PrecisionTemp

RV550 EC, RV550NSP EC & M550 EC Water Heater

Service Manual

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Models: **RV550 EC**
RV550NSP EC
M550 EC

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Section 1. Definition of Terms

AutoCal – A procedure by which the microprocessor in the heater accesses a stored calibration table to convert gas flow to voltage to control the gas valve.

DSI (Direct Spark Ignition) – The circuit board that controls the ignition process. Once supplied with 12 vdc by the main circuit board, it opens the gas solenoid, sparks the igniter, and senses the flame. Also, during operation it continues to monitor the flame and will fire the igniter if flame rectification is lost.

Ignition or minimum burn – The ignition gas flow and the lowest burn that the software will permit, which is normally about 15,000 Btu.

Maximum burn – The highest burn that will pass through the unit, normally 55,000 Btu.

T-in thermistor– # 1436 The temperature measured at the entrance to the heat exchanger
T-mid thermistor– # 2008 The temperature measured near the center of the heat exchanger
T-out thermistor - # 1437 The temperature measures at the exit of the heat exchanger
T-set – The stabilization temperature set by the pot on the circuit board #1841-RV

Section 2.1 Description of Operation for all RV550 EC Models

Note: The next 8 steps take place in 3-5 seconds.

- The **flow meter** senses the water flow & sends a flow signal to the **green control board.**
- The **green control board** sends 12 VDC through the **brown wire** to the **pressure differential switch** and on to the **black relay** that powers the **power vent blower**.
- The **relay** closes the 12VDC contacts to start the **blower**.
- Fluing is proofed by the **vacuum tube** that runs from the **blower** to the **pressure differential switch**.
- The **pressure differential switch** contacts close, sending 12 VDC to the **spark ignition module** via the second **brown wire**.
- The **Ignition module** simultaneously affects a spark through the **ignition wire** to the **spark ignition probe,** positioned over the **burner**, and sends 12 VDC to the **combination gas valve** via the **blue wire**.
- Ignition of the burner's element is effected and the flame is proofed and monitored through the same **ignition wire** by the **spark ignition module**.
- The **green control board** sends DC voltage to the **modulating gas valve** for one second to effect flame cross-over to all burners.
- The micro-processor on the **green control board** monitors water flow with the **flow meter** and temperature with the three **thermistors** twice / second and varies voltage 0 – 12 VDC to the **gas modulating valve,** varying gas flow to burner in order to maintain constant water temperature output.
- Burner remains lit as long as water flow continues, but if flame is extinguished for any reason, the **gas valve** will shut off in less than 1 second and re-ignition will be attempted.
- When water is turned off and the water heater no longer senses flow the heater shuts down to standby mode.

Section 3.Trouble-Shooting the RV550EC

3.1 Water Leak

- Identify the location. If a shark bite (quick release) fitting is the source, be sure the pex and copper pipe is fully seated into the fitting.
- If the leak persists replace the shark bite quick release fitting.
- .

3.2 Gas Leak

Use leak tester to identify the specific location. Correct leak by either:

- Tightening the fitting
- Opening the fitting and re-applying thread sealer. The thread sealant must be an AGA-approved product for use with propane gas (LPG).
- Replacing the leaking parts.
- NOTE: DO NOT USE PIPE DOPE ON GAS FLARE FITTING. THESE FITTING ARE TO BE “DRY” CONNECTIONS.
-

CAUTION: When checking for gas leaks using dish detergent or leak detector. DO NOT use flame.

3.3 No Green LED flash or Green LED stays on, but does not flash

1. Check to insure power to the heater is turned ON and panel breaker/fuse is not tripped. With power OFF Disconnect power wire connections to the RV wiring. Attach a multi meter and turn power to heater ON. If there is no power then trouble-shoot the power supplied by the electrical system.

2. Be sure all electrical connectors are secure. Check polarity of the 12 vdc supply to the RV550 EC. The positive (+) lead must be connected to the red (+) lead on the rear of the RV550 EC. The negative (-) lead must be connected to the green (-) lead.
CAUTION: Supplying the RV550 EC with reverse polarity will damage the circuit boards.

3. Do you have a converter? If so, the 12 vdc supply to the RV550 EC must be from a fully rectified DC converter or connected directly to the battery. Refer to your converter manual to verify hookup. Also, check the AC content on the 12 vdc supply to the RV550. Normally, it should be less than ±0.3 vac.

4. Check the power at the circuit board by placing the red multimeter probe into the red wire of the red 2 pin connector on the left/rear of the circuit board. Black probe should be place into the black test point just in front of the red 2 pin connector. Voltage should be 10.8 – 14.4 vdc. If voltage is lower than the minimum the ignition board may not function. If voltage is above the maximum it is possible to damage either circuit board. If there is no voltage at the control board then check the in line fuse in the power supply cable for an open circuit (blown fuse).

5. If the problem persists then change board 1841-RV. Refer to SM550-01 for the change procedure.

3.5 Green LED flashes, but no ignition (igniter sparks, no gas)

1. Check the ECO for an open circuit by checking continuity on each connector. The ECO is a bi-metal switch that opens when temperature goes above 165°F.

2. Check that the propane tank is ON, there is gas in the tank and the supply line is purged of air. Gas pressure to the RV550 while running should be 11.0–14.0 wci.

3. Check to insure the gas solenoid wire connectors are secure to the wiring harness. Check that 12 vdc is getting to the gas solenoid over the blue wire from the DSI connector. If there is no voltage or the voltage is less than 10.0 vdc, replace the DSI.
4. If there is voltage, check both blue wires on ECO to assure voltage on both contacts.

3.6 Green LED flashes, but no ignition (no igniter sparks, no gas flow, no gas odor)

1. If the flowmeter is not sending a signal there may be cold water bypassing into the hot water lines somewhere in the coach. See the description under the problem Section 4.1 'Cold Water Bypass' to learn more about this condition.

2. After verifying that water is flowing and there is no bypass, check for a Hz signal from the flowmeter to the control board at the 3pin connector yellow wire or count the green led flashes between pauses while hot water is flowing. 40Hz equals 1 GPM or 9 green flashes between pauses equal 1 GPM. The flow through the RV550 can also be read from the green LED as specified in section 4.3 ' Reading flow using the green LED'.

3. Place a finger on the ignition relay on the circuit board (see figure -4) and turn on water. Do you feel or hear a click from the relay actuating?
5. If NO, and there is no red light faults flashing and the Hz signal has been verified The control board may need replacement or calibrated.

3. Check that the green (ground) wire on DSI cable 1333 is attached to the grounding connection.

4. Check the height of igniter electrode above the burner. This height should be 0.125 – 0.187 inch. See SM550 -11 service bulletin.

5. Disconnect the ignition wire from the DSI spade connector . During ignition a spark should be seen at the DSI spade connector. If there is none, replace the DSI board 3158 per SM550-02.

3.7 The unit ignites, but will not rise above minimum burn or water at the faucet is cool

1. Check flow out of faucet by measuring the time it takes to fill a gallon container. Calculate water flow in gallons per minute (GPM) by dividing the number one by the time in minutes it takes to collect one gallon of water. Refer to figure -1 to be sure that you are in the normal operating range.

2. The flow through the RV550 can be read from the green LED as specified in section 4.3 'Reading flow using the green LED'. If the flow at the faucet being calculated by using the green LED is more than 0.25 GPM greater than the flow through the RV550, read about 'Cold Water Bypass'.

3. While the faucet is turned off check the voltage to the modulating valve Brown test point. It should read about 12vDC without water running. When a hot water faucet is opened the voltage should drop below 12vDC. If the voltage does not drop it could be a thermistor or calibration issue. If no voltage is found at the brown test point disconnect the modulating valve connector and ohm out the coil (white & black wires) A normal reading will be in the 50 - 60 ohm range. If you find an open circuit replace the modulating valve coil. If coil is good proceed to next step.

4. Check thermistors per the section 4.5 'T-in, T-mid, T-out Thermistor and T-set Readout'. If a thermistor is sending a false high temperature reading it will cause the heater to stay in low burn. Replace defective thermistor.

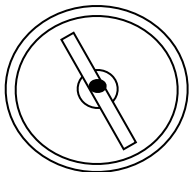
5. Propane regulator may be bad, reducing gas flow. Dynamic gas pressure (while heater is running) should be 11WCI.

6 If you are unable to determine the cause Call for technical assistance 800-934-9690

3.8 Large fluctuations in temperature

1. Are you operating on the water pump? If yes, check to see if the water is pulsing at a low flow. If YES, then you may need an accumulator tank to smooth out the water flow. See the section 4.4 'Using the water system pump'.

