



Universal H Series Heaters

Troubleshooting Guide



HxxxFD(N/P)



HxxxFD(N/P)ASME

Safety Precautions



High Voltage Electrocutation Hazard

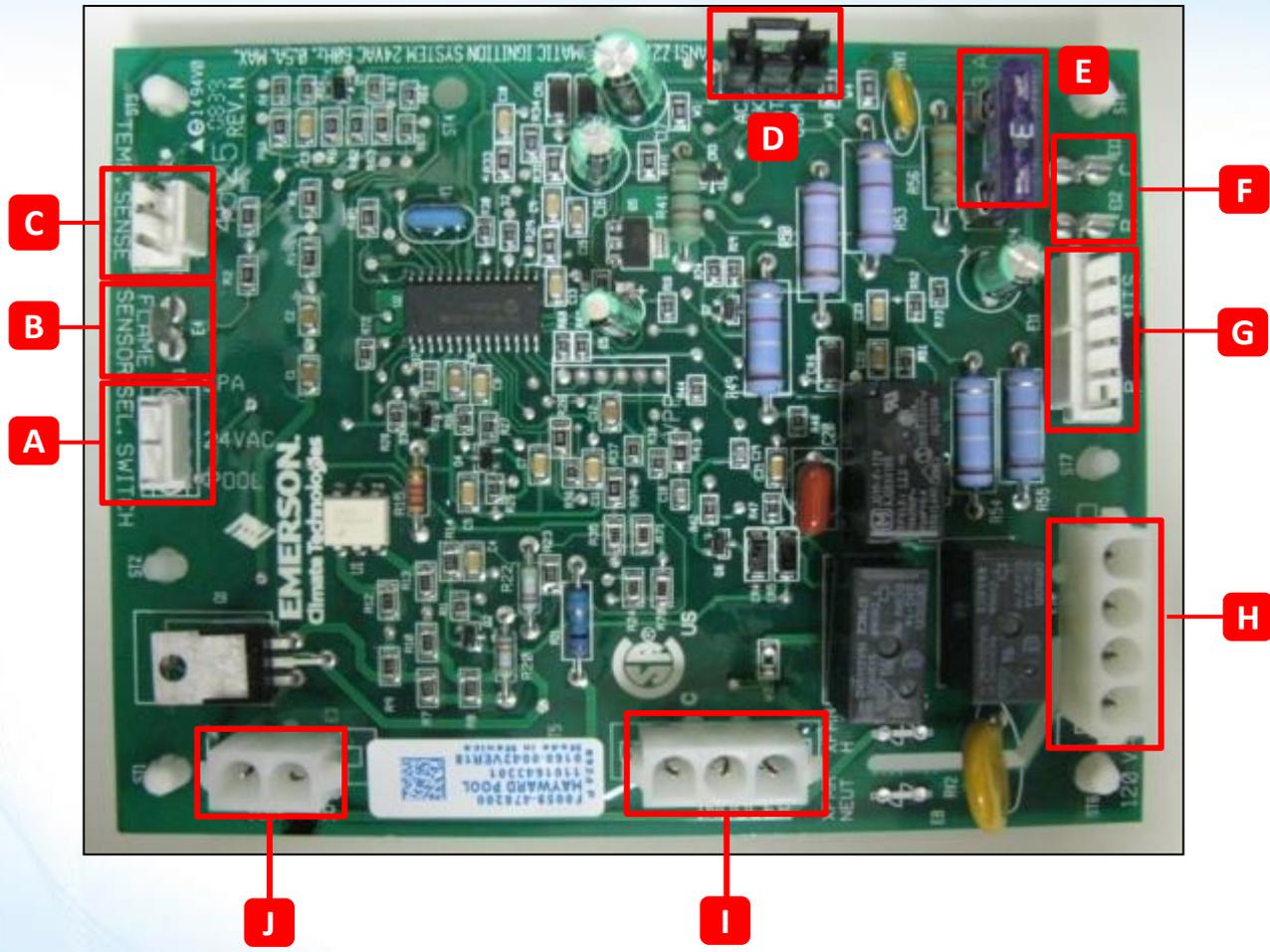
Hazardous voltage can shock, burn, cause serious injury and or death. To reduce the risk of electrocution and or electric shock hazards:

- Only qualified technicians should remove the panel
- Replace damaged wiring immediately
- Insure panel is properly grounded and bonded

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Integrated Control Board Layout (ICB)

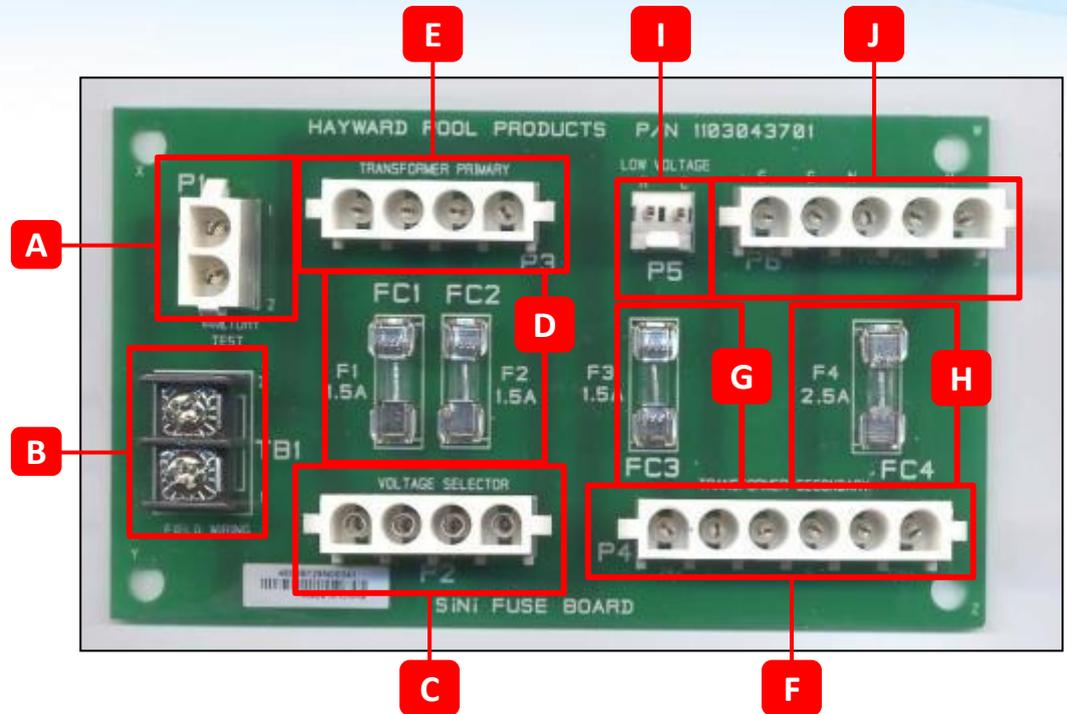


A	Remote Control: 24 <u>VAC</u> (E1)
B	Flame Sensor (E4)
C	Temperature Sensor (E2)
D	Display Output: 24 <u>VAC</u> (E7)
E	3A Fuse (F1)
F	Low Voltage R & C: 24 <u>VAC</u> (E12, E13)
G	Gas Valve & Safety Switches: 24 <u>VAC</u> (E11)
H	High Voltage: 120 <u>VAC</u> (E10)
I	Blower/Inducer (E6)
J	Ignitor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

Fuse Circuit Board Layout

Fuse board configuration Prior to November 2010 (Older Style)

A	Power connection for junction boxes: 120/240VAC (P1) After Aug 08
B	Terminal block for field wiring connections: 120/240VAC (TB1) Before Aug 08 Input
C	Voltage Selector 240 OR 120VAC determined by plug (P2): NOTE: 240VAC plug factory installed
D	Fuse: 3A protect primary input voltage, will fail with excessive voltage, improper wiring, shorted transformer or fuse board (FC1 & FC2)
E	Transformer Primary: 120/240VAC (P3)
F	Transformer Secondary: 24 (left) & 120VAC (right) (P4)
G	Fuse: 1.5A protects transformer secondary, will fail if short occurs between fuse & ICB (FC3)
H	Fuse: 2.5A protects transformer high voltage secondary, will fail with blower, ignitor or ICB failure (FC4)
I	Low Voltage Output: 24VAC (P5)
J	High Voltage Output: 120VAC (P6)



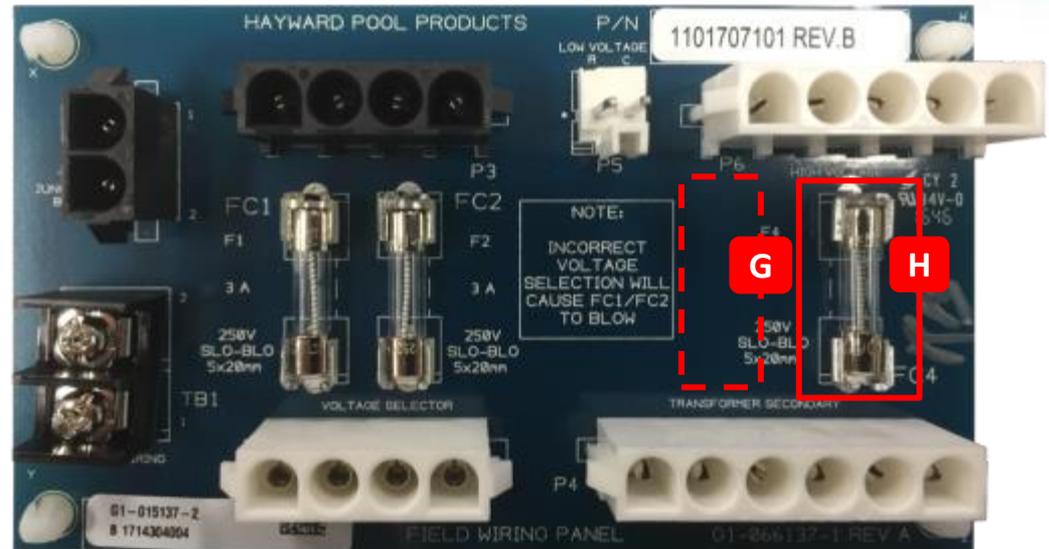
Fuse Circuit Board Layout

Fuse board configuration as of November 2010 (Newer Style)

Changes compared to older style fuse board:

G Fuse: (FC3) has been removed, since the F1 fuse was added to the ICB

H Fuse: (FC4) is now a 3A fuse, matching the FC1 & FC2



**NOTE: Fuses located on THIS board are all 250v SLO-BLO 5 x 20 mm.
Hayward Part # FDXLFSK19F30 (Qty. 10)**

UHS 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:

1. The control checks for open blower vacuum switch
2. Blower starts pre-purge cycle as the ignitor heats up (20 Sec).
3. The control checks for a closed blower vacuum switch.
4. At proper ignitor temp, a 4 second trial begins. Gas valve opens and monitors flame sense. The blower will turn off for one second. The ignitor is de-energized at flame sense or at completion of 4 sec trial. If the flame is sensed, The blower vacuum switch, control loop, temp sensor & flame sensor are constantly monitored during call for heat.
5. When set temp is reached, the control ends the call for heat. The gas valve is de-energized, and the flame is extinguished.
6. The blower will operate for a 30 second post purge.

NOTE: If during step four, the heater fails to fire, please proceed to the next page for more details outlining failure to light operations.

UHS Sequence of Operation: Failure to Light

If trial fails:

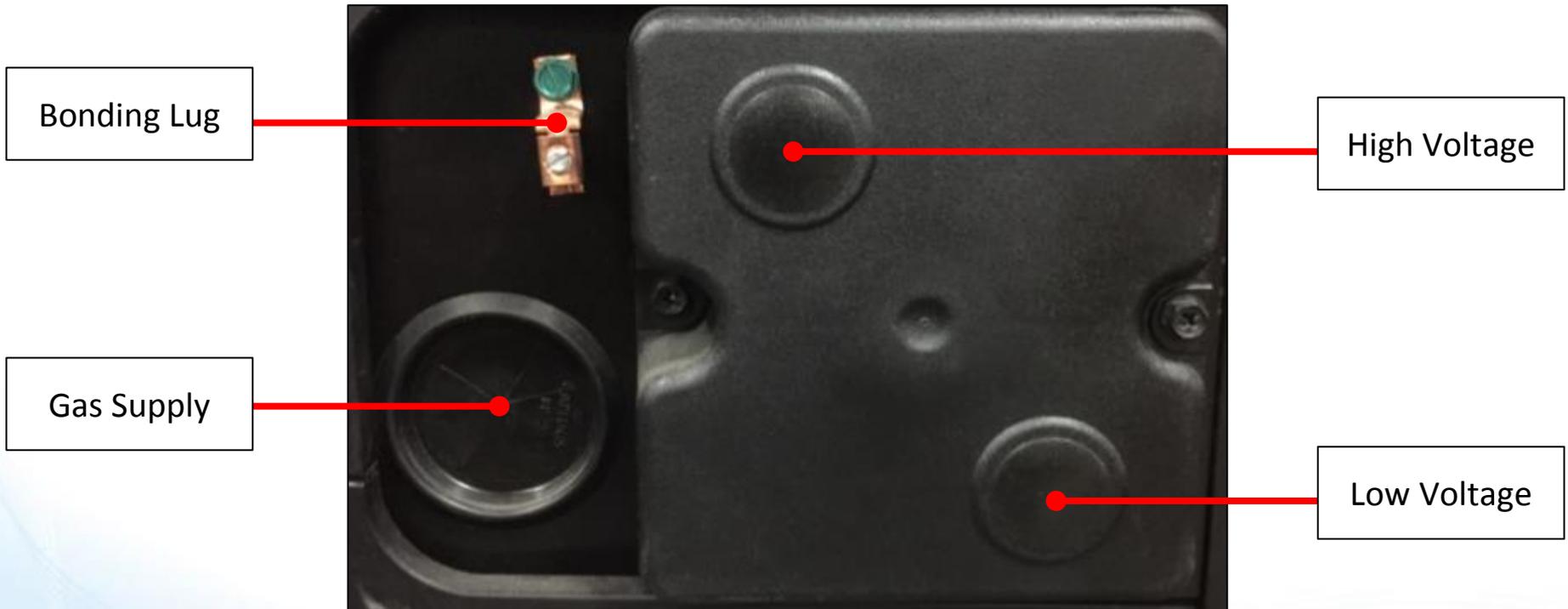
1. Gas valve de-energizes (for 30 second, blower post purge).
2. Starts over at #2 of heating mode sequence.
3. Retries 3 times until lockout (IF code).
4. Waits 60 minutes then retries 3 more times.
5. Will continue to retry every 60 minutes, until demand for heat is stopped.

NOTE: When making keypad entries of any type there may be a 5-10 sec delay for certain situations.

UHS Electrical & Gas Connection

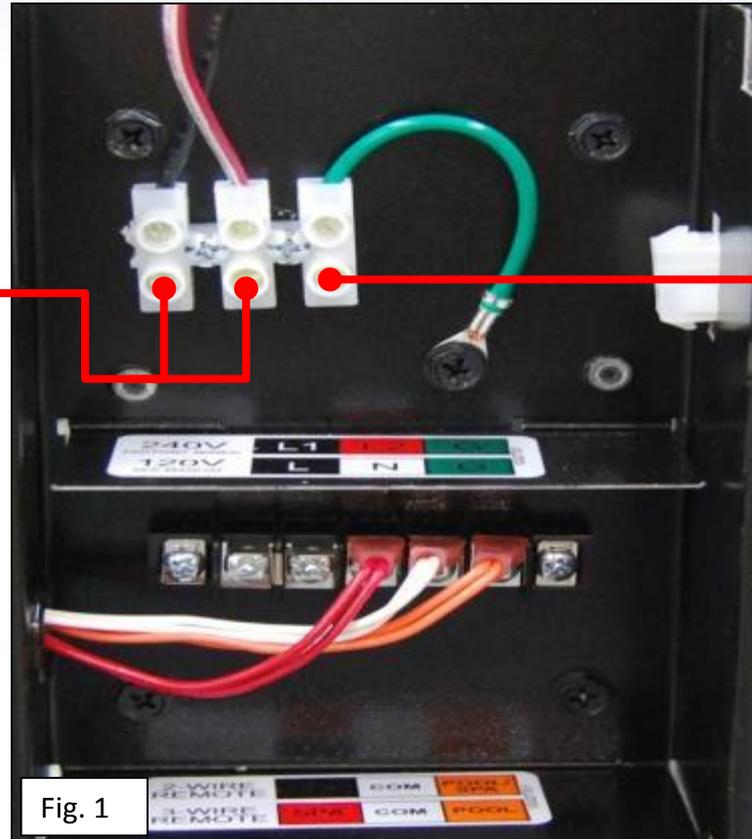
Electrical & Gas connections as of September of 2008 (Newer Style)

Connections located on both the left & right side of heater cabinet



Electrical & Control Connections (cont.)

