Dual Motor Focus Controller v3.x

Thank you for choosing our Dual Motor Focus Controller



Introduction

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 **D**ual **M**otor **F**ocus **C**ontroller (**DMFC**) has been developed to meet these requirements. Designed in high quality with modern electronics it can provide digital precise control of compatible motor focusers from a PC or from manual operation.

DMFC is suitable for visual astronomers and astro-photographers. Its unique design can support two modes. It can drive DC motors, by its Pulse Width Modulation duty cycle control or bipolar & unipolar stepper motors for absolute position focusing. Using the click of your mouse the mode can be instantly changed from 'stepper' to 'dc' motor.

Controller can be operated by PC by its USB 2.0 connectivity. Moreover, a manual operation by utilizing the digital encoder on the side of the controller emulates the knob of your focuser. Turn the knob as it was your telescope focuser. If you press it, the steps of the motor will be reduced to 1:10.

There is a standard 2.1mm centre positive DC power connection which powers on the controller.

A dual colour light emitted diode (Green / Orange) is fitted on the side of the unit. Each colour indicates a mode and the led can be turned on or off by its software during an observing session.

- **Motor output is fully compatible with "Robofocus ©" or Moonlite pin out (DMFC version =< v3.1)**
- An optional RJ45 to DB9 cable is needed to turn motor pinout fully compatible with "Robofocus ©" pin out **(DMFC version >= v3.2)**

A cable converter (serial to mono jack) is required for simple DC pulse motors.

An external digital temperature sensor input is located near the motor connector. The digital probe of length 0.6m is in the package. The probe can be placed near the focuser so the exact temperature of the focuser / environment can be seen through the supplied software or ASCOM driver.

Controller supports absolute position focusing and it stores the exact focuser position so it can be retrieved in the next observing session. Moreover, it can store max speed of the stepper motor to comply with motor specification.

The controller can be operated by the standalone DMFC software. (Available for Windows OS). It is also fully compatible with ASCOM 6.

Controller firmware supports reprogramming via the USB 2.0 connection with the help of a firmware upgrade software, for future features which may become available.

The controller has its own software drivers, applications, allowing full functionality to be quickly and effectively.

All the drivers and applications may be used together with the same, or multiple controllers.

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

Controller Design Overview





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 9V minimum to DC 15V maximum. Please use a power supply that can provide DC 12V / 1A (at least)

Insert the 2.1mm plug on the DC power cable. Controller will initialize and the status LED will light in green colour.

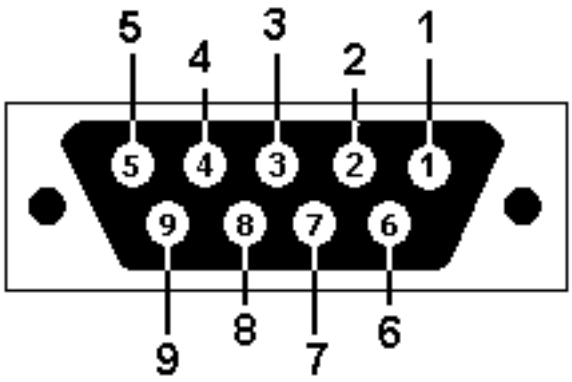
⚠ Unit has been designed with reverse polarity protection. If you accidentally reverse the power source polarity the unit will cut the power.

Motor Connector – DB9 (Older - DMFC 3.1)

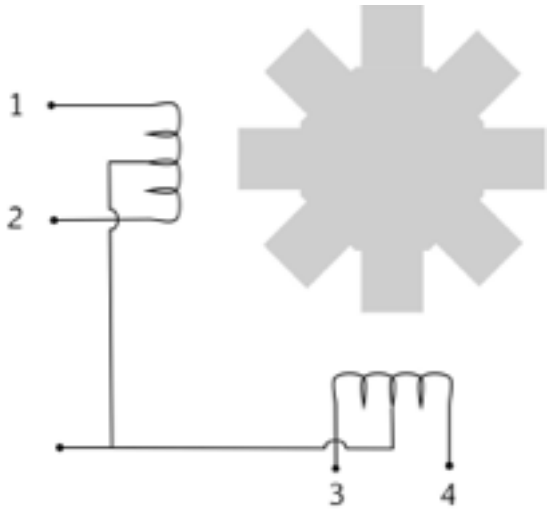


The controller is fitted with a D Sub 9 Pin Female jack.

- Stepper Motors utilize first four (4) pins of D Sub 9 female jack
- DC Motors utilize first two (2) pins of D Sub 9 female connector. Duty cycle pulse width modulation (PWM) controls the motor.



