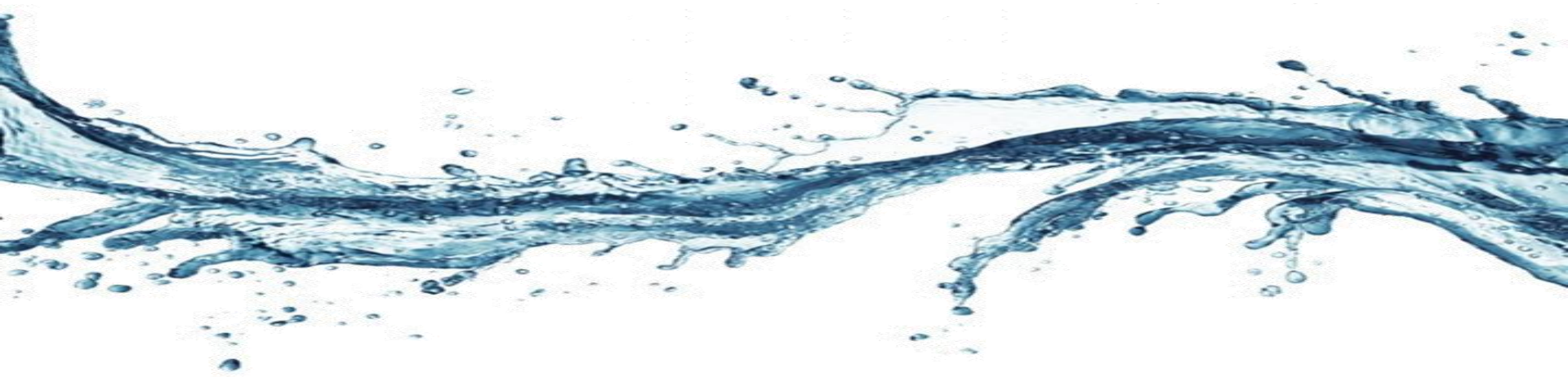


# Rinnai SENSEI™

## N-Series Condensing Tankless Water Heater Training Program

### Level II – Installation Fundamentals



# What is Rinnai's SENSEI™, N-Series Water Heater?

The Rinnai N-Series Water Heater is a condensing tankless water heater that has been designed specifically for the North American market in order to.....

.....Make Installation Easier

.....Increase Serviceability

..... All while maintaining the quality and reliability Rinnai is known for.



# What's New about Rinnai's SENSEI™, N-Series Water Heaters?

## Technical changes:

- Stainless Steel Heat Exchangers.
  - Primary and Secondary heat exchangers are stainless steel.
- Zero Governor Gas Valve.
  - The volume of gas supplied to the burner is directly proportional to the combustion air flow. This maintains the proper gas/air mixture at lower gas supply pressures or restricted intake / exhaust air flows.
- Sealed Pre-mix Turbo Combustion Fan.
  - More powerful fan that delivers pre-mixed gas and air to burner and allows for longer vent lengths.



# What's New about Rinnai's SENSEI™, N-Series Water Heaters?

## Technical changes:

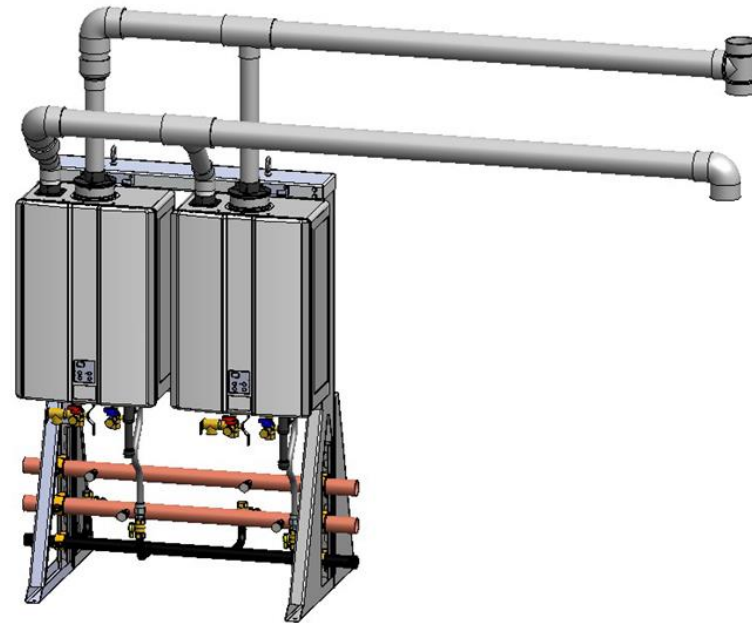
- Switching Venturi.
  - Adjusts combustion air flow at low Btu inputs to maintain efficiency.
- Integrated Vent Check Valve.
  - Internal vent check valve prevents air backflow into the water heater and allows for enhanced freeze protection and less complicated common vent installations. (internal between burner and fan assembly)
- Integrated Multi-Unit Controls (commercial models).
  - Simplifies multi-unit installations.



# What's New about Rinnai's SENSEI™, N-Series Water Heaters?

## Installation Changes:

- Multiple venting options / Longer Vent Lengths.
  - 2"x4" or 3"x5" Concentric Vent
  - 2" or 3" PVC/CPVC/PP Twin Pipe Vent
  - Increased termination location options
  - Room combustion air option
  - Common Vent (multiple configurations)
  - Internal vent check valve (for common vent and enhanced freeze protection)
  - Extended venting up to 150' equivalent length (vent diameter, vent type dependent)
- Adjustable Mounting Bracket.
  - increased installation flexibility



# What's New about Rinnai's SENSEI™, N-Series Water Heaters?

## Installation Changes:

- Simplified High Altitude Adjustment.
  - Altitude adjustments made through control panel (no dip switch adjustments).
- Isolation Valve Kit included with More Flexible Pressure Relief Valve Installation.
  - Isolation valve connections are separate from pressure relief valve connection.
- Wi-Fi Ready.
  - Easy installation of Wi-Fi module.
- Lowered Minimum Gas supply pressure
  - Minimum gas supply pressure as low as 3.5" W.C. (NG). 8.0" W.C. for LPG.



# What's New about Rinnai's SENSEI™, N-Series Water Heaters?

## Service Improvements:

- Easier Component Access.
  - Simplified components and revised placement allows for easier service access.
- Decreased Component Replacement Times.
  - Easier service access plus quick-disconnect fittings speed up component replacement.
- Streamlined Wire Harness.
  - Simplified components and component placement allows for a streamlined wire harness for a cleaner, more accessible cabinet.
- Quick Gas Type Conversions.
  - Zero Governor Gas Valve allows conversions to be accomplished easily and quickly by changing one part.



# What's New about Rinnai's SENSEI™, N-Series Water Heaters?

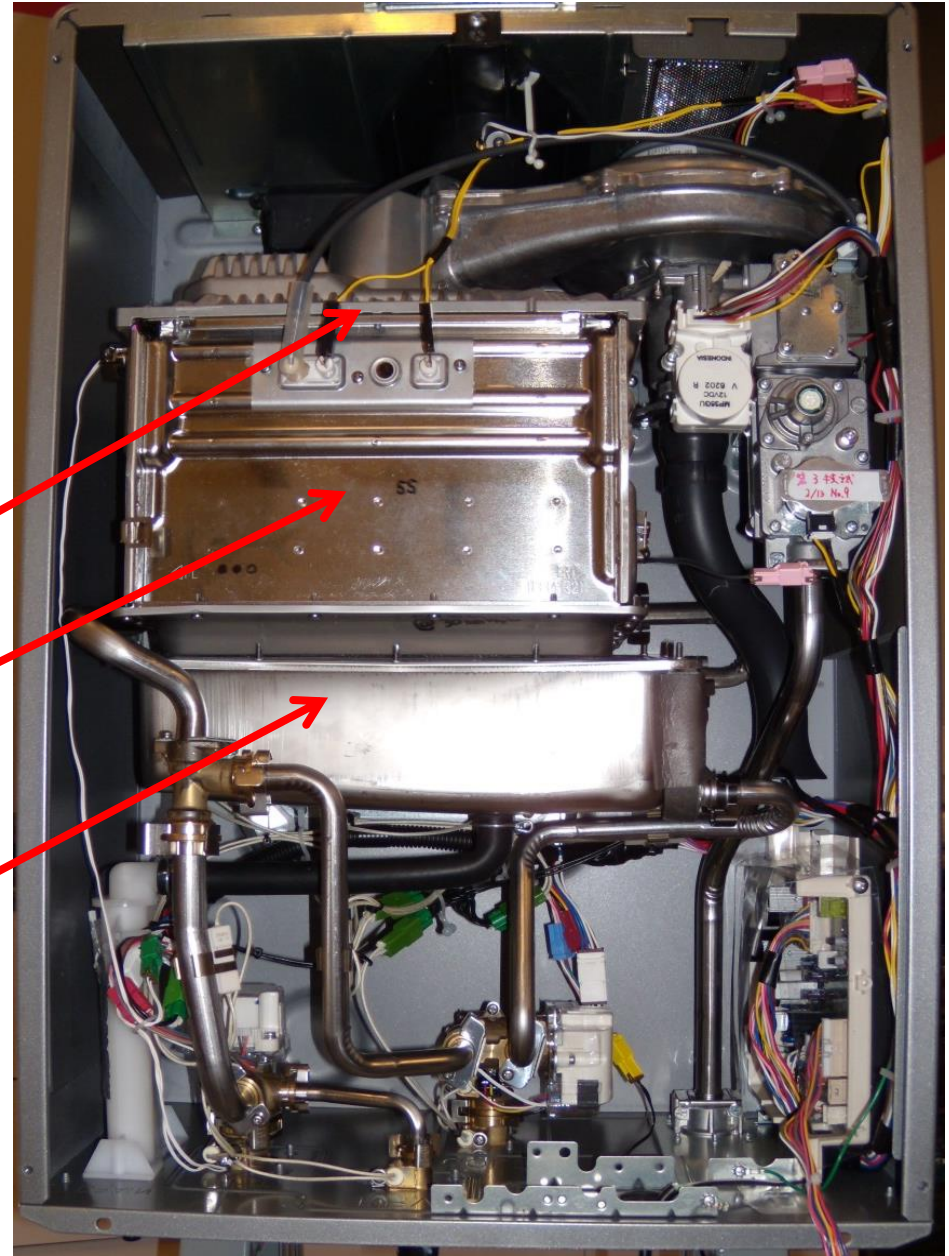
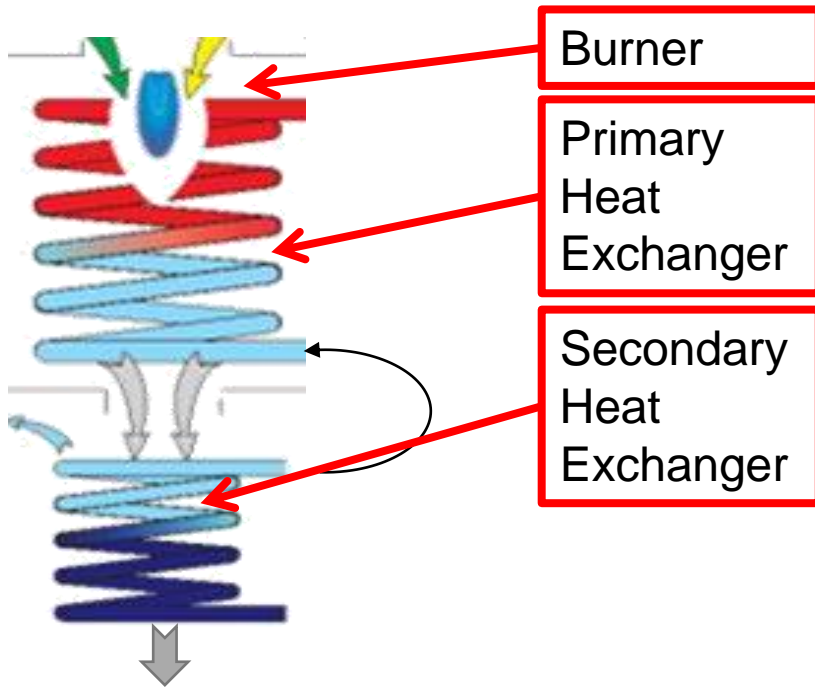
## Service Improvements:

- Built-in Insect / Debris Screen.
  - Screen at combustion air inlet helps keep insects and other debris out of the cabinet.
- Included Venting Bird Screen.
  - A bird screen is included for installations using PVC venting to keep birds / nests and other small animals out of the venting.
- Parts Commonality Among Models.
  - Many parts are interchangeable between models.



# Component Identification:

The SENSEI™, N-Series  
Condensing models have a down-  
firing burner with a secondary heat  
exchanger located at the bottom of  
the assembly.



# Component Identification:

Bug / Debris Screen

Sealed Pre-mix Turbo Fan

Switching Venturi

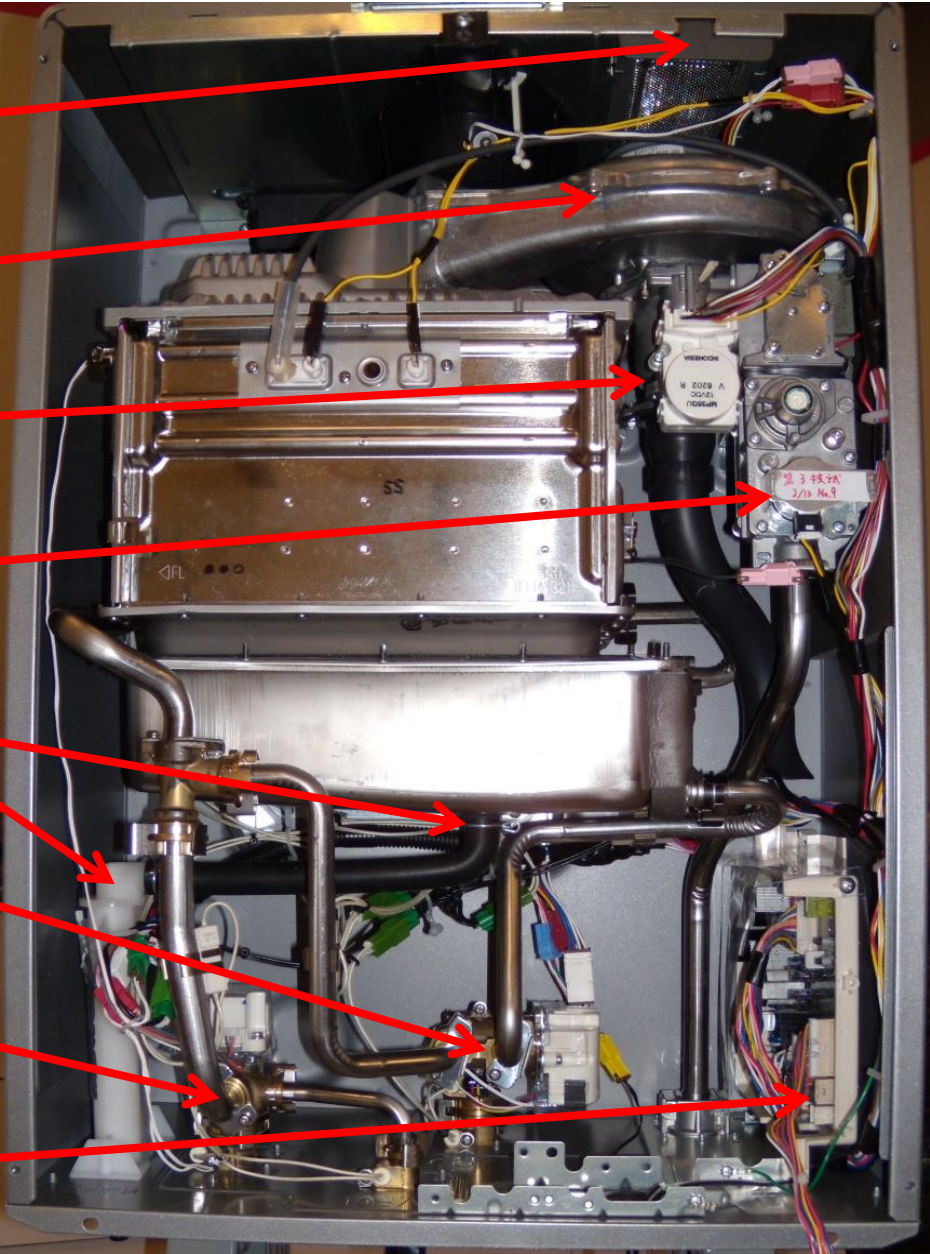
Zero Governor gas valve

Condensate drain and trap

Bypass Servo

Water flow Servo

Main Circuit Board



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# Rinnai Service and Support (800-621-9419)

- **CEC – Consumer Experience Center – general calls, consumer questions, etc.**

Available from 8 a.m. to 8 p.m. EST, Monday – Friday.

- **Parts Department – parts orders.**

Available from 8 a.m. to 8 p.m. EST, Monday – Friday.

- **Warranty Department – warranty claim issues.**

Available from 8 a.m. to 5 p.m. EST, Monday- Friday.

- **Technical Support Department – technical issues related to the function and repair of Rinnai products.**

Available in the office from 8 a.m. to 8 p.m. EST, Monday – Friday AND **24/7/365** on call support for technicians who are at the service location. **Technicians only, call 1-888-RINNAIS ( 888-746-6247)**

- **Engineering / Applications Department – calls related to product use and applications including sizing.**

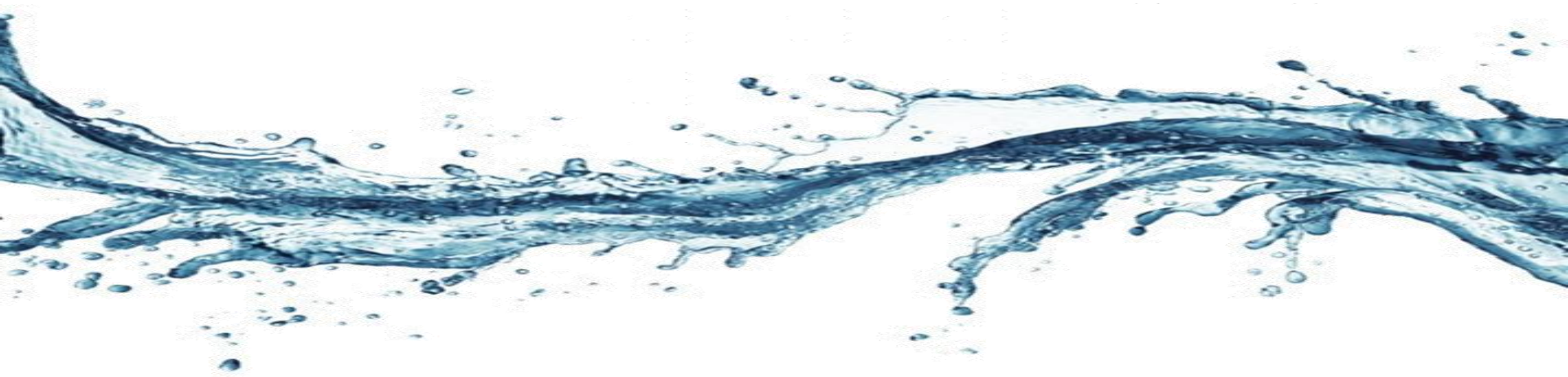
Available from 8 a.m. to 5 p.m. EST, Monday - Friday.

## Rinnai America also provides the following websites for support:

- [www.rinnai.us](http://www.rinnai.us) –for installation manuals, product specifications and supporting documents. More technical information is available in the “Partner Portal” section of the website. Registration is required for access.
- [www.trainingevents.rinnai.us](http://www.trainingevents.rinnai.us) – to register for Rinnai product training live and online classes and videos. Service manuals, installation manuals and other technical documents are available under the “Resources” section of the site.

# SENSEI™

## N-Series Models



# Residential:

## Models.

Model Designation	Full Model Number	Min Btu's	Max Btu's	Min Activation Flow Rate (approx.)	Max Flow Rate 30° Rise	Max Flow Rate 50° Rise	Max Flow Rate 70° Rise	Uniform Energy Factor (UEF)
<b>RU130i</b>	REU-N2025FF-US	15K	130K	0.4 GPM	6.6 GPM	5.0 GPM	3.5 GPM	.91
<b>RU130e</b>	REU-N2025W-US							
<b>RU160i</b>	REU-N2530FF-US	15K	160K	0.4 GPM	8.0 GPM	6.1 GPM	4.4 GPM	.92
<b>RU160e</b>	REU-N2530W-US							
<b>RU180i</b>	REU-N2934FF-US	15K	180K	0.4 GPM	9.0 GPM	6.9 GPM	4.9 GPM	.92
<b>RU180e</b>	REU-N2934W-US							
<b>RU199i</b>	REU-N3237FF-US	15K	199K	0.4 GPM	9.8 GPM	7.7 GPM	5.5 GPM	.93
<b>RU199e</b>	REU-N3237W-US							
<b>*RUR160i</b>	REU-NP2530FF-US	15K	160K	0.4 GPM	8.0 GPM	6.1 GPM	4.4 GPM	.92
<b>*RUR160e</b>	REU-NP2530W-US							
<b>*RUR199i</b>	REU-NP3237FF-US	15K	199K	0.4 GPM	9.8 GPM	7.7 GPM	5.5 GPM	.93
<b>*RUR199e</b>	REU-NP3237W-US							

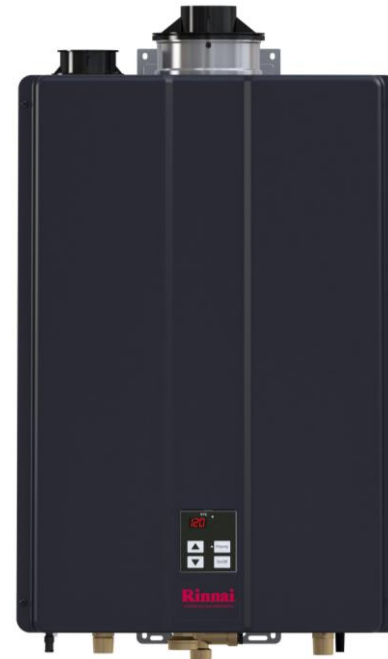
\*RUR models with ThermaCirc360™ integrated circulation pump and a thermal bypass valve allowing for hot water circulation in almost all homes.

# Commercial:

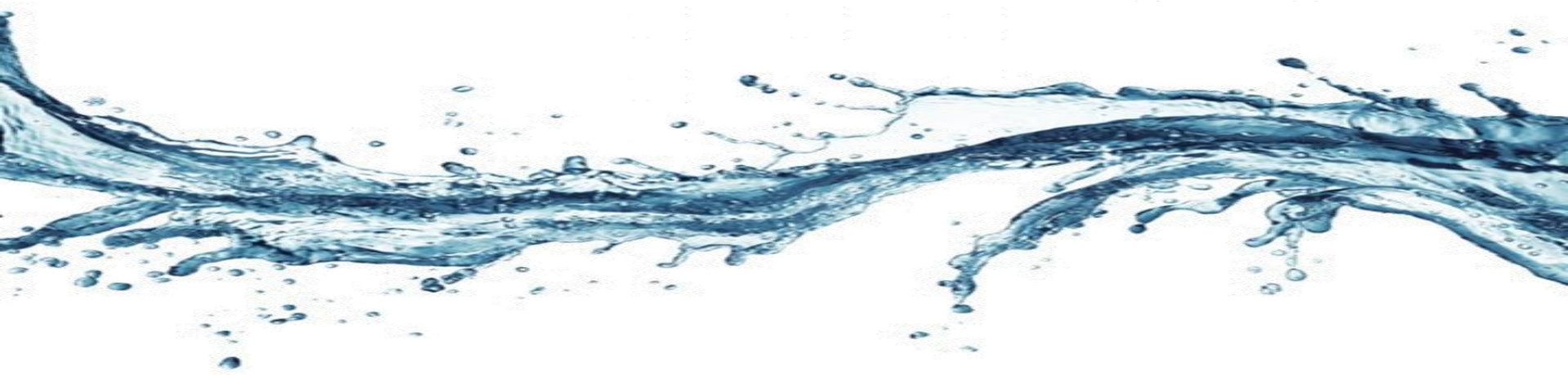
## Models.

Model Designation	Full Model Number	Min Btu's	Max Btu's	Min Activation Flow Rate (approx.)	Max Flow Rate 30° Rise	Max Flow Rate 50° Rise	Max Flow Rate 70° Rise	Uniform Energy Factor (UEF)
CU160i	REU-N2025FF-US	15K	160K	0.4 GPM	8.0 GPM	6.1 GPM	4.4 GPM	.92
CU160e	REU-N2025W-US							
CU199i	REU-N2530FF-US	15K	199K	0.4 GPM	9.8 GPM	7.7 GPM	5.5 GPM	.93
CU199e	REU-N2530W-US							

- CU160 and CU199 models are for commercial applications ONLY.

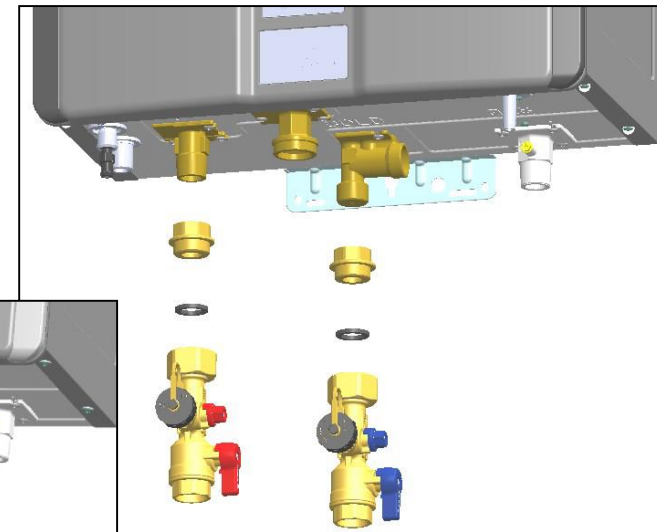
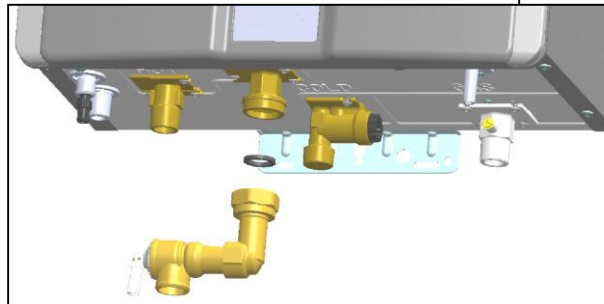


# Features



# Product Features:

- Rinnai SENSEI™, N-Series tankless water heaters have an activation flow rate as low as 0.4 gallons per minute and a minimum gas input rate as low as 15,000 Btu.
  - Deactivation flow rate is approximately 0.26 gpm.
- A temperature controller is included to allow selecting specific output water temperatures.
  - Maximum output temperature is limited to 120°F in the factory default configuration for residential models. This temperature limit can be increased to 140°F if allowed or needed (commercial models have a factory default max temperature of 140°F).
  - Temperature range for residential applications is 98°F to 140°F.
  - For commercial applications temperatures from 98°F up to 185°F can be obtained.
    - ❑ To obtain temperatures over 140°F for commercial applications a commercial temperature controller (MCC-91-2) will need to be connected..... or the C199/C160 commercial models will need to be installed.
    - ❑ The temperature can be displayed in Celsius.
- Isolation valve kit and pressure relief valve is included.
- All models are gas type convertible.
- Mobile and Modular home approved.
- All parts are replaceable.



# Product Features / Safety Devices:

- Child / function lock.
- Flame rod: Flame rod validates the presence of flame or indicates flame failure.
- Over heat bi-metal sensor.
- Integrated boiling protection.
- Built-in freeze protection to  $-22^{\circ}\text{F}$  for indoor units and  $-4^{\circ}\text{F}$  for outdoor units when protected from direct wind exposure (must have electrical power).
  - A freeze protection drain down kit can be installed to drain the water from the unit in case of a power failure or if the unit experiences a fault code while in the freeze protection mode. Units will require further manual draining for full freeze protection or winterization.
- Combustion fan senses blocked intake or exhaust flue.
- Direct electronic ignition (no standing pilot).
- Grounded (shorted) component detection.
- Service reminder notification.
- PC Board is protected by a glass fuse (fuse size will vary by model).
- Main components are monitored by the circuit board and will post an error code if a failure or abnormal operation is detected.

# Product Features: Circ-Logic™

- **Circ-Logic programming** (standard on all SENSEI™ models) offers a hot water circulation option for installations that utilize a circulation system with a dedicated circulation return line.
  - The RUR models can be used in applications that do not have a dedicated return line. This will be explained later in the presentation.
- **With Circ-Logic™, the water heater has the ability to power an external circulation pump\* and control the ON/OFF cycles of the pump.\*\***

## Circ-Logic™ has two modes of operation:

- Comfort Mode: Cycles the pump On and OFF based on a specific cycle.\*\* The comfort mode keeps the loop temperature closer to the water heater's set temperature. This mode can be used when higher loop temperatures are desired or with systems that have high heat loss.
- Economy Mode: Cycles the pump less often\*\* (half as often as the Comfort mode). This mode can be used where lower loop temperatures are acceptable or where the loop is well insulated and has minimal heat loss.

**These modes allow the consumer to customize their circulation system to suit their particular application as well as their comfort and efficiency preferences.**

\*For pump size and loop length limitations see the water heater installation manual or the Circ-Logic installation manual.

\*\*For pump cycle times see tables provided in the water heater installation manual or the Circ Logic installation manual.

# Product Features: Circ-Logic™

There are three basic methods of utilizing Circ-Logic™.

- 1. Internal Circ-Logic programming only.** With this method Circ-Logic will be active on a 24 hour per day basis. The pump ON/OFF cycles will be determined by the Economy or Comfort settings on the main circuit board and the water heater's set temperature.
- 2. Internal Circ-Logic programming in conjunction with a pump that incorporates a timer (Rinnai GTK15 kit).** With this method the pump's timer will allow the pump to operate only during certain times of the day and the Circ-Logic programming will cycle the pump on and off during those periods.
- 3. Internal Circ-Logic programming in conjunction with the Rinnai MC-195T timer controller.** This is similar to option #2 except the timers are incorporated into the MC-195T controller. The MC-195T timer settings allow the pump to operate only during the specified time periods and the Circ-Logic programming will cycle the pump on and off during those periods. The MC-195T has two separate timer programs plus the timers can be temporarily overridden if desired ( the MC-195T timer/controller is for use only with a pump that has no timer).

**NOTE: The recirculation mode cannot be used with the optional Bath Fill controller (BC-100) a hydronic heating system (such as an air handler) or with multiple Rinnai water heaters linked electronically.**

# Product Features: Circ-Logic™

The Rinnai GTK15 pump w/timer kit is designed to work in conjunction with the Rinnai Circ-Logic programming.

- The timer incorporated into the GTK15 pump allows the consumer to select what times of day the circulation system will be active.
- NOTE: If utilizing the Circ-Logic feature in conjunction with a pump that has no timer, the pump will operate based on the comfort or economy settings but will be active 24 hr/day basis.

Additionally, Rinnai offers a MC-195T timer/controller that takes over the timer functions plus adds additional features to further enhance circulation system operation. ( an external pump without a timer should be used when installing a MC-195T).



GTK15 pump kit



MC-195T timer/controller

# Product Features: RUR with ThermaCirc360™

The Rinnai RUR models with ThermaCirc360™, Circ-Logic programming include an integral circulation pump.

The RUR models can be installed in applications with or without a dedicated circulation return line.

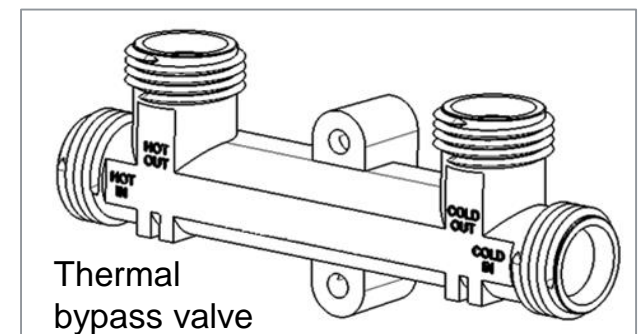
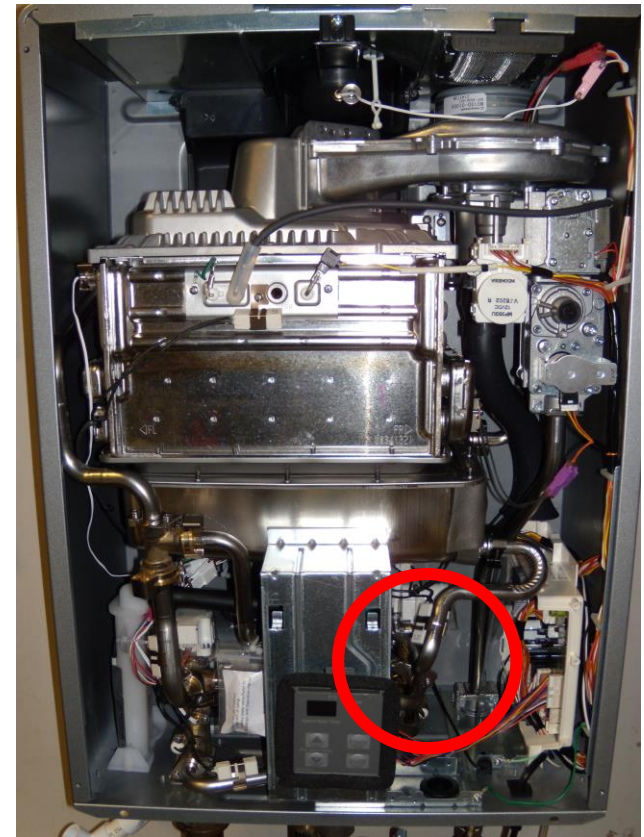
➤ Applications that do not have a dedicated return line will require the installation of a thermal bypass valve in the plumbing. This valve will be included with the RUR water heater.

To utilize ThermaCirc360™ either a MC-195T timer/controller or a Control-R™ Wi-Fi Module (not both) will need to be connected to the water heater.

➤ The MC-195T controller or the Wi-Fi Module (in conjunction with the Rinnai App) allows the user to set the timing and duration of circulation system operation.

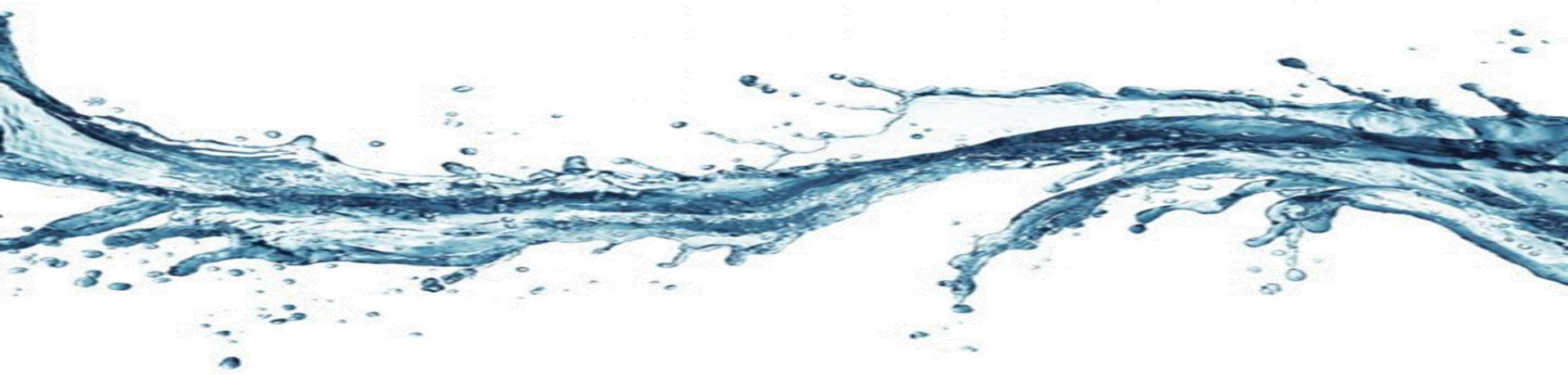
• The Circ-Logic programming built into the water heater will operate the pump during the active circulation periods.