Electrical connections as of September of 2008 (Newer Style)



120VAC or 240VAC
Connection

240V FACTORY WIRE	L1	L2	G
120V SEE MANUAL	L	N	G

Ground connection

Three Wire Remote Connection:

Orange (Pool),
White (24V), & Red
(Spa).

Two Wire Remote Connection:

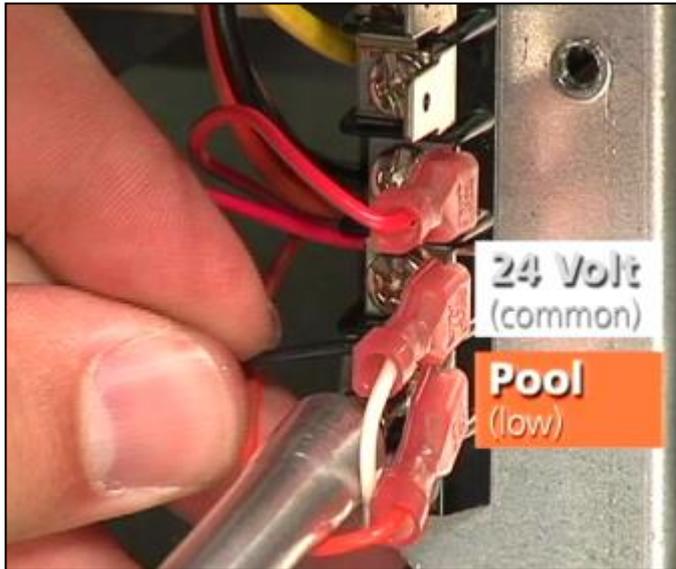
Orange (Pool) and
White (Common)

2-WIRE REMOTE	COM	POOL/ SPA	
3-WIRE REMOTE	SPA	COM	POOL

Electrical & Control Connections (cont.)

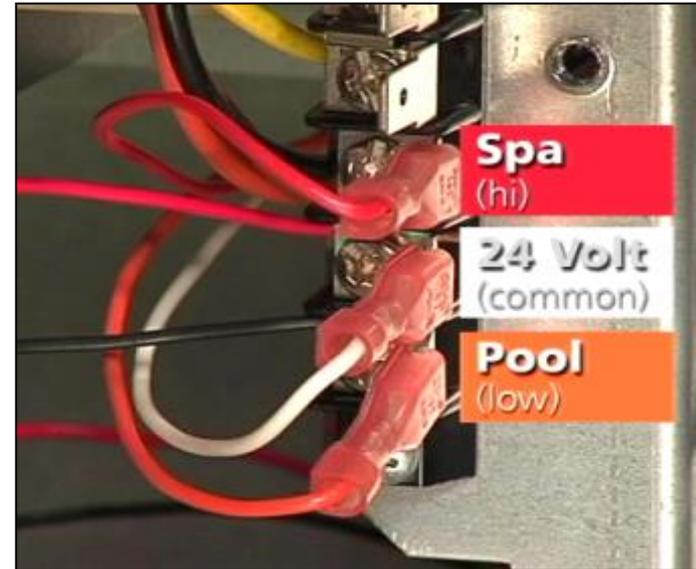
Electrical connections prior to September of 2008 (Older Style)

Two wire hook-up



Orange (Pool) & White (24VAC, Common)

Three wire hook-up



Orange (Pool), White (24VAC, Common), & Red (Spa)

NOTE: Control hookup located outside control box.



Universal H Series Heaters[®]

How To:



How To: Program Heater Bypass Operation

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

Step 1



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

Step 2



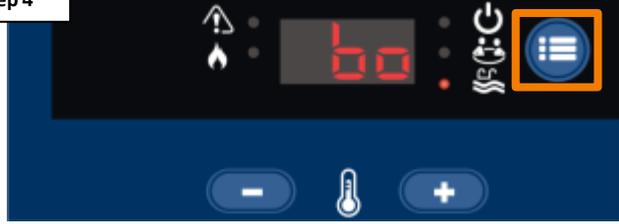
Press and hold the minus button and 'MENU ICON' button for 3 seconds.

Step 3



'bo' should appear on the display when the heater has successfully entered bypass mode.

Step 4



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

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

How To: Program Temperature Lock-Out

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

Step 1



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

Step 2



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

Step 3



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

Step 4



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

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

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

This feature is available on heaters manufactured after February 25th 2011.



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'.

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

How To: Test/Adjust Gas Pressure

Measure the inlet static pressure (valve off) & load pressure (valve on / energized).

Step 1



The static & load values should be within the levels listed on the data plate, example on [Page 17](#).

Measure the outlet manifold pressure (valve on / energized), as shown below.

Step 2



Manifold reading should be between 1.8" - 2.0" w.c for natural Gas or 6.8" - 7.0" w.c for propane.

NOTE: Please refer to Installation Manual for proper gas line sizing.



Universal H Series Heaters[®]

Troubleshooting:



Diagnostic Codes

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

Diagnostic Code	Description
AC	Blower Vacuum Switch closed
AO	Blower Vacuum Switch open
BD	Bad board or secondary high voltage fault
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

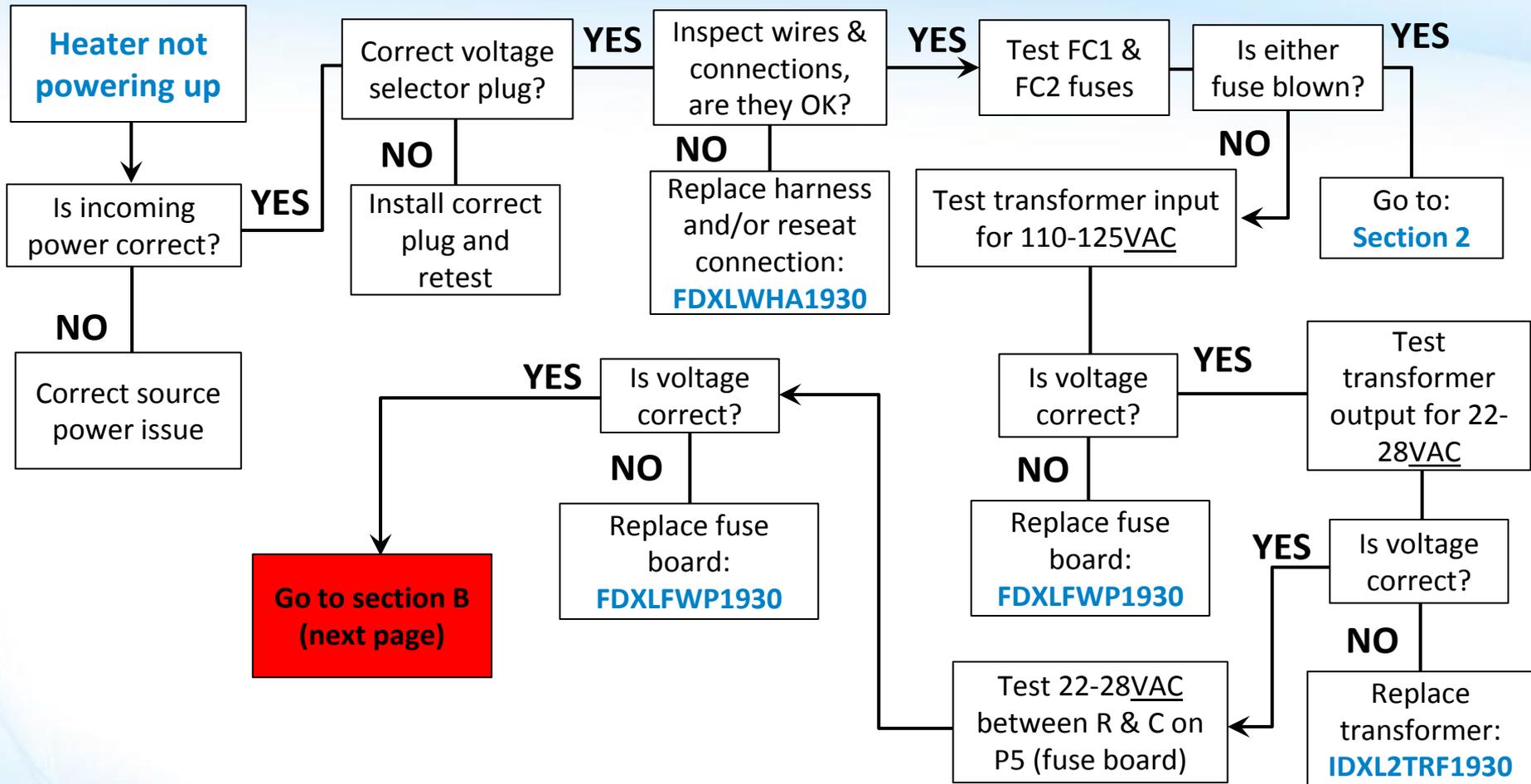
Troubleshooting Part Numbers

The following outlines the various replacement parts required for this troubleshooting guide.

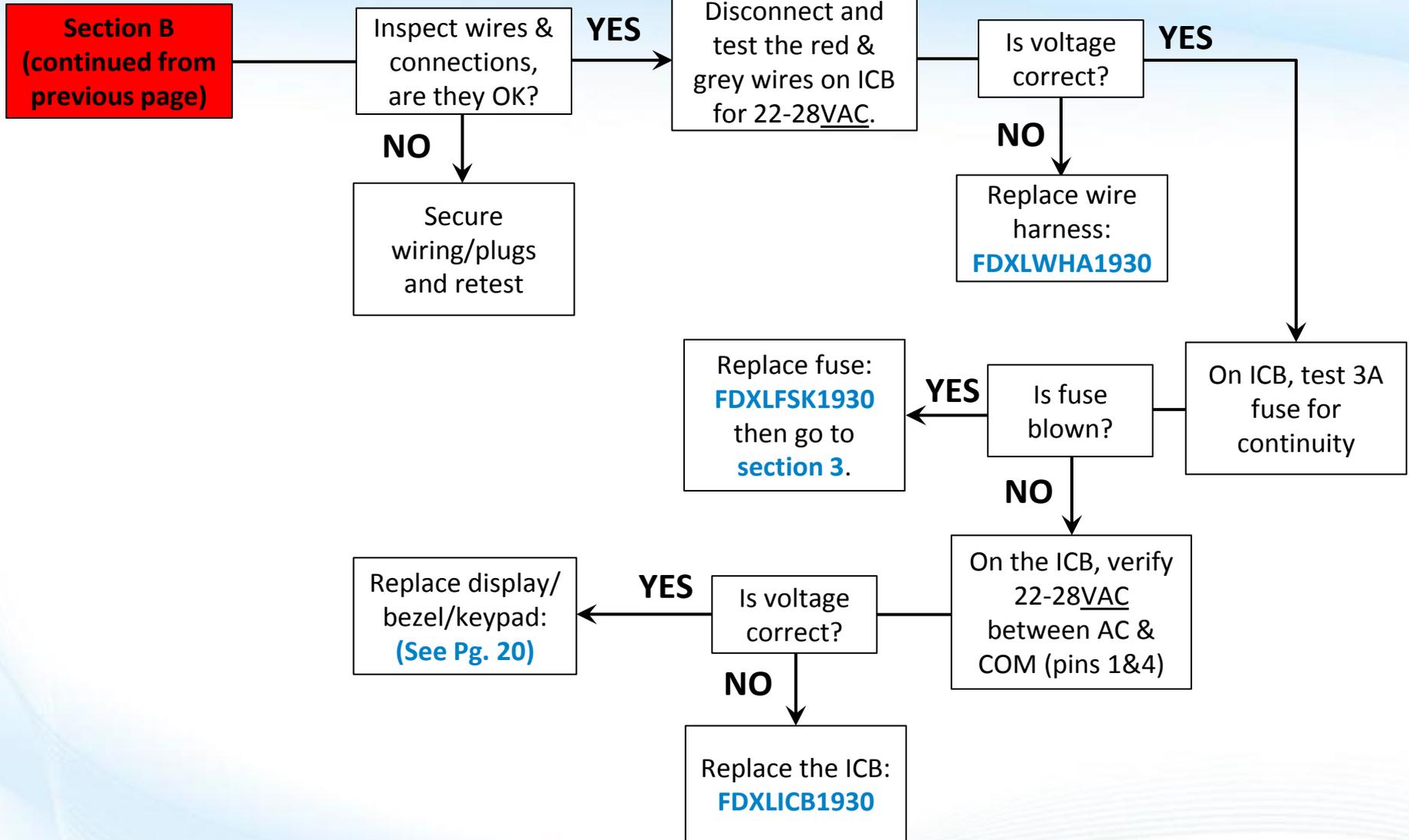
*** Heaters made prior to 07/16 that want the new display/bezel/keypad, will need to replace the old display with the Kit-Bezel Control Panel specific to their model heater.**

Part Number: (H150-H400)	Part Number: (H500)	Description	Part Number: (H150-H400)	Part Number: (H500)	Description
IDXL2TRF1930	IDXL2TRF1930	Transformer	FDXLBWR1930	FDXLBWR1500	Blower
FDXLFWP1930	FDXLFWP1930	Fuse Board (field wiring panel)	FDXLIGN1930	FDXLIGN1930	Ignitor
FDXLWHA1930	FDXLWHA1930	Wiring Harness Kit (complete)	FDXLTER1930	FDXLTER1930	Thermistor (temperature sensor)
FDXLICB1930	FDXLICB1930	ICB (integrated control board)	IDXL2SNT1930	IDXL2SNT1930	Combustion Blower Tube Kit
IDXL2DB1930	IDXL2DB1930	Prior 07/16 -Display Board (only)	FDXLEGL1931	FDXLEGL1931	Exhaust Gas Limit Switch
FDXLBKP1930	FDXLBKP1930	Prior 07/16 -Bezel/Keypad Assy.	FDXLHLI1930	FDXLHLI1930	High Limit Kit (temperature limits)
*FDXLBKP1932	*FDXLBKP1932	Display/Bezel/Keypad Assy.	IDXLFLS1930	IDXLFLS1930	Flame Sensor (3" & 5")
FDXLBCP1150		Kit-Bezel Control Panel 150	FDXLFSK1930	FDXLFSK1930	Fuse Kit
FDXLBCP1200		Kit-Bezel Control Panel 200	FDXLWPS1930	FDXLWPS1930	Water Pressure Switch
FDXLBCP1250		Kit-Bezel Control Panel 250	FDXLBVS1930	FDXLBVS1930	Blower Vacuum Switch
FDXLBCP1300		Kit-Bezel Control Panel 300	FDXLBRN1930	FDXLBRN1930	Burner Kit
FDXLBCP1350		Kit-Bezel Control Panel 350	*FDXLGSV0001	FDXLGSV1500N	Gas Valve (Natural Gas)
FDXLBCP1400		Kit-Bezel Control Panel 400	FDXLGSV002	FDXLGSV1500P	Gas Valve (Propane)
	FDXLBCP1500	Kit-Bezel Control Panel 500	FDXLVPS1930	FDXLVPS1930	Vent Pressure Switch

1. Heater Not Powering Up



1. Heater Not Powering Up (cont.)



1. Heater Not Powering Up

Verify heater manufacture date

Step 1A



For models manufactured prior to August of 2008, proceed to step 1B. IF model is later, go to 1C.

