TECHNICAL SERVICE DEPARTMENT
Technical Service Bulletin
1-800-432-8373

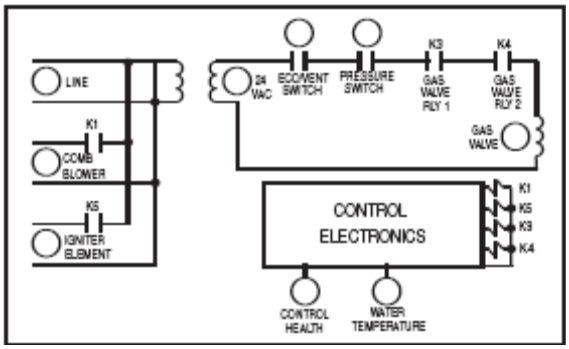
AdvantagePlus Troubleshooting

When first diagnosing an AdvantagePlus, check the following:

- If the unit is not operating, is the power on?
- Is the unit gas valve turned on?
- Is the unit thermostat temperature setting high enough to call for heat?
- What is the temperature of the water in the tank?
- Is there "LOC" in the LED panel window? (Press red reset button on front panel. Allow retrying for ignition. Then diagnose based on the table below.)

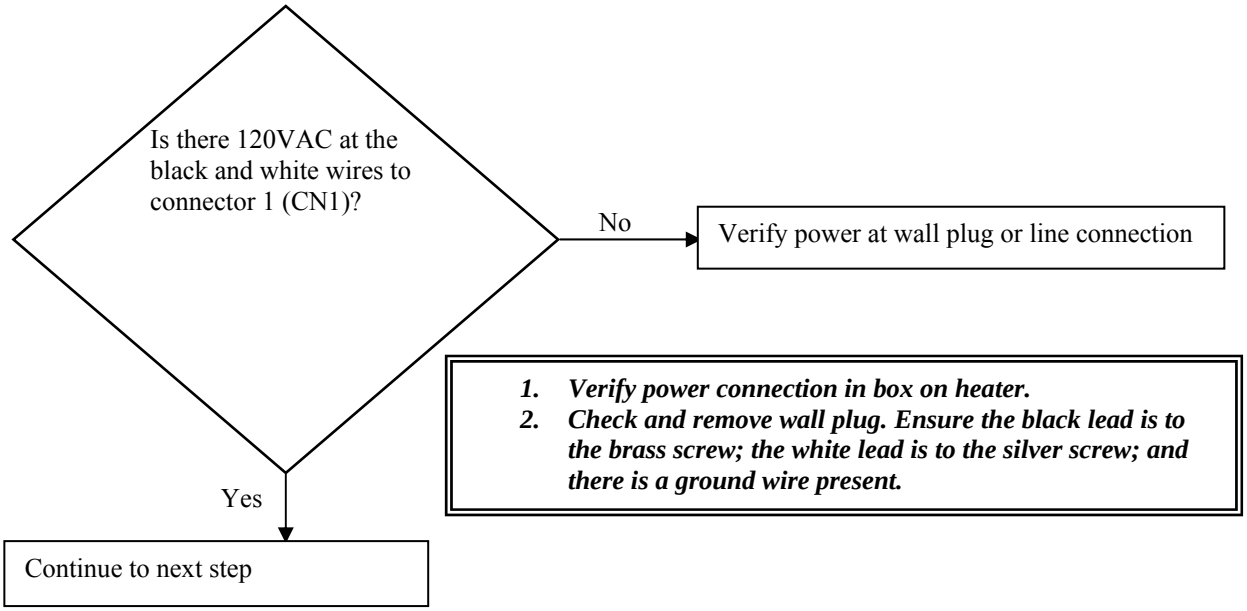
LINE LED is off; does not have 120VAC

Explanation: This LED monitors incoming AC line voltage. The LED is ON when 120VAC line voltage is present on the control board. If the wall plug is properly wired, you will see a green LED light on the bottom left hand corner of the control board.



At a minimum, check the following:

1. Plug in unit; check circuit breaker
2. Polarity is correct or ground is missing on wall plug
3. Re-seat CN1 Molex plug on control board
4. Verify display ribbon cable is connected to main board and display board



Is the green LED on the bottom left side of the control board lit up?

No → Replace control board

Remove and check wall plug. Ensure the black lead is to the brass screw; the white lead is to the silver screw; and there is a ground wire present.
Check the wiring connections inside the blue plastic junction box on the heater. Black to black, white to white; ground to green.
If the green LED is not ON, then the unit thinks polarity is not correct.

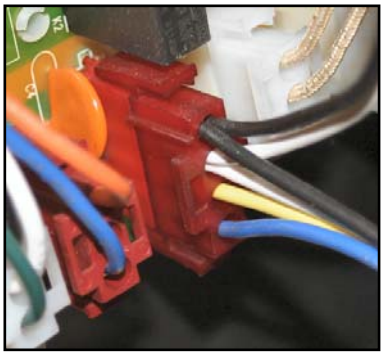
Yes

Unit appears to be OK. Recycle power.

24 VAC LED is off; does not have 24VAC out of the transformer

Explanation: This LED monitors voltage from the transformer. The LED is ON when secondary 24VAC is present. You may have line voltage and not have the 24VAC line lit if the board is bad.

