

QHYCCD

PoleMaster

A high precision, easy to use electronic polar scope

Instruction Manual (EN)

Northern Hemisphere



PoleMaster User Manual (Northern Hemisphere)

1. Hardware Installation

1.1 Attach the PoleMaster camera unit to the quick install plate using the three bolts supplied. In the case of the AZ EQ5-GT and Mesu mounts, attach the PoleMaster camera unit directly to the mounting plate.

1.2 With the exception of the AZ EQ5-GT and Mesu mounts, attach your PoleMaster's base mount on to your mount. In many cases, this will be achieved by placing the base mount in the exit hole of your mount's existing polarscope tube and using an Allen key to tighten the inner screw(s) to lock the adapter in place.

For other mounts, you may need to use one or more bolts to secure the base mount in the correct position on the face of the equatorial mount.

1.3 Attach the USB cable to the camera and tighten the two cable retaining bolts

1.4 With your mount in the park position (weights down, telescope pointing up), stand to the north of the mount facing south. Insert the quick install plate into the base mount adapter ensuring that the USB socket faces to the left (east). This position aligns the PoleMaster's sensor correctly and makes azimuth and altitude adjustments during polar alignment more intuitive as the up/down directions on the image will be the mount's elevation angle directions and the left/right directions will be the azimuth angle directions without there being too much adverse interaction between the two. Furthermore, when carrying out the atmospheric refraction calibration, which is required for locations with a latitude of below 40 degrees, this orientation is vital.

1.5 Tighten the thumbscrew and make sure that the quick install plate is secured.

In future alignments you can simply install/uninstall the PoleMaster with the a quick install plate/PoleMaster combination. However, always ensure that the USB cable faces to the east after installation.

1.6 Adjust the altitude of the mount to match your local latitude and adjust the azimuth so that it is pointing in the direction of north as identified by the presence of the magnitude +1.97 star, Polaris

2. Software Installation

PoleMaster requires two pieces of software, the camera's driver software and the PoleMaster application software.

These can be download from <http://www.qhyccd.com/PoleMaster.html#PoleMaster>

2.1 Unzip the two downloads and run POLEMASTERDriver*****.exe to install the camera's driver

2.2 Run PoleMasterV*.*.*Setup.exe to install the PoleMaster application software

2.3 Attach the USB cable to the camera and tighten the two cable retaining bolts

2.4 Attach the other end of the USB cable to a spare USB 2.0 socket on your PC and wait for the system to identify the camera

3. Focusing

Each PoleMaster's lens is focused at infinity before shipping from the factory. However, if for some reason re-focusing is required, the lens can be focused manually.

Focusing steps:

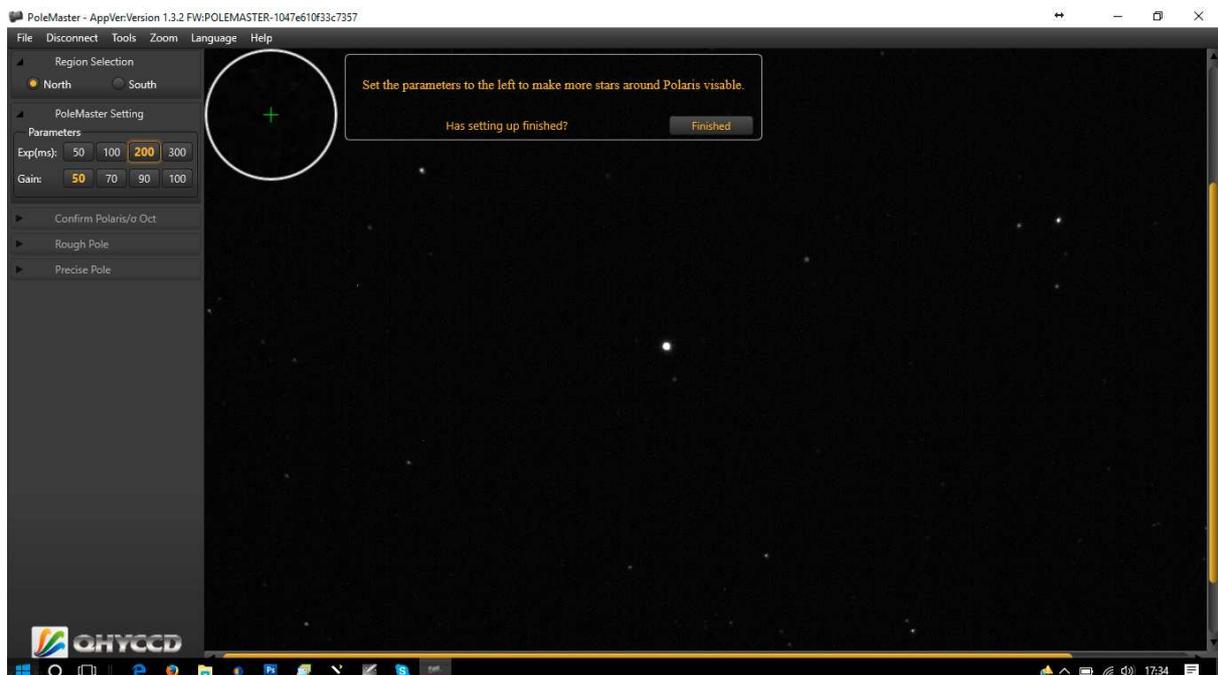
- 3.1 Point the PoleMaster at the magnitude +1.97 star, Polaris
- 3.2 Remove the front protective tube by carefully unscrewing it while holding the camera base firmly
- 3.3 Use an M2 Allen Key to unscrew the set screw (focus locking screw) on the side of the lens barrel
- 3.4 Rotate the lens in or out until the star is correctly focused i.e. bright and small
- 3.5 Retighten the set screw and reinstall the protective tube removed in step 3.2

