

Diagnostic Use of the Controller

1. To display error codes, press the ON/OFF button followed by the ▲ thermostat button to cycle through the error codes.
2. To display the water flow rate from the water heater engine to the tank, press the ▲ thermostat button (hold for 3 seconds) and then press the ON/OFF button while continuing to hold the ▲ thermostat button.
3. To display the hot water temperature going into the tank, press the ▼ thermostat button (hold for 3 seconds) and then press the ON/OFF button while continuing to hold the ▼ thermostat button.

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

Water Inlet Max is 150 PSI

Table 1

Gas Inlet Min/Max		Forced Low		Forced High	
Nat. G.	LPG	Nat. G.	LPG	Nat. G.	LPG
4" W.C. / 10.5" W.C.	8" W.C. / 13.5" W.C.	1.10" W.C.	1.23" W.C.	2.8" W.C.	3.0" W.C.

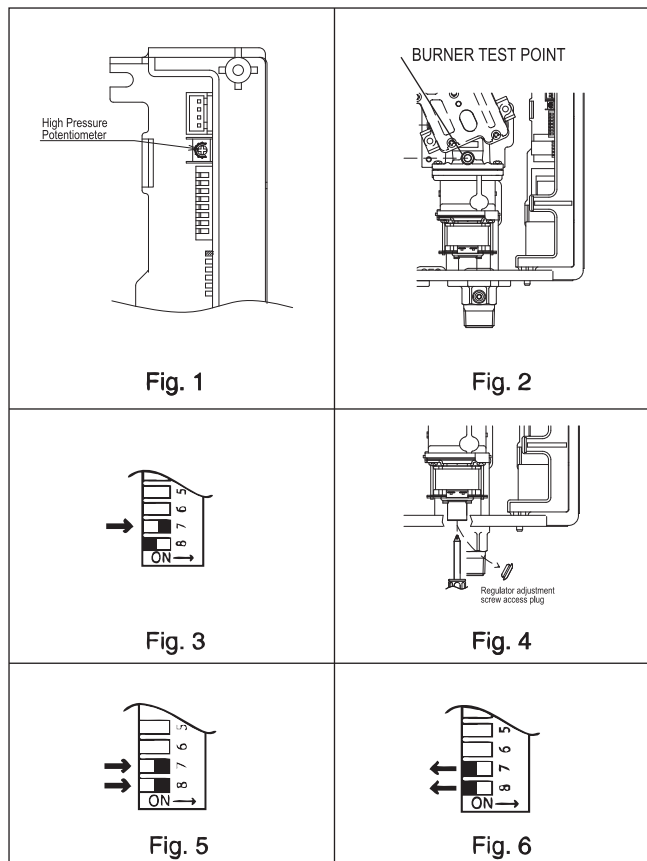
Ensure gas pressure check under Commissioning has been completed first! The regulator is electronically controlled and factory pre-set. Under normal circumstances it does not require adjustment during installation. Make adjustments only if the unit is not operating correctly and all other possible causes for incorrect operation have been eliminated.

1. Turn OFF the gas supply.
2. Turn OFF the 120 V power supply.
3. Remove the front panel from the appliance.
4. Check the gas type using the data plate on the side of the unit. If using a spare PC board, check that the gas type switches are in the correct position (dip switch 1: ON for natural gas, NG, and OFF for propane, LPG). See dip switch settings section below. (ON is towards the right and OFF is towards the left.)
5. Attach the pressure gauge to the burner test point, located on the gas control (Fig. 2).
6. Turn ON the gas supply.
7. Turn ON the 120 V power supply.
8. Turn the unit ON with the controller. Select the maximum delivery temperature and open an available hot water fixture. Leave the fixture on until all gas pressure setting is complete
9. When the red "In Use" light turns on, set the unit to "Forced Low" combustion by setting No. 7 dip switch to ON (Fig. 3).
10. Check the burner test point pressure.
11. Remove the rubber access plug and adjust the regulator screw on the modulating valve (Fig. 4) as required in Table 1. Replace the rubber access plug.
12. Set the unit to "Forced High" combustion by setting both No. 7 and No. 8 dip switches to ON (Fig. 5). Ensure maximum water flow.
13. Check the burner test point pressure.
14. Adjust the high pressure potentiometer (POT) on the PC board as required to the pressure shown in Table 1.
15. Return the unit to normal operation by setting dip switches 7 and 8 back to OFF (Fig. 6). Close all water taps.
16. Turn OFF the gas supply and 120 V power supply.
17. Remove the pressure gauge and install sealing screw.
18. Turn ON the gas supply and 120 V power supply.
19. Operate the unit and check for gas leaks at the test point.
20. Install the front panel.

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

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.



