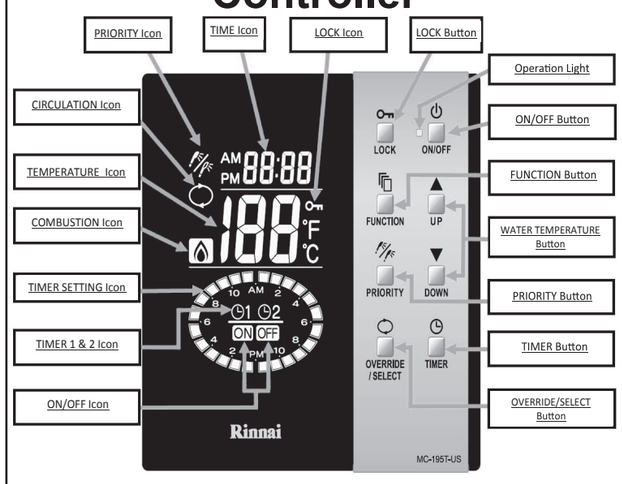
Controller



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-195T 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 (ºF / ºC)

With the water heater turned on, press FUNCTION button to reach Function 4. Once at Function for use ▲ and ▼to select 1 for F and 2 for C.

To Turn Off the Controller Sound (Mute)

With the water heater turned on, press FUNCTION button to reach Function 2. Once at Function for use ▲ and ▼to select ON or OFF.

Locking the Controller

The MC-195T controller can be locked or unlocked by pressing and holding the LOCK button for approximately 3 seconds.

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 (SW1 in DIPSW2 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 SW8 in DIPSW1 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 SW8 in DIPSW1 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 SW8 in DIPSW1 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 screw.
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.

Gas Pressure Setting

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

WARNING 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

		Water Inlet Max	Gas Inlet Min./Max Nat. G	Gas Inlet Min./Max LPG	Forced Low Nat. G	Forced Low LPG	Forced High Nat. G	Forced High LPG
RUR98i	Short flue length	150 PSI	4" W.C. /10.5"W.C.	8" W.C. /13.5"W.C.	0.51"W.C.	0.52"W.C.	3.1"W.C.	3.7"W.C.
	Long flue length				0.53"W.C.	0.55"W.C.	3.3"W.C.	3.9"W.C.

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.

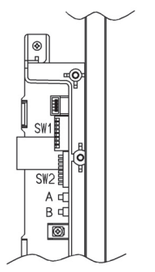


Fig. 1

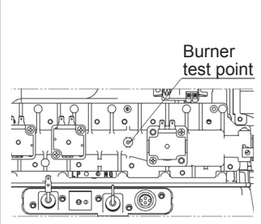


Fig. 2

Fig. 3

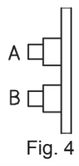


Fig. 4

Fig. 5

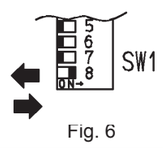


Fig. 6

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 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).

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

Wire color	Voltage	Resistance	Connector #	Pin #'s
(Main) Black - Pink	11 ~ 13 VDC	24 ~ 28 ohms	B1	3 - 4
(SV1) Black - Blue	11 ~ 13 VDC	35 ~ 41 ohms	B3	4 - 6
(SV2) Black - Yellow	11 ~ 13 VDC	35 ~ 41 ohms	B2	4 - 7
(SV3) Black - Red	11 ~ 13 VDC	39 ~ 42 ohms	B4	4 - 5
(POV) Yellow - Yellow	2 ~ 15 VDC	67 ~ 81 ohms	D1	1 - 2

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

Red - Pink	N / A	44 ~ 52 ohms	G2	3 - 4
White - Blue	N / A	44 ~ 52 ohms	G2	1 - 2
Grey - Brown	N / A	N / A	G2	5 - 7
Grey - Orange	N / A	N / A	G2	6 - 7

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

(QS) Water Flow Sensor:

Black - Red	11 ~ 13 VDC	N / A	L3	E10 - G7
Yellow - Black	4 ~ 7 VDC	N / A	L3	E1 - G7

By-pass Flow Control:

Red - Pink	N / A	44 ~ 52 ohms	G1	12 - 13
White - Blue			G1	10 - 11

(IG) Ignition System:

Grey - Grey	110 ~ 130 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	9.60 ~ 9.75 K ohms	L2	3 - 5
Yellow - Black	11 ~ 13 VDC	3.90 ~ 4.05 K ohms	L2	4 - 5

Recirculation Pump:

White - Black	108 ~ 132 VAC	17 ~ 21 ohms	H1	1 - 2

Set your meter to the hertz scale. Reading across the white and black wires at terminals 3 and 5 you should read between 60 and 420 hertz.