Verify input power

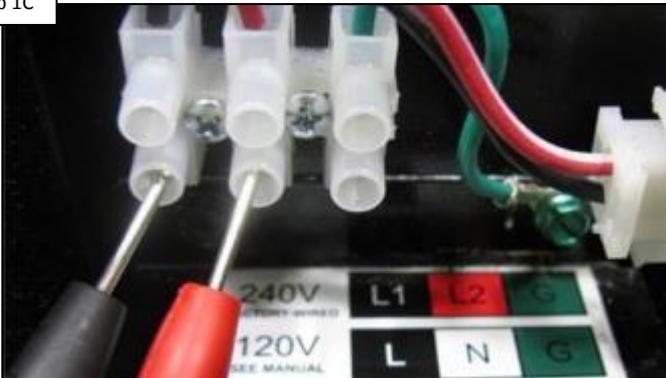
Step 1B



Verify 110-125 or 220-245V_{AC} off fuse board (TB1). IF correct, go to 1D. IF NOT, correct source power.

Models after August 2008

Step 1C



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

Voltage selector plug

Step 1D



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

1. Heater Not Powering Up (cont.)

Inspect connections

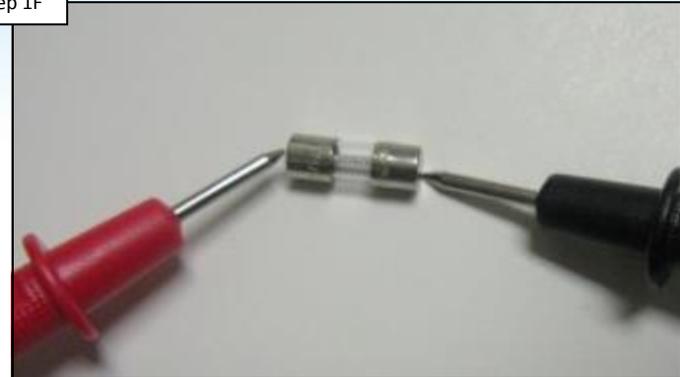
Step 1E



Inspect Fuse Board wiring, ensuring all plugs are securely fastened. IF correct, proceed to step 1F.

Test Fuses

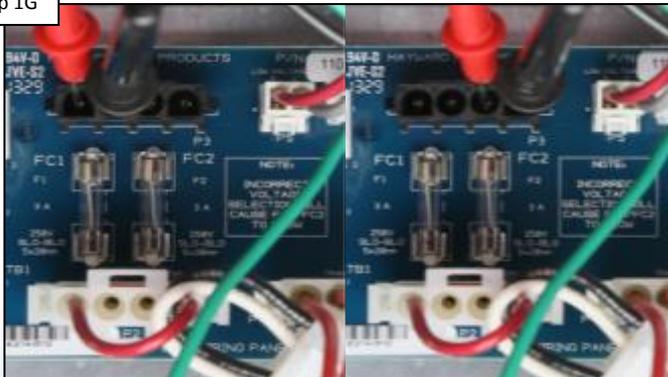
Step 1F



Verify that FC1 & FC2 fuses aren't open. Replace all open fuses & go to [section 2](#). IF correct, go to 1G.

Test transformer input

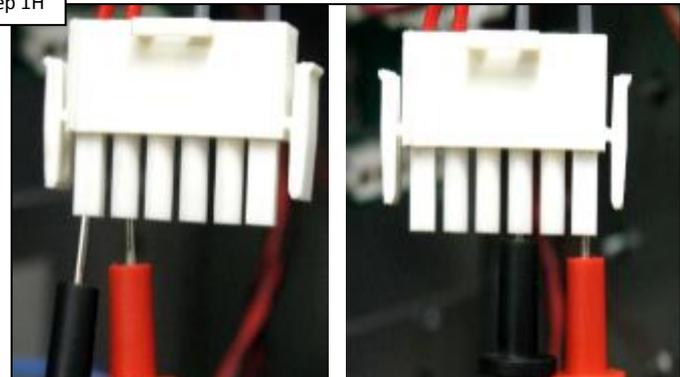
Step 1G



Disconnect the P3 plug from the fuse board. Test 110-125VAC between pins 1&2 and 3&4 on the board. IF good, go to 1H. IF NOT, replace the Fuse board ([pg. 20](#)).

Test transformer output

Step 1H

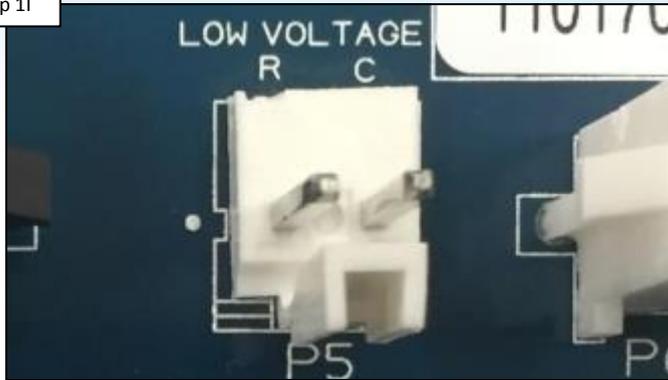


Disconnect P4 plug from fuse board. Verify 22-28VAC between pins 1 & 2 (red wires), then 110-125VAC between pins 4-6 (grey wires). IF correct, go to 1I. IF incorrect replace transformer ([pg.20](#)).

1. Heater Not Powering Up (cont.)

Test P5 (low voltage)

Step 1I



Disconnect the plug from P5 (on fuse board). Test 22-28VAC between R & C. IF no voltage, replace Fuse Board (pg. 20). If correct, go to step 1J.

NOTE: Step 1I – Heaters older than 11/2010 – If no voltage across R & C, remove FC3 fuse and test for continuity. IF open go to page 24. IF OK go to Step 1J

Inspect wiring

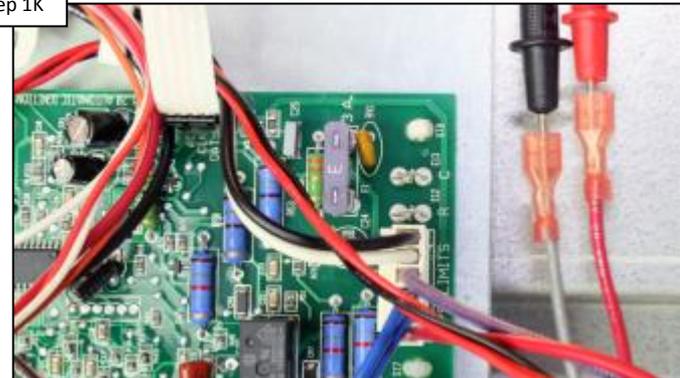
Step 1J



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

Test ICB input (low voltage)

Step 1K



Disconnect and test the red and grey wires from the ICB. IF 22-28VAC is present go to step 1L. IF NOT, replace wire harness (pg. 20).

1. Heater Not Powering Up (cont.)

Test F1 (3AMP) fuse

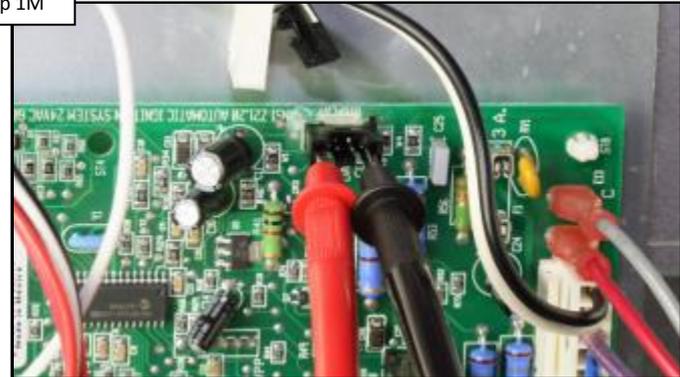
Step 1L



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

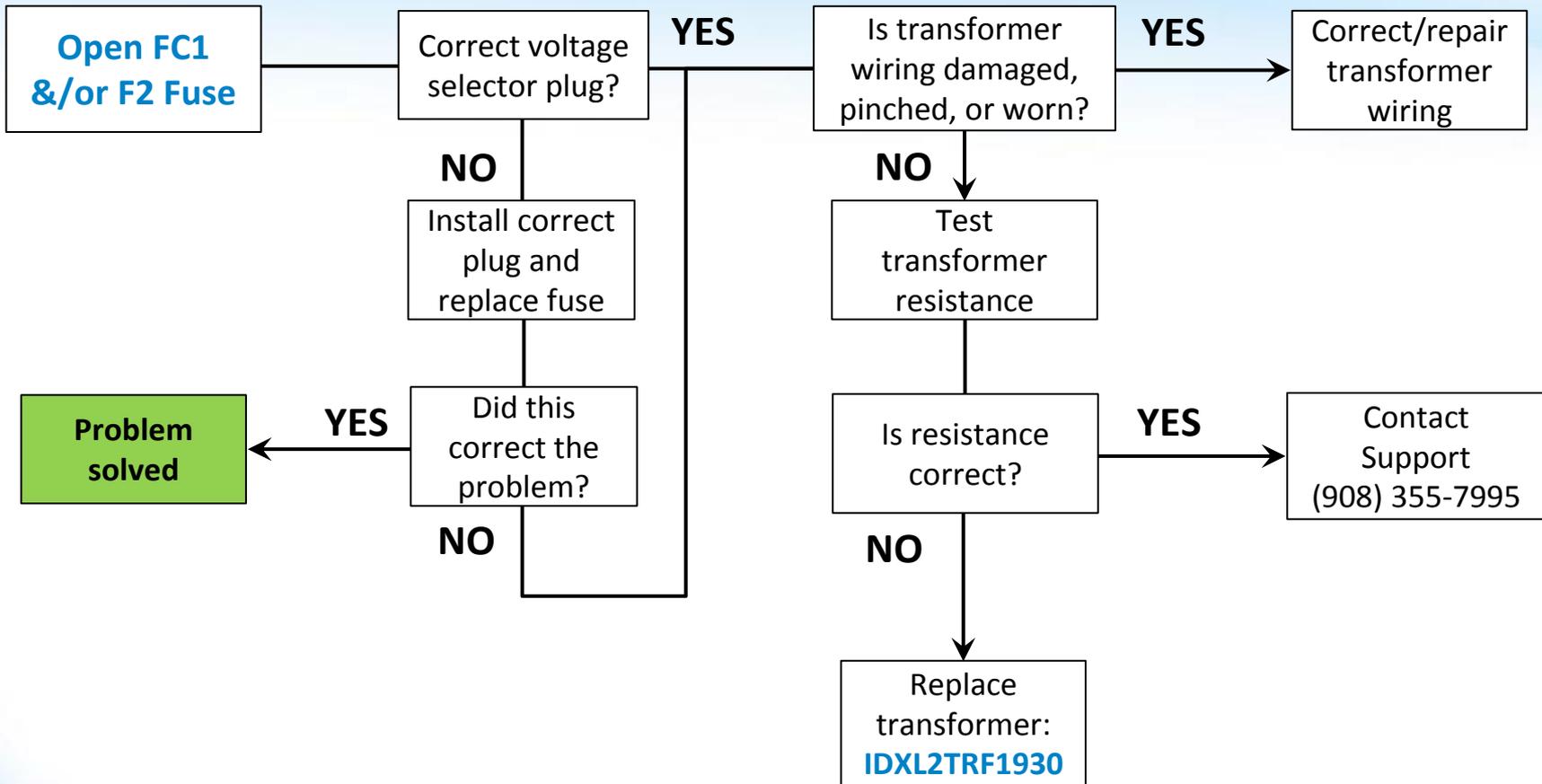
Test ICB's display output

Step 1M



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. 20](#)).

2. Open FC1 &/or F2 Fuse



2. Open FC1 &/or F2 Fuse

Verify voltage selector plug

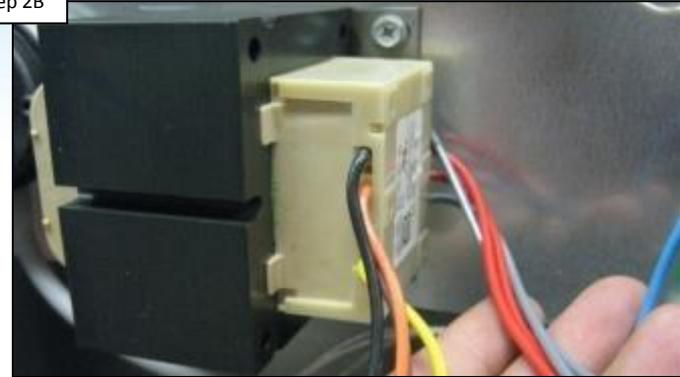
Step 2A



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

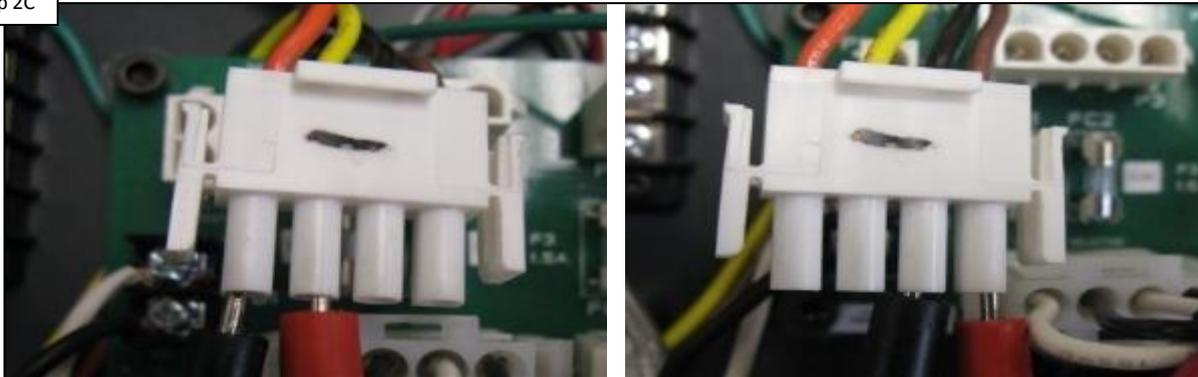
Step 2B



Inspect transformer wiring, ensuring the insulation on the wiring is not damaged. IF damaged replace transformer ([pg. 20](#)). IF OK go to 2C.

