

# FOCUS MOTOR

## INSTRUCTION MANUAL

ENGLISH • MODEL #94155-A



The Focus Motor provides hands-free focusing for Celestron Schmidt-Cassegrain (SCT), EdgeHD, and Rowe-Ackermann Schmidt Astrograph (RASA) telescope optical tubes. This is a great convenience, especially for astroimagers with remote telescope setups and people who have dexterity issues that limit their ability to use a focus knob.

The focus motor is compatible with all Celestron SCTs from 6" to 14" in aperture that have been produced since the year 2006; it is not compatible with 5" SCTs or older models. It is compatible with all EdgeHD telescopes. It is compatible with the 8" and 36cm Rowe-Ackermann Schmidt Astrograph (RASA) models, and the Celestron 7" Maksutov-Cassegrain. The focus motor can also be used with the 11" RASA, but if it has the FeatherTouch MicroFocuser installed, then it will require the Focuser Retrofit Kit for the RASA 11 (#94255).

For 6" Schmidt-Cassegrain telescopes only, the Off-Axis Guider (#93648) cannot be used when the focus motor is installed due to mechanical interferences.

If using a Celestron computerized mount, the focus motor can be powered by the mount, and allows focus control from the telescope's hand control or from a computer connected to the mount. If not using a Celestron mount, the focus motor can be controlled directly by a computer via a USB cable, and is powered by the USB connection or an optional 12V DC power supply.

Please read through the entire instruction manual before attempting to use the focus motor. The manual will guide you through the various methods of powering and controlling the focus motor. For installation instructions, refer to the Setup Guide included with the focus motor.

## CHECKING CLEARANCES

The focus motor protrudes outward from the rear cell of the telescope. After installation, check to make sure the focus motor does not interfere with the telescope's mount as it points to different parts of the sky. Specifically, if using a fork mount that has adjustable positioning of the optical tube on the fork, such as the NexStar SE and NexStar Evolution mounts, make sure the focus motor does not interfere with the mount when pointed straight up (or at the pole if using an equatorial wedge).

If it does interfere, simply reposition the telescope on the fork mount until the focus motor clears the base. The telescope may be a bit out of balance, but it should not affect performance.

To prevent interferences, the focus motor orientation relative to the telescope's rear cell can also be changed. This is done by using a different set of mounting holes to mount the focus motor onto the focuser cover plate, or by rotating the cover plate itself. Refer to the Setup Guide for more information.



## USING THE FOCUSER MOTOR THROUGH A CELESTRON COMPUTERIZED MOUNT

### METHOD 1: WITH THE NEXSTAR+ OR STARSENSE HAND CONTROL

If using a Celestron computerized mount, the focus motor can be powered and controlled from the mount. This is done by connecting the AUX port on the focus motor to an AUX port on the mount using the supplied cable. If there are no available AUX ports, the optional Celestron Aux Port Splitter can be purchased.

Once connected to the mount's AUX port, the focus motor can be controlled from the mount's hand control. Both the the NexStar+ hand control (requires version 5.30+ of the firmware) and the StarSense hand control (requires version 1.19+ of the firmware) are compatible.

**NOTE:** If your hand control firmware is not up-to-date, use the Celestron Firmware Manager (CFM) to update it. This program can be found at [celestron.com/CFM](http://celestron.com/CFM).

The focus control can be accessed by pressing the hand control's MENU button, then selecting "Focuser."



The focus motor controlled by the NexStar+ hand control through a Celestron mount.

### METHOD 2: WITH A COMPUTER

When connected to the AUX port, the focus motor can also be controlled through the mount from a computer. This is especially desirable when doing astronomical imaging, as this will allow control of both the mount and the focus motor from the computer. Connect the hand control to the computer using a USB A-to-mini B cable (not included). One end of the cable is connected to the USB mini B port on the bottom of the hand control, the other end is connected to the computer.

Once connected, you can use most any astronomy telescope control software that has focuser control by using the Celestron Unified ASCOM mount driver, which can be downloaded from [ascm-standards.org](http://ascm-standards.org).



The focus motor controlled by a computer through a Celestron mount.

