

# PHD2 Drift Alignment

The drift align tool in PHD2 can be used to quickly obtain a precise polar alignment of your equatorial mount. The process takes a little bit of practice, but after doing it a few times, you should be able to obtain an accurate polar alignment in minutes.

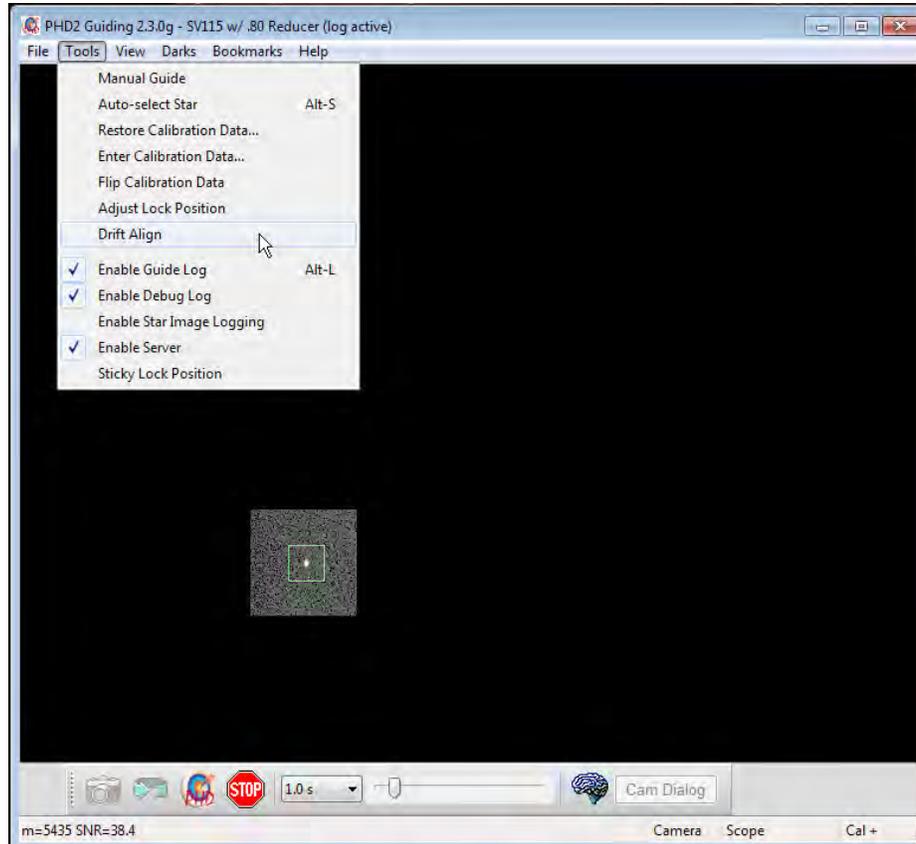
## Preparation

- Make sure your mount is reasonably level.
- Make sure your scope is balanced and ready for guiding.
- Try to get your mount's polar axis roughly aligned by using your mount's polar alignment scope if it has one. Otherwise, make sure the mount's polar axis is pointing towards the pole, and the altitude setting corresponds to your local latitude.
- Make sure you can see your computer screen when you are standing at the mount.
- Start PHD2 and connect your equipment.
  - You should be using an up-to-date version of PHD2, preferably version [2.3.11](#) or newer.
  - These instructions assume you have an ASCOM connection to your mount so PHD2 knows where your scope is pointing. You can still drift align without an ASCOM connection, see [Note about ASCOM](#).
- Calibrate on any convenient guide star, preferably at a low declination.
- Make sure your PHD2 settings have the correct values for your guide scope focal length and your guide camera pixel size. (Brain => Global tab for focal length, Camera tab for pixel size)

