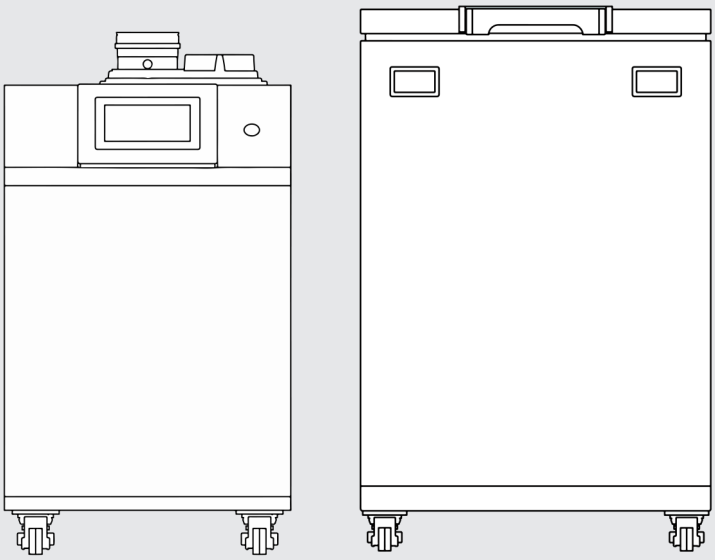
SOLO MODELS:

RCB500AN
RCB750AN
RCB1000AN



CSA/ANSI Z21.13 CSA 4.9

Rinnai Commercial Boiler

Installation and Operation Manual

Rinnai

⚠ WARNING

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

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

Contents

1. Welcome

Thank you for purchasing a Rinnai Condensing Boiler. Before installing and operating this boiler, be sure to read these instructions completely and carefully to familiarize yourself with the boiler's features and functionality.

1.1 To The Consumer

- You must read the entire manual to properly operate the boiler.
- Keep this manual for future reference.
- As when using any appliance generating heat, there are certain safety precautions you should follow. See section "2.2 Safety Precautions" for detailed safety precautions.
- Be sure your boiler is installed by a licensed installer.
- If installing in the state of Massachusetts, read section "14.6 Massachusetts State Gas Regulations" in this manual.

1.2 To The Installer

- A trained and qualified professional must install the boiler, inspect it, and leak test it before use. The warranty will be voided due to any improper installation.
- The trained and qualified professional should have skills such as:
  - Gas line sizing
  - Connecting gas lines, water lines, valves, and electricity
  - Knowledge of applicable national, state, and local codes
  - Installing venting through a wall or roof
  - Training in installation of condensing boilers. Training on Rinnai Condensing Boilers is accessible at: rinnaipro.myabsorb.com.
- Read all instructions in this manual before installing the boiler. The boiler must be installed according to the exact instructions in this manual.
- Proper installation is the responsibility of the installer.
- When installation is complete, leave this manual with the boiler or give the manual directly to the consumer.

1.3 Acronyms and Abbreviations

Following is a list of common acronyms and abbreviations used in this manual:

Table 1: Acronyms and Abbreviations

ANSI	American National Standards Institute
Btu	British Thermal Unit
CH	Central Heating
SOLO	Heating only boiler capable of DHW through an indirect tank
DHW	Domestic Hot Water
GPM	Gallons per minute
LP	Liquid Propane
LWCO	Low Water Cut Off
NG	Natural Gas
PP	Polypropylene
PRV	Pressure Relief Valve
PSI	Pounds per square inch
wc	Inches water column

2. Safety

⚠ WARNING

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

- Do not store or use gasoline or other flammable vapors and liquids in the vicinity of this or any other appliance.
- WHAT TO DO IF YOU SMELL GAS:
  - Do not try to light any appliance.
  - Do not touch any electrical switch; do not use any phone in your building.
  - Immediately call your gas supplier from a neighbor's phone. Follow the gas supplier's instructions.
  - If you cannot reach your gas supplier, call the fire department.
- Installation and service must be performed by a qualified installer, service agency or the gas supplier.
- The warning signs in this manual are here to prevent injury to you and others. Please follow them explicitly.

2.1 Safety Symbols

This manual contains the following important safety symbols. Always read and obey all safety messages.

⚠ Safety alert symbol. Alerts you to potential hazards that can kill or hurt you and others.

⚠ DANGER

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

⚠ WARNING

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

⚠ CAUTION

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

2.2 Safety Precautions

The following precautions apply to the installer and consumer. Read and follow all instructions in this section.

- Before operating, smell all around the appliance area for gas. Be sure to smell next to the floor because some gas is heavier than air and will settle on the floor.
- Keep the area around the appliance clear and free from combustible materials, gasoline, and other flammable vapors and liquids.
- Do not store or use gasoline or other flammable vapors and liquids in the vicinity of this or any other appliance.
- Combustible construction refers to adjacent walls and ceiling and should not be confused with combustible or flammable products and materials. Combustible and/or flammable products and materials should never be stored in the vicinity of this or any gas appliance.

Always check the water temperature before entering a shower or bath. (when connected to an indirect tank)

- Do not use this appliance if any part has been under water. Immediately call a licensed professional to inspect the appliance and replace any part of the control system and any manual gas control valve which has been under water.
- Do not use substitute materials. Use only parts certified for the appliance.
- Should overheating occur or the gas supply fail to shut off, turn off the manual gas control valve to the appliance.
- It is strongly recommended that you use a trained and qualified professional who has attended a Rinnai installation training class to adjust parameter settings.
- Do not use an extension cord or adapter plug with this appliance.
- Any alteration to the appliance or its controls can be dangerous and will void the warranty.
- To protect yourself from harm, before performing maintenance:
  - Turn off the electrical power supply by turning off the electricity at the circuit breaker. (The boiler controller does not control the electrical power.)
  - Turn off the gas at the gas control, usually located immediately below the boiler.
  - Turn off the incoming water supply. Turning off the water for the central heating system is done at the boiler system filling station shut-off valve or the main water supply to the building.
  - Use only your hand to turn the manual gas control valve. Never use tools. If the manual gas control valve will not turn by hand, do not try to repair it; call a trained and qualified professional. Force or attempted repair may result in a fire or explosion.
- Proper venting is required for the safe operation of this appliance. Failure to properly vent this appliance can result in death, personal injury and/or property damage.
- Flammable liquids such as cleaning solvents, aerosols, paint thinners, adhesives, gasoline and propane must be handled and stored with extreme care. These flammable liquids emit flammable vapors and when exposed to an ignition source can result in a fire hazard or explosion. Flammable liquids should not be used or stored in the vicinity of this or any other gas appliance.
- DO NOT operate the boiler without the front and side panel installed. The front and side panel should only be removed for service/maintenance or replacing internal components.
- BURN HAZARD. Hot exhaust and vent may cause serious burns. Keep away from the boiler. Keep small children and animals away from the boiler.
- Heating supply and return pipes leaving the boiler can be hot to touch.
- Install the vent system per local and national codes.
- Do not install this boiler above 10,200 ft (3,109 m).
- Do not obstruct combustion air to the boiler.
- This product burns gas to produce heat. The appliance must be properly installed, operated, and maintained to avoid exposure to appreciable levels of carbon monoxide and the installer is required to confirm that at least one carbon monoxide alarm is installed in the living space before the appliance is put into operation. It is important for the carbon monoxide alarms to be installed, maintained, and replaced following the alarm manufacturer's instruction and applicable local codes. Rinnai recommends that every home have a carbon monoxide (CO) alarm in the hallway near bedrooms in each sleeping area. Check batteries monthly and replace them annually.

3. About the Boiler

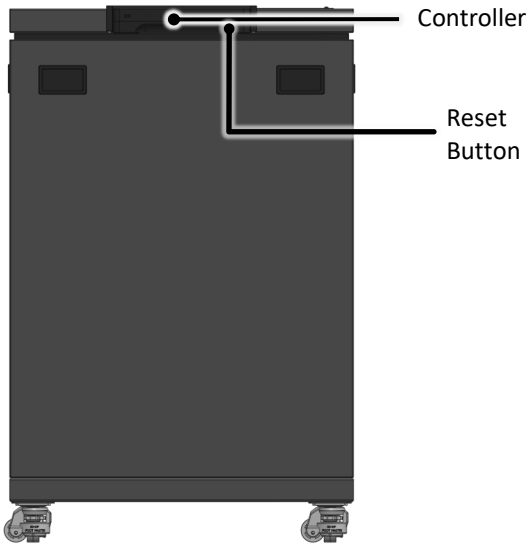
Topics in this section	
• Front View • Back View • Components • Altitude	• Specifications • Dimensions • Included Accessories • Optional Accessories

The Rinnai Commercial Boiler is a floor-standing, gas-fired boiler designed to provide heating to the building with the ability to connect an indirect tank for DHW production.

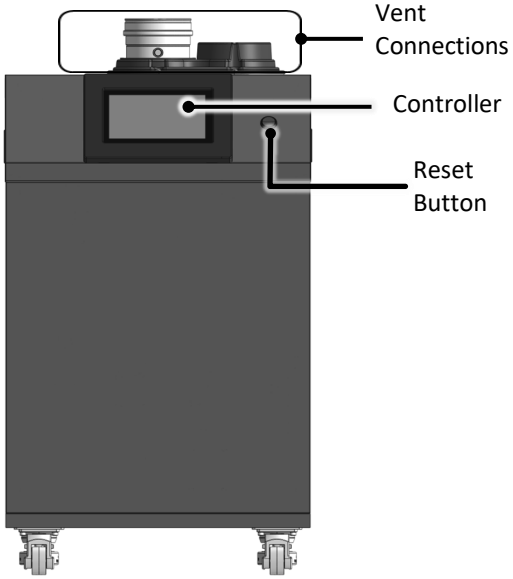
3.1 Front View

Figure 1

RCB750AN / RCB1000AN



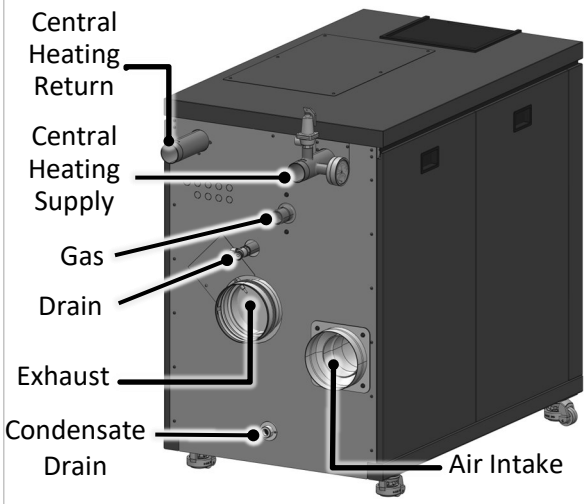
RCB500AN



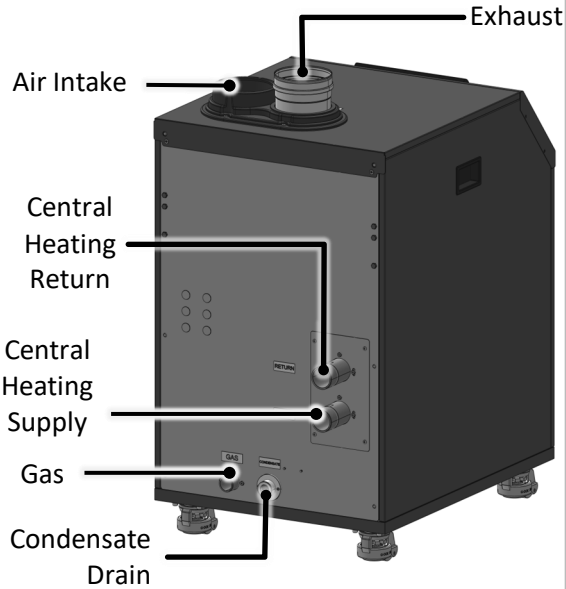
3.2 Back View

Figure 2

RCB750AN / RCB1000AN



RCB500AN



3.3 Components

Refer to the next page for a description of each component.

Figure 3

RCB1000N shown

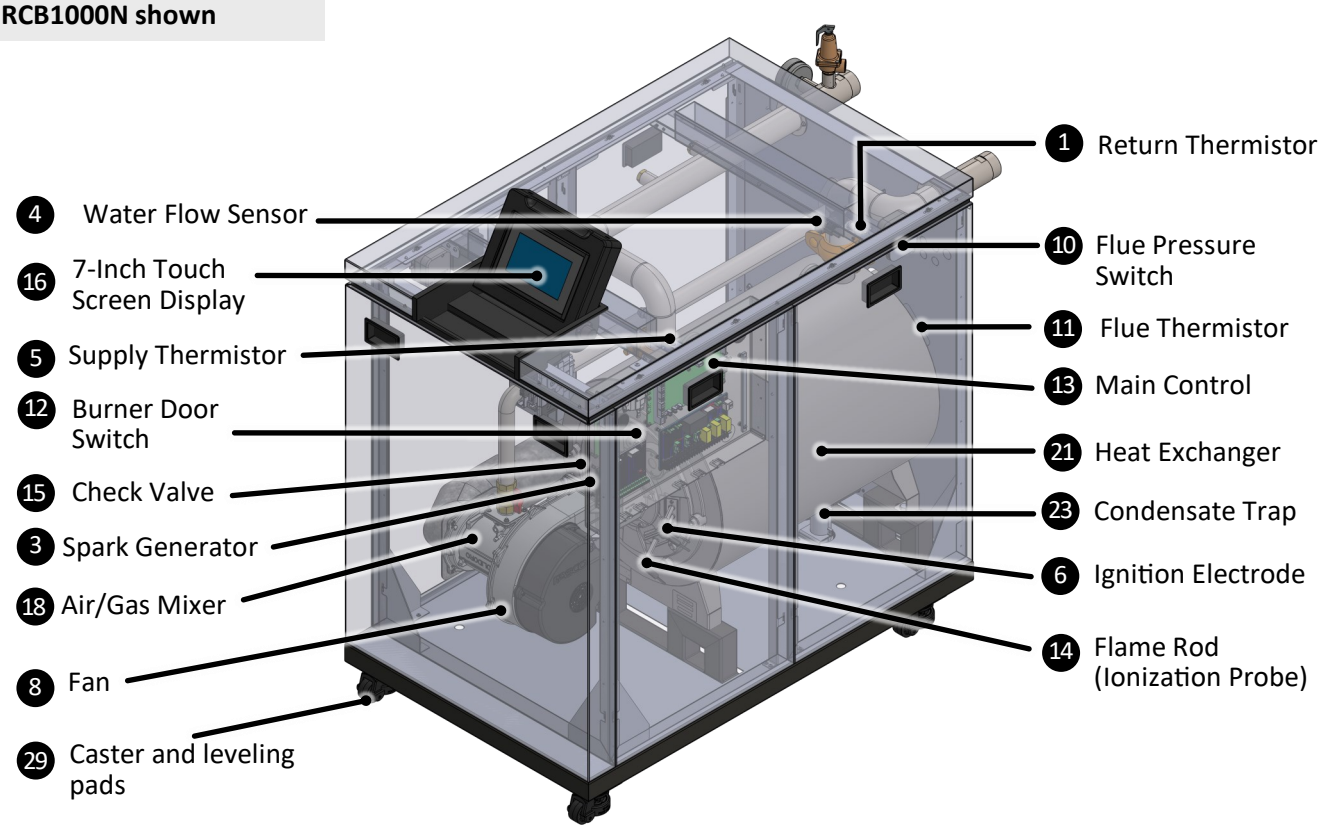
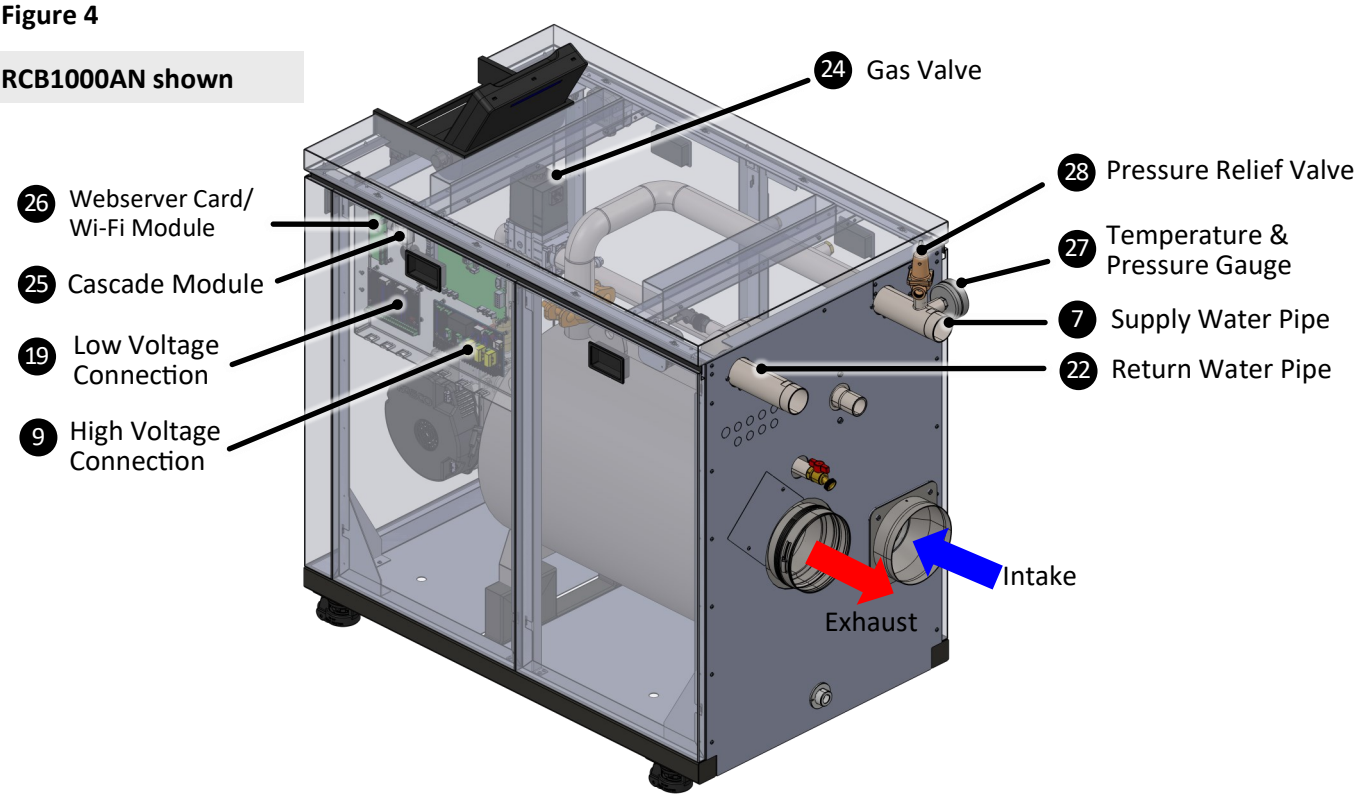


Figure 4

RCB1000AN shown



Refer to the next page for a description of each component.

Figure 5

RCB500AN shown

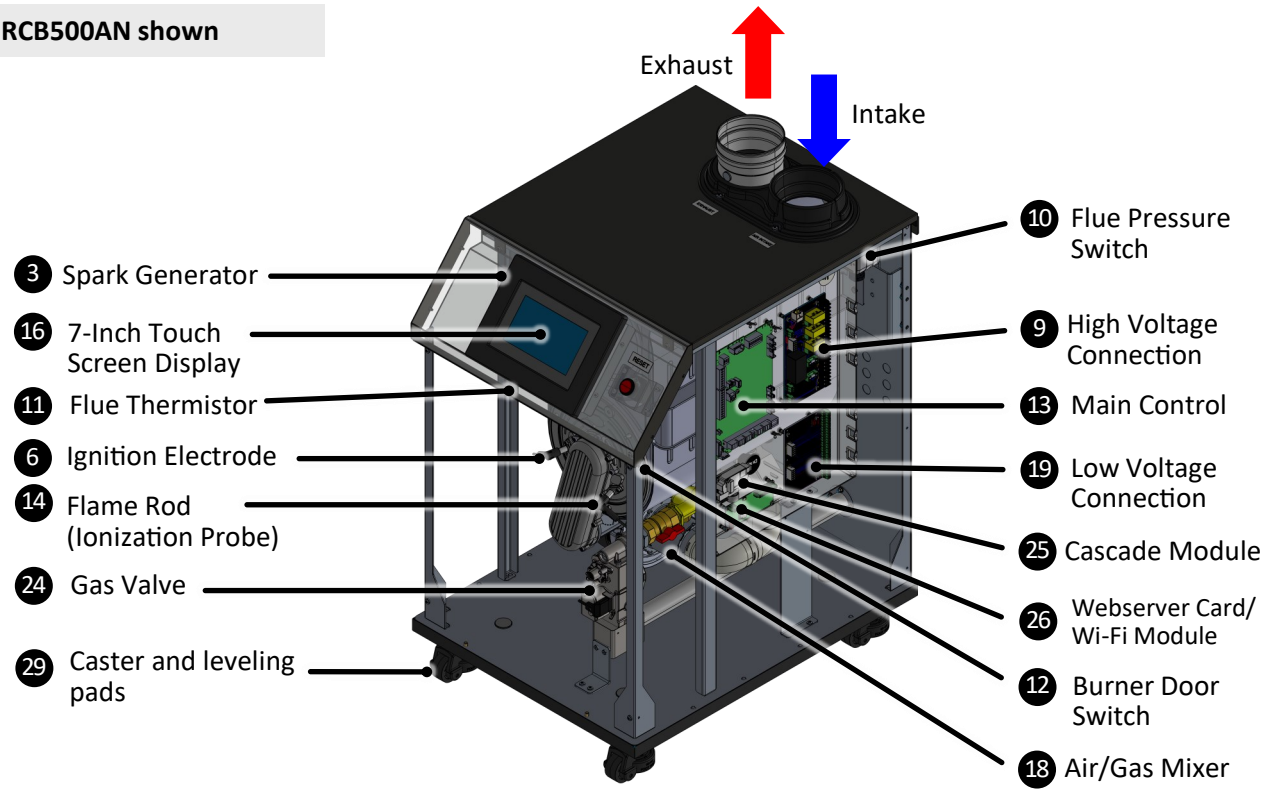
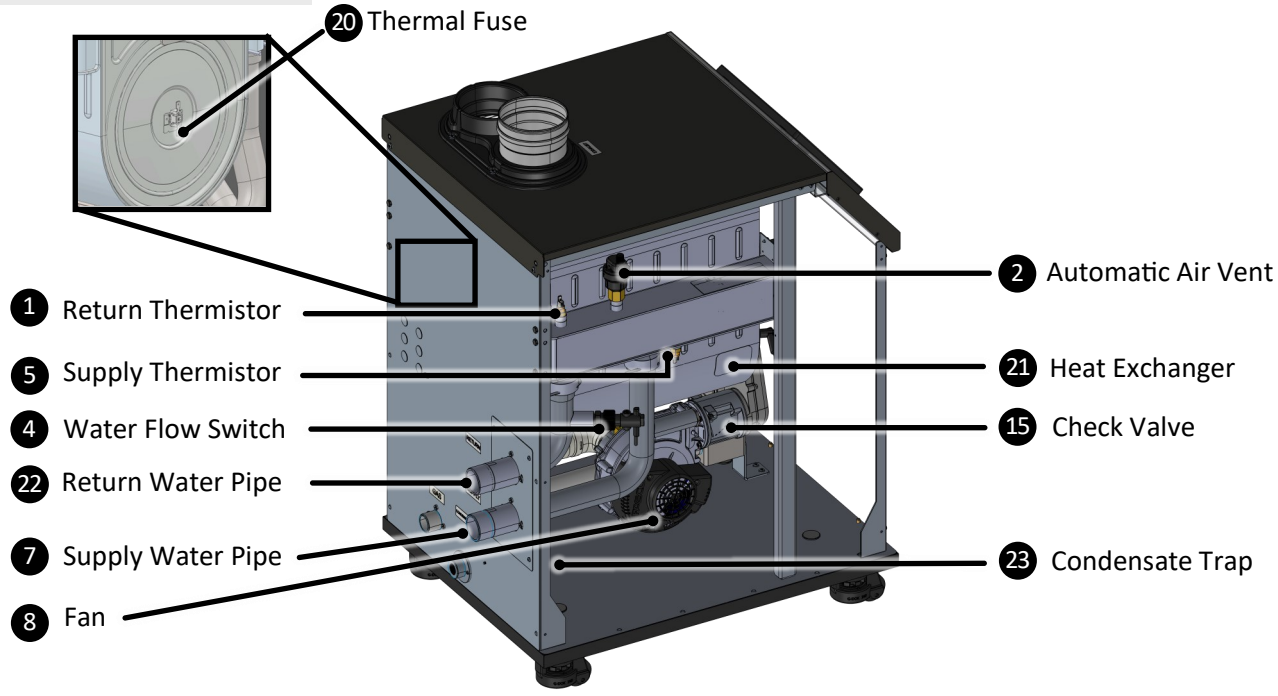


Figure 6

RCB500AN shown



Listed below are descriptions of each boiler component. Refer to the previous page for component illustration.

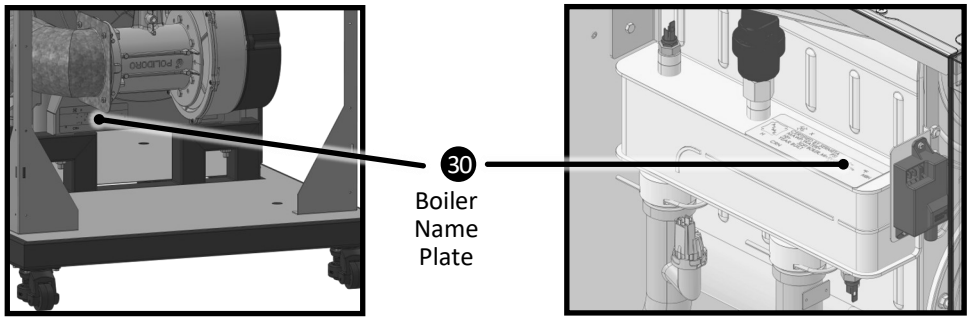
Table 2: Boiler Component Descriptions

Item	Name	Description
1	Return Thermistor	A sensor that monitors the water temperature returning into the boiler.
2	Automatic Air Vent	A device used to bleed the air from the heating system.
3	Spark Generator	Applies high voltage through the spark electrode to ignite the burner.
4	Water Flow Switch	A switch that monitors water flow when boiler receives a heat demand. This switch will disable boiler operation in case there is a heat demand but the flow is not detected.
5	Supply Thermistor	A sensor that monitors the boiler outlet water temperature. The control will shut down the boiler in case the temperature exceeds a certain limit.
6	Ignition Electrode	Provides direct spark to ignite the burner.
7	Supply Water Pipe	1-1/2 In for RCB500AN model and 2 In for RCB750AN and RCB1000AN models.
8	Fan	Pulls air and gas through the air/gas mixer. Air and gas are pre-mixed inside of the fan and are pushed into the burner for combustion.
9	High Voltage Terminal Strip	Contains connection points for main power supply and all pumps power.
10	Flue Pressure Switch	A safety device that monitors the pressure in the vent and shuts down the appliance in case of blockage to avoid unsafe conditions.
11	Flue Thermistor	A sensor that monitors the flue gas exit temperature. The control will shut down the boiler if the flue gas temperature gets too hot to protect the flue pipe from overheating.
12	Burner Door Switch	A switch that will break the control circuit, shutting down the boiler in case the burner door temperature is too high.
13	Main Control	The integrated controller monitors and controls the system operation. The controller responds to internal and external signals and controls the fan, gas valve, spark generator, and pumps to meet the heat demand.
14	Flame Rod (Ionization Probe)	Detects and monitors the presence of a flame.
15	Check Valve	Prevents flue gas back flow into the fan in case of negative pressure in the boiler room in a power vent installation. The check valve also acts as back flow preventer in a common vent system where multiple units are cascaded.
16	7-Inch Touch Screen Display	The full-color touch screen allows a user friendly interface with the boiler control.
17	Air/Gas Mixer	The venturi controls the mixture of air and gas before entering the burner for combustion.
18	Low Voltage Terminal Strip	Contains connection points for low voltage input and output signals.

Table 2 (Continued): Boiler Component Descriptions (Continued)

Item	Name	Description
19	Thermal Fuse	A safety device that will stop the boiler operation in case of unusual temperature rise.
20	Heat Exchanger	The stainless steel condensing heat exchanger is efficiently designed to maximize heat transfer through the coils while providing protection against flue gas corrosion.
21	Return Water Pipe	1-1/2 In for RCB500AN model and 2 In for RCB750AN and RCB1000AN models.
22	Condensate Trap	The high efficiency heat exchange produces condensate during operation. The condensate trap manages the condensate disposal and the built-in float prevents flue gases to escape through the condensate drain.
23	Gas Valve	The zero governor gas valve regulates the gas flow through the venturi based on suction from the fan.
24	Cascade Module	Used to establish communication between boiler in a cascade system by connecting them to each other using two conductor 18-20 AWG shielded wire.
25	Webserver Card/ Wi-Fi Module	The Webserver Card/Wi-Fi Module allows the installer to remotely monitor the system operation, pro-actively optimize efficiency, and aid in troubleshooting. This card also establishes the communication between main control board and user interface screen.
26	Temperature & Pressure Gauge	This device show the current boiler supply temperature and system pressure.
27	Pressure Relief Valve	The boiler is supplied with a 75 PSI Pressure Relieve Valve. This is a safety device that will relief pressure and prevent unsafe operation in case the system pressure is too high.
28	Caster and leveling pads	The boiler is had built-in caster that can facilitate moving the boiler to its installation location. Also, the leveling pads can be used to level the boiler once it is in place.
29	Boiler Name Plate	The ASME name plate (Figure 7) includes the National Board (NB) and Canadian Registration Number (CRN) numbers.
Additional Components Not Shown in Images:		
	Burner	The metal fiber and stainless steel burner uses premixed air and gas to provide a wide range of firing rates.
	Outdoor Sensor	Uses the outdoor temperature to adjust the unit setpoint to provide greater efficiency.
	Cascade System Sensor	In a cascade system, the master boiler requires a system supply sensor to operate properly. The location of the sensor should be downstream of the of the boiler connection in the main system loop.
	DHW Sensor/ Aquastat	Monitors and controls the temperature of an indirect tank.

Figure 7



3.4 Altitude

This boiler can operate from sea level up to 10,200 feet [3,109 m]. The table below represents the de-rates for each model, gas type, and altitude. For proper operation ensure to set the control for proper gas type and altitude. Tap the setup, boiler setup page on the boiler screen for proper gas type and altitude settings. De-rate values are based on proper combustion settings as recommended in this manual. For installation above 2,000 ft (609 m) in Canada, follow all applicable local codes and regulations.

NOTE: See control section on how to change altitude setting from the control panel.

ALTITUDE VENTING:

500 model ONLY: For altitudes above 2,000 ft (609 m), vent length is reduced to 110 ft (33 m).

Table 3

Model	0 - 2000 ft (0-609 m)		2001 - 5400 ft (610 -1645 m)		5401 - 7700 ft (1646 - 2346 m)		7701 - 10200 ft (2347 - 3109 m)	
	NG	LP	NG	LP	NG	LP	NG	LP
RCB500AN	0.0 %	0.0 %	10.0 %	10.0 %	20.0 %	20.0 %	25.0 %	25.0 %
RCB750AN	0.0 %	0.0 %	10.0 %	10.0%	15.0 %	15.0 %	20.0 %	20.0 %
RCB1000AN	0.0 %	0.0 %	0.0 %	0.0%	10.0 %	10.0 %	15.0 %	15.0 %

NOTE: The values listed on the above table are the total percentage of boiler input de-rate for each elevation range.

3.5 Specifications

Table 4: Specifications

Model		RCB500AN	RCB750AN	RCB1000AN
Ignition System		Direct Electronic Ignition		
Dimensions (Appliance) - In. (mm) - w, h, d		21.75 x 39.5 x 30.75 (550 x 1004 x 781)	28.5 x 44.5 x 51.75 (723 x 1127 x 1312)	
Weight (Appliance)		243 lb (110 kg)	525 lb (238 kg)	567 lb (257 kg)
Dimensions (Shipping) - In. (mm) - w, h, d		30 x 48 x 36 (770 x 1220 x 910)	38 x 57 x 60 (970 x 1450 x 1530)	
Weight (Shipping)		300 lb (136 kg)	591 lb (268 kg)	633 lb (287 kg)
Heat Exchanger Surface Area		36.8 sq ft	60.9 sq ft	75.4 sq ft
Gas Consumption (Btu/h)	Minimum	50,000	75,000	99,000
	Maximum	500,000	750,000	999,000
Temperature Setting	CH	(Minimum - Maximum) 86°F - 180°F (30°C - 82°C)		
	Indirect Tank (DHW)	104°F - 176°F (40°C - 80°C)		
Water Content		2.7 gal (10.1 lt)	6.6 gal (24.8 lt)	8.1 gal (30.6 lt)
Water Pressure	CH	Minimum: 14.5 PSI (1 bar) Maximum Allowable Water Pressure (MAWP): 160 PSI (1103 kPa)		
	PRV	75 PSI (5.2 bar) (Pressure Relieve Valve included with system)		
Electrical Data	Normal	350 W	484 W	605 W
	Standby	10 W		
	Max Current	20 Amps		
	Fuse	Main controller: 2 x 6.3 Amps Each Pump (Boiler, CH, DHW): 5 Amps		
Gas Supply Pressure[1]	Natural Gas	3.5 in. - 10.5 in. wc (0.87 - 2.61 kPa)		
	Propane	8.0 in. - 13.5 in. wc (1.99 - 3.36 kPa)		
Electric Connections		AC 120 Volts, 60 Hz		
Certifications		ANSI Z21.13, CSA 4.9, ASME		
Canada CRN		Y6325.2C	R5402.5C	
Warranty		Heat Exchanger: 10 Years. All Other Parts & Components: 1 Year. Reasonable Labor: 1 Year. See the "Rinnai Commercial Boiler Warranty" for Complete Details		
Venting 45° elbow is equivalent to 3 ft (1 m). 90° elbow is equivalent to 6 ft (2 m).	Options:	• Direct Vent • Non-Direct Vent (Room Air)		
	Materials	PVC, CPVC, PP and Stainless Steel		
	Vent Size	4 in. PVC/CPVC	6 in. PVC/CPVC	
	Exhaust [2]	Vent Run (Min-Max): 10 ft (3 m) - 140 ft (43 m)		
	Intake [2]	Vent Run (Min-Max): 0 ft (0 m) - 140 ft (43 m)		

1 Maximum gas supply pressure must not exceed the value specified by the manufacturer.
Rinnai products are continually being updated and improved; therefore, specifications are subject to change without prior notice.

2 500 model ONLY: For altitudes above 2,000 ft (609 m), vent length is reduced to 110 ft (33 m).

3.6 Dimensions

Dimensions: RCB500AN MODEL

Figure 8

Measurements: in. [mm]

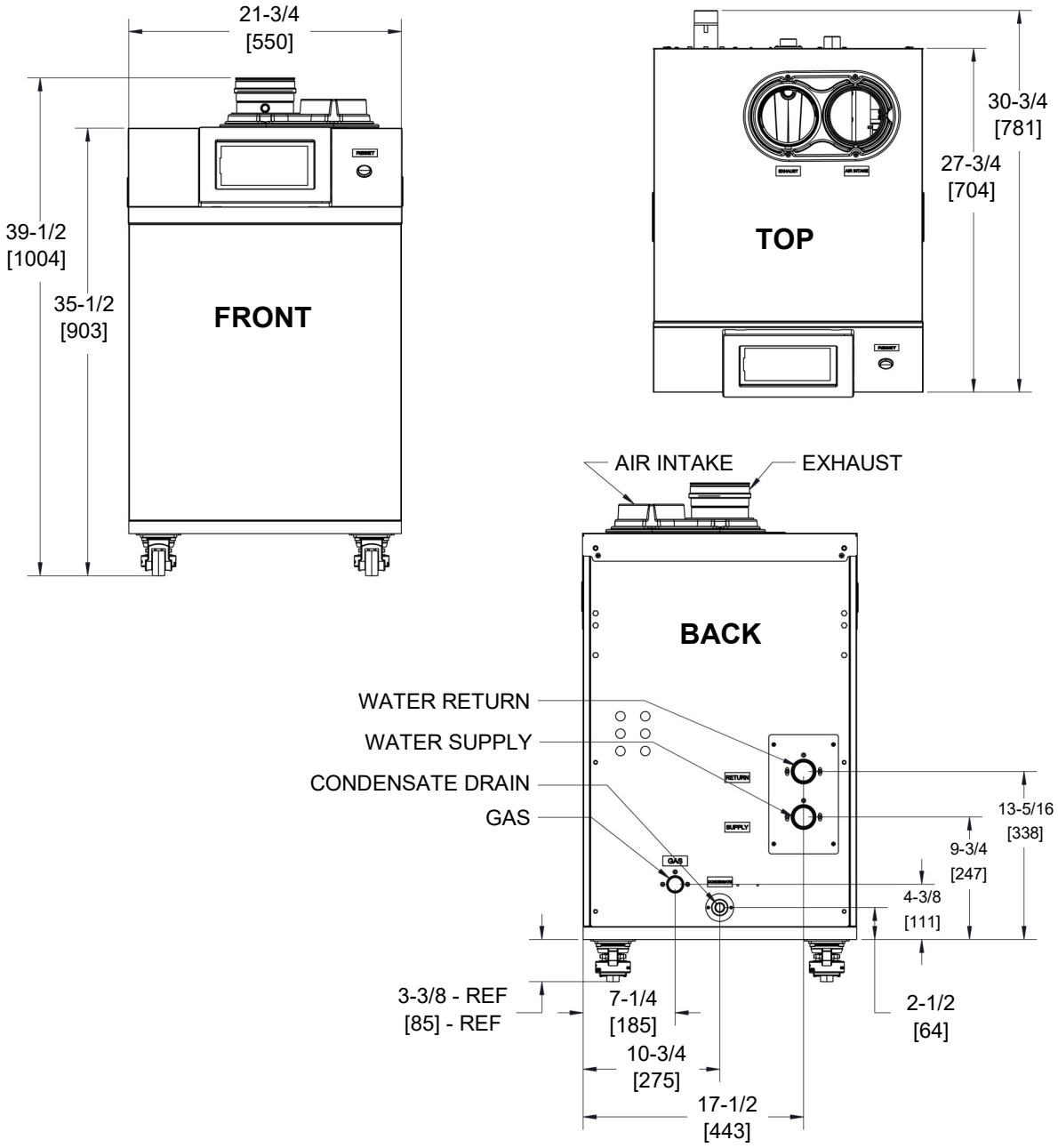


Table 5

Connection	Connection Size	Minimum Pipe Size
Gas	1 in. NPT	1 in.
CH In (CH Return)	1-1/2 in. NPT	1-1/2 in.
CH Out (CH Supply)	1-1/2 in. NPT	1-1/2 in.
Condensate Drain	1 in. NPT	3/4 in.
Venting (Intake & Exhaust)	4 in. PVC/CPVC	4 in.

Dimensions: RCB750AN & RCB1000AN MODELS

Figure 9

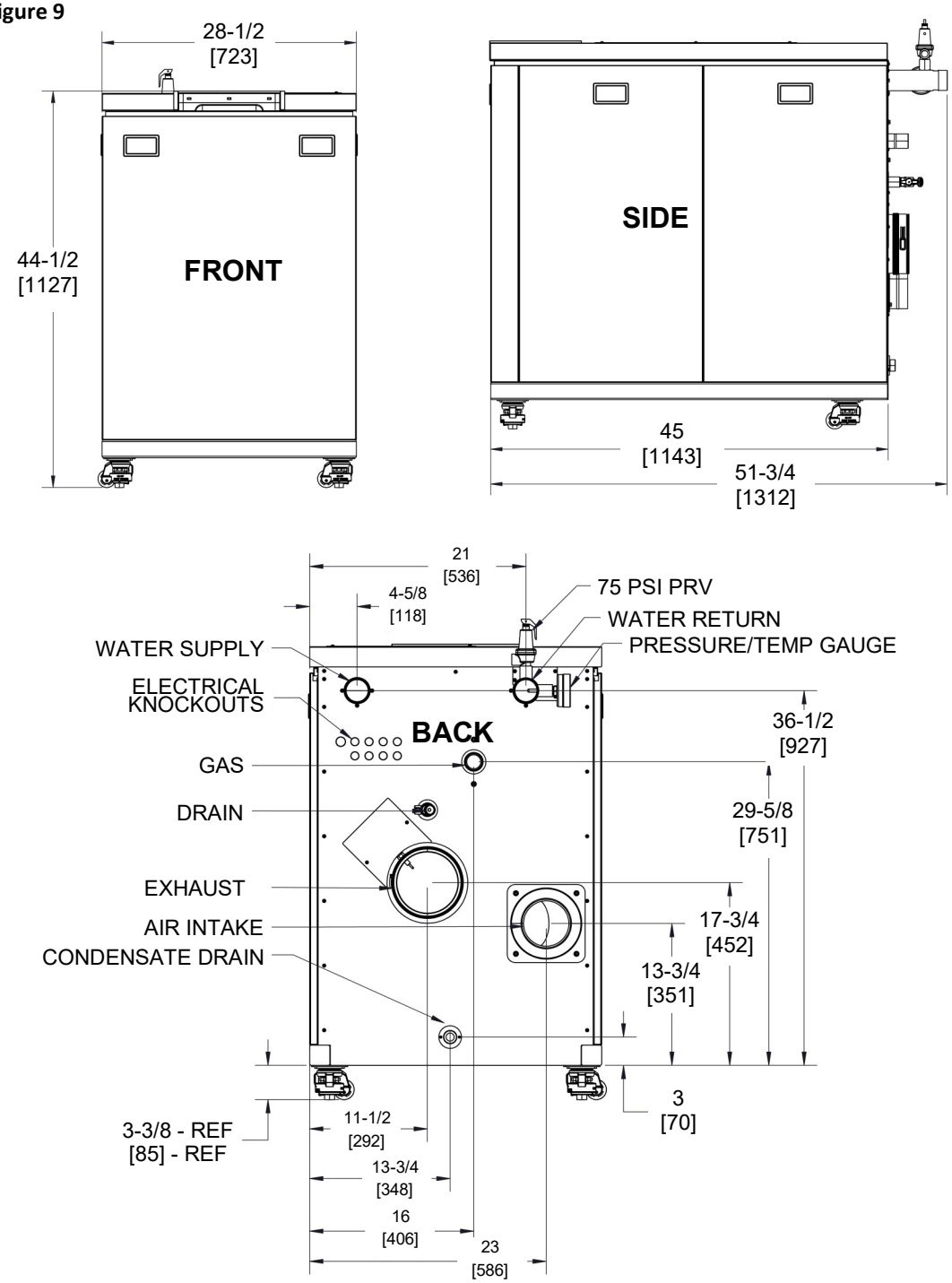


Table 6

Connection	Connection Size	Minimum Pipe Size
Gas	1-1/4 in. NPT	1-1/4 in.
CH In (CH Return)	2 in. NPT	2 in.
CH Out (CH Supply)	2 in. NPT	2 in.
Condensate Drain	1 in. NPT	3/4 in.
Venting (Intake & Exhaust)	6 in. PVC/CPVC	6 in.

3.7 Included Accessories

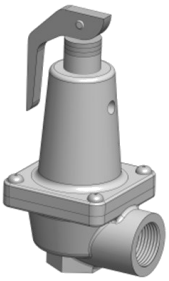
Carefully unpack your boiler system and verify the following contents are included. If any items are damaged or missing, contact your local dealer/distributor. Do not attempt to use any item that appears damaged.

Figure 10

TEMPERATURE & PRESSURE GAUGE

PART #: 803000092

PRESSURE RELIEF VALVE, 75 PSI



PART #: 807000224

OUTDOOR TEMPERATURE SENSOR

PART #: 805000097

SPARE FUSES - 2 X 6.3 A

(LOCATED INSIDE OF MAIN CONTROL COVER)

PART #: 803000079

INTAKE PIPE SCREWS (QTY 3)
4.8 X 25 MM SS PANHEAD PH2
(TAPPED TO INTAKE ADAPTER)

PART #: 809000304

DOCUMENTATION

- Installation and Operation Manual (this manual)
- User Manual
- Warranty Card
- Additional technical literature included inside product box
- CSD-1 Form

3.8 Optional Accessories

The following optional accessories are available for the Rinnai Commercial Boiler.

Figure 11

CONDENSATE NEUTRALIZER

Neutralizes the condensate generated by the boiler.

PART #: 804000074

AIR INLET FILTER

500 MODEL ONLY

Filters and eliminates debris (> 0.5 mm) from entering the combustion chamber for indirect venting (room air) piping.

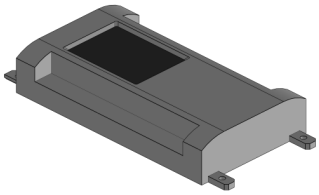
PART #: 803000050

CASCADE SYSTEM SENSOR

In a cascade system the Master boiler requires a system supply sensor in order to operate properly. The location of the sensor should be downstream of the of the boiler connection in the main system loop.

PART #: 803000051

BACNET ADAPTER



To establish boiler communication with Building Management System (BMS) through BACnet.

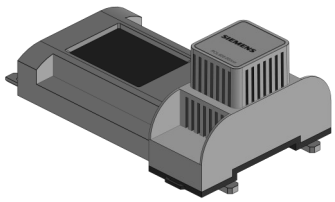
PART #: 803000078

GAS CONVERSION KIT

Converts the boiler gas type.

PART #: 803000083 - 500 NG
PART #: 803000084 - 500 PROPANE
PART #: 803000085 - 750 NG
PART #: 803000086 - 750 PROPANE
PART #: 803000087 - 1000 NG
PART #: 803000088 - 1000 PROPANE

BACNET ADAPTER WITH LONWORKS



To establish boiler communication with Building Management System (BMS) through LonWorks.

PART #: 803000080

Continued on next page

Figure 11 A

Optional Accessories (Continued)

WATER TEMPERATURE HIGH LIMIT

This device limits the boiler supply temperature and will shut the boiler down in case of high temperature. It has a manual reset function and complies with CSD-1 requirements.

PART #: 804000089

LOW WATER CUT-OFF (LWCO)

This device detects system water level and will shut the boiler down in case the water level is low. It has a manual reset and complies with CSD-1 requirements.

PART #: 803000090

HIGH & LOW GAS PRESSURE SWITCHES

These devices monitor gas pressure and will shut the boiler down in case the gas pressure is too low or too high. They have a manual reset function and comply with CSD-1 requirements.

PART #: 803000091

4. Installation

Topics in this section

- Installation Guidelines
- What You Will Need
- Choose an Installation Location
- Prepare the Boiler
- Fill the Condensate Collector

THIS SECTION IS INTENDED FOR THE INSTALLER

Installer qualifications: A trained and qualified professional must install the appliance, inspect it, and leak test the boiler before use. The warranty will be voided due to any improper installation. The trained and qualified professional should have skills such as: Gas sizing; Connecting gas lines, water lines, valves, and electricity; Knowledge of applicable national, state, and local codes; Installing venting through a wall or roof; and training in installation of condensing boilers.

4.1 Installation Guidelines

- This boiler is certified for installation in residential and commercial applications.
- This boiler is suitable for combination water heating through an indirect tank and central heating.
- The installation must conform with local codes or, in the absence of local codes, with the *National Fuel Gas Code, ANSI Z223.1/NFPA 54*, or the *Natural Gas and Propane Installation Code, CSA B149.1*. If installed in a manufactured home, the installation must conform with the *Manufactured Home Construction and Safety Standard, Title 24 CFR, Part 3280* and/or *CAN/SCA Z240 MH Series, Mobile Homes*.
- The appliance, when installed, must be electrically grounded in accordance with local codes or, in the absence of local codes, with the *National Electrical Code, ANSI/NFPA 70*, or the *Canadian Electrical Code, CSA C22.1*.
- The appliance and its main gas valve must be disconnected from the gas supply piping system during any pressure testing of that system at test pressures in excess of 1/2 psi (3.5 kPa) (13.84 in W.C.). For system testing at pressures less than or equal to 1/2 psi (3.5 kPa) (13.84 in W.C.) the appliance must be isolated from the gas supply piping by closing its individual manual shutoff valve.
- You must follow the installation instructions and those in section "5. Venting" for adequate combustion air and exhaust.
- Should overheating occur or the gas supply fail to shut off, turn off the manual gas control valve to the appliance.
- Combustion air must be free of chemicals, such as chlorine or bleach, that produce fumes. These fumes can damage components and reduce the life of your appliance.
- Where required by the authority having jurisdiction, the installation must comply with the Standard for Controls and Safety Devices for Automatically Fired Boilers, ANSI/ASME CSD-1.

- Ensure the wall is of sufficient strength to support the weight of the boiler, piping and any other components needed for installation; if it is not, please reinforce the wall as appropriate.
- Operating limits of the boiler:

Table 7

Maximum boiler set point temperature:	180°F (82°C)
Maximum operating pressure:	160 psi (11 bar)
Maximum allowable working temperature ASME:	210°F (99°C)
Maximum allowable working pressure ASME:	160 psi (11 bar)
Pressure Relief Valve (shipped with unit):	75 psi (5.2 bar)

DO NOT

DO NOT install the boiler in an area where water leakage of the unit or connections will result in damage to the area adjacent to the appliance or to lower floors of the structure. When such locations cannot be avoided, it is required that a suitable drain pan, adequately drained, be installed under the boiler. The pan must not restrict combustion air flow.

DO NOT install the boiler in an area with negative air pressure.

DO NOT obstruct the flow of combustion and ventilation air.

DO NOT use substitute parts that are not authorized for this boiler.

DO NOT install the boiler on carpeting.

DO NOT install boiler outdoors.

4.2 What You Will Need

Gather the recommended tools and parts before starting installation.

Items Needed

- Boiler Pump
- Pressure relief valve for domestic hot water (150 PSI / 10.3 Bar) (as necessary, if using a separate indirect tank).
- Pressure/Temperature Gauge

  Note: When attaching the pressure/ temperature gauge, please comply with applicable codes and the ASME standard.
- Low loss header or closely spaced tee
- Expansion tank for a closed heating system
- Air separator
- Standard tools for central heating, gas fitting, plumbing and electrical wiring.
- Digital manometer
- Combustion analyzer (intended for use with condensing boilers)
- Digital multimeter capable of reading microamps
- pH digital meter or test strips
- For wall mounting bracket installation:
  - Level
  - Screws (use appropriate screws for type of wall construction)

Other Items You May Need

- Pallet Jack, Forklift, or Hoist

4.3 Choose an Installation Location

When choosing an installation location, you must ensure that clearances will be met and that the vent length will be within required limits. Consider the installation environment, water quality, and need for freeze protection. Requirements for the gas line, water lines, electrical connection, and condensate disposal can be found in their respective installation sections in this manual.

This section provides information on the importance of water quality to the Rinnai Condensing Boiler. The information is intended to serve as general guidelines only and is not a complete list of water quality guidelines.

4.3.1 Water Quality Guidelines

Consideration of care for your boiler should include evaluation of water quality.

- The water must be potable, free of corrosive chemicals, sand, dirt, or other contaminants.
- It is up to the installer to ensure the water does not contain corrosive chemicals or elements that can affect or damage the boiler.
- Water that contains chemicals exceeding the levels below can damage the boiler.
- **The pH level must fall between 6.5 and 8.5.**
- **Total water hardness must fall between 5 and 12 grains per gallon.**
  - When water hardness is higher than 12 grains per gallon consult local water treatment companies.
- **Chloride concentration must be less than 150 ppm (mg/l)**
  - Do not fill appliance to work with water containing chlorides in excess of 150 ppm (mg/l).
  - Using chlorinated fresh water should be acceptable as levels are typically less than 5 ppm (mg/L).
  - Do not connect the appliance to directly heat swimming pool or spa water.
- **Total Dissolved Solids (TSD) must be between 100 and 350 ppm (mg/l).**
  - Total dissolved solids are minerals, salts, metals, and charged particles that are dissolved in water.
  - The greater the amounts of TDS present, the higher the corrosion potential due to increased conductivity in the water.
  - If using softened water to fill the appliance, it is still possible to have high TDS. This water can be corrosive. Consult local water treatment companies for other treatment solutions to reduce this affect.
- Unsuitable heating system water can cause the formation of scale or sludge, which affects system efficiency. It can also cause corrosion and reduce life of the heat exchanger. It is critical to monitor pH, hardness level, chlorides, and TDS to prolong the life of the appliance.
- Never use water that has been treated by a reverse osmosis, deionized, or distilled water to soften the water to fill the heating system.
- Continual fresh makeup water will reduce the life of the appliance. The addition of oxygen carried in by the make up water can cause internal corrosion in the system.
- When using a make up water, It is recommended to install a water meter to monitor the amount of water being introduced into the system. The total annual make up water should not exceed 5% of the total system water volume.
- Oxygen permeable or rubber tubing is not permitted in the heating system unless it is separated from the boiler by a plate heat exchanger.
- Thoroughly flush the system prior to filling. While flushing, isolate the boiler.
- Do not introduce any system cleaner into the boiler. Flush the system thoroughly to remove all system cleaner before filling the boiler with water.
- When freeze protection of the heating system is desired, use Rinnai-approved antifreezes.

Consult the glycol manufacturer for details on the suggested mix of glycol and water for the desired freeze protection level and the de -rate effect it will have on the boiler output. NEVER use automotive antifreeze. Use ONLY inhibited propylene glycol solutions, which are specifically formulated for hydronic heating system. Ethylene glycol is toxic and can attack gaskets and seals used in hydronic heating system. The allowed maximum concentration is 40 percent.

IMPORTANT

Replacement of components due to water quality damage is not covered by the warranty.