2. Are the inlet and outlet water supply lines hooked up properly? Six flashes of the red LED indicates reversed water hookups. The water inlet connection is the lower and the hot water outlet is the upper connection.
3. There might be a built in check/pressure reducing valve in some newer coaches. It is built into the hose hookup assembly. To locate it remove the water supply hose and the strainer/washer. Now, look into the water inlet. You typically will see a plastic spring retainer. This can severely restrict water flow.



By putting a small screwdriver beside the spring retainer and turning it you can increase or decrease water flow. By turning adjust this check valve so that your showerhead, on full hot and no cold water running, makes the green LED on the water heater blink 12 to 16 times between interrupts during the summer and 8 to 12 blinks during winter operation or when on cold well water.

3.9 During a 'Navy' style shower water is cold for a short time after turning off and then back on

1. When water flow is turned off the RV550 will also turn off. Turning the water on again will result in a few seconds of higher temperature water and then a few seconds of cold water. The software minimizes the duration of the cold water, but it takes about three seconds to sense the flow and ignite the burner. The user can do the following:

- If you are not dry-camping enjoy your shower and let the water run. The RV550 is designed to provide unlimited hot water.

3.10 Pressure relief valve leaks

1. Check water supply pressure. Pressure approaching 90psi will cause the PRV to open.

2. Briefly, open valve to clear any debris that might be lodged in the seat. Then let the lever snap back.

3. If the valve continues to leak, replace pressure relief valve 1375.

3.11 During the AutoCal procedure the unit shuts down and restarts

This condition is usually caused by low/high water flow or low gas pressure. Check flow rate by counting flashes from green light. During calibration water flow must be in the range of 1.25 – 1.75 GPM. Dynamic gas pressure (while heater is running) should be 11WCI.

3.12 Exhaust contains dark smoke

1. While the heater is operating check the burner manifold for any indication of large yellow flame. This is observed as a localized, large flame or a flame located other than above the burner. All burners must have a flame.

2. Check for obstructions in the heat exchanger, vent or air intake.

3. Shutdown the unit and contact a factory representative at (800)934-9690.

Section 4.

4.1 Cold water bypass

A cold water crossover occurs anywhere the cold water can flow into the hot water line, bypassing the water heater (see figure -6). The places to look for this happening are outside wash down boxes or showers, (always shut the water valve off, not just the shower head button. This will prevent cold water from entering the hot water system through the valve. Other areas to look at are water heater by-pass kits, showers with a shutoff on the shower head, washing machines with a hot/cold splitter hose going into the machine.

There can also be planned crossover in the shower mixing valves that have anti-scald provisions built into them. If you turn the shower hot water valve on with the cold water valve off you cannot get 100% hot water from it.

The shower-mixing valve is designed to always bleed a little cold water in to the hot even when the cold water is off. With the RV-550 series water heater you may feel hotter water coming from your lavatory sink than the shower. This is normal.

4.2 Flowmeter checkout

Find the three-pin connector on the circuit board (see figure -4). Place the ground (-) probe of the multimeter in the back of the connector at the black wire and place the high (+) probe at the red wire. With power ON the multimeter should read 5 vDC. Now set the meter to read Hz, move the high (+) probe to the middle or yellow wire of the flowmeter connector. Turn water flow ON (greater than 0.5 GPM). . If you have a multimeter with frequency measurement (Hz) go to that scale. The frequency is proportional to flow with 40 hertz ≈ 1 GPM. If no Hz signal is read replace the flowmeter assembly (p/n 3713) per SM550-12.

4.3 Reading flow using the green LED

Anytime the RV550 detects flow greater than 0.4 GPM it will flash a code on the green LED that corresponds to water flow. With power ON and water running through the unit watch the green LED. The LED will flash approximately once every second. Watch the green LED to find one longer pause between flashes (1.5 seconds versus 1.0 seconds). Begin counting the green LED flashes until the next longer pause. The flashes correspond to water flow. Each flash is approximately 1/8 GPM so that water flow can be calculated: Water flow in GPM = number of green flashes divided by 8

4.4 Using the water system pump

When you see or feel pulsing of the water pressure or wide variations is flow through the showerhead or faucet you are seeing pulsing as the pump starts and stops. With some RV pumps the water does not move in a steady flow. This causes a momentary hesitation of the water movement in the water line. This can cause temperature control problems.

To solve this problem an accumulator or expansion tank needs to be installed in the cold water line just after the pump. The accumulator tank must have a rubber bladder in it. If there is no bladder the water will absorb the head of air leaving nothing for the water to compress against, leaving the system as if no accumulator tank had been installed. A good accumulator tank will smooth the pulses and make the water flow as smooth as if it were on city water.
The RV550 EC series water heaters use a water flow meter. The water heater should not come on if there is a leak in the hot water system. The flow meter is used so the computer can know when the water flow is four-tenths of a gallon per minute or higher before the water heater will come on. The computer also uses the water flow rate, the set temperature, and the incoming water temperature to calculate the BTU setting of the modulating gas valve. If the water pump system is pulsing, the flow meter will read the GPM on the high side of the pulse. The computer will set the gas valve to that BTU setting on the low side of the pulse it will read a new lower GPM setting and say to itself “they just reduced the water flow. Lower the BTU gas setting quickly”. This condition will keep the RV550 series from controlling the water temperature and cause wide temperature fluctuations.

4.5 T-in, T-mid, T-out 550 and T-set readout

If the red LED is flashing, turn power OFF for 5 seconds and then turn power ON? If the red LED continues to flash, there is a potential problem with a 550.

To diagnose the problem, run water though the unit for at least 30 seconds with the power OFF then turn the water off. The output of the 550 should be checked with the power ON using a multimeter to read DC volts. Plug the ground (-) probe into the black test connector (TP1) on the circuit board
1841-RV and the high (+) probe into:

T-out	orange test connector (TP2)
T-mid	yellow test connector (TP3)
T-in	6 pin connector on 1841-RV at right (inboard) blue wire
T-set	blue test connector (TP4)

Compare the voltage reading of the three 550 outputs which should all be within .5 or less volts of each other.

An alternative method to reading the 550s;
Turn power OFF. Unplug the 2-pin connectors (figure -4) and, using a multimeter, check the resistance across the each 550. If the suspect 550 is more than 75 ohms from the other 550s, replace the 550. Otherwise, replace the 550 cable first. If that does not fix the problem, replace the 550.

T-set (blue test point) is set to 2.1 vdc (120°F) at the factory. The T-set pot output will change about 0.44 vdc (7°F) per turn of the pot. For example, to adjust T-set to 122°F turn the pot until the readout is 2.2 vdc.

Section 5. Service Code Diagnostics

Note: All red LED flashes can be reset by cycling the power OFF for 5 seconds and then ON if a hard fault is not set..

Double red flash/second (two flashes per second)

Indicates that the T-mid (yellow) thermistor has failed. The heater will not operate without maintenance action. Check that the 2-pin and 6-pin connectors are all plugged in and inspect the wiring for any indications of a problem. Unplug the T-mid thermistor 2008 at the 2-pin connector and check for continuity on the two yellow wires. If either wire shows a break, replace the cable 1329. Otherwise, replace the T-mid thermistor p/n 2008 per SM550-08.

Single Red flash

Indicates that the T-out thermistor (red) has failed. The heater will substitute a calculated (model) T-out, based on T-mid, and continue to operate. At a constant water flow the temperature output will remain constant. Over the operating water flow range, normally, this approximation will be within ±3°F. If the variation is noticeable and improvement is needed, proceed with the checkout in section 4.3 and, if necessary, replace the T-out thermistor per SM550-09. Otherwise, the unit can continue to operate.

Two Red flashes

Indicates that the T-in thermistor (blue) has failed. The heater will assume 70°F for T-in and continue to operate. As long as incoming water temperature is near 70°F operation will be normal. However, as inlet water temperature deviates from 70°F the unit will be slower reaching the set temperature and eventually, the unit will be unable to reach the set temperature. If the variation is noticeable and improvement is needed, proceed with the checkout in section 4.3 and, if necessary, replace the T-in thermistor per SM550-07. Otherwise, the unit can continue to operate.

Three Red flashes

T-mid thermistor (yellow) is not in the operating range of 30 - 160°F. The unit continues to operate using the measured T-mid, however, the operation is likely affected since the T-out model will be much different and the unit will not be able to reach the set temperature at many or all water flows. If the variation is noticeable and improvement is needed then proceed with the checkout in section 4.3 and, if necessary, replace the T-mid thermistor per SM550-08. Otherwise, the unit can continue to operate.