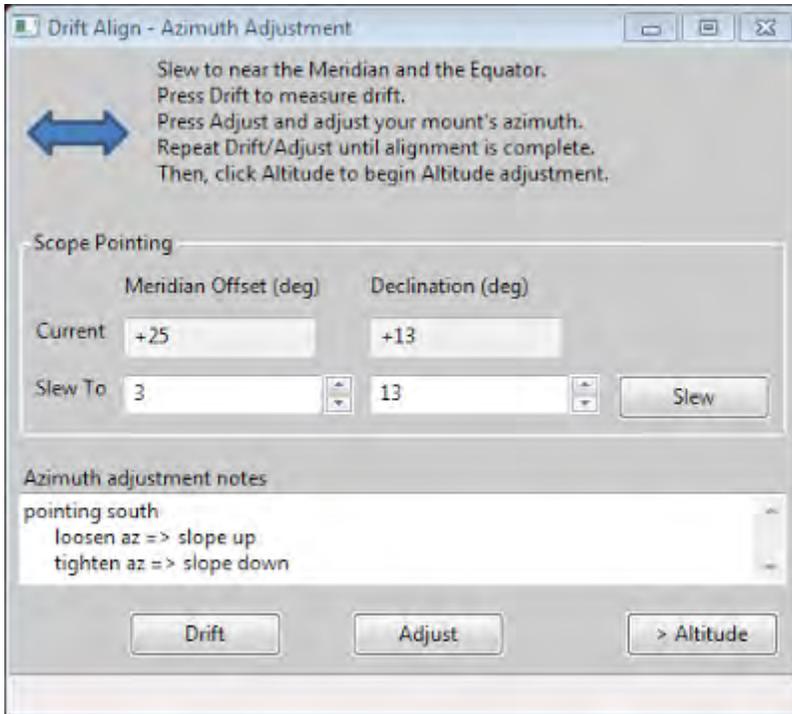
Now you are ready for drift aligning.

## Azimuth Alignment

Open the Drift Align Tool:



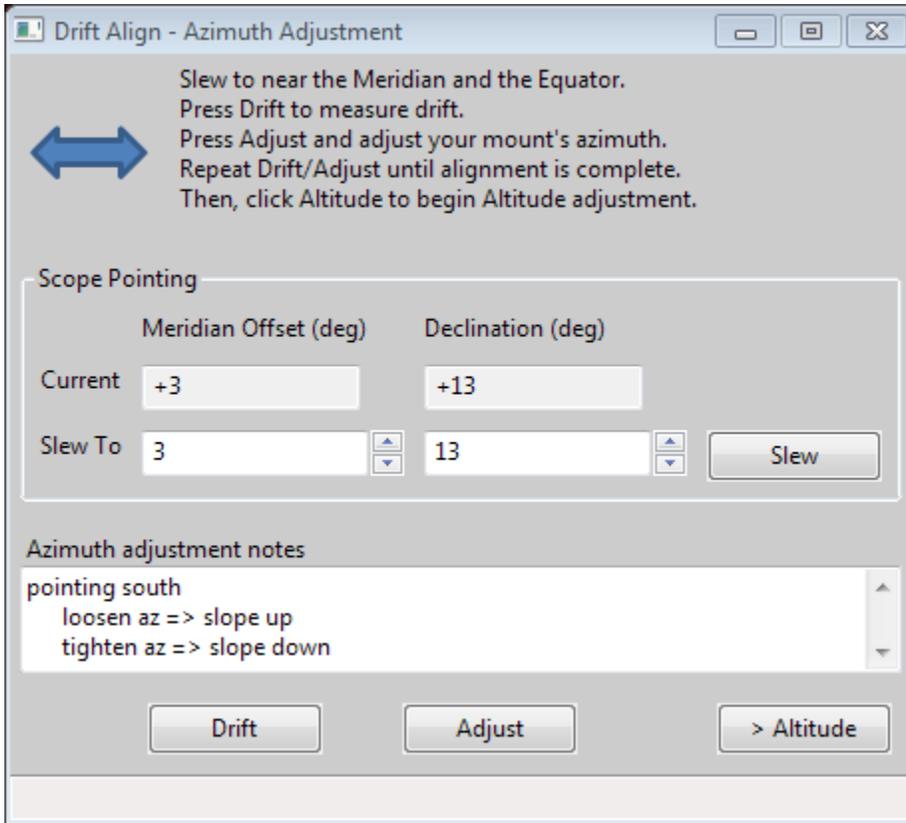
You will see a window like this:



