



MonsterMOAG™ Off-Axis Guider
for 2 inch focuers

Part #: MMOAG-1, MMOAG-2, MMOAG-3 & MMOAG-4



Introduction

The MonsterMOAG™ (MMOAG) is the our most popular off-axis guider (OAG) from Astrodon® designed for CCD imaging.



It is designed to have a large (2.55"; 65 mm) opening with its 2.7" threaded fittings. It is suitable for the largest imaging detectors (KAF16803, KAF09000) with dimensions of 36x36mm and a 52 mm diagonal.

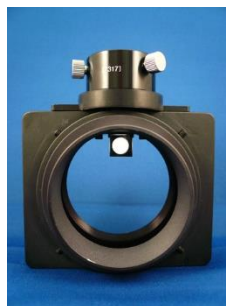
To the best of our knowledge, the MMOAG is one of the thinnest OAG available, taking up only 1.25" of backfocus (1.45" with connectors). It is thin enough to be used on the Takahashi FSQ106N refractor, with its very short 4.75" (120mm) backfocus.



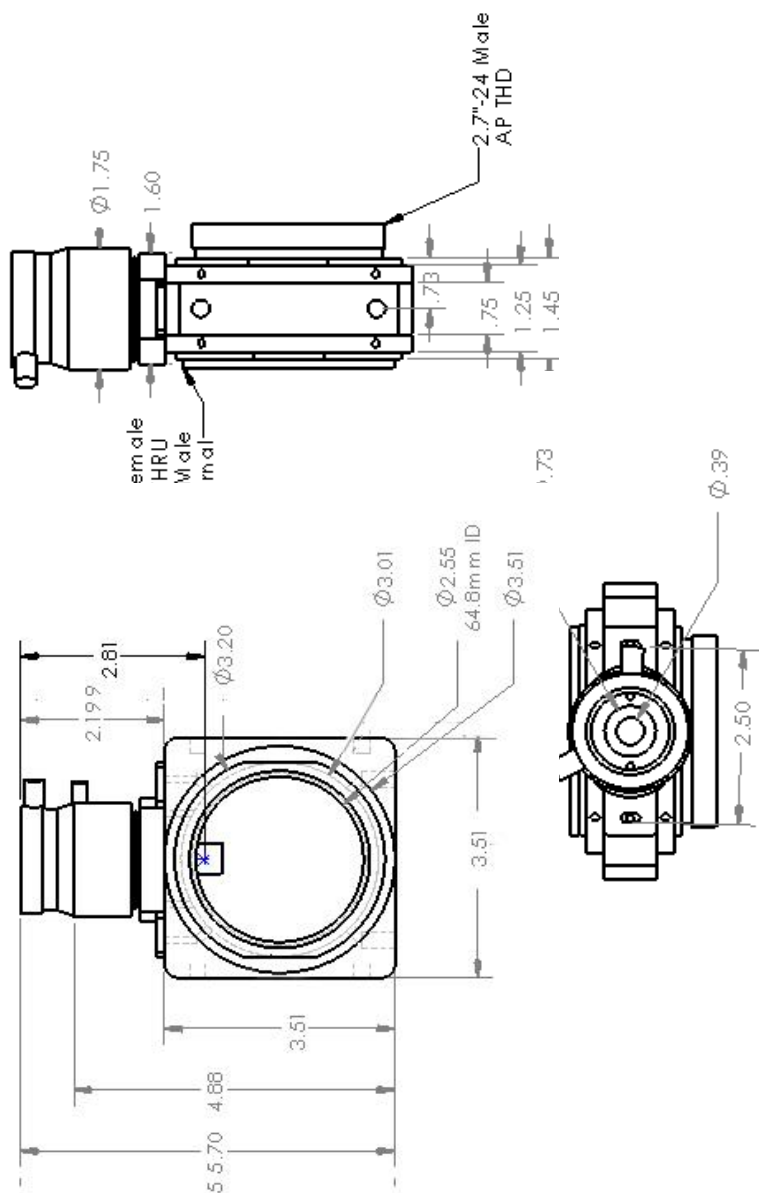
The MMOAG was modified in June, 2015. The rectangular body was made square and the through hole for the prism/focuser assembly was replicated on all sides. This enables up to four guiding ports to be used. We refer to these as MMOAG-1, -2, -3 and -4 where the number represents the number of guide ports occupied. You can add additional ports later. Any unused port comes covered with a black plate with an indent that protrudes into the hole to block any light from entering the MMOAG.

