DIFFRACTION LIMITED

SBIG® StarChaser
Off-Axis Guiding Cameras

User's Manual

Version 1.03 – January 12, 2024

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

Industry Canada Compliance Statement
This Class A digital apparatus complies with Canadian ICES-003.

European Union
This product has been tested and found to comply with the limits for Class A Information Technology Equipment according to CISPR 22/European Standard EN 55022. Warning: This equipment is compliant with Class A of CISPR 32. In a residential environment this equipment may cause radio interference.

Visit us at:

http://diffractionlimited.com

and

http://forum.diffractionlimited.com/

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SBIG StarChaser User's Manual

Contents

1 – The SBIG StarChaser Guider

Diffraction Limited's SBIG StarChaser guiders provide autoguiding fully independent of the main camera. Featuring built-in adaptive optics support, StarChasers are available either as a standalone guide camera, or with integrated off-axis guiding. The fully integrated StarChaser SC-4 features a pick-off mirror, focal reducer, shutter, guider camera, guide port and adaptive optics control. Off-axis guiding eliminates the problem of flexure between the imaging camera and a separately mounted guider by using the same optical path for both the main camera and the guider.

The SC-4 is designed for SBIG cameras with 3-inch diameter optical interfaces. It supports the Aluma AC camera series, as well as many older models such as the STXL series. The SC-4 acts both as an off-axis guider and a controller for the optional AO-X Adaptive Optics Unit.

Competing off-axis guider assemblies are awkward to use, consume too much back focus, and require you to focus by sliding a camera in and out of an eyepiece holder. SBIG pioneered simplified off-axis guiding, with guide sensors built into CCD cameras. Later, we created the self-guiding filter wheel, placing the guide sensor in the light path, ahead of photon-robbing narrowband filters.

The SC-4 incorporates stainless steel precision spacers to ensure that there is no possibility of focal plane tilt at the camera.

Next Generation Off-Axis Guiding

The StarChaser represents our next generation of off-axis guiding technology. The SC-4 attaches to the front of your filter wheel and adds minimal back focus distance of 0.875" (22.2 mm). The SC-4 weighs only 0.6 lb (273 gm). The guiders feature a high-sensitivity 1.3 megapixel Global Shutter CMOS sensor with 4.8 micron pixels. A 0.7X focal reducer is built-in, to provide higher sensitivity and a wider field of view.

Unlike competing autoguiders, the StarChaser has a mechanical shutter for easy dark frame correction. This feature, standard on all SBIG guiders, optimizes sensitivity and eliminates hot pixels that can degrade guiding accuracy.

Focus adjustment is easily made with a convenient knob. Unlike previous versions, the SC-4 moves the sensor inwards with a clockwise motion, which is more intuitive. It also has a more convenient adjustment rate than previous models. The focal adjustment allows you to make the guide camera parfocal with the main camera.

The pick-off mirror position is easily adjustable from outside the guider. Simply loosen the mirror adjustment knob. Slide the knob inwards or outwards as needed, and then retighten it.

The focus range of the SC-4, with the mirror in the fully-out position, is 0.8" to 1.8" (20.3 mm to 45.7 mm). The mirror position can be moved inwards by up to 0.3" (7.6 mm); moving the mirror inwards increases the back focus distance range by the same amount. With the mirror fully inwards that changes the back focus range to 1.1" to 2.1" (27.9 mm to 53.3 mm).

Once the mirror position and focus is set, it generally does not need to be adjusted again unless the equipment configuration is changed.

Adaptive Optics Control

The StarChaser SC-4 directly controls our renowned AO-X Adaptive Optics unit. The AO-X bolts on in front of the StarChaser, providing image stability beyond what ordinary telescope guiding can provide. Adaptive optics technology eliminates guiding errors caused by common mount problems such as stiction, periodic error, and wind loads. It can even reduce "slow seeing" effects resulting in higher resolution images.

Supports Your SBIG Investment

Our renowned MaxIm LT software is included with your purchase, providing integrated control of your StarChaser and SBIG main camera. We also provide API interfaces for third-party software running under Windows, MacOS, or Linux. An ASCOM standard camera interface is also included. Note however that ASCOM does not currently support adaptive optics.

The StarChaser SC-4 supports the following SBIG cameras: Aluma AC4040, Aluma AC2020, Aluma AC455, STX-16803, STXL-6303E, STXL-11002, and STXL-16200. The SC-4 attaches to the front of the filter wheel, or can be

attached directly to the front of the camera. The SC-4 also connects directly to our AO-X Adaptive Optics unit. All guiding and AO operations take place independently of the main camera.

The StarChaser requires only a +12V power supply (included) and a USB 2.0 mini cable (6 foot / 2 meter cable included). It can send guider commands to the telescope either via ASCOM PulseGuide or the included ST-4 style guide cable.

2 – Supplied components

Observe proper handling procedures for sensitive electronic equipment and unpack your StarChaser and accessories carefully in a clean, dry, static-free area. Inspect the contents to ensure all components are present and in good order. You should find the following:

- StarChaser SC-4 Off-Axis Guiding Camera
- Power supply:
  - Universal +12V (60014A)
  - Power cable with US plug (51089), European plug (50392), or Australia/New Zealand plug (50390) (type specified on ordering)
  - Power extension cable (68007)
- ST-4 style guider-to-telescope mount interface cable (TIC) RJ12-RJ12. NOTE: This cable has its pin connections flipped from one end to the other – they are not straight-through connections.
- USB 2.0 A to Mini-B cable, 6 feet (2 meters)
- Four 6-32 x 1-1/8" socket head cap screws
- 7/64-inch hex key wrench
- USB flash drive

3 – Installing the software

NOTE:
If you already have MaxIm DL Pro, **please update to the latest version**.

The MaxIm LT imaging application supplied with your SBIG StarChaser allows you to operate it using a Windows computer. The application is found on the flash drive included with your camera. Drivers (excluding application software) are also provided for the Mac and Linux operating systems.

3.1 System requirements

The following hardware and software is required for MaxIm LT:

- MS Windows (applicable versions: 7, 8, 8.1, 10)
- Recommended minimum memory size: 1 GB or larger.
  Processing larger images or opening multiple images simultaneously will require correspondingly more memory. 2 GB memory is recommended for processing large arrays, including images larger than 6 megapixels.
- Disk space: 100 MB for program installation
- Video display: 1024x768, 16-bit color or higher
- Mouse

3.2 Windows installation

1. Proceed to step 8 if you are an SBIG camera owner who already has MaxIm DL Pro or MaxIm LT installed.

2. Go to the Registration page on the Diffraction Limited website at:
   https://diffractionlimited.com/maxim-lt-registration

3. Enter the requested information and serial number to register the MaxIm LT application. Use your camera's serial number for this. You will then automatically be emailed a license key.

4. Insert the supplied USB flash drive into an available USB port on your computer.

5. Open Windows Explorer and navigate to the DL Imaging Driver (Aluma) folder on the flash drive.

6. Double-click Launcher.exe, then choose Install MaxIm DL. This applies whether you are installing the included MaxIm LT application or a licensed version of the fully-featured MaxIm DL program.

7. Follow the on-screen instructions and enter the license key you received when prompted.

   NOTE 1:
   To enter your license key properly, you must select all the text from the email you receive and copy it to the clipboard. You then start MaxIm LT and open the Enter License dialog. The license key will be entered automatically

– there is no need to paste it since MaxIm LT finds it on the clipboard and pastes it for you.

