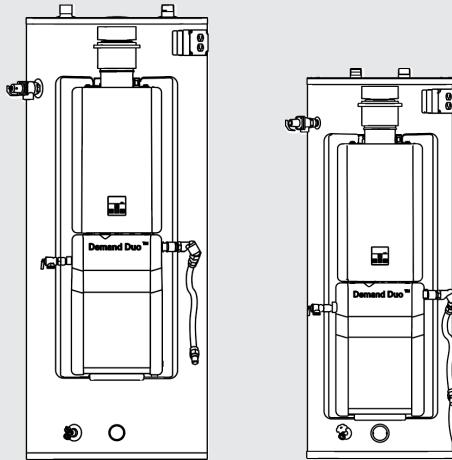


MODELS:

CHS199100RECiN CHS19980RECiN
CHS199100RECiP CHS19980RECiP



Demand Duo™ R-Series

Installation and Operation Manual

Rinnai



10000080800001

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.**

READ ALL OF THE INSTRUCTIONS THOROUGHLY BEFORE INSTALLING OR OPERATING THIS WATER HEATER.

This manual provides information on the installation, operation, and maintenance of the water heater. For proper operation and safety, it is important to follow the instructions and adhere to the safety precautions.

A licensed professional must install the water heater according to the exact instructions in this document.

The owner must read the entire manual to properly operate the water heater and understand maintenance requirements.

WARNING

**This product is for indoor commercial applications only.
This product is NOT intended for residential applications.**

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1. Welcome

Thank you for purchasing Rinnai's Demand Duo™ R-Series Commercial Automatic Circulating Tank Water Heater. This manual provides information on the installation, operation, and maintenance of Rinnai's Demand Duo™ R-Series Commercial Automatic Circulating Tank Water Heater. Read this manual completely before installing or operating the system.

1.1 To The Installer

- A trained and qualified professional must install the system, inspect it, and leak test it before use. The warranty may be voided due to any improper installation.
- The trained and qualified professional should have skills such as:
 - Gas line sizing
 - Connecting gas lines, water lines, valves, and electricity
 - Knowledge of applicable national, state, and local codes
 - Installing and routing B-Vent through a roof
 - Training in installation of water heaters. Training on Rinnai Water Heaters is accessible at www.rinnapro.myabsorb.com.
- Read all instructions in this manual before installing the system. The system must be installed according to the exact instructions in this manual.
- Proper installation is the responsibility of the installer.
- When installation is complete, leave this manual with the system or give the manual directly to the owner.

1.2 To The Owner

- You must read the entire manual to properly operate the water heater and understand maintenance requirements.
- Keep this manual for future reference.
- When using any appliance generating heat, there are certain safety precautions you should follow. See section "2.2 Safety Precautions" for detailed safety precautions.
- Be sure your water heater is installed by a trained and qualified professional.

For Your Records

Dealer Name: _____

Dealer Phone #: _____

Purchase Date: _____

Tank Serial #: _____

System Serial #: _____

2. Safety

2.1 Safety Symbols



This is the safety alert symbol. This symbol alerts you to potential hazards that can kill or hurt you and others.



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



WARNING Indicates a potentially hazardous situation which, if not avoided, could result in personal injury or death.



CAUTION Indicates a potentially hazardous situation which, if not avoided, could result in minor or moderate injury. It may also be used to alert against unsafe practices.

2.2 Safety Precautions



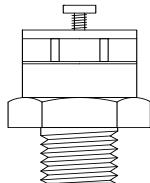
WARNING

- Before operating, smell all around the appliance area for gas. Be sure to smell next to the floor because some gas is heavier than air and will settle on the floor.
- Keep the area around the appliance clear and free from combustible materials, gasoline, and other flammable vapors and liquids.
- Combustible construction refers to adjacent walls and ceiling and should not be confused with combustible or flammable products and materials. Combustible and/or flammable products and materials should never be stored in the vicinity of this or any gas appliance.
- Always check the water temperature before entering a shower or bath.
- To protect yourself from harm, before performing maintenance:
 - Turn off the electrical power supply by unplugging the power cord or by turning off the electricity at the circuit breaker. (The "On/Off" button on the temperature controller does not control the electrical power.)

- Turn off the gas at the gas valve, usually located immediately before the water heater.
- Turn off the incoming water supply. This can be done at the isolation valve immediately before the water heater or by turning off the water supply to the building.
- Use only your hand to push in or turn the gas control knob. Never use tools. If the knob will not push in or turn by hand, DO NOT try to repair it; call a licensed professional. Force or attempted repair may result in a fire or explosion.
- DO NOT use this appliance if any part has been under water. Immediately call a licensed professional to inspect the appliance and to replace any part of the control system and any gas control which has been under water.
- DO NOT use substitute materials. Use only parts certified for the appliance.
- Should overheating occur or the gas supply fail to shut off, turn off the manual gas control valve to the appliance.
- DO NOT adjust the parameter settings unless specifically instructed to do so. Only trained and qualified professionals are permitted to adjust parameter settings.
- DO NOT use an extension cord or an adapter plug with this appliance.
- Any alteration to the appliance or its controls may be dangerous and will void the warranty.
- Proper venting is required for the safe operation of this appliance with 6 in. B-Vent or greater. Refer to this manual or NFPA 54, and/or CSA B149.1 for proper venting techniques for fan-assisted Category 1 appliances.
- If a 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 on how to control thermal expansion.
- Keep the air intake location free of chemicals such as chlorine or bleach that produce fumes. These fumes can damage components and reduce the life of your appliance.
- Corrosive fumes, sometimes found in hair/ nail salons, spas, or other industries exposed to toxic fumes, may be released through these vents when not in operation. Chemicals that are corrosive in nature should not be stored or used near the water heater or vent termination.
- You must follow the installation instructions and those in section "11. Maintenance" for adequate combustion air intake and exhaust.
- Make sure the water heater and its water lines are protected from freezing. Damage due to freezing is not covered by the warranty.

- Install the vacuum relief valve per local codes. Massachusetts 248 CMR Section 10.14 (I) "All potable water pressure tanks shall be provided with a vacuum relief valve at the top of the tank that will operate up to a maximum water pressure of 200 P.S.I.G. and to a maximum water temperature of 200°F (93°C)."

**Vacuum Relief Valve
(Not Supplied)**



If required, install per local code and valve manufacturers' instructions.

DANGER



Hot water can be dangerous, especially for infants or children, the elderly, or infirm.

There is hot water scald potential if the thermostat is set too high.

Water temperatures over 125°F (51°C) can cause severe burns or scalding resulting in death.

Hot water can cause first degree burns with exposure for as little as:

3 seconds at 140°F (60°C)

20 seconds at 130°F (54°C)

8 minutes at 120°F (48°C)

Test the temperature of the water before placing a child in the bath or shower.

DO NOT leave a child or an infirm person in the bath unsupervised.

CAUTION

- **BURN HAZARD.** Hot exhaust and vent may cause serious burns. Keep away from the water heater unit. Keep small children and animals away from the unit.
- Hot water outlet pipes leaving the unit can be hot to touch.

WARNING

FLAMMABLE

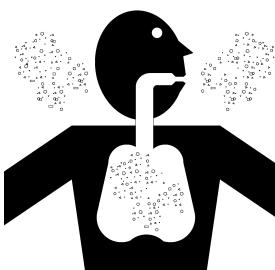


FOR YOUR SAFETY

DO NOT store or use gasoline or other flammable vapors and liquids in the vicinity of this or any other appliance.

WARNING

Carbon Monoxide Hazard



Install vent system per local and national codes.

Exposure to carbon monoxide can cause serious brain injury or death. Read and follow all instructions in this section.

DO NOT install this water heater above 5,400 ft. (1,646 m).

DO NOT obstruct water heater air intake.

Failure to properly vent this appliance can result in death, personal injury and/or property damage.

Gas and carbon monoxide detectors are available.

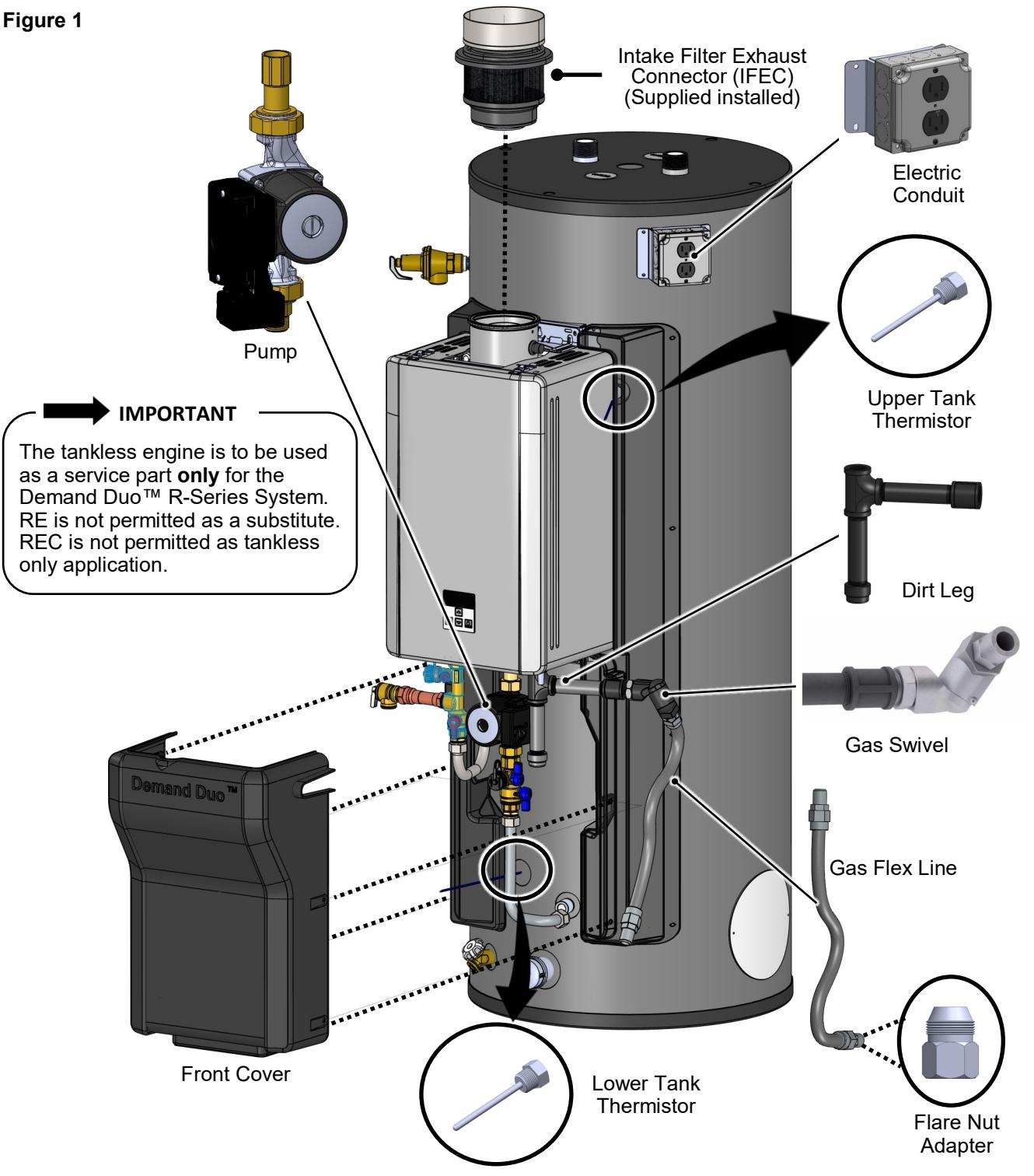
Every building should have a carbon monoxide (CO) alarm in central areas. Check batteries monthly and replace them annually.

DO NOT operate water heater if flood damaged.

3. About the Water Heater

3.1 Components

Figure 1



3.2 Specifications

3.2.1 Specifications for 80 Gallon Storage Tank

Product Number		CHS19980RECiN	CHS19980RECiP
Product Description		Automatic Circulating Tank Water Heater	
Installation Type		Indoor	
Minimum Gas Consumption Btu/hr (kW/hr)		11,900 (3.5)	
Maximum Gas Consumption Btu/hr (kW/hr)		199,000 (58.3)	
Tank Volume		80 Gallons (303 Liters)	
First Hour Delivery at 100°F Rise		249 Gallons (942 Liters)	
Temperature Setting		120°F (49°C) to 180°F (82°C)	
Product Weight		331 lbs. (150 kg)	
Noise level		54 dB	
System Electrical Data	Normal	236 W	
	Standby	1 W	
	Freeze Protection (Tankless)	226 W	
	Max Current	9.0 A	
	Fuse	Tankless Engine - 10 A	
Electric Connections		Appliance: AC 120 Volts, 60Hz.	
Bypass Flow Control		Bypass Servo Control	
Gas Supply Pressure		Natural Gas: 4.0 in. wc - 10.5 in. wc	Propane: 8.0 in. wc - 13.5 in. wc
Connections		Gas Supply Inlet - 3/4 in. MNPT Hot Water Outlet - 1-1/2 in. MNPT Cold Water Inlet - 1-1/2 in. MNPT	
Ignition System		Direct Electronic Ignition	
Maximum Water Supply Pressure		150 PSI	
Meets or exceeds energy efficiency requirements of ASHRAE 90.1b (current standard), C.E.C. Listed 80% Recovery Efficiency.			

Table 1: Recovery capacities with respect to temperature for 80 gallon storage tank

Tank Capacity		RECOVERY CAPACITIES												
		U.S. GALLON/HR LITERS/HR AT TEMPERATURE RISE INDICATED												
		°F	30°F	40°F	50°F	60°F	70°F	80°F	90°F	100°F	110°F	120°F	130°F	140°F
CHS19980RECiN/ CHS19980RECiP	80 U.S. Gals.	°C	17°C	22°C	28°C	33°C	39°C	44°C	50°C	56°C	61°C	67°C	72°C	78°C
	303 Liters	LPH	2,435	1,826	1,461	1,217	1,044	913	812	730	664	609	562	522

3.2.2 Specifications for 119 Gallon Storage Tank

Product Number		CHS199100RECiN	CHS199100RECiP
Product Description		Automatic Circulating Tank Water Heater	
Installation Type		Indoor	
Minimum Gas Consumption Btu/hr (kW/hr)		11,900 (3.5)	
Maximum Gas Consumption Btu/hr (kW/hr)		199,000 (58.3)	
Tank Volume		119 Gallons (450 Liters)	
First Hour Delivery at 100°F Rise		276 Gallons (1046 Liters)	
Temperature Setting		120°F (49°C) to 180°F (82°C)	
Product Weight		364 lbs. (165kg)	
Noise level		54 dB	
System Electrical Data	Normal	236 W	
	Standby	1 W	
	Freeze Protection (tankless)	226 W	
	Max Current	9.0 A	
	Fuse	Tankless Engine - 10 A	
Electric Connections		Appliance: AC 120 Volts, 60Hz.	
Bypass Flow Control		Bypass Servo Control	
Gas Supply Pressure		Natural Gas: 4.0 in. wc - 10.5 in. wc	Propane: 8.0 in. wc - 13.5 in. wc
Connections		Gas Supply Inlet - 3/4 in. MNPT Hot Water Outlet - 1-1/2 in. MNPT Cold Water Inlet - 1-1/2 in. MNPT	
Ignition System		Direct Electronic Ignition	
Maximum Water Supply Pressure		150 PSI	
Meets or exceeds energy efficiency requirements of ASHRAE 90.1b (current standard), C.E.C. Listed 80% Recovery Efficiency.			

Table 2: Recovery capacities with respect to temperature for 119 gallon storage tank

RECOVERY CAPACITIES														
Tank Capacity		U.S. GALLON/HR LITERS/HR AT TEMPERATURE RISE INDICATED												
		°F	30°F	40°F	50°F	60°F	70°F	80°F	90°F	100°F	110°F	120°F	130°F	140°F
CHS199100RECiN/ CHS199100RECiP	119 U.S. Gals.	GPH	643	482	386	322	276	241	214	193	175	161	148	138
	450 Liters	LPH	2,435	1,826	1,461	1,217	1,044	913	812	730	664	609	562	522

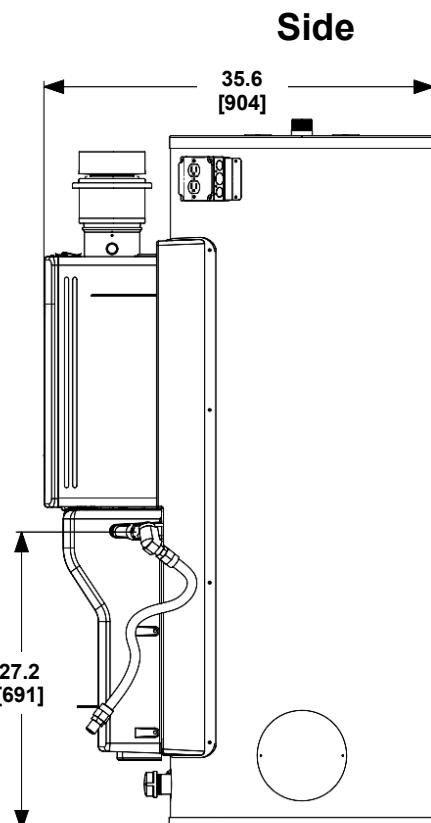
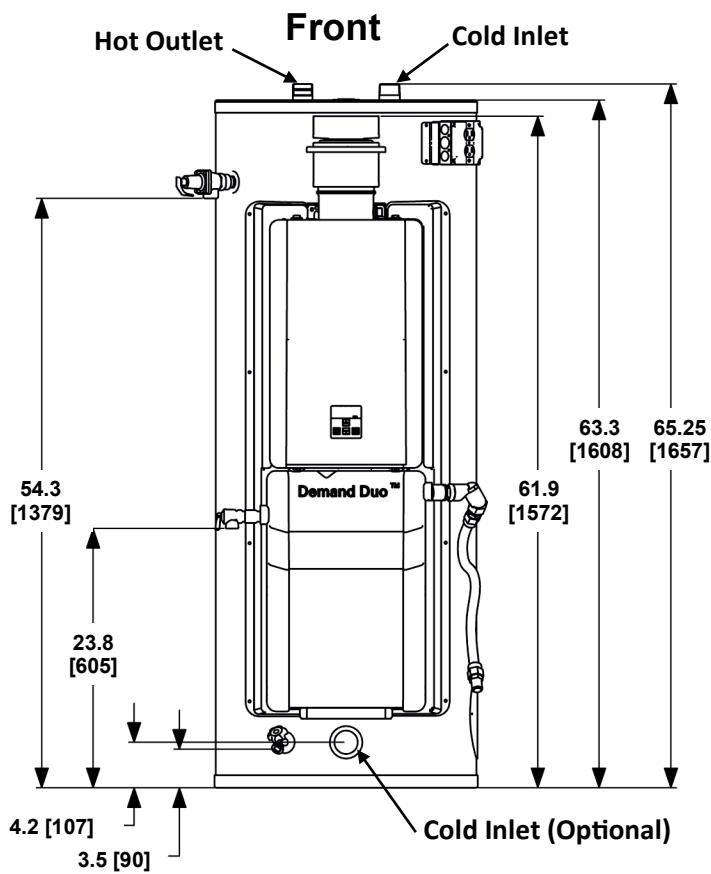
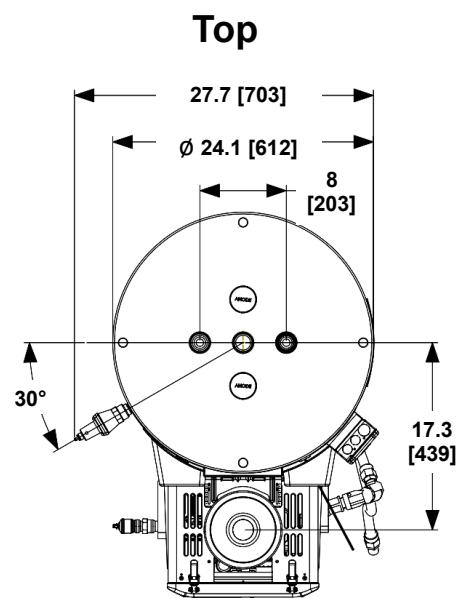
3.3 Dimensions

