

QHY POLEMASTER ELECTRONIC POLAR SCOPE

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The QHY PoleMaster allows you to obtain a high precision polar alignment (up to 30 arcseconds). This precise alignment can be achieved in a couple of minutes (Figure 1).

The PoleMaster electronic polar scope uses a CMOS camera to take a picture of sky around Polaris. Considering that the camera is much more sensitive than your eyes, it can record the faint stars that surround Polaris, providing a more exact location of true north. The PoleMaster uses this image to calculate the North Celestial Pole (NCP), and that is the first step in achieving a precise polar alignment.

The Polemaster must be installed in front of the Right Ascension axis of an equatorial mount using a special adapter¹ (Figure 2).



Figure 1 – QYH Polemaster.

¹ Polemaster specific adapters can be bought for most available equatorial mounts.

Specifications

Model	PoleMaster
Field of View	11 degrees x 8 degrees
Sensitivity	9th Magnitude
Coarse Adjustment	5 arc minutes
Fine Adjustment	Up to 30 arc seconds
Computer Interface	Mini USB2.0 Port
Software	QHYCCD PoleMaster Calibration Software
Internal non-volatile memory	Non-volatile internal EEPROM memory capable of storing several small frames for calibration routines, focus, optic analysis, etc.
Weight	106g

How to use the Polemaster

The PoleMaster achieves polar axis alignment following a simple idea: *Finding the position of the pole and then make it coincide with the centre of rotation of the equatorial mount's RA axis, so that the right ascension axis of the equatorial mount is aligned with the axis of the Earth's rotation.*

The PoleMaster must be mounted in front of the Equatorial Mount's RA axis. Its sensitivity is higher than the naked eye, so not only can you see the North Star, but you can also see several dim stars near Polaris. Based on the location of these stars, the software calculates the true north pole position.

The PoleMaster detects the position of the centre of rotation of the right ascension axis and then marks the position of the two points on the screen.

All you must do is adjust the equatorial mount so that the two points overlap, and the polar axis is aligned. Polar alignment is now a simple matter of moving the two centres of rotation, so they overlap.

In comparison with other polar alignment techniques, PoleMaster has the following advantages²:

1. Speed and convenience: With PoleMaster you do not need to move the telescope to a specific place just to unblock the polar scope. You do not need to kneel or contort your body to look through the polar scope. You do not need to fully dark adapted just to see the pole star. You do not need to level your mount. You do not need to worry about the entering the date and time in your handset and figure out where to rotate the mount to coincide with the current pole star position.
2. Accuracy: The imaging camera in PoleMaster has a resolution of 30 arc second, so the best polar alignment that can be achieved is also in the order of 30 arc seconds.
3. Wide angle view of the polar region: A wide field of view of 11x8 degree makes it very easy to locate Polaris.
4. Easy to install: The PoleMaster can be easily installed onto any equatorial mount through mount-specific adapters, even on mounts without a polar scope.

² <https://www.qhyccd.com/polemaster/>

5. Real time polar alignment checking / adjustment: Your polar alignment can be monitored in real time. If polar alignment is lost, it is a simple matter to bring it back without having to start from scratch.
6. Three-star alignment no longer needed: Once you are polar aligned, you will only need to perform one star alignment.
7. Perfect companion to single axis mounts: When used with single (RA-only) axis mount, good polar alignment will minimize drift in the DEC axis therefore maximizing the performance of your mount.



Figure 2- Polemaster installed on a Takahashi EM400 mount.



Figure 3- Polemaster camera.



Figure 4- Polemaster adapter (Takahashi EM-400).



Figure 5- Polemaster adapter (Sky-Watcher Eq-6).



Figure 6- Polemaster adapter (Sky Watcher Star Adventurer).



Figure 7- Polemaster, EM-400 mount & dedicated software.

