



# Universal HC Series Heater®

## Troubleshooting Guide



# Safety Precautions



## High Voltage Electrocution Hazard

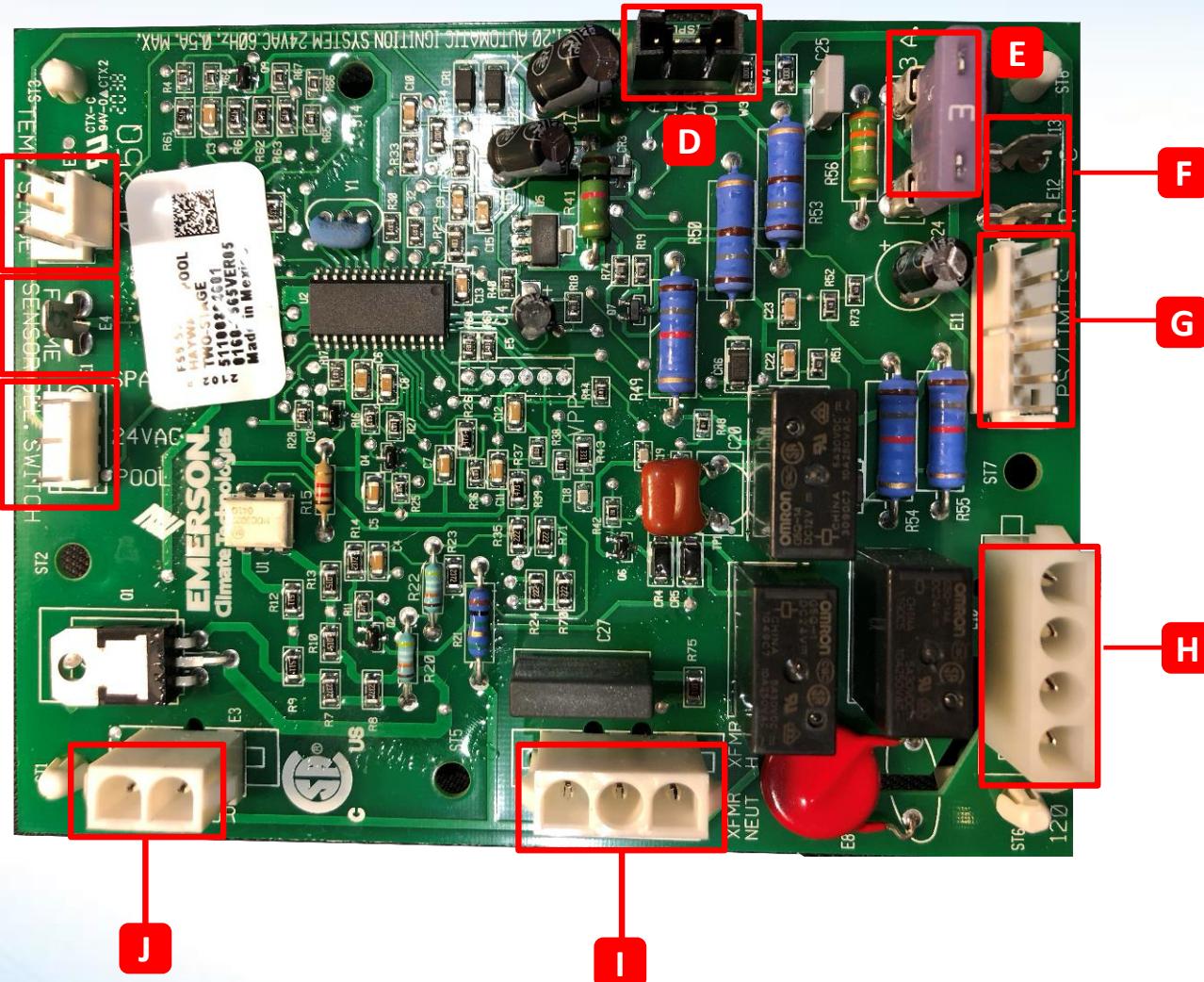
Hazardous voltage can shock, burn, cause serious injury and or death. To reduce the risk of electrocution and or electric shock hazards:

- Turn off power to unit before making repairs
- Only qualified technicians should service heater
- Replace damaged wiring immediately
- Ensure appliance is properly grounded and bonded

# Table of Contents

ICB and Fuse Board Layout	4-5	<b>Troubleshooting: (cont.)</b>	Pg. <b>27-57</b>
Sequence of Operation: Normal/Failure to Light	6	5. "BD" Code	38
Gas and Electrical Connections	7	6. "EE" or "CE" Code	39
<b>How To:</b>	<b>Pg. 8-26</b>	7. "IO" or "SB" Code	40
Program Heater Bypass & Temperature Lockout	9-11	8. "SF" or "HS" Code	41
Change/Replace Gas Mixer	12	9. "PF" Code	42
Test/Adjust Gas Pressure	13-15	10. "HF" Code	43
Burner Inspection	16-19	11. "LO" Code	44-47
Change/Replace Combustion Chamber	20-26	12. "IF" Code	48-49
<b>Troubleshooting:</b>	<b>Pg. 27-57</b>	13. "AC" Code	50
Diagnostic Codes and Part Numbers	28-29	14. "A1, A2, A3" Codes	51-53
Wiring Diagram	30	15. "b1" Code	54
1. Heater not powering up	31-33	16. "b2" Code	55
2. Open FC1&/FC2 Fuse	34	17. "b3" Code	56
3. Open FC3&/F1 Fuse	35-36	18. "b4" Code	57
4. Open FC4 Fuse	37		

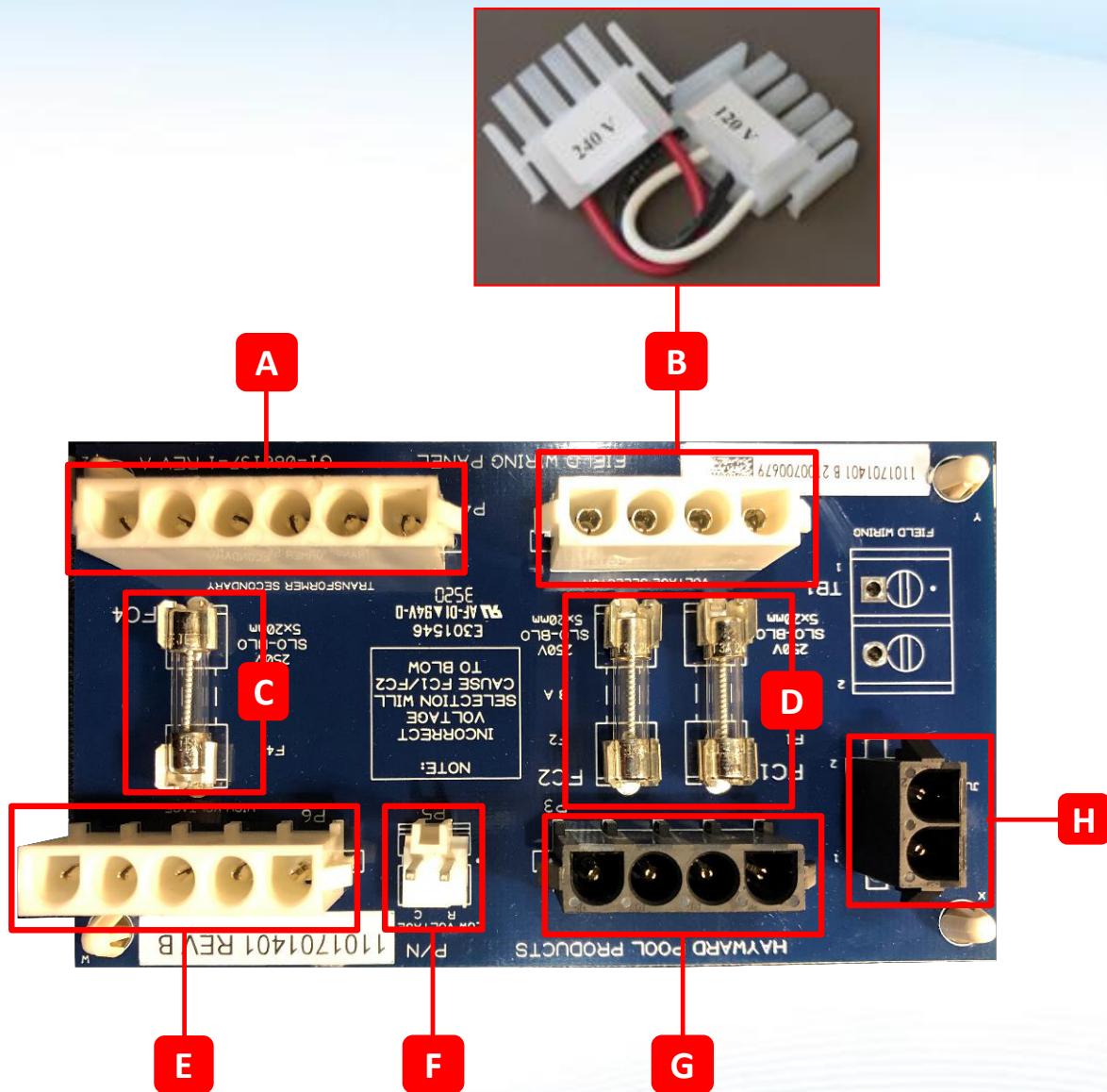
# Integrated Control Board Layout (ICB)



<b>A</b>	Remote Control: 24VAC (E1)
<b>B</b>	Flame Sensor (E4)
<b>C</b>	Temperature Sensor (E2)
<b>D</b>	Display Output: 24VAC (E7)
<b>E</b>	3A Fuse (F1)
<b>F</b>	Low Voltage R & C: 24VAC (E12, E13)
<b>G</b>	Gas Valve & Safety Switches: 24VAC (E11)
<b>H</b>	High Voltage: 120VAC (E10)
<b>I</b>	Blower/Inducer (E6)
<b>J</b>	Ignitor (E3)

# Field Wiring Panel Layout

A	Transformer Secondary: 24 <u>VAC</u> (right) & 120 <u>VAC</u> (left) (P4)
B	Voltage Selector 240 OR 120 <u>VAC</u> determined by plug (P2): <b>NOTE: 240<u>VAC</u> plug factory installed</b>
C	Fuse: 3a protects transformer high voltage secondary, will fail with blower, ignitor or ICB failure (FC4)
D	Fuse: 3A protect primary input voltage, will fail with excessive voltage, improper wiring, shorted transformer or fuse board (FC1 & FC2)
E	High Voltage Output: 120 <u>VAC</u> (P6)
F	Low Voltage Output: 24 <u>VAC</u> (P5)
G	Transformer Primary: 120/240 <u>VAC</u> (P3)
H	Power connection for junction boxes: 120/240 <u>VAC</u> (P1)



# UHC Sequence of Operation: Normal

*The control continually compares the set temp to the actual water temp. When the water temp is 1° below the set point the following sequence starts:*

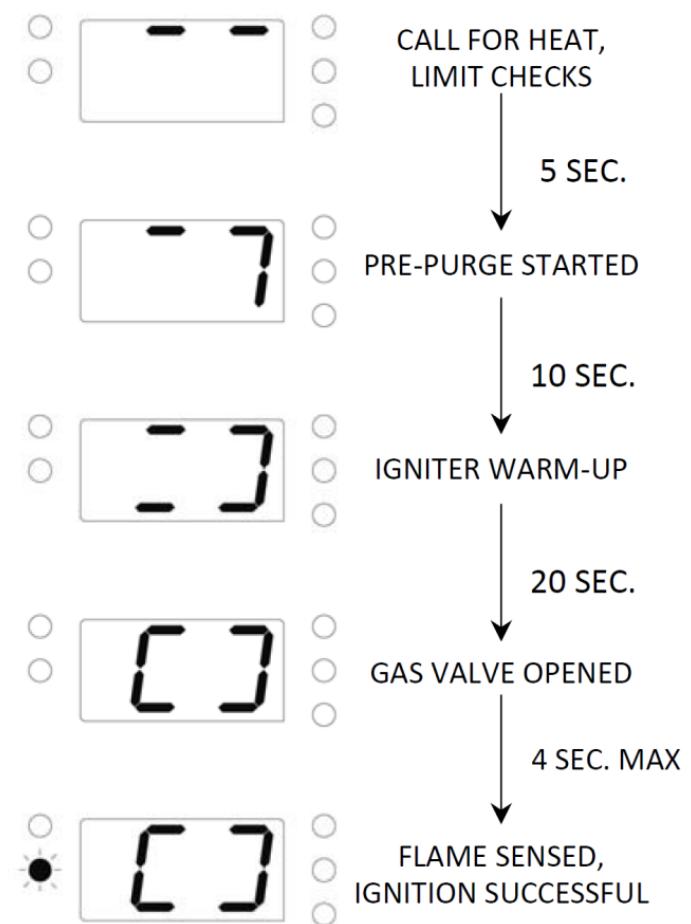
## NORMAL OPERATION FOR POOL & SPA MODES:

The control continually compares the water temperature with the set point and the high limit temperature. When the sensed water temperature is more than 1°F below the set point, a call for heat is generated and a heating cycle is initiated. When a call for heat starts, the numeric display on the user panel will show a series of lines to indicate the progression of the unit's ignition sequence. The displayed indicators, along with approximate times between each step are shown in Figure A. When the ignition sequence completes successfully, the current water temperature will be displayed again. The temperature set point cannot be adjusted while the ignition sequence indicators are active.

1. The control checks the differential pressure switch for open contacts and then energizes the blower. After the blower is energized, the contacts are checked again to ensure they are closed and the 30 sec. pre-purge timer is started.
2. The control energizes the igniter during the pre-purge cycle and allows it to reach ignition temperature, approximately 20 seconds.
3. The control energizes the gas valve to permit the flow of gas for the 4 sec. trial for ignition and monitors flame current.
4. The igniter is turned off when flame current is sensed or when the trial for ignition is completed.

