

# Drift Align in 5 minutes Using PHD

By Alister Ling

*It's really only 6 steps, but it seems like 20 on the first read.  
3 practice sessions and you're set for life!  
It's easier than collimating a Newt.*

# CONSISTENCY IS KEY!

- Always set up the same way and adjust the same way
- No need for Polaris or sigma Octantis
- First couple of times take it slow
- Practice! After a few times, deliberately do a poor rough align to force yourself to work the process. I have found you can get lucky initially, then panic when it doesn't come together under pressure.

- Point camera and guidescope near the celestial equator opposite the pole
- Rough align  
Eyeball is fine,  
polar scope is better
- Guider cable is N-S aligned  
(helps me, PHD doesn't care)
- Calibrate PHD to get green crosshairs

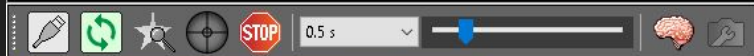
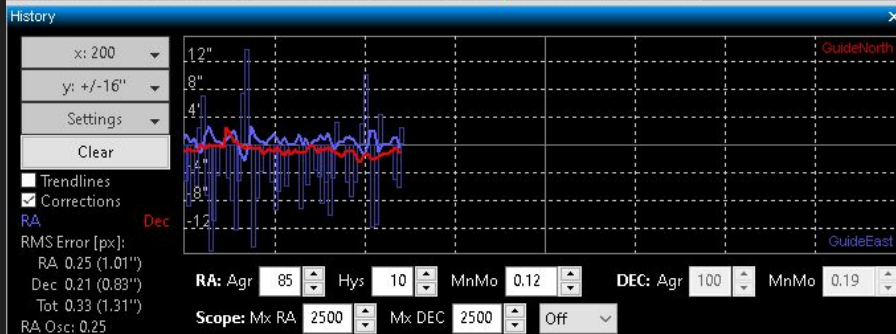
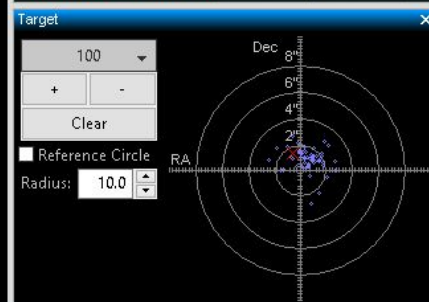
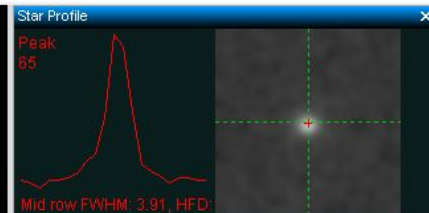


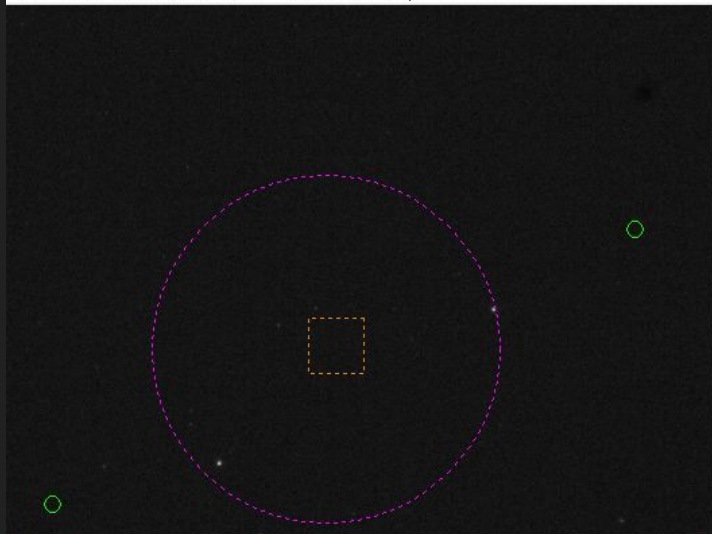
- Manual Guide
- Auto-select Star Alt-S
- Review Calibration Data Alt-C
- Modify Calibration >
- Adjust Lock Position
- Comet Tracking
- Star-Cross Test
- Calibrate meridian flip
- Guiding Assistant
- Drift Align**
- Polar Drift Align
- Static Polar Align
- ☒ Enable Server
- Sticky Lock Position

- FIRST cycle the camera, autoselect star, hit green target; it will go into calibration mode
- Wait 2 minutes to get the green cross!

