FEB-24ED 3 STAR TECHNICAL DOCUMENTATION

29-05-13 version 1.0

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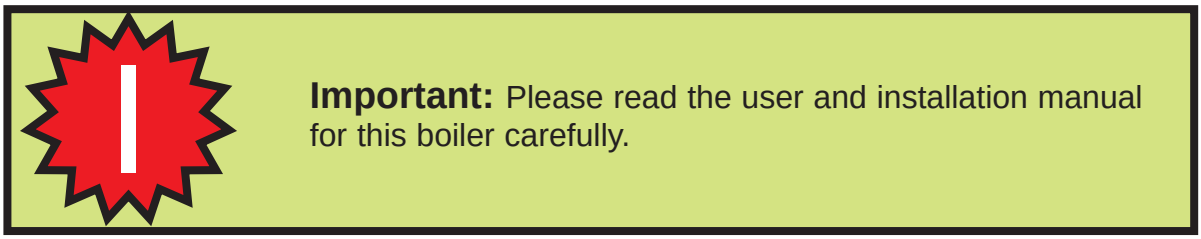
1.- Warnings and precautions

In order for the boiler to function correctly, it is vitally important for the appliance to be correctly adjusted on installation in accordance with gas installation regulations.

Boiler installation must comply with the conditions described by in the user and installation manual provided with the appliance



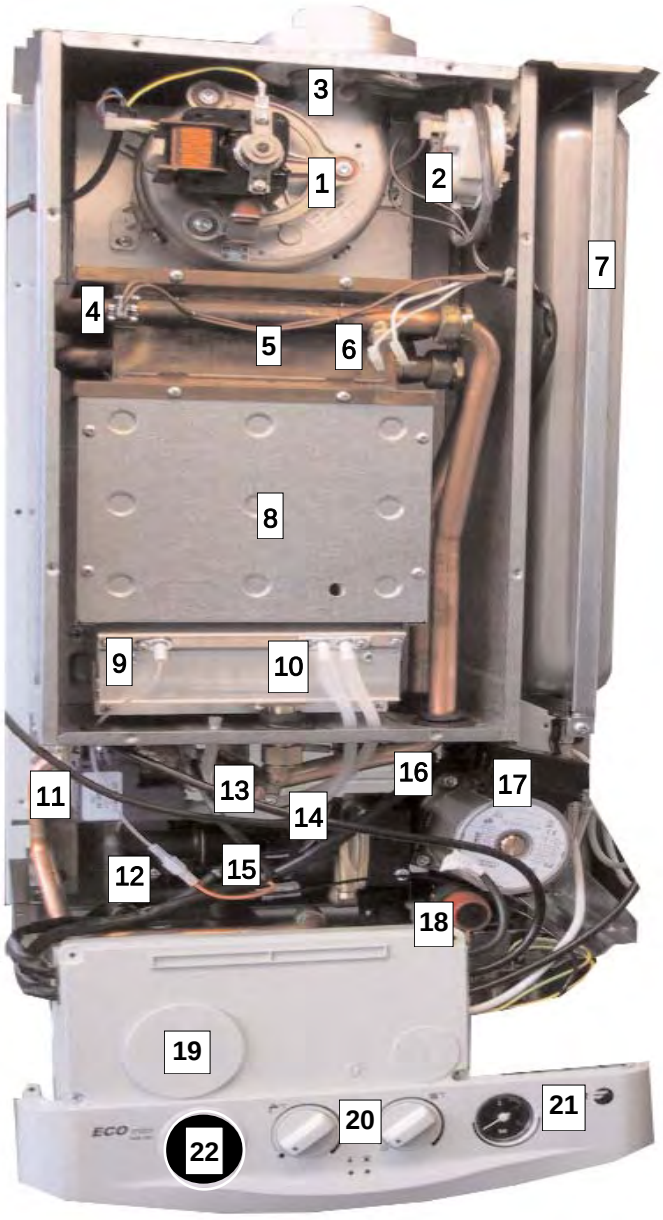
PLEASE NOTE THAT THE FAULT CODES AND SOFTWARE DIFFER FROM THE FEB24E & ED FAULT CODES. ALWAYS USE THIS MANUAL FOR FAULT FINDING AND TROUBLE SHOOTING ON THE FEB24ED 3 STAR

2.- Features

The boiler FEB-24ED 3 Star is a wall hung, room sealed, fan assisted, microprocessor controlled fully modulating gas combination boiler for providing both central heating and domestic hot water.

The boiler has a continuous electronic modulation field. The boiler has an output power of between 7.7 kW and 24.5 kW (26,291.07 -83,653.41 Btu/h).

FEB-24ED 3 STAR



1. Fan
2. Air pressure swithch
3. Venturi
4. Central heating flow thermistor
5. Copper heat exchanger
6. High limit thermostat
7. Expannsion vessel
8. Combustion chamber
9. Ionisation electrode
10. Circulation Pump with automatic air vent
11. Modulating gas valve
12 Central heating low pressure switch
13. Burner pressure test point
14. DHW micro switch
15. Hydraulic assembly & plate heat exchanger
16. Central heating return thermistor
17. Pump & Automatic air vent.
18. Safety valve
19. PCB inspection panel
20. Control knobs & LCD panel
21. Pressure gauge
22. Time clock

TECHNICAL DATA

Model			FEB-24ED 3★
Category			II2H3P
Type			C_{12}, C_{32}, C_{42}, C_{52}, C_{82}, B_{22}
Central heating and domestic hot water performances	Maximum output	kW	24.5
		Btu/h	83,653.41
	Minimum output	kW	7.7
		Btu/h	26,291.07
Nominal central heating and domestic hot input (Gross)	Maximum	kW	28.9
	Minimum	kW	9.2
Nominal central heating and domestic hot input (Gross)	Maximum	kW	25.5
	Minimum	kW	8.2
Domestic hot water flow at 25°C (l/min)			14.04
Domestic hot water flow at 35°C (l/min)			10.04
Nominal D.H.W. flow rate at 34°C (l/min)			10
Minimum flow rate for activating D.H.W. (l/min)			2
Operating pressure (bar)	Maximum	Central Heating	2.5
	Maximum	D.H.W.	10
	Minimum D.H.W. activation		0.3
Expansion Vessel capacity (l)			7
Temperature selection range (°C)	Central heating circuit	Radiators	60-85
		Floor heating	40-60
	D.H.W. circuit		30-65
Gas inlet pressure (mbar)	Natural G-20		20
	Propane G-31		37
Gas consumpion (Hi)	Natural G-20 (m3/h)		2.69
	Propane G-31 (kg/h)		2.03
Electrical supply (V/Hz)			230V~50Hz
Maximum Power Consumption (W)			120
Combustion product's Temperature (°C)			100
Combustion product's Mass Flow (g/sec.)			11,858
Dimensions (mm)	Height		680
	Width		390
	Depth		254
Minimum clearence (mm)	Top		200
	Bottom		150
	Sides		5
	Front		5
	Gas Inlet		¾ BSP
	Domestic cold water inlet		½ BSP
	D.H.W. outlet		½ BSP
	Central heating flow		½ BSP
	Central heating return		¾ BSP
Net weight (kg)			30
Type of gas	Propane G-31		X

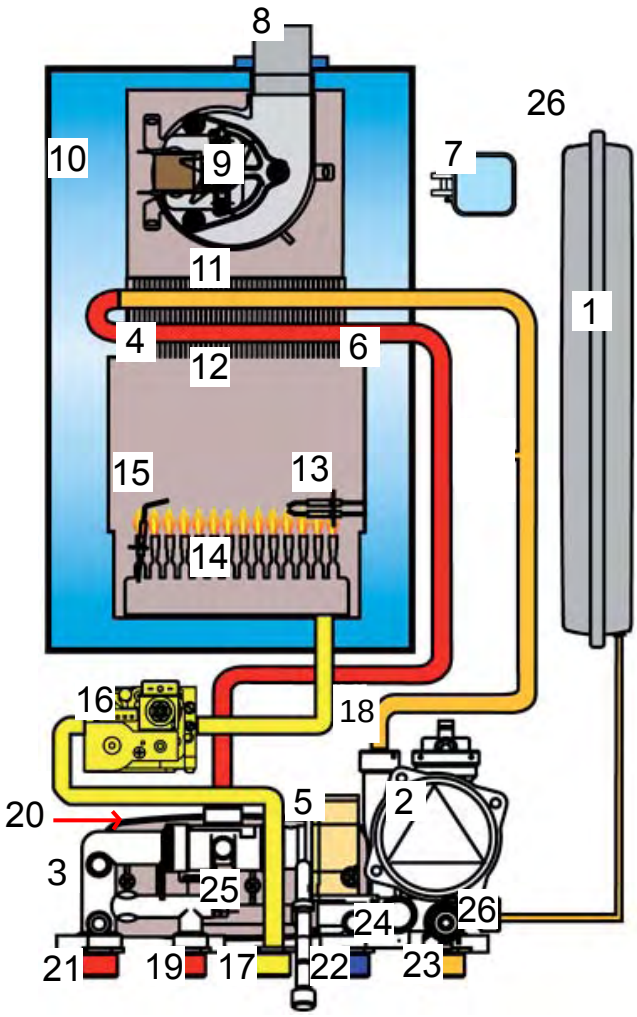
3.- Description of functioning

3.1.- General description

3.1.1.- Hydraulic Circuit

Hydraulic Circuit

FEB-24ED 3 STAR



1. Expansion vessel
2. Pump
3. Low pressure switch
4. Flow thermistor
5. Three way valve
6. High limit stat
7. Air pressure switch
8. Venturi
9. Fan
10. Sealed air box
11. Copper heat exchanger
12. Combustion chamber
13. Ignition electrodes
14. Main burner
15. Ionisation electrode
16. Modulating gas valve
17. Gas inlet
18. Return thermistor
19. Hot water outlet
20. Plate heat exchanger
21. C.H. Flow
22. Cold water inlet
23. C.H. Return
24. Safety valve
25. By-pass
26. C.H.Drain valve

Filling the heating circuit:

-In order for the boiler to function correctly, the heating circuit pressure must be at around 1.6 Bar when it is cold.

-Both the boiler and the heating installation must be correctly purged, as air in the water pipes can cause excessive noise and malfunctioning.

-The boiler has a pressure relief valve incorporated to the pump body.

-The radiators and upper areas of the heating circuit should be provided with an automatic air vents. The procedure for correct filling of the installation is as follows:

- Fill the heating circuit by introducing a sufficient antifreeze/inhibitor solution via the double check valve on the filling loop assembly.

- When the pressure gauge shows that a pressure of 1.6 bar has been reached. Vent radiators and re-check pressure.

- Ensure there is no leakage from the installation or boiler. Check all the connections thoroughly.

Domestic Hot Water Functioning (DHW):

-Water begins to circulate through the domestic circuit of the boiler. The cold water flows through the 3-way valve, this action ports the 3 way valve and micro switch into DHW mode.

-Water heated in the primary circuit flows through the plate heat exchanger to heat up the water coming from cold mains water supply. As the cold water circulates, it is heated up in the plate heat exchanger.

The temperature of the DHW is controled by the central heating return thermistor and the temperature selected by the user and limited for safety.

Heating Functioning:

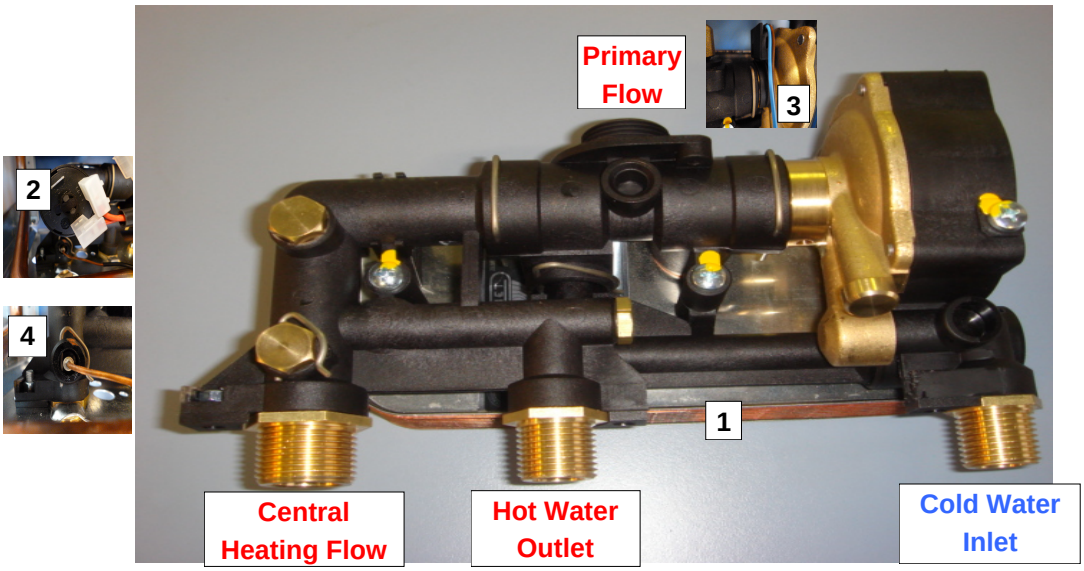
The pump starts up and water begins to circulate through the radiator circuit. The fan and the burner then start up. The heating output temperature is controlled at all times by both thermistors.

Draining the heating circuit:

The boiler has a drain valve incorporated for draining the heating circuit when necessary. The safety valve mustn't be used for this purpose.

Description and function of the hydraulic components:

Hydraulic Assembly complete, This unit consists of various hydraulic components:
Group 1: Main body 3 way valve(MCB2191) encompassing diaphragm(MCB2255), Automatic bypass & DHW Plate heat exchanger(MCB2160)



1. DHW Plate Heat Exchanger
2. Low Pressure Switch
3. DHW Micro Switch
4. Pressure Gauge Connection.

MCB3125

Group 2: Pump body(MCB3125) encompassing drain valve(MCB2180) & Automatic air vent(MCB3115).

Circulating pump head(MCB3120), Safety valve(MCB2185), Low Pressure Switch(FCB1480), Flow restrictor(MCB2240).

All these parts together form a compact unit.

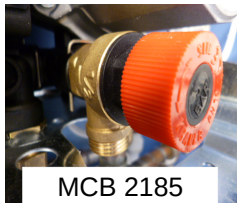
MCB3120

Circulating pump head:(Part number MCB3120)

Operates in both CH and DHW mode. Circulation of the primary circuit either to the radiators or to the plate heat exchanger when operating in DHW mode. Pump combines a manual and automatic anti-blocking system.
The capacity of this pump has a mamometric head of 5 metres for the 24kW boiler.

Safety valve:(Part number MCB2185)

Also called an Pressure Relief Valve, Its function is to prevent the heating circuit exceeding 3.0 Bar pressure. DO NOT USE FOR DRAINING BOILER


MCB 2185

Drain valve:
This component allows the heating circuit to be drained. Finger operated located to the right hand side of the safety valve. (Part number MCB2180)

3 Way valve:

Integrated within hydraulic unit, operates whenever a hot tap is opened.
This action activates the micro switch and ports the primary circuit away from the radiators to the plate heat exchanger In order to produce hot water at the taps.
(Part number MCB2191 Complete unit)

Micro switch
Located on the 3 way valve brass diaphragm housing. Activation occurs when the white switch tip which sits on the diaphragm push rod in CH mode is released as the diaphragm push rod ports the 3 way valve to DHW.
This action places the PCB into DHW mode allowing the boiler to commence the ignition sequence (Part number MCB2320).

Flow restrictor
Located within the hydraulic unit between the brass inlet union and the cold inlet port on the hydraulic unit.
This component restricts the flow of water into the boiler to 10 litres per min (Part number MCB2240)

NOTE
THIS RESTRICTOR IS NOT SUPPLIED WITH NEW HYDRAULIC UNITS. ALWAYS ENSURE THAT THIS ITEM IS REPLACED INTO THE HYDRAULIC UNIT IF ANY WORK IS CARRIED OUT ON THE HYDRAULIC UNIT

Expansion vessel: (Part number MCB2005)

The expansion vessel is a hermetically closed receptacle with two chambers separated by an SBR membrane. One chamber contains nitrogen (air) and the other is filled with the water from the heating circuit. It has a capacity of 7 litres.

The function of the expansion vessel is to absorb the increase in volume of the heating circuit water when it is heated up.

The amount of expansion by the expansion vessel depends on the temperature selected by the user for the heating circuit, and on the total volume of the heating circuit.

Automatic bypass:

The bypass is located inside the hydraulic unit. It joins the heating outlet and return.

It is preset, only opening when the pressure between the bypass inlet and outlet exceed 0.3 bar.

Its purpose is to assist when there is a large loss of load in the circuit and the pump consequently has difficulty in moving the water. When the bypass opens, an amount of water which was flowing towards the radiators is made to circulate directly to the return pipe, thus making the work of the pump easier.

