

MC200



Installation and Setting Instructions

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1. General Description

The MC200 is a high specification heating controller designed specifically to meet the demands of modern fuel efficient heating equipment and the latest energy saving and environmental guidelines.

Optimum start technology is available that will continually monitor the heating systems previous performance to determine the optimum time to turn the heating on to raise the space temperature to the required level for when occupancy begins. Optimum stop can also be selected which can save energy at the end of the heating period.

The control uses a simple menu based structure for entering User settings.

The MC200 is protected by 2 levels of password. The User password may be set to restrict access to certain User controls. The second password is for use by commissioning and servicing engineers and allows access to parameters normally used only in the initial setting of the controller, a fault log and system reset facility.

The user keypad allows easy selection of the heating and fan only modes, the override functions and fault reset. These may also be locked in various combinations to allow different levels of user accessibility.

The MC200 can give a readout of the hours the burner has operated, to help accessing servicing intervals and after being programmed with the correct data, can also give an indication of the running costs of the heating appliance. In addition a forward service date can be programmed. When the due date is reached a notification will be shown which alternates with the normal display. This notification can only be removed by a Service Engineer.

The MC200 can be used to directly control both Hi/Lo and Modulating burners, the latter by an internally generated 0-10V signal.

2. Specifications

General

Electricity supply	230V 50Hz Fused at 6A.
Internal Fuses	F1 20mm 6.3A 230V.(HRC), F2 20mm 500mA 230V. (Non replaceable)
Display	2 line 5mm L.C.D.
Day set point range	10 - 30°C.
Night set point range	1 - 15°C.
Temperature accuracy	0.5 °C.
Overall switching differential	Adjustable 0.5 - 10.0°C for Hi/Lo burner types.
Sensing Element	Internal or remotely mounted up to 100m from control.
Switching contacts ratings	12A. 230V.ac. (resistive). All Volt Free
Modulating Control	0-10V dc
Heating ON Indicator	Red L.E.D.when the heater is a single-stage burner, Green when the burner is a Hi-Low type, and Yellow when the burner is a Modulating type.
Fault (Lockout) Indicator	Orange L.E.D.
Protection Rating	IP20
Software version	3.0

Clock

- The unit date range is from 01/01/2001 to 31/12/2099
- Leap years are recognised
- BST begins on the last Sunday in March and ends on the last Sunday in October. The time changes at 01:00 GMT.
- The clock may gain or lose up to 10 minutes in a year.

Time Switch

- 14 timers are provided in the software, and each can be assigned to any single day of the week, or to day groupings such as weekdays or weekends. This allows greatest flexibility in operating the heating whenever required.
- It is possible to schedule timers so that one starts before another has finished. The heating will be on while any timer is requiring Heat On, and the heating will turn off only when **all** timers have reached Heat Off. The requested temperature will be set by the most recent timer to switch On. When an overlapping timer switches Off, the requested temperature will be set by the remaining timer(s).
- No timer can be programmed to run past midnight, because it is assigned to a day of the week. If timed heating is required across midnight, it must be provided by two timers, one ending at 23:59 and the other starting at 00:00. At midnight, all manual over-rides and extensions are cleared.

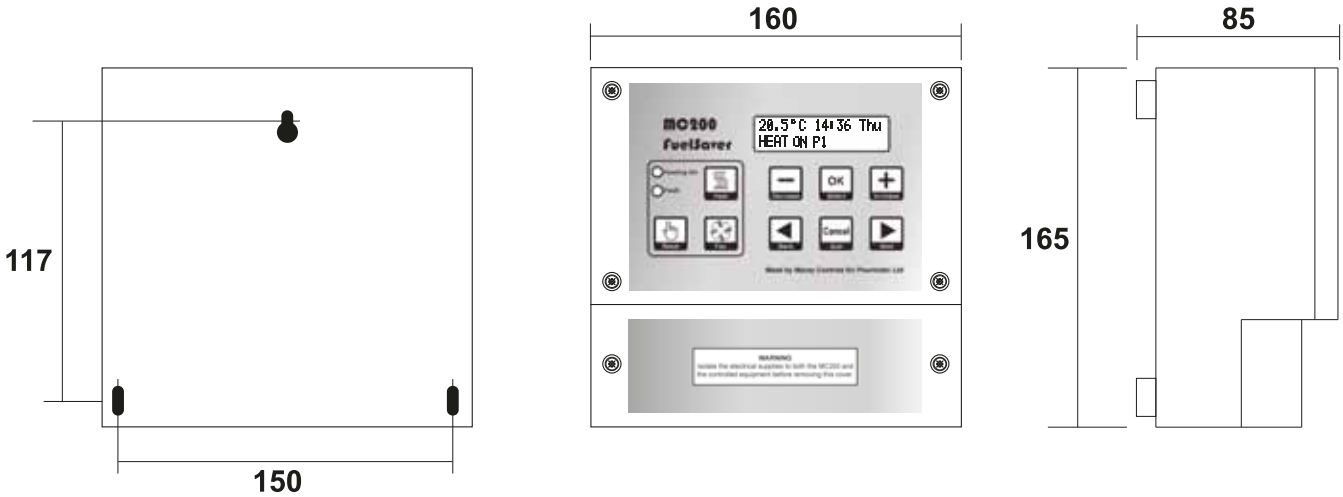
Optimum Start

- The MC200 achieves Optimum start by keeping a moving record of how many minutes it takes to increase the temperature per degree in each 3° band of temperature from 5°C to 20°C. The current overnight temperature is referenced and the MC200 can estimate how many minutes are required to bring the temperature to the required level. When Optimum Start is enabled the switch-on time for the heater is then advanced accordingly to achieve the required temperature by the Heat On time i.e. the warmer the night time temperature the closer the switch on time will be to the Heat On time

Optimum Stop

- The MC200 keeps a note of how many minutes are taken for the temperature to drop the number of degrees entered against this parameter when the heating period ends. When Optimum Stop is enabled, the MC200 switches off the heating that number of minutes early.

3 Dimensions



4 Installation

IMPORTANT

The MC200 and sensor **MUST NOT** be sited in areas of high electromagnetic fields, i.e. distribution boards, transformers or heavy duty supply cables.

MC200

Location

Siting of the MC200 is important in that it must be fitted where the temperature will be generally representative of the area to be heated. It should be installed 1.7m above floor level and away from draughty areas or areas subjected to direct heat from sunlight, radiators etc. (Unless a remote sensor is being used). It should also be in a position easily accessible for programming and operation.

Fixing

The MC200 will accept cable entry from the back and base. A sub base is available, as an optional extra, to allow cable entry from the top or side.

Remove the two screws from the terminal cover and remove. Check that the unit fits in the intended mounting position. Using the template on the packaging box mark the location of the three fixing holes. Secure the top fixing leaving approximately 5mm protruding. Hang the MC200 on the top fixing screw, line up the bottom fixing holes and secure using two screws.

Remote Sensor (optional)

Location

The sensor should be sited no further than 100m from the main unit. Siting of the sensor is important in that it must be fitted where the temperature will be generally representative of the area to be heated. It should be installed 1.7m above floor level and away from draughty areas or areas subjected to direct heat from sunlight, radiators etc.

Fixing

Remove cover and offer the sensor up to the intended mounting position and mark two fixing holes. Fix sensor base plate to the wall.

5 Electrical Connections

IMPORTANT

Wiring external to the MC200 must be installed in accordance with I.E.E. Regulations together with any local regulations which may apply. Wiring should be completed in conduit, entry for which is provided in the bottom of the unit. See external wiring diagram. Mains supply and control circuit wiring should be completed in cables not less than 0.5mm² and fan circuit in not less than 1.5mm². The connection to the mains electrical supply can be taken from the appliance or a separate 'local' supply, but in both cases a local isolator must be fitted adjacent to the MC200. Should more than one appliance be controlled from one MC200 an interfacing relay box **MUST BE USED** with the MC200 driving the relay coils.

WARNING - SENSOR WIRING

Sensor cable must be screened two core and a minimum of 0.6mm² if solid and 7 x 0.2mm² if multistrand. The screen must be grounded only at the MC200. Wiring for the temperature sensor **MUST BE RUN SEPARATELY** and apart from ALL other wiring. Failure to regard this instruction may cause the MC200 to malfunction and may render it faulty. Under no circumstances must voltage be applied to the sensor connections - see Section 9 regarding alternative sensor inputs.

Burner Reset

Note: The reset terminal is internally connected to NEUTRAL when the reset button is pressed.

6 Keypad Layout

6.1 User keypad (3 Buttons)

Heat Button - (Note: this facility may be limited or disabled by the User).

If heating is ON (via programme)

- pressing the Heat button for less than 2 seconds overrides the programme to OFF. Any extension time that has been set is cancelled.



- pressing the heat button for more than 3 seconds determines that heat will remain on for an extension time after the programmed off time. The extension timer will increase in 30 minute steps, up to the maximum allowed period, and then revert to 0 minutes. Release the button when the required extension period is showing.

If heating is OFF (via override)

- pressing the Heat button removes override and reverts to the current programme.

If heating is OFF (via programme)

- pressing the Heat button for less than 2 seconds brings on heating for 30 minutes.

