

13.10.6 – Outdoor reset with room compensation

While in the “Installers’ Menu” (section

13.17) set the **CH** parameter to 02. The system will function exactly as described in the previous “Outdoor reset adjustment” sections except that now the boiler pump will stay on permanently. The opening of the room thermostat contacts will translate into a parallel downward movement of the curve in Figures 13-2 and 13-3. The value by which the curve moves downwards can be adjusted by the

Ln parameter present in the “Installers’ Menu”, see section 13.17.

The **Ln** parameter can range from 1 °F (1 °C) to 36 °F, (20°C). The suggested values for this parameter are:

- 18 °F (10°C) for high temperature radiator systems;
- 6 °F (3°C) for low temperature radiant panel systems

Values of this parameter that are too high may translate into room temperature instability. Values that are too low may make the action of the room thermostat ineffective.

Climatic adjustment with room compensation can be used in all the systems described in Section 13.10.1. The advantage being that the constant running of the pump will stabilize and standardize the room temperatures. This is especially true when some loops in the heating system have considerably greater volume than others.

- OA = Slope of the line
- Ob = Minimum heating temperature
- Oc = Maximum heating temperature
- br = “Fix point” of the angle fulcrum of the line
- b = parallel shift of the line (adjusted by the heating knob, item “7” of figure 13-1)

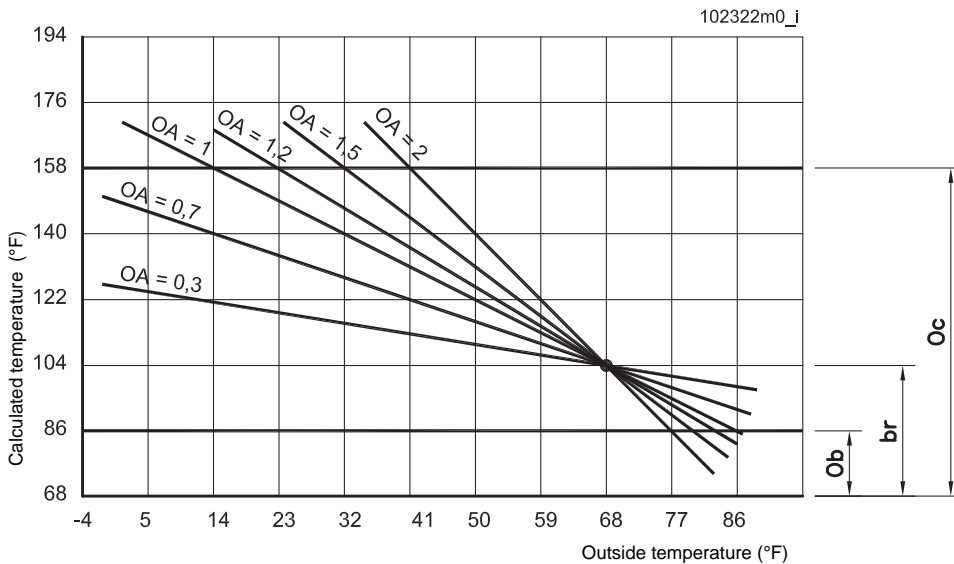


Figure 13-2 - Graph of the outdoor reset adjustment (influence of parameters “br”, “OA”, “Ob” and “Oc”)

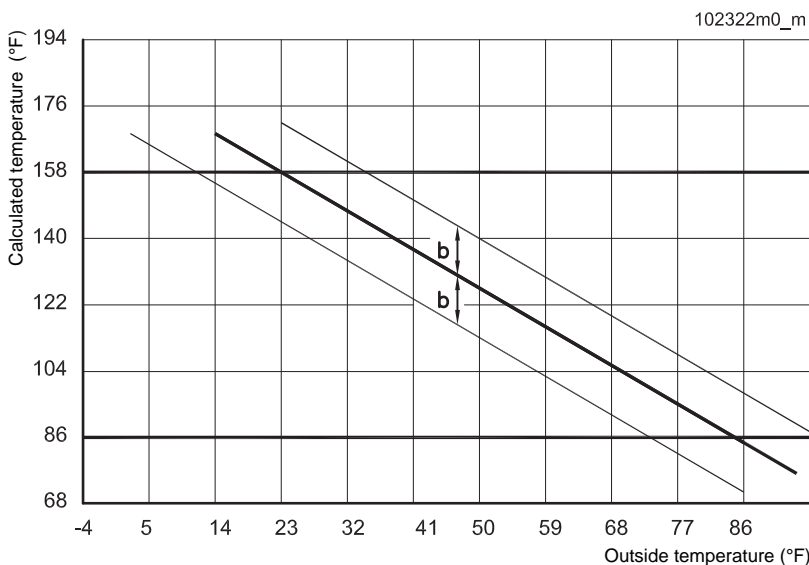


Figure 13-3 - Graphs of the outdoor reset adjustment (influence of parameter “b”)

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13.11 - Boiler switch settings

The control board shown in Figure 3-1, item "14", contains a series of switches that allow the boiler to be configured to match the application. The table below lists each switch and its corresponding functions.

SWITCH	Position	Description
1	OFF	Boiler without production of D.H.W
	ON	Boiler with production of D.H.W. via storage tank
2	OFF	Boiler with production of instantaneous D.H.W.
	ON	Position not available for this serie of boilers
3	OFF	Heating pressure switch, disabled
	ON	Heating pressure switch, enabled
4	OFF	EBM PAPST brand fan
	ON	Position not available for this serie of boilers
5	OFF	Combination boiler for heating and D.H.W.
	ON	Boiler for heating only
6	OFF	High temperature heating service, 86°F (30°C) to 176°F (80°C)
	ON	Low temperature heating service, 68°F (20°C) to 113°F (45°C)
7	OFF	Boiler configuration change, disabled
	ON	Boiler configuration change, enabled
8	OFF	Maximum heating supply water temperature of 176°F (80°C)
	ON	Position not available for this kind of boilers

CAUTION!!! Improper setting of these switches could cause the boiler to malfunction resulting in improper system performance. Only a qualified technician, with an in-depth knowledge of the boilers' control system, should change them.

13.12 - Delays, alarms and protective actions

To protect the life of the appliance, improve comfort, and maximize energy savings, the following timings have been incorporated into the control logic:

- a - Pump delay: each time the room thermostat is satisfied, the circulator pump continues to run for 1 minute;
- b - DHW delay: each time the domestic hot water demand is satisfied, a 2 minutes delay must pass before the heating service is allowed to restart;
- c - Protection against legionnaires bacteria: if the boiler is connected to a DHW storage tank the boiler will increase the tank temperature to 140 °F (60 °C) every seven days, prevent the formation of legionnaires bacteria. This function is displayed by **AL**.
- d - DHW alarm: if the call for domestic hot water lasts for longer than two hours, an **A01** alarm is generated. This function is only for boilers set up to provide instantaneous DHW.

e - Time delay in restarting the burner: in its normal functioning state, except when providing domestic water, every time the burner stops, there is a delay time of 3 minutes before the boiler restarts again.

13.13 - Circulator pump and three way valve protection

During the summer months, the circulator is run once a day for around 15 seconds to prevent it from seizing. At the same time, the three way valve (if present) is activated for the same reason.

13.14 - Boiler's Freeze protection

CAUTION!!! For the freeze protection function to work, the boiler must remain connected to the electrical and gas supplies with knobs "7" and "11" in Figure 13-1, in the OFF position.

CAUTION!!! This freeze protection function is conceived to protect the boiler only, not the heating system.

CAUTION!!! Because the boiler's freeze protection function depends from the electrical supply and from the gas supply, it is mandatory install a safety device that alarm the user in a case the boiler room will reach a temperature near 35°F (2°C).

Once the boiler has reached a temperature of 45 °F (7 °C), the heating pump will automatically comes on. If the temperature falls below 35 °F (2 °C), the burner will light to prevent the boiler from freezing. If the boiler will not be used for long time it should be drained per Sections 14.10 and 14.11.

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13.15 - Display in energy saving mode

If desired, the display, item “1” and “2” in Figure 13-1, can be switched permanently off, with the exception of when it displays errors or settings. To switch the display off, access the “Installers’ Menu”, in section 13.17

and set the **S** parameter at a value other than zero. Keep in mind that each value will correspond to a delay in minutes until the display goes into Energy Saving mode.

13.16 - “Users’ menu”

When entering the “Users’ menu”, the display, item “1” in Figure 13-1, will start blinking indicating that a change of mode has taken place. To access the “Users’ menu” (see also Section 17 to better understand the several menus):

1. press the **Reset** button for 2 seconds until the display starts blinking;
2. press and release the **Reset** button several times until the desired parameter is displayed;
3. use the **+** or **-** keys, to change the value of the selected parameter;

4. press **Reset** to save the parameter change before going to the next parameter.

When the last parameter has been reached and the **Reset** button pressed, the display will stop blinking indicating exit from the menu.

NOTE: If no key is pressed for more than 60 seconds, the control automatically exits the “Users’ menu”. Any parameter change not saved

using the **Reset** button, will be lost.

The table below lists each “Users’ menu” parameter, what it affects and its adjustment range.

PARAMETER	DESCRIPTION	INFORMATION ON DISPLAY ITEM “2” of Figure 13-1
0A	Adjustment of the curve angel as shown in Figure 13-2 when outdoor reset is active per section 13.9.	Setting range: 0,1 to 5,0
0b	Adjustment of the “Minimum heating temperature” as shown in Figure 13-2 when outdoor reset is active per section 13.9.	Setting range: see section 13.10.3
0c	Adjustment of the “Maximum heating temperature” as shown in Figure 13-2 when outdoor reset is active per section 13.9.	Setting range: see section 13.10.3
b	Adjustment of the parallel shift of the curve as shown in Figure 13-3 when outdoor reset is active per section 13.9.	The adjustment is made by turning knob “7” shown in Figure 13-1. The selected curve can be shifted up or down by 36 °F (20 °C).
c	Display of the calculated heating temperature when outdoor reset is active per section 13.9, or display of the temperature set by knob “7” shown in Figure 13-1.	Temperature display only, with a range between 68 °F (20 °C) and 189 °F (87 °C).
d	Display of the domestic hot water temperature when set by knob “11” shown in Figure 13-1.	Temperature display only with a range between 104 °F (40 °C) and 158 °F (70 °C), see section 13.7.
E	Display of last error code registered, Section 13.18.2	Error code display per section 13.18.2
L	Display of last lockout occurred, Section 13.18.1	Lockout code per section 13.18.1

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13.17 - “Installer’s menu”

CAUTION!!! Changing these parameters could cause the boiler and therefore the system to malfunction. For this reason, only a qualified technician who has in-depth knowledge of the boiler should change them.

The boiler’s micro-processor makes this menu of parameters available to the qualified technician for the analysis of the functioning and adjustment of the appliance to the system. When entering the “Installers’ Menu”, the display item “1” in Figure 13-1, will start to blink indicating that a change of mode has taken place. To access the “Installers’ Menu” just (see also Section 17 to better understand the several menus):

1. press and hold the **Reset** button down for 12 seconds until the **U 1** parameter is displayed;
2. press and release the **Reset** button to scroll through the list of the parameters;
3. once the parameter has been displayed, it can be changed using the **+** or **-** keys;
4. press and release the **Reset** button to confirm the amended data before moving to the next parameter.

When the last parameter has been reached and the **Reset** button pressed, the display will stop blinking indicating the exit from the menu.

NOTE: If no key is pressed for more than 60 seconds, the control automatically exits the “Installers’ menu”. Any parameter change not saved using the **Reset** button, will be lost.

The next table lists each “Installers’ menu” parameter, what it affects and its adjustment range.

PARAMETER	DESCRIPTION	INFORMATION ON DISPLAY ITEM “2” OF FIGURE 13-1
U 1	Boiler temperature, measured by U1 sensor	Value in °F (cannot be changed)
U 2	DHW temperature, measured by U2 sensor	Value in °F (cannot be changed)
U 3	Domestic cold water (or ind. water heater) temperature , measured by U3 sensor	Value in °F (cannot be changed)
U 4	Outdoor temperature, measured by U4 sensor	Value in °F (cannot be changed) (displayed only if outdoor reset is active, as per section 13.9)
U 5	Ionization current value	Value from 0 to 99 (cannot be changed) (30 corresponds to a current of 1uA) (99 corresponds to a current of 5.5 uA)
U 6	High limit temperature, measured by U6 sensor	Value in °F (cannot be changed)
U 7	Flue gas temperature, measured by U7 sensor	Value in °F (cannot be changed)
U 8	Heating return temperature, measured by U8 sensor	Value in °F (cannot be changed)
t 4	Type of basic setting of control board	Can be changed in accordance with Section 11.6
r t	Status of room thermostat contact	00 = contact open (heating service off) 01 = contact closed (heating service on)
F	Measurement of fan speed rotation	Value in g/1’/100 (rpm/100) (cannot be changed)
P	BTU input for heating service	Adjustable according to the instructions of section 12.10

Continue

13 - USE

Continued

PARAMETER	DESCRIPTION	INFORMATION ON DISPLAY ITEM "2" OF FIGURE 13-1
CH	Heating service functioning mode	Can be changed (see Section 13.9): 00 = thermostatic adjustment; 01 = outdoor reset; 02 = outdoor reset with room compensation;
Cn	Reaction to external temperature	Keep always at value of 1
br	Angle fulcrum of climatic adjustment	Can be changed from 16°F (-9°C) to 149°F (65°C) (active only with outdoor reset). See section 13.10.3 for its adjustment.
tn	Reduction of temperature generated by the opening of the room thermostat	Can be changed: from 1°F (1°C) to 36°F (20°C) (active only with outdoor reset featuring room compensation) See section 13.10.6 for its adjustment.
L	Boiler knobs' status	Can be changed: 01 = knobs presents; 00 = knobs absent.
S	Display "1" and "2" as per figure 13-1 energy saver	Can be changed: 00 = display always on; any other value, corresponds to a delay in the switching off of the display, expressed in minutes (see also Section 13.15)
PS	Parameter disabled for this kind of boiler	
dE	Domestic sensitivity setting	No influence in this kind of boiler
St	Minimum domestic setpoint during sleep mode	No influence in this kind of boiler
CP	Proportional band of the heating PID modulation	Must be maintained at 20 value
CI	Integral of the heating PID modulation	Must be maintained at 40 value
AC	Burner Anticycling: minimum delay from a burner light-off to the sequent light-on. Value expressed in sec x 10	Can be changed between 1 and 54. Default value is 18 (180 sec). Can be modified only in conjunction with factory technicians.
dP	Indirect water heater priority selection: Value expressed in minutes.	Can be changed between 00 (function disabled) and 99 minutes. Default value is 00 (See also section 9.1.1).