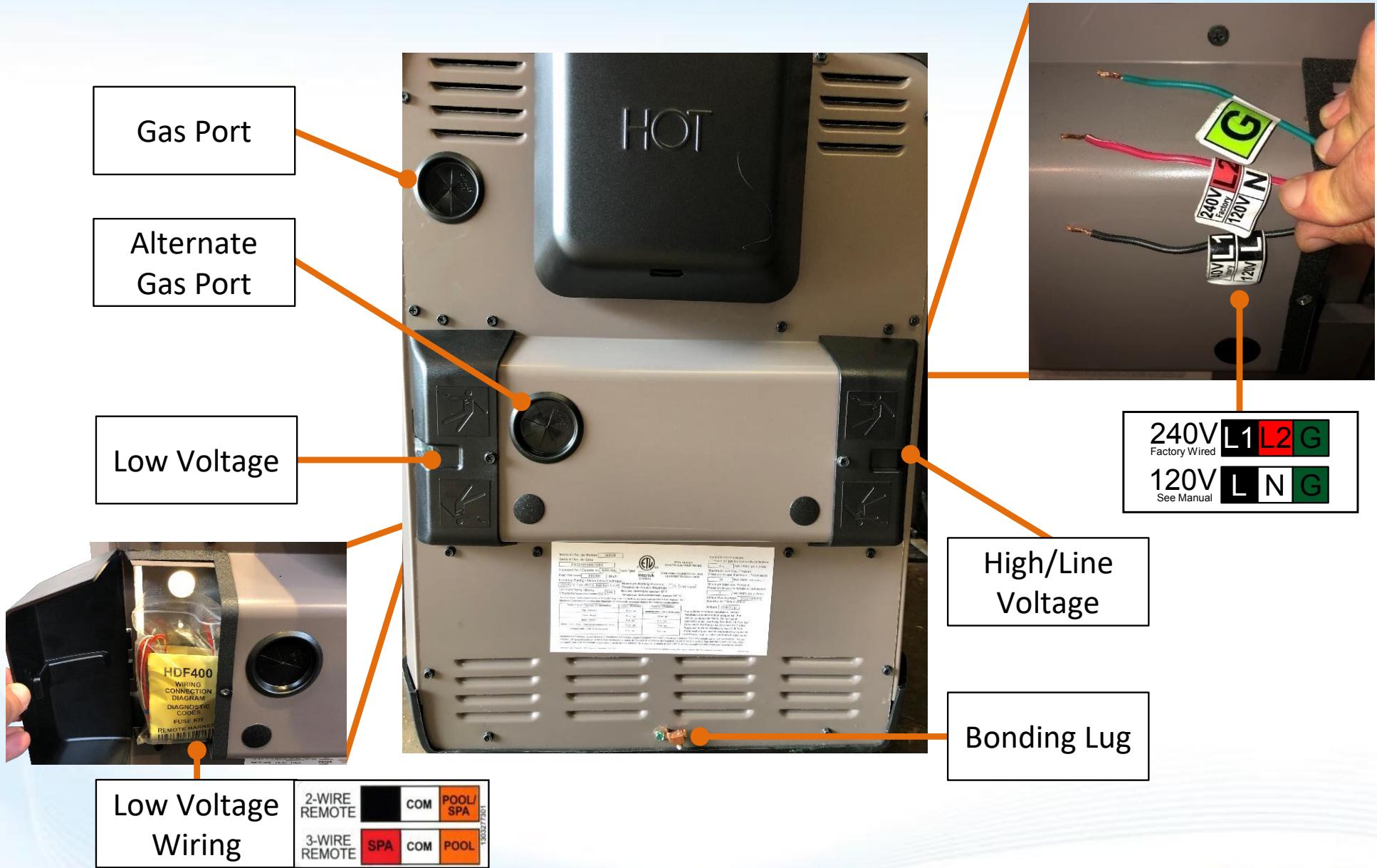
During a heating cycle, the differential pressure switch, limit string, water temperature sensor, and flame current are constantly monitored to assure the heater is operating properly. When the thermostat is satisfied and the call for heat ends, the control immediately de-energizes the gas valve and flame extinguishes. The control operates the blower an additional 30 seconds as a post-purge.

**Figure A: Ignition Sequence Display**



# UHC Electrical & Gas Connection

The low voltage and high/line voltage compartments can be reversed but NOT shared.





# Universal HC Series Heaters®

## How To:



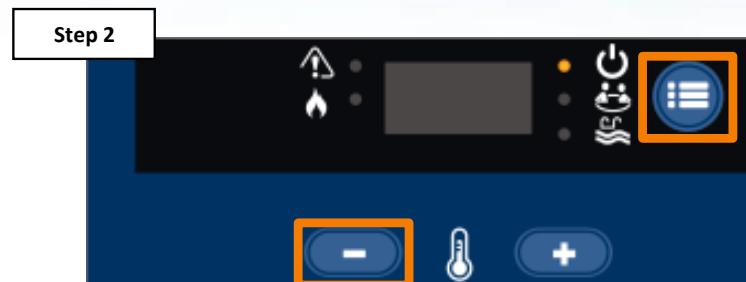
# How To: Program Heater Bypass Operation

Follow the included steps to place the heater in bypass operation for external control.

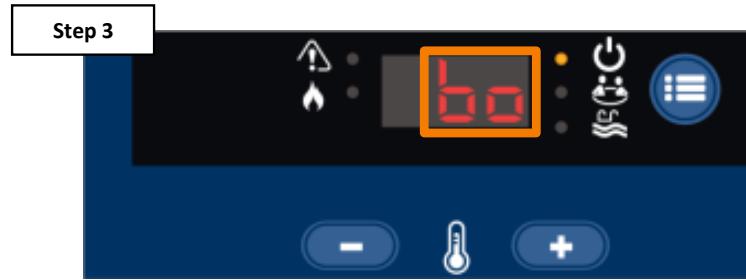
**NOTE:** the maximum temperature set point is 104° F.



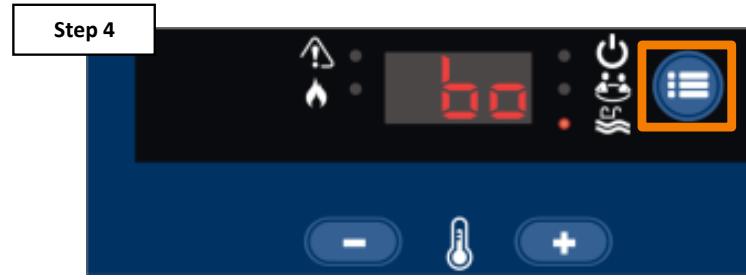
Press the 'MENU ICON' button to place the heater in 'STANDBY'.



Press and hold the 'MINUS' button and 'MENU ICON' button for 3 seconds.



'bo' will appear on the display when the heater has successfully entered bypass operation.



Once in bypass, press the 'MENU ICON' button until 'POOL' or 'SPA' is illuminated.

# How To: Program Temperature Lock-Out

Follow the included steps to lock the maximum temperature allowed.

**NOTE: The default Max temp set points are 90°F (Pool) 104°F (Spa).**

**When setting the max temp lock-out set point, the LEDs & display should flash rapidly.**



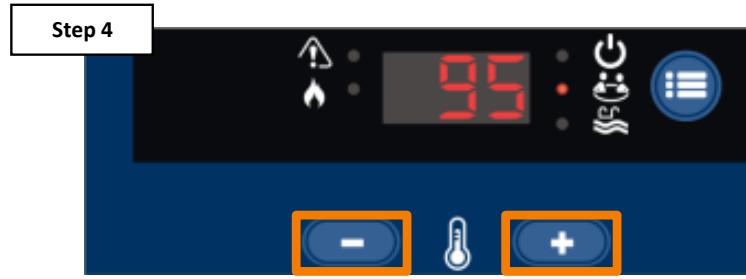
Press the 'MENU ICON' button to place the heater in 'STANDBY' mode.



Press and hold the minus & plus buttons for 3 seconds.



The 'SPA' indicator will flash & the display should show the Max Temp set point.



Raise or lower the temperature displayed using the minus or plus button.

# How To: Program Temperature Lock-Out (cont.)

**NOTE: The default Max temp set points are 90°F (Pool) 104°F (Spa).**

**When setting the max temp lock-out set point, the LEDs & display should flash rapidly.**



Press the 'MENU ICON' button to toggle to the 'POOL' now that the 'SPA' is set.



Raise or lower the temperature displayed using the minus or plus button.



To finalize, press the 'MENU ICON' button until the heater goes back into 'STANDBY'.

# How To: Change/Replace Fuel/Air Mixer

Remove screws from header cover



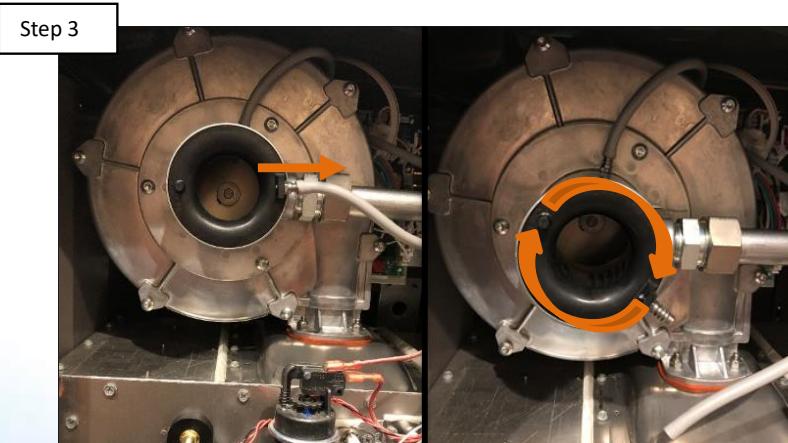
Turn power off, remove the 4 screws from the header controls cover and remove the panel.

Remove screws from control cover



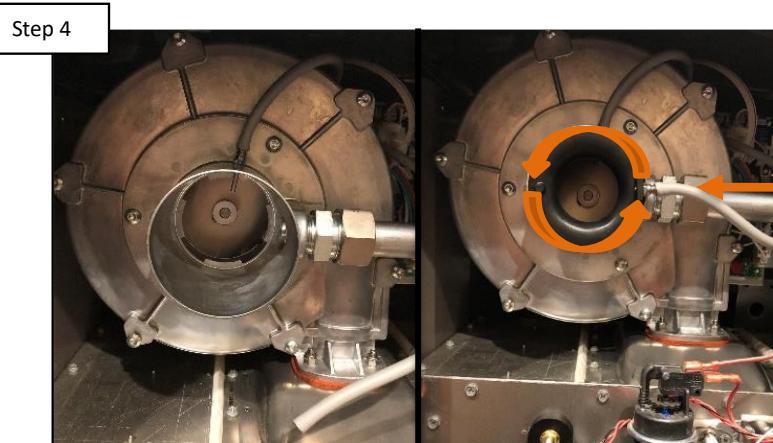
Lift the cabinet top slightly, then remove the 4 screws from the control cover and remove.

Remove fuel/air mixer



Remove pressure hose from front of fuel/air mixer.  
Rotate mixer clockwise and pull straight out to remove.

Re-install/install fuel/air mixer



Re-install/install new mixer back into blower and rotate counter clockwise to reinstall and reconnect pressure hose to front of fuel mixer.

# How To: Test/Adjust Gas Pressure

Turn off gas supply

Step 1

**Table 11: Required Gas Pressures  
(in. wc.)**

Measurement	Natural Gas	Propane
Manifold Pressure*	-0.1 to -0.3	
Inlet Pressure, Minimum	+4.0	+4.0
Inlet Pressure, Maximum	+14.0	+14.0

Turn off gas supply to heater. Gas readings should be in line with the chart above.

Inlet: Remove test plug from inlet

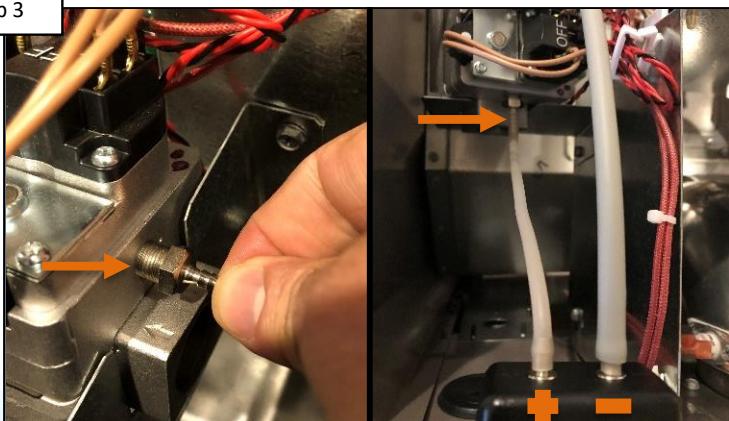
Step 2



Locate the inlet test port on the side of the gas valve, and remove the 1/8" Allen plug.

Connect Manometer

Step 3



Install a 1/8" barbed fitting and connect the positive (+) hose from the manometer to the barbed fitting. Turn the gas on to the heater.

Test Inlet Pressure

Step 4



Leave the heater in "Stand By", your static pressure should be no less than +4.0 and no greater than +14.0" WC.

# How To: Test/Adjust Gas Pressure

Turn off gas supply

Step 1



Turn off gas supply to heater. Remove 1/8" Allen plug from the pressure port on the gas valve.

Locate test ports

Step 2



Install barbed fitting from manometer in the pressure port of the gas valve..

Remove test port plug(s)

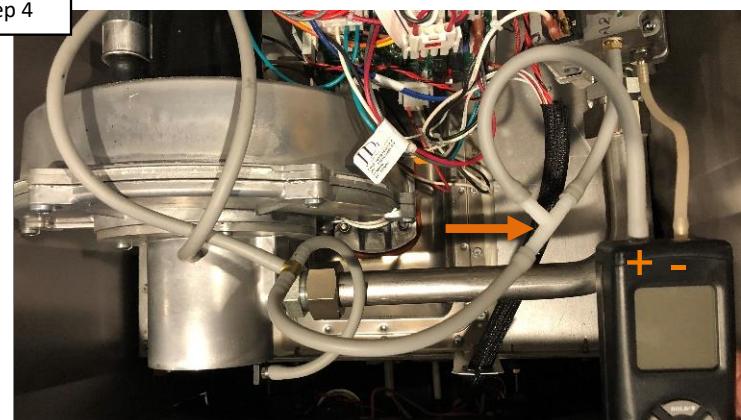
Step 3



Remove the silicone tubing from the vent port on the gas valve, leaving the barbed fitting installed on the gas valve.

Connect manometer

Step 4



Connect the negative side of your manometer to the pressure port. Connect the positive side to the vent port as show above. You will need a 3/16" barbed "T" for your manometer.

# How To: Test/Adjust Gas Pressure (cont.)

*NOTE: IF incoming gas pressure is within range, then your manifold pressure should be correct per factory settings.*

## Manometer Connected

Step 5



Once the manometer is connected, turn gas back on & test inlet & manifold gas pressures. Go to Step 6.

## Remove plug from gas valve

Step 7



Remove plug from gas valve with a flat head screwdriver. Go to Step 8

Step 6

**Table 11: Required Gas Pressures (in. wc.)**

Measurement	Natural Gas	Propane
Manifold Pressure*	-0.1 to -0.3	
Inlet Pressure, Minimum	+4.0	+4.0
Inlet Pressure, Maximum	+14.0	+14.0

IF inlet pressures are correct AND the manifold pressure is high or low, go to step 7.

## Adjust gas pressure

Step 8



Once removed, increase pressure by rotating screw clockwise, (counter clockwise to reduce pressure).