Thermal Fuse / Overheat Switch:

Red - White	11 ~ 13 VDC	Below 1 ohms	B8 B7	B1 - G8

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 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.

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; 86°F = 6.4 ~ 7.8KΩ; 113°F = 3.6 ~ 4.5KΩ; 140°F = 2.2 ~ 2.7KΩ; 221°F = 0.6 ~ 0.8KΩ

Outgoing Water Thermistor:

White - White	N / A	See example above	E6	2 - 3
Blue - Blue	N / A	See example above	E6	4 - 5

Heat Exchanger Temperature Thermistor:

Pink - Pink	N / A	See example above	E5	4 - 7

Inlet Thermistor:

White - White	N / A	See example above	E9	4 - 9

Remote Controls:

Terminals J	10 ~ 13 VDC	1.5 ~ 3.0 K ohms	J	1 - 2

Frost Protection:

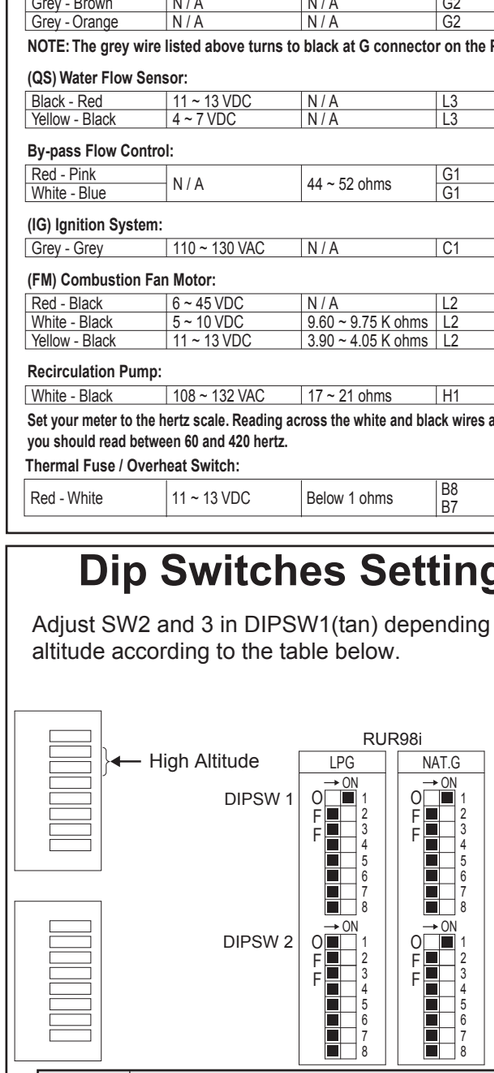
This unit has frost protection heaters mounted at different points to protect the water heater from freezing. All of them should show a positive resistance reading.

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.

Dip Switches Settings

Adjust SW2 and 3 in DIPSW1(tan) depending on your altitude according to the table below.



Recirculation DIP Switch Settings

Operation		SW 4 in DIPSW2	SW 7 in DIPSW2	SW 8 in DIPSW2
Pump OFF		OFF	OFF	OFF
Dedicated Return	Economy Mode	OFF	ON	OFF
	Comfort Mode	OFF	ON	ON
Cross Over Short Loop	Economy Mode	ON	ON	OFF
	Comfort Mode	ON	ON	ON
Cross Over Long Loop	Economy Mode	ON	OFF	OFF
	Comfort Mode	ON	OFF	ON

WARNING

DO NOT adjust the other dip switches unless specifically instructed to do so. Incorrect Dip Switch Settings can cause the Rinnai water heater to operate in an unsafe condition and may damage the water heater and void the warranty.

SW No.	NOTES								
2	High Altitude	Off	Level 0 0-2000 ft (0-610 m)	Off	Level 1 2001-5200 ft (610-1585 m)	On	Level 2 5201-7700 ft (1585-2347 m)	On	Level 3 7701-10200 ft (2347-3109 m)
3		Off		On		Off		On	

Diagnostic Codes

03 Power interruption during Bath fill (Water will not flow when power returns)
- Turn off all hot water taps. Press ON/OFF twice.

05 Bypass Servo
- Replace bypass servo

10 Air Supply or Exhaust Blockage
- Ensure approved venting materials are being used.
- Check that nothing is blocking the flue inlet or exhaust.
- Check all vent components for proper connections.
- Ensure vent length is within limits.
- Verify dip switches are set properly.
- Check fan for blockage.
- Burner Sensor (see code 31)

11 No Ignition
- 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.
- Ensure gas type and pressure is correct.
- Ensure gas line, meter, and/or regulator is sized properly.
- Bleed all air from gas lines.
- Verify dip switches are set properly.
- Ensure igniter is operational.
- Check igniter wiring harness for damage.
- Check gas solenoid valves for open or short circuits.
- Remove burner cover and ensure burners are properly seated.
- Remove burner plate; inspect burner surface for condensation/debris.
- Check the ground wire for the PC board.

