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After Sales Service

Service Manual

E01 – FLAME ERROR

Is a flame present at ignition?

YES

If the flame stays lit for 10 seconds and then it shuts off check flame detection

- Check/ Confirm electrical supply
- Check polarity
- Check/ Confirm voltage between the two leads is less than 3V
- Check ground

NO

When the burner attempts ignition is a spark present?

NO

Check for correct power supply at the Ignition Transformer, check the power supply at the PCB and the cable between PCB and Igniton Tranformer.

YES

NOTE: Check the Ignition Rods: the electrode should spark during the entire trial for ignition and the distance between the electrodes is between 3 - 5 mm(1/8 -3/16 in).

Check static and dynamic gas supply pressures, as per Procedure 1.
Is gas supply correct?

NO

Check gas supply, piping and regulator

YES

NOTE:
- If the dynamic pressure is low: check the installation and the gas supply.
- If the static pressure is high (> 24” in WC): the gas valve will be damaged.

If gas pressure is good and electrode sparks:
Is there gas supply to the Burner?
Refer to Procedure 2

NO

- Confirm volatage at Gas Valve. If there is no voltage present check the cable and/ or the PCB Refer to Procedure 3 to determine if the Gas Valve coils are damaged
- If the Gas Valve has power and the coils are not damaged, open the adjusting screws and retry. Refer to Procedure 2 to determine if the Gas Valve is mechanically fit. If gas eventually passes through the Gas Valve follow Procedure 7.

YES

The flame does not light, or goes out after ignition .

The gas mixture is not correct, refer to Procedure 7 to ignite the unit, then adjust the CO_2.

Is the detection of the ionization current correct?
- Check condition of the Ionization Electrode. Inspect the wire leading into the Ionization Electrode. Ensure continuity from the tip of the electrode to the end of the cable;
- Confirm the ionization current is a minimmum of 3-5 µAmp (as per Procedure 4)

If all the above checks are correct, replace the PCB

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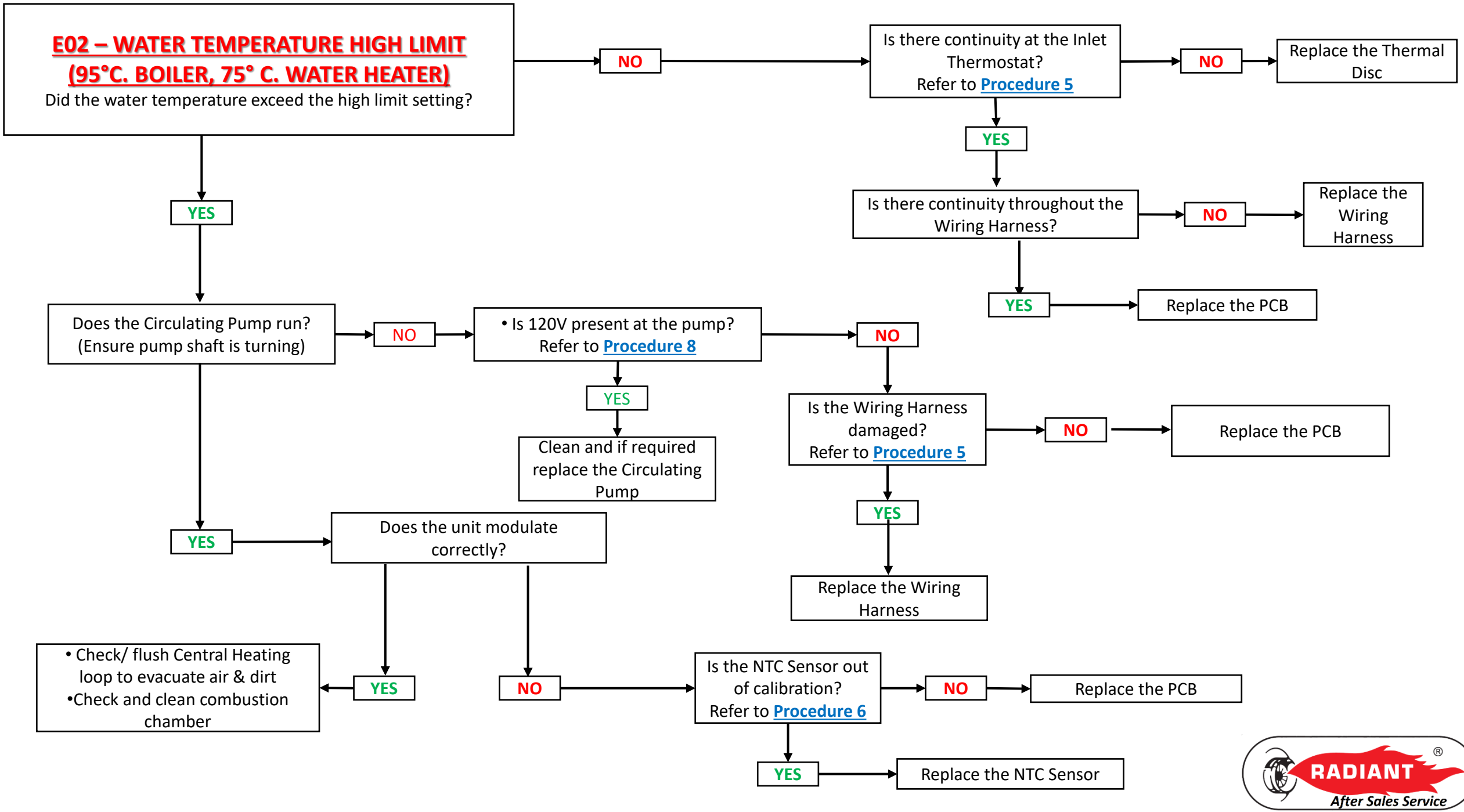
E02 – WATER TEMPERATURE HIGH LIMIT (95°C. BOILER, 75° C. WATER HEATER)
Did the water temperature exceed the high limit setting?
NO
Is there continuity at the Inlet Thermostat? Refer to Procedure 5
NO
Replace the Thermal Disc
YES
Is there continuity throughout the Wiring Harness?
NO
Replace the Wiring Harness
YES
Replace the PCB
YES
Does the Circulating Pump run? (Ensure pump shaft is turning)
NO
• Is 120V present at the pump? Refer to Procedure 8
NO
YES
Clean and if required replace the Circulating Pump
Is the Wiring Harness damaged? Refer to Procedure 5
NO
Replace the PCB
YES
Replace the Wiring Harness
YES
Does the unit modulate correctly?
• Check/ flush Central Heating loop to evacuate air & dirt
•Check and clean combustion chamber
YES
NO
Is the NTC Sensor out of calibration? Refer to Procedure 6
NO
Replace the PCB
YES
Replace the NTC Sensor
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E03 – EXHAUST SAFETY HIGH LIMIT

The Exhaust safety high limit is a one time use Thermofuse and it can be varified by Procedure 5.
Is the Thermofuse blown?

YES → Replace the Thermofuse

NOTE
The Thermofuse opens at a temperature of 102 ± 2 °C. When this occurs, **the Thermofuse must be replaced**. It is critical to diagnose why it opened: it is very unlikely to open on its own.
Do not replace fuse without addessing cause.