NOTE 2:
The required USB drivers are available through Windows Update. The drivers will automatically be downloaded when the device is plugged in and if an internet connection is present. If the USB drivers do not install automatically, then please see <u>3.3 Manual Windows Driver Installation</u>.

8. StarChaser uses the DL Imaging driver package. Download the latest drivers and camera configuration utility from the Diffraction Limited website at: **https://diffractionlimited.com/down/SetupDLAPI.exe**

9. When the download is complete, open Windows Explorer and navigate to your Downloads folder, then double-click the **SetupDLAPI.exe** file. Follow the on-screen instructions to install the DL Config Utility application.

10. When the installation is complete, an entry named DL Config Utility will appear on the Start menu under the DL Config folder icon.

    NOTE:
    In addition to being a standalone program, this utility is also accessible from within MaxIm LT.

    Click OK to finish.

11. Proceed to section <u>4 – Installing the StarChaser hardware</u> to install the guider.

3.3 Manual Windows Driver Installation

Automatic installation requires:

- Your Windows system to have the latest updates installed
- An active Internet connection

Simply plug in the camera's USB cable and power it up – the drivers should install automatically.

Should this not happen, these are the steps to install the drivers manually:

1. Plug the included **USB Flash Drive** into your computer, and access it via Windows Explorer
2. Copy this folder to a convenient location on your hard drive:

   `\DL Imaging Driver (Aluma, STC, StarChaser)\System Drivers`

3. Open the **Windows Device Manager**
4. Right-click on **SBIG Driver**, select **Update Drivers**.
5. Click **Browse my computer for drivers**
6. Click **Browse** to open a directory picker

7. Select the folder on your hard drive where you copied the system driver files (Step 2)
8. Click **Next** and continue through until the device drivers are detected and installed
9. If successful go to the section 1.4 Testing the Camera and test out the connection.

Note:

On some systems it may be necessary to also update the FTDI D3XX USB drivers. Our USB drivers are based on FTDI's, and some systems may require these to be updated.

The FTD3XX driver update is available on the USB Flash Drive under:

`\DL Imaging Driver (Aluma, STC, StarChaser)\`

Alternatively, you can download the latest version from:

https://ftdichip.com/drivers/d3xx-drivers/

3.4 MacOS and Linux Drivers

Drivers for the Mac and Linux operating systems are available by request. Please post your request in our Support forum, Aluma section at: https://forum.diffractionlimited.com/forums/aluma-series.49

3.5 Software Development Kit

A software development kit for all DL Imaging cameras is available by request. Please post your request in our Support forum, Aluma section at: https://forum.diffractionlimited.com/forums/aluma-series.49

4 – Installing the StarChaser hardware

This procedure presumes that you have a filter wheel attached to your imaging camera. This is normally an AFW series filter wheel, though the older FW7-STX and FW8S-STXL wheels are also supported.

PROCEDURAL ORDER:

➢ If you are installing a new filter wheel along with your StarChaser, follow the instructions in your camera and filter wheel user manuals to install the wheel before installing the StarChaser.

➢ If you are using an AO-X unit, it must be installed on top of the StarChaser SC-4 using the same mounting bolts that hold it to the filter wheel. The AO-X must be installed in an orientation that does not block the StarChaser's heat sink port. Please refer to the AO-X user manual for additional details on AO-X installation and operation.

1. Carefully remove the StarChaser guider and other components from their packaging. Retain the packaging materials for future use, if ever required.

2. Place your imaging camera and filter wheel assembly on a clean flat surface, with the telescope opening facing upwards.

3. Ensure that the power into the camera is disconnected.

   ➡ *CAUTION:*

   Never "hot plug" cables into or from units. This is especially important for AUX and I^{2}C connectors. Always disconnect power before connecting or disconnecting accessories or cables.

4. Remove the four 6-32 x 1/4" screws holding adapter plate to the front of the filter wheel. Set the adapter plate aside.

5. Place the StarChaser onto the filter wheel, with the SBIG logo facing away from the filter wheel. Align the four screw holes of the guider with those on the filter wheel. Note the orientation of the StarChaser and filter wheel.
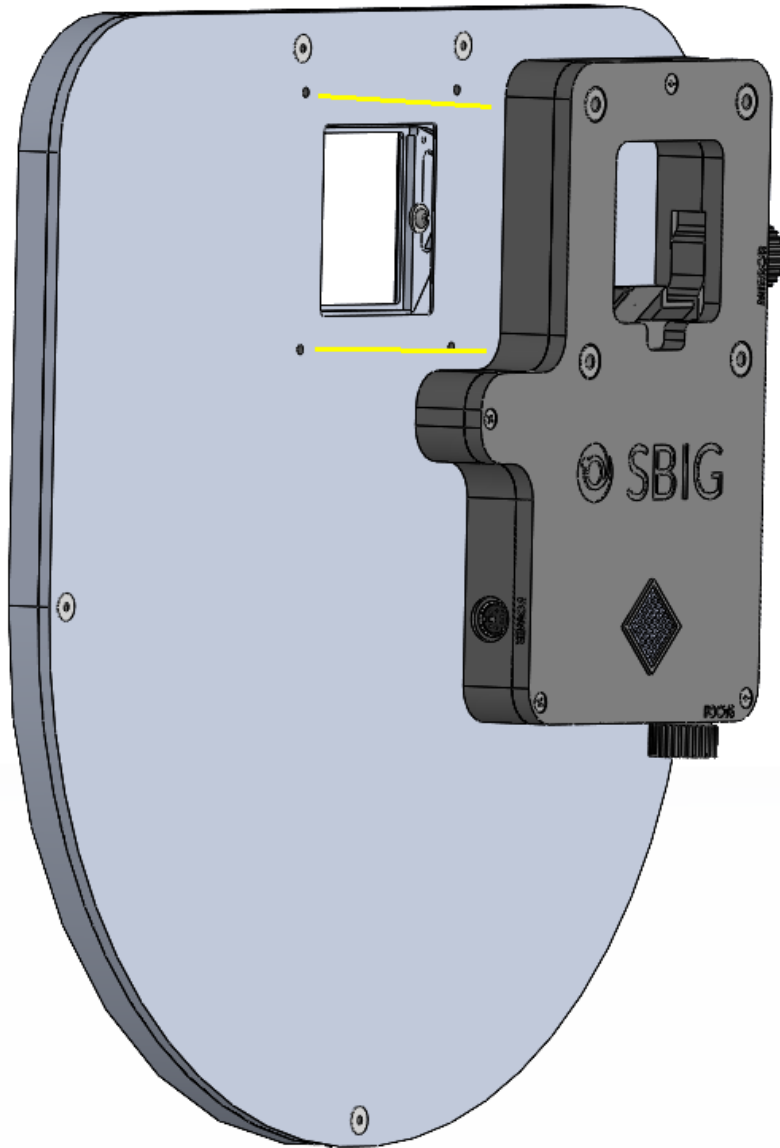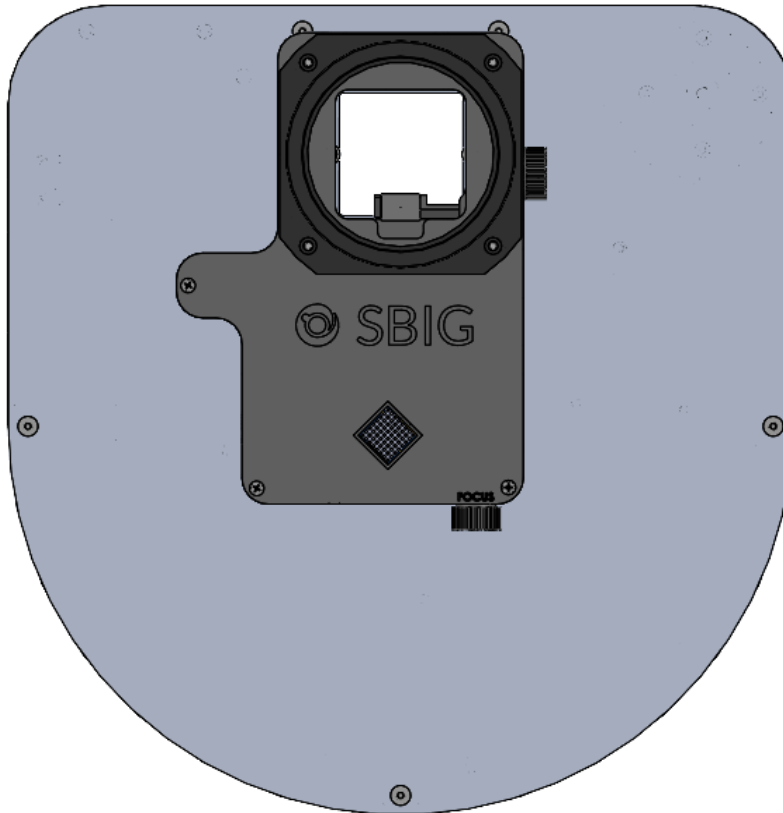
6. Attach the Adapter Plate (10018) that was supplied with the camera over the StarChaser and align the four mounting holes with those on the guider.