- pressing the heat button for more than 3 seconds will increase the on time in 30 minute steps, up to the maximum allowed period, and then revert to 0 minutes. Release the button when the required heating period is showing.

Fan Button -

In WINTER mode and OFF mode, the Fan button has no control over the air heater fan.

In SUMMER mode, the Fan button switches on the fan for air circulation, and another press switches it off. If the fan is left on, it will be automatically switched off at midnight. If the fan is running because the heating is on and the fan is in Auto or Const mode, the Fan button cannot switch it off.



If the fan is in On mode, it always runs, in WINTER, SUMMER and OFF. The Fan button cannot switch it off.



Reset Button - Press to reset the burner controls from lockout, (when this facility is available on the heater).

6.2 Indicators



Heating On - Is illuminated when the MC200 is calling for heat (It does not confirm that the heating is actually working). It shows Red when the heater is a single-stage burner, Green when the heater is a Hi-Low type, and Yellow when the heater has a Modulating burner.



Fault - Is illuminated when the burner control is at lockout or when a service call is due (if this has been set) or when there is a sensor fault.

6.3 Display

The display normally shows

- the current air temperature as measured by the sensor, or the average temperature if two sensors are fitted.
- the time of day using 24-hr notation. The colon flashes once per second to confirm that the clock is running.
- the day of the week. Programmes are associated with individual days of the week or day-groups such as weekday or weekend.
- the current setting of the heater: ON or OFF, as determined by the internal programmes (the display will say ON even if the MC200 is not currently calling for heat because the thermostat is satisfied) or
- for High/Low and Modulating burners an indication of the heat demand: HEAT HI or HEAT LO for Hi-Low burners, or a simple bar-graph display for modulating control heaters where 1 bar is low fire and 10 bars is high fire.
- Pn where n represents the active programme number.

6.4 Programming keypad (6 Buttons)



Select Button - Press to accept changes.



Decrease Button - Press to decrease values.



Increase Button - Press to increase values.



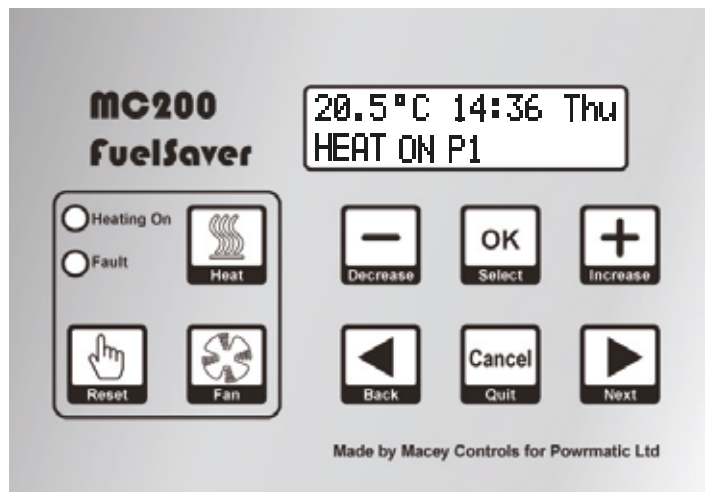
Cancel Button - Press to exit without saving change values.



Back Button - Press to enter User Menu, go back to previous screen.



Next Button - Press to to enter User Menu, go forward to next screen.



7 User Controls

7.1 Direct Control

If configured during the commissioning stage the User has the following direct control of the heater without using the menu.

- If the Fault LED is on because the heater is at lockout, the user can reset the heater by pressing the Reset button.
- The user can switch on or off heating by pressing the Heat button.
- The user can start or cancel extension time by pressing the Heat button longer than 3 seconds.
- The user can run the fan without heating, by pressing the Fan button.

7.2 User Settings

7.2.1 General

The second line of the display shows what keypad buttons are active.

After changing settings press OK to save the new setting. To return to the normal display press **Cancel** or do not touch any keys for 15 or more seconds.

Keys ◀, ▶, – and + will auto-repeat if held down longer than approximately half a second. The + key will automatically wrap round from the maximum value to the minimum value and the – key will wrap the other way.

7.2.2 Description of User Settings

Temperature

This shows the temperature set by the currently active programme, and it is the target temperature for thermostatic control. The user can increase or decrease the value to adjust comfort. This will not alter the set temperature associated with the programme, but it will temporarily alter the target temperature for thermostatic control.

The effect of altering the temperature lasts until the current programme expires or until another programme changes the set temperature requirement.

Note: the range of adjustment permitted may be limited during commissioning. Temperature adjustment can be disabled by a setting within the user menu.

Clock Set

Sets the current date and the time of day. The correct date allows the MC200 to know the day of the week, allows for automatic BST-GMT changeovers, carries out the holiday shutdown function and permits override password entry.

Programme Settings

The MC200 has 14 programmes, each of which can be assigned to any day of the week. Each programme can be given an ON time, an OFF time and a set temperature. The user may organize the programmes in any way that suits. The simplest would be one programme on in the morning, off at the end of the afternoon, active Monday to Friday.

If two or more programmes are active at the same time, for instance one is on all day and another is on between 11:00 and 13:00, then the set temperature of the second programme will apply between 11:00 and 13:00, and the set temperature of the first programme will apply during the rest of the working day. Programme times increment in 5 minute steps.

Extension time (if set) applies when all programmes have reached the end of their set period for that day.

Optimum start applies at the beginning of the first programme to switch on and optimum stop applies at the end of the last programme to switch off.

Holiday date

A future date can be set so that the heating will not operate on that date, and remains “OFF” for a consecutive number of days from that date. The date includes the year number, ensuring that the holiday shutdown date is not automatically repeated the following year.

During the holiday period the heater will only operate if the temperature falls below the frost temperature and if frost temperature operation is selected “ON” in the engineer menu. The night temperature setting is ignored during holidays. During the holiday period, manual operation of the fan or heater is permitted. Any manual operation still on at midnight will be automatically cancelled.

Run Mode

The MC200 has three Run modes: WINTER, SUMMER and OFF.

Winter - the heating operates when any programme is in a “Heat On” period. The heating also operates to maintain the Night Temperature if this has been set. The heating also operates when the temperature drops below the frost temperature.
Note: Summer/Winter mode has no connection with the clock change from GMT to BST.

Summer - the fan operates to circulate air when switched on manually. With certain types of heater or certain types of installation, Fan-only operation may not be appropriate and the fan control circuit should not be used.

In SUMMER the heating never operates unless the temperature drops below the frost temperature. During commissioning the frost temperature operation will be set to be on or off. If the frost setting is off, the heater will not operate under frost conditions in any User mode.

Off - the heater never operates unless the temperature drops below the frost temperature (see above).

User Button Permissions

This menu option facilitates the user to enable or disable the following controls separately if it is required to restrict unauthorized access to user controls. Note: User permissions are only effective when User access to the menu is protected by a password.

Reset - Allows operation of the reset button

Change temperature - Allows temporary adjustment of the current set temperature

Heat Override - Allows switching ON/OFF and extension of Heat ON time

Fan override - Allows switching ON/OFF of the fan

Set Password

The user may enter a 4-digit password here. Once set, the password must be given before selected user controls may be accessed or changed. "Set password" cannot be entered unless the password has been given.

As delivered, the MC200 has no User password restrictions, the user password being set to 0000. Entering a password of 0000 will remove all restrictions.

Extension time

A user can extend the heating to operate beyond the switch-off time of the last programme of the day, in 30minute increments, by pressing the Heat button. This menu option allows a maximum extension period to be set, in units of 30minutes. If set to 0 minutes, extension is not permitted. Factory default setting: 1hour. Maximum setting 3hours.

Cost Log

This option shows the total hours run and the total cost of running since the log was last cleared. The display will show the date when it was last cleared. For this option to function it is necessary to enter the fuel cost and heater rating (see Engineer Menu for the latter). The cost log should be cleared whenever the heater type is changed.

For Hi/Lo heaters, there are two heater power entries and the MC200 will calculate the run cost according to the level of heat requested. In the case of modulating control heaters, the cost is an estimate based on half the full heater power.

Password

Once a password has been set, the password must be entered at this menu option to allow access to selected user controls.