NO

Is there continuity throughout the fuse wiring?
Refer to Procedure 5

NO → Replace the wiring

YES

Replace the PCB

Check if the Circulating Pump is powered **AND** the pump shaft turning

Check the flue gas temperature

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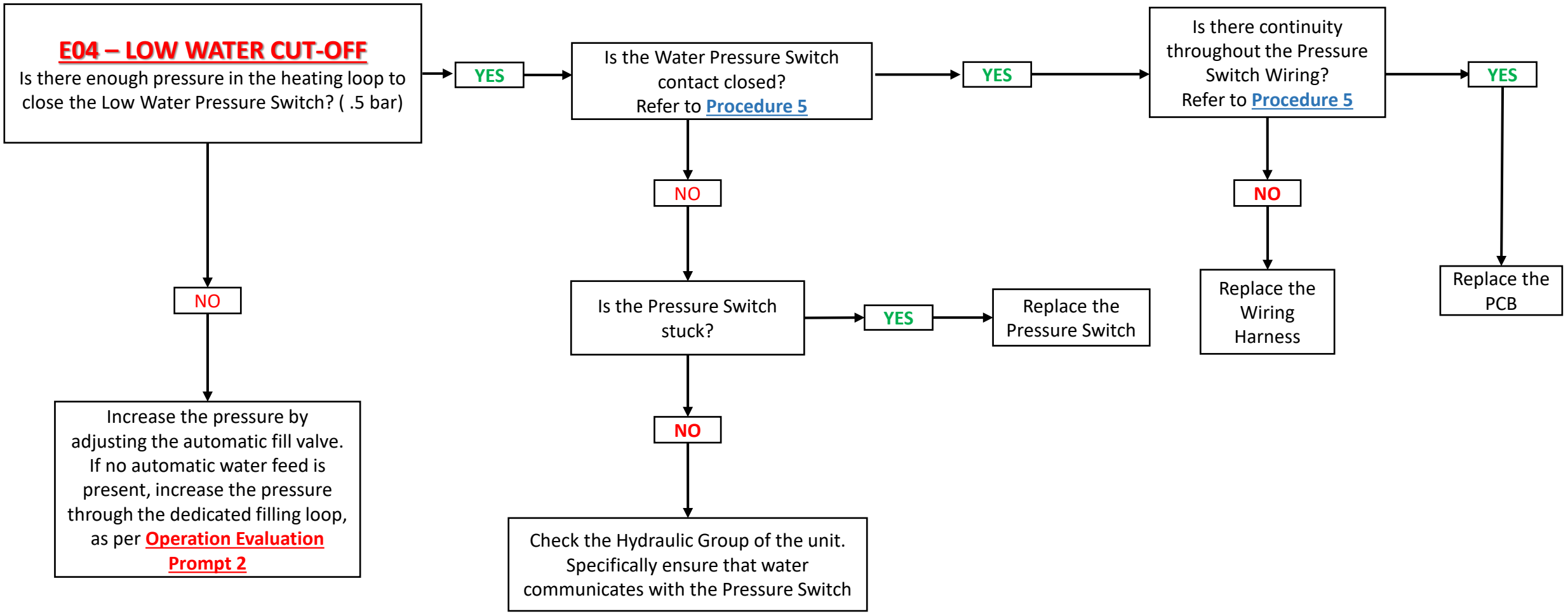
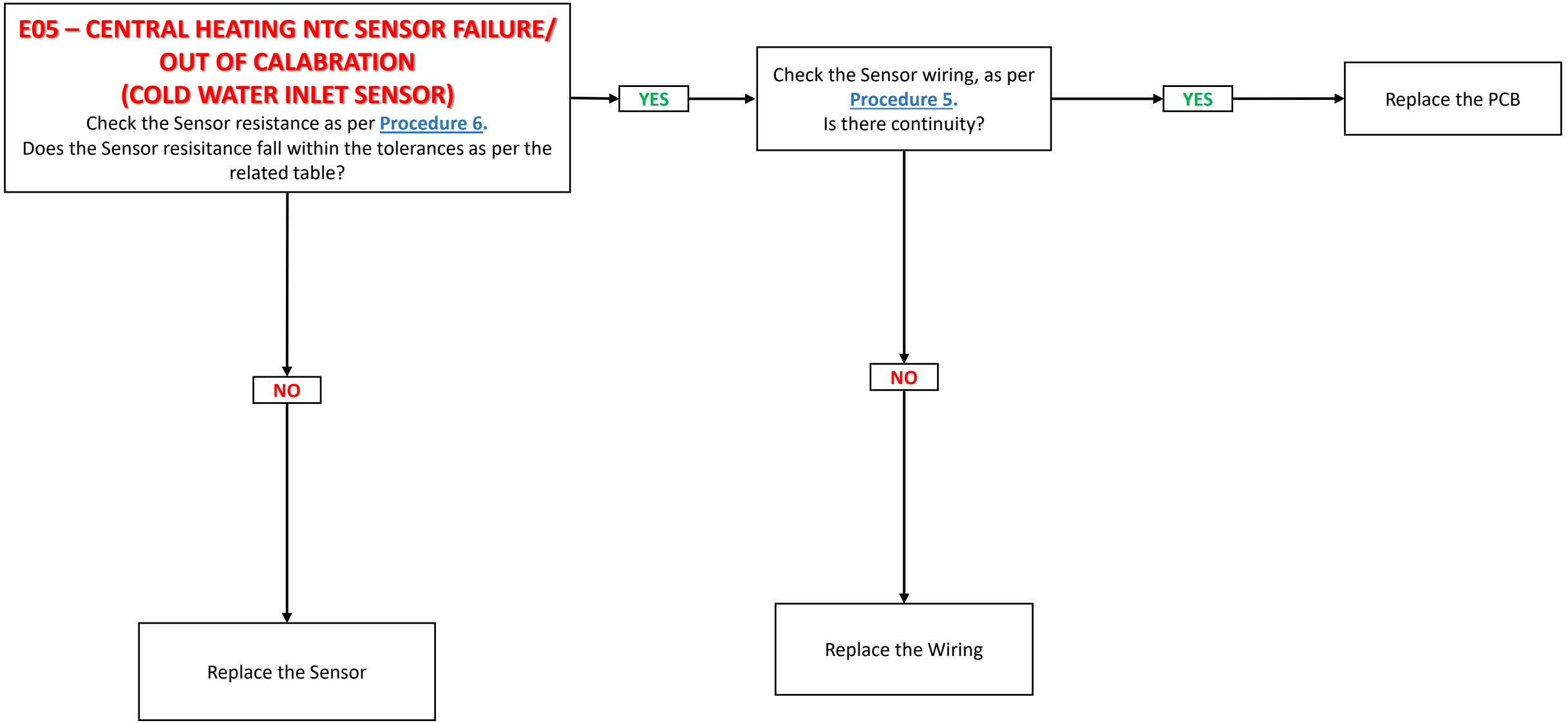
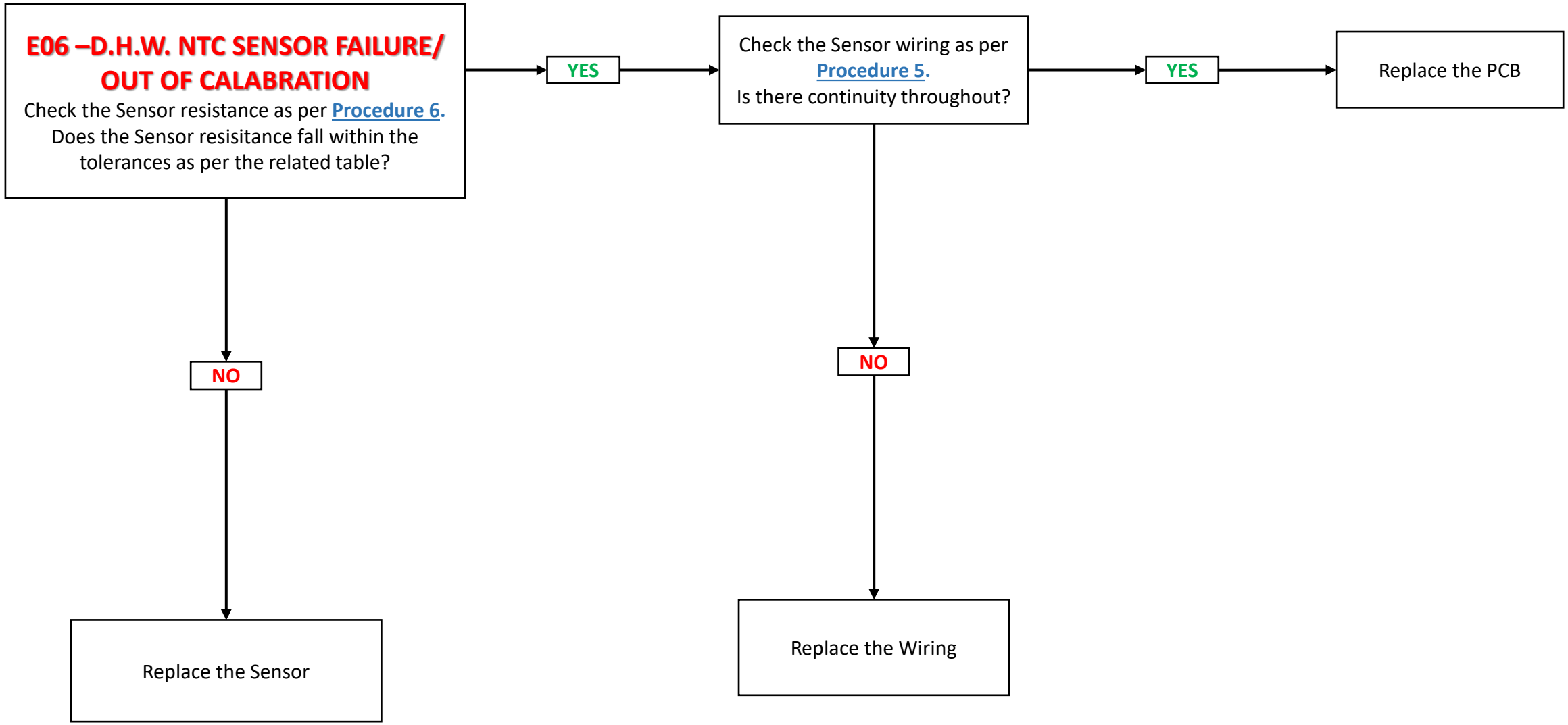
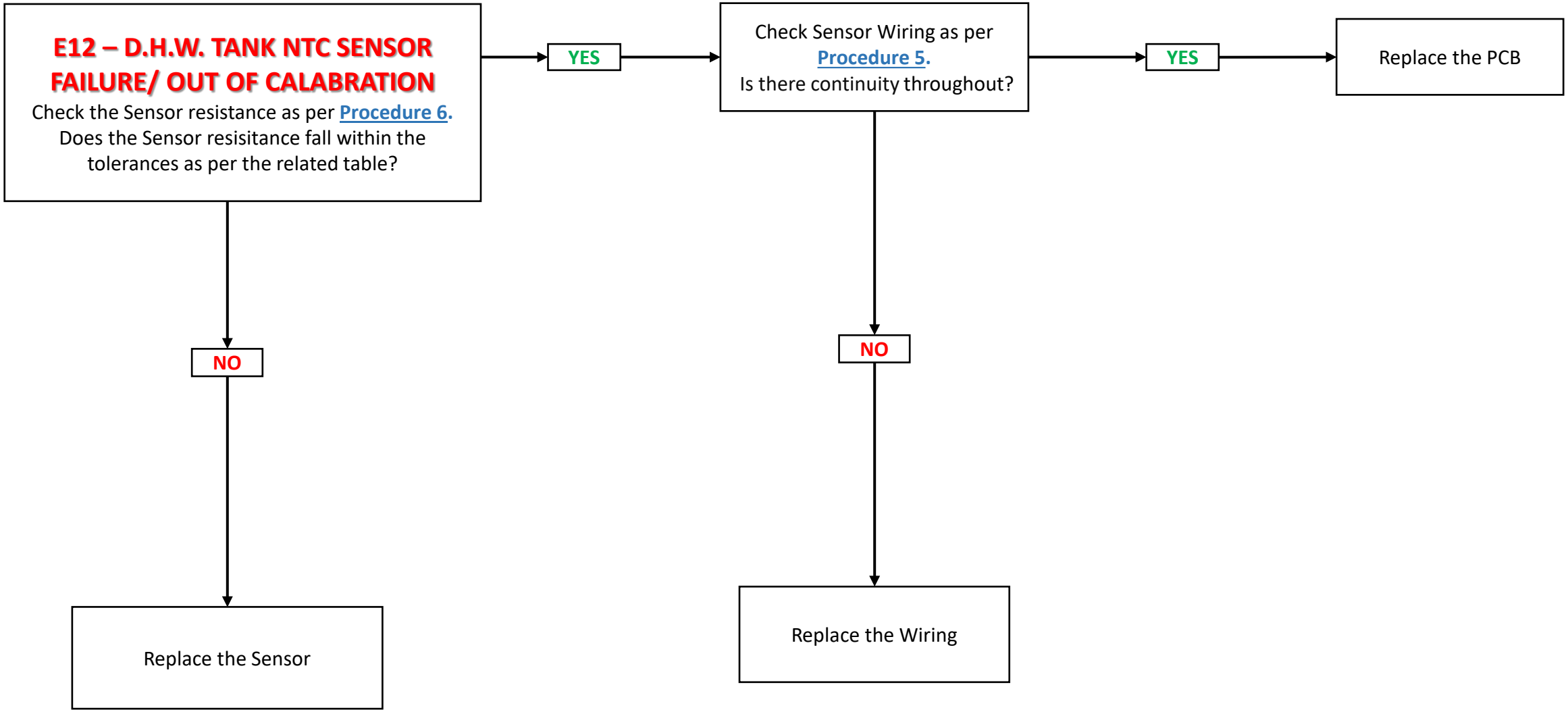