Position your scope for the Azimuth axis adjustment. Point near the Meridian and the celestial equator. You can either click the Slew button, or move the mount manually. Your scope should now be pointing something like this



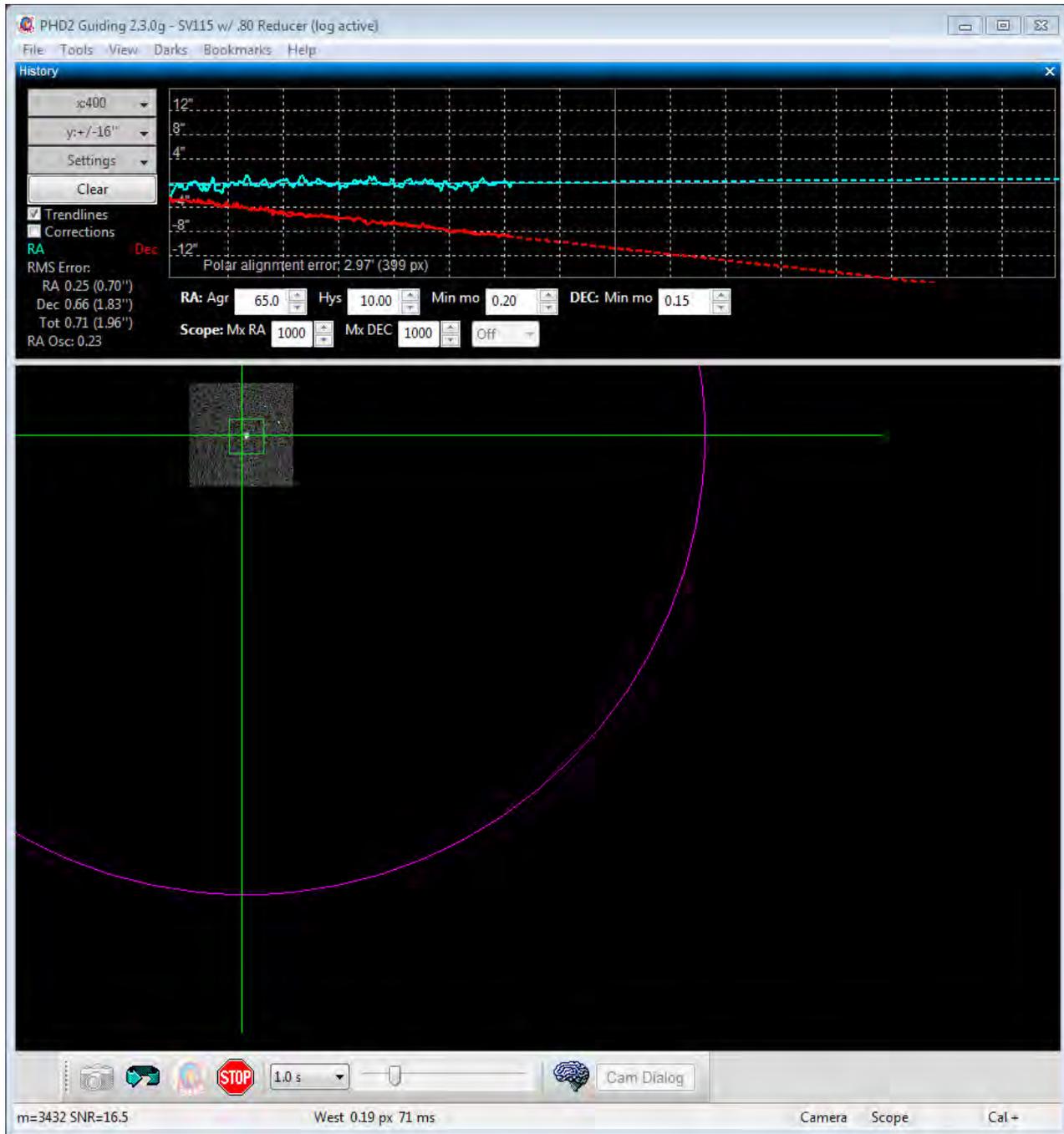
And the Drift Align window will look like this



Notice we are only a few degrees off the meridian ("Meridian offset"), and close to the equator (small value of Declination.)

