

Shoestring Astronomy

USB Focus Motor Controller User Manual Model FCUSB

Revision 1.1
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Introduction

The Shoestring Astronomy USB Focus Motor Controller is designed to allow personal computers to control DC motors that are commonly found on telescope focusers. Because it is a USB device, it is very convenient to install, is compatible with many operating systems, and requires no additional power source. However, you will need more than this device alone, you will also need a cable that is compatible with your focuser motor, and software that supports this product. Consult the Shoestring Astronomy website for a current list of cables. Shoestring Astronomy provides FocusPal software to allow you to control your focuser from a personal computer, or you can use any third-party software that supports the ASCOM Focuser standard (www.ASCOM-Standards.org) using the Shoestring FCUSB ASCOM driver.

Features

- Plugs directly into your computer's USB port.
- Receives power from your computer via the USB port, so no external power source or battery is necessary.
- Uses the USB HID (Human Interface Device) class driver, which is included with most operating system such as Windows 98 Second Edition, Windows 2000, and Windows XP. There is no need for a proprietary USB driver.
- Compatible with any DC focus motor that uses 5 to 12v, works best with 5V motors.
- Output is a standard 3.5mm mono jack, so making a cable specific to your focus motor is easy if one is not already available.
- Red-green LED for software-dependent status indication.
- Speed control and PWM frequency control allow you to tune the controller to optimize its performance with your specific model of motor.

Device Installation

The first time you plug the FCUSB into a computer, it will automatically be identified as a new device. See the section below that applies to your operating system. Operating systems prior to Windows 98 Second Edition do not support USB and the HID class of devices.

After the first installation is complete, the next time you plug the FCUSB into your computer, it will remember that this device has already been installed once and will automatically recognize it.

To remove the FCUSB from your computer, simply unplug it from the USB port.

Installation under Windows XP or Windows 2000

Plug the device into a USB port. The red LED on the FCUSB should light immediately. A “Found New Hardware” balloon will pop up on your monitor. Wait a few moments and the text in the balloon should change to say “Your new hardware is installed and ready to use”. It really is that simple!

Installation under Windows 98 Second Edition

Win98SE installation is a little more work, but still pretty simple. Plug the device into a USB port. The red LED on the FCUSB should light immediately.

- 1) The “Add New Hardware Wizard” should open up. Click the “Next” button.
- 2) The wizard will then say “What do you want Windows to do?” Select “Search for the best driver...”, then click the “Next” button.
- 3) The wizard then says “Windows will search for new drivers...”. Uncheck all the boxes and click “Next”.
- 4) Next the wizard says “Windows driver file search for the device:”, and should show the location as C:\WINDOWS\INF\HIDDEV.INF. Just click the “Next” button.
- 5) At this point, you will probably be asked to insert the Windows 98 Second Edition CD-ROM. Do this, then click “OK”, then click “OK” again
- 6) Finally, click “Finish” and you should be done!

Connecting to Your Focus Motor

The output of the FCUSB is a standard 3.5mm mono jack. Many focus motor manufacturers already use this type of connector. If your motor does not, then you will need a cable that has a 3.5mm mono plug at one end, and the appropriate focuser-specific connector at the other end. Several types of cable are available from Shoestring Astronomy, or you may choose to build your own.

Operation Verification

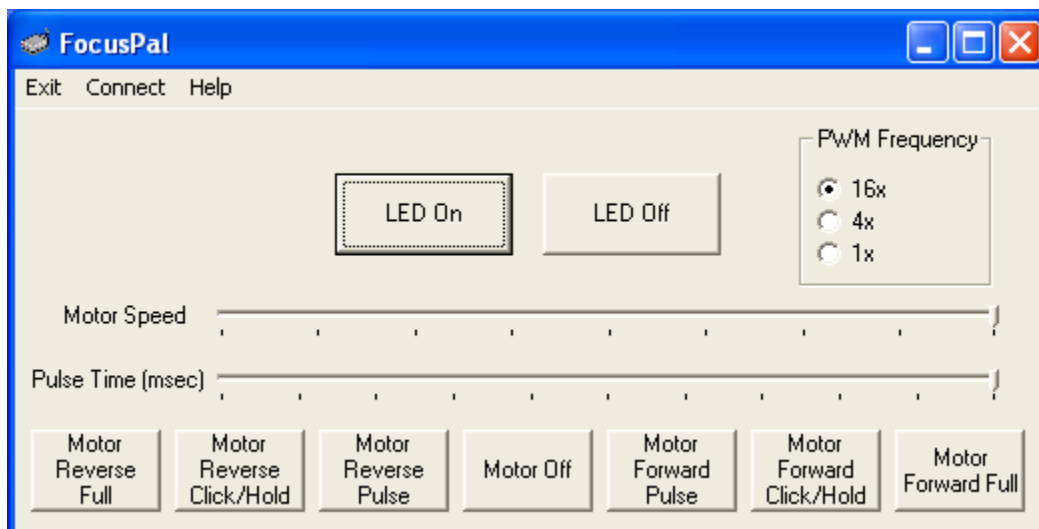
Once you have completed the initial installation, you will want to verify that the FCUSB is working properly. To do this, you should download and install FocusPal from the Shoestring Astronomy website and follow the FocusPal instructions below. Even if you intend to use third-party focuser software instead of FocusPal, you should do this first to verify that everything is working properly. Should you have trouble getting your third-party focuser software to work, using FocusPal will allow you to troubleshoot your setup. In other words, if everything works with FocusPal, then your problem most likely is with your third-party software.

