## **Remote Controller**



### **To Display Error Codes**

• Press and hold the "On/Off" for 2 seconds and then the 🔺 (Up) button simultaneously.

## To Display 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
50	Outgoing Temperature	°F
03	Combustion Hours	x100 Hours
04	Combustion Cycles	See following info
05	Fan Frequency	Hz
06	Additional Controllers Connected	See following info
۵ŋ	Water Flow Control Position	0=mid, 1=Open, 2=Closed
08	Inlet Temperature	°F
09	Fan Current	x10mA
10	Total Bath Fill Amount	gallons
11	HEX Outlet Temperature	°F
IЛ	Freeze Protection Temperature	°F

	<b>Combustion</b>	Cycles					
	DISPLAY	CYCLE COUNT					
	000 to 999	x100 (0 to 99,900)					
	10- to 99-	x10,000 (100,000 to 990,000)					
	I to Б	x1,000,000 (1,000,000 to 6,000,000)					

Controllers Connected							
Controller Model	CONNECTED	NOT CONNECTED					
MC	!	0					
BC	_!_	_0_					
BSC & BSC2	¦, 2 (QTY2)	0					

## To Change the Temperature Scale (°F / °C)

With the water heater turned off, press and hold the ON/OFF button until the display changes to the other temperature scale (about 5 seconds).

## To Turn Off the Controller Sound (Mute)

To turn the sound off (mute), press and hold both the A and thermostat buttons until a "beep" is heard (about 5 seconds).

# Gas Pressure Setting

NOTE: For additional installation and commissioning information refer to the Operation and Installation Manual.

# WARNING

ppliance must be installed, serviced and removed by a trained and qualified person. During pressure testing of the consumer piping, ensure the unit is isolated by turning off the gas valve prior to the unit. Failure to do so may result in serious injury to yourself or damage to the unit.

## **PCB Interface Layout & Functions**

## ① Push Button 1 (PB1) - White

- Data transfer button, for PCB replacement purposes. 2 Push Button 2 (PB2) - Black
- MODE button, places the PCB into programming mode. ③ Push Button 3 (PB3) - White
- MENU button, cycles through available menus 1,2,3,4,5,6,7 and B (see Programming Parameters section). Increases gas pressure during forced mode operation.
- ④ Push Button 4 (PB4) White VALUE button, cycles through available menu values (see Programming Parameters section). Decreases gas pressure during forced mode operation.
- ⑤ Push Button 5 (PB5) White Forced High / Low selection rate setting.
- 6 LED Digital Display Displays MENU (1, 2, etc.), VALUE (R, b, etc.) and Forced Low/High status (L or H).
- ⑦ Dipswitch
- By factory default, all switches are in OFF position. Used for High Altitude adjustment. ⑧ Communication Interface Socket
- Only used in conjunction with Data transfer button.
- (9) Data transfer indicator LED
- Only used in conjunction with Data transfer button, illuminates to show data transfer is in progress.

### **PCB Interface Basic Operation**

- 1. To enter programming mode, press and hold PB2 until the LED Display shows 1. The current set value will display shortly after NOTE: If inactive for 10 minutes, the PCB will automatically exit programming mode
- 2. To exit programming mode and save selected settings, press and hold PB2 until the LED display clears.



viewed from the front

# **Electrical Diagnostics**

NOTE: Wiring diagram is available 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 trai 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).

