FEC Heliports Equipment

HEMS-Station®

FEC Types: HP0723 & HP0725

User Manual

HP0725 HEMS-Station® Installation at Hereford (inset shows open HEMS-Station®)

HEMS-Station® Version 1 Issue: 3 16th January 2018

Note that this manual relates to

Hardware V1 and Software V3.04 onwards

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Document Revision Sheet

Version - Issue	Date	Changes
1 - 1	20 December 2017	New Document for HEMS-Station® V1 Production model
1 - 2	21 December 2017	Typos corrected
1 - 3	16 January 2018	Appendix 7 - Software update section revised

Notes

1. Physical and electrical installation of both versions of HEMS-Station® is covered in a separate manual (included on the distribution CD):
    a. HEMS-Station® HP0725 - Installation Manual.
2. Operation of the HEMS-Star® is covered in a separate manual (included on the distribution CD):
    a. MIL-Star® and HEMS-Star® - HP0678 Manual
3. The HEMS-Station® Lighting Control (HLC) version (HP0725) contains a Cellular Radio - 2G/3G in GSM served territories, 4G/LTE in the USA. Throughout this document this is referred to as ‘GSM’ or the ‘Cell’.
4. This manual covers all HLC commands available to the Operator and User. Additional commands available to FEC, System and the OEM are contained in separate documents.

Optional Meteorological Pack
(Pole Mounted)

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1 HP0725 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.

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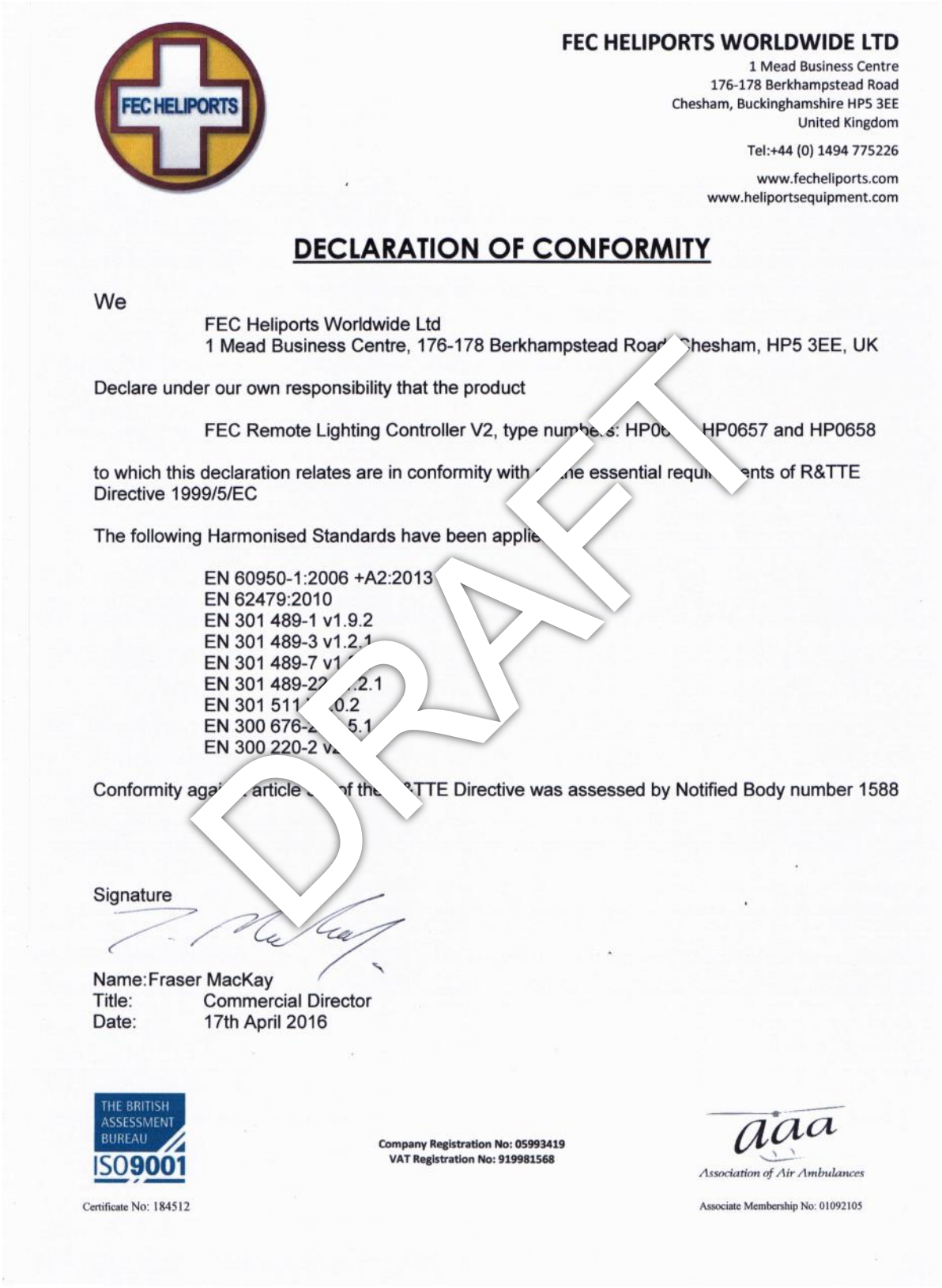
2 HP0725 Compliance Statement – Europe



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DECLARATION OF CONFORMITY

We

FEC Heliports Worldwide Ltd
1 Mead Business Centre, 176-178 Berkhampstead Road, Chesham, HP5 3EE, UK

Declare under our own responsibility that the product

FEC Remote Lighting Controller V2, type numbers: HP0[illegible] HP0657 and HP0658

to which this declaration relates are in conformity with the essential requirements of R&TTE Directive 1999/5/EC

The following Harmonised Standards have been applied:

EN 60950-1:2006 +A2:2013
EN 62479:2010
EN 301 489-1 v1.9.2
EN 301 489-3 v1.2.1
EN 301 489-7 v1[illegible]
EN 301 489-22 [illegible].2.1
EN 301 511 [illegible].0.2
EN 300 676-2 [illegible] 5.1
EN 300 220-2 v[illegible]

Conformity against article [illegible] of the R&TTE Directive was assessed by Notified Body number 1588

Signature

Name: Fraser MacKay
Title: Commercial Director
Date: 17th April 2016

THE BRITISH ASSESSMENT BUREAU ISO9001
Certificate No: 184512

Company Registration No: 05993419
VAT Registration No: 919981568

aaa
Association of Air Ambulances
Associate Membership No: 01092105

DRAFT

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

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3 The HEMS-Station® Systems

There are two variants of the HEMS-Station®:

HP0723 - Basic unit for housing and charging up to 10 HEMS-Stars®

HP0725 - As above plus HEMS-Station® Lighting Controller (HLC)

Both versions have the same basic power supply unit, wiring harnesses, LED logo light, enclosure light, mains thermostatically controlled cabinet heater and power distribution boards to the individual light racks.

HP0725 additionally has the HLC unit (all assembled within the LCD & Keypad enclosure), additional main harness (for power, signalling and relay control), external USB socket and GSM, VHF and UHF antenna cables and connectors.

Door mounted Spike Racks are standard for both versions

HP0723 – Basic HEMS-Station®

HP0725 – HLC HEMS-Station®

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.

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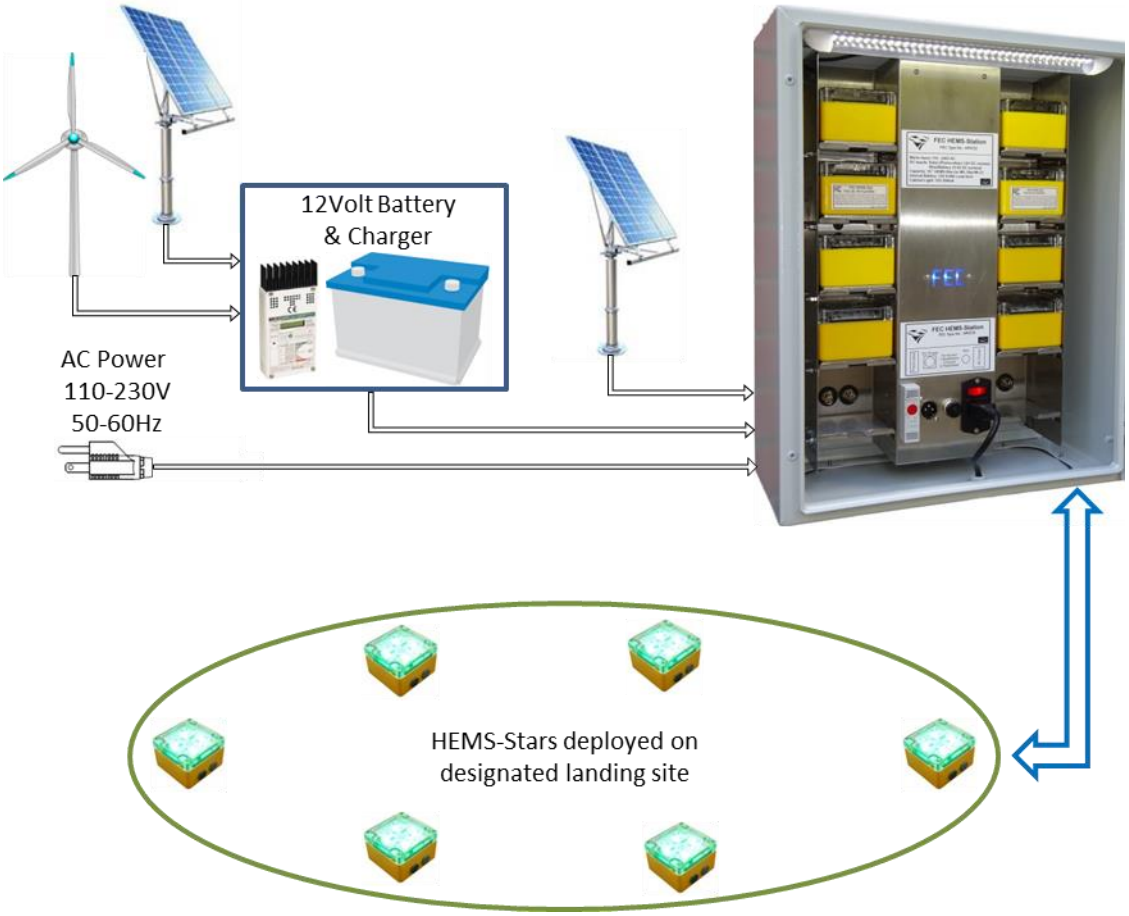
4 Basic Architecture of HEMS-Station® HP0723/5

HEMS-Station® features:

- Capacity to charge up to 10 HEMS-Stars® simultaneously:
  - Simple, wire-free, slide-in rack mounting & charger connection of lights
  - Quick deployment lift and slide-out
  - Turn on, testing of lights and charge status check while lights in rack
- Flexible power source options:
  - Mains supply (110-23VAC 50/60Hz) Power Supply Unit (PSU)
  - Direct Photo Voltaic (PV) Solar Panel/Battery input
  - Combined Wind Turbine and/or Solar Panel and 12V lead-acid battery
  - Simultaneous mains and Solar/Wind/Battery combinations
  - Automatic selection of mains with automatic switch-over to DC sources
- Cabinet light with independent Li-ion battery (charged as per lights)
- Cabinet heater with user settable thermostat (Mains supply only)
- Rack for up to 10 HEMS-Stars® Ground Spikes
- Secure powder-coated steel enclosure with twin key locks
- Flexible mounting options:
  - Wall mount with pre-drilled mounting holes
  - Pole mount with optional pole clamp
- Complete pole mounting kits available as options



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5 Architecture of HEMS-Station® HP0725

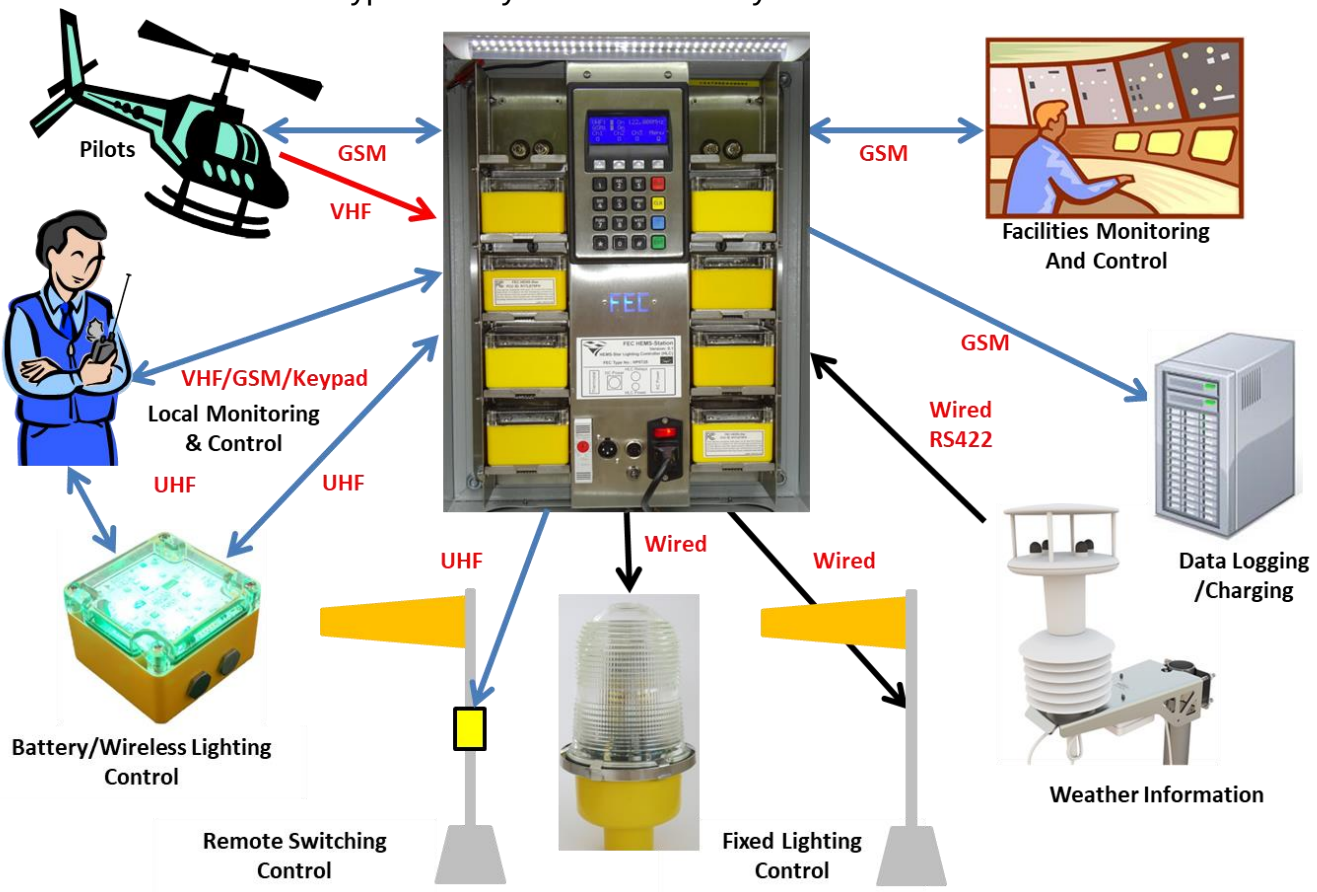
The HP0725 has the same characteristics and capabilities as the HP0723 and adds both local and remote radio control and monitoring of fixed and portable lights.

At the heart of the HP0725 is a HEMS-Station® Lighting Controller (HLC) including:

- A state-of-the-art, fully synthesised digital VHF receiver
- 2G/3G Cellular Radio (GSM) Module (4G/LTE for the USA)
- UHF bi-directional UHF transceiver[1]
- 3 channel relay driver circuits
- RS422 serial interface

This comprehensive architecture enables very flexible control and monitoring:

- Activation of wired and wireless lights:
  - Pilot activation via VHF or GSM radios
  - Local operator activation via keypad, VHF or GSM radios
  - Remote central/regional activation via GSM radio
- Monitoring and data acquisition via keypad/LCD or GSM:
  - Reporting of HEMS-Station® operational status
  - Reporting of critical system parameters (voltages, temperature)
  - Weather information (if optional MetPak fitted)
- Configuration of system and operation
  - Via keypad locally or GSM remotely



[1] Battery/Wireless (868MHz UHF) UK/EU/ROW - (915MHz UHF) USA

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6 Basic Operation – HP0723 & HP0725

6.1 Access

The HEMS-Station® is accessed using the two key locks (both the same key profile) on the front door. The door opens to the right.

6.2 Charging

Mains Supply

The HEMS-Station® is fitted with an internal mains 15V DC Power Supply Unit (PSU). Connection to the PSU is via the front panel switched/fused IEC connector and mains lead.

With the mains supply connected, turn on the rocker switch. The switch illuminates when on. If it does not, check the mains feed wiring and fuses etc. and also the fuse in the fuse holder of the IEC connector.

Use a small screwdriver blade to open the fuse holder. There are two 5A 20mm fuses in the holder, the operating fuse and a spare (closest to the outside of the holder). Examine the state of the operating fuse and ensure it is OK, changing it for the spare if not. Repeated blowing of the fuse indicates a fault in which case disconnect the unit from the mains and contact FEC for assistance.

Solar PV/Battery and Wind Turbine/Battery

The HEMS-Station® has two external DC inputs on the front panel. The combinations which can be connected are:

1) A 12V or 24V Battery
2) A Photo-Voltaic (PV) Solar Panel
3) A PV Solar Panel, Charge Controller and 12V battery, and
4) A Wind Turbine, Charge Controller and 12V battery

Any two of the above can be connected simultaneously with or without a mains supply to power the unit.

The HEMS-Station® incorporates automatic power feed selection such that whichever source is providing the highest voltage supplies the unit. If there is a mains supply it will power the unit in preference to a 12V battery feed. Should the mains supply be lost the supply would immediately and seamlessly switch to the alternative source.

When power is supplied from any source the FEC logo in the centre of the front panel is illuminated and all of the spring contactors in the charging bays are powered at the source voltage.

The FEC logo is not powered by the internal systems power battery (next section) and will therefore not illuminate when the systems power is turned on.

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6.3 System Power

The internal cabinet light (and HEMS-Station® Lighting Controller system on Type: HP0725) are powered from an internal 7.5V (nom) 2.4Ah Li-Ion battery which is charged from any of the power source that the HEMS-Station® is connected to.

This supply is completely independent of the charging circuit but uses the same power sources (i.e. mains, solar or wind turbine/battery).

To avoid this internal battery discharging when in storage or delivery prior to installation, the internal supply is delivered turned off via the rotary switch on the lower front panel.

Once the HEMS-Station® has been installed and provided with a source of power, the rotary switch can be turned on by inserting the key (ident upwards) and rotating clockwise ¼ turn. The key can be removed from the switch in either the Off or On states.

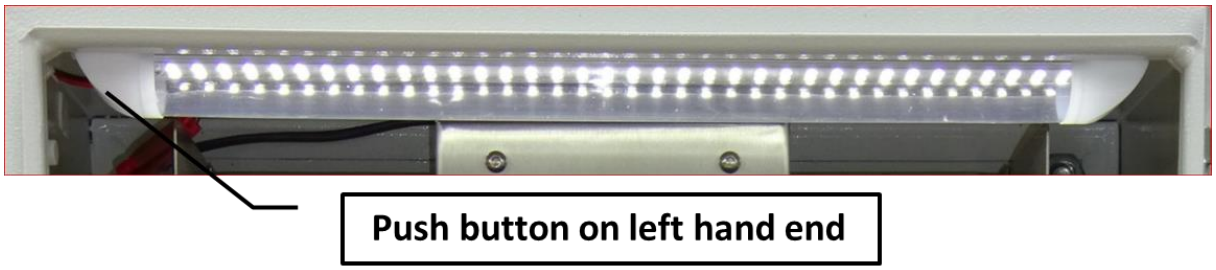
There is no direct indication on a basic HEMS-Station® (Type: HP0723) that the systems power is on but it can be checked by turning the cabinet light on (next section).

Before power is removed from the HEMS-Station® ensure that the system power is turned off.

6.4 Cabinet Light

To ensure safe and efficient night-time operation the HEMS-Station® is fitted with a cabinet light situated at the top of the cabinet.

To turn the light on, press and release the push button on the left hand end of the light.



Press and release the button again to turn it off.

NB: It is important to turn the cabinet light off at the end of any operation. Failure to do so will run the internal systems battery down.

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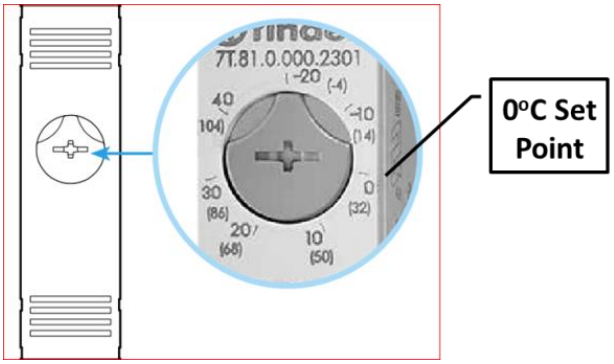
6.5 Cabinet Heater

To reduce the risk of condensation in the cabinet, HEMS-Station® is fitted with a cabinet heater controlled by a user-settable thermostat.

The heater will only work on mains power since the load would be too great to operate from batteries.

As shipped, the thermostat is set to 0°C. The set point can be set using the rotary dial on the front of the thermostat:



6.6 Charging Bays

HEMS-Station® is fitted with two 5 way charging bays with wire-free spring contacts for quick and effective insertion and removal of up to 10 HEMS-Stars®.

Every HEMS-Star® has its own intelligent charging controller built in so there is no need to 'manage' the charging of the lights – the on-board chargers will calculate the charging requirement of each light, fully charge it and then stop charging.

This means that lights in a variety of charge states can be safely put into the HEMS-Station® at the same time with no worry about over or under charging.

HEMS-Stars® are simply placed into the bays with their charging studs facing the back, gently pushed against the spring and set behind the lip of the shelf which holds them in the correct position.

To take HEMS-Stars® out of the bays, place a finger under the front of the light and gently lift it. The springs will push the light forward and they are then simply extracted.

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7 HP0725 – HEMS-Station® with HLC - Principles of Operation

7.1 Keypad and LCD Display - Overview

The FEC HLC is fully configurable via the front panel keypad and screen.

All setup, test and monitoring of the controller is carried out via the front panel keypad and LCD display (many commands also possible remotely via SMS – see later section). There are no controls inside the case.

The menus are arranged in an 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.

The key features of the interface are:

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.

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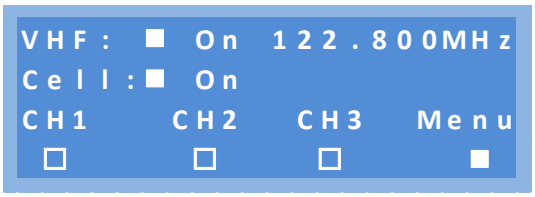
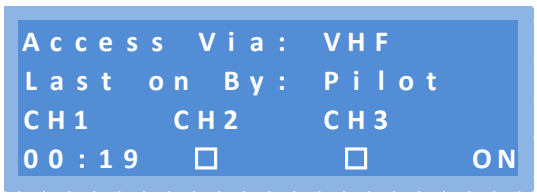
7.2 The Main Screen

The top menu is not really a menu at all but rather the main status display page with two main options: 1) select the menu or 2) directly activate a Channel.

By default the screen remains 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 commanded 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 system setup.





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

The screen on the left is showing the following:

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: The Cell receiver is ON - shown by both the filled box and the word 'On'.

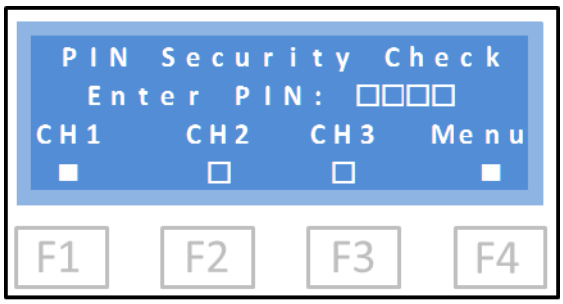
Line 3: Is the legend and functional description of the function keys

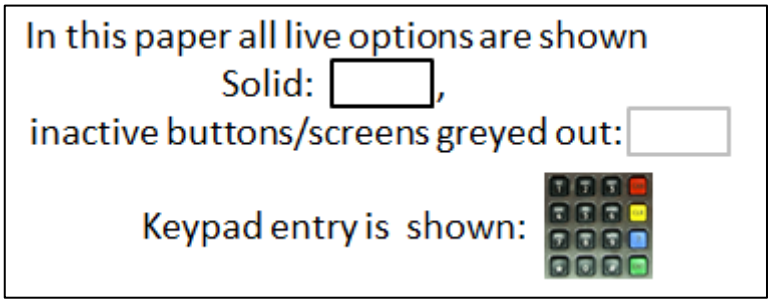
Line 4: Indicates the status of the channels. In this example, none are active (open boxes) and the Menu is available via the Function Key 4 below it.

In the screen on the right a Pilot has activated the system via VHF Channel 1 (Relay 1) is active and the system menu is unavailable until the predefined time-out period. The timeout period is shown, down counting every second.

7.2.1 Entering Menu Mode

To enter the Menu mode, simply press the function key (F4).





You will be taken immediately to the PIN challenge screen (above) to enter your security PIN.

Note that the representation above is used consistently throughout the manual. The FEC HLC adopts a set of simple but key principles in its mode of operation. These principles, which guide how the system works, are outlined below.

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7.3 General

The controller is designed to 'fail safe'. For example – If power is lost at any time, on resumption of power, the controller will re-start under the conditions it was in at the time of power failure: If the VHF receiver had previously been set to 'inactive' that is the state it will restart in. There are a number of 'Types' of users of the system:

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

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

Agency – A third party who the operator wishes to be informed of operational activity.

Mimic – A designated mimic panel used to remotely control and report HLC activity

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.

The options available to FEC and OEM are explicitly defined as part of the supply agreement.