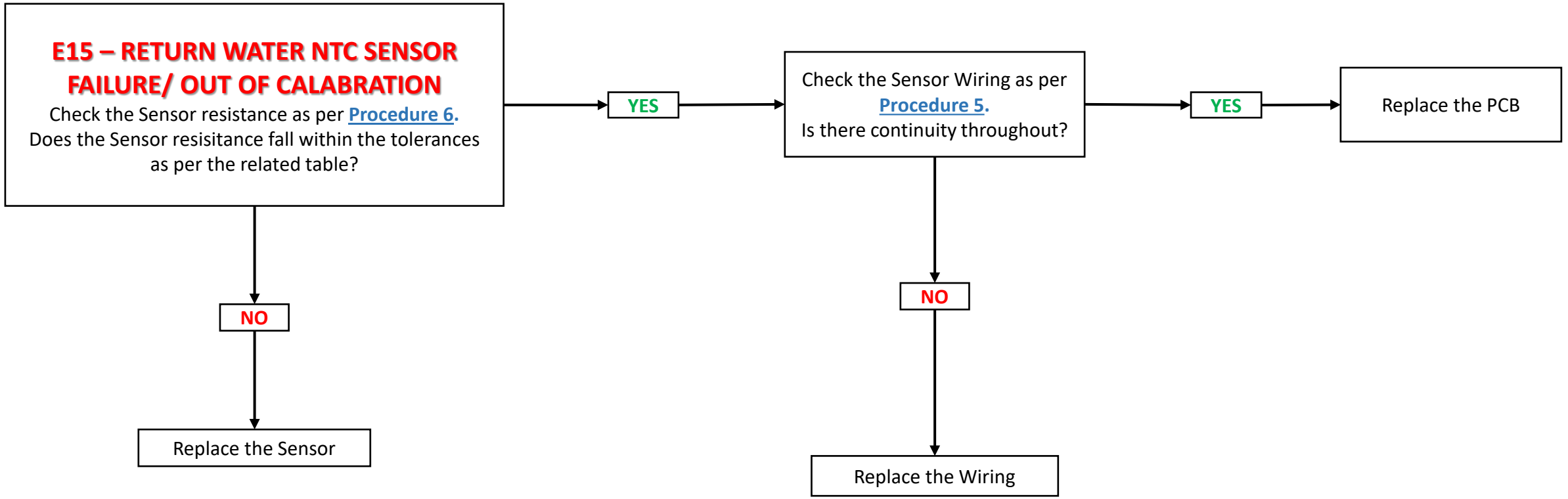
Note

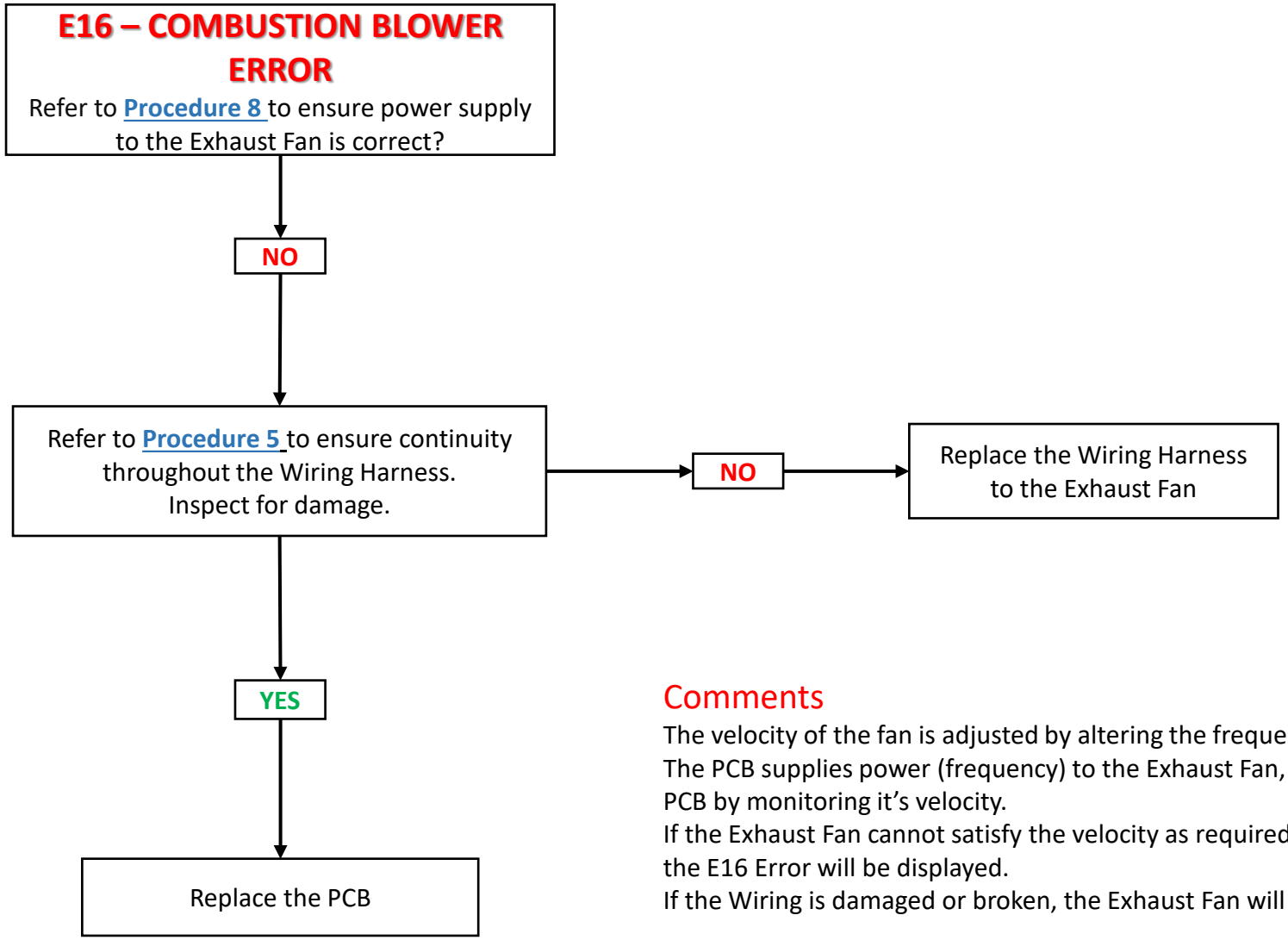
When the E04 error is repaired, the F33 Function activates to flush the air from the system. It is highly recommended not to deactivate the F33 Function, as this may lead to boiling and internal stresses within the unit.