Error	С	bd	es	5	
-			-		

- **12** No burner operation during freeze protection mode 32 Outgoing Thermistor · Check sensor wiring for damage Service call. Measure resistance of sensor. · Clean sensor of scale build up. I Air Supply or Exhaust Blockage • Replace sensor. · Ensure Rinnai approved venting materials are being used. 33 Heat Exchanger Thermistor · Check that nothing is blocking the flue inlet or exhaust. · Check sensor wiring for damage. Verify dip switches are set properly. · Measure resistance of sensor. · Check fan for blockage. · Clean sensor of scale build up. · Replace sensor. 11 No Ignition Check that the gas is turned on at the water heater, gas meter, ų. **Outside Temperature Thermistor** or cylinder. · Check sensor wiring for damage. Ensure gas type and pressure is correct. · Measure resistance of sensor. · Ensure gas line, meter, and/or regulator is sized properly. · Clean sensor of scale build up. Bleed all air from gas lines. · Replace sensor. · Verify dip switches are set properly. 52 Modulating Solenoid Valve Signal Abnormal · Ensure appliance is properly grounded. · Check modulating gas solenoid valve wiring harness for loose Ensure igniter is operational. or damage terminals · Check igniter wiring harness for damage. · Measure resistance of valve coil. Check gas solenoid valves for open or short circuits. · Remove burner cover and ensure all burners are properly 51 **Combustion Fan** seated. · Ensure fan will turn freely. Remove burner plate and inspect burner surface for Check wiring harness to motor for damaged and/or loose condensation or debris connections Measure resistance of motor winding. 2 No Flame C PC Board · Check that the gas is turned on at the water heater and gas · Replace PC Board. meter. Check for obstructions in the flue outlet · Ensure gas line, meter, and/or regulator is sized properly. Solenoid Valve Circuit · Ensure gas type and pressure is correct. · Check wiring harness to all solenoids for damage and/or loose · Bleed all air from gas lines. connections · Verify dip switches are set properly. Measure resistance of each solenoid valve coil. · Ensure appliance is properly grounded. · Disconnect keypad. □2 Flame Rod · Check power supply for loose connections. · Ensure flame rod is touching flame when unit fires. · Check power supply for proper voltage and voltage drops. · Check all wiring to flame rod for damage. · Ensure flame rod wire is connected. • Remove flame rod and check for carbon build-up; clean with · Check flame rod for carbon build-up. sand paper · Disconnect and re-connect all wiring harnesses on unit and PC Check inside burner chamber for any foreign material blocking board flame at flame rod Check all components for electrical short. · Measure micro amp output of sensor circuit with flame present. Check gas solenoid valves for open or short circuits. Replace flame rod. · Remove burner plate and inspect burner surface for condensation or debris. Scale Build-up in Heat Exchanger LC# • LC0~LC9 indicates that there is scale build up in the heat 님 Thermal Fuse LCI exchanger and that the heat exchanger needs to be flushed · Check gas type of unit and ensure it matches gas type being LC2.. to prevent damage. Refer to flushing instructions in manual. used Hard water must be treated to prevent scale build up or Check for restrictions in air flow around unit and vent terminal. damage to the heat exchanger. · Check for low water flow in a circulating system causing short-To operate the water heater temporarily until the heat cycling exchanger can be flushed, push the On/Off button on the • Ensure dip switches are set to the proper position. temperature controller 5 times. Repeated LC codes will · Check for foreign materials in combustion chamber and/or eventually lockout the water heater. exhaust piping. · Check heat exchanger for cracks and/or separations. Please call Rinnai technical department. · Check heat exchanger surface for hot spots which indicate blockage due to scale build up. Refer to instructions in manual FF Maintenance Indicator for flushing heat exchanger. Placeholder in Diagnostic code history indicating that a service · Measure resistance of safety circuit. provider performed maintenance or service. · Ensure high fire and low fire manifold pressure is correct. Enter this code after performing service by pressing & holding · Check for improper conversion of product. ▲Up, ▼(Down) and ON/OFF consecutively. FF is visible on the monitor. **6** Over Temperature Warning
  - Check for restrictions in air flow around unit and vent terminal.
  - · Check for low water flow in a circulating system causing short-
  - · Check for foreign materials in combustion chamber and/or exhaust piping.
- **No Code** (Nothing happens when water flow is activated.)
  - Clean inlet water supply filter.
  - · On new installations ensure hot and cold water lines are not
  - reversed. · Check for bleed over. Isolate unit from building by turning off