7.4 Channels

The HLC uses the concept of 'Channels'. Channels are activated via the Keypad, VHF, an Auxiliary Input and Cell. Channels are then mapped to control which relays are activated. The default settings are as follows:

Keypad Action	VHF Action [1]	Cell SMS	Default Relay Activated
Soft Key # 1 Pressed	3 'clicks'	C1a	Relay 1 activated
Soft Key # 2 Pressed	5 'clicks'	C2a	Relay 2 activated
Soft Key # 3 Pressed	7 'clicks'	C3a	Relay 3 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, Channel 3/Relay 3 are dedicated to this activity

7.5 VHF Operation

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

This will turn on whichever relay(s) have been assigned to channels 1, 2 or 3 respectively for the periods previously set by the operator (default 15 minutes) for each relay. There is no restriction as to who can use the VHF part of the controller. If it is active and someone is on frequency they can operate it.

During this period the 'Menu' option is not available but additional channels can be activated by pressing the microphone switch again. Each time a channel is set the timeout period for that relay is reset.

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7.6 Keypad Operation

If the controller is at the main menu level (waiting for input) or a channel(s) is already active, pressing function button 1, 2 or 3 will invoke the PIN password challenge which, if successful, will then turn on Channels 1, 2 or 3.

During this period the 'Menu' option is not available but additional channels can be activated by repeating the above action. Each time a channel is set the timeout period is reset.

7.7 Keypad Cancel

If any channel has been set On (via VHF, Cell or keypad) input the Operator can terminate all of the timeout periods. To do this:

1) Press the <CAN> key
2) Enter Operator PIN

The timeout loops will be aborted and the system will return to the main menu.

Any other inputs or the wrong PIN will be ignored and the timeouts continue.

7.8 Cell/SMS Operation

A summary of the User options and some of the Operator options is as follows:

Action	User	Operator	Comment
Obtain Help Menu	√	√	User receives 1 text of help, the Operator 2 covering the extended commands available
Turn Channel(s) ON/OFF	√	√*	*Note a User can turn a channel OFF only if they previously turned it ON An Operator can always turn channels OFF irrespective of who turned it ON
Turn HEMS-Stars(s) ON	√	√	
Obtain current status	√	√	Will also receive meteo information if present
Obtain Cellular radio status	√	√	
Turn Cellular radio On/Off		√	
Turn UHF radio On/Off		√	
Turn VHF Radio On/Off		√	
Obtain Meteorological data	√	√	Only with optional Meteorological package
Confirm Meteorological Units	√	√	
Change Meteorological Units		√	e.g. wind speed from knots to mph
Obtain all build, configuration and operational data		√	
Set User, Operator and Mimic PINS		√	

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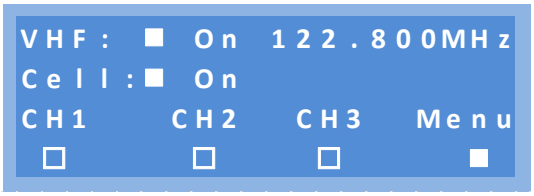
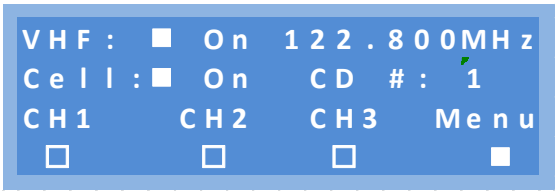
8 Normal Operation

8.1 Activation by VHF

When operating normally the screen will typically show the following (left):





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

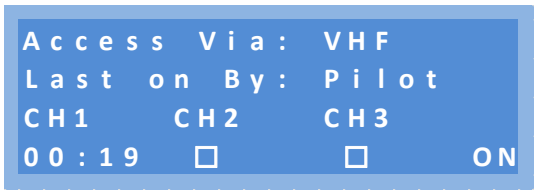
In this case indicating that both VHF and Cell are ON but that no channel is active.

As soon as a VHF signal is detected on frequency the screen will immediately change to that **on the right indicating 1 Carrier Detect (CD) activity.**

During a 5 second period (a de-facto standard for Pilot Controlled Lighting) the system is counting 'clicks' from the pilot. The number of clicks (CD) received in the 5 second period is displayed as shown above and at the end of that period the following occurs:

Clicks	Action	Comment – NB Default Settings
1, 2, 4, 6 or 8 or more clicks	No action taken Return to standby	One click will be detected any time a pilot or ground station on frequency presses their push-to-talk microphone button.
3	Activate channel 1	See screen below
5	Activate channel 2	
7	Activate channel 3	

If no action is taken, the screen will return to that shown at the top of the page (left), or if a channel is activated, for example to one, shown below.



The above shows that Chanel 1 (Relay 1) is active (ON) and that the system is timing down. The time-out period in this example is 0 minutes 19 seconds. At the end of this period the channel will be de-activated.

At any time the pilot can re-activate the same channel or activate a different channel by pressing their PTT again the required number of clicks. The channels requested will be activated and its time-out period begin counting down again.

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8.2 Activation by Keypad

At any time (other than during menu operations) touching any of the three 'channel' keys (F1 – F3) will immediately challenge for a PIN number. The system will accept either a valid User or Operator PIN. If a correct PIN number is given, the system will then activate the selected channel (relay)). This method of activation is a secure and convenient way of activating the lights if the helipad is manned.

Note that even if a channel has already been activated by a different user/route (as above), it is possible to re-activate the same channel (to extend the timeout period) or activate a different channel. In the example below, Channel 1 (Relay 1) was already active and then the Operator has activated Channel 2 (Relay 2) and started its time-out.

The screen will display the status of the relays and also confirm that the latest activation is via the keypad and by either a User or the Operator (a function of the PIN code used).

The system will down-count for the time-out periods just as it would for a VHF input.

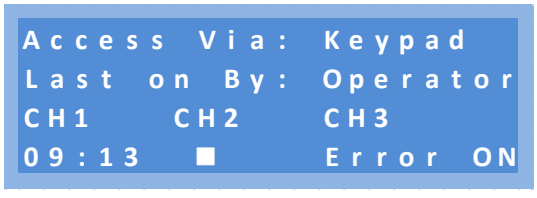
Note that if the HLC is fitted with both VHF and Cell receivers and the 'Operator' number has been entered, the Operator will receive an SMS notification when a channel is activated via the keypad as well as VHF and Cell. This allows the Operator to maintain awareness of all channel activations however triggered.

With the exception of Keypad Cancel (see later section), once activated the Menu option is unavailable and any key presses on the keypad are ignored (other than F1 - F4 and <CAN>). This is a safety feature to ensure no compromise of the operation once initiated.

8.2.1 Display of Error Conditions

If the system determines that there is an error in activating a circuit this will be communicated three ways:

a) The LCD screen will show which channel is in error (see screen below)
b) The relevant BMS output will be made, and
c) The Operator will receive an SMS confirming this (if the Operator number has been entered into the system)



In the above example, Channel 3 is in error.

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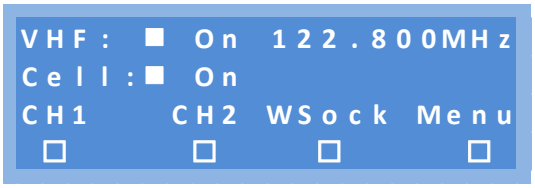
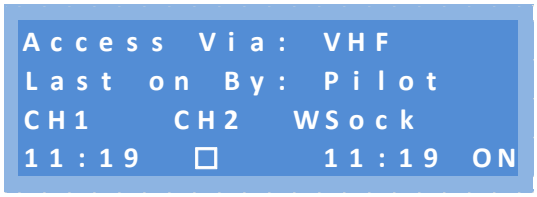
8.3 Operation with Timeout Alert

In some territories it is a requirement that the windsock light is flashed for the 10 minutes prior to the timeout of the main controlled lights. As an example, the requirement in Australia is shown at the foot of this page. To achieve this, the windsock light must be connected to relay 3 and the system setup (see later section) to define which of either channel 1 or 2 is the trigger for the flashing mode.

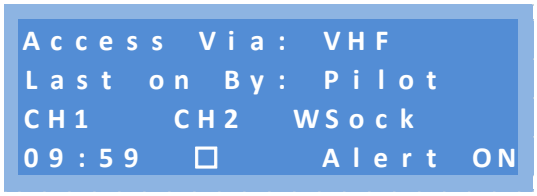
Once the system has been set to use relay 3 neither channel 3 nor relay 3 are available for normal operation and cannot be triggered by any source other than the nominated trigger channel. The normal main screen changes as follows:



In the following example it is assumed that channel 1 has been assigned to provide the trigger. Once assigned, no further setup is required. As soon as the channel (1 in this example) is triggered both it and the Windsock (on relay 3) are turned on and the timeout defined for the trigger channel applied to both:



In the above example it is assumed that the timeout period has come down from a higher value and has reached 11 minutes and 19 seconds – both relays are on. At 10 minutes to timeout, relay 3 (windsock) starts to turn on and off at 50 cycles a minute (and can be heard switching) and the screen displays:



As normal, the timeout can be reset by the pilot and at the end of the period all relays are Off.

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.

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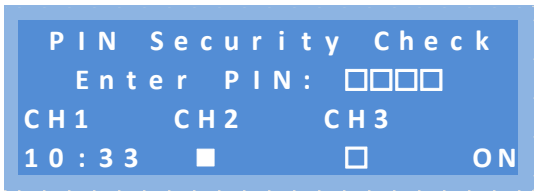
8.4 Keypad Cancel by Operator

At any time when the channel(s) are active the Operator can terminate the timeout periods/turn the lights Off. To do this:

1) Press the <CAN> key
2) Enter the valid Operator PIN



The timeout loops will be aborted and the system will return to the main menu. Any other inputs or the wrong PIN will be ignored and the timeout continue.

Note that if the HLC is fitted with both VHF and Cell receivers and the 'Operator' number has been entered, the Operator will receive an SMS notification when a channel is de-activated via the keypad as well as Cell.

Note that if a User has activated a channel(s) (either by keypad or SMS) they will not receive confirmation that the channel(s) have been de-activated.

If used with a Mimic system, the Mimic will always receive notification of de-activation.

If an Agency number has been entered, The Agency will always receive notification of de-activation.

8.4.1 Keypad Cancel of Auxiliary Input by Operator

If the Auxiliary input is being used to control channel (relays), as in the example above, then after the Operator PIN challenge above the system will ask if the Auxiliary switching is to be turned off. If this is the case, the following screen will appear:

If the Operator selects **Yes** then the following occurs:

1) The Auxiliary Input is turned off
2) The Auxiliary Relay mapping is cleared, and
3) All channels (relays) are cleared

If the Operator selects **No** then the following occurs:

1) Any channels (relays) not controlled by the Auxiliary Input (Channel 1 in the above example) are turned off.
2) The channels (relays) controlled by the Auxiliary Input are left unchanged (on).

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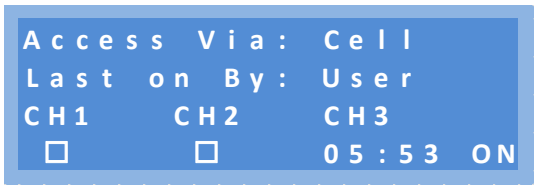
8.5 Activation by Cell/SMS

If a channel is activated by an SMS (see later section for format) then the following screen will appear.



Note that additional SMS may be sent to the unit so that, for example, if channel 3 (relay 3) has already been turned on (as above), channels 1 and/or 2 can then be also turned on. Note that each SMS can turn 1, 2 or 3 channels on or off at one time.

If a User has activated the channel (with the correct User PIN) then the User can turn it off again.

To avoid a situation where a User has finished with the lights but not turned them off, the Operator can also turn the lights off even though it was a User who turned them on.

The Operator must be absolutely sure that the situation is safe for the lights to be turned off.

8.5.1 SMS Commands and Response (User)

As a User with the correct PIN you can:

1) Obtain a User help menu
2) Turn channels On/Off
3) Turn HEMS-Star® (wireless battery helipad lights) On to specific channels/Off
4) Check the status of the system
5) Get the Cellular Radio status
6) Obtain meteorological data (if optional MetPak meteorological package is fitted)
7) Check meteorological units set (even if MetPak not fitted)
8) Get the UHF radio status

8.5.2 SMS Commands and Response (Operator)

As an Operator with the correct PIN you can (in addition to all of the above):

1) Obtain Operator help menus
2) Obtain build, configuration, system and log data
3) Turn the VHF, UHF and Cell Radios On/Off
4) Set the time & date
5) Set new User, Operator and Mimic PINs
6) Change the reporting units of the Meteorological unit
7) Restore the factory default settings
8) Re-boot the controller

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8.5.3 User Example

A User of the system has been given the Cell (cell phone) number of the controller and the current PIN (in this case the default User PIN is 0000) and wishes to turn on channel 1.

Example 1 – Single Channel On and Off

To turn the lights ON the User sends the following SMS to the Controller:

U0000C1A

Note all commands start with the user type, in this case 'U' for User – in conjunction with the PIN this forms part of the security validation.

Next the PIN number is sent '0000', followed by the required action.

In our example we have asked for Channel 1 to be made Active (turned ON).

Note that lower case can be used for the C and the A and that all commands follow the same format (next pages).

If the SMS is correct (right syntax, correct PIN), the controller will carry out that task.

Turning the channel off again is:

U0000c1n

The User has asked for channel 1 to be made negative (turned OFF).

Example 2 – Multiple Channel On and Off

To turn the lights ON the User sends the following SMS to the Controller:

U0000C231A

The User and PIN are as above

In this example we have asked for Channels 1, 2 and 3 to be made Active (turned ON).

Turning the channel off again is:

U0000c12n

The User has asked for channels 1 and 2 to be made negative (turned OFF).

Note that in the above example:

1) The channel numbers do not have to be entered in order, and
2) A different number of channels can be turned on and off. In the example above channel 3 would remain on until the end of the timeout period or it was turned off individually.

See section 8.10 for Help Menus.

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8.6 SMS Commands

The commands and scope of control available via SMS are defined by the type user.

Users have a limited set of operations and reports they can access (below).

Summary and Syntax of SMS Commands (All Users)

Description	Start Code	PIN Code	Command Code	Item	Value	Response	Example SMS String	Comment
Turn **C**ircuit **1/2/3** On	U/O/M	****	C	1,2,3	A	Unit turns Circuit(s) 1,2,3 On and returns status	U****C13A	Channels 1 & 3 On A = Active
Turn **C**ircuit **1/2/3** Off	U/O/M	****	C	1,2,3	N	Unit turns Circuit(s) 1,2,3 Off and returns status	U****C321N	Channels 1, 2 & 3 Off N = Negative
Turn **H**EMS-Star On/Off	U/O	****	H	0-9	A/N P	Unit controls groups of HEMS-Star lights	U****H0A4	Turn HEMS-Star Group 0 Program 4 On
Send Controller **S**tatus	U/O/S/F/I	****	S			Unit returns status (& if unit fitted, Meteorological data)	M****S	Mimic Panel Requests Status
Send **V**HF Radio status	U/O/S/F/I	****	V	S		Reports VHF Radio status	F****VS	
Send **M**eteorological Status/Units	U/O/S/F/I	****	M	S/U		Unit sends meteorological data (if MetPak fitted) or units	F****MS	FEC requests Meteorological Data (S) or Units (U)
Read Real Time Clock/Calendar	U/O/S/F/I	****	Z			Unit Returns Time and Date Set	O****Z	
Help	U/O/F/I	****	?			Returns list of commands user type can enter	O****?	User gets one text, Operator, FEC & OEM 3

Operators have the greatest operational control over the system and, for example, are the only type of user able to turn elements of the system on and off (e.g. the VHF radio).

System type user access is restricted to obtaining status and configuration reports and has no operational control capability (for safety reasons).

Summary and Syntax of Operator, FEC, System & OEM SMS Commands

Description	Start Code	PIN Code	Command Code	Item	Value	Response	Example SMS String	Comment
VHF Radio On/Off	O/F/I	****	V	A/N		Turns VHF Radio On (A) or Off (N)	F****VN	
Turn **G**SM (Cellular Radio) On/Off	O/F/I	****	G	A/N		Turns GSM (Cellular) radio On/Off (A/N) and returns status	O****GN	A – GSM Active N – GSM Off (for control)
Read **G**SM (Cellular Radio) Build & Status	O/F/S/I	****	G	B/S		Returns GSM (Cellular) radio Build & Status	O****GB	B – GSM Build data S – GSM Status data
Turn **U**HF Radio On/Off	O/F/S/I	****	U	A/N		Turns UHF radio On/Off and returns status	O****GN	A – GSM Active N – GSM Off (for control)
Turn **U**HF Re-transmit on/off	O/F/I	****	U	R/O		Turns UHF radio Re-transmit on/off	O****GR	R – UHF Re-transmit On O – UHF O/P Once
Set **B**arometric Pressure Units	O/F/I	****	B	H/M/I		Sets Units of Pressure of Meteorological Pack and confirms all settings	O****BH	H = HectoPascals M = MilliBars I = Inches of Mercury
Set **T**emperature Units	O/F/I	****	T	C/F		Sets Units of Temperature of Meteorological Pack and confirms all settings	F****TF	C = Centigrade F = Fahrenheit (temperature & dew point)
Set **W**ind Units	O/F/I	****	W	K/M/N		Sets Units of Wind Speed of Meteorological Pack and confirms all settings	F****WN	K = Kilometres Per Hour M = Miles Per Hour N = Nautical Miles/ Hour (Knots)

Start Code is User Type: U = User, O = Operator, M = Mimic Panel, S = System, F = FEC, I = OEM
**** is PIN code for User Type. Defaults are: User PIN: 0000, Operator PIN: 1111
System PIN: Range 9980-9989 (Default 9980) & Remote/Mimic PIN: Range 9990-9999 (Default 9990)

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FEC and OEM additionally have the ability to access technical areas and perform hierarchical tasks such as reset an Operator's PIN but cannot control the system, again for safety reasons.

Summary and Syntax of Operator, FEC, System & OEM SMS Commands (continued)

Description	Start Code	PIN Code	Command Code	Item	Value	Response	Example SMS String	Comment
Set New **U**ser **P**IN	O/F/I	****	P	U	XXXX	Unit sets new User PIN and returns status	O****PUXXXX	Operator Sets User PIN to XXXX
Set New **O**perator **P**IN	O/F/I	****	P	O	YYYY	Unit sets new Operator PIN and returns status	F****POYYYY	FEC Sets Operator PIN to YYYY
Set New **M**imic **P**IN	U/O/F/I	****	P	M	ZZZZ	Unit sets new Mimic PIN and returns status	F****PMZZZZ	FEC Sets Mimic PIN to ZZZZ
Set New **B**MS **P**IN	U/O/F/I	****	P	B	AAAA	Unit sets new BMS PIN and returns status	F****PBAAAA	FEC Sets Mimic PIN to AAAA
Send **A**ssembly Data	O/F/I	****	A			Unit sends assembly data	F****A	H.W. & S.W. Versions and dates
Send **E**lectrical supply status	O/M/F/S/I	****	E			Unit returns mains, solar PV, wind turbine &system volts	U0000E	Most installations only have 1 or 2 supplies
Factory Restore	O/F/I	****	F			Unit restores all variables to shipped condition	F****F	FEC Performs Factory Restore
Send Unit **L**ogs	O/F/S/I	****	L			Unit sends system logs	F****L	FEC Requests Unit Logs
Reset Unit	O/F/I	****	R			Unit performs a warm restart	F****R	FEC Performs Reset
Set Real Time Clock/Calendar	O/F/I	****	Y		yyyymmdd hhmm	Unit Returns Time and Date Set	O****Y yyyymmdd hhmm	All values to be entered as two digits (e.g. May = 05)

There are a number of diagnostic routines that can be inserted into special releases of software so that the OEM can perform specific tests. These routines may vary from release to release and may be specific to one installation for example, for fault finding.

Summary and Syntax of OEM SMS Commands

Description	Start Code	PIN Code	Command Code	Item	Value	Response	Example SMS String	Comment
Set New **F**EC **P**IN	I	****	P	F	ZZZZ	Unit sets new FEC PIN and returns status	I****PFZZZZ	OEM Sets new FEC PIN to ZZZZ
Set New **S**ystem **P**in	I	****	P	S	YYYY	Unit sets new System PIN and returns status	I****PSYYYY	OEM Sets new System PIN to YYYY
Special Function *1	I	****	X	1		Sends raw MetPak string (if fitted)	I****X1	Ignores errors and checksum errors
Special Function *9	I	****	X	9		Performs OEM Reserved functions	I****X9	

Start Code is User Type: U = User, O = Operator, M = Mimic Panel, S = System, F = FEC, I = OEM
**** is PIN code for User Type. Defaults are: User PIN: 0000, Operator PIN: 1111
System PIN: Range 9980-9989 (Default 9980) & Remote/Mimic PIN: Range 9990-9999 (Default 9990)

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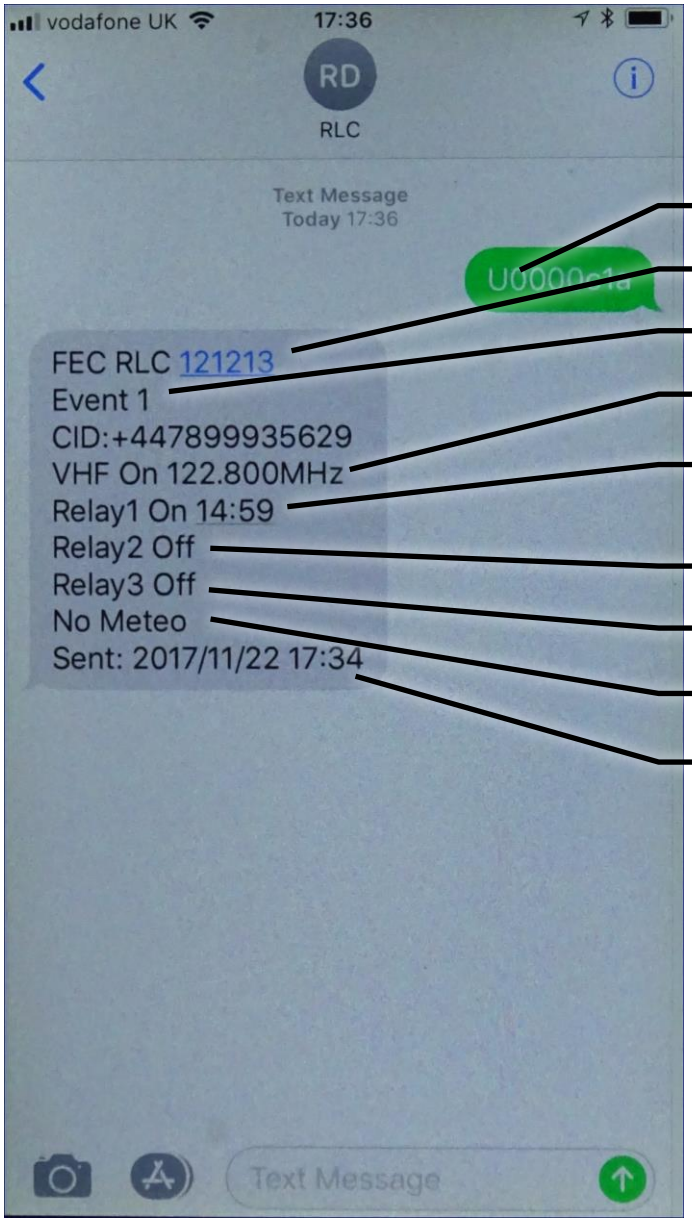
8.7 System Response – To User – No Meteorological Pack fitted

The controller will respond to the caller (either User or Operator) with confirmation of the system status.

The standard response is shown in the screen shot of an iPhone below:



Command sent bv User

Controller ID

Event Number

VHF Radio Active 122.8MHz

Confirmation: Relay 1 Timeout: 14 Minutes 59 Seconds

Confirmation: Relav 2 Off

Confirmation: Relav 3 Off

No Meteorological Pack fitted

Time/Date stamp of transmission in international format

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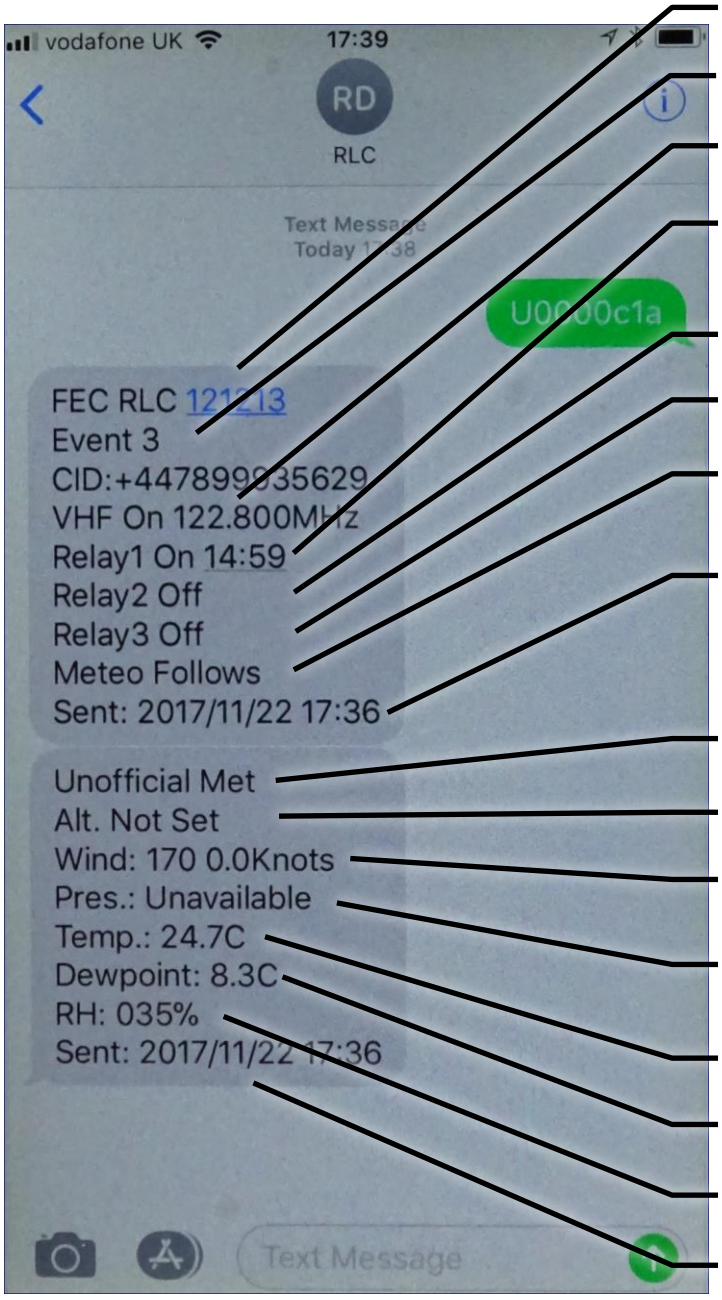
8.8 System Response – To User – MetPak fitted – No Altitude Set

The standard response is shown in the screen shot of an iPhone below if a MetPak is fitted but altitude NOT set. If the meteorological station altitude is not set, no pressure information is sent.



