

Pegasus Astro

Stepper Motor Focus Controller v1.x

Thank you for choosing Pegasus Astro - Stepper Motor Focus Controller v1.x (SMFC)

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 **Stepper Motor Focus Controller (SMFC)** 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 / Laptop

SMFC is suitable for astro-photographers. It can drive unipolar stepper motors for absolute position focusing.

Controller have to be operated by PC by its USB v2 connectivity.

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

A single color (red) light emitted diode is fitted on the side of the unit. When controller powers on the led will remain on.

Motor output is fully compatible with “Robofocus ©” or Moonlite pin out.

An external digital temperature sensor input is located near the motor connector. The digital probe of length 1.5m is supplied. 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 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 / SMFC software. (Available for Windows OS). It is also fully compatible with ASCOM 6.

Controller firmware supports reprogramming via the USB 2.0 connection using upgrade software, for future upgrades 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



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

The controller is fitted with a standard 2.1mm center 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 / 1-2A.

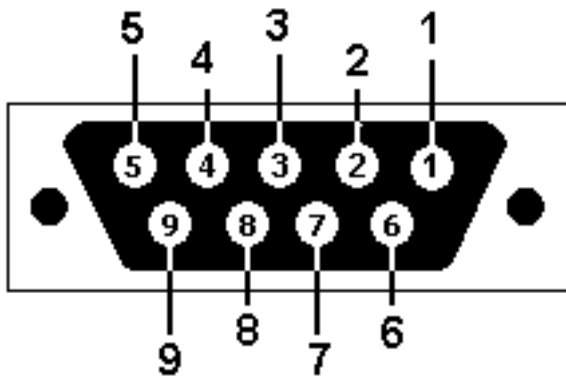
Insert the 2.1mm plug on the DC power cable. Controller will initialize and the status LED will stay illuminate in red color.

Motor Connector

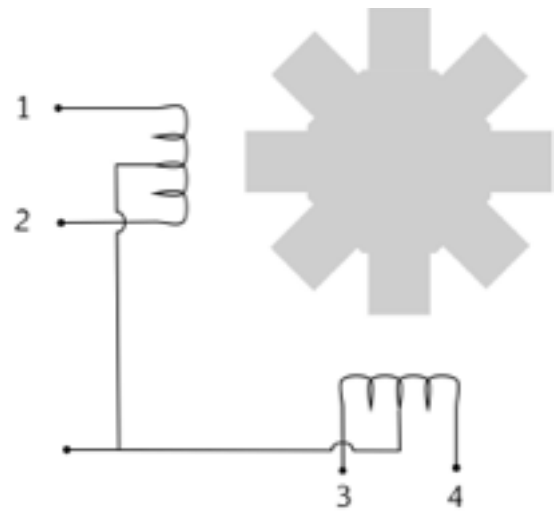


The controller is fitted with a D Sub 9 Pin Female Connector.

- Unipolar Stepper Motors utilize first five (5) pins of D Sub 9 female connector



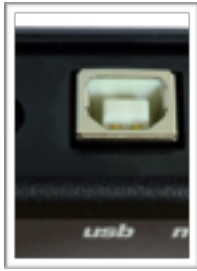
Female D Sub



Stepper Motor

FOCUSER CONNECTION IN STEPPER MODE	
PIN 1	COIL 1+
PIN 2	COIL 1-
PIN 3	COIL 2+
PIN 4	COIL 2-
PIN 5	12V DC +
PIN 6 -9	NO CONNECTION

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, the other end into the USB type B receptacle on the controller labeled USB.

Controller will be identified as “SMFC v1.x” and a serial port will be appeared to the operating system.

Temperature Probe



The probe is an external temperature measurement device which is attached to the controller. It comes with length of 1m cable. Probe measures temperatures from -55°C to +125°C.

Accuracy of the probe is $\pm 0.5^{\circ}\text{C}$ from -10°C to $+85^{\circ}\text{C}$. 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.



Keep in mind you have to connect the temperature probe before you power on the controller. If you connect it later the probe will not report temperature reading. You will need to recycle power to make the probe work.

Status Led

A single color LED is fitted on the side of the unit.