E05 – CENTRAL HEATING NTC SENSOR FAILURE/ OUT OF CALABRATION (COLD WATER INLET SENSOR)
Check the Sensor resistance as per Procedure 6.
Does the Sensor resisitance fall within the tolerances as per the related table?
YES
Check the Sensor wiring, as per Procedure 5.
Is there continuity?
YES
Replace the PCB
NO
Replace the Sensor
NO
Replace the Wiring


E06 –D.H.W. NTC SENSOR FAILURE/ OUT OF CALABRATION
Check the Sensor resistance as per Procedure 6.
Does the Sensor resisitance fall within the tolerances as per the related table?
YES
Check the Sensor wiring as per Procedure 5.
Is there continuity throughout?
YES
Replace the PCB
NO
Replace the Sensor
NO
Replace the Wiring


E12 – D.H.W. TANK NTC SENSOR FAILURE/ OUT OF CALABRATION
Check the Sensor resistance as per Procedure 6.
Does the Sensor resisitance fall within the tolerances as per the related table?
YES
Check Sensor Wiring as per Procedure 5.
Is there continuity throughout?
YES
Replace the PCB
NO
Replace the Sensor
NO
Replace the Wiring


E15 – RETURN WATER NTC SENSOR FAILURE/ OUT OF CALABRATION
Check the Sensor resistance as per Procedure 6.
Does the Sensor resisitance fall within the tolerances as per the related table?
YES
Check the Sensor Wiring as per Procedure 5.
Is there continuity throughout?
YES
Replace the PCB
NO
Replace the Sensor
NO
Replace the Wiring



Comments

The velocity of the fan is adjusted by altering the frequency of modulation.
The PCB supplies power (frequency) to the Exhaust Fan, the Exhaust Fan then responds to the PCB by monitoring it's velocity.
If the Exhaust Fan cannot satisfy the velocity as required by the PCB for at least 30 seconds, the E16 Error will be displayed.
If the Wiring is damaged or broken, the Exhaust Fan will ramp up to maximum speed.

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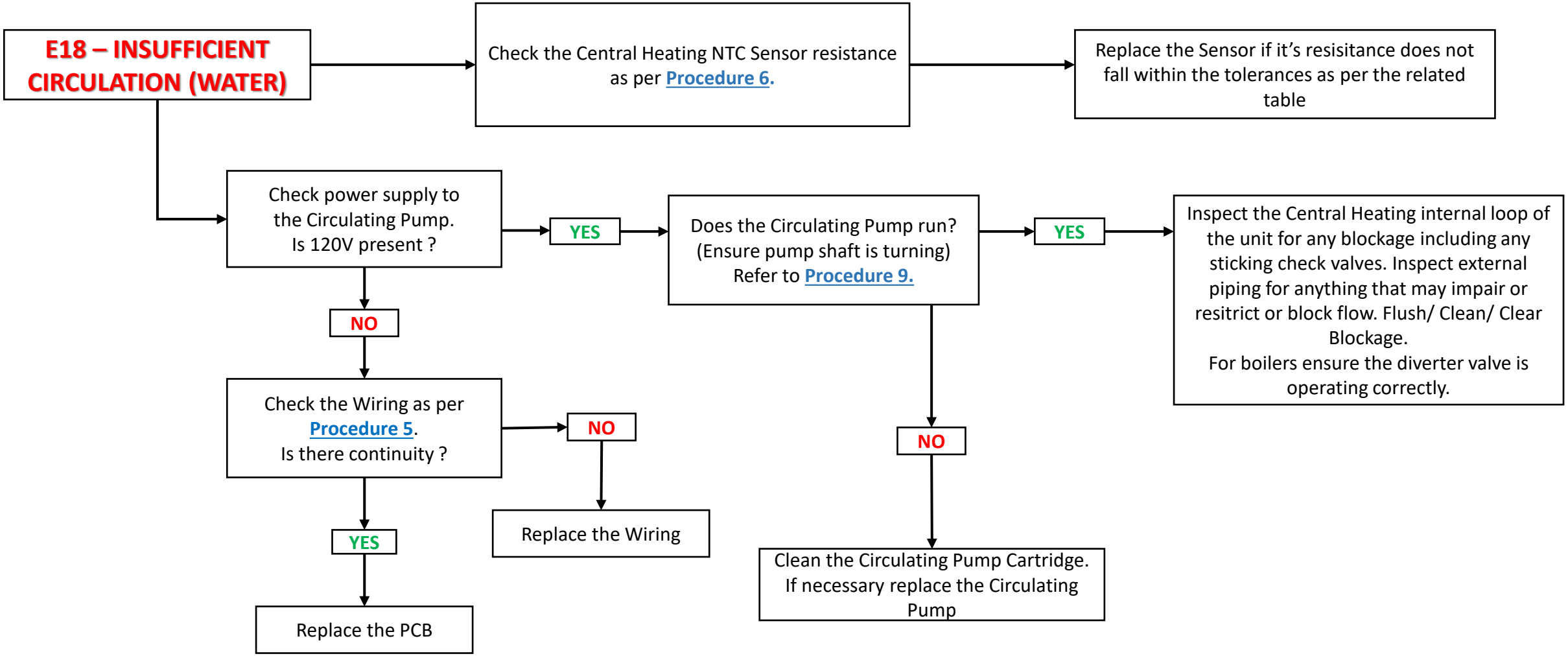

Note

The **E18** error is related to the temperature rise detected at the Primary Heat Exchanger Sensor. (For boilers the Central Heating NTC Sensor and for Water Heaters the Outlet NTC Sensor.)
After 10 seconds of flame detection, a minimum of 1°C temperature variation must exist for water cirulation. If there is a lack of water circulation detected, the appliance will shut down and restart after 2 minutes. Failing water circulation a second time requires the boiler to be manually reset after a safety period on standby.

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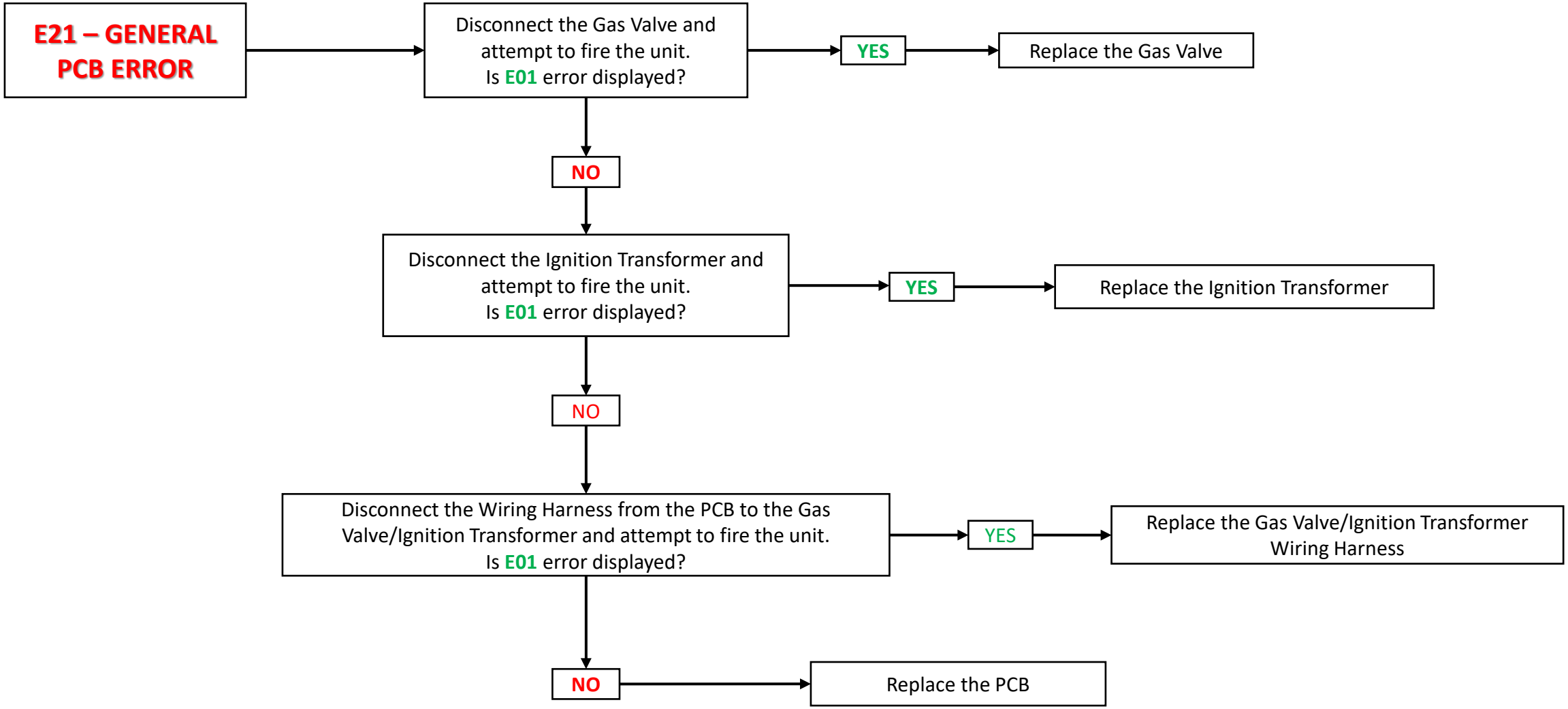

Note:

The E21 error is only displayed during the ignition cycle and **very rarely** is the error caused by the PCB

The E01 error displayed during these tests is predictable as the burner will not see ignition when the various components are disconnected.