# Clean/Replace Burner

Remove screws from both sides

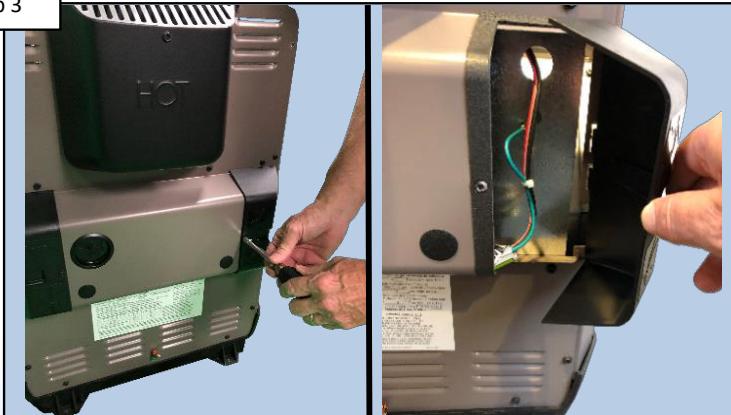
Step 1



Turn the Power and the gas off to the unit. Remove the 2 top screws on each side of the heater as shown above.

Remove electrical cover

Step 3



Remove the one screw that holds the right side electrical cover and remove cover.

Remove cabinet top

Step 2



Carefully lift up on the top of the heater cover and disconnect the ribbon cable from the display, then remove cabinet top.

Remove right side sheet metal

Step 4

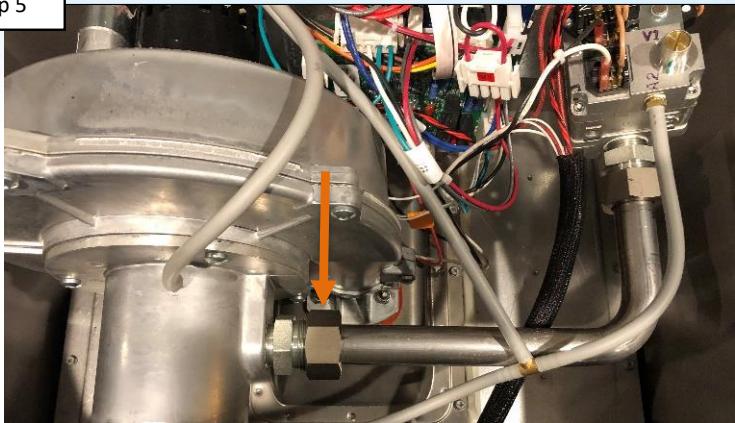


Locate and remove the 4 screws from the right side sheet metal and lift up to remove the sheet metal.

# Clean/Replace Burner (cont.)

Loosen flare nut

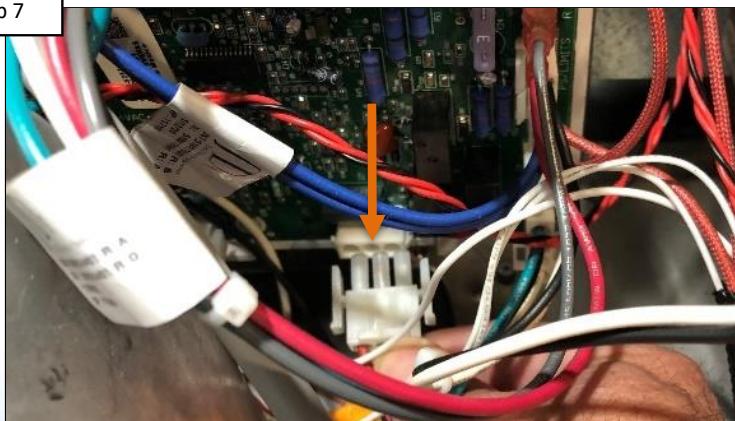
Step 5



Loosen the flare nut from the gas manifold closest to the blower. Gently pull the manifold out of blower.

Disconnect wiring

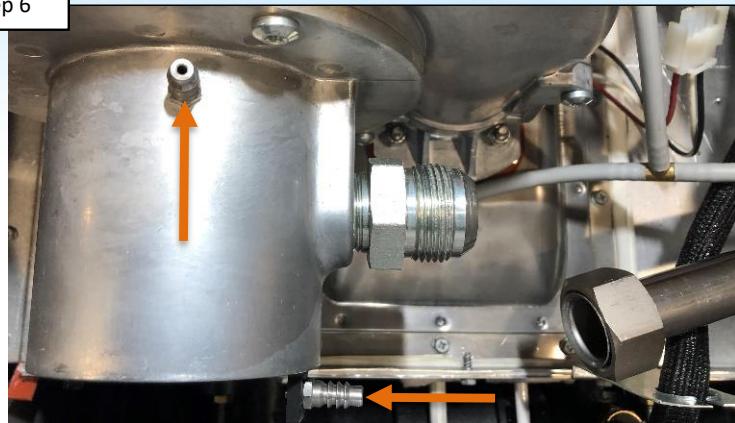
Step 7



Disconnect the Blower/Inducer (E6) wire harness from the ICB Board.

Remove silicone tubing

Step 6



Remove the silicone tubing from both ports on the blower. Make note of where each tube ends for re-installation.

Remove burner screws

Step 8

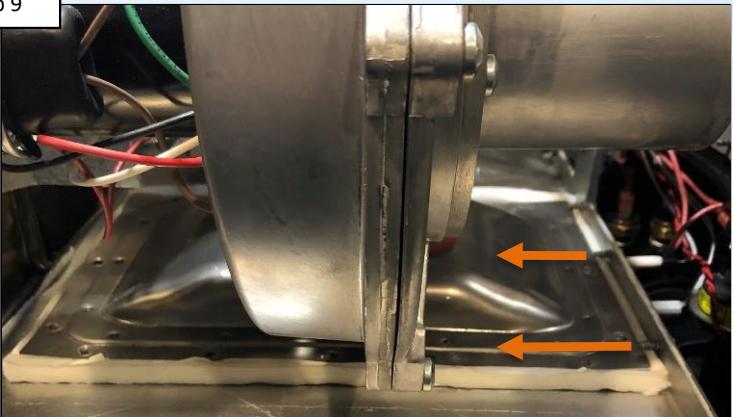


Remove the 16 screws from the burner to release the entire blower and burner assembly.

# Clean/Replace Burner (cont.)

Remove blower/burner assembly

Step 9



Slide left slightly and then lift the blower / burner assembly straight up out of the heater.

Remove blower nuts

Step 10



Remove the 4 each 7/16" nuts that hold the blower assembly to the burner.

Remove blower assembly

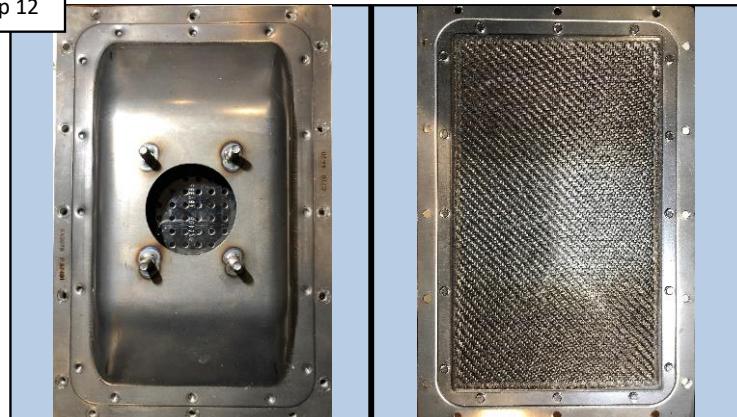
Step 11



Lift straight up to remove blower assembly from the burner. Gently lay the blower aside.

Clean burner

Step 12



This is showing you a clean burner rear and front view.

# Clean/Replace Burner (cont.)

## Blow out burner

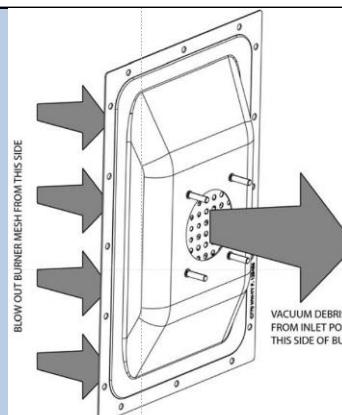
Step 13



Using compressed air blow the burner out from the front to the rear. Make sure that you blow around all four corners.

## Vacuum burner

Step 14

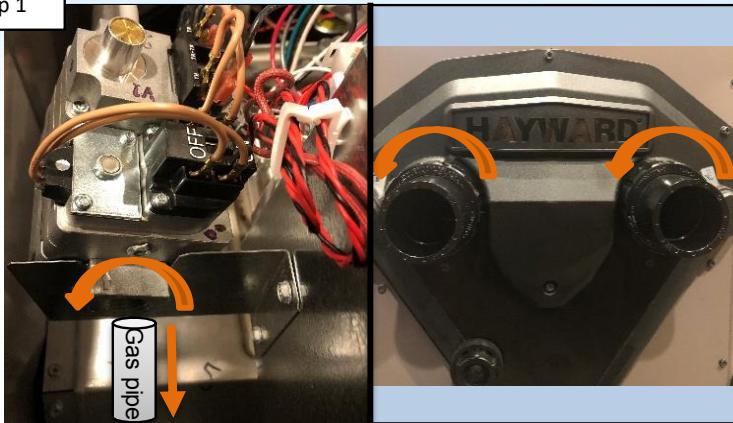


Turn the burner over and shake out any loose dirt and debris. You can use a wet dry vac to vacuum any smaller particles out of the burner.

# Change/Replace Combustion Chamber

Disconnect gas & water unions

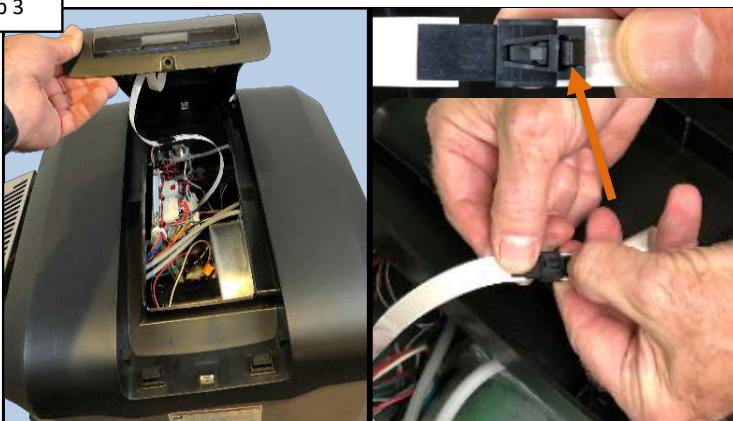
Step 1



Turn Power and gas off to unit, disconnect the gas line and plumbing unions from the heater.

Disconnect ribbon cable

Step 3



Lift cover and locate the quick disconnect for the ribbon cable. Press down on tab and pull apart.

Remove screw from Display

Step 2



Using a 5/16 nut driver or #2 Phillips Head screwdriver, remove screw from below display.

Remove top cover screws

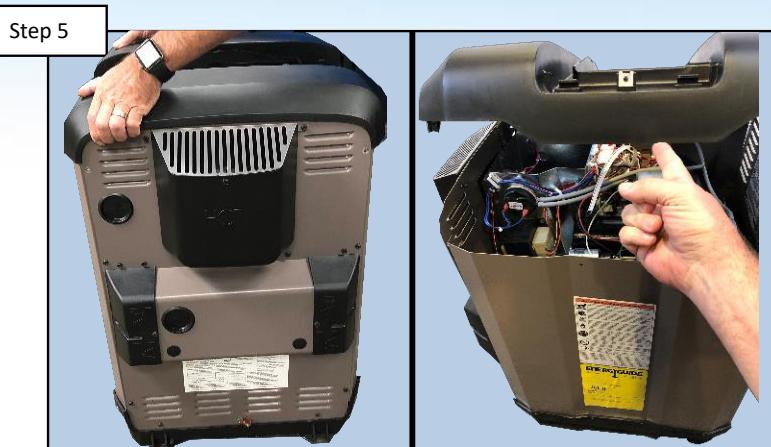
Step 4



Locate and remove the 2 screws from the top of each side of the heater (shown above).

# Change/Replace Combustion Chamber (cont.)

Remove cabinet top



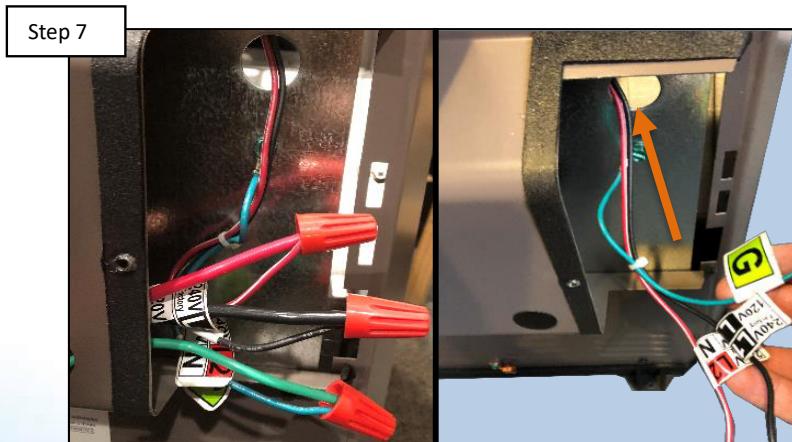
Lift to remove top cover. Use caution when removing, so you do not lose the screw tabs.

Remove wiring cover



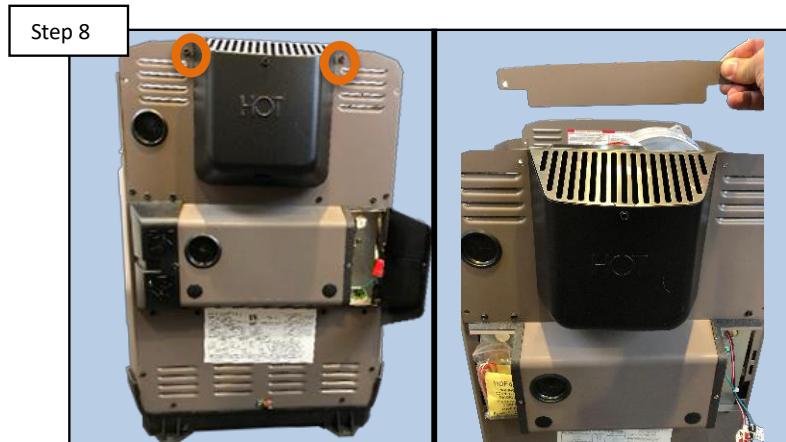
Remove screw from front wiring cover (shown left)  
Remove plastic wiring cover (shown right).

Disconnect wiring



Pull wires out of compartment. Remove wire nuts, disconnect electric from cabinet. Push heater supplied wiring into cabinet.