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 and POV) Gas valve and Modulating solenoids

(Set meter above 2K)

Wire Color	Voltage	Resistance	Connector #	Pin #'s
(Main) Pink - Black	11 ~ 13 VDC	39 ~ 44 ohms	F6	(F) 6 - 7
(SV1) Blue - Black	11 ~ 13 VDC	35 ~ 41 ohms	F7	(F) 5 - 6
(SV2) Yellow - Black	11 ~ 13 VDC	39 ~ 44 ohms	F8	(F) 4 - 6
(POV) Orange - Orange	2 ~ 15 VDC	65 ~ 85 ohms	F2 & F3	(F) 9 - 10

(M) Water Flow Control Servo or Geared Motor

Red - Pink	5 ~ 7 VDC	N/A	G1	(G) 5 - 6
Red - Orange		N/A		(G) 5 - O
Blue - White		N/A		(G) 3 - 4
Blue - Orange		N/A		(G) 3 - O
Grey - Yellow	4 ~ 6 VDC	N/A		GY - (G)1
Grey - Brown		N/A		GY - (G)2

(QS) Water Flow Sensor:

Red - Black	11 ~ 13	N/A	A1	(A) 9 - 5
Yellow - Black	4 ~ 7 VDC	N/A		(A) 1 - 5

Note: Red turns to Orange and Black turns Grey on the PCB.

(IG) Ignition System

Grey - Grey	90 ~ 110	N/A	H1	(H) 1 - 2
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(FM) Combustion Fan Motor:

Red - Black	7 ~ 45 VDC	N/A	B1	(B) 1 - 2
Yellow - Black	11 ~ 13	N/A		(B) 3 - 2
White - Black	7 ~ 45 VDC	N/A		(B) 4 - 2

(FV) Flammable Vapor Sensor:

Red - Black	1.9 ~ 2.1	N/A	D1	(D) 1 - 6
White - Yellow	25.5 ~ 39.5 mVDC	N/A		(D) 4 - 3

(COS) Carbon Monoxide Sensor:

Red - Black	1.9 ~ 2.1	N/A	C1	(C) 1 - 5
Blue - Yellow	29 ~ 31 mVDC	N/A		(C) 4 - 3

Thermal Fuse / Overheat Switch

White - White	11 ~ 13 VDC	Below 1 ohm	A6 F1	(F) 12 - (A) 6
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Note: White turns to red on the PCB

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.

Heat Exchanger & Tank Thermistor Temperature	BurnerThermistor Temperature
59°F = 11.4 ~ 14.0 kΩ	59°F = 21.5 ~ 23.8 kΩ
86°F = 6.4 ~ 7.8 kΩ	86°F = 14.7 ~ 16.2 kΩ
113°F = 3.6 ~ 4.5 kΩ	392°F = 0.98 ~ 1.02 kΩ
140°F = 2.2 ~ 2.7 kΩ	752°F = 210 ~ 223.9 Ω
221°F = 0.6 ~ 0.8 kΩ	1112°F = 85.7 ~ 92.7 Ω

Wire Color	Voltage	Resistance	Connector #	Pin #'s
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Tank Temperature Thermistor (White & Yellow at the PCB)

White - White	N/A	See Chart Above	A2	(A) 3 - (A) 4
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Heat Exchanger Temperature Thermistor

(Brown & Yellow at the PCB)

White - White	N/A	See Chart Above	A3	(A) 7 - (A) 8
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Burner Sensor Temperature Thermistor

(Pink & Grey at the PCB)

Black - Black	N/A	See Chart Above	A4	(A)10 - (A)11
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Surge Protector:

Blue - Brown	108 ~ 132 VAC	N/A	I1	(I)1 - (I)3
Black White	108 ~ 132 VAC	N/A	I2	N/A

With the power off you can check the continuity through the surge protector. Place a meter lead on the top pin #1 of the surge protector and pin #3 on the bottom of the surge protector. Check across the top pin #3 and bottom pin #1. If you read continuity across these two points then the surge protector is good. If you do not get continuity then replace the surge protector.

Amp Fuses:

This unit has one inline (5) amp glass fuse. Remove the fuse and check continuity through it. If you have continuity through the fuseB then it is good. Otherwise the fuse is blown and

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.

Dip Switches Settings

Set dip switches 2 and 3 to the values shown in table below for your altitude. The default setting for the appliance is 0 - 2000 ft (0 - 610 m) with switches No. 2 and No. 3 in the OFF position.