4. Software Operation

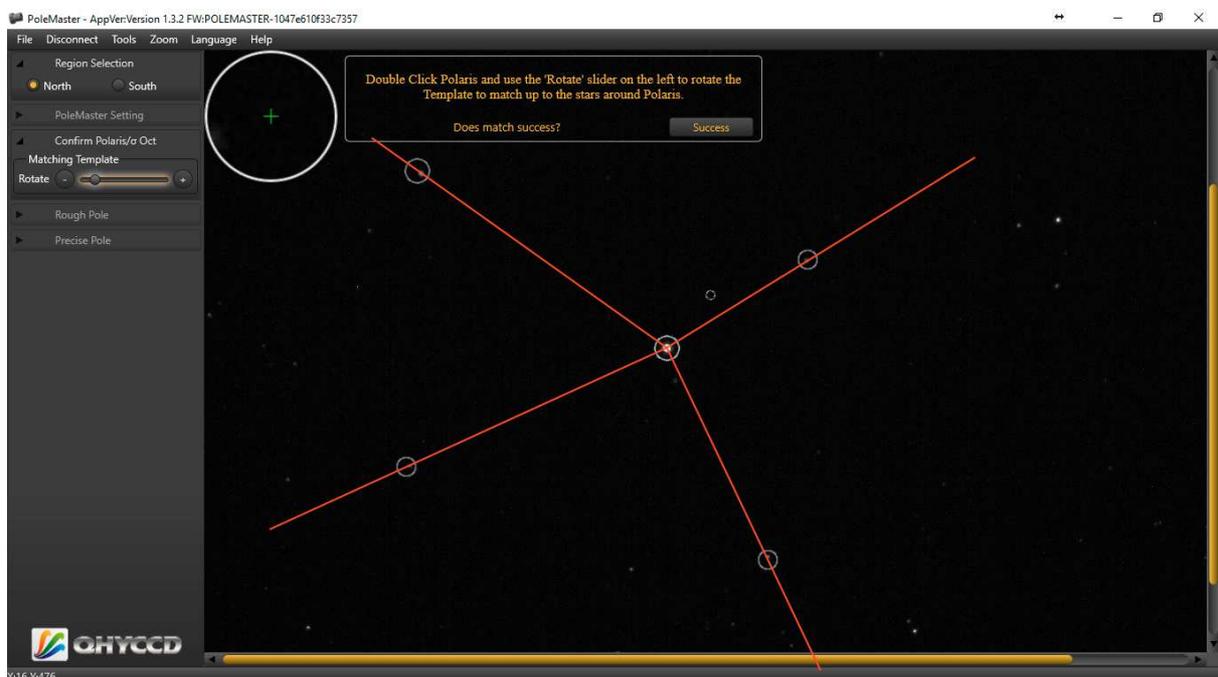
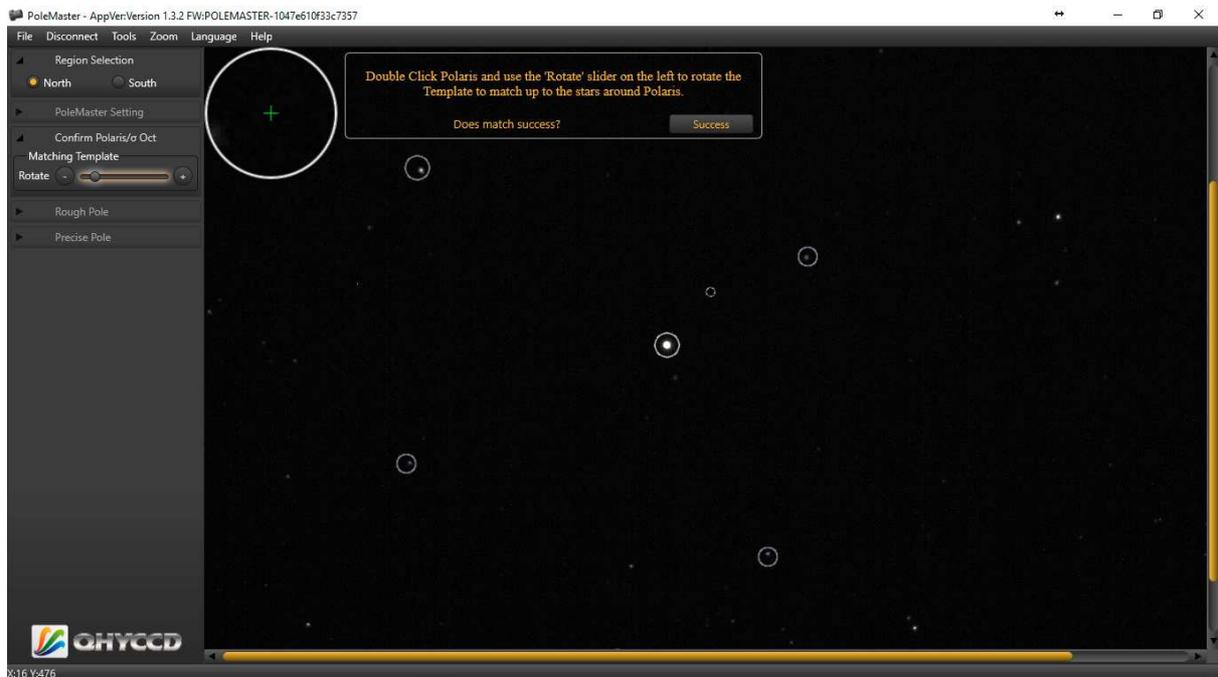
Some of the operations here will lead to multiple dialogue screens, simply follow the instructions shown on each screen.

- 4.1 Ensure that the PoleMaster USB cable is connected to both the camera and the PC's USB ports
- 4.2 Set your mount to the 'Park' position
- 4.3 Run the PoleMaster application and select *Connect* from the top menu bar

The PoleMaster camera has a wide field of view (11 degrees * 6 degrees), so you should now be able to identify Polaris in the image. If no stars are apparent, adjust the gain and exposure time by clicking on the relevant buttons at the left hand side of the screen until the stars are clearly visible. When you can see a good selection of stars, click on the **Finished** button.



Double click on the bright star Polaris and rotate the template that appears by using the Matching Template slider at the left hand side of the screen or you can use the **+** and **-** buttons, up and down cursor keys on your keyboard, left and right cursor keys on your keyboard or your mouse's centre roller button. If each white circle in the template aligns with a dimmer star then you can be sure that you have chosen the correct star for Polaris. Align these circles accurately on the relevant stars as this process is also the start of the rotation centre calculation. Because of manufacturing tolerances and, therefore, slight differences in the focal lengths between the lenses supplied with the PoleMaster, the stars may not appear in the exact centre of each white circle. This is not critical, just achieve the rotation that averages the star positions most evenly by imagining lines drawn from Polaris through each white circle as shown below. Click on the **Success** button when you have the best alignment.