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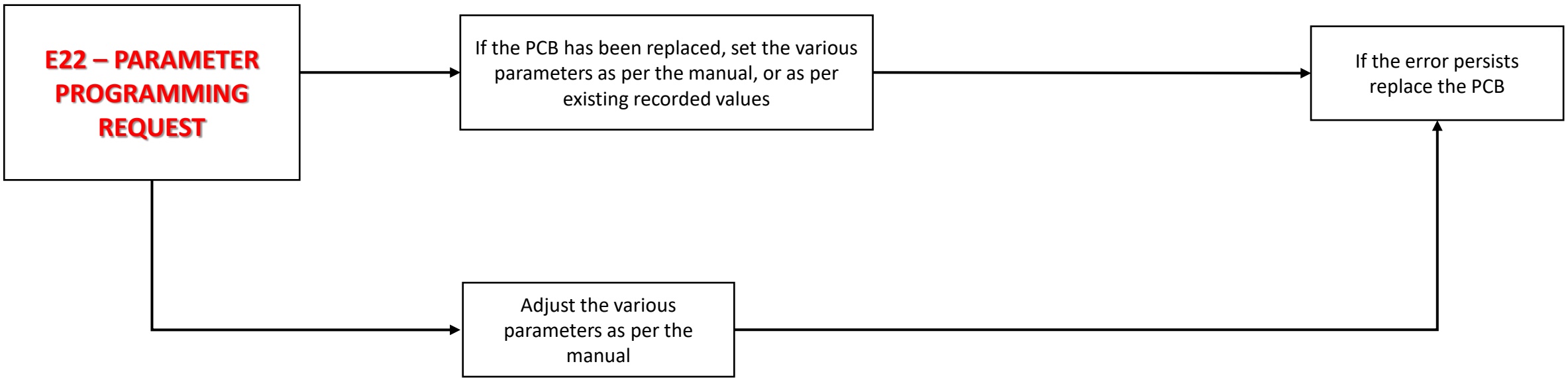

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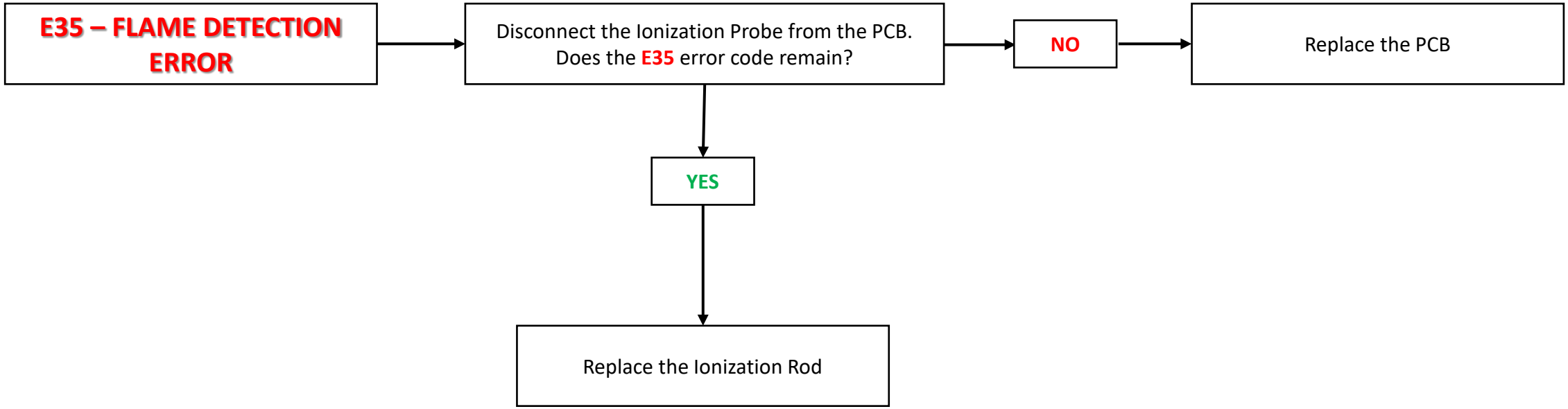
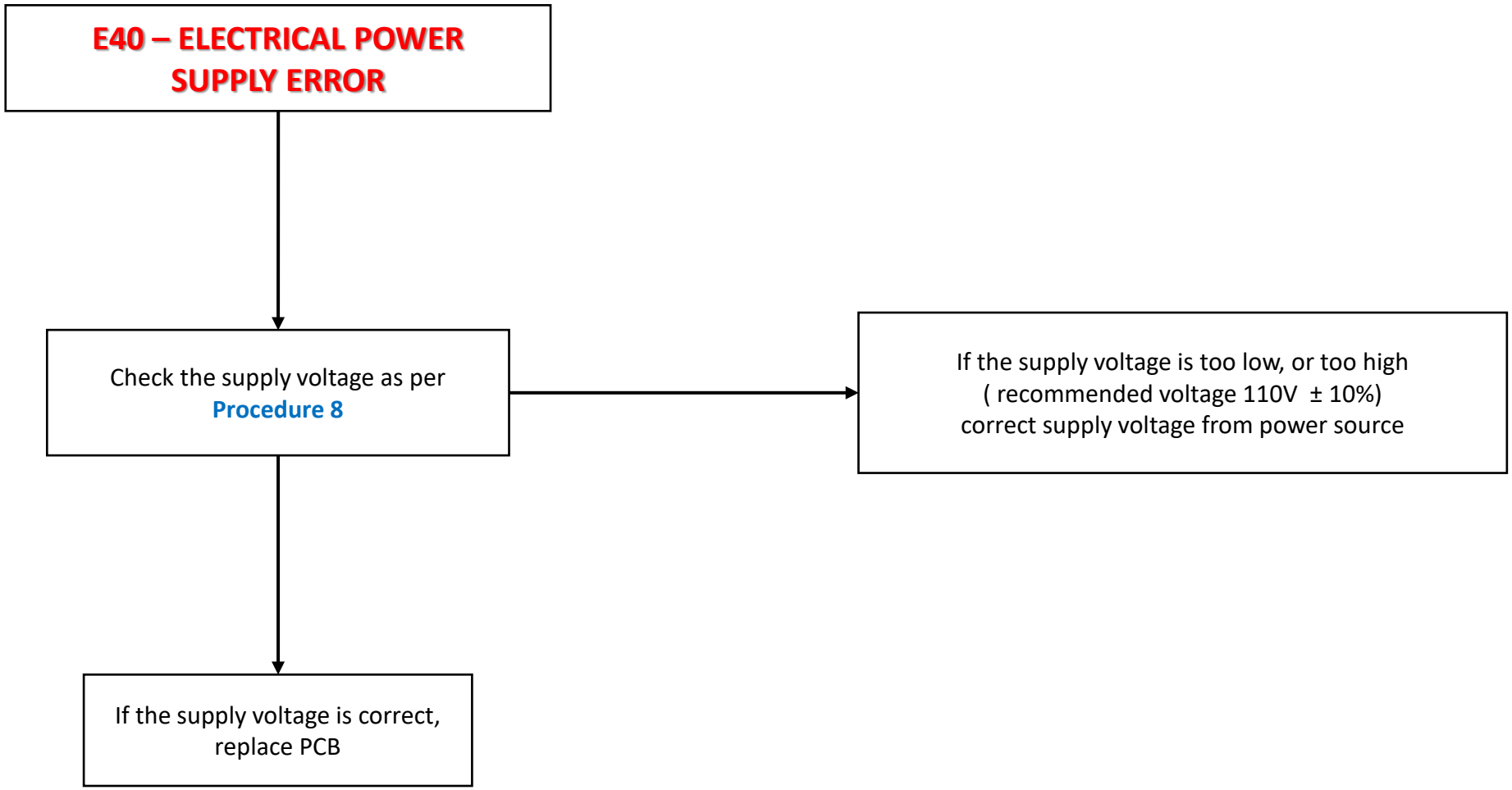

E35 – FLAME DETECTION ERROR
Disconnect the Ionization Probe from the PCB.
Does the E35 error code remain?
NO
Replace the PCB
YES
Replace the Ionization Rod



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DIAGNOSTICS PROCEDURES

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Procedure 1 – Measuring the Dynamic and Static Gas Pressures

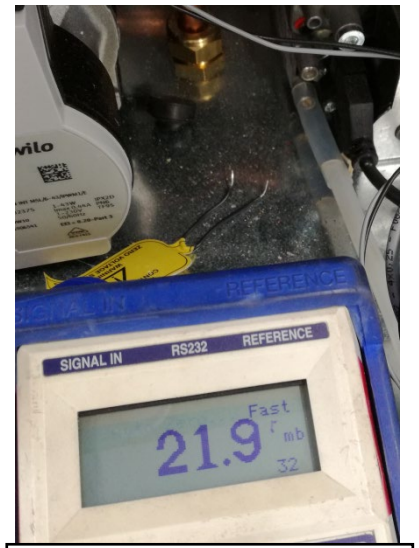
Static Pressure

To measure the Static Gas Pressure supplied to the unit:

- Turn Unit off
- Insert Manometer hose onto the gas valve inlet port and turn unit on
- Displayed value is the static pressure as the unit is not firing

To measure the Dynamic Gas Pressure supplied to the unit:

- Complete the above proceedure to measure/ record Static Gas Pressure
- Fire unit to its maximum power. Observe the Static Pressure reading drop to the Dynamic Gas Pressure value once stabilized. Ensure this value meets the minimum supply pressure documented in the technical manual



Dynamic Pressure

Notes:

The gas pressure drop is measurable, and is dependant on the gas pipe losses through the gas piping.

The resistance increases with long pipe runs, number of fittings and small pipe diameter.