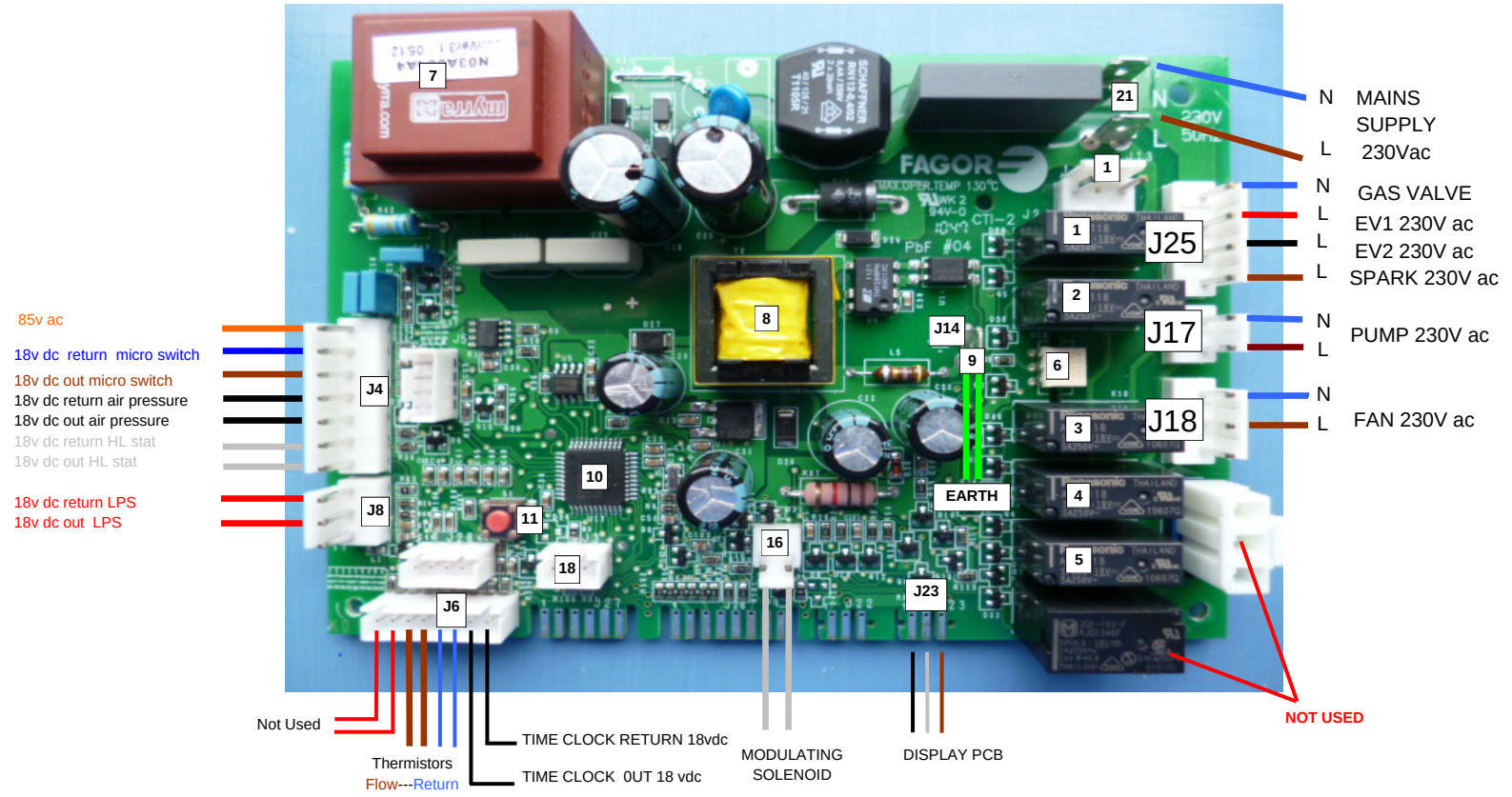
Central heating low pressure switch: (Part number FCB1480)

This indicates the pressure inside the heating circuit is correct. If the pressure is under 0.5 bar the switch opens and the boiler locks out (F3)

FCB1480

The expansion vessel pressure is 1 bar/14 psi with zero pressure in the heating circuit.

3.1.2.- Main P.C.B (Part number MCB3000)



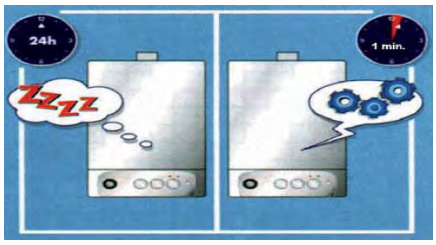
1	DHW ANTI-FREEZING RELAY (J24) (NOT USED ON FEB-24ED 3 STAR)
2	GAS VALVE 1 RELAY. EV1 (J25) (220VAC)
3	GAS VALVE 2 RELAY. EV2 (J25) (220VAC)
4	PUMP RELAY (J17)
5	FAN RELAY (J18)
6	“Opto triac” SPARKS(J25)
7	TRANSFORMER (Ionisation. 70-80V AC)
8	TRANSFORMER (MAIN BOARD FUNCTIONS)
9	EARTH
10	MICROPROCESSOR. CONTROL
11	CONFIGURATION BUTTON
12	(J4) DIGITAL INPUTS (AIR PRESSURE SWITCH,H.L.THERMOSTAT, …).
13	(J8) LOW PRESSURE SWITCH
14	(J6) FLOW & RETURN THERMISTORS, ROOM THERMOSTAT, EXTERNAL PROBE
15	(J22 OR J23) DISPLAY PCB (3 PURPLE WIRES OR BLACK,WHITE & BROWN)
16	(J16) MODULATING GAS VALVE (18VDC)
17	(J27) PORT FOR SOTWARE PROGRAM
18	AUTO TEST PORT
19	SUPPRESSION FILTER
20	SUPPRESSION FILTER
21	MAIN ELECTRICAL SUPPLY CONECTORS (230V, 50Hz)

Anti Freeze Safety:

When the temperature (read by flow thermistor) falls to 6ºC the pump will run until the temperature reaches to 9ºC. If the temperature continues to fall and the flow thermistor reads less than 3 ºC the boiler will light up at minimum power until the heating circuit temperature reaches 20º C after that the pump runs for a further 30 minutes. After the pump has run for 1 hour the PCB reads the temperature if it is between 3º and 6º C the pump will stop running

If the burner is burning for over 3 hours, the control circuit stops the burner, reads the temperature and if the temperature is lower than 3 degrees the burner will relight.

Pump Antiblock safety:



If during the last 23 hours the pump has not run the PCB will run the pump for 30 seconds

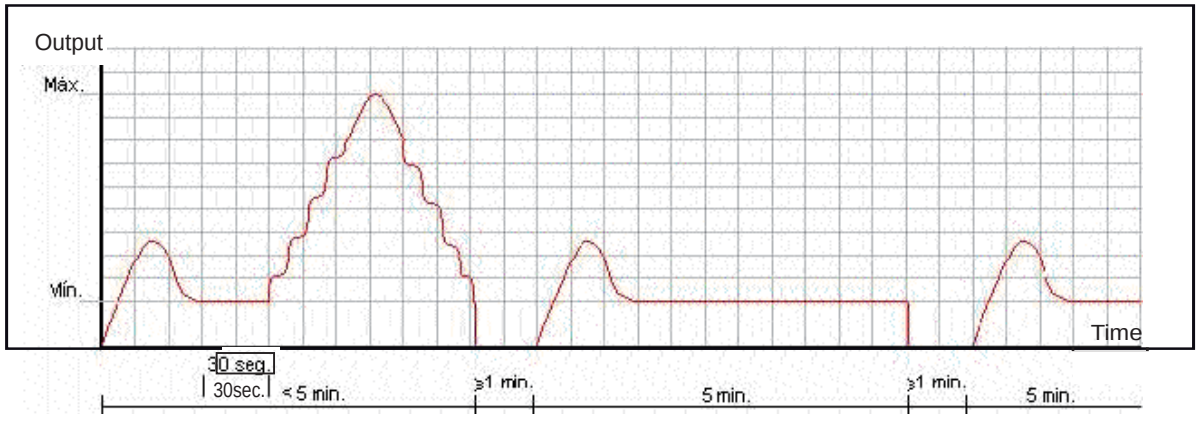
Overheating:

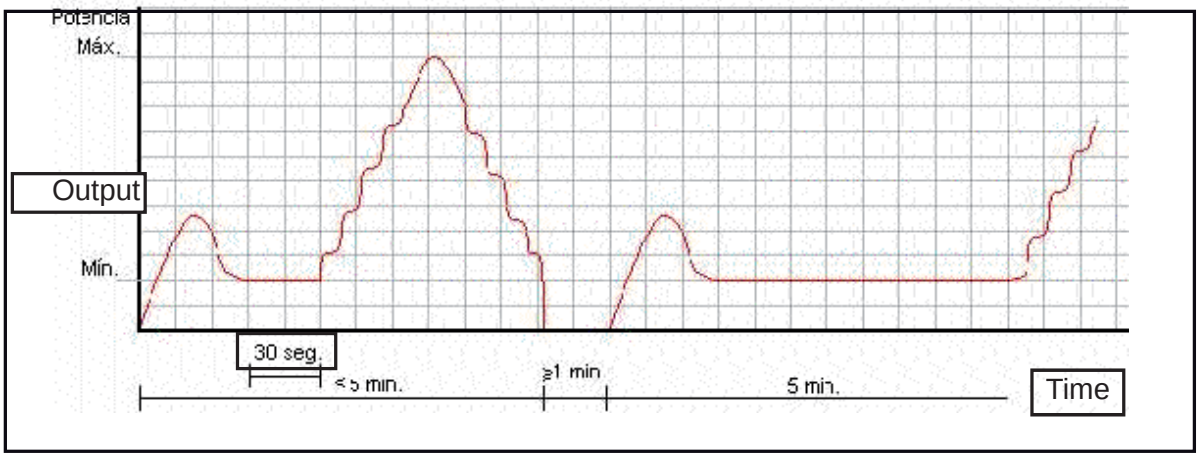
If the flow thermistor detects a lower temperature than 50ºC and there is a higher output than 95% after 5 minutes the boiler will shut down then relight

Fuzzy logic

This program operates only in central heating mode the principal purpose is to detect the size of the heating load connected to the boiler and to reduce unnecessary gas use.

In heating demand the boiler will only operate at minimum burner pressure for (4.0mb propane) for the first 30 seconds after the flame is established.
After this period of minimum burn the boiler will then modulate to increase the power to the heating system if required.





If the heating selected temperature is achieved in less than 5 minutes. The next heating cycle will result in the minimum burn period to be extended to 5 mins.

If the burner continues to burn at minimum power for 5 minutes without restarting the Modulation process can then start to increase the burner power if required.

If during the 5 minutes at minimum power the boiler shuts down, the above sequence is repeated.

Set point Security

When the boiler is working in D.H.W, with the burner lit with at least the minimum power, and the DHW energy requirment is lower than the minimum power.

The above situation will result in the following if DHW temperature is greater than DHW selected temp (+ 8º C) or+ 4º C for more than 15 seconds then the boiler starts to work in ON-OFF cycling mode.

While the boiler is in ON-OFF mode, the boiler starts at least 8 seconds and stops working for; at least, 4 seconds, and always working at the minimum power. The boiler comes out of this ON-OFF mode when DHW temperature is lower than DHW set point - 4º C or when DHW temperature is lower than DHW set point during more than 45 seconds and the boiler begins to regulate again

85º C Security

While DHW is working, if the temperature of the primary circuit reaches 85º C, the boiler will limit (by modulation) not to go over 85º C. This security works while DHW temprature is lower than DHW selected temprature.

88º C Security

While DHW is working, if the temperature of the primary circuit arrives up to 88º C the gas valve closes and the burner will shut down, the pump continues to run in order to reduce the temperature of the primary circuit. When the temperature of the primary circuit reaches at DHW selected temperature + 20º C the boiler will relight and modulate.

92º C Security (without DHW demand)

If flow thermistor value arrives to 92º C, the pump will run making cycles of 10 second starting and stopping. If the temperature remains high the pump will continue cycling until a lower temperature is detected.

180 minutes security:

When the burner is working continuously for 180 minutes, the burner will shut down for a period and if it is necessary, the burner will relight.

Control and safety components:

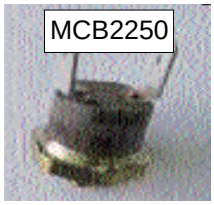
Main PCB:

This circuit governs the correct functioning of all the boiler functions.

High limit thermostat: (Part number MCB2250)

This is in direct contact with the the primary heat exchanger (dry pocket)
It controls the temperature of the outlet circuit, protecting the boiler against overheating. It goes to open circuit at 102º C.

The contacts of this thermostat are normally closed. When the thermostat is activated, the boiler will lock out (F4 block). The thermostat resets automatically, although the F4 fault will need resetting from the control panel.



Thermistors:(MCB2245)

There are two thermistors incorporated into the boiler. The flow thermistor is located top left on the primary heat exchanger, and is responsible for most of all boiler functions along with the return thermistor which is located on the return pipe from the pump body.

The flow & return thermistors control the temperature of the primary circuit within the boiler.

The flow thermistor is also responsible for first stage over heat protection any overheating within the boiler is detected and controlled by the pump cycling in 10 second intervals until a lower value is reached.

The flow thermistor also reads the temperature for the built in frost protection.Faulty or out of range thermistors will cause the boiler to lock out. Both thermistors are the same (Part number MCB2245).
Flow thermistor fault code: F13
Return thermistor fault code:F12

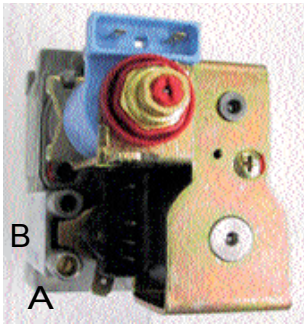
Note: When the heating is working and within the range shown in the table below, If the thermistors are out of range the boiler will lock out, automatically “resetting” again when the working range is entered. In case DHW is working the boiler continues to work even if the LED displays fault. The boiler uses the return thermistor and temperature selected to regulate DHW.

Relation between Temperature-Voltage and Thermistor nominal Resistance		
Temperature (ºC)	**Voltage (Volts)**	**Resistance (k)**
85	0.92	1.44
80	1.01	1.65
75	1.15	1.91
70	1.28	2.21
65	1.41	2.57
60	1.54	2.99
55	1.71	3.51
50	1.93	4.13
45	2.13	4.87
40	2.34	5.78
35	2.55	6.89

3.1.3.- Gas Circuit

Characteristics of the gas components:

Gas valve: (Part number FCB1130)

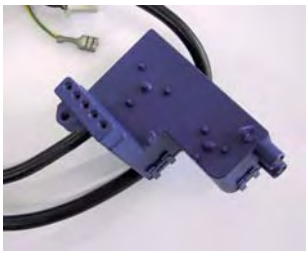


FCB1130

This is one of the most important components of the boiler. It regulates output power, gas consumption, combustion, modulation.

The SIT-845 SIGMA valve is equipped with two on/off safety valves powered by the PCB at 230V AC, plus a modulating valve also powered by the PCB in DC ensuring continuous modulation.
The valve has two test nipples (A) is the inlet supply pressure
(B) Is the outlet pressure from the modulating section of the valve
(Burner pressure can also be tested at the inlet pipe to the burner)

Spark generator



This component has 2 functions the 1st is to create a high tension voltage at the spark electrodes. The unit also provides a connection for the 230v ac from the PCB to the twin gas valve solenoids (EV1 +EV2)

(Part number MCB3055)

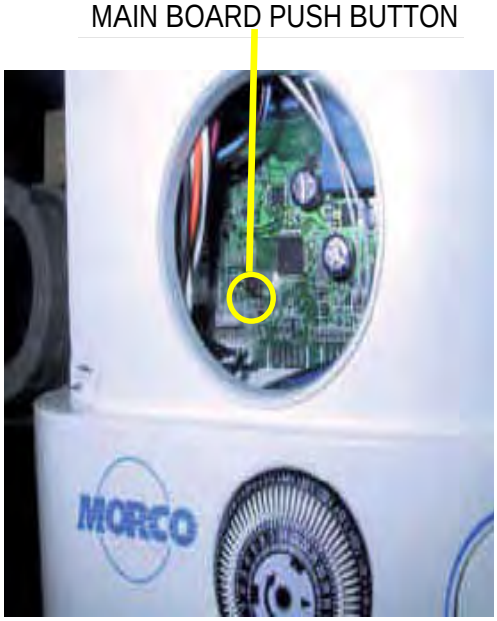
Gas pressure modulation:

This is a progressive modulation type boiler, i.e. it automatically adjusts its gas consumption to the USER's needs at all times.

When the boiler needs to heat water at maximum power, there is maximum gas pressure to the burner and, inversely, when modulation is at a minimum it uses minimum power and the pressure to the burner is also minimum.

The gas pressure to the burner varies according to the gas type (propane/ natural)

MAIN BOARD PUSH BUTTON



FEB-24ED 3 STAR:

Installation Menu.

To enter in the Installation menu, with the left knob out of the O position and the right knob must be placed in to the middle, more or less at 75ºC, after the boiler must be turned off, turned on, turned off again and finally turned on again, using the left knob, in every movement you cannot stay more than 3 seconds and it'll appear "- -" at the display, and before 5 seconds, the right knob must be moved to the minimum ("summer" position) and them the display shows "P1" and another value alternately.

To move between different steps, the left knob (DHW) is used and to change the selected step's value, the right knob (CH) is used. When the right knob (CH) is in summer position, the display shows the stored value of the selected step. And it is pushed the main board button when a new value wanted to be stored, then the display shows "- -" to indicate that the value has being stored. To leave installation menu it can move the right knob back to the O position.