4.3.2 Water Treatment Guidelines

- Keep the system free of impurities, construction dust, sand, copper dust, grease, carbon deposits, and welding flux residue before and during boiler assembly. Rinse the old system with clear water mixed with a highly concentrated rinse agent.
- More generally, it is advised to implement any procedure necessary to prevent or treat contamination.
- Black oxide sludge (magnetite - Fe304) forms as a result of continuous electrolytic corrosion in any system unprotected by an inhibitor.
- Iron oxide (Fe203) (red oxide sludge) is produced during oxygenation. Scale deposit is made up of lime scale contained in most distributed water that settles over the warmest surfaces of the system. Sludge and scale do mix together and are the cause of many field problems on heating applications. The presence of these substances indicate that standard precautions have not been implemented and may void warranty.
- The chemical compatibility of several products for the treatment of heating water equipment has been tested on this boiler's heat exchanger.
- Rinnai recommends using the system cleaners, corrosion/scale inhibitors in the table below.

IMPORTANT

- If replacing a boiler, add system cleaners while the old boiler is installed and operate the old boiler for heating for several days to most effectively clean the system.
- The Rinnai boiler must be closed off (valved off) from the rest of the system, or not connected, while cleaners are in the system.
- When cleaning is complete, drain the system and then flush with clean water to remove any sediment.

Table 8: Corrosion/Scale Inhibitors and Recommended Suppliers

Producers	Fernox	Sentinel	Sotin	ADEY
Inhibitors	Protector F1/Alphi 11	X100, X500	Siotin 212	MCI+
Noise Reducer		X200		
Universal Cleaner	Restorer	X300		
Sludge Remover	Protector F1, Cleaner F3	X400	Siotin 212	
Tightness		Leaker Sealer F4		

Table 9: Corrosion/Scale Treatment Types

Treatment Type	Preventive	Curative
Protector F1	X	
Cleaner F3	X	X
X100	X	
X200	X	
X300		X
X400		X
X500	X	
Alphi 11	X	
Leaker Sealer F4	X	
Siotin 212		X
MCI+	X	

Table 10: Approved System Antifreezes

Approved System Antifreezes
Chem Frost 100%
Fernox Alphi 11
Hall-Chem Solar II
Noble Noburst AL
Rechochem Recofreeze AL
Rhomar RhoGar Multi-Metal (AL safe)
Sentinel X500

4.3.3 Environment

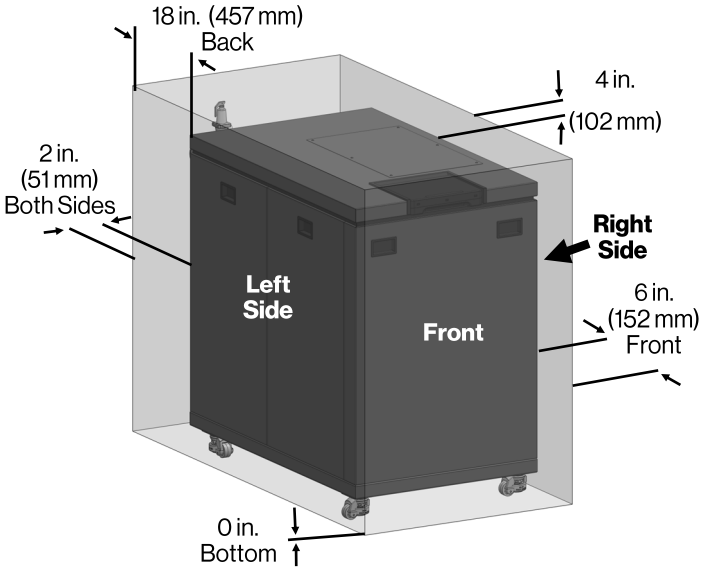
Air surrounding the boiler, venting, and vent termination(s) is used for combustion and must be free of any compounds that cause corrosion of internal components. These include corrosive compounds that are found in aerosol sprays, detergents, bleaches, cleaning solvents, oil based paints/varnishes, and refrigerants. The air in beauty shops, dry cleaning stores, photo processing labs, and storage areas for pool supplies often contains these compounds. The boiler, venting, and vent termination(s) should not be installed in any areas where the air may contain these corrosive compounds.

4.3.4 Minimum Clearances

Table 11: Minimum Clearances

Location	Clearance
Top	4 in. (102 mm) *0 in. from vent components*
Bottom (Ground)	0 in. (0 mm)
Front	6 in. (152 mm) Clearance for servicing is 24 in. (610 mm) in front of boiler
Back	18 in. (457 mm).
Sides (Left and Right)	2 in. (51 mm) Clearance for servicing is 24 in. (610 mm) on the right side and 12 in. (305 mm) on the left side.
Vent	0 in. (0 mm)

Figure 12



This image is not to scale and is for illustration purposes only.

4.3.5 Installation Location Checklist

Use this checklist to ensure you have selected the correct location for the boiler.

☐	The boiler is not exposed to corrosive compounds in the air.
☐	The boiler location complies with the required clearances.
☐	The planned combustion air and exhaust termination locations meet the required clearances.
☐	The water supply does not contain chemicals or exceed total hardness that will damage the heat exchanger.
☐	Ensure boiler is properly connected and grounded from 120 VAC, 60 Hz power source .
☐	The installation must conform with local codes or, in the absence of local codes, with the *National Fuel Gas Code, ANSI Z223.1/NFPA 54*, or the *Natural Gas and Propane Installation Code, CSA B149.1*.

4.4 Prepare the Boiler

IMPORTANT

When installing the boiler, the boiler must be level to ensure proper flow of condensation inside the boiler heat exchanger. Boiler must be level from side-to-side and front-to-back.

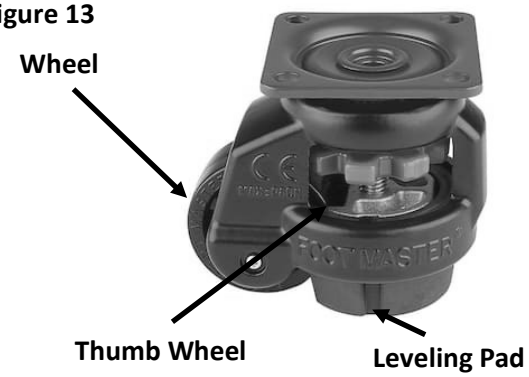
Instructions:

1. Remove the boiler from the shipping packaging and move it to the installation location. **NOTE:** The boiler is equipped with casters /leveling feet that makes it easy to maneuver the boiler.

   When moving the boiler, the leveling pads should be raised to allow the wheels to touch the ground and roll.

   When the boiler is at its final installation location, the leveling pads should be lowered to ensure the boiler is stationary. The leveling pads can be used to ensure the boiler is leveled properly.

Figure 13



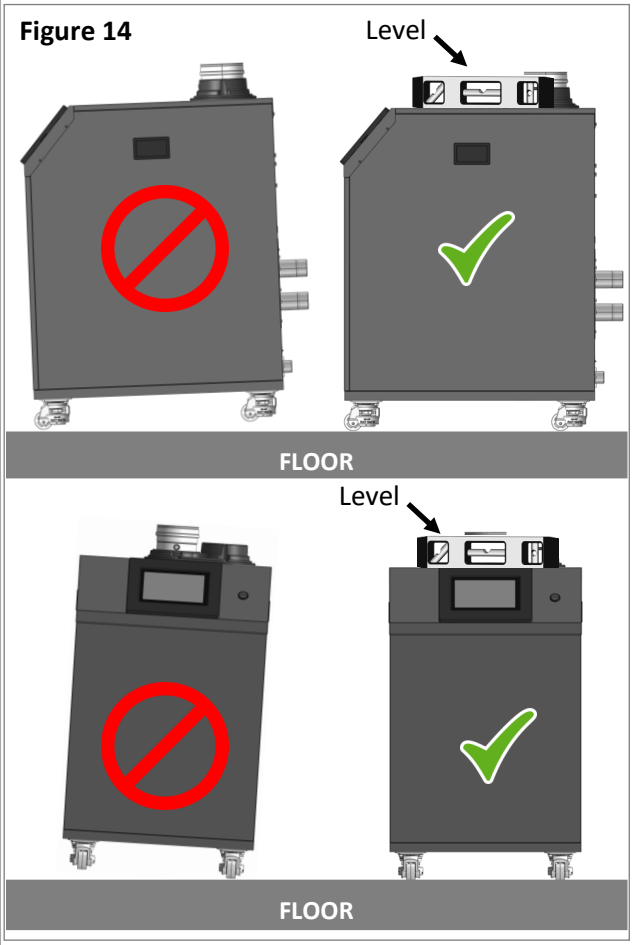
- Turn the thumb wheel to the left to raise the leveling pad.
- Turn the thumb wheel to the right to lower the leveling pad.

2. In order for condensation to drain properly from the boiler collection system, the boiler must be properly leveled. Use a level to verify that the boiler is level from side-to-side and front-to-back.

IMPORTANT

The boiler must be installed in an upright and level position. Do not install the boiler upside down or on its side.

Figure 14



4.5 Fill the Condensate Collector

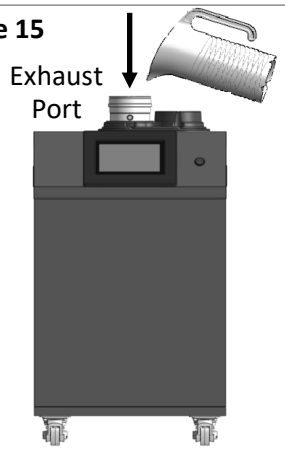
⚠ WARNING

Before operation of the boiler, the condensate collector must be filled with water. This is to prevent the potential of exhaust gasses from entering the building. Failure to fill the condensate collector could result in severe personal injury or death.

The condensate collector must be filled with water prior to installing the vent system.

Pour approximately 10 ounces (1.25 cups) of water directly into the boiler's exhaust port.

Figure 15



5. Venting

Topics in this section

- Guidelines
- Venting Installation Sequence
- Termination Considerations
- PVC Venting Safety Switch
- Venting Options

5.1 Guidelines

- The boiler is rated ANSI Z21.13 Category IV (pressurized vent, likely to form condensate in the vent) and requires a special vent system designed for pressurized venting.
- This boiler can be installed in direct vent or non-direct (room air) vent applications.
- When installed as Direct Vent, refer to the following section for a complete list of approved vent manufacturers and products: “5.5.1 Direct Vent: Approved Vent Manufacturers and Products.”
- Exhaust must be directly vented to the outside. Combustion air can be provided from outside (Direct Vent) or from room air (Non-Direct Vent).
- If using room air (non-direct vent) for combustion, ensure the required volume of indoor air is available according to the National Fuel Gas Code, ANSI Z223.1/NFPA 54.
- Avoid dips or sags in horizontal vent runs by installing supports per the vent manufacturer’s instructions.
- Support horizontal vent runs every 4 ft (1.2 m) and all vertical vent runs every 6 ft (1.83 m) or as per vent manufacturer’s instructions or local code requirements.
- Venting should be as direct as possible with a minimum number of pipe fittings.
- For manufactured vent systems, vent connections must be firmly pressed together so that the connections form an air tight seal. Follow the venting manufacturer’s instructions.
- Refer to the Schedule 40 PVC/CPVC manufacturer for appropriate fittings, solvents or joining methods.
- If venting reassembly is needed, follow the steps for installing the venting in the following sections. Make certain that the vent piping and seals are not damaged. Only use sealants, primers, or glues that are approved for the vent material in use.
- Refer to the instructions of the vent system manufacturer for component assembly instructions.
- If the vent system is to be enclosed, it is suggested that the design of the enclosure shall permit inspection of the vent system. The design of such enclosure shall be deemed acceptable by the installer or the local inspector.
- Any issues resulting from improper vent installation will not be covered by warranty.

⚠ WARNING

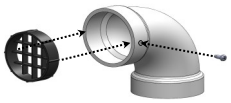
- DO NOT use cellular core PVC/CPVC.
- DO NOT use Radel, ABS, or galvanized material to vent this appliance.
- DO NOT cover non-metallic vent pipe and fittings with thermal insulation.
- DO NOT combine vent components from different manufacturers.
- Vent diameter cannot be less than 4 in. for RCB500AN model and less than 6 in. for RCB750AN and RCB1000AN models.
- DO NOT connect the venting system with an existing vent or chimney.
- DO NOT common vent with the vent pipe of any other manufacturer’s boiler or appliance.

5.2 Venting Installation Sequence

1. Determine the termination method - horizontal or vertical, concentric or twin pipes terminations, etc.
2. Determine proper location for wall or roof penetration for each termination.
3. Install termination assembly as described in this manual or in the vent manufacturer's installation instructions.
4. Install intake and exhaust piping from boiler to termination.
5. Slope horizontal exhaust run towards the boiler 1/4 in per foot. DO NOT slope combustion air pipe towards boiler.
6. Install vent supports and brackets allowing for movement from expansion, or as per vent manufacturer's instructions or local code requirements.
7. *(Optional step)* Install vent screen or room air filter (not included with purchase) at intake and exhaust terminations as illustrated below.

Figure 16

Vent Screen



- Press vent screen inside of termination piece/elbow.
- Secure vent screen to the termination piece/elbow with screw.

5.3 Termination Considerations

Check to determine whether local codes supersede the following clearances:

- Avoid termination locations near a dryer vent.
- Avoid termination locations near commercial cooking exhaust.
- Avoid termination locations near any air inlets.
- You must install a vent termination at least 12 in. above the ground or anticipated snow level.

The vent for this appliance shall not terminate:

- Over public walkways.
- Near soffit vents or crawl space vents or other area 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.

Listed below are important considerations for locating vent termination under a soffit (ventilated or unventilated or eave vent; or to a deck or porch):

- Do not install 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 installed too close.
- Do not install the vent termination too close under the soffit where it could present recirculation of exhaust gases back into the combustion air intake of the termination.

Horizontal portions of the venting system shall be supported to prevent sagging:

- For category IV boilers, have horizontal runs sloping upwards not less than 1/4 in. per foot (21 mm/m) from the boiler to the vent terminal;
- For category IV boilers, be installed so as to prevent accumulation of condensate; and
- For category IV boilers, where necessary, have means provided for drainage of condensate.

5.4 PVC Venting Safety Switch

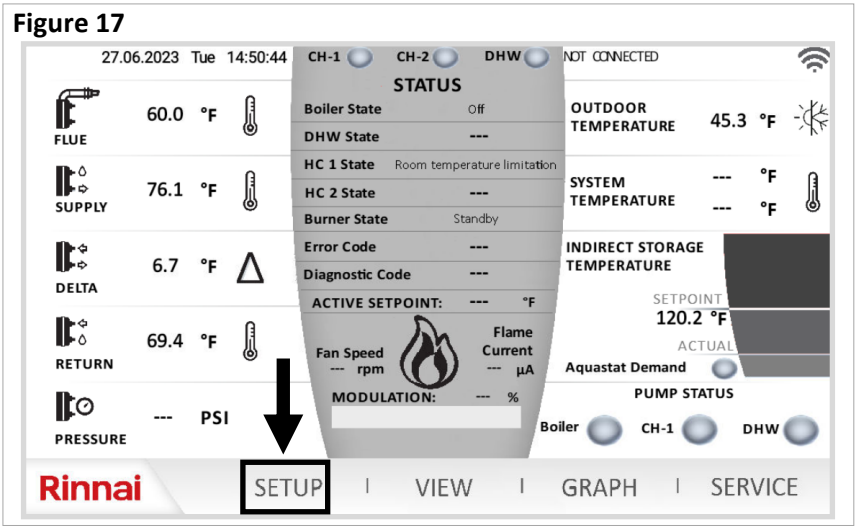
⚠ WARNING **The instructions in this section explain how to adjust boiler settings to allow for higher exhaust temperatures. These instructions apply only for installations using CPVC, listed Polypropylene, or stainless steel venting. If these instructions are not followed exactly, a fire or carbon monoxide leak may result causing property damage, personal injury, or death. DO NOT adjust boiler settings to allow higher exhaust temperatures when venting with PVC.**

This product is equipped with safety devices to control the exhaust temperature which allows for a variety of venting materials to be used in its final installation. The boiler is set up from the factory to be installed with a PVC venting system and a built-in control to limit the exhaust temperature to be below 149°F (65°C). In high temperature applications where the exhaust temperature can exceed 149°F (65°C), CPVC, listed Polypropylene (PP), or stainless steel venting must be used. The choice of venting materials may have an impact on overall performance. Also, If the vent material is other than PVC (CPVC, listed PP or stainless steel) follow the procedure below to adjust the internal settings.

5.4.1 High Temperature Vent Setting Instructions

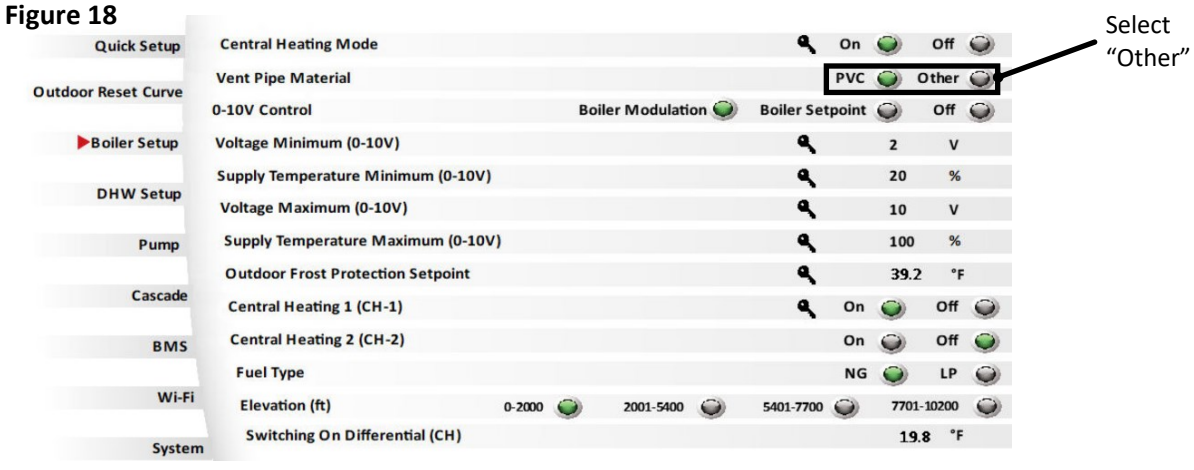
1. Press “Setup” on the home screen (Figure 17).

Figure 17



2. The first screen of the setup function appears. Press “Boiler Setup” menu to access the screen shown below.
3. Change the parameter “Vent Pipe Material” from “PVC” to “Other” to allow for higher vent temperature (Figure 18).

Figure 18



5.5 Venting Options

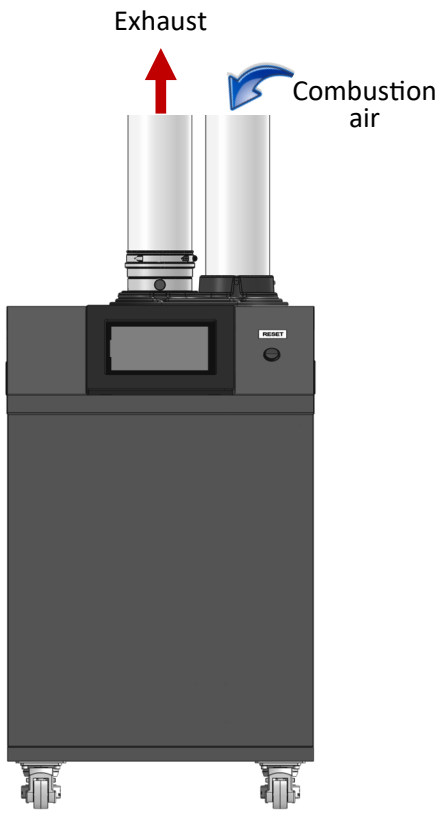
Two venting options are available: Direct Vent and Non-Direct Vent (Room Air).

Option 1 Direct Vent

See the **Direct Vent** section for complete details.

If installing a direct vent option, combustion air must be drawn from the outside directly into the boiler intake and exhaust must terminate outdoors. The vent termination can be twin pipe (2 separate penetrations, or concentric with a single penetration)

Figure 19

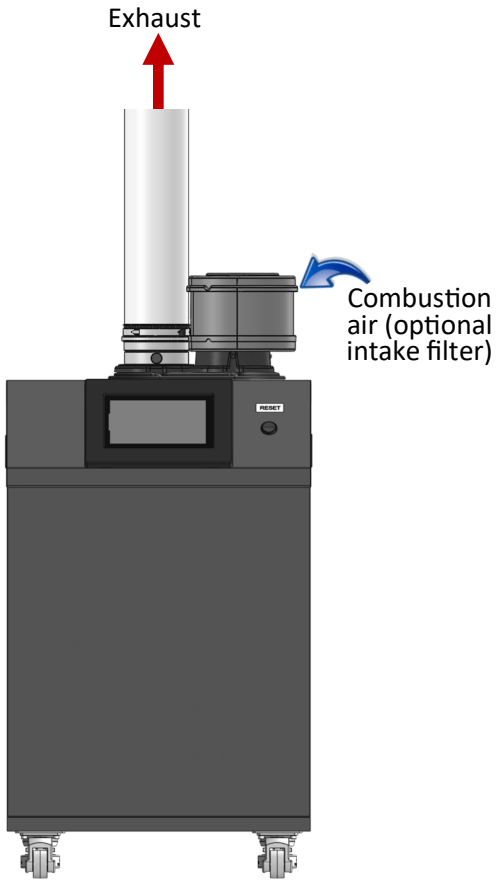


Option 2 Non-Direct Vent (Room Air)

See the **Non-Direct Vent** section for complete details.

If installing a non-direct vent (room air), indoor air is used for combustion while exhaust vents to the outside.

Figure 20



5.5.1 Direct Vent: Approved Vent Manufacturers and Products

Following is a list of vent components and terminations for Direct Vent installations (concentric and twin pipe). Install the correct venting for your model according to the venting manufacturer's instructions and the guidelines below. The information below is correct at time of publication and is subject to change without notice. Contact the vent manufacturer for questions related to the vent system, products, part numbers and instructions.

Table 12: Approved Vent Manufacturers

Manufacturer	Vent Material	Phone	Web Site
Centrotherm	Polypropylene	877-434-3432	www.centrotherm.us.com
IPEX	PVC/CPVC	U.S.: 800-463-9572 Canada: 866-473-9462	www.ipexamerica.com, www.ipexinc.com
DuraVent	Polypropylene, Metal	800-835-4429	www.duravent.com
Royal	PVC	800-232-5690	www.royalbuildingproducts.com
ECCO Manufacturing	Polypropylene	877-955-4805	www.eccomfg.com
DiversiTech	PVC/CPVC	800-995-2222	www.diversitech.com

VENT TERMINATIONS (RCB50AN MODEL)

Table 13

Manufacturer	Manufacturer Part Number/ Order Number	Product Description	Diagram	Horizontal	Vertical
CONCENTRIC VENT TERMINATIONS (4 Inch)					
Duravent-PolyPro	4PPS-HKC	4"X6" PolyPro Horizontal Termination Kit w/LB2		✓	
	4PPS-HSTSL	4"x6" Horizontral Termination for Commercial Systems		✓	
	4PPS-VKC 4PPS-VK-TCC	4"x6" Vertical Termination Kit w/Black Cap & LB2 4"x6" PolyPro Vertical Termination Kit w/ Terracotta Cap w/ LB2			✓
Duravent-FasNSeal	FSEDVWMT04U	4" Universal Concentric Kit		✓	
	FDVWMT04RH FSEDVWMT04LH	Wall Mount Concentric Kit Wall Mount Concentric Kit		✓	
	FDVWT04	Remote Concentric Kit		✓	

Table 13 continue

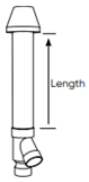
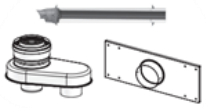
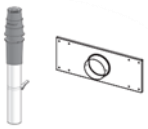
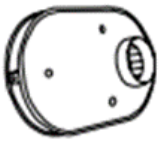
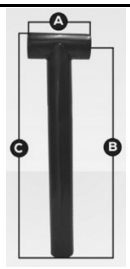
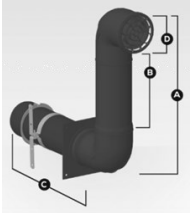
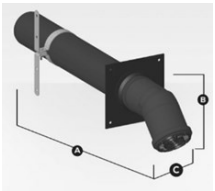
Manufacturer	Manufacturer Part Number/ Order Number	Product Description	Diagram	Horizontal	Vertical
CONCENTRIC VENT TERMINATIONS (4 Inch) - CONT.					
IPEX	196021 197021 397021	System 636 Concentric Termination Kit - PVC (white) System 636 Concentric Termination Kit - CPVC (grey) System 1738 Concentric Termination Kit - PVC (black)		✓	✓
ECCO	190488	Horizontal Concentric Wall Termination-Polypropylene		✓	
	190295	Vertical Concentric Roof Termination-Polypropylene			✓
	190483	4”x6” Horizontal Concentric Wall Termination–Polypropylene		✓	
	190484	4”x6” Vertical Concentric Roof Termination -Polypropylene			✓
Duravent	4PPS-HTPC	4” Twin Pipe Termination-Polypropylene		✓	
Centrotherm	ISLPT0404	4” Low Profile Wall Termination		✓	
IPEX	196986 397986	System 636 FGV Low Profile Termination Kit – PVC (Beige) System 1738 FGV Low Profile Termination Kit – PVC (Black)		✓	

Table 13 continued

Manufacturer	Manufacturer Part Number/ Order Number	Product Description	Diagram	Horizontal	Vertical
TWIN PIPE TERMINATIONS (4 Inch) - CONT.					
Duravent-PolyPro	4PPS-E90BC	4" Black UV Resistant 90 elbow		✓	✓
	4PPS-TBC	4" Black Termination Tee		✓	
Duravent-FasNSeal	FSBS4	4" Bird Screen 23°			✓
	FSTT4	4" Termination Tee		✓	
	FSTB4	4" Termination Box			✓
Centrotherm	ISTT0420	4" Termination Tee			✓
	ISSNKL041	4" Snork		✓	
	ISHT0445	4" Snout		✓	
IPEX	286715	SGV Rain Cap			✓

VENT TERMINATIONS (RCB750AN & RCB1000AN MODELS)

Table 14

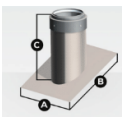
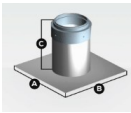
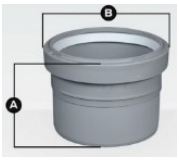
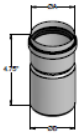
Manufacturer	Manufacturer Part Number/ Order Number	Product Description	Diagram	Horizontal	Vertical
CONCENTRIC VENT TERMINATIONS (6 inch) - CONT.					
Duravent-PolyPro	6PPS-VTMC	Vertical Termination			✓
	6PPS-HSTL	Horizontal Termination		✓	
Duravent-FasNSeal	FSTT6	6 Inch Termination Tee		✓	✓
	FSRC6	Rain Cap			✓
Centrotherm	ISLPT0606	Low Profile Wall Termination		✓	
	ISTT0620	Termination Tee		✓	✓
	ISEP06	End Pipe PP Gray		✓	✓
	IAPRF06	Pitched Roof Flashing			✓
	IAFRF06	Flat Roof Flashing			✓
ECCO	190628	Single Wall Vertical Termination			✓
	190613	87 degree elbow - UV resistant		✓	✓
	190611	45 degree elbow - UV resistant		✓	✓

Table 14 continue

Manufacturer	Manufacturer Part Number/ Order Number	Product Description	Diagram	Horizontal	Vertical
APPLIANCE ADAPTER (4 Inch and 6 Inch)					
Duravent-PolyPro	4PPS-AD-M	Appliance Adapter for PVC Pipe - 4 Inch		✓	✓
	4PPS-ADL	Appliance Adapter for PVC Coupler - 4 Inch		✓	✓
	4PPS-04PVCM-4PPF 6PPS-06PVCM-6PPF	Male PVC Appliance Adapter - 4 Inch Male PVC Appliance Adapter - 6 Inch		✓	✓
Duravent-FasNSeal	FSA-04M-4PPF FSA-04M-4PPF	PVC to FasNSeal Appliance Adapter - 4 Inch PVC to FasNSeal Appliance Adapter - 6 Inch		✓	✓
Centrotherm	ISAGL0404 ISAGL0606	Appliance Adapter - PVC to PP - 4 Inch Appliance Adapter - PVC to PP - 6 Inch		✓	✓
	ISAAL0404 ISAAL0606	Appliance Adapter – PVC to PP - 4 Inch Appliance Adapter – PVC to PP - 6 Inch		✓	✓
ECCO	4PPSSAD	Appliance Adapter-SS - 4 Inch		✓	✓

VARIOUS 4 in. and 6 in. SCHEDULE 40 PVC/CPVC TERMINATIONS

Table 15

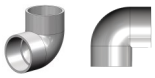
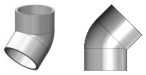
Product Description	Diagram	Horizontal	Vertical
Air Filter Screen		✓	✓
Tee		✓	✓
90° Elbow		✓	✓
45° Elbow		✓	✓

Table 16: Approved Materials for Exhaust and Intake Pipe

Approved Materials for Exhaust and Intake Pipe			
Item	**Material**	**Standard for Installation in North America**	
		United States	**Canada**
Pipe (Intake or Exhaust)	SS AL29-4C	Certified for direct vent category IV appliance	
	PVC Schedule 40/80	UL-1738 or ANSI/ASTM D1785	UL-1738 or ULC -S636 Intake pipe may be of the materials listed in this table.
	PVC-DWV Schedule 40/80	UL-1738 or ANSI/ASTM D2665	
	CPVC Schedule 40/80	UL-1738 or ANSI/ASTM F441	
	Polypropylene	UL-1738 or ULC-S636	
Fitting (Intake or Exhaust)	PVC Schedule 40	UL-1738, ANSI/ASTM D2465 or D2666	
	PVC Schedule 80	UL-1738, ANSI/ASTM D2465 or D26667	
	CPVC Schedule 40	UL-1738 or ANSI/ASTM F438	
	CPVC Schedule 80	UL-1738 or ANSI/ASTM F438	
Pipe Cement and Primer	PVC	ANSI/ASTM D2564	ULC -S636
	CPVC	ANSI/ASTM F493	
Pipe and Fittings for Intake Only	ABS	ANSI/ASTM D2661	ANSI/ASTM D2661
Pipe Cement and Primer for Intake Only	ABS	ANSI/ASTM D2235	ANSI/ASTM D2235

NOTICE: DO NOT USE CELLULER (FOAM) CORE PIPE FOR EXHAUST VENTING.

Refer to the PVC/CPVC manufacturer for appropriate fittings, solvents or joining methods.

5.5.2 Direct Vent (Concentric and Twin Pipe): Termination Clearances

The information below applies to Concentric and Twin Pipe.

Figure 21

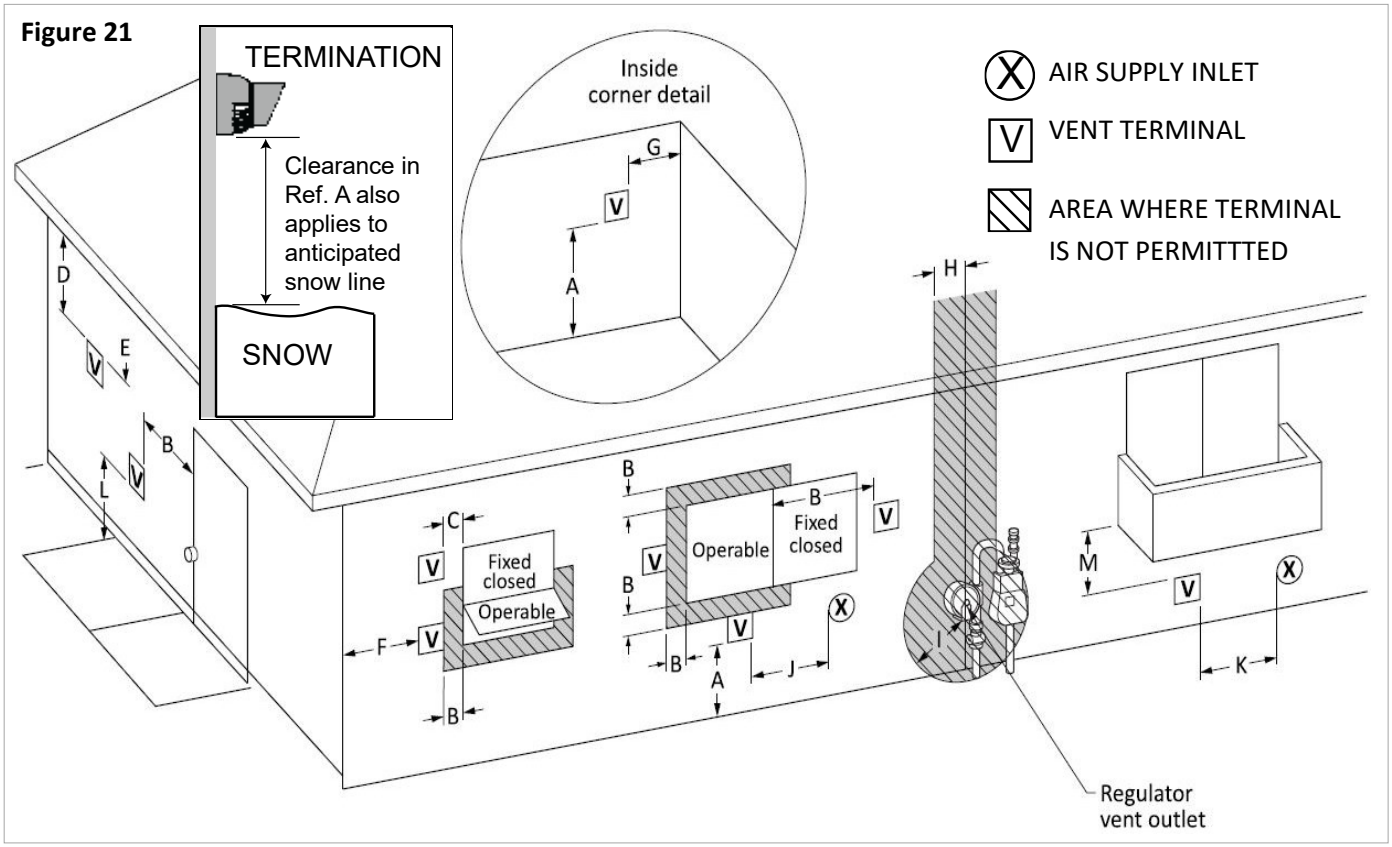


Table 17: Direct Vent Termination Clearances - ANSI Z223.1 / NFPA54 for US and CAN/CSA B149.1 for Canada.

		Canadian Installations (CSA B149.1)	U.S. Installations (ANSI Z223.1 /NFPA 54)
Ref	**Description**	**Direct Vent (Indoor Unit)**	**Direct Vent (Indoor Unit)**
A	Clearance above grade, veranda, porch, deck, or balcony	12 in. (30 cm)	12 in. (30 cm)
B	Clearance to window or door that may be opened	36 in. (91 cm)	4 ft (1.2 m) below or to side of opening; 1 ft (30 cm) above opening
C	Clearance to permanently closed window	*	*
D	Vertical clearance to ventilated soffit, located above the terminal within a horizontal distance of 2 ft (61 cm) from the center line of the terminal	*	*
E	Clearance to unventilated soffit	*	*
F	Clearance to outside corner	*	*
G	Clearance to inside corner	*	*
H	Clearance to each side of center line extended above meter/regulator assembly	*	*
I	Clearance to service regulator vent outlet	Above a regulator within 3 ft (91 cm) horizontally of the vertical center line of the regulator vent outlet to a maximum vertical distance of 15 ft (4 m)	*
J	Clearance to non-mechanical air supply inlet to building or the combustion air inlet to any other appliance	36 in. (91 cm)	12 in. (30 cm)
K	Clearance to a mechanical air supply inlet	6 ft (1.83 m)	3 ft (91 cm) above if within 10 ft (3 m) horizontally
L	Clearance above paved sidewalk or paved driveway located on public property	7 ft (2.13 m) [1]	*
M	Clearance under veranda, porch, deck, or balcony	12 in. (30 cm) [2]	*

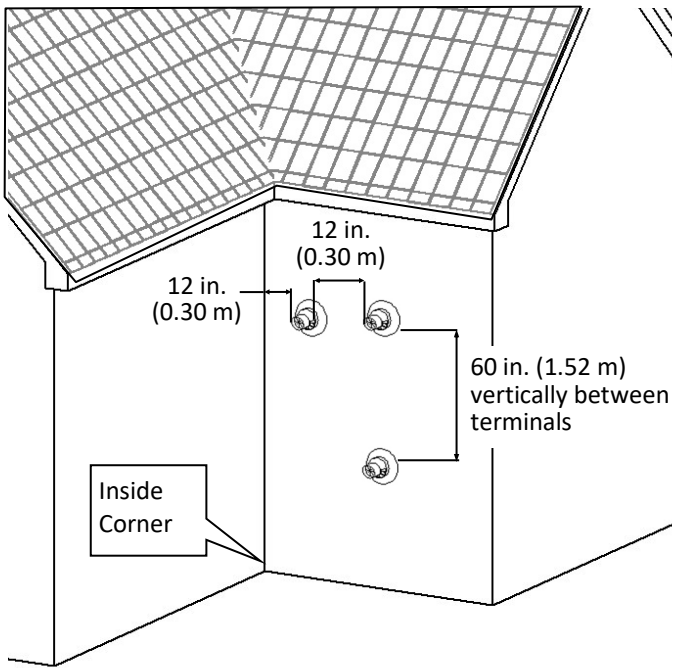
Table 18

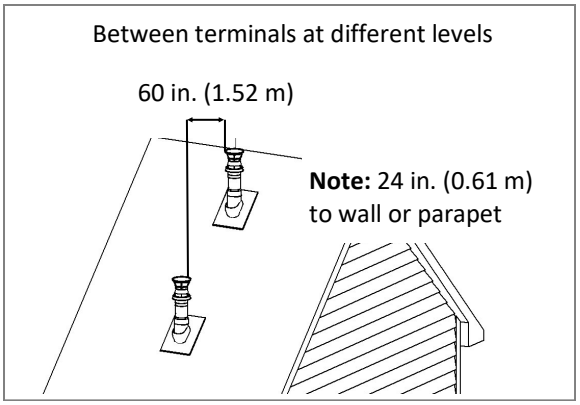
Clearance to opposite wall is 24 in. (60 cm).	
[1] A vent shall not terminate directly above a sidewalk or paved driveway that is located between two single family dwellings and serves both dwellings. [2] Permitted only if veranda, porch, deck, or balcony is fully open on a minimum of two sides beneath the floor.	* Clearances are in accordance with local installation codes and the requirements of the gas supplier.

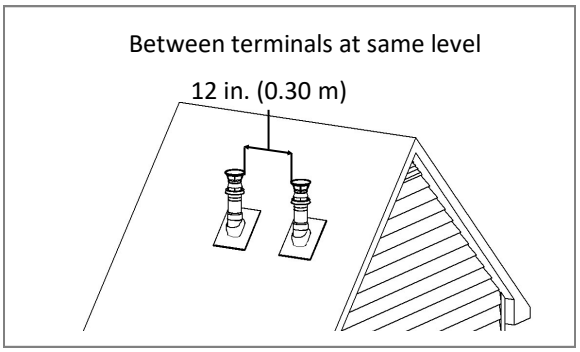
5.5.3 Direct Vent: Concentric Pipe

Concentric Pipe: Termination Clearances

Figure 22



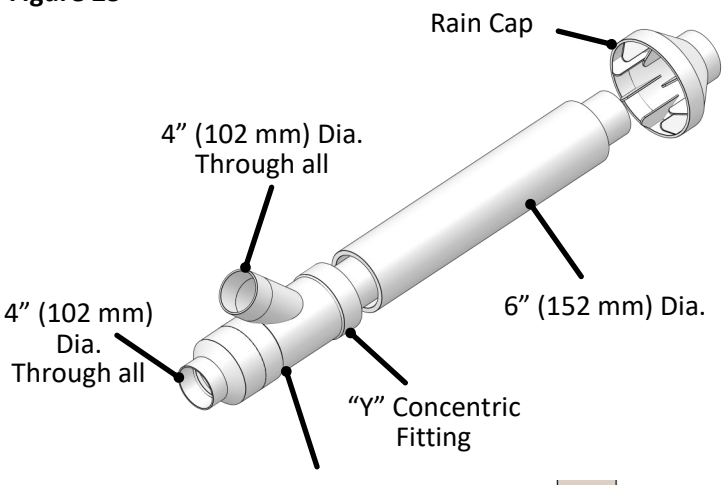


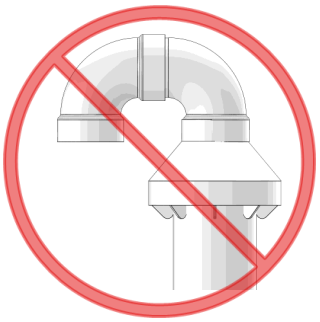


All terminations (horizontal and/or vertical) must terminate 12 in. (0.30 m) above grade or anticipated snow level.

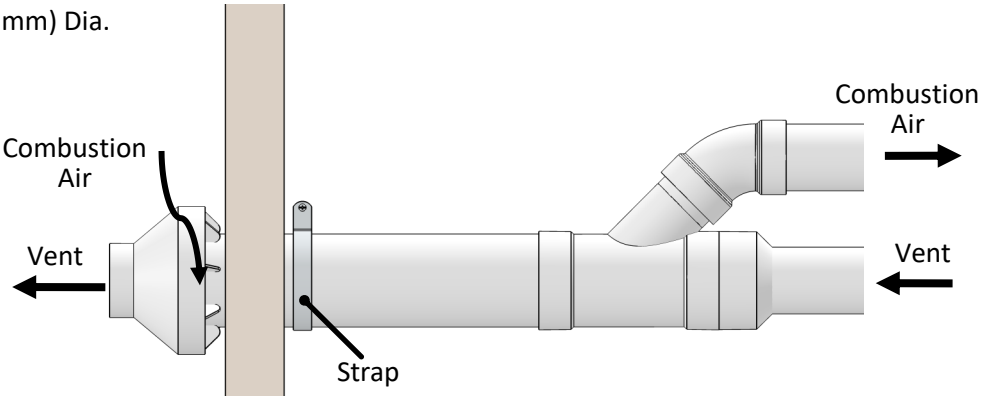
Concentric Pipe (500 Model ONLY)

Figure 23





Do Not Install U-Bend to Rain Cap



5.5.4 Direct Vent: Twin Pipe

Twin Pipe: Termination Clearances

Figure 24 **Twin Pipe Vertical Termination of Multiple Boilers**

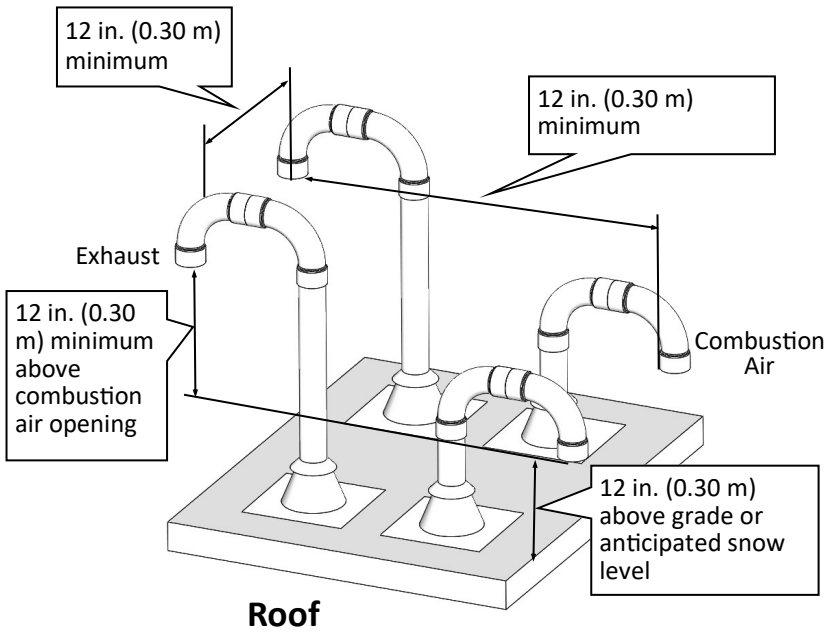


Figure 25 **Sidewall Clearances**

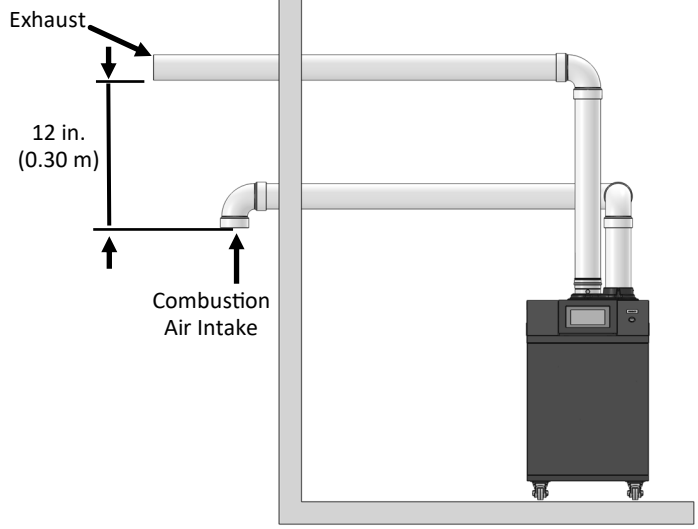
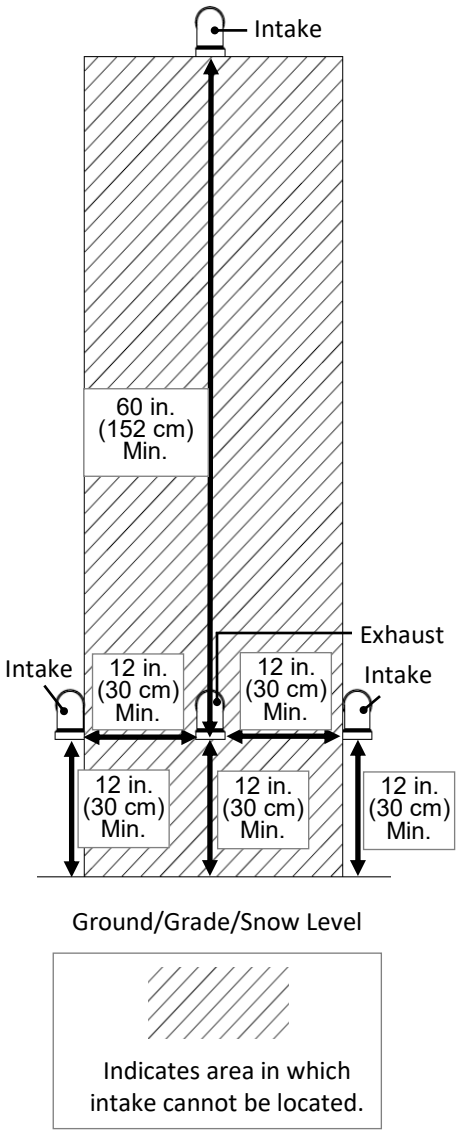


Figure 26

Horizontal Vent and Combustion Air Piping



Twin Pipe: Maximum Equivalent Vent Length

Table 19: Twin Pipe Maximum Equivalent Vent Lengths

MODEL	RCB500AN	RCB750AN and RCB1000AN
Vent Sizes	4 in. PVC/CPVC	6 in. PVC/CPVC
Min-Max Exhaust Vent Run	10 feet (3 meters) - 140 ft (43 m)	
Min-Max Intake Vent Run	0 feet (0 meters) - 140 ft (43 m)	
• 45° elbow is equivalent to 3 ft (1 m) • 90° elbow is equivalent to 6 ft (2 m)		

Table 20

ACCEPTABLE	ACCEPTABLE	NOT ACCEPTABLE
90° Elbows, Long Sweep	90° Elbows, Short Sweep	90° Elbows, Close Turn
		

Vent length includes the additional venting, fittings and terminations.

Twin Pipe: Installation Instructions

⚠WARNING

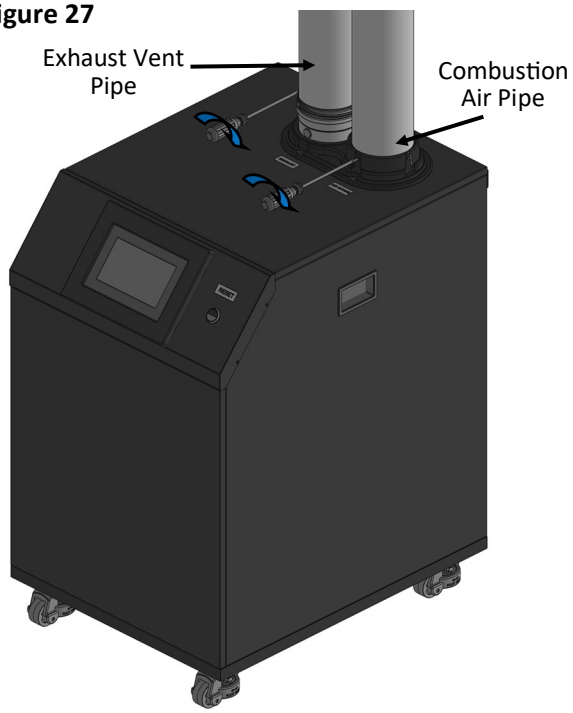
DO NOT apply PVC glues, solvents, or cleaners to the boiler's combustion air or exhaust gasket connections. Failure to correctly assemble the components according to these instructions may result in property damage, personal injury, or death.

RCB500AN MODEL

The intake and exhaust adapters on top of the appliance are designed to fit 4 Inch PVC/CPVC pipe. When using other vent materials such as PP and Stainless Steel pipes ensure to use an appliance adapter from the pipe manufacturer to properly connect to the boiler adapters.

1. **Exhaust Pipe:** Align and slide down PVC/CPVC pipe on the exhaust vent connection.
   NOTE: Ensure that the pipe passes through the rubber gasket on the metal vent adapter and also hits a stop on the vent connection.
2. To secure the exhaust air vent pipe, tighten the clamp attached on exhaust air vent using a screwdriver.
3. **Air Intake:** Align and slide down PVC/CPVC pipe on the air intake connection.
4. Secure the pipe to the intake air adapter using 3 screws (supplied with appliance).

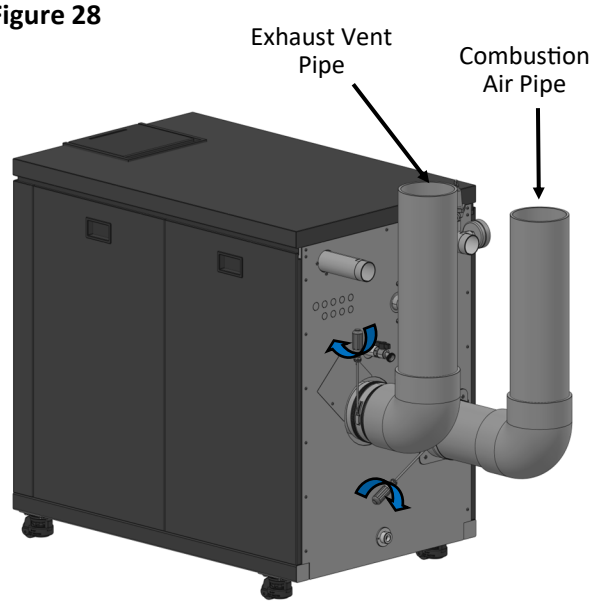
Figure 27



RCB750AN and RCB1000AN MODELS

The intake and exhaust adapters on back of the appliance are designed to fit 6 Inch PVC/CPVC pipe. When using other vent materials such as PP and Stainless Steel pipes ensure to use an appliance adapter from the pipe manufacturer to properly connect to the boiler adapters.

Figure 28



1. **Exhaust Pipe:** Align and insert the PVC/CPVC pipe on the exhaust vent connection.
   NOTE: Ensure that the pipe passes through the rubber gasket on the metal vent adapter and also hits a stop on the vent connection.
2. To secure the exhaust air vent pipe, tighten the clamp attached on exhaust air vent using a screwdriver.
3. **Air Intake:** Align and insert the PVC/CPVC pipe on the air intake connection until it hits a stop.
4. Secure the pipe to the intake air adapter using 3 screws (supplied with appliance).

Twin Pipe: Example Vent Application Configurations

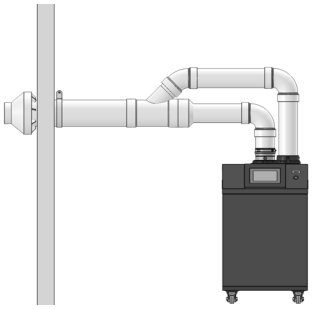
Slope horizontal exhaust 1/4 in. per foot towards the boiler. DO NOT slope combustion air pipe towards the boiler.

⚠ CAUTION Rinnai cautions against installing the boiler in applications with venting in different pressure planes. It is possible to have poor performance with this installation.

Figure 29

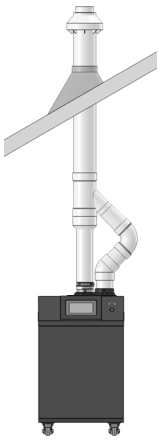
PVC/CPVC
IPEX / Royal Concentric
Side Wall Termination

This configuration <u>requires</u> the use of a Concentric Vent Termination.