Controller ID

Event Number

VHF Radio Active 122.8MHz

Confirmation: Relay 1 On Timeout: 14 Mins. 59 Secs.

Confirmation: Relay 2 Off

Confirmation: Relay 3 Off

Meteorological reporting option fitted – information to follow

Time/Date stamp of transmission in international format

Caution

Caution: Meteo altitude not set

Wind Direction and Speed

Barometric Pressure not sent as Meteo Altitude not set

Temperature

Dewpoint

Relative Humidity

Time/Date Stamp

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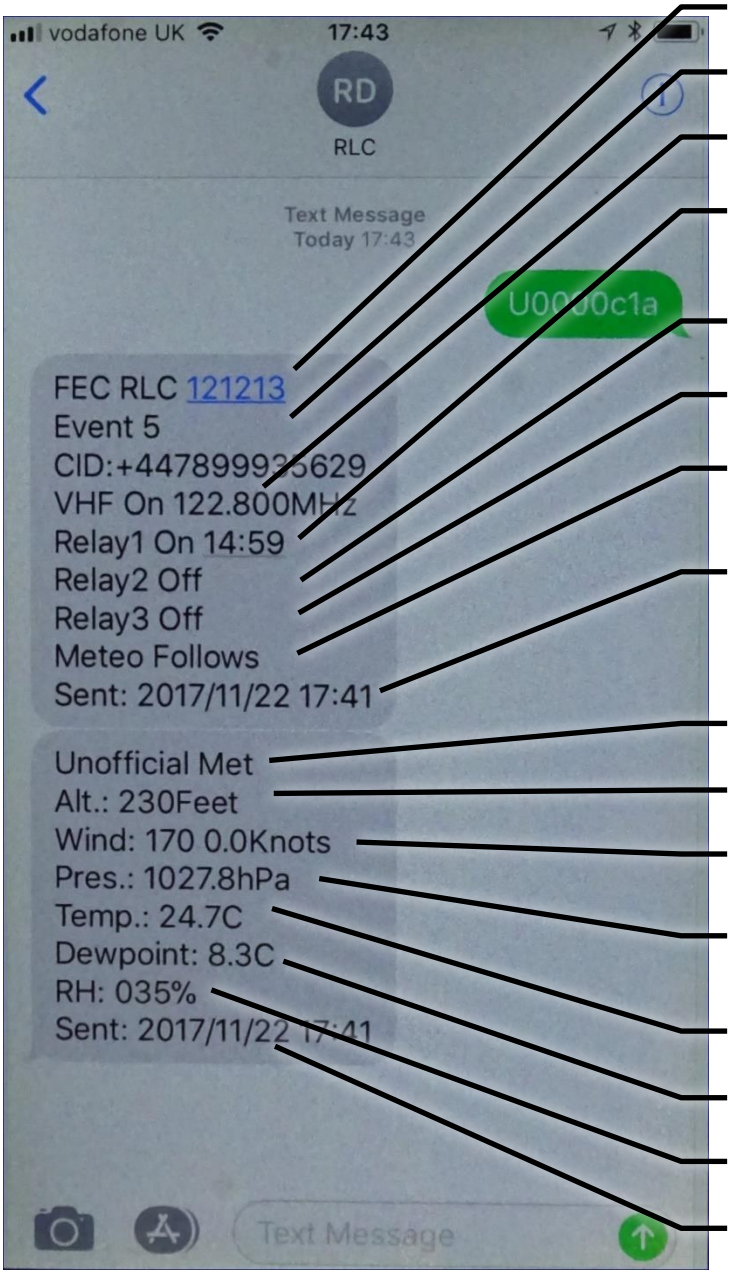
8.9 System Response – To User – MetPak fitted – Altitude Set

The standard response is shown in the screen shot of an iPhone below if a MetPak is fitted and altitude is set. Pressure information has been sent as the meteorological station altitude is set.



Controller ID

Event Number

VHF Radio Active 122.8MHz

Confirmation: Relay 1 On Timeout: 14 Minutes 59 Seconds

Confirmation: Relay 2 Off

Confirmation: Relay 3 Off

Meteorological reporting option fitted – information to follow

Time/Date stamp of transmission in international format

Caution

Meteo altitude set

Wind Direction and Speed

Barometric Pressure sent as Meteo Altitude set

Temperature

Dewpoint

Relative Humidity

Time/Date Stamp

The SMS is just as readable on older handsets but may require scrolling to read all of the message. If the controller had failed to make the channel active then in this example it would read: Relay 1 Off.

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8.10 Help SMS(s)

Users, the Operator, FEC and the OEM can all request help screen(s) which give a summary of the commands available via SMS. The request is User-Type PIN ? e.g. U0000?

Users – Receive Help screen 1 with the commands available to them.

Operators, FEC & OEM – Receive Help Menus 1, 2 and 3 - with the reserved commands available to them.

Help Screen Returns

Users	Operator, FEC & OEM	
Screen 1	Screen 2	Screen 3
Help C123A/N=Channel(s) On/Off H0-9A/N/=HEMS-Star 0-9 Grp A/N On/Off P Prog S=Status VS=VHF Status US=UHF Status MS/U=Meteo Status/Units Z=Read Clock	VA/N=VHF On/Off GA/N=Cell On/Off GB/S=Cell Build/Status UA/N=UHF On/Off UR/S= UHF Re-Tran./Single BH/M/I=Set Pres. Units TC/F=Set Temp. Units WK/M/N=Set Wind Units	PU/O/M/BXXXX=Set PIN A=Assembly Data E=Elect. Supplies F=Factory Restore L=Logs R=Restart D=Data Variables Xx=OEM Fn.x Yyyyymmddhhmm=Set Clock

8.11 System Response – To Others

Every time that the controller changes state or makes a channel active or inactive, at the Operators option, message will also be sent to any or all of the following:

1) Operator – Receives all state changes to the controller
2) Agency – An Operator agreed number that will receive operational changes only
3) Mimic – The designated Mimic panel

Examples:

1) If the Operator turns the VHF radio receiver off, only the Operator will receive confirmation of that.
2) If a User turns the lights on via SMS, the User, Operator, Agency and Mimic numbers will all be sent the appropriate system response.

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9 System Setup and Configuration

9.1 System Access Menu

Pressing ‘Menu’ on the main menu first brings up a PIN challenge menu to determine which ‘type’ of user is accessing the system since each can perform different functions:

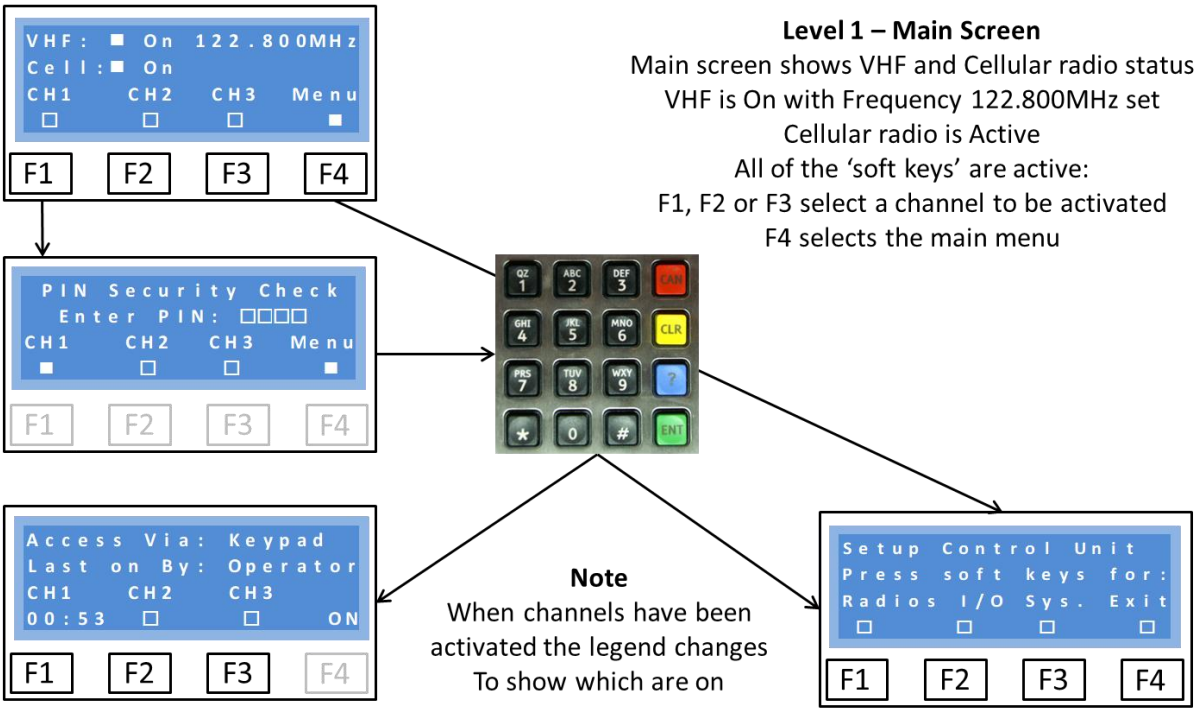
There are six types of ‘User’ defined in the system who can access the system:

1) User – A person granted permission to perform certain commands.
2) Ops. – The Owner/Operator of the facility.
3) Mimic – The remote control/monitoring panel (not entered via keypad)
4) System – Machine to Machine interface for data logging
5) FEC – Technical staff from FEC.
6) OEM – The Original Equipment Manufacturer.

Each type of user has a PIN access code and can perform a variety of configuration and other tasks on the system.

Using the numeric PIN code, enter the 4 number PIN code. As each number is pressed it replaces the relevant box until four numbers are entered.

NB – As an additional security measure, if numbers 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 or Cell 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

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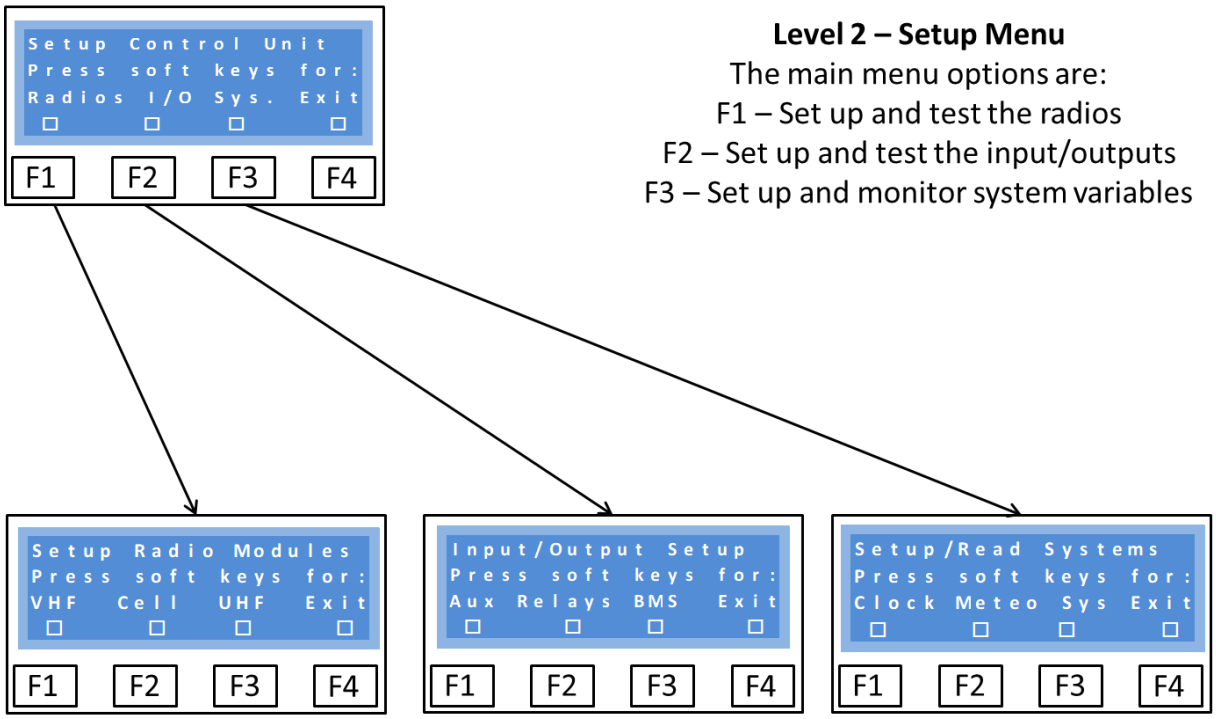
9.2 Setup Control Menu

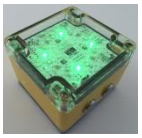
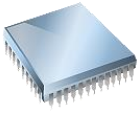
Once the correct PIN has been entered the Setup menu is entered.



There are three main setup areas: Radios, Input/Output (Relays) and System.

In the following sections we will go through each of these areas in turn.

To aid navigation within this document, the radio, cell phone, HEMS-Star® and chip images are used to represent the VHF Radio, Cell Radio, UHF Radio and System respectively:

VHF Radio:	**UHF Radio:** **(Battery HEMS-Star® Controller)** 
Cell Radio:	**System:** 

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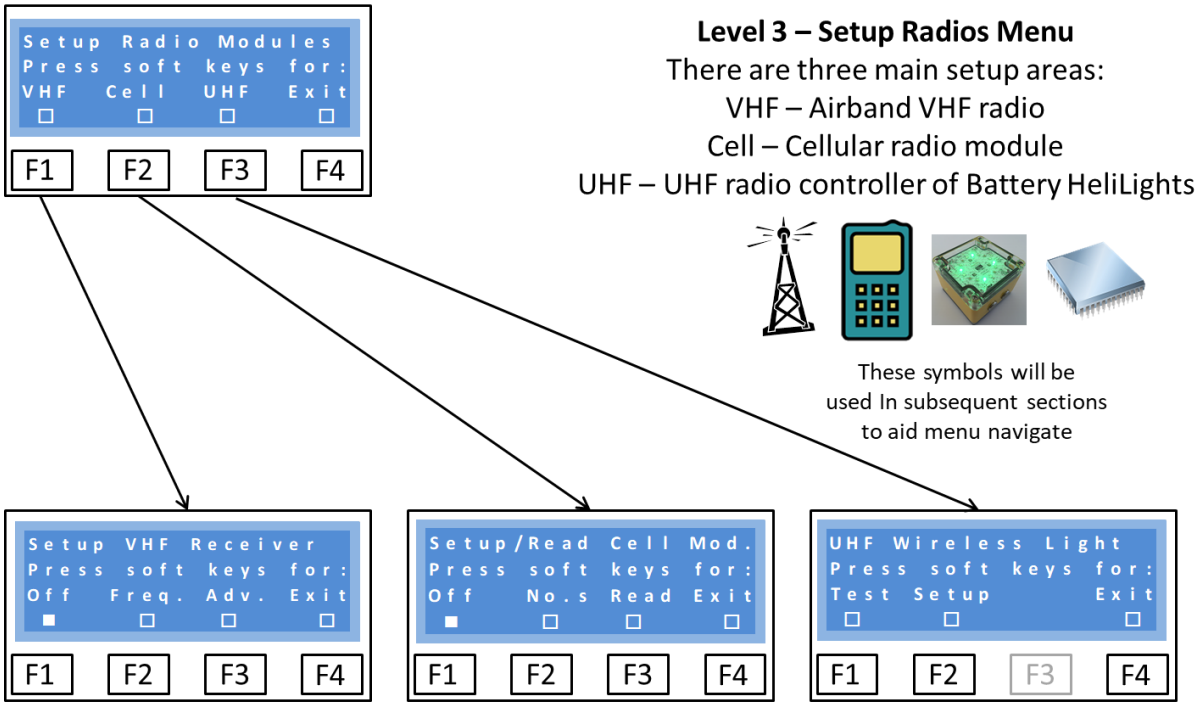
9.3 Radios Menu

There can be up to 3 radios in the system:

1) VHF Airband receiver
2) Cell Tri-band transceiver, and
3) UHF Wireless modem for controlling battery lights (HEMS-Star®) (Not available in USA)

Each of the radios has its own menus. The main radio menu is as follows:



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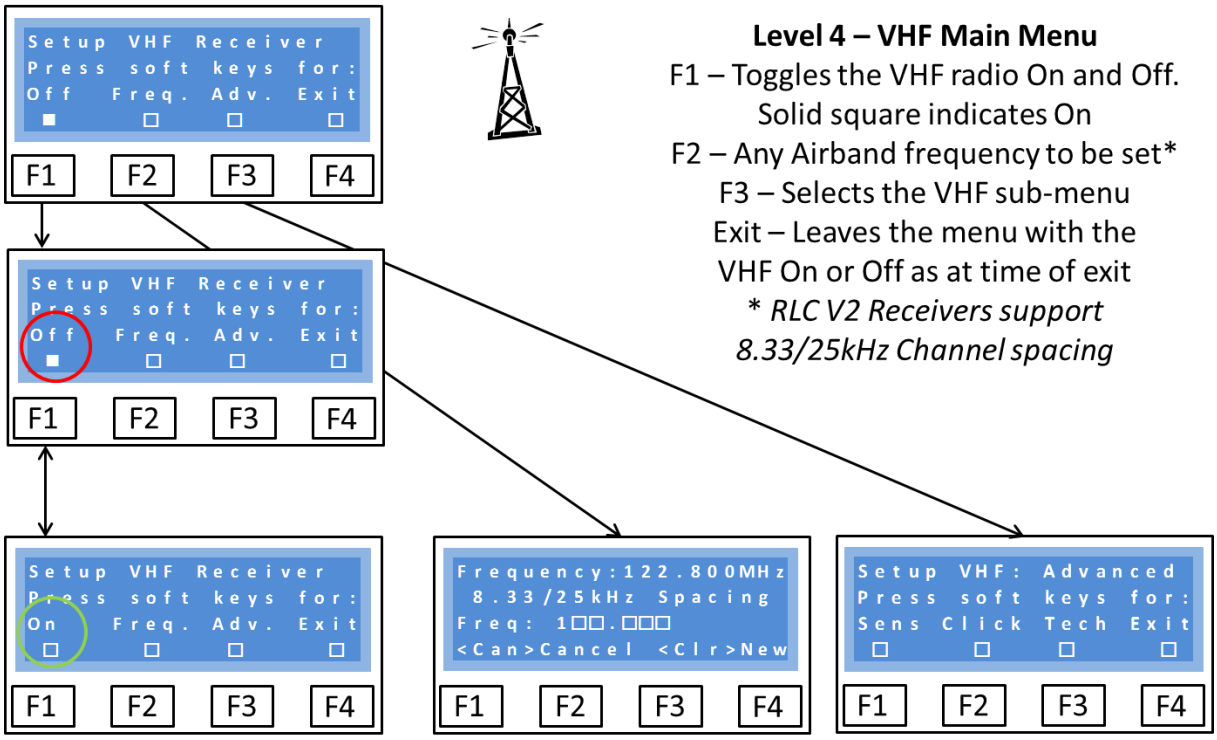
9.3.1 Setup VHF Receiver - Basic

The Setup VHF Receiver menu enables:

1) The VHF receiver to be turned On and Off (also available to Operators via SMS)
2) The operating frequency of the controller to be set to any channel in the VHF Airband in the range:
    a. 118.000 - 136.975MHz with 25kHz channel spacing, and
    b. 118.000 – 136.990 with 8.33kHz & 25kHz channel spacing
3) Select further setup advanced options



Note that the VHF radio is toggled On/Off using F1 and is set in that state when exiting the menu using F4. A solid square means ‘On’ and the action of the function key is to turn it off.

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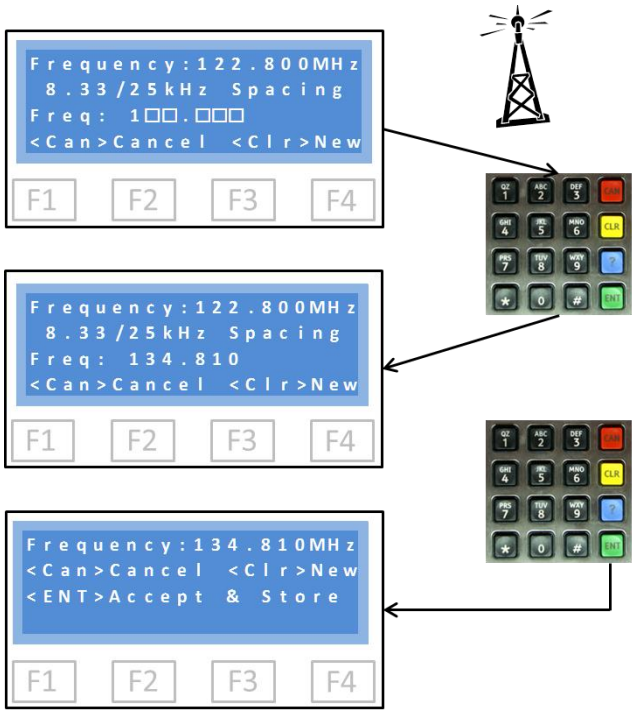
9.3.1.1 VHF Frequency Setting

The international channel convention for 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. See examples on following page.



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 ensure da correct and unique channel.

The full frequency is displayed (screen 3) and confirmation requested (<ENT>).

9.3.2 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.

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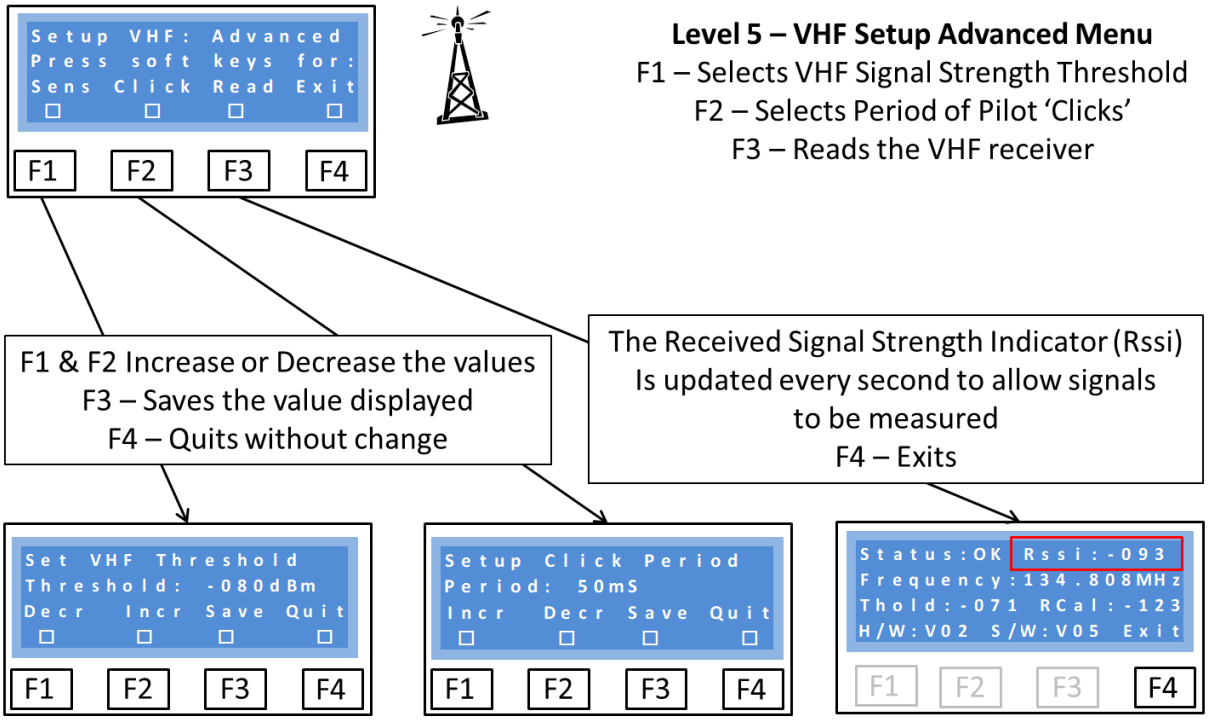
9.3.3 Setup VHF Receiver - Advanced



VHF Status – Frequency reading

Note that in the screen (extreme right) 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.

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9.3.3.1 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 antenna 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 antenna feed.

Before changing the threshold level, read the section about the display of RSSI(accessed via the Tech option and described over) as this will give good information about the local conditions.

9.3.3.2 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.

9.3.3.3 Tech – Reading the receiver status

Selecting ‘Tech’ from the Advanced VHF menu reads 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

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 (antennae, down-feed etc.) and setting up the receiver.

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9.3.4 VHF Technical – OEM Only

If an OEM User selects Tech from the 'Setup VHF Receiver – Advanced' menu two options are presented:

1) Read the status of the VHF receiver (as described in previous section), and
2) Test the receiver

Selecting Test enables the receiver to be temporarily setup to facilitate sensitivity testing without changing any of the normal operational parameters.