   Note: If attaching an AO-X, it is installed at this step instead of the adapter plate. Be sure to orient the AO-X so it does not block the diamond-shaped heat sink vent on top of the SC-4.

7. Insert the four 6-32 x 1-1/8" screws supplied with the SC-4 in through the top of the adapter plate.

8. Thread and tighten the four screws into the filter wheel.

The StarChaser is now ready to be configured and adjusted. Proceed to section 5 – Setting up the StarChaser.

IMPORTANT NOTE:

The power connectors have a locking mechanism – both the power brick connector and the extension cable connector.   The lock is engaged by pressing the plug into the socket. It is unlocked by pulling back on the shell. If you experience difficulty latching it, try pulling on the shell a couple of times to loosen it up.

AUX

STEP 1

Retract Hood
Before Insertion

STEP 2

Release Hood
After Insertion
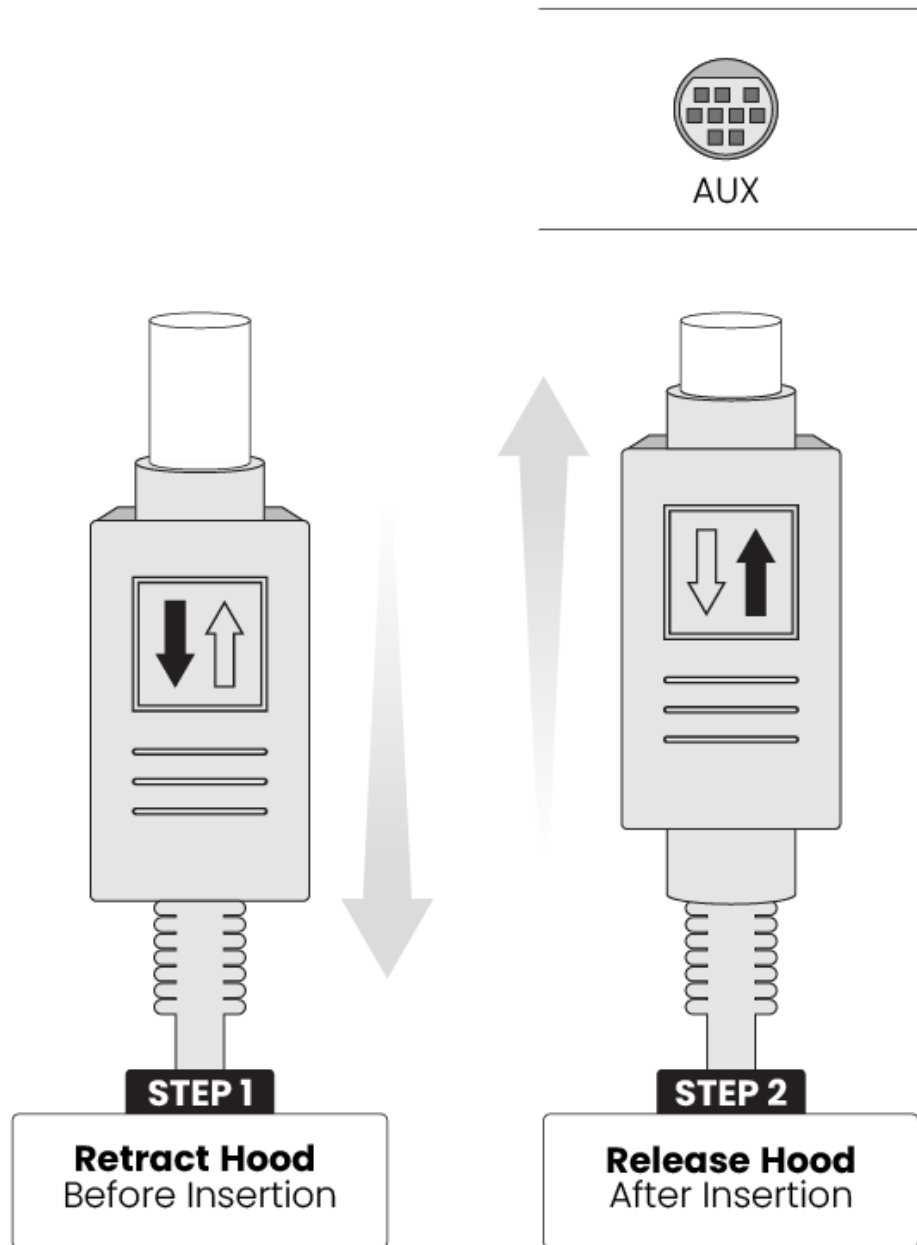
5 – Setting up the StarChaser

The SBIG StarChaser includes the MaxIm LT application, and this section describes how to set up the guider with that software. MaxIm LT allows full configuration and control of the SBIG StarChaser.

This procedure details the basic steps to configure and adjust the StarChaser to get it ready for autoguiding. Click on *Help Topics* or *PDF Manual* under the program's *Help* menu for detailed information on performing autoguiding, parameter descriptions, and for various tutorials. Please note however that since MaxIm LT and MaxIm DL Pro both share the same PDF Manual and Help files, not all of the program features detailed in those files will be enabled in MaxIm LT. Full program feature access requires MaxIm DL Pro.