➤ The Wi-Fi Module combined with optional wireless accessories can operate the Circ-Logic as an On-Demand circulation system (without the MC-195T timer/controller or Wi-Fi module connected, the water heater will operate but Circ-Logic will be disabled).



# Performance

(sizing and sequence of operation)

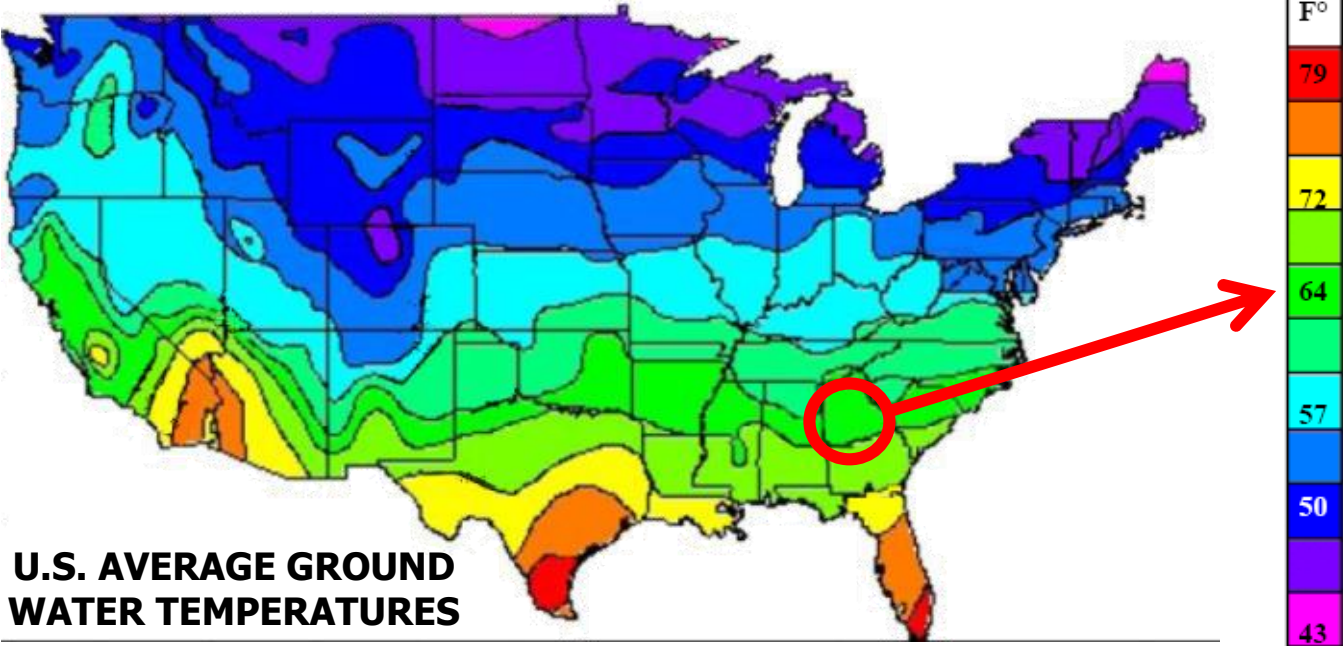


# Sizing: What is Delta T?

Delta T ( $\Delta T$ ) is the difference between the incoming water temperature and the water heater's set temperature. The maximum flow rate will depend on the Delta T.

EXAMPLE: A home located in the Atlanta GA area....

- The average ground water temperature is 64°
- Rinnai Tankless Water Heater's temperature is set to 120°
- Subtract the incoming water temperature from the water heater's set temperature to determine the  $\Delta T$ :  $120^\circ - 64^\circ = 56^\circ$



**U.S. AVERAGE GROUND WATER TEMPERATURES**

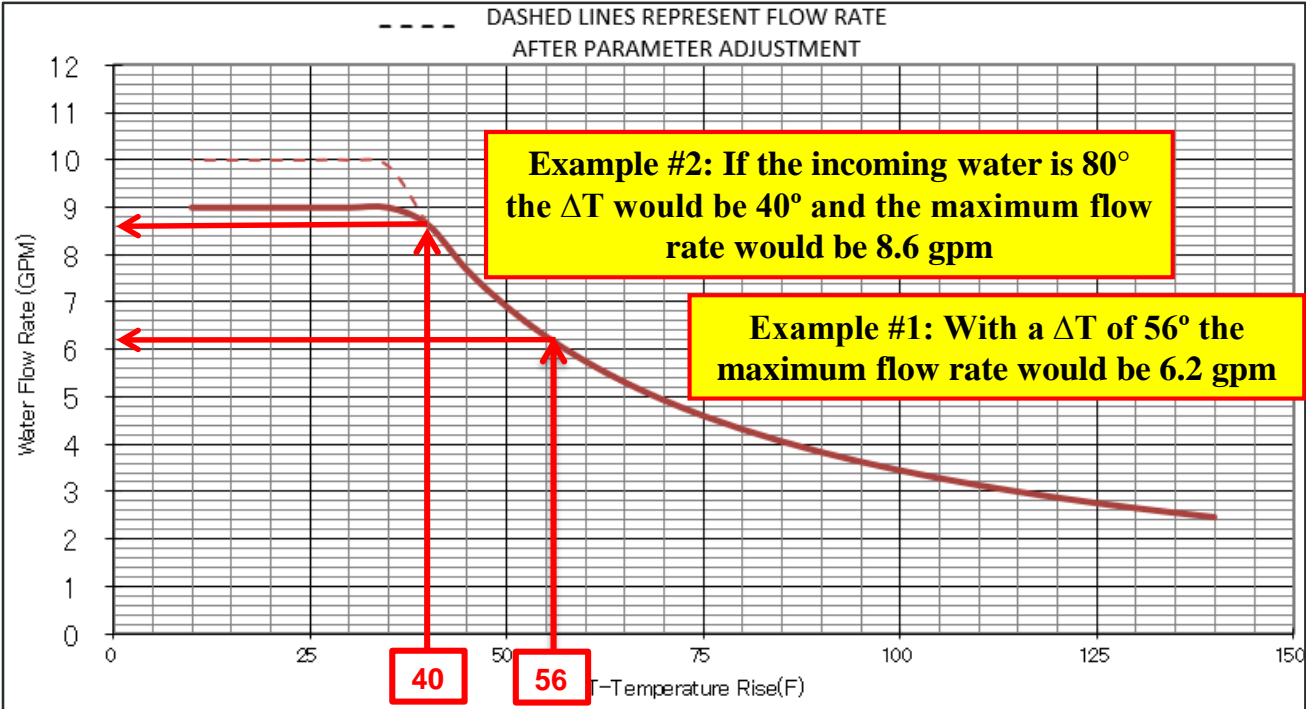
# Sizing: Maximum flow rate.

The maximum flow rate for a Rinnai water heater at a given Delta T can be determined using the flow chart for that model. This flow rate can be found where the Delta T intersects the flow curve.

➤ Example from previous page: **Delta T = 56°**

Rinnai RU180 flow curve illustrated here.

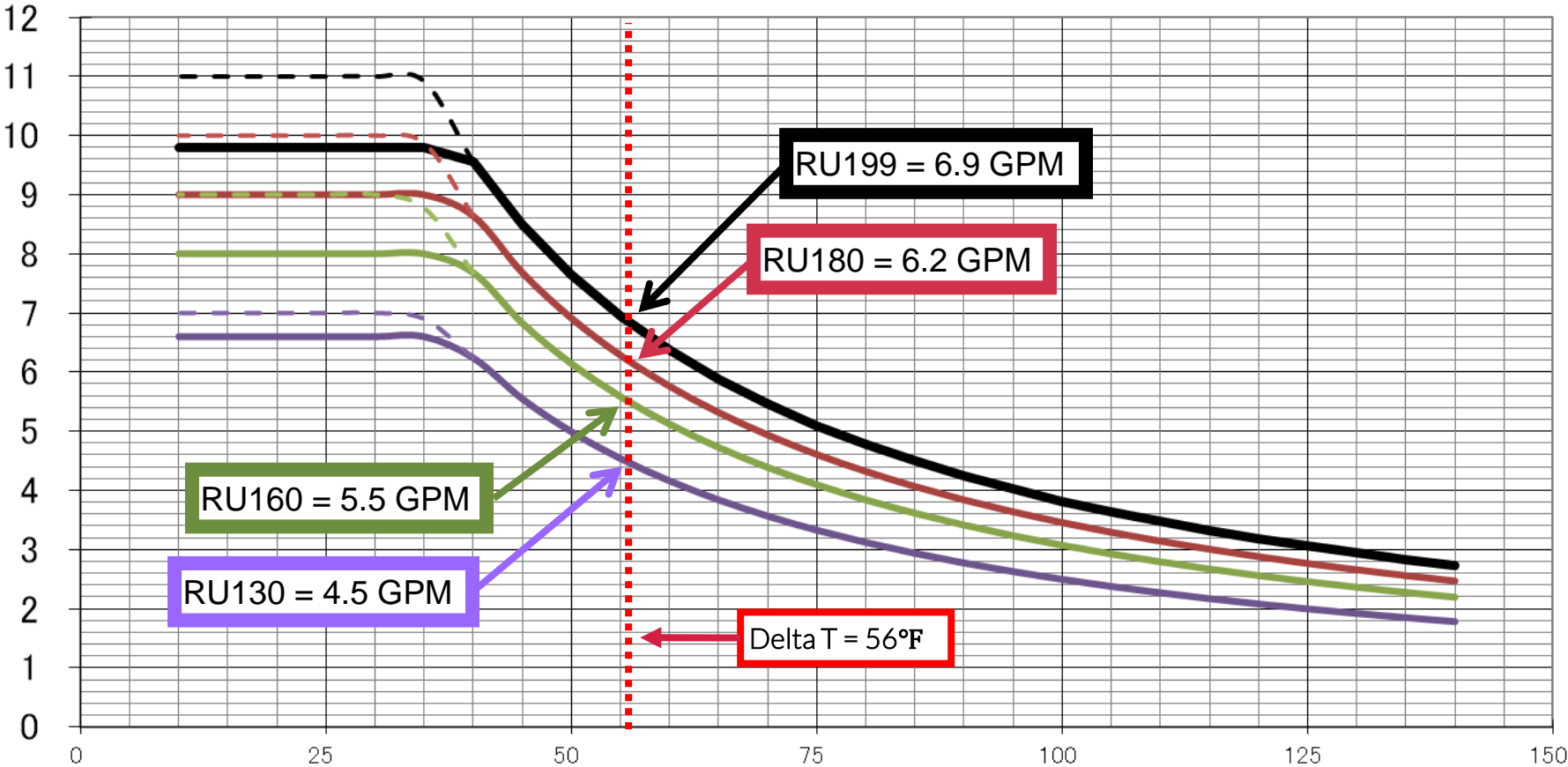
Maximum flow rates vary as water temperatures fluctuate throughout the year.



- The installer will need to determine if these flow rates will be sufficient to meet the needs of the home or business. If not, a larger unit or multiple units may be required.

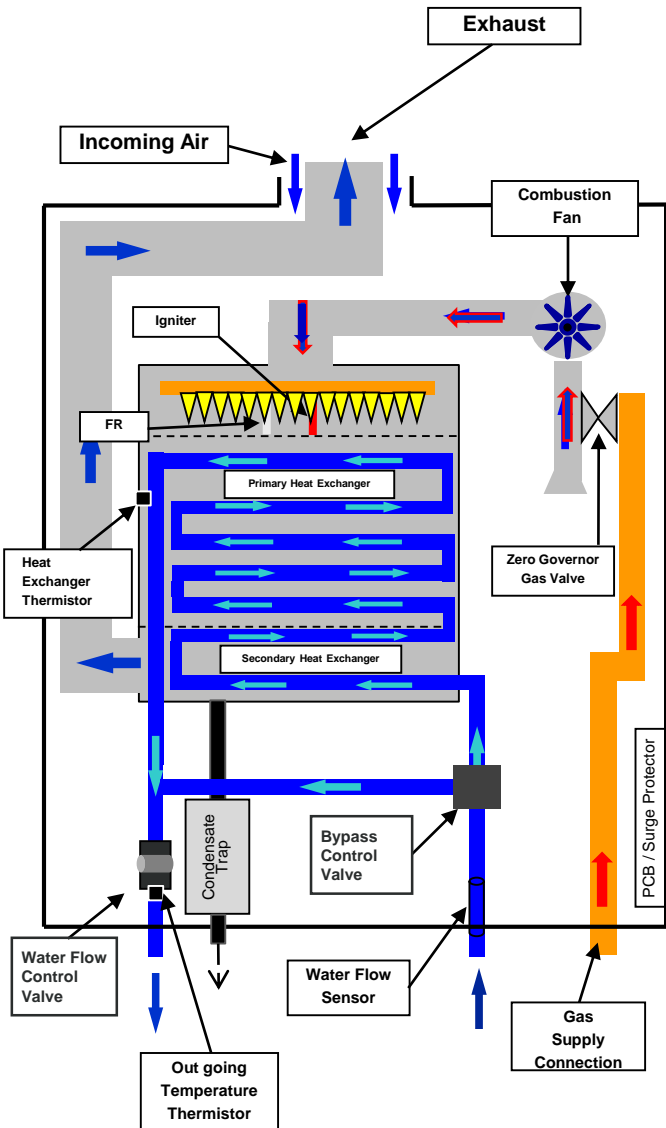
# Sizing: Flow Rates By Model

Using a Delta T of 56 degrees the flow rates for the following models would be:



**Note:** Dashed line indicates increased flow rates available at low Delta T ranges ( $\Delta T$  less than  $40^\circ\text{F}$ ). A parameter adjustment must be made to access the increased flow rate. See section 3.12, "Parameter Settings" of installation manual.

# Sequence of operation:



## 1. Water flow begins:

- Water flow sensor sends pulses to the PCB.
- When flow exceeds approximately 0.4 gpm the ignition sequence begins.

## 2. Ignition Sequence:

- Combustion fan starts, drawing air in from the venting and through the unit.
- Spark igniter begins sparking.
- Gas control assembly opens. Gas is pre-mixed with air in the fan assembly then delivered to the burner.
- Ignition Occurs.
- When the flame rod has proven flame the spark igniter stops sparking.

## 3. Normal Operation:

- PCB monitors flame rod, fan motor frequency, outlet water temperature, temperature set point, and water flow rate.
- Fan speed modulates as needed to meet user's water flow demand.
- Zero Governor gas valve automatically maintains proper gas/air mixture.
- Water is preheated in the secondary (latent) heat exchanger.
- Water is heated further as it passes through the primary heat exchanger.
- In certain circumstances the heat exchanger will purposely overheat the water inside the heat exchanger while the bypass valve tempers the water down to the set point temperature. This can provide for higher flow rates.
- The water flow control valve will limit flow as needed to maintain output temperature.
- Due to the combustion efficiency, condensation forms inside the heat exchanger(s) and drains into the condensate trap and through drain at the bottom of the unit.

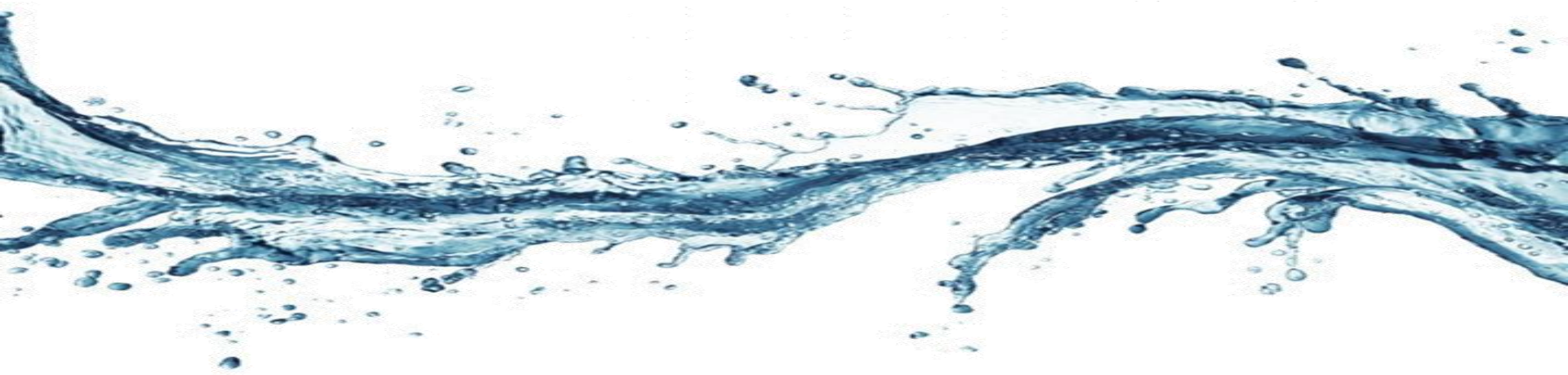
## 4. Shut-down Sequence:

- PCB senses flow rate less than 0.26 gpm.
- Gas control valve closes & water flow control valve resets to a standby position.
- Combustion fan will then run for a period of time to purge the combustion chamber.

## 5. Standby Mode:

- PCB monitors all components.

# Installation



# Installation: Key points.

- SENSEI™, N-Series water heaters are certified for installation in commercial applications and residential applications (and are certified for manufactured / mobile homes).
  - The CU199/CU160 models are for commercial applications only.
- All models are manufactured in natural gas or propane versions (and can be converted).
- Indoor models must be installed within the confines of a structure and vented to the outside.
- Outdoor models must be installed where the exhaust can be safely vented directly from the front of the water heater.
- Residential installations are potable water applications in single family dwellings with a maximum water temperature setting of 140°F.
- Commercial installations are potable water applications for restaurants, schools, hotels, car washes, coin laundries, assisted living facilities, etc.
  - For commercial applications requiring water temperatures over 140°F, an optional MCC-91 temperature controller allows a maximum water temperature setting of 185°F.
  - The Commercial specific models do not require the MCC-91-2 controller to achieve 185°F output temperatures.

NOTE: The maximum operating temperature for the RUR models is 140°F.

## Installation: Key points.

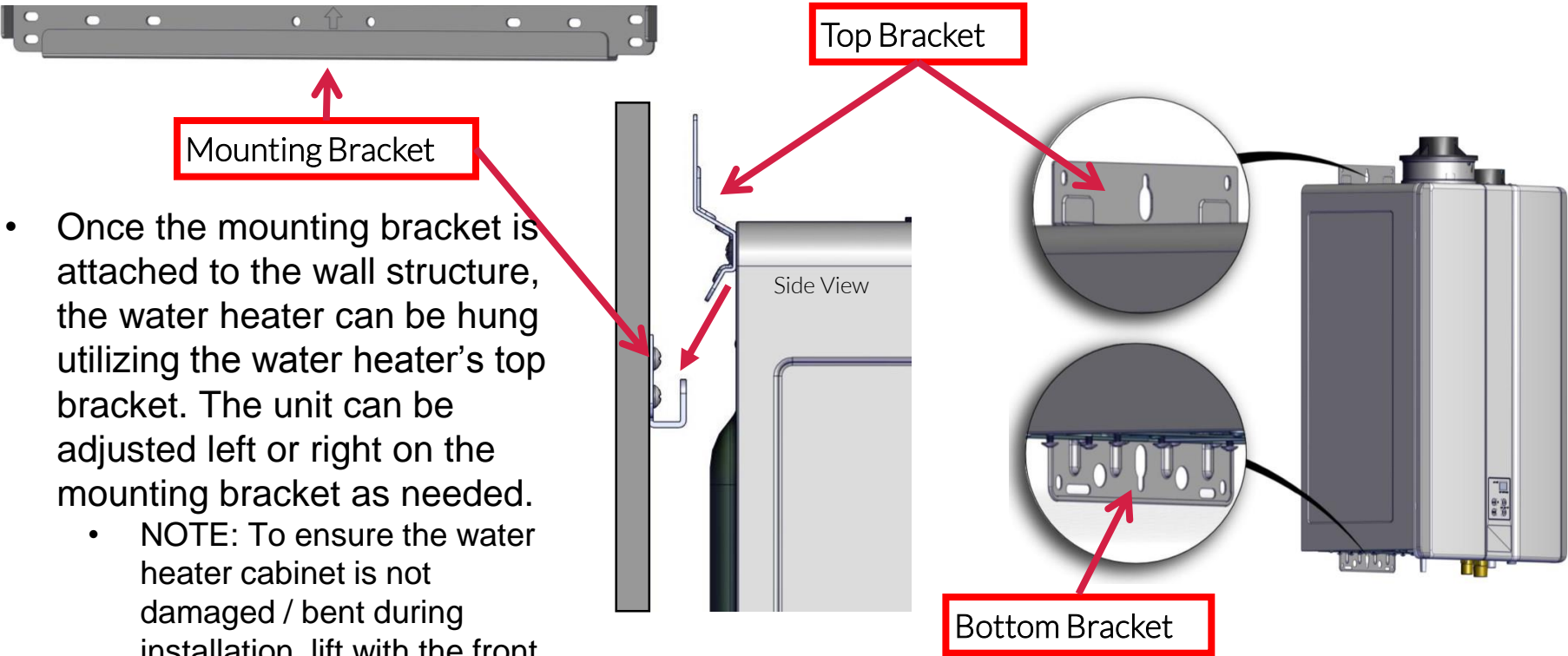
- If the water heater is installed in an area where water leakage from the unit or the plumbing connections could result in water damage to the area surrounding the appliance or to floors or lower levels of the structure, it is required that a suitable drain pan, adequately drained, be installed under the appliance. The drain pan must not restrict combustion air flow.
- If the water heater is installed in a closed water supply system, such as one having a backflow preventer in the cold water supply line, means shall be provided to control thermal expansion.
  - Water heaters utilizing a circulation system will require the installation of an expansion tank.
- DO NOT use Rinnai water heaters in applications such as a pool or spa heater that uses chemically treated water.
  - The water heater is suitable for filling large tubs or whirlpool spa tubs with potable water.
- If the water heater is installed in a area that is known to have hard water or water that causes scale build-up, the water must be treated and may require more frequent service (flushing of the heat exchanger).

# Installation: Key points.

- When selecting an installation location you must ensure specified clearances will be met and the vent length will be within the required limits.
  - There are required installation clearances to the water heater cabinet as well as recommended clearances for servicing. Vent terminations have specific clearance requirements. Vent elbows and certain vent termination types may be assigned equivalent lengths that will reduce the overall developed length of the vent system.
- Consider the installation environment, water quality, and the need for freeze protection.
  - A contaminated environment surrounding the water heater cabinet can have a detrimental effect on the operation and longevity of the product. Contaminated combustion air (whether sourced from the indoor air space or from the outside) can also have detrimental effects on the water heater.
  - Water not meeting specifications can limit performance and cause possible damage to the water heater.
- Requirements for the gas line, water lines, electrical connection, and condensate disposal can be found in their respective sections of the installation manual.
  - An inadequate utility supply could hinder water heater performance or cause operational failures (fault codes).

# Installation: Mounting the Water Heater.

- The Rinnai SENSEI™, N-Series models include an adjustable mounting bracket.
  - The separate wall mounting bracket will be attached to the wall first allowing easy installation of the water heater. The bracket is sized for 16" on-center wall studs.



- Once the mounting bracket is attached to the wall structure, the water heater can be hung utilizing the water heater's top bracket. The unit can be adjusted left or right on the mounting bracket as needed.
  - NOTE: To ensure the water heater cabinet is not damaged / bent during installation, lift with the front cover installed and do not lift from the middle / front of the cabinet.

# Installation: Key points.

**It is important to ensure the following incoming fall within specifications:**

- **Water –**

- Pipe sizing and incoming water pressure must meet each model's requirements as stated in the installation manual and water quality must meet the EPA National Secondary Drinking Water Standards.

- **Venting (air) –**

- **Only** the vent components that are certified and listed with the water heater can be used. The venting must be installed per specifications and proper clearances must be maintained.

- **Gas –**

- Adequate gas pressure and volume (gas line sizing) must be verified for proper operation.

- **Electricity –**

- A properly polarized and grounded 120 VAC, 60 Hz power supply is required (the temperature controller operates on 12 VDC. This voltage is supplied by the water heater main circuit board).

❖ All national, state, and local codes must be followed.

# Installation: Water supply.

## • WATER PRESSURE

- Minimum water pressure: 50 psi.
- Maximum water pressure 150 psi.
- Rinnai recommends 60-80 psi for maximum performance.
- ANSI Code requires the addition of an approved pressure relief valve.
  - Valve must be rated no more than 150 psi and no less than the water heater's maximum Btu input.

## • INCOMING PIPING REQUIREMENTS

- All performance data of Rinnai Water Heaters are based on systems plumbed with 3/4" pipe (unless otherwise noted). Performance may vary with other pipe sizes.

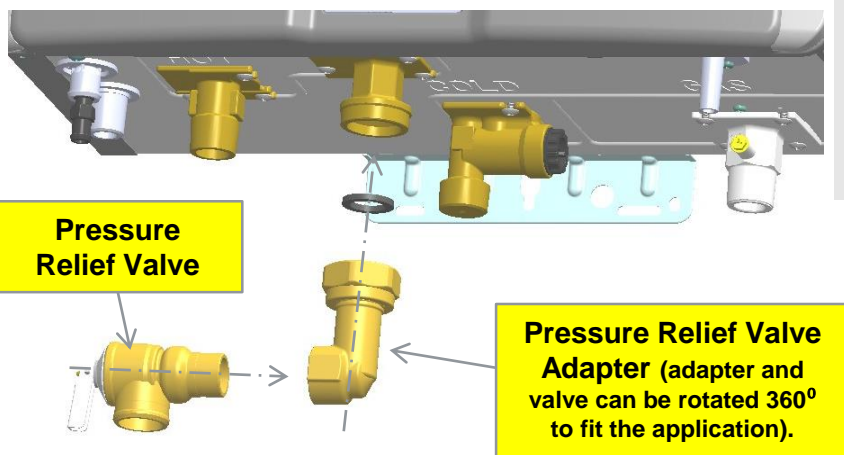
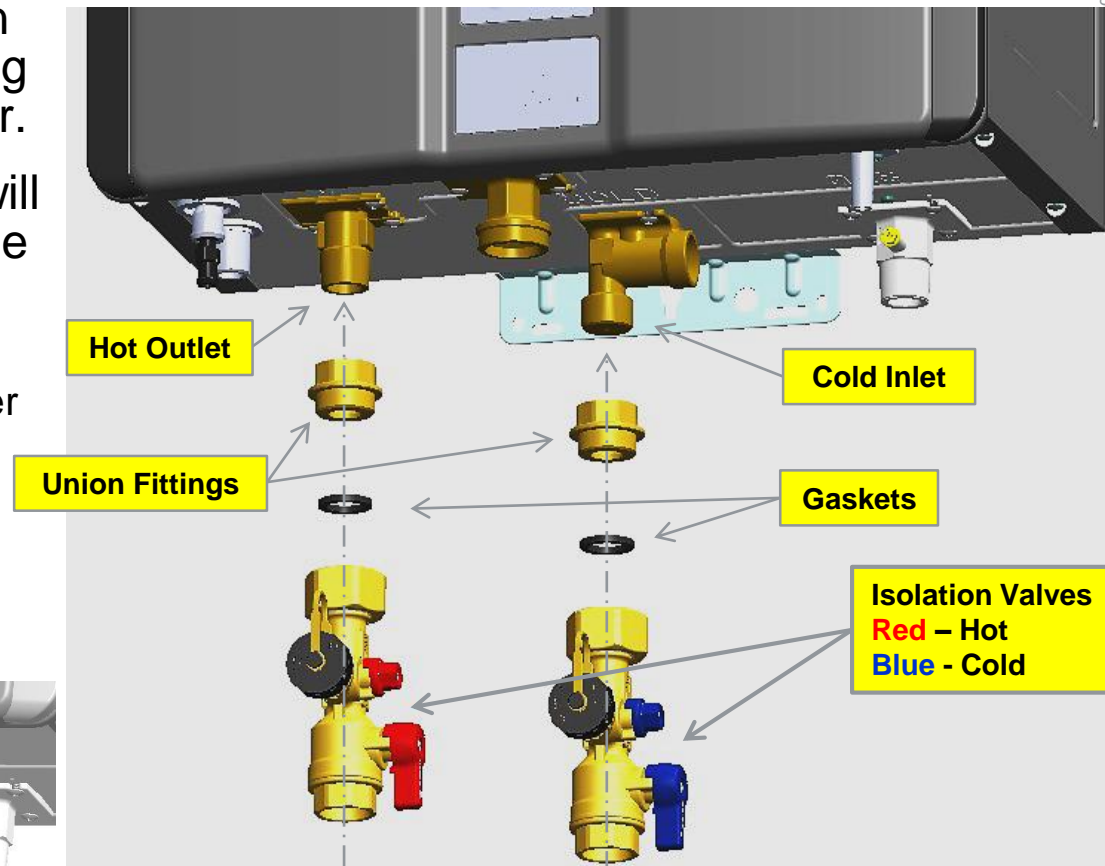
## • WATER QUALITY

- Care for your water heater should include an 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 is free of elements that can affect or damage the heat exchanger. Water that contains chemicals exceeding the levels set forth in the install manual (see below) can effect and damage the heat exchanger. Replacement of the heat exchanger due to water quality is not covered under warranty.
- The maximum levels (with the exception of total hardness and dissolved carbon dioxide) come from CFR, Title 40, Chapter 1 – EPA, Subchapter D, Part 143 - National Secondary Drinking Water Regulations.

	Total Hardness	Aluminum*	Chlorides*	Copper*	Dissolved Carbon Dioxide (CO2)	Iron*	Manganese*	*pH	*TDS (Total Dissolved Solids)	*Zinc
MAX LEVEL	Up to 200 mg/L (11.7 gpg)	Up to 0.2 mg/L	Up to 250 mg/L	Up to 1.0 mg/L	Up to 15.0 mg/L or PPM	Up to 0.3 mg/L	Up to 0.05 mg/L	6.5 to 8.5	Up to 500 mg/L	Up to 5 mg/L

# Installation: Water - Isolation valve kit.

- Rinnai recommends the use of an isolation valve kit when connecting the water lines to the water heater.
- All SENSEI™, N Series models will include an Isolation Valve kit in the shipping box.
  - This kit includes hot and cold water shut-off valves with hot and cold water drain valves, and an ANSI approved pressure relief valve.
  - This kit meets all individual states' lead-free standards.



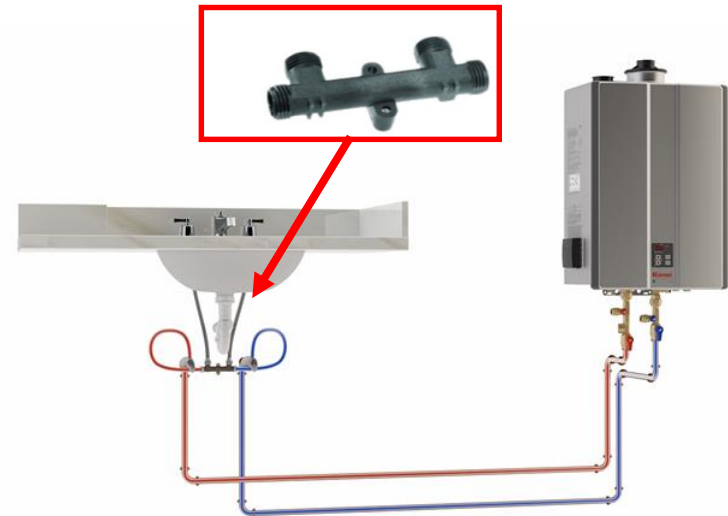
- Use of the kit allows flushing of the heat exchanger as well as aids in servicing and troubleshooting.

# Installation: Plumbing configuration for RUR models with ThermaCirc360™

- If a ThermaCirc360™ (RUR) model is to be utilized, the installer will need to confirm the type of circulation system available or that is to be installed at the site.
  - Installations with a dedicated circulation return loop will require no physical changes to the water heater but will require specific parameter settings to be made through the controller in order for the system to operate properly.
  - Installations that do not have a dedicated circulation return line will require the installation of the included Thermal Bypass Valve, a quick and simple reconfiguration of the water heater in addition to making specific parameter settings on the controller. In this configuration, the cold water line is used in lieu of a dedicated circulation return line.
    - The Thermal Bypass Valve should be installed at the farthest fixture (in terms of the length of plumbing to that fixture).



Dedicated Return



Crossover mode.

- Important considerations:
  - **DO NOT** install in combination with hydronic heating applications.
  - **DO NOT** electronically manifold (Cascade / EZ-Connect) multiple RUR models together.
  - **DO NOT** install the MC-195T Timer/Controller and the Control-R Wi-Fi module together as they are not compatible accessories.

# Installation: RUR model Crossover Mode configuration.

- Plug / Filter Assembly.

➤ For proper operation of the RUR model water heater in the crossover mode the water heater must be reconfigured by replacing the crossover plug with the crossover filter.

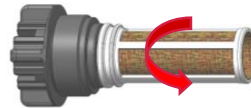
1. Remove the threaded cap and Bypass plug assembly from the hot water outlet at the bottom of the water heater.



2. Remove the Bypass plug from the threaded cap.



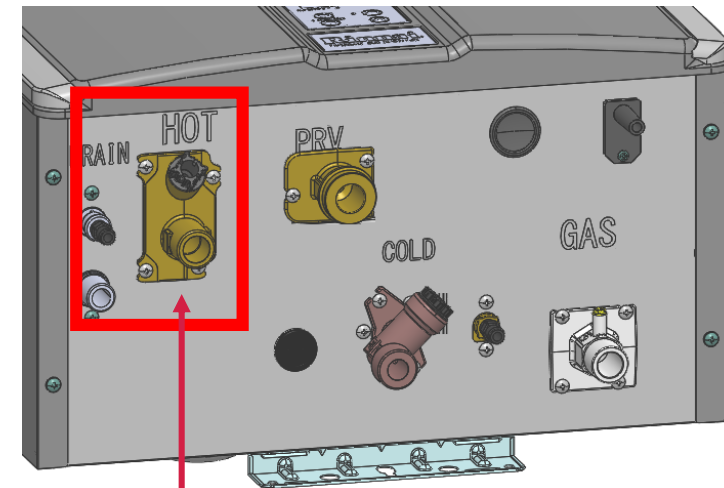
3. Install the Bypass filter onto the threaded cap.



4. Install the threaded cap and Bypass filter assembly into the hot water outlet at the bottom of the water heater.



5. Adjust parameter settings to the proper configuration for your application.



Hot water outlet

# Installation: RUR model Crossover Mode configuration.

- Parameter settings:

Refer to the Parameter setting section of the installation manual.

- Adjusting parameters will be covered later in this presentation.

Setting #	Setting Description	Selection			
		A	B	C	D
04 (RUR Model)	Recirculation Settings	No Recirculation	Recirculation		
			Dedicated Mode	Crossover Mode	
				Long Loop	Short Loop
05	Recirculation Modes	Comfort	Economy		

- 04 – Recirculation Settings:

**No Recirculation:** (factory default setting) If the parameter is set to **04A** the water heater operates normally but without circulation.

**Dedicated Mode:** If the parameter is set to **04B** the water heater must be installed with a dedicated circulation return line for proper circulation operation.

**Crossover Mode:** (No dedicated return line needed)

- **Long Loop:** Adjust parameter setting to **04C** for a maximum recirculation loop length of 400 ft. with ¾ inch pipe or maximum of 100 ft. for ½ inch pipe.
- **Short Loop:** Adjust parameter setting to **04D** for a maximum recirculation loop length of 200 ft. for ¾ inch pipe or 50 ft. for ½ inch pipe.