Remove top plate

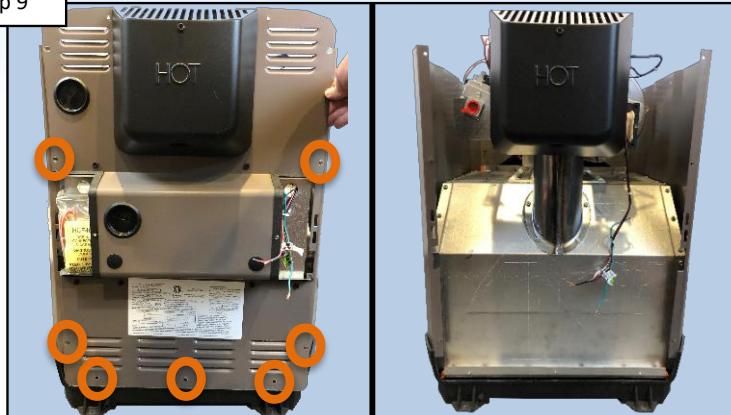


On the exhaust side of the heater, remove the 2 screws from top (left pic), remove the top plate. (right pic).

# Change/Replace Combustion Chamber (cont.)

Remove exhaust side cover

Step 9



Remove the 7 screws (left pic.). Lift up and then pull out on the bottom of the panel and slide down to remove.

Remove header controls cover

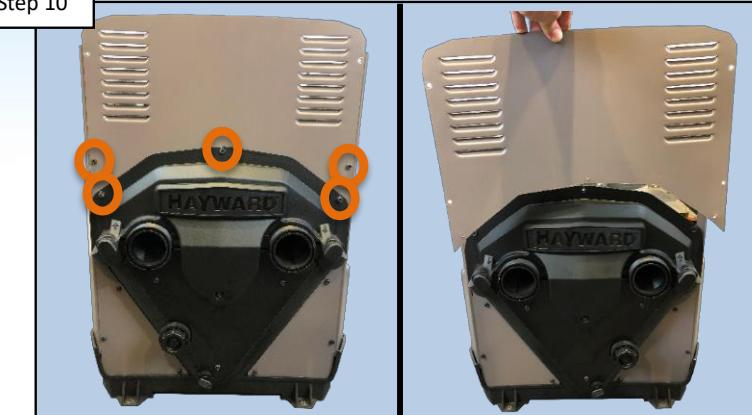
Step 11



Remove the center screw (left pic.) from the header controls cover. Remove controls cover (right pic) by lifting up on the cover.

Remove water side cover

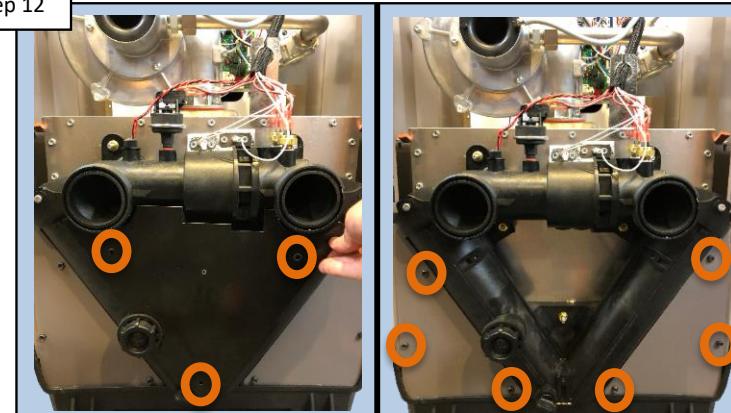
Step 10



On the water side of the heater, remove the 5 screws from the top panel & controls cover(left pic). Remove right top panel by lifting up on panel.

Remove waterside trim panels

Step 12



Remove 3 screws on bottom header cover (left). Remove 3 screws from left & right lower trim panels, and remove all.

# Change/Replace Combustion Chamber (cont.)

Remove front & rear panels

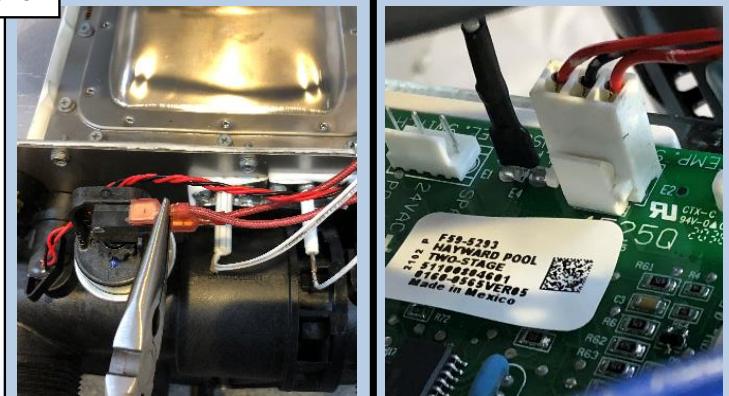
Step 13



Remove the 4 screws from the bottom of the front and rear panels and pull up and out to remove each one.

Remove wires from water pressure switch

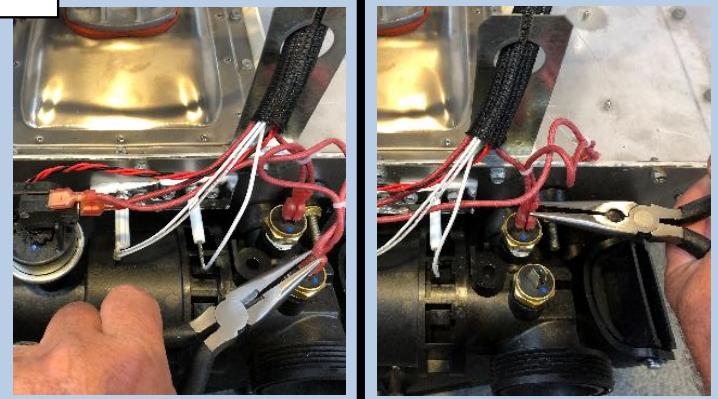
Step 15



Remove wires from water pressure switch (left) and disconnect the thermistor (temp sensor) from the ICB board (right).

Remove wires from limit switches

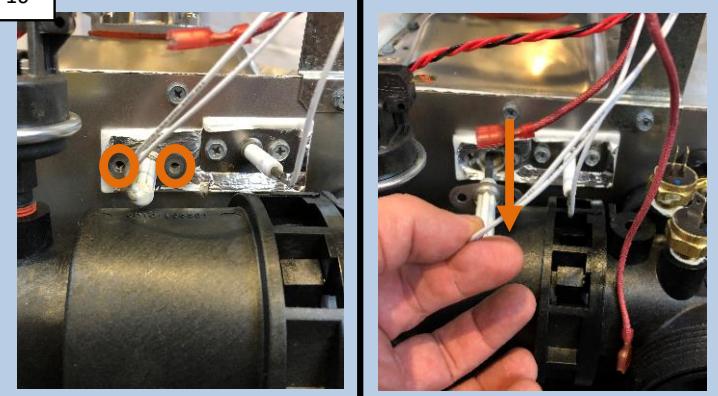
Step 14



Use needle nose pliers to remove the 2 red wires from each of the high limit switches.

Remove ignitor

Step 16

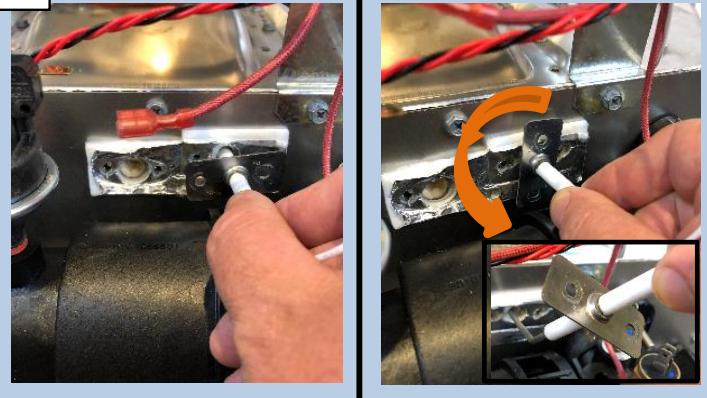


Remove the 2 screws from the ignitor and carefully pull the ignitor straight out of the cabinet.

# Change/Replace Combustion Chamber (cont.)

## Remove flame sensor

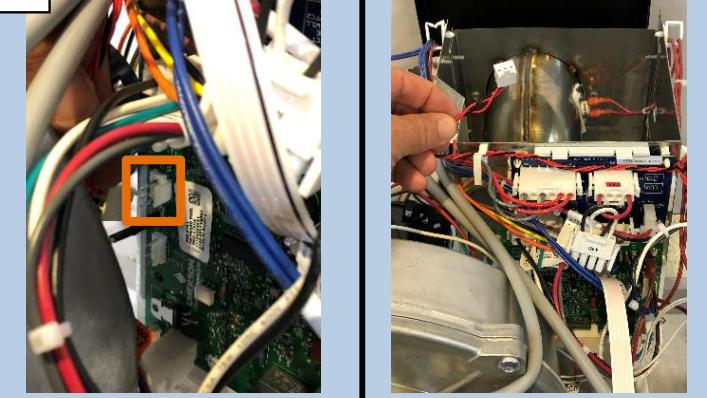
Step 17



Remove the 2 screws from Ignitor pull out slightly then rotate 180 degrees then pull rest of way out.

## Pull temp sensor wiring

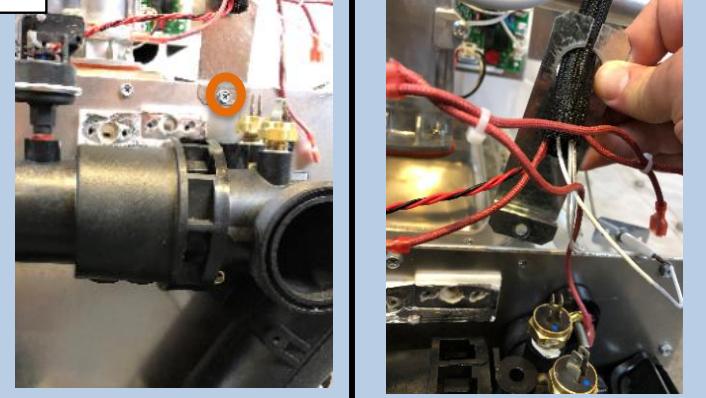
Step 19



Pull the thermistor (temperature sensor) wire out of the heater.

## Remove wire harness screw

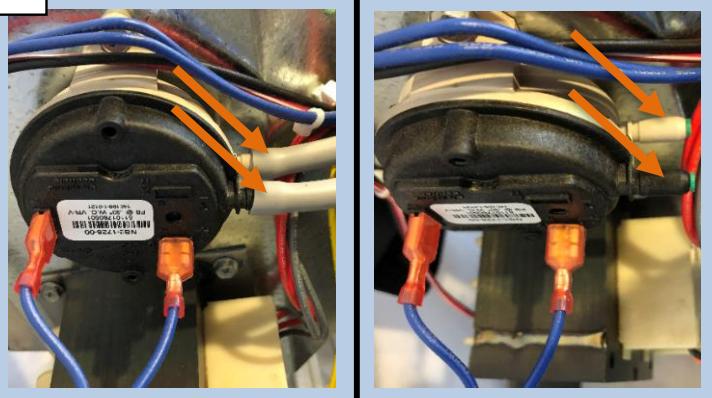
Step 18



Remove screw from the wire harness holder (left). Remove wires from holder and set aside.

## Remove diff. pressure switch tubing

Step 20

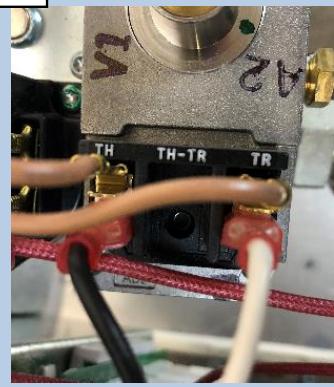


Remove silicone tubing from differential pressure switch. Front hose goes to the "T" connection and the rear hose goes to the blower.

# Change/Replace Combustion Chamber (cont.)

## Remove gas valve wiring

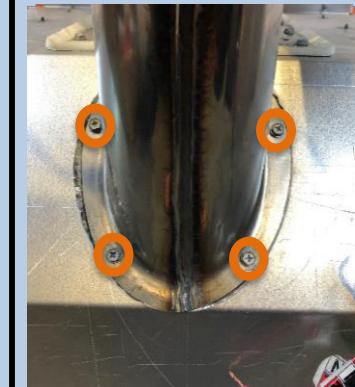
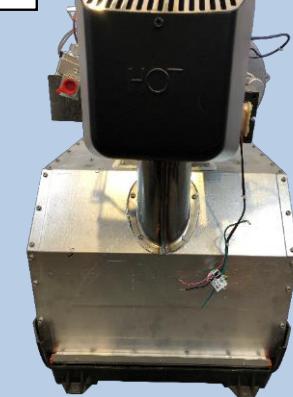
Step 21



Using needle nose pliers, remove the black and white wire from the gas valve.

## Remove vent pipe

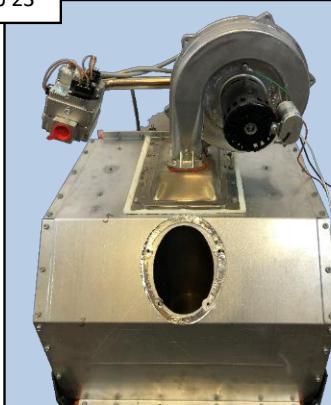
Step 22



Locate and remove the 4 screws (right) from the vent pipe assembly and remove.

## Remove blower

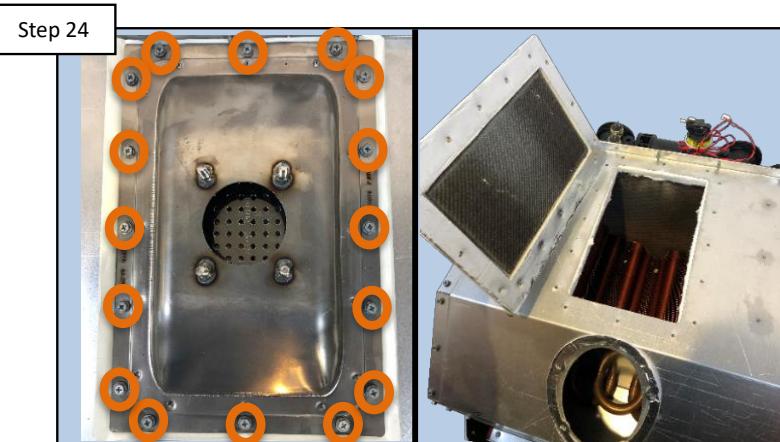
Step 23



Remove the 4 nuts from the bottom of the blower (right) assembly and lift up to remove.

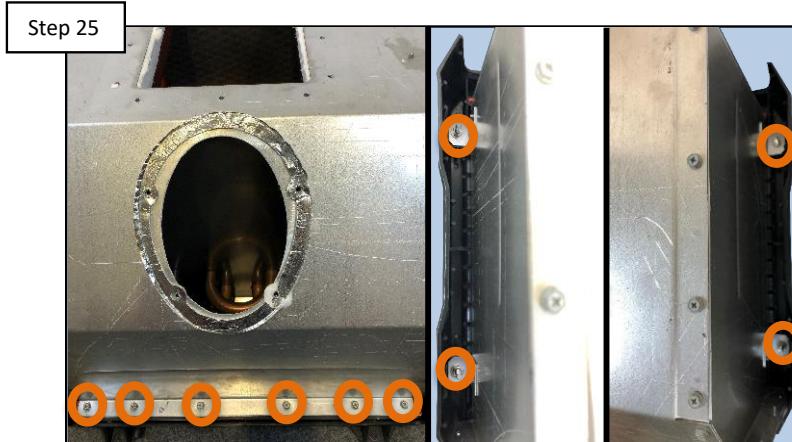
# Change/Replace Combustion Chamber (cont.)

