

Operating Instructions

Meade® Model 647 CCD Flip-Mirror System (2")

Introduction: The Meade Model 647 CCD Flip-Mirror System (2") is a major advancement in systems specifically designed for CCD imaging where large CCD chips (e.g., the Pictor 1616XT) are employed. One of the most important aspects of this system is the dramatic reduction in setup and focus time after initial calibration. Threaded on to the rear cell of any Meade LX-series mirror-lens telescope or to other Schmidt-Cassegrain telescope brands, the Flip-Mirror allows direct visual inspection of the imaging area, permitting quick and convenient image composition and focus. The Flip-Mirror may be used with any Meade Pictor CCD Autoguider/Imager or with other CCD imager brands, or with removable-lens 35mm SLR cameras.

Detailed here, are the standard accessories for the Meade Flip-Mirror (2"), and instructions for use.

Attaching the Flip-Mirror to the Telescope: Remove any attachments to the threaded rear cell of the telescope (e.g., eyepiece holder or diagonal prism/mirror) and attach the Flip-Mirror, by turning the Flip-Mirror's thread-on, knurled ring (1, Fig. 2) clockwise to a firm feel.

If a different viewing angle is desired, slightly turn the Flip-Mirror's thread-on, knurled ring counterclockwise to loosen the device from the rear cell, rotate the device to the desired position and re-tighten using the method described above.

Attaching the CCD Camera to the Flip-Mirror: Meade Pictor Autoguider/Imagers (or other CCD camera system brands) are attached to the Flip-Mirror by means of the T-thread interface (4 or 5, Fig. 2) or the 1.25" Barrel Adapter Holder (3, Fig. 2). It is also possible to use the Pictor 216XT, 416XT, or 1616XT with the Pictor Color Filter System (either #616 or #616A) in conjunction with the Flip-Mirror.

To attach the CCD camera to the Flip-Mirror using the 1.25" Barrel Adapter, first connect the 1.25" Barrel Adapter Holder (3, Fig. 2) to the Flip-Mirror's Back Plate (2, Fig. 2) by securing it with the inner set of three thumbscrews (1, Fig. 1), then slide in the camera. Secure the camera to the 1.25" Barrel Adapter Holder with the outer set of three thumbscrews (2, Fig. 1).

Many CCD cameras, including all Pictor Autoguider/Imagers, can be attached to the Flip-Mirror via the T-thread interface, with or without their corresponding color filter systems. To attach a T-thread compatible CCD camera without a color filter system, thread-in the Long T-Adapter (4, Fig. 2) to the CCD camera body. Then attach the Long T-Adapter with CCD camera to the Flip-Mirror's Back Plate (2, Fig. 2), securing the Long T-Adapter with the three thumbscrews.

To attach a T-thread compatible CCD camera with a color filter system (or a removable-lens 35mm SLR camera body with the appropriate optional camera-specific T-mount), thread-in the Short T-Adapter (5, Fig. 2) to the camera body. Then attach the Short T-Adapter with CCD camera to the Flip-Mirror's Back Plate (2, Fig. 2), securing the Short T-Adapter with the three thumbscrews.

With either T-Adapter attached, the rotational orientation of the CCD camera head can be changed as desired by loosening the T-Adapter's three thumbscrews slightly (while securely holding the camera) and changing the rotational position of the CCD camera. Secure the camera by tightening the three thumbscrews of the T-Adapter.

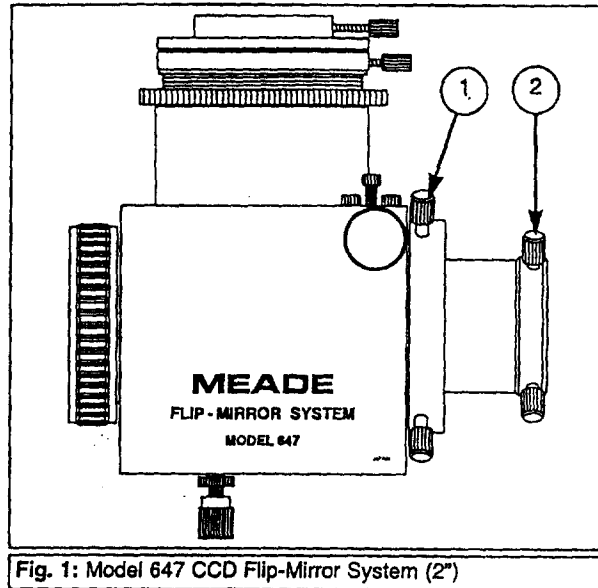


Fig. 1: Model 647 CCD Flip-Mirror System (2")