Only now can you proceed:

- Click **Tools-> Drift Align**
- NOT Polar Drift Align





### Drift Align - Azimuth Adjustment

Slew to near the Meridian and the Equator.  
Press Drift to measure drift, watch the Dec trend line.  
Press Adjust and adjust your mount's azimuth.  
Repeat Drift/Adjust until alignment is complete.  
Then, click Altitude to begin Altitude adjustment.

Scope Pointing

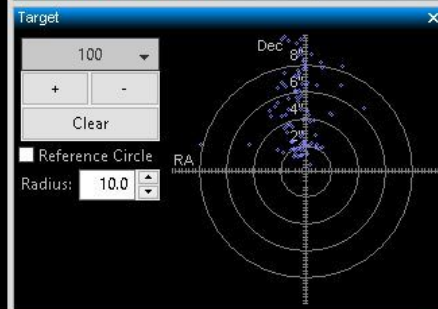
Meridian Offset (")	Declination (")
Current --	--
Slew To 0	0

Buttons: Slew, Save

Azimuth adjustment notes  
if star or line below, LEFT TIGHT

Buttons: Drift, Adjust, > Altitude

Adjust azimuth, click Drift when done



Clear x:200

	RMS [px]	Peak [px]
RA	0.40 (1.57")	2.00 (7.92")
Dec	0.65 (2.58")	2.98 (11.82")
Total	0.76 (3.02")	

RA Osc	0.28
RA Limited	0 (0%)
Dec Limited	0 (0%)

Starts in Az adjust mode

If you set up like I did, you are already near meridian and equator

Use y +/- 16; click **Drift** button

Wait 15 seconds for RED line to settle.





*Click Adjust!* Now move mount's Az knobs.

If red going down:

- Left hand tighten, right hand loosen
- About 2 twists of the wrist ( $\frac{1}{2}$  turn)
- Bring star about 90% of the way to purple circle

If red line steep down, you won't see the purple circle. Pivot entire mount 5 degrees CLOCKWISE.

The knobs only need to be snug. If you tighten hard, the mount will jump when you try to adjust it next.

If red ABOVE: left loose, right tight

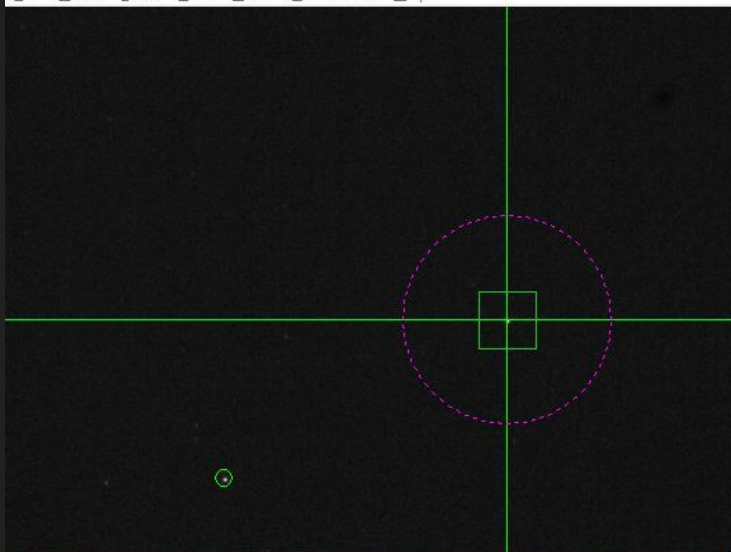
Red steep up? Pivot whole mount CCwise.

### **SOUTHERN HEMISPHERE:**

Probably do the opposite of everything <grin>

Type your result into the NOTES!





### Drift Align - Azimuth Adjustment

Slew to near the Meridian and the Equator.  
Press Drift to measure drift, watch the Dec trend line.  
Press Adjust and adjust your mount's azimuth.  
Repeat Drift/Adjust until alignment is complete.  
Then, click Altitude to begin Altitude adjustment.

