FocusCube v2

Operating Manual

Dear valued customer, congratulations and thank you for buying Pegasus Astro - FocusCube v2. This manual will give you a brief introduction to your FocusCube v2. Before using the FocusCube v2, please take some time to read it thoroughly and if you have any other questions, feel free to contact us at info@pegasusastro.com

The evolution of technology in astronomy requires a system which will assist the focusing of the telescope with great accuracy. Fast optics and modern camera devices require automatic focusing in every small period of time as temperature can affect focal length and modify the optimal focus position. Pegasus FocusCube v2 has been developed to meet these requirements. This device can easily **lift more than 6kg** (212 ounces) of imaging equipment when the telescope points to the zenith!

Designed in high quality with modern electronics it can provide digital precise focus control from a PC. FocusCube v2 includes a stepper motor for absolute position focusing. Electronics and stepper motor are enclosed in a compact sized box.

Controller Design Overview



Back View



Side View (Universal Bracket)



FocusCube v2 - SCT Bracket

What is in the box

Name	Quantity
FocusCube v2 Controller	1
DC Cable (2.1m) to Cigarette Lighter (3A fused)	1
USB2 Cable Type B (1.8 meters)	1
Temperature Sensor (RJ45 plug)	1
Black Anodized Bracket (Universal L shaped or SCT model) * SCT Model includes 2 pulleys	1
Different sizes of bolts and spacers	5 pairs
Motor Couplers (solid - different sizes from 3mm to 8mm)	6

Optional Accessories

- Hand Controller

Controller Care

- Controller is not waterproof and it should be kept clean and dry. Moisture 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
- Do not touch the internal components as they may get hot when in use

Stepper Motor

FocusCube has an embedded high-resolution geared stepper motor **(Step Angle (Deg) 7.5 / 120 (Gearbox reduction rate = 0.06255 Deg per step)**. Its gearbox has low backlash and high torque, suitable to focus in micron scale.

⚠ **DO NOT TRY TO MOVE THE MOTOR MANUALLY WITHOUT POWER. MOTOR ACTS A BRAKE. IF YOU TRY TO ROTATE SHAFT OF MOTOR MANUALLY MIGHT CAUSE DAMAGE TO THE METAL GEARS OF THE MOTOR. USE ONLY THE HAND CONTROLLER.**

Power Supply

The controller is fitted with a standard **2.1mm** centre positive DC power connection which powers on the controller. It can accept DC 11-15V. Please use a power supply that can provide DC 12V-13.8V / **1A** (at least).

Insert the 2.1mm plug on the DC power cable. Controller will initialize (led will fast blink 3 times) and the green led with turn solid on after 4 seconds. This means that firmware was loaded successfully and controller is fully operational.

⚠ **Unit has been designed with reverse polarity protection. If you accidentally reverse the DC power source polarity the unit will cut off the power.**

Temperature Sensor Socket

The external probe is temperature measurement device which is attached to the controller. It comes with length of 0.6m cable with a RJ45 plug. Probe measures temperatures from -55°C to +125°C.

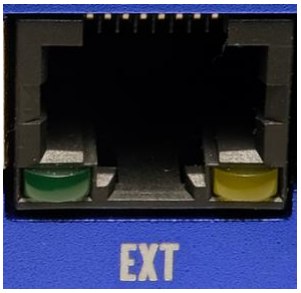
Accuracy of the probe is ±0.5°C from -10°C to +85°C. The controller instantly detects during startup the presence of the probe and requests temperature readings every 30 seconds.

When using multiple controllers and probes, the reported temperature may differ slightly between units due to small differences between individual sensor readouts. This does not affect the operation of the units, as they respond to measured temperature change, not to the actual temperature.

⚠ **Please notice that you have to connect the sensor before you power on the controller. You can also connect it later but you will need to wait for 15-30 seconds for sensor detection and calibration.**

External Connector (EXT)

The controller is fitted with a RJ45 Female Jack for auxiliary usage. In this socket you can **ONLY** plug the temperature sensor or the optional Hand Controller.



IMPORTANT NOTICE:

DO NOT CONECT ANY MOTOR OUTPUT OF AN EXTERNAL CONTROLLER SUCH AS ULTIMATE POWERBOX OR DUAL MOTOR FOCUS INTO THE RJ45 PORT.
THIS MIGHT CAUSE SEVERE DAMAGE TO THE DEVICE

Status Led

Two LED indicators are fitted right and left of the RJ45 socket. The light displayed by the led indicates the status of the device.

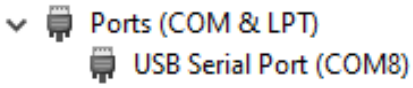
Permanently Green Light	Controller is fully operational
Permanently Orange Light ON	Motor is moving
Orange Light OFF	Motor is idle

USB Connection

Unit has been designed with a USB type B connector. Plug one end into a spare USB 2.0 port on the computer or USB Hub, the other end into the USB type B receptacle on the controller labelled USB.



Controller will be identified as "*FocusCube v2* revX" and a "USB Serial Port COMx" will be appeared to the device manager of Windows, under Ports (COM & LPT).



⚠ Each device gets a unique serialized COM number (e.g: COM8) so you can simultaneously plug to your PC as many controllers as you need.

Hand Controller - Rotary Encoder Knob

An optional hand controller for manual focus control can be acquired for those who might want to add this functionality. Please refer to the Hand Controller manual for operating instructions.



