

ZWO ASIAir

The Missing Manual

Version 1.9, May 2026



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Change history

Version	Summary
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- | | |
|-----|---|
| 1.9 | Correction: ASIAir uses HFD, not HFR (throughout) and 9.8 updated.
Merged sections 10 and 11.
Inserted 11.7 Strain-wave (Harmonic) mounts.
Revised 13 – To dither, or not.
Duplicated figure 43 replaced.
Removed duplicated text. |
| 1.8 | Added 9.3 - GOTO using a previous image
Added 9.5 - Number of stars needed for platesolving
Section 18- Video – inserted figures showing the settings
Added 25.1. - Viewing/Saving images using the ASIAir App
Added 25.2. - Transfer to a computer – via USB C port
Replaced FWHM with HFR throughout |
| 1.7 | Edited Tuning the Autoguider.
Typos corrected throughout. |
| 1.6 | Updated for ASIAir 2.5 with additional figures throughout
Edited Star quality – FWHM, and Mosaics
Added 10 Sky Atlas and 11 Celestial Library |
| 1.5 | Added 13 Custom Targets |
| 1.4 | Added Change history
Added Darks, Flats, or Bias for live stacking
Added Mosaics |

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Many thanks are due to my wife and family for their patience when I disappear in the dark to tinker with ASIAir; to the “testers” - Igor Hodoba and the members of Northern Sydney Astronomical Society, and to catchlight, dstoenner, and MichaelACG at CloudyNights for proofreading.

1. Introduction

1.1. Background

2018 ZWO [published a manual](#) but it has not been maintained. When I bought my ASIAir it arrived with no instructions - and I learnt outside with the scope by trial and error, and more recently some of my local club members were also struggling. In addition, the ASIAir user interface is cryptic and its complexity such that beginners need guidance from more experienced users. So... I started this to help them.

Due to the wide variety of equipment across the imaging community some of the details might not be ideal (i.e. different mounts, harmonic mounts, those using DSLRs, or star trackers) - there is no hard right or wrong. But I hope it will get you started well enough to find out what works for you.

This guide is based on software version 2.3 and updated for version 2.5 (December 2025). It describes the sequence to set up an equatorial mount and (with a little luck) begin imaging using the ZWO ecosystem. Screenshots are from an iPad/iPhone; the setup included a Skywatcher equatorial mount, ASIAir Plus with an SD card, ASI2600MC DUO camera, EAF and CAA so some variations will arise according to your combination of hardware. The information presented here has also been checked against a few other mounts and other recent ZWO cameras.

Section 5.8. includes a note concerning ASI2600MC Air and ASI585MC Air cameras.

1.2. What it does...

ASIAir offers a compact all-in one fully integrated suite for imaging with a small telescope. Once you have mastered the basics, many users can set up and start imaging in 30 minutes. Thankfully the ASIAir firmware will remember most of its settings from one session to the next, so once you begin to have some success, subsequent sessions should be simpler.

1.3. ... Help

The ASIAir user interface is complex, and full of cryptic icons. Setting up for the very first time involves a daunting number of steps and settings, and it is inevitable beginners will overlook something, so take your time to work through it all. If you are struggling seek help from:

- **an experienced user – strongly recommended on your first night;**
- **the [Cloudynights forum](#), or**
- **the [ZWO BBS forum](#).**

1.4. Platesolving limitations

ASIAir platesolving works best with a main camera having a field of view between 0.4 degree to 33 degrees. It may work outside these ranges, but not reliably. This in turn constrains the choice of focal length vs the main camera sensor size – for example with an APS-C sensor 3000mm focal length is the practical limit, or with a full-frame sensor 4500mm.

1.5. Choice of main camera – DSLR vs astro cameras

Many beginners start out hoping to use their DSLR. With a high-end DSLR taking 60 megapixel images GOTO, polar alignment or focusing can be excruciatingly slow because it takes minutes to extract each image out of the camera.

Most astro cameras offer binning, where images are downsampled in-camera by a factor of 2, 3 or 4 to reduce the filesize and dramatically speed things up when full quality isn't needed. For example, with the ASI2600 and BIN4, PREVIEW mode can run at 1 frame/sec which is fine for a quick look to frame a target, and for many, BIN2 is fine for autofocus. BIN4 is also sufficient for polar alignment.

1.6. Exposure times

The camera settings and exposure times indicated here were for a one-shot colour camera (ASI2600MC DUO) with gain 100, no filters working with a telescope at f/12, in a Bortle 4 sky. They're just a guide, not hard-and-fast. If you are so lucky as to have Bortle 1 sky you could use longer exposures, or under Bortle 9 you will need to reduce them.

If you are using a camera with filters you will need to increase the exposure times according to the transmission of the filter; for example, the Optolong L-Pro or Altair tri-band filters have a transmission around 50% so you could double the exposure time.

Conversely if you are using a faster telescope, you could reduce the exposure time or reduce the camera gain. For example, using the same gain at f/6, divide the exposure times shown here by a factor of 4.

2. Quick Start

- **Set up** the tripod, mount and telescope (section 3)
- **Balance** the scope, configure the site location, date, time (3.5)
- **Set location, date, time** and do a 1-star alignment (3.6 - 3.7) using the mount handset
- **PARK** the mount (3.8) using the mount handset
- **Connect ASIAir** to the mount (4.6)
- **Check the mount and cameras are connected and configured** (5)
- **Select PREVIEW** mode (9)
- **Rough focus** to confirm stars visible in the main camera (6.4-6.7)
- **Align** the mount on the celestial pole (7 and 8).
- **Choose a target** and GOTO (9)
- **Configure the Autoguider** (9.8)
- **FOCUS** precisely (6.6 and 6.8)
- Configure and start **AUTORUN** (12), or
- **Live Stacking** (EAA) (16) or
- Define and run a **PLAN** (13) or
- Live **VIDEO** (17)
- **Shutdown** (19)
- **Extract images** (24.4)

3. Setting up the telescope

3.1. Locate north/south

Locate north/south within a degree or two by any means you like, for example a compass, a distant tree, building, light pole, sign....

If you are using a compass allow for the [magnetic variation](#) at your location, and get well clear of any steel or iron objects - at least 20 metres from objects such as cars, steel tripods, scopes with steel OTAs, fences, steel buildings. Use the compass to identify a distant landmark due north or south.

3.2. Assemble tripod

Position the tripod with the azimuth peg aligned with the landmark indicating north/south.

3.3. Level the tripod head

Levelling isn't essential but it makes repeat setups easier as the elevation will be close to correct, on subsequent occasions.

3.4. Assemble mount and scope, camera, guide camera

Assemble the mount on the tripod, mount the telescope, main camera, guide camera and attach cables.

3.5. Balance the mount

If using a mount with counterweights, balance the scope. While a perfect balance might seem desirable, many mounts will guide better if there is a slight imbalance on each axis as this reduces backlash. In RA, east-heavy is best.

3.6. Set the site location date & time

Using the mount handset, enter the site latitude, longitude, altitude, date, time and daylight saving. It is quite common to make an error with these which can result in odd GOTO positioning later – a 15 degree error implies either the hour or daylight saving were incorrect; a 30 degree error implies the month was incorrect, while a persistent 1 degree error suggests the day was incorrect. Similarly, an error in latitude or longitude may result in corresponding errors in RA or declination.

3.7. Using the mount handset, do a 1-star align

Using the mount handset choose a 1-star alignment. Selecting a star at low elevation, the mount will point the scope where it calculates the star should be relative to the base of the mount. Use this to adjust the azimuth of the mount – rotate the base to align the OTA with the star. Don't slew the mount for this alignment.

3.8. Slew the mount to the PARK or HOME position

This should set the mount to declination +/- 90 degrees, with the counterweight down. **Note that when PARKed most mounts turn RA tracking off.**

3.9. Connect ASIAir and accessories

Connect ASIAir to the mount via the USB2 port, cameras and accessories as suggested in the cable diagram, Figure 1. Depending on your choice of accessories, some can be powered from the ASIAir or your battery box. EAF should be connected to ASIAir USB port directly, while CAA or a filter wheel can be daisy-chained via a camera.

4. Cables and power

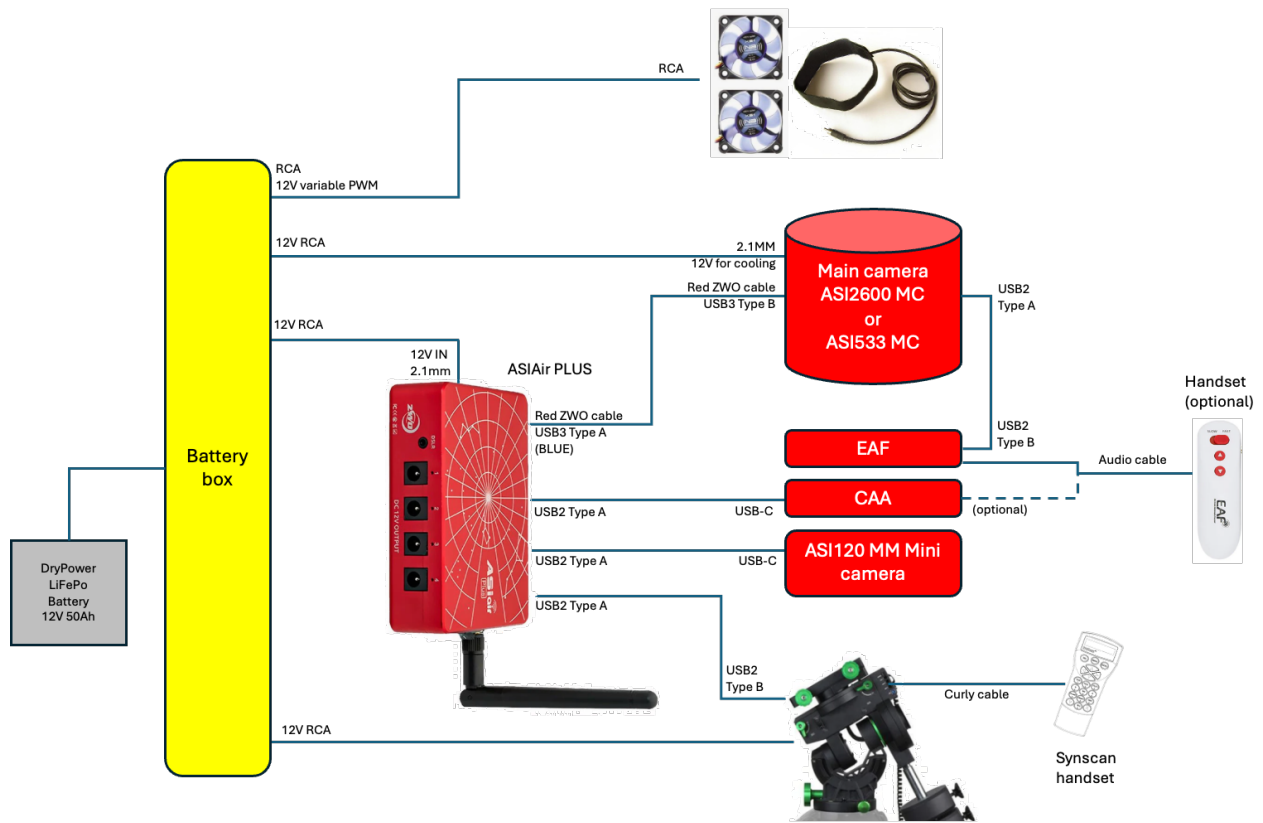


Figure 1. Typical cable diagram for ASIAir

4.1. Input power

By itself with no other loads, the ASIAir draws 0.3A at 12VDC. If you use the 12V outputs the total input power will increase accordingly.

4.2. 12V power for camera coolers, fans or heaters

You can use the 12V outputs from the ASIAir to supply power to cooled cameras, fans or heaters; though take care to ensure the total demand of these does not exceed the capacity of the ASIAir:

- The current drawn from each port must be under 3A, and
- The total current from all four ports must be less than 6A.

If items will exceed these limits can cause ASIAir to crash randomly. If that occurs the loads should be supplied directly from your battery, not ASIAir.

NOTE: ASI2600 or ASI6200 series cameras can draw 5A and should be supplied directly from a 12V supply, not the ASIAir.

4.3. USB Connections

The ASIAir provides 4 USB connections. Two ports (blue) are USB3 for devices using a very high data rate (high-resolution cameras, or fast USB storage). Two ports (black) are USB2 to connect low-data-

rate devices such as the mount, focuser, filter wheel, CAA, or a small-sensor guide camera such as the ASI120, ASI220 or ASI174.

4.4. Guide Cameras – ASI120/220/174

If you connect a guide camera to the main camera you may find the USB connection from the main camera to ASIAir is unreliable. The most reliable arrangement is to connect the guide camera direct to ASIAir, not the main camera.

4.5. WiFi

ASIAir includes a WiFi hub to connect a recent smartphone (iPhone or Android), tablet or laptop with the ASIAir app installed. With ASIAir powered up, in your tablet/phone/laptop settings select WiFi and connect to the address corresponding to your ASIAir unit.

The ASIAir is shipped with a default name and password that is the same for all devices (12345678) and if there are several units in proximity (as at a star party or club night) there is a risk others will accidentally connect to your device. To prevent this:

- a) Change your SSID to one that is identifiably yours, and
- b) Change your WiFi password to a unique key, and/or
- c) Set a 6-digit PIN code (the default is 000000).

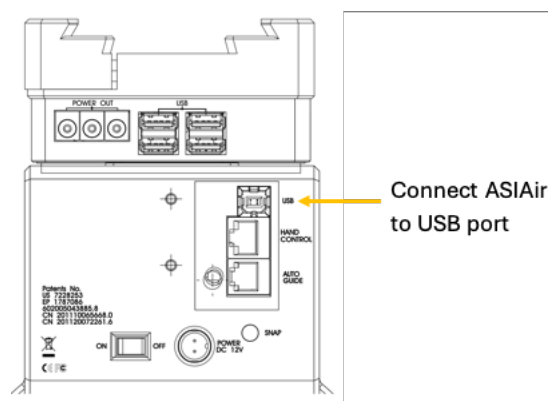
From ASI Air 2.3 onwards, ASIAir includes a lock code to prevent more than 1 device attempting to connect to it simultaneously. The default code is 000000, **however you should change this.**

Some users have reported the WiFi from the ASIAir as weak (limited range) or prone to dropouts. To optimize this make sure you have a direct line of sight between the antenna and your phone/tablet. Large metal objects will block WiFi such as your telescope tube, or your vehicle.

Position the ASIAir to avoid its signal being blocked or connect it via an Ethernet cable to a separate WiFi base station located some distance from the telescope.

Known Issues:

- Unreliable (may drop out),
- Other ASIAir users in proximity,
- Large metallic objects near the ASIAir.
- USB cables near the antenna will reduce its range.



4.6. Connect ASIAir to Mount

With the mount powered, aligned, and PARKed:

Connect ASIAir to power and switch it on – the tiny LEDs next to the antenna should start flashing followed by an audible beep.

Connect to WiFi - on your handheld device (smartphone, table or computer) open the WiFi settings for your device and connect to the WiFi hotspot of your ASIAir.

5. Open the ASIAir App & configure mount, cameras

5.1. Open the ASIAir app and set location

Upon launching the app the first setting is to select or define the location. If the device has GPS it will use that, or with an internet connection the location can be set from a map. Alternatively you can define a custom location and set longitude and latitude manually.

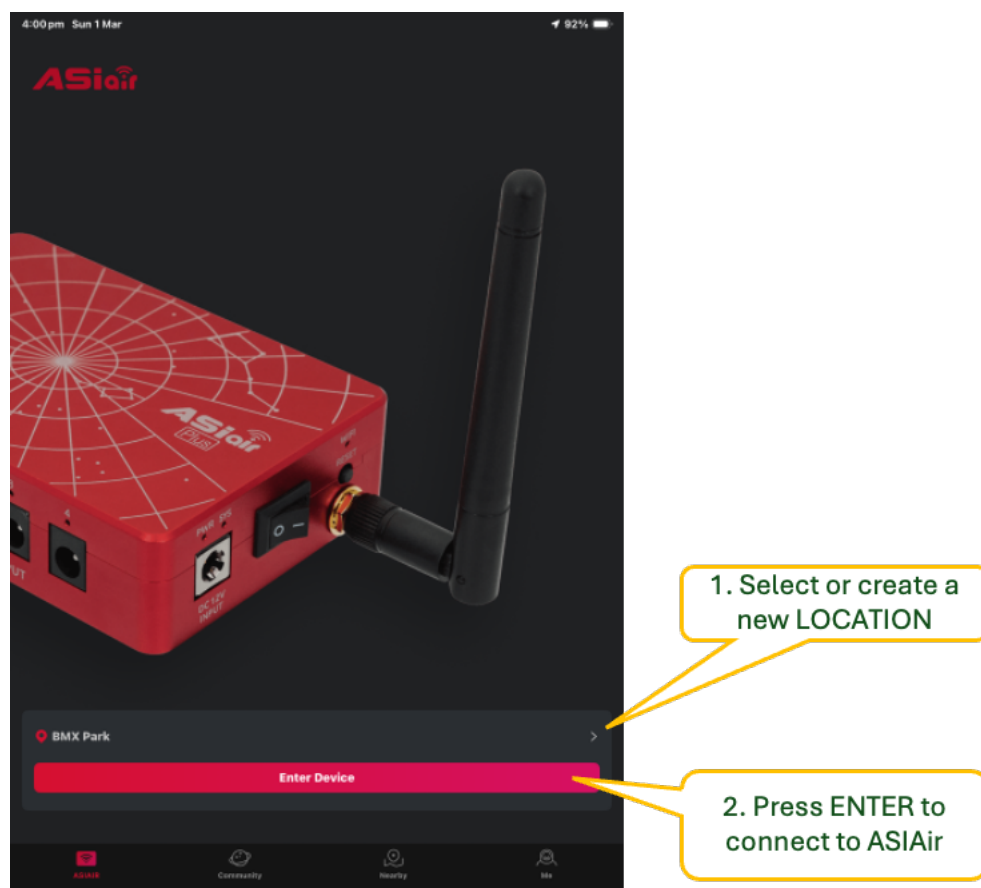


Figure 2. Setting the location

Note that ASIAir 2.5 must have a location set because when connecting to the mount it will attempt to set that location in the mount. If the location in ASIAir is incorrect that may set incorrect values in the mount, affecting polar alignment, and GOTOs may be erratic.

5.2. Connect to ASIAir - Press ENTER DEVICE

Assuming it found an ASIAir in the WiFi network, the app will open to the PREVIEW mode, Figure 3. Now its time to configure it for your setup – telescope, cameras, mount and accessories, per the next sections.

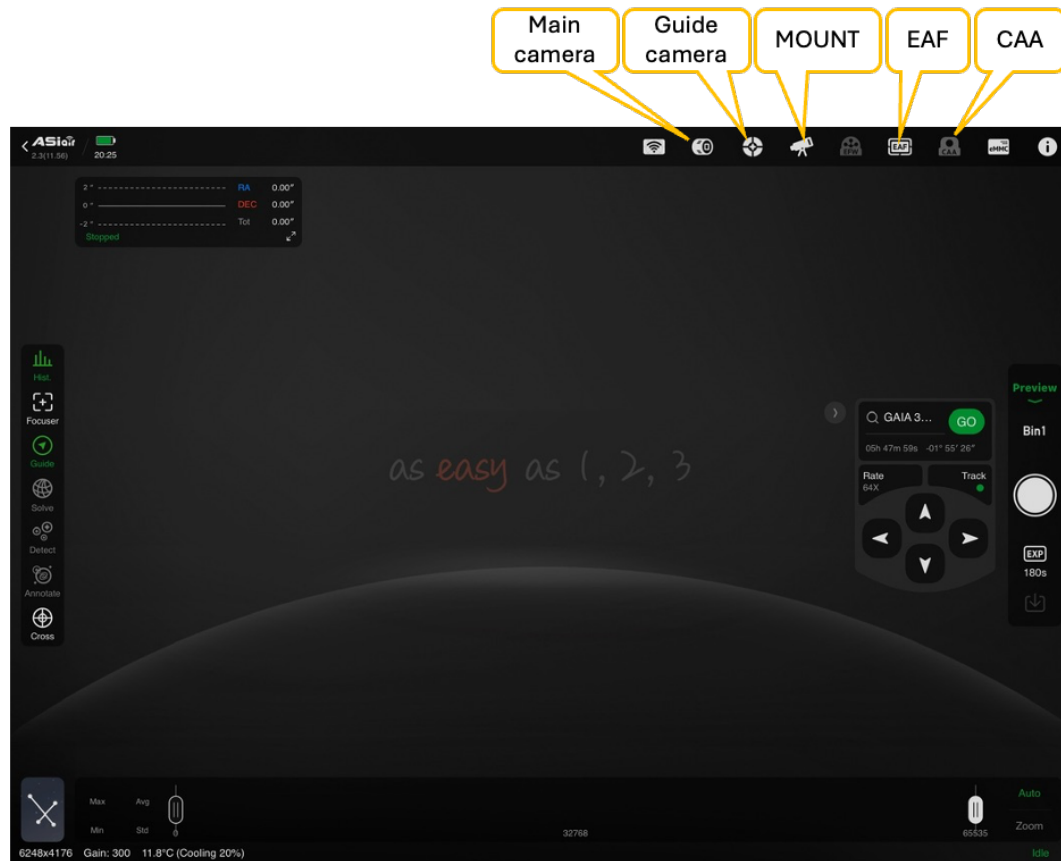


Figure 3. Configure your equipment

5.3. Mount

If it finds a mount connected the parameters in Figure 4 should be displayed. Referring to Figure 4, the **SYNC to MOUNT** button will be green (enabled).

NOTE: In version 2.5 ASIAir attempts to set the position in the mount using the coordinates ASIAir acquires from GPS or internet location. In version 2.3 and earlier, ASIAir will acquire the latitude, longitude, date and time from the mount.

1. If you haven't put the scope in the PARK position, it will appear to work, but the first GOTO's may result in the scope slewing into the ground or the tripod.
2. Check carefully that both ASIAir and the mount have the correct latitude and longitude.
3. Check where ASIAir thinks the scope is pointing. ASIAir assumes the mount has had an initial 1-star alignment and is PARK'd pointing at the celestial pole with counterweight down as the starting point.

For Southern hemisphere users, by default, ASIAir assumes the PARK position for the scope is aimed at the north pole (Dec +90 degrees). For those in the southern hemisphere this is incorrect (it appears to ignore the site latitude acquired from the mount). Press SYNC TO MOUNT to make sure it has got this correct for your hemisphere - ie check that it shows Dec -90 degrees.

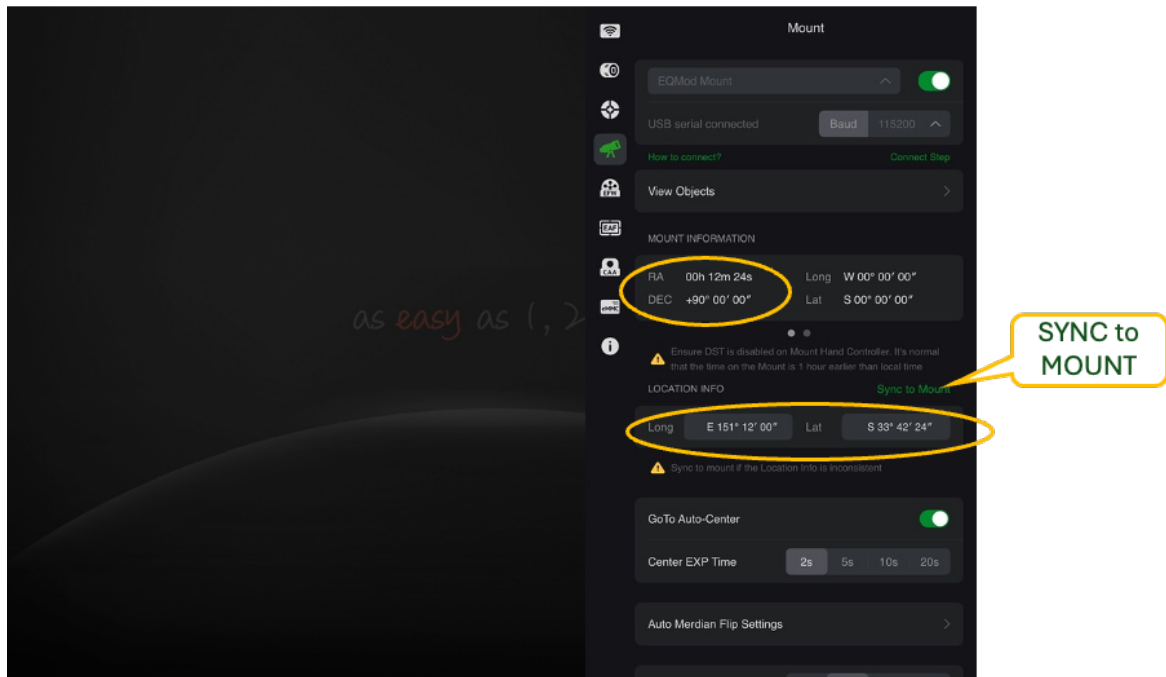


Figure 4. Mount parameters

5.4. GOTO with Platesolving

To enable GOTO with platesolving, turn on “GOTO Auto Centre” (Figure 4).