Four Red flashes

T-out thermistor (red) is not in the operating range of 30 - 180°F. The unit continues to operate using the measured T-out, however, the operation is likely affected since the real heat exchanger outlet temperature will be much different and the unit will not be able to reach the set temperature at many or all water flows. If the variation is noticeable and improvement is needed then proceed with the checkout in section 4.3 and, if necessary, replace the T-out thermistor per SM550-09. Otherwise, the unit can continue to operate. Temporary, improved operation may be obtained by disconnecting the T-out thermistor at the 2-pin connector (see ‘Single Red Flash’).

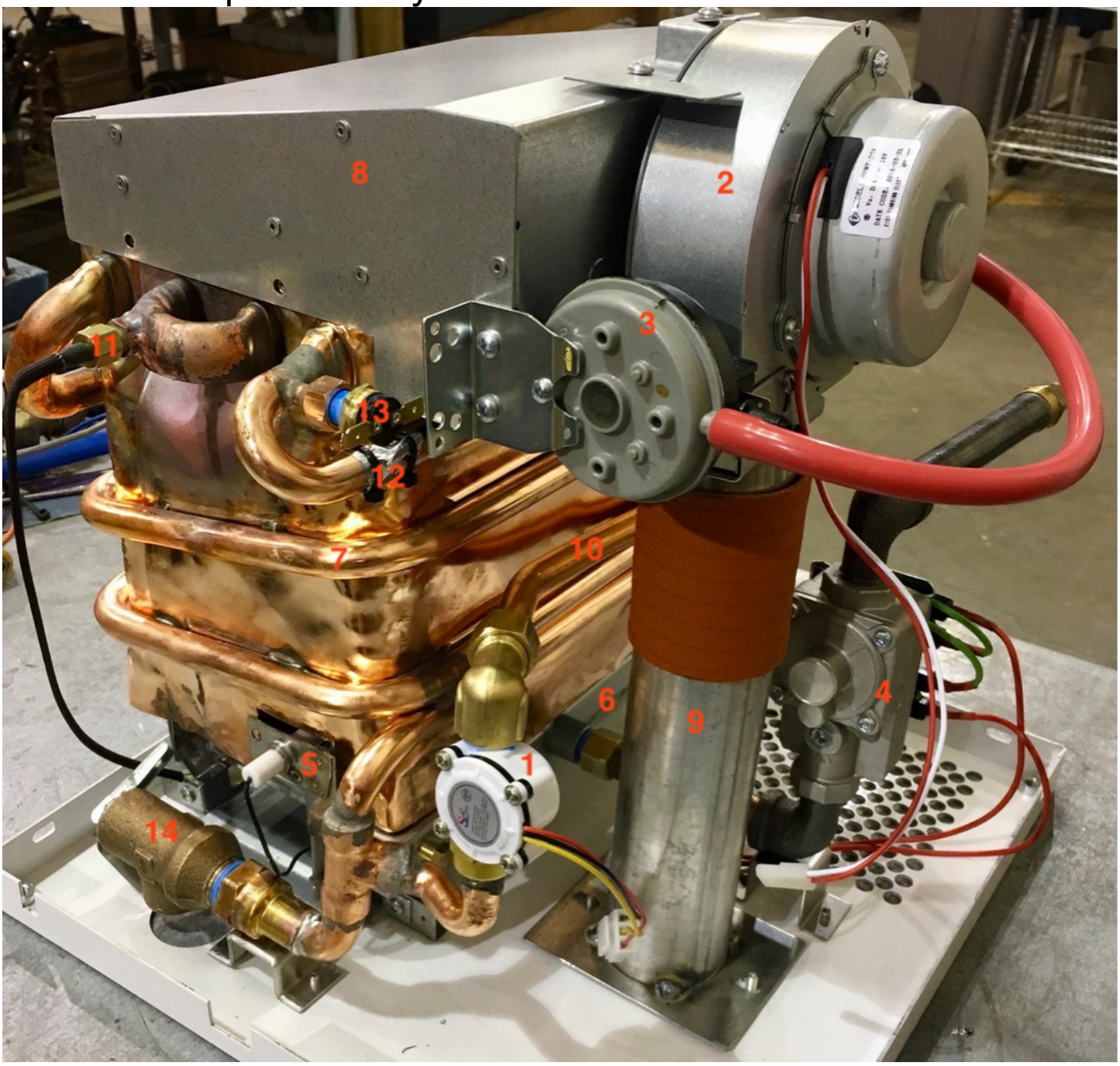
Five Red flashes

T-in thermistor (blue) is not in the operating range of 30 - 110°F. The unit continues to operate using the measured T-in, however, the operation is likely affected since the real heat exchanger inlet temperature will be much different and the unit will not be able to reach the set temperature at many or all water flows. If the variation is noticeable and improvement is needed then proceed with the checkout in section 4.3 and, if necessary, replace the T-in thermistor per SM550-07. Otherwise, the unit can continue to operate. Temporary, improved operation may be obtained by disconnecting the T-in thermistor at the 2-pin connector (see ‘2 Red Flashes’).

Six Red flashes

This indicates that the water is flowing through the unit backwards. Check the water inlet and outlet connections because they must be reversed. The water inlet is the lower connection and the water outlet is the upper connection.

RV550 Component Layout Picture



550-EC Component Layout

1. Hall Sensor Flow Meter
2. Power Vent
3. Fluing Vacuum Switch
4. Combination Gas Valve
5. Igniter / Proofing Probe
6. Manifold and Burner
7. Finned Tube Heat Exchanger
8. Flue Hood
9. Flue Pipe
10. T-In Thermistor
11. T-Mid Thermistor
12. T-Out Thermistor
13. 165°F ECO
14. 100 PSI Pressure Relief Valve
15. Gas Modulation Valve

NOT PICTURED

16. 12 VDC Relay
17. Control Board
18. Direct Spark Ignition Board

NOTE:
COMPONENT LAYOUT OF RV-550-EC IS IDENTICAL TO NSP-550-EC and M550 EC EXCEPT FOR FLUING ORIENTATION .

