ASTRONOMICAL LEAGUE

A FEDERATION OF ASTRONOMICAL SOCIETIES
A NON-PROFIT ORGANIZATION

- ★ *To promote the science of astronomy:*
- ★ *By fostering astronomical education;*
- ★ *By providing incentives for astronomical observation and research;*
- ★ *By assisting communication among amateur astronomical societies.*

ASTRO NOTES

Produced by the Astronomical League

Note 15: Accurate Polar Alignment

Two methods are presented here for accurately aligning your equatorial mounting's polar axis to the north celestial pole. Both methods are more involved than those presented in **Astro Note 1**, Polar Alignment in the Field, and you may spend several hours completing the alignment, depending on the precision you desire. Each method assumes that the mounting is approximately aligned to start, either by one of the techniques described in **Astro Note 1**, or by some other method.

Three Stars Method

This method requires that the mounting be equipped with a declination circle. Its accuracy will depend on the accuracy of the graduations and your ability to read the setting. The technique is based on a theorem which states: if the telescope mounting is so adjusted that the positions of any three stars are correctly indicated by the declination circle, then the polar axis is correctly aligned.

1. Select three bright stars that are easily located: one near or a little east of the meridian, one well to the east and one well to the west. It is desirable that all three stars be near the celestial equator. Designate these stars M, E and W, respectively.

2. Look up the declinations of all three stars and make a note of the values.

3. Center star M in the telescope field and set the declination circle to read the value for that star's declination.

4. Move the telescope until it reads the declination for star E and clamp the declination axis. Swing the telescope about the polar axis to star E. It will most likely not be centered in the field. Note whether the telescope must be moved north or south to center star E.

5. Repeat the last step for star W, to the west of the meridian.

6. Compare your results with the following table:

Move to center Star E	Move to center Star W	Move polar axis
south	south	raise
north	north	lower
north	south	west
south	north	east

The movement of the polar axis refers to the top end of the axis and can be done by means of shims or adjusting screws, depending on your particular mounting.

Star Drift Method

This method does not require a declination circle, but does require an eyepiece with a crosshair. It works best if the mounting is equipped with a clock drive, but careful use of slow motion will work almost as well. If you have neither, simple let the field drift for a period of time and then bring it back by moving only in right ascension.

1. Choose a bright, easily located star close to the equator (to maximize the drift rate) and near your meridian. Center it on the crosshair of your eyepiece.

2. Track the star until its drift in declination becomes noticeable. Ignore any drift in right ascension. If the star drifts northward, move the polar axis east. If the star drifts southward, move the polar axis west. Repeat, making finer adjustments, until the drift becomes negligible.

3. Choose another bright, easily located star near the eastern or western horizon and center it in your crosshair eyepiece.

4. Track the star until its drift in declination becomes noticeable. Ignore any drift in right ascension. If you are looking east and the star drifts northward, move the polar axis down. If you are looking east and the star drifts southward, move the polar axis up. (Reverse the corrective action if you are looking west.) Repeat, making finer adjustments, until the drift becomes negligible.

Suggested Stars and Declinations (J2000)

Star	mag.	Declination	Star	mag.	Declination
β Cet	2.0	-17° 59'	α CMi	0.4	+05° 14'
α Cet	2.5	+04° 05'	α Hya	2.0	-08° 40'
α Tau	0.9	+16° 31'	α Leo	1.4	+11° 58'
β Ori	0.1	-08° 12'	β Vir	3.6	+01° 46'
δ Ori	2.2	-00° 18'	α Vir	1.0	-11° 10'
ε Ori	1.7	-01° 57'	β Lib	2.6	-09° 23'
ζ Ori	1.8	-01° 57'	γ Oph	3.8	+02° 42'
α Ori	0.5	+07° 24'	α Aql	0.8	+08° 52'
α CMa	-1.5	-16° 43'	α Aqr	3.0	-00° 19'