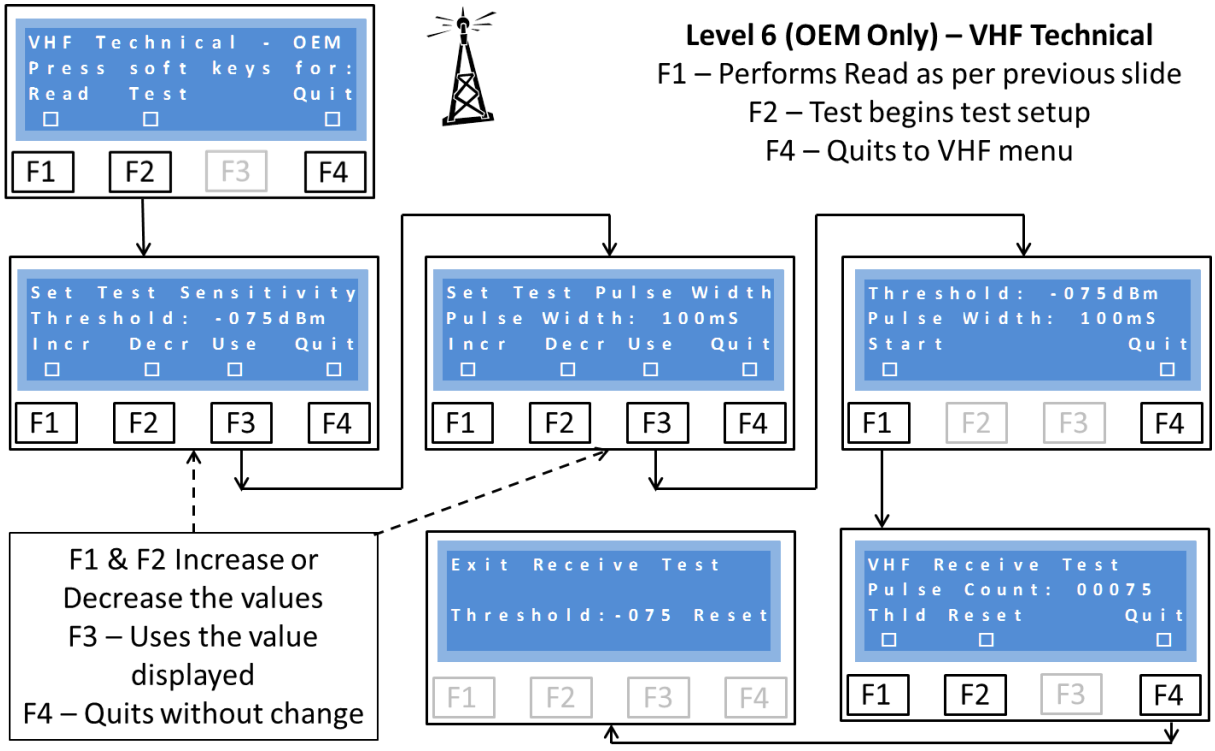
The test routine first loads the User Threshold level and then allows this to be changed in 1dB steps between 0dBm and -120dBm. Care should be taken using values below -100dBm as the receiver will likely be susceptible to noise.

Once the threshold is selected the length of test pulse of carrier to be used is set. The default is 100mS and in steps of 10mS can be set anywhere between 50mS and 500mS.

Test values are displayed and if happy to proceed select Start.

Using the values given the system will now count (at 1mS granularity) the number of times the carrier is detected during the Pulse Period selected. If the number of times is greater than the Pulse Period in mS (-20) then the Pulse Count is incremented by one and a Flash Light sent to Group 0 HEMS-Star and the cycle begins again.

At any time The Threshold and Reset keys can be pressed to change the test parameters or reset the counter respectively. Quitting at the end of the test restores the user threshold value and puts the HEMS-Star back into Manual mode.



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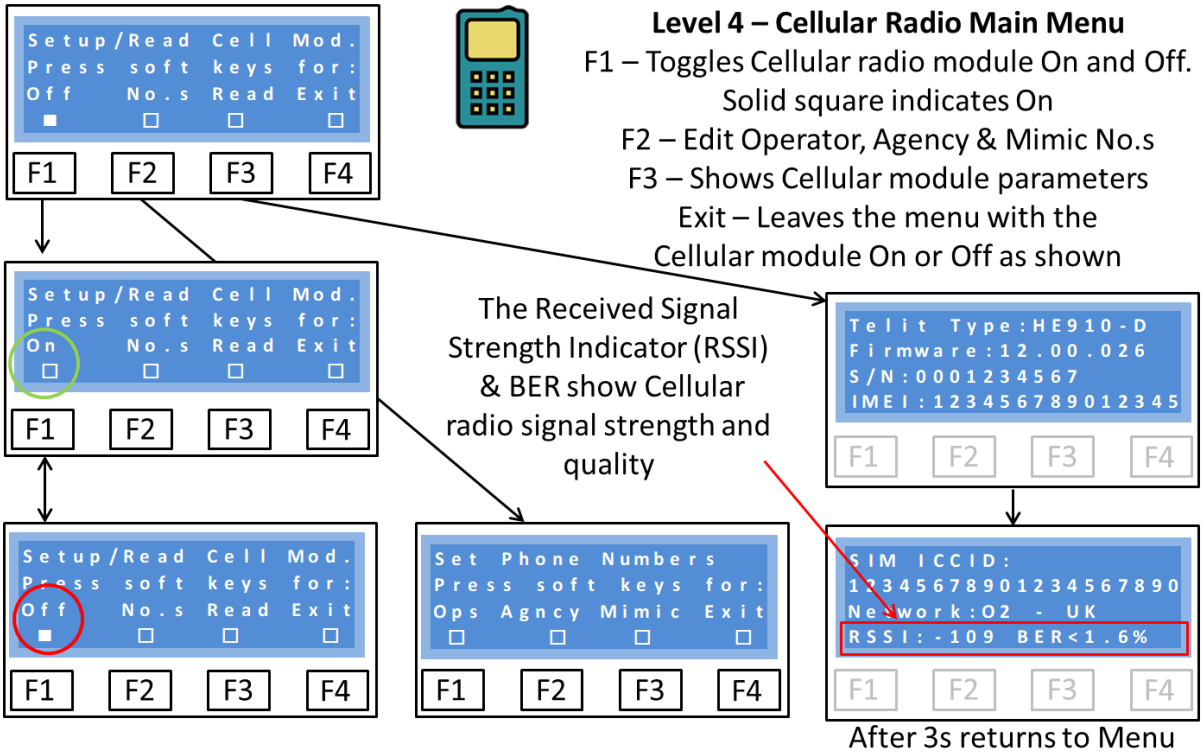
9.4 Setup Cell/SMS Unit

If the Cell receiver was on when Setup was selected, then the screen will appear as follows.



Note that the 1st soft key is solid indicating that the Cell receiver is ON and that the soft key option is to turn it Off. Pressing F1 will toggle the Cell receiver on and off and it will be left in that state on Exit. The other menu options are:

'No.s' accesses the Cell number directory to enable Operator, Agency and Mimic numbers to be stored.

Selecting the 'Read' option initiates a read of the Cell module.

There are two parts to the read operation; the first screen shows details about the module itself and the second screen shows operational data.

From the former the IMEI number of the module is displayed.

From the second screen both the Received Signal Strength and the Bit Error Rate (a measure of the quality of the link) are obtained.

Once the data have all been displayed there is a pause of a few seconds and then the system returns to the Setup/Read Cell Unit menu.

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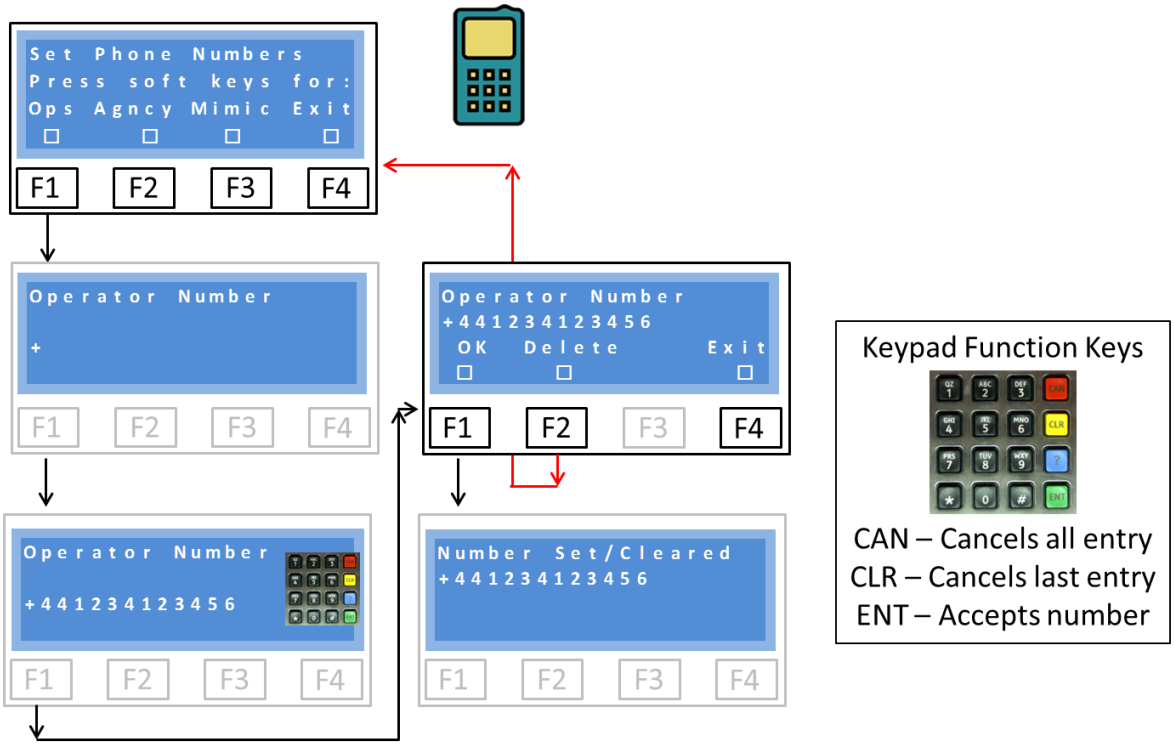
9.4.1 Set Cell Numbers

The system can store three numbers:

1) Operator (Ops) – This is the number of the Owner/Operator. It is very important to enter this number as a report will be sent to it every time there is a system change (e.g. turn the VHF radio on or off) or an operational activity on the system (e.g. turn on the lights)
2) Agency – This number, which is optional, is the number to which only operational reports are sent. This can be any third party that the Operator wishes to keep informed of activity without the bother of having to manually alert them.
3) Mimic - This number, which is optional, is the number to which only operational reports to allow remote monitoring and alerting of channel activation



In the above example the Operator number has been selected (F1).

The current Operator number is displayed (middle left) and in this case is blank as no previous number has been entered. ***Note the number must be entered in the international format.***

The required number is entered after the '+' prompt (part of the international dialling scheme). ***Note*** in contrast to other screens the keypad CAN, CLR and ENT keys are active.

If an error is made, CLR can be used to backspace and correct.
To clear the entire entry and start over press CAN.
To accept the number press ENT.
The process for entering the Agency and Mimic numbers is exactly the same as for Operator.

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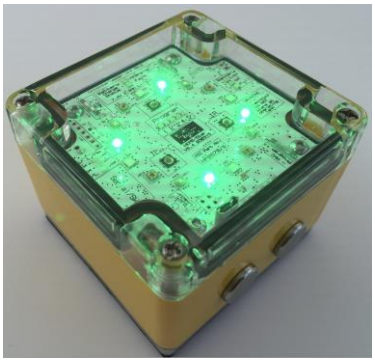
9.5 UHF Transceiver

The HLC is fitted with an 868MHz (UK/EU) or 915MHz (USA) UHF modem transceiver for controlling local battery powered, wirelessly controlled HEMS-Stars® (left) or Remote Switching Controllers (right).



This part of the system may not be available in certain markets where the local radio licencing authority does not allow this spectrum to be used for licence-exempt operation of this type.

9.5.1 HEMS-Star® Modes

HEMS-Star®s are always in wireless mode, either with the main LEDs lit or in Standby mode. There are five programs.

Item	Program	Meaning
1	1 to 5 pre-set programs covering all combinations of colour, intensity, dual colour/IR, night time switching, flashing and stealth modes	HEMS-Star®s are delivered with the 5 programs pre-configured to the most popular settings according to the local market. Via a PC and wireless interface these can be changed by the user.

Note:

a) In addition to mapping Groups and Programmes to Channels, via SMS (see section on Cell control) any HEMS-Star® program can be selected or the HEMS-Star® put in Standby mode.

9.5.2 Remote Switching Controller (RSC)

The current version of RSC software activates its 3 channels by activating Groups 1, 2 and 3 corresponding to relays 1, 2 and 3.

Note:

a) Future versions will support both RSC Group numbers and setting Programs 1 – 3 corresponding to relays 1, 2 and 3.

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9.5.3 Commanding the HEMS-Star® Wirelessly

For Users/Operators there are three ways of wirelessly operating the lights:

1) HLC - By associating a wireless Group of lights with channels of the HLC and then activating HLC channels as normal (keypad, VHF or SMS)
2) SMS - By sending specific text commands to the HLC which translates and transmits commands to the Group lights (see attachment for details)
3) Key Fob – Using the three buttons – Covered in HEMS-Star® Manual

Notes:

There is no need to switch to Wireless Mode explicitly as this mode is automatically selected when a Wireless On command is issued

a) When a Wireless Off command is issued the main LEDs will go off but the unit will remain in Wireless (standby) Mode
b) HEMS-Stars® will only respond to commands that are specifically addressed to their set Group
c) HEMS-Star®s may be individually addressed using their unique Serial Number.

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9.5.4 HLC – Using Channels

In the same way that different relays can be associated with different channels, different Groups of HEMS-Star®s can be associated in exactly the same way.

To associate a Group of lights with a channel, select Menu>Radios>UHF and then Setup (over). Follow the instructions to map a Group number to a channel.

For HEMS-Star®s the required Program to be run is stored and can be changed through the menu.

Notes:

a) By default all channels are set to activate Group 0 (i.e. any channel will control any active wireless HEMS-Stars®)
b) By default HEMS-Star®s are set to activate Program 1 on all Channels

9.5.5 SMS – Direct Control

In the same way that you can activate a channel by SMS you can activate a Group of HEMS-Star®s.

The difference in the command structure is that the required Program Number needs to be appended to the command string.

Example for HEMS-Star®: User turns on Group1, Program 5: U0000H1A5

Notes:

a) This method does not require any mapping of Groups to Channels as it directly addresses the wireless lights
b) Both Group/Channel mapping and direct addressing can be used simultaneously
c) Additional commands will be added to the SMS structure to allow more sophisticated programming of the lights

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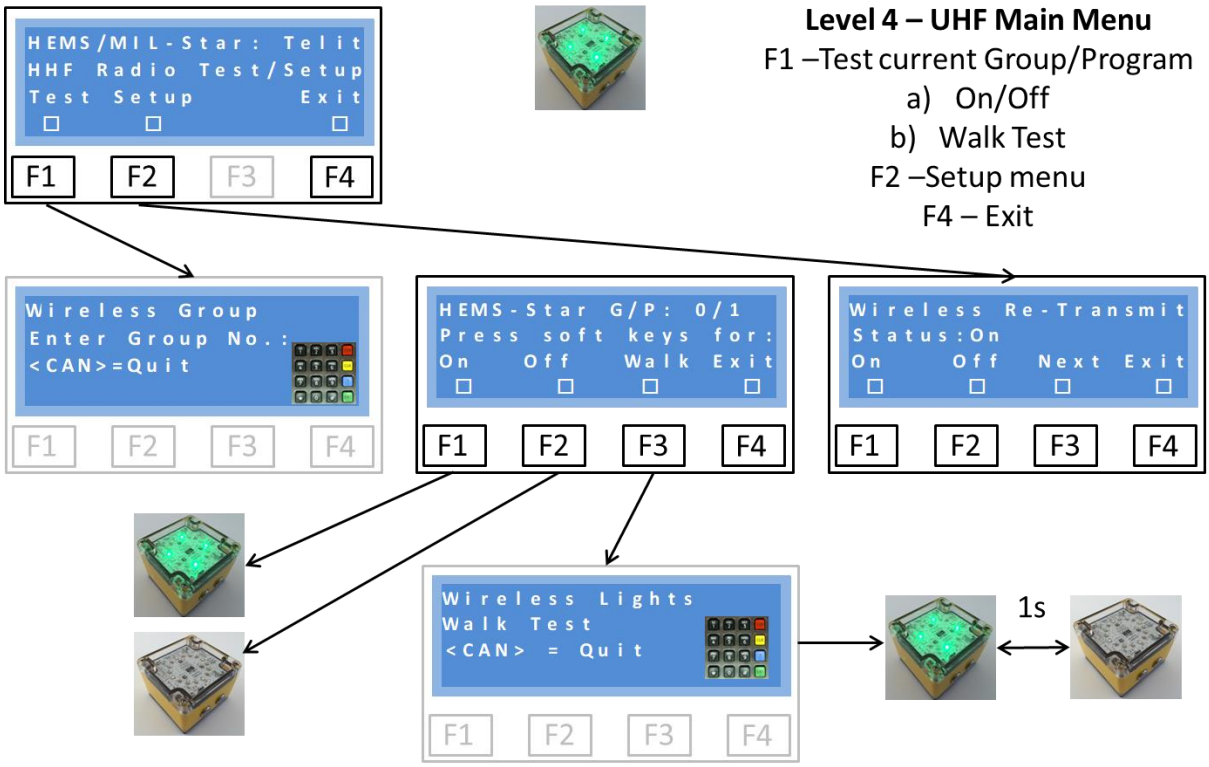
9.5.6 Setting up the UHF Transceiver

Before using the HLC to operate Battery HEMS-Stars it is necessary to:

1) Define the Channel to HEMS-Star® 'Group' mapping
2) To define the Channel to Program mapping
3) To test that the lights are operating correctly, and
4) That they are in range of the HLC.

9.5.7 HEMS-Star® – Test & Setup

There are two basic tests on Menu 2: On/Off and a Walk Test.



To perform a Walk Test, press F1 on Menu 2 and the HLC will send alternating On and Off commands every second (1 second On, 1 second Off) and will continue to do for either:

1) Until the <CAN> key is pressed to cancel, or
2) 10 minutes have elapsed since entering menu mode.

Once the walk test is activated, simply go to the desired location of the lights and place on the ground to confirm that they continue to flash On/Off indicating they are receiving the signal.

To ensure that the range is adequate it is advisable to go some distance beyond the chosen location to ensure the signal is still being received.

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9.5.8 HEMS-Star® - Channel Setup

This operation can be performed without any HEMS-Star®s.

The UHF transceiver can be toggled on or off using F1 button.

When the HLC is used to control HEMS-Star® battery Helipad Lights it can be set to re-transmit the status every second. By default the HLC is set not to do this.

If the automatic re-transmit is set on, this means that as soon as the HLC is turned on it will transmit to turn off all Group/Program to HEMS-Star®s, whether present or not. Use F2 to toggle between Re-Transmit On and Re-Transmit Off.

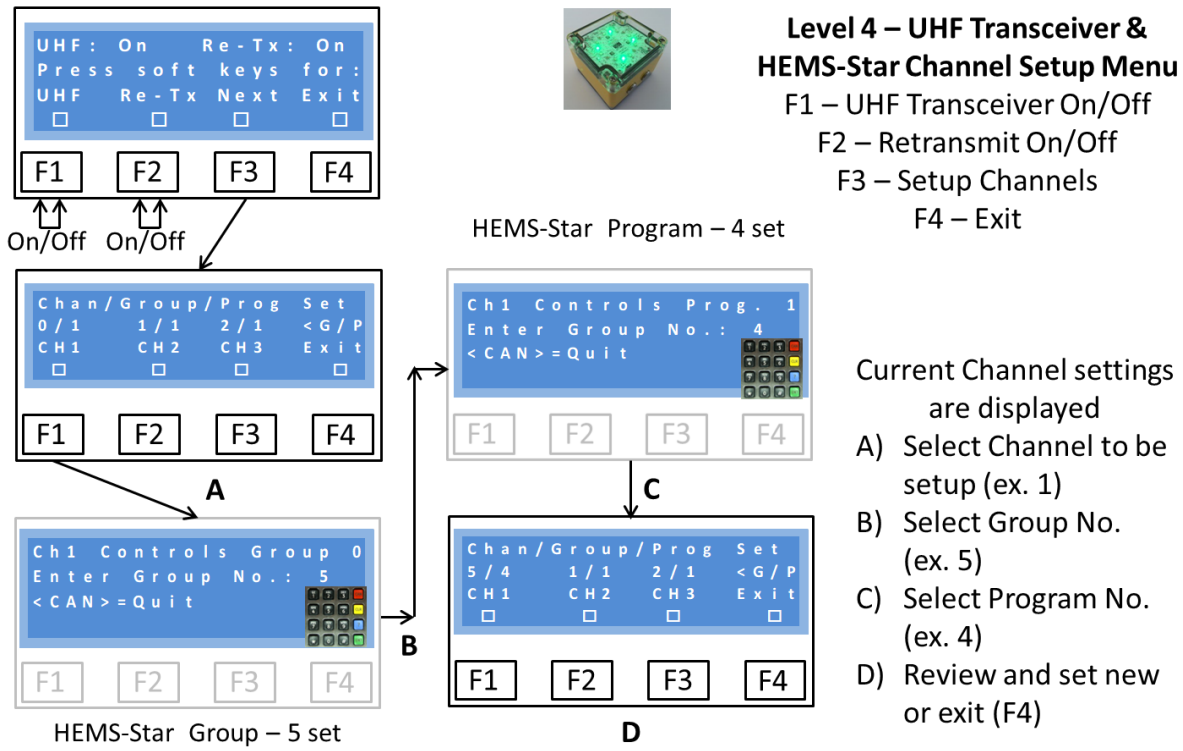
To configure the mapping select F3 'Next' and the screen (middle left) will appear confirming which Groups and Programs are currently mapped to the 3 channels.

Press F1 – F3 to select which channel is to be configured and the screen (bottom right) will prompt for the Group number. Enter 0 – 9. In the example shown Group 5 has been selected.

The system will immediately prompt for the Program number to be entered (centre) and will accept Program Numbers 1 to 5. In the Example shown, Program 4 has been selected.

The system will accept the value entered and display the new mapping (middle bottom).

Change the channels as required and then press F4 to Exit (and save mapping values).



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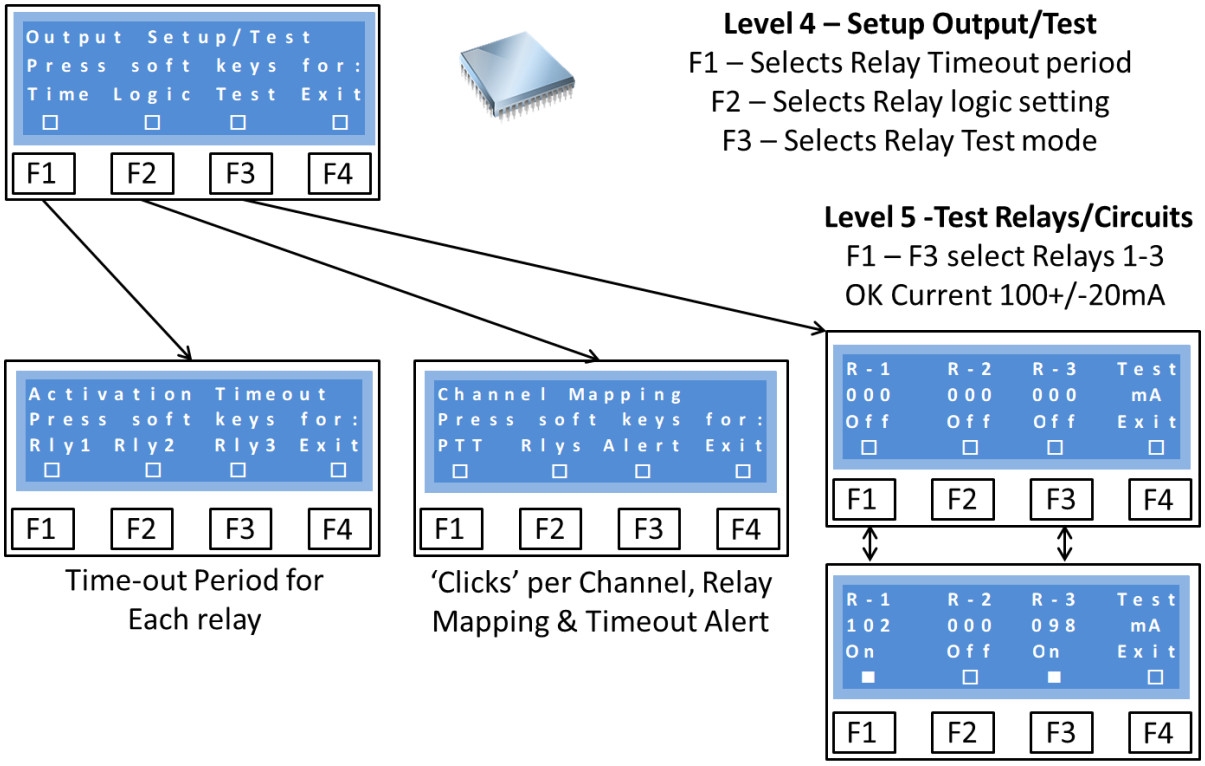
9.5.9 Relay Setup and Testing

There are three options for setting up and testing the output (relays):

1) Setting the time-out period for each relay
2) Defining the number clicks from a VHF transmitter to trigger a channel, mapping the relays to channels and setting up the Timeout Alert function, and
3) Testing the relays



9.5.10 Testing the Relays and Circuits

Each Relay and circuit can be tested in turn. After initial installation tests this is the first function that should be performed.

Relays are tested from the same screen. Initially all of the relays are off and the screen will appear as that at the top right. Selecting F1, F2 and F3 activates Relays 1 – 3 respectively. If the relay operates properly the coil current (second row) should indicate 100 +/-20mA and the open box become a filled box. The relay can also be heard engaging and disengaging.