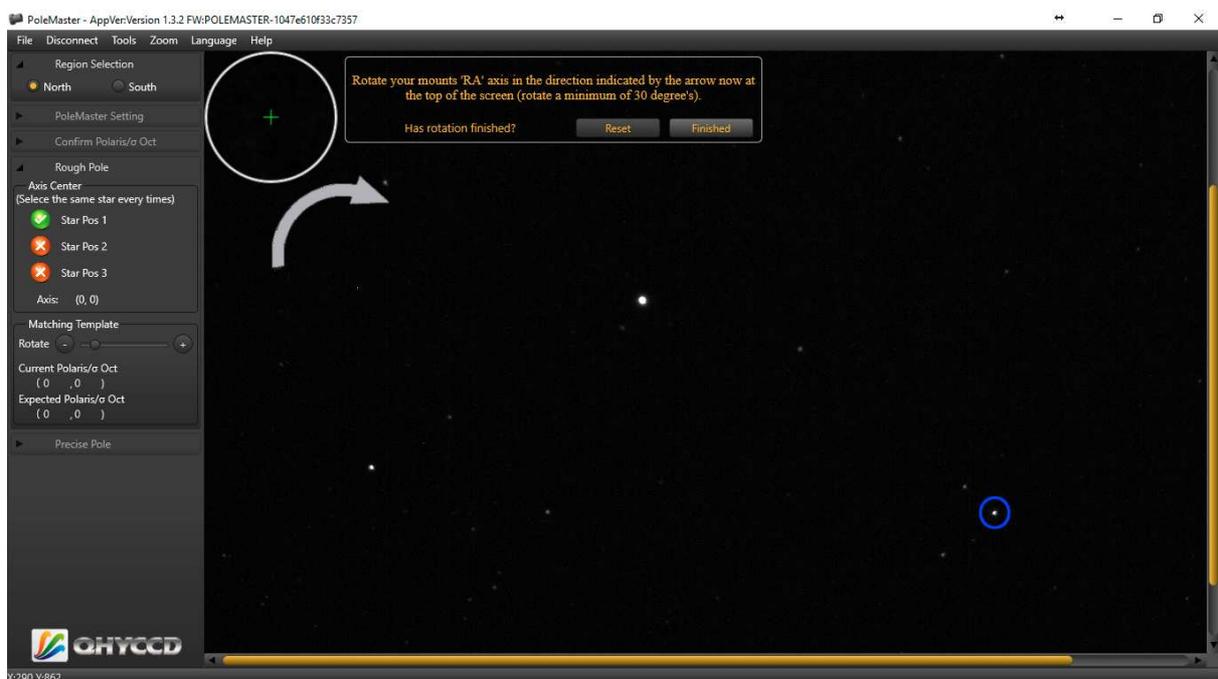
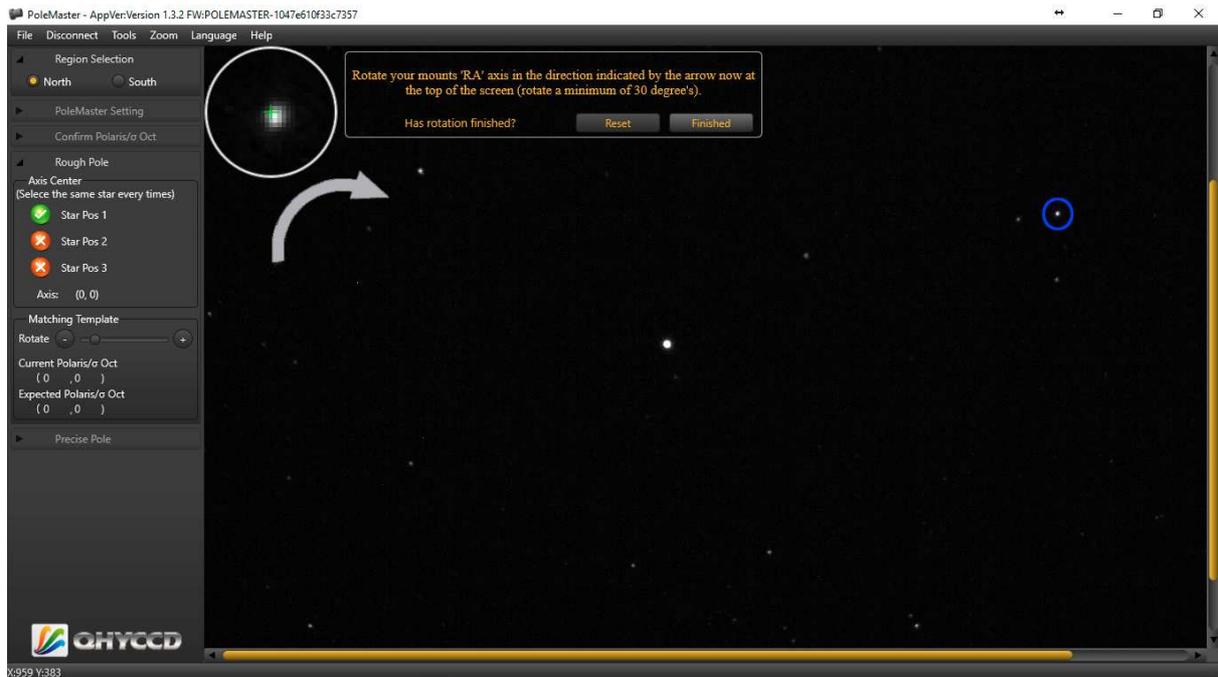
5. Calculate the rotation centre

The centre of rotation is the point in the sky around which the Right Ascension (RA) axis rotates. The aim of Polar Alignment is make this point coincident with the North Celestial Pole (NCP), the point in the sky that represents the axis of the Earth's rotation.

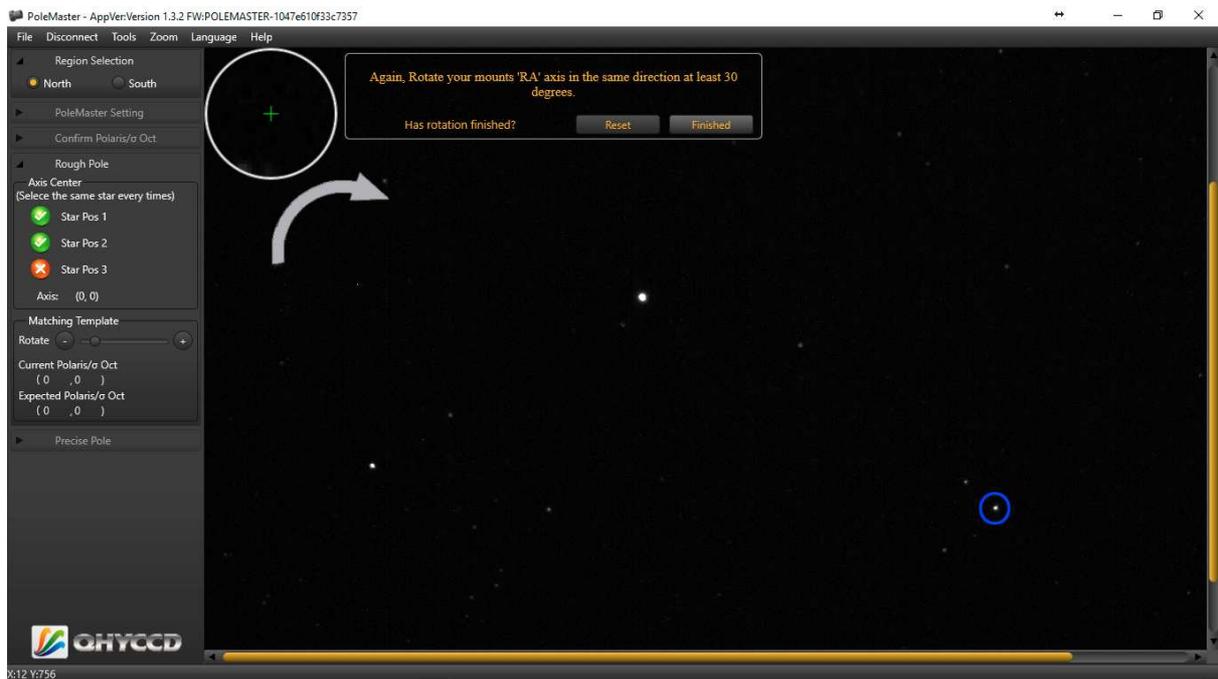
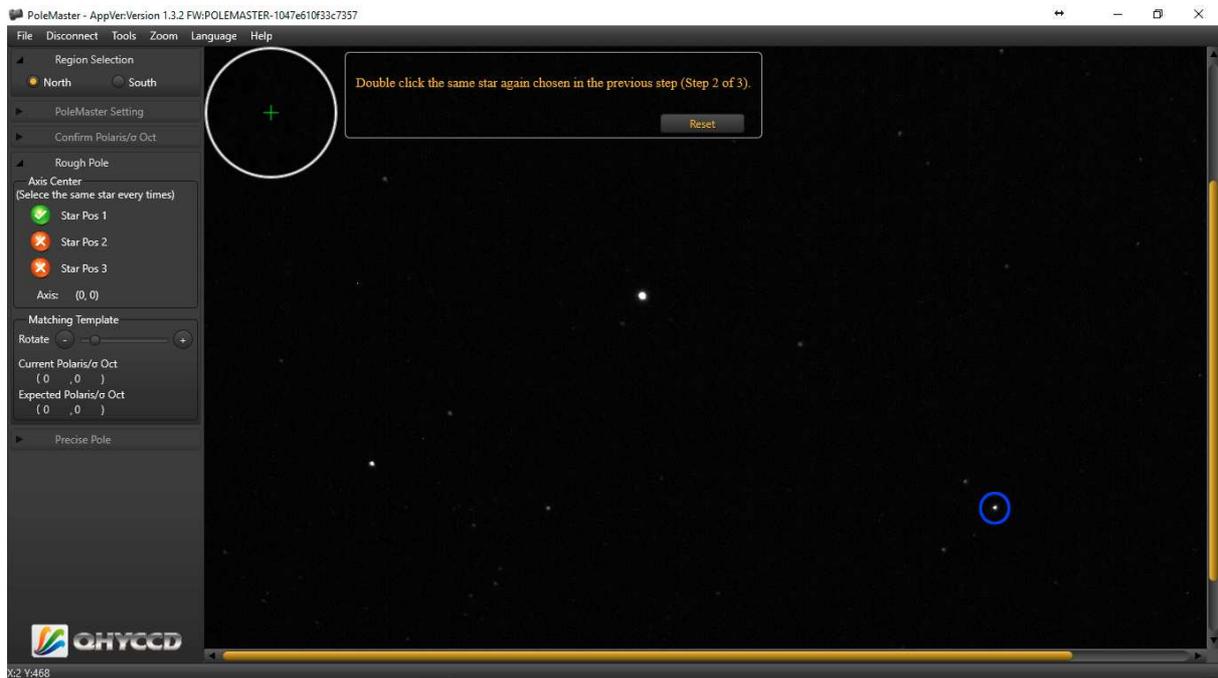
If this is your first PoleMaster alignment, follow steps 5.1 – 5.10. If your installation is permanent and this is a subsequent PoleMaster alignment and you haven't moved the PoleMaster camera, you will be asked if you want to use the last calibration click on YES to start the 'Precise Polar Alignment' process from 5.9 onwards.

