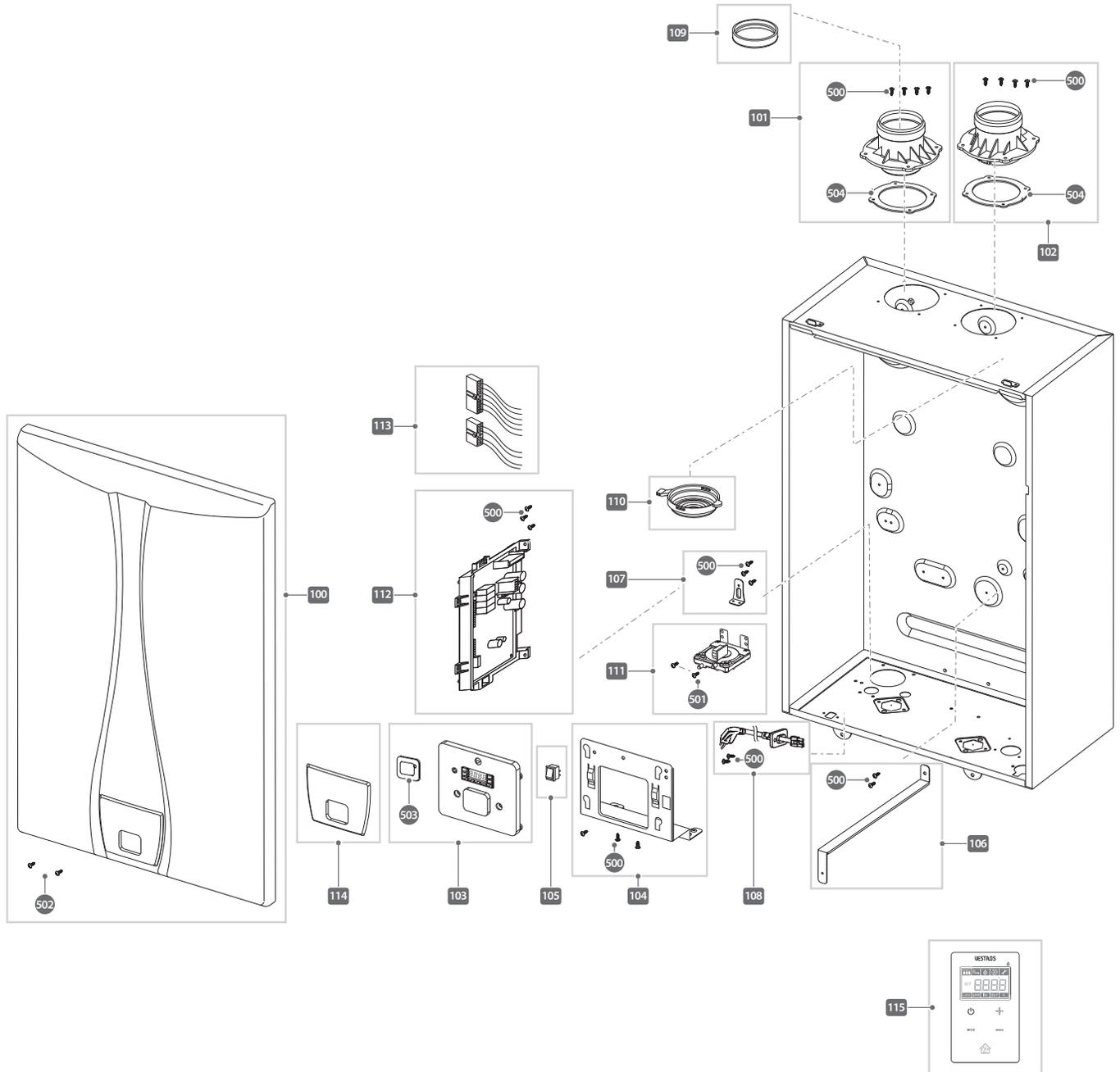


Ladder Diagram



Component Assembly Diagrams