Figure 1. Operating Range of the RV550

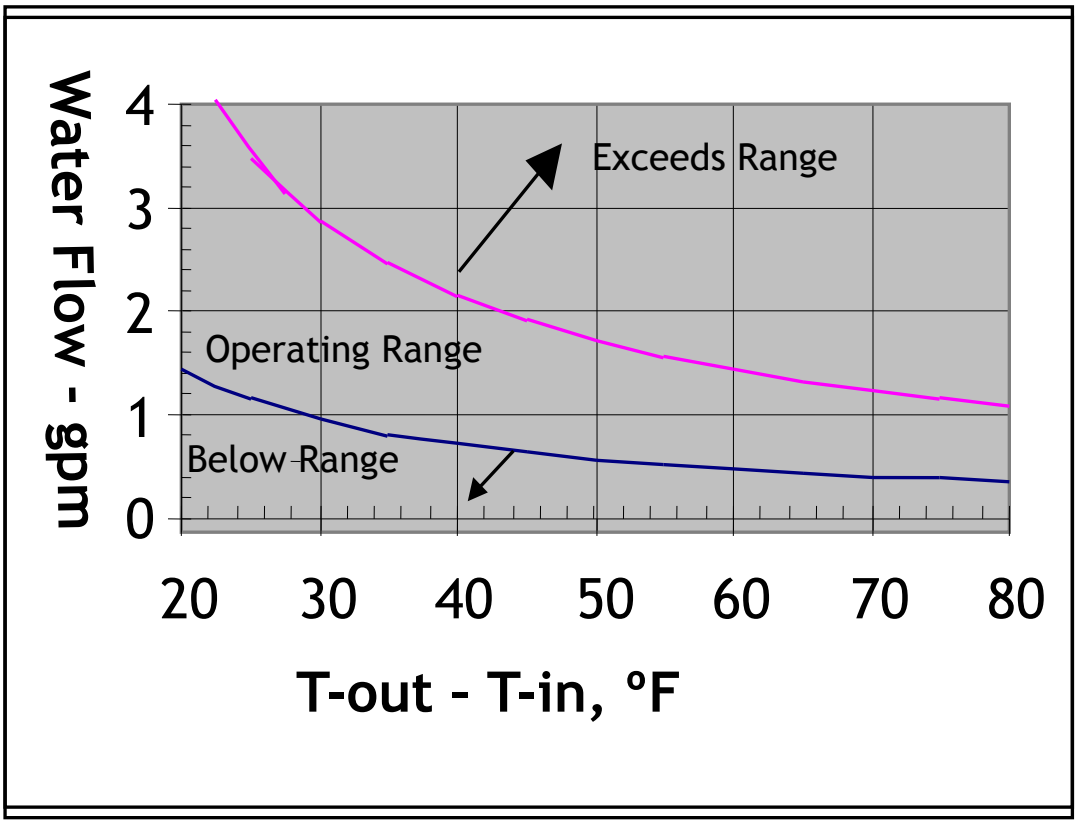
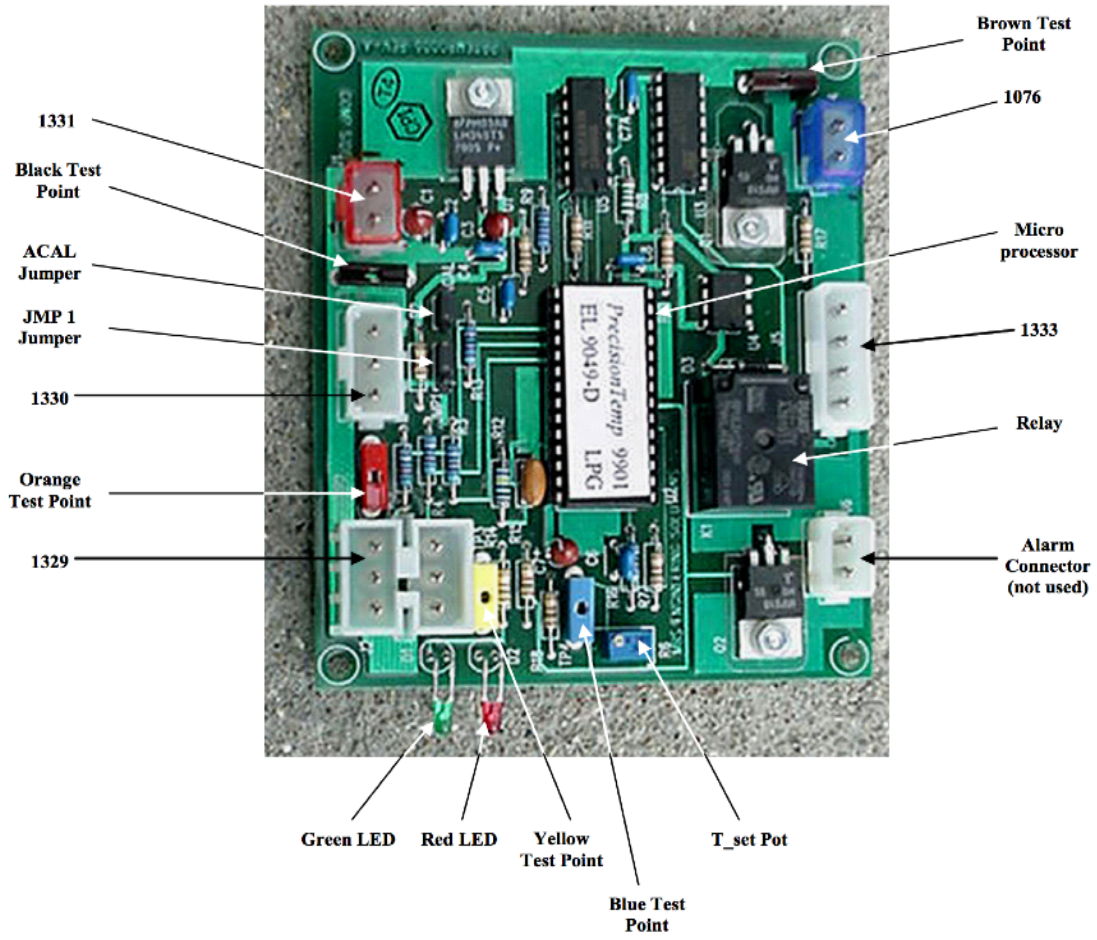


Figure 4 Electronic Control Board 200-14



1076	Modulating Gas Valve Connection
1329	Thermister Wiring Harness Connector
1330	Flowmeter Connection
1331	Power Supply Wiring Harness Connector
1333	DSI Wiring Harness Connector
Alarm	Alarm Connector Not Used (in this application)
ACAL Jumper	Jumper for Auto-Cal
JMP 1 Jumper	Board Function Jumper
Orange Test Point	Test Point for T_out Thermister
Yellow Test Point	Test Point for T_mid Thermister
Blue Test Point	Test Point for Setting Temperature
Brown Test Point	Test Point for Modulating Valve
Black Test Point	Test Point for Ground (common)

