Remote Lighting Controller V4
FEC Type: HP0832
User Manual – Specification – Diagnostics

RLC Version 4 Issue: 4   25th May 2022
Note that this manual relates to
Software V4.05 and SMS V7.5 onwards

Table of Contents

Document Revision Sheet

Version - Issue	Date	Changes
4 - 1	26th June 2020	New Document for RLC V4 Production model
4 – 2	10th October 2020	Updated for software version 4.01
4 - 3	16th August 2021	Details of 12V DC power supply option
4 - 4	25th May 2022	Sequential and Concurrent Channel modes added

Notes

1)   this manual covers all commands available to the Manager and User. Additional commands available to FEC, System and the OEM are contained in separate documents.

1   Compliance Statement - USA

FCC Compliance WARNING

Changes or modifications to the transmitter not expressly approved by the manufacturer could void the user's authority to operate this RF device.

FCC Compliance Statement

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

1. This device may not cause interference, and

2. This device must accept any interference, including interference that may cause undesired operation of the device.

USA-Federal Communications Commission (FCC)

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy. If not installed and used in accordance with the instructions, it may cause harmful interference to radio communications. However, there is no ensured specification that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by tuning the equipment off and on, the user is encouraged to try and correct the interference by one or more of the following measures:

• Reorient or relocate the receiving antenna.

• Increase the distance between the equipment and the receiver.

• Connect the equipment to outlet on a circuit different from that to which the receiver is connected.

• Consult the dealer or an experienced radio/TV technician for help.

Any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

2   Compliance Statement – Europe

EU Declarations of Conformity for the Bluetooth and Cellular radio modules are included in the appendix.

This product has been marked with the CE mark to show it is compliant with the relevant standards.

3 Overview

The Remote Lighting Controller (RLC) is a fully digital design that combines ease of installation and use with sophisticated yet simple and secure configuration via the IP65 rated keypad and LCD display or via SMS. This manual relates to the RLC Version 4. Throughout this document the RLC is referred to as the Controller.

3.1 Key Features

- Traditional VHF Pilot Controlled Lighting configuration
- Simple 25kHz/8.33kHz frequency setting through front panel – no fiddly switches
- Defined number of presses to activate Channels 1, 2 or 3
- Programmable timeout for VHF, keypad and Cellular/LAN activation
- Each channel has fully independent time-out (10 seconds to 60 minutes)
- VHF and Cellular operation can be remotely enabled/disabled for extra security
- FCC/EU approved, Integrated Bluetooth module for local SMS control
- Sequential and Concurrent channel operating modes
- Secure PIN code protected SMS commands to monitor and control your installation
- Secure status reporting – check out your installation before taking off
- Remotely activate Channels 1, 2 or 3
- 3 Status relay contact outputs for BMS interface
- 4 Auxiliary and 1 BMS input for switching or BMS control of VHF receiver
- Five 20 Amp heavy duty relays (3 Channels, Windsock & Beacon)
- Local and remote test and diagnostics integrated into the unit
- Very low power consumption – Approx. 3W (idle) and less than 30W max. (including internal winter heater)
- Operates from 110-240V AC 50-60Hz or 12V DC (ideal for solar and batteries)

3.2 Part Numbers

Standard Equipment

RLC V4 Base System	HP0832	

Optional Extras

Interface Harness	HP0827	

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NB – Reference is made in this manual to Cellular, LAN and Wi-Fi interfaces. These have subsequently been withdrawn as options. Ignore reference in this manual to them.

FEC and Interleader Ltd have a policy of continuous product improvement and reserve the right to change specifications of products. See website for latest details.

4 Architecture of Remote Lighting Controller

Effective operator or pilot control of Helipad Lighting is critical to the safe operation of an installation. Traditional radio Pilot Controlled Lighting (PCL) solutions using the VHF radio is a tried and trusted method.

Now there is a new way to control your lighting and peripheral circuits using FEC's new Controller which integrates both traditional VHF PCL and adds Systems Management Software (SMS) control and monitoring with the option of automatic weather reporting (wind speed/direction, temperature, dew point and pressure) right from your helipad.

FEC's Controller sits at the heart of a monitoring and control capability bringing together for the first time remote lighting control, helipad weather and system reporting.

The architecture can be used simply to control lights or, with additional meterological sensors, to provide richer monitoring and reporting both by helipad operators and other agencies.

All of these features are under the full and secure control of the owner/operator and are the basic building blocks on which future FEC developments will be built.

RLC V4 Architecture
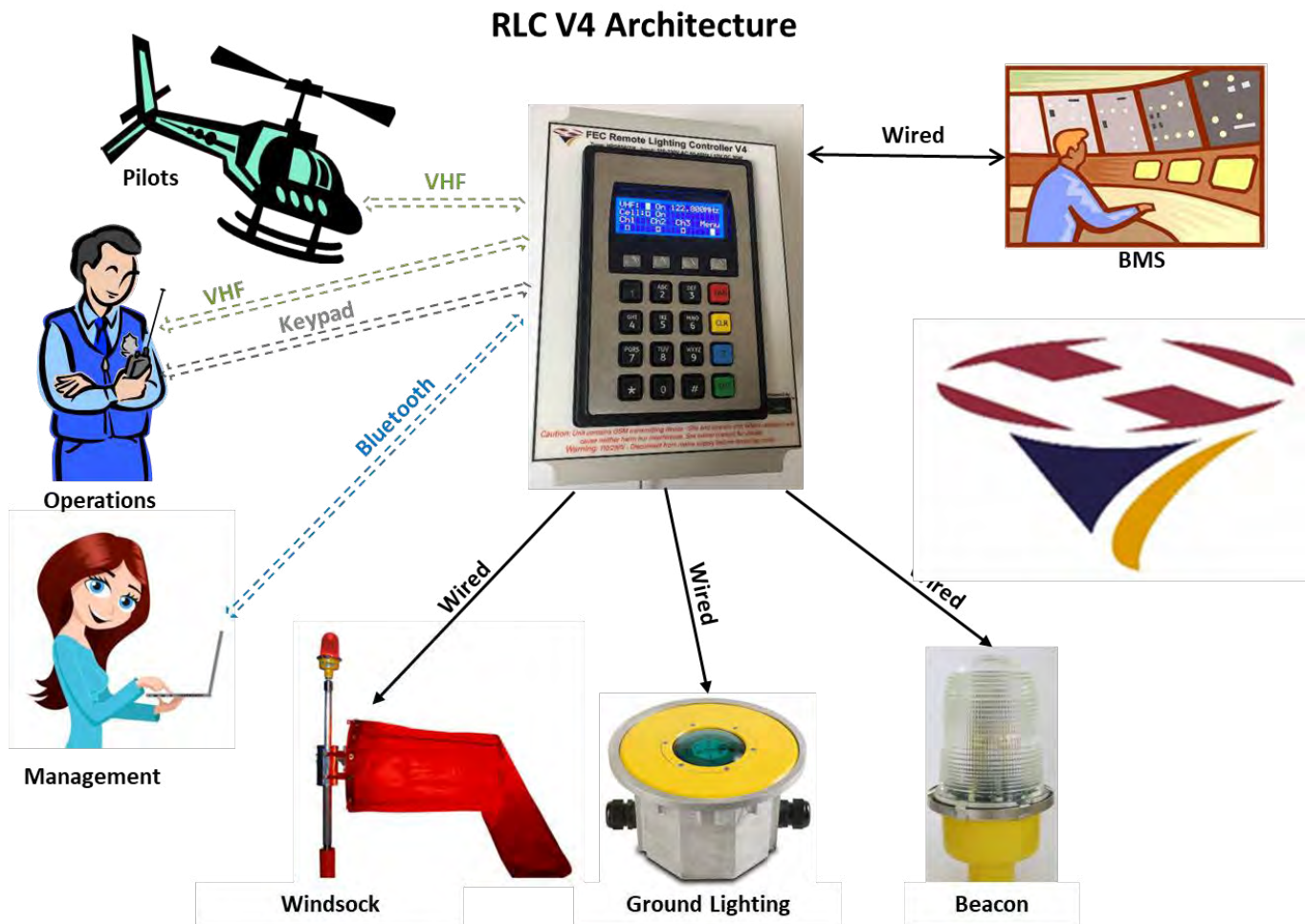
5 Principles of Operation

5.1 Keypad and LCD Display - Overview

The basic functions of the Controller are configurable via the front panel keypad and screen.

Basic setup, test and monitoring of the controller is carried out via the front panel keypad and LCD display. There are no controls inside the case.

The menus are arranged in a hierarchical structure with a consistent presentation format and key operation. Extensive use is made of the 4 'Function Keys' above the main 16 key keypad and, in conjunction with changing legends on the screen, intuitively guide the user through the various steps.

Key features of the interface are shown below.

LCD Screen Common Layout

Line 1 indicates the menu level

Line 2 provides instruction

Line 3 Indicates the 'Function Keys' function

Line 4 identifies the keys and their status

Function Keys 1-4 (left to Right)

Data Entry Keypad

In the example to the left:

The 1st line indicates VHF Radio on 122.800MHz.

The 2nd line indicates Cell Radio on.

The 3rd line confirms the function of each key.

The 4th line represents the Function Keys.

Note that in some menus the boxes in the 4th line also give the current status of that function. For example, in the Test Output (O/P) test mode, the relays can be set and unset individually. As they change state the squares change from open to solid to indicate the active state.

Note that in some menus more information is provided and hence the exact layout above not followed. The approach is the same and where there are differences instructions provided.

F4, usually marked 'Exit', returns to the previous level in the menu and in many screens accepts the conditions set in that menu. If Marked 'Quit' then that screen is discarded before return.

Repeatedly pressing F4 will bring you back to the main menu.

5.2 Systems Management Software – Overview

All FEC products can be configured, tested, controlled and monitored with the Systems Management Software (SMS) via a Bluetooth (included in all products).

SMS runs on any PC, Laptop or Tablet running MS Windows 10 and which supports Bluetooth LE (V4.X). The main menu displays the products supported:
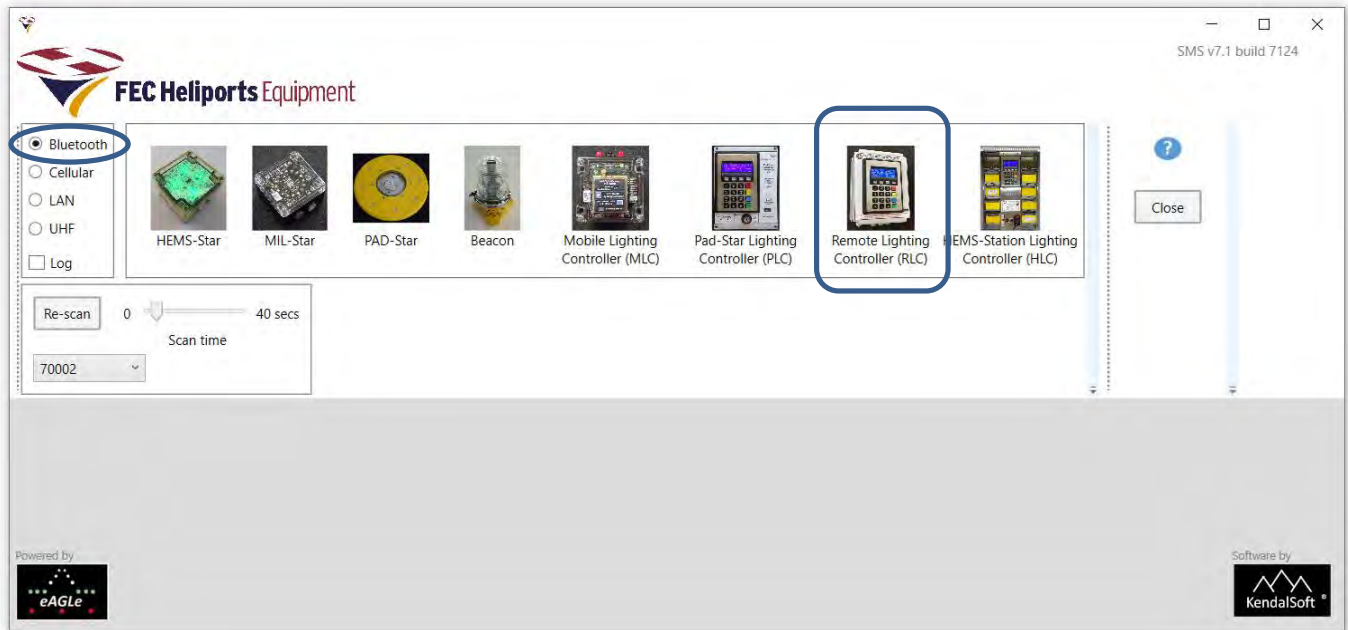
Select the link type ⬭ (default is Bluetooth) and SMS will find all of the FEC products in range and turned on. In this case it has found device serial number 70002 which is an RLC.

Click on the RLC image ▢ and SMS will connect to the desired device:
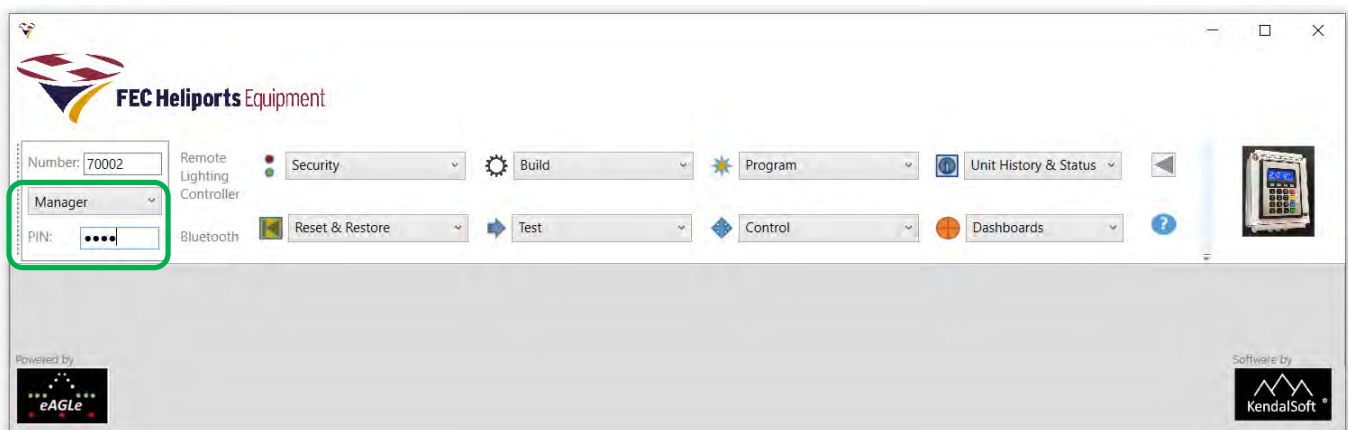
This is the main Controller Menu. To access the device through the menus, select your User Type (example is Manager) and the relevant PIN ▢. The Sub-menus are covered in later sections.

5.3 User Types

Users of the system are classified by User Type. For security, each User Type has a unique PIN code associated with it and different levels of access. User Types and their basic attributes are:

User – This is generally the pilot who has been given permission to use the system.

Manager – This is the owner or operator of the facility.

FEC – FEC have defined access to certain options (e.g. reset the Operators PIN).

System – Machine to Machine system interface for data logging

OEM – The Original Equipment Manufacturer has defined access to perform diagnostic and support options.

Each type of user has a PIN access code and are arranged in a hierarchical manner – User has the fewest privileges, OEM the most, to perform a variety of tasks on the system.

5.4 Modes of Operation

After the initial start-up sequence, when the system checks out its sub-systems, the Controller enters its operational state continuously monitoring all of the triggers that can activate channels or provide responses to either the Bluetooth, Cellular Radio Module or LAN interfaces.

The exception to this is when a user enters the menu mode from the keypad to perform setup or testing operations. During this access all other inputs are ignored.

To avoid the Controller becoming 'stuck' in this state, after 10 minutes the Controller will return to its main operational state. As an additional security measure, if PINs are not entered within 5 seconds of each other, the screen times out and returns to the main menu. Also, if the wrong code is given this is advised and a return made to the main programme.

Warning - Once the Menu Mode is selected, the system no longer monitors the VHF, radio or LAN receivers and will not respond to remote commands. All setups should be performed when it is known that no movements requiring the lighting controller are required

5.5 Channels

The Controller uses the concept of 'Channels'. Channels are activated via Start-Up, Inputs, the Keypad, VHF or SMS. Channels are then mapped to control which relays are activated.

The default settings are as follows:

Keypad Action [1]	VHF Action	SMS	Default Relay Activated
Function Key # 1 Pressed	3 'clicks'	Channel 1	Relay 1 activated
Function Key # 2 Pressed	5 'clicks'	Channel 2	Relay 2 activated
Function Key # 3 Pressed	7 'clicks'	Channel 3	Relay 3 activated
<CAN> Manager only	6 or 8 'clicks'	Channels Off	All relays de-activated

Notes:

1) 3, 5 & 7 clicks are the default but can be changed to any desired unique number per channel
2) Any combination of relays can be activated instead of the defaults (see later section)
3) If Timeout Alert is active, The Winsock is flashed according to the parameters set through SMS (default 10 minutes).

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[1] By default, no PIN is required to activate channels via the keypad. This can be changed via SMS

5.6 Activation Options

There are five ways to activate channels:

- *Start-up* and *Wired Inputs* trigger channels to stay on until turned off, and
- *Keypad, VHF* and *SMS* all start timers to de-activate the channel after a defined period for each channel.

1) **Start-up** The Controller can be configured so that at start-up (or after a power-cut) a specified channel is activated.

   The Controller remains in this state until another trigger. This is a 'fail-safe' option of operation. Start-up channels are inactive by default and are configured via SMS.

2) **Wired Inputs** The Controller has 3 inputs (which can be activated by a switch or relay) which turn on the channels with no time-out.

   Wired Inputs have the highest priority of all triggers and once set cannot be cancelled unless the switch/relay is opened.

3) **Keypad** All channels can be triggered by selecting Fn1 – Fn3 keys. The relevant channel will be activated with the time-out timer running.

   By default no PIN is required to activate channels via the keypad but this is configurable via SMS.

4) **VHF** All channels can be activated by a pilot using a series of 'Clicks' - pressing the Push To Talk (PTT) transmit switch in the aircraft. The relevant channel is activated with the time-out timer running.

   Each of the channels 1 -3 have a default number of clicks of 3, 5 & 7 respectively. The number of clicks, including the option to cancel via VHF, are configured via SMS

5) **SMS** Channels can be controlled On (with timer running) or Off via SMS and either the Bluetooth, Cellular Radio or LAN links.

As well as activating the 3 channels, both the Windsock and Beacon interfaces are activated by default.

How channels control these, including a Windsock Alert is configurable via SMS.

Note that in this version of software (V4.05 onwards) channels can be activated in Sequential Mode (default) or in Concurrent Mode. This is selected in the VHF Configuration menu of SMS.

In *Sequential Mode* only one channel can be active at a time (although it can control up to 3 channel, beacon and windsock relays). Activation of a second channel immediately sets that channel on and cancels the current channel.

For example, if channel 1 is active and channel 3 is triggered, channel 1 will be immediately cancelled and channel 3 activated.

Via SMS the controller can be set in *Concurrent Mode* where any combination of channels from any source can be activated at the same time. As noted above, wired inputs take absolute priority and once set will block any other source setting or clearing that channel.

6   Setup through the Keypad and LCD Screen

The top menu is not really a menu but rather the main status display page with two main options:

1) Select the menu, or
2) Directly activate a Channel.

If neither a Cellular Radio nor LAN interface is fitted to the Controller then the start-up checks are skipped. The screen will appear as shown right. No Network device (Cellular Radio or LAN) is fitted.

```
VHF:  ■  On  122.800MHz
Net:  □  None
CH1      CH2    CH3    Menu
  □        □      □      ■
```

If a LAN interface is fitted then after the start-up checks the screen will appear as shown on the right. The LAN interface needs to be tested by using SMS to confirm connection.

```
VHF:  ■  On  122.800MHz
Net:  ■  LAN
CH1      CH2    CH3    Menu
  □        □      □      ■
```

If a cellular radio module is fitted the start-up process includes checking, configuring and connecting to the network. There are more start-up screens showing this progress and it takes 10 seconds. once the system has performed its start-up checks the screen will appear as shown right. A Cell Module is fitted, the receiver is ON - shown by both the filled box and the word 'On'.

```
VHF:  ■  On  122.800MHz
Cell:■  On
CH1      CH2    CH3    Menu
  □        □      □      ■
```

If a cellular radio module is fitted but a network connection has not been made at start-up then the screen will appear as shown right. N/C is short for No Connection. No communication will be possible with the unit in this state. Check all connections, particularly the antenna and re-cycle the power.

```
VHF:  ■  On  122.800MHz
Cell:□  N/C
CH1      CH2    CH3    Menu
  □        □      □      ■
```

The screen provides the essential information to show the status of the system. Including:

Line 1:   The VHF receiver is ON – shown by both the filled box and the word 'On' and the operating frequency is shown – in this example a US UNICOM frequency.

Line 2:   LAN or Cell Radio Module status.

Line 3:   Is the legend and functional description of the function keys

Line 4:   Indicates the status of the channels. In this example, none are active (open boxes) and the Menu is available via the Function Key 4 below it. The Menu box will flash open/solid every second.

By default, the screen remains back-lit all of the time.

To save power (particularly useful in battery powered installations) the LCD screen back-light can be set to 'Auto' in which case it goes out 30 seconds after the last key was pressed or the screen was refreshed. To re-activate the backlight, simply momentarily touch any key and the screen will light up for another 30 seconds.

During an Active Period (when the controller has been activated to turn on the lights) the screen is regularly updated with a down-count to the end of the Active Period and so the screen remains on. See section on SMS system setup.

6.1   Entering Menu Mode

To enter the Menu mode, simply press the function key (F4).
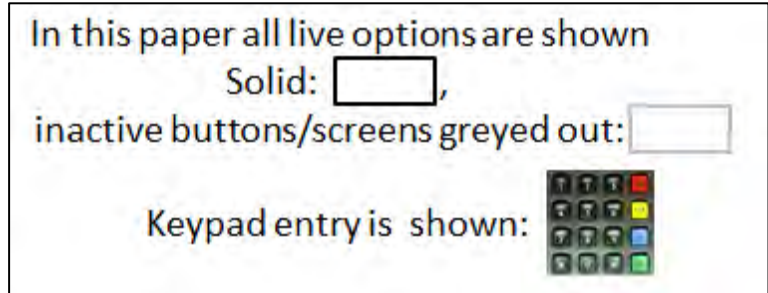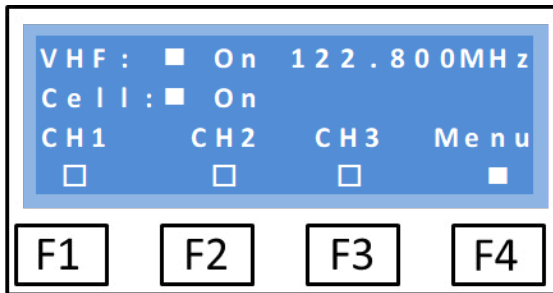
Note that the function key representation above is used consistently throughout the manual.

On pressing F4 (for the main menu) you will be taken immediately to the PIN challenge screen to enter your security PIN. If successful, the Setup Control Unit menu will be displayed.