Dipswitch detail when

#### APPLIANCE OPERATING PRESSURES

			Tab	le 1			
	Water Inlet	Gas Inlet Min./Max		Force	d Low	Forced High	
	Max.	NAT.G	LPG	NAT.G	LPG	NAT.G	LPG
V53De	150 PSI	4.5"W.C. /10.5"W.C.	8"W.C. /13.5"W.C.	0.63"W.C.	0.79"W.C.	3.9"W.C.	4.7"W.C

#### Commissioning

With all gas appliances in operation at maximum gas rate, the inlet pressure at the incoming test point

should read 4.5" W.C. - 10.5" W.C. on natural gas and 8" W.C. - 13.5 W.C. on propane gas. If the pressure is lower, the gas supply is inadequate and the unit will not operate to specification. Check the gas meter regulator and pipework for correct operation/sizing and correct as required. Ensure gas pressure check under Commissioning has been completed first! The regulator is electronically controlled and factory pre-set. Under normal circumstances it does not require

adjustment during installation. Make adjustments only if the unit is not operating correctly and all other possible causes for incorrect operation have been eliminated. **BURNER TEST POINT** 

- 1. Turn OFF the gas supply.
- 2. Turn OFF the 120 V power supply. 3. Remove the front panel from the
- appliance. 4. Turn ON the 120 V power supply.
- 5. Check the gas type using the data plate on the side of the unit. ⊳⊯⊡ Enter programming mode. Press and hold PB2 2 until the LED display shows I. After 2 seconds the display changes to the current gas type. (R = LPG, C = NG)
- 6. Exit programming mode. Press & hold PB2 until the LED display goes blank.
- 7. Removing sealing screw and attach the pressure gauge to the burner test point, located on the gas control (shown to the right).

8. Turn ON the gas supply.

- 9. If a controller is installed, turn the unit ON with the controller. Select the maximum delivery temperature.
- 10. Flow water through the water heater at the maximum flow rate obtainable. (At least 3 gallons per minute is recommended. If there is not enough water flowing, the water heater could shut off or sustain damage due to overheating.)
- 11. Open all available hot water taps.
- 12. Push and hold PB5<sup>(5)</sup> to set the unit to "Forced Low." The LED display will show L, the front status monitor will show FL.
- 13. If adjustments are required, press PB3 to increase pressure, or PB4 to decrease the pressure.
- 14. Push and hold PB5 to change to "Forced High." The LED display will show H, the front status monitor will show FH.
- 15. If adjustments are required, press PB3 to increase pressure, or PB4 to decrease the pressure.
- 16. Return the unit to normal operation: press and hold PB5 until the LED Display turns off.
- 17. Turn OFF the gas supply and 120 V power supply.
- Remove the pressure gauge and reinstall sealing screw.
- 19. Turn ON the gas supply and 120 V power supply.
- 20. Operate the unit and check for gas leaks at the test point.
- 21. Install the front panel.

#### **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 5 VDC. 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 1 inline (5) amp glass fuse located on the PC Board. 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.

