



eyePower Limited

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eyePower Windows™ Software User Manual

Version 2.2

18th August 2025

SAFETY NOTICE

End users must be made aware that power outlets are remote controlled

This unit is not certified for safety isolation of the electrical supply



Overview

The eyePower Limited power distribution unit (PDU) has fourteen individually switched outlets with inlet current/voltage measurement and optional output current measurement. The status of each outlet (on, off, fuse blown) can be seen on the front panel indicators, checked via the integrated serial port using a control system, or embedded Ethernet web server.

eyePower TCP Config software is available for setting up an eyePower PDU using the Ethernet port. An alternative program, eyePower Windows™ software connected via a serial port, has additional control functions not available in eyePower TCP Config. Either of these programs can be used to change unit fixed IP and DHCP enable/disable options, although units ship with DHCP enabled. IP address changes will be added to the web browser interface, but the benefit of using standalone software is separation of operational and engineering functions. As will be seen, IP settings are only a small part of the functions offered by eyePower TCP Config software that allows programming of macros controlling outputs and GPIs.

eyePower Limited's designs have been incorporated in intelligent PDU since the 1990s and started with delayed sequence-on units followed by changeover, dual supply units. The SMS unit, now over a decade old and well proven, was developed after users asked for widely varying combinations of sequence on/off, response to GPIs etc. SMS offered total programmability with user defined macro routines. eyePower represents the next generation after SMS, with current and various voltage measurements going beyond basic RMS measurements that do not fully represent modern, complex power loads.

Using eyePower TCP Config software, the eyePower Power Distribution Unit (PDU) can be loaded with sequencing routines so the unit works autonomously. These autonomous routines are loaded into the eyePower PDU and are stored into memory that will last for decades without the unit even being powered. With no control system connected, autonomous operation can still be influenced by external events such as night-time shutdown, changeover to backup power, or a fire. This requires logic level (0V/+5V) signals to be connected into any of the four GPI (General Purpose Interface) connections of the eyePower PDU.

This document explains operation of the eyePower TCP Config Software. However, details of the robust communications protocol are available as a separate document for those wanting to write their own control software or gain more in-depth knowledge of the eyePower PDU operation.

With thousands of units now in service, we have seen how installations world-wide have made best use of the programming capabilities.

As for any software, some users need no help while others have contacted eyePower Limited for advice and how best to write macro programs. This is all part of the service, not least because we are interested how the units are used, but we also want to see them used in the best way.



Connections and Communications

Serial Port:

Data connections to the eyePower PDU are industrial RS422/485 balanced, whereas a PC usually provides the same data as unbalanced RS232. For fixed installations or multiple eyePower units, the PC should be fitted with an RS422 port or converter. However, the standard PC RS232 port should suffice for one-to-one programming or live control over a short distance with eyePower Software.

Computers have extremely tolerant RS232 ports and it will usually be possible to connect a PC RS232 port directly to an eyePower PDU serial port, using only ground, one TX and one RX pin.

The rear of the eyePower PDU is equipped with a single D9 chassis socket. This was selected over the RJ45 connector to allow breakout of the GPI connections if required. For those wanting to use commercially available RJ45 leads, custom wireable D9/RJ45 adapter modules are recommended.

The connector pinout is,

1 GND	6 GPI4
2 TXA(-)	7 TXB(+)
3 RXB(+)	8 RXA(-)
4 GPI1	9 GPI2
5 GPI3	

where TX/RX are data from/to the unit respectively.

For unbalanced connection to a standard PC serial port, wire the following cable,

	PC End		SMS End
	Free D9 Socket		Free D9 Plug
RX	2 -----	2	TXA(-)
TX	3 -----	8	RXA(-)
GND	5 -----	1	GND

This assumes PC has D9 rather than D25 connection.

Please Note: The serial connection is deactivated if an Ethernet cable is plugged into any device (linked).



Ethernet Port:

An Ethernet port is available for network connection, to allow control and monitoring of the unit through a web browser interface. Power over Ethernet (PoE) is fitted as standard and will run the PDU electronics in case of power failure or extended brownout.

Optional Dallas/Maxim 1-Wire™:

An port is available to connect external Dallas/Maxim 1-Wire™ environmental sensors.

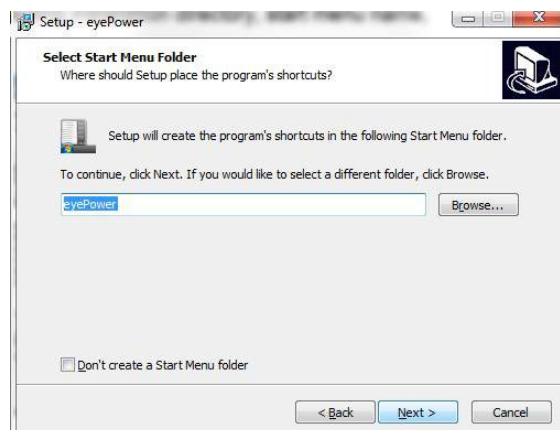
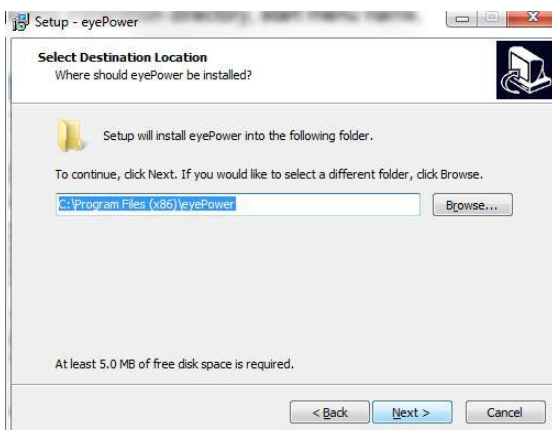


Software Installation:

Download eyePower Software from www.eyepowerlimited.co.uk - support menu top right of the screen. Extract the zip file and double click on the setup.exe file, confirming that you wish to install eyePower Software on your computer. The Setup Wizard will start, click Next to continue and confirm the License Agreement. The prompts that follow are typical for any Windows software installation, selecting installation directory, start menu name, desktop icons etc.

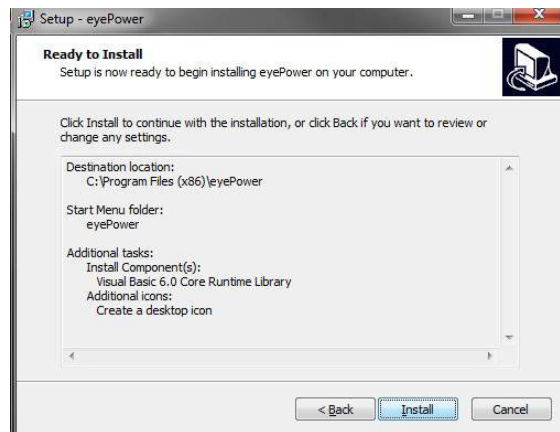
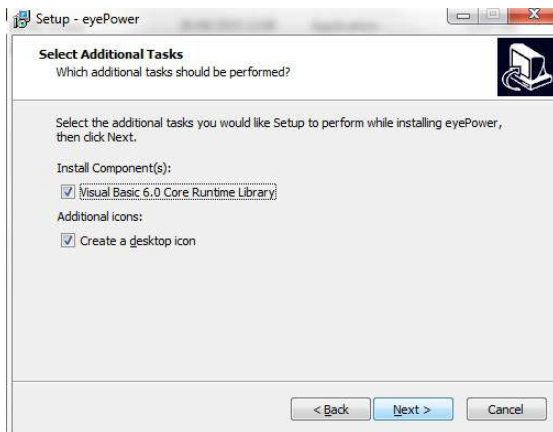


The default installation directory is C:\Program Files\eyePower. The default start menu folder is eyePower. Both of these items can be changed.





