

not compatible with Alternate Temperature Settings. Alternate Temperature Settings are for commercial applications only. DO NOT use the MC-91-1, MCC-91-1, MC-100V-1, or BC-100V-1 controllers when dip switches 2 and 3 (Dip SW2) are in the ON position.

### **Diagnostic Use of the Controller**

1. To display the most recent diagnostic codes press and hold the "On/Off" button for 2 seconds on the MC-91 controller.

2. To enter or exit the maintenance monitor information mode press and hold the down button for 2 seconds and without releasing it press the ON/OFF button.

No.	Data	Unit
01	Water flow rate	0.1 gal/min
02	Outgoing water temperature	Degrees Fahrenheit

### 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  $\blacktriangle$  and  $\blacktriangledown$ thermostat buttons until a "beep" is heard (about 5 seconds).

# Locking the Controller

The MC-91-2 controller can be locked or unlocked by pressing the Priority button and the up button together for 5 seconds. A beep will sound confirming that the controller is locked. The display will alternately show "LOC", the temperature setting, and a diagnostic code if one has been activated. All of the controllers in the system are also locked

To unlock the controller press the Priority button and the up button together for 5 seconds.

# **Gas Pressure Setting**

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

#### WARNING $\sim$

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

#### APPLIANCE OPERATING PRESSURES Table 1



### Commissioning

With all gas appliances in operation at maximum gas rate, the flowing inlet pressure at the incoming test point on the Rinnai water heater should read 4" 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.

## **Gas Pressure Setting**

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.

- 1. Turn OFF the gas supply.
- 2. Turn OFF the water supply.
- 3. Remove the front panel (four screws).
- 4. Check the gas type using the data plate on the side of the unit. Confirm that the gas type switch is in the correct position (switch 1 of Dip SW2 is ON for natural gas, NG, and OFF for propane gas, LPG.) Figure 1.
- 5. Remove the screw and attach the manometer to the burner test point located on the gas control. Figure 2.
- 6. Turn on the gas supply and the power supply.
- 7. 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.)
- 8. Move switch 8 of Dip SW1 to ON. Figure 3.
- 9. Push the PC board switch A for one second. Figure 4.
- 10. Calibrate "Forced Low" combustion using switch A (up) and switch B (down).
- 11. Move switch 8 of Dip SW1 to OFF and then back to ON Figure 6.
- 12. Push the PC board switch B for one second. Figure 4.
- 13. Calibrate "Forced High" combustion using switch A (up) and switch B (down)
- 14. Move switch 8 of Dip SW1 to OFF. Figure 5.
- 15. Close hot water taps.
- 16. Turn off gas supply and 120 V power supply.
- 17. Remove manometer and re-install allen head plug.
- 18. Turn on the gas supply and 120 V power supply.
- 19. Operate the unit and check for gas leaks.
- 20. Install the front panel using four screws.