Celestron also offers FREE Windows PC software that directly controls the focus motor without the need for an ASCOM driver. The simple Celestron Focuser Utility Program application can be downloaded from the Focus Motor product page at [celestron.com/FocusMotor](http://celestron.com/FocusMotor). Alternatively, the focus motor can be controlled with the Celestron PWI software. This program is available at [celestron.com/CPWI](http://celestron.com/CPWI). If using either of these two programs along with the Celestron CGX or CGX-L mounts, the computer can be directly connected to the mount's USB port (requires a USB A-to-B cable).

**NOTE:** If control commands arrive from multiple sources, such as the hand control and a computer program, the focus motor will answer all commands in the order they arrive.



The free Celestron Focus Utility Program provides a simple user interface for controlling the focus motor.

## USING THE FOCUS MOTOR WITHOUT A CELESTRON MOUNT

If you are not using a Celestron mount, the focus motor can be powered and controlled via the USB port. This can be done by connecting it to a USB3 port or a USB2 port that provides at least 900 mA. To connect to a USB port, you will need a USB A-to-B cable (not included). Make sure to use a good quality cable, or the motor may not receive enough power. Connect the cable to the USB port on the focus motor, and connect the other end to your computer or USB hub.

Alternatively, the focus motor can be powered from a 12V DC power source. The power source needs to be able to supply at least 1A. Connect the power source to the 12V DC jack on the focus motor using a tip positive 5.5mm/2.1mm plug. Using an external 12V DC power source will prevent your laptop battery from being drained by the focus motor. Also, if your computer's USB2 port does not provide enough power, an external 12V DC power source can be used.

To use the focus motor with astronomy software, you will need the Celestron USB Focuser ASCOM driver, which can be downloaded from the Focus Motor product page at [celestron.com/FocusMotor](http://celestron.com/FocusMotor). Celestron also offers FREE Windows PC software that directly controls the focus motor without the need for an ASCOM driver. The simple Celestron Focuser Utility Program is available on the Focus Motor product page at [celestron.com/FocusMotor](http://celestron.com/FocusMotor).



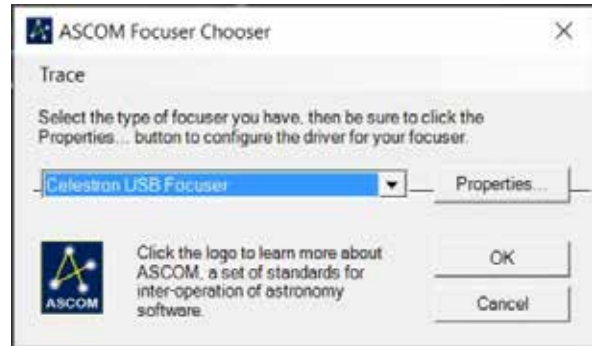
The focus motor controlled directly from computer through its USB port.

## CALIBRATING THE FOCUS MOTOR

Before using it for the first time, we recommend calibrating the focus motor to indicate where the inward and outward limits of mechanical focuser travel for the telescope are. This will prevent the motor from reaching the focuser limits and straining the motor. Calibrating the focuser also sets the focuser index positions so that accurate “Move To” commands can be executed. The focus motor only needs to be calibrated during the initial setup or if it is removed and reinstalled on the optical tube. After calibration, the focuser limits and index positions are stored in the focus motor.

To calibrate using a Celestron hand control, press the MENU button, then select “Focuser,” then “Calibration.” If using either the Celestron Focuser Utility Program or Celestron PWI software, calibration can be done directly from the program’s user interface.

If using an ASCOM driver along with third-party focuser control software, you can calibrate with the driver. Select “ASCOM focuser” as the focuser, then for Focuser Settings select “Celestron USB Focuser.” The calibration routine can then be accessed from the “Properties” button within the ASCOM Focuser Chooser.



The focus motor can be calibrated using any of the above methods and will not need to be done again if changing how the focus motor is controlled. For example, you can calibrate with a Celestron hand control and then use third-party software without needing to calibrate again.

When initiated, the calibration routine will slew to the inward focuser travel limit, then to the outward travel limit. This process takes several minutes. When completed, the full range of travel will be indexed from zero (the inward limit) to 1000x the number of turns of the focuser knob needed to reach the outward limit. So, for example, if the focuser knob has a total of 40 turns of travel, the focuser positions will be indexed from 0 to 40,000.

## USING THE FOCUS MOTOR

There are two ways to control the focus motor: the motor can be manually slewed to change focus or it can automatically slew to a specific focuser index position.