Remove burner assembly



Remove the 16 perimeter screws from the burner assembly. Lift up on the burner to remove (clean if necessary).

Remove heat exchanger



Remove the 6 screws at bottom of combustion chamber. Remove 2, 7/16" nuts on each side of chamber (right pics). Remove combustion Chamber.



# Universal HC Series Heater®

## Troubleshooting:



# Diagnostic Codes

*Below is a list of all Diagnostic Codes for the HDF Heater. Troubleshooting Steps for each Code are covered on the following pages.*

Diagnostic Code	Description
AC	Blower Vacuum Switch closed
A1	Air switch circuit open before ignitor warm-up
A2	Air switch circuit open after ignitor warm-up
A3	Air switch circuit open after post purge
b1	Ignition control board data error
b2	Gas valve sensed "ON" error
b3	Gas valve sensed "OFF" error
b4	Data retrieval error
bo	Bypass operation mode
CE	Communication Error Between Control Module and Display Interface Assembly
EE	Bad board
HF	Flame present with Gas Valve not energized.
HS	Maximum return water temperature exceeded and / or rapid water temperature rise.
IF	Ignition Failure
IO	Ignitor Circuit Open
LO	Water Pressure Switch, Vent Pressure Switch, or Temperature Limit Switch Fault
PF	Voltage polarity reversed, low voltage detected
SB	Keypad failure
SF	Temperature Sensor (thermistor) input failure

# Part Numbers

Description	Service Kit SKU	Description	Service Kit SKU
Cabinet Top	HDXFTOP001	Burner	HDXFBRN001
Control Access Panel Assy.	HDXFCAP001	Exhaust Pipe Assembly	HDXFEXP001
Header Controls Cover	HDXFHCC001	HDF Inlet/Outlet Header Kit	HDXFIOH001
Water Side Trim Panels	HDXFWTP001	V-Header Assembly	HDXFVHD001
Cabinet Base	HDXFBOT001	Pressure Relief Port Plug	CHXPLG1930
Exhaust Box Assembly	HDXFEXB001	Drain Plug with O-Rings	SPX400FG
Ignition Control Board	HDXFICBRD001	Gasket Kit, Blower/Burner	HDXFBSGK400
Display Board & Ribbon Cable	HDXFUIBRD001		
Field Wiring Panel (Fuse Board)	FDXLFWP1930		
Thermistor	FDXLTER1931	HDF Header Hardware Kit	HDXFHDW001
Differential Pressure Switch	HDXFDPS400	Union Flange Kit	SPX3200UNKIT
Transformer	IDXL2TRF1930	HDF Header O-Ring Kit	HDXFORK001
Water Pressure Switch	FDXLWPS1931	Voltage Selector Jumper	FDXLVSJ1930
HDF High Limit Kit	HDXFHLI001	Fuse Service Kit	FDXLFSK1930
Ignitor & Flame Sensor	HDXFIGFS001	Fuse Kit, 3.0A FWP (Qty. 10)	FDXLFSKF1930
Exhaust Gas Temp. Limit	FDXLEGL1930	Fuse Kit, 3.0A ICB (Qty. 10)	FDXLFC1930
Gas Valve	HDXFGSV001	Wiring Harness Kit, Complete	HDXFWHA001
Gas Manifold	HDXFMAN001	Silicone Tubing Kit	HDXFTUB001
Combustion Blower	HDXFBWR400	Electrical Accessory Kit	HDXFEAK001
Natural Gas Fuel/Air Mixer Propane Fuel/Air Mixer	HDXFMXN400 HDXFMXP400		

# Wiring Connection Diagram

## Wiring Connection Diagram / Schéma de Connexion de Câblage

HDFXXX Gas Heaters / Chaudière Gas à HDFXXX

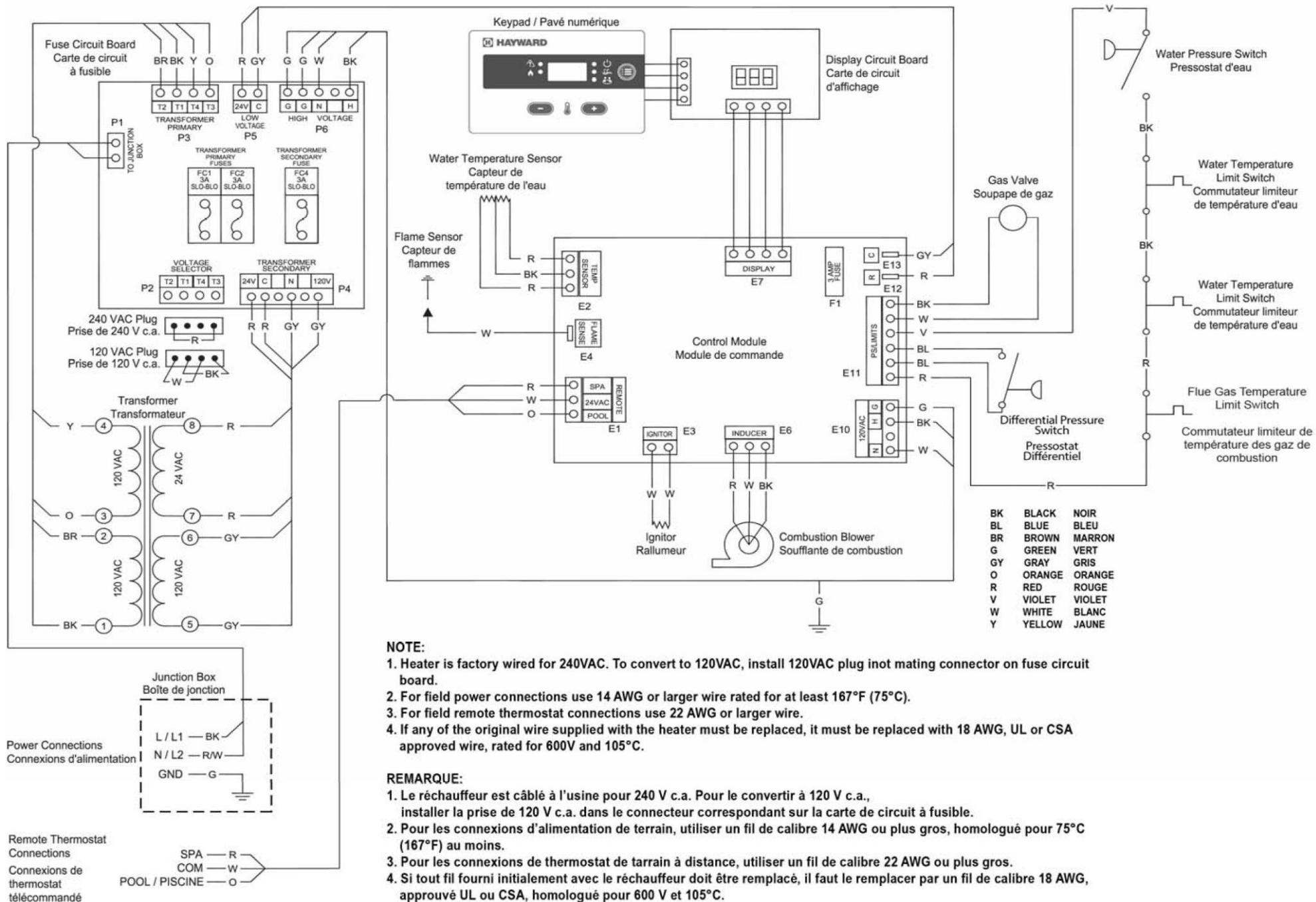


Figure 2: Wiring Diagram

# 1. Heater Not Powering Up

## Check Incoming Power

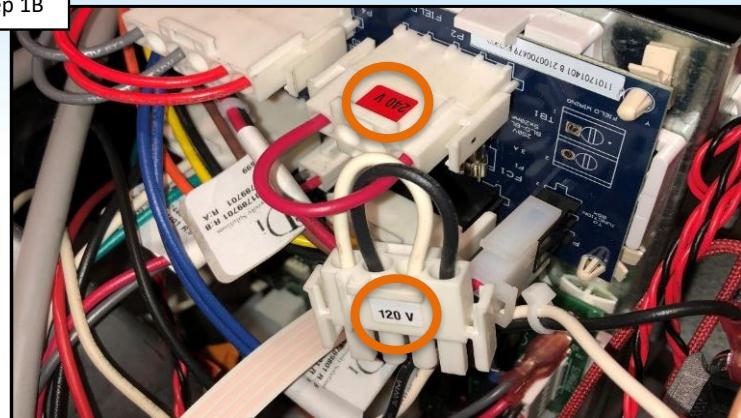
Step 1A



IF voltage is present, go to step 1B. IF voltage is incorrect, correct source power.

## Voltage selector plug

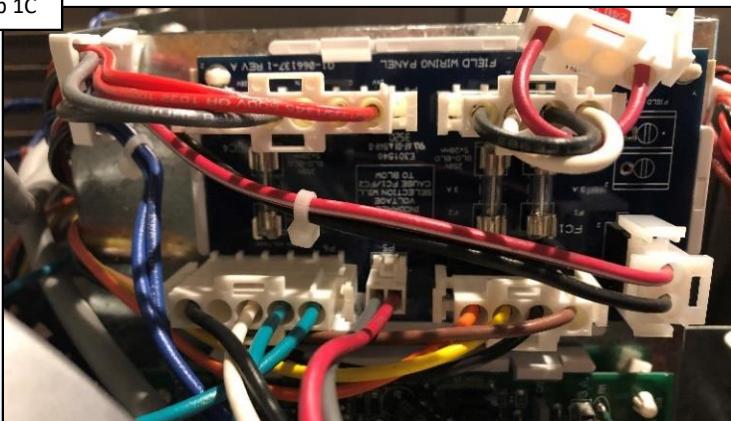
Step 1B



Verify selector plug matches incoming line power.  
IF it does not, power OFF & correct. IF OK, go to 1C.

## Inspect connections

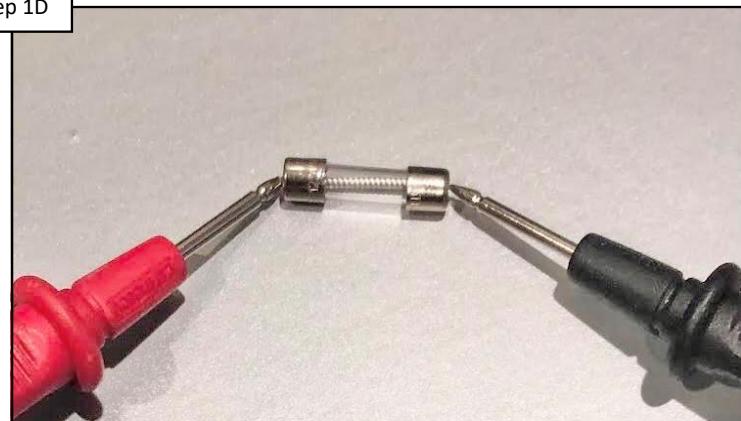
Step 1C



Inspect Field Wiring Panel, ensuring all plugs are securely fastened ([pg. 5](#)). IF correct, proceed to step 1D.

## Test Fuses

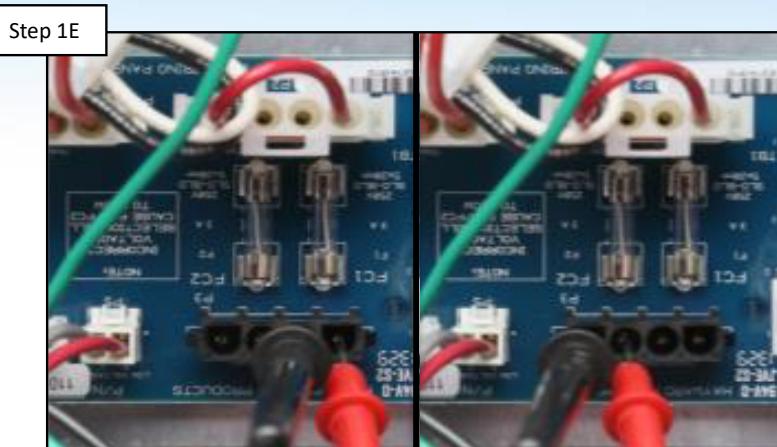
Step 1D



Verify that FC1 & FC2 fuses aren't blown. Replace all blown fuses & go to [Page 29](#). IF correct, go to step 1E.

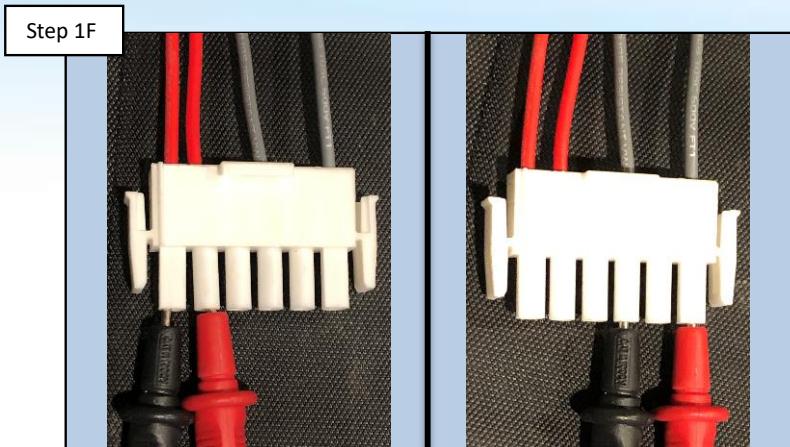
# 1. Heater Not Powering Up (cont.)

Test transformer input



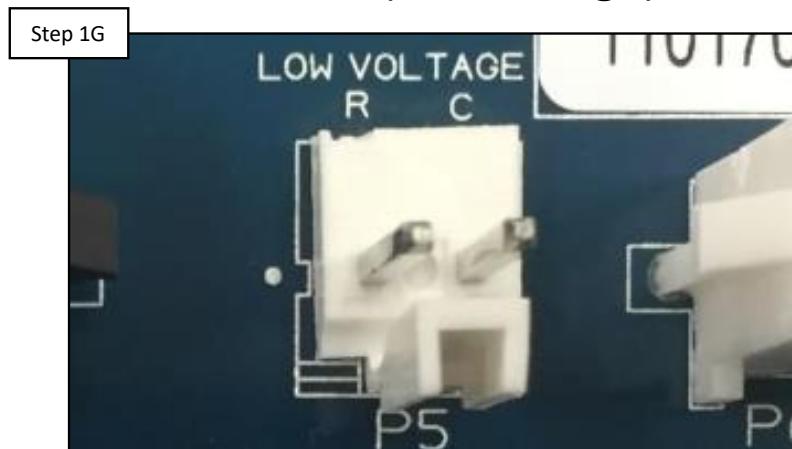
Disconnect the P3 plug from field wiring panel (FWP). Test 110-125VAC between pins 1&2 and 3&4 on the board. IF good, go to 1F. IF NOT, replace the field wiring panel ([pg. 25](#)).