You are going to alternate between measuring the error (Drift), and adjusting the mount (Adjust). The rate of declination drift tells us the amount of alignment error. Each adjustment will reduce the error, and you repeat the process as many times as you need to get the error close to zero.

Click Drift to start measuring the declination drift. PHD2 will select a guide star and start guiding. After a few moments you should see something like this:

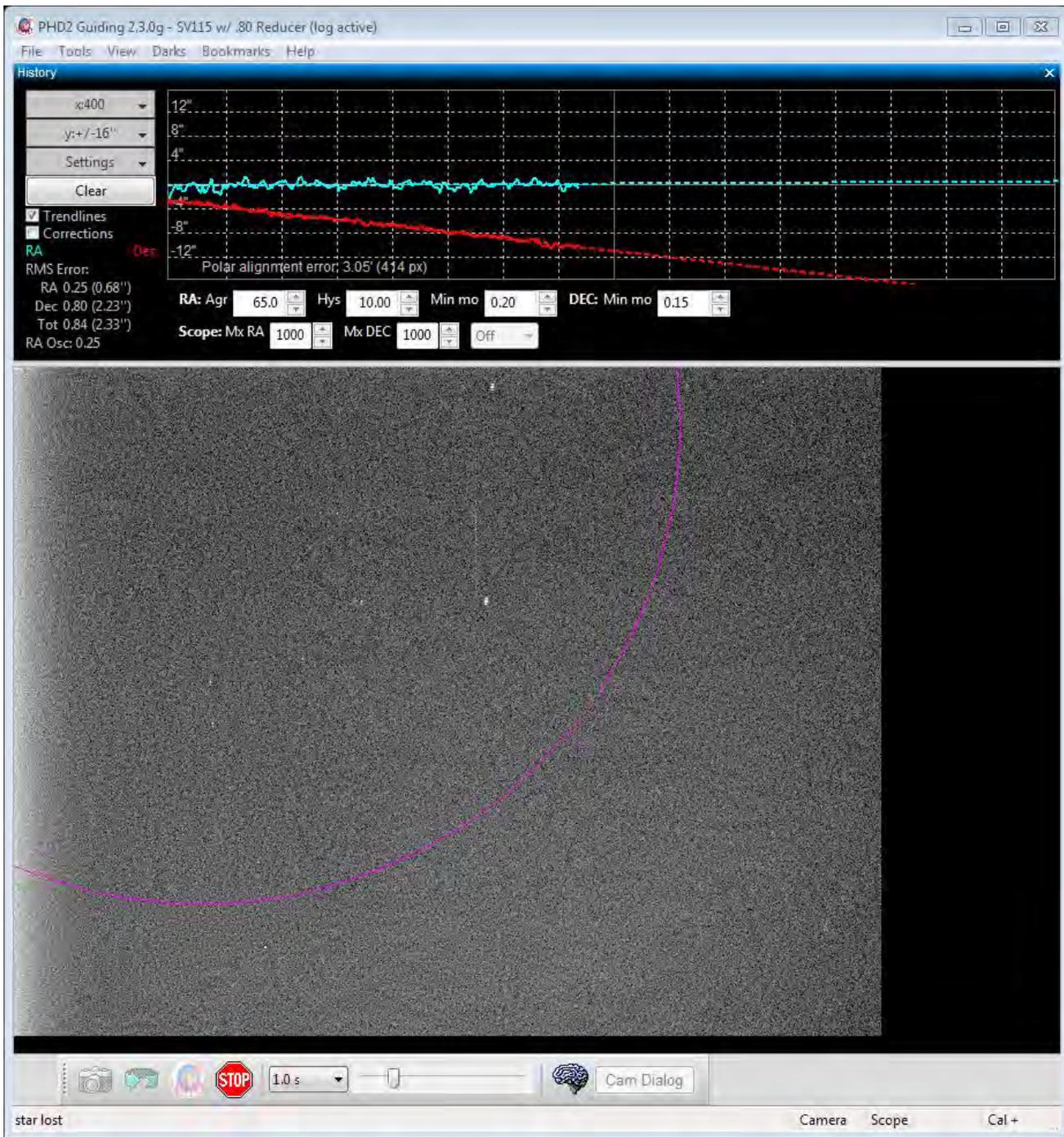


Pay particular attention to the Declination trend line (Red). At first the Dec trend line will be jumping up and down, but soon the noise should "average out" and the slope of the line will become somewhat stable. When that happens you are ready to adjust the mount's Azimuth.