Features

- Solid aluminum body for no flexure, 3.1 x 3.1 x 1.23"
- Supplied with male and female adaptors (1 each)
 - 2.7"-24TPI threads (TPI, threads per inch)
 - Dovetail connection to MMOAG
 - Allows for rotation and lock down on both sides
 - Dovetail pulls 3.2" dia. knurled flange against MMOAG body for no camera tilt
 - Male adaptor has low reflectivity I.D.
 - Female adaptor has 2.7"-24 threads on the I.D. and 3.00-24" male threads on the O.D. compatible with the new, large filter wheels
- Optional adaptors for the camera side of varying thicknesses (backfocus) – see web site.
 - Provides additional space to bring the focus above the helical focuser for some camera/CFW combinations
 - Makes a direct connection between MMOAG and large CFW from Apogee/Andor 7S), SBIG and Finger Lake Instruments, also with rotation and lock down
- Helical focuser for 1.25" nose piece of guiding camera for fine focus adjustment
- ½" AR-coated right-angle prism
- Additional 0.125" spacer provided to extend prism further into the optical path
- 1.1 lbs (0.49 kg) with body, connectors and helical focuser



- Slots for rotation on the focuser holder for fine alignment of the prism parallel to the optical axis



Installation Issues

The flat side of the prism and the male 2.7" AP adaptor face the telescope.

We suggest that you remove the male fitting by loosening the 8-32 set screws in the MMOAG raised flanges with a 5/64 ball driver or with the provided hex wrench set. Screw the adaptor into a female AP 2.7" compatible extension tube or connector on your telescope. The MMOAG adaptor has a knurled, raised 3.20" diameter flange that can be used to tighten or to remove it.

Next, place the MMOAG over the dovetail fitting and proceed to tighten the four 8-32 set screws. As you tighten, the MMOAG body will be pulled flush against the 3.20" raised flange on the adaptor to minimize any camera tilt.

Repeat this process on the camera side. There are several options. Use the supplied adaptor with the female AP 2.7" threads to accept a connector with male AP 2.7" threads. For example, there is an STL-to-AP(male) adaptor that screws into the SBIG STL nose plate. Simply screw the supplied 2.7" MMOAG female adaptor onto this part, insert into the MMOAG body and tighten down as before. You can place AP (www.astro-physics.com) extension tubes between the male and female 2.7" parts in this way.

The MMOAG female adaptor also has 3.000"-24 male threads on the outside that are 1/8" long. These fit into the new, large CFWs from Apogee Instruments

(www.ccd.com), SBIG (www.sbig.com), and Finger Lakes Instruments (www.fli-camera.com). However, the "overhang" of the holder for the helical focuser on top of the MMOAG may interfere with the CFW.

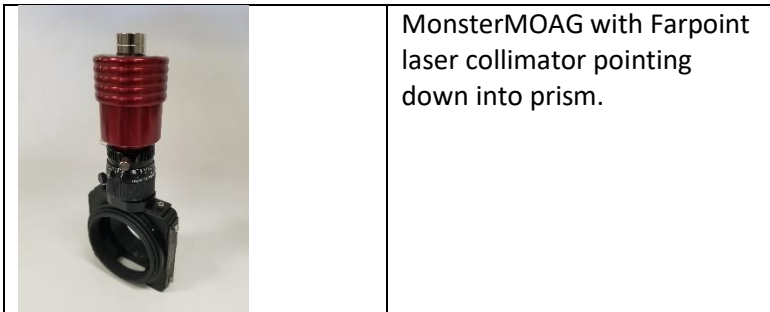
There are two solutions. First, you can purchase our optional 0.75" long adaptor having the dovetail on one side and 3.000"-24 threads on the other or other adaptors (please see our web page). Second, you can move the focuser holder up 0.1" with the additional (3 x 3.4") spacer provided.