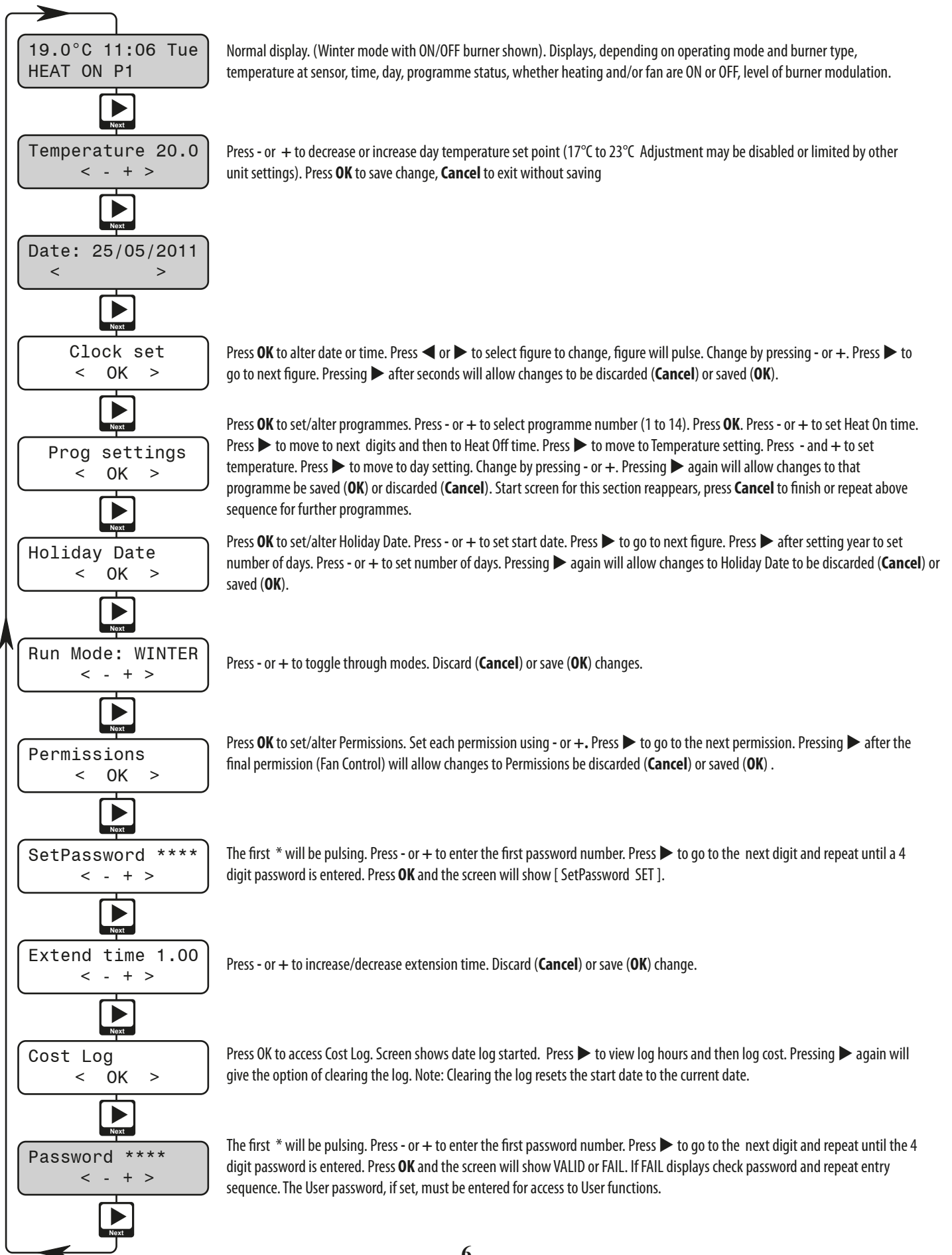
Once entered the password gives access to the User menu functions for 60 minutes. To re-apply the restrictions before the end of the 60 minute period, select the 'Enter password' option and press OK without entering any digits. The display will show 'Password CLOSED'.

Service Date

When the MC200 is installed the Commissioning Engineer may have entered a date for when the heating equipment requires servicing. When this date is reached the MC200 fault indicator will be illuminated and the display will alternate between the normal display and "Service due, call engineer". The Service Engineer can clear this display by entering a new service date when the heating equipment has been serviced.

7.3 User Operation flow chart

Use ◀ or ▶ to navigate through menu. Pressing **Cancel (Quit)** at any of the displays shown below will return you to the normal display. Bottom line of display shows which keys can be used in menu programming modes. Displays shown shaded are the only ones visible when the MC200 is password protected.



8 Engineer Controls

The engineer menu is enabled by entering the engineer pass-code at the Password menu option.

In order to ensure that the engineer code and the user code are *always distinct*, the engineer code is a 3-digit number and one asterisk and is factory set as 535*

Once the engineer code has been correctly entered no user or engineer codes will be required for a period of 1 hour. This will then allow an engineer to move between all screens / modes without having to keep re-entering a code.

Once the engineer pass-code has been entered, an additional menu option becomes visible, leading to the engineer's sub-menu. Many of the Engineer settings are determined by the installed equipment however others will be to the end users preferences. The latter should be left at default settings if there is no end user when the control is being commissioned.

8.1 Engineer Settings

If the engineer code is entered the "Engineer" menus will be added to menu list available. Press OK to enter the engineer sub-menu and > or < to move through the options. At any point, press Cancel to exit from the engineer sub-menu back to the User menu. If the Users menu is password protected the Engineer code permits access to both the Engineer menu and the User menu.

Burner type (On/Off, High-Low, Modulating)

Defines the type of controlled burner.

Burner High Rating (kW)

Defines the high (and Low) heat input (in kW) of the controlled burner for cost calculations.

Test Burners

Facilitates direct testing of the controlled burner(s) irrespective of current control settings, times etc.

High-Low differential (°C)

Sets the temperature difference between the Hi and Lo stages of Hi/Lo burners

Note: This menu item only appears when Hi/Lo burner type has been selected.

Modulation offset (°C)

Sets the temperature at which the 0-10V signal will be 10V and the burner will be at High Fire.

Note: This menu item only appears when Modulating burner type has been selected.

Auto reset (On/Off)

Sets whether the control will complete an automatic reset of lockout, If lockout signal is not removed by a manual reset the MC200 will initiate an automatic reset 30 minutes after the lockout signal and then once every 24hrs.

Reset Time (1 sceond, 3 seconds, 5 seconds)

Sets how long the lockout reset terminal is connected to neutral when the reset button is pressed.

Sensor 2 Function (Not Used, Remote, Heat Off, Heat On)

Sets the function of sensor 2 input

Trim Temperature (°C)

A temperature offset can be entered here to adjust the displayed temperature to agree with the sensor temperature. Range of adjustment -5°C to +5°C

Set User Temperature minimum (°C)

Sets the minimum temperature that the User can select. Default 15°C, can reduce to 10°C.

Set User Temperature maximum (°C)

Sets the maximum temperature that the User can select. Default 25°C, can increase to 30°C.

Temp Adjust (°C)

Sets °C that User can temporarily adjust the current set point up or down.

Constant Fan (Off/Auto/Const/On)

Sets the mode of Fan operation between Auto, Const, ON or OFF.

Frost/Setback (On/Off)

Sets frost protection/night setback to active or inactive.

Setback Temperature (°C)

Sets the frost protection/night setback temperatue value.

Optimum Start (On/Off)

Sets whether Optimum Start is active

Optimum Stop (°C)

Sets the Optimum Stop temperature

Service Date

Allows a service date to be set

Lockout Log

Displays the most recent lockout time and date

Clear Lockout Log

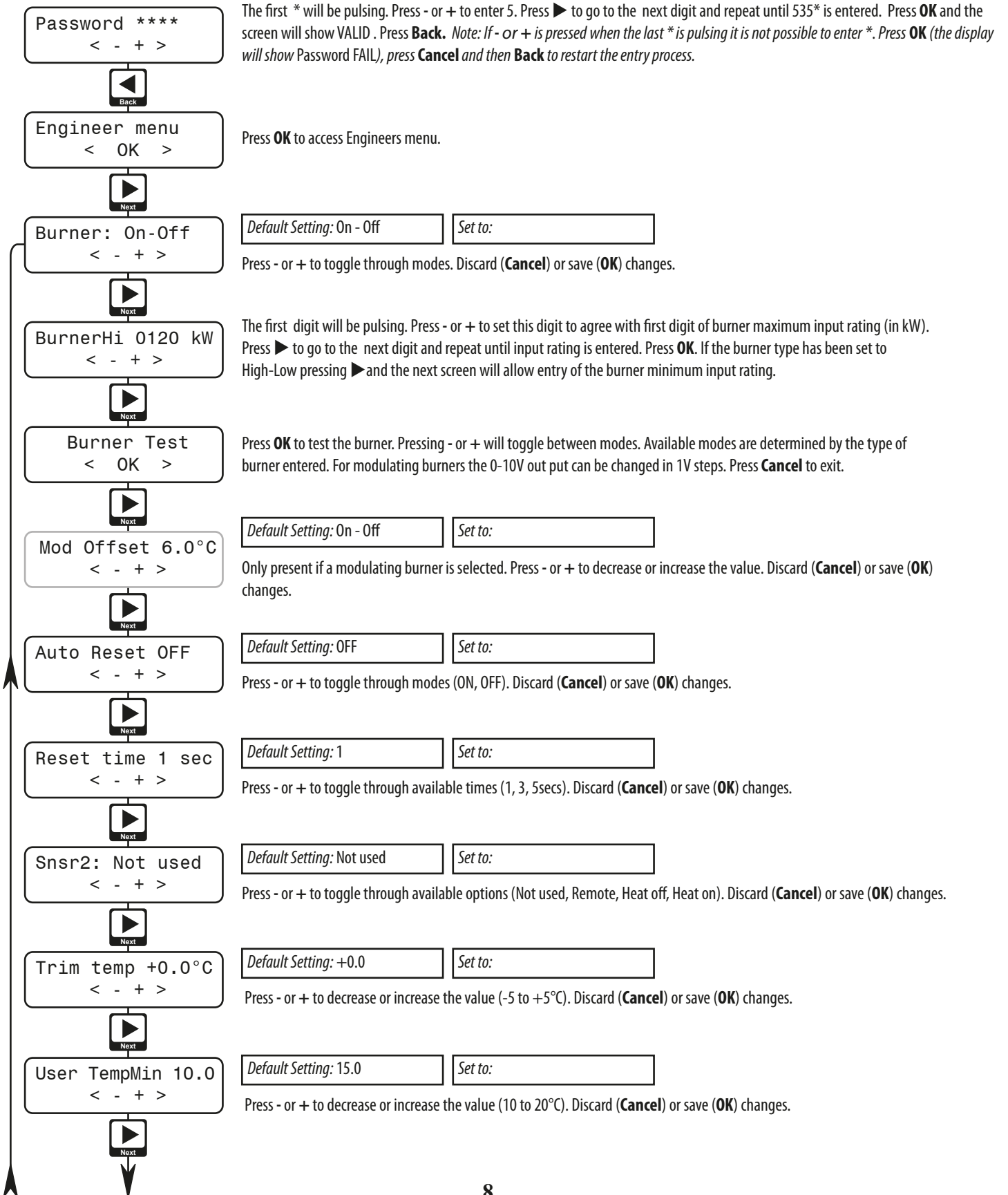
If lockout log is not cleared newer events will over-write older ones.