Permanently Red Light	Controller is on and operational
Permanently Off	Controller not operational or LED switched off from software

Technical Specifications

Supply Voltage	9 - 15V DC (12V preferred)
Motor Compatibility	Unipolar motors Bipolar models
Motor Output	Unipolar / Bipolar stepper motors, max 1.6 Amps (0.8 Amps per phase)
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	D Sub 9 female connector
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 the red led to turn on.
Stepper motor does not move	Check mode slider switch is in stepper	Set slider switch to stepper mode 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 noise	Motor has been connected with wrong cabling or a cable has been disconnected / cut. (stepper motor requires 5 cables)	Check cable order is correct and retry or replace serial cable
Stepper motor makes strange noise 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)
Sensor does not report temperature	If you have connected sensor after controller’s power on the sensor will not work	Check connectivity of the sensor. Recycle power and retry.

Software installation

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

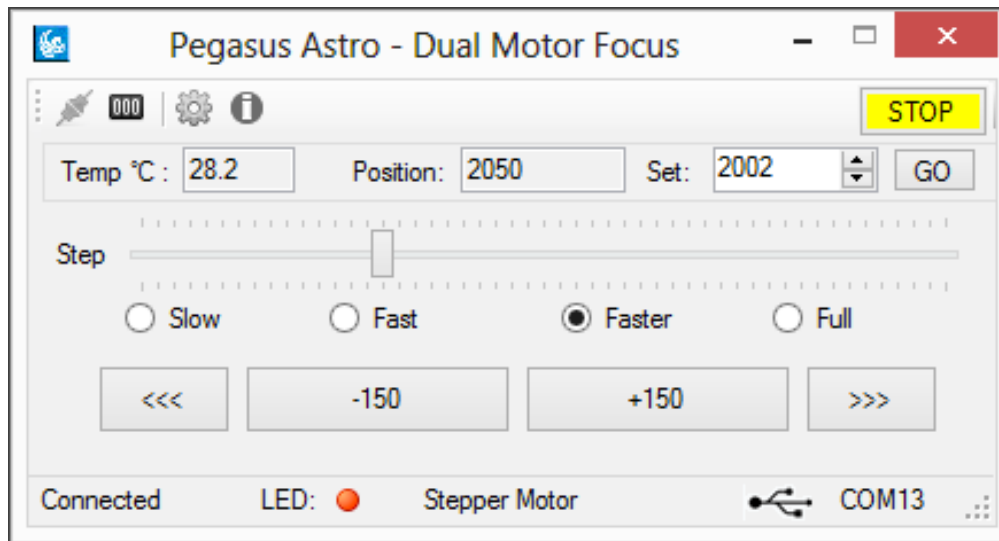
<http://pegasusastro.com/support>

Please download and install the following:

- ASCOM6 Driver for DMFC/SMFC
- Standalone DMFC/SMFC Application
- USB Drivers for DMFC/SMFC (Probably you will not need this as windows will auto install the controller’s driver)

Standalone DMFC / SMFC Application

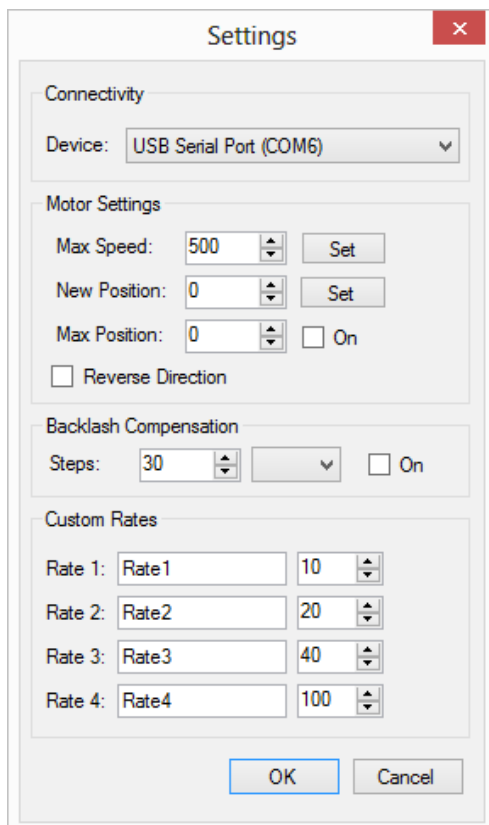
Standalone application does not require ASCOM drivers and it can configure and operate the Single Motor Focus Controller.



In order to connect from the supplied software to the controller, you need to first configure the serial port

- Click on "Settings" icon 

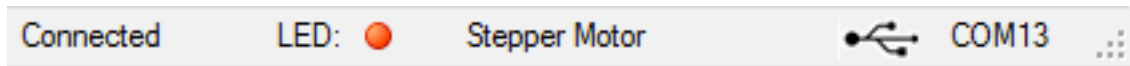
The following window will appear



- Click “Device”. A drop down list of discovered SMFC controllers will appear. Choose the “Single Motor Focus Controller” device and click “OK”
- Press “Connect” button

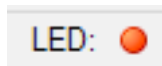


- Application will connect to the controller and the “**Connected**” status will appear on the bottom taskbar.