Level 1 – Main Screen
Main screen shows VHF and Cellular radio status
VHF is On with Frequency 122.800MHz set
Cellular radio is On
All of the 'soft keys' are active:
F1, F2 or F3 select a channel to be activated
F4 selects the main menu

Note
When channels have been
activated the legend changes
To show which are on
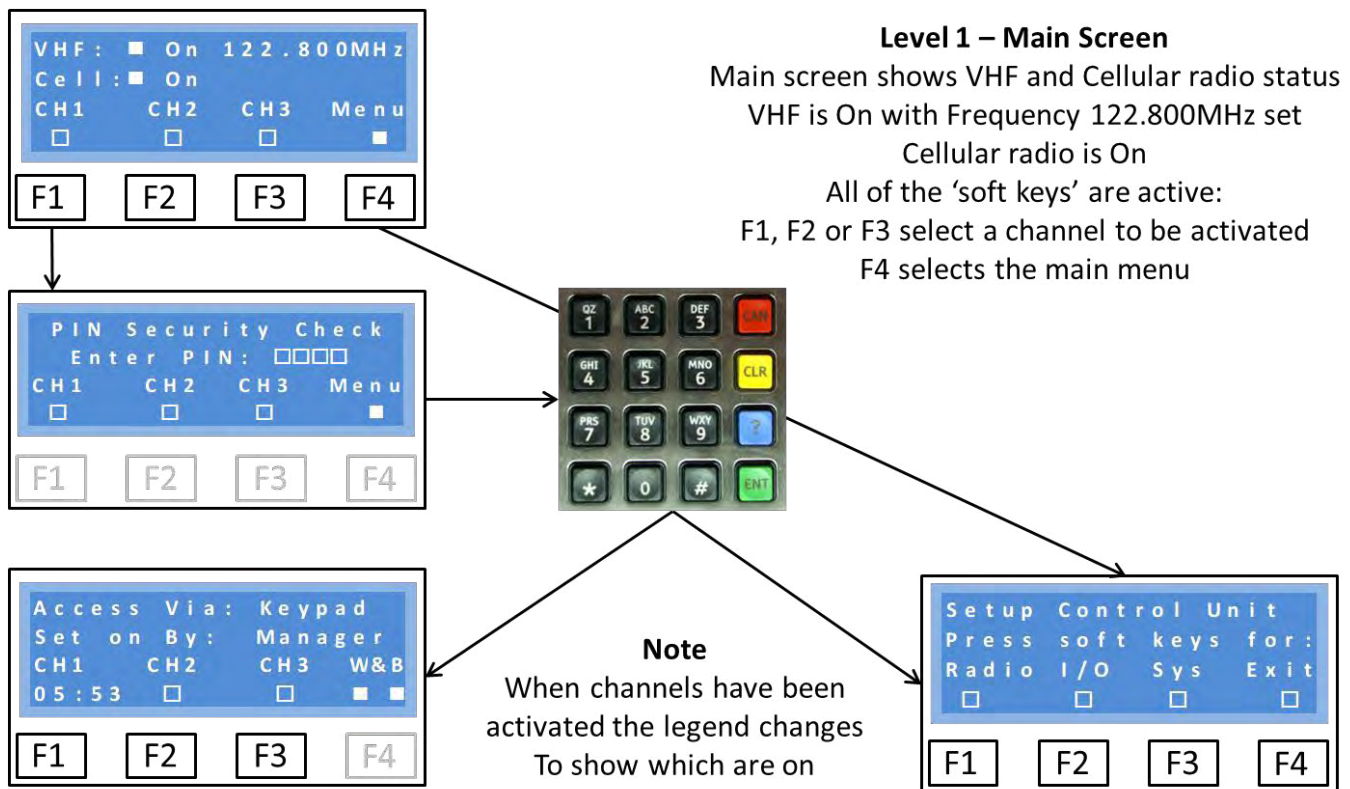
6.2 Setup Control Unit

The Setup Control Menu gives access to basic Radio, Input & Output and system settings. All of these basic functions and many more sophisticated functions are also available via SMS which is the advised method of system configuration and testing.

Level 2 – Setup Menu
The main menu options are:
F1 – Set up and test the radios
F2 – Test the input/outputs
F3 – Set and monitor system variables

This symbol will be used In subsequent sections to indicate a systems setting
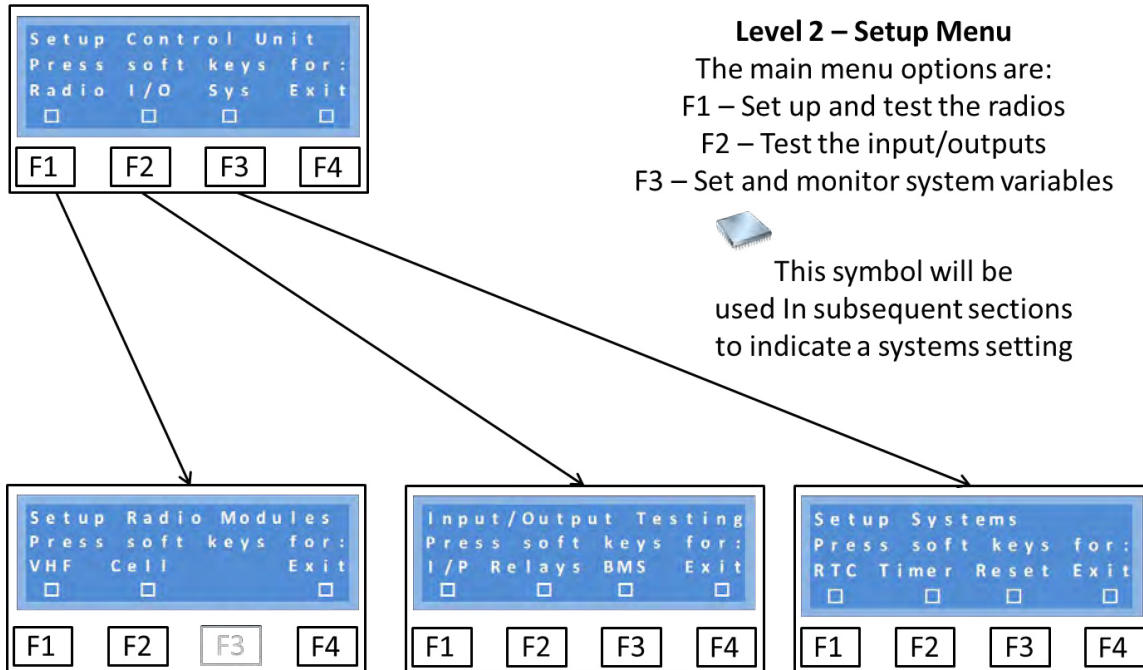
6.2.1 Radio

The Radio menu gives access to the VHF receiver and Cellular Radio module.

Level 3 – Setup Radios Menu
There are two main setup areas:
VHF – Airband VHF radio
Cell – Cellular radio module

These symbols will be used In subsequent sections to aid menu navigate

6.2.1.1 VHF Receiver

Level 4 – VHF Main Menu
F1 – Set VHF frequency*
F2 – Set sensitivity & 'click' period
F3 – Reads the VHF receiver
F4 - Exit – to previous menu
* 8.33/25kHz Channel spacing supported

The Received Signal Strength Indicator (Rssi)
is updated every second to allow signals
to be measured
F4 – Exits

6.2.1.2 VHF Frequency Setting

The international channel convention of 8.33kHz provides 16 channels per 100kHz of bandwidth and as a consequence not all frequencies are available. For example, 134.810 is valid but 134.815 is not.

Frequency reading

Note that in the screen (over the page) the frequency is displayed as 134.808MHz even though the channel selected is 134.810. This is because the channels are a simplified and rounded (down or up) representation of the frequency used.
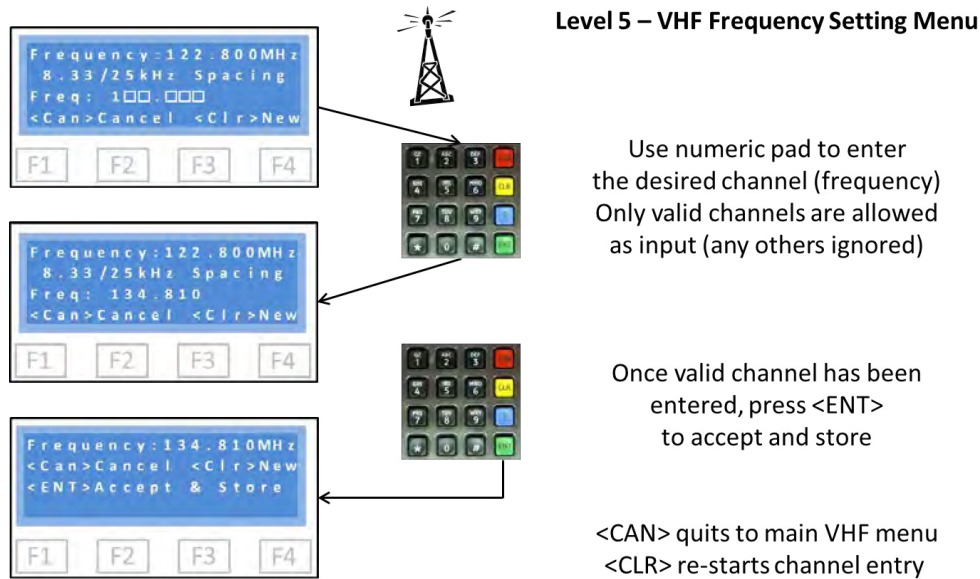
A table showing the first 16 channels versus their frequency is shown below. The user does not need to know any of this detail.

Channel	Frequency	Channel	Frequency	Channel	Frequency	Channel	Frequency
118.000	*118.0000*	*118.025*	*118.0250*	*118.050*	*118.0500*	*118.075*	*118.0750*
118.005	118.0000	118.030	118.0250	118.055	118.0500	118.080	118.0750
118.010	118.0083	118.035	118.0333	118.060	118.0583	118.085	118.0833
118.015	118.0166	118.040	118.0416	118.065	118.0666	118.090	118.0916

Note that the 25kHz spacing channels (italics) are an exact frequency but that the 8.33kHz channels are not.

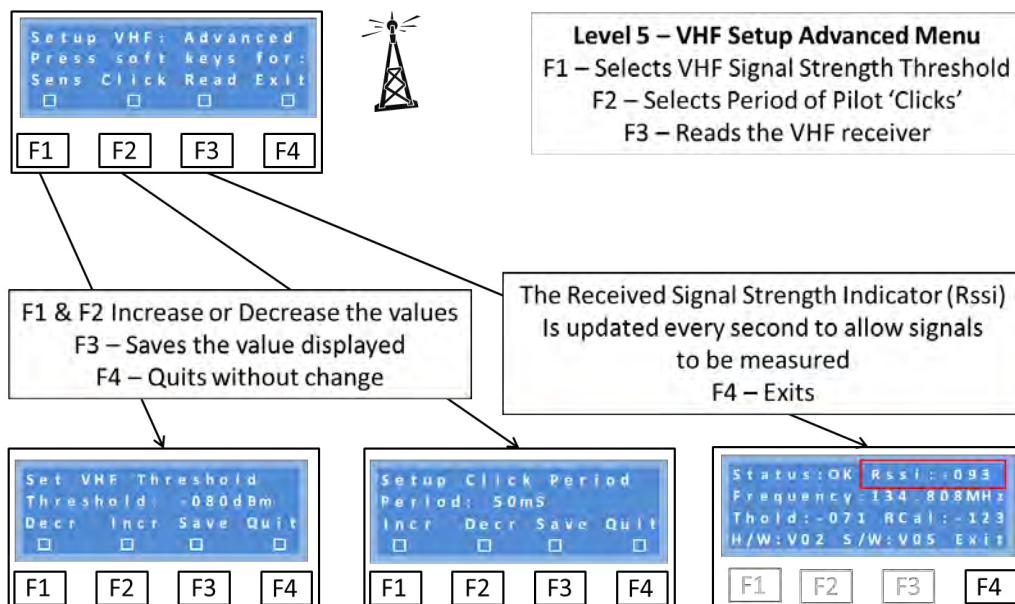This pattern is repeated every 100kHz for all 3,040 channels.

Level 5 – VHF Frequency Setting Menu

Use numeric pad to enter
the desired channel (frequency)
Only valid channels are allowed
as input (any others ignored)

Once valid channel has been
entered, press <ENT>
to accept and store

<CAN> quits to main VHF menu
<CLR> re-starts channel entry

Frequency (Channel) Setting – as each number is entered it is checked to ensure that the frequency (channel) is valid. If valid the number entered is displayed and the cursor moves to the next space. Any invalid entries are ignored, nothing is displayed and the cursor does not move.
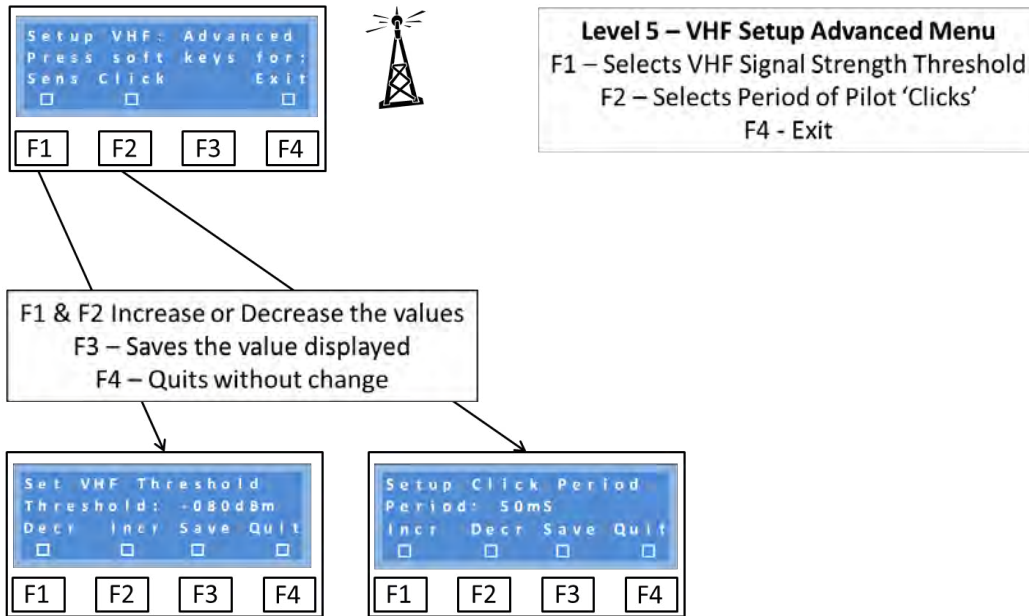
Once all numbers have been entered the system has ensured a correct and unique channel. The full frequency is displayed (screen 3) and confirmation requested (<ENT>).

6.2.1.3 Setup VHF Receiver – Advanced

There are currently three menu options to:

1) Set the sensitivity of the VHF receiver threshold detection level (this is analogous to a 'squelch' on earlier systems)

2) Set the minimum period of the Pilot 'Clicks' (presses of the Push To Talk – PTT button), which will trigger the system, and

3) Read the radio parameters in real time. This is an essential part of the setup process.

Level 5 – VHF Setup Advanced Menu
F1 – Selects VHF Signal Strength Threshold
F2 – Selects Period of Pilot 'Clicks'
F3 – Reads the VHF receiver

F1 & F2 Increase or Decrease the values
F3 – Saves the value displayed
F4 – Quits without change

The Received Signal Strength Indicator (Rssi)
Is updated every second to allow signals
to be measured
F4 – Exits

Level 5 – VHF Setup Advanced Menu
F1 – Selects VHF Signal Strength Threshold
F2 – Selects Period of Pilot 'Clicks'
F4 - Exit

F1 & F2 Increase or Decrease the values
F3 – Saves the value displayed
F4 – Quits without change

Sensitivity – Setting the threshold

The Threshold is the level of Received Signal Strength at which the receiver is set to detect the carrier signal (so called Carrier Detect) and is expressed as the power at the aerial socket.

By default it is set to -75dBm and can be varied between 0dBm and -125dBm (where 0dBm is the highest level and -125dBm the lowest).

Great care should be exercised in setting the threshold too low (less than -80dBm) as noise may cause false triggers. Equally if very high signal levels are experienced, an attenuator may need to be introduced to the aerial feed.

Before changing the threshold level, read the section about the display of RSSI (Read command below) as this will give good information about the local conditions.

Click – Setting the minimum PTT press period

As well as setting the signal level at which the system will trigger, the minimum length of time that the Push To Talk (PTT) switch is activated can also be set.

This 'Click' period helps mitigate against the effects of 'noisy' switches which can otherwise cause problems of false activations.

The system employs digital filtering of the received signal and waits for the signal to be stable above the threshold level for the 'Click' time before it counts as a genuine PTT press.

Each click is counted in a 5 second period and if 3, 5 or 7 clicks successfully received, channels 1, 2 or 3 are set (see later section on mapping of channels to relays).

The default setting for Click is 100ms (100 milliseconds) and can be set between 1 and 250mS. Some experimentation may be necessary to ensure correct operation in any particular installation.

Reading the VHF receiver status

Selecting 'Read' retrieves and displays all of the relevant status registers from the VHF receiver.

Of importance to the operator are:

1) That the status is OK
2) The Rssi level of the received signal
3) That the Frequency is as set and expected
4) That the Threshold level is as set and expected


```
Status:OK   Rssi:-093
Frequency:134.808MHz
Thold:-071   RCal:-123
H/W:V02   S/W:V05   Exit
```
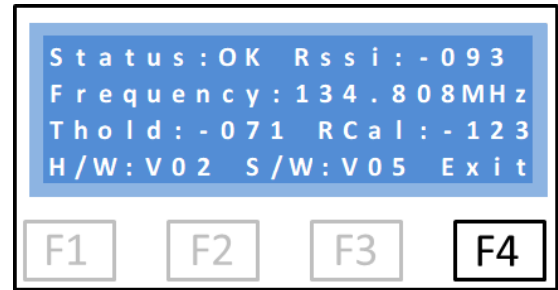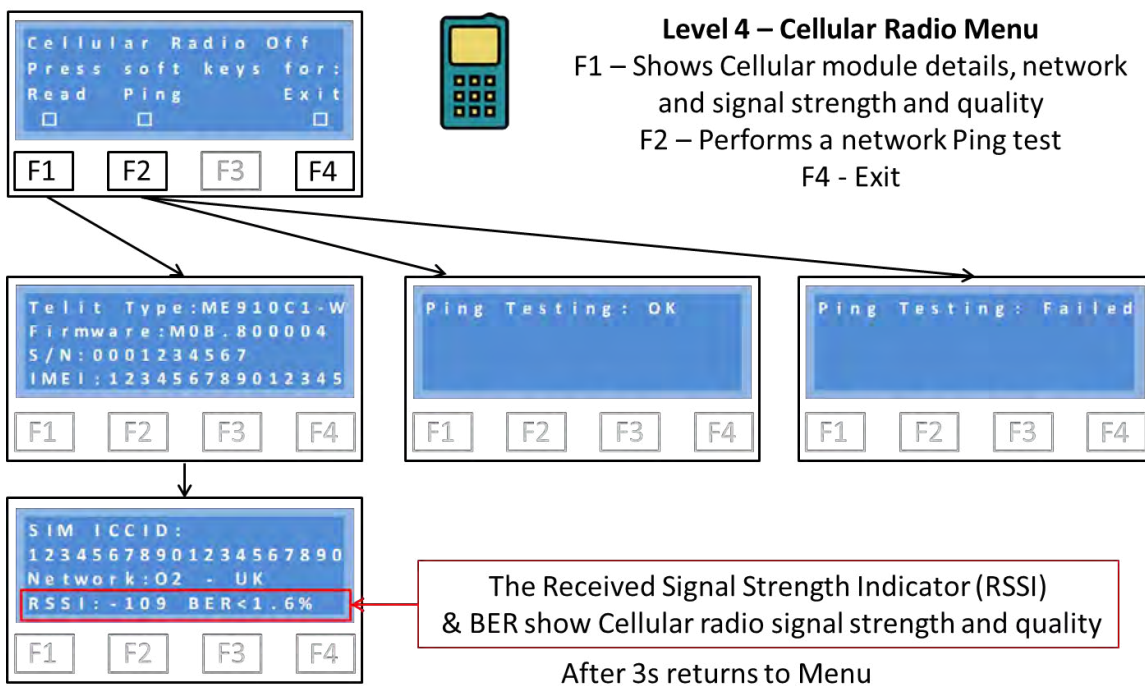
Once this command is invoked, the receiver will be continuously re-read every 1 second and the Rssi figure will be updated. This is extremely useful in checking the installation (aerials, down-feed etc.) and setting up the receiver.

6.2.2 Cellular Radio

If a cellular module is fitted the basic module details, signal strength and quality can be obtained and a network 'ping' to test the network connection are available.

These simple routines are useful in fault finding and diagnostics.


```
Cellular Radio Off
Press soft keys for:
Read   Ping       Exit
```

Level 4 – Cellular Radio Menu
F1 – Shows Cellular module details, network and signal strength and quality
F2 – Performs a network Ping test
F4 - Exit

```
Telit Type:ME910C1-W
Firmware:M0B.800004
S/N:0001234567
IMEI:123456789012345
```

```
Ping Testing: OK
```

```
Ping Testing: Failed
```

```
SIM ICCID:
12345678901234567890
Network:O2 - UK
RSSI:-109  BER<1.6%
```

The Received Signal Strength Indicator (RSSI) & BER show Cellular radio signal strength and quality
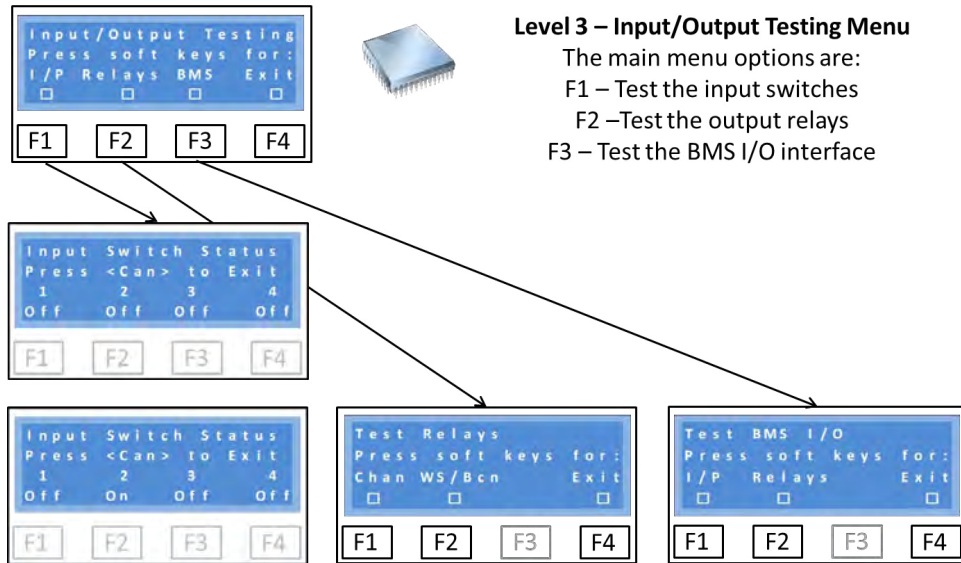
After 3s returns to Menu

Read returns the basic information about the module and the network characteristics. In the example above the module is attached to the UK O2 network with a reasonable signal strength and low Bit Error Rate (BER) which is a measure of network quality.

Ping performs a network access ping to the service provider network. This test will take a few seconds to complete.

6.3 Input and Output Testing Menu

The 4 inputs, BMS input and 3 relays, 3 channel, Windsock and Beacon relays can all be tested through the Input/Output Testing menu.

These tests are extremely useful during installation to check that all of the interface

Level 3 – Input/Output Testing Menu
The main menu options are:
F1 – Test the input switches
F2 –Test the output relays
F3 – Test the BMS I/O interface

In the lower left screen above input 1 has been made active and is shown in line 4 as 'On'.

6.3.1 Test Inputs

The status of the Inputs are displayed.

6.3.2 Test Relays

From the Test Relays Menu either the Channel relays or the Windsock and Beacon relays can be tested.
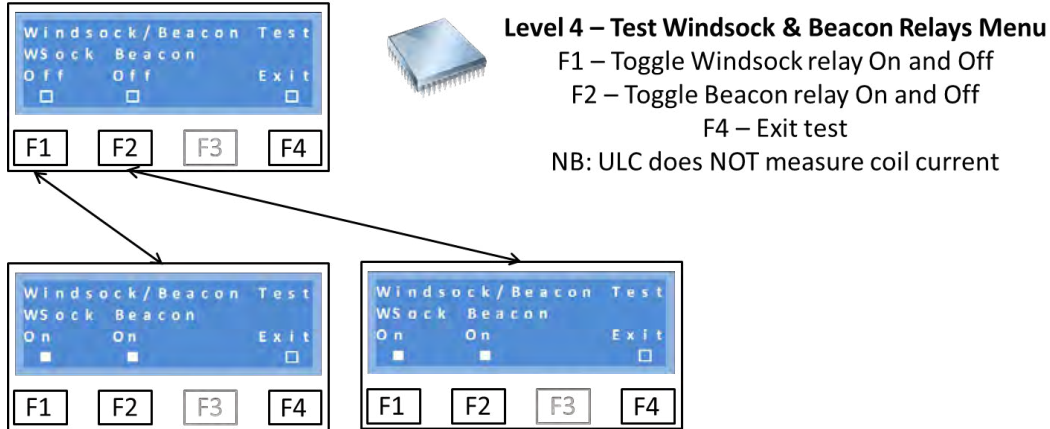
6.3.2.1 Test Channel Relays

Pressing F1, F2 or F3 toggle the three relays 1 – 3 respectively. As the relays are activated a 'clunk' should be heard from the unit. The coil currents of these relays are measured to ensure there is continuity in the circuit. A figure of 100 +/-10mA should be displayed for the active relays.

When de-activated they can be heard disengaging.