Test transformer output



Disconnect P4 plug from FWP. Verify 22-28VAC between pins 1 & 2 (red wires), then 110-125VAC between pins 4-6 (grey wires). IF correct, go to 1G. IF incorrect replace transformer ([pg. 25](#)).

Test P5 (low voltage)



Disconnect the plug from P5 (on fuse board). Test 22-28VAC between R & C. IF no voltage, replace field wiring panel ([pg. 25](#)). If correct, go to step 1H.

# 1. Heater Not Powering Up (cont.)

## Inspect wiring

Step 1H



Inspect ICB wiring, ensuring all plugs are securely fastened. IF wiring is OK go to Step 1I. IF NOT, secure wiring/plugs then retest.

## Test F1 (3AMP) fuse

Step 1J



On the ICB, locate and test the 3A fuse for continuity. IF fuse is blown, replace it and go to [Page 30](#). IF Ok, go to step 1K.

## Test ICB input (low voltage)

Step 1I



Disconnect and test the red and grey wires from the ICB. IF 22-28VAC is present go to step 1J. IF NOT, replace wire harness ([pg. 25](#)).

## Test ICB's display output

Step 1K



On the ICB, verify 22-28VAC between AC & COM terminals (pins 1 & 4). IF voltage is present, replace display/bezel/keypad. IF no voltage, replace ICB ([pg. 25](#)).

## 2. Open FC1 &/or F2 Fuse

Verify voltage selector plug

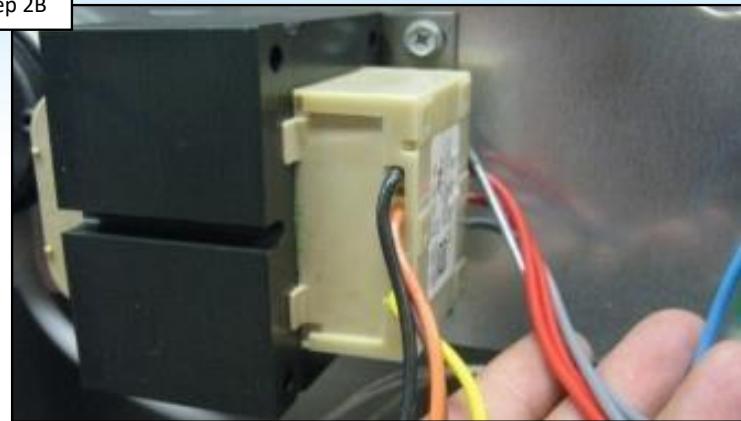
Step 2A



IF voltage selector plug matches voltage, go to step 2B. IF not, power down, replace FC1 & FC2 fuses, & switch plug to proper voltage.

Inspect transformer wiring

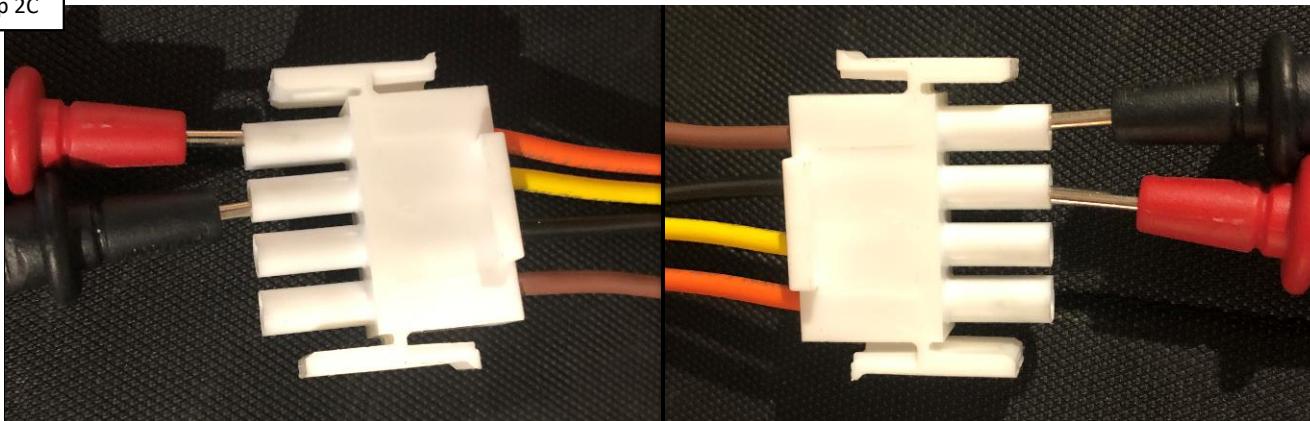
Step 2B



Inspect transformer wiring, ensuring the insulation on the wiring is not damaged. IF damaged replace transformer (pg. 25). IF OK go to 2C.

Test transformer resistance

Step 2C

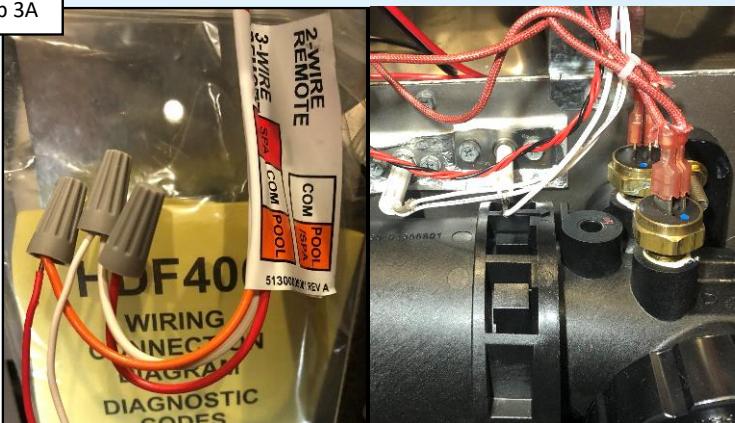


With power off, remove the P3 & P4 plugs. On the P3 plug measure resistance between the orange & yellow wires for 1.9 – 2.9 Ohms, then do the same between the black and brown wires. IF resistance is out-of-range, replace transformer (pg. 25). IF OK and problem still persists, contact technical support: (908) 355.7995.

# 3. Open F1 Fuse

Inspect connections/high limits

Step 3A



Power down and inspect all remote connections and high limit wiring for damage. IF damaged, repair/replace (pg. 25). IF OK, go to step 3B.

Inspect differential pressure switch

Step 3C



With power off, inspect the diff. pressure switch wiring for damage. IF damaged, replace the wire harness (pg. 25). IF OK, go to step 3D.

Inspect water pressure switch

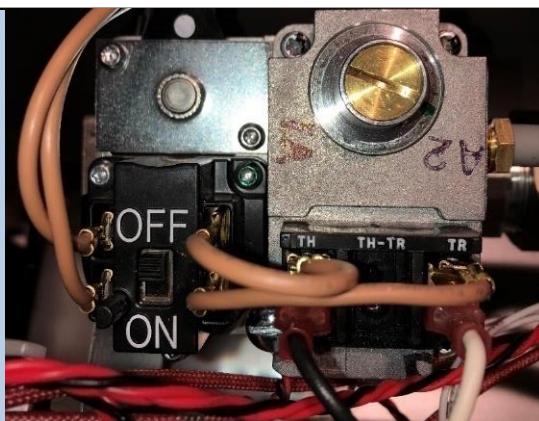
Step 3B



With power off, inspect the water pressure switch wiring for damage. IF damaged, replace the wire harness (pg. 25). IF OK, go to step 3C.

Inspect gas valve wiring

Step 3D



With power off, inspect the gas valve wiring for damage. IF damaged, replace the wire harness (pg. 25). IF OK, go to step 3E.

### 3. Open F1 Fuse (cont.)

*When testing the gas valve, if continuity appears between any wires and ground, then this implies a short has occurred and the gas valve will need to be replaced.*

Verify gas valve is not shorted

Step 3E



With power off, measure resistance, comparing each terminal to ground. IF any terminal shows continuity, replace the gas valve ([pg. 25](#)). IF OK, go to step 3F.

ICB wiring

Step 3F



Inspect ICB wiring. IF wiring is damaged, replace the wire harness with a new wire harness kit ([pg. 25](#)). IF OK and the problem still exists, replace the ICB ([pg. 25](#))

# 4. Open FC4 Fuse

## Ignitor and blower wiring

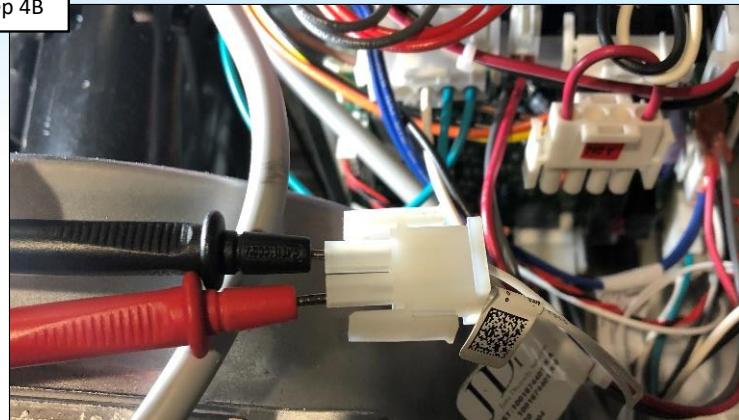
Step 4A



Inspect the Ignitor & Blower wiring. Verify insulation is not damaged. IF wires are damaged, replace the damaged part ([pg. 25](#)). IF OK, go to 4B.

## Verify ignitor resistance

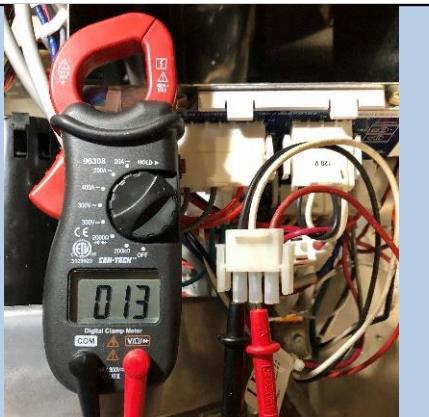
Step 4B



Disconnect ignitor from ICB & measure resistance of ignitor. Verify 8-25 ohms between 20°-140°F. IF correct, go to 4C. IF NOT, replace ignitor ([pg. 25](#)).

## Measure blower resistance

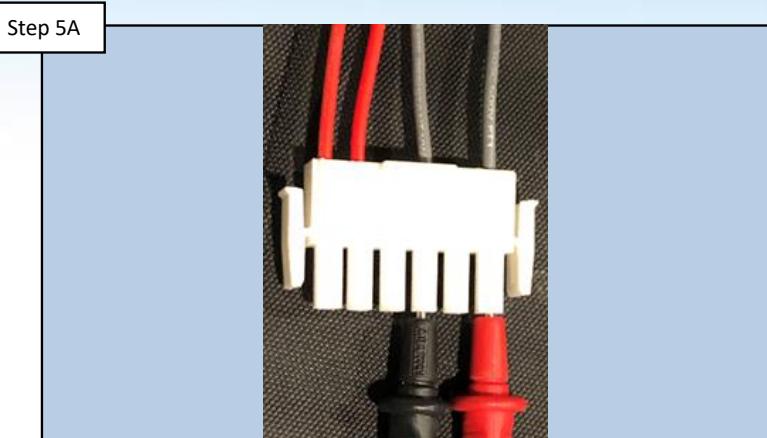
Step 4C



Measure for 13-18 ohms across the black and white (red wire not used) terminal wires. IF out-of-range, replace blower ([pg. 25](#)). IF correct, contact technical support (908)355-7995.

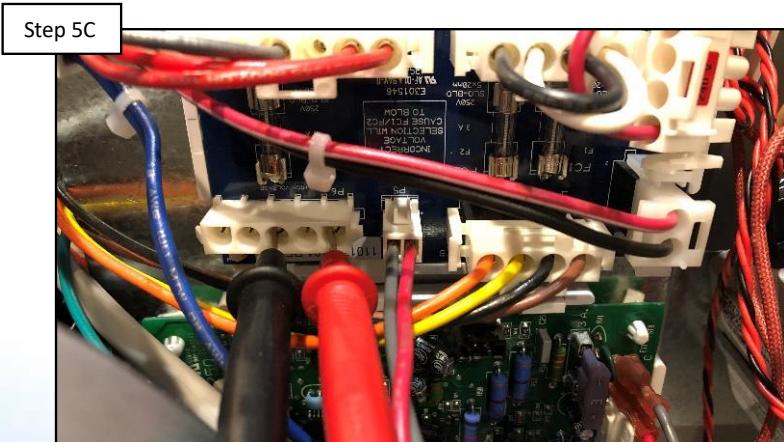
# 5. Service LED ON: 'BD' Code

Verify transformer output



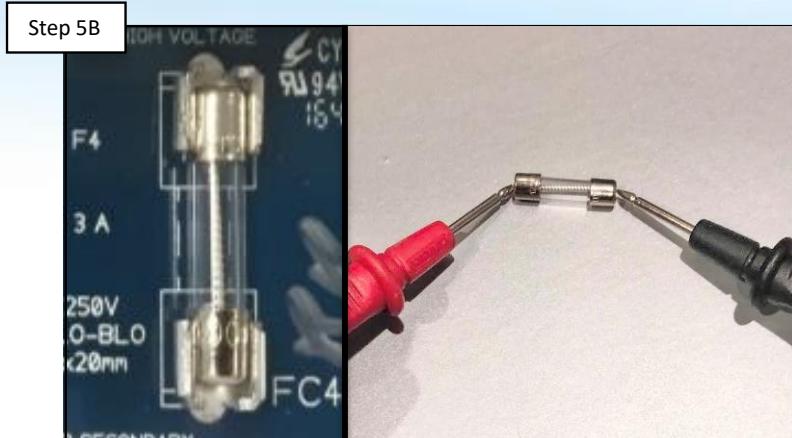
Disconnect P4 from fuse board. Verify 110-125VAC between 4-6 (grey wires). IF OK, replace fuse board. IF NOT, replace transformer (pg. 25).

Verify ICB output



Disconnect the P6 connector and test voltage for 110-125VAC between pins 3-5. IF no/low voltage, go to step 5D. IF correct, go to 5D.

Test the FC4 fuse (continuity)



With power off, verify the FC4 fuse has continuity. IF fuse is good, go to 5B. IF fuse is blown, go to Page 33.

Verify ICB input



Disconnect the E10 connector from ICB. Verify 110-125VAC between 1-3 (white & black). IF present, replace ICB. IF NOT, replace wire harness (pg. 25).