5.1 Configuration and connection

1. Loosen the LOCK knob on the side of the guider assembly by turning it slightly counter clockwise.
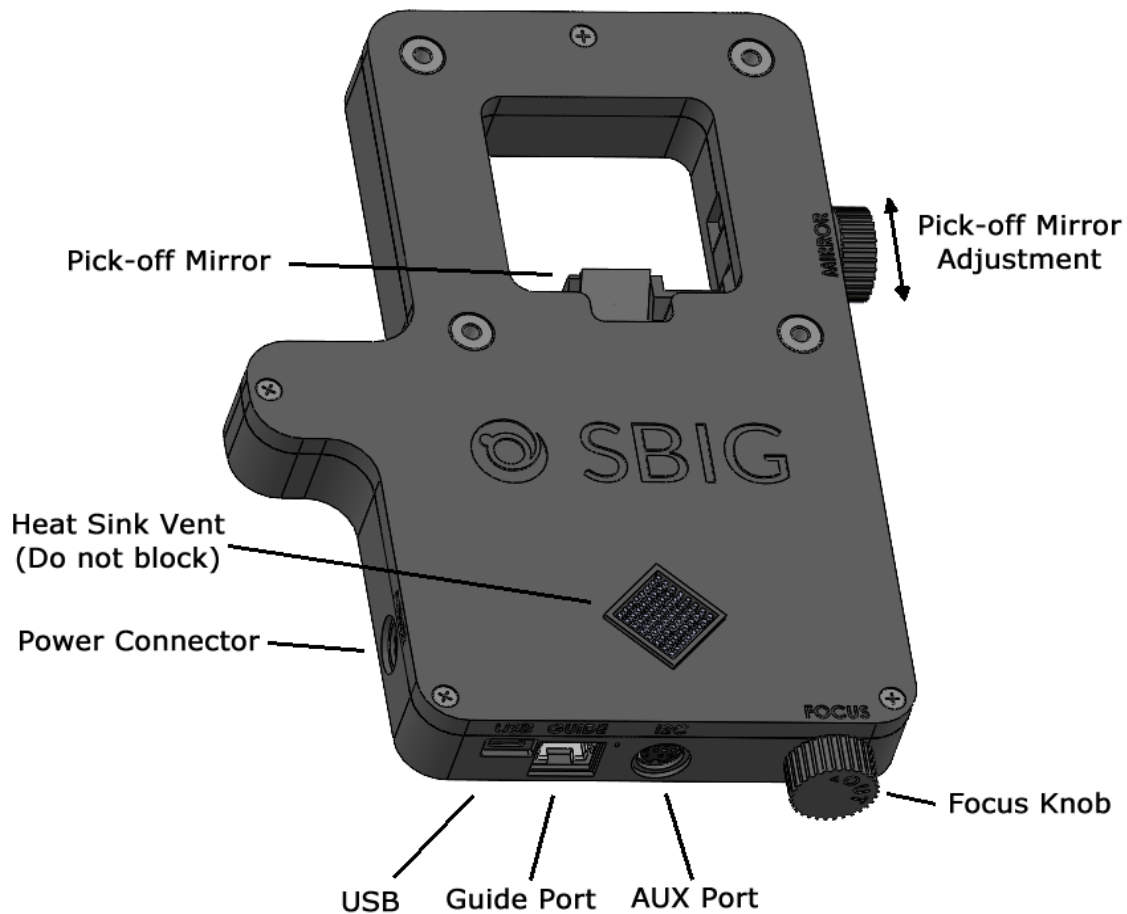

2. To adjust the mirror, simply slide the lock knob up or down, and then tighten the lock knob. This will be explained in more detail in Section 5.2.

3. Mount the camera+filter wheel+StarChaser equipment assembly onto your telescope.

4. Attach your camera and filter wheel cables in their usual manner and then power the units up.

5. Refocus the main camera, and take an image. Check whether the mirror is forming a shadow on the sensor. If so, move the mirror outwards and try again.

6. Connect the supplied USB cable between the StarChaser's USB port and your computer.

7. If you plan to use the supplied ST-4 telescope mount interface cable to send autoguider commands to the telescope mount, connect the cable between the StarChaser's GUIDE port and the telescope mount's guider port. If your telescope mount has an ASCOM driver that supports "Pulse Guide" then you can alternatively send the autoguider commands through that interface. Additional information is provided in step 10 below.

8. Connect the StarChaser's power supply to the POWER port and apply power.

9. Launch MaxIm LT to connect to and configure the main camera, filter wheel, and guider.

10. Click the *Settings* item under the main *File* menu. In the **Settings** window click the *Site and Optics* tab and enable the *Same as main scope* checkbox in the *Guide Telescope* block. Click *OK* to finish.
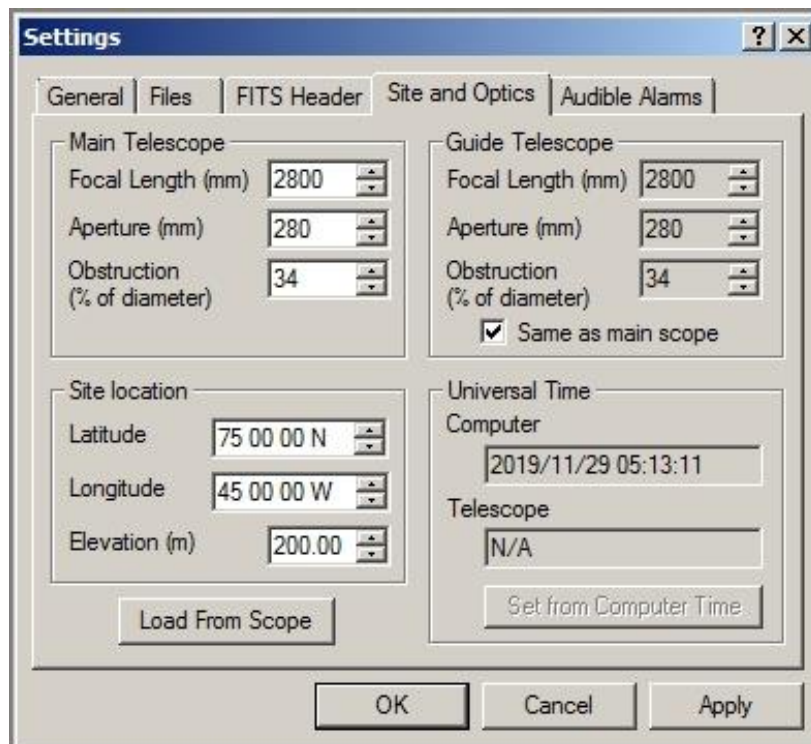
11. You have several options for sending the autoguider commands from the StarChaser to your telescope mount. If you connected the ST-4 style telescope mount interface cable in step 6, commands can be sent directly from the StarChaser to the mount. Alternatively if your telescope has an ASCOM standard driver for computer control via USB, serial port, or other means, then you do not need to connect that cable.