Operating Instructions:

- Plug the temperature sensor to the RJ45 socket.
- Plug the supplied USB type B cable to the device.
- Plug DC 12V/1-2Amps power cable into the DC 2.1mm socket.
- Device will boot and after three seconds the green indication LED will turn ON. This means that firmware was loaded successfully and the "FocusCube v2" is now fully operational.
- Download USB drivers, standalone software or ASCOM drivers from pegasusastro.com/support in order to connect to the device.

Focuser Compatibility (Universal Bracket)

We have successfully installed our Universal L shape bracket on:

- Takahashi TSA120
- Takahashi FS60
- Takahashi FSQ85
- Takahashi FSQ106
- Skywatcher Esprit Series (80 ED, 100ED, 120ED, 150ED)
- Skywatcher PDS 130
- Explore Scientific ED Series (ED80, ED102, ED127, ED152)
- Explore Scientific ED-FCD100 Series (ED80-FCD100, ED102-FCD100, ED127-FCD100)
- Explore Scientific FPL53 (ED140, ED115)
- Feathertouch Focuser 2.5''
- Feathertouch Focuser 3"
- Feathertouch Focuser 3.5"
- Vixen VC200L
- Altair Wave Series Telescopes (All models)
- Celestron SCT C 6,8,9.25,11,14
- Celestron SCT Edge 6,8,9.25,11,14
- Celestron RASA 8,11
- Orion ED80T

Focuser Compatibility (SCT Bracket)

A special shaped black anodised aluminium bracket, hard to bend, can be attached to most of the Celestron SCT telescopes. **We provide three SCT versions**. The difference is in the metal pulley bore diameter & the screw length in the package. Make sure you have selected the correct type.

- Celestron **EdgeHD** 8, 9.25 , 11, 14 (13mm bore)
- Celestron SCT C6, C8, C925, C11, C14 (22mm bore)
- Celestron **RASA** 8 (13mm bore)

- Celestron **RASA**v2 11” (22mm bore)
- Celestron **RASA** 14” (22mm bore)

Warranty

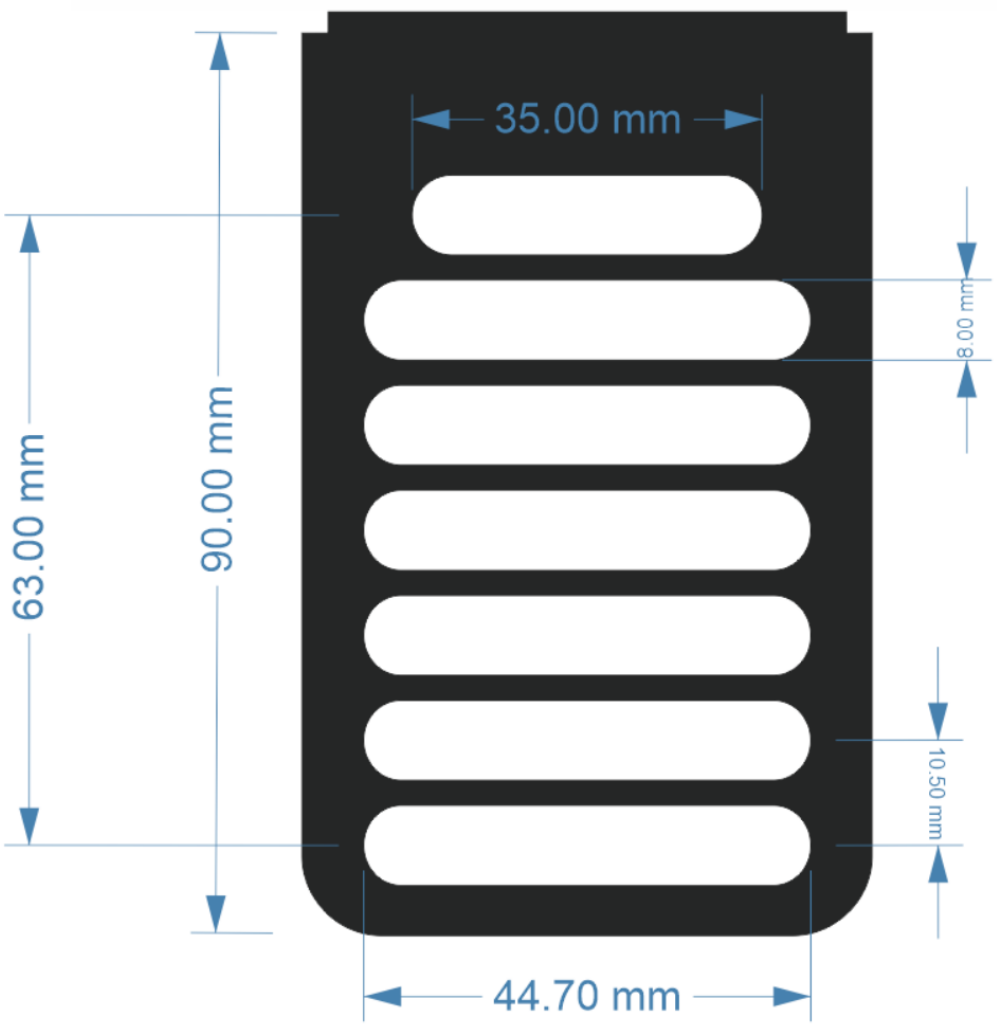
We provide 1-year warranty for our products. We will offer the repair service for free or replace the item for free if the unit does not work properly within the warranty period. After the warranty period, we will continue to provide repair support and service on a charged basis. This warranty does not apply to damage that occurred because of abuse or misuse, or damage caused by a fall, or any other accidental failures after purchase. The customer must pay for shipping when shipping the camera back for repair or replacement. If you get a faulty unit, please contact us as soon as possible through email: *support@pegasusastro.com*

Please describe the problem in detail, and we will do our best to solve the problem. Most instances are perceived problems which are caused by a bad driver install or software configuration.