3.3.1 Dimensions for 80 Gallon Storage Tank

Figure 2

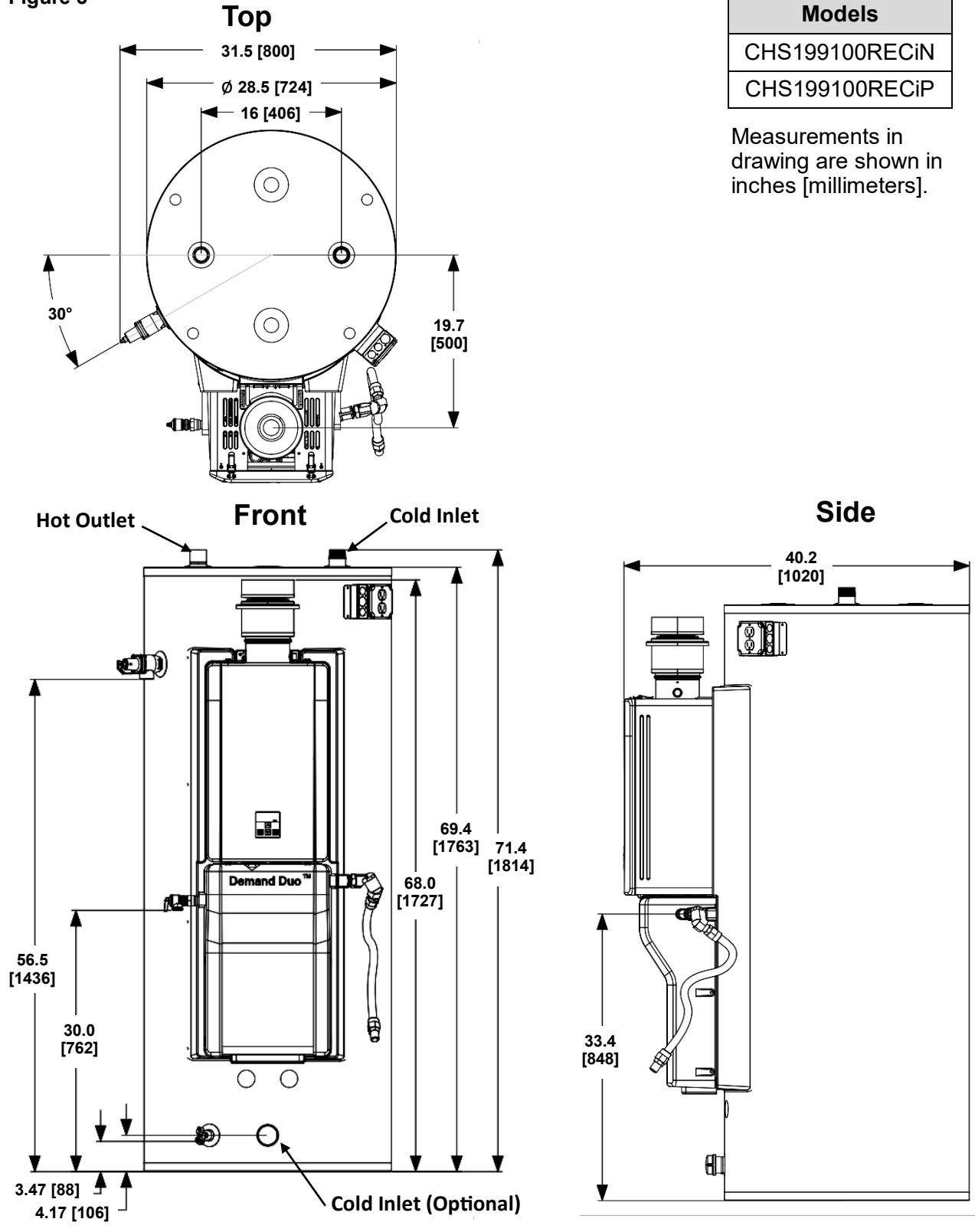
Models
CHS19980RECiN
CHS19980RECiP

Measurements in drawing
are shown in inches
[millimeters].



3.3.2 Dimensions for 119 Gallon Storage Tank

Figure 3



4. Installation

Topics in this section

- Installation Guidelines
- What You Will Need
- Choose an Installation Location

THIS SECTION IS INTENDED FOR THE INSTALLER

Installer qualifications: A trained and qualified professional must install the appliance, inspect it, and leak test it before use. The warranty may be voided due to any improper installation. The installer should have skills such as: Gas sizing; Connecting gas lines, water lines, valves, and electricity; Knowledge of applicable national, state, and local codes; Installing venting through a roof; Venting Category I, Fan-Assisted Appliances per NFPA 54, CSA B149.1 and local codes. If you lack these skills contact a licensed professional.

4.1 Installation Guidelines

For installation in commercial applications only. When installing the water heater, follow these guidelines:

- The installation must conform with local codes or, in the absence of local codes, with the *National Fuel Gas Code, ANSI Z223.1/NFPA 54*, or the *Natural Gas and Propane Installation Code, CSA B149.1*.
- The appliance, when installed, must be electrically grounded in accordance with local codes or, in the absence of local codes, with the *National Electrical Code, ANSI/NFPA 70*, or the *Canadian Electrical Code, CSA C22.1*.
- The appliance and its main gas valve must be disconnected from the gas supply piping system during any pressure testing of that system at test pressures in excess of 1/2 psi (3.5 kPa) (13.84 in W.C.).

- Combustion air provided to the appliance should not be taken from any area of the structure that may produce a negative pressure (i.e. exhaust fans, powered ventilation fans).
- Combustion air must be free of chemicals, such as chlorine or bleach, that produce fumes. These fumes can damage components and reduce the life of your appliance.
- You must follow the installation instructions and those in section “5. Venting” for adequate combustion air and exhaust.
- If a 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 on how to control thermal expansion.
- Should overheating occur or the gas supply fail to shut off, turn off the manual gas shutoff (control) valve to the appliance.

DO NOT:

- DO NOT install the Commercial Water Heater outdoors.
- DO NOT install the appliance in an area where water leakage of the unit or connections will result in damage to the area adjacent to the appliance or to lower floors of the structure. When such locations cannot 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.
- DO NOT obstruct the flow of combustion and ventilation air.
- DO NOT use this appliance in an application such as a pool or spa heater that uses chemically treated water. (This appliance is suitable for filling large or whirlpool spa tubs with potable water.)
- DO NOT use substitute parts that are not authorized for this appliance.

4.2 What You Will Need

4.2.1 Items Included

- Commercial Hybrid System
- Temperature and Pressure Relief Valve (pre-installed on Tank)
- Pressure Relief Valve (PRV) (pre-installed on Tankless Water Heater)
- Intake Filter Exhaust Connector (IFEC)
- Gas Flex/Union
- Drip leg (pre-installed on Tankless Water Heater)
- B-Vent Offset Adapter

4.2.2 Items Needed (Field-Supplied)

- Pipe Wrenches (2)
- Adjustable pliers
- Screwdrivers (2)
- Wire Cutters
- Gloves
- Safety Glasses
- Level
- Soap or gas leak detector solution
- Approved venting (6 in. B-Vent or greater)
- Teflon tape (recommended) or pipe compound
- Pipe insulation
- Gas Valve
- Hot/Cold Isolation Valve

4.2.3 Items You May Need

- Hammer drill with concrete bits
- Saw
- Threading machine with heads and oiler
- Core drill with diamond head
- Torch set
- Copper tubing cutter
- Steel pipe cutter
- Heat tape
- Electrical wire and conduit per local code
- PVC glue/cement
- 5/8 in. ID PVC flexible tubing
- 2 conductor 22 AWG wire for controller
- Single gang electrical box
- Wire nuts
- Unions and drain valves
- Drain Pan
- Earthquake strap

4.3 Choose an Installation Location

When selecting an installation location, you must ensure that clearances will be met and vent length meets the requirements of ANSI Z223.1/NFPA 54, and/or CSA B149.1. Consider the installation environment and water quality. Requirements for the gas line, water lines, and electrical connection can be found in their respective installation sections of this manual.

4.3.1 Water Quality Guidelines

This section provides information on the importance of water quality to the Rinnai R-Series Commercial Automatic Circulating Tank Water Heater. The information is intended to serve as general guidelines only and is not a complete list of water quality guidelines.

Consideration of care for your water heater should include evaluation of water quality. The water must be potable, free of corrosive chemicals, sand, dirt, or other contaminants. It is up to the installer to ensure the water does not contain corrosive chemicals or elements that can affect or damage the water heater. Water that contains chemicals exceeding the levels below can damage the water heater. Replacement of components due to water quality damage is not covered by the warranty.

Table 3: Water Quality Guidelines

Contaminant	Maximum Level
Total Hardness	Up to 200 mg/L
Aluminum *	Up to 0.2 mg/L
Chlorides *	Up to 250 mg/LL
Copper *	Up to 1.0 mg/L
Dissolved Carbon Dioxide (CO ₂)	Up to 15.0 mg/L
Iron *	Up to 0.3 mg/L
Manganese *	Up to 0.05 mg/L
pH *	6.5 to 8.5
TDS (Total Dissolved Solids)*	Up to 500 mg/L
Zinc *	Up to 5 mg/L

* Source: Part 143 National Secondary Drinking Water Regulations

If you install this water heater in an area that is known to have hard water or that causes scale build-up, the water must be treated and may require a more frequent flushing schedule.

When scale build-up in the heat exchanger begins to affect the performance of the water heater, a diagnostic code "LC" will display. Flush the heat exchanger to prevent damage to it.

This water heater also includes a service indicator (Service Soon, 55). When selected in the parameter settings, an 55 code will display on the controller indicating that it is time to flush and service the water heater. Scale build-up is caused by hard water and can be accelerated if the water heater is set at a high temperature.

Rinnai offers Southeastern Filtration's "ScaleCutter Water Conditioning System" that offers superior lime scale prevention and corrosion control by feeding a blend of control compounds into the cold water supply.

4.3.2 Environment

Air surrounding the water heater is used for combustion and must be free of any compounds that cause corrosion of internal components. These include corrosive compounds that are found in aerosol sprays, detergents, bleaches, cleaning solvents, oil based paints/varnishes, and refrigerants. The air in beauty shops, dry cleaning stores, photo processing labs, and storage areas for pool supplies often contains these compounds.

The water heater should not be installed in any areas where the air may contain these corrosive compounds.

DO NOT store or use gasoline or other flammable vapors and liquids in the vicinity of this or any other appliance.

Flammable liquids such as cleaning solvents, aerosols, paint thinners, adhesives, gasoline and propane must be handled and stored with extreme care. These flammable liquids emit flammable vapors and when exposed to an ignition source can result in a fire hazard or explosion. Flammable liquids should not be used or stored in the vicinity of this or any other gas appliance.

4.3.3 Freeze Protection

The water heater and its water lines must be protected to prevent freezing. Damage due to freezing is not covered by the warranty. When connected to a 120-volt power supply and gas is on, the water heater will not freeze when the outside air temperature is as cold as 22°F (-30°C) when protected from direct wind exposure. Because of the "wind-chill" effect, any wind or circulation of air on the water heater will reduce its ability to protect itself from freezing. In the event of a power failure and/or gas interruption at temperatures below freezing, the water heater should manually be drained of all water to prevent freezing damage. In addition, drain the water line and pressure relief valve.

Loss of freeze protection may result in water damage from a burst heat exchanger or water lines that freeze and break.

4.3.4 Clearances

Figure 4

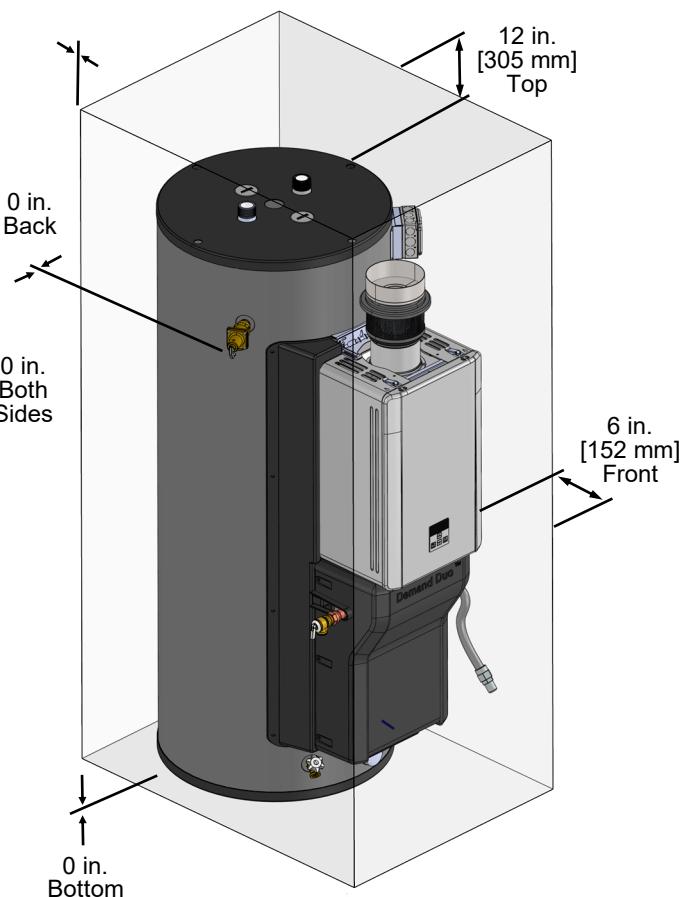
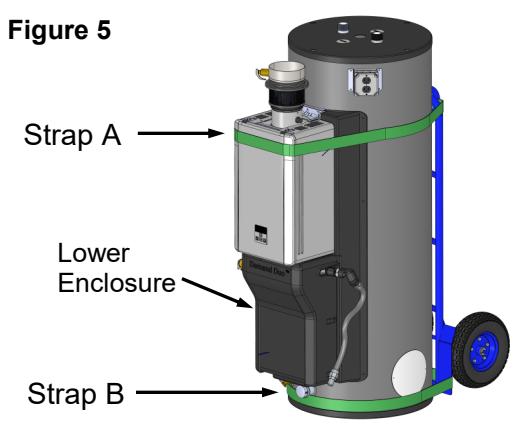


Table 4: Clearances to Combustibles and Non-Combustibles

Location	Clearance
Top	12 in. (305 mm) <i>*Clearance for servicing the anode rods is 54 in. from the top of the water heater.</i>
Sides	0 in.
Back	0 in.
Front	6 in. (152 mm) <i>**Clearance for servicing is 24 in. (610 mm) in front of the water heater.</i>
Intake Filter Exhaust Connector (IFEC)	6 in. (152 mm)
Single Wall B-Vent	

4.3.5 Transport

1. Choose the right hand truck to support the weight and size of the water heater. Refer to section "3. About the Water Heater" in this manual for specific weights and dimensions.
2. Use proper lifting techniques to load the water heater onto the hand truck:
 - Position the water heater onto the hand truck so the weight is evenly balanced and the tank is touching the rails of the hand truck.
 - Secure the water heater to the hand truck:
 - Position **STRAP A** around the tankless unit as illustrated below.
 - Position **STRAP B** around the base of the tank below the LOWER ENCLOSURE. DO NOT add strap around the exhaust or vent connection.



4.3.6 Earthquake Strapping

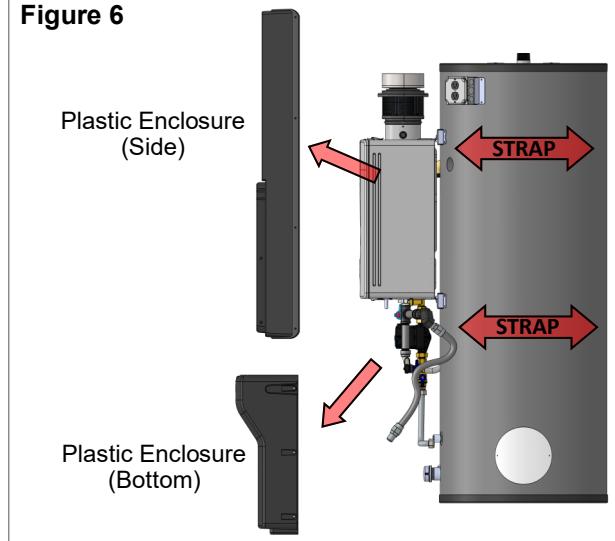
→ IMPORTANT

Product installed in the state of California must be braced, anchored, or otherwise secured to avoid motion or falling during an earthquake. Contact the California Office of the State Architect located at 1102 Q Street, Suite 5100, Sacramento, CA 95811 for instructions.