When the gas pressure drop is excessive the following may result:

- Flame light off and drop out
- Improper combustion and noise
- Poor efficiency, and/or unit unable to fire at maximum power

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Procedure 8 – Measurement of Voltage

Fig.1

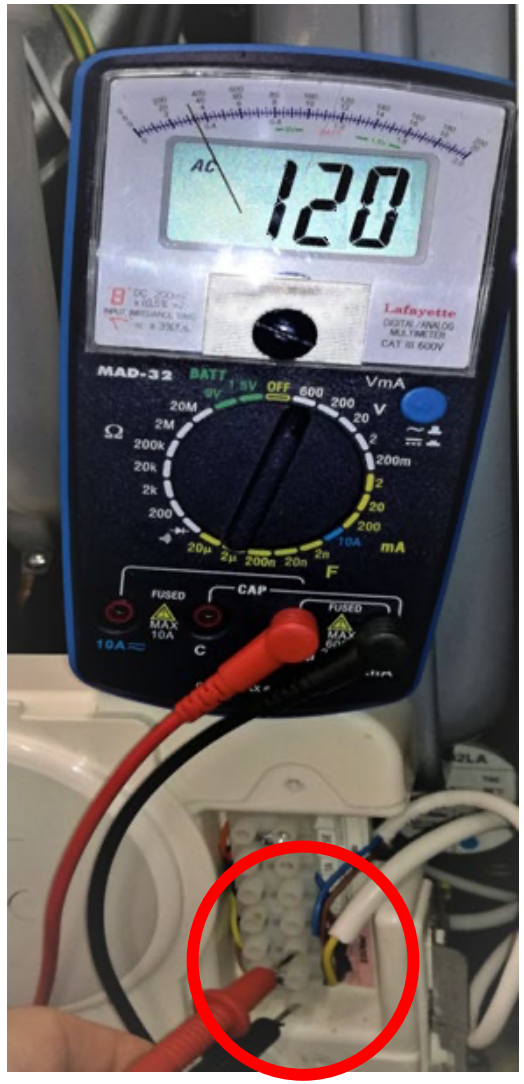
Fig.2

- Select the “Volts” mode on the Multimeter (Figure 1.)
- Choose the Voltage range according to the maximum value to be measured (Figure 2.)
- Insert the Meter Probes into the terminal openings to be measured (Figure 3.)
- Checking the value between the Line (Black) and Neutral (White) will indicate if the circuit is open (meter will read 120V) or closed (meter will read 0V)
- Taking the reading from your Line (Black) wire to Ground (Green) will show if the unit is recieveing the correct amount of voltage.

Polarity Check:

- Probe value between Line (Black) and Ground (Green) = 120V ☑
- Probe Value between Nuetral (White) and Ground (Green) = 0V ☑

Fig.3



Reverse Polarity: Probe Value between Neutral (White) and Ground (Green) = 120V ☒

This condition MUST be corrected for proper operation

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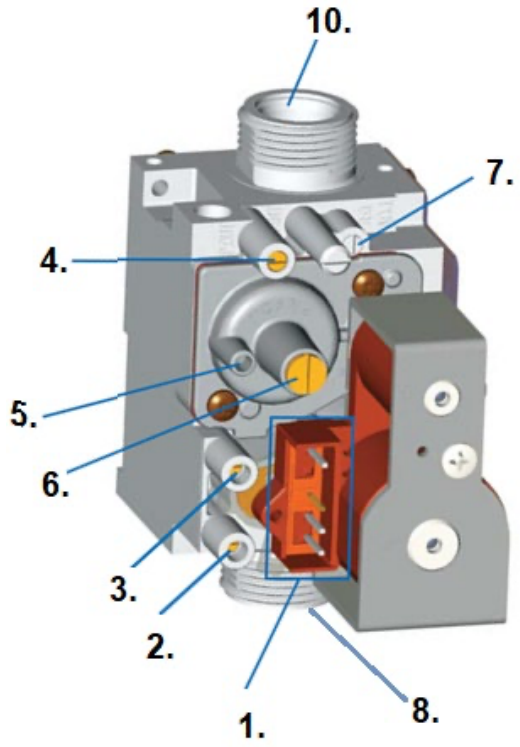
Procedure 2 – Verifying Gas Valve operation

To verify Gas Valve operation:

- Turn off the unit and insert manometer hose onto the gas valve inlet port **2** . The manometer will measure the gas pressure supplied
- Close the gas tap located on the bottom of the unit and fire the burner
- If the gas valve opens, the Manometer pressure display will rapidly go to zero, or even to a negative value because the blower will draw from the gas valve venturi if there is no gas supply
- If the gas valve does not open, the Manometer gas pressure reading will remain the same during the ignition process

Note: Venting can also be a factor in opening the gas valve. If the venting has too much restriction or an obstruction, it can cause a positive back pressure preventing the gas valve from opening.

Static pressure



1 On-Off solenoid valves EV1 and EV2 terminals
2 Inlet pressure test point
3 Outlet pressure test point
4 Additional outlet pressure test point (version with gas/air adjuster)
5 Air signal connection
6 Zero adjustment (offset)
7 Gas/air ratio adjuster (optional)
8 Gas inlet
9 Pilot outlet (optional)
10 Main gas outlet

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Procedure 3 – Testing the Sit 848 Gas Valve coils - 120 v.

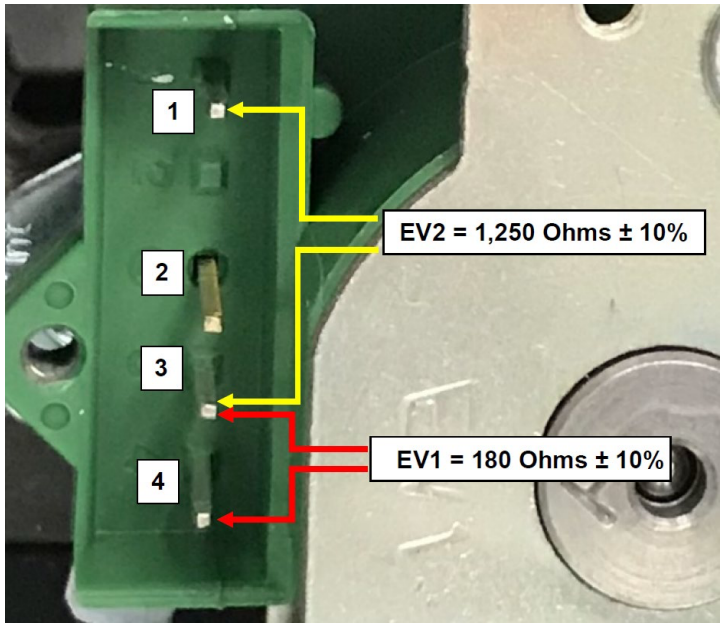
Set the meter as per Figure 1. Measure the resistances of coils EV1 and EV2 per Figure 3.

The values should measure:

- Ev1 180 Ohm between Pin 3 and Pin 4
- Ev2 1,250 Ohm between Pin 3 and Pin 1

A variance of ± 10% from the above values is acceptable.

Fig 3.

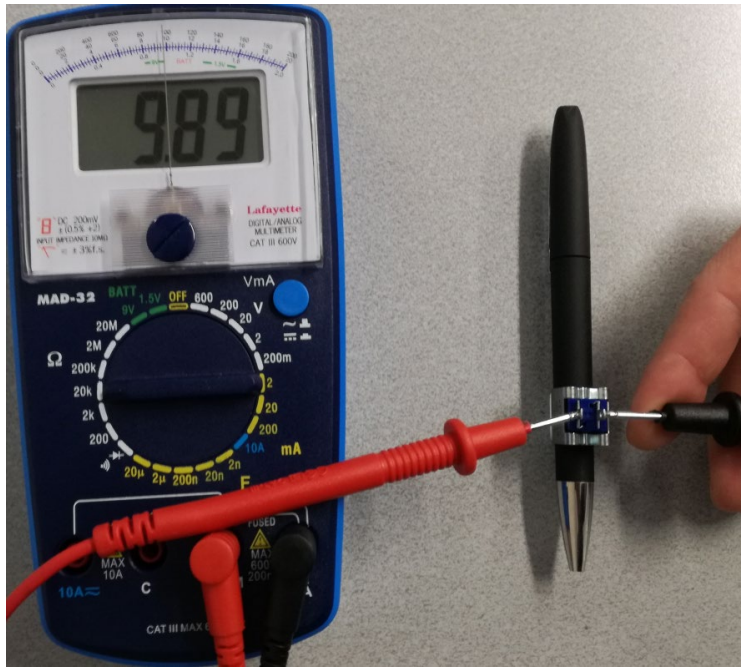


Modulator:

The pneumatic modulator varies according to the fan speed (hertz) of the inducer fan motor.

Fig 1.

