INSTRUCTION MANUAL

for

NJP

TAKAHASHI

Thank you for your purchase of the Takahashi NJP equatorial mount. In order to use the mount to the limit of its capabilities, please read this manual carefully and familiarize yourself with the parts and their functions before using it.

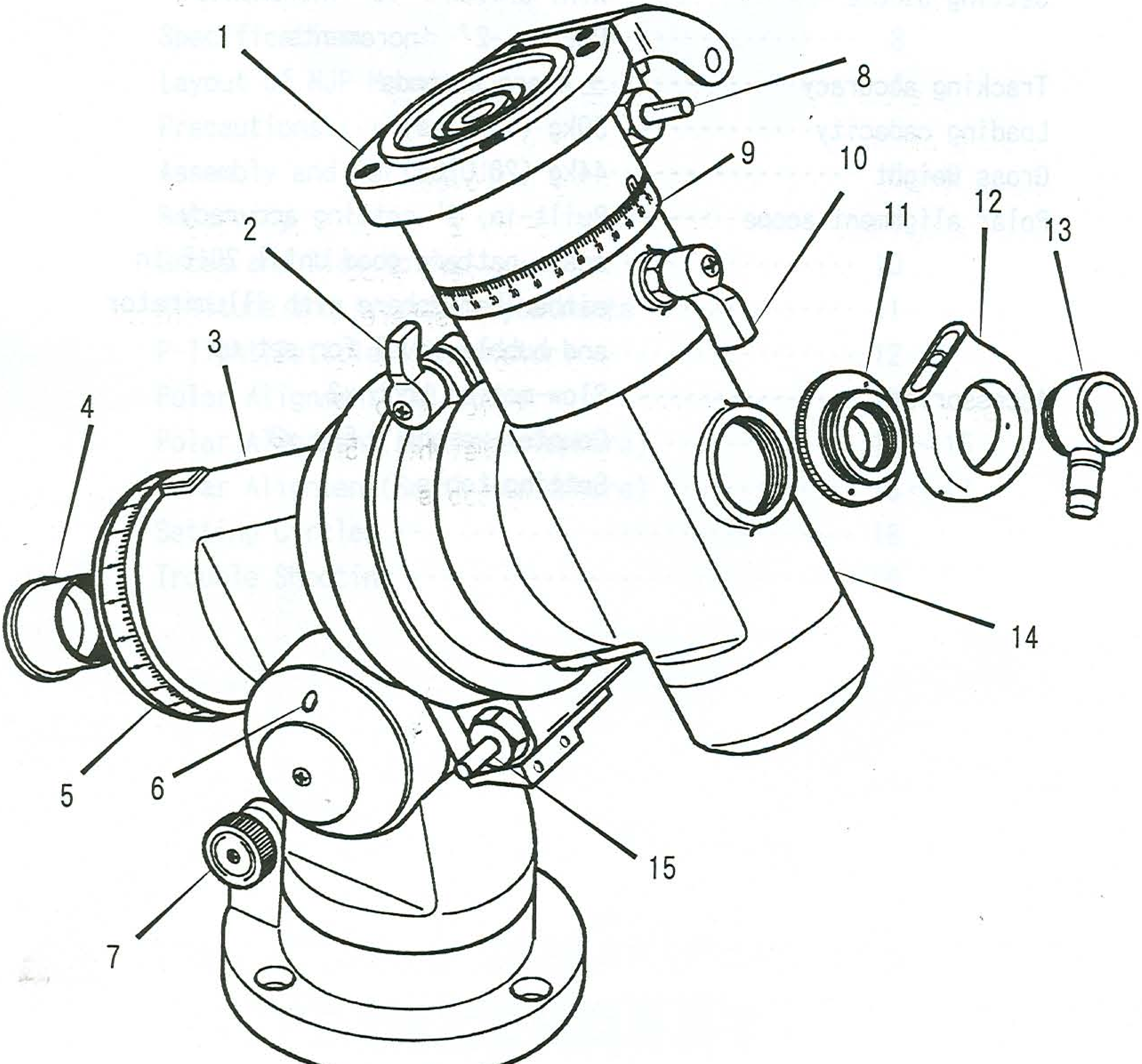
Table of Contents

Specifications

Type	German equatorial mount with PD-7XY motor drive system
R.A. slow-motion	Manually or motor driven
Dec. slow-motion	Manually or motor driven
Azimuth adjustment	Adjustable ±5° with double-screw
Elevation	Adjustable 25°～48° with screw Available for lower latitude (0°～28°) use
Setting Circle	R.A. driven - 10' increments Dec. - 2° increments
Tracking accuracy	±4 arc seconds
Loading capacity	30kg (13.6lbs)
Gross weight	44kg (20.0lbs)
Polar alignment scope	Built-in, 2' setting accuracy scale pattern good until 2015 in either hemisphere with illuminator and bubble level for set up
Accessories	Slow-motion knob x2 Counter-weight 6.5kg x3 Setting tools