If using a Celestron hand control, you can manually slew the focuser by pressing the MENU button, then selecting “Focuser”, then “Move In/Out”. You will then be prompted to select a motor speed rate, from 1 (slowest) to 3 (fastest). The rates correspond to the following knob rotation rates:

RATE 1: 8°/sec

RATE 2: 32°/sec

RATE 3: 128°/sec

Then, use the SCROLL DOWN and SCROLL UP buttons to rotate the focus knob. Specifically, the SCROLL DOWN button will rotate the focus knob clockwise, which moves the primary mirror inwards (i.e. towards the rear cell), and the SCROLL UP button will rotate the focus knob counter-clockwise, which moves the primary mirror outwards (i.e. towards the Schmidt corrector).



If you wish to change the motor speed rate, simply press the BACK button, and select another rate.

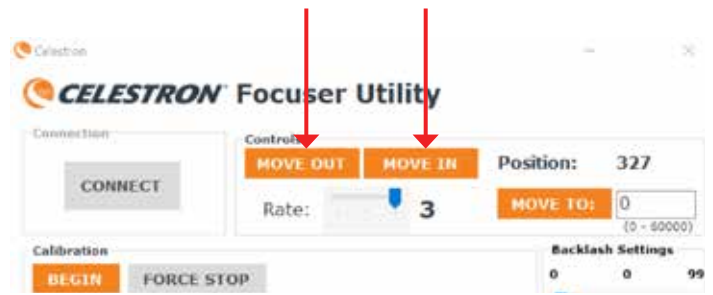
If using with the Celestron Focuser Utility Program or Celestron PWI, you can manually slew the focuser by using the MOVE IN (rotates the motor clockwise) and MOVE OUT (rotates the motor counter-clockwise) buttons from the user interface. Change the speed rate by using the Rate slider.

When the focus motor is in use, you can see the rear of the motor's clamping collar rotating. There is a reference printed in white on the focus motor to determine which way the primary mirror is moving within the telescope. The reference indicates that when the motor is rotating clockwise, the primary mirror is moving in the negative direction (i.e. towards the rear cell), and when the motor is rotating counter-clockwise, the primary mirror is moving in the positive direction (i.e. towards the Schmidt corrector).

You can go to a specific focuser index position by using a "Move To" command. If using a Celestron hand control, press MENU and select "Focuser", then "Move To." From here, you can enter a focuser index position and the motor will automatically slew to that position. When using the Celestron Focuser Utility Program or Celestron PWI, enter a focuser index position in the MOVE TO window, and the motor will automatically slew to that position.

The "Move To" function is convenient to use after you have determined the best focus for your setup. Take note of the focuser index position, and you can automatically return to that position in the future. The current index position is shown on the "Move To" screen for the hand control, and above the MOVE TO button for the Celestron Focuser Utility Program and Celestron PWI.

**NOTE:**When using the "Move To" command to automatically move the focuser to an index position, the focus motor will always approach focus in the positive direction (i.e. with the focus knob rotating counter-clockwise and the primary mirror moving outward). This is done to ensure the best accuracy of the "Move To" command, as it eliminates any potentially "lost" index position steps due to backlash in the telescope's focuser system. If the desired index position is inward (i.e. a lower number) from the initial position, the focus motor will move 500 steps inward past the selected index position before reversing direction and returning to the selected position.



The "+" and "-" reference printed in white on the motor indicates the direction in which the primary mirror is moving.

## BACKLASH SETTINGS

When changing direction of the focus motor, you may notice a little bit of backlash in the telescope's focus. This means that the motor is turning a bit before the focus of the telescope changes. This will typically manifest itself when critically focusing on a star using the slowest motor speed rate. You can compensate for this backlash with the backlash setting.

In the Celestron hand control, the backlash setting can be found by pressing the MENU button, then selecting "Focuser," then "Backlash." For the Celestron Focuser Utility Program or Celestron PWI, there is a Backlash Settings slider in the user interface. The backlash setting can be set from 0-99.