and Parts Lists

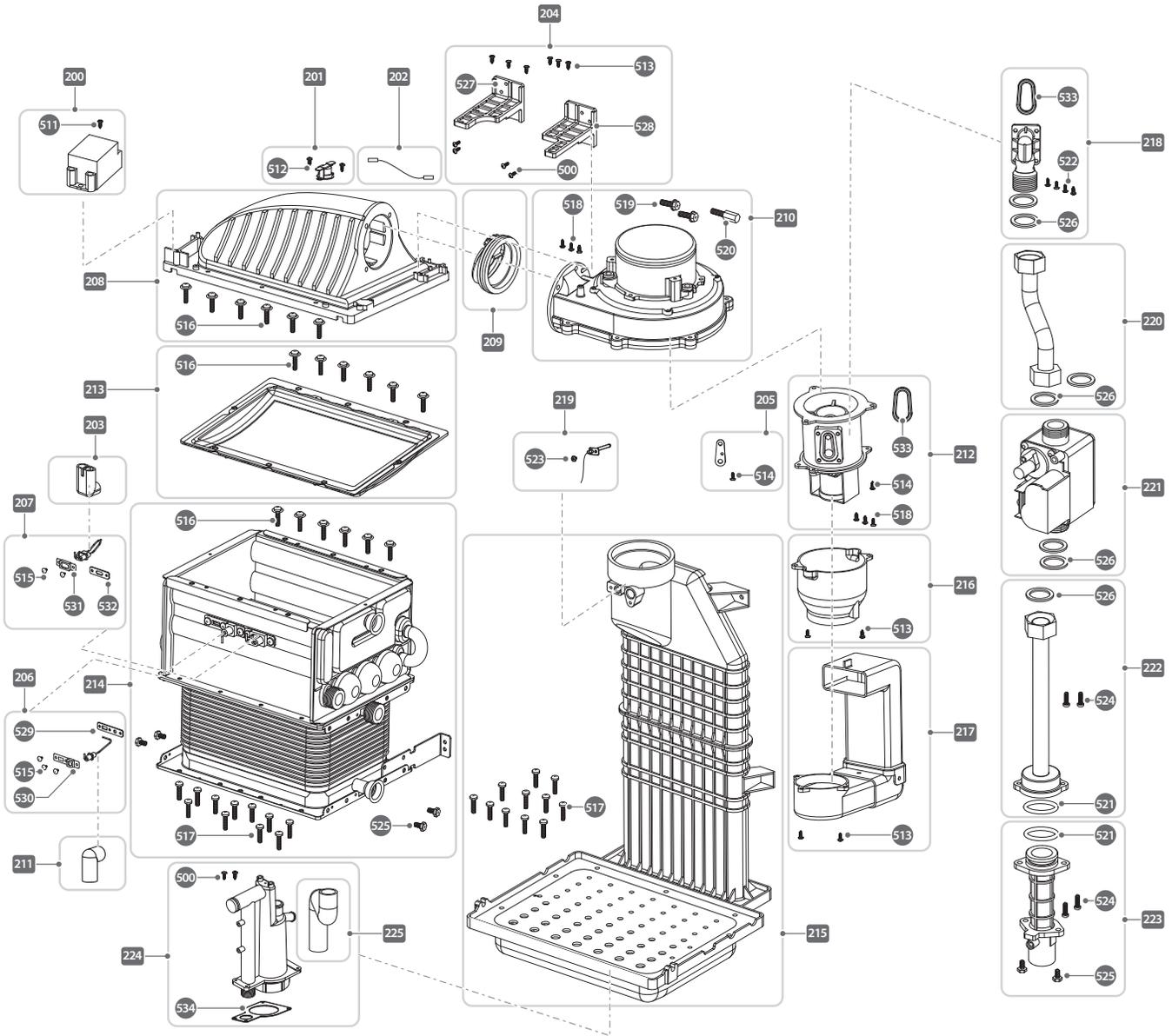
■ Case Parts (VRP & VRS)