Female D Sub



Stepper Motor

STEPPER MODE	
PIN 1	COIL 1+
PIN 2	COIL 1-
PIN 3	COIL 2+
PIN 4	COIL 2-
PIN 5 - 9	NO CONNECTION

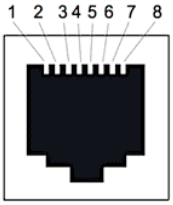
DC MODE	
PIN 1	POWER +
PIN 2	POWER -

Motor Connector – RJ5 (Current - DMFC 3.2)



The controller is fitted with a RJ45 Female Jack**.**

- Stepper Motors utilize first four (5) pins of RJ45 female jack
- DC Motors utilize pins 3 and 4 of RJ45 female connector. Duty cycle pulse width modulation (PWM) controls the motor.



Rj-45 Jack
(Female)

STEPPER MODE	
PIN 1	-
PIN 2	-
PIN 3	COIL 1+
PIN 4	COIL 1-
PIN 5	COIL 2+
PIN 6	COIL 2-
PIN 7	-
PIN 8	-

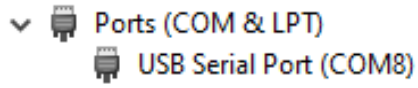
DC MODE	
PIN 3	POWER +
PIN 4	POWER -

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 “DMFC v3.x” and a “USB Serial Port COMx” will be appeared to the device manager of Windows, under Ports (COM & LPT).



Temperature Probe

The probe is an external temperature measurement device which is attached to the controller. It has a mini stereo jack and comes with a 0.6m cable length. 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 detects the presence of the probe and requests temperature readings at 30 sec intervals. When using multiple controllers and probes, the reported temperature may differ slightly between units due to small differences between individual sensor readouts.

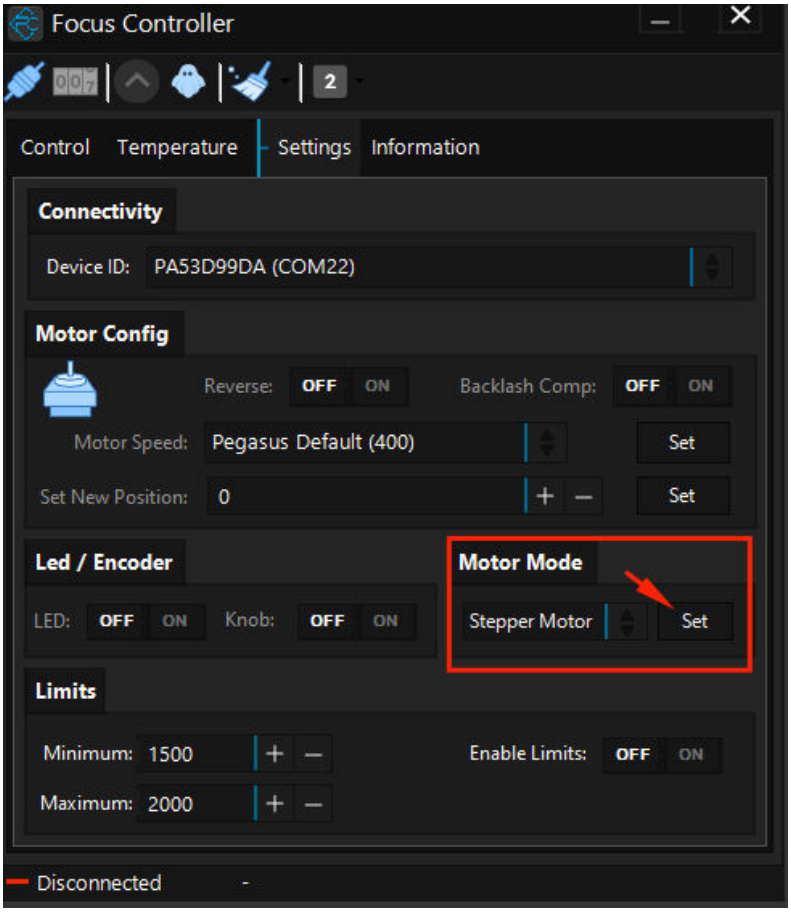
This does not affect the operation of the units, as they respond to measured temperature change, not to the actual temperature.

⚠ **Please notice that you have to connect the temperature probe before you power on the controller. If you connect it later you will have to wait for 30 seconds for probe recalibration.**

Motor Mode Selection

By its unique design controller can support two motor modes. The motor selection can be achieved inside the standalone software

- Click the drop-down menu of the **Motor Mode** (image below). Software will ask you to switch to selected mode (Stepper Motor or DC Motor)



Mode can be changed <u>only</u> from the software.

Status Led

A dual colour LED is fitted on the top of the unit. It can light in yellow or green colour. The light displayed by the led indicated the status of the device.