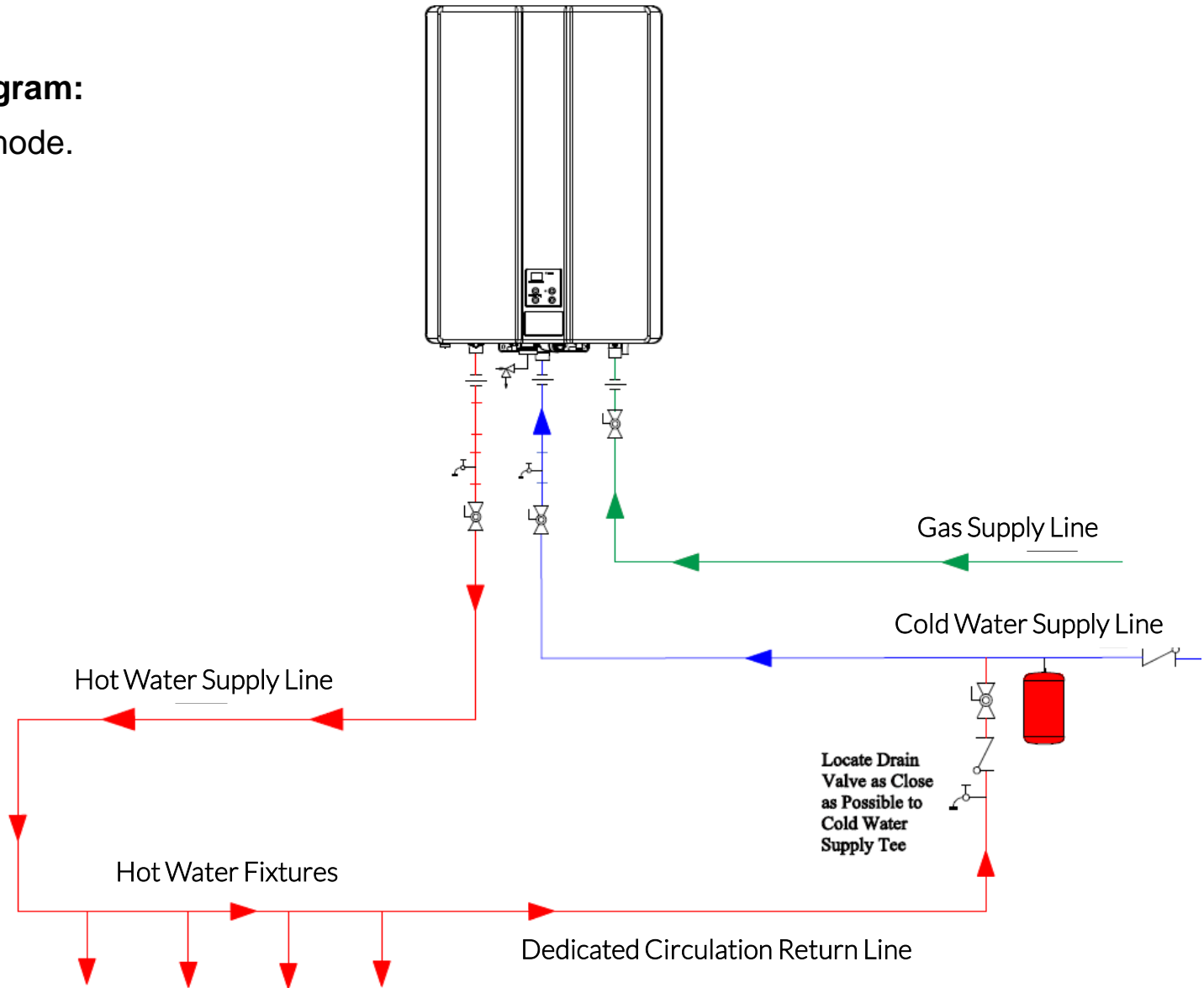
- 05 – Recirculation Modes:

**Comfort or Economy:**

- **Comfort:** (factory default) Adjust parameter setting to 05A. This mode cycles the pump more frequently to ensure circulation loop temperature remains higher (but uses more energy).
- **Economy:** Adjust parameter setting to 05b. This mode cycles the pump less often using less energy (but allows the loop temperature to drop slightly lower).

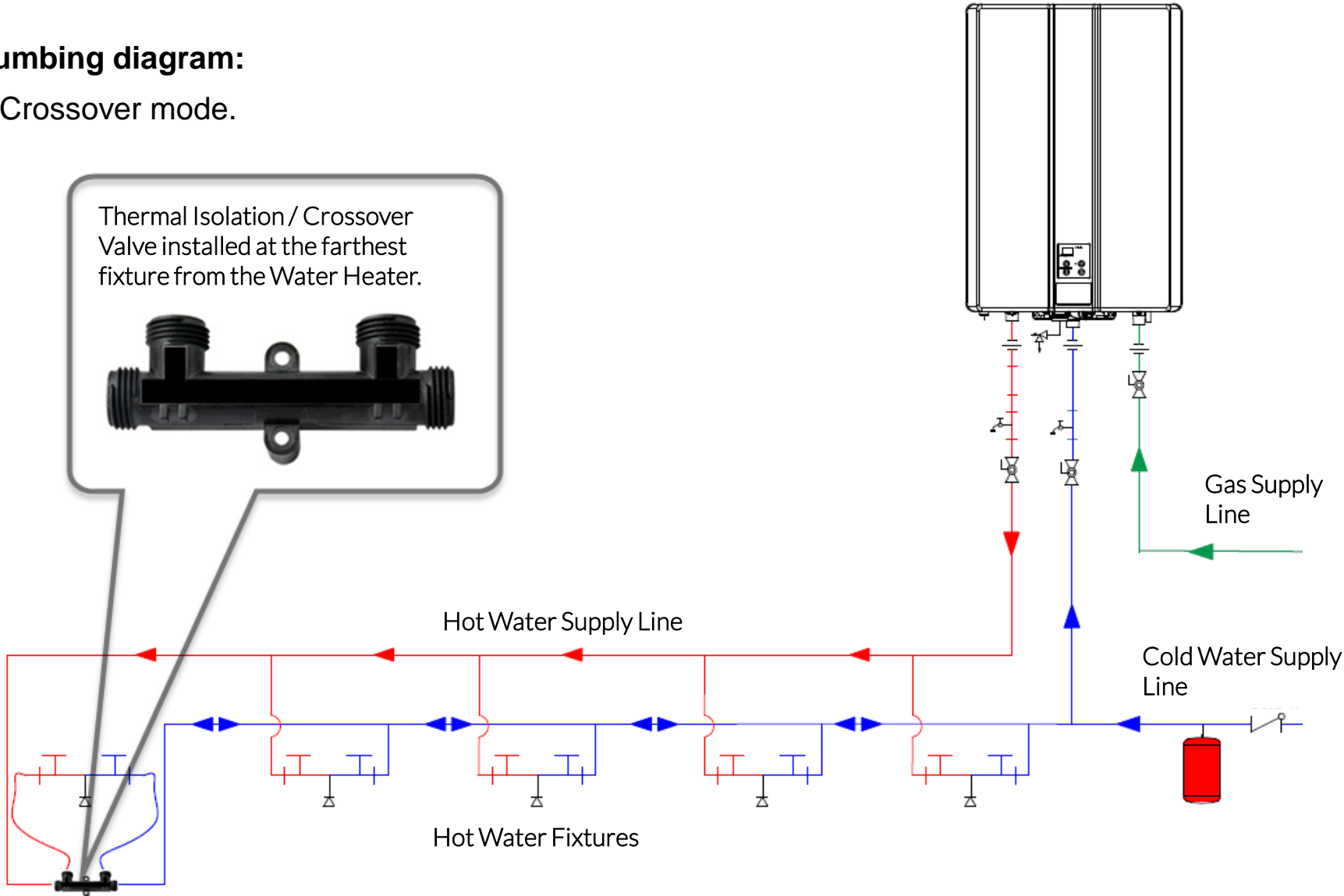
# Installation: Plumbing configuration for RUR models.

- **Plumbing diagram:**  
Dedicated mode.



# Installation: Plumbing configuration for RUR models.

- **Plumbing diagram:**  
Crossover mode.



# VENTING REQUIREMENTS

- Follow all proper vent installation guidelines.
  - Do not mix venting components between non-condensing and condensing models or between different manufacturers or vent system types as dangerous conditions could occur!

**! WARNING**

**Improper installation of vent system components or failure to follow installation instructions could result in property damage or serious injury or death!**

# Installation: Venting guidelines.

## **! WARNING**

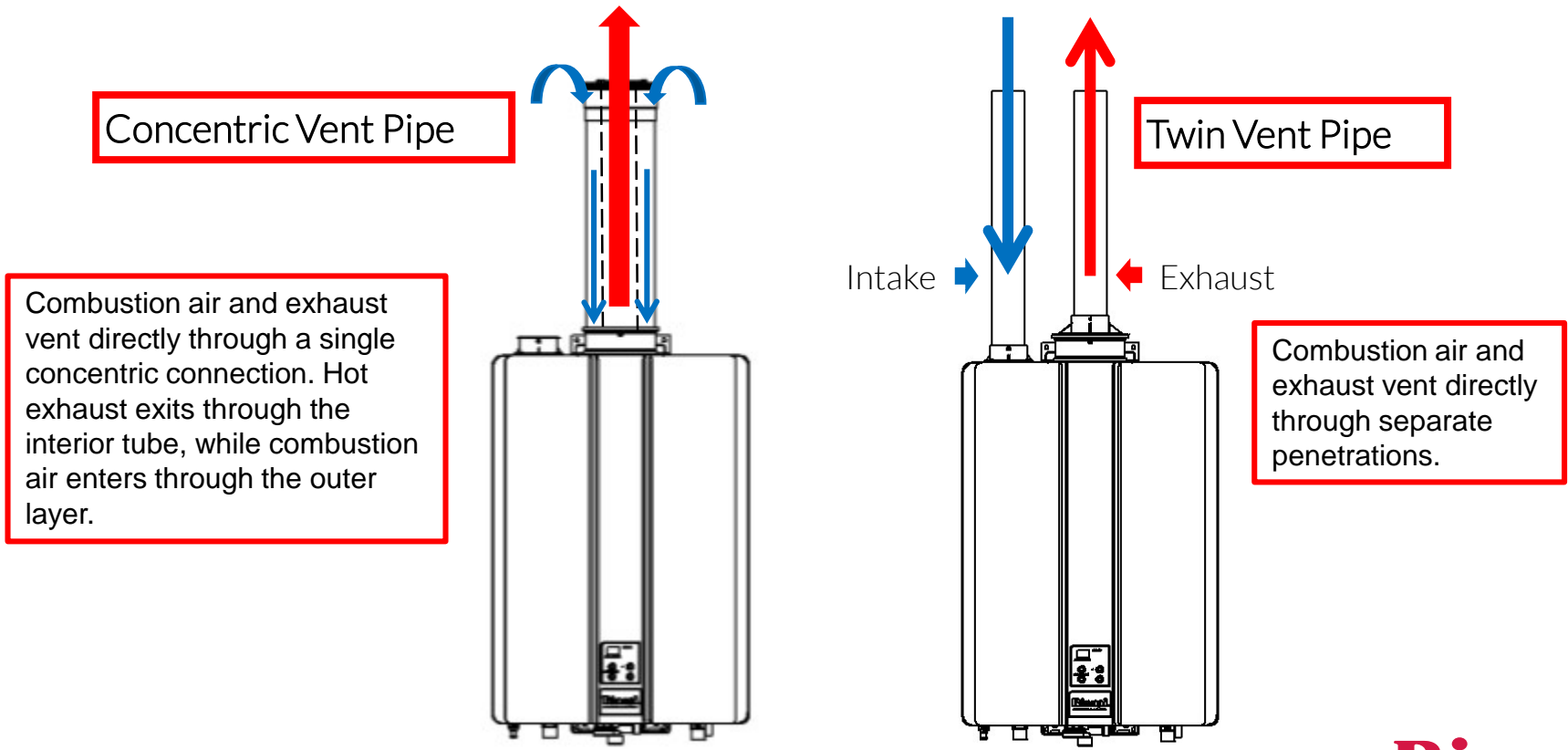
- **DO NOT** use cellular core or foam core PVC or CPVC.
- **DO NOT** use Radel, ABS or galvanized material to vent the Rinnai Water Heater.
- **DO NOT** cover non-metallic vent pipe with thermal insulation.
- **DO NOT** combine vent components from different manufacturers.
- **DO NOT** reduce the vent diameter. Vent Diameter cannot be less than 2 inches (51 mm).
- **DO NOT** connect the venting system with an existing vent or chimney.
- **DO NOT** common vent with the vent pipe of any other manufacture's water heater or appliance.

Rinnai water heaters can only be common vented with Schedule 40 PVC/CPVC or with a Rinnai certified common vent system.

# Installation: Venting options.

## Rinnai SENSEI™, N-Series condensing water heaters have three basic types of vent installation options.

### Venting Option #1: Direct Vent (Concentric OR Twin Pipe Vent)



Concentric Vent Pipe

Combustion air and exhaust vent directly through a single concentric connection. Hot exhaust exits through the interior tube, while combustion air enters through the outer layer.

Twin Vent Pipe

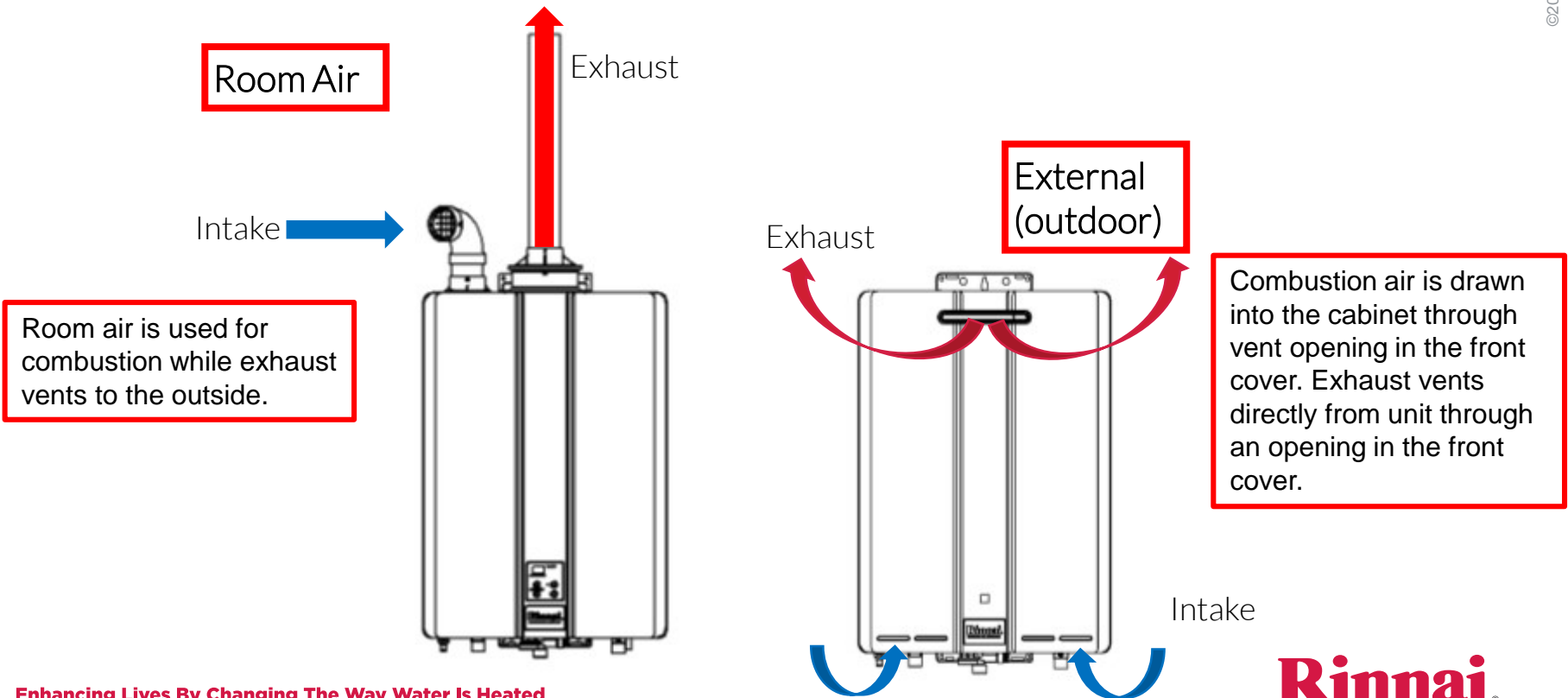
Combustion air and exhaust vent directly through separate penetrations.

Intake → Exhaust

# Installation: Venting options.

## Rinnai SENSEI™, N-Series condensing water heaters have three basic types of vent installation options.

### Venting Option #2: Non-Direct Vent (Room Air and External Unit)



# Installation: Venting options.

## Rinnai SENSEI™, N-Series condensing water heaters have three basic types of vent installation options.

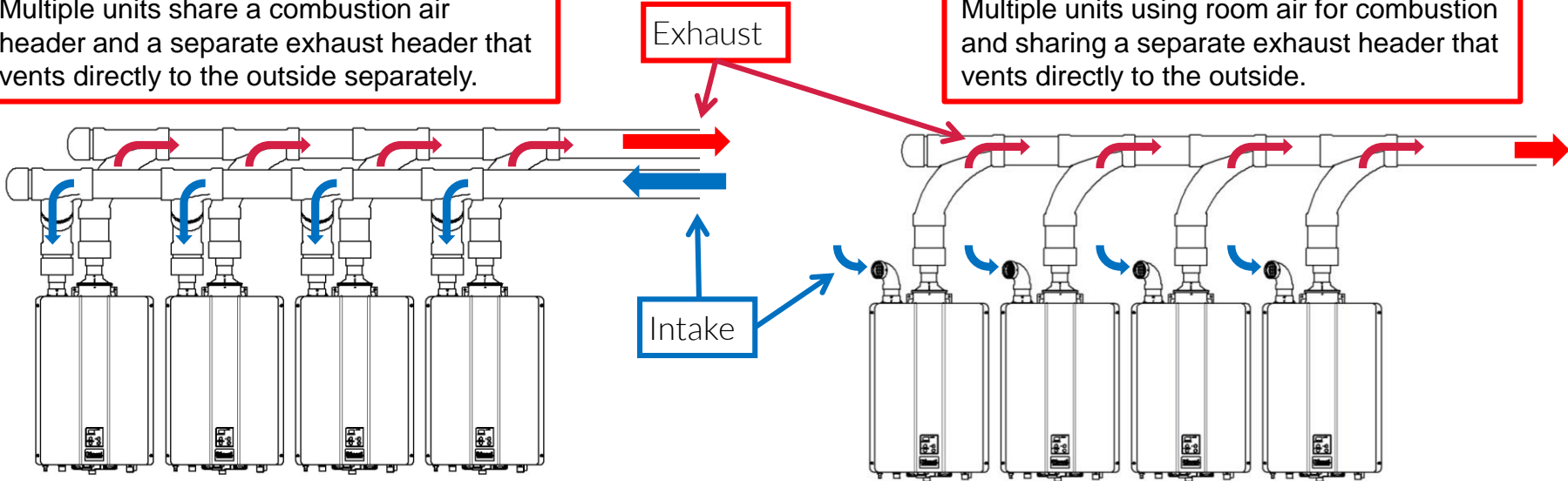
### Venting Option #3: Common Vent (Indoor Units Only. Direct Vent and Non-Direct/Room Air Vent)

Direct Vent  
Common Vent

Multiple units share a combustion air header and a separate exhaust header that vents directly to the outside separately.

Non-Direct Vent  
Room Air Vent

Multiple units using room air for combustion and sharing a separate exhaust header that vents directly to the outside.



# Installation: Venting options.

## The previously described vent options include:

- Concentric Direct Vent Systems - 2" x 4" or 3" x 5" diameter piping.
  - Two pipe PVC / CPVC or Polypropylene Direct Venting - 2" or 3" diameter pipe for both intake and exhaust.
  - Single pipe PVC / CPVC or Polypropylene Non-Direct Venting - 2" or 3" diameter pipe for the exhaust and using room air for combustion.
  - Common Vent Direct Vent Systems - 3", 4" or 6" diameter piping for both intake and exhaust.
  - Common Vent Non-Direct Vent Systems - 3", 4" or 6" diameter piping for the exhaust and using room air for combustion.
- **NOTE:** When utilizing room air for combustion follow all applicable guidelines in regards to adequate air for combustion and air quality. Failure to do so can result in unit failure, fire, explosion, serious bodily injury or death.

# Installation: Venting options.

- Rinnai tankless water heaters are certified and listed with the vent system.
  - You must use **ONLY** the vent components and materials that are certified and listed with the water heater.

## Tested, Certified and Listed vent manufacturers for the condensing indoor models.

Manufacturer	Listed and Tested Vent Products
Ubbink* (available from Rinnai)	Rolux Condensing Vent System
Ubbink (available from Rinnai)	Ubbink Common Vent Systems
Centrotherm	Innoflue Vent System
Heat-Fab *	Saf-T Vent SC System
Metal-fab *	Corr/Guard Vent/Air Intake System
Ipex	Concentric & Low Profile Terminations
M&G Dura Vent	Venting, Concentric & Two Pipe Terminations
Royal	Concentric and Low Profile Terminations
Various Manufacturers	PVC / CPVC piping.

\* Concentric venting

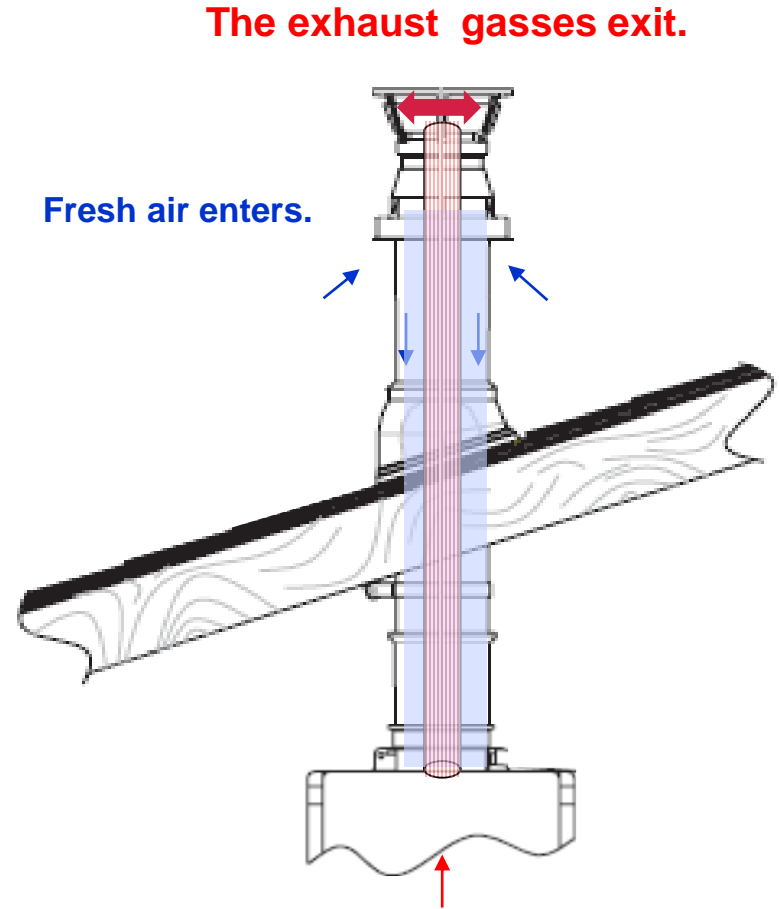
# Installation: Concentric Venting / Direct Vent

## • Operation of a concentric vent system.

- Fresh air enters the appliance through the outer part of the pipe.
- Exhaust gasses exit the appliance through the center part of the pipe.

### Tested, Certified and Listed Condensing Concentric Vent Systems.

Manufacturer	Product
Rinnai / Ubbink	Rolux Condensing Vent System (available from Rinnai)
Heat-Fab	Saf-T Vent SC system
Metal-Fab	Corr/Guard Vent/Air Intake System



**NOTE:** Rinnai condensing water heaters have a built-in condensate trap to collect condensation from the heat exchanger and any condensation draining into the unit from the vent system.

**Important:** Install the vent termination according to the instructions in the manual. Slope the venting  $\frac{1}{4}$  inch per foot back toward the water heater according to the vent manufacturer's installation instructions. Dispose of condensate per local codes.

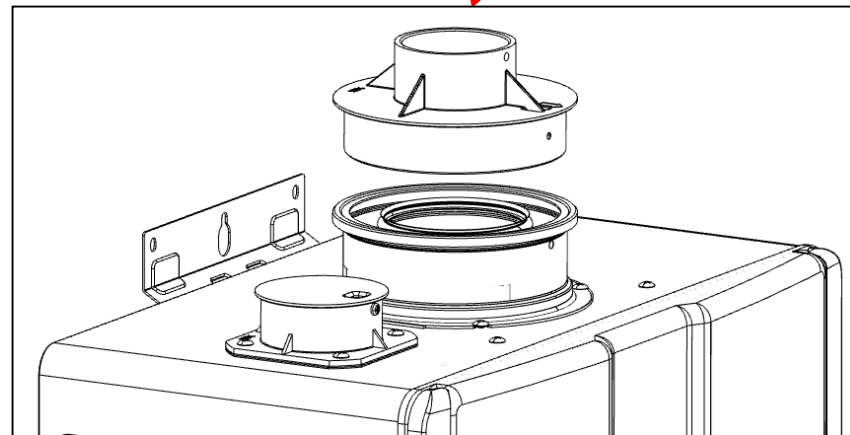
# Installation: Concentric Venting / Direct Vent

To utilize the Rinnai/Ubbink 2" x 4" or 3" x 5" concentric vent systems, the PVC exhaust adapter ring must be removed prior to connecting the vent pipe.

- **The Intake Cap must remain in place.**

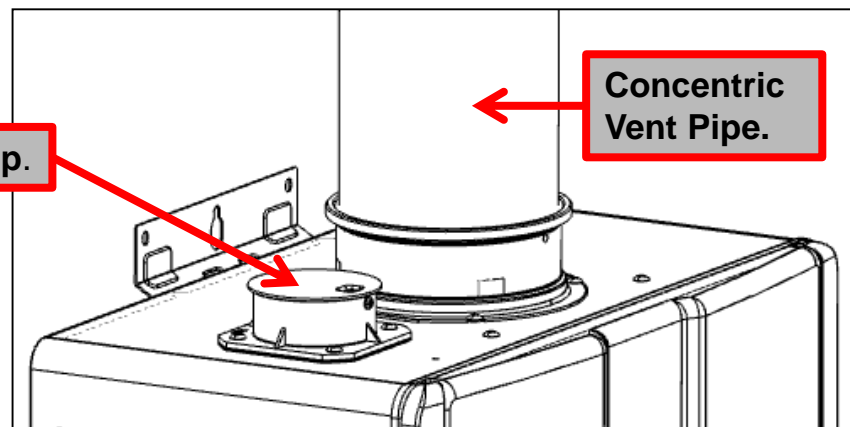
Note: The same procedure is to be used for Centrotherm twin pipe venting when using the Centrotherm adapter.

Exhaust Adapter Ring.



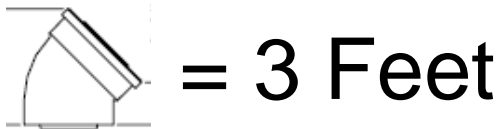
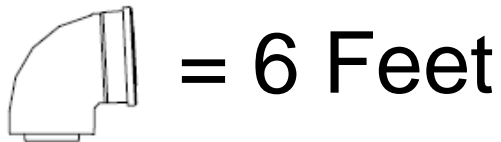
Intake Cap.

Concentric Vent Pipe.



# Installation: Concentric Venting / Direct Vent

- The Rinnai / Ubbink concentric venting is available in two diameter configurations. NOTE: The maximum equivalent vent lengths are diameter dependent:
  - **Up to 65 feet for the 2" x 4" vent.**
  - **Up to 150 feet for the 3" x 5" vent.**
- When calculating the equivalent vent length, each 90° elbow is equal to 6 feet and each 45° is equal to 3 feet.



## Vent Length Example

Add the total length of all vent pipe and the equivalency of all bends:

3' (termination)

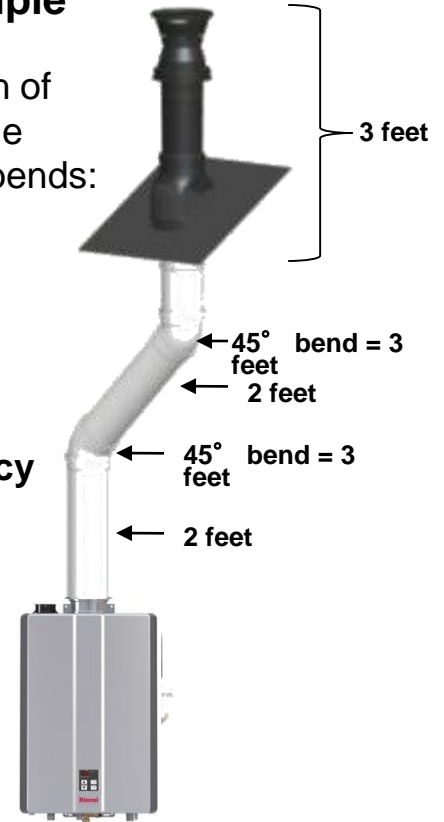
+3' (bend)

+2' (extension)

+3' (bend)

+2' (extension)

**13 foot equivalency**

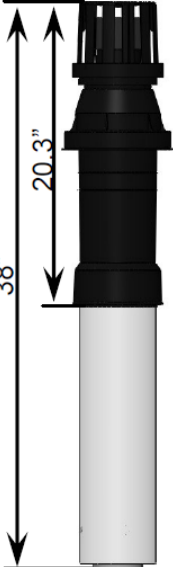

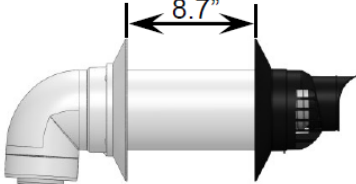
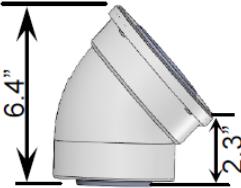
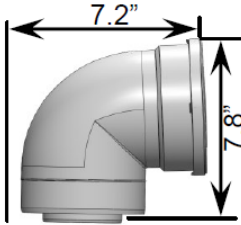
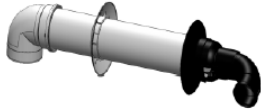
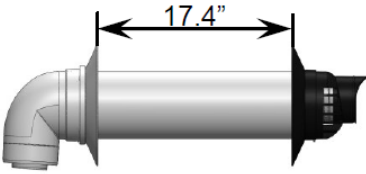
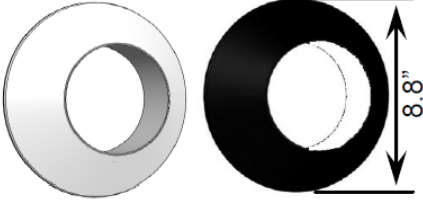


- **Comply with all vent guidelines – refer to the vent manufacturer installation instructions.**

# Installation: Concentric Venting / Direct Vent Components

Ubbink Condensing vent components available through Rinnai distributors.

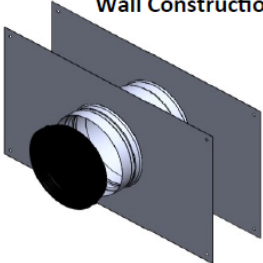
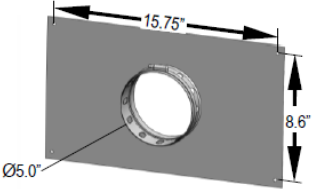

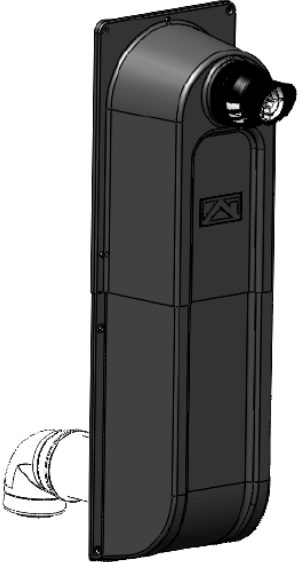
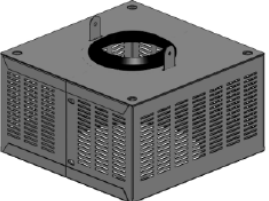
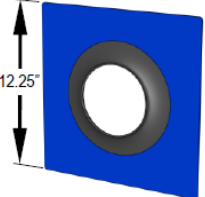

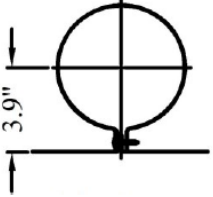
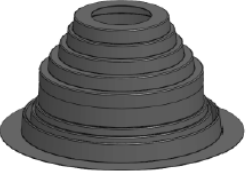
➤ **3" X 5" Concentric Vent components shown below.**

CONDENSING, (PP) POLYPROPYLENE VENT COMPONENTS													
<p>Roof Discharge Termination Part No.: 184162PP</p> 	<p>Roof Termination Extension Kit Part No.: 185344PP</p> 	<p>12" Termination Kit Part No.: 223176PP</p> 	<p>45 Degree Elbow Part No.: 224077PP</p> 	<p>90 Degree Elbow Part No.: 224078PP</p> 	<p>21" Horizontal Termination Diverter Kit Part No.: 223186PP</p> 								
		<p>21" Condensing Termination Kit Part No.: 223177PP</p> 	<p>Vent Pipe Extension</p> <table border="1"> <thead> <tr> <th>Length "L"</th> <th>Part Number</th> </tr> </thead> <tbody> <tr> <td>10"</td> <td>224087PP</td> </tr> <tr> <td>19.5"</td> <td>224079PP</td> </tr> <tr> <td>39"</td> <td>224080PP</td> </tr> </tbody> </table>	Length "L"	Part Number	10"	224087PP	19.5"	224079PP	39"	224080PP	<p>Rubber Wall Plate Part No.: 710342(White) Part No.: 710602 (Black)</p> 	
Length "L"	Part Number												
10"	224087PP												
19.5"	224079PP												
39"	224080PP												

# Installation: Concentric Venting / Direct Vent Components

Ubbink Condensing vent accessories available through Rinnai distributors.

➤ **3" X 5" Concentric Vent components shown below.**

<p><b>Thimble</b> Part No.: 224045</p> <p>*Fits 2x4 or 2x6 Wall Construction</p> 	<p><b>Vent Support Bracket</b> Part No.: 224049</p> 	<p><b>Roof Flashing</b></p>  <table border="1" data-bbox="846 548 1309 716"> <thead> <tr> <th>Roof Pitch</th> <th>Part No. for Shingle Roofs</th> <th>Part No. for Tile Roofs</th> </tr> </thead> <tbody> <tr> <td>1/12 to 6/12</td> <td>189950</td> <td>50171949</td> </tr> <tr> <td>6/12 to 12/12</td> <td>189951</td> <td>50171961</td> </tr> <tr> <td>8/12 to 16/12</td> <td>189952</td> <td>50171954</td> </tr> </tbody> </table>	Roof Pitch	Part No. for Shingle Roofs	Part No. for Tile Roofs	1/12 to 6/12	189950	50171949	6/12 to 12/12	189951	50171961	8/12 to 16/12	189952	50171954	<p><b>Condensing Raised Horizontal Termination Kit "Snorkel"</b> Part No.: 224047PP</p>  <p>Kit Includes: 14.2" Vent Extension, Qty 3-90° Elbow, 19.5" Vent pipe extension, Special wall terminal, Cover.</p>
Roof Pitch	Part No. for Shingle Roofs	Part No. for Tile Roofs													
1/12 to 6/12	189950	50171949													
6/12 to 12/12	189951	50171961													
8/12 to 16/12	189952	50171954													
<p><b>Universal Bug Guard</b> Part No.: 224042</p> 	<p><b>Horizontal—Flashing Panel</b> Part No.: 102000012</p> 	<p><b>Roof Flashing—Flat</b> Part No.: 146141</p> 													
	<p><b>Pipe Clamp</b> Part No.: 169044</p> 	<p><b>Flashing for Metal Roof</b> Part No.: 242141</p> 													

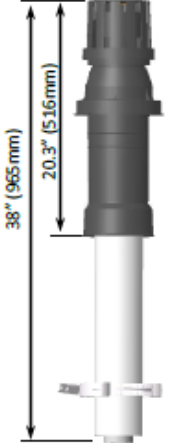

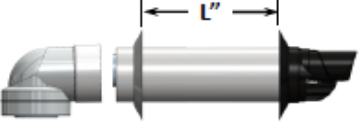


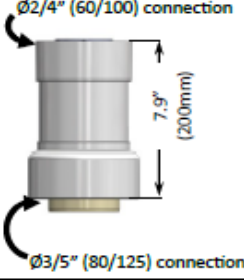

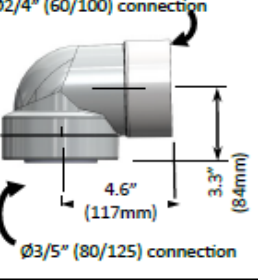
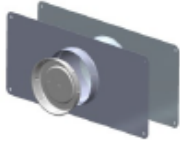

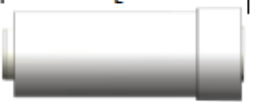
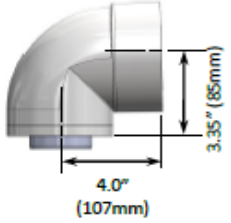
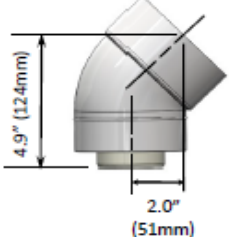
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# Installation: Concentric Venting / Direct Vent Components

Ubbink Condensing vent components available through Rinnai distributors.