NO	Part NO	Part Name
100	2010613S	Front cover, VRP-199
	2010614S	Front cover, VRP-150
	2010615S	Front cover, VRS-199
	2010616S	Front cover, VRS-150
101	2110304S	Exhaust adapter (VR)
102	2110303S	Intake adapter (VR)
103	2081091S	R/C (WH)
104	3011565S	Bracket, R/C (VR)
105	2080736	Switch, Main power supply
106	3011632S	Bracket_L, R/C (VR)
107	3011608S	PCB Fixing bracket (S)
108	3130755S	Cord, Power (VRS,VRP)
109	3080235	O-ring, Flue sealing
110	3040604	Filter, Air intake
111	2100363S	Switch, Air pressure (S/P-199, C-120/140)
	2100365S	Switch, Air pressure (S/P-150, B-110)
112	2081070S	PCB, VRP-199
	2081141S	PCB, VRP-150
	2081071S	PCB, VRS-199
	2081142S	PCB, VRS-150
113	3130756	Wire Harness, VRP-150/199
	3130757	Wire Harness, VRS-150/199
114	3040640	RC Cover(VRS-150)
	3040774	RC Cover(VRS-199)
	3040775	RC Cover(VRP-150)
	3040776	RC Cover(VRP-199)
115	2081182	Remote Control

NO	Part NO	Part Name (Individual order not available)
500	3100214	Ø4X10 Tapping screw (STS)
501	3100215	Ø4X7 Tapping screw (STS)
502	3100044	M4X12 Screw
503	3090385	R/C Cover gasket
504	3090369	Flue Gasket

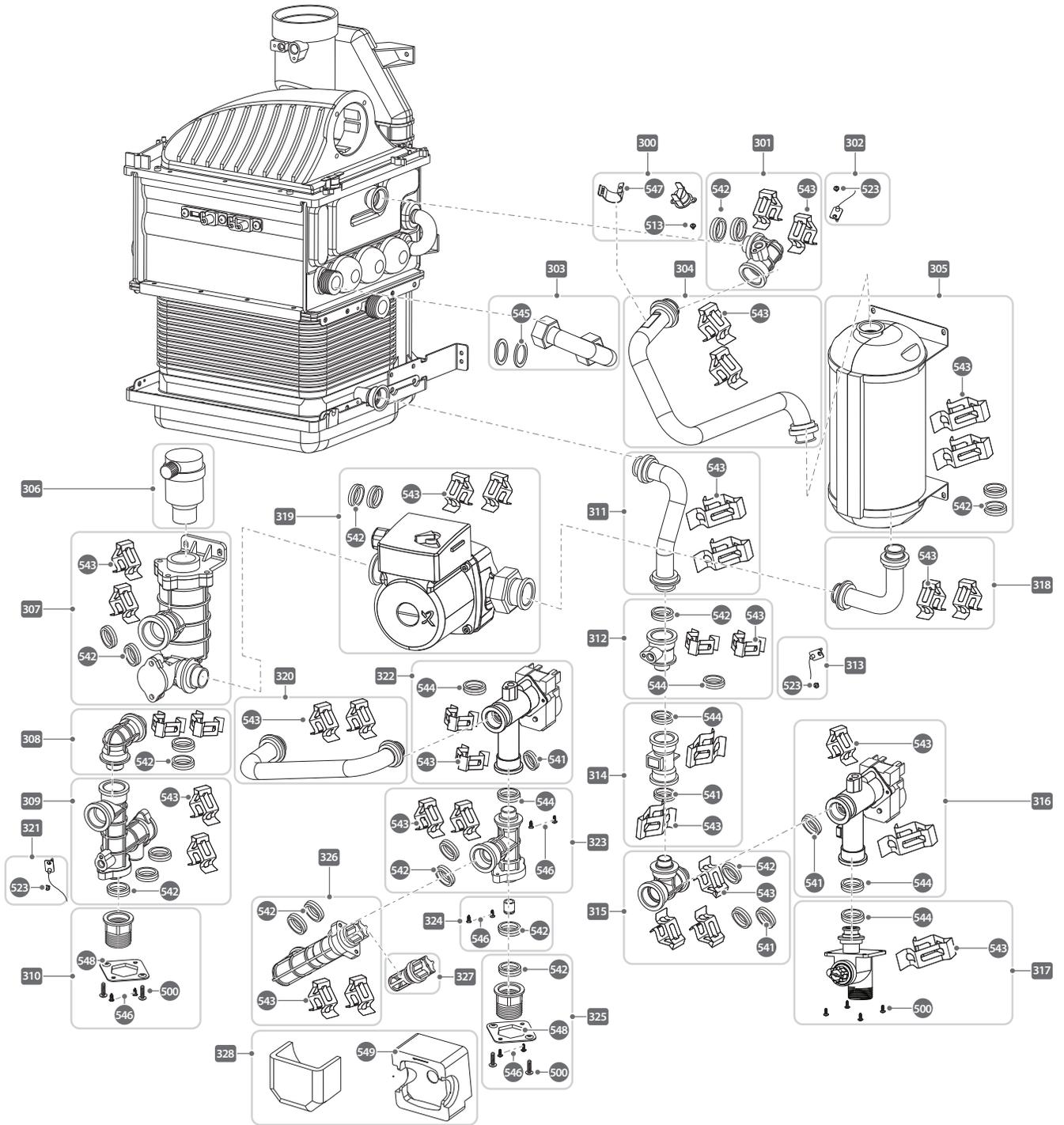
Flue Parts (VRP & VRS)



