Review: Orion P1 Polar Alignment Camera

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The one benefit of having an observatory in the back yard is once you've polar aligned, you never have to do it again unless you move the mount. Unfortunately, this creates a terrible unwillingness to do anything that might move the mount since you need to polar align at the site then again once you get the scope home! This is especially true of a telescope like my Celestron 8" SCT which has a very narrow field of view, which makes some of the tools available in PHD2 and EKOS for polar alignment more difficult to use since Polaris tends to not be in the FOV of the camera.

Since I'd like to take the telescope to a dark sky site, including the Spruce Woods Star Party, this fear of polar alignment needs to be conquered. Fortunately, there's a tool out there that makes very accurate polar alignment easy and even (dare I say it!) fun!

I decide to forge ahead with a polar alignment camera and started looking around for a vendor and discovered that Orion resells the QHYCCD Polemaster under it's brand name on Amazon, allowing me to use Prime to get free, fast delivery. The QHY product is a bit cheaper on other sites but the cost of shipping makes the cost about the same, $429, so I ordered from Amazon.ca. A week later, a box arrived.

Figure 1 - Orion P1 Polar Alignment Camera compnents

When you order this camera you need to take care to order the correct adapters for your mount, and if you need it on multiple mounts you need a separate adapter for each one unless they're the same. Since I plan on using this camera with both my Orion Sirius EQ/G mount and my Celestron CG5, I'll need both adapters. The good news is once you have the adapters you can easily move the camera between them and quickly set them up.

The camera arrived in a tin box with a paper box accompanying with the adapters in it – no documentation whatsoever. But, this is easily fixed as Orion has manuals online at telescope.com/manuals so I quickly located the correct manual, and also on the same page the Windows driver and software for the camera. Why they don't include this on a stick with the camera is beyond me, considering the miniscule cost these days but what can you do. Install the driver before attaching the camera, and install the Orion P1 software to confirm it all works.

To attach the adapter you simply split the telescope side (seen in figure 1 with a set screw) and the camera side (seen in figure 1 with three screw holes to attach to the camera). You attach the camera side to the camera with three long Philips screws. On the telescope you attach the ring by inserting into the top of the RA axis (figure 2). This adapter can stay in this position permanently, so Orion provides a cap for the hole to keep it from getting dusty . On my EQ-G this still allows the polar alignment scope to be used if you don't have the camera handy. After installing the software on my laptop (install the driver software before inserting the cable for the camera!) I connected the camera and it worked.

During the day, I attached the ring to the mount RA axis viewport – a bit fiddely to get the hex key into and you could only turn the setscrew $1/8^{th}$ of a turn at a time, but if you pre-set them to almost the right spot it only takes a turn or two to tighten up the ring – it doesn't need much. The camera itself then slides into the ring and is tightened with a thumbscrew. Ready for a clear sky!

Figure 2 – Ring mounted, camera attached (lenscap on), camera with lenscap removed at night

Out under the stars, after figuring out there's a screw on cap on the lens itself (mentioned nowhere in the docs!) I managed to run through the Windows software included with the camera pretty quickly. Initially you need to roughly polar align the mount so that Polaris is in the field of view – not too hard considering the field of view of the camera is very wide, 11x8 degrees!

The software included with the camera is pretty simple – once you select the option to connect the camera, you can choose exposure and gain from 4 pre-defined options. In my case the lowest gain and exposure showed Polaris nicely. Since my mount was already pretty close Polaris was already centred, but I decentered and recentered it with my altaz adjustments on the mount and the star moved very little in the wide field. Quite a relief after trying to do the same operation using the miniscule field of my SCT!

