

VERSION 1.3

AUGUST 20, 2019



ULTIMATE POWERBOX V2

PRODUCT MANUAL

BY PEGASUS ASTRO

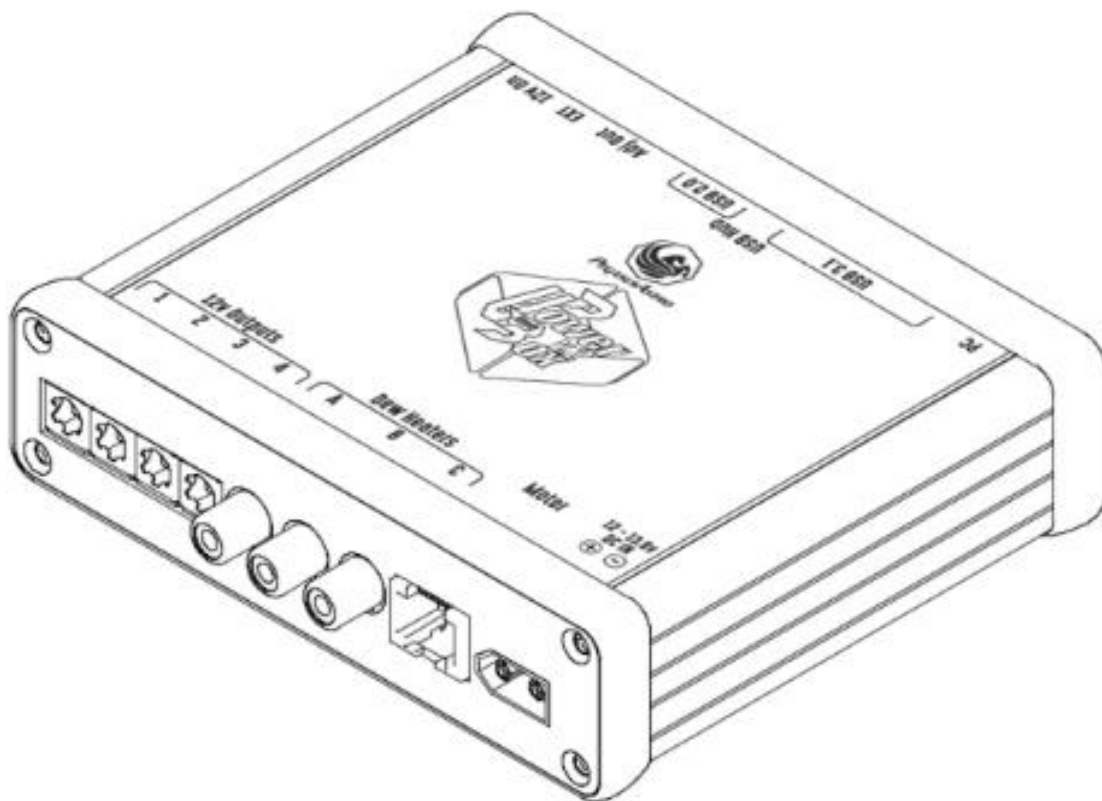
INTRO

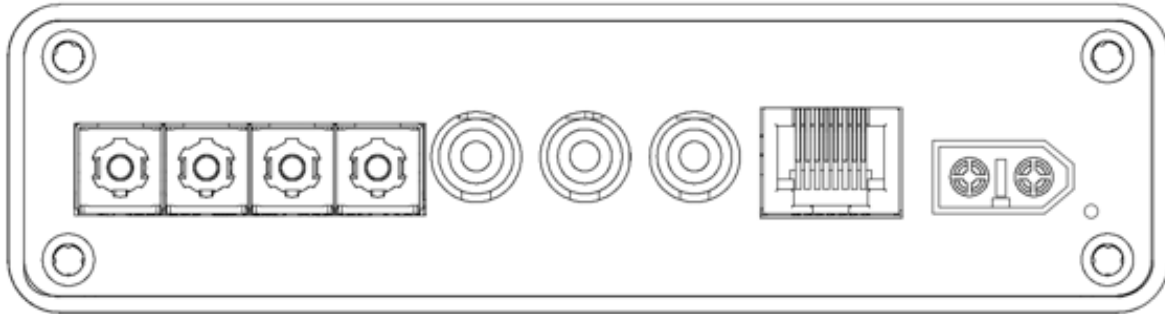
Thank you for purchasing our Pegasus Astro - Ultimate Powerbox v2. Ultimate Powerbox v2 (UPBv2 in short) is the successor of our renowned Ultimate Powerbox. If you are tired of carrying multiple power packs and dealing with a mess of power and data cables, our Ultimate Powerbox v2, a sophisticated power 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 v2 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