An Additional Tasks window is displayed where you can select whether to install the VB6 Core Runtime Library and Create a desktop Icon. You should install the Core Runtime Library, but the desktop item is optional. A Window will be displayed summarising what is about to be installed.



Once completed, a window will be displayed giving you the option to run the eyePower Software. Select Finish to complete the installation.



eyePower Software is now installed on your computer.



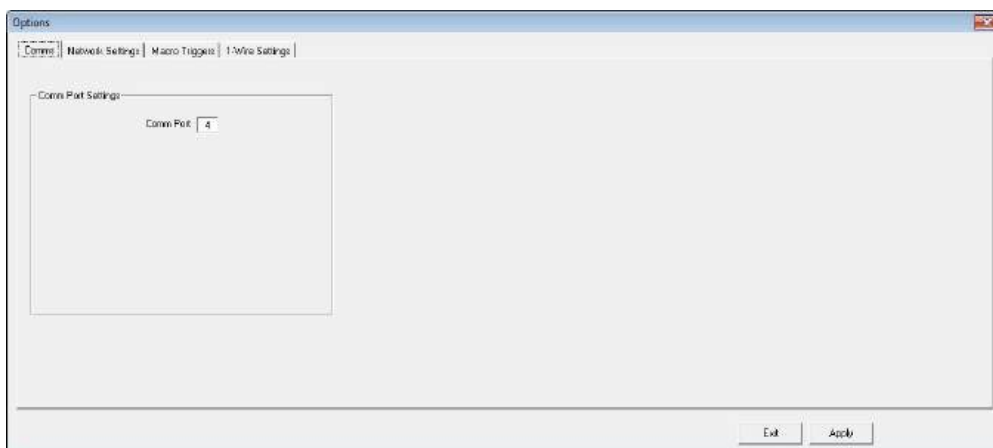
Software Setup:

First Run:

Run the software using your preferred start button or desktop icon.

The first screen you will see is the Options screen, which will allow you to set the serial com port. Normally this screen must be selected from the top of the main screen drop down tools menu.

The first option is to select a valid serial port, without which eyePower Software can not run. If you are using a USB to Serial converter, this must have been installed and be plugged into the computer before running eyePower Software.



Options: Serial Port setting.

After setting the com port you should click 'Exit' to return to the main program screen and start communication with the units – look forward in the manual to Unit Setup.

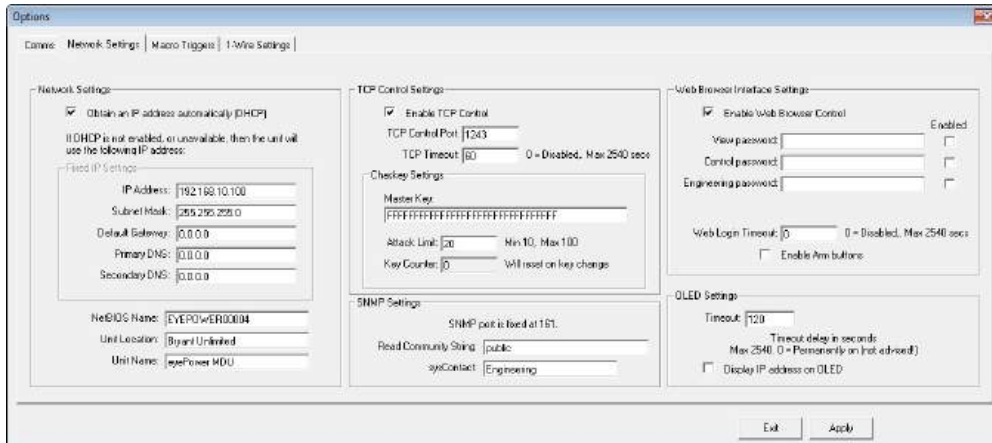
On the mains screen there are two indicators top left, TX and RX. TX will be green for a good serial port, RX will be green for good data returned from an PDU, which proves that the cable is wired correctly.

You can then revisit the Options tab to continue configuring eyePower Software, although these other options can be edited later.



Option / Network Settings Tab:

This tab allows you to set the parameters to allow you to connect to your eyePower PDU through your network using the web browser interface.



Options: Network Settings.

By default, the PDU is set up with DHCP enabled, so it automatically picks up an IP address from your DHCP server. The PDU has a default fixed IP address set to 192.168.10.100, so you can connect from your computer directly by plugging an Ethernet cable between the two. The PDU Ethernet interface is auto-MDIX, so you do not need a crossover cable. However, you will need to set your computer to be on the same IP range (192.168.10.xxx).

Network Settings section:

Obtain an IP address automatically (DHCP): Unticking this check box will allow you to set your own fixed IP address, default gateway etc.

IP Address: Network address for the eyePower PDU.

Subnet Mask: The subnet mask, normally 255.255.255.0

Default Gateway: IP address of the gateway for network traffic destined to other networks or subnets.

Primary & Secondary DNS: IP address of the name server(s) for your network.

NetBIOS Name: The default setting for the NetBIOS name is EYEPOWERxxxxx. The last 5 digits are the last 5 digits of the unit's serial number. You can change this NetBIOS name to be whatever you like up to a maximum of 14 characters, avoid spaces and lower-case characters. You may be able to connect to the eyePower PDU by typing the NetBIOS name into your web browser address bar.

Unit Location and Unit Name: These fields are available for you to give a location and name to each PDU on your network, 'Main CAR' and 'Rack 17' for instance. These names will be displayed at the top of the eyePower software screen and also in the web browser interface.



TCP Control Settings section:

Enable TCP Control:	Ticking this check box enables PDU control over TCP using third-party control systems. (Default is ticked)
TCP Control Port:	The port (default 1243) to connect to the PDU over TCP.
TCP Timeout:	The timeout value for the TCP control port in seconds (default 60), which can be set in multiples of 10 seconds up to a maximum of 2540, after which the port will close unilaterally if it hasn't received any commands from a controller. A value of 0 (zero) will disable this feature.
Master Key:	The master 128-bit Chaskey key that is required for authenticated control of an eyePower PDU by a third-party control system (default 16 x FFh = disabled).
Attack Limit:	The upper limit for badly authenticated commands received (default 20), after which all TCP control is disabled.
Key counter:	The current value of the key counter (read only).

