FEC Heliports Equipment

Pad-Star Lighting Controller

FEC Type: HP0712/3/4

User Manual – Specification - Diagnostics



PLC Version 1 Issue: 3 16th October 2017

Note that this manual relates to

Hardware V1.0 and Software V1.03 onwards

Powered by *eAGLe* Light Engines

™ Interleader Limited

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Document Revision Sheet

Version - Issue	Date	Changes
1 - 1	21st February 2017	New Document for PLC V1 Production model
1 - 2	24th April 2017	Document revised for version 1.03 Software - Wireless
1 - 3	16th October 2017	Reference to SMS Version 3

Note this manual covers all commands available to the Operator and User.

Additional commands available to FEC and the OEM are contained in separate documents.

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1 Compliance Statement - USA

FCC Compliance WARNING

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

FCC Compliance Statement

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

1. This device may not cause interference, and

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

USA-Federal Communications Commission (FCC)

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

• Reorient or relocate the receiving antenna.

• Increase the distance between the equipment and the receiver.

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

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

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

2 Compliance Statement – Europe

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

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3 Overview

FEC's Pad-Star Lighting Controller (PLC) is an all new, fully digital design that combines ease of installation and use with sophisticated yet simple and secure configuration via the IP65 rated keypad and LCD display. This manual relates to the PLC Version 1.

3.1 Key Features

- Very low power consumption – Approx. 3W (idle) and less than 30W max. (including internal winter heater).
- Operates from 110-240V AC 50-60Hz or 12V -24V DC (ideal for solar and batteries.
- Simple helipad cabling – two core cable taken to each light.
- Smart installation, setup, control and monitoring – communication over the data cable to intelligent light drivers
- ICAO plus additional light levels for both visible and infra-red LEDs

3.2 Part Numbers

FEC Part Number	Device	Comment
HP0712	Pad-Star Lighting Controller with internal 240W Power Supply Unit	Single unit enclosed in an ABS enclosure for smaller installations
HP0713	Pad-Star Lighting Controller with external 320W Power Supply Unit	Single unit enclosed in a steel enclosure for larger installations
HP0714	Pad-Star Lighting Controller with external XXW Power Supply Unit	Single unit enclosed in a steel enclosure for custom installations

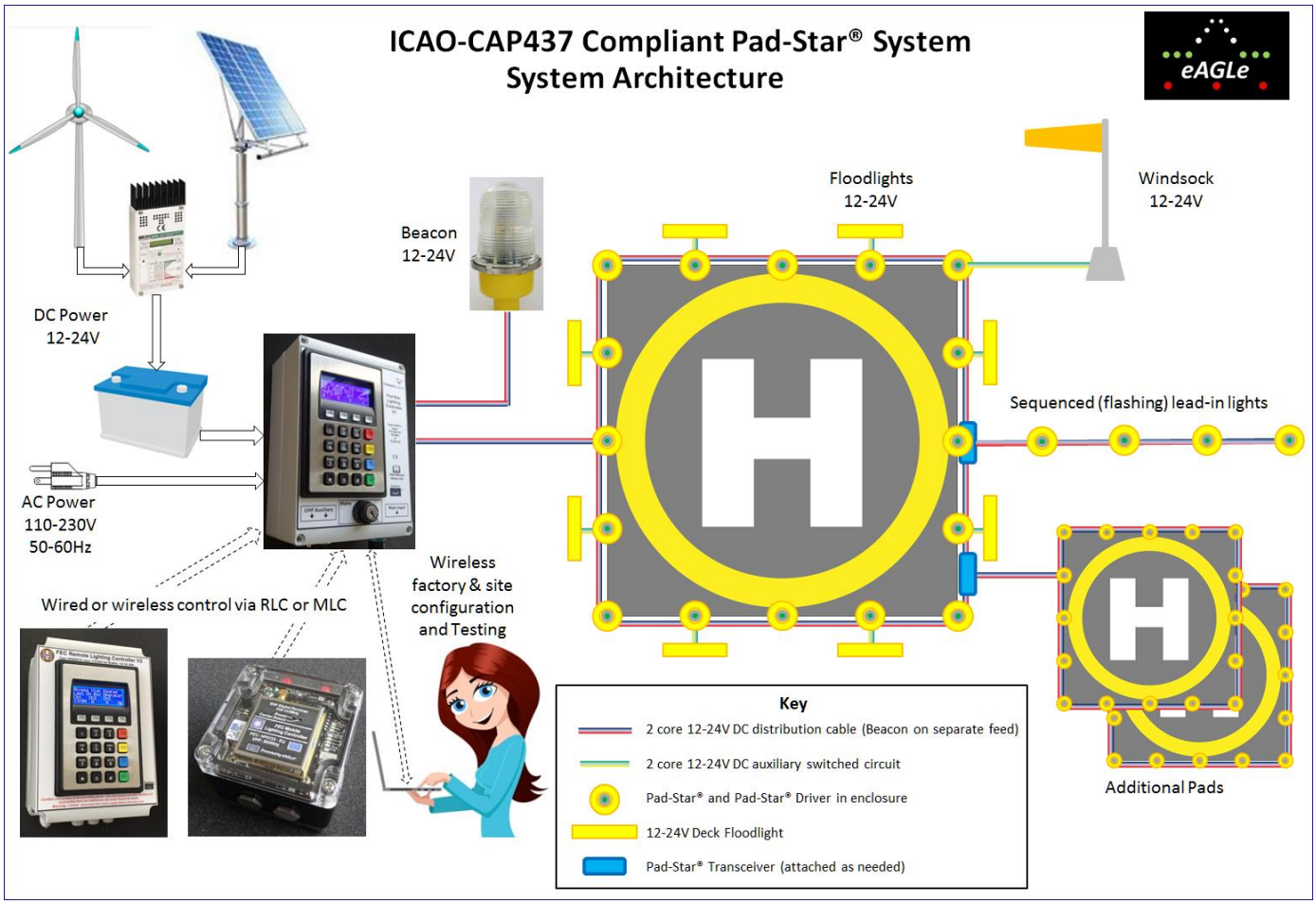
FEC and Interleader Ltd have a policy of continuous product improvement and reserve the right to change specifications of products. See website for latest details.

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4 Architecture of Pad-Star Lighting Controller

Effective operator or pilot control of Helipad Lighting is critical to the safe operation of an installation.

Now there is a new way to control your lighting and peripheral circuits using FEC's new PLC which controls low voltage Pad-Star LED lights



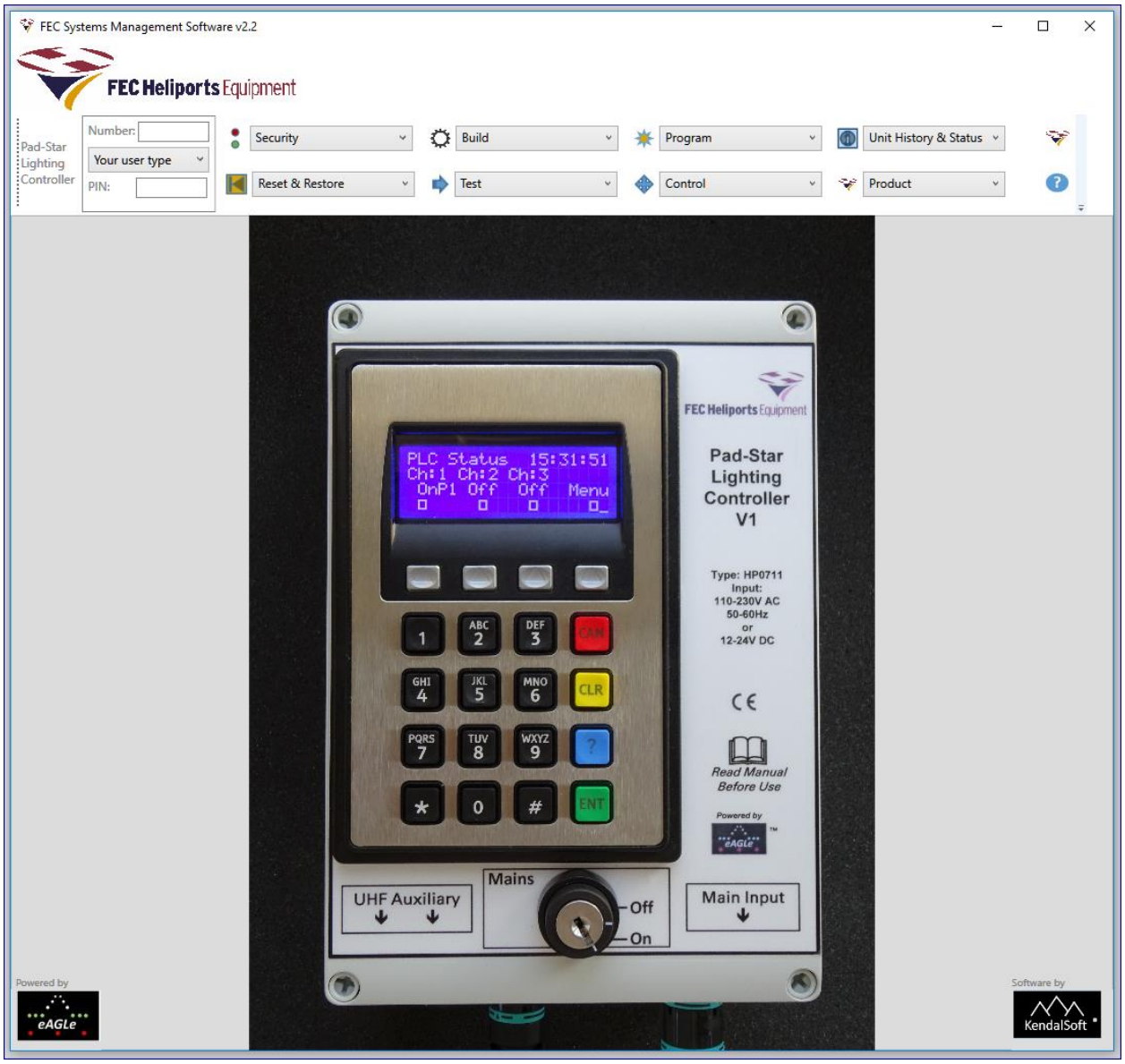
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5 Wireless PC Setup and Control

The Pad-Star Lighting Controller is a member of the *eAGLe* Group of products all of which can be setup and controlled via the integrated FEC Systems Management Software (SMS).

Using the SMS is the recommended option for all of these tasks as it offers enhanced functionality over the keypad/LCD.

In addition the SMS can access all Pad-Star Drivers attached to the PLC so they can all be configured, tested and operated wirelessly.



The SMS software id shipped with the PLC as is the correct USB-UHF ‘Dongle’.

The SMS automatically finds and uses the correct interface.

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6 Principles of Operation

6.1 Keypad and LCD Display - Overview

The FEC PLC 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. There are no controls inside the case.

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



The key features of the interface are shown left.

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 has the Real Time Clock.

The 2nd line has the Channel legends.

The 3rd line displays the Channel status.

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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6.2 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.

6.3 User Types

There are a number of 'Types' of users of the system and are declared and defined by discreet PIN numbers. The User Types are:

User	This is generally the pilot who has been given permission to use the system
Manager	This is the owner or operator of the facility
FEC	FEC have defined access to certain options (e.g. reset the Operators PIN)
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.

6.4 Channels

The PLC uses the concept of 'Channels' to control activity. Each Channel is assigned both a Group and Actions. When a channel is turned on it sends the appropriate commands to the assigned Group or Groups.

The PLC has 3 channels which can be turned on an off via the keypad or with external switches or relay contacts.

Basic circuit schematics for switch or relay input are shown in Appendix 1.

6.5 Groups

Lights (and associated Auxiliary items) are assigned to a Group number.

Using lights assigned to different Groups on the same power bus enables independent control of each Group.

The convention adopted is that lights will only respond to their Group Number.

Exceptionally, all lights will respond to commands addressed to Group 0 (zero).

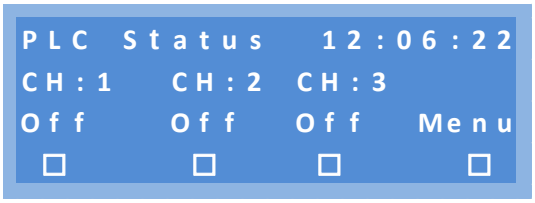
As delivered (the default state) all lights are assigned to Group 1.

6.6 Actions

Each Channel can take up to three Actions and also control the dedicated 'Beacon' output. The actions, specific to individual Groups, are; No action, Steady Light, Flash Light and control an auxiliary circuit.

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7 The Main Screen



The Main Screen status display page with two main options:

1) directly activate a Channel, or
2) select the Main Menu

7.1 Keypad Operation

If the controller is at the Main Screen level (waiting for input) or a channel(s) is already active, pressing function button 1, 2 or 3 will then turn on Channels 1, 2 or 3 respectively.

If set, there is a PIN password challenge which, if successful, allows the action to be taken. Only a User or Manager with the correct password can activate the system in this way.

If a channel has been turned on by an external switch or relay it cannot be turned off via the keyboard.

7.2 Keypad Cancel

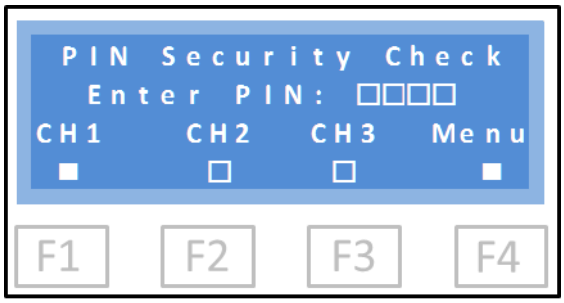
If any channel has been set on via the keypad, pressing that function button will turn it off.

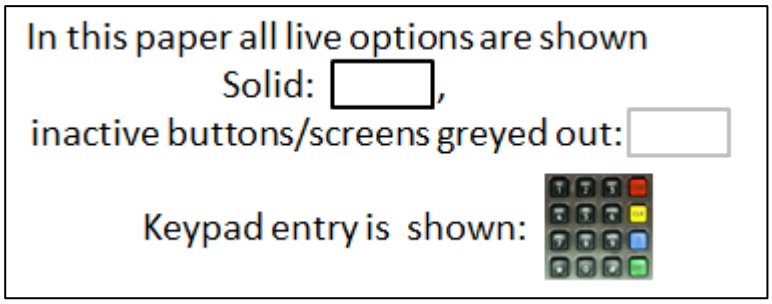
If set, there is a PIN password challenge which, if successful, allows the action to be taken. Only a User or Manager with the correct password can activate the system in this way.

Any other inputs or the wrong PIN will be ignored.

7.3 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.

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.

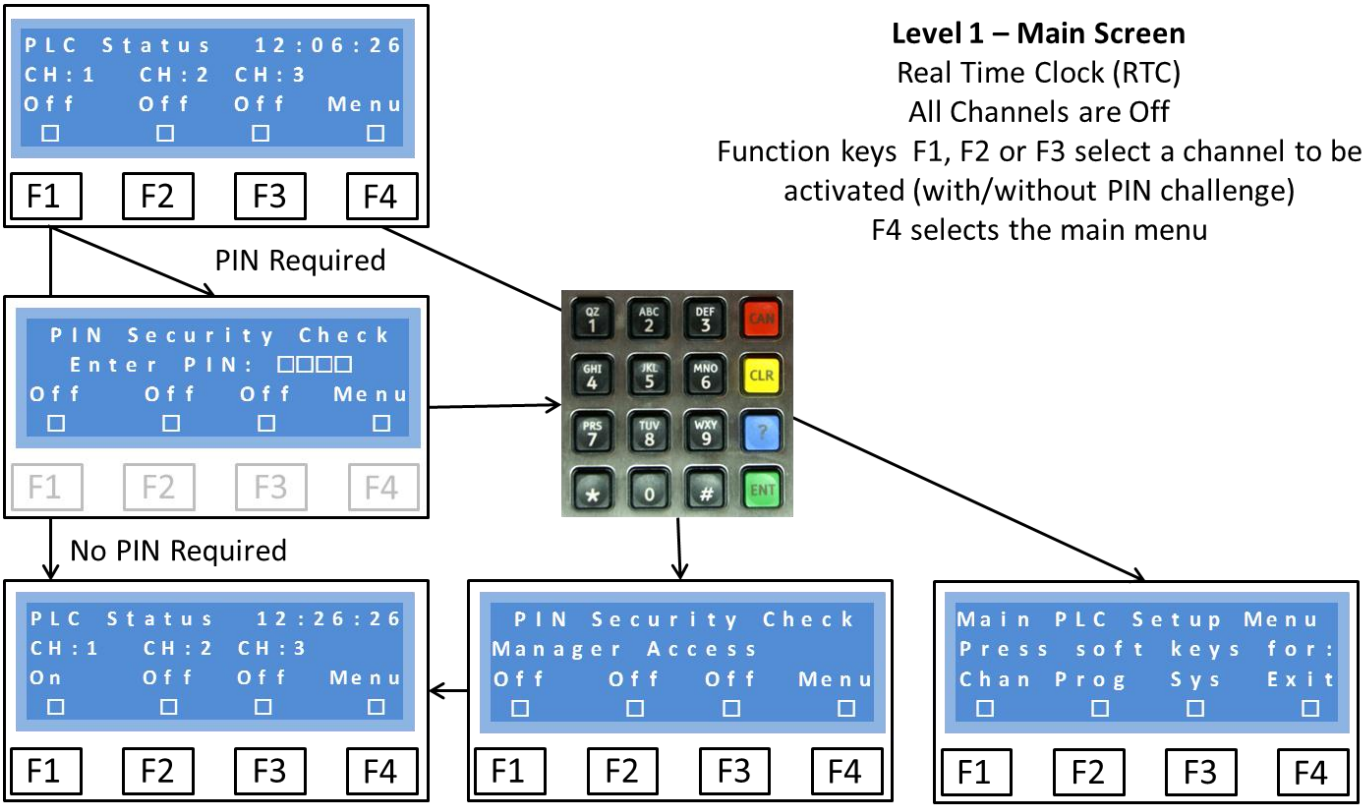
NB – As an additional security measure, if numbers are not entered within 5 seconds of each other, the screen times out and returns to the main menu. Also if the wrong code is given this is advised and a return made to the main programme.