At a minimum, check the following:
Transformer wiring
Reseat plugs on control module (CN4)



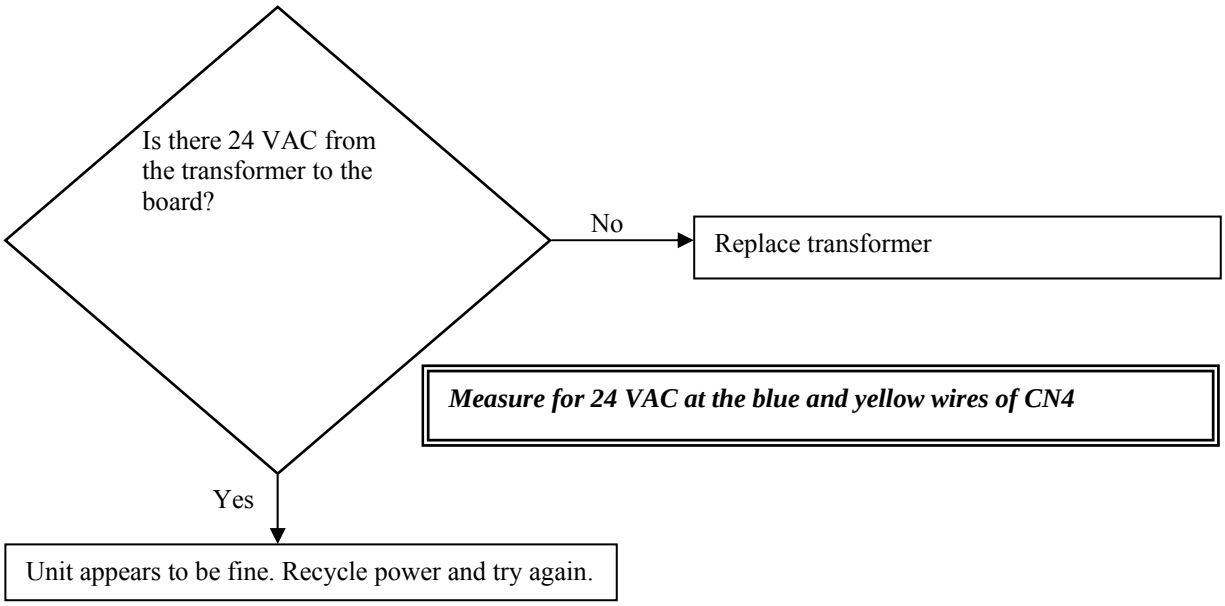
Is there 120 VAC line voltage from the board to the transformer?

No → Replace board

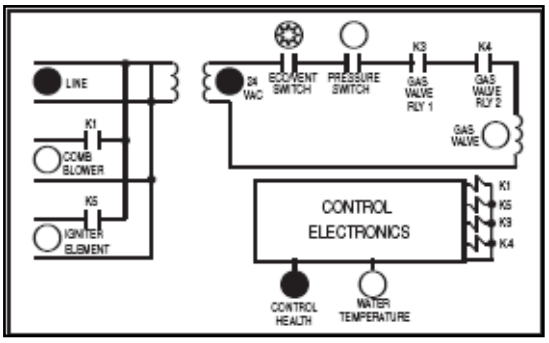
Measure for 120 VAC at the black and white wires of CN4

Yes

Continue to next step



ECO/VENT SWITCH; Water in tank is too hot or vent gas is too hot or low water cut off switch has tripped



Explanation: This LED monitors the ECO loop in the tank water, the low water cut off switch and the vent over temperature switch. LED is ON when all three of these safety devices are normal. The loop is electrically closed.

At a minimum, check the following:

1. Water temperature
2. Vent temperature at exhaust coupling
3. Low water level in tank

Follow this process in sequence: Recycle power to the water heater. If the blower does not come on, go to step #1; if the blower is does come on, go to step #2.

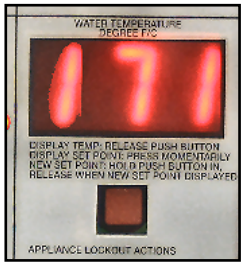
2. Is the ECO activated? (Verify the water temperature in the tank by pressing the red button on the display.)

No → Unit appears to be fine. Recycle power.

ECO will trip at 200^{0}F and automatically reset when the water cools to 160^{0}F.
Measure the water temperature from the T&P valve. If the water temp exceeds 160^{0}F, then flush cold water thru the tank.

Yes

Fill unit with cold water. Recycle power and attempt to relight burner.



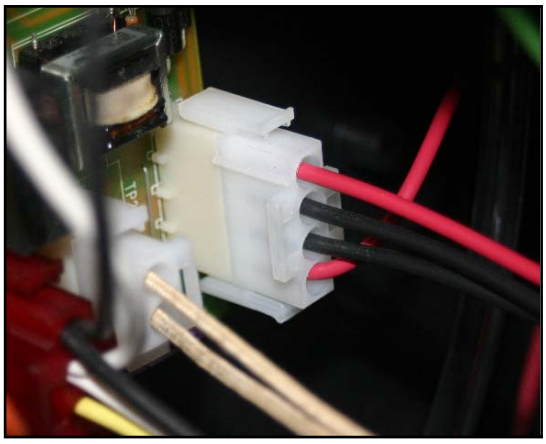
3. Does the ECO have continuity?

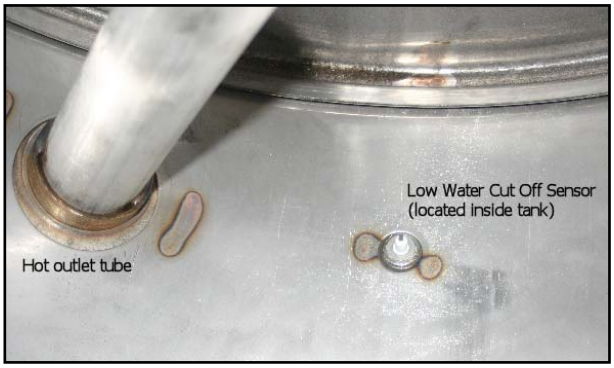
No → Replace ECO/Temp probe

Disconnect CN3. Check continuity of both red wires thru the ECO/Temp Probe.