Technical Specifications

Supply Voltage	DC 12V – 13.8V / 1Amp
Motor Compatibility	Stepper Motor is inside the enclosure
Motor Output	None (Stepper Motor is in the enclosure)
Motor Specification	High resolution geared stepper motor (Step Angle (Deg) 7.5 / 120 (Gearbox reduction rate = 0.06255 Deg). 5755 steps per circle of rotation. *** Firmware implements half step drive so one motor cycle is:** **5755 x 2 = 11510 steps**
USB Connectivity	USB 2.0 Type B plug
Thermal Sensor Resolution	9-bit Celsius temperature measurements – External Sensor with RJ45 plug
Power Input Connector	2.1mm Centre Positive Socket
Dimensions	56mm x 63mm x 39 mm / 300 grams

Universal Bracket



Troubleshooting guide

Problem	Cause	Cure
Controller LED is off	Power supply is not connected	Connect Power and wait for a solid green light
Stepper motor makes strange noises or step gaps when accelerates	You have specified a “max speed” larger than motor can support	Go to “Settings” and limit the max speed (try between 200-400). Every stepper motor has a maximum speed or else it will jump and loose steps. Pegasus Astro Stepper Motor support max speed up to 400.
Sensor does not report temperature	Check that sensor is in place	Check sensor plug if it is in good condition. Recycle power and retry or wait for 1 minute for sensor recalibration.
Controller randomly loses USB connectivity	Check that your USB cable does not exceed 5m length.	Use a shorter cable or a powered USB hub. The USB 2.0 specification limits the length of a cable between USB 2.0 devices (Full Speed or Hi-Speed) to 5 meters.

Software installation

Latest software and drivers release can be found at Pegasus Support site:

http://pegasusastro.com/support

Please download and install the following:

- ASCOM Focus Driver
- Focus Controller (Stand Alone application)
- USB Drivers (FTDI)

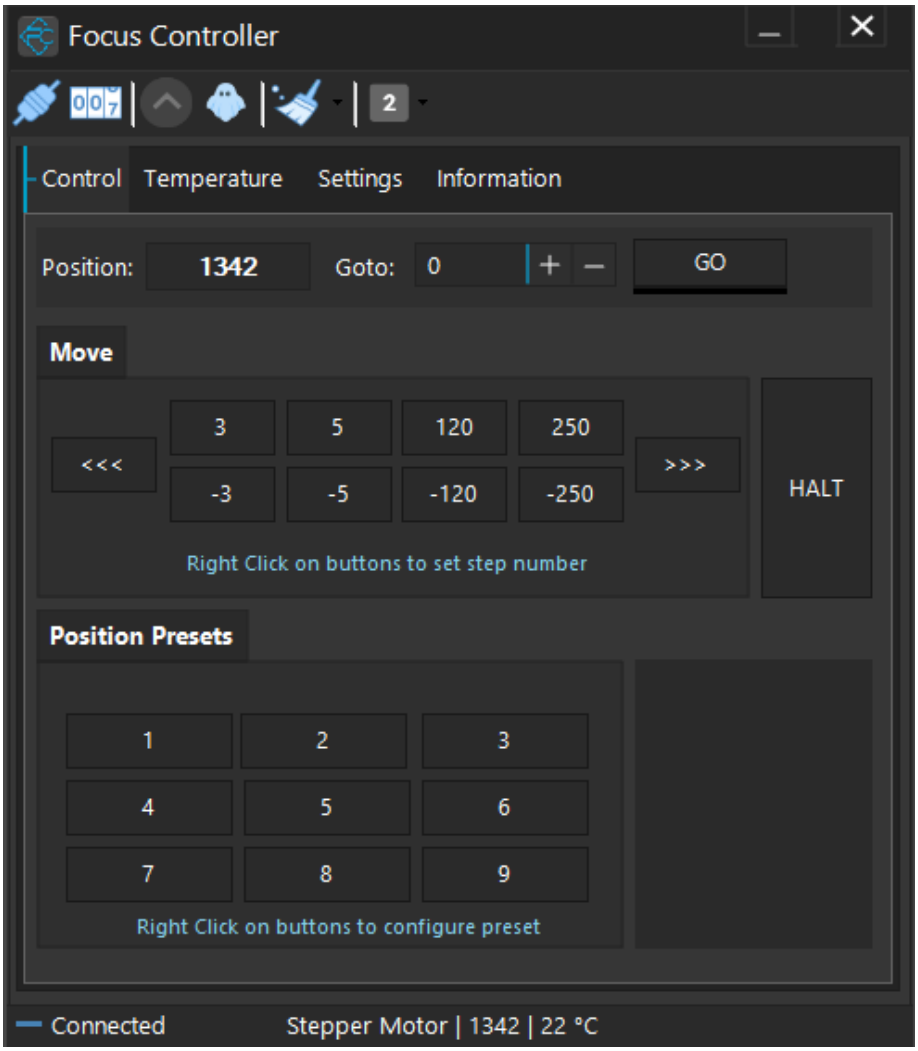
INDI (Open Astronomy Instrumentation) supported

Pegasus Focuscube v2 is fully compatible with INDI. Driver is included in stable libindi.

