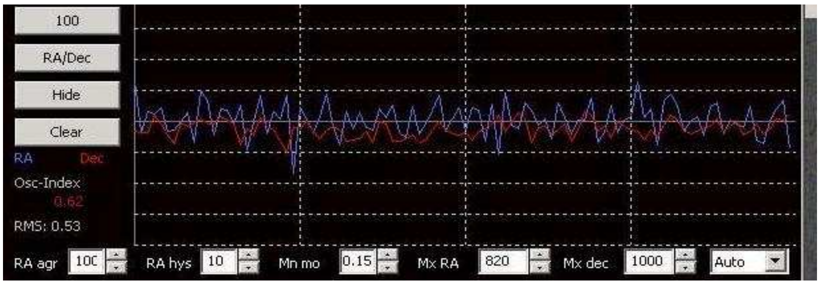
AWR PULSE ANALYSER PA2

AWR Technology have been supplying custom GOTO drives for telescopes from venerable Victorian Calvers to 32” Richey Cretiens for many years. They do upgrades for many well known telescope mounts, such as the Russian Alter D-6 and the EQ 5/6 series. So a new product from AWR is an exciting event! The AWR Pulse analyser PA2 is the latest product from the stable.
Astrophotographers employ several different techniques for autoguiding. Professional telescopes usually have what is called an A and G box. The Acquisition and Guide box consists of a pick off mirror for the autoguider, and a mounting plate for the instrument. The important point here is that both instruments use the light beam from the telescope optics. Some amateurs use a separate telescope for the autoguider, but that is subject to the possibility of differential flexure between the two telescopes, particulary if the focal length of the imaging astrograph is a meter or more.
Amateur instruments often employ an off axis guider, which uses the same optics as the imaging camera. A pick off prism feeds starlight to the guide camera, which sends correction pulses to the drive box. Because corrections to the drive must overcome the inertia of the entire telescope the process takes longer than if an adaptive optics system is employed, where a moving mirror or glass plate does the corrections. AO systems typically make corrections at 5 to 10 times per second.
The AWR Pulse Analyser looks at the correction pulses from an autoguider camera, and fits between the guide camera and the drive box. It does not alter the pulses, and has no effect on the autoguiding process. What it does do is to help you to fine tune the guiding process, so that guiding pulses are of the correct length for the particular telescope and mount combination. The information is displayed in the form of flashing LED's. Using this information it is also possible to diagnose periodic error and backlash in the gear train. By observing the drift in both axes you can fine tune the polar alignment. The instructions are very clear as to how to make the diagnosis for these problems.
This is what you get for your money:

So, how did it make out in practice?
The unit consists of a box with RJ12 sockets for connection to the guide camera and drive box. The LEDs are visible on the face of the box. These need to be visible from any orientation of the telescope. Therefore I decided to attach it to the pillar of the telescope mount using velcro.
The unit is powered by a PP3 9 volt battery. It operates in two modes, REAL TIME MODE and PULSE STRETCH MODE. The instructions tell you which mode to use for the different diagnostics.
First I checked the drift in both axes. I would normally use the graphical presentation in K3CCD Tools from a webcam for polar alignment, so this made for an interesting comparison.
There was no perceptible drift in either axis as displayed by the LEDs. This is confirmed by the fact that I can expose for at least 5 minutes at a focal length of 1400 mm without guiding, and still end up with nice round star images.
The human brain soon picks out any pattern in the flashing LEDs, and sure enough it did show up a small amount of periodic error in RA. But I knew this anyway, as all but the most expensive double opposed worm drives show at least some periodic error.
I tried guiding on a really bright star – not usually a good idea! The exposure time, using the Lodestar guider and PHD guide software was 0.2 secs! The PA2 Analyser showed rapidly flashing lights in REAL TIME mode, and in STRETCHED MODE the correction pulses were too fast.
So I changed to a much fainter star that required 2.5 secs exposure. The pulse length now became more realistic and was within the recommended 0.2 to 0.3 seconds, with occasional excursions into the 0.3 to 1 sec. range.The time graph from PHD guiding now shows around +/- 1 arc sec guide accuracy.



The graph – from PHD guiding, shows the RA and Dec traces after optimising with the PA2.
NB. Lodestar has 8 micron pixels, astrograph is 1400mm fl, and the separation between dotted lines is one pixel.
In REAL TIME mode you can set up polar alignment. First point the telescope at a star to the EAST, and start guiding. Check the DEC LEDs. You will find that one is flashing, indicating that the error is in one direction. If you move the equatorial head in ALTITUDE and reset the guide star, the error will gradually zero out. Do the same for a star in the SOUTH and alter the AZIMUTH. It is a bit fiddly since you do not initially know which way to move the head. That is why I actually prefer to use the graphical method in K3CCD TOOLS, since you can see the slope of the graph change as you move the head.

CONCLUSION

The PA2 Pulse Analyser from AWR is a very useful diagnostic tool for fine tuning a telescope autoguiding system. This is its primary use, and as such is a valuable addition to the astrophotographers tool kit.
It is also possible to see periodic errors and backlash, although it is not really possible to put a figure on these.
Polar alignment can be done fairly rapidly by observing the drift in both axes. My personal

preference for polar alignment using the drift method is to use a webcam with K3CCD Tools and look at the graphical presentation for reasons explained.
The instructions which describe pinout connections for the guide cameras include the SBIG ST series, which are no longer in production. I would like to have seen the Starlight Xpress LODESTAR guide camera included in this list, since it is one of the most popular guide cameras.

David Jackson (ex-RGO) April 2013