Our goal is to make the Dec trend line "flat" -- neither trending up nor down over time. By adjusting the mount's azimuth, you will change the slope of the Dec trend line.

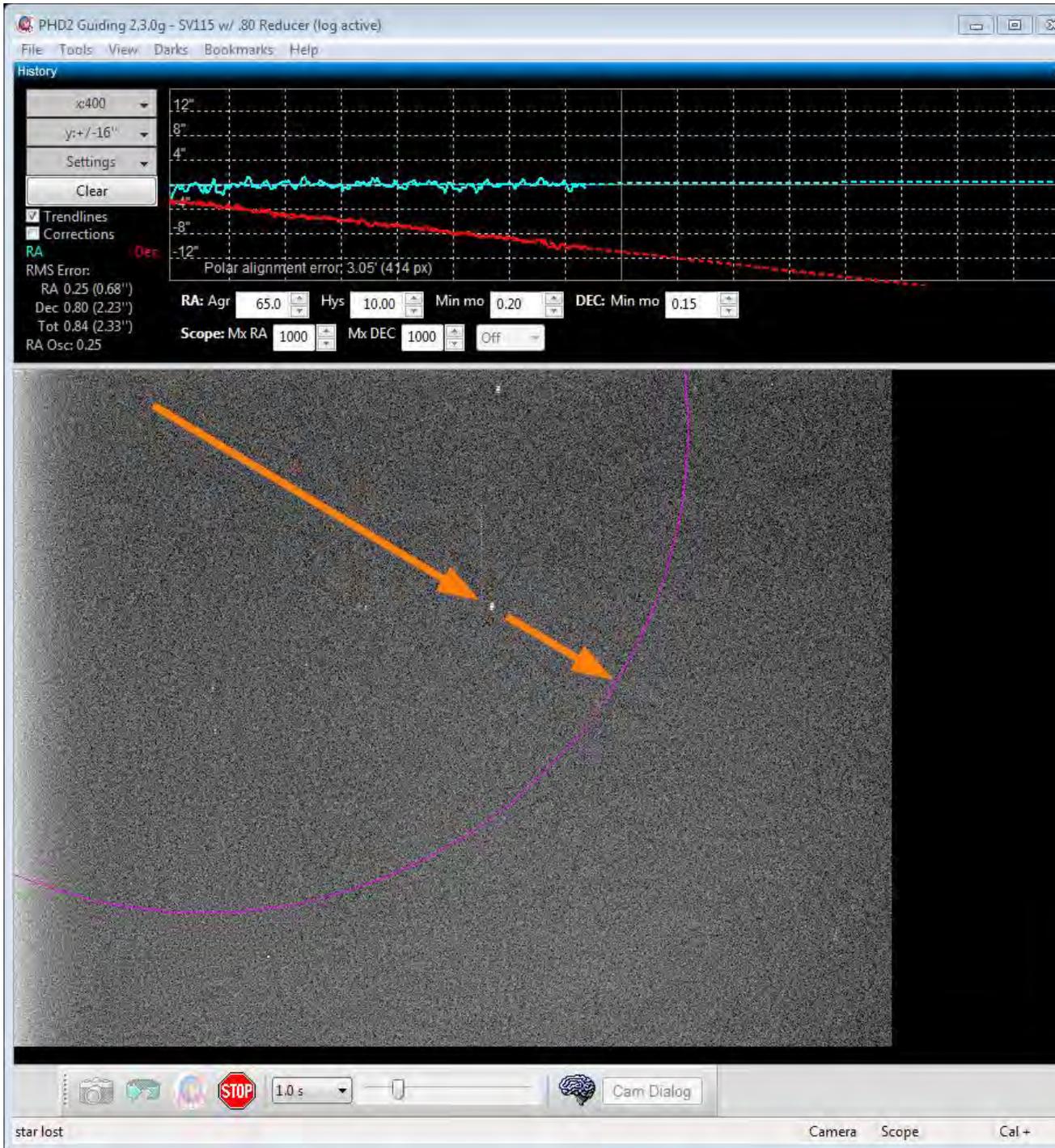
If this is your first time adjusting Azimuth, you will not know which way to go--East or West? PHD2 does not know either, so you just have to guess, and you have a 50-50 chance of getting it right. If you choose correctly, the new drift line will be flatter (less steep, closer to horizontal) If you choose incorrectly, the drift rate will increase (more steeply downward in the example above.)