NO	Part NO	Part Name
200	2081069S	Ignition Transformer (VR)
201	2081098S	High limit switch (VR Hood)
202	3130782	Wire, High limit switch (VRS, VRP)
203	3080313	Cover, Spark plug (VR)
204	3050114S	Bracket, HX mounting
205	3011624S	Orifice, (VR/NG)
	3011587S	Orifice, (VR/LP)
206	2020415S	Flame rod (VR)
207	2020416S	Spark plug (VR)
208	2130507S	Burner hood (VR)
209	3080264S	Damper (VR)
210	2100336S	Fan (VR)
211	3080314	Cover, Flame rod (VR)
212	2030290S	Valve, TDR solenoid
213	2020414S	Burner, Metal fiber (VR)
214	2070719S	Heat Exchanger (VRS, VRP)
215	2130508S	Exhaust duct (VR)
216	3040650S	Air Mixer (VR)
217	2120083S	Silencer (VR)
218	3050112S	Manifold, Gas supply (VR)
219	3130751S	Thermistor, Exhaust gas (VR)
220	2091076S	Pipe, Gas outlet (VR)
221	2030291KS	Valve, Gas (VR)
222	2091075S	Pipe, Gas inlet (VR)
223	3050092S	Pipe, Gas (VR)
224	2060374S	Trap, Condensate (VRP, VRC, VRB)
	2060396S	Trap, Condensate (VRS)
225	3080270	Hose, Condensate (VRS, VRP)

NO	Part NO	Part Name (Individual order not available)
511	3100212	Ø4X12 Tapping screw
512	3100053	Ø3.5X6 Tapping screw
513	3100051	Ø4X10 Tapping screw
514	3100198	M3*0.5p Screw
515	3100181	Ø4X12 Tapping screw (STS)
516	3100192	M4*0.7p(L=20)Screw+Washer
517	3100209	Ø4X18 Tapping screw (STS)
518	3100184	M4*8 Screw
519	3100171	M5*0.8p Screw
520	3100172	M5*0.8p*16 Screw
521	3080115	O-ring (Gas Nipple)
522	3100191	M4*0.7p Screw(L=10)
523	3100033	Ø4X8 Tapping screw
524	3100125	M4*14 Screw
525	3100150	M5*0.8p Screw
526	3080176	O-ring (Gas 3/4")
527	3050114	HX Fixing Bracket (L)
528	3050115	HX Fixing Bracket (R)
529	3090367	Flame rod gasket
530	3011764	Flame rod bracket
531	3011763	Spark plug bracket
532	3090368	Spark plug gasket
533	3080263	Orifice gasket
534	3090384	Condensate trap gasket