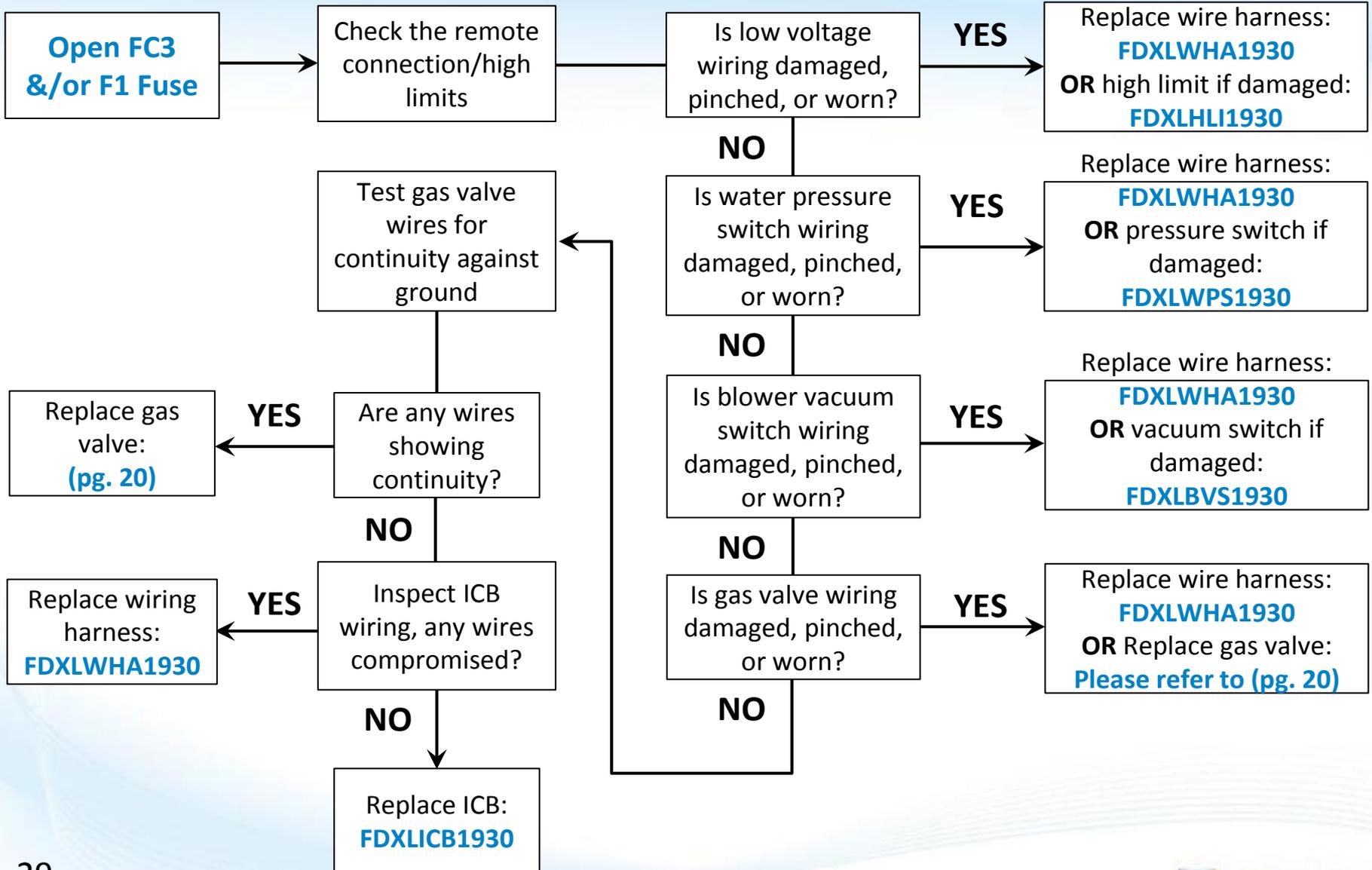
Test transformer resistance

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. 20](#)). IF OK and problem still persists, contact technical support: (908) 355.7995.

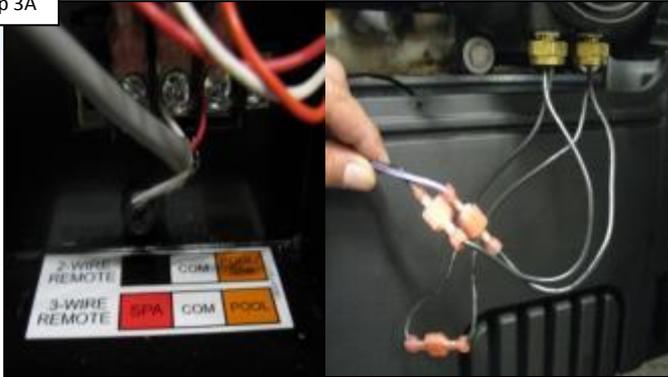
3. Open FC3 &/or F1 Fuse



3. Open FC3 &/or 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. 20). IF OK, go to step 3B.

Inspect blower vacuum switch

Step 3C



With power off, inspect the blower vacuum switch wiring for damage. IF damaged, replace the wire harness (pg. 20). 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. 20). 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. 20). IF OK, go to step 3E.

3. Open FC3 &/or 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 (refer to pg. 20 for part number).

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. 20). IF OK, go to step 3F.

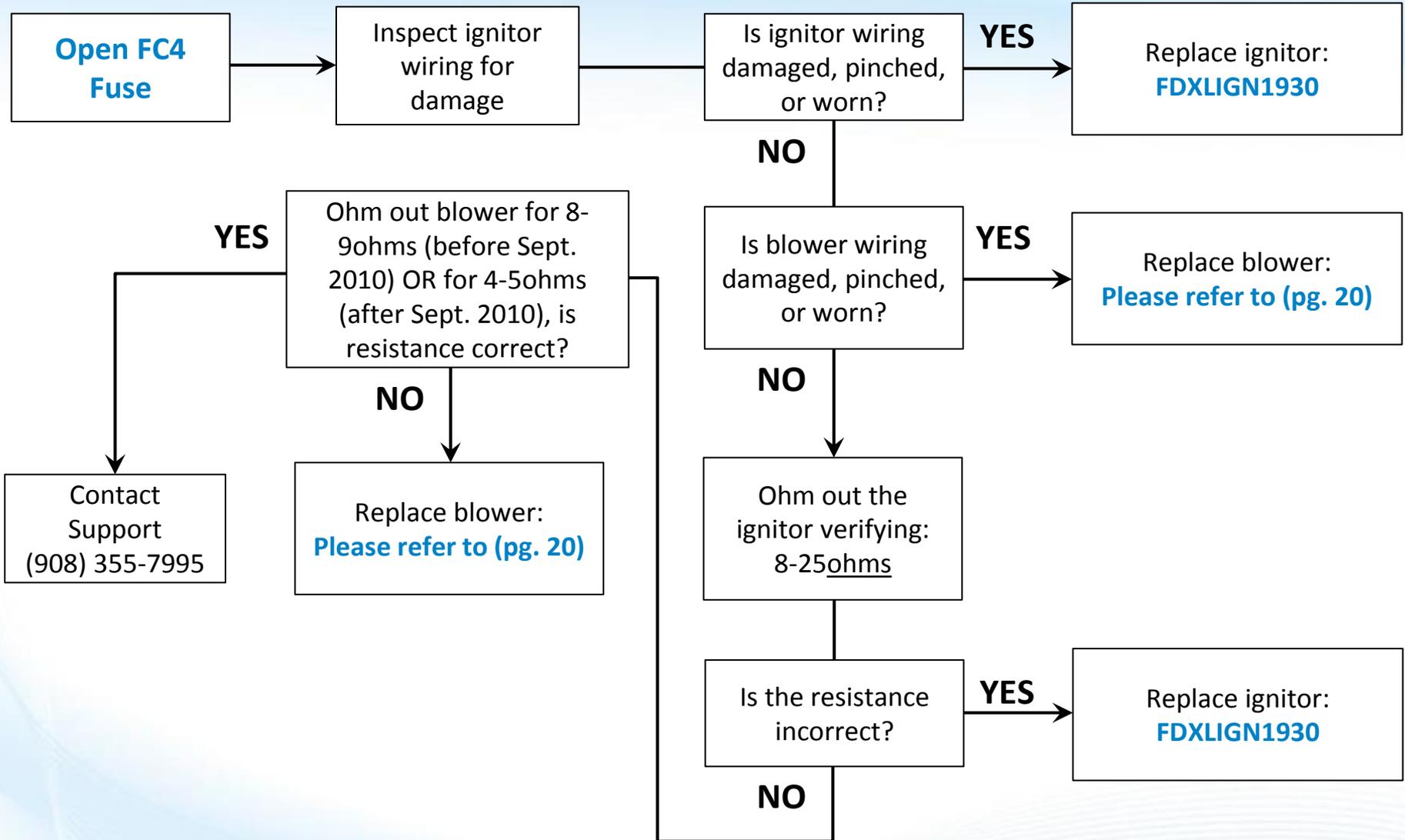
ICB wiring

Step 3F



Inspect ICB wiring. IF wiring is damaged, replace the wire harness with a new wire harness kit (pg. 20). IF OK and the problem still exists, replace the ICB (pg. 20)

4. Open FC4 Fuse



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. 20). 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. 20).

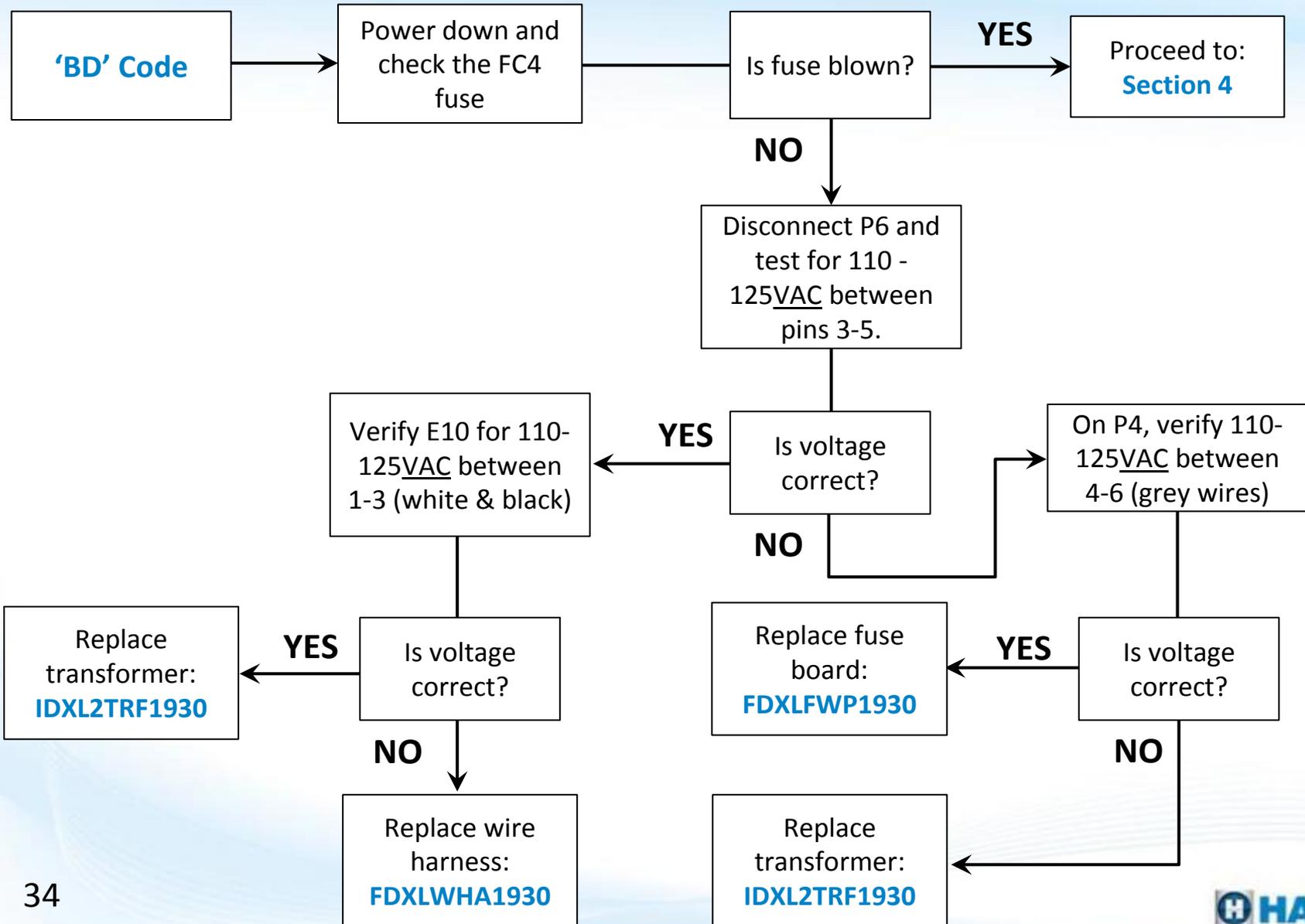
Measure blower resistance

Step 4C



With power off, disconnect blower plug from ICB. Models manufactured before Sept. 2010: measure across pins 1-2 (black & red), then 3-4 (white & blue) for 8-9 ohms. Models after Sept. 2010: measure for 4-5 ohms across the two terminal with wires. IF out-of-range, replace blower (pg. 20). IF correct, contact technical support (908)355-7995.

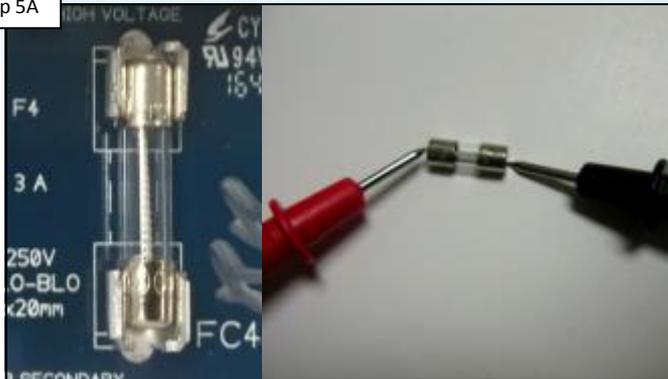
5. Service LED ON: 'BD' Code



5. Service LED ON: 'BD' Code

Test the FC4 fuse (continuity)

Step 5A



With power off, verify the FC4 fuse has continuity. IF fuse is good, go to 5B. IF fuse is blown, go to [Section 4](#).

Verify ICB output

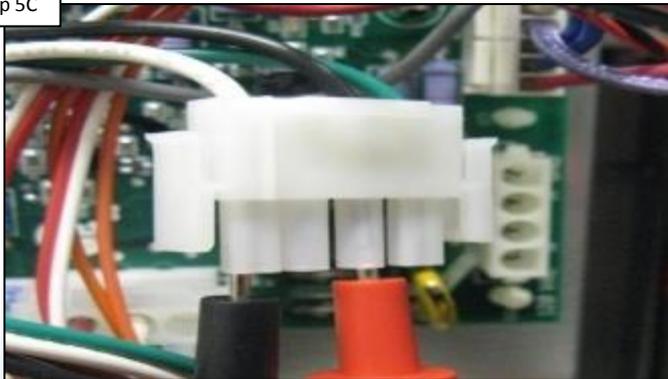
Step 5B



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 5C.

Verify ICB input

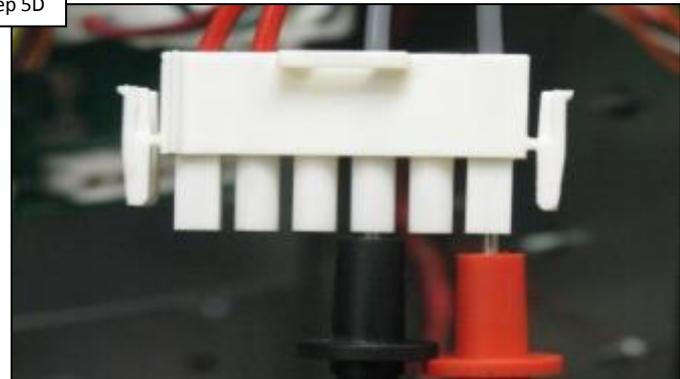
Step 5C



Disconnect the E10 connector from ICB. Verify 110-125VAC between 1-3 (white & black). IF present, replace ICB. IF NOT, replace wire harness ([pg. 20](#)).