These are the 7 Installation Menu´s Steps:

Step 1. Select gas type. The display shows "P1" and the value selected "6n" or "LP". "6n" is for Natural Gas and "LP" for propane/butane. When the gas type is stored the value of the maximum and minimum power will automatically change. When the right knob (CH) is in summer position, the display shows the stored value of the selected step. And must be pushed the main board button when a new value wanted to be stored, then the display shows "- -" to indicate that the value has being stored.

N.B
Gas change requires that the correct injectors for the gas type are replaced, and the adjustment of the maximum and minimum pressures on the gas valve and the correct electrical values to be set on the PCB.

Gas Type	Maximum Power	Minimum Power
Natural Gas	74%	35%
Propane	92%	46%

Step 2. Maximum Heating Power. The display shows “P2” and the value selected alternatively. When the right knob (CH) is in summer position, the display shows the stored value of the selected step. And must be pushed the main board button when a new value wanted to be stored, then the display shows “- -” to indicate that the value has being stored. The value is limited between 20 and 99.

Step 3. Post-Circulation time of the pump after an ambient thermostat cut-off. Display shows “P3” and the selected time (when right knob is in summer position). Default value is 1 minute and it can be changed with right knob until 85 minutes. To store the selected value use the main board push button.

Step 4. Type of heating circuit (radiators or floor heating). The display will show P4 and it will alternate between this P4 and the selected option, RA (radiator) or SU (floor heating). Using right knob (CH) RA (radiators) or SU (floor heating) can be selected. In case floor heating (SU) is selected, the set point must be stored. Using the right knob (CH) it can be selected the value between 40 and 60 ªC and using the main board button the value will be stored and the display will show “- -” again to indicate that the value has being stored. When this option (SU) is chosen, the right knob (CH set point) won’t be able to select the CH set point in normal operation; it will be always the stored value in the configuration menu.

Step 5. External Probe. Display shows “P5” and “X” the selected curve alternatively. If SE=0 no external probe will be connected. In all the other cases(“A”, “b”, “C” or “d”) it will be selected the best option for the external probe. To store the value, use the main board push button.

Step 6. Flue System Cleaner. Display shows “P6” and a hot water tap must be opened to activate this function. It’ll turn the boiler on and set the maximum power to clean the flue system.

The table below shows the gas pressure values at the burner for each model of boiler:

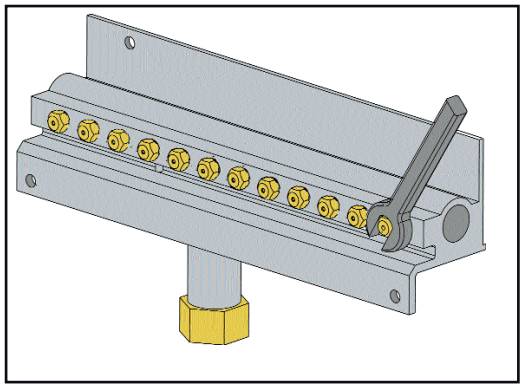
OUTPUT (kcal/h)	BURNER PRESSURE IN mb OF WATER GAUGE	
	BOILER 24KW	
	Natural	Propane
20382	18.0	35.0
18060	13.3	27.0
16340	11.2	23.0
14620	8.6	19.0
12900	7.0	14.8
11180	5.3	11.9
9460	4.0	8.6
7740	2.3	5.8
6536	1.3	3.2
Ignition Pressure	4.0	8.0
Ø Injectors (mm)	1,14	0,75

Important: It is very important to know that when you are making adjustments to the gas regulation you may use the values of this table.
The values should be equal or lower never higher. For example if you are making a maximum natural gas regulation the table says 18.0mb so you achieve 18.0 mb or less than 18.0mb.

Changing the gas:

This boiler is designed to function using PROPANE GAS or NATURAL GAS GAS.

To change the type of gas used, the only components that need to be changed are the injectors. The injectors corresponding to the gas to be used are fitted as shown in Table 3.



After the injectors have been changed, the gas is to be adjusted depending on the type used, as shown in Table 3.

- Maximum pressure adjustment (@Gas valve)
- Minimum pressure adjustment (@Gas valve
- Ignition pressure adjustment (see step 5 T5 adujusting boiler parameters) using built in auto test feature)

MCB3100

3.1.4- Air Circuit

Characteristics of the air circuit components:

Fan: (Part number MCB2030)

The function of the fan is to draw in air from the outside and evacuate the burnt gases produced during combustion.The 24kW boiler fan has a power of 35W.
Part number MCB2030

Air pressure switch: (Part number MCB3100)

This component ensures that the fan is running, that there are no obstructions anywhere in the flue or in the flue venturi, also checks that the flue is installed and working correctly 24kW boiler -> 120/100Pa pressure switch

If a pressure switch is calibrated to 120/100 Pa, for example, this means that the pressure switch contacts are activated at a differential pressure of 120Pa (1.2 mb) and deactivated at 100Pa (1.0 mb).

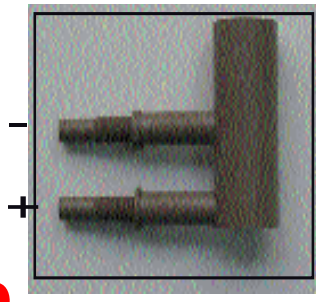
To measure the differential pressure, first measure the pressure using the manometer on one of the pressure ports, and then with the manometer on the other. The result will be the sum total of both.

This data is to be taken as an approximate value only, as variations of a few Pascals

occur in the measurements while the fan is running.

Flue Venturi : (Part number MCB2100)

This is fitted to the fan outlet pipe. When the air or flue gases flow through it, a pressure difference is produced which must be great enough to activate the differential air pressure switch.

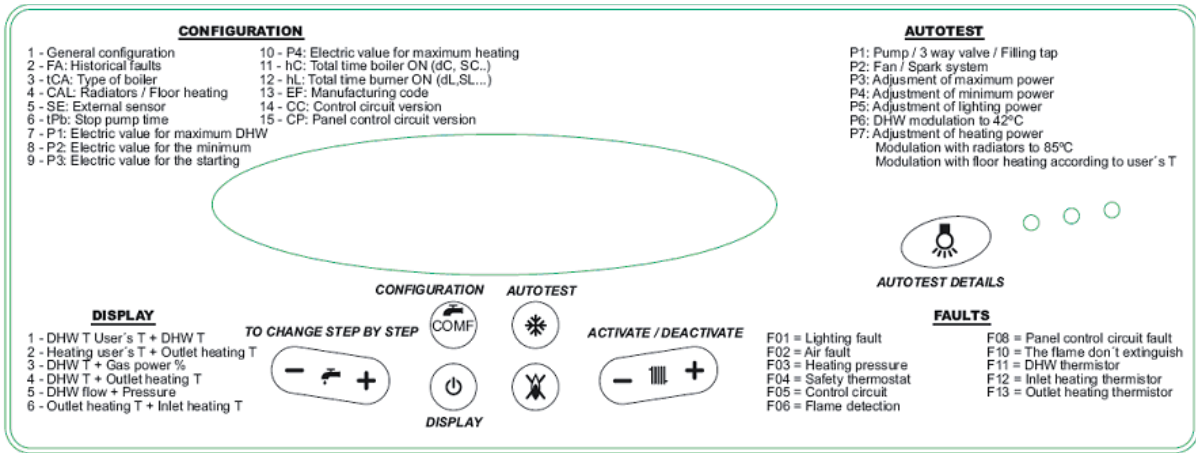


PLEASE NOTE THAT DURING PERIODS OF SHUT DOWN. THE FLUE VENTURI MAY BECOME BLOCKED WITH INSECTS.
IT WILL BE NECESSARY TO REMOVE AND CLEAN THE VENTURI
THE VENTURI WILL ONLY FUNCTION CORRECTLY WHEN FITTEI
WITH THE LONGEST PART FACING UPWARDS(- TO TOP)

3.2- Troubleshooting

A.S.S. Control

It's an appliance connected to BMF net from the main control board of the boiler, it's used by the A.S.S. (After Sales Service) to configure and adjust the boiler parameters.



To enter in the different menus, the ON/OFF, WINTER and COMFORT push buttons must be used.

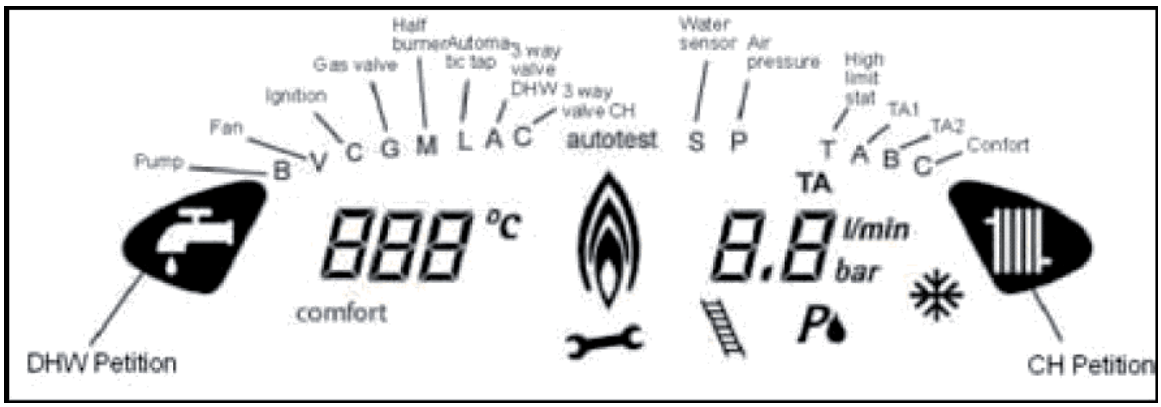
- ON/OFF ===> Shows boiler status.
- WINTER ===> Adjust boiler parameters (AUTOTEST)
- Comfort ===> Configure the boiler.

Showing boiler status.

The symbols from the top of the display show the actual state of the different inputs/outputs and with both 7 segment displays show set points, temperatures, water flow, pressure and power of the boiler.

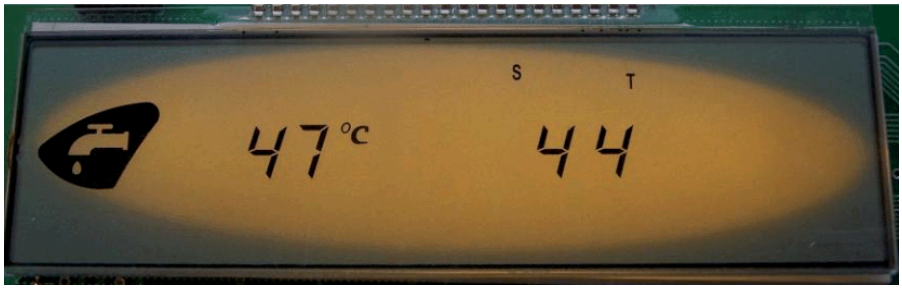
The values of visualization are shown in groups of two and using the push buttons to increase/decrease D.H.W. set point all the different groups will be shown

B = PUMP
V = FAN
C = SPARK
G = GAS VALVE

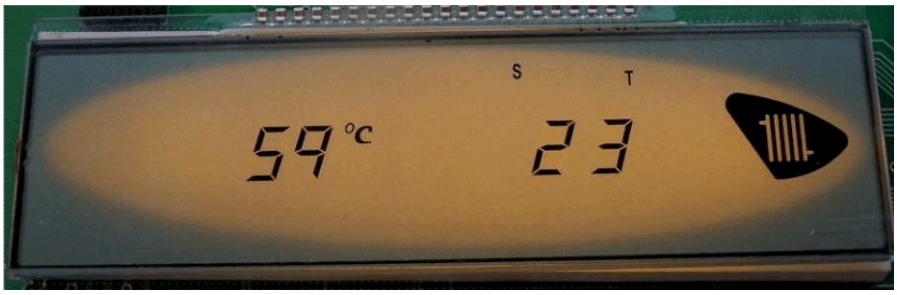


The different groups are the following:

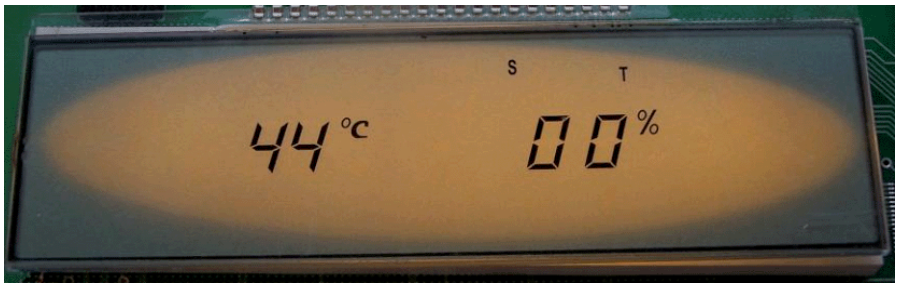
- D.H.W. Set point and temperature (tap symbol).



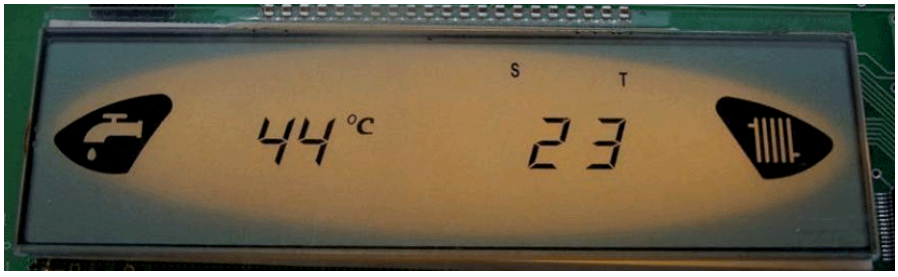
- Central Heating set point and temperature (radiator symbol).



- D.H.W. Temperature (ºC) and gas valve power (%).

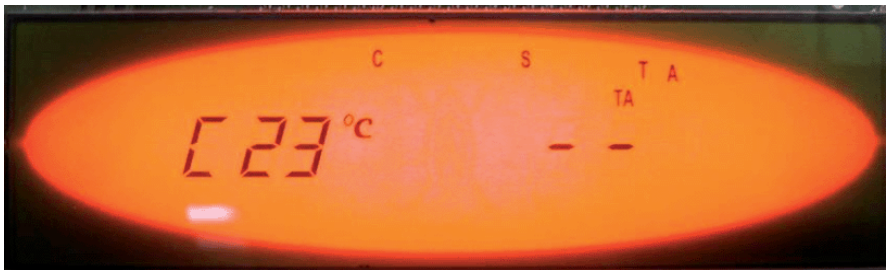


- D.H.W. Temperature and Central Heating Temperature (tap and radiator symbol).



- Water flow and pressure (symbols l/min y bar). NOT AVAILABLE ON FEB24ED 3 STAR

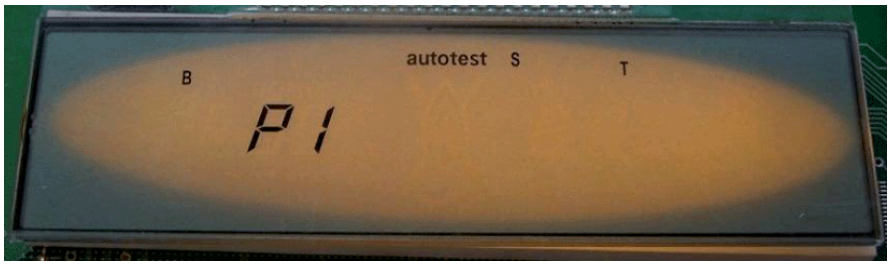
- Input and output temperature in the exchanger (No NTC at the output appears “- -”)



AUTOTEST. A.S.S. TEST. Parameters adjust.

It has 7 different steps:

- Step 1. Switch ON/OFF the pump and 3-way valve. The display shows P1.



Light button: When pressed, display shows D.H.W. Temperature and C.H. Temperature.

- D.H.W. set point increase button: Pump ON / OFF.
- D.H.W. set point decrease button: Change 3-way valve.

- Step 2. Switch ON/OFF the fan and sparks system. The display shows P**2.**

- Light button: When pressed, display shows D.H.W. Temperature and C.H. Temperature.
- D.H.W. set point increase button: Fan ON / OFF.
- D.H.W. set point decrease button: Activates Spark System for ten seconds.

- Step 3. Maximum DHW Power Regulation. Display shows P3 and electrical value. Limited between 56 and 99.

- Light button: When pressed, display shows D.H.W. Temperature and electrical value of this step.

- D.H.W. set point increase/decrease button: To set the electrical value.

- Winter Button (Central Heating): Push to store the selected value

- Step 4. Maximum DHW Power Regulation. Display shows P4 and electrical value. To adjust this value use the same instructions that are used in Step 3.Limited between 20 and 55.

- Step 5. Start-up Pressure Regulation. Display shows P5 and electrical value.

To adjust this value use the same instructions that are used in Step 3.Limited between 20 and 60.

- Step 6. Check the boiler operation, sets the DHW temperature to 42ºC.

Display shows P6. No action possible in this step. Pushing light button, DHW temperature and hundred percent value of the gas valve are shown.