Polar alignment Step by Step³

1. Before using the Polarmaster the equatorial mount should be roughly polar aligned using a compass or a smartphone app
2. Connect your camera to the computer (USB2)
3. The computer will recognize the camera and install the specific driver
4. Launch the Polamaster software⁴
5. Connect camera (Menu)
6. Choose North or South (hemisphere)
7. Adjust the exposure settings (gain & exposure time) to optimize the display⁵
8. Click finish when done
9. Locate your pole star on the screen. Double click on the pole star (Polaris or Sigma Octantis)
10. Once you have double clicked on the pole star, the application will ask you to align the overlay (circles) to match the display
11. Rotate the overlay by either using the keyboard arrow keys or by sliding on the slider tool made "Rotate"
12. Click "Success" to proceed to next step
13. Determine the centre of rotation
14. Choose a bright star adjacent to the pole star in the next step by double clicking it. To make the process more accurate, it is best to use a star that is not too close to the pole star.
15. The on-screen instruction will prompt you to rotate the mount. In this step the application will try to determine the mechanical axis of rotation of your mount

³ <https://www.qhyccd.com/uploadfile/2018/1225/20181225042450636.pdf>

⁴ <https://www.qhyccd.com/download/>

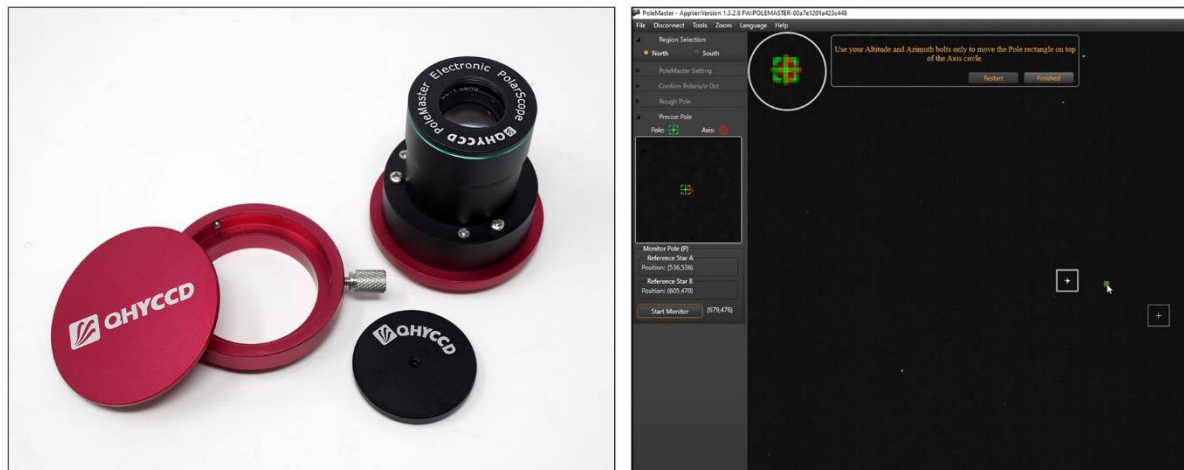
⁵ Ideally you should adjust the setting until you can clearly see the pole star (Polaris in Northern hemisphere and Sigma Octantis in Southern hemisphere) plus a number of adjacent stars.

16. Rotate the mount such that the star moves by about 15 degrees. Click "Finished" then double click on the bright star again. Repeat one more time⁶
17. The Application will draw a green circle on the screen with the bright star on it. The centre of the circle is where the Application think the centre of rotation is. To verify this is correct, slew the bright star back to its original position (usually the West button, if you have used the East button in the previous step, or you can use the "Park" function of the mount if you start off from the park position in the previous step)
18. Double click on the pole star again and match up the on-screen overlay as per the earlier step. Click "Success" when done
19. On the screen there is a small green circle. This is where your pole star should be. Use the mount azimuth and altitude adjustors, align the pole star with the green circle. When done, click "Finished"
20. Double click on the pole star again and match up the on-screen overlay as per the earlier step. Click "Success" when done
21. For Precise Polar Alignment Click "Start Monitor"
22. Fine polar alignment is achieved when the small green circle and small red circle become aligned
23. Click "Finished" when done or "Restart" to try again.

YOUTUBE VIDEO

QHY POLEMASTER Electronic PolarScope | Pedro RÉ

<http://pedroreastrophotography.com/>



<https://youtu.be/o9mGFrlp1b8>

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⁶ Make sure you are using the handset controller or computer software (like EQMOD, ASCOM etc) to perform the rotation. Don't manually perform the rotation by loosening the RA clutch as it will cause the rotational center to shift and result in large apparent error.