➤ **2" X 4" Concentric Vent components shown below.**

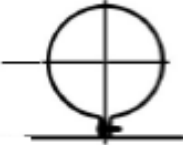
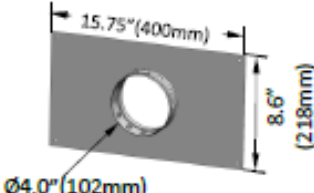
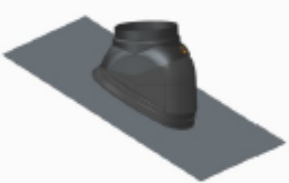
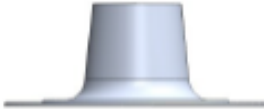

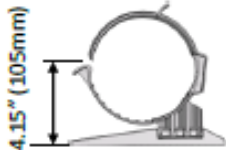
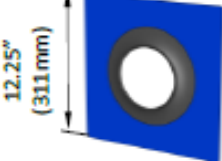

**(PPs) POLYPROPYLENE VENT COMPONENTS**

<p>2/4 (60/100) Condensing Roof Discharge Termination 20" above Roof Part #: 224356NPP</p> 	<p>2/4 (60/100) Condensing Roof Termination Extension Kit Part #: 185348NPP</p> 	<p>2/4 (60/100) Condensing Horizontal Termination Kit (termination, elbow, rubber wall plates)</p>  <table border="1" data-bbox="788 605 1116 786"> <thead> <tr> <th>Maximum wall thickness "L"</th> <th>Part Number</th> </tr> </thead> <tbody> <tr> <td>8.7" (221 mm)</td> <td>229011NPP</td> </tr> <tr> <td>12" (305 mm)</td> <td>229012NPP</td> </tr> <tr> <td>21" (533 mm)</td> <td>229013NPP</td> </tr> </tbody> </table> <p>2/4 (60/100) Condensing 21 in. Wall Termination (includes 2 wall plates) Part #: 229016NPP</p> 	Maximum wall thickness "L"	Part Number	8.7" (221 mm)	229011NPP	12" (305 mm)	229012NPP	21" (533 mm)	229013NPP	<p>2/4 (60/100) Condensing 90 Degree Diverter Nose Part #: 710202NPP</p>  <p>2/4 (60/100) Condensing Vertical Starter Adapter Part #: 227412NPP</p> 	<p>2/4 (60/100) Condensing 45 Degree Diverter Nose Part #: 710215NPP</p>  <p>2/4 (60/100) Condensing Horizontal Starter Adapter Part #: 229253NPP</p> 
Maximum wall thickness "L"	Part Number											
8.7" (221 mm)	229011NPP											
12" (305 mm)	229012NPP											
21" (533 mm)	229013NPP											
<p>2/4 (60/100) Thimble Part #: 224055</p>  <p>Fits 2x4 or 2x6 Wall Construction</p>	<p>2/4 (60/100) Rubber Wall Plate Part #: 710265 (White) Part #: 710192 (Black)</p> 	<p>2/4 (60/100) Condensing Vent Pipe Extension</p>  <table border="1" data-bbox="774 1158 1116 1325"> <thead> <tr> <th>Length "L"</th> <th>Part Number</th> </tr> </thead> <tbody> <tr> <td>10" (254 mm)</td> <td>229308NPP</td> </tr> <tr> <td>19.5" (240 mm)</td> <td>229309NPP</td> </tr> <tr> <td>39" (991 mm)</td> <td>229310NPP</td> </tr> </tbody> </table>	Length "L"	Part Number	10" (254 mm)	229308NPP	19.5" (240 mm)	229309NPP	39" (991 mm)	229310NPP	<p>2/4 (60/100) Condensing 90 Degree Elbow Part #: 229230NPP</p> 	<p>2/4 (60/100) Condensing 45 Degree Elbow (Qty. 2) Part #: 229205NPP</p> 
Length "L"	Part Number											
10" (254 mm)	229308NPP											
19.5" (240 mm)	229309NPP											
39" (991 mm)	229310NPP											

# Installation: Concentric Venting / Direct Vent Components

Ubbink Condensing vent accessories available through Rinnai distributors.

➤ **2" X 4" Concentric Vent components shown below.**

<p>2/4 (60/100) Pipe Clamp Metal Part #: 169013</p> 	<p>2/4 (60/100) Vent Support Bracket Part #: 224056</p> 	<p>Roof Flashing*</p> 	<p>Roof Flashing Assembly- Flat* Part #: 146141</p> 	<p>Universal Bug Guard* Part #: 224042</p> 												
<p>Pipe Clamp Universal Plastic* Part #: 169044</p> 	<p>2/4 (60/100) Horizontal— Flashing Panel Part #: 102000022</p> 	<table border="1"> <thead> <tr> <th>Roof Pitch</th> <th>Part No. Shingle Roofs</th> <th>Part No. Tile Roofs</th> </tr> </thead> <tbody> <tr> <td>1/12 to 6/12</td> <td>189950</td> <td>50171949</td> </tr> <tr> <td>6/12 to 12/12</td> <td>189951</td> <td>50171961</td> </tr> <tr> <td>8/12 to 16/12</td> <td>189952</td> <td>50171954</td> </tr> </tbody> </table>	Roof Pitch	Part No. Shingle Roofs	Part No. Tile Roofs	1/12 to 6/12	189950	50171949	6/12 to 12/12	189951	50171961	8/12 to 16/12	189952	50171954	<p>Flashing for Metal Roof* Part #: 242141</p> 	<p>*Components are universal for use with 2/4(60/100) and 3/5 (80-125) components.</p>
Roof Pitch	Part No. Shingle Roofs	Part No. Tile Roofs														
1/12 to 6/12	189950	50171949														
6/12 to 12/12	189951	50171961														
8/12 to 16/12	189952	50171954														

# Installation: Two pipe PVC/CPVC venting approved materials.

- If Twin Pipe PVC/CPVC venting is chosen, the vent material must meet the following standards.

## Certified Vent and Air Piping Materials

Item	Material	Standard for Installation in North America	
		United States	Canada
Exhaust vent or combustion air intake pipe and fittings	PVC Schedule 40	ANSI/ASTM D1785	Thermoplastic vent pipe must be certified to ULC S636. Intake Pipe may be of any material listed (left).
	PVC-DWV	ANSI/ASTM D2665	
	CPVC schedule 40	ANSI/ASTM F441	
Combustion air intake pipe and fittings	ABS schedule 40	ANSI/ATSM D2661	
PVC pipe cement & primer	PVC	ANSI/ASTM D2564	
	CPVC	ANSI/ASTM F493	

Refer to the vent manufacturer's installation instructions for proper assembly of vent components.

- Ubbink concentric non-condensing venting is NOT approved for use with Rinnai condensing water heaters. (Ubbink non-condensing venting uses an aluminum inner exhaust pipe. The Ubbink condensing venting uses a polypropylene inner exhaust pipe.)
- Ensure the differences between non-condensing and condensing vent installation guidelines are understood.
- DO NOT mix vent parts or the individual installation requirements between different vent manufacturers or types.

# Installation: Two pipe PVC/CPVC maximum vent lengths.

**NOTE: Maximum equivalent vent lengths are dependent on the diameter of the vent pipe.**

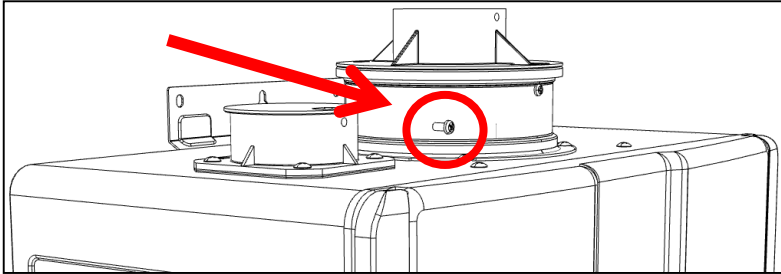
Vent Type	Maximum equivalent length.
Two Pipe -PVC/CPVC/Polypropylene*	2" - up to 65 feet.
	3" - up to 150 feet.
Two Pipe PP* (Centrotherm)	2" - up to 65 feet.
	3" - up to 150 feet.

**\* NOTE:** When calculating equivalent lengths for Concentric or PVC / CPVC / Polypropylene two pipe venting, each 90° elbow is equal to 6 feet and each 45° elbow is equal to 3 feet. **The approved terminations also have length equivalencies depending on the configuration. See the installation manual for specifics.**

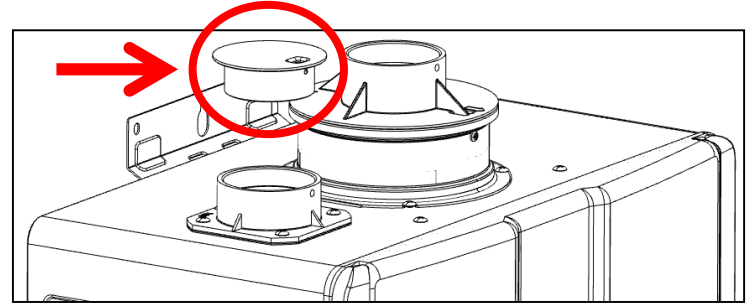
- For PVC / CPVC / Polypropylene two pipe venting keep the intake and exhaust pipe lengths as equal as possible.
- When installing a two-pipe PVC / CPVC / Polypropylene vent system, the vent termination configuration may result in slightly different equivalent lengths for the intake and exhaust pipes.
  - The total equivalent length is calculated from the longer of the intake or exhaust piping. The equivalent lengths of intake and exhaust are not added together.

# Installation: Two Pipe Venting / Direct Vent

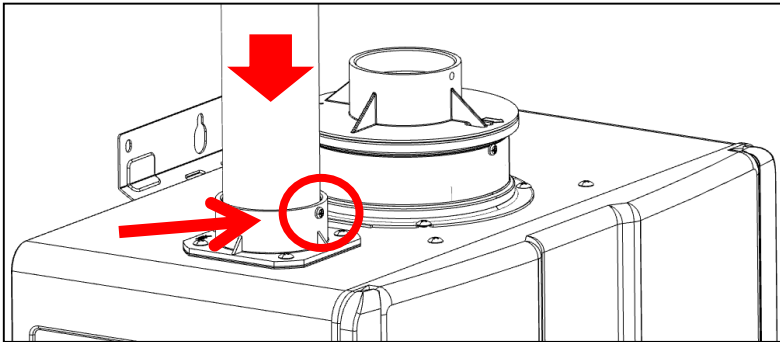
1. Remove fastener from the combustion air vent connection.



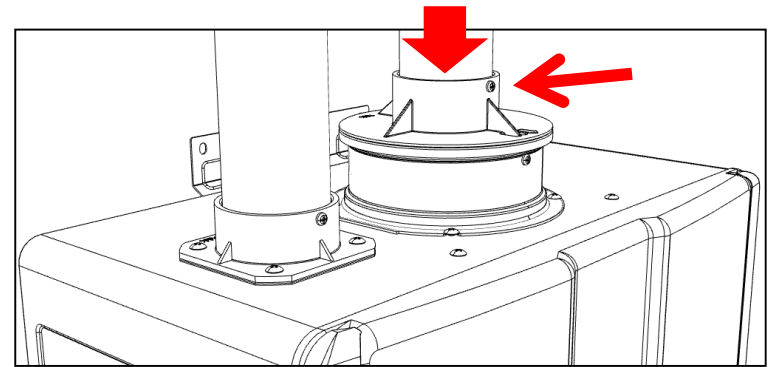
2. Remove and discard the combustion air vent cap.



3. Install the combustion air vent pipe and secure with the supplied screw.



5. Install the exhaust vent pipe and secure with the supplied screw.

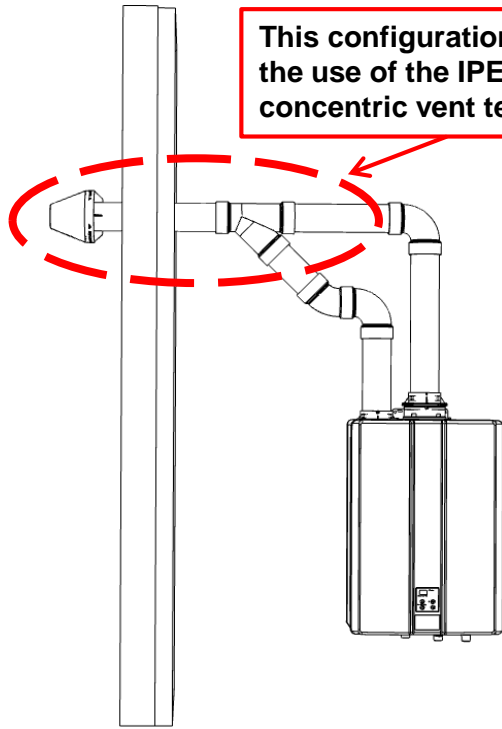


The Sensei N-Series indoor water heaters are equipped with 2" pipe connections. Using 3" pipe will require a field supplied reducer.

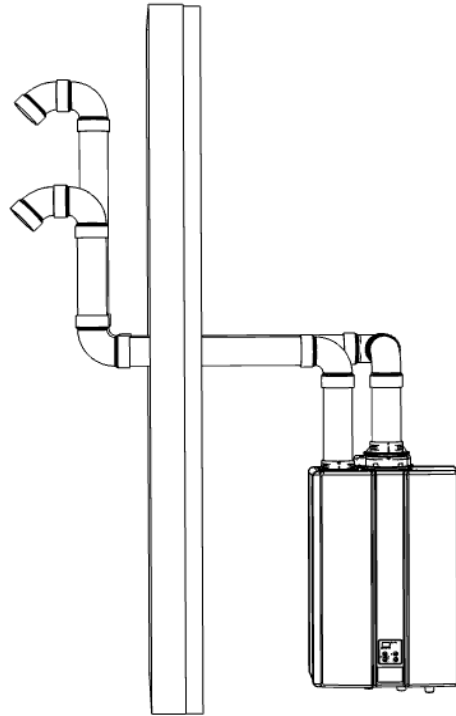
# Installation: Two Pipe Venting / Direct Vent

## Horizontal twin pipe vent termination examples.

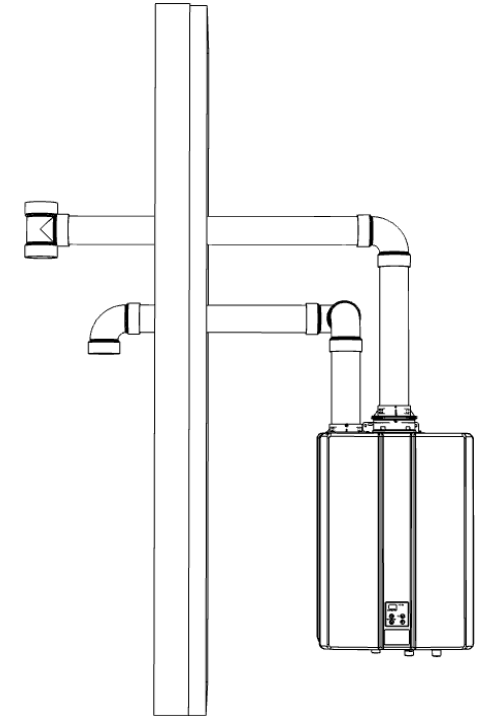
This configuration requires the use of the IPEX or Royal concentric vent termination.



2" or 3" PVC/CPVC Concentric Side Wall Termination.



2" or 3" PVC/CPVC Snorkel Termination.



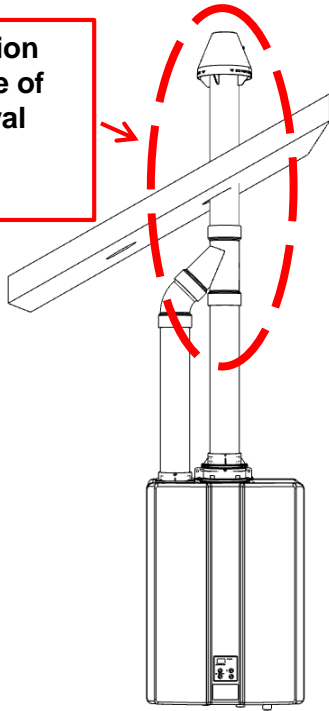
2" or 3" PVC/CPVC Tee Side Wall Termination (90° elbow can be used for exhaust).

Refer to the water heater's operation and installation manual for each termination's equivalent length and specific clearances.

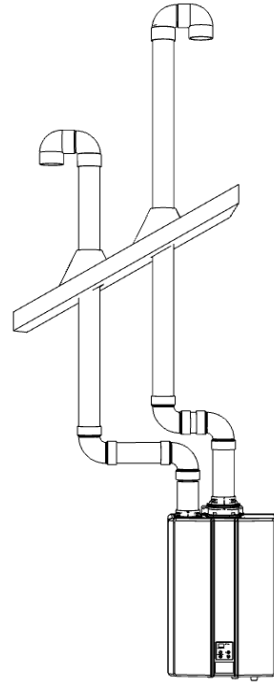
# Installation: Two Pipe Venting / Direct Vent

## Vertical twin pipe vent termination examples.

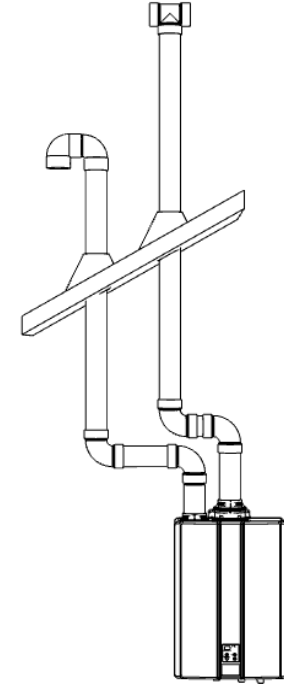
This configuration requires the use of the IPEX or Royal concentric vent termination.



2" or 3" PVC/CPVC with Concentric Vertical Termination.



2" or 3" PVC/CPVC Standard Upside down "U" Vertical Termination.

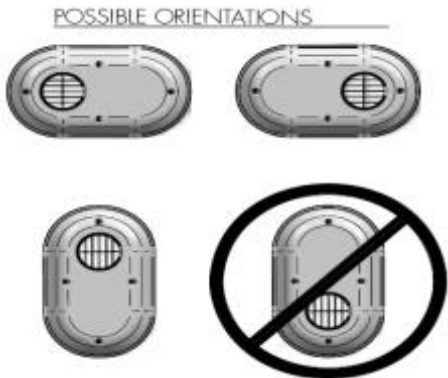


2" or 3" PVC/CPVC Tee Vertical Termination.

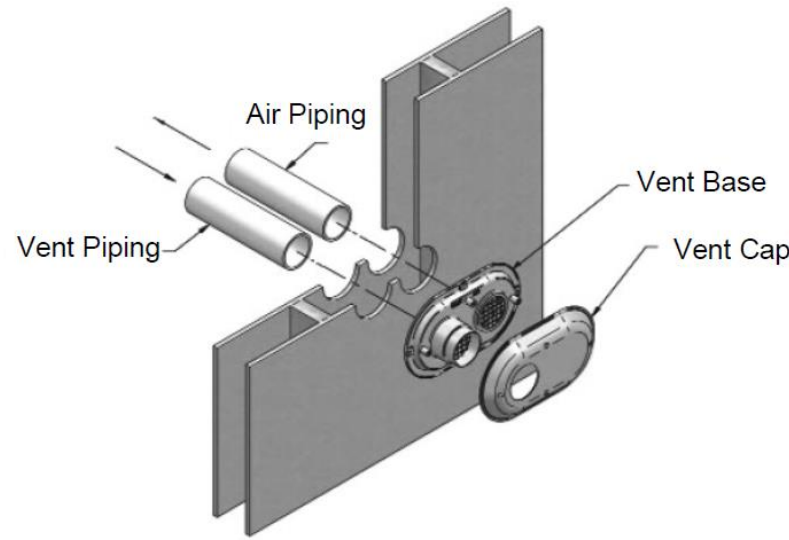
Refer to the water heater's operation and installation manual for each termination's equivalent length and specific clearances.

# Installation: Two Pipe Venting / Direct Vent

**Horizontal twin pipe low profile vent termination example.**



2" or 3" PVC/CPVC  
Low Profile Horizontal  
Termination.



**Refer to the water heater's operation and installation manual for each termination's equivalent length and specific clearances.**

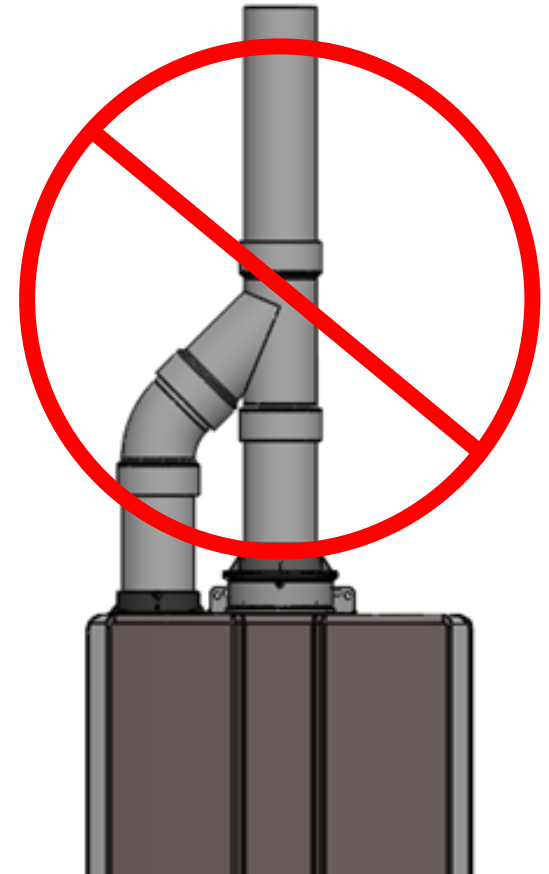
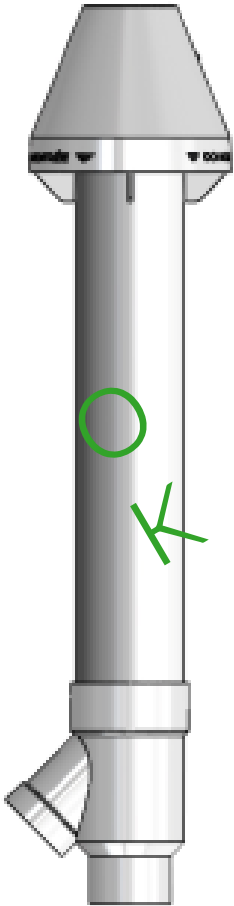
# Installation: Two Pipe Venting / Direct Vent

**PVC/CPVC concentric vent termination.**

**Warning!**

Exhaust and combustion air **MUST NOT** be brought together into a single PVC pipe using a pipe fitting.

Do not mistake the concentric termination (shown at left) to be PVC pipes glued together (shown at right). This results in exhaust gasses being drawn back into the water heater cabinet and into the burner.



# Installation: Room Air Venting / Non-Direct Vent

**NOTE:** When utilizing room air in a non-direct vent configuration all venting guidelines in regards to adequate air for combustion and for air quality must be adhered to. Failure to do so can result in unit failure, fire, explosion, serious bodily injury or death.

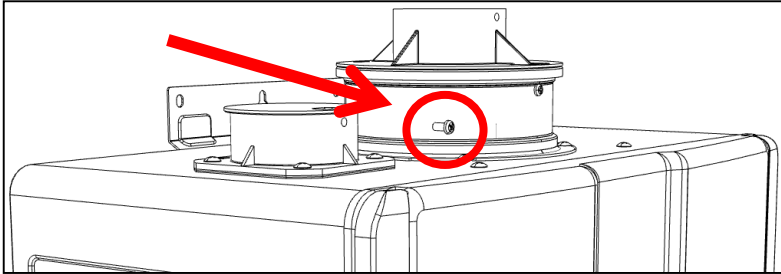
**NOTE: Maximum equivalent vent lengths are dependent on the diameter of the vent pipe.**

Vent Type	Maximum equivalent length.
PVC/CPVC/Polypropylene*	2" - up to 65 feet.
	3" - up to 150 feet.
PP* (Centrotherm)	2" - up to 65 feet.
	3" - up to 100 feet.

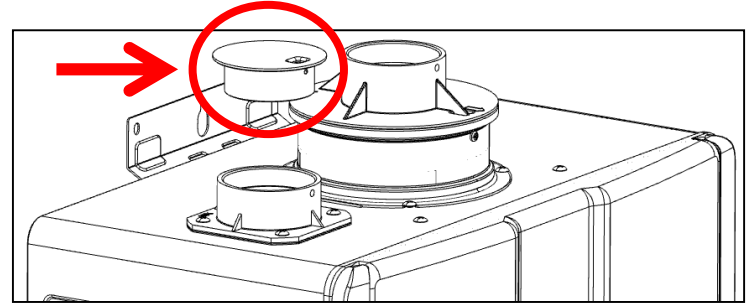
**\* NOTE:** When calculating equivalent lengths for Concentric or PVC / CPVC / Polypropylene two pipe venting, each 90° elbow is equal to 6 feet and each 45° elbow is equal to 3 feet. The approved terminations also have length equivalencies depending on the configuration. See the installation manual for specifics.

# Installation: Room Air Venting / Non-Direct Vent

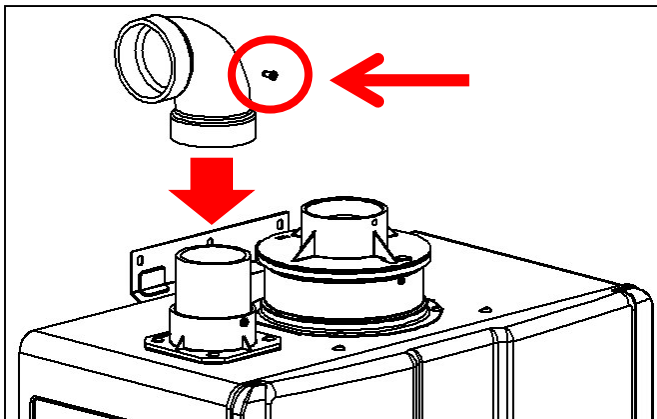
1. Remove fastener from the combustion air vent connection.



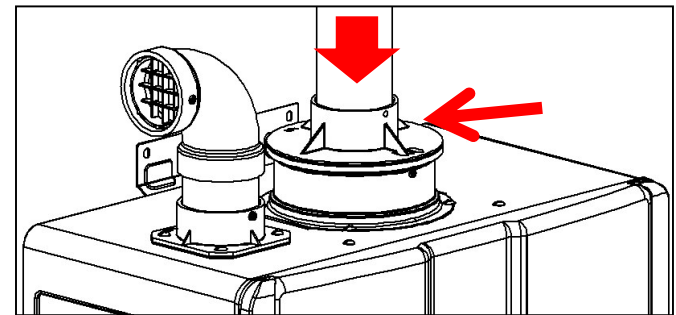
2. Remove and discard the combustion air vent cap.



3. Install the combustion air vent pipe and secure with the supplied screw. Glue the elbow to the vent pipe per manufacturer's instructions.



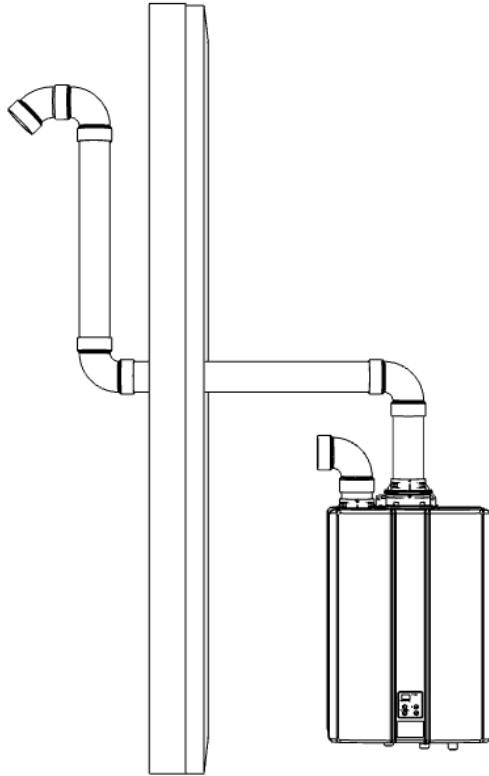
5. Install the exhaust vent pipe and secure with the supplied screw.



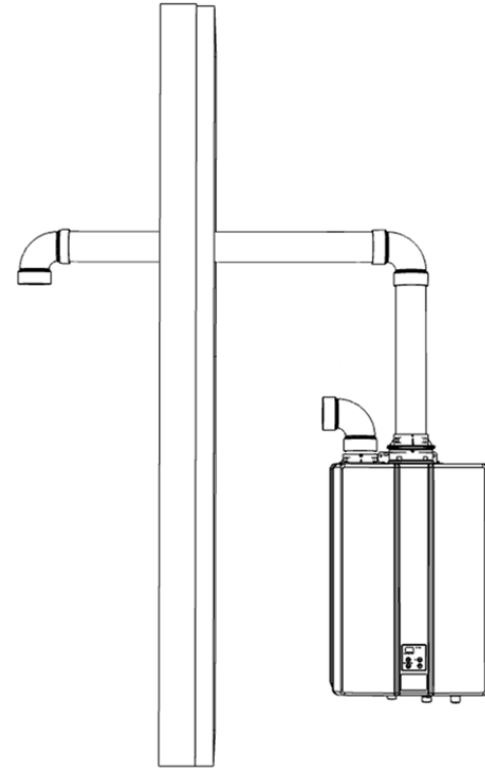
The N-Series indoor water heaters are equipped with 2" pipe connections. Using 3" pipe will require a field supplied reducer.

# Installation: Room air / Non - Direct Vent

## Horizontal Non-Direct Vent / Room Air vent termination examples.



2" or 3" PVC/CPVC  
Snorkel Termination.

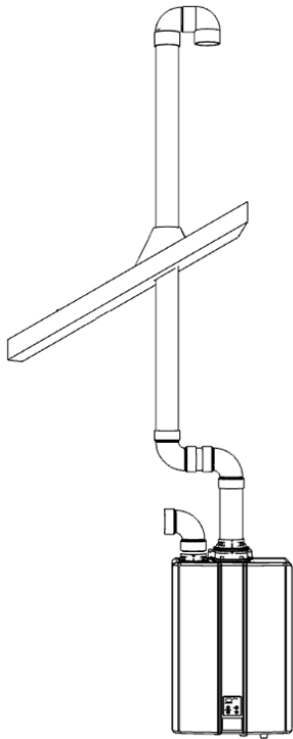


2" or 3" PVC/CPVC Elbow Side Wall Termination  
( Tee fitting can be used for exhaust).

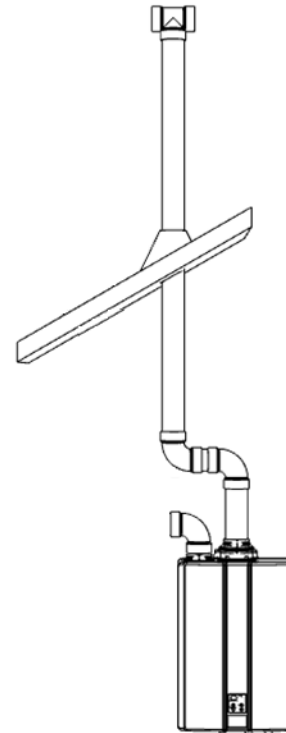
Refer to the water heater's operation and installation manual for each termination's equivalent length and specific clearances.

# Installation: Room air / Non - Direct Vent

## Vertical Non-Direct Vent / Room Air vent termination examples.



2" or 3" PVC/CPVC Standard Upside down "U" Vertical Termination.



2" or 3" PVC/CPVC Tee Vertical Termination.

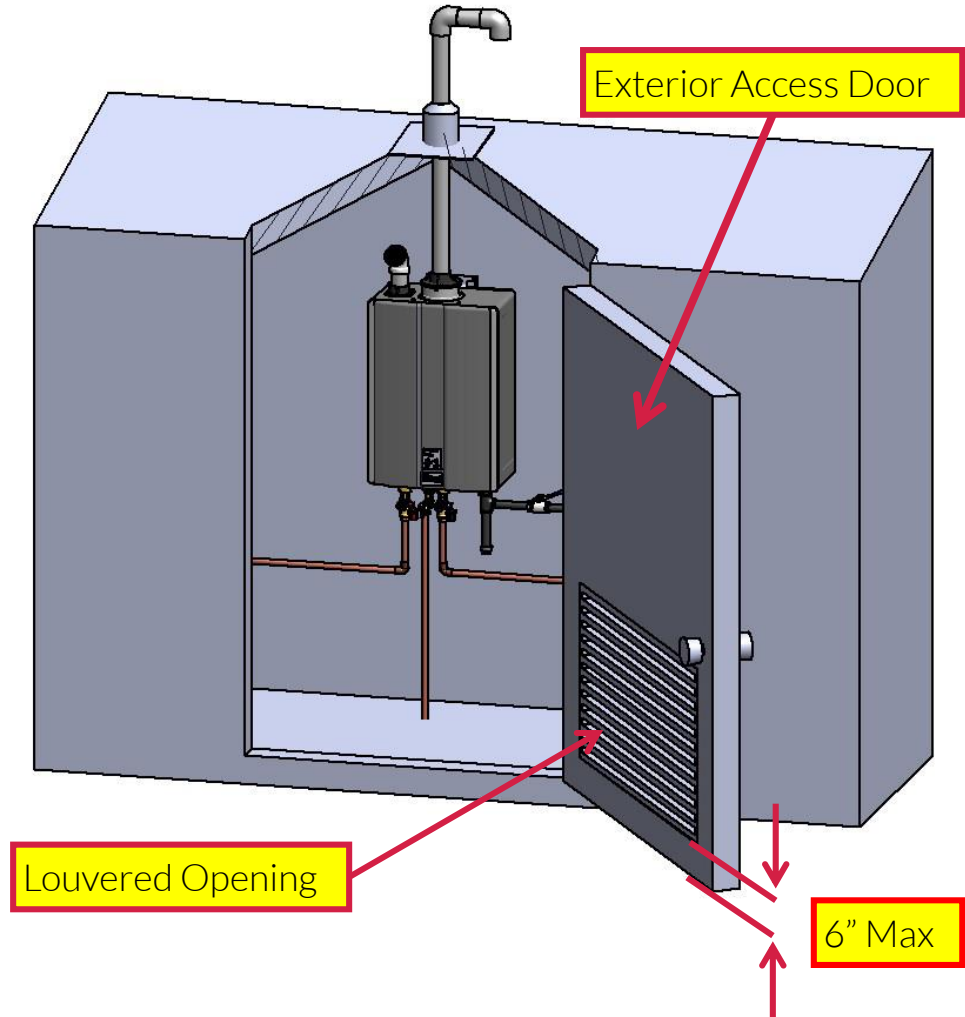
Refer to the water heater's operation and installation manual for each termination's equivalent length and specific clearances.