5.5. Turn Tracking ON.

Referring to Figure 5, if you haven’t already, **make sure tracking is turned ON** (it is off by default when the mount is PARKed) and the desired tracking speed is selected (usually sidereal).

5.6. Meridian flip

ASIAir will perform meridian flips, if enabled (Figure 5, Figure 6). There are settings for when to pause the tracking before reaching the meridian (minutes) and the flip timing after meridian. In addition, there is a setting to decide whether to recalibrate the autoguider after flipping; it’s advisable to set this to ON.

There is also a setting which determines whether to allow a meridian flip during an AUTORUN imaging session. While meridian flips appear to be reliable, I strongly recommend you watch the mount to ensure it does not crash the scope into the tripod or pier.

5.7. Guide speed

The optimum choice of guide speed (Figure 7) depends on both your mount and the image scale of the guide scope - and it’s not particularly critical. The guide rate should be fast enough to respond to tracking errors quickly, but not so fast that the mount overcompensates and overshoots or worse, starts to oscillate and does not settle. A good value to start with is 1.0X. which should be fine for most with guider focal lengths up to 1000mm. It may be desirable to reduce this when using extremely long guider focal lengths – for example at 3000mm I use 0.5X. The guide rate also affects how quickly the guider will calibrate (section 11.17).

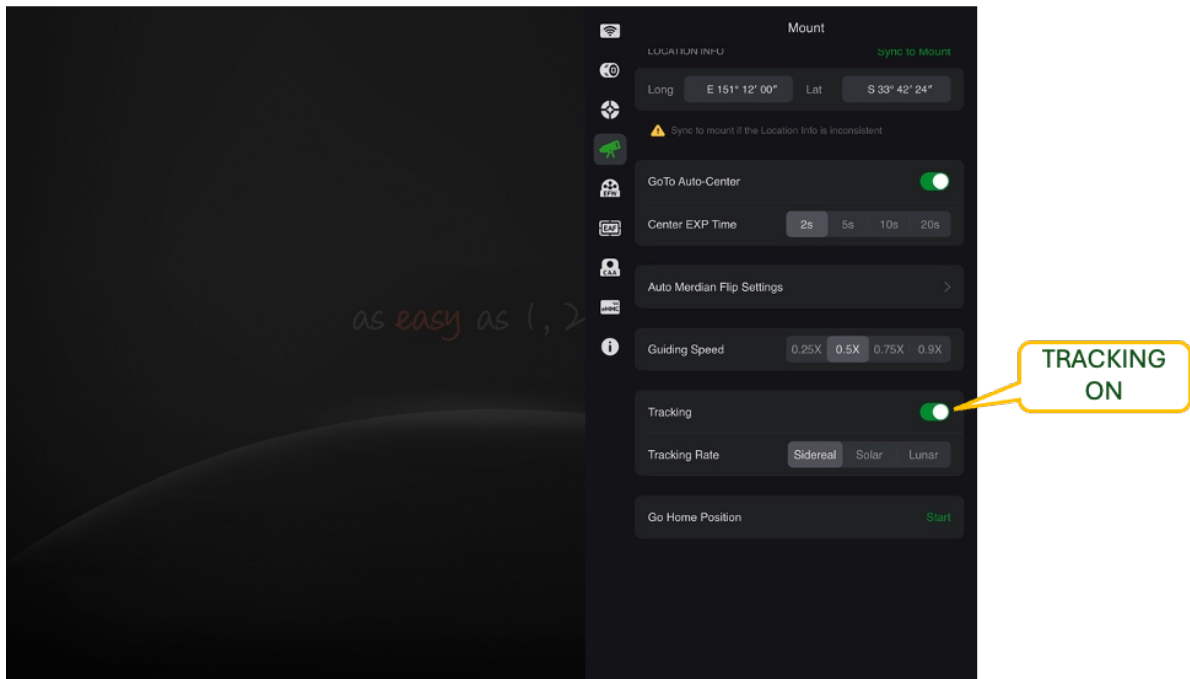


Figure 5. Mount parameters (continued)

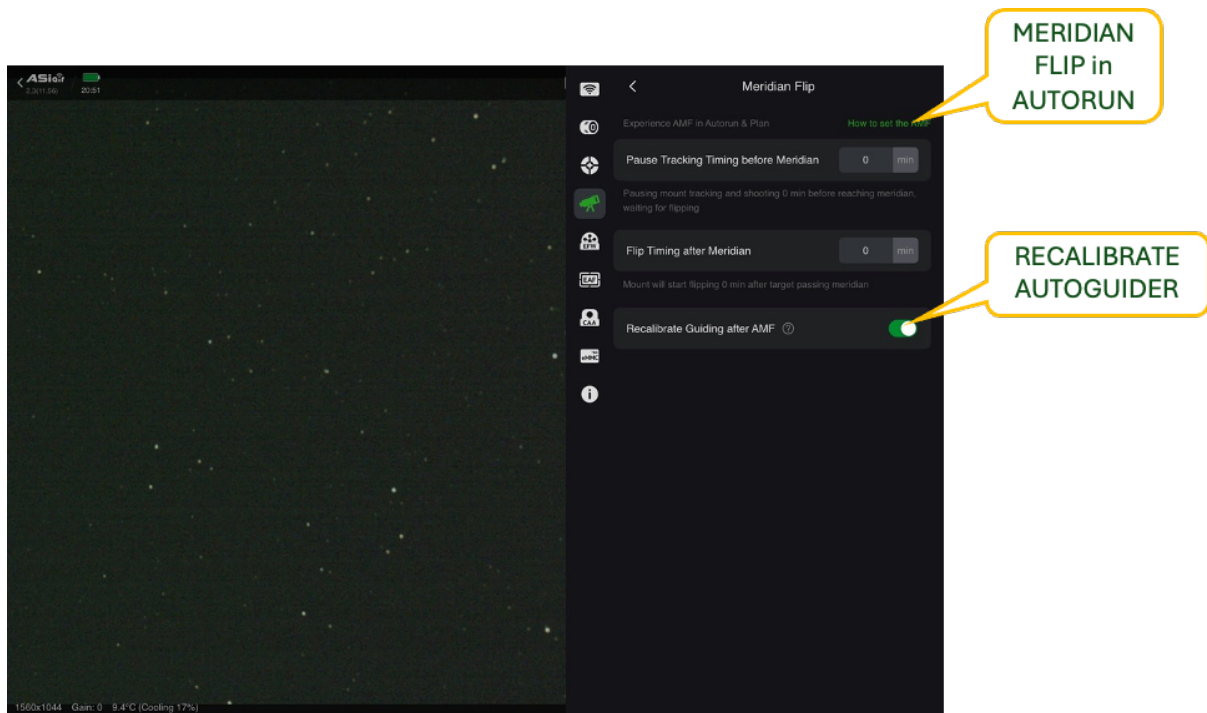


Figure 6. Meridian flip settings

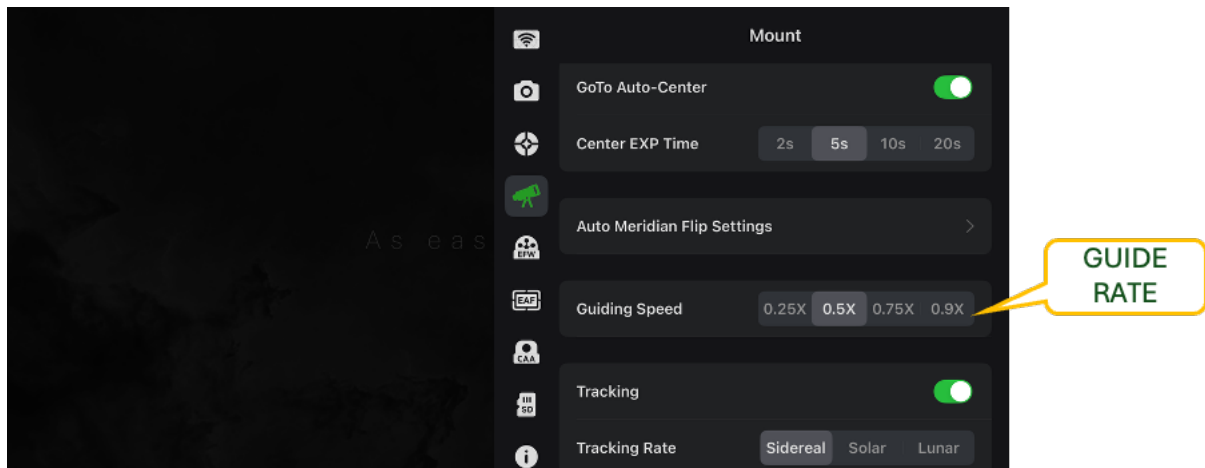


Figure 7. Autoguider guide rate

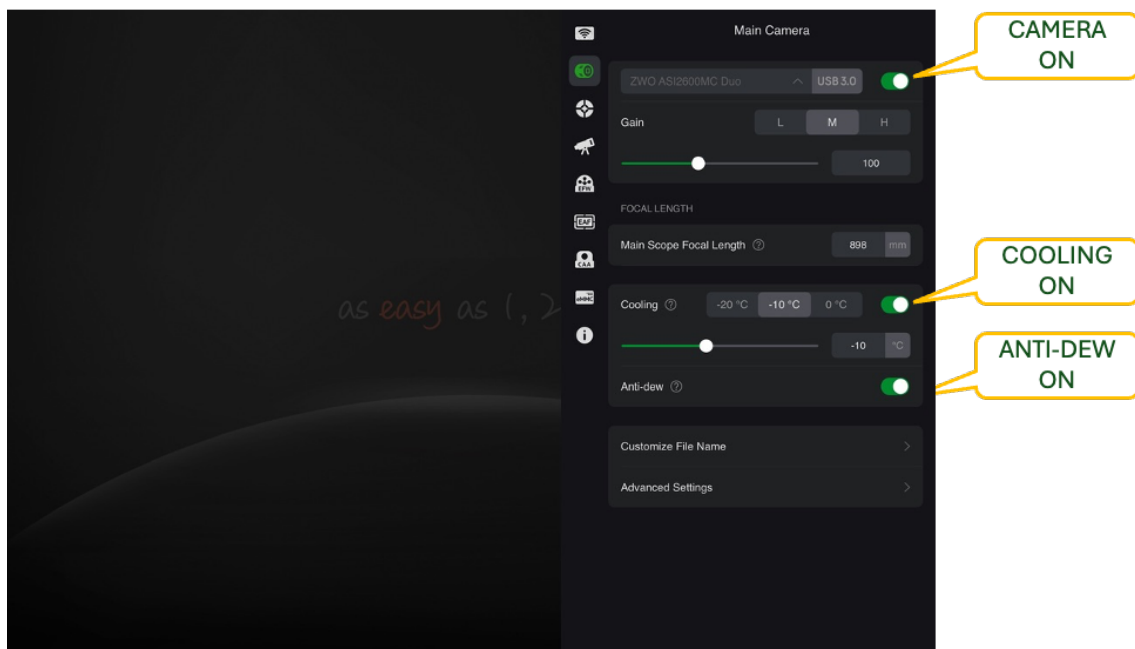


Figure 8. Main camera parameters

5.8. Cameras – Main and Guide

Referring to figure 1, select the Main camera and configure settings (Figure 8), and repeat for the guide camera (Figure 9). Check each has the desired camera selected (ON), and a focal length has been set – an approximate value is fine as it will determine this later from platesolving. For the main camera:

- turn it ON,
- if it has cooling turn this ON, and
- if it has an anti-dew heater, make sure that is also ON (the default is OFF - these settings are not stored).
- Do likewise for the guide camera (figure 7).

e) On each camera start with a gain set to Medium (M) in the middle of the slider.

For the ASI2600 Air and 585MC Air there is also a setting for single-frame or continuous shooting in PREVIEW mode, under the **Main Camera** settings.

5.9. Guide camera

A couple of parameters to note for the guide camera:

- Make sure the guide camera is switched ON
- Auto-restore calibration means it will recover the previous calibration each time ASIAir starts. This is useful for a permanent setup, but for a portable rig it should be switched off.

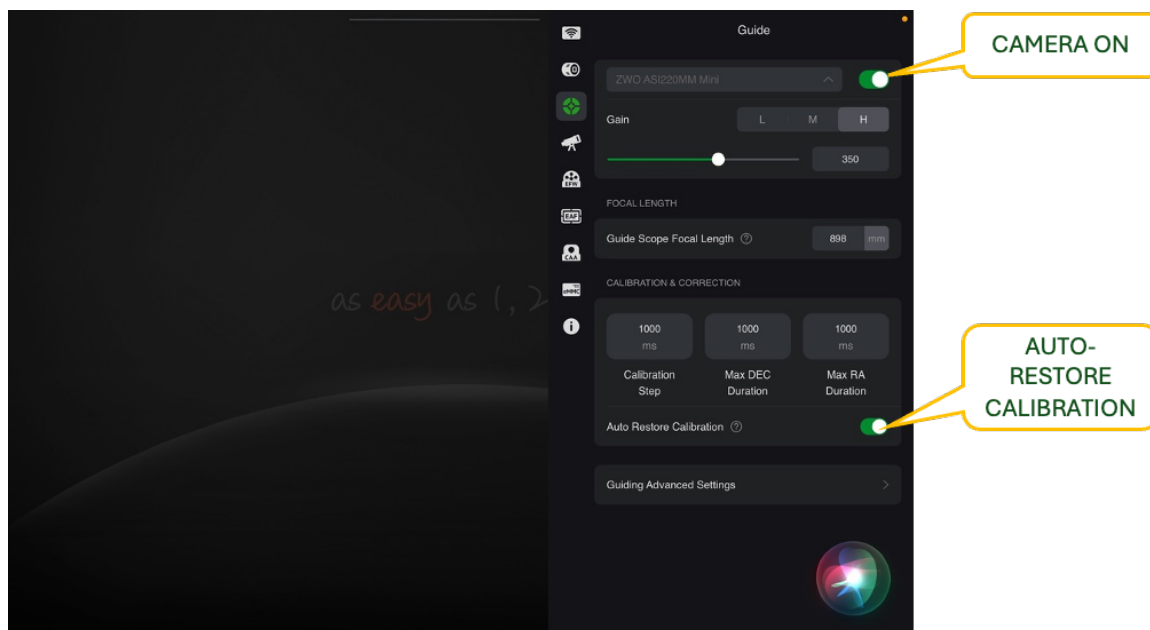


Figure 9. Guide camera parameters

5.10. Calibration Step

To start with, leave this at its default value of 1000 milliseconds. This parameter is discussed in more detail at 11.17 and 11.3.

5.11. Max Dec, Max RA duration

These settings determine the maximum duration of a guide pulse, in milliseconds. Leave these settings at the default, 1000 milliseconds to start with.

5.12. Guider gain vs exposure (cycle time)

If you have a mount with large PE, you might need to reduce the guide exposure time. In the past, this had been a terrible compromise to make, because the centroid measurement error would become larger as you reduce the exposure time. However, multi-star guiding offers a significant improvement (using two stars is equivalent to double the exposure time, using 4 stars of equal SNR is equivalent to 4 times longer exposure time, etc). The limiting factor becomes the sensitivity of the guide camera and the aperture of your guide scope.

The guide sensor can also be binned – BIN1 or BIN2 (Figure 10) which is relevant when using long guide scope focal lengths over 1000mm (e.g. an SCT with an OAG) which may reduce unnecessary moves arising from poor seeing.

Where the guide camera image scale is small (ego 1 arcsec/pixel or less) this sensitivity setting has no effect - the guider will issue pulses responding to movements of the star due to seeing

5.13. Guiding Advanced Settings

There are additional settings for the guider – dithering, Bin1 or Bin2 (Figure 10) and setting the time to wait for guiding to settle before imaging commences (Figure 11)

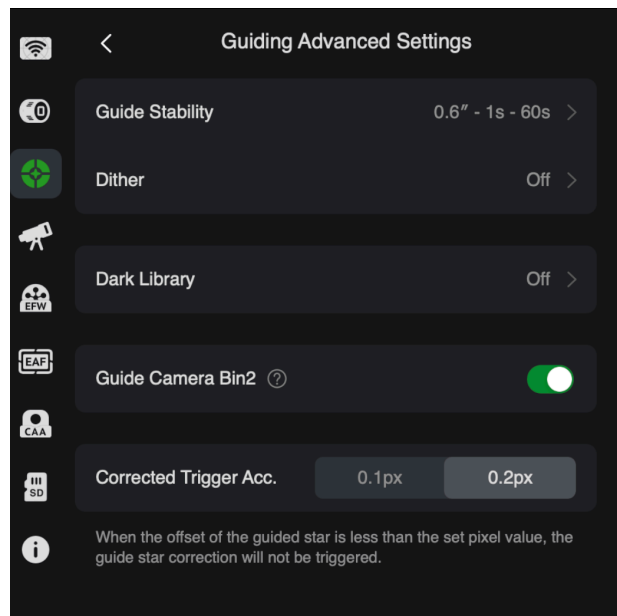


Figure 10. Autoguider advanced settings

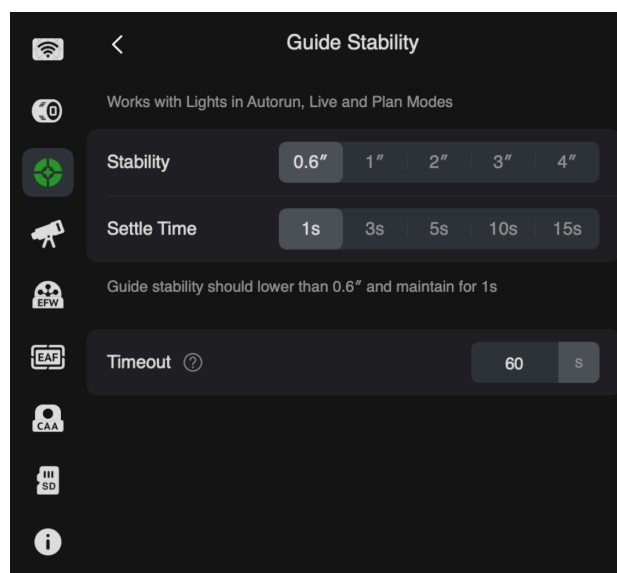


Figure 11. Autoguider stability

5.14. EAF

If you are using an EAF, once it is connected to the ASIAir, select the EAF pane (figure 11), select the EAF and **turn it ON**. The default settings as shown in Figure 12 work for me, however, think carefully

about what each does before altering them as there is no facility to reset to the defaults. The range of steps is 0...60,000.

The fine and coarse step settings scale according to focal ratio and are not critical – i.e. +/-50% does not matter. The values shown are for a scope that was f/5; for f/10 try 20 and 100 respectively, or for f/15 try 30 and 150.

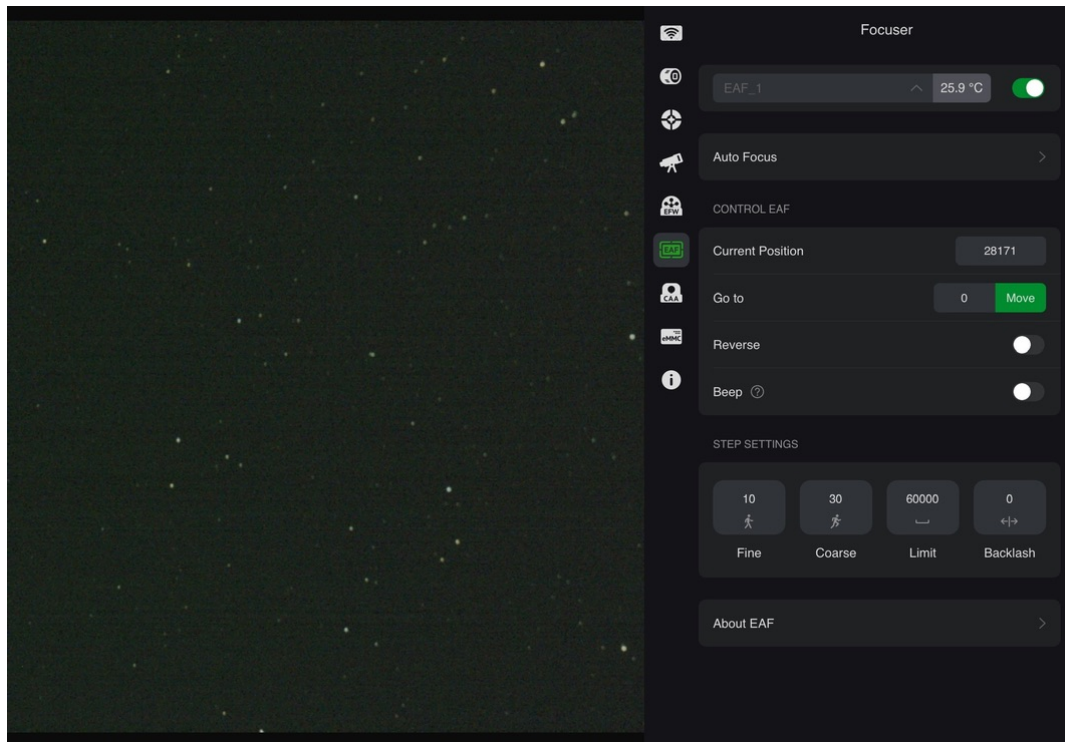


Figure 12. EAF settings

5.15. Rotating the camera manually

Some scopes have a manual rotator in the imaging train to allow the camera to be rotated to frame the target as desired. If rotating the camera also rotates the guider camera (off-axis guider or ZWO DUO cameras) you must recalibrate the autoguider.

5.16. CAA Auto Rotator

If you have a ZWO Camera Angle Adjuster (CAA) in the image train this allows the camera to be rotated to frame the target, and the ASIAir will adjust the guider orientation accordingly so recalibration is not needed. It also automatically performs a 180-degree rotation after a meridian flip.

WARNING: Make sure the cables can accommodate the 180-degree rotation WITHOUT SNAGGING. If you do not want the CAA to rotate automatically after a meridian flip, turn the CAA off (disable) it. You can leave the USB connected and still operate it manually with the handset.

Referring to Figure 13, use the rotary slider to set the desired rotation, then press ROTATE.

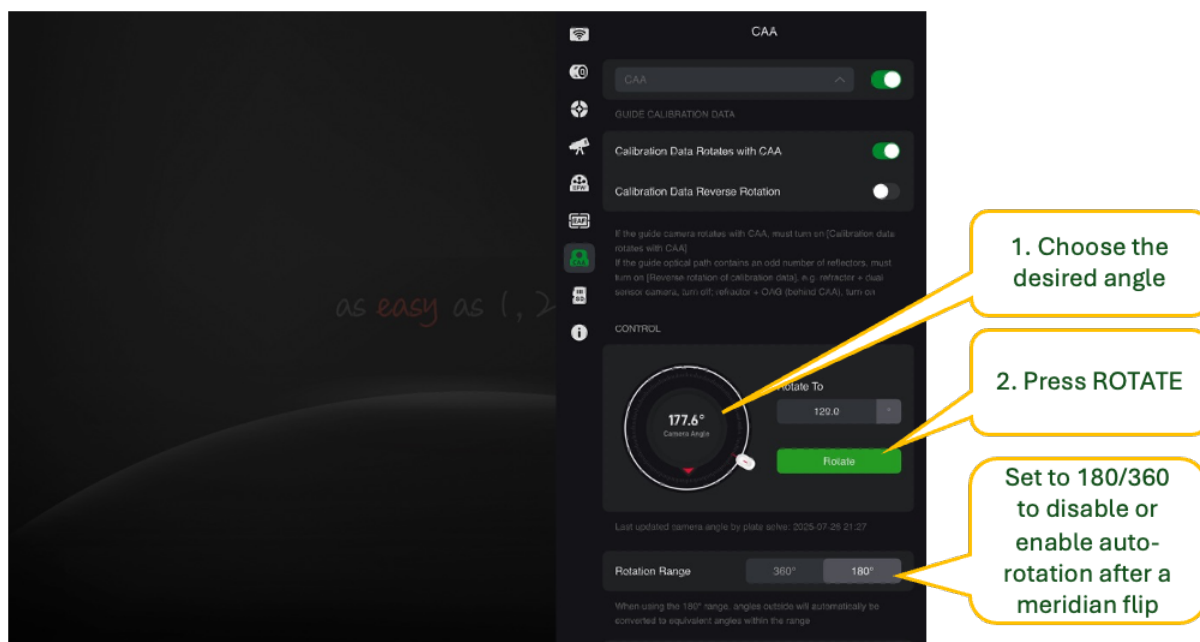


Figure 13. CAA settings

When assembling the camera and CAA onto your telescope using screw adapters, quite likely your camera will be at some odd angle.

- a) Using the ASIAir, set the CAA to 0 degrees and rotate to that.
- b) Connect the optional handset (from the EAF) and use this to rotate the camera to the desired orientation for 0 degrees.

To get a 90-degree rotation to the left and to the right of a nominal zero position:

- a) Drive the CAA all the way to the hardware zero, it will beep twice.
- b) Set the ASI AIR to 180 degrees for the CAA.
- c) Move the CAA to the 90-degree position using the ASI AIR.
- d) Use the manual CAA on the telescope to set the camera at 90 degrees with respect to the telescope.