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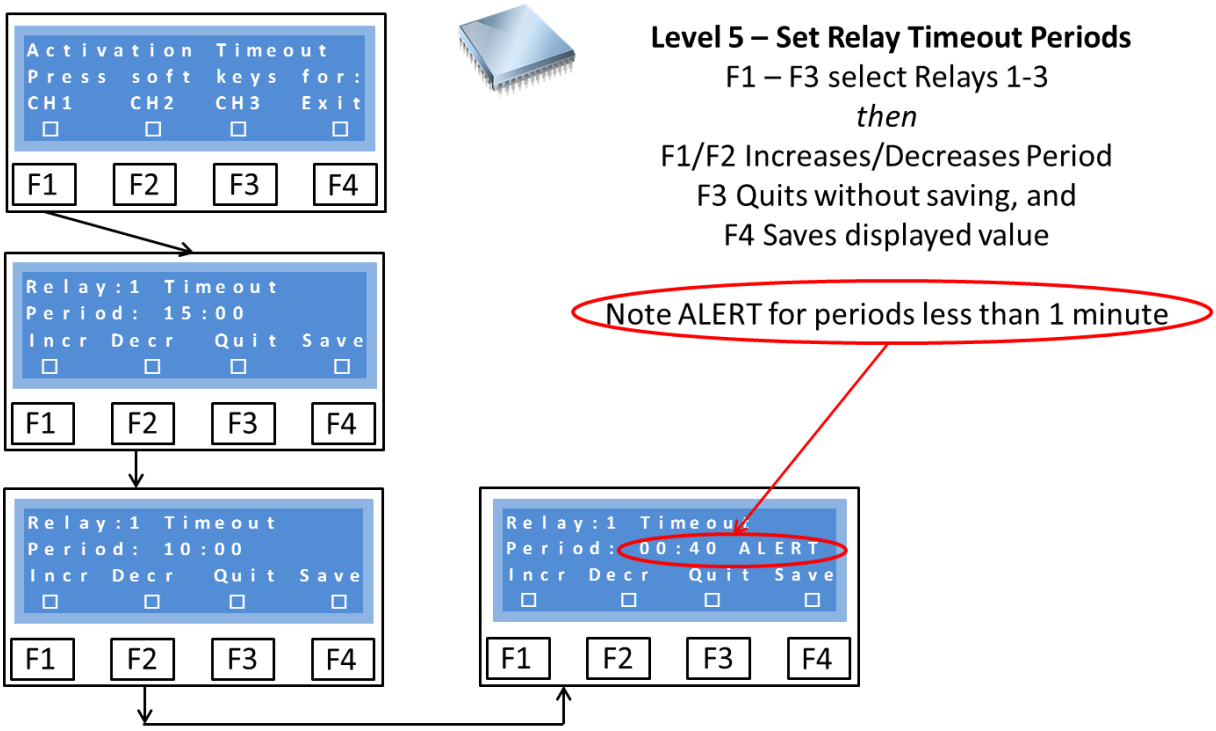
9.5.11 Timers

The timer option allows the time-out period for **each relay** to be set in the range:

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

The default setting for each relay is 15 minutes.



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

Notes:

1) 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.
2) Because multiple relays can be mapped to a single ‘click’ value, setting of differential timers for each relay allows more sophisticated control of lighting circuits. As an example – All three relays could be mapped to come on with 3 ‘clicks’ with their timers set to:
    a. R-1 (15 minutes) to control the helipad lights
    b. R-2 (5 minutes) to control ground movement traffic lights, and
    c. R-3 (30 minutes) to control the apron lights

    In this scenario the pilot would give a single command of 3 ‘clicks’ and set all of the circuits operating, turning off as set by the timers. At any time the pilot could re-start the sequence by pressing 3 ‘clicks’ again.

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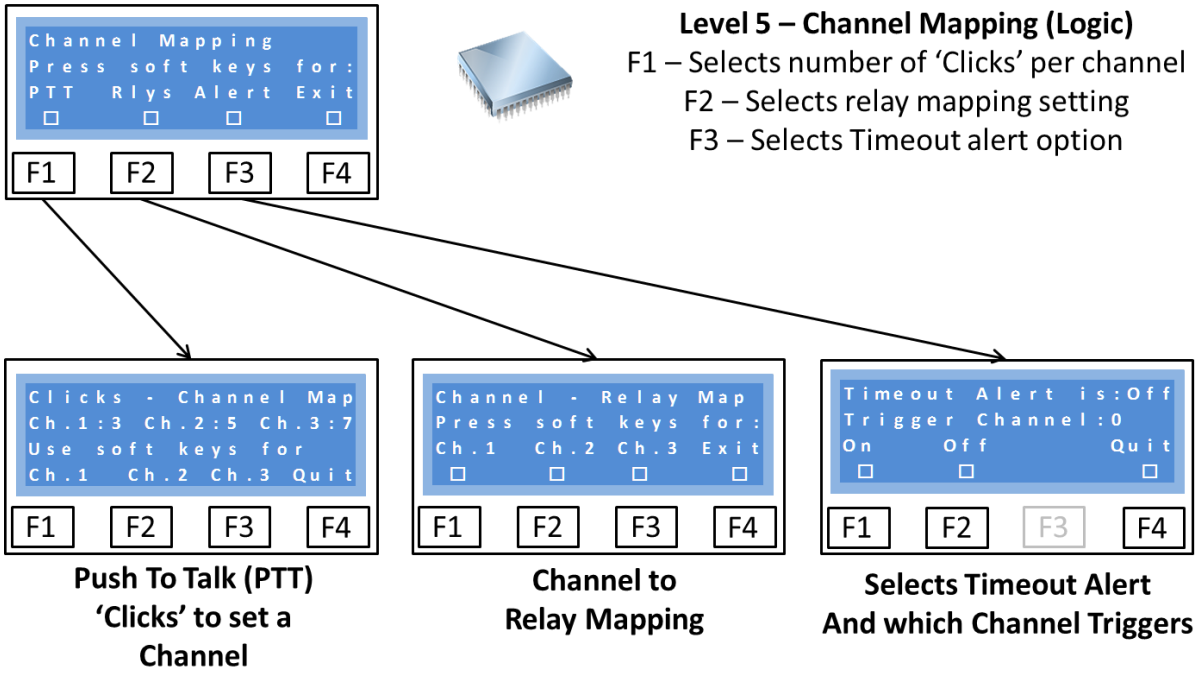
9.5.12 Channel, Relay and Timeout Mapping and Setting

Selecting 'Logic' from the Output Setup/Test menu gives three further options:

1) Defining the number clicks from a VHF transmitter to trigger a channel (PTT)
2) Mapping the relays to channels, and
3) Setting up the Timeout Alert function



These options are covered in the next three sections.

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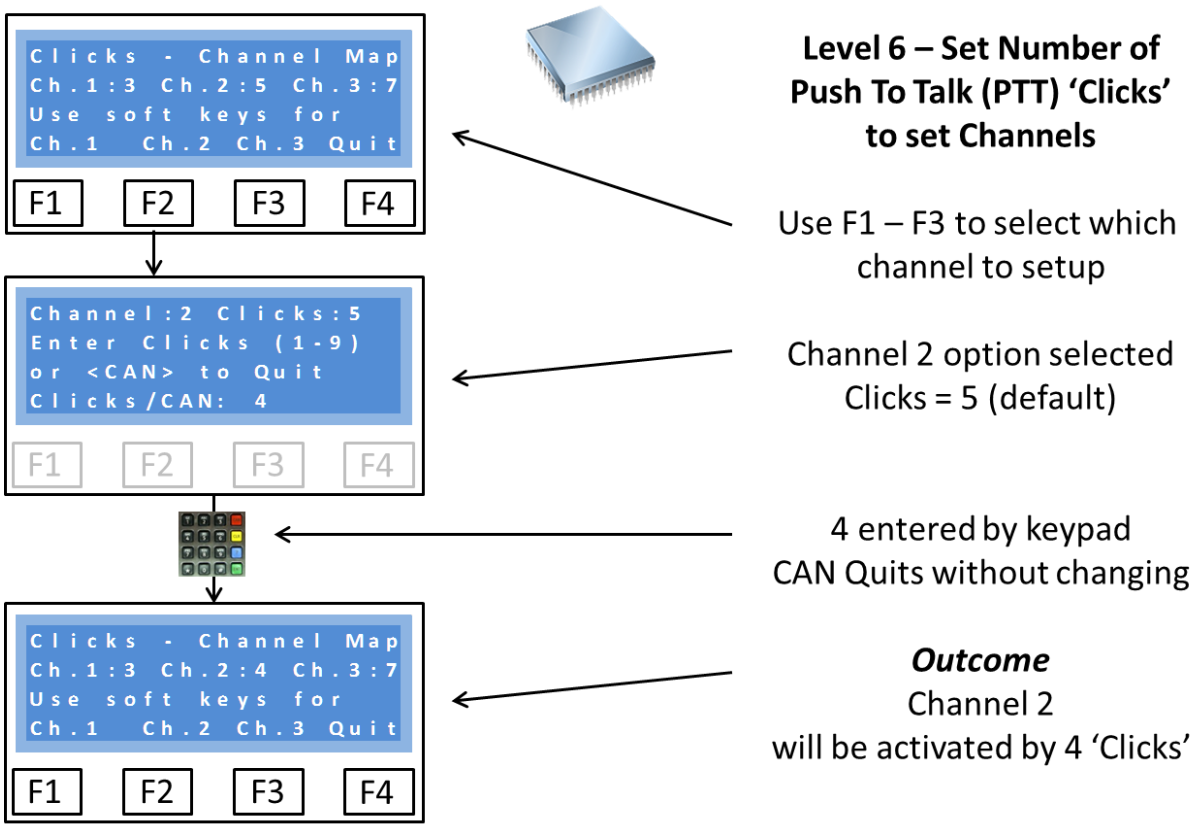
9.5.13 VHF 'Clicks' to Channel Mapping

The HLC uses the concept of 'Channels' to control which of the control relays are activated by VHF commands. The default settings are as follows:

VHF Clicks	Default Channel Activated
3 'clicks'	Channel 1 activated
5 'clicks'	Channel 2 activated
7 'clicks'	Channel 3 activated

The number of times the pilot presses the VHF Push To Talk (PTT) switch 'Clicks' to activate the channels can be set to any number between 1 and 9. There is no restriction on the number chosen except that the same number of clicks cannot be set for different channels.



In the above example Channel 2 (normally triggered by 5 Clicks) has been changed to be triggered by 4 Clicks.

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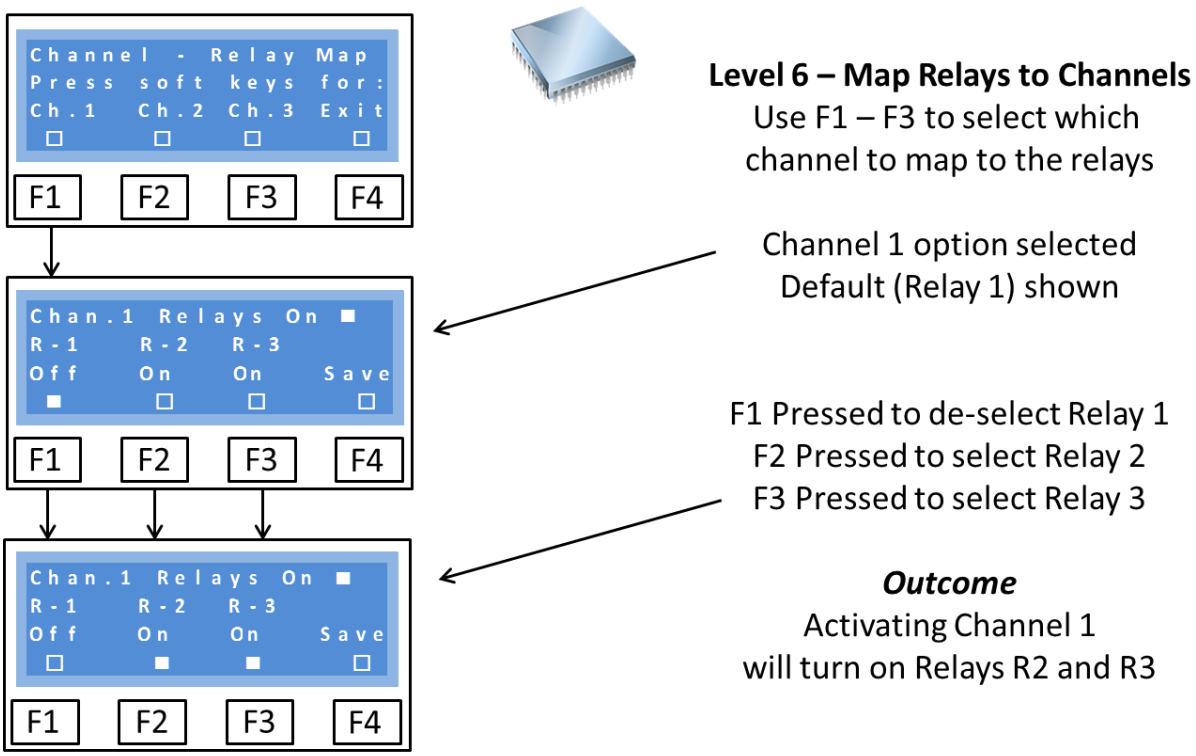
9.5.14 Channel to Relay Mapping

By default the following mapping exists between Channels and Relays set:

Channel Active	Default Relay Activated
1	1
2	2
3	3

Using this option allows any combination of relays to be mapped to these inputs.
Note: If no relays are selected the unit will not enter the timeout period.



In the above example, Ch1 will activate Relay 1 (by default).
This has then been changed instead to activate Relays 2 and 3.
This is a powerful facility for performing a variety of switching tasks.

NB – If the Timeout Alert Function (next section) is active any mapping for Relay 3 is overridden and ignored until Timeout Alert is de-activated.

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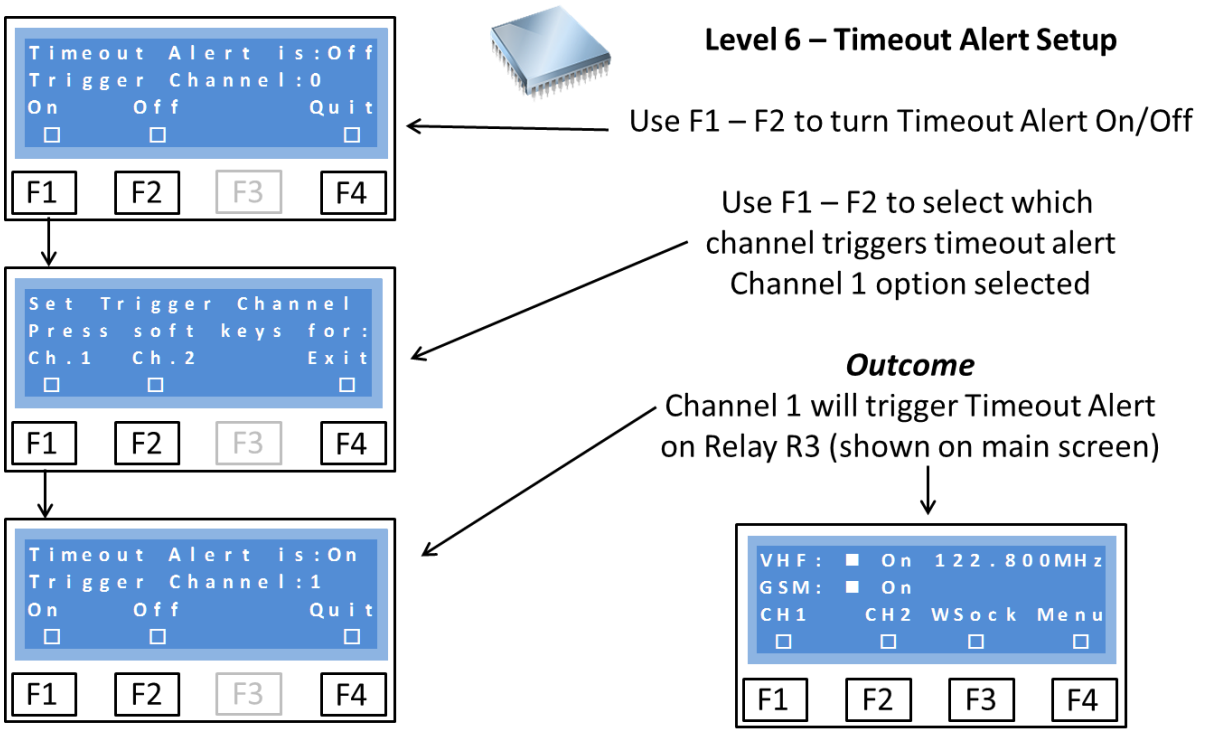
9.5.15 Timeout Alert

In normal operation 3 Channels and Relays are available for independent configuration as outlined in earlier sections. Certain regulatory authorities (e.g. Australia – see footer) require that the windsock is flashed for the last 10 minutes of the timeout period. By default this function is off.

To support Timeout Alert Channel 3 and Relay 3 are used exclusively for the windsock (see Section 8.11 for wiring setup). Relay 3 is 'slaved' to either Channels 1 or 2 (but not both):



In the above example, first the function is turned on and then the channel selected (Channel 1). When Timeout Alert is active the main screen will show WSock to indicate that Channel 3 / Relay 3 are assigned to this function.

See section 6.4 Operation with Timeout Alert.

NB – The Timeout Alert is set at 10 minutes. The trigger channel can be set to any desired period but if less than 10 minutes then the Timeout Alert will begin immediately!

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.

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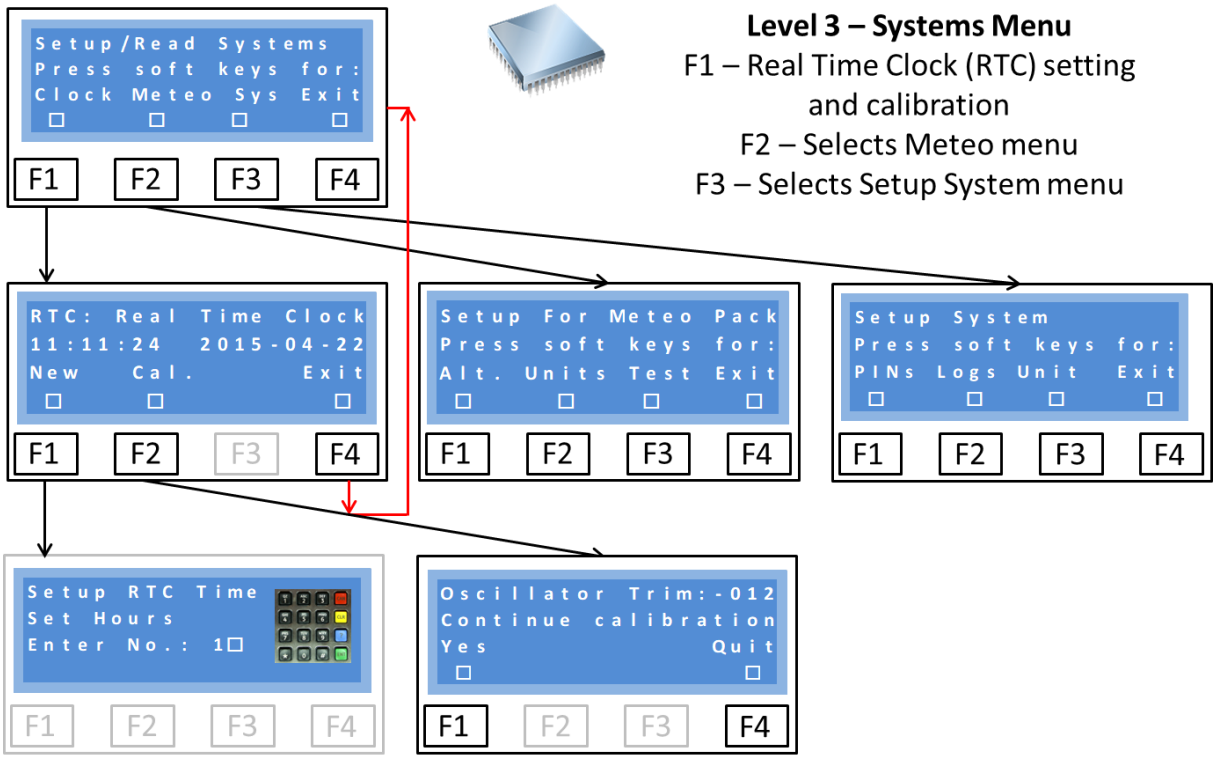
9.6 Setup Unit Menu

There are three options available to the Operator:

1) Set and calibrate the clock
2) Setup the Meteo Unit,
3) Setup further system/unit variables



Clocks - The FEC HLC V3 has two, battery backed up, Real Time Clock/Calendars (RTC).

The main system hosts the primary HLC which supports system related clock and timing functions. The secondary HLC is on the Cell sub-system.

Both clocks are set simultaneously so there is only one clock setting routine (over).

The system RTC has been calibrated during manufacture but maybe calibrated by the Operator to adjust for fast or slow running.

Meteo – Essential setup and testing options are available from this menu option.

Sys – Includes infrastructure and power management.

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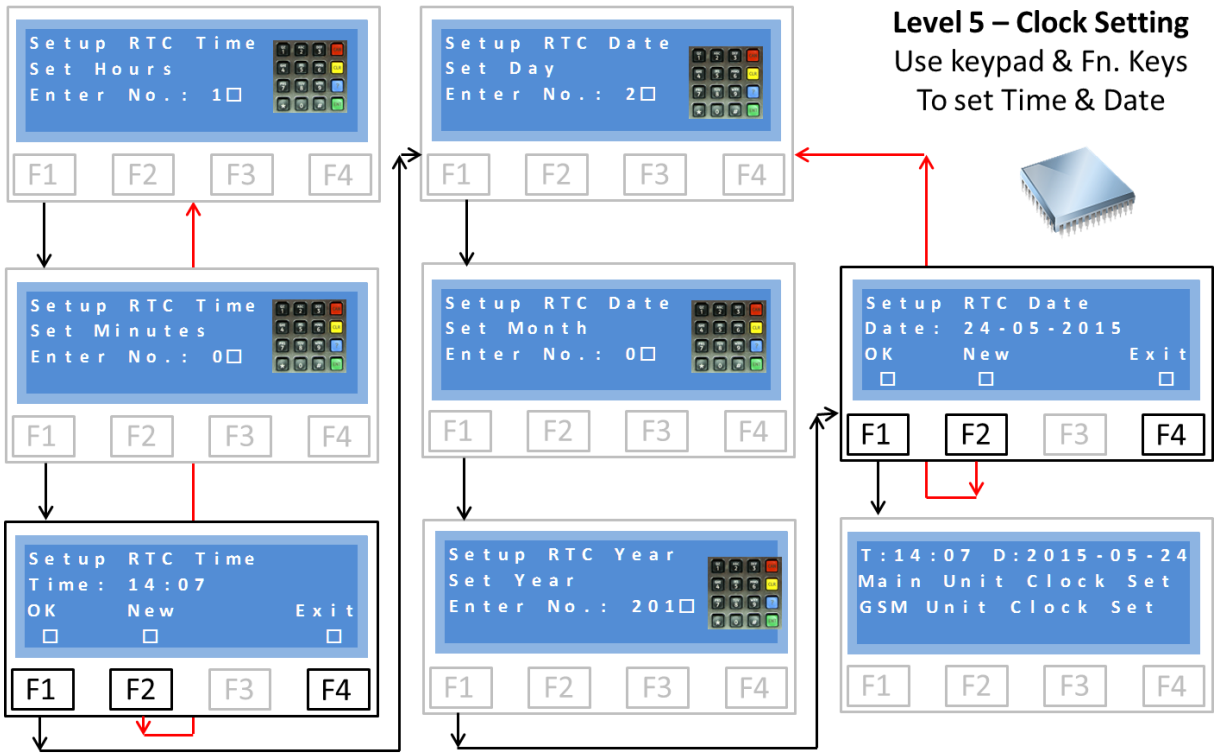
9.6.1 Set Real Time Clocks

Selecting Clock then New 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.

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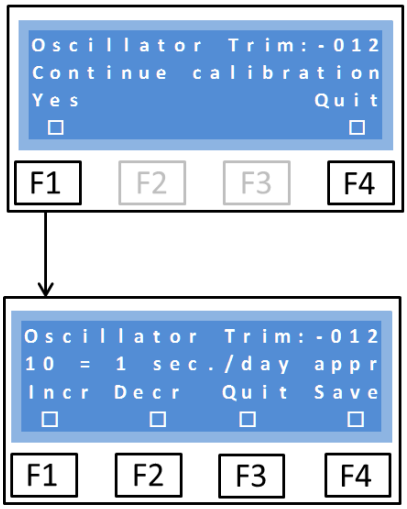
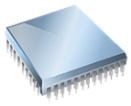
9.6.2 Calibrating the System Real Time Clock

Selecting Clock then Cal from the previous menus enters the clock calibration process:





Level 5 – RTC Calibration
F1 – Continue with calibration
F4 – Quit without change

A trim value of 10 equals 1 second a day (approximately)
F1 – Increases the trim value
F2 – Decreases the trim value
F3 – Quits without change
F4 – Saves the current value

The current trim value is shown in the top right hand corner of the screen.

If calibration is required, select F1 – Yes, otherwise press F4 to quit without change.

If calibration is selected the lower screen is displayed. Use the F1 and F2 buttons to increase the value of the trimmer and then either quit or save.

Note that the mid-point of the trimmer is +000. Values above this make the clock run faster and below this, slower.

To calibrate the clock, first determine by how much the clock is drifting to give a start point for the calibration.

To increase the speed of the clock by approximately 1 second per day, increase the trimmer value by 10. In the example above this would mean taking the trimmer value from -012 to -002.

It maybe that a couple of iterations over a number of days are required to achieve the required accuracy.