Rough Polar Alignment

5.1 Use your mouse to select a star (other than Polaris!) that is not too close to the edge of the field of view and not too close to Polaris. Once selected, 'Star Pos 1' at the left hand side of the screen will have a Green Tick alongside it. The blue circles shown in the following images are not shown on the PoleMaster screen, they are presented here simply to highlight the chosen star.

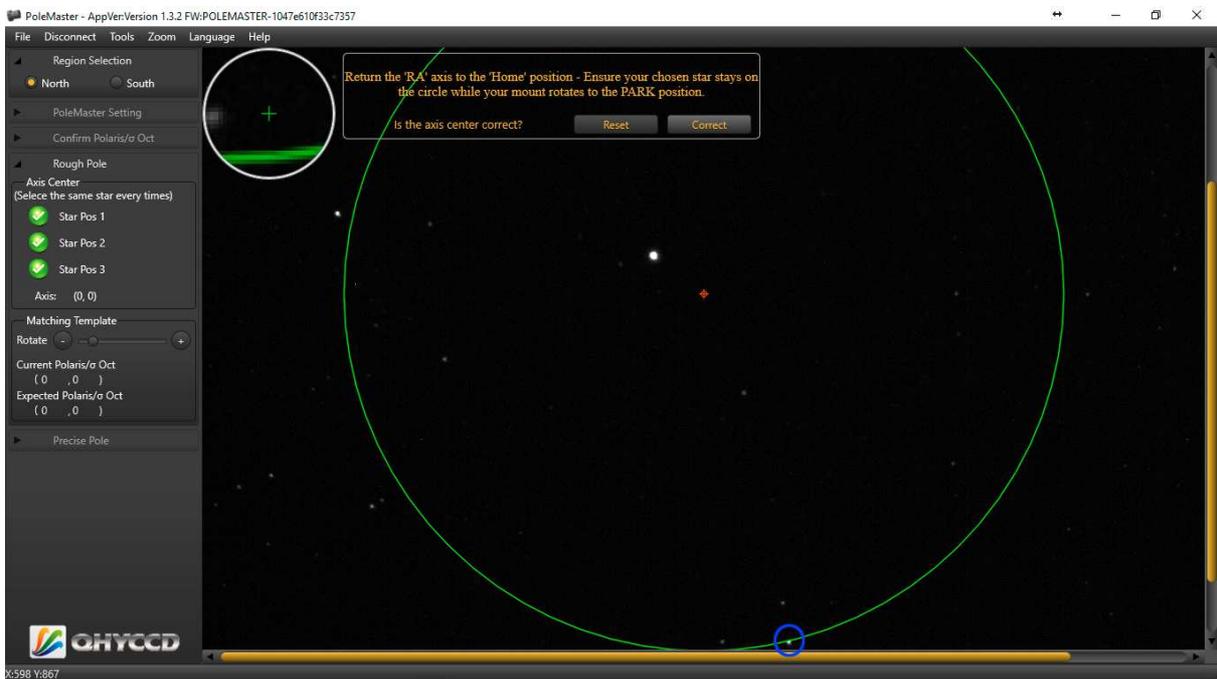
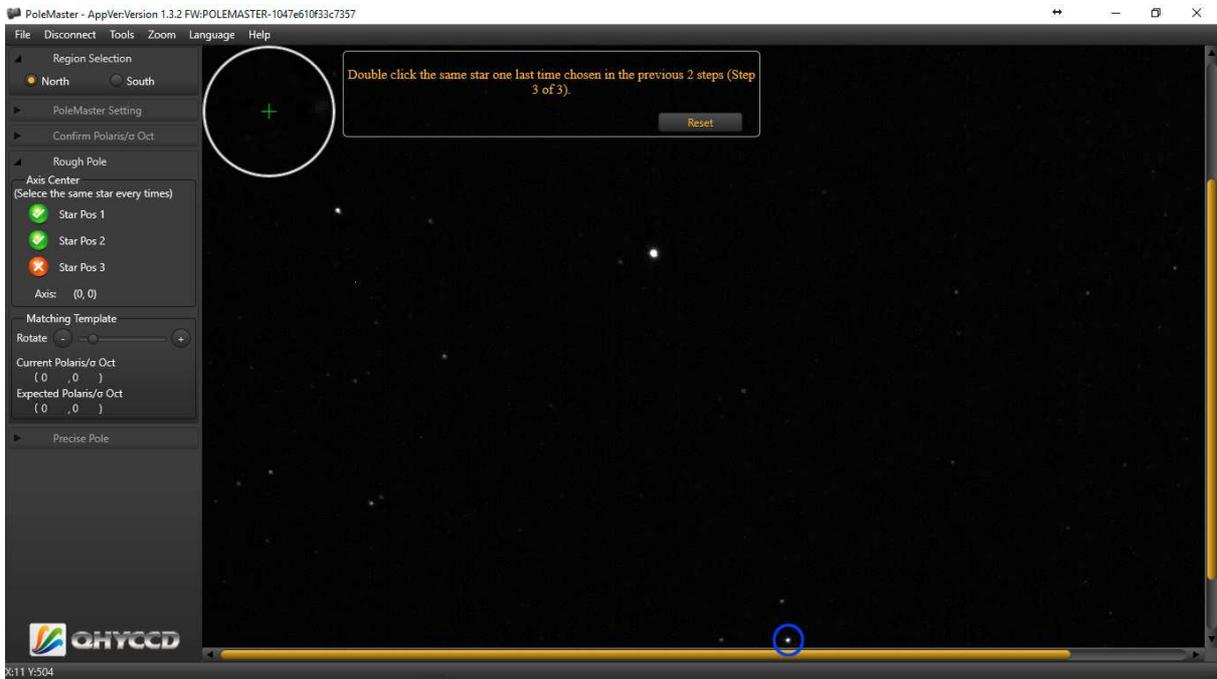