⚠ WARNING

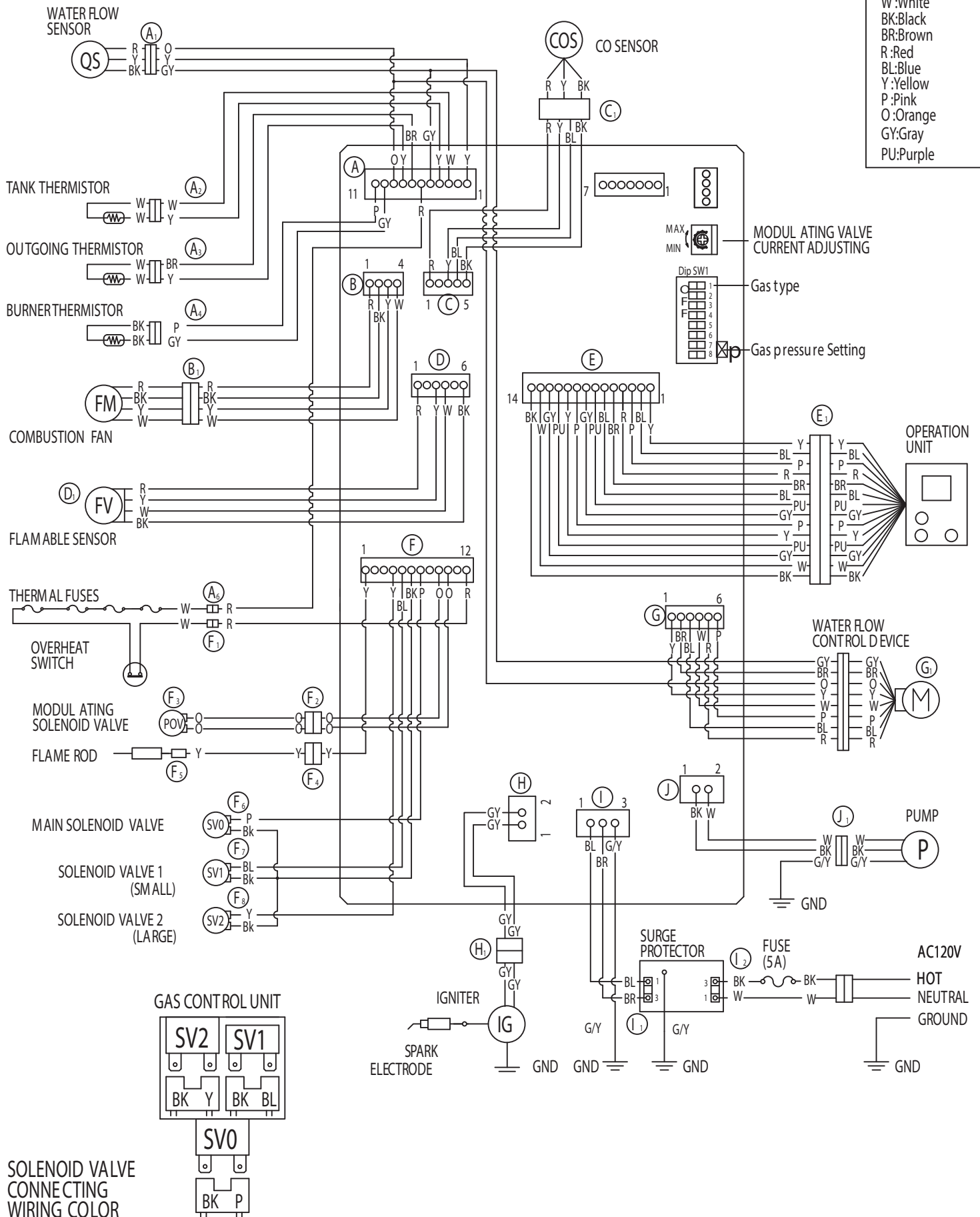
DO NOT adjust the other dip switches unless specifically instructed to do so. Incorrect Dip Switch Settings can cause the Rinnai water heater to operate in an unsafe condition and may damage the water heater and void the warranty.

	0-2000 ft (0-610 m)	2001-5400 ft (610-1646 m)
Switch No. 2	OFF	OFF
Switch No. 3	OFF	ON
SWITCH		SWITCH

WIRE DIAGRAM

COLOR CODING

W :White
BK:Black
BR:Brown
R :Red
BL:Blue
Y :Yellow
P :Pink
O :Orange
GY:Gray
PU:Purple



Error Codes

05 Air Filter Error

Follow the procedure in the “Air Screen” section of the owner's manual. If the error code continues to flash after cleaning the air filter, review the items in “Code 10” or contact a qualified service technician.

07 Circulation Flow Rate has dropped below 2.1 gpm

Check water filter for blockage
Check pump operation and wiring
Clean Heat Exchanger

10 Air Supply or Exhaust Blockage

Ensure listed 4" b-vent is used and there are no reductions in the vent system
Check that nothing is blocking the vent, inlet screen or “Combustion Air Assembly”
Check all vent components for proper connections.
Check fan for blockage
Ensure vent length, vent size and combustion air comply with the requirements stated in the *National Fuel Gas Code, ANSI Z223.1/NFPA 54*, or the *Natural Gas and Propane Installation Code, CSA B149.1*.