1. Loosen screws along the perimeter of the plastic enclosures.
2. Remove plastic enclosures.

3. Position straps around the Demand Duo tank per the requirements of California Office of the State Architect. **DO NOT POSITION STRAPS OVER PIPE, FITTINGS or WIRE.**
4. Replace the plastic enclosures. (*Modification of the plastic enclosures may be necessary to fit the enclosures over the earthquake straps.*)
5. Replace the screws around the perimeter of the plastic enclosures.

Figure 6



4.3.7 Installation Location Checklist

<input type="checkbox"/>	The water heater is not exposed to corrosive compounds in the air.
<input type="checkbox"/>	The water heater location complies with the clearances.
<input type="checkbox"/>	The planned venting termination location meets the clearances.
<input type="checkbox"/>	The water supply does not contain chemicals or exceed total hardness that will damage the heat exchanger.
<input type="checkbox"/>	The installation must conform with local codes or, in the absence of local codes, with the <i>National Fuel Gas Code, ANSI Z223.1/NFPA 54</i> , or the <i>Natural Gas and Propane Installation Code, CSA B149.1</i> .
<input type="checkbox"/>	Leave the entire manual taped to the water heater, or give the entire manual directly to the owner.

5. Venting

Topics in this section

- Venting Requirements
- Combustion Air Requirements
- Venting Installation Checklist

5.1 Venting Requirements



WARNING Poison carbon monoxide gas hazard.

If this appliance is replacing a previously common vented water heater, it may be necessary to resize the existing chimney liner or vent to prevent over sizing problems for the other remaining appliance(s). See codes and/or standard having jurisdiction. Failure to properly vent this water heating appliance or other appliance(s) can result in death, personal injury and/or property damage.



WARNING To prevent possible personal injury or death due to asphyxiation, common venting with other manufacturer's induced draft appliances is not allowed.



WARNING Devices attached to the vent system intended to increase system efficiency by reducing the heat loss of the vent system MUST not be used on this water heater. Rinnai accepts no liability for damage or injury if such devices are installed on the vent system with this appliance.



WARNING Vent Pipe Assembly: To avoid damage to the vent and intake filter exhaust connector (IFEC), pre drill holes with a 1/8 in. drill bit. Attach the vent to the vent adapter with #8 screws. Refer to the "Vent Pipe Assembly" section on the following page for more information.

- This water heater must be vented vertically to the outside of the building or structure.
- This water heater is not designed or certified for side wall horizontal vent terminations.
- All installations must be vented in accordance with *National Fuel Gas Code, ANSI Z223.1/NFPA 54* - latest edition and the requirements of state or local codes. In Canada, the water heater must be vented in accordance with the National Standard of Canada, and CAN/CSA B149.1 - latest editions and amendments and the codes of the local utility or other authority having jurisdiction.

NOTE
The maximum horizontal length of a single-wall connector shall be 75% of the height of the chimney.

- All vent (Category I) passing through a concealed space, an attic or floor, MUST be Type B double-wall vent and/or Type B double-wall vent connectors.
- This appliance CANNOT be vented into any chimney serving an open fireplace or any other solid fuel burning appliance.
- Use the same diameter Category I connector or vent as permitted by NFPA 54, ANSI Z223.1 venting tables and/or CSA B149.1.
- The vent must be 6 in. or larger in diameter. It is not permitted to reduce vent diameter (6 in.).
- Vertical Category I vent or vent connector runs must be as short and direct as possible.
- Vertical outdoor runs of type B or ANY single - wall vent below the roof line are NOT permitted.
- All horizontal vent runs to be sloped up away from this appliance a minimum of 1/4 in. (6 mm) per foot (21 mm per meter).

IMPORTANT
If reusing existing venting, it should be inspected for damage and to ensure it is appropriate (approved) for this water heater. To ensure safe and proper operation, damaged vent components MUST be replaced before operating the water heater.

- Existing gas vent or chimney is to be checked to ensure they meet clearances and local codes.
- This appliance can ONLY be connected to a manufactured chimney or vent that complies with a recognized standard. Venting into a masonry or concrete chimney is only permitted as outlined in the NFPA 54/ANSI Z223.1, and/or CSA B149.1, National Fuel Gas Code venting tables. It is therefore a contractual obligation on the part of the installer to follow all safe venting requirements.

Vent Pipe Assembly

⚠️ WARNING Vent Pipe Assembly: To avoid damage to the vent and intake filter exhaust connector (IFEC), pre drill holes with a 1/8 in. drill bit. Attach the vent to the vent adapter with #8 screws.

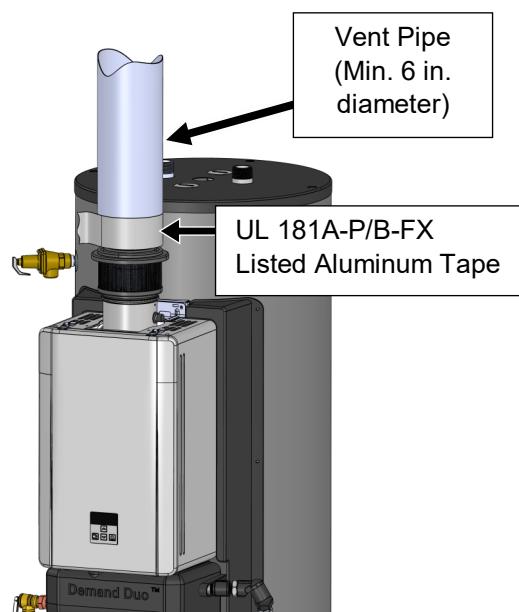
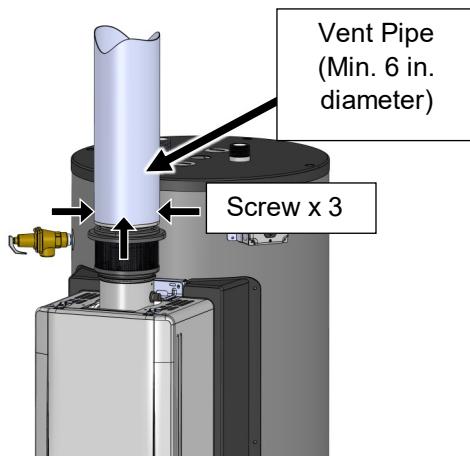
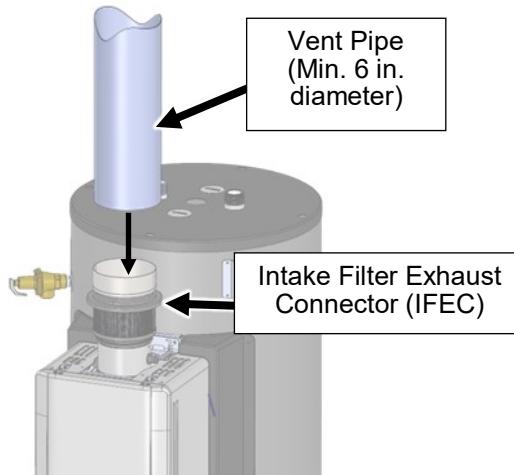
⚠️ WARNING Type B listed gas vent pipe and fittings must be used. Refer to the vent manufacturer's installations instructions for safe and proper installation of the vent.

The entire vent system (combustion air ducts, louvers, exhaust vent, etc.) must be checked periodically for signs of obstruction, rust, or damage. If damaged components are observed, they must be repaired or replaced immediately.

Refer to Figure 7 for the following instructions.

1. Assemble the field supplied 6 in. B-vent to the top side of the IFEC.
2. Fasten the 6 in. B-vent to the IFEC with the provided three (3x) screws.
3. Apply UL 181A-P/B-FX Listed aluminum tape around the perimeter of the 6 in. B-vent to properly seal the connection to the IFEC.

Figure 7



Vent Dampers

Vent dampers must be certified in accordance with ANSI Z21.68

Before installing any flue damper, consult the local gas authority and damper manufacturer for proper installation.

WARNING

Thermal Operated Vent Dampers: Should NOT be used with this appliance. This appliance has a thermal efficiency greater than 80%. This higher efficiency will result in lower flue gas temperatures. Such temperatures may be too low to activate a thermal operated vent damper. Use of a thermal operated flue damper on this product may result in spillage of exhaust gases and ultimately carbon monoxide poisoning.

Vent Inspection

The entire vent system (combustion air ducts, louvers, exhaust vent, etc.) must be checked periodically for signs of obstruction, rust, or damage. If damaged components are observed, they must be repaired or replaced immediately.

Vent Size

WARNING

This water heater is equipped with a 6 in. vent adapter and must never be attached to a vent smaller than 6 in. Certain applications may require vent diameters greater than 6 in. Consult your local gas supplier or authority to aid in the proper vent diameter selection per the requirements of the vent tables in the current edition of the National Fuel Gas Code ANSI Z223.1/NFPA 54, and/or CSA B149.1.

Vent Connectors

Vent Connectors are relatively short runs of vent, connecting the appliance to the chimney or vertical vent run.

Following is a list of appropriate vent connector material for use between the water heater and the chimney:

Type B (B-Vent) Double-wall, U.L. listed vent pipe
Type B (B-Vent) Single-wall, U.L. listed vent pipe

Note the following when installing a vent connector from the appliance to the chimney or vertical vent:

Length:

A vent connector shall be as short as practical and the appliance located as close as practical to the chimney or vent. The maximum horizontal length of the vent connector cannot exceed 75% of the height of the chimney or vent. Unnecessary bends should be avoided as to not create excessive resistance to flow of vent gases.

Single-Wall Vent Connectors:

A single-wall vent connector must not pass through any interior walls, floors or ceilings. A single-wall vent connector must not be installed in attics, crawl spaces or any other confined space or inaccessible location. Maintain a minimum of 6 in. from combustibles when using single-wall vent connectors.

Double-Wall, B-Vent:

It is acceptable to pass through walls or partitions with double-wall, B-Vent.

Slope:

Vent connectors must pitch $\frac{1}{4}$ inch per foot (21 mm per meter) upward (Figure 8).

Inspection:

The entire length of the vent connector shall be readily accessible for inspection, cleaning and replacement.

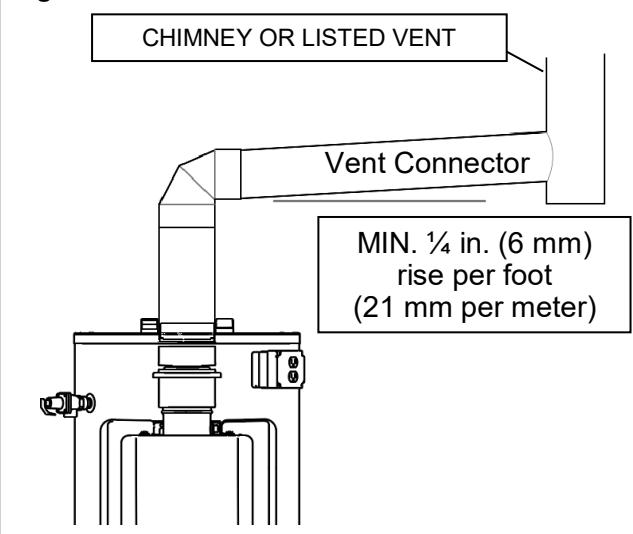
Joints:

Must be fastened by sheet metal screws or other approved methods.

Support:

Vent connectors must be supported per the vent manufacturer's installation instructions to avoid dips or sags in the vent and maintain the required clearances.

Figure 8



Vent Termination

All flue (vent) gases must be directed to the outdoors of the building or structure and must not terminate horizontally.

The vent termination shall comply with the following requirements:

If the listed gas vent is 12 in. (300 mm) or less in diameter and located not less than 8 ft. (2.4 m) from a vertical wall or similar obstruction, the termination must comply with the requirements stated in Table 5 and Figure 9. If the gas vent is greater than 12 inches in diameter or located less than 8 ft. (2.4 m) from a vertical wall or similar obstruction, the termination must end at a minimum of 2 ft. (0.6 m) above any portion of a building within 10 ft. (3.0 m) horizontally.

Table 5

Roof Slope	H (minimum)	
	ft	m
Flat to 6/12	1.0	0.30
Over 6/12 to 7/12	1.25	0.38
Over 7/12 to 8/12	1.5	0.46
Over 8/12 to 9/12	2.0	0.61
Over 9/12 to 10/12	2.5	0.76
Over 10/12 to 11/12	3.25	0.99
Over 11/12 to 12/12	4.0	1.22
Over 12/12 to 14/12	5.0	1.52
Over 14/12 to 16/12	6.0	1.83
Over 16/12 to 18/12	7.0	2.13
Over 18/12 to 20/12	7.5	2.27
Over 20/12 to 21/12	8.0	2.44

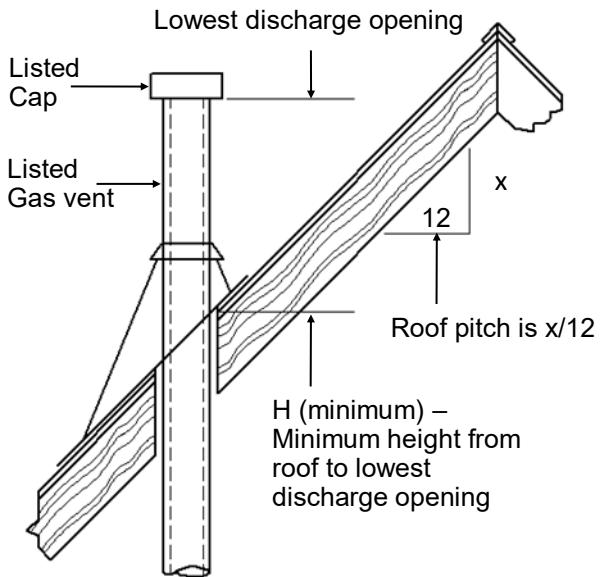
B-Vent type gas vent shall terminate at least 5 ft. (1.5 m) in vertical height above the highest connected appliance draft hood or flue collar.

Decorative shrouds or coverings shall not be installed over the gas vent termination unless listed for use with the specific gas vent and are installed in accordance with the manufacturer's installation instructions.

All gas vents shall extend through the roof flashing, roof jack, or roof thimble and terminate with a listed cap or listed roof assembly.

The gas vent shall terminate at least 3 ft. (0.9 m) above any forced air inlet located within 10 ft. (3.0 m).

Figure 9



Example: X = 6, Roof Slope = 6/12, H (Minimum 1.25 ft. (0.38))

Masonry Vertical Venting

Masonry Chimneys shall be built and installed in accordance with *NFPA 211, Standard for Chimneys, Fireplaces, Vents and Solid Fuel-Burning Appliances*.

Before assembling the vent connector to a chimney, the chimney must be inspected for signs of obstruction or damage. If previously used for solid or liquid fuel burning appliances or fireplaces, the chimney must be cleaned.

DO NOT connect the vent of this water heater to a chimney servicing a separate solid fuel burning appliance.

DO NOT connect the vent of this water heater to a tile lined masonry chimney. The chimney must be lined with either B-Vent or a listed chimney lining system.

Connection to a chimney must be firmly attached, sealed and must be located above the extreme bottom of the chimney.

Vertical Venting

Vertical gas vent must be installed with U.L. listed type B-vent material in accordance with the manufacturer's installation instructions and the requirements stated in the "National Fuel Gas Code", NFPA 54, ANSI Z223.1 and/or CSA B149.1 (latest edition), and the requirements of local codes.

Vent should extend in a generally vertical direction. Any vent angle less than 45 degrees is considered horizontal. The total horizontal distance of the vent system plus the horizontal length of the vent connector must not exceed 75 percent of the vertical height of the vent.

An unused chimney or masonry enclosure may be used as a chase for the installation of listed B-vent material.

Common Venting

Common venting of this Category 1, fan-assisted appliance is permitted. Consult the latest version of the National Fuel Gas Code (ANSI Z223.1/NFPA 54). As a Category I appliance, this water heater can be vented vertically with type B-Vent systems and lined masonry chimneys. Follow the National Fuel Gas Code, ANSI Z223.1 and or the National Gas Installation code and CSA-B149.1 for proper installation practices. If you are unsure or need assistance in correct application of a common vent installation consult the local gas authority for assistance in vent system design. **DO NOT** common vent with other manufacturer's induced draft appliance.

Adjustment for High Altitude Installations

IMPORTANT

Water heaters covered in this manual have been tested and approved for installation at elevations up to 5,400 ft. Failure to change the parameter settings for high altitude will result in improper and inefficient operation of the water heater.

Use parameter settings to select the appropriate altitude for your installation (Table 6).

The default setting for the appliance is 0-2,000 ft. (0-610 m), Parameter Setting 2A.

Refer to section "7. Configure Parameter Settings" for more information.

Table 6: High Altitude

Altitude	Parameter Setting
0 - 2,000 ft (0 - 610 m)	02A
2,001 - 5,400 ft (610 - 1,646 m)	02b

5.2 Combustion Air Requirements

This water heater requires adequate combustion air for ventilation and dilution of flue gases. Failure to provide adequate combustion air can result in unit failure, fire, explosion, serious bodily injury or death. Use the following methods to ensure adequate combustion air is available for correct and safe operation of this water heater.

IMPORTANT

Combustion air must be free of corrosive chemicals. DO NOT provide combustion air from corrosive environments. Appliance failure due to corrosive air is not covered by warranty.

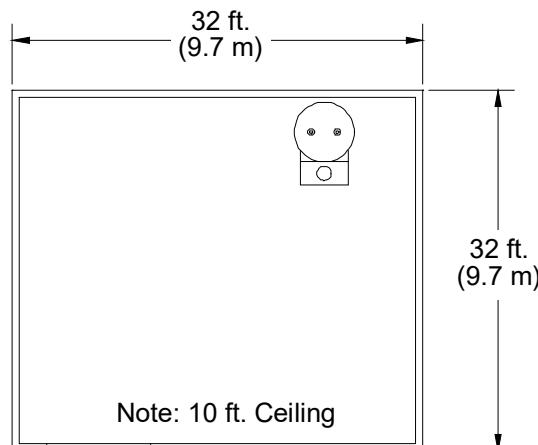
Combustion air must be free of acid forming chemicals such as sulfur, fluorine and chlorine. These chemicals have been found to cause rapid damage and decay and can become toxic when used as combustion air in gas appliances. Such chemicals can be found in, but not limited to bleach, ammonia, cat litter, aerosol sprays, cleaning solvents, varnish, paint and air fresheners. DO NOT store these products or similar products in the vicinity of this water heater.

