



## HyperStar C14 Operating Instructions

The HyperStar C14 Lens Assembly allows CCD imaging at  $f/1.9$  with compatible Celestron 14" Schmidt-Cassegrain telescopes and compatible CCD and SLR 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](http://www.starizona.com) and see the *Guide to CCD 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**
- **Camera Adapter**



*Secondary mirror holder and HyperStar lens (with camera adapter attached)*

## Removing the Secondary Mirror

- 1) Begin by positioning the telescope with the front end slightly up. This will prevent the secondary mirror from falling out.
- 2) The secondary mirror holder doubles as the bottom cap for the HyperStar lens. Unthread the holder to remove it from the HyperStar.
- 3) Unthread the retaining ring from the secondary mirror assembly on the front of the telescope.
- 4) Carefully remove the secondary mirror assembly from the front of the telescope. Do not touch the surface of the mirror itself.
- 5) Place the secondary mirror assembly into the holder. Note the small pin on one side of the mirror assembly and the matching notch in the holder. The mirror assembly will only fit into the holder (and the telescope) in one orientation. Use the retaining ring to lock the mirror assembly in place.



## Attaching the Camera

- 6) The HyperStar C14 includes either a T-thread adapter (left) or an SLR adapter (right) depending on the camera being used. Additional adapters are available separately. If not already attached, thread the appropriate adapter onto the HyperStar lens.



- 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. SLR cameras attach using a standard bayonet mount identical to a camera lens mount. Locate the mark on the HyperStar adapter and line this up with the mark on the camera body as you would a normal lens.



- 8) Attach the camera to the HyperStar lens.



- 9) Carefully screw the entire assembly into the front of the telescope. Camera orientation can be changed later. **Tip:** *It may be easier for SLR camera users to thread the HyperStar lens onto the scope first, then attach the camera using the bayonet mount.*



## **Balancing the Telescope**

Use the standard balancing procedure to accurately balance the telescope. The HyperStar and camera will push the center of gravity of the scope forward, so the optical tube will need to be moved back. Holding the telescope in place with one hand, loosen the declination clutch. Carefully release the telescope. If the front of the telescope sinks, slide the optical tube back. Once the telescope is stationary with the clutch loose, it is balanced in declination. Balance the telescope in right ascension using the same technique and by moving the counterweights up or down the shaft. **Note:** *Always balance the declination axis of a German equatorial mount first.*

**Tip:** *Balancing the telescope is critical for getting good tracking accuracy.*

## Collimating the HyperStar Lens

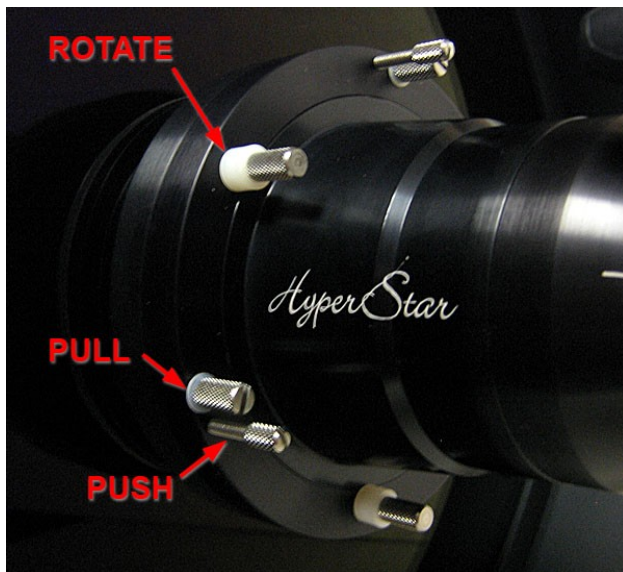
The HyperStar incorporates a simple collimating system. The three pairs of screws around the base of the HyperStar push and pull to tilt the lens and correct for any alignment error.

**Warning:** *Keep in mind that the three rotation screws (shown below) hold the lens in place on the telescope. Do not loosen these screws too much. The nylon bushings under the screw heads will allow the camera to be rotated with the screws barely loosened..*

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 1/4 turn at a time. Very little adjustment is all that is usually necessary.*



**Note:** *Do not overtighten the collimation screws, as this will cause the HyperStar lens to be difficult to remove from the telescope.*

## **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 with Digital SLR Cameras**

The HyperStar SLR adapter has internal threads for a 48mm (2") filter. This allows the use of light pollution (LPR) filters or hydrogen-alpha (H-alpha) narrowband filters. Remove the SLR adapter from the HyperStar lens to thread the filter in place inside the adapter. Keep in mind that LPR filters have around a 2x filter factor, meaning the required exposure is twice as long as an unfiltered image. However, the background sky will be much darker, allowing more detail to be seen. Narrowband filters typically have a 10x filter factor. While most HyperStar images can be taken unguided, narrowband images may require guiding for the best results.

**Note:** *The transmission characteristics of narrowband filters are affected by very fast focal ratios, such as that of the HyperStar lens. A filter with a bandpass of 10nm is recommended for use with the HyperStar*

## HyperStar C14 Specifications

**Focal Ratio:** f/1.9

**Focal Length:** 675mm

### Field of View and Resolution with Common Cameras

Camera	Field of View	Pixel Resolution
Atik 420	35.6' x 27.1'	1.32"/pixel
Atik 428EX	44.6' x 33.5'	1.39"/pixel
Canon EOS 7D	111.9' x 74.8'	1.29"/pixel
Starlight Xpress SXVR-H9C	45.2' x 33.6'	1.94"/pixel
Starlight Xpress SXVR-M25C	117.4' x 78.3'	2.35"/pixel

### Exposure Factors (Equivalent Exposure Times)

Focal Ratio	Exposure Factor	Example Exposures
f/1.9 (HyperStar C14)	1	30 seconds
f/3.3	3	1.5 minutes
f/5	6.9	3.5 minutes
f/6.3	11	5.5 minutes
f/10	28	14 minutes

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