- 5.2 While keeping an eye on the chosen star, use your mount's handset or the virtual controls on your mount's control software, to rotate the mount in RA between 30 and 45 degrees following the direction of the arrow shown on the image. **Do not release your mount's clutch and rotate by hand as this may disturb the RA axis slightly.** Click on the original star's new position. Once selected, 'Star Pos 2' at the left hand side of the screen will have a Green Tick alongside it.

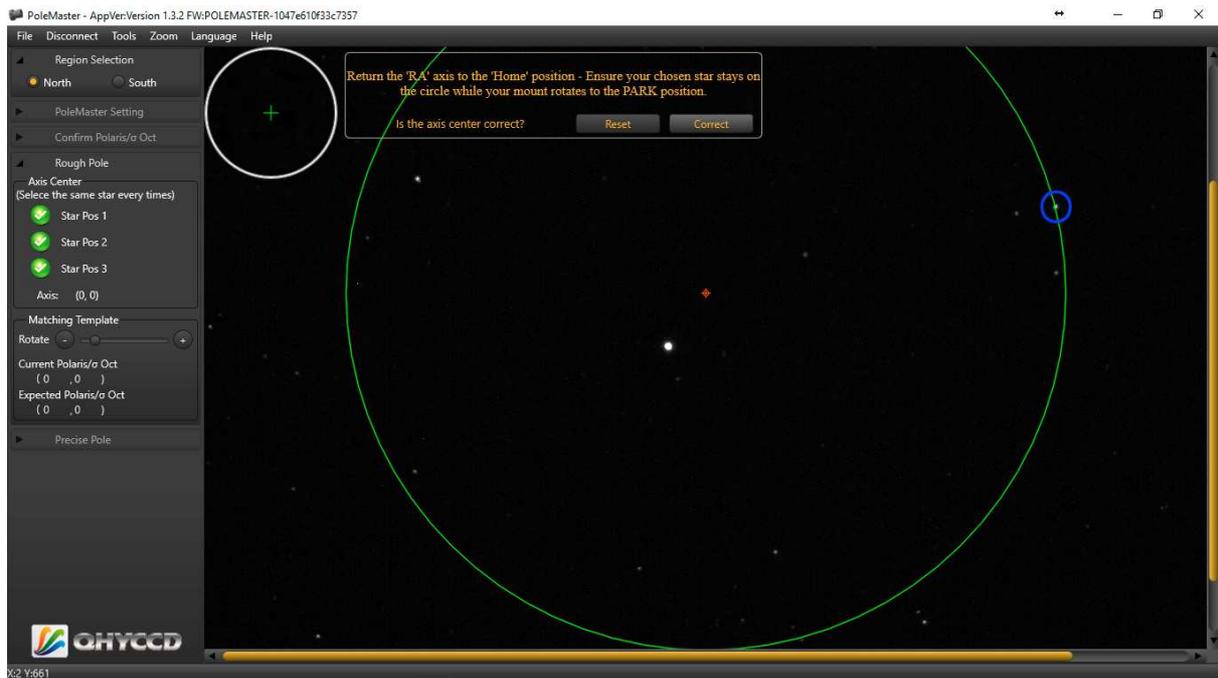


- 5.3 Rotate the RA axis a further 30 – 45 degrees. Select the same star in its new position for a third time, 'Star Pos 3' at the left hand side of the screen will have a Green Tick alongside it.

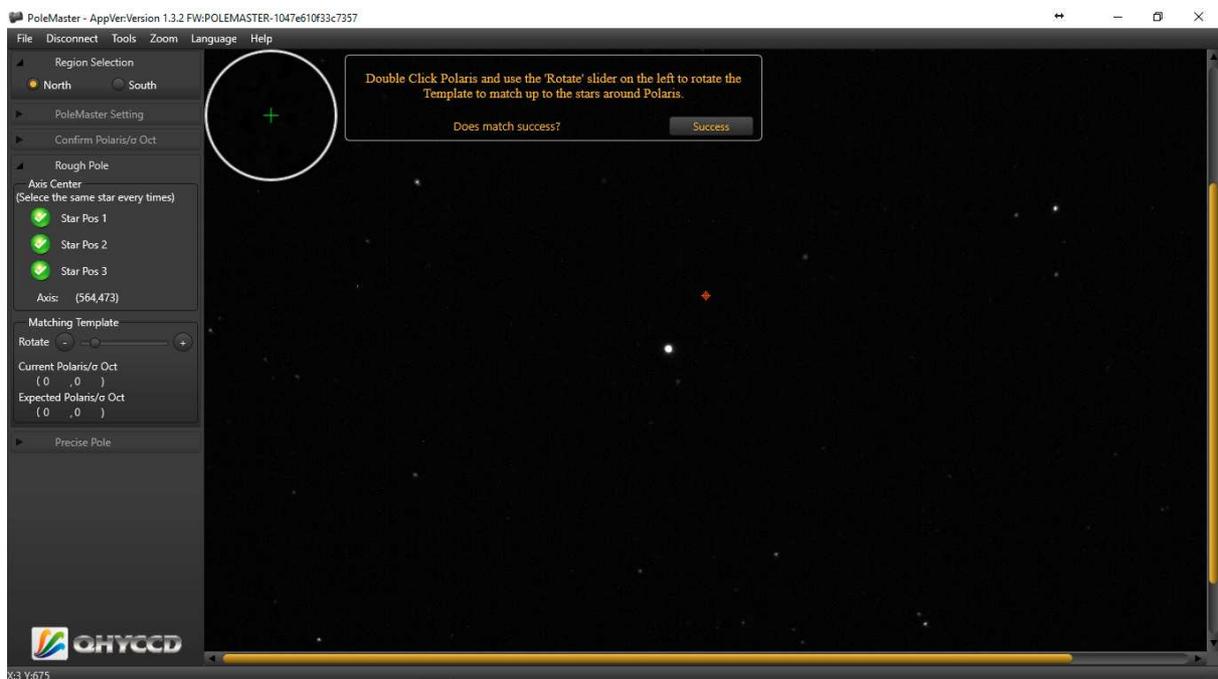
The software will draw a large green circle on the screen just touching your chosen star. This circle will be used to confirm that the centre of rotation has been calculated correctly by the previous process.