For more information about Chaskey authenticated control of eyePower PDU, please request a copy of the 'Security of eyePower Ethernet' document from eyePower Limited.

SNMP Settings section:

Read Community String:	The Community String for use with SNMP V2c monitoring of an PDU.
sysContact:	The textual identification of the contact person for this managed node, together with information on how to contact this person.

Web Browser Interface Settings section: (Not currently enabled)

Enable Web Browser Control:	Ticking this check box will enable control of the eyePower PDU through its web browser interface. (Default is ticked)
Passwords and enabled:	The Web Browser Interface will have three different levels of user access, View, Control and Admin. If an Admin password is set, this will also have to be entered by anyone connecting to the unit using our eyePower TCP Config software over the network.
Web Login Timeout:	The timeout value for the Web Browser Interface login in seconds (default 0 (zero)), which can be set in multiples of 10 seconds up to a maximum of 2540, after which the user is logged out if they haven't clicked a command button in the Web Browser Interface. A value of 0 (zero) will disable this feature.
Enable Arm Buttons:	Ticking this check box will display Arm buttons in the Web Browser Interface to make control of outlet relays and macro triggers a two click process. (Default is ticked)



OLED Settings section:

- Timeout:** The timeout value for the front panel OLED screen in seconds (default 120), which can be set in multiples of 10 seconds up to a maximum of 2540. A value of 0 (zero) will leave the OLED screen on permanently. This is not advised as like all display technologies, OLED screens have a finite lifespan.
- Display IP address on OLED:** Enables a page on the front panel OLED which will display the current IP address of the PDU.

Once you have set the Network Settings, you must click 'Apply'. Then you can either click 'Exit' to return to the main program screen or select another Options Tab to continue configuring eyePower.

These settings will only be applied to the PDU Ethernet interface after it is reset. Ethernet Reset can be accessed through the 'Unit' menu on the PDU front panel display.

Option / Macro Settings Tab:

As described later in this document, the eyePower PDU has a sophisticated macro programming language built into each unit allowing you to pre-program relay on-off sequences. This tab will allow you to set up triggers to run a specific sequence by clicking a button on the Macro Triggers page of the web browser interface.

Macro	Macro Trigger Name	Address	Enable
Macro 1	Macro Name 1	10	<input type="checkbox"/>
Macro 2	Macro Name 2	20	<input type="checkbox"/>
Macro 3	Macro Name 3	30	<input type="checkbox"/>
Macro 4	Macro Name 4	40	<input type="checkbox"/>
Macro 5	Macro Name 5	50	<input type="checkbox"/>
Macro 6	Macro Name 6	60	<input type="checkbox"/>
Macro 7	Macro Name 7	70	<input type="checkbox"/>
Macro 8	Macro Name 8	75	<input type="checkbox"/>

Options: Macro Trigger settings.

- Macro Trigger Name:** A descriptive name for the macro sequence.
- Address:** The macro address of the sequence that you want to run (in Hex).
- Enable:** Allows you to enable or disable specific macros from being run through the web browser interface.

Once you have set the Macro Trigger Settings, you must click 'Apply'. Then you can either click 'Exit' to return to the main program screen or select another Options Tab to continue configuring eyePower.



1-Wire® Environmental Sensors

eyePower offers a 1-Wire® port to allow connection of environmental sensors. The 1-Wire system was invented by Dallas Semiconductor, that company acquired by Maxim in 2001, and combines both power and data on a single cable core. The "1-Wire" refers to this power/data line but signal ground is also required. The powering method is referred to as parasitic power, with sensors charging between bursts of data.

Although 1-Wire is widely used for environmental sensors, one variant is coin-sized ID devices that have been used for many years as door access control or that are often seen as personalised keys for cash registers. The technology is well proven, reliable and stable. All 1-Wire devices have a unique, factory set 64 bit address.

Sensors currently supported and sold by eyePower Limited are

- DS18B20 temperature (type T single or TS string)
- DS2438 temperature (MS-T)
- DS2438 temperature and humidity (MS-TH)

Temperature sensors based on the DS18B20 are supplied fully wired with CAT5 cable and RJ45 plugs. Options include a single sensor T or a string of six sensors TS spaced to suit the height of an equipment rack. To wire multiple T or TS with fitted plugs, the eyePower 1-Wire port should be distributed using an RJ45 parallel strip or splitter.

DS2438 was originally designed as a battery monitor, measuring temperature and voltage when integrated inside battery packs. This sensor was quickly adopted for other uses such as temperature and humidity sensors which output a voltage relative to humidity, a voltage that the DS2438 can convert. MS-T and MS-TH sensors are easily wired in a chain because the small enclosures have two RJ45 sockets to allow loop through. If combining a wired DS18B20 sensor or string and humidity sensor, for example, then the wired sensor can be daisy chained off the humidity sensor.



T-String (TS) cable with 6 x DS18B20 temperature sensors.

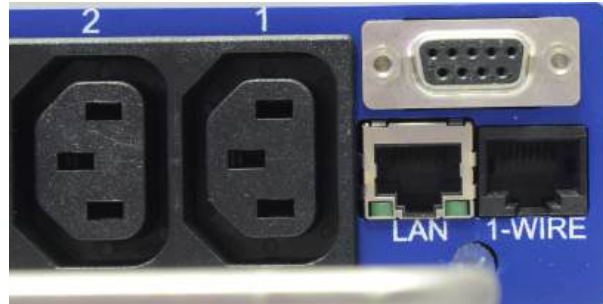


Temperature and Humidity module (MS-TH).

There are standard 1-Wire sensors that offer GPIO capability, but any future demand for GPIO is likely to be met with a custom Bryant GPIO box that would be 1-Wire compatible and still communicate on the 1-Wire bus. eyePower equipped with 1-Wire also offer four GPIOs as standard on the adjacent D9 socket.



Various cable and connector types have been used for 1-Wire but the ubiquitous RJ45 connector with unscreened CAT5/CAT5e cable is now widespread. The eyePower rear panel connector is an RJ45 socket, with the pin used for data/power different to the pins used for Ethernet data so mis-plugging between the two rear connectors is not an issue.



eyePower PDU Interface Ports.

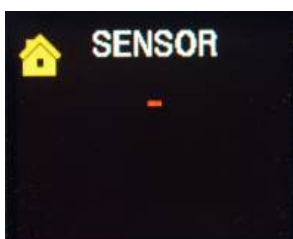
- Pin 2 1-Wire optional 5V, grounded in eyePower units to indicate use of parasitic power
- Pin 4 1-Wire data and parasitic power
- Pin 5 1-Wire ground return

Large numbers of 1-Wire devices can be connected on a shared bus (firmware V1.4.3 onwards), sensors' unique IDs are used for every message with robust cyclic redundancy checksums used to prove message validity.