- Step 7. Regulation of maximum heating Power and regulation at 85ºC. Display shows P7 and electrical value. To adjust this value use the same instructions that are used in Step 3.Limited between 20 and 99 for radiators and between 20 and 70 for floor heating. Pushing UNLOCK button the fault memory will be cleared.

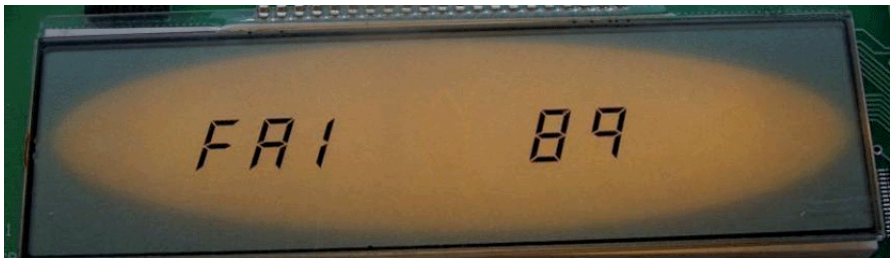
First 2 digits indicate the boiler type depending on type of water pressure detector, if the boiler uses water pressure switch, the boiler will be 00 and if the boiler uses water pressure sensor (digital pressure gauge) the boiler will be 04.

Second 2 digits are explained in following tables:

First Number from "YY"	Heating Circuit Type (CA)		Heating Plumb Delay (Tpb)		Plumb Cycling (PC)	
	rA	SU	1min.	2-99min.	OFF	ON
0	x		x		x	
1		x	x		x	
2	x			x	x	
3		x		x	x	
4	x		x			x
5		x	x			x
6	x			x		x
7		x		x		x

Second digit from “YY”	External probe (SE)
0	Without probe
A	Curve A
b	Curve B
C	Curve C
d	Curve D

- Step 2. Latest Faults. Shows an historical with fifty last faults of the boiler. At first its shown “FAI” (historical fault) and the number of faults occurred since last time fault clean. Later using increase/decrease CH set point buttons is selected different faults. It shows from “F1” to “F50” and the number of occurred fault (“XX”). If it shows “- -”means that somebody has entered in the fault menu from ASS Control.



- Step 3. Type of boiler. Using increase/decrease CH set point buttons is selected different type of boiler. From 00 to 03 means that the boiler has water pressure switch and if its from 04 to 13 the boiler has water pressure sensor. To store the selected value use the comfort button.

- Step 4. Type of heating circuit (radiators or floor heating). The display will show CA as it’s shown in the picture and the selected option, RA (radiator) or SU (floor heating). Using increase/decrease CH set point buttons is selected and pressing comfort the value is stored. In case floor heating (SU) is selected, the set point must be also stored. Select the floor heating set point value using increase/decrease CH set point buttons (between 40 and 60) and pressing comfort the value is stored. When this option (SU) is chosen, CH set point won’t be able to select the CH set point in normal operation; it will be always the stored value in the configuration menu.

- Step 5. External Probe. Display shows “SE” and “X” the selected curve. If SE=0 no external probe will be connected. In all the other cases it will be selected the best option for the external probe. To store value, use the comfort button to store the selected value.

- Step 6. Post-Circulation time of the pump after the room thermostat cuts-off. Display shows “tPb” and the selected time. Default value is 1 minute and it can be changed with increase/decrease CH set point until 99 minutes. To store the selected value use the comfort push button.

- Step 7. Pumb Cycling. Display shows “PC” and “On” or “OF” depending on the state of the pump cycling function. Select the desired value using increase/decrease CH se point buttons and store it with the comfort push button.

When the boiler is working in central heating function at a high temperature if a tap is opened,very hot water is produced at the initial flow to tap. To avoid this possibility pump cycling function can be used. In that case, if the DHW is too high (DHW set point + 20º C), the pump will make ON-OFF to try to regulate the water temperature. When the temperature goes in normal values the pump will work normally.

- Step 8. Maximum DHW Power Regulation. Only displays the selected value in AUTOTEST (P1 XX).

- Step 9. Minimum DHW Power Regulation. Only displays the selected value in AUTOTEST (P2 XX).

- Step 10. Start-up Pressure Regulation. Only displays the selected value in AUTOTEST (P3 XX).

- Step 11. Maximum heating Power. Only displays the selected value in AUTOTEST (P4 XX).

- Step 12. Boiler Working Time. Only shows how long has being the boiler working in hours (h), days (d) or weeks (w).

- Step 13. Burner Working Time. Only shows how long has being the burner working in hours (h), days (d) or weeks (w).

- Step 14. State of manufacture. (EF XX).

- Step 15. Main board software version. i.e. “CC 1.1”.

- Step 16. Front panel control software version. i.e. “CP 2.3”.

CONFIGURATION BUTTON

EATING SELECTION WITHOUT EXTERNAL AUTO TEST

Selection of heating mode (radiators/ under floor heating)

The boiler can be configured for either heating radiators (rA) or under floor heating(SU)

2 configuration methods are available via the digital control knobs

a- Using the configuration menu page 29
b- Doing the following

1- Set the Left Regulating Knob (DHW) to the right (maximum) and the right knob (CH) to summer position now push the PCB configuration button.

2- The display will show CA as shown in the photo and will alternate between rA and CA if the configuration button is pressed before 10

seconds time, the opposite option will be chosen and the display will show “- -” to indicate that a different option has being stored and after it will show the stored option. In case floor heating (SU) is selected, the set point must be stored. Using the right knob (CH) it can be selected the value between 40 and 60 ºC and using the main board button the value will be stored and the display will show “- -”again to indicate that the value has being stored. When this option (SU) is chosen, the right knob (CH set point) won’t be able to select the CH set point; it will be always the stored value in the configuration menu.

4. If nothing is touched in 10 seconds the selected value will be stored. If the Left Regulating Knob is set to O position it’ll also be stored the selected value.

5. Every time the boiler is switched on, it shows the selected value in the display for a few seconds, if the heating circuit is radiator it will show rA and if the heatingcircuit is floor heating it will show SU.

Adjusting boiler’s parameters. AUTOTEST

To enter in the AUTOTEST function menu, both knobs must be place to minimum (to the left), DHW knob in O position and CH knob in summer position and then push the main board button once, the boiler is in the AUTOTEST menu.

To move between different steps, the left knob (DHW) is used and to change the selected step’s value, the right knob (CH) is used. When the right knob (CH) is in summer position, the display shows the stored value of the selected step. The main board button must be pressed to store the new selected value. The display will then shows “- -”to indicate that the value has being stored. To leave AUTOTEST menu it can move the right knob out of O position and taking it back to the O position.

- Step 1. Pump in operation. Display shows t1.3.1.- General description

- Step 2. Fan in operation. Display shows t2.

- Step 3. Maximum DHW Power Regulation. Display shows t3 and the electrical value alternately. When the right knob (CH) is in summer position, the display shows the stored value and turning clockwise the right knob the selected value can be changed. Once it's selected the desired value, it can be stored pushing the main board button, then the display shows "- -" to indicate that the value has being stored. The electrical value is limited from 56 to 99. (LPG VALUE 93)

- Step 4. Minimum Boiler Power Regulation. Display shows t4 and the electrical value alternately. When the right knob (CH) is in summer position, the display shows the stored value and turning clockwise the right knob the selected value can be changed. Once it's selected the desired value, it can be stored pushing the main board button, then the display shows "- -"to indicate that the value has being stored. The electrical value is limited from 20 to 55. (LPG VALUE 46)

- Step 5. Start-up Pressure Regulation. Display shows t5 and the electrical value alternately. When the right knob (CH) is in summer position, the display shows the stored value and turning clockwise the right knob the selected value can be changed. Once it's selected the desired value, it can be stored pushing the configuration button, then the display shows "- -"to indicate that the value has being stored. The electrical value is limited from 20 to 60 (LPG VALUE 20)

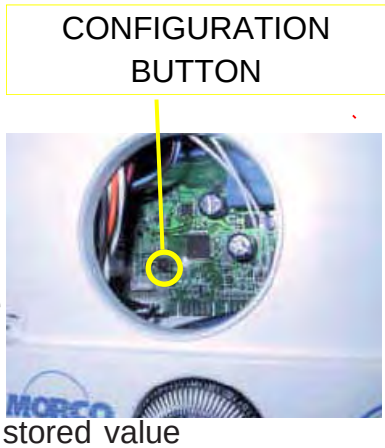
- Step 6. Check the boiler operation, sets the DHW temperature to 42ºC. Display shows t6. No action possible in this step.

- Step 7. Regulation of maximum heating Power and regulation at 85ºC.

Display Shows t7 and the electrical value alternately. When the right knob (CH) is in summer position, the display shows the stored value and turning clockwise the right knob the selected value can be changed. Once it's selected the desi

red value, it can be stored pushing the main board button, then the display shows "- -"to indicate that the value has being stored. The electrical value is limited from 20 to 99 when heating circuit is radiators (RA) and from 20 to 70 when heating circuit is floor heating (SU). (LPG VALUE rA 70)

Boiler Configuration Menu.



To enter in the Configuration menu, both knobs must be place to minimum (to the left), DHW knob in O position and CH knob in summer position and then push the configuration button twice, then the boiler is in the Configuration menu. To move between different steps, the left knob (DHW) is used and to change the selected step's value, the right knob (CH) is used. When the right knob (CH) is in summer position, the display shows the stored value of the selected step. The configuration button must be pressed when a new value is to be stored, then the display shows "- -"to indicate that the value has being stored. To leave configuration menu both knobs must be moved to the O position.

These are the different Configuration Steps:

- Step 1. Main Configuration Viewer. It can not be modified. Alternately shows in the display "Cn" "XX" "YY", where "XX" is the boiler class (class 00) and "YY" refers to the boiler configuration, as the following boards.

First 2 digits indicate the boiler type depending on type of water pressure detector, if- the boiler uses water pressure switch, the boiler will be 00 and if the boiler uses water pressure sensor, the boiler will be 04.

Second 2 digits are explained in following tables:

First Number from "YY"	Heating Circuit Type (CA)		Heating Pump Delay (Tpb)		Pump Cycling (PC)	
	rA	SU	1min.	2-99min.	OFF	ON
0	x		x		x	
1		x	x		x	
2	x			x	x	
3		x		x	x	
4	x		x			x
5		x	x			x
6	x			x		x
7		x		x		x

Second digit from “YY”	External probe (SE)
0	Without probe
A	Curve A
b	Curve B
C	Curve C
d	Curve D

I.E. A boiler that shows “Cn” “00” “3B” in this step means that is a boiler type 00 (with pressure switch) and it is configured with 3 what means that the heating circuit is floor heating (SU), its time to stop the pump after heating switch off is greater than 1 minute and the pump cycling option is activated. Looking “b” it can be known that must be connected a probe with curve type B.

- Step 2. Latest Faults. Shows an historical with ten last faults of the boiler. At first its shown “hF” (historical fault) and the number of faults occurred since last time fault clean alternately. Later using right knob is selected different faults. It shows from “F0” to “F9” and the number of occurred fault (“XX”) also alternately. If it shows “- -“ means that somebody has entered in the fault menu from TAS Control.

- Step 3. Type of boiler. It shows alternately “ti” and the number of the type of boiler selected. If the value stored is 00 to 03 means that the boiler has presotat and if the value is 04 to 08 means that it has pressure sensor. With the right knob at the summer position, the value stored is shown and using this knob we can select the desired value, to store it just push the main board button and “- -” will be displayed meaning that the value is stored

- Step 4. Type of heating circuit (radiators or floor heating). The display will show CA as it’s shown in the picture and it will alternate between this CA and the selected option, RA (radiator) or SU (floor heating). Using right knob (CH) RA (radiators) or SU (floor heating) can be selected. In case floor heating (SU) is selected, the set point must be stored. Using the right knob (CH) it can be selected the value between 40 and 60 ºC and using the main board button the value will be stored and the display will show “- -”again to indicate that the value has being stored. When this option (SU) is chosen, the right knob (CH set point) won’t be able to select the CH set point in normal operation; it will be always the stored value in the configuration menu.

- Step 5. External Probe. Display shows “SE” and “X” the selected curve alternatively. If SE=0 no external probe will be connected. In all the other cases it will be selected the best option for the external probe. To store the value, use the main board push button

- Step 6. Post-Circulation time of the pump after room thermostat cut-off

Display shows “tP” and the selected time (when right knob is in summer position). Default value is 1 minute and it can be changed with right knob until 85 minutes. To store the selected value use the main board push button.

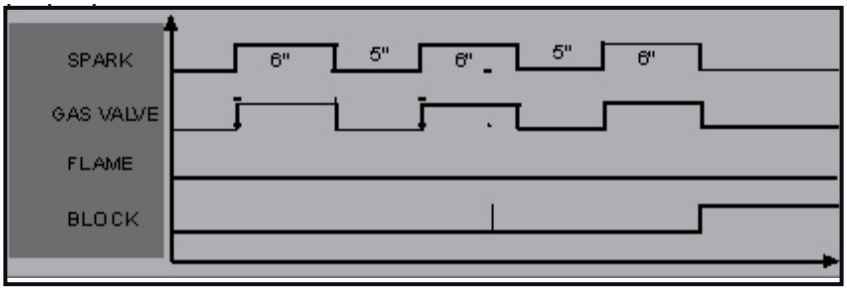
- Step 7. Pump Cycling. Display shows alternatively “PC” and “On” or “OF” (when right knob is in summer position) depending on the state of the pump cycling function. Select the desired value using right knob (CH) and store it with the main board push button. When the boiler is working in central heating mode at high temperature if a hot tap is opened, the initial flow at the tap will very hot To reduce the initial temperature at the tap the pump will cycle to decrease the heat transfer to the DHW. In the case, if the DHW temp is too high (DHW set point + 20º C), the pump will make ON-OFF to try to regulate the water temperature.When the temperature goes in normal values the pump will work normally.

Failures and Fault Finding:

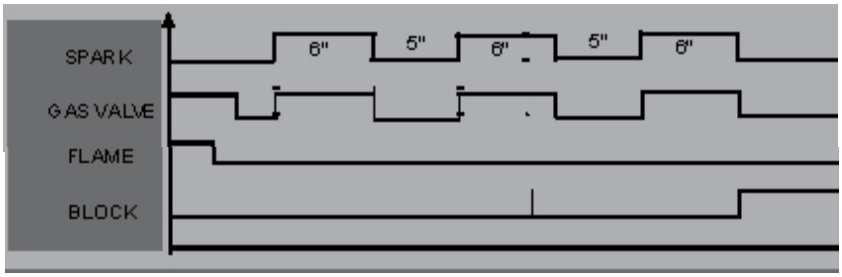
The different type of failures the boiler will show with a lockout light:

F01

The boiler trys 3 times to establish the flame:
each sequence lasts 6 seconds between each sequence the stop time is 5 seconds
If the ionisation electrode fails to detect a flame the boiler will lock out (F1)



When the boiler is working and the flame fails due to a malfunction of the gas valve or ionisation electrode after 1 second without flame detection the boiler will shut down (gas valves) The boiler will then attempt to relight if no flame is detected the boiler will lock out (F1)



POSSIBLE CAUSES

-NO GAS

-NO SPARK

- FAULTY GAS VALVE

- FAULTY IONISATION ELECTRODE

- FAULTY PCB

F02

In the lighting up process the PCB checks if the air pressure switch contacts are open prior to the fan starting,if after 3 minutes if the air pressure switch contacts remain closed then the boiler will lockout F2 (F21 IN HISTORICAL FAULTS)

In the lighting up process the PCB checks if the air pressure switch contacts are closed.If after 6 minutes the air pressure switch contacts remain open the boiler locks out

If the air pressure switch contacts open whilst the boiler is running another lighting up process will take place after 2 seconds. If the air pressure switch doesn´t close after 6 minutes the boiler gets locks out F2 (F22 F23 HISTORICAL FAULTS)

Possible causes:

- Fan failure

- Air pressure switch failure

- Obstruction in the flue or in flue venturi.
- Faulty PCB

F03

If the heating circuit's pressure falls below 0.5 b, or the central heating low pressure switch fails (contacts open) the boiler locks out. (F31 OR 32 HISTORICAL FAULTS)

F04

If the high limit thermostat activates at 102ºC) or fails (contacts open) the boiler locks out.

F05

If there is any failure in the software protections of the boiler control program the boiler gets locked.The user can not reset this fault, the circuit remains blocked.
(F 51 TO 58 HISTORICAL FAULTS)

F06

The boiler locks out if a flame is detected flame in the following cases:

If the burner lights, before the gas valve is opened and flame is detected for 6 seconds

If the burner shuts down once the gas valve is closed, but flame continues for 6 seconds

When the boiler locks out with the above fault, the pump and the fan run or remain working. This fault can be reset by the user.

F8

If there is any failure in the control panel PCB F8 will be displayed the control PCB will need replacing. Part number (MCB3005)

F10

This fault that occurs when there is a problem with the gas valve or PCB.
As the burner shuts down the solenoids on the gas valve. These close one at a time until the flame extinguishes. If the flame remains on for 5 seconds the PCB will repeat the shut down by turning off the solenoid that failed the 1st time.
If a flame continues to be detected after the 2nd shut down sequence the boiler will lock out.