		Me	easurement		
	COMPONENT	CN	WIRE COLOR	VALUE RANGE	
	Main Power Code	В	W-BL	AC108-132V	
	Remote Controller	A1	BK-BK	DC11-13V	
	Igniter	D3	R-BK	DC11-13V	
	Flama Dad	D10	Y-BODY	OVER DC5V	
		010	Y-FR	OVER 1µA	
	Thermal Fuse	D7	R-R	<dc1 <1ω<="" td="" v,=""></dc1>	
	Overheat Switch	D2	BK-BK	<dc1 <1ω<="" td="" v,=""></dc1>	
	Modulating Solenoid Valve	סח	Y-Y	DC2-17V/10-20Ω	
	Main Solenoid Valve	09	BK-BK	DC8-13.5V/15-25Ω	
	Solenoid Valve 1	8ח	BL-BK		
	Solenoid Valve 2	00	Y-BK	DC8-13.5V/20-30	
	Outgoing Water TH1	DE	W-W (No.1,2)	15°C:11.4-14kΩ	
	Outgoing Water TH2		W-W (No.3,4)	30°C:6.4-7.8kΩ 45°C:3.6-4.5kΩ	
	Heat Exchanger Water Thermistor	D11	W-W	60°C:2.2-2.7kΩ 100°C:0.6-0.8kΩ	
	Freeze Protection Thermistor	D6	Y-Y	0°C:38-43kΩ 10°C:22-26kΩ 20°C:14-17kΩ	
	Water Flow Separ		R-BK	DC11-13V	
		D4	Y-BK	DC4-7V	
			R-0, P-0		
			BL-O, W-O	DC3-0V	
	Water Flow Control Device	F1	R-P,BL-W	40-60Ω	
			BR-GV	<dc1 td="" v<=""></dc1>	
			BIG OT	DC4-6V	
			R-BK	DC7-48V	
	Combustion Fan	D1	Y-BK	DC11-14V	
I			W-BK	DC2-14V	

Check for clogged heat exchanger.

#### B Electrical Grounding

cycling

Check all components for electrical short.

- hot water line to building. Isolate the circulating system if present. Open your pressure relief valve; if unit fires, there is bleed over in your plumbing.
- · Ensure you have at least the minimum flow rate required to fire unit.
- Ensure turbine spins freely.
- · Measure the resistance of the water flow control sensor. · Remote control does not light up but you have 12 VDC at the terminals for controls.

## **Dip Switches Settings**

When delivered, the switches are set to OFF by default.

Factory default dipswitch settings



# **Programming Parameters**

MENUL#						
WENU #	MENU DESCRIPTION	8	ь	E	6	E
I	Gas Type	LPG	n/a	NG	n/a	n/a
2	Model Type	1620	n/a	n/a	n/a	n/a
Э	Fixed Temperature	120°F 48.9°C	140°F 60°C	n/a	n/a	n/a
ч	Hax Temp Setting120of Controllers48.9		140°F 60°C	n/a	n/a	n/a
5	OFF Water Flow Rate *1	+5°F +3°C	+11ºF +6ºC	n/a	n/a	n/a
Б	Adjustment due to Piping Heat Loss	0°F 0°C	+2°F +1℃	+4°F +2°C	+5°F +3°C	n/a
ŋ	Post Purge Fan Time	65 sec.	120 sec.	240 sec.	480 sec.	15 sec.
8	Post Purge Fan Speed	180 Hz	100 Hz	n/a	n/a	n/a

Note: Depending on the model version, some parameters may not appear. Do not adjust parameters 7 or 8 unless specifically instructed to do so.

\*1 The outlet temperature is constantly monitored by a built in sensor. If the outlet temperature rises above the selected value, the burner will turn off.

A: Burner turns off at 5°F (3°C) over set temperature.

b: Burner turns off at 11°F (6°C) over set temperature.

### **Commissioning, Servicing and Programming Record**

When required this record MUST be completed by an authorized technician. Ensure all data is recorded along with date and programming changes performed.

MENU #		MENU VALUE						
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η						Г		
8						_		
Date	/ /		1 1	1 1	1 1	Û		

070 00012 38301 9	

V53De (AM1620WD-US)

U340-1358X02(00)



THERMAL FUSE LOCATION When replacing heat exchanger, thermal fuse must be properly installed and secured. Refer to the following illustration.