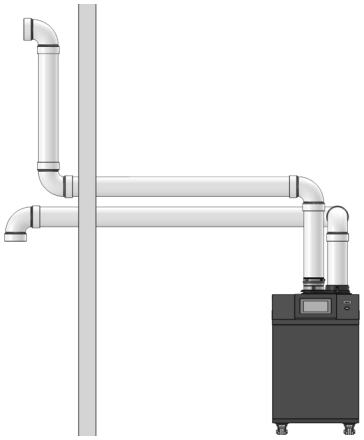


PVC/CPVC
IPEX /Royal Concentric
Vertical
Termination

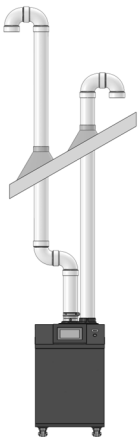
This configuration <u>requires</u> the use of a Concentric Vent Termination.



Schedule 40 PVC/CPVC Snorkel Termination

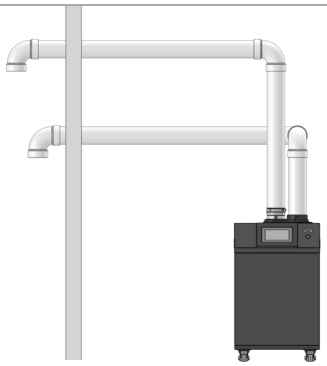


Schedule 40 PVC/CPVC Standard Upside Down
"U" Vertical Termination

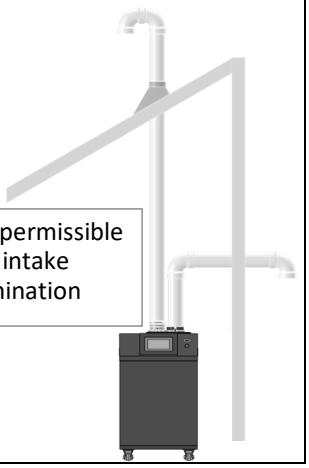


Schedule 40 PVC/CPVC
Elbow or Tee Side Wall Termination

Tee not permissible for intake termination



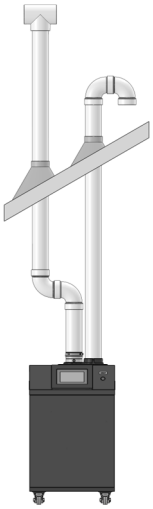
Schedule 40 PVC/CPVC
Side Wall Intake Vertical Exhaust



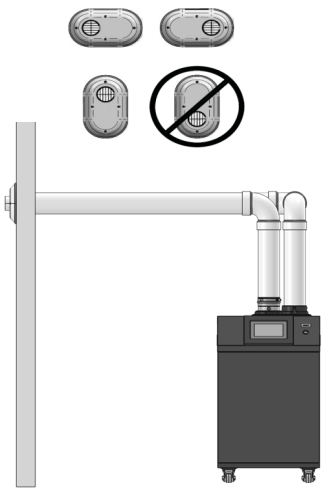
Tee not permissible for intake termination

Schedule 40 PVC/CPVC
Tee Vertical Termination

Tee not permissible for intake termination

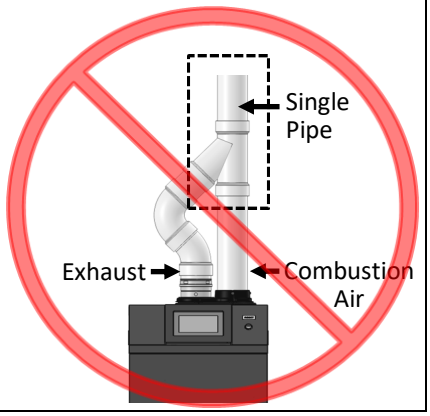


PVC Low Profile Termination



⚠ WARNING

Exhaust and combustion air <u>MUST NOT</u> be brought together into a single PVC pipe using a pipe fitting.



5.5.5 Non-Direct Vent (Room Air)

Room Air: Termination Clearances

Figure 30

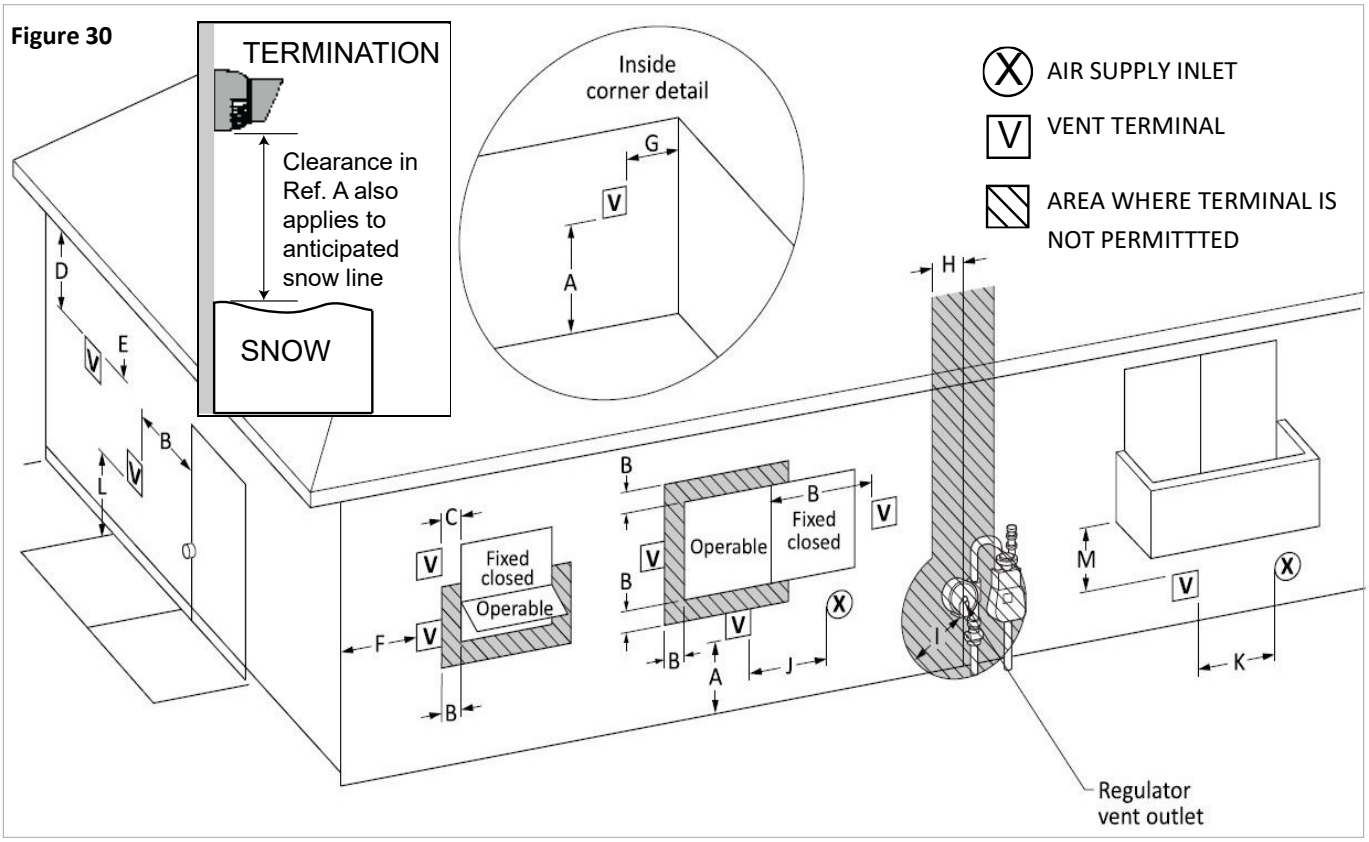


Table 21: Room Air Termination Clearances

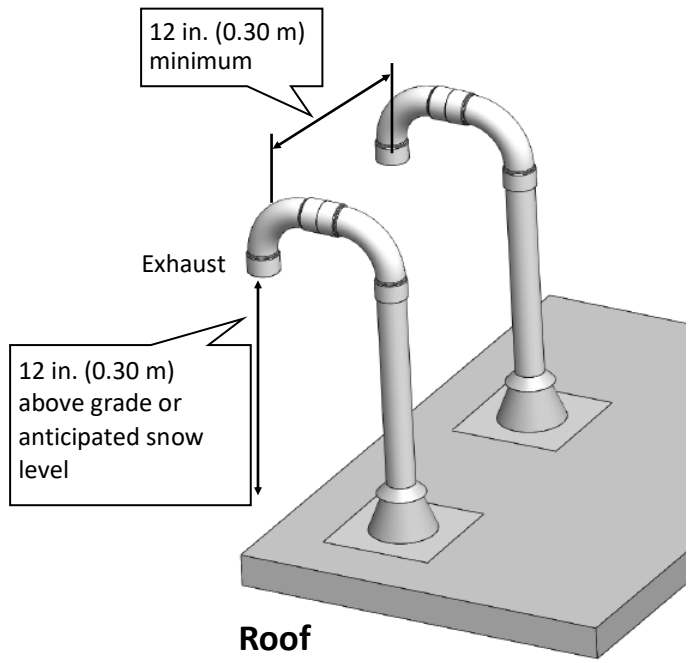
		Canadian Installations (CSA B149.1)	U.S. Installations (ANSI Z223.1 /NFPA 54)
Ref	**Description**	**Other than Direct Vent (Room Air)**	**Other than Direct Vent (Room Air)**
A	Clearance above grade, veranda, porch, deck, or balcony	12 in. (30 cm)	12 in. (30 cm)
B	Clearance to window or door that may be opened	36 in. (91 cm)	4 ft (1.2 m) below or to side of opening; 1 ft (30 cm) above opening
C	Clearance to permanently closed window	*	*
D	Vertical clearance to ventilated soffit, located above the terminal within a horizontal distance of 2 ft (61 cm) from the center line of the terminal	*	*
E	Clearance to unventilated soffit	*	*
F	Clearance to outside corner	*	*
G	Clearance to inside corner	*	*
H	Clearance to each side of center line extended above meter/regulator assembly	*	*
I	Clearance to service regulator vent outlet	Above a regulator within 3 ft (91 cm) horizontally of the vertical center line of the regulator vent outlet to a maximum vertical distance of 15 ft (4 m)	*
J	Clearance to non-mechanical air supply inlet to building or the combustion air inlet to any other appliance	36 in. (91 cm)	4 ft (1.2 m) below or to side of opening; 1 ft (30 cm) above opening
K	Clearance to a mechanical air supply inlet	6 ft (1.83 m)	3 ft (91 cm) above if within 10 ft (3 m) horizontally
L	Clearance above paved sidewalk or paved driveway located on public property	7 ft (2.13 m) [1]	7 ft (2.13 m)
M	Clearance under veranda, porch, deck, or balcony	12 in. (30 cm) [2]	*

Table 22

Clearance to opposite wall is 24 in. (60 cm).	
[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.	* Clearances are in accordance with local installation codes and the requirements of the gas supplier.
[2] Permitted only if veranda, porch, deck, or balcony is fully open on a minimum of two sides beneath the floor.	

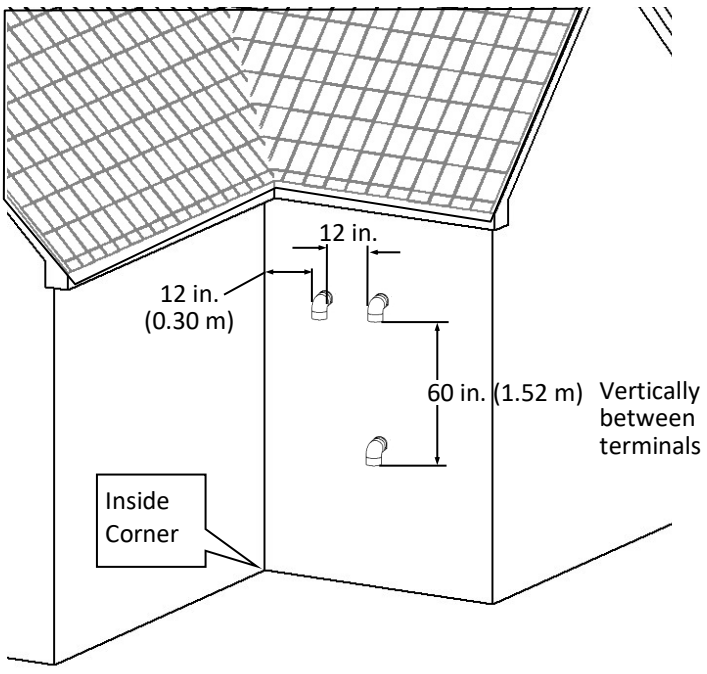
Room Air Vertical Termination of Multiple Boilers

Figure 31



Exhaust Termination Clearances for Internal (Indoor) Room Air Applications

Figure 32



IMPORTANT

- Installation of Room Air must use listed Category IV venting.
- All terminations (horizontal and/or vertical) must terminate 12 in. above grade or anticipated snow level.

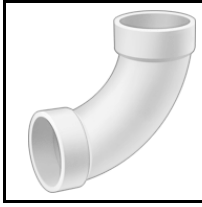
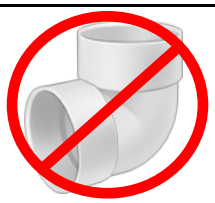
Room Air: Maximum Equivalent Vent Length

Table 23: Room Air Maximum Equivalent Vent Lengths

MODEL	RCB500AN	RCB750AN and RCB1000AN
Vent Sizes	4 in. PVC/CPVC	6 in. PVC/CPVC
Min-Max Exhaust Vent Run	10 feet (3 meters) - 140 feet (43 meters)	
Min-Max Intake Vent Run	0 feet (0 meters) - 140 feet (43 meters)	
• 45° elbow is equivalent to 3 ft (1 m) • 90° elbow is equivalent to 6 ft (2 m)		

Vent length includes the additional venting, fittings and terminations.

Table 24

ACCEPTABLE	**ACCEPTABLE**	**NOT ACCEPTABLE**
90° Elbows, Long Sweep	90° Elbows, Short Sweep	90° Elbows, Close Turn
		

Room Air: Combustion Air

⚠WARNING

- This boiler requires adequate combustion air for ventilation and dilution of flue gases. Failure to provide adequate combustion air can result in unit failure, fire, explosion, serious bodily injury or death. Use the following methods to ensure adequate combustion air is available for correct and safe operation of this boiler.
- Direct Venting is recommended in unusually tight buildings or in installation locations subject to significant negative air pressure.

IMPORTANT

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

For applications containing corrosive indoor air, this appliance must be installed as direct vent. DO NOT use room air in applications where combustion air contains acid forming chemicals such as sulfur, fluorine and chlorine. These chemicals have been found to cause rapid damage and decay and can become toxic when used as combustion air in gas appliances. Such chemicals can be found in, but not limited to bleach, ammonia, cat litter, aerosol sprays, cleaning solvents, varnish, paint and air fresheners. Do not store these products or similar products in the vicinity of this boiler.

Unconfined Space

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

Confined Space

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

Using Indoor Air For Combustion

When using air from other room(s) in the building, the total volume of the room(s) must be of adequate volume (greater than 50 cubic feet per 1000 Btu/hr). Combustion air openings between joining rooms must have at least 1 square inch of free area for each 1000 Btu/hr, but not less than 100 square inches each.

Using Outdoor Air For Combustion

Outdoor air can be provided to a confined space through two permanent openings, one commencing within 12 in. (0.30 m) of the top and one commencing within 12 in. (0.30 m) of the bottom, of the confined space. The openings shall communicate to the outside by one of two ways.

When communicating directly with the outdoors through horizontal ducts, each opening shall have a minimum free area of 1 in^2/2000 Btu/hr (1100 mm^2/kW) of total input rating of all appliances in the confined space.

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

Louvers and Grills

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

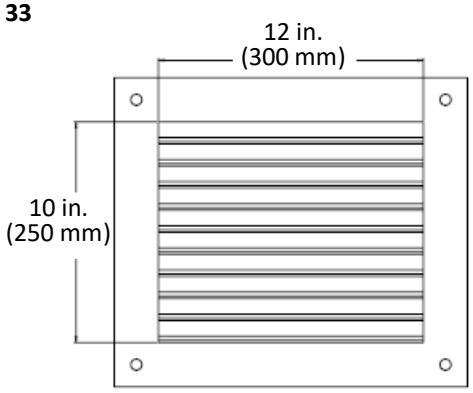
Examples: Wood: 10 in. x 12 in. x 0.25 = 30 $in.^2$

Metal: 10 in. x 12 in. x 0.75 = 90 $in.^2$

Location

To maintain proper circulation of combustion air two permanent openings (one upper, one lower) must be positioned in confined spaces. The upper shall be within 12 in. (0.30 m) of the top of the confined space and the lower opening shall be within 12 in. (0.30 m) of the bottom of the confined space. Openings must be positioned as to never be obstructed.

Figure 33



IMPORTANT

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

⚠WARNING

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

Checklist for Combustion Air and Venting Requirements

☐	Verify all combustion air opening sizes are correct.
☐	Ensure that the Combustion Air Requirements are followed that will provide sufficient combustion air for the appliance.
☐	DO NOT use room air for combustion in applications where the indoor air is corrosive.
☐	Verify that adequate combustion air is available for all appliances installed in the space.
☐	Installation complies with National Fuel Gas Code, ANSI Z223.1/NFPA 54 as well as local and state regulations therein.

Room Air: Installation Instructions

⚠WARNING

DO NOT apply PVC glues, solvents, or cleaners to the boiler's combustion air or exhaust gasket connections. Failure to correctly assemble the components according to these instructions may result in property damage, personal injury, or death.

RCB500AN MODEL

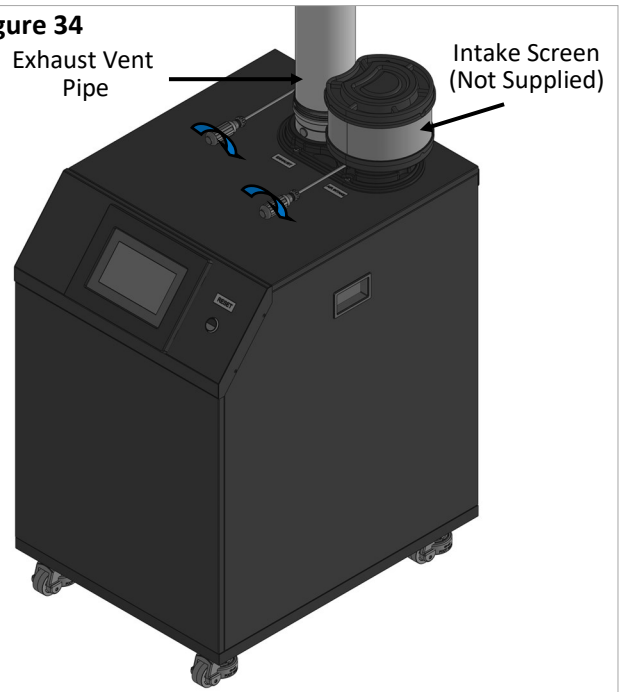
The intake and exhaust adapters on top of the appliance are designed to fit 4 Inch PVC/CPVC pipe. When using other vent materials such as PP and Stainless Steel pipes ensure to use an appliance adapter from the pipe manufacturer to properly connect to the boiler adapters.

1. **Exhaust Pipe:** Align and slide down PVC/ CPVC pipe on the exhaust vent connection.
   NOTE: Ensure that the pipe passes through the rubber gasket on the metal vent adapter and also hits a stop on the vent connection.

2. To secure the exhaust air vent pipe, tighten the clamp attached on exhaust air vent using a screwdriver.

3. **Air Intake:** Secure the optional intake screen to the intake connection using 3 screws (supplied with appliance).

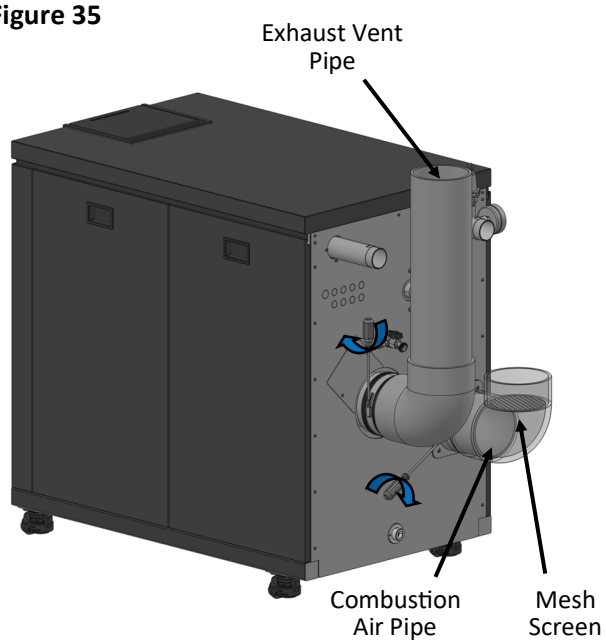
Figure 34



RCB750AN and RCB1000AN MODELS

The intake and exhaust adapters on back of the appliance are designed to fit 6 Inch PVC/CPVC pipe. When using other vent materials such as PP and Stainless Steel pipes ensure to use an appliance adapter from the pipe manufacturer to properly connect to the boiler adapters.

Figure 35



1. **Exhaust Pipe:** Align and insert the PVC/CPVC pipe on the exhaust vent connection.
   NOTE: Ensure that the pipe passes through the rubber gasket on the metal vent adapter and also hits a stop on the vent connection.

2. To secure the exhaust air vent pipe, tighten the clamp attached on exhaust air vent using a screwdriver.

3. **Air Intake:** Align and insert the PVC/CPVC pipe on the air intake connection until it hits a stop.

4. Secure the pipe to the intake air adapter using 3 screws (supplied with appliance).

5. Install a mesh screen on the intake pipe to prevent large debris from entering the combustion chamber

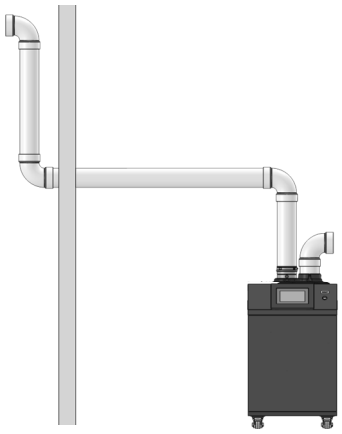
Room Air: Example Vent Applications

⚠ CAUTION

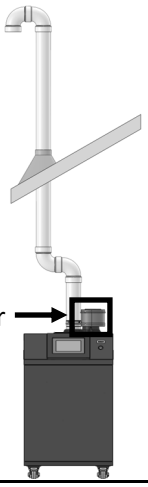
Rinnai cautions against installing the boiler in applications with venting in different pressure planes. It is possible to have poor performance with this installation.

Figure 36

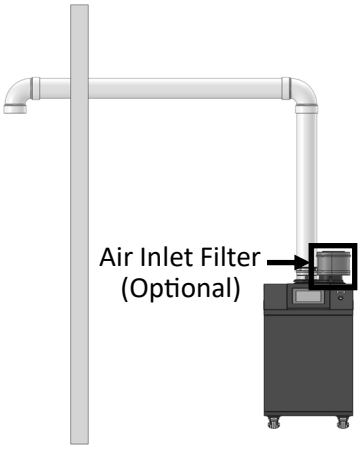
Schedule 40
PVC/CPVC Snorkel
Termination
Configuration



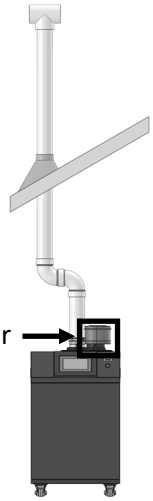
Schedule 40
PVC/CPVC Standard
Upside Down "U"
Vertical Termination
Configuration



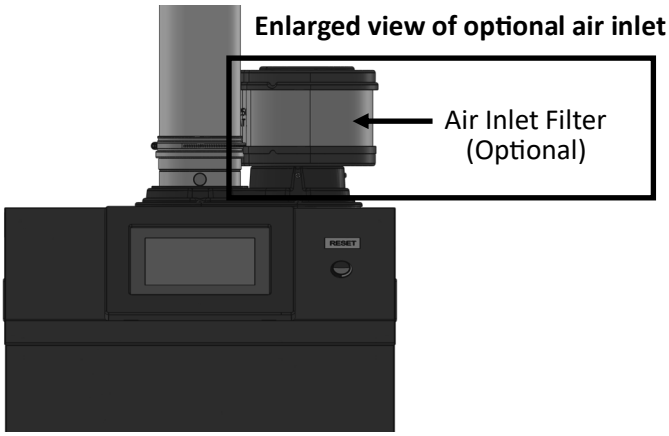
Schedule 40
PVC/CPVC Elbow or
Tee Side Wall
Termination
Configuration



Schedule 40
PVC/CPVC Tee
Vertical Termination
Configuration



Enlarged view of optional air inlet filter.



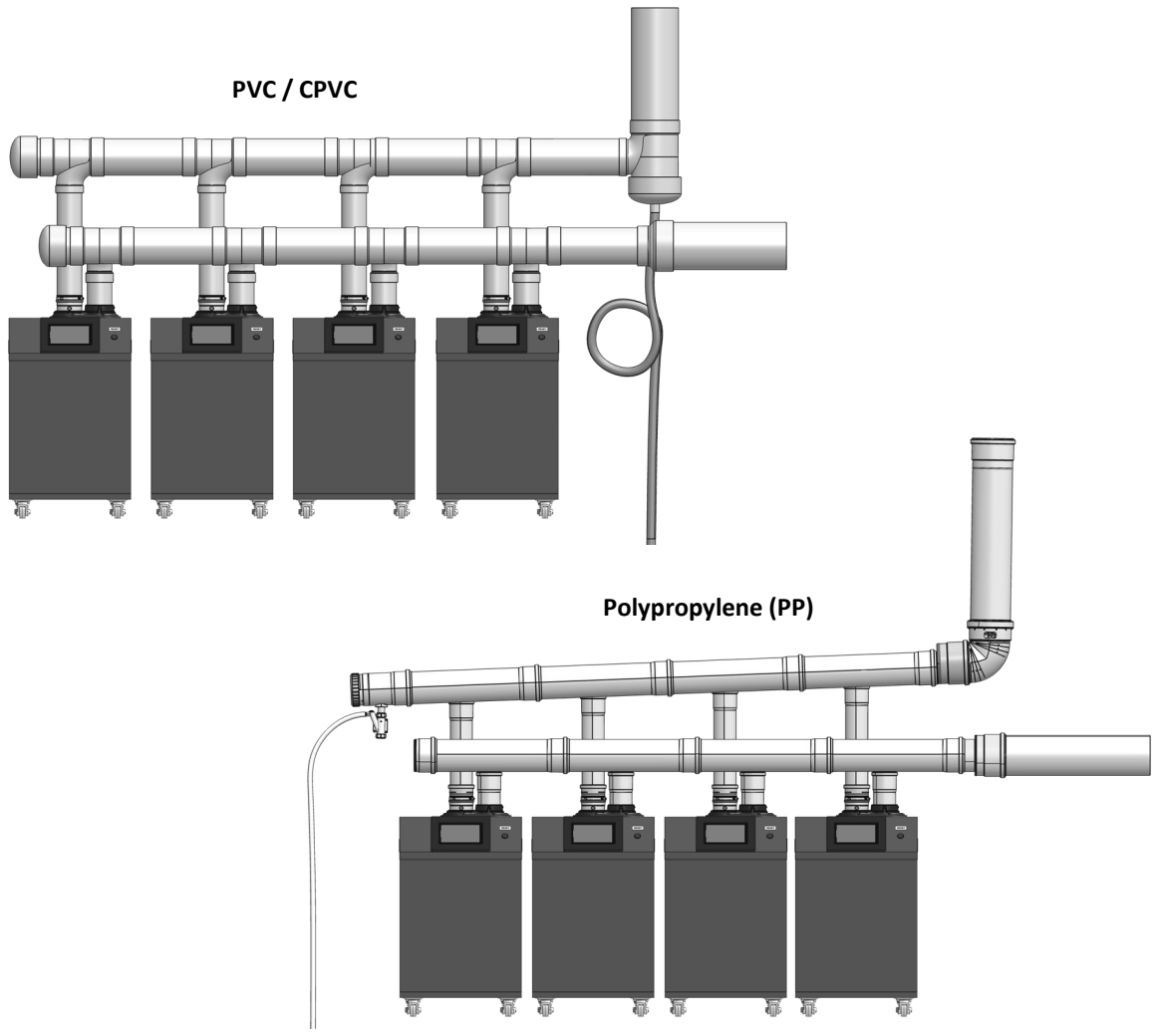
5.5.6 Common Venting

A maximum of four (4) RCB500AN Rinnai Commercial Boilers can be common vented. A maximum of two (2) RCB750AN or RCB1000AN Rinnai Commercial Boilers can be common vented. Follow the following guidelines to assure safe operation:

1. Only common vent boiler of the same size and DO NOT exceed a maximum number of units listed above.
2. DO NOT common vent Rinnai Commercial Boilers with other manufacturer's products or other models from Rinnai.
3. When common venting units, they must be wired and set-up to work as cascade.
4. Common venting system can be vented vertically or horizontally using direct vent or power vent.

For detailed information about common venting including vent header size, approved venting, and vent run, refer to separate "Rinnai Commercial Boiler Common Venting Installation Instructions" or contact Rinnai.

Figure 37 (RCB500AN model shown)



6. Gas Supply

Topics in this section

- Connect the Gas Supply
- Gas Operating Instructions
- Gas Pipe Sizing Reference Tables

6.1 Connect the Gas Supply

⚠WARNING

- A licensed professional must install the gas supply.
- Turn off 120V power supply.
- Turn off the gas.
- Gas is flammable. Do not smoke or provide other ignition sources while working with gas.
- Do not turn on the boiler or gas until all fumes are gone.

IMPORTANT

- The boiler shall be installed such that the gas ignition system components are protected from water (dripping, spraying, rain, etc.) during appliance operation and service (circulator replacement, condensate trap, control replacement, etc.).
- A sediment trap must be provided upstream of the gas controls.
- A manual gas shutoff valve between the gas supply and the boiler must be installed.

Figure 38

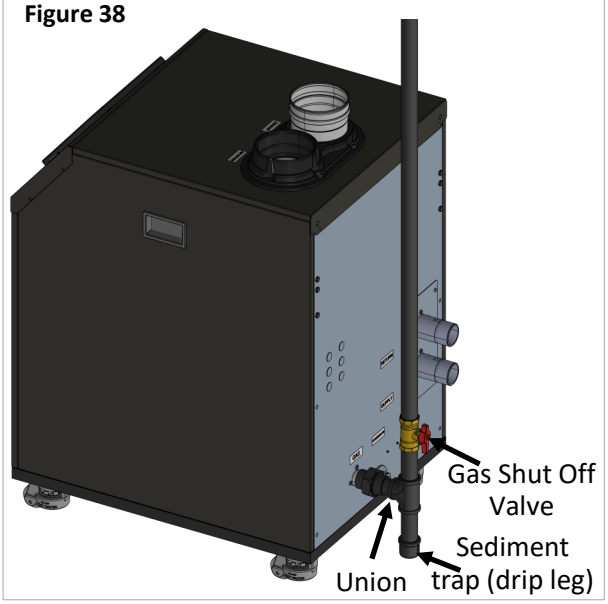
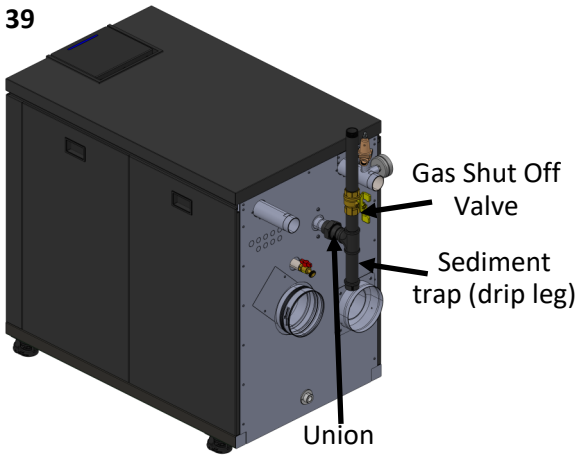


Figure 39



1. Check the type of gas and gas supply pressure before connecting the boiler. If the boiler is not of the gas type that the building is supplied with, converting the gas type of the boiler is necessary. A gas conversion kit is available and can be purchased as an accessory. Remove the Gas connection cap from the gas pipe connection on the boiler before connecting the gas supply piping.
2. Check the gas supply pressure immediately upstream at a location provided by the gas company. Supplied gas pressure must be within the limits shown below:
   Natural Gas: 3.5 in. - 10.5 in. wc (0.87 - 2.61 kPa)
   Propane Gas: 8.0 in. - 13.5 in. wc (1.99 - 3.36 kPa)
   Maximum gas pressure checked with no flow (lockup) or with boiler on.
   Minimum pressure checked with gas flowing and unit running at 100% of the firing rate.
3. Before placing the appliance in operation, all joints including the heater must be checked for gas tightness by means of soap, gas leak detector solution, or an equivalent nonflammable solution, as applicable. Since some leak test solutions, including soap and water, may cause corrosion or stress cracking, the piping shall be rinsed with water after testing, unless it has been determined that the leak test solution is non-corrosive.
4. Use approved and appropriately sized connectors to connect the boiler to the gas line. Purge the gas line of any debris before connection to the boiler.
5. Any compound used on the threaded joint of the gas piping shall be a type that resists the action of liquefied petroleum gas (propane/LPG).
6. The gas supply line shall be gas tight, sized, and so installed as to provide a supply of gas sufficient to meet the maximum demand of the heater and all other gas consuming appliances at the location without loss of pressure. If in doubt about the size of the gas line, refer to section “6.3 Gas Pipe Sizing Reference Tables.”
7. Perform a leak and pressure test prior to operating the boiler. If a leak is detected, do not operate the boiler until the leak is repaired.

6.2 Gas Operating Instructions

FOR YOUR SAFETY READ BEFORE OPERATING

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

A This appliance does not have a pilot. It is equipped with an ignition device which automatically lights the burner. Do not try to light the burner by hand.

B BEFORE OPERATING smell all around the appliance area for gas. Be sure to smell next to the floor because some gas is heavier than air and will settle on the floor.

WHAT TO DO IF YOU SMELL GAS:

- **DO NOT try to light any appliance.**
- **DO NOT touch any electric switch; DO NOT use any phone in your building.**
- **Immediately call your gas supplier from a neighbor's phone. Follow the gas supplier's instructions.**
- **If you cannot reach your gas supplier, call the fire department.**

C Use only your hand to turn the gas control valve. Never use tools. If the gas control valve will not turn by hand, don't try to repair it, call a qualified service technician. Force or attempted repair may result in a fire or explosion.

D Do not use this appliance if any part has been under water. Immediately call a qualified service technician to inspect the appliance and to replace any part of the control system and any gas control which has been under water.

OPERATING INSTRUCTIONS

1. **STOP! Read the safety information above on this label.**
2. **Set the temperature controller to lowest setting.**
3. **Turn off all electric power to the appliance.**
4. **This appliance does not have a pilot. It is equipped with a direct ignition device which automatically lights the burner. DO NOT try to light the burner by hand.**
5. **Turn the manual gas control valve located at gas inlet of appliance clockwise ↷ to the OFF position.**
6. **Wait five (5) minutes to clear out any gas. Then smell for gas, including near the floor. If you smell gas, STOP! Follow "B" in the safety information above on this label. If you don't smell gas, go to the next step.**
7. **Turn the manual gas control valve located at gas inlet of appliance counterclockwise ↶ to the ON position.**
8. **Turn on all electric power to the appliance.**
9. **Set the temperature controller to desired setting.**
10. **If the appliance will not operate, follow the instructions "To Turn Off Gas To Appliance" and call your service technician or gas supplier.**

TO TURN OFF GAS TO APPLIANCE

1. **Set the temperature controller to the lowest setting.**
2. **Turn off all electric power to the appliance if service is to be performed.**
3. **Turn the manual gas control valve located at gas inlet of appliance clockwise ↷ to the OFF position.**

6.3 Gas Pipe Sizing Reference Tables

The gas supply must be capable of handling the entire gas load required at the location. Gas line sizing is based on gas type, the pressure drop in the system, the gas pressure supplied, and gas line type. For gas pipe sizing, refer to the National Fuel Gas Code, ANSI Z223.1/NFPA 54, or the Natural Gas and Propane Installation Code, CSA B149.1

For some tables, you will need to determine the cubic feet per hour of gas required by dividing the gas input by the heating value of the gas (available from the local gas company). The gas input needs to include all gas products at the location and the maximum Btu usage at full load when all gas products are in use.

Use the table for your gas type and pipe type to find the pipe size required. The pipe size must be able to provide the required cubic feet per hour of gas or the required Btu/hr.

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

GAS PIPE SIZING CALCULATION WORKSHEET

Instructions: Enter values in empty boxes.

Rinnai Model Gas Input:

A		Btu/hr

Additional Appliance Total Gas Input:

B		Btu/hr

Heating Value of Gas:

C		Btu/ft^3

Cubic Feet Per Hour (CFH):

$$(CFH) = \frac{A + B}{C}$$

$$(CFH) = \frac{\quad}{\quad}$$

ANSWER: CFH = _____ FT^3/HR

Natural Gas

Table 25

Pressure Drop 0.5 in. w.c.

Information in table obtained from NFPA 54, ANSI Z223.1.

Gas Pipe Sizing Reference Table

Schedule 40 Metallic Pipe	
Inlet Pressure:	Less than 2 psi
Specific Gravity:	0.60

	Nominal Pipe Size (in.)					
	1	**1 1/4**	**1 1/2**	**2**	**2 1/2**	**3**
Length in ft	Capacity in Cubic Feet of Gas per Hour					
10 (3)	678	1,390	2,090	4,020	6,400	11,300
20 (6)	N/A	957	1,430	2,760	44,00	7,780
30 (9)		768	1,150	2,220	3,530	6,250
40 (12)		657	985	1,900	3,020	5,350
50 (15)		583	873	1,680	2,680	4,740
60 (18)		528	791	1,520	2,430	4,290
70 (21)		486	728	1,400	2,230	3,950
80 (24)		452	677	1,300	2,080	3,670
90 (27)		424	635	1,220	1,950	3,450
100 (30)		400	600	1,160	1,840	3,260

EXAMPLE

Rinnai Model Gas Input:

A	1,000,000	Btu/hr

Additional Appliance Total Gas Input:

B	100,000	Btu/hr

Heating Value of Gas:

C	1,000	Btu/ft^3

Cubic Feet Per Hour (CFH):

$$(CFH) = \frac{A + B}{C}$$

$$(CFH) = \frac{1{,}000{,}000 + 100{,}000}{1000}$$

ANSWER:

CFH =	1,100	FT^3/HR

For this example, the pipe diameter must be at least 1-1/2 in. pipe size and maximum 30 ft (9 m) in length.

Natural Gas

Table 26

Pressure Drop 3.0 in. w.c.

Intended use: Initial supply pressure of 8.0 in. w.c. or greater.

Information in table obtained from NFPA 54, ANSI Z223.1.

Schedule 40 Metallic Pipe	
Inlet Pressure:	Less than 2 psi
Specific Gravity:	0.6

Gas Pipe Sizing Reference Table

	Nominal Pipe Size (in.)						
	3/4	**1**	**1 1/4**	**1-1/2**	**2**	**2-1/2**	**3**
Length in ft (meters)	Capacity in Cubic Feet of Gas per Hour						
10 (3)	949	1,790	3,670	1,580	3,050	4,680	8,580
20 (6)	652	1,230	2,520	1,090	2,090	3,340	5,900
30 (9)	524	986	2,030	873	1,680	2,680	4,740
40 (12)	448	844	1,730	747	1,440	2,290	4,050
50 (15)	397	748	1,540	662	1,280	2,030	3,590
60 (18)	360	678	1,390	600	1,160	1,840	3,260
70 (21)	331	624	1,280	552	1,060	1,690	3,000
80 (24)	308	580	1,190	514	989	1,580	2,790
90 (27)	N/A	544	1,120	482	928	1,480	2,610
100 (30)		514	1,060	455	877	1,400	2,470

EXAMPLE

Rinnai Model Gas Input:

A	1,000,000	Btu/hr

Additional Appliance total Gas Input:

B	100,000	Btu/hr

Heating Value of Gas:

C	1,000	Btu/ft^3

Cubic Feet Per Hour (CFH):

$$(CFH) = \frac{A + B}{C}$$

$$(CFH) = \frac{1{,}000{,}000 + 100{,}000}{1000}$$

ANSWER:

CFH = 1,100 ft^3/HR

For this example, the pipe diameter must be at least 1 in. nominal pipe size and maximum 20 ft (6 m) in length.

Propane (Undiluted)

Table 27

Pressure Drop 0.5 in. w.c.

Information in table obtained from NFPA 54, ANSI Z223.1.

Schedule 40 Metallic Pipe	
Inlet Pressure:	11 in. w.c.
Specific Gravity:	1.50

Gas Pipe Sizing Reference Table

	Nominal Inside Pipe Size (in.)					
	3/4	**1**	**1 1/4**	**1-1/2**	**2**	**2-1/2**
Length in ft (meters)	Capacity in Thousands of Btu/hr					
10 (3)	608	1,150	2,350	3,520	6,790	10,800
20 (6)	N/A	787	1,620	2,420	4,660	7,430
30 (9)		632	1,300	1,940	3,750	5,970
40 (12)		541	1,110	1,660	3,210	5,110
50 (15)		N/A	985	1,480	2,840	4,530
60 (18)			892	1,340	2,570	4,100
70 (21)			821	1,230	2,370	3,770
80 (24)			763	1,140	2,200	3,510
90 (27)			716	1,070	2,070	3,290
100 (30)			677	1,010	1,950	3,110

EXAMPLE

Rinnai Model Gas Input:

A	1,000,000	Btu/hr

Additional Appliance Total Gas Input:

B	100,000	Btu/hr

Total Gas Input:

$$\text{Total Gas Input} = A + B$$

$$\text{Total Gas Input} = 300{,}000 + 100{,}000$$

ANSWER:

Total Gas Input	=	1,100,000	Btu/hr

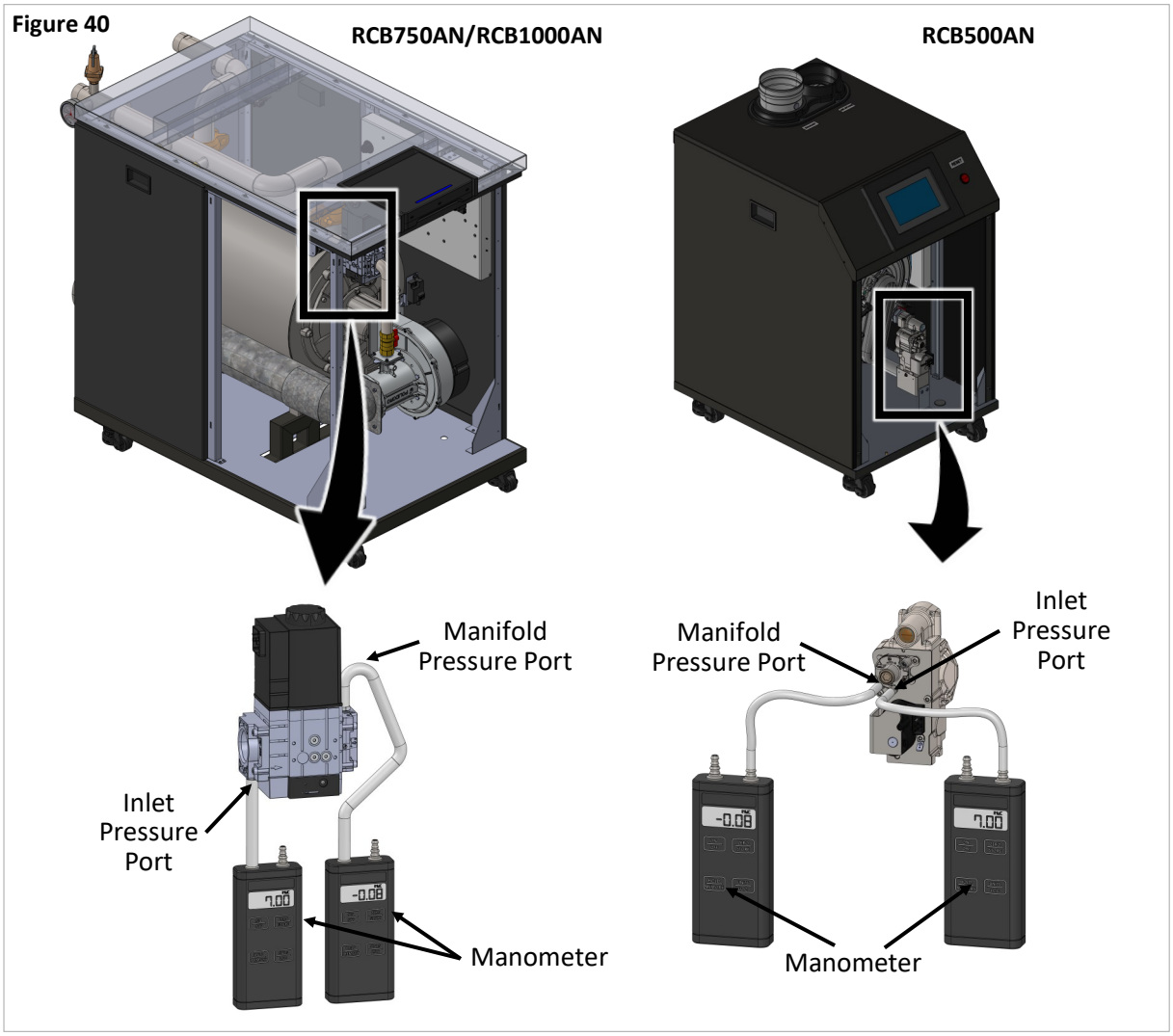
For this example, the pipe diameter must be at least 1-1/4 in. nominal pipe size and maximum 40 ft (12 m) in length.

Check Inlet Gas Supply

The gas piping must be sized for the proper flow and length of pipe, to avoid excessive pressure drop. Both the gas meter and the gas regulator must be properly sized for the total gas load. If you experience a pressure drop greater than 1 inch w.c. (249 Pa), the meter, regulator, or gas line is undersized or in need of service. Perform the steps below when checking inlet gas supply:

1. Turn OFF the electrical power to the unit.
2. Shut off the gas supply at the manual gas valve in the gas piping to the appliance.
3. Remove the front panel as shown in front panel removal instructions (see section “14. Appendices”). Place the front panel in a safe place where it can not be damaged.
4. Locate the gas valve inlet measurement port (see figure below).
   500 model: Use a Torx T-10 driver to undo the screw a half turn.
   750 and 1000 models: Use a small flat head screw driver to undo the screw a half turn.
5. Slip a tube over the nipple and connect to a manometer (pressure taps have a 0.35” [9mm] outer diameter).
6. Slowly turn ON the gas supply at the manual gas valve.
7. Restore the electrical power to the unit.
8. Use the boiler controller to adjust the temperature setpoint and call for heat.
9. Observe the gas supply pressure as the unit fires at 100% of the input rate. Percent Boiler modulation (percentage) will be displayed on the home screen of the unit.
10. Ensure the inlet pressure is within the specified range. Minimum and maximum gas supply pressures are specified in this section of the manual. If the gas pressure is out of range, contact the gas utility, gas supplier, qualified installer or service agency to determine the necessary steps to provide proper gas pressure to the control.
11. Turn OFF the electrical power to the unit.
12. Shut off the gas supply at the manual gas valve in the gas piping to the appliance.
13. Remove the manometer from the pressure tap located on the gas valve. Ensure that the screw is closed and leak tight after the testing (Torque: 0.9 - 8.9 Lb-in [0.1 - 1 Nm]).

Figure 40



7. CH System Piping

Topics in this section

- Guidelines
- Instructions
- Common CH Components
- Hydraulic Separation
- Connect the Pressure Relief Valves
- Connect the Condensate Drain Line

7.1 Guidelines

- This boiler is designed to work in a closed loop system with pressure no less than 14.5 psi (100 kPa). NOTE: Non-metallic system piping must have an oxygen barrier to be considered a closed loop.
- Purge the heating system to remove all debris and air. Debris and air in the lines will damage the boiler.
- When removing the plastic sealing caps from the boiler connections, water may come out of the boiler due to live fire testing during manufacturing.
- The boiler, when used in connection with a refrigeration system, must be installed so the chilled medium is piped in parallel with the boiler with appropriate valves to prevent the chilled medium from entering the boiler.
- The boiler piping system of a hot water boiler connected to heating coils located in air handling units where they may be exposed to refrigerated air circulation must be equipped with flow control valves or other automatic means to prevent gravity circulation of the boiler water during the cooling cycle.
- Some installations with multiple zone valves may require a differential bypass, which will prevent excessively high flow rates through a single zone when the other zone valves are closed.
- It is required to include an air separator on the central heating supply of the system.
- System piping should be insulated when freezing is a potential concern.
- All piping must comply with local, state, national or ASME code as appropriate.

⚠ CAUTION

The boiler may not be installed directly to a heating system where polybutylene or other oxygen permeable piping is used.

7.2 Instructions

To connect the water supply, follow the instructions below.

For standard installations, refer to the “Piping Diagram for Basic Central Heating Installation” in this chapter.

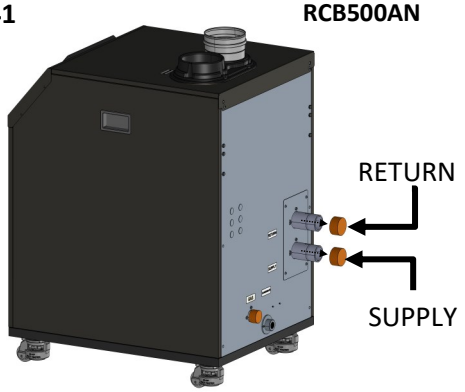
IMPORTANT

Water connections to the boiler should follow all state and local plumbing codes.

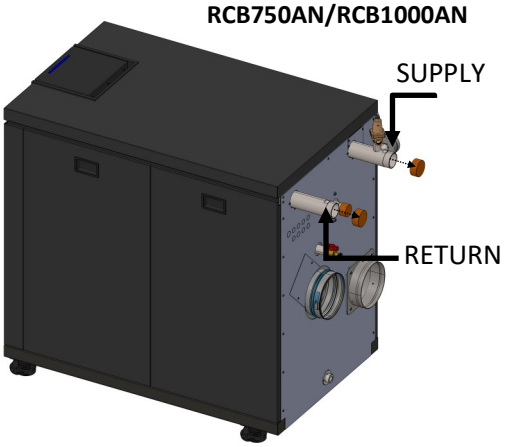
Remove the caps and plumb the heating supply and return lines to the heating return connection on the bottom of the boiler. The return and supply connections are 1-1/2” NPT for the RCB500AN model and 2” NPT to RCB750AN and RCB1000AN models.

Figure 41

RCB500AN



RCB750AN/RCB1000AN



7.3 Common CH Components

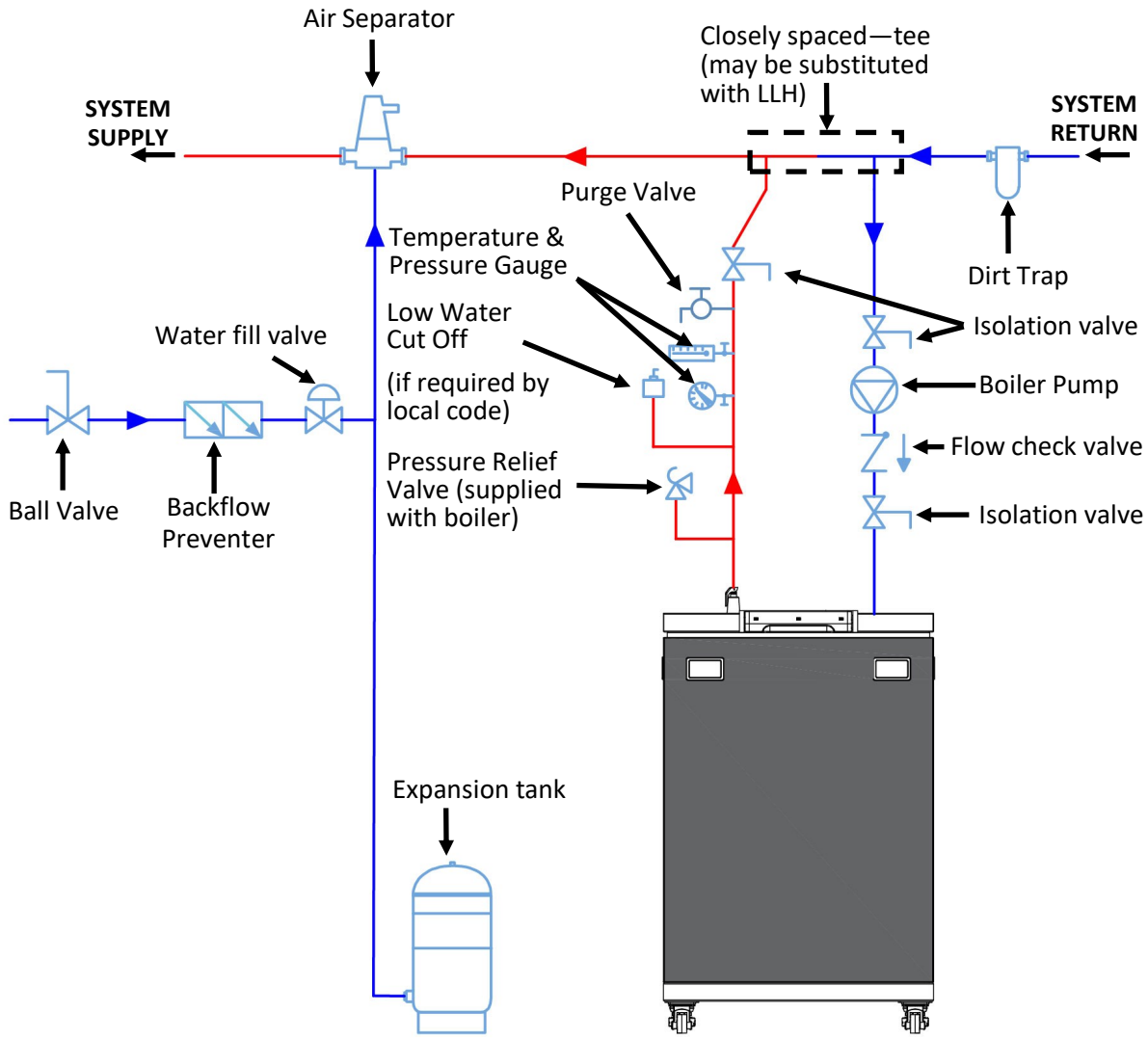
Listed below are common components in a Central Heating system. Refer to the diagram on the next page.