Level 4 – Test Channel Relays Menu
F1 – F3 – Toggle relays On and Off
F4 – Exit test

Relay 1: On OK (~100mA)   Relay 1: Fault (000mA)   Relay 3: On OK (~100mA)
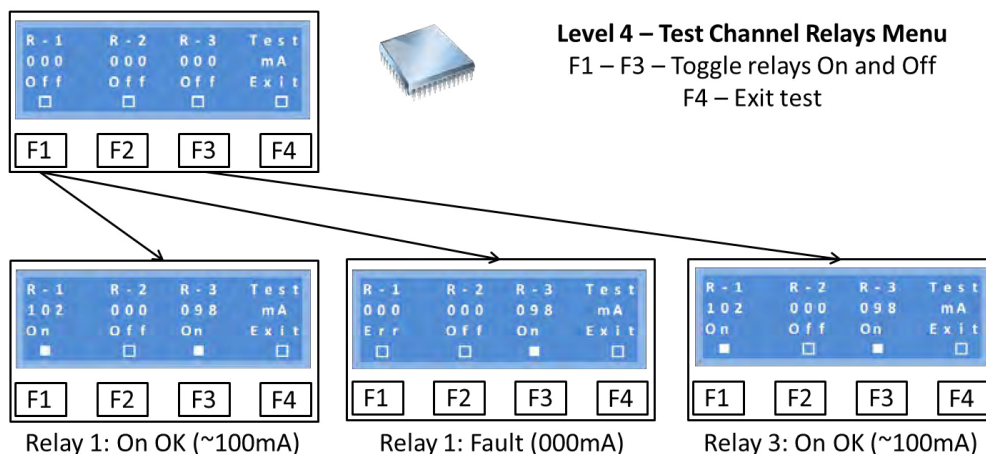
6.3.2.2 Test Windsock & Beacon Relays

The windsock and beacon relays are tested in the same manner as the channel relays. Note that the coil currents are not measured for these relays.
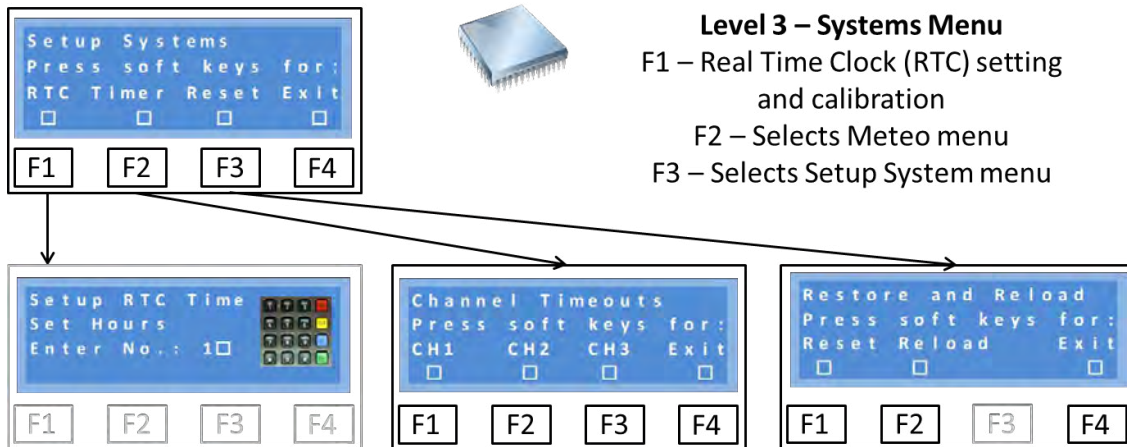

Level 4 – Test Windsock & Beacon Relays Menu
F1 – Toggle Windsock relay On and Off
F2 – Toggle Beacon relay On and Off
F4 – Exit test
NB: ULC does NOT measure coil current

6.3.3 BMS Input and Output Tests

The BMS input and three BMS output relays can be tested.

Level 4 – BMS I/O Menu
F1 – Shows the status of the BMS input
F2 – Toggles the state of the 3 BMS
output relays
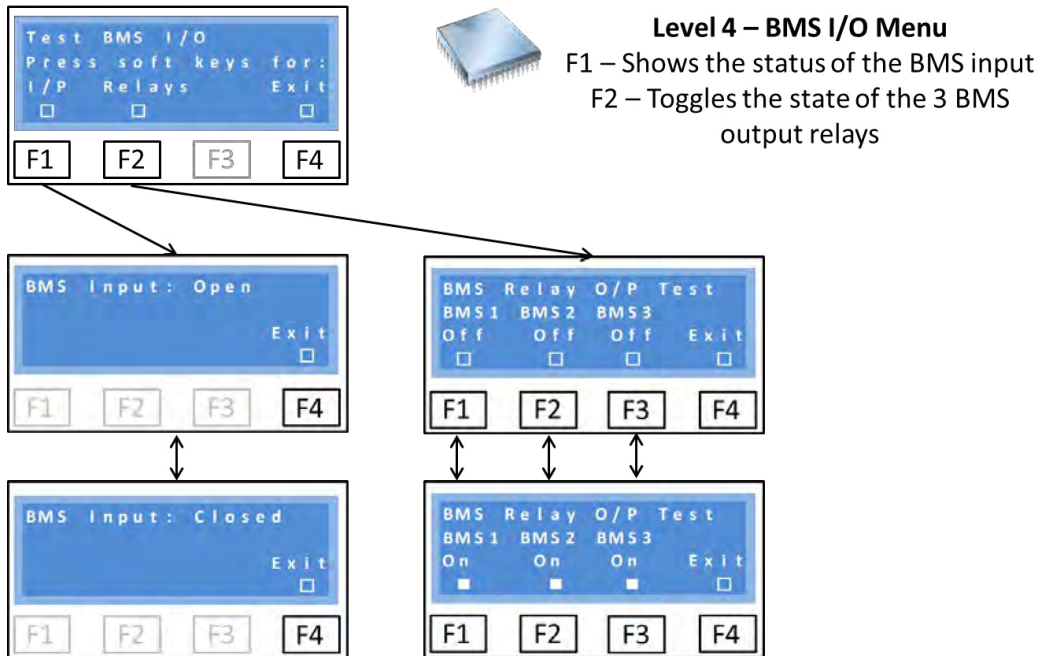
Selecting input monitors the state of the input and displays it. Press F4 to exit.

Each of the 3 BMS relays can be tested by using F1-3 which toggles them on and off. Unlike the power relays, these are small signal relays are inaudible in operation. Us a circuit tester across their output contacts to test action. Schematics are shown in the Appendix.

6.4   Setup Systems

Level 3 – Systems Menu
F1 – Real Time Clock (RTC) setting
and calibration
F2 – Selects Meteo menu
F3 – Selects Setup System menu

6.4.1   Set Channel Timeouts

Level 4 – Set Timers
F1 – F3 Set the timeouts for channels 1 – 3
Then
F1/F2 – Increase/decrease the timeouts in
1 minute increments (10s below 1 min)
F3 – Quit without saving
F4 – Exit saving displayed value

NB: Alert for timeouts less than 1 minute
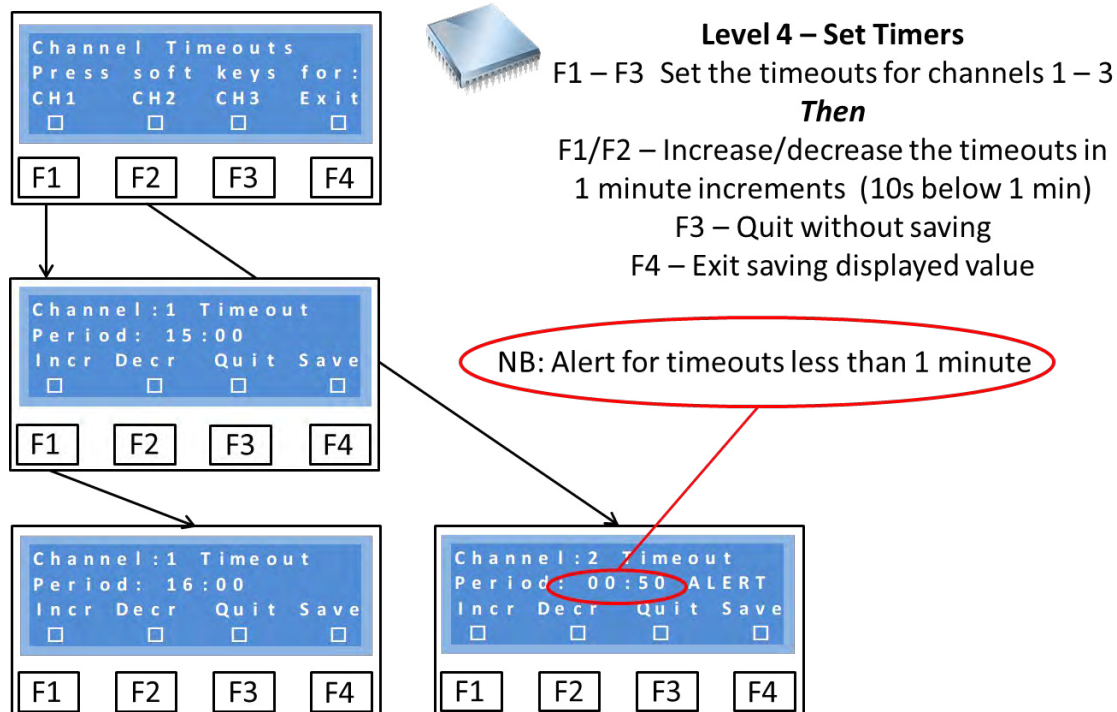
The time-out period for each **channel** to be set in the range (default 15 minutes):

a) 10 seconds to 1 minute (in 10 second intervals), and
b) 1 to 60 minutes (in 1 minute intervals)

Changes are made simply using the F1 & F2 keys and then either quitting or saving when happy with the new value.

NB: The provision of very short time-out periods is to allow the driving of latching infrastructure (either direct contactor switching or a BMS, for example). Such short periods would not normally be used to drive lighting circuits directly.

When using Windsock alert (as required in certain territories) ensure that the channel timeout chosen is longer than the windsock alert period (default 10 minutes).

6.4.2 Set Real Time Clocks

Selecting RTC from the previous menus starts the clock setting process:
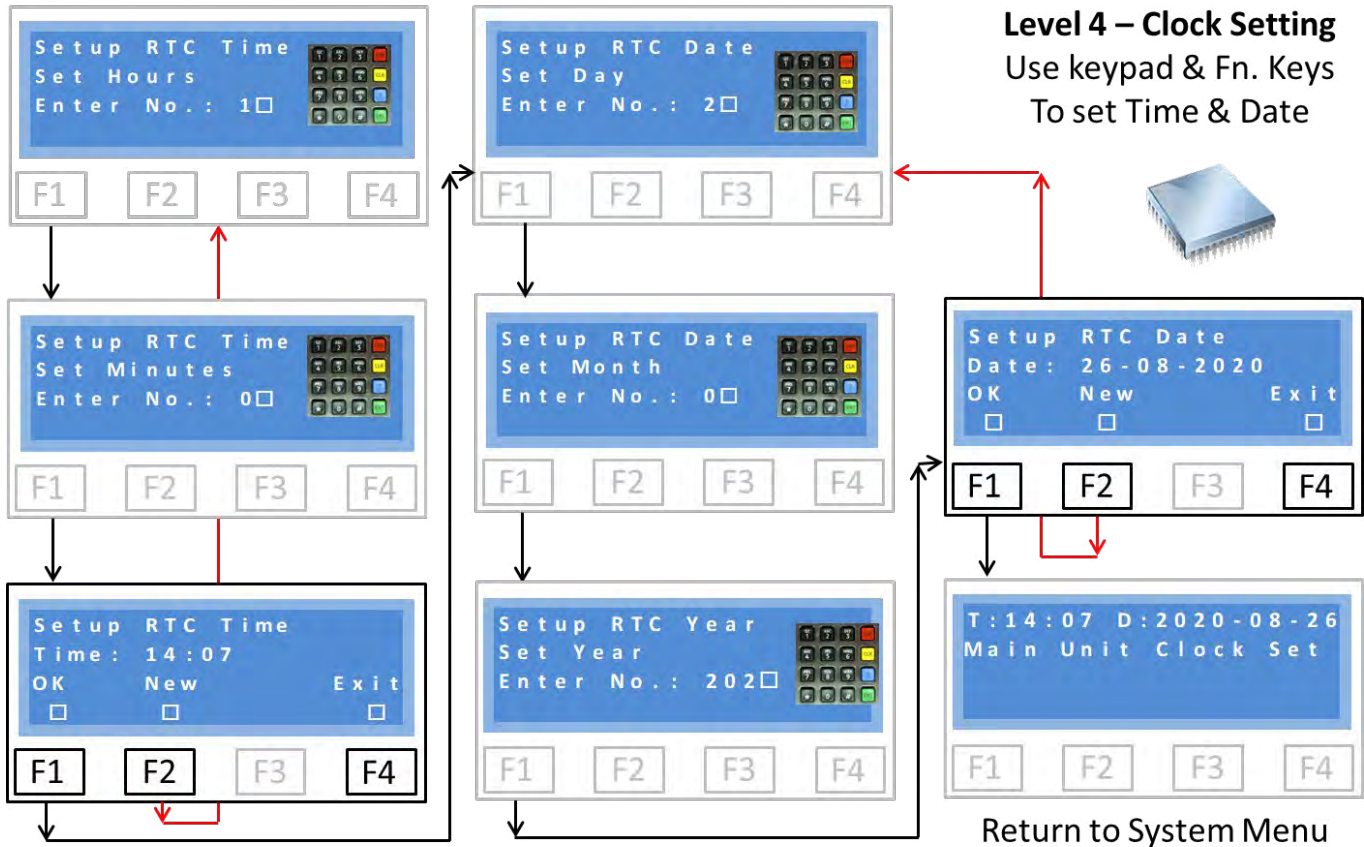
The first screen requests the hour. This must be entered in 24 hour format and as a two digit number. For example, 9 o'clock in the morning would be entered '09' and 5 o'clock in the afternoon '17'.

Immediately that the two numbers for the hours have been entered you are prompted to enter minutes. Again, this is as a two digit number.

Immediately the minutes have been entered the time is shown (bottom left screen) which you can accept (F1 -OK) or reject and start over (F2-New).

Once the time has been correctly entered, the day of the month is prompted for. Again this is in a two digit format. The number is checked to be in the range 01-31 but does not check against the month which is entered in the same way, again being checked to be in a valid range of 01-12.

Once the month has been correctly entered you are prompted for the year. The system pre-fills the Century (20) and accepts all years from 15 - 99.

On completion of the above there is a screen to confirm the date with the same options as before. Pressing F1 accepts the date/time and sets the clocks.

Confirmation that the clocks have been set is displayed for a short period before returning to the main menu.

The clock can also be set via SMS.

6.4.3   Reset and Reload (Software)

Level 4 - Reset and Reload (S/W)
F1 – Resets all factory defaults
F2 – Starts the process to reload the system software
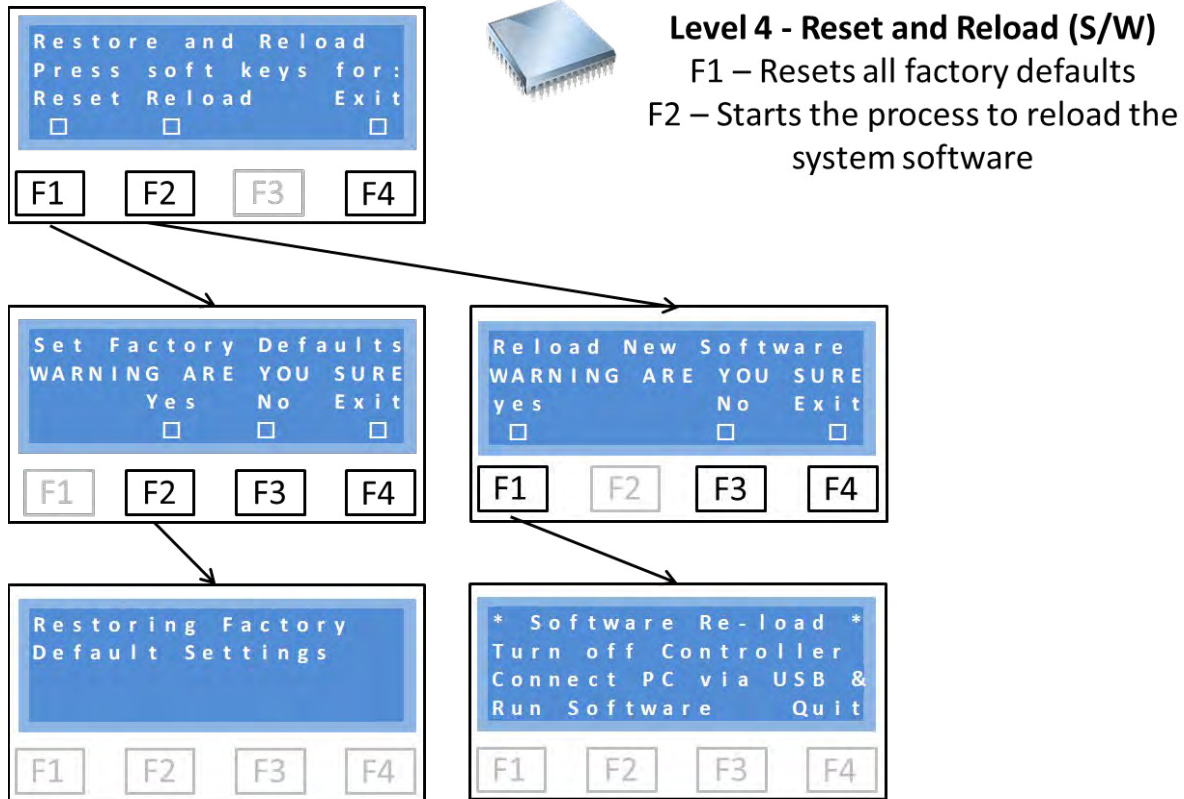
The variables such as VHF frequency and Channel timeouts can be reset to the factory default settings (see Factory Default Settings section later in this manual). Note that all settings are taken back to their factory default state and all user configuration will be lost.

New software can loaded into the controller either via the USB port (the method shown above and in the Appendix) or via a wireless link (Bluetooth or Cellular Radio/LAN if fitted).

7 Operation

In normal operational mode the channels are activated from 5 sources:

1) **Start-up** – On first power-up of the unit (or after a power cut)
2) **Wired Inputs** – Either switch or relay contacts

Channels triggered via 1 and 2 have no timeouts and stay on until turned off

3) **Keypad**
4) **VHF**
5) **SMS**

Channels triggered via 3, 4 and 5 have timeouts and stay on until:

1) Turned off by timeout
2) They are turned off by the Manager, or
3) A new channel is triggered (in Sequential Mode)

By default, activating any channel will turn on both the Windsock and Relay.

In this version of SMS the Beacon and Windsock trigger channels can be set.

In some territories it is necessary to flash the windsock a defined period before the main lighting circuit times-out. e.g.

CASA MoS Part 139 compliance (Australian Civil Aviation) requires:

9.3.1.5 *Ten minutes before the aerodrome lighting system is due to turn OFF, the PAL must cause the lights of at least the primary Illuminated Wind Direction Indicator (IWDI), in accordance with Paragraph 9.6.1.10, to commence to flash at approximately 50 cycles per minute (approximately 0.6 seconds ON and 0.6 seconds OFF), and continue to flash until either:*

(a) the PAL system switches OFF, and all aerodrome lighting, including the IWDI lights, is extinguished; or

(b) the PAL system has been reset for another ON period.

This requirement is fully supported by the Controller and is setup via SMS. Once active, the Windsock relay can be heard engaging and dropping out and the windsock indicator on the LCD will flash.

7.1 Activated via Start-Up

If a channel is selected to be on at Start-up, at power-up that channel will come on and remain on until a further command is given, either to turn it off or to select another channel.

```
Access Via:  Start-up
Set  on  By:     Unknown
CH1     CH2      CH3    W&B
On      Off      Off    ■ ■
```

The LCD screen will show the channel that is on, the access route (Start-up) and who turned it on (Unknown – since no User Type PIN in entered). Note that legends W&B refer to the Windsock and Beacon respectively.

In this example both have come on with channel 1 (default).

7.2   Activated by Input

If a channel is activated via the wired inputs (e.g. switch or relay) it will immediately cancel any other input and set the desired channel. Inputs have priority over every other route. The LCD screen will show the channel that is on, the access route (Input) and who turned it on (Unknown). Again, both the Windsock and Beacon have come on with channel 2.

```
Access Via: Input
Set on By:   Unknown
CH1    CH2    CH3   W&B
Off    On     Off   ■ ■
```
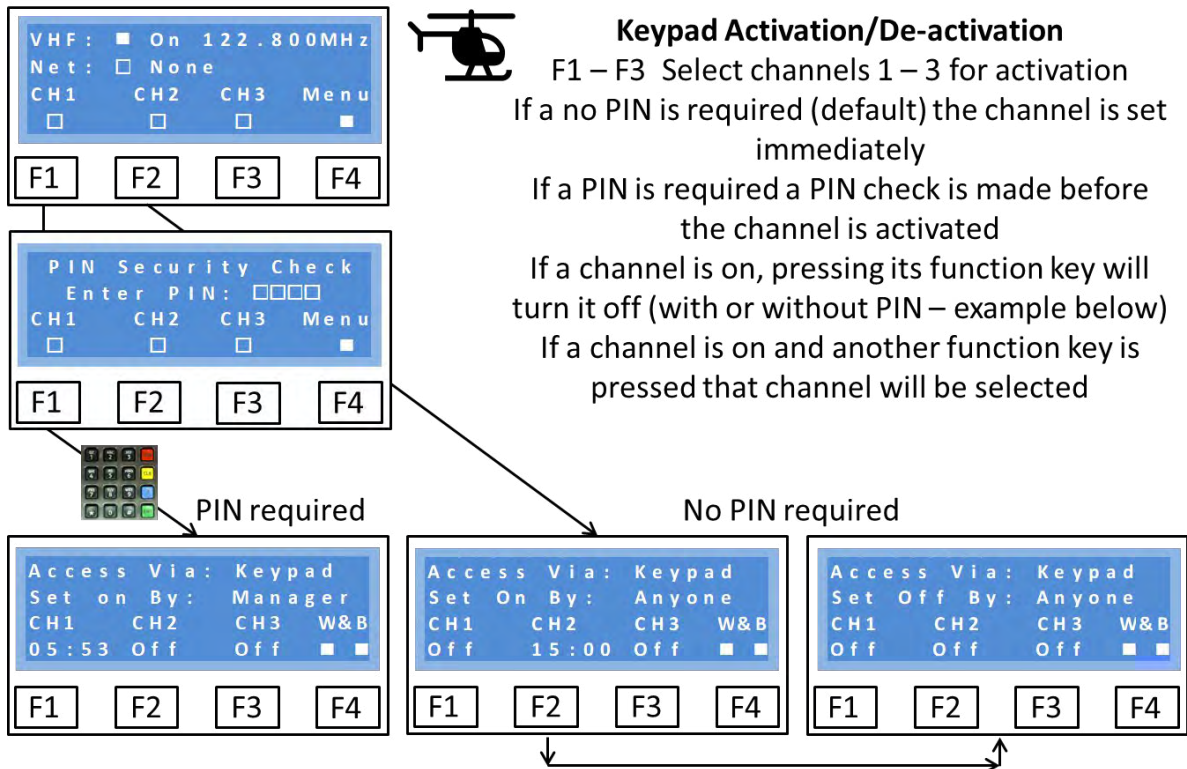
Once the input is de-activated the screen will show that the channels are off. The route (Input) and who turned it off (Unknown) are also shown. This will be displayed for 1 minute after which the screen will change to the main screen.

```
Access Via: Inputs
Set Off By:  Anyone
CH1    CH2    CH3   Menu
□      □      □      ■
```

7.3   Activated by keypad

A channel can be directly turned on or off via the function keys on the keypad. By default no PIN is required to achieve this but this can be changed via SMS.

Keypad Activation/De-activation
F1 – F3 Select channels 1 – 3 for activation
If a no PIN is required (default) the channel is set immediately
If a PIN is required a PIN check is made before the channel is activated
If a channel is on, pressing its function key will turn it off (with or without PIN – example below)
If a channel is on and another function key is pressed that channel will be selected

In the example above to turn on channel 1, If a PIN is required, then after pressing F1 the PIN check screen is presented. If the correct PIN is entered the channel is activated and the screen shows who activated it. If F1 is pressed again to turn the channel off, again a valid PIN is required before the channel is de-activated.

If no PIN required, for example to turn on channel 2, pressing F2 will immediately activate channel 2. Pressing F2 again will immediately de-activate it. Pressing F1 or F3 will select those channels.

The keypad Cancel key <CAN> can also be used to deactivate all channels. This always requires a Manager PIN or above to action.

7.4   Activated by VHF

If VHF is 'Active' then the controller will be activated if 3, 5 or 7 (default) presses of the aircraft microphone switch (PTT) are made in a 5 second period by an approaching pilot on frequency.

```
VHF:  ■  On  122.800MHz
Cell:■  On     CD #:  1
CH1     CH2    CH3    Menu
 □       □      □      ■
```

As the 'clicks' are received the CD (Carrier Detect) counter will be displayed on the screen:

This will turn on the relevant channel for the periods previously set by the operator (default 15 minutes).

```
Access Via:  VHF
Set on By:    Pilot
CH1     CH2    CH3    W&B
15:00    □           ■  ■
```

There is no restriction as to who can use the VHF part of the controller. If it is active and someone is on frequency, then they can operate it. The screen will appear:

During this period the 'Menu' option is not available but alternative channels can be activated by pressing the microphone switch again – including re-activating the same channel. Each time a channel is set the timeout period restarts.