# 6. Service LED ON: “EE” OR “CE” Code

“EE” Code

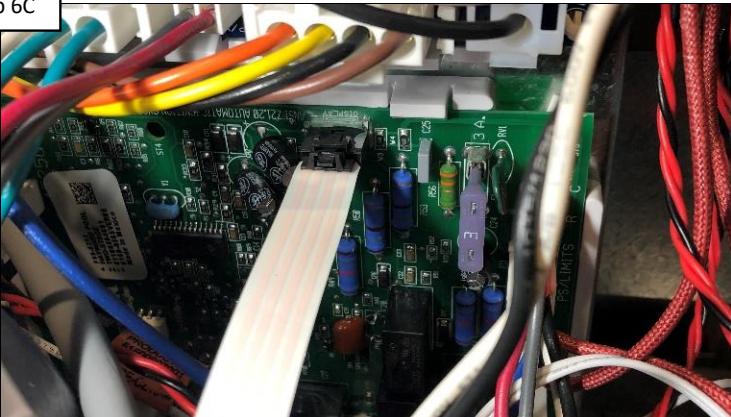
Step 6A



“EE” error indicates you have a defective ICB board. IF this error appears, replace ICB ([pg. 25](#)). IF no EE error, go to 6B.

Display board and ribbon cable

Step 6C



Verify ribbon cable is secure. IF cable is secure, replace display/bezel/keypad assy. ([pg. 25](#)) then go to 6D. IF NOT secured, reconnect.

“CE” Code

Step 6B



“CE” (communication error) indicates a problem between the ICB & display board. Cycle power OFF/ON. IF error persists, go to 6C.

Display board

Step 6D



IF after replacing display/bezel/keypad, “CE” error persists, replace ICB ([pg. 25](#)). IF replacing ICB fails to solve problem, contact support (908) 355-7995.

# 7. Service LED ON: “IO” OR “SB” Code

## “IO” Code

Step 7A



“IO” error indicates ignitor open. IF this error appears, go to step 7B. IF “IO” does not appear, go to step 7D.

## Ohm out ignitor

Step 7C



With power off, verify ignitor ohm resistance ( 8-25 ohms between 20°- 140°F). IF correct, replace ICB. IF out-of-range, replace ignitor ([pg. 25](#)).

## Inspect ignitor wires

Step 7B



Verify ignitor is securely attached to ICB. If OK, inspect wires for damage. If damaged/worn, replace ignitor ([pg. 25](#)) IF OK, go to step 7C.

## “SB” Code

Step 7D



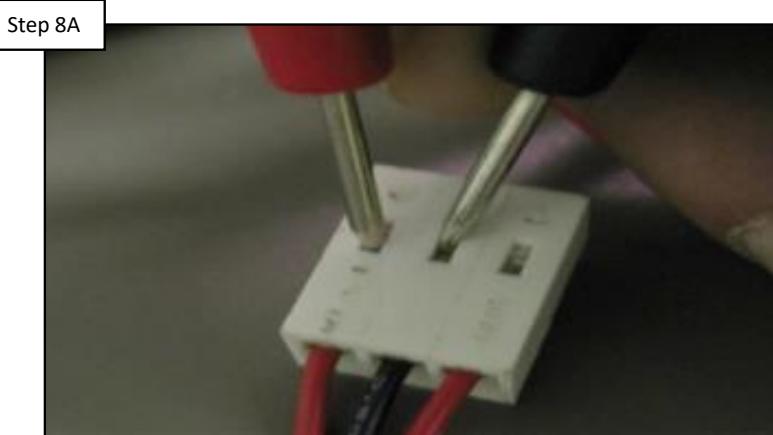
“Stuck Button” indicates display board is acting as if the button is being pressed and held. Replace display/bezel/key pad ([pg. 25](#)).

# 8. Service LED ON: “SF” OR “HS” Code

The “HS” (High Sense (water temperature)) will appear if the water sensor is reading above 105° OR if the sensor detects an increase of more than 6° with-in 60 seconds.

Verify the pump is running & adequate water is flowing through heater.

“SF” Code



The “SF” (Sensor Failure) indicates that the thermistor (or temp sensor) is reading out of range. Ohm temp sensor, checking each red to black. IF the two readings differ, replace thermistor. IF NOT, replace ICB ([pg. 25](#)).

“HS” Code



Verify the water inlet & outlet are not reversed; reversing plumbing will cause the “HS” error code. Follow the steps outlined in 8A. IF the thermistor is good, replace the ICB ([pg. 25](#)).

# 9. Service LED ON: “PF” Code

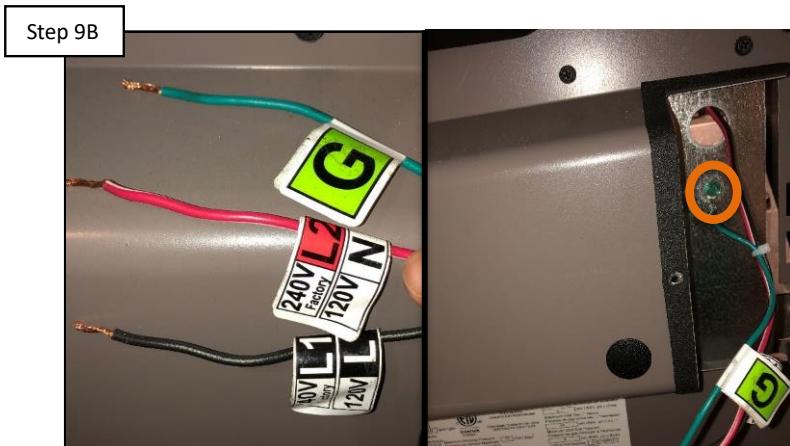
*“Polarity Failure” This code will display if low voltage is detected, if the ground path is not sufficient, or the ICB is defective. Reset is immediate after error is corrected.*

Verify incoming power



Ensure voltage is within 10% + or – of required voltage. IF voltage is correct, go to step 9B. IF NOT, then the problem is related to source power and must be corrected before error will clear.

Line voltage connections



Verify both neutral and ground connections (both internal and external) are clean and secured. IF ground and neutral connections check-out, then replace the ICB ([pg. 25](#)).

# 10. Service LED ON: “HF” Code

“HF” (heat or flame sensed) will occur if flame is sensed when the gas valve is off, the control will go into lockout. The blower will continuously run until corrected. When corrected, control will run blower for 5 seconds then restart heater after 2 minutes.

Power cycle heater



Power cycle the heater, in an attempt to clear the “HF” code. IF power cycling clears to the “HF” code and the heater fires, drop the temperature to suspend heating, IF “HF” reappears, go to step 10B.

Call for heat and test gas valve



Press the mode button to toggle the heater and call for heat. IF 24VAC is not present at gas valve AND manifold pressure is present, gas valve is defective and needs to be replaced. Otherwise, replace the ICB ([pg. 25](#)).

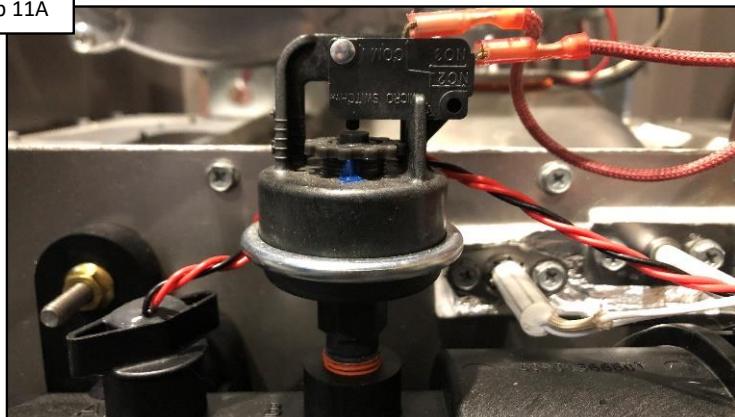
# 11. Service LED ON: “LO” Code

“LO” Code (Limit Open) may relate to water flow. Verify the pump is running & adequate water is flowing through heater.

“LO” is NORMAL when the pump is turned off or there is insufficient water flow.

Inspect water pressure switch

Step 11A



Inspect the water pressure switch wiring, ensuring wire harness terminals are securely fastened. IF damaged, replace wire harness (pg. 25). IF secure and free of damage, go to step 11B.

Voltage test

Step 11B



With filter pump running, take one lead from your multi-meter and place it on the terminal with the white wire on the gas valve, then Go To Step 11C.

# 11. Service LED ON: “LO” Code

“LO” Code (Limit Open) may relate to water flow. Verify the pump is running & adequate water is flowing through heater.

“LO” is NORMAL when the pump is turned off or there is insufficient water flow.

Test pressure switch voltage

Step 11C



Next take the other lead on your multi-meter and test for 24V AC on one of the terminals on the water pressure switch, then Go To Step 11D.

Test pressure switch voltage (cont.)

Step 11D

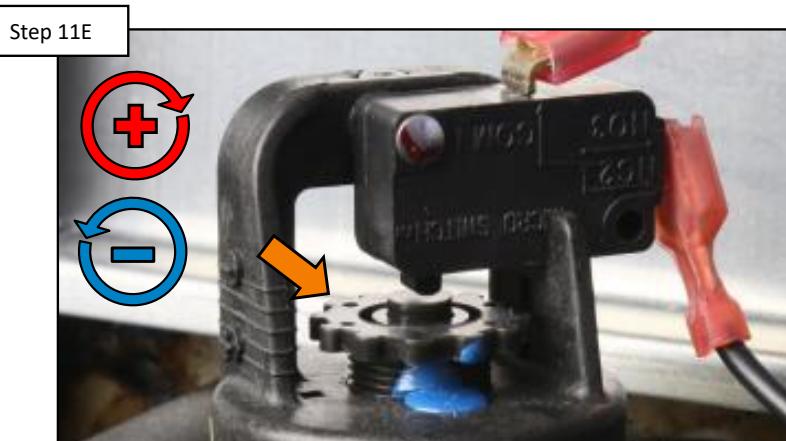


Test for 24V AC on the opposite terminal on the water pressure switch. IF no voltage, replace water pressure switch (pg. 25). IF OK, go to Step 11E.

# 11. Service LED ON: “LO” Code (cont.)

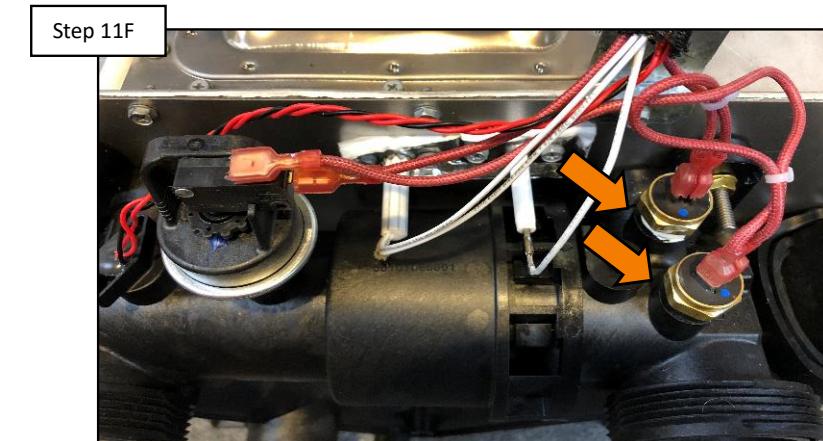
*The water pressure switch should not need adjusting, some sites may require a water pressure switch adjustment*

Pressure switch adjustment



If adjustment is required refer to the water pressure switch test/adjustment section in the I/O Manual. IF adjustment does not correct or was not required, go to 11F.

Inspect and test high limits

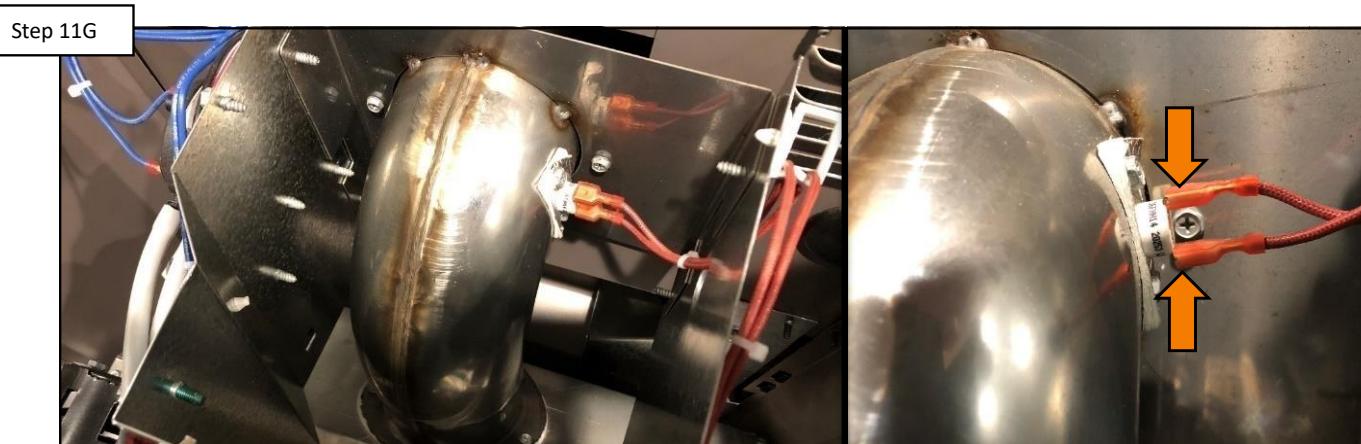


Inspect & test high limits. Verify continuity across the temperature limit switches. IF open or wire is damaged, replace (pg. 25). IF OK, go to 11G.

# 11. Service LED ON: “LO” Code (cont.)

*Note: This exhaust gas limit switch is a one time safety. Once the switch has tripped then it NEEDS to be replaced and the combustion chamber should be inspected for soot or damage.*

Indoor/Outdoor



With one meter lead on the gas valve white wire (page 40, Step 11B), take other meter lead and test for 24V AC across both terminals on the exhaust gas limit switch. IF no voltage is present, replace switch (pg. 25). IF problem still persists, contact support: (908) 355-7995

# 12. Service LED ON: “IF” Code

Inspect main gas supply

Step 12A



IF “Ignition Failure”, Ensure main gas supply is in the ON position. IF ON, go to step 12B. IF NOT, open gas supply.

Verify gas valve is ON

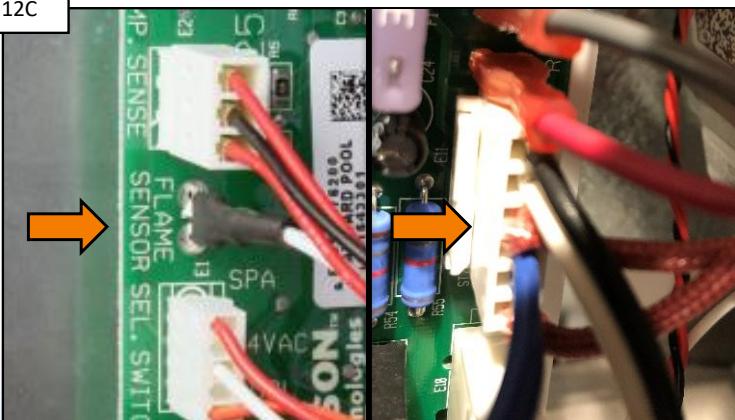
Step 12B



Verify that the gas valve, inside the heater, is in the “ON” position. IF correct, go to step 12C. IF NOT, slide switch to “ON” position.