Once this is done you will have a -90 degree (hardware zero to the CAA) rotation to the right and a + 89.9 degrees (hardware 179.9 to the CAA) to the left.

ASIAir determines the initial orientation of the CAA relative to the sky from a platesolve. Before you start using the CAA from the ASIAir app, complete the following to ensure ASIAir has established the current angle:

- In PREVIEW mode, take an image and plate-solve, or
- In PREVIEW mode, open the planetarium and execute a GOTO with plate-solve.

6. ASIAir Operating Modes



Figure 14. PREVIEW mode

ASIAir has 7 operating modes: PA (Polar Alignment), FOCUS, PREVIEW, LIVE, AUTORUN, PLAN, or VIDEO.

Referring to Figure 14, at the right-hand side of the main display the **current mode** is shown in green. If it's not showing **PREVIEW**, select **PREVIEW**. The other modes are:

- PA – polar alignment,
- PREVIEW – display the main camera view, quick focus, choose targets, and GOTO.
- FOCUS – for precise focusing with an electronic focuser (EAF).
- LIVE – live stacking on a target, where successive frames from the main camera are stacked and the result displayed.
- AUTORUN – to run an automated sequence of images (e.g. for deep-sky imaging) with preset gain and exposure duration for the main camera.
- PLAN – multiple targets each with an AUTORUN configured.
- VIDEO – to display video from the camera (e.g. a small-sensor planetary camera)

Before attempting polar alignment, in PREVIEW check the main camera is working and focused. Stars should be reasonably sharp, not circular blurs.

6.1. Display the main camera image

Confirm the main camera is working and showing stars, and whether its focussed well enough for polar alignment – or not. If all you see is grey, it's not focused.

- a) Set the camera to medium gain, and
- b) In the PREVIEW mode choose BIN4 and an exposure of 2s, and
- c) Click the white button to start the main camera.

In PREVIEW mode The camera should run and exposures displayed on your device, until you press the STOP button. For slower focal ratios (more than f/10) the exposure duration may need to be increased, for slower scopes (f/3 or less) it can be decreased.

6.2. Focusing

There are three ways to focus:

- Manually, by taking an image, zooming and looking at the stars, and adjusting the focus from one frame to the next. Hint: In PREVIEW mode, use the DETECT button at the left to show the HFD of stars in the image. At best focus the average HFD will be minimized, or
- Using a Bhatinov mask to display a diffraction pattern, and manually adjust focus; accordingly, or
- Automatically, with a ZWO EAF.

For the most this manual an EAF is assumed as this is by far the most accurate way to focus.

6.3. Configuring EAF focus range

The EAF uses a stepping motor with a range of 0...60,000 steps. If you try to exceed these values, or the focuser reaches a hard stop, the EAF will stop and beep.

After assembling EAF on your focuser, at the point where you have the coupling attached but the grub screws are not tight, connect the EAF to ASIAir and power it up to check which way it will rotate from 0 to 60,000. Set the EAF to 0, manually wind the focuser to where 0 should be then tighten the grub screws.

There is a recent update for EAF (December 2025) which increases this to 300,000.

6.4. Finding focus – for the first time

The first time you attempt to couple the camera to the scope it is likely you're really way, way off focus. And may even need extension tubes.

Put an eyepiece in the scope and aim it at something really obvious like the moon or a very bright target such as Jupiter or Sirius. Focus with the eyepiece. With most modern eyepieces the focal plane is about 5-7mm outside the end of the draw tube holding the eyepiece. That's where your camera sensor needs to be. NB with many scopes originally designed for visual you will need 50...55mm of extension tubes focus the camera. Alternatively, add a filter drawer and manual rotator.

Method 1: Use a ruler or tape to measure this with respect to the end of the OTA, or the base of the focuser. Consult your camera specifications (from the ZWO website) for the distance between the faceplate and sensor, and subtract this to find the distance required from the end of the OTA to the faceplate of the camera. Attach the camera to the scope at this distance, making sure you still have a few mm of travel in/out.

Method 2: If you have to do this in the dark at a remote location, proceed as follows. With the camera not mounted on the scope, connect it to ASIAir and set it to PREVIEW mode at BIN4, 1 second, so it updates fast. With the scope still at the moon/bright target, remove the eyepiece and

hold the camera in your hand at the back of the focuser. Moving the camera in and out you should be able to roughly find where the camera needs to be to get an image. If possible attach to the focuser, but if there isn't enough travel, go find some extension tubes.

Once you know it's close:

- a) Aim the scope at a field with something bright - Jupiter, Sirius. In the main camera settings increase the gain to medium, say 100-150 (not critical).
- b) Select PREVIEW mode and set this for BIN4 and a fast cycle time like 1 second. BIN4 means the frames will be small (in megabytes) hence it should update fast.
- c) Adjust focus a little then stop and let AA update TWICE (2 frames) because there is a bit of a lag.
- d) When you start to see de-focused stars, you're getting close, so use smaller focus changes.
- e) If you don't have one, buy or make a Bhatinov mask (not the tri-Bhatinov) this is essential for precise manual focus.
- f) For perfect focus switch to BIN1 and zoom in on the display.

6.5. Quick focus - Manually

If the telescope has a manual focuser (i.e. no EAF) adjust focus while watching the image on the PREVIEW display, remembering to wait as each image is loaded and displayed.

The image can be zoomed in/out using the pinch gesture (tablets or phones) or mouse (macOS), and panned to obtain a close look at part of the image.

If you are focusing manually a [Bhatinov mask](#) is strongly recommended.

6.6. Precise Focus – Manual

While you can visually adjust the focus purely by eye, a Bhatinov mask will assist with achieving focus quickly and more accurately. Alternatively you could select FOCUS mode and by observing the width (HFD) of a star, find the best focus by minimising the HFD.

6.7. Quick focus – Electronic Focuser (EAF)

If the telescope has an EAF fitted select FOCUS mode. At the lefthandside up/down buttons will be displayed which can be used to adjust focus in/out, or if you have the handset, use that to adjust focus while watching the image. The focus doesn't have to be perfect at this point, just good enough to show stars for polar alignment.

6.8. Autofocus – Electronic Focuser (EAF)

If you have an EAF installed on your scope, electronic auto-focusing is also supported by ASIAir. To start off **you must have the camera reasonably close to focus** (i.e. seeing stars) otherwise it will fail to find a suitable star.

When selected, it will rack the camera out of focus, take a frame and repeat, using the HFD of a suitable star to find the position of minimum HFD. It even plots a graph showing the progress and should indicate when it has found the best focus. During this process it plots a parabolic curve (Figure 15) – the bottom of the curve identifies the best focus, and when the process finishes a **red dot is displayed** at the best focus. If the dots do not follow a distinct parabolic curve this suggests your EAF is unable to focus – a common cause is that the screws in the coupling on the shaft are slipping, the focuser has reached the end of its travel, or - for Crayford focusers with a roller – the roller is slipping.

If you are using a Crayford focuser driven by a roller you may also find the position of best focus is not repeatable. This is because the roller types often exhibit a slight creep. A rack & pinion focuser should show a repeatable focus position.

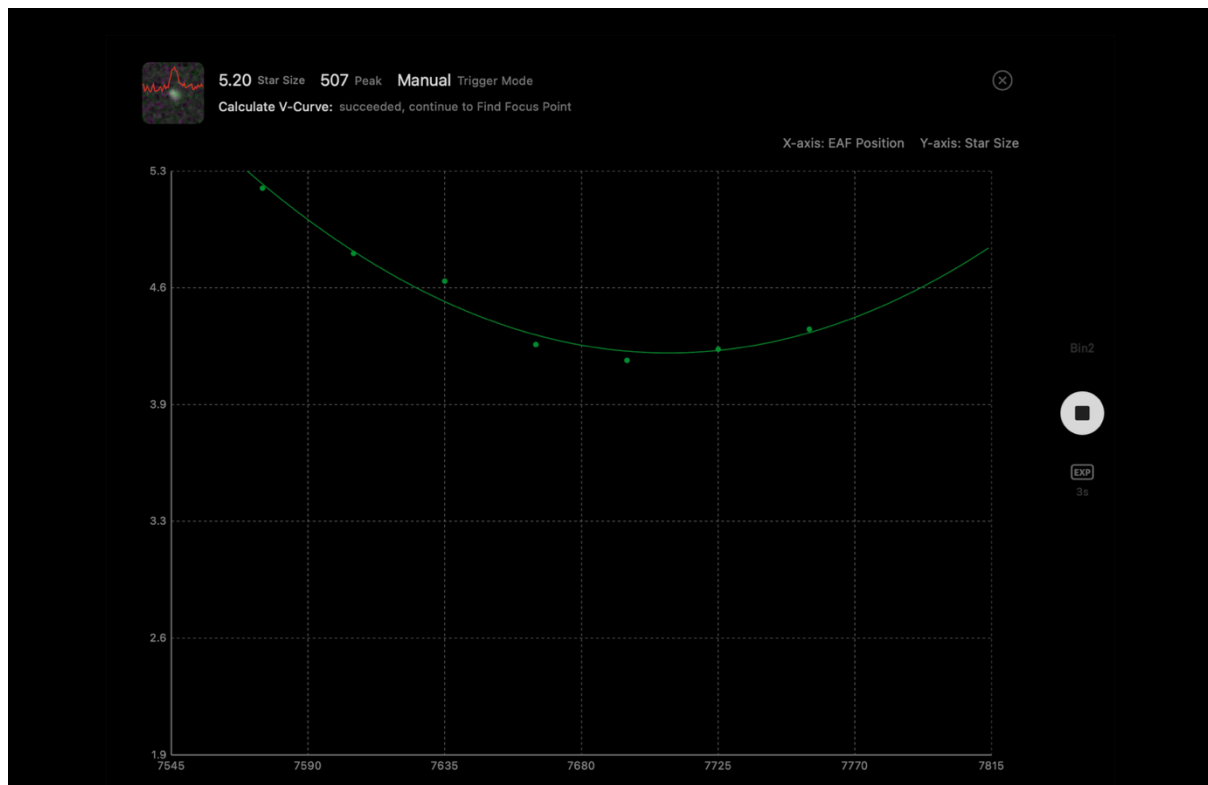


Figure 15. Auto-focusing with EAF

Referring to Figure 15, the selected star is shown in the little box at top-left; and it's measuring the HFD of the star it selected – the units are pixels. The bottom of the curve should be close to the HFD calculated for your scope (see **Error! Reference source not found.**). If not, there are several possible causes:

The causes of fat stars during the autofocus routine are:

- Poor seeing, it happens;
- Thermal effects (seeing) from a heat strap on the OTA or heater ring in front of the corrector (remove it, there are other solutions to prevent dew which do not involve heat);
- Wind - shaking the mount and scope;
- ASIAir picked a close binary star. Move it to a different field and try again;
- Overexposing the frames; or
- Collimation isn't perfect.

6.9. Compensate for focus shift

The EAF determines the best focus by measuring the width (HFD) of a star as seen by the camera. This can be incredibly small, for example using an f/5 telescope and a camera with 4-micron pixels, a difference of 1 pixel equates to just ± 20 microns at the focal plane. Most telescopes will exhibit slight focus shifts due to thermal contraction of the optical tube as it cools during the night, or slight

shifts of the optics after slewing, notably cassegrains, SCTs, RC, maksutovs and Mewlons. The ZWO EAF and ASIAir provide four ways to address these:

- While the EAF does have an internal temperature sensor this is not representative of the telescope, and a better solution is to connect the optional external sensor, and place that at the midpoint of the optical tube. Configure the ASIAir to refocus if the temperature changes.
- Configure ASIAir to refocus periodically; I use 30-minute intervals.
- Configure ASIAir to refocus at the start of each AUTORUN session.
- Configure ASIAir to refocus after a meridian flip (cassegrains with moving-mirror focusing, e.g. SCTs).

7. Polar Alignment settings

Assuming your camera now shows some stars in PREVIEW mode, it is ready to polar align, accurately. Choose the little round "i" icon at top right, and make sure:

- All-sky polar alignment - should be OFF.
- New plate solving routine – ON or OFF.

Personal experience with these has been that the all-sky PA routine is less accurate than the original method, and the “New plate solving routine” should normally be OFF, it is for a specific scenario where very few stars are found.

8. Polar Alignment

8.1. Original or All-Sky Polar Alignment routine

ASIAir supports two PA methods - the original method in which the scope is aimed at and rotates around the celestial pole, and a “**All-Sky Polar Alignment**” selectable in the ASIAir settings (Figure 47). Of the two, the original method is the most accurate.

The **All-Sky Polar Alignment** is useful at locations where the pole cannot be seen directly by the scope. If this method is selected, the first target should be west of the meridian because ASIAir will rotate the mount 30 degrees east.

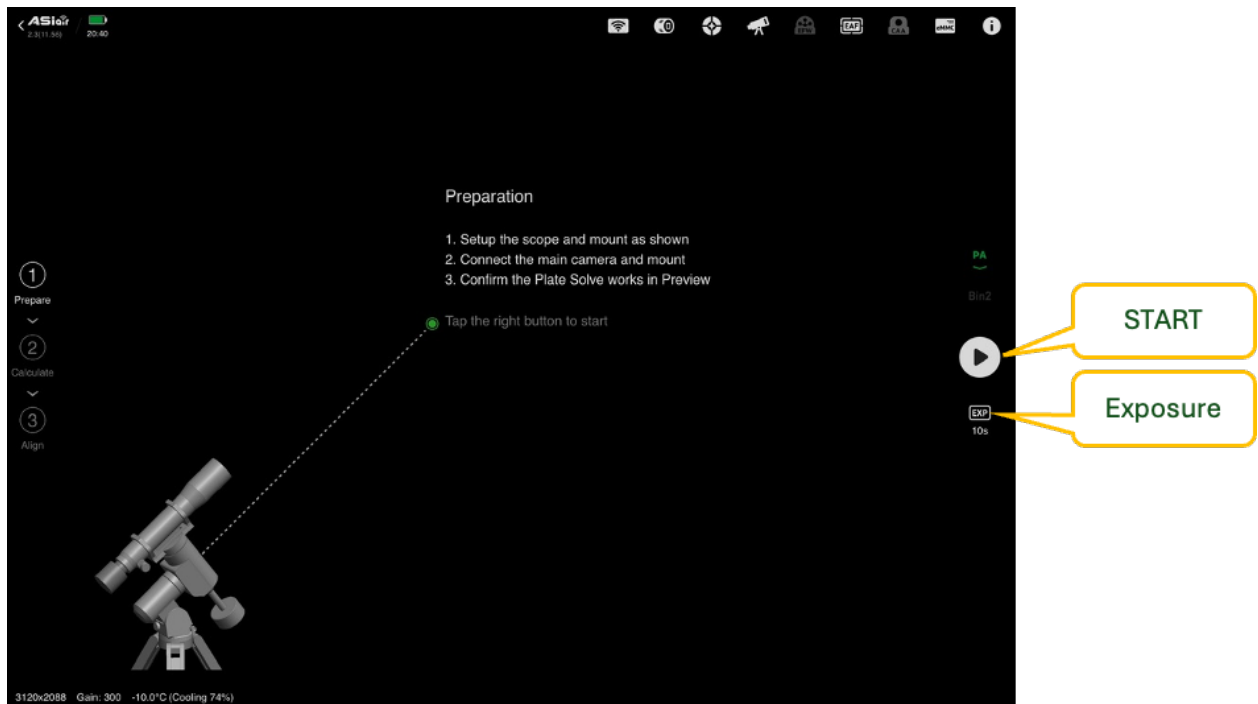


Figure 16. Starting polar alignment

8.2. PA Procedure

Selecting PA mode on the right-hand side opens the page shown in Figure 16. At f/5 to f/12 an exposure duration of 10 seconds at medium gain is adequate to show many stars. Press the START button to commence PA.

ASIAir will:

- Take a frame and platesolve.
- Rotate the polar axis 60 degrees, take a second frame and platesolve (**original routine**) or rotate 15 degrees east, take another frame and platesolve, and repeat (**All-Sky Polar Alignment**).
- Using the frames taken, determine where the polar axis is pointing relative to the celestial pole.
- Determine the offset from the celestial pole.

After the first platesolve it will display the information in Figure 17:

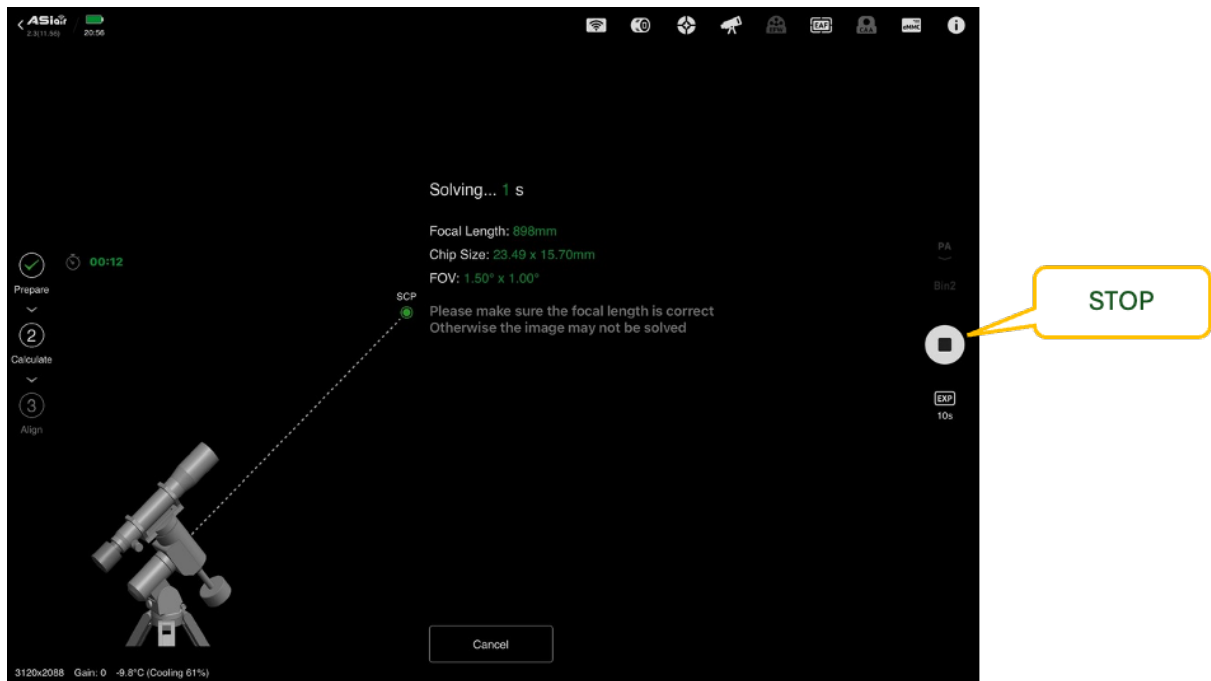


Figure 17. Adjust mount azimuth and elevation

Assuming the platesolve is successful it produces the display in Figure 18 showing where your polar axis is pointing relative to the celestial pole. Adjust the elevation and azimuth of your polar axis as indicated to bring the orange circle (the RA axis) as close as possible to the green dot (the pole). The PA error is displayed at the right, watch if these go up or down as you make adjustments, and press REFRESH to have the camera take another shot and platesolve.

Reasons why platesolving may fail:

- Insufficient stars in the field (ideally 50-200).
- Stars poorly focused.
- Image is overexposed or very noisy (hot pixels counted as stars) – reduce the gain.
- Field of view is more than 5 degrees away from the celestial pole – you will need to correct this
- Field of view less than 0.5 degree – use a shorter focal length for PA.

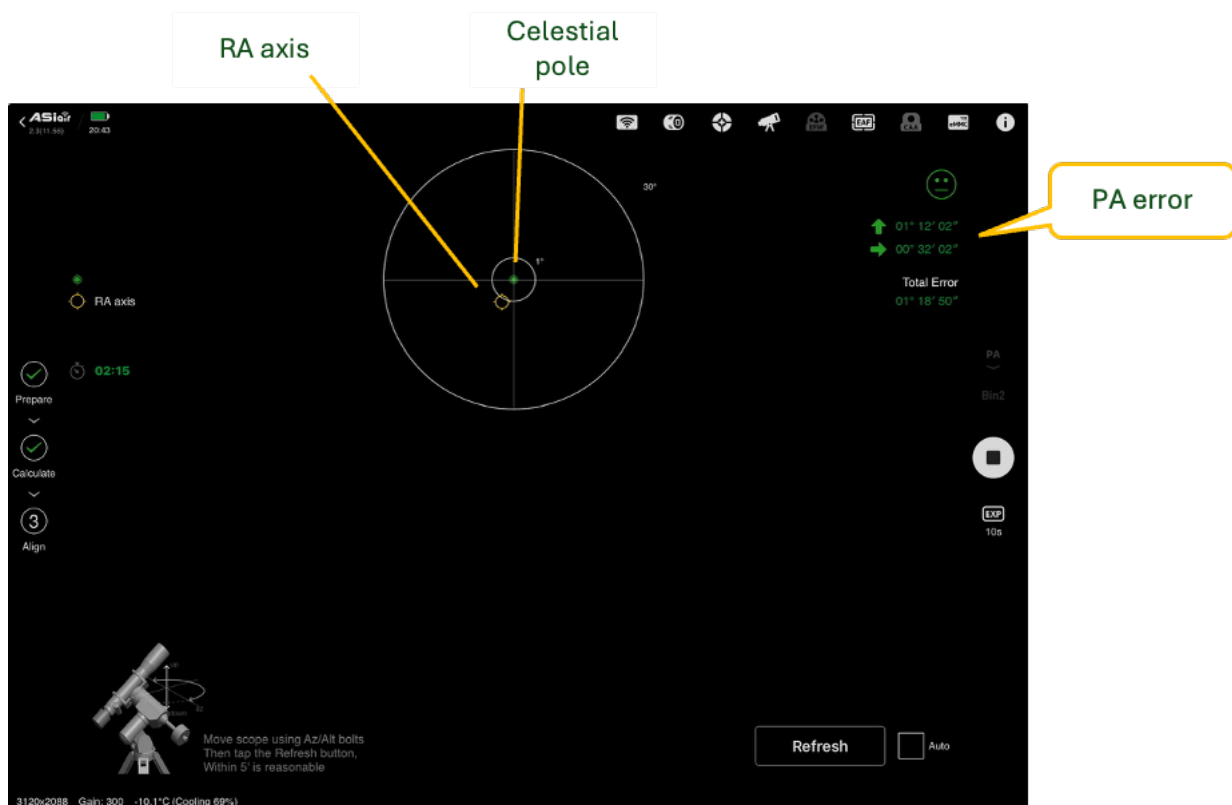


Figure 18. Adjust mount azimuth and elevation

If it completes successfully and your mount is within a few minutes/seconds of arc you are done, press the STOP button.

If you need to adjust the camera exposure, gain or refocus it is necessary to:

1. STOP the PA routine and make the desired changes.
2. Reset the mount to the PARK position,
3. Restart the PA routine from the beginning.

9. PREVIEW Mode – Choosing a target and GOTO

9.1. Choose a target using the star atlas/catalogs

Referring to Figure 20, select PREVIEW mode and if the main camera is exposing, stop the exposure.

- a) Select the icon at bottom left resembling the Southern Cross (4 stars) (Figure 19). This opens the star atlas and catalog to look up an object,
- b) In the catalog locate the desired object and press the GOTO icon (3) on the map and slew to it.
- c) Press GOTO to initiate a slew and platesolve.
- d) Once on target press SYNC to make sure the mount and ASIAir synchronize their coordinates; this is analogous to a 1-star calibration, and it improves the accuracy of subsequent GOTOs.

Selecting the cross icon at lower left (Figure 19) and the sky atlas is displayed. Selecting an object and pressing the GOTO icon, the mount will slew to it, takes a frame and platesolves to verify it is on

target. The position of the target is a blue rectangle, and the view of the main camera shown as a RED rectangle (Figure 21).