Click the Camera Control icon to open the **Camera Control** window and then click the *Guide* tab. Click the *Settings* button to open the *Guider Settings* form.
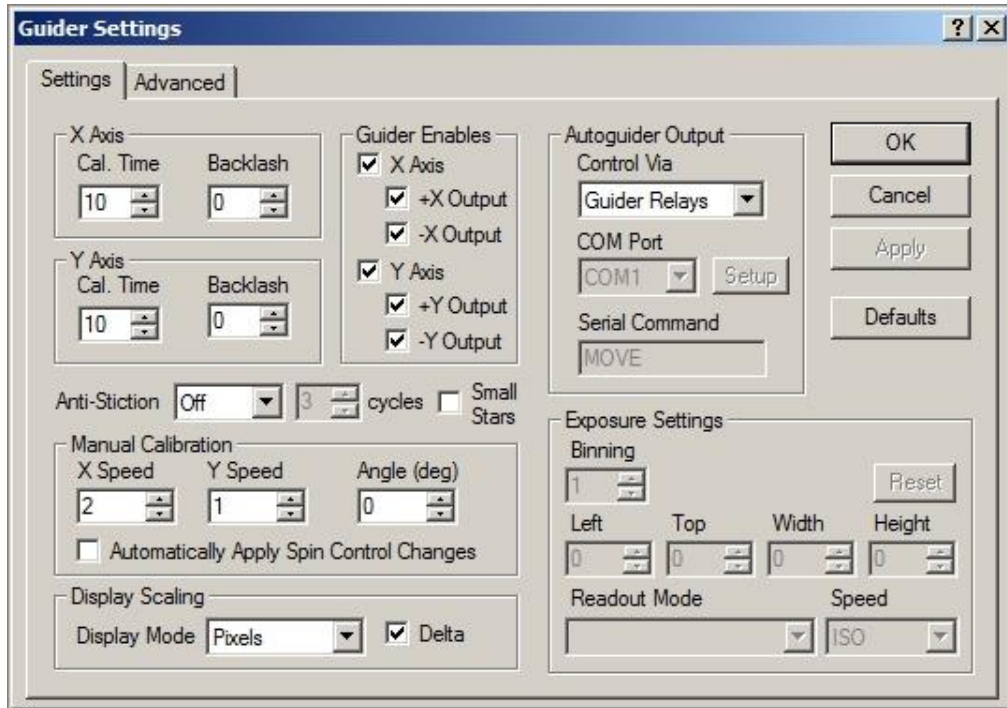

Set the *Autoguider Output Control Via* drop-down menu to your preferred method:

- To send commands directly from the StarChaser to the mount via the ST-4 telescope mount interface cable, select *Guider Relays*.

- If you are using MaxIm DL Pro to control the telescope mount via the **Observatory Control** window and ASCOM driver, then select *Telescope*. This allows you to use a single cable to control the mount and send autoguider commands, and so the ST-4 cable is not necessary.

- If you are using MaxIm LT then the **Observatory Control** window is not available. In this case, select *ASCOM Direct* and click the *Setup* button to configure your ASCOM driver. Note that this method is also recommended for MaxIm DL Pro if you are using the DC-3 Dreams ACP Observatory Control software to control the telescope. The ST-4 cable is not necessary for this option either.

Choose your desired method and then click *OK* to finish.

12. Click the *Setup* tab in the **Camera Control** window.

13. For Aluma AC imaging cameras with the StarChaser:

    a. Set up the main imaging camera under *Camera 1* as *DL Imaging* and click the *Advanced* button. The **DL Config** form opens. This form allows you to check camera parameters and also to perform firmware updates and additional camera configuration.
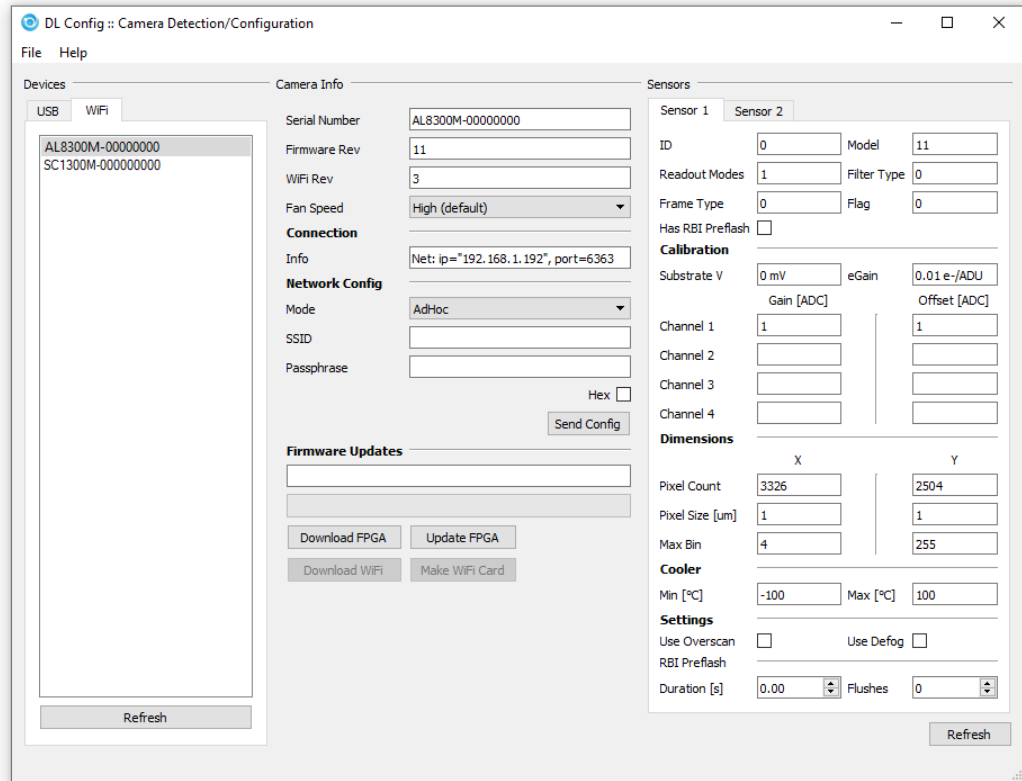

    b. Select your camera from the *Devices* list. Various camera parameters will auto-populate the display fields under the *Sensor 1* tab. Use the default values and close the form.

    c. Back in the **Camera Control** window, ensure that the *Dual Chip Mode* checkbox is not selected.

    d. Click the *Setup Filter* button under *Camera 1* and set the *Filter or Controlling Camera Model* parameter to *DL Imaging+FW*.

    e. Configure your filter positions, names, and focus offsets as desired in the list. Click the *OK* button to accept your settings and close the form.

    f. Configure the StarChaser under *Camera 2.* Click the *Setup Camera* button and select *DL Imaging* as the *Camera Model*.

    g. If you will be using an adaptive optics unit, select *Sensor 1* from the *AO* drop-down menu. Otherwise select *Off*.

    h. Press the *Advanced* button to open the **DL Config** form.

i. Select the StarChaser from the *Devices* list. Various parameters will auto-populate the display fields. Use the default values and close the form.

j. Back in the **Camera Control** window, click the *Connect* button. This connects your main imaging camera and the StarChaser.

k. Proceed to 5.2 Pick-off mirror adjustment and focusing.

13. For STXL or other older model SBIG cameras with the StarChaser:

a. Set up the main imaging camera under *Camera 1*. Select *SBIG Universal* from the *Camera Model* dropdown menu and *USB* from the *Connect To* menu, then click *OK* to accept your settings and close the form.

b. Back in the **Camera Control** window, ensure that the *Dual Chip Mode* checkbox is not selected.

c. Click the *Setup Filter* button under *Camera 1* and set the *Filter or Controlling Camera Model* parameter to *SBIG Universal.*

d. Configure your filter positions, names, and focus offsets as desired in the list. Click the *OK* button to accept your settings and close the form.

e. Configure the StarChaser under *Camera 2.* Click the *Setup Camera* button and select *DL Imaging* as the *Camera Model.*

f. If you will be using an adaptive optics unit, select *Sensor 1* from the *AO* drop-down menu. Otherwise select *Off*.

g. Press the *Advanced* button to open the **DL Config** form.

h. Select the StarChaser from the *Devices* list. Various parameters will auto-populate the display fields. Use the default values and close the form.

i. Back in the **Camera Control** window, press the *Connect* button. This connects your main imaging camera and the StarChaser.

