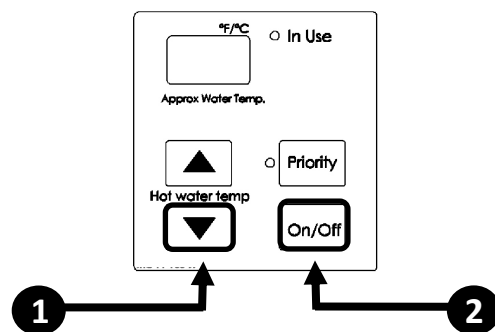




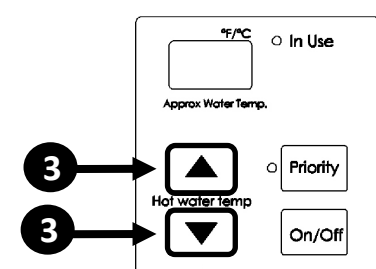
## PERFORMANCE DATA

### To obtain Performance Data:

- Press and hold the ▼ (Down) button.
- While holding the ▼ (Down) button for 2 seconds, press and hold the "On/Off" button (hold both buttons simultaneously).



- Use the ▲ (Up) and ▼ (Down) buttons to scroll to the desired performance information described below.



### Performance Data Table

#	DATA	UNIT
01	Water Flow Rate	x0.1 gal/min
02	Outgoing Temperature	°F
03	Combustion Hours	x100 Hours
04	Combustion Cycles	See following information
05	Fan Frequency	Hz
06	Additional Controllers Connected	See following information
07	Water Flow Control Position	0=mid, 1=Open, 2=Closed
08	Inlet Temperature	°F
09	Fan Current	x10 mA
10	Total Bath Fill Amount	gallons
11	HEX Outlet Temperature	°F
12	By-Pass Flow Control Position	Degrees of opening
15	Freeze Protection Temperature (Indoor Unit Only)	°F
17	Freeze Protection Temperature (Outdoor Unit Only)	°F
19	Pump Hours	x100 Hours
20	Pump Cycles	See following information
21	Exhaust Temperature	°F

DISPLAY	CYCLE COUNT
000 to 999	x100 (0 to 99,900)
10- to 99-	x10,000 (100,000 to 990,000)
1-- to 9--	x1,000,000 (1,000,000 to 9,000,000)

CONTROLLER MODEL	CONNECTED	NOT CONNECTED
MC	--1	--0
BC	--1-	--0-
BSC & BSC2	1-- , 2-- (QTY2)	0--

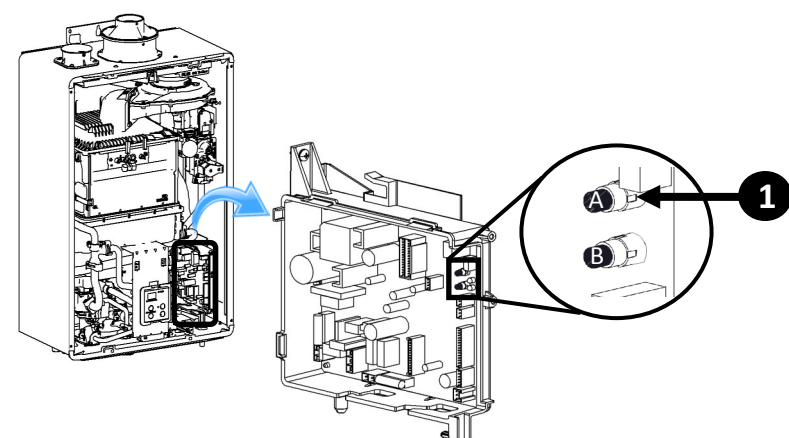
Default display is 100.

- depends on connection status of another controller.

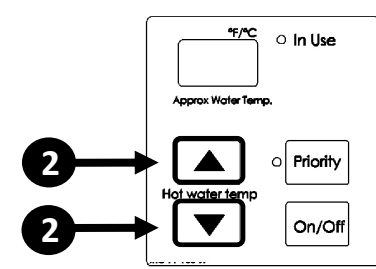
## PARAMETER SETTINGS

### To adjust the parameters:

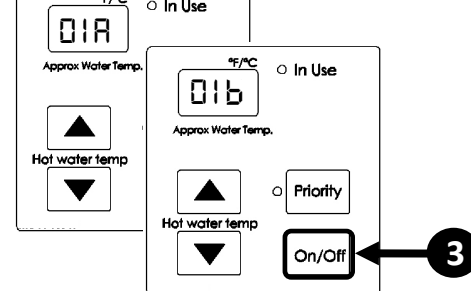
- Press the "A" button for 1 second.