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8 Normal Operation

8.1 Activating Channels by Keypad

At any time (other than during menu operations) touching any of the three 'Channel' keys (F1 – F3) will immediately change the state of the relevant channel or, if PIN control is active, will prompt for a valid PIN before carrying out the action. This method of activation is a secure and convenient way of activating the lights if the helipad is manned locally.



If set to challenge for a PIN number, the system will accept either a valid User or Manager PIN. In the above example, the Manager has turned on channel 1.

If a correct PIN number is given, the system will then change the state of the selected channel.

8.2 Accessing the Main Menu

Pressing the Menu button (F4) will always challenge for a PIN before access is granted to the Main Menu (over). Users cannot access the Main Menu.

Warning

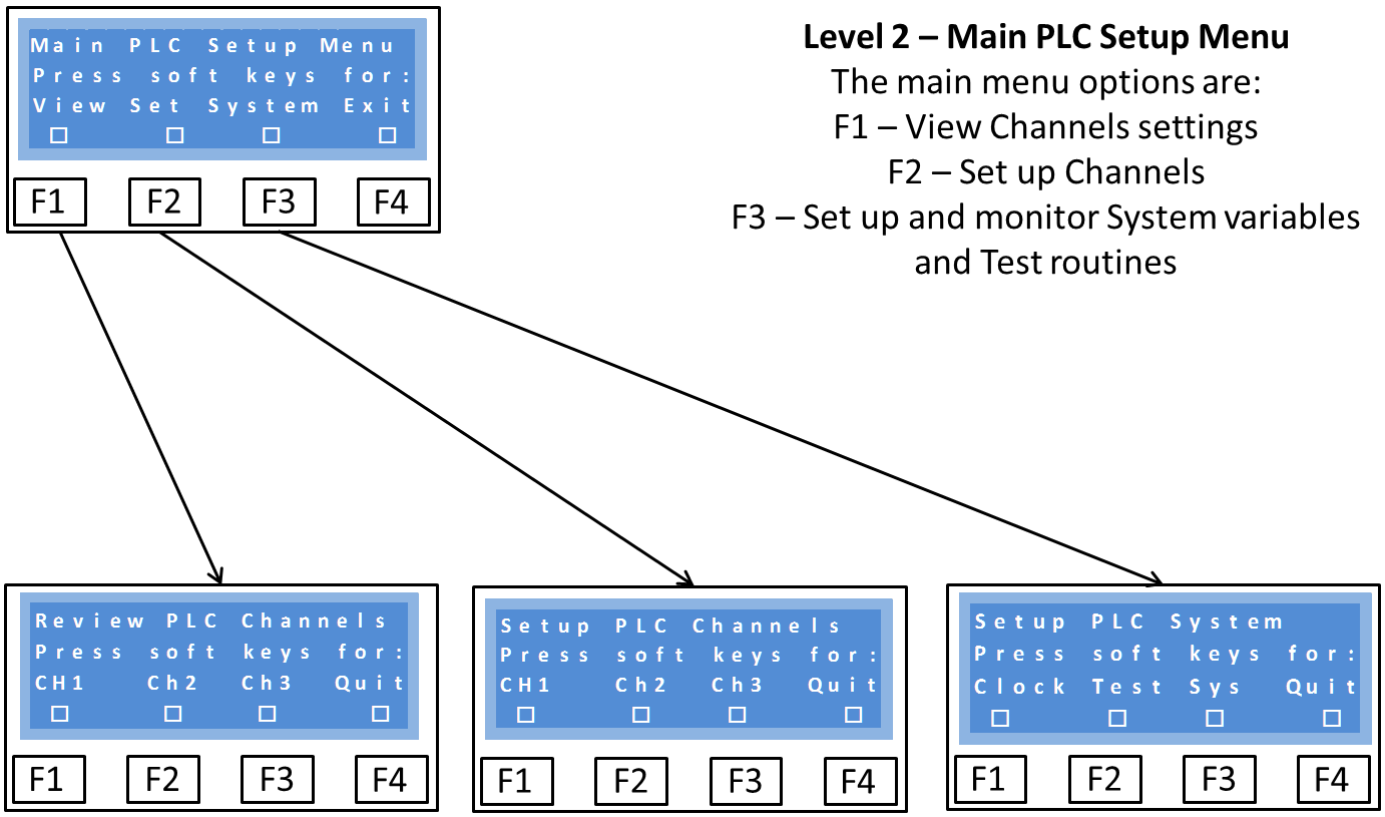
Once the Menu Mode is selected, the system no longer monitors the keypad channel function keys or switches/relay inputs and will not respond to remote commands.

All setups should be performed when it is known that no movements requiring the lighting controller are required

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9 System Setup and Configuration

From the Main Menu the Channel configuration and the System setup can be accessed and changed.



Level 2 – Main PLC Setup Menu

The main menu options are:

F1 – View Channels settings

F2 – Set up Channels

F3 – Set up and monitor System variables and Test routines

Remember that function button 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.

9.1 Light Settings

Lights can be set at a range of intensities (as a percentage of their maximum output). The Visible and IR LEDs can be set independently allowing to great flexibility:

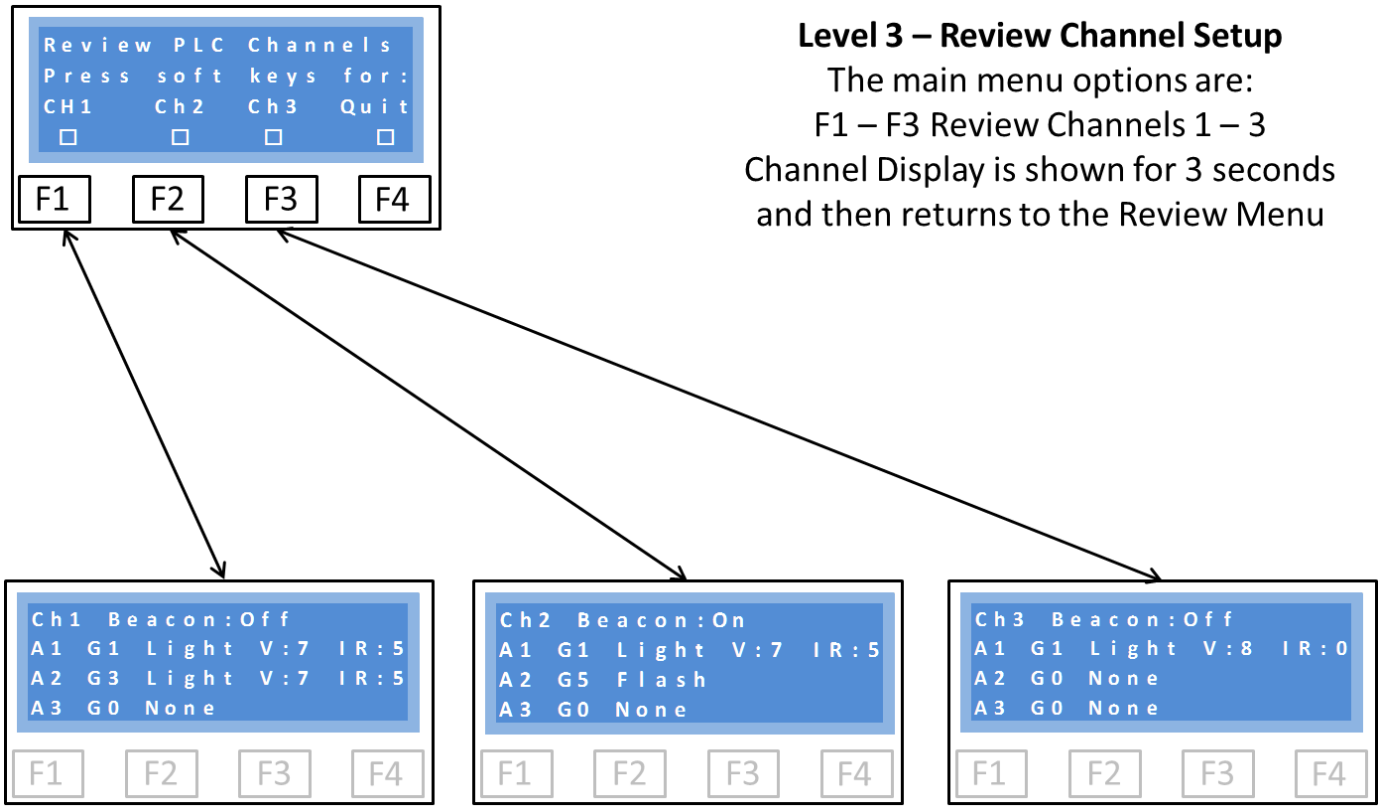
Setting	Level	Comment
0	Off	
1	1%	ICAO setting
2	3%	ICAO setting
3	10%	ICAO setting
4	20%	
5	30%	ICAO setting
6	50%	
7	75%	
8	100%	ICAO setting

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9.2 Review Channels

The current Channel settings can be viewed by pressing the relevant Chanel select key.

The current Actions are shown for 3 seconds and then returns to the Review Menu.



In the above the Channels are setup as follows:

Channel 1

Action 1: Group 1, Steady Light – Visible at 75% of maximum, IR at 50%

Action 2: Group 3, Steady Light – Visible at 75% of maximum, IR at 50%

Action 3: No action

Channel 2

Action 1: Group 1, Steady Light – Visible at 75% of maximum, IR at 50%

Action 2: Group 3, Flash Light (at levels previously programmed into Group 3 lights)

Action 3: No action

Channel 3

Action 1: Group 1, Steady Light – Visible at 100% of maximum, IR Off

Action 2: No action

Action 3: No action

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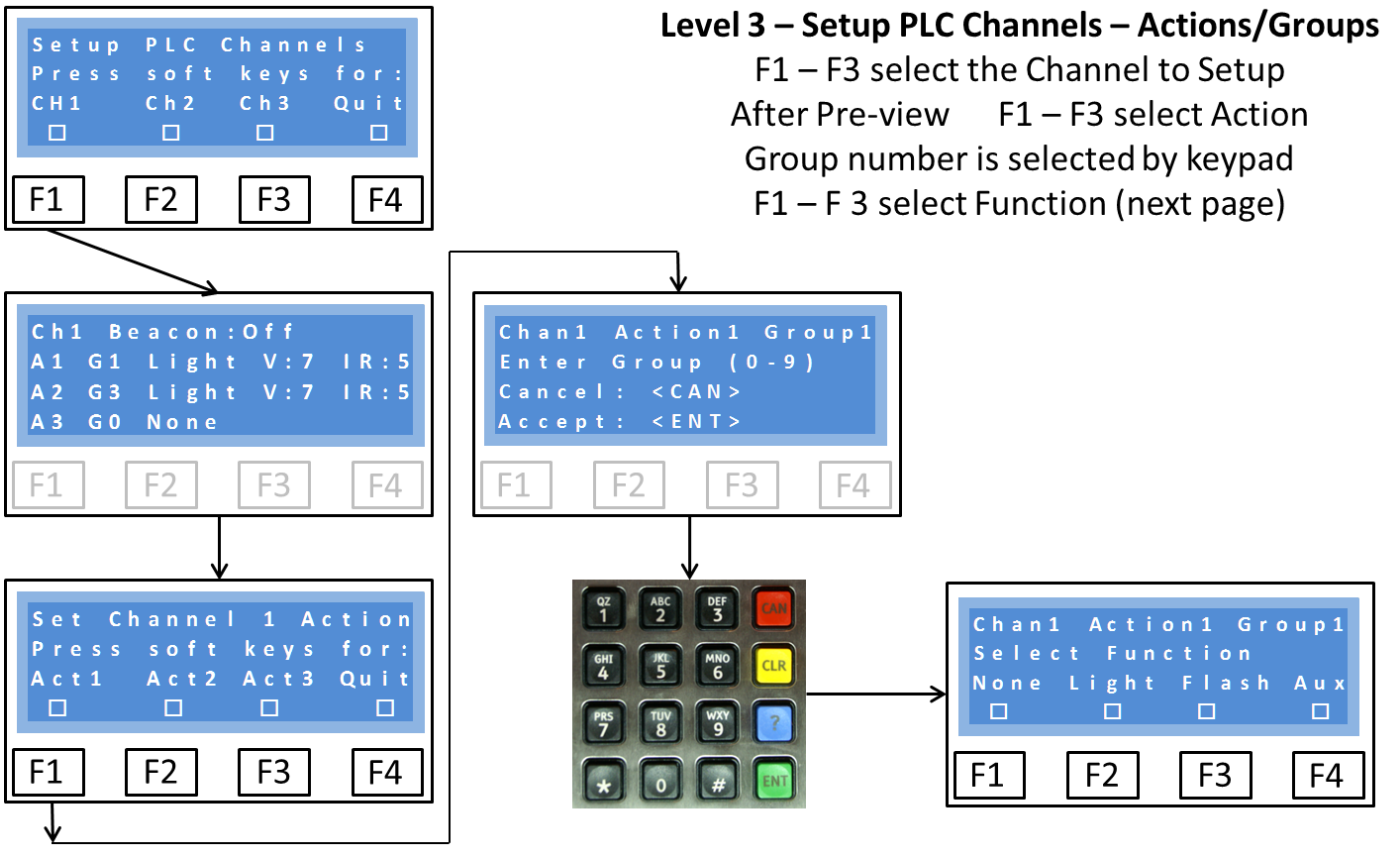
9.3 Setup Channels

9.3.1 Select Action and Group

The order for setting up what each Channel will do when active is:

1) Select the Channel to setup
2) Select the Action of that Channel (actions 1 – 3)
3) Select which Group is actioned (Groups 0 – 9)
4) Select the Function for that Action (with Visible and IR levels for Steady Light)
5) Determine if the Channel activates the Beacon

Steps 1 to 3 are shown below:



In this example Channel 1 is selected. As the Channel is selected, the current setup is shown for a few seconds (as per Review Command – previous section).

Action 1 is selected with the F1 key.

The required Group number is entered and displayed and new Group entered via the keypad.

Press <ENT> to accept the displayed value or <CAN> to start again.

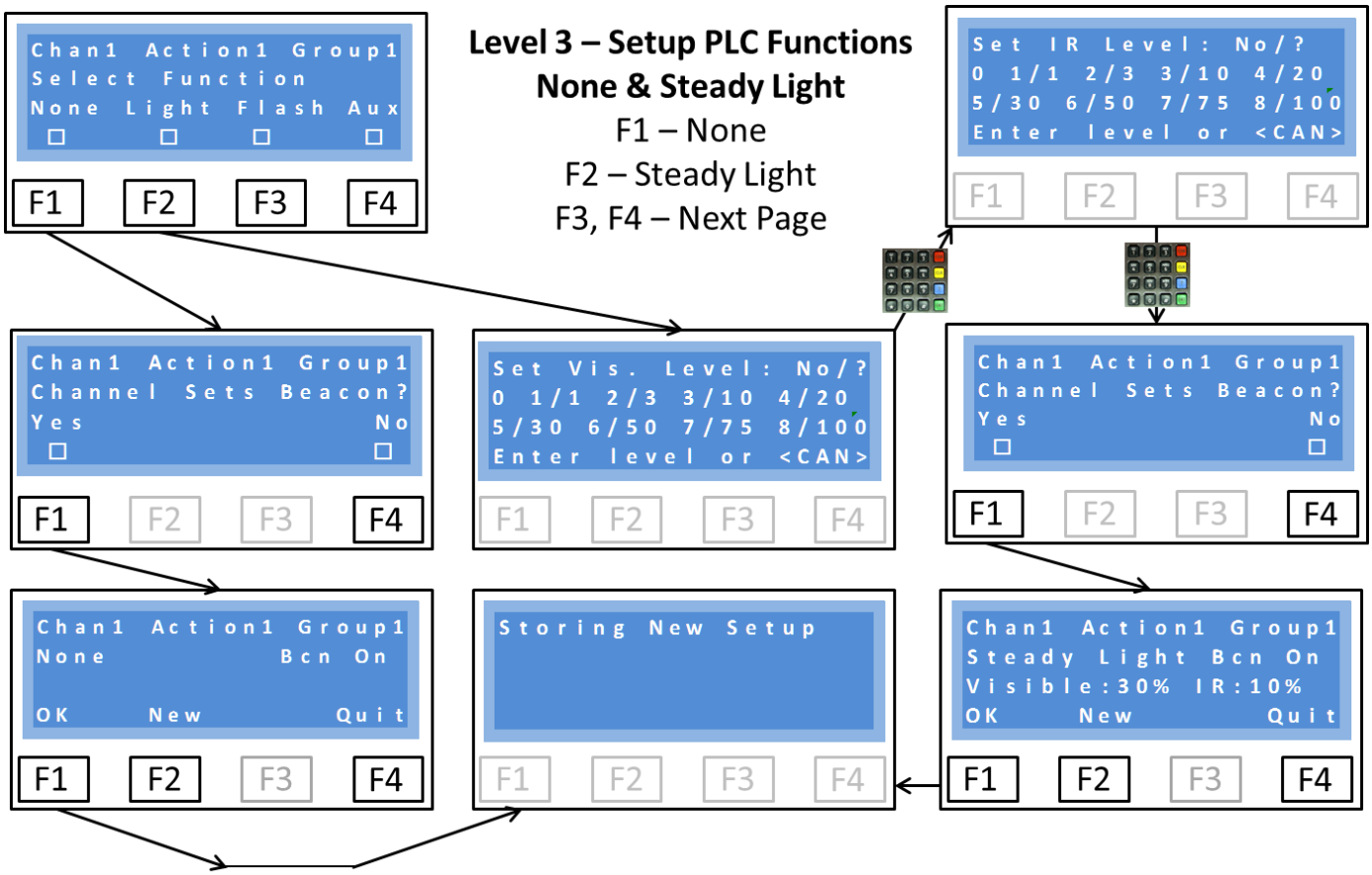
The Function to be performed is then requested (see over).