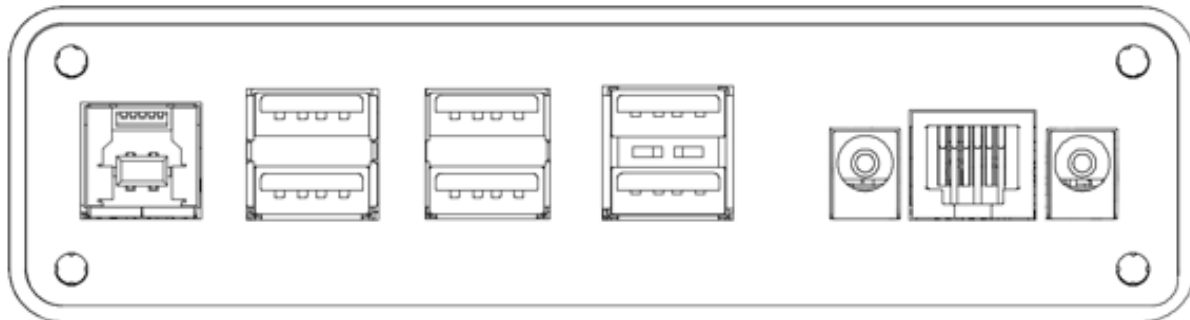
DESIGN OVERVIEW





FRONT: From left to right:

- 4 Channel x 12V DC Outputs (6 Amps each)
- 3 Channel x 12V DC PWM Duty Cycle Outputs – For dew heaters / flatbox / fans (6 Amps each)
- Focus Output for Unipolar / Bipolar Stepper Motor
- Input Power 12V-13.8 DC XT60 (Left Pin is + , Right Pin is -)
- Led (blue) indicator



BACK: From left to right:

- Input USB3.1 type B connector / PC
- 4 (2 x Dual Stacked) Ports USB3.1 - Industrial Grade USB Hub
- 2 (1 x Dual Stacked) Ports USB2 - Industrial Grade USB Hub
- Variable Output (3-12V) / 3Amps Max
- Ext Port & Environmental Sensor (Relative Humidity /Temperature)
- Always ON / 12V Output



Ultimate Powerbox handles all power (12V DC) and data (USB2/USB3) cables. Mini PC is piggyback on the Ultimate Powerbox. Only one cable (Main Power) exits the setup

What is inside the box



Ultimate Powerbox v2



1 x DC Cable (XT60) to Cigarette Lighter (10 fused)



Pack of 4 Power Cables (1 meter / 3 feet)



1 x USB3 Cable Type B (1.8m / 5.9 feet)



1 x Environmental Sensor

POWER INPUT

Controller can accept voltage ranges from DC 12V – 13.8V *. 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.

Under no circumstance exceed DC 16V input as you will cause a severe damage to the internal controller

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 XT60 DC power connection which powers on the unit.



Insert the XT60 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 14.5V the Ultimate Powerbox v2 will shut down all output ports to save your precious equipment from overvoltage.

USB 3.1 HUB

USB3.1 Hub implementation is an Industrial/Automotive Grade - Temperature Rated (-40°C to +80°C) USB 3.1 Super-Speed 7-Port Hub Controller. Four (4) USB 3.1 Super Speed & two (2) USB2.0 High Speed Ports are available at the back of the controller. The 7th port is used for the internal controller communication.

Each USB port can provide at max 2.5 Amps of current. Each port has a current limit/protection and it will automatically decrease current to 2.5Amps if a short-circuit detected or a connected device will draw more current than 2.5Amps.

Each USB port can switch voltage and data ON or OFF via the supplied software.



DATA CONNECTIVITY

A USB3 Type B port at the back of the unit accepts the USB cable for PC connection. A 1.8m USB3 type B cable is supplied in the package.

POWER OUTPUTS

Device 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 of these 4 ports can switch ON/OFF via software

Each 12V power output has the following specifications:

Voltage type	Port
12V-13.8V DC unregulated	5.5 x 2.1mm DC Power Jack / 6 Amps each (center positive)

- One Adjustable Output (ADJ OUT)

Voltage type	Port
3-12V Regulated (per 1Volt step) Voltage level is stored and automatically retrieved from EEPROM during UPBv2 boot.	5.5 x 2.1mm DC Power Jack / 3 Amps constant (4 Amps peaks) (center positive)

- One 12V DC unregulated output – Always ON

Voltage type	Port
12V-13.8V DC unregulated	5.5 x 2.1mm DC Power Jack / rated up to 8Amps (center positive)

DEW HEATER OUTPUTS

Device has three (3) 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 or drive your telescope's fans.