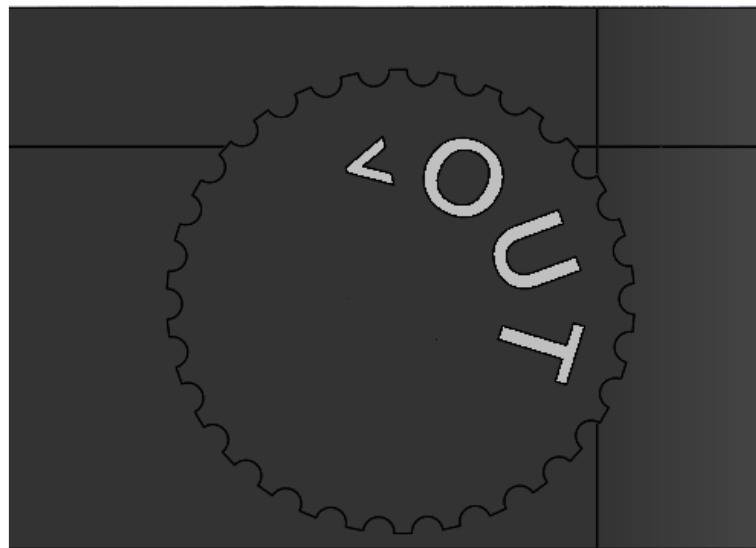j. Proceed to 5.2 Pick-off mirror adjustment and focusing.

5.2 Pick-off mirror adjustment and focusing

Prior to using the StarChaser for autoguiding, the position of the pick-off mirror may need to be adjusted to eliminate or minimize any possible vignetting in your optical system. Perform the following procedure to determine if you need to make an adjustment for use in your system. This should be done prior to installing an adaptive optics unit, if applicable.

1. Point the telescope at a nearby wall or flat field screen illuminated by ambient light or artificial light of some kind. Total darkness is not necessary.

2. Click the *Expose* tab in the **Camera Control** window and enable the *Camera 1* radio button. Start the main camera in *Continuous* mode, with an exposure duration adequate to get a uniform but not saturated field. A count level of 5,000 to 50,000 should be fine for a 16-bit CCD or 1,000 to 3,500 for a 12-bit CMOS sensor. Use the **Information** window to view the pixel values in the images.

3. If you see a shadow on one side of the camera's image, this is the shadow of the guider mirror vignetting the camera's CCD. Since this is undesirable, it requires adjustment. The amount of adjustment varies with the telescope design and focal ratio. The goal of this adjustment is to get the mirror as far into the field of view as possible without vignetting the main imager. If you do not see a shadow, proceed to step 7.

4. Loosen the Mirror Lock knob on the side of the StarChaser guider assembly by turning it counter clockwise.

5. Move the Mirror Lock knob downwards by a small amount, and then retighten the lock knob. The range of motion of the mirror is 0.3" (7.6 mm).
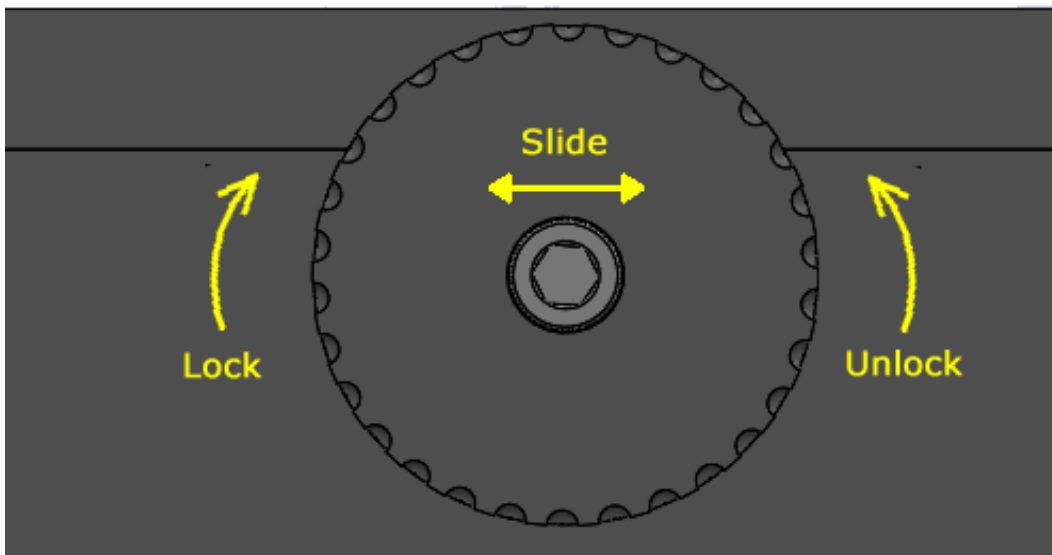
6. If vignetting is still present, repeat steps 3 to 5 until the vignetting is removed or minimized. Otherwise, proceed to step7.

   Once the pick-off mirror has been properly positioned, it should only require re-adjustment if you mount your camera assembly on another telescope type or otherwise change your optical configuration.

7. If you are installing an adaptive optics unit, then proceed to section 6 – Installing an Adaptive Optics Unit to complete your installation. Otherwise, complete this procedure to focus the StarChaser.

8. Point the telescope at a star-rich region in the night sky. Select the desired main camera filter to use and ensure that the *Camera 1* radio button is enabled. Start the main camera in *Continuous* mode and focus it using the telescope focuser controls. Stop the exposures when focusing is completed.

9. Enable the *Camera 2* radio button and start the StarChaser in *Continuous* mode with an exposure duration of 1 to 3 seconds.

10. Focus the StarChaser's image by turning the FOCUS knob on the unit until a good focus is achieved. Turn left (CCW) to focus outwards, or right (CW) to focus inwards.

Finding guide stars initially can sometimes be a bit difficult, so target an open cluster or other star-rich area of the sky to facilitate this. Also, as is typical for off-axis guiders, the off-axis arrangement without correcting optics may not yield perfectly round stars on the guide sensor. This is normal and will not affect performance.

NOTE 1:
Once you have obtained a good initial focus, it is sometimes beneficial to slightly defocus a guide star image when actually guiding. This may allow the system to perform more consistent centroid calculations.

NOTE 2:
You may see a gradient in the guider image's sky background. This is due to the various apertures upstream from the guider assembly limiting its field of view, but this does not affect guiding. It merely causes stars that are farther off-axis to be dimmer.

11. Perform the standard guider calibration procedure in your MaxIm LT or MaxIm DL Pro software to calibrate the StarChaser. Refer to the online Help file for procedural details.

    When the calibration is complete, your StarChaser is ready for guided imaging!

TIPS:

The pick-off mirror position affects the back-focus distance, so to achieve the full range of back-focus adjustment you may need to reposition the mirror.

The moon is a very easy-to-find initial target during setup.

6 – Installing an Adaptive Optics Unit

You must perform the procedure in 5.1 Configuration and connection, and then steps 1 to 9 in procedure 5.2 Pick-off mirror adjustment and focusing prior to installing an Adaptive Optics unit.

NOTE 3:
In order to connect to an AO-X, an Adapter Cable (11066) is available separately from Diffraction Limited. If you purchase a package including both the StarChaser SC-4 and the AO-X, then the cable is included.