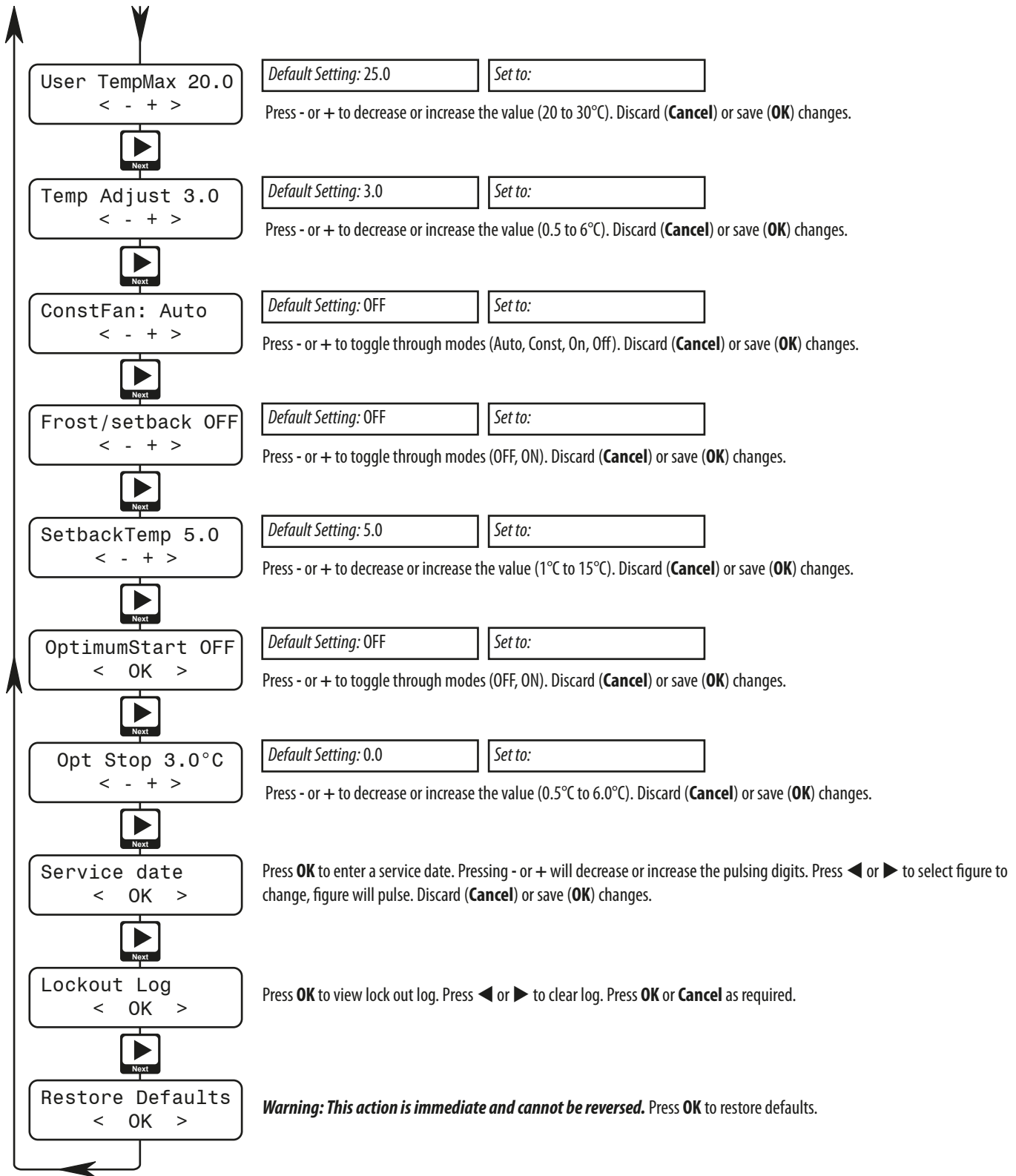
Restore Defaults

Resets all parameters to factory default settings.

8.1 Engineer Settings Menu flow chart

At the normal display screen press **Back** to access the Password screen





9. Temperature Sensors

Options are

Default internal sensor	Terminals Sen1 & Com
Remote sensor	Terminals Sen1 & Com
Internal + Remote	Terminals Sen1, Com & In2
Remote + Remote	Terminals Sen1, Com & In2

Temperatures returned by the two sensors are averaged by the MC200.

The remote sensor may be either 'room' or 'duct' type.

The second 'sensor' input (Terminals Com & In2) can also accept a volt free switch input i.e. a volt free switch is connected across Terminals Com & In2 to facilitate additional functions as below

Sensor terminal options are (It is assumed that Sensor 1 is always fitted)

- | | |
|------------------|--|
| 1) In2: Not used | The sensor 2 terminals are ignored |
| 2) In2: Remote | A temperature sensor is connected |
| 3) In2: Heat off | A switch is fitted. When it closes, heating goes off |
| 4) In2: Heat on | A switch is fitted. When it closes, heating goes on |

Heating will be overridden by the switch closure during programmed heating times. Heating control returns to normal when the switch opens, or when the programmed control period ends.

The switched control does not occur while heating is turned on due to manual override in non-programmed times, and does not occur during the manually-selected extension time at the end of a programmed control period.

If heating has been manually overridden to be off during a programmed heating period, the switched control cannot bring on the heating.

The fourth option (Heat on) means that heat will be turned fully on by the switch. For high-low burners, the high and low relays will be on, and for modulating burners, the control output will be 10v.

Cost logging operates as usual. During these switch control periods the burn time is recorded at the maximum rate.

If the sensor goes open-circuit (if either of the sensors goes open-circuit where two are fitted), the Fault LED will flash. The LCD display will show "sensor failed".

NOTE: The earlier MC100 sensor cannot be used with the MC200 and the MC200 sensor cannot be used with the MC100.

10. Outputs

10.1 Single burner

When configured for a single burner heater, the Low heat relay (Terminals **Heat In Lo** and **Heat Out Lo**) operates when the sensor temperature is below the set temperature.

10.2 Two-stage

When configured for a two-stage burner heater, the Low heat relay (Terminals **Heat In Lo** and **Heat Out Lo**) operates when the sensor temperature is below the set temperature i.e. as ON/OFF. The High heat relay (Terminals **Heat In Hi** and **Heat Out Hi**) operates when the sensor temperature is more than a given number of degrees below the set temperature as set in the Hi/Lo differential parameter to switch from low fire to high fire

The Low Level relay also remains operated while the High heat relay is operated.

10.3 Modulating

The 0-10Vdc output stays at zero and the Low heat relay (Terminals **Heat In Lo** and **Heat Out Lo**) will remain de-energized while the sensor temperature is at or above the set temperature. Below the set temperature, the Low heat relay (Terminals **Heat In Lo** and **Heat Out Lo**) will operate and the modulating output voltage (Terminals **0-10v+** and **0-10v-**) increases, reaching 10v when the sensor temperature falls to the threshold set i.e 0V at low fire, 10V at High Fire.

11. Handover

Demonstrate the setting up and operation of the control to the end user. Leave the User Instructions with the end user.