We provide one additional 0.125" thick (1 ¼ x 9/16") spacer that fits underneath the prism holder. This permits you to move the prism further into the optical path and away from the edge of the field of view. This can be beneficial for better focus if the flat field does not extend to the periphery of the I.D. Also, you have more flexibility along these lines with smaller detectors while still minimizing any vignetting.

Remove the camera from the focuser. Remove the two 4-40 button head screws (BHCS) on the slotted tabs of the focuser holder with a 1/16 ball driver or with the hex wrench from the provided set. Pull the assembly out of the MMOAG body. Remove the two 4-40 socket head cap screws (SHCS) from the

prism holder (3/32" ball driver/wrench), being careful not to let the prism fall and chip and edge. Add the additional spacer and reconnect the prism holder and prism. Re-insert the assembly into the top of the MMOAG and secure with the two 4-40 cap screws.

Please note that the 4-40 button head screws fit into slots in the focuser holder. This allows you to rotate the prism to ensure that its face is perpendicular to the optical axis of the scope. You may make this adjustment on the telescope and then tighten it securely. I use a Farpoint Laser Collimator placed on top of the helical focuser on a table. I then align the edge of the MMOAG body against a rail. I then move a target along that rail closer and further away from the MMOAG. If the prism is aligned, the laser spot will not move side to side. If it does move, I make fine rotation adjustments to the focuser holder and repeat the process until no movement is observed. I then tighten down the BHCS and lock the prism holder in place.





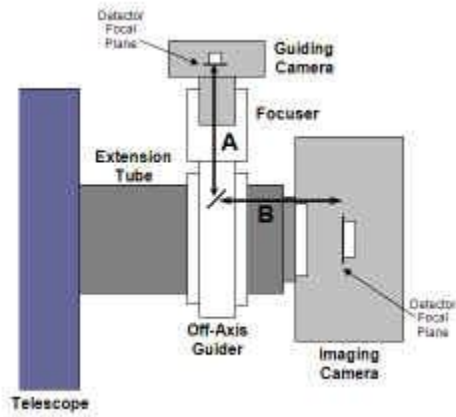
Laser spot is seen on a target about 6" away. Note the target is held fixed along the side of the table with the same plate.



Laser spot is seen on target about 2' away, again aligned with the table using the metal plate. Note that the spot has not moved left or right.

Coming to Focus

It is important to realize that any OAG must be placed within a narrow range of distances from the imaging camera for the guiding camera to come to focus. The distance between the prism and guide camera focal plane (A) must equal the analogous distance between the



prism and the focal plane of the imaging camera (**B**). If too close, the focal point will be inside the helical focuser on the MMOAG. If too far, the focal point may be too far above the focuser, and require an eyepiece extender or just be too far away to be stable. Please see our web page for a more current set of distances and help

The backfocus distances for some popular large format cameras at the time of this writing are:

- Finger Lakes Proline + CFW-4-7s - 1.8"
- Apogee U16M + AI-FW50-7s - 2.0"
- SBIG STL/FW8 + STL-to-AP(male) adaptor - 2.2" (1.9" with internal CFW)

Add the midpoint of the MMOAG where the prism is located to these numbers, plus the 0.1" raised flange of the fitting (0.625 + 0.1 = 0.725"), and the values for **B** become:

- FLI Proline + CFW-4-7s + MMOAG - $1.8 + 0.7" = 2.5"$
- Apogee U16M + AI-FW50-7s + MMOAG - $2.0" + 0.7" = 2.70"$
- SBIG STL/FW8 + STL-to-APmale adaptor + MMOAG - $2.2" (1.9" \text{ with internal CFW}) + 0.7" = 2.9"$

The minimum distance **A** with the helical focuser screwed all the way in is 2.8". Add 0.6" for the backfocus of guider cameras, such as the SBIG ST-402 and the minimum distance **A** becomes 3.4". The helical focuser has approximately ½" of travel. So, it

would be useful to plan for the mid-range of travel, or $3.4'' + \frac{1}{2}(1/2) = 3.6''$ as the target for **A**.

There are several ways to increase **B** and/or decrease **A** to arrive at focus.

1. Use a 2.7'' male fitting on your CFW. Add the appropriate AP extension tube to achieve $>3.65''$ for **B**. Connect directly into the AP Female 2.7'' adaptor provided with the MMOAG. The guider nose piece does not have to be placed flush into the focuser. It can be retracted perhaps $\frac{3}{4}''$. **Disadvantage – purchasing of a 2.7'' male fitting for your CFW and AP extension tubes.**
2. Replace the helical focuser with the provided 1.25'' nose-piece holder decreasing **A** from 3.6'' to 2.7'' **AND** purchase the additional dovetail-to-3'' male 0.75'' long adaptor. This makes **B** for YR, Apogee and FLI 3.08'', 3.24'' and 3.51'', respectively. In this way, the guide camera can be partially retracted from the nose piece and then locked in place to achieve focus. **Disadvantage – losing the fine focus capability of the helical focuser.**

Another Way to Attach the Guide Camera

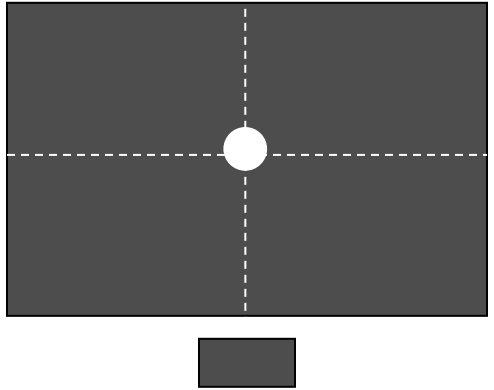
We have learned that the outside threads on the helical focuser match the internal threads in SBIG remote guide head (RGH) and ST-402 guide cameras. This allows the guider to be moved closer to the prism by eliminating the 1.25'' nose piece, if focus cannot be achieved otherwise.

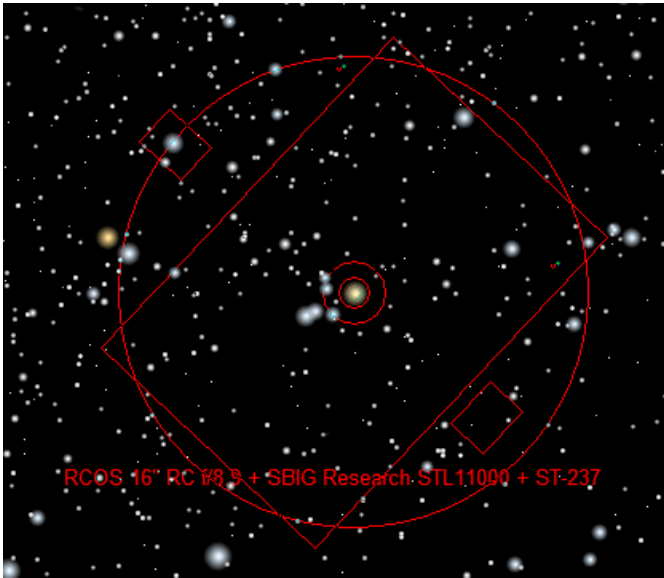
1. Remove the 1.25" nosepiece from the camera.
2. Make sure the two thumbscrews at the top of the focuser are retracted and do not interfere with light coming to the guide camera. If you remove these thumbscrews, make sure you tape over the holes (e.g. black electrical tape) to prevent stray light from getting into the guide camera.
3. Screw the guide camera all the way onto the top of the helical focuser. It may not be aligned with the optical axis.
4. Loosen the set/cap screw at the side of the holder into which the helical focuser screws into at the top of the MonsterMOAG.
5. Rotate the base of the helical focuser until the guide camera is parallel to the optical axis.
6. Tighten the set/cap screw to prevent guide camera rotation.

