



HyperStar Lens - 14" Meade Operating Instructions

The HyperStar Lens Assembly allows CCD imaging at $f/2.0$ with compatible Meade 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 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 main pieces:

- **HyperStar Lens (with camera adapter installed)**
- **Secondary Mirror Holder (shipped attached to HyperStar Lens)**
- **Counterweight**

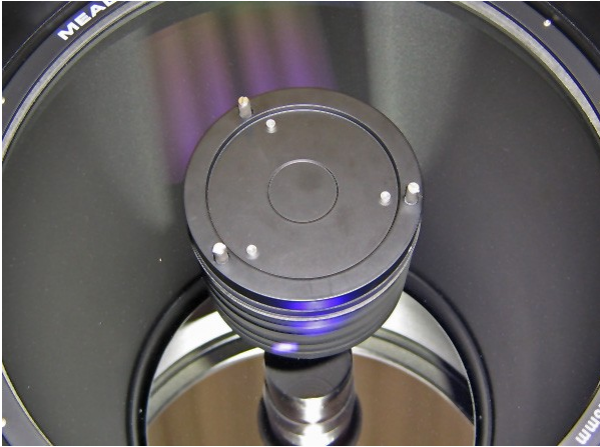


Secondary holder, HyperStar lens, and counterweight

Also included are three thumb screws to replace the hex-head screws holding the secondary mirror to the telescope.

Compatibility

Not all Meade SCTs are compatible with the HyperStar lens. Only scopes with six screws on the secondary mirror holder (as shown below) are compatible. Three screws are used for collimating the telescope optics and three allow the secondary mirror to be easily removed. For telescopes with a non-compatible design, Starizona offers a kit to retro-fit the telescope with a compatible mirror assembly.



Positioning the Telescope & Attaching the Counterweight

- 1) Begin by aiming the telescope vertically. This will prevent the secondary mirror or HyperStar lens from falling out during installation.
- 2) Attach the counterweight by threading it onto the rear cell of the telescope. Do NOT overtighten the counterweight; if the temperature changes significantly, it will be very difficult to remove the weight. Note that additional weights can be stacked onto the main weight if needed. Additional weights are sold separately.



Removing the Secondary Mirror

- 3) The secondary mirror holder doubles as the bottom cap for the HyperStar lens. Unthread the three short thumbscrews to remove the mirror holder.
- 4) Use a hex-head wrench to remove the three screws holding the secondary mirror assembly to the telescope. In the future, the included thumbs screws can be used in place of the hex-head screws to attach the mirror assembly to the telescope, making for easier interchangeability.
- 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 holder. Note that the screw holes are asymmetrical. The mirror assembly will only fit into the holder (and the telescope) in one orientation. Use the three thumb screws to lock the mirror assembly in place.



Attaching the Camera

- 7) The HyperStar M14 includes either an SLR adapter (below top) or T-thread adapter (below bottom) depending on the camera being used. Additional adapters are available separately. If not already attached, thread the appropriate adapter onto the HyperStar lens.



- 8) A CCD camera will attach to the HyperStar (or adapter) 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.



- 9) Attach the camera to the HyperStar lens.



10) Carefully set the entire assembly into the front of the telescope. Note that the screw hole pattern is asymmetrical, allowing the HyperStar to attach in only one orientation. Camera orientation can be changed later. Use the shorter three screws to attach the lens to the scope.



Balancing the Telescope

Holding the telescope in place with one hand, loosen the declination clutch. Carefully release the telescope. If the front of the telescope sinks, counterweights must be added to the main weight. Once the telescope is stationary with the clutch loose, it is balanced. Tighten the declination clutch again to engage the motor drive.

Collimating the HyperStar Lens

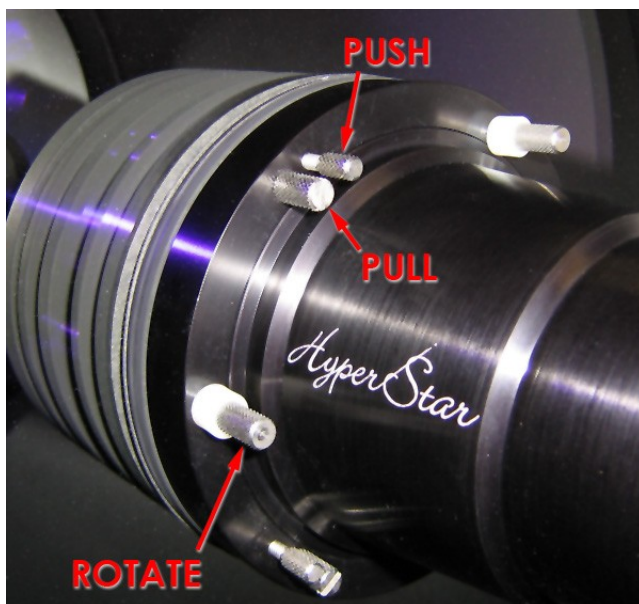
The HyperStar incorporates a simple collimating system. The three pairs of screws around the base of the HyperStar push and pull to tilt the lens and correct for any alignment error.

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 1/4 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.

HyperStar M14 Specifications

Focal Ratio: f/2.0

Focal Length: 700mm

Field of View and Resolution with Common Cameras

Camera	Field of View	Pixel Resolution
Canon EOS 7D	109.5' x 73.2'	1.27"/pixel
SBIG ST-8300	88.4' x 66.3'	1.59"/pixel
Starlight Xpress SXVR-H9C	44.2' x 32.9'	1.91"/pixel
Starlight Xpress SXVR-M25C	114.9' x 76.6'	2.30"/pixel

Exposure Factors (Equivalent Exposure Times)

Focal Ratio	Exposure Factor	Example Exposures
f/2.0 (HyperStar M14)	1	30 seconds
f/3.3	2.7	1.4 minutes
f/5	6.3	3.1 minutes
f/6.3	9.9	5.0 minutes
f/10	25	12.5 minutes

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