12. Short List of Parts

Item	Powrmatic Part #
Complete unit	MC200
PCB alone	143070033
Internal sensor bead	143070034
Remote sensor (air temperature)	143070031
Black bulb sensor (radiant temperature)	143070032
Duct Sensor	143070035

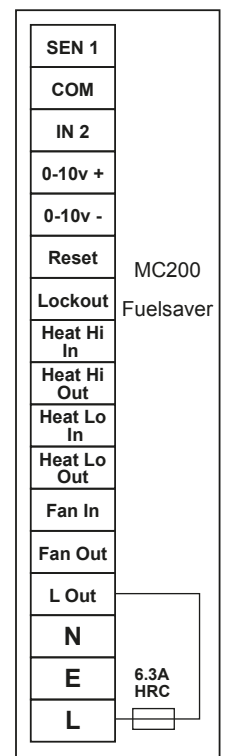
13. Terminal Layout

Terminal	Type	Function
Sen1	Input (no voltage) ¹	Connection for prime sensor (not polarity sensitive)
COM	Input (no voltage) ¹	Common connection for sensors and/or auxillary switch
IN 2	Input (no voltage) ¹	Connection for 2nd sensor (averaging) or for auxillary switch
0-10V +	Output	Positive rail of 0-10V modulating control vottage
0-10V -	Output	Negative rail of 0-10V modulating control vottage
Reset	Output	Internally connected to NEUTRAL when reset button pressed.
Lockout	Input (230V~) ²	Receives Lockout signal from burner controls
Heat Hi In	Input (Volt free) ²	Heat Hi relay contact
Heat Hi Out	Output (Volt free) ²	Heat Hi relay contact
Heat Lo In	Input (Volt free) ²	Heat Lo relay contact
Heat Lo Out	Output (Volt free) ²	Heat Lo relay contact
Fan In	Input (Volt free) ²	Fan relay contact
Fan Out	Output (Volt free) ²	Fan relay contact
L Out	Output (230V~)	As required (Derived from L terminal via internal 6.3A HRC fuse)
N	Input	Electrical Supply
L	Input (230V~)	Electrical Supply
E	Earth	Electrical Supply

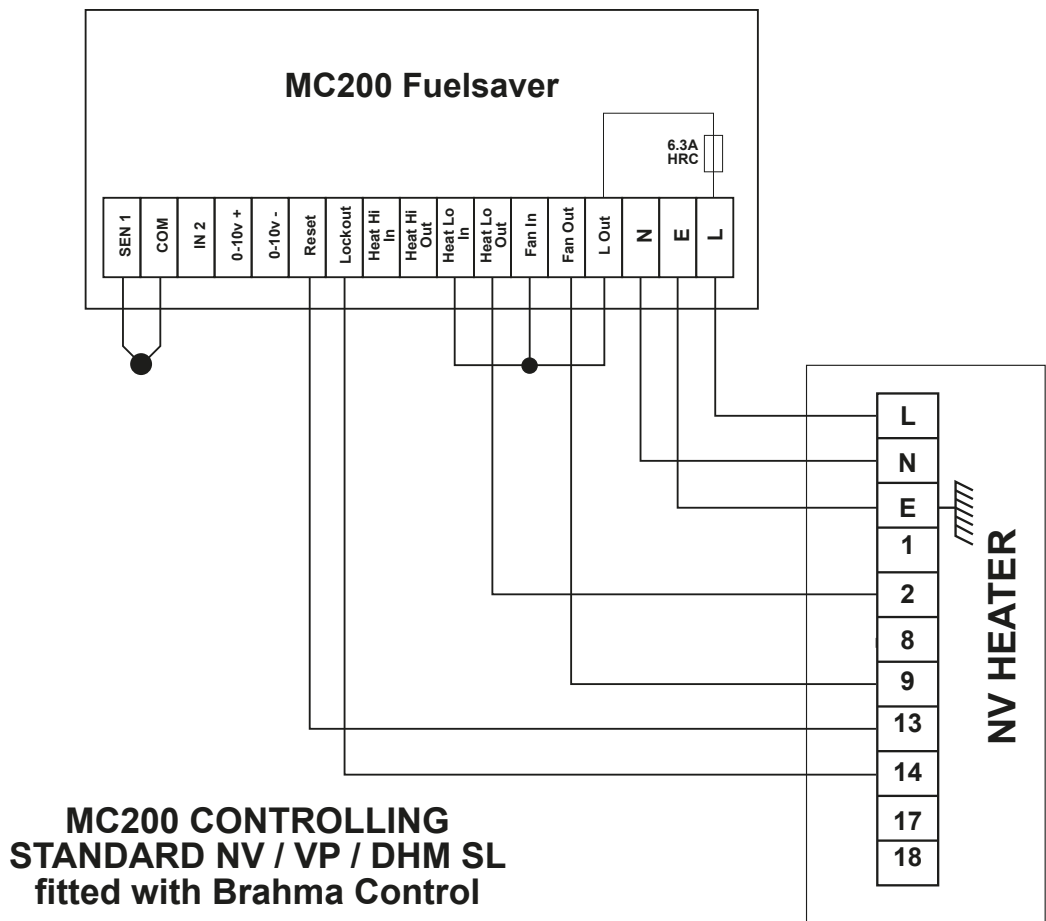
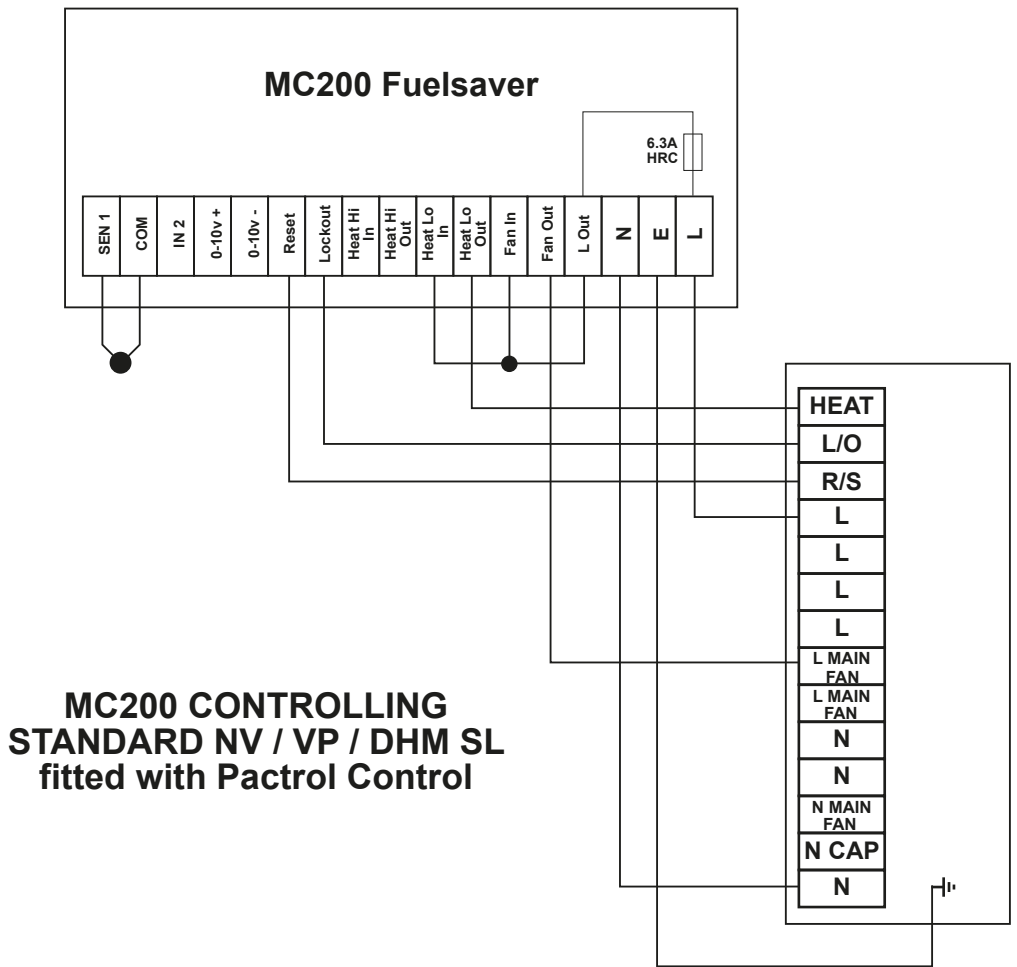
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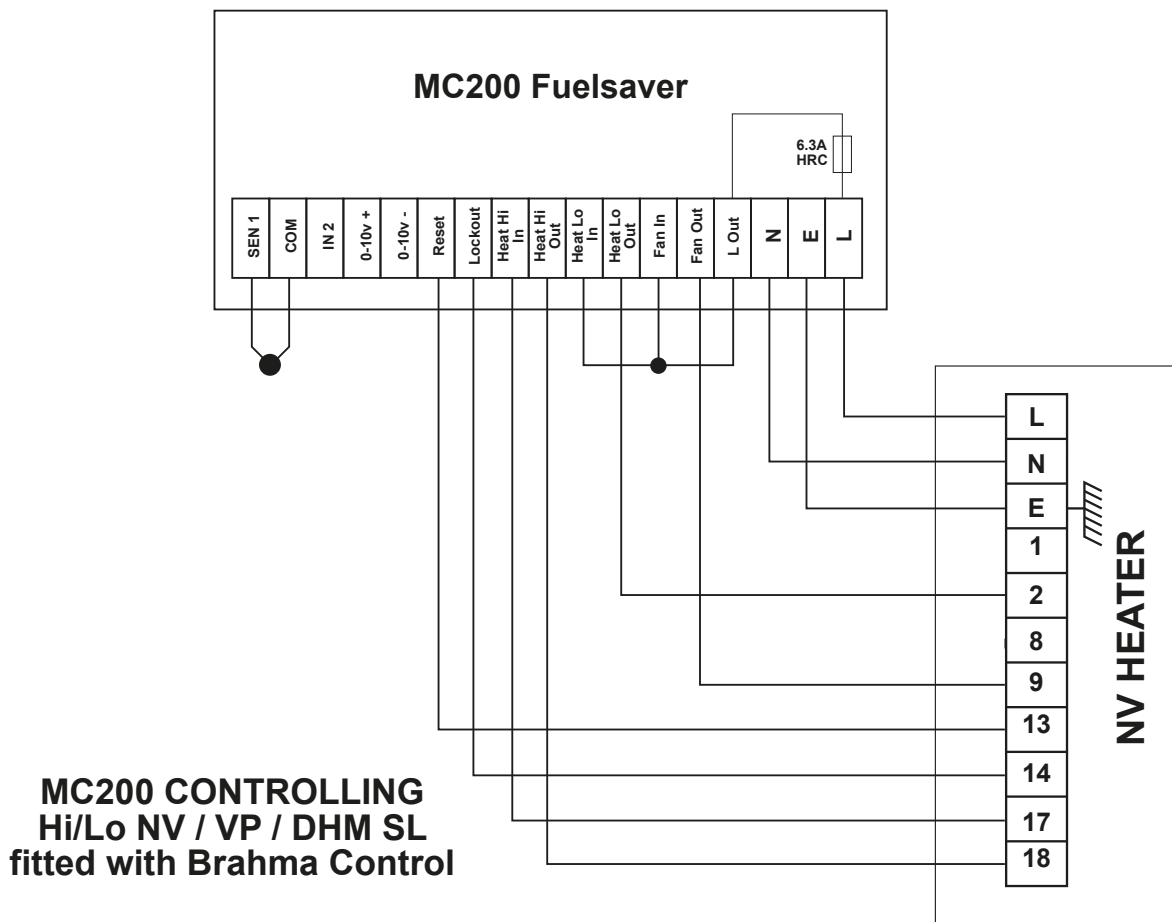
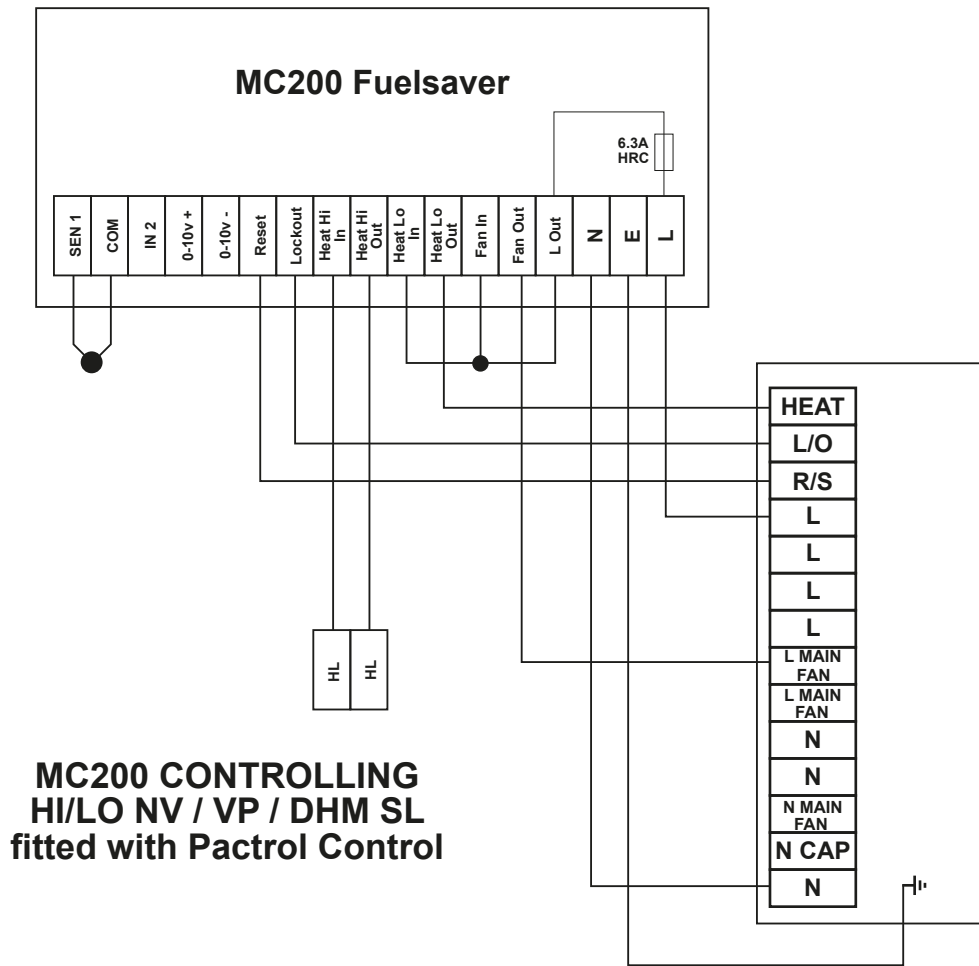
1 - Voltage must not be applied to the sensor terminals. If a switch is fitted across COM and IN 2 it must be volt free.