12 No Flame
- 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.
- Ensure gas type and pressure is correct.
- Bleed all air from gas lines.
- Ensure proper venting material was installed.
- Ensure condensation collar was installed properly.
- Ensure vent length is within limits.
- Verify dip switches are set properly.
- Check power supply for loose connections.
- Check power supply for proper voltage and voltage drops.
- Ensure flame rod wire is connected.
- Check flame rod for carbon build-up.
- Disconnect and reconnect all wiring harnesses on unit and PC board.
- Check for DC shorts at components.
- Check gas solenoid valves for open or short circuits.
- Remove burner plate; inspect burner surface for condensation/debris.

14 Thermal Fuse
- Ensure SW5 in DIPSW2(white) is in the off position.
- Check for restrictions in air flow around unit and vent terminal.
- Check gas type of unit and ensure it matches gas type being used.
- Check for low water flow in a circulating system causing short-cycling.
- Ensure dip switches are set to the proper position.
- Check for foreign materials in combustion chamber and exhaust piping.
- Check heat exchanger for cracks or separations.
- 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.
- Measure resistance of safety circuit.
- 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.
- 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.

25 Condensate Trap
- Condensate trap is full. Check condensate trap and drain pipe for blockage.
- Replace condensate trap.

31 Burner Sensor
- Measure resistance of sensor.
- Replace sensor.

32 Outgoing Water Temperature Sensor
33 Heat Exchanger Outgoing Temperature Sensor
41 Outside Temperature Sensor
51 Inlet Water Temperature Sensor
- Check sensor wiring for damage.
- Measure resistance of sensor.
- Clean sensor of scale build-up.
- Replace sensor.

52 Modulating Solenoid Valve Signal
- Check modulating gas solenoid valve wiring harness for loose or damaged terminals.
- Measure resistance of valve coil.

57 Burner
- Contact a service provider.

58 Secondary Heat Exchanger
- There is scale build up in the secondary heat exchanger and it needs to be flushed to prevent damage. Refer to the flushing instructions in the manual. Hard water must be treated to prevent scale build up or damage to the heat exchanger.

61 Combustion Fan
- Ensure fan will turn freely.
- Check wiring harness to motor for damaged and/or loose connections.
- Measure resistance of motor winding.

63 Circulation Pump
- Ensure cold inlet and hot outlet valves are open to plumbing.
- Inspect/clean inlet filter for debris.
- If application is using thermal bypass valve inspect/clean pump filter. If
- installed with dedicated return, inspect return line.
- If draining pump, purge air from recirculation pipe before running fixture.
- If installed in a cold climate, open hot water fixture and run for 5 min.
- Repalce Pump.

65 Water Flow Servo
- 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.

70 PC Board
- Check PC board DIP switches for correct positons.
- Check the connection harness at the connection on the PC board.
- Replace PC board.

71 Solenoid Valve Circuit
- Replace the PC Board.

72 Flame Sensing Device
- Verify flame rod is touching flame when unit fires.
- Check all wiring to flame rod.
- Remove flame rod;check for carbon build-up; clean with sand paper.
- Check inside burner chamber for any foreign material blocking flame at flame rod.
- Measure micro amp output of sensor circuit with flame present.
- Replace the PC Board.