Figure 5. 550 Conversion from Volts & Ohms to °F

PrecisionTemp™

Thermister Calibration

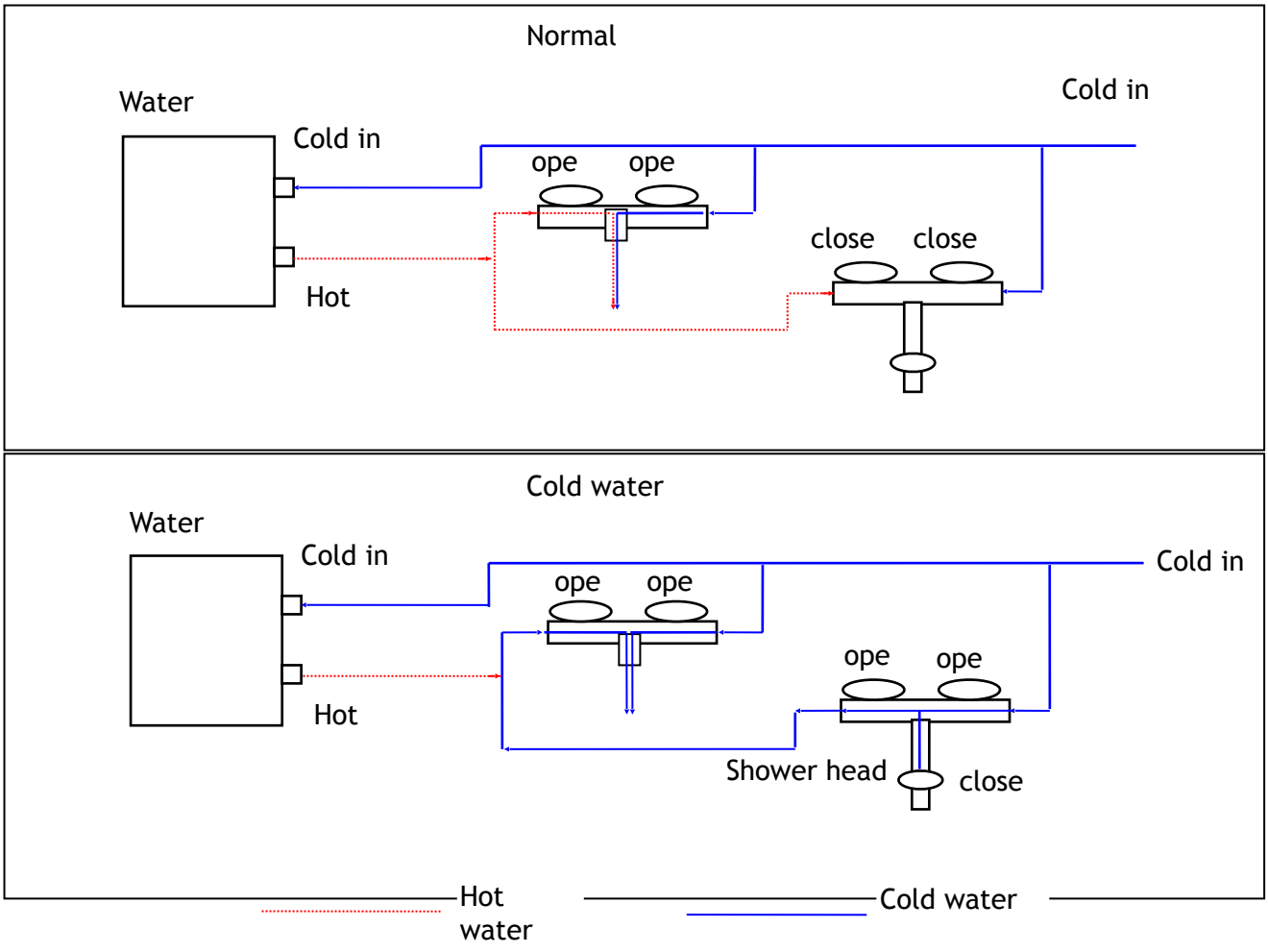
Check @ colored test point

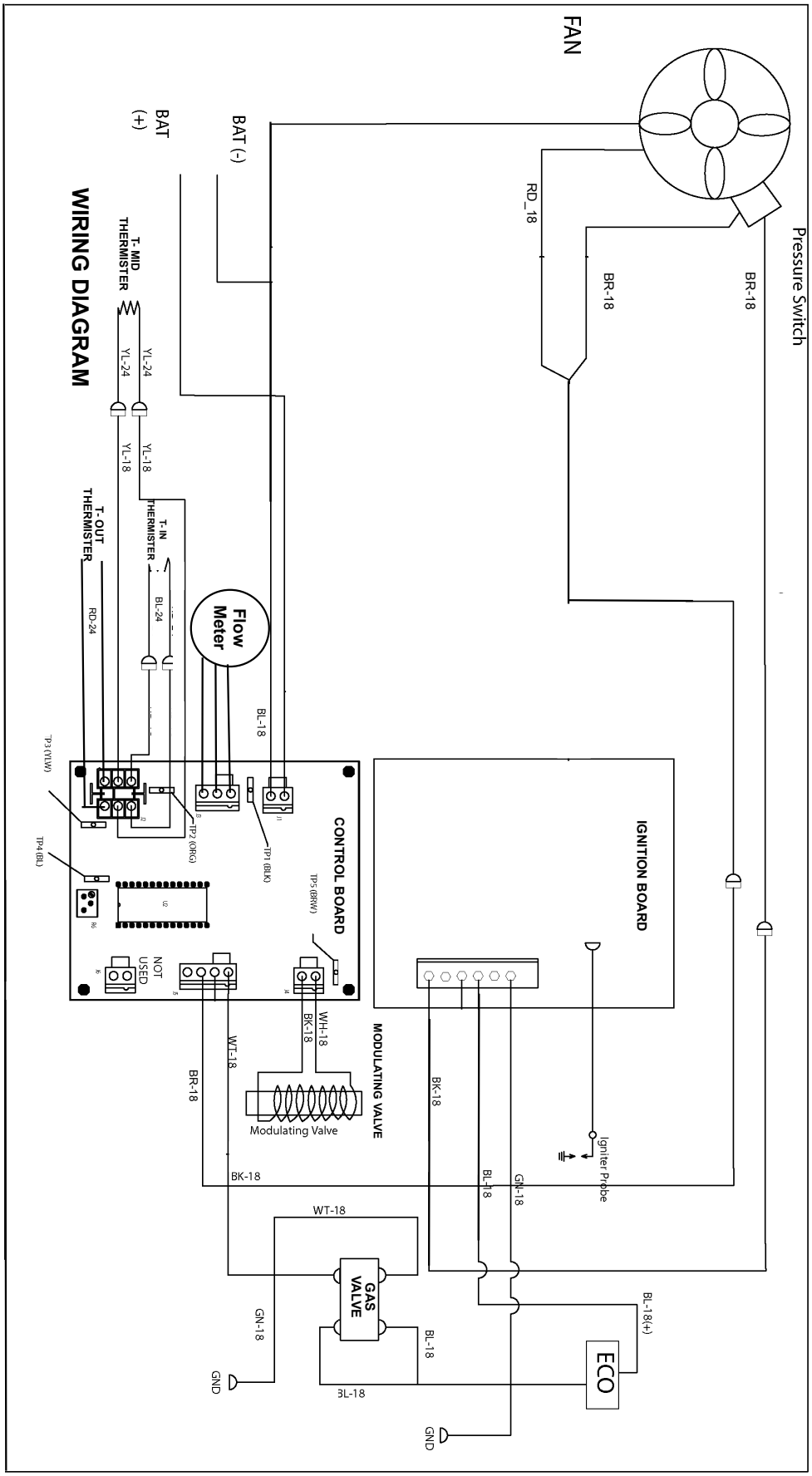
Yellow = T-Mid Black = Common

Orange = T-out Inboard Blue wire = T-in

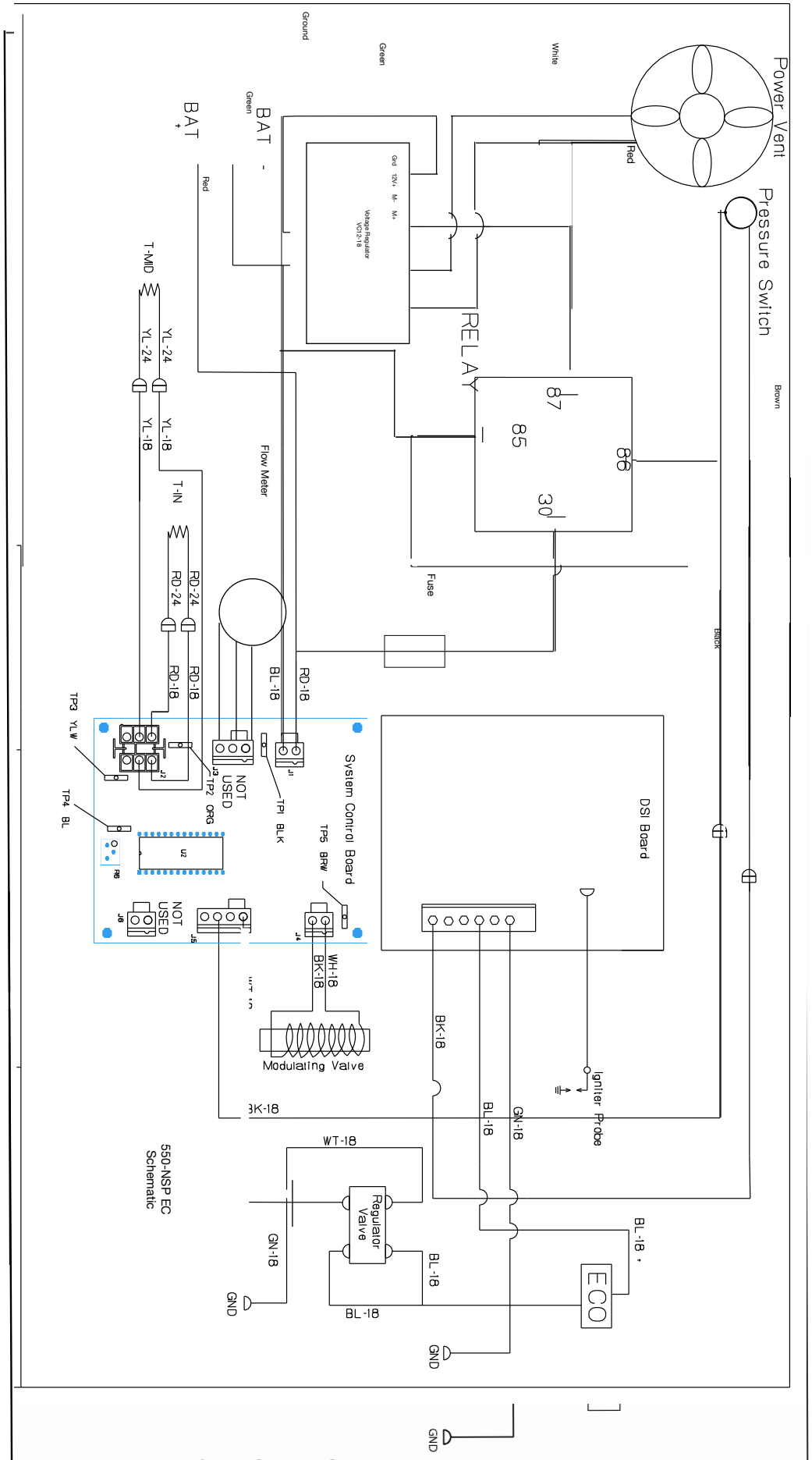
K-OHMS	°F	Volts	K-OHMS	°F	Volts	K-OHMS	°F	Volts	K-OHMS	°F	Volts
2.500	41.19	4.1514	0.273	135.06	1.7411	0.179	156.54	1.2971	0.107	184.70	0.8657
2.400	42.68	4.1223	0.271	135.42	1.7327	0.177	157.13	1.2863	0.106	185.24	0.8590
2.300	44.25	4.0911	0.269	135.79	1.7244	0.175	157.73	1.2755	0.105	185.78	0.8523
2.200	45.89	4.0575	0.267	136.16	1.7159	0.173	158.34	1.2646	0.104	186.33	0.8455
2.100	47.62	4.0214	0.265	136.53	1.7075	0.171	158.95	1.2537	0.103	186.88	0.8388
2.000	49.45	3.9825	0.263	136.91	1.6990	0.169	159.58	1.2426	0.102	187.44	0.8320
1.900	51.38	3.9403	0.261	137.28	1.6904	0.167	160.21	1.2316	0.101	188.01	0.8252
1.800	53.43	3.8944	0.259	137.67	1.6818	0.165	160.85	1.2204	0.100	188.58	0.8183
1.700	55.62	3.8444	0.257	138.05	1.6732	0.163	161.50	1.2092	0.099	189.16	0.8115
1.600	57.95	3.7897	0.255	138.44	1.6645	0.161	162.16	1.1979	0.098	189.75	0.8046
1.500	60.45	3.7295	0.253	138.83	1.6558	0.159	162.82	1.1866	0.097	190.34	0.7977
1.400	63.15	3.6630	0.251	139.23	1.6470	0.157	163.50	1.1751	0.096	190.95	0.7908
1.300	66.08	3.5892	0.249	139.63	1.6382	0.155	164.19	1.1637	0.095	191.55	0.7838
1.200	69.27	3.5067	0.247	140.03	1.6293	0.153	164.89	1.1521	0.094	192.17	0.7769
1.100	72.78	3.4140	0.245	140.44	1.6204	0.151	165.60	1.1405	0.093	192.79	0.7699
1.000	76.67	3.3091	0.243	140.85	1.6114	0.149	166.32	1.1288	0.092	193.42	0.7629
0.900	81.03	3.1892	0.241	141.26	1.6024	0.147	167.05	1.1170	0.091	194.06	0.7558
0.800	85.97	3.0511	0.239	141.68	1.5933	0.145	167.79	1.1052	0.090	194.71	0.7488
0.700	91.67	2.8902	0.237	142.11	1.5842	0.143	168.55	1.0933	0.089	195.37	0.7417
0.600	98.39	2.7003	0.235	142.53	1.5751	0.141	169.32	1.0813	0.088	196.03	0.7346
0.580	99.88	2.6581	0.233	142.96	1.5659	0.139	170.10	1.0692	0.087	196.71	0.7274
0.560	101.44	2.6144	0.231	143.40	1.5566	0.137	170.89	1.0571	0.086	197.39	0.7203
0.540	103.06	2.5690	0.229	143.84	1.5473	0.135	171.70	1.0449	0.085	198.08	0.7131
0.520	104.75	2.5218	0.227	144.28	1.5379	0.133	172.52	1.0326	0.084	198.78	0.7059
0.500	106.52	2.4728	0.225	144.73	1.5285	0.131	173.35	1.0202	0.083	199.49	0.6987
0.480	108.36	2.4218	0.223	145.18	1.5191	0.129	174.20	1.0078	0.082	200.21	0.6914
0.460	110.30	2.3687	0.221	145.64	1.5096	0.128	174.63	1.0016	0.081	200.95	0.6841
0.440	112.34	2.3134	0.219	146.11	1.5000	0.127	175.07	0.9953	0.080	201.69	0.6768
0.420	114.49	2.2556	0.217	146.57	1.4904	0.126	175.51	0.9890	0.079	202.44	0.6695
0.400	116.75	2.1954	0.215	147.05	1.4807	0.125	175.95	0.9827	0.078	203.21	0.6621
0.380	119.15	2.1324	0.213	147.52	1.4710	0.124	176.40	0.9764	0.077	203.98	0.6548
0.360	121.70	2.0666	0.211	148.01	1.4612	0.123	176.85	0.9700	0.076	204.77	0.6474
0.350	123.04	2.0325	0.209	148.50	1.4514	0.122	177.30	0.9637	0.075	205.57	0.6399
0.340	124.42	1.9976	0.207	148.99	1.4415	0.121	177.76	0.9573	0.074	206.38	0.6325
0.335	125.13	1.9799	0.205	149.49	1.4316	0.120	178.23	0.9509	0.073	207.21	0.6250
0.330	125.85	1.9620	0.203	149.99	1.4216	0.119	178.70	0.9444	0.072	208.05	0.6175
0.325	126.58	1.9438	0.201	150.50	1.4115	0.118	179.17	0.9380	0.071	208.90	0.6100
0.320	127.32	1.9254	0.199	151.02	1.4014	0.117	179.65	0.9315	0.070	209.77	0.6024
0.315	128.08	1.9068	0.197	151.54	1.3912	0.116	180.13	0.9250	0.069	210.65	0.5948
0.310	128.86	1.8879	0.195	152.07	1.3810	0.115	180.62	0.9185	0.068	211.54	0.5872
0.305	129.64	1.8689	0.193	152.61	1.3707	0.114	181.11	0.9120	0.067	212.46	0.5796
0.300	130.45	1.8496	0.191	153.15	1.3604	0.113	181.61	0.9054	0.066	213.38	0.5719
0.295	131.26	1.8300	0.189	153.70	1.3500	0.112	182.11	0.8989	0.065	214.33	0.5642
0.290	132.10	1.8102	0.187	154.25	1.3395	0.111	182.62	0.8923	0.064	215.29	0.5565
0.285	132.95	1.7902	0.185	154.81	1.3290	0.110	183.13	0.8857	0.063	216.27	0.5488
0.280	133.82	1.7699	0.183	155.38	1.3184	0.109	183.65	0.8790	0.062	217.27	0.5410
0.275	134.70	1.7494	0.181	155.96	1.3078	0.108	184.17	0.8724	0.061	218.29	0.5332