## PARTS LIST

Number	Description	Part Number	Quantity	Number	Description	Part Number	Quantity	Number	Description	Part Number	Quantity
001	Front Panel	109000787	1	117	Electrode Bracket	109000780	1	711	Sensor Harness	105000303	1
002	Wall Bracket	109000788	2	118	Electrode Sleeve	AU206-218	1	712	Power Supply Harness	105000304	1
003	Ground Screw	10900076	2	119	Burner Unit Assembly	106000152	1	713	Fuse Harness	105000305	1
004	Front Panel Packing	109000789	1	125	Heat Exchange Assembly	107000406	1	714	Fuse Holder	109000786	4
005	Screw	CP-30580-JW	3	126	Comb Chamber Bracket	109000781	1	715	Fuse Holder	109000499	4
006	Quick Control Connection	109000048	1	127	Pipe Bracket	109000782	1	716	Heater	105000306	1
007	Cable Seal Packing	AU169-126	1	128	Pipe Bracket	109000783	1	717	Heater Clip	U250-625	1
008	Top Reinforcement	109000790	1	130	Flue Outlet	108000103	1	718	Heater Clip	109000795	2
009	Thermistor Grommet	109000490	1	131	Flue Outlet Packing	U216-406X03	1	719	Thermistor Sensor	105000296	1
010	Connection Reinforcement Plate	109000774	1	132	Seal Packing	109000054	1	720	Twin Thermistor	105000297	1
011	Heat Shield Plate	109000775	1	150	Fan Motor Assembly	108000100	1	722	Remote Control Harness	105000052	1
013	Front Panel Packing	109000791	2	151	Fan Casing Assembly	108000101	1	723	Status Monitor	105000307	1
015	Screw Cover	109000792	2	152	Fan Motor All Assembly	108000102	1	724	Status Monitor Harness	105000308	1
016	Ground Screw	109000793	2	400	3/4 Water Inlet	H73-501-2	1	725	Heat Exchanger Thermistor	105000309	1
017	Rubber Bushing	AU105-113	2	401	Plug Band	109000018	1	726	Thermistor Bracket	CP-90172	1
100	3/4 Gas Inlet	106000153	1	402	Filter Assembly	H98-510-S	1	807	Ground Screw	CP-80452	1
101	Test Port Set Screw	C10D-5	2	404	Rectifier	M8D1-15	1	808	Screw	U217-449	1
102	Gas Control Assembly	106000154	1	406	Water Flow Servo & Sensor Assembly	107000404	1	809	Screw	108000021	2
103	Manifold Assembly (LPG)	106000144	1	407	Water Flow Servo Cover	107000093	1	820	O-Ring	M10B-13-4	2
103	Manifold Assembly (NG)	106000145	1	410	3/4 Water Outlet	107000407	1	821	O-Ring	M10B-1-24	1
104	Damper	106000146	1	411	Plug Band	109000784	1	822	Packing	109000181	1
105	Burner Case Front Panel	106000147	1	412	Drain Valve	107000405	1	825	O-Ring	M10B-2-4	2
106	Packing	109000776	1	700	PC Board	105000298	1	826	O-Ring	M10B-2-7	1
107	Manifold Upper Packing	109000777	1	701	Igniter Bracket	109000785	1	828	O-Ring	M10B-2-14	2
108	Manifold Lower Packing	109000778	1	702	PCB Electric Cover	109000794	1	829	O-Ring	M10B-2-16	1
110	Burners	106000148	12	703	Igniter	105000295	1	830	O-Ring	M10B-2-18	1
111	Burner Case Back Panel	106000149	1	704	Height Tension Cord	BH38-710-200	1	882	Card Board Set-LPG	Box-V53De LPG	1
112	Comb Chamber Front Panel	106000150	1	705	MR Sensor	105000176	1	882	Card Board Set-NG	Box-V53De NG	1
113	Comb Chamber Front Panel Packing	106000151	1	706	Over Heat Switch	105000299	1	884	Styrofoam Set	109000797	1
114	Electrode	105000293	1	707	Main Solenoid Harness	105000300	1	888	Manual	100000561	1
115	Flame Rod	105000294	1	708	Valve Heater 120V	105000301	1	889	Tech Sheet	100000562	1
116	Electrode Packing	109000779	1	710	Solenoid Harness	105000302	1				'