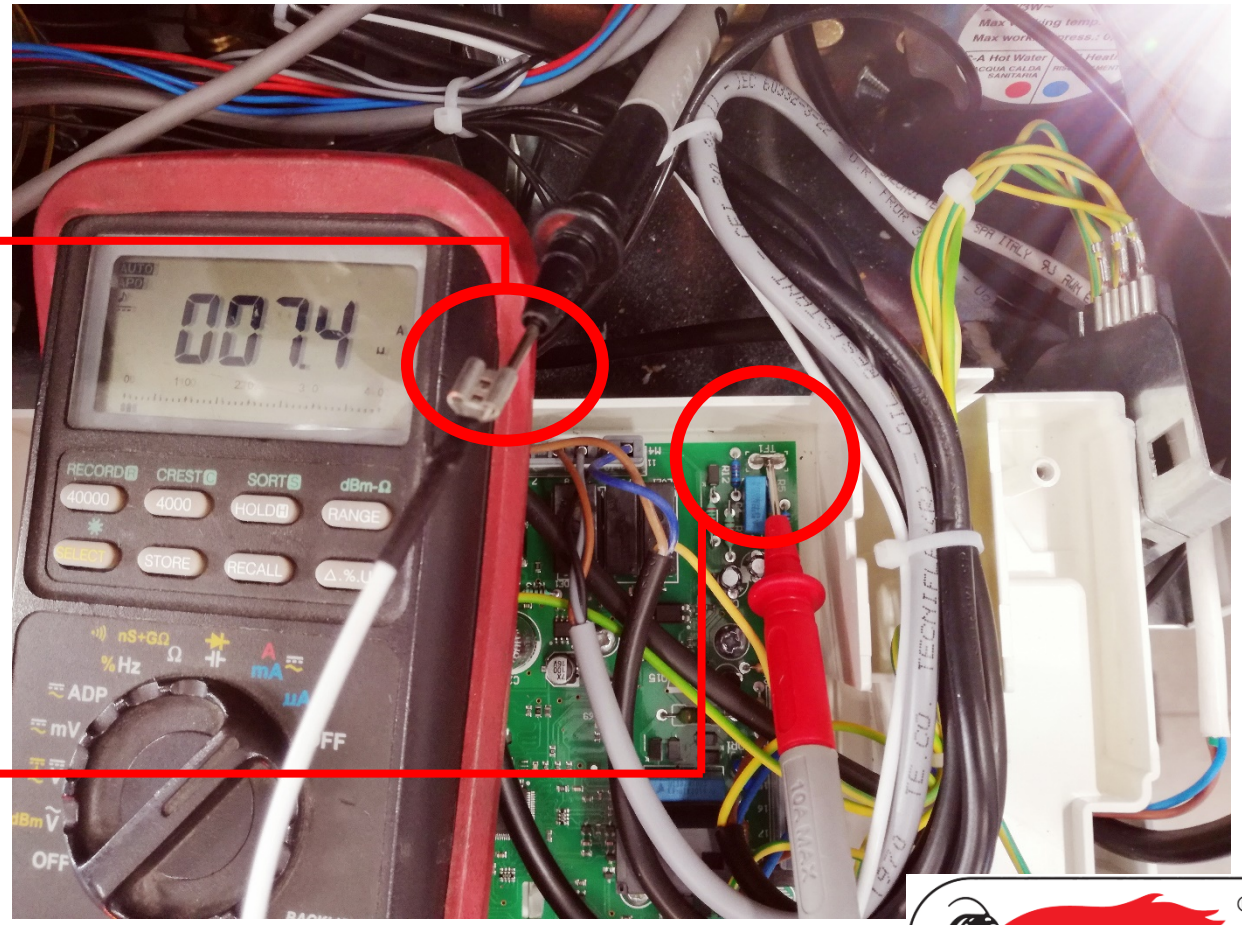
Fig 2.



Procedure 4 – Measuring the Ionization Current

- Set the Meter to µA (Micro Ampere)
- Remove Ionization Electrode Spade Connector from the Spade Terminal on the PCB
- Connect the Meter Probes in series between the Ionization Electrode Spade Connector and the Ionization Electrode Spade Terminal on the PCB
- The Ionization Current should read at least 3-5 µA

3 – 5 µA



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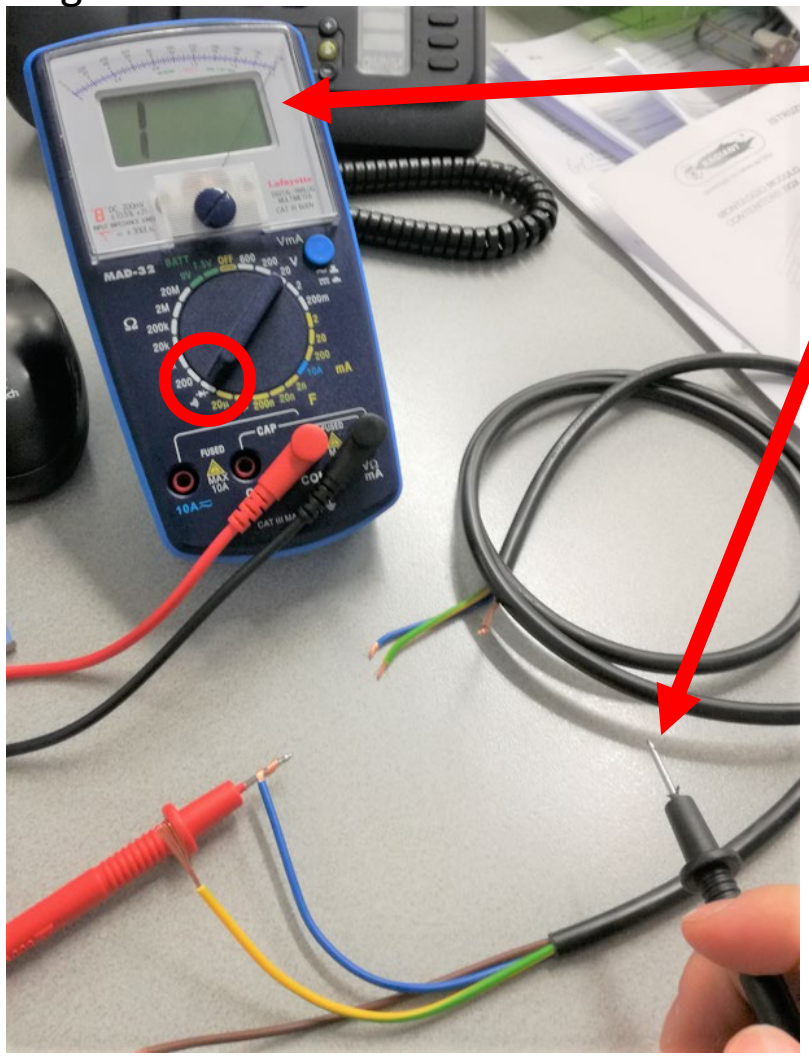
Procedure 5 – Continuity Analysis

Using a Multimeter, it is possible to verify if an electrical circuit is interrupted.

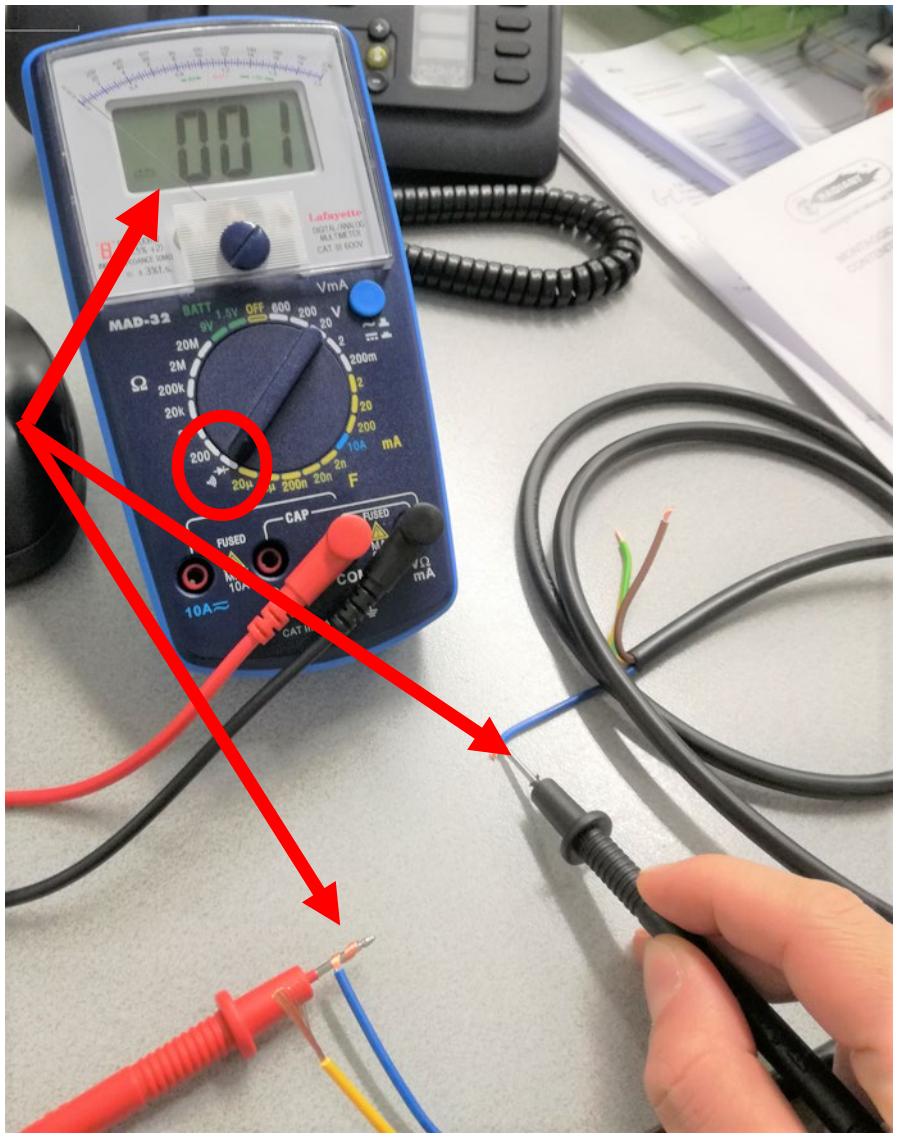
- Position the selector to the Ohm (**Ω**) symbol (Figure 1)
- Position the pins of the Tester on the bare wires of the circuit to verify (Figure 2)

Fig. 1



Note:
Some Meters may produce an audible beep, if the circuit is closed.

Fig. 2



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Procedure 6 – Verifying Resistances

Each individual sensor has a resistance value that varies with temperature. Using a Multimeter, it is possible to verify if the sensors are calibrated correctly.