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9.3.2 Select Function

None and Steady Light

Once the Action and Group have been selected a Function is then assigned to it:



None

Selecting F1 (None) in this example sets Channel 1, Action 1, Group 1 to No Action (None).

Note that even though no Group Action is set, the Beacon has been set to On.

Confirmation is then sought for this setting (lower left). Selecting OK stores the new setting, confirmed by a screen (bottom centre).

Caution: Do not set two actions to perform light functions on the same Group

Steady Light

Selecting F2 (Steady Light) first requests that the visible light level is set (0 – 9) followed by the IR level (0 – 9).

Note that all permutations are accepted so setting V=0 and IR=0 would result in the light being turned off.

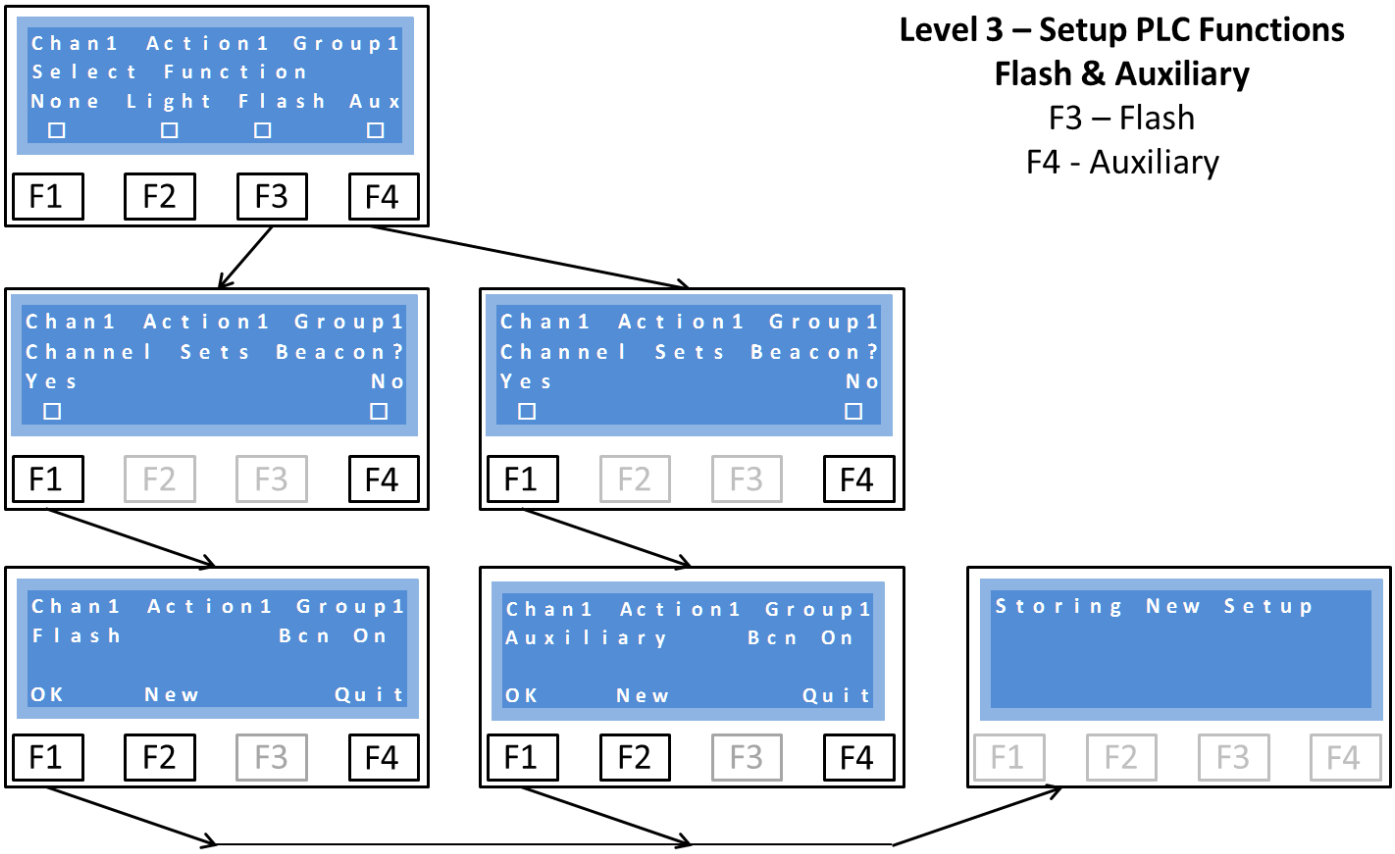
Whether the Beacon should be set is then requested.

Once entered, the configuration is displayed and confirmation is then sought for this setting (lower right). Selecting OK stores the new setting, confirmed by a screen (bottom centre).

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Flash & Auxiliary

The Function can also be set to Flash or Auxiliary:



Flash

Selecting F3 (Flash) in this example sets Channel 1, Action 1, Group 1 to Flash.

As before, the Beacon can be set or not (On in this example).

Confirmation is then sought for this setting (lower left). Selecting OK stores the new setting, confirmed by a screen (bottom right).

Auxiliary

Pad-Star Drivers (/A Options) have an ‘Auxiliary’ output which can be used to switch additional circuits (e.g. low voltage/power lights, relays etc.).

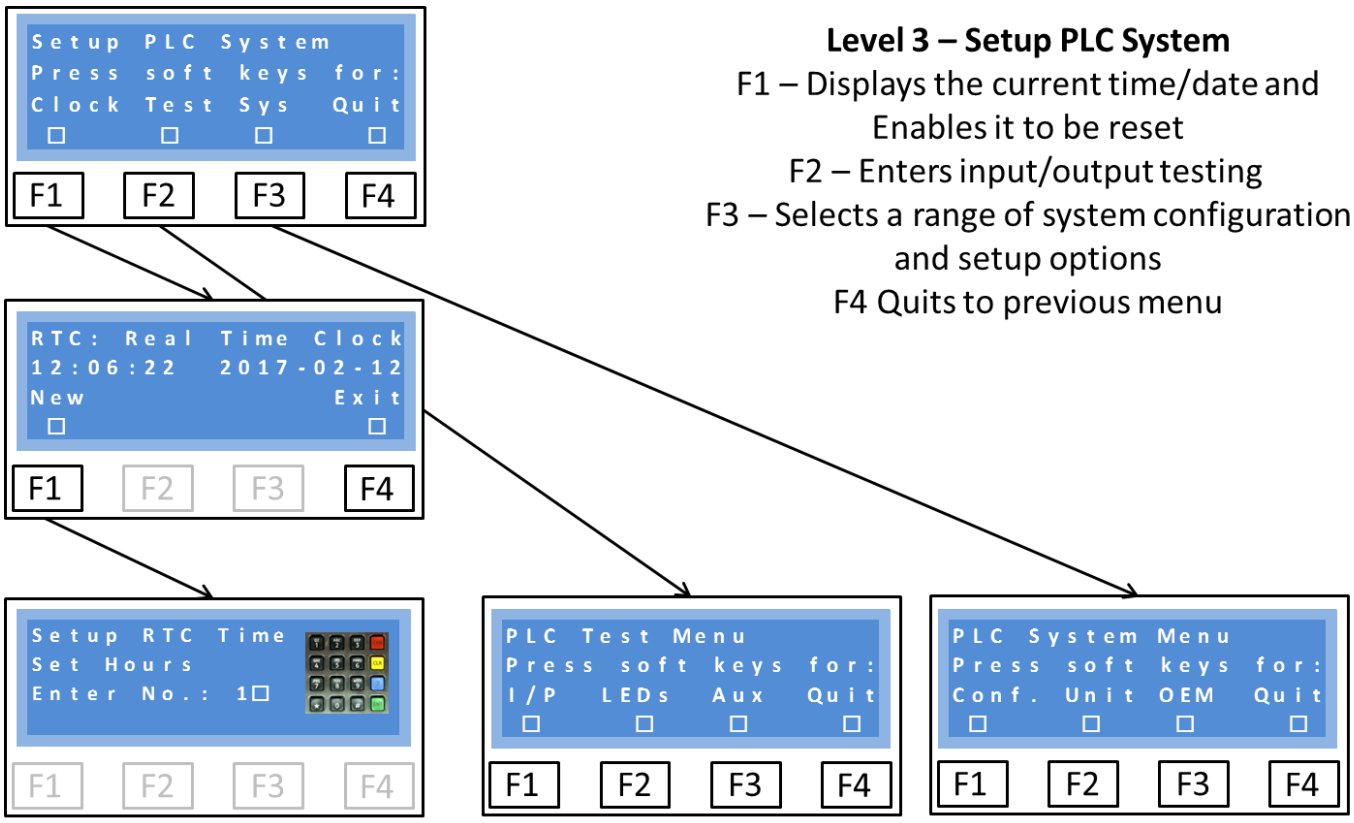
The Auxiliary function of a Group can be used at the same time as, for example, setting that Group to Steady Light.

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9.4 Setup PLC System

The Setup PLC System section enables:

1) The Real Time Clock (RTC) to be set
2) The Input lines (from switches/relays) to be monitored
3) Both the helipad lights and the auxiliary functions to be tested.



Level 3 – Setup PLC System

F1 – Displays the current time/date and Enables it to be reset

F2 – Enters input/output testing

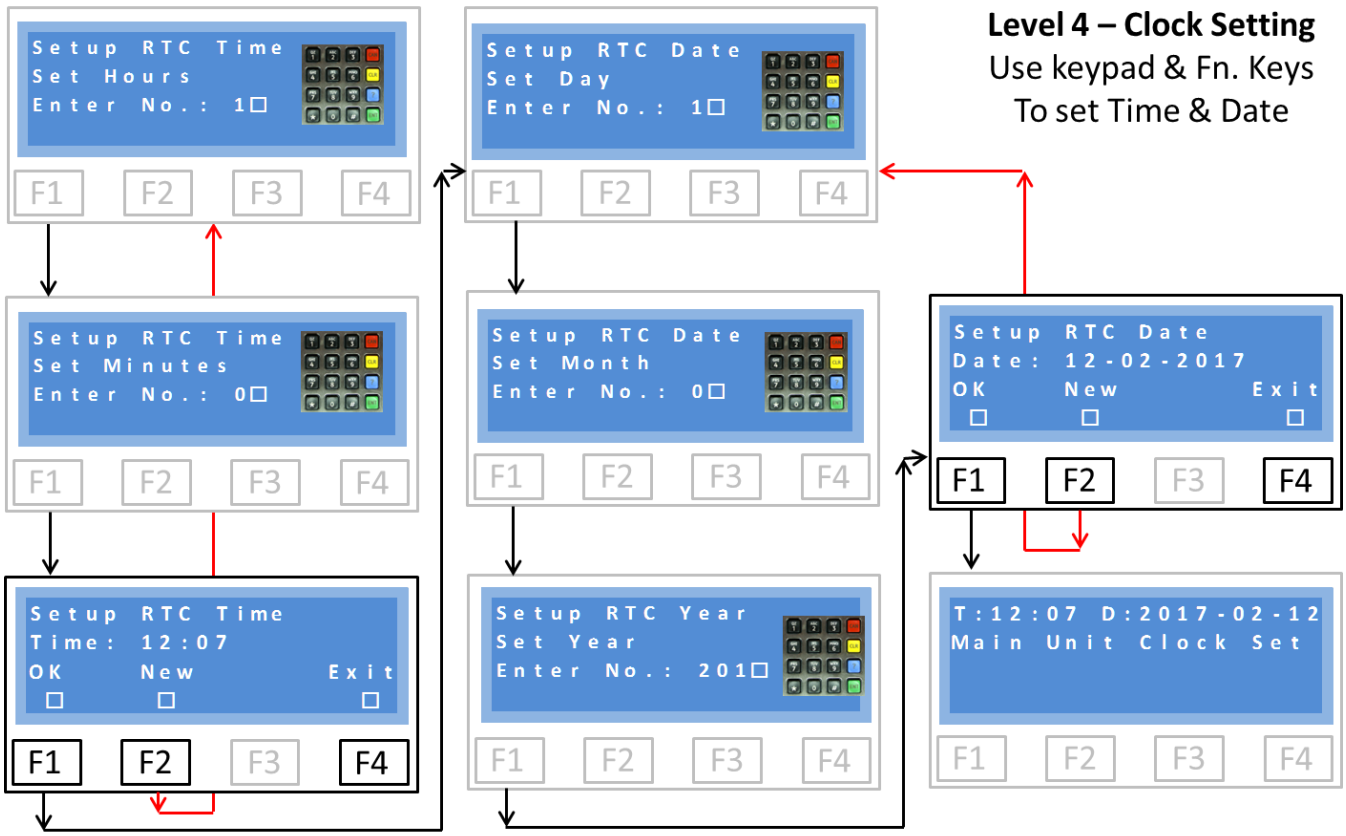
F3 – Selects a range of system configuration and setup options

F4 Quits to previous menu

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9.4.1 Set Real Time Clock (RTC)

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.

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9.4.2 Calibrating the Real Time Clock – OEM Only

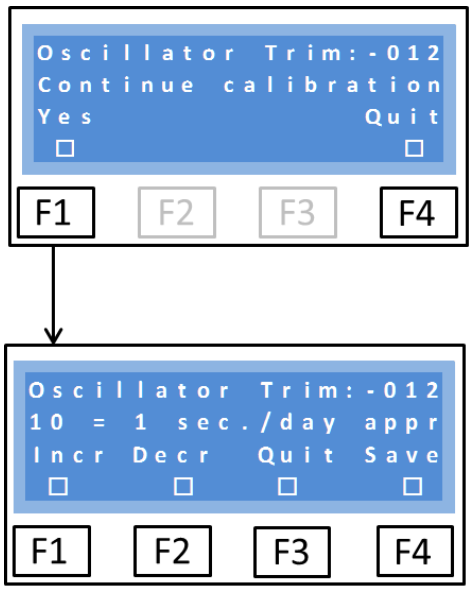
Selecting Clock then Cal from the previous menus enters the clock calibration process:

Factory Setting

Factory setting requires access to a highly accurate frequency counter. The process and settings to be made are part of the OEM Assembly and Test Manual.

Field Setting

Post manufacture, the clock can be calibrated in the field with access only required to an accurate timepiece.



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.