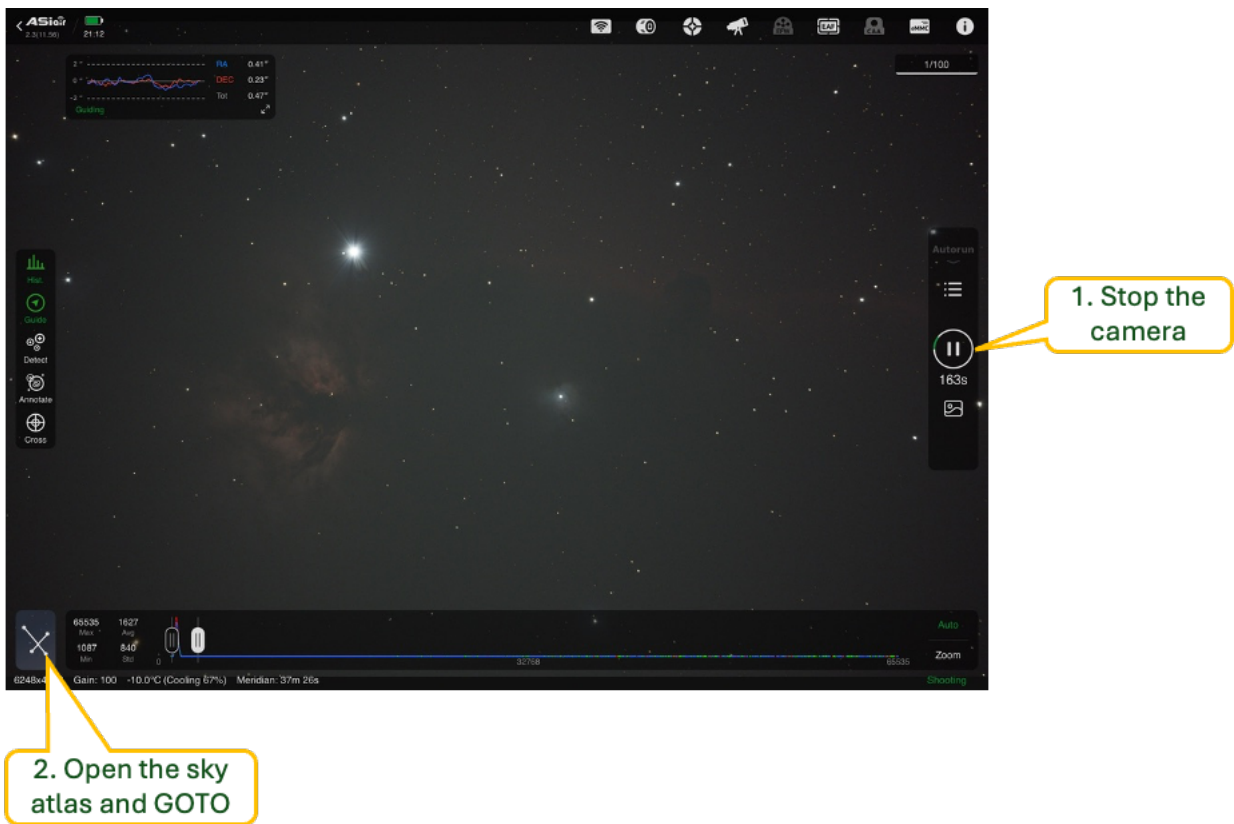


Figure 19. Open the sky atlas...

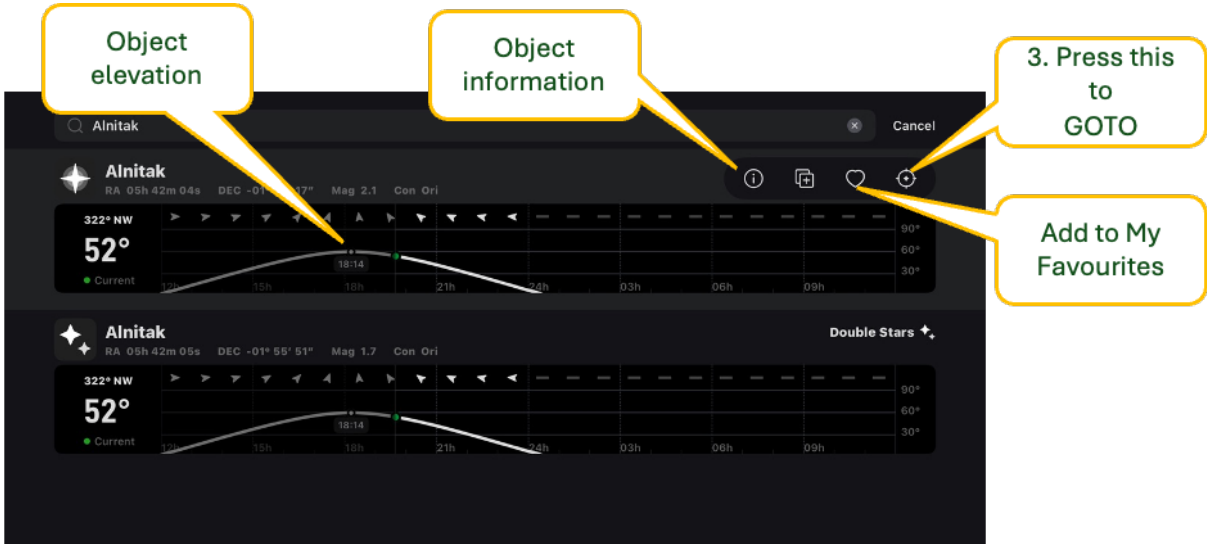


Figure 20. Choose a target and GOTO...



Figure 21. GOTO...

This sequence may be repeated a couple of times to refine the position, and ensure the mount approaches with the final movement from the east to avoid backlash in RA. If successful, it displays something like figure 18. Usually the final move is from the east to ensure there is no backlash in RA. While slewing ASIAir will show the target location, and the slew can be stopped by pressing CANCEL.

9.2. Manual GOTO a position using RA and Declination

If a target is not in the ASIAir catalog, you can enter its RA and declination and GO to those coordinates. In **Preview** mode, note the RA and declination are displayed. Clicking these will open scrolling menus to set the value. Scroll the menus to set the desired values... and press the green GO button to start the slew, Figure 22.

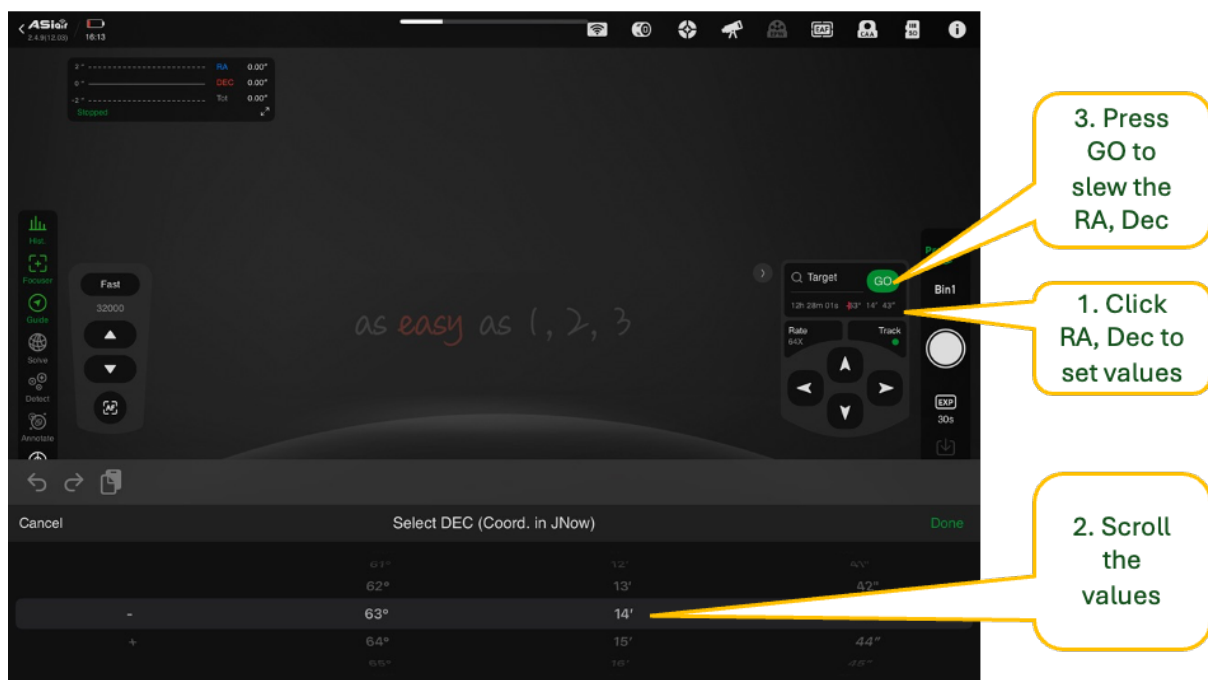


Figure 22. GOTO a selected RA and declination

For its internal catalogs, ASIAir converts internally between J2000 and JNOW, however when entering a coordinate manually it may be necessary to calculate the JNOW position. When manually entering a position ASIAir supports both JNow and J2000 and converts between the two automatically. Tap JNOW or J2000 to switch between these, Figure 23.

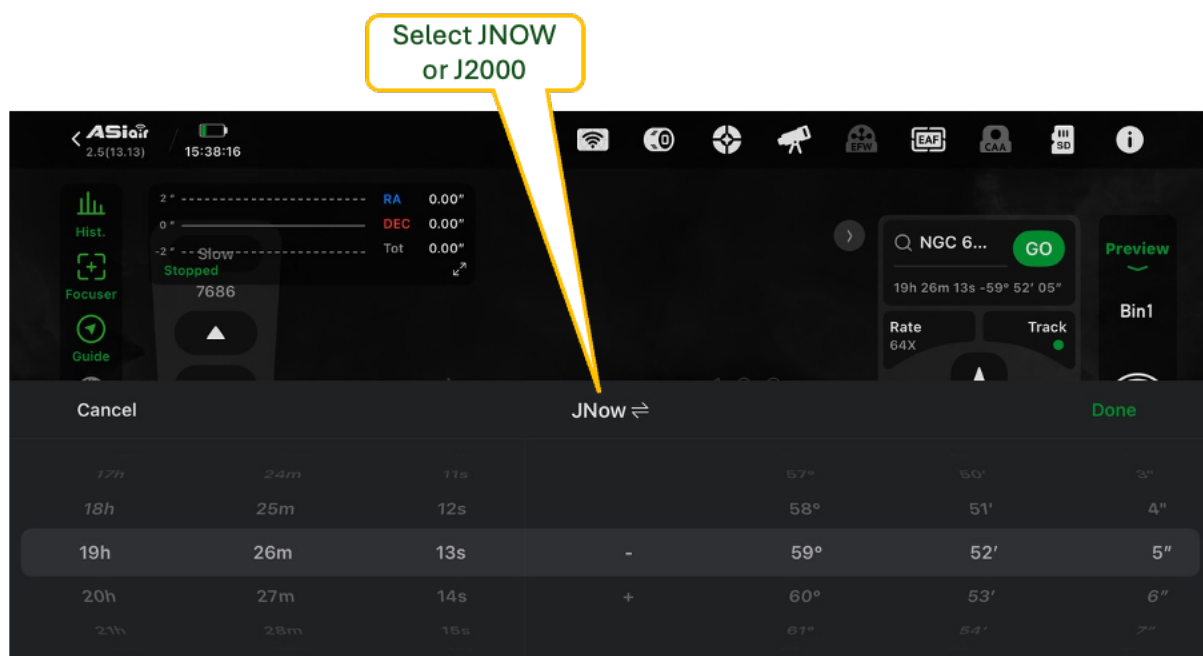


Figure 23. JNow or J2000 coordinates

9.3. GOTO using a previous image

If ASIAir has stored images from a previous session, you can set the scope to the same location again by locating an image (see section 24.1) and pressing GOTO. This will initiate a GOTO with platesolve.

If you have a CAA on your scope, it will also rotate to align the field of view.

If there is no CAA and the camera was rotated since the earlier image, it will still centre the field but may raise an alert indicating the rotation does not match.

9.4. Platesolving during GOTO

Under the MOUNT settings there is a setting to use platesolving for GOTOs, ("GOTO Auto-Centre"). If this is enabled ASIAir will slew to the target, take a shot and platesolve, possibly back off a little and take another, then settle on the target.

If plate-solving is taking too long or fails, **STOP** the solve, check where the scope is on the sky atlas, and manually reposition if desired. There are circumstances where a platesolve may fail.

9.5. Number of stars needed for platesolving

From experience, platesolving requires at least 20 stars and is reliable with 50 ... 100 stars. Having hundreds of stars in the frame merely means it will take longer to solve and may fail, so if it is taking a long time with thousands of stars, consider reducing the exposure.

There are circumstances where platesolving will fail, notably on star clusters or globulars with thousands of stars or more in the field, as well as large nebulae obscuring stars (such as M42). If that happens choose a target off to one side of your desired position, GOTO that, then reposition onto the exact position desired.

9.6. Platesolving accuracy

Platesolving should position the telescope better than 5 arc minutes of the target position.

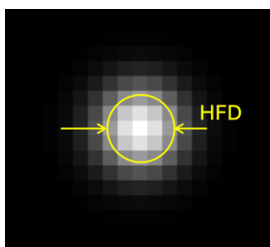
Sometimes the ZWO catalog positions are a bit off-target, but you can define a custom position, if desired.

9.7. Preparing for imaging

The workflow is:

- a) Choose the target
- b) Preview the shot to make sure you have a suitable gain, exposure and BIN settings.
- c) Confirm AUTOGUIDER is GUIDING
- d) Precise Focus
- e) Configure AUTORUN
- f) Start AUTORUN
- g) PAUSE or STOP AUTORUN.

9.8. Average Star Size: HFD



The HFD is the diameter of a circle such that the flux of a star falling inside the circle equals the flux outside the circle. It is similar to the Full-Width-Half-Maximum (FWHM) – and for an ideal gaussian distribution, $HFD = 1.06 \times FWHM$. Optical theory also shows $FWHM = 1.02 \lambda/D$, so the theoretical minimum $HFD = 1.08 \lambda/D$ where FWHM and HFD are in radians, λ is the wavelength of light (0.55 micron) and D is the telescope aperture.

Alternatively in linear units at the focal plane, the minimum $HFD = 1.08 \lambda F$, where F is the focal ratio of the telescope. Hence for an f/10 telescope such as an SCT, the minimum HFD is 6 microns. Divide by the pixel scale to convert that to pixels.

In practice the measured HFD is always larger than the minimum due to:

- Less than perfect optics – ie. aberrations, particularly off-axis – such as field curvature, coma, astigmatism and chromatic aberrations;
- Sensor tilted relative to the focal plane;
- Poor focus (stars appear bloated);
- Stars being overexposed (bloated);
- Atmospheric seeing (turbulence), or
- Guiding errors.

On a night with good seeing HFD under 2 arcsec is good for an amateur telescope, less than 1.5 arcsec is exceptional. A detailed explanation of the effects of seeing is available at

https://www.telescope-optics.net/seeing_and_aperture.htm

The ASIAir's measurement of average HFD (Figure 24) is thus a measure of how wide stars appear in your images, for stars not over-saturated. The HFD is stated in pixels, and arcsec. This is available for any image captured in PREVIEW, AUTORUN or PLAN mode and HFD displayed in the autoguider (for the guide star) and during autofocus.

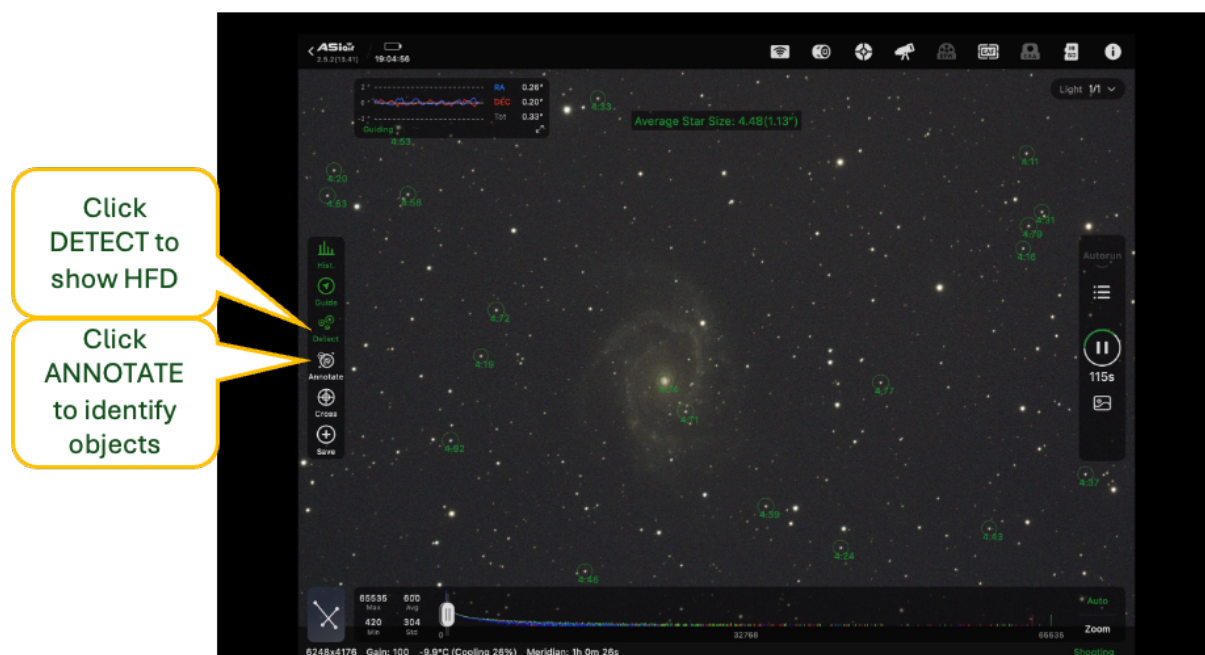


Figure 24. Measuring HFD, and annotation

9.9. Identifying objects

ASIAir can identify stars and deep-sky targets from its library catalogs, select ANNOTATE (Figure 24). This is available for any image captured in PREVIEW, AUTORUN or PLAN mode; the values are displayed only and not stored with the image.

10. Sky Atlas and Object Library Catalogs

10.1. Sky Atlas display settings

The atlas has the usual settings similar to SkySafari and other planetarium software, figure 25.

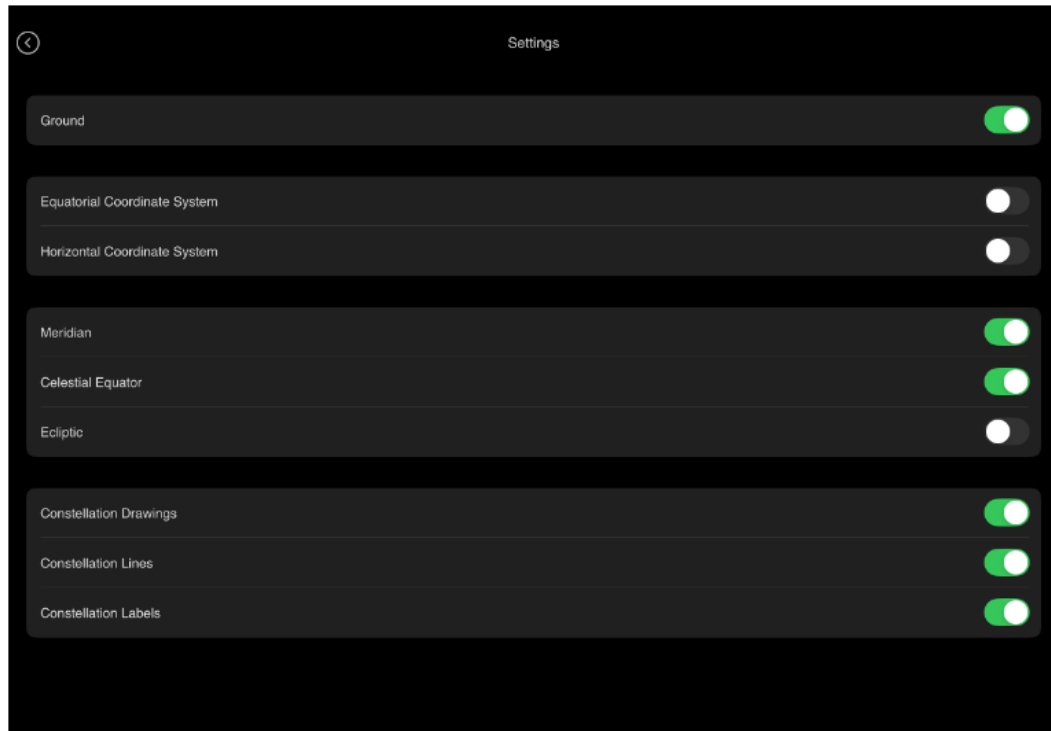


Figure 25. Sky atlas settings

10.2. Library Catalogs

ASIAir 2.5 includes several popular catalogs of objects – solar system, planetary nebulae, named stars, double stars Messier, Caldwell, NGC and more. In addition, further down are two useful groups - **My Favourites** and **Custom Objects** which you can configure.

10.3. Access the Catalogs

With the sky atlas displayed, press the OBJECTS icon  to list the catalogs available... (Figure 26).

Alternatively, depending on which pane you are currently at, press the LIBRARY icon  at top-right to list the various catalogs available (Figure 27).



Figure 26. Press OBJECTS to list the catalogs

10.4. Tonights Best

Selecting **Tonights Best** ASI Air displays a scrolling list of objects arranged in order of magnitude. For each object a graph is provided showing its elevation and the time it crosses the meridian. The list includes the most popular targets for small telescopes that might be used for outreach or a star party.

10.5. My Favourites

To add an object to **My Favourites**, locate the target in a catalog and enable the heart icon. Disabling the icon removes it from **My Favourites**. To access your favourites, scroll through the library to locate **My Favourites** near the bottom.

10.6. Custom Objects

Custom objects can also be defined (Figure 28) as well as **groups** of custom objects. Scroll down the library to **Custom Objects**, select that, add one and give the target a name, define the RA and dec.

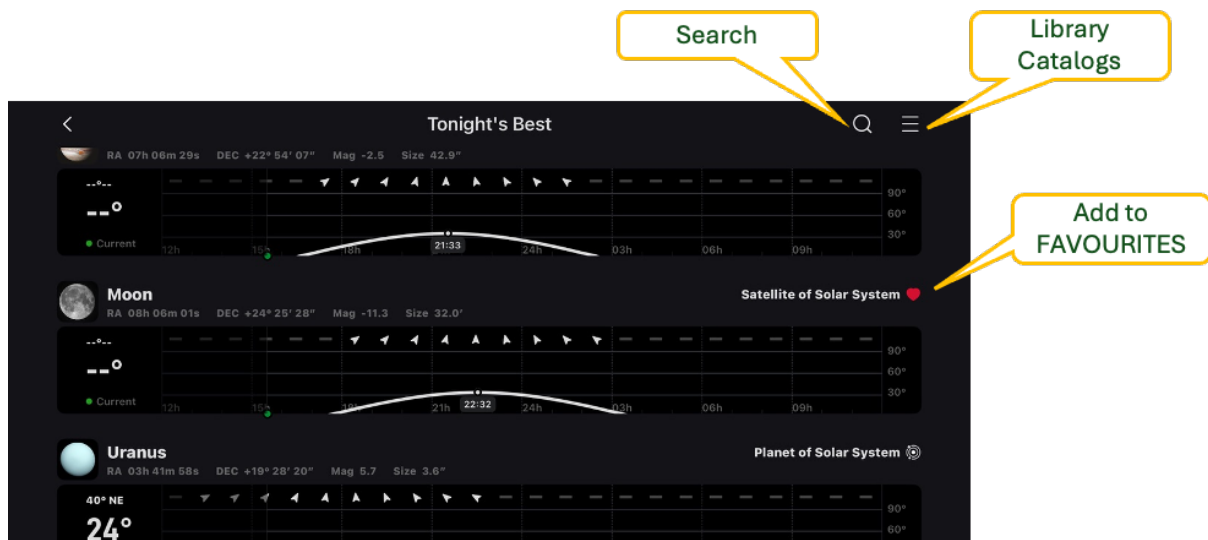


Figure 1. Press LIBRARY to list the catalogs

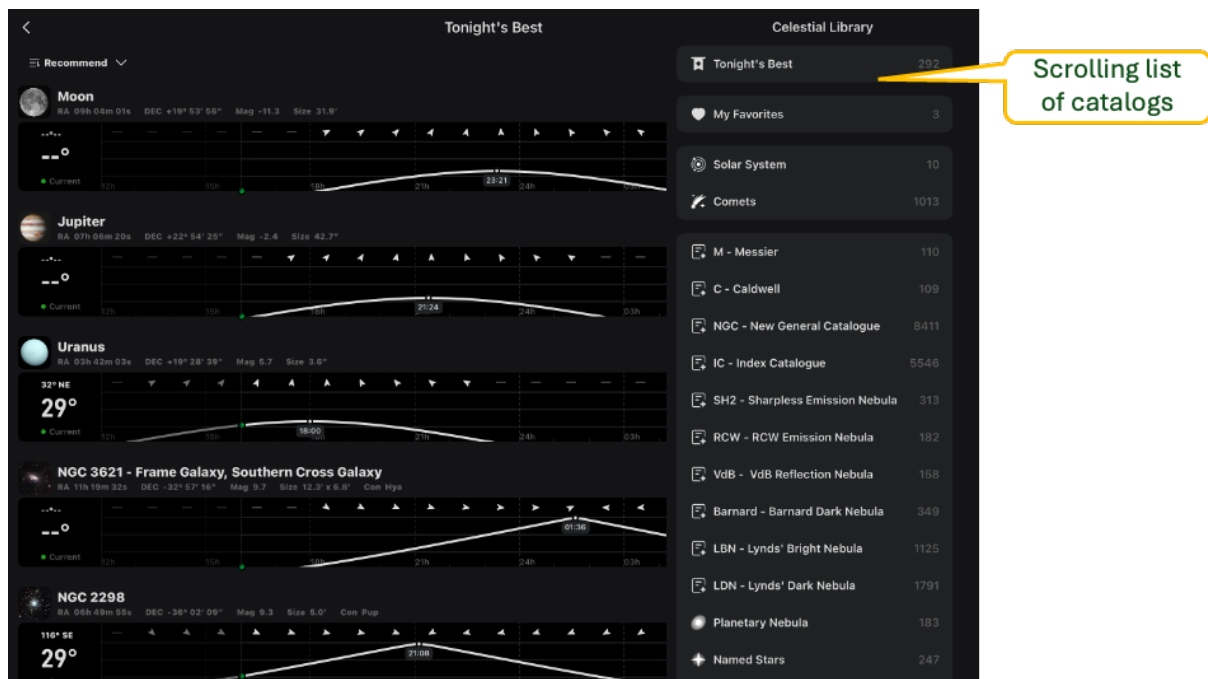


Figure 27. Catalogs

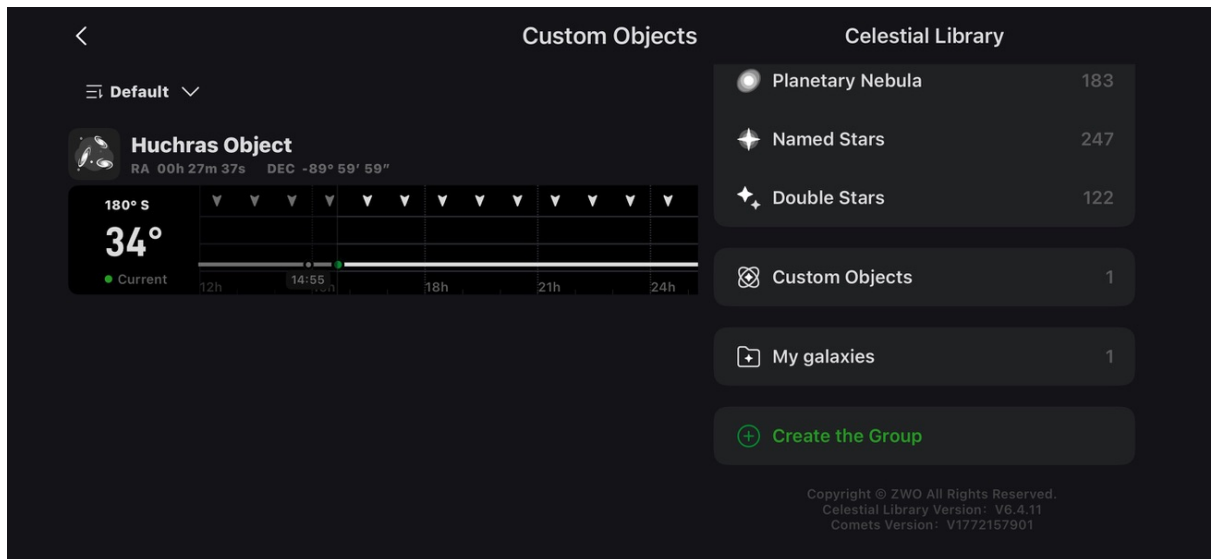


Figure 28. Custom Objects catalog

10.7. Filter Objects

ASIAir supports filtering the catalogs (Figure 29), e.g. by time, elevation, azimuth or field of view. This is particularly useful when applied to **Tonights Best**, your **favourites** or **custom objects**.