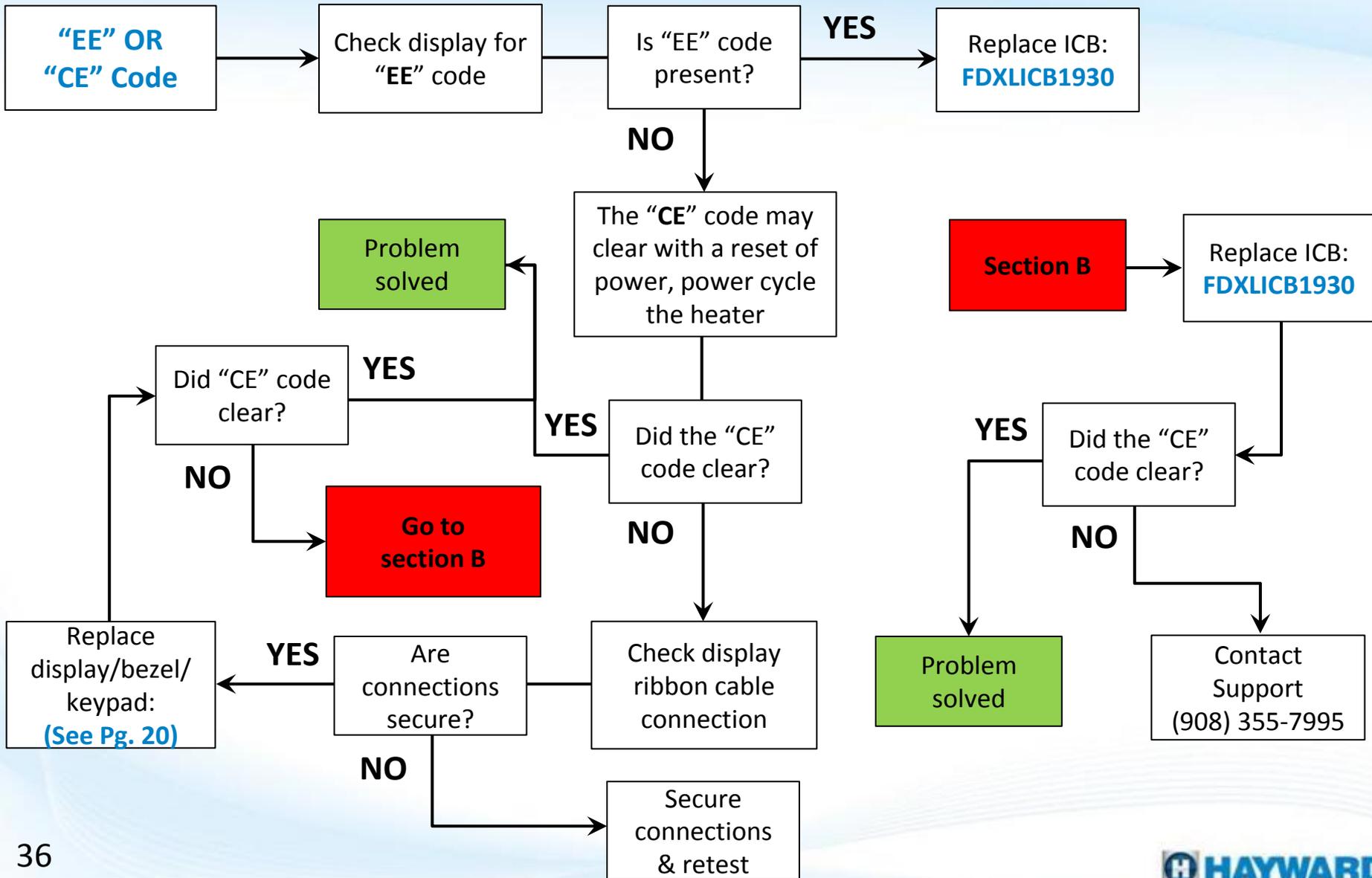
Verify transformer output

Step 5D



Disconnect P4 from fuse board. Verify 110-125VAC between 4-6 (grey wires). IF OK, replace fuse board. IF NOT, replace transformer ([pg. 20](#)).

6. Service LED ON: "EE" OR "CE" Code



6. Service LED ON: “EE” OR “CE” Code

Check display for “EE”

Step 6A



“EE” error indicates the you have a defective ICB board. IF this error appears, replace ICB (pg. 20). IF no EE error, go to 6B.

Check display for “CE”

Step 6B



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

Inspect display connections

Step 6C



Verify ribbon cable is secure. IF cable is secure, replace display/bezel/keypad assy. (pg. 20) then go to 6D. IF NOT secured, reconnect.

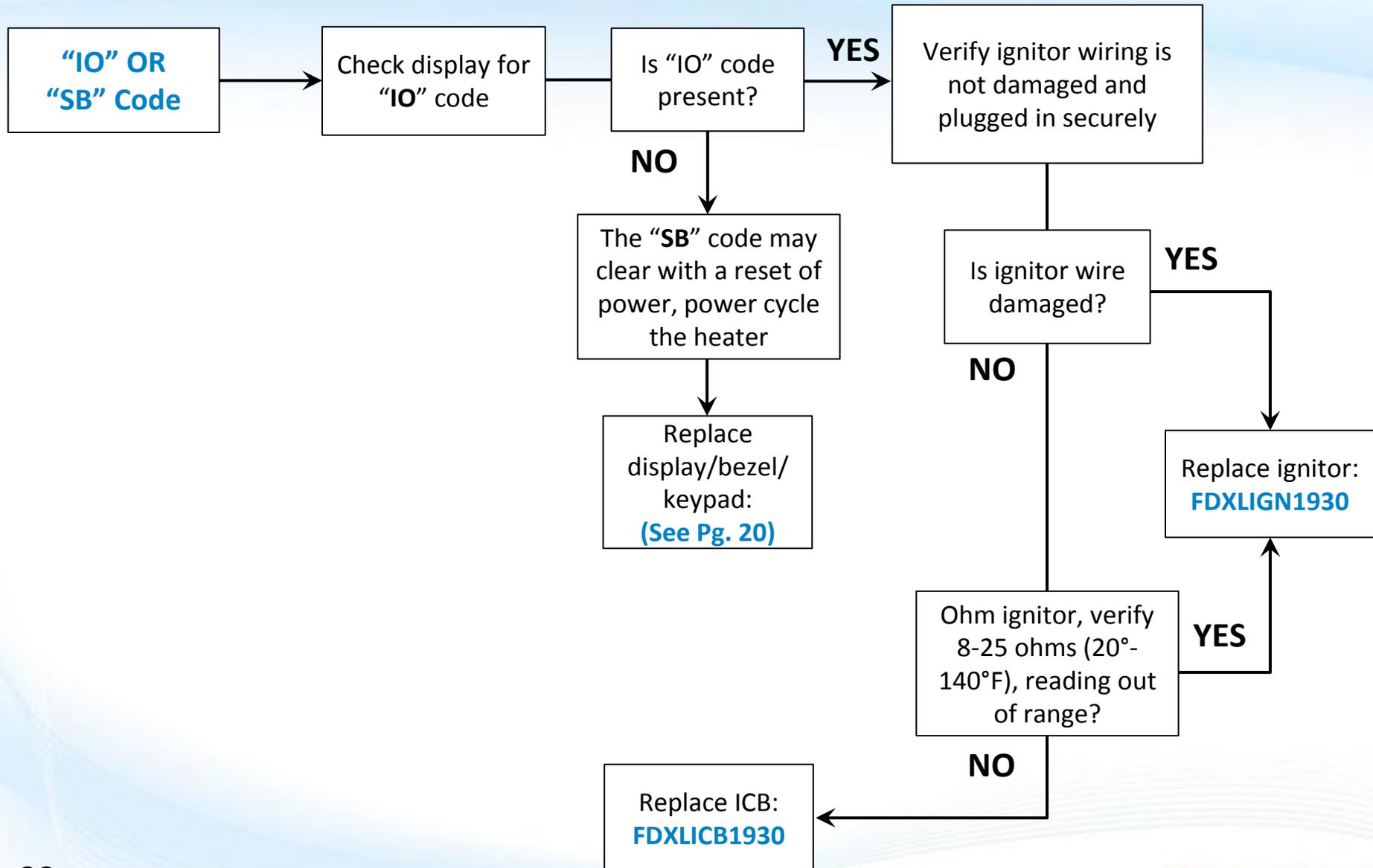
Verify “CE” has cleared

Step 6D



IF after replacing display/bezel/keypad, “CE” error persists, replace ICB (pg. 20). IF replacing ICB fails to solve problem, contact support (908) 355-7995.

7. Service LED ON: "IO" OR "SB" Code



7. Service LED ON: “IO” OR “SB” Code

Check display for “IO”

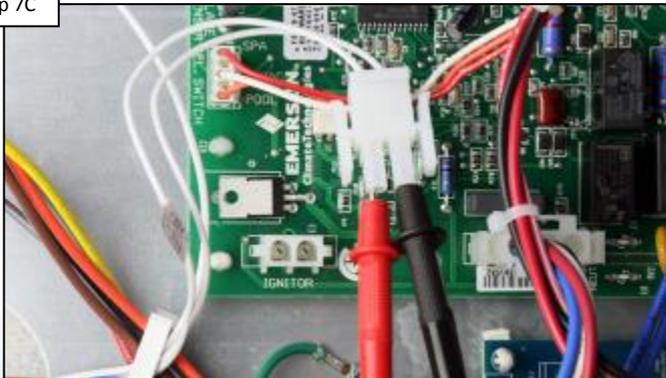
Step 7A



“IO” error stand for 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. 20](#)).

Inspect ignitor wires

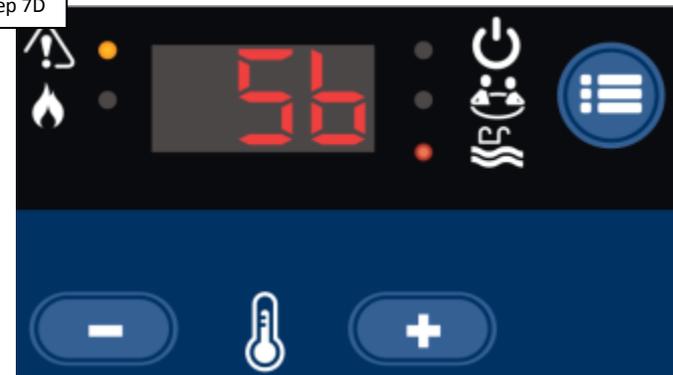
Step 7B



Power down and inspect ignitor wiring, ensuring ignitor plug is securely attached to the ICB. IF OK, go to step 7C. IF not, secure plug.

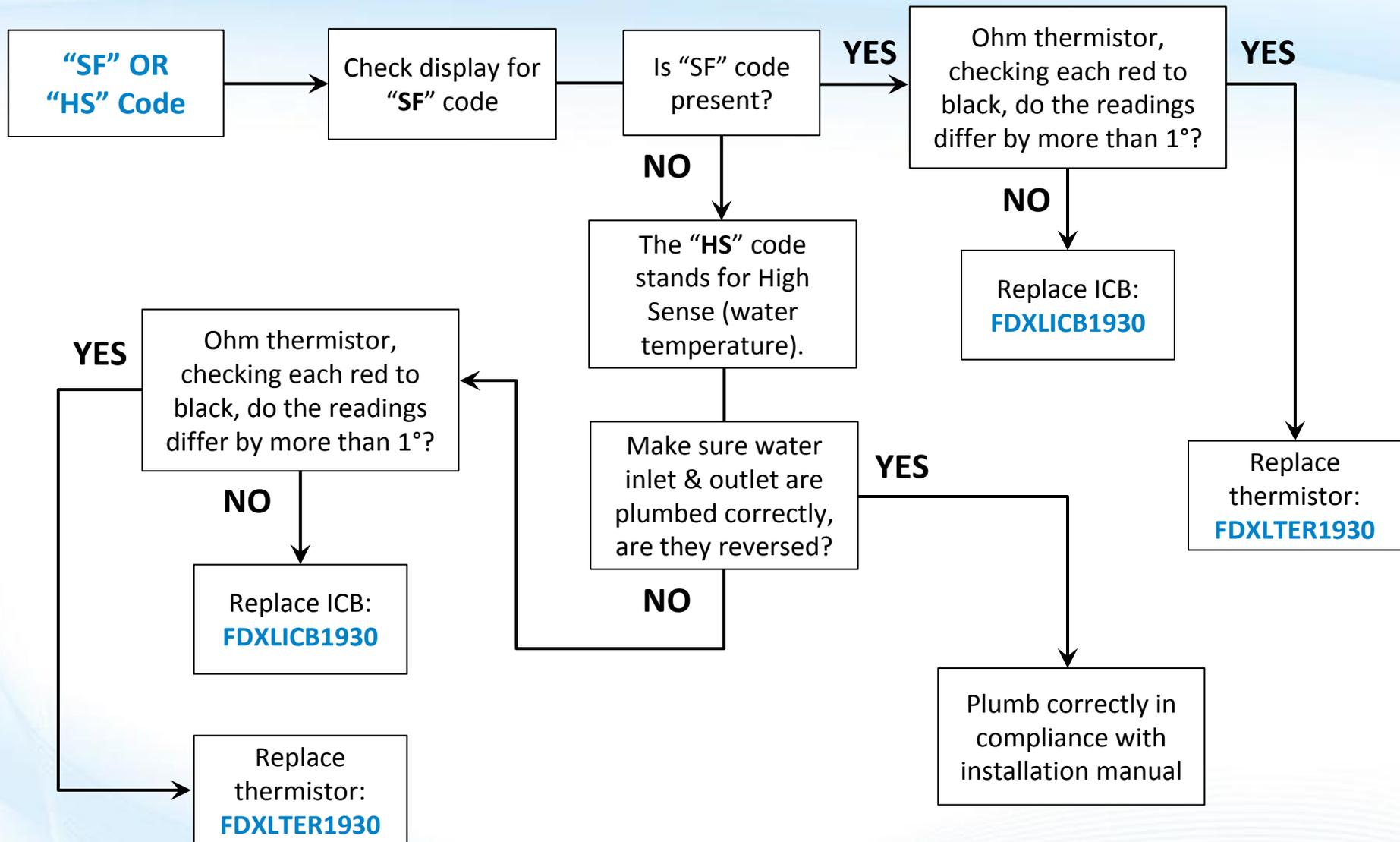
Check display for “SB”

Step 7D



“Stuck Button” indicates display board is acting as if the button is being pressed and held. Replace display/bezel/key pad ([pg. 20](#)). [Go to pg. 66 to test.](#)

8. Service LED ON: "SF" OR "HS" Code

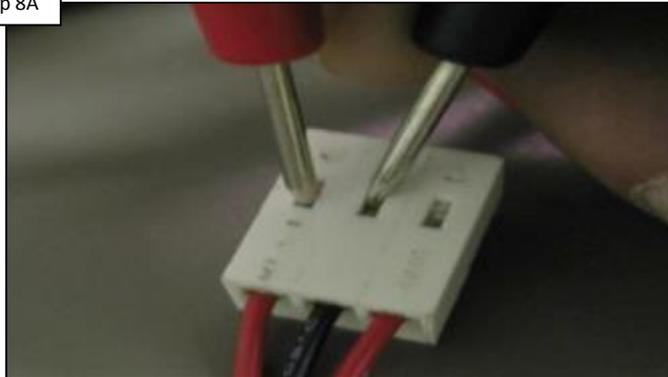


8. Service LED ON: “SF” OR “HS” Code

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.

Check display for “SF”

Step 8A



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 more than 1°, replace thermistor. IF NOT, replace ICB ([pg. 20](#)).

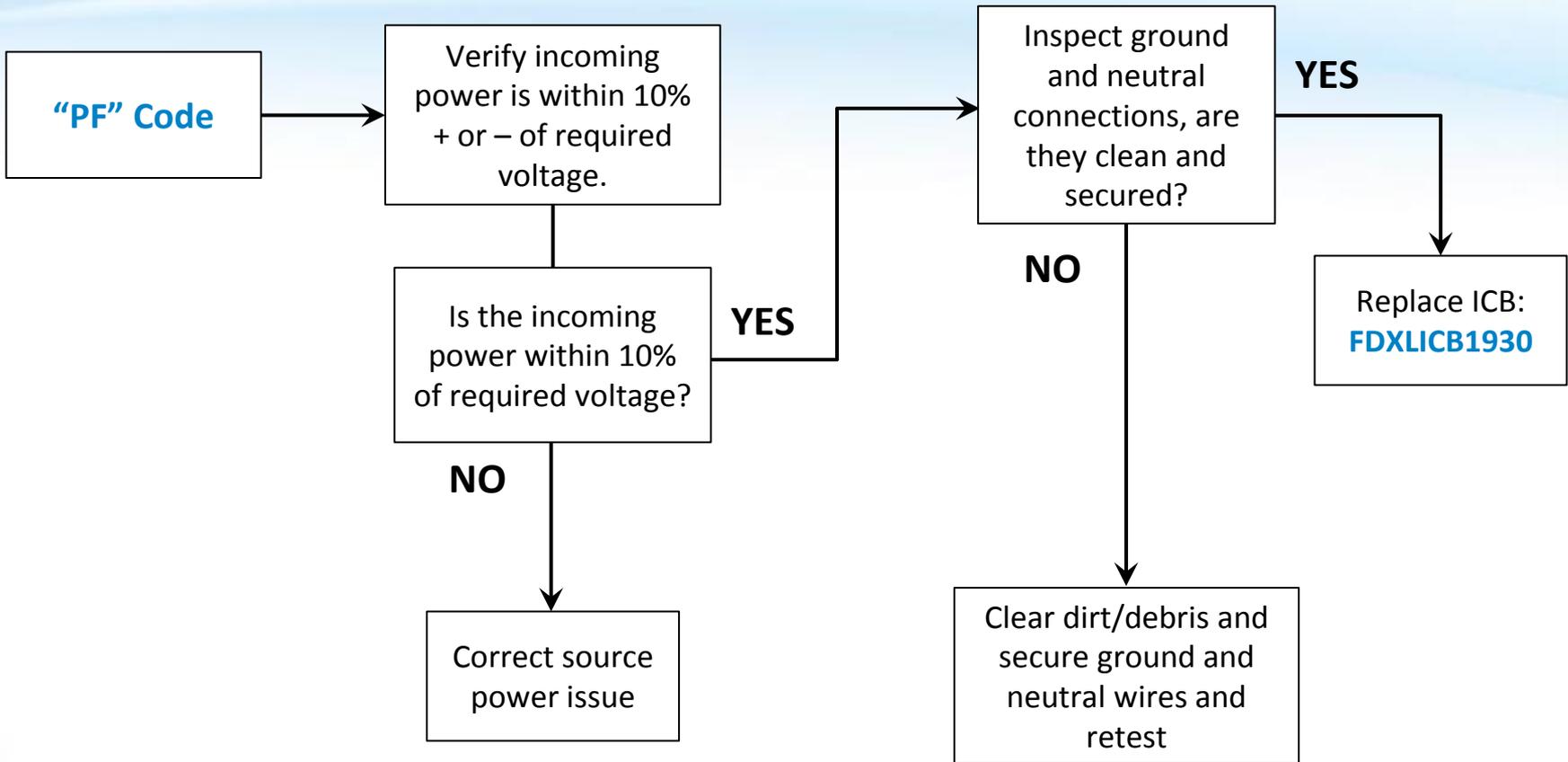
“HS”, are inlet/outlet reversed?