# Installation: Room air / Non - Direct Vent

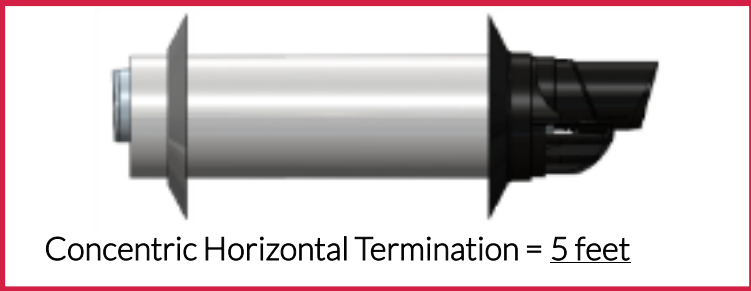
## Non-Direct Vent / Room Air venting in a Manufactured (mobile) Home.

NOTE: Combustion air MUST NOT be supplied from occupied spaces of a manufactured home.

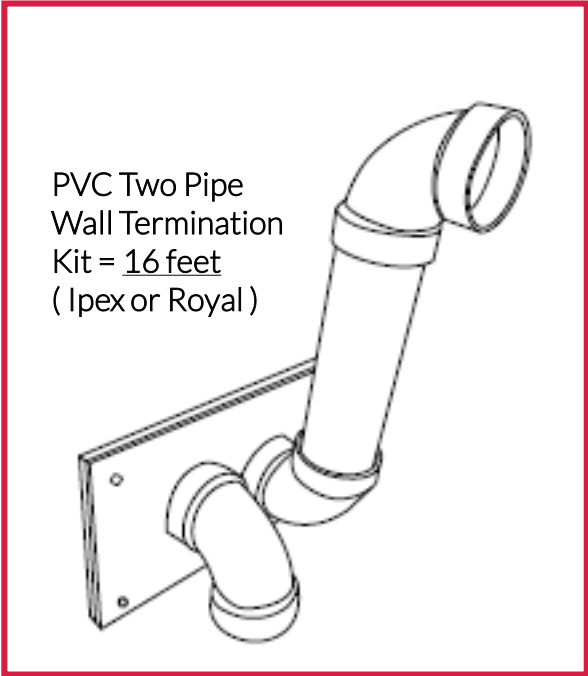
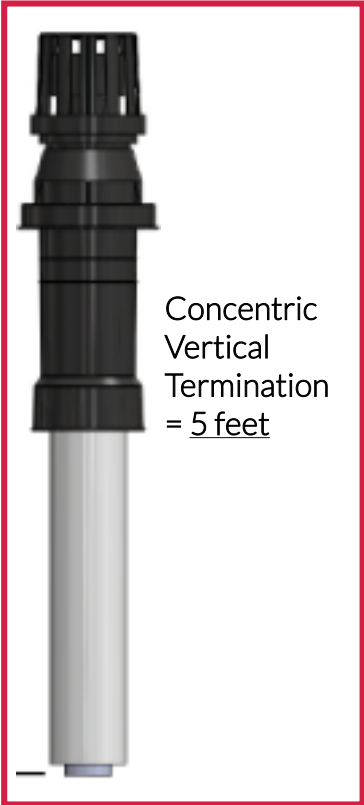
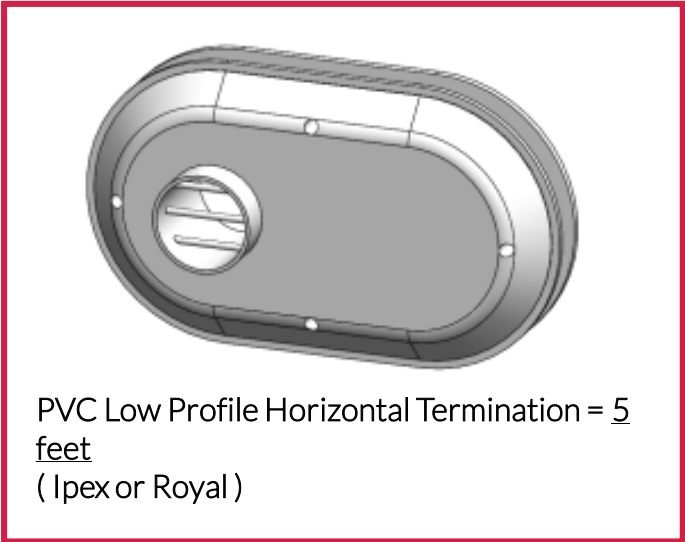
- Access panels, doors or opening of any kind are not permitted between the installation enclosure and the inside of the manufactured home.
- The installation enclosure must include an exterior access door incorporating a single opening positioned a maximum of 6" above the lower edge of the door. The opening in the access door must be metal with no less than ¼" mesh.



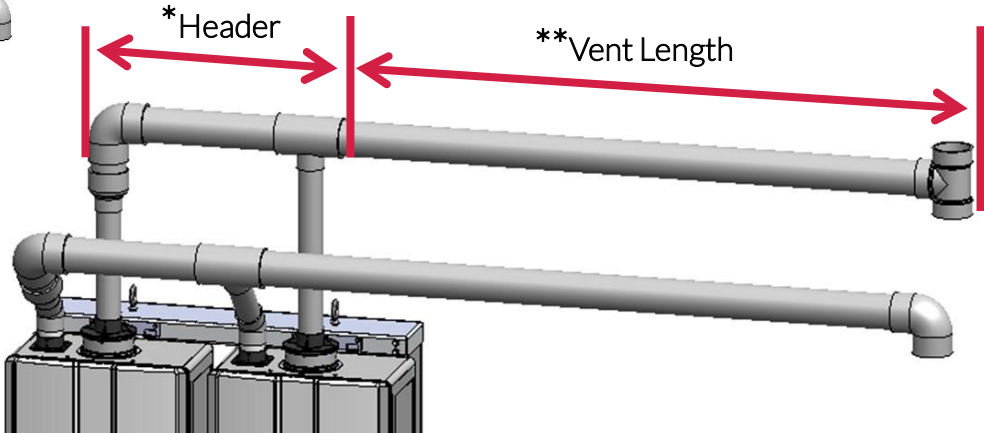
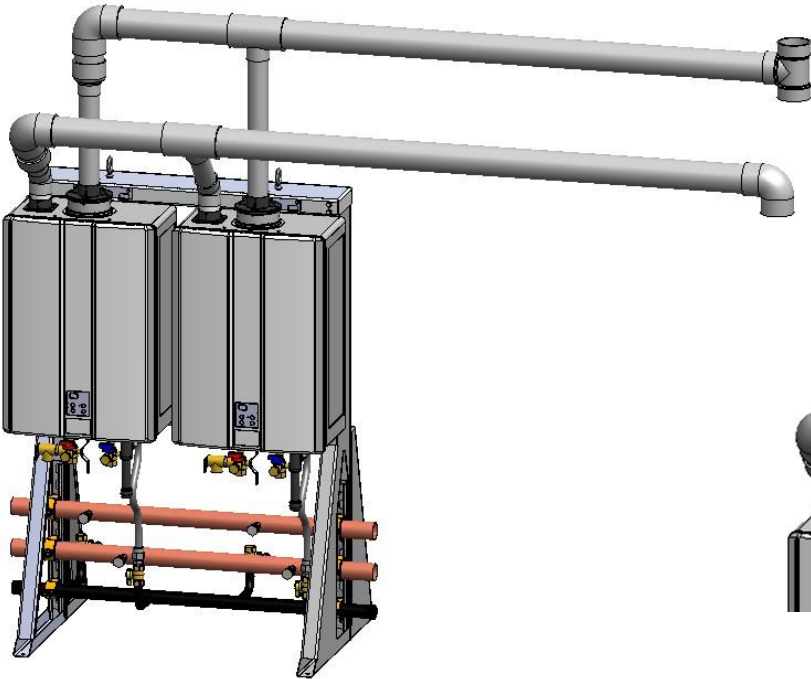
# Installation: Examples of Termination Equivalent Lengths



See the Installation Manual for more complete equivalent length information.



# Installation: Common Vent – Indoor only. (Direct Vent and Non-Direct vent / Room Air)



- \*Header is the main vent pipe into which several vents connect.
- \*\*Vent length is the distance from the end of the header to the vent termination.
- Maximum vent length measurement starts at the end of the header.

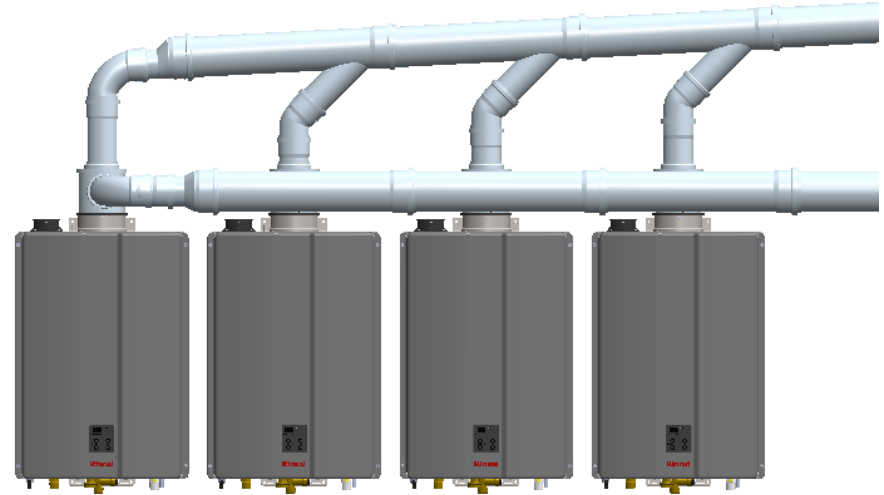
Number of Water Heaters	Water Heater Model	Max Vent Length		
		3" Vent	4" Vent	6" Vent
2	RU130i	90 ft.	150 ft.	150 ft.
2	RU / RUR160i			
2	RU180i	65 ft.	150 ft.	150 ft.
2	RU / RUR199i			

**Refer to the water heater’s operation and installation manual for each termination’s equivalent length and specific clearances.**

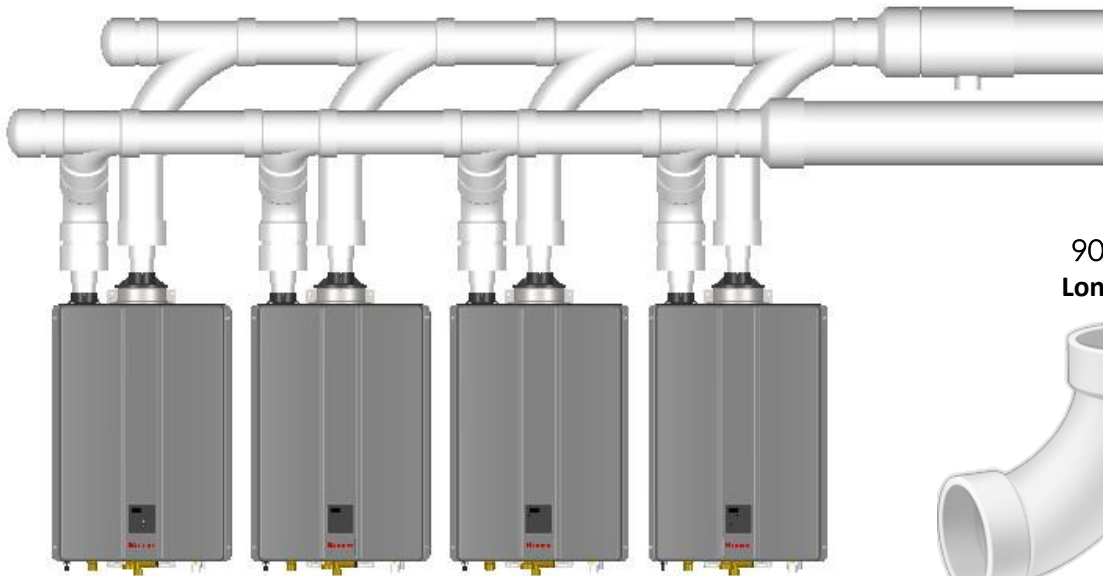
# Installation: Commercial Common Vent – Indoor only. (Direct Vent and Non-Direct vent / Room Air)

Rinnai water heaters can only be common vented with Schedule 40 PVC/CPVC or with the Rinnai C-Vent Common Vent System.

Rinnai Common Venting (C-Vent)



Schedule 40 PVC/CPVC Common Vent.



Acceptable

90° Elbow  
Long Sweep



90° Elbow  
Short Sweep



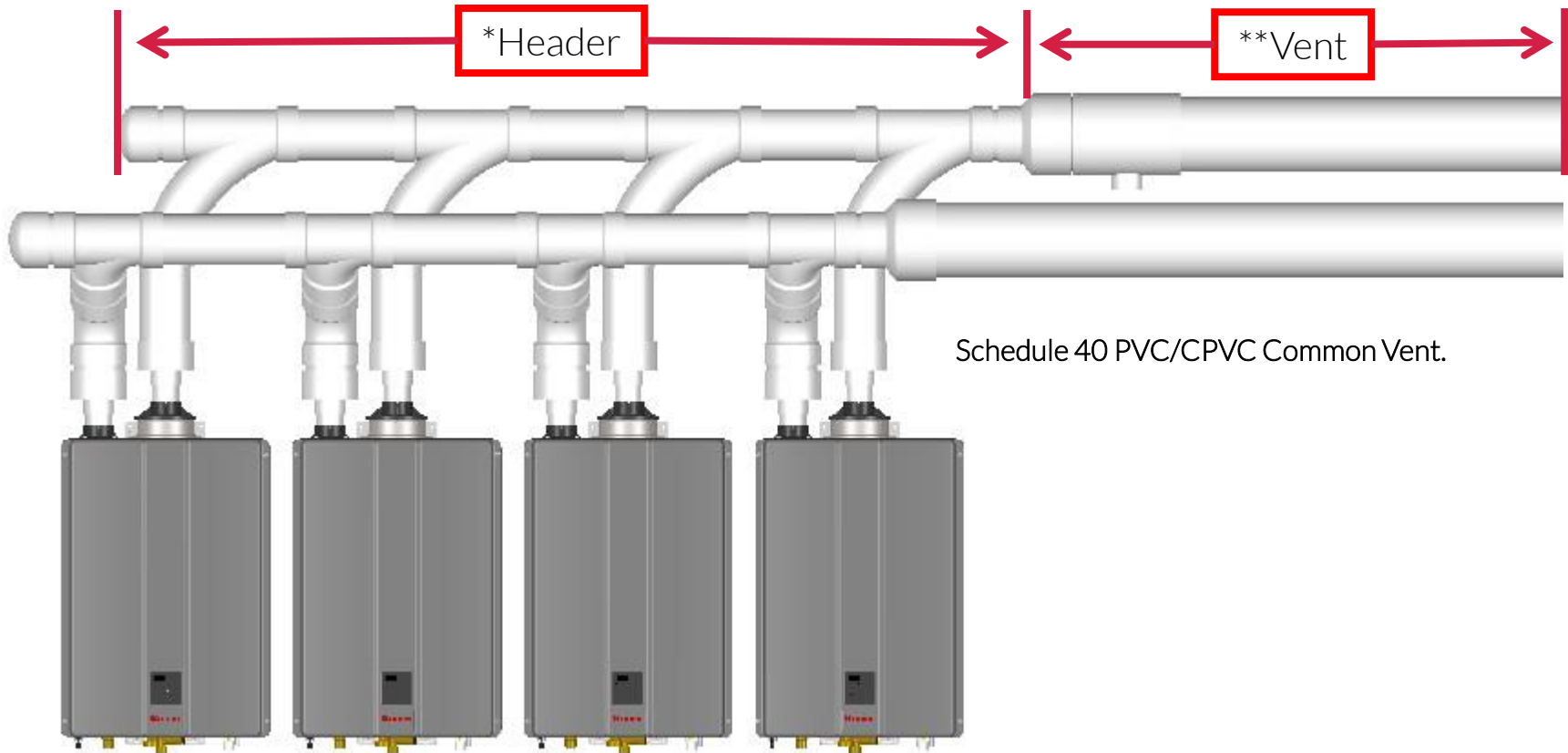
Not acceptable

90° Elbow  
Close Turn



# Installation: Commercial Common Vent – Indoor only. (Direct Vent and Non-Direct vent / Room Air)

- \*Header is the main vent pipe into which several vents connect.
- \*\*Vent length is the distance from the end of the header to the vent termination.
- Maximum vent length measurement starts at the end of the header.



# Installation: Commercial Common Vent – Indoor only. (Direct Vent and Non-Direct vent / Room Air)

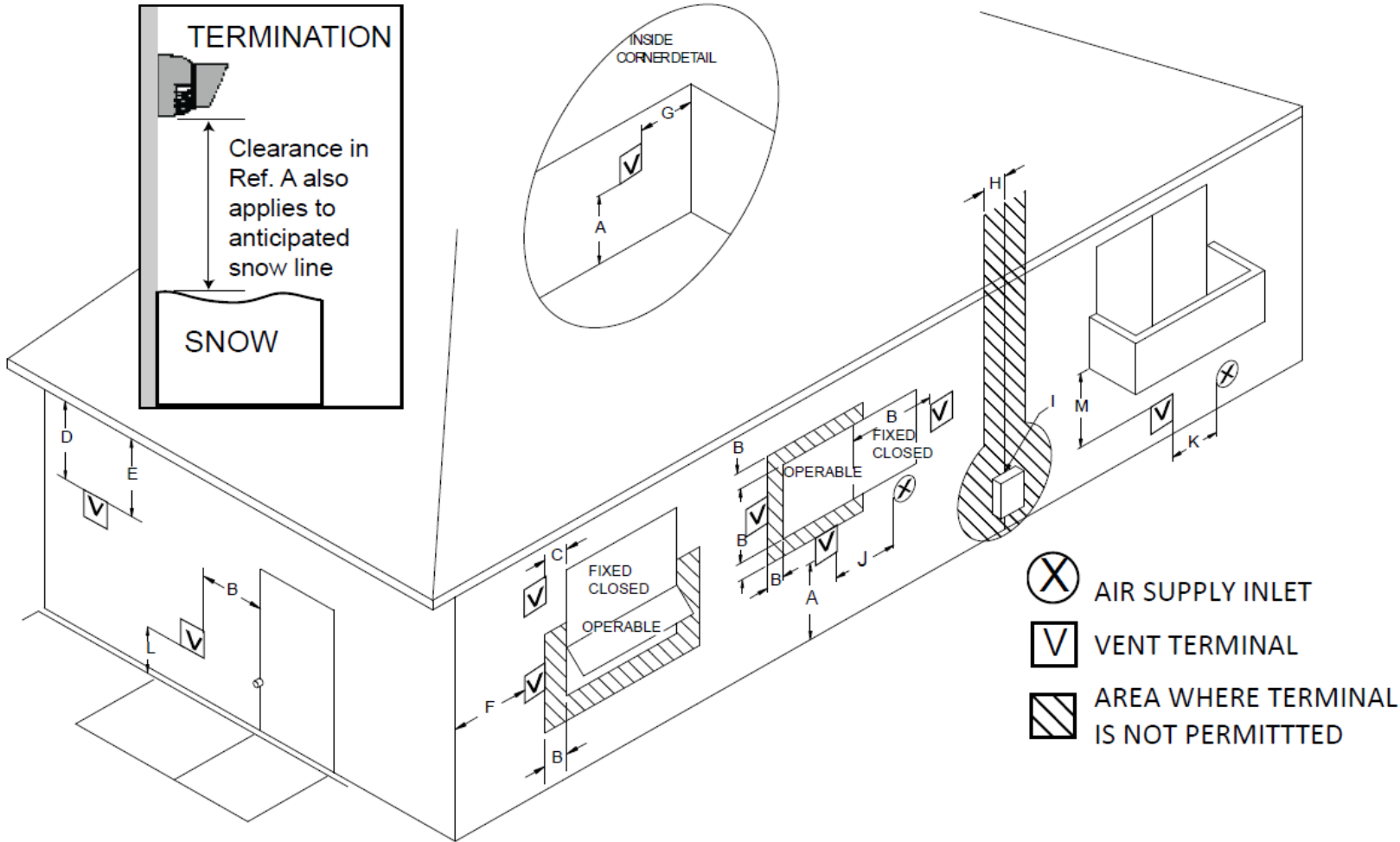
## Commercial Common Vent Maximum Equivalent Vent length Rinnai Common Vent System or Schedule 40 PVC/CPVC

Water Heater Model	# Of Water Heaters	Max System Btu/Hr	Header Diameter			
			3"	4"		6"
			3" Vent Diameter	4" Vent Diameter	6" Vent Diameter	6" Vent Diameter
CU199i	2	398,000	65 ft	150 ft	150 ft	150 ft
	3	597,000	65 ft	65 ft		
	4	796,000		150 ft		
	5	995,000		70 ft		
	6	1,194,000				
	7	1,393,000				
	8	1,592,000				
CU160i	2	320,000		90 ft	150 ft	150 ft
	3	480,000	65 ft	100 ft		
	4	640,000		65 ft		

# Installation Venting: Vent clearances – ANSI standards.

## Direct Vent Terminal Clearances (Indoor Units)

For indoor models, you must install a vent termination to bring in combustion air and expel exhaust to the outside.



# Installation Venting: Direct Vent clearances – For Concentric and Twin Pipe – ANSI standards.

Ref	Description	U.S. Specifications	Canadian Specifications
A	Clearance above grade, veranda, porch, deck or balcony	12 inches (30 cm)	12" (30 cm)
B	Clearance to window or door that maybe opened	12 inches (30 cm)	36" (91 cm)
C	Clearance to permanently closed window	*	*
D	Vertical clearance to ventilated soffit, located above the terminal within a horizontal distance of 2 feet (61 cm) from the center line of the terminal	*	*
E	Clearance to unvented soffit	*	*
F	Clearance to outside corner	*	*
G	Clearance to inside corner	*	*
H	Clearance to side of center line extended above meter / regulator assembly	*	*
I	Clearance to service regulator vent outlet	*	Above a regulator within 3 ft (91cm) horizontally of the vertical center line of the regulator vent outlet to a maximum vertical distance of 15 ft. (4 m)
J	Clearance to non-mechanical air supply inlet to building or the combustion air inlet to any other appliance	12 inches (30 cm)	36 inches (91 cm)
K	Clearance to a mechanical air supply inlet	3 feet (91 cm) above if within 10 feet (3 m) horizontally	6 feet (2 m)
L	Clearance above paved sidewalk or paved driveway located on the public property	*	7 feet (2.25 m) ①
M	Clearance under veranda, porch, deck, or balcony	*	12 inches (30 cm) ②

For clearances not specified in ANSI Z223. 1/NFPA 54 or CSAB149.1, clearances are in accordance with local installation codes and the requirements of the gas supplier.

① A vent shall not terminate directly above a sidewalk or paved driveway that is located between two single family dwellings and serves both dwellings.

② Permitted only if veranda, porch, deck or balcony is fully open on a minimum of two sides beneath the floor.

Clearance to opposite wall is 24 inches (60 cm).

# Installation Venting: Non-Direct Vent clearances – Room Air and External models – ANSI standards.

Ref	Description	U.S. Specifications	Canadian Specifications
A	Clearance above grade, veranda, porch, deck or balcony	12 inches (30 cm)	12" (30 cm)
B	Clearance to window or door that maybe opened	4 ft. (1.2 m) below or to the side of opening; 1 ft. (300 mm) above opening	36 inches (91 cm)
C	Clearance to permanently closed window	*	*
D	Vertical clearance to ventilated soffit, located above the terminal within a horizontal distance of 2 feet (61 cm) from the center line of the terminal	*	*
E	Clearance to unvented soffit	*	*
F	Clearance to outside corner	*	*
G	Clearance to inside corner	*	*
H	Clearance to side of center line extended above meter / regulator assembly	*	*
I	Clearance to service regulator vent outlet	*	Above a regulator within 3 ft (91cm) horizontally of the vertical center line of the regulator vent outlet to a maximum vertical distance of 15 ft. (4 m)
J	Clearance to non-mechanical air supply inlet to building or the combustion air inlet to any other appliance	4 ft. (1.2 m) below or to the side of opening; 1 ft. (300 mm) above opening	36 inches (91 cm)
K	Clearance to a mechanical air supply inlet	3 feet (91 cm) above if within 10 feet (3 m) horizontally	6 feet (1.83 m)
L	Clearance above paved sidewalk or paved driveway located on the public property	*	7 feet (2.13 m) ①
M	Clearance under veranda, porch, deck, or balcony	*	12 inches (30 cm) ②

For clearances not specified in ANSI Z223. 1/NFPA 54 or CSAB149.1, clearances are in accordance with local installation codes and the requirements of the gas supplier.

① A vent shall not terminate directly above a sidewalk or paved driveway that is located between two single family dwellings and serves both dwellings.

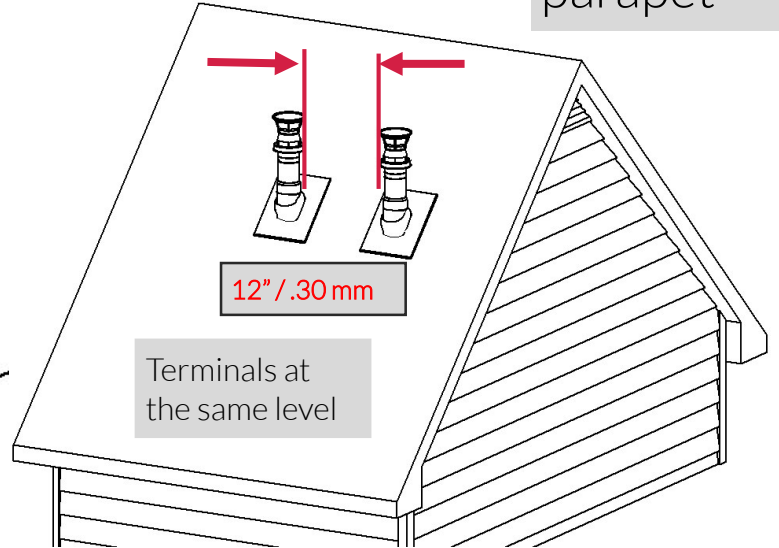
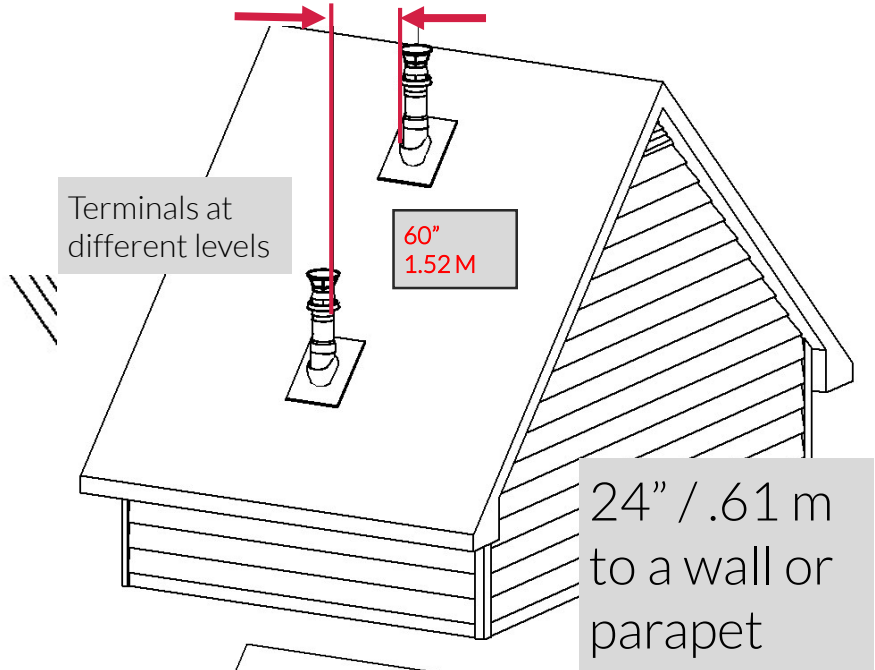
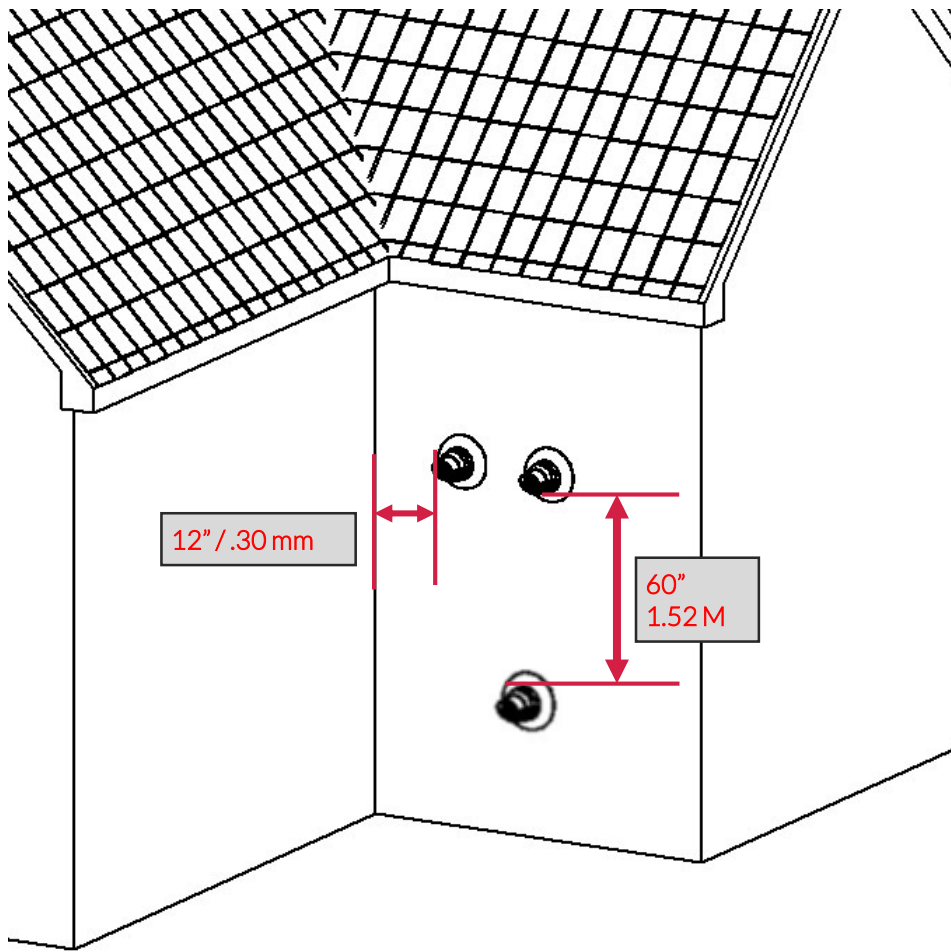
② Permitted only if veranda, porch, deck or balcony is fully open on a minimum of two sides beneath the floor.

Clearance to opposite wall is 24 inches (60 cm).

# Installation Venting: Termination Considerations.

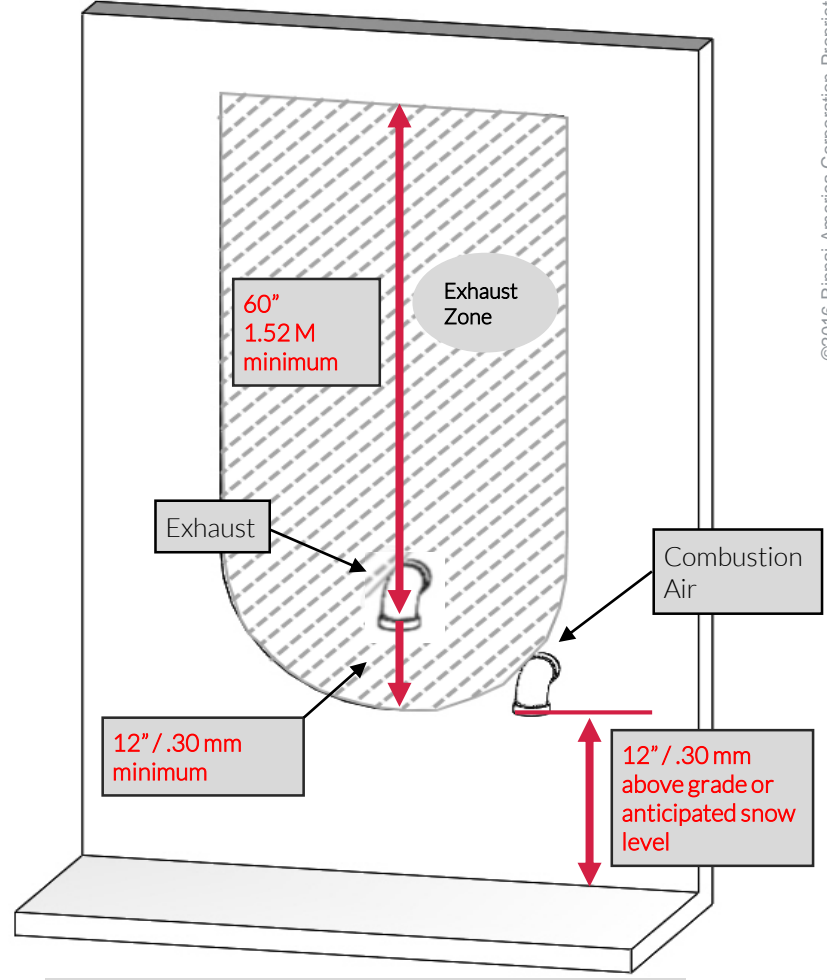
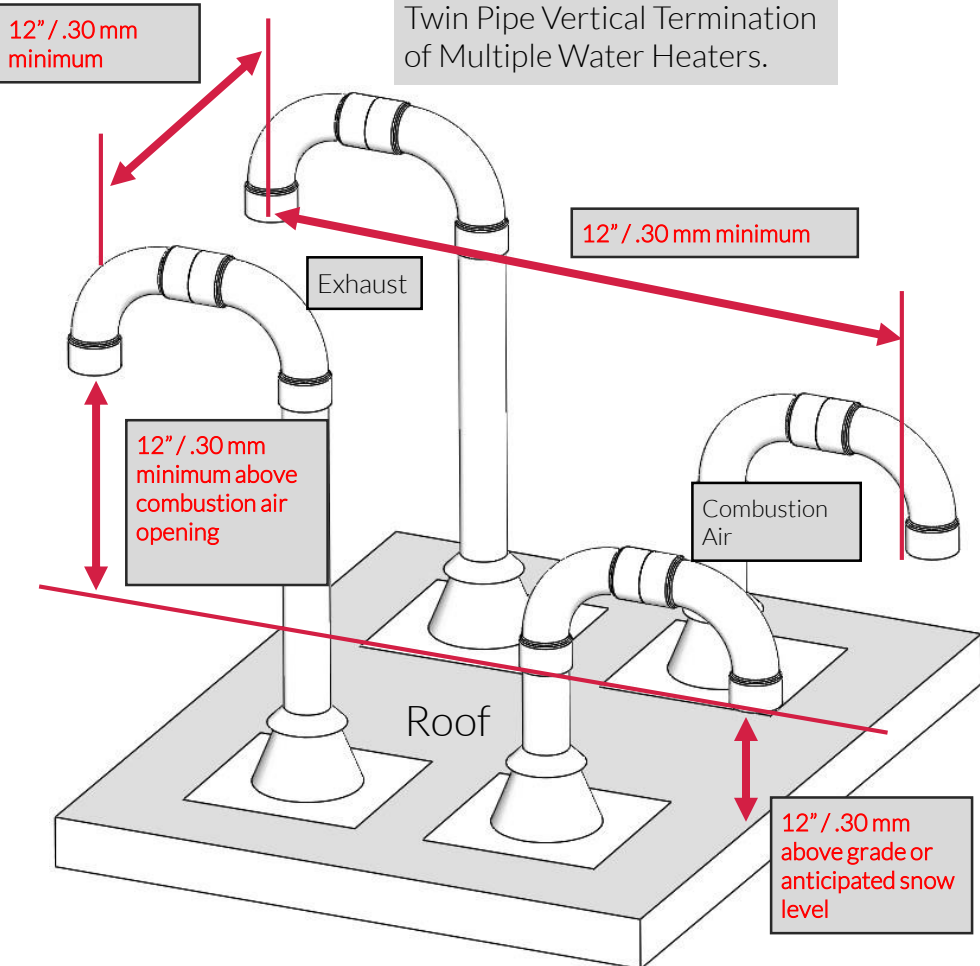
- **Local Codes will supersede the following recommendations.**
  - Avoid termination locations near a dryer vent.
  - Avoid termination locations near a commercial cooking exhaust.
  - Avoid termination locations near any air inlets.
  - You must install a vent termination at least 12 inches above ground or anticipated show level.
- **The vent for this appliance shall not terminate:**
  - Over Public walkways.
  - Near soffit vents or crawl space vents or other areas where condensate or vapor could create a nuisance or hazard or cause property damage.
  - Where condensate or vapor could cause damage or could be detrimental to the operation of regulators, pressure relief valves or other equipment.
- **Below are important considerations for locating the vent termination under a soffit (ventilated or unventilated) or to an eave vent or to a deck or porch.**
  - Do not install the vent termination under a soffit vent such that exhaust can enter the soffit vent.
  - Install vent termination such that exhaust and rising moisture will not collect under eaves. Discoloration to the exterior of the building could occur if too close.
  - Do not install the vent termination too close under the soffit where it could present recirculation of exhaust gasses back into the combustion air part of the termination.