1. Disconnect the camera and guider in the **Camera Control** window of MaxIm LT. Then turn off the AC power to both the camera and StarChaser units.

2. Detach required cables and remove the camera+filter wheel+StarChaser assembly from your telescope. Place it on a clean flat surface, with the telescope opening facing upwards.

3. Detach and remove the adapter plate from the StarChaser by removing the four 6-32 x 1-1/8" screws. Set the adapter plate aside.

4. Place your AO unit on a clean flat surface, with the telescope opening facing upwards.

5. On the front (telescope side) of the AO there are four screws that hold the unit together. Remove the screws and carefully lift off both the front plate and the body of the AO from the rear plate. Place them aside on a clean flat surface.

6. Place the AO rear plate on top of the StarChaser and align the four mounting holes.
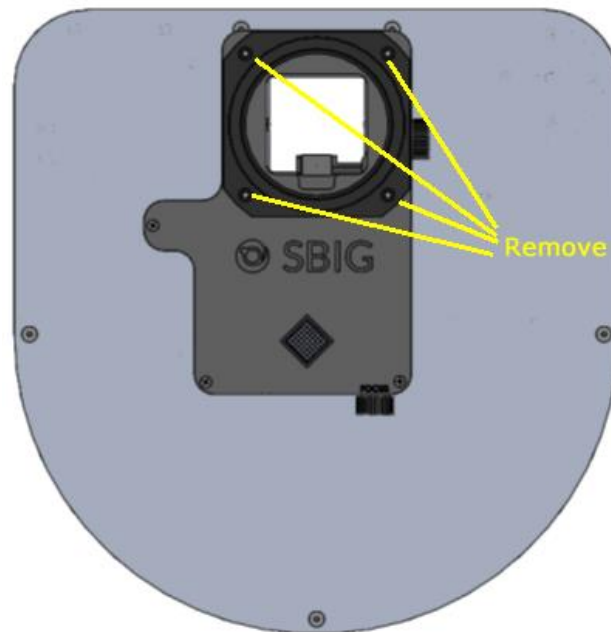
7. Fasten the AO rear plate and the StarChaser to the filter wheel using the four supplied 4-40 x 1-inch screws (for SC-2) or 6-32 x 1-1/8" screws (for SC-4).

8. Carefully place the AO body and front plate back onto the rear plate and fasten them together using the four screws removed in step 5.

   Note: The StarChaser and AO-X do not have to be in the specific orientation shown; however, it is important that the AO-X not overlap with the diamond-shaped heat sink vent on the StarChaser. Otherwise the AO-X will not lay flat and the StarChaser electronics may overheat.
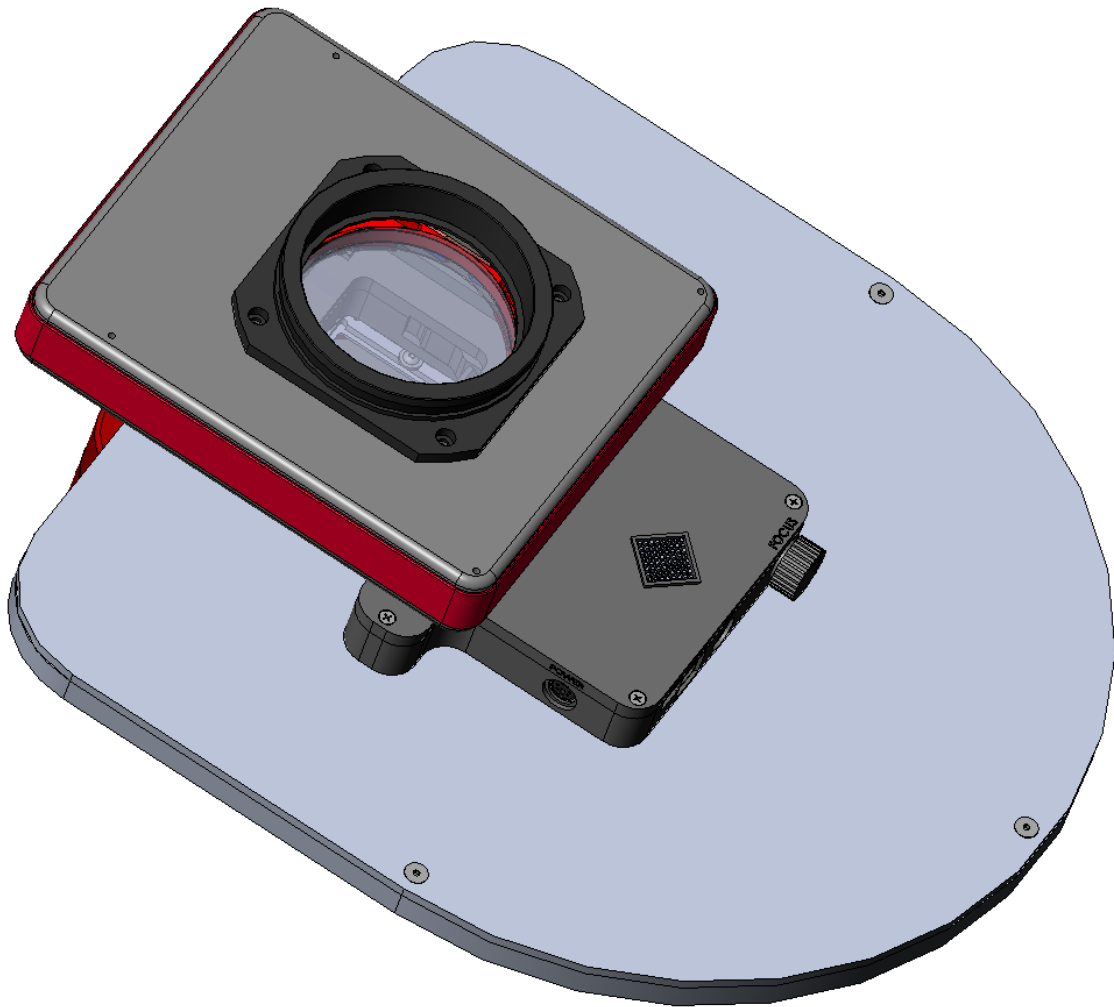
9. Attach the camera's adapter plate to the front of the AO-X and then attach the T-thread nosepiece to the plate. Note also that if your camera was supplied with adapter plate shims, then these need to be reinstalled under the plate, as stated in the camera's user manual.

10. Re-install the completed equipment assembly onto your telescope.

11. Re-attach your camera, filter wheel, and StarChaser cables.

> ➡ *CAUTION:*
>
> Never "hot plug" cables into or from units. This is especially important for AUX and I²C connectors. Always disconnect power before connecting or disconnecting accessories or cables.

12. Connect the Adapter Cable (11066) between the AO-X unit's I²C OUT port and the StarChaser SC-4 AUX port.

13. Apply power to the main imaging camera and the StarChaser.

14. Launch MaxIm LT and click the Camera Control icon 🔲 to open the **Camera Control** window.

15. In the *Setup* tab, click the *Connect* button. You configured all of your components in 5.1 Configuration and connection and MaxIm LT retains those settings, so no additional configurations are required.

16. Point the telescope at a star-rich region in the night sky. Select the desired main camera filter to use and ensure that the *Camera 1* radio button is enabled. Start the main camera in *Continuous* mode and focus it using the telescope focuser controls. Stop the exposures when focusing is completed.