Click the Adjust button. PHD2 will stop guiding, and you can make your adjustment. You'll see something like this



Slowly turn your mount's Azimuth adjustment, watching the screen and moving the guide star towards the magenta circle. The magenta circle shows how far the guide star needs to move. The magenta circle is larger when the Dec slope is steeper, and it may initially be so large that it is not visible on the screen. That's to be expected; if it is not visible, just move the guide star approximately the width of the screen.

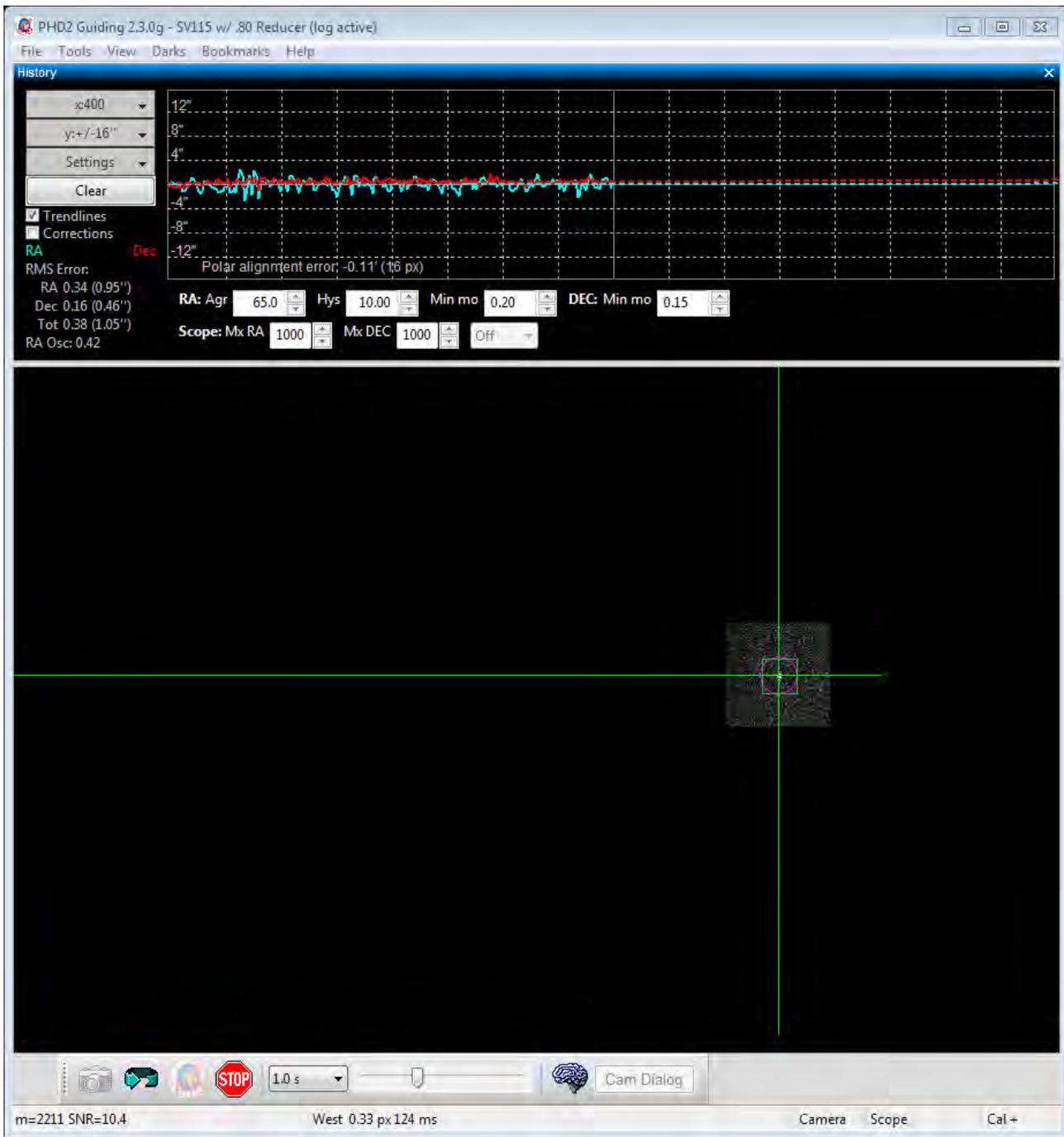
If you do see the magenta circle, you should move the guide star to the circle, like this:



After moving the guide star, click Drift to make another measurement. Before you click Drift, it's OK to nudge the mount to re-center the star, or to find a different star, or to get back closer to the meridian. Also, you can choose your own guide star by clicking on it, or just let PHD2 choose.

After a short time drifting, you will have another Dec trend line. Did it get better (closer to horizontal) or worse (away from horizontal)? Make a note to yourself in the "Azimuth adjustment notes" area of describing how you adjusted azimuth, and which direction the Dec slope moved. You can use this information next time you drift align so you do not have to guess which way to make the azimuth adjustment. For example, with my setup, turning the azimuth knob clockwise makes the slope go down. Having the note there reminds me that I need to turn the azimuth knob counter-clockwise to make the slope go up.

Repeat the measurement and adjustment of the mount until you achieve a good flat horizontal dec trend line, like this:



## Altitude Alignment

Now, you will need to repeat the process for the mount's Altitude adjustment. Click the Altitude button; the Drift tool will now look like this:

Drift Align - Altitude Adjustment

↑ ↓

Slew to a location near the Equator and the Eastern or Western horizon.  
Press Drift to measure drift.  
Press Adjust and adjust your mount's altitude.  
Repeat Drift/Adjust until alignment is complete.  
Click Azimuth to repeat Azimuth adjustment.