**Diagnostic Codes** 03 Power interruption during Bath fill (Water will not flow when 32 Outgoing Water Temperature Sensor power returns) 33 Heat Exchanger Outgoing Temperature Sensor Turn off all hot water taps. Press ON/OFF twice. 41 Outside Temperature Sensor 51 Inlet Water Temperature Sensor 10 Air Supply or Exhaust Blockage · Check sensor wiring for damage. Ensure approved venting materials are being used. Measure resistance of sensor. Check that nothing is blocking the flue inlet or exhaust. Clean sensor of scale build-up. Check all vent components for proper connections. · Replace sensor. Ensure vent length is within limits. Verify dip switches are set properly. 52 Modulating Solenoid Valve Signal Check fan for blockage. Check modulating gas solenoid valve wiring harness for loose or damaged terminals. 11 No Ignition Measure resistance of valve coil. Check that the gas is turned on at the water heater, meter, or cylinder. If the system is propane, make sure that gas is in the tank. Ensure appliance is properly grounded. 61 Combustion Fan Ensure gas type and pressure is correct. Ensure fan will turn freely. Ensure gas line, meter, and/or regulator is sized properly. Check wiring harness to motor for damaged and/or loose Bleed all air from gas lines. connections. Verify dip switches are set properly. Measure resistance of motor winding. Ensure igniter is operational. Check igniter wiring harness for damage. Check gas solenoid valves for open or short circuits. 65 Water Flow Servo Remove burner cover and ensure burners are properly seated. Remove burner plate; inspect burner surface for condensation/debris. 12 No Flame 70 PC Board Check that the gas is turned on at the water heater, meter, or cylinder. Check for obstructions in the flue outlet. If the system is propane, make sure that gas is in the tank. Ensure gas line, meter, and/or regulator is sized properly. Replace PC board. Ensure gas type and pressure is correct. Bleed all air from gas lines. 71 Solenoid Valve Circuit Ensure proper venting material was installed. · Replace the PC Board. Ensure condensation collar was installed properly. Ensure vent length is within limits. Verify dip switches are set properly. 72 Flame Sensing Device Check power supply for loose connections. Check power supply for proper voltage and voltage drops. Check all wiring to flame rod. Ensure flame rod wire is connected. Check flame rod for carbon build-up Disconnect and reconnect all wiring harnesses on unit and at flame rod. PC board. Check for DC shorts at components. · Replace PC Board. Check gas solenoid valves for open or short circuits. Remove burner plate; inspect burner surface for condensation/debris. Check the ground wire for the PC board. 79 Water leakage detected 14 Thermal Fuse • Ensure dip switch 5 in second bank of switches (white) is in off position. C# Scale Build-up in Heat Exchanger (when checking Check for restrictions in air flow around unit and vent terminal. maintenance code history "00" is substituted for "LC") Check gas type of unit and ensure it matches gas type being used. LC0~LC9 indicates that there is scale build up in the heat exchanger Check for low water flow in a circulating system causing short-cycling. Ensure dip switches are set to the proper position. and that the heat exchanger needs to be flushed to prevent damage. Refer to the flushing instructions in the manual. Hard water must be Check for foreign materials in combustion chamber and exhaust piping. Check heat exchanger for cracks or separations. treated to prevent scale build up or damage to the heat exchanger. Check heat exchanger surface for hot spots which indicate • To operate the water heater temporarily until the heat exchanger can blockage due to scale build-up. Refer to instructions in manual be flushed, push the On/Off button on the temperature controller 5 times. Repeated LC# codes will eventually lock out the water heater. for flushing heat exchanger. Hard water must be treated to prevent scale build up or damage to the heat exchanger. Measure resistance of safety circuit. **FF** Maintenance Performed Ensure high fire and low fire manifold pressure is correct. Check for improper conversion of product. 16 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-cycling. · Clean inlet water supply filter. Check for foreign materials in combustion chamber and exhaust piping. Check for blockage in the heat exchanger.

# 19 Electrical Grounding

Check all components for electrical short.

• 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 Check PC board DIP switches for correct positons. • Check the connection harness at the connection on the PC board. · Verify flame rod is touching flame when unit fires. • Remove flame rod; check for carbon build-up; clean with sand paper. Check inside burner chamber for any foreign material blocking flame · Measure micro amp output of sensor circuit with flame present. Turn off water supply and contact licenced professional.

• Indicates a service provider performed maintenance or repair. Enter this code by pressing up, down, and ON/OFF simultaneously.

**No Code** (Nothing happens when water flow is activated.)

- On new installations ensure hot and cold water lines are not reversed.
- Verify you have at least the minimum flow rate required to fire unit.
- Check for cold to hot cross over. Isolate circulating system if present.
- Turn off cold water to the unit, open pressure relief valve; if water
- continues to flow, there is bleed over in your plumbing. Verify turbine spins freely.
- Measure the resistance of the water flow control sensor.
- If the display is blank and clicking is coming from the unit, disconnect the water flow servo motor (GY, BR, O, W, P, BL, R). If the display comes on then replace the water flow servo motor.

# Troubleshooting

#### **Important Safety Notes**

There are a number of (live) tests that are required when fault finding this product. Extreme care should be used at all times to avoid contact with energized components inside the water heater. Only trained and gualified 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)

#### (SV1, SV2, SV3, SV4 and POV) Gas valve and Modulating solenoids: (Set meter above 2K)

(,,,		3	(		
Wire color	Voltage	Resistance	Connector #	Pin #'s	
(Main) Black - Grey	11 ~ 13 VDC	24 ~ 28 ohms	D1	B3 - B4	
(SV1) Black - Blue	11 ~ 13 VDC	36 ~ 42 ohms	B3	4 - 6	
(SV2) Black - Yellow	11 ~ 13 VDC	36 ~ 42 ohms	B2	4 - 7	
(SV3) Black - Red	11 ~ 13 VDC	36 ~ 42 ohms	B4	4 - 5	
(SV4) Black - Orange	11 ~ 13 VDC	35 ~ 41 ohms	B1	4 - 8	
(POV) Pink - Pink	2 ~ 15 VDC	67 ~ 81 ohms	D1	1 - 2	

#### (M) Water Flow Control Device Servo or Geared Motor

N/A

Grey - Orange

2

3

ed - Pink	N/A	44 ~ 52 ohms	G2	3 - 4
/hite - Blue	N/A	44 ~ 52 ohms	G2	1 - 2
rev - Brown	N/A	N/A	G2	5 - 7