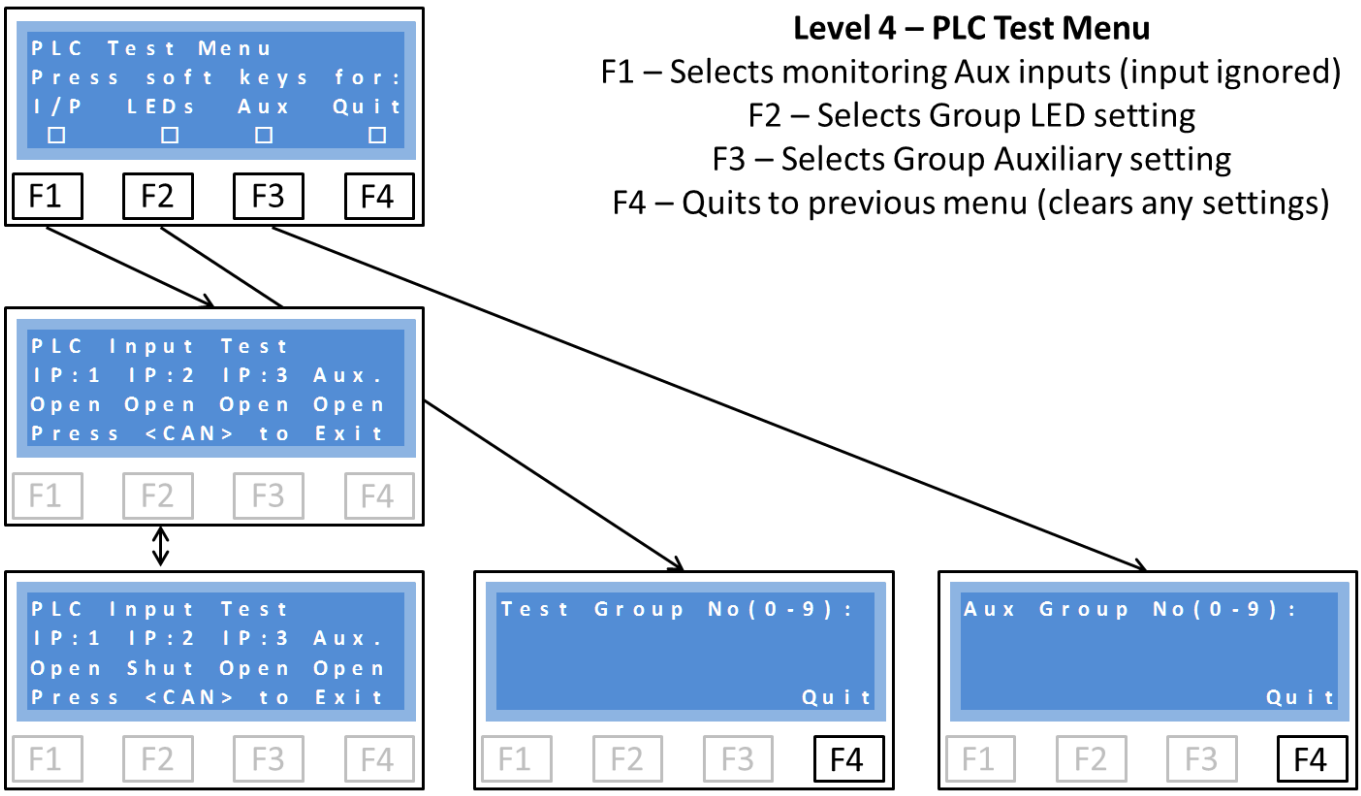
It maybe that a couple of iterations over a number of days are required to achieve the required accuracy.

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9.5 PLC Test Menu

The Test Menu access three test options which are extremely useful at the installation and test stage:

1) Monitor and display the state of the input switches/relays
2) Test a Group of LEDs, and
3) Set a Group Auxiliary function



9.5.1 Input Switch Monitoring

The circuit schematics concerning external switches/relays is shown in Appendix 1.

As the state of the input switches (IP:1 – IP:3 and Aux) are changed, their status displayed on line 3 of the display (left middle and bottom) changes. In this example IP:2 has been closed.

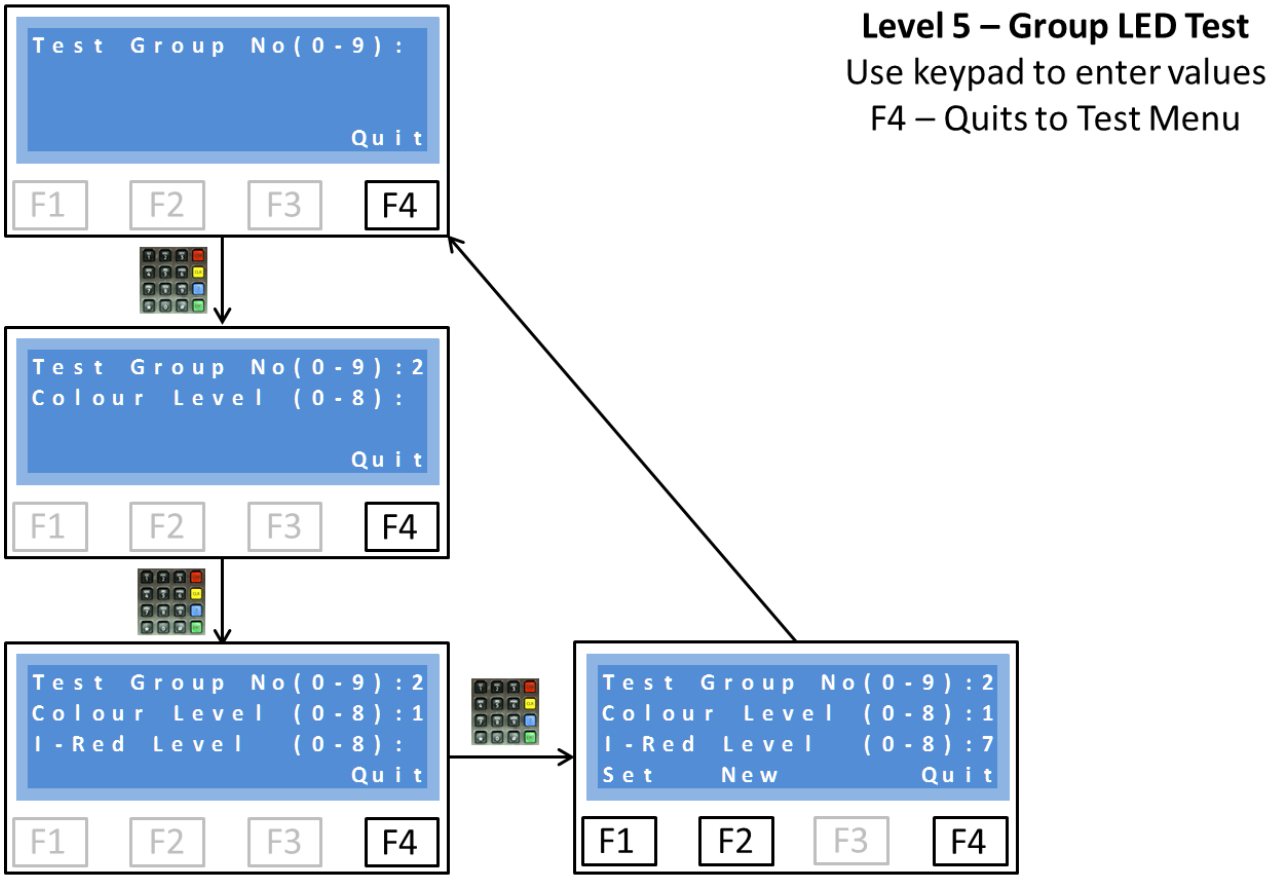
Note that during this test menu, the switches have no action, their status is simply displayed.

Caution: be aware that as the system is taken back to the Main Screen the inputs are immediately actioned.

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9.5.2 Group LED Testing

The LED Test routine allows the Visible (Colour) and IR LEDs of any Group to be set.



In this example the user has selected to test Group 2 (middle left)

Colour level is set to 1 and then IR level set to 7 (bottom left)

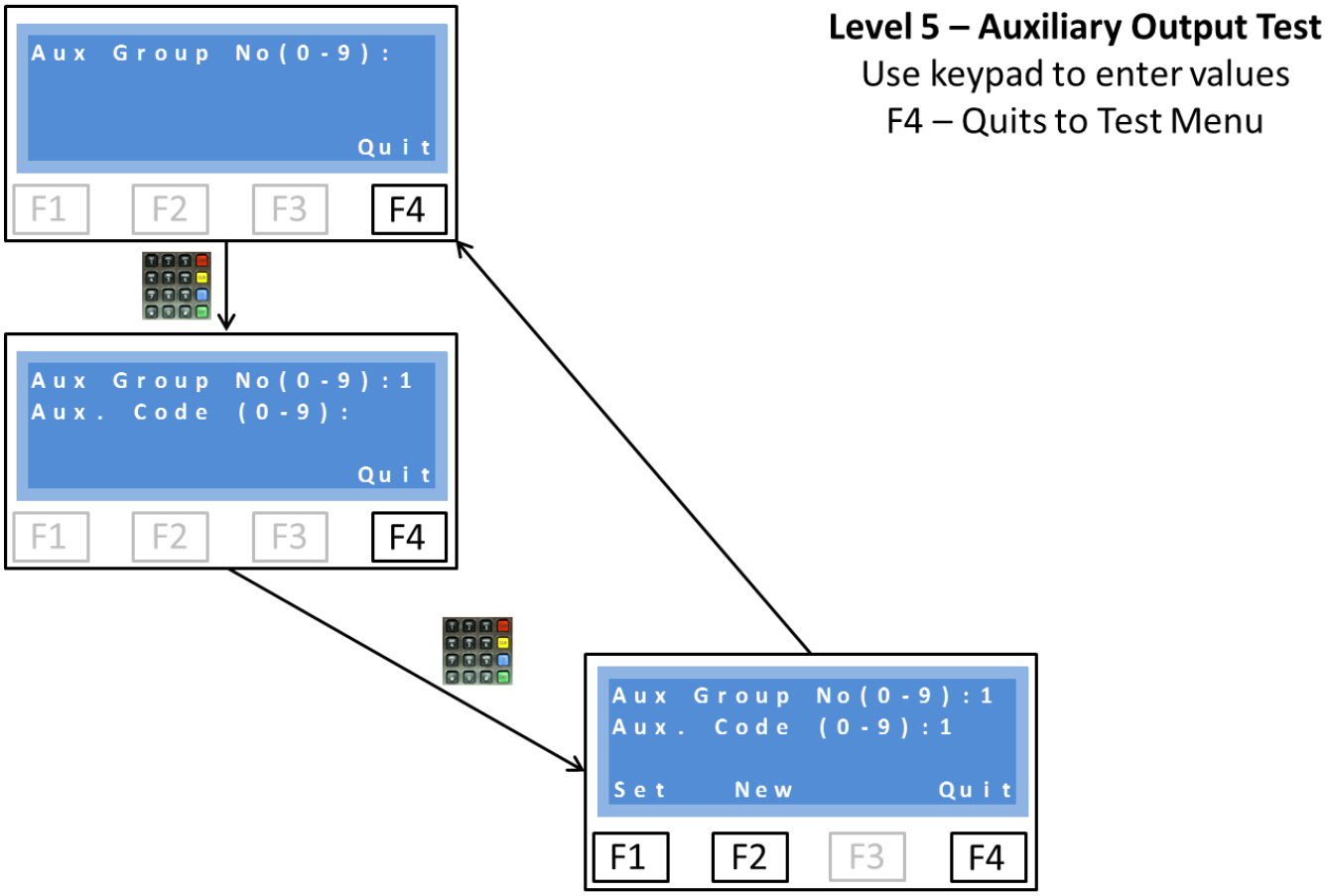
These figures can then be Set (F1), the settings rejected and a new set entered (F2) or Quit (F4)

This sequence can be cycled continuously while testing takes place.

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9.5.3 Auxiliary Output Test

The Auxiliary Output Test allows peripherals controlled by Pad-Star Drivers to be tested.



In this example the user has selected to test Group 1 (middle left)

The auxiliary code is set to 1 (middle left)

This setting can then be Set (F1), the settings rejected and a new setting entered (F2) or Quit (F4)

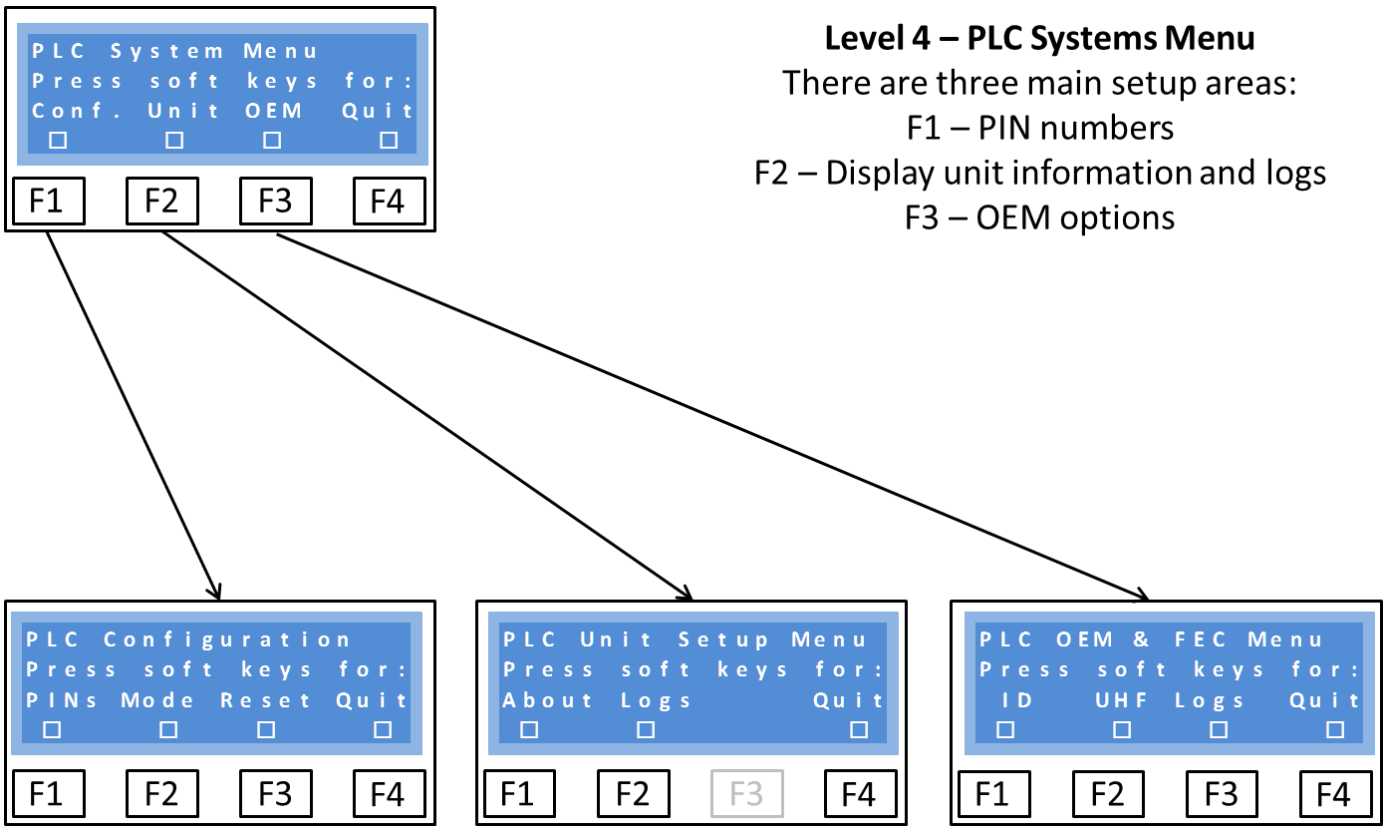
This sequence can be cycled continuously while testing takes place.

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9.6 System Menu

There are two options available to the Operator:

1) Review and set the configuration, and
2) Review unit data and logs



The PIN numbers for the Manager and User can be viewed and reset through the PIN menu.

The 'Mode' (whether a PIN is required to activate/deactivate a channel) is set through the Mode menu

Reset reloads the factory default values for the PLC.

OEM section is reserved for FEC and OEM for internal setup and diagnostic routines.

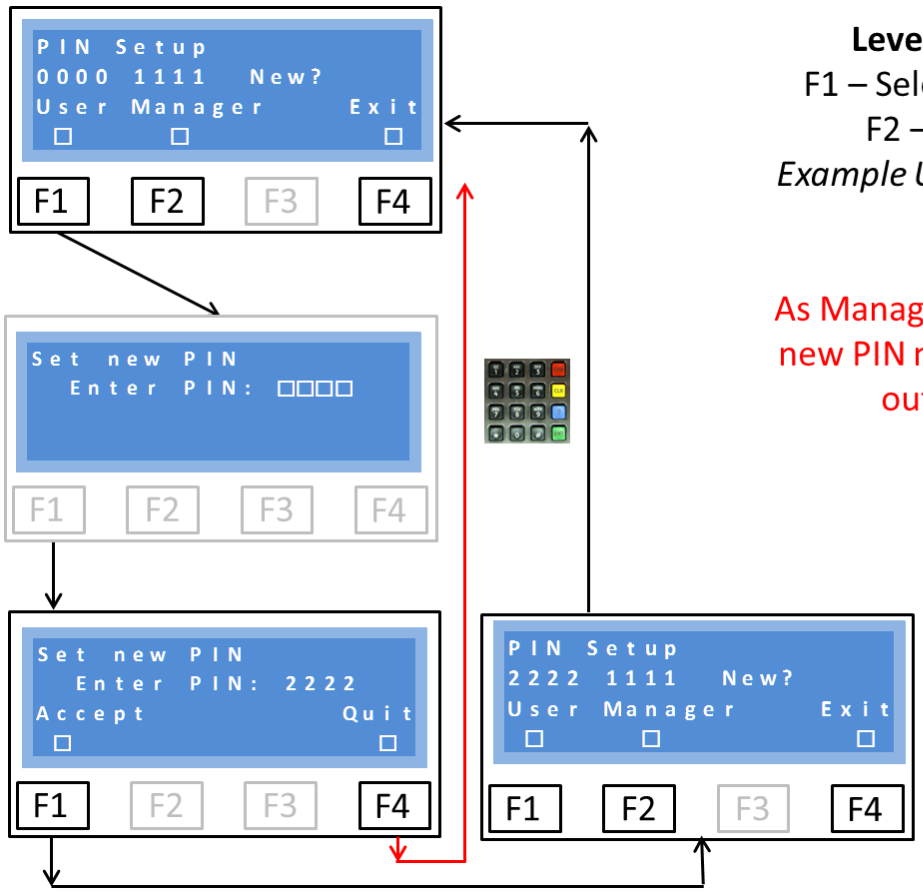
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9.6.1 PLC Configuration – Setting PINs

In the example below, the Manager has chosen to change the User PIN from 0000 (default) to 2222.