Most users will not approach the limits of the 1-Wire port. It is difficult to give an exact figure for the number of sensors relative to maximum cable length. This is the same for any multidrop bus, but it is recommended to use only CAT5e network cabling and wire as a chain or, less ideal, star wired close to the eyePower unit. Do not combine chain/star arrangements and avoid stubs. eyePower supports a maximum sixteen sensors, where temperature/humidity counts as two. Sixteen sensors will work reliably if cabling is local to an equipment rack. Electrically noisy environments will limit 1-Wire cable length, but smaller numbers of sensors will work over a few tens of metres' cabling. Performance at the limit can be improved with the addition of an external power supply that injects power into the bus, rather than relying on parasitic power. Contact eyePower Limited for more details if required.

Basic 1-Wire with Single Sensor

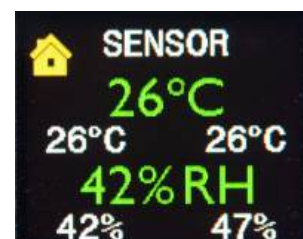
The simplest 1-Wire connection is a single sensor, which will display automatically as temperature or temp/humidity on the unit's OLED display. This is the same as software before version 1.4.3 (September 2015). The web browser interface will also display temp or temp/humidity values.



No sensor connected



Temp T or MS-T with min/max



Temp/humidity MS-TH



1-Wire with Multiple Sensors

Sensors sold by eyePower Limited are marked with the sensor's 64 bit address, although the T-String is labelled with only one of the six sensors. However, anyone buying DS18B20 sensors to wire themselves will not have the address information.

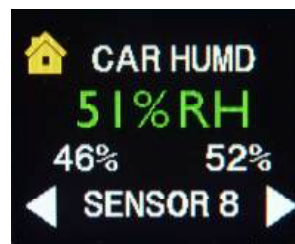
Even with the address information it would be onerous to type into the eyePower Windows program all addresses for a multi sensor system. eyePower Limited have developed a far more user-friendly method.

From now an eyePower unit holds no 1-Wire sensor addresses. For a basic system this is not an issue, a single sensor added at any time will be automatically detected and there is no need for eyePower to store that sensor's address. For multiple sensors, as sensors are plugged in turn they are added to a live table of sensor addresses. The first sensor plugged into eyePower becomes sensor 1, the next is sensor 2 etc. When strings are plugged, all six sensors are automatically added in order with the sensor closest to the RJ45 plug the first to be added. Default sensor names are SENSE1, SENSE2 etc. which are used on the local OLED and embedded web browser interface where fitted.

While at least one sensor remains plugged to eyePower, and power is maintained to eyePower, this live table is maintained. However, if the sensor chain has to be rescanned as a whole due to disconnection or mains power cycle then it will not return in the same order as plugged - the scanning order is determined by a complex branch and fork discovery technique designed into the 1-Wire standard. Therefore it is important when the sensors have been plugged in the required order that the live addresses are committed to permanent memory. At the same time each sensor can be given a more helpful name than the default SENSEx. See 1-Wire Options below.



Multiple Sensor (TS) with edited name



Multiple Sensor (MS-TH) with edited name

It may help to understand that the saved table can be cleared at any time, i.e. the table is not fixed for life. eyePower will then behave as if the sensors had again been plugged but not committed to memory. Also, the table of addresses is simply what is read first before searching for additional sensors hence new sensors can be easily added (then committed) to the end of an existing chain if there is no requirement to re-order the existing sensors.



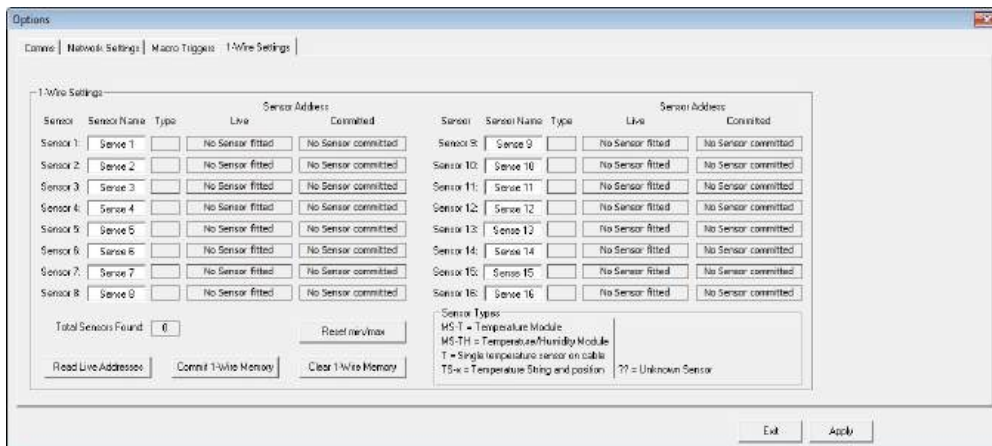
Where eyePower expects to detect sensors, either because they are in the temporary live table or have been committed to memory, any missing sensor will be noted on the OLED or web browser interface as FAULT.



Multiple Sensor (TS) with edited name

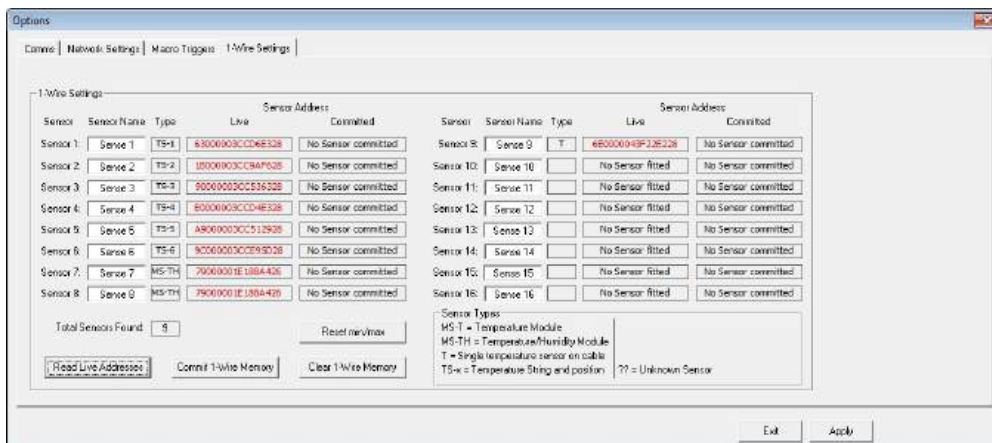
Options / 1-Wire Settings Tab

The 1-Wire Options tab, in either eyePower Software or eyePower TCP Config, can be used to commit the 1-Wire sensor addresses to memory and edit the Sensor names that are displayed on the local OLED screen and embedded web browser interface.



Options: 1-Wire Settings: No sensors fitted.