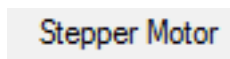
Led status

You can operate the led indicator on the top of controller on demand. Click the circle “LED” icon and switch on or off the LED of the controller.



Mode status

The mode selection of the controller will always be reported in this section of the taskbar as “Stepper Motor” (As seen below)



Motor Settings – Max Speed

It’s **critical** to set “Max speed” of stepper motor. All stepper motors have limits in max speed they can achieve. If you set a speed faster than your motor can support it probably jump steps or make weird noise as it cannot operate correctly.

- Connect to the controller
- Go to settings and check “Motor Settings”

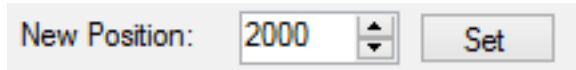


- Set steppers motor “Max Speed” and click “Set”. Setting will be saved to controller’s memory (EPROM)
- Power cycle controller to read new setting and configure motor output

Motor Settings - New Position

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

- Type new position and press “Set” Button



- Controller will instantly set new position the value you specified.
Notice that controller will not move motor. Controller will only change value of reported current position

This 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 “000” button in the top taskbar of the application.




Custom Rates

You can easily set and save custom names and step / pulse values in the following section of “Setup” page.



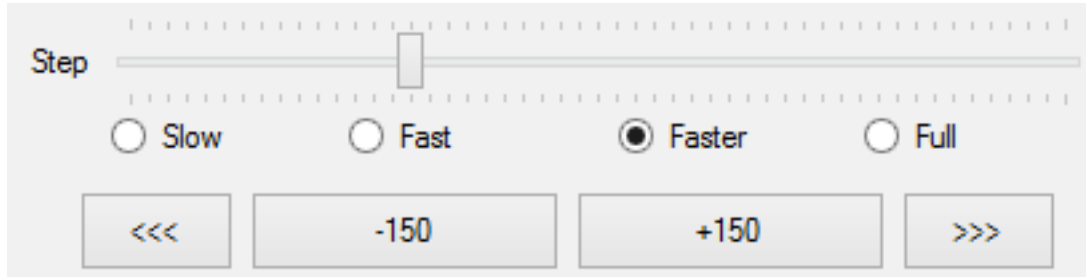
Click “OK” and your settings will appear in the main application.



Control Motor

From these buttons you will control the steps of the stepper motor or pulses from DC motor.

- Set the “Step” to the value you want (bigger the step / pulse count, larger the movement of the motor shaft)

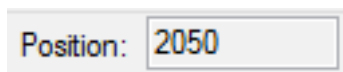


You can also fast select the predefined values you specified in “Custom Rates”

- Click once the “step number” button. This is how many steps the motor will move forward (+ steps) or backwards (- steps).



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



There are also two more buttons that will forward / reverse accelerate the motor. Keep mouse down and the motor will start accelerating to the director you clicked.

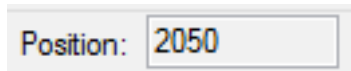


Use these buttons only if you need to fast move in or out the focuser

! In every motor movement, final position (when motor stops) is saved in controller’s memory. This will ensure next time you power on the controller, last saved position will be retrieved from its memory.

Current Motor Position

Controller continuously (every 500 millicsec) reports motor / focuser position. Reading can be found in the following image:



Set A New Motor Position

You can easily specify a new motor position. Set the value and click "GO" button. Motor will start moving to the new position you defined.



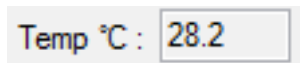
Emergency Motor Stop

Click the "STOP" yellow button and the motor will instantly stop. This can save you if you specified a wrong position and the focuser is extending very fast.

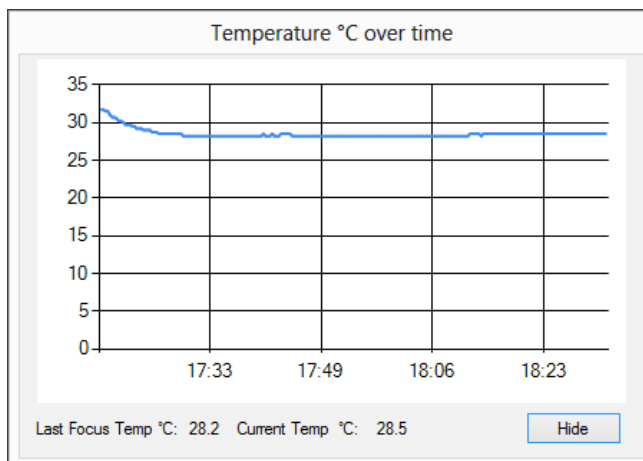


Temperature of sensor

Existing environmental temperature of the sensor can be seen in the following reading.