Process for changing Manager's own PIN is exactly the same.

Note warning about not forgetting own PIN.



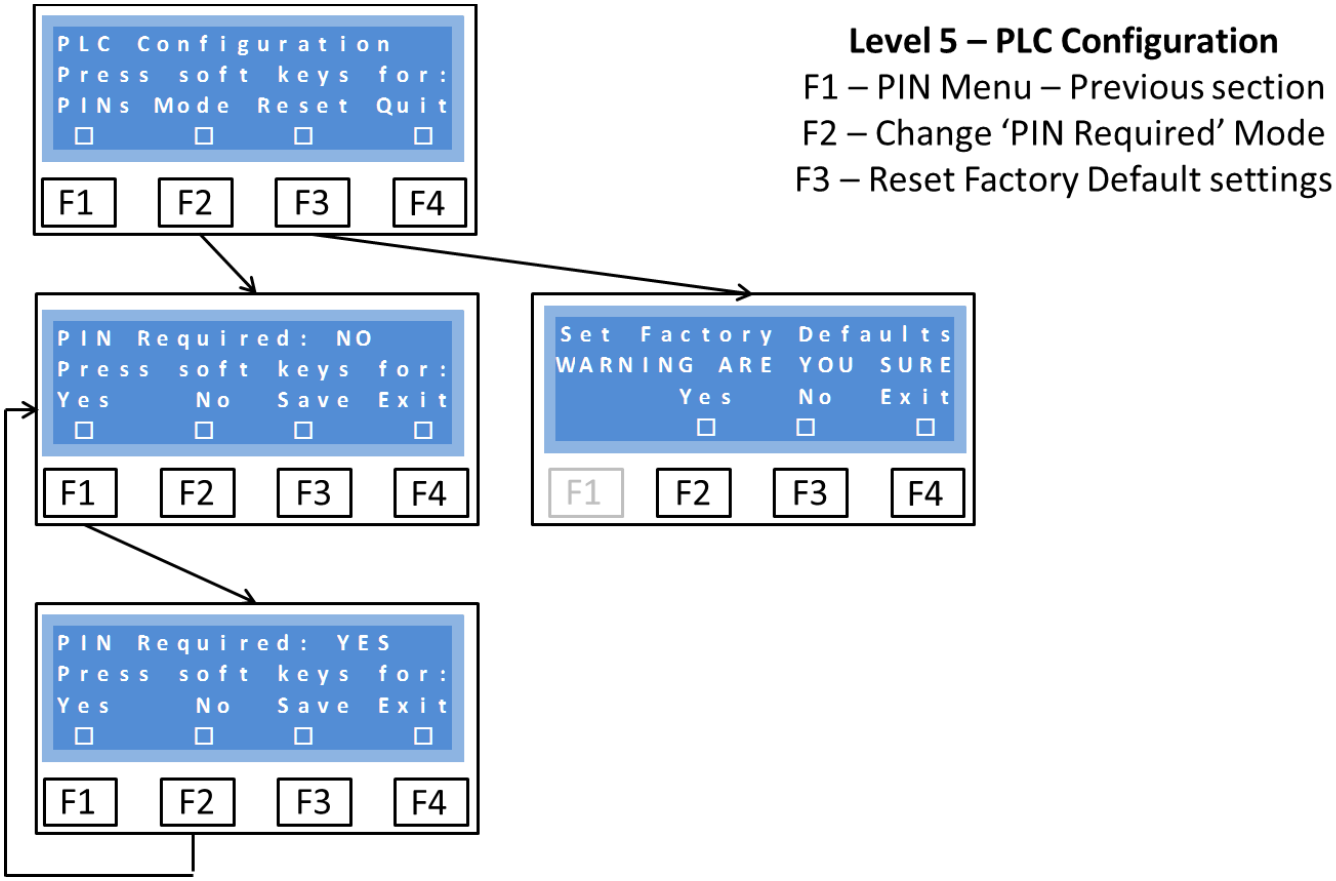
Level 5 – PIN change menu
F1 – Selects User PIN setup mode
F2 – Selects Manager PIN
Example User – Manager is the same

Warning
As Manager ensure that you note your new PIN number or you will be locked out of your own system!

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9.6.2 PLC Configuration – Mode and Reset

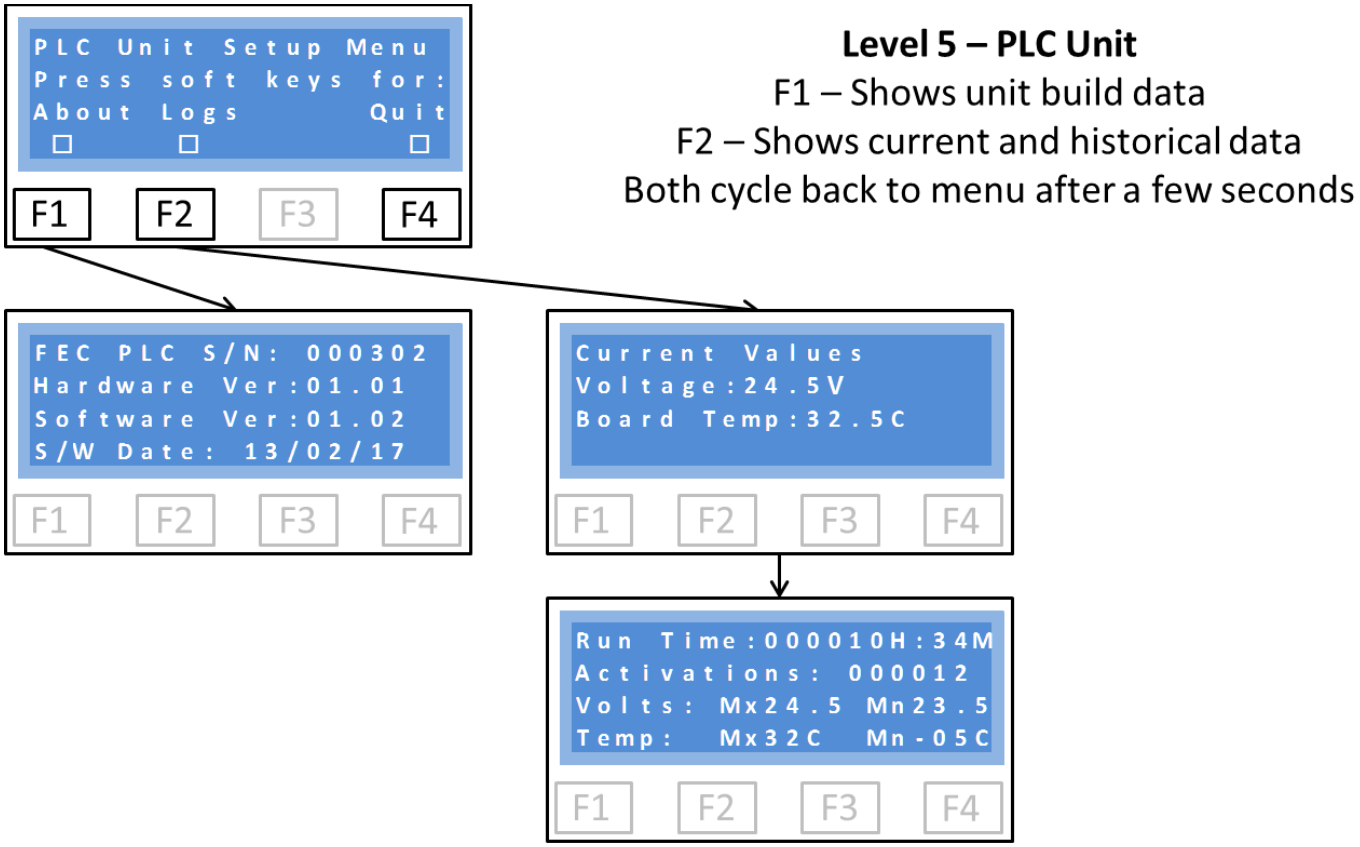
Whether or not a PIN is required to activate or deactivate channels from the main screen can be set. By default no PIN is required and is a suitable setting if access to the PLC is restricted.



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9.6.3 PLC Unit Menu

The following summary unit data are useful for diagnostic purposes



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10 Installation

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

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

10.1 Locating the Controller

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

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

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

Keep in mind that the controller will need mains electricity supply and connection to the circuits to be controlled

10.2 Things you will need

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

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

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10.3 Preparing for Installation – HP0712

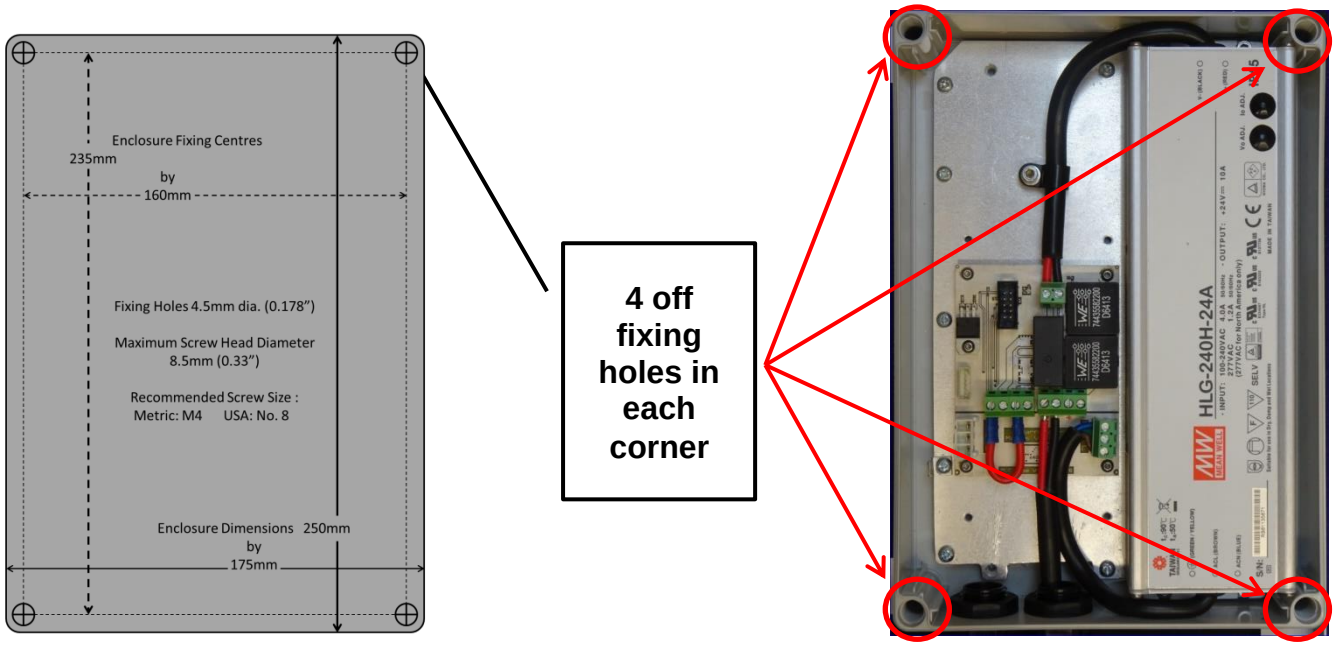
Lay the controller on its back on a clean soft surface at least twice the width of the unit and undo the four corner retaining screws (they are 'captive' and do not need to be fully removed).

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

Disconnect the main power and controller ribbon cable.

10.4 Installing the Base Unit – HP0712

Either by measurement or using the template in Appendix 1, mark out and drill (and plug) the surface to which the controller is to be fixed.



If the fixing screws are not in a convenient position for the surface on which the controller is to be fixed then the use of rails, frames or battens is recommended.

DO NOT DRILL HOLES THROUGH THE ENCLOSURE BASE

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

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

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

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

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10.5 Preparing for Installation – HP0713

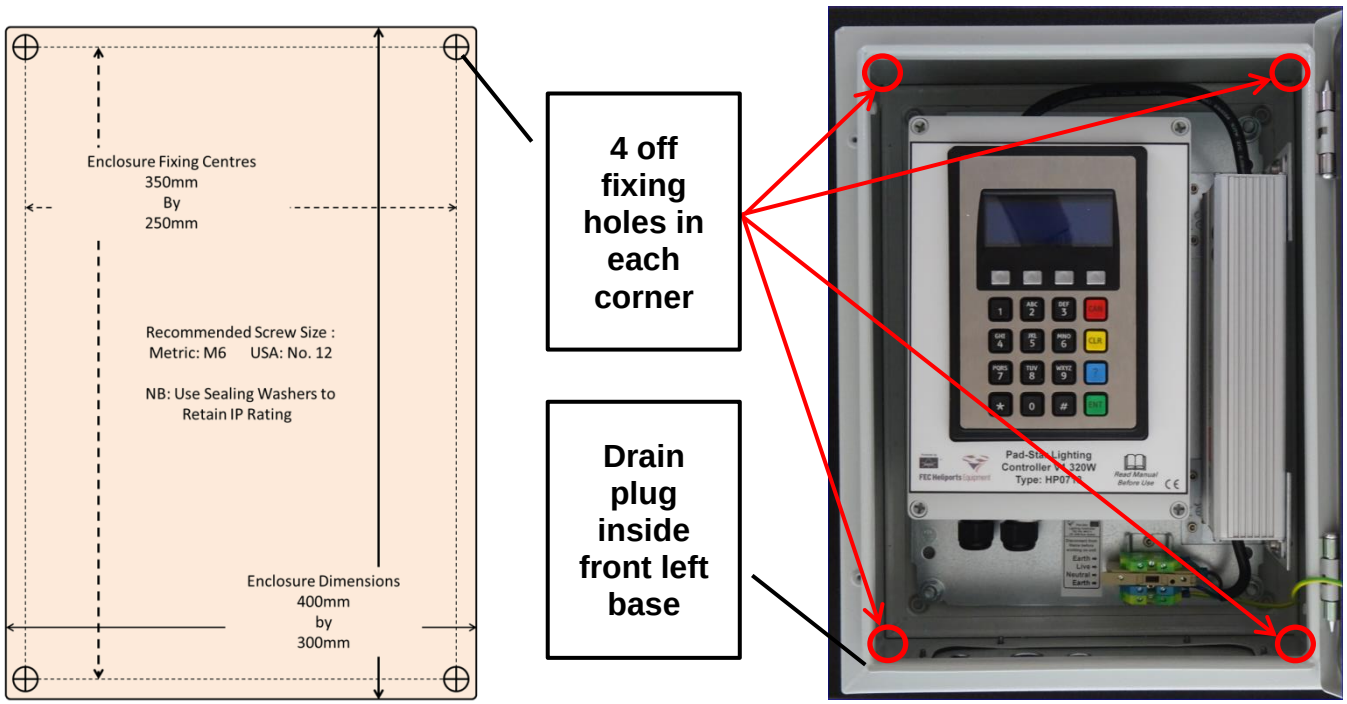
With the controller upright on its base, push out the plugs fitted into the four corner fixing holes.

If water ingress to the cabinet or severe condensation is likely, also push out the drain plug situated at the front left of the base of the cabinet. An insect-proof plug should be fitted.

If required, the inner base plate can be removed complete with the controller and Power Supply Unit (PSU) to aid installation. To do this, use a socket spanner

10.6 Installing the Base Unit – HP0713/4

Based on the diagram in Appendix 2 mark out and drill (and plug) the surface to which the controller is to be fixed.



If the fixing screws are not in a convenient position for the surface on which the controller is to be fixed then the use of rails, frames or battens is recommended.

DO NOT DRILL ADDITIONAL HOLES IN THE ENCLOSURE BASE

Recommended screw sizes are Metric M6 or USA No. 12 of a suitable length and type for the surface.

To retain the IP rating of the enclosure, suitable waterproof washers (such as nylon or butyl rubber) must be used.