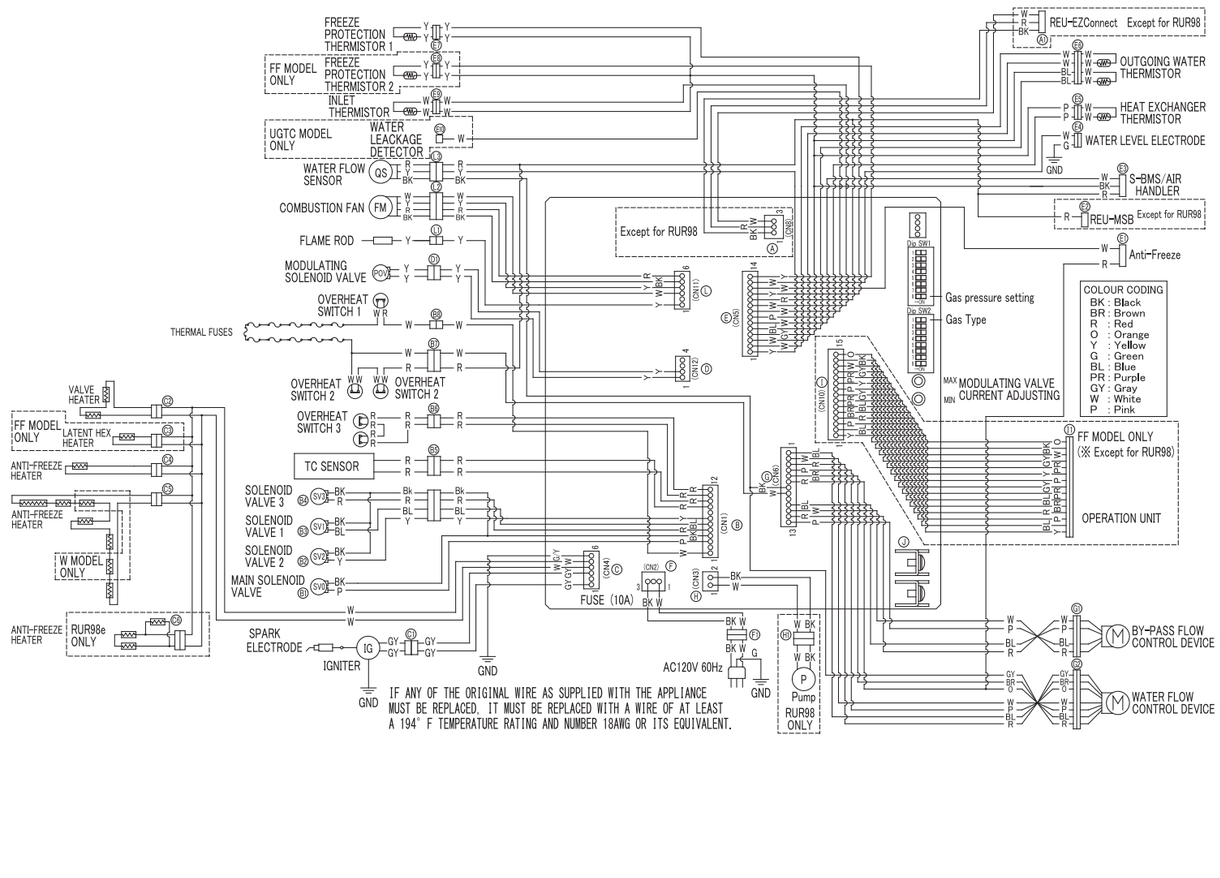
73 Burner Sensor Circuit
- Check sensor wiring and PC board for damage.
- Replace sensor.

LC# Scale Build-up in Heat Exchanger (when checking maintenance code history "00" is substituted for "LC")
- LC0~LC9 indicates that there is scale build up in the heat exchanger and that the heat exchanger needs to be flushed to prevent damage. Refer to the flushing instructions in the manual. Hard water must be treated to prevent scale build up or damage to the heat exchanger.
- To operate the water heater temporarily until the heat exchanger can be flushed, push the On/Off button on the temperature controller 5 times. Repeated LC# codes will eventually lock out the water heater.

FF Maintenance Performed
- 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.)
- Clean inlet water supply filter.
- 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.