- Use the ▲ (Up) and ▼ (Down) button on the controller to select a setting number (See Parameter Settings Table).



- Once the desired setting number is selected, use the "On/Off" button on the controller to change the selection for the setting number.  
Example: Display will change from 01A to 01b for Maximum Temperature setting (as shown below).



- To exit the parameters, press the "A" button on the PC board for 1 second.

### Parameter Settings Table

Default is A for all settings below except 12, 13, and 14 which are factory set.

SETTING #	SETTING DESCRIPTION	SELECTION			
		A	B	C	D
01	Maximum Set Temperature	Residential: 120°F	Residential: 140°F		
02	High Altitude (Installation Location)	0 - 2,000 ft (0 - 610 m)	2,001 - 5,400 ft (610 - 1,646 m)	5,401 - 7,700 ft (1,646 - 2,347 m)	7,701 - 10,200 ft (2,347 - 3,109 m)
03	Service Soon <sup>1</sup>	Disabled	0.5 Year	1 Year	2 Years
04	Recirculation Settings	No Recirculation	Recirculation		
			Dedicated Mode	Crossover Mode	
05	Recirculation Mode <sup>2</sup>	Comfort	Long Loop		
			Economy	Short Loop	
06	Control Switch	BMS <sup>3</sup>	Air Handler (AH)		
07	Units in Standby (EZ Connect)	2	1		
10	Gas Type (Factory Set)	NG	LPG		
11	Maximum Flow Rate <sup>4</sup>	Standard	High		
		High	Standard		
12	Water Heater Model	Without Pump	With Pump		
		199 (3237)	160 (2530)		
13	(Factory set values and not adjustable)	Internal (Indoor)	External (Outdoor)		
		160 (2530)	199 (3237)		
14	(Factory set values and not adjustable)	Internal (Indoor)	External (Outdoor)		

<sup>1</sup> See section "Service Soon, 55" in the Installation and Operation Manual for more information.

<sup>2</sup> Setting 05 is available only if setting 04b, 04c, or 04d is selected.

**Comfort mode** cycles the pump more frequently, ensuring the loop temperature remains higher (but also uses more energy).

**Economy mode** cycles the pump less often, using less energy to maintain the circulation loop temperature.

<sup>3</sup> BMS = Building Management System

<sup>4</sup> Selecting "High" will increase the water flow rate to the maximum capacity.

## ELECTRICAL DIAGNOSTICS

**NOTE:** Wiring diagram is available in manual and on the inside front cover.

### Important Safety Notes

There are a number of (live) tests required when performing electrical diagnostics on this product. Proceed with caution at all times to avoid contact with energized components inside the water heater. Only trained and qualified service technicians should attempt to repair this product. Before checking for resistance readings, disconnect the power source to the unit and isolate the item from the circuit (unplug it).

### Freeze Protection

This unit has freeze protection heaters mounted at different points to protect the water heater from freezing. All of them should display a positive resistance reading.

### Flame Rod

Place one lead of your meter to the flame rod and the other to ground. With the unit running you should read between 5 - 150 VAC. Set your meter to the micro (μ) amp scale and arrange meter leads in line with the flame rod. You should read 1 μ amp or greater for proper flame circuit. In the event of low flame circuit, remove the flame rod and check for carbon or damage.

### Amp Fuses

This unit has two glass fuses located on the PC Board, one inline (10) amp and one (4) amp glass fuse. Remove the fuses and check continuity through it. If you have continuity through each fuse then it is functioning. Otherwise the fuse is blown and must be replaced.

### Thermistors

Check all thermistors by inserting meter leads into each end of the thermistor plug. Set your meter to the 20 K scale and read resistance. Applying heat to the thermistor bulb should decrease the resistance. Applying ice to the thermistor bulb should increase the resistance.

Below are examples of typical temperatures and resistance readings.