Corrosive fumes, sometimes found in hair/ nail salons, spas, or other industries exposed to toxic fumes, may be released through these vents when not in operation. Chemicals that are corrosive in nature should not be stored or used near the water heater or vent termination.

Unconfined Space

An unconfined space is defined in *National Fuel Gas Code, ANSI Z223.1/NFPA 54, and/or CSA B149.1* as "a space whose volume is not less than 50 cubic feet per 1000 Btu/hr (4.8 m³ per kW per hour) of the aggregate input rating of all appliances installed in that space. Rooms communicating directly with the space in which the appliances are installed, through openings not furnished with doors, are considered a part of the unconfined space." If the "unconfined space" containing the appliance(s) is in a building with tight construction, additional outside air may be required for proper operation. Outside air openings should be sized the same as for a confined space.

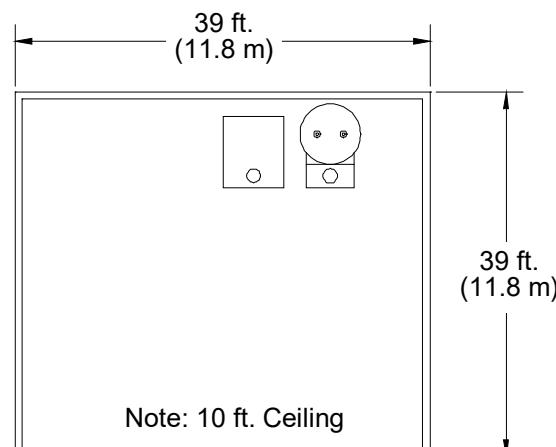
Figure 10



$$32 \text{ ft.} \times 32 \text{ ft.} \times 10 \text{ ft.} = 10,240 \text{ ft.}^3$$

$$\frac{50 \text{ ft.}^3}{1,000 \text{ ft.}} \times 199,000 \text{ Btu/Hr} = 9,950 \text{ ft.}^3$$

Above calculation is an example of the minimum required volume for Unconfined Space (water heater only).



$$39 \text{ ft.} \times 39 \text{ ft.} \times 10 \text{ ft.} = 15,210 \text{ ft.}^3$$

$$\frac{50 \text{ ft.}^3}{1,000 \text{ ft.}} \times 299,000 \text{ Btu/Hr} = 14,950 \text{ ft.}^3$$

Above calculation is an example of the minimum required volume for Unconfined Space (water heater and a 100,000 BTU furnace).

Confined Space

(Small Room, Closet, Alcove, Utility Room, Etc.)

A confined space is defined in the *National Fuel Gas Code, ANSI Z223.1/NFPA 54*, and/or *CSA B149.1* as "a space whose volume is less than 50 cubic feet per 1000 Btu/hr (4.8 m³ per kW per hour) of the aggregate input rating of all appliances installed in that space." A confined space must have two combustion air openings. Size the combustion air openings based on the BTU input for all gas utilizing equipment in the space and the method by which combustion air is supplied.

Louvers and Grills

When sizing the permanent opening as illustrated in Figure 12, consideration must be taken for the design of the louvers or grills to maintain the required free area required for all gas utilizing equipment in the space. If the free area of the louver or grill design is not available, assume wood louvers will have 25% free area and metal louvers or grills will have 75% free area. Under no circumstance should the louver, grill or screen have openings smaller than $\frac{1}{4}$ ".

Example:

$$\text{Free Area} = \text{Height} \times \text{Length} \times \% \text{ free area}$$

$$\text{Wood: } 18 \text{ in} \times 24 \text{ in} \times 0.25 = 108 \text{ in}^2$$

$$\text{Metal: } 18 \text{ in} \times 24 \text{ in} \times 0.75 = 324 \text{ in}^2$$

Location

To maintain proper circulation of combustion air two permanent openings (one upper, one lower) must be positioned in confined spaces. The upper shall be within 12 in. (300 mm) of the top of the confined space and the lower opening shall be within 12 in. (300 mm) of the bottom of the confined space. Openings must be positioned as to never be obstructed.

Combustion air provided to the appliance should not be taken from any area of the structure that may produce a negative pressure (i.e. exhaust fans, powered ventilation fans).

Figure 11

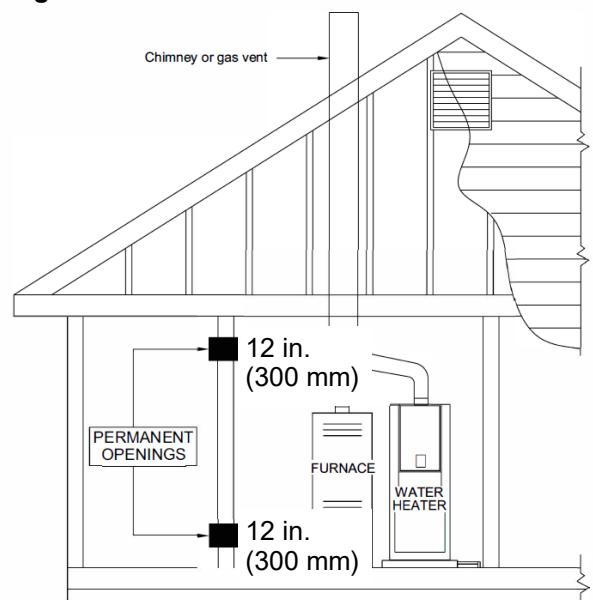


Figure 12

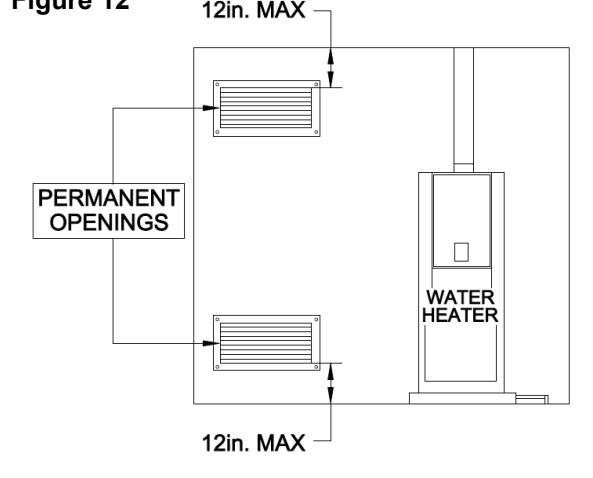
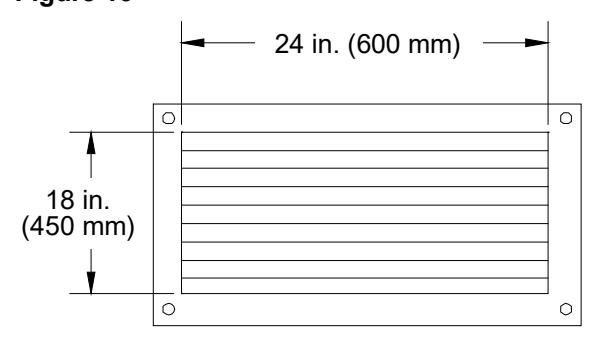


Figure 13

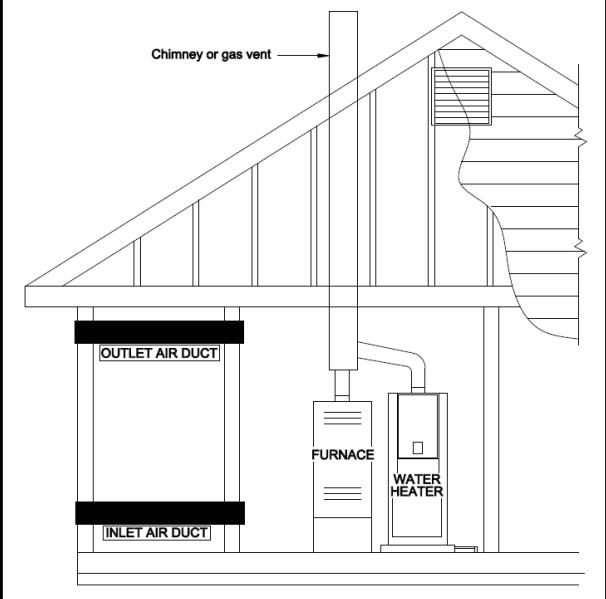


Using Outdoor Air For Combustion

Outdoor air can be provided to a confined space through two permanent openings, one commencing within 12 in. (300mm) of the top and one commencing within 12 in. (300mm) of the bottom, of the confined space. The openings shall communicate to the outside by one of two ways:

1. Directly through horizontal ducts
2. Indirectly through vertical ducts

Figure 14



When communicating **directly** with the outdoors through horizontal ducts, each opening shall have a minimum free area of 1 in²/2000 Btu/hr (1100 mm²/kW) of total input rating of all appliances in the confined space.

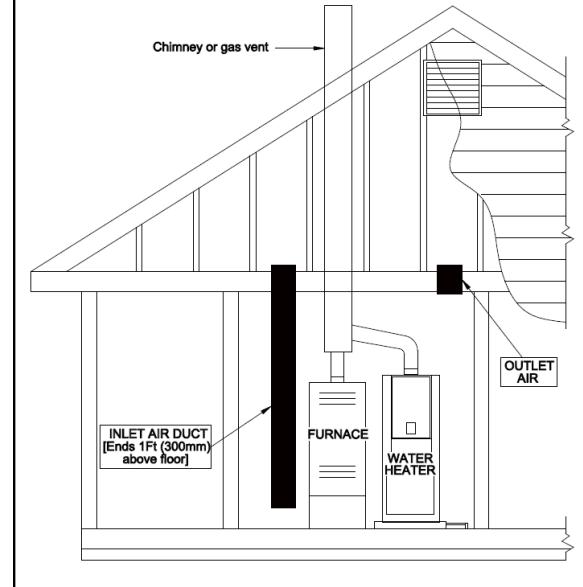
NOTE

If ducts are used, the cross sectional area of the duct must be greater than or equal to the required free area of the openings to which they are connected.

Using Indoor Air For Combustion

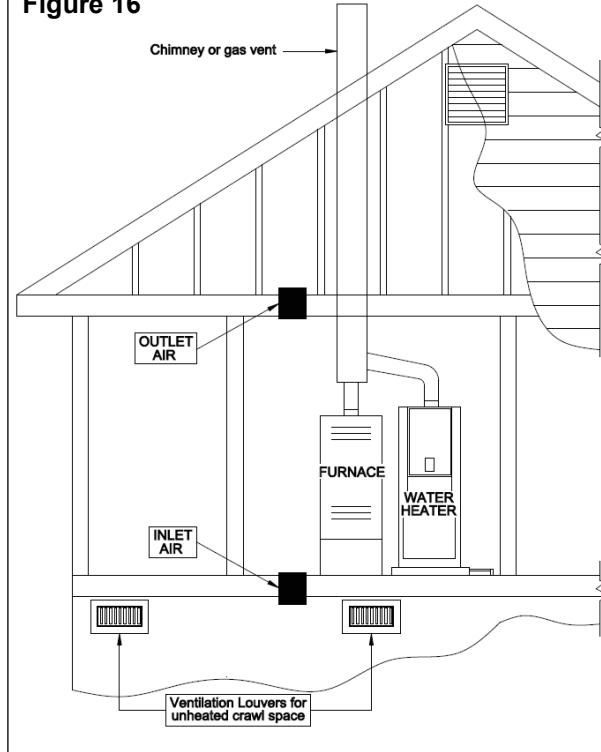
When using air from other room(s) in the building, the total volume of the room(s) must be of adequate volume (greater than 50 cubic feet per 1000 Btu/hr). Regardless of the calculated free area, the combustion air opening should never be less than 100 square inches each.

Figure 15



When communicating **indirectly** with the outdoors through vertical ducts, each opening shall have a minimum free area of 1 in²/4000 Btu/hr (550 mm²/kW) of total input rating of all appliances in the confined space. Combustion air to the appliance can be provided from a well ventilated attic or crawl space.

Figure 16



5.3 Venting Installation Checklist

<input type="checkbox"/>	Verify proper clearances around the vents.
<input type="checkbox"/>	Ensure that the Combustion Air Requirements are followed that will provide sufficient combustion air for the appliance.
<input type="checkbox"/>	Ensure you have used the correct venting products for Category 1 and that you have completely followed the venting manufacturer's installation instructions and these installation instructions. All installations must be vented in accordance with National Fuel Gas Code NFPA 54/ANSI Z223.1 - latest edition and the requirements of state or local codes. In Canada, the furnaces must be vented in accordance with the National Standard of Canada and CAN/CSA B149.1 - latest editions and amendments and the codes of the local utility or other authority having jurisdiction.
<input type="checkbox"/>	All horizontal vent runs must be sloped up away from the water heater a minimum of 1/4 in. (6 mm) per foot.
<input type="checkbox"/>	Verify that the vent termination clearances are followed.
<input type="checkbox"/>	Verify that there is adequate combustion air.
<input type="checkbox"/>	Confirm high altitude settings are correct for installation location requirements. See Parameter Settings Table for more information.

6. Gas and Power Supply

Topics in this section

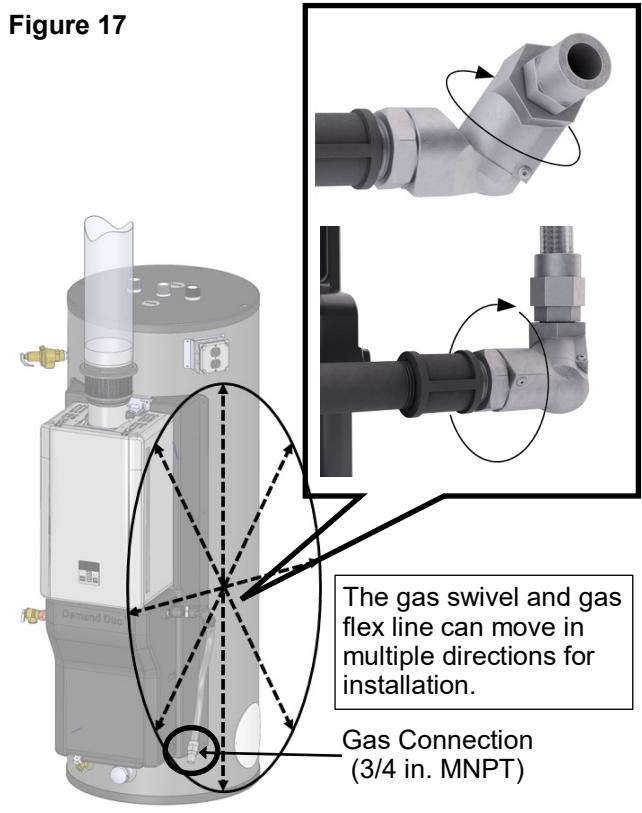
- Connect the Gas Supply
- Gas Operating Instructions
- Gas Pipe Sizing Reference Tables
- Connect Electricity
- Checklist for Gas and Electricity

6.1 Connect the Gas Supply

⚠ WARNING

- A licensed professional must install the gas supply.
- Confirm the gas type before connecting. Failure to install correct gas type may result in injury or damage to the unit.
- Turn off 120v power supply.
- Turn off the gas.
- Gas is flammable. **DO NOT** smoke or provide other ignition sources while working with gas.
- **DO NOT** turn on the water heater or gas until all fumes are gone.

Figure 17



MUST DO

- A gas valve must be placed in the gas supply line to the water heater. Flex line provided with the appliance can be used as a union.
- Check the type of gas and the gas inlet pressure before connecting the water heater. If the water heater is not of the gas type that the building is supplied with, **DO NOT** connect the water heater. Contact the dealer for the proper unit to match the gas type.
- Check the gas supply pressure immediately upstream at a location provided by the gas company. Supplied gas pressure must be within the limits shown in the "Specifications" section with all gas appliances operating.
- Before placing the appliance in operation, all joints including the water heater and gas flex must be checked for gas tightness by means of leak detector solution, soap and water, or an equivalent nonflammable solution, as applicable. (Since some leak test solutions, including soap and water, may cause corrosion or stress cracking, the piping shall be rinsed with water after testing, unless it has been determined that the leak test solution is non-corrosive.)
- Use approved connectors to connect the unit to the gas line. Purge the gas line of any debris before connection to the water heater.
- Any compound used on the threaded joint of the gas piping shall be a type which resists the action of liquefied petroleum gas (propane/ LPG).
- The gas supply line shall be gas tight, sized, and so installed as to provide a supply of gas sufficient to meet the maximum demand of the heater and all other gas consuming appliances at the location without loss of pressure.

6.1.1 Gas Flare Adapter

1. Apply a pipe sealant approved for gas to the field-supplied 3/4 MNPT gas line (Figure 18).

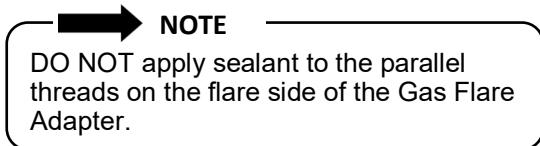
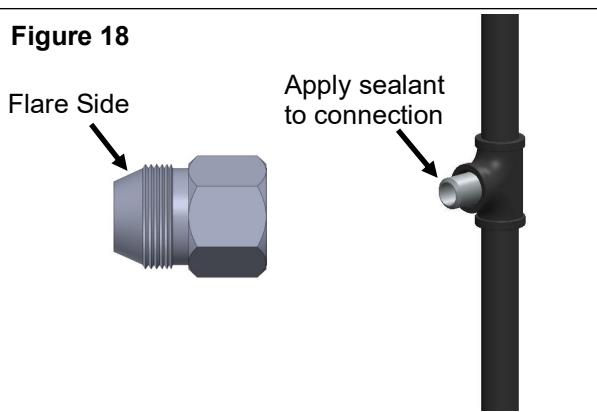
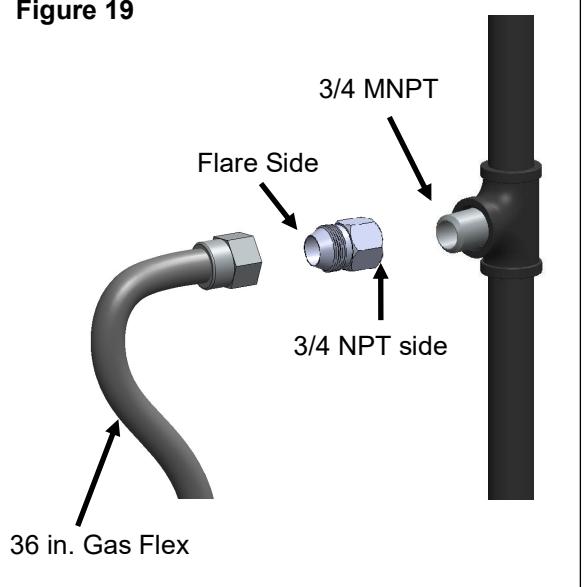


Figure 18



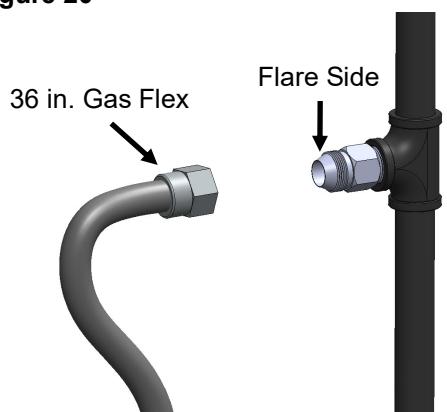
2. Thread the 3/4 NPT side of the flare nut onto the field-supplied 3/4 MNPT gas line (Figure 19).