Wire Diagram

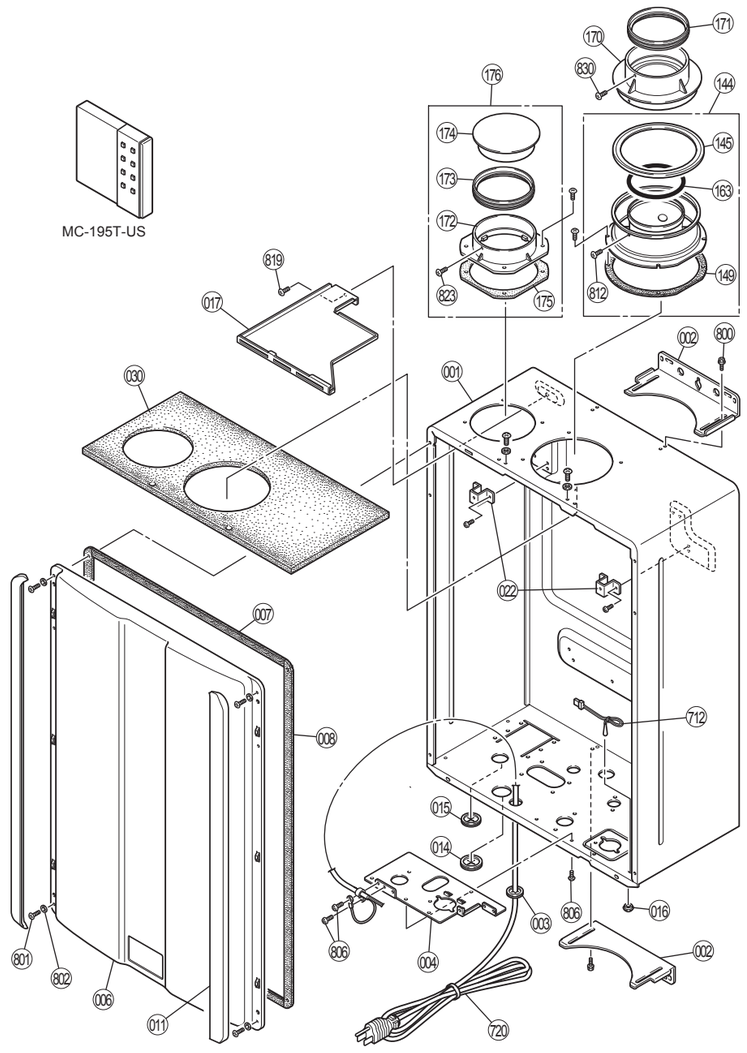


070 00012 37150 4

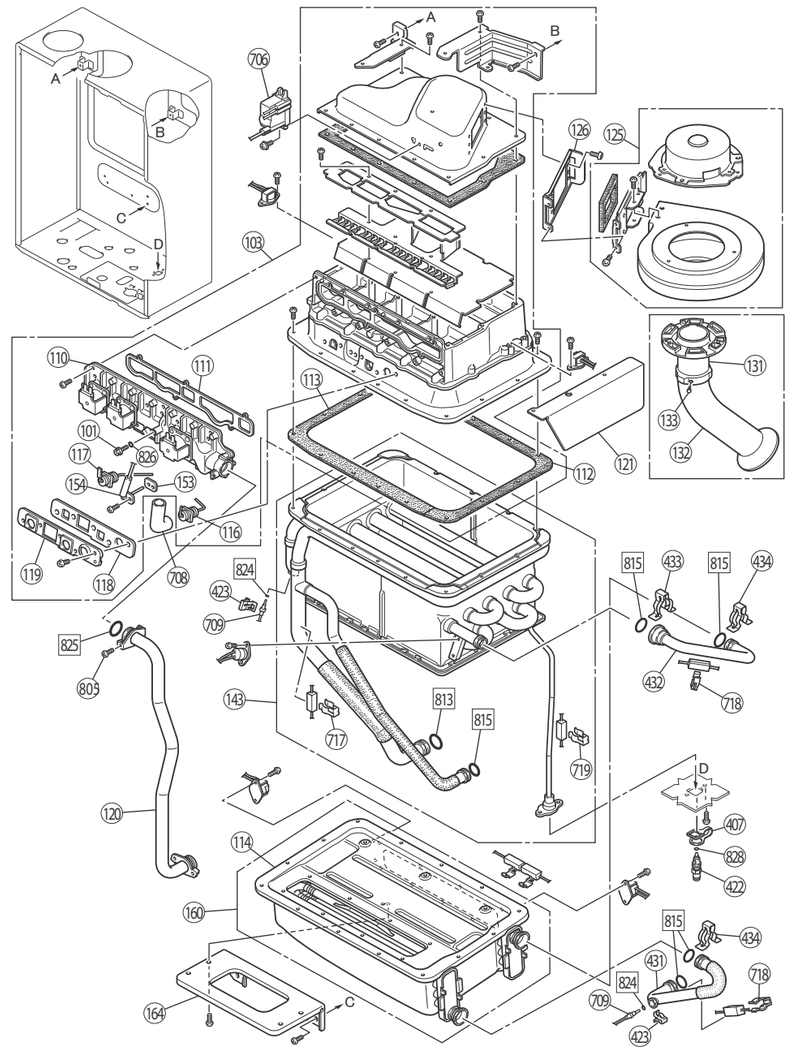
RUR98i (KBP3237FFUD-US)