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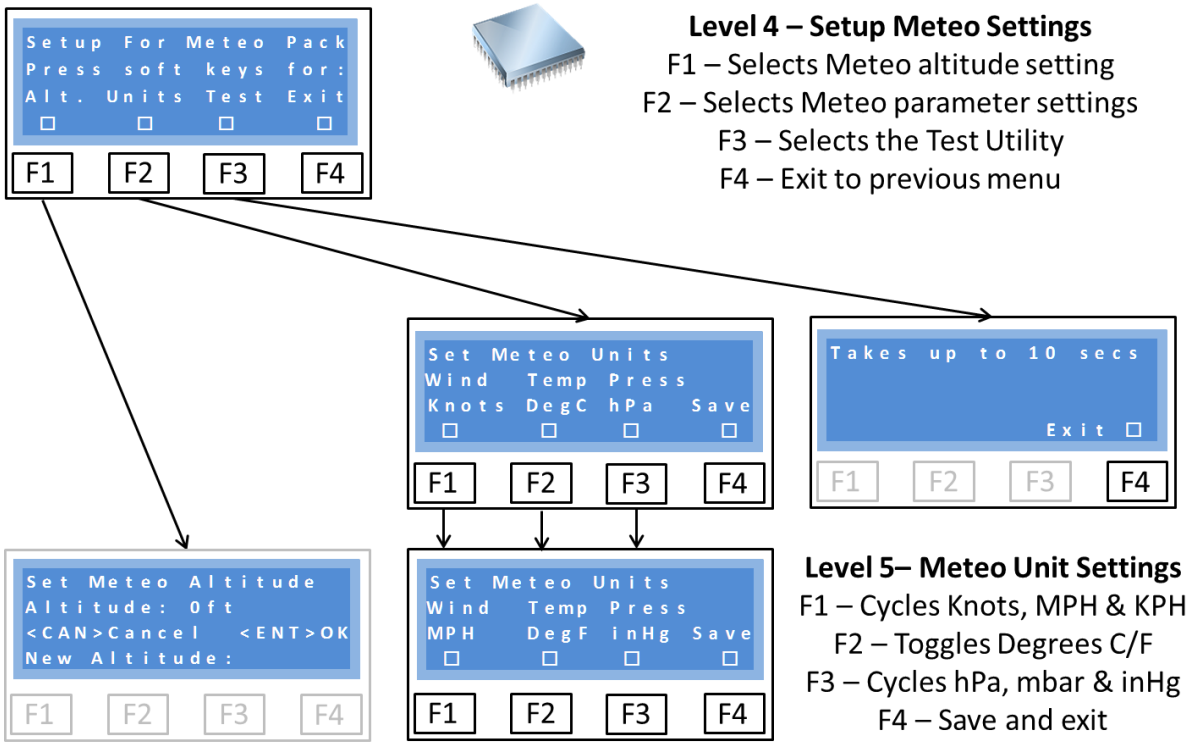
9.6.3 Meteo Setup - Units

The Meteo option allows the height of the meteorological station to be defined and, to cater for the wide variety of parameters used worldwide, the units the meteorological data will be presented in to be set.

The Meteorological instrument pack (MetPak) includes sensors to measure: Wind direction and speed, Temperature, Dew Point, Relative Humidity and Pressure.

The pressure reading assumes that the sensor is at 0 feet AMSL. Before the unit is used and will report pressure information the height of the sensor above or below mean sea level must be entered into the unit.

It is also necessary to confirm what units the system will report in.



Meteo Altitude setting – next page.

To change the Meteo Units, select Units from the menu and press F1, F2 or F3 repeatedly to cycle through the available units for Wind Speed, Temperature (and Dewpoint) and Pressure respectively:

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9.6.3.1 Meteo Setup - Altitude

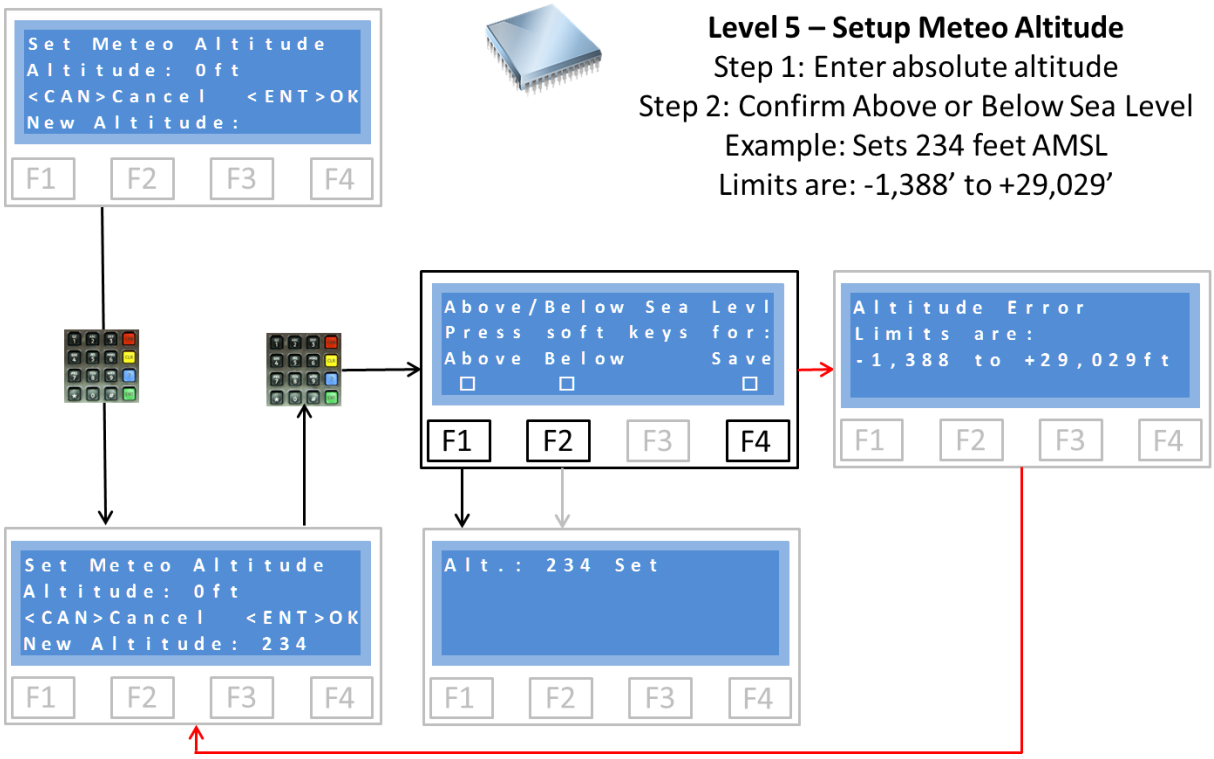
The pressure reading assumes that the sensor is at 0 feet AMSL.

Before the unit is used and will provide pressure information the height of the sensor above or below mean sea level must be entered into the unit.

Until this is done, the unit will not report pressure, instead it will report 'Pressure Uncalibrated' in meteorological reports.

The conversion factor is: Pressure Correction = Altitude * 0.036438 (hPa).

Note that this is simple correction sufficient for most situations but Operators must satisfy themselves that the reported figure is accurate for their implementation.



The current stored altitude (0 feet default as shipped) is displayed and the new (absolute) altitude prompted for. A maximum of 5 digits are allowed.

In the example above 234 feet has been entered. Press <ENT> and the system prompts whether this figure is Above or Below Mean Sea Level. Press F1 or F2 as appropriate. In the example above AMSL is chosen and the system immediately confirms that the new value has been set.

The altitude cannot be changed by SMS command.

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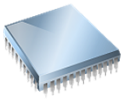
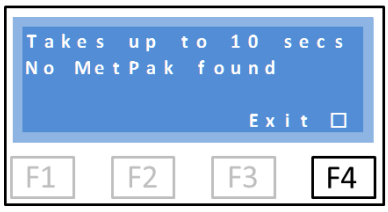
9.6.3.2 Meteo Setup - Test

Selecting Test from the Meteo Menu will enter a test loop where the HLC will continually search for the MetPak and read the MetPak if found.

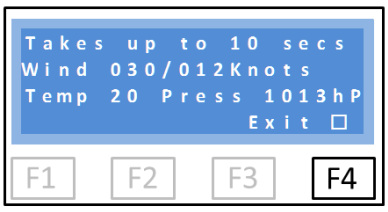


Level 5 – MetPak Test Utility
Continuously reads from MetPak
Press 'F4' to Exit



Screen is as above if no MetPak feed is found
Press 'F4' to Exit
(may take a second or two to respond)

Screen is as above if MetPak feed is found but data stream is corrupted
Press 'F4' to Exit
(may take a second or two to respond)



Screen is as above if MetPak feed is found and data stream is OK
Note units are the default values and pressure uncorrected for altitude
Press 'F4' to Exit

If no MetPak is detected, the screen will show:

No MetPak Found

If a MetPak is found but there is a data error then the screen will show:

MetPak Data Error

If the MetPak is found and the data is good, the screen will show:

Wind 0XX/0YY Knots

Temp ZZ Press ABCDhP

Note that these are a sub-set of the full report and in the default units of the MetPak. Press Exit to return to the main Meteo Menu.

Using other sources of data (local meteorological reports, hand held instruments etc.) confirm that the readings are as expected.

NB – The pressure reading is the raw pressure reading from the MetPak uncorrected for the station altitude. Refer to previous sections of the manual to ensure that the units and altitude are set correctly.

Using a Cell phone and with the HLC at the main menu, text the HLC for its status. The Meteorological data will be appended to the text in the chosen units and corrected for station altitude if entered.

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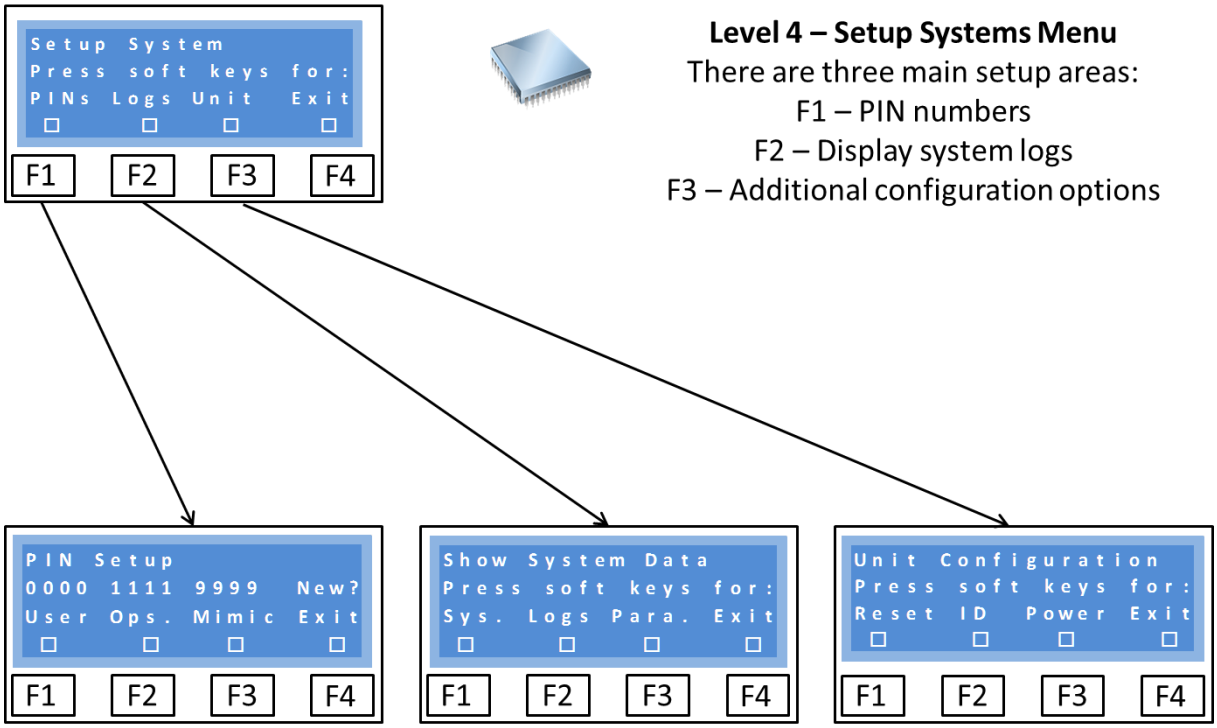
9.6.4 Setup Unit



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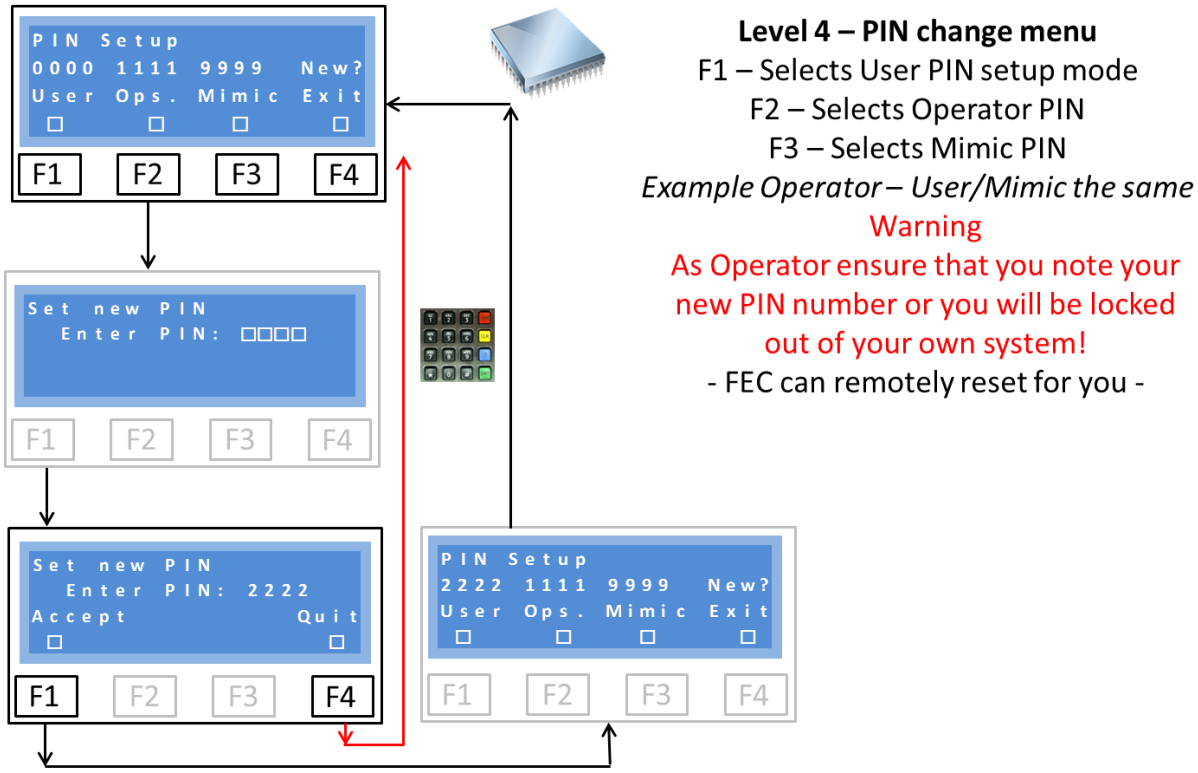
9.6.4.1 Setting PINs

The Operator can set PINs for Users, themselves and the Mimic panel.



The above example shows how the Operator can reset their own PIN.

Note the warning about forgetting the Operator PIN – you will be locked out of your own system and only have User privileges until reset.

If an Operator does lock themselves out, FEC will be able to remotely reset.

Entering a new PIN is also possible via SMS.

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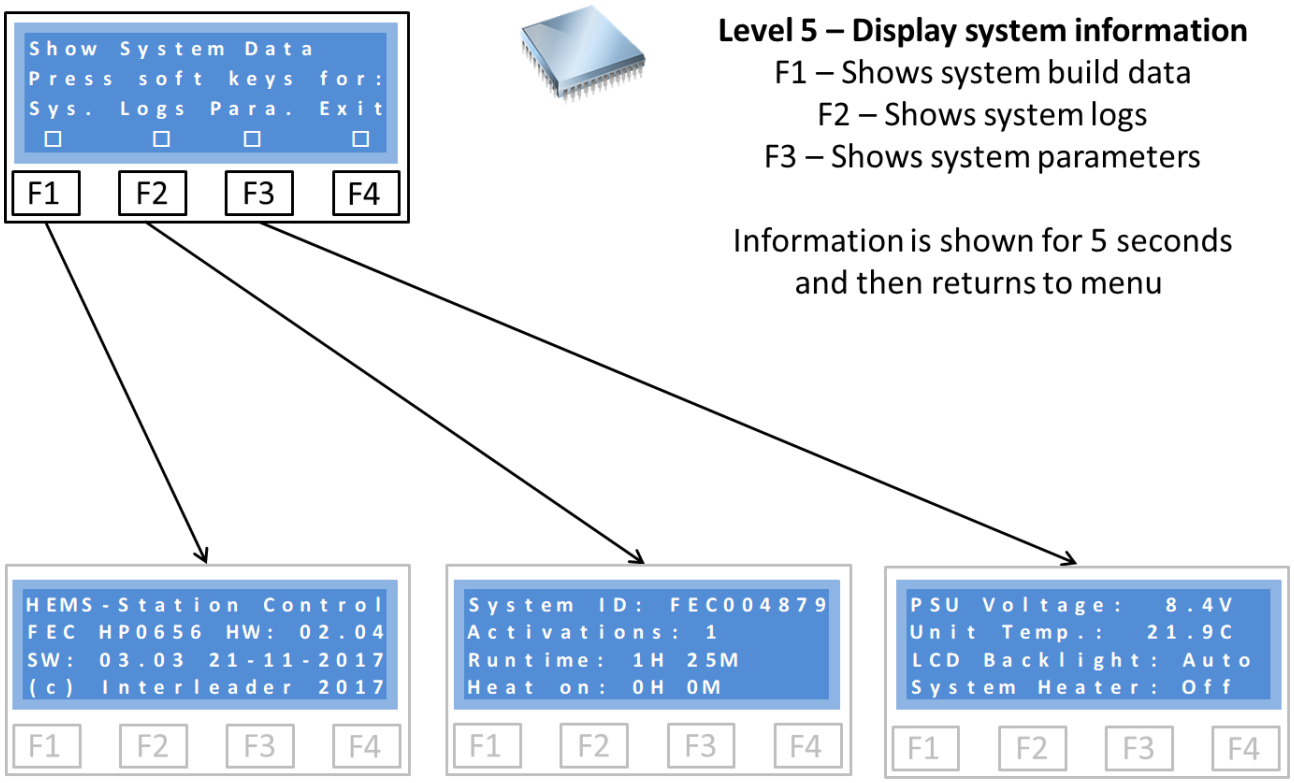
9.6.4.2 Show System Logs

A number of configuration and system data are held and updated by the system. This information is available through this menu.



System

Shows the type and hardware & software configuration.

History Logs

Shows the system ID, the number of times the unit (not channels) has been turned on and off (activations), the total unit run-time and the time the heater has run for.

System Parameters

Shows the current Power Supply Unit (PSU) voltage and unit temperature and the configuration of the LCD Backlight (Auto – default or On) and heater (Off – Default or On).

Note that even if the unit is being run from a 12V battery, the PSU voltage will indicate the internal system battery voltage and will be in the range 6.0V (nearly exhausted) to 8.5V (fully charged).

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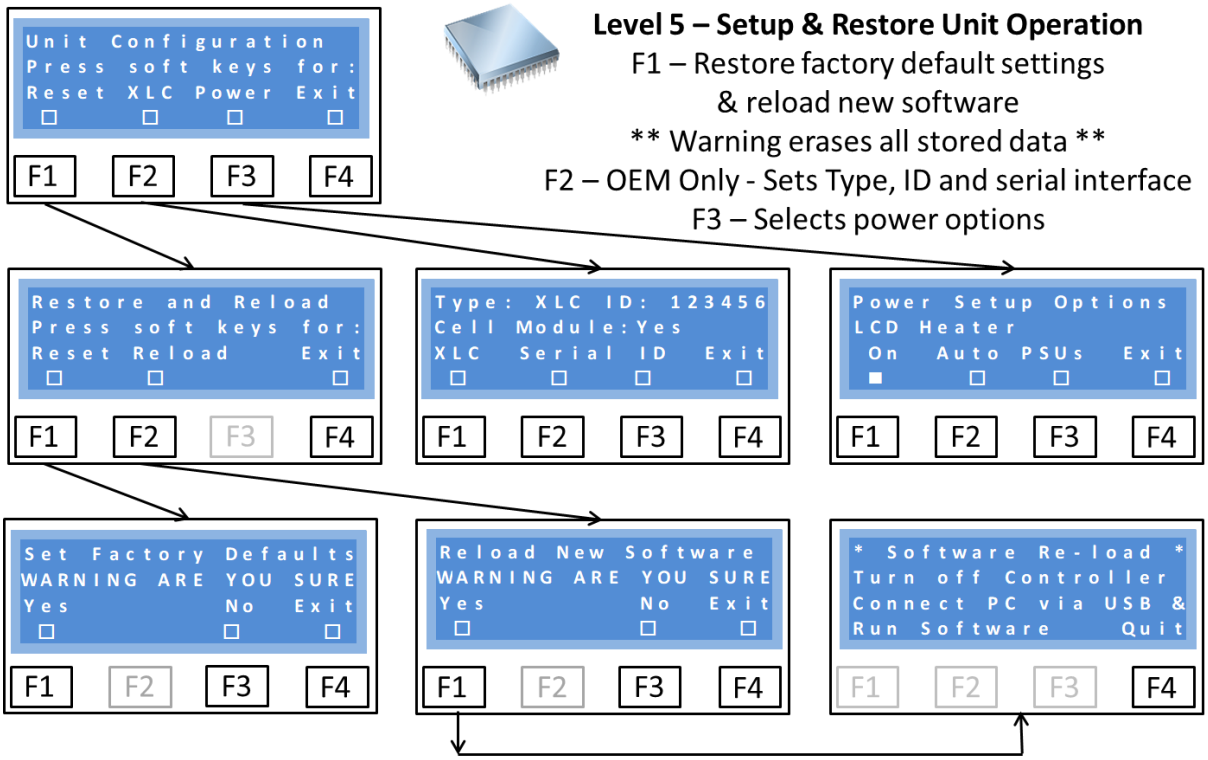
9.6.4.3 Setup Unit Operation

This option allows the operator to:

1) Restore all of the factory set default values and load new software,
2) Set the Type and ID number of the unit (OEM only), and
3) Set-up power saving options and measure voltages



Reset

There are two options.

1) Restore Factory Defaults

This option puts the configuration back to the factory default settings listed in the appendix. WARNING – All telephone numbers, radio settings etc. will be lost and will need to be re-entered.

2) Reload Software

This option allows new software to be loaded (see later section on software update)

XLC (OEM only)

Power Settings

See over for details.

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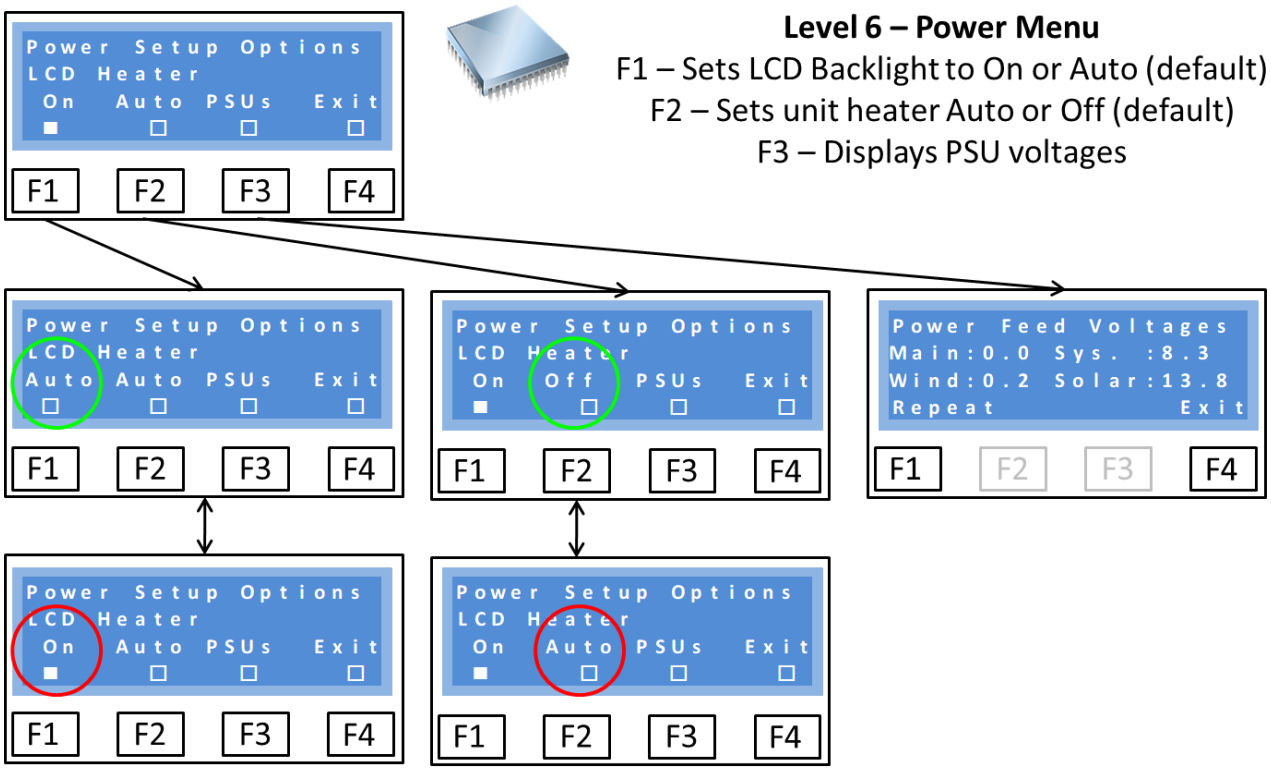
9.6.5 Power Settings

There are three options:

1) Configure the LCD backlight operation
2) Enable/Disable the internal heater for power management, and
3) Measure the circuit currents and setup the unit to alarm on errors



LCD

By default the LCD display Backlight is set to Auto to save power. In auto mode the backlight goes off if no key is pressed or message sent to the screen for ten minutes. Touching a key or sending a message to the screen will immediately turn the back-light back on again. If the HEMS-Station® is powered from the mains, the LCD backlight can be set to On.