Possible causes:

- PCB failure (one of the electrovalve relay is broken)

- Gas valve failure

F12

Occurs when the return thermistor is out of range, open or short-circuited

If this fault ocours the heating mode will work normally and the DHW mode will

also work but using the heating thermistor as reference to heat the DHW.

This fault will auto-reset when the thermistor is in range.

F13

It´s a failure of the heating thermistor, that it is out of range, open or short-circuited.
If this fault occurs, the boiler blocks. This fault auto-reset , when the thermistor returns within normal operating range.

Possible causes:

- Heating thermistor failure

- Faulty PCB

- Minimum very high

NC

No Comunication. It's a comunication error between main control circuit and front panel circuit.

NOTE: Apart from the failure codes, the word "Err" may appear on the control panel.

Meaning: If it appears on the 4 digit display, it means that there is no communication

between the control card and the control panel card.

This may be caused by a poor connection of the 5-way cable joining the two PCB's; “Err” may also appear very briefly on the display when the boiler is plugged into the mains or when entering auto-test mode; in this case it does not necessarily indicate a failure.

A6UA

This indicates that the pump requires manually turning by removing the centre disk on pump head.
If a repeated A6UA fault appears change both thermistors.

In the A.S.S. (Auto test unit) the fault codes are stored in this way:
F18 Ignition failure (F1)

F 21, F22

Fault on pressure switch system. During the start before up and before the fan runs the APS contacts must be open lock out ocours after 3mins if the contacts remain closed (F21)

If the contacts are open prior to the start up and fail to close afer 6 minutes then lock out will ocour after a maximun time of 6 minutes if the contacts remain open. (F22)

F 31

Fault on water circuit of the boiler. The heating circuit is empty or the pressure detected is lower than 0.5 bar

F 32

Fault on water circuit of the boiler. The central low heating pressure switch is faulty or disconnected

F 51, F 52, F 53, F 54, F 55, F56, F 57, F 58

These faults are internal electronic faults of the main control circuit.

F 61

Fault in flame detection. Detects flame in burner after closing gas valve.

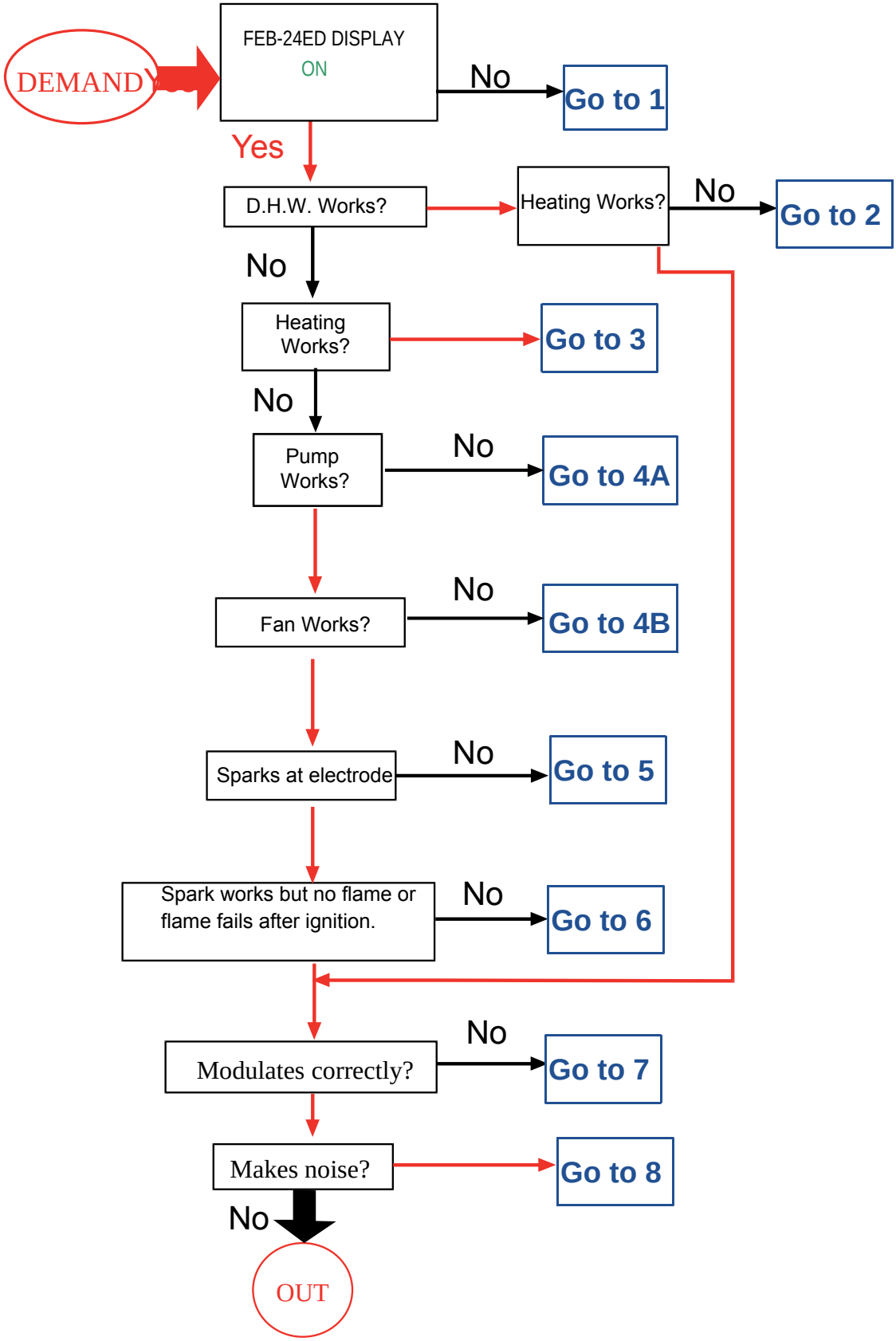
F 62

Fault in flame detection. Detects flame for 10 seconds when the boiler is not demanding the burner to burn.

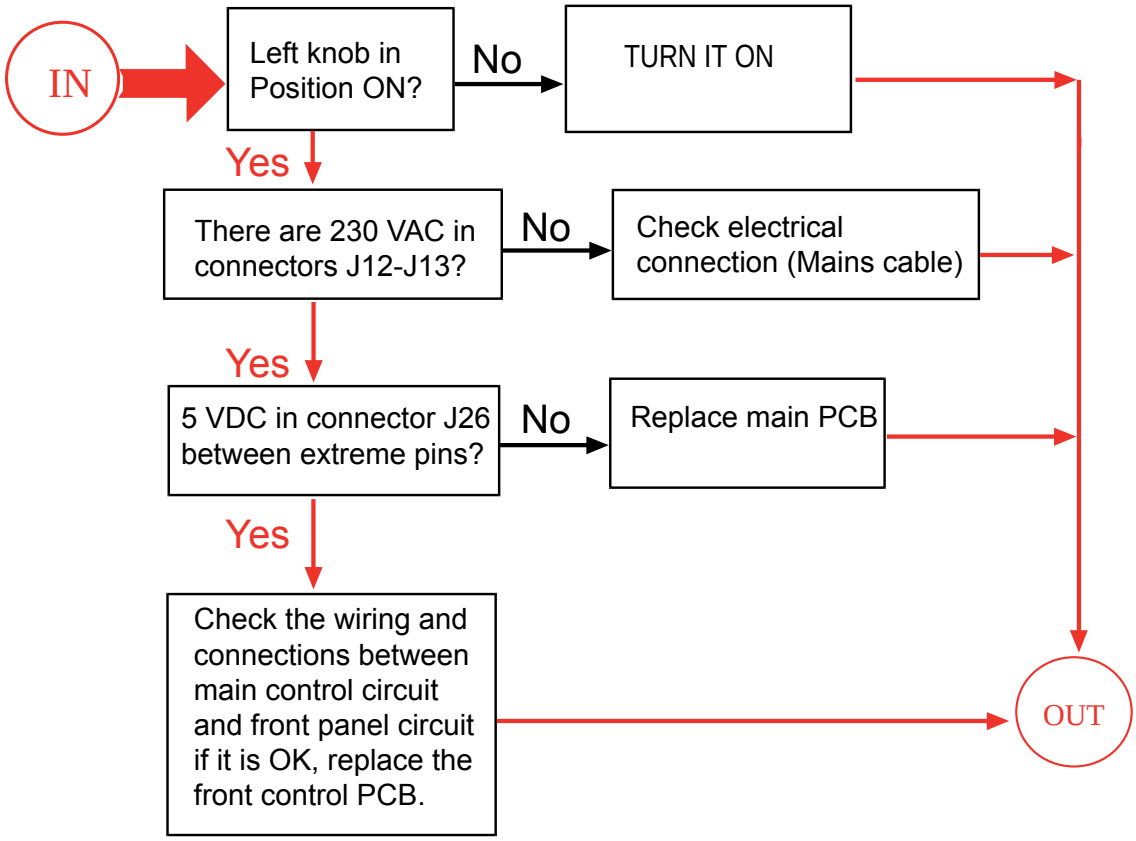
F 63

Fault in flame detection. Detects flame in burner start before opening gas valve.

Fault Finding: Boiler FEB-24ED 3 STAR

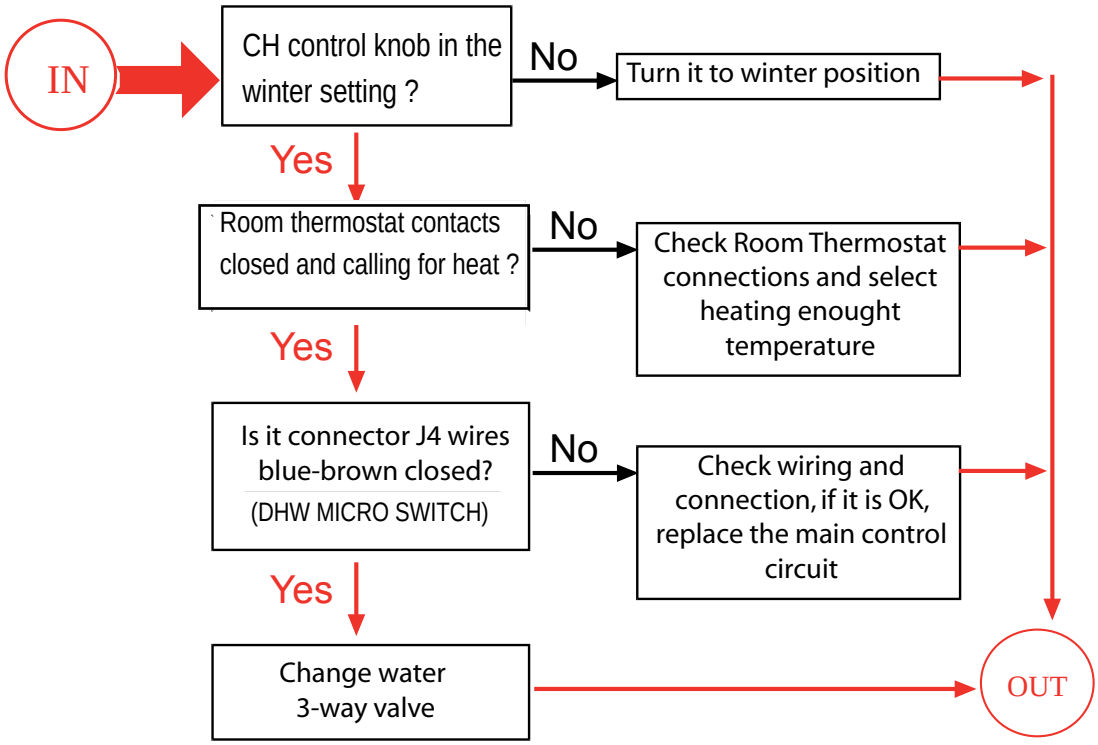


1 LIGHTING UP INCORRECT

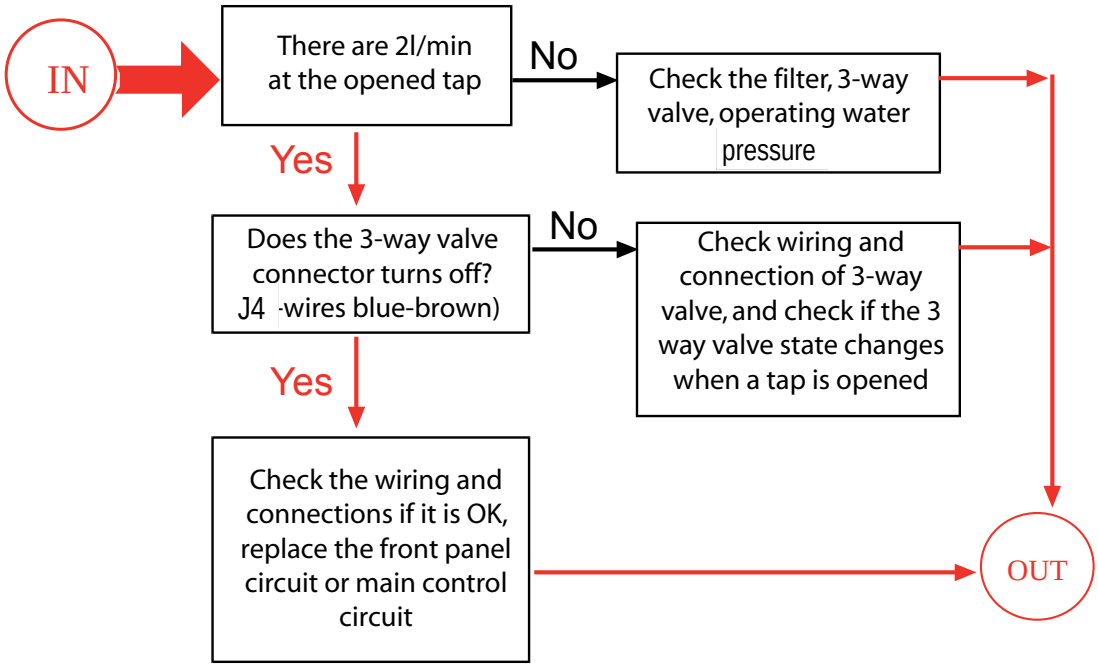


No lights on front display. Remove both wires off the High Limit Thermostat.
If front display lights up! Replace faulty High Limit Thermostat(MCB2250).

