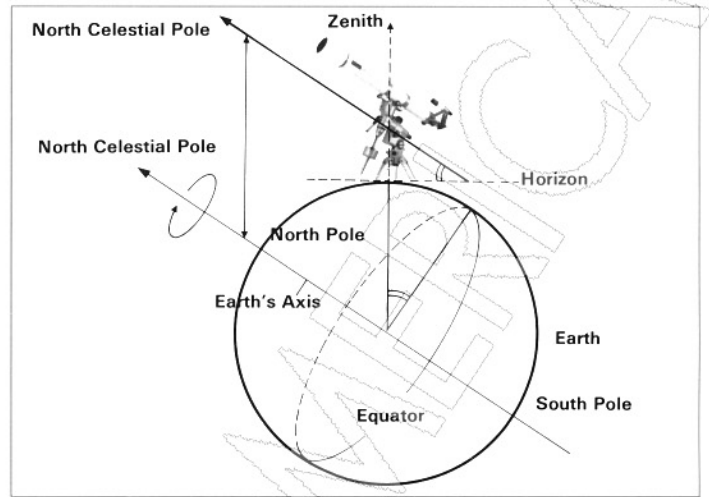


HOW TO SET UP THE EQUATORIAL MOUNT TELESCOPE

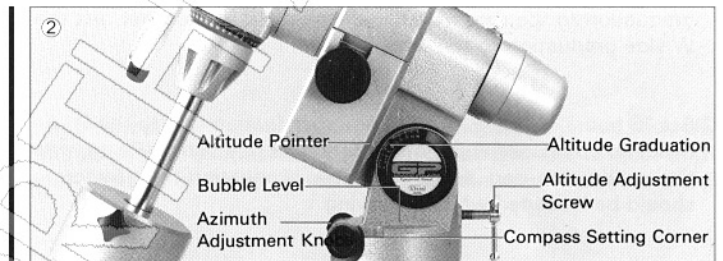
The stars appear to move across the sky. For observers in the northern hemisphere, all stars appear to move around the north celestial pole. For observers in the southern hemisphere, all stars appear to move around the south celestial pole. This motion is caused by the Earth's rotation about its axis. To have your telescope track the stars as they move across the sky, the telescope's axis of rotation must be made parallel to the Earth's axis.



Roughly Aligning the Polar Axis of the Telescope

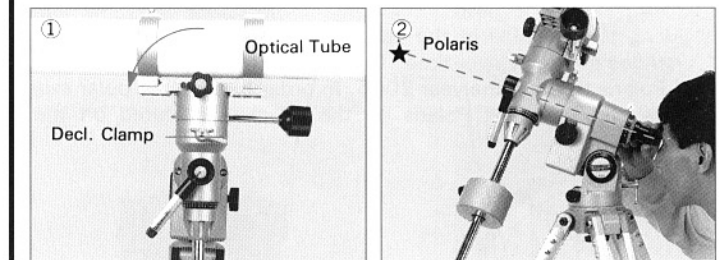
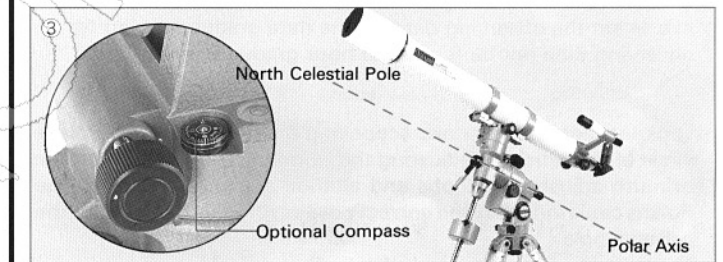
The following simple alignment of the polar axis is good enough for just observing an object—but not accurate enough for prolonged observation or astrophotography.

- ① Find out the latitude of your location referring to a map, etc.
- ② Set the altitude graduation to the latitude of your location with the altitude adjustment screw turned.
- ③ Set the polar axis of the telescope towards the north. With a compass, you can do it easier.



The following is to make a more precise alignment when Polaris can be seen.

- ① Unfasten the Decl. clamp and turn the optical tube until it is nearly at right angles to the polar axis.
- ② Take off the polar axis cap. Look through the polar axis scope and bring Polaris in its field of view by adjusting the azimuth and altitude with the azimuth adjustment knobs and altitude adjustment screw. If the polar axis scope is not available on your telescope, look through the polar axis hole and bring Polaris in the view.