System Heater

Note that there are two heaters in the HEMS-Station®; one is in the cabinet (see earlier section) the other in the system enclosure. By default the system heater is set to Off to conserve the system battery. If the HEMS-Station® is powered from the mains, this can be set to Auto so that as the internal temperature of the box drops towards freezing, the heater is run at increasing power to maintain the keyboard, display and electronics at a temperature above freezing.

PSUs

This screen shows the current system supply voltages. If the system is being powered from the internal mains PSU it will show 15.0 +/- 0.5V. If the unit is powered from an external battery, for example, it will show the voltage of that battery.

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10 Installation

Before starting, read the HEMS-Station® HP0725 - Installation Manual (included on the distribution CD) which covers physical and electrical installation of both versions of HEMS-Station®.

Installation of the HEMS-Station® must be carried out by a suitably qualified electrician with full authority to undertake work in the safety critical environment of a helipad if a mains supply is to be used.

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.

FEC sell a range of build and installation kits depending on requirement. Please contact your FEC sales office for details.

10.1 Locating the Controller

The HEMS-Station® should be located in a secure location that is easy for operational staff to access the keypad and screen and appropriate for the antennae, mains and circuit wiring.

The enclosure is intended for wall mounting and, with suitable rails or adaptors, can be frame or pole mounted. 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 antenna
3) An external UHF antenna (supplied), and
4) An external Cell antenna (supplied).

It is recommended that as a minimum, 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.

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10.2 Cellular Radio Micro SIM

It is highly recommended that if an HP0725 HEMS-Station® has been ordered that you either arrange for FEC to source the SIM for you or you provide FEC with the Micro SIM you wish to use at the time of ordering. The SIM will be fitted as the unit is being built and fully tested prior to shipment.

10.3 Fitting the Micro SIM

It is highly recommended that this process is carried out by two people because of the number of components, cables etc.

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. An M3 Allen key or runner
2. A No. 0 or 1 Philips (PH1/2) or No. 1 Pozidrive (PZ1) screwdriver to access SIM cover.
3. The Micro SIM (not Mini or Nano) that you will be using. You will need to know the number to call it, but the controller does not need to know.

With the HEMS-Station® disconnected from all electrical supplies and the systems power switched off at the rotary switch, remove the 4 M3 screws from around the keypad bezel.

With all screws removed, gently draw the keypad unit forward and lift out from the casing. Take great care not to disturb any of the cables, particularly the UHF antenna cable which is located at the bottom of the enclosure.

Carefully rotate the unit forward so that all of the cables are exposed and the keypad is in a horizontal position.

If working single handed

Note the position and connection of all of the cables and be aware that:

- The VHF connector is a BNC type and is released with a push and twist anti-clockwise movement
- The Cellular and UHF Radio connectors are SMA – turn anti-clockwise to release
- The two 9-Way D connectors have connector retaining screws
- The USB connectors pulls straight out

Remove all of the cables and place the keypad unit on a protective surface and proceed to the next section to fit the SIM.

If working as a pair

One person holds the keypad steady horizontally while the other fits the SIM.

Re-fitting

Re-fitting is the reverse of the above – take care not to over-tighten the connectors and that all wires are clear of the metalwork as the unit is re-fitted. Use of a small amount of Loctite 248 medium strength screw locking compound is recommended for the four fixings screws.

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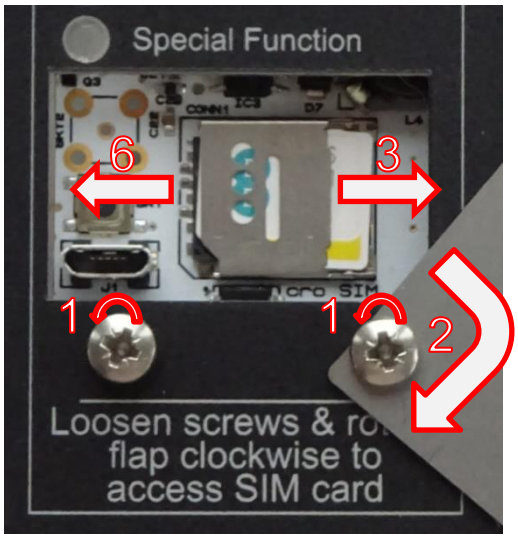
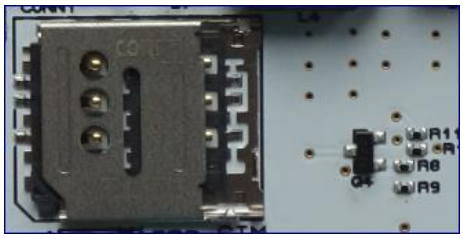
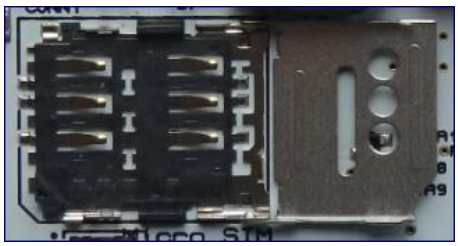
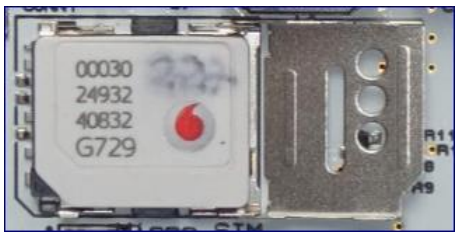
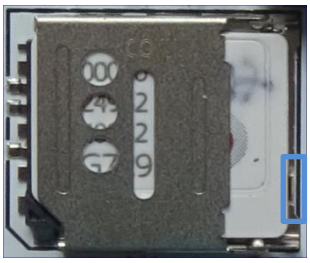
10.4 Inserting the SIM

The SIM holder is located behind a rotating flap on the back of the keypad unit (right).



To fit the SIM:

1) Slacken the two screws (using a Philips PH1/2 or Pozidrive PZ2 screwdriver). There is no need to remove the screws or cover
2) Rotate the cover clock-wise as shown

3) Slide the metal SIM carrier gently to the right and then pull forward	4) Open the cover to the right
	
5) Place the SIM onto the contacts oriented as shown.	6) Ensuring that the SIM is properly aligned within the holder, close the lid fully and, while applying gentle pressure, slide the cover to the left until a click is heard/felt.
	

7) Check that the cover is properly shut and that the SIM is butted to the stop (blue box – photo, bottom right)
8) Rotate the cover back into place and gently re-tighten the screws.

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11 Appendix 1 - Summary Specification

- Controller modes: 4 - VHF PCL, Cell/SMS, Keypad or Aux
- VHF Frequency Range: 118 to 137 MHz
- Channel spacing (V2 Receiver): 8.33kHz
- VHF Sensitivity: > -90dBm
- Frequency selection: Any channel within the Air Band
- VHF antenna: BNC - External remote mounted (Not supplied)
- Cell Bands: 3G (with 2G fall-back). 4G/LTE in USA
- Network: Operators choice subject to coverage
- Tariff: Account (recommended) or pre-pay
- Cell antenna: SMA Connector for remote mounted antenna (supplied)
- UHF antenna: SMA Connector for remote mounted antenna (supplied)
- Degree of protection: IP65 (general)
- LCD and Keypad protection: IP65 and 'vandal resistant'
- Unit operating temperature: -20°C to +50°C
- System Storage temperature: -20°C to +60°C
- Compliance: ROHC Compliant except exempt items (radios)
- Operating voltage (AC): 100-240V AC 50-60Hz
- Electrical Protection (HLC not circuits) 5A 20mm Fuse
- Operating voltage (DC): 15V DC
- Max voltage range (DC): 12V – 24V 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 (Cell transmitting): 12V DC: 10 watts (maximum)
- Max power consumption: DC/AC: 30 watts (including optional winter heater)
- Size: Height - 500mm
  Depth – 200mm
  Width – 400mm
- System Enclosure material: ABS
- Outer Enclosure: Powder coated steel
- Weight (without shipping packaging): 18kg (excludes mounting arrangements, antennae and HEMS-Stars®
- Warranty: 2 years return to FEC

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12 Appendix 2 - UHF Radio Modem Specification

The same Telit UHF Radio Modem is used in MIL-Star®, HEMS-Star®, HLC, MLC, PLC, KFC and the FEC Systems Management PC Dongle.

The Modem has the following specification.

Parameter	**Value**	
	UK/EU/ROW 868 MHz	USA 915MHz
Manufacturer:	Telit	Telit
Modem type:	LE70 - 868	LE70 - 915
Nominal frequency band:	868MHz	915MHz
Frequency (sub)band:	869.525MHz (869.4 - 869.65MHz)	902 – 928MHz (915.375 1st Channel)
Frequency hops/dwell time:	N/A	50/350mS
Freq. tolerance @ 20C	+/-2.5kHz	+/-2.5kHz
Rx filter bandwidth	81kHz	81kHz
Deviation:	+/-20kHz	+/-20kHz
Power output set	100mW (20dBm)	100mW (20dBm)
Receiver sensitivity:	Max –110dBm at 38.4kbps	Max –110.5dBm at 38.4kbps
Controller range:	To 200m subject to antenna & terrain	To 200m subject to antenna & terrain
Addressing - module level:	Transparent (secure addressing later)	Transparent (secure addressing later)
Addressing schema:	One to Many	One to Many
Addressing – device level:	Handled in software	Handled in software
Encryption:	None (AES 128bit later)	None (AES 128bit later)
RF Baud rate:	38.4kbps	38.4kbps
Modem data rate:	19.2kbps	19.2kbps
Modulation:	2GFSK	2GFSK
Operating temperature:	-40C to +85C	-40C to +85C
Compliance:	CE (0682)	Compliance for FCC is to 47 CFR part 15.249. FCC ID: R17LE70FH

All specifications are manufacturer’s data

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13 Appendix 3 - Power Supply Unit Specification

The Mains PSU fitted is a 100 watt PSU type LPV 100-15.

MEAN WELL 100W Single Output Switching Power Supply **LPV-100 series**

■ Features :

- Constant voltage design
- Universal AC input / Full range
- Fully encapsulated with IP67 level (Note.8)
- Withstand 300VAC surge input for 5 seconds
- Protections: Short circuit / Over current / Over voltage
- Fully isolated plastic case
- Cooling by free air convection
- 100% full load burn-in test
- Low cost, high reliability
- Suitable for LED lighting and moving sign applications(Note 7.)
- 2 years warranty

IP67 CE

SPECIFICATION

MODEL		LPV-100-5	LPV-100-12	LPV-100-15	LPV-100-24	LPV-100-36	LPV-100-48
OUTPUT	DC VOLTAGE	5V	12V	15V	24V	36V	48V
	RATED CURRENT	12A	8.5A	6.7A	4.2A	2.8A	2.1A
	CURRENT RANGE	0 ~ 12A	0 ~ 8.5A	0 ~ 6.7A	0 ~ 4.2A	0 ~ 2.8A	0 ~ 2.1A
	RATED POWER	60W	102W	100.5W	100.8W	100.8W	100.8W
	RIPPLE & NOISE (max.) Note.2	80mVp-p	120mVp-p	120mVp-p	150mVp-p	150mVp-p	150mVp-p
	VOLTAGE TOLERANCE Note.3	±8.0%	±5.0%				
	LINE REGULATION	±1.0%					
	LOAD REGULATION	±6.0%	±2.0%				
	SETUP, RISE TIME Note.6	2000ms, 25ms / 230VAC 2000ms, 25ms / 115VAC					
	HOLD UP TIME (Typ.)	50ms/230VAC 14ms/115VAC at full load					
INPUT	VOLTAGE RANGE Note.4	90 ~ 264VAC 127 ~ 370VDC					
	FREQUENCY RANGE	47 ~ 63Hz					
	EFFICIENCY (Typ.)	80%	85%	87%	88%	88%	89%
	AC CURRENT	2.2A/115VAC 1.2A/230VAC					
	INRUSH CURRENT(max.)	COLD START 30A/115VAC 75A/230VAC					
	LEAKAGE CURRENT	0.25mA / 240VAC					
PROTECTION	OVER CURRENT	110 ~ 150% rated output power					
		Protection type : Hiccup mode, recovers automatically after fault condition is removed					
	OVER VOLTAGE	5.75 ~ 6.75V	13.8 ~ 16.2V	17.25 ~ 20.25V	27.6 ~ 32.4V	41.4 ~ 48.6V	55.2 ~ 64.8V
		Protection type : Shut down o/p voltage, re-power on to recover					
ENVIRONMENT	WORKING TEMP.	-25 ~ +70℃ (Refer to "Derating Curve")					
	WORKING HUMIDITY	20 ~ 90% RH non-condensing					
	STORAGE TEMP., HUMIDITY	-40 ~ +80℃, 10 ~ 95% RH					
	TEMP. COEFFICIENT	±0.03%/℃ (0 ~ 50℃)					
	VIBRATION	10 ~ 500Hz, 2G 10min./1cycle, period for 60min. each along X, Y, Z axes					
SAFETY & EMC	SAFETY STANDARDS	IP67 approved; Design refer to TUV EN60950-1					
	WITHSTAND VOLTAGE	I/P-O/P:3KVAC					
	ISOLATION RESISTANCE	I/P-O/P:>100M Ohms / 500VDC / 25℃/ 70% RH					
	EMC EMISSION	Compliance to EN55022 (CISPR22) Class B, EN61000-3-2 Class A(≪80% load), EN61000-3-3					
	EMC IMMUNITY	Compliance to EN61000-4-2,3,4,5,6,8,11; EN55024, light industry level, criteria A					
OTHERS	MTBF	703Khrs min. MIL-HDBK-217F (25℃)					
	DIMENSION	190*52*37mm (L*W*H)					
	PACKING	0.63Kg;20pcs/13.6Kg/0.51CUFT					
NOTE	1. All parameters NOT specially mentioned are measured at 230VAC input, rated load and 25℃ of ambient temperature. 2. Ripple & noise are measured at 20MHz of bandwidth by using a 12" twisted pair-wire terminated with a 0.1uf & 47uf parallel capacitor. 3. Tolerance : includes set up tolerance, line regulation and load regulation. 4. Derating may be needed under low input voltage. Please check the static characteristics for more details. 5. The power supply is considered as a component that will be operated in combination with final equipment. Since EMC performance will be affected by the complete installation, the final equipment manufacturers must re-qualify EMC Directive on the complete installation again. 6. Length of set up time is measured at first cold start. Turning ON/OFF the power supply may lead to increase of the set up time. 7. The unit might not be suitable for lighting applications in EU countries. Please check with your local authorities for the possible use of the unit. 8. Suitable for indoor use or outdoor use without direct sunlight exposure.						

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14 Appendix 4 - Factory Default Settings

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

Item	Default Setting	Comment
LCD Backlight	Auto	Option = On
Backlight timeout period	1 minute	Cannot be changed
In-Menu timeout period	10 minutes	Cannot be changed
Heater Enable	Off	Option = Auto
VHF Frequency	122.800MHz	Any valid 8.33kHz channel
Relay Timers	3	1 per relay
Relay 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 Active	On	Option = Off
UHF Active	Off	Option = On
UHF Command Repeat	Off	Option = On
User PIN	0000	
Operator PIN	1111	
Mimic PIN	9990	Range 9999 - 9999
System PIN	9980	Range 9980 - 9989
Unit ID	Set to Unit Serial Number	Cannot be set by Operator
Wind Units	Knots	Options: mph, kph
Temperature Units Dewpoint Units	Celsius	Fahrenheit Note: Temperature and Dewpoint change together
Barometric Pressure Units	HectoPascals	Options: mbar, inHg
Meteo Unit (Site) Altitude (Above Mean Sea Level)	0 feet	Used to adjust pressure reading
Channel 1 Relay(s)	1	Options: any combination
Channel 2 Relay(s)	2	Options: any combination
Channel 3 Relay(s)	3	Options: any combination
Relay 3 Timeout Alert	Off	Option = On

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15 Appendix 5 - 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.

Warning

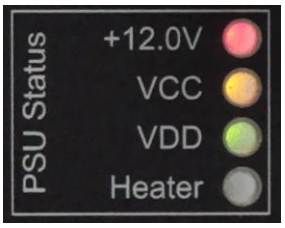
If the controller is mains powered, the enclosure will contain dangerous voltages. A qualified electrician must perform all of the necessary safety checks on the unit prior to any other tests being carried out.

HP0723 & HP0725 - Basic 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
  - If the mains or DC supply are connected the blue FEC logo should be lit
- If the logo is lit but the lights appear not to be getting charged, attach a DC voltmeter set to 20V range across a pair of spring contacts in one of the bays. This should give a reading of 15V if on mains supply and the external battery voltage if powered from a DC source. E.g. a 12V solar PV/Battery combination should give a reading between 12V – 14V depending on its state of charge.

HP0725 - Basic Operational Checks

- Perform the above and if still not operating, with the rotary system power switch on, check that:
  - The LCD back-light comes on when a key is pressed
  - The controller responds correctly to keypad inputs
- If not, carefully remove the keypad assembly from the metalwork and check the Status LEDs on the rear panel. They should show:
- +12.0V – Lit
- VCC – Lit
- VDD - Lit



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*

16 Appendix 6 - Spare Parts

There are no other user serviceable parts.

Items requiring repair need to be returned to FEC.

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17 Appendix 7 – Software Updater

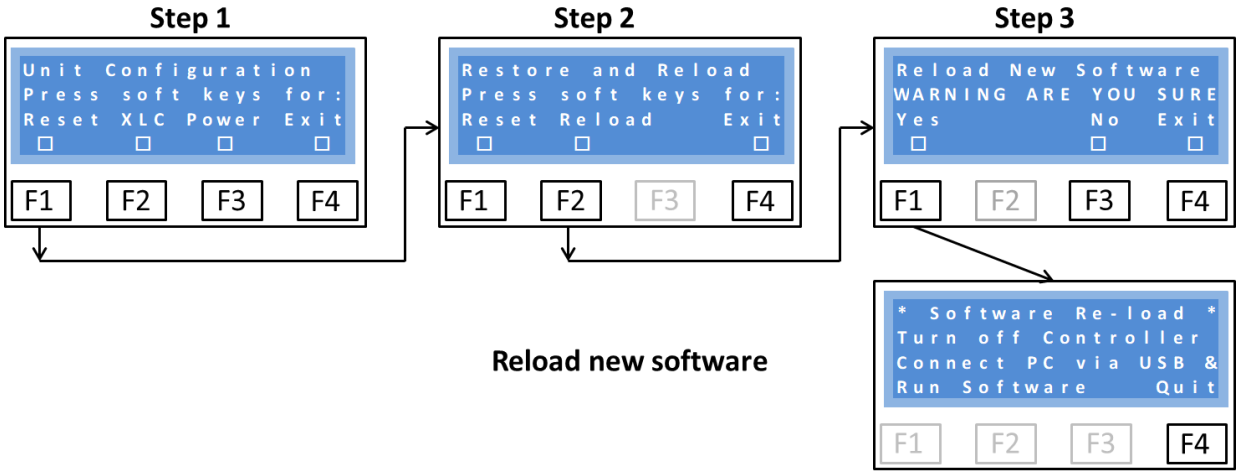
17.1 Preparing your PC to Update Software

The HLC can be updated with new software in situ. To update the software requires a Windows PC with connection to the internet (only for the download period) 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.

New software may be downloaded from the FEC or manufacturer’s website in executable (.exe) and zipped (.zip) format or emailed to you. Many firewalls block the download of executable files. If so download and extract the zipped (.zip) format.

17.2 Preparing the HLC to Update Software



Step 1: From the Unit Configuration Menu (Section 9.6.4.3) select Reset

Step 2: Select Reload.

Step 3: To continue press Yes. This is the last chance to Quit the reload.

After confirming Yes, the screen confirms what to do next:

1. Turn off the HLC with the key
2. Connect the PC via the USB cable, and
3. Run the software.

Note: When the PC is plugged in, the HLC will display the loader screen:

If at this point, if you want to abandon the reload:

1. Remove the USB cable
2. Turn the unit On and Off three times with the key
3. The unit will re-start with the currently loaded software

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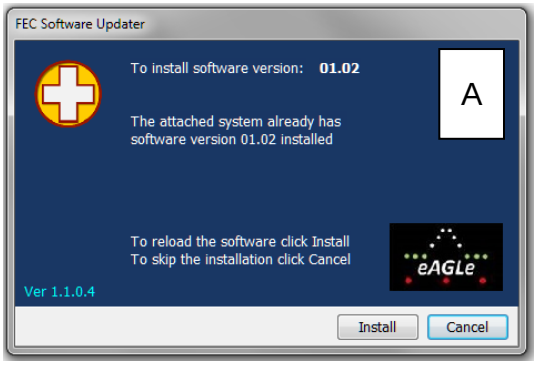
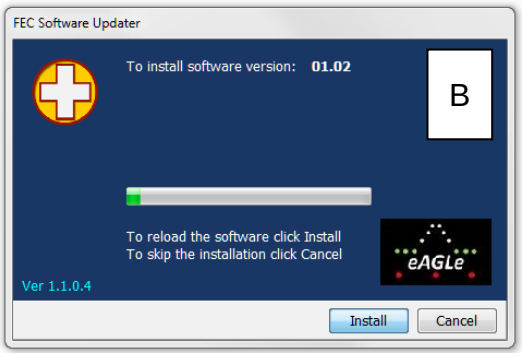
17.3 PC Software Update Process

With the PC connected via the USB cable and the HLC screen showing the 'Loader' page.

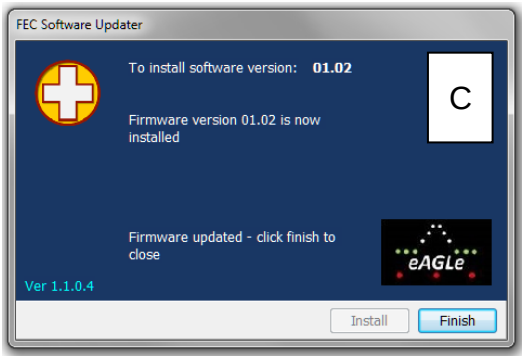
1) Double click on the update file and a screen similar to that shown (Screen A) will appear
2) The screen on the PC should now advise that the system is connected and the Install button will change from greyed-out to active



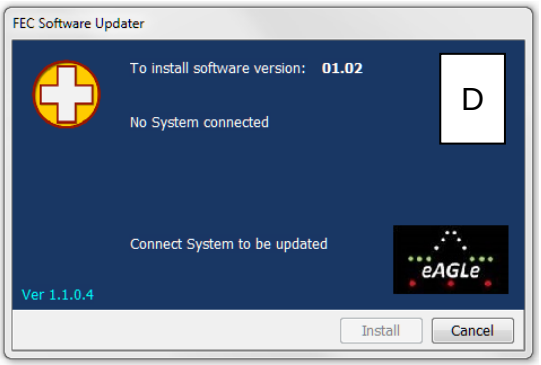
3) Click Install and the software will be automatically uploaded to the controller
4) Screen B confirms the update is in progress



5) When complete (Screen C) – click finish and the window will close
6) If Windows asks if the programme installed ok – click yes
7) Disconnect the USB cable
8) Turn the HLC on with the key and observe the start-up screen to confirm it is running the new software (Next page)



9) If the software fails to recognise the HLC (Screen D), close and re-open the software



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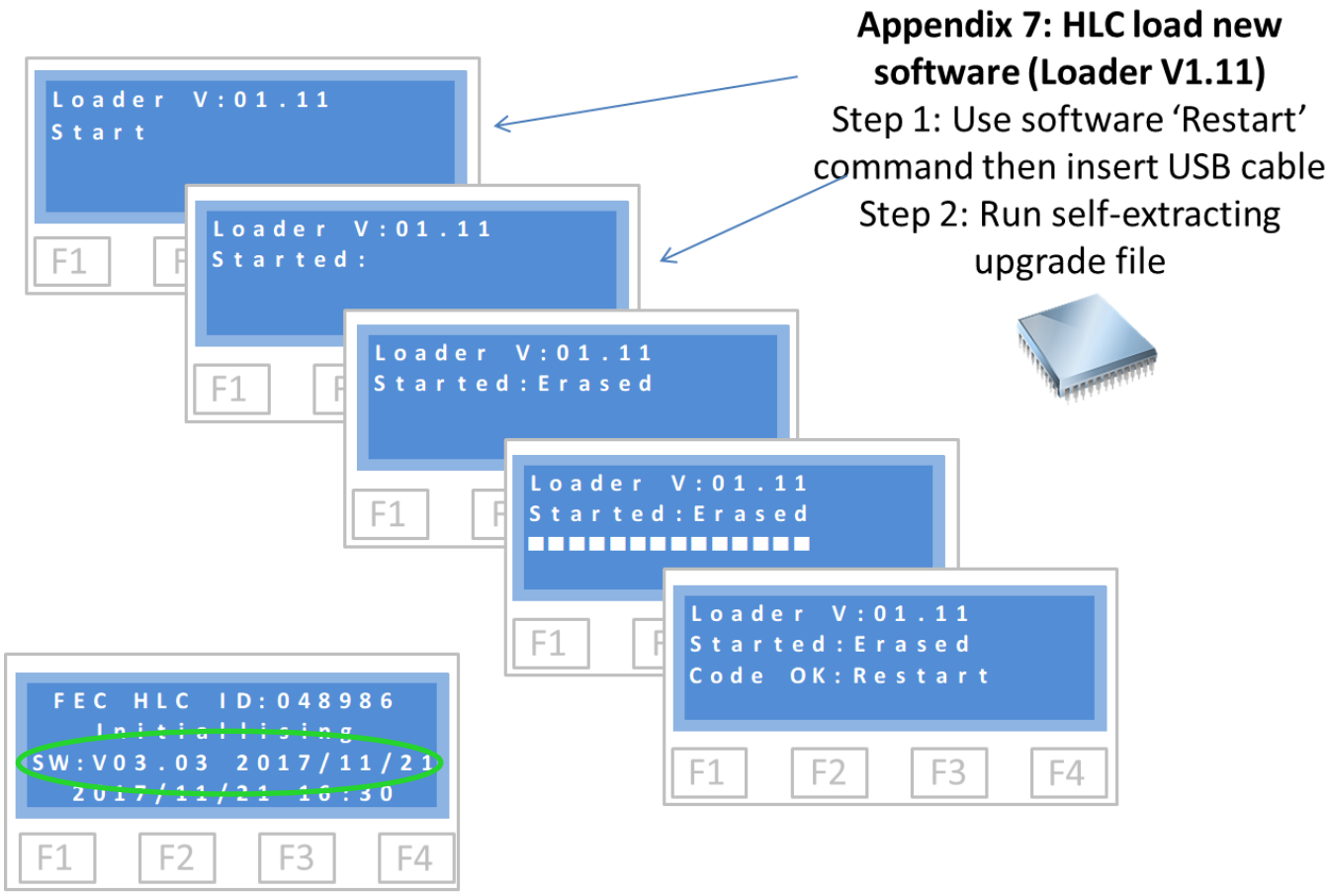
17.4 HLC Software Update Screens

Below is the sequence of screens that the HLC 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.