Official Indi Driver : http://indilib.org/devices/focusers/pegasus-dmfc.html

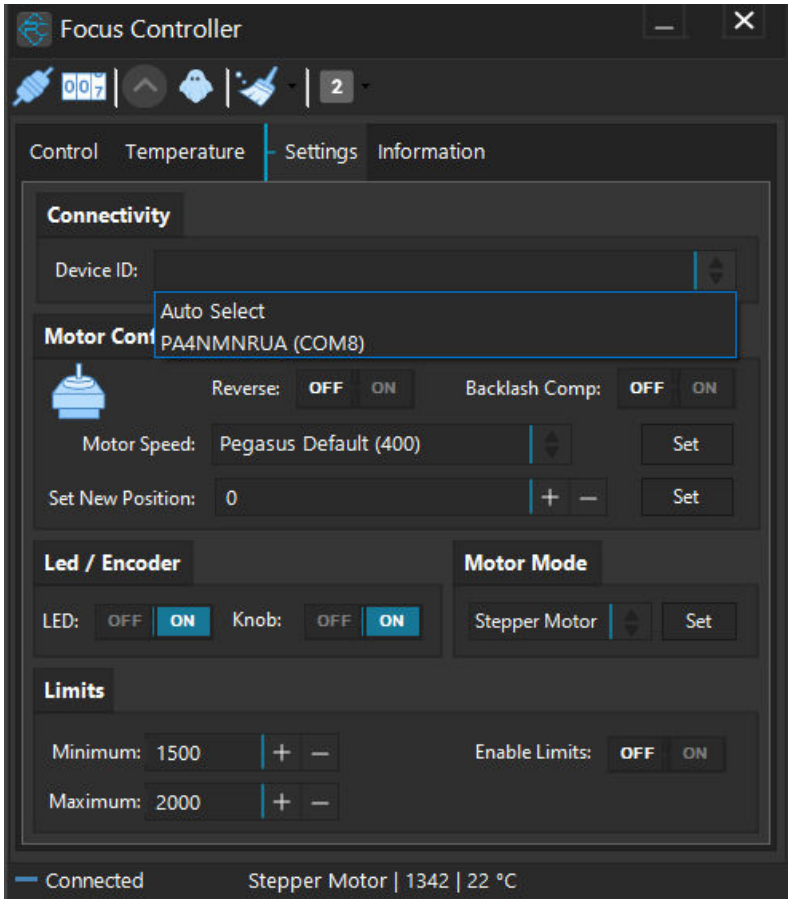
Standalone Application (Focus Controller)

Standalone application does not require ASCOM drivers and it can fully configure / operate the controller.

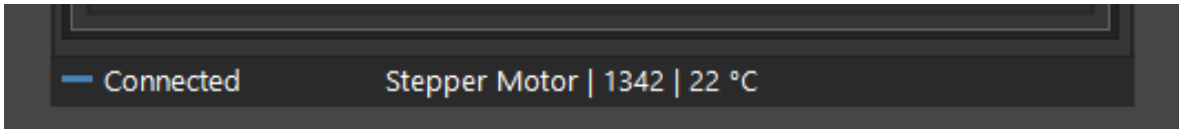


The first thing you need to do is to select your Focus controller.

- Click “Settings” tab and locate the Connectivity section.



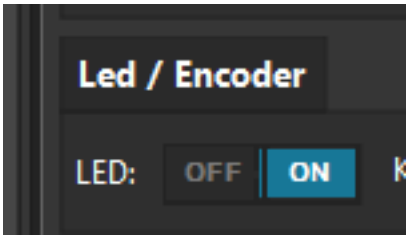
- Click “Device ID”. A drop-down instantly lists all the discovered Pegasus Astro Focus controllers.
- Select your desired device from this list. You can also choose the “Auto Select” option which will automatically use the first discovered controller of your system.
- Press “Connect” button located at the toolbar. 
- Application will connect to the controller and the “**Connected**” status will appear at the bottom taskbar. Taskbar also displays the reported step position, ambient temperature and the type of the motor that is controlled.



Led status

You can switch ON or OFF the led indicator of the controller. A handy feature if you need to fully turn off the LED light (night vision etc).

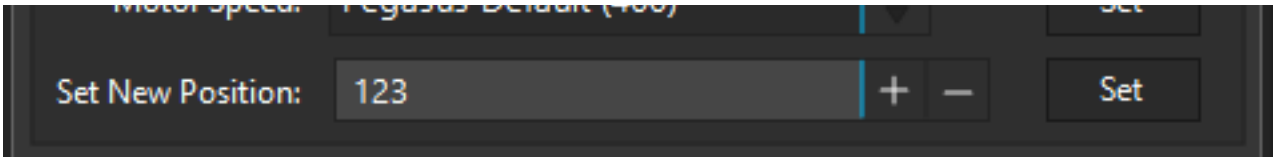
⚠ Please note that LED will turn ON after every controller power startup.



Motor Settings - New Position

If you need to change the current position of the controller, you can do it through this option.

Locate the “Set New Position” field, type the new desired position and click **Set** button on the right.