After centering Polaris you're prompted to rotate a template until it aligns with the stars surrounding Polaris (figure 3) – this allows the software to determine the actual point of the celestial pole.
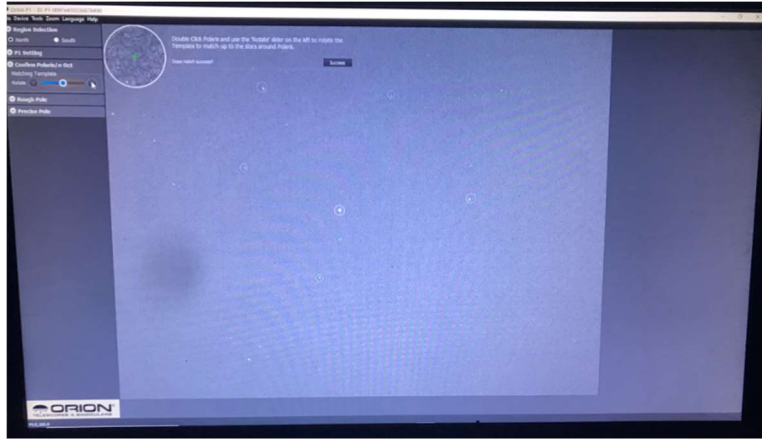
Figure 3 – Polaris Centred with alignment stars

Finally you're prompted to click on one of the alignment stars, move the mount in RA a couple of times and re-click the alignment star each time to determine where the centre of rotation of the RA axis is. Use the motors to run the mount rather than doing it by hand, which is apparently more accurate. The software will not draw a rotating circle on the screen and invite you to move Polaris into this circle using the altaz adjustments on your mount. Once this is done, you're pretty well aligned to, it's claimed, ~5 arcminutes. But, there's another step that allows a "Precision Polar Alignment".

Clicking a "Start Monitor" button – the software will watch the stars in the field and provide two boxes, one the current RA alignment, and one the correct polar alignment. Use the altaz adjustment on the scope to ensure these two boxes overlap, and you've gotten aligned to about 30 arc minutes, which should allow for a couple of minutes unguided exposures on your camera (depending on focal length).

Since I normally use a Raspberry Pi running KStars/EKOS/PhD2 to control my mount, I was very interested to know if I could use the Orion camera to run the polar alignment processes in PhD2 (Push here Dummy V2) and EKOS.
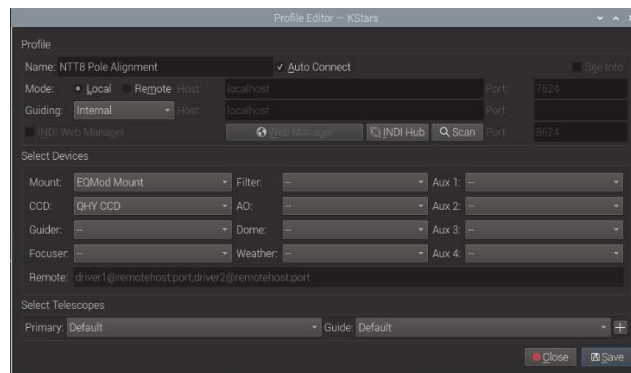

Figure 4 – INDI config for Mount and Polemaster

With INDI (Independent Device Interface, the Linux equivalent of ASCOM) configured for a QHY device (who makes the camera for Orion,) starting up the driver resulted in a connected device named QHY CCD POLEMASTER-0097, with options to set the exposure, and and other options. The camera turned out to be 1280x960 resolution with 3.7u pixels, 8 bits per pixel. So no problem at all running this camera

under Linux and Raspberry Pi, which is great news – I can pretty much pitch the Windows software as the PhD2 functions particularly are much more comprehensive.

I won't get into the nitty gritty of polar alignment routines under PhD2 or EKOS (both are extensively covered on Youtube) but even if you're a Windows user, I'd suggest using PhD2 instead of the QHY software included with the device. PhD2 automatically creates a darks library when you first connect the camera meaning any bright pixels are excluded from images used to align, and the Polar Alignment and Polar Drift Alignment functions probably result in a much more accurately aligned mount. You can be pretty confident moving forward you have a good alignment with PhD2, so any additional problems with tracking can eliminate polar alignment from the mix!

Overall I'd highly recommend this device for anyone who doesn't have a permanently mounted telescope and has to polar align every session, or those who take their mounts of out of the observatory seeking darker skies.