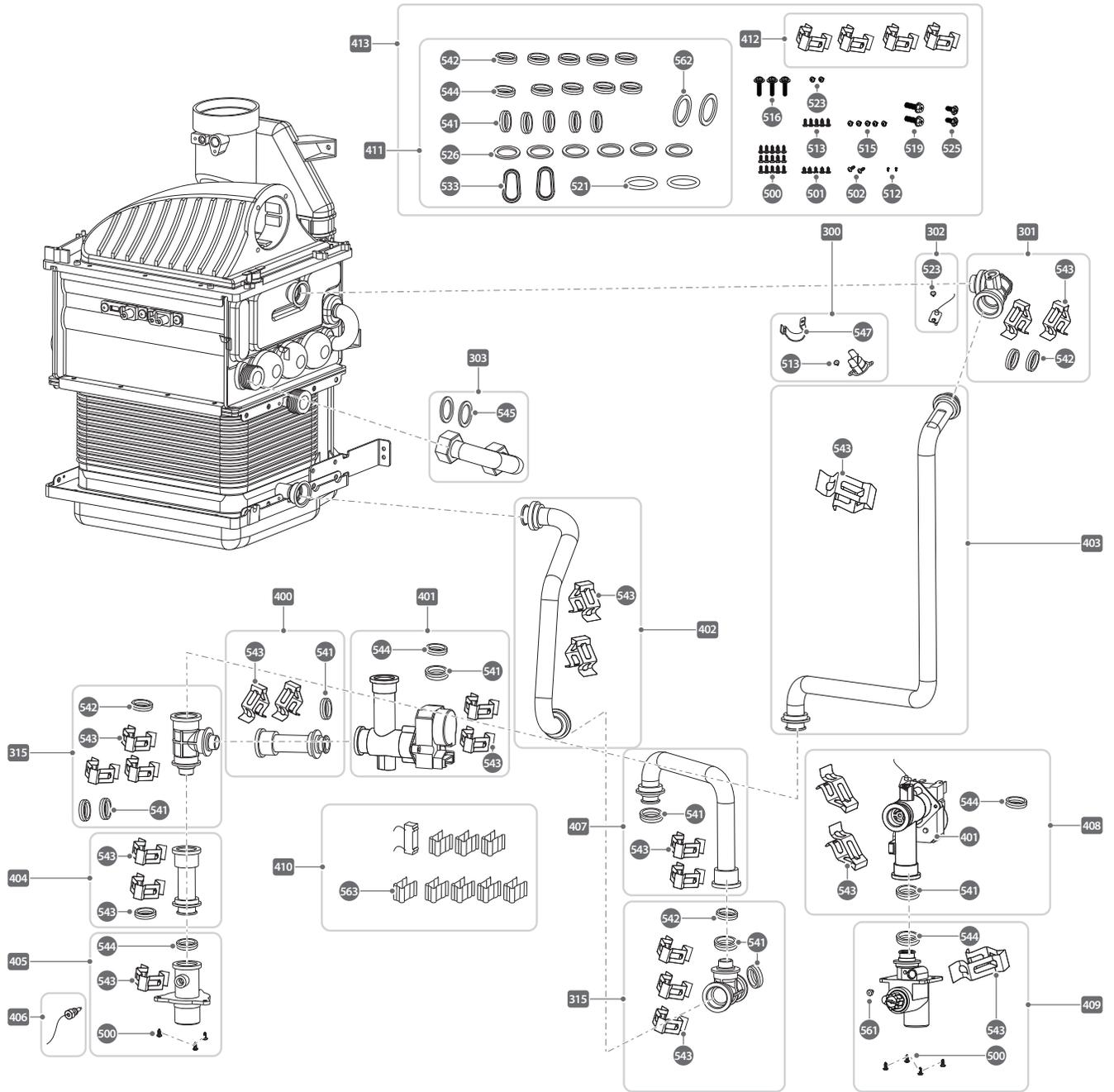
Water Parts (VRP Model)



NO	Part NO	Part Name
300	2080390S	High limit switch (VR)
301	3040656S	Elbow, Supply (VRS, VRP)
302	3130758S	Thermistor, HX (VRS, VRP)
303	2091077S	Pipe, HX connect (VRP)
	2091124S	Pipe, HX connect (VRS)
304	2091078S	Pipe, Supply(HX&Tank)
305	2060358S	Buffer tank
306	2060360S	Air vent (VRP, VRB)
307	2060359S	Body, Air vent(VRP,VRB)
308	3040662S	Elbow, Air vent
309	2060361S	Connector, Outlet
310	3030214S	Nipple, Hot water (VRP)
311	2091081S	Pipe, Cold water (VRP)
312	3040670S	Connector, Flow sensor
313	3130380S	Thermistor, Cold water Inlet (WH)
314	2060364S	Sensor, Flow (VRP)
315	3040669S	T_Socket
316	2040156S	Valve, Flow control (VRP)
317	2060363S	Nipple, Cold water (VRP, VH)
318	2091079S	Pipe, Supply (Tank&Pump)
319	2050153S	Pump, Recirculation
320	2091080S	Pipe, Internal recirc
321	3130759S	Thermistor, Outlet (VRP)
322	2040159S	Valve, Mixing (VRP)
323	3040666S	Connector, Recirc elbow
324	2060344S	Valve, Check (Recirc)
325	3030248S	Nipple, Recirc return
326	2060362S	Connector, Internal recirc
327	3040671	Filter, Recirculation, Cold water
328	3140460S	Styrofoam, Pump holder