Position the Tester Selector to **Ω** (Ohm), the scale must be set to a value higher than the value to be measured (Figure 1)

Position the Tester probes on the terminals of the component to be verified;

All the Radiant sensors bear the value of 10,000 **Ω** @ 25°C as per the attached table (Figure 2)

Fig. 1

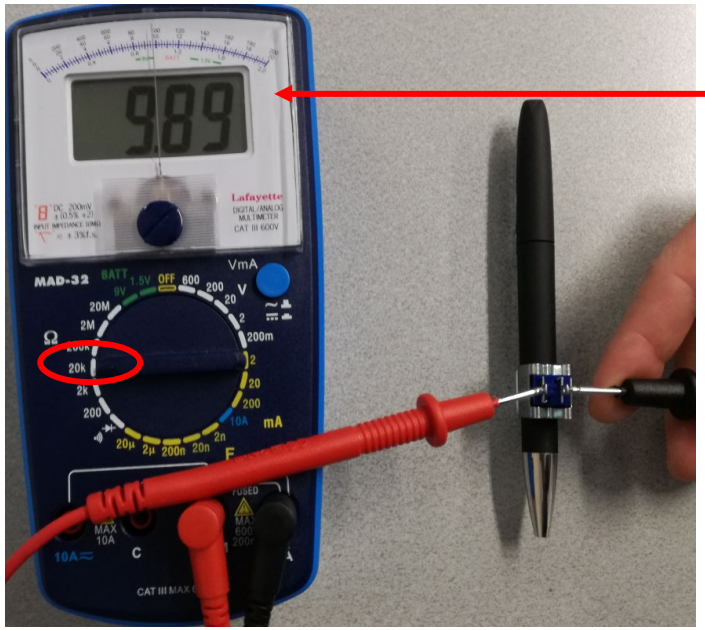

Fig. 2

Temp	R NTC	Temp	R NTC	Temp	R NTC	Temp	R NTC	Temp	R NTC
-50	329200	-15	53432	20	12090	55	3538	90	1266
-49	310868	-14	51018	21	11634	56	3426	91	1232
-48	293656	-13	48707	22	11199	57	3319	92	1199
-47	277489	-12	46513	23	10781	58	3216	93	1168
-46	262299	-11	44429	24	10382	59	3115	94	1137
-45	248023	-10	42449	25	9999	60	3021	95	1109
-44	234600	-9	40568	26	9633	61	2928	96	1079
-43	221976	-8	38780	27	9281	62	2839	97	1051
-42	210099	-7	37079	28	8945	63	2753	98	1024
-41	198922	-6	35463	29	8622	64	2669	99	998
-40	188399	-5	33925	30	8313	65	2589	100	973
-39	178490	-4	32461	31	8016	66	2512	101	948
-38	169156	-3	31069	32	7731	67	2437	102	925
-37	160359	-2	29743	33	7458	68	2365	103	901
-36	152068	-1	28481	34	7196	69	2292	104	879
-35	144250	0	27279	35	6944	70	2229	105	857
-34	136876	1	26136	36	6702	71	2164	106	836
-33	129912	2	25044	37	6470	72	2101	107	815
-32	123353	3	24004	38	6247	73	2040	108	796
-31	117154	4	23014	39	6033	74	1982	109	776
-30	111299	5	22069	40	5828	75	1925	110	757
-29	105769	6	21168	41	5630	76	1870		
-28	100544	7	20309	42	5440	77	1817		
-27	95605	8	19489	43	5258	78	1766		
-26	90934	9	18706	44	5082	79	1717		
-25	86518	10	17959	45	4933	80	1669		
-24	82339	11	17245	46	4751	81	1622		
-23	78384	12	16563	47	4590	82	1577		
-22	74641	13	15912	48	4444	83	1534		
-21	71097	14	15289	49	4300	84	1491		
-20	67739	15	14694	50	4161	85	1451		
-19	64571	16	14126	51	4026	86	1411		
-18	61563	17	13582	52	3897	87	1373		
-17	58719	18	13062	53	3773	88	1336		
-16	56016	19	12565	54	3653	89	1300		

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Procedure 7 – Air/ Gas Mixture/ Flammability

To initiate proper combustion, there must be proper gas to air ratio present.

Ignition spark is critical, but the spark must be present in the correct gas to air ratio.

If the gas valve is functioning correctly, and opens, but there is no ignition (as per **Procedure 2**), we would recommend these simple steps :

- Turn off the unit
- Partially block the fresh air inlet of the Combustion Blower (Air Intake Tube) using your hand
- Ignite the burner and at the start of the ignition cycle slowly remove your hand until the burner fires-up.

If the burner does not ignite after a number of tries, there is probably too much gas that has collected and will need to dissapate before the burner will ignite.

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Procedure 9 – Circulation Pump Operation Analysis

1. Place a large towel on the bottom of the Pump.
2. Protect all electronic components from potential water exposure.
3. Remove the large screw in the centre of the motor end of the Pump (See Fig. 1).
4. Activate the Pump by initiating a call.
5. The Pump shaft should turn (See Fig 2), or a magnetic field should be felt with a screw driver at the end of the shaft.
6. If the Pump shaft does not turn, insert a screwdriver to manually turn/ free the Pump shaft (See Fig 3).

Notes:

1. If the pump shaft is stiff and does not turn freely, the pump cartridge must be cleaned.

Fig.1

Fig.2

Fig.3

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OPERATION EVALUATION PROMPTS

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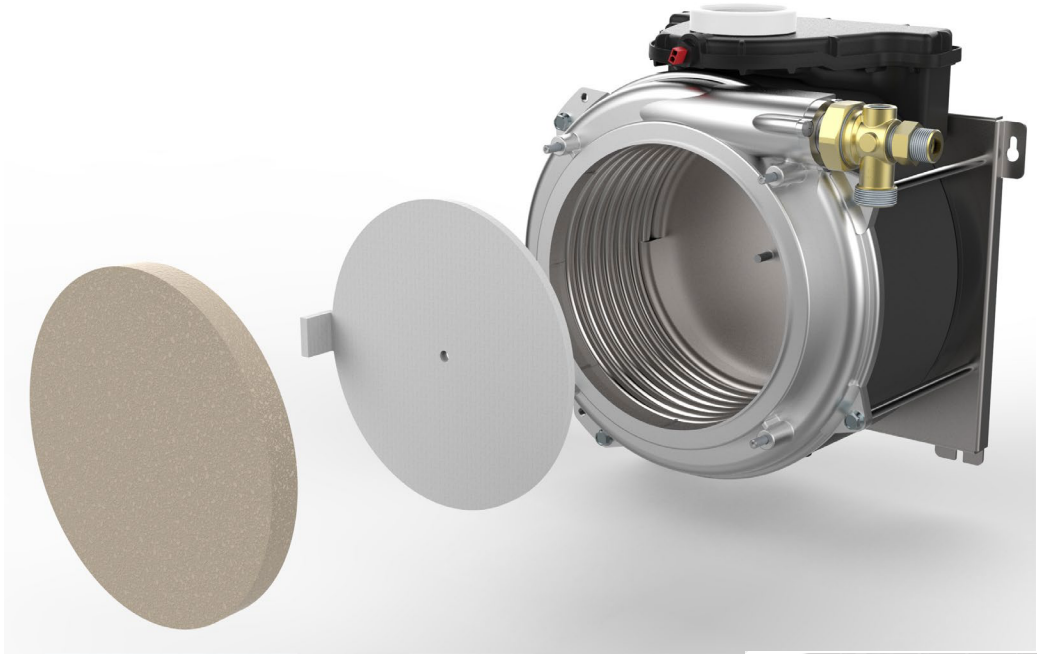
General System Operation Prompt 1 – High Exhaust Temperature

In the event that exessively high exhaust temperatures are present, the Thermofuse will fail as a safety measure. In this case The Thermofuse must be replaced.
Note: It is critical to diagnose why the Thermofuse opened, as it is very unlikely to open on its own.

An excessively high flue temperature can be caused by:

- Over firing the burner
- Dirty heat exchanger on the combustion side
- Dirty heat exchanger on the DHW water side
- Deteriorated or broken refractory panels;

It is also important to ensure that the refractory positioning is correct. If positioning is a concern we recommend a Radiant Refractory Replacement Kit (65-00538) be installed.
This kit includes the refractory components shown in the picture
(** note the position of the back panel tab and the thermo fuse)



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General System Operation Prompt 2 – What pressure should the heating circuit be charged to?

The Central Heating Loop is a closed circuit.
In order to avoid corrosion, circulation, and thermal efficiency problems in the system it is necessary to ensure the presence of a minimum pressure throughout all points of the system.
It is recommended to maintain a minimum pressure of 7.5 psi (0,5 Bar) at the highest point of the system, especially if there is an automatic purge at that highest point.
If a system is 33 feet high (10 m) , and the boiler is installed in the lowest point of the system, 21 psi (1.5 Bar) would be a reasonable pressure value.

1 bar = 14.7 psi
0.5 bar (7.5 psi) = minimum pressure in the highest point of the system

In order to avoid frequently adding water to the Central Heating loop, it is suggested to keep the pressure of the Expansion Tank charged slightly lower than the system's operating pressure.
In the above example, if the vessel is charged at 1.4 bar there will be a small amount of water coming out of the Expansion Tank to keep the pressure stable longer over time.

Note:

It is important to remember that low water pressure in the Heat Exchanger will provide conditions that promote water boiling or "Kettling".
On the other hand, if the water pressure is high, the boiling point increases. This will reduce the risk of damaging the Heat Exchanger or other component failures that are caused when the appliance overheats.

Radiant boilers operate best under pressure conditions of 14.7psi (1 bar) and have an upper limit of 43.5 psi (3 bar). Safety is ensured by the presence of a pressure relief valve.

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