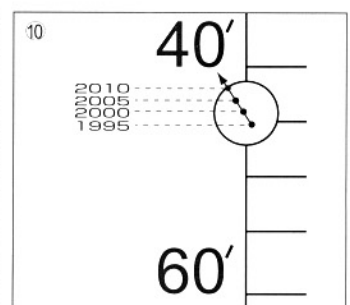
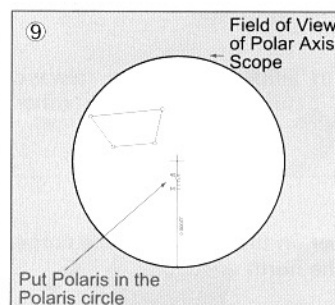
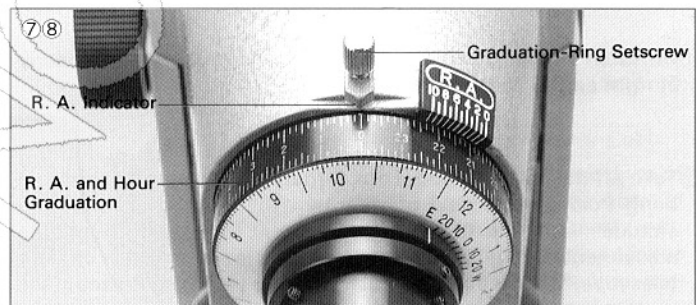
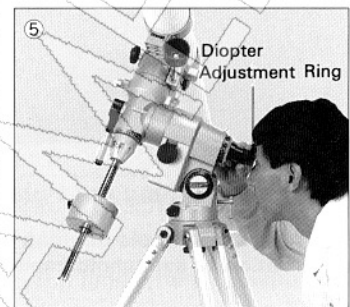
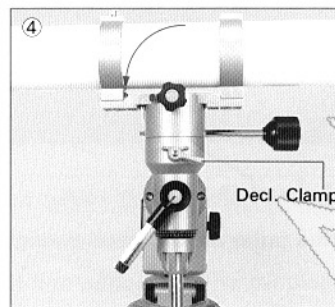
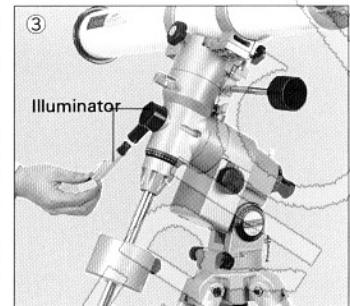
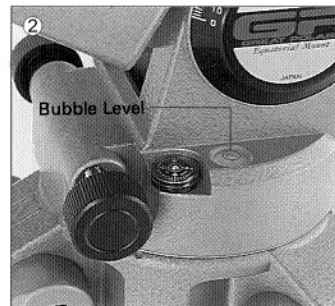
[Note] When turning the azimuth adjustment knobs, always unfasten one adjustment knob before tightening the other adjustment knob.

《Optional Compass》

There is a compass setting corner on the mount. On the corner, set the optional compass with its needle parallel to the polar axis. The compass is useful to find the north direction.