Yes

Recycle power.

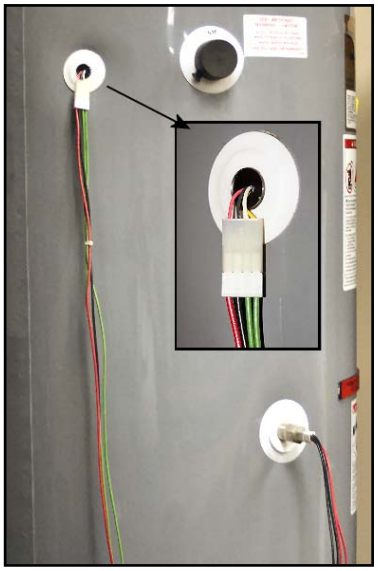




4. Is the low water cut off switch activated? (Make sure the tank is full of water by bleeding @ a gallon from a near by hot water faucet.)

No → Verify 24VAC power from transformer splice.

Recycle power and verify 24 VAC between the black and red wires at the low water cut off switch connection.



Yes → Fill unit with cold water. Recycle power and attempt to relight burner.

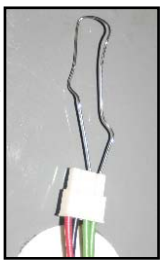
5. Is the low water cut off switch working properly? (It has power going to it; so now we are checking if the switch has continuity.)

Yes → Unit appears to be fine. Recycle power.

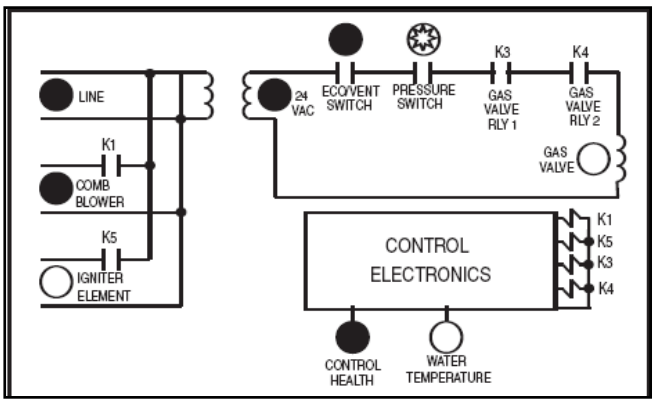
Disconnect green wire from vent overtemp switch. Leaving the Molex connected at the low water cut off, check for continuity between the two green wires at the low water cut off switch. If you has continuity, then follow "yes".

No →

1. Disconnect the Molex and jumper the two green wires.
2. Recycle power.
3. If the unit goes to main burner, then replace low water cut off switch.
4. If the unit does not go to main burner, then recheck step # 4 above.



PRESSURE SWITCH; Air pressure switch or blower motor not operating properly; problem with venting.



Explanation; Monitors the positive air pressure switch. Means there is sufficient combustion airflow. The LED is ON when the pressure switch is closed. Fault indicates insufficient airflow thru the venting and blower system.

At a minimum, check the following:

1. Venting blockage (air in and air out)
2. Blower not operating
3. Pressure switch stuck open
4. Vinyl tubing to pressure switch is kinked

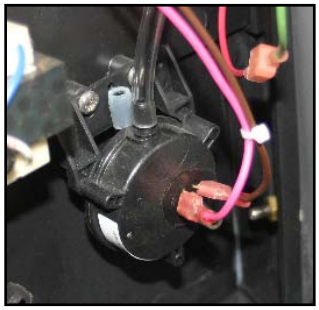
Is the PVC venting causing the problem?

No → Continue to next step

Disconnect both side of the venting and recycle power. If the unit goes to main burner, the problem is in the venting. If the unit does not go to main burner, the venting is probably OK.

Yes

Diagnose and repair venting issue. See list of venting questions on the next page.



Is the pressure switch OK?

No → Replace pressure switch

Yes

Continue to next step

1. ***The pressure switch is a normally open, positive pressure switch. It activates (closes) on +4.75 inches w.c. If you use a manometer to verify blower motor pressure you can diagnose venting. IF the pressure drops below normal, then the problem is the fresh air inlet side of the venting. IF the pressure increases above normal, then the problem is the exhaust side of the venting.***
2. ***Verify the pressure switch is open with a continuity test. If the switch is closed, replace the switch.***
3. ***Remove either the pink or brown wire from the pressure switch. If the blower runs, then replace the pressure switch***
4. ***If the blower does not run, then go to next step.***

Is the blower getting 120 VAC?

No → Replace control board

The main control board passes the 120VAC from the power source to the blower motor. The blower always has 120 VAC present.

Measure for 120 VAC on the black and white wires of CN4. You can verify the 120 VAC on the black and white wires at the blower motor. If so, then you have power to the blower. If not, replace the control board.

Yes → Continue to next step

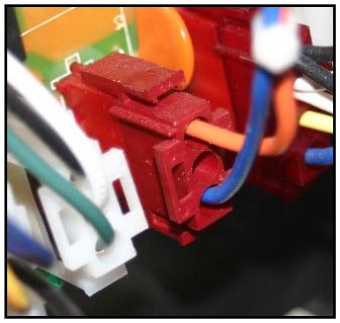
Is the blower getting DC control voltage from the board?

No → Replace control board

DC voltage is used to signal the blower to turn on and off. This signal is generated by the control board. Press the red reset button on the LED panel. When the blower LED comes on then…..

Measure for 2.0 and 8.8 DC volts on the orange (+) and blue (-) wires at CN2. You can verify the DC voltage on the orange and blue wires at the blower motor. If so, then you have the proper signal for the blower to operate. If not, replace the control board.