NO	Part NO	Part Name (Individual order not available)
541	3080157	P15 Back Up ring
542	3080140	P18 Back Up ring
543	3011010	Clip, Joint (16A)
544	3080142	P16 Back Up ring
545	3080031	Packing (3/4")
546	3100137	Ø4X10 Tapping screw
547	3011614	Overheat Prevent Sensor B/K
548	3011185	Nipple Bracket
549	3140461	Styrofoam, Pump fixing (Body)

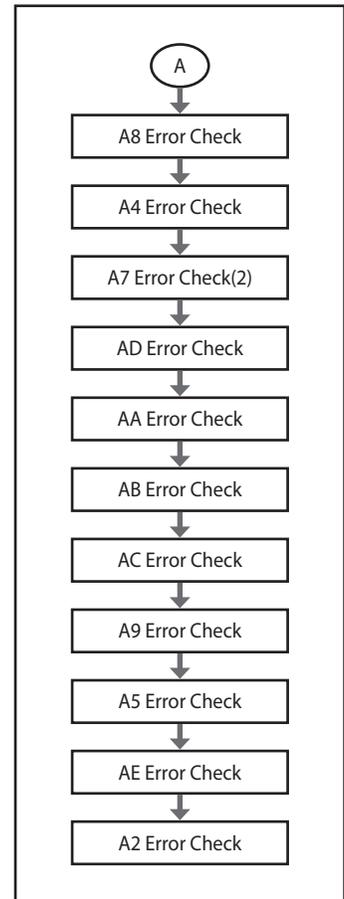
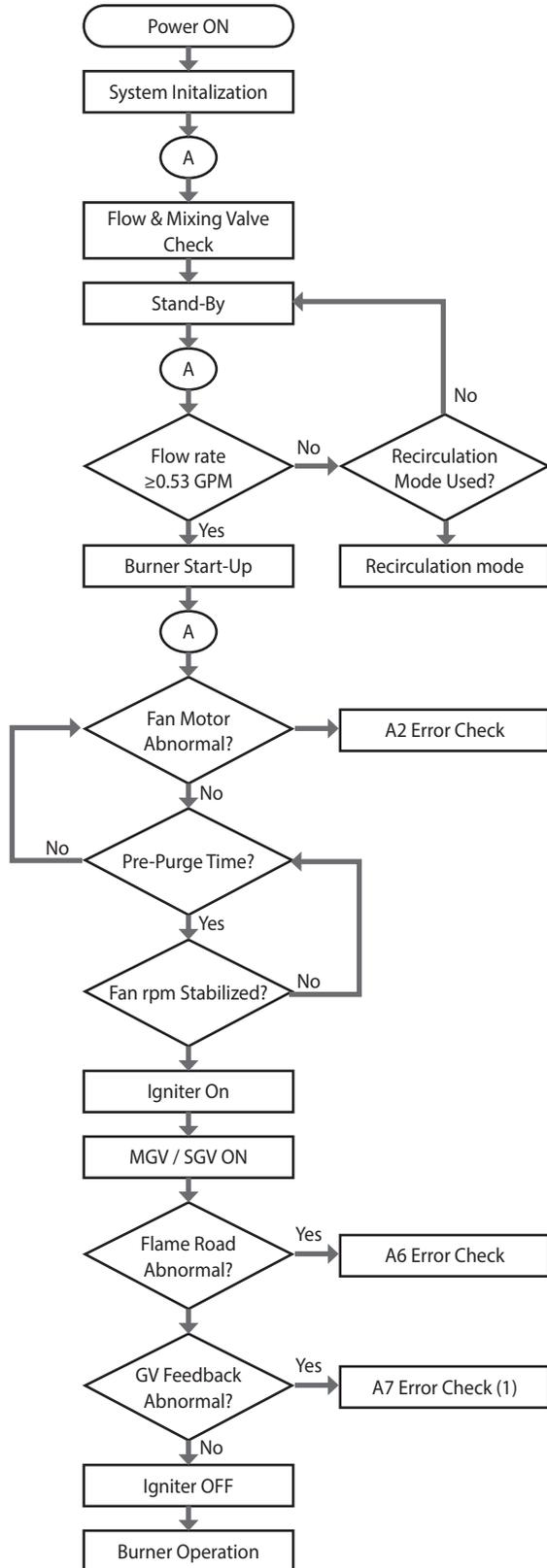
Water Parts (VRS Model)