This is a useful feature if, for example, a landing is delayed and the lights are approaching turning off (indicated by the flashing windsock if implemented. The pilot simply re-keys the required clicks for the channel and the timer re-starts.

```
Access Via:  Unit
Set Off By:  Timeout
CH1     CH2    CH3    Menu
 □       □      □      ■
```

At the end of the time-out period the channel is de-activated and the display shows that the unit has timed-out. This will be displayed for 1 minute after which the screen will change to the main screen.

```
Access Via:  VHF
Set Off By:  Pilot
CH1     CH2    CH3    Menu
 □       □      □      ■
```

The Manager can set 6 or 8 'clicks' to de-activate all channels/relays. If setup this way, the pilot can de-activate the channel with number of clicks.

7.5   Activated by SMS

Channels can be activated, deactivated and monitored via SMS. With a cellular radio module or LAN module fitted this enables truly remote management of the lighting.

```
Access Via:  SMS
Set on By:   User
CH1     CH2    CH3    W&B
 □       □     03:39■  ■
```

Once activated by SMS the screen will show which channel is active and the timeout period left to run. Note that all of the other options to deactivate or change the channel remain active.

Channels can also be de-activated via SMS and the display shows that the unit has been turned off. This will be displayed for 1 minute after which the screen will change to the main screen.

```
Access Via:  SMS
Set Off By:  User
CH1     CH2    CH3    Menu
 □       □      □      ■
```

8 System Management Software (SMS)

Using a Bluetooth wireless interface and a PC with the FEC Systems Management Software (Version 7.1 onwards) it is possible to access the Controller directly and perform a range of control, testing and configuration tasks. This option requires that the PC/Laptop/Tablet has an embedded Bluetooth module or an adaptor that acts like one.

The relevant commands are in the following sections – Please read carefully before attempting to install or run the software.

8.1 Preparing for Installation

Before beginning installation make sure:

1) The Controller is powered
2) You have a PC with Windows 10 (has been shown to work on Windows 7 or later but will not run on any earlier version of Windows, or on Apple iOS or Android devices)
3) Access to the internet with a fast connection

8.2 Materials on the Supplied Media (USB or CD)

There are a number of folders and files on the USB Memory Stick/CD typically containing:

Application Files	Systems Management Software
Software	Software running the Controller
Manuals	Controller User Installation and Operational Manual
Systems Management Software	Systems Management Software (SMS)
Setup	Setup file for SMS

It is recommended that you copy all of the files on the USB memory stick

However you organise the copied files, ensure that the following are all together, at the same level, in the same directory (C:\Downloads recommended):

Folder: Application Files

Manifest File: Systems Management Software V7.X

Setup File: Setup.exe

8.3 Installing Systems Management Software (SMS)

The software uses Microsoft .Net Framework v4.6 components which are included with Windows 10.

If you are running an earlier version of Windows, at the time of installation, these components may download automatically but if not, you will need to download them manually. Note that this is a large download and even with a fast internet connection will take some tens of minutes and will require a re-start of the PC to take effect.

To install the software:

1) Shut down all other applications running on your PC
2) Uninstall any previous installation of the same version of the SMS
   a. Select: Windows key, All apps, double click on FEC SMS and select uninstall
3) switch on the Controller
4) You may need to switch off protection virus software such as Avast, McAfee completely
5) Run the setup.exe file
   a. This can either be from the memory stick or the location you copied the files to
   b. If you get a screen displayed saying this is risky software and a 'Don't install' button then select 'More Info' and then press 'Install anyway'.
6) A 'Publisher cannot be verified' screen will be displayed – select 'Install'.
7) The software will install and appear thus:
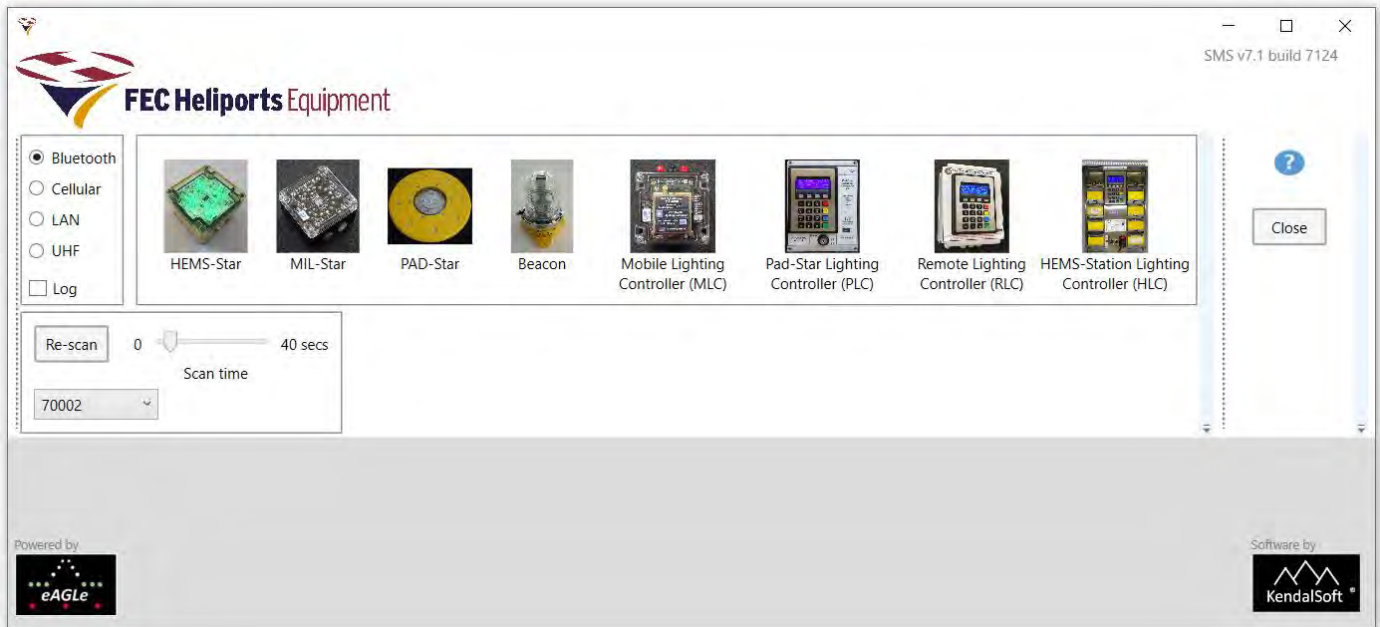
If it does not appear at all, repeat the process above ensuring that all steps are followed exactly. On narrower screens, the menu area may appear truncated from the right (for example the Help area may not be visible). This is quite normal and is managed by use of the drop-down menus (see later sections).

Operational Note:

Check that you have the correct product (e.g. RLC) serial number, the power is applied and the unit switched on before running the software or you will receive various failure and time-out messages.

.

8.4   Selecting the Communication Channel and Device
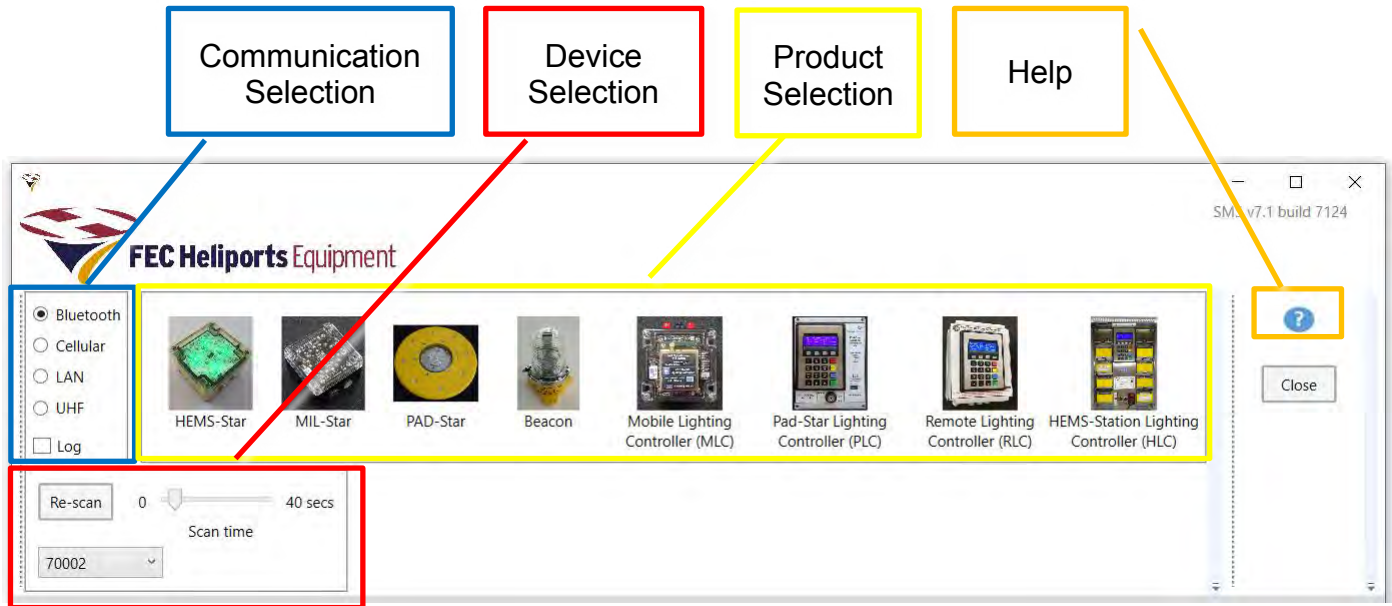
Communication Selection

SMS supports a range of communication options Bluetooth (default – all products) or Cellular Radio or LAN (if fitted) but only for a Controller.

Device Selection

The serial number of all FEC devices that are in range will be found and available to select from the drop-down menu. In this example it is device 70002.

Product Selection

The Systems Management Software is capable of configuring and controlling a number of FEC lighting products - simply click on the product that you wish to establish communication with. The software will automatically check the device and product selected and show the menu.

<p style="text-align:center; color:red;">NB – The Product and Serial Number must match</p>

Potential Communication Issues

If you are unable to communicate with the chosen device, check that it is properly powered up, you have identified the correct serial number and that the PC and Controller are within a few meters of each other and there is no wireless obstruction (e.g. metal structures) between them.

SMS will scan for devices with a default scan period of 40 seconds. This can be increased if required to give the PC longer to find all devices.

8.5   Product Menu

The menu for a Controller appears as follows:
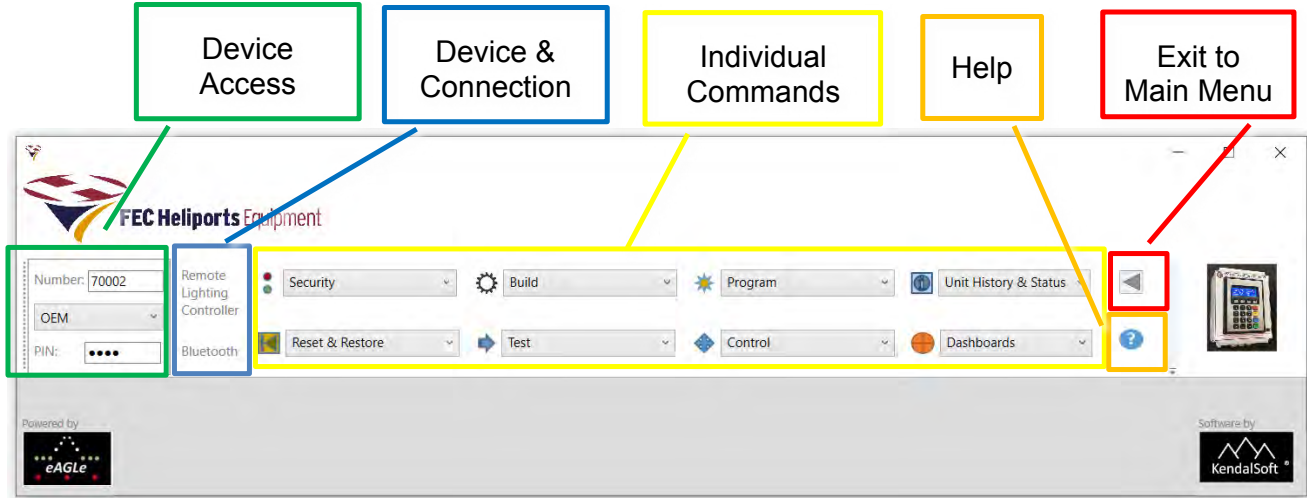
The commands that can be performed are grouped as follows (details in later sections):
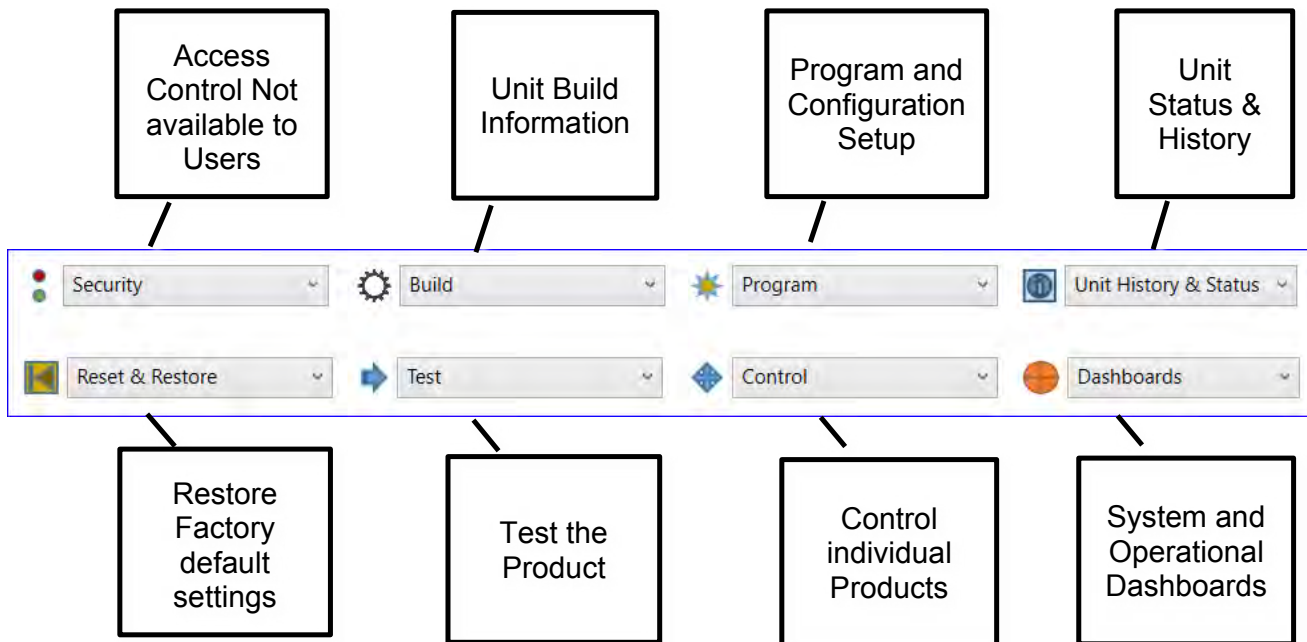
The 'look and feel' of the commands is similar across all menus making it easier to navigate and be productive.

Help

Pressing the Help key brings up simple text-based help.

This will be expanded in subsequent releases of the software.

8.6   Security

The Security menu options are:

1) Display PINS – PINs displayed are a function of User Type
2) Update PIN - PINs can be changed depending on User Type
3) Keypad PIN – Define whether direct keypad input to set or unset channels requires a PIN or not.
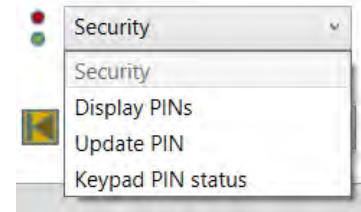
Display & Update PINs

A Manager will see current PINs (left). Pressing Change brings up a screen to allow a new PIN to be entered. Once successfully applied the screen will appear as right.

a) Any attempt to change a PIN of higher authority will be rejected (e.g. Manager tries to change FEC PIN), and
b) A Manager may change their own PIN. Be careful to make a note of it as you could lock yourself out of your own product!
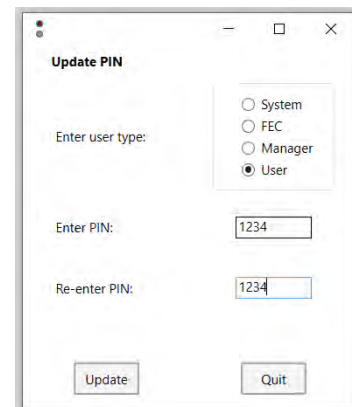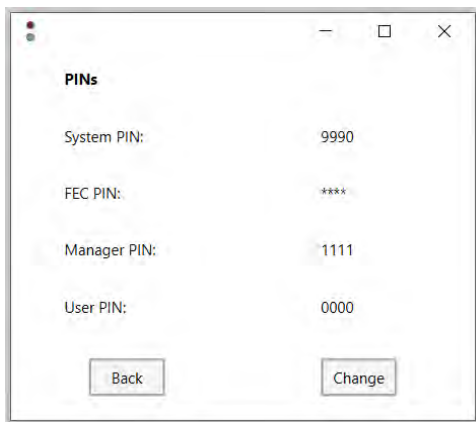
Keypad PIN

Dy default no PIN is required to set or unset a channel via the F1 (Channel 1), F2 (channel 2) or F3 (channel 3) function keys.

To require that a PIN is entered to perform these actions, select PIN required from the drop-down menu and the Update.
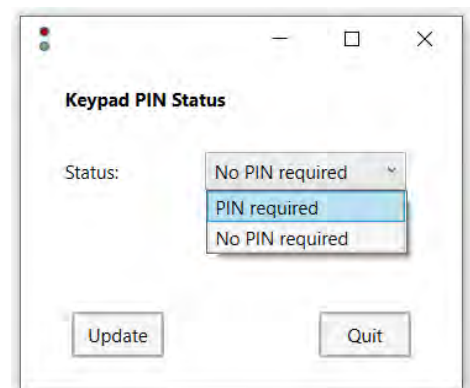
8.7 Unit Build Commands

User Commands

Only the Build Data is available to the User.

Manager Commands

The options available to Managers are:

1. Build Data option - returns details of the unit
2. VHF Version – Check HW & SW version of receiver
3. Download Program file – download new Controller software
4. Update Device Software – install new Controller software
5. ULC Type and Setup – Enables the LCD backlight and internal heater to be configured – important for battery installations – and if a Cellular radio is retro-fitted to enable it. Fuller instructions are supplied with the module.
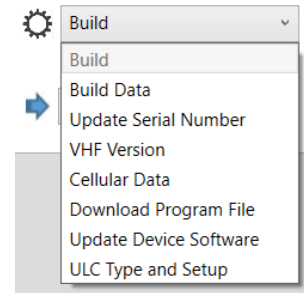
FEC Commands

As for Manager.

OEM Only Commands

Update Serial Number: The serial number entered will be stored immediately allowing other commands to be entered.

The LAN is a factory fit open and only available to the OEM.
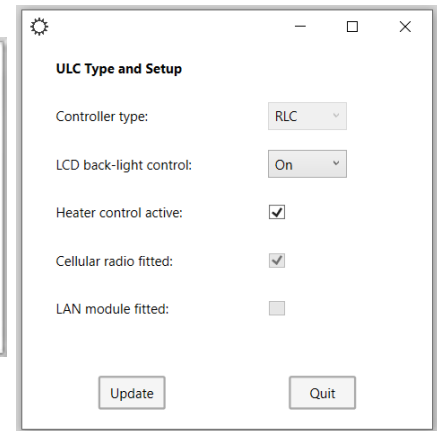
Download Program File

New software can be downloaded from the manufacturer's website. Select Download Program File and SMS will automatically search the relevant download area for software. Select the required file and then download and the software will be downloaded. Confirmation of download is shown on successful completion.

The software (.hex) will be stored in:

This PC>Documents>FEC>Programs.

Update Device Software

Select Update Device Software and the previously downloaded file will be found.

Select the required file and open.
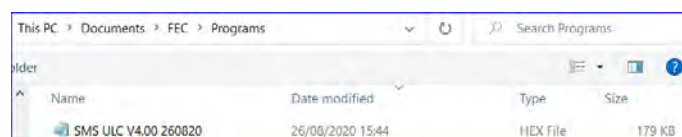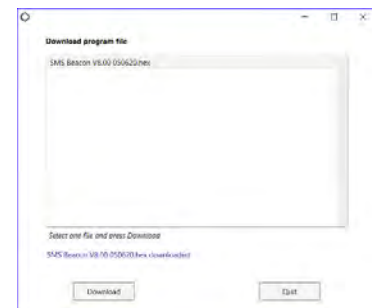
Program File Information

Information about the software will open. Read carefully and ensure that it is the version you want to install and then press Next.

Devices

Enter the device serial number that is to be programmed into the starting serial number box and press Add. The serial number will be transferred to the Defined serial numbers box. If correct, press Next, otherwise clear the list and start over.

SMS will get the current version of software from the Controller and confirm if it is a previous, current or new version.

Device Status

Normally the software will be the next version but there may be a need to either regress to a previous version of the software or reload the current version. All options are possible.

Select the desired software and press update software to continue or back, refresh or quit as appropriate.

Update Software

The software updater automatically builds a report file of the software update including date, time, versions and, if entered, the name of the person performing the update.

If there is a suspected issue with updating, then also check the diagnostic report which will be useful to FEC in diagnosing any issues.

Once ready, click Start Update.
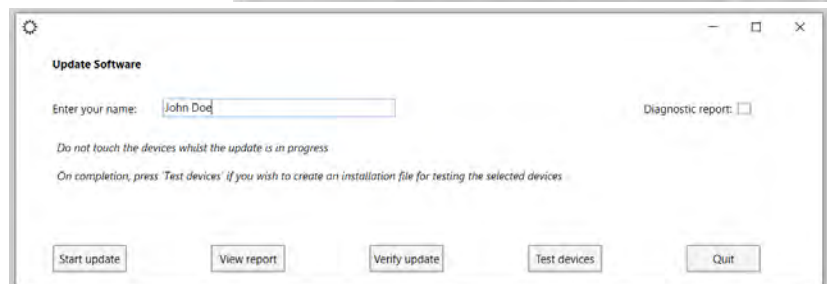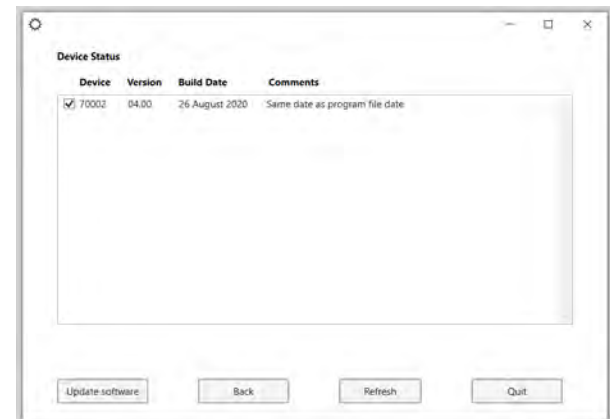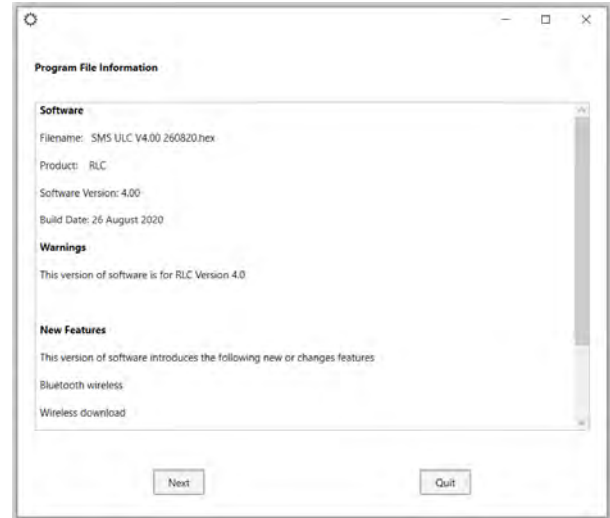
Final Warning

A final warning is given that once started the process must run to completion and that if it does not the Controller will need to be updated via the USB port (later section). If happy to proceed, click Yes
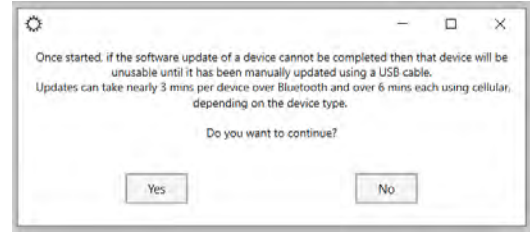
Update Software
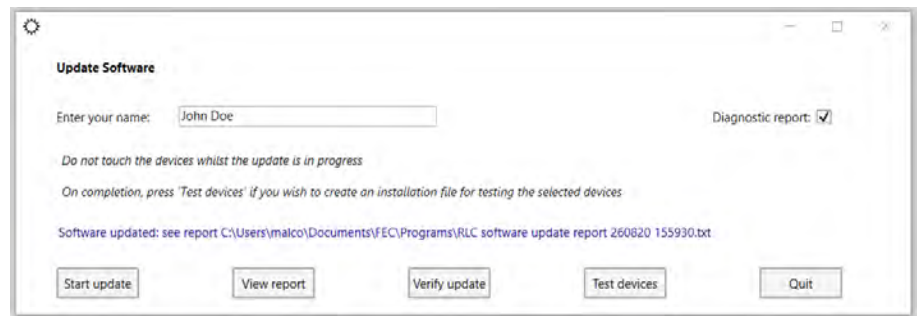
SMS will then show that the software is updating.
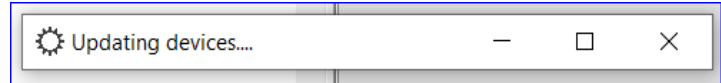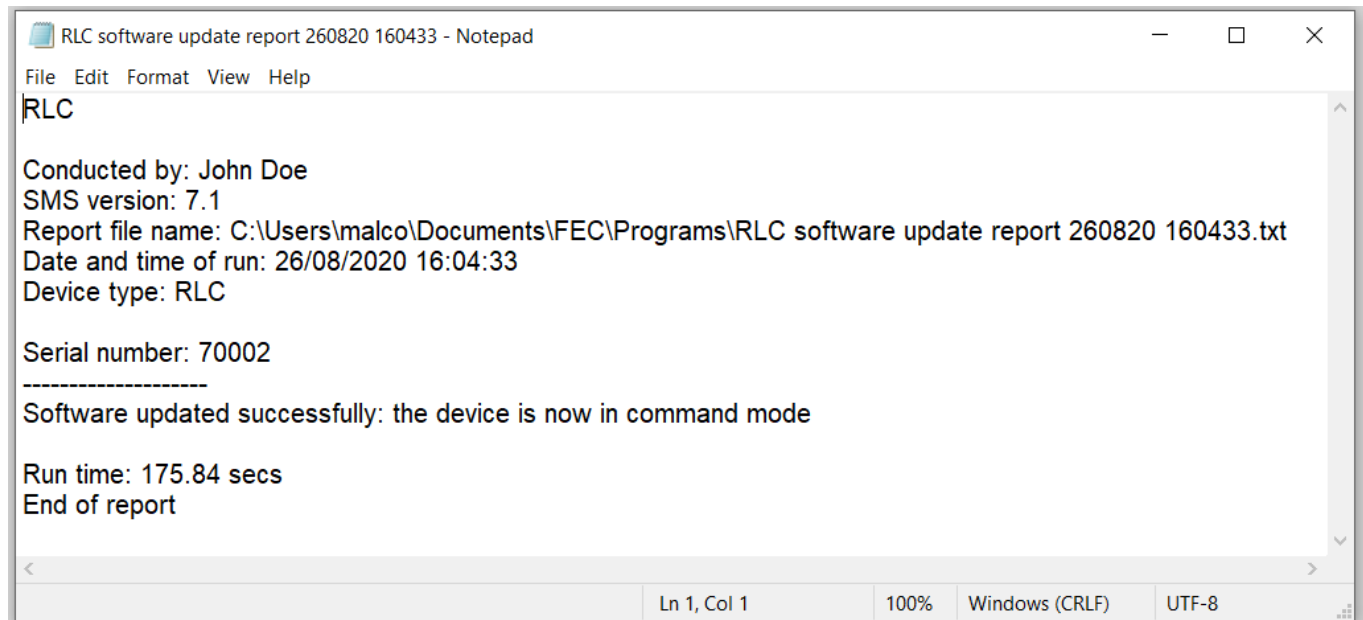
At the same time the LCD display will confirm progress.