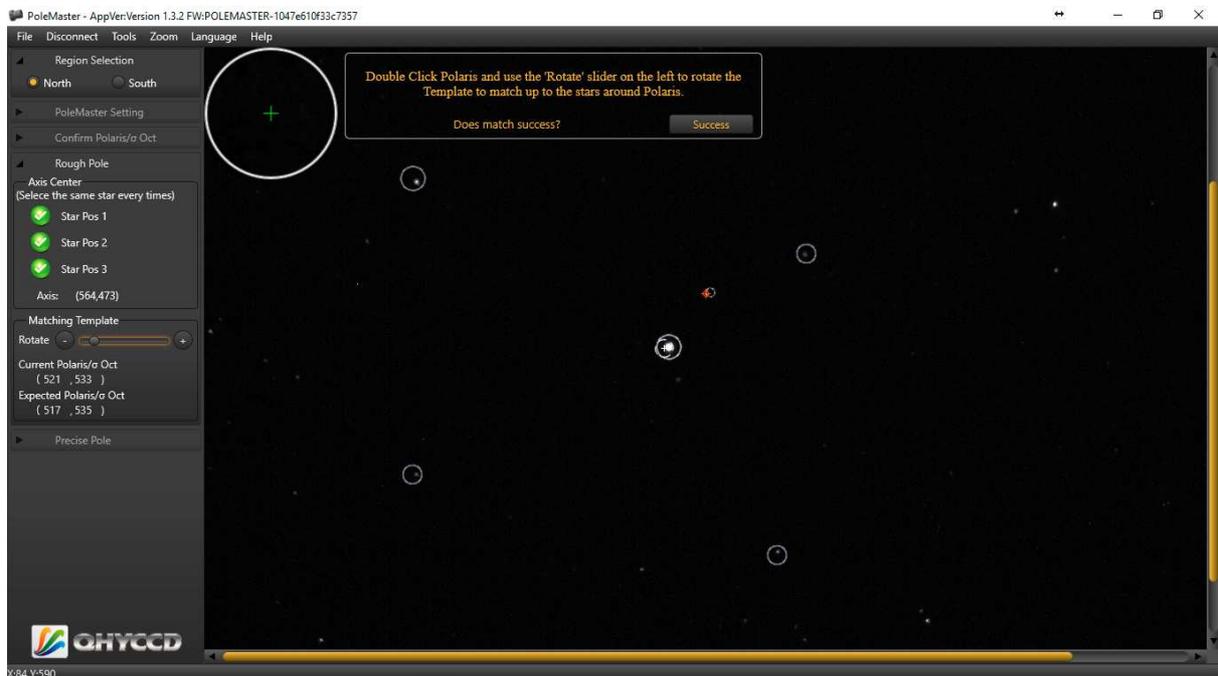


- 5.4 While keeping an eye on the chosen star and its position on the green circle, use your mount's handset or the virtual controls on your mount's control software, to rotate the mount back to the 'Park' position. If your chosen star does not follow the green circle as the mount returns to the 'Park' position, restart the Rough Polar alignment from 5.1

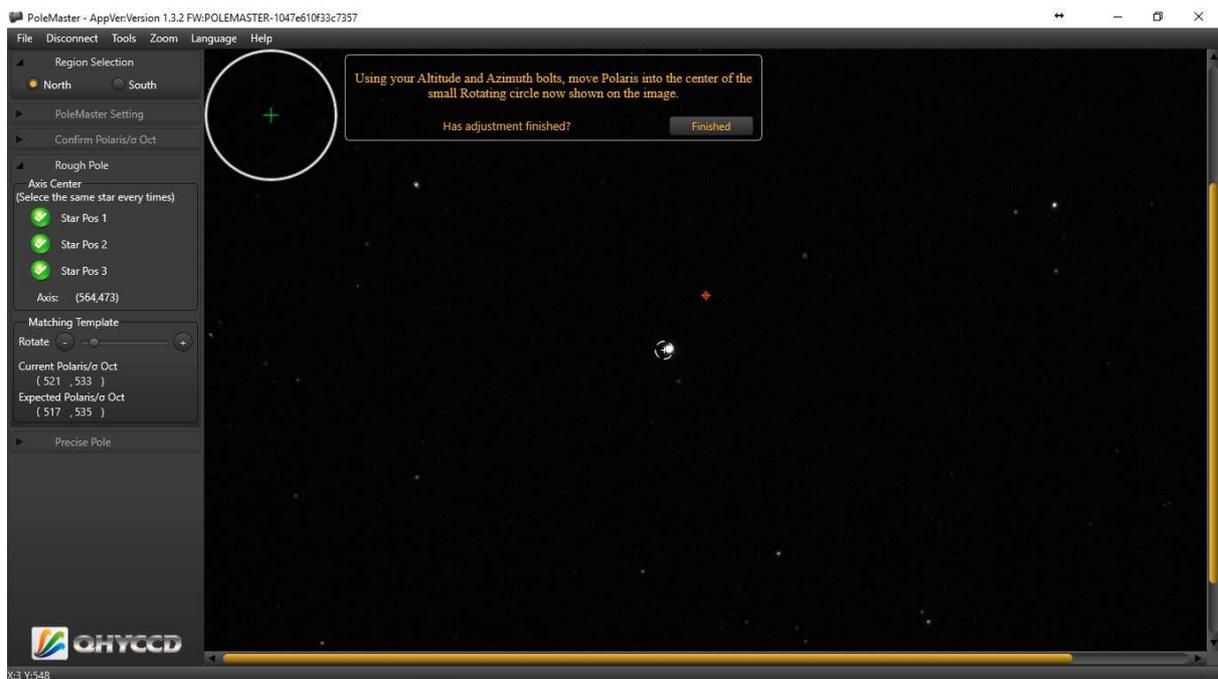


- 5.5 Double click on Polaris and use the template rotation controls to align the template with the visible stars for a second time. A small red circle will remain on the image. This red circle is the centre of rotation of your mount. Nearby, you will also see a slightly larger green circle. This green circle represents the approximate position of the NCP.