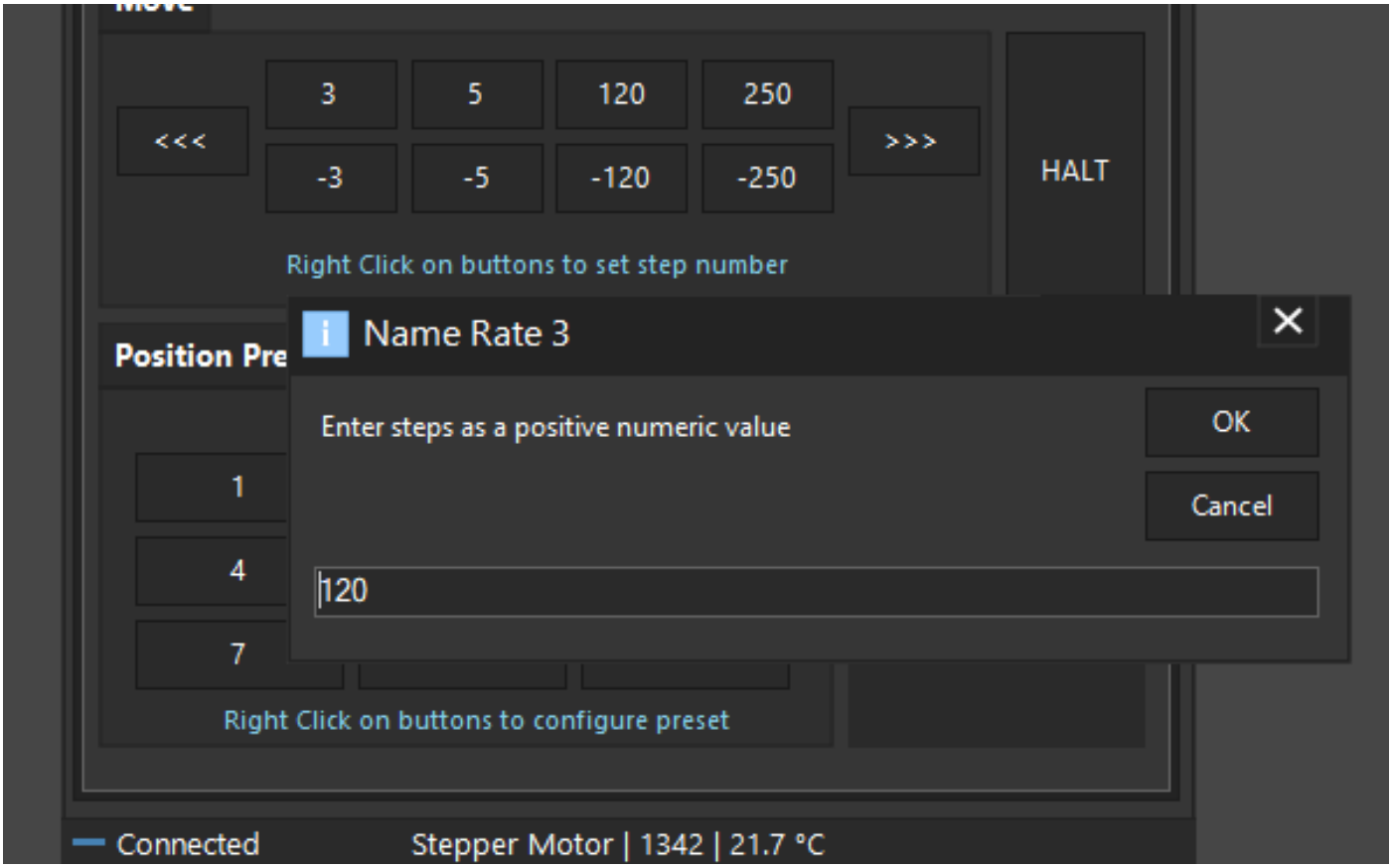
Controller will set as new position the value you typed.

> ⚠ **Please note:** controller will **not** move the motor. Controller will only change the value of the reported current position. This feature is very useful when you need to zero the position of the focuser or set another value.

You can also zero the position of the focuser by clicking the  button at the top taskbar of the application.

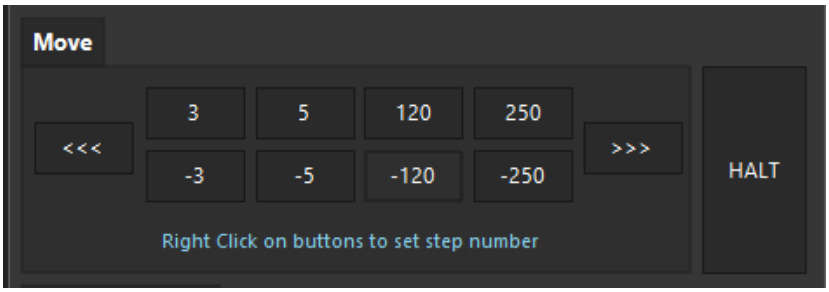
Position Presets and Motor Rates

You can easily set and save custom names and step values. **Right click** each position preset or rate and a popup window will appear. Type the desired step count and click **OK** button.



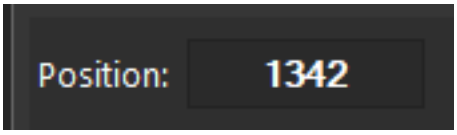
Motor Control

From these buttons you can control the step count of your stepper motor (or pulses if you have a DC motor plugged into DMFC controller).



Click each button. Each button represents how many steps the motor is going to move forward (+ steps) or backwards (- steps).