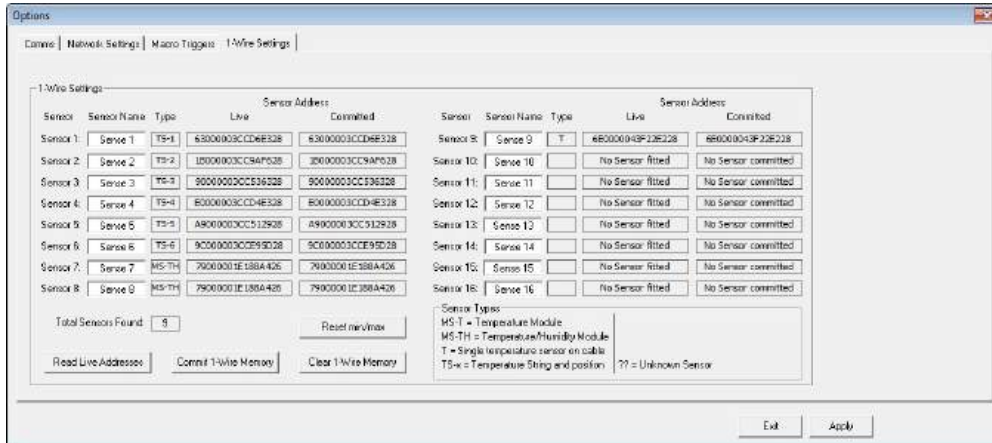
Remembering that the sensors will appear in the order that you plug them in, after you have connected all sensors, wait for about 5 seconds and click the 'Read Live Addresses' button to populate the 'Type' and 'Live' fields. The sensor addresses will be highlighted in red to show that they have not been committed to memory.



Options: 1-Wire Settings: 9 sensors fitted, but not committed.

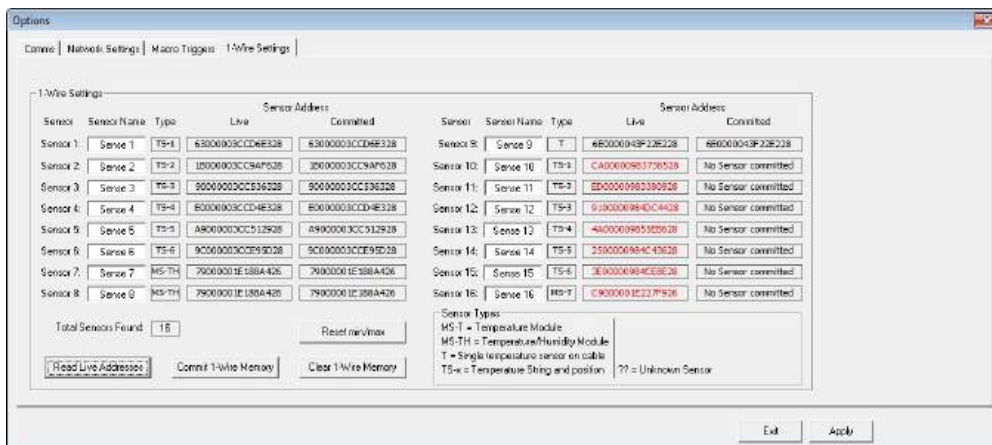


Once you can see all of the sensors in the 'Live' address fields, you can commit the 1-Wire addresses to internal memory using the 'Commit 1-Wire Memory' button. This fixes the positions of the sensors so that they will always appear in the same place.



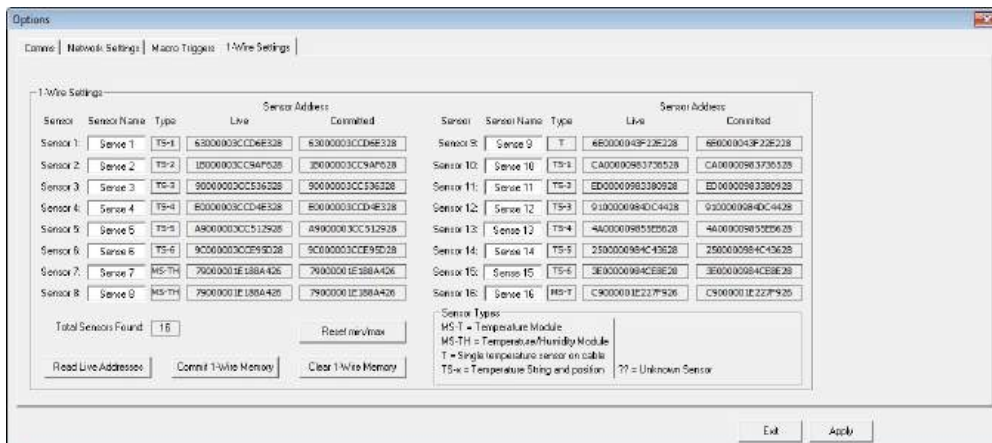
Options: 1-Wire Settings: 9 sensors fitted and committed.

Additional sensors can be added to those already committed. Plug in the new sensors, wait 5 seconds, click on the 'Read Live Addresses' button. Again, any addresses not committed to memory will be highlighted in red.



Options: 1-Wire Settings: 16 sensors fitted, 9 sensors committed, 7 sensors not committed.

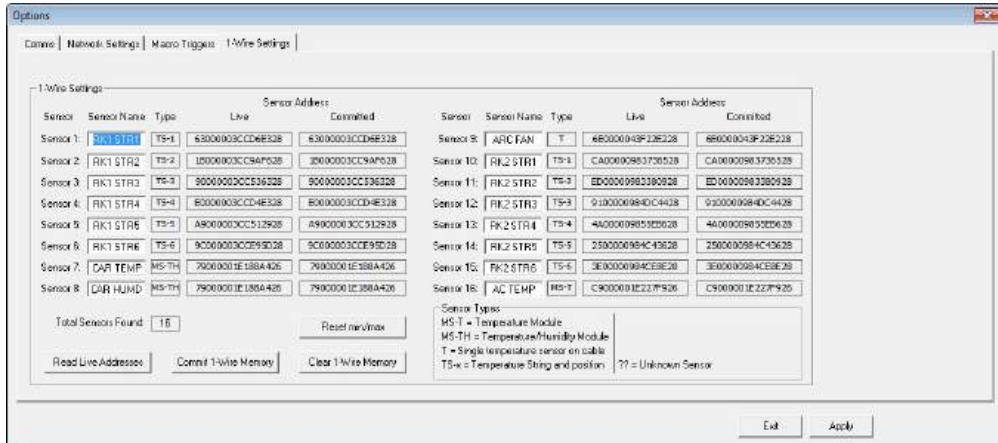
Click on the 'Commit 1-Wire Memory' button to commit the new sensors to memory.



Options: 1-Wire Settings: 16 sensors fitted and committed.