11 No Ignition

Check that the gas is turned on at the water heater, gas meter, or cylinder.
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 appliance is properly grounded.
Ensure igniter is operational.
Check igniter wiring harness for damage.
Check gas solenoid valves for open or short circuits.
Remove burner cover and ensure all burners are properly seated.
Remove burner plate and inspect burner surface for condensation or debris.

12 Flame Failure

Check that the gas is turned on at the water heater and gas meter. Check for obstructions in the flue outlet.
Ensure gas line, meter, and/or regulator is sized properly.
Ensure gas type and pressure is correct.
Bleed all air from gas lines.
Ensure vent length, vent size and combustion air comply with the requirements stated in the *National Fuel Gas Code, ANSI Z223.1/NFPA 54*, or the *Natural Gas and Propane Installation Code, CSA B149.1*.
Verify dip switches are set properly.
Ensure appliance is properly grounded.
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 and inspect burner surface for condensation or debris.

13 Combustion Error

Review items listed under codes “05” and “10”

FE Flammable Vapors Detected

- Leave the area immediately, leaving the exit point open to allow ventilation
- Do not touch any electric device (including phone or light switch)
- Call emergency personnel from a neighbors phone
- Do not try to reset the water heater or light the pilot to any other appliance

When safety personnel have identified the area as safe and all flammable vapors have been evacuated the units can be rest by unplugging the unit then plugging back in.

If “FE” continues to flash after area is determined safe, contact a qualified service technician.

14 Thermal Fuse

Check gas type of unit and ensure it matches gas type being used.
Check for restrictions in air flow around unit and vent terminal.
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/or exhaust piping.
Check heat exchanger for cracks and/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.
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 gas type of unit and ensure it matches gas type being used.
Check for restrictions in air flow around unit
Check for foreign materials in combustion chamber and/or exhaust piping.
Check for clogged heat exchanger.

30 FV Sensor Error

Check sensor wiring for damage.
Measure resistance of sensor.
Replace sensor.

31 Burner Sensor Error

Measure resistance of sensor.
Replace sensor.

32 Heat Exchanger Outgoing Temperature Sensor Fault

Check sensor wiring for damage.
Measure resistance of sensor.
Clean sensor of scale build-up.
Replace sensor.

35 Tank Temperature Sensor Fault

Check sensor wiring for damage.
Measure resistance of sensor.
Clean sensor of scale build-up.
Replace sensor.

38 CO or FV Sensor Error

Check sensor wiring for damage.
Measure resistance of sensor.
Replace PCB and sensors.

52 Modulating Solenoid Valve Signal Abnormal

Check modulating gas solenoid valve wiring harness for loose or damaged terminals.
Measure resistance of valve coil.

61 Combustion Fan Failure

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

63 Circulation Flow Rate has dropped below 1.2 gpm

Check water filter for blockage
Check pump operation and wiring
Clean Heat Exchanger

71 SV0, SV1, SV2, and SV3 Solenoid Valve Circuit Fault

Check wiring harness to all solenoids for damage and/or loose connections.
Measure resistance of each solenoid valve coil.