The first time that the HLC is started after a software update pay attention to the initialisation screens (highlighted in green ellipse above) and confirm version of software is as expected. Repeat with the correct version if not.

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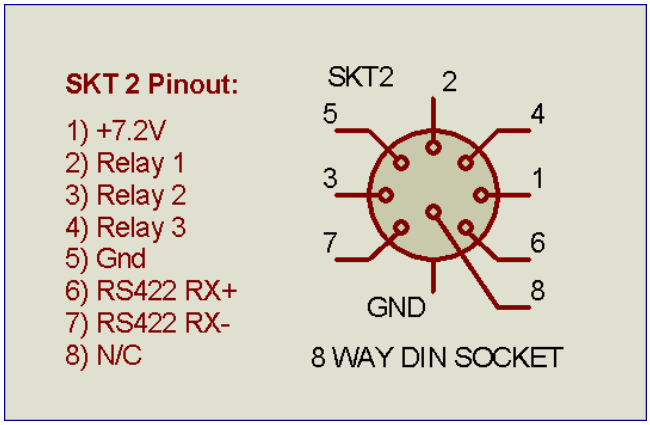
18 Appendix 8 – Auxiliary Connector

The HEMS-Station® HP0725 is equipped with an auxiliary connector for controlling up to three relays and interfacing to a Gill Instruments MetPak meteorological package.

The Mating Plug is a Lumberg 8 way line plug - 0332 08-1. (Farnell: 1212134, RS: 698-9265).

18.1 Connector Pinout

The following is the pinout for the 8 way connector:



18.2 Relay Output

The relay outputs are ‘Open Drain’ FET Transistor switches designed to switch external relays with supply voltages up to 28VDC and coil currents of 250mA each.

DC voltages > 28V and mains AC voltages must never be applied to the connector or its wiring.

This would cause significant damage and pose a real safety threat.

The relays are not powered by the HEMS-Station® but from the external source. This provides maximum flexibility in the choice of supply.

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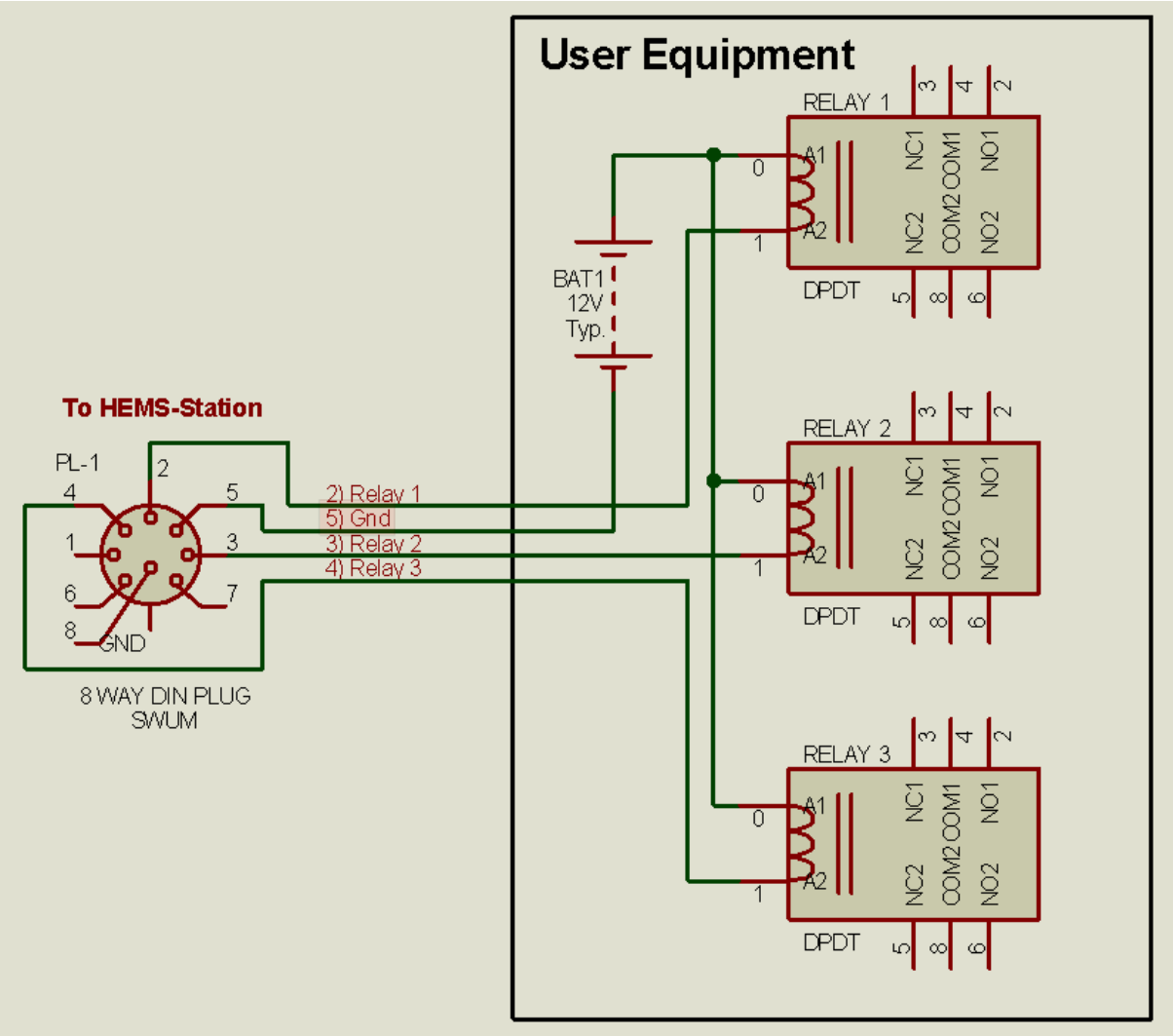
Diagram for three Relays

Below is a schematic which shows how users relays are connected to the HEMS-Station® HP0725.



In this example an external 12V battery and three relays are connected via a 4 core cable to the 8way plug.

Illuminated Windsock Relay

A pre-configured relay unit and connecting cable are available from FEC to switch a 12V illuminated windsock. The wiring arrangements for this are included in the HEMS-Station® HP0725 - Installation Manual.

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19 Appendix 9 – Antennae and Cables

19.1 Mains Cables, Switches and Fuses

No external mains cables, switches or fuses are supplied with the HLC. 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.

19.2 UHF Antenna

The HLC is supplied with a wall mounting UHF antenna which must be attached to the SMA socket on the front of the unit. An antenna extension cable may be used but, to avoid undue cable losses, keep the cable as short as possible (total max 10m).

19.3 Cellular Radio Antenna

The HLC is supplied with a wall mounting Cellular Radio antenna which must be attached to the SMA socket on the front of the unit. An antenna extension cable may be used but, to avoid undue cable losses, keep the cable as short as possible (total max 10m).

19.4 VHF Antenna

The HLC is not supplied with any of the VHF antenna 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 antenna (example lower right: Diamond D-777).

This should be specified and installed by an experienced antenna 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 antenna type e.g. D-777
2) 1 off antenna mounting bracket
3) 1 off Static Surge Protector e.g. type SP-350V
4) 1 off link cable (between antenna 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 HLC.

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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.

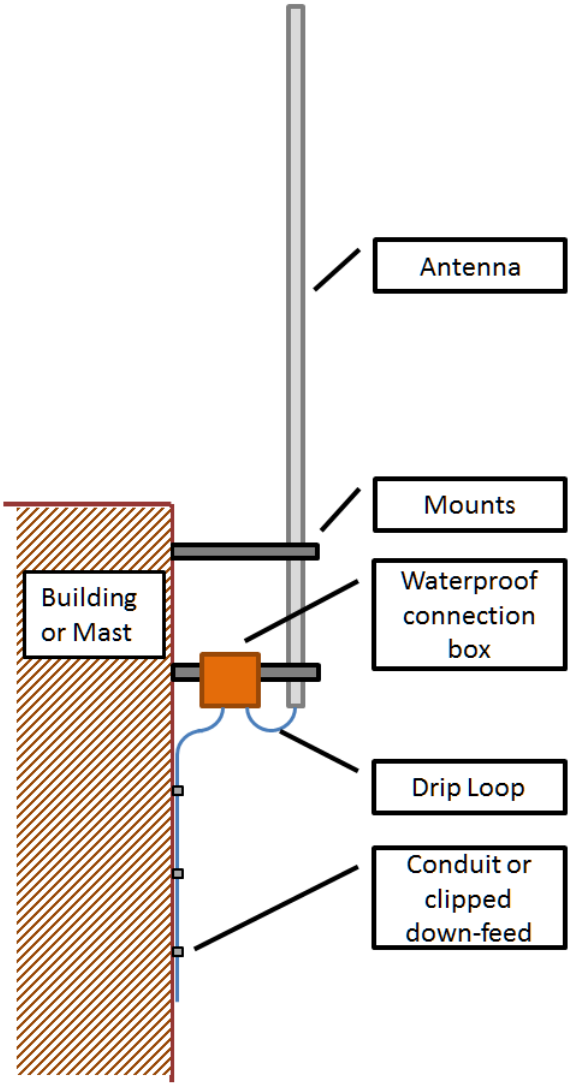
Customers are advised to make sure that:

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 antenna installation.

Your installer will be able to advice on the details specific to your installation.



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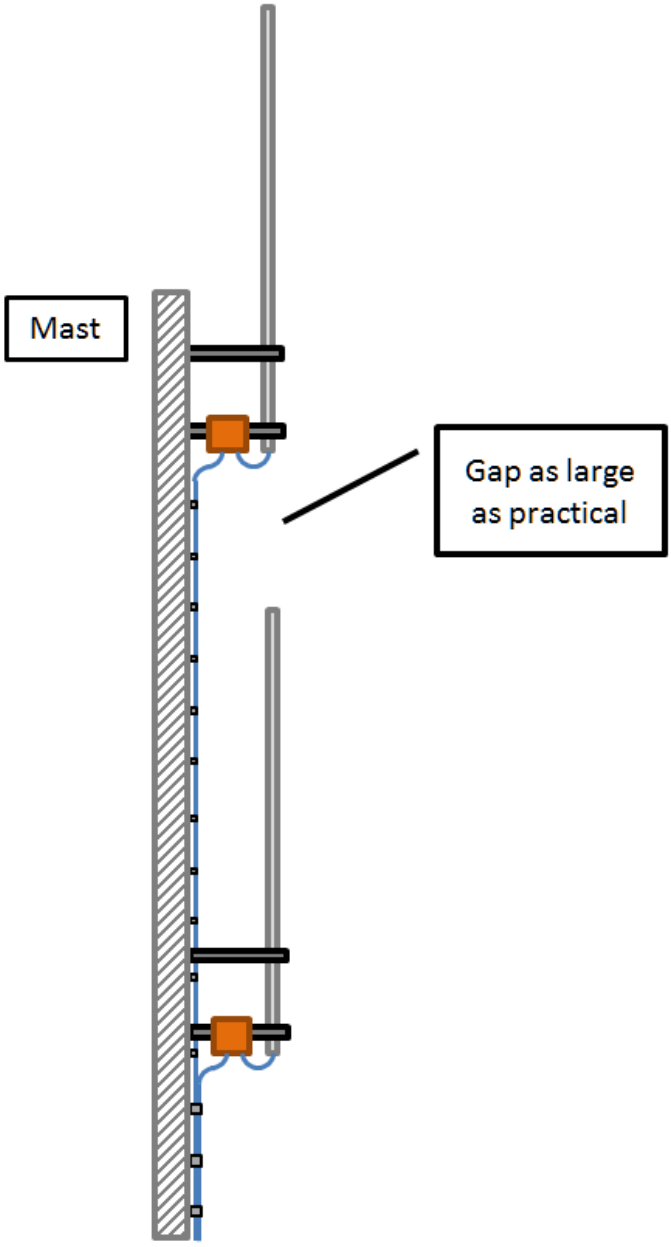
Multiple Antennae

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

To avoid interference or damage to the HLC, the HLC and other device's antennae 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:



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20 Appendix 10 – Mounting and Connection of MetPak

20.1 Mounting arrangements

The MetPak unit is supplied with all the necessary fixings to attach to a mounting pole. Instructions and tips about mounting are all contained in the manuals supplied on the enclosed Gill Instruments CD.

Pay particular attention to the following:

Positioning

1. Mount at the top of and away from the mounting pole (i.e. ensure the head is clear of and not beside the pole)
2. Clear of close obstructions likely to influence the readings (e.g. trees, buildings (wind) and air-conditioning fans (wind and temperature & RH)
3. So as not to cause an obstruction to aircraft movements
4. **Ensure that the head is correctly aligned to North** (there are diagrams in the Gill Instruments manual which identify this)

Electrical

1. Ensure that the mast and MetPak are earthed with suitably sized grounding cable (the MetPak has an earth bonding point on the mounting arm)
2. The signal cable is properly and securely connected
3. The shield wire of the signal cable is connected to the Grounding point in the connector box (see photo later)
4. The signal cable is securely supported in conduit, trunking and fixed with tape, clips or wrap-ties at short centres

20.2 Signal Cable

The MetPak is supplied with 30m of 3 pair screened (Belden type 9503 or similar) data cable and has been terminated both ends and fully tested before shipment.

Note that the cable is made up of 3 twisted pairs and a screen:

1) Red and Black
2) White and Black
3) Green and Black
4) Outer screen

The Red, White and Green sleeving round the pairs in the photograph have been added as the cable is made up to aid identification and ease of installation. The outer screen has a thin green sleeve.

If the cable is extended or shortened, the pairing must be maintained or the unit may not operate or even be damaged.

Lengths up to 150m can be supplied at additional cost.

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20.3 Connection – HEMS-Station® to the MetPak

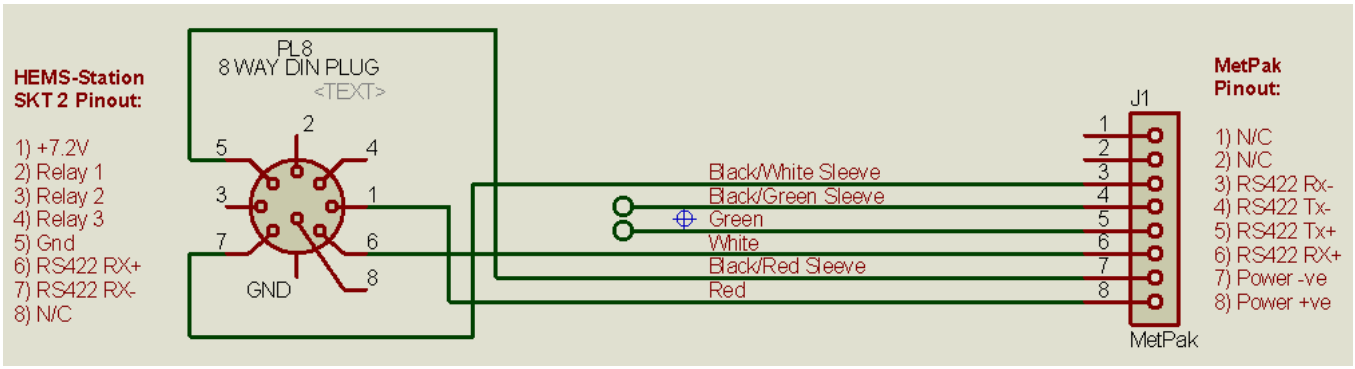
Unless absolutely necessary it is strongly recommended that the data cable is not separated from the MetPak but that the installation is performed with it connected.

If removal is necessary, follow the guidance in the following sections with regard to removal and re-fitting.

To install the cable into the HLC:

1) Drill out the HEMS-Station® removable panel in the steel enclosure to accept an appropriate sized cable gland (12mm is recommended).
2) Pass the MetPak signal cable through the gland and terminate to the 8 Way DIN plug (supplied with the MetPak if ordered at the same time as the HEMS-Station®)
3) The connections are as follows:

8 Way DIN Pin No.	Wire Colour	Comment
1	Red	Power +ve
2		No Connection
3		No Connection
4		No Connection
5	Black/Red Sleeve	RS422 Rx-
6	White	RS422 Rx+
7	Black/White Sleeve	Power -ve
8		No Connection



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20.4 MetPak Connections

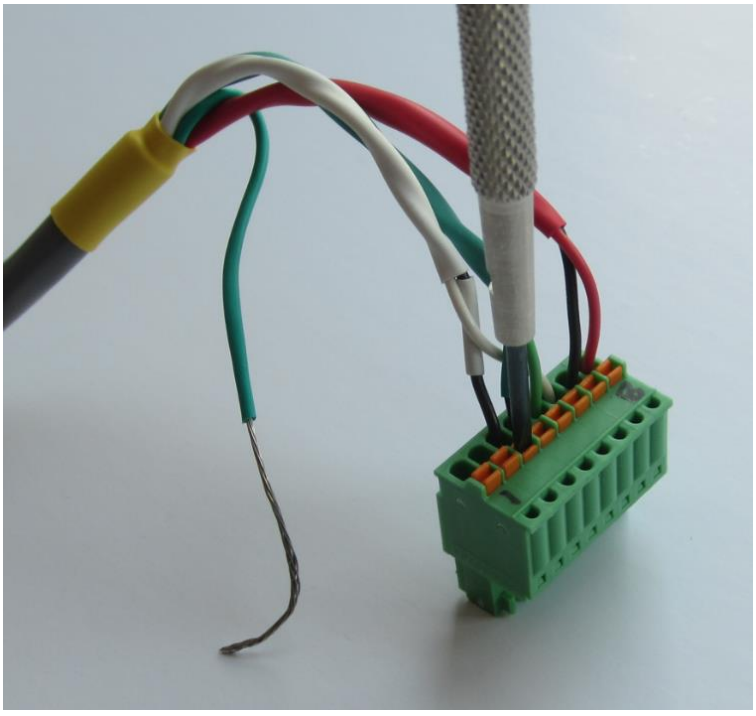
The following is provided to enable the connector to be safely removed and re-fitted. This should not normally be necessary.

MetPak Connector Number	XLC 9 Way D Connector	HEMS-Station 8 Way Connector	Colour	Comment
1	N/C		None	N/C
2	N/C		None	N/C
3	3	7	Black/ White Sleeve	RS422 Rx-
4	4		Black/ Green Sleeve	RS422 Tx-
5	5		Green	RS422 Tx+
6	6	6	White	RS422 Rx+
7	7	5	Black/Red Sleeve	Ground (0V)
8	8	1	Red	Power +ve
Ground Screw	9		Green shield wire	A crimp eye can be attached after the cable is inserted

20.5 The MetPak Connector

The first operation is to release the connector from the cable.

To do this, hold the connector face down and apply pressure to each release ‘switch’ in turn with a small screwdriver while at the same time gently easing the cable out (Photo right).



Once the ‘switches’ are fully depressed the wire can be easily released. DO NOT FORCE or the connector will be damaged.

Insertion of the wires is the reverse operation – hold down the switch, fully insert the wire and release the switch. Gently pull on the wire to ensure it is secure.

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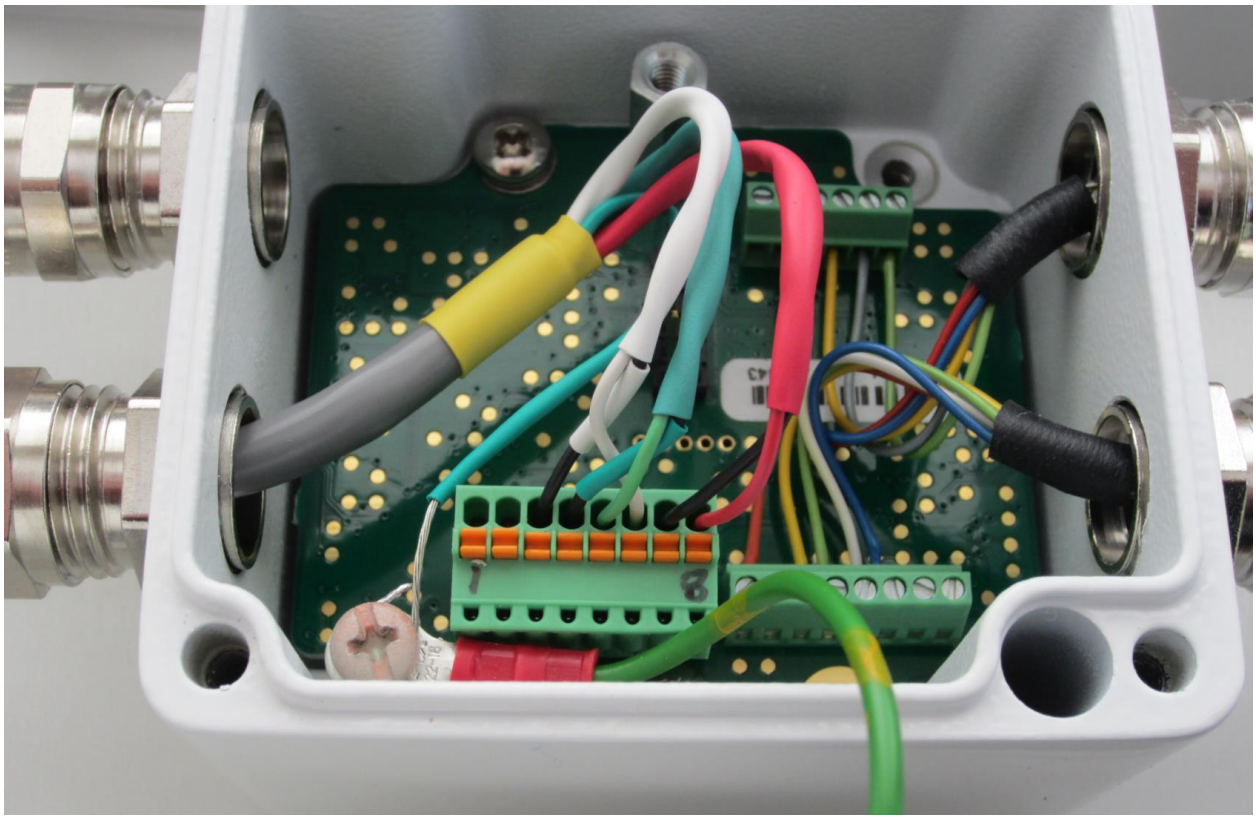
20.6 Connecting the MetPak

The following is only applicable if the cable has had to be removed from the MetPak connector box, e.g. to fit a longer cable.

The entry cable gland of the connection box is fitted with both an IP rated sealing ring and also a spring steel cable grip (internal to the connector). This allows a cable to be easily pushed into the box but stops it being withdrawn. Take care to insert only sufficient cable to make the connection (see photo below for guidance). If the cable does have to be withdrawn, release the lock nut fully and withdraw all of the cable gland/clamp components.

The order of activity is:

1) Open the box lid
2) Slacken the cable gland (note leave the blanked one)
3) Pass sufficient cable through the gland to allow easy connection
4) Fit each of the wires in the correct position in the connector
    - Note it is much easier to push the connector fully home and then fit the wires as described on the previous page
5) Either fit a crimp eye to the screen wire or make a loop (as shown in photo) and attach to the Grounding screw and re-tighten
6) Double check that all wires are secure by gently pulling each in turn
7) Re-tighten the cable gland sufficiently to make a seal
8) Refit the box lid and re-tighten screws
9) Securely mount the MetPak and ensure it is level and facing north



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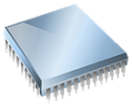
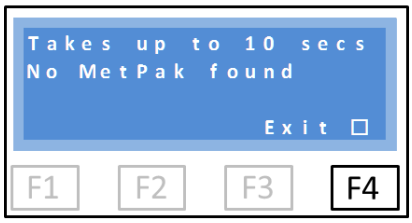
20.7 Commissioning the MetPak

Via the HLC menu Screen enter the Meteo Setup Menu:

Meteo>PIN>Sys> Meteo>Test

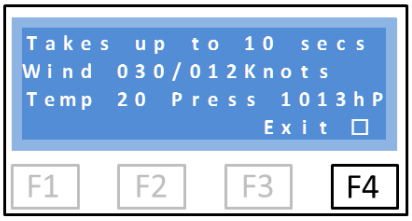


Level 5 – MetPak Test Utility
Continuously reads from MetPak
Press 'F4' to Exit



Screen is as above if no MetPak feed is found
Press 'F4' to Exit
(may take a second or two to respond)

Screen is as above if MetPak feed is found but data stream is corrupted
Press 'F4' to Exit
(may take a second or two to respond)



Screen is as above if MetPak feed is found and data stream is OK
Note units are the default values and pressure uncorrected for altitude
Press 'F4' to Exit

The HLC will continually search for the MetPak and data.

If no MetPak is detected, the screen will show: ***No MetPak Found***

If a MetPak is found but there is a data error then the screen will show: ***MetPak Data Error***

If the MetPak is found and the data is good, the screen will show:

Wind 0XX/0YY Knots

Temp ZZ Press ABCDhP

Note that these are a sub-set of the full report and in the default units of the MetPak.

Using other sources of data (local meteorological reports, hand held instruments etc.) confirm that the readings are as expected.

NB – The pressure reading is the raw pressure reading from the MetPak uncorrected for the station altitude. Refer to earlier sections of the manual to ensure that the units and altitude are set correctly.

Using a Cell phone and with the HLC at the main menu, text the HLC for its status. The Meteorological data will be appended to the text in the chosen units and corrected for station altitude if entered.

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End of Document

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