Step 8B



Verify the water inlet & outlet are not reversed; reversing these will often cause frequent occurrences of the “HS” error code. Follow the steps outlined in 8A. IF the thermistor checks-out, replace the ICB ([pg. 20](#)).

9. Service LED ON: “PF” Code

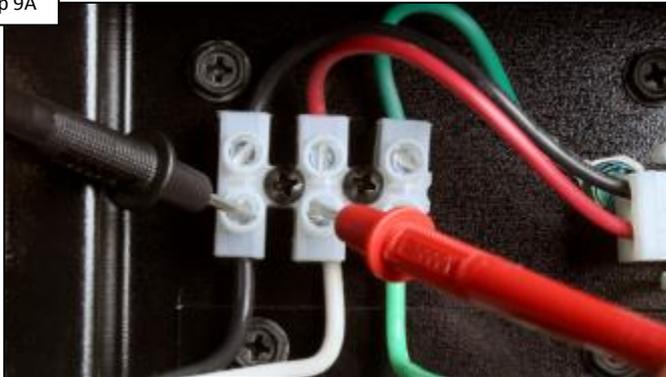


9. Service LED ON: “PF” Code

“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

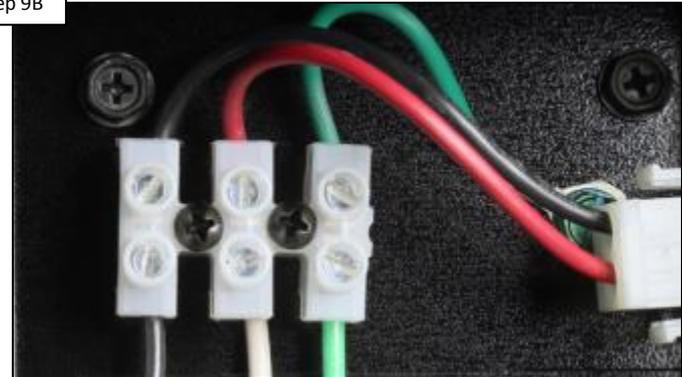
Step 9A



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.

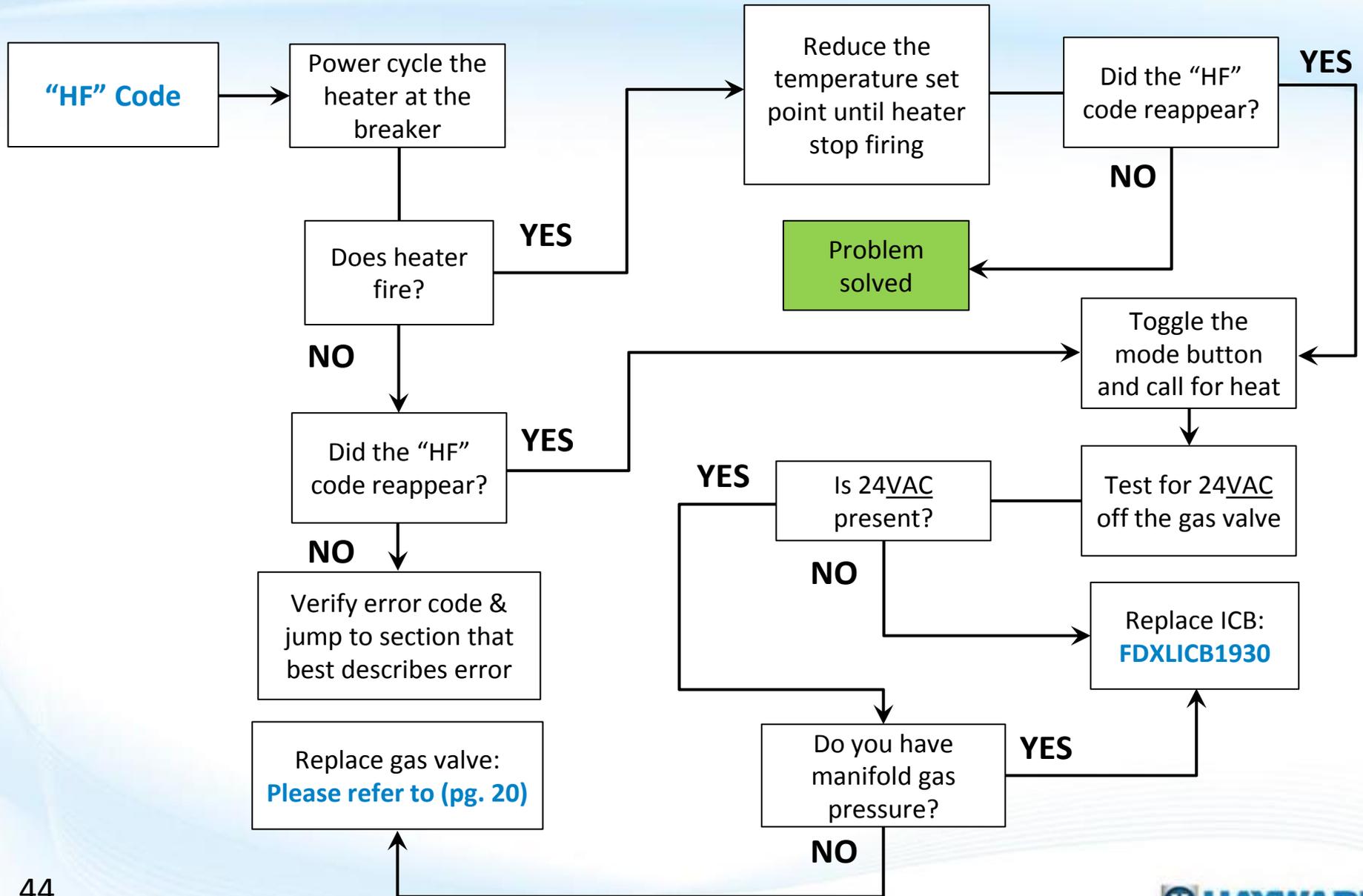
Inspect ground & neutral

Step 9B



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. 20).

10. Service LED ON: "HF" Code



10. Service LED ON: “HF” Code (cont.)

“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



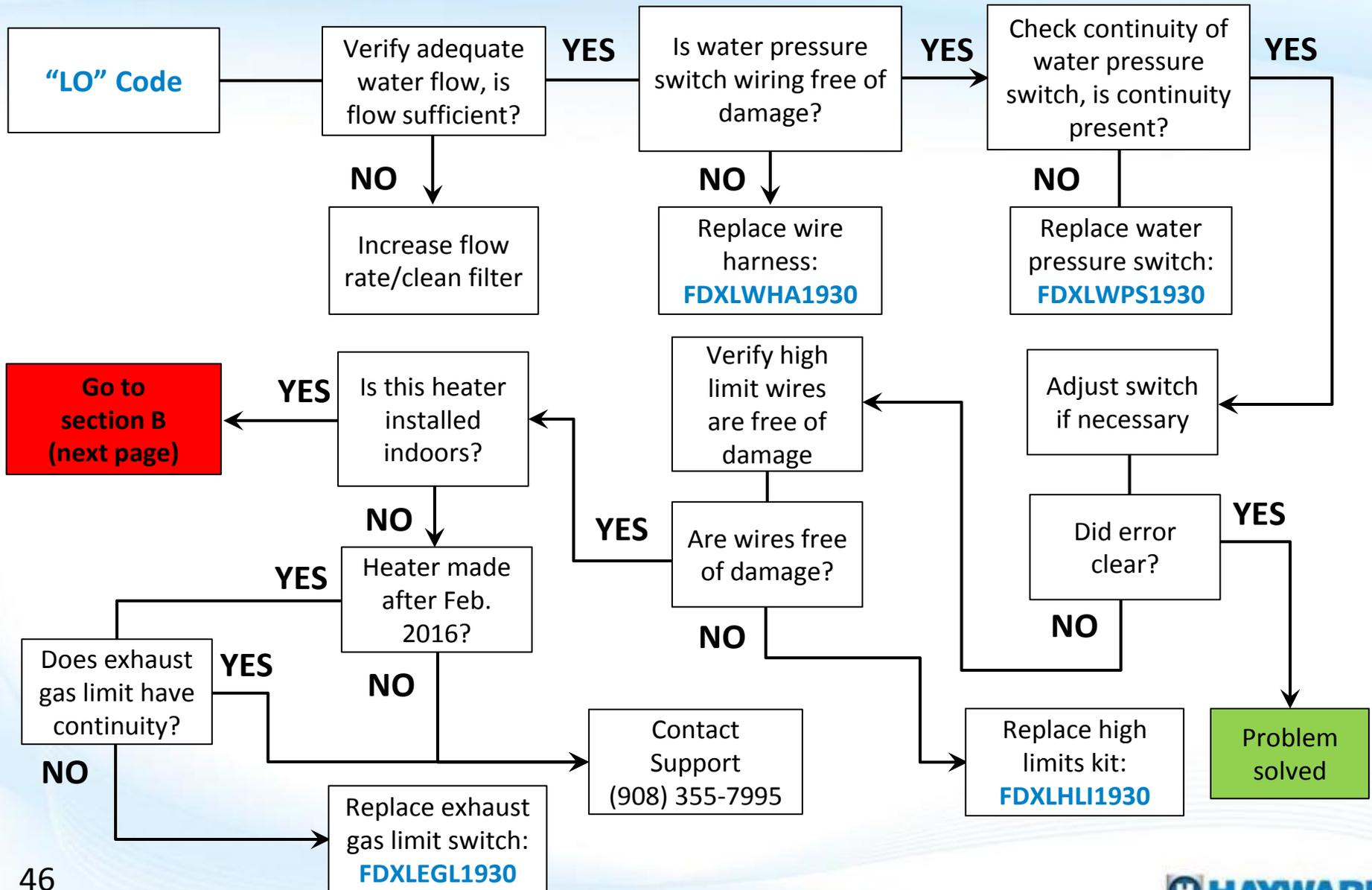
Power cycle the heater, in an attempt to clear an erroneous “HF” code. IF power cycling clears to the “HF” message and the heater fires, drop the temperature to suspend heating. IF “HF” reappears, go to step 10B.

Call for heat and test gas valve

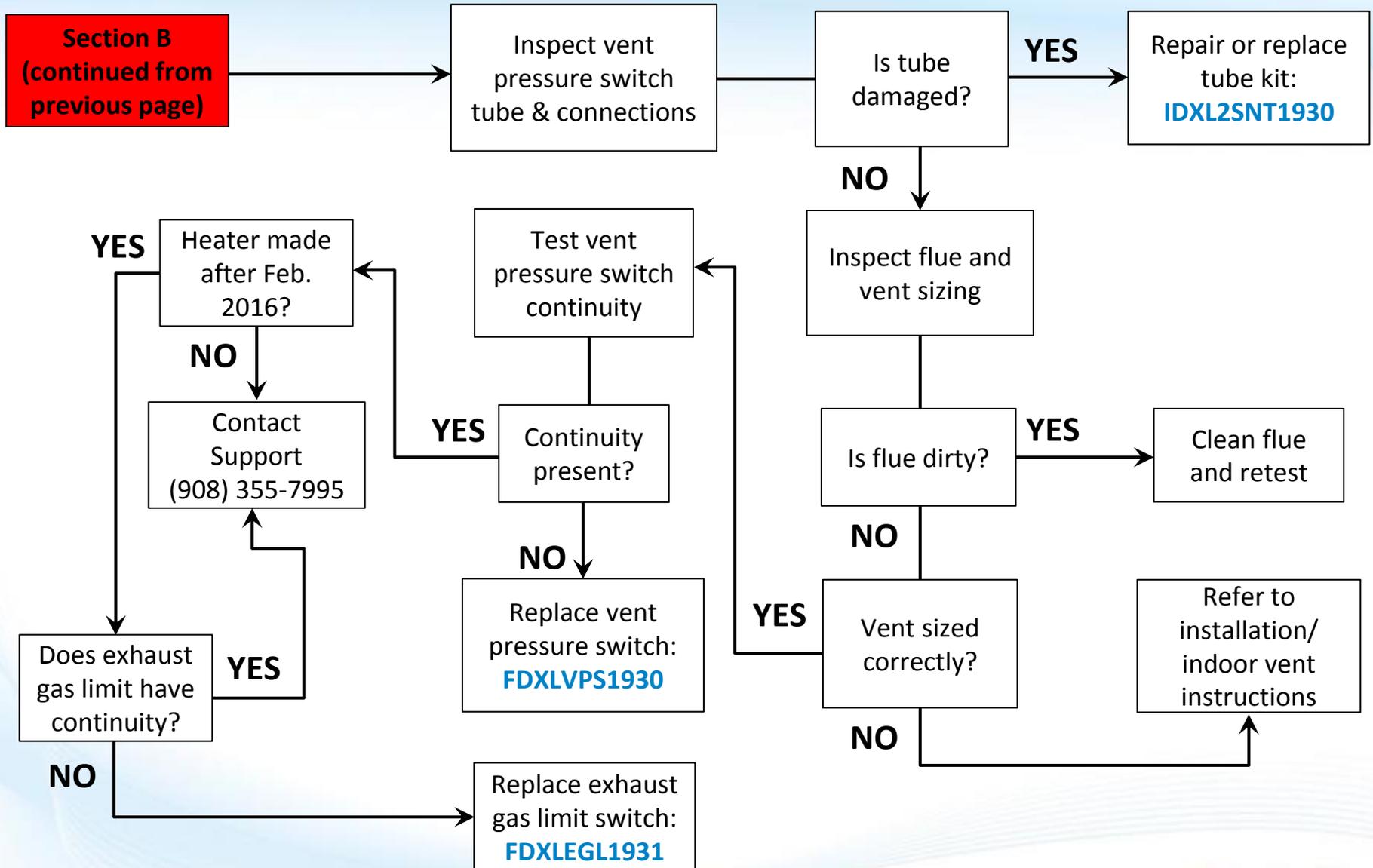


Press the mode button to toggle the heater and call for heat. IF 24VAC is still present at gas valve AND manifold pressure is not present, gas valve is defective and needs to be replaced. Otherwise, replace the ICB (pg. 20).

11. Service LED ON: "LO" Code



11. Service LED ON: "LO" Code



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.

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. 20](#)). IF secure and free of damage, go to step 11B.