72 Flame Sensing Device Fault

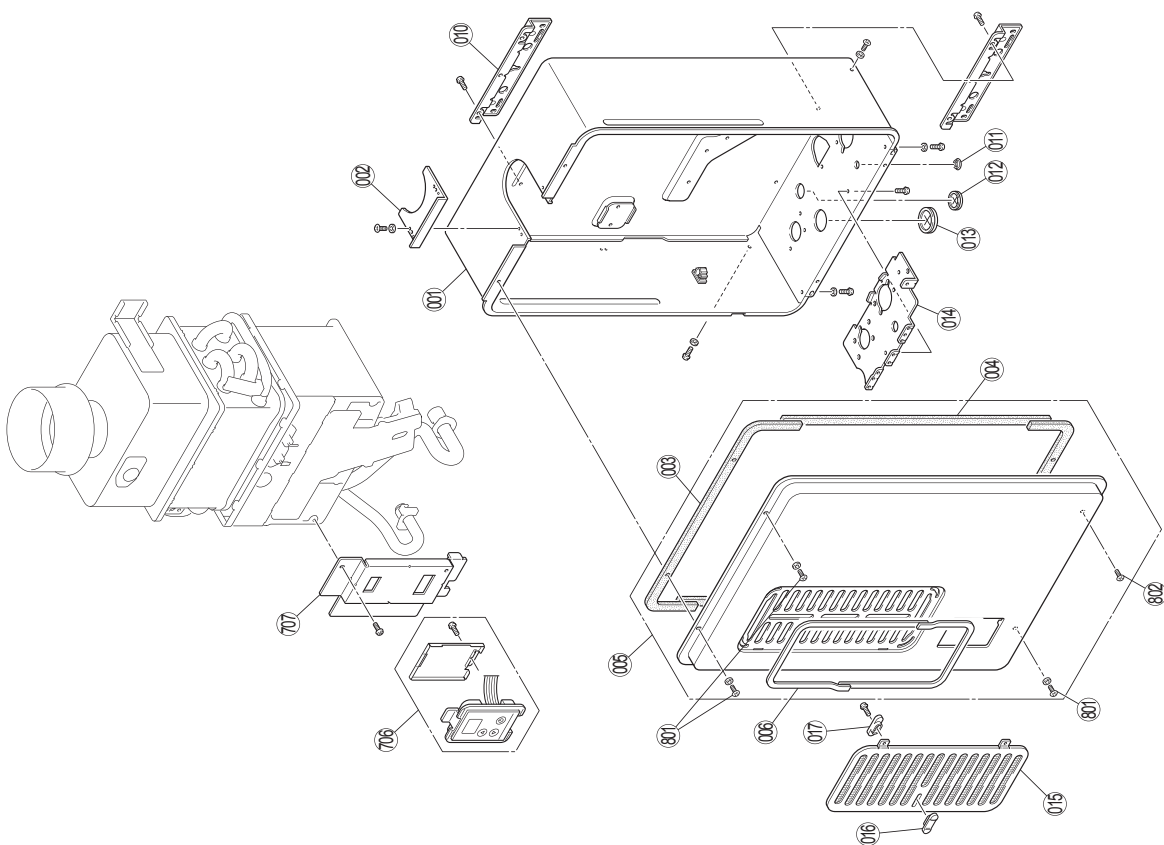
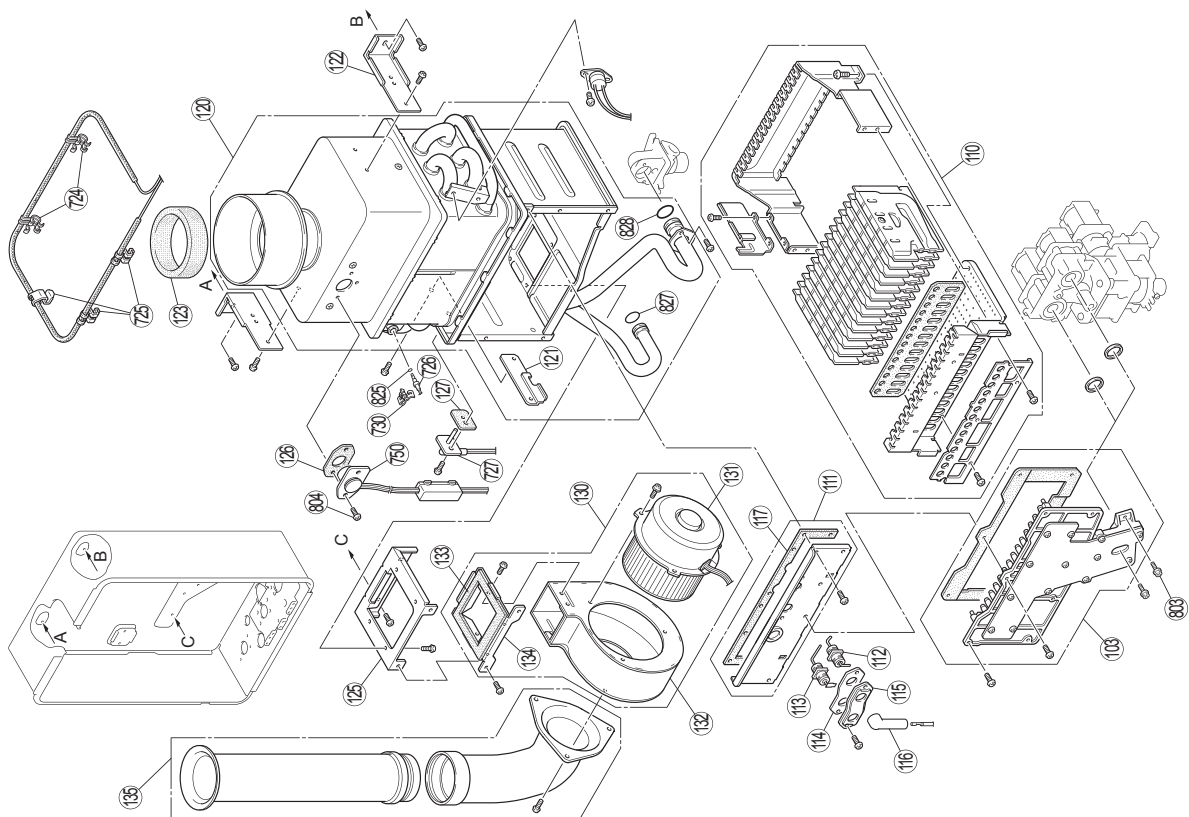
Ensure flame rod is touching flame when unit fires.
Check all wiring to flame rod for damage.
Remove flame rod and check for carbon build-up; clean with sand paper.
Check inside burner chamber for any foreign material blocking flame at flame rod.
Measure micro amp output of sensor circuit with flame present.
Replace flame rod.