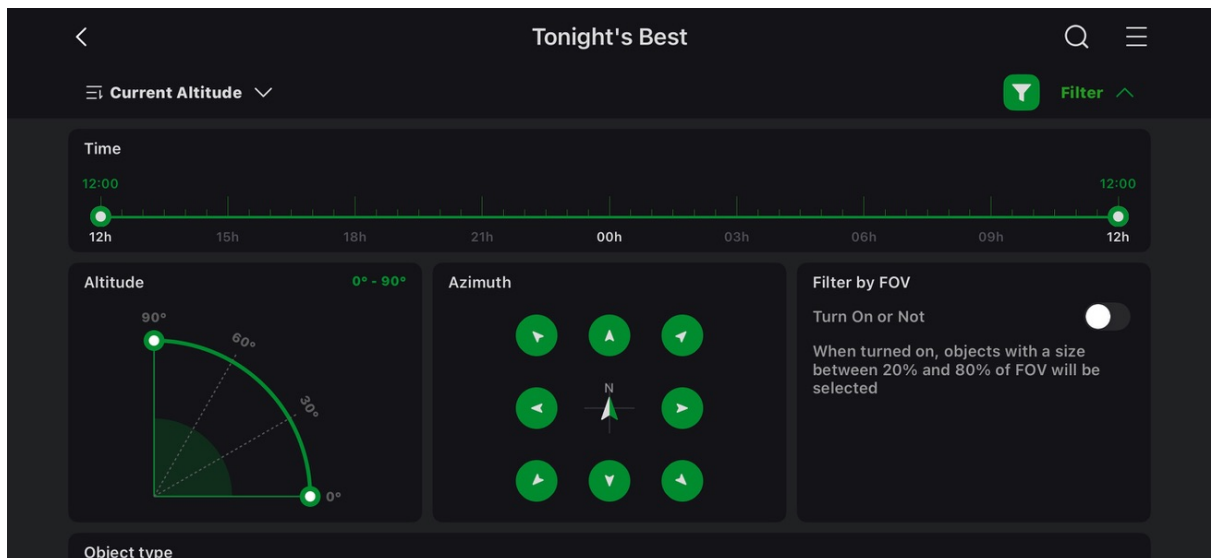


Figure 29. Filter objects

10.8. Object information

Double tapping an object, ASIAir will show information about the object (Figure 30) such as its rise, set, magnitude and coordinates. With an internet connection an image and detailed article are available.

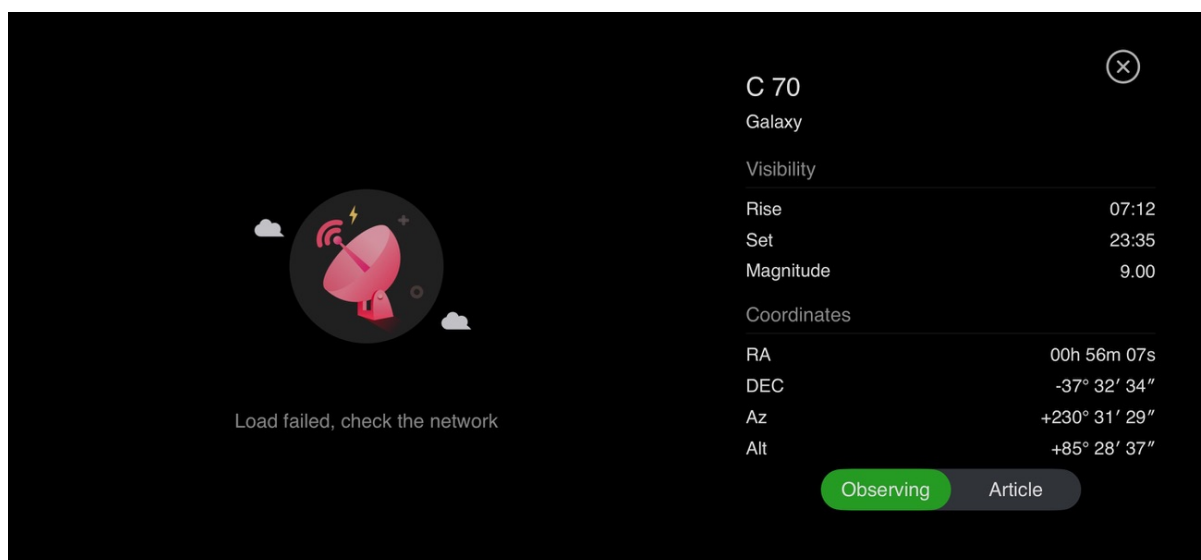


Figure 30. Object details

11. Autoguiding

11.1. Hardware

This section assumes you have any of the following:

- An Off-Axis Guider (OAG) and guide camera, or
- An On-axis Guider (ONAG) and guide camera, or
- A piggy-back guidescope and guide camera, or
- An integrated main and guide camera, such as the ASI2600 DUO.

11.2. Considerations

Autoguiding utilises a control-system engineering technique as “closed-loop feedback” (Figure 31), in which the telescope is to stay precisely on target (the guide star) despite unpredictable disturbances such as mechanical flexure (ground, tripod, mount and telescope), mechanical inaccuracies (gears) and the influence of external “noise” – such as wind. One or more target stars are selected and the guide camera begins taking frames in rapid succession. From one frame to the next, ASIAir measures the movement of the target star from one frame to the next, and instructs the mount to move north/south or east/west to keep the guide star at its default position (i.e. on the cross hairs).

This is also a time-sampled control system, in the sense that it takes a frame, solves it, locates the star and computes an adjustment at intervals as fast as 0.1 second, or as slow as about 5 seconds per frame.

Image scale of the guide camera. This concerns the focal length of the guidescope and camera, in arcseconds/pixel.

Guider resolution/accuracy While some sources claim guiding is possible to 0.1 pixel RMS, personal experience that 0.3 pixel RMS is more realistic. This implies the guidescope and camera should have an image scale not exceeding 3x that of the main scope, or, if the main and guide cameras have similar pixel sizes, the guide camera should have a focal length not less than 1/3 the focal length of the main scope.

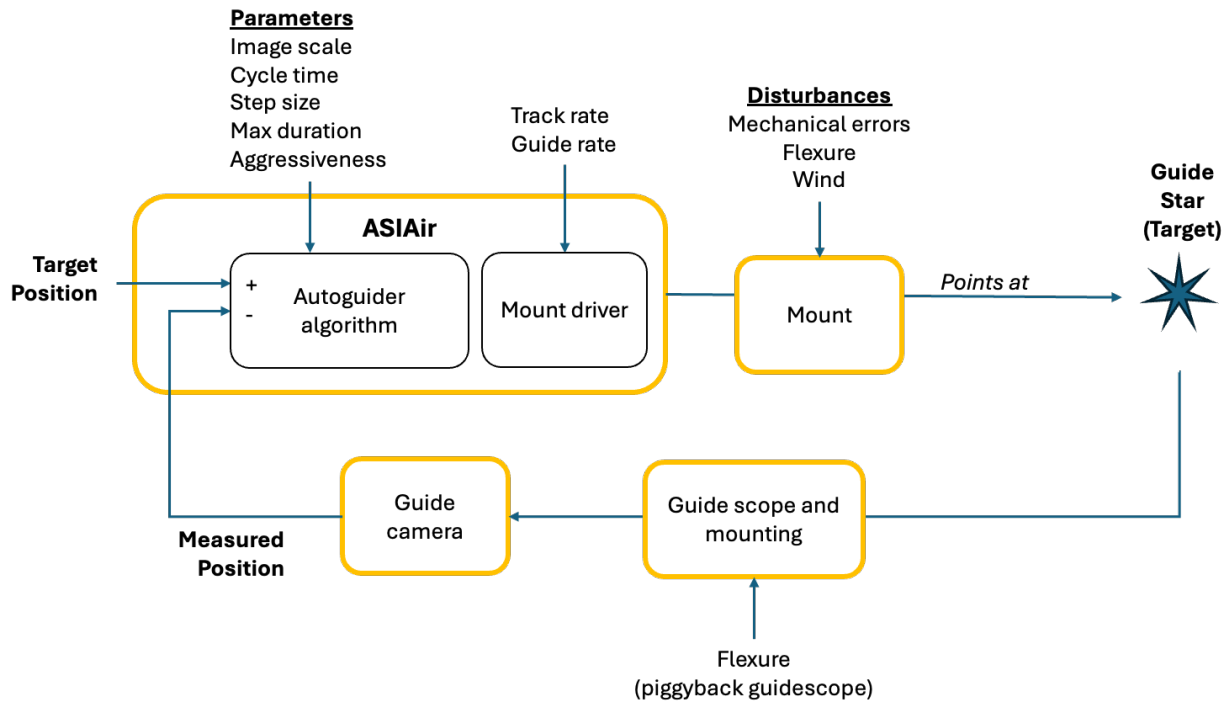


Figure 31. Autoguider and mount as a closed-loop feedback system

Seeing limitations. At many locations seeing is often of the order of 1.5-2 arcsec, sometimes worse, sometimes better. Another aspect of seeing is the typical frequency involved, for example its possible to have very good seeing with slow “waves” which the guider and mount may be able to track the stars precisely. Conversely in poor conditions stars will appear to move very fast – much faster than can be accommodated by the autoguider. In these conditions it may be useful to extend the guide exposure time to 2 or perhaps 3 seconds.

Angular resolution of the guidescope. Many users with small mounts use the little 30mm piggyback guidescopes with focal lengths of the order of 150-200mm, and claim guiding better than 0.5 arcsecond, this is absurd from a scope that cannot resolve 3 arcseconds. All it means is that the guider errors are lower than what can be reliably measured. The real guiding performance is revealed when the HFD of stars from the main camera are measured.

Focal length: Guidescope vs main scope Following from the above, it implies that for guide and main cameras with similar pixel sizes, the focal length of the guide camera should be no less than 30% of the focal length of the main scope. Seeing also imposes another limit.

Guide exposure (cycle) time vs seeing and periodic errors: Many sources suggest seeing is of the order of 1.5 arcsec on “average” nights at “average” locations, although significant differences arise due to local topography and weather patterns. One approach is to use a cycle time for the guide camera of the order of 2-3 seconds – shorter than the mechanical periodic errors of the mount, and long enough to average the seeing. If the mount can respond very quickly in both axes and declination backlash is negligible the guide rate time can be as fast as 0.1 second.

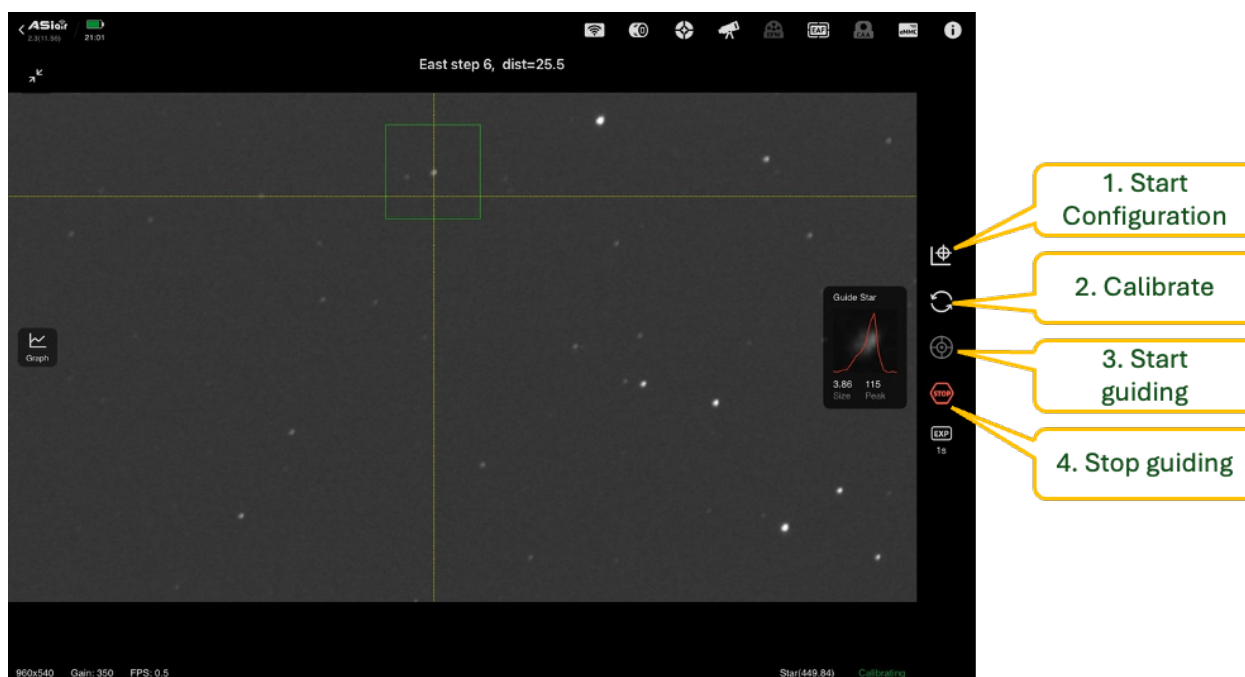


Figure 32. Calibrating the Autoguider...

Referring to Figure 32 there are 4 steps:

- a) Display the current calibration (Figure 33), this shows the current orientation of north/south/east west. RA is blue, Dec is red.
- b) Start the guide camera, this should show stars from the camera. If not, make sure you have removed the lens cover (!) check the exposure, gain, and possibly focus.
- c) Calibrate. The software will make small moves east/west/north/south to determine the closed-loop gain in the system, i.e. how much the image moves in response to the guide signals. If successful it will automatically attempt to start guiding.
- d) Stop.

Note: ASIAir stores the calibration from one night to the next so if your rig is permanently set up, you will not need to redo it each night. If you assemble your rig each night you must **clear the previous calibration** (refer Figure 33) and repeat it. The calibration must also be cleared and repeated if the guider has been rotated (eg if you have a manual rotator in the image train), and should be repeated after a meridian flip.

Lastly, the performance of most mounts changes somewhat depending on whether the target is on the east or west side of the meridian. It is important to calibrate on the same side of the meridian you will be imaging – ie if imaging a target in the east, calibrate on a target in the east.

Once calibration is completed ASIAir displays a red and blue line indicating the orientation of RA and Declination (Figure 33).

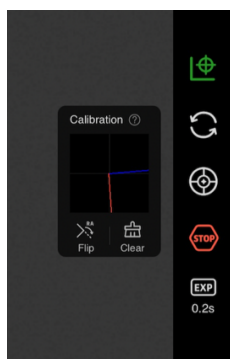


Figure 33. Calibrated ...

11.3. Calibration and Meridian Flips

When using a typical equatorial mount and tracking a target east of the meridian, as it approaches the meridian it is necessary to stop tracking and flip the telescope to the other side, and resume tracking west of the meridian. In the process of the flip, the orientation of the sky relative to the main and guide cameras is also rotated 180 degrees, i.e. in the guide camera north/south are swapped, as are east/west.

If you calibrated the guider east of the meridian, you must re-calibrate on a target on the west side after the meridian flip.

Similarly, if you calibrated the guider on a target west of the meridian and decide to switch to a target east of the meridian, you must also re-calibrate it after the meridian flip.

Alternatively, if you are using either an OAG or a DUO camera with the CAA rotator, you can allow the CAA to rotate 180 degrees after the flip, rotating the main and guide cameras. This eliminates the need to recalibrate after the flip.

11.4. Calibration step duration

This sets the duration of the pulses used to move the mount in each direction (east, west, north, south) during calibration. During calibration the guider attempts to move the star 25 pixels in each direction (east/west, then north/south) and ideally this should take about 10 steps, so each move will be about 2.5 pixels. However the calibration stepsize is defined by the duration (time) of each pulse issued to the mount, in milliseconds. The default value for the stepsize is 1,000 milliseconds (ie 1s), which may be OK as a starting point, but small mounts (eg using small guidescopes under 200mm focal length) may take a long time – and a lot of steps – to complete the calibration. In this situation you can do two things:

- Increase the guide rate to the maximum (1.0X)
- Increase the calibration step size to 2,000 or even 5,000.

If the calibration step size is too large, the mount will move too quickly and the guide star will move out of the autoguider frame, resulting in “star lost”. If this occurs, (1) reduce the calibration step size, and/or (2) reduce the guide rate, and/or select BIN2.

For the technically minded, the nominal calibration stepsize is $66 \times \frac{\text{stepsize} \times \text{imagescale}}{\text{guiderate}}$ milliseconds,

where stepsize is in pixels (nominally 2.5 to 5), imagescale is in arcsec/pixel per above, and the guide rate selected is in the range 0.25X ... 1.0X sidereal.

If the guide camera is set to Bin2, the move required is doubled, so the nominal calibration stepsize becomes $133 \times \frac{\text{stepsize} \times \text{imagescale}}{\text{guiderate}}$ milliseconds.

The calibration step duration is not critical and values suggested below for a guide camera with 4 micron pixels (eg ASI120 or ASI220).

Guidescope	Guidescope focal length (mm)	Guide rate	Binning	Calibration stepsize (ms)
Mini guidescope (30mm f/4)	120	1.0X	Bin1	2000
Small refractor 60...80mm f/7	500	1.0X	Bin1	1000
Telescope with OAG or DUO camera (refractors 100...150mm, 8" f/4 Newtonians, 5"-6" SCT)	1000	0.5X	Bin1	200-300
Telescope with OAG or DUO camera	2000	1.0X	Bin2	50-150
11" SCT with OAG or DUO camera	2800	0.5X	Bin1	100-150
11" SCT with OAG or DUO camera	2800	0.5X	Bin2	200-300

11.5. Max Dec duration, Max RA duration

These settings control the maximum duration of the guide pulses to correct the mount periodic errors. Since the autoguider can issue a pulse on each cycle, the pulse duration cannot exceed the guide exposure time, so 1000ms is a good starting point.

If it's much less than the guide exposure time the max pulse duration could be too short to correct periodic error, and the star will slowly drift out of the guide frame.

If the pulse duration is too large, the autoguider could respond to an error spike (e.g. poor seeing) and issue a very large pulse pushing the guide star out of the guider frame entirely, losing the star.

11.6. Backlash

Most gear-driven equatorial mounts have backlash to some extent, and can also behave differently depending on how the manufacturer configured the firmware in the mount. Most modern mounts include some form of backlash compensation internally.

Its significance also depends on whether the mount is perfectly balanced, or is slightly imbalanced. When perfectly balanced wind can blow the scope off target through the backlash angle, resulting in very poor and erratic guiding. My own preference is to have the mount slightly slightly unbalanced in both axes to prevent this.

11.7. Strain-wave (Harmonic) mounts

While strain-wave mounts don't have backlash, they can have substantial errors in RA requiring shorter guide cycle times (typically 0.5 or 1s) than might be used with worm-driven or friction mounts.

11.8. Choosing a guide star

Touch the screen to select a star and the software should put a green box around it and display a little red graph of the HFD of the star, with a reading of its intensity. Ideally you want one with a peak 100...200 units; more than that the top will be clipped off and guiding will be less accurate; under 50 units the guider might lose the star. Adjust the guide camera gain and exposure to suit, ideally a 1

second cycle should work well, but you can use anything in the range 0.1 ... 5 seconds, less (faster) is best.

11.9. Guide success

If guiding established successfully (Figure 34) you should see the target star will stay stationary in the green crosshairs, and the graph at the bottom start to show a graph of the guiding performance in both axes, as small jiggles in each axis and the RMS errors. After a few seconds, the word **GUIDING** appears in green at bottom right. If it fails or has lost the star it will show **LOOPING** in red.

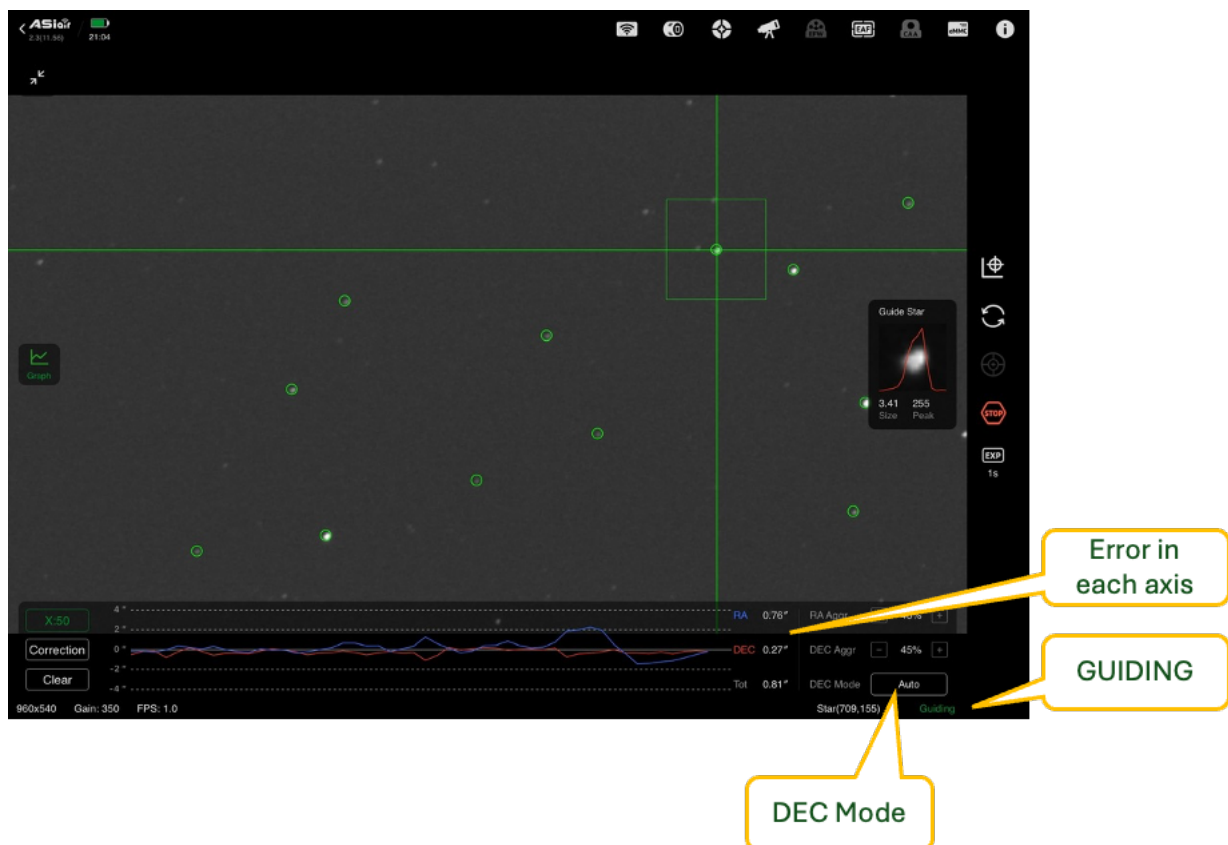


Figure 34. Guiding

11.10. Multistar guiding

If you allow ASIAir to choose the guide star automatically it should engage multistar guiding if there are several suitable stars available. If you wish to choose the star manually, stop the guiding and tap the star, the green guider box should be located over the star and guiding re-commence.