Notice that "Position" indicator will change its value and will confirm your command



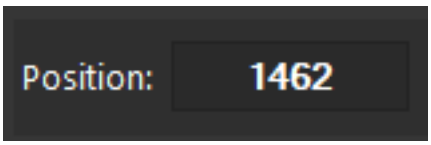
There are two additional buttons (<<< & >>>) that will forward / reverse accelerate the motor. Keep mouse down and the motor will start accelerating to the direction you have clicked.

Use these buttons only if you need to quickly move in or out your focuser (be careful not to exceed focuser limits!)

⚠ In every motor movement, final position (when motor stops) is stored after 10 secs into controller's EEPROM memory. This will ensure that next time you power on the controller, last saved position will be retrieved from its memory.

Current Motor Position

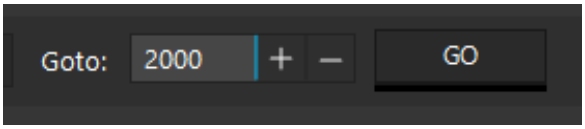
Controller continuously (every 500 milisec) reports motor / focuser position. Current **Position** readout can be found at the control tab. (check image below)



Set A New Motor Position

You can command the motor to move to a new position. Set the value and click "GO" button.

Motor will start moving to the new position you defined. You can monitor the running motor position on the position readout.



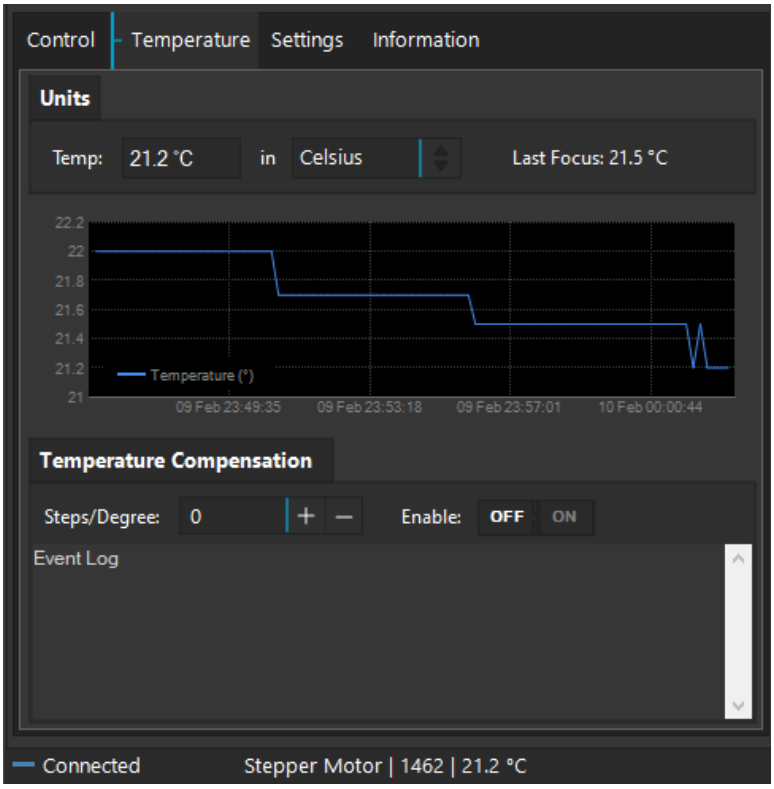
Emergency Motor Stop

Click the “HALT” button and the motor will instantly stop. A handy button if you want to instantly stop the running motor.



Ambient Temperature

Existing environmental temperature and temperature readout over time (chart) can be seen at the “Temperature” tab.



You can easily check what was the last focus temperature so you will estimate if it is time to refocus.

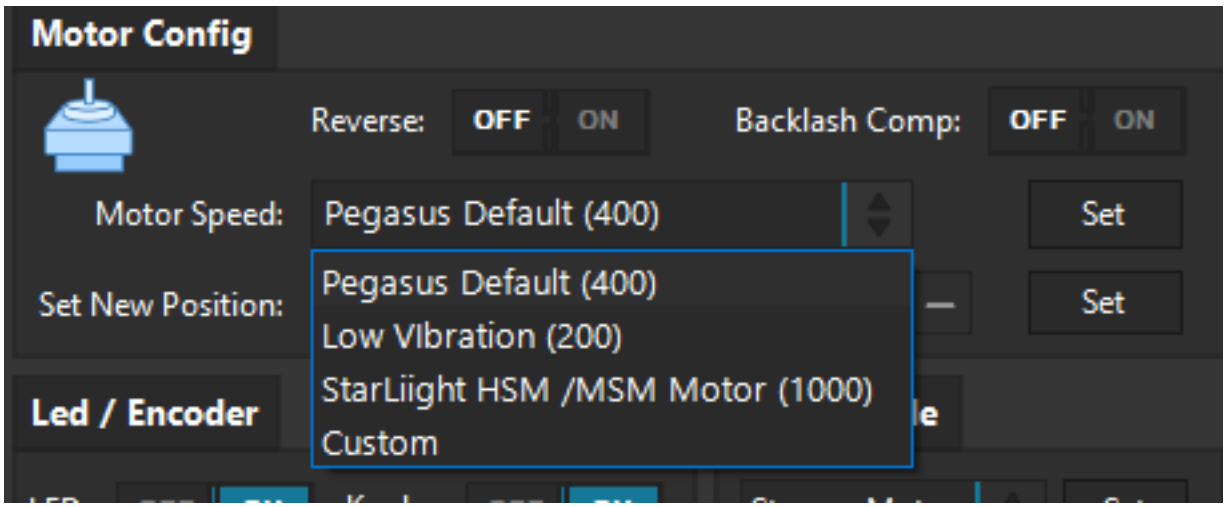
Usually, a temperature difference of 2 degrees demands a telescope re-focus. (Lots of factors rule this decision such as type of glass, carbon or aluminum tube etc.)