Figure 19



3. Thread the flare side of the 36 in. Gas Flex into the flare side of the Gas Flare Adapter (Figure 20).

Figure 20



4. Use a backer wrench to tighten all connections to the recommended torque value of 62 lbs·ft (Figure 21).

Figure 21



5. Leak test ALL gas fittings and assembly using a leak test solution, soap and water, or an equivalent nonflammable solution.
6. If leak is identified at the flex connection, gradually tighten fitting until leak stops.

DO NOT connect gas flex directly to pipe threads of gas supply pipe or appliance. Install Gas Flex using only the Gas Flare Adapter provided.

6.2 Gas Operating Instructions

FOR YOUR SAFETY READ BEFORE OPERATING



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

- A. This appliance does not have a pilot. It is equipped with an ignition device which automatically lights the burner. Do not try to light the burner by hand.
- B. BEFORE OPERATING smell all around the appliance area for gas. Be sure to smell next to the floor because some gas is heavier than air and will settle on the floor.

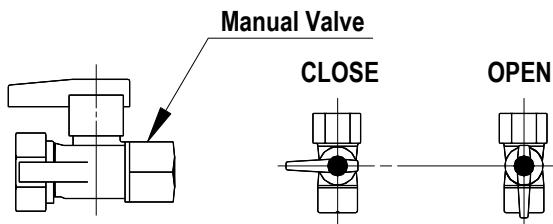
WHAT TO DO IF YOU SMELL GAS

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

- If you cannot reach your gas supplier, call the fire department.
- C. Use only your hand to push in or turn the gas control knob. Never use tools. If the knob will not push in or turn by hand, do not try to repair it, call a qualified licensed professional. Force or attempted repair may result in a fire or explosion.
- D. Do not use this appliance if any part has been under water. Immediately call a qualified licensed professional to inspect the appliance and to replace any part of the control system and any gas control which has been under water.

OPERATING INSTRUCTIONS

1. **STOP!** Read the safety information above.
2. Set the thermostat to lowest setting.
3. Turn off all electric power to the appliance using the ON/OFF button.
4. This appliance is equipped with an ignition device which automatically lights the burner. Do not try to light the burner by hand.
5. Locate the manual gas valve on the side of the heater. Turn the manual valve clockwise to the full OFF position. ↗
6. Wait five (5) minutes to clear out any gas. Then smell for gas, including near the floor. If you smell gas, **STOP!** Follow "B" in the safety information above. If you don't smell gas, go to the next step.
7. Turn the manual gas valve counterclockwise to the full ON position. ↘
8. Turn on all electric power to the appliance using the ON/OFF button.
9. Set the thermostat to desired setting.
10. Open a hot water tap. If the appliance will not operate, follow the instructions "To Turn Off Gas To Appliance" and call your licensed professional or gas supplier. See manual for additional information.



TO TURN OFF GAS TO APPLIANCE

1. Set the thermostat to lowest setting.
2. Turn off all electric power to the appliance using the ON/OFF button.
3. Locate the manual gas valve on the side of the heater. Turn the manual valve clockwise to the full OFF position. ↗

6.3 Gas Pipe Sizing Reference Tables

The gas supply must be capable of handling the entire gas load required at the location. Gas line sizing is based on gas type, the pressure drop in the system, the gas pressure supplied, and gas line type. For gas pipe sizing in the United States, refer to the *National Fuel Gas Code, NFPA 54*, and/or *CSA B149.1*.

The below information is provided as an example. The appropriate table from the applicable code must be used.

1. For some tables, you will need to determine the cubic feet per hour of gas required by dividing the gas input by the heating value of the gas (available from the local gas company). The gas input needs to include all gas products at the location and the maximum BTU usage at full load when all gas products are in use.
2. Use the table for your gas type and pipe type to find the pipe size required. The pipe size must be able to provide the required cubic feet per hour of gas or the required BTU/hour.

Example:

The heating value of natural gas for your location is 1000 BTU/FT³. The gas input of the CHS19980REC is 199,000 BTU/HR. Additional appliances at the location require 65,000 BTU/hr. Therefore the cubic feet per hour = (199,000 + 65,000) / 1000 = 264 FT³/HR. If the pipe length is 10 feet then the 3/4 inch pipe size is capable of supplying 264 FT³/HR of natural gas.

$$(CFH) = \frac{\text{Gas Input of all gas products (BTU/HR)}}{\text{Heating Value of Gas (BTU/FT}^3)}$$

Table 7: Pipe Sizing Table - Natural Gas

Length	Pipe Size (inches)			
	3/4	1	1 1/4	1 1/2
10	273	514	1,060	1,580
20	188	353	726	1,090
30	151	284	583	873
40	129	243	499	747
50	114	215	442	662
60	104	195	400	600
70	95	179	368	552
80	89	167	343	514
90	83	157	322	482
100	79	148	304	455

Table 8: Pipe Sizing Table - Propane Gas

Length	Pipe Size (inches)			
	1/2	3/4	1	1 1/4
10	291	608	1,150	2,350
20	200	418	787	1,620
30	160	336	632	1,300
40	137	287	541	1,110
50	122	255	480	985
60	110	231	434	892
80	101	212	400	821
100	94	197	372	763

6.4 Connect Electricity

⚠ WARNING

- **DO NOT** use an extension cord or adapter plug with this appliance.
- The water heater must be electrically grounded in accordance with local codes and ordinances or, in the absence of local codes, in accordance with the National Electrical Code, ANSI/NFPA No. 70.
- The water heater is equipped with a three-prong (grounding) plug for your protection against shock hazard and should be plugged directly into a properly grounded three-prong receptacle. **DO NOT** cut or remove the grounding terminal from this plug. This appliance includes an integrated junction box for hard wire or three-prong plug.

6.4.1 Guidelines

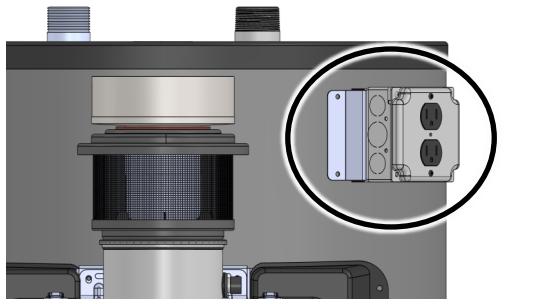
When connecting the power supply, follow these guidelines:

- **DO NOT** rely on the gas or water piping to ground the water heater. Ground locations are provided inside the tankless water heater and inside the provided junction box.
- The water heater requires 120 VAC, 60 Hz power from a properly grounded circuit.
- When using the 6 ft. (1.8 m) power cord (included with tankless water heater), plug it into the provided 3 prong 120 VAC, 60 Hz properly grounded outlet or hard wire to the integrated junction box.
- The water heater wiring diagram is located on the inside of the water heater front cover.

6.4.2 Instructions

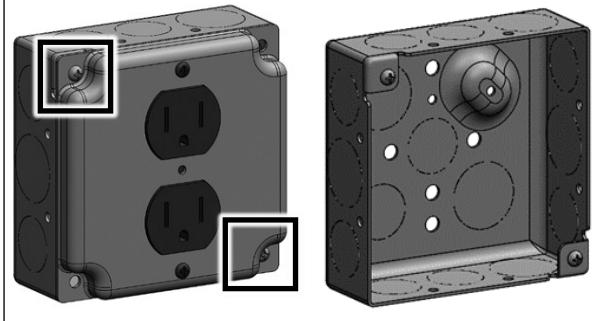
1. Locate the electric conduit on the side of the water heater (Figure 22).

Figure 22



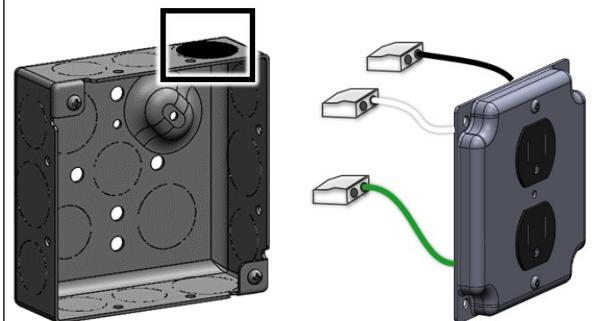
2. Remove the two screws around the outlet cover. Remove the outlet cover and prewired outlet (Figure 23).

Figure 23



3. Remove the desired knockout along the perimeter of the electric box for conduit installation (Figure 24).

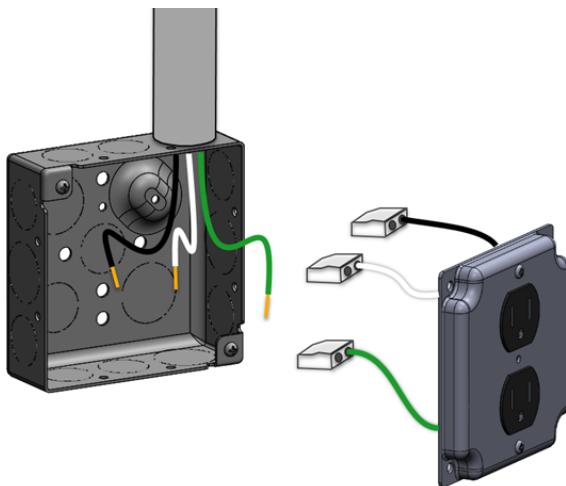
Figure 24



4. Install conduit into the knockout opening and pull the green, white and black wires into the box.

5. Strip the green, white, and black field supplied wires 1/2 in. Make sure the conductors are completely bare (Figure 25).

Figure 25

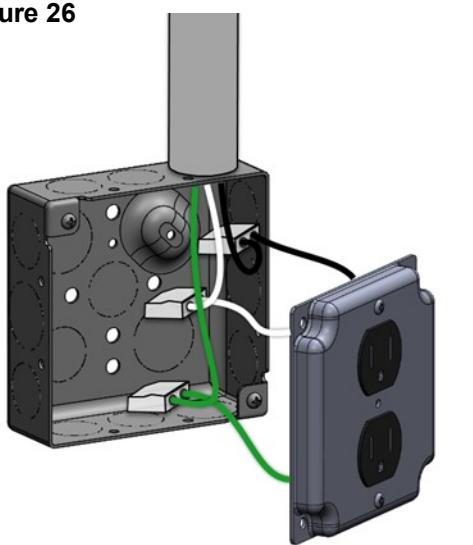


6. Match the wire colors, then grip the wire firmly and push the conductor into open port of the push in connector (Figure 26).

NOTE

Use only one conductor per port. Verify conductor is fully inserted to the back of the connector.

Figure 26



6.5 Checklist for Gas and Electricity

<input type="checkbox"/>	A manual gas control valve is placed in the gas line to the water heater.
<input type="checkbox"/>	Check the gas lines and connections for leaks.
<input type="checkbox"/>	Confirm that the gas inlet pressure is within limits.
<input type="checkbox"/>	Confirm that the water heater is rated for the gas type supplied.
<input type="checkbox"/>	Confirm that the electricity is supplied from a 120 VAC, 60 Hz power source and is in a properly grounded circuit.
<input type="checkbox"/>	Confirm that an extension cord or an adapter plug has NOT been used with the water heater.

7. Configure Parameter Settings

7.1 Instructions



WARNING DO NOT adjust parameter settings unless specifically instructed to do so.

To adjust the parameters:

1. Locate the PC Board (lower right side of unit).
2. Locate the two push buttons (A and B) on the PC Board.
3. Press the "A" button for 1 second.
4. Use the ▲ (Up) and ▼ (Down) buttons on the controller to select a setting number.

Figure 27

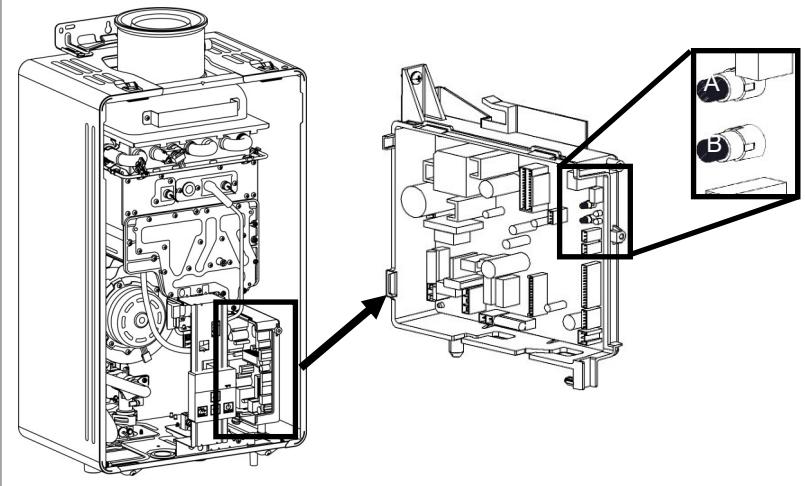
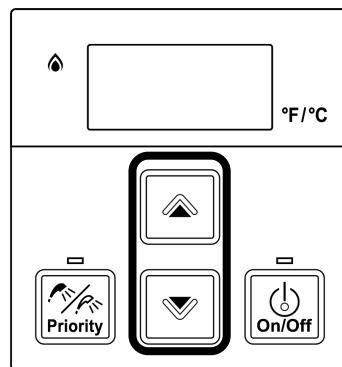


Figure 28



5. Once the desired setting number is selected, use the "On/Off" button on the controller to change the selection for the setting number.
6. To exit the parameters, press the "A" button for 1 second.

Table 9: Parameter Settings

Parameter Number	Setting Item	A	B	C	d
2	High Altitude	0 - 2,000 ft (0 - 610 m)	2,001 - 5,400 ft (610 - 1,646 m)		
3*	Service Soon	Disable	0.5 Year	1 Year	2 Years
10**	Gas Type	LPG	NG		
50***	Retrofit Application	Disable (Default)	Enable		

* See Section "7.2 Service Indicator (Service Soon, 55)" for more information on Service Soon.

** Factory set. Only used with approved conversion kit.

*** Factory set. Do not adjust unless instructed by Technical Support.

7.2 Service Indicator (Service Soon, SS)

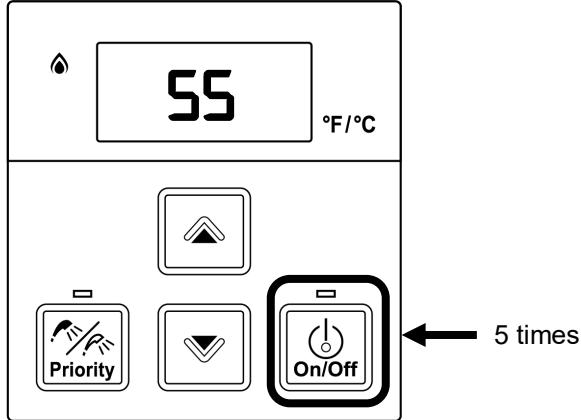
This water heater includes a service indicator (Service Soon, SS). When selected in the parameter settings, an SS code will display on the controller indicating that it is time to flush and service the water heater.

- Selection is installers preference based on water conditions or other factors that may influence the suggested interval of service.
- If Service Soon (SS) appears on the controller display, contact your local service provider to flush and service the water heater.
- Service Soon will appear again based on the selected service interval.

Figure 29

To Reset Service Soon (SS)

Press the ON/OFF button 5 times.



NOTE: Service Soon (SS) will display on the controller again when the water heater reaches the interval selected in the parameter settings.

8. System Plumbing

Topics in this section

- Pressure Relief Valve Requirements
- Temperature - PRV Requirements
- Typical Installations
- Piping Diagram for Basic Installations
- Piping Diagram for Multiple Unit Installations
- Connect the Water Heater to the Water Supply
- Plumbing Checklist

8.1 PRV Requirements

An approved pressure relief valve (PRV) (preinstalled) is required by the *American National Standard (ANSI Z21.10.3)* for all water heating systems and shall be accessible for servicing.

DO NOT

- DO NOT plug the PRV and do not install any reducing fittings or other restrictions in the PRV line. The relief line should allow for complete drainage of the valve and the line.
- DO NOT place any other type valve or shutoff device between the PRV and the water heater.

MUST DO

- The PRV must comply with the standard for *Relief Valves and Automatic Gas Shutoff Devices for Hot Water Supply Systems ANSI Z21.22* and /or the standard *Temperature, Pressure, Temperature and Pressure Relief Valves and Vacuum Relief Valves, CAN1-4.4*.
- The PRV must be rated up to 150 psi and to at least the maximum BTU/hr of the appliance.
- The discharge from the PRV should be individually piped to the ground or into a drain system per local codes.
- The PRV must be manually operated once a year to check for correct operation.
- The PRV is installed near the tankless hot water outlet according to the manufacturer's instructions. DO NOT place any other type valve or shut off device between the PRV and the water heater.



WARNING Water discharged from the PRV could cause severe burns instantly or death from scalds.

- If a PRV 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 PRV.