On completion SMS will confirm the update and also run the new program.

Clicking Verify update will show the version now installed. Same screen as Device Status above.

View Report

Click View report for the details of the update process.

8.8   Program

The Program menu provides access to:

Unit Configuration - To check and make changes to the configuration settings which are common to all programs
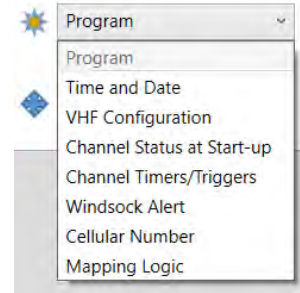
Time and Date

When Time and Date is selected, the Real Time Clock/Calendar (RTC) in the Controller is read and the current time and date displayed (right).
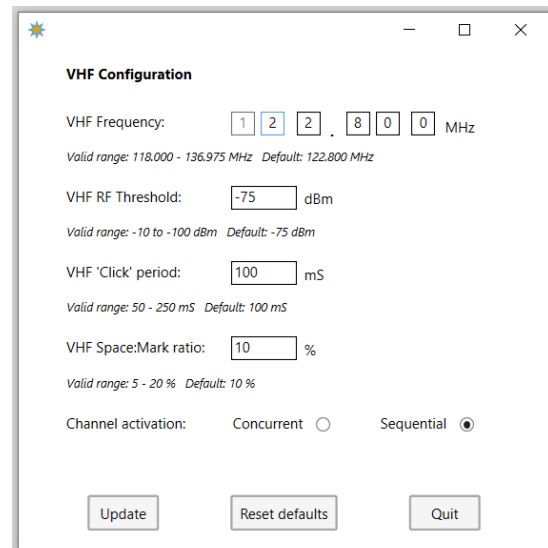
Select Change to update (far right).
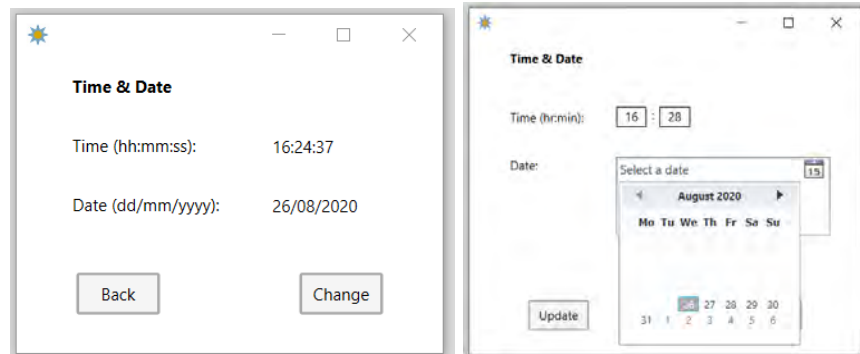
VHF Configuration

The VHF Configuration menu provides similar functions as provided through the keypad menus.

The VHF frequency, activation threshold and 'Click' period can all be set.

NB: Sequential (default) or Concurrent channel activation is active for all input routes, not just VHF.

Channel Status at Start-up

The controller can be programmed to immediately activate a channel on start-up and keep the channel active until commanded to do otherwise (off or activate another channel). This is a very useful feature where it is desired, for example, for the system to come on following a power cut.

Select the desired channel to come on at start up and press 'Set'. Note that only one channel can be set as the start-up channel but that channel can control up to three relays.
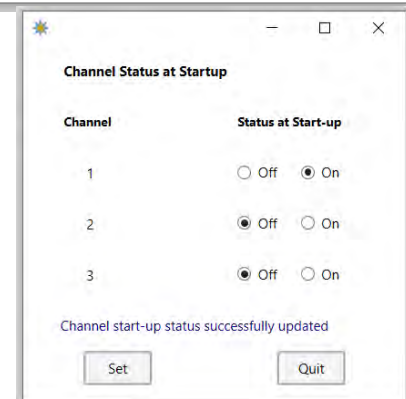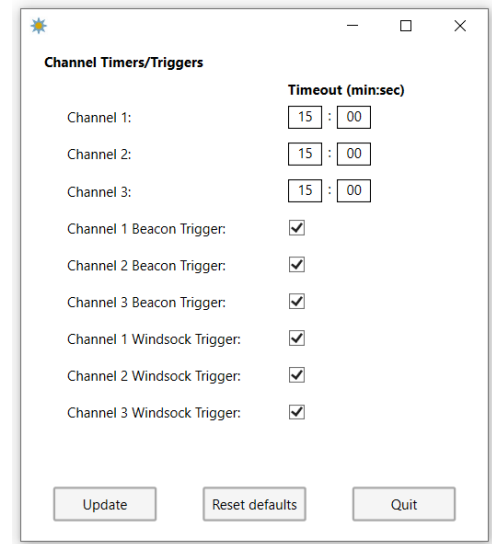
Channel Timers & Triggers

Selecting Channel Configuration shows the current channel timeouts and whether or not each channel also triggers the Beacon.

Channel timeouts can be set in whole minutes above 1 minute or 10 seconds below 1 minute.

Warnings are issued for erroneous values.

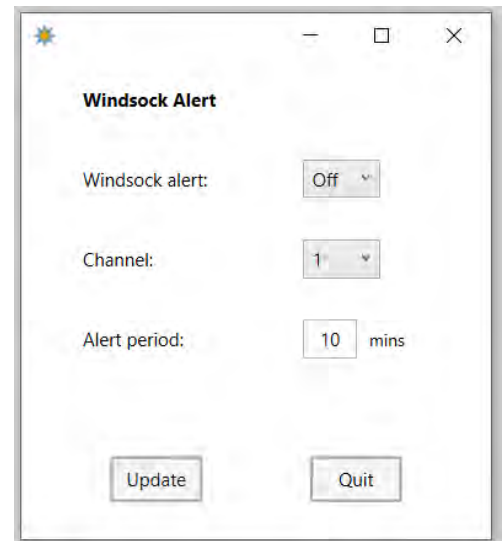To make changes, simply enter the desired values and press Update.

Winsock Alert

In some territories it is necessary to flash the windsock a defined period before the main lighting circuit times-out. e.g.

CASA MoS Part 139 compliance (Australian Civil Aviation) requires:

9.3.1.5 *Ten minutes before the aerodrome lighting system is due to turn OFF, the PAL must cause the lights of at least the primary Illuminated Wind Direction Indicator (IWDI), in accordance with Paragraph 9.6.1.10, to commence to flash at approximately 50 cycles per minute (approximately 0.6 seconds ON and 0.6 seconds OFF), and continue to flash until either:*

(a) the PAL system switches OFF, and all aerodrome lighting, including the IWDI lights, is extinguished; or

(b) the PAL system has been reset for another ON period.

Select whether the Windsock Alert is on or off, the channel which will trigger the alert and the period of the alert.
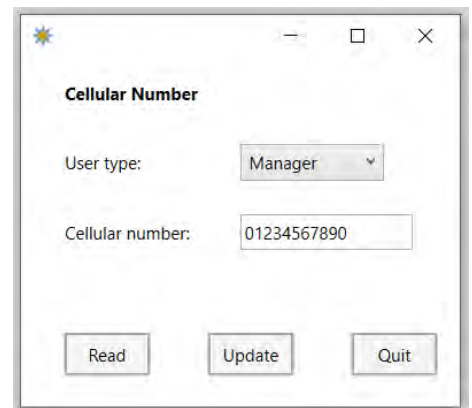

Cellular Numbers

For future product development and for units fitted with Cellular Radios, cellular radio numbers can be stored in the Controller.

Mapping Logic

Clicks to Activate

Each of the channels can be activated by a programmable number of 'clicks' from the pilot's PTT switch on their VHF Radio . By default these are:

Channel 1 – 3 clicks

Channel 2 – 5 clicks, and

Channel 3 – 7 clicks

The number of clicks to activate each channel can be changed using the drop-down menus. The constraints on this are:

1) No two channel can have the same number of clicks assigned (SMS blocks this), and
2) 6 and 8 clicks are reserved for the cancel function

Channel to Relay Mapping

Each of the channels can turn on 1, 2 or 3 relays. By default these are:

Channel 1 – Relay 1
Channel 2 – Relay 2
Channel 3 – Relay 3

The relays to be activated by each channel can be changed using the check boxes. The only constraint is that each channel must activate at least one relay.

Input Switch to Channel Mapping

There are 3 wired inputs that can be connected to switches or relays (see appendix for sample wiring schematics). By default these are mapped as follows:
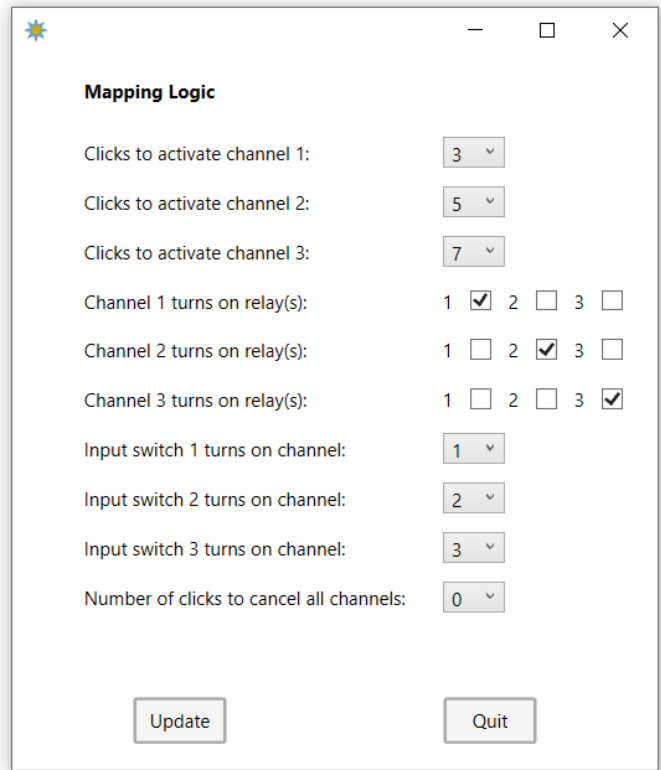
Input 1 – Channel 1
Input 2 – Channel 2
Input 3 – Channel 3

Inputs can be mapped to any channel without restriction. If an input is set to channel 0 then that input is ignored.

Clicks to Cancel Channels

It is possible to cancel all channels by selecting either 6 or 8 clicks from the drop- down menu.

This function is off by default (clicks = 0) and should only be used if the operator and pilots are all conversant with the setup.

8.9 Unit History and Status

Unit History & Status provides:

Unit History – Maxima and minima

Unit Status – Current status of: VHF Radio, Wired Interface (Inputs), Cellular Radio (if fitted), Weather Reports (if optional MetPak is fitted), and Controller activity.

Unit History

Products build a history log for diagnostic purposes and is a read-only function.

Data returned includes:

1) the maximum and minimum supply voltage detected
2) the maximum and minimum temperature of the system
3) the number of times the product has been activated (turned on), and
4) the total running time of the Controller in hours and minutes

UHF Radio Setup

Non-standard product to special order. Will normally report 'Not Fitted'

VHF Status

The VHF status command reads the VHF receiver parameters. The frequency, threshold, click period and space/mark ratio are all as set in the Program menu.

Also displayed is the Received Signal Strength. This is a very useful way, in conjunction with the refresh button, of understanding the performance of the radio and is a vital aid to setup, testing and subsequent validation.

Wired Interface Status

This menu shows the status of the Inputs (switch or relay circuits) and again is extremely useful during installation and testing as well as monitoring the satus of the inputs.

In the exampleto the right input 2 is closed (on).Press refresh to get the current status.
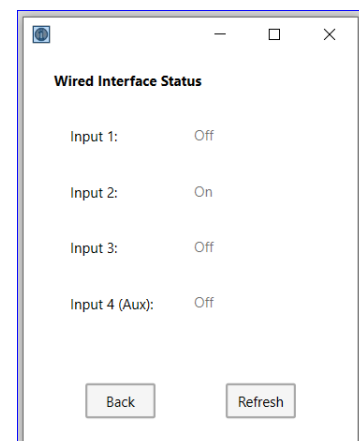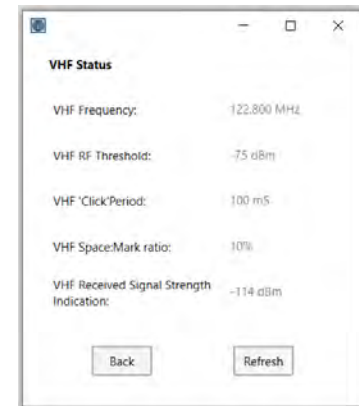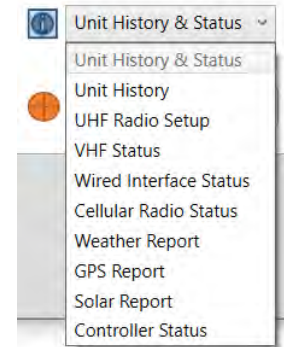
Cellular Radio Status

The basic network information for the Cellular Radio can be read (if fitted).
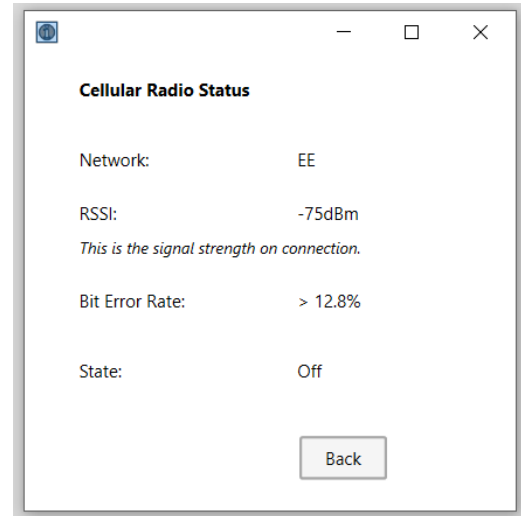
Do not use this command if no cellular radio is fitted.

Weather Report

If a MetPak is fitted to the Controller, basic weather information is available.

The MetPak reports the current parameters every second and these are buffered by the Controller.

The default units are those shown (right) and can be changed to using the radio buttons to the desired local units.

NB: The altitude of the weather station must be entered (and is stored in SMS) in order for the reported barometric pressure to be properly reported, corrected for the installation altitude of the MetPak.

Pressing Refresh re-reads the data from the MetPak/Controller.

Depending on customer demand, additional processing of the data may be possible to provide trending, max and min and gusting for example.
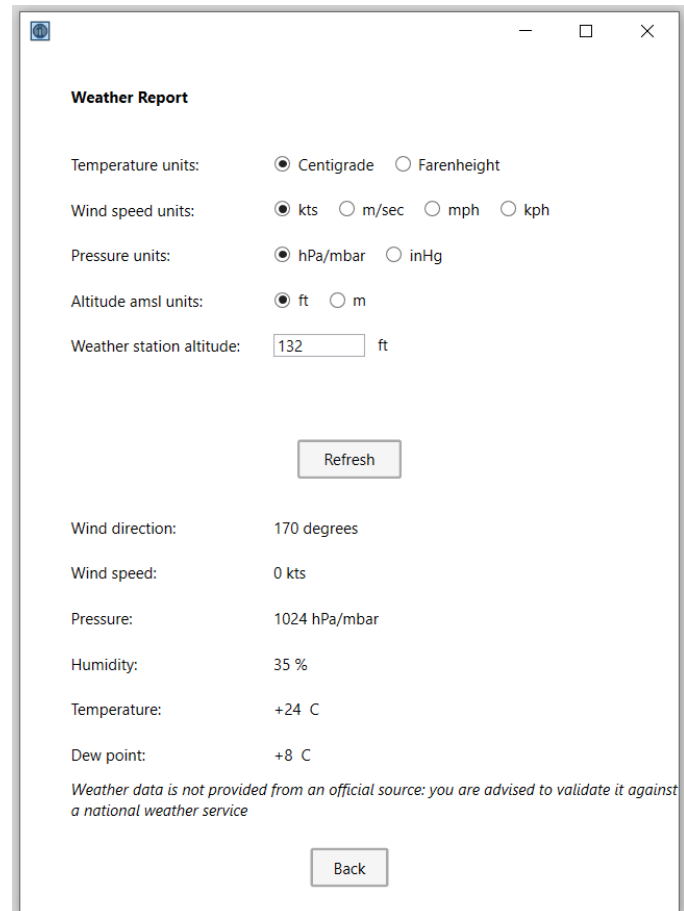
GPS Report

Not implemented in this version of SMS.

Solar Status

Not implemented in this version of SMS.

Controller Status

The Controller Status screen shows the current unit temperature and voltage and the status of the channels, windsock and beacon.

In the example to the right, Channel 2 is active with 13 minutes 21 seconds left to run on the timeout. Both the Windsock and Beacon are active.

Press Refresh to get an updated status.

Note that the Windsock shows the instantaneous status of the windsock relay. If Windsock Alert has been set, Windsock may show as active or inactive depending on exactly when the status was obtained.
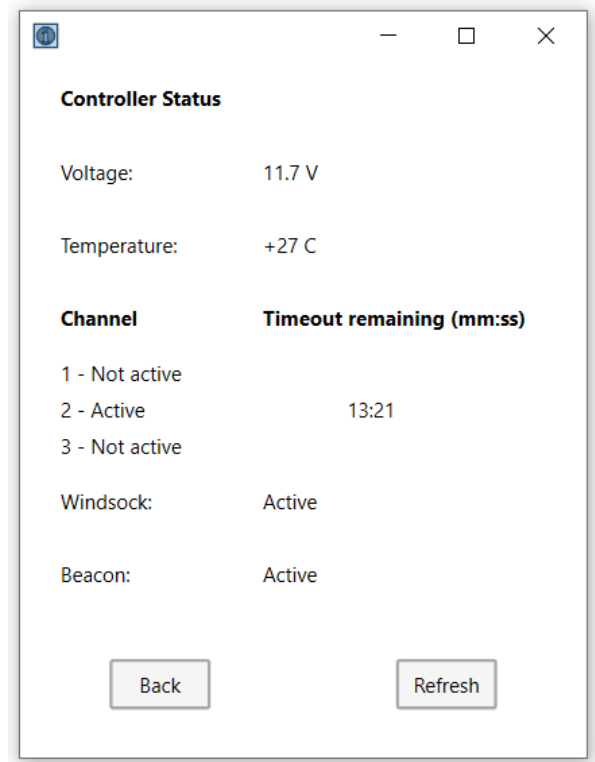
8.10 Reset & Restore

Of the menu options, only the Reset Factory Defaults option is available to Managers but not to Users.

The program and/or channel settings along with all of the configuration and calibration data are re-loaded with the product default values. All user settings are lost.

8.11 Test

Of the menu options, Managers can access:

- Test Relays, and
- Display (Bluetooth) Signal Strength.

Check RTC Oscillator

Only available to OEM for testing and setting up.

Calibrate RTC

Only available to OEM for testing and setting up.

Test Relays

All of the Controller's relays can be tested.

Relays 1 to 3 have their coil currents measured and reported.

A figure of 100 +/- 15mA is acceptable. Readings outside of this should be investigated and reported.

For technical reasons neither the Winsock nor Beacon relays have their coil currents measured.

Display Signal Strength

An assessment of the performance of the Bluetooth radio link can be made.

Note that:

1) This is the signal strength measured at the time of connection.
2) It is only available if SMS is connected via Bluetooth.
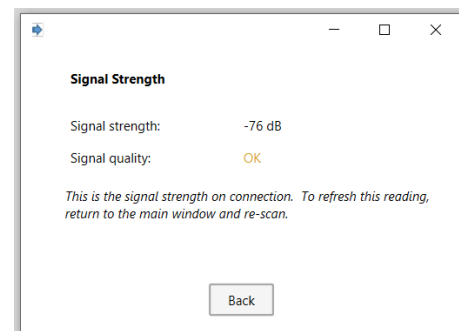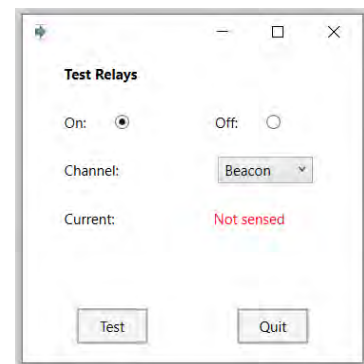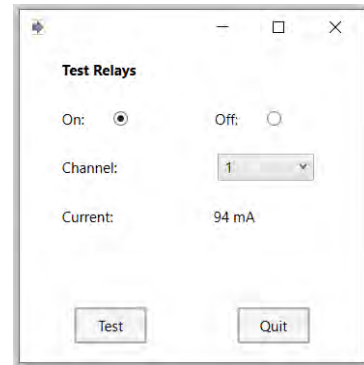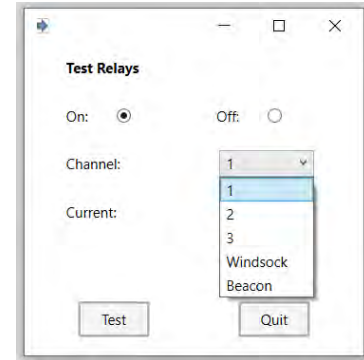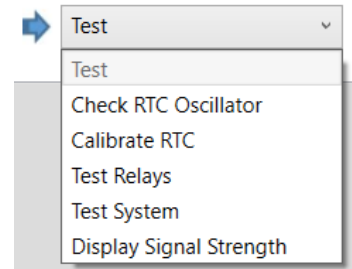
8.12 Control

It is possible to directly control the Controller channels and switch radio on and off.
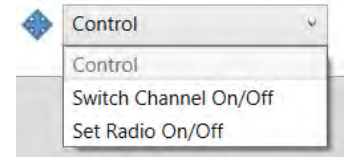
Set Channel

Select the required channel to turn on or off and press update.