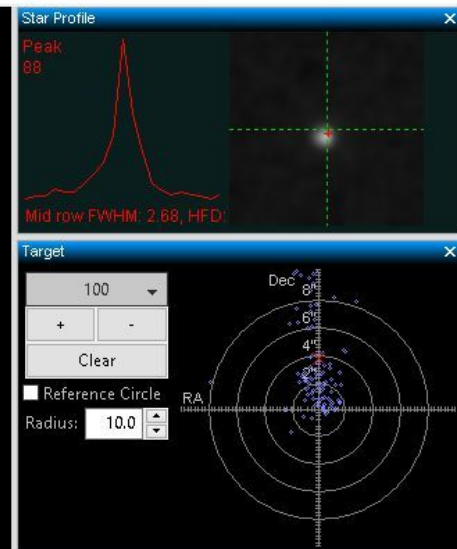
Scope Pointing

Meridian Offset (")	Declination (")
Current --	--
Slew To 0	0

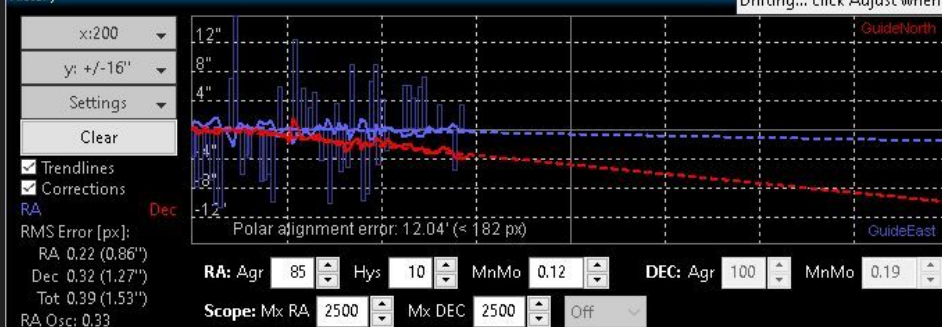
Azimuth adjustment notes  
if star or line below, LEFT TIGHT

Drift Adjust > Altitude

Drifting... click Adjust when done drifting



History



Clear	x:200
RMS [px]	
RA	0.22 (0.86")
Dec	0.32 (1.27")
Total	0.39 (1.53")
Peak [px]	
RA	0.60 (2.39")
Dec	1.05 (4.17")
Total	1.05 (4.17")
RA Osc	
RA Limited	0 (0%)
Dec Limited	0 (0%)

Click **Drift**, wait 20 sec for red line to stabilize

- OK, we're closer. Red line shallower. Note purple circle smaller.
- **Click Adjust.**
- Move Az knobs, but LESS
- Click **Drift** again, wait 20 sec



Guiding

2/2 SNR 20.0

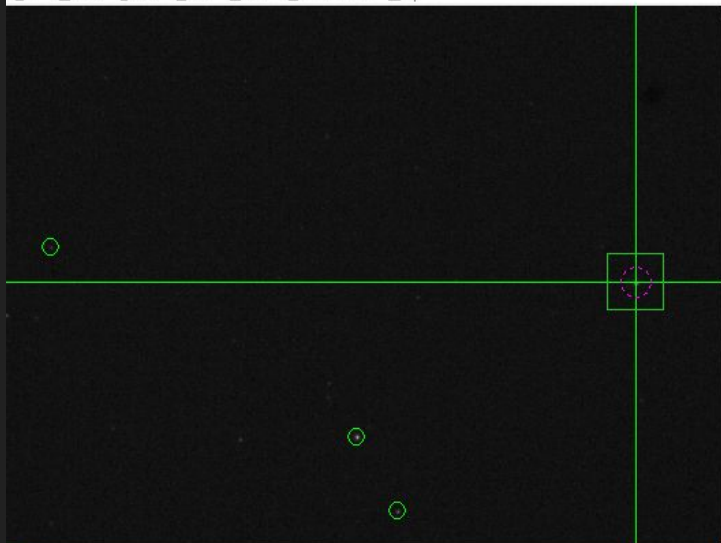
Dark

Cal

# Smaller and smaller steps, try not to overshoot

- I prefer to undershoot twice but get closer each time instead of trying to nail it on the first attempt
- Too big a change: you have to switch directions and the backlash will fool your muscle memory, and you correct too much, then backlash again in the first direction.





### Drift Align - Azimuth Adjustment

Slew to near the Meridian and the Equator.  
 Press Drift to measure drift, watch the Dec trend line.  
 Press Adjust and adjust your mount's azimuth.  
 Repeat Drift/Adjust until alignment is complete.  
 Then, click Altitude to begin Altitude adjustment.