N/A

#### NOTE: The grey wire listed above turns to black at G connector on the PCB.

(QS) Water Flow S	ensor:			
Black - Red	11 ~ 13 VDC	5.5 ~ 6.2 K ohms	L3	E10 - G7
Yellow - Black	4 ~ 7 VDC	1 ~ 1.4 Mega ohm	s L3	E1 - G7
By-pass Flow Cor	itrol:	-		
Red - Pink	NI / A	44 . 50 ahma	G1	12 - 13
White - Blue	N/A	44 ~ 52 onms	G1	10 - 11
(IG) Ignition Syste	m:			
Grey - Grey	90 ~ 110 VAC	N/A	C1	1 - 3
(FM) Combustion	Fan Motor:			
Red - Black	6 ~ 45 VDC	N/A	L2	5 - 6
White - Black	5 ~ 10 VDC	N/A	L2	3 - 5
Yellow - Black	11 ~ 13 VDC	N/A	L2	4 - 5
Set your meter to the you should read be Thermal Fuse / Ov	ne hertz scale. Reading tween 60 and 420 hertz erheat Switch:	g across the white and k z.	black wires a	terminals 3 and
White - White	11 ~ 13 VDC	Below 1 ohms	B8	B1 - E10

#### 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 µ amp scale and series your meter in line with the flame rod. You should read 1  $\mu$  amp or greater for proper flame circuit. In the event of low flame circuit remove the flame rod and check for carbon or damage.

#### Heat Exchanger, Outgoing Water Temperature and Inlet 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. See below for examples of typical temperatures and resistance readings.

Example:	59°F = 11.4 ~ 14KΩ	140°F = 2.2 ~ 2.7KΩ
	86°F = 6.4 ~ 7.8KΩ	221°F = 0.6 ~ 0.8KΩ
	113°F = 3.6 ~ 4.5KΩ	

#### **Outgoing Water Thermistor**

White - White	N/A	See example above	E5	2 - 3		
Blue - Blue	N/A	See example above	E5	4 - 5		
Heat Exchanger Temperature Thermistor:						
Pink - Pink	N/A	See example above	E4	4 - 7		
Inlot Thormistor:						

White - White See example above E 4 - 9 N/A Remote Controls 1.5 ~ 3.0 K ohms Terminals J 10~13 VD0 11-2

#### **Frost Protection:**

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

#### Amp Fuses:

This unit has one inline (10) amp glass fuse. Remove the fuse and check continuity through it. If you have continuity through the fuse then it is good. Otherwise the fuse is blown and must be replaced.

NAT G

RL75e

NAT G

LPG

RL94e

LPG

# **Dip Switches Settings**

Adjust switches 2 and 3 of Dip SW1 (upper side) depending on your altitude according to the table below.







RL75e (VC2528WD-US) U307-0733(00)