Choosing the Eyepiece and Matching Focus to the Camera: Once the focus is matched between the eyepiece and the CCD camera, focusing the eyepiece using the telescope's focus knob assures a sharp focus in the CCD camera. A great many eyepieces, both 1.25" and 2" O.D., match focus with Meade Pictor Series Autoguider/Imagers and with many other CCD camera brands, when used with the Meade Model 647 Flip-Mirror System (2"). Among the eyepieces manufactured by Meade, these specific eyepieces may be employed with Meade Pictor Autoguider/Imagers:

- All Meade Illuminated Reticle Eyepieces including PL9mm and MA12mm (1.25" O.D.)
- Meade MA 12mm Astrometric Eyepiece (1.25" O.D.)
- Meade Plössl 25mm CCD Framing Eyepiece (1.25" O.D.)
- All Series 3000 Plössl Eyepieces (1.25" O.D.)
- All Series 4000 Super Plössl Eyepieces (1.25" O.D.)
- All Series 4000 Super Wide Angle Eyepieces (1.25" O.D.)
- Series 4000 Ultra Wide Angle Eyepieces 4.7mm, 6.7mm, and 8.8mm (1.25" O.D.)
- Series 4000 Super Wide Angle Eyepieces 32mm and 40mm (2" O.D.)

NOTE: Directions to turn the Mirror Control Knob to the "UP" or "DOWN" position (i.e., clockwise or counterclockwise) are described as when facing the Flip-Mirror Case Cover (16, Fig. 2).

To match focus with the selected eyepiece to the attached CCD camera, place the mirror of the Flip-Mirror in the "UP" position, by turning the Mirror Control Knob (6, Fig. 2) counterclockwise until the knob reaches its stop. This allows the light coming through the telescope to reach the imaging plane of the CCD camera. Focus is made by turning the telescope's focus knob in the usual method as described in the camera's instruction manual. Use the instruction manual for the CCD camera to focus the image. Once the image (e.g., a star or other celestial object) is precisely focused on the CCD camera, turn the Mirror Control Knob clockwise to place the mirror in the "DOWN" position until the knob reaches its stop.

The Meade Flip-Mirror employs a 2" O.D. Helical Focuser with a removable 2" to 1.25" O.D. Eyepiece Holder Adapter (7, Fig. 2) to allow use of 1.25" O.D. or 2" O.D. eyepieces. Matching eyepiece focus with the attached CCD camera is achieved by releasing the Focuser Lock Ring (8 Fig. 2), by turning it counterclockwise and turning the Helical Focuser Tube (9, Fig. 2) clockwise or counterclockwise until the image is sharp as seen through the eyepiece.

Do not turn the focus knob of the telescope to focus the eyepiece, as such operation negates the precise focus to the CCD camera's imaging plane.

Lock the eyepiece focus in position by turning the Focus Lock Ring to a firm feel. Depending on the eyepiece selected, the Helical Focuser Tube may be turned to furthest threaded-out position, where it may be necessary to raise the eyepiece holder out of the eyepiece barrel to achieve correct focus. In this circumstance, loosen the eyepiece holder's thumbscrew and lift the eyepiece until the image is sharp. Tighten the eyepiece holder's thumbscrew to secure the proper focus position of the eyepiece.