- **Expansion Tank** — A properly sized expansion tank charged to 2 PSI (14 kPa) below the cold system pressure is required to limit pressure changes in the heating system. When replacing an expansion tank, consult the expansion tank manufacturer for sizing. Size the expansion tank for the required system volume and capacity according to the expansion tank manufacturer's instructions.
- **Air Separator** — An air separator is needed on the central heating supply side of the system to remove any air that may be present in the piping.
- **Pressure/Temperature Gauge** — The current pressure and temperature will alternately be displayed on the boiler control panel. An external temperature and pressure gauge is recommended to be installed on the boiler supply pipe.
- **Pressure Relief Valve (PRV)** — A PRV located directly on the supply side of the boiler is required. A 75 PSI (517 kPa) PRV is supplied with the boiler. This boiler has a high-temperature shut-off device built-in as a standard safety feature. Therefore, a "pressure only" relief valve is required. DO NOT install a relief valve with a pressure rating in excess of 75 psi (517 kPa) - the maximum allowable operating pressure of the boiler. The relief valve capacity must exceed the BTU/H input capacity of the boiler.
- **Oxygen Elimination** — The boiler may only be installed in a pressurized closed-loop heating system, free of air and other impurities. If using oxygen permeable tubing in the central heating system, a plate heat exchanger is necessary to isolate the tubing and boiler.
- **Low Water Cut Off (LWCO)** — This boiler has a factory-installed pressure sensor type LWCO. The boiler's internal LWCO is not serviceable or adjustable. Check your local codes to determine if a LWCO is required and if this device conforms to the local code. If a LWCO is required to be installed, the probe must be located higher than the minimum safe water level. When a LWCO is installed, it must be wired back to the appropriate terminal on the boiler.
- **Water Fill Valve** — Maintains proper water pressure in the central heating circuit.
- **Back Flow Preventer** — Use a back flow preventer in the filling circuit to the appliance as required by local code.
- **Dirt Trap** — Protects the boiler from debris in the plumbing system. It is recommended to install dirt trap in a retrofit installation to remove debris left in the system.
- **Magnetic separator** — This device is recommended to be installed in a retrofit system containing cast iron and/ or steel pipe. It should be located in the heating return line as close as possible to the boiler.
- **Boiler Circulator Pump** — A properly sized pump should be installed on the return line pumping into the boiler. The pump should be sized according to the pressure losses of the boiler and the related heating system.

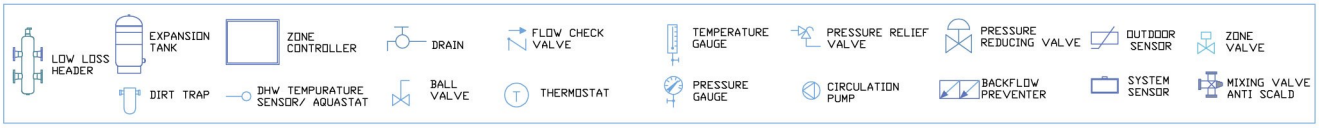
- **Purge Valve -** The boiler purge valve is used to eliminate air from the system during start-up.
- **Boiler Isolation Valves -** Full port ball valves must be used. Any other type of valves may cause flow restriction to the boiler.
- **Boiler Piping -** Boiler piping must be sized properly to avoid unnecessary flow reduction and poor boiler performance. The minimum pipe size is 1-1/2 inch for RCB500AN model and 2 Inch for RCB750AN and RCB1000AN models.
- **Flow Check Valve -** Check valves are important to prevent reverse flow condition when the pump is not operating (off-cycle).

Figure 42

CH System Common Components Diagram



Piping Diagram Symbols Legend

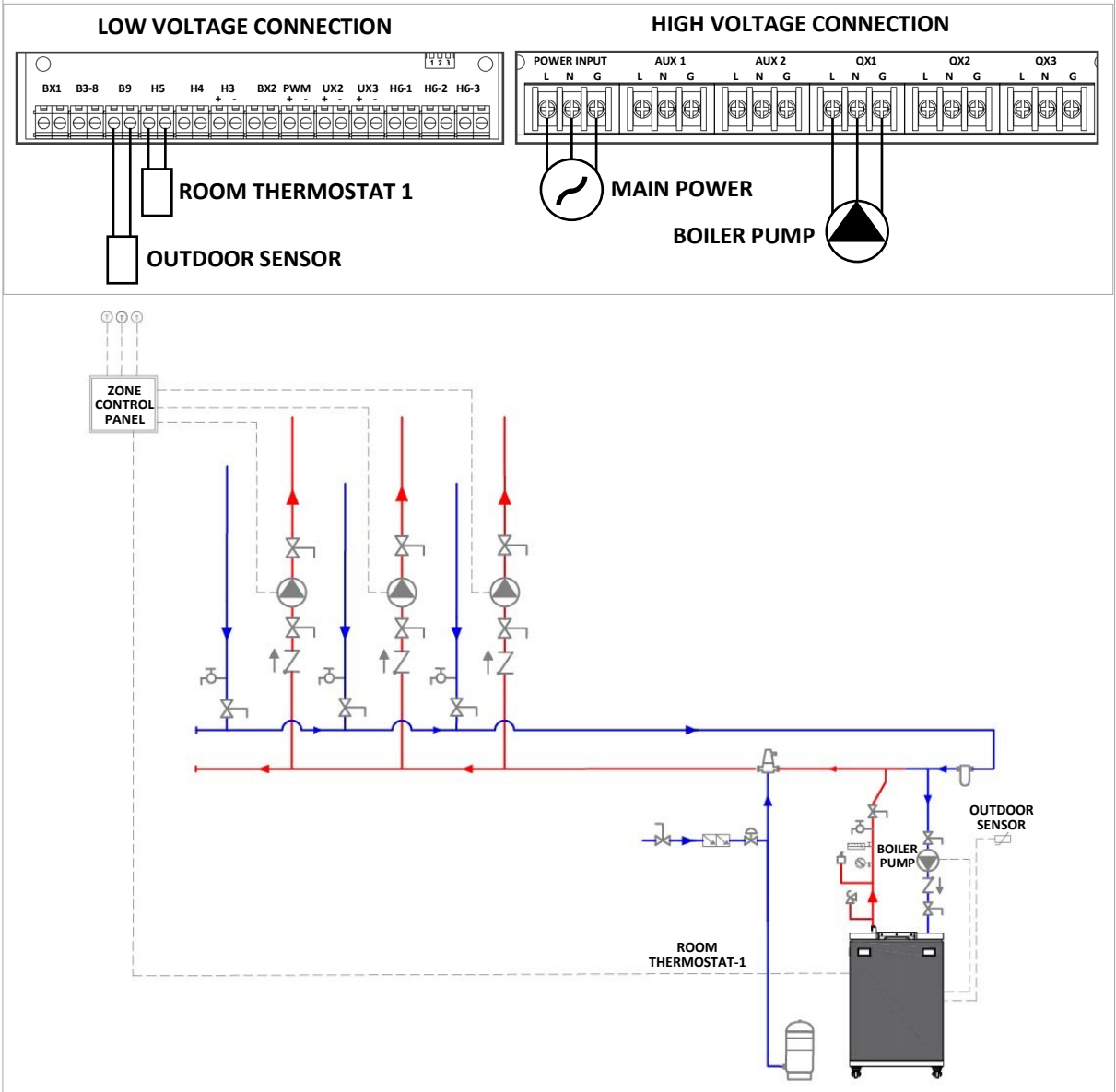


Piping Diagram - Single Boiler with Pumps

NOTES:

- Primary/Secondary piping must be used (closely spaced tees or low loss header).
- All closely spaced tees shall be within 4 pipe diameters center to center spacing.
- The minimum boiler piping must be at least 1-1/2 inch for RCB500AN model and 2 Inch for RCB750AN and RCB1000AN models. Do not downsize boiler heating loop.
- It is recommended to use a check valve to prevent reverse flow and/or gravity circulation when pump is in off-cycle.
- Boiler pump must be properly sized to ensure proper flow rate through the boiler and related piping. (minimum flow rate must be maintained to prevent short cycling)
- System flow rate should always be greater than boiler primary loop flow rate when the boiler is in operation to prevent short cycling.

Figure 43



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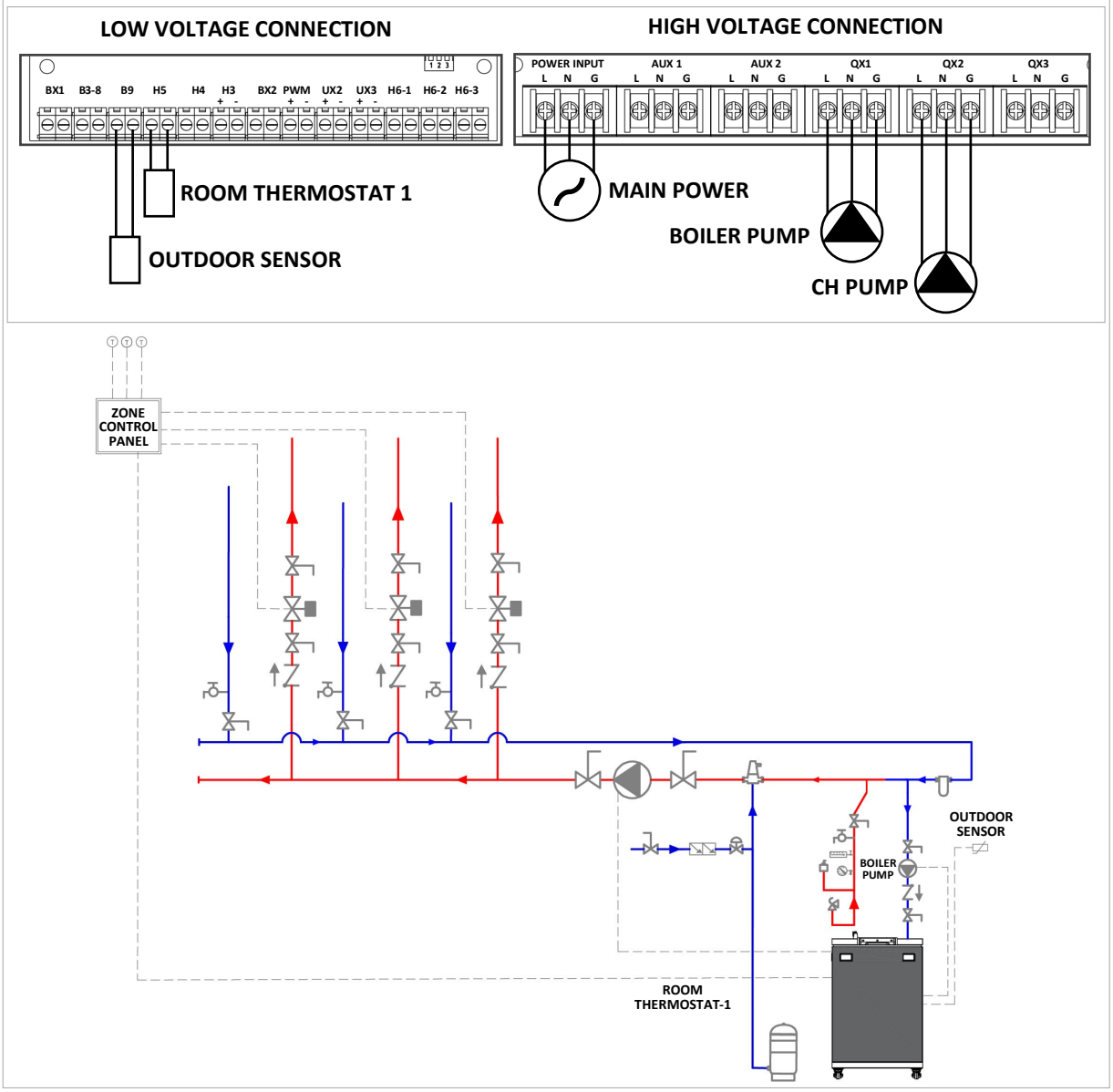
Piping Diagram - Single Boiler with Zone Valves

NOTES:

- Primary/Secondary piping must be used (closely spaced tees or low loss header).
- All closely spaced tees shall be within 4 pipe diameters center to center spacing.
- The minimum boiler piping must be at least 1-1/2 inch for RCB500AN model and 2 Inch for RCB750AN and RCB1000AN models. Do not downsize boiler heating loop.
- It is recommended to use a check valve to prevent reverse flow and/or gravity circulation when pump is in off-cycle.
- Boiler pump must be properly sized to ensure proper flow rate through the boiler and related piping (minimum flow rate must be maintained to prevent short cycling)
- System flow rate should always be greater than boiler primary loop flow rate when the boiler is in operation to prevent short cycling.

Figure 44



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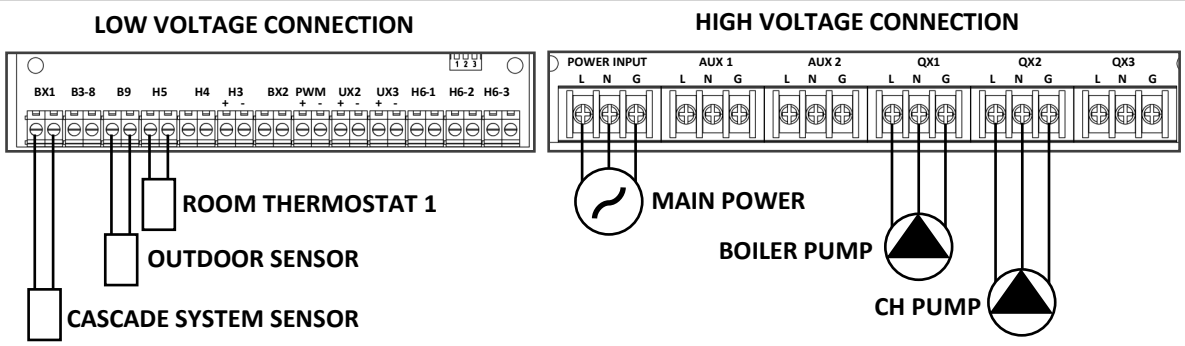
Piping Diagram - Cascade Boiler with Pumps

NOTES:

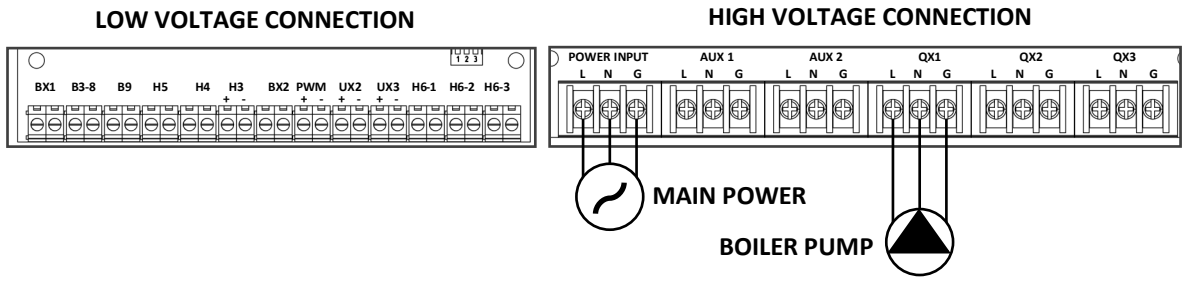
- Primary/Secondary piping must be used (closely spaced tees or low loss header).
- All closely spaced tees shall be within 4 pipe diameters center to center spacing.
- The minimum boiler piping must be at least 1-1/2 inch for RCB500AN model and 2 Inch for RCB750AN and RCB1000AN models. Do not downsize boiler heating loop.
- It is recommended to use a check valve to prevent reverse flow and/or gravity circulation when pump is in off-cycle.
- Boiler pump must be properly sized to ensure proper flow rate through the boiler and related piping (minimum flow rate must be maintained to prevent short cycling)
- Indirect Water Heater Application—Ensure boiler output does not exceed indirect water heater transfer capability.
- System flow rate should always be greater than boiler primary loop flow rate when the boiler is in operation to prevent short cycling.

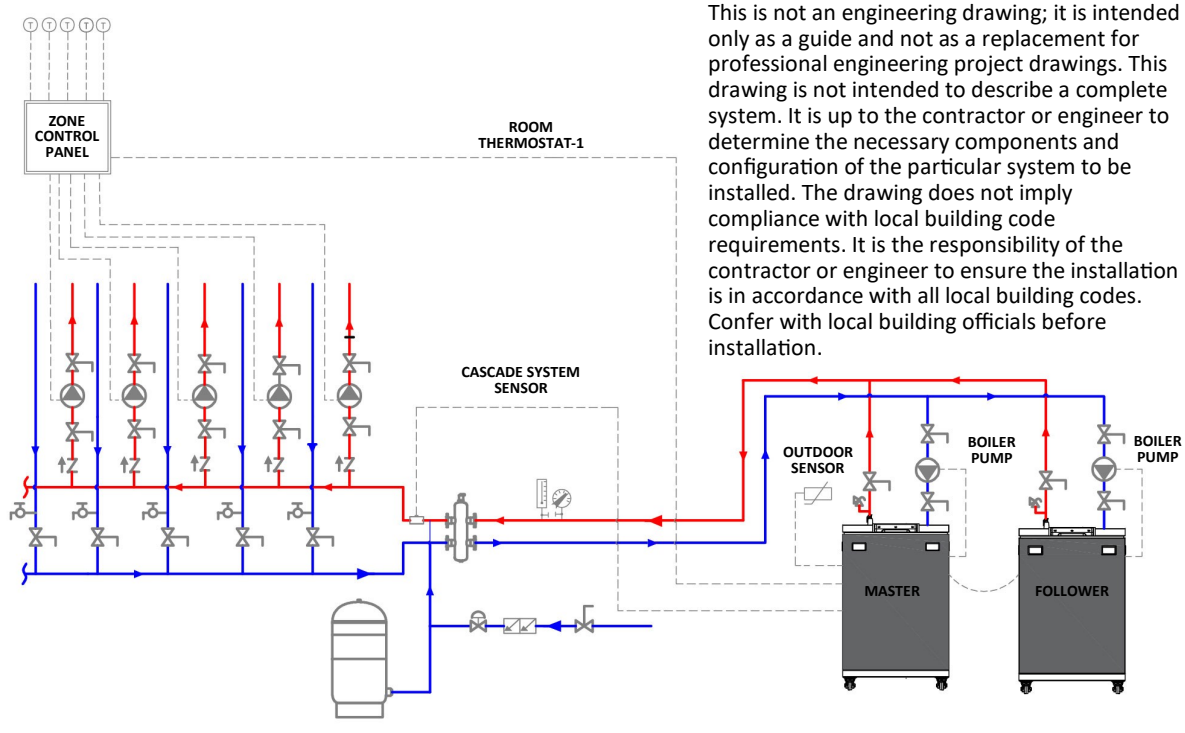
Figure 45

MASTER UNIT



FOLLOWER UNIT





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7.4 Hydraulic Separation

Rinnai requires the use of hydraulic separation between the boiler and central heating system. Hydraulic separation and primary/secondary piping allow two or more circulators in a hydronic system to operate independently, without interfering with flow in connecting piping circuits.

NOTE

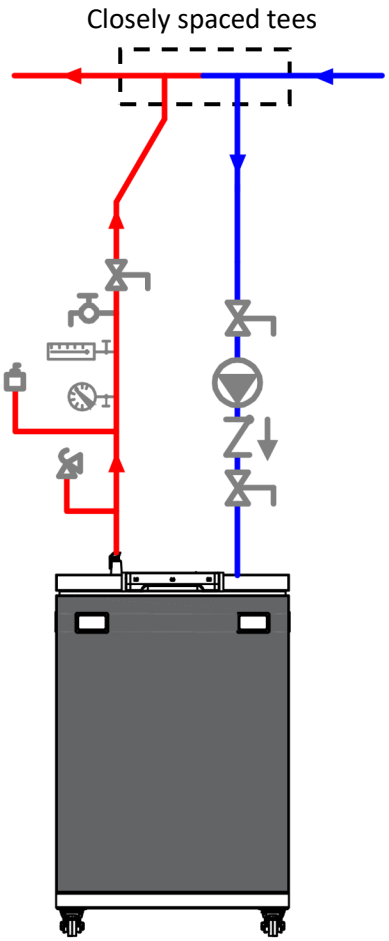
When Rinnai Commercial Boilers are in use with Rinnai air handlers, please reference the air handler Installation and Operation Manual for installation and performance details.

Examples of Hydraulic Separation

Closely spaced tees and low loss headers are common examples of hydraulic separators and are used to separate the boiler loop from the central heating loop.

Figure 46

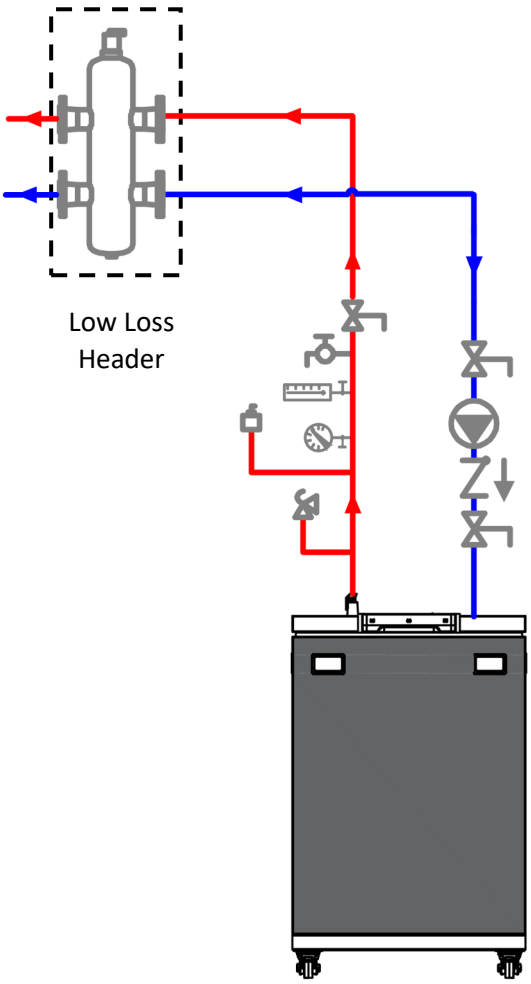
Primary/Secondary Piping



IMPORTANT

For closely spaced tee installations, the separation at the header is to be no more than four pipe diameters.

Low Loss Header

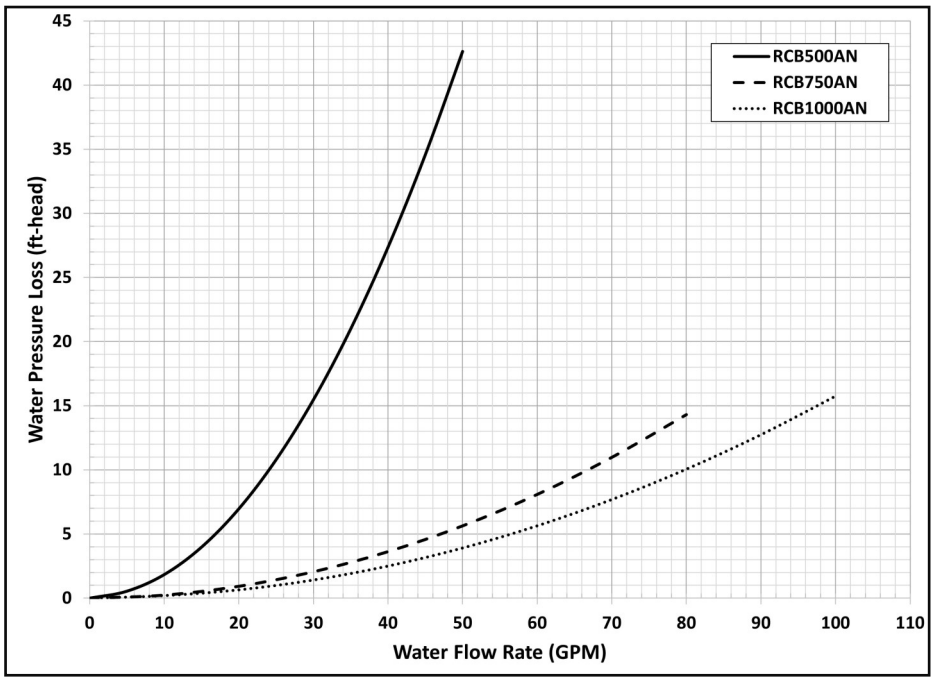


IMPORTANT

If using a low loss header, install the PRV and shut off valves between the boiler and low loss header (as illustrated in the above image).

7.4.1 Pressure Drop and Water Flow Curve with Hydraulic Separation

The Rinnai Commercial Boiler does not have an included boiler pump. An external boiler pump must be installed and sized to the flow rate and pressure drop through the boiler, system piping, and system components. Larger systems, or systems with large pressure drops, should incorporate a form of hydraulic separation, such as closely spaced tees or a low loss header.



Circulator sizing information based on temperature rises:

Table 28: Circulator Sizing Information

Model	Minimum Pipe Size	20°F		25°F		30°F		35°F	
		GPM	Ft/Hd	GPM	Ft/Hd	GPM	Ft/Hd	GPM	Ft/Hd
RCB500	1-1/2 In.	49	41	39	22	32	17	28	13
RCB750	2 In.	73	12	58	8	49	6	42	4
RCB1000	2 In.	97	16	78	10	65	7	55	5

Recommended pipe sizing when using multiple units:

Table 29: Pipe Sizing with Multiple Units

Model	Number of Units / Common Header Pipe Sizes (inches)						
	2	3	4	5	6	7	8
RCB500	3	4	4	4	5	5	6
RCB750	4	4	5	6	6	6	8
RCB1000	4	5	6	6	8	8	8

7.5 Connect the Pressure Relief Valves

⚠WARNING

Water discharged from the pressure relief valve could cause severe burns instantly or death from scalds.

7.5.1 General Guidelines

An approved pressure relief valve is required by the *American National Standard (ANSI Z21.13) and ASME Boiler and Pressure Vessel Code, Section IV (Heating Boilers)* for all water heating systems and shall be accessible for servicing (an approved pressure relief valve is supplied with the boiler). When connecting a pressure relief valve, follow the guidelines below:

- The pressure relief valve must comply with the standard for *Relief Valves and Automatic Gas Shutoff Devices for Hot Water Supply Systems ANSI Z21.22*, the standard *Temperature, Pressure, Temperature and Pressure Relief Valves and Vacuum Relief Valves, CAN1-4.4,* and/or the *ANSI/ASME Boiler and Pressure Vessel Code, Section IV (Heating Boilers)*.
- The pressure relief valve must be rated up to 75 psi for central heating systems, and to at least the maximum Btu/hr of the appliance.
- The discharge from the pressure relief valve should be piped to the ground or into a drain system per local codes.
- The pressure relief valve must be manually operated once a year to check for correct operation.
- The discharge line from the pressure relief valve should pitch downward and terminate 6 in. (152 mm) above drains where discharge will be clearly visible.
- The discharge end of the line shall be plain (unthreaded) and a minimum of 3/4 in. nominal pipe diameter. The discharge line material must be suitable for water at least 180° Fahrenheit.
- If a pressure relief valve discharges periodically, this may be due to thermal expansion in a closed water supply system. Contact the water supplier or local plumbing inspector on how to correct this situation. Do not plug the pressure relief valve.
- The *American National Standard (ANSI Z21.13)* does not require a combination temperature and pressure relief valve for this appliance. However, local codes may require a combination temperature and pressure relief valve.
- Protect pressure relief valve and pressure relief valve discharge line from freezing. Do not plug or restrict flow of the pressure relief valve.

➡ IMPORTANT

An ASME 75 psi safety pressure relief valve is included with the boiler and must be fitted before any shut off valve in the system.

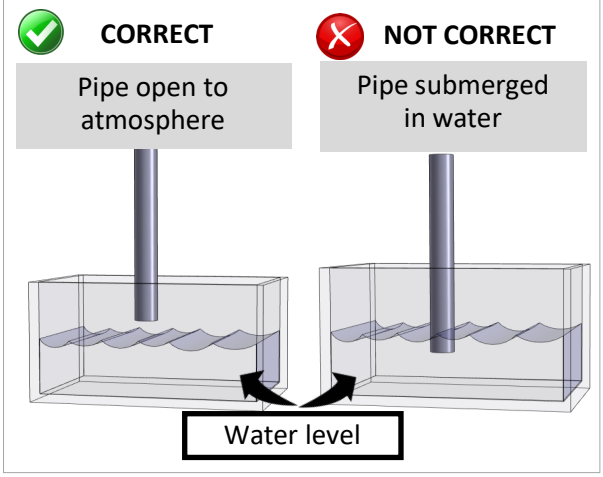
- DO NOT plumb the pressure relief valve with the condensate drain; both must be plumbed independently to drain.
- DO NOT plug the pressure relief valve and do not install any reducing fittings or other restrictions in the relief line. The pressure relief line should allow for complete drainage of the valve and the line.
- DO NOT place any other valve or shutoff device between the pressure relief valve and the boiler.

7.6 Connect the Condensate Drain Line

7.6.1 Guidelines

- Do not plumb the condensate drain with the pressure relief valve; both must be plumbed independently to drain.
- All condensate must drain and be disposed of according to local codes.
- Use only corrosion resistant materials for the condensate drain lines such as PVC pipe or plastic hose.
- The condensate drain pipe (along its entire length) must be at least 3/4 inches.
- The condensate drain pipe should be as short as possible and have a downward pitch.
- Condensation drain lines installed in areas that are subject to freezing temperatures should be wrapped with an approved supplemental heat source. Install per manufacturer's instructions.
- Slope the condensate drain lines toward the inside floor drain or condensate pump.
- If the condensate drain pipe is closed or stuck, the drain water will come out from the side hole on the condensate drain pipe connection.
- The end of the condensate drain pipe should be open to the atmosphere. The end should not be under water or other substances.
- If a floor drain is not available or the drain is above the level of the condensate drain, a condensate pump should be installed.
- Use a tee at the condensate connection with a branch vertically up and open to atmosphere to prevent a vacuum that could obstruct the flow of condensate from the boiler.

Figure 47



- A condensate neutralizer kit is available from Rinnai. The kit allows condensate to flow through neutralizing media that raises the pH of the condensate to a level that will help prevent corrosion of the drain and public sewer system. Refer to section "3.7 Included Accessories" for more information.
- Before operation of the boiler, the condensate collector must be filled with water.
- Refer to neutralizer Installation Manual and local codes for neutralizer installation guidelines.

DO NOT

- **DO NOT connect the condensate drain line with an air conditioning evaporator coil drain.**
- **Boilers have an integrated condensate trap. DO NOT install an external condensate trap.**

EXTERNAL TRAP NOT REQUIRED

Figure 48

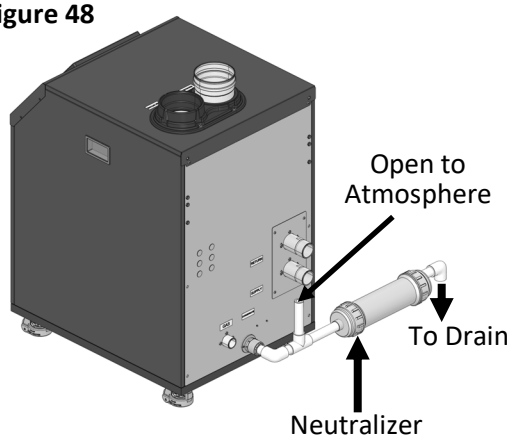
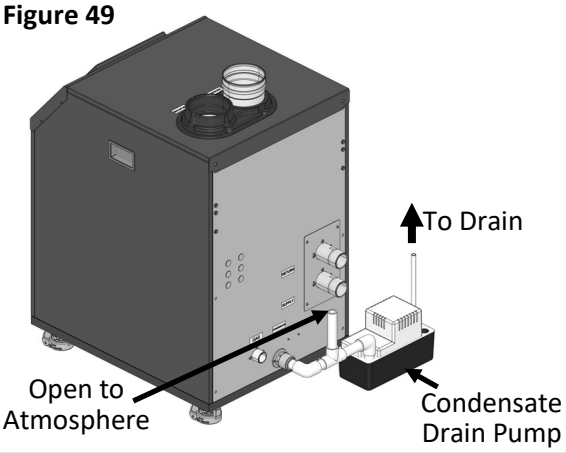


Figure 49



8. DHW System Piping with Indirect Tank

Topics in this section

- Guidelines
- Indirect Tank Control Options

This boiler provides DHW through an indirect tank. The boiler incorporates temperature control features for the boiler and indirect tank controls, including indirect tank heating priority.

8.1 Guidelines

- The piping (including soldering materials) and components connected to this appliance must be approved for use in potable water systems.
- Purge the water line to remove all debris and air. Debris will damage the boiler.
- DHW must not be connected to a system that was previously used with a non-potable water heating appliance.
- DO NOT introduce toxic chemicals such as those used for boiler water treatment to the potable water used for central heating into the DHW system.

⚠ DANGER

Water temperatures over 125° F (52° C) can cause severe burns or scalding resulting in death.

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

- 3 seconds at 140°F (60°C)
- 20 seconds at 130°F (54°C)
- 8 minutes at 120°F (49°C)

Children, disabled, or elderly are at highest risk of being scalded. Feel water before bathing or showering.

8.2 Indirect Tank Control Options

The indirect tank temperature is controlled through either a thermistor (default) or thermostat/aqua-stat.

- Thermistor (Default): The Indirect Tank temperature setpoint range is 104°F to 176°F. Connect the thermistor to the low voltage terminal labeled 'DHW sensor'. When a thermistor is connected, the boiler will automatically recognize the temperature in the tank. Once the setpoint is selected, the boiler will automatically calculate the supply temperature setpoint in order to efficiently satisfy the Indirect Tank demand. The maximum boiler supply temperature is 180°F (82°C). The higher the supply temperature to the tank, the quicker the tank will heat up.
- Thermostat: If thermostat control of the tank is desired, the thermostat connects to the low voltage terminal labeled 'DHW sensor'. Set the Indirect Setpoint to match the setting of the Aqua-Stat mounted on the tank. Once the setpoint is selected, the boiler will automatically calculate the supply temperature setpoint in order to efficiently satisfy the Indirect Tank demand. The maximum boiler supply temperature is 180°F (82°C). The higher the supply temperature to the tank, the quicker the tank will heat up.

Piping Diagram - Single Boiler with Pump and Indirect Tank

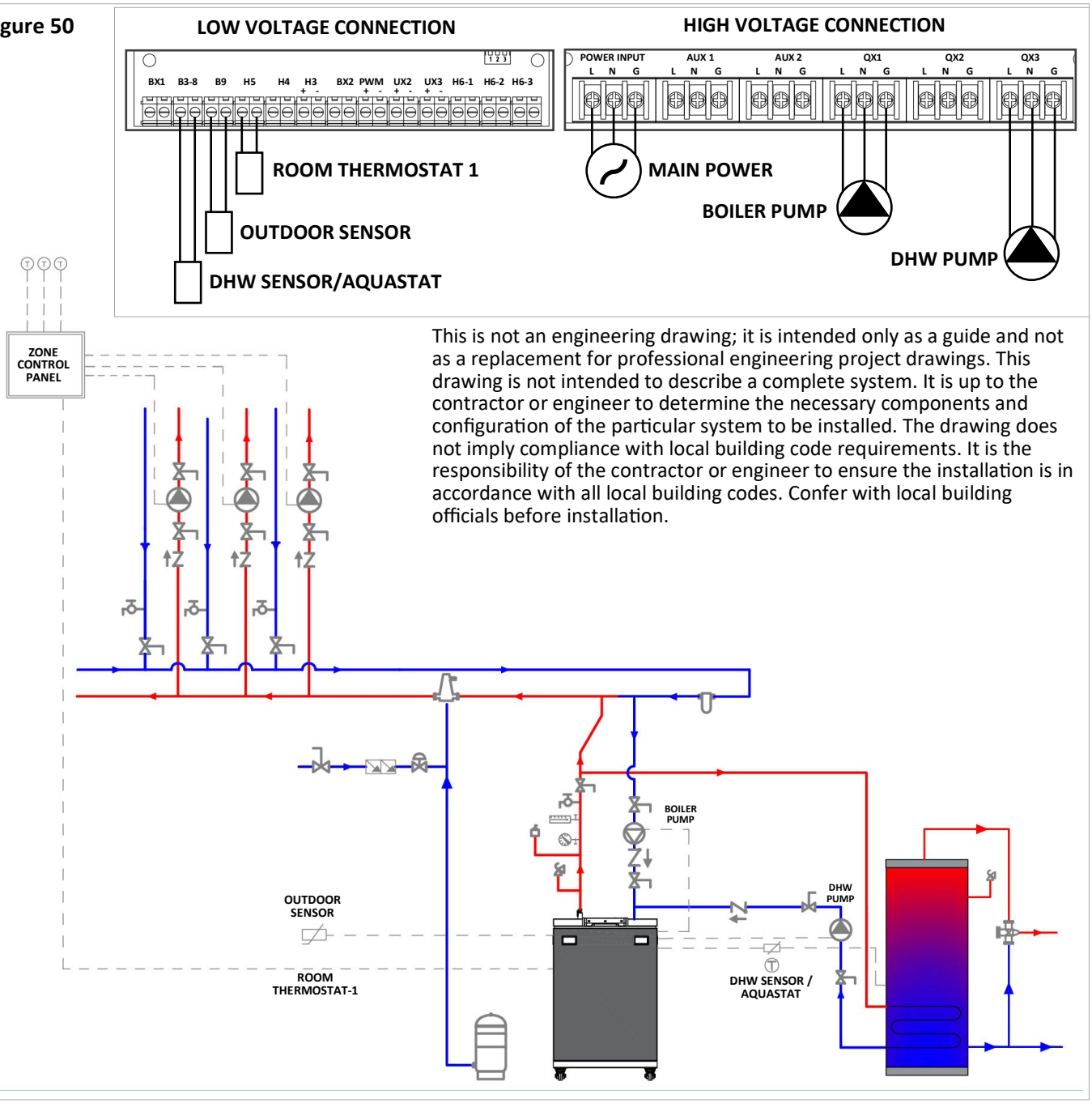
Piped on Primary Loop

NOTES:

- Primary/Secondary piping must be used (closely spaced tees or low loss header).
- All closely spaced tees shall be within 4 pipe diameters center to center spacing.
- The minimum boiler piping must be at least 1-1/2 inch for RCB500AN model and 2 Inch for RCB750AN and RCB1000AN models. Do not downsize boiler heating loop.
- It is recommended to use a check valve to prevent reverse flow and/or gravity circulation when pump is in off-cycle.
- Boiler pump must be properly sized to ensure proper flow rate through the boiler and related piping (minimum flow rate must be maintained to prevent short cycling)
- Indirect Water Heater Application—Ensure boiler output does not exceed indirect water heater transfer capability.
- System flow rate should always be greater than boiler primary loop flow rate when the boiler is in operation to prevent short cycling.

⚠ WARNING Low temperature heating zones must be protected with a mixing valve if running simultaneous DHW and Central Heating.

Figure 50



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Piping Diagram - Single Boiler with Pump and Indirect Tank

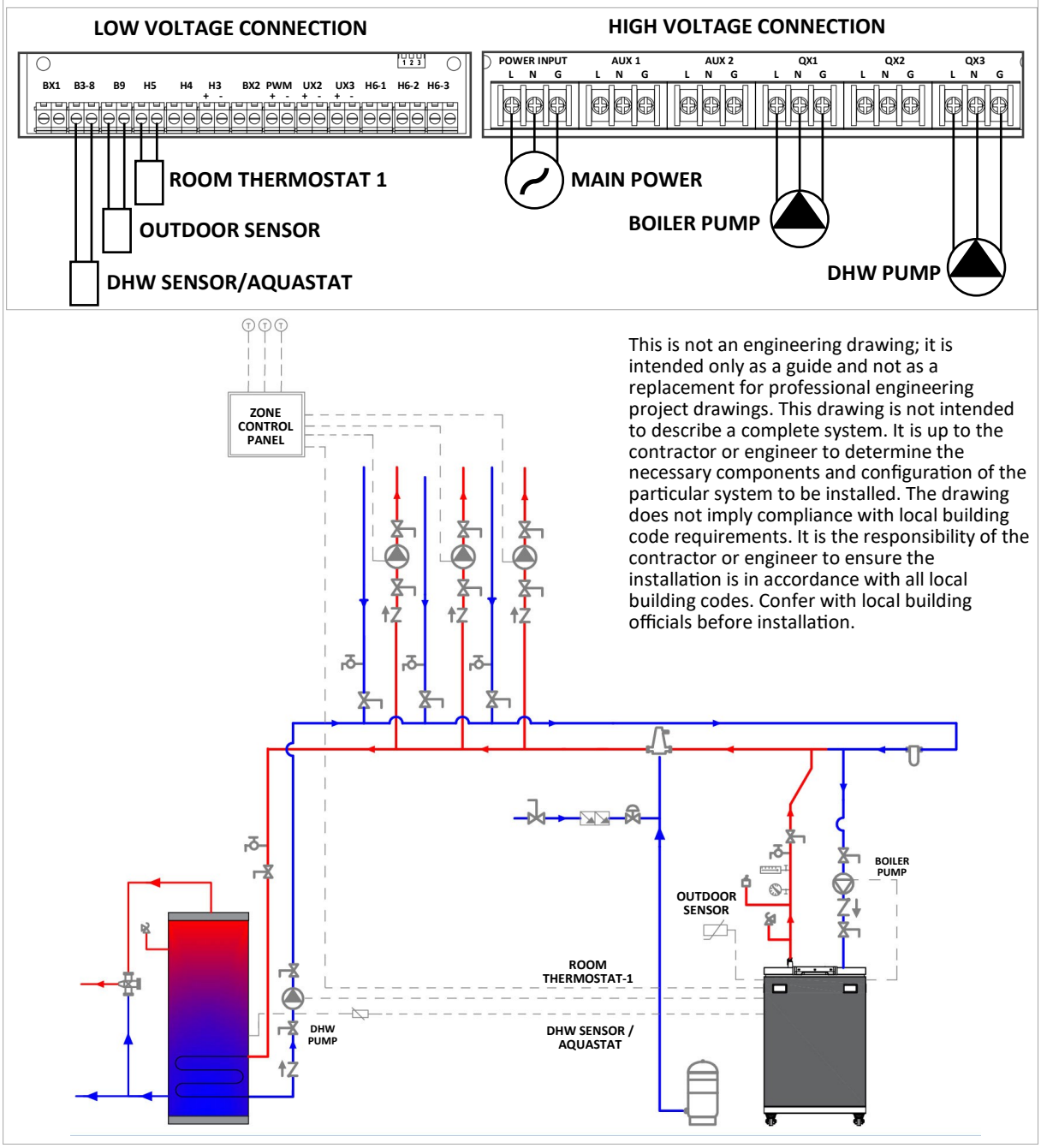
Piped on System Loop

NOTES:

- Primary/Secondary piping must be used (closely spaced tees or low loss header).
- All closely spaced tees shall be within 4 pipe diameters center to center spacing.
- The minimum boiler piping must be at least 1-1/2 inch for RCB500AN model and 2 Inch for RCB750AN and RCB1000AN models. Do not downsize boiler heating loop.
- It is recommended to use a check valve to prevent reverse flow and/or gravity circulation when pump is in off-cycle.
- Boiler pump must be properly sized to ensure proper flow rate through the boiler and related piping (minimum flow rate must be maintained to prevent short cycling)
- Indirect Water Heater Application—Ensure boiler output does not exceed indirect water heater transfer capability.
- System flow rate should always be greater than boiler primary loop flow rate when the boiler is in operation to prevent short cycling.

⚠ WARNING Low temperature heating zones must be protected with a mixing valve if running simultaneous DHW and Central Heating.

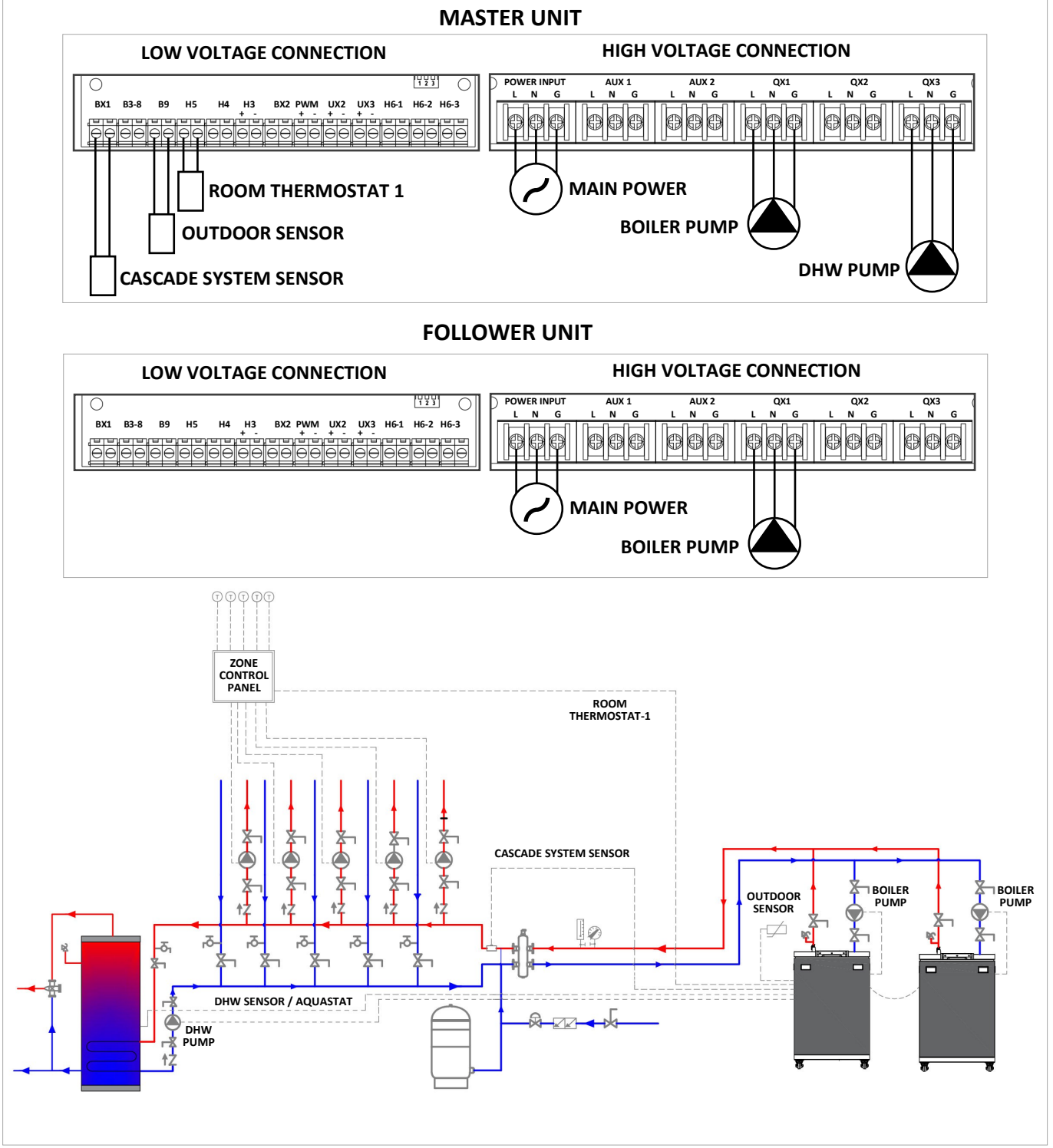
Figure 51



Piping Diagram - Cascade Boiler with Pumps and Indirect Tank

Piped on System Loop

Figure 52



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NOTES:

- Primary/Secondary piping must be used (closely spaced tees or low loss header).
- All closely spaced tees shall be within 4 pipe diameters center to center spacing.
- The minimum boiler piping must be at least 1-1/4 inch. Do not downsize boiler heating loop.
- It is recommended to use a check valve to prevent reverse flow and/or gravity circulation when pump is in off-cycle.
- Boiler pump must be properly sized to ensure proper flow rate through the boiler and related piping (minimum flow rate must be maintained to prevent short cycling)
- Indirect Water Heater Application - Ensure boiler output does not exceed indirect water heater transfer capability.
- System flow rate should always be greater than boiler primary loop flow rate when the boiler is in operation to prevent short cycling.

9. Power Supply

Topics in this section

⚠ WARNING

- Do not use an extension cord or adapter plug with the boiler.
- If an external electrical source is utilized, the boiler, when installed, must be electrically bonded to ground in accordance with the requirements of the authority having jurisdiction or, in the absence of such requirements, with the National Electrical Code, ANSI/NFPA 70, and/or the Canadian Electrical Code Part I, CSA C22.1, Electrical Code.

⚠ CAUTION

To avoid possible electrical shock hazard, turn off electrical power supply to the boiler before:

- Performing repairs or installation to internal components or accessories.
- Making wiring connections and/or changes to the wiring terminals on the boiler.

⚠ CAUTION

- No changes may be made to the wiring of the boiler.
- All connections should be designed in accordance with the applicable regulations.
- Label all wires prior to disconnection when servicing controls. Wiring errors can cause improper and dangerous operation.
- Verify proper operation after servicing.

9.1 Guidelines

When connecting the power supply, follow these guidelines:

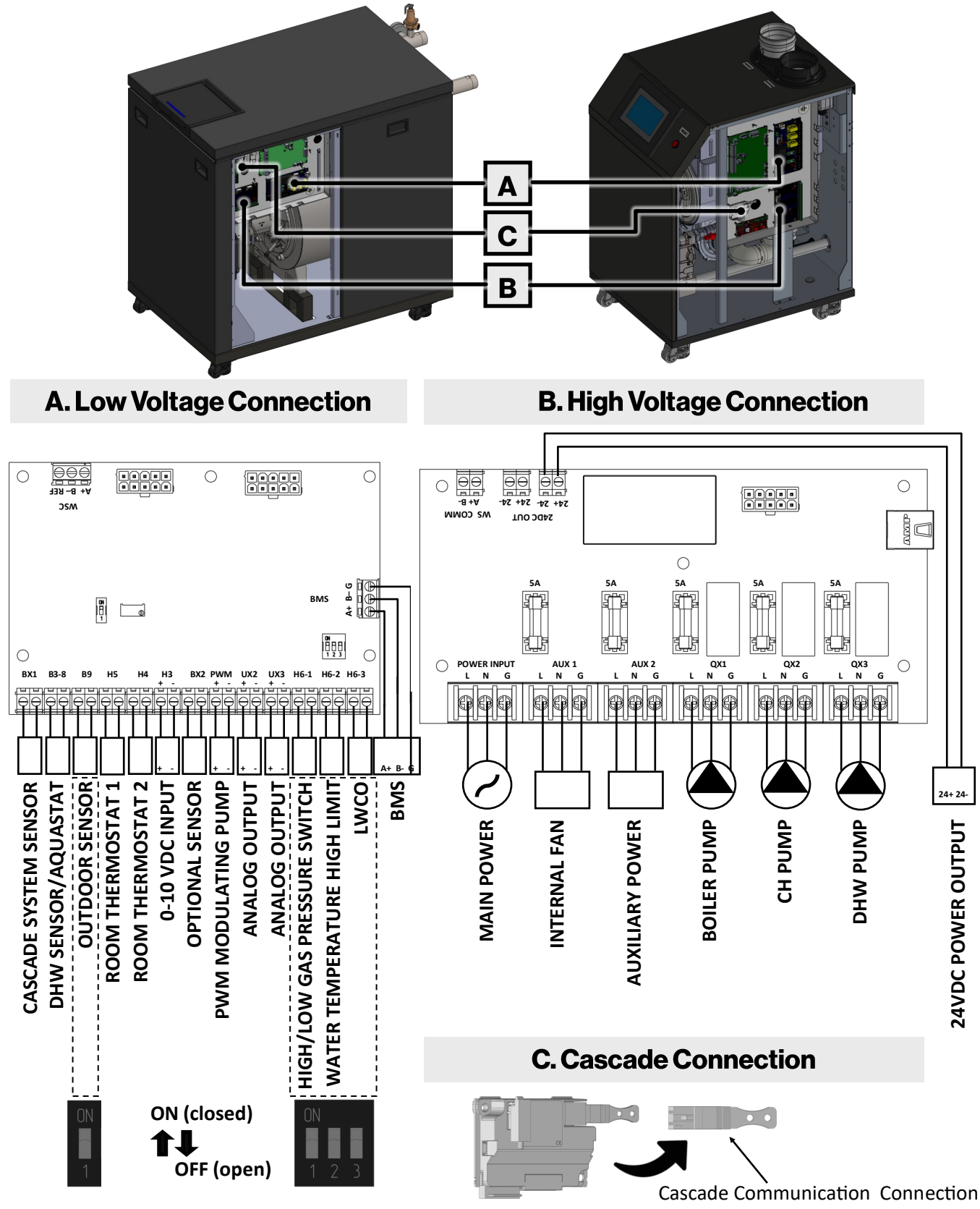
- Connect 120 VAC power wiring to the line voltage power terminals.
- The boiler requires 120 VAC, 60 Hz power from a properly grounded circuit.
- A 20 amp (recommended) fused disconnect or service switch must be installed as required by the code.
- Do not rely on the gas or water piping to ground the boiler. Ground locations are provided inside the boiler.
- The wiring diagram is located on the inside of the boiler front cover.