Continuity test

Step 11B

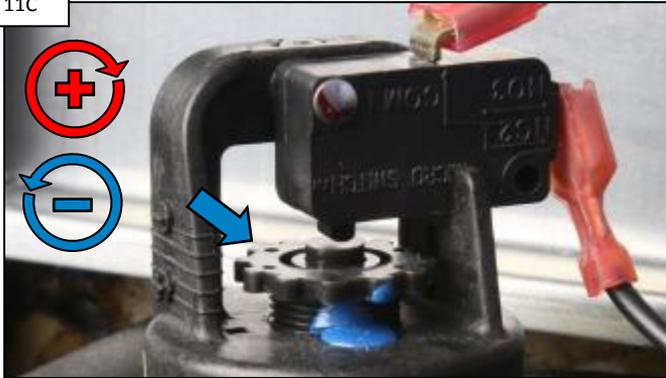


Remove wires from water pressure switch & measure continuity across terminals (while pump is running). IF open, replace water pressure switch. IF OK, go to Step 11C.

11. Service LED ON: “LO” Code (cont.)

Pressure switch adjustment

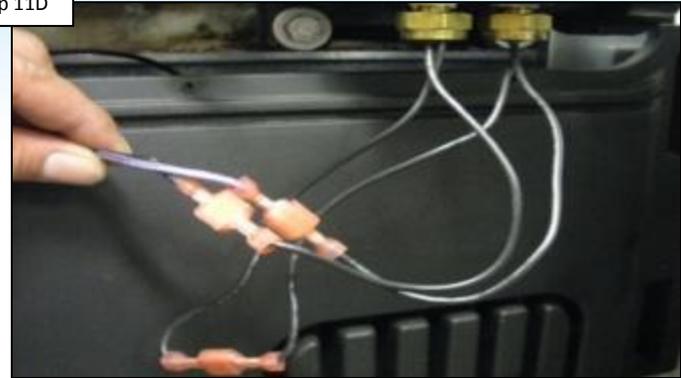
Step 11C



Some sites may require a pressure switch adjustment. IF adjustment does not correct or was not required, go to 11D.

Inspect and test high limits

Step 11D



Inspect & test high limits. Verify continuity across the temperature limit switches. IF open or wire is damaged, replace (pg. 20). IF OK, go to 11E.

Indoor application?

Step 11E



IF this heater is installed in an indoor application, proceed to step 11F. IF heater is installed in an outdoor environment, go to step 11I.

Vent pressure switch/tubing

Step 11F



Applies To Indoor Installations ONLY: Inspect the vent pressure switch tube connections. IF OK, go to 11G. IF NOT, repair/replace tubing (pg. 20).

11. Service LED ON: “LO” Code (cont.)

Note: Please ensure that the vent size is sufficient for the heater model installed. Failure to properly size venting may result in damage to heater OR COULD PUT INHABITANTS AT SERIOUS RISK.

Inspect flue and vent sizing

Step 11G



Ensure that flue is not blocked or restricted. See indoor vent sizing requirements in the heater’s Installation Manual/Indoor Vent Instructions. IF OK, go to step 11H. IF NOT, contact installer.

Vent pressure switch continuity

Step 11H



Disconnect wires from vent pressure switch and measure continuity between VPS terminals. IF open, replace the vent pressure switch (pg. 20). IF OK, go to 11I.

11. Service LED ON: “LO” Code (cont.)

Note: This switch is a one time safety. Once the switch has tripped then it NEEDS to be replaced and the heat exchanger should be inspected for soot or damage.

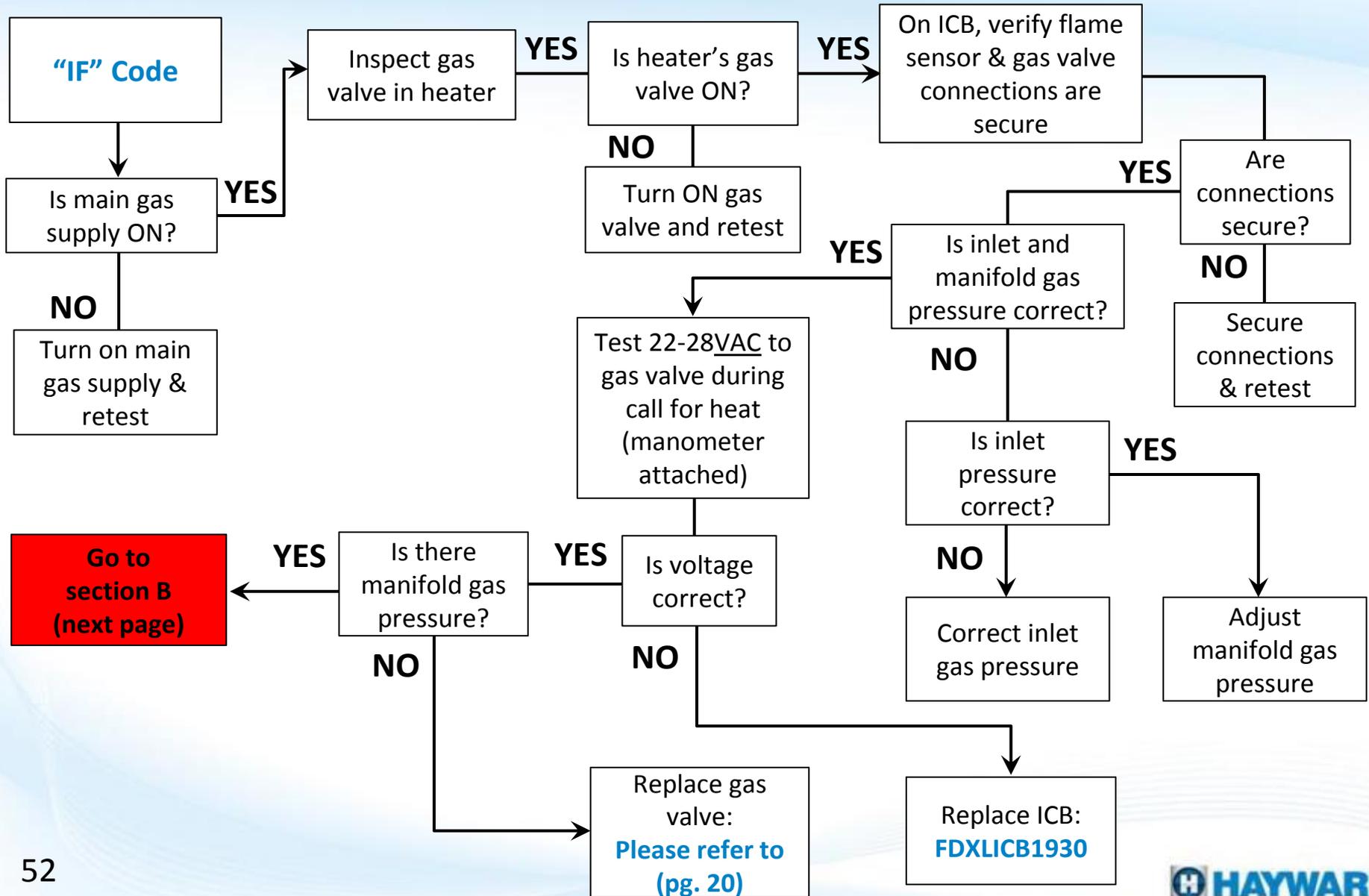
Indoor/Outdoor: Feb. 2016 and newer

Step 111

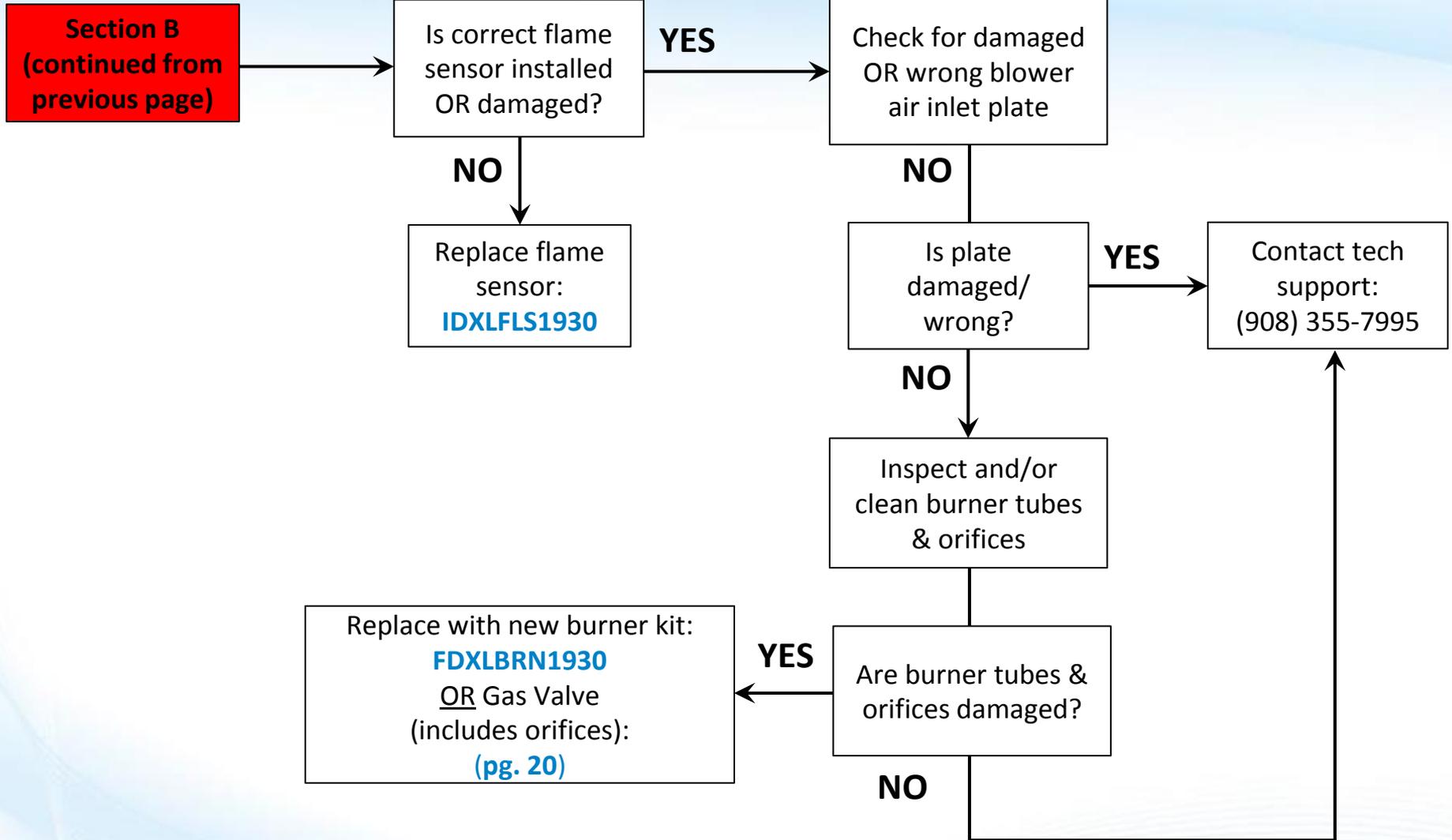


Test continuity across the exhaust gas limit switch. IF open, replace switch ([pg. 20](#)). IF switch does not exist AND problem still persists, contact support: (908) 355-7995

12. Service LED ON: "IF" Code



12. Service LED ON: "IF" Code



12. Service LED ON: "IF" Code

Inspect main gas supply

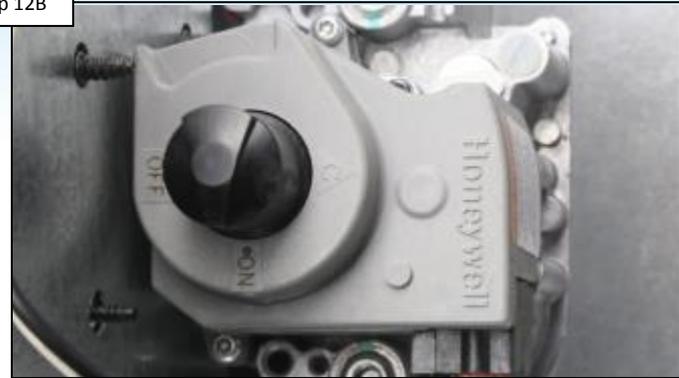
Step 12A



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, rotate knob 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.

Verify gas pressure

Step 12D

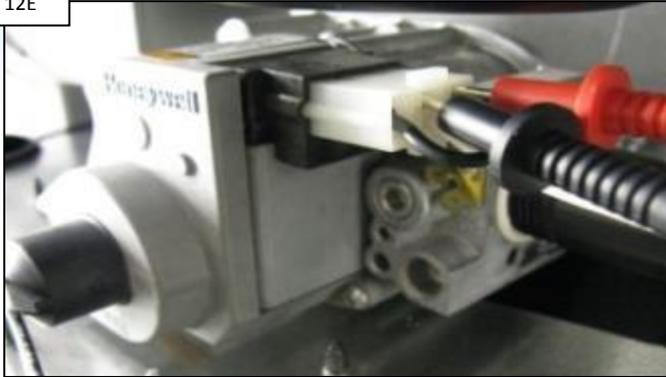


Ensure gas static, load, and manifold pressures are correct ([See Page 16 & 17](#)). IF OK, go to Step 12E. IF NOT, go to Step 12F.

12. Service LED ON: "IF" Code (cont.)

Voltage/pressure off gas valve

Step 12E



Verify 22-28VAC off gas valve during ignition trial. IF present & no pressure (manometer attached), replace valve. Otherwise, replace ICB (pg. 20).

Verify blower air inlet plate

Step 12G



Check for damaged/wrong blower air inlet plate. IF wrong or damaged contact tech support (908) 355-7995. IF OK, go to step 12H.

Verify correct flame sensor

Step 12F



Verify that the installed flame sensor is 5". IF 3" is installed OR IF sensor is damaged, replace it with the 5" version (pg. 20). IF correct, go to step 12G.

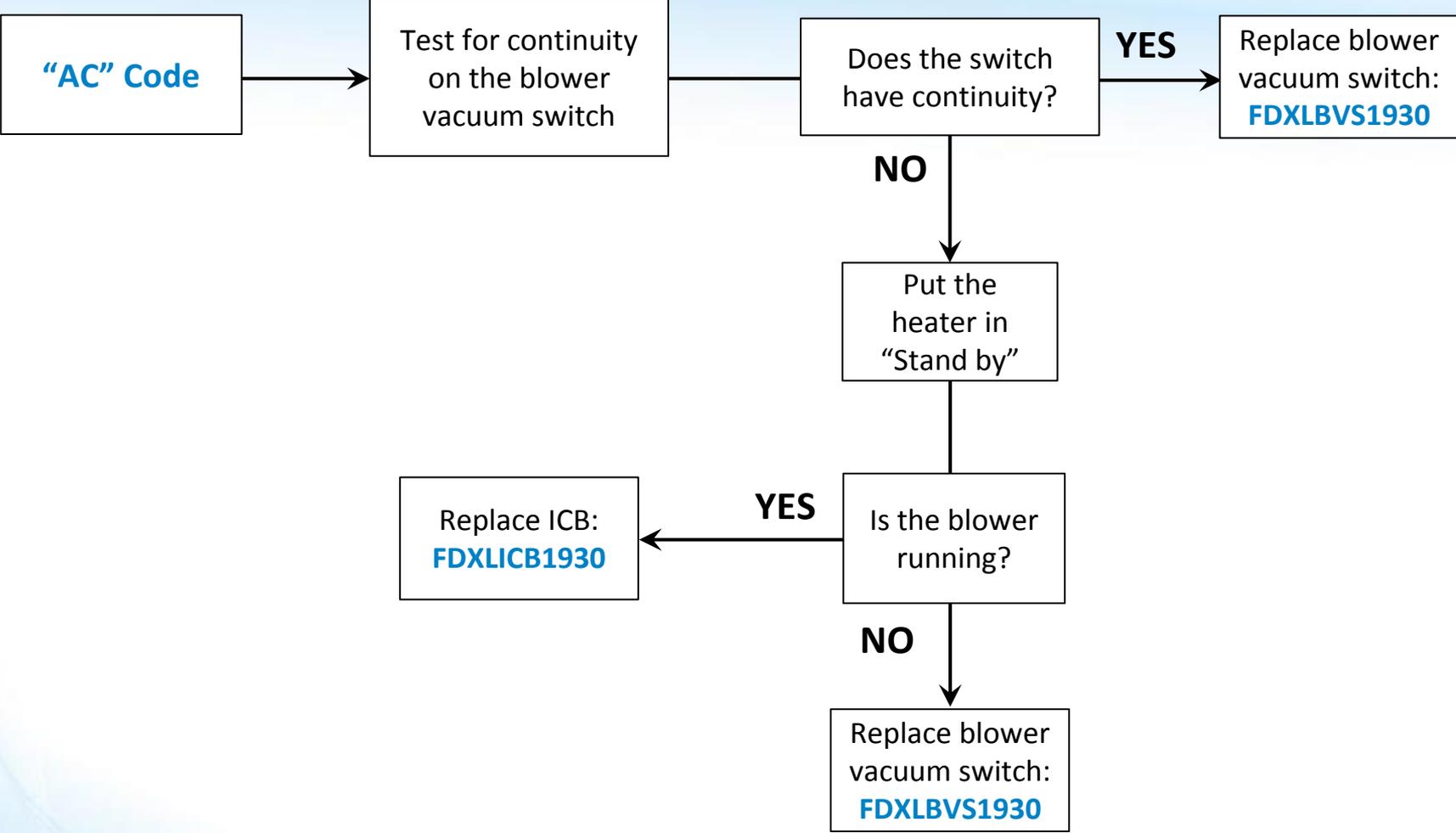
Inspect orifices & burner tubes

Step 12H



Inspect Gas Orifices & Burners for blockage. Clean as required. IF damaged, replace (pg. 20). IF NOT damaged, contact tech support (908) 355-7995.

