VERSION 1.3

FEBRUARY 1, 2019

ULTIMATE POWERBOX

PRODUCT MANUAL

BY PEGASUS ASTRO

INTRO

Thank you for purchasing our Pegasus Astro - Ultimate Powerbox. If you are tired of carrying multiple power packs and dealing with a mess of power and data cables, our Ultimate Powerbox, a sophisticated power control unit, is the absolute solution. Our idea is one enclosure that makes available a sufficient number of amperes. No cables disturb the movements of the mount and the instrument, only the main power cord and one USB data cord comes to the Ultimate Powerbox from which branch off the other cables powering all devices.

CONTROLLER CARE

- Controller is protected from moisture but it is not waterproof and it should be kept clean and dry.
- Excessive moisture for long periods of time can damage electronics and connectors
- Do not allow solvents or chemicals to come into contact with the device
- Store controller indoor in a dry room when not in use for long time
- Do not touch the internal components as they may get hot when in use

DESIGN OVERVIEW

POWER INPUT

Controller can accept voltage ranges from DC 9V – 14V *. We strongly recommend to use a branded linear or low ripple power supply unit of **12V-13.8V DC**. A 13.8V lead (or calcium/lead) battery is also recommended. Please use a power supply that can provide at least 6 Amps of current. For your observatory needs you might need 10-15Amps of current.

Unit has been designed with reverse polarity protection. If you accidentally reverse the power source polarity, the unit will cut the power. The controller is fitted with a 2.5mm centre positive DC power connection which powers on the unit.

Insert the 2.5mm plug on the DC power cable. Controller will initialize and the status LED will turn red after 4 seconds. *(The 4 seconds wait time duration is on purpose for a new firmware upload process)*

* Above 14V the Ultimate Powerbox (Firmware 1.4) will shut down all output ports to save your precious equipment from overvoltage. Firmware 1.5 allows voltage up to 14.5V before shutting down the output ports.

USB2 HUB

USB2 Hub implementation includes an Industrial Temperature Rated (-40°C to +80°C) USB 2.0 Hi-Speed 7-Port Hub Controller. Six (6) USB 2.0 High Speed ports are available at the back of the controller. The 7th port is used for the controller communication.

Moreover, the 6th port can provide 3 Amps of current. If you have a device (such as a Compute PC Stick) that requires more than 500mA please use only the 6th port. Moreover, this port is always turned ON. Port is "**artificially**" colored at the bellow image.

USB2 High Speed Ports can turn ON or OFF via the supplied software.
*(Please notice: there is no option, in Windows OS, to selectively switch a port on / off. All ports, except 6th, switched ON / OFF **globally**)*

*Hint: There is an option to selectively switch ON/OFF individual USB ports in Linux and OSX: Please check: **https://github.com/mvp/uhubctl***

DATA CONNECTIVITY

A USB2 Type B port at the back of the unit accepts the USB cable for PC connection. A type B USB cable is supplied in the package.

POWER OUTPUTS

Ultimate Powerbox has four (4) 12V DC unregulated output. Each output is driven by a Smart Mosfet, capable to deliver up to 6 Amps of current. These mosfets incorporates a broad range of smart features like diagnose and protection.

Each 12V power output has the following specifications:

Voltage type	**Port**
12V-13.8V DC unregulated	2.1mm DC Power Jack / 6 Amps Each

DEW HEATER OUTPUTS

Device includes two (2) channel dew heater outputs. Like power outputs, each dew heater output includes same Smart Mosfet types, capable to deliver up to 6 Amps of power.

A smart function exists in the controller's firmware: The controller consults the environmental readings of the dew point and automatically adjust power of the Dew Heaters. This functionality can be switched on / off from the software.

Please notice: Dew heater outputs are also suitable to light a flat panel.

Voltage type	**Port**
12-13.8V DC – PWM - Duty Cycle %	RCA Female Jack / 6 Amps Each

BUILT IN POWER SENSORS

Each output (4 x 12V + 2 x Dew Heaters) has an individual current meter. Smart Mosfets are capable to diagnose the power consumption of each port and provide protection against overload, over temperature and short circuit.

A DC voltmeter is installed after controller's power input. (Measures 5 – 15 Volts)
A current meter is installed after controller's power input. (Measures 0 – 30 Amps)

STEPPER MOTOR CONTROLLER

A stepper motor controller will move your focuser with absolute positioning. Backlash compensation is implemented in the firmware and can be enabled, tuned or disabled from the supplied software. An ASCOM6 focuser driver is available.

Controller can only drive **unipolar stepper** motors. It can support max 1.6 Amps (**0.8 Amp per phase**). An auto-recovery PTC fuse is installed inside the controller to avoid any overcurrent issue with the connected stepper motors.