U306-1460(00)X01

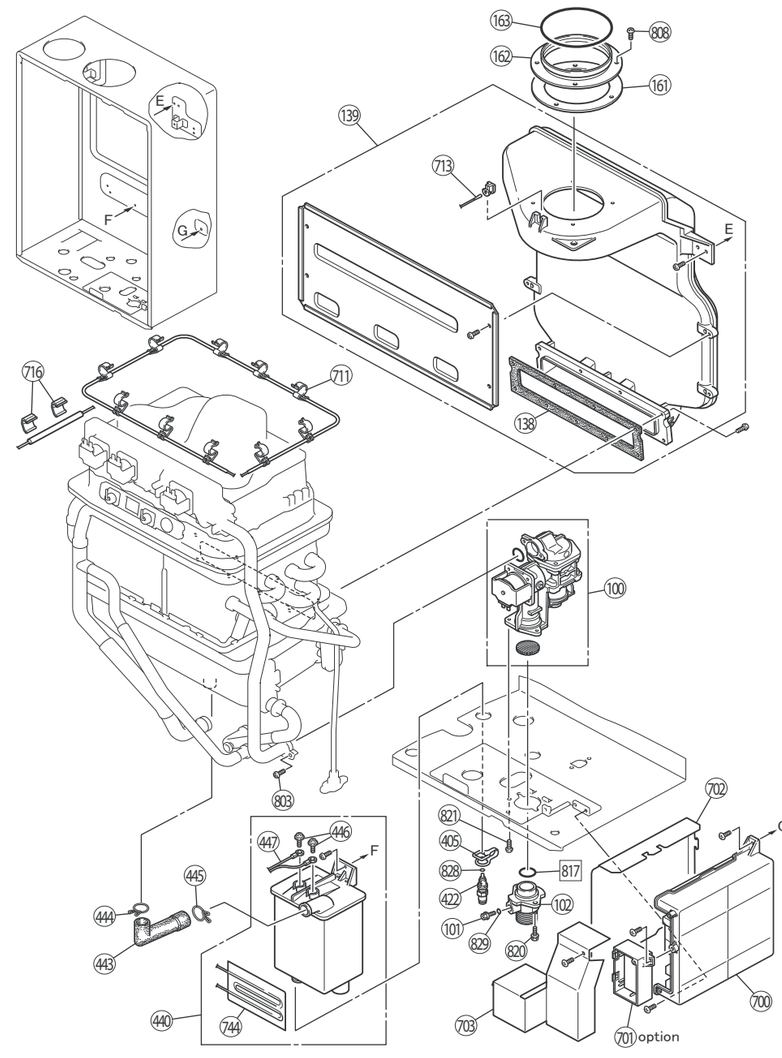
EXPLODED VIEW - CABINET



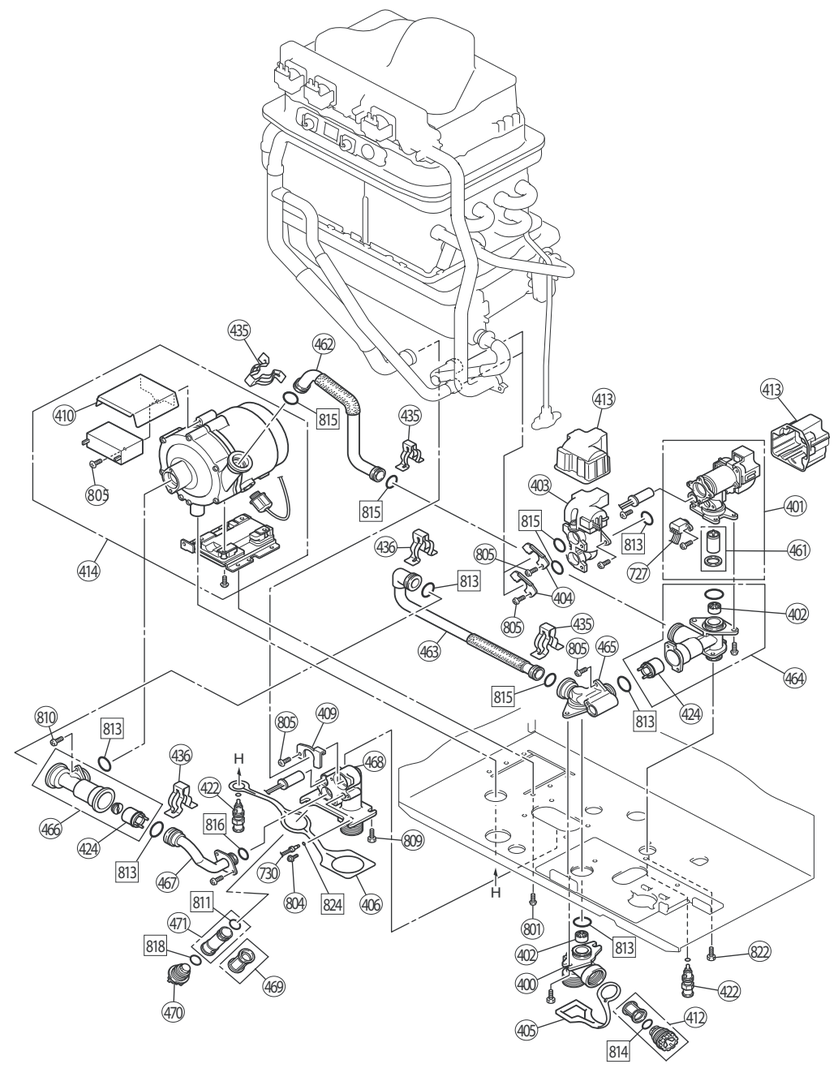
EXPLODED VIEW - INTERNALS



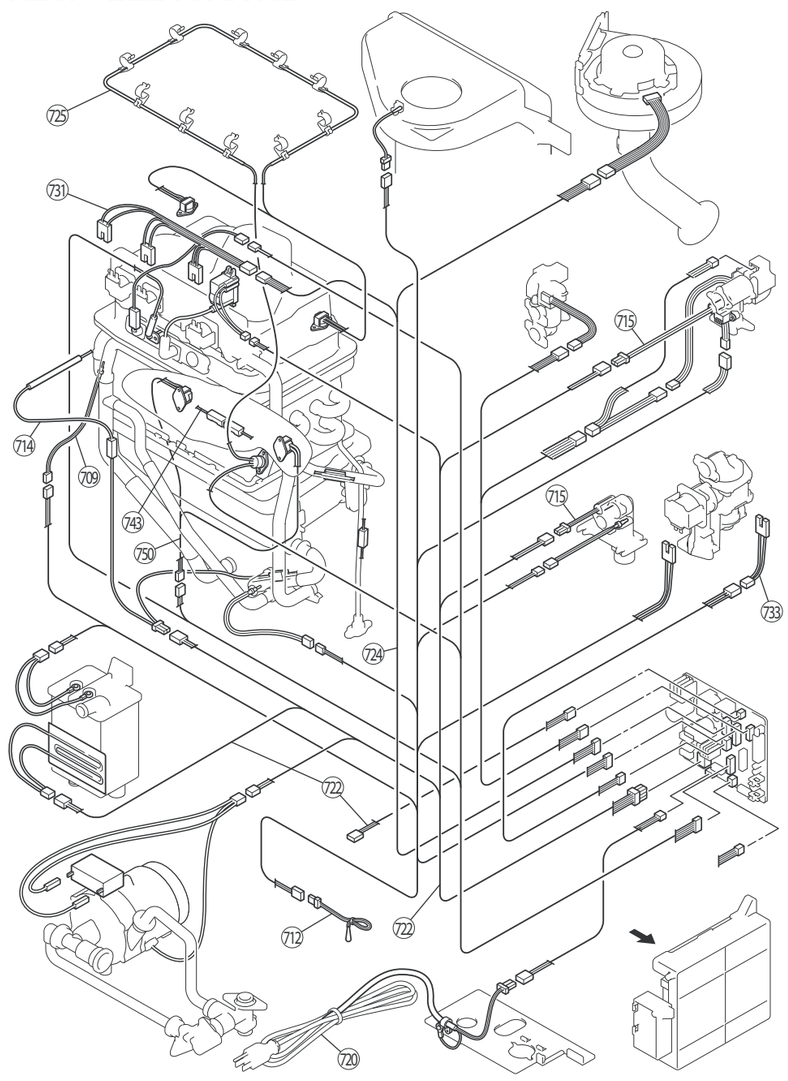
EXPLODED VIEW - INTERNALS



EXPLODED VIEW - INTERNALS



EXPLODED VIEW - ELECTRICAL



Item	Description	Part Number	Qty
001	Main Body	109000443	1
002	Wall Bracket	109000143	2
003	Rubber BushingA	CF79-41020-A	1
004	Connection Reinforcement Panel	109000445	1
006	Front Panel	109000227	1
007	Gasket - Top and Bottom	109000120	2
008	Gasket - Side	109000121	2
011	Screw Cover	109000230	2
014	Rubber Bushing	U245-125	1
015	Rubber Bushing	ACF10-120X01	1
016	Gasket	109000276	1
017	Air Intake Diverter	108000074	1
022	Attachment Bracket	109000274	2
030	Top Plate Insulation	109000421	1
100	Gas Valve Assembly	106000101	1
101	Test Port Set Screw	C10D-5	2
102	Gas Connection 3/4" NPT	106000065	1
103	Burner Unit Assembly	106000070	1
110	Manifold Assembly-LPG	106000066	1
110	Manifold Assembly-NG	106000067	1
111	Gasket	109000232	1
112	Gasket	109000233	1
113	Gasket	109000234	1
114	Gasket	109000235	2
116	Electrode	105000145	1
117	Flame Rod	105000146	1
118	Electrode Packing	109000236	1
119	Electrode Holder	109000237	1
120	Gas Pipe Assy	106000084	1
121	Plate	109000447	1
125	Fan Motor All Assembly	108000052	1
126	Fan Bracket	108000053	1
131	Noise Filter A	108000054	1
132	Noise Filter B	108000055	1
133	Filter Rivet	109000427	1
138	Gasket	109000238	1
139	Exhaust Duct Assembly	108000056	1
143	Heat Exchanger Assembly	107000132	1
144	Flue Connection Assembly	108000058	1
145	O-ring	109000239	1
149	Gasket	109000240	1
153	Burner Sensor Gasket	109000241	1

