HyperStar
Imaging at the Speed of Light

HyperStar Lens - 9.25" Celestron Operating Instructions

The HyperStar Lens allows CCD imaging at f/2.2 with compatible Celestron 9.25" Schmidt-Cassegrain telescopes and compatible CCD cameras. These instructions show the proper methods for installing the HyperStar lens and CCD camera on the telescope, and for collimating the lens for the best optical performance.

For more details on CCD imaging, visit www.starizona.com and see the *Guide to CCD Imaging*, and visit www.hyperstarimaging.com for video tutorials on imaging.

Warning: *When the HyperStar lens and CCD camera are mounted on the telescope, there is the potential for damaging the corrector plate if caution is not exercised at all times. Be especially careful not to bump the CCD camera or HyperStar lens while they are attached to the telescope. Also, be sure that all cables from the CCD camera are properly tied off to prevent them from pulling on the camera and lens. Additional tips and warnings are clearly marked throughout the assembly instructions. As long as care is used, no problems will occur.*

Parts List

The HyperStar Lens Assembly includes three pieces:

- **HyperStar Lens**
- **Secondary Mirror Holder**
- **Counterweight**



Secondary holder (shipped attached to lens) & HyperStar lens

Positioning the Telescope

1) Begin by aiming the telescope up at about a 45-degree angle. This will prevent the secondary mirror or HyperStar lens from falling out during installation.

Attaching the Counterweight

2) The included counterweight goes into the standard 1.25" visual back on the rear of the telescope. Begin by sliding the weight partway into the visual back and lock it in place with the set screws. Later you will balance the telescope to determine the proper position of the counterweight.



Removing the Secondary Mirror Holder

3) The secondary mirror holder also functions as the bottom cover for the HyperStar lens. It simply unthreads from the bottom of the HyperStar lens. The holder consists of a metal cylinder with a vinyl cap on the bottom.



Removing the Secondary Mirror

4) Unthread the retaining ring from the secondary mirror holder as shown below.



5) Carefully remove the secondary mirror assembly from the front of the telescope. Do not touch the surface of the mirror itself.

6) Place the secondary mirror assembly into the secondary mirror holder. Note the notch on the side of the secondary holder which accepts the small screw on the side of the mirror assembly. Use the original retaining ring to lock the mirror assembly in place.



Attaching the CCD Camera

7) A CCD camera will attach to the HyperStar using T-threads. Most cameras have a 1.25" or 2" nosepiece that must be removed to allow the HyperStar to thread into the T-threads. DSLR cameras will attach using a standard bayonet mount.

8) Attach the CCD camera or DSLR to the HyperStar lens.



9) Carefully thread the entire assembly into the front of the telescope. Camera orientation can be changed later.

Balancing the Telescope

10) While holding on to the telescope tube, release the altitude clutch on the fork arm. Carefully release the telescope tube and see if it is front-heavy or rear-heavy. If the front of the scope moves down, you need to slide the counterweight farther back. If the front of the scope moves up, you need to slide the counterweight forward.

Balancing the telescope is critical for getting good tracking accuracy.

Collimating the HyperStar Lens

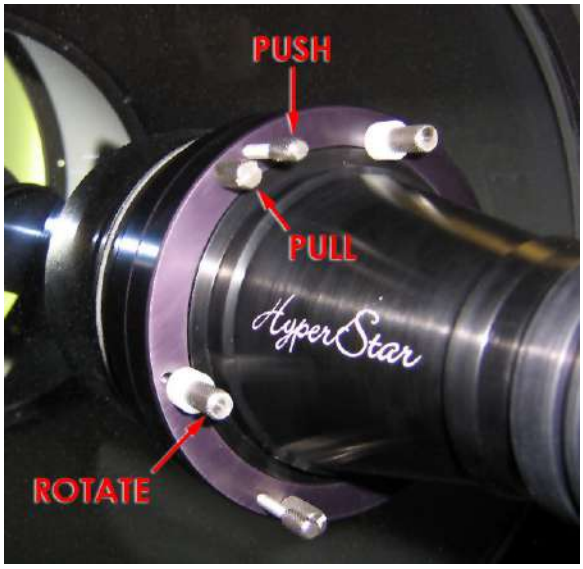
The HyperStar incorporates a simple collimating system. The three pairs of screws around the base of the HyperStar push and pull to tilt the lens and correct for any alignment error.

Warning: *Keep in mind that the three pull screws (shown below) hold the lens in place on the telescope. Do not loosen these screws too much. Small adjustments should be all that is necessary to collimate the HyperStar.*

You will only need to make a collimation adjustment if there is a noticeable coma effect (flaring of the star images to one side) on one edge or corner of the field while the rest of the stars appear sharp. This implies the primary mirror is slightly tilted and not perfectly aligned with the optical axis of the HyperStar. This is normally compensated by adjusting the secondary mirror, but with the mirror removed it now needs to be compensated for with the HyperStar.

The easiest method is to take a single short exposure of a star field (1-3 seconds is usually enough). Make an adjustment by loosening one of the pull screws (shown below) and tightening one of the push screws. This will tip that side of the HyperStar outward. Take a second image and see if there was an improvement. If things got worse, return the pair of screws to their original position and try a different set. Continue until the stars are sharp across the full field. It may be necessary to refocus during adjustment to see the best results.

Tip: *Try adjusting the screws about ¼ turn at a time. Very little adjustment is all that is usually necessary.*



Adjusting Camera Position

The third set of screws (labeled above as ROTATE) allow the HyperStar and camera to be rotated into a different orientation for the purpose of framing objects. Loosen the three screws slightly. The nylon bushings will allow the lens to rotate with the screws still somewhat snug. Once the camera and lens are in the desired orientation, tighten down the screws.

Using Filters

The top portion of the HyperStar lens is a removable adapter, specific to your camera. The inside of this adapter is threaded for 2" filters. Unthread the adapter from the HyperStar lens. A 2" filter can then be threaded into the inside of the adapter. Replace the adapter on the HyperStar lens and you are set to go. Popular filters include the IDAS LPS-D1 and Optolong L-Pro filters, both of which work well to block light pollution.

HyperStar C9.25 Specifications

Focal Ratio: f/2.2

Focal Length: 525mm

Field of View and Resolution with Common Cameras

Camera	Field of View	Pixel Resolution
Atik 490EX	81.8' x 65.5'	1.45”/pixel
Canon EOS 80D	147.3’ x 98.2’	1.46”/pixel
ZWO ASI183MC	86.4’ x 57.6’	0.94”/pixel
ZWO ASI294MC	125.7’ x 85.8’	1.82”/pixel

Exposure Factors (Equivalent Exposure Times)

Focal Ratio	Exposure Factor	Example Exposures
f/2.2 (HyperStar C9.25)	1	30 seconds
f/3.3	2.3	1.2 minutes
f/5	5.2	2.6 minutes
f/6.3	8.2	4.1 minutes
f/10	20.7	10.4 minutes

Starizona
5757 N. Oracle Rd., Suite 103
Tucson, AZ 85704
520-292-5010
www.starizona.com