NO	Part NO	Part Name
400	2091085S	Pipe, Mixing pipe 2
401	2040160S	Valve, Mixing (VRS)
402	2091083S	Pipe, Cold water (VRS)
403	2091082S	Pipe, Supply water (VRS)
404	2091084S	Pipe, Hot water (VRS)
405	3030208S	Nipple, Hot water (VRS)
406	3130379A	Thermistor, Outlet (VRS)
407	2091086S	Pipe, Mixing pipe 1
408	2040157S	Valve, Flow control (VRS)
409	2060377S	Nipple, Cold water (VRS)
410	2081073S	Heater, Freezing protection
411	2110319S	Kit, O-ring (VRS, VRP)
412	3011010S	Clip, Joint (16A) x 4EA
413	2110337S	Kit, Screw/Packing/Clip (VRP, VRS)

NO	Part NO	Part Name (Individual order not available)
561	3100119	M4*0.7p Screw
562	3080286	Packing (1")
563	3011119	Ceramic Heater Clip

Normal Operating Sequence



OPERATING INSTRUCTIONS

/ Instructions d'allumage

1. STOP! Read the safety information above on the label. / ARRÊTEZ! Lisez les informations de sécurité ci-dessus sur l'étiquette.
2. Set the thermostat to lowest setting. / Réglez le thermostat au plus bas.
3. Turn off all electric power to the appliance. / Coupez l'alimentation électrique de l'appareil.
4. Do not attempt to light the burner by hand. / Ne pas essayer d'allumer le brûleur manuellement.
5. Turn the gas control manual valve(installed on the gas supply line external to the unit) clockwise to the position.
/ Tournez la vanne de contrôle du gaz manuelle (installée sur la conduite d'alimentation en gaz externe de l'unité) dans le sens des aiguilles d'une montre jusqu'à la position.
6. Wait five (5) minutes to clear out any gas. If you then smell gas, STOP! Follow "B" in the safety information above on warning label. If you don't smell gas, go to the next step.
/ Attendez cinq (5) minutes pour laisser échapper tout gaz. Si vous sentez une odeur de gaz, ARRÊTEZ! Suivez «B» dans les consignes de sécurité ci-dessus sur cette étiquette. Si vous ne sentez pas de gaz, passez à l'étape suivante.
7. Turn the gas control manual valve(installed on the gas supply line external to the unit) counterclockwise to the full ON position.
/ Tournez la soupape de contrôle du gaz manuelle (installée sur la conduite d'alimentation en gaz à l'extérieur de l'unité) dans le sens contraire des aiguilles d'une montre jusqu'à la position ON complète.
8. Turn on all electric power to the appliance. / Mettez l'alimentation électrique de l'appareil.
9. Wait unit default temperature (98 °F) is displayed. Set desired water temperature. Turn on hot water faucet.
/ La température par défaut de l'unité de secours (98 °F) est affichée. Réglez la température de l'eau désirée. Allumez le robinet d'eau chaude.
10. Set the thermostat to desired setting. / Réglez le thermostat à la position désirée.
11. If the appliance will not operate, follow the instructions "To Turn Off Gas To Appliance" and call your service technician or gas supplier.
/ Si l'appareil ne fonctionne pas, suivez les instructions «Pour couper le gaz de l'appareil» et appelez votre technicien d'entretien ou fournisseur de gaz.

TO TURN OFF GAS TO APPLIANCE

/ Comment couper l'admission de gaz de l'appareil

1. Set the thermostat to lowest setting. / Réglez le thermostat au plus bas.
2. Turn off all electric power to the appliance if service is to be performed.
/ Coupez l'alimentation électrique de l'appareil si le service doit être exécuté.
3. Turn the gas control manual valve(installed on the gas supply line external to the unit) clockwise to the full OFF position.
/ Tourner la soupape de commande manuelle du gaz (installée sur la conduite d'alimentation en gaz externe de l'unité) dans le sens des aiguilles d'une montre jusqu'à la position OFF complète.

Memo



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Ver. 7.0