An RJ12 connector is located at the back of the Ultimate Powerbox. Pinout can be seen at the following table:

UNIPOLAR STEPPER MOTOR (RJ45 – 8PIN) CONNECTOR	
PIN 1	12V DC
PIN 2	12V DC
PIN 3	COIL 1+
PIN 4	COIL 1-
PIN 5	COIL 2+
PIN 6	COIL 2-
PIN 7	N/C
PIN 8	N/C

ENVIRONMENTAL SENSOR

The probe is an external temperature / humidity / dew point measurement device which is attached to the controller. It comes with length of 1m cable. Probe measures:

- 0 to 100% humidity readings with 2-5% accuracy
- -40 to 80°C temperature readings ±0.5°C accuracy

The unit detects the presence of the probe and requests temperature readings every 10 sec intervals.

A stereo 3.5mm jack connects the environmental sensor with the UPB unit.

RESET WATCHDOG

A watchdog resets the device if for any reason there is no response from the controller after two (2) seconds. A neat feature in the unlikely event of a microcontroller freeze – when have a remote observatory and you need to be sure that everything works as expected.

STATUS LED

A red colored LED is fitted on the right front side of the unit. The light pattern displayed by the led indicated the status of the device. The led can be turned on / off from the software at your demand.

Permanently Light	Device is up and running
Flashing Light (4 times every 4 sec)	Device entered to firmware upload
Flashing Light (once per second)	A power issue (overvoltage) exists and controller had already shut down the ports. Check diagnose message in software
Permanently Off	Controller not operational or LED switched off from software

MOUNTING

We strongly advise to securely mount the UPB on a lightweight Losmandy or Vixen dovetail. We provide a pair of optional brackets to achieve that. Grip the plate on the telescope or under your mount's saddle.

RECOMMENDATION

- We advise to buddle the UPB with **a Compute PC Stick** or a **small PC cube.** These tiny computers have (nowadays) sufficient power for your astrophotography requirements.
- It is wise to select and use good quality and short length USB cables.
- Do the same for power cables. Long and thin power cables will have an effect of voltage drops. This can cause issues to your camera/ccd image quality or mount tracking.
- Make sure you use a good quality 2.5mm DC input socket with a thick power cable (1mm each pole). Verify there are no gaps that can cause power disconnect
- Pay extra attention of you are using a "step up voltage converter" in the DC input. You need at least 6 Amps to power all of your devices. (We don't recommend step up converters – buy a good battery or a decent linear PSU).

DIMENSIONS

Size (Width, Depth, Height)	10cm x 13cm x 3cm
Weight	400 grams

FREQUENTLY ASKED QUESTIONS

Question	**Answer**
What kind of power supply do I need?	We strongly suggest to use a good linear 12V / 10-20A branded power supply. Cheap units will lead to voltage drops on high load and ripple effect. This will cause issues and artifacts to your precious CCD / CMOS Camera.
What type of cable do I need to use for input?	If you are going to make a custom input cable notice that you need at least a AWG 18 cable. Make also sure that you do not exceed 3m to reduce voltage drops.
I would like to use the Ultimate Powerbox to my remote observatory. What if the device freezes for some reason?	We have good news for you. The device has a hardware watchdog and resets itself if the microcontroller is not responsive after 2 seconds
My observatory is in a very cold place. Is there any issue with the electronics of the device?	All electronic components were selected to support temperature ranges from -40 to +80 °C. Moreover, USB2 Hub Chip is an industrial model which fully complies with this temperature range.

What if I accidentally short-circuit an output?	Ultimate Powerbox has an internal protection for all outputs. In less that 5 milisecs it will cut off the power of this output and a warning message will be appeared at the software screen.
What if I accidentally reverse polarity?	Ultimate Powerbox has an input reverse polarity protection. Device will not power on and of course will not allow any voltage to leak to outputs.
What if I short-circuit a USB Hub port?	Device has a USB short-circuit / overcurrent protection per port. It will instantly isolate/disable the selected USB port. Just remove the USB device and plug another one to bring it to life.
I have a USB device which requires more power than a normal USB port	No problem. The 6th port of the USB hub can support up to 3Amps of current. Plug it there and it will do the job.
Can I upgrade the firmware?	Of course, device has beem designed to support firmware upgrade for future features or bug fixes.
Why don't you place a mini PC inside the Ultimate Powerbox?	We really don't support this idea. Why to buy something and pay noticeable amount of money for a mini PC that will be obsolete (in its specification) after 6-12 months? What we suggest is to just buy a compute stick, plug it in the 6th USB hub port to supply it with enough power juice and you have your tiny PC up and running! If you don't like it after some time, buy another one with higher specs