



# Lacerta for Lodestar User's Guide

Thank you for purchasing the Lacerta focus aide device. Combined with FocusLock, you can achieve automatic and continuous focus using an off-axis guider and Lodestar or Lodestar X2 auto-guide camera, with performance similar to the ONAG On-Axis Guider developed by Innovations Foresight, LLC.

The purpose of this document is to get you up and running with continuous auto-focus quickly.



## Introducing a New Way to Auto-Focus

**FocusLock** is based upon SharpLock technology developed by Innovations Foresight, LLC and is covered under U.S. utility patent #14470935. Titled "Closed-Loop System for Auto-Focusing in Photography and a Method of Use Thereof", Optec has licensed this technology to develop FocusLock auto-focus software.

### Theory of Operation:

FocusLock takes advantage of the slight astigmatism introduced by the cold-mirror used in Innovations Foresight's On-Axis Guider, or ONAG. The ONAG was developed to provide an alternative to off-axis guiding by using a dichroic beam splitter whereby the visible light is reflected to a primary imaging camera above, and the near infrared (NIR) light is passed straight through to a guide camera.

### Use with Off-Axis Guiders:



Off-axis guiders do not provide the slight astigmatism required for FocusLock operation by default. Optec engineers have developed the **Lacerta for Lodestar** optical device which adds a small tilt-window to the imaging path of any Starlight Xpress Lodestar or Lodestar X2 auto guider without adding significant back-focus.



<http://optecinc.com/astronomy/catalog/focuslock/lacerta.htm>



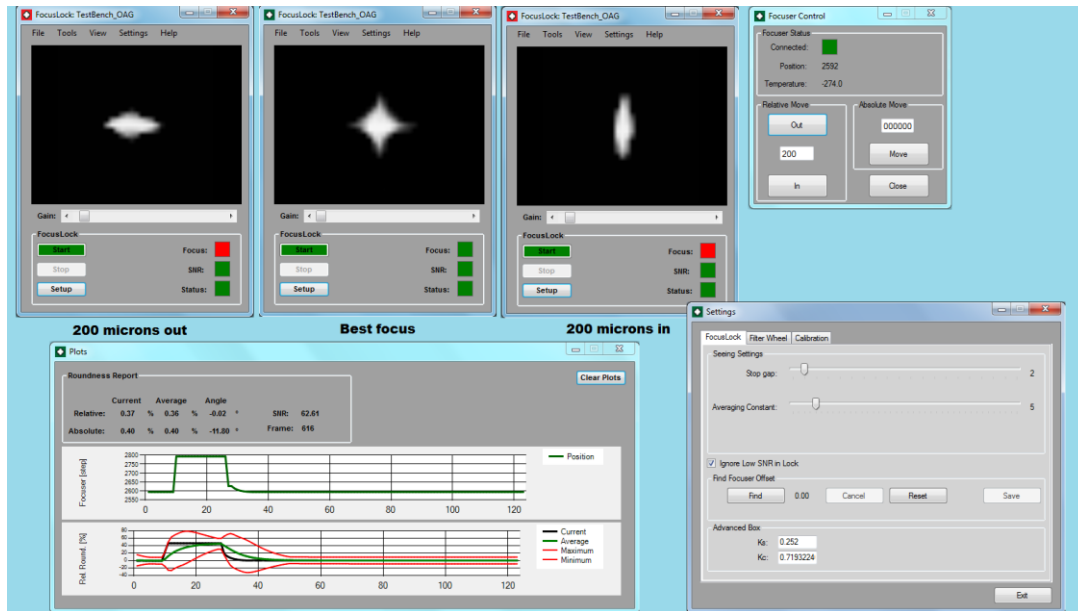
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## How FocusLock Works:

FocusLock operates by continually analyzing the guide camera image for relative roundness of the guide star. The relative roundness is a measure of focus with signed information showing which side of focus the camera is currently positioned. By setting the imaging camera and guide camera parfocal, FocusLock can drive any ASCOM focuser to the ideal focus in real-time without leaving the imaging target.

The diagram below shows the shape of a guide star inside focus, at perfect focus, and outside focus.



Designed as an ASCOM local server application with a pass-through methodology, FocusLock operates seamlessly and transparently to all other guide and imaging applications. Similar to Optec's Alt-Az Derotation Server software, the ASCOM shim is part of the magic behind FocusLock. As long as the telescope is guiding, the focus remains locked.

## Allowance for Filter Offsets

FocusLock works with most any imaging workflow when an ONAG or OAG is utilized. Filter focus offsets can be determined once and then stored for automatic focus adjustment when a new filter is moved into the imaging camera's light path. Even if the guide camera is not located behind the filter wheel, focuser offsets can still move the imaging camera to the precise, optimal focal point.



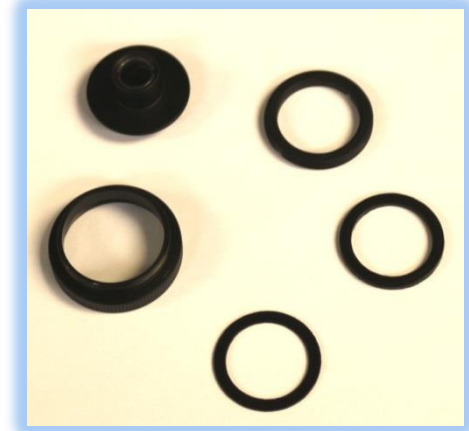
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### #19860 Kit Contents

- Lacerta tilt-window focus aide holder,
- C-thread retainer ring,
- 0.8mm spacer,
- 1.6mm spacer,
- C-to-CS extension.