Using Your Polar Axis Scope in the Northern Hemisphere

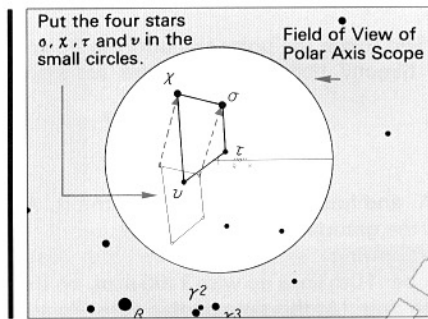
- ① In the Northern Hemisphere, locate Polaris in the sky and point the polar axis of the mount in the direction of Polaris.
- ② Adjust the tripod legs until the bubble level on the left side of the mount indicates the tripod is level. (An optional tripod-leg adjuster makes the adjustment easier.)
- ③ Install the polar axis scope illuminator onto the front of the polar axis and turn on the switch. (Refer to the paragraph «How to use a Polar Axis Scope Illuminator».)
- ④ Unfasten the Decl. clamp and turn the optical tube until it is nearly at right angles to the polar axis. If you do not do this, the polar axis scope will be shaded with the Decl. axis and can not be used.
- ⑤ While looking in the polar axis scope, adjust the diopter adjustment ring to focus on the reticle in the field of view.
- ⑥ Look at a map or atlas that shows the longitude of your observing site. Once you know your longitude, find the difference between that and the standard time meridian for your zone. Set the difference on the time meridian offset scale. If your observing site is located in the east of the standard time meridian, set the E side graduation to the time meridian indicator. If in the west, set the W side graduation to the time meridian indicator.
- ⑦ Set "0 hour" on the R. A. and hour graduation ring to the R. A. indicator after loosening the graduation-ring setscrew. Re-tighten the graduation-ring setscrew. (The graduation-ring setscrew should be loosened when observing.)
- ⑧ Unfasten the R. A. clamp and turn the telescope around the polar axis to set the observing date on the date graduation ring to the observing time on the R. A. and hour graduation ring.
- ⑨ Look through the polar axis scope and bring Polaris in the Polaris circle of the reticle by adjusting the azimuth and altitude with the azimuth adjustment knobs and altitude adjustment screw. The Polaris circle indicates the correct position of Polaris relative to the celestial pole.
- ⑩ Owing to a wobble in the earth's axis, the position of Polaris changes gradually over time. The diagram ⑩ shows the position of Polaris through the year 2005. In order to align the polar axis more precisely, put Polaris on the position indicated on the diagram.



Using Your Polar Axis Finder in the Southern Hemisphere

The polar axis scope also contains a reticle for the southern hemisphere. The reticle shows the relative positions of four stars near the south celestial pole. The stars are Sigma (σ), Tau (τ), Chi (χ) and Upsilon (υ) of Octantis.

- ① Point the polar axis of the mount toward Octantis.
- ②~⑤ Refer to the instructions described for using in the northern hemisphere.
- ⑥ While looking through the polar axis scope, adjust the mount in altitude and azimuth or rotate the polar alignment reticle until the four stars mentioned above are in the respective circles on the reticle. The polar alignment reticle is rotated by moving the telescope in right ascension.

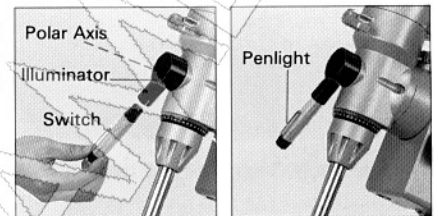


Octantis

Star	Magnitude
σ	5.5
χ	5.2
τ	5.6
υ	5.7

«How to use a Polar Axis Scope Illuminator»

- ① The illuminator is installed on the front of the polar axis. When turning on the penlight switch, the field of view of the polar axis scope is illuminated in dim red so that the polar alignment reticle can be seen clearly. The penlight can be switched on by turning its switch either way.
- ② When polar alignment is completed, remove the illuminator.
- ③ The penlight is also useful as a map light when looking at a star chart, etc.