Temperature	Resistance Readings
59°F	11.4 - 14KΩ
86°F	6.4 - 7.8KΩ
113°F	3.6 - 4.5KΩ
140°F	2.2 - 2.7KΩ
221°F	0.6 - 0.8KΩ

### Electrical Circuit Table

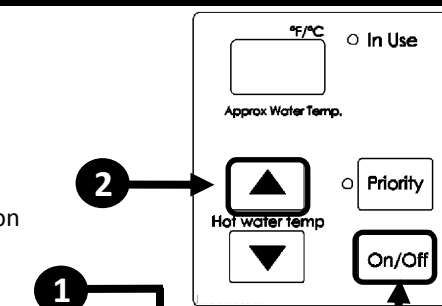
COMPONENT	WIRE COLOR	VOLTAGE	RESISTANCE	PCB		
				CONNECTOR	CONNECTOR	PIN
Spark Electrode	Red-Black	11~13VDC*	34 K ~ 40 K ohms	D2	D	12-21
Combustion Fan	Red-Black	7~48VDC*	N/A	D3	D	4-6
	White-Black	10~12VDC*	N/A	D3	D	10-6
	Yellow-Black	11~13VDC*	N/A	D3	D	8-6
Water Flow Control Device	Red-Pink	N/A	44~52 ohms	D4	D	18-20
	White-Blue	N/A	44~52 ohms	D4	D	16-14
Venturi Control Device	Grey-Orange	12~14VDC	N/A	D4	D	30-12
	Blue-White	N/A	35~41 ohms	D5	D	5-7
	Yellow-Red	N/A	35~41 ohms	D5	D	11-9
	Black-Red	12~14 VDC	N/A	D5	D	30-12
	Black-Brown	less than 1VDC*	N/A	D5	D	30-25
By-Pass Flow Control Device	Red-Pink	N/A	44~52 ohms	D6	D	15-13
	White-Blue	N/A	44~52 ohms	D6	D	17-19
Gas Solenoid Valve	Yellow-Black	11~13VDC*	18~22 ohms	D7	D	29-27
Outgoing Thermistor	White-White			H1	H	3-2
	Blue-Blue			H1	H	8-11
Inlet Thermistor	White-White			H2	H	4-2
Exhaust Thermistor	White-White			H3	H	2-5
Heat Exchanger Thermistor	White-White			H4	H	2-6
Freeze Protection Thermistor	Yellow-Black			H5	H	2-7
Overheat Switch	Black-Black	11~13 VDC	less than 1 ohm	H6	H	28-14
Water Flow Sensor	Black-Red	11~13 VDC	N/A	H7	H	30-12
	Yellow-Black	4~7 VDC*	N/A	H7	H	12-30
Additional Controller(s)	White-White	10~13 VDC	N/A	K	-	-

(\* Value to be measured while unit is in operation)

## DIAGNOSTIC CODES

### To display diagnostic codes:

- Turn off the water heater by pressing the "On/Off" button.
- Press and hold the "On/Off" for 2 seconds and then the ▲ (Up) button simultaneously.
- The last 9 maintenance codes display and flash one after the other.
- To exit diagnostic codes and return the water heater to normal operation, press and hold the "On/Off" button for 2 seconds and then the ▲ (Up) button simultaneously.
- Turn on the water heater by pressing the "On/Off" button.



03	<b>Power interruption during bath fill</b> (Water will not flow when power returns) • Turn off all hot water taps. Press ON/OFF twice.
05	<b>By-Pass Flow Control</b> • Measure resistance values of the by-pass flow control (See Electrical Diagnostics). • Replace By-Pass flow control device.
10	<b>Air Supply or Exhaust Blockage/Condensate Trap is Full</b> • Ensure condensate line is not blocked. • Ensure internal air filter is clean with no obstructions. (Indoor Only) • Ensure High Altitude setting. (See Parameter Settings) • Ensure Combustion air and Exhaust vents are not blocked and approved venting materials are being used. (Indoor Only) • Ensure vent length is within limits. (Indoor Only) • Check fan for debris and ensure wheel turns freely. • Verify check valve is not stuck between fan casing and burner body.
11	<b>No Ignition (Heater Not Turning On)</b> • Check that the gas is turned on at the water heater, meter, or cylinder. • If the system is propane, make sure that gas is in the tank. • Ensure gas type and inlet gas pressure are correct. • Bleed all air from gas lines. • Check the ground wire for the PC Board. • Ensure flame rod wire is connected. • Ensure igniter is operational. (See Electrical Diagnostics) • Check gas solenoid valves for open or short circuits. (See Electrical Diagnostics) • Verify gas orifice is correct.
12	<b>No Flame</b> • Check that the gas is turned on at the water heater, gas meter, or cylinder. • If the system is propane, make sure that gas is in the tank. • Ensure flame rod wire is connected. • Ensure gas type and inlet gas pressure is correct. • Bleed all air from gas lines.
14	<b>Heat Exchanger Overheat</b> • Measure resistance of Overheat Switch. (See Electrical Diagnostics) • Check heat exchanger surface for hot spots which indicate blockage due to scale build-up. • Refer to instructions in manual for flushing heat exchanger. Hard water must be treated to prevent scale build-up or damage to the heat exchanger. • Ensure it is not forced Hi setting.
15	<b>Venturi Control</b> • Ensure the Venturi motor is operating correctly. (See Electrical Diagnostics) • Replace gas valve assembly. • Clear diagnostic code by resetting the main power supply to the water heater.
16	<b>High Outgoing Temperature</b> (safety shutdown because water heater is too hot) • Confirm fan motor is functioning correctly. • Replace the gas valve assembly.
17	<b>Venturi Blockage</b> • Ensure Venturi isn't blocked. • Please call Rinnai technical department.
19	<b>Electrical Grounding</b> • Check all components for electrical short.
21	<b>Data Transfer Error</b> • If the PCB has been replaced, ensure the data transfer process has been completed.
25	<b>Condensate Pump (Accessory)</b> • Confirm wire connections and harness are good. • Ensure condensate reservoir is empty and condensate pump is operating.
32	<b>Outgoing Thermistor</b>
33	<b>Heat Exchanger Thermistor</b> • Check sensor wiring for damage. • Measure resistance of sensor. (See Electrical Diagnostics) • Clean sensor of scale build-up. • Replace sensor.
38	<b>Exhaust Thermistor</b>
41	<b>Freeze Protection Thermistor</b> • Check sensor wiring for damage. • Measure resistance of sensor. (See Electrical Diagnostics) • Replace sensor.