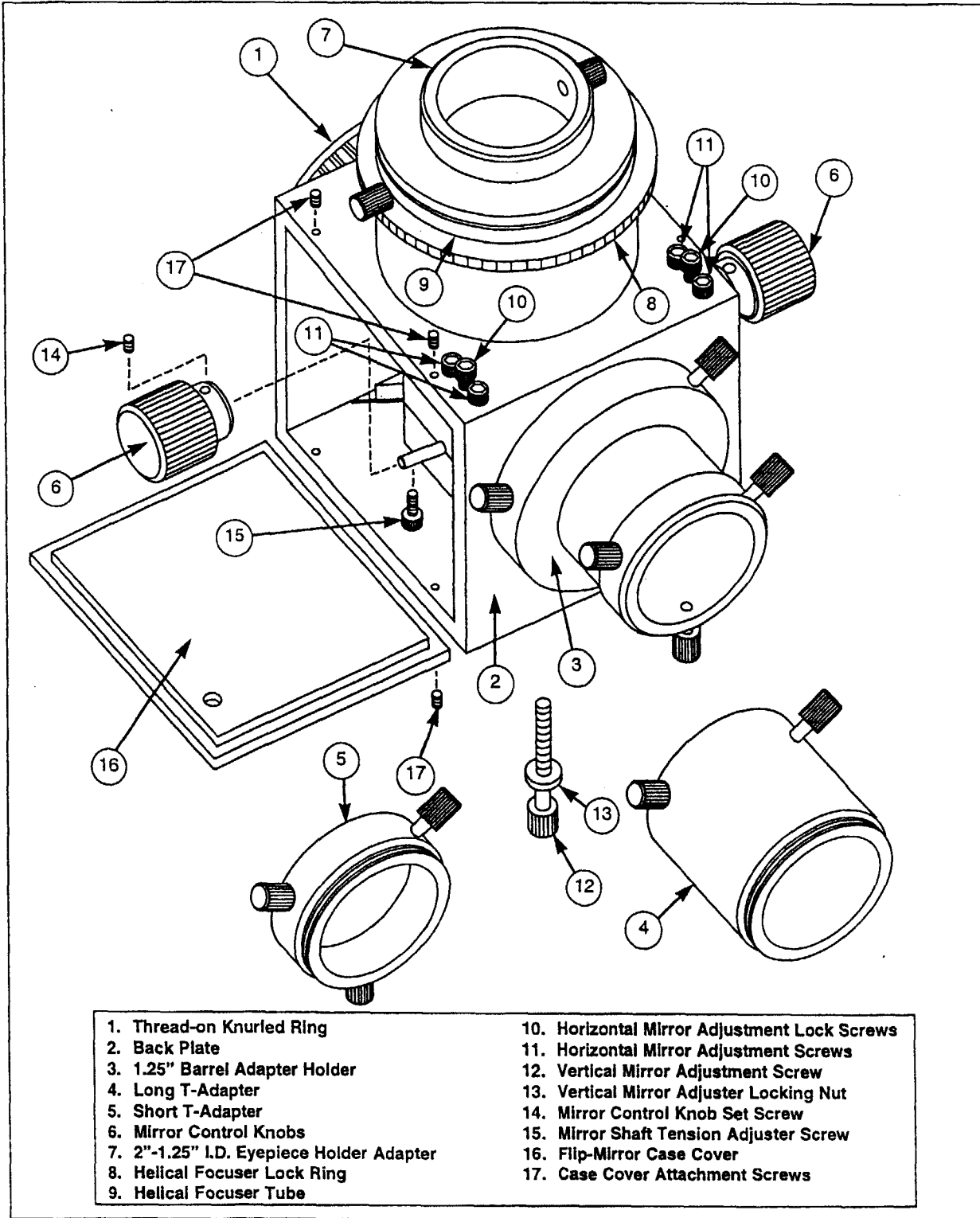


Fig. 2: Meade Model 647 Flip-Mirror System (2") — Exploded View

Important Note: Provided that the camera/eyepiece combination remains unchanged, the Flip-Mirror remains calibrated to match focus during subsequent imaging runs, greatly reducing setup and focus times when taking CCD images.

Without the CCD imaging camera, the Flip-Mirror can replace the telescope's usual 2" diagonal mirror and can be used with any 1.25" or 2" O.D. eyepiece for visual observing.