13.18 - Diagnostics

During the normal operation of the boiler, the display, of Figure 13-1, continually shows the operating status of the boiler as shown below (see also section 17):

PARAMETER	PARAMETER REFERENCE	DISPLAY READ OUT (ITEM "2", FIGURE 13-1)
O	Boiler in stand-by mode or pause (no request for heating or domestic hot water)	Boiler temperature (°F)
P	Anti-freeze function active	Boiler temperature (°F)
A	Boiler not in lock-out mode but in Attention mode.	01 = Boiler temperature (°F) Domestic hot water service active for more than 120 minutes. Turn domestic hot water to OFF position to reinstate heating. 02 = Data connection interrupted between cascade boilers
FILL	System pressure too low, system must be filled. See section 13.1.	No display
d	Domestic hot water service active	Domestic hot water temperature (°F)
C	Heating service active	Heating temperature (°F)
L	Boiler in lock-out mode. To reset it, press the Reset button. If the lock-out occurs frequently, contact a professionally qualified technician.	Lock-out code (see section 13.18.1 for decodification).
E	Blocking error. Contact a professionally qualified technician. Blocking errors automatically reset if the condition causing the block disappears	Error code (see section 13.18.2 for decodification).
F	Auto-purging procedure that last 3 minutes in progress (see section 13.4).	Boiler temperature (°F)
AL	Boiler in Anti-legionella functioning (see section 13.12)	Storage tank temperature (°F)

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13.18.1 - Diagnostics: “L” lock-outs

“L” Code	Lock-out description	Checks to make	Solutions
L01	No flame detected after three ignition attempts.	<p>Check:</p> <ul style="list-style-type: none"> a-correct gas supply pressure (see section 12.7); b-ignition spark (see section 14.4); c-correct combustion air pressure (see section 12.8); d-120Vac at the gas valve; e-resistance of the two gas valve coils should be 0.18 kohm and 1.1 kohm; f- If the burner lights, but goes out at the end of the ignition attempt, check: that the ionization current is set at a value greater than 60 (follow procedure in section 14.12.4) 	<ul style="list-style-type: none"> a-If the gas supply pressure is incorrect, it must be adjusted to the correct pressure; b-If spark is not present, check for correct ignition electrode position and gap as per section 14.4; If position is correct, check for 120Vac at the supply of the spark generator. c-if the combustion air pressure is incorrect, inspect the vent system and eliminate any obstructions; d-if the voltage to the gas valve is not 120Vac the power control board must be replaced; e-if the resistance of the gas valve coils is not 0.18 kohm and/or 1.10 kohm, the gas valve must be replaced. f-If the ionization current is not greater than 60, confirm that the the CO2 content is adjusted properly (see section 12.9). Check the flame detection electrode (section 14.4) and if necessary replace it, check the integrity of the flame detection electrode electrical wires.
L02	Flame extinguishes three times.	<p>Check:</p> <ul style="list-style-type: none"> a-that the ionization current is set at a value greater than 60 (follow procedure in section 14.12.4); b-check that gas valve open fast enough; 	<ul style="list-style-type: none"> a-If the ionization current is not greater than 60, confirm that the the CO2 content is adjusted properly (see section 12.9). Check the flame detection electrode (section 14.4) and if necessary replace it, check the integrity of the flame detection electrode electrical wires. b-Following procedure as per Section 14.12.4, check few times if passing from low fire to high fire the flame extinguish. If extinguish, change the gas valve.
L03	Boiler temperature is over 203° F (95°C).	<ul style="list-style-type: none"> a-Check that the circulator pump is working; b-Check if the water flow is not less than 5 GPM 	<ul style="list-style-type: none"> a-If the circulator pump is bad, replace it, if is good, replace the power control board. b-If the water flow is less than 5 GPM check for any zone valves that must be opened.
L04	Gas valve command relay		Replace the power control board
L05	Safety relay	Check for correct polarity of the wires to the pump. Try to switch the wires.	If the pump won't run replace it. If the pump is good try to replace the power control board.
L06	Flue gas sensor over 210°F (99°C)	<p>Check:</p> <ul style="list-style-type: none"> a - that the electrical resistance of the flue gas sensor complies with the graph in Section 14.13; b - that the efficiency of the boiler is over 86% 	<ul style="list-style-type: none"> a-If the flue gas sensor resistance does not correspond with the correct values, replace it; b-if the boiler efficiency is less than 86% and the CO2 content is correct, the primary heat exchanger has to be replaced and proper water treatment methods employed to prevent mineral build up on the water side
L07	Electrical circuit of flue gas sensor is interrupted	Check that the electrical resistance of the flue gas sensor corresponds with the graph in section 14.13;	If the sensor resistance does not correspond with the correct values, replace it;
L08	Spark generator relay		Replace the power control board
L09	RAM memory		Replace the power control board
L10	E2prom memory damaged		Replace the power control board
L12	E2prom memory damaged		Replace the power control board
L13	Program error		Replace the power control board
L14	Program error		Replace the power control board
L15	Program error		Replace the power control board
L16	Program error		Replace the power control board
L17	The temperature difference between the U1 and U6 sensors is too great	<p>Check that:</p> <ul style="list-style-type: none"> a - the electrical resistance of the two sensors corresponds with the graph in section 14.13; b -check that the heating water flow is not too low. 	<ul style="list-style-type: none"> a-If one or both sensors does not have the correct resistance value, it must be replaced; b-If temperature difference between U1 and U8 is higher than 55°F at maximum input, the heating water flow rate is too low. The heating water flow rate must be corrected.

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13.18.1 - Diagnostics: “L” lock-outs (continued)

“L” Code	Lock-out description	Controls	Solutions
L18	Program error		Replace the power control board
L19	Flame sensed for 10 seconds, after the closure of the gas valve		Call technical service
L20	Flame sensed before opening of the gas valve.		Call technical service
L21	Boiler in blocking state for more than 20 hours		Press RESET button and check the blocking error “E” on Section 13.18.2
L25	U1 or U6 sensor increase its temperature too fast	Check: a - that the heating water flow is not too low; b - that the circulator pump is working	a - If temperature difference between U1 and U8 is higher than 55°F (31°C), at maximum input, the heating water flow rate is too low. The heating water flow rate must be corrected. b - If the pump works, replace the power control board.
L32	Program error		Replace the power control board
L33	Fan rotation error	Check that the voltage to the fan is 163(±10)Vdc.	If the fan is powered with 163Vdc, replace the fan. If the voltage to the fan is not 163 Vdc, replace the board.
L45	Heating circuit filling time longer than 10 minutes.	Check: a - that the heating pressure switch setting pressure, FILL appears when the pressure drops below 8.7 psi (0,6 bar), and disappears when the pressure rises above 22 psi (1.5 bar);	a -If the heating pressure switch is not correctly set, it must be replaced; b - if the system has a leak, it must be fixed.
L46	Filling of heating circuit repeated 16 times in 24 hours	b - check that there are no water leaks in the heating system.	
L47	Flue pressure switch open time longer than 60 minutes	Check: a - that no obstructions are in the flue discharge/air intake line b - check the flue pressure switch setting point, setting is 4.5 in.W.C c - check that the electrical resistance of the flue gas sensor corresponds with the graph in section 14.13; d - check that the electrical connection cables between the flue pressure switch, the flue sensor and the power control board.	a -If there is an obstruction, it must be removed; b - If the flue pressure switch is not correctly set, it must be replaced; c - If the flue sensor resistance does not correspond, it must be replaced; d - if the electrical circuit is damaged, it must be repaired; if the previous four cases do not apply, replace the power control board

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13.18.2 - Diagnostics: “E” blocking errors

“E” Code	Blocking description	Checks to make	Solutions
E01	U1 boiler temperature sensor circuit interrupted.	Check that the electrical resistance of the sensor corresponds with the graph in section 14.13; check that the electrical connection cables between the sensor and the power control board have continuity and carry current	If the sensor resistance does not correspond, it must be replaced; if the electrical circuit is damaged, it must be repaired; if the previous two cases do not apply, replace the power control board
E02	U2 domestic hot water temperature sensor circuit interrupted.	Check that the electrical resistance of the sensor corresponds with the graph in section 14.13; check that the electrical connection cables between the sensor and the power control board have continuity and carry current	If the sensor resistance does not correspond, it must be replaced; if the electrical circuit is damaged, it must be repaired; if the previous two cases do not apply, replace the power control board
E04	U8 return temperature sensor circuit interrupted	Check that the electrical resistance of the sensor corresponds with the graph in section 14.13; check that the electrical connection cables between the sensor and the power control board have continuity and carry current	If the sensor resistance does not correspond, it must be replaced; if the electrical circuit is damaged, it must be repaired; if the previous two cases do not apply, replace the power control board
E07	U3 cold water or indirect water heater sensor circuit interrupted	Check that the electrical resistance of the sensor corresponds with the graph in section 14.13; check that the electrical connection cables between the sensor and the power control board have continuity and carry current	If the sensor resistance does not correspond, it must be replaced; if the electrical circuit is damaged, it must be repaired; if the previous two cases do not apply, replace the power control board
E08	U6 boiler temperature sensor circuit interrupted.	Check that the electrical resistance of the sensor corresponds with the graph in section 14.13; check that the electrical connection cables between the sensor and the power control board have continuity and carry current	If the sensor resistance does not correspond, it must be replaced; if the electrical circuit is damaged, it must be repaired; if the previous two cases do not apply, replace the power control board
E11	U1 boiler temperature sensor circuit short-circuited.	Check that the electrical resistance of the sensor corresponds with the graph in section 14.13; check that the electrical connection cables between the sensor and the power control board have continuity and carry current	If the sensor resistance does not correspond, it must be replaced; if the electrical circuit is damaged, it must be repaired; if the previous two cases do not apply, replace the power control board
E12	U2 domestic hot water temperature sensor circuit short-circuited	Check that the electrical resistance of the sensor corresponds with the graph in section 14.13; check that the electrical connection cables between the sensor and the power control board have continuity and carry current	If the sensor resistance does not correspond, it must be replaced; if the electrical circuit is damaged, it must be repaired; if the previous two cases do not apply, replace the power control board
E13	Erroneous temperature reading.		Replace the power control board

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13.18.2 - Diagnostics: “E” blocking errors (continued)

“E” Code	Blocking description	Checks to make	Solutions
E14	U8 return temperature sensor short-circuited	Check that the electrical resistance of the sensor corresponds with the graph in section 14.13; check that the electrical connection cables between the sensor and the power control board have continuity and carry current	If the sensor resistance does not correspond, it must be replaced; if the electrical circuit is damaged, it must be repaired; if the previous two cases do not apply, replace the power control board
E15	U4 outside sensor short-circuited	Check that the electrical resistance of the sensor corresponds with the graph in section 14.14; check that the electrical connection cables between the sensor and the power control board have continuity and carry current	If the sensor resistance does not correspond, it must be replaced; if the electrical circuit is damaged, it must be repaired; if the previous two cases do not apply, replace the power control board
E16	Erroneous temperature reading.		Replace the power control board
E17	U3 cold water temperature or indirect water heater temperature sensor circuit shorted	Check that the electrical resistance of the sensor corresponds with the graph in section 14.13; check that the electrical connection cables between the sensor and the power control board have continuity and carry current	If the sensor resistance does not correspond, it must be replaced; if the electrical circuit is damaged, it must be repaired; if the previous two cases do not apply, replace the power control board
E18	U6 boiler temperature sensor circuit shorted	Check that the electrical resistance of the sensor corresponds with the graph in section 14.13; check that the electrical connection cables between the sensor and the power control board have continuity and carry current	If the sensor resistance does not correspond, it must be replaced; if the electrical circuit is damaged, it must be repaired; if the previous two cases do not apply, replace the power control board
E19	E2prom memory damaged		Replace the command and control board
E20	Flame presence with gas valve closed		Replace the gas valve
E21	Phase and neutral inverted	Invert phase and neutral	If phase and neutral are correctly wired, replace the power and control board
E22	Electrical supply frequency other than 60Hz	Check the electrical frequency of the system. Check if CS parameter is at 03 (see section 17)	If the electrical supply frequency is other than 60Hz, contact the electric company; if the mains frequency is 60Hz, replace the command and control board. Make sure that the CS parameter is at 03.
E23	Ground connection is absent	Check if the boiler is properly grounded	if the boiler is properly grounded, replace the power control board
E30	Erroneous temperature reading.		Replace the power control board
E31	Erroneous temperature reading.		Replace the power control board
E32	Erroneous temperature reading.		Replace the power control board
E33	Erroneous temperature reading.		Replace the power control board
E42	Program error		Replace the power control board
E50	Error in the boiler tY parameter selection	Move ON switches 7 an set again the correct tY value (see section 17)	If tY value is correct, change the power control board
E51	Reset button pressed too often in a short period time		
E52	Heating flow switch closed	Check if the heating pump is running. Check if the flow switch contact is stuck	The pump should not run and the contact should open The contact must be open
E53	Heating flow switch open	Check if the heating pump is running. Check if the flow switch contact is broken	The pump should run and the contact should closed The contact must be closed

14 - MAINTENANCE

14.1 - Care and maintenance

This section must be brought to the attention of the user by the installer so that the user can make the necessary arrangements with a qualified service agency for the periodic care and maintenance of the boiler. User must check its boiler follow Table 14-1 column "User maintenance".

The installer must also inform the user that the lack of proper care and maintenance of this boiler and any fuel burning equipment may result in a hazardous condition.

Installer should discuss contents of the Section 13 (User's section) with the user.

A trained and qualified service technician should perform the inspection listed in these instructions before each heating season and at regular intervals.

! WARNING!!! Servicing, inspection and adjustment must be done by a trained technician in accordance with all applicable local and national codes. Improper servicing or adjustment could damage the boiler! Failure to comply with this warning can result in a fire or explosion causing property damage, personal injury or loss of life!

! WARNING!!! Never store combustible materials, gasoline or any product containing flammable vapors and liquids in the vicinity of the boiler. Failure to comply with this warning can result in extensive property damage, severe personal injury or death!

Service and maintenance schedules	
Service Technician	User maintenance
<p>Annual Startup:</p> <ul style="list-style-type: none"> - Address reported problems (Follow section 14.1.1); - Check all piping for leaks (Follow section 14.1.2) - Verify flue and air lines in good condition and sealed tight (Follow section 14.1.3); - Check system water pressure/system piping/ expansion tank (Follow section 14.1.4); - Check control settings (Follow section 14.1.5); - Check ignition and flame sense electrodes (Follow section 14.1.6); - Check wiring and connections (Follow section 14.1.7); - Perform performance verification (Follow section 14.1.8); - Flame inspection (Follow section 14.1.9); - Check flame signal (Follow section 14.1.10); - Clean the heat exchanger if flue temperature is more than 72°F (40°C) above return water temperature (Follow section 14.3). - Clean condensate trap (Follow section 14.5). - Check combustion air pressure (Follow section 12.8). - Check relief valve (Follow section 14.1.11); - Check for any air inside the domestic heat exchanger (Follow section 12.1.4); - Check any domestic water softener if need any maintenance (follow softener's manufacturer instructions) 	<p>Daily:</p> <ul style="list-style-type: none"> - Check boiler area (Follow section 14.1.12); - Check pressure gauge (Follow section 14.1.13); <p>Monthly:</p> <ul style="list-style-type: none"> - Check vent piping (Follow section 14.1.14); - Check air piping (Follow section 14.1.15); - Check condensate drain system (Follow section 14.1.16); <p>Every six month:</p> <ul style="list-style-type: none"> - Check boiler piping (gas and water) for leaks (Follow section 14.1.17); <p>End of season months:</p> <ul style="list-style-type: none"> - Shut boiler down (unless boiler used for domestic hot water) (Follow section 14.1.18);

Table 14-1 - Service and Maintenance Schedules

14 - MAINTENANCE

! WARNING!!! Never obstruct the flow of combustion and ventilation air. Failure to provide adequate combustion air for this boiler can result in excessive levels of carbon monoxide which can result in severe personal injury or death!

! WARNING!!! If maintenance is performed on the vent-air intake system it must be properly reassembled and sealed. Failure to properly maintain the vent-air system can result in excessive levels of carbon monoxide which can result in severe personal injury or death!

! WARNING!!! Before performing any maintenance operations, shut the boiler off, close the manual gas shut-off valve (Figure 11-1) and shut off electrical power to the boiler. Follow the Operating Instructions outlined in the section "SAFETY INSTRUCTIONS" (Beginning of the manual).

14.1.1 - Address reported problems

Inspect any problems reported by the owner and correct before proceeding.

14.1.2 - Check all piping for leaks

CAUTION!!! Eliminate all system or boiler leaks. Continual fresh makeup water will reduce boiler life. Minerals can build up in sections, reducing heat transfer, overheating heat exchanger, and causing heat exchanger failure. Leaking water may also cause severe property damage.

1. Inspect all water and gas piping and verify to be leak free.
2. Look for signs of leaking lines and correct any problems found.

3. Check for gas leaks: using soap solution, check for gas leaks from meter to boiler including all pipes and fittings and boiler connections. Use liquid soap solution for all gas testing.

! WARNING!!! Do not check for gas leaks with an open flame. Use the bubble test. Failure to use the bubble test or check for gas leaks with an open flame can cause explosion, severe personal injury, death, or substantial property damage.

14.1.3 - Verify flue and air lines in good condition and sealed tight;

1. Check for obstruction, condensation, corrosion and physical damage, water stains, any signs of rust, other corrosions or separation of the vent and air intake piping.
2. Check outside terminations. Screens and louvers should be free of any debris and must be cleaned as required.

14.1.4 - Check system water pressure/system piping/expansion tank;

1. Check water piping and accessories for leaks. Slightest leaks should be corrected.
2. Check the system to be full of water and pressure to remain stable at correct setting on gauge.

14.1.5 - Check control settings

1. Thermostat Test (control knobs items "7" and "11", Figure 13-1): Set knobs setting to low enough to end call for heat. Gas valve should close and burner should stop firing. Fan go into a post purge, then shuts off.
2. Control Safety Shutdown test: with the burner firing, close the manual gas shut off valve (Figure 11-1) . Gas valve should close and burner should stop firing. The boiler will try for ignition three times after this, then should lock out with an "L 01" error shown on the display. Open the manual gas shut-off valve, and press the "Reset" button to return to normal operation.