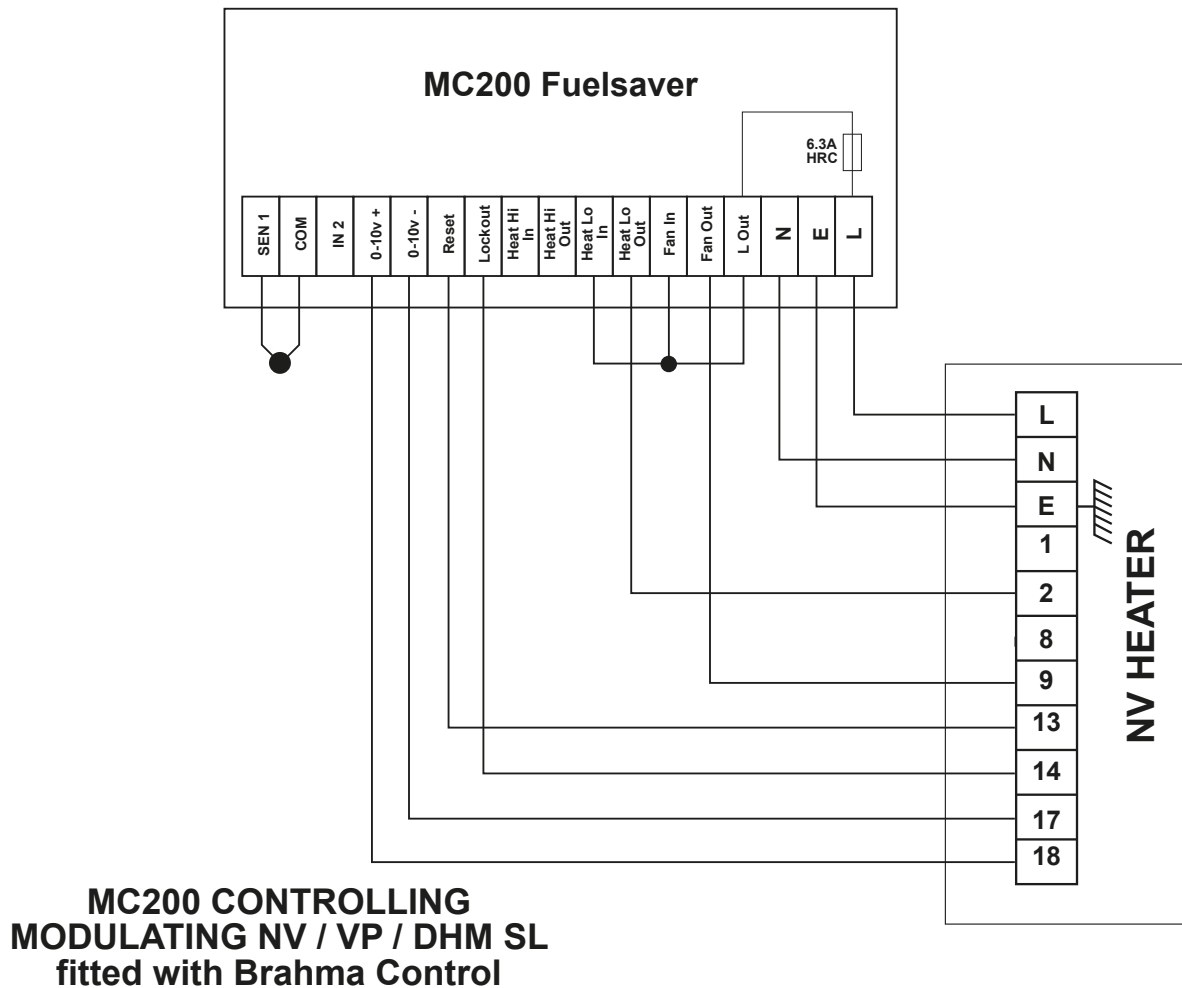
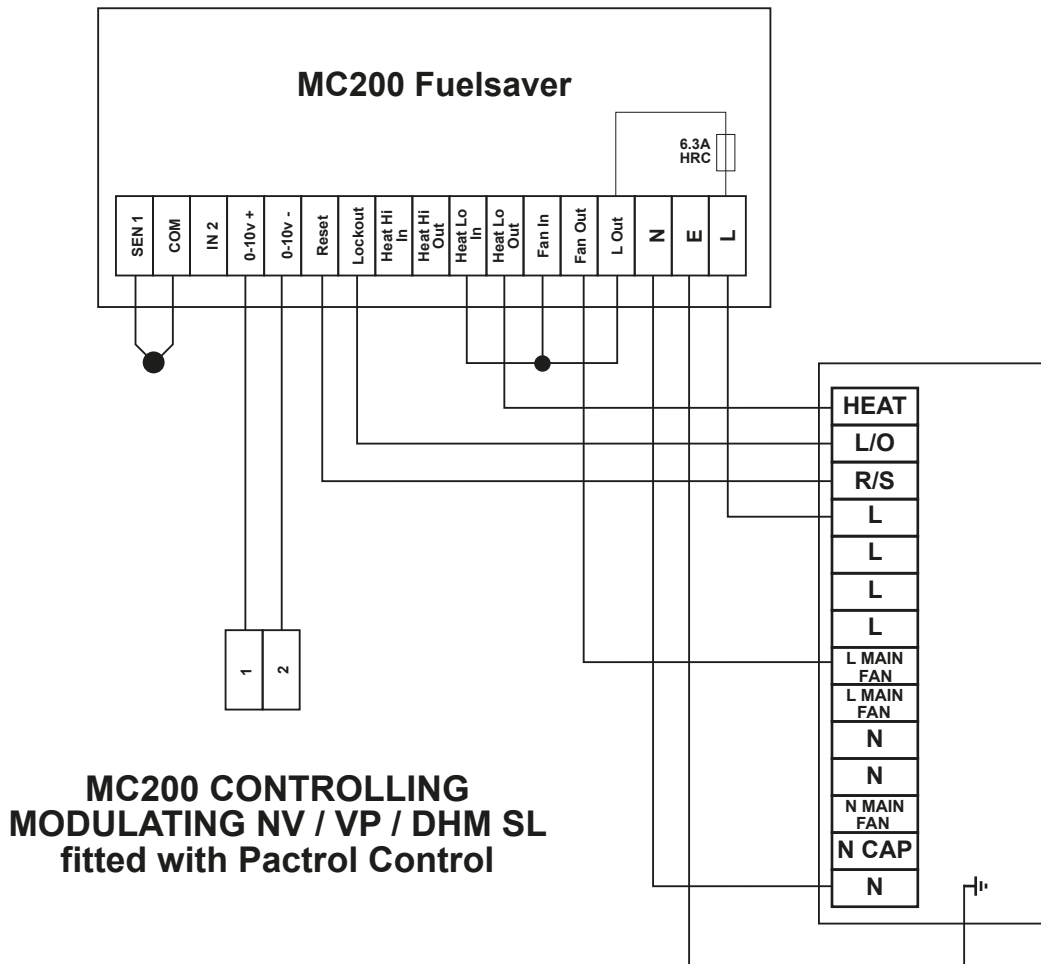
2 - If an output voltage is required (230V, 24V, 10V etc) the appropriate voltage must be applied to the corresponding input terminal.