Yes → Replace blower

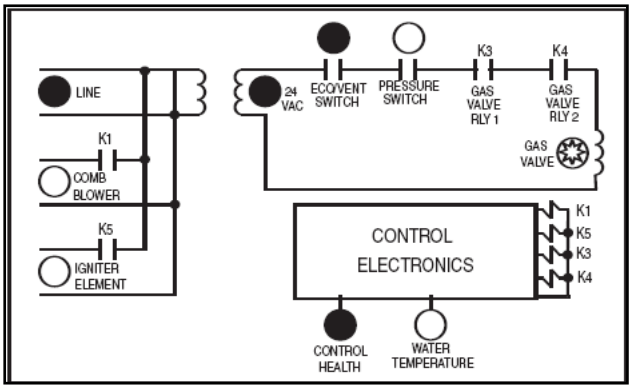


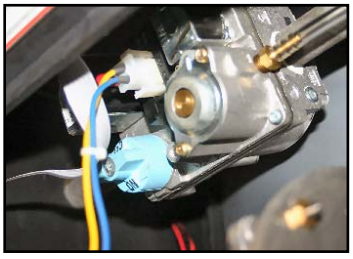
Venting Related Questions

1. Is the unit vented with the proper 2” or 3” piping as required by the BTU input?
2. How many elbows/angles in the exhaust pipe?
    a. See the vent table in the Installation Manual for equivalent footage impact.
3. How many elbows/angles in the combustion air pipe?
    a. See the vent table in the Installation Manual for equivalent footage impact.
4. How many feet of pipe in the exhaust?

   a. Equivalent footage for combustion air and exhaust may not exceed the specified limitations in the vent table.
5. How many feet of pipe in the combustion air?
   a. See the vent table in the Installation Manual for equivalent footage impact.
6. How is the venting system terminated?
   a. Two pipe, concentric vent kit, or V-1000 aluminum kit. See the Use and Care Manual for examples of proper vent termination on the exterior wall or roof.
7. Are both the combustion air and exhaust terminated on the same plane?
8. Is the separation, and offset within specification for a two-pipe termination?
   a. See the Use and Care Manual for examples of proper vent termination on the exterior wall or roof.
9. Is the coupling on the exhaust, and the tee on the combustion air and oriented correctly?
   a. A concentric vent assembly must have every joint glued, or exhaust will contaminate the combustion air. Is the "Y" on the concentric vent horizontal termination only pointing up perpendicular to the ground?
   b. If using the V-1000, the combustion air pipe must be butted to the "L" bracket spot welded to the inside of the vent assembly cover, and the exhaust pipe glued to the exhaust coupling in the vent assembly cover.
10. Is the termination adjacent to an inside vertical corner, or roof overhang? Is it within 3 feet of either?
    a. This will cause the combustion gases to re-circulate back in to the fresh air intake.
11. Is the termination behind bushes or shrubs?
    a. This will cause the combustion gases to re-circulate back in to the fresh air intake. And it will kill the shrubs.
12. If the termination is horizontal, is there a wall or other vertical obstruction within 4' of the exhaust line of travel?
    a. This will cause the combustion gases to re-circulate back in to the fresh air intake.
13. Are all horizontal exhaust pipe runs pitched 1/4" to the foot back to the heater?
14. Is the pipe supported so there are not traps for condensate in the exhaust?
15. Is the exhaust pipe pitched upward when exiting the no hub fitting on the unit?
    a. This point almost always seems to get pitched down because they don't support that short piece of pipe between the no hub fitting and the first elbow. The elbow becomes a trap for water, thus adding equivalent footage to the vent.

GAS VALVE; no flame rectification; maximum ignition attempts.

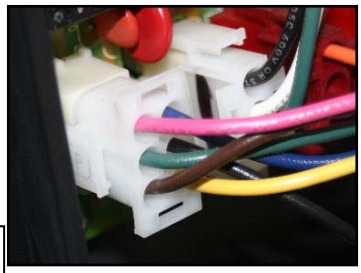




Explanation: The LED is ON when power is applied to the gas valve. Controls are looking for flame rectification, meaning there is main burner. Unit will make three successive trials; then lock out

At a minimum check the following:

1. Gas valve shut OFF
2. Broken or corroded flame sensor wire
3. Connectors on control panel unplugged
4. Tubing between valve and air inlet is present
5. Unit has proper service pressure
6. Gas fuel supply or piping problem
7. Gas valve improperly adjusted
8. Verify green polarity light on board

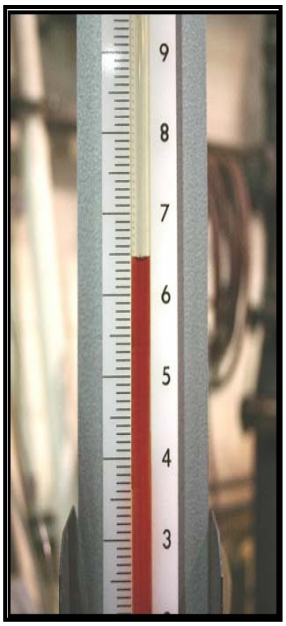


Is the gas valve operating properly?

No → Replace control board

1. Recycle power to the heater. When the "GAS VALVE" LED is ON, measure 24 VAC between the yellow and blue wires of CN6. This is the power to the gas valve.
2. If you get less than 24 VAC, then disconnect the low water cut-off. Jumper the two green wires.
3. Recycle power. If the main burner comes on, replace the low water cut off switch. If the unit does not come on, continue to next step.

Yes → Continue to next step



Is the gas pressure and fuel supply OK?

No → Repair as needed

Gas pressure (natural) between 7" and 14" w. c. during firing cycle. If inlet pressure drops below 7" during burner operation, the gas supply piping, regulator(s), meter, or LP tank, etc. is undersized.