14.1.6 - Check ignition and flame sense electrodes

1. Remove the fan-burner assembly unit (see section 14.3)
2. Remove any deposits accumulated on the ignition/flame sense electrode using sand paper.
3. Check electrodes positioning meet Section 14.4

14.1.7 - Check wiring and connections

Inspect all boiler wiring, making sure wires are in good condition and securely attached.

14.1.8 - Perform performance verification.

1. Start boiler and perform a combustion test as per section 12.9.
2. Verify cold fill pressure is correct and that operating pressure does not go too high (could be a problem on the expansion tank).

14.1.9 - Flame inspection

1. Inspect flame through observation window.
2. If the flame is unsatisfactory at either high fire or low fire, clean the burner following section 14.3.

14.1.10 - Check flame signal

1. Follow section 14.12.4 to check the flame signal.
2. At high fire and low fire the flame signal shown on the display should be within values given in Section 15, header "ionisation current". A lower flame signal may indicate a fouled or damaged flame sense electrode. If cleaning the flame sense electrode does not improve, ground wiring is in good condition, and ground continuity is satisfactory, replace the flame sense electrode.

14.1.11 - Check relief valve

Inspect the relief valve and lift the lever to verify flow. Before operating any relief valve, ensure that it is piped with its discharge in a safe area to avoid severe scald potential. Read Section 7.2.2 before proceeding further. Relief valve should be re-inspected at least once every three years, by a licensed

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plumbing contractor or authorized inspection agency, to ensure that the product has not been affected by corrosive water conditions and to ensure that the valve and discharge line have not been altered or tampered with illegally.

Certain naturally occurring conditions may corrode the valve or its components over time, rendering the valve inoperative. Such conditions are not detectable unless the valve and its components are physically removed and inspected. This inspection must only be conducted by a plumbing contractor or authorized inspection agency – not by the user.

⚠ WARNING!!! Failure to re-inspect the boiler relief valve as directed could result in unsafe pressure buildup, which can result in severe personal injury, death, or substantial property damage.

14.1.12 - Check boiler area

⚠ WARNING!!! To prevent potential of severe personal injury, death, or substantial property damage, eliminate all materials discussed below from the boiler vicinity and the vicinity of the boiler combustion air inlet.

If contaminants are found: Remove products immediately from the area. If they have been there for an extended period, call a qualified service technician to inspect the boiler for possible damage from acid corrosion.

If products cannot be removed, immediately call a qualified service technician to re-pipe vent and air piping and locate vent termination/air intake away from contaminated areas.

1. Combustible/flammable materials -- Do not store combustible materials, gasoline or any other flammable vapors or liquids near the boiler. Remove immediately if found.

2. Air contaminants -- Products containing chlorine or fluorine, if allowed to contaminate the boiler intake air, will cause acidic condensate in the boiler. This will cause significant damage to the boiler if allowed to continue. Read the list of potential materials listed in Section 10.2. If any of these products are in the room from which the boiler takes its combustion air, they must be removed immediately or the boiler combustion air (and vent termination) must be relocated to another area.

14.1.13 - Check pressure gauge

1. Make sure the pressure reading on the boiler pressure gauge does not exceed 25 psi. Higher pressure may indicate a problem with the expansion tank.
2. Contact a qualified service technician if problem persists.

14.1.14 - Check vent piping

1. Visually inspect the flue gas vent piping for any signs of blockage, leakage, or deterioration of the piping. Notify your qualified service technician at once if you find any problems.

⚠ WARNING!!! Failure to inspect the vent system as noted above and have it repaired by a qualified service technician can result in vent system failure, causing severe personal injury or death.

14.1.15 - Check air piping

1. Visually inspect the air inlet termination to be sure it is unobstructed. Inspect the entire length of air piping to ensure piping is intact and all joints are properly sealed.
2. Call your qualified service technician if you notice any problems.

14.1.16 - Check condensate drain system

1. Inspect the condensate drain line, condensate fittings and condensate trap for signs of weeping or leakage.
2. If you detect signs of leakage, immediately contact your qualified service technician to inspect the boiler and system.

14.1.17 - Check boiler piping (gas and water)

1. If gas odor or leak is detected, immediately shut down the boiler following the procedures on page 3. Call a qualified service technician.
2. Visually inspect for leaks around water piping. Also inspect the circulators, relief valve, and fittings. Immediately call a qualified service technician to repair any leaks.

⚠ WARNING!!! Have leaks fixed at once by a qualified service technician. Failure to comply could result in severe personal injury, death, or substantial property damage.

14.1.18 - Shut boiler down (unless boiler is used for Domestic Water)

1. Follow "To Turn Off Gas to Appliance" on page 3 of this manual.
2. Do not drain the system unless exposure to freezing temperatures will occur.
3. Do not drain the system if it is filled with an antifreeze solution.
4. DO NOT shut down boilers used for domestic water heating, they must operate year-round.

14.2 - Removing the casing

In order to remove the casing, follow the steps below while referring to Figure 14-1:

1. remove screws "A";
2. raise latch "C";
3. remove the front cover;
4. press the two plastic springs, item "L", down;
5. lower the electrical box;
6. lift latch "G";
7. pull the bottom of cover "H" out by around 4 in (10 cm);
8. lift cover "H" up by around 1in (2 cm) and remove it.

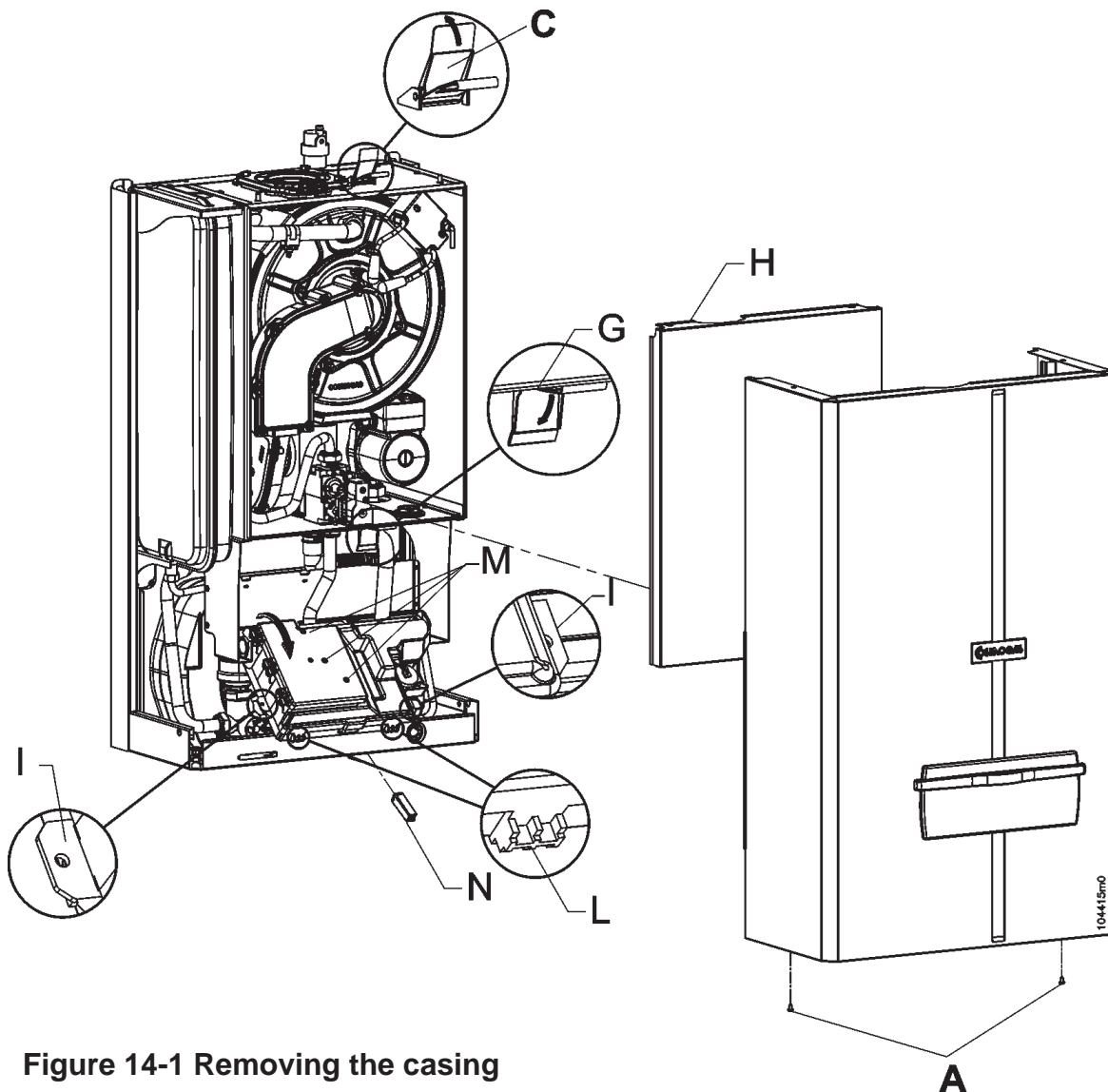


Figure 14-1 Removing the casing

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14.3 - Cleaning the burner and primary heat exchanger, flue gas side

Burner and primary heat exchanger must be checked every year and cleaned if required. To correctly clean the burner and the flue gas side of the heat exchanger follow the steps below:

! WARNING!!! Before proceeding to the next step, verify that the electrical supply to the boiler, and any other electrical supply near the boiler, is off. Failure to comply with this warning can cause extensive property damage, severe personal injury or death!

1. follow the steps in Section 14.2 to gain access to the sealing chamber;
2. unscrew nut "D" (Figure 14-2) from the gas valve (taking care not to lose gasket "E" in Figure 14-4);
3. disconnect the two wires from the ignition electrodes and the wire from the flame detection electrode, Figure 3-1, details "47" and "50";
4. disconnect the wire from safety sensor "F" in Figure 14-2;
5. unscrew the four nuts "C" in Figure 14-2;

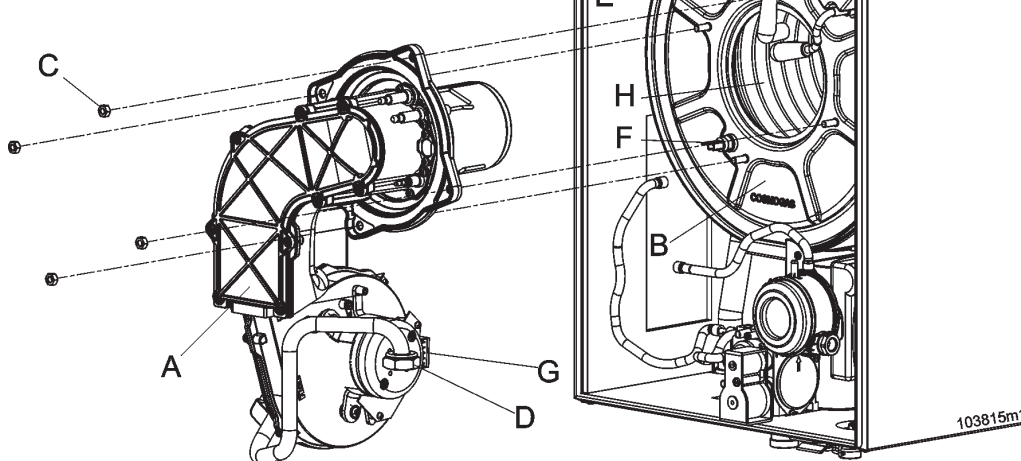


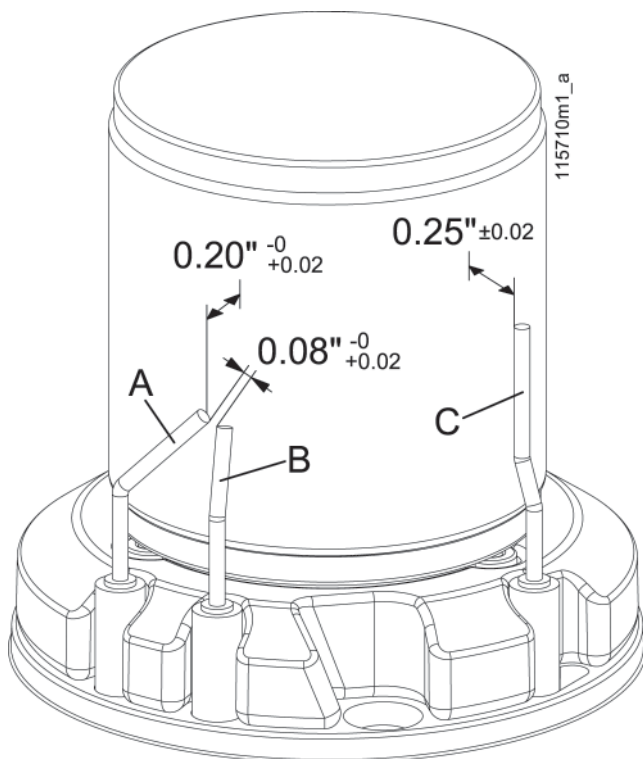
Figure 14-2 Remove the fan-burner assembly unit

6. prepare a suitable cover for the gas valve outlet under nut "D" so that no dirt, water, or other foreign objects can fall into the gas valve during cleaning;
7. remove the entire fan - burner assembly, detail "A" in Figure 14-2;
8. use a cylindrical brush with plastic bristles to clean the inside of the combustion chamber, detail "H" in Figure 14-2;
9. use a vacuum cleaner to remove any unburned residue from the combustion chamber "H" in figure 14-2;
10. using the same vacuum cleaner, clean the surfaces of the burner and around the electrodes;
11. using only water, wash the inside of the combustion chamber, detail "H" in Figure 14-2. The water, will drain into the condensate drain. Clean the condensate trap (see Section 14.6) before reassembling components;
12. reassemble the components by proceeding in reverse order;
13. open the manual gas shutoff valve;
14. restore electrical power to the boiler;
15. check that there are no gas leaks.

! WARNING!!! while performing the next step, carefully wash only the inside of the combustion chamber "H" of Figure 14-2, and do not get water on the outside of the combustion chamber opening. Failure to comply with this warning can cause extensive property damage, severe personal injury or death!

! WARNING!!! Never use an open flame to test for gas leaks. Always use an approved leak detection method. Failure to comply with this warning can cause extensive property damage, severe personal injury or death!

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A = Left ignition electrode
B = Right ignition electrode
C = Flame detection electrode

**Figure 14-3 Positioning electrodes on burner
(Use a hand caliper to verify the distances of the
electrodes)**

14.4 - Correct positioning of the ignition and flame detection electrodes

For the boiler to work properly the electrodes must be positioned as shown in Figure 14-3:

- ☞ the distance between the ignition electrodes "A" and "B", must be between 0.08 in (2 mm), and 0.10 in (2.5 mm);
- ☞ the distance of the ignition electrodes to the burner surface must be between 0.20 in (5.0 mm), and 0.22 in (5.5 mm);
- ☞ the distance of the flame detection electrode to the burner surface must be between 0.23 in (6.0 mm), and 0.27 in (7.0 mm).

NOTE: To insure correct functioning of boiler the distances listed above shall be verified with a hand caliper.

14.5 - Domestic hot water heat exchanger (only for 160-C model)

The production of DHW takes place in the secondary heat exchanger, detail "42" in Figure 3-1. If this heat exchanger loses efficiency over time, it may be necessary to clean or replace it.