13. Service LED ON: "AC" Code



13. Service LED ON: “AC” Code

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

Test blower vacuum switch

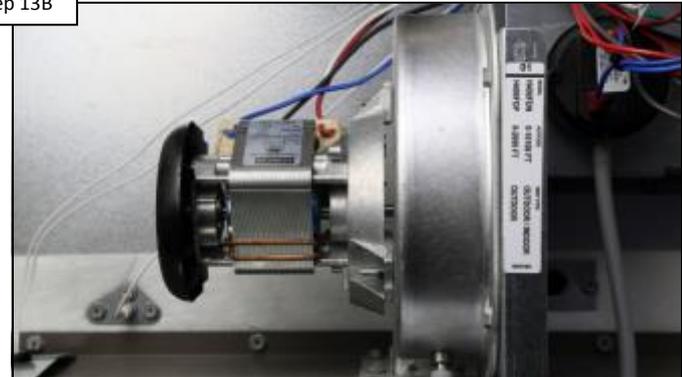
Step 13A



Isolate the blower vacuum switch. Measure continuity between switch terminals. IF continuity exist, replace switch (pg. 20). IF OK, go to 13B.

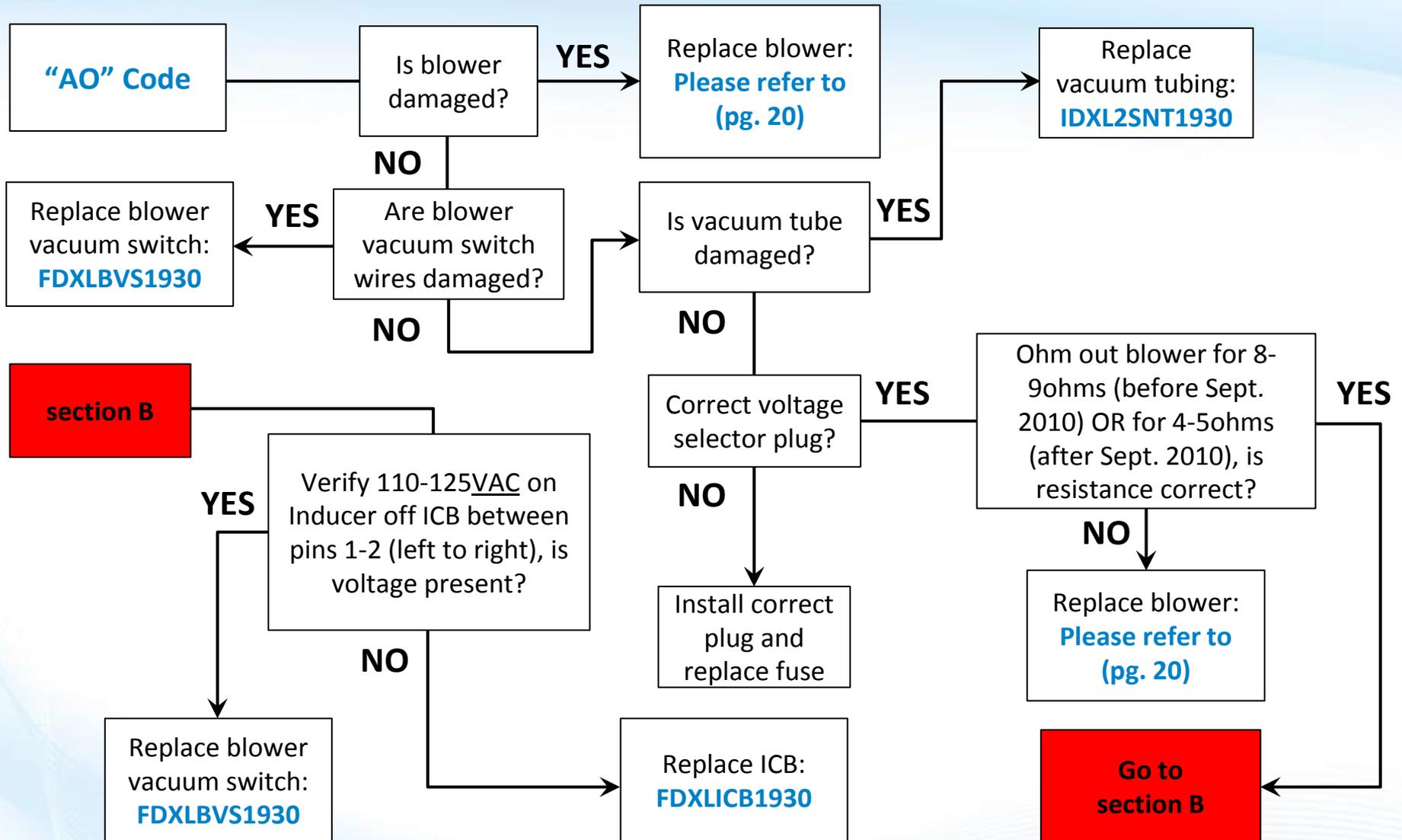
Verify blower operation

Step 13B



With the heater off (in “Stand By”), IF the blower continues to run/operate, replace the ICB. IF not, replace the blower vacuum switch (pg. 20).

14. Service LED ON: "AO" Code



14. Service LED ON: “AO” Code

Blower & vacuum switch wiring

Step 14A



Check for bad blower and/or damaged blower vacuum switch wiring. IF OK, go to step 14B. IF damaged, replace compromised part (pg. 20).

Vacuum tube

Step 14B



Check for damaged vacuum tubing as well as its connection to the blower. IF OK, go to 14C. IF NOT, replace vacuum tubing (pg. 20).

Verify voltage selector plug

Step 14C



IF voltage selector plug matches voltage, go to step 14D. IF not, power down, replace FC1 & FC2 fuses (if open), & switch plug to proper voltage.

14. Service LED ON: "AO" Code (cont.)

Measure blower resistance

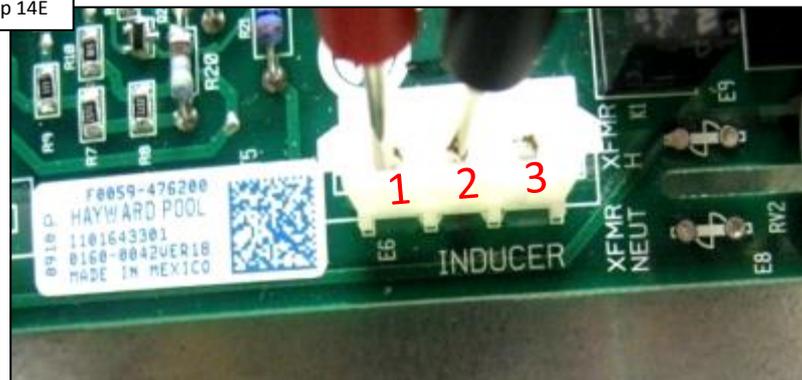
Step 14D



With power off, disconnect blower plug from ICB. Models manufactured before Sept. 2010: measure across pins 1-2 (black & red), then 3-4 (white & blue) for 8-9 ohms. Models after Sept. 2010: measure for 4-5 ohms across the two terminal with wires. IF out-of-range, replace blower (pg. 20). IF correct, go to step 14E.

Blower plug on ICB

Step 14E



On the ICB (while calling for heat). Verify 110-125VAC across Pins 1 & 2 of Inducer on ICB. IF OK, replace blower vacuum switch (pg. 20). IF NOT present, replace ICB (pg. 20)

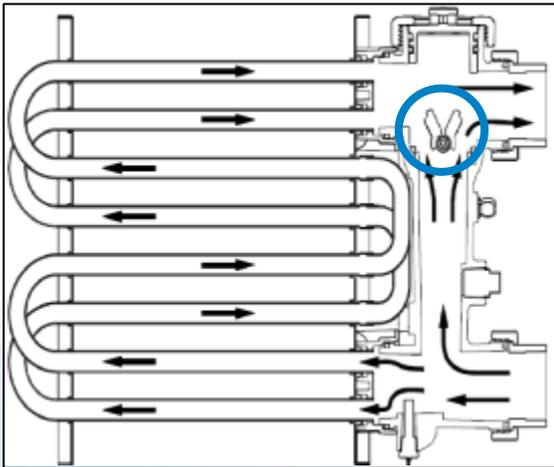
Heat Exchanger: Flow Requirements

Flow requirements should be checked to insure proper operation.

Never allow heater to operate below minimum flow requirements or damage may occur.

- Flow less than minimum could cause issues such as the heater dry firing or water to boil causing high limits to trip and possible damage to heat exchanger.
- Flow exceeding maximum flow could cause issues such as damage to the heat exchanger by thinning the tube walls.

Internal By-Pass



NOTE: Internal by-pass should be inspected periodically as it could be the cause of low or high water flow through the exchanger

Flow Requirements

Model	Min GPM
H150FD H200FD	20
H250FD H300FD	25
H350FD H400FD	30
H400FD	40
Maximum water flow 125 GPM	

Heat Exchanger: Inspection

1. Remove black metal Trim Plate (around water manifold, 5 Black screws)
2. Remove water connection side Upper End Cap (Black Polymer- 4 screws in rectangle holes marked with an arrow)
3. Disconnect Unions from plumbing (water connections, 1 inlet, 1 outlet.)
4. Remove (8) 1/2" hex head bolts (4 on each side-inlet and outlet)
5. Remove water manifold (also called the "Header") and black polymer "Mounting Blocks" to expose the ends of the heat exchanger tubes.
6. If there is any doubt as to whether or not there is damage from aggressive water chemistry: take 3 pictures, 1 of each pair of tubes (inlet side and outlet side), as well as the Model & Serial number decal, and send to your local technical representative, or call (908) 355-7995 for further instructions.

Heat Exchanger tubes should look like this picture

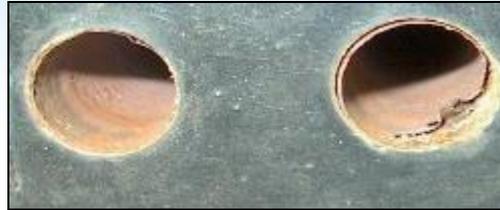


Heat Exchanger: Potential Failure Causes

New, Clean Exchanger



Low pH or High Water Flow



High Sanitizer Levels



Annealed Fins – Low Water Flow



Low pH



High Sanitizer Levels



High pH, Alkalinity or Calcium Hardness

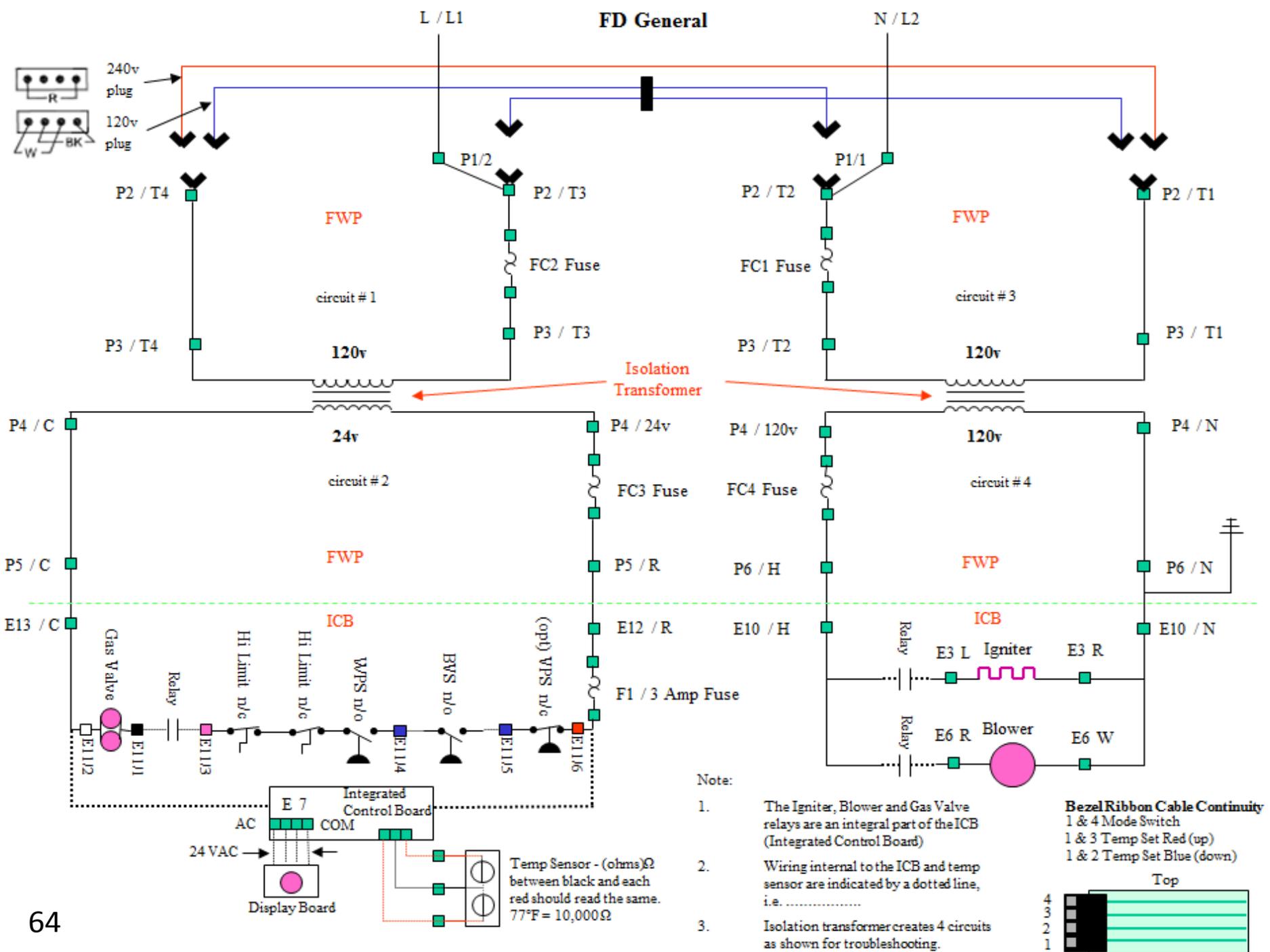


Sooted – Improper Fuel and Air Mixture.



Freeze Damage





Wiring Connection Diagram