51	<b>Inlet Thermistor</b> • Check sensor wiring for damage. • Measure resistance of sensor. (See Electrical Diagnostics) • Clean sensor of scale build-up. • Replace sensor.
52	<b>Gas Valve</b> • Check flame rod and wire for damage. • Check gas solenoid valve for open or short circuit. (See Electrical Diagnostics) • Replace gas valve assembly. • Please call Rinnai technical department.
54	<b>High Exhaust Gas Temperature</b> • Ensure Heat Exchanger fins are clean and not blocked. • Confirm inlet water temperature is not too high. • Clear diagnostic code by resetting the main power supply to the water heater.
61	<b>Combustion Fan</b> • Check the motor wire harness for loose or damaged connections. • Measure resistance of motor wire harness. (See Electrical Diagnostics) • Ensure the combustion fan spins freely.
63	<b>Recirculation Low Flow</b> • Ensure bypass plug is removed and bypass filter is installed. (COV Mode) • Ensure both the inlet water filter and bypass filter are clean and free of debris. • Ensure Parameter setting are correctly set for recirculation mode. • Ensure Pump supply voltage. • Ensure air is removed from the recirculation line.
65	<b>Water Flow Control</b> • Measure resistance values of the water flow control (See Electrical Diagnostics) • The water flow control valve has failed to close during the bath fill function. Immediately turn off the water and discontinue the bath fill function. Contact a licensed professional to service the appliance.
70	<b>PC Board</b> • Replace PC Board
71	<b>Solenoid Valve Circuit</b> • Ensure dip switch on PC board is in the OFF position. • Ensure gas control wire is not loose or damaged. • Ensure heater circuit is not grounded. • Replace PC Board.
72	<b>Flame Rod</b> • Check flame rod and wire for damage. • Verify HEX is not leaking.
55	<b>(SS) Service Soon (Flush Heat Exchanger)</b> • 55 is a time-based service indicator set during installation. See section "3.12 Parameter Settings" for additional details on setting and changing the 55 indicator. • 55 indicates that it is time for service. The heat exchanger should be flushed to prevent damage (refer to section "5.3 Flushing the Heat Exchanger" for more information). <b>Hard water must be treated to prevent scale build-up or damage to the heat exchanger.</b> • To reset the 55 code, push the On/Off button on the temperature controller 5 times in 5 seconds.
<b>NO CODE - Nothing happens when water flow is activated</b> • Verify you have at least the minimum flow rate required to fire unit. • Measure the resistance of the water flow control sensor. (See Electrical Diagnostics) • Clean inlet water supply filter. • On new installations ensure hot and cold water lines are not reversed.	
<b>5E Cascade Diagnostic Display (Commercial units only)</b> • With cascade connections, display will flash between "5E" and the selected set temperature when an error code is displayed on any secondary unit.	
<b>FF Maintenance Indicator</b> • Placeholder in Diagnostic code history indicating that a service provider performed maintenance or service. • Enter this code after performing service by pressing ▲ (Up), ▼ (Down) and On/Off simultaneously. • FF is visible on the monitor.	