Permanently Green Light	Controller Start-up
Permanently Green Light	Knob encoder set to normal speed
Permanently Yellow Light	Knob encoder set to 1/10 speed
Permanently Off	Controller not operational or LED switched off from software

Permanently Orange Light	Digital Encoder functionality is disabled (knob on the top)

Rotary Encoder Knob

On the side of controller there is an infinite turn - rotary knob. This digital encoder knob simulates your focuser's knob. In every small step turn, motor will respond clockwise or anticlockwise.

Rotary encoder has two presets. The fast step (50 steps in every click of your turn). and 1/10 reduction. (5 steps in every click of your turn)

Switching these two pre-sets is easy by pressing down the knob on the side of the device.
You can also disable the encoder functionality by keep pressing the knob for two seconds. Led will turn to orange and the encoder will not obey at your commands. Press the knob one more time and you will enable the encoder functionality again.

⚠ Emergency Stop: When you press the knob, controller will halt every motor operation. This is useful when you need to stop the motor instantly.

LED Indications

Yellow Light	Knob encoder set to 1/10 speed (5 steps)
Green Light	Knob encoder set to normal (20 steps)
Orange Light	Knob encoder is disabled

Please note that rotary encoder is in operation in parallel with PC commands. They both work simultaneously and update the exact position of the motor.

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	12V (Controller has a voltage tolerance from 6V to 15V)
Motor Compatibility	DC motor - adjustable frequency PWM Unipolar motors Bipolar models
Motor Output	DC motor, max 1 Amp Unipolar / stepper motors, max 2.0 Amps (1.0 Amps per phase) Continuous output current per channel: 1 A Peak output current per channel: 3 A Continuous paralleled output current: 2 A
USB Connectivity	USB 2.0 Type B plug
Thermal Sensor Resolution	9-bit Celsius temperature measurements
Power Input Connector	2.1mm Centre Positive Socket
Motor Connector	RJ45 8P8C / (D Sub 9 female jack for older model)
Dimensions	66mm x 66mm x 28 mm

Troubleshooting guide

Problem	**Cause**	**Cure**
Controller LED is off	Power supply is not connected	Connect Power and wait for three green light blinks (Controller Boot)
Stepper motor does not move	Check if mode is in “stepper motor” setting	Set mode to “stepper motor” setting and retry
DC motor does not move	Check if mode is in “dc motor” setting	Set mode to “dc motor” setting and retry
Mode is in stepper but stepper motor does not move	Motor speed is very low or zero	Go to settings in software and set max speed of motor (try to set 400-500 steps).
Stepper motor makes strange noises	Motor has been connected with wrong cabling or a cable has been disconnected / cut (stepper motor requires 4 cables)	Check cable order is correct and retry or replace serial cable

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 400-600). Every stepper motor has a maximum speed or else it will jump and loose steps. Pegasus Astro Stepper Motor support max speed up to 500.
Knob on the side does not work	Check that LED is not orange colored. This means you have disabled the knob encoder functionality	Press the knob to enable the encoder. The led light will turn yellow or green
Sensor does not report temperature	Check that sensor is in place	Check connectivity of the sensor. Recycle power and retry or wait for 1-3 minutes for sensor recalibration.
Controller randomly looses 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:

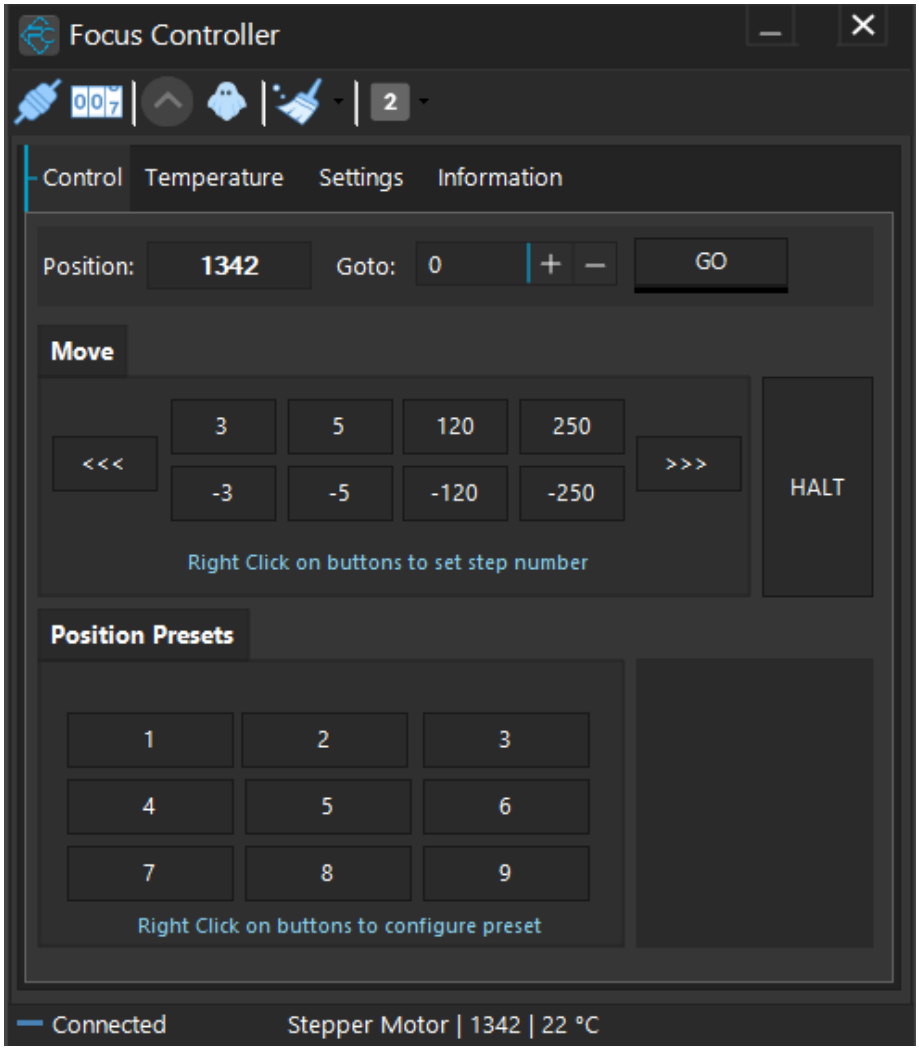
http://pegasusastro.com/support

Please download and install the following:

- ASCOM6 Driver for DMFC
- Standalone DMFC Application
- USB Drivers for DMFC

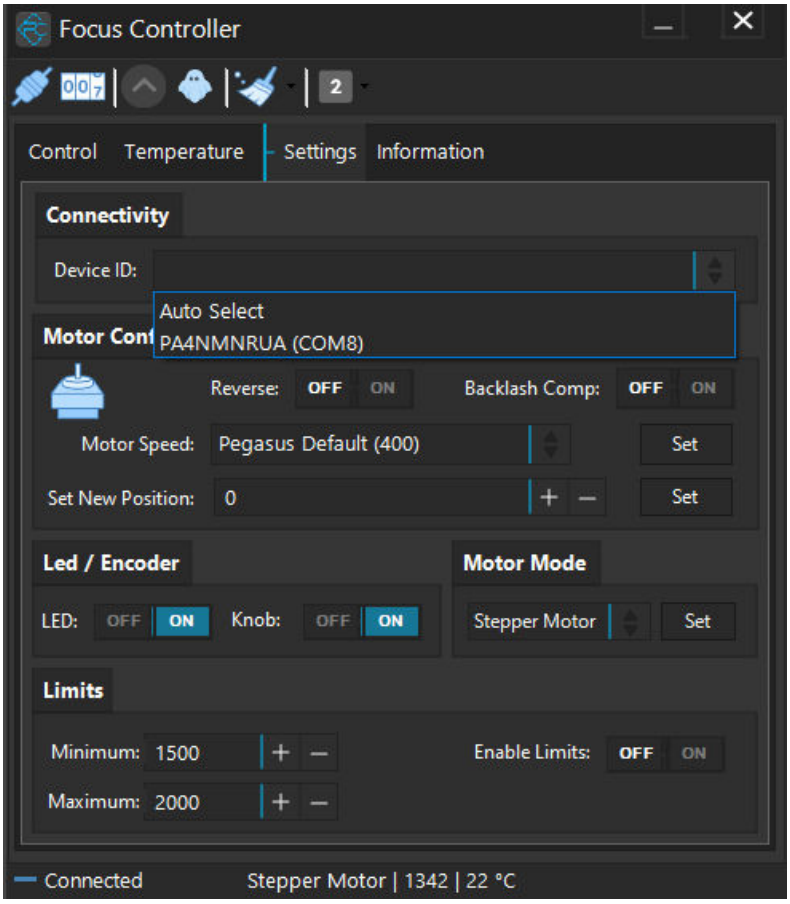
Standalone Application (Focus Controller)

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

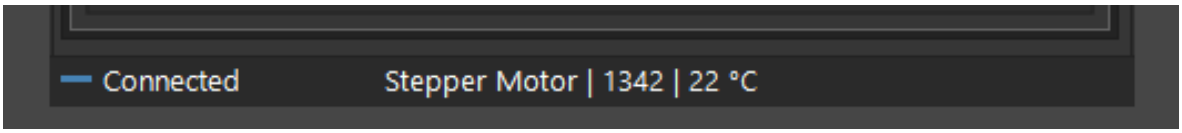


The first thing you need to do is to select your Focus controller.