Figure 6. Cold Water Bypass





RV-550 EC Wiring Diagram



550-NSP EC Wiring Diagram

SM550-01 Circuit Control Board Replacement

Other service documents required:

SM550-15 Automatic calibration (AutoCal)

Tools Required:

Needle-nose pliers

1. **Turn off power. Disconnect all electrical connectors at the circuit (Green) board.**
2. **Remove the circuit board. A needle-nose plier can be used to remove the circuit board standoffs.**
3. **Remove the two black LED holders (if necessary) so they will not interfere with the installation of the new board.**
4. **Install the new board with the LEDs located toward the front. Reconnect all connectors to the board. CAUTION: there are two two-pin connectors. Be sure that the power supply connector (red and green wire) goes to upper left corner (Red connector) and the modulating valve connector (white and black wire) goes to upper right (Blue connector) (see figure -4).**
5. **The set temperature is already at 120°F. Contact PrecisionTemp for adjusting water temperature information.**
6. **You must run AutoCal to complete the installation. Refer to SM550-15.**

Part:

1841- RV Control Board

SM550-02 Direct Spark Ignition (DSI) Board Change

Other service documents required:
none

1. **Turn off power. Disconnect all electrical connectors at the DSI board.**

2. **Remove the two 11/32” nuts holding the ignition board to the right side wall.**

3. **Install the new DSI board and re-attach the wire harnesses plug and ignition wire.**

Part:
3369 Direct Spark Ignition (DSI) board

SM550-03 Exhaust Blower Replacement

1. **Turn power off.**
2. **Remove water heater door.**
3. **Unplug the exhaust blower white connector (red and white wires) from the wiring harness black connector (red and green wires) and the two brown wires from the pressure switch terminals.**
4. **Using a Phillips screwdriver remove the two screws holding the Exhaust Chamber to the top of the cabinet. Access the two screws through two holes in the exhaust chamber directly below the screws. Pull Exhaust Chamber out of the heater cabinet.**
5. **Remove the three Phillips screws holding the exhaust blower to the exhaust chamber assembly. Remove the exhaust blower assembly.**
6. **Install replacement exhaust blower and tighten the three screws.**
7. **Slide exhaust chamber assembly into water heater cabinet, install and tighten the two cabinet mounting screws.**
8. **Attach the Exhaust blower white connector (red and white wires) to the wire harness black connector (red and green wires) and the two brown wires to the pressure switch terminals.**
9. **Turn power on.**
10. **Turn hot water on to verify ignition occurs.**
11. **If the heater does not ignite inspect all wiring disconnected during this repair for loose connections. If problem persists contact PrecisionTemp technical support.**
12. **Install door.**

Part: 3333

NOTE: REMOVE MOTOR FROM SHIPPING HOUSING TO INSTALL

SM550-3.1 NSP Exhaust Blower Replacement

1. **Turn power off.**
2. **Remove water heater door and top.**
3. **Unplug the exhaust blower wires (red or red/green and white) from the voltage regulator.**
4. **Remove the three Phillips screws holding the exhaust blower to the exhaust chamber assembly. Remove the exhaust blower assembly.**

5. **Install replacement exhaust blower and tighten the three screws.**
6. **Attach the Exhaust blower wires to the voltage regulator, red or red/green to M+ and white to M-.**

   NOTE: DO NOT REVERSE POLARITY WHEN CONNECTING EXHAUST BLOWER WIRES TO VOLTAGE REGULATOR. REVERSING POLARITY WILL PERMANENTLY DAMAGE THE EXHAUST BLOWER MOTOR.
7. **Turn power on.**
8. **Turn hot water on to verify ignition occurs.**
9. **If the heater does not ignite inspect all wiring disconnected during this repair for loose connections. If problem persists contact PrecisionTemp technical support.**
10. **Install door.**

SM550-04

RV550 Exhaust Hood Removal

1. **Turn power off.**
2. **Remove water heater door.**
3. **Unplug the exhaust blower white connector (red and white wires) from the wiring harness black connector (red and green wires) and the two brown wires from the pressure switch terminals.**
4. **Using a Phillips screwdriver remove the two screws holding the Exhaust Chamber to the top of the cabinet. Access the two screws through two holes in the exhaust chamber directly below the screws. Pull Exhaust Chamber out of the heater cabinet.**
5. **To reinstall slide exhaust chamber assembly into water heater cabinet, install and tighten the two cabinet mounting screws.**
6. **Attach the Exhaust blower white connector (red and white wires) to the wire harness black connector (red and green wires) and the two brown wires to the pressure switch terminals.**
7. **Turn power on.**
8. **Turn hot water on to verify ignition occurs.**
9. **If the heater does not ignite inspect all wiring disconnected during this repair for loose connections. If problem persists contact PrecisionTemp technical support.**
10. **Install door.**

SM550-05

Interior component disassemble/removal instructions for repair of the heat exchanger and burner assembly.