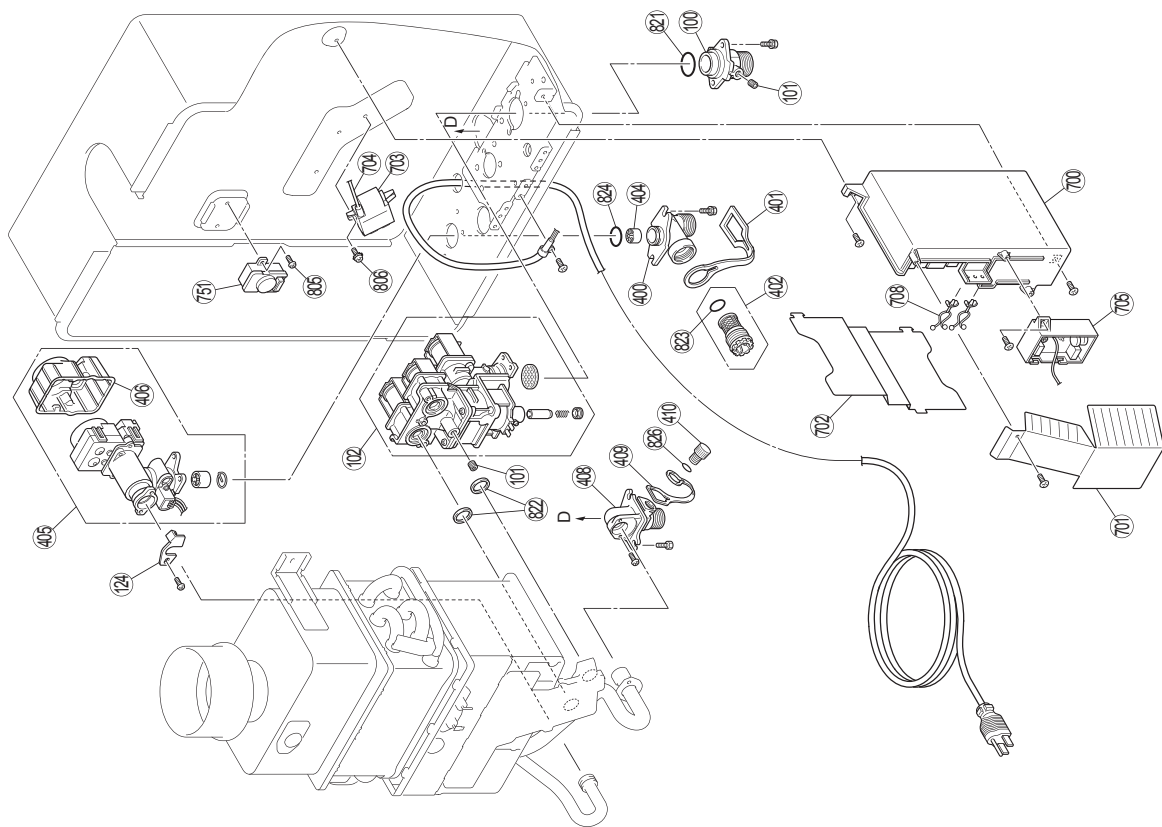
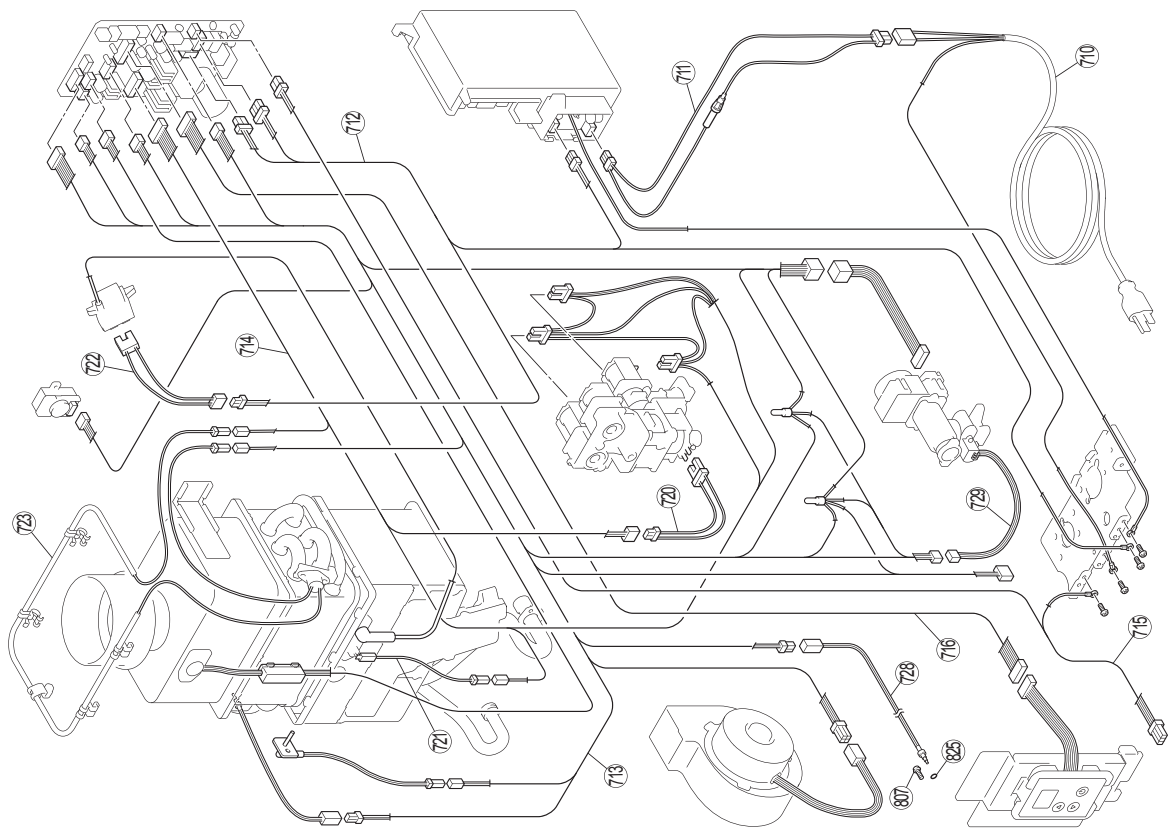
73 Burner Sensor Circuit Error