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



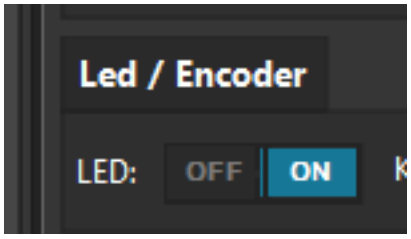
- Click “Device ID”. A drop-down instantly lists all the discovered Pegasus Astro Focus controllers.
- Select your desired device from this list. You can also choose the “Auto Select” option which will automatically use the first discovered controller of your system.
- Press “Connect” button located 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).

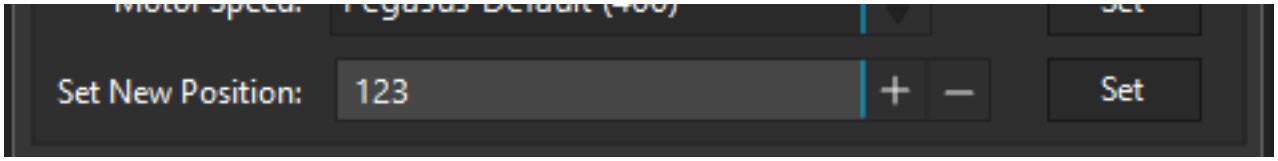
⚠ Please note that LED will turn ON after every controller power startup.



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.



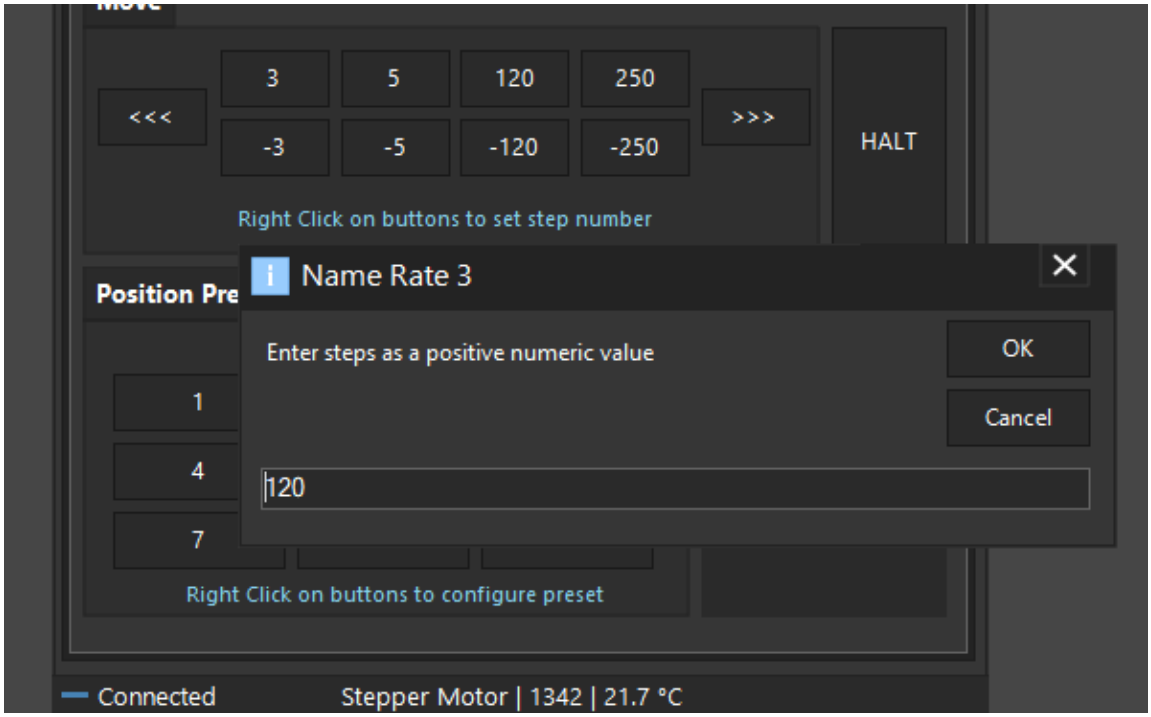
Controller will set as new position the value you typed.

> ⚠ **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.

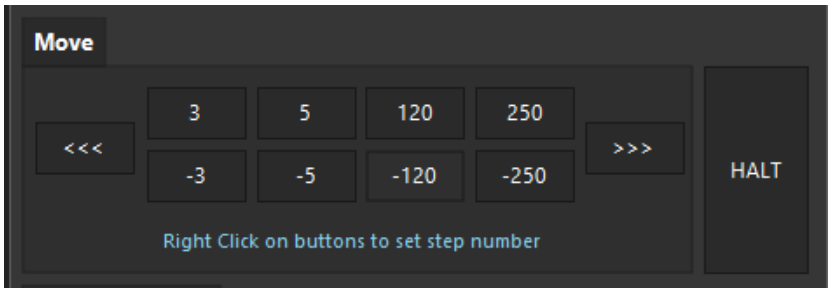
Position Presets and Motor Rates

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.