11.11. Guiding on close double stars

Sometimes ASIAir will select and attempt to guide on close double stars which, while not resolved, appear to be abnormally wide. This leads to poor guiding performance and ideally you should select another guide star. This may involve having to reposition the scope slightly to find a suitable star.

11.12. Guiding on a hot pixel

If the gain of the guide camera is excessive the guide image will be visibly noisy. In this condition the guider may lock on a hot pixel and appear to guide fantastically well, but the mount is really drifting

free, and the stars in the main camera will look like wiggly snakes. If this happens reduce the gain to eliminate noise and increase the cycle time to find suitable guide stars.

11.13. Focusing the Autoguider

On guide scopes with mechanical or electric focusing, adjust the focus gently watching the HFD from one frame to the next, best focus being achieved at the minimum value. Tweak the focus a little, wait for the next image to be taken and the display refreshed. Then repeat.

The DUO cameras have a silver knob on the side of the body; this adjusts the position of the guide camera relative to the main camera. After the main camera has been focused accurately, open the autoguider display and note the HFD width of a guide star (this is in pixels, by the way). Gently turn the silver knob say 30 degrees while watching the HFD again for a few seconds to see if its more or less than the previous value. Adjust accordingly and repeat. Once this is optimized for your scope you won't need to do it again.

11.14. DEC Mode

In the guider settings there is one to be aware of – the DEC Mode (Figure 35). If this is set incorrectly to North or South, your scope will drift off in declination and cause much frustration. Usually this should be set to AUTO for most mounts.

On mounts that have significant declination backlash such as the small star-trackers for DSLRs, it may be worthwhile setting this to NORTH or SOUTH - the effect is that declination signals will only be in one direction, and the dec drive will not reverse. To make use of this, it is advisable to deliberately skew the polar alignment of the mount slightly east/west of the pole, ensuring the declination drifts in one direction. This is only recommended once you are familiar with autoguiding and have a few successful nights prior practice.

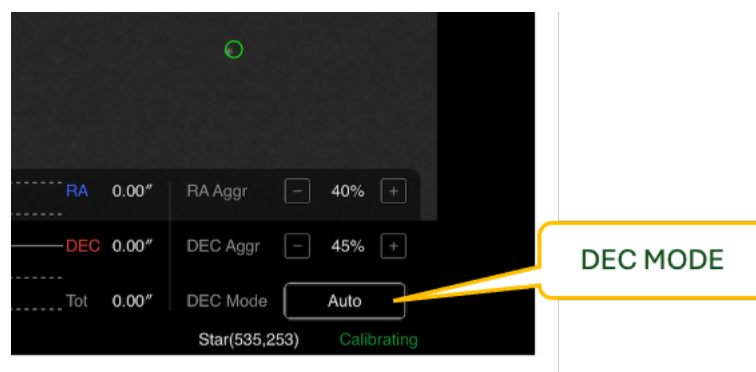


Figure 35. DEC Mode

11.15. Tuning the autoguider

Depending on what your mount is and the focal length of the guidescope, there are a few settings to experiment with - the guide speed (usually 0.25, 0.5, 0.75 or 1.0X sidereal), maximum duration of the guide signals (the default is 1000 milliseconds) and "aggressiveness".

How does it work: ASIAir computes a correction in pixels, over previous few seconds of guide errors (target – actual position). This is multiplied by the "aggression" (100% = 1X) to determine how large a correction to apply. The guide speed (in the mount settings - 0.25X to 1.0X sidereal) sets the speed of the movement. These two factors multiplied together are the "gain" used in a closed-loop feedback control system.

Lowering aggression will correct errors more slowly. If really low, the mount might not correct large errors properly.

Increasing aggression means it should correct errors more quickly, but if its too high the mount will begin to oscillate back and forth and not settle.

To tune the guider, increase the aggression until it oscillates, then reduce it by 25% or perhaps 30%. This should respond to errors quickly and settle with minimal overshoot. Repeat for each axis.

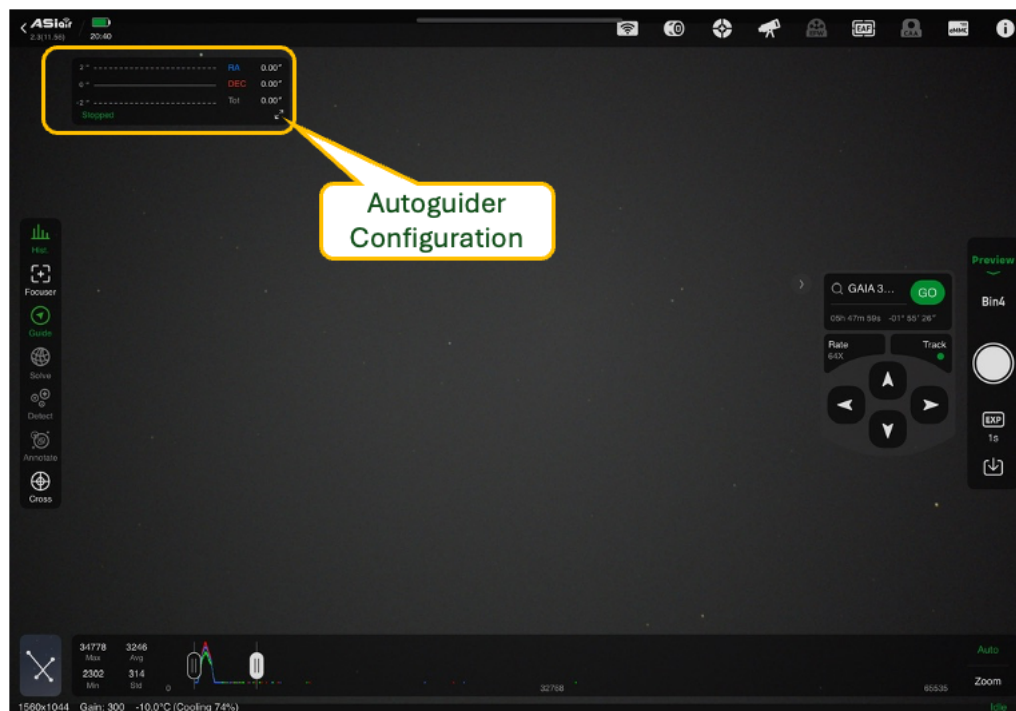


Figure 36. Select the Autoguider...

11.16. Autoguider Workflow

Slew to a patch of sky near the celestial equator (i.e. Declination +20 ... -20) with plenty of stars. The autoguider status is shown at the topleft of the main page. In PREVIEW mode, referring to Figure 36, click the pair of green arrows to open the autoguider calibration pane, Figure 32. There are 4 icons down the righthand side and you must work through these top-down. When you select the first one it should start showing some stars as seen by the guide camera.

11.17. Calibration

The autoguider software has to be calibrated according to the focal length of your guide scope, the orientation of the camera (up/down/left/right vs actual direction on the sky N/S/E/W) as well as the guiding speed selected for your mount (in the mount settings). In addition, if you are using an off-axis guide the diagonal mirror introduces a reflection so the guide image is left-right reversed.

During calibration, the guider attempts to move a guide star in each direction to determine the orientation (north/south/east/west) and the closed-loop gain of the whole system. It attempts to move approximately 25 pixels in each direction. Ideally this should be in about 5-10 small steps, so the step size should be about 2...5 pixels.

If the guide rate or calibration step size are too large, the moves will be too big, and the guider will lose the star.

If the guide rate or calibration step size are too small, the moves will be tiny, calibration will require many dozens of steps and could take a very long time.

The optimum solution for your rig depends on several factors to the extent there is no hard “right” or “wrong” – there isn’t a unique set of optimal settings. The closed-loop gain in each axis is also proportional to product of the **mount guide rate**, the **guide camera exposure time** (cycle time), the **max guide pulse duration**, and the “**aggressiveness**” value (in percent).

If you run with these all set too high, the guiding may oscillate back and forth and not settle. If that happens, try reducing the aggressiveness, or the guide rate, usually there is a point at which suddenly the guiding will settle down – responding to errors quickly without overshooting. If oscillation occurs:

- Reduce the guide speed, or
- Reduce the maximum duration of the guide pulse, or
- Reduce the aggressiveness setting, or
- Reduce the guide camera exposure time.

11.18. Guide exposure time vs seeing

A common (but flawed) concept to deal with poor seeing is to extend the guide exposure time to several seconds, hoping the guide camera will measure the “average” position of the star in that interval. This can have adverse results, in that the guider makes no attempt to correct mechanical or wind errors during the cycle time. In practical terms, 2-3 seconds seems to be the upper limit for typical consumer-grade mounts.

At shorter cycle times another effect arises. In average seeing conditions the jittery motion of the guide star often has characteristic frequencies in the range 0.5...1.5Hz, with the result that setting a guide exposure time of 1.0 second can result in “chasing the seeing”.

Some well-adjusted mounts can be very fast (responsive), and if you have a bright guide star you can reduce the cycle time below 1 second. For example, a Skywatcher CQ350 can respond at 10 cycles/sec (i.e. a guide camera set to 0.1 sec). At this rate the mount may track the seeing well enough to reduce the effects of poor seeing, resulting in tighter star images from the main camera.

11.19. Guide failure

If it fails to guide, ASIAir displays LOOPING as the stars slide out of the guide camera field - possible causes include:

- Declination Mode is not set to AUTO.
- Star too dim (HFD below 50).
- Guidscope has dewed-over or cloud cover (!) – look up!
- Mount has reached the meridian and stopped tracking, with a meridian flip about to be executed (don’t panic!)
- Mount has been parked and/or tracking is turned off.

12. Imaging with AUTORUN

12.1. Configure an AUTORUN

Selecting Autorun opens a page to configure one or more imaging sessions (Figure 37, Figure 38). Click the large “+” icon to create a new session. Note that meridian flipping is enabled/disabled globally for all sessions.

The configured sessions are shown as tiles; select a tile to configure each session; the parameters are self-explanatory.

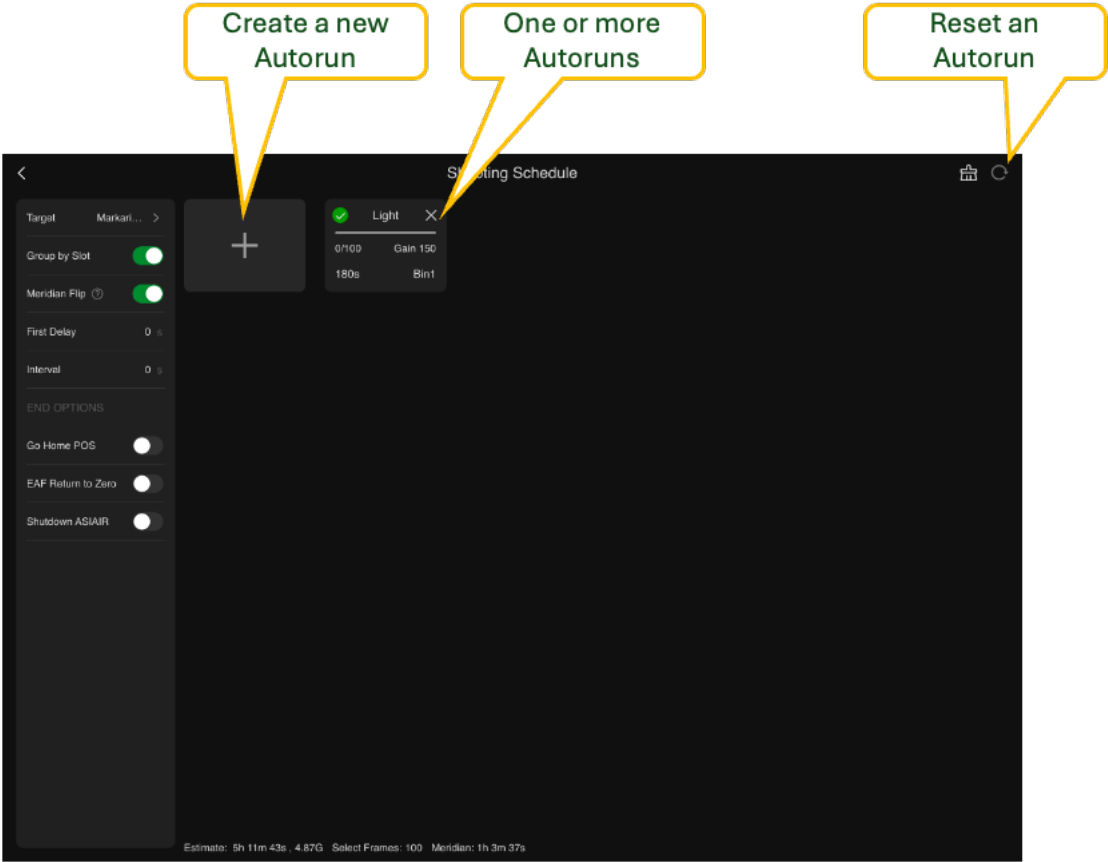


Figure 37. Autorun sessions

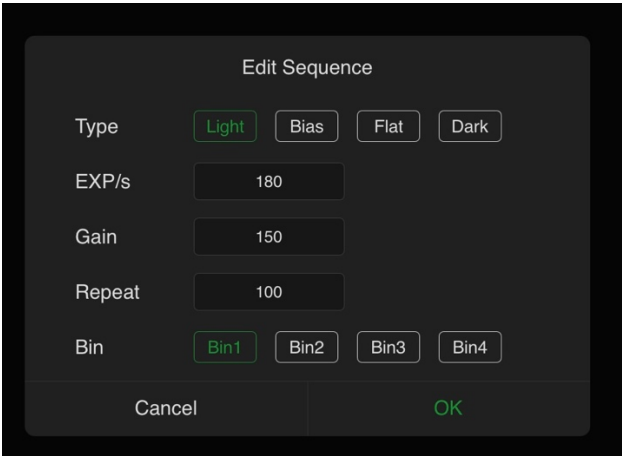


Figure 38. Autorun parameters

12.2. Start/Pause/Reset the AUTORUN

Returning to the main page:

- a) Make sure the guider has a guide star and guiding is stable.
- b) Check the camera is focused.
- c) Press the circular white button to commence an Autorun; this will start the first exposure, and it should begin counting down.

If a cloud, satellite or aircraft is approaching you can PAUSE the exposure pressing the II icon. Note that this doesn't stop or reset the AUTORUN session.

If you have paused an AUTORUN before it finished the number of frames specified, and you want to run it again, RESET before you can start it again on a new target. The RESET button is at the top right corner (Figure 37).

Shooting deep sky objects regularly from the same location you may find one AUTORUN setting is sufficient based on the sky conditions, you can re-use the same AUTORUN for each target.

12.3. Meridian flips (equatorial mounts)

If the scope is approaching the meridian and you notice the imaging, guiding and tracking stop – **DON'T PANIC** or try to interfere manually! You can enable or disable automatic meridian flips in the AUTORUN page. If automatic meridian flip is enabled, ASIAir will:

- Stop the camera a few minutes before the mount reaches the meridian,
- Stop the mount tracking,
- Execute the meridian flip to put the scope on the opposite side of the mount,
- Rotate the camera 180 degrees (optional, if CAA fitted),
- Complete the flip with a plate-solve to reposition the camera on target,
- Recalibrate the guider (optional) and resume guiding,
- AUTOFOCUS (optional, recommended for SCTs and other cassegrains); and
- Commence shooting.

After a meridian flip the camera is effectively rotated 180 degrees. When processing your images afterwards, most good stacking software will detect the rotation and handle this automatically.

Recalibrating the guider after a flip is optional, many users may decide this is not necessary, some may.

13. To dither, or not

Dithering is useful in two situations:

- If your images are undersampled you can increase the resolution of the images by dithering the subs and drizzling during the stacking,
- If your images show walking noise (Figure 39), dithering will slightly shift position between subs. When stacked, the walking noise pattern should be reduced.



Figure 39. Walking noise pattern

Dithering is configured in the **Guiding Advanced Settings**:

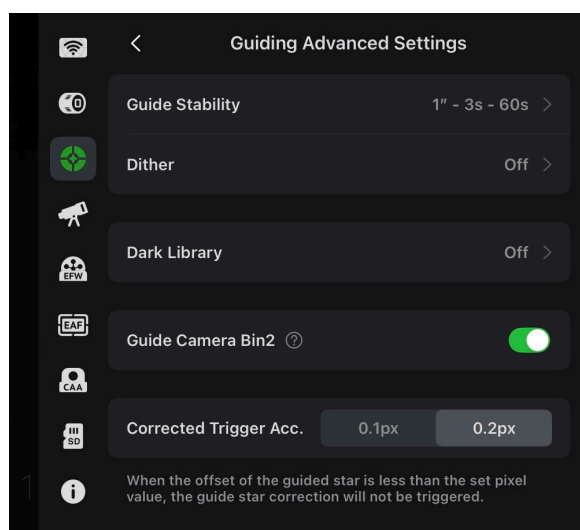


Figure 40. Dither setting

14. Imaging with PLAN

14.1. What PLAN does

PLAN is used to execute a sequence of AUTORUNS autonomously, each with a designated target. Its main uses are where you might want to program a mosaic, whole sequence of different exposures (eg a mono rig with filters, with darks and flats), or multiple targets to be done one after the other. This should be planned carefully beforehand consulting a planetarium or SkySafari to determine the right time and duration for each target according to its elevation/azimuth, or twilight/moonlight etc... This can become complex.

PLAN relies on positions from the catalogs in ASIAir. To image at an arbitrary position (ie something not in the catalog) define a custom object (refer 10.6) or manually position the scope of the target, and use AUTORUN.

When the PLAN is started the scope will goto each target, start guiding, execute the imaging and after that go on to the next target; and at the end (optionally) PARK the scope, stop the RA tracking and do an orderly shutdown (eg in case you have gone to sleep or dawn is approaching).

Autofocusing, cooling and meridian flips are also configurable options.

A plan can be used over multiple nights – ASIAir will save the progress.

14.2. Importing a PLAN

The data in a plan is stored as CSV delimited text containing target information, including name, Right Ascension (RA), and Declination (Dec) in JNOW coordinates. Telescopius.com is one tool to generate the data. Alternatively it can be prepared and exported from a spreadsheet or document as text (.CSV). In the relevant app on your device (eg NOTES) select and copy the text.

In ASIAir, navigate to "Plan Mode," tap the + button, select **+ Import** at bottom left to paste the text into the provided box. After pasting, configure the exposure time, gain and number of exposures for each target.

15. Mosaics

Creating a mosaic (Figure 41) with ASIAir involves:

- creating a imaging plan,
- selecting a target in the Sky Atlas,
- tap the "Mosaic" button to defining how many panels, the desired overlap and rotation, and
- running the automated plan.

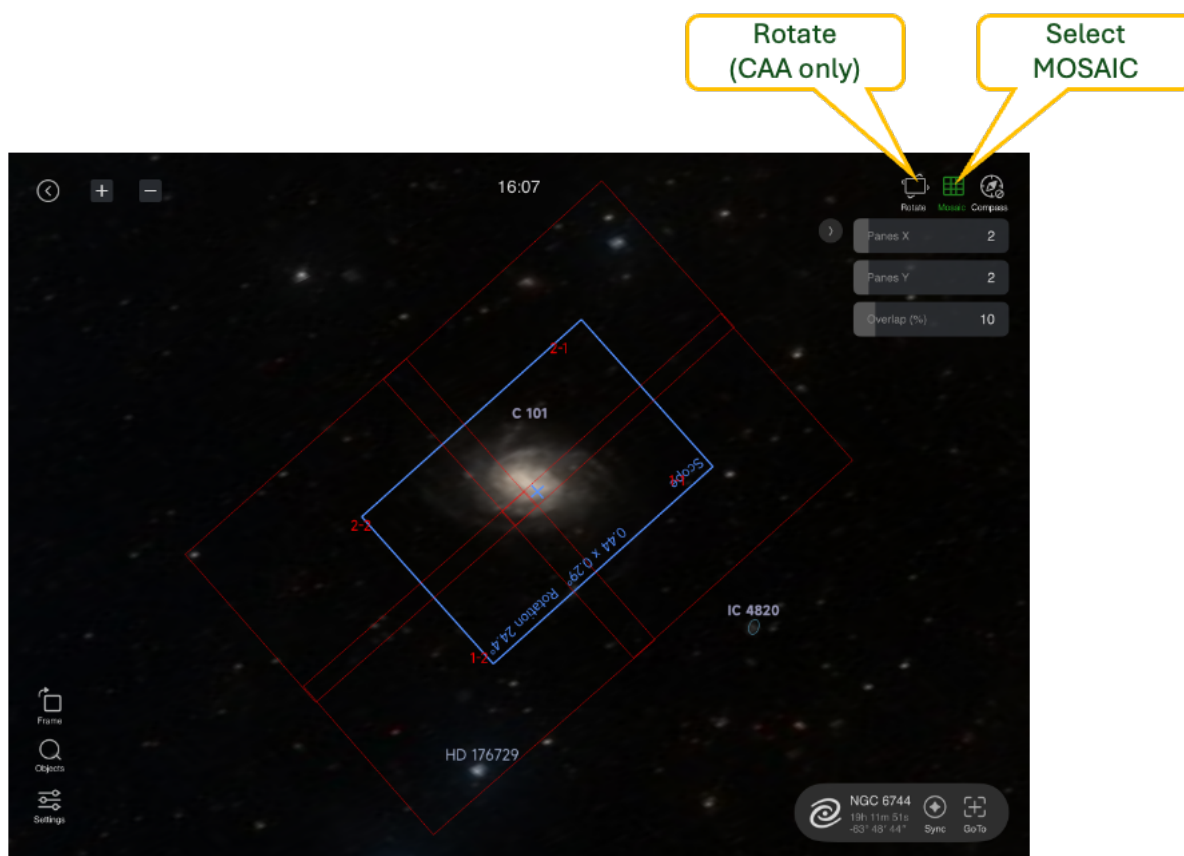


Figure 41. Configuring a mosaic

1. Setup & Initial Framing:

- Slew to your target and ensure **Preview** mode is selected.
- Open the **Sky Atlas** (top icon) and the target.
- Select the **Mosaic** icon in the upper-right corner.

2. Configure the Grid:

- Adjust the grid to the desired number of panels (e.g., 1x2, 2x2, 3x3),
- Set the overlap between panels to at least 15–25% to ensure proper stitching in post-processing.
- Drag the grid to center the target.

3. Save and Plan:

- Tap the "+" (**Add to Plan**) button to save these frames to a new PLAN.
- Go to **Plan** mode and open the saved mosaic plan.
- Click on each panel to define imaging parameters, such as exposure time, filters, and number of frames.

4. Execute the Plan:

- Ensure all panels are checked (active).
- Press the "Go" button to start the imaging sequence.

5. Post-Processing:

- After extracting the images use software like PixInsight or AstroPixelProcessor to stitch the panels together.

16. LIVE Stacking

16.1. Setting up

In the LIVE mode ASIAir will take frames from the main camera, stack them and display the result continuously. This is quite useful to show a crowd of people watching the scope eg at a star party, or online. The settings are straightforward, per Figure 42:

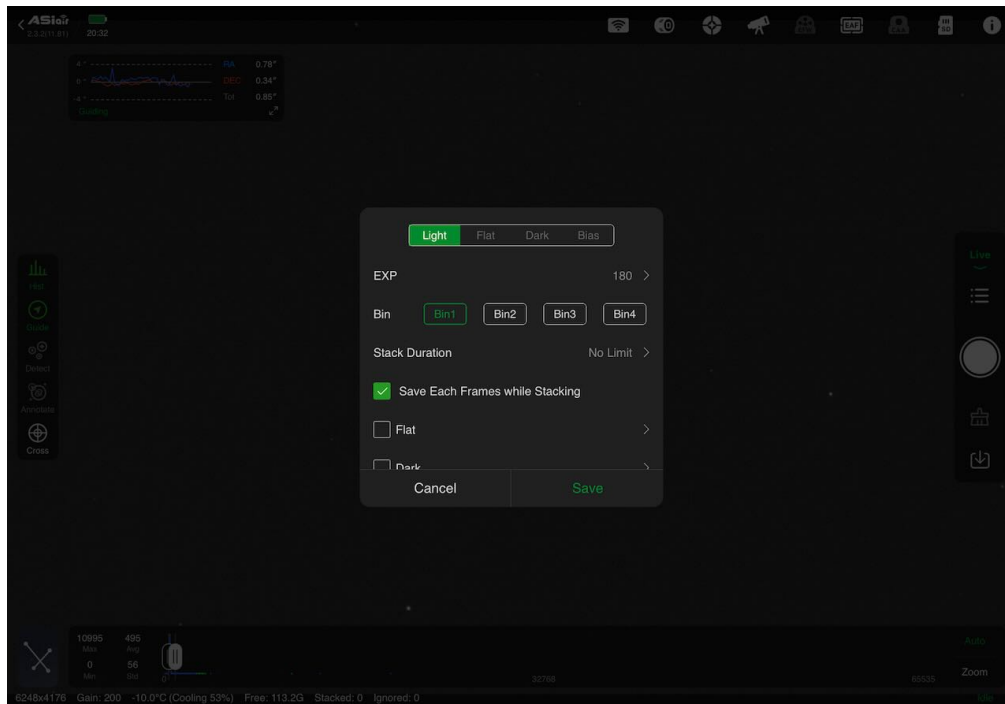


Figure 42. Live stacking parameters

16.2. Darks, Flats, or Bias for live stacking

The dialog in Figure 42 includes options to shoot flats, darks or bias frames. Select the option, set the desired number of subs (eg 5 or 10), then save. Then cover the scope and start. It will automatically collect and stack however many of each were selected.