Special Note Regarding Use with Focal Reducers: When used with a Meade (or other brand of) Schmidt-Cassegrain telescope, the Flip-Mirror may not reach focus in conjunction with a focal reducer lens such as the Meade f/3.3 or f/6.3 Focal Reducer/Field Flatteners.

Mirror Adjustments: Once the eyepiece focus has been matched to the CCD camera, the next step is to adjust the internal mirror so that what is centered in the eyepiece is also centered in the CCD camera. Prior to using the Flip-Mirror System, the System's internal mirror must be adjusted so that the center of the CCD image's focal plane (*i.e.*, with the System's internal mirror in the "UP" position) coincides with the center of the eyepiece's field of view (*i.e.*, with the System's internal mirror in the "DOWN" position).

To make horizontal adjustments to the mirror, use the supplied hex-head wrench to release (turning counterclockwise) one of the hex-head Horizontal Mirror Adjustment Lock Screws (10, Fig. 2). Then turn the two hex-head Horizontal Mirror Adjustment Screws (11, Fig. 2) clockwise or counterclockwise by equal amounts. Check for horizontal centering in the eyepiece by locking (turning clockwise) the hex-head Horizontal Mirror Adjustment Lock Screw (10, Fig. 2). If the object has moved within the field of view of the eyepiece in an undesired direction, return the Horizontal Mirror Adjustment Screws to their original position. Then make adjustments to the other set of screws on the opposite side of the Flip-Mirror.

To make vertical adjustments, locate the Vertical Mirror Adjustment Screw (12, Fig. 2) and release its Locking Nut (13, Fig. 2). Turn the Vertical Mirror Adjustment Screw clockwise or counterclockwise as necessary until the object is perfectly centered in the eyepiece. Turn the Vertical Mirror Adjustment Locking Nut clockwise until it is snug.

Using the Flip-Mirror: With the focus matched and the mirror adjusted, the Flip-Mirror is now ready for use. To take an image follow this procedure

- Turn the Mirror Control Knob clockwise to place the mirror in the "DOWN" position until the knob reaches its stop.
- Confirm that the object is in the field of view.
- Look through the telescope eyepiece and verify focus. Make any focus adjustments using the telescope's focus knob.
- To take an image, turn the Mirror Control Knob counterclockwise to place the mirror in the "UP" position until the knob reaches its stop. This allows the light coming through the telescope to reach the imaging plane of the CCD camera so an exposure can be made.

NOTE: Changing the focus position of the Helical Focuser negates the matched focus of the camera. If there is any change to the eyepiece/camera combination the focus and mirror adjustment sections of these instructions must be verified. If the camera is rotated for a new image orientation, the mirror adjustment must be verified.

Maintenance: If the Mirror Control Knob shaft loses tension it is unable to hold the mirror in a given position. To increase tension to this shaft use the supplied hex-head wrench to remove the left-side Mirror Control Knob (6, Fig. 2) from the shaft by releasing the hex-head set screw (14, Fig. 2). Then remove the four Case Cover Attachment Screws (17, Fig. 2) from the Flip-Mirror Case Cover (16, Fig. 2) on the left side of the Flip-Mirror's Case to gain access to the Mirror Shaft Tension Adjustment Screw (15, Fig. 2). Turn the hex-head screw slightly clockwise, while testing the tension by turning the remaining Mirror Control Knob.

Avoid cleaning the flip-mirror optics: a little dust on the surface of the mirror causes virtually no degradation of image quality and should not be considered reason to clean the mirror. DO NOT disassemble the flip-mirror to clean the interior surfaces.

When absolutely necessary, dust should be removed with gentle strokes of a camel hair brush or blown off with an ear syringe (available at any pharmacy). DO NOT use a commercial photographic lens cleaner.

If you have any questions regarding the use of the Flip-Mirror, please call Meade Customer Service at (949) 451-1450. Customer Service hours are from 8:30 A.M. to 4:30 P.M. Pacific Time, Monday through Friday.