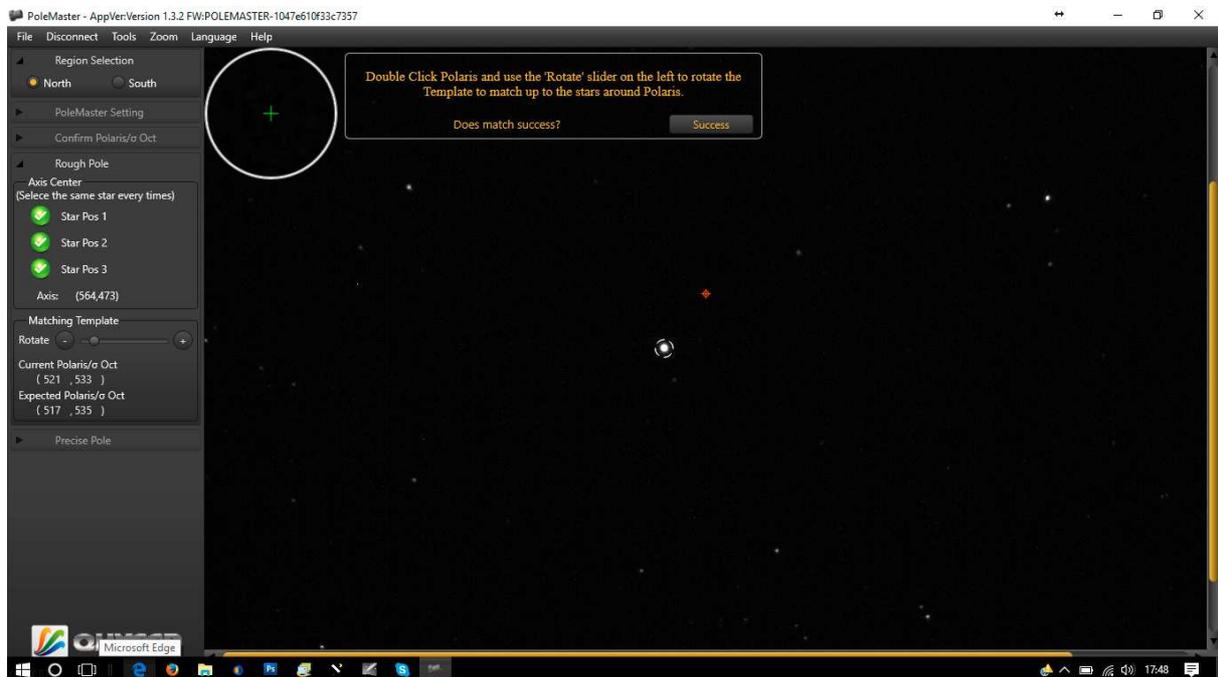
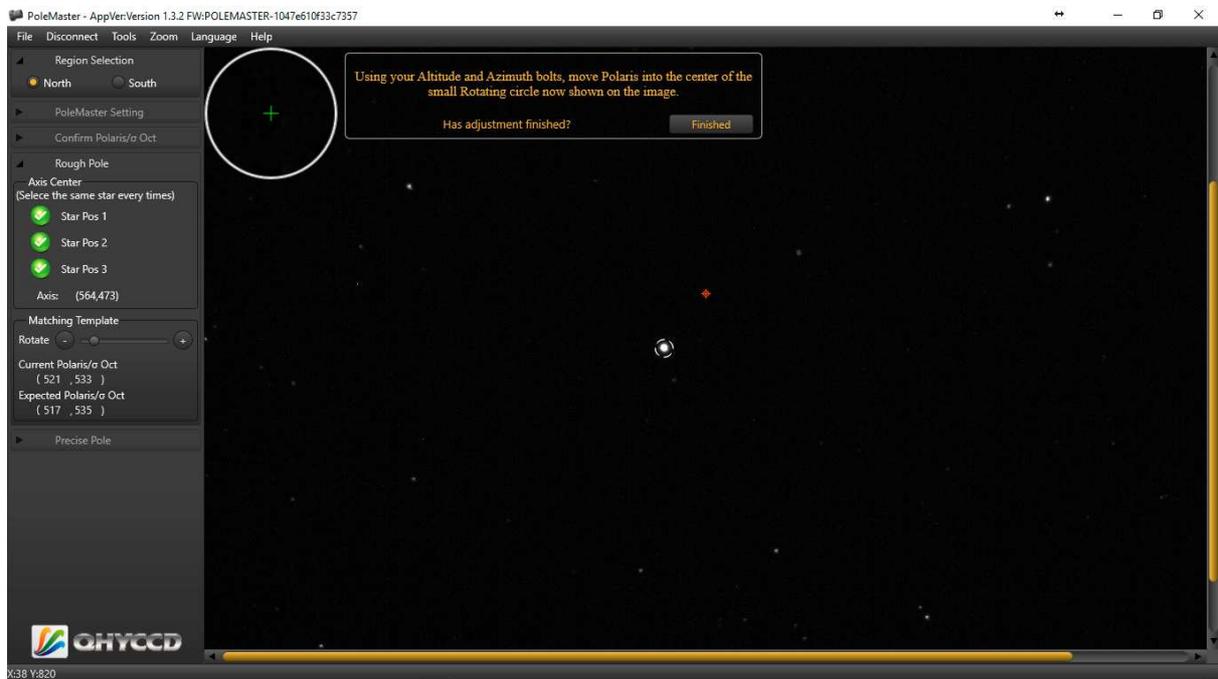




5.6 When you have aligned the template on the stars, click the **Success** button. This will place a white rotating circle around Polaris

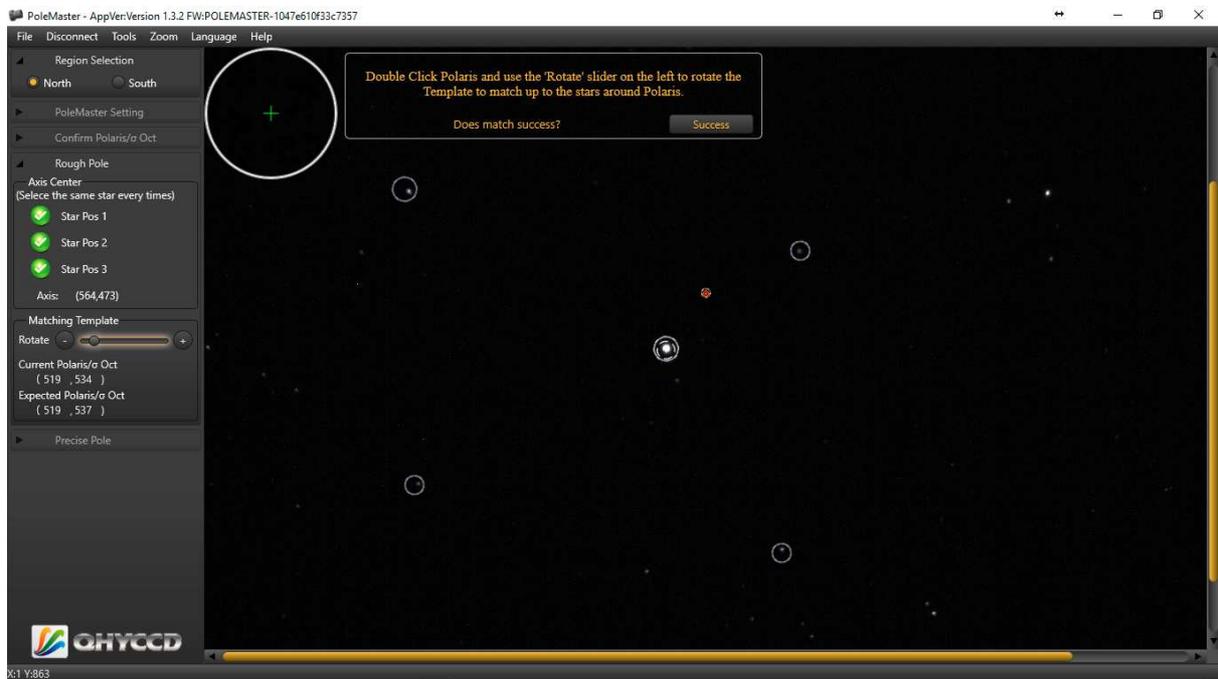


5.7 Using the manual adjustments on your mount, adjust the mount in azimuth and altitude to move Polaris to the centre of the rotating circle.