17. VIDEO

"Video" mode in ASIAir is useful for capturing casual short videos of the Moon or planets. Several adjustments are available, as shown in Figure 43 ... Figure 45.

- Once on the target adjust the gain and exposure to achieve a satisfactory image. Then adjust the color levels to set the color balance.
- Take a bunch of short videos and afterwards extract these from the ASIAir to a desktop computer.
- ASI Studio includes a ASIVideoStack which will stack the video frames.

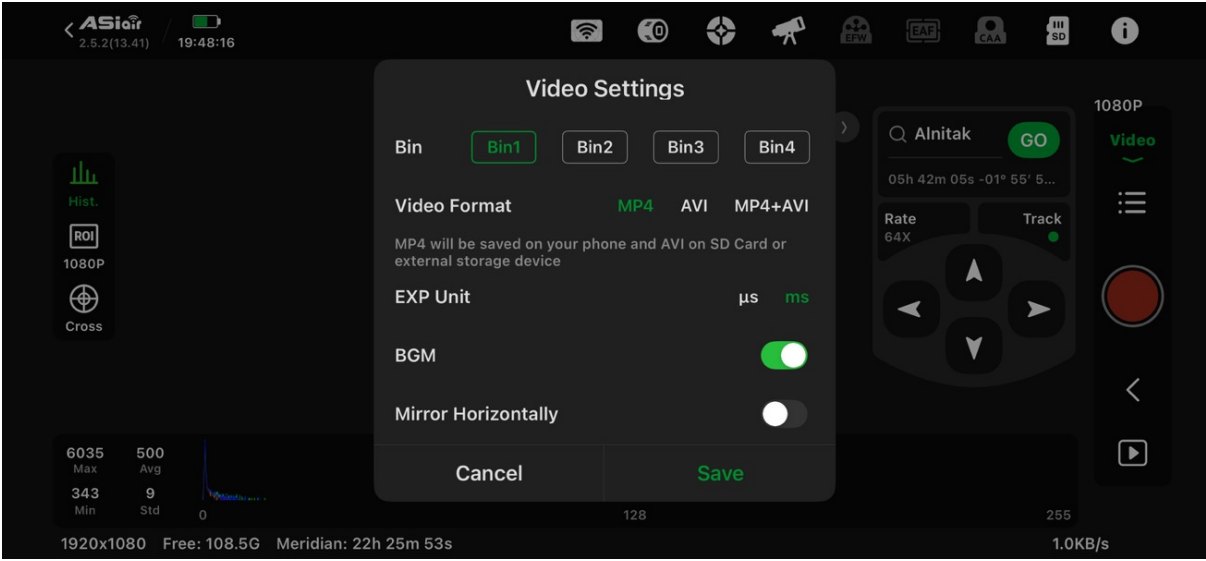


Figure 43. Video settings

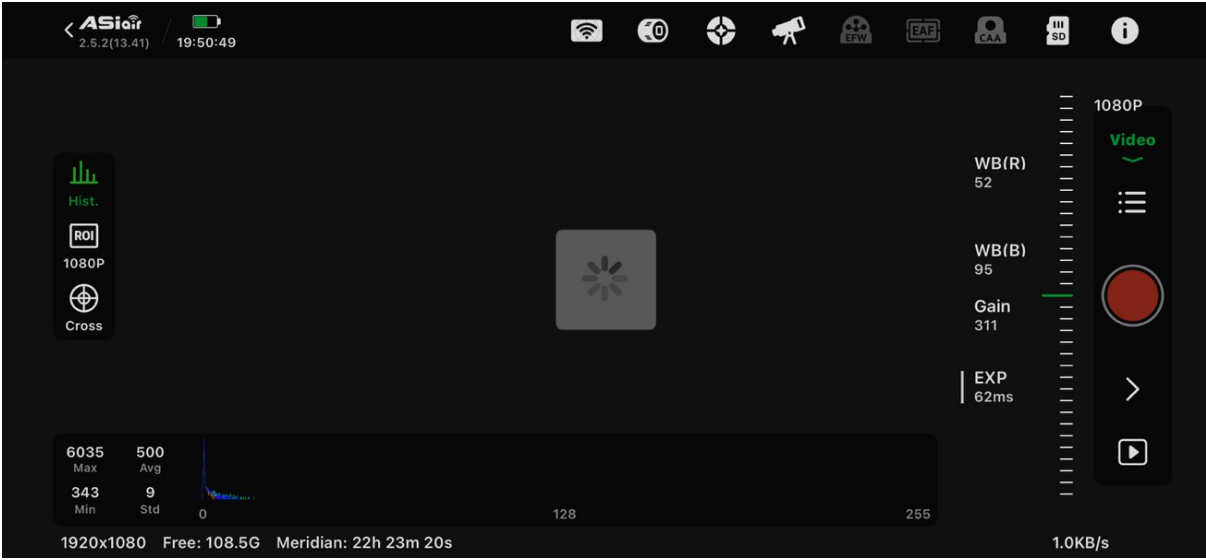


Figure 44. Gain, white-balance and exposure settings

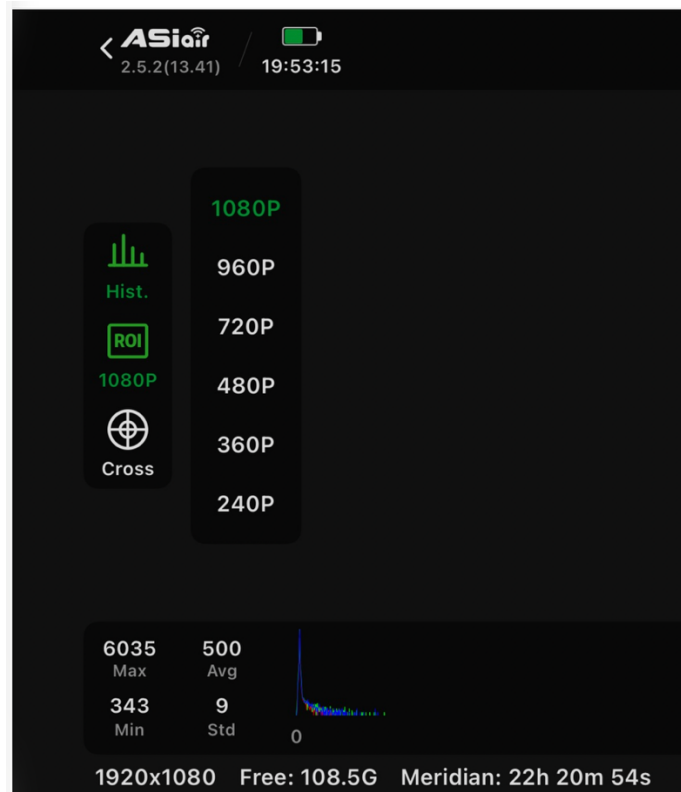


Figure 45. Region-Of-Interest settings

However the ASIAir is limited and far from ideal, and if you are serious about planetary imaging you will should consider use a more capable computer connected directly to the camera, and other specialised software apps for the purpose. By way of example, the ASIAir 533MC Pro camera is capable of a sustained video stream at 9 gigabytes/minute over USB C – way beyond what the ASIAir is capable of. The only storage technology able to keep up with that is an NVMe SSD card – and a fast one at that – which requires a fairly high-end laptop.

18. Suspending an image – lights, satellites, aircraft

While imaging in AUTORUN, PLAN or LIVE, if you can see something will spoil an image such as bright lights from cars, satellites or aircraft - and you don't want to discard it - you can PAUSE the camera, which will stop the exposure, and resume once the issue has passed.

19. Orderly shut down

Before shutting down it's a good idea to PARK your scope (under Mount settings). Select the ASIAir icon, and the red SHUTDOWN slider (Figure 46):

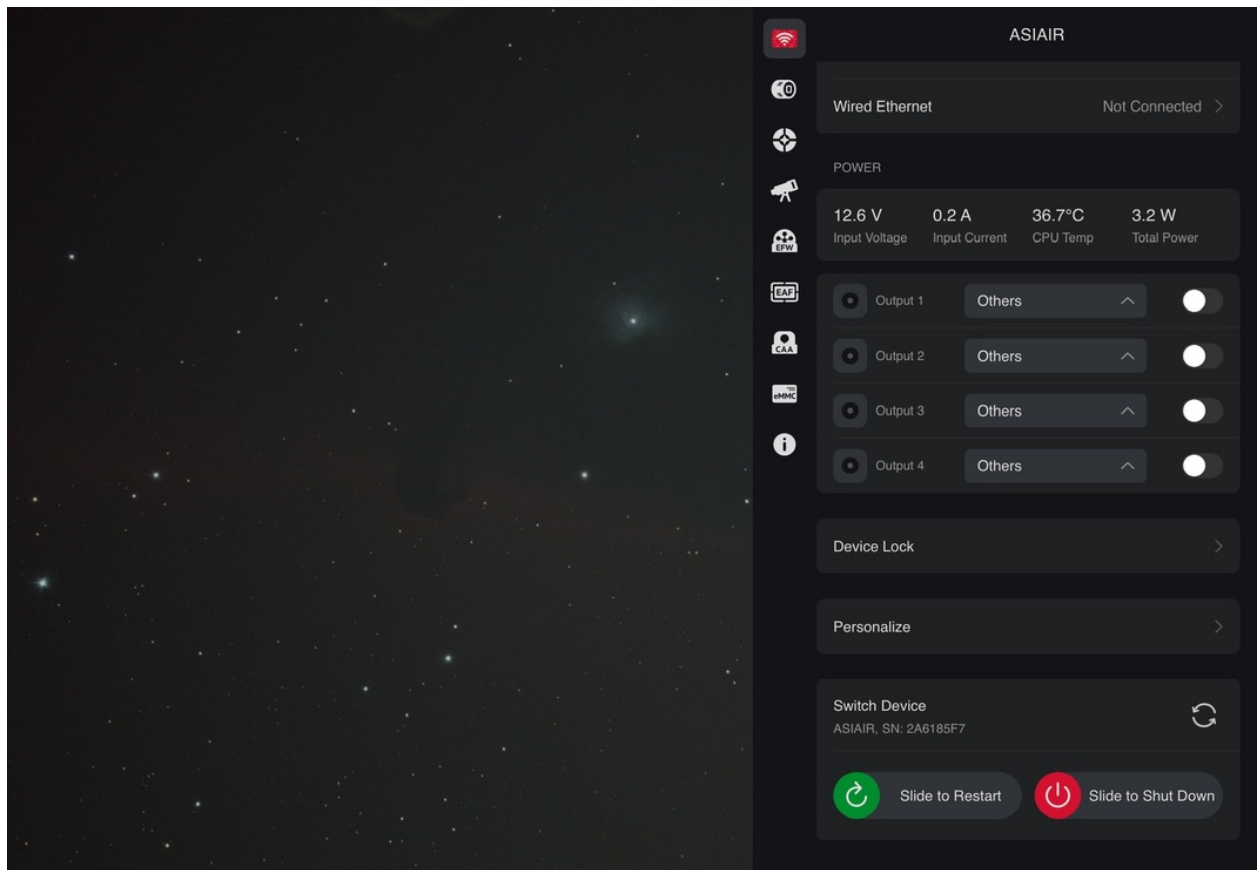


Figure 46. Select Shut Down...

20. When it all comes together – take screenshots

When you have a “magic night” when it all works, take screenshots of the settings before you packup. That way you have a starting point for next time especially if you want to tune the autoguider, camera settings, AUTORUN or PLAN settings.

21. But wait, there’s more...

21.1. Polar Alignment options

There are still more settings lurking under the green ASI Air “i” button at lower left, Figure 47. These are self-explanatory.

The **All-Sky Polar Alignment** is useful at locations where the pole cannot be seen directly by the scope; however personal experience suggests it is less accurate than the standard method.

21.2. Plate Solving options

New Plate Solve is intended for cases where very few stars (under 50) are captured. If left on, this may fail to solve where there are larger numbers of stars in the frame.

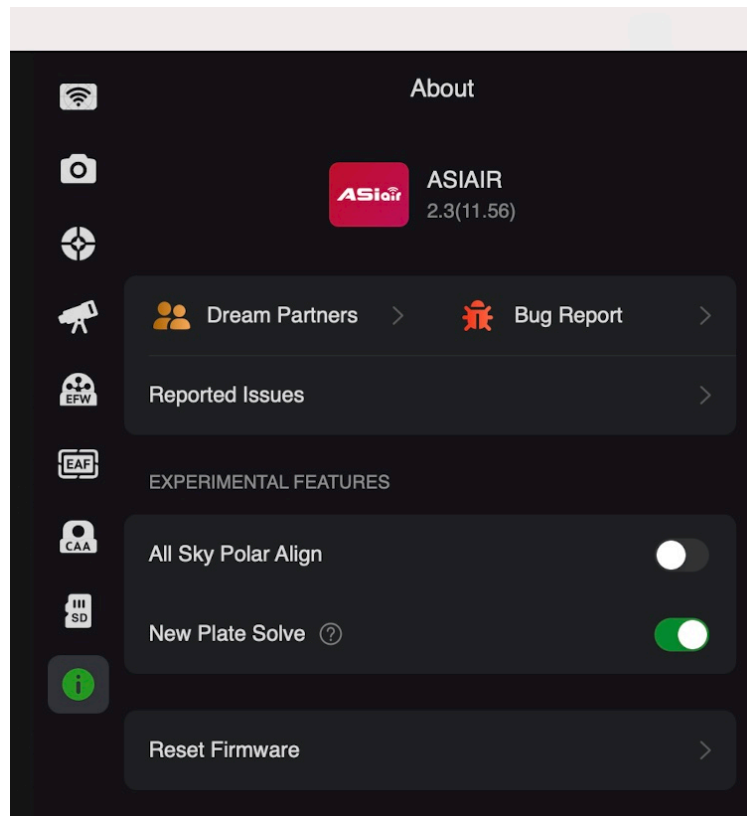


Figure 47. Miscellaneous ASI Air settings...

22. Report an Issue - ASI Air Bug Report

If you identify a bug in ASI Air take a screenshot if possible, and report the issue to ZWO.

You must have an account at <https://support.zwoastro.com>, and the device (phone or tablet) must be connected to the internet. To submit a bug report, open the “i” page and select **Bug Report** (Figure 48, Figure 49). This opens a dialog where you can attach up to 3 screenshots. The log data is not displayed.



Even if your device isn’t connected to the internet, you can still retrieve logs using the following method: After the issue occurs, long-press the “ASI AIR” icon on the app’s home screen to export the log file, then email it to: luffy.liu@zwoastro.com.

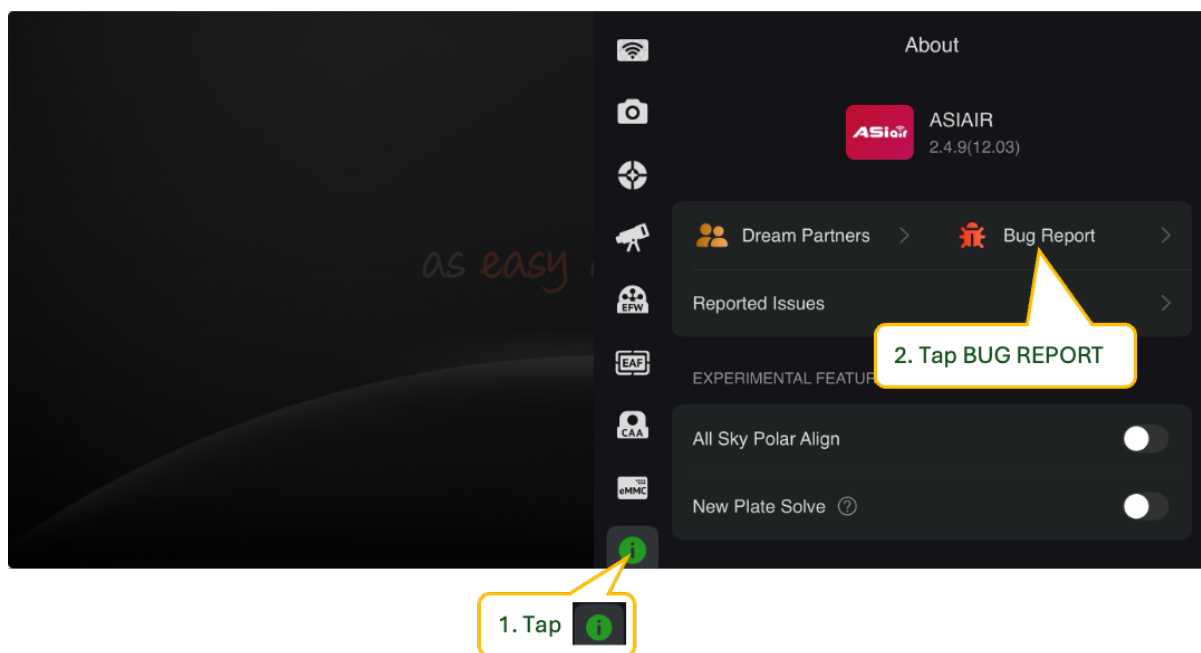


Figure 48. Submitting a Bug Report

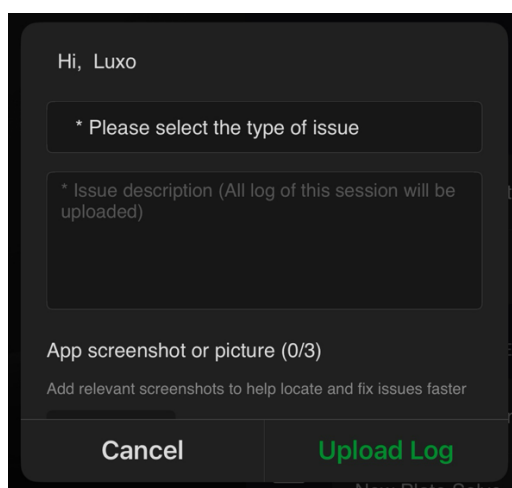


Figure 49. Submitting a Bug Report

23. Storage – USB or Micro SD Cards

Some models of ASI Air have a slot for a micro SD card. Removing the card and transferring it to a computer is by far the quickest way to extract images from the ASI Air. When a card is inserted ASI Air automatically uses this for storing images and logs, and the file structure is shown in Figure 52.

You can also use USB keys, however you may need to restart ASI Air after inserting the key.

24. Accessing images

24.1. Viewing/Saving images using the ASIAir App

You can view/save images from ASIAir by selecting the FILES icon (Figure 50), then **Image Management** and explore the folder/file structure there, and when you find an image (FITS file) tap that to open.

There are options (Figure 51) to save to your device (transfers to your photo app in the phone/tablet), delete, rename or GOTO the same location.

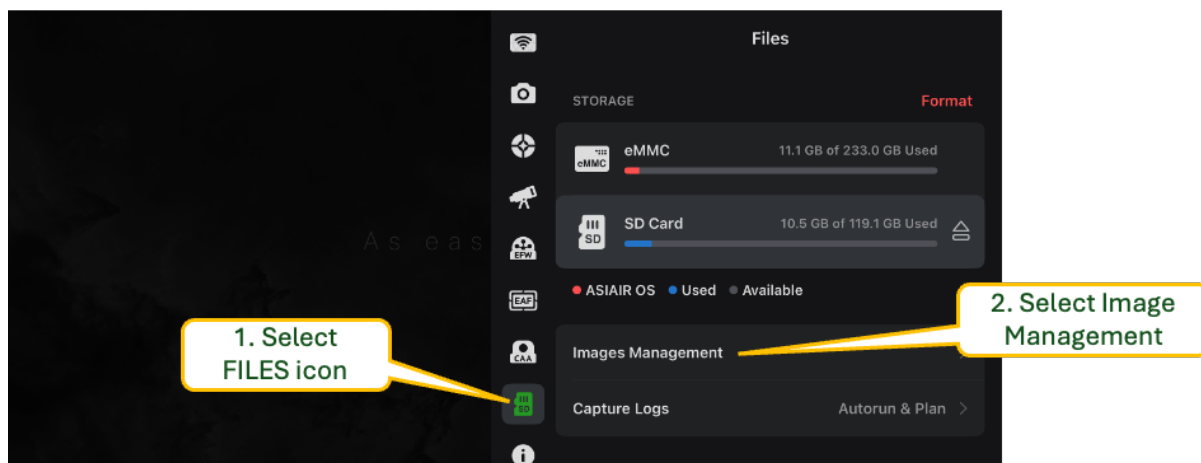


Figure 50. Selecting the FILES icon

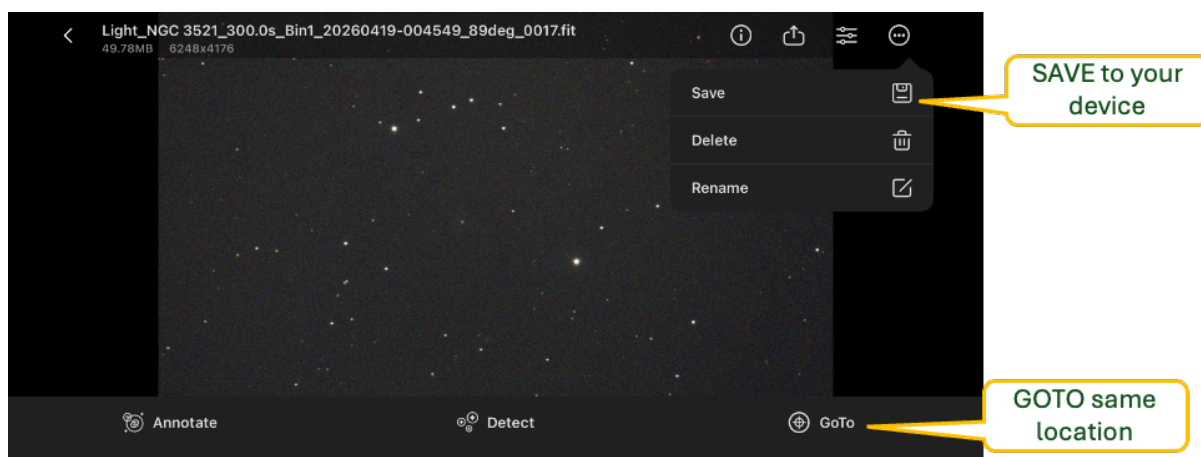


Figure 51. Image options

24.2. Transfer to a computer – via USB C port

MacOS Users

- 1. Open the Finder settings and make sure **Connected Servers** is **ON** (by default its off)
- 2. Power up ASIAir and connect to the Mac via a USB-C cable
- 3. You should see a volume **Untitled** mounted on the desktop - this is the ASIAir. Open that and explore the folders within (Figure 52).

If you miss step 1 it will not show on the desktop.

Windows users

- 1. Power up ASIAir and connect to the Mac via a USB-C cable
- 2. In Windows Explorer under **My PC** you should see a volume **Untitled** mounted - this is the ASIAir. Open that and explore the folders within.

24.3. Transfer to a computer – SD Card

If your ASIAir has a Micro SD card, extract that and insert in a desktop computer. Files can be transferred as usual. MacOS users may experience issues with deleting files, this is a permissions error and can be resolved using the Finder to reset the permissions on the parent folder and all files within. Note that images are stored as FITS files and JPG thumbnails.