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

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10.7 Installing the UHF antenna

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

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

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10.8 Mains Electrical Installation - HP0712

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

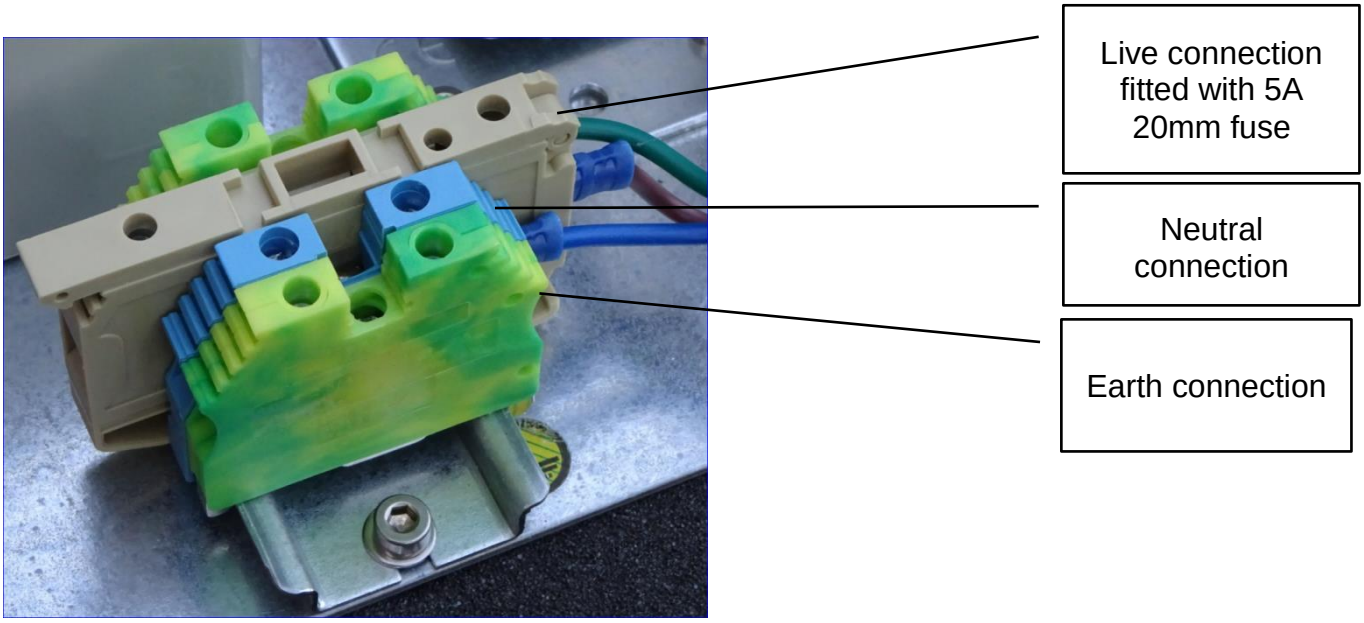
If the FEC PLC is to be operated from a mains power supply it must be connected to the supply using a fused double pole isolator.

The controller has a maximum power consumption of 300watts and a 5 Amp fuse should be used.

A power cord is supplied with the unit appropriate to the territory it is shipped to.

10.9 Main Electrical Installation – HP0713/4

The arrangement of the mains connections in the base unit is shown below:



Notes:

1) Live (Brown), Neutral (Blue) and Earth (Green/Yellow) 4mm IMO DIN rail mounted connector strips are provided for customer wiring.
2) Additional connectors can be added by the customer but pay particular attention to:
    a. Such connectors are often open on one side. Care must be taken to ensure that the open side is always covered by its neighbour or end plate.
    b. The earth connector is fixed and grounded to the DIN rail by a central screw. To move this connector, slacken the central screw, move as required and re-tighten.
    c. The Earth connector provides the earth bonding connection to the controller.
    d. The connectors must be gently pushed tight against the PSU and Relay Interface Board to ensure that these items are prevented from sliding on the rail.

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

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10.10 Basic 24V DC Connections

Only FEC Pad-Star components can be connected to the DC output circuit to the Helipad as they are specifically designed to support the Power Line Communication (PLC) technology used to control the system.

Attaching other devices will stop the system working

The DC input and Output to the unit is via the two 4 way terminal strips. The connections are:

12-24V DC Input		24V DC Output	
+ve	-ve	+ve	-ve
From Source		From Mains PSU	

12-24V DC Output		12-24V DC Output	
+ve	-ve	+ve	-ve
To Helipad Lights		To Beacon	

All PLCs use the same base unit but only HP0712 has the mains interconnected via the PCB.

The PLC Base for the HP0713/4 is as per the photo (right).

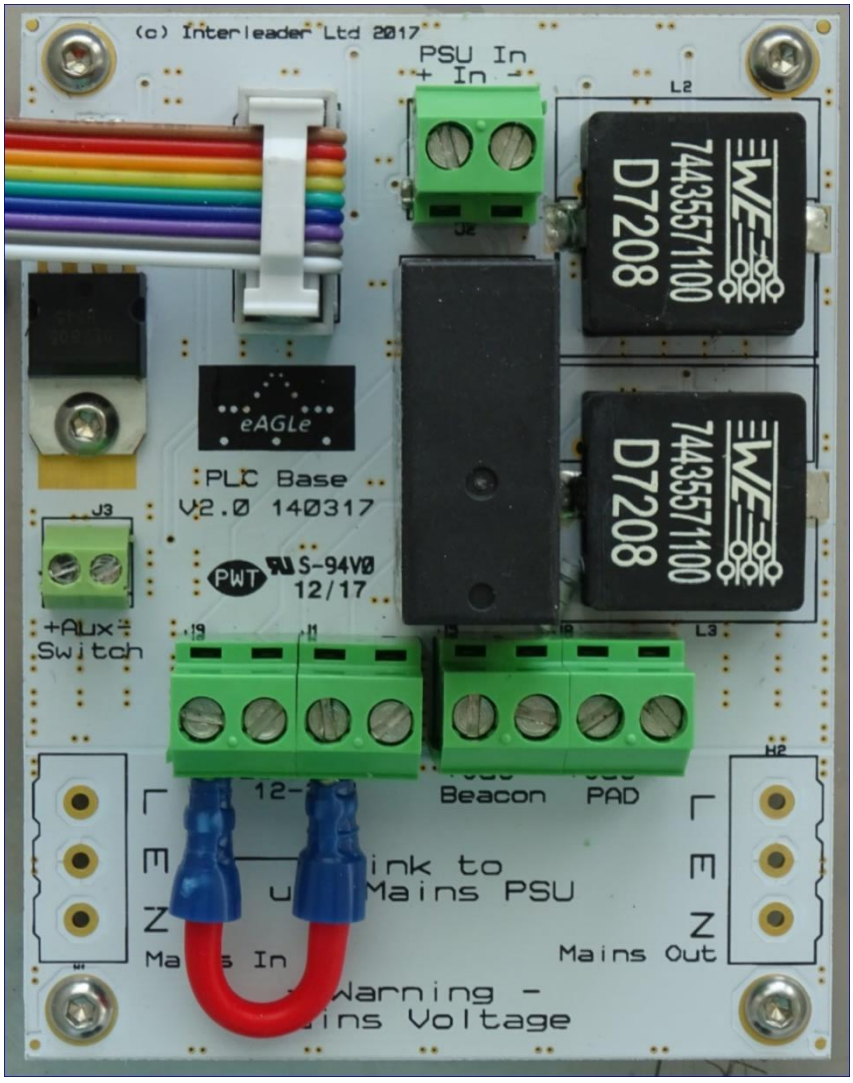
If mains powered, the only connections necessary are to connect the cable to the helipad wiring.

The output to the helipad is marked Out and the terminals marked P+ and P-.

Connect the +ve wire of the cable to the terminal marked P+ and the negative to P- as shown.

The PLC Base PCB require a link to be fitted on the terminal strip if the unit is powered from the internal mains PSU.

This link is fitted as shipped and need not be touched unless the unit is to be run from an external power source.



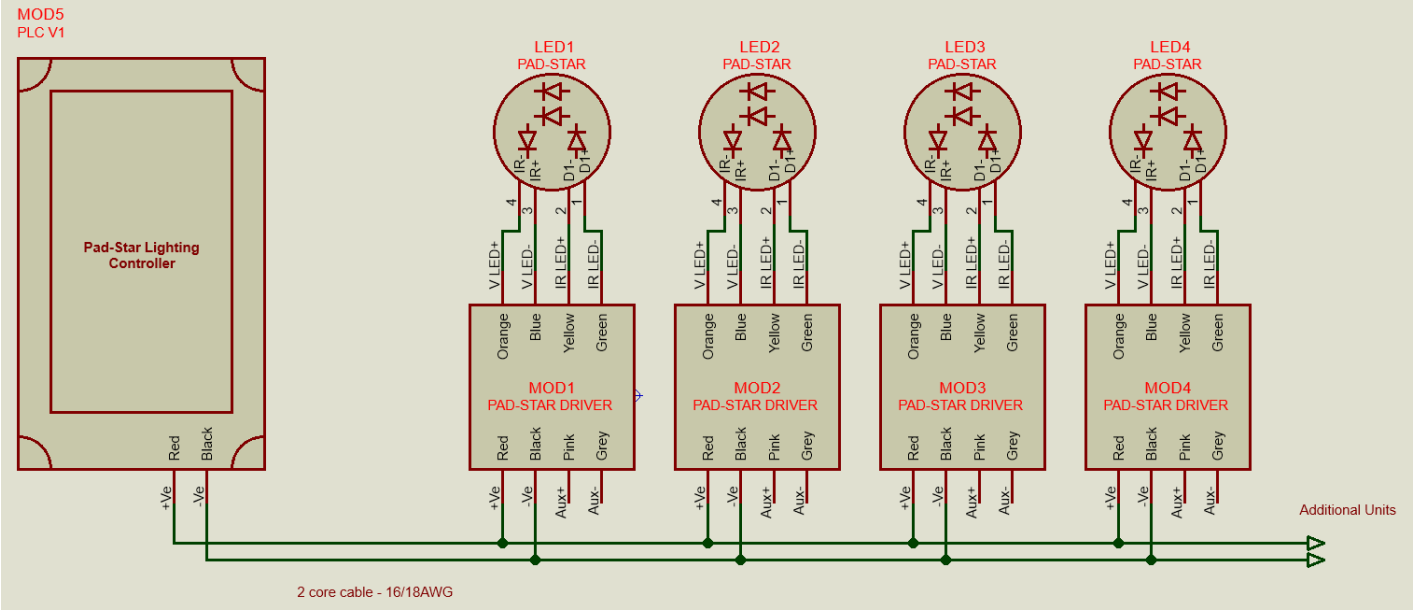
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10.11 Basic Circuit Wiring

The wiring of the Pad-Star Lighting Controllers and Pad-Star Drivers is extremely simple because all of the control signals are carried over the power wiring.

The wiring should be sized to carry a maximum of at least 10A (@24V) for an HP0712 and at least 15A (@24V) for an HP0713. Consideration of voltage drops should also be made for long feeder cables.

The Basic wiring schematic is as below:



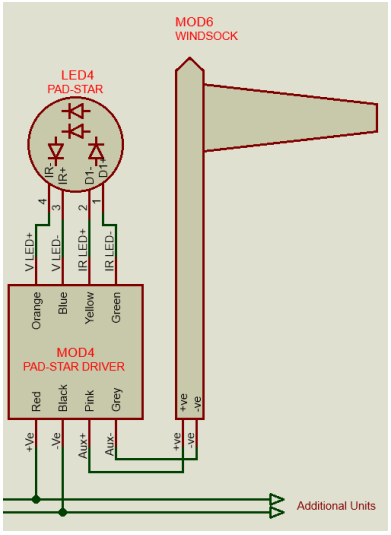
The circuit topology can be linear, branched or a loop (ring circuit) to suit the specific installation.

The number of Pad-Star drivers that can be connected to single ‘bus’ is 10.

Systems larger than this need to be divided up into a primary bus and a number of spur secondary busses. See next section on Transceivers

Auxiliary Circuit

If an auxiliary light is to be driven from one of the Pad-Star Drivers (must be a /A variant) it is connected as shown on the right.:



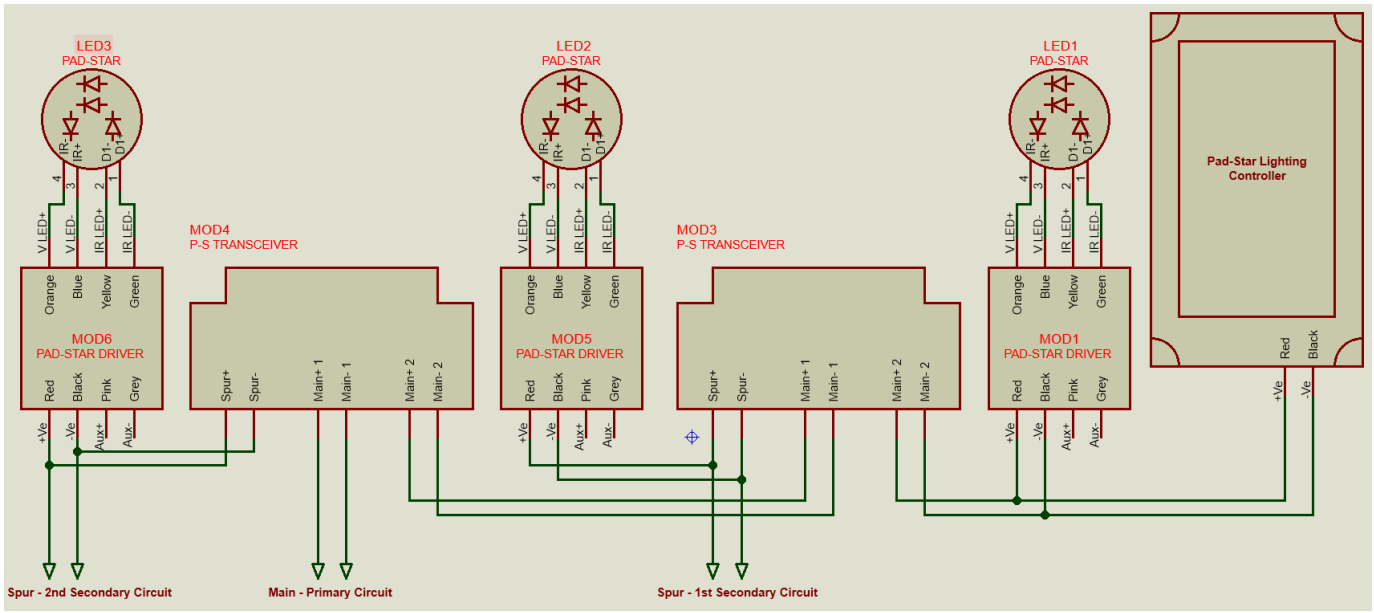
© Interleader Ltd 2017

10.12 Pad-Star Transceivers

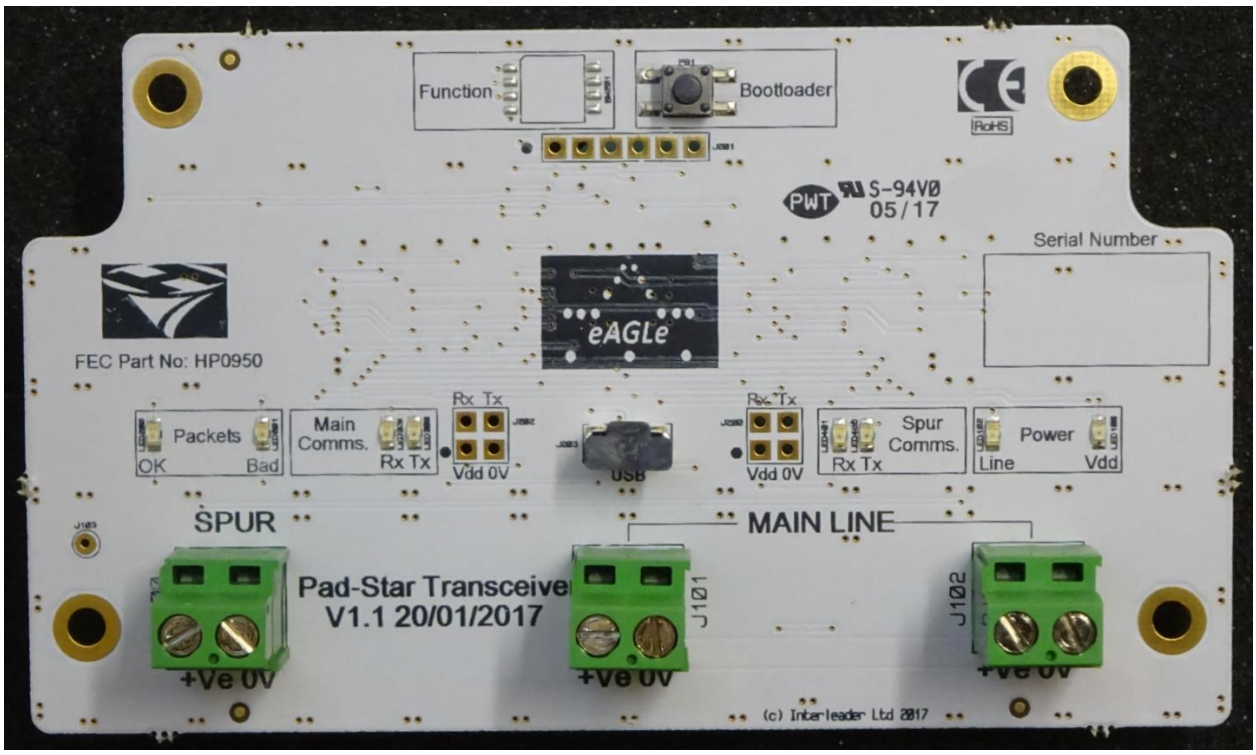
Where a large number of lights are to be connected it is important to split them across a number of ‘Spur’ secondary busses.

The Pad-Star Transceiver is designed to perform this function allowing up to 10 Pad-Star Drivers to be connected per Spur secondary circuit.