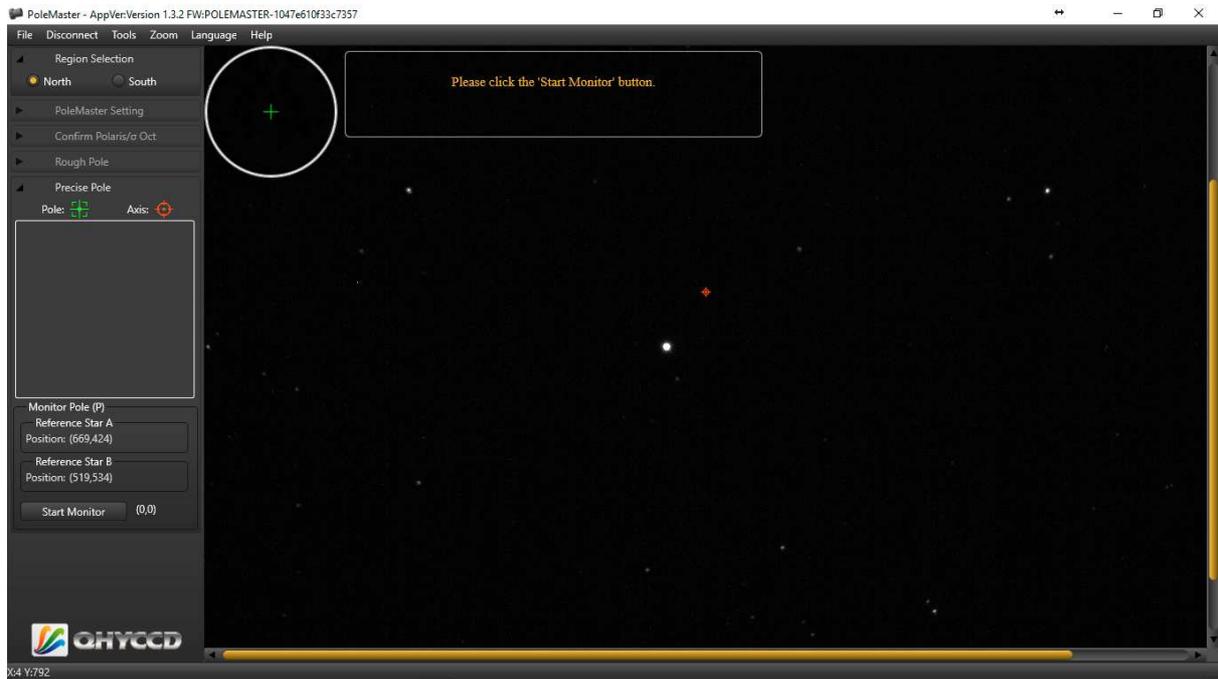


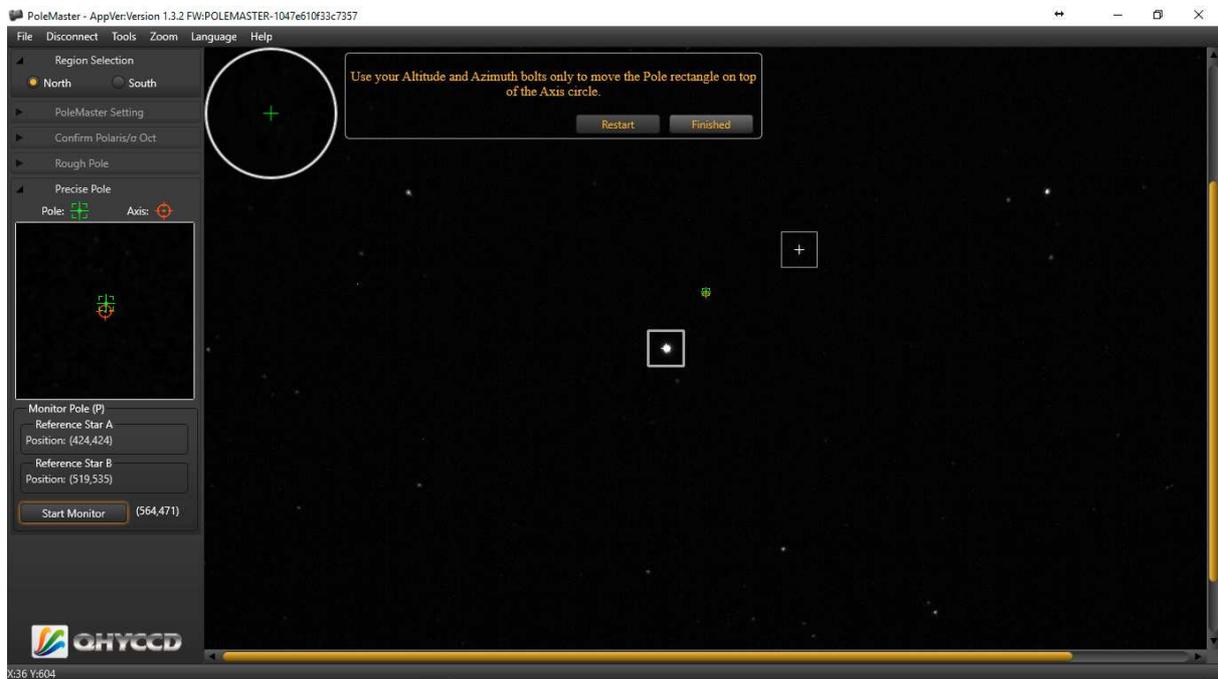
Precise Polar Alignment

- 5.8 Double click on Polaris and use the template rotation controls to align the template with the visible stars (for a third time if this is your first PoleMaster Alignment).



- 5.9 Click on the **Start Monitor** button to produce a pair of white rectangles surrounding a star each on the main screen and a green and red marker on the main screen but magnified in a new zoom window at the left of the screen. Please note that if there are no stars in the two white rectangles, the green circle will fly about randomly and it will not be possible to proceed further, polar alignment will not be achieved and the process will need to be re-started.





- 5.10 Using the manual adjustments, adjust the mount in azimuth and altitude to match the green and red markers in the magnified view at the left of the screen perfectly to obtain a polar alignment with an accuracy of up to 30 arcseconds. The last figure shows a highly magnified facsimile of what you are trying to achieve but you won't see the markers at this magnification, it is included here for clarification only.