Yes → Continue with Gas Supply Related Questions

Gas Supply Related Questions:

1. What is the Utility Co. meter capacity compared to the total connected gas load?
    a. Must be of adequate capacity to handle total load. This includes meter and meter regulator serving building gas distribution.
2. Is the service a 5 pound, 2 pound, or inches WC service?
    a. If the service is a 7" WC service, it is most unlikely there will be 7" WC operating gas pressure at the unit.
3. Is there an in-line appliance regulator serving the AdvantagePlus?
    a. How far up stream is the in-line appliance regulator from the AdvantagePlus?

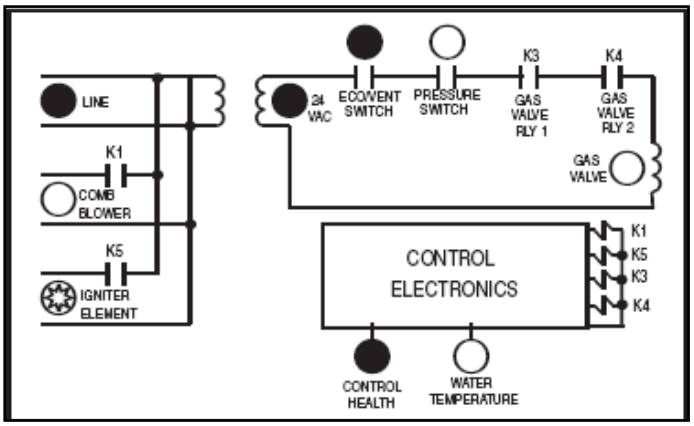
b. What size is the pipe between the appliance regulator and the AdvantagePlus ¾ inch x ½ inch factory installed reducing coupling?
c. Most of the time these regulators are installed too close to the unit. They must be upstream 10', and minimum 3/4" ID black steel pipe run all the way to the 3/4" x 1/2" factory installed reducing coupling. No flex connectors allowed, except a Dormont 3/4" ID commercial grade connector.
d. What is the BTU capacity of the in-line appliance regulator?

4. The gas supply regulator must be of sufficient size to accommodate all gas products it will service. If you have two 100,000 BTU heaters, then the regulator must be capable of supplying a minimum of 200,000 BTUs of fuel.
5. Is the in-line regulator vented to the atmosphere?
   a. If not, is the regulator equipped with a "vent limiter"?
   b. In our experience some regulators are prone to field problems with inconsistent regulator performance. They have vent-limiting devices, and do not respond well.
6. Verify the gas orifice is installed, and it is the correct orifice for the gas in use.
7. Is there a fabricated drip leg to keep debris out of the gas valve?

Adjust the AdvantagePlus using a CO meter. CO above 10 parts per million will cause premature igniter failure, premature burner failure, and huffing and puffing sounds.

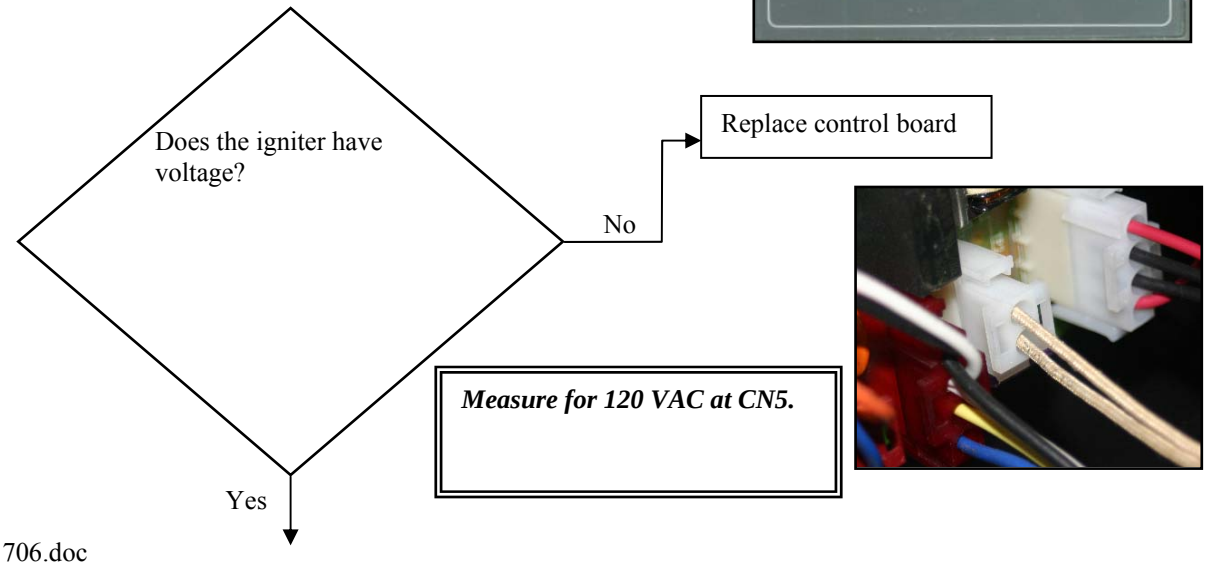
Many installations on natural gas are victims of insufficient gas volume due to inadequate gas available on the job. Meter sizing, and building distribution piping, more often than not, is the culprit. In addition, CSST (Corrugated Stainless Steel Tubing) is a major problem! This material may be used only on 2-pound systems to supply high-pressure gas to the appliance regulator, assuming it is properly sized for the job. The low-pressure gas from the regulator to the AdvantagePlus must be 10 feet of 3/4" ID black steel pipe.

Igniter; Power to igniter



Explanation: Monitors igniter element output. The LED is ON when 120VAC power is applied to the igniter.