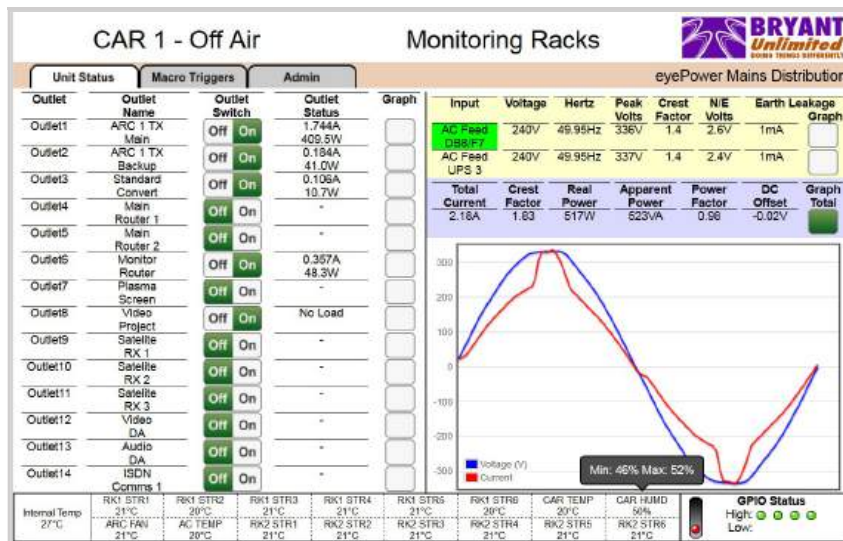


You can change the default SENSEx name (up to 8 characters) for each sensor, which will be displayed on the local OLED and embedded web browser interface (only valid if the multiple sensor display is active). Once you have entered the names, you must click 'Apply' to save the names back to the PDU.



Options: 1-Wire Settings: 16 sensors fitted and committed with Sensor Names.

Note: Before these names will appear in the embedded web server interface, you must press Ethernet Reset using the front panel button menu, or the 'Reset Ethernet Processor' button in the eyePower TCP Config software.



Optional embedded web browser interface showing multiple 1-Wire sensors with names and Min/Max tooltip.

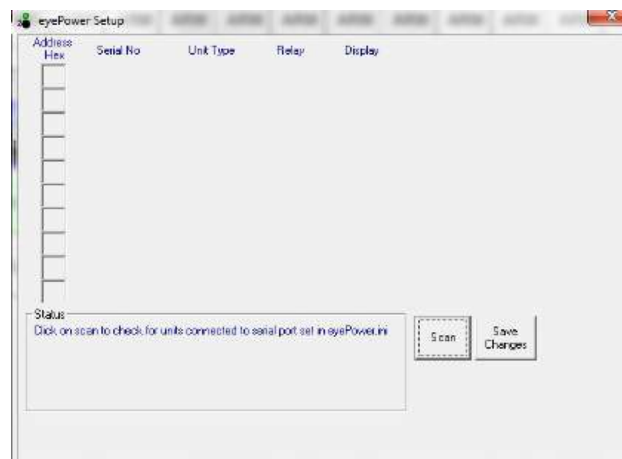


Unit Setup:

There is a unit setup page, which allows you to change an address on the multidrop RS422/485 for use with eyePower software.

However, with a single PDU and eyePower Software, this screen is useful for checking serial numbers.

From the Tools menu at the top of the screen, select Unit Setup,



Unit Setup: Pre Scan.

With the eyePower PDU connected and powered, click on the Scan button. Connected units will repeatedly acknowledge at random times up to seven seconds.

As units are discovered they are silenced, hence after ten seconds of no serial port activity, eyePower will have found all connected units.

This eyePower Software can only be connected to one eyePower PDU at a time, set on Address 00. eyePower Professional is required for connection to multiple eyePower PDU.



Unit Setup: Single unit found.



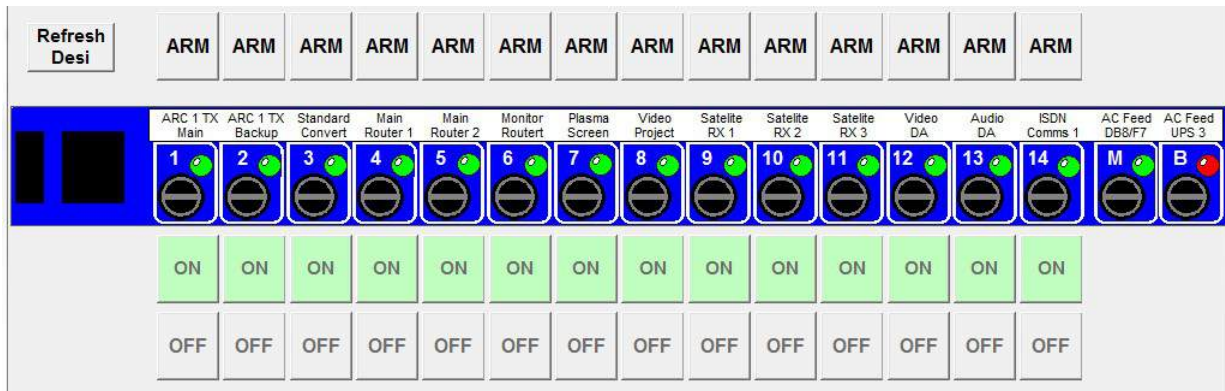
Using eyePower Software

The text of the designation strip can be changed to the PDU. When it is changed, click on 'Save Designation', but as for Network Settings, the Ethernet interface will only recognise these changes after it is reset.

Live control is simply a matter of clicking ARM for the relevant outlet, followed by ON or OFF.

The methods for Basic and Advanced setup are considered next, i.e. how the unit will operate when powered and in response to GPI stimulus. Before considering the detail, a simple explanation of the live and autonomous control options follows.

With eyePower Software running, part of the PC screen looks like this,



eyePower Software: Main control interface.

For each outlet, clicking on ARM enables ON and OFF for that outlet only. In this case, outlets 1-4 are powered although the red indicator on outlet 4 shows a blown fuse on the SMS front panel.

You may not want to control an eyePower PDU live from a PC, but want to configure it with a switching sequence and leave it to work alone. The eyePower PDU evolved from the proven eyePower Limited SMU sequential mains units, which power outlets in order with a fixed delay of 600 milliseconds. The SMU simply prevents nuisance tripping of main fuses due to inrush current. Delays in the eyePower PDU are fully configurable from 100 milliseconds to 105 minutes, for turn-on and turn-off operations, each outlet with its own unique timings. This allows complex routines, such as sequencing power to a computer server and separate hard drives or shutting down equipment gradually when mains power has failed and a UPS has limited life.

When you apply power to the eyePower PDU it knows nothing of the world. Like a personal computer, it looks to its memory for its first instruction. Until it has loaded that instruction, it will not operate any relays. If you do not program the eyePower PDU with any instructions, it will do nothing at all. It will accept live controls from eyePower Software and reflect changes on its front panel, but will not perform any autonomous actions. However, the units do leave the factory programmed to sequence on and off like a standard SMU unit so you have useable power distribution on delivery. The front panel switch will work as basic sequence



on, sequence off but this is all performed by a default macro sequence that you can view and edit. The front panel switch could be limited to control only certain outputs or none at all. It could even have its function changed based on the presence of a GPI or the number of times it has been operated.

If you do load a routine into the eyePower PDU, it may be so simple that it turns on one outlet and then stops. Not all outlets have to feature in the routine, but you have live control over all outlets available at all times if required.