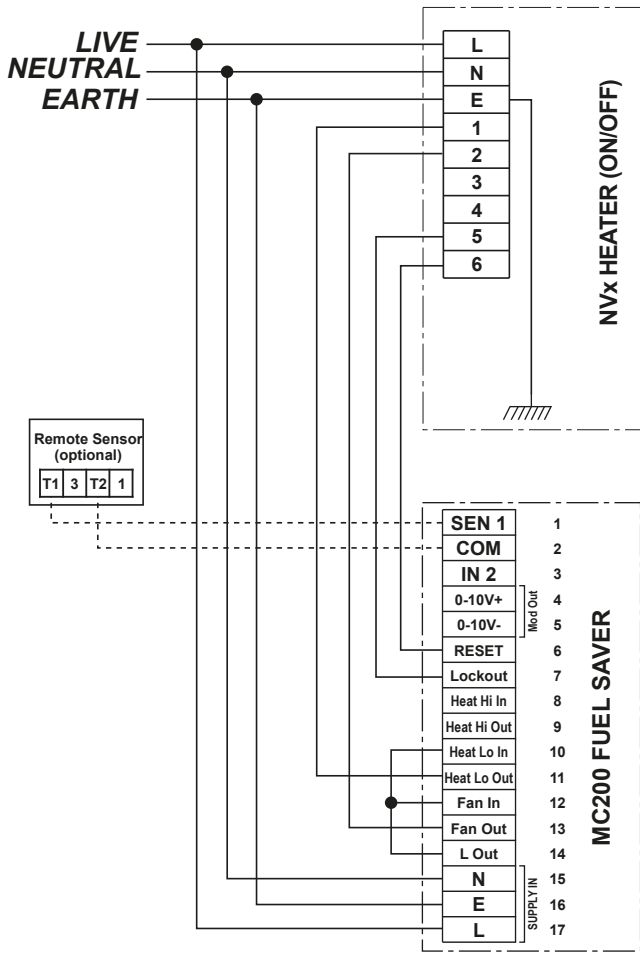


14. Connections to Powrmatic Heaters

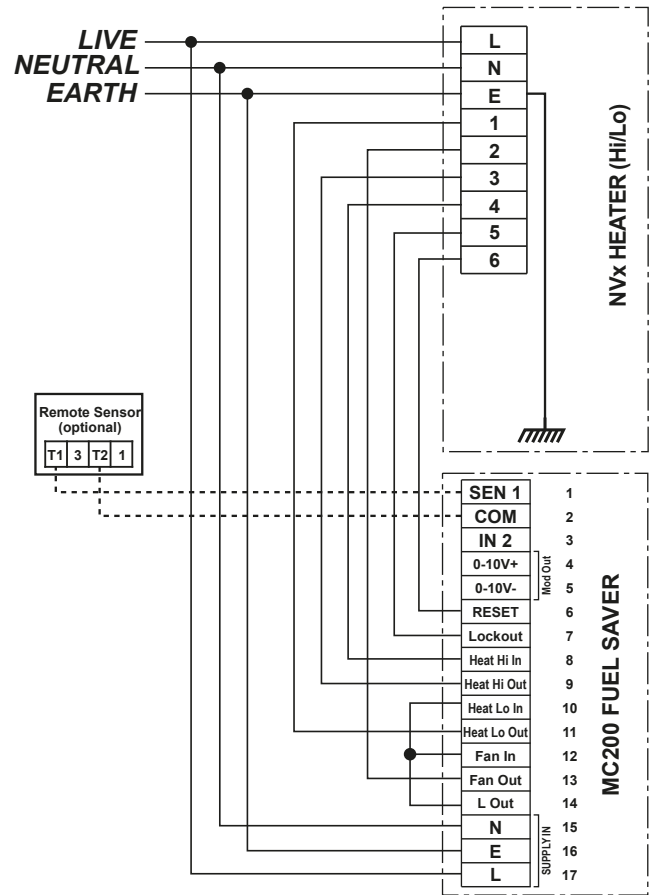




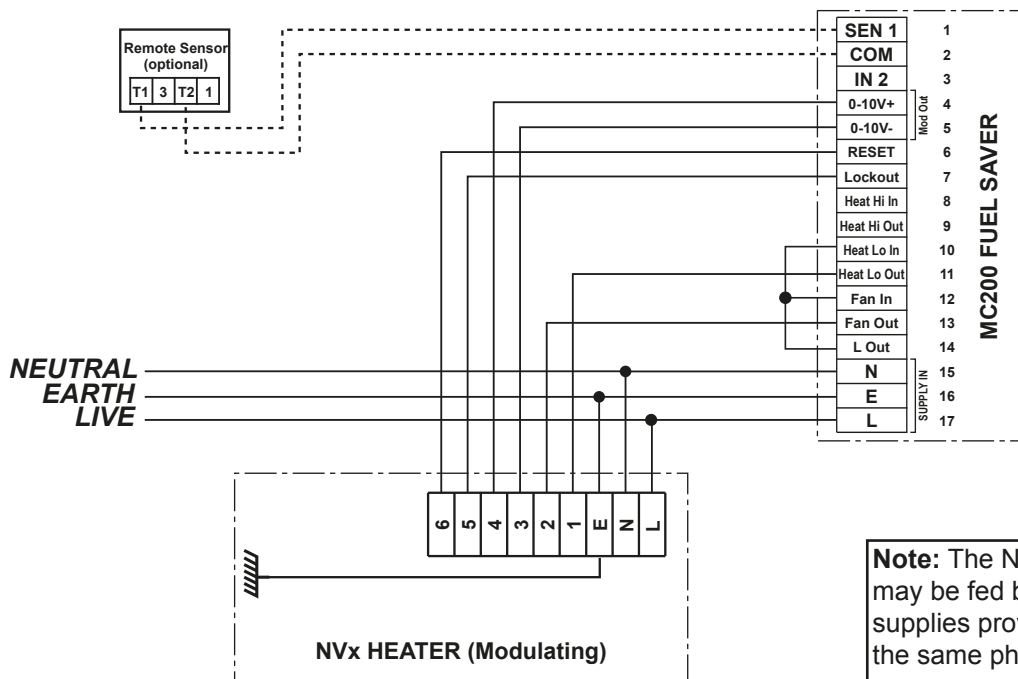




**MC200 CONTROLLING
On/Off NVx**



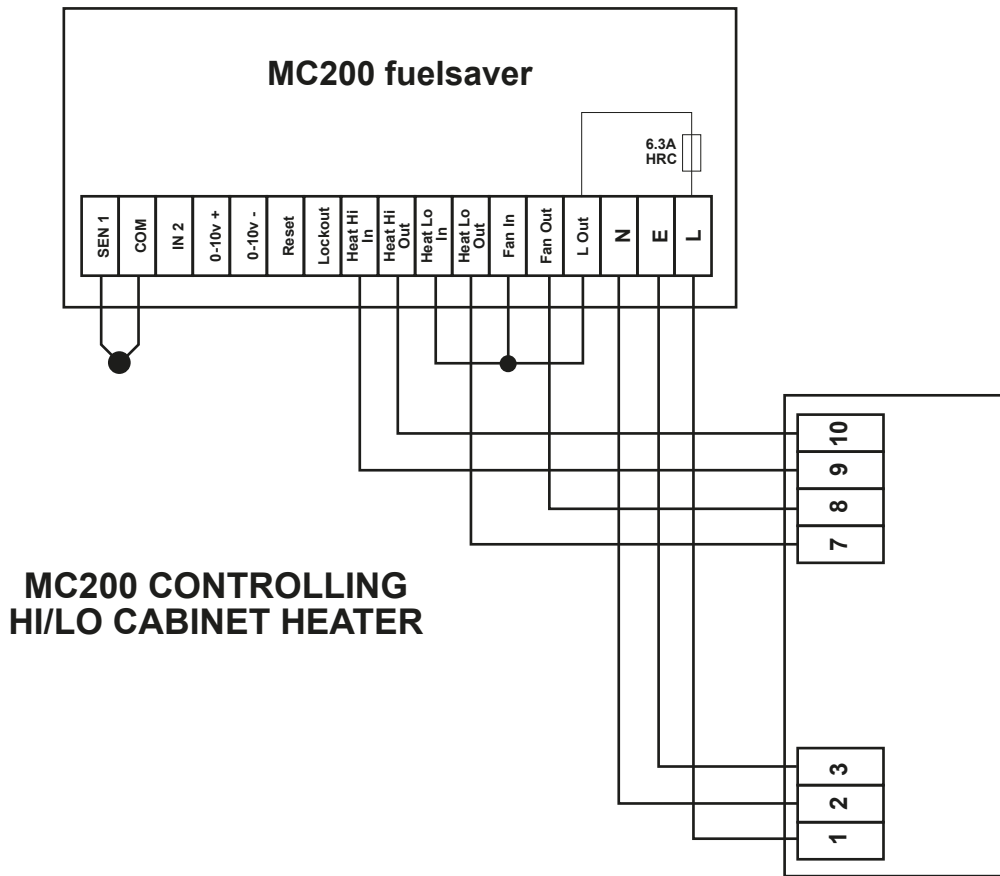
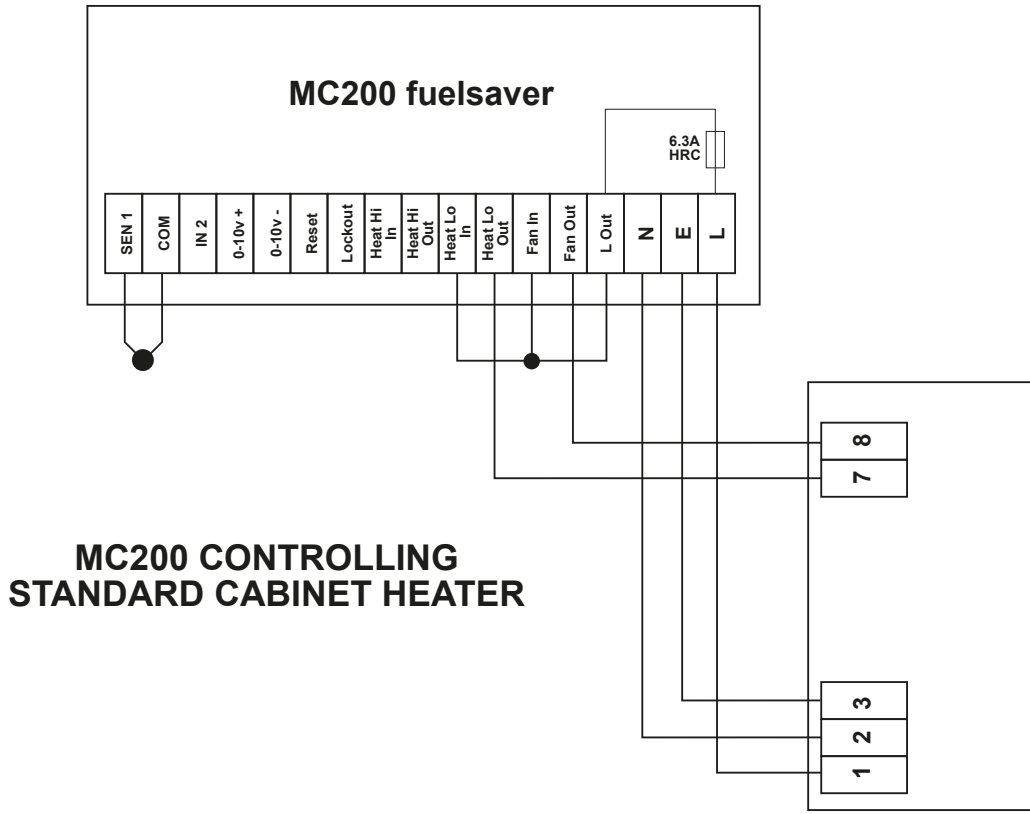
**MC200 CONTROLLING
Hi/Lo NVx**

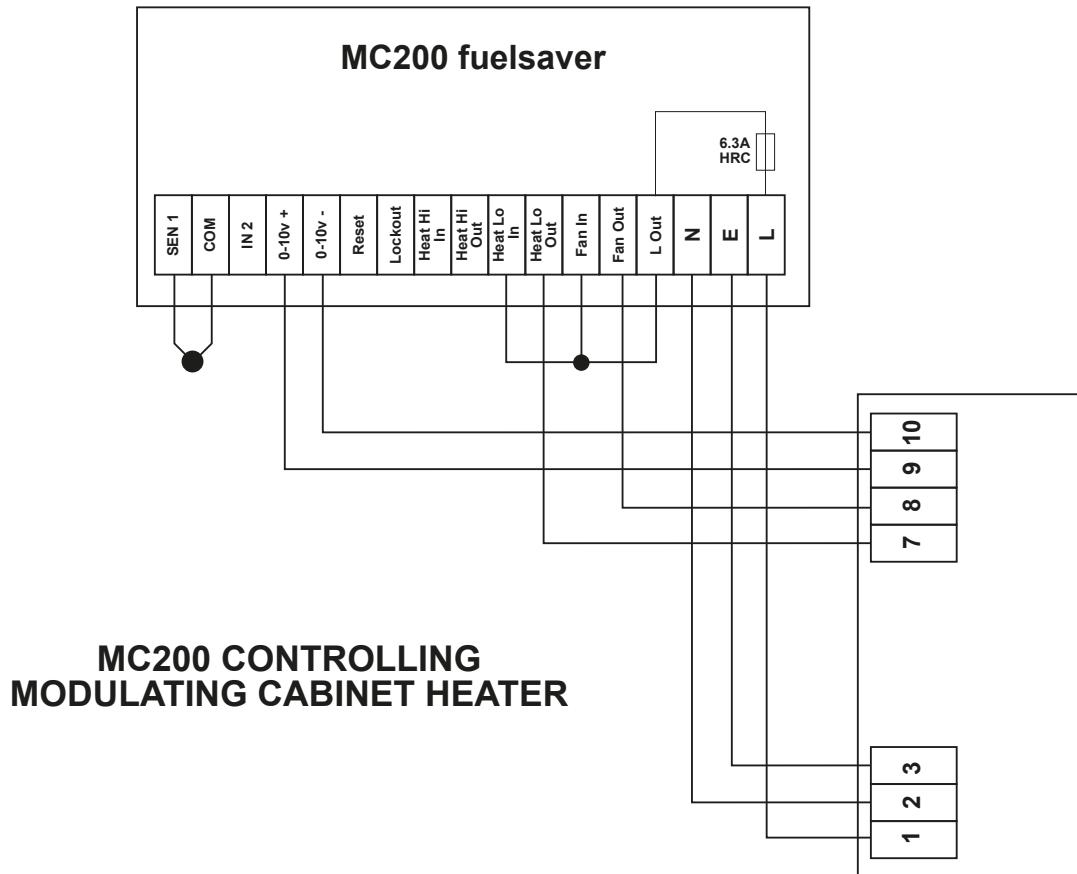


**MC200 CONTROLLING
Modulating NVx**

Note: The NVx Heater and MC200 may be fed by separate electrical supplies providing both supplies are the same phase.

Warning: If external controls are not isolated 230V may be present at heater terminals even when the heater is isolated.





**MC200 CONTROLLING
MODULATING CABINET HEATER**

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Ind. & Comm. Air Heaters;
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