Locating A Guide Star

This is often times the most difficult, time-consuming part of using an OAG for the first time. With rectangular CCDs, such as those in SBIG's ST or STL series, the internal guide CCD is halfway across and below the long axis of the CCD. The OAG is generally placed toward the "top" of the camera (closest to the window) and is on the other side of the imaging CCD, opposite the internal guide detector. I will describe my process using the rectangular detector in an SBIG STL camera. I will describe this procedure using Diffraction Limited's MaxImDL V4.58 and Software Bisque's TheSkyV6.

1. Orient your camera along N,S,E,W.
2. Slew to a bright star, such as Deneb, and center it.
3. Do an image link with TheSky to determine your orientation.
4. Note the position of the internal guide detector.
5. The location of the guide camera in the MMOAG is on the opposite side of the imaging detector in the field-of-view (FOV) indicator in TheSky.
6. Open up the motion control box in TheSky
7. Go to focus mode in MaxIm and select continuous and a short exposure time, such as 1s.
8. Start slewing the scope in small increments (e.g. 1-5 arcmin, depending upon your focal length) and watch the star move up (you will have to figure out which direction to move it, but the direction is away from the internal guide detector).
9. Eventually it will move off the main imaging detector.
10. In MaxIm, stop the exposures, select guide CCD instead of imaging CCD and start taking data continuously.
11. Continue slewing, but use smaller movements and watch to see the bright star begin to appear. Make the appropriate adjustments to center the star.
12. Note current position in TheSky. Since the bright star was originally centered in the imaging detector you can center the FOV on the bright star again and edit the FOV indicator by adding a new element – a circle that goes through the position of the guide detector that you just determined.





13. Add another element to TheSky that represents the size of the guide detector at the proper position on that circle. Please note that this will likely be rotated 90 degrees with the long direction point away from the center of the FOV due to the prism reflection. Here is an example with the guide star centered in the rectangle representing the guide camera (upper left)

The procedure is the same for other brands of cameras lacking an internal guide detector as a benchmark with larger square detectors. You may have to experiment as to whether to go up or down when you slew.

Miscellaneous

We have endeavored to provide the most popular 2.7" and 3" fittings for the MMOAG. There is no doubt that there will be

other fittings needed for other configurations. In this case we recommend that you contact PreciseParts, at www.preciseparts.com who specialize in making one-of-a-kind threaded adaptors for astronomy. They know the specifications of the MMOAG dovetail adaptors and how the part fits into other systems.

Support

We appreciate the trust you have placed in Astrodon Imaging in purchasing the MonsterMOAG. We stand behind our product. We will repair or replace any part that is defective or becomes defective for 2 years, with the exception of misuse, such as galling or stripping threaded connections, chipping the prism etc. Please contact us for technical support, and BEFORE any parts are shipped back for repair. We will issue an RMA (returned material authorization) for reference, which should be noted in any shipment of products to Astrodon. Astrodon will not accept any shipments without an RMA. Thank you again for your purchase of Astrodon products.

Get Behind the Science!

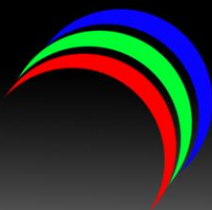
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Jerry Mason
Department of Astronomy
Ohio State University



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