Scope Pointing

Meridian Offset (")	Declination (")
Current: --	Current: --
Slew To: 0	Slew To: 0

Azimuth adjustment notes  
 if star or line below, LEFT TIGHT

Drift Adjust > Altitude

Drifting... click Adjust when done drifting

### Star Profile

Peak 64  
 Mid row FWHM: 3.09, HFD:

### Target

100  
 + -  
 Clear  
☒ Reference Circle  
 Radius: 10.0

### History

x:200  
 y: +/-16"  
 Settings  
 Clear  
☒ Trendlines  
☒ Corrections  
 RA Dec  
 RMS Error [px]:  
 RA 0.42 (1.67")  
 Dec 0.30 (1.19")  
 Tot 0.52 (2.06")  
 RA Osc: 0.28

Polar alignment error: -1.83' (< 28 px)

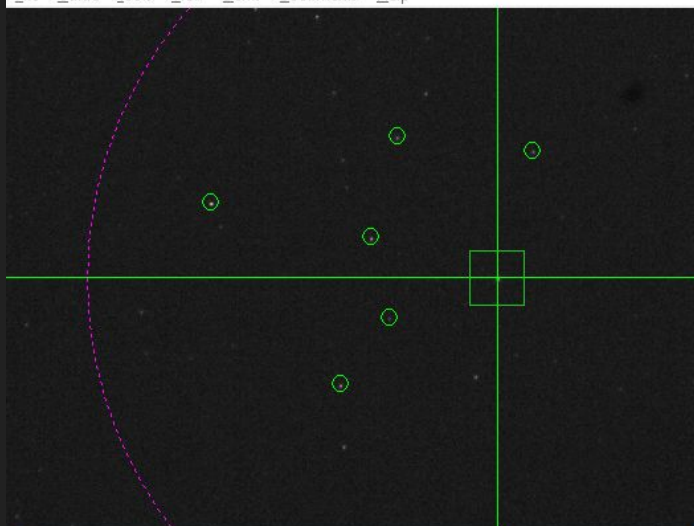
RA: Agr 85 Hys 10 MnMo 0.12 DEC: Agr 100 MnMo 0.19  
 Scope: Mx RA 2500 Mx DEC 2500 Off

Clear x:200

	RMS [px]	Peak [px]
RA	0.42 (1.67")	1.28 (5.08")
Dec	0.30 (1.19")	1.09 (4.34")
Total	0.52 (2.06")	

RA Osc	0.28
RA Limited	0 (0%)
Dec Limited	0 (0%)

Watch it **drift** again, wait longer, 30-40 secs  
 If red line still not horizontal, **click Adjust** and turn knobs a fraction. Hit **drift** again.  
 BAM! Red line super close.  
**Now click ->Altitude**



## Drift Align - Altitude Adjustment



Slew to a location near the Equator and the Eastern or Western horizon.  
Press Drift to measure drift, watch the Dec trend line.  
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 (°)

Declination (°)

Current

--

--

Slew To

-65

0

Slew

Save

## Altitude adjustment notes

Red below, left hand thumb up.

Drift

Adjust

&lt; Azimuth

Drifting... click Adjust when done drifting

## History

x:200  
y: +/-16"  
Settings  
Clear

☒ Trendlines  
☒ Corrections

RA

Dec

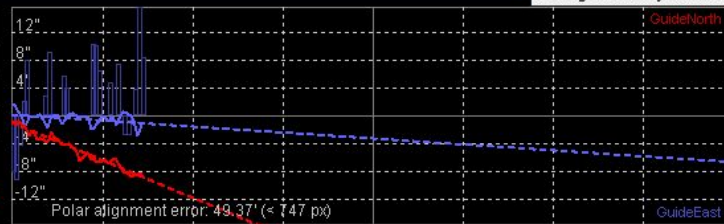
RMS Error [px]:

RA 0.24 (0.94")

Dec 0.60 (2.36")

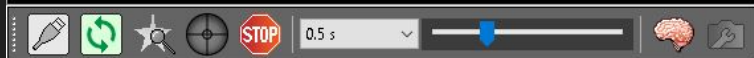
Tot 0.64 (2.55")

RA Osc: 0.19



RA: Agr 85 Hys 10 MnMo 0.12 DEC: Agr 100 MnMo 0.19

Scope: Mx RA 2500 Mx DEC 2500 Off



Guiding

- Loosen main RA clutch, rotate whole rig to point low in W or E
- Click **Drift**, wait 15 seconds
- In my yard I always choose E.
- BE CONSISTENT
- TYPE NOTES !