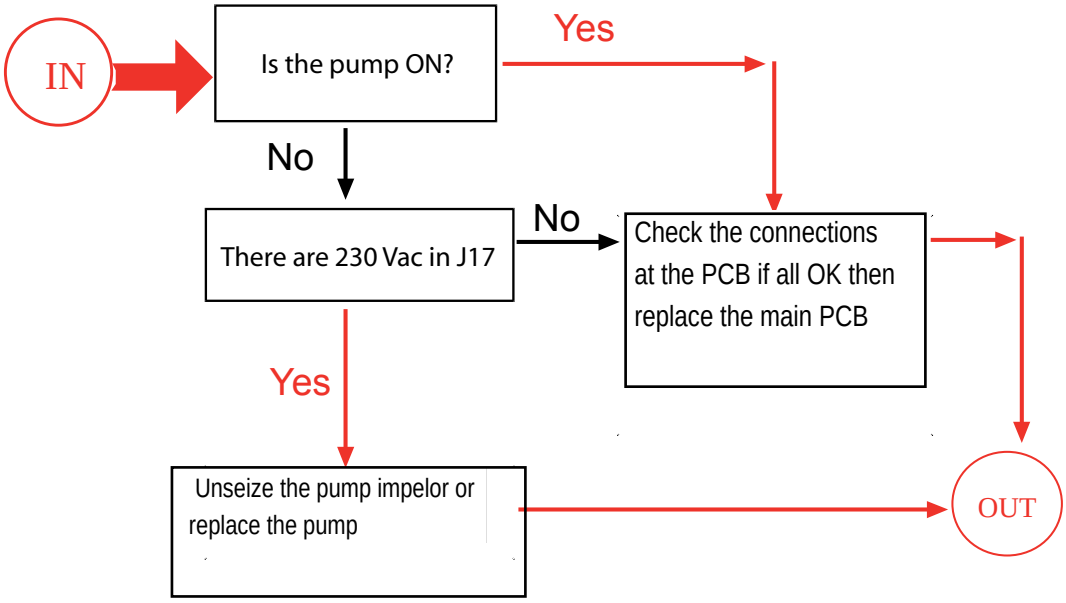
2 DHW WORKS BUT HEATING DOESN´T WORK



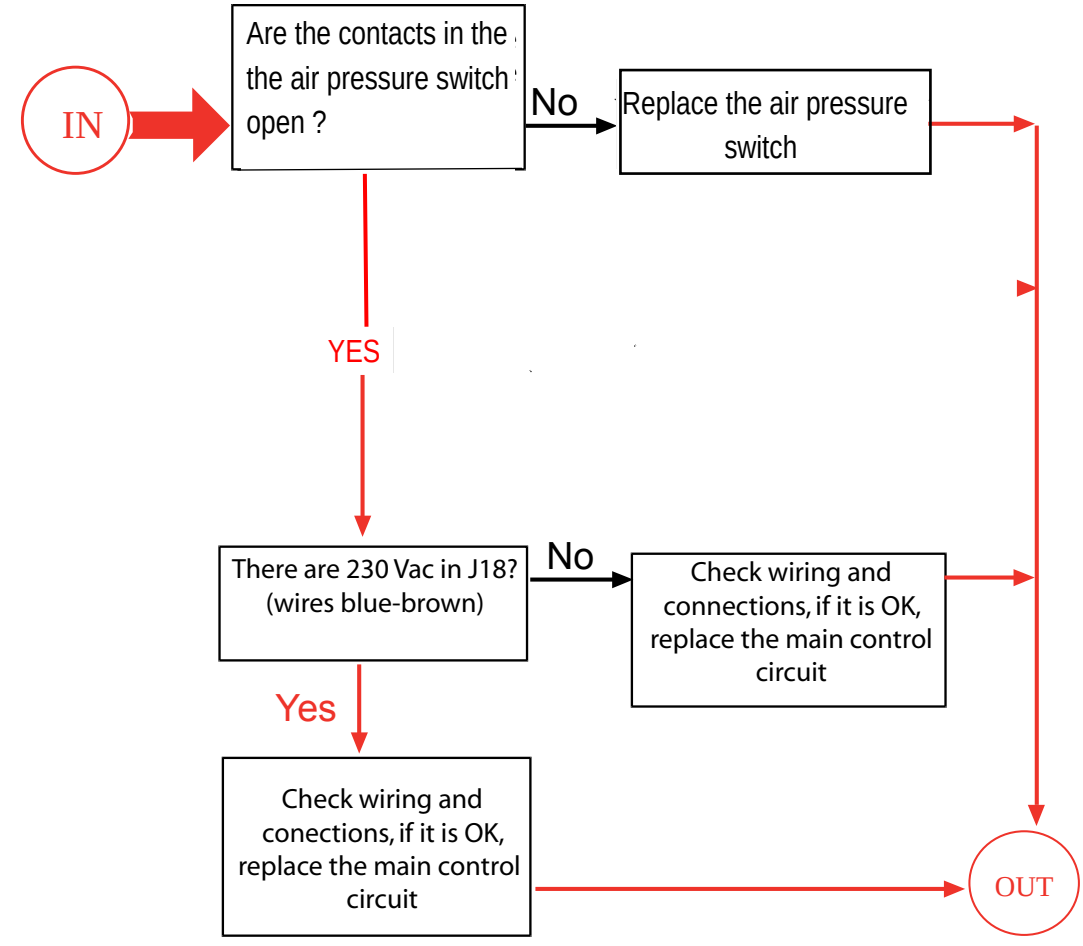
3 DHW DOESN´T WORK BUT HEATING WORKS



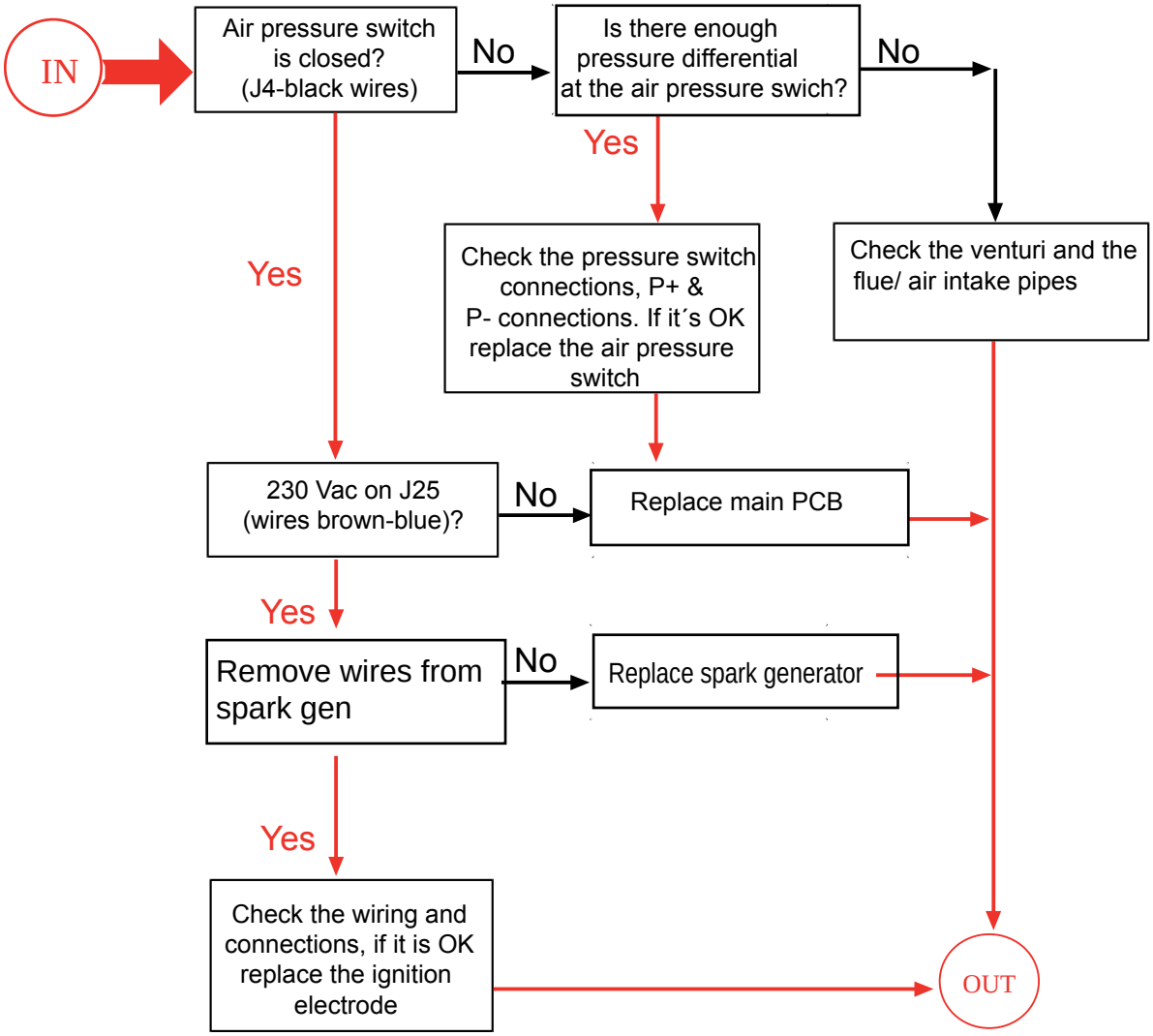
4A PUMP DOESN´T WORK



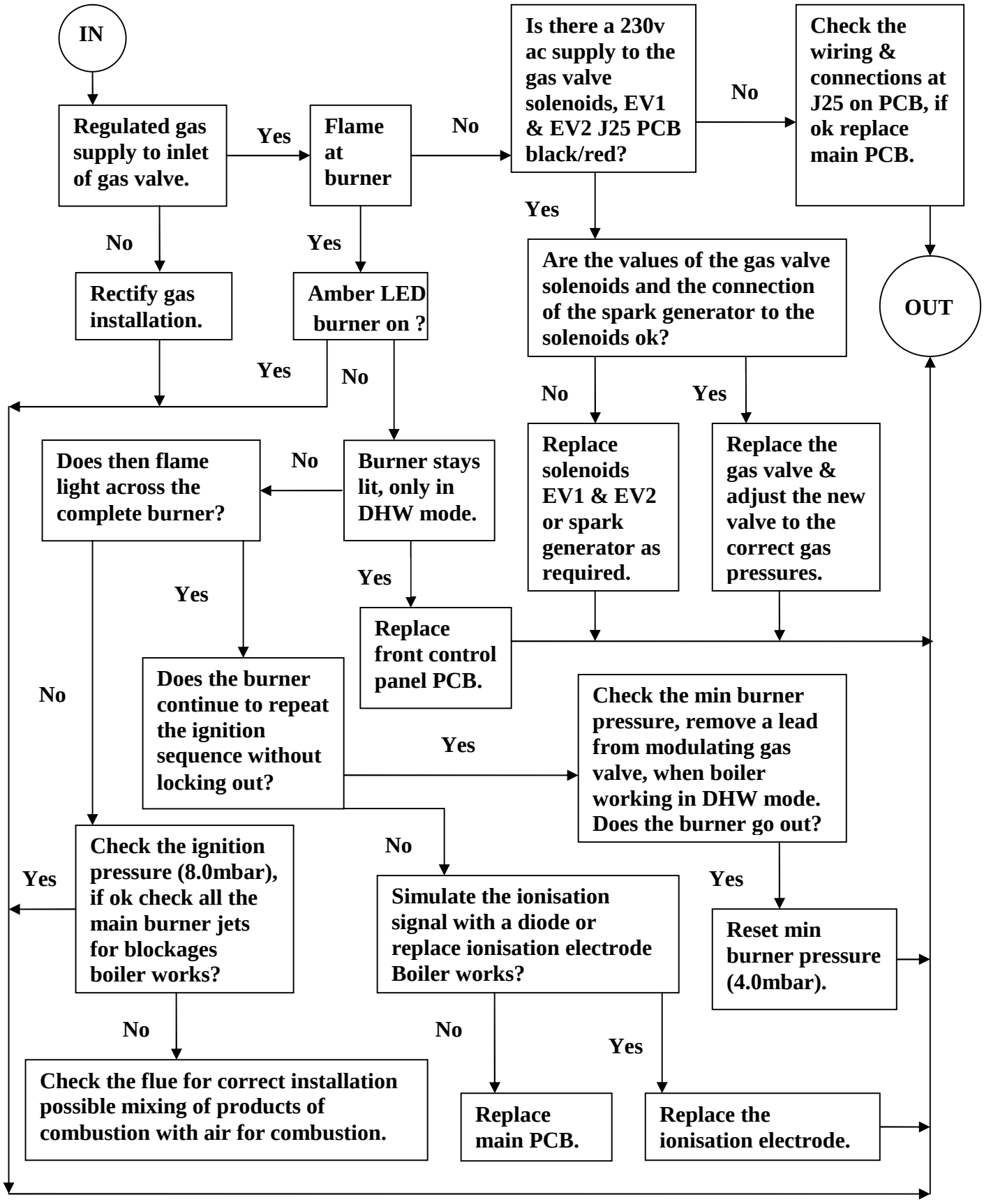
4B FAN DOESN´T WORK



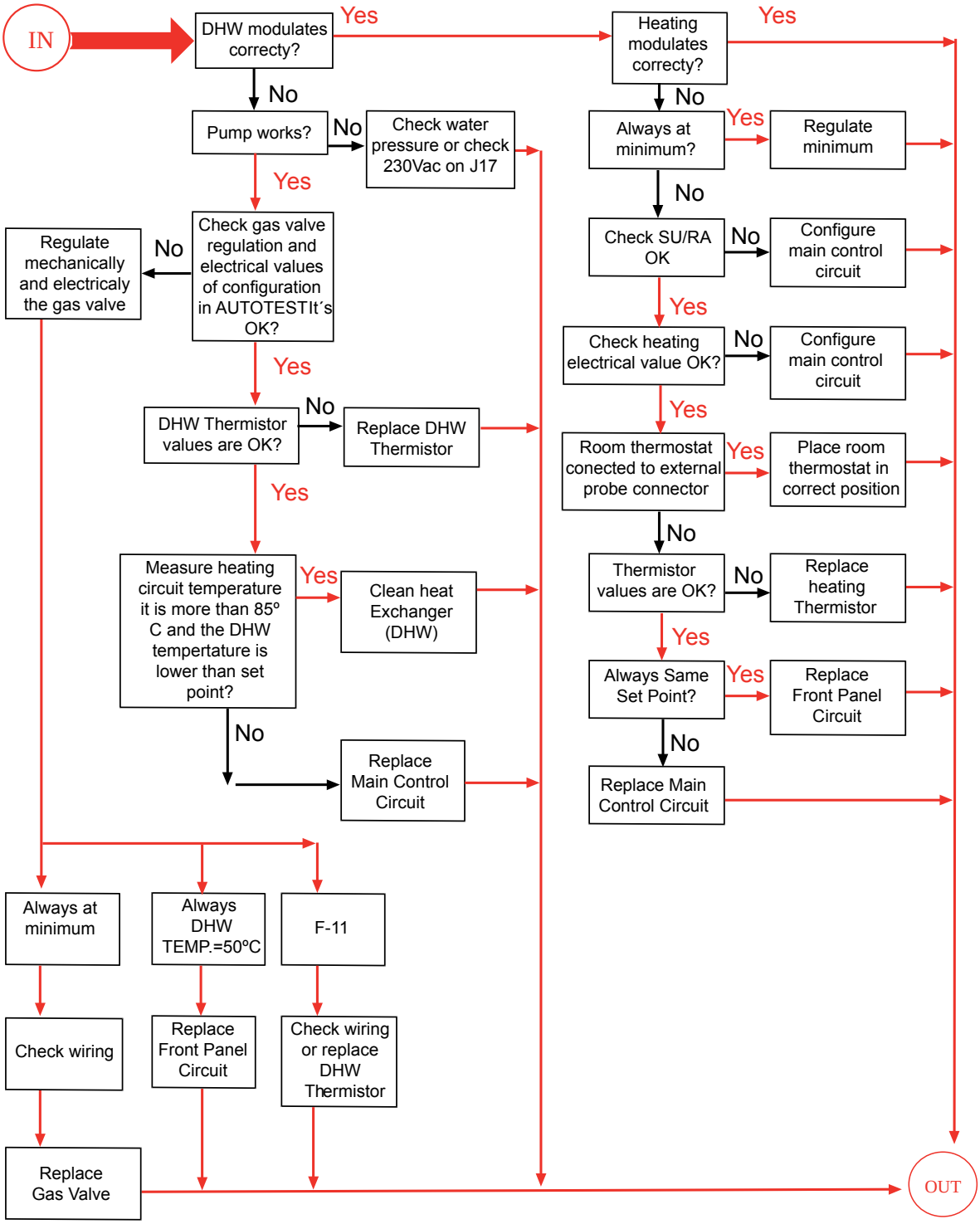
5 PUMP AND FAN WORK BUT THERE IS NO SPARK



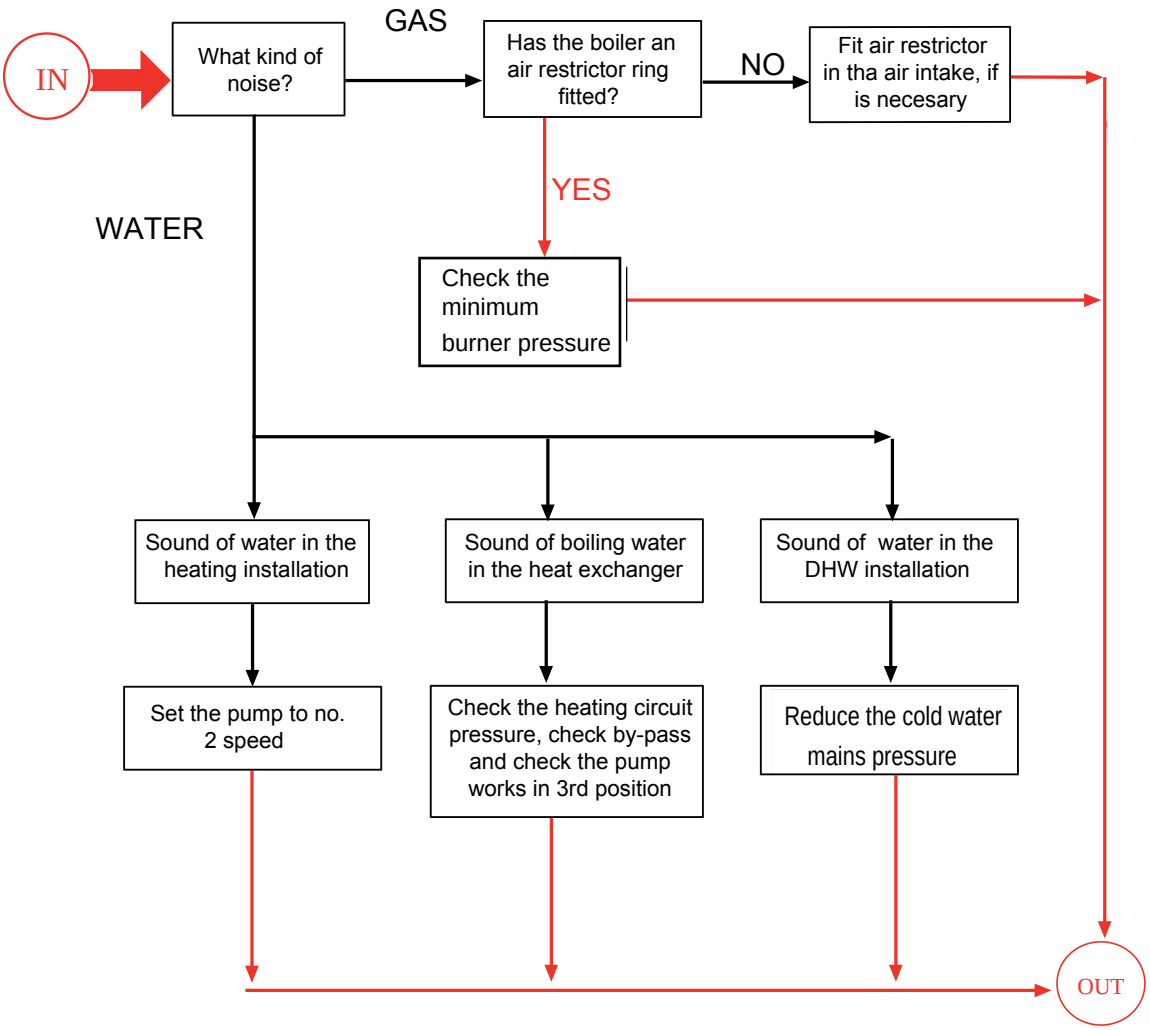
6. SPARK WORKS BUT NO FLAME/FLAME FAILS AFTER IGNITION.