At a minimum, check the following:
1. Igniter current draw is too low.
2. Molex is connected.



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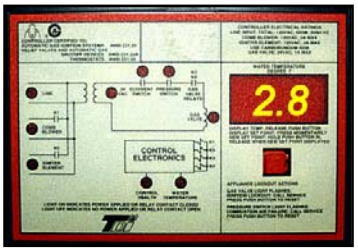


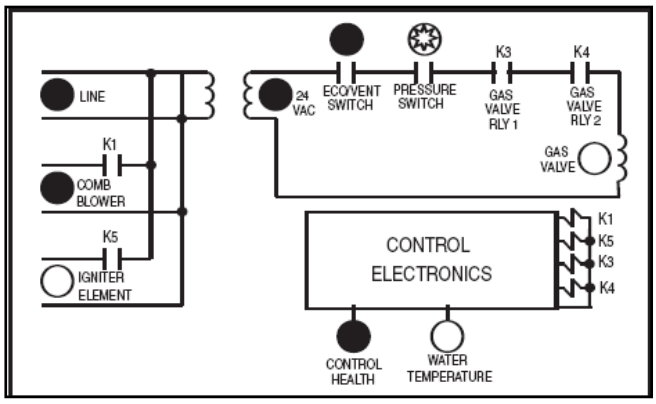
Does the igniter circuit show proper amp draw?

No → Replace igniter

1. Press the black button on the front of the black enclosure during igniter operation. The reading in the LED should be between 2.5 and 3.5 amps.
2. Verify between 100 and 200 Ohms resistance on the igniter probe.

Yes → Unit appears to be fine. Recycle power and try again.

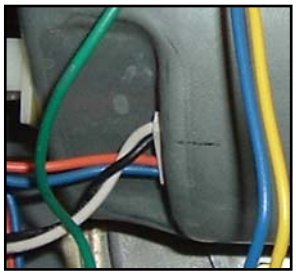
Combustion Blower; Power to blower

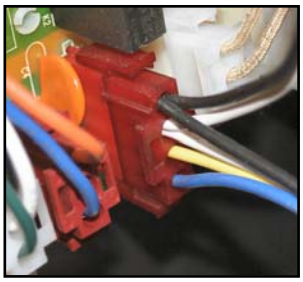


Explanation: If the blower motor fails, then the **PRESSURE SWITCH** indicator light will blink. The **COMB BLOWER** LED IS on when power is supplied to the blower motor.

At a minimum check the following:

1. Molex connections are tight on the board
2. Molex connects are tight on the blower





Is the blower getting 120 VAC?

No → Replace control board

Yes → Continue to next step

The main control board passes the 120VAC from the power source - there is not a direct link to line voltage except through the main control board.

1. Measure for 120 VAC on the black and white wires of CN4. You can verify the 120 VAC on the black and white wires at the blower motor. If so, then you have power to the blower. If not, replace the control board.

Is the blower getting DC control voltage from the board?

No → Replace control board

Yes → Replace blower

DC voltage is used to signal the blower to turn on and off. This signal is generated by the control board.

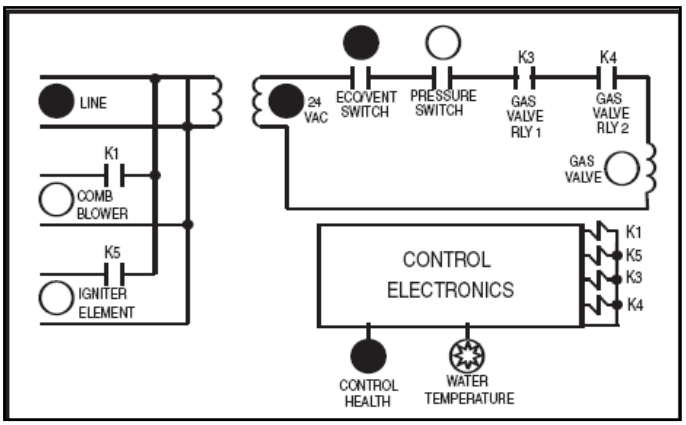
2. Measure for between 2.0 and 8.8 DC volts on the orange (+) and blue (-) wires at CN2. You can verify the DC voltage on the orange and blue wires at the blower motor. If so, then you have the proper signal for the blower to operate. If not, replace the control board.

You must perform BOTH tests to determine if the blower motor or control board is bad. Unit must PASS both tests to verify the blower motor is bad; or FAIL one test to determine the main control board is bad.

Things to remember:

A. The main pc control board passes the 120VAC to the motor. There is NOT a direct link to the line voltage except through this board.
B. If you have 120VAC on plug CN1, you must have 120VAC on the plug CN4 or the pc board is bad.
C. You must perform all tests to determine if the blower motor or pc control board is good or bad.

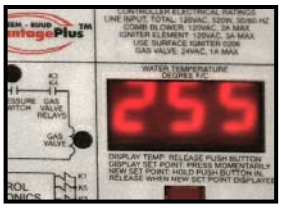
WATER TEMPERATURE; problem with the water temperature probe or the water temperature



Explanation: This is the thermistor that monitors the water temperature inside the tank. The LED is ON when the water temperature drops below the set point on the LED panel. If the water temp LED is ON, then the unit should be in main burner or attempting to fire off.

At a minimum check the following:

1. Temperature probe wiring is unplugged
2. Probe open internally
3. Probe wiring shorted
4. Probe shorted internally
5. Thermostat set point is OK. See resistance chart at end of this document
6. If the display reads "255", then the temperature probe is damaged and needs replacement



Is there any Ohms resistance thru the thermistor?