## Star Profile

Peak

60

Mid row FWHM: 1.98, HFD:

## Target

100

+

-

Clear

☐ Reference Circle

Radius: 10.0



## ***Click Adjust button, adjust Altitude*** ***BE CONSISTENT!***

From same (polar scope) side as before, choose a hand.

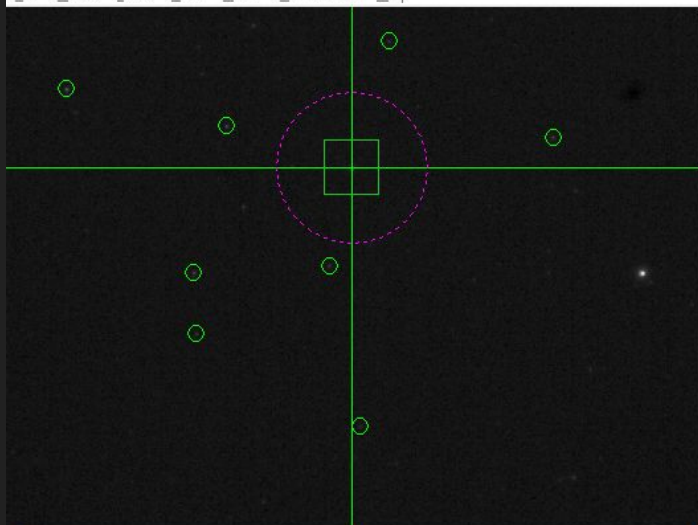
If red line below, then left hand turn so ***thumb moves up/forward***.. Move star 90% of the distance to the purple circle. Do NOT use “clockwise” or “counterclockwise” because the knob is on the other side and you will get confused!

***Click drift***, wait 20 seconds. Hopefully the line is less steep. If not, ***click adjust***, turn the other way (there will be backlash) WITH THE SAME HAND. Type in the NOTES section which hand you used and if thumb moved forwards or backwards.

Always use the same hand with “red above, left hand thumb down/back” or “red above, right hand thumb up/forward” Keep it simple.

***Click drift***, wait 20 seconds, ***Click adjust***. Repeat, using smaller turn.





## Drift Align - Altitude Adjustment



Slew to a location near the Equator and the Eastern or Western horizon.  
Press Drift to measure drift, watch the Dec trend line.  
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 (°)

Declination (°)

Current

--

--

Slew To

-65

0

Slew

Save

## Altitude adjustment notes

Red below, left hand thumb up.

Drift

Adjust

&lt; Azimuth

Drifting... click Adjust when done drifting

## History

x:200  
y: +/-16"  
Settings  
Clear

- ☒ Trendlines  
☒ Corrections

RA

Dec

RMS Error [px]:

RA 0.28 (1.11")

Dec 0.45 (1.78")

Tot 0.53 (2.10")

RA Osc: 0.30



Polar alignment error: -9.19' (&lt; 1.39 px)

RA: Agr

85

Hys

10

MnMo

0.12

DEC: Agr

100

MnMo

0.19

Scope: Mx RA

2500

Mx DEC

2500

Off

Clear

x:200

	RMS [px]	Peak [px]
RA	0.28 (1.11")	0.99 (3.94")
Dec	0.45 (1.78")	2.14 (8.48")
Total	0.53 (2.10")	

RA Osc	0.30
RA Limited	0 (0%)
Dec Limited	0 (0%)

## Star Profile

Peak  
69

Mid row FWHM: 1.34, HFD:

## Target

100

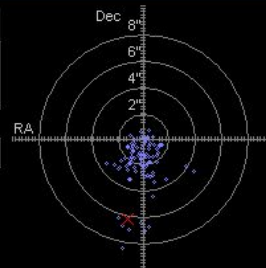
+

-

Clear

☐ Reference Circle

Radius: 10.0

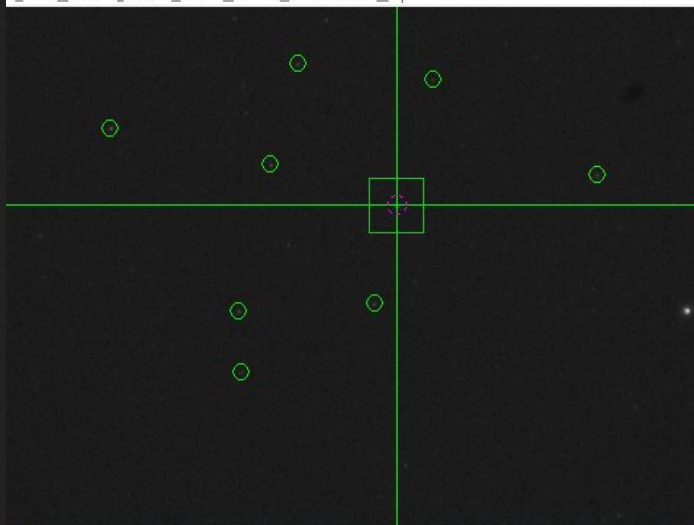


Dang, went too far!

- **Click Adjust**
- Small circle means small turn! (there will be backlash)
- **Click Drift**







### Drift Align - Altitude Adjustment

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

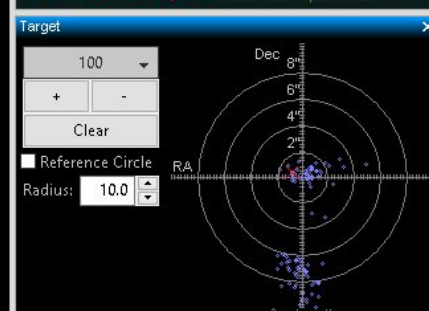
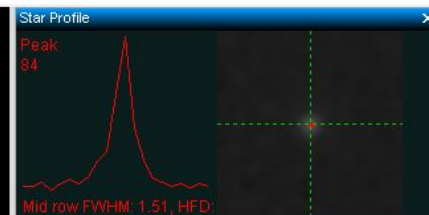
Scope Pointing

Meridian Offset (")	Declination (")
Current --	--
Slew To -65	0

Altitude adjustment notes  
Red below, left hand thumb up.

Drift Adjust < Azimuth

Drifting... click Adjust when done drifting



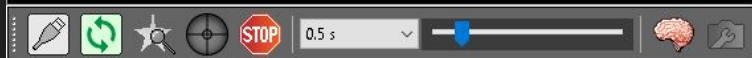
Clear x:200

	RMS [px]	Peak [px]
RA	0.30 (1.21")	1.25 (4.95")
Dec	0.12 (0.48")	0.35 (1.41")
Total	0.33 (1.30")	

RA Osc	0.25
RA Limited	0 (0%)
Dec Limited	0 (0%)

Got it!

Click X to leave.

All done - unless you are OCD  
or require 6 min subs



# Final Thoughts: 1

- Slow down! The more you rush, the more mistakes you make.
- Find a full Moon night to ONLY practice alignment. After you succeed, deliberately shift the mount away with your other hand and re-align. | Do it again. Go too far to get a sense of the backlash effect.
- Know your arcseconds per pixel setup: if it is 4, then your blue (RA) needs to sit inside the  $\pm 2$  channel, and the red line cannot drift past 4. A little bit outside won't kill the image, especially if it is brief during a long sub.
- It's ok to dial it back! If you can't get the red line to stay under your threshold for 4 minutes, then shoot 3 minutes and let go the worrying!
- Technically after doing Az and Alt adjusts, you should refine the Az, because the Alt adjust shifted the geometry. For less than 5 min sub, don't bother.

## Final Thoughts: 2

- Anytime you shoot near the meridian, if you see the red line separating too much, you can quickly stop guiding and shooting, tweak the Az knobs as if you were drift aligning, then restart guiding and shooting. I do this in 15 secs. But I have practiced.
- Anytime you shoot near the E or W, if you see the red line separating too much, you can quickly stop guiding and shooting, tweak the Alt knob as if you were drift aligning, then restart guiding and shooting. I do this in 15 secs. But I have practiced.
- If you reposition to a new object, or re-balance the load, or change lens, it's worth the 5 minutes to drift align again.
- The shorter the focal length, the wider the margin; the longer, the more careful you need to be.
- Under great skies, NEVER try new things, go with what you know for sure will work.