1. Turn power, water and propane off.

2. Remove water heater door.

3. Disconnect hot and cold water out connections (shark bite fitting) from rear of water heater cabinet

4. Unplug the exhaust blower white connector (red and white wires) from the wiring harness black connector (red and green wires) and the two brown wires from the pressure switch terminals. Unplug all connectors from the ignition and control board. Unplug freeze protection power connector from wiring harness.

5. Using a Phillips screwdriver remove the two screws holding the Exhaust Chamber to the top of the cabinet. Access the two screws through two holes in the exhaust chamber directly below the screws. Pull Exhaust Chamber out of the heater cabinet.

6. Disconnect spark probe ignition wire from ignition module, unplug wires from the white freeze protection and high limit switches located at the top of the copper heat exchanger.

9. Unscrew the two screws located at the right and left base of the burner assembly.

10. Pull heat exchanger and burner assembly from cabinet.

SM550-06 Pressure Switch installation

1. Turn power off.
2. Remove water heater door.
3. Disconnect the two brown wires from the pressure switch.
4. Remove the orange hose from the pressure switch barb.
5. Remove the copper 90 degree fitting from the pressure switch barb.
6. Remove the two screws holding the pressure switch bracket to the metal cabinet or the one screw holding the pressure switch to the mounting bracket.
7. Install replacement pressure switch.
8. Reinstall the two brown wires, the orange hose on the grey barb and the copper fitting on the black barb onto the replacement pressure switch (turn copper fitting to align with the hole in the door).
9. Turn on power.
10. Turn on hot water. Once the heater ignites block the exhaust. The flame should go out. Remove the blockage and the heater should reignite.
11. Install the door.

Part: 3438

NOTE:

1. If the flame does not go out when the exhaust is blocked use a 7/32" Allen wrench and turn the pressure switch adjustment screw ½ to one full turn clockwise. After the adjustment if flame does not extinguish when the exhaust is blocked contact PrecisionTemp.
2. If the heater does not ignite adjust the pressure switch 7/32 Allen adjustment screw ½ to one full turn counter clockwise. If ignition does not occur contact PrecisionTemp.
3. Turn on hot water. Once the heater ignites block the exhaust. The flame should go out. Remove blockage and the heater should reignite.
4. If ignition issue continues contact PrecisionTemp, 800-934-9690.

SM550-07 T-in Thermistor Change Procedure (Blue Wires)

Tools Required:

Wire cutter, Scissors , or other cutting tool.

1. **Remove the wire ties, metal tape, and old 550. Clean off the old heat sink compound from pipe.**

2. **Apply a pea size dab of heat sink compound to copper tube.**

3. **Place the thermistor tip into the heat sink compound. Wrap metal tape around the tube and 550 then gently conform tape to around thermistor tip.**

4. **Place one wire tie around the copper pipe and wires as a strain relief approximately 3/8-1/2 inch from the tip of the thermistor. Use the other wire tie to secure the 550 wires to the wiring harness. CAUTION: Do not place the tie wrap over the thermistor tip as this may crack and damage the 550, Do not over-tighten the wire tie.**

5. **Route the blue wire leads to the 550 harness that goes back to the control board. And secure with wire tie.**

Part:

1436 T-in 550 assembly kit

SM550-08 T-mid Thermistor Change Procedure (Yellow Wires)

Tools Required:

14 mm & 9/16" open end wrench
(or use adjustable wrench)

1. **Remove old thermistor. CAUTION: Use two wrenches: one on the hex (9/16") of the 550 and one on the hex (14 mm) located on the heat exchanger fitting. Failure to do so may damage the heat exchanger.**

2. **Place the fitting and the ferrule on the 550 as shown in figure -7.**

3. **Insert the end of the thermistor without electrical leads into the heat exchanger until the heat shrink (black) on the thermistor touches the fitting then pull back ¼ inch and tighten the fitting finger-tight. Wiggle to locate center.**

4. **The final tightening should be done using two wrenches as described in step 1.**

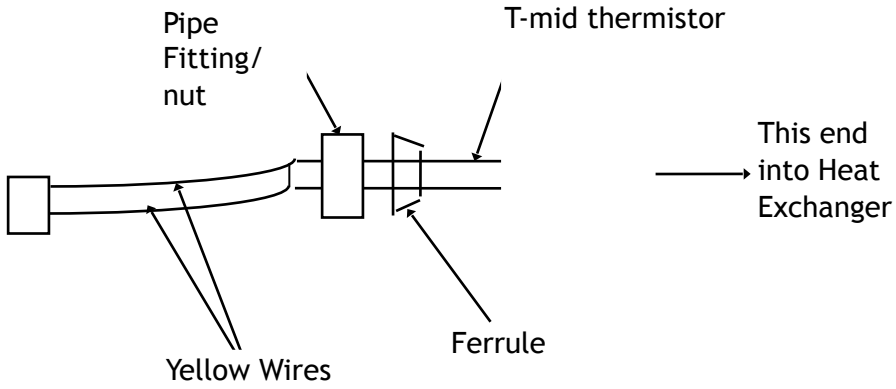
5. **Wire tie the harness together with the other two thermistors and connect into the thermistor harness coming from the control board.**

Part:

3728 T-mid thermistor assembly kit

Figures:

Figure-7 T-mid Ferrule Assembly



SM550-09 T-out Thermistor Change Procedure (Red Wires)

Other service documents required:
None

Tools Required:
Scissors (or other cutting tool)

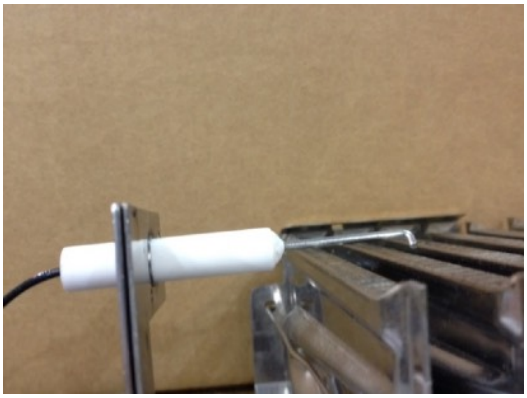
1. **Remove the wire ties, metal tape, and old thermistor. Clean off the old heat sink compound and remove excess compound from copper pipe.**
2. **Place a pea size dab of heat sink compound on the pipe to replace the compound removed.**
3. **Place the thermistor tip into the heat sink compound with the wire leads pointing down along the tube. Make sure the tip of the thermistor is completely submerged in the compound.**
4. **Wrap metal tape around the tube and 550. Gently push on the tape to get a snug fit on the pipe.**
5. **Take one wire tie and attach it around the pipe over the thermistor wires (about 3/8”-1/2” away from the 550 tip) to hold the thermistor in place on the tube. CAUTION: 1) Do not place the tie wrap over the thermistor tip as this may crack the thermistor, and 2) Do not over-tighten the wire tie..**
6. **Wire tie the thermistor wires to the main harnesses and connect the white connector to the thermistor harness that goes back to the control board.**

Part:

1437 T-out Thermistor assembly kit (red wires)

SM550-11 Igniter Probe Gap Settings

The spark rod should be centered over the second burner blade from the front with a 1/8-3/16 inch gap between the rod tip and the burner blade.



SM550-12 Flowmeter Replacement

Tools Required

- 13/16 open end wrench
- Phillips head screw driver
- Teflon thread tape

If The Flow Meter is Not Leaking, proceed as follows

1. Remove the four screws from the front cover using a phillips head screw driver and remove the front cover. Disconnect wires from control board.
2. Remove the front cover from the new flow meter and install onto old flow meter.
3. Plug wire lead into three pin connector on control board.

If Flow Meter Housing is Leaking Replace Whole Flow Meter as Follows:

1. Turn power OFF, water OFF, and gas OFF

2. Disconnect the flow meter connector from the control board.
3. Remove heat pad covering the flowmeter.
4. Loosen the upper compression fitting nut. Carefully turn the flowmeter counter clockwise to release the bottom connection.

5. Reverse the above procedure and install the new flowmeter assembly, use Teflon pipe thread tape or paste to seal the threaded connections. Take care not to over tighten and damaging threads.
6. Plug connector into control board.