**EXPLODED VIEW - ELECTRICAL** 



		RL94e (VC2837)	RL75e (VC2528)			RL94e (VC2837)	RL75e (VC2528)			RL94e (VC2837)	RL75e (VC2528)
Item Description	Part Number	Qty	Qty	Item Description	Part Number	Qty	Qty	Item Description	Part Number	Qty	Qty
001 MAIN BODY	109000257	1	1	132 HEAT EXCHANGER BRACKET	109000277	2	2	719 AWG18 HARNESS	105000162	1	1
002 WALL BRACKET	109000281	2	2	135 FLUE OUTLET ASSEMBLY	108000065	1	1	724 SENSOR HARNESS-2	105000164	1	
003 TOP SIDE REINFORCEMENT	109000260	1	1	136 FLUE OUTLET	108000066	1	1	724 SENSOR HARNESS-6	105000192		1
004 CONNECTION REINFORCEMENT	109000261	1	1	137 FLUE OUTLET PACKING	108000067	1	1	725 FUSE HARNESS	105000167	1	1
005 HEAT PROTECTION PLATE	109000275	1	1	138 SEAL PACKING	AH24-653-6	1	1	726 POWER SUPPLY HARNESS	105000181	1	1
006 FRONT PANEL	109000262	1	1	143 HEAT EXCHANGER ASSEMBLY	107000100	1		727 WATER FLOW SENSOR	105000176	1	1
008 FRONT PANEL PACKING	U245-3185-4	2	2	143 HEAT EXCHANGER ASSEMBLY	107000109		1	728 IGNITOR BRACKET	109000272	1	1
008 FRONT PANEL PACKING	109000077	2	2	400 WATER INLET	H73-501-2	1	1	730 TWIN THERMISTOR	105000108	1	1
012 RUBBER STOP	CF79-41020-A	1	1	401 WATER FLOW SERVO & SENSOR	107000090	1	1	731 SOLENOID HARNESS	105000168	1	1
013 THERMISTOR STOP	109000276	1	1	402 RECTIFIER	M8D1-15	1	1	732 THERMISTOR	105000187	1	1
014 RUBBER STOP	U245-125	1	1	403 BY-PASS SERVO ASSEMBLY	107000091	1		733 THERMISTOR	H111-650	1	1
016 SCREW COVER	109000197	2	2	404 PIPE BRACKET	AH69-310	2	1	740 HEATER	105000154	1	1
100 GAS CONTROL ASSEMBLY	106000085	1	1	405 PLUG BAND	109000018	1	1	741 HEATER	105000169	1	1
101 TEST PORT SET SCREW	C10D-5	2	2	406 FIXED BYPASS	107000103		1	742 HEATER	105000170	1	1
102 3/4 GAS INLET	106000065	1	1	407 CLIP	109000278		1	801 TRUSS SCREW	CP-30580	4	4
103 BURNER UNIT ASSY (LPG)	106000072	1	1	408 HOT WATER OUTLET (3/4 NPT)	107000092	1		802 NYLON WASHER	AU33-184X01	4	4
103 BURNER UNIT ASSY (NG)	106000073	1	1	408 HOT WATER OUTLET (3/4 NPT)	107000104		1	803 SCREW	109000280	2	2
104 BURNER CASE FRONT PANEL	106000074	1	1	409 STOP BRACKET	U211-322	1		804 SCREW	U217-449	2	2
106 PACKING	109000264	1	1	409 STOP BRACKET	AU162-1876		1	805 SCREW	CP-20883-410UK	3	2
107 BURNERS	106000054	17	17	412 FILTER ASSEMBLY	H98-510-S	1	1	806 SCREW	10900025	2	2
108 BURNER CASE BACK PANEL	106000075	1	1	413 COVER	107000093	2	1	807 PLASTIC WASHER	AU48-174	4	4
109 DAMPER(LPG)	106000076	1	1	414 CLIP	105000090	1	1	808 SCREW	CP-30580	4	4
109 DAMPER (NG)	106000077	1	1	461 WATER FLOW TURBINE	107000088	1	1	810 O-RING	M10B-2-4	3	3
110 MANIFOLD ASSEMBLY (LPG)	106000078	1	1	700 PC BOARD	105000159	1		812 O-RING	M10B-2-10		1
110 MANIFOLD ASSEMBLY (NG)	106000079	1	1	700 PC BOARD	105000190		1	813 O-RING	M10B-2-18	3	2
111 COMB CHAMBER PACKING UPPER	106000080	1	1	702 COVER	109000247	1	1	814 O-RING	M10B-2-16	1	2
112 COMB CHAMBER PACKING LOWER	106000081	1	1	703 EC COVER	109000248	1	1	815 O-RING	M10B-2-14	2	1
114 COMB CHAMBER FRONT PANEL	106000082	1	1	706 IGNITOR	105000180	1	1	817 O-RING	M10B-1-24	1	1
115 COMB CHAMBER PACKING - 2	106000083	1	1	707 HIGH TENSION CORD	BH38-710-240	1	1	818 PACKING	109000181	1	1
116 FLECTRODE	105000179	1	1	708 ELECTRODE SLEEVE	AU206-218	1	1	819 HEXAGON HEAD SCREW	ZQAA0512UK	3	3
117 FLAME ROD	105000093	2	2	709 THERMISTOR	105000114	1	1	820 HEXAGON HEAD SCREW	ZQAA0514UK	2	2
118 ELECTRODE BRACKET	105000156	1	1	710 RETAINER (THERMISTOR)	CP-90172	1	1	821 HEXAGON HEAD SCREW	ZQAA0508UK	1	1
119 ELECTRODE PACKING	105000157	1	1	714 FUSE HOLDER	U250-670X01	8	8	822 SCREW	CP-30580	2	2
125 EAN MOTOR ASSEMBLY	1080000107	1	1	716 HEATER CLIP	109000271	2	2	830 O-RING	M10B-13-4	2	2
127 FAN CONNECTING BRACKET	108000000	1	1	717 HEATER CLIP	AU100-721	1	1	888 MANUAL	100000244	1	1
	10000002	1	1	718 HEATER CLIP	AU124-618	1		889 TECH SHEET	100000246	1	1
	100000000	1	1	718 HEATER CLIP	109000282		1				
	100000000	í	'								