Note turning a channel on will start its timer running and after the timeout period it will turn off.
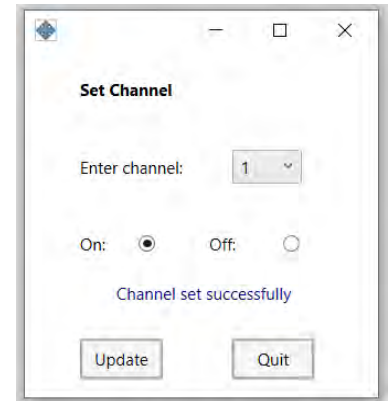
Set Radio

The VHF, Cellular and UHF (if fitted) radios can be switched on and off.

Strictly speaking they are logically not physically turned on and off.

This is too support operational needs to, for example, block false activations due to interference.

The LCD screen will display

```
V H F :  □  O f f  b y  O p s .
C e l l : □  N o n e
C H 1      C H 2      C H 3      M e n u
    □          □          □          ■
```
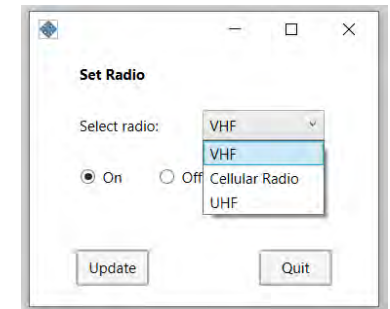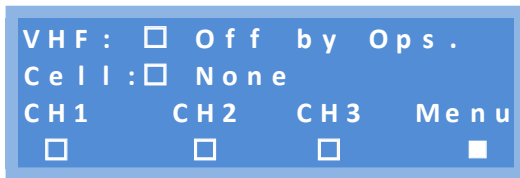
8.13 Dashboards

All previous commands are structured as a single command-response transaction with the option via a 'Refresh' button to repeat the command. Dashboards provide automated windows of commonly accessed data which is continuously polled and refreshed without further user action. There are two dashboard: Systems and Operational.
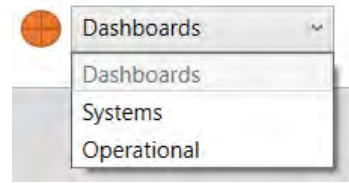
Systems Dashboard

The dashboard below has been accessed by a Manager and hence the Manager and User PINs are visible. Pressing any of the Change buttons closes the dashboard and takes the user directly to that area to affect the required changes.

Operational Dashboard

The dashboard below provides access to the operational (status) data.

In this example Input 1 is on (closed) and has activated Channel 1 which, because it is an Input, has not time-out. Both the Beacon and Windsock are active and because a weather station is fitted and the elevation entered, weather data is available.

In addition to the screen output, every time a channel changes state (e.g. non-active to active) the PC's bell is sounded to alert the operator to the change.

Operational Dashboard

Program

Time and date: 20:13:13 10/10/2020

[Change]

History

Battery volatge

Maximum: 11.8 V

Minimum: 3.7 V

Temperature

Maximum: +29 C

Minimum: +04 C

No. of activations: 2

Run time: 1 hr 2 mins

Status: Wired Interface

Input 1:   On

Input 2:   Off

Input 3:   Off

Input 4 (Aux):   Off

Controller Status

System voltage: 11.7 V

Temperature: +28 C

Channel	Timeout
1 - Active	00:00
2 - Not active	
3 - Not active	
Beacon:	Active
Windsock:	Active

Weather

Wind direction: 30 degrees

Wind speed: 12 kts

Pressure: 1022 hPa/mbar

Humidity: 55 %

Temperature: +20 C

Dew point: +15 C

[Change Units]

Weather data is not provided from an official source: you are advised to validate it against a national weather service

[Back]

9   Installation

Installation of the FEC Remote Lighting Controller must be carried out by a suitably qualified electrician with full authority to undertake work in the safety critical environment of a helipad.

It is recommended that a formal Statement of Works, Standard Operating Procedure or similar is created and used for the initial installation and testing and all subsequent test and maintenance activities to ensure the safety of the installation and personnel.

9.1   Locating the Controller

The controller should be located in a secure location that is easy for operational staff to access the keypad and screen and appropriate for the aerials, mains and circuit wiring.

The enclosure is intended for wall mounting and, with suitable rails or adaptors, can be frame or pole mounted. Appendix 6 has a full size template for the mounting holes.

Although the enclosure is IP65 rated, a sheltered location is recommended.

Keep in mind that the controller will need:

1) Mains electricity supply and connection to the circuits to be controlled
2) An external VHF aerial connected, and
3) An external Cell aerial (if option selected).

It is recommended that a mobile (cell) phone, on the same network as that intended for the controller, is used to check the signal strength/quality in the intended location if Cell option selected.

9.2   Things you will need

Before starting the installation ensure that you have at least the following items in addition to those required for the rest of the installation:

1) A No.2 Philips (PH2) or No. 2 Pozidrive (PZ2) screwdriver to open the main enclosure.
2) Small (3mm) slotted head screwdriver
3) Fixing screws and wall plugs as required.

9.3   Preparing for Installation

Lay the controller on its back on a clean soft surface at least twice the width of the unit and undo the four corner retaining screws (note these screws are 'captive' and do not need to be fully removed).

Gently lift the front of the enclosure away from the base and lay face down to the left of the base unit. Be careful not to strain the cables as this could cause permanent damage.

Disconnect the following cables from the keypad enclosure:

1) Main power and relay cable
2) VHF SMA Aerial cable, and
3) Auxiliary/BMS/Meteorological connection cable (if fitted)

Note: 1) and 3) have retaining screws. Use a small slotted head screwdriver to remove and use a small amount of Loctite 248 Medium Strength thread locking compound on re-assembly.

The unit may be fitted with a wrap-tie transit strap around the PSU. This may be cut off at this stage.

9.4 Installing the Base Unit

Either by measurement or using the template in Appendix 1, mark out and drill (and plug) the surface to which the controller is to be fixed.
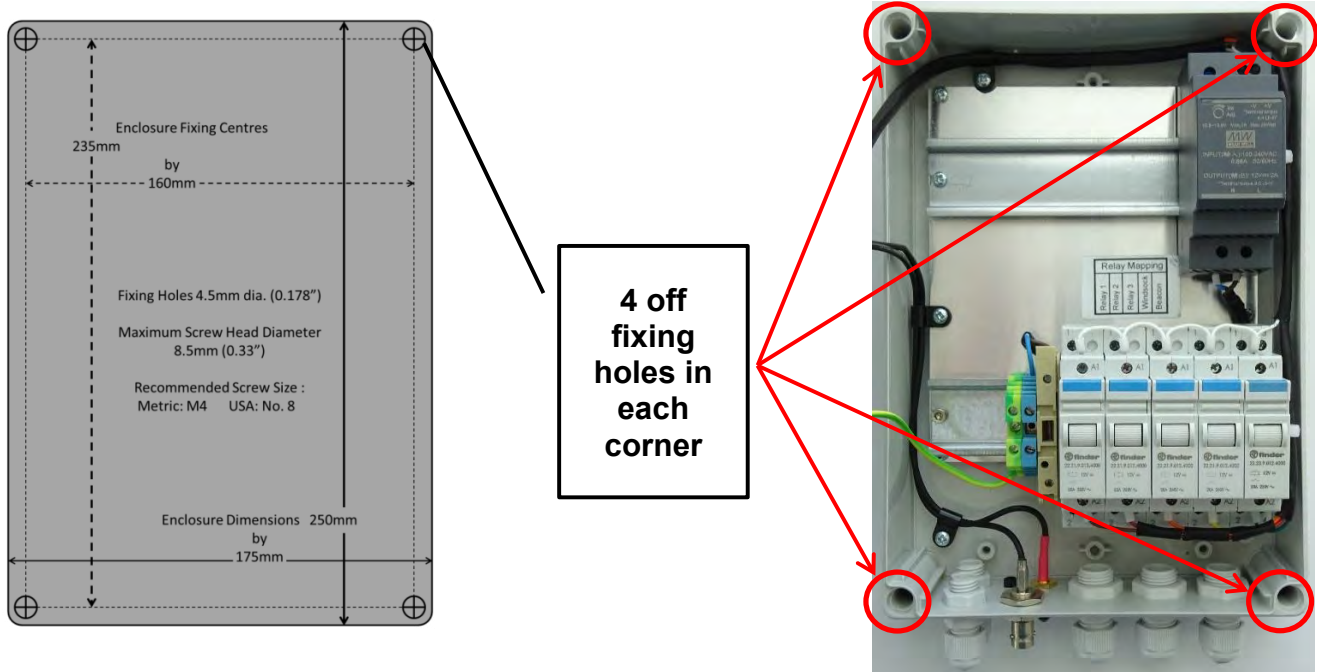
If the fixing screws are not in a convenient position for the surface on which the controller is to be fixed then the use of rails, frames or battens is recommended.

DO NOT DRILL HOLES THROUGH THE ENCLOSURE BASE

The fixing screws are in the same position as the top cover retaining screws. The maximum screw diameter is 4.5mm (0.178") and a maximum head diameter of 8.5mm (0.33"). Recommended screw sizes are Metric M4 or USA No. 8 of a suitable length and type for the surface.

Mount the base of the enclosure and ensure that the fixing screws are secure but do not over-tighten as this could damage the enclosure and compromise the IP65 rating.

Once the base has been fitted, the unit can be wired up (next section). Take particular care not to damage the Power Supply Unit, Relay Driver board and Relays during the installation of cables.

In anticipation that many installations will only require two cables to be fitted, one of the cable glands is fitted with a nylon plug to ensure integrity of the enclosure if only two cables are required. To use this gland, simply remove the plug. If replacing, do not over-tighten as this may permanently damage the gasket.

9.5 Installing the Cell aerial

The Cell aerial is shipped in the outer accessory packaging. Carefully remove it from the plastic bag and screw onto the external aerial connector. Do not over-tighten as this may permanently damage the aerial or socket but ensure it is fully home.

Be careful when handling the front panel to ensure that the aerial is not damaged.

9.6 Electrical Installation

It is recommended that mains cables are fixed first to avoid damage to aerial or signal cables.

If the FEC Controller is to be operated from a mains power supply it must be connected to the supply using a fused double pole isolator.

The controller has a maximum power consumption of 30watts so if the supply is only powering the controller (the switched circuits being separate) then a 5 Amp fuse should be used.

If the same supply is to be used both to power the controller and the switched circuits then the cable, switch and fuse rating need to be sized accordingly.

WARNING – If the circuits to be switched are fed from a separate isolator it is imperative that this is also isolated before work is commenced.

9.7 Circuit Connectors and Cable Entry *(V4 enclosure)*

The Picture below shows the connectors and cable entry arrangements on the bottom of the base for Controller V4 units

| VHF aerial connector |
| Meteorological Cable Gland (with blank plug) |
| Aux/BMS Cable Gland (without blank plug) |
| Optional UHF connector |
| Cellular Radio connector |

3 Mains in/out cable glands (1 with blanking plug)
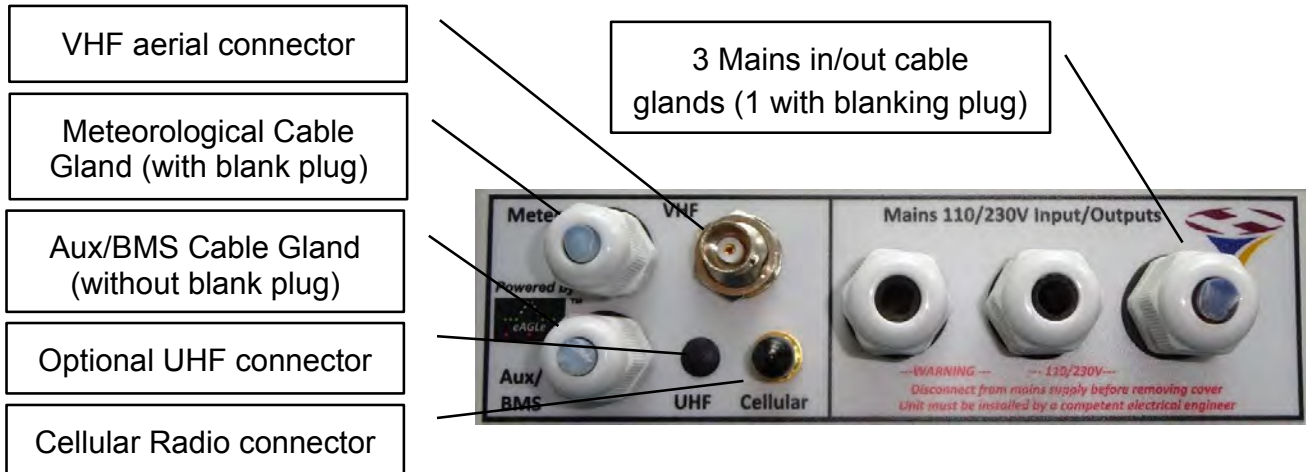
9.8 Relays

Three 20 Amp Finder type 22.21 relays are fitted to the controller. Each has 1 Normally Open (NO) contact set as shown in the schematic (box right).

HP0656: Finder 22.21 Relay Connections
A1 – Coil – DO NOT TOUCH
A2 – Coil – DO NOT TOUCH
1 – NO1
2 – COM1

Top view as mounted in base
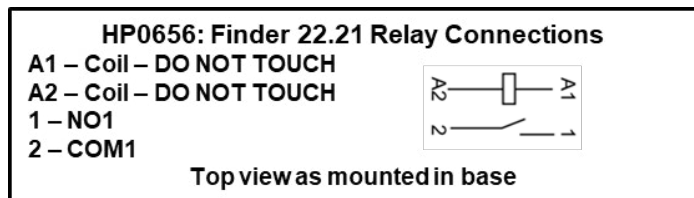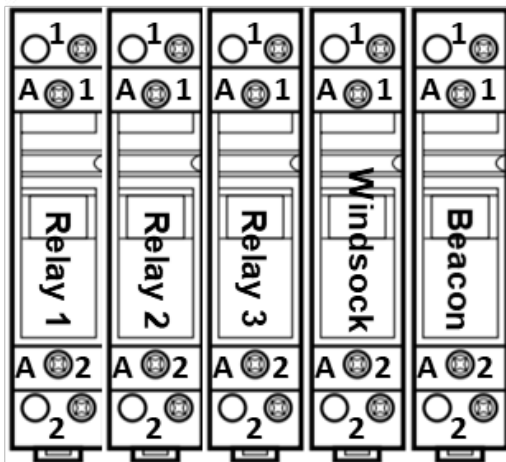
9.9   Mains wiring

The arrangement of the standard mains powered base units is shown below:
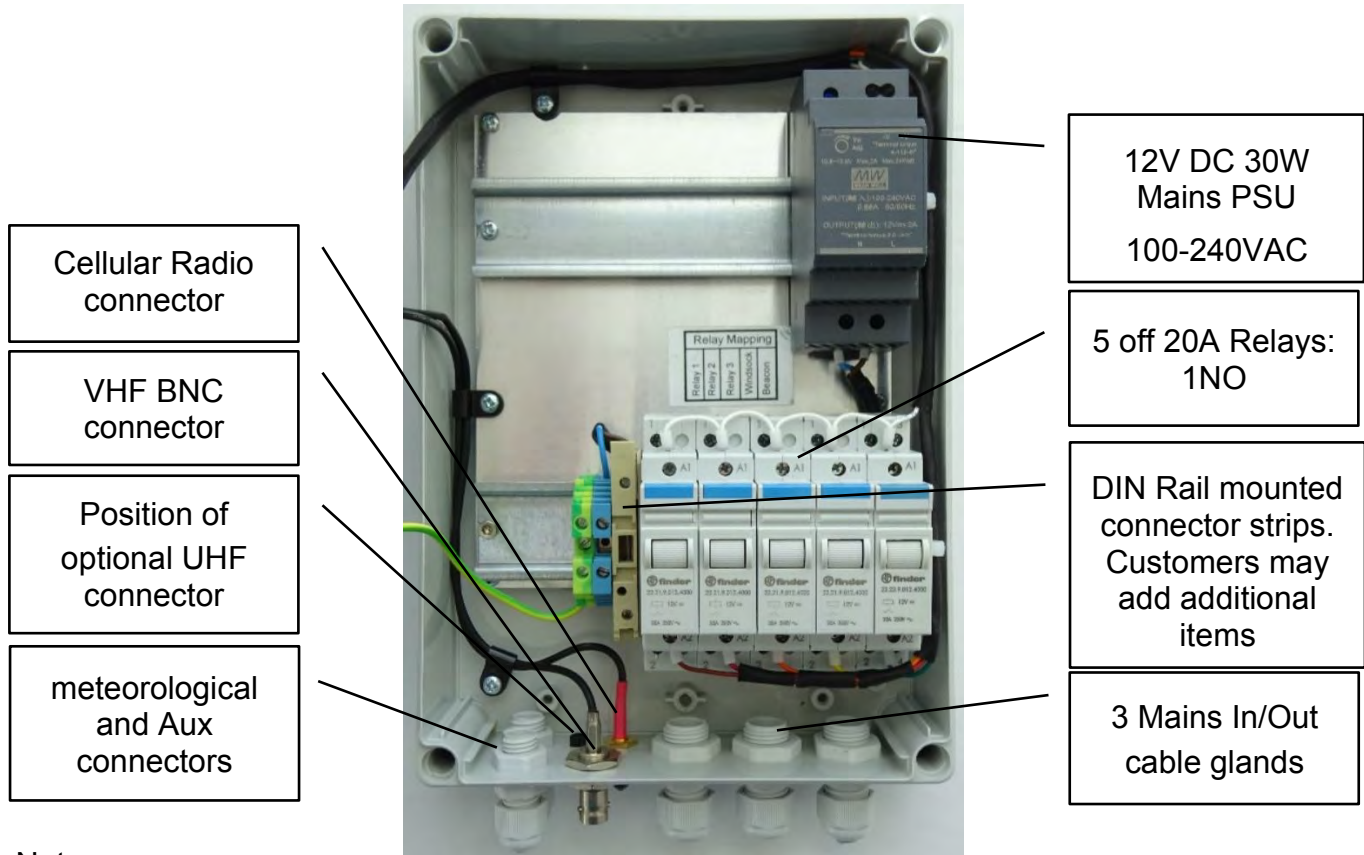
Notes:

1) Live (Brown), Neutral (Blue) and Earth (Green/Yellow) 4mm IMO DIN rail mounted connector strips are provided for customer wiring.

2) Additional connectors can be added by the customer but pay particular attention to:

   a. Such connectors are often open on one side. Care must be taken to ensure that the open side is always covered by its neighbour or end plate.

   b. The earth connector is fixed and grounded to the DIN rail by a central screw. To move this connector, slacken the central screw, move as required and re-tighten.

   c. The Earth connector provides the earth bonding connection to the controller.

   d. The connectors must be gently pushed tight against the PSU and Relay Interface Board to ensure that these items are prevented from sliding on the rail.

3) The controller is fitted with a mains powered 12V Power Supply Unit (PSU). The installer must connect this to the incoming mains supply via the fuse (provided) using suitable 2 core cable (2x1mm 240V). The PSU is double insulated and is not earthed.

4) The relays are rated at 20A AC for a resistive load.

5) If higher currents or highly inductive loads are to be switched by the controller the use of an external 'Contactor' of the correct rating must be used.

9.10 Basic Mains Wiring Diagram

A simplified circuit diagram is shown below for a single switched circuit.

NB – To allow the lights to be operated in the event of a unit failure it is strongly recommended that a mains by-pass switch is incorporated into the circuit by a qualified electrician.
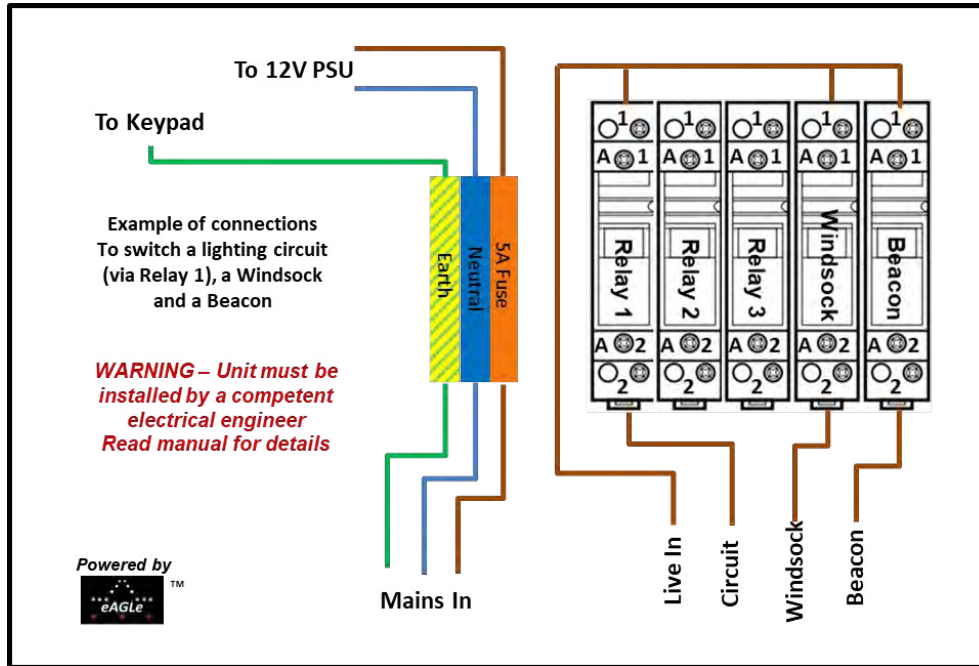
Notes

1) The 5A fuse in the DIN rail holder is for fusing the feed to the 12V PSU only.
2) Installers can add additional DIN rail mounting Live, Neutral and Earth terminals.
3) DIN Rail mounting fuse holders may also be added.
4) If additional items are added to the rail, follow the instructions below.
5) Secondary circuit load characteristics may require an external contactor.

NB – Do not run the light circuits via the 5A fuse – this is only for the feed of the 12V mains Power Supply Unit (PSU).

Any light circuit fuses should be specific to each circuit.

DIN Rail Mounted Items

DIN rail mounting terminals etc. generally 'snap' onto the rail with plastic clips either side.

The Earth terminal has grips onto the rail which are metal, connected to the terminal block (to earth the rail) and actuated by the middle screw (of three).

To add terminal blocks:

a) Slacken the middle screw of the earth block and slide it down the rail (there is no need to remove it)
b) Snap in the required additional terminals (sliding others as required)
c) Push the earth terminal back up to ensure no gaps between terminal and re-tighten the middle screw

NB – Ensure that no live connections are exposed by the insertion of additional connectors.