IMPORTANT

A manually-operated remote switch should be located outside the boiler room door for shutting down the boiler. Consideration should be given to protect the switch against tampering. If there is more than one door to the boiler room, a switch should be located at each door.

9.2 Electrical Connections

Figure 53 View of electrical connections with boiler side panel removed.



1. When connecting an outdoor sensor, ensure to move the DIP switch to the OFF position. The board is supplied with a built-in resistor to provide a false outside temperature in order to eliminate an error code on the screen.
2. When connecting a safety input to terminals H6, ensure to move the DIP switch to OFF position. These DIP switches also can be sued to trouble shoot which safety input is causing the error code.

Low Voltage Connections (Signal Terminals):

- **Cascade Sensor (system supply sensor)**

  Connect the cascade system sensor to the low voltage terminal **BX1**. On a multiple unit installation a system sensor must be used and mounted to the supply pipe of the system loop.

- **DHW Sensor / thermostat**

  Connect the Indirect tank sensor or thermostat (aqua stat) to the low voltage terminal **B3-8**. The control is set at the factory (default setting) to use a tank sensor. In order to use an thermostat please refer to control section on how to set parameters accordingly.

- **Outdoor Temperature Sensor**

  Connect the outdoor sensor to the low voltage terminal **B9**. When an outdoor sensor is connected, the boiler will operate using the outdoor reset curve. The control provides options to set two separate outdoor reset curves for each room thermostat connection. If fixed temperature operation is desired, do not install outdoor sensor. NOTE: This connection is set from the factory with a fixed temperature. Ensure to set the DIP switch to OFF position when using an outdoor sensor.

- **Room Thermostat**

  Connect the room thermostats to the low voltage terminal **H5** and **H4**, for room thermostat 1 and 2, respectively. The room thermostat 1 is enabled from the factory. The room thermostat 2 is disabled from the factory, in order to use this connection, a parameter will need to be enabled in the control (refer to the control section). NOTE: Room thermostat 2 cannot be used if an Indirect Tank is connected to the boiler.

- **Boiler Management System (0-10V Input)**

  Connect the BMS to the low voltage terminal **H3**. An external control may be used to control the setpoint of the boiler. **NOTE:** This control does not take priority over a room thermostat.

- **Optional Sensor**

  Not used (**BX2**)

- **PWM Modulating Pump**

  Not used (**PWM)**

- **UX2 / UX3 Analog Output (0-10V)**

  This connection is used to provide 0-10V signal for boiler modulation. **U2**; **U3**.

- **Safety Inputs**

  Use terminals **H6-1**, **H6-2**, and **H6-3** to connect external safety devices (Gas Pressure Switches, Water Temperature High Limit, and LWCO). NOTE: These terminals are jumped from the factory with DIP switches (On position). Ensure to set the DIP switches to OFF position when connecting external devices.

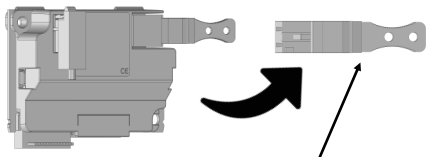
- **Modbus / BACnet**

  Connect the Modbus / BACnet interface module to the low voltage terminal **BMS**.

- **Cascade Connection**

  Connect boilers with each other by using a pair of 22 gauge wires connected to the cascade modules located next to the low voltage terminals. When more than 2 units are connected, the units located between 2 or more boilers will take 2 sets of wires to create a daisy-chain connection.

Figure 54

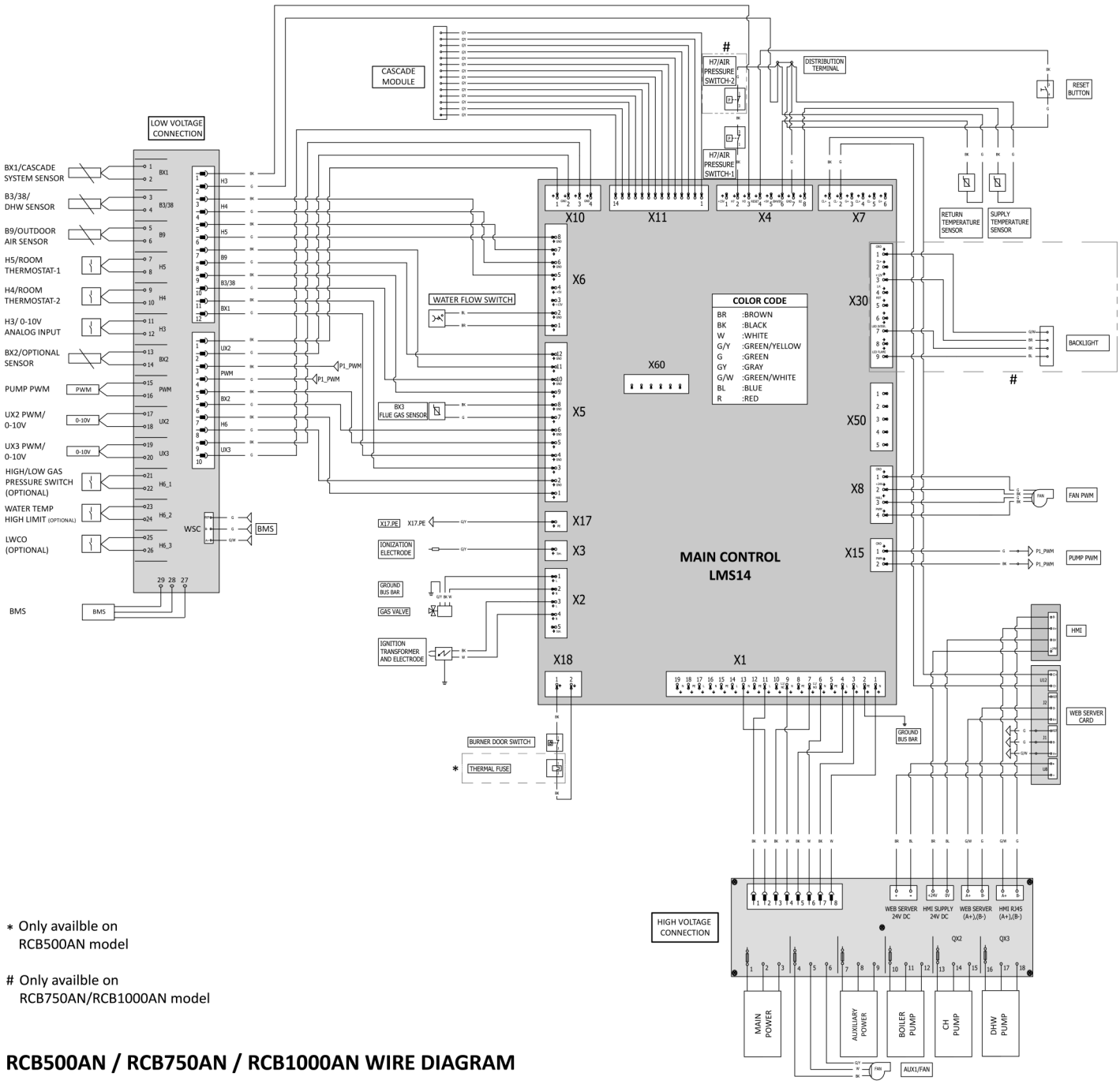


Cascade Communication Connection

⚠ CAUTION

- Rinnai recommends the use of spade connectors or similar components for wiring to the screw terminals.
- Ensure that the insulation of the wire is not exposed to contact any other components besides the terminal.
- If exposed wiring contacts to any other exposed wiring or metal components, an electrical short may occur and cause damage to the PCB or other connected components.
- Use proper size of screwdriver for preventing the screw on the terminal from breaking.
- Do not use an electric or torque screwdriver for wiring on the PC Board.
- Wiring should pass through the grommets provided at the bottom of the boiler.
- Use the proper diameter and size of wiring.

Wiring Diagram



∗ Only availble on RCB500AN model

Only availble on RCB750AN/RCB1000AN model

RCB500AN / RCB750AN / RCB1000AN WIRE DIAGRAM

REV.00 MAY 14, 2024

Table 30: Connectors

Connector	Pin	Marking	Description	Voltage
X1	1	N	Main Power Supply	120VAC
	2	PE		
	3	L		
	4	L	QX2 / CH Pump	120V AC
	5	PE		
	6	N		
	7	L1/NO	QX3 / DHW PUMP	120V AC
	8	PE		
	9	N		
	10	L1/NC	Not Used	
	11	L	QX1 / Boiler Pump	120V AC
	12	PE		
	13	N		
	14	L	AUX2 / Auxiliary Power	120V AC
	15	PE		
	16	N		
	17	L	Fan Power	120V AC
	18	P		
	19	N		
X2	1	L	Gas Valve Power	120V AC
	2	N		
	3	L	Spark Generator	120V AC
	4	N		
	5	Ion	Not used	-
X3	-	Ion	Ionization Current	-
X4	1	+15V	Not used	-
	2	H7	Air Pressure Switch	-
	3	H3	0-10V Input	-
	4	RESET	Reset	-
	5	+5V	Not Used	-
	6	BX4/B7	Return Sensor	-
	7	GND	Ground	-
	8	B2	Supply Sensor	-
X5...	1	H6	External Safety Input	-
	2			
	3	-	BX1 / Cascade Sensor	-
	4	GND		

Connector	Pin	Marking	Description	Voltage
...X5	5	-	BX2 / Optional Sensor	-
	6	GND		
	7	-	BX3 / Flue Gas Sensor	-
	8	GND		
	9	-	B3 /38 / DHW Sensor	-
	10	GND		
	11	-	B9 / Outdoor Sensor	-
	12	GND		
X6	1	-	H1 / Pressure Sensor	-
	2	GND	H1 / Pressure Sensor	
	3	+15V	Not Used	
	4	+5V	H1 / Pressure Sensor	
	5	-	H5 / Room Thermostat 1	-
	6	GND		
	7	-	H4 / Room Thermostat 2	-
	8	GND		
X7	1	CL+	BSB	-
	2	CL-	BSB	-
	3	G+	Not used	-
	4-6	-	Not used	-
X8	1	GND	Fan PWM	-
	2	+24		
	3	HALL		
	4	PWM		
X10	1	-	UX2 - PWM / 0-10V	-
	2	GND		
	3	-	UX3 - PWM / 0-10V	-
	4	GND		
X11	1-14	-	Cascade Module	-
X15	1	GND	PUMP PWM	-
	2	PWM		
X17	-	PE	Ionization Ground	-
X18	1	-	Internal Safety Input	120V AC
	2	-		
X30	1-9	-	LED Backlight	
X50	1-5	-	Not Used	-
X60	1-6	-	Not Used	-

9.3 Post-Power Supply Connection Checklist

☐	Confirm that the electricity is supplied from a 120 VAC, 60 Hz power source and is in a properly grounded circuit.
☐	Confirm that an extension cord or adapter plug has NOT been used with the boiler.
☐	Confirm connection terminals are connected correctly.

10. Commissioning

Topics in this section

- Safety Precautions
- Filling Process
- Deaeration Process

THIS SECTION IS INTENDED FOR THE INSTALLER

This boiler must be commissioned by a licensed professional. Installer qualifications: A trained and qualified professional must install the appliance, inspect it, and leak test the boiler before use. The warranty will be voided due to any improper installation. The trained and qualified professional should have skills such as: Gas sizing; Connecting gas lines, water lines, valves, and electricity; Knowledge of applicable national, state, and local codes; Installing venting through a wall or roof; and training in installation of condensing boilers.

Boiler commissioning is a procedure used after boiler installation to ensure the system and boiler were installed correctly and ready for operation.

10.1 Safety Precautions

⚠ WARNING

Failure to properly commission the boiler as described in this section may result in unreliable and unsafe burner operation and reduced component life.

IMPORTANT

- Work on the boiler must be carried out by a licensed professional, using correctly calibrated instruments with current test certification. The commissioning instructions are intended for licensed professionals who have the necessary knowledge and are approved for working on heating and gas systems.
- The fan will operate when power is initially provided to perform a safety check on the boiler.
- The boiler and its individual shut off valve must be disconnected from the gas supply piping system during any pressure testing of that system at test pressures in excess of 1/2 PSI (3.5 kPa).
- Before the boiler is fired for the first time:
  - Ensure the boiler and system are fully de-aerated
  - Purge the gas line between the gas meter and boiler
  - Prime the pump (as described in this section)

10.2 Filling Process

IMPORTANT

Do not fill the boiler unless permanent power is available. Freeze protection is not available if the boiler is not filled, air purged, and supplied with power and gas.

1. Ensure all boiler components are installed correctly.
2. Open the air vent inside the boiler.
3. Power on the boiler.
4. Open the fill valve on the filling circuit.
5. Check the pressure on the pressure gauge. Fill the boiler to a minimum of 14.5 PSI (100 kPa) water pressure and a maximum of 70 PSI (483 kPa).
6. Check the heating system for leaks.
7. Begin the deaeration process shown in the next section (“10.3 Deaeration Process”).

10.3 Deaeration Process

Deaeration is an effective method of purging air from the boiler after the system has been filled or serviced.

1. Fill the boiler to a minimum of 14.5 PSI (100 kPa) water pressure and a maximum of 70 PSI (483 kPa).
2. The deaeration process should be performed for at least 15 minutes if all three (3) pumps terminals are being used.
3. After approximately one week, all air in the system should be eliminated via the air separator in the piping system.

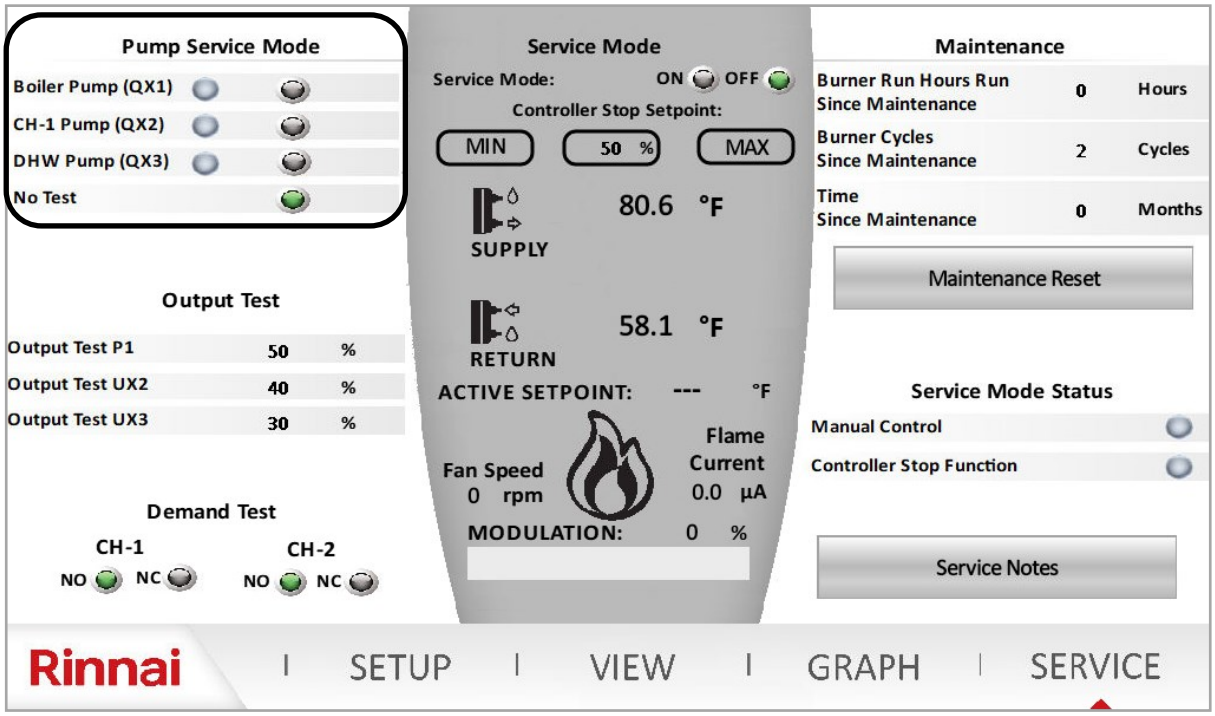
⚠ WARNING

DO NOT operate the boiler without performing deaeration process. Perform deaeration during commissioning or if any part of the system has been opened or disconnected. Failure to properly deaerate the boiler and system may result in damage to the boiler, which is not covered by the boiler warranty.

Press the SERVICE icon on the boiler home page. It will prompt the user to enter a password. In order to access the SERVICE page, the control will prompt the user to select the access level and enter password. The password for Installer is **9419**. The technician and Engineer user levels can ONLY be accessed by a Rinnai employee.

Use the Pump Service Mode to manually energize each pump individually to remove air from the system. It is recommended to run each pump for a minimum of five (5) minutes in order to purge the air from the system. Run the Boiler Pump to remove air from the primary boiler circuit. If and indirect tank is being used, also run the DHW Pump to remove air from the DHW piping. Then move to each central heating zones to remove air from the system side (Run CH-1 Pump and/or DHW Pump (If assigned for a CH-2 zone).

NOTE: It is critical that the Pump Service Mode is set to No Test when the deaeration service has been completed.



11. Post-Installation Checklist

Complete the following checklist when boiler installation is complete. You should be able to answer YES to each question. If you answer NO, installation is not complete. Refer to the applicable section in this manual for additional information.

Table: Post-Installation Checklist

INSTALLATION LOCATION	YES	NO
Have you verified the unit, vent and air intakes meet the clearance requirements?	❒	❒
VENTING	**YES**	**NO**
Have all corrosive compounds been removed from around the combustion air intake of the boiler?	❒	❒
Have you followed the combustion air requirements to provide sufficient combustion air for the boiler?	❒	❒
Are the correct venting products for the installed model being utilized?	❒	❒
Have you installed the vent screen(s) for Schedule 40 PVC/CPVC vent applications if applicable?	❒	❒
Have you verified the vent system does not exceed maximum length?	❒	❒
SYSTEM PIPING	**YES**	**NO**
Have the water lines been purged of all debris and the filter cleaned?	❒	❒
Have you verified the supply and return water lines to the boiler are not interchanged?	❒	❒
Does the water supply to the boiler have adequate pressure? Is it free of chemicals? Did you verify it does not exceed total hardness that will damage the heat exchanger?	❒	❒
Have you verified that no toxic chemicals were introduced to the potable water?	❒	❒
Did you drain the boiler if not intended to be used immediately?	❒	❒
Have water quality issues (if any) been addressed?	❒	❒
Have you performed the leak and pressure test for the boiler and plumbing system?	❒	❒
CONDENSATE DRAIN	**YES**	**NO**
Did you verify the condensate drain pipe is as short as possible and has a downward pitch toward the drain or condensate pump?	❒	❒
Is all condensate drained and disposed of as per local codes?	❒	❒
Did you use ONLY corrosion resistant materials for the condensate drain lines?	❒	❒
Did you verify the condensate drain pipe along its entire length is at least the same diameter as the drain line?	❒	❒
Did you check to ensure the condensation drain lines are protected from freezing?	❒	❒
Have you verified the condensate drain line is not plumbed with the pressure relief valve?	❒	❒
Have you confirmed the condensate drain line is not connected with an air conditioning evaporator coil drain?	❒	❒
This boiler has an integrated condensate trap. Have you verified that an external condensate trap is not installed?	❒	❒
Have you confirmed the end of the condensate drain pipe is open to atmosphere?	❒	❒
Has an air gap been installed in the condensate drain line?	❒	❒

Post-Installation Checklist (Continued)

PRESSURE RELIEF VALVE (PRV)	YES	NO
Does the PRV comply with the standard for *Relief Valves and Automatic Gas Shutoff Devices for Hot Water Supply Systems ANSI Z21.22,* and/or the standard *Temperature, Pressure, Temperature and Pressure Relief Valves and Vacuum Relief Valves, CAN1-4.4*?	❒	❒
Did you verify the heating system PRV is rated to 75 PSI?	❒	❒
Is the discharge from the PRV piped to the ground or into a drain system as per local codes?	❒	❒
Is the discharge line from the PRV installed downward and does it terminate 6 in. (152 mm) above the drains?	❒	❒
Is the discharge end of the line plain (unthreaded) and a minimum of 3/4 in. diameter?	❒	❒
Is the discharge line material suitable for at least 180° F water?	❒	❒
Did you take measures to protect the PRV and PRV discharge line from freezing?	❒	❒
Have you verified the PRV **is not** plumbed with the condensate drain line?	❒	❒
Have you verified the PRV **is not** plugged and that reducing fittings, valves, or other restrictions are not installed in the relief line?	❒	❒
GAS SUPPLY	**YES**	**NO**
Did you verify the gas system is appropriately sized?	❒	❒
Did you verify the boiler is rated for the gas type supplied?	❒	❒
Have you performed a gas line and connection leak test?	❒	❒
Did you install a manual gas control valve in the gas line to the boiler?	❒	❒
Is the inlet gas pressure within limits?	❒	❒
Did you purge the gas line of any debris before connecting the boiler?	❒	❒
POWER SUPPLY	**YES**	**NO**
Did you confirm that the electricity is supplied from 120 VAC, 60 Hz power source and is in a properly grounded circuit?	❒	❒
Did you confirm that an extension cord or an adapter plug has NOT been used with the boiler?	❒	❒
COMMISSIONING	**YES**	**NO**
Was the boiler filled to 14.5 - 70 PSI?	❒	❒
Was the deaeration process performed on the boiler?	❒	❒

12. Operation

Topics in this section

- Start-Up Information
- Control Panel
- Error and Diagnostic Codes
- Perform Combustion Analysis
- Operating Information

12.1 Start-Up Information

IMPORTANT

- On initial startup of the system, it is necessary to manually run the pumps from the service page to remove all air from the system piping and boiler. Failure to properly deaerate the boiler and system may result in damage to the boiler, which is not covered by the boiler warranty.
- It can take up to a week before all the air has disappeared from a newly-filled and pressurized installation. During the first week of operation, noises can be heard which indicate the presence of air. The automatic air vent in the boiler and air separator in the heating system will remove the air, which means the water pressure will reduce some during this period; therefore, additional water is necessary to maintain proper pressure in the heating system. Water pressure needed for operation:
  - The boiler is in normal operation between 14.5 - 70 PSI (100 - 483 kPa).
  - The maximum pressure permitted inside the heat exchanger is 160 PSI (1103 kPa).
  - The pressure relief valve supplied with the boiler is rated to 75 PSI (517 kPa).

12.2 Control Panel

12.2.1 Home Page / Dashboard

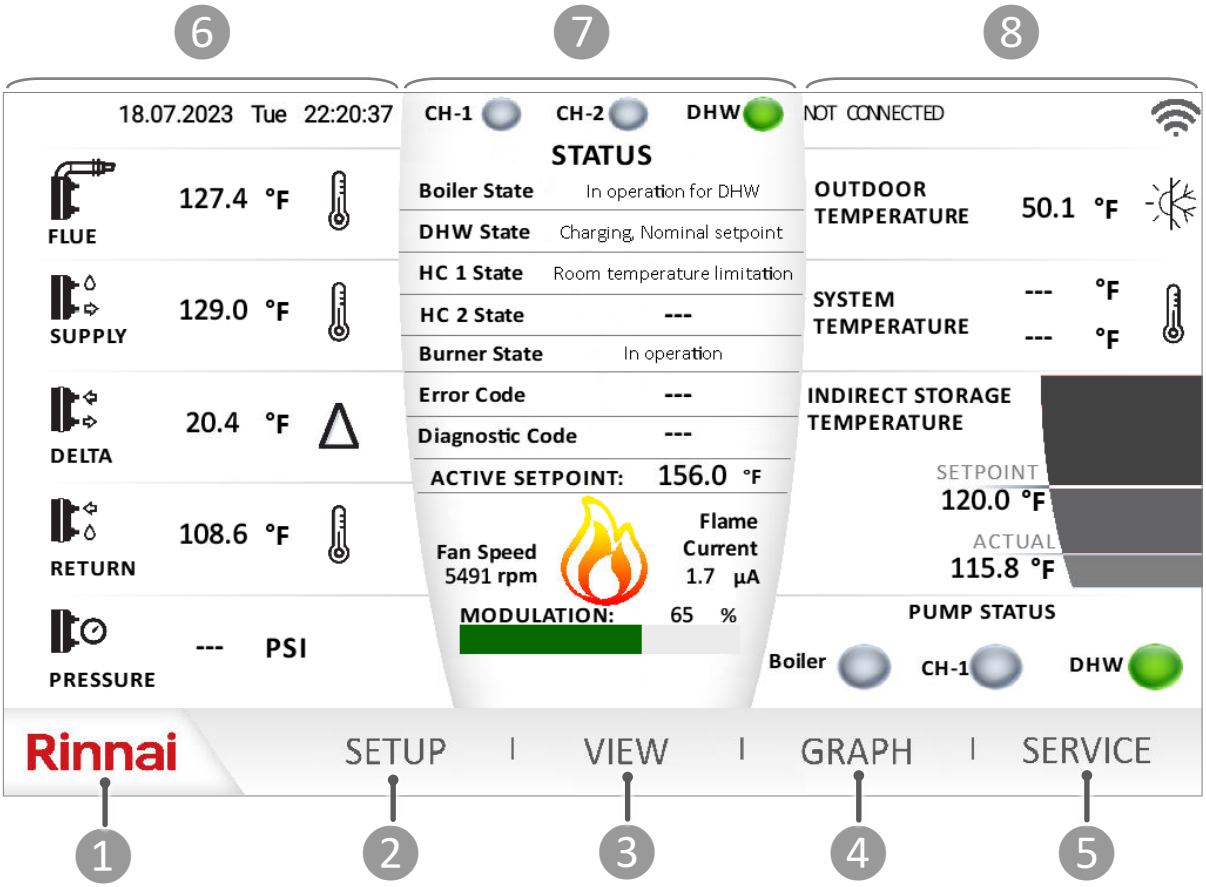


Table 31: Home Screen

ITEM	DESCRIPTION	FUNCTION
1	RINNAI	The Rinnai logo will return the user to the home page (shown). This page will provide information regarding the boiler operation.
2	SETUP	This page will allow the user to adjust and customize parameters, such as outdoor reset curve(s), and others. **NOTE:** This page should only be accessed by qualified service technician.
3	VIEW	The view screen shows the state of the appliance and its internal components (temperature values, switches condition, water pressure, fan speed, and all other inputs and outputs).
4	GRAPH	The graph page allows the user to monitor real time system information (temperature, pressure, pump operation, and fan speed).
5	SERVICE	This page allows for a different user level selection by choosing user from the dropdown menu and enter a password to access parameters from basic to critical functions.
6	LEFT PANE	This pane provides information about boiler internal temperature and pressure. It also incudes date and time. NOTE: Date and time can be changed from the setup page.
7	CENTER PANE	This pane shows information about demand, boiler modulation, error messages, setpoint, fan speed, and ionization current. The center pane changes color to show the boiler status: Dark Gray - standby; Light Gray - Running; Red - Error Code (hard lockout), Yellow - Error Code (soft lockout); Orange - service reminder
8	EXTERNAL	This pane shown information about external devices connect to the boiler (outdoor sensor, system sensor, indirect tank sensor/thermostat, pump status, and Wi-Fi).

12.2.2 Setup

To access the SETUP page, the control will prompt the user to select the access level and enter password. The password for Installer is **9419**. The technician and Engineer user levels can ONLY be accessed by a Rinnai employee.

Quick Setup

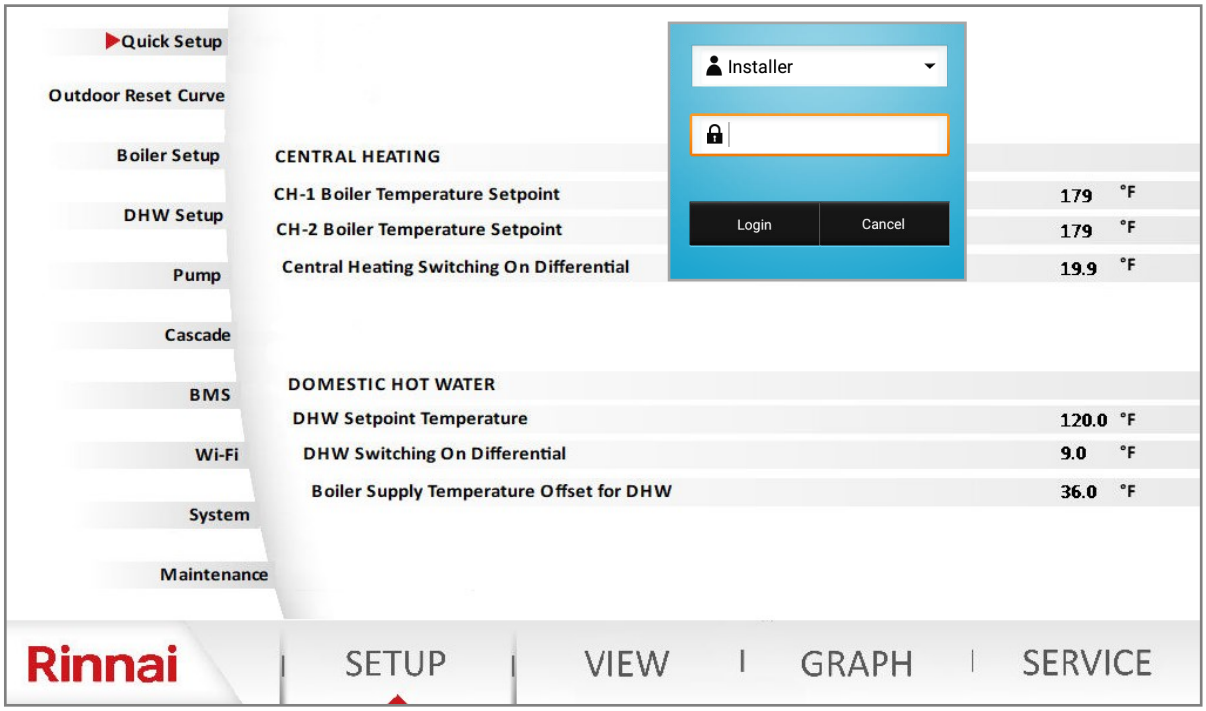


Table 32: Setup Page

NO.	DESCRIPTION	FUNCTION
		CENTRAL HEATING
1	CH-1 Boiler Temperature Setpoint	This parameter is used to set the boiler supply temperature setpoint for CH-1 manually if an outdoor sensor is not used. When an outdoor reset function is desired use the Outdoor Reset Curve page to set the boiler min and max temperatures. Range: 86°F [30°C] - 180°F [82°C]; Default: 180°F [82°C]
2	CH-2 Boiler Temperature Setpoint	This parameter is used to set the boiler supply temperature setpoint for CH-2 manually if an outdoor sensor is not used. When an outdoor reset function is desired use the Outdoor Reset Curve page to set the boiler min and max temperatures. Range: 86°F [30°C] - 180F [82°C]; Default: 180°F [82°C]
3	Central Heating Switching On Differential	This parameter is used to set the temperature differential when the boiler will light up the burner. For instance if the boiler setpoint is 180°F [82°C] and this parameter is set to 20°F [11°C], the boiler will ONLY fire when the actual supply temperature is below 160°F [71°C]. Range: 0°F [0°C] - 36°F [20°C]
		DOMESTIC HOT WATER
4	DHW Temperature Setpoint	This parameter is used to set the temperature setpoint for the DHW indirect tank. Range: 104°F [40] - 176°F [80°C]; Default: 120°F [49°C]
5	DHW Switching On Differential	This parameter is used when a DHW indirect tank is controlled via a sensor. This parameter sets the temperature differential when the DHW tank will call for heat demand. For instance if the Indirect tank setpoint is 120°F [49°C] and this parameter is set to 9°F [5°C], the boiler will ONLY activates the DHW demand when tank temperature is below 111°F [44°C]. Range: 0°F [0°C] - 36°F [20°C]
6	Boiler Supply Temperature Offset for DHW	When there is a DHW demand, the boiler temperature setpoint will be the DHW temperature setpoint + this parameter. For instance if DHW temperature setpoint is 120°F [49°C] and this parameter is set to 36°F [20°C] the boiler supply setpoint for DHW will be 156°F [69°C]. Range: -4°F [-20°C] - 108°F [60°F], Default: 36°F [20°C]

12.2.3 Outdoor Reset

An outdoor sensor is provide with the boiler. The boiler control allows for two customizable outdoor reset curves for each head demand from room thermostats one and two. The graph below represents outdoor reset curve for heating circuit one. To set the second outdoor reset curve press on the arrow at the bottom right corner of the page. Set the minimum and maximum boiler supply temperatures along with minimum and maximum outside temperatures to set outdoor reset curves. The warm weather shutdown is the temperature value at which the boiler will ignore the call for heat. Use the outdoor reset power icon to enable or disable the outdoor reset curve. When an outdoor sensor is not being used the boiler will operate using the maximum boiler temperature value set in this table. When the outdoor reset curve is not intended to be used, the boiler setpoint can be set from the quick setup page and the outdoor reset curve should be disabled. See next page for outdoor reset temperature guideline.

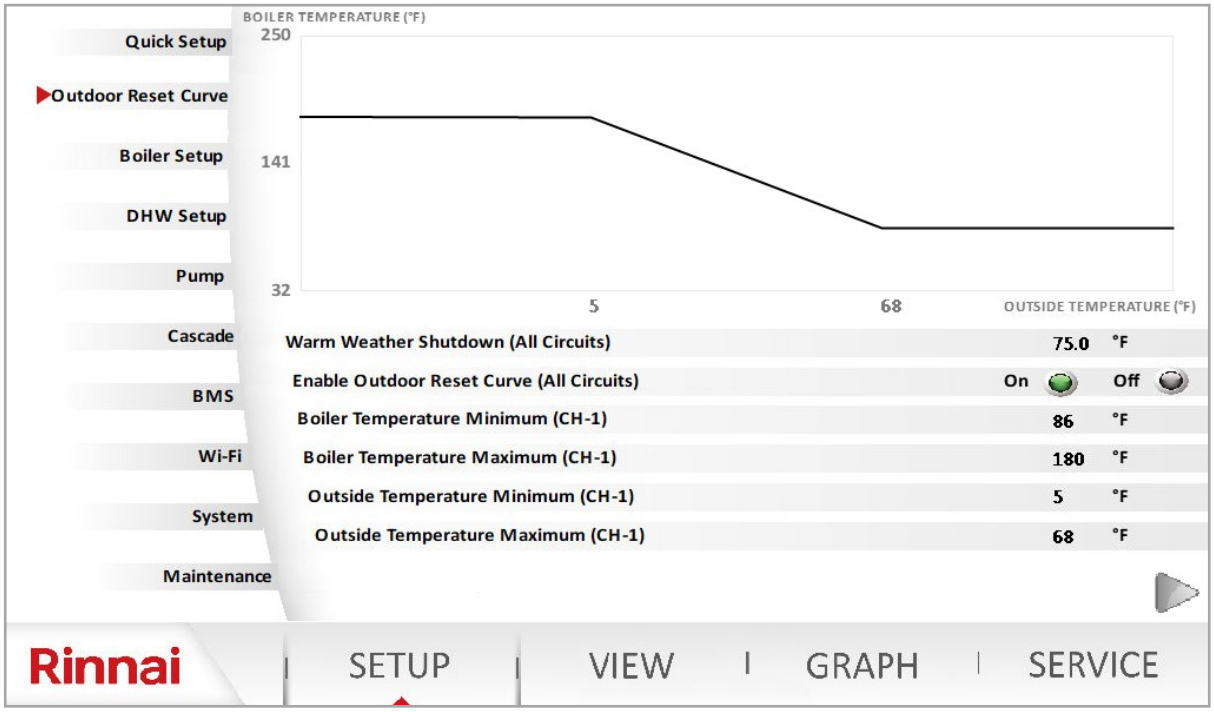


Table 33

NO.	DESCRIPTION	FUNCTION
1	Warm Weather Shutdown (All Circuits)	This parameter is used to set the outside temperature to disable boiler operation for central heating due to warm weather. Range: 46°F [8°C] - 86°F [30°C]; Default: 75°F [24°C]
2	Enable Outdoor Reset Curve (All Circuits)	This parameter is used to enable or disable the outdoor reset curve function. Range: On - Off; Default: On
3	Boiler Temperature Minimum (CH-1)	This parameter sets the minimum boiler supply temperature for the outdoor reset curve. Range: 86°F [30°C] - Boiler Temperature Maximum; Default: 86°F [30°C]
4	Boiler Temperature Maximum (CH-1)	This parameter the sets the maximum boiler supply temperature for the outdoor reset curve. Range: Boiler Temperature Minimum - 180°F [82°C]; Default: 180°F [82°C]
5	Outside Temperature Minimum (CH-1)	This parameter sets the minimum boiler outside temperature for the outdoor reset curve. Range: -40°F [-40°C] - Outside Temperature Maximum; Default: 5°F [-15°C]
6	Outside Temperature Maximum (CH-1)	This parameter the sets the maximum outside temperature for the outdoor reset curve. Range: Boiler Temperature Minimum - Warm Weather Shutdown; Default: 68°F [20°C]

Outdoor reset is a built-in function to help maximize the efficiency of the boiler. The design of this function is to adjust the target temperature of the boiler relative to the outdoor ambient temperature via the flexible outdoor reset curve options included in the boiler setup page. The outdoor ambient temperature is observed via the provided outdoor temperature sensor.

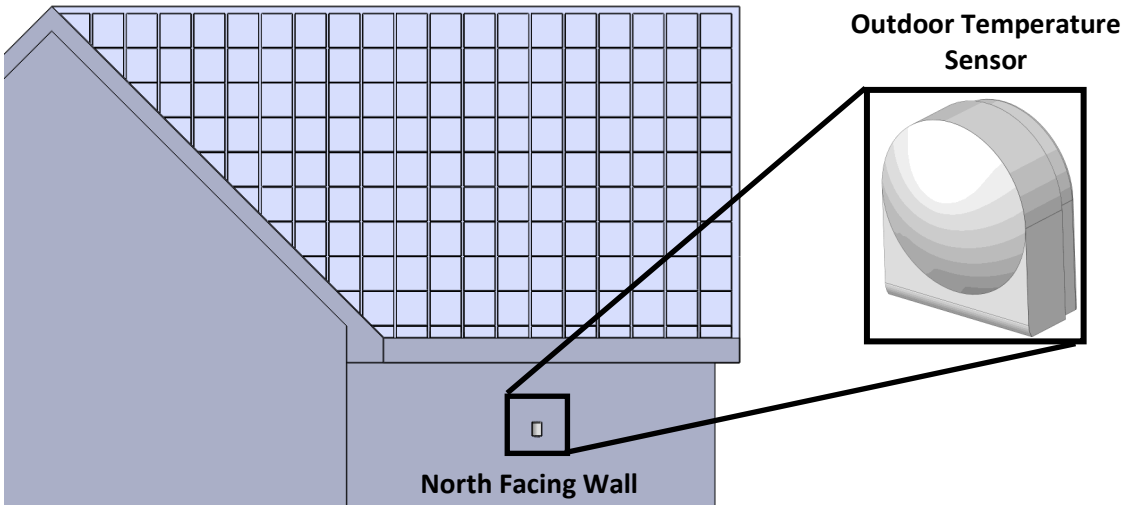
NOTE: When a DHW indirect tank is installed as a heating zone, and the outside temperature may exceed the maximum limit of warm weather shutdown (86°F), the outdoor reset must be disabled.

During warm weather shutdown, the boiler will not provide any heat to the indirect tank if it is connected to the boiler as a heating zone.

12.2.4 Outdoor Temperature Sensor

The outdoor temperature sensor (1 kOhm) should be mounted to avoid direct sun light (to prevent obtaining false reading of the outdoor temperature) ideally on a North facing wall of the house. The sensor should also be mounted away from any vent, duct, or other device that may create an artificial heat source. The sensor should then be wired back to the outdoor temperature sensor terminal on the boiler. Refer to the wiring sections for more information.

Figure 55



12.2.5 Outdoor Reset Curve Temperature Guidelines

Below are some typical target temperatures for various heat emitters. These are basic guidelines; thus, check with the emitter manufacturer or consult your heating design engineer.

Table 34

Type of Heat Emitter	Typical Minimum Supply Temperature	Typical Maximum Supply Temperature
Hydronic Air Handler	120 - 140°F	140 - 180°F
Unit Heater	130 - 140°F	160 - 180°F
Base Board Convectors	100 - 140°F	140 - 180°F
Cast Iron/Panel Radiator	90 - 120°F	140 - 180°F
Undermount Radiant	100 -120°F	120 - 150°F

12.2.6 Boiler Setup

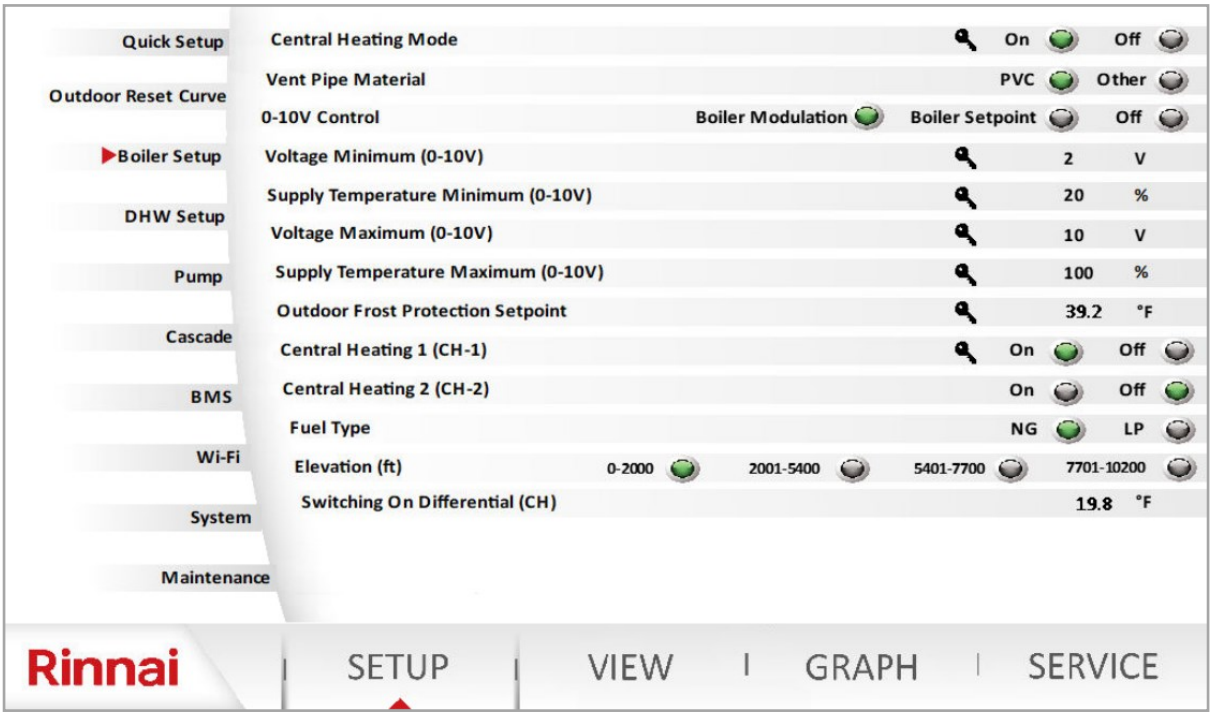


Table 35

NO.	DESCRIPTION	FUNCTION
		Boiler Setup
1	Central Heating Mode	This function enables or disables the central heating mode (Room Thermostat 1, Room Thermostat 2, and 0-10V input functions). Range: On - Off; Default: On **NOTE:** Requires Technician or Engineer level for access.
2	Vent Pipe Material	This parameter will set the flue temperature limit based on the material used for venting. When set to PVC, the boiler will start to reduce modulation when the vent temperature reaches 140°F [60°C] and will shutdown at 149°F [65°C]. When set as others (CPVC, PP, and FNS), the boiler will reduce modulation when the vent temperature reaches 198°F [92°C] and will shutdown and lockout at 207°F [97°C]. Ensure to use the proper venting material and appropriate parameter setting depending on the application to prevent damage to the vent pipe or boiler short cycling. Range: PVC- Others. Default: PVC
3	0-10V Input Control	This parameter is used to select the two different modes of 0-10V operation or disable the 0-10V function. Range: Boiler Modulation, Boiler Setpoint, Off; Default: Off. NOTE: It is recommended to avoid running low voltage wires in parallel to high voltage wiring to avoid induced voltage. False voltage signal will cause the boiler to operate when it is not needed.
4	Voltage Minimum (0-10V)	This parameter sets the minimum voltage for the 0-10V input function. Range: 0V - 10V; Default: 2V. **NOTE:** DO NOT change the default setting. Requires Technician or Engineer level for access.
5	Supply Temperature Minimum (0-10V)	This parameter sets the minimum boiler supply temperature or modulation percentage for 0-10V input operation. For instance when the input voltage is set to 2V, the boiler supply setpoint is 86°F [30°C]. Range: 86°F [30°C] - Supply Temperature Maximum (0-10V); Default: 86°F [30°C]
6	Voltage Maximum (0-10V)	This parameter sets the maximum voltage for the 0-10V input function. Range: 0V - 10V; Default: 10V. **NOTE:** DO NOT change the default setting. Requires Technician or Engineer level for access.
7	Supply Temperature Maximum (0-10V)	This parameter sets the maximum boiler supply temperature or modulation percentage for 0-10V input operation. For instance when the input voltage is set to 10V, the boiler supply setpoint is 180°F [82°C]. Range: Supply Temperature Minimum (0-10V); - 180°F [82°C] - Default: 180°F [82°C]
8	Outdoor Frost Protection Setpoint	This function will alert the boiler about an outside freeze condition based on the set value. The boiler will monitor the supply temperature before activating the freeze protection mode. Range: 40°F [4] - 60°F [16]. **NOTE:** Requires Technician or Engineer level for access.

Table 35 continue

NO.	DESCRIPTION	FUNCTION
Boiler Setup (cont.)		
9	Central Heating 1 (CH-1)	This parameter enables or disables CH-1 room thermostat operation. Range: On - Off; Default: On. **NOTE:** Do not disable this parameter.
10	Central Heating 2 (CH-2)	This parameter enables or disables CH-2 room thermostat operation. Range: On - Off; Default: Off. **NOTE:** ONLY enable this parameter if you intend to replace the DHW zone with a second CH zone. The DHW pump needs to be assigned as CH-2 pump in the pump setup page for proper operation.
11	Fuel Type	This function will assign the proper fan speed for NG or LP gas depending on the selection. Range: NG - LP; Default: LP
12	Elevation	This function will assign the proper fan speed for each elevation selection. Range: 0-2000 ft; 2001-5400 ft; 5401-7700 ft; 7701-10200ft; Default: 0-2000ft
13	Central Heating Switching On Differential	This parameter is used to set the temperature differential when the boiler will light up the burner. For instance if the boiler setpoint is 180°F [82°C] and this parameter is set to 20°F [11°C], the boiler will ONLY fire when the actual supply temperature is below 160°F [71°C]. Range: 0°F [0°C] - 36°F [20°C] ; Default: 20°F [11°C]

12.2.7 DHW Setup

Table 36

NO.	DESCRIPTION	FUNCTION
DHW Setup		
1	DHW Operating Mode	This function enables or disables DHW operation (Aquastat or Sensor). Range: On - Off; Default: On **NOTE:** Requires Technician or Engineer level for access.
2	DHW Sensor	This parameter allows the user to choose either a 10K Ohm sensor (thermistor) or an Aquastat (thermostat) to control the DHW indirect tank demand. In Aquastat mode the control is looking for either an open (no demand) or closed (demand) contact. In Sensor mode the control is reading the actual temperature against the setpoint to determine heat demand. When a sensor is accidentally selected and aquastat is used, the boiler will present an error code when aquastat is closed. Range: Aquastat - Sensor; Default: Aquastat

Table 36 continue

DHW Setup

NO.	DESCRIPTION	FUNCTION
DHW Setup (cont.)		
3	DHW Temperature Setpoint	This parameter allows the user to set the DHW indirect tank temperature. NOTE: When an aquastat is used ensure to match this parameter with the setting on the mechanical aquastat to ensure proper operation. The control will use this value to set the boiler supply temperature for DHW. Range: 104°F [40°C] - 176°F [80°C]; Default: 120°F [49°C].
4	DHW Priority Time	This parameter sets the DHW priority time in case there are both DHW and Central Heating demands. The control will prioritize DHW demand for the set time and then switch to central heating demand. The control will switch between the two demands until one or both are satisfied. Range: 10 - 600 Minutes; Default: 30 Minutes
5	Boiler Supply Temperature Offset for DHW	When there is a DHW demand, the boiler temperature setpoint will be the DHW temperature setpoint + this parameter. For instance if DHW temperature setpoint is 120°F [49°C] and this parameter is set to 36°F [20°C] the boiler supply setpoint for DHW will be 156°F [69°C]. Range: -4°F [-20°C] - 108°F [60°F], Default: 36°F [20°C]
6	DHW Switching On Differential	This parameter is used when a DHW indirect tank is controlled via a sensor. This parameter sets the temperature differential when the DHW tank will call for heat demand. For instance if the Indirect tank setpoint is 120°F [49°C] and this parameter is set to 9°F [5°C], the boiler will ONLY activate the DHW demand when tank temperature is below 111°F [44°C]. Range: 0°F [0°C] - 36°F [20°C]; Default: 9°F [5°C]
7	Boiler Pump with DHW	This parameter will allow the user to enable the boiler pump to operate during a DHW demand. For instance, if the DHW indirect tank is piped in the system loop as one of the heating zones, the boiler pump can be enabled to deliver the heat to the system loop. NOTE: It is critical to ensure low temperature zones are protected via mixing valve to prevent overheating due to higher setting of boiler supply temperature for DHW. Range: On - Off; Default: Off

12.2.8 Pump Setup

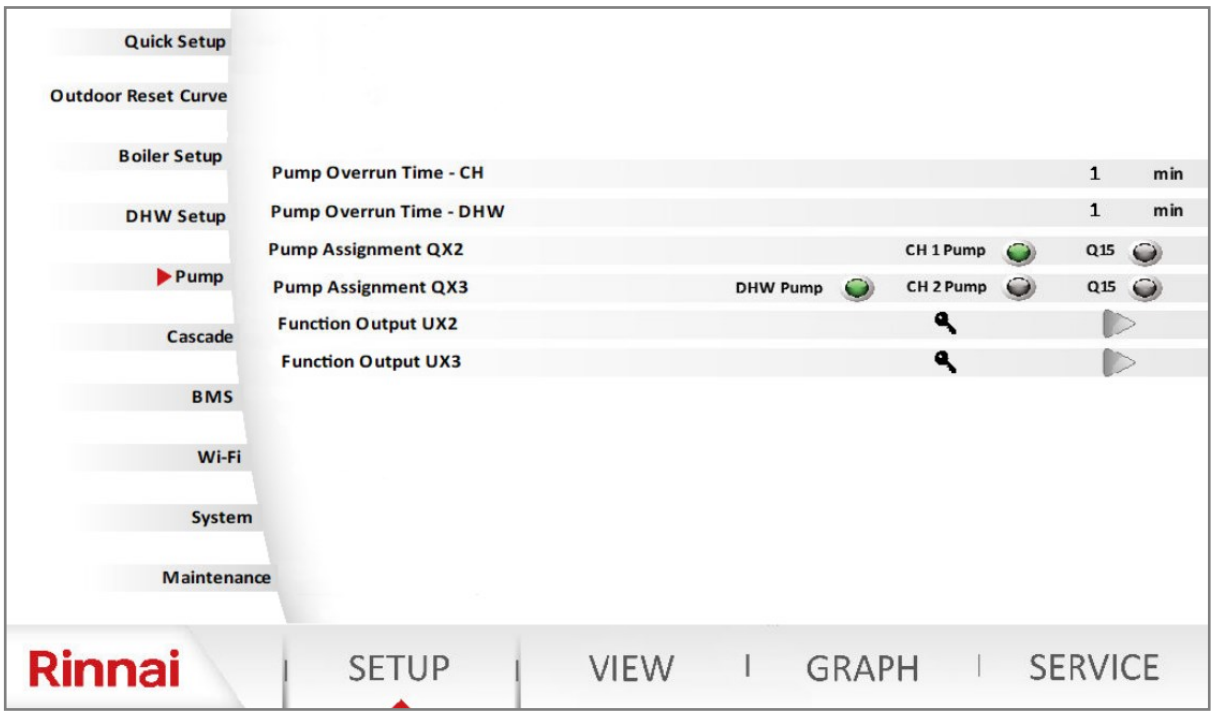


Table 37

NO.	DESCRIPTION	FUNCTION
		Pump Setup
1	Pump Overrun Time - CH	Allows boiler and CH pumps to continue to run after the flame is turned off, when a CH demand is terminated. Range: 0-240 Minutes; Default: 1 Minute
2	Pump Overrun Time - DHW	Allows the DHW pump to continue to run after the flame is turned off, when a DHW demand is terminated. Range: 0-240 Minutes; Default: 1 Minute
3	Pump Assignment QX2	This parameter can be used to assign the CH-1 Pump to run with a room thermostat call (room thermostat 1) or Using a 0-10V for Boiler Temperature control. When using Room thermostat, it should to set to CH-1 Pump, when using 0-10V for boiler temperature control it should be set to Q15 pump. Range: CH-1 Pump, Q15. Default: Q15
4	Pump Assignment QX3	This parameter can be used to assign the DHW pump terminal to be used as a DHW pump , CH-2 pump, or Q15 (0-10V operating for boiler temperature control). In case a DHW indirect tank is not used and a second heating zone is desired, this parameter can be set to CH-2. Also CH-2 thermostat needs to be enabled from the boiler setup page. Range: Boiler Pump; CH-1 Pump; CH-2 Pump; DHW Pump; Cascade Pump Q25; Default: DHW Pump
5	Function Output UX2	When Burner Modulation is selected, this parameter can be used to read boiler status and modulation information via a 0-10V signal. 0-0.5V - Boiler in error State; 0.5V - 1V - Boiler in Off state, standby, pre-purge, post-purge...; 1V - 10V—represents 0% - 100% modulation. Range: None, Boiler Pump, DHW Pump, CH-1 Pump, CH-2 Pump, Burner Modulation; Default: Burner Modulation.
6	Function Output UX3	When Burner Modulation is selected, this parameter can be used to read boiler status and modulation information via a 0-10V signal. 0-0.5V - Boiler in error State; 0.5V - 1V - Boiler in Off state, standby, pre-purge, post-purge...; 1V - 10V—represents 0% - 100% modulation. Range: None, Boiler Pump, DHW Pump, CH-1 Pump, CH-2 Pump, Burner Modulation; Default: Burner Modulation.