NOTE: Not all items will be used in every installation.



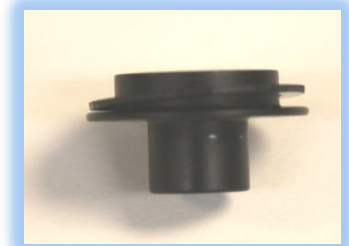
### Lacerta for Lodestar Installation

#### Remove Lodestar:

The Lacerta tilt-window is specially designed to fit into the Lodestar camera without significantly affecting back-focus. First remove the camera from your current Off-Axis Guider (OAG) installation.

#### Insert the Lacerta:

Drop the Lacerta into the camera head. Note the device will fit precisely into the hole just above the image sensor bringing the tilt-window close to the sensor. A spacer can also be placed beneath the Lacerta to increase the distance above the sensor or allow for a tighter fit of the retainer or pick-off stalk. The proximity of the tilt-window to the sensor is not critical.



#### OAG Variations:

Your installation will vary depending upon how the OAG is connected.



For example, the Starlight Xpress OAG and AO unit use a pick-off stalk that ends with a male C-thread. This male C-thread can be used to hold the Lacerta device in place without any other spacers or retainers needed. Simply drop the Lacerta into place, screw the stalk into the female C-thread, and then insert the stalk back into the OAG or AO unit. Either spacer can be added if the stalk does not screw down tightly.

Other OAG installations may use the female C-threads in different ways. The C-thread retainer can be used to hold the Lacerta in place if the entire Lodestar body is clamped into the OAG using the 1-1/4" outer diameter of the body. Alternatively, the C-to-CS extension can be used if there is not enough female C-thread left exposed and the OAG has a male C-thread to connect the Lodestar.



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Two spacers, one approximately 0.8mm thick and another 1.6mm thick, may be used singly or together to take up any slack under the threads or to adjust the distance of the Lacerta to the imaging sensor as necessary.

After installation, check to see if the Lacerta is properly seated by gently shaking the camera and listen for a rattle. The Lacerta flange is less than 1mm thick and is machined precisely to fit the Lodestar body.

### Parfocal Adjustments to Main Camera

It is important the Guide camera and main Imaging camera are parfocal. That is, the optical distance to the center of each imaging sensor should be the same. To accomplish this parfocal adjustment, we recommend the following steps be done at the telescope.

#### Step 1 - Focus the Imaging camera:

With the Lacerta installed into the Lodestar, re-assembly your Off-Axis Guider (OAG) and re-attach to the main Imaging camera. Reinstall on the telescope and adjust your focuser for best focus on the main Imaging camera. A Bahtinov mask or other diffraction based focus aide can be very helpful in this step.

#### Step 2 - Adjust the OAG Guide camera focus:

With the main Imaging camera in sharp focus, you now adjust the Lodestar camera for best focus. The Starlight Xpress OAG allows a simple mechanism to adjust the height of the pick-off mirror stalk to bring the Lodestar guide camera into sharp focus. You will notice the astigmatism introduced by the Lacerta. Adjust the off-axis guide star image for the best cross possible by manually adjusting the height of the pick-off stalk.

For QSI camera owners using the Lodestar guide camera, Gary Jarrette offers his KISS focuser which makes this step very simple –

See <https://www.youtube.com/watch?v=YX-nyWe0qp0>.

Other camera and OAG installations may require other adjustments but the idea is to ensure the Lodestar guide camera is in focus when the main Imaging camera is also in focus.



#### Step 3 - Find Focuser Offset:

Ideally, the Guide and Imaging cameras are parfocal, but for fine adjustments FocusLock allows an offset between the two cameras. Open *FocusLock – Settings* and click the Find button in the Find Focuser Offset panel. Follow the instructions to set the focuser offset between the Guide and Imaging cameras.



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## FocusLock Software

### Download FocusLock Software:

FocusLock is licensed software and requires a valid license key for continued use. The software package can be downloaded from Optec's website at:

<https://optecinc.com/astronomy/downloads/focuslock.htm>



The software can be used on any Windows 7, 8.1, or 10 computer with ASCOM Platform version 6.1 or higher installed. The license agreement allows a 60-day trial of the software before a license key must be purchased. The only way to purchase a valid FocusLock license key is through the Optec website and PayPal portal.

Visit the webpage below to purchase a license key.

<https://optecinc.com/astronomy/catalog/focuslock/19685.htm>



Follow the FocusLock Software User's Guide instructions to install and setup FocusLock for use with the Lacerta. See <https://optecinc.com/astronomy/downloads/focuslock.htm>.

### Additional Resources:

Within the FocusLock main form, click **Help -> Help** at any time for more detailed information for setup and use of the auto-focus software. There are many other features included in FocusLock including Filter Wheel offsets and Scripting. For a complete description consult the help manual.

Visit <http://video.optecinc.com> for FocusLock related videos and tutorials. Contact [support@optecinc.com](mailto:support@optecinc.com) with any configuration questions, issues, comments or bug-fixes.

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