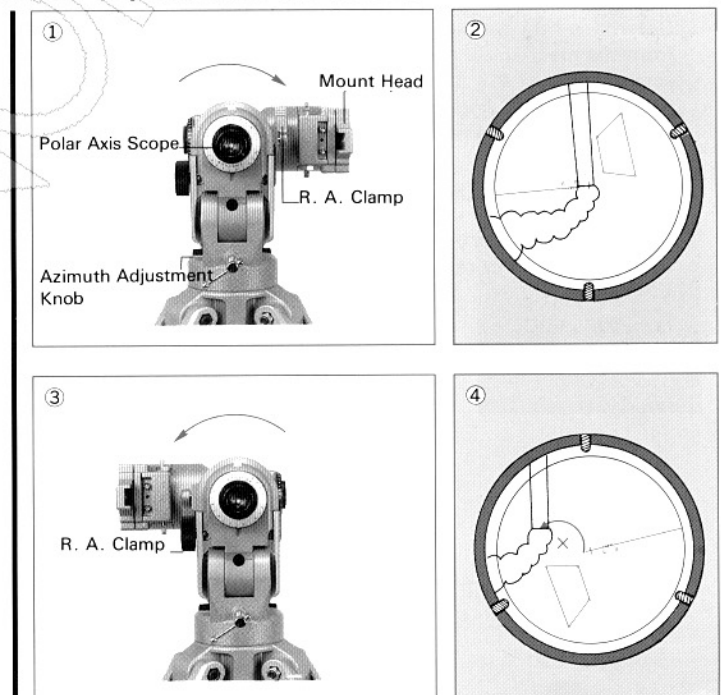


Aligning the Polar Axis Scope

The polar axis scope is installed and aligned at the factory. If the adjustment screws are loosened or if the mount is jarred severely, the polar axis scope may have to be realigned. The optical axis of the polar axis scope must be made parallel to the rotational (R. A.) axis of the mount and the Polaris circle which indicates the proper position of Polaris relative to the pole must be set to the R. A. and hour graduation and date graduation.

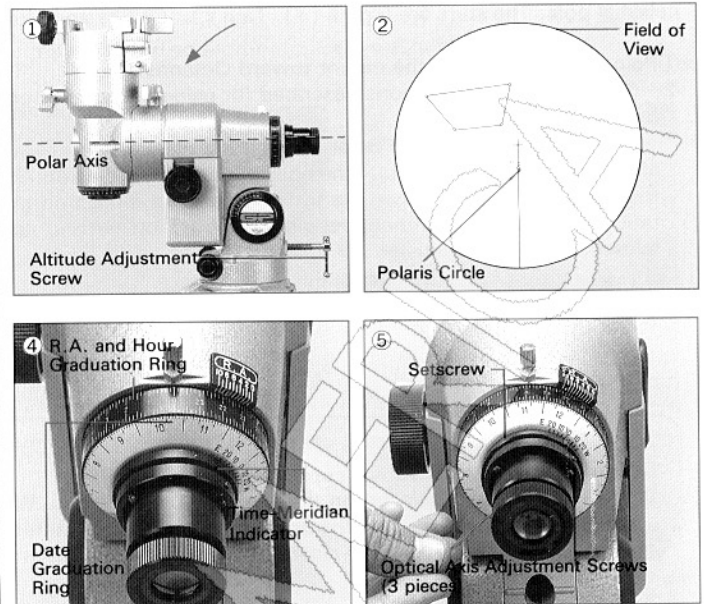
«How to know if the optical axis of the polar axis scope is parallel to the rotational axis of the mount»

- ① Remove the optical tube, counterweight shaft and counterweight from the mount. Release the R. A. clamp and rotate the mount head until it is on the right side of the mount.
- ② Find an object in excess of 1km away and center it in the field of view.
- ③ Release the R. A. clamp again and rotate the mount head so that it is on the left side of the mount.
- ④ If the optical axis of the polar axis scope is parallel to the rotational axis of the mount, the object will be kept at the center. If not, it will move off center as shown on the illustration.



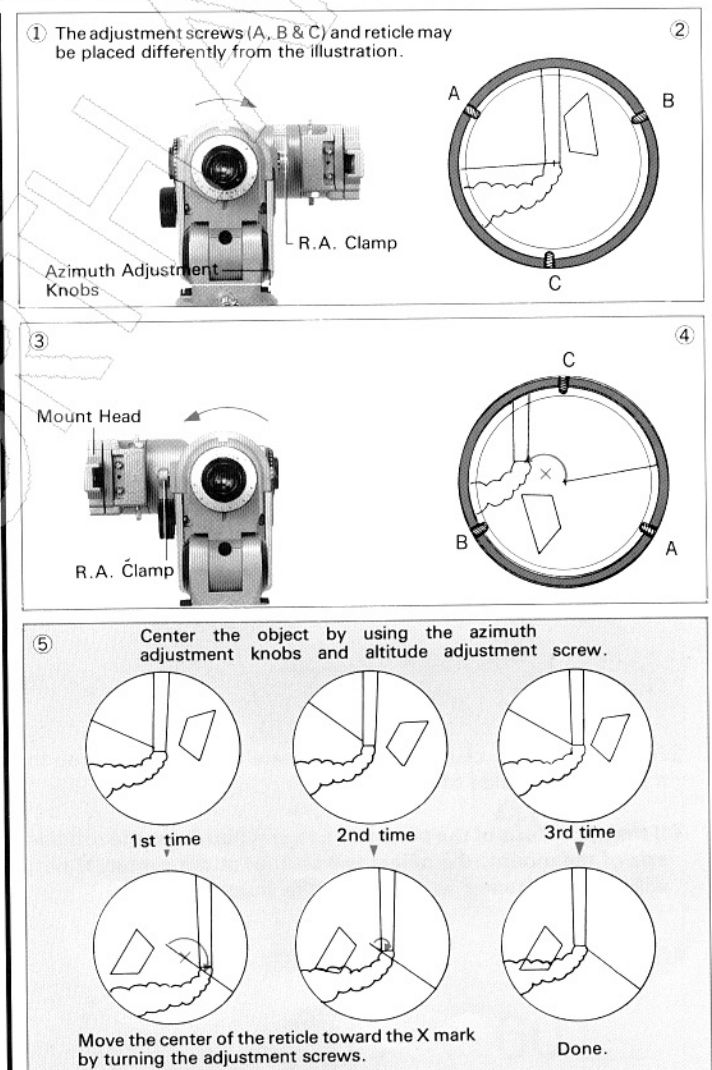
[How to set the Polaris circle to the R. A. and hour graduation and date graduation]