8.2 T&P Relief Requirements

Install the Temperature-Pressure Relief (T&P) Valve according to these instructions. The tank portion of this system is provided with a combination T&P Relief Valve. For safe operation of the water heater, the relief valve(s) must not be removed from its designated point of installation or plugged.

An approved T&P Relief Valve is required by the *American National Standard (ANSI Z21.10.3)* for all water heating systems, and shall be accessible for servicing.

DO NOT

- DO NOT plug the T&P Relief valve and do not install any reducing fittings or other restrictions in the relief line. The relief line should allow for complete drainage of the T&P Relief valve and the line.
- DO NOT place any other type valve or shut off device between the PRV and the water heater.
- DO NOT pipe T&P Relief valve and/or PRV together into a common pipe.

MUST DO

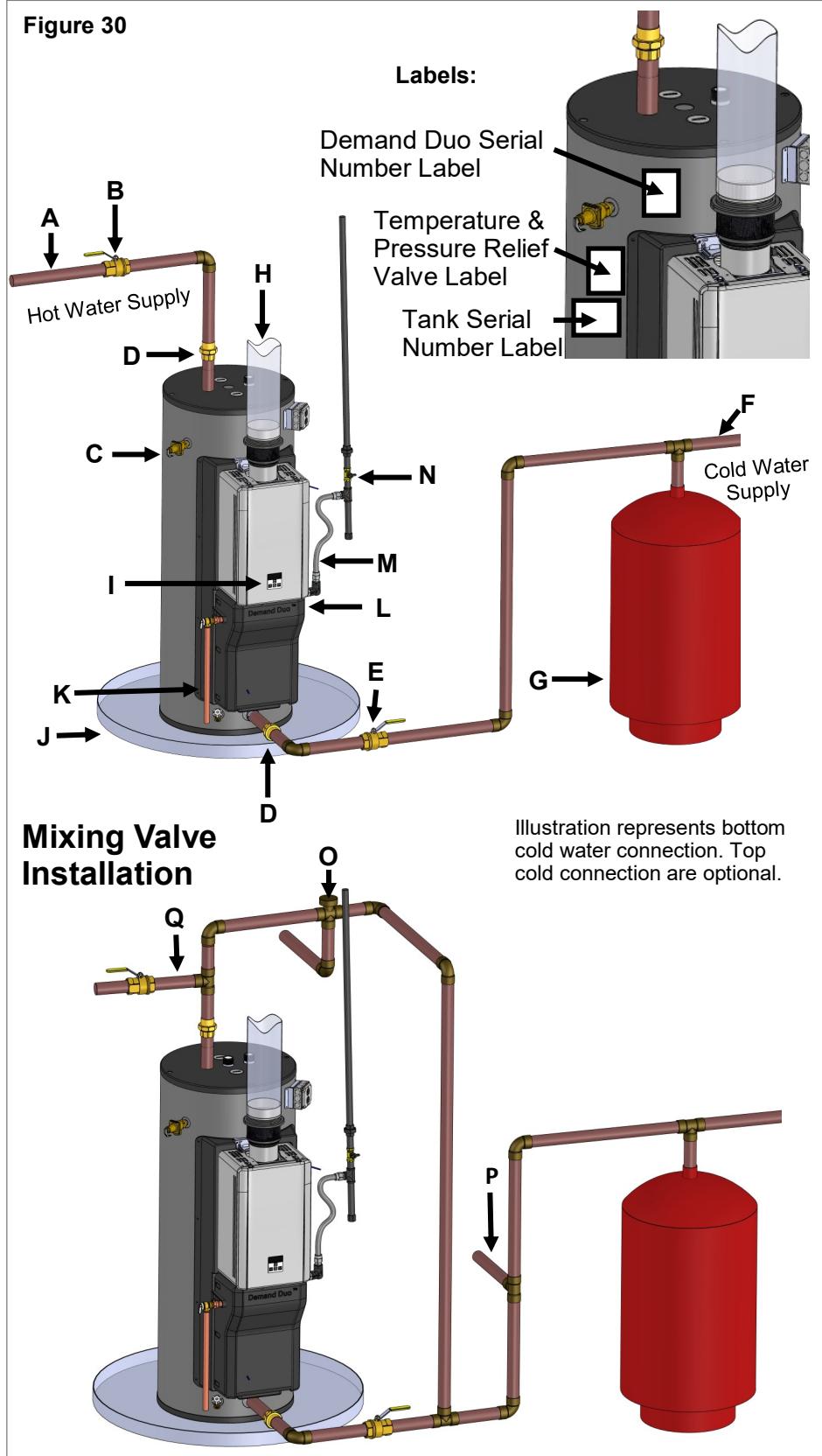
- The T&P Relief valve must comply with the standard for *Relief Valves and Automatic Gas Shutoff Devices for Hot Water Supply Systems ANSI Z21.22* and /or the standard *Temperature, Pressure, Temperature and Pressure Relief Valves and Vacuum Relief Valves, CAN1-4.4*.
- The T&P Relief valve must be rated up to 150 psi and to at least the maximum BTU/hr of the appliance.
- The discharge from the T&P Relief valve should be individually piped to the ground or into a drain system to prevent exposure or possible burn hazards to humans or other plant or animal life. Follow local codes. Water discharged from the relief valve could cause severe burns instantly, scalds, or death.
- The T&P Relief valve must be manually operated once a year to check for correct operation.

8.3 Typical Installations

A	Hot Water Outlet	*
B	Hot Water Outlet Valve	*
C	Temperature-Pressure Relief Valve	
D	Cold and Hot Unions	*
E	Cold Water Supply Valve	*
F	Cold Water Supply	*
G	Thermal Expansion Tank	*
H	6 in. B-Vent	*
I	Operation Unit / Temperature Control	
J	Drain Pan	*
K	Pressure Relief Valve Discharge Pipe (do not cap, plug, or reduce)	
L	Drip Leg (Sediment Trap) (<i>Not Shown</i>)	
M	Gas Union	
N	Gas Valve	*
O	Thermostatic Mixing Valve	*
P	Non-Tempered Return Line	*
Q	Non-Tempered Supply Line	*

* Field Supplied

Figure 30



8.4 Piping Diagram for Basic Installations

Single Unit Circulation

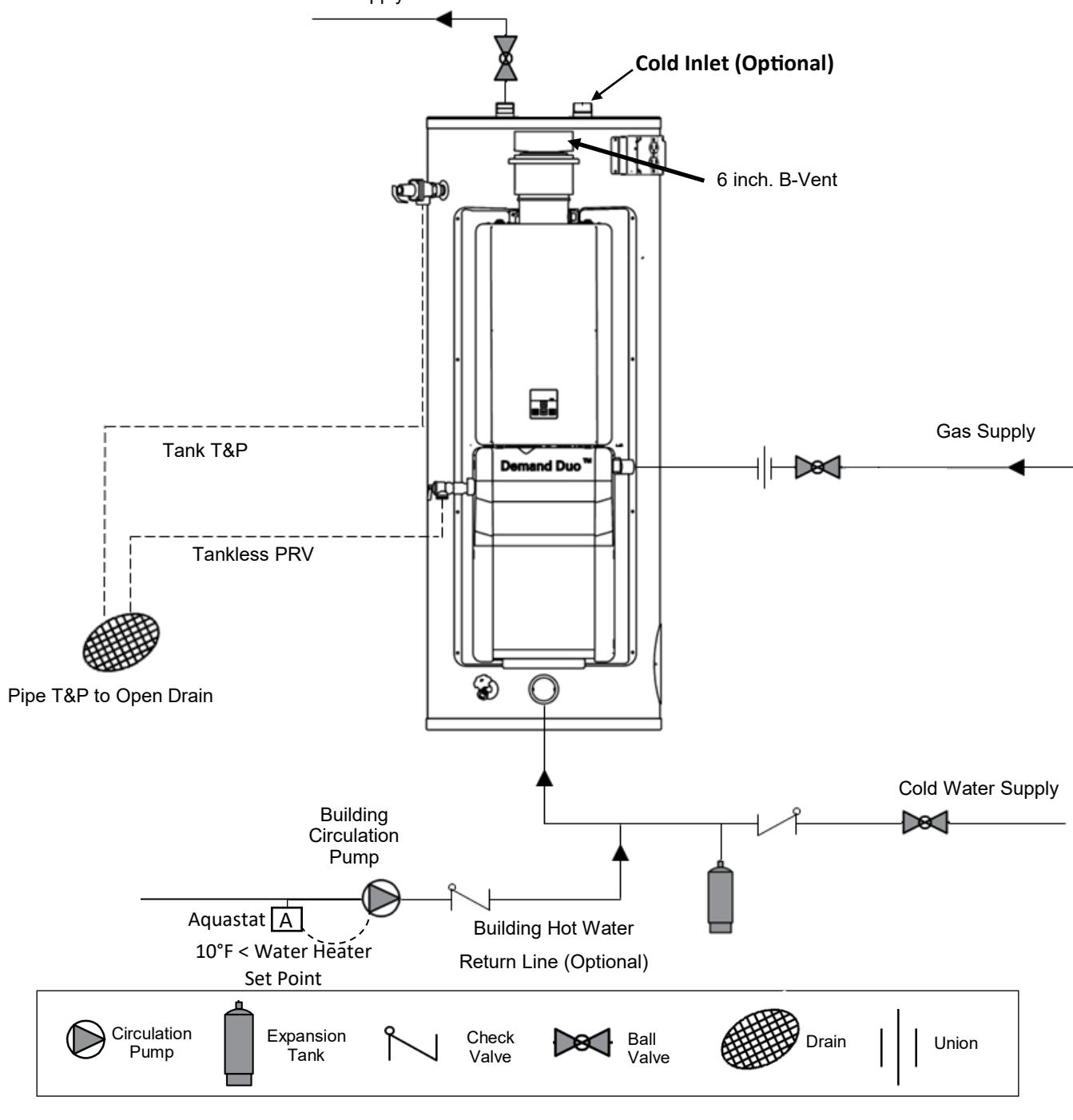
Note:

Installation must conform to applicable codes and all requirements listed in this manual. Balancing valves, equivalent piping, pressure gauges, and temperature gauges are to be used as necessary to ensure proper flow between units.

All components shall be selected for the pressure and temperature rating of the installation.

Figure 31

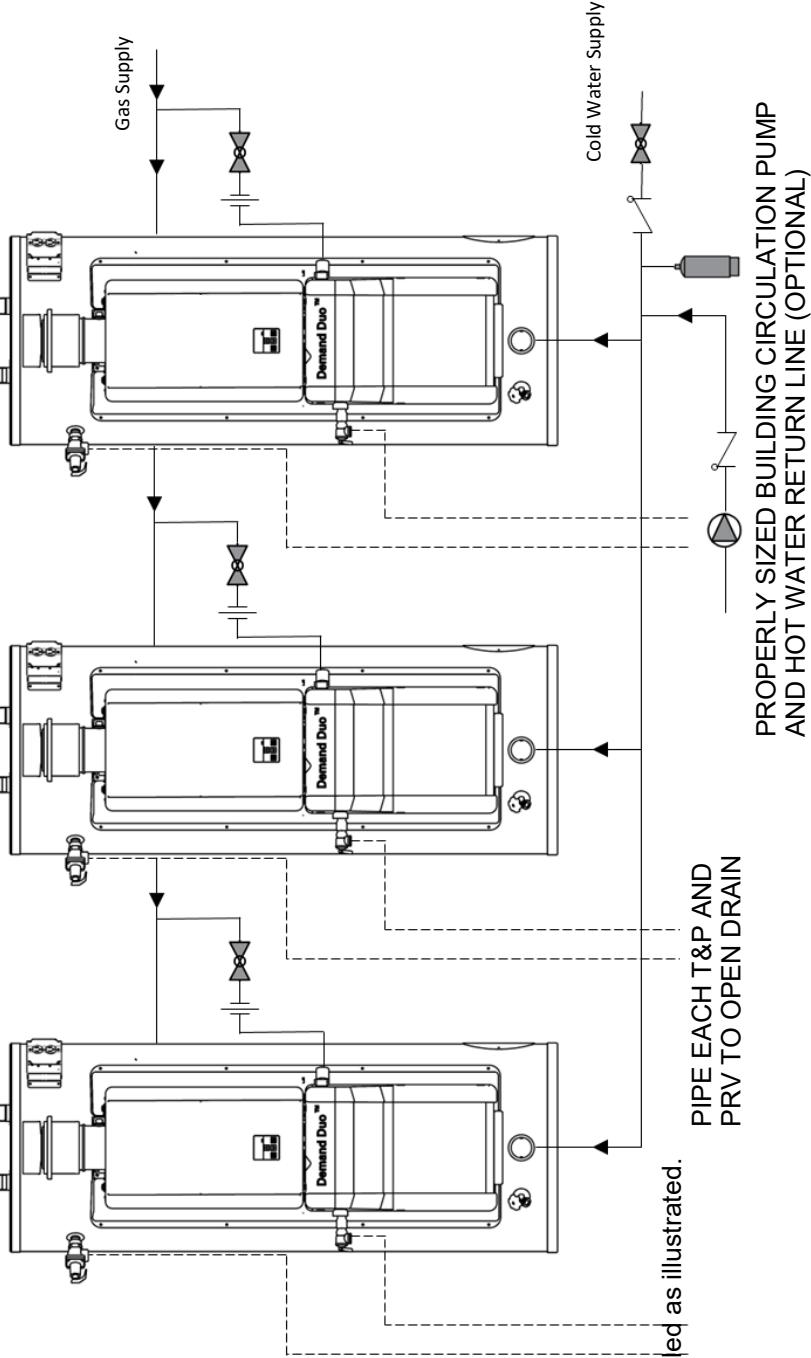
Hot Water Supply Line



8.5 Piping Diagram for Multiple Unit Installations

Figure 32

Hot Water Supply Line
Alternate connection
for cold water supply.



Notes:

- Installation must conform to applicable code and all requirements listed in the installation manual. Balancing valves, equivalent piping, pressure gauges, and temperature gauges are to be used as necessary to ensure proper flow between units.
- Common venting of this Category 1, fan-assisted appliance is permitted. Consult the latest version of the National Fuel Gas Code (ANSI Z223.1/NFPA 54, and/or CSA B149.1).
- **IMPORTANT;** Piping must be completed in parallel (first in / Last out) configuration.

8.6 Connect the Water Heater to the Water Supply

Water connections to the water heater should follow all state and local plumbing codes. If this is a standard installation, refer to section "8.4 Piping Diagram for Basic Installations."

1. Use of this layout should provide a trouble-free installation for the life of the water heater. Before making the plumbing connections, locate the **COLD** water inlet and the **HOT** water outlet.
 - The **COLD** water inlet is a 1.5 in. MNPT fitting on the lower portion of the tank or at the top right side of the tank. Install a shut-off valve close to the water heater in the cold water line.
 - The **HOT** water outlet is a 1.5 in. MNPT fitting located at the top of the tank. It is recommended that unions be installed in the cold and hot water lines so that the water heater can be easily disconnected, if servicing is required.
2. When assembling the hot and cold piping, use a good, food grade pipe joint compound, and ensure all fittings are tight. It is imperative that open flame is not applied to the inlet and outlet fittings, as heat will damage or destroy the plastic lined fittings. **This will result in premature failure of the fittings, which is not covered by the warranty.**

8.6.1 Filling the System

DO NOT OPERATE THIS WATER HEATER UNLESS IT IS COMPLETELY FULL OF

WATER. To prevent damage to the water heater, all air must be relieved from the system and a hot water fixture must be flowing water before the water heater is plugged in and turned on. If air is not relieved, then pump may not operate properly.

To ensure safe and effective operation of the water heater, use the following filling procedure. To fill the water heater:

1. Ensure the drain valve located at the bottom of the tank is closed.
2. Open the nearest hot water fixture in the plumbing system.
3. Open the cold water supply valve to the water heater.
4. Keep the hot water fixture open until the tank is filled and constant flow is obtained at the fixture.
5. Check water heater connections and plumbing system for damage or leaks. Repair if needed.

8.7 Plumbing Checklist

<input type="checkbox"/>	Ensure that hot and cold water lines are not crossed to the unit and are leak free.
<input type="checkbox"/>	Ensure that a pressure relief valve is installed with a rating that exceeds the BTU input of the water heater model. Refer to the rating plate on the side of the water heater for BTU input.
<input type="checkbox"/>	Clean the inlet water filter by closing the cold and hot water inlet isolation (shut-off) valves below the tankless water heater. Put a bucket under the filter at the bottom of the water heater to catch any water that is contained inside the unit. Unscrew the water filter. Rinse the filter to remove any debris. Install the filter and open the isolation valves.
<input type="checkbox"/>	Ensure any issues regarding water quality have been properly addressed.

WARNING

DO NOT OPERATE THIS WATER HEATER UNLESS IT IS COMPLETELY FULL OF WATER.

9. Post-Installation Checklist

<input type="checkbox"/>	The water heater is not subject to corrosive compounds in the air. Corrosive fumes, sometimes found in hair/ nail salons, spas, or other industries exposed to toxic fumes, may be released through vents when not in operation. Chemicals that are corrosive in nature should not be stored or used near the water heater or vent termination.
<input type="checkbox"/>	The water supply does not contain chemicals or exceed total hardness that will damage the heat exchanger.
<input type="checkbox"/>	Balanced system piping for multiple units.
<input type="checkbox"/>	Building recirculation pump is sized correctly.
<input type="checkbox"/>	System check valves are installed for recirculation circuit.
<input type="checkbox"/>	Clearances from the water heater unit are met.
<input type="checkbox"/>	Clearances from the vent termination are met.
<input type="checkbox"/>	A manual gas control valve has been placed in the gas line to the water heater.
<input type="checkbox"/>	Ensure that a pressure relief valve is installed with a rating that exceeds the BTU input of the water heater model. Refer to the rating plate on the side of the water heater for BTU input.
<input type="checkbox"/>	Clean the inlet water filter by closing the cold and hot water inlet isolation (shut-off) valves. Put a bucket under the filter at the bottom of the water heater to catch any water that is contained inside the unit. Unscrew the water filter. Rinse the filter to remove any debris. Install the filter and open the isolation valves.
<input type="checkbox"/>	Check the gas lines and connections for leaks.
<input type="checkbox"/>	Visually inspect all connections to the tank and assembly for leaks.
<input type="checkbox"/>	Confirm that the gas inlet pressure is within limits.
<input type="checkbox"/>	Confirm that the water heater is rated for the gas type supplied.
<input type="checkbox"/>	Confirm that the electricity is supplied from a 120 VAC, 60 Hz power source, is in a properly grounded circuit, and turned on.
<input type="checkbox"/>	Verify the temperature controller is functioning properly.
<input type="checkbox"/>	Verify that parameter setting 02 is set correctly for your altitude. Maximum altitude is 5,400 ft.
<input type="checkbox"/>	Using Diagnostic Code 01 (Reference section "11.1 Diagnostic Codes"), confirm recovery flow rate is between 3-4 GPM.
<input type="checkbox"/>	Verify the system is functioning correctly by connecting your manometer to the gas pressure test port on the water heater. Operate all gas appliances in the facility at high fire. The inlet gas pressure at the water heater must not drop below that listed on the rating plate.
<input type="checkbox"/>	Install the front panel.
<input type="checkbox"/>	Explain to the customer the operation of the water heater, safety guidelines, maintenance, and warranty.
<input type="checkbox"/>	The installation must conform with local codes or, in the absence of local codes, with the <i>National Fuel Gas Code, ANSI Z223.1/NFPA 54</i> , or the <i>Natural Gas and Propane Installation Code, CSA B149.1</i> .
<input type="checkbox"/>	Leave Installation and Operation Manual taped to the water heater, or give both manuals directly to the owner.