7 DOESN´T MODULATE CORRECTLY

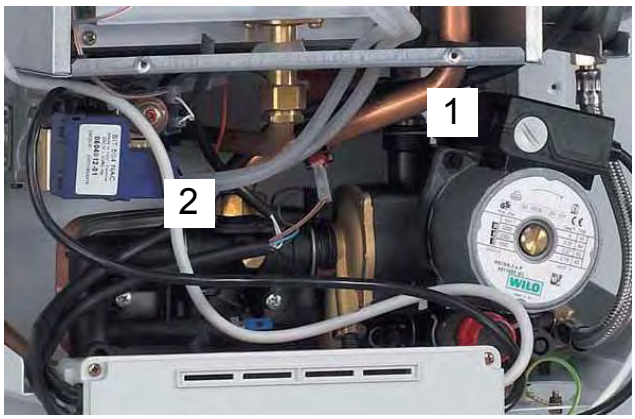


8 BOILER MAKES NOISE



3.3- Assembly and disassembly instructions

PLEASE NOTE THAT THE HYDRAULIC UNIT CONTAINS A FLOW RESTRICTOR. THIS IS LOCATED IN THE COLD WATER INLET PORT WITHIN THE UNIT. FAILURE TO REFIT THIS PART WILL ALLOW AN EXCESSIVE FLOW FROM THE BOILER. THIS WILL RESULT IN TEPID OR LUKE WARM WATER AT TAPS UNLESS THE FLOW IS RESTRICTED AT TAP.



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Changing the entire hydraulic unit:

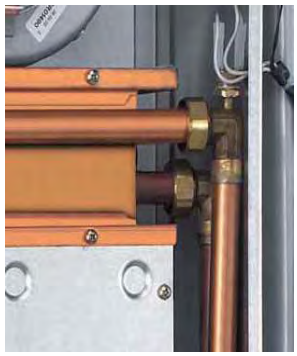
- Drain the heating circuit and the DHW circuit.

- Unplug the boiler from the mains.

- Disconnect the electrical connections, i.e. the 3-way valve micro switch and thermistor connections.

- Remove the heating return pipe (1) and the heating outlet pipe (2) from the hydraulic unit.

- Remove the pressure sensor from the heating return pipe for ease of handling.



- Remove the heating outlet pipe (3) from the main heat exchanger, for ease of handling.

- Remove the screws holding the hydraulic unit to the boiler base (they are on the underside).

- Release the hydraulic unit from the lower connectors (DHW inlet and outlet and heating inlet and outlet).

The water intake connectors do not need to be removed.

Changing the plate heat exchanger and the 3-way valve diaphragm:

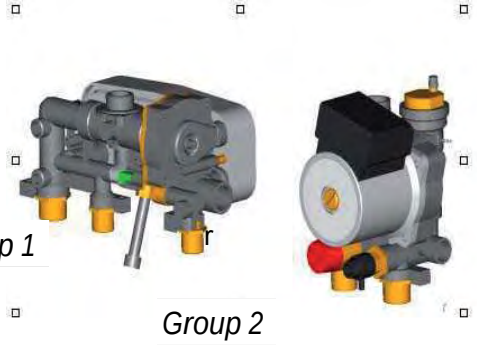
To change these elements, part of the hydraulic unit must first be disassembled. The whole unit is divided into two parts: unit 1 and unit 2 (see photograph 25).

Disassembling unit 1: (see photographs 23 and 24)

- Drain the heating circuit and the DHW circuit.

- Unplug the boiler from the mains.

- Disconnect the electrical connec-



Group 1 *Group 2*

tions, i.e. the 3-way valve micro switch and the thermistor connections.

- Remove the heating outlet pipe (2) from the hydraulic unit.

- Remove the pressure sensor from the heating return pipe, for ease of handling.

- Remove the heating outlet pipe (3) from the heat exchanger for ease of handling.

Remove the screws holding unit 1 to the boiler base (they are on the underside).

- Release unit 1 from the lower connectors (DHW inlet and outlet and heating outlet). The water intake connectors do not need to be removed.

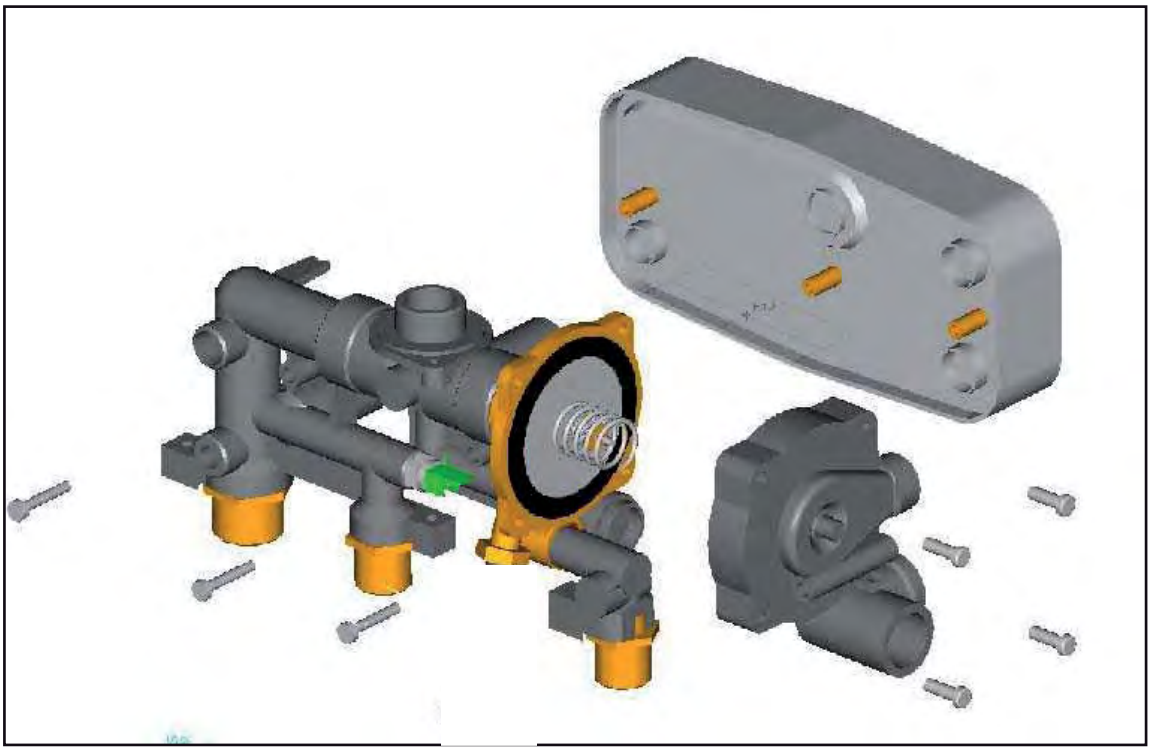
Changing the plate heat exchanger :

- Remove the four screws holding the plate heat exchanger to unit 1 (be very careful with the O-rings; they should be changed).

Changing the 3-way valve diaphragm :

- Firstly, remove the plate heat exchanger.

- Remove the diaphragm cover (see photograph 26)**.**

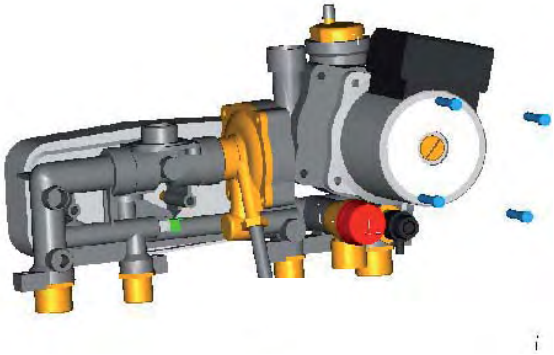


Changing the Pump :

- Drain the heating circuit and the domestic circuit.

- Remove the four Allen screws holding the pump body to the hydraulic unit, and remove the pump.

- Remove the pump electrical connection to the PCB.



Changing the drain valve :

- Drain the heating circuit.

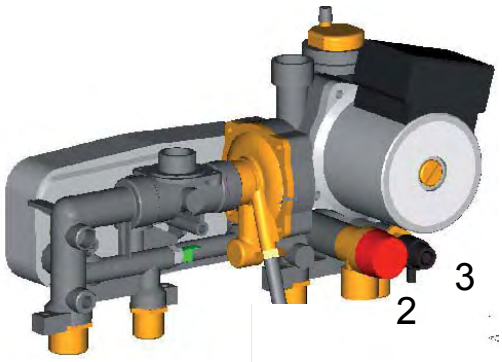
- Remove the pump, and remove the clip holding the drain valve in place.

Changing the safety valve and drain valve :

Safety valve or drain valve: 2 and 3.

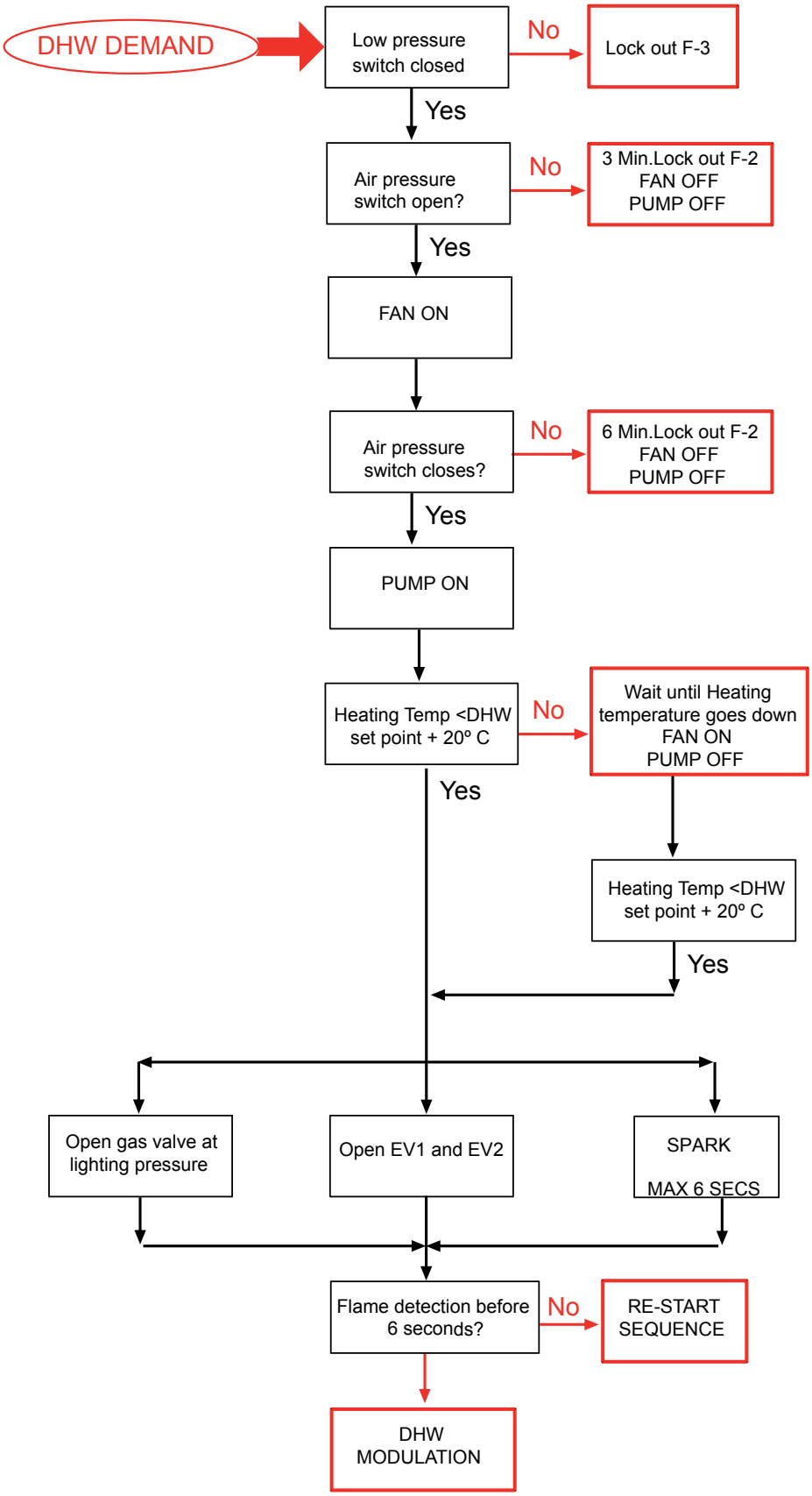
1. Drain the heating circuit.