Item	Description	Part Number	Qty
154	Burner Thermistor	105000147	1
160	Secondary Heat Exchanger	107000089	1
161	Outlet Pipe Packing	109000161	1
162	Outlet Pipe	107000064	1
163	O-ring	108000018	2
164	Secondary Heat Exchanger Bracket	109000242	1
170	Exhaust Adapter Ring	102000012	1
171	Exhaust O-Ring	102000013	1
172	Air Intake Pipe	102000014	1
173	Air Intake O-Ring	102000015	1
174	Intake Cap	102000016	1
175	Air Intake Pipe Gasket	102000017	1
176	Air Intake Assembly	102000018	1
400	Water Inlet 3/4" NPT	H73-501-2	1
401	Water Flow Servo & Sensor Assy	107000090	1
402	Rectifier	107000105	2
403	Bypass Flow Assembly	107000091	1
404	Stop Bracket	AH69-310	2
405	Plug Band	109000018	2
406	Drain Valve Band A	109000428	1
407	Plug Band	109000429	1
408	Plug Band	109000465	1
409	Stop Bracket	U211-322X01	1
410	Condenser Cover	109000448	1
412	Water Filter Assembly	H98-510-S	1
413	Servo Cover	107000093	2
414	Recirculation Pump Assembly	107000133	1
422	Drain Plug	107000058	4
423	Clip	105000090	2
424	Check Valve	107000134	2
431	Connecting Pipe - Inlet	107000135	1
432	Connecting Pipe - HEX	107000095	1
433	Clip	109000132	1
434	Clip	109000244	2
435	Clip	109000133	3
436	Clip	109000450	2
440	Condensate Trap	109000245	1
443	Condensate Drain Tube	109000246	1
444	Band	109000137	1
445	Band	109000138	1
446	Screw	109000155	2
447	Connection Harness	105000105	1

Item	Description	Part Number	Qty
461	Water Flow Turbine	107000088	1
462	Pump Outlet Tube	107000136	1
463	ByPass Tube	107000137	1
464	Cold Water Connection	107000138	1
465	Cold Water Separation	107000139	1
466	Pump Connection Assy	107000140	1
467	Recirculation Tube	107000141	1
468	Hot Water Outlet	107000142	1
469	Bypass Filter	109000451	1
470	Filter Plug	109000452	1
471	Bypass plug	109000453	1
700	PC Board	105000203	1
701	Anti Frost Unit	BU195-1873-2	1
702	PC Board Cover Side	109000247	1
703	PC Board Cover Front	109000426	1
706	Ignitor	106000068	1
707	High Tension Cord Assembly	105000197	1
708	Electrode Sleeve	109000249	1
709	Thermistor	H111-650	2
711	Thermal Fuse Clip	109000250	10
712	Frost Sensing Thermistor Assembly	105000150	1
713	Frost Sensing Thermistor-5	105000151	1
714	Anti Frost Heater 120V	105000152	1
715	Valve Heater 120V	105000154	1
716	Anti Frost Heater Clip	CF29-742	2
717	Anti Frost Heater Clip A	AU124-618	1
718	Anti Frost Heater Clip	U250-625	2
719	Anti Frost Heater Clip	109000251	1
720	Power Cord	CP-90580	1
722	IG Anti Frost Harness	105000205	1
724	Sensor Harness US-5	105000198	1
725	Thermal Fuse Harness Assembly	105000175	1
727	Water Flow Sensor	105000176	1
730	Twin Thermistor	105000108	1
731	Solenoid Connection Harness	105000177	1
733	Connection Harness	105000178	1
743	Secondary Heat Exchanger Heater	107000106	1
744	Condensate Trap Harness	105000106	1
750	Over Heat Switch Harness	105000199	1
800	Screw	ZIHD0510UK	8
801	Screw	109000178	4
802	Washer	AU33-184X01	4

Item	Description	Part Number	Qty
803	Screw	108000021	2
804	Screw	U217-449	1
805	Screw	CP-20883-410UK	9
806	Screw	ZBA0408UK	4
808	Screw For Air Duct Fixation	109000255	4
809	Screw	109000466	4
810	Self Tapping Screw	ZHAA0412UK	2
811	O-ring	109000454	1
812	Exhaust Adapter Ring Fastener	109000433	1
813	O-ring	M10B-2-18	7
814	O-ring	M10B-2-16	1
815	O-ring	M10B-2-14	10
816	O-ring	M10B-2-12.5	1
817	O-ring	M10B-1-24	1
818	O-ring	109000456	1
819	Truss S Screw	109000430	1
820	Screw	ZQAA0514UK	4
821	Screw	ZQAA0512UK	1
822	Screw	ZQAA0508UK	4
823	Intake Cap Fastener	109000432	1
824	O-ring	M10B-2-4	3
825	O-ring	109000252	2
826	O-ring	109000459	1
828	O-ring	109000182	4
829	O-ring	M10B-13-4	1
830	Exhaust Adapter Ring Fastener	109000433	1
888	Technical Data Sheet-FF	100000376	1
889	Manual-US	100000352	1
900	Front Panel Label-RUR98	109000461	1