



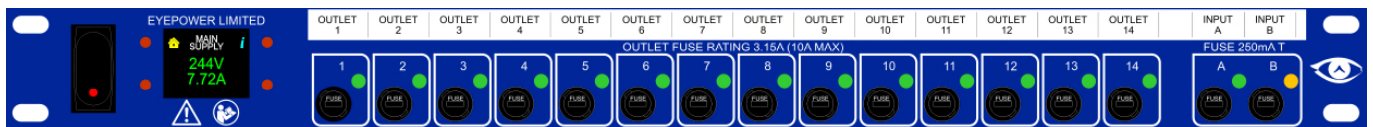
eyePower Limited

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eyePower 214 changeover PDU User Manual

Version 1.0

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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



Features:

Inlets / Outlets

Dual inlet changeover fitted with two 16A powerCON connectors. The unit is rated for 16A total, no need for a front panel breaker which would affect fusing discrimination with the upstream 16A supply. Fourteen 10A IEC outlets are fitted, together with dual supply, RS422/485, Ethernet and external sensor connections are on the rear panel.

Internal Distribution

eyePower Limited PDU do not rely on PCB tracks for power distribution, all units are hand wired with crimped cables and soldered busbars. Installation fault currents can be surprisingly high, a 10A fuse can pass 30A for 30 seconds worst case. I²R heating of the distribution is then 9 times higher than normal running. PCBs can be damaged in this time with failure possibly in the long term rather than immediate. Even for short circuits connected to the unit, technical installations often have low loop impedances with high fault currents of kA that the distribution must withstand before the fuse ruptures.

Fusing

Outlets are 10A rated to the unit maximum of 16A. Factory fit is 3.15A fuses which suits most loads and provides clear discrimination between supply and outlet fusing. Customers can uprate fuses as required to maximum 10A.

Relay Switching

Relays are high quality, 20A rated with a tagged output wired direct to the 10A IEC outlets. Standard relays are preferred, this latest unit reduces relay power consumption and heating by 70%. Relays hardly get warm using PWM, a technique now favoured in the automotive industry to save energy.

Voltage Presence Detect

Supply voltage is detected after each fuse and after each relay, using a circuit which consumes 0.25W total for over 30 measurements. Some other designs consume this much power for each presence detect and do not check both fuse and relay.

Current Measurement

Current measurement is performed with high sensitivity current transformers. Unlike cheap, PCB mounted shunt resistors there are no heating issues and reliability is maintained by simply passing the outlet cable through the centre of the transformer rather than routing via PCB. With no direct connection to the supply, there are no issues when measuring current throughout supply voltage disturbances. Currents from mA to 40A (70A peak) can be monitored.

1-Wire™ Sensors

Dallas/Maxim sensors can be connected. Sixteen are supported for local connection, allowing for temperature, humidity and GPIs in addition to the standard four GPIs if required.

Macro Programs

eyePower PDU have at their core user programmable sequences for outlet and GPI interactions. This gives the web interface access to complicated sequences to meet any requirement. Even the front panel switch can access these macro routines, so the switch is extremely versatile. The unit can also redefine GPI and switch use according to live requirements.



Monitoring System

Fully equipped, eyePower uses 22 separate 24 bit, oversampling A-D converters together with a number of 10 bit ADC to measure diverse parameters including neutral/earth, residual current and "DC on the mains". You cannot manage what you cannot measure and eyePower gives unparalleled access to mains power information. Even after years of work the development team are still surprised by loads that exhibit strange behaviour when monitored on a graph. Traditional current and voltage figures do not give a clear picture of the dynamic behaviour of modern equipment and eyePower Limited are looking forward to further software developments for a hardware platform that will extract useful information about the state of the user's power distribution.

Discrete Microcontrollers

Relay control, display and measurement, Ethernet are all performed by separate microcontrollers. It would be a simple matter to combine all the program code into one processor, but dedicated microcontrollers increase reliability. Ethernet code is particularly complicated and should not be combined with basic relay functions, however the processors do communicate constantly.

OLED Display

A full colour front panel display allows menu-driven access to unit status that will change over time to meet users' needs.

Ethernet (option)

Custom developed 10/100Mbit Ethernet module with PoE as standard that can power the entire unit and provide status data through power failure or brown out. The powerful, 32 bit processor will meet the demands of future developments. There is a software road map with upgrade policy and user requests will be considered to develop the different methods of access and control. The initial web browser with dynamic voltage/current graphs demonstrates the standard of features that can be expected.

Web Browser Interface

eyePower PDU, fitted with optional Ethernet port on the rear panel, have an inbuilt web server to provide a sophisticated Web Browser Interface (WBI) for control and monitoring across a network.

Controller PSU

The PSU is high quality, a linear supply with over-specified components that runs much cooler than a cheap switched mode unit with limited life. Linear supplies are more tolerant to supply harmonics and voltage dips.