2. Remove the clip and pull out the valve.

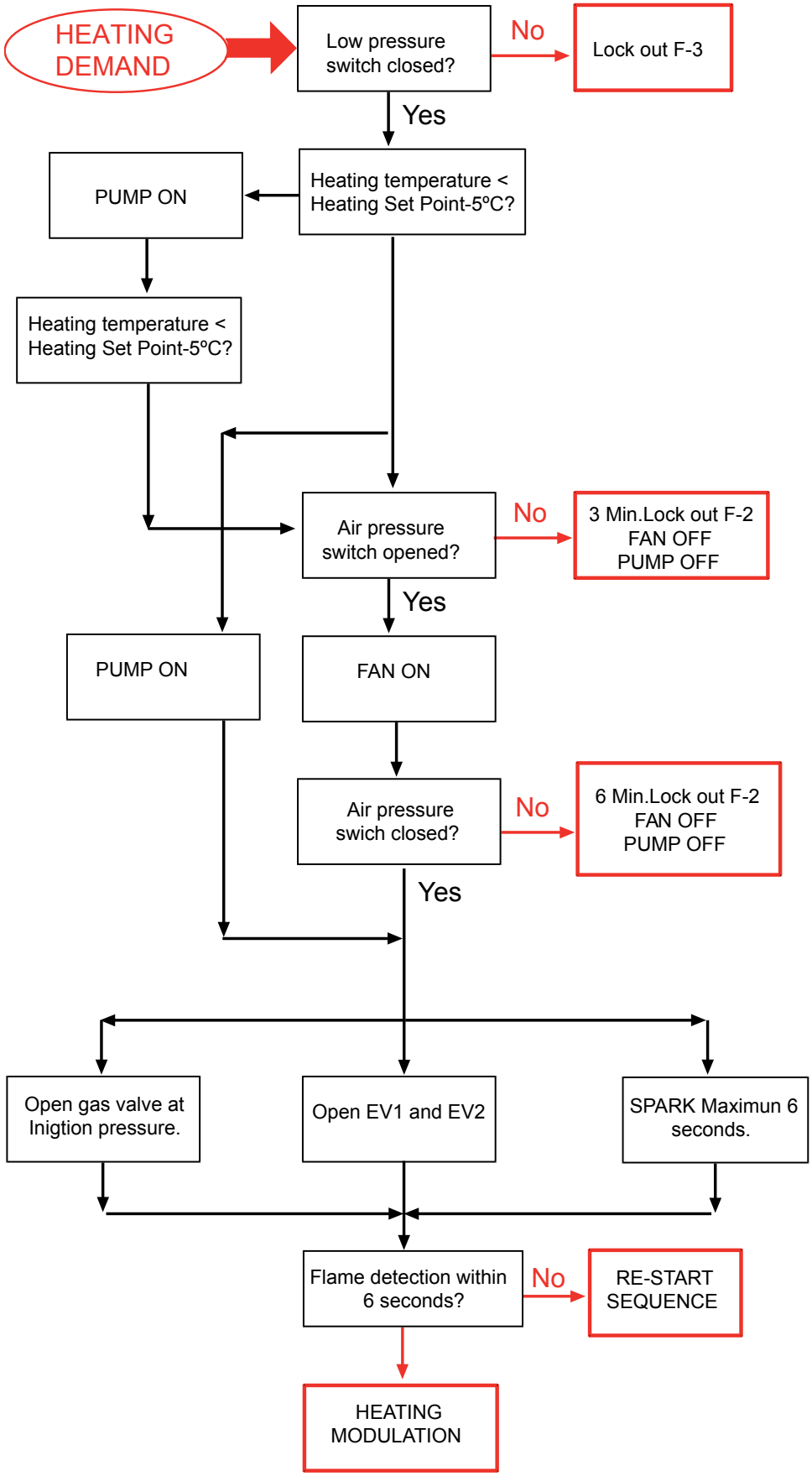


3.4.- Lighting up Sequence and Electrical Circuit

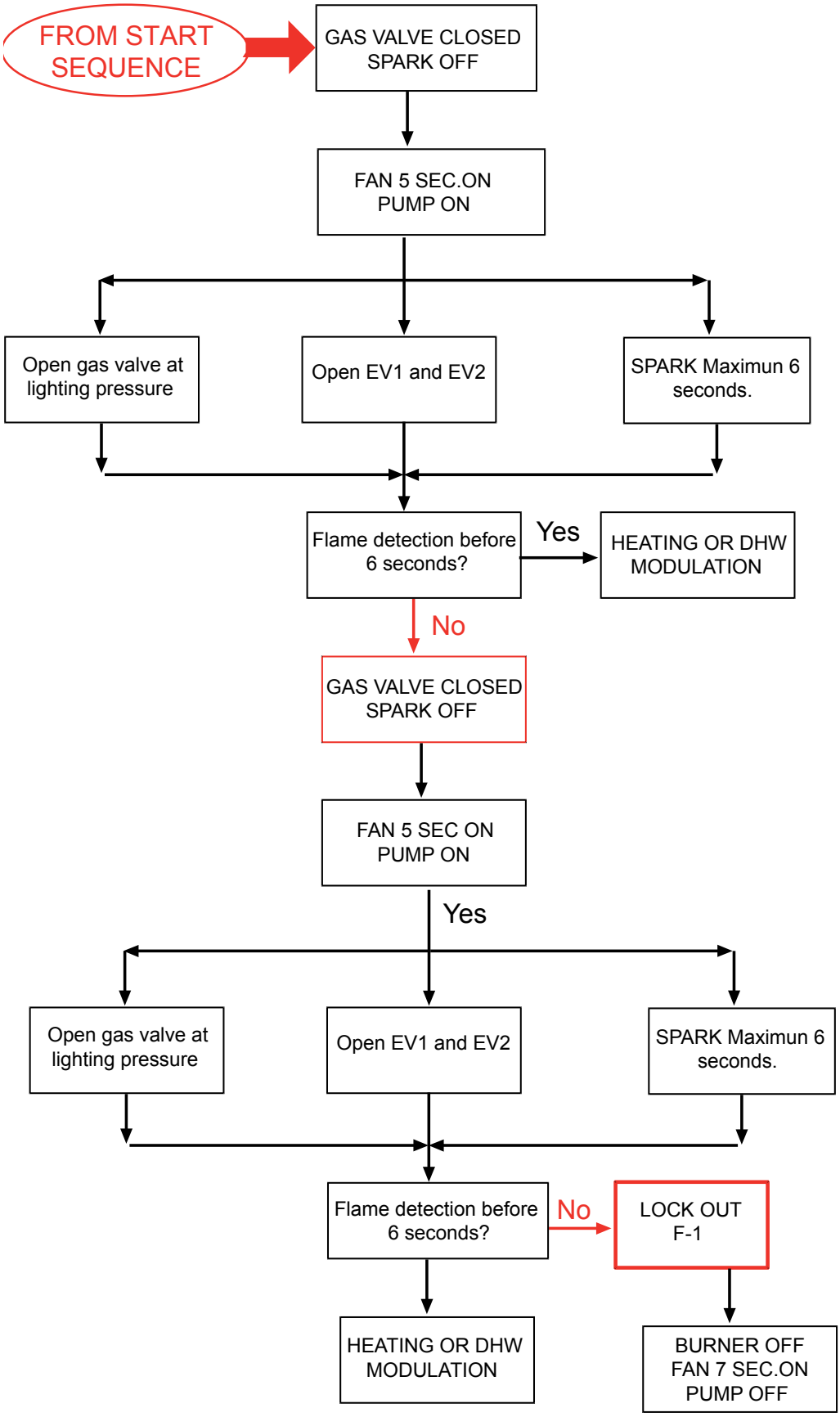
DHW start sequence FEB-24ED 3 STAR



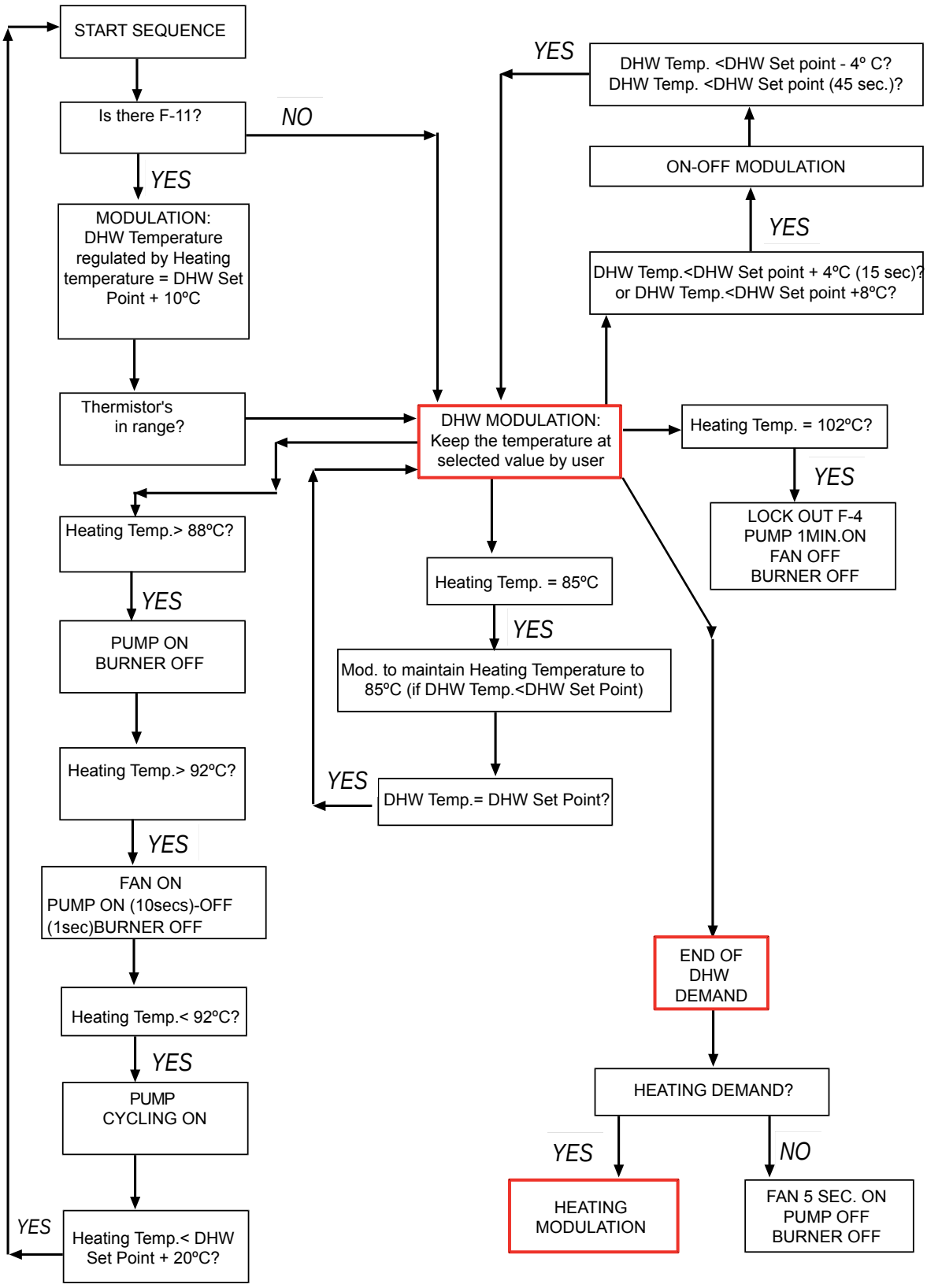
Heating start sequence FEB-24ED 3 STAR



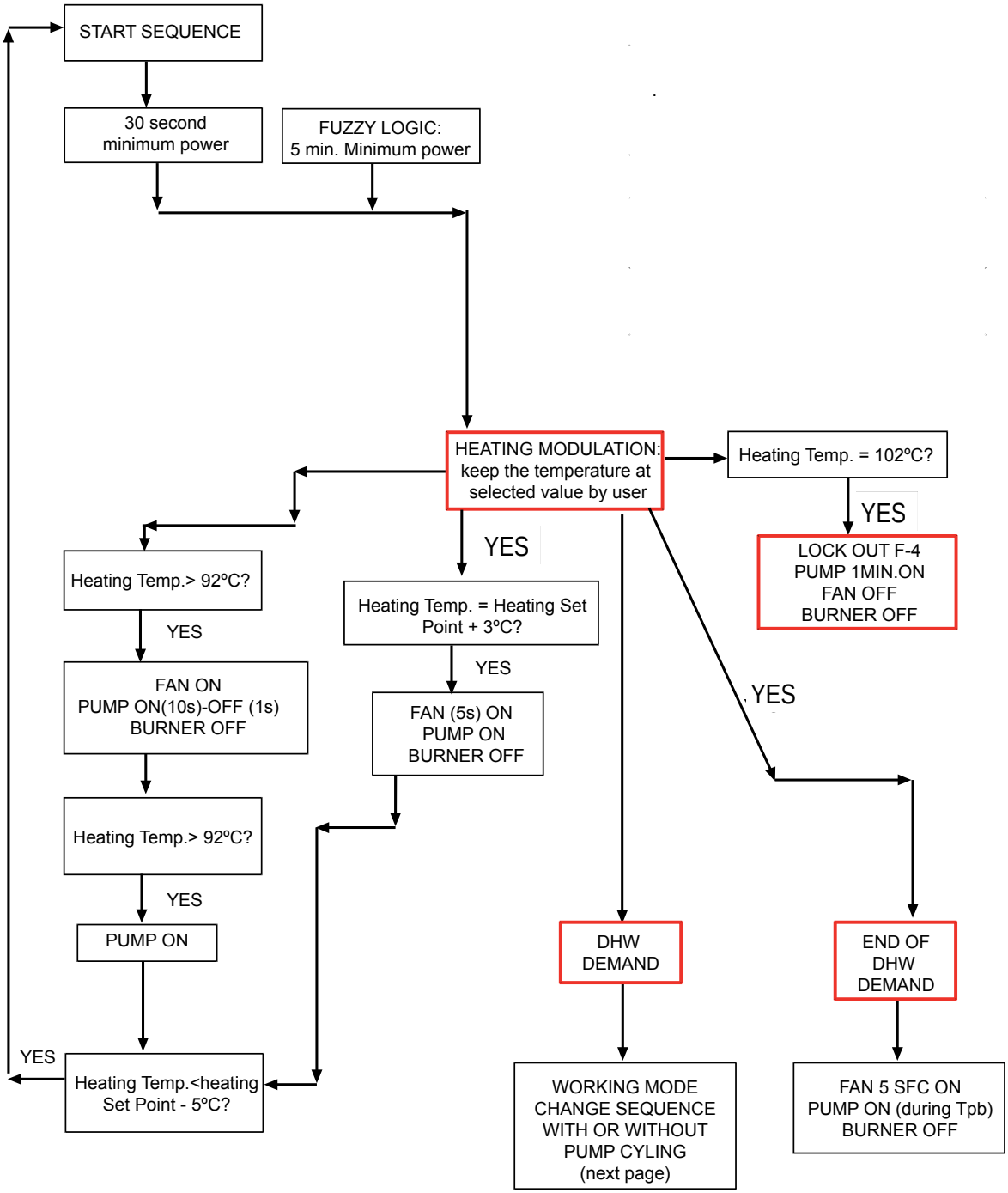
RE-start sequence FEB-24ED 3 STAR



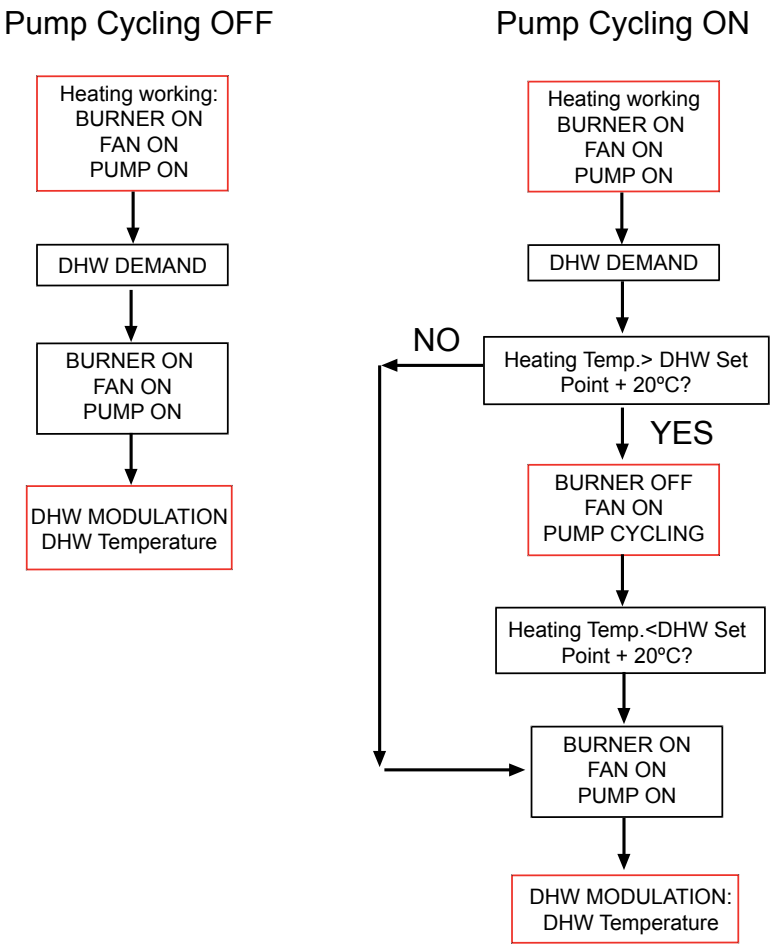
DHW Service: FEB-24ED 3 STAR



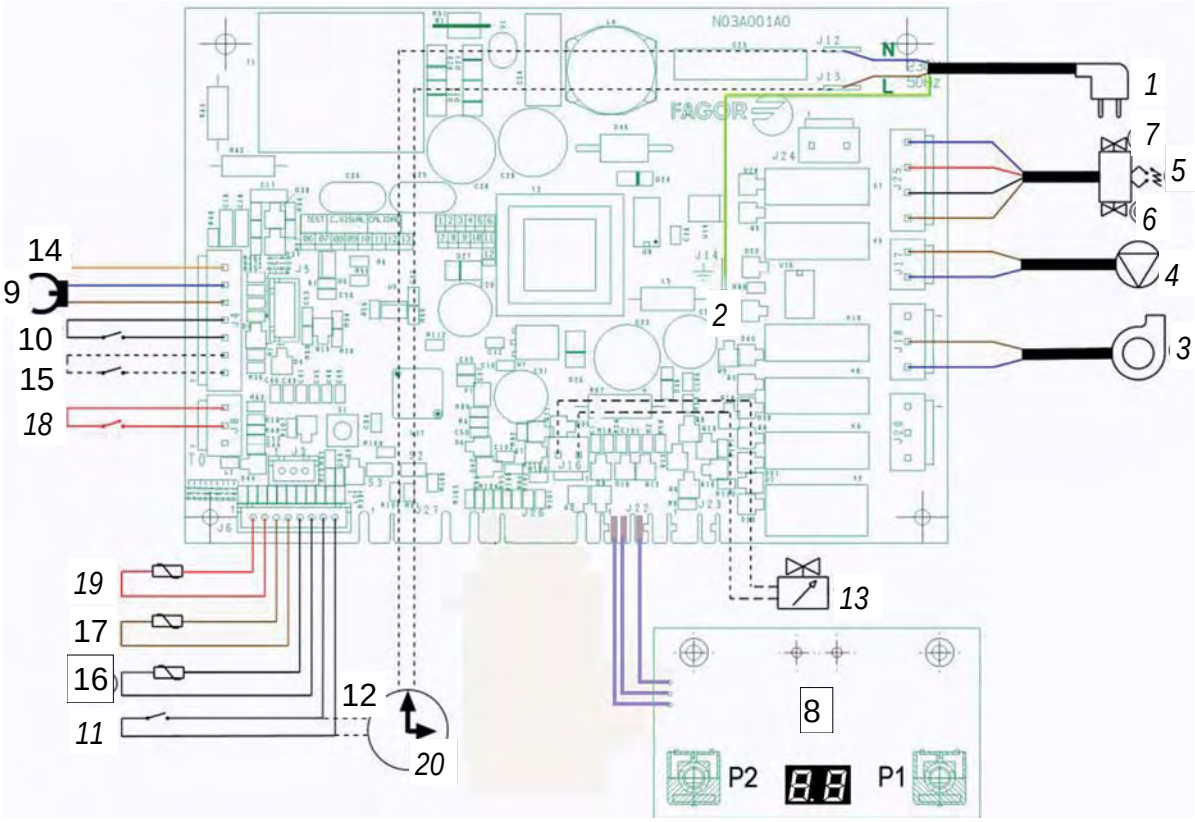
HEATING SERVICE FEB-24ED 3 STAR



Working mode change sequence: from Heating to DHW.



Electrical Circuit diagrams: FEB-24ED STAR



1.- Mains connection (230v ac)

2.- Earth

3- Fan (230v ac)

4.- Pump (230v ac)

5.- Ignition (230v ac)

6.- Gas valve solenoid 1 (230v ac)

7.- Gas valve solenoid 2 (230v ac)

8.- Front panel control

9.- 3 way valve micro switch

10.- Air pressure switch

11.- Room stat (optional)

12.- Clock connection

13.- Modulating solenoid valve

14.- Ionisation electrode

15.- High limit stat

16.- Return thermistor

17.- Flow thermistor

18.- CH low Pressure switch

19.- External Probe(Not Used)

20.- Clock (230 v ac)

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