A more sophisticated routine may turn on all outlets, with varying time delays between them. An example from eyePower might look like this,

	ARC 1 TX Main	ARC 1 TX Backup	Standard Convert	Main Router 1	Main Router 2	Monitor Routert	Plasma Screen	Video Project	Satellite RX 1	Satellite RX 2	Satellite RX 3	Video DA	Audio DA	ISDN Comms 1	AC Feed DB8/F7	AC Feed UPS 3
ON ORDER	1	2	3	4	5	6	7	8	9	10	11	12	13	14	M	B
	Wait 1	Wait 2	Wait 3	Wait 4	Wait 5	Wait 6	Wait 7	Wait 8	Wait 9	Wait 10	Wait 11	Wait 12	Wait 13	Wait 14		
	0.0	0.0	0.0	0.0	5.0	0.5	0.5	10.0	0.5	3.0	0.5	0.5	0.5	0.5		
OFF ORDER	14	13	12	11	10	9	8	7	6	5	4	3	2	1		
	Wait 14	Wait 13	Wait 12	Wait 11	Wait 10	Wait 9	Wait 8	Wait 7	Wait 6	Wait 5	Wait 4	Wait 3	Wait 2	Wait 1		
	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5		

RESET

eyePower Software: Basic sequence setup interface.

Two methods of sequence setup are offered, basic and advanced. Basic is shown above. When the front panel switch is switched down, the eyePower PDU will run through the on sequence, which here would power the first 4 outlets immediately then wait 5 seconds before powering outlet 5, with subsequent varying delays for other outlets. Outlets can be powered in any order, and de-powered in any order.

The 'off' sequence is triggered by switching the front panel switch up.

The LED on the front panel switch will flash when the eyePower PDU is running a sequence.

This is the Basic Setup, which will satisfy many applications. Macro programs are generated for uploading to the eyePower PDU, but a full understanding of the operation is not required.

For the advanced user the Advanced Setup allows custom macro programs to be scripted. Limited experience of writing a computer program and a basic knowledge of hexadecimal (9 is followed by A not 0) is probably required. Some example macro routines are included with eyePower Software. Having uploaded the above Basic Setup to an eyePower PDU, subsequent downloading into the Advanced Setup page shows the macro routine to achieve the required sequence-on.

It begins by disabling the GPIs, which allows definition of GPI interrupts before any can be acted upon. Then this is followed by settings for the front panel switch, jumps to addresses 1A / 2A for On / Off respectively. Then finally. GPIs are enabled for the duration of the program.



This is the Basic Setup, but Advanced editing allows the user to define an entirely custom program including setting of GPI inputs and outputs.

The screenshot shows the 'WinPower Advanced Editing' window. At the top, there are 14 outlet status indicators labeled 1 through 14, each with a green 'ON' light and a red 'OFF' light. Below these are two rows of buttons: a top row of 14 green 'ON' buttons and a bottom row of 14 red 'OFF' buttons. To the right of these buttons are 'CLEAR MEMORY' and 'STANDARD SETTINGS' buttons. On the left side, there are control buttons: 'STOP', 'GOTO', 'WAIT', 'ALL OFF', and 'ALL ON'. The main area contains a table of GPI settings and a list of macro commands.

	GPI1 LOW	GPI2 LOW	GPI3 LOW	GPI4 LOW
	GPI1 HIGH	GPI2 HIGH	GPI3 HIGH	GPI4 HIGH
	GPI1 LOW INT	GPI2 LOW INT	GPI3 LOW INT	GPI4 LOW INT
	GPI1 HIGH INT	GPI2 HIGH INT	GPI3 HIGH INT	GPI4 HIGH INT
	GPI1 INHIBIT	GPI2 INHIBIT	GPI3 INHIBIT	GPI4 INHIBIT
	GPI DISABLE	ON/OFF ON INT	COUNT1 LOAD	COUNT2 LOAD
	GPI ENABLE	ON/OFF OFF INT	COUNT1 DEC	COUNT2 DEC
		ON/OFF INHIBIT	COUNT1 INC	COUNT2 INC

```

10 03 00 GPI Disable
11 D2 1A Set on/off switch on interrupt address 1A
12 D3 2A Set on/off switch off interrupt address 2A
13 62 3A Set GPI1 as input, low interrupt address 3A
14 72 4A Set GPI2 as input, low interrupt address 4A
15 63 19 Set GPI1 as input, high interrupt address 19
16 04 00 GPI Enable
17 00 00 Stop
18 00 00 Stop
19 00 00 Stop
1A 40 00 Turn on outlet 1 after 0.0 seconds, skip if already on
1B 41 00 Turn on outlet 2 after 0.0 seconds, skip if already on
1C 42 00 Turn on outlet 3 after 0.0 seconds, skip if already on
1D 43 00 Turn on outlet 4 after 0.0 seconds, skip if already on
1E 44 32 Turn on outlet 5 after 5.0 seconds, skip if already on
1F 45 05 Turn on outlet 6 after 0.5 seconds, skip if already on
  
```

At the bottom right, there are input fields for 'Second Byte Hex' (value 32) and 'Second Byte As Time' (value 5.0 Secs). There are also 'UPLOAD', 'SAVE FILE', and 'LOAD FILE' buttons. At the bottom, there are checkboxes for 'Auto increment' and 'Trace', and a 'GOTO' field with the value 10.

eyePower Software: Advanced setup - Macro editing screen.

Before more detailed explanations of each mode, to summarise,

- Live Control** Turn outlets on and off via PC screen, outlet status visible.
- Basic Setup** Define on sequence and off sequence using none, any or all of the outlets. Outlets used, time delays and order can be different for each sequence. By default, the front panel switch will trigger the on/off sequences or this can be done from eyePower Software.
- Advanced Setup** Program custom macro routines that turn outlets on or off as required, manipulate GPIs as outputs or inputs that change the macro routine that is run. Other macros not used in the basic setup allow GOTO or counting, for example to limit the number of times a macro sequence is run.



Basic Setup:

To enter basic setup from the live control screen, click on



This will hide the arm buttons and transform the on/off buttons for order and delay setting rather than outlet live control.

Before outlining how the on/off sequences are modified, a summary of how they are used is,

Power applied to unit	Nothing appears to happen although the front panel OLED display will turn on to the home screen
Switch down	Unit will sequence up using On Sequence
Switch up	Unit will sequence down using Off Sequence

Importantly, both sequences don't have to be programmed. If only a complicated on sequence is required, for example gradual start-up of a computer and ancillary hard drives, then only the on sequence need be entered. The off sequence lists would be best left empty.

To change the sequence orders, click on one of the two order buttons for the sequence to be changed.



Then just click on the now blank buttons associated with each outlet,



Starting with 1, the buttons will be labelled up to sequence order 14, although once again note that none, some or all of the outlets can be in the sequence.

Type into the box on each button the required time delay between 0.1 and 6300 seconds, or zero. The unit makes all timings to 0.1 seconds accuracy but the time required is stored in less memory by making the following assumptions about the delays,

- 0.1 to 6.3 seconds in 0.1 second steps
- 1 to 63 seconds in 1 second steps
- 10 to 630 seconds in 10 second steps
- 100 to 6300 seconds in 100 second steps

eyePower Software automatically calculates the nearest allowable value for any time entered onto a button.



The Wait check box on each button is a shortened name for 'Always Wait'. Normally delays are ignored if the outlet is already in the required state – the macro routine moves straight on to the next instruction. If the check box is ticked, delay times are always used even if the outlet is already in the required state.