10. Operation

Topics in this section

- Safety Precautions
- Control Panel
- Basic Operation Settings

10.1 Safety Precautions

⚠ 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.
- Before operating, smell all around the appliance area for gas. Be sure to smell next to the floor because some gas is heavier than air and will settle on the floor.
- WHAT TO DO IF YOU SMELL GAS
 - **DO NOT** try to light any appliance.
 - **DO NOT** touch any 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.

⚠ WARNING

- If you install this water heater in an area that is known to have hard water or that causes scale build-up, the water must be treated and/or the heat exchanger flushed regularly.

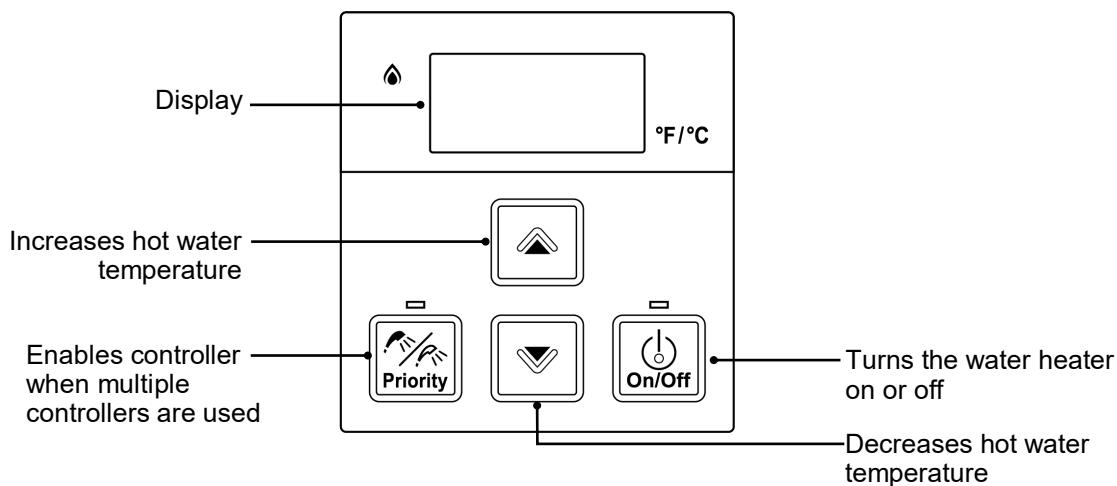
Rinnai offers a "Scale Control System" that provides superior lime scale prevention and corrosion control by feeding a blend of control compounds into the water supply. Damage and repair due to corrosive compounds in the air is not covered by warranty.

- Keep the air intake location free of chemicals such as chlorine or bleach that produce fumes. These fumes can damage components and reduce the life of your appliance. Damage and repair due to scale in the heat exchanger is not covered by warranty.

- Keep the area around the appliance clear and free from combustible materials, gasoline, and other flammable vapors and liquids.
- Always check the water temperature before entering a shower or bath.
- **DO NOT** use this appliance if any part has been under water. Immediately call a licensed professional to inspect the appliance and to replace any part of the control system and any gas control which has been under water.
- Should overheating occur or the gas supply fail to shut off, turn off the manual gas control valve to the appliance.
- **DO NOT** adjust the parameter settings unless specifically instructed to do so.
- **DO NOT** use an extension cord or an adapter plug with this appliance.
- Any alteration to the appliance or its controls can be dangerous and will void the warranty.

10.2 Control Panel

Figure 33



10.2.1 Temperatures Available with a Controller

A temperature lower than 120°F (49°C) can be obtained at the tap by mixing with cold water.

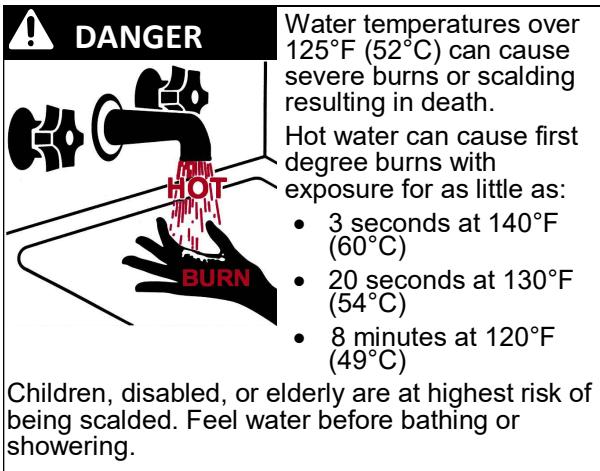
To change the temperature scale from Celsius to Fahrenheit or vice versa, press and hold the "On/Off" button for 5 seconds while the water heater is OFF.

Table 10: Available Temperature Settings

Temperature Settings Available													
Fahrenheit °F	120	125	130	135	140	145	150	155	160	165	170	175	180
Celsius °C	48.9	51.7	54.4	57.2	60	62.8	65.5	68.3	71.1	73.9	76.7	79.4	82.2

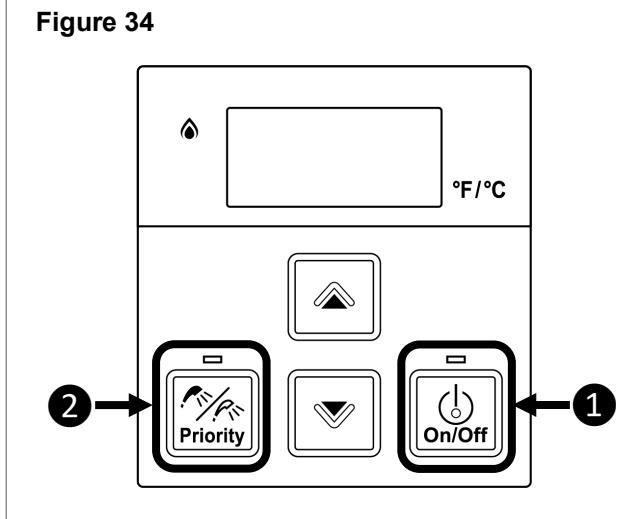
10.3 Basic Operation Settings

10.3.1 Setting the Temperature



1. If the water heater is off, press the On/Off button to turn on.
2. If the Priority light is off, then press the "Priority" button on the temperature controller. The green Priority light will glow indicating that this controller is controlling the temperature and that the water heater is ready to supply hot water. (The priority can only be changed while no hot water is running.)

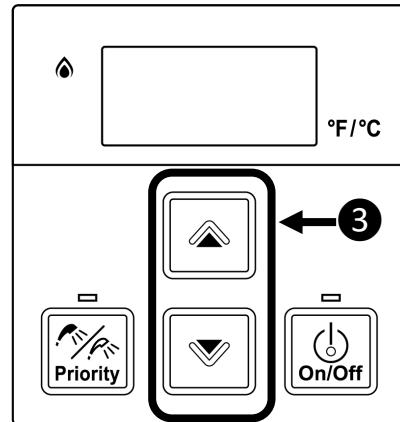
Figure 34



3. Press the ▲(Up) or ▼(Down) buttons to obtain the desired temperature setting.

The temperature can only be changed when the "In Use" light is off.

Figure 35



IMPORTANT

- Check local codes for the maximum water temperature setting allowed when used in nursing homes, schools, day care centers, and all other public applications.
- There may be a variation between the temperature displayed on the temperature controller and the temperature at the tap due to weather conditions or the length of pipe to the water heater.
- For applications that require less than 120°F, install thermostatic mixing valve.

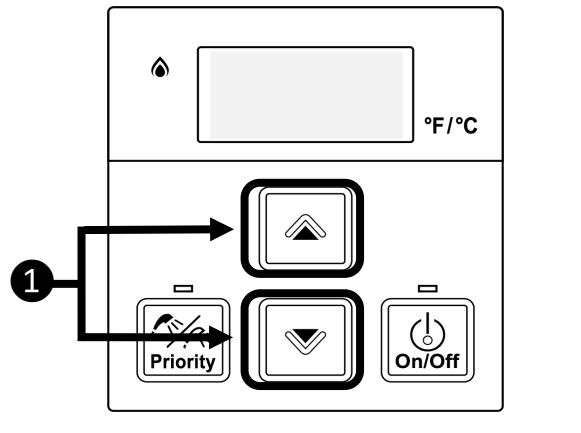
10.3.2 Setting the Controller to Mute

To eliminate the beeps when keys are pressed follow the steps below.

1. Press and hold both the ▲ (Up) and ▼ (Down) buttons at the same time until a beep is heard (approximately 5 seconds). Then, release both buttons.

To turn on the beeps, repeat the above steps.

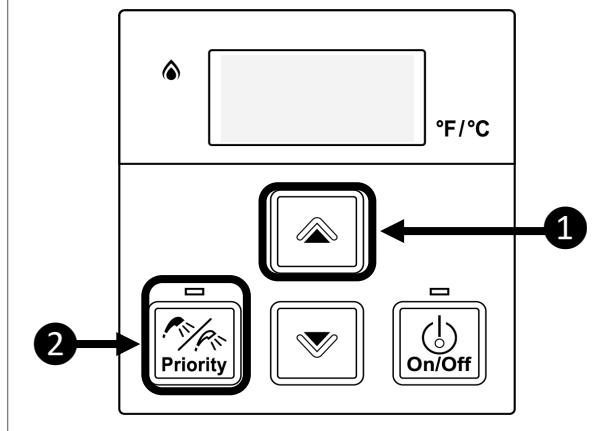
Figure 36



10.3.3 Locking the Controller

1. To lock the controller, press and hold down the “Priority” button.
2. While holding down the “Priority” button, press the ▲ (Up) button until a beep is heard (approximately 5 seconds). Then, release both buttons at the same time.

Figure 37



3. **LOC** appears in the display indicating the controller is locked.

→ **NOTE**

The display flashes between **LOC** and the set temperature to indicate the controller is locked.

To unlock the controller, follow the above steps.

11. Maintenance

Topics in this section

- Diagnostic Codes

Anodes

The storage tank is equipped with two magnesium anodes designed to extend the life of the storage tank. Slowly consumed over time, the anode protects the glass-lined tank from corrosion. It is strongly recommended to inspect the anodes every two (2) years. If more than half of the anodes have been consumed, they should be replaced.

The longevity of the storage tank can be reduced when a water softener is introduced to fight hard water. Sodium salts added by a softener can make the water extremely conductive; therefore, the anodes are consumed at a faster rate. In such conditions, the anodes should be inspected on a yearly basis.

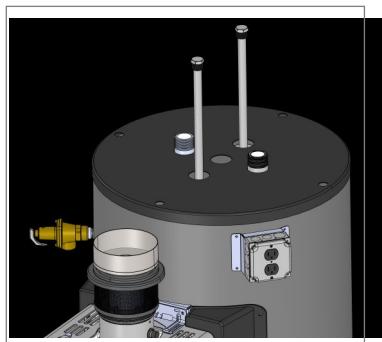
In certain conditions, the anodes may react with the water, producing discolored or smelly water. The most common complaint is hot water that smells like rotten eggs. This is the result of the reaction between the anode and hydrogen sulphide gas dissolved in the water, which is common in well systems. This issue can usually be eliminated or reduced by changing the magnesium anodes to aluminum anodes and by chlorinating the storage tank and plumbing system. If the problem continues, special filtration equipment may be required. Under no circumstances are the anodes to be removed from the water heater on a permanent basis.

Removal of the anodes will lead to premature failure of the water heater and will void the warranty.

Anode

Replacement Procedure

1. Remove plastic caps.
2. With 1-1/8 in. socket wrench, remove the anode.



Storage Tank

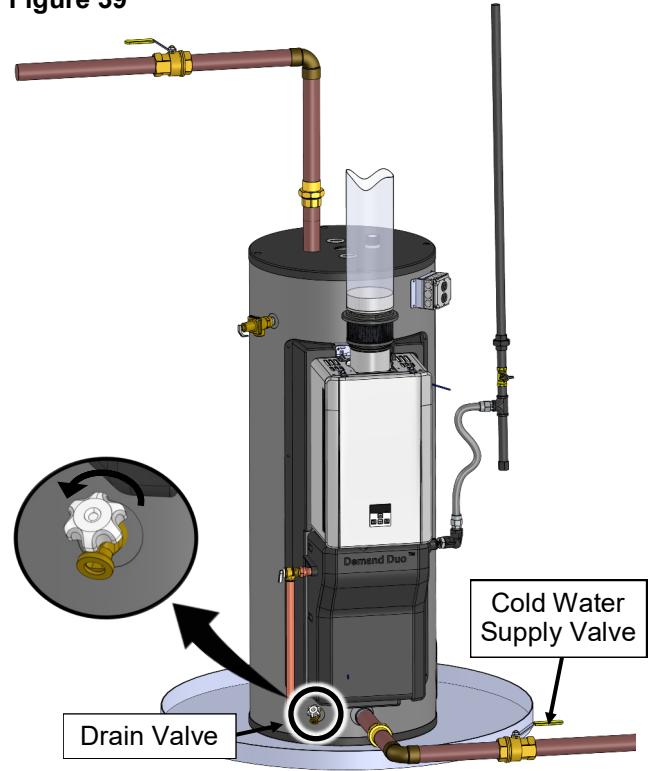
Drain water through the drain valve at least once a year. This will remove excess sediment from the bottom of the tank. This sediment, if allowed to accumulate, will reduce the efficiency and the life of the tank.

Draining the Storage Tank

To completely drain the storage tank:

1. Turn the power "OFF" to the system by disconnecting power to the system. (The system will not be fully shut down by simply pressing the power button on the controller.)
2. Close the cold water supply manual shut-off valve.
3. Connect one end of a garden hose to the storage tank drain valve and put the other end next to a free-flowing drain.
4. Open the drain valve by turning the knob counter clockwise. ↘
5. Open a hot water faucet to allow air into the system.

Figure 39



Note: The cold water inlet can be installed either at top or bottom of unit.

Cleaning and Inspecting the (IFEC) Air Filter

INSPECTION:

- To maintain optimum performance, periodically inspect the air filter.
- If the air filter appears to have lint and/or dust build up, follow the cleaning procedure described below.
- If the air filter appears damaged, contact a trained and qualified professional for a replacement air filter assembly.

CLEANING:

1. Power OFF the water heater. Push the "On/Off" button located on the right-hand side of the controller. The display will go blank when the power is off.
2. Vacuum lint or debris from the surface of the vent screen.
3. Power ON the water heater.

Temperature Controller

Use a soft damp cloth to clean the temperature controller. DO NOT use solvents.

Lime/Scale Build-Up

Scale build-up is caused by hard water and can be accelerated if the water heater is set at a high temperature. Refer to section "11. Maintenance" ("Flushing the Heat Exchanger" section). Refer to section "4.3.1 Water Quality Guidelines" to determine if your water needs to be treated or conditioned. The water must be potable, free of corrosive chemicals, sand, dirt, or other contaminates. It is up to the installer to ensure the water does not contain corrosive chemicals, or elements that can affect or damage the heat exchanger. Water that contains chemicals exceeding required levels, affect and damage the heat exchanger. Replacement of the heat exchanger due to water quality damage is not covered by the warranty.

Water Filters

Clean the inlet water filter by closing the cold and hot water inlet isolation (shut-off) valves. Put a bucket under the filter at the bottom of the water heater to catch any water that is contained inside the unit. Unscrew the water filter. Rinse the filter to remove any debris. Install the filter and open the isolation valves.

Pressure Relief Valves

Operate the pressure relief valve manually once a year. In doing so, it will be necessary to take precautions with regard to the discharge of potentially scalding hot water under pressure. Ensure discharge has a safe place to flow. Contact with your body or other property may cause damage or harm.

WARNING

Testing the pressure relief valve should only be performed by a trained and qualified professional. Water discharged from the pressure relief valve could cause severe burns instantly or death from scalds.

Visual Inspection of Flame

Verify proper operation after servicing. The burner must flame evenly over the entire surface when operating correctly. The flame must burn with a clear, blue, stable flame. See the parts breakdown of the burner for the location of the view ports.

The flame pattern should be as shown in the images below:

Figure 40  **SATISFACTORY**

FRONT VIEW

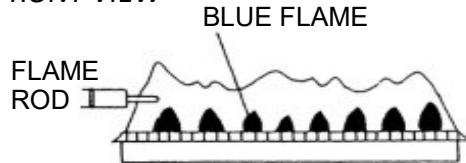
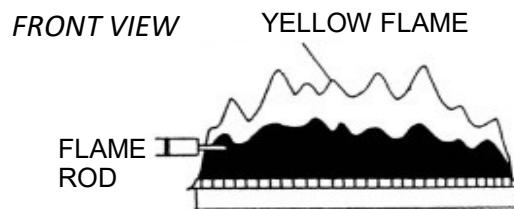


Figure 41  **UNSATISFACTORY**

FRONT VIEW



Flushing the Heat Exchanger

This water heater includes a service indicated/reminder (Service Soon, SS). When selected in the parameter settings, an SS code will display on the controller indicating that it is time to flush and service the water heater. An LC diagnostic code also indicates the unit is beginning to lime up and must be flushed. Failure to flush the appliance will cause damage to the heat exchanger. Damage caused by lime build-up is not covered by the water heater's warranty. Rinnai strongly recommends installation of isolation valves to allow for flushing of the heat exchanger.