9.10.1 Conversion of Mains to 12V DC Supply

The arrangement of the modified 12V DC powered base units is shown below (after conversion):

Position of optional Cellular Radio connector		DIN Rail mounted connector strips. Customers may add additional items
VHF BNC connector		
Position of optional UHF connector		12V DC 30W Connection Fused 5A
		5 off 20A Relays: 1NO
meteorological and Aux connectors		3 Mains In/Out cable glands
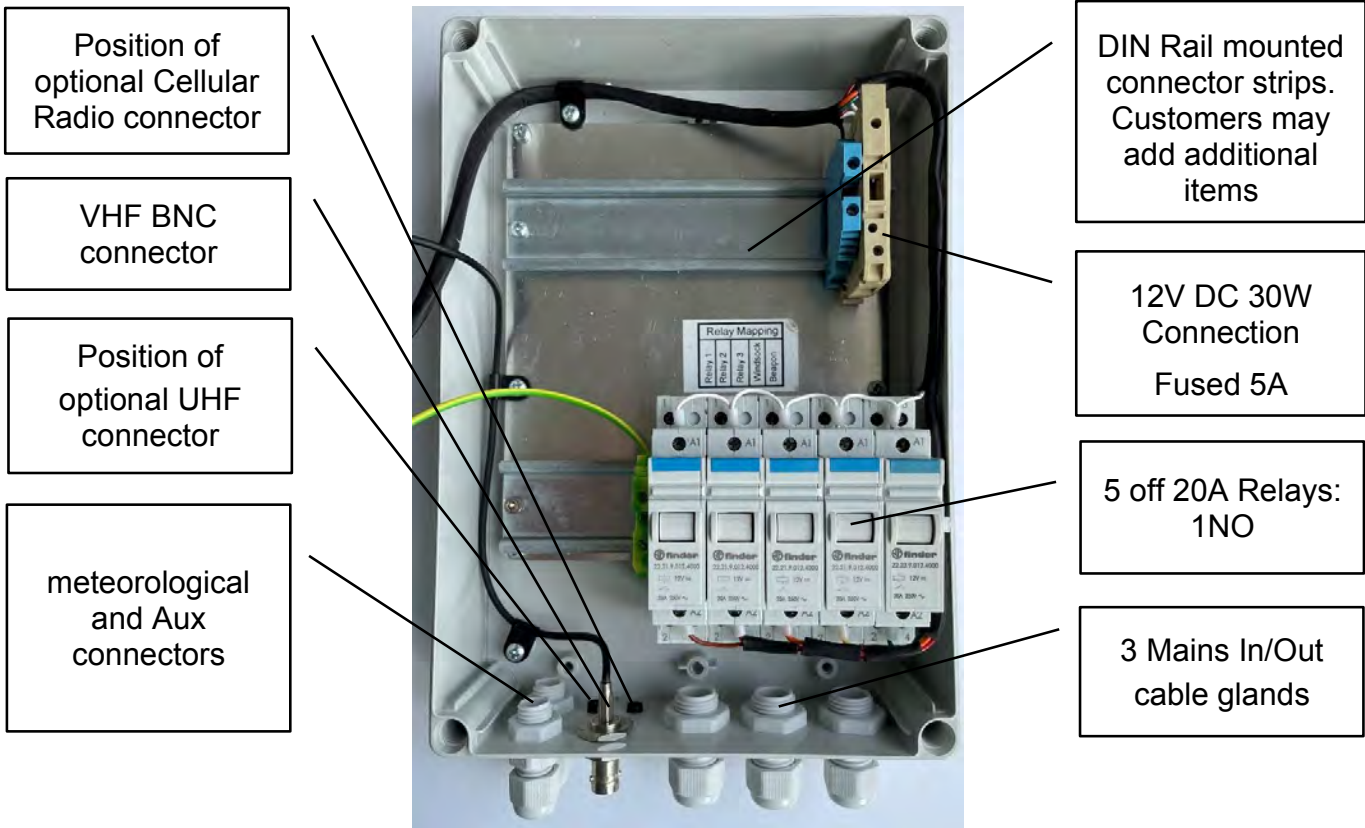
9.10.2 Conversion Steps

To convert the standard mains PSU to a 12V DC configuration, follow the steps below:

1) Ensure that the unit is disconnected from all sources of power.
2) Cut through the cable tie on the side of the PSU to release the harness from it.
3) Disconnect the mains cable harness between the current mains input connectors and the Mains PSU.
4) Disconnect the DC connection from the mains PSU.
5) Using a flat blade screwdriver, insert in the release tab at the mains end of the PSU and gently prize it open. This will release the mains PSU from the DIN rail.
6) Set the Mains PSU and mains cable harness aside – they are not needed again.
7) Using a flat blade screwdriver, gently prize the retention tabs of the live (brown) and neutral (blue) cable connectors to allow them to be released from the DIN Rail. The photo (right) shows the combination live connector and fuse holder being released.
8) Relocate the two connector as shown in the top photograph and snap onto the DIN rail.
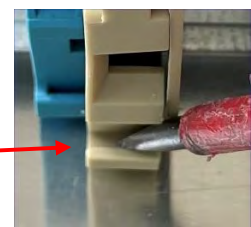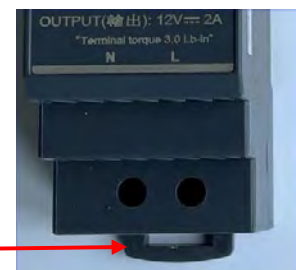
9) Slacken the central screw of the earth connector and slide it sideways until it is next to the relay block and then re-tighten the central screw to grip the DIN rail.

10) Open the fuse holder of the brown connector and connect the white and black harness cables as shown:
   a. White to the brown connector
   b. Black to the blue connector

11) Pass your 12V DC power cable through an appropriate cable gland and connect to the blocks as follows:
   a. 12V (+ve) to the brown connector
   b. 0V (-ve) to the blue connector

12) Switch on the 12V DC supply

13) Close the fuse holder and the PSU LEDs on the rear panel of the RLC should be lit. If not check
   a. All connections
   b. Correct polarity
   c. The fuse (5A 20mm)

9.10.3 Basic 12V DC Wiring Diagram (switching Mains Circuits)

The basic circuit diagram is shown below:
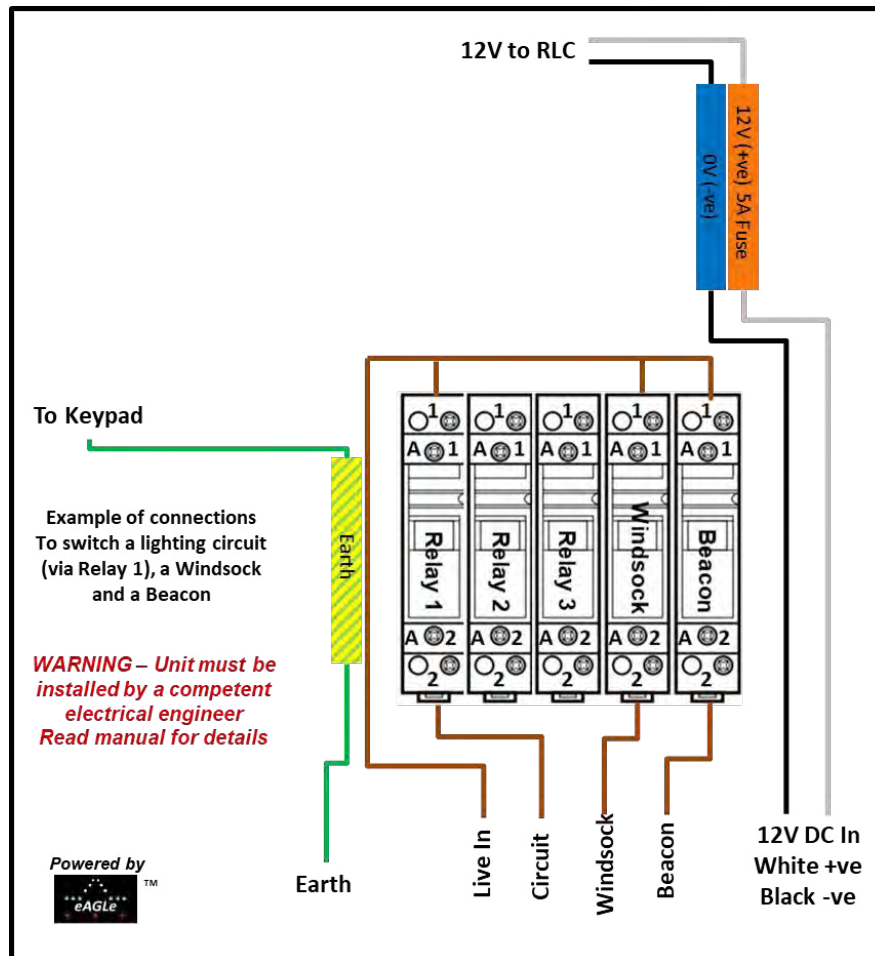
9.10.4 Basic Circuit Testing

Even before connecting the keypad, the circuits can be tested as the relays incorporate manual testing buttons.

Once the mains wiring has been completed and it is safe to energise the controlled circuit, turn on the mains supply.

9.10.5 12V DC PSU

Check that the PSU LED is lit:

- The blue LED on the PSU marked 'DC OK

If the LED on the PSU does not light, then check the mains supply, cable and fuse.

If the LED on the PSU lights but the LEDS on the rear of the keypad enclosure do not light, suspect a continuity problem with the DC feed cable to the keypad. If this cannot be resolved there is a fault with the unit which must be returned.

9.10.6 Manually checking the mains switched circuit

To test the mains switched circuit, press the button on the top of the relay(s).

This will make the contact for the normally open contact and break the contact for the normally closed contact.

Once the PSU and circuit have been checked as above the controller can be re-assembled in the reverse order that it was taken apart and the front cover attached.
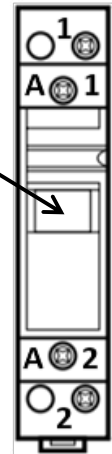
9.11 Final Assembly

Re-attach the cable(s) between the front panel unit and the base unit.

Re-attach the VHF antenna cable to the BNC socket.

Re-attach the Cellular Radio antenna cable to the SMA socket on the keypad rear panel

If fitted, re-attach the UHF Radio antenna cable to the SMA socket on the keypad rear panel

Re-assemble the front cover to the base unit and tighten the retaining screws firmly but not too tight.

Take care that:

1) All connectors and cables are secure and that they are not caught in anything.
2) The enclosure retaining screws are screwed in evenly and firmly but not too tight

You are now ready to configure the unit (section 6).

10 Summary Specification

- Controller modes: 5 – Start-up, VHF PCL, Cell, Keypad or Switch (or relay) input
- VHF Frequency Range: 118 to 137 MHz
- Channel spacing: 8.33kHz & 25kHz
- VHF Sensitivity: > -90dBm
- Frequency selection: Any channel within the Air Band
- VHF aerial: BNC - External remote mounted (Not supplied)
- BMS Output: 3 relay (normally open – Max 5W/24V DC/0.25A peak)
- BMS input: 1 (high impedance 12V output – ground to operate)
- Auxiliary Inputs: 4 (3 dedicated to Channels)
- Degree of protection: IP65 (general)
- LCD and Keypad protection: IP65 and 'vandal resistant'
- Unit operating temperature: -25ºC to +50ºC
- System Storage temperature: -25ºC to +80ºC
- Compliance: ROHC Compliant except exempt items (radios)
- Operating voltage (AC):   100-240V AC 50-60Hz
- Electrical Protection (Controller not circuits)   5A 20mm Fuse
- Operating voltage (DC):   12V DC Nominal. Range (DC): 10V – 15V DC
- Power (standby – LCD Backlight On):   12V DC: 3 watts (approx.)   240V AC: 9.10W
- Power (standby – LCD Backlight Off):   12V DC: 2.25 watts (approx.)   240V AC: 8.33W
- Power (all relays active):   12V DC: 6.25 watts (approx.)   240V AC: 11.55W
- Power (Cell transmitting):   12V DC: 10 watts (maximum)
- Max power consumption: DC/AC: 30 watts (including optional winter heater)
- Relay capacity: 5 off 20A Relays (1 NO): 3 Channels, Windsock & Beacon
                                                            DIN rail mounting
- Cable Entry (Mains):   3 off M16 Cable glands – 10mm max cable diameter
- Cable entry (MetPak) V4 Enclosure: M12 Cable gland
- Cable entry (Aux/BMS) V4 Enclosure: M12 Cable gland
- Size: Height: 280mm   Depth: 165mm   Width: 180mm
- Package Size: Height: 240mm   Depth: 320mm   Length: 350mm
- Enclosure material: ABS
- Weight (with shipping packaging):   2.5kg 5.5lbs (4.0kg 8.8lbs)
- Warranty: 2 years return to FEC (excluding relays)
- Optional Cellular Radio
  - Cell Bands: 3G (with 2G fall-back). 4G/LTE in USA
  - Network: Selected by SIM
  - Tariff: Included in service contract
  - Cell aerial: SMA Connector for remote mounted aerial (supplied)
- Optional UHF Radio
  - UHF aerial: SMA Connector for remote mounted aerial (supplied)
- Optional LAN
  - Connector/Cable   RJ45 / Cable not supplied

11   Optional Cellular Radio (HP0839)

If not fitted at the time of ordering the Cellular radio will be supplied as an installation kit comprising:

1) Cellular Radio V2 (fitted with SIM)
2) 4 off M3 button head fixing screws
3) Enclosure antenna cable
4) 2 off size 2 'P' clips
5) Wall mount antenna fitted with 3m of coaxial cable and an SMA plug

Controller with keypad back panel removed
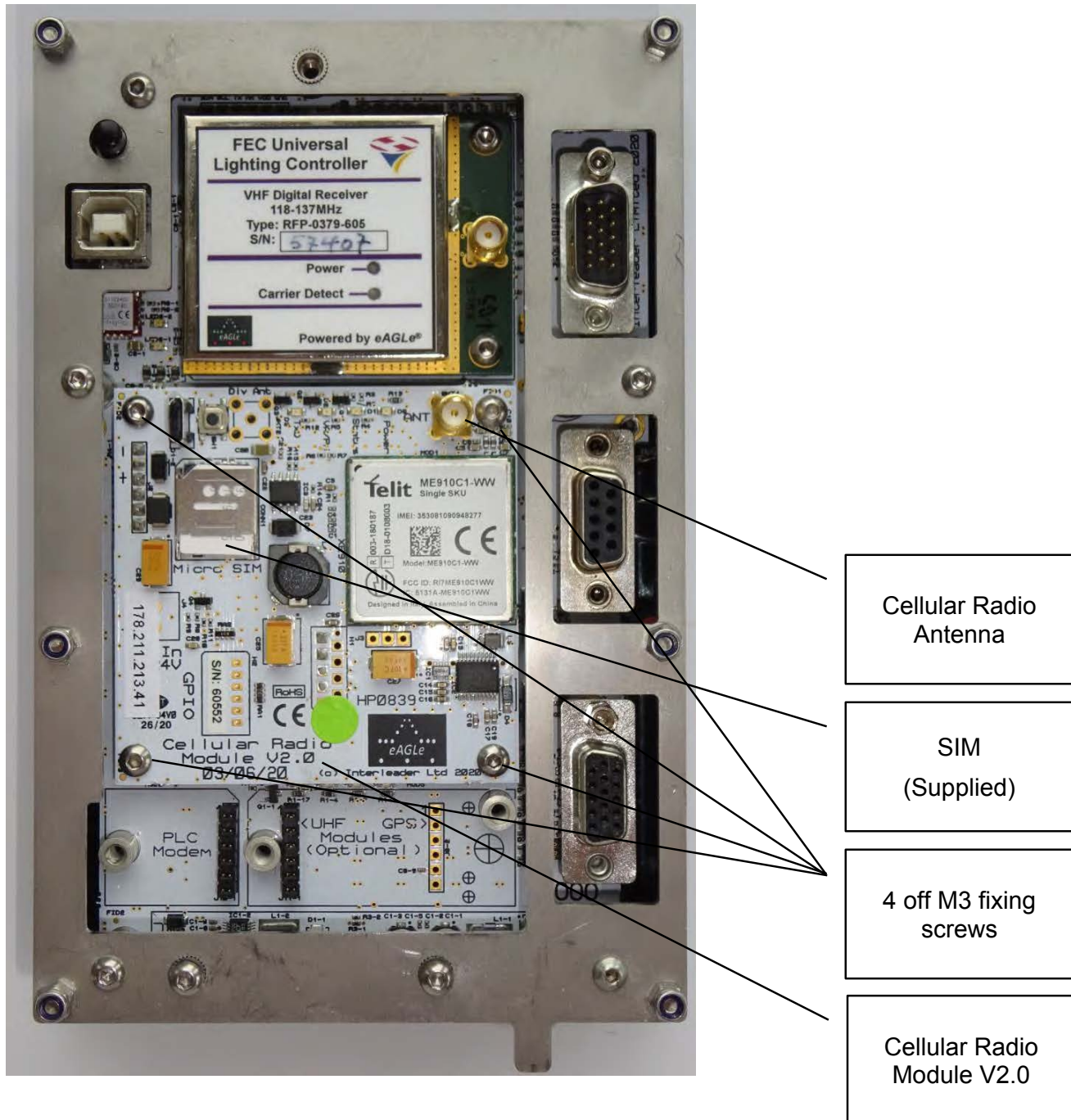
Fitting the Cellular Radio

Detailed fixing instructions are provided with the installation kit. In summary to install:

1) Turn of the power
2) Open Controller's ABS enclosure
3) Remove the top keypad back panel screws and loosen the bottom two
4) Remove the back panel and the blanking plug for the Cellular antenna
5) Carefully align the Cellular Radio module onto the connector strip and mounting holes
6) Push carefully home and fit 4 off M3 button head screws
7) Refit the keypad back panel
8) Remove the blanking plug from the base of the ABS enclosure
9) Fit the SMA bulkhead connector to the ABS base and tighten retaining nut
10) Remove the 2 off size 1 'P' clips holding the VHF antenna cable
11) Fit 2 off size 2 'P' clips to accommodate both VHF and Cellular antenna cables
12) Fit SMA plug to the Cellular Radio
13) Check all cables and refit enclosure lid to the base
14) Connect the Cellular Radio antenna (supplied in the kit)
15) Turn Controller on and with SMS confirm Cellular Radio fitted (Section 8.7 of this manual)
16) Turn the controller off and back on again and confirm that the system on start-up configures the Cellular Radio
17) Return to the SMS main screen, select 'Cellular' as the connection route and add serial number of the Controller and IP address of the Cellular Radio (supplied with the kit)
18) Connect to the Controller via Cellular

Replace 2 off P clips with size 2

Remove blank plug and fit SMA socket in ABS Base

12 Power Supply Unit Specification

All specifications are manufacturer's data:

- Manufacturer: Meanwell
- Manufacturers Model No.: HDR-30-12
- Universal AC input/Full range 85-264V AC 47-63 Hz
- Input current (full load): 0.48A (230VAC), 0.88A (110VAC)
- Protections: Short circuit/Over load/Over voltage
- Cooling by free air convection
- Can be installed on DIN rail TS-35/7.5 or 15
- Isolation class
- LED indicator for power on
- 100% full load burn-in test
- Approvals:

13 Spare Parts

The following spare parts are available and can be fitted by users:

13.1 Relays

Spare relays are available that can be easily fitted by the user/operator.

The tools required to access the controller are:

- Medium flat tipped or PZ No 2 or PH No 2 cross-head screw driver to remove cover and detach relays from rail and disconnect/reconnect wiring.

13.2 Other

There are no other user serviceable parts.

Items requiring repair need to be returned to FEC.

14 Factory Default Settings

The following are the Factory default settings and are re-applied with a 'factory reset':

Item	Default Setting	Comment
LCD Backlight	On	Option = Auto
Backlight timeout period	1 minute	Cannot be changed
In-Menu timeout period	10 minutes	Cannot be changed
Heater Enable	Auto	Option = Off
VHF Frequency	122.800MHz	Any valid 8.33kHz channel
Channel Timers	3	1 per channel
Channel Timeout Period (all)	15 minutes	Range: 10 seconds – 60 minutes
VHF Threshold	-75dBm	Range 0dBm -110dBm
'Click' period	100mS	Range 1 – 250mS
VHF Active	On	Option = Off
Cell Fitted	No	Option = Yes
Cell Active	Off	Option = On
LAN Fitted	No	Option = Yes
User PIN	0000	
Operator PIN	1111	
System PIN	9980	Range 9980 - 9989
Unit ID	Set to Unit Serial Number	Cannot be set by Operator
Channel 1 Relay(s)	Channel 1	Options: any combination
Channel 2 Relay(s)	Channel 2	Options: any combination
Channel 3 Relay(s)	Channel 3	Options: any combination
Windsock Trigger Channels	Channels 1, 2 and 3	Options: any combination
Beacon Trigger Channels	Channels 1, 2 and 3	Options: any combination
Windsock Timeout Alert	Off	Option = On
Windsock Alert Trigger Channel	Channel 1	Options: any combination
Input 1	Channel 1	None
Input 2	Channel 2	None
Input 3	Channel 3	None
BMS Input	Unassigned this S/W	

15 Diagnostics and Fault Finding

The following are the range of simple tests that an end-user of the controller can perform – to be carried out in the order given.

<div align="center">

Warning

If the controller is mains powered, the controller box will contain dangerous voltages.

A qualified electrician must perform all of the necessary safety checks on the unit prior to any other tests being carried out.

</div>

Basic Visual Checks – Ensure that:

- The unit is properly mounted, secure and appears physically undamaged
- There are no signs of overheating
- The wiring, switches and fuses that power the unit are all working as expected

Basic Operational Checks – Ensure that:

- The Status LEDs on the rear of the keypad enclosure are as follows:
- Line – Lit
- VCC – Lit
- VDD - Lit
- The LCD back-light comes on when a key is pressed
- The controller responds correctly to keypad inputs.

<div align="center">
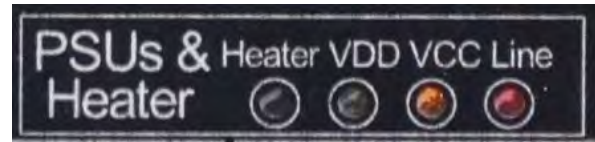
If all of the above are OK but the LCD is still not backlit and the keypad does not work there is a fault that requires the unit to be returned for repair

</div>

16 Appendix 1 – Software Updater

The Controller can be updated with new software in situ.

To update the software requires a Windows PC and a USB cable with type 'A' plug one end and type 'B' the other.

The installer requires neither software nor drivers to be installed on your PC – the standard Windows HID drivers already installed are used.

Software updates can be emailed to you as a self-extracting zip file.

Controller screens are shown next page.

To update the software (initiated through the Boot-loader Switch):

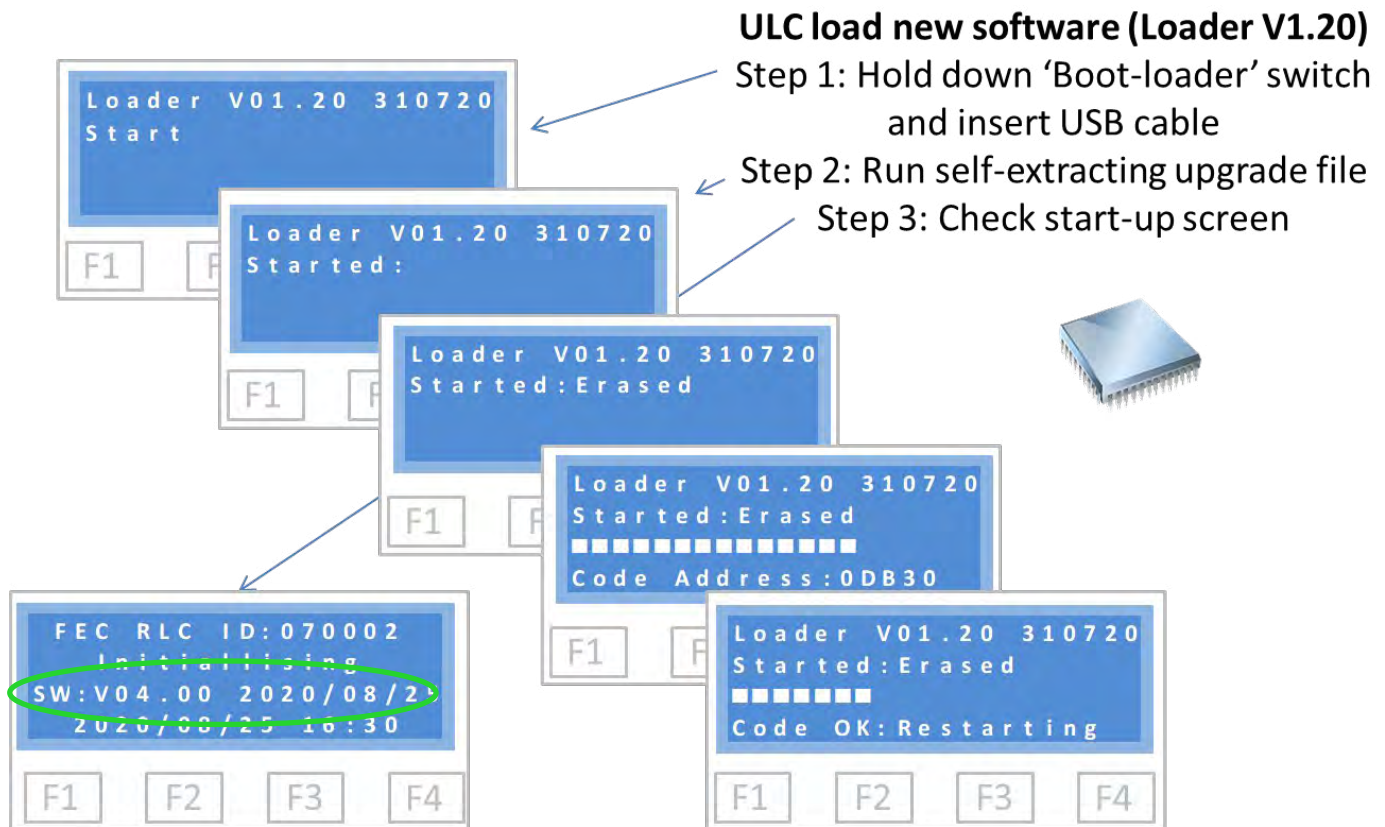The following is the simplest way of initiating the uploading of new software.