12.2.9 Cascade

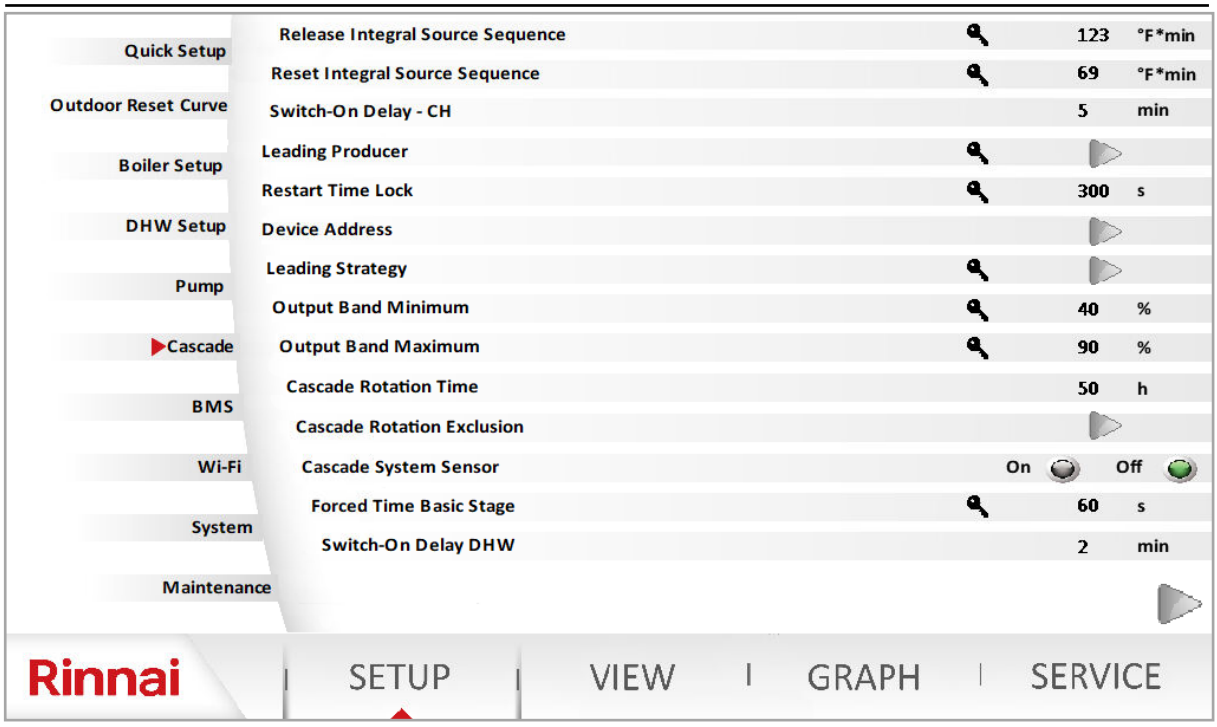


Table 38

NO.	DESCRIPTION	FUNCTION
Cascade		
1	Released Integral Source Seq	Controls the units release on a cascade system. The higher the value the quicker is the release. Range: 0-500 C*min; Default: 51 C*min
2	Reset Integral Source Seq	Controls when the units are shut-down in a cascade system When the value is decreased, heat sources are switched off at a faster rate. Range: 0-500 C*min; Default: 21 C*min
3	Switch-On Delay - CH	Sets the wait time to release units in a cascade system during a heat demand. For instance when a unit is released for a heat demand in a cascade system due to the modulation load, this unit will wait for this set time before igniting the burner. Range: 0-120 Minutes; Default: 5 Minutes
4	Leading Producer	This parameters sets the first unit that will be energized in a cascade system. The boiler automatically follows the lead-lag strategy according to the operating hours. Range: 1-8; Default: 1 (Master Boiler)
5	Restart Time Lock	The restart lock prevents a deactivated heat source from being switched on again. It is released again only after the set time elapsed. This prevents too frequent switching actions of the heat source and ensure stable plant operating states. Range: 0-1800 Seconds; Default: 300 Seconds
6	Device Address	This parameter sets the cascade address of the device. Range: Standalone; Master, Follower 1, …, Follower 7. Default: Standalone
7	Leading Strategy	This parameter sets the cascade leading strategy. Range: :Late on, early off; Late on, late off; Early on, late off. Default: Early on, late off. **Late on, early off** - Additional boilers are switched on as late as possible (output band max) and switched off again as early as possible (output band max). This means that the **smallest possible number of boilers are in operation**, or additional boilers operate with short on times. **Late on, late off** - Additional boilers are switched on as late as possible (output band max) and switched off again as a late as possible (output band min). This leads to the **smallest possible number of boiler switched on/off actions** for the boiler. **Early on, late off**—Additional boilers are switched on as early as possible (output band min) and switched off again as late as possible (output band min). This means that the **largest possible number of boilers are in operation**, or additional boilers operate with the longest possible on time.
8	Output Band Minimum	The heat sources are switched on and off according to the selected lead strategy while giving consideration to the preset output band. NOTE: To deactivate the impact of the output band, the limit values must be set to 0% and 100%, and the lead strategy to be selected is Late on, late off. Range: 0-100%; Default: 40%
9	Output Band Maximum	The heat sources are switched on and off according to the selected lead strategy while giving consideration to the preset output band. NOTE: To deactivate the impact of the output band, the limit values must be set to 0% and 100%, and the lead strategy to be selected is Late on, late off. Range: 0-100%; Default: 90%
10	Cascade Rotation Time	This parameter sets the time for leading source rotation is a cascade system. The boiler loads in a cascaded system can be influenced by defining the order of a lead lag boiler. Range: 10-990 Hours; Default: 50 Hours

Table 38 continue

NO.	DESCRIPTION	FUNCTION
		Cascade (cont.)
11	Cascade Rotation Exclusion	This parameter excludes unit from cascade rotation. Range: None, First, Last, First and Last. Default: None
12	Cascade System Sensor	Assigns cascade supply sensor BX1 connection as B10, cascade system sensor. Range: On-Off; Default: Off NOTE: This parameter must be on for a proper operation of a cascade system.
13	Forced Time Basic Stage	Unit will run at min rate and wait for the set time before starting to modulate . Range: 0-1200 Seconds; Default: 60 Seconds
14	Switch-on Delay - DHW	Sets the wait time to release units in a cascade system during a DHW demand. For instance when a unit is released for a DHW demand in a cascade system due to the modulation load, this unit will wait for this set time before igniting the burner. Range: 0-120 Minutes; Default: 2 Minutes
15.	Cascade Master	As soon as more than one heat source is present, the controller with unit address 1 assumes the role of cascade master. It activates the required function and shows the additional operating menus with the cascaded related parameters. Detection of the master role can be automatic (Auto) or can be switched as fixed (always). Range: Auto-Always; Default: Auto.
16	Setpoint Compensation	This function will add an offset value to the boiler setpoint above the cascade system sensor temperature setpoint. Range: 1-100; Default: 36°F [20°C]

12.2.10 BMS

Table 39

NO.	DESCRIPTION	FUNCTION
BMS		
1	Modbus Address	Sets the Modbus Address for BMS. Range: 0-2; Default: 1
2	Baud Rate	Sets the Baud Rate for BMS. Range: 4800, 9600, 19200, 38400, 115200; Default: 1115200
3	Parity	Sets the Parity for BMS. Range: None, Even, Odd; Default: Even
4	Stop Bits	Sets the Stop Bits for BMS. Range: 1 Bit - 2 Bits; Default: 1 Bit
5	Apply Setting	This parameter is used to apply the settings after making changes to the parameters listed above.

12.2.11 Wi-Fi

Table 40

NO.	DESCRIPTION	FUNCTION
BMS		
1	Wi-Fi or Ethernet Enable/Disable	This Parameter is used to enable or disable Wi-Fi or Ethernet connectivity. Range: On-Off; Default: Off. **NOTE:** ONLY enable Wi-Fi when connecting the boiler to a router.
2	Forget Network	This function is available in case there is a need to forget the current Wi-Fi connectivity and connect to a new Wi-Fi. Press the icon to forget network.
3	Ethernet Settings	This parameter is used to configure Ethernet connection (enable or disable DHCP). Use this function to configure IP address, Subnet Mask, and Default Gateway.

12.2.12 System

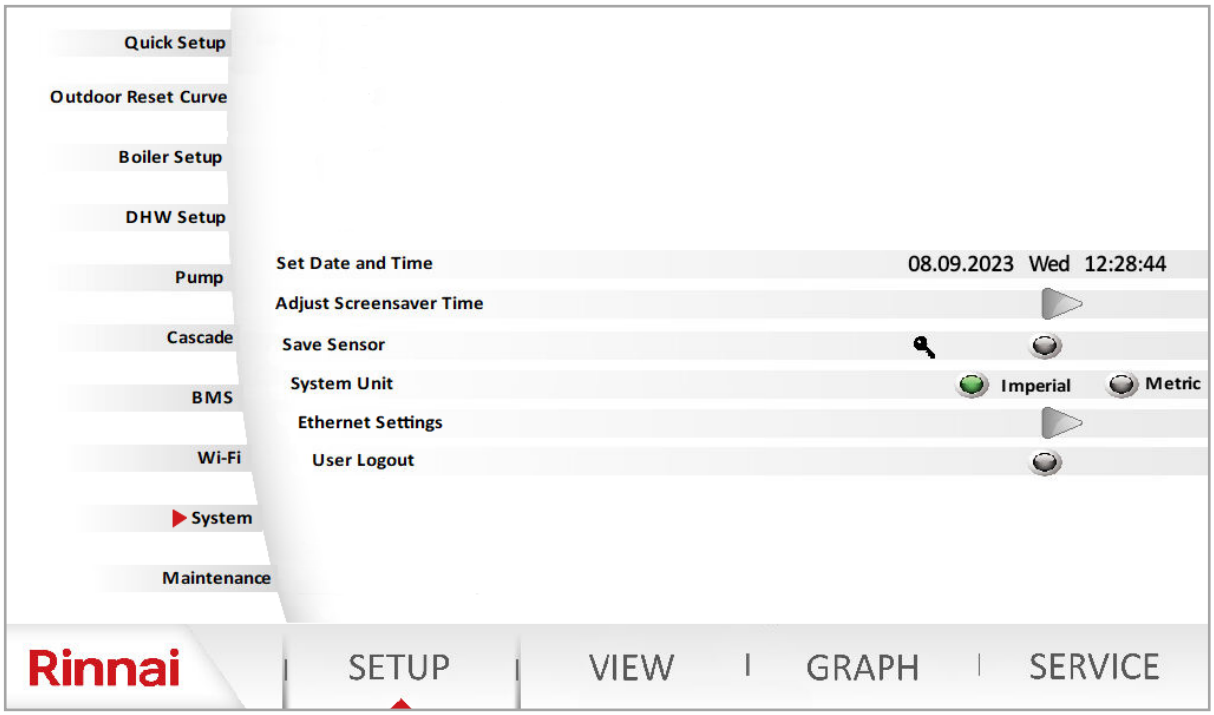


Table 41

NO.	DESCRIPTION	FUNCTION
	System	
1	Set Date and Time	This function can be used to set the current Date and Time . The user also has options to select a time zone. The clock will adjust automatically for day light savings based on time zone.
2	Adjust Screensaver Time	Sets the screensaver time. This time is also related to how long the system will maintain the Installer, Technician, or Engineer logged in. Range: 1-99 Minutes; Default: 10 Minutes
3	Save Sensor	At midnight, the controller saves the statuses at the sensor terminals, provided controller has been in operation for at least 2 hours. If a sensor drops out after saving, the controller generates an error message. This setting is used to ensure immediate saving of sensors. This becomes a requirement when, for instance, a sensor is removed because it is no longer needed. Range: On - Off Default: Off
4	System Unit	Use this function to change the system of units from Imperial (F, Psi, Btu) to Metric (C, Bar, kWh), or vice-versa. Range: Imperial - Metric Off; Default: Imperial
5	Ethernet Settings	This function can ONLY be accessed by a Rinnai employee.
6	User Logout	This function can be used to logout of SETUP or SERVICE pages, and to change user level once logged in.

12.2.13 Maintenance

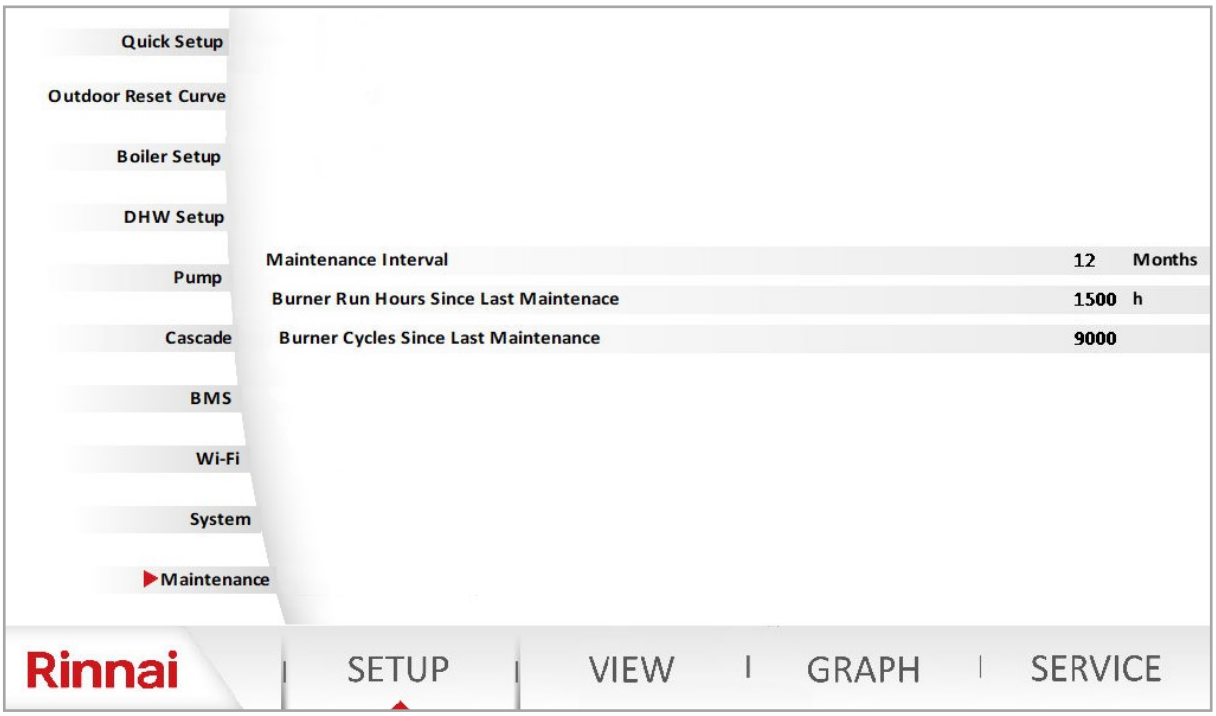


Table 42

NO.	DESCRIPTION	FUNCTION
Maintenance		
1	Maintenance Interval	Sets the boiler maintenance interval in months. Range: 1-240 Months; Default: 12 Months
2	Burner Hours Since Last Maintenance	Sets the boiler maintenance interval based on burner run hours. Range: 100 - 10,000 Hours; Default: 1500 Hours
3	Burner Cycles Since Last Maintenance	Sets the boiler maintenance interval based on ignition cycles. Range: 100 - 65,500 Cycles; Default: 9000 Cycles

12.2.14 View Page

The view function can be used to monitor boiler operation. NOTE: Password is not required to access this page.

VIEW - Boiler State:

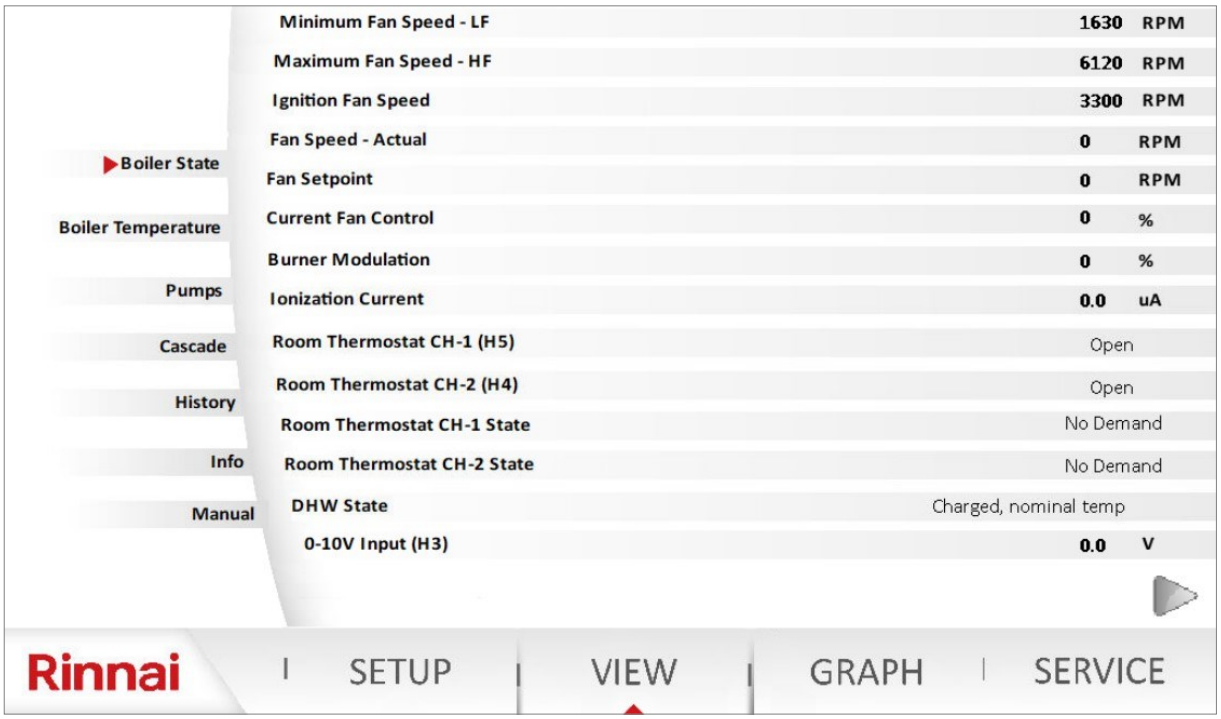


Table 43

NO.	DESCRIPTION	FUNCTION
	Boiler State	
1	Minimum Fan Speed	Displays the minimum fan speed setpoint of the boiler based on model, gas type, and elevation
2	Maximum Fan Speed	Displays the maximum fan speed setpoint of the boiler based on model, gas type, and elevation
3	Ignition Fan Speed	Displays boiler ignition speed setpoint
4	Fan Speed Actual	Displays the current fan speed
5	Fan Setpoint	Displays the current fan setpoint
6	Current Fan Control	Displays the current fan PWM (as a percentage)
7	Burner Modulation	Displays the current boiler modulation from 0% - 100%. 0% represents the minimum boiler input rate, and 100% represents the maximum boiler input rate.
8	Ionization Current	Display the current ionization current of the flame in uA. The boiler will extinguish the flame when the ionization current is less than 0.8 uA.
9	Room thermostat CH-1	Displays the status of the room thermostat CH-1 connection. The contact is normally open and will display open when a room thermostat is not connected or the demand for heat is off. The state will change to closed when a room thermostat is connected and calling for heat demand.
10	Room thermostat CH-2	Displays the status of the room thermostat CH-2 connection. The contact is normally open and will display open when a room thermostat is not connected or the demand for heat is off. The state will change to closed when a room thermostat is connected and calling for heat demand.

Table 43 continue

NO.	DESCRIPTION	FUNCTION
VIEW - Boiler State (cont.)		
11	Room Thermostat CH-1 State	Display a message regarding the state of the room thermostat CH-1
12	Room Thermostat CH-2 State	Display the a message regarding state of the room thermostat CH-1
13	DHW State	Display the a message regarding DHW demand state
14	0-10VDC Input (H3)	Displays 0-10VDC input signal to control the boiler temperature setpoint
15	Boiler State	Displays the current status of the boiler
16	Burner State	Displays the current status of burner operation (standby, pre-purge, post-purge, running, …)
17	Water Pressure Sensor	The water pressure sensor state is normally closed when water pressure voltage is more than 5VDC. Below 5VDC the state will change to open and the control will generate an error code.
18	Water Pressure Sensor Voltage	Displays the current input voltage for water pressure sensor
19	Air Pressure Switch	The air pressure switch is normally closed during normal operation. The switch will open in case of a vent or condensate blockage and the control will generate an error code.
20	Safety Input	Displays the status of the external safety inputs (High and Low Gas Pressure Switches, Water Temperature High Limit, LWCO).

12.2.15 View: Boiler Temperature

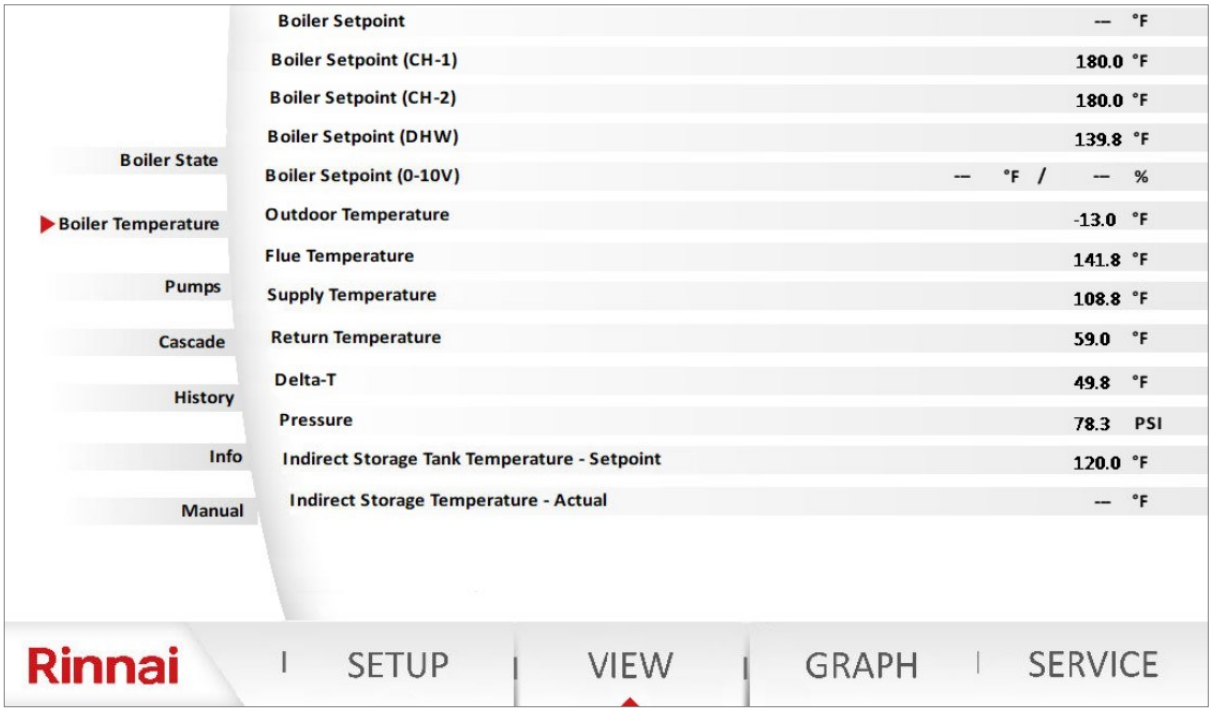


Table 44

NO.	DESCRIPTION	FUNCTION
VIEW - Boiler Temperature		
1	Boiler Setpoint	Displays the boiler active temperature setpoint. In case there are demands from both room thermostats (CH-1 and CH-2), the boiler setpoint will be the highest setpoint. NOTE: A mixing valve must be used to protect the lower temperature zone.
2	Boiler Setpoint (CH-1)	Displays the boiler active setpoint of room thermostat CH-1
3	Boiler Setpoint (CH-2)	Displays the boiler active setpoint of room thermostat CH-2
4	Boiler Setpoint (DHW)	Displays the boiler active setpoint for an indirect tank demand. This setpoint is equal to DHW temperature setpoint + Boiler Supply Temperature Offset for DHW (on SETUP—DHW Setup page)
5	Boiler Setpoint (0-10V)	Displays the boiler active setpoint or modulation setpoint for 0-10VDC input demand.
6	Outdoor Temperature	Displays the current outside temperature when an outdoor temperature sensor is connected to the boiler
7	Flue Temperature	Displays the current flue temperature
8	Supply Temperature	Displays the actual boiler supply temperature
9	Return Temperature	Displays the actual boiler return temperature
10	Delta-T	Displays the actual boiler temperature differential (Difference between Supply and Return temperatures)
11	Pressure	Displays the system pressure from the built-in water pressure sensor
12	Indirect Storage Tank Temperature—Setpoint	Displays the indirect storage tank active setpoint
13	Indirect Storage Tank Temperature—Actual	Displays the actual indirect storage tank temperature. NOTE: This will ONLY display a value when a temperature sensor is being used to control the indirect storage tank.

12.2.16 View: Pumps

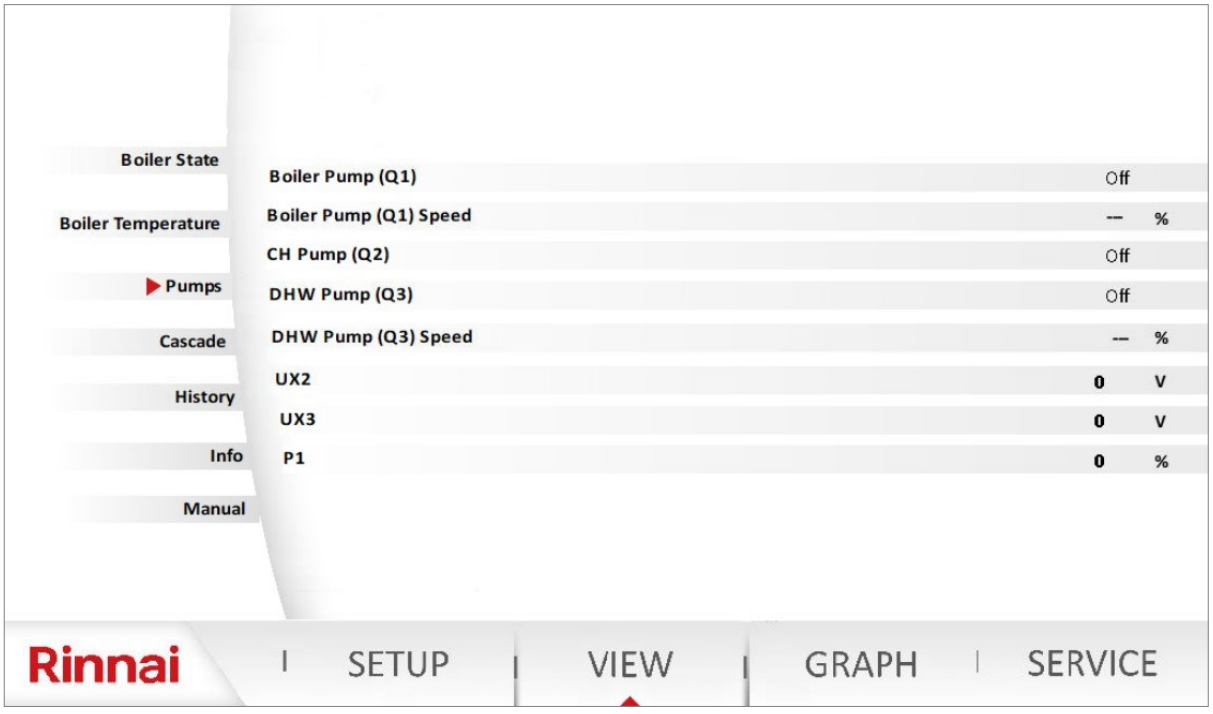


Table 45

NO.	DESCRIPTION	FUNCTION
	VIEW - Pumps	
1	Boiler Pump (Q1)	Displays the current state of boiler pump (on / off)
2	Boiler Pump (Q1) Speed	Not used
3	CH Pump (Q2)	Displays the current state of CH pump (on / off). NOTE: This is for CH-1 room thermostat connection zone.
4	DHW Pump (Q3)	Displays the current state of DHW pump (on / off). NOTE: If DHW pump is assigned as a CH-2 pump from SETUP-DHW Setup page, then this will represent the state of the CH-2 pump for CH-2 room thermostat connection zone.
5	DHW Pump (Q3) Speed	Not used
6	UX2	Displays the value of 0-10V output signal for UX2 connection
7	UX3	Displays the value of 0-10V output signal for UX3 connection
8	P1	Displays the PWM value in % for P1 connection.

12.2.17 View: Cascade

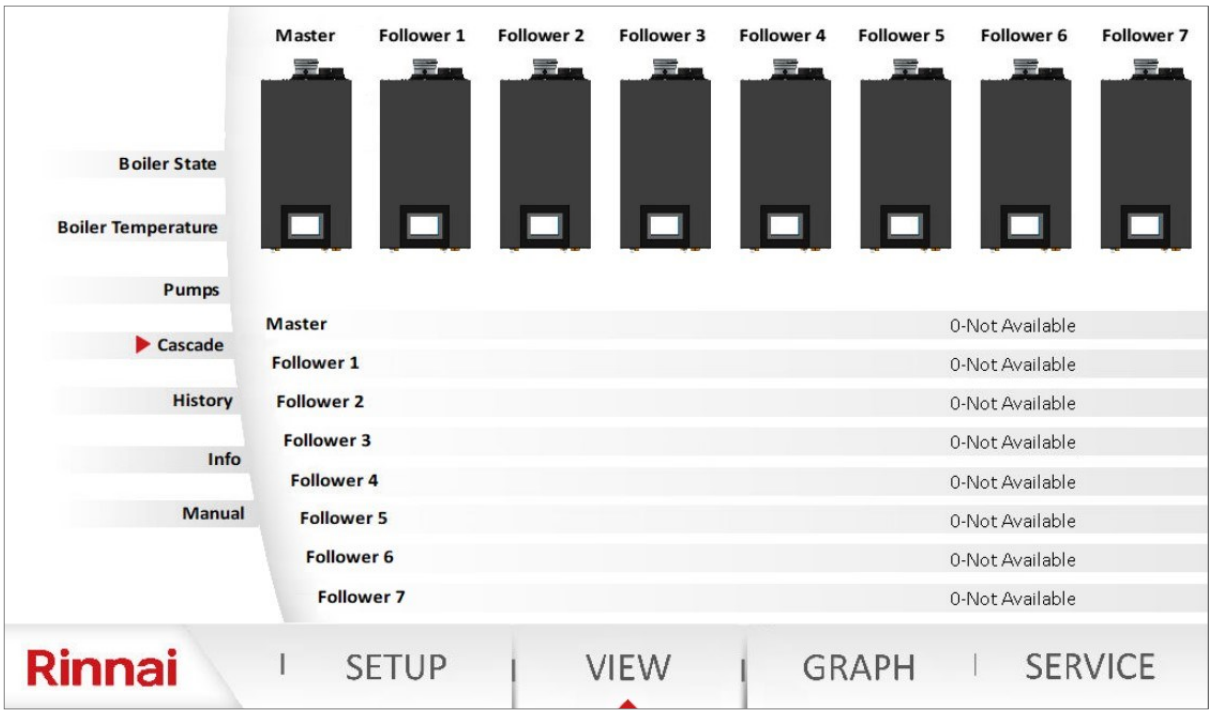


Table 46

NO.	DESCRIPTION	FUNCTION
		VIEW - Cascade
1	Bars explanation	White Color - Units not available in the cascade system (missing) Gray Color - Units available and not released for operation in the cascade system (standby, or service mode active) Yellow - Unit temporarily not available or outside temperature limit active Green - Units are released to operate in the cascade system Red - Unit in a hard lockout state
2	Master	Displays the status message of the Master unit.
3	Follower 1	Displays the status message of the Follower 1 unit.
4	Follower 2	Displays the status message of the Follower 2 unit.
5	Follower 3	Displays the status message of the Follower 3 unit.
6	Follower 4	Displays the status message of the Follower 4 unit.
7	Follower 5	Displays the status message of the Follower 5 unit.
8	Follower 6	Displays the status message of the Follower 6 unit.
9	Follower 7	Displays the status message of the Follower 7 unit.

12.2.18 View: History

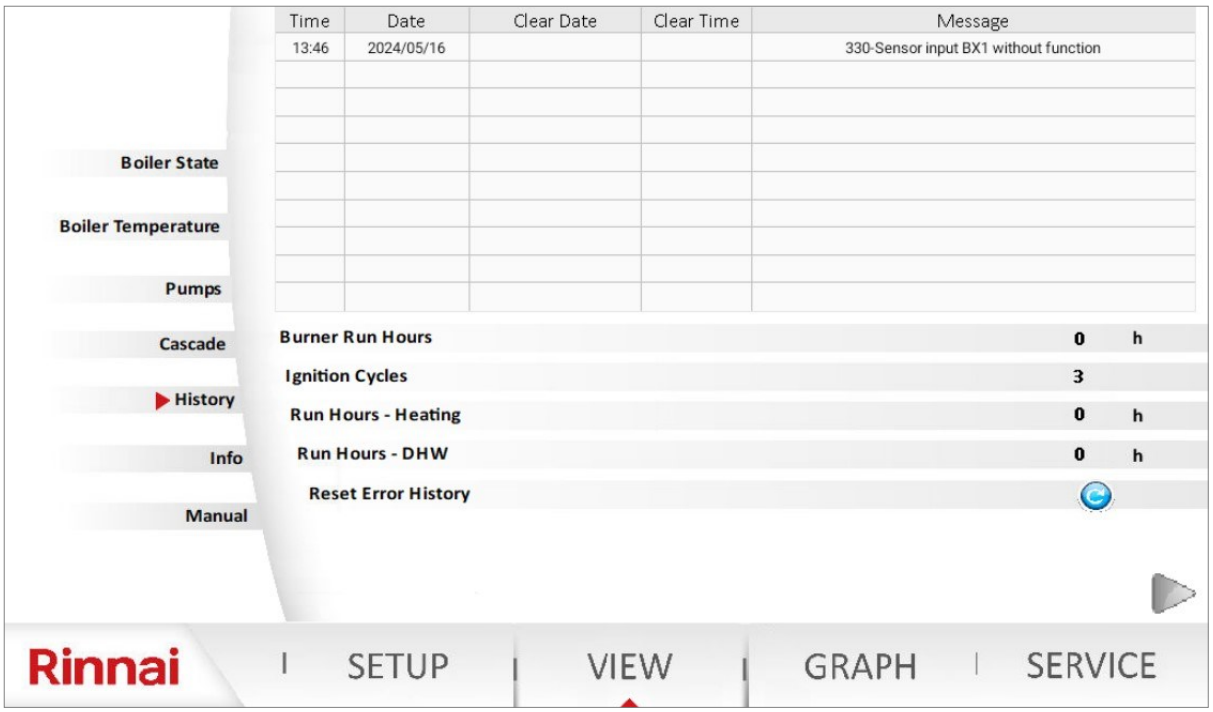


Table 47

NO.	DESCRIPTION	FUNCTION
		VIEW - History
1	Table explanation	The table shows historical data of error codes with date and time stamp of when the error occurred and when the error was resolved. Once the error has been cleared the line will change color from gray to green.
2	Burner Hours Run	Shows total burned run hours
3	Burner Starts Stage 1	Shows total ignition cycles

Table 47 continue

NO.	DESCRIPTION	FUNCTION
VIEW - History (cont.…)		
4	Hours Run Heating	Displays the run hours for Central Heating (CH) mode
5	DHW Hours Run	Displays the run hours for DHW mode
6	Reset Error Code	This will clear the error history (ONLY available for Rinnai employees)
7	List of Error Codes	This page accumulative error codes. This list can ONLY be reset by a Rinnai employee.

12.2.19 View: Info

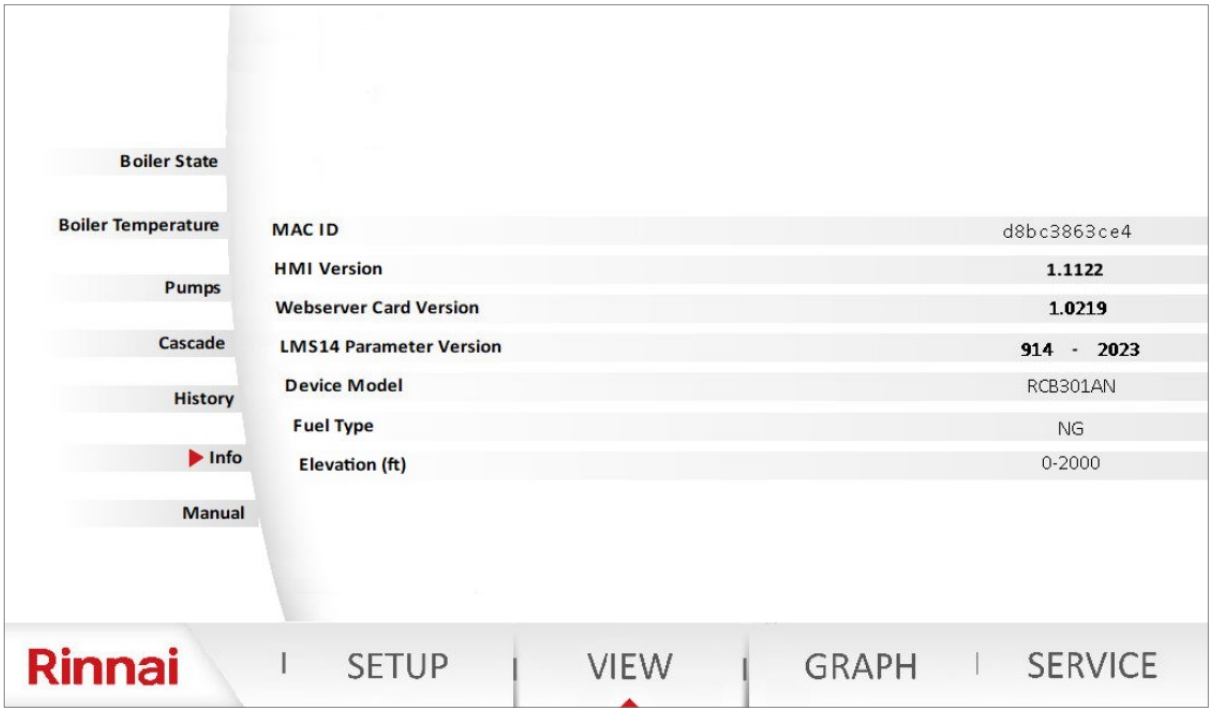


Table 48

NO.	DESCRIPTION	FUNCTION
VIEW - Info		
1	MAC ID	Displays boiler MAC ID for Wi-Fi connection
2	HMI Version	Displays the firmware version of the touch panel—HMI
3	Webserver Card Version	Displays the firmware version of the webserver card (located on the bottom of the boiler)
4	LMS14 Parameter Version	Display the parameter file version of the main control board (LMS14)
5	Device Model	Displays the boiler model (RCB301AN, RCB399AN, RCB500AN, RCB750AN, OR RCB1000AN)
6	Fuel Type	Displays the fuel type NG or LP
7	Elevation (ft)	Displays the elevation setting

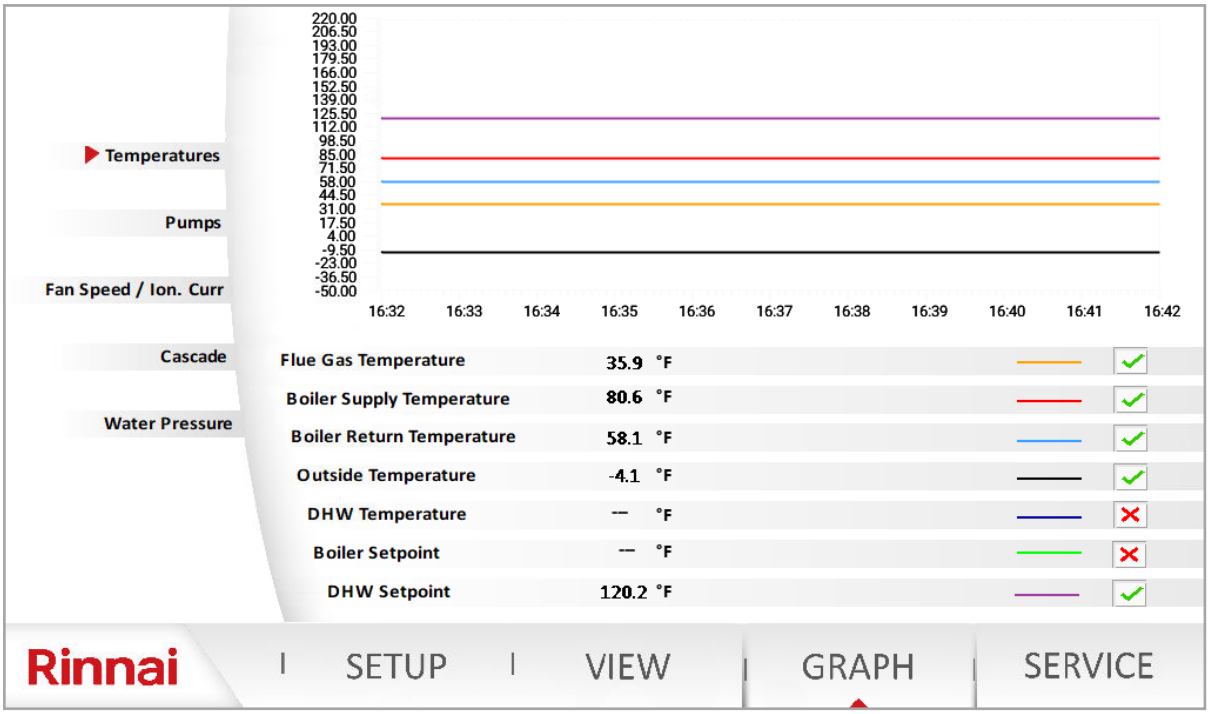
12.2.20 Manual

Scan the QR code on this screen to access the literature for the appliance.

12.2.21 Graph Page

The graph function can be used to monitor boiler operation and aid in troubleshooting.

NOTE: Password is not required to access this page.



In order to activate each data point the boxes next to each parameter needs to be activate with a check mark. As long as the current graphical page remains active a total of 10 minutes, data will be shown on the screen. Once the user leaves the screen the graph will clear and start from the current time. There are four different graphs (Temperatures, Pumps, Fan Speed / Ion. Curr., Cascade, and Water Pressure), and ONLY one of the graphs can be viewed at once.

12.2.22 Service Page

The service page can be used during boiler commissioning. This is useful to manually run the pumps and remove air from the system. Also, it can be used for combustion analysis by running the unit at minimum and maximum firing rate or any other firing rate in between. NOTE: The service mode operation will automatically end after 4 hours unless it is manually turned off by the user. **NOTE:** It is extremely important to turn-off the service mode after boiler commissioning to avoid issues during normal operation.

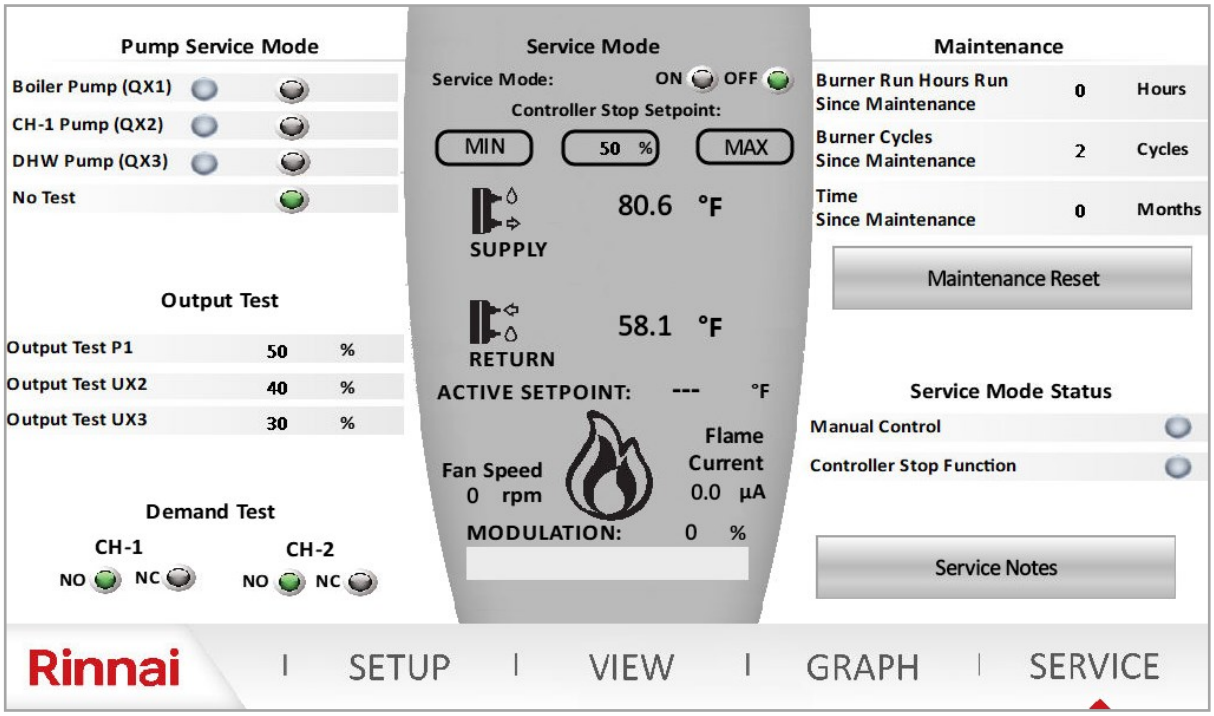
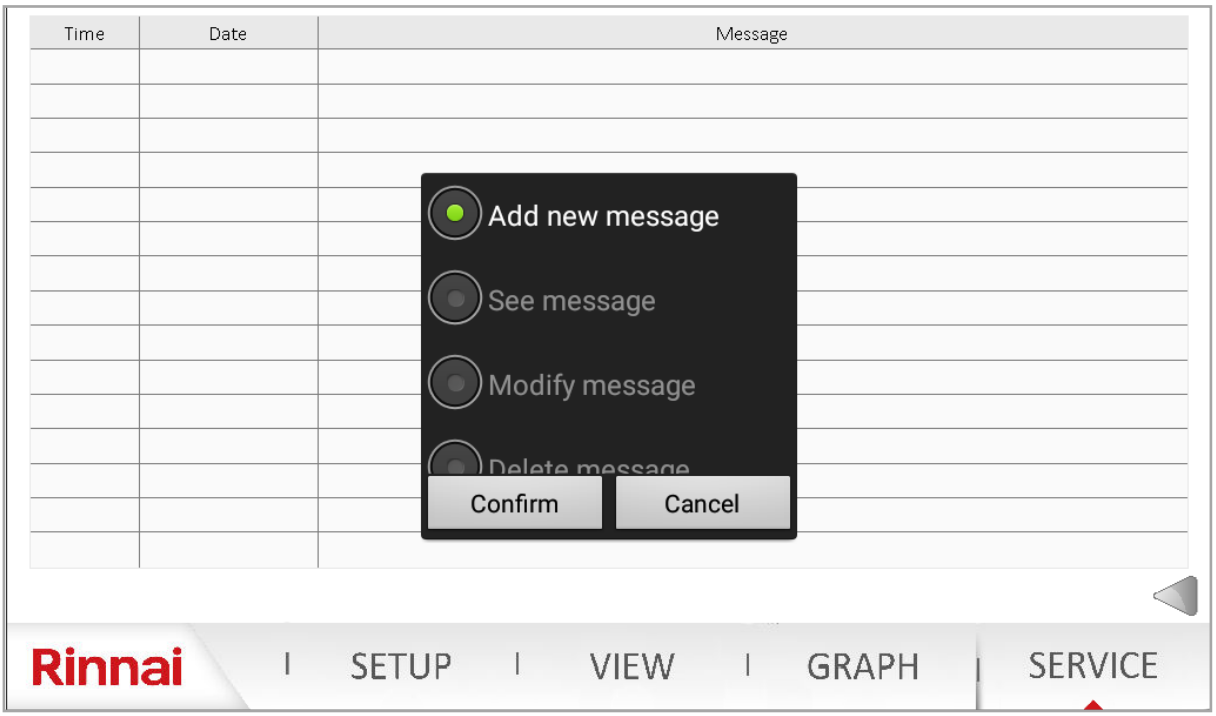


Table 49

NO.	DESCRIPTION	FUNCTION
		LEFT PANE
1	Pump Service Mode	This function is used to manually run each one of the pumps individually. This is a useful means to check pumps for operation and remove air from the system during deaeration process. NOTE: ONLY one pump can be energized at a time. Once the testing is completed, press “No Test” to de-energize the pump.
2	Output Test	This function can be used to test the operation of 0-10V and PWM output signals. The values are in terms of percentage. For instance if the user is looking for 4V, then 40% should be entered. The readable values can be confirmed from VIEW - Pumps page.
3	Demand Test	This function can be used to test functionality of room thermostat connection without any wiring connected to the boiler terminals. These contacts are normally open (NO). By clicking on Normally Closed (NO), this will close the room thermostat connection and the boiler will get a demand for heat. NOTE: It is very critical to return these values to the default setting (NO) once the testing is completed.

Table 49 continue

NO.	DESCRIPTION	FUNCTION
		CENTER PANE
4	Service Mode	Service mode can be used to manually fire the unit and adjust its firing rate. Press on the ON icon in front of Service mode to activate a call for heat. Once the demand for heat is active, the two LED lights under Service Mode Status (right pane) will illuminate. The firing rate can be adjusted by clicking on MIN (this will bring the boiler to the minimum firing rate), MAX (this will bring the boiler to its maximum firing rate), or percentage box (will prompt the user to enter a value between 0% and 100%). NOTE: The boiler target setpoint will be 180F once this mode is active. It is important for the user to ensure there is enough head load connected to the boiler to dissipate the heat. During this mode all 3 pumps will be energized, it is also critical to ensure not to overheat an indirect tank that is connected to the boiler. The remaining information on the center pane are to view ONLY.
		RIGHT PANE
5	Maintenance	The information showing (Burner Run Hours Since Maintenance, Burner Cycles Since Maintenance, and Time Since Maintenance) are used to display boiler operation since last maintenance service. Once the service has been performed , the user can click on Maintenance Reset box to reset the counter.
6	Service Mode Stats	This is read only information. Once the service mode has been activated both LED indicators will turn green to confirm operation.
7	Service Notes	Click on Service Notes box to enter notes, contact information for the record. See info below for more details.



To add new notes, double tap the screen on an empty line under the message. A confirmation box will pop-up. Click on confirm, then a new text box will pop up to for the user to type the information. Once the information has been entered, click on confirm to save the content.

To edit previous messages, double click on the desired message. It will be highlighted in blue and confirmation will pop-up. Click on Modify Message to make changes to current message, or Delete Message to delete current selected message.

12.3 Error and Diagnostic Codes

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

The list of error codes with occurrence day and time and with clear date and time are saved in the History page. This information can be accessed via the boiler controller by clicking on VIEW - History.