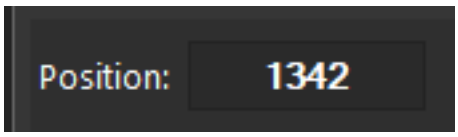
Motor Control

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



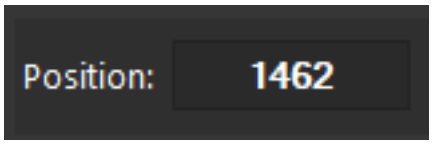
There are two additional buttons (<<< & >>>) that will forward / reverse accelerate the motor. Keep mouse down and the motor will start accelerating to the direction you have clicked.

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.

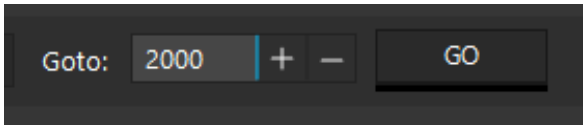
Current Motor Position

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.



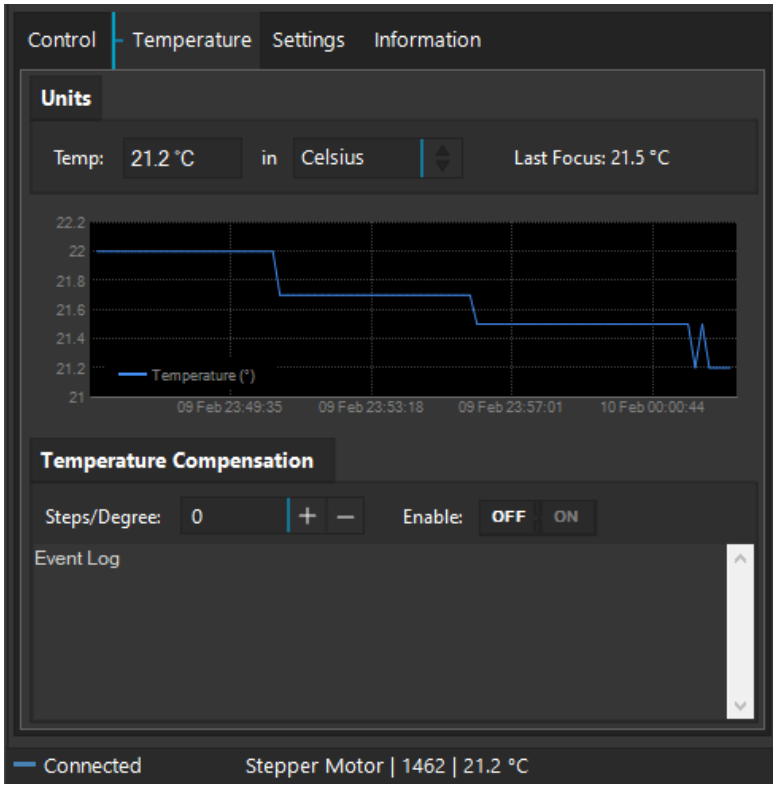
Emergency Motor Stop

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.

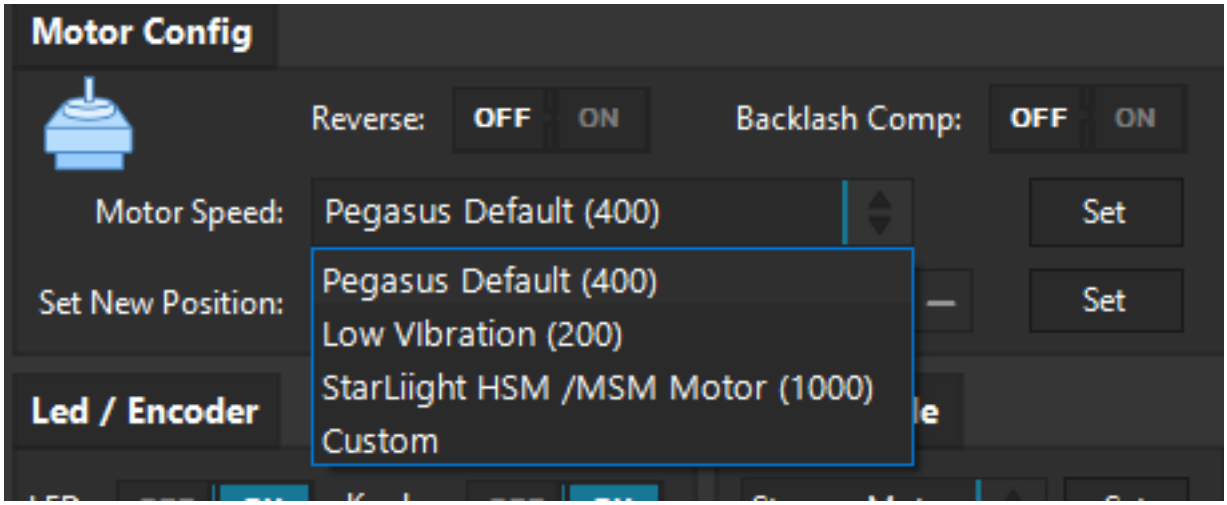
Usually, a temperature difference of 2 degrees demands a telescope re-focus. (Lots of factors rule this decision such as type of glass, carbon or aluminum tube etc.)