1. Turn power on at the controller.
2. Disconnect electrical power from the source.
3. Close the shutoff valves on both the hot water and cold water lines (V3 and V4).
4. Connect pump outlet hose (H1) to the cold water line at isolation valve (V2).
5. Connect drain hose (H3) to the hot water line at isolation valve (V1).
6. Pour four gallons of undiluted virgin, food grade, white vinegar into pail.
7. Place the drain hose (H3) and the hose (H2) to the pump inlet into the cleaning solution.
8. Open both isolation valves (V1 and V2) on the hot water and cold water lines.
9. Restore power to the water heater for 20-30 sec. (this will open the water flow servo).
10. Disconnect electric power from the source.
11. Operate the pump and allow the vinegar to circulate through the water heater for at least 1 hour at a rate of four gallons per minute (15.1 liters per minute).
12. Turn off the pump.
13. Rinse the vinegar from the water heater as follows:
 - A. Remove the free end of the drain hose (H3) from the pail. Place in sink or outside to drain.
 - B. Close isolation valve (V2) and open shutoff valve (V4). DO NOT open shutoff valve (V3).
 - C. Allow water to flow through the water heater for five minutes.

D. Close shutoff valve (V4). When unit has finished draining remove the in-line filter at the cold water inlet and clean out any residue. Place filter back into unit and open valve (V4).

E. Close isolation valve (V1) and open shutoff valve (V3).

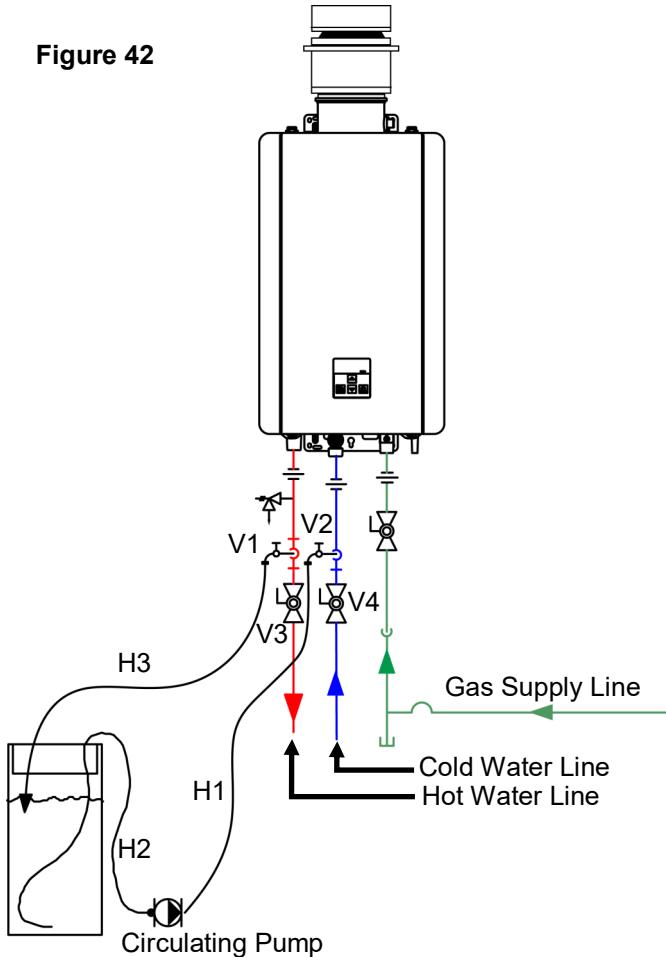
14. Disconnect all hoses.

15. Restore electrical power to the water heater.

NOTE

Scale build-up will affect the performance of the water heater. Water should be treated. Rinnai offers water conditioning solutions that provide superior lime scale prevention and corrosion control by feeding a blend of scale control compounds into the cold water supply.

Figure 42



11.1 Performance Data

To Display Performance Data

1. Press and hold the ▼(Down) button.
2. While holding the ▼(Down) button for 2 seconds, press and hold the “On/Off” button (hold both buttons simultaneously) (Figure 43)
3. Use the ▲(Up) and ▼(Down) buttons to scroll to the desired information described in Table 11: Performance Data Table.
4. To exit performance data, repeat step 2 above.
5. When complete, the set temperature appears in the display.

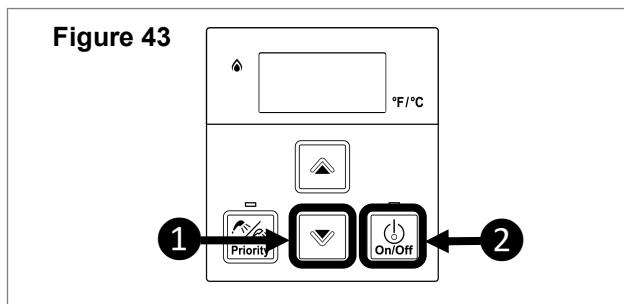


Table 11: Performance Data

No.	Data	Unit
01	Water Flow Rate	0.1gal/min
02	Outgoing Temperature	°F
03	Combustion Hours	x100 Hours
04	Combustion Cycles	*
05	Fan Frequency	Hz
06	Additional Controllers Connected	*
07	Water Flow Control Position	0=Mid, 1=Open, 2=Closed
08	Inlet Thermistor Temperature	°F
09	Fan Current	10mA
11	HEX Outlet Temperature	°F
12	Bypass Flow Control Position	Degrees of opening
19	Pump Hours	x100 Hours
20	Pump Cycles	*
30	Upper Tank Thermistor Temperature	°F
31	Lower Tank Thermistor Temperature	°F

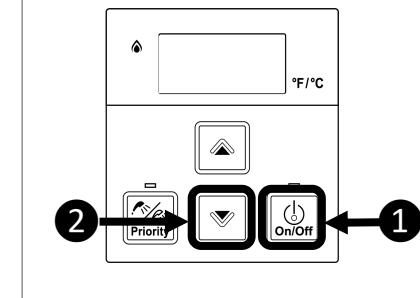
11.2 Diagnostic Codes

This water heater is designed to display diagnostic codes. If there is a potential operation concern, refer to the code and remedy in this section.

To Display Diagnostic Information

1. Turn off the water heater by pressing the “On/Off” button.
2. Press and hold the “On/Off” for 2 seconds and then the ▲ (Up) button simultaneously.
3. The last nine maintenance codes display and flash one after the other.
4. To exit diagnostic codes and return the water heater to normal operation, press and hold the “On/Off” button for 2 seconds and then the ▲(Up) button simultaneously.
5. Turn on the water heater by pressing the “On/Off” button.

Figure 44



WARNING

Some of the checks below should be performed by a licensed professional. Owners should never attempt any action that they are not qualified to perform.

10 Air Supply or Exhaust Blockage

- Confirm exhaust vent / flue is not blocked.
- Confirm Intake Filter Exhaust Connector (IFEC) is not blocked or dirty.
- Check all vent components for proper connections.
- Ensure approved venting materials are being used.
- Check fan for blockage.
- Verify High Altitude setting is set properly.

11 No Ignition (Heater Not Turning On)

- Check that the gas is turned on at the water heater, meter, or cylinder.
- If the system is propane, make sure that gas is in the tank.
- Ensure appliance is properly grounded.
- Ensure gas type and pressure are correct.
- Ensure gas line, meter, and/or regulator is sized properly.
- Bleed all air from gas lines.
- Verify dip switches are set properly.
- Ensure igniter is operational.
- Check igniter wiring harness for damage.
- Check gas solenoid valves for open or short circuits.
- Remove burner cover and ensure all burners are properly seated.
- Remove burner plate and inspect burner surface for condensation or debris.
- Check the ground wire for the PC board.

12 No Flame

- Check that the gas is turned on at the water heater, gas meter, or cylinder.
- Check for obstructions in the flue outlet.
- If the system is propane, make sure that gas is in the tank.
- Ensure gas line, meter, and/or regulator are sized properly.
- Ensure gas type and pressure are correct.
- Bleed all air from gas lines.
- Ensure proper venting material was installed.
- Check power supply for loose connections.
- Check power supply for proper voltage and voltage drops.
- Ensure flame rod wire is connected.
- Check flame rod for carbon build-up.
- Disconnect and reconnect all wiring harnesses on unit and PC board.
- Check for DC shorts at components.
- Check gas solenoid valves for open or short circuits.
- Remove burner plate and inspect burner surface for condensation or debris.

14	Thermal Fuse
	<ul style="list-style-type: none"> • Check for restrictions in air flow around unit and vent terminal. • Check gas type of unit and ensure it matches gas type being used. • Check for low water flow in a circulating system causing short-cycling. • Check for foreign materials in combustion chamber and/or exhaust piping. • Check heat exchanger for cracks and/or separations. • Check heat exchanger surface for hot spots which indicate blockage due to scale build-up. Refer to instructions in manual for flushing heat exchanger. • Hard water must be treated to prevent scale build up or damage to the heat exchanger. • Measure resistance of safety circuit. • Ensure high fire and low fire manifold pressure is correct. • Check for improper conversion of product.
15	Over Temperature Warning
	<p>(Safety shutdown because unit is too hot)</p> <ul style="list-style-type: none"> • Check for restrictions in air flow around unit and vent terminal. • Check for low water flow in a circulating system causing short-cycling. • Check for foreign materials in combustion chamber and/or exhaust piping. • Check for blockage in the heat exchanger.
19	Electrical Grounding
	<ul style="list-style-type: none"> • Check all components for electrical short.
32	Outgoing Water Temperature Sensor
	<ul style="list-style-type: none"> • Check sensor wiring for damage. • Measure the resistance of the sensor. (See Electrical Diagnostics) • Clean sensor of scale build-up. • Replace sensor if necessary.
33	Heat Exchanger Outgoing Temperature Sensor
	<ul style="list-style-type: none"> • Check sensor wiring for damage. • Measure resistance of sensor. • Replace sensor.
34	Combustion Air Temperature Sensor
	<ul style="list-style-type: none"> • Check for restrictions in air flow around unit and vent terminal. • Check sensor wiring for damage. • Measure resistance of sensor. • Clean sensor of scale build-up. • Ensure fan blade is tight on motor shaft and is in good condition. • Replace sensor.
35	Upper Tank Temperature Sensor
	<ul style="list-style-type: none"> • Check sensor wiring for damage. • Measure resistance of sensor. (See Electrical Diagnostics) • Replace sensor if necessary.
36	Lower Tank Temperature Sensor
	<ul style="list-style-type: none"> • Check sensor wiring for damage. • Measure resistance of sensor. (See Electrical Diagnostics) • Replace sensor if necessary.
51	Inlet water temperature thermistor
	<ul style="list-style-type: none"> • Check sensor wiring for damage. • Measure resistance of sensor. • Clean sensor of scale build-up. • Replace sensor.
52	Modulating Solenoid Valve Signal
	<ul style="list-style-type: none"> • Check modulating gas solenoid valve wiring harness for loose or damaged terminals. • Measure resistance of valve coil.
61	Combustion Fan
	<ul style="list-style-type: none"> • Ensure fan will turn freely. • Check wiring harness to motor for damaged and/or loose connections. • Measure resistance of motor winding.

63	Recirculation Low Flow	<ul style="list-style-type: none"> • Ensure the inlet water filter is clean and free of debris. • Ensure Parameter setting are correctly set for recirculation mode. • Ensure Pump supply voltage. • Ensure the wiring harness to the pump and PCB for damaged and/or loose connections. • Ensure air is removed from the recirculation line. 	LE #	Scale Build-up in Heat Exchanger (when checking maintenance code history, "00" is substituted for "LC")	<ul style="list-style-type: none"> • LC0~LC9 indicates that there is scale build up in the heat exchanger and that the heat exchanger needs to be flushed to prevent damage. Refer to the flushing instructions in the manual. Hard water must be treated to prevent scale build up or damage to the heat exchanger. <p>To operate the water heater temporarily until the heat exchanger can be flushed, push the "On/Off" button five times. Repeated LC codes will eventually lockout the water heater.</p>
65	Water Flow Control	The water flow control valve has failed to close during the bath fill function. Immediately turn off the water and discontinue the bath fill function. Contact a licensed professional to service the appliance.			
66	Bypass Flow Servo	<ul style="list-style-type: none"> • Measure the resistance values and voltage of the bypass servo valve.* • Ensure the harness and connector are not wet. • If the voltage from the PC Board is abnormal, replace the PC Board; otherwise, replace the bypass servo valve. 	55	Service Soon	<ul style="list-style-type: none"> • Clean inlet water supply filter. • On new installations ensure hot and cold water lines are not reversed. • Verify you have at least the minimum flow rate required to fire unit. • Check for cold to hot cross over. Isolate circulating system if present. • Turn off cold water to the unit, open pressure relief valve; if water continues to flow, there is bleed over in your plumbing. • Verify turbine spins freely. • Measure the resistance of the water flow control sensor. • If the display is blank and clicking is coming from the unit, disconnect the water flow servo motor (GY, BR, O, W, P, BL, R). If the display comes on then replace the water flow servo motor.
70	PC Board	<ul style="list-style-type: none"> • Check the connection harness at the connection on the PC board. Inspect for any damage. • Replace PC board. 	FF	Maintenance has been performed	Indicates a licensed professional performed maintenance or corrected an issue.
71	Solenoid Valve Circuit	Replace the PC Board.		No Code - Nothing happens when pump is activated	<ul style="list-style-type: none"> • Clean inlet water supply filter. • Verify you have at least the minimum flow rate required to fire unit. • Verify turbine spins freely. • Measure the resistance of the water flow control sensor.
72	Flame Sensing Device	Replace the PC Board.			
79	Water Leak Detected	Water has been detected at the bottom of the unit. Turn off water supply. Check all plumbing internally for leakage.			

12. Warranty

Limited Warranty for Demand Duo™ R Series - CHS199100REC / CHS19980REC

What is Covered?

The Rinnai Standard Limited Warranty covers any defects in materials or workmanship when the product is installed and operated according to Rinnai written installation instructions, subject to the terms within this Limited Warranty document. This Limited Warranty applies only to products that are installed correctly in the United States. Improper installation may void this Limited Warranty. It is recommended that a trained and qualified professional who has attended a Rinnai installation training class complete your installation. This Limited Warranty coverage, as set out in the table below, extends to the original purchaser and subsequent owners, but only while the product remains at the site of the original installation, and terminates if the product is moved or reinstalled at a new location.

Table 12: Warranty Period of Coverage

Item	Period of Coverage (from date of purchase)
	Commercial Applications Only
Heat Exchanger	8 years [1]
Storage Tank	6 years [1]
All Other Parts and Components	5 years
Reasonable Labor	1 year

[1] For commercial applications, the heat exchanger warranty is 8 years or 12,000 combustion hours, whichever occurs first.

Notes: From date of purchase, period of coverage is reduced to 8 years or 12,000 combustion hours, whichever occurs first, if the Rinnai Tankless Water Heater temperature settings exceed 160°F (71°C).

What Will Rinnai Do?

Rinnai will repair or replace the covered product or any part or component that is defective in materials or workmanship as set forth in the above table. Rinnai will pay reasonable labor charges associated with the repair or replacement of any such part or component during the term of the labor warranty period. All repair parts must be genuine Rinnai parts. All repairs or replacements must be performed by a qualified professional who is properly trained to do the type of repair.

Replacement of the product may only be authorized by Rinnai at its sole discretion. Rinnai does not authorize any person or company to assume for it any obligation or liability in connection with the replacement of the product. If Rinnai determines that repair of a product is not possible, Rinnai may replace the product with a comparable product at Rinnai's sole discretion. The warranty claim for product parts and labor may be denied if a component or product returned to Rinnai is found to be free of defects in material or workmanship; damaged by improper installation, use or operation; or damaged during return shipping.

How To Obtain Service

For the name of a trained and qualified professional, please contact your place of purchase, visit the Rinnai website (www.rinnai.us), call Rinnai at 1-800-621-9419 or write to Rinnai at 103 International Drive, Peachtree City, Georgia 30269.

Proof of purchase is required to obtain warranty service. You may show proof of purchase with a dated sales receipt, or by registering within 30 days of purchasing the product. To register your Rinnai Tankless Water Heater, please visit www.rinnai.us. For those without internet access, please call 1-800-621-9419. Receipt of registration by Rinnai will constitute proof-of-purchase for this product. Registration of product installed in new home construction may be verified with a copy of the closing papers provided by the initial home buyer. However, registration is not necessary in order to validate this Limited Warranty.

What Is Not Covered?

This Limited Warranty does not cover any failures or operating difficulties due to the following:

- Accident, abuse, or misuse
- Alteration of the product or any component part
- Misapplication of this product
- Improper installation (such as but not limited to)
 - Product being installed in a corrosive environment
 - Condensate damage
 - Improper venting
 - Incorrect gas type
 - Incorrect gas or water pressure
 - Absence of a drain pan under the appliance
- Water quality
- Improper maintenance (such as but not limited to scale build-up, freeze damage, or vent blockage)
- Incorrect sizing
- Any other cause not due to defects in materials or workmanship
- Problems or damage due to fires, flooding, electrical surges, freezing or any acts of God.
- Force majeure

There is no warranty coverage on product installed in a closed loop application, commonly associated with space heating only applications.

This Limited Warranty does not apply to any product whose serial number or manufacture date has been defaced.

This Limited Warranty does not cover any product used in an application that uses chemically treated water such as a pool or spa heater.

Limitation on Warranties

No one is authorized to make any other warranties on behalf of Rinnai America Corporation. Except as expressly provided herein, there are no other warranties, expressed or implied, including, but not limited to warranties of merchantability or fitness for a particular purpose, which extend beyond the description of the warranty herein.

Any implied warranties of merchantability and fitness arising under state law are limited in duration to the period of coverage provided by this Limited Warranty, unless the period provided by state law is less. Some states do not allow limitations on how long an implied Limited Warranty lasts, so the above limitation may not apply to you.

Rinnai shall not be liable for indirect, incidental, special, consequential or other similar damages that may arise, including lost profits, damage to person or property, loss of use, inconvenience, or liability arising from improper installation, service or use. Some states do not allow the exclusion or limitation of incidental or consequential damages, so the above limitation may not apply to you.

This Limited Warranty gives you specific legal rights, and you may also have other rights which vary from state to state.

www.rinnai.us/warranty

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