Name	Date Modified	Size	Kind
ASIAIR	24 May 2025 at 7:14 PM	--	Folder
log	16 Aug 2025 at 9:24 PM	--	Folder
Autorun_Log_2025-08-16_202009.txt	17 Aug 2025 at 2:21 AM	20 KB	Plain Te
PHD2_GuideLog_2025-08-16_200100.txt	17 Aug 2025 at 2:21 AM	1.4 MB	Plain Te
Preview	19 Jul 2025 at 10:28 PM	--	Folder
NGC6302	19 Jul 2025 at 10:28 PM	--	Folder
Preview_NGC6302_2.0s_Bin1_20250719-212805_thn.jpg	19 Jul 2025 at 10:28 PM	16 KB	JPEG in
Preview_NGC6302_2.0s_Bin1_20250719-212805.fit	19 Jul 2025 at 10:28 PM	52.2 MB	Flexibl..
Autorun	24 May 2025 at 7:19 PM	--	Folder
Light	17 Aug 2025 at 1:51 AM	--	Folder
NGC7293	17 Aug 2025 at 2:18 AM	--	Folder
Light_NGC7293_180.0s_Bin1_20250817-011854_0010.fit	17 Aug 2025 at 2:19 AM	52.2 MB	Flexibl..
Light_NGC7293_180.0s_Bin1_20250817-011854_0010_thn.jpg	17 Aug 2025 at 2:18 AM	14 KB	JPEG in
M83	21 Jun 2025 at 11:47 PM	--	Folder
Live	3 Apr 2025 at 8:38 PM	--	Folder
Light	26 Jul 2025 at 9:03 PM	--	Folder
NGC6744	26 Jul 2025 at 9:08 PM	--	Folder
Light_NGC6744_300.0s_Bin1_20250726-200822_0002_thn.jpg	26 Jul 2025 at 9:08 PM	15 KB	JPEG in
Light_NGC6744_300.0s_Bin1_20250726-200822_0002.fit	26 Jul 2025 at 9:08 PM	52.2 MB	Flexibl..
Light_NGC6744_300.0s_Bin1_20250726-200321_0001_thn.jpg	26 Jul 2025 at 9:03 PM	15 KB	JPEG in
Light_NGC6744_300.0s_Bin1_20250726-200321_0001.fit	26 Jul 2025 at 9:03 PM	52.2 MB	Flexibl..
Plan	14 Feb 2019 at 10:12 PM	--	Folder
Video	14 Feb 2019 at 10:12 PM	--	Folder

Figure 52. ASIAir file structure

24.4. Extracting images from ASIAir internal EMMC memory – WiFi/ Ethernet

- Connect ASIAir to a 12VDC supply near your computer, and power up, or
- Connect to the ASIAir via WiFi, or via Ethernet to your network router, or
- Mount the ASIAir as a drive (Windows) or in MacOS, mount it as a SMB volume. It should be found at the address smb://10.0.0.1.

24.5. Analysing autoguider logs

Autoguider logs are stored in PHD2 format and can be analysed using the app “[phdlogview](#)” (macOS or Microsoft Windows) and install. This will open ASIAir guide logs and display them graphically for analysis. The files are text i.e. can also be read using a text editor.

25. Software issues

25.1. Support

ZWO have an active bulletin board where announcements such as updates, beta versions, new products and other issues can be discussed at <https://bbs.zwoastro.com> This appears to be the best place to stay up to date with known issues, and the latest stable release.

25.2. Reliability – or the lack of it

Unfortunately some versions of ASIAir have been buggy and unreliable. “Known good” versions of ASIAir include 2.3.3 with firmware 12.03, released in May 2025. Version 2.5 also appears reliable.

If you are experiencing issues try reverting to version 2.3.3, 2.2.2 or even 2.1.5.

25.3. Version numbers of the app/firmware are different !

When the ASIAir app connects to the ASIAir the app version and the firmware version are displayed, Figure 53. You can also find these under the “i” page (Figure 48). When your device has internet access and a software update is available the app will be updated through the App Store (iOS) or the Android equivalent.

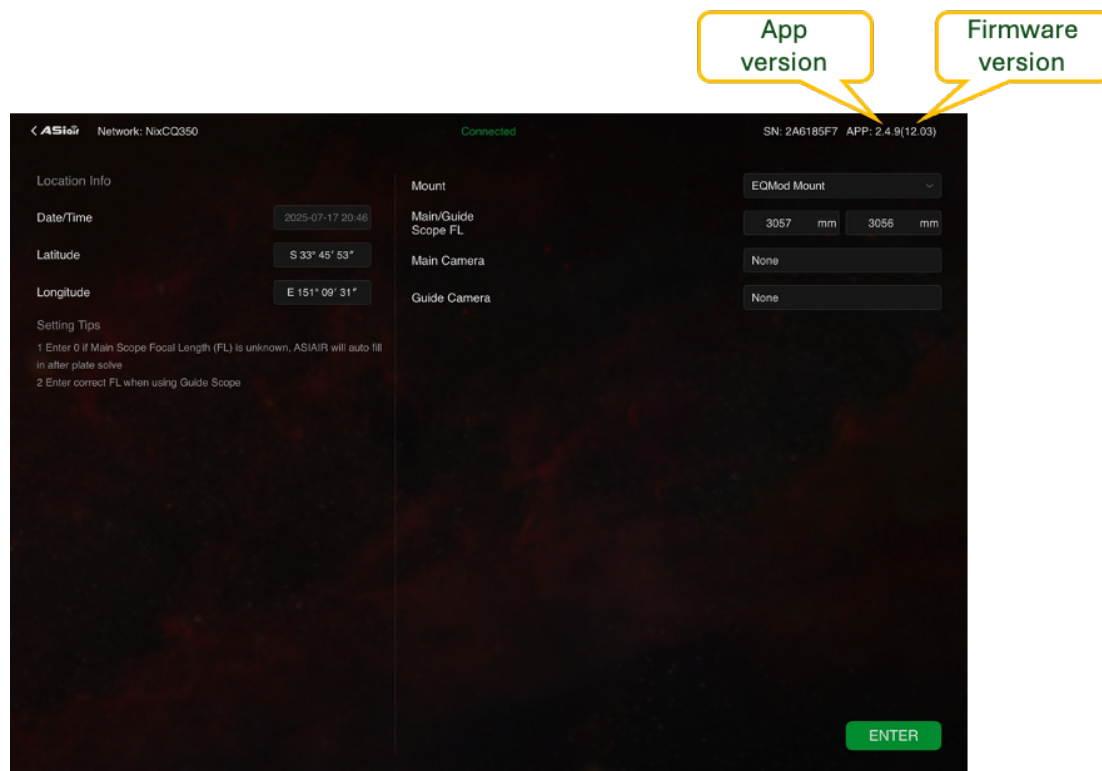


Figure 53. Software/Firmware versions

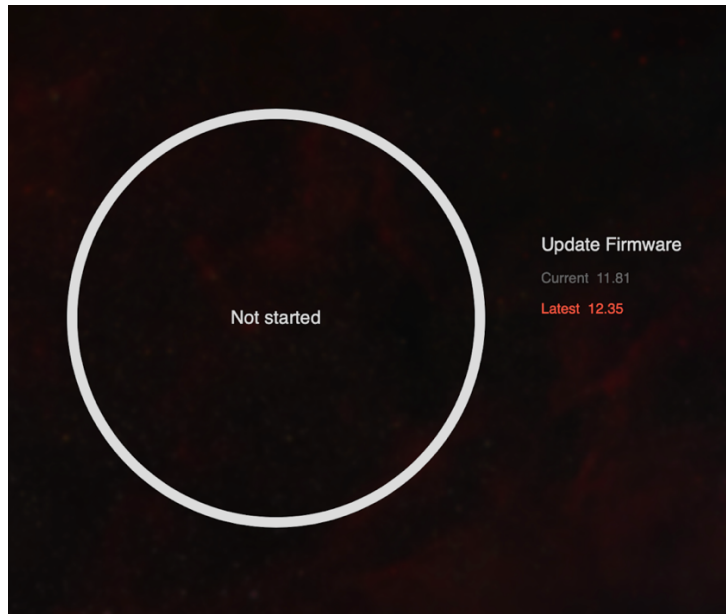


Figure 54. Firmware update

The matching firmware is stored within the app; upon connecting to the ASIAir it may advise that the firmware is to be updated (Figure 54) and commence installing. Note that the app version and firmware version numbers do not match.

Always make sure you are using the correct version of firmware matching the version of your app. While mixing other versions is possible the results are unpredictable.

25.4. Reverting to previous versions - iOS

If you are using iOS and have previously installed the ASIAir app, you can downgrade to any previously released version of ASIAir as follows:

1. Open the ASIAir app you are currently using, connect to ASIAir, and apply RESET FIRMWARE to remove that. Disconnect from the ASIAir, it will restart by itself, but do not reconnect.
2. To stop iOS overwriting ASIAir with the latest one, open the **System Settings**, choose General, choose **Software Update** and make sure **Automatic Updates** is switched **OFF**. You will still be notified when there are updates, and you can choose which apps to update or not.
3. On a Mac or PC, use a sideloading tool to install a specific version - such as iMazing from <https://imazing.com> - not the version from Apples App Store.
4. Connect your device to the Mac or PC and open iMazing (Figure 55)
5. Navigate to "**Manage Apps**"
6. Click the "**Library**" tab. This lists all those you have installed at some time. Select the desired app (**ASIAir**).
7. **Control-click (right-click) the ASIAir app** in the library to show the available versions available from the App Store...
8. Select a version and press the download icon. This will download that version from the App Store to your backup library. Note that you can download several versions (if you like) to the library.

9. Select the version you want to install and press INSTALL (lower right) to install on your iOS device.
10. When you launch the older version and connect to ASIAir it will install the matching firmware on the ASIAir, which will restart.
11. Once that has restarted, reconnect to ASIAir and you are ready to go.

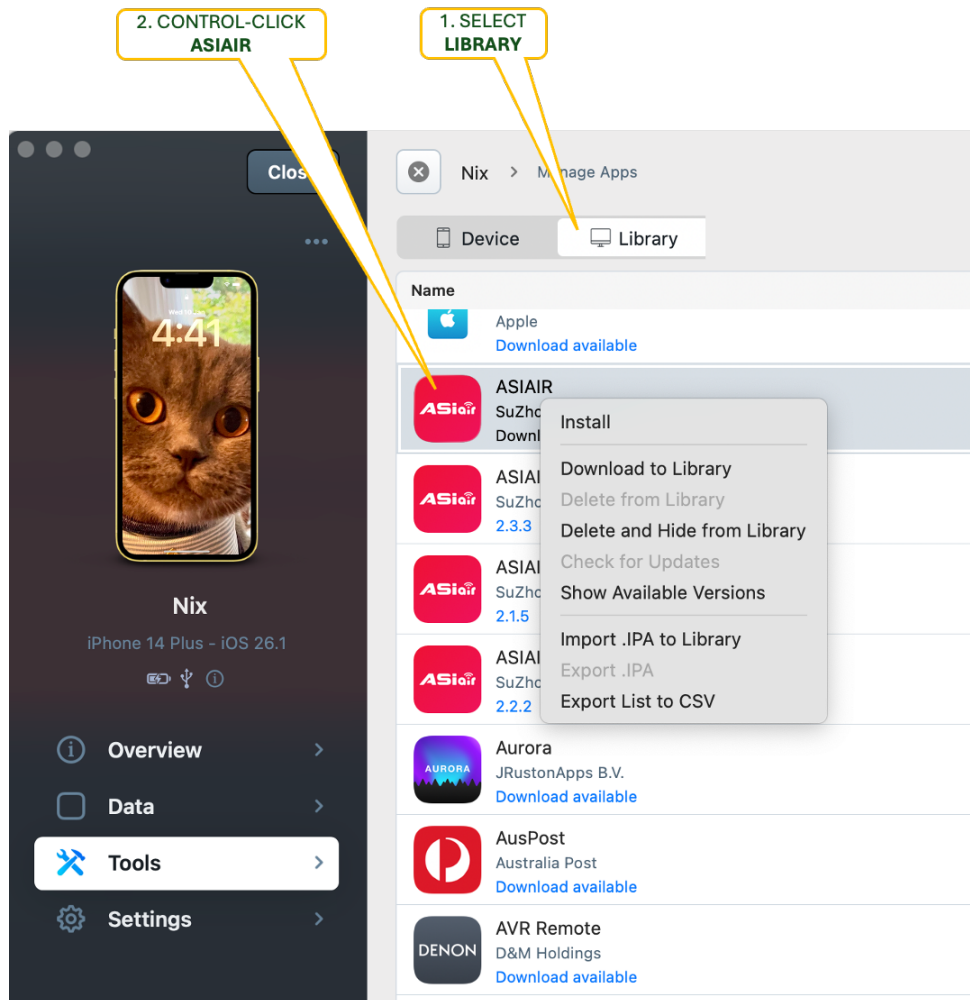


Figure 55. iMazing user interface

25.5. Reverting to previous versions – Android

If you are using Android and have previously installed the ASIAir app, you can downgrade to a previous version of ASIAir as follows:

1. Open the ASIAir app you are currently using, connect to ASIAir, and apply RESET FIRMWARE to remove that. Disconnect from the ASIAir, it will restart by itself, but do not reconnect.
2. Delete the ASIAir app.
3. Older versions are available from <https://apkpure.com/asiar/com.zwoasi.asiair/versions>. Download and install the version desired on your Android device.

4. When you launch the older version and connect to ASIAir it will install the matching firmware on the ASIAir, which will restart.
5. Once that has restarted, reconnect to ASIAir and you are ready to go.

25.6. Connecting ASIAir to a WiFi Base Station (Station Mode) or Network Router

Assuming you have set up a network with a Wifi Base Station or NAT router, proceed as follows.

- Assign a static IP address for your ASIAir in your base station or router within its subnet of addresses.
- Connect the ASIAir to a LAN port on the router using an ethernet cable or configure ASIAir to use Station Mode to join via the WiFi LAN. An ethernet cable provides a noticeably faster connection.
- Configure IP port forwarding in your router to forward ports 139, 445, 4400, 4700 and 4800 to the IP address of the ASIAir.
- When you open the ASIAir App start screen select "Connect via IP" and put in your router's external IP address. It should then find the ASIAir and connect to it.

If you are unsure of the address acquired by the ASIAir you will need a network analysis tool which can scan the network to find the devices connected, and the open ports. While ASIAir does not identify itself by name, it can be identified from the open ports, which are 22 (for SSH) 139 and 445 (for SMB file transfers).

26. EAF temperature sensor

The internal temperature sensor of the EAF is useless, since it is a sensor on the die of the microcontroller in the EAF, and does not measure ambient temperature -- the more the EAF is used, the higher the reading, and when its not in use its reading drops. The optional probe available from ZWO is a better way to measure ambient temperature outside the EAF, or make your own with a simple thermistor as described at <https://bbs.zwoastro.com/d/16601-eaf-hack>

27. ASIAir as an INDI Server

27.1. SkySafari, SharpCap and other software

ASIAir acts as an INDI server and will support connections from other popular astronomy applications such as SkySafari, SharpCap or KStars.

27.2. Limit it to 1 connection

While ASIAir can support simultaneous connections from multiple devices – smartphones, tablets, laptop computer etc. use only 1 device to control the mount – i.e. polar alignment, slewing and GOTO. If multiple devices are used, each is unaware of slewing commands issued by other devices and you will find the scope pointing in unpredictable directions, or worse, crashing into the ground/pier/tripod.

Appendix 1 – ASIAir 2.5

ASIAir 2.5 adds several features some will find useful:

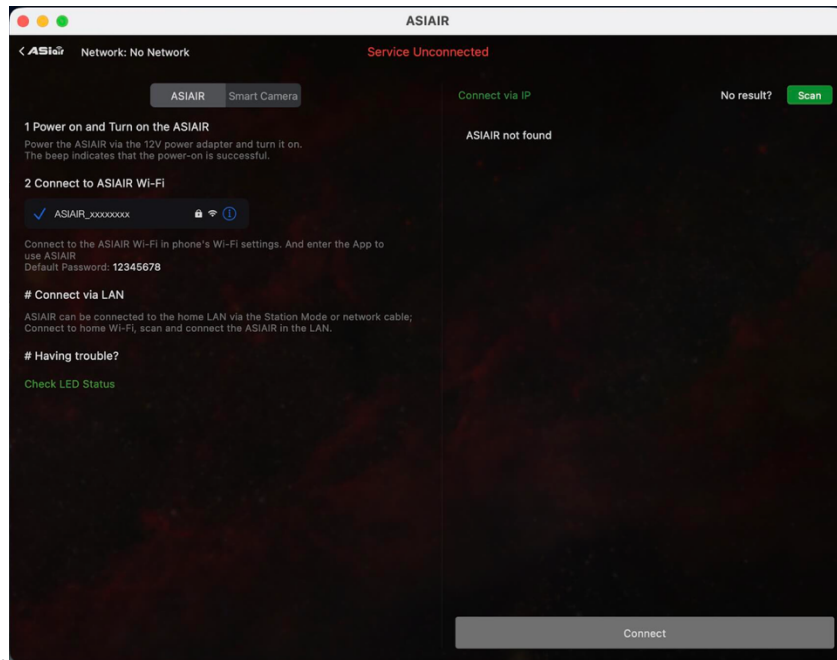
1. Enhanced Mount Control (ASIMount only)
 - Added mount parking feature
 - Autorun and Plan tasks now support setting "Park" as an end event for the mount
2. Support for Setting and Using Filter Offsets
 - After switching filters during Autorun or Plan mode, ASIAIR will auto-adjust the EAF focus position based on preset filter offsets
3. New One-Click Save Function in Capture Page - Quickly save the current capture target as a custom celestial object
4. Support temporarily skipping firmware upgrade
5. Create and Manage Frequently Used Equipment Positions from the Home Page
6. Image Information Management
 - Supports including the camera angle in the FITS filename and header
 - Expanded details in image info pages: includes shot time, file information, object information, camera settings, and file path
7. Supports setting power light status and adjusting fan speed for cameras including ASI2600MM/MC DUO, ASI2600MM/MC Pro and ASI6200MM/MC Pro released in 2025, ASI4400MC Pro, ASI2600MM/MC Air, and ASI585MM/MC Air
8. New Features in the Celestial Object Library
 - Ability to edit custom celestial object names, types, and coordinates
 - View detailed information about celestial objects
9. Enhancements in Plan Mode
 - Added "astronomical twilight" option for start times
 - One-click function to clear the current task sequence

You can [download further details](#) of the changes.

Appendix 2 - Known issues

A2.1. Freezes/crashes - 1

The ASIAir firmware isn't completely reliable and is prone to freezing. If this occurs and when a reconnection is attempted the app displays "SERVICE UNCONNECTED" (below).



To recover quickly:

- Do not touch the mount.
- Switch the ASIAir power OFF.
- Count to 10 (a short delay is needed).
- Switch power to the ASIAir ON and wait for the beep indicating it has started.
- Reconnect the app to ASIAir, reconnect mount and cameras, etc.
- Select the MOUNT pane and press SYNC TO MOUNT. This will restore the settings for date, time, location and the current position of the mount.
- A GOTO to your target should move the scope back to the target.

A2.2. Freezes/crashes - 2

Freezes/crashes can also be the result of overloading the 12V outputs from ASIAir, for example heater straps drawing more than 1A, or using these ports to power a large mount, the ASI2600 or ASI6200 series cameras. In these cases power the devices directly from the battery, not ASIAir.

A2.3. USB connections unstable - devices disconnecting

Unstable USB connections can result from two causes:

- Poor-quality USB cable – swap the cable for a different one;
- USB devices overloading the USB port. For example, connecting EAF and CAA to an ASI2600 camera then the 2600 to ASIAir. The EAF and CAA contain stepping motors and can draw a lot of power from the USB port. A better solution is to connect EAF directly to the ASIAir, or use a **powered USB hub**.

A2.4. Unreliable WiFi connection

The WiFi signal on ASIAir is weak and many users have reported very limited range outdoors. There is a known issue where the ASIAir app will freeze when there are multiple ASIAir units within 20m of each other.

- If possible, choose a location at least 50m away from other ASIAir users.
- If the ASIAir app freezes, restart your device (tablet or phone) and reconnect. The ASIAir itself should be running as usual.
- If the ASIAir unit beeps, it has performed a cold reboot. Reconnect.
- Review where you have placed the ASIAir – if there are large metal objects (mount, telescope tube, or mirrors) close to the antenna, these will block the signal. Relocate it accordingly.
- Try a high-gain WiFi antenna. Some antennas are better than others and there is an element of trial and error here.
- Acquire a portable WiFi base station or router, connect and configure ASIAir to use “station mode” in which it will connect to the WiFi LAN, or connect it with an ethernet cable. See 25.6. reconfiguring the base station / router.

A2.5. Multiple WiFi connections and (in)security

While ASIAir can accommodate WiFi connections from more than 1 device I have yet to find a scenario where this is desirable and considering most users do not change the default WiFi SID or password, accidental connections can be an issue at a crowded observing site with many of these devices in proximity. Strongly recommended:

- Change the WiFi SID to something easily identifiable such as “My XYZ Scope”.
- Change the WiFi password.

A2.6. ASIAir app unable to connect (MacOS)

To use the ASIAir app on Apple Silicon macs, in the **System Preferences** select **Privacy & Security**, add the ASIAir application and set **Allow to communicate** with devices on your local network to **ON**. By default, this is OFF.

A2.7. ASIAir does not detect camera

Issue 1: Poor-quality USB3 cable. Try a different cable - the ZWO ones appear good but others I’ve tried are not. Also consider using a shorter USB3 cable.

Issue 2: While ASIAir can power a main camera and guide camera (e.g. ASI2600 and ASI220) on one USB port, attempting to run an ASI2600MC DUO (with internal ASI220) and an ASI120MM Mini on one port may be unreliable – one camera will not be detected. Similarly, daisy chaining an ASI533 to an ASI2600 will result in one camera not being detected. Some cooled cameras may appear to work off USB alone but do require 12VDC supply. Connect each camera directly to the ASIAir USB ports.

Issue 3: Cooled camera does not have 12V supply. Connect the 12VDC power supply to the camera. If you have connected a 12V output from ASIAir to the camera, enable the corresponding 12V output in the ASIAir app.

A2.8. ASIAir does not detect guide camera

Issue: Daisy-chaining a guide camera (ASI120 or 220) to a USB port on the main camera may result in ASIAir being unable to connect the guide camera reliably. Connect each camera directly to ASIAir.

A2.9. Plate-solving fails during GOTO

Issue: Field contains too few stars - Solutions:

- Stop the GOTO and complete the positioning manually.
- Increase the exposure time on the mount pane ("Centre EXP Duration") to 5 or 10 secs,
- Increase camera gain.

Issue: A large bright nebula or star cluster dominates most of the field such as M42, or Omega Centauri. In these cases, platesolving may not work and you will have to position the scope manually in the star atlas without plate-solving.

Issue: Field less than 30 arc minutes wide. Use a scope with shorter focal length or switch plate solving off for GOTO.

A2.10. Polar alignment – plate-solving fails

Issue1: Platesolve fails, reporting fewer than 50 stars.

- Too few stars – less than 40 - increase camera gain or exposure time.
- Check the mount is within 5 degrees of the celestial pole, and readjust altitude/azimuth;
- Out of focus - In PREVIEW mode, check stars are well focused.

Issue 2: Platesolve takes a long time then fails, large number of stars reported. In this situation the camera gain is probably too high resulting in a noisy image, and the noise or hot pixels are being detected as "stars". In PREVIEW mode, review your image and make sure it shows a dark background with real stars, and is not noisy.

A2.11. Polar alignment – mount does not rotate

Issue: Loose cables or no power to the mount. Check cables and mount connection and that power is on.

A2.12. Polar alignment – mount rotates the wrong way

Issue: ASIAir has not been synced to the mount when the scope was in the PARK position. In the mount settings, PARK the scope, then press "Sync to mount".

A2.13. Scope slews into the ground

Issue: ASIAir has not been synced to the mount when the scope was in the PARK position. In the mount settings, PARK the scope, then press "Sync to mount".

Issue: Using the mount handset or a second device to slew the mount. In this situation ASIAir is not aware of the new position. Solution: Only use 1 device to control mount position (GOTO etc.).

A2.14. GOTO – not permitted

Issue: Main camera is exposing (in PREVIEW, AUTORUN, PLAN or EAA mode). Stop the main camera exposing.

A2.15. Mount tracking stopped

Issue: Tracking is switched off by default when the scope is parked, and must be manually turned on.

Issue: Mount has stopped at the meridian and a meridian flip is imminent (normal behaviour).

Issue: Software bug. Some versions of ASIAir have a habit of turning tracking off unexpectedly. Check the mount settings and turn it back on.

A2.16. Main Camera – blurred or hazy images

Issues:

- Poor focus,
- Poor guiding,
- Poor collimation of your scope.

A2.17. CAA rotates unexpectedly

Issue: CAA is enabled and it rotated after a meridian flip. Disable CAA in ASIAir (leave USB and handset connected for manual operation).

A2.18. Egg-shaped stars

Issue: Fan vibration (cooled cameras).

Issue: Egg-shaped stars from the main camera – this indicates flexure is occurring between the piggyback guide camera and the main camera. Either:

- Makes sure both the main scope are rigidly attached, ideally with rings.
- Try an Off-axis guider (OAG), or On-axis guider.
- Use a DUO camera with the guide camera integral with the main camera.

A2.19. Guider – “Guiding” but stars slide out of the guider

Issue 1: The guider may lock onto hot pixels as “stars” if the camera gain is high – this is likely if the image appears noisy. Reduce the gain and try again.

A2.20. Guider – not guiding

- Guider not calibrated, or restored from a previous session, or calibrated on the wrong side of the meridian – recalibrate
- Did not settle
- DEC guiding is incorrectly set to NORTH or SOUTH, should be set to AUTO.
- Star too faint (below 50) due to the guide camera exposure being too short, or the gain too low.

A2.21. Guiding – RA guides OK, but declination slowly drifts off

Issue: DEC guiding is incorrectly set to NORTH or SOUTH, should be set to AUTO

A2.22. Guiding - very rough declination guiding

Issue: Mount has significant backlash in declination, consider adjusting (minimising) this.

A2.23. Guiding oscillates, does not settle or loses the star

Issue: Closed-loop gain of the guider is too high, see section 11.15.