- ① Incline the polar axis by turning the altitude adjustment screw so that it is parallel to the ground.
- ② Release the R. A. clamp and rotate the polar axis until the Polaris circle on the reticle is directly below. (Ignore the southern hemisphere reticle.)
- ③ Fasten the R. A. clamp.
- ④ Set "0 hour" on the R. A. and hour graduation ring to the R. A. indicator after loosening the graduation-ring setscrew. Re-tighten the graduation-ring setscrew. Turn the date graduation ring until October 10th lines up with 1:20 a.m. on the R. A. and hour graduation ring. (At this time on this date, Polaris is at upper culmination.)
- ⑤ Loosen the setscrew that secures the ring with the time meridian indicator. Turn the ring until the time meridian indicator points to the "0" mark on the time meridian offset scale. Re-tighten the setscrew.



[How to make the optical axis of the polar axis scope parallel to the rotational axis of the mount]

- ① Release the R. A. clamp and rotate the mount head until it is on the right side of the mount.
- ② Find an object in excess of 1km away and center it in the field of view. (The optical axis is at the center of the field of view.)
- ③ Rotate the mount head again so that it is on the left side of the mount. The object originally seen at the center will describe a semicircle around the point where the mechanical axis is pointing and will move off center.
- ④ Determine how far and in what direction the optical axis moved from the mechanical axis. By turning the optical axis adjustment screws, move the optical axis toward the point where the mechanical axis is pointing. Keep in mind that the image in the polar axis scope is inverted.
- ⑤ Repeat this process until the optical axis of the polar axis scope is centered on the rotational axis of the mount. When properly aligned, the object remains centered while rotating the mount.



HOW TO USE THE R.A. AND DECL. GRADUATION RINGS (SETTING CIRCLES)

The R.A. and Decl. graduation rings (setting circles) are helpful to search for faint nebulae and clusters which are hard to be found with the naked eye. To make a search with the graduation rings, you first have to locate a bright star near the object you want to observe. The following is an example on how to use the graduation rings.

Example: Finding the Ring Nebula, M57

From the star atlas, you will see that the Ring Nebula, M57, is close to the star Vega. Vega is a bright star of magnitude 1 and can be seen from Spring to Autumn in most places. Let's use Vega as a base to find M57. (The telescope must be polar aligned.)

- 1 Find the coordinates (right ascension and declination) of Vega and M57 in a book or star atlas.

	R.A.	Decl.
Vega	18h36m	39°
M57	18h52m	33°

- 2 Center Vega in the field of view of the telescope using a low-power eyepiece (under 50X).
- 3 Turn the R.A. graduation ring and set it to 18h36m (18 hours 36 minutes).
- 4 Set the Decl. graduation ring to 39 degrees.
- 5 To have the telescope moved to M57, turn the R.A. slow-motion control knob or drive the R.A. motor until the R.A. and hour graduation ring is set to 18h52m.
- 6 Turn the Decl. slow-motion control knob or drive the Decl. motor until the Decl. graduation ring is set to 33 degrees.
- 7 The Ring Nebula can now be seen in the field of view. But, it may be very small. Try to use a higher-power eyepiece.