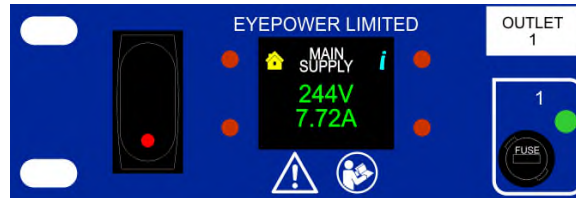
Manufacturing Standards

The units and sub-assemblies are manufactured in the UK to a very high standard using the highest quality components. Design and manufacturing teams take pride in the units they produce. Compliance with current European standards is assured, which unfortunately is not true for all PDUs on the market.



Operation

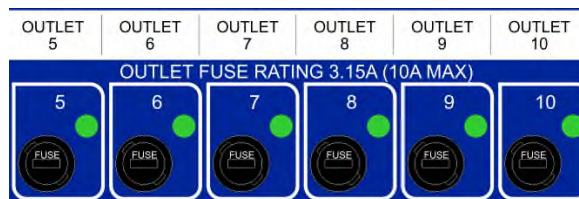
Front Panel



On the left of the front panel is a toggle switch and an OLED display with four buttons.

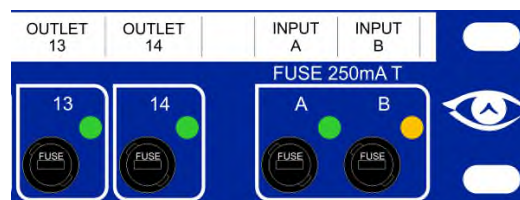
The switch is programmed to run sequence up and sequence down macros making it work in a similar way to an on/off switch. However, it should be noted that the macros can be user modified using external software to make the toggle switch operate completely differently, or not at all.

The OLED display gives access to all the measurements available in the PDU subject to the model specified. Operation of the front panel buttons should be self-explanatory, following the icons/text on the display next to each button.



Each outlet is individually fused and supplied fitted with 3.15AT HRC ceramic fuses. Individual fuses can be updated to a maximum of 10A subject to the unit maximum of 16A.

If a fuse fails, the associated LED will turn red and the rest of the outlet LEDs will flash (see below). Note that flashing can be disabled in the options using configuration software.



On the right of the front panel are the fuses and LEDs associated with the Inlets. The fuses are only for the internal PSU components, they are not in the distribution chain. Appropriate protection should be installed in the supply to the PDU.



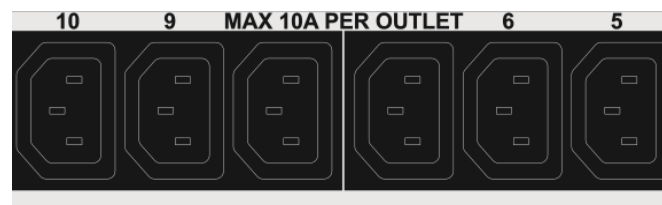
Rear Panel



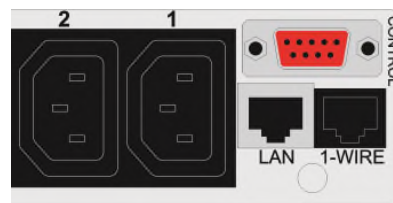
On the left of the rear panel are two 16A powerCON inlets and a supplementary earth stud.

The supplies to the PDU should be protected by a suitable disconnect devices as specified by the Electrical Consultant as the unit itself does not have any fusing in the distribution chain. Note that powerCON connectors are 'connectors without breaking capacity' so the supply should be turned off before disconnecting.

A supplementary earth stud with M4 lock nut is supplied for installations where earthing via the supply inlet cannot be guaranteed.



The unit is fitted with 14 IEC outlets rated to a maximum of 10A per outlet subject to the unit maximum of 16A. Cable retention is facilitated by a cable tie bar (not shown).



On the right of the rear panel are a 9 pin D female, an RJ45 1-Wire[®] socket and optional RJ45 Ethernet socket.

The 9 pin D socket can be used for serial control and monitoring, setting options, macro programming and firmware update. The port is RS422/485 but can be used RS232 for short cable runs. The connector is not a standard pinout, so will require the user to make a custom serial cable. Please download the latest technical manual for more information.

eyePower offers a 1-Wire[®] master port to allow connection of up to 16 environmental sensors. Please contact eyePower Limited for more information.

The optional 10/100Mbit auto-MDIX Ethernet port with PoE as standard can be used for Ethernet control and monitoring, setting options, macro programming and Ethernet firmware update. Please download the latest Technical Manual, TCP Config manual and Web Browser Interface manual for more information.

<https://www.eyepowerlimited.co.uk/eyepower-support/>



eyePower PDU LEDs and Alarms

eyePower changeover PDU have two inlets, which are labelled 'A' & 'B'. Failure of 'A' will cause changeover to 'B'. On return of 'A', when both supplies have been stable for ten seconds and the two supplies are synchronous for one mains zero crossing, an eyePower PDU will change back to 'A' automatically. Note this delay can be changed using eyePower Limited's Windows software via the serial port.