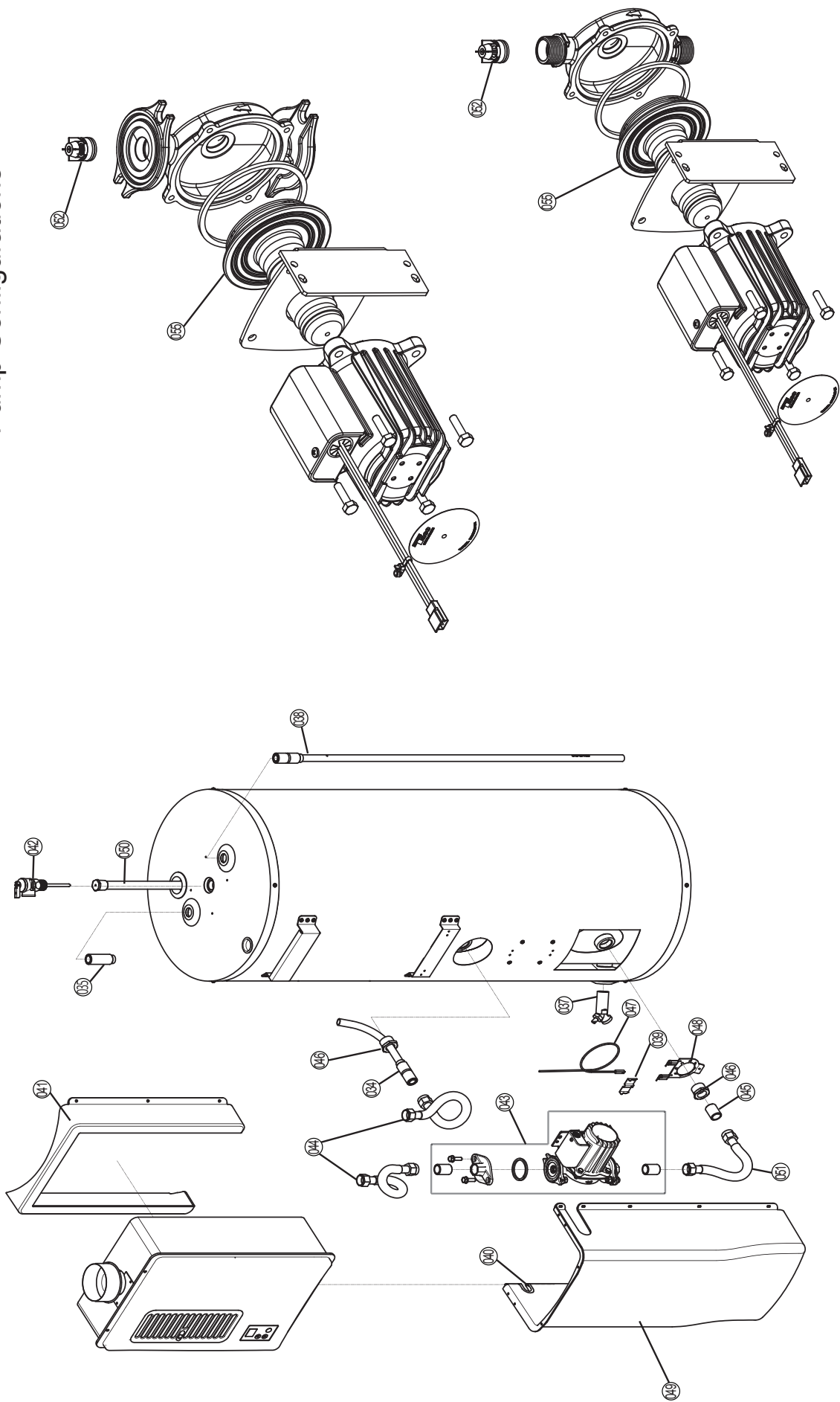
Check sensor wiring and PCB for damage.
Replace sensor.