Motor Config –> Motor Speed

All stepper motors have limits of the max speed they can achieve. If you set a higher “max speed” than your motor can support, it will probably jump / loose steps and make weird noises as it will never be able to keep up with the controller’s designated steps.

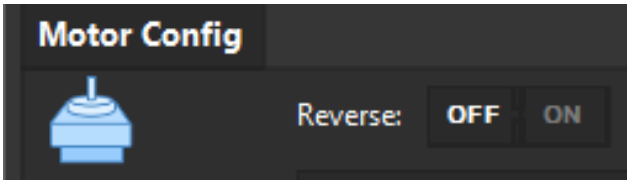
Click the **Motor Speed** drop down menu and select the desired max speed.
Click **Set** button on the right to push this setting to the controller. Setting is stored in controller’s memory

⚠ WE STRONGLY SUGGEST TO LEAVE THE MAX SPEED TO “PEGASUS DEFAULT” AS IT IS OPTIMIZED FOR THE PEGASUS STEPPER MOTOR

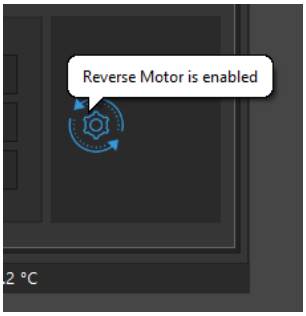


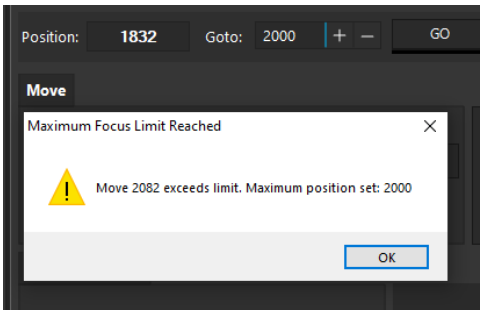
Motor Config -> Reverse Direction

In case you need to reverse the motor rotation you can switch the “**Reverse**” button to ON. Reverse button is located at “Settings tab. Reverse Setting is stored in controller’s memory



A reverse icon will be appeared at the status window of the main application pointing that you have enabled this option.





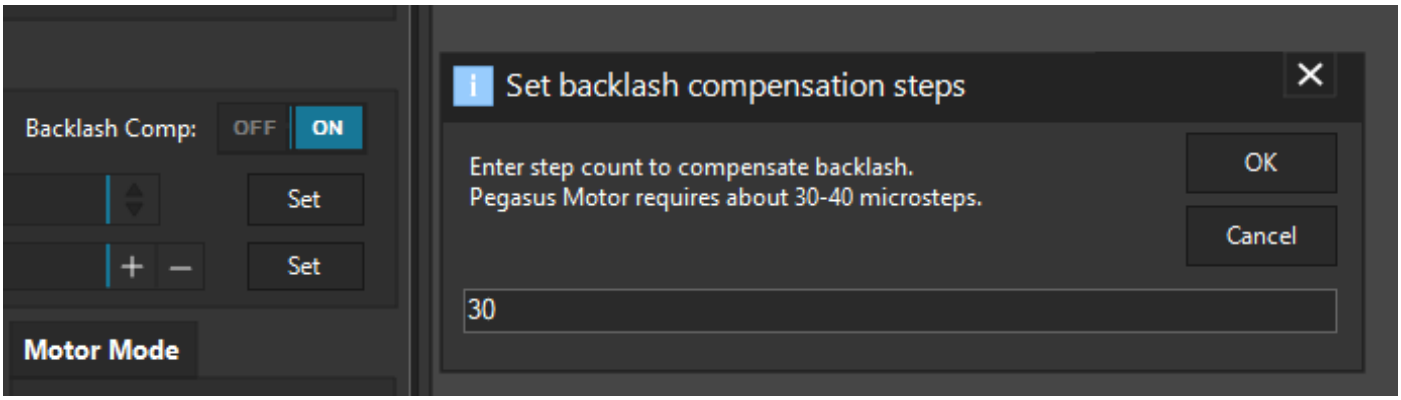
Motor Config -> Backlash Compensation

Backlash, sometimes called lash or play, is clearance or lost motion in a mechanism caused by gaps between the parts. Motor's gearbox or other components in the focuser can have an amount of backlash.

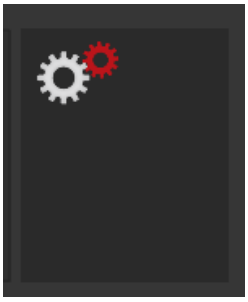
Compensation will be invoked when the move in opposite of the compensation direction. Just make sure the amount specified is more than needed to remove the backlash.

To enable backlash compensation, set Backlash Comp to ON and type the backlash step number at the popup window. Click OK.

Setting is stored in the EEPROM and backlash compensation is applied on every motor movement.