Table 50

Error Code	Message	Remedies **NOTE:** The numbers in parenthesis are diagnostic codes associated with each error code
10	Outdoor sensor fault (B9)	The error will auto-reset once the issue is resolved (610) **NOTE:** This error code does not prevent boiler operation; However, it will prevent any other error codes to show on the home page. 1- Check the outdoor sensor connection to ensure it is not open or not connected (if not connected, the jumper should remain in place - supplied from the factory) - check continuity 2- Check outdoor sensor wiring to ensure it is connected properly (1 kOhm sensor supplied from the factory) - check continuity 3- Check the resistance of the outdoor sensor and compare to the value shown on the resistance value table 4- Replace the outdoor sensor if malfunction is detected 5- If the issue persists, replace the main control board
20	Boiler Supply temperature sensor fault (B2)	The error will auto reset once the issue is resolved (unless the diagnostic code is 2- manual reset required) 1- Check supply temperature sensor wiring to ensure it is connected properly (10 kOhm sensor) - check continuity 2- Check supply temperature sensor to ensure it is not short or open (2) 3- Check the resistance of the supply temperature sensor and compare to the value shown on the resistance value table (737, 591, 249, 552) 4- Replace the supply temperature sensor if malfunction is detected. 5- If the issue persists, replace the main control board
26	Cascade temperature sensor fault (B10)	The error will auto-reset once the issue is resolved **NOTE:** This error code does not prevent boiler operation; However, it will prevent any other error codes to show on the home page. 1- Check cascade temperature sensor wiring to ensure it is connected properly (10 kOhm sensor) 2- Check cascade temperature sensor to ensure it is not short or open 3- Check the resistance of the cascade temperature sensor and compare to the value shown on the resistance value (Table 51: Temperature vs. Resistance). The cascade temperature sensor is ONLY required on the Master boiler. Confirm the cascade address is set correctly. Ensure the cascade sensor is set correctly on SETUP - cascade setup page. If everything is set correctly, use the save sensor option on SETUP - system setup to configure this sensor. 4- Replace the supply temperature sensor if malfunction is detected. 5- If the issue persists, replace the main control board

Table 50 continue

Error Code	Message	Remedies **NOTE:** The numbers in parenthesis are diagnostic codes associated with each error code
28	Flue gas temperature sensor fault (BX3)	The error will auto reset once the issue is resolved (unless the diagnostic code is 0 or 540 - manual reset required) 1- Check flue gas temperature sensor wiring to ensure it is connected properly (10 kOhm sensor) - check continuity 2- Check flue gas temperature sensor to ensure it is not short (543 or 0) or open (544 or 540) 3- Check the resistance of the flue gas temperature sensor and compare to the value shown on the resistance value (Table 51: Temperature vs. Resistance). 4- Replace the flue gas temperature sensor if malfunction is detected. 5- If the issue persists, replace the main control board
40	Return temperature sensor fault (B7)	The error will auto reset once the issue is resolved (unless the diagnostic code is 0- manual reset required) 1- Check return temperature sensor wiring to ensure it is connected properly (10 kOhm sensor) - check continuity 2- Check return temperature sensor to ensure it is not short (441) or open (442) 3- Check the resistance of the return temperature sensor and compare to the value shown on the resistance value table (52, 738, 250, 0) 4- Replace the return temperature sensor if malfunction is detected. 5- If the issue persists, replace the main control board
50	DHW temperature sensor/ thermostat fault (B3)	The error will auto-reset once the issue is resolved (55) **NOTE:** This error code does not prevent boiler operation; However, it will prevent any other error codes to show on the home page. 1- Check what type of device is used to control the indirect tank temperature (sensor or aquastat). Verify that the settings on the boiler (SETUP-DHW Setup) match the application 2- Check the DHW temperature sensor connection to ensure it is not open or not connected (if an aquastat is being used ensure the correct setting is used on SETUP-DHW setup page) 3- Check DHW temperature sensor wiring to ensure it is connected properly (10 kOhm sensor) - check continuity 4- Check the resistance of the DHW temperature sensor and compare to the value shown on the resistance value table 5- Replace the DHW temperature sensor / Aquastat if malfunction is detected 6- If the issue persists, replace the main control board
81	LPB short-circuit or no bus power supply	The error will auto-reset once the issue is resolved (67) 1- Check cascade communication cable to ensure the wires are not shorted 2- Ensure the cable connection from cascade module to the main control board is connected properly and secured 3- If the problem persists and the unit is not cascaded with other units, disconnect the cascade module from the main controller. **NOTE:** LPB is the cascade bus (the power comes directly form the main controller)
82	LPB address collision	The error will auto-reset once the issue is resolved (67) NOTE: This error code will ONLY happens if there are two or more units connected with each other. 1- Check to ensure the cascade addresses for the units in the cascade system are unique. For instance if there are one or more units set as Master, the LPB address collision error code will be displayed.

Table 50 continue

Error Code	Message	Remedies **NOTE:** The numbers in parenthesis are diagnostic codes associated with each error code
83	BSB-Wire short-circuit or no communication	The error will auto reset once the issue is resolved (595) 1- Ensure the wiring from the Webserver card/Wi-Fi Module and LMS is not jumped or disconnected. NOTE: BSB is the communication between the Webserver card/Wi-Fi Module and main controller.
91	Data loss in EEPROM	The error will auto reset once the issue is resolved (618) This error code should only happen during flashing of the main controller at the factory. 1- Loss of data on EEPROM - replace the main control board
105	Maintenance message	The error will auto reset once the maintenance interval has been reset (87) 1- Perform the boiler service as recommended by the manufacturer 2- Once the service has been performed, access the SERVICE page and perform a maintenance reset.
110	SLT lock-out SLT - Safety Limit Thermostat (electronic)	This error code requires a manual reset 1- Boiler return temperature not possible (< 32°F [0°C]) - (424) 2- Boiler supply temperature not possible (<32°F [0°C]) - (422) 3- Boiler supply temperature not possible (>255°F [124°C]) - (422, 809) 4- Safety Limit Thermostat (SLT) is open (551, 412) - check continuity of thermofuse, burner door switch and jumper on high voltage terminal block) 5- Boiler return temperature > 208°F (98°C) - (425) 6- Boiler Supply Temperature > 208°F (98°C) - (419, 430, 432) 7- Boiler temperature rises faster than allowed (5.4°F [3°C]) - (426, 437) 8- Reset criteria (boiler temperature less than boiler temperature setpoint and Delta-T less than 72°F [40°C] for error 426 not reached - (427) 9- Delta T (difference between supply and return) is higher than 101°F (56°C) - (428) 10- Reset criteria (Delta-T less than 36°F [20°C] after error 433 not reached)-(429) 11- Boiler return temperature is higher than boiler supply temperature + 27°F (15°C) - (420, 431) 12- Boiler return temperature is higher than/equal to boiler supply temperature + 31°F (17°C) - (420) 13- Supply temperature increases after the burner is off - residual heat (436) 14- Delta-T (difference between supply and return) is greater than 72°F [40°C] - (433, 438) 15- Supply temperature exceeds 208°F (98°C) - (432)
111	Temperature limiter safety shut-down	The error will auto reset once the supplied temperature is below 203°F (95°C) (264) 1- Supply temperature has exceeded 203°F (95°C) (264)
117	Water pressure too high (H1)	The error will auto reset once the water pressure decreases to less than 83 PSI (5.7 bars) (566) 1- Ensure the water pressure in the system does not exceed 87 PSI (6 bar). This is very unlikely since the maximum setting on the factory supplied pressure relieve valve is 75 PSI 2- If the actual pressure in the system has been confirmed to be below 87 PSI, replace the water pressure sensor.
118	Water pressure too low (H1)	The error will auto reset once the water pressure is at least 16 PSI (1.1 bar) (566) **NOTE:** The boiler will reduce the output power when pressure in the system is between 12 PSI (0.8 bar) - 20 PSI (1.4 bar). The boiler will continue to operate and an error code will be displayed on the home screen. When the pressure increases above 20 PSI (1.4 bar) the error will disappear. If the pressure decreases below 12 PSI (0.8 bar) the boiler will shut-down and keep the error code. 1- Ensure the water pressure in the system is at least 12 PSI (0.8 bar). Check the pressure setting on the water auto feed to the boiler loop. Check for water leaks in the system piping. 2- If the pressure in the system is still below 16 PSI (1.2 bar), replace the water pressure sensor.

Table 50 continue

Error Code	Message	Remedies **NOTE:** The numbers in parenthesis are diagnostic codes associated with each error code
125	Maximum boiler temperature exceeded Boiler pump and fan will continue to run to dissipate the heat.	The error will auto reset once the boiler supply temperature decreases below 203F (95C) minus the boiler switch on differential, 20°F (11°C) - default settings. **NOTE:** The boiler will start reducing the firing rate when supply temperature reaches 190°F (88°C) 1- The boiler temperature has reached 203F (95C) (286, 500, 740) 2- No temperature change on supply sensor after flame (501) 3 - No temperature change on return sensor after flame (502)
128	Loss of flame in operation (10 times)	This error code requires a manual reset 1- Loss of flame in operation (625) 2- Ionization current has fallen below 0.8uA (854) 3- Ensure the boiler electrical connection is properly grounded to the ground source. 4- Monitor the gas pressure to the unit while in operation. The gas pressure should be within the limits specified in this manual. 5 - Check the flame signal on the display. It should be above 0.8uA when the burner is lit. The flame current should be stable after the boiler has been firing for at least one minute and it is normally between 3 - 7uA. if the flame current is less than 0.8uA, disassemble the burner door and check the ionization probe quality and distance to the burner (clean if necessary).
130	Flue gas temperature maximum limit exceeded (BX3)	This error code will automatically reset if the issue is resolved within 10 minutes. Otherwise a manual reset is required. 1- Ensure the proper setting is being used for the flue pipe venting material. If the flue temperature for the application is higher than 149°F (65C), vent material other than PVC must be used and the setting for the flue gas temperature limit must be set to other on the controller (SETUP-Boiler Setup). 2- The control will limit the flue temperature to 149°F (65°C) for PVC pipe and 207°F (97°C) for other venting materials. The boiler will automatically start to modulate when the vent temperature reaches 140F (60°C for PVC and 194°F (90°C) for other venting material. The control will shut down and monitor the vent temperature for 10 minutes. If the temperature exceeds the value shown here after 10 minutes the control will lock-out. 3- Check flue gas temperature resistance and compare to the value listed on the resistance table 4- Ensure the correct gas type is used. If the unit is Natural Gas and Propane gas is connected to the unit this will cause boiler overheating and unsafe conditions.
133	Safety time for establishment of flame exceeded (4 times)	This error code requires a manual reset 1- The boiler failed to ignite four times during one heat call (625) 2- Check electrical connection to the unit and check for proper grounding and polarity. 3 - Check the ignition transformer wiring connection for reverse polarity. 4- Check for sparks through the sight glass on the burner door. 5- If there is spark but no flame, monitor the static gas pressure to ensure it is within the limits specified in this manual 6- Check for vent or condensate blockage. 7- If the problem persists, remove the burner door and inspect the ignition electrodes (check for gaps and distance to the burner. Clean if necessary)

Table 50 continue

Error Code	Message	Remedies **NOTE:** The numbers in parenthesis are diagnostic codes associated with each error code
151	BMU internal fault	This error requires a manual reset Internal error on the main controller (630) 1- Error at closing(330) or opening (331) ignition relay 2- Error at closing (332) or opening (333) gas valve relay 1 3- Error at closing (336) or opening (337) the safety relay 4- Replace the main controller
152	Parameterization error	This error will auto-reset once the issue is resolved unless diagnostic code is 780, 781, 782, 851, 840 or 853 - manual reset required This error happens when setting parameters on the main controller. For instance if the fan speeds are not set within the min and max range set on the main controller.
153	Unit manually locked	This error code requires a manual reset (press reset button for less than 10 seconds) 1- Unit manually locked (reset button pressed more than 10 seconds)
160	Fan speed threshold not reached	This error code requires a manual reset NOTE: These error codes happen in case the impeller on the fan gets stuck. 1- Fan speed threshold not reached: home run (377) 2- Fan speed threshold not reached: standby (378) 3- Fan speed threshold not reached: ignition (379) 4- Fan speed threshold not reached: pre-purge (380) 5- Fan speed threshold not reached : post-purge (381) 6- Fan speed threshold not reached : in operation (233, 749)
162	Air pressure switch does not close	This error code requires a manual reset (9) 1- Air pressure switch is normally closed and will open in case of condensate or vent blockage. 2- Check the pressure switch wiring—check continuity. 3- Check vent pipe and condensate trap for blockage. Disconnect the hose from the air pressure switch and check for operation. If the unit operates normal, either condensate on vent pipe is blocked. If the unit does not operate check pressure switch. 4- Check the pressure switch wiring to ensure it is normally closed when the unit is on standby. 5- If the issue persists replace the air pressure switch.
164	Flow/pressure switch HC fault	This error will auto-reset once the issue is resolved 1– Water flow is not detected after receiving a heat demand (562) 2– Ensure the pump is operational and providing adequate flow rate. 3– Ensure the flow switch is connected properly and facing the flow direction. 4– Ensure the return and supply pipes are connected correctly. 5– Check continuity to ensure the flow switch contact is closed when there is no water flow and closed with water flow.
183	Unit in parameterization mode	This error code requires a manual reset 1- Unit in parameterization mode (301) 2- Unit in parameterization mode (770 - parameter stick)

Table 50 continue

Error Code	Description	Remedies **NOTE:** The numbers in parenthesis are diagnostic codes associated with each error code
217	Sensor fault	This error code will auto-reset once the issue is resolved 1- Short-circuit of ionization electrode (765, 766). The ionization current is shorted to ground. 2- Check the condensate trap to ensure the condensate is draining properly. If there is water in the heat exchanger in contact with the ionization electrode this error code will appear.
317	Grid frequency OOR	This error code will auto-reset once the frequency is back within the range NOTE: This error code happens when the power frequency is out of the range [42 Hz - 72 Hz] 1- Mains frequency outside specification (275, 461)
353	Cascade temperature sensor missing (B10)	This error code will auto-reset once the issue is resolved **NOTE:** On a cascade system, a cascade temperature sensor is required to be installed on the system loop. Once a sensor is connected to the unit, the main controller recognized the sensor. If the sensor gets disconnected this error code will be shown. If the unit is no longer set as a cascade, the sensor must be disabled from the cascade setup menu, and save sensor function must be applied from the system setup menu. 1- Cascade temperature sensor missing (B10) (139)
384	Extraneous light	This error code requires a manual reset (625) **NOTE:** This error code happens if unit detects fan while the gas valve is not energized (false flame)
385	Main under voltage	This error code will auto-reset once the voltage is back within the range NOTE: This error code happens when the voltage is out of the range [102V - 132V] 1- Voltage outside of the range (554, 555)
386	Fan speed tolerance	This error code requires a manual reset 1- Fan speed out of tolerance (+/-300 rpm): home run (387) 2- Fan speed out of tolerance (+/-300 rpm): standby (388) 3- Fan speed out of tolerance (+/-1200 rpm): ignition (374, 382, 383) 4- Fan speed out of tolerance (+/-1200 rpm): pre-purge (389,531) 5- Fan speed out of tolerance (+/-1200 rpm): post-purge (390, 532, 534) 6- Fan speed out of tolerance (+/-1200 rpm): in operation (232, 750, 375, 385, 386)

Other possible issues without an error code:

1. There is call for heat, pumps are running however the unit is not firing. Check boiler active setpoint and compare with boiler actual supply temperature values. The boiler will ONLY fire when the active setpoint is equal or higher than the boiler actual temperature plus the differential.

2. The main screen is blank. Ensure the CAT5 cable is properly connected to the main screen (it must be connected to port RS485). Check the webserver card/Wi-Fi Module located on the bottom of the unit to ensure it is getting power. If so, please check the wiring from webserver card/Wi-Fi Module to the HMI for proper connection (see wiring diagram for details).

3. The temperature values on the main screen are all zeros. Ensure the webserver card/Wi-Fi Module is properly connected to the main controller and is getting power.

Table 51: Temperature vs. Resistance

Supply Temperature Sensor Return Temperature Sensor Flue Temperature Sensor Cascade System Sensor DHW Temperature Sensor		Outdoor Temperature Sensor	
Temperature [°F]	**Resistance [Ω]**	**Temperature [°F]**	**Resistance [Ω]**
		-22	13034
		-13	9889
		-4	7578
		5	5861
		14	4574
		23	3600
32	32555	32	2857
41	25339	41	2284
50	19873	50	1840
59	15699	59	1492
68	12488	68	1218
77	**10000**	**77**	**1000**
86	8059	86	827
95	6535	95	687
104	5330	104	575
113	4372	113	483
122	3605	122	407
131	2989		
140	2490		
149	2084		
158	1753		
167	1481		
176	1256		
185	1070		
194	915		
203	786		
212	677		

12.4 Perform Combustion Analysis

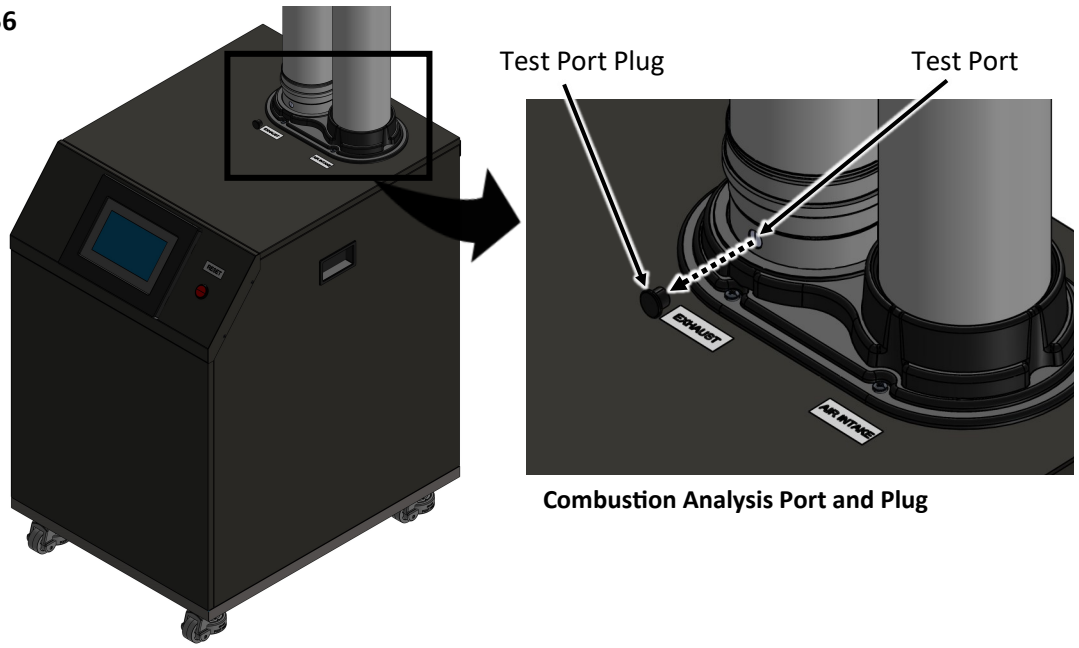
⚠ WARNING Combustion analysis must be performed by a trained and qualified professional.

To perform a combustion analysis:

1. Remove the boiler's front panel by removing the two screws that secure the panel.
2. **500 model:** Remove the combustion analysis port plug and insert the gas analyzer probe into the port (Figure 56).

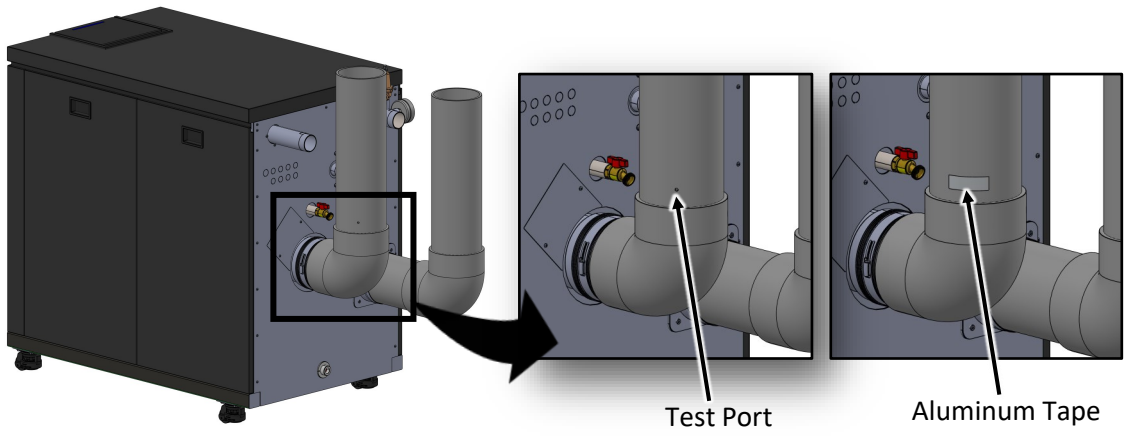
   750 and 1000 models: Drill a hole on the exhaust pipe to insert the combustion analyzer probe. Ensure to have a piece of aluminum tape to plug the hole once the test is completed (Figure 57).
3. Use the SERVICE page on the boiler home screen to manually run the unit at maximum and minimum firing rate to check for proper combustion adjustment. This boiler has an automatic ignition system. When the main burner has lit, the flame symbol will on the home page will illuminate and the modulation percentage will show on the home page. The maximum firing rate is 100% of modulation and the minimum firing rate is 0% of modulation.

Figure 56



Combustion Analysis Port and Plug

Figure 57



4 Use a combustion analyzer to verify CO2 is within the range listed in the table below for both minimum and maximum firing rates. If a combustion analyzer is not available:

- For minimum firing rate, adjust the **offset screw** counterclockwise to decrease CO2 and clockwise to increase CO2 (Figures 58 and 59).
- For maximum firing rate, adjust the **throttle screw** to increase or decrease the CO2. See Figures 60 and 61 for steps on increasing or decreasing CO2.

IMPORTANT: When making adjustments to the gas valve, it is critical to make a small adjustment first, then wait for the combustion to settle before making further adjustments. The boiler is pre-set at the factory and only a slight adjustment should be made to the gas valve for tuning. Make adjustments to the minimum firing rate first, and then proceed to the maximum firing rate adjustment.

Figure 58

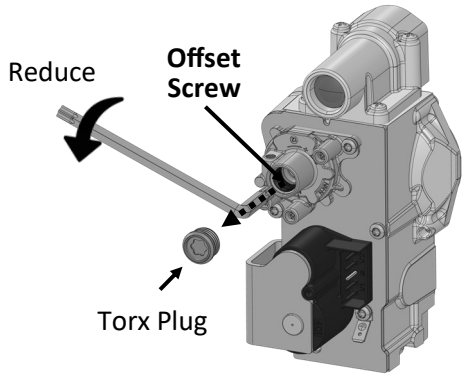
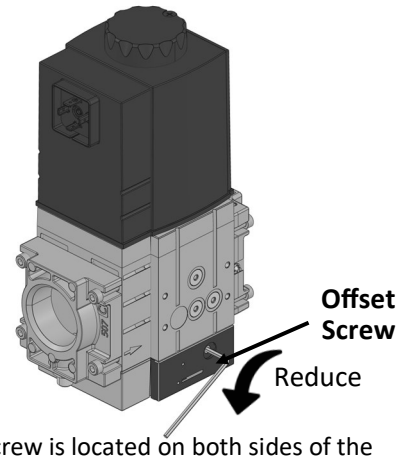


Figure 59



Adjustment screw is located on both sides of the gas valve. Only one side needs to be adjusted.

Figure 60

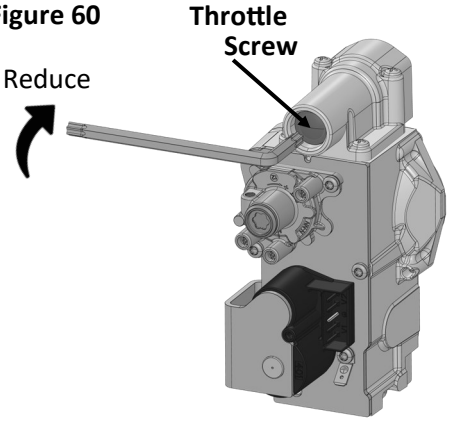
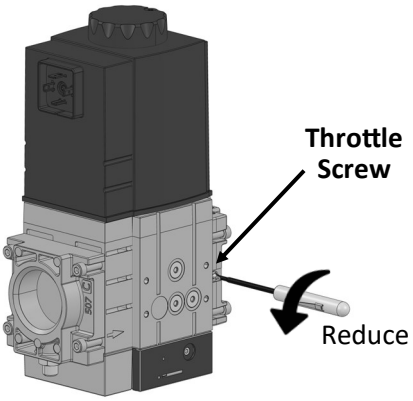


Figure 61



Adjustment screw is located on both sides of the gas valve. Only one side needs to be adjusted.

Table 52: **Information in table applies to both Minimum and Maximum firing rates.**

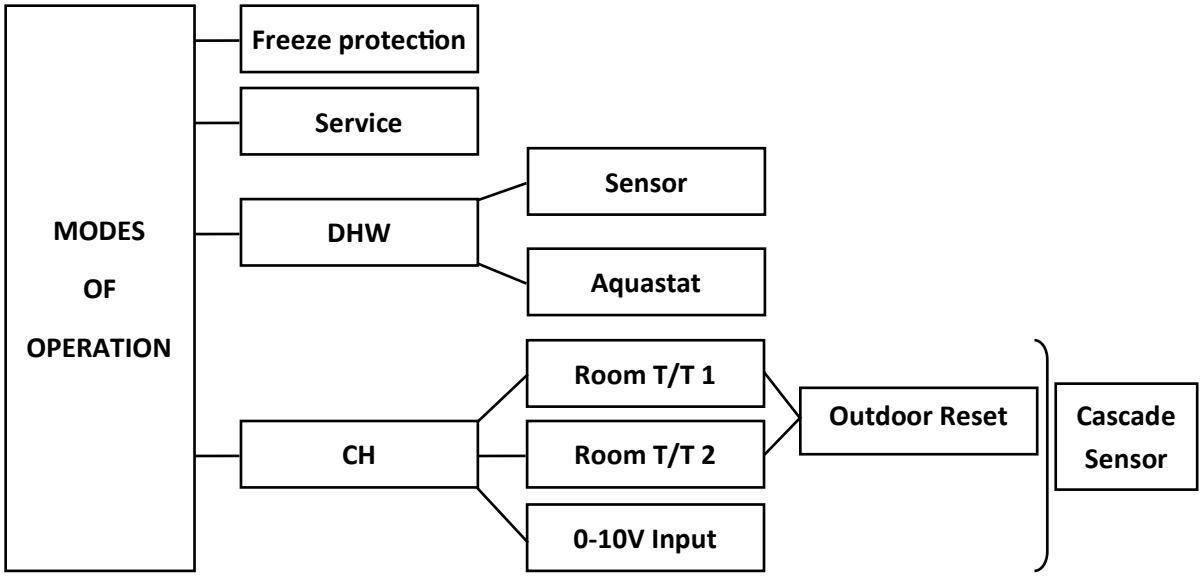
TYPE OF GAS	CO2 TARGET (%)	CO2 RANGE (%)	CO LIMIT (PPM)
NG	9.0	8.5 - 9.7	< 175 PPM
PROPANE	10.0	9.5 - 10.5	< 175 PPM

5. For RCB500AN model: After measurement, remove the gas analyzer probe, and replace the combustion analysis port plug.

   Add another statement for RCB750AN / RCB100AN models: After measurement, remove the gas analyser probe, and cover the test port (drilled hole) using aluminium tape.

IMPORTANT: When making adjustments to the gas valve, it is critical to make a small adjustment first, then wait for the combustion to settle before making further adjustments. The boiler is pre-set at the factory and only a slight adjustment should be made to the gas valve for tuning. Make adjustments to the minimum firing rate first, and then proceed to the maximum firing rate adjustment.

12.5 Operating Information



Freeze Protection (priority 1):

The electronic management system of the boiler includes protection against frost. If the water temperature falls below 41°F [5°C], the burner starts up and the boiler pump runs to provide a water temperature of 46°F [8°C] + Boiler Offset 9°F [5°C] + Boiler Differential 20°F [11°C]. Once the target temperature has been reached the burner will turn off, the boiler pump will continue to run and turn off after post purge period. This function only works if boiler is turned on, the gas supply is ON and the water pressure is correct. **NOTE:** The boiler will not engage in freeze protection mode if there are any soft or hard lockout error codes.

Service (priority 2):

When service mode is activated, the relays are no longer energized and deenergized according to the control state, but are set to a predefined manual control state in accordance with their functions (For instance: QX1- Boiler Pump; QX2 - CH-1 Pump; QX3 -DHW pump). The relay outputs are set to a state where heat is provided, independent of their hydraulic function. When a service mode is activated for a heat call, all three pumps will be energized. It is important to ensure that there is sufficient heat load connected to the appliance before operating the unit at full firing rate. With service mode each pump can be run independently to either purge air from the system or test the relays for proper operation.

Domestic Hot Water (DHW) (priority 3):

The boiler can be connected to an indirect tank to provide domestic hot water (DHW). The control allows for a tank sensor or aquastat (thermostat) connection to the low voltage terminal. The boiler is shipped with **aquastat** as a default setting to control an indirect tank. Ensure to set the DHW temperature to match the setting of the mechanical aquastat installed on the tank. When a tank **sensor** is connected, the DHW sensor option on the boiler setup page needs to be changed to sensor. The control has an offset parameters that will set the boiler supply temperature to a higher temperature in order to meet the demand of the indirect tank (default is + 20°F [11°C]). For instance if the indirect tank is set to 120°F, the boiler will supply 140°F to the indirect tank coil.

DHW Pump (QX3):

When either a sensor or aquastat is connected to the low voltage signal, the boiler will acknowledge the demand and will run the DHW pump to satisfy the DHW demand. If an indirect tank is not used, this pump can be assigned to run when there is a call for room thermostat 2. When an indirect tank is piped on the system loop, there is an option on the DHW setup page to enable boiler pump to run during a DHW call. **NOTE:** It is critical to protect a low temperature zone with a mixing valve when the boiler temperature for DHW is higher than the low temperature zone setpoint.

Central Heating (CH) (priority 4):

Room Thermostat

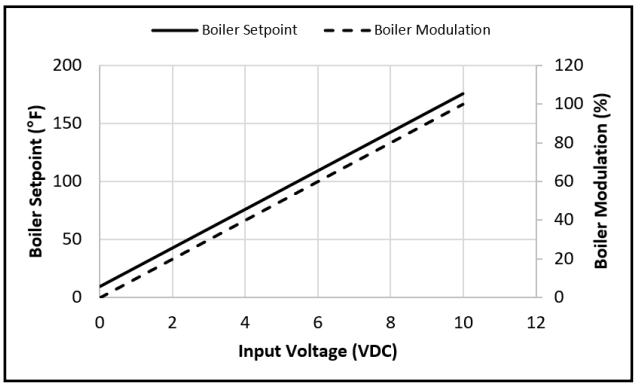
There are two head demands connections available on this control. These inputs commands the boiler to provide hot water for central heating. Each demand has its own setpoint and outdoor reset curves. The first room thermostat connection is enabled form the factory. The second room thermostat is disabled from the factory. In case an indirect tank is not being used, the DHW pump can be assigned for room thermostat 2 (CH-2 pump) from Setup Pump Setup page. When there are multiple demands active, the control will gives priority to the demand with the highest set point. **NOTE:** It is very critical to protect a low temperature zone to avoid overheating or damages to the heating system. For instance, Assume room thermostat 1 setpoint is 160°F, room thermostat 2 setpoint is 120°F, and both have a call for heat. The boiler will deliver a temperature of 160°F until both demands are satisfied or will deliver 120°F once demand from room thermostat 1 is satisfied.

Outdoor Reset Curve:

Outdoor reset is a built-in function to help maximize the efficiency of the boiler. The design of this function is to adjust the target temperature of the boiler relative to the outdoor ambient temperature via the outdoor reset curve options included in the boiler setup page. The outdoor ambient temperature is observed via the provided outdoor temperature sensor. There are two outdoor rest options available on the setup page, one for each room thermostat connections.

0-10VDC Input (Boiler Setpoint or Boiler Modulation):

The boiler can be controlled and activated via a Building Management System (BMS) using a 0-10VDC signal. There two possible options to control the boiler via this signal: Boiler Setpoint and Boiler Modulation. These functions are predefined with two fixed points (min. voltage / min. setpoint or modulation), (max. voltage / max. setpoint or modulation). The request for heat becomes active when the applied voltage is 200mV and will remain active as long as the voltage is a minimum of 150 mV. **NOTE:** It is critical to keep the 0-10V input voltage wiring away from the line voltage wiring to avoid induced voltage which may cause the boiler to be energized when not desired. The following graphs are linear representation of the 0-10V operation.



Boiler Pump (QX1):

The boiler pump will run anytime there is a central heating demand. This pump will also run during a freeze protection or service mode. There is an option in the controller to enable boiler pump to run during a DHW demand (in case an indirect tank is piped on the system loop).

CH-1 Pump (QX2):

The CH-1 pump will run when there is a call for heat from room thermostat 1 or there is a demand from 0-10V input with boiler modulation option. In case 0-10V input with boiler setpoint is desired the Pump Assignment QX2 needs to be Q15 under Setup - Pump page.

Cascade:

When multiple boilers are installed they can be wired and programmed to work in a cascade system. A maximum of eight units can be controlled from a single control. In this application one boiler would be assigned as a Master control and all others would be assigned as follower controls. The Master control sequences the operation of other members in the cascade system using the efficiency optimization control method. The room thermostat connections, 0-10V input, outdoor sensor, cascade system sensor get connected on the Master boiler. Once a call for heat is received, the control will determine the system setpoint. Each boiler in the cascade system will have a setpoint up to 20F [11C] higher than the system setpoint to account for heat loss on the primary loop piping. Once the actual system temperature gets close to the target system temperature each boiler setpoint will be lowered accordingly to maintain the required temperature on the system loop.

Similar approach can be sued for DHW operation. If the entire cascade system will be used to satisfy DHW demand, the indirect tank sensor / aquastat only needs to be connected to the Master boiler and will control the DHW demand accordingly. In this application, the boiler temperature for each unit will be the indirect tank setpoint + DHW offset + Cascade Setpoint Compensation. If desired, the DHW offset can be set to zero in this case. If only certain units are intended for the DHW application, there is a parameter in the setup-cascade page to set DHW as a separate circuit. In this case each unit intended to be dedicated for DHW application needs to have DHW separate circuit parameter set to ON. If only one unit is dedicated for DHW application either a sensor or an aquastat can be used and must be connected on this specific unit. If more units are dedicated for DHW, and aquastat must be used and connected in parallel to each unit. In this application, the boiler temperature for each unit will be the indirect tank setpoint + DHW offset.

To establish a cascade system:

1. Set the address of each unit under Setup Cascade page. The Master must be addressed as Master, the followers can be addressed from Follower 1 thru Follower 7. **NOTE:** The addressed must be unique otherwise there will be an error code.
2. Enable the cascade system sensor on the Master boiler ONLY. Connect the cascade system to the master boiler low voltage signal. **NOTE:** The cascade sensor must be installed on the system supply piping as close a possible to the low loss heater or closely spaced tees. The cascade sensor (10kOhm) is surface mount type and it might need to be insulated in case of heat loss.
3. Connect units to each other using 18 or 20 gauge wires (maximum total length for 18 gauge wire is 262 ft [80 m]; for 20 gauge wire is 131 ft [40 m]). The Master and last follower units will take a pair of wires, all other units in between will take 2 pair of wires to create a daisy chain connection.
4. The units are set from the factory to rotate every 50 hours in order to balance the run hours. All other parameters in the cascade setup are optional depending on the system application.

Boiler Safety Features:

Gradient limiting:

During operation, if the boiler supply temperature is rising too quickly, the control will start to modulate down and reduce the firing rate down to the lowest setting to prevent overheating (in case of no flow conditions).

Reverse flow detection:

During operation, the boiler will monitor both supply and return temperatures to ensure the return temperature is not much higher than the supply temperature (in case of reverse flow or malfunction of either supply or return thermistors).

Flow monitoring

The boiler is equipped with a water flow switch to ensure the boiler operates safely. The switch monitors water flow when boiler receives a heat demand. This switch will disable boiler operation in case there is a heat demand but the flow is not detected.

Supply Temperature, and Flue Temperature Supervision

The control monitors the boiler supply temperature thermistor, when this temperature exceeds 190°F [88°C] the control will reduce the output power. If this temperature continues to rise and exceeds 203°F [95°C] the control will shutdown the burner until it cools off. The control will shutdown and lockout if the supply temperature exceeds 208°F [98°C] - manual reset required.

The flue temperature is monitored by a sensor located on the secondary heat exchanger. There are two settings on the controller to monitor this temperature based on the material used for venting. The following table explains the limits and control behavior for each selection. The boiler will modulate to maintain the flue temperature below the settings shown in the table below. In case the temperature exceeds the maximum limit, the boiler will shutdown and run the fan in post-purge mode. If the temperature drops within ten minutes the boiler will return to normal operation, otherwise it will go into a lockout state.

Table 53

Vent Material	Flue gas temperature output reduction	Flue gas temperature output reduction to minimum firing rate	Flue gas temperature switch off limit
PVC	140°F [60°C]	145°F [63°C]	149°F [65°C]
OTHERS	198°F [92°C]	203°C [95°C]	207°F [97°C]

Air pressure switch, Burner door limit switch, and thermal fuse (500 model ONLY)

The control is equipped with a pressure switch to monitor the vent pressure and condensate trap water level. In case the pressure in the vent exceeds 4 in. WC or the condensate trap water level is 4 in. above the air pressure switch connection port the unit will shutdown and go into an error state.

The boiler is equipped with a switch located on the burner door and thermal fuse located on the back of the heat exchanger set to 500°F [260°C] , and 605°F [318°C], respectively. These switches prevents overheating in case of abnormal operation of the appliance or premature deterioration of the insulation disk located on the back of the combustion chamber.

13. Maintenance

Topics in this section

⚠ WARNING

- Maintenance is required to maintain safe operation of the boiler.
- The boiler must be inspected annually by a licensed professional. Repairs and maintenance shall be performed by a licensed professional. The licensed professional must verify proper operation after servicing.
- Keep the boiler area clear and free from combustible materials, gasoline, and other flammable vapors and liquids.
- To protect yourself from harm, before performing maintenance:
  - Turn off the electrical power supply by unplugging the power cord or by turning off the electricity at the circuit breaker. (The boiler controller does not control the electrical power.)
  - Turn off the gas at the manual gas control valve, usually located immediately below the boiler.
  - Turn off the incoming water supply. This can be done at the isolation valve immediately below the boiler or by turning off the water supply to the building.

13.1 Owner Maintenance

⚠ WARNING

If you encounter a problem that is difficult to solve, stop the operation and immediately contact a licensed professional.

Table 54

MONTHLY
Boiler Area
• Verify the area is free of combustible materials, gasoline and other flammable vapors and liquids. • Verify the area is clean from dust and obstructions • Verify the air intake area is free of any contaminants listed in the boiler Installation and Operation Manual. Any contaminants in the boiler intake air vicinity must be removed. If they cannot be removed, contact a licensed professional.
Piping
• Inspect all water, gas, and condensation piping for leaks. Look for signs of leaking lines or corrosion. • Confirm the condensation line is not blocked. If a condensation drain pump is used, confirm the condensation drain pump operates correctly.
Venting
• Verify the boiler vent discharge and air intake is clean and free of obstructions. • Check for leakage, damage, or deformation of venting.
Boiler
• Verify the boiler is free from any abnormal situations, such as diagnostic error codes, loud noises, leakage or other potential issues. • Check that the pressure on the controller display or external pressure gauge indicates 20-70 psi (138-483 kPa).

13.2 Licensed Professional Maintenance

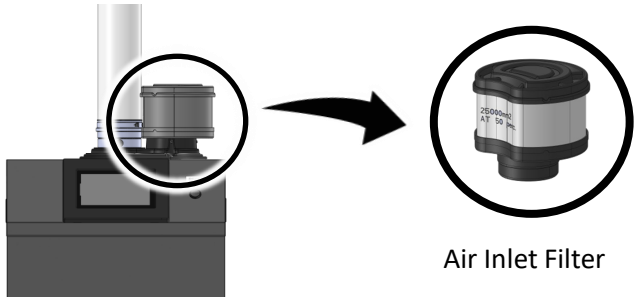
Table 55

ANNUALLY	
Vent System	• Inspect for blockages or damage. • Inspect vent screen or room air filter (if using) for debris and blockages. Clean if needed.
Fan and Motors	Clean dust and dirt from fan and motor (motors are permanently lubricated and do not require lubrication).
Controller	Clean by using a soft, damp cloth. Do not use solvents.
Pressure	Confirm the pressure is within the proper range between 20-70 PSI (1.3 -4.8 Bar). If the pressure is lower than the specified range, add water until in the proper range.
Pressure Relief Valve	Check the operation of pressure relief valve manually once a year. In doing so, it will be necessary to take precautions with regard to the discharge of potentially scalding hot water under pressure. Ensure discharge has a safe place to flow. Contact with your body or other property may cause damage or harm. **⚠ WARNING** Testing the pressure relief valve should only be performed by a licensed professional. Water discharged from the pressure relief valve could cause severe burns instantly or death from scalds.
Heating System Dirt Trap	Clean annually. Be sure to close the shut off valves under the boiler. After cleaning and installing the filter, purge the air.
Expansion Tank	Perform annual checks as recommended by the manufacturer to ensure proper operation.
Condensation Trap	Check if the trap contains sediment. To remove sediment, unplug the bottom of the condensate trap. Remove the sediment, and then return the plug. Do not use a wrench to tighten the condensate drain as this could cause the connection to break.
Condensation Drain	• Confirm the condensation drain line is not blocked or clocked. • Ensure the condensation drain pump (if utilized) is working correctly. • Inspect the condensate neutralizer (if utilized) to ensure the condensate is draining properly, and there is adequate amount of neutralizing agent available.
Draining Water	When the system will be shutdown for a long period of time (seasonal shutdown), close the shutoff valves below the boiler and drain the boiler to protect it from potential freeze damage.

Table 55 continue

Water Quality	Confirm the water quality. Refer to section “4.3.1 Water Quality Guidelines” to determine if the water needs to be treated or conditioned, and for complete water quality guidelines. DHW must be potable, free of corrosive chemicals, sand, dirt, or other contaminates. It is up to the installer to ensure the water does not contain corrosive chemicals or elements that can affect or damage the heat exchanger. Water that contains chemicals exceeding the levels required affect and damage the heat exchanger. Replacement of the heat exchanger due to water quality damage is not covered by the warranty.
Snow Accumulation	• Verify the area around the flue terminal is free of snow and ice. The boiler will not function properly if the combustion air or exhaust vent pipes are impeded (blocked or partially blocked) by obstructions. • Verify the condensate drain line is free of snow and ice. Ensure the line is not blocked or clogged and that condensate is flowing freely.
Freeze Protection	• Freeze protection for new or existing systems must use glycol that is specially formulated for this purpose. This includes inhibitors, which prevent the glycol from attacking the metallic components. The glycol should be for multi-metallic components. Check that the system fluid is correct for the glycol concentration and inhibitor level. The system should be tested at least once a year and as recommended by the producer of the glycol solution.
Coastal Area Installations	Installations located in or near coastal areas may require additional maintenance due to corrosive airborne ocean salt. If corrosion is observed on the body of the boiler, the boiler shall be inspected to ensure proper operation and repaired or replaced, if necessary.
Cleaning	It is imperative that control compartments, burners, and circulating air passageways of the boiler be kept clean. Check burner flame for proper color. Once ignited, the flame must cover the surface of the burner. The flame must burn with a clear, blue, stable flame. If the flame does not have this appearance, complete the following steps: • Turn off and disconnect electrical power. Allow to cool. • Remove the front panel. • Use a vacuum to remove dust from the main burner and fan blades. Do not use a wet cloth or spray cleaners on the burner. Do not use volatile substances such as benzene and thinners; they may ignite or fade the paint. • Inspect the combustion chamber and clean if needed. Follow the cleaning procedure listed in this manual. Condensate Trap Cleaning: • Inspect the condensate drain assembly inside the boiler and your external drain system. • Remove any debris that may be present in the condensate removal system.

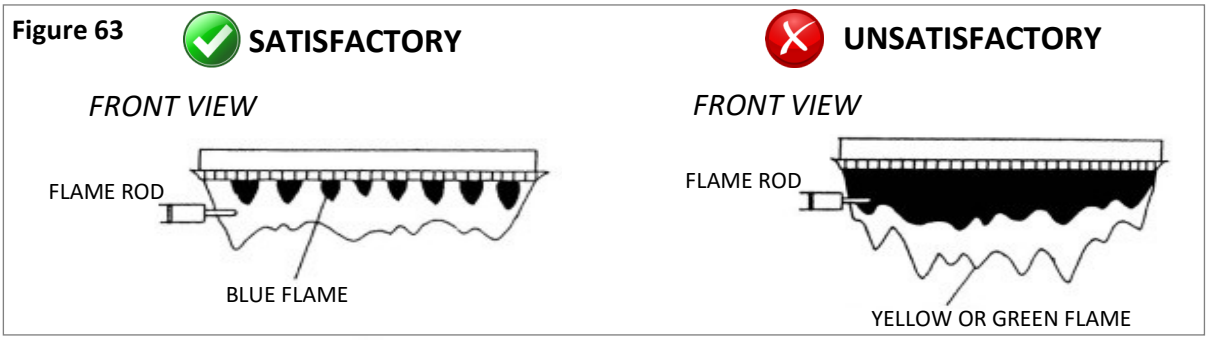
Table 55 continue

Intake Filter	**Inspection:** • To maintain optimum performance, periodically inspect the air filter. • If the air filter appears to have lint and/or dust build up, follow the cleaning procedure described below. • If the air filter appears damaged, contact a trained and qualified professional for a replacement air filter assembly. **Cleaning:** • Clean the Air Filter: With mild dish soap and a soft bristle brush, scrub the filter area of the air filter door. With clean water, rinse the soap off the filter. • Dry the Air Filter: With a lint free towel, dry the air filter. **Figure 62**  Air Inlet Filter

AFTER SERVICING: VISUAL INSPECTION OF FLAME

Verify proper operation after servicing. The burner must flame evenly over the entire surface when operating correctly. The flame must burn with a clear, blue, stable flame. See the parts breakdown of the burner for the location of the view ports. The flame pattern should be as shown in the images below:

Figure 63



Freeze Protection Operation

The electronic management system of the boiler includes protection against frost. When the boiler detects low outdoor ambient temperatures, the boiler will begin its freeze protection operation. When freeze protection is in operation, the pump may circulate water and/or the boiler may fire to prevent the boiler from freezing. Ensure power and gas are supplied to the boiler for freeze protection to function. The internal freeze protection will not necessarily prevent the system piping from freezing. If the water temperature falls below 41°F [5°C], the burner starts up and the boiler pump runs to provide a water temperature of 46°F [8°C] + Boiler Offset 9°F [5°C] + Boiler Differential 20°F [11°C].

Once the target temperature has been reached the burner will turn off, the boiler pump will continue to run and turn off after post purge period. This function only works if boiler is turned on, the gas supply is ON and the water pressure is correct. **NOTE:** The boiler will not engage in freeze protection mode if there are any soft or hard lockout error codes.

When the system needs to be shutdown for extended periods of time, the power and gas supply should be disconnected from the boiler. The boiler and all system piping should then be drained. Freezing damage may occur if there is water remaining in the boiler or system piping. The plumbing lines should also be blown out via compressed air.

13.3 Service of Heat Exchanger

1. Before beginning this procedure, ensure to disconnect the electrical power to the boiler and close the gas ball valve external to the unit. It is very important to wait for the boiler to cool down to the touch before continuing with this process.
2. Remove the front panels and visually inspect the water level in the condensate trap to ensure it is draining properly.
3. Disconnect the wiring connection from the ignition electrodes, ionization probe, and burner door switch (located on burner door).
4. Disconnect the incoming flex line to the venturi by removing the nut. Detach the fan assembly from the heat exchanger by removing 4 nuts located towards the back of the unit.
5. Remove the 6 nuts to disassemble the burner door from the heat exchanger (follow the sequence as shown in the Figure below). Carefully slide out the burner door to clear the studs on the heat exchanger (pull while rotating to clear any obstruction and avoid damaging the components on the burner door assembly).

CLEANING THE HEAT EXCHANGER:

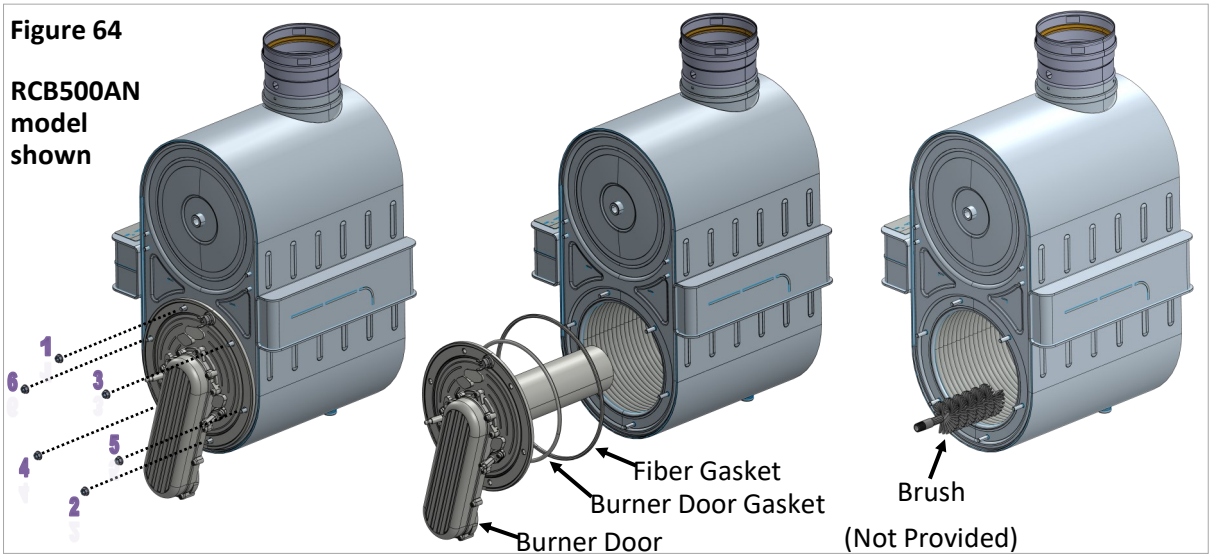
6. Inspect the insulation disk located on the rear of the combustion chamber. Use a nylon brush and vacuum to clean combustion residue located inside of the combustion chamber.

NOTE: DO NOT use a metal brush. Using a metal brush will cause irreparable damage to the heat exchanger.

7. Rinse with clean water. NOTE: Do not rinse the target wall insulation located on the back of the combustion chamber. If required spray with white vinegar or a cleaning product suitable for stainless steel (leave to work for 3 to 5 minutes).
8. Inspect the burner door insulation disk and gaskets (replace if they are damaged).
9. Check whether the surface of the burner is damaged in any way . Replace burner and its gaskets if they are damaged. To disassemble the burner, remove 5 screws securing the burner inlet channel to the burner door. To install new burner, ensure to install it with the burner cap facing down to ensure the burner flange sits flat on the burner door.

Figure 64

RCB500AN model shown



WARNING If the gaskets are damaged DO NOT reuse, the gaskets must be replaced.

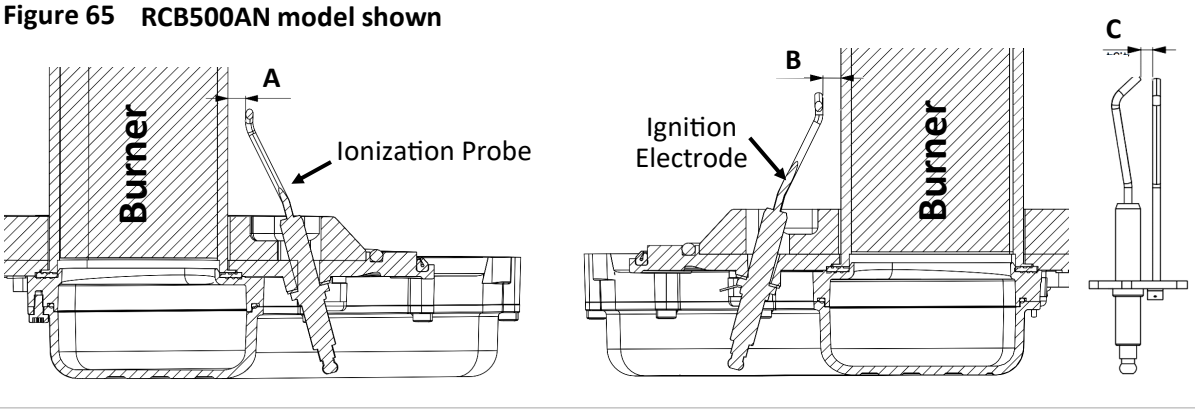
INSPECTING BURNER DOOR ASSEMBLY:

10. Inspect the ignition and ionization electrodes. Check the gas of ignition electrodes. Check the distance from ignition electrode to the burner and check the gap from ionization probe to the burner.

Table 56

A	B	C
10.5MM +/- 1		4.5MM +/- 0.5

Figure 65 RCB500AN model shown

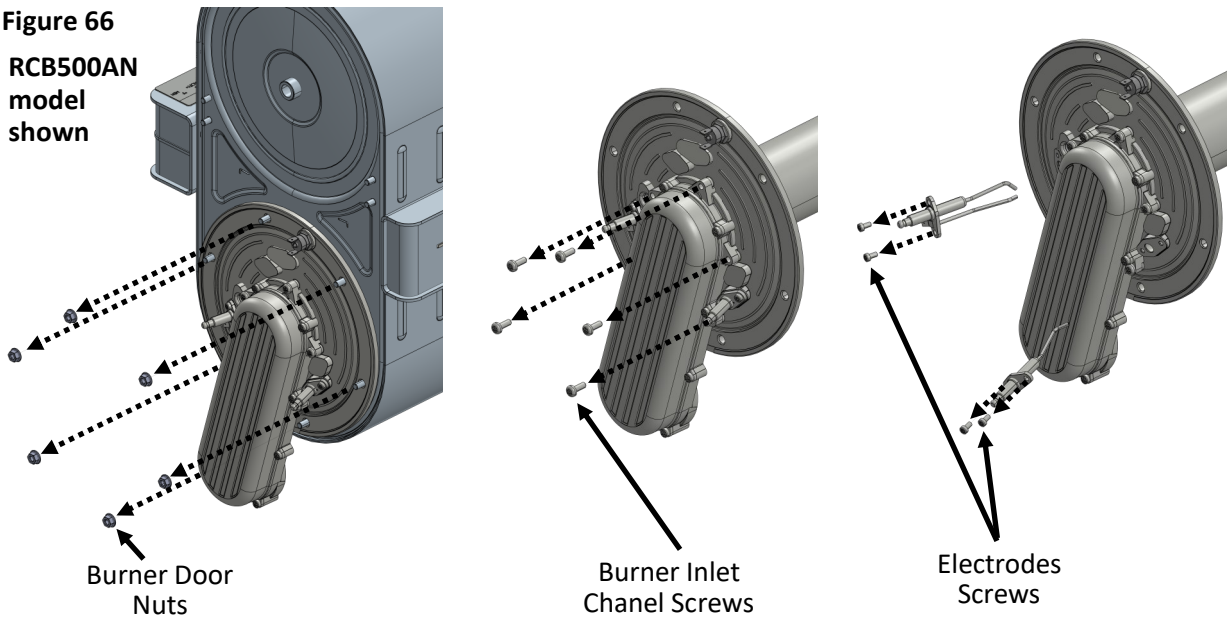


11. Replace the electrodes if they are damaged or the gap and/or distance to the burner is out of the specifications shown in the above table. NOTE: Do not remove the ignition or ionization electrode unless you have spare gaskets and spare parts with gasket available. Most likely the gasket will get damaged when electrodes are removed.
12. Reassemble the components in the reverse way they were disassembled. **NOTE:** Ensure to install the burner door using torque sequence as shown in Figure below. Ensure all gaskets are in good condition or replace them if necessary. All screws must be tight and torqued according to the table below.