# Installation Venting: Rinnai Recommended Clearances – Concentric Venting



# Installation Venting: Rinnai Recommended Clearances – Twin Pipe

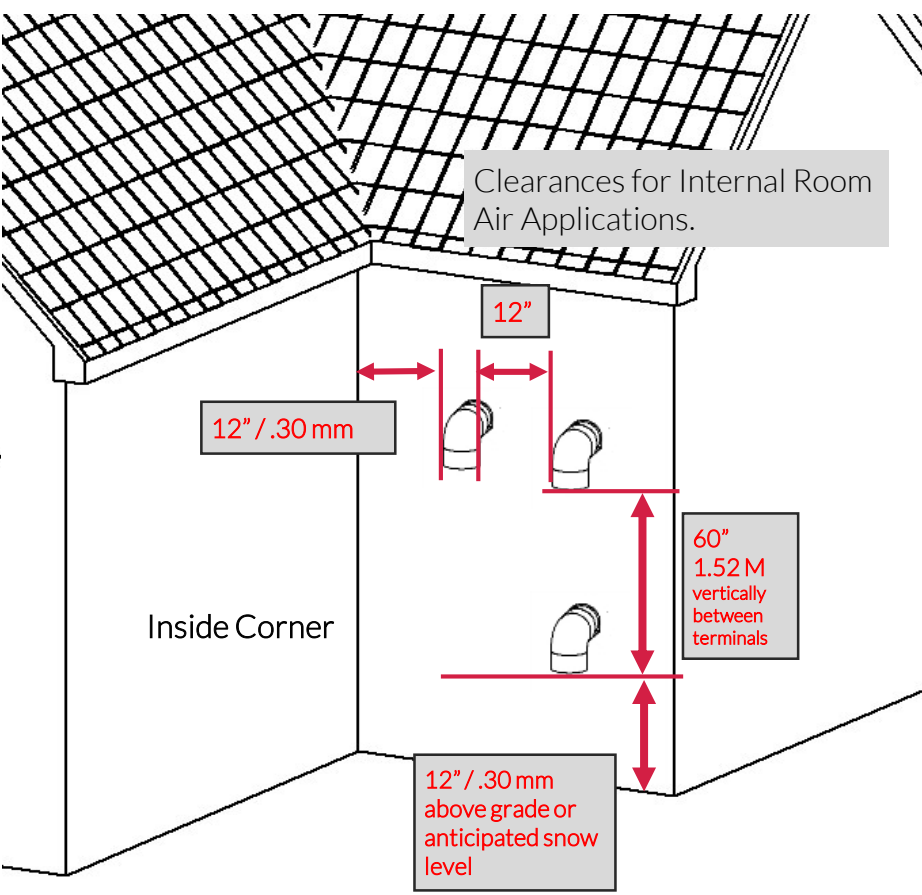
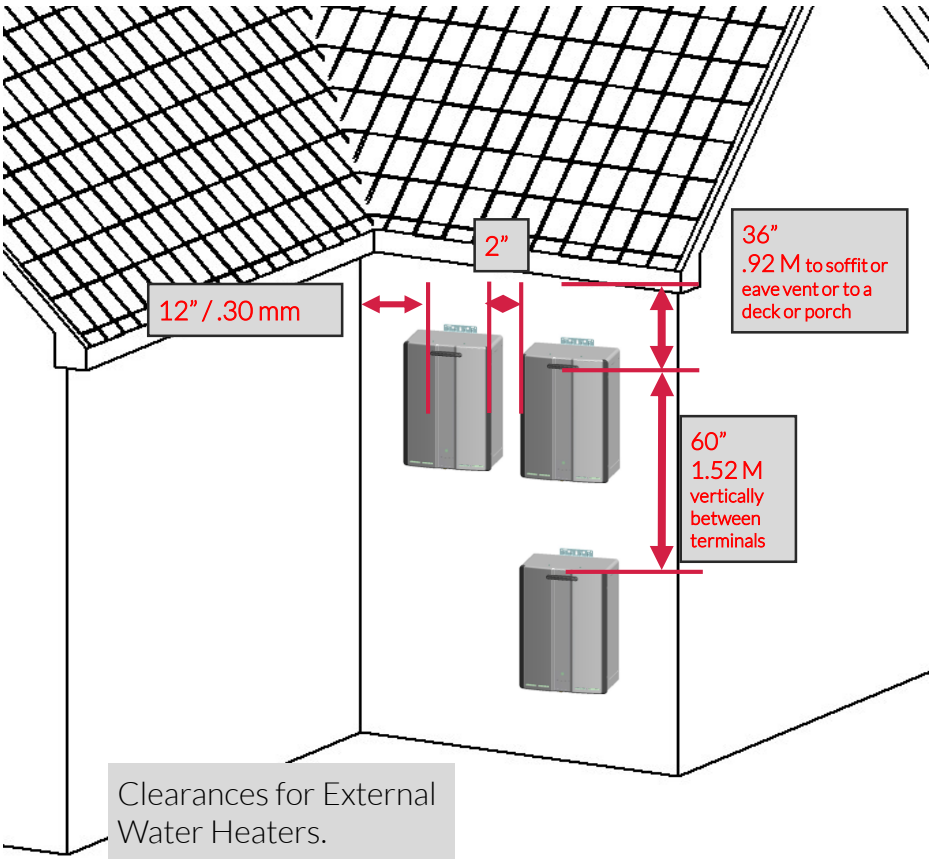
Twin Pipe Vertical Termination of Multiple Water Heaters.



Horizontal Vent and Combustion Air Piping.

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# Installation Venting: Rinnai Recommended Clearances – Non-Direct Vent : Room Air and External



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# Rinnai N-Series Tankless Condensing Water Heater Maximum Vent Length Quick Reference

Vent Diameter / Vent Type / # of Units	RU130i, RU160i RU180i, RU199i	RUR160i RUR199i	CU160i CU199i	Demand Duo W/CU199
	Maximum Equivalent Length in Feet			
<b>CONCENTRIC DIRECT VENT</b>				
2" x 4" Concentric (Direct Vent)	65	65	65	65
3" x 5" Concentric (Direct Vent)	150	150	150	150
<b>TWIN PIPE DIRECT VENT</b>				
2" PVC/CPVC/PP (Dual Pipe - Direct Vent)	65	65	65	65
3" PVC/CPVC/PP (Dual Pipe - Direct Vent)	150	150	150	150
3" Centrotherm PP, Vent System (Dual Pipe - Direct Vent)	150	150	150	150
<b>SINGLE PIPE, NON-DIRECT VENT (Room Air)</b>				
2" PVC/CPVC/PP (Single Pipe – Room Air)	65	65	65	65
3" PVC/CPVC/PP (Single Pipe – Room Air)	150	150	150	150
<b>PVC / CPVC / PP DIRECT COMMON VENT, RESIDENTIAL</b>				
3" PVC/CPVC (Dual Pipe - Direct Vent) 2 units	65	65		
4" PVC/CPVC (Dual Pipe - Direct Vent) 2 units	65	150		
6" PVC/CPVC (Dual Pipe - Direct Vent) 2 units	65	150		
<b>PVC / CPVC / PP NON – DIRECT COMMON VENT (Room Air), RESIDENTIAL</b>				
3" PVC/CPVC (Single Pipe - Room Air) 2 units	65	65		
4" PVC/CPVC (Single Pipe - Room Air) 2 units	65	150		
6" PVC/CPVC (Single Pipe - Room Air) 2 units	65	150		

**NOTE:** When calculating vent lengths, the termination configuration may have a length equivalency that will need to be added to the length of straight pipe and the elbow equivalencies (listed below). For two-pipe vent installations, use the calculated length of the intake or exhaust, whichever is longer. Do not add them together. See installation manual for specifics.

Equivalent lengths – 2" x 4" / 3" x 5" concentric vent	
90° Elbow = 6 feet	45° Elbow = 3 feet

Equivalent lengths – 2", 3", 4", 6" PVC/CPVC/PP and Common vent	
90° Elbow = 10 feet	45° Elbow = 5 feet

**NOTE:** This document is meant as a guide and not as a replacement for the information contained in the applicable water heater and/or common vent installation manuals. Refer to the appropriate manual for complete details.

# Rinnai N-Series Tankless Condensing Water Heater Maximum Vent Length Quick Reference

Vent Diameter / Vent Type / # of Units	CU160i		CU199i		Demand Duo W/CU199	
	Maximum Equivalent Length in Feet					
	PVC / CPVC / PP DIRECT COMMON VENT / NON - DIRECT COMMON VENT (Room Air), COMMERCIAL					
	3" Header		3" Header		3" Header	
3" Vent (Dual Pipe - Direct Vent / Single Pipe - Room Air) 2 Units	90		65		65	
	4" Header	6" Header	4" Header	6" Header	4" Header	6" Header
4" Vent (Dual Pipe - Direct Vent / Single Pipe - Room Air) 2 Units	150		150		150	
4" Vent (Dual Pipe - Direct Vent / Single Pipe - Room Air) 3 Units	100		150		150	
4" Vent (Dual Pipe - Direct Vent / Single Pipe - Room Air) 4 Units	65		65		65	
6" Vent (Dual Pipe - Direct Vent / Single Pipe - Room Air) 2 Units	150	150	150	150	150	150
6" Vent (Dual Pipe - Direct Vent / Single Pipe - Room Air) 3 Units	150	150	150	150	150	150
6" Vent (Dual Pipe - Direct Vent / Single Pipe - Room Air) 4 Units	150	150	150	150	150	150
6" Vent (Dual Pipe - Direct Vent / Single Pipe - Room Air) 5 Units			150	150	150	150
6" Vent (Dual Pipe - Direct Vent / Single Pipe - Room Air) 6 Units			150	150	150	150
6" Vent (Dual Pipe - Direct Vent / Single Pipe - Room Air) 7 Units			70	150	70	150
6" Vent (Dual Pipe - Direct Vent / Single Pipe - Room Air) 8 Units				150		150

**NOTE:** When calculating vent lengths, the termination configuration may have a length equivalency that will need to be added to the length of straight pipe and the elbow equivalencies (listed below). For two-pipe vent installations, use the calculated length of the intake or exhaust, whichever is longer. Do not add them together. See installation manual for specifics.

Equivalent lengths – 3", 4", 6" PVC/CPVC/PP Common vent	
90° Elbow = 10 feet	45° Elbow = 5 feet

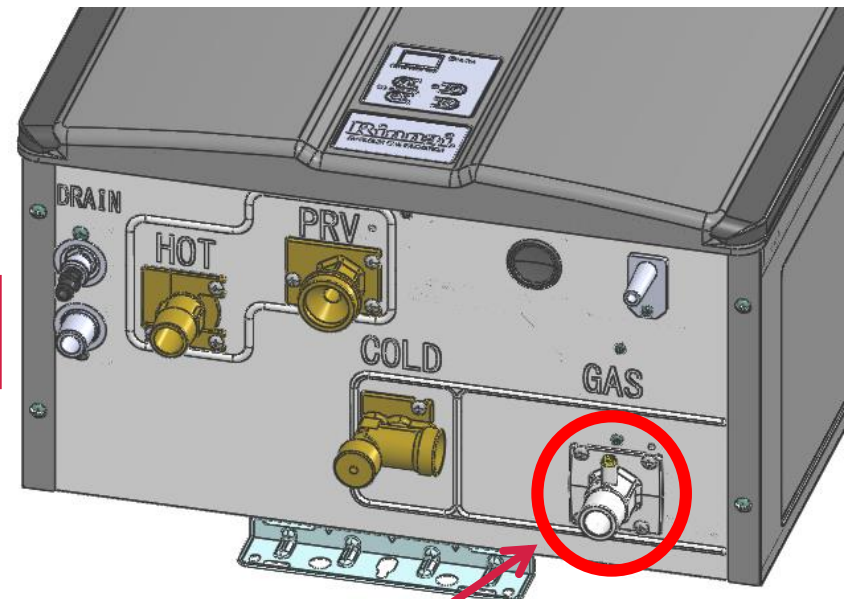
**NOTE:** This document is meant as a guide and not as a replacement for the information contained in the applicable water heater and/or common vent installation manuals. Refer to the appropriate manual for complete details.

# Installation: Gas supply.

- **An adequate gas supply is critical for proper operation of all Rinnai tankless water heaters.**
- The supplied gas pressure must be within the limits shown on the rating plate or specification sheet for the selected water heater and the gas lines must be able to carry the volume of gas needed by the appliance.
  - Tankless water heaters typically require a higher volume of gas than tank water heaters therefore the gas supply line and the building's gas meter capacity, taking into consideration the building's total gas load, should be verified to ensure there is adequate capacity.
- An insufficient gas supply can result in:
  - Poor appliance operation and/or water heater shutdown due to fault codes.
  - Noisy operation due to an incorrect gas/air mixture.

**The gas supply should be tested with all appliances on that gas service operating at max capacity.**

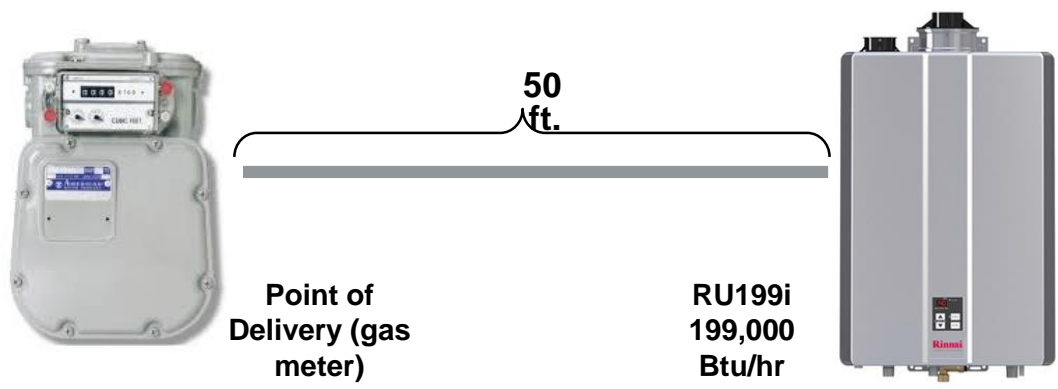
- If a symptom exists suggesting a gas supply issue may be a factor, a gas manometer will be needed to verify if the supply is adequate.



Gas connection  $\frac{3}{4}$ " NMPT

# Installation: Gas supply.

- For gas pipe sizing, refer to the National Fuel Gas Code, ANSI Z223.1/NFPA 54, or the Natural Gas and Propane Installation Code, CSA B149.1
  - The information in the table below was obtained from NFPA 54, ANSI Z223.1 -2015. Reference the chart that corresponds to your gas type, piping type, inlet pressure requirements and specific gravity.
  - First determine the pipe length and the total gas load on that pipe.
  - From the chart determine the minimum pipe sizing.
- In the example below we have a 199,000 Btu water heater with 50 feet of pipe from the gas source.
- Using the row marked for 50 ft. of pipe, move across the row to find the pipe diameter with sufficient Btu capacity.
- Based on a 199,000 Btu load, the min. pipe diameter is 1”



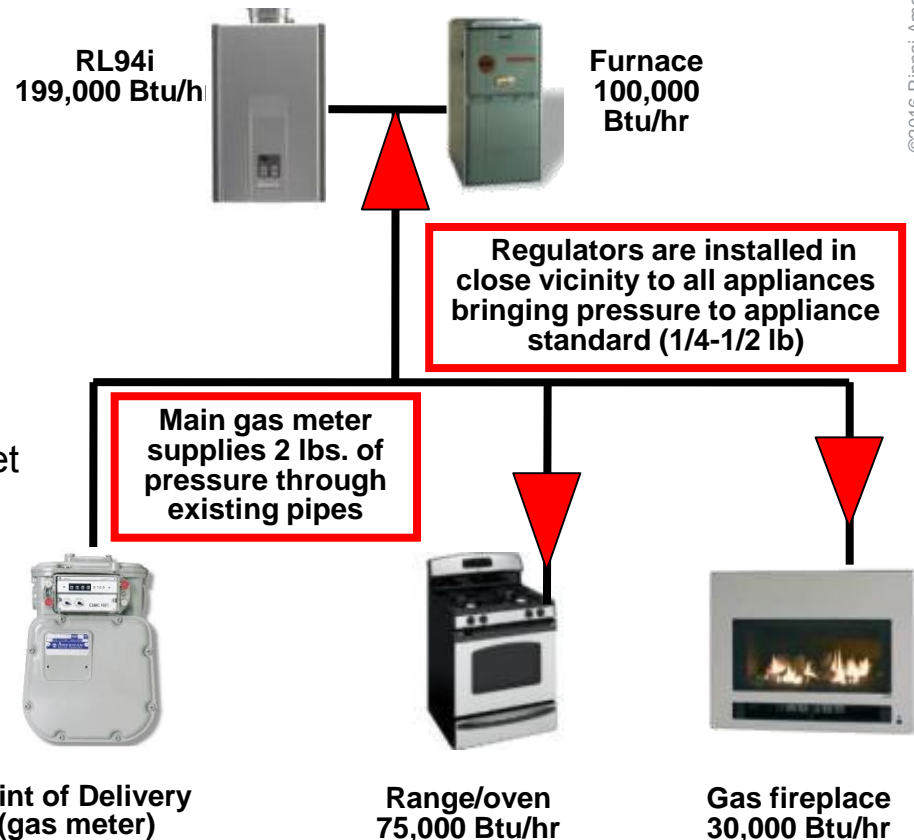
Schedule 40 Metallic Pipe, Natural Gas, less than 2 psi inlet pressure, 0.5" w.c. pressure drop, 0.60 specific gravity.					
Pipe Size (in.)					
Nominal:	½	¾	1	1 ¼	1 ½
Length (ft)	Capacity in Cubic Feet of Gas per Hour (CFH=Btu/1000)				
10	172	360	678	1390	2090
20	118	247	466	957	1430
30	95	199	374	768	1150
40	81	170	320	657	985
50	72	151	284	583	873
60	65	137	257	528	791
70	60	126	237	486	728

Any other appliance(s) on the same gas service will need to be figured into the gas line size calculation.

# Installation: Gas supply.

- If the gas supply is not adequate and resizing a gas supply line is not a feasible option, a two stage supply system may be used (depending on local code guidelines).
- In a two stage system, higher pressure gas (usually 2 lbs or approximately 56" w.c.) is supplied throughout the supply system.
- Increasing the system pressure can help overcome gas line sizing limitations (to a certain point).
- Regulators are then placed close to each appliance to reduce the supply pressure to within the appliance's recommended range.
- Never exceed the manufacturers maximum supply pressure recommendations. All Rinnai tankless water heaters should be supplied with no more than 1/2" lb. inlet pressure (14" w.c.).
- Follow all NFPA / ANSI / CSA guidelines and code requirements when sizing two stage systems.
- Two stage systems can be used in NG or LP applications—sizing values differ by gas type.
- Gas meter capacity must also be considered.

The below example has the following parameters  
Gas: NG Inlet pressure: 2 PSI



# Installation: Electrical.

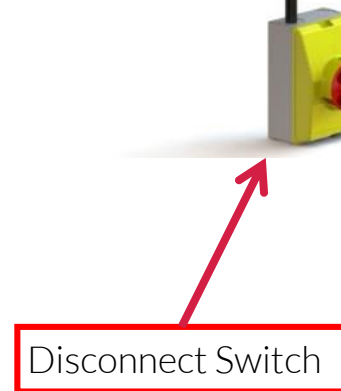
- Rinnai water heaters require 120 VAC, 60 Hz power from a properly grounded circuit.

## ➤ Indoor / Interior models:

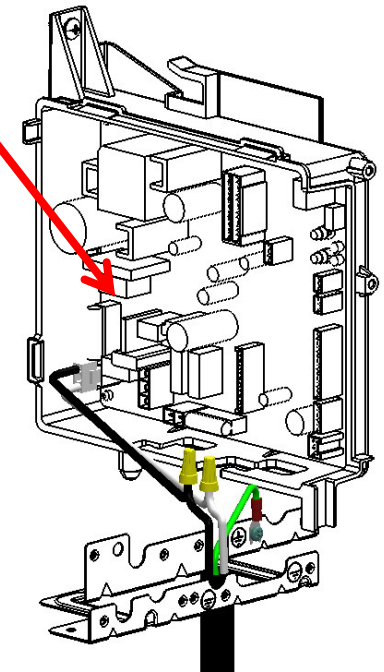
- Indoor models are supplied with a 5 ft. standard 3-prong power cord that is to be plugged into a 120VAC properly grounded wall outlet.

## ➤ Outdoor / Exterior models:

- Outdoor models are not supplied with a power cord but connections for the power supply are provided with the water heater.
- The electrical power supply for outdoor models should be of a type that is suitable for outdoor use. A disconnect switch must be provided and installed for the incoming power 120VAC power supply. The installation must meet any applicable National Electrical codes and local building codes.



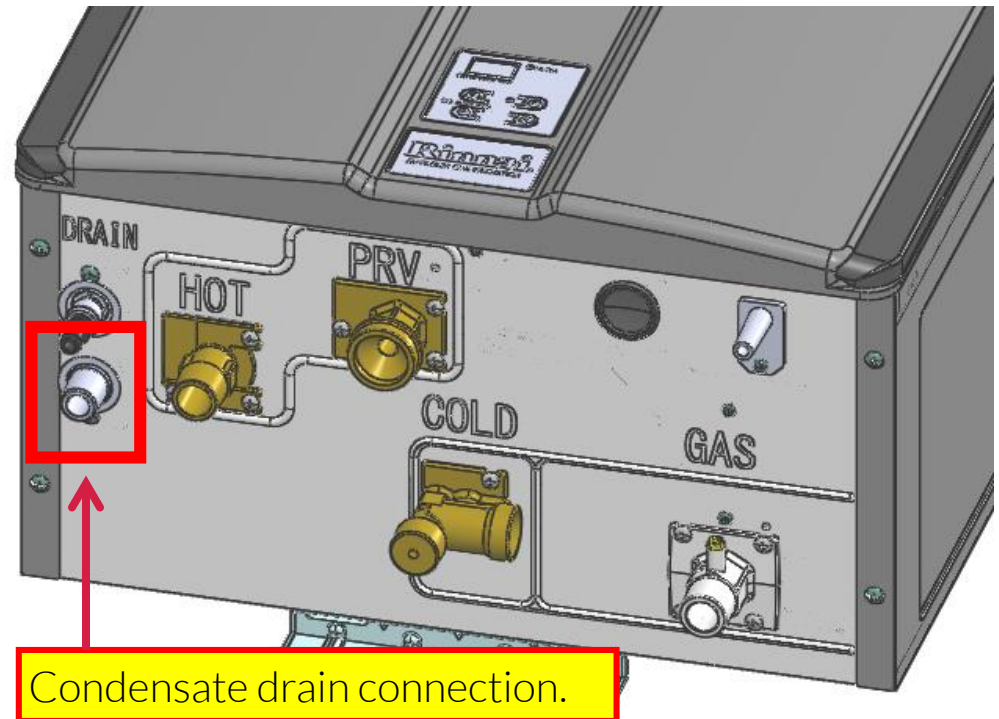
Disconnect Switch



# Installation: Condensate

Each Rinnai Condensing Tankless water heater has a condensate trap and drain outlet built into the cabinet. A drain line must be connected to each water heater.

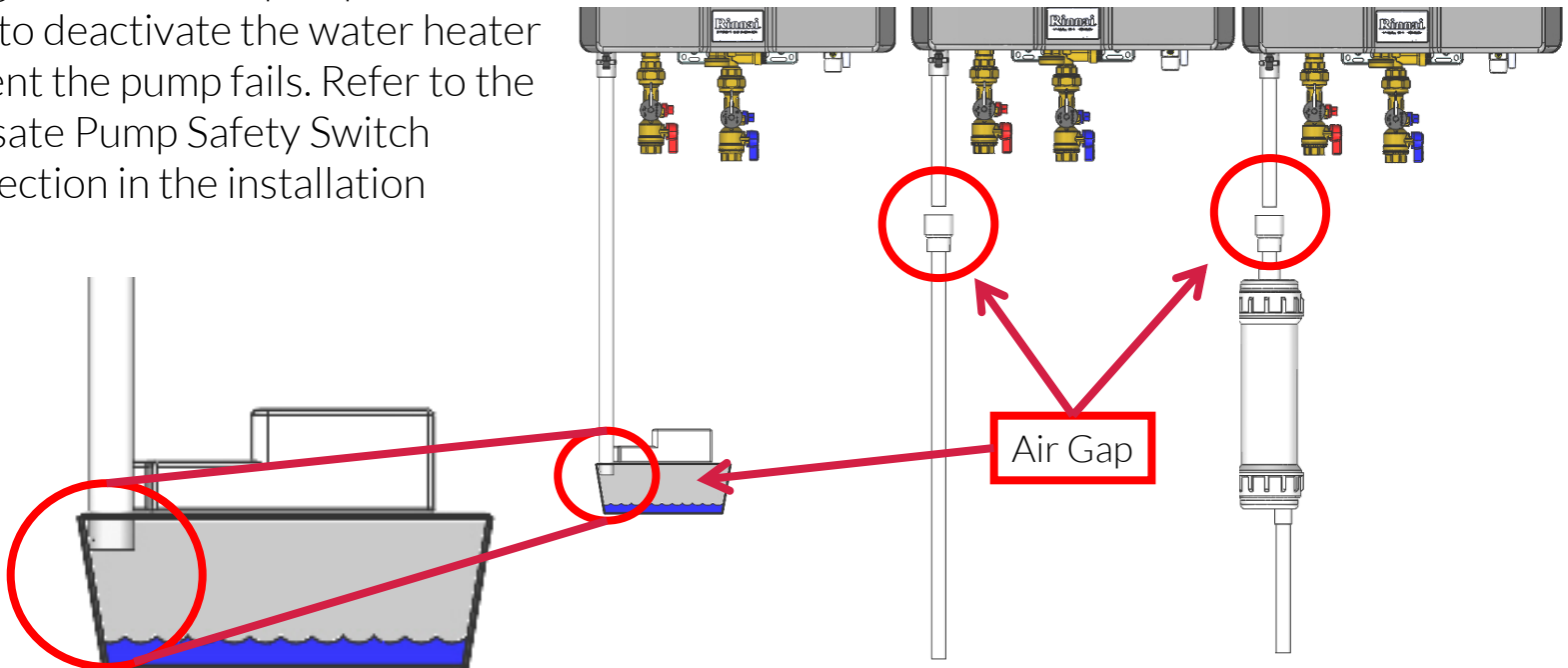
- All condensate must drain and be disposed of in accordance with local codes.
- Do not plumb the condensate drain with the pressure relief valve, both must be plumbed independently to the drain.
- Use only corrosion resistant materials for the condensate drain such as PVC pipe or plastic hose.
- The condensate pipe, along its entire length, must be at least the same diameter as the drain (1/2" NPT).
- Due to the integrated trap, do not install an additional external condensate trap.



# Installation: Condensate

**When installing the condensate drain line, care must be taken to ensure proper drainage.**

- The drain line should be sloped toward the drain or condensate pump avoiding low spots.
- It is advisable that an air gap be provided between the water heater and the drain line to ensure proper drainage.
- If a floor drain is not available or the drain is above the level of the water heater's condensate drain, a condensate pump should be installed.
- If utilizing a condensate pump it should be wired to deactivate the water heater in the event the pump fails. Refer to the "Condensate Pump Safety Switch Wiring" section in the installation manual.

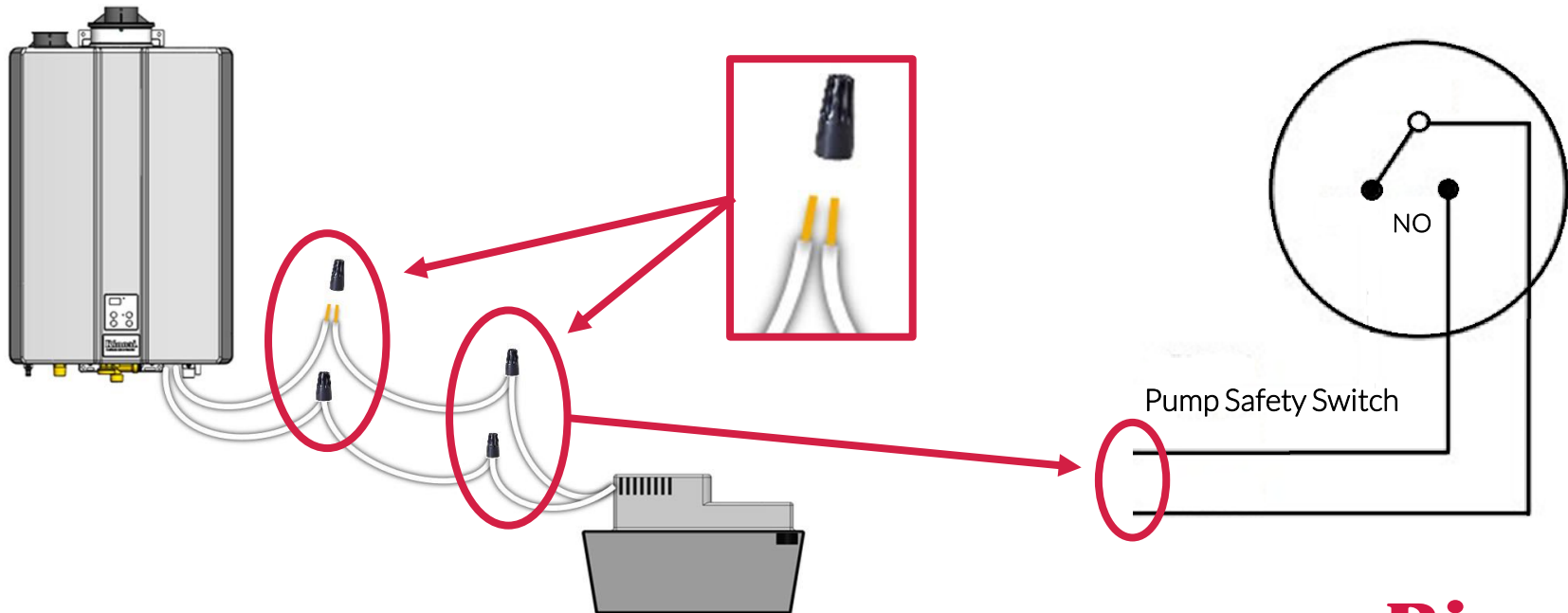


The end of the condensate pipe should be open to the atmosphere. The end should not be under water.

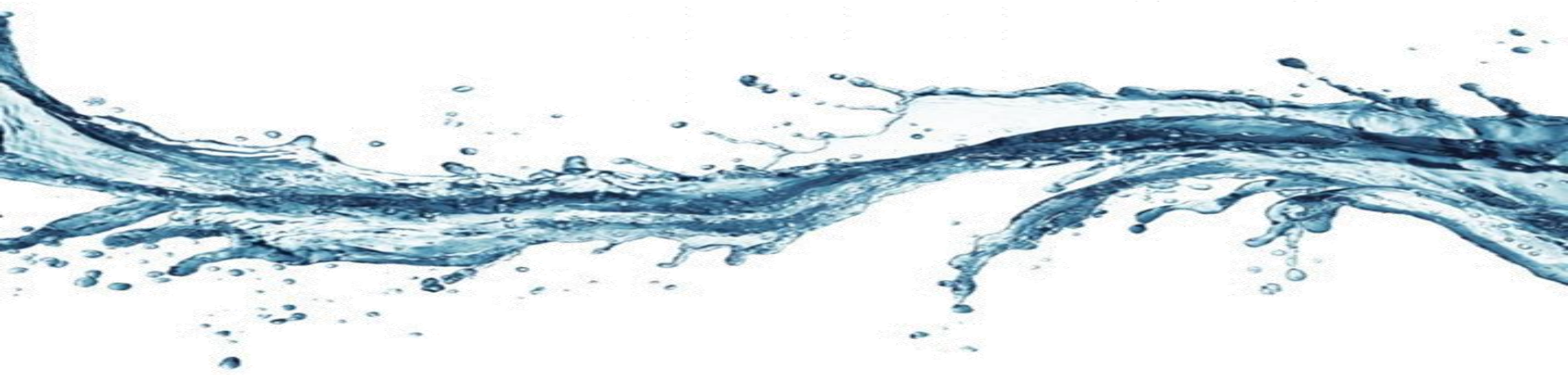
# Installation: Condensate Safety Switch connection.

**Installation of a condensate pump safety must conform with local codes and the guidelines established by the National Electric Code (NEC).**

- Locate the two wires inside the water heater labeled “To Condensate Pump Safety Switch”.
- Cut the wire crimp connector off of the labeled wires and using two-conductor wire (18 AWG or greater), connect the water heater wiring to the normally open contacts of the condensate pump safety switch using wire nuts or other approved wire connectors.
- When connected, if the condensate reservoir fills to the point the safety switch contacts close, the water heater will shut down and post a code “25” on the controller display.
- Once the problem is corrected the water heater can be reset by turning the water heater Off at the controller, waiting 5 seconds then turning the unit back on.



# Temperature Controllers and Parameter adjustment



# Temperature Controllers:



**MC-91-2  
MCC-91-2\***

\*for commercial / hydronic use only



**MC-195T (optional)**

All N-Series Rinnai Water Heaters will accept up to four temperature controllers.

NOTE: Only one MC-195T can be installed per unit.

# Temperature Controllers:

- The Rinnai N Series water heaters use the MC-91-2 and MCC-91-2 controllers.
  - All temperature settings and other parameter adjustments are made through the controller. The main circuit board no longer has dip switches for these adjustments.
- Other features available through the controller:
  - Monitor performance data
  - Retrieve diagnostic codes
  - Lock the controller
  - Mute controller sounds
  - Select Fahrenheit or Celsius temperature display.



# Temperature Controllers:

## TEMPERATURE INDICATION

Indicates the selected water temperature. Diagnostic Codes flash if operator intervention is required.

## THERMOSTAT

Increases or decreases the desired water temperature.

## MODEL NUMBER

The model number will indicate if the controller is a standard or commercial controller.



## IN USE INDICATOR

Indicates if the water heater is in operation.

## PRIORITY BUTTON & INDICATOR

When multiple controllers are installed, the priority button allows each to individually set temperature output of the water heater. The priority indicator reports which controller has control.

## ON/OFF BUTTON

Turns the water heater ON and OFF. Power will still be applied to the unit when OFF and diagnostic functions are still operable.