Using FocusPal Software

Download and install FocusPal software from the Shoestring Astronomy website. Plug the FCUSB into a USB port on your computer or a USB hub. Plug your focus motor cable into the FCUSB output jack, then the other end into your focus motor.

Now, start the FocusPal software. A message box should pop up telling you that it has found the FCUSB. Click OK to proceed to the main FocusPal panel. If the message box says that it cannot find the FCUSB, then either the FCUSB is not properly plugged into a USB port, the USB port is bad, or the FCUSB is no longer operating properly. Try unplugging and replugging the FCUSB into a USB port and click Connect on the FocusPal menu bar.

The main FocusPal window looks like this:



LED On / Off

Normally, the LED on the FCUSB will be red, and change to green when the FCUSB is energizing the motor. If you wish to extinguish the LED, click LED Off. Click LED On to re-enable the LED indicator.

Motor Speed

The output of the FCUSB is a pulse-width modulated voltage that can be varied from an average value of 5V down to 0V. The Motor Speed slider allows you to control the average voltage in a linear fashion. Note however that the speed of DC motors does not respond linearly to the voltage applied across it, so the actual motor speed will not necessarily vary linearly with the position of the Motor Speed slider.

PWM Frequency

Motors also behave differently as a function of the frequency used by the pulse-width modulator. This radio button allows you to select one of three frequencies to further optimize the performance of your focuser motor. The 16x setting provides a PWM frequency of about 25 kiloHertz, which is above most human hearing. Selecting 4x (about 6 kHz) or 1x (about 1.6 kHz) may provide better performance, but it may also result in more audible noise when the motor is energized.

Pulse Time

This slider allows you to adjust the amount of time the motor is energized when you click on one of the Motor Pulse buttons.

Motor Forward Pulse and Motor Reverse Pulse

These buttons will energize the motor for the amount of time set by the Pulse Time slider. One click will energize the motor, then it will turn off automatically once the pulse time is complete.

Motor Forward Click/Hold and Motor Reverse Click/Hold

Clicking and holding down on the mouse button will leave the motor energized for as long as you hold. Once you release the mouse button, the motor will stop.

Motor Forward Full, Motor Reverse Full, and Motor Off

Clicking the Motor Forward Full or Motor Reverse Full buttons will energize the motor until either the Motor Off button is clicked, or you exit out of FocusPal software completely.

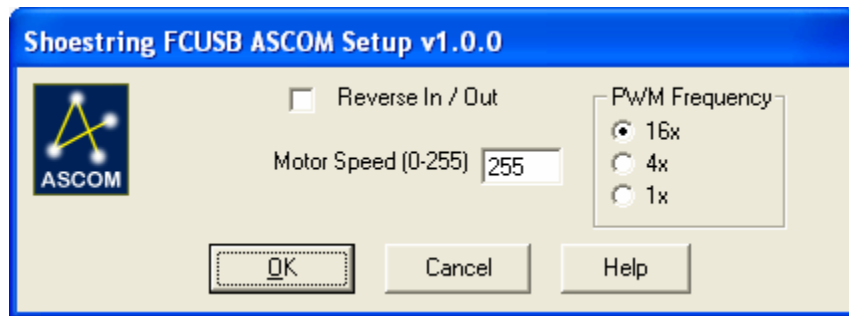
NOTE: The FCUSB and any software used with it has no capability to sense when the focuser is run completely in or out. Damage may result if you run the focuser too far in either direction. Know your focuser and decide for yourself if this could be an issue.

The settings of Motor Speed, PWM Frequency, and Pulse Time will automatically be saved when you exit FocusPal and recalled when you start it next time.

ASCOM Driver and Third-Party Software

If you wish to use the FCUSB with third-party focus software, a free ASCOM driver for the FCUSB is available for download from the Shoestring Astronomy website. You should first download and install the ASCOM platform from www.ASCOM-Standards.org. Then, download and install the FCUSB ASCOM driver from Shoestring Astronomy. Finally, install your third-party focuser software.

The FCUSB ASCOM driver provides a Setup window that allows you to set the motor speed and PWM Frequency as described in the FocusPal operation above. You can also reverse the operation of the motor using the Setup window. The settings you select in the Setup window will be saved and recalled each time you invoke the FCUSB ASCOM driver.



Operating Hints and Tips

- 1) Unless specifically outfitted with a positional encoder, DC motors provide no indication of their position. Thus, repeatability of focuser position is not guaranteed.
- 2) Temperature will affect how your motor performs, so you may need to retune the motor speed and PWM frequency as the temperature changes.
- 3) In spite of points 1) and 2), it is quite possible that you can get very good results with automated focus software. Experiment with the pulse time and PWM frequency parameters to optimize the performance of your FCUSB and focuser.

Limited Warranty

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