The general arrangement is as below:



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11 Summary Specification

- Controller modes: 2 - Keypad or Switches/Relays
- Degree of protection: IP65 (general)
- LCD and Keypad protection: IP65 and 'vandal resistant'
- Unit operating temperature: -25°C to +50°C
- System Storage temperature: -25°C to +80°C
- Compliance: ROHC Compliant except exempt items (radios)
- Operating voltage (AC): 100-240V AC 50-60Hz
- Operating voltage (DC): 12V – 24VDC
- Max voltage range (DC): 10V – 24V DC
- Electrical Protection (HP0713/4) 5A 20mm Fuse
- Max power consumption: DC/AC: 300 watts (including optional winter heater)
- Cable Entry (Mains): 2 off M20 Cable glands – 10mm max cable diameter
- Size: Height - 11" (280mm)
  Depth - 6.5" (165mm)
  Width - 7" (180mm)
- Enclosure material: ABS
- Weight (with shipping packaging): 2.5kg 5.5lbs (3.9kg 8.6lbs)
- Warranty: 2 years return to FEC

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12 UHF Radio Modem Specification

The same Telit UHF Radio Modem is used in MIL-Star, HEMS-Star, RLC, MLC, PLC and 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 Power Supply Unit Specification – HP0712

MEAN WELL 240W Single Output Switching Power Supply **HLG-240H series**



■ Features :

- Universal AC input / Full range (up to 305VAC)
- Built-in active PFC function
- Protections: Short circuit / Over current / Over voltage / Over temperatur
- Cooling by free air convection
- OCP point adjustable through output cable or internal potentiometer
- IP67 / IP65 design for indoor or outdoor installations
- Three in one dimming function (1~10Vdc or PWM signal or resistance)
- Suitable for LED lighting and street lighting applications
- Compliance to worldwide safety regulations for lighting
- Suitable for dry / damp / wet locations
- 5 years warranty (Note.10)

TAIWAN EXCELLENCE 2011

SELV IP65 IP67 CB CE

HLG-240H-12 A Blank : IP67 rated. Cable for I/O connection.
A : IP65 rated. Output voltage and constant current level can be adjusted through internal potentiometer.
B : IP67 rated. Constant current level adjustable through output cable with 1~10Vdc or 10V PWM signal or resistance.
C : Terminal block for I/O connection. Output voltage and constant current level can be adjusted through internal potentiometer.
D (option) : IP67 rated. Timer dimming function, contact MEAN WELL for details.

SPECIFICATION

MODEL		HLG-240H-12	HLG-240H-15	HLG-240H-20	HLG-240H-24	HLG-240H-30	HLG-240H-36	HLG-240H-42	HLG-240H-48	HLG-240H-54
OUTPUT	DC VOLTAGE	12V	15V	20V	24V	30V	36V	42V	48V	54V
	CONSTANT CURRENT REGION Note.4	6 ~ 12V	7.5 ~ 15V	10 ~ 20V	12 ~ 24V	15 ~ 30V	18 ~ 36V	21 ~ 42V	24 ~ 48V	27 ~ 54V
	RATED CURRENT	16A	15A	12A	10A	8A	6.7A	5.72A	5A	4.45A
	RATED POWER	192W	225W	240W	240W	240W	241.2W	240.24W	240W	240.3W
	RIPPLE & NOISE (max.) Note.2	150mVp-p	150mVp-p	150mVp-p	150mVp-p	200mVp-p	250mVp-p	250mVp-p	250mVp-p	350mVp-p
	VOLTAGE ADJ. RANGE Note.6	11.2 ~ 12.8V	14 ~ 16V	18.6 ~ 21.4V	22.4 ~ 25.6V	28 ~ 32V	33.5 ~ 38.5V	39 ~ 45V	44.8 ~ 51.2V	50 ~ 57V
	CURRENT ADJ. RANGE	Can be adjusted by internal potentiometer or through output cable								
		8 ~ 16A	7.5 ~ 15A	6 ~ 12A	5 ~ 10A	4 ~ 8A	3.3 ~ 6.7A	2.86 ~ 5.72A	2.5 ~ 5A	2.23 ~ 4.45A
	VOLTAGE TOLERANCE Note.3	±2.5%	±2.0%	±1.0%	±1.0%	±1.0%	±1.0%	±1.0%	±1.0%	±1.0%
	LINE REGULATION	±0.5%	±0.5%	±0.5%	±0.5%	±0.5%	±0.5%	±0.5%	±0.5%	±0.5%
	LOAD REGULATION Note.8	±2.0%	±1.5%	±1.0%	±0.5%	±0.5%	±0.5%	±0.5%	±0.5%	±0.5%
	SETUP, RISE TIME Note.9	2500ms, 80ms at full load 230VAC / 115VAC								
	HOLD UP TIME (Typ.)	15ms at full load 230VAC / 115VAC								
INPUT	VOLTAGE RANGE Note.5	90 ~ 305VAC 127 ~ 431VDC								
	FREQUENCY RANGE	47 ~ 63Hz								
	POWER FACTOR (Typ.)	PF>0.98/115VAC, PF>0.95/230VAC at full load (Please refer to "Power Factor Characteristic" curve)								
	EFFICIENCY (Typ.)	90%	90%	92%	93%	93%	93%	93%	93.5%	94%
	AC CURRENT (Typ.)	4A / 115VAC 2A / 230VAC 1.2A / 277VAC								
	INRUSH CURRENT (Typ.)	COLD START 75A/230VAC								
	LEAKAGE CURRENT	<0.75mA / 277VAC								
PROTECTION	OVER CURRENT Note.4	95 ~ 108%								
		Protection type : Constant current limiting, recovers automatically after fault condition is removed								
	SHORT CIRCUIT	Hiccup mode, recovers automatically after fault condition is removed								
	OVER VOLTAGE	13.5 ~ 18V	17.5 ~ 21.5V	23.5 ~ 27.5V	27 ~ 34V	33 ~ 39V	43 ~ 49V	48 ~ 54V	55 ~ 63V	60 ~ 67V
		Protection type : Shut down and latch off o/p voltage, re-power on to recover								
	OVER TEMPERATURE	105℃ ±5℃ (TSW1)		95℃ ±5℃ (TSW1)						
		Protection type : Shut down o/p voltage, recovers automatically after temperature goes down								
ENVIRONMENT	WORKING TEMP.	-40 ~ +70℃ (Refer to "Derating Curve")								
	WORKING HUMIDITY	20 ~ 95% RH non-condensing								
	STORAGE TEMP., HUMIDITY	-40 ~ +80℃, 10 ~ 95% RH								
	TEMP. COEFFICIENT	±0.03%/℃ (0 ~ 50℃)								
	VIBRATION	10 ~ 500Hz, 5G 12min./1cycle, period for 72min. each along X, Y, Z axes								
SAFETY & EMC	SAFETY STANDARDS Note.7	UL1012, CAN/CSA-C22.2 No. 107.1-01, UL8750, CSA C22.2 No. 250.0-08, TUV EN61347-1, EN61347-2-13 independent (except for HLG-240H-C type), UL60950-1, UL8750, TUV EN60950-1, IP65 or IP67, J61347-1, J61347-2-13 approved								
	WITHSTAND VOLTAGE	I/P-O/P:3.75KVAC I/P-FG:1.88KVAC O/P-FG:0.5KVAC								
	ISOLATION RESISTANCE	I/P-O/P, I/P-FG, O/P-FG:100M Ohms / 500VDC / 25℃/ 70% RH								
	EMC EMISSION	Compliance to EN55015, EN55022 (CISPR22) Class B, EN61000-3-2 Class C (≥50% load); EN61000-3-3								
	EMC IMMUNITY	Compliance to EN61000-4-2,3,4,5,6,8,11, EN61547, EN55024, light industry level (surge 4KV), criteria A								
OTHERS	MTBF	207.9Khrs min. MIL-HDBK-217F (25℃)								
	DIMENSION	244.2*68*38.8mm (L*W*H) (HLG-240H-Blank/A/B) 251*68*38.8mm (L*W*H) (HLG-240H-C)								
	PACKING	1.3Kg; 12pcs/16.6Kg/0.84CUFT (HLG-240-Blank/A/B) 1.23Kg; 12pcs/15.8Kg/1.16CUFT (HLG-240-C)								

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. Constant current operation region is within 50% ~100% rated output voltage. This is the suitable operation region for LED related applications, but please reconfirm special electrical requirements for some specific system design.
5. Derating may be needed under low input voltages. Please check the static characteristics for more details.
6. Type A and type C only.
7. Safety and EMC design refer to EN60598-1, subject 8750(UL), CNS15233, GB7000.1, FCC part18.
8. Length of set up time is measured at cold first start. Turning ON/OFF the power supply may lead to increase of the set up time.
9. 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.
10. Refer to warranty statement.

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14 Power Supply Unit Specification – HP0713

MEAN WELL

320W Single Output Switching Power Supply **HEP-320 series**

SPECIFICATION

MODEL		HEP-320-12□	HEP-320-15□	HEP-320-24□	HEP-320-36□	HEP-320-48□	HEP-320-54□
OUTPUT	DC VOLTAGE	12V	15V	24V	36V	48V	54V
	RATED CURRENT	22A	19A	13.34A	8.9A	6.7A	5.95A
	RATED POWER	264W	285W	320.16W	320.4W	321.6W	321.3W
	RIPPLE & NOISE (max.) Note.2	150mVp-p	150mVp-p	150mVp-p	250mVp-p	250mVp-p	350mVp-p
	VOLTAGE ADJ. RANGE Note.5	10.8 ~ 13.5V	13.5 ~ 17V	21 ~ 26V	32 ~ 39V	43 ~ 52V	49 ~ 58V
	CURRENT ADJ. RANGE Note.5	11 ~ 22A	9.5 ~ 19A	6.67 ~ 13.34A	4.45 ~ 8.9A	3.35 ~ 6.7A	2.97 ~ 5.95A
	VOLTAGE TOLERANCE Note.3	±3.0%	±2.0%	±1.0%	±1.0%	±1.0%	±1.0%
	LINE REGULATION	±0.5%	±0.5%	±0.5%	±0.5%	±0.5%	±0.5%
	LOAD REGULATION	±2.0%	±1.5%	±0.5%	±0.5%	±0.5%	±0.5%
	SETUP, RISE TIME Note.6	2500ms,80ms/115VAC 500ms,80ms/230VAC at full load					
	HOLD UP TIME (Typ.)	15ms at full load 230VAC /115VAC					
INPUT	VOLTAGE RANGE Note.4	90 ~ 305VAC 127 ~ 431VDC					
	FREQUENCY RANGE	47 ~ 63Hz					
	POWER FACTOR (Typ.)	PF>0.98/115VAC, PF>0.95/230VAC, PF>0.94/277VAC at full load					
	EFFICIENCY (Typ.)	91%	92.5%	94%	94%	94.5%	95%
	AC CURRENT (Typ.)	3.5A / 115VAC 1.65A / 230VAC 1.45A / 277VAC					
	INRUSH CURRENT(Typ.)	COLD START 70A at 230VAC					
	LEAKAGE CURRENT	<0.75mA / 277VAC					
PROTECTION	OVER CURRENT	105 ~ 125%					
		Protection type : Hiccup mode, recovers automatically after fault condition is removed					
	SHORT CIRCUIT	Hiccup mode, recovers automatically after fault condition is removed					
	OVER VOLTAGE	14 ~ 17V	17.5 ~ 21V	27 ~ 33V	40 ~ 46V	53.5 ~ 60V	59 ~ 65V
		Protection type : Shut down and latch off o/p voltage, re-power on to recover					
	OVER TEMPERATURE	Shut down and latch off o/p voltage, re-power on to recover					
ENVIRONMENT	WORKING TEMP.	-55 ~ +70℃ (Refer to "Derating Curve")					
	WORKING HUMIDITY	20 ~ 95% RH non-condensing					
	STORAGE TEMP., HUMIDITY	-60 ~ +80℃, 10 ~ 95% RH					
	TEMP. COEFFICIENT	±0.03%/℃ (0 ~ 60℃)					
	VIBRATION	20 ~ 500Hz, 10G 12min./1cycle, period for 72min. each along X, Y, Z axes					
SAFETY & EMC	SAFETY STANDARDS Note.6	UL60950-1, IP65 (or IP68 for HEP-320 Blank-Type) approved ; design refer to TUV EN60950-1					
	WITHSTAND VOLTAGE	I/P-O/P:3.75KVAC I/P-FG:2KVAC O/P-FG:1.5KVAC					
	ISOLATION RESISTANCE	I/P-O/P, I/P-FG, O/P-FG:100M Ohms / 500VDC / 25℃/ 70% RH					
	EMC EMISSION	Compliance to EN55022 (CISPR22) Class B, EN61000-3-2,-3					
	EMC IMMUNITY	Compliance to EN61000-4-2,3,4,5,6,8,11, EN55024, light industry level (surge 6KV), criteria A					
OTHERS	MTBF	154.2K hrs min. MIL-HDBK-217F (25℃)					
	DIMENSION	252*90*43.8mm (L*W*H)					
	PACKING	1.88Kg; 8pcs/16Kg/0.92CUFT					

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 voltages. Please check the static characteristics for more details.
5. A-type only.
6. Length of set up time is measured at cold first start. Turning ON/OFF the power supply may lead to increase of the set up time.
7. 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.
8. The ambient temperature derating of 3.5℃/1000m is needed for operating altitude greater than 2000m(6500ft).

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15 Spare Parts

There are no other user serviceable parts.

Items requiring repair need to be returned to FEC.

16 Factory Default Settings

The following are the Factory default settings:

Item	Default Setting	Comment
LCD Backlight	On	Option = Auto
Backlight timeout period	1 minute	Cannot be changed
In-Menu timeout period	10 minutes	Cannot be changed
Heater Enable	Auto	Option = Off
User PIN	0000	
Manager PIN	1111	
Unit ID	Set to Unit Serial Number	Cannot be set by Operator
Aux Input	On	Always active except in menu setup

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17 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 controller box will contain dangerous voltages.

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

Basic Visual Checks – Ensure that:

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

Basic Operational Checks – Ensure that:

- The PLC Base Status LED is lit indicating power to the system.

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18 Software Updater

The PLC can be updated with new software in situ.

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

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

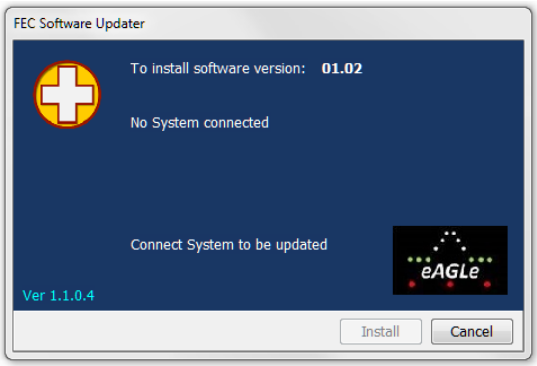
Software updates can be emailed to you as a self-extracting zip file.

PLC screens are shown next page.

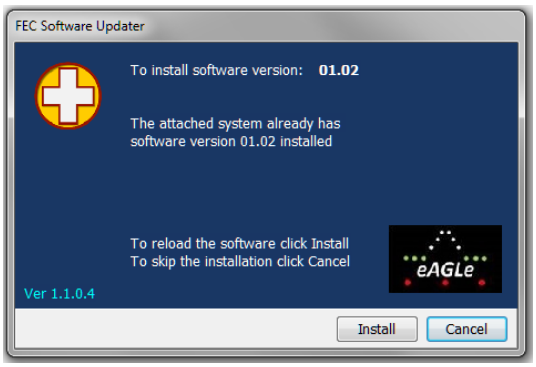
To update the software (initiated through the Boot-loader Switch):

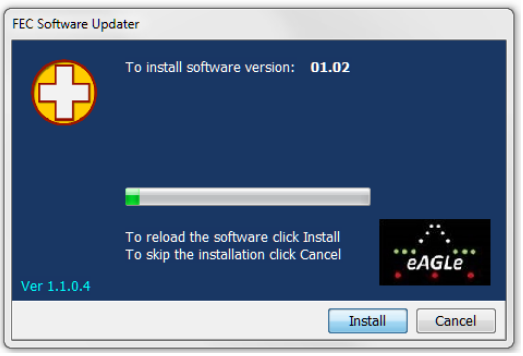
The following is the simplest way of initiating the uploading of new software.