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.

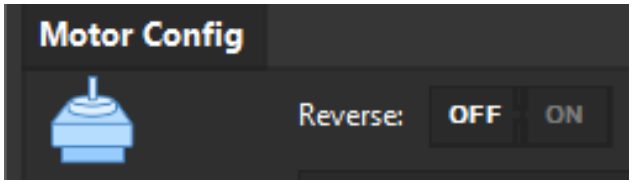
Click the **Motor Speed** drop down menu and select the desired max speed.
Click **Set** button on the right to push this setting to the controller. Setting is stored in controller’s memory

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

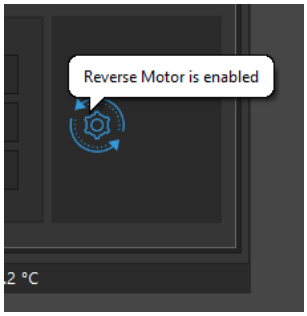


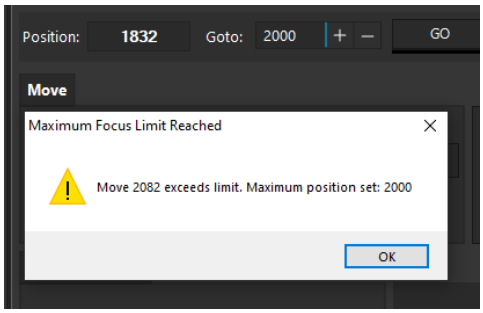
Motor Config -> Reverse Direction

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.





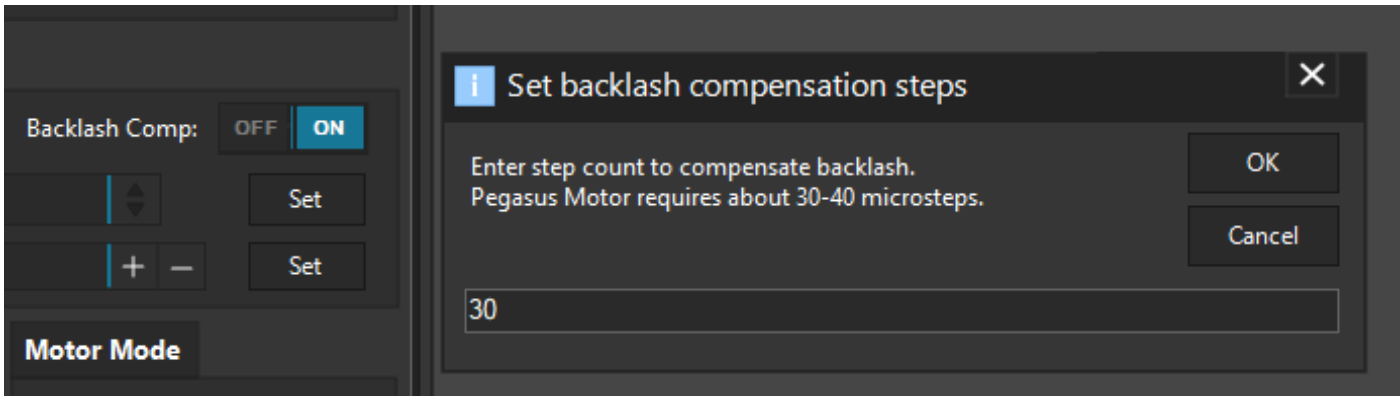
Motor Config -> Backlash Compensation

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.

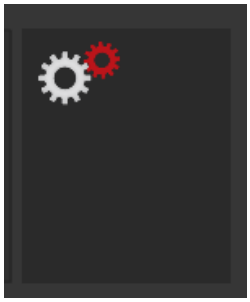
Compensation will be invoked when the move in opposite of the compensation direction. Just make sure the amount specified is more than needed to remove the backlash.

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.