To find the best backlash setting, first acquire a bright star in your telescope's field of view and roughly focus it. Next, set the motor speed rate to its slowest setting and defocus the star using one of the hand control's SCROLL buttons, or the MOVE IN or MOVE OUT command from the computer program. Defocus the star until you can

clearly see the out-of-focus "doughnut" star image. Now, reverse direction of the focus motor. If the defocused star image immediately starts becoming smaller, then the backlash setting should remain at 0 (i.e. the default setting). If you notice a bit of time elapsing before the image begins changing, then increase the backlash setting. Repeat this procedure until the focus of the telescope immediately changes when changing direction of the focus motor. If you set the backlash setting too high, you will notice the focus rapidly changing as soon as you change directions, and it may "overshoot" your desired focus. If this occurs, decrease the backlash setting.

## PORT COVERS

To best protect the focus motor, keep the tethered covers on the ports when not in use. When the ports are in use, the covers can be hooked onto the posts on the side of the focus motor to keep them from dangling.



## CELESTRON TWO YEAR LIMITED WARRANTY

- A.** Celestron warrants your telescope to be free from defects in materials and workmanship for two years. Celestron will repair or replace such product or part thereof which, upon inspection by Celestron, is found to be defective in materials or workmanship. As a condition to the obligation of Celestron to repair or replace such product, the product must be returned to Celestron together with proof-of-purchase satisfactory to Celestron.
- B.** The Proper Return Authorization Number must be obtained from Celestron in advance of return. Please submit your request to Celestron's online technical support center at <https://www.celestron.com/pages/technical-support> or call 1(800) 421-9649 to receive the number to be displayed on the outside of your shipping container.

All returns must be accompanied by a written statement setting forth the name, address, and daytime telephone number of the owner, together with a brief description of any claimed defects. Parts or product for which replacement is made shall become the property of Celestron.

The customer shall be responsible for all costs of transportation and insurance, both to and from the factory of Celestron, and shall be required to prepay such costs.

Celestron shall use reasonable efforts to repair or replace any telescope covered by this warranty within thirty days of receipt. In the event repair or replacement shall require more than thirty days, Celestron shall notify the customer accordingly. Celestron reserves the right to replace any product which has been discontinued from its product line with a new product of comparable value and function.

This warranty shall be void and of no force of effect in the event a covered product has been modified in design or function, or subjected to abuse, misuse, mishandling or unauthorized repair. Further, product malfunction or deterioration due to normal wear is not covered by this warranty.

CELESTRON DISCLAIMS ANY WARRANTIES, EXPRESS OR IMPLIED, WHETHER OF MERCHANTABILITY OF FITNESS FOR A PARTICULAR USE, EXCEPT AS EXPRESSLY SET FORTH HEREIN. THE SOLE OBLIGATION OF CELESTRON UNDER THIS LIMITED WARRANTY SHALL BE TO REPAIR OR REPLACE THE COVERED PRODUCT, IN ACCORDANCE WITH THE TERMS SET FORTH HEREIN. CELESTRON EXPRESSLY DISCLAIMS ANY LOST PROFITS, GENERAL, SPECIAL, INDIRECT OR CONSEQUENTIAL DAMAGES WHICH MAY RESULT FROM BREACH OF ANY WARRANTY, OR ARISING OUT OF THE USE OR INABILITY TO USE ANY CELESTRON PRODUCT. ANY WARRANTIES WHICH ARE IMPLIED AND WHICH CANNOT BE DISCLAIMED SHALL BE LIMITED IN DURATION TO A TERM OF TWO YEARS FROM THE DATE OF ORIGINAL RETAIL PURCHASE.

Some states do not allow the exclusion or limitation of incidental or consequential damages or limitation on how long an implied warranty lasts, so the above limitations and exclusions may not apply to you.

This warranty gives you specific legal rights, and you may also have other rights which vary from state to state.

Celestron reserves the right to modify or discontinue, without prior notice to you, any model or style telescope.

If warranty problems arise or if you need assistance in using your product, please visit Celestron's online technical support center at <https://www.celestron.com/pages/technical-support>, or call 1(800) 421-9649.

**NOTE:** This warranty is valid to U.S.A. and Canadian customers who have purchased this product from an authorized Celestron dealer in the U.S.A. or Canada. Warranty outside the U.S.A. and Canada is valid only to customers who purchased from a Celestron's International Distributor or Authorized Celestron Dealer in the specific country. Please contact them for any warranty service.

**FCC NOTE:** This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

Product design and specifications are subject to change without prior notification.  
This product is designed and intended for use by those 14 years of age and older.



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