When the audible alarm is enabled, the unit will beep, and output LEDs will flash to amber to attract attention to an alarm condition. The first press of any OLED button will silence the alarm but continue to show the cause of alarm on the front panel inlet LEDs. A second press of the button will cancel the visible indication if the warning is historic, for example supply failed. The visible warning will remain if the problem remains, e.g. red channel LED to show fuse failure.

When the audible alarm is not enabled, such silent alarms follow the description above after the first button press.

Possible LED warnings include faults that have never been seen in installations and only produced under R&D conditions. Warnings are included for completeness, in service units have proven extremely reliable.

A. Supply LEDs when not alarming

- A1. Off = not present
- A2. Green = present and selected
- A3. Red solid = present, standby with sync change possible in the past ten seconds
- A4. Green short flash to off = okay selected but non-sync throughout last ten seconds
- A5. Red short flash to off = okay standby but non-sync throughout last ten seconds

B. Supply LEDs when alarming

- B1. Off = not present, i.e. failed
- B2. Green short flash to red = selected but supply failed and returned
- B3. Red short flash to green = standby but failed and returned
- B4. Green short flash to red then off = B2 + A4
- B5. Red short flash to green then off = B3 + A4

C. Channel output LEDs

- C1. Off = channel off
- C2. Green = channel on and good
- C3. Red = fuse fail*
- C4. Flashing green = output on, should be off, relay stuck
- C5. Flashing red = channel on, fuse good but relay no good
- C6. Multiple channel LEDs flashing green to amber = unit in alarm mode. (See paragraph two above)

* If all channel LEDs are red then this could mean a couple of things.

1. The selected supply is wired Live Neutral reversed. This can be checked by looking at the Neutral/Earth reading on the OLED display (Input > i > ◀ or ▶ to scroll to Neutral Earth reading). On a changeover PDU, the display will alternate between 'A' supply and 'B' Supply readings.
2. The PDU does not have a good earth.



Preferred Supply

eyePower changeover PDU are designed for use on two synchronous and phase coherent supplies. The 'A' supply is preferred, in that it will always switch back to the 'A' supply if it is present.

Change from 'A' to 'B' occurs on loss of the 'A' supply. Change from 'B' to 'A' occurs when both supplies have been stable for at least ten seconds. If non-sync supplies are slowly "running through" at different frequencies, i.e. not locked out of sync, then change to preferred will occur when the two supplies are coincident. This could be a long time, but as one example, free-running generator vs mains can be surprisingly quick.

If the two supplies are permanently out of sync, i.e. two phases of a three-phase supply, then the 'A' to 'B' operation will work as normal on 'A' supply fail, but the unit will never switch back to the 'A' supply when it returns. Switching over to the 'A' supply can be forced by removing the 'B' supply inlet completely (preferred method) or removing the fuse marked "B" on the front panel. Note the latter does not disconnect the 'B' supply, but makes the internal electronics think that it has disappeared.

Note that eyePower Limited do not recommend operation of the current eyePower PDU in this manner and take no responsibility if the switch between two non-sync supplies causes any damage to connected equipment or causes one or both supply breakers to trip.

A future release of firmware will allow for non-sync switch back to the 'A' supply. When the 'A' supply returns, the unit will wait a further minute for the opportunity to make a sync change, even if the supplies are "running through" at different frequencies. After the further delay, non-sync changeover to preference is enforced with a gap created in the supplies. This carries certain risks, to greatly minimise the change of arcing between supplies all input and output relays are briefly opened hence a total of nineteen relays operate at the same time.

Notes:

THIS UNIT MUST BE EARTHED. THIS UNIT IS DESIGNED FOR EUROPEAN STANDARD TYPE TN MAINS WITH NEUTRAL NEAR TO SAME POTENTIAL AS EARTH. 220V/240V NOMINAL.

INLETS ARE 16A AND ALL INTERNAL WIRING IS RATED FOR 20A MAXIMUM, UPSTREAM SUPPLY MUST BE FITTED WITH FUSE/BREAKER NO GREATER THAN 16A.

OUTLET FUSES ARE 3.15A AS SHIPPED, OFFERING REASONABLE DISCRIMINATION AGAINST UPSTREAM SUPPLY FUSING AND HIGH ENOUGH CURRENT RATING FOR MOST TYPICAL LOADS. USERS CAN UPRATE OUTLET FUSES TO 10A MAXIMUM, HIGH RUPTURE CURRENT (HRC) 20mm CERAMIC. **GLASS FUSES SHOULD NOT BE USED.**

For more information and software relating to eyePower PDU, including how to perform an Electrical Safety Test (PAT test), please visit <https://www.eyepowerlimited.co.uk/eyepower-support>.