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

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)

EXT PORT

A RJ12 expansion port is available for future devices. Expansion Port allows the connectivity of current and future Pegasus Astro Products. Plugged devices can be controlled from UPB software (ASCOM /INDI / Standalone).

- Expansion port can accept wide range of future devices, simultaneously. A Hub device will be available as an optional accessory in order to allow this.
- Stock Temperature/Humidity Sensor is also connected into this port



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 & bipolar stepper** motors. It can support max 2.4 Amps (**1.2 Amp per phase**).

RJ45 connector is located at the front of the Ultimate Powerbox v2. Pinout can be seen at the following table:

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

Supported Stepper Motors	
Pegasus Motor Focus Kit	Requires RJ45 to RJ45 common straight network cable
Robofocus	Requires Cable RJ45 to DB9
Moonlite	Requires Cable RJ45 to DB9 (Robofocus Pinout)
Lakeside	Requires Cable RJ45 to DB9 (Robofocus Pinout)
Starlight HSM	Requires RJ45 to RJ45. custom cable
Starlight MSM	Requires RJ45 to RJ12 custom cable
Rigel nStep	Requires RJ45 to RJ12 custom cable

ENVIRONMENTAL SENSOR

The stock probe is an external temperature / humidity sensor which is attached to the controller. It comes with length of 60cm cable. Probe measures:

- 0 to 100% humidity readings with 2-5% accuracy
- -40 to 80°C temperature readings $\pm 0.5^\circ\text{C}$ accuracy

The unit automatically detects the presence of the probe and gets temperature readings every 15 seconds.

A RJ12 socket (**EXT**) connects the temperature/humidity sensor with the Ultimate Powerbox v2 controller



Important: Please ensure that the sensor is plugged into the EXT port ONLY. Do not plug the sensor to the motor output! Severe damage to the sensor might happen if you accidentally plug the sensor to motor output

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.

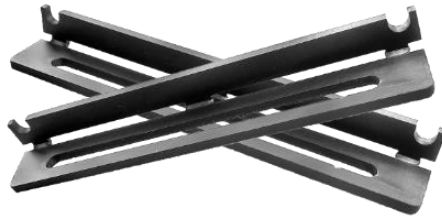
Permanently Light	Device is up and running
Flashing Light (4 times every 4 sec)	Device entered to firmware upload

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

LOSMANDY BRACKETS FOR UPBV2

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.



SMALL FACTOR PC BASE PLATE FOR UPBV2

An anodized aluminum base plate to securely mount your small factor PC (e.g Intel NUC) on the UPBv2.



RECOMMENDATION

- We advise to bundle the Ultimate Powerbox v2 with a **Compute PC Stick** or a **small factor PC**. 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 DC input socket with a thick power cable (1.5mm 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)	12cm x 10cm x 3cm (4.72 inch x 4.06 inch x 1.2 inch)
Weight	400 grams (14.1 ounces)

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 17 cable. Make also sure that you do not exceed 2meters (6feet) 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 flow 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	Each USB port can deliver up to 2.5Amps of current
Can I upgrade the firmware?	Of course, device has been 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 a 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

Optional Accessories

 <p>Battery Coupler for DSLR /Mirrorless Cameras (Different types for Canon, Sony, Fuji, Nikon)</p>	 <p>Pair of Dovetail Brackets for UPBv2</p>	 <p>Stepper Motor Cable (Robofocus Pinout) RJ45 to DB9</p>
 <p>Power cable for Skywatcher EQ8 or Power cable for Skywatcher EQ6R / EQ6-AZ</p>	 <p>Power Supply Unit 12v/10A XT60 Plug</p>	 <p>Pegasus Stepper Motor Kit (Universal L shape Bracket or SCT Bracket)</p>
 <p>Small Factor PC Base Plate for UPBv2</p>		