Flame sensor & gas valve

Step 12C



Ensure both flame sensor and gas valve are both securely fastened to the ICB. IF correct, proceed to step 12D. IF NOT, fasten securely.

Verify gas pressure

Step 12D

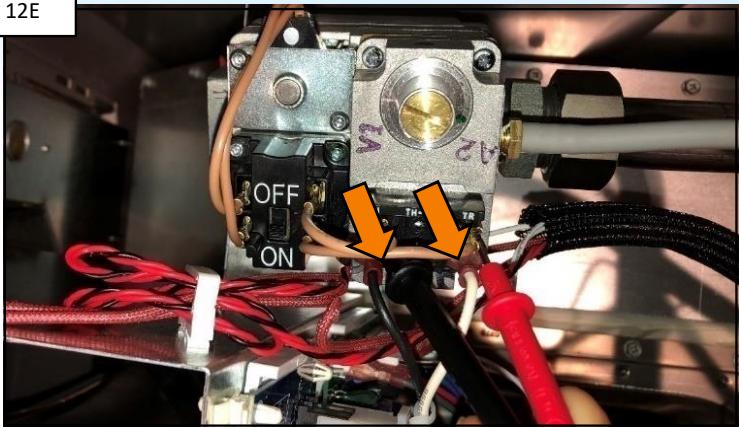


Ensure gas static, load, and manifold pressures are correct ([Pg. 13](#)). IF OK, go to Step 12E. IF NOT, go to Step 12F.

# 12. Service LED ON: “IF” Code (cont.)

## Voltage/pressure off gas valve

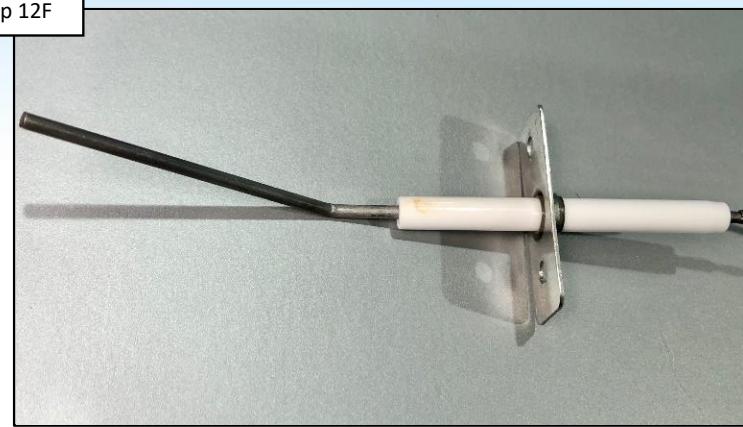
Step 12E



Verify 22-28VAC on gas valve (black & white wires) during ignition trial. IF present & no pressure (manometer attached), replace valve. Otherwise, replace ICB ([pg. 25](#)).

## Verify correct flame sensor

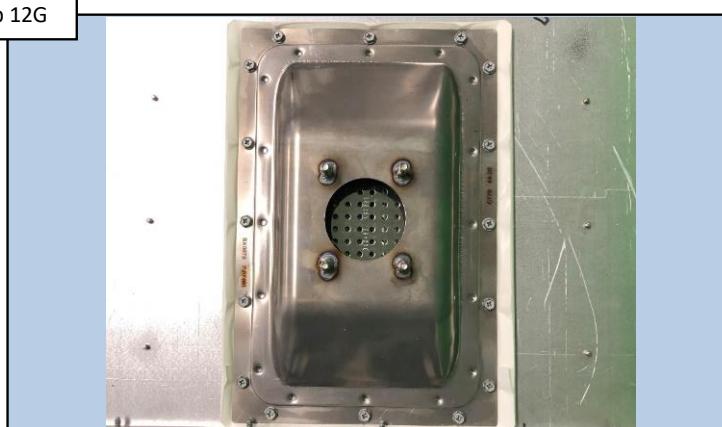
Step 12F



Verify that the installed flame sensor is clean and free of any damage, if flame sensor is damaged replace ([pg. 25](#)). IF good, go to step 12G.

## Inspect burner

Step 12G



Inspect burner for cleanliness. Clean as required ([pg. 15](#)). IF damaged, replace ([pg. 25](#)). IF NOT damaged, contact tech support (908) 355-7995.

# 13. Service LED ON: “AC” Code

“AC” Code stands for “Air Switch Closed”. The differential pressure switch is closed, when it was expected to be open.

Verify blower operation



With the heater off (in “Stand By”), IF the blower continues to run/operate, replace the ICB (pg. 25).  
IF blower cuts off, go to Step 13B.

Test differential pressure switch



Isolate the diff. pressure switch. Measure continuity between switch terminals. IF continuity exist, replace the blower vacuum switch (pg. 25).

## 14. Service LED ON: “A1, A2, & A3” Code

*“A1” Code stands for “Air switch circuit open before ignitor warm up”. Differential Pressure Switch (DPS) open when expected closed. The switch circuit never closed when the blower turned on or re-opened within 10 seconds of blower starting.*

*“A2” Code stands for “Air switch open after ignitor warm up”. Differential Pressure Switch (DPS) open when expected closed. The switch opened during the heating cycle.*

*“A3” Code stands for “Air switch open during post purge”. Differential Pressure Switch (DPS) open when expected closed. The switch opened after heating cycle ended but before the post purge time (30 sec.) completed.*

# 14. Service LED ON: “A1, A2, & A3” Code (cont.)

## Verify voltage selector plug

Step 14A



Verify selector plug matches incoming line power.  
IF it does not, power OFF & correct. IF OK, go to  
Step 14B.

## Check blower tubing

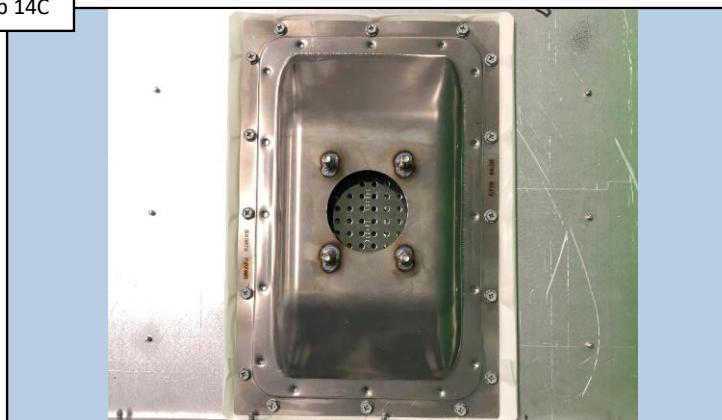
Step 14B



Check blower tubing for damage/loose fit. IF  
damaged, replace tubing ([pg. 25](#)). IF correct, go to  
Step 14C.

## Verify burner is clear

Step 14C



Verify burner is clean and not damaged. If dirty  
clean ([pg. 15](#)). damaged replace ([pg. 25](#)). IF OK, go  
to Step 14E.

# 14. Service LED ON: “A1, A2, & A3” Code (cont.)

Test blower

Step 14D



Test the blower for the proper resistance. Measure for 3-5 ohms across red and white terminal wires. IF out-of-range, replace blower (pg. 25). IF OK, go to Step 14F.

Test differential pressure switch

Step 14E



Verify diff. pressure switch is open when blower is off, turn heater on and check to see if dps switch closes. IF NOT, replace switch. IF problem persists, contact Technical Support at (908) 355-7995.

# 15. Service LED ON: “b1” Code

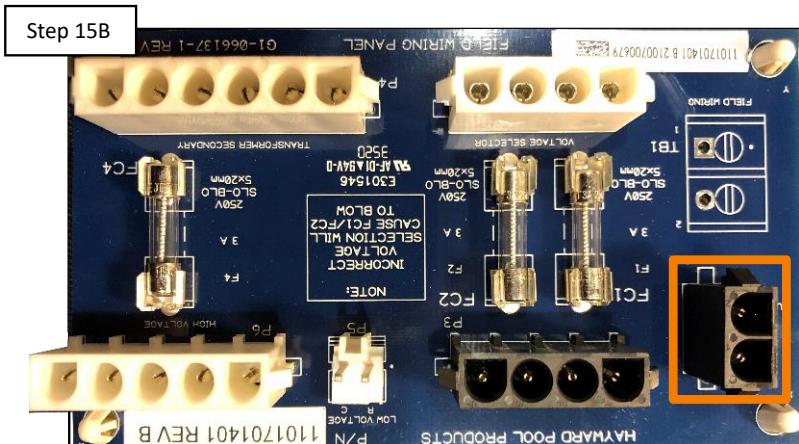
“b1” Code stands for “Ignition Control Board (ICB) data error”. If the ICB does not satisfy self-diagnostic on power up or initial trial for ignition, the ICB will lock out until error condition is corrected.

Power cycle heater



Power cycle the heater, in an attempt to clear the “b1” code. IF power cycling clears to the “b1” code and heater fires, drop temperature to suspend heating. IF “b1” reappears, go to step 15B.

Test incoming power

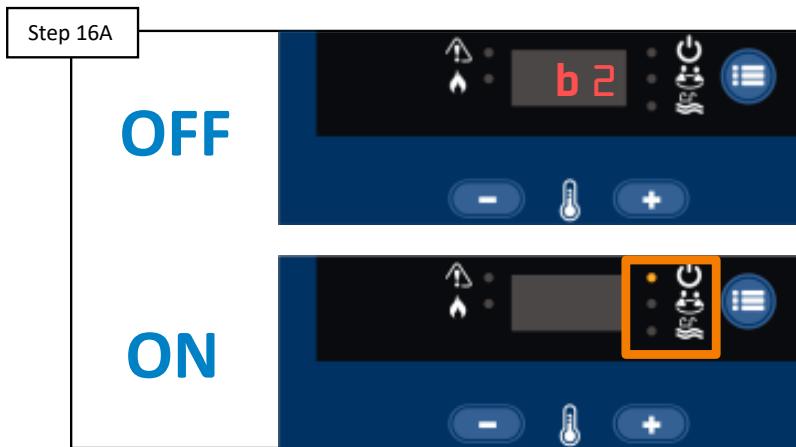


Unplug the wire harness from the P1 terminal and test voltage on the harness (115VAC or 230VAC). IF incoming voltage is out of range (+/-10%), correct incoming voltage. Otherwise, replace the ICB (pg. 25).

# 16. Service LED ON: “b2” Code

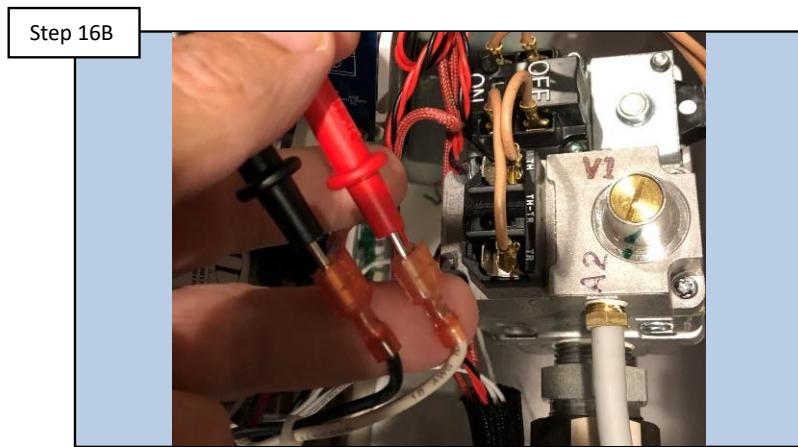
“b2” Code stands for “Gas valve sensed as “ON” error. If gas valve is powered when it should be off, the heater will shut down and go into lock out. The blower will operate until error condition is corrected.

Power cycle heater



Power cycle heater, in an attempt to clear the “b2” code. IF power cycling clears to the “b2” message and the heater fires, drop the temperature to suspend heating. IF “b2” reappears, go to step 16B.

Call for heat and test gas valve



With heater in standby mode, test for 24VAC on the gas valve (black & white wires), IF 24VAC is present, replace gas valve (pg. 25). Otherwise, replace the ICB (pg. 25).

# 17. Service LED ON: “b3” Code

“b3” Code stands for “Gas valve sensed as “OFF” error. If gas valve is unpowered but flame is sensed, the blower will run for 5 seconds then start a new ignition sequence. If error occurs 10 times during a call for heat, the ICB will go into lockout.

Power cycle heater



Power cycle heater, in an attempt to clear the “b3” code. IF power cycling clears to the “b3” message and the heater fires, drop the temperature to suspend heating. IF “b3” reappears, go to step 17B.

Call for heat and test gas valve



With heater in standby mode, test for 24VAC on the gas valve (black & white wires), IF 24VAC is present, replace gas valve ([pg. 25](#)). Otherwise, replace the ICB ([pg. 25](#)).

# 18. Service LED ON: “b4” Code

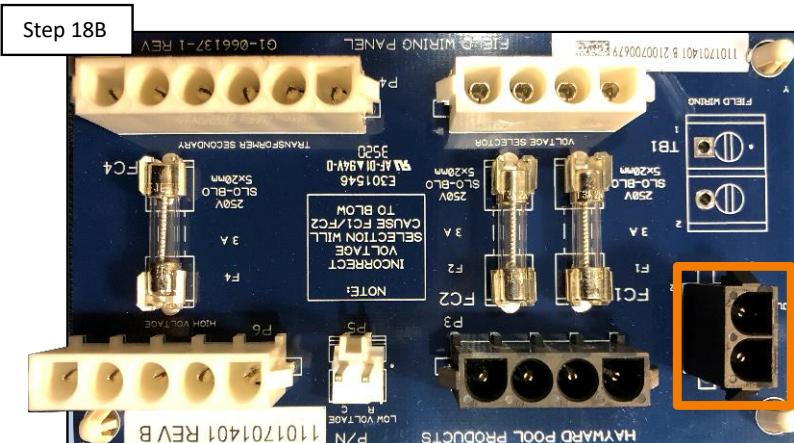
“b4” Code stands for “data retrieval error”. If input data values are corrupted on power up or initial trial for ignition, the ICB will lockout until error condition is corrected.

Power cycle heater



Power cycle heater, in an attempt to clear the “b4” code. IF power cycling clears to the “b4” message and the heater fires, drop the temperature to suspend heating. IF “b4” reappears, go to step 18B.

Test incoming power



Unplug the wire harness from the P1 terminal and test voltage on the harness (115VAC or 230VAC). IF incoming voltage is out of range (+/-10%), repair incoming voltage. Otherwise, replace the ICB (pg. 25).