1) Turn the unit off and disconnect from the normal power source
2) Open the enclosure as described in earlier sections (open carefully and disconnect aerial and connecting cable and earth wire)
3) Lay the controller front panel face down on a protective flat surface
4) Double click on the update file and a screen similar to that to the top-right will appear
5) Connect the USB cable to the PC
6) Hold down the Boot-loader switch at the same time as connecting to the USB port on the rear of the controller (image right) – this will power the controller from the PC
7) The screen on the PC should now advise that the system is connected and the Install button will changed from greyed-out to active.
8) Click Install and the software will be automatically uploaded to the controller checked
9) A screen (right) confirms the update in progress
10) When complete – click finish and the window will close
11) If Windows asks if the programme installed ok – click yes
12) Disconnect the USB cable
13) Reassemble the controller and turn on
14) The controller will now be running the new software (Version and build date displayed on the LCD screen at start-up and via SMS)
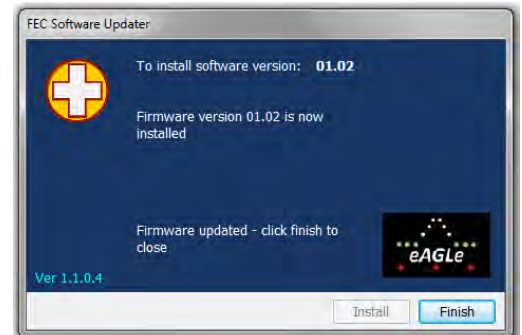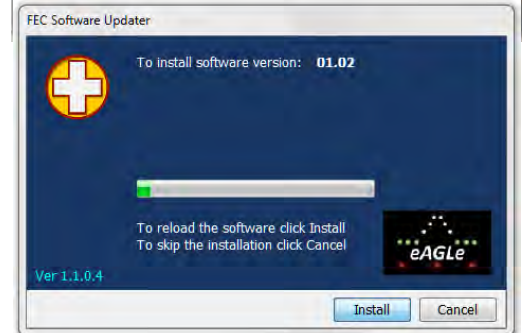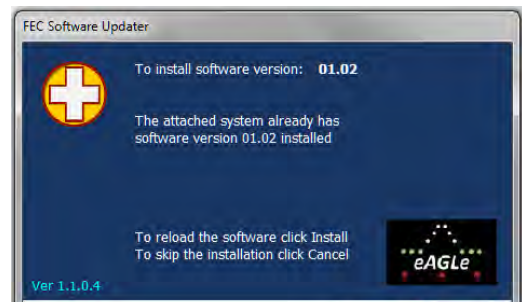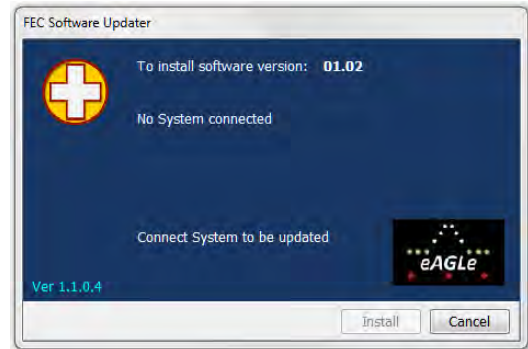
Controller Software Update Screens

Below is the sequence of screens that the Controller will display as the new software is loaded indicating progress.

DO NOT interrupt the process once started. If the process needs to be repeated, start from beginning of the process.

ULC load new software (Loader V1.20)
Step 1: Hold down 'Boot-loader' switch and insert USB cable
Step 2: Run self-extracting upgrade file
Step 3: Check start-up screen

The first time that the Controller is started after a software update pay attention to the initialisation screens and con firm version of software is as expected. Repeat with the correct version if not.

17 Appendix 2 – Aux Input and BMS Input/Output and MetPak Interface

The Controller has an auxiliary socket to support inputs, BMS input and outputs and the interface to the MetPak weather station.

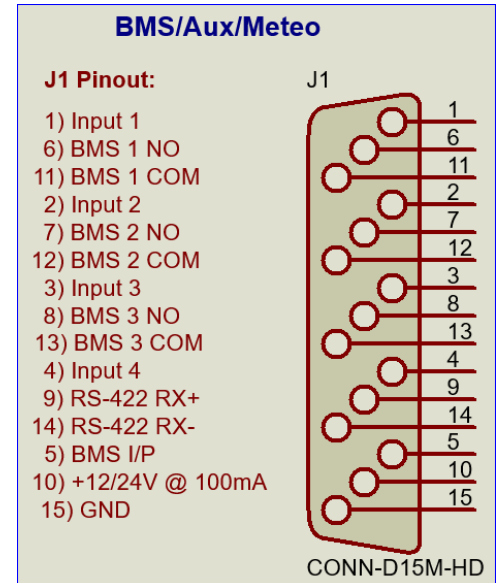The connector is a 15 way High Density D connector with the pinout shown below:

Note that power (12V for an RLC) at a maximum of 100mA is available from pin 10 to power external devices.

BMS Outputs

The BMS outputs are voltage free relay outputs.

BMS Input

The BMS IP (pin 5) can have the same range of inputs as the auxiliary inputs (below).

BMS/Aux/Meteo

J1 Pinout: J1

1) Input 1
6) BMS 1 NO
11) BMS 1 COM
2) Input 2
7) BMS 2 NO
12) BMS 2 COM
3) Input 3
8) BMS 3 NO
13) BMS 3 COM
4) Input 4
9) RS-422 RX+
14) RS-422 RX-
5) BMS I/P
10) +12/24V @ 100mA
15) GND

CONN-D15M-HD

Auxiliary Inputs

Below are a few options for controlling the Aux Inputs:

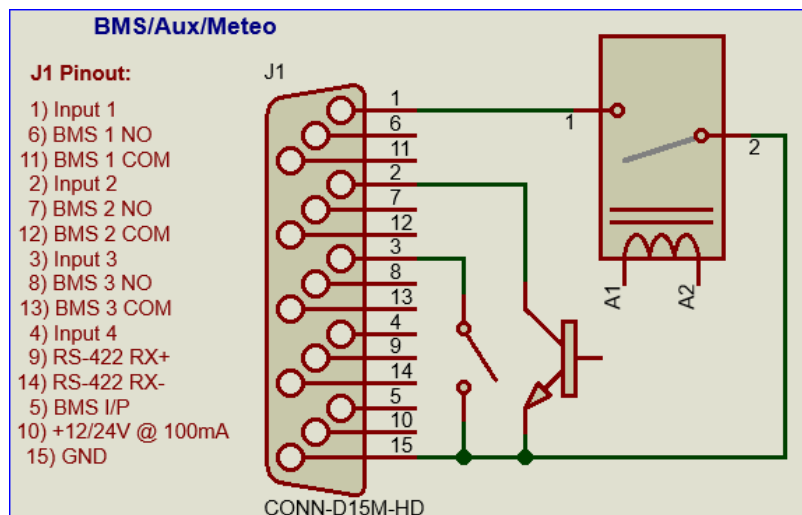**1) Relay contact on Input 1**
a. An instrument relay can be used
b. Ensure that there are no high voltages >12V DC present

2) Transistor (Open Collector/Drain) on Input 2
a. Either a junction transistor (NPN shown) or an FET can be used
b. Inputs have internal pull-up
c. Device must be rated >12V

3) Simple Switch on Input 3
a. Could be any good quality switch. Examples include: micro-switch, instrument switch.

BMS/Aux/Meteo

J1 Pinout: J1

1) Input 1
6) BMS 1 NO
11) BMS 1 COM
2) Input 2
7) BMS 2 NO
12) BMS 2 COM
3) Input 3
8) BMS 3 NO
13) BMS 3 COM
4) Input 4
9) RS-422 RX+
14) RS-422 RX-
5) BMS I/P
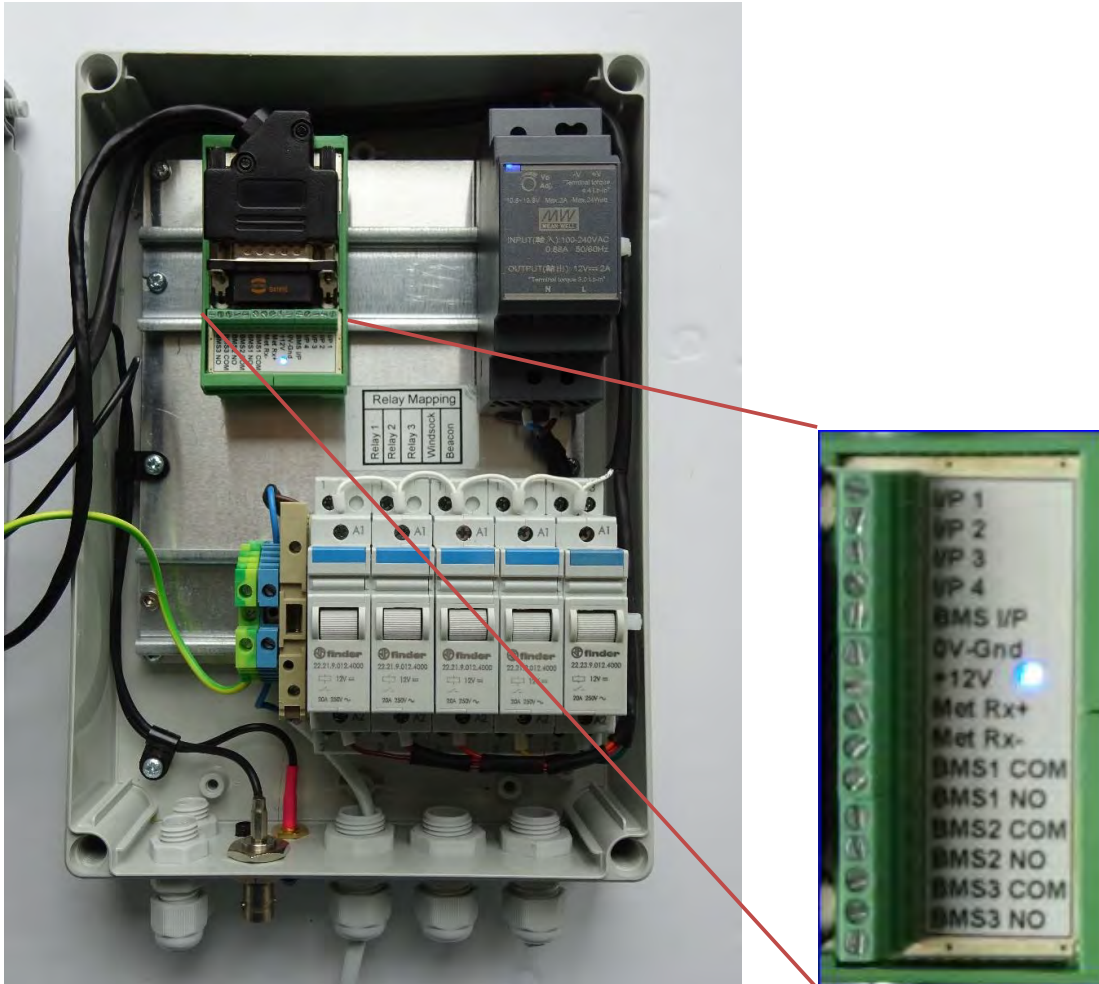10) +12/24V @ 100mA
15) GND

CONN-D15M-HD

MetPak Interface

Covered in the separate MetPak manual

17.1 Auxiliary Cable Harness - HP0827

For customers who do not wish to solder wires to the D connector an interface harness is available which brings the connections out on a 15 way screw terminal block mounted on the DIN rail in the base of the enclosure.

The pinout for this connector is shown to the right:

J2   I/O Pin-out

1) Input 1
2) Input 2
3) Input 3
4) Input 4
5) BMS I/P
6) Ground
7) +12/24V @ 100mA
8) RS-422 RX+
9) RS-422 RX-
10) BMS 1 COM
11) BMS 1 NO
12) BMS 2 COM
13) BMS 2 NO
14) BMS 3 COM
15) BMS 3 NO

17.2 Example Switch – Twilight Switch

The following is an example of the wiring for a standard, low voltage light level switch. The example shown (with cover removed) is a Danlers 'Twilight' switch which has been suitably modified to work with the Controller.

This switch should be mounted externally, protected from the weather and not pointing at any light source, particularly the lights it will control.

Connection to the Controller is via 4 core 0.35mm^2 (22 AWG) instrument cable (AlphaWire 1174L or similar).

The wiring is connected as follows:

15 Way Male 'D' Connector	Cable Core	Twilight Switch
Pin 10	Red wire	12V
Pin 1	White wire	O/P (Output from switch)
Pin 15	Black and Green wires	0V
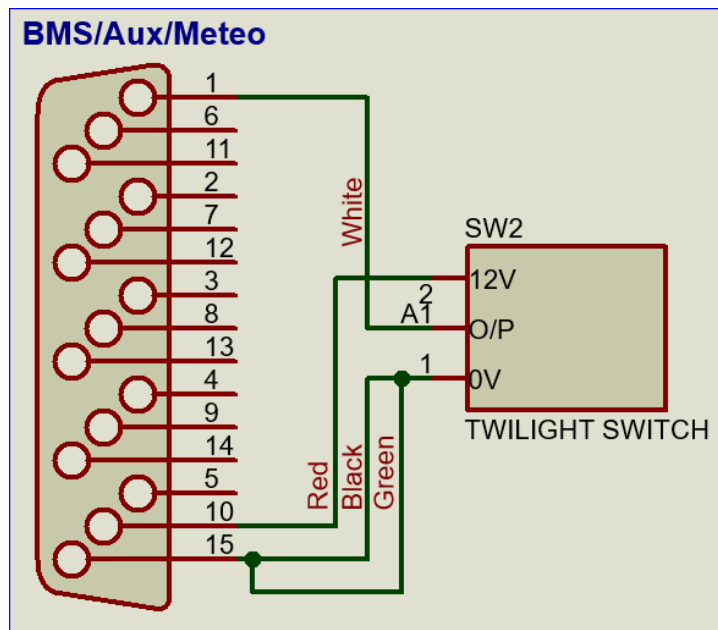
Control for adjusting light level at which switch will come on.

Use a small screwdriver to make small adjustments, waiting for 10 seconds each time to confirm the change.

Once installed use the Aux input screens to confirm that the switch is closing.

Note that the switch has a time-delay of many seconds to avoid false triggers. Ensure you take this into account when testing the switch.

18 Appendix 3 – Aerials and Cables

18.1 Mains Cables, Switches and Fuses

No external mains cables, switches or fuses are supplied with the Controller. It is the responsibility of the owner/installer to ensure that the installation is carried out in such a manner as to ensure the safety of the installation and that it meets all of the relevant local regulations.

18.2 Cell Aerial

The Controller is supplied with a Cell aerial which must be attached to the socket on top or base of the unit (Enclosure V1) or remotely mounted (Enclosure V2 onwards).

For the top-mounted stub aerial, ensure that it is a secure fit but do not over-tighten.

The remote Cell aerial is supplied with suitable coax cable fitted with an SMA connector.

An aerial extension cable may be used but, to avoid undue cable losses, keep the cable as short as possible (total max 10m).

18.3 VHF Aerial

The Controller is not supplied with any of the VHF aerial components required.

Inventory

For installations with good signal strength a simple mag-mount whip antenna (example upper right: Aviator-2 WSM-225) maybe all that is required.

It is recommended that a higher gain antenna is used. A pole mounted air-band aerial (example lower right: Diamond D-777).

This should be specified and installed by an experienced aerial installer.

You are strongly recommended to fit a Static Surge Protector into the down-feed (example: SP-350V).

A typical installation would need:

1) 1 off aerial type e.g. D-777
2) 1 off aerial mounting bracket
3) 1 off Static Surge Protector e.g. type SP-350V
4) 1 off link cable (between aerial and SP-350V) fitted with PL-259 plugs each end
5) 50ohm down-cable (length/type to suit installation – see over)
6) 1 off PL-259 plug to connect to SP-350V, and
7) 50ohm BNC Plug to connect to Controller.

VHF Cable

For a long run you may want to use RG213 cable (this has an outside diameter of 10.3mm).

For a short run you may want to use RG58 cable (this has an outside diameter of 4.99mm).

At the controller end you will need to terminate in a BNC plug which are available for both of the above.

When installing cable it is not just the diameter of the trunking but two areas are critical and the contractor should be aware:

1) All cables are specified with a Minimum Bending Radius (MBR). Check the data sheet but this is usually a minimum of 10 times the diameter so for the RG213 above is 103mm (4")

2) Kinking or twisting of the cable must be avoided. If a cable is 'bent', even when straightened out again, the internal core will be permanently damaged and cause additional loss and unwanted signal reflections in the cable.

Customers are advised to make sure that:

1) Their contractor is experienced in installing and terminating such cables

2) The cable-ways, ducts, trunking etc. allow for easy bends that exceed the MBR and provide good support

3) The installation work is closely monitored

4) Their installer performs a TDR (Time Domain Reflectometry) test and presents this as part of his certification of installation (the TDR test will both demonstrate that the cable has not been damaged and provide you with a reference document for future audits or checks).

Installation

The diagram to the right gives a suggested general layout for an aerial installation.

Your installer will be able to advise on the details specific to your installation.
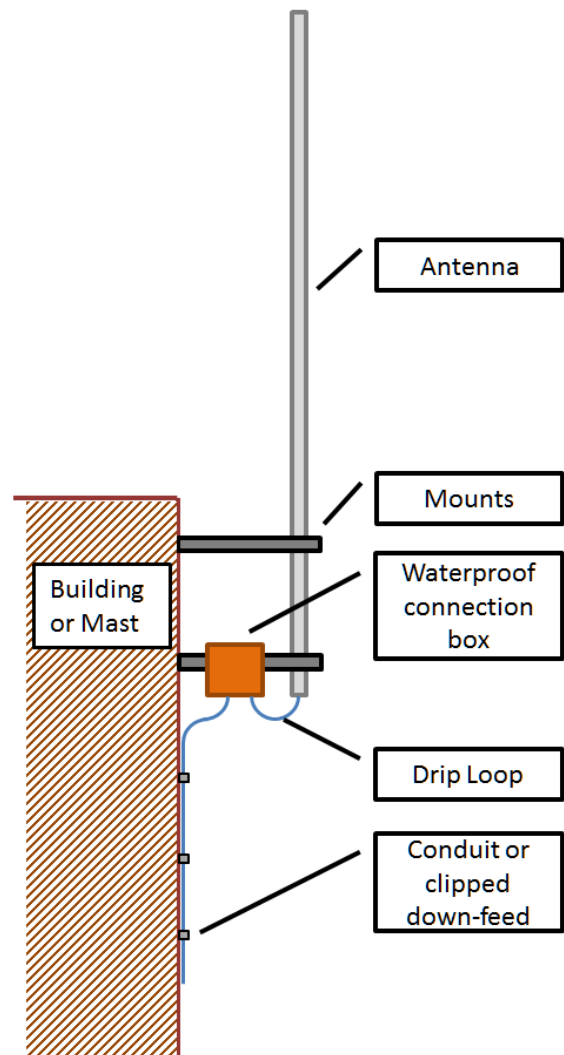
Multiple Aerials

Where a Controller is to be installed at a facility with other Airband VHF transmitting devices a separate aerial **must** be used for the Controller.

To avoid interference or damage to the Controller, the Controller and other device's aerials should be either:

1) Located some distance apart horizontally (greater than 10 meters), or
2) If located on the same mast, aligned vertically one above the other with an ideal separation of at least 2 meters.

The drawing below gives the general layout:
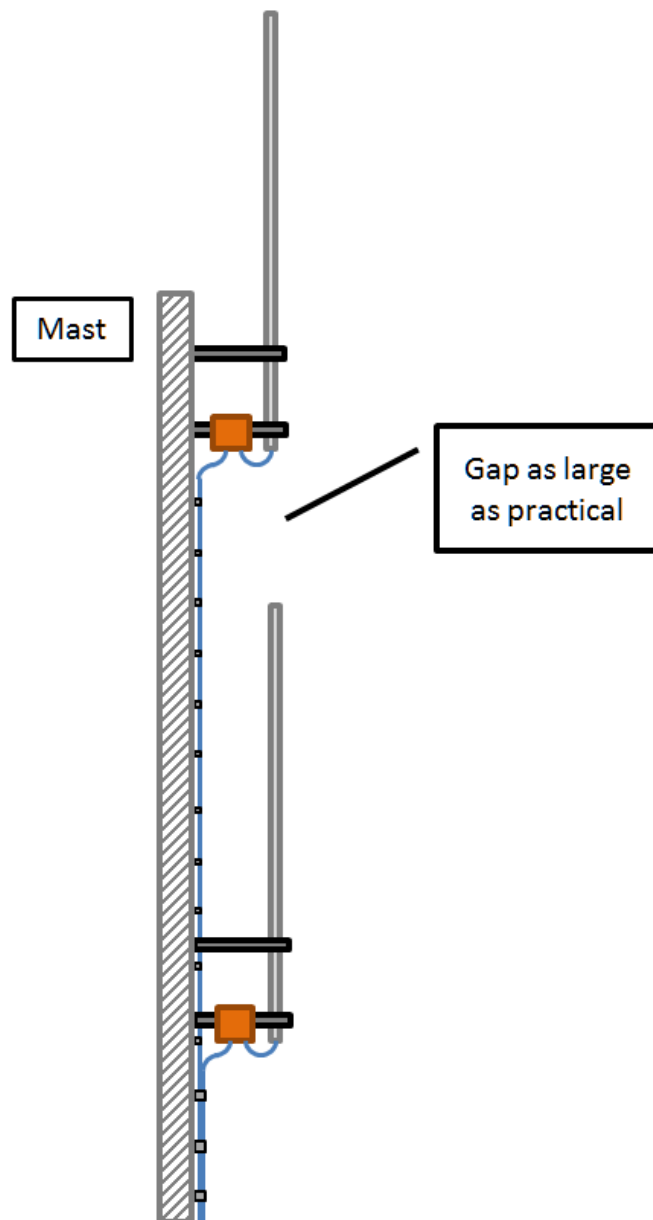
19 Appendix 4 – Bluetooth Radio – EU Declaration of Conformity

23.5 EU Declaration of conformity

$$CE$$

EU DECLARATION OF CONFORMITY

Radio equipment: 2611011024000

The manufacturer: Würth Elektronik eiSos GmbH & Co. KG
Max-Eyth-Straße 1
74638 Waldenburg

This declaration of conformity is issued under the sole responsibility of the manufacturer.

Object of the declaration: 2611011024000

The object of the declaration described above is in conformity with the relevant Union harmonization legislation: Directive 2014/53/EU and 2011/65/EU.
Following harmonized norms or technical specifications have been applied:

EN 300 328 V2.1.1 (2016-11)
EN 301 489-1 V2.1.1 (2017-02)
EN 301 489-17 V3.1.1 (2017-02)
EN 62368-1:2014 + AC:2015 +A11:2019

i.A. G. Eßlardt

Trier, 17th of December 2019
Place and date of issue

Proteus-III reference manual version 1.0   © February 2020
www.we-online.com/wireless-connectivity   212

20 Appendix 5 – Cellular Radio – EU Declaration of Conformity

EU DECLARATION OF CONFORMITY [20618DOC00170A Rev.1]

1 **ME910G1-W1** (product name)

2 Telit Communications S.p.A. – Via Stazione di Prosecco, 5/B – 34010 Sgonico TRIESTE – ITALY (manufacturer)

3 This declaration of conformity is issued under the sole responsibility of the manufacturer

4 NB-IoT and eMTC E-UTRA FDD FDD B1, B3, B8, B20, B28 + GNSS wireless module. SW Version(s) M0C.300001

Operating frequency bands and related max radio-frequency power transmitted:

All LTE FDD bands: +20 dBm +/- 2dB

5 The object of the declaration described above is in conformity with the relevant Community harmonisation: European Directive 2014/53/EU (RED)

6 The conformity with the essential requirements set out in Art.3 of the 2014/53/EU has been demonstrated against the following harmonized standards:

Harmonized Standard reference	Article of Directive 2014/53/EU
EN 62368-1:2014+A11:2017 EN 62479:2010 / EN 50385:2017	3.1 (a): Health and Safety of the User
EN 301 489-1 V2.2.3 / EN 301 489-19 V2.1.1 / EN 301 489-52 V1.1.0	3.1 (b): Electromagnetic Compatibility
EN 301 908-1 V11.1.1 / EN 301 908-13 V11.1.2 EN 303 413 V1.1.1	3.2: Effective use of spectrum allocated

7 The conformity assessment procedure referred to in Article 17 and detailed in Annex III of Directive 2014/53/EU has been followed with the involvement of the following Notified Body:

TÜV Rheinland LGA Products GmbH, Tillystaße 2, 90431 Nümberg, Germany. NB No. 0197

Thus, CE is placed on the product

8 The product can be considered compliant to the essential requirements set out in Art.3 of 2014/53/EU only in combination with the above-mentioned SW version(s).

9 The Technical Documentation (TD) relevant to the product described above and which supports this Declaration of Conformity, is held at: Telit Communications S.p.A., Via Stazione di Prosecco, 5/b - 34010 Sgonico – TRIESTE – ITALY

Trieste,   2020-06-22

DocuSigned by:
F68BE52BD60F49E...
VP Global Certification, R&D
Paolomaria Schiratti

EU-Type Examination Certificate No. RT 60145585 0001   Technical Documentation: 30618TCF00140A

www.Telit.com/RED

Telit Communications S.p.A.   Cap. Soc. € 3.000.000   Società soggetta all'attività   Società con socio unico
Via Stazione di Prosecco n. 5/B   Partita IVA 03711600266   di direzione e coordinamento   (Telit Communications PLC)
34010 Sgonico (TS) - ITALY   Cod.Fisc. 03711600266   da parte di Telit Communications PLC
Phone +39 040 4192 111   Nr. R.E.A. TS-120027   con sede in Londra (art.2497 bis C.C.)
Fax   +39 040 4192 333

Mod 243 2017-02 Rev.1- This declaration is issued according to 768/2008/EC

21 Appendix 6 – Mounting Template

The template below is at a scale of 1:1 if this document is printed on A4 paper or US Letter and no scaling options are used e.g. do NOT use the printing option 'scale to fit'.

Enclosure Fixing Centres
235mm
by
160mm

Fixing Holes 4.5mm dia. (0.178")

Maximum Screw Head Diameter
8.5mm (0.33")

Recommended Screw Size :
Metric: M4   USA: No. 8

Enclosure Dimensions   250mm
by
175mm