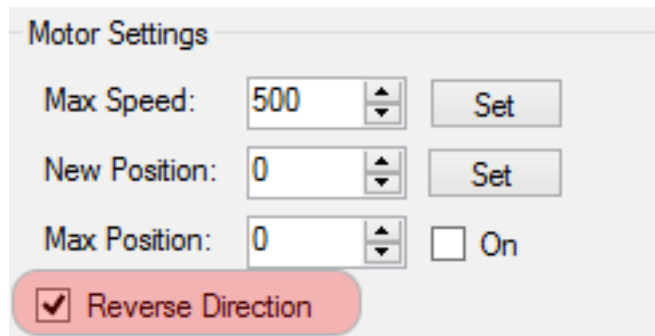
Click the temperature and a graph which displays temperature over time will appear



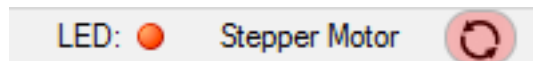
You can easily view when was the last focus temperature so you can know exactly if it is time to refocus.

Reverse Direction

In case you need to invert the motor in anti-clockwise rotation you can click the “Reverse Direction” option from settings. This option can be useful if you use gears to transmit motor’s movement to your focuser.



An anti-clockwise icon will appear on the status bar of the main application pointing that you have selected this option.



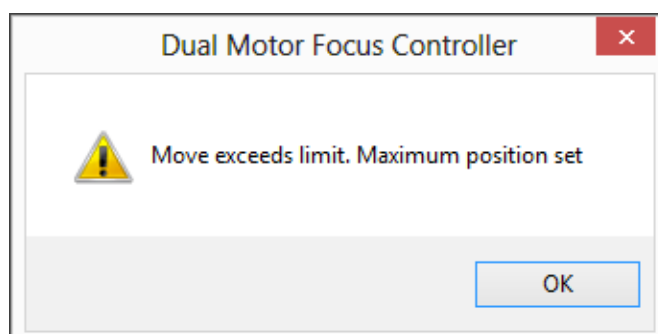
Maximum Position

You have the option to specify the maximum steps of the motor. This will enforce the controller to disallow a motor move to the direction you are about to exceed this limit. This is a useful option to prevent the focuser to fully move in or out.

Move to settings and type the numeric limit in the “Max Position” section you need to enforce. Click the “On” check button



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.

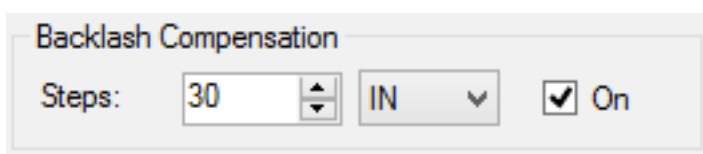


Backlash Compensation

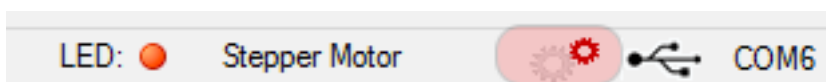
Backlash, sometimes called lash or play, is clearance or lost motion in a mechanism caused by gaps between the parts. Motor's gearbox or other components in the focuser can have an amount of backlash.

Compensation will be invoked when the move in opposite of the compensation direction. For example, if you select "IN" then on every "OUT" move, the compensation will be invoked such that the focuser will be moved out by the amount specified and then in by that amount to remove the backlash. There is no need to be exact about the amount of compensation to use. Just make sure the amount specified is more than needed to remove the backlash.

To enable backlash compensation, choose the extra steps you need to calculated in compensation, select the direction of it and click the "On" check box.



An indication on the main status bar will notify you that the backlash compensation functionality is enabled.



Firmware and Software Version

Connect to controller and click the "informational" button on the taskbar of the main application.



In this window you can verify the firmware version of the controller including the version of the standalone application. Keep in mind that software supports new feature combined with the latest firmware release.

Please check <http://pegasusastro.com/support> for latest firmware & software updates of “Single Motor Focus Controller”.