17. Enable the *Camera 2* radio button and start the StarChaser in *Continuous* mode with an exposure duration of 1 to 3 seconds.

18. Focus the StarChaser's image by turning the FOCUS knob on the unit until a good focus is achieved. Finding guide stars initially can sometimes be a bit difficult, so target an open cluster or other star-rich area of the sky to facilitate this. Also, as is typical for off-axis guiders, the off-axis arrangement without correcting optics may not yield perfectly round stars on the guide sensor. This is normal and will not affect performance.

    NOTE 1:
    Once you have obtained a good initial focus, it is sometimes beneficial to slightly defocus a guide star image when actually guiding. This may allow the system to perform more consistent centroid calculations.

    NOTE 2:
    You may see a gradient in the guider image's sky background. This is due to the various apertures upstream from the guider assembly limiting its field of view, but this does not affect guiding. It merely causes stars that are farther off-axis to be dimmer.

19. Perform either the standard guider or AO calibration procedure in your MaxIm LT or MaxIm DL Pro software to calibrate the StarChaser. Refer to the online Help file for procedural details.

When the calibration is complete, your StarChaser is ready for guided imaging!

7 – Maintenance

The StarChaser Off-Axis Guiding Camera requires only minimal maintenance. Use cotton swabs and isopropyl (rubbing) alcohol to clean the pick-off mirror if it becomes necessary. Never re-use a cotton swab – use only fresh ones. Apply only gentle pressure with the cotton swab during cleaning.

8 – Specifications

StarChaser SC-4

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Sensor:	1.3 megapixel global shutter CMOS 1280 x 1024 pixels, 4.8 micron square pixels 10-bit ADC readout
Power:	Approximately 300 mA
Dimensions:	7.68 x 5.65 x 0.875 inches (188 x 144 x 22.2 mm)
Weight:	Approximately 0.65 pounds (300 gm)
Back Focus Range:	0.8" to 1.80" (20.3 mm to 45.7.7 mm)
Mirror Adjustment	0.3" (7.6 mm) – note that this distance is added to the back focus range when the mirror is moved inwards.
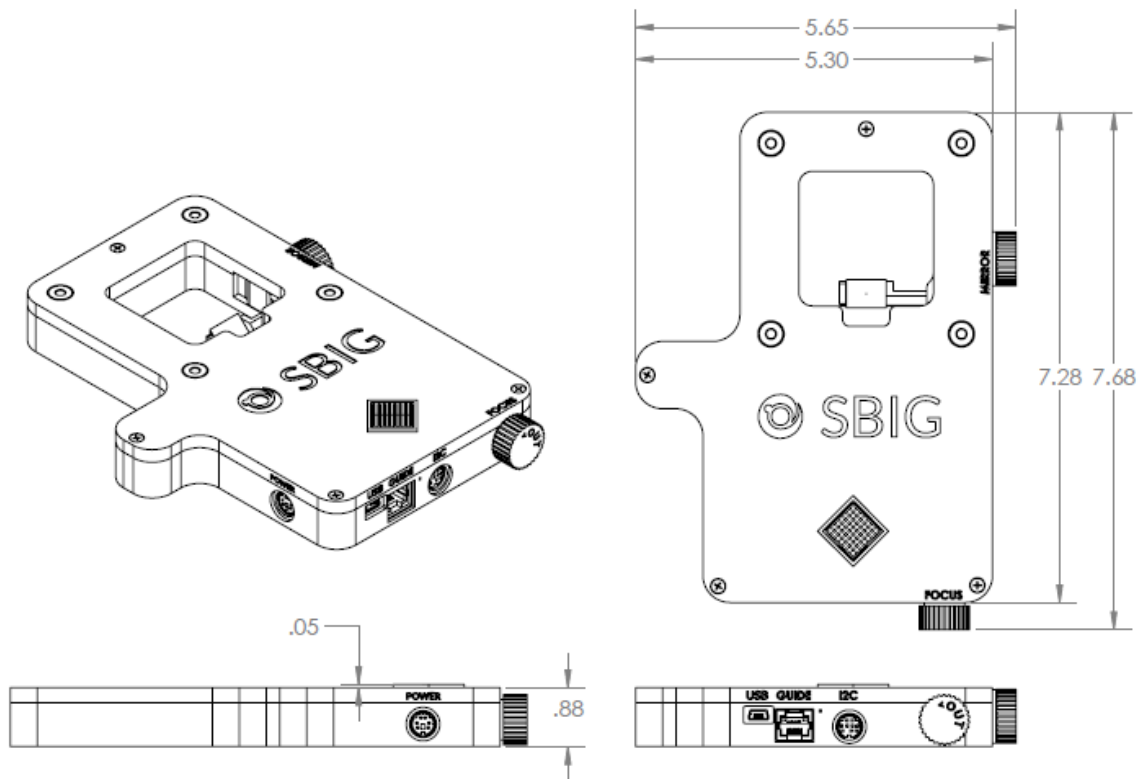
Appendix A: SBIG StarChaser Camera Details

5.1 A-1 Connector pinouts

USB connector pinout is to the USB standard. The connector works with USB 2.0 mini cables.

AUX connector (9-pin mini-DIN)
The diagram shows the pin number identification when looking into the camera connector.
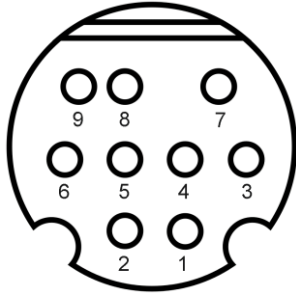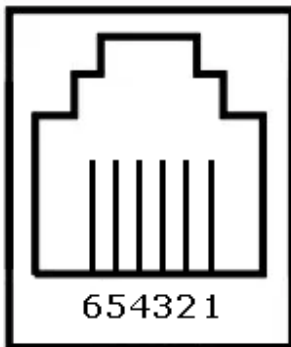

Pin 1: GND	Pin 6: 3.3V Out
Pin 2: I2C SDA	Pin 7: 12V Out
Pin 3: I2C SCL	Pin 8: N/C
Pin 4: N/C	Pin 9: N/C
Pin 5: N/C	

NOTES:
- I2C interface is nominally 3.3V, and will accept up to 5V input.

GUIDE OUT (RJ-12) Looking into the StarChaser; diagram orientation matches the StarChaser connector panel with the locking tab at top:

Pin 1: X+
Pin 2: Y+
Pin 3: Y-
Pin 4: X-
Pin 5: COMMON
Pin 6: AUX (not connected)

POWER connector (6-pin mini-DIN)
The diagram shows the pin number identification when looking into the camera connector.
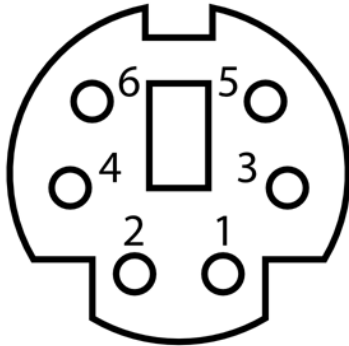
Pins 1, 3, 5: +12V
Pins 2, 4, 6: GND

NOTES:
- Maximum recommended input voltage is 14V DC
- The shell of the connector is connected to ground via 1 Megaohm in parallel with 100 pF, and should be connected to the cable shield.
- Power ground is connected to the chassis of the camera through a low impedance.
- For a positive retention power connection we recommend using locking connector Kycon 806-KMDLAX-6P.