No → Replace temperature probe

Yes

Measure the OHM resistance between the two black wires at CN3. Nominal reading is approx 12k (thousand) ohms at room temperature (70^0F); less resistance is cooler water; more resistance is hotter water. An 'open' reading means the thermistor is damaged.
See resistance chart on last page of this document.

If the unit is operating, but not holding temperature, verify the flow rate of water is within the GPM performance for the temperature rise. If flow is not the problem, look at the ECO/Temperature probe. There may be a hole in the probe allowing water into the electronics, thus causing a false signal.

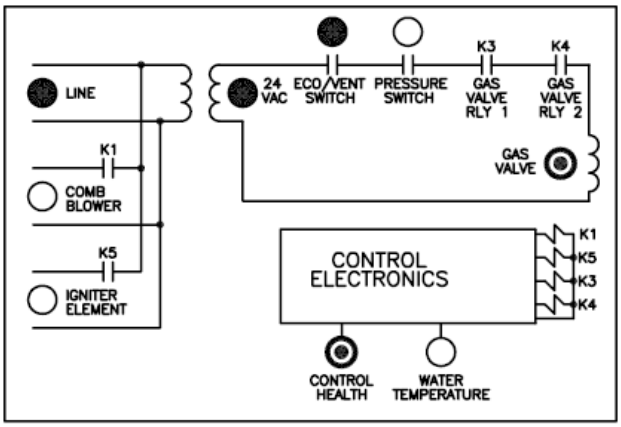
CONTROL HEALTH; problem with the control self diagnosis

Is the main circuit board OK?

No → Replace board

Press red reset button and recycle power. If error occurs repeatedly, replace main control board.

CONTROL HEALTH and GAS VALVE; failed to establish main burner after 3 successive attempts



Explanation: The unit will make three attempts for main burner, then locks out. This is probably associated with a fuel supply problem.

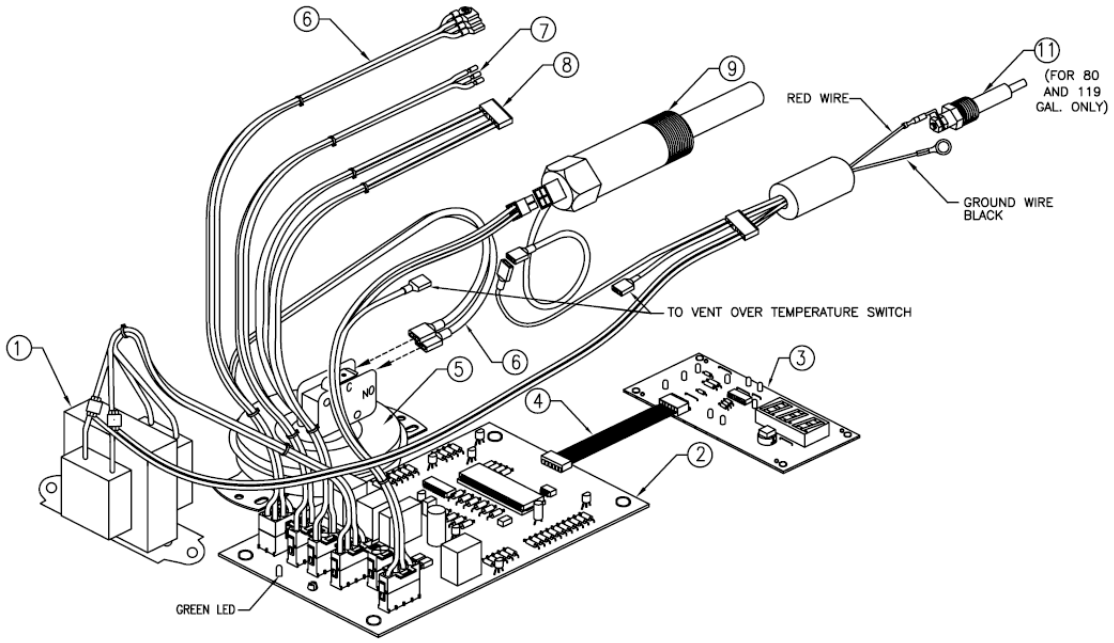
At a minimum, check the following:

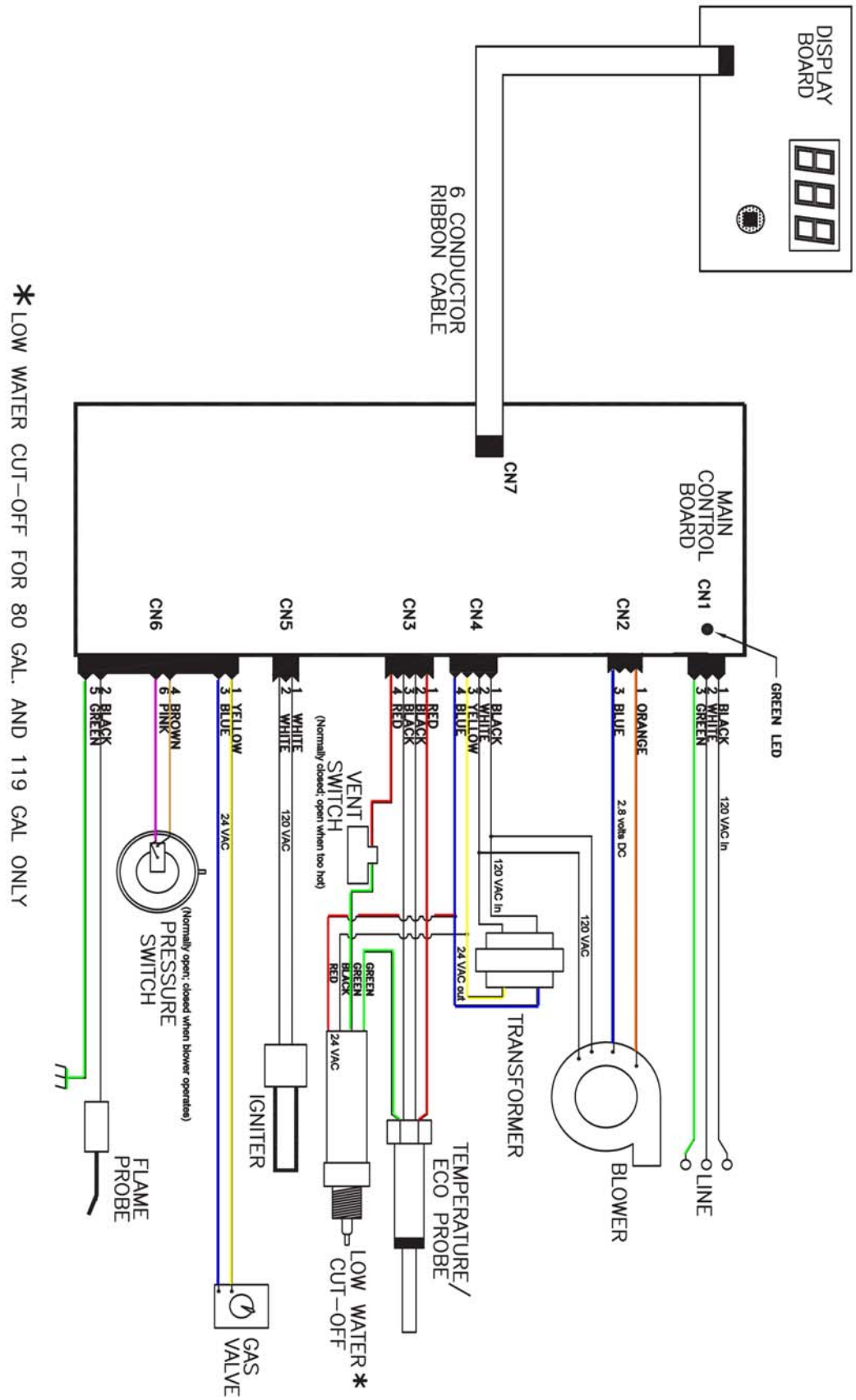
1. Gas valve ON
2. Gas valve connector Molex is firmly seated.
3. Wires to this Molex are firmly seated into the connection itself.
4. Recycle power by pushing the red button.

INTEGRATED WATER HEATER CONTROL
1200 BOARD SYSTEM

REPLACEMENT PARTS IDENTIFICATION		
ITEM	DESCRIPTION	HTP PART NUMBER
1	TRANSFORMER & BLOWER SUPPLY CABLE	7000-666
2	CONTROL BOARD – MUST SPECIFY MODEL & SERIAL NUMBER WHEN ORDERING	7000-702
3	DISPLAY BOARD	7000-664
4	DISPLAY BOARD TO CONTROL BOARD WIRE	7000-665
5	PRESSURE SWITCH	7250P-150
6	WIRE HARNESS FROM CN6 TO GAS VALVE, FLAME PROBE AND PRESS. SWITCH	710B0041
7	WIRE HARNESS FROM CN1 TO LINE POWER	710B0048
8	WIRE HARNESS FROM CN2 TO COMBUSTION BLOWER & TRANSFORMER	7000-666
9	ECO/TEMPERATURE PROBE (WIRED TO CN3)	WHC1001-ECO-1
*10	PUSH BUTTON SWITCH FOR IGNITOR & FLAME CURRENT	7000-667
11	LOW WATER CUT-OFF SENSOR ASSEMBLY (FOR 80 AND 119 GAL. ONLY)	7000P-852

*NOT SHOWN





* LOW WATER CUT–OFF FOR 80 GAL. AND 119 GAL ONLY

Temperature °F	Ω Resistance
70	11,884
71	11,593
72	11,308
73	11,031
74	10,764
75	10,501
76	10,249
77	10,000
78	9,762
79	9,526
80	9,300
81	9,078
82	8,862
83	8,653
84	8,448
85	8,251
86	8,056
87	7,869
88	7,685
89	7,507
90	7,333
91	7,164
92	6,999
93	6,838
94	6,683
95	6,530
96	6,383
97	6,238
98	6,098
99	5,961
100	5,827
101	5,698
102	5,571
103	5,449
104	5,327
105	5,210
106	5,095
107	4,984
108	4,876
109	4,769
110	4,666

Temperature °F	Ω Resistance
111	4,564
112	4,467
113	4,370
114	4,277
115	4,185
116	4,096
117	4,008
118	3,923
119	3,840
120	3,759
121	3,681
122	3,603
123	3,529
124	3,455
125	3,383
126	3,313
127	3,244
128	3,178
129	3,112
130	3,049
131	2,986
132	2,926
133	2,866
134	2,809
135	2,752
136	2,697
137	2,643
138	2,590
139	2,539
140	2,488
141	2,439
142	2,391
143	2,343
144	2,297
145	2,253
146	2,209
147	2,166
148	2,124
149	2,083
150	2,043

Temperature °F	Ω Resistance
151	2,003
152	1,966
153	1,928
154	1,891
155	1,855
156	1,820
157	1,786
158	1,752
159	1,719
160	1,687
161	1,656
162	1,625
163	1,594
164	1,565
165	1,536
166	1,508
167	1,480
168	1,453
169	1,426
170	1,400
171	1,375
172	1,350
173	1,326
174	1,302
175	1,278
176	1,255
177	1,233
178	1,211
179	1,190
180	1,169
181	1,148
182	1,120
183	1,108
184	1,089
185	1,070
186	1,052
187	1,033
188	1,016
189	998
190	981