Layout of NJP Mount

1. Tube holder base
2. R.A. clamp
3. Polar axis housing
4. Polar scope rear cap
5. R.A. setting circle
6. Elevation clamp screw
7. Azimuth adjusting screw
8. Dec. slow-motion shaft
9. Dec. setting circle
10. Dec. clamp
11. Polar scope front cap
12. Bubble Level
13. Polar illuminator
14. Dec. housing
15. R.A. slow-motion shaft



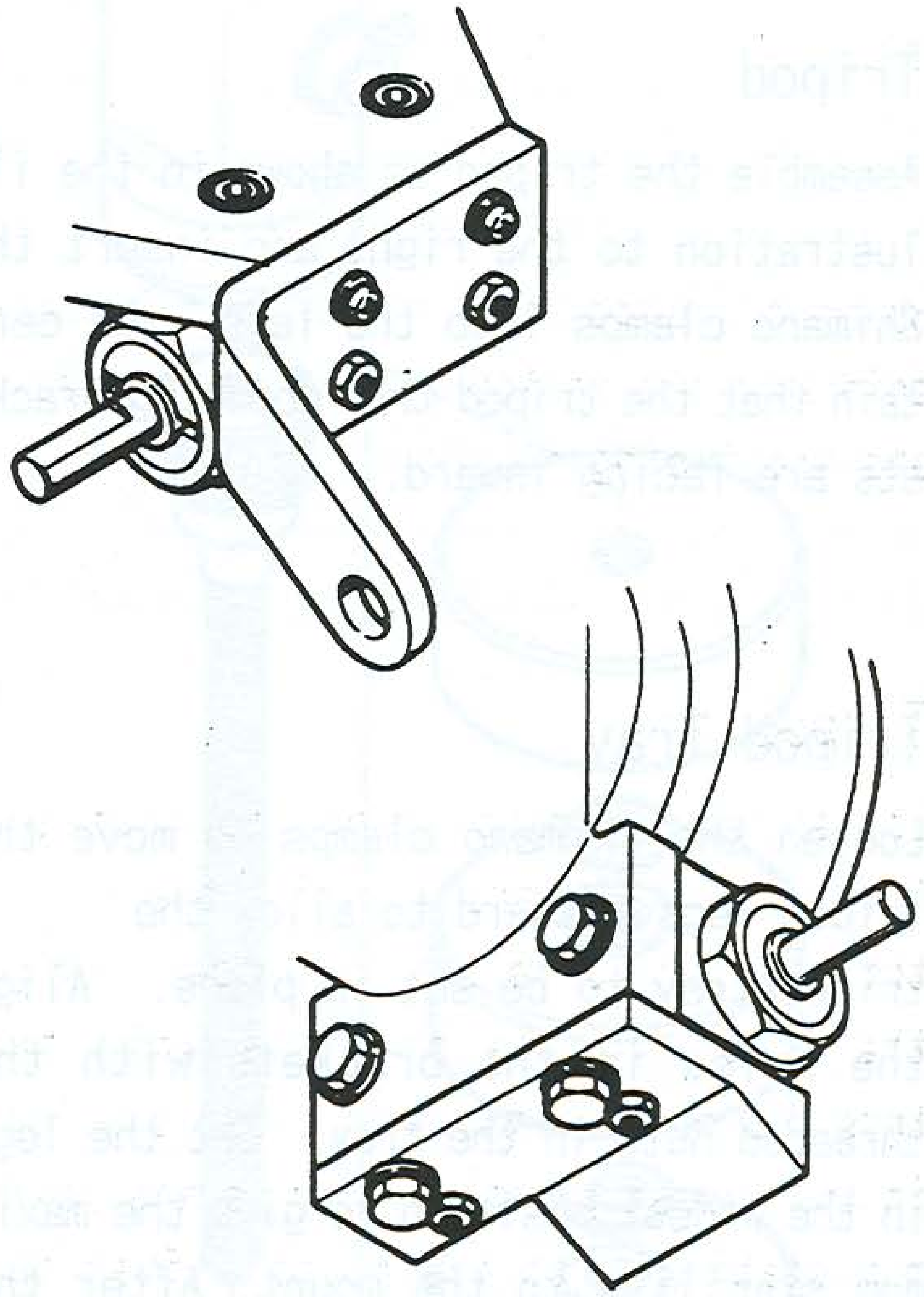
Precautions

