

## Precise polar alignment

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Polar alignment of your equatorial mount can be done in several ways. The most precise way is to use the drift of a star in declination (north or south on the sky) in your field of view.

The declination drift method requires that you monitor the drift of selected stars. The drift of each star tells you how far away the polar axis is pointing from the true celestial pole and in what direction. Although declination drift is simple and straight-forward, it requires a great deal of time and patience to complete when first attempted.

The declination drift method should be done after using latitude and north celestial pole alignment techniques.

To perform the declination drift method, you need to choose two bright stars. One should be near the eastern horizon and one due south near the meridian. Both stars should be near the celestial equator (i.e.,  $0^\circ$  declination). You will monitor the drift of each star one at a time and in declination only. While monitoring a star on the meridian, any misalignment in the east-west direction is revealed. While monitoring a star near the east horizon, any misalignment in the north-south direction is revealed. As for hardware, you will need an illuminated reticle ocular to help you recognize any drift. For very close alignment, a Barlow lens is also recommended since it increases the magnification and reveals any drift faster. When looking due south, insert the diagonal so the eyepiece points straight up. Insert the cross hair ocular and rotate the cross hairs so that one is parallel to the declination axis and the other is parallel to the right ascension axis. Move your telescope manually in R.A. and DEC to check parallelism.

First, choose your star near where the celestial equator (i.e. at or about  $0^\circ$  in declination) and the meridian meet. The star should be approximately 1/2 hour of right ascension from the meridian and within five degrees in declination of the celestial equator. Center the star in the field of your telescope and monitor the drift in declination.

If the star drifts south, the polar axis is too far east.

If the star drifts north, the polar axis is too far west.

Make the appropriate adjustments to the azimuth of the polar axis to eliminate any drift. Once you have eliminated all the drift, move to the star near the eastern horizon. The star should be 20 degrees above the horizon and within five degrees of the celestial equator.

If the star drifts south, the polar axis is too low.

If the star drifts north, the polar axis is too high.

This time, make the appropriate adjustments to the polar axis in altitude to eliminate any drift. Unfortunately, the latter adjustments interact with the prior adjustments ever so slightly. So, repeat the process again to improve the accuracy, checking both axes for minimal drift. Once the drift has been eliminated, the telescope is very accurately aligned.

NOTE: If the eastern horizon is blocked, you may choose a star near the western horizon, but you must reverse the polar high/low error directions. If this is done in the southern hemisphere, swap south and north in the above instructions.