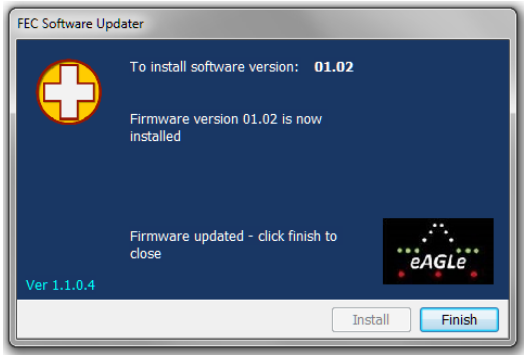
1) Read the instructions and information contained in the readme file that is sent with the new software
2) Turn the unit off and disconnect from the normal power source
3) Open the enclosure as described in earlier sections (open carefully and disconnect aerial and connecting cable and earth wire)
4)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









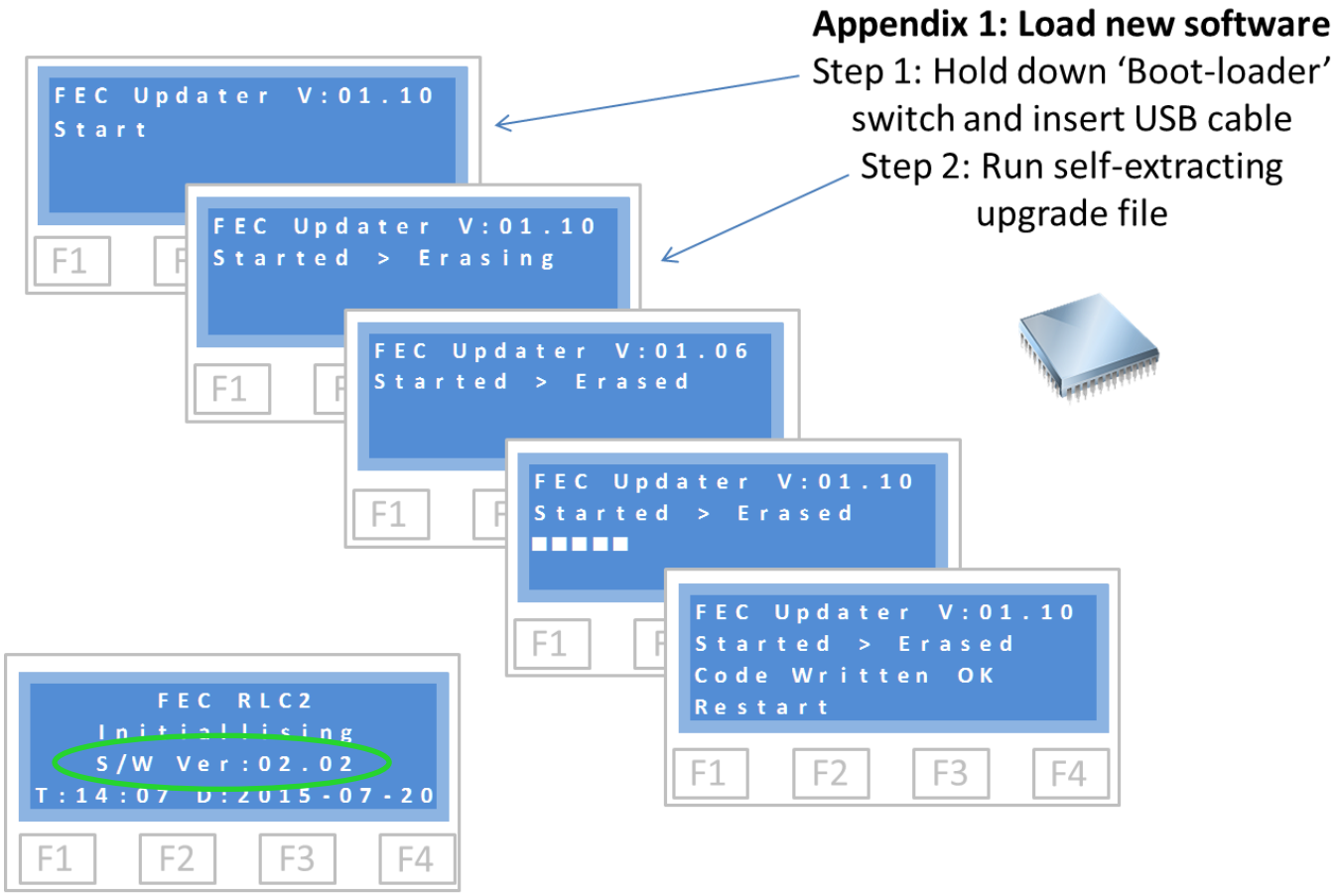


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PLC Software Update Screens

Below is the sequence of screens that the PLC 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 that the PLC is started after a software update pay attention to the initialisation screen and confirm version of software is as expected. Repeat with the correct version if not.

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19 Appendix 1 – External Switch/Relay Wiring Schematic

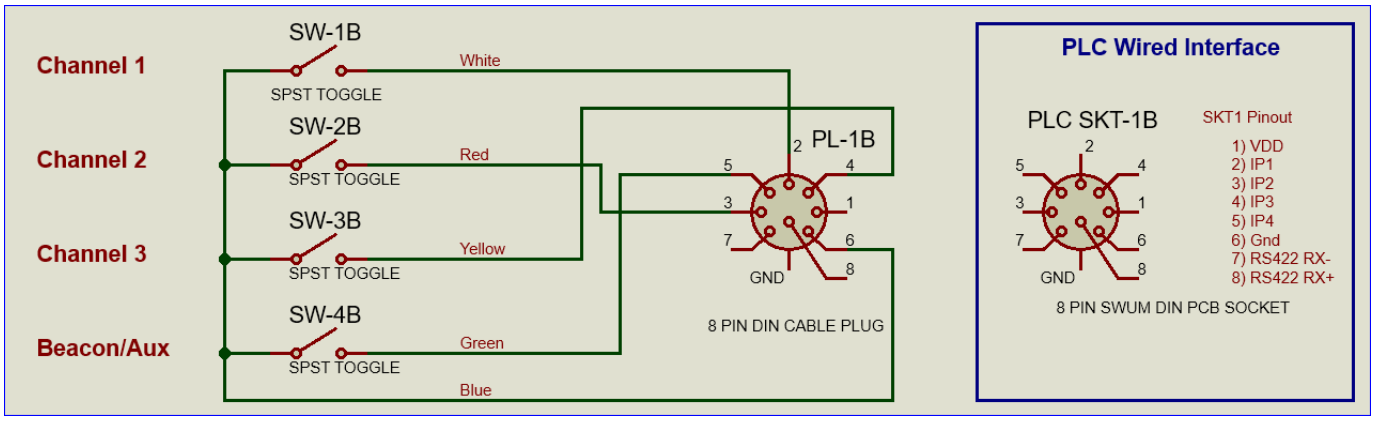
Below are the schematics for connecting external switches or relays (or both) to the PLC.

The circuits must be 'voltage free' (i.e. do not use solid state relays). Do not make any connections to pins 1, 7 and 8.

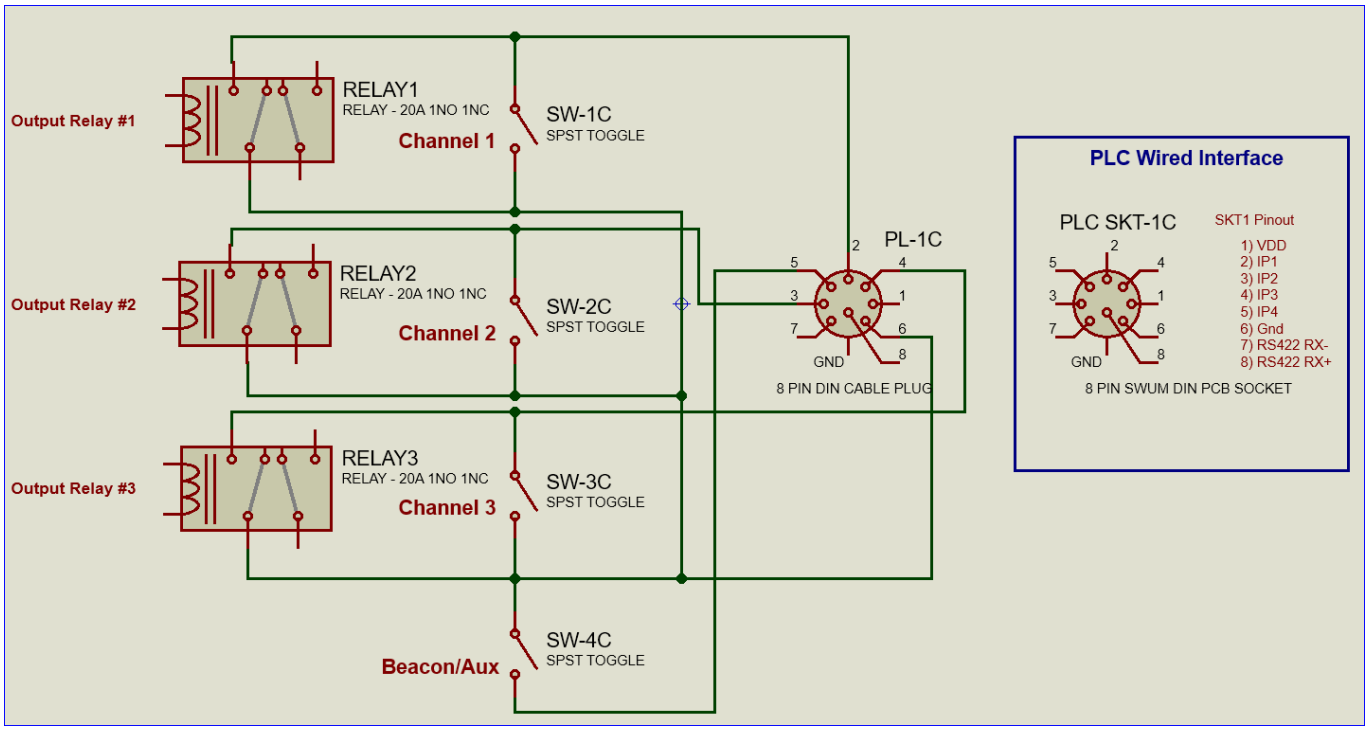
The plug is an 8 way IP rated, locking DIN type. Lumberg part number: 0332 08-1 (shown right).



19.1 Switch Inputs



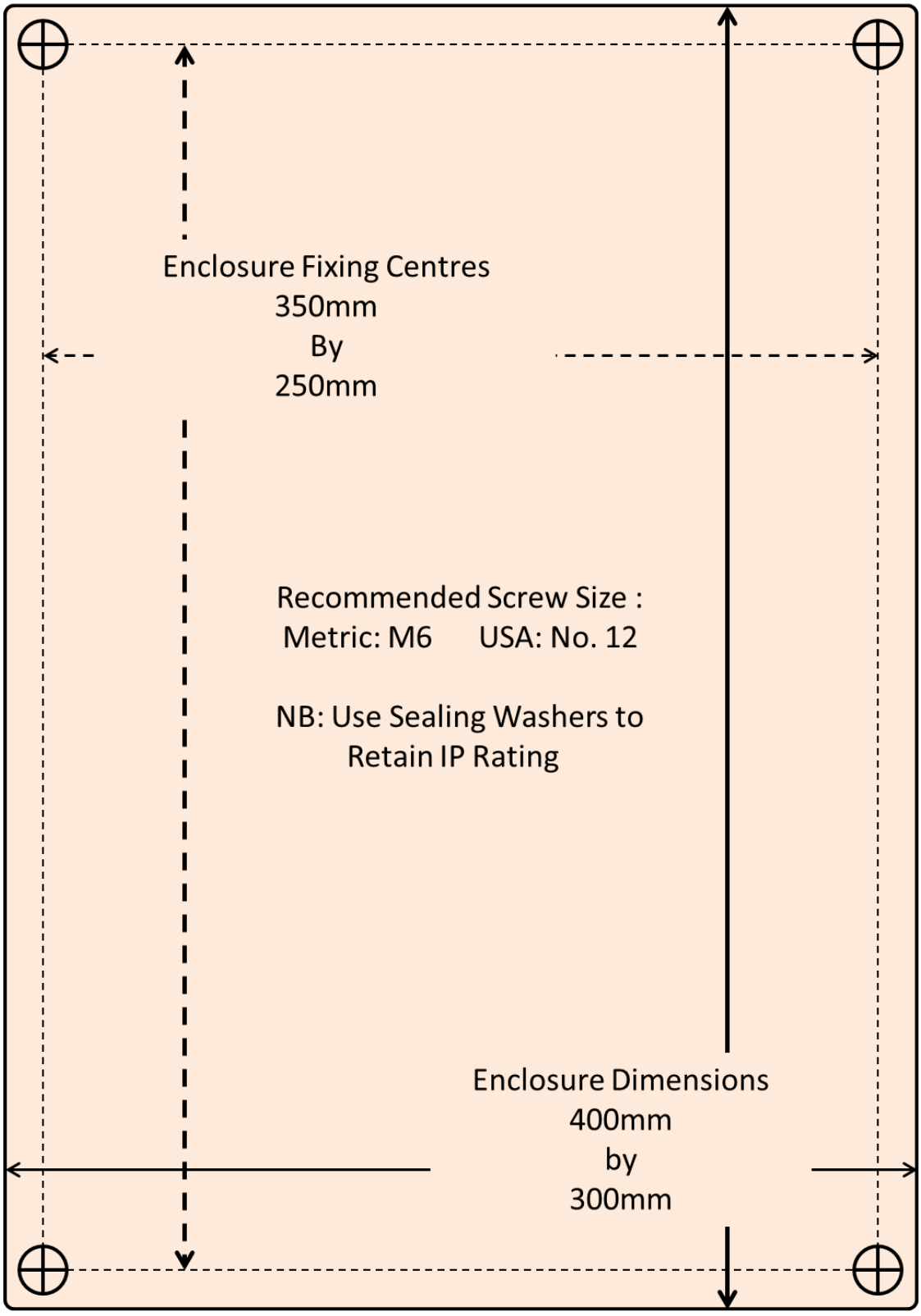
19.2 Relay Inputs



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20 Appendix 2 – Mounting Details – HP0713, HP0714

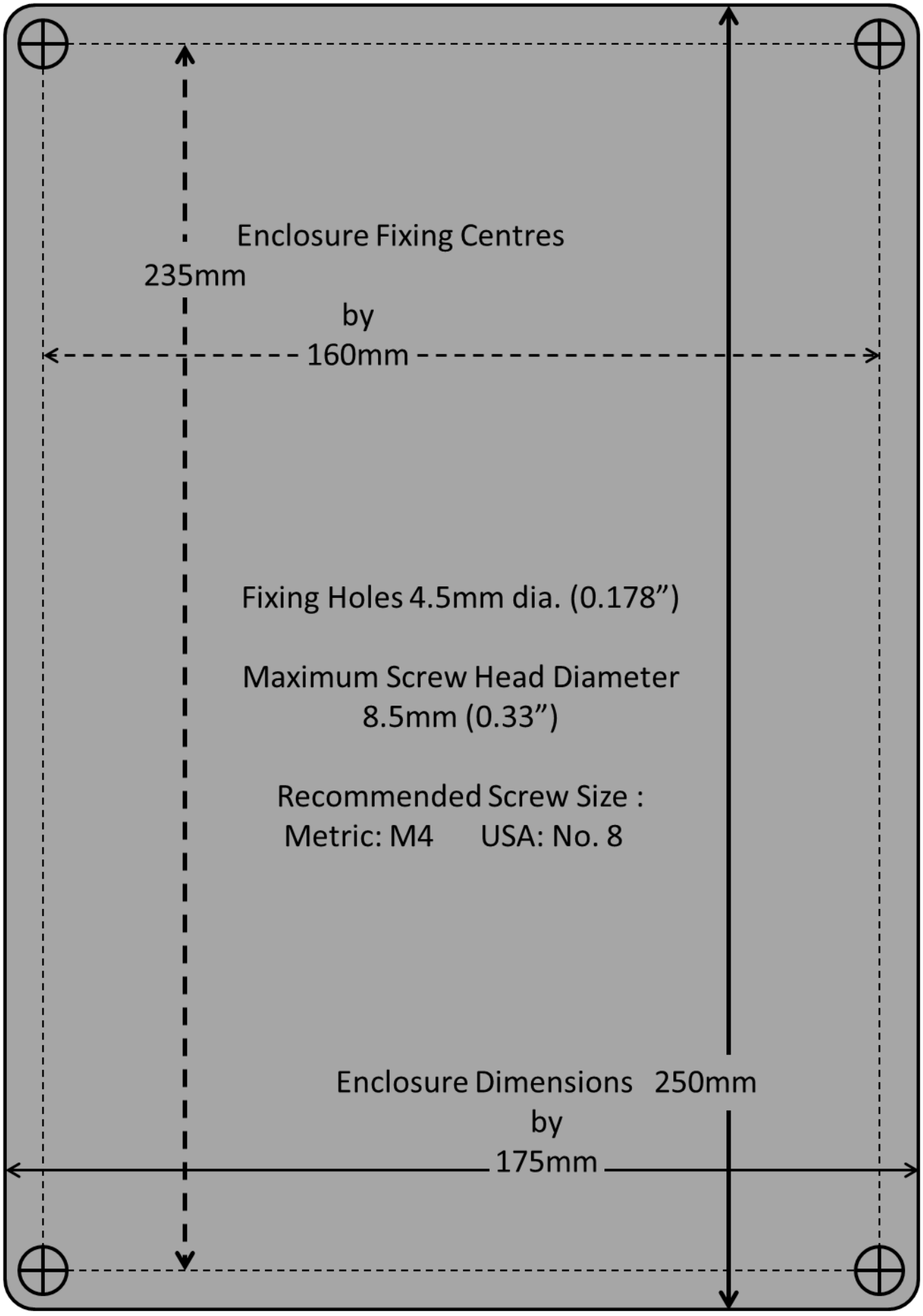
NB This diagram is not to scale and is not a template.



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21 Appendix 3 – Mounting Template – HP0712

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



End of Document