Table 57

For Model: RCB500AN			
Components	Burner Door Nuts (M6)	Burner Inlet Chanel Screws (M5)	Electrodes Screws (M4)
Torque	44.5 Lb-in (5 Nm)	31 Lb-in (3.5 Nm)	22 Lb-in (2.5 Nm)
For Models: RCB750AN / RCB1000AN			
Components	Burner Door Nuts (M10)	Burner Inlet Chanel Screws (M5)	Electrodes Screws (M4)
Torque	442.5 Lb-in (50 Nm)	31 Lb-in (3.5 Nm)	22 Lb-in (2.5 Nm)

Figure 66
RCB500AN model shown



13.4 Instructions to Clean Condensate Trap

The condensate trap must be filled with water during all times of boiler operation to avoid flue gas emission from the condensate drain line. Failure to fill the trap could result in severe personal injury or death.

1. Before beginning this procedure, ensure to disconnect the electrical power to the boiler and close the gas ball valve external to the unit. It is very important to wait for the boiler to cool down to the touch before continuing with this process.
2. Remove the boiler front panel and locate the condensate trap.
3. Loosen the clamp and remove the hose connected to the inlet of the condensate trap. Disconnect the clear hose from the APS connected on the side of the condensate trap inlet connection.
4. Loosen the nut on the discharge of the condensate trap. NOTE: Inspect the gasket and replace if needed.
5. Remove the condensate trap assembly for inspection. Remove the cap located on the bottom of the condensate trap and clean with fresh water. Inspect the floating ball and O-rings located inside of the condensate trap and ensure the ball is floating freely.

Figure 67 **RCB1000AN model shown**

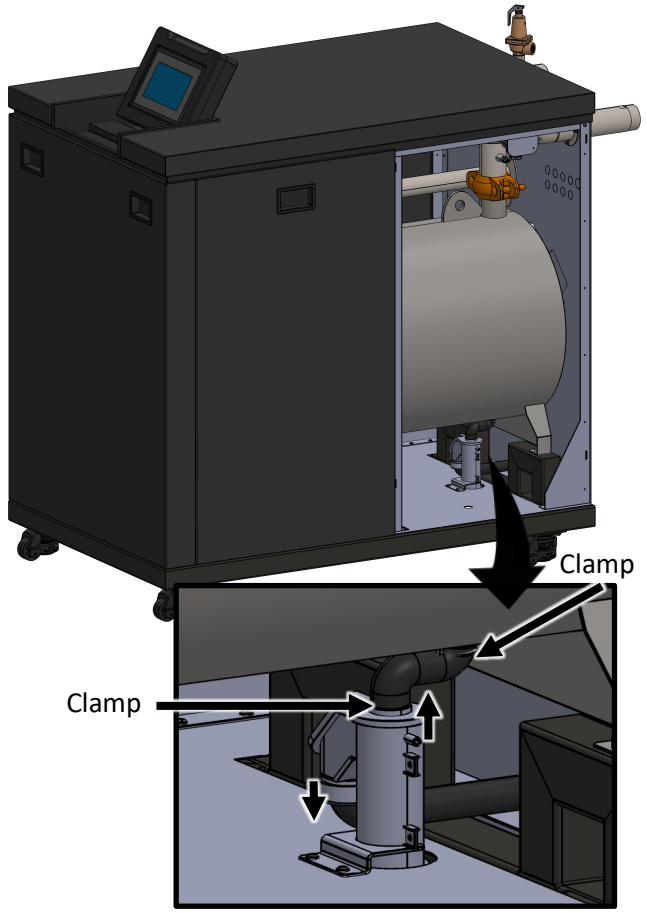
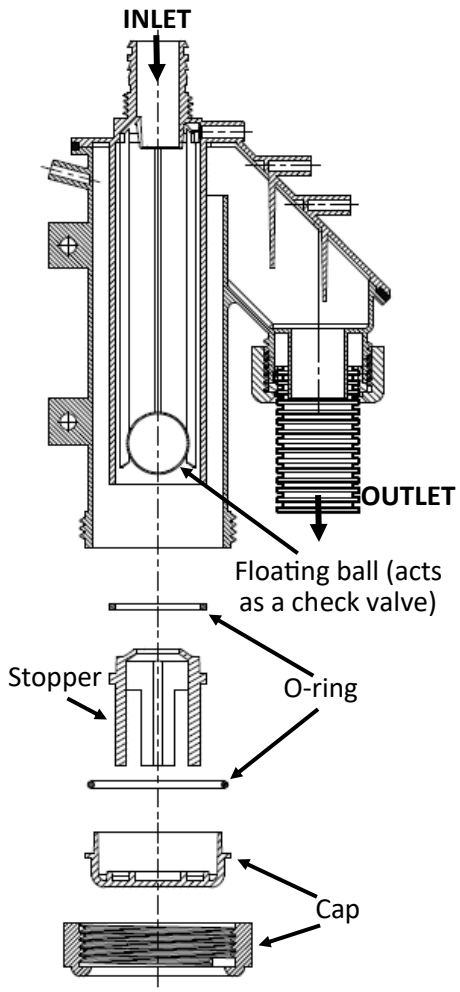


Figure 68

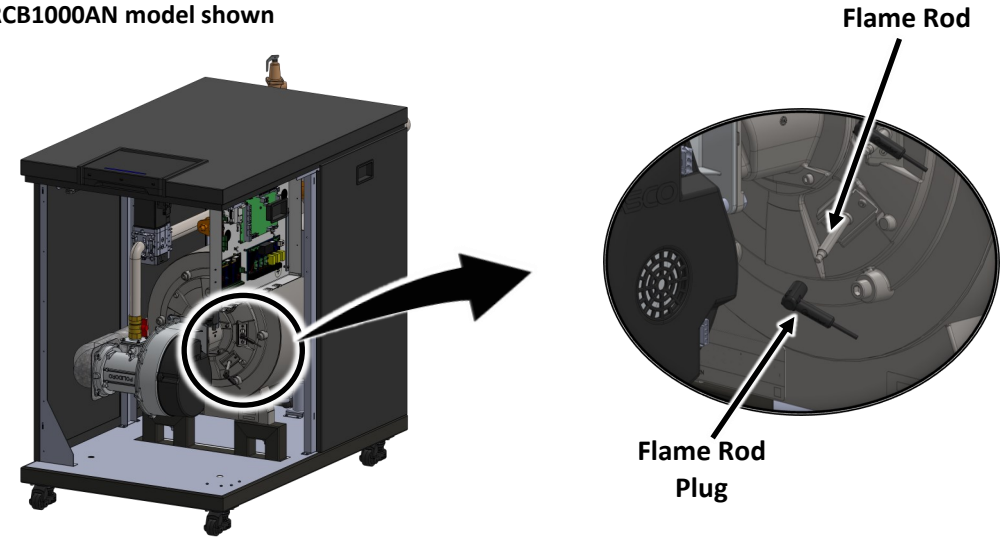


WARNING If the gaskets/O-rings are damaged DO NOT reuse, they must be replaced.

13.5 Test the Ignition Safety Shut Off Device

1. Remove the boiler front panel.
2. Ensure the boiler is not currently firing and the flame rod is not hot to touch.
3. Disconnect the wiring connection from the flame rod (located on burner door—lower side)

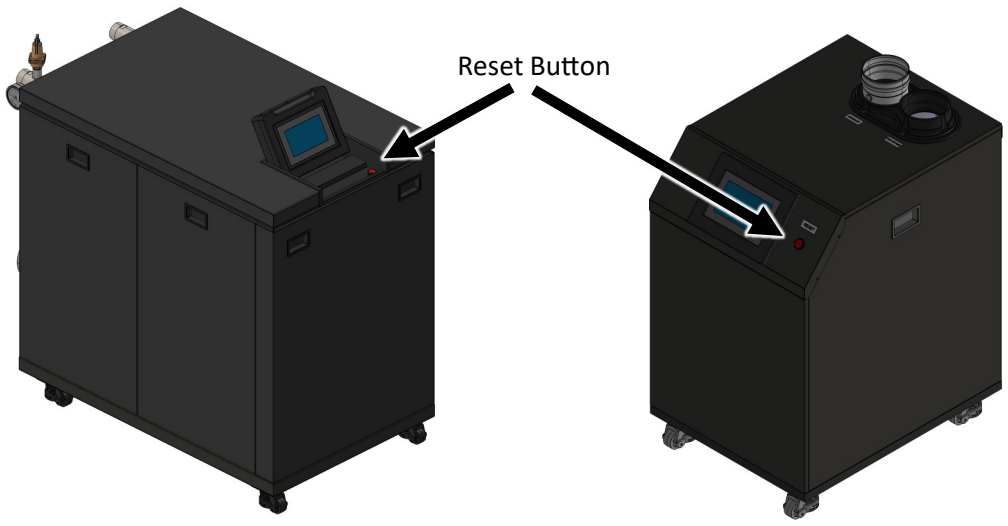
Figure 69 RCB1000AN model shown



WARNING Do not touch the inside of the wiring connection while it is disconnected.

4. Place the boiler in operation by a call for heat (using room thermostat or from service page).
5. The boiler initiates one start-up attempt followed by three restart attempts.
   After the last start-up attempt, the boiler locks out and the gas valve shuts off. Code '133 Safety time for establishment of flame' appears on the controller display which indicates ignition system safety shutoff.
6. Reconnect the wiring connection to the flame rod. Be careful not to touch the inside of the wiring connection. To reset the error, press the **reset button located on the right side of the display panel on 500 model, and under the display panel assembly for 750 and 1000 models** . The boiler starts up.

Figure 70



7. Replace the boiler front panel.
8. The boiler may now go back into normal operation.

14. Appendices

14.1 Flush the CH Plumbing System

When replacing an existing boiler, the heating system shall be flushed with an approved system cleaner before the new boiler is added to the system.

The Rinnai boiler must be isolated from the system while the system is flushed. No system cleaner should ever enter the boiler heat exchanger due to its caustic nature which could damage the heat exchanger.

Instructions

1. Flush the CH system with water.
2. Isolate the boiler from the CH system.
3. Fill the CH system with an approved cleaner and circulate through the system.
4. If the installation is a zone system (utilizes multiple zones), flush out each zone individually.
5. Flush the CH system with water again, ensuring all zones have been flushed.
6. Clean out the dirt trap per manufacture's instructions.
7. The boiler and system may now be filled through the fill valves.
8. If using glycol, ensure it is an approved glycol and ratio.
9. Verify water quality is within the stated values in section "4.3.1 Water Quality Guidelines."

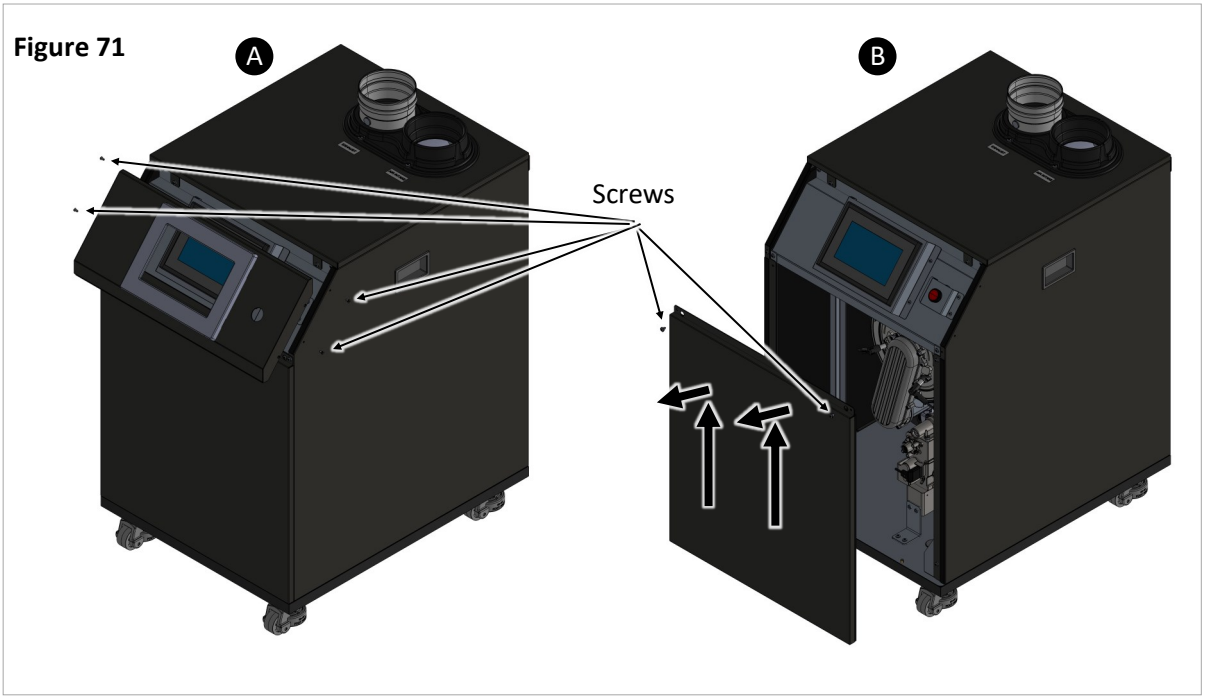
IMPORTANT

- Water should be within guidelines for water quality listed in section "4.3.1 Water Quality Guidelines."
- Use the proper water treatment to ensure the pH and water hardness are within the Rinnai boiler water quality guidelines listed in section "4.3.1 Water Quality Guidelines."
- Test the pH of the water that will be used for filling the system.

Front Panel Removal Instructions (500 Model):

1. Use a Phillips head screwdriver to remove four (4) screws securing the angle panel around the display assembly (A in Figure 71). Place it is safe location until it is needed for re-assembly.
2. Use a Phillips head screwdriver to remove two screws securing the front panel (B in Figure 71). Slide the panel up to clear the pins on the bottom, then pull it out to remove it from the boiler.
3. Place the removed front panel at a safe location until it can be remounted after the service.

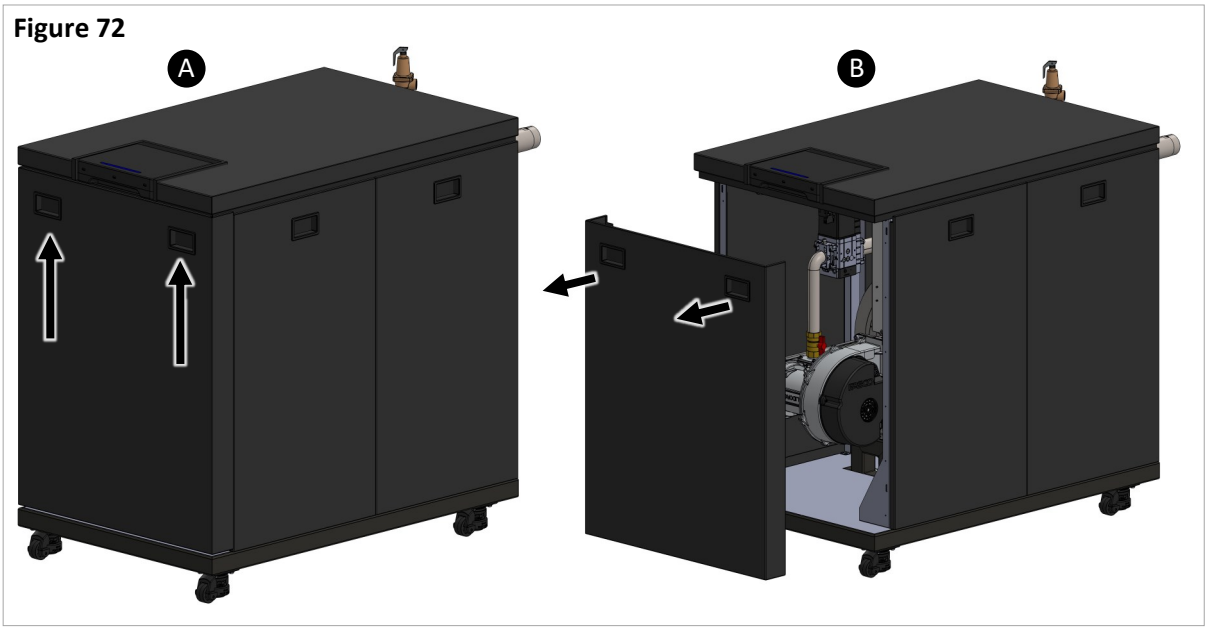
Figure 71



Front Panel Removal Instructions (750 & 1000 Models):

1. Use two handles to move up to front panel in order for the hooks to clear the slots holding the front panel in place (A in Figure 72).
2. Pull the panel out and remove it from the boiler (B in Figure 72).
3. Place the removed front panel at a safe location until it can be remounted after the service.

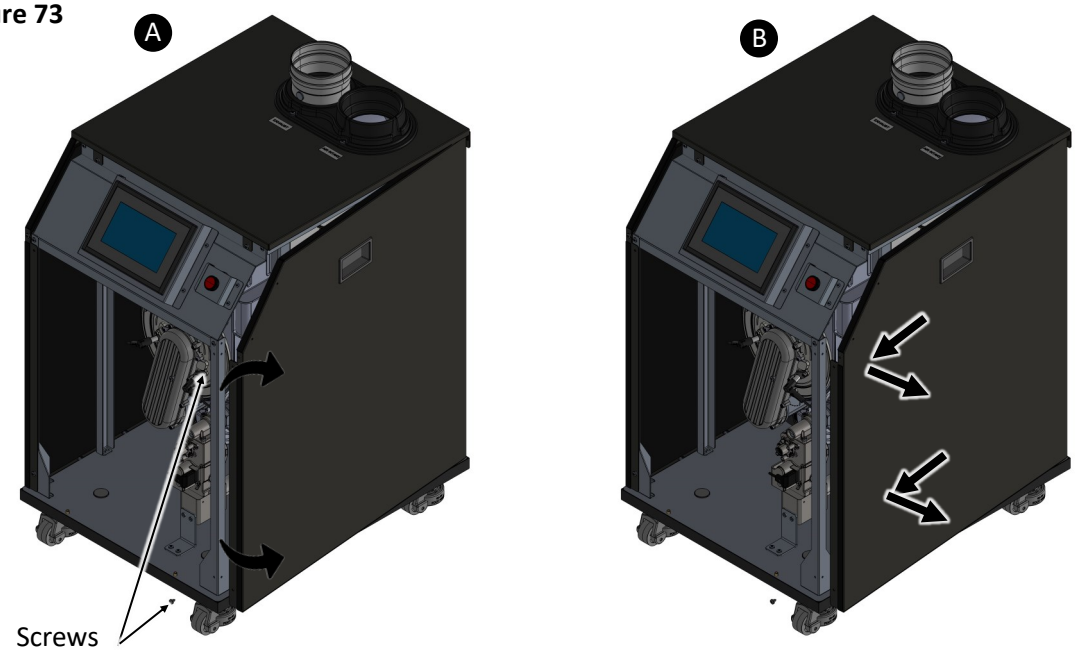
Figure 72



Side Panel Removal Instructions (500 Model):

1. Remove the front panel as shown in front panel removal instructions. Place the front panel on a safe place where it can not be damaged.
2. Remove two screws for each panel from the front of the boiler, then rotate the side panel out to clear the bottom part of the side panel (A in Figure 73).
3. Pull the panel forward to clear the locking mechanism on the back side then pull the panel out (B in Figure 73).
4. Place the removed side panel at a safe location until it can be remounted after the service.

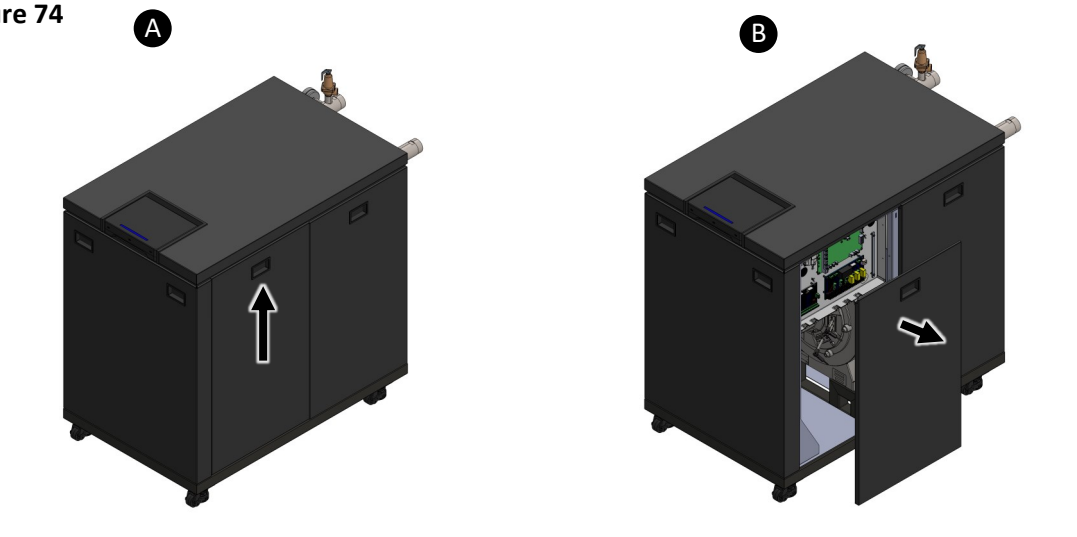
Figure 73



Side Panel Removal Instructions (750 and 1000 Models):

1. Use two handles to move up to front panel in order for the hooks to clear the slots holding the front panel in place (A in Figure 74).
2. Pull the panel out and remove it from the boiler (B in Figure 74).
3. Place the removed side panel at a safe location until it can be remounted after the service.

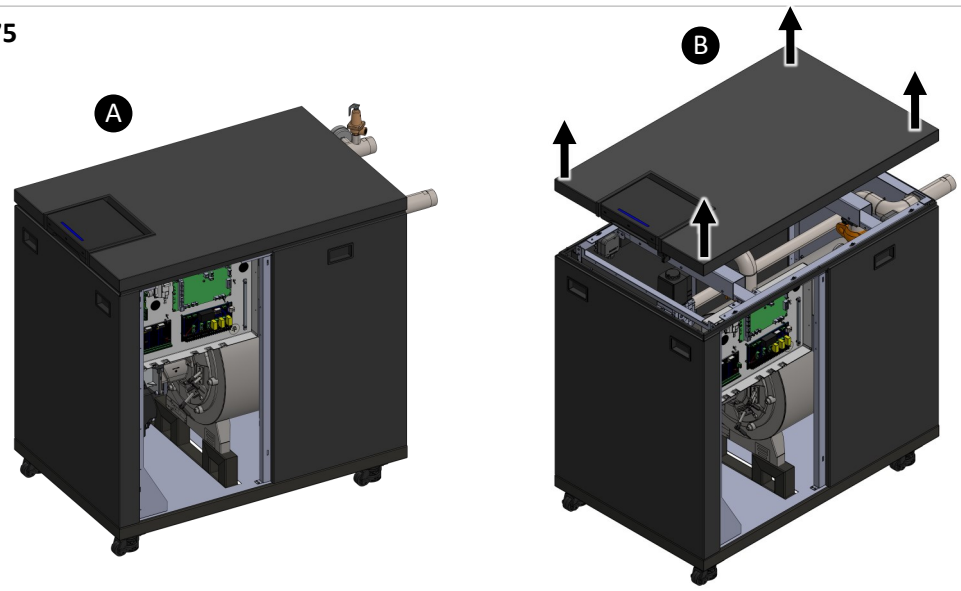
Figure 74



Top Panel Removal Instructions (750 and 1000 Models):

1. Remove the front left side panel to gain access to the electrical connections.
2. Disconnect the display LAN cable from the high voltage connection board, remove the quick disconnects for reset button cable and LED indicator cable.
3. The top panel assembly (with display) is secured in place with 6 locking pins. Pull up the top panel from the four corners to disconnect it from the boiler.
4. Place the removed top panel at a safe location until it can be remounted after the service.

Figure 75



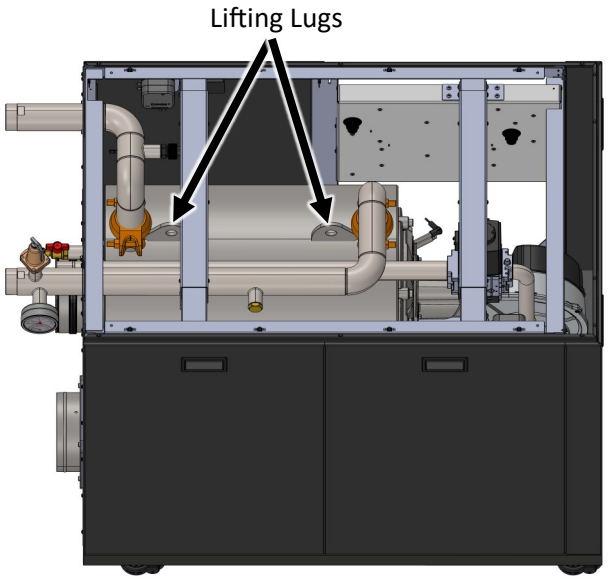
Boiler Lifting Instructions (750 and 1000 Models):

Due to heavy weight, it might be difficult to move the appliance to certain location. The appliance has built-in casters that facilitates to move them around on flat surfaces. Also the unit can be picked up using pallet jack or forklift if needed. In some circumstances the unit might need to be lifted to go through an area with limited access. In this case, follow the steps below:

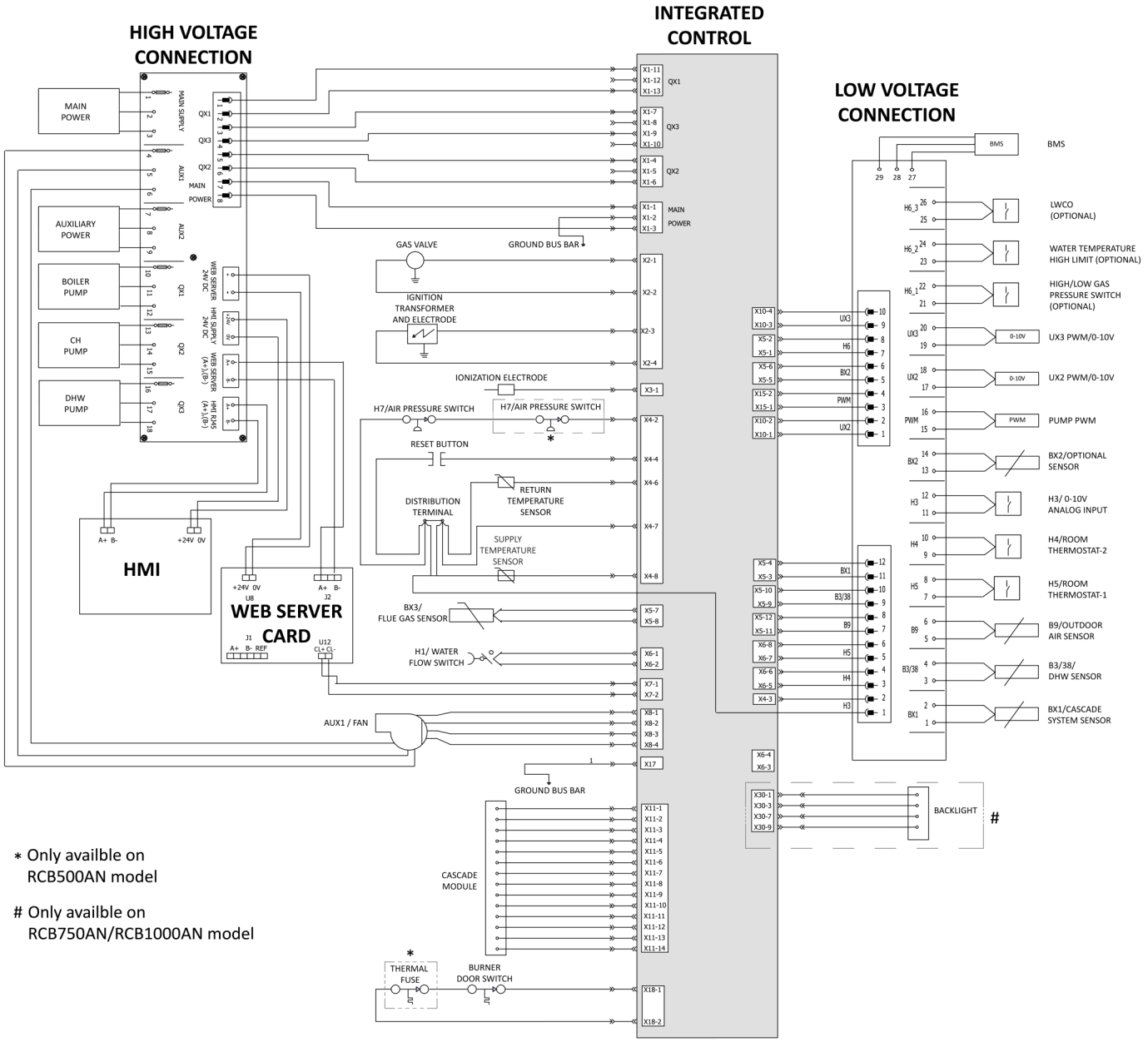
1. Follow the above instruction to remove the top panel assembly (Figure 75).
2. Use the provided lifting lugs on the heat exchanger to lift the boiler (Figure 76).

Place the removed side panel at a safe location until it can be remounted after the service.

Figure 76



14.2 Ladder Diagram



∗ Only availble on RCB500AN model

Only availble on RCB750AN/RCB1000AN model

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RCB500AN / RCB750AN / RCB1000AN LADDER DIAGRAM

14.3 Wi-Fi Connectivity

The Rinnai Commercial Boiler is shipped out of the factory with built-in Wi-Fi. In order to connect the unit to Wi-Fi follow the steps below:

1. Access the boiler SETUP page under Wi-Fi sub-menu to enable Wi-Fi.
2. Use a smart phone, tablet, or computer with Wi-Fi access and search for the device, the name should be Boiler - xxxxxxxxxxxx (Figure A). The digits in front of the boiler represent the boiler MAC ID. If there are multiple devices in the same boiler room, check for the correct MAC ID of the device being connected from the VIEW page sub-menu info. NOTE: If the device was previously connected to Wi-Fi and new connection is being established, press forget Wi-Fi icon on the boiler SETUP page under Wi-Fi submenu to forget previous connection.
3. On the Wi-Fi list, click on Boiler - xxxxxxxxxxxx to connect to the device. A new screen will pop-up and prompt for a password. The password is 123456789. Enter the password then click Join to connect to the device (Figure B).
4. Once the credentials are verified, the screen will disappear and new window will pop-up to configure Wi-Fi. In case this window does not show up automatically, go to internet browser and type the following address: 192.168.4.1 (Figure C).
5. Click on configure Wi-Fi window to enter Wi-Fi credentials for the network intended for this connection (Figure D).
6. New screen will pop-up while the credentials are being saved and verified. Once the connection has been established the screen will disappear.
7. Verify on the boiler home page (top right corner) for connectivity.
8. Follow next steps on Rinnai Central app to add the device to the user account.

Figure A

Figure B

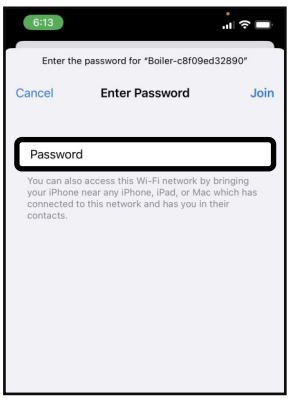


Figure C

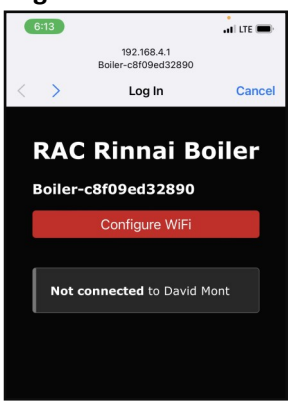


Figure D

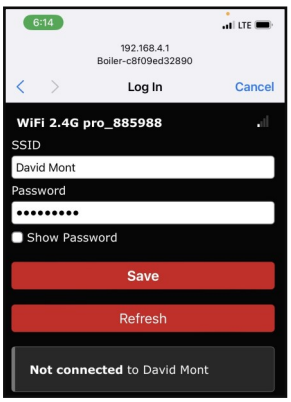
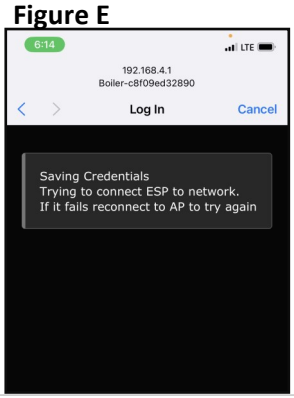


Figure E

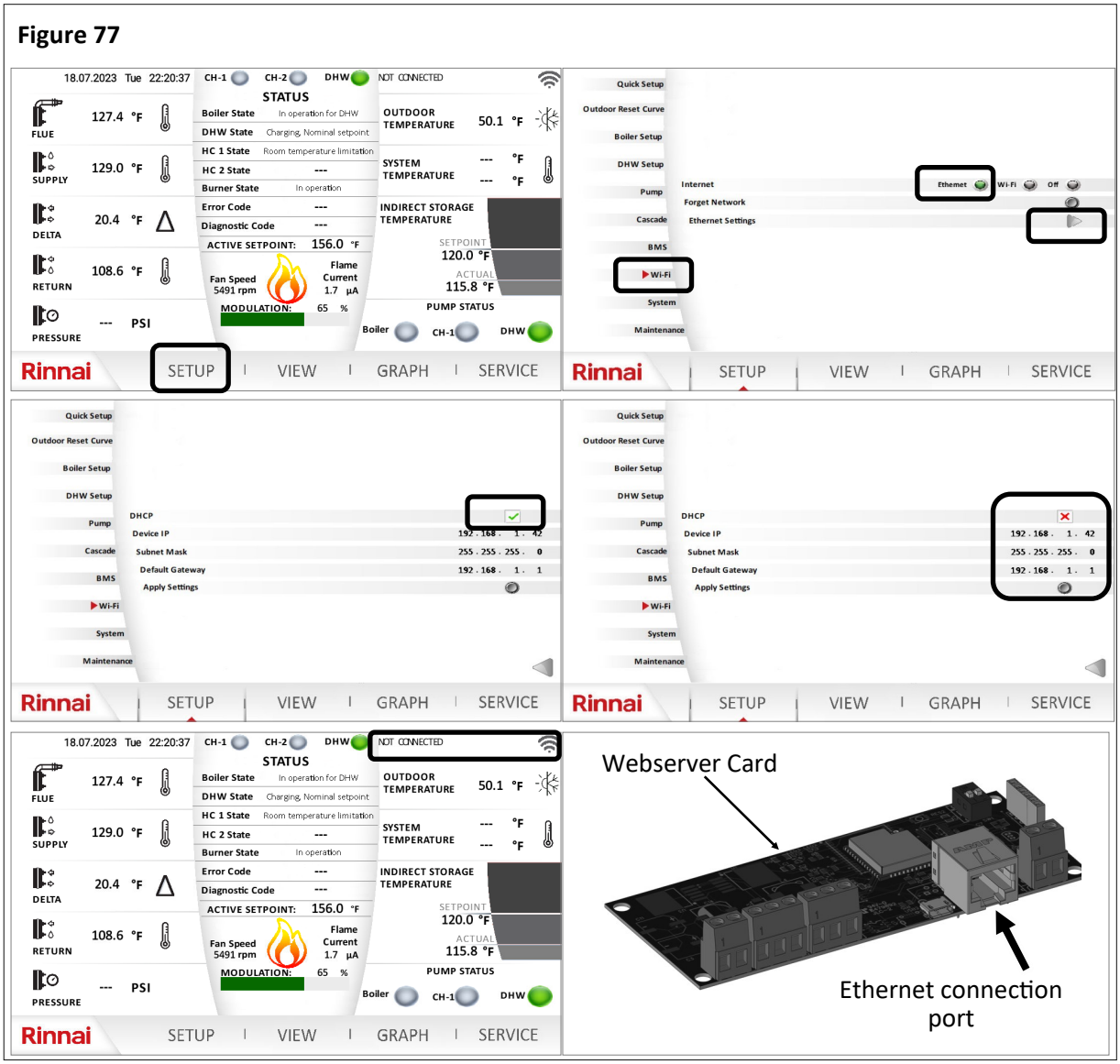


14.4 Ethernet Connectivity

The Rinnai Commercial Boiler is shipped out of the factory with built-in Wi-Fi. If Wi-Fi signal is not available at the installation site or if the signal is poor, the boiler can be hardwired and connected via an ethernet port. Follow the steps below:

1. Connect a LAN cable (CAT 5 or CAT 6) from the Webserver Card to the Network device.
2. From the Home screen, click on SETUP and select the appropriate user and enter the password to gain access to SETUP page.
3. Once in the SETUP page, click on Wi-Fi submenu on the left.
4. Select Ethernet option (default is Off).
5. Once Ethernet option is selected, then click on the arrow for Ethernet Settings .
6. If DHCP is enable on the network (it varies from site to site - user preference), then click on the DHCP icon to enable DHCP. The unit should connect to the network. Verify on the Wi-Fi home page for connectivity.
7. If DHCP is disabled. Disable the DHCP on the Wi-Fi screen , under Ethernet Settings.
8. Enter the Device IP, Subnet Mask, and Default Gateway into the related filed on the screen. Once the process is completed, click on Apply Settings to save the configuration. Verify on the Wi-Fi home page for connectivity.

Figure 77



14.5 Building Management System (BMS)

This section of the manual provides guidelines for the use of Modbus communication system with Rinnai Commercial Boiler (RCB) appliances.

1. Disconnect the electrical power before beginning the process. Failure to do so could result in electrical shock, property/appliance damage, serious personal injury , or death.
2. Ensure to have a Modbus master device such as a Building Management System (BMS) or a computer with Modbus master software, and an RS-485 serial port or USB port with a converter to RS-485.
3. Wire the BMS to the Modbus connections on the low voltage terminals labeled BMS (A+; B- ; REF).
4. On the boiler screen enter the SETUP page and click on BMS to access the Modbus configuration.

Modbus Address:

Addresses 1 - 20 (Default: 1) are free to be assigned to Modbus devices on the bus. Each address can be assigned to ONLY one Modbus device on the bus.

Baud Rate:

All devices must have the same baud rate. The baud rate (communication speed) can be set on the control display to 4800, 9600, 19200, 38400 or default (115200) baud. The higher the value the higher is the speed, but less number of devices can be connected and the cable length gets shorter. This boiler, as well as any other device on the same bus and the Modbus master, must have the same baud rate setting. Select the highest baud rate that offers the most reliable communication performance over the bus. Some things that can affect communications are: Long wire runs; Wire quality; A noisy electrical environment; The number of devices on the bus. These conditions may require using a lower baud rate.

Parity & Stop Bits:

All devices must have the same parity and stop bits. The parity & stop bits parameters of the Modbus must be set to match the rest of the devices on the bus. Although it is common to set serial devices to use no parity, setting the parity to even or odd may improve communications reliability on all connected devices on the bus. This parameter has 6 possible selections which should be sufficient to establish communication with other devices (Parity none - 1 stop bits; Parity none - 2 stop bits; Parity eve - 1 stop bits; Parity even - 2 stop bits; Parity odd - 1 stop bits; Parity odd - 2 stop bits).

Apply Settings:

Click on apply settings button to save parameters after adjustments.

Building Management System (BMS)

Table 58

MODBUS LIST					
MODBUS REGISTER	**POINT NAME**	**POINT RESOLUTION**	**RELATED LINE NUMBER**	**READ (R) or WRITE (W)**	**UNIT**
600	FLUE TEMPERATURE	x10	8316	R	°C | °F
601	SUPPLY TEMPERATURE	x10	8310	R	°C | °F
602	RETURN TEMPERATURE	x10	8314	R	°C | °F
603	WATER PRESSURE	x10	9005	R	BAR | PSI
604	BOILER SETPOINT	x10	8311	R	°C | °F
605	ERROR CODE	-	6700	R	-
606	DIAGNOSTIC CODE	-	6705	R	-
607	FLAME CURRENT	x10	8329	R	µA
608	CURRENT FAN SPEED	-	8323	R	RPM
609	OUTDOOR TEMPERATURE	x10	8700	R	°C | °F
610	SYSTEM TEMPERATURE ACTUAL	x10	8318	R	°C | °F
611	SYSTEM TEMPERATURE SETPOINT	x10	8319	R	°C | °F
612	DHW TEMPERATURE ACTUAL	x10	8830	R	°C | °F
613	DHW TEMPERATURE SETPOINT	x10	1610	R	°C | °F
614	BOILER STATE	-	8005	R	-
615	DHW STATE	-	8003	R	-
616	HC1 STATE	-	8000	R	-
617	HC2 STATE	-	8001	R	-
618	BURNER STATE	-	8009	R	-
619	MODULATION	-	8326	R	%
620	MINIMUM FAN SPEED LF	-	9524	R	rpm
621	MAXIMUM FAN SPEED HF	-	9529	R	rpm
622	IGNITION FAN SPEED	-	9512	R	rpm
623	FAN SETPOINT	-	8324	R.	rpm
624	CURRENT FAN CONTROL	-	8325	R	%
625	ROOM THERMOSTAT CH1	-	7865	R	-
626	ROOM THERMOSTAT CH2	-	7860	R	-
627	THERMOSTAT STATE CH1 DEMAND	-	8749	R	-
628	THERMOSTAT STATE CH2 DEMAND	-	8779	R	-
629	0-10V INPUT H3	x10	7854	R	V
630	WATER PRESSURE SENSOR H1	-	7841	R	-
631	WATER PRESSURE VOLTAGE	x10	7840	R	V
632	AIR PRESSURE SWITCH H7	-	7874	R	-
633	GAS PRESSURE SWITCH H6	-	7872	R	-
634	BURNER RUN HOURS	-	8330	R	h

Table 58 continue

MODBUS LIST					
MODBUS REGISTER	**POINT NAME**	**POINT RESOLUTION**	**RELATED LINE NUMBER**	**READ (R) or WRITE (W)**	**UNIT**
635	IGNITION CYCLES	-	8331	R	-
636	RUN HOURS HEATING	-	8338	R	h
637	RUN HOURS DHW	-	8339	R	h
638	TOTAL GAS ENERGY HC	-	8378	R	kWh
639	TOTAL GAS ENERGY DHW	-	8379	R	kWh
640	TOTAL GAS ENERGY CH & DHW	-	8380	R	kWh
641	GAS ENERGY FOR CH	-	8381	R	kWh
642	GAS ENERGY FOR DHW	-	8382	R	kWh
643	GAS ENERGY FOR CH & DHW	-	8383	R	kWh
644	BOILER PUMP Q1	-	8031	R	-
645	BOILER PUMP Q1 SPEED	-	8308	R	%
646	CH PUMP Q2	-	9032	R	-
647	DHW PUMP Q3	-	9033	R	-
648	DHW PUMP Q3 SPEED	-	8825	R	%
649	UX2	-	7717 / 7719	R	V | %
650	UX3	-	7725 / 7726	R	V | %
651	P1	-	7714	R	%
652	CASCADE MASTER INFO	-	8101	R	-
653	CASCADE FOLLOWER 1 INFO	-	8103	R	-
654	CASCADE FOLLOWER 2 INFO	-	8105	R	-
655	CASCADE FOLLOWER 3 INFO	-	8107	R	-
656	CASCADE FOLLOWER 4 INFO	-	8109	R	-
657	CASCADE FOLLOWER 5 INFO	-	8111	R	-
658	CASCADE FOLLOWER 6 INFO	-	8113	R	-
659	CASCADE FOLLOWER 7 INFO	-	8115	R	-
660	WEB SERVER CARD VERSION	x1000	-	R	-
661	LMS PARAMETER VERSION 1	-	6230	R	-
662	LMS PARAMETER VERSION 2	-	6231	R	-
663	IMPERIAL/METRIC SELECTION	0-1	-	R	-

NOTE: For the switches state: 0 - Open ; 1 - Closed

14.6 Remove a Boiler from a Common Vent System

The following information is required by ANSI Z21.13:

NOTE: Not all statements are applicable to this appliance.

If a boiler is removed from a common vent system, the common vent system is likely to be too large for proper venting of the remaining appliances connected to it.

The instructions shall include the test procedure set forth below:

At the time of removal of an existing boiler, the following steps shall be followed with each other appliances remaining connected to the common venting system are not in operation.

1. Seal any unused openings in the common venting system.
2. Visually inspect the venting system for proper size and horizontal pitch and determine there is no blockage or restriction, leakage, corrosion and other deficiencies which could cause an unsafe condition.
3. Insofar as is practical, close all building doors and windows and all doors between the space in which the appliances remaining connected to the common venting system are located and other spaces of the building. Turn on clothes dryers and any appliance not connected to the common venting system. Turn on any exhaust fans, such as range hoods and bathroom exhausts, so they will operate at maximum speed. Do not operate a summer exhaust fan. Close fireplace dampers.
4. Place in operation the appliance being inspected. Follow the lighting instructions. Adjust thermostat so appliance will operate continuously.
5. After it has been determined that each appliance remaining connected to the common venting system properly vents when tested as outlined above, return doors, windows, exhaust fans, fireplace dampers, and any other gas-burning appliance to their previous condition of use.
6. Any improper operation of the common venting system should be corrected so the installation conforms with the National Fuel Gas Code, ANSI Z223.1/NFPA 54, and/or the Natural Gas and Propane Installation Code, CAN/CSA B149.1. When resizing any portion of the common venting system, the common venting system should be resized to approach the minimum size as determined using the appropriate tables in Chapter 13 of the National Fuel Gas Code, ANSI Z223.1/NFPA 54, and/or the Natural Gas and Propane Installation Code, CAN/CSA B149.1.

14.7 Massachusetts State Gas Regulations

FOR GAS MODELS SOLD IN MASSACHUSETTS

NOTICE BEFORE INSTALLATION:

This direct-vent appliance must be installed by a properly trained licensed professional. If you are not properly trained, you must not install this unit.

IMPORTANT: In the State of Massachusetts (248 CMR 4.00 & 5.00):

For all side wall horizontally vented gas fueled equipment installed in every dwelling, building or structure used in whole or in part for residential purposes, including those owned or operated by the Commonwealth and where the side wall exhaust vent termination is less than 7 ft above finished grade in the area of the venting, including but not limited to decks and porches, the following requirements shall be satisfied:

1. INSTALLATION OF CARBON MONOXIDE DETECTORS. At the time of installation of the side wall horizontal vented gas fueled equipment, the installing plumber or gasfitter shall observe that a hard wired carbon monoxide detector with an alarm and battery back-up is installed on the floor level where the gas equipment is to be installed. In addition, the installing plumber or gasfitter shall observe that a battery operated or hard wired carbon monoxide detector with an alarm is installed on each additional level of the dwelling, building or structure served by the side wall horizontal vented gas fueled equipment. It shall be the responsibility of the property owner to secure the services of qualified licensed professionals for the installation of hard wired carbon monoxide detectors

   A In the event that the side wall horizontally vented gas fueled equipment is installed in a crawl space or an attic, the hard wired carbon monoxide detector with alarm and battery back-up may be installed on the next adjacent floor level.

   B In the event that the requirements of this subdivision can not be met at the time of completion of installation, the owner shall have a period of thirty (30) days to comply with the above requirements; provided, however, that during said thirty (30) day period, a battery operated carbon monoxide detector with an alarm shall be installed.

2. APPROVED CARBON MONOXIDE DETECTORS. Each carbon monoxide detector as required in accordance with the above provisions shall comply with NFPA 720 and be ANSI/UL 2034 listed and IAS certified.

3. SIGNAGE. A metal or plastic identification plate shall be permanently mounted to the exterior of the building at a minimum height of 8 ft above grade directly in line with the exhaust vent terminal for the horizontally vented gas fueled heating appliance or equipment. The sign shall read, in print size no less than one-half (1/2) inch in size, **"GAS VENT DIRECTLY BELOW. KEEP CLEAR OF ALL OBSTRUCTIONS**."

4. INSPECTION. The state or local gas inspector of the side wall horizontally vented gas fueled equipment shall not approve the installation unless, upon inspection, the inspector observes carbon monoxide detectors and signage installed in accordance with the provisions of 248 CMR 5.08(2)(a)1 through 4.

14.8 Warranty

Models: RCB500AN, RCB750AN, and RCB1000AN

What Is Covered?

The Rinnai Standard Limited Warranty covers any defects in materials or workmanship when the product is installed and operated according to Rinnai published product specifications, subject to the terms within this Limited Warranty document. This Limited Warranty applies only to products that meet the requirements of a “qualified product installation” and are originally installed in the United States and Canada. Improper installation may void this Limited Warranty. A “qualified product installation” consists of the following: (1) installed by a company or individual which (a) holds a current government issued license which certifies the company or individual is qualified to install and service commercial gas boilers in the state where the product is located, if such licensing is required; and, (b) has successfully completed Rinnai commercial gas boiler product training at an approved Rinnai training facility and/or by a remote training program Rinnai authorized trainer, and (2) installation, startup, operation and service is performed in compliance with (a) all Rinnai published engineering, application, installation, startup and service documentation, (b) all applicable federal, state and local laws, (c) applicable plumbing, electrical, mechanical and building codes and best industry standards. This Limited Warranty is subject to the conditions that the Rinnai boiler has been installed per the “qualified product installation” terms and ongoing and proper maintenance has been performed, according to Rinnai Installation and Service documentation, by a professional, licensed (if required) heating contractor. Proof of the required service and maintenance tasks being completed must be kept in the provided Rinnai Installation, Commissioning and Service Record. This Limited Warranty coverage, as set out in the table below, extends to the original end use purchaser and subsequent owners, but only while the product remains at the site of the original installation, and terminates if the product is moved or reinstalled at a new location.

Table 59

Item	Period of Coverage (from date of purchase)
Heat Exchanger	10 Years
All Other Parts and Components [1]	1 Year
Reasonable Labor	1 Year

[1] Parts replaced during recommended maintenance procedures are not covered by this Limited Warranty.

What Will Rinnai Do?

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

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

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

Proof of purchase is required to obtain warranty service. You may show proof of purchase with a dated sales receipt, or by registering within 90 days of purchasing the product. To register your Rinnai Commercial Boiler, please visit www.rinnai.us. For those without internet access, please call 1-800-621-9419. Receipt of registration by Rinnai will constitute proof-of-purchase for this product. Registration of product installed in new home construction may be verified with a copy of the closing papers provided by the initial home buyer. However, registration is not necessary in order to validate this Limited Warranty.

What is Not Covered? This Limited Warranty does not cover any failures, heat exchanger leakage, or operating difficulties due to the following:

- Accident, abuse, or misuse
- Alteration or Misapplication
- Force majeure
- Improper installation (such as but not limited to inadequate water quality, condensate damage, improper venting, incorrect gas type, incorrect gas or water pressure, or absence of a drain pan under the product)
- Improper maintenance (such as but not limited to scale build-up, freeze damage, or vent blockage)
- Improper water quality or the use of unapproved antifreeze or other chemical additives in the boiler system
- Installation of the boiler in a heating system where polybutylene pipe without an oxygen barrier is used
- Any installation that is not closed loop or where oxygen may enter the heating system
- Use in or around areas where chemical agents are used (such as but not limited to chlorine, hair spray, or hair dyes)
- Damage or failure caused by contaminated air, including, but not limited to sheetrock particles, plasterboard particles, dust, dirt, or lint entering the boiler or any of its components
- Incorrect sizing
- A failure of any component in the Hydronic system not supplied by Rinnai
- Any other causes other than defects in materials or workmanship

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

This Limited Warranty does not cover any other costs including but not limited to lodging, fuel, transportation, handling, etc. incurred during in the installation, removal, replacement, repair, maintenance, troubleshooting or complying with National, State or Local building, mechanical or electrical codes nor any expenses associated with providing substitute or temporary equipment and/or service during time in which product is inoperable or not being utilized pending repair or replacement under this Limited Warranty.

If you purchase a Rinnai product from an unauthorized dealer, or if the original factory serial number has been removed, defaced or altered, your Rinnai warranty will not be valid.

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

This Limited Warranty shall not be affected, extended, or enlarged and no additional obligation or liability will be incurred by Rinnai providing technical information, applications recommendations, or equipment modifications to any entity or person who is related to the design, equipment selection, installation, operation, maintenance, service, or repair of the product.

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

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

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

Rinnai America Corporation

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