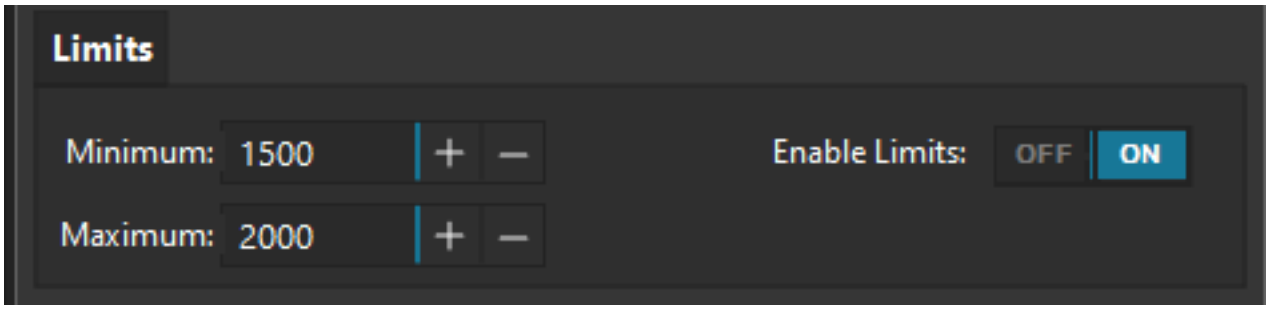


The “gear mesh” icon below will notify you that the backlash compensation functionality is enabled.



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.

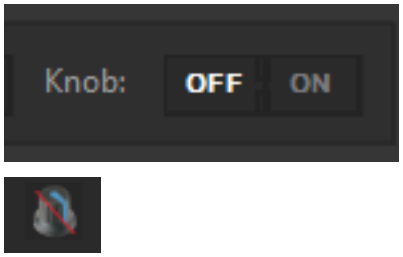
When you try to exceed this limit the controller will deny to increase steps and it will notify you that the limit was about to exceed.

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.



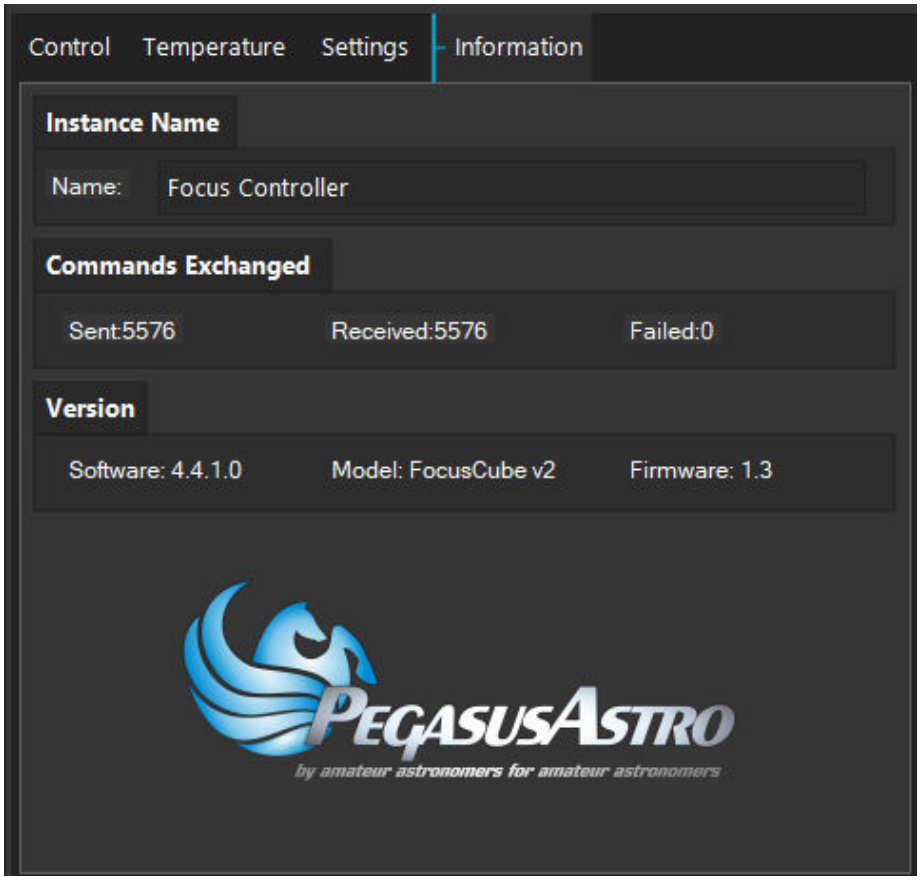
Press the knob one more time to enable the encoder functionality

Firmware and Software Version

Useful information about the:

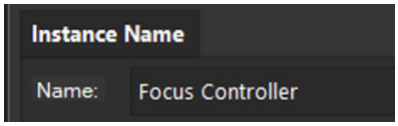
- Commands exchanged
- Software version
- Model of your controller (name and revision of the electronic board)
- Firmware version

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).