Parts:

- 3673 Flowmeter assembly

SM550-13 Gas Solenoid Replacement

1. **Turn power OFF, water OFF, and gas OFF.**
2. **Remove the exhaust hood, SM550-03**
3. **Disconnect Gal line connection and unscrew the black iron pipe from the gas solenoid. .**
4. **Disconnect the gas solenoid wire connector. .**
5. **Unscrew the gas solenoid from the 90 degree fitting connecting it to the modulating gas valve and remove from the unit.**
6. **USE AGA-APPROVED SEALANT ON ALL GAS THREAD CONNECTIONS. Install the top elbow fitting into the new gas solenoid.**
7. **Screw the gas solenoid onto the end of the lower 90 degree fitting. Continue to tighten until the upper fitting is pointing toward the rear of the cabinet and attach the black iron pipe to the upper fitting**
8. **Reconnect the wire connector to the wiring harness.**

.

9. **Connect the gas supply and test for leaks.**

Parts:

3628 Gas Solenoid

SM550-14 Modulating Valve & Coil Replacement

Other service documents required:

SM550-15 Automatic Calibration (AutoCal)
SM550-13 Gas solenoid replacement

1. **Turn power OFF, water OFF, and gas OFF.**
2. **Remove the gas solenoid using bulletin SM550-13**
3. **Unplug the Modulating valve connector from the control board (J4).**
4. **Unscrew the 90 degree fitting from the modulating valve tube.**
5. **To replace the coil only remove the right C clip from the modulating valve tube, slide the coil off and install replacement coil. Make sure the direction arrow is pointed toward the manifold (wire connector on right side). Reinstall C clip.**
6. **When replacing the modulating valve assembly unscrew it from the gas manifold fitting.**
7. **USE AGA-APPROVED SEALANT ON ALL GAS THREAD CONNECTIONS. Reconnect the the new modulating valve and into the manifold. Take care not to get any thread sealant into the modulating valve because this will cause the valve to stick.**
8. **Re-assemble the heater reversing the procedure of steps 5, 4, 3, and 2.**
9. **Check for gas leaks.**
10. **Check the unit for normal operation and perform the AutoCal procedure (SM550-15) .**

Parts:

1076 Modulating Valve assembly
1103 Modulating Valve Coil

SM550-15A Automatic Calibration (Auto Cal) Procedure

Tools Required:
Needle-nose pliers

CAUTION: During this test the unit will not be controlling water temperature. It will incrementally increase the gas flow from minimum to maximum burn over approximately 8 minutes. Be sure to monitor the unit for safe operation.

1. **Turn off power. From the front circuit (Green) board remove 2-pin jumper from ACAL (back jumper) using pliers or fingers (see figure -4).**

2. **Set water flow to approximately 1.5 gpm (flow is similar to shower flow) Once ignition occurs count the green light flashes between pauses, 12 green light flashes between pauses equals 1.5 gpm.**

3. **Turn power ON. Green LED should flash and burner comes on at minimum burn. If red light flashes when power is turned on there is a problem with the temperature sensors which must be corrected before continuing. Over the next 8 minutes the unit will be increasing the gas flow to calibrate the modulating valve. The unit will run the test by itself and only requires monitoring for safety. When the calibration process is complete the red LED will rapidly flash.**

4. **Turn power OFF.**

5. **Wait 5 seconds then reinstall the jumper on the board.**

6. **Turn on power.**

6. **Check the unit for normal operation. If operation appears normal the procedure is complete. If the unit does not control water temperature or gas flow varies excessively repeat the calibration procedure.**

Refer to Figure 4 Illustration 200-14 (control board)

RV550 EC OPERATING INSTRUCTIONS

The RV-550EC is designed to give a continuous flow of hot water as long as required and maintain temperature within the capacity of the heater (88°F temperature rise at one GPM). The temperature on your water heater has been factory set to approximately 120°F. It is not recommended that you change this setting. Doing so could result in dangerously hot temperatures that could result in severe injury. If it is necessary to change the setting refer to the Service Manual or call PrecisionTemp. The heater is dormant until a hot water tap is opened. The heater will not fire at very low flows; i.e., under 0.4 GPM. During normal operation the RV550EC will have a steady flashing green LED light on the green control board. A red flashing LED indicates a self diagnostic trouble code; refer to the Service Manual or call PrecisionTemp for assistance. When adjusting water temperature it is best to start with hot only and slowly add cold into the mix until the desired temperature is reached.
NOTE: When using an "on/off" button on a shower head or an outside wash down box, always turn off the hot and cold water valves when finished. Not doing so will result in cold water bleeding into the hot water system. This will either cause the water heater not to ignite or result in alternating warm and cold water.

Dry Camping
RV showerheads are designed to drip when turned off and will allow the hot water line to be filled with cold water. When showering it is recommended that you leave the water running as you would at home. You will not run out of hot water and you will not waste additional water waiting for the cold water to purge from the water line every time the water is turned back on.

Winter Operation
When operating the RV550EC in cold climate conditions the flow of water may have to be slightly restricted or slowed at the faucet to maintain the set temperature of 120 degrees. **NOTE: Your RV550EC is equipped with the Cold Weather Protection Package. 12vdc power and propane must be left on to protect the RV550EC from freezing in cold climate conditions.**

Winter Driving Instructions: **Under no circumstances should you travel in freezing conditions without first draining water from the unit.** Follow the winter driving draining instructions prior to driving in freezing temperatures. Freezing is not covered under the product warranty.

RV550EC Water Heater

Winter Driving Draining Instructions

1. **Turn off water supply and 12 Volt power.**
2. **Open all hot water faucets.**
3. **Remove the RV550EC door and open the Pressure Relief Valve by moving the lever to the open position.**
4. **The water lines and the RV550EC should now drain.**
5. **When all water is drained from the hot water lines and the Rv550EC Flowmeter is empty reinstall the water heater door. Leave the Pressure Relief Valve and hot water faucets open while driving.**
6. **The heater is now safe to drive in freezing temperatures.**
7. **Once your destination is reached close the RV550EC Pressure Relief Valve. Turn on water supply and 12 volt power and close all hot water faucets once air is purged from the lines.**

Routine Maintenance

All faucet aerators and showerhead screens should be cleaned regularly. It is recommended that the RV-550EC be inspected by a qualified service technician at least once a year. Particular attention should be paid to the following:

1. Inspect the air inlet openings and flue area to be clear of any debris or obstructions, (leaves, bug nests, spider webs, etc.)
2. Check that the heater mounting is secure to the coach and there are no areas for potential water leaks.
3. Open the cover of the heater and inspect for debris or obstructions under the burner or in flue hood.
4. Visually inspect wiring. Be sure there is no chafing of the insulation. Be sure that the direct spark ignition cable (black) wire is secured to the spark probe located at the lower right heat exchanger area.
5. Check for soot around the flue. Soot is a sign of incomplete combustion. If you find soot a qualified service technician should be notified to correct the problem.
6. The pressure relief valve should be manually activated once a year by moving the lever on the top of the valve 90°while power is turned off. Never perform this operation while the burner is operating or scalding could occur. Never plug the pressure relief valve. If the valve is actuating too frequently contact PrecisionTemp or replace valve.
7. Unplug all connectors and reconnect with power turned off. Inspect and clean corrosion from the ignition cable/spark probe connection and the ground wire connection.

NOTE: Should overheating occur or the gas supply fails to shut off, turn off gas valve at the supply tank. Immediately call a qualified service technician

WARNING: Always turn off the 12-volt power supply to the heater while the vehicle is moving and during any fueling operations. Operating this water heater or any other ignition source during fueling could cause a fire or explosion, which could result in serious injury or death. Trying to produce hot water while driving or moving may damage the RV550 electrical components and cause a fire.

IMPORTANT COLD WEATHER PROTECTION INFORMATION

WARNING: Do not disconnect the electrical supply or turn off the propane supply when temperatures are near or below freezing. The RV550EC freeze protection system will not work if the electrical power source or propane is disconnected. Your heater is equipped with the cold weather protection package (call PrecisionTemp for details).

WARNING: Under no circumstances should you travel during freezing conditions without first draining water from the RV550EC.

WINTERIZING

Draining

1. Turn off the power and gas supply to the RV550.
2. Turn off main water supply.
3. Open all hot water taps. (bathroom, kitchen, laundry, etc.)
4. Drain all water from plumbing lines.
5. Open pressure relief valve to drain remaining water from the RV550EC flowmeter and heat exchanger.
6. After completely draining the system it can be winterized like any other RV by purging remaining water out of water lines with compressed air or pumping RV antifreeze solution through the hot and cold water system; no bypass valve is required.

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