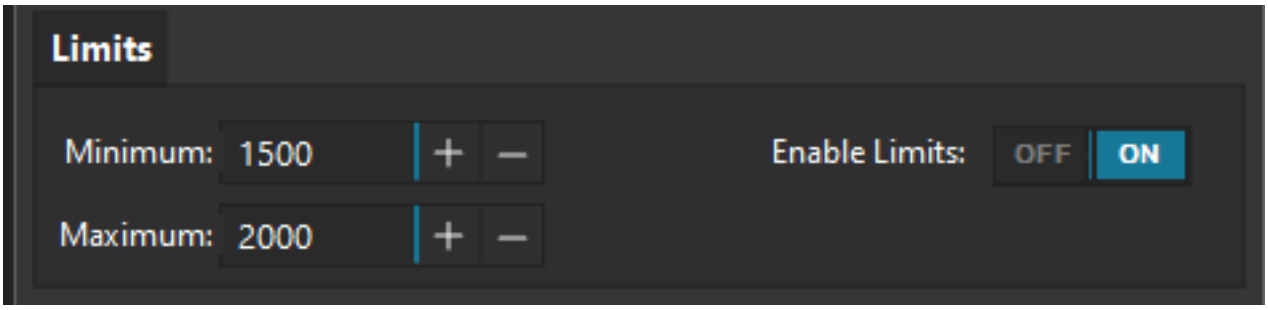


The "gear mesh" icon below will notify you that the backlash compensation functionality is enabled.



Position Limits

You can set the maximum & minimum step position that the motor can go. This will enforce the controller to disallow a motor move to the direction you are about to exceed this limit. This is a handy option to prevent the focuser to fully move in or out.



- Move to the **Settings** tab and type the numeric limit inside the “Minimum” and “Maximum” field.
- Click the “ON” to enable these limits.

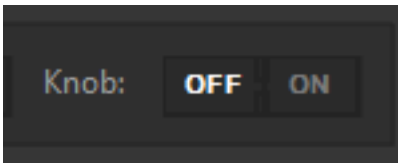
When you try to exceed this limit the controller will deny to increase steps and it will notify you that the limit was about to exceed.

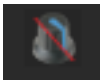
Disabled Knob of the Hand Controller

If you would like to disable knob on the side of the controller

- Press the knob for two (2) seconds.
- You can also disable it from the settings of the standalone software.

Hand Controller’s both leds will turn on and the software will report the disabled status of the knob.





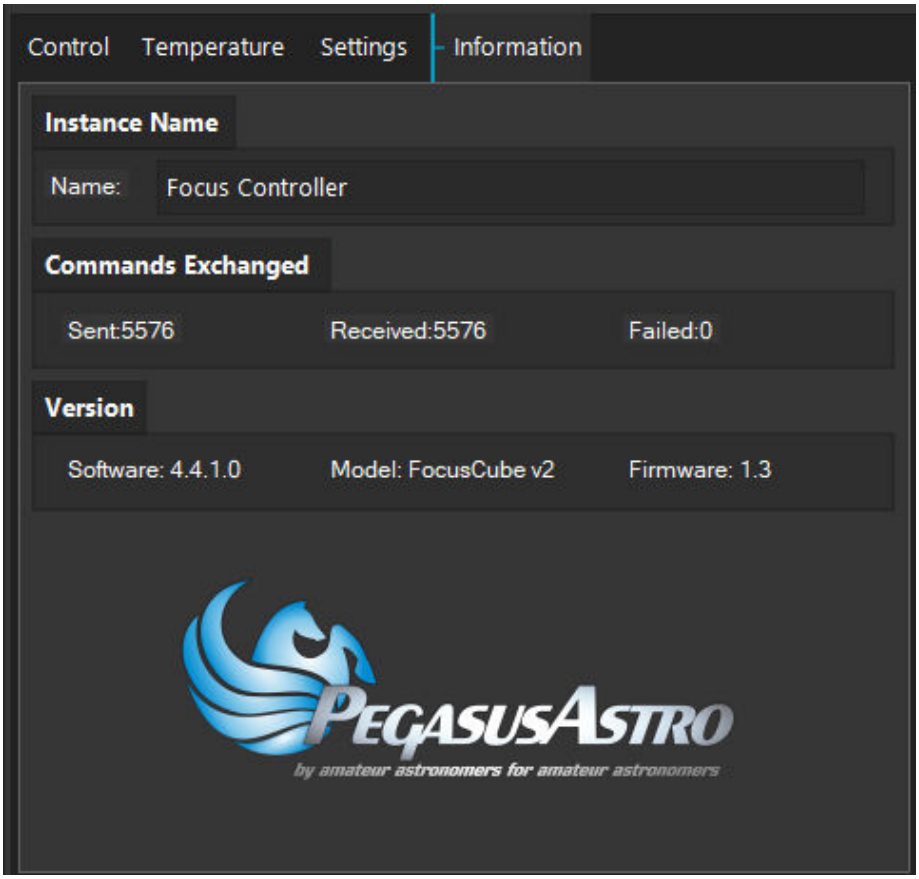
Press the knob one more time to enable the encoder functionality

Firmware and Software Version

Useful information about the:

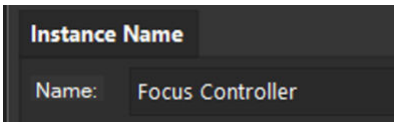
- Commands exchanged
- Software version
- Model of your controller (name and revision of the electronic board)
- Firmware version

can be viewed on the “Information” tab.



Launch up to 4 software instances.

Each instance / profile keeps its own settings. If you have multiple controllers you can launch a new profile, set an instance name and use its unique settings for your motor controller.



Locate the instance launch button on the toolbar. Click 

button. Which will allow you to spawn up to 4 different instances (with different settings).