# Temperature Controllers:

## Standard Temperature Setting Range

<b>Fahrenheit - °F</b>	98	100	102	104	106	108	110	115	120	125 *	130 *	135 *	140 *	150 **	160 **	185 **
<b>Celsius - °C</b>	37	38	39	40	41	42	43	46	49	52	54	57	60	66	71	85

\* Standard model factory default temperature range is 98°F to 120°F (parameter setting **01A**). Higher temperature settings (up to 140°F) are available by adjusting parameter settings to **01b** (see section 3.12 of the installation and operation manual).

\*\* Temperatures above 140°F will require the installation of the MCC-91-2 Controller **OR** utilizing a CU199 / CU160 commercial model plus adjusting the parameter settings.

## Commercial Model Temperature Setting Range

<b>Fahrenheit - °F</b>	110	115	120	125	130	135	140	145 *	150 *	155 *	160 *	165 *	170 *	175 *	180 *	185 *
<b>Celsius - °C</b>	43	46	49	52	54	57	60	63	66	68	71	74	77	79	82	85

\*Commercial model factory default temperature range is 98°F to 140°F (parameter setting **01A**). Higher temperatures settings (up to 185°F) are available by adjusting parameter settings to **01b** (see section 3.12 of the installation and operation manual).

**NOTE:** When the higher temperature setting range is selected, the minimum temperature setting becomes 110°F.

**NOTE:** The maximum temperature setting for the RUR model water heater is 140°F. (Installing a MCC-91-2 controller will NOT allow settings above 140°F).

# Temperature Controllers: MC-195T

- The MC-195T Timer / Controller is for use only with models equipped with Circ-Logic™ programming.
- The MC-195T's timers control when the Circ-Logic™ function is ON or OFF.
  - The Circ-Logic™ programming on the main circuit board controls actual pump operation during the ON periods.



## MC-195T-US

- Dual Timer Programs.
- Override Function to allow interruption of the timers without changing timer settings.
- Function Lock.
- Power Saving feature.
- Clock.
- Combustion and Circulation indicators.

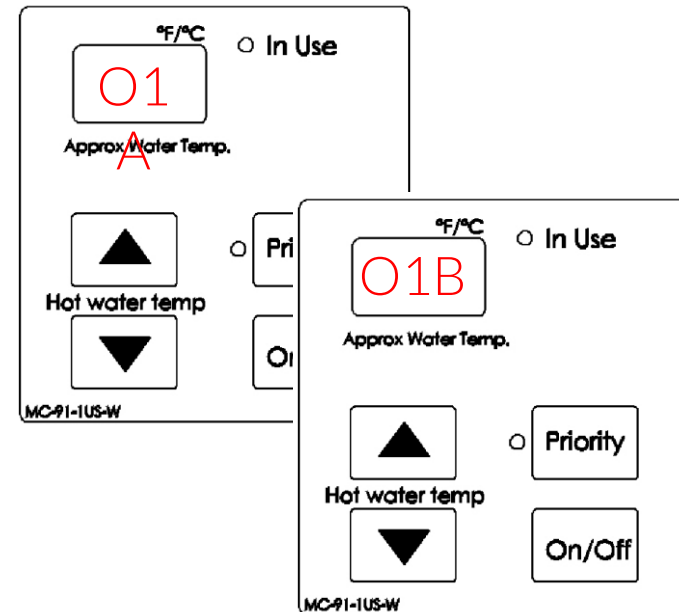
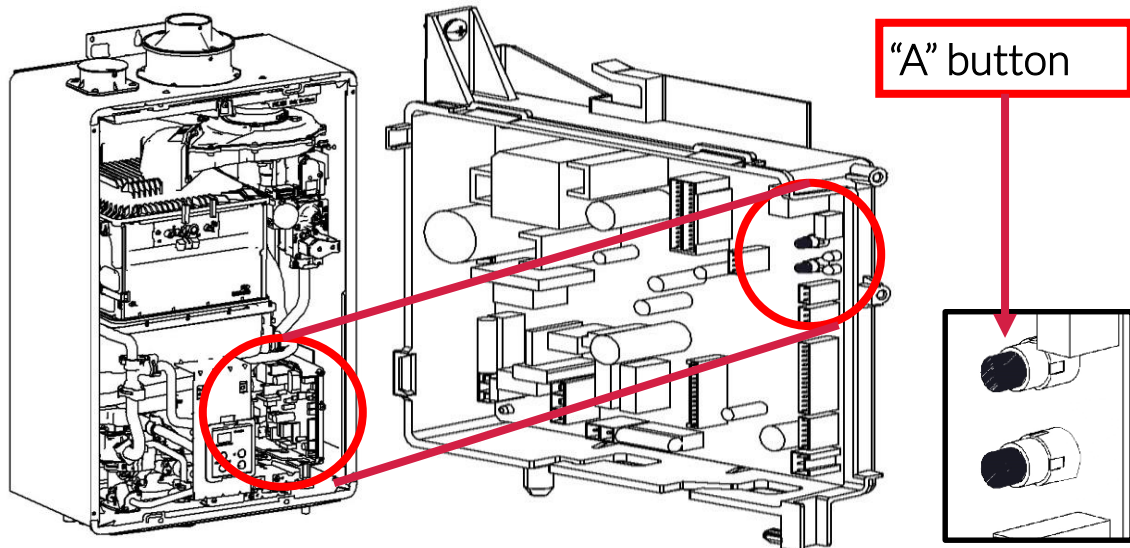
**NOTE:** In order for Circ-Logic to function on the RUR model, the MC-195T controller or the Wi-Fi module will need to be connected to the water heater.

If utilizing the Wi-Fi module, The Rinnai App and/or optional wireless devices will be required.

# Temperature Controllers: Parameter Settings

Certain elements of the installation may require adjusting parameters on the tankless water heater.

- **To adjust the parameters:** See section 3.12 Parameter Settings of the install manual.
  - Locate the PC Board (Remove the front cover, PCB is located on the lower right side of the cabinet).
  - Locate the two push buttons (A and B) on the PC Board.
  - Press the “A” (upper) button for one second. A parameter number and setting will be displayed on the temperature controller (see example below).
  - Use the UP and Down arrow buttons on the controller to select the desired setting number.
  - Once the desired setting number is selected, use the On/Off button to change the selection for that particular parameter.
  - To exit the parameters, press the “A” button for 1 second.



# Temperature Controllers: Parameter Settings

## Parameter Settings Table: All Models

Setting #	Setting Description	Selection						
		A	B	C	D	E	F	
01	Maximum Set Temperature	120° (Residential) 140° (Commercial)	140° (Residential) 185° (Commercial)					
02	High Altitude	Level 0 0 – 2,000 ft. (0 – 610 M)	Level 1 2,001 – 5,400 ft. (610 – 1,646 M)	Level 2 5,401 – 7,700 ft. (1,646 – 2,347 M)	Level 3 7,701 – 10,200 ft. (2,347 – 3,109 M)			
03	Service Soon	Disabled	0.5 Year	1 Year	2 Years			
04	Recirculation Settings	No Recirculation	Recirculation (Dedicated Mode)					
04 (RUR Model ONLY)	Recirculation Settings	No Recirculation	Recirculation					
			Dedicated Mode	Crossover Mode				
				Long Loop	Short Loop			
05	Recirculation Modes	Comfort	Economy					
06	Control Switch	BMS <sup>1</sup>	Air Handler (AH)					
07	EZ Connect	2 Units (in standby)	1 Unit (in standby)					
08 (Commercial ONLY)	Cascade	Secondary (1-24)	Primary					
09 (Commercial ONLY)	Units In Standby (Cascade)	1	2	3	4	5	6	
10	Gas Type	NG	LPG					
11	Maximum Flow Rate <sup>2</sup>	Standard	High					

<sup>1</sup>BMS – Building Management System

<sup>2</sup>For Regions with warm ground water, selecting HIGH flow rate will enable an increase in the maximum flow through the water heater.

# Temperature Controllers: Auxiliary Functions

- **To change from Fahrenheit to Celsius:**

With the controller turned OFF, press and hold the ON/OFF button for approximately 5 seconds. The display will switch to the opposite temperature scale. Repeating the procedure will switch the display back to the original setting.

- **Locking the controller:**

Press the Priority button then the UP arrow (in that order) at the same time for approximately 5 seconds. A beep will sound confirming the lock. The display will alternately show “LOC” and the temperature setting. Error codes will display if needed. All controllers in the system will also lock. To unlock, repeat the procedure.

- **Muting the controller:**

Press the UP and Down arrows together for approximately 5 seconds. The controller will beep once the mute function has been activated. Repeat the procedure to reactivate the beep.



# Temperature Controllers: Auxiliary Functions

The MC-91-2 temperature controllers provide the following diagnostic capabilities:

- **To display the diagnostic code history:**  
Press and hold the ON/OFF button. After 2 seconds, simultaneously press the UP arrow then let go of both buttons. The diagnostic code history will be displayed with the most recent code being displayed first (up to 9 codes). To exit the code history, repeat the procedure.
- **To enter the performance data mode:**  
Press and hold the Down arrow. After 2 seconds, simultaneously press the ON/OFF button then let go of both buttons. An “01” will be displayed briefly followed by the water flow rate (in GPM). To select the next information mode, press the up arrow. An “02” will be displayed followed by the water heater output temperature (in Fahrenheit). Continue to press the up or down arrow to scroll through the remaining information modes \*. To exit the information mode, repeat the procedure.



# Temperature Controllers: Performance Data

## To enter the performance data display mode:

Press and **hold** the DOWN arrow. After two seconds simultaneously press the ON/OFF button. Then let go of both buttons. First "01" will be displayed followed by a reading of the flow rate in GPM. Pressing the UP or Down arrow will scroll through the remaining functions.

Code #	Reading	Units	Description / Notes
01	Water Flow Rate in GPM	0.1 GPM	Water flow rate in gallons and tenths per minute, decimal not shown.
02	WH Outlet Temperature.	Deg. F	Output Water Temperature.
03	Hours of Operation.	X100	Total Combustion Hours x 100.
04	Combustion cycles.	X 100 / 10K / 1Mil	Total Combustion (burner on/off) Cycles. See Tech Data Sheet
05	Fan Frequency.	Hertz	Fan Motor Hertz (if operating).
06	System Controllers.	# of controllers	Total # controllers connected. See Tech Data Sheet.
07	Water Flow Servo Position.*	*	* 0 = Mid, 1 = Open, 2 = Closed
08	Inlet Water Temperature.	Deg. F	Ground water supply temp / Return water temp for recirculation
09	Fan Current.	X10 mA	Fan Current Draw (in miliamps, if operating).
10	Total Bath Fill Volume.	Gallons	Volume of Hot Water (in gallons) Used During Bath Fill Mode.
11	HEX Outlet Temperature.	Deg. F	Heat exchanger output water temp (before bypass mix)
12	Bypass Servo Position.	Degrees	Degrees of opening
15	Freeze Protection Temperature	Deg. F	Indoor Models Only
17	Freeze Protection Temperature	Deg. F	Outdoor Models Only
19	Pump Hours	X100	Total pump operation hours (RUR models only)
20	Pump Cycles	X 100 / 10K / 1Mil	Total pump operation cycles (RUR98 models only) See Tech Data Sheet
21	Exhaust Temperature	Deg. F	Exhaust Gas Temperature.

Note: Not all diagnostic functions will be available on all models. If a water heater does not have a particular function that number will be skipped when scrolling through the menu.

# Temperature Controllers: Additional Performance Data

## To enter the performance data display mode:

Press and **hold** the DOWN arrow. After two seconds simultaneously press the ON/OFF button. Then let go of both buttons. First "01" will be displayed followed by a reading of the flow rate in GPM. Pressing the UP or Down arrow will scroll through the remaining functions.

Code #	Reading	Units	Description / Notes
<b>A0</b>	Total Water Usage	X 1 Gallon	Total up to 999 gallons.
<b>A1</b>	Total Water Usage	X 1,000 Gallons	Total up to 999,000 gallons.
<b>A2</b>	Total Water Usage	X 1,000,000 Gallons	Total up to 999,000,000 gallons.
<b>C0</b>	Total Calorie Usage	X 1 Kcal / min	Total up to 999 Kcal / min.
<b>C1</b>	Total Calorie Usage	X 1,000 Kcal / min	Total up to 999,000 Kcal / min.
<b>C2</b>	Total Calorie Usage	X 1,000,000 Kcal / min	Total up to 999,000,000 Kcal / min.
<b>1 Kcal / min = 238 Btu / hr</b>			
Note: Not all diagnostic functions will be available on all models. If a water heater does not have a particular function that number will be skipped when scrolling through the menu.			

# Temperature Controllers: Diagnostic Codes

## To display the diagnostic code history:

Press and **hold** the On/Off button. After two seconds simultaneously press the UP button. Then let go of both buttons. First “1” will be displayed followed by a display of the most recent diagnostic code. The remaining code history will be displayed in sequence.

The sequence number followed by two dashes ( - - ) indicates no further codes are stored.

Code	Description / Remedy
<b>03</b>	Power interruption during bath fill (water will not flow when power is restored) <ul style="list-style-type: none"> <li>• Turn off all water taps, Press On/Off twice.</li> </ul>
<b>05</b>	By-Pass Flow Control <ul style="list-style-type: none"> <li>• Measure resistance values of the by-pass flow control.</li> <li>• Replace by-pass flow control device.</li> </ul>
<b>10</b>	Air Supply or Exhaust Blockage / Condensate Trap full. <ul style="list-style-type: none"> <li>• Ensure Condensate line is not blocked.</li> <li>• Ensure internal air filter is clean with no obstructions (indoor models only).</li> <li>• Ensure high altitude settings are correct (see parameter settings).</li> <li>• Ensure combustion air and exhaust vents are not blocked and only approved venting materials are being used (indoor model only).</li> <li>• Ensure vent lengths are within limits (indoor models only).</li> <li>• Check fan for debris and ensure wheel turns freely.</li> <li>• Verify check valve is not stuck between fan casing and burner body.</li> </ul>

Code	Description / Remedy
<b>11</b>	No Ignition (no flame formation or no flame detection) <ul style="list-style-type: none"> <li>• Check that the gas supply is turned on to the water heater / propane tank has adequate quantity.</li> <li>• Ensure gas type and inlet pressure are correct.</li> <li>• Bleed air from the gas lines.</li> <li>• Check the ground wire to the PCB.</li> <li>• Ensure flame rod wire is connected.</li> <li>• Ensure igniter is operational (see electrical diagnostics).</li> <li>• Check gas solenoid valves for open or short circuits (see electrical diagnostics).</li> <li>• Verify gas orifice is correct (for correct gas type).</li> </ul>
<b>12</b>	No Flame (flame extinguished after detection) <ul style="list-style-type: none"> <li>• Check same as for Code 11 (except for igniter and solenoid check)</li> </ul>
<b>14</b>	Heat Exchanger Overheat <ul style="list-style-type: none"> <li>• Check resistance of overheat switch (see electrical diagnostics).</li> <li>• Check heat exchanger for hot spots (indicating possible blockages or scale buildup). See manual for flushing procedure.</li> <li>• Ensure unit is not in forced hi fire setting.</li> </ul>

# Temperature Controllers: Diagnostic Codes

## To display the diagnostic code history:

Press and **hold** the On/Off button. After two seconds simultaneously press the UP button. Then let go of both buttons. First “1” will be displayed followed by a display of the most recent diagnostic code. The remaining code history will be displayed in sequence.

The sequence number followed by two dashes ( - - ) indicates no further codes are stored.

Code	Description / Remedy
<b>15</b>	<b>Venturi Control</b> <ul style="list-style-type: none"> <li>• Ensure venturi motor is operating correctly (see electrical diagnostics).</li> <li>• Replace gas valve assembly.</li> <li>• Clear the code by resetting the main power supply to the water heater.</li> </ul>
<b>16</b>	<b>High Outgoing Temperature</b> (safety shutdown because water is too hot). <ul style="list-style-type: none"> <li>• Confirm fan motor is functioning correctly.</li> <li>• Replace the gas valve assembly.</li> </ul>
<b>17</b>	<b>Venturi Blockage.</b> <ul style="list-style-type: none"> <li>• Ensure Venturi isn't blocked.</li> <li>• Call Rinnai Technical Support.</li> </ul>
<b>19</b>	<b>Electrical Grounding.</b> <ul style="list-style-type: none"> <li>• Check components for electrical shorts.</li> </ul>
<b>21</b>	<b>Data Transfer Error.</b> <ul style="list-style-type: none"> <li>• If the PCB has been replaced, ensure data transfer process has been completed.</li> </ul>
<b>25</b>	<b>Condensate Pump</b> (field supplied accessory). <ul style="list-style-type: none"> <li>• Ensure wire connections from water heater are good.</li> <li>• Ensure reservoir is empty and pump is operating.</li> </ul>

Code	Description / Remedy
<b>32</b>	<b>Outgoing Thermistor</b>
<b>33</b>	<b>Heat Exchanger Thermistor</b> <ul style="list-style-type: none"> <li>• Check sensor wiring for damage.</li> <li>• Measure resistance of sensor (see electrical diagnostics).</li> <li>• Check Sensor for buildup.</li> <li>• Replace sensor.</li> </ul>
<b>38</b>	<b>Exhaust Thermistor</b>
<b>41</b>	<b>Freeze Protection Thermistor</b> <ul style="list-style-type: none"> <li>• Check sensor wiring for damage.</li> <li>• Measure resistance of sensor (see electrical diagnostics).</li> <li>• Replace sensor.</li> </ul>
<b>51</b>	<b>Inlet Thermistor</b> <ul style="list-style-type: none"> <li>• Check sensor wiring for damage.</li> <li>• Measure resistance of sensor (see electrical diagnostics)</li> <li>• Replace Sensor.</li> </ul>
<b>52</b>	<b>Gas Valve</b> <ul style="list-style-type: none"> <li>• Check flame rod and wiring for damage.</li> <li>• Check gas solenoid valve for open or short circuit (see electrical diagnostics).</li> <li>• Replace gas valve assembly.</li> <li>• Call Rinnai Technical Support.</li> </ul>

# Temperature Controllers: Diagnostic Codes

## To display the diagnostic code history:

Press and **hold** the On/Off button. After two seconds simultaneously press the UP button. Then let go of both buttons. First “1” will be displayed followed by a display of the most recent diagnostic code. The remaining code history will be displayed in sequence.

The sequence number followed by two dashes ( - - ) indicates no further codes are stored.

Code	Description / Remedy
<b>54</b>	<b>High Exhaust Gas Temperature</b> <ul style="list-style-type: none"> <li>• Ensure Heat Exchanger fins are clean and not blocked.</li> <li>• Confirm Inlet water temperature is not too high.</li> <li>• Clear the code by resetting the main power supply to the water heater.</li> </ul>
<b>61</b>	<b>Combustion Fan</b> <ul style="list-style-type: none"> <li>• Check the motor wire harness for loose or damaged connections.</li> <li>• Measure resistance of motor wire harness (see electrical diagnostics).</li> <li>• Ensure combustion fan spins freely.</li> </ul>
<b>63</b>	<b>Recirculation Low Flow</b> <ul style="list-style-type: none"> <li>• Ensure the bypass plug is removed and bypass filter is installed (RUR model in crossover mode).</li> <li>• Ensure both the inlet water filter and bypass filter are clean and free of debris.</li> <li>• Ensure parameter settings are correctly set for the recirculation mode.</li> <li>• Check for proper pump supply voltage.</li> <li>• Ensure air is removed from the circulation line.</li> </ul>

Code	Description / Remedy
<b>65</b>	<b>Water Flow Control</b> <ul style="list-style-type: none"> <li>• Measure resistance values of the water flow control (see electrical diagnostics).</li> <li>• Water flow control valve has failed to close during bath fill function. Immediately turn off water and discontinue use of the bath fill function.</li> </ul>
<b>70</b>	<b>PC Board</b> <ul style="list-style-type: none"> <li>• Replace PC Board</li> </ul>
<b>71</b>	<b>Solenoid Valve Circuit</b> <ul style="list-style-type: none"> <li>• Ensure dip switch on PC board is in the Off position.</li> <li>• Ensure gas control wires are not loose or damaged.</li> <li>• Ensure freeze protection heater circuit is not grounded.</li> <li>• Replace PC Board.</li> </ul>
<b>72</b>	<b>Flame Rod Circuit</b> <ul style="list-style-type: none"> <li>• Check flame rod and wire for damage.</li> <li>• Verify Heat Exchanger is not leaking.</li> <li>• Replace PC Board.</li> </ul>

# Temperature Controllers: Diagnostic Codes

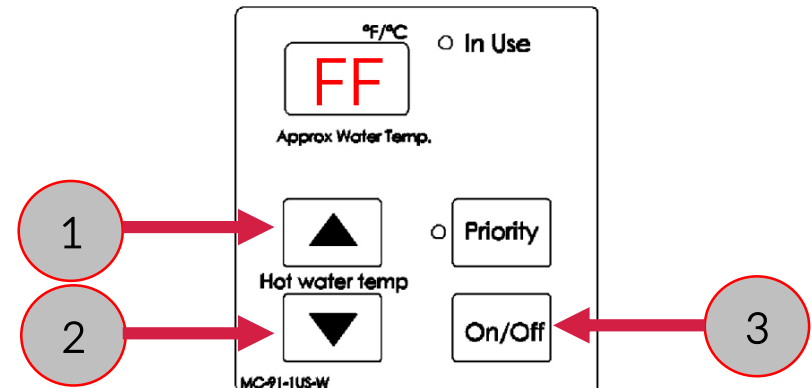
## To display the diagnostic code history:

Press and **hold** the On/Off button. After two seconds simultaneously press the UP button. Then let go of both buttons. First “1” will be displayed followed by a display of the most recent diagnostic code. The remaining code history will be displayed in sequence.

The sequence number followed by two dashes ( - - ) indicates no further codes are stored.

Code	Description / Remedy
<b>SS</b>	<p><b>(SS) Service Soon (Flush Heat Exchanger)</b></p> <ul style="list-style-type: none"> <li><b>SS</b> is a time based service indicator set during installation. See section 3.12 “Parameter Settings” for additional details on changing and setting the <b>SS</b> indicator.</li> <li><b>SS</b> indicates it is time for service. The heat exchanger should be flushed to prevent damage. Refer to section 5.3 “Flushing the Heat Exchanger” for more information. <b>Hard water must be treated to prevent scale buildup or damage to the heat exchanger.</b></li> <li>To reset the <b>SS</b> code, push the On/Off button on the controller 5 times within 5 seconds.</li> </ul>
<b>NO Code</b>	<p>Nothing happens when water flow is activated.</p> <ul style="list-style-type: none"> <li>Verify you have at least the minimum flow rate required to fire the water heater.</li> <li>Measure the resistance of the water flow control flow sensor (see electrical diagnostics).</li> <li>Clean the inlet water supply filter.</li> <li>Ensure the hot and cold water lines are not reversed.</li> <li>Check for crossover where cold and hot water lines are connected (mixing valves, washing machine fill valves. Etc.)</li> <li>Check water temperature thermistors / wiring for damage causing false temperature readings.</li> <li>Check water flow turbine and ensure it spins freely.</li> </ul>

Code	Description / Remedy
<b>SE</b>	<p><b>Cascade Diagnostic Display (commercial models only).</b></p> <ul style="list-style-type: none"> <li>With Cascade connections, controller display will flash “<b>SE</b>” and the selected temperature when an error code is displayed on any secondary unit.</li> </ul>
<b>FF</b>	<p><b>Maintenance Indicator.</b></p> <ul style="list-style-type: none"> <li>Placeholder in Diagnostic Code history indicating a service provider performed maintenance or service.</li> <li>Enter this code after performing service by pressing and holding the UP, Down and On/Off buttons (in that order) simultaneously.</li> <li><b>FF</b> will display on the controller and be recorded into the diagnostic code history.</li> </ul>



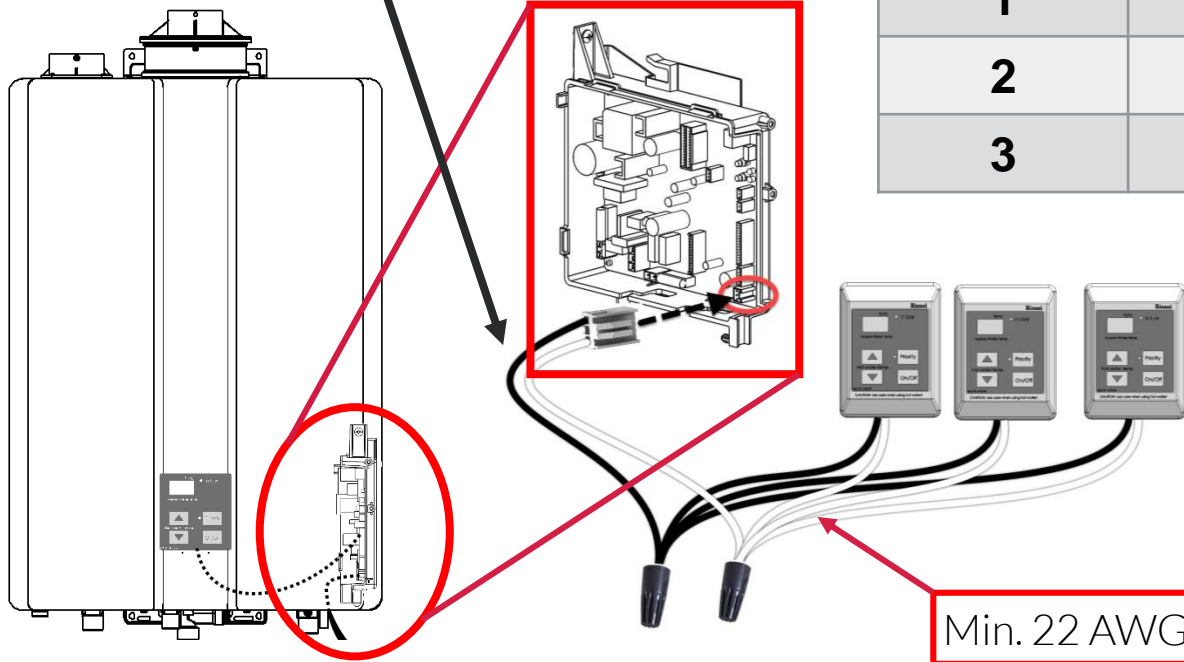
# Temperature Controllers: Adding additional controllers

Additional digital temperature controllers are available as accessories.

- A maximum of 4 temperature controllers can be connected to a single water heater or a bank of water heaters. (3 controllers + the controller built into the water heater).
  - Additional controllers can only be wired in parallel, they cannot be wired in series.

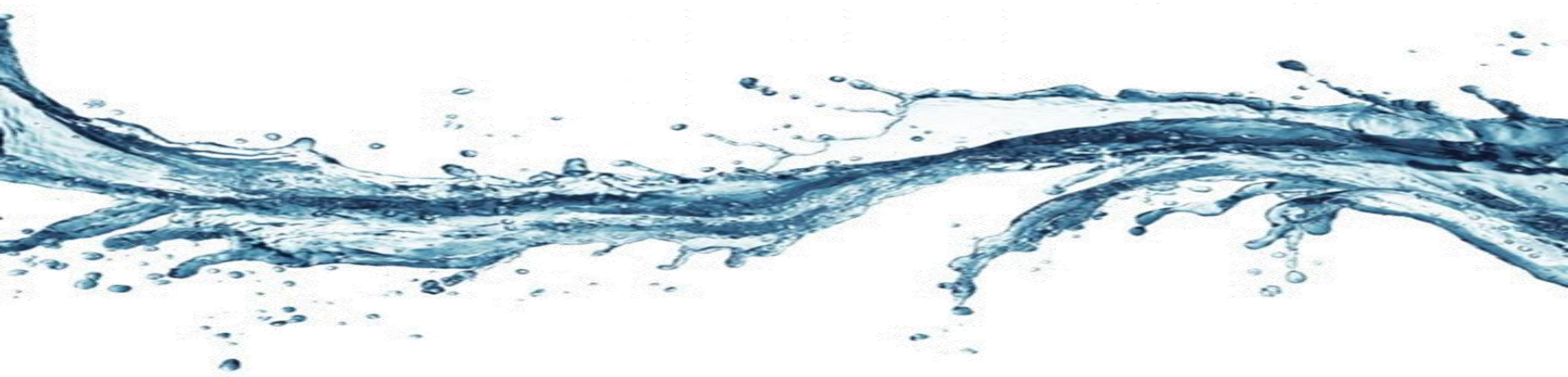
➤ Additional controllers are connected to a accessory harness that connects to the water heater's PC Board. This harness is included.

Number of Wired Controllers	Maximum cable length for each controller connected to the water heater
1	328 ft. (100 m)
2	164 ft. (50 m)
3	65 ft. (20 m)



- Avoid locations:
  - ...Where the controller may become hot
  - ...In direct sunlight.
  - ...Where the controller may become wet.
  - ...Where the controller may be adjusted by the public or in the reach of small children.

# MAINTENANCE



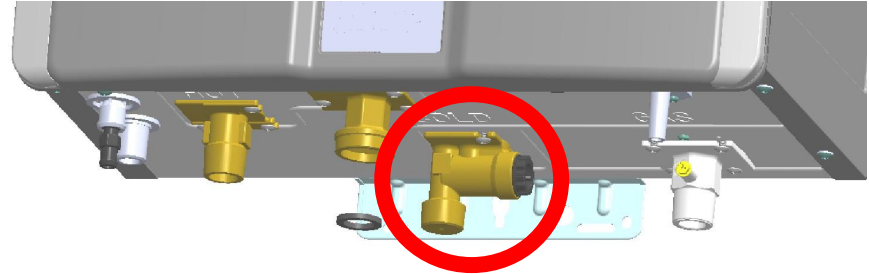
# Maintenance: General maintenance.

- Cleaning:
  - It is imperative that control compartments, burners and circulating air passageways of the appliance be kept clean.
- Vent System:
  - The vent system should be inspected at least annually for blockages or damage.
- Motors:
  - Motors are permanently lubricated and do not need periodic lubrication. However you must keep the fan and motor free of dust and dirt by cleaning annually.
- 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 operated at high set temperatures Refer to section 5.3 “Flushing the Heat Exchanger” for more information. Also refer to the water quality guidelines to determine if your water needs to be treated or conditioned.
- Snow Accumulation:
  - Keep the area around the flue terminal and the condensate drain line free of snow and ice. The water heater will not function properly if the vent pipes or condensate drain are blocked.

# Maintenance: General maintenance.

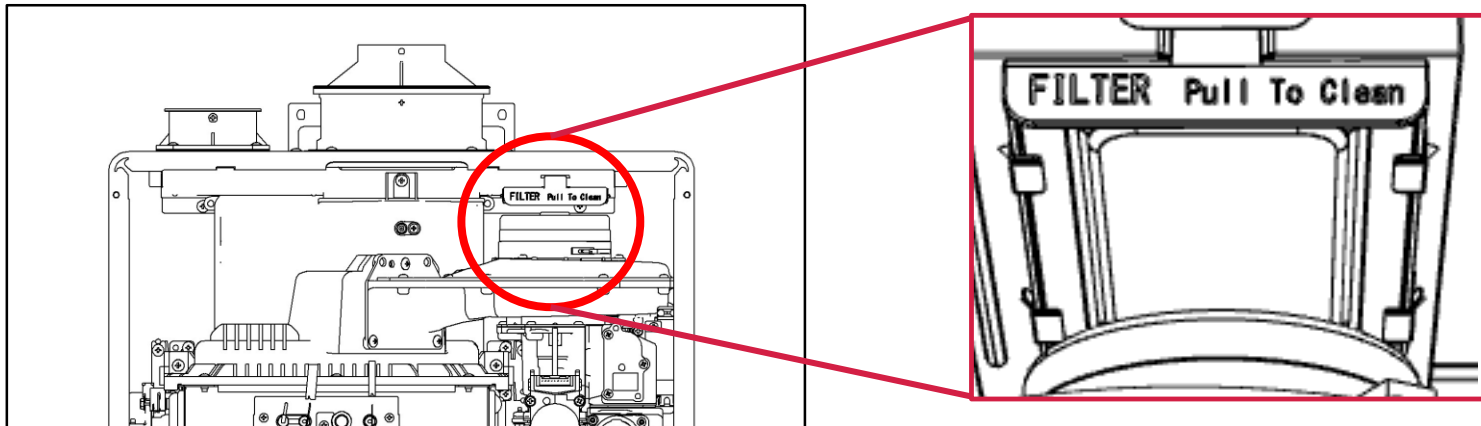
- Coastal Installations:

- Installations located in or near coastal areas may require additional maintenance due to the corrosive airborne sea salt.



- Filters:

- Water Filter – The inlet water filter should be cleaned after initial installation and periodically thereafter or if the plumbing system has been opened for repairs or modifications. See section 5.1 “Maintenance” of the Operation and Installation manual for further information.
- Air Filter – To maintain optimum performance periodically inspect and clean the air filter. See Section 5.2 “Cleaning and Inspecting Air Filter”



# Maintenance: General maintenance.

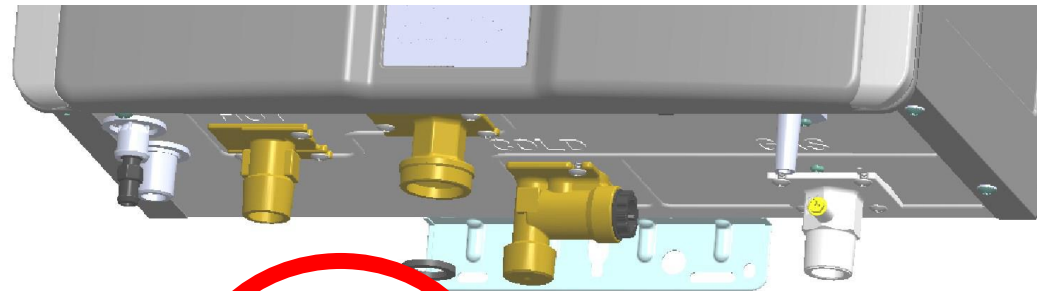
- Filters:

- Bypass Filter – Clean the bypass filter after initial installation and periodically thereafter. This should be done in conjunction with the inlet water filter maintenance. NOTE, the bypass filter is only used on the RUR model when in the Crossover Mode.



- Pressure Relief Valve:

- Operate the pressure relief valve manually once a year. Use caution due to the potential discharge of hot water.



# Maintenance: General maintenance.

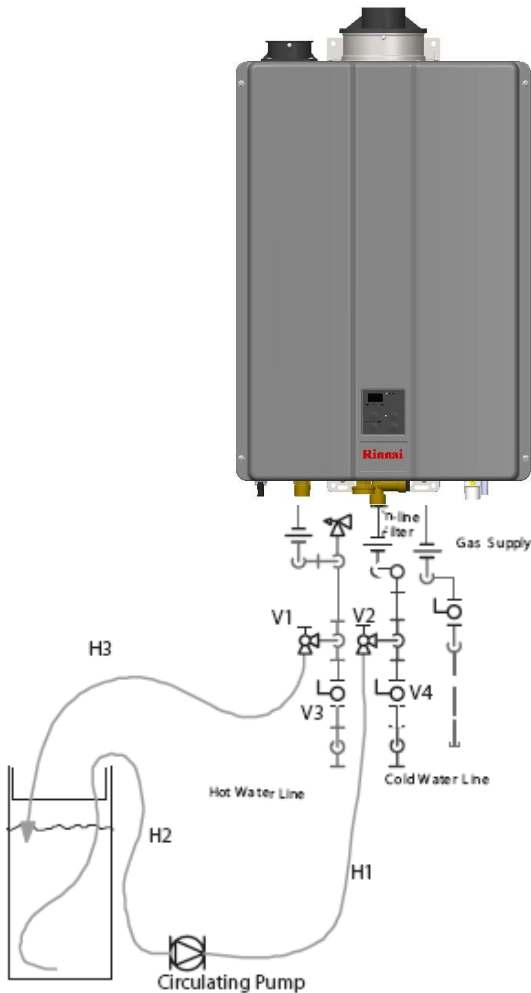
- Visual Inspection of Flame
  - Verify proper operation after servicing. When correctly operating, the burner flame will be even over the entire surface. The flame must burn with a clear blue, stable flame. If the flame does not have this appearance clean the burner and the fan. See the installation manual for instructions on the visual inspection of the flame.
- Freeze Protection:
  - In case of freezing conditions ensure the water heater and its water lines are adequately protected. Damage due to freezing is not covered under the warranty. (see section 3.2 “Choose an installation Location > Freeze Protection” for more information).
  - The water heater may be drained manually however, a drain down solenoid valve kit is available that will automatically drain the water from the unit should power be lost. (the pressure relief valve and condensate trap are not drained by the kit and will have to be drained manually).