Scope Pointing

	Meridian Offset (deg)	Declination (deg)
Current	+36	+18
Slew To	37	18

Altitude adjustment notes

pointing east  
tighten alt => slope up  
loosen alt => slope down

Drift Adjust < Azimuth

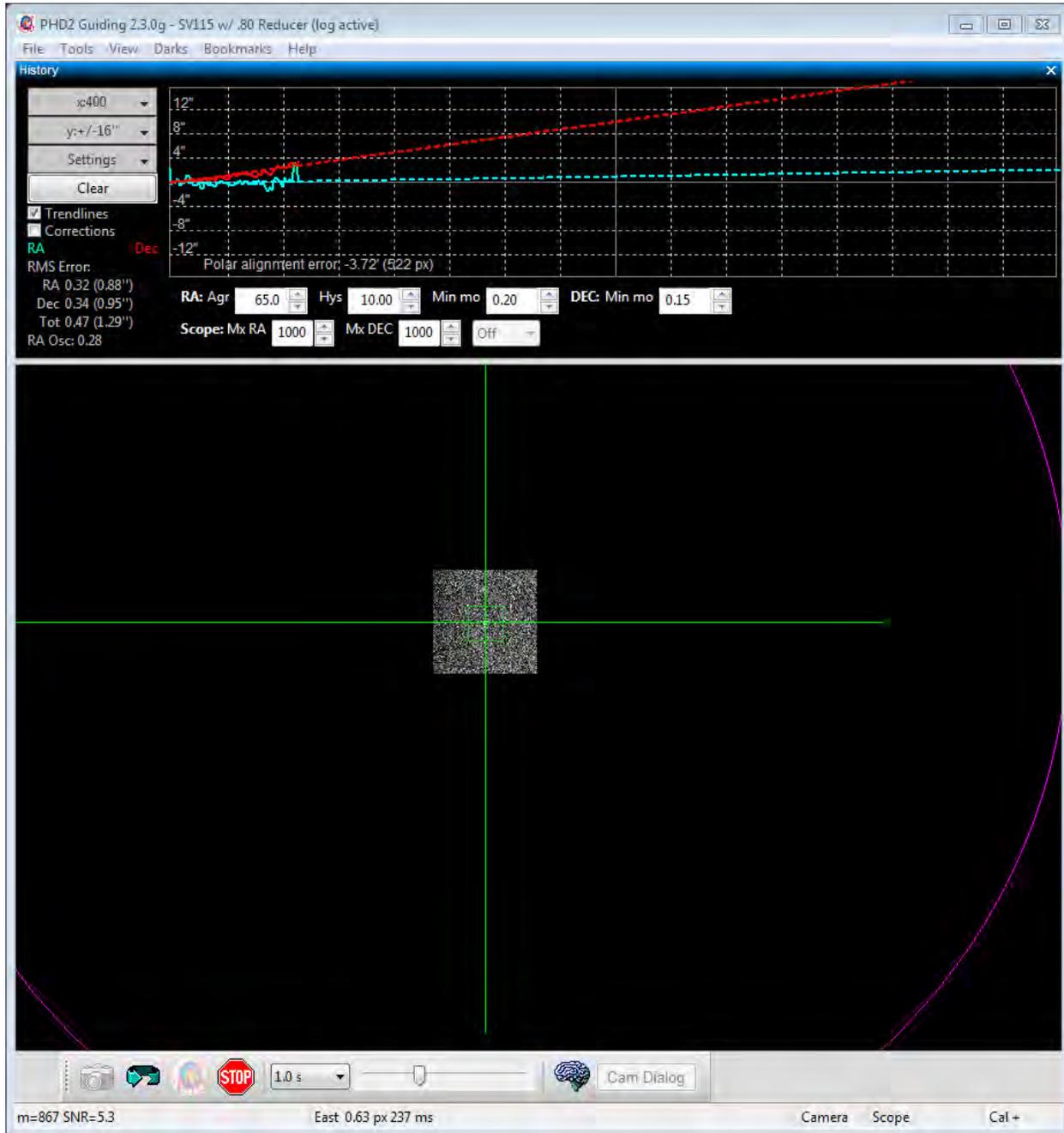
Drifting... click Adjust when done drifting

Click Slew or manually slew your mount towards the horizon (East or West):



The exact position is not important, but 25-35 degrees above the horizon works well.

Click Drift to start drifting.



Drift until you have a stable Dec slope. Click Adjust, then turn the mount's Altitude adjustment knob. Use your notes recorded in the "Altitude adjustment notes" area from a previous session to determine which way to turn the knob to move the slope in the desired direction. For example, with my setup I turn the altitude knob clockwise to make the slope go "down".

Just as with the Azimuth adjustment, repeat cycles of Drift and Adjust making the measurements and moving the guide star to the magenta circle. Again, the goal is to get the dec drift line to be horizontal.

## Note about ASCOM

The instructions and screenshots above correspond to what you see in PHD2 with an ASCOM connection to the mount. There are a couple differences if you do not have an ASCOM connection.

- The scope pointing information and the Slew button are disabled. You'll need to manually slew the mount to the required location.
- The solid magenta circle becomes a dashed-line magenta circle. The dashed magenta circle represents a limit to how far the guide star needs to move, not the exact distance. We only know that the star should not move past the circle. Rather than moving the star all the way to the circle, you may want to only move it half-way or so as an initial guess. You can use Bookmarks to keep track of where the guide star was in each Drift/Adjust iteration.