The Standard Settings button fills the sequence buttons and delay boxes with,

On order Relays 1-14 with 0.5s delays for inrush

Off order Relays 14-1, 0.5s second steps

After defining settings as required, click on



This will store the settings in the eyePower PDU. However, complete re-powering is recommended to prove the unit before it enters service. Note if no relays are enabled, it will take some time for the eyePower PDU power supply to discharge when the unit is disconnected. Disconnecting and reconnecting the eyePower PDU quickly may cause confusion as the macro code will not restart. Look at the eyePower Software display where it is clear (red RX indicator top left) that the unit is offline before repowering.

Advanced Setup:

Enter the Advanced editing mode by clicking on Advanced setup. If the previous unit settings were basic, these will be displayed. However, do note if they are uploaded again from the advanced screen they can not be edited in the basic screen which will still work but for input only.

It is suggested demonstration setups are loaded first,

Click on Load File and select sample macro routine 'sequential start up only.sms'. This is a macro routine to power relays 1 to 14 in order like a simple sequential mains unit. Click on upload and, when complete (message at top of screen), disconnect the eyePower PDU, wait, then reconnect.



Assuming the eyePower PDU sequenced on as expected when the front panel switch is switch down, look at the macro routine listing,

```
10 03 00 GPI Disable
11 D2 1A Set on/off switch on interrupt address 1A
12 D3 2A Set on/off switch off interrupt address 2A
13 04 2A GPI Enable
14 00 00 Stop
15 00 00 Stop
16 00 00 Stop
17 00 00 Stop
18 00 00 Stop
19 00 00 Stop
1A 40 00 Turn on outlet 1 after 0.0 seconds, skip if already on
1B 41 00 Turn on outlet 2 after 0.0 seconds, skip if already on
1C 42 00 Turn on outlet 3 after 0.0 seconds, skip if already on
1D 43 00 Turn on outlet 4 after 0.0 seconds, skip if already on
1E 44 32 Turn on outlet 5 after 5.0 seconds, skip if already on
1F 45 05 Turn on outlet 6 after 0.5 seconds, skip if already on
```

The first column, 10 to 1F is the macro address for each line of macro code. When the eyePower PDU is first powered, it always looks to address 10 for its first macro command. In this case it is GPI Disable. Commands follow on in turn, until stop is reached at macro address 14 (hexadecimal).

The green numbers are the two hexadecimal values stored in the eyePower PDU for each macro command. Using eyePower Software, knowledge of these numbers is not important.

Click the Trace check box. The red outline box will jump to location 38 as it is theoretically at the end of it's off sequence. Switching the front panel switch down, the red outline box should follow the macro code currently being executed and stop at location 28.

Disable trace.

To write an experimental program, click on Clear Mem to start with a blank program list. Click on the top (10) program line, i.e. where the eyePower PDU will look for its first command. Enter delays into the time box,

Second Byte As Time

Secs

Always wait

The time will be red until OK is pressed, which calculates the hexadecimal equivalent and displays it in the box above. 'Always wait for delays' is explained for the basic setup.



Ignoring the grey buttons to the left of the program list, enter a sample sequence of outlets turning on and off using the green/red buttons associated with each outlet. To select the next line, either click on the line required or check the Auto increment box, which will advance one line every time a macro is programmed.

Upload the sample program then disconnect, wait, reconnect the eyePower PDU and prove your basic programming skills.

The grey buttons that have not been used provide the following macro commands,

STOP	Halts program execution, could be restarted by a GPI if programmed
GOTO	Goto macro address, set 10,11,12 etc. by first entering in 'second byte as hex' box and clicking OK. Then click GOTO
WAIT	Waits for time pre-entered (+OK) in time box
ALL OFF	Waits for time pre-entered (+OK) in time box then turns off all outlets
ALL ON	Waits for time pre-entered (+OK) in time box then turns on all outlets
GPIx LOW	Set GPIx as low output
GPIx HIGH	Set GPIx as high output
GPIx LOW INT	Set GPIx as input. If GPIx is already low or goes low in the future, macro execution will jump to address specified by first entering in 'second byte as hex' box and clicking OK.
GPIx HIGH INT	Set GPIx as input. If GPIx is already high or goes high in the future, macro execution will jump to address specified by first entering in 'second byte as hex' box and clicking OK, Again for front switch.
GPIx INHIBIT	Inhibit GPIx effect as an input for time pre-entered (+OK) in time box. When time expires any GPI level change during inhibit will be effective.
GPI DISABLE	GPI input and front switch interrupts are disabled allowing sequences to complete before interrupts re-enabled. This is an important command that should be issued before setting several interrupts or as the first command in an interrupt routine to ensure predictable behaviour.
GPI ENABLE	Re-enable after disable above, when routine is complete, or new interrupts will not be processed. By default enabled at power on.
ON/OFF ON INT	If the front panel on/off switch is already in the 'on' position or is switched to the on position in the future, macro execution will jump to address specified by first entering in 'second byte as hex' box and clicking OK.
ON/OFF OFF INT	If the front panel on/off switch is already in the 'off' position or is switched to the off position in the future, macro execution will jump to address specified by first entering in 'second byte as hex' box and clicking OK.
ON/OFF INHIBIT	Inhibit the on/off switch from any effect for time pre-entered (+OK) in time box. When time expires any on/off switch position change during inhibit will be effective.
COUNTx LOAD	Load counter x with a number pre-entered in 'second byte as hex' box
COUNTx DEC	Decrement counter x, if it reaches zero then jump to macro address specified by first entering in 'second byte as hex' box and clicking OK
COUNTx INC	Increment counter x, if it reaches 255 then jump to macro address specified by first entering in 'second byte as hex' box and clicking OK



Other sample .sms files:

eyePower Counter demo.sms

Loads counter 1 with 5, turns outlet 1 on then off, decrements counter, carries on switching outlet 1 until counter is zero. Then turns on outlet 14 before stopping.

This is a very simple demonstration, but the counter may be used to limit the number of times equipment is restarted after power failure, before triggering an alarm as a GPI or connected to a mains output.

GPI 1 to 4 operate outlets 1 to 4 with disable used to ensure completion .sms

The sequence starts by disabling interrupts, so that interrupt definition can complete without interruption. Once re-enabled, the current state of GPIs will direct program flow, Each GPI routine starts by disabling further interrupts. This ensures completion of that GPI sequence, before re-enabling other GPIs.

Not all applications will use GPI Disable. It may be important to allow GPIs to override other actions.

Configuration file eyepower.ini:

Normally set via the user screens, advanced users may prefer to edit this configuration file directly, which is found in the eyePower installation directory. It should be possible to simply 'double click' on the filename eyepower.ini and Windows™ will open the file in Notepad. The first lines read,

```
[Comms]
CommPort=n
```

where the value n should be edited to be the correct PC serial port number (must be between 1 & 16).

Other entries in the ini file, for example relating to SNMP are retained for compatibility with the older SMS units.

There are further entries that relate to eyePower Professional and future eyePower development, which can be ignored for single unit operation.