## Winterization:

- If the water heater is intended to go unused / unpowered and exposed to freezing conditions certain measures should be taken to ensure no damage is incurred. See section 5.1 “Winterization” and 5.4 “Draining the Water Heater” of the installation and operation manual for more detailed instructions. (NOTE: these instructions should be used as a guide only. Rinnai assumes no liability for any issues resulting from the use of this information)

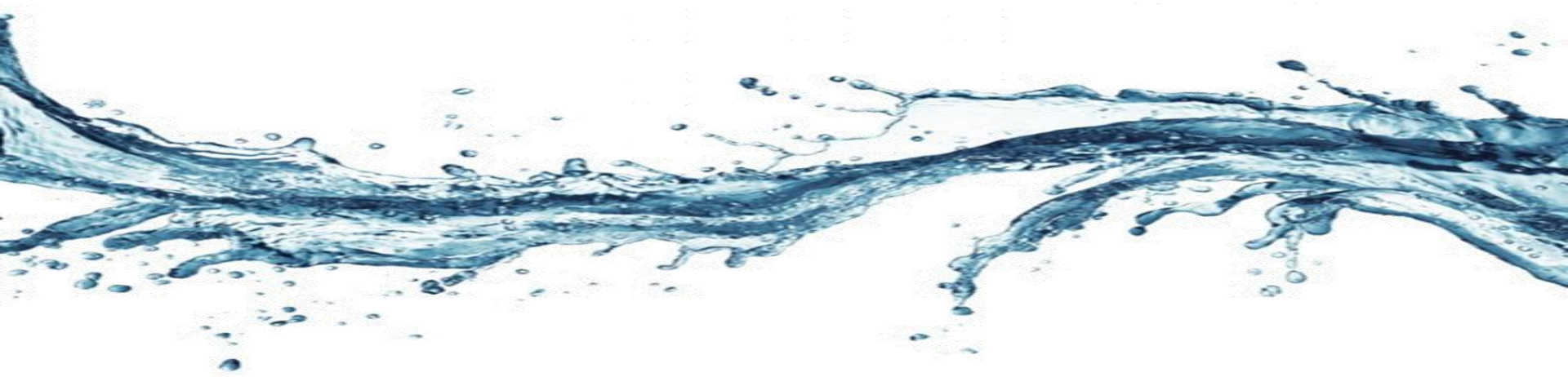
# Maintenance: Heat exchanger flush procedure.

The RinnaiSENSEI™ N - Series water heaters include a service indicated / reminder. When selected in the parameter settings an “SS” code will display on the controller indicating it is time to flush and service the water heater. Failure to service the appliance may cause damage to the heat exchanger. Damage caused by scale build-up is not covered under the water heater’s warranty. Rinnai strongly recommends installation of the included isolation valves to allow for proper servicing of the water heater.



1. Turn off power at the controller, Disconnect electrical power to the water heater, Disconnect from MSB ,Cascade or E-Z connect cables from unit (if applicable).
2. Close the shutoff valves on both the hot and cold water lines (V3 and V4)
3. Connect pump outlet hose (H1) to the cold water line at service valve V2
4. Connect drain hose (H3) to service valve V1
5. Pour approximately 4 gallons of virgin food grade white vinegar into pail
6. Place the drain hose (H3) and the hose (H2) to the pump inlet into the cleaning solution
7. Reconnect power to unit and allow Water flow servo and Water flow by-pass time to reset to start position, approximately 10-15 seconds. Disconnect power again before flushing.
8. Open both service valves (V1 and V2) on the hot and cold water lines
9. Operate the pump and allow the cleaning solution to circulate through the water heater for at least 1 hour at a rate of 4 GPM (15.1 L/min).
10. Turn off the pump
11. Rinse the cleaning solution from the water heater by:
  - a. Remove the free end of the drain hose (H3) from the pail and place in a suitable drain
  - b. Close service valve, V2, and open shutoff valve, V4. Do not open shutoff valve, V3.
  - c. Allow water to flow through the water heater for 5 minutes
  - d. Close service valve, V1 and shutoff valve V4.
12. Disconnect all hoses
13. Remove the in-line filter at the cold water inlet and clean out any residue
  - a. Place the filter back into the unit.
14. Open shutoff valves V3 and V4.
15. Reconnect MSA, Cascade or E-Z Connect cable (if applicable). Restore electrical power to the water heater.

# Warranty



# Warranty & Maintenance: See manual for full details.

Item	Period of coverage (from date of purchase)	
	Residential Applications	Commercial Applications
Heat Exchanger*	15 years	8 years
Other parts and components	5 years	5 years
Reasonable Labor	1 year	1 year

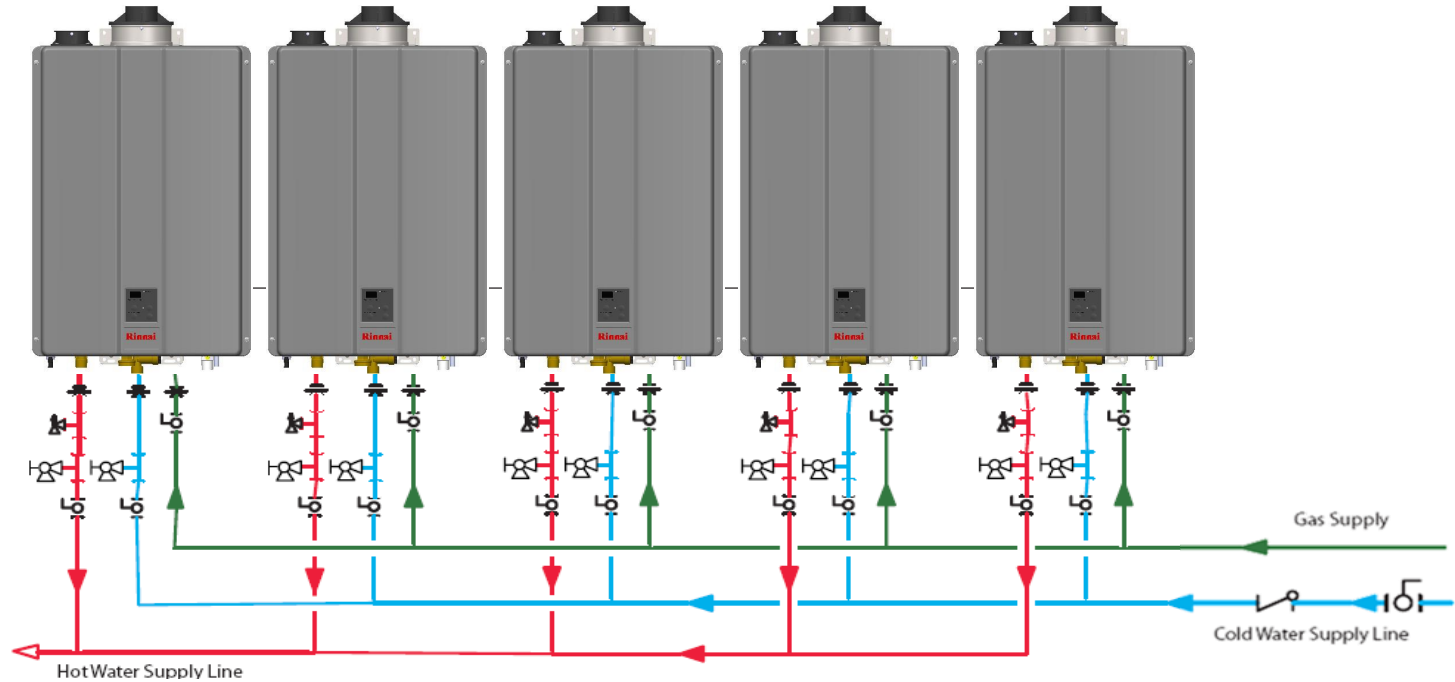
\*The heat exchanger warranty will be 15 years or 12,000 operation hours, whichever occurs first.

- NOTE:
  - From date of purchase, period of coverage is reduced to 8 years or 12,000 operation hours, whichever occurs first, if the Rinnai water heater temperature setting exceeds 160°F (71°C).
  - The integrated controller has a 1 year warranty on parts.
- 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 the limited warranty document.
- Limited warranty applies only to products that are installed correctly in the United States and Canada.
- Improper installation may void this limited warranty.
- In order for this warranty to apply, it is required that you use a licensed professional who has attended a Rinnai installation training class before installing this water heater.
- 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. This limited warranty extends only to the first/original installation of the product and terminates if the product is moved or reinstalled at a new location.
- This limited warranty doesn't cover failures or operating difficulties due to accident, abuse, misuse, alteration, misapplication, improper installation, maintenance, or service, inadequate water quality, scale buildup, or freeze damage, any damage due to fires, flooding, electrical surges, freezing or acts of God, operating the water heater with anything other than potable water or 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.
- Use of a MCC-91-2 controller in a residential dwelling will reduce the warranty coverage to that of a commercial warranty application except when used with a hydronic air handler with temperature settings no higher than 160°F (71°C)

# Multiple Unit Installations

# Multiple Unit Operation:

**Why is multi-unit control technology needed?**



In the example shown above, if a multi-unit control system is not used, it could take in excess of 2.0 GPM total water flow through the system to fire any single unit (5 units X a 0.4 GPM activation flow rate for each unit).

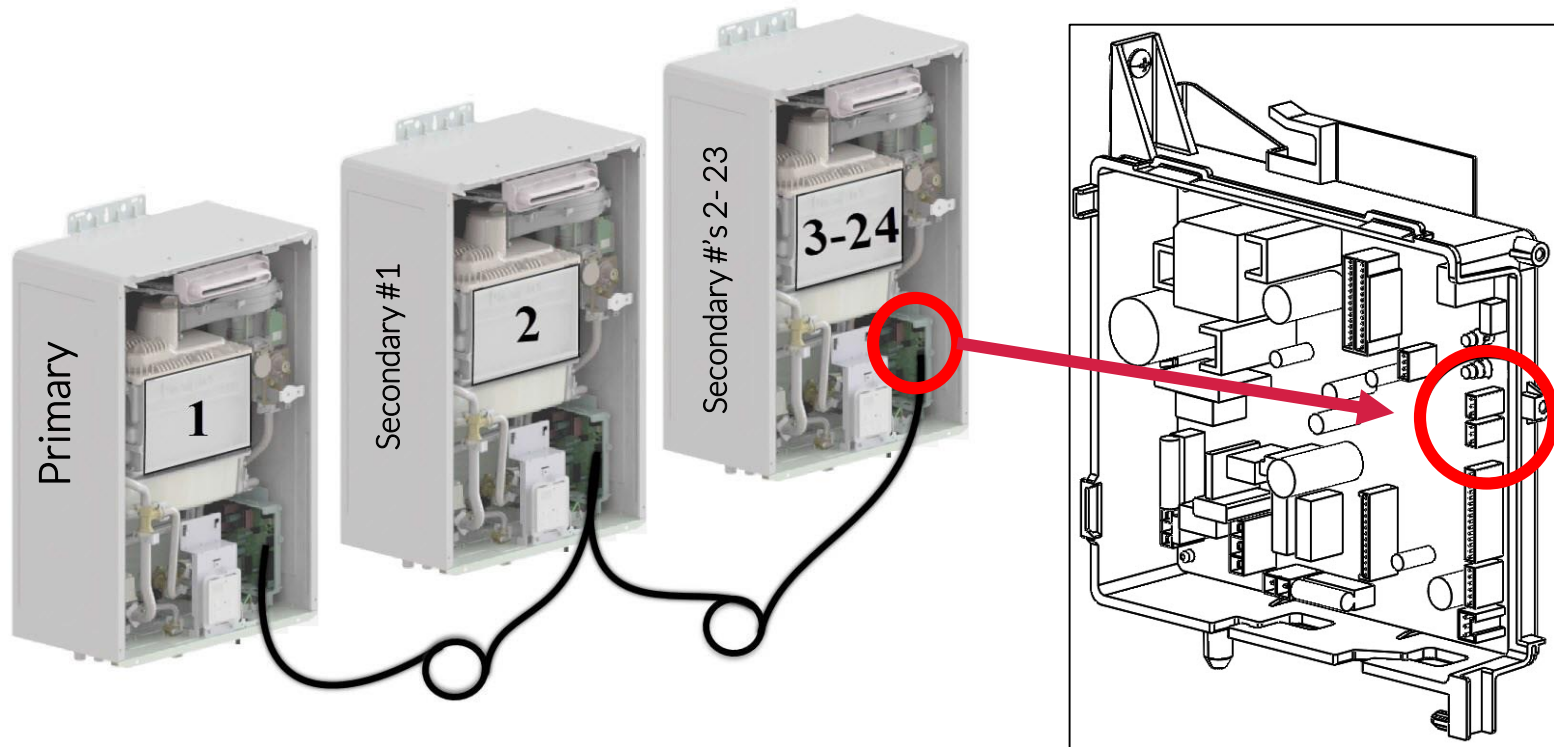
With a total water flow of less than 2.0 GPM the flow would be divided among all five water heaters. The flow through each unit would be less than 0.4 GPM (assuming equal flow through each unit). This is below the minimum activation flow rate for a single water heater. Under this circumstance none of the water heaters would fire.

The solution is to use Rinnai's Cascade Communication system (commercial models only) or EZ-Connect technology (if connecting only two water heaters).

This technology allows multiple water heaters to communicate with each other and operate as one. Only the number of water heaters necessary to satisfy the water flow demand would be operated.

# Multiple Unit Operation: Cascade Communication – Commercial models.

- With the use of cascade cable(s) up to 24 water heaters can be electronically connected.
  - The cascade connection enables all connected water heaters to modulate operation and function as one single hot water source.
  - The connection will rotate water heater operation to ensure equal usage among the entire system.



- **NOTE:** For proper operation do not combine different models with cascade communication.



# Multiple Unit Operation: Cascade Communication – Commercial models.

- Programming Cascade Communication. See section 3.12 Parameter Settings of the install manual.

Setting #	Setting Description	Selection					
		A	B	C	D	E	F
08 (Commercial ONLY)	Cascade	Secondary (1-24)	Primary				
09 (Commercial ONLY)	Units In Standby (Cascade)	1	2	3	4	5	6

## • Setting # 08 Cascade:

- **Primary:** Select the water heater intended to be the primary water heater for cascade communication. Set the parameter for this water heater to “**Primary**” – (08b). **NOTE:** This controller will display the set temperature for the system.
- **Secondary:** Factory Default setting for each water heater is set to “**Secondary**” - (08A). Parameter adjustment will only be necessary on the water heater identified as “Primary”. **NOTE:** Secondary water heater controller(s) will display “ - - - ” when the primary unit is selected.

## • Setting # 09 Units in Standby:

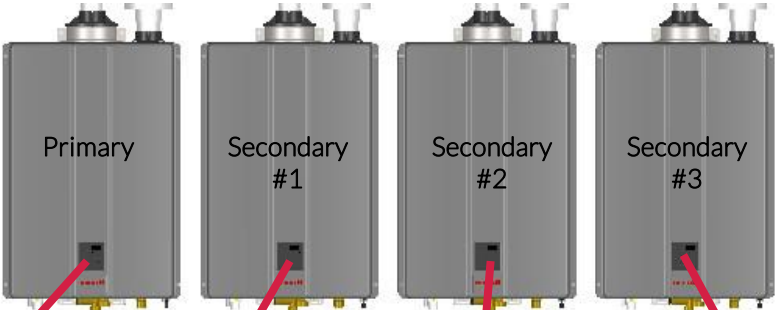
- Adjust the parameter setting of the **Primary** unit to select the number of water heaters in standby mode. Up to 6 units can be selected to be in the standby mode. Standby units will maintain operation with the water flow control valve in the Open position. The standby units will be ready to fire when sufficient water flow is detected.
- The remaining secondary water heaters will maintain operation with the water flow servo valve closed and will operate when water flow demand increases to the point additional units are needed.

## • Setting Secondary ID:

- After identifying the “**Primary**” water heater in the parameter settings, set the **Secondary ID** for ALL remaining water heaters in the system by pressing the On/Off button on each controller.
- When a position ID setting is successful, the controller on that unit will change from “ - - - ” to show the newly set ID number. The secondary ID will be displayed in the order the buttons are pressed on the secondary units.
  - Example: First secondary unit will show “ - 01 - ”, Second secondary unit will show “ - 02 - ” and so on.

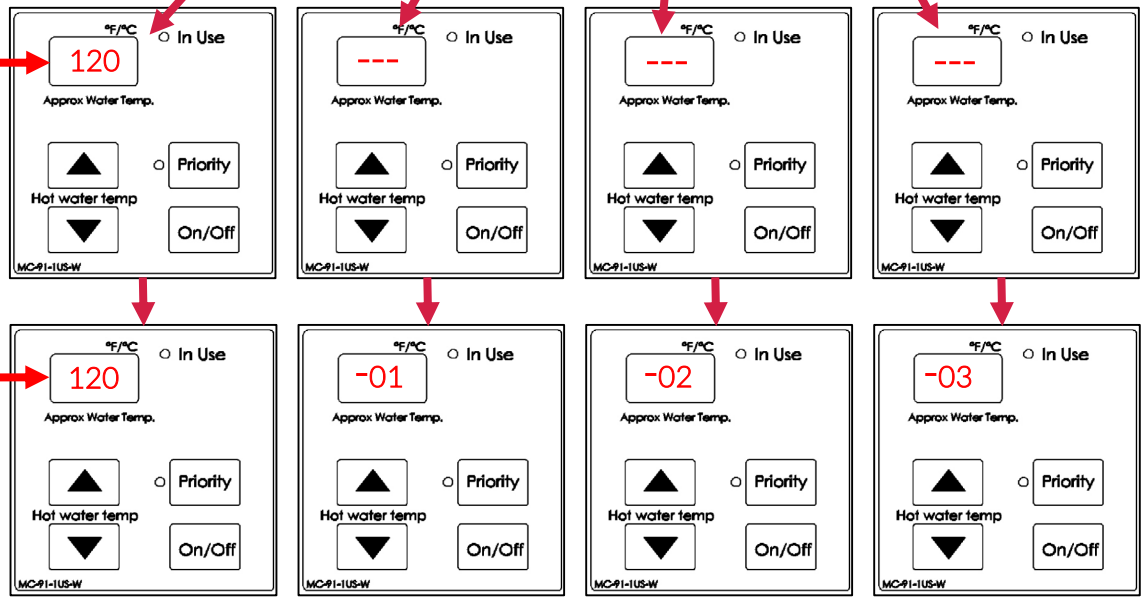
# Multiple Unit Operation: Cascade Communication – Commercial models.

- Programming Cascade Communication: Display examples.
  - When the primary and secondary units are designated through the parameter settings the display will be as shown below.



When the Primary unit is designated through parameter setting #08 the display will show the set temperature. Secondary units will show “- - -”

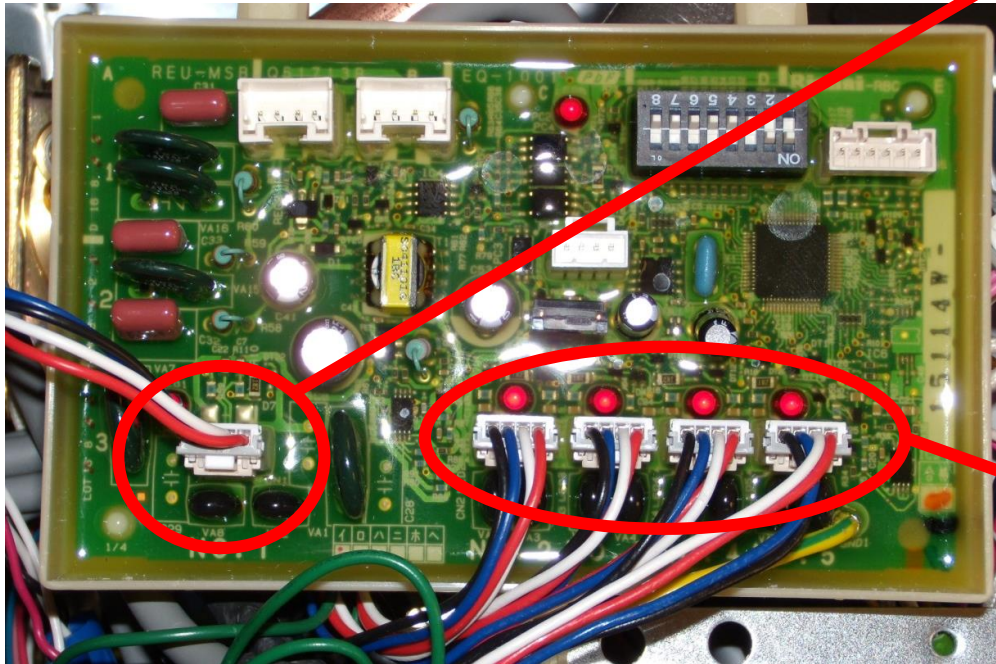
After the Primary unit is designated, press the On/Off button on the secondary units in order. The displays will change from the “- - -” to show the ID number of each unit in the Cascade system.



# Multiple Unit Operation: MSB Board – Residential Models.

The main component of Rinnai's MSB technology is the MSB circuit board. This board can be used to link up to 5 water heaters. The board is mounted inside one water heater and is connected to other units by a wire harness. The basic MSB-M kit contains all parts needed to link two water heaters. Additional wire harnesses will be needed for additional water heaters.

Cable connected to the primary unit in the MSB system.



Cables linking the MSB to other water heaters.

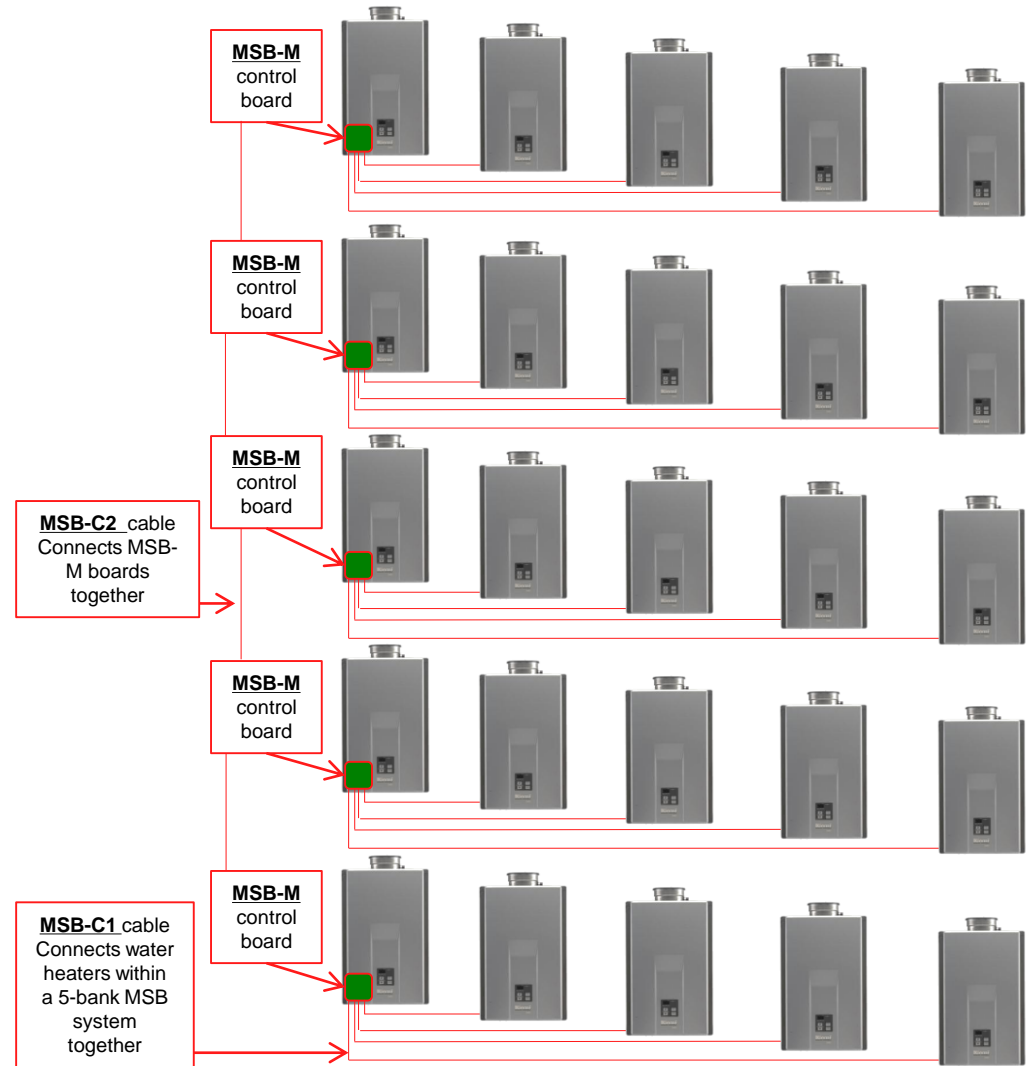
# Multiple Unit Operation: MSB Board – Residential Models.

Each MSB board can link up to 5 water heaters.

UP to 5 MSB boards can be linked together for a total of 25 water heaters operating as one system.

➤ Dip switches on the MSB board will allow the installer to select how many units (attached to each MSB board) are in a standby mode with their water control valves open ( and ready to fire) thus allowing quicker response to a water flow demand.

➤ Depending on which model water heater is used, a MSB system could have an operating range of 10,000 Btu to as great as 4.9 million Btu. Or, in terms of flow rate: 0.4 GPM to 245 GPM!



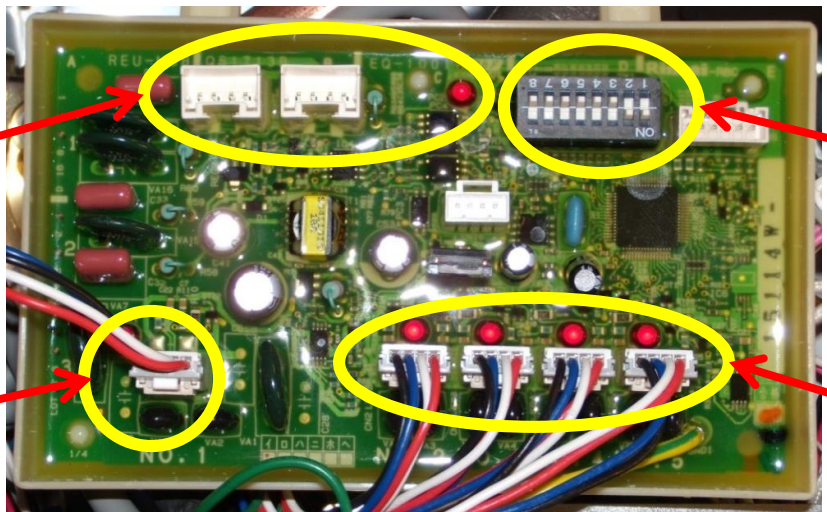
# Multiple Unit Operation: MSB Board – Residential Models.

- The MSB board will take a unit out of operation if a fault code is detected (by closing the water flow servo valve of the unit with the fault).
- There are several LED lights on the MSB board that will give basic status information about the water heaters connected to the board.

LED Status	Water Heater Status
LED On Solid	Water heater is operating OR the unit is in a “Ready” condition and will operate when water flow is initiated. (water flow servo valve is open)
LED Flashing Slow (1.2 sec. On / 0.5 sec. Off)	Unit is in the “OFF” condition and will not operate until the water flow demand is increased. (water flow servo valve is closed)
LED Flashing Fast (0.5 sec. On / 0.5 sec. Off)	A fault code has been detected at this unit. (To reset fault code power to the MSA/MSB or the particular unit will need to be cycled Off then back On)
LED Off	No unit detected / connected at this connection.

Connection points for multiple MSB boards. This LED will be illuminated solid if connections are correct.

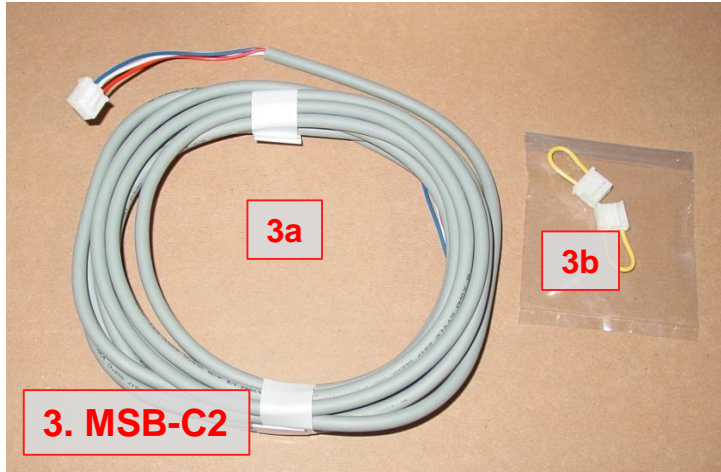
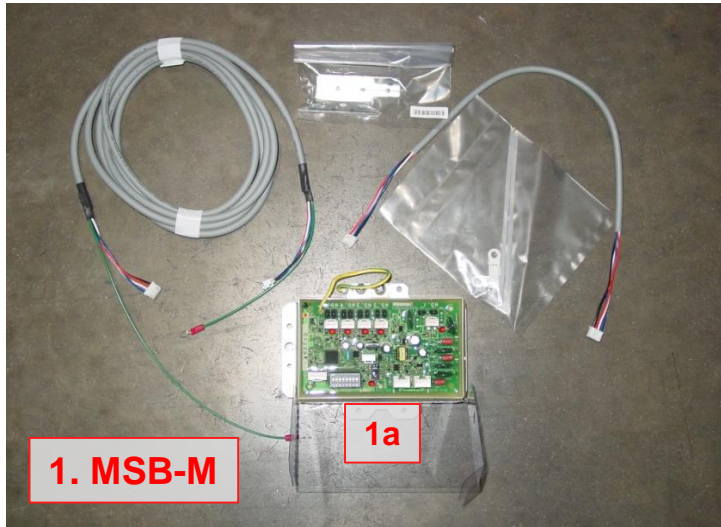
The primary water heater for this MSB board will be connected here.



Dip switches for configuring number of units “Ready” and also the number of MSB boards in use.

Water heater status LED's

# Multiple Unit Operation: MSB system components.



## 1. MSB-M Kit

2. MSB-C1 Kit (for connecting water heaters to the MSB Board).

3. MSB-C2 Kit (for connecting multiple MSB Board together).

**NOTE:** It is recommended to space the water heaters 2 inches apart. If additional spacing is used, these cables may not be long enough to reach the farthest units. Contact Rinnai Engineering if needed.

# Multiple Unit Operation: EZ-Connect – Residential or Commercial.

When connecting only two water heaters together, a MSB board is not necessary. An EZConnect cable can be used. It connects to a harness on the primary water heater and to the PCB on the secondary unit. Three or more water heaters will require the use of an MSB system for residential models or Cascade cables for Commercial models.

The EZ-Connect and MSB technology will rotate operation between units within a group of units in order to equally distribute operating hours among all units in the system.

Setting #	Setting Description	Selection					
		A	B	C	D	E	F
01	Maximum Set Temperature	120° (Residential) 140° (Commercial)	140° (Residential) 185° (Commercial)				
07	EZ Connect	2 Units (in standby)	1 Unit (in standby)				
08 (Commercial ONLY)	Cascade	Secondary (1-24)	Primary				
09 (Commercial ONLY)	Units In Standby (Cascade)	1	2	3	4	5	6

- In a MSB configuration, the temperature controller connected to the primary or #1 water heater will control the temperature output on ALL units in the system.
- When using EZ-Connect both units must be set to the same maximum set temperature in Parameter setting #01 and the desired standby configuration in Parameter setting #07.
  - Units in standby will have the water flow servo open and be ready for operation when water flow is detected. Units not in standby will have the water flow servo closed until the flow demand requires additional units.
- See EZ-Connect instructions for specific details.

# MANUFACTURER ACCESSORIES

## Accessories: Condensate neutralizer. For condensing boilers and water heaters.

- Neutralizers raise the pH level of the condensate prior to disposal to prevent possible damage to plumbing and may be required by local building codes.
  - Check with local authorities for the condensate disposal requirements in your area.
- **Rinnai has two condensate neutralizers available.**
  - P/N 804000074 – for single unit applications (includes media).
    - 1.6 Gallon/hour capacity
    - Clear housing to easily see when media refill is needed (refill P/N 809000114).
  - P/N 103000067 – for multiple unit/commercial applications (includes media).
    - 45 Gallon/hour capacity (4.8 gallon tank).
      - Can handle up to a 7 million Btu appliance (35 tankless units operating at max Btu).
    - Tank and lid are made from polypropylene.
    - Weight 45 lbs.
    - Media refill P/N 103000068.



**NOTE:** If no gravity drain is available, install a condensate removal pump may need to be installed. The condensate pump must be equipped with an overflow switch to prevent the appliance from running should a failure occur.

## Accessories: Domestic Priority Switch / Maintenance Indication switch.

**This switch is intended to be installed in a Rinnai tankless water heater when connected to one of the following products or systems.....**

- The switch can be used when a Rinnai tankless water heater is used in conjunction with a Rinnai or other branded hydronic air handler. The switch provides for domestic hot water priority and will turn the air handler off during high domestic hot water demands and allow it to come back on when the demand is reduced.
- The switch can also be used to connect a Rinnai water heater to a simple building management system. The switch will signal the building management system if an fault code causes the water heater to shut down (it indicates only that a water heater is not operating, not what the actual fault code is).

The switch is a volt-free Normally Open (NO) / Normally Closed (NC) switch.



**P/N 10300037**

# Accessories: ScaleCutter Water Conditioning System.

## Southeastern Filtration’s “ScaleCutter Water Conditioning System”.

- Rinnai offers Southeast Filtration’s “ScaleCutter Water Conditioning System” as an accessory if the water heater is installed in an area that is known to have hard water or that causes scale build-up in the heat exchanger.
- The ScaleCutter water conditioning system offers scale prevention and corrosion control by feeding a blend of control compounds into the cold water supply.



Part Number	Description
103000038	Southeastern Filtration ScaleCutter System 3/4" Feed
103000039	ScaleCutter Refill

# Accessories: Pipe Covers and Recess Boxes.

Accessories:

## ➤ Pipe cover boxes.

- Pipe cover boxes mount underneath the water heater to enclose visible pipes.
- This allows for a cleaner looking installation as well as provides increased security and weather protection (insulation can be installed inside the cover is desired).
- Pipe covers are available for all models.

## ➤ Recess boxes.

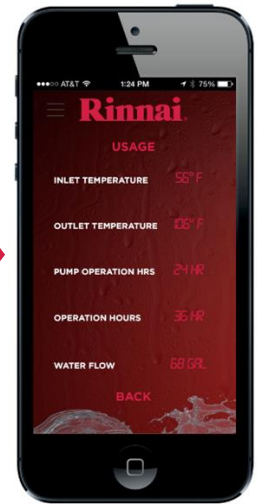
- Recess boxes allow outdoor models to be installed recessed into an exterior wall.
- The recess box encloses the water heater and the associated piping.
- This allows for a cleaner looking installation as well as provides increased security and weather protection.



# Accessories: Control-R™, Wi-Fi

## Consumer Features

- Unit Registration
- Temperature Control
- Fault Codes
- Maintenance Modes
- Remote Monitoring
- Power On/Off
- Circulation
  - Sensors
  - Push Buttons



## Dealer Features

- Unit Registration
- Device Manager
  - Error History
  - Maintenance Modes
- Alerts
  - Error Codes & Troubleshooting
- Remote Monitoring
- Dealer Tools
- Profile/Settings



**This concludes the Rinnai  
SENSEI™, N- Series  
Tankless Water Heater Training  
Program  
Level II – Installation Fundamentals**