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14.6 - Condensate trap cleaning

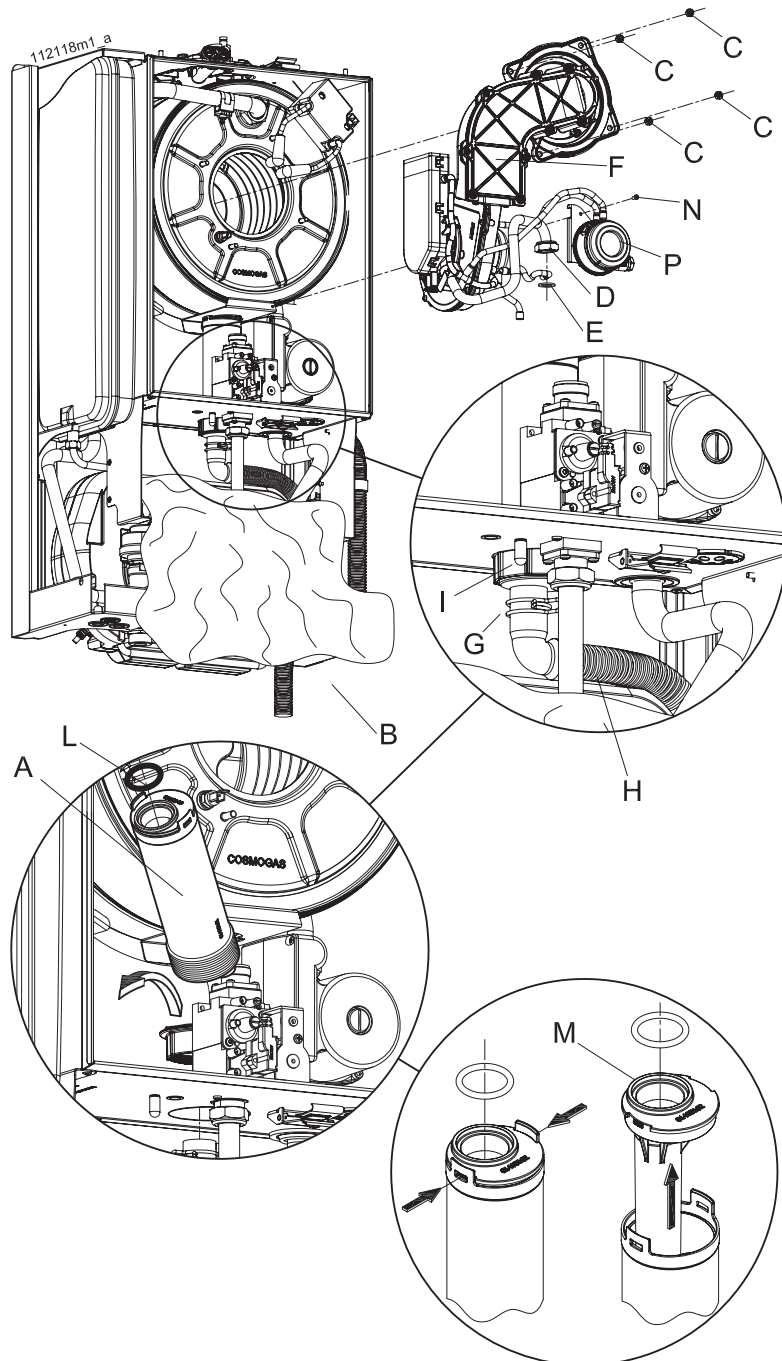
The condensate trap must be checked every year and cleaned if required. Follow the steps below to properly clean the condensate trap and its associated components while referring to Figure 14-4:

1. turn the power switch to on, item "12" in Figure 13-1;

2. press the **+** and **-** keys together for more than 10 seconds, until a blinking **F** is displayed;

3. the combustion blower will run at maximum speed for 10 minutes. During this time the burner will not light. This will minimize the amount of liquid present in the trap, item "A";

4. press the **Reset** button



! WARNING!!! Before proceeding to the next step, verify that the electrical supply to the boiler, and any other electrical supply near the boiler, is off. Failure to comply with this warning can cause extensive property damage, severe personal injury or death!

5. follow the steps in Section 14.2 to gain access the internal components;
6. carefully cover the electrical panel "B" with a waterproof material to prevent water from entering the electrical system;
7. grip spring clamp "G" with a pair of pliers and slide it downwards;
8. pull the condensation trap hose "H" off the trap;
9. remove the fan-burner assembly unit, follow steps of section 14.3;
10. cover the gas valve outlet to ensure that no objects or condensate water enters the gas valve;
11. disconnect the condensate hose "O" from the condensate trap "A".
12. unscrew nut "I" from the bottom of the trap, "A", and pull it upwards, taking care not to spill the condensation;
13. open the condensate trap taking care not to lose o ring "L" and clean the inside "M";
14. re-assemble everything in reverse order, taking care that oring "L" is placed in the proper location;
15. refill the condensate trap per Section 12.1.2.
16. open the manual gas shutoff valve;
17. restore electrical power to the boiler;
18. check that there are no gas leaks.

! WARNING!!! Never use an open flame to test for gas leaks. Always use an approved leak detection method. Failure to comply with this warning can cause extensive property damage, severe personal injury or death!

Figure 14-4 Removing the condensating trap

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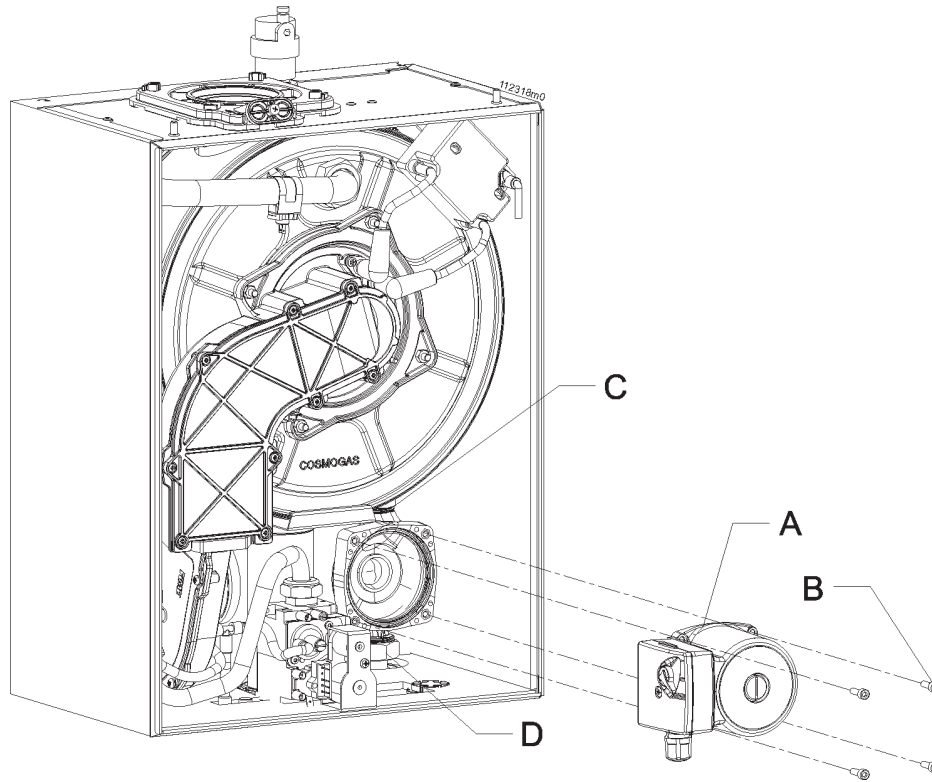


Figure 14-5 Replacing the pump motor (only for 160-C model)

14.7 - Circulator pump motor replacement (only for 160-C model)

To replace the circulator pump follow the steps below while, referring to Figure 14-5:

1. follow the steps in Section 14.10 to isolate and drain the water from the boiler;
2. follow the steps in Section 14.2 to gain access the internal components;
3. remove screws "B";
4. remove the circulator pump motor "A";
5. label the electrical wires of the circulator pump motor, phase and neutral must be respected;
6. disconnect the electrical wires from the circulator pump motor
7. install the new circulator pump motor and reassemble the boiler
8. open the heating system isolation valves and heating system fill valve
9. follow the steps in Section 12.1.3 to bleed the air from the heating system.

NOTE: If display shows L05 reverse polarity (phase and neutral) to the pump

14.8 - Expansion tank pressure (only for 160-C model)

To check the expansion tank pressure follow the steps below:

1. follow the steps in Section 14.10 to isolate and drain the water from the boiler
2. follow the steps in Section 14.2, to gain access the internal components;
3. check the pressure of the expansion tank, item "4" of Figure 3-1 (The air inlet probe is on the top of the expansion tank). It must be 14 psi (1 bar). If the pressure is lower recharge the expansion tank while letting the water run out of the heating system drain valve.

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14.9 - 3-way valve removal (only for 160-C model)

The 3-way valve, details "M" and "Q" in Figures 14-6 and 14-7, directs hot water produced by the primary heat exchanger to the heating circuit or to the secondary heat exchanger for the production of D.H.W. To replace or clean it, follow the steps below while referring to Figures 14-6 and 14-7:

1. follow the steps in Section 14.10 and 14-11 to isolate and drain the water from the boiler;
2. follow the steps in Section 14.2, to gain access the internal components;
3. disconnect fittings "A";
4. remove screws "C";
5. rotate "D" flange in the direction of the black arrow (See particular fig. 1);
6. remove the bracket "E";
5. remove fitting "F";
6. remove fitting "L";
7. remove fitting "M" and check its state.
8. remove spring "N";
9. remove servomotor "O";
10. remove the fitting "P"
11. remove the spring "Q" and check for any dirt.

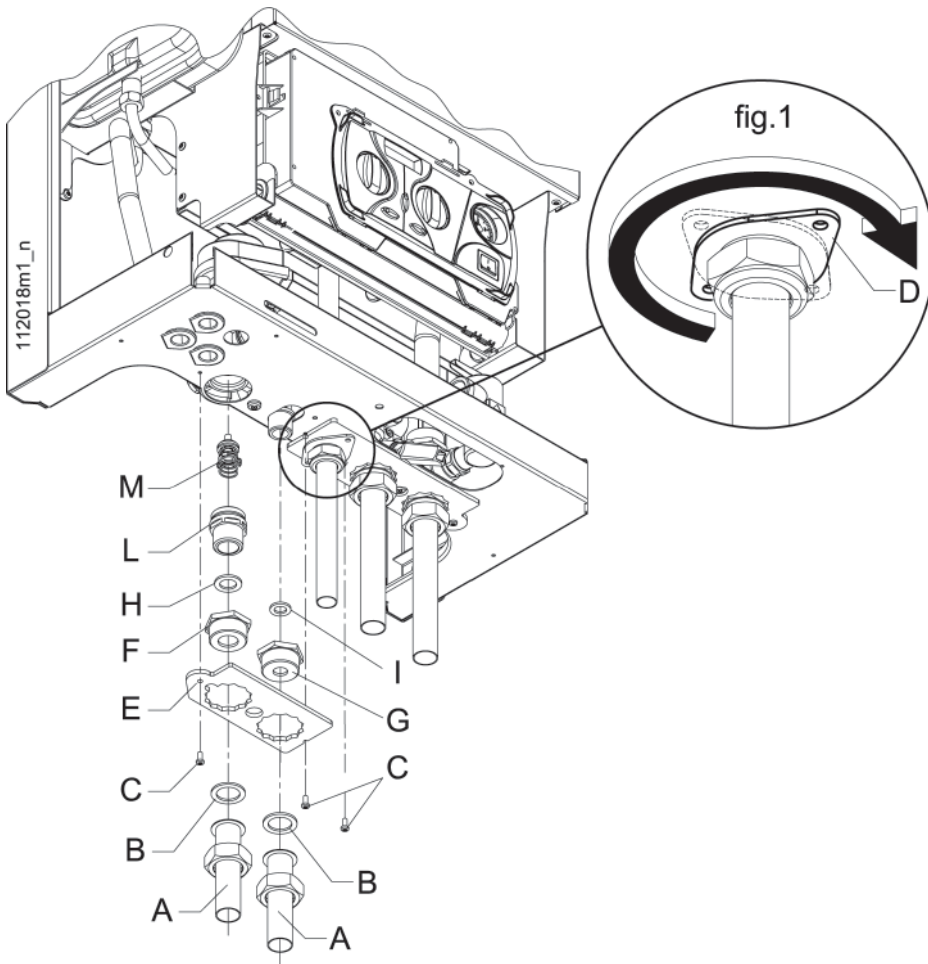


Figure 14-6 Supply fittings removal (only for 160-C model)

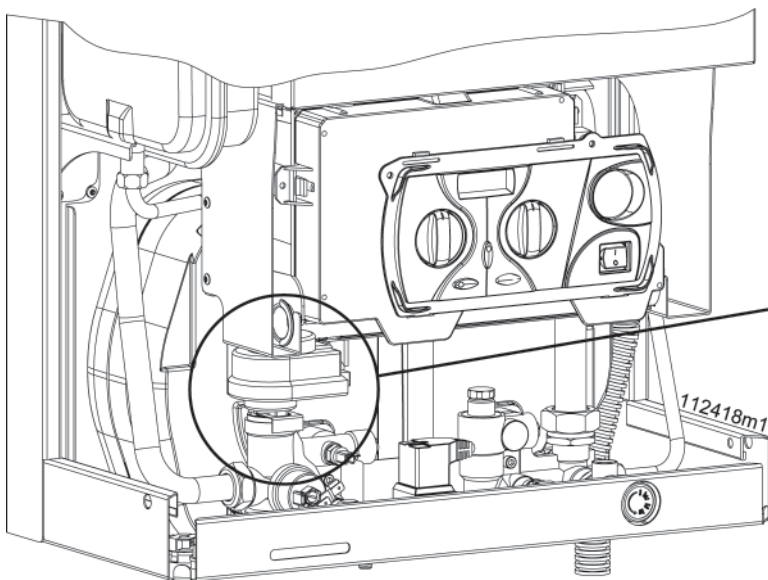


Figure 14-7 3-way valve servomotor removal

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14.10 - Draining the heating side of the boiler

To drain the heating side of the boiler follow the steps below:

1. cool boiler turning knob "7" in Figure 13-1 to 114°F (45°C). Wait until the display, item "1" in Figure 13-1, shows a temperature less than 114°F (45°C);
2. turn off the boiler;
3. shut off electrical power to the boiler;
4. close the manual gas shutoff valve, Figure 11-1;
5. close the boiler isolation valves, in the heating system. If isolation valves haven't been installed, the entire heating system will have to be drained.
6. close the heating system fill valve;
7. follow the steps in Section 14.2, to gain access the internal components;
8. connect a hose to the boiler drain valve item "4" in Figure 7-6 and 7-7, and place the other end in a sink or some other suitable drain;
9. open the boiler drain valve and drain the boiler;
10. if boiler isolation valves have not been installed in the heating system open any bleed valves at the highest point of the system;
11. after draining out all the water, close the bleed valves and the boiler drain valve;

NOTICE: The boiler cannot be drained completely of water without purging the unit with an air pressure of 15 psi.

⚠ WARNING!!! Do not recover and/or re-use water drained from the heating circuit for any purpose as it could be contaminated. Failure to comply with this warning can cause extensive property damage, severe personal injury or death!

14.11 - Draining the domestic hot water side of the boiler

To drain the domestic hot water side of the boiler follow the steps below:

1. turn off the boiler;
2. close the valve in the water main supplying the DHW system;
3. open all the hot and cold faucets in the building;
4. if there isn't a faucet or drain valve below the boiler level, disconnect DHW connections "10" and "12" in Figure 3-1.

14.12 – Overrides

To carry out specific checks covered in the manual, it is possible to override the control logic of the boiler. See the following sections:

14.12.1 - Auto-purging

To reset the auto-purging procedure

press the **+** and **-** keys together for 10 seconds. When the blinking **F** appears on the display, press **Reset**.

14.12.2 - Fan

To run just the fan at full speed press

the **+** and **-** keys together for 10 seconds, until the blinking **F** appears on the display. The fan will run at full speed for 10 minutes. To shut the fan off before the 10 minutes is up press the **Reset** key.

14.12.3 – Minimum and maximum output

The boiler can be run at its minimum or maximum output in both the heating and domestic hot water modes by following the steps below:

1. generate a demand for the mode to be overridden:
 - for heating turn up the room thermostat and turn knob "7" in Figure 13-1 to its maximum;

- for domestic hot water turn knob "11" in Figure 13-1 to its maximum and fully open a hot water faucet;

2. press the **+** and **-** keys together for more than 10 seconds, until a blinking **F** appears on the display;

3. press the **+** key until the display shows:

- **⌊** for minimum heating output;

- **⌋** for maximum heating output adjusted by P parameter, see section 12.10;

- **⌋** for maximum heating output;

- **S** for minimum DHW output;

- **S** for maximum DHW output;

4. press the **Reset** key in order to restore the boiler to normal running conditions.

14.12.4 – Checking the flame current

While running at the minimum and maximum output described in Section 14.12.3, the display will show the letter of the mode checked. In the second part of the display the value of the ionization current will be shown. 30 corresponds to a current of 1 uA, 99 to a current of 5.5 uA. The flame current must always be at the correspondent value as shown in Section 15, header "ionisation current". If the value is not within the above values, check:

- a - positioning of the flame sensor electrode as per section 14.4;
- b - CO₂ content as per section 12.9;
- c - combustion air pressure as per section 12.8.