Device is covered by two (2) years warranty

Designed and Assembled in Gr

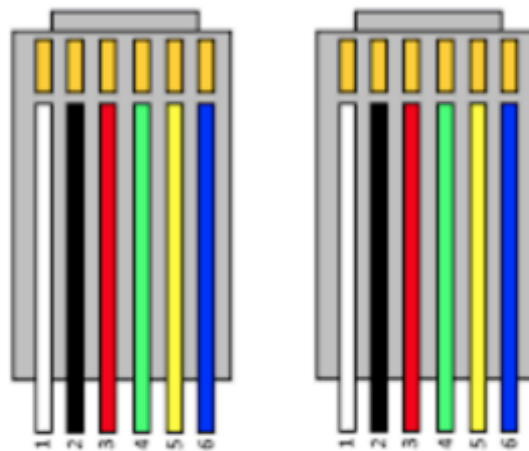
APPENDIX

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Starlight MSM20/30/35

Motor Cable Pinout for **UPBv2 & DMFC**

RJ12 Pegasus Controller RJ12 MSM Motor

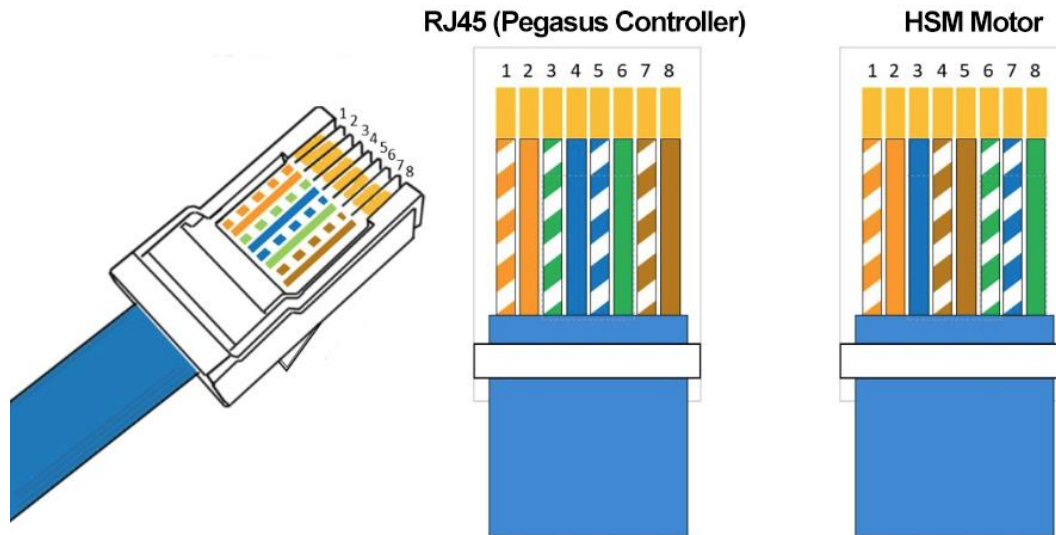


In short: cable is RJ12 to RJ12 straight, one to one pinout

Please note that RJ12 fits to RJ45 UPBv2 / DMFC motor output and works successfully

Pin Number	RJ12 (Pegasus Controller)	RJ45 (HSM Motor)
1	White	White
2	Black	Black
3	Red Coil A+	Red Coil A+
4	Green Coil A-	Green Coil A-
5	Yellow Coil B+	Yellow Coil B+
6	Blue Coil B-	Blue Coil B-

Starlight HSM20/30/35 - RJ45 Motor Cable Pinout for **UPBv2 & DMFC**

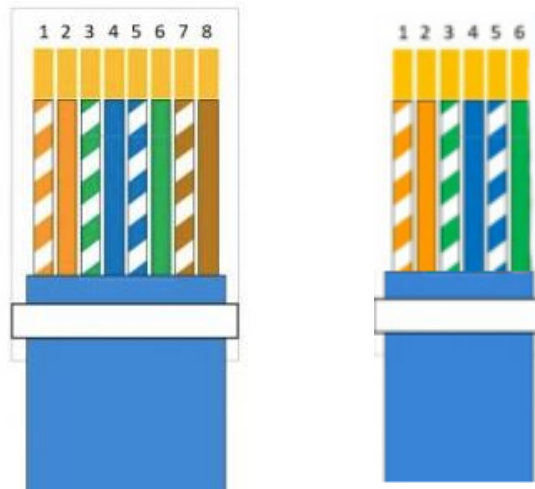


Pin Number	RJ45 (Pegasus Controller)	RJ45 (HSM Motor)
1	White-Orange	White-Orange
2	Orange	Orange
3	White-Green Coil A+	Blue Coil A-
4	Blue Coil A-	White-Brown
5	White-Blue Coil B+	Brown
6	Green Coil B-	White-Green Coil A+
7	White-Brown	White-Blue Coil B+
8	Brown	Green Coil B-

Starlight HSM20/30/35 & Rigel nStep Motor Cable Pinout for **UPBv2 & DMFC**

RJ45 Pegasus Controller

RJ12 Rigel Motor



Pin Number	RJ45 Pegasus Controller)	RJ45 (HSM Motor)
1	White Orange	White Orange
2	Orange	Orange
3	White Green Coil A+	White Green Coil A+
4	Blue Coil A-	Blue Coil A-
5	White Blue Coil B+	White Blue Coil B+
6	Green Coil B-	Green Coil B-
7	White Brown	-
8	Brown	-

Pegasus Motor Focus Kit (v1/v2)

Pegasus Motor Focus Kit requires a common straight RJ45 to RJ45 network cable