NO CODE No hot water

Confirm the water heater is plugged in and 120 volts is available.





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PARTS LIST

Item	Description	Part Number	Qty	Item	Description	Part Number	Qty
002	Top Seal Plate	109000092	1	110	Burner Unit-1	106000029	1
003	Front Panel Packing	BU195-167	2	110	Burner Unit-2	106000030	1
004	Main Body Packing Side	AU115-163	2	111	Combustion Chamber Front	106000031	1
005	Front Panel Assembly	109000093	1	112	Electrode	H73-120	1
006	Air Filter Packing	109000094	2	113	FR Electrode	105000010	1
010	Wall Hang Bracket	BU195-121	2	114	Electrode Packing	109000098	1
011	Seal Packing	AU105-113	1	115	Electrode Holder	109000099	1
012	Rubber Bushing-A	CF79-41020-A	1	116	Electrode Sleeve	AU206-218	1
013	Rubber Bushing	U245-125	1	117	Packing	109000100	1
014	Connection Reinforcement Panel	109000095	1	120	Heat Exchanger Assembly	107000031	1
015	Air Filter Ass'y	108000030	1	121	Slide Plate	109000101	1
016	Door latch A	109000096	1	122	Duct Fitting Plate	109000102	2
017	Door latch B	109000097	1	123	Seal Packing-D	109000103	1
034	J-Tube	107000116	1	124	Fixing Bracket	AU195-322	1
035	Outlet Nipple	107000117	1	125	Combustion chamber Bracket	106000032	1
037	Drain Valve	107000118	1	126	CO Sensor Packing	109000104	1
038	Diptube	107000119	1	127	Burner Thermistor Packing	109000149	1
039	Thermistor Bracket	109000368	1	130	Fan Motor All Assembly	108000031	1
040	Shoe-Horse Grommet	109000369	1	131	Fan Motor Assembly	108000032	1
041	Side Trim	109000370	1	132	Fan Casing Assembly	108000033	1
042	Temperature and Pressure Relief Valve	107000120	1	133	Fan Motor Packing	109000106	1
043	Pump	107000121	1	134	Fan Motor Bracket	109000107	1
044	Flexible Hose	107000122	2	135	Noise Filter Ass'y	109000108	1
045	Close Nipple	107000123	1	400	Water Inlet (3/4"NPT)	H73-501-2	1
046	Hexagonal Reducing Bushing	107000124	2	401	Plug Band	109000018	1
047	Thermistor	105000196	1	402	Filter Assembly	107000032	1
048	Thermistor Bracket	109000371	1	404	Rectifier	M8D1-15	1
049	Front Cover	109000372	1	405	Water Flow Servo&Sensor Assembly	107000033	1
050	Anode	107000125	1	406	Water Flow Servo Cover	109000130	1
051	Flexible Hose	107000126	1	408	Hot Water Outlet (3/4"NPT)	107000034	1
052	Flow Check Valve	107000045	1	409	Plug Band	109000019	1
055	Cartridge Assembly	107000048	1	410	Drain Valve	AU142-444	1
100	Gas Connection(1/2"NPT)	106000027	1	700	PCB oard	105000076	1
101	Screw	AU39-965	2	701	EC Cover -US	U250-1755	1
102	Gas Control Assembly	106000019	1	702	Electric Unit Cover	108000034	1
103	Manifold Assembly -A	U250-200-A-ASX02	1	703	Ignitor	EI-144	1
103	Manifold Assembly -D	106000028	1	704	High Tension Cord	105000019	1
				705	Surge Protector	105000077	1
				706	Operation Unit Assy	105000078	1
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