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14.13 - Water and flue temperature sensor

The boiler has a number of sensors that measure temperature. The electrical resistance between the sensor wires must correspond with the values shown in Figure 14-8.

The temperature sensors are: U1; U2, U3, U5, U6, U7 and U8. The location of each sensor can be found in Figure 3-1 and Section 14.15 and 14.16.

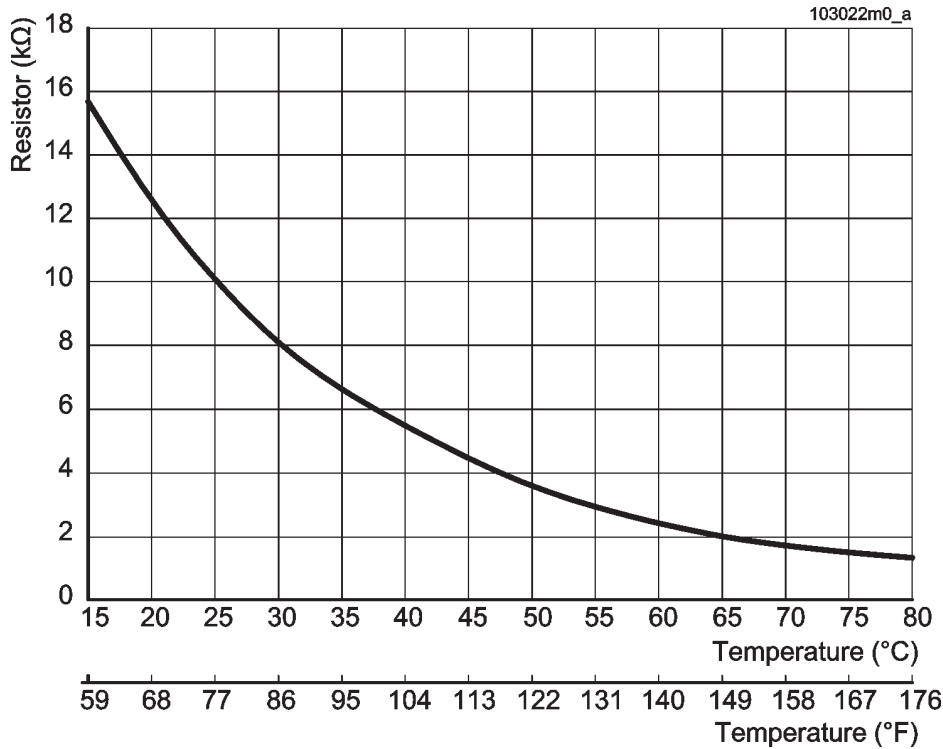


Figure 14-8 Water temperature sensors' curve

14.14 - Outdoor temperature sensor (optional)

An outdoor temperature sensor can be connected to the boiler (see section 8.1.4). The electrical resistance existing between the sensor wires must correspond with the values shown in Figure 14-9.

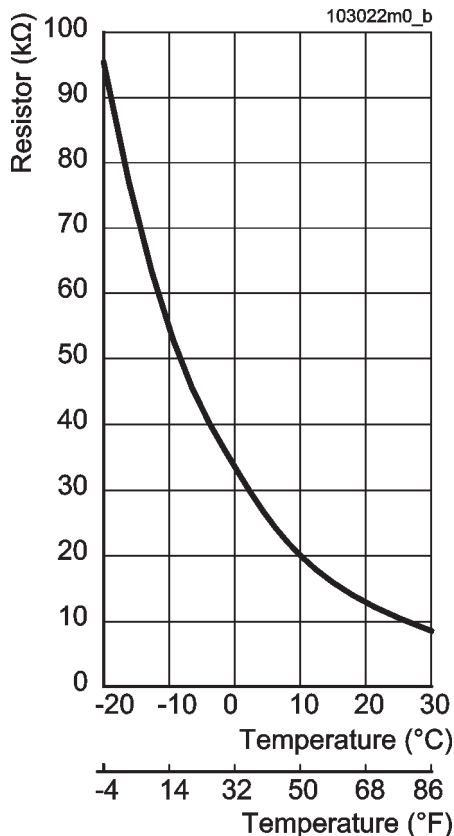


Figure 14-9 Outdoor temperature sensor curve

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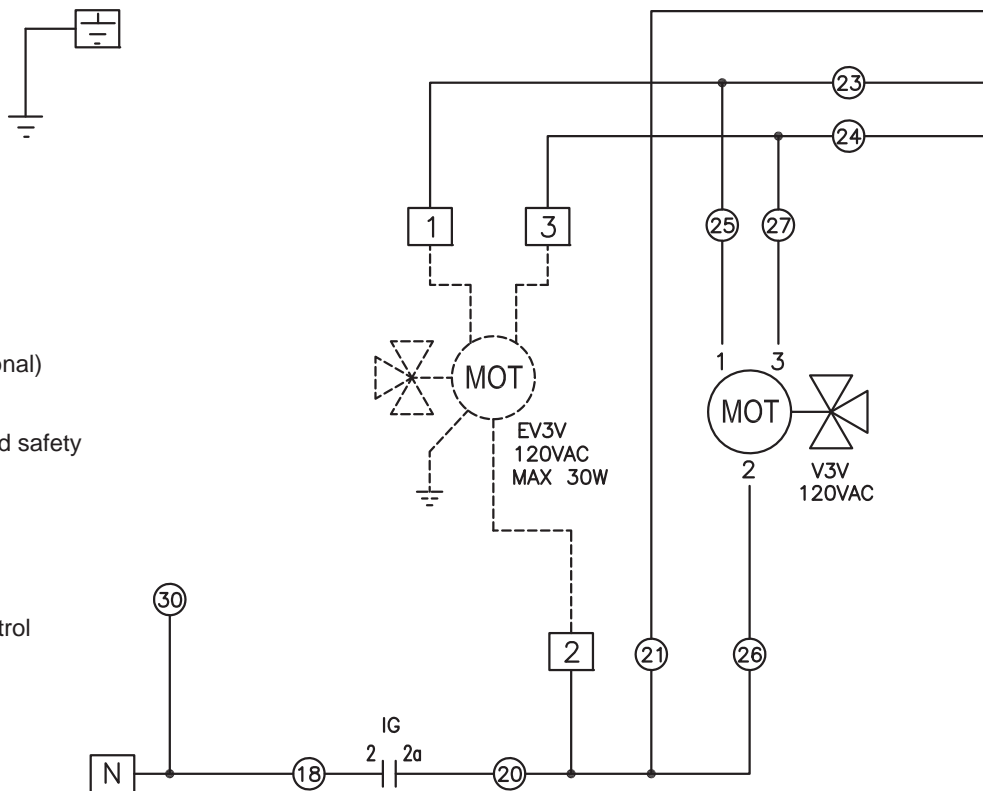
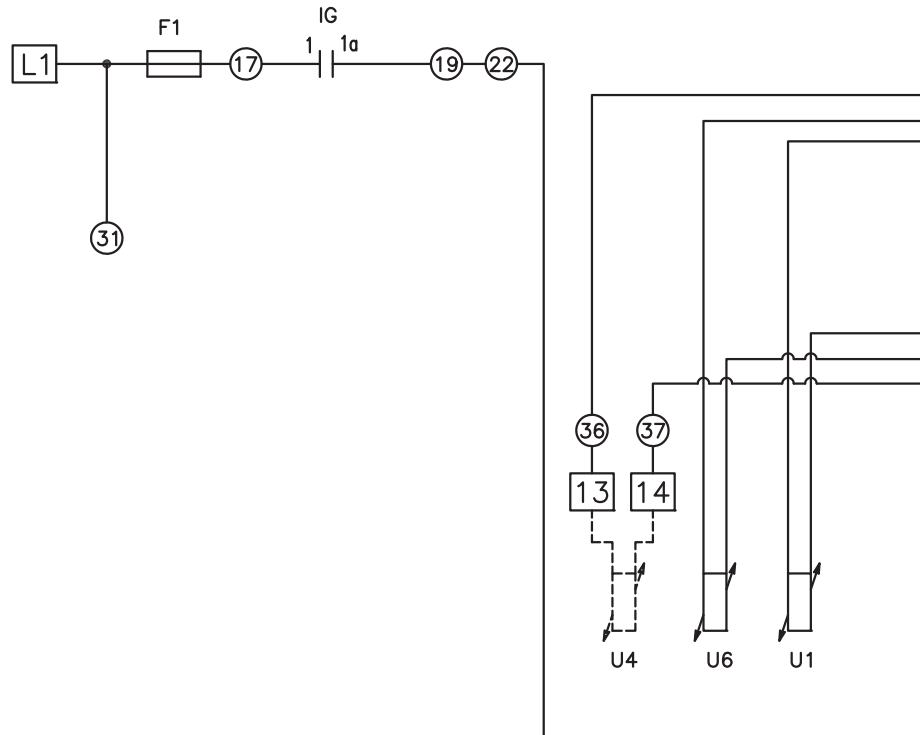
14.15 - Functional wiring diagram

⚠ WARNING!!! Label all wires prior to disconnection when servicing controls. Wiring errors can cause improper and dangerous operation! Verify proper operation after servicing Failure to comply with this warning can cause extensive property damage, severe personal injury or death!

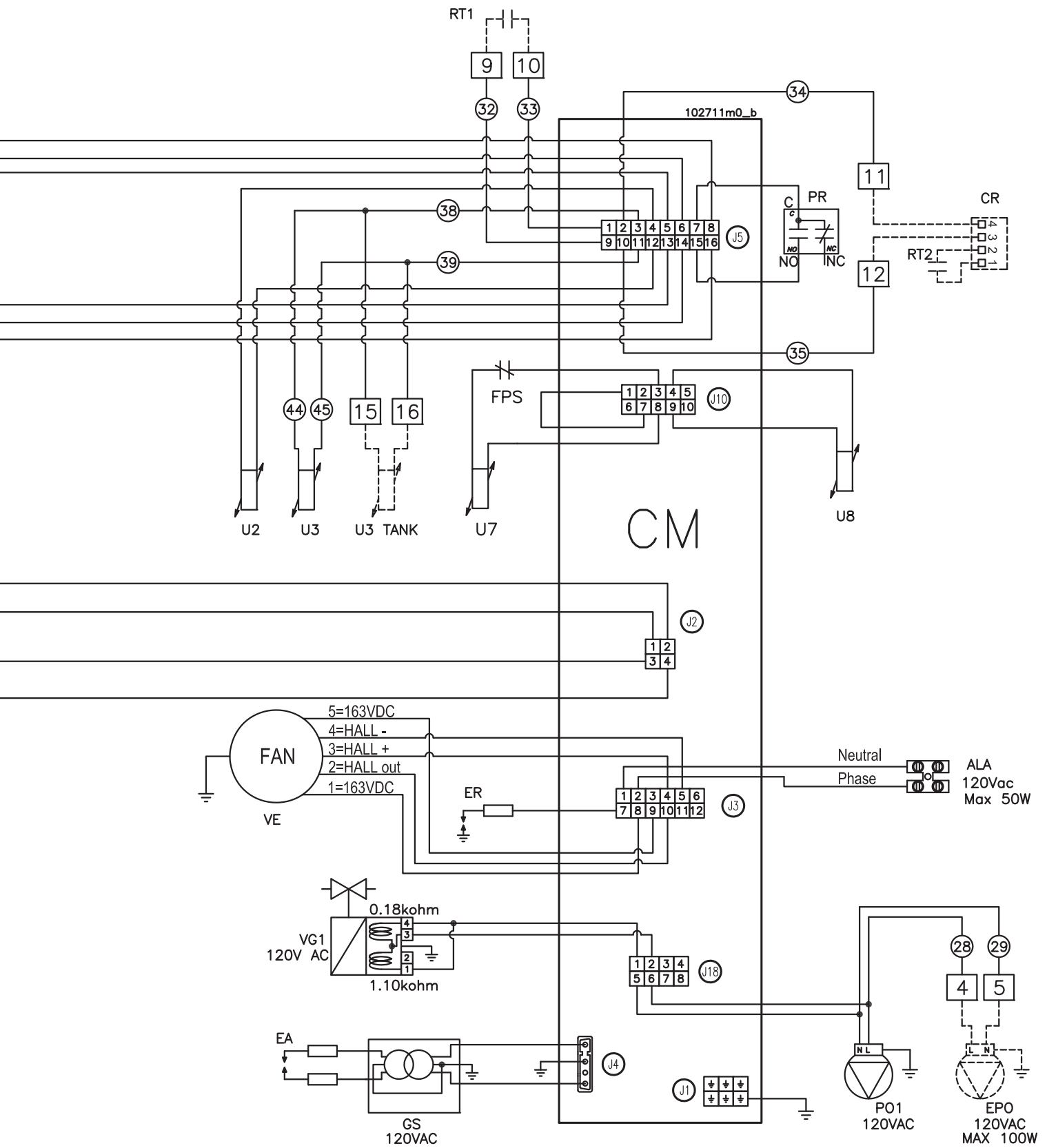
⚠ ATTENTION!!! *Au moment de l'entretien des commandes, étiquetez tous les fils avant de les débrancher. Des erreurs de câblage peuvent entraîner un fonctionnement inadéquat et dangereux. S'assurer que l'appareil fonctionne adéquatement une fois l'entretien est terminé.*

LEGEND:

- ALA - Alarm output
- CM - Power control board
- CR - Remote command (only for outdoor models)
- EA - Ignition electrode
- ER - Flame detection electrode
- EPO - External pump (REQUIRED FOR MODEL 160-B)
- EV3V - External three way valve (optional)
- F1 - Fuse 2Amps
- FPS - Flue pressure switch
- GS - Spark generator
- IG - Main electrical switch
- J1 - Six poles connector
- J2 - Four poles connector
- J3 - Twelve poles connector
- J4 - Four poles connector
- J5 - Sixteen poles connector
- J10 - Ten poles connector
- J18 - Height poles connector
- U1 - Supply temperature sensor
- U2 - Domestic hot water temperature sensor
- U3 - Domestic cold water temperature sensor
- U3 TANK - Storage tank temperature sensor (optional)
- U4 - Outside temperature sensor (optional)
- U6 - Heating Safety high limit temperature sensor
- U7 - Flue gases temperature sensor with integrated safety high limit switch
- U8 - Return temperature sensor
- PO1 - Heating pump
- PR - Heating pressure switch
- SDC - Electrical connection board
- RT1 - Room thermostat connection
- RT2 - Room thermostat connection on remote control "CR" (optional)
- VE - Fan
- VG1 - Gas valve
- V3V - Three way valve



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14.16 - Multiwire wiring diagram



WARNING!!!

Label all wires prior to disconnection when servicing controls. Wiring errors can cause improper and dangerous operation! Verify proper operation after servicing. Failure to comply with this warning can cause extensive property damage, severe personal injury or death!

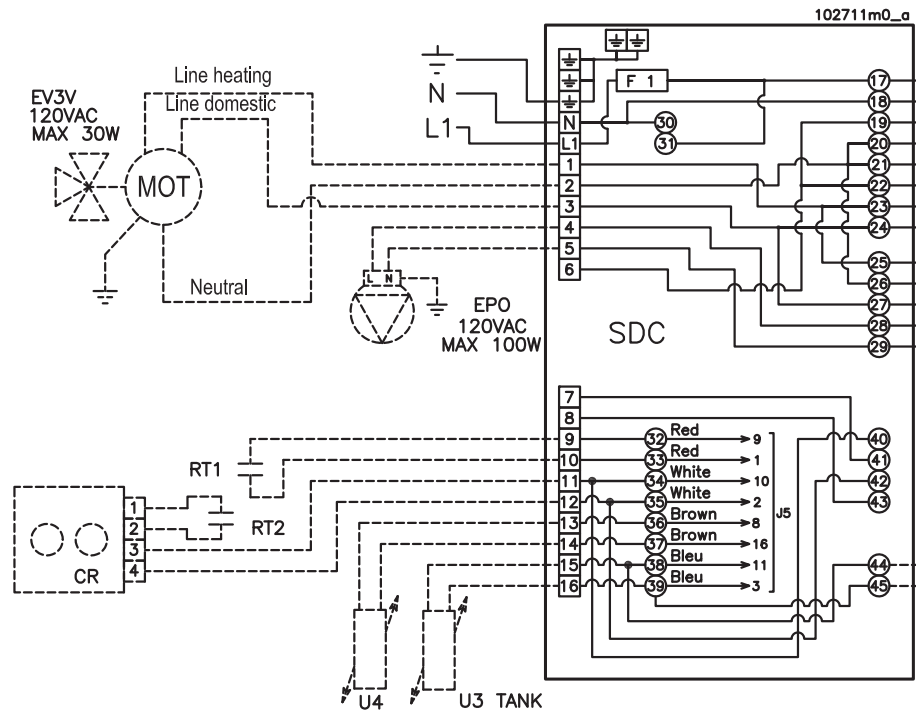


ATTENTION!!!

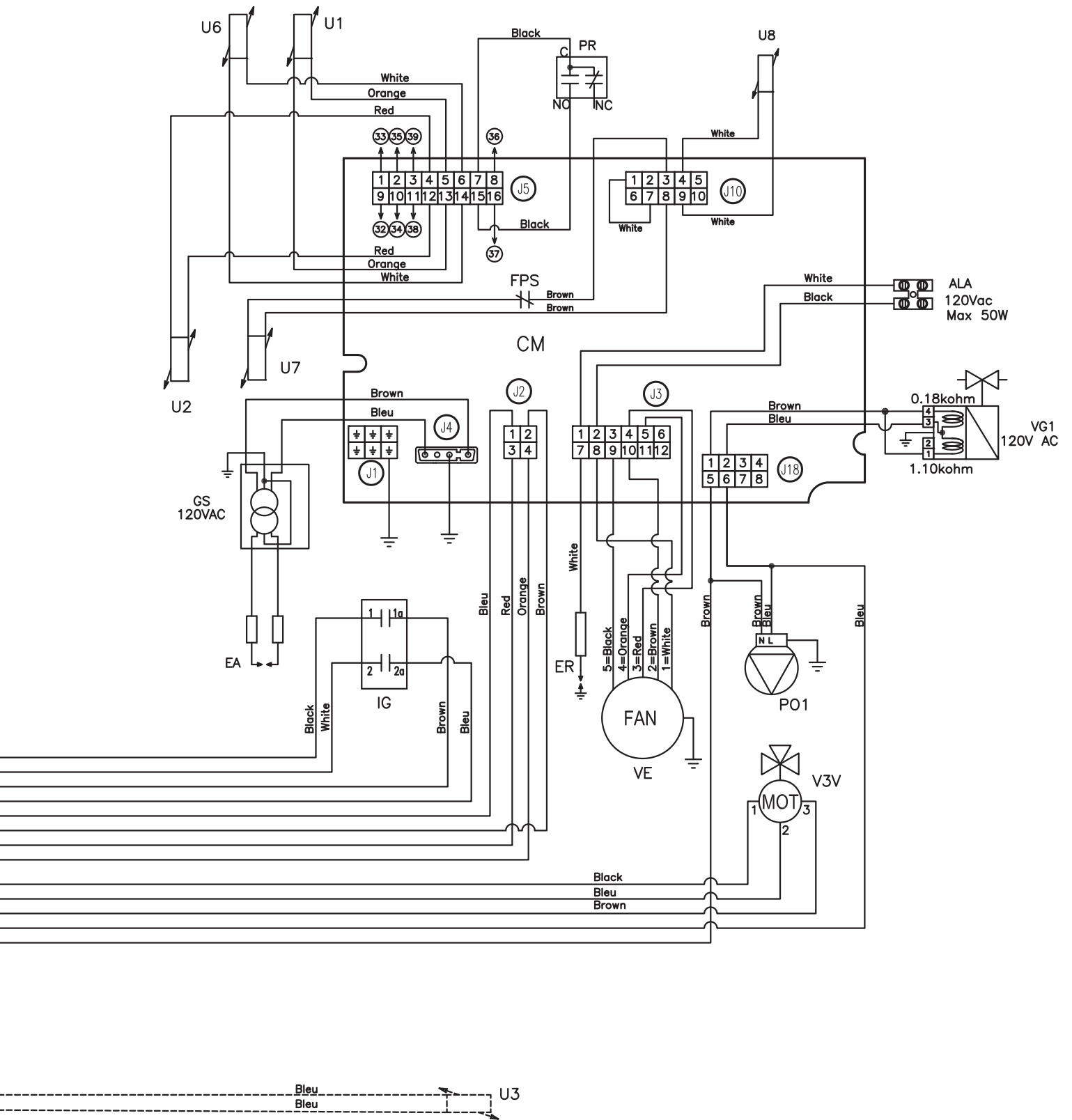
Au moment de l'entretien des commandes, étiquetez tous les fils avant de les débrancher. Des erreurs de câblage peuvent entraîner un fonctionnement inadéquat et dangereux. S'assurer que l'appareil fonctionne adéquatement une fois l'entretien est terminé.

LEGEND:

- ALA - Alarm output
- CM - Power control board
- CR - Remote command (only for outdoor models)
- EA - Ignition electrode
- ER - Flame detection electrode
- EPO - External pump (REQUIRED FOR 160-B model)
- EV3V - External three way valve (optional)
- F1 - Fuse 2Amps
- FPS - Flue pressure switch
- GS - Spark generator
- IG - Main electrical switch
- J1 - Six poles connector
- J2 - Four poles connector
- J3 - Twelve poles connector
- J4 - Four poles connector
- J5 - Sixteen poles connector
- J10 - Ten poles connector
- J18 - Height poles connector
- U1 - Supply temperature sensor
- U2 - Domestic hot water temperature sensor
- U3 - Domestic cold water temperature sensor
- U3 TANK - Storage tank temperature sensor (optional)
- U4 - Outside temperature sensor (optional)
- U6 - Heating Safety high limit temperature sensor
- U7 - Flue gases temperature sensor with integrated safety high limit switch
- U8 - Return temperature sensor
- PO1 - Heating pump
- PR - Heating pressure switch
- SDC - Electrical connection board
- RT1 - Room thermostat connection
- RT2 - Room thermostat connection on remote control "CR" (optional)
- VE - Fan
- VG1 - Gas valve
- V3V - Three way valve



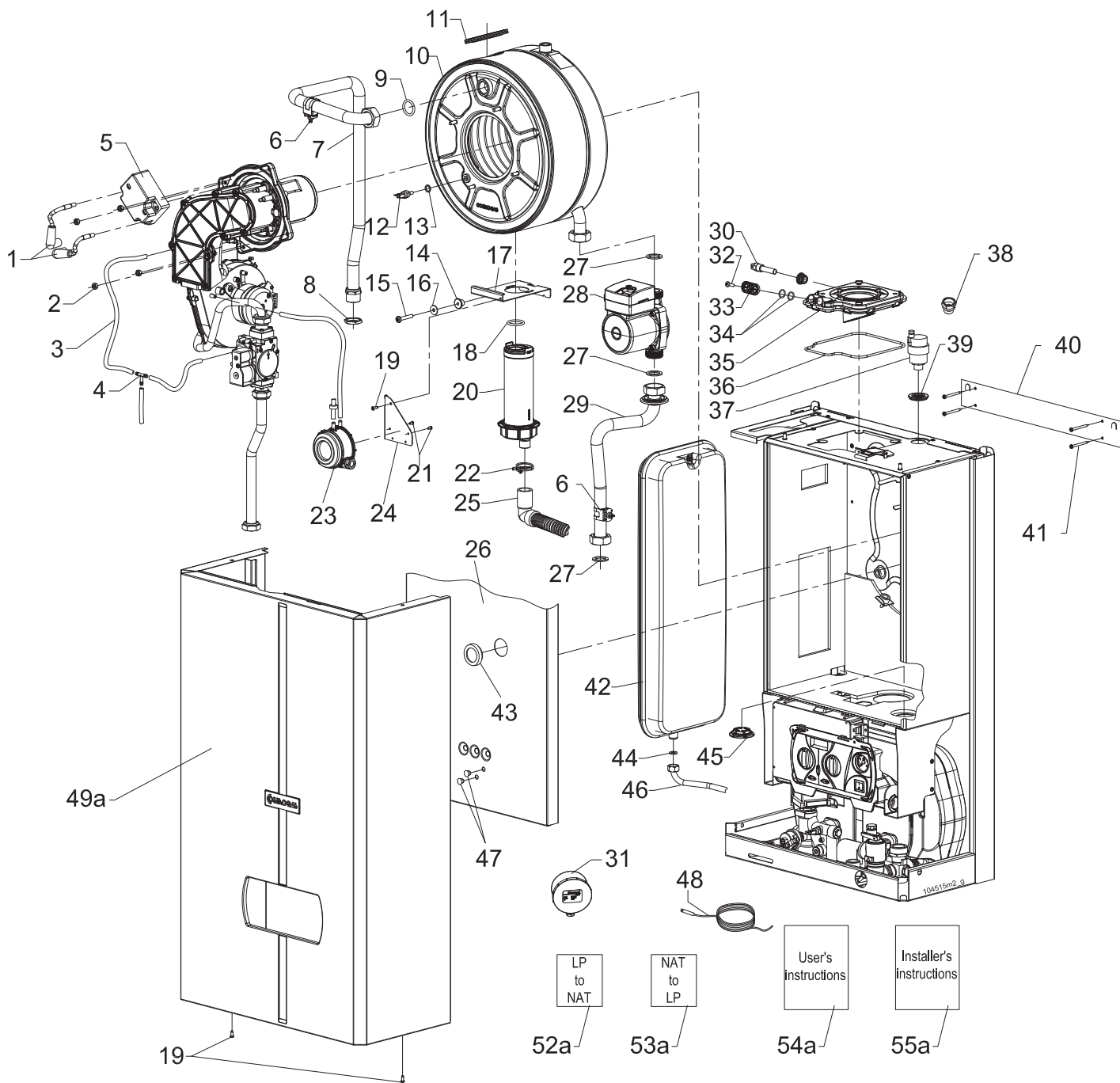
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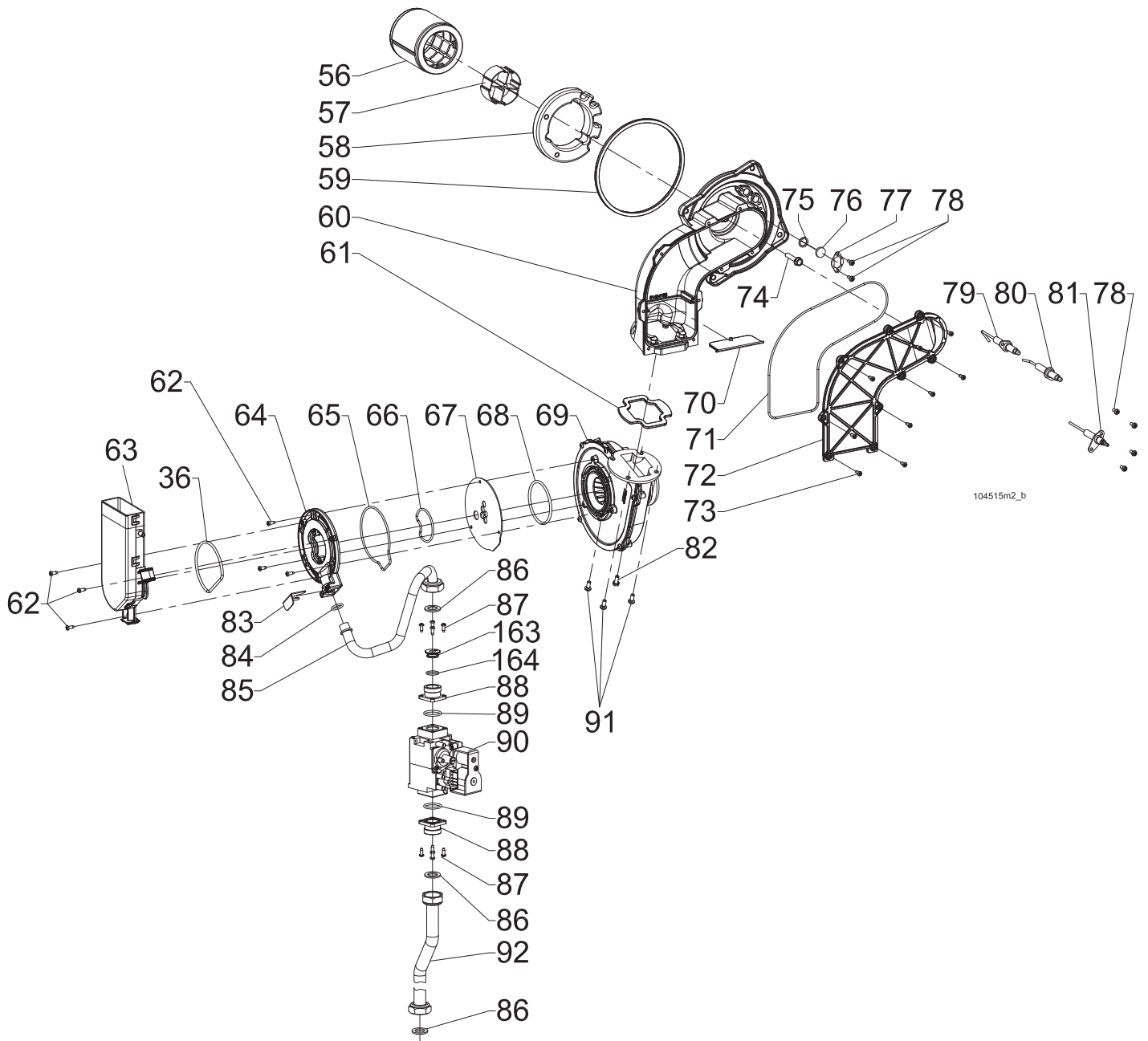
15 - TECHNICAL DATA

MODEL		VSL-160-B; VSL-160-C;
Country of destination		USA and Canada
Type of boiler		Direct Vent and room combustion air
Category of discharge chimney		IV
CSA certificate N°		2045300 (114696)
Maximum Heat input	Btu/hr	160,000
Minimum heat input	Btu/hr	30,000
Efficiency at maximum heat input (160°F/140°F)	%	93
Maximum Heat output (160°F/140°F)	Btu/hr	148,800
Efficiency at minimum heat input (122°F/86°F)	%	97
Minimum heat output (122°F/86°F)	Btu/hr	29,100
Certified AFUE rate	%	91.5
Gas flow rate	Natural gas ft ³ /hr	156
	LP Gas gal/hr	1.75
Gas supply pressure	Natural gas In.W.C.	7
	LP Gas In.W.C.	11
Minimum gas supply pressure	Natural gas In.W.C.	3
	LP Gas In.W.C.	3
Maximum gas supply pressure	Natural gas In.W.C.	13
	LP Gas In.W.C.	13
Combustion air pressure with min. length	Natural gas In.W.C.	2.5 to 3.1
	LP Gas In.W.C.	2.1 to 2.7
Combustion air pressure with max. length	Natural gas In.W.C.	2.1 to 2.7
	LP Gas In.W.C.	1.8 to 2.4
Instantaneous d.h.w production [rise 75°F (42°C)]	gal/min	4.32
Maximum heating temperature	°F	189
Minimum heating temperature	°F	68
Maximum heating pressure	PSI	30
Minimum heating pressure	PSI	8
Maximum pressure of domestic hot water circuit	PSI	150
Minimum pressure of domestic hot water circuit	PSI	1
Capacity of expansion tank (160-C model only)	gal	2.64
Supply voltage		120Vac - 60Hz
Absorbed electric power	W	170
Flue gas pipes diameter (split)	" (mm)	3.15" (80)
Max. length flue gas pipes (split)	ft	300
Flue gas pipes diameter (coaxial)	" (mm)	2.36/3.94 (60/100)
Max. length flue gas pipes (coaxial)	ft	70
Equivalent length of one elbow	ft	45° elbow = 3ft, 90° elbow = 5ft
CO (Carbon monoxide) with natural gas	ppm	<150
CO (Carbon monoxide) with LP gas	ppm	<250
NOx (0% O ₂ with natural gas)	ppm	<30
CO ₂ (Carbon dioxide) for Natural gas at high fire	%	9.1 to 9.3
CO ₂ (Carbon dioxide) for Natural gas at low fire	%	8.4 to 9
CO ₂ (Carbon dioxide) for LP gas at high fire	%	9.3 to 9.7
CO ₂ (Carbon dioxide) for LP gas at low fire	%	9.2 to 9.8
O ₂ (Oxygen) for Natural gas at high fire	%	4.4 to 4.6
O ₂ (Oxygen) for Natural gas at low fire	%	5.1 to 5.7
O ₂ (Oxygen) for LP gas at high fire	%	5.7 to 5.9
O ₂ (Oxygen) for LP gas at low fire	%	6.1 to 6.7
Ionisation current		71 to 90
Maximum flue gas temperature	°F	210
Flue gas mass-flow	lb/hr	160
Head pressure available for flue vent/air intake line	In.W.C.	3.6
Maximum condensation flow rate	gal/hr	1.32
Average acidity of condensation	PH	4
Boiler weight (empty of water) (160-C model)	lb	125
Boiler weight (empty of water) (160-B model)	lb	93

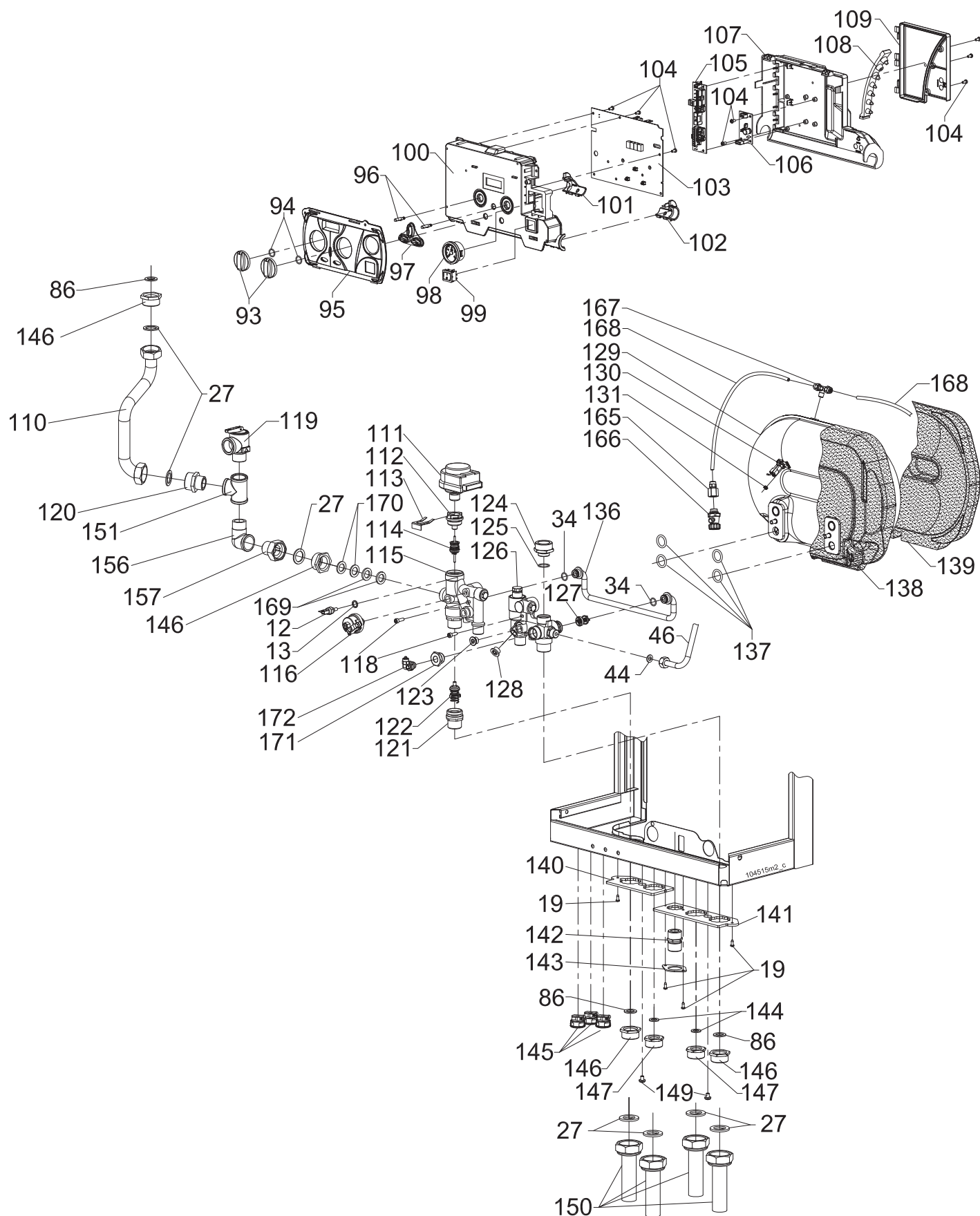
16 - SPARE PARTS



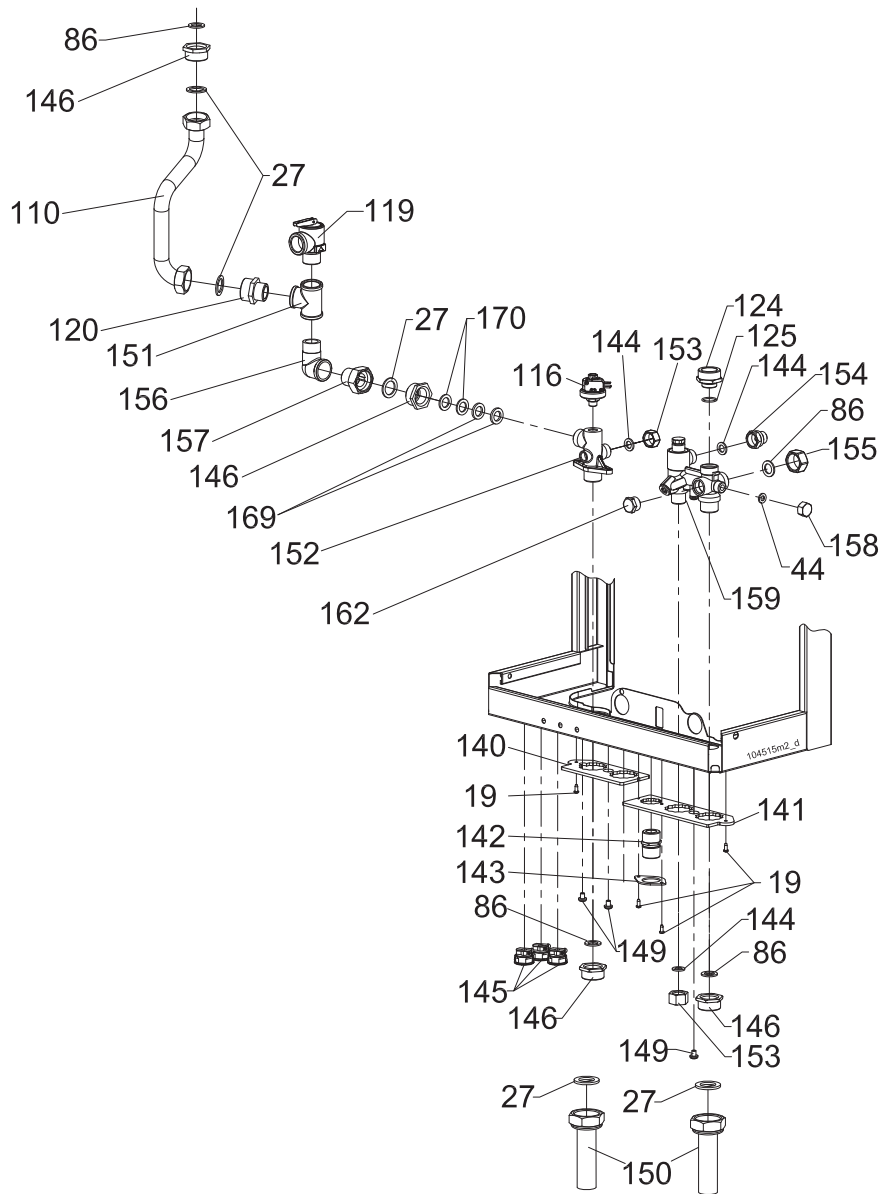
16 - SPARE PARTS



16 - SPARE PARTS



16 - SPARE PARTS



Bottom side of the 160-B model

Spare parts list

- 1 - 81 9010 000 - CABLE UL IGNITOR CONN 90° L155
- 2 - 81 9011 000 - NUT ZINC COATED 6MA
- 3 - 81 9012 000 - SILICONE PIPE D 4X8
- 4 - 81 9013 000 - TEE FOR DRY WATER CONDENSATION
- 5 - 81 9014 000 - SPARK GENERATOR NO CABLE UL
- 6 - 81 9015 000 - SENSOR NTC 10 KOHM A KLIP DIAM.22
- 7 - 81 9016 000 - COPPER PIPE D22 M/F 3/4"G-1"G
- 8 - 81 9017 000 - 3/4" RING NUT
- 9 - 81 9018 000 - O-RING NBR 2,62 X 20,63
- 10 - 81 9019 000 - PRIMARY HEAT EXCHANGER C.R.R ASME
- 11 - 81 9020 000 - GASKET EPDM X OSSIDO D84 H7
- 12 - 81 9021 000 - SENSOR NTC 10 KOHM 1/8"
- 13 - 81 9022 000 - GASKET COPPER 1/8" SP.1,5
- 14 - 81 9023 000 - SILICONE TAP
- 15 - 81 9024 000 - SCREW 6X35 ZINC TC-CR
- 16 - 81 9025 000 - WASHER 6X18X1,5 PIA-ZIN-LAR UNI6593
- 17 - 81 9026 000 - BRACKET SIPHON L84 H130 P32

- 18 - 81 9027 000 - O-RING 134 EPDM 3,53 X 25,8
- 19 - 81 9028 000 - SCREW SELFTAPPING 3.9 X 9.5 CROSS HEAD
- 20 - 81 9029 000 - SIPHON
- 21 - 81 9030 000 - SCREW SELFTAPPING 2.9 X 6.5 CROSS HEAD
- 22 - 81 9031 000 - SPRING 28,7
- 23 - 81 9032 000 - PRESSURE SWITCH ON 4,5 INWC
- 24 - 81 9033 000 - BRACKET PRESSURE SWITCH
- 25 - 81 9034 000 - POLIETHYLENE PIPE L=1000
- 26 - 81 9035 000 - SEALING CHAMBER DOOR
- 27 - 81 9036 000 - 1P GASKET
- 28 - 81 9006 000 - PUMP GRUNDFOS UP 15/58U BRUTE USA
- 29 - 81 9038 000 - COPPER PIPE D22 RETURN SEALING CHAMBER
- 30 - 81 9039 000 - SENSOR NTC 10K BAIO
- 31 - 81 9040 000 - OUTDOOR SENSOR
- 32 - 81 9041 000 - SCREW 4,8X19 ZINC AF TC-CR UNI6954
- 33 - 81 9042 000 - PLUG FOR FLUE AIR FITTING
- 34 - 81 9043 000 - O-RING 2050 EPDM 1,78 X 12,42
- 35 - 81 9044 000 - DISCHARGE RACCORD PP
- 36 - 81 9045 000 - GASKET ROUND SPONGE D.3,5 MM IP44 S3
- 37 - 81 9046 000 - AUTOMATIC AIR VENT

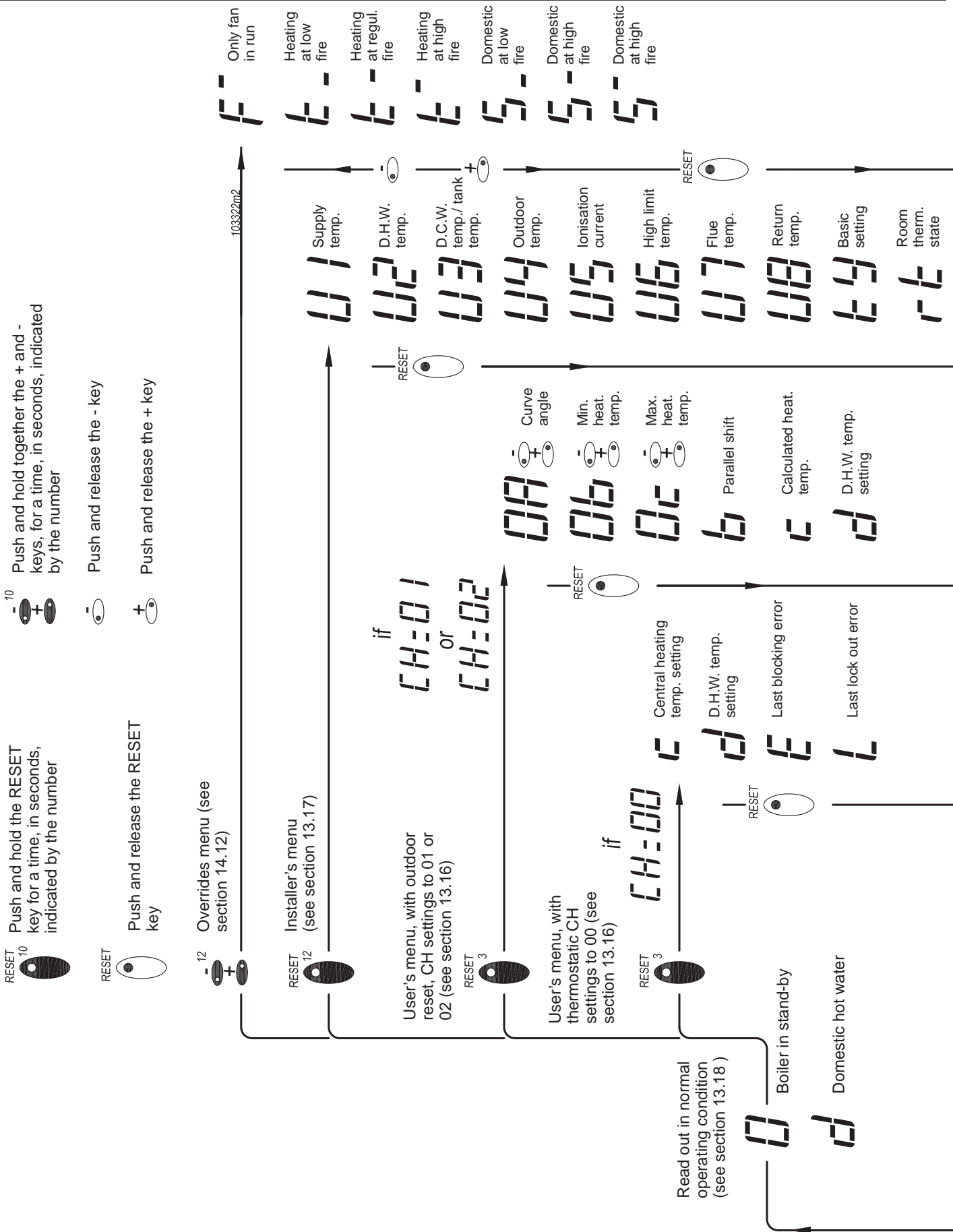
16 - SPARE PARTS

- 38 - 81 9047 000 - 3/8G MALE to 1/8NPT FEMALE BUSHING
39 - 81 9048 000 - GASKET EPDM D38 F20 SP6
40 - 81 9049 000 - 45xx WALL MOUNTING BRACKET
41 - 81 9050 000 - SCREW SELFTAPPING 5X50 WOOD
42 - 81 9051 000 - EXP TANK LT. 8 561X203X80 RETT.
43 - 81 9052 000 - GLASS WINDOW WITH GASKET
44 - 81 9053 000 - 3/8" G GASKET
45 - 81 9054 000 - FAIRLEAD 6 POLES SILICONE
46 - 81 9055 000 - EXP TANK PIPE
47 - 81 9056 000 - PLASTIC CAP TPP 8.5
48 - 81 9057 000 - TANK SENSOR
49a - 81 9058 000 - EXTERNAL JACKET 500X840X245 WITHOUT DOOR
50 - not used
51 - not used
52a - 81 9191 000 - VSL 160 LP TO NATURAL CONVERSION KIT
53a - 81 9190 000 - VSL 160 NATURAL TO LP CONVERSION KIT
54a - 81 9063 000 - VSL 160 USER'S INSTRUCTIONS
55a - 81 9506 000 - VSL 160 INSTALLER'S INSTRUCTIONS FROM S/N 12130000
56 - 81 9065 000 - BURNER HEAD
57 - 81 9066 000 - EXTRUSION L.25MM
58 - 81 9067 000 - THERM. INSULATION VERMICULITE D117 F74 SP21,5
59 - 81 9068 000 - GASKET. SIL. D157 F145 H6,7
60 - 81 9069 000 - BASE MANIFOLD AIR ALUMINUM
61 - 81 9070 000 - GASKET SIL.MANIFOLD FAN D83 SP3,5
62 - 81 9071 000 - SCREW SELFTAPPING 4X12 TC S-TT UNI-8112
63 - 81 9072 000 - MANIFOLD AIR CUTTED
64 - 81 9073 000 - MIXER AIR/GAS "COSMOMIX"
65 - 81 9074 000 - O-RING 3350 NBR 2,62 X 88,57
66 - 81 9075 000 - O-RING 3200 NBR 2,62 X 50,47
67 - 81 9076 000 - DIAPHRAGM COSMOMIX 9 HOLES D.10
68 - 81 9077 000 - O-RING 165 NBR 3,53 X 61,91
69 - 81 9078 000 - FAN 45 KW USA
70 - 81 9079 000 - BACK FLUE-GASES PREVENTER
71 - 81 9080 000 - O-RING 3825 SIL 2,62 X 209,22
72 - 81 9081 000 - COVER MANIFOLD AIR ALUMINUM
73 - 81 9082 000 - SCREW SELFTAPPING 4X10 TC S-TT UNI-8112
74 - 81 9083 000 - SELFTAPPING BOLT 6.3X38
75 - 81 9084 000 - GASKET FRIZITE D15,5 F11,5 SP1,5
76 - 81 9085 000 - GLASS PIREX D15,5 SP3,3
77 - 81 9086 000 - FLANGE L21,2 H34
78 - 81 9087 000 - SCREW SELFTAPPING 4X8 TC S-TT NI-8112
79 - 81 9088 000 - LEFT IGNITION ELECTRODE
80 - 81 9089 000 - RIGHT IGNITION ELECTRODE
81 - 81 9090 000 - DETECTION ELECTRODE
82 - 81 9091 000 - SCREW 5X12 EXAGONAL HEAD
83 - 81 9092 000 - SPRING MIXER
84 - 81 9093 000 - O-RING 3056 NBR (118) 2,62X13,95
85 - 81 9094 000 - GAS PIPE (SIT) USA
86 - 81 9095 000 - GASKET 3/4P 24X15X2 KLINSIL
87 - 81 9096 000 - SCREW 4X10 ZINC TC-CR
88 - 81 9097 000 - FLANGE GAS 32X32 3/4P
89 - 81 9098 000 - O-RING 130 2,62 X 22,22
90 - 81 9099 000 - GAS VALVE SIGMA848 120V
91 - 81 9100 000 - BOLT 5X12 CROSS HEAD
92 - 81 9101 000 - PIPE D18 F/F 3/4P-3/4P SIT USA
93 - 81 9102 000 - CONTROL KNOB S3
94 - 81 9103 000 - O-RING NBR 1,6 X 11,1
95 - 81 9104 000 - FRONT INTERFACE
96 - 81 9105 000 - TREE POTMETER-KNOB
97 - 81 9106 000 - KEYS RUBBER 3 POSITIONS
98 - 81 9107 000 - PRESSURE GAUGE DIAM.38 - 1/4" PSI
99 - 81 9108 000 - MAIN SWITCH
100 - 81 9109 000 - BASE ELECTRICAL BOX
101 - 81 9110 000 - FAIRLEAD SX
102 - 81 9111 000 - FAIRLEAD DX
103 - 81 9112 000 - POWER CONTROL BOARD PHC 120V
104 - 81 9113 000 - SCREW 4X8 ZINC TC-CR DIN4042
105 - 81 9114 000 - JUNCTION BOARD 45
106 - 81 9115 000 - INTERFACE OPENTERM
107 - 81 9116 000 - COVER ELECTRICAL BOX
108 - 81 9117 000 - FAIRLEAD 7 EXIT
109 - 81 9118 000 - COVER JUNCTION BOX
110 - 81 9119 000 - COPPER PIPE D.22 SUPPLY SEALING CHAMBER
111 - 81 9120 000 - 3 WAY VALVE MOTOR 120V
112 - 81 9121 000 - PLUG PISTON BODY OT.
113 - 81 9122 000 - SPRING FORCK 3V
114 - 81 9123 000 - UPPER PISTON
115 - 81 9124 000 - HYDRONIC SUPPLY GROUP.
116 - 81 9125 000 - HEATING PRESSURE SWITCH
117 - 81 9126 000 - GASKET COPPER 1/4P
118 - 81 9127 000 - SCREW 5X18 ZINC TC-ES-INC UNI5931
119 - 81 9128 000 - ASME SAFETY RELIEF VALVE
120 - 81 9129 000 - BRASS NIPPLE 1" - 3/4"
121 - 81 9130 000 - COVER PISTON HEATING
122 - 81 9131 000 - PISTON HEATING SIDE
123 - 81 9132 000 - PLUG BRASS 1/4P M WITH O-RING
124 - 81 9133 000 - NIPPLE OT 1"-22X1,5 MM
125 - 81 9134 000 - O-RING 2075 EPDM 1,78 X 18,77
126 - 81 9135 000 - HYDRONIC RETURN GROUP
127 - 81 9136 000 - BY-PASS VALVE
128 - 81 9137 000 - 3/8" MALE CAP
129 - 81 9138 000 - DOMESTIC HEAT EXCHANGER "ACQUAJET"
130 - 81 9139 000 - SENSOR NTC 10 KOHM KLIP WITH SCREW
131 - 81 9140 000 - NUT ZINC COATED 4MA
132 - 81 9141 000 - O-RING 3037 EPDM 2,62 X 9,19
133 - 81 9142 000 - PURGING PIPE
134 - 81 9143 000 - PURGING VALVE M10X1
135 - 81 9144 000 - FORCK BY-PASS PIPE
136 - 81 9145 000 - BY-PASS PIPE
137 - 81 9146 000 - O-RING 4075 EPDM 3,53 X 18,64
138 - 81 9147 000 - FRONT THERM. INSULATION "ACQUAJET"
139 - 81 9148 000 - REAR THERM. INSULATION "ACQUAJET"
140 - 81 9149 000 - BRACKET EXAGONAL HOLES SHORT
141 - 81 9150 000 - BRACKET EXAGONAL HOLES LONG
142 - 81 9151 000 - NIPPLE OTT 3/4NPT-3/4P USA
143 - 81 9152 000 - BRACKET EXAGONAL HOLE SMALL
144 - 81 9153 000 - 1/2" G GASKET
145 - 81 9154 000 - FAIRLEAD PA 107 SCREW HILO 3,5X14,5
146 - 81 9155 000 - CONNECTION BRASS 3/4P TO 1P
147 - 81 9156 000 - CONNECTION BRASS 1/2P TO 1P
148 - 81 9157 000 - 3/4" NUT
149 - 81 9158 000 - SCREW 6X8 ZINC TC-CR DIN7985
150 - 81 9159 000 - COPPER PIPE 1P TO 3/4P
151 - 81 9160 000 - BRASS 3/4P FEMALE TEE
152 - 81 9161 000 - HYDRONIC SUPPLY GROUP ONLY HEAT
153 - 81 9162 000 - 1/2P CAP
154 - 81 9163 000 - 1/2"-1/4" FF BRASS FITTING
155 - 81 9164 000 - PLUG BRASS 3/4P F
156 - 81 9165 000 - BRASS ELBOW 3/4P MF
157 - 81 9166 000 - 3/4 NUT
158 - 81 9167 000 - PLUG BRASS 3/8P F
159 - 81 9168 000 - HYDRONIC RETURN GROUP ONLY HEATING
162 - 81 9169 000 - BRASS 1/2P MALE CAP
163a - 81 9188 000 - 9.1MM NATURAL GAS INJECTOR
163b - 81 9189 000 - 5.7MM LP GAS INJECTOR
164 - 81 9200 000 - 2.62X13.10 NBR O-RING
165 - 81 9192 000 - Ø6/4-1/4" FEMALE FITTING
166 - 81 9193 000 - 1/4" TAP
167 - 81 9194 000 - Ø6/4-Ø6/4-1/8" MALE TEE FITTING
168 - 81 9195 000 - 4X6 PTFE FLEXIBLE PIPE
169 - 81 9196 000 - 24X17X2 AISI316L WASHER
170 - 81 9197 000 - 24X17X1.5 AISI316L WASHER
171 - 81 9198 000 - 1/2"-1/4" MF BRASS FITTING
172 - 81 9199 000 - Ø6/4-1/4" MALE BRASS ELBOW FITTING (WITH VITON O-RING)

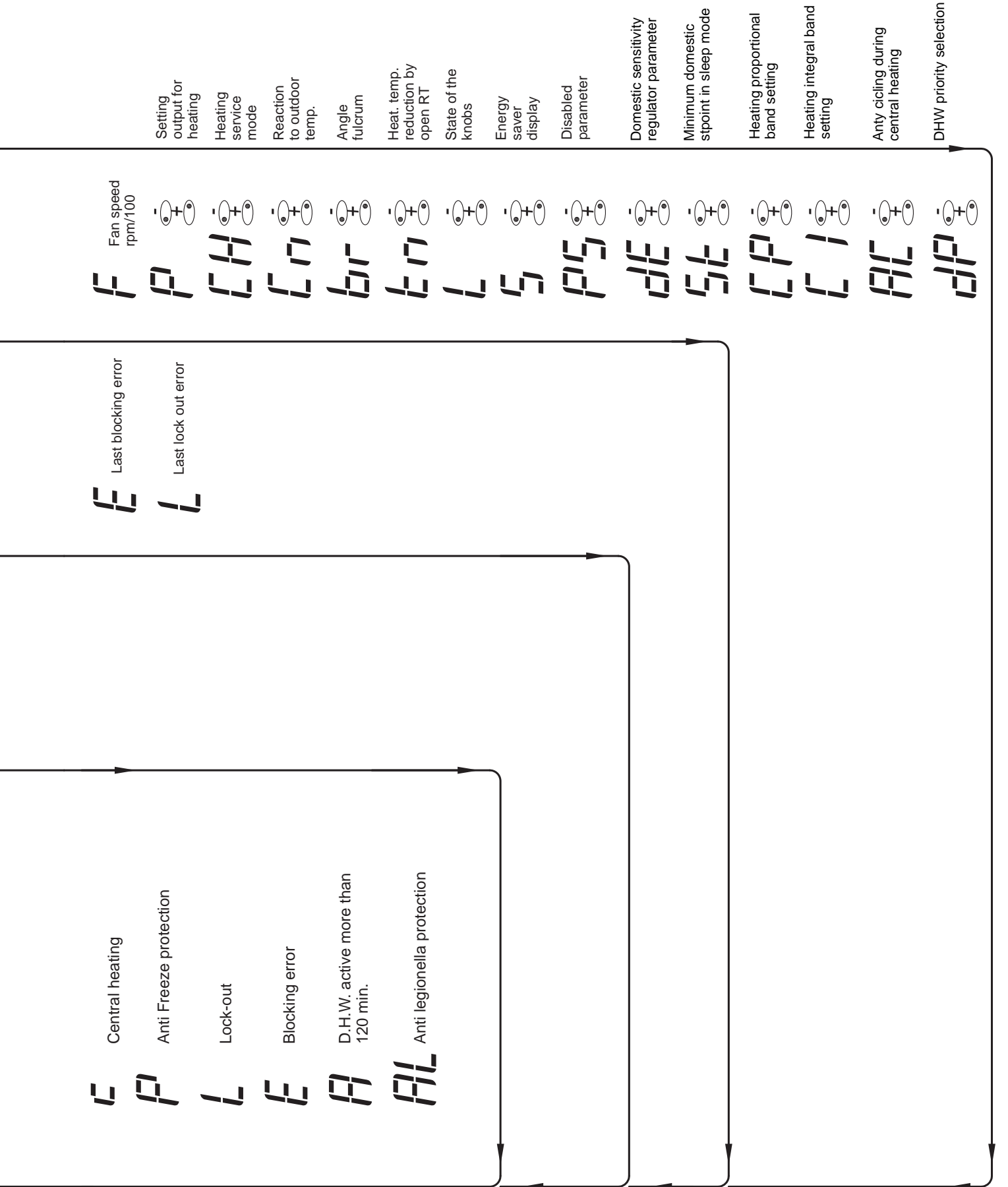
If replacement parts are needed

When parts are needed, refer to boiler model and serial number shown on the boiler name/rating plate. Control identification and replacement should be attempted only by a qualified technician. Relief/Safety valves must be ASME rated for the pressure and gross output of the boiler.

17 - READ OUT FLOW CHART



17 - READ OUT FLOW CHART



17 - READ OUT FLOW CHART

CAUTION!!! Changing these parameters could cause the boiler and therefore the system to malfunction. For this reason, only a qualified technician who has in-depth knowledge of the boiler should change them.

The boiler's micro-processor makes this menu of parameters available to the qualified technician for the setting of the appliance .

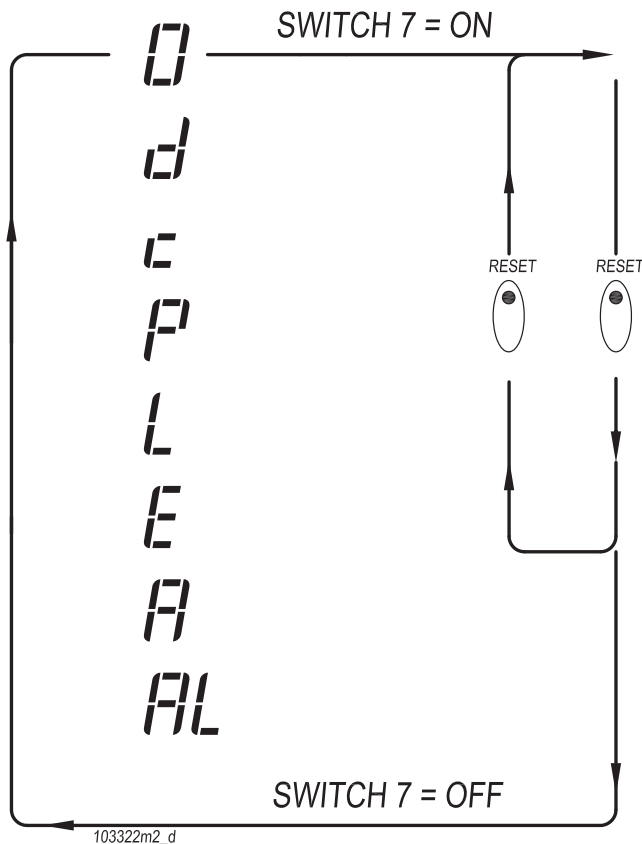
To enter this menu you must:

1. turn the main electrical supply Off;
2. move the switch #7 (see Figure 9-2, item "D") to the ON position;
3. turn the main electrical supply On.

Now "ty" is displayed. Use plus and minus keys to change the value; use RESET key to save the value and swap to the next parameter.

To exit this menu you must:

1. turn the main electrical supply Off;
2. move the switch # 7 (see Figure 9-2, item "D") to the Off position;



- tY** Basic functionalities selection and Speed blower selection (see below for more explanations)
- tS** Main electrical supply and temperature unit selection (see below for more explanations)
- dS** Domestic functionalities selection. Must be always at 00
- CU** Master or slave selection in a module configuration. Must be always at 00.
- Cr** Rotating selection in a module configuration. Must be always at 00.
- FS** Heating Water Flow Switch. (Function present only for certain boilers) (See below for more explanations)
- Or** Outdoor temperature sensor range (See below for more explanations)

tY may assume the follow values:
61 - for boilers at NATURAL gas;
62 - for boilers at LP gas;

tS may assume the follow values:
00 - 230Vac, 50Hz, °C;
01 - 230Vac, 50Hz, °F;
02 - 120Vac, 60Hz, °C;
03 - 120Vac, 60Hz, °F

dS may assume the follow values:
00, 01 and 02. Must be always at 00.

CU If readable, may assume the follow values:
00, 01, 02, 03, 04, 05, 06, 07 and 08. Must be always at 00.

Cr If readable, may assume the follow values:
00, 01, 02, 03, 04, 05, 06, 07 and 08. Must be always at 00.

FS if readable, may assume the follow values:
00 = Flow Switch disabled;
01 = Flow Switch enabled;

Or if readable, may assume the follow values:
00 = Outdoor minimum temperature of 14°F;
01 = Outdoor minimum temperature of -39°F; (add a 68 kohm 1/4W resistor in parallel with the outdoor sensor).