How to use the Verniers

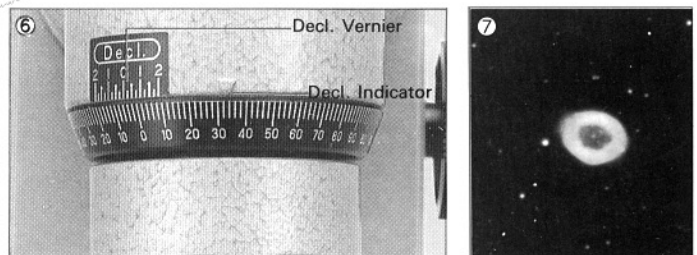
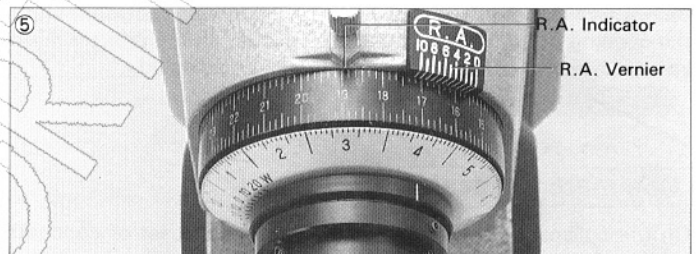
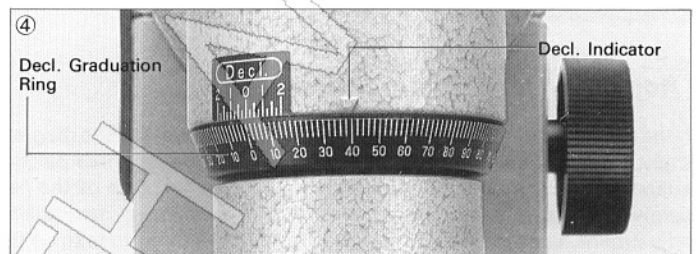
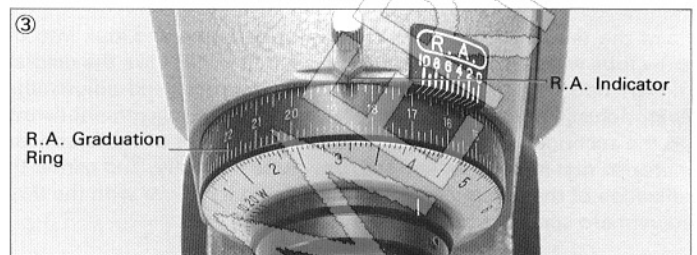
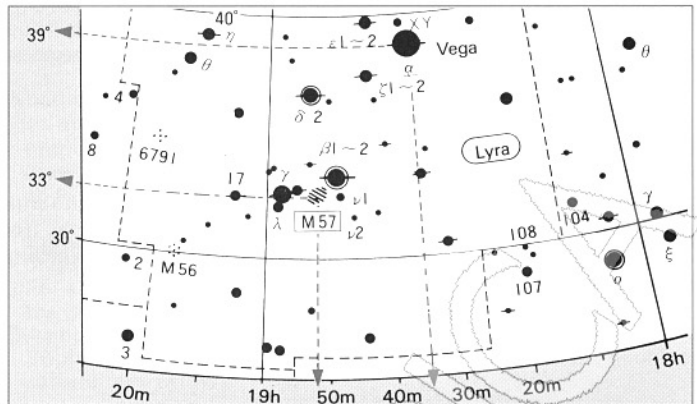
If you use the verniers, the R.A. and Decl. graduations can be set more precisely.

- 1 Reading the R.A. graduation with the vernier

On the right example, the vernier graduation 0 is positioned between 22h0m and 22h10m. The R.A. graduation and vernier graduation coincide at the vernier graduation 4. Then, the R.A. graduation is read as 22h4m ($22h0m + 4m$).

- 2 Reading the Decl. graduation with the vernier

The vernier graduation 0 is in the middle of the Decl. vernier. Use the vernier graduation in the increment direction of the Decl. graduation. On the right example, the vernier graduation 0 is positioned between 48° and 50°. As the Decl. graduation is incremental to the left side, use the left side vernier graduation. The Decl. graduation and vernier graduation coincide at the vernier graduation 1°30'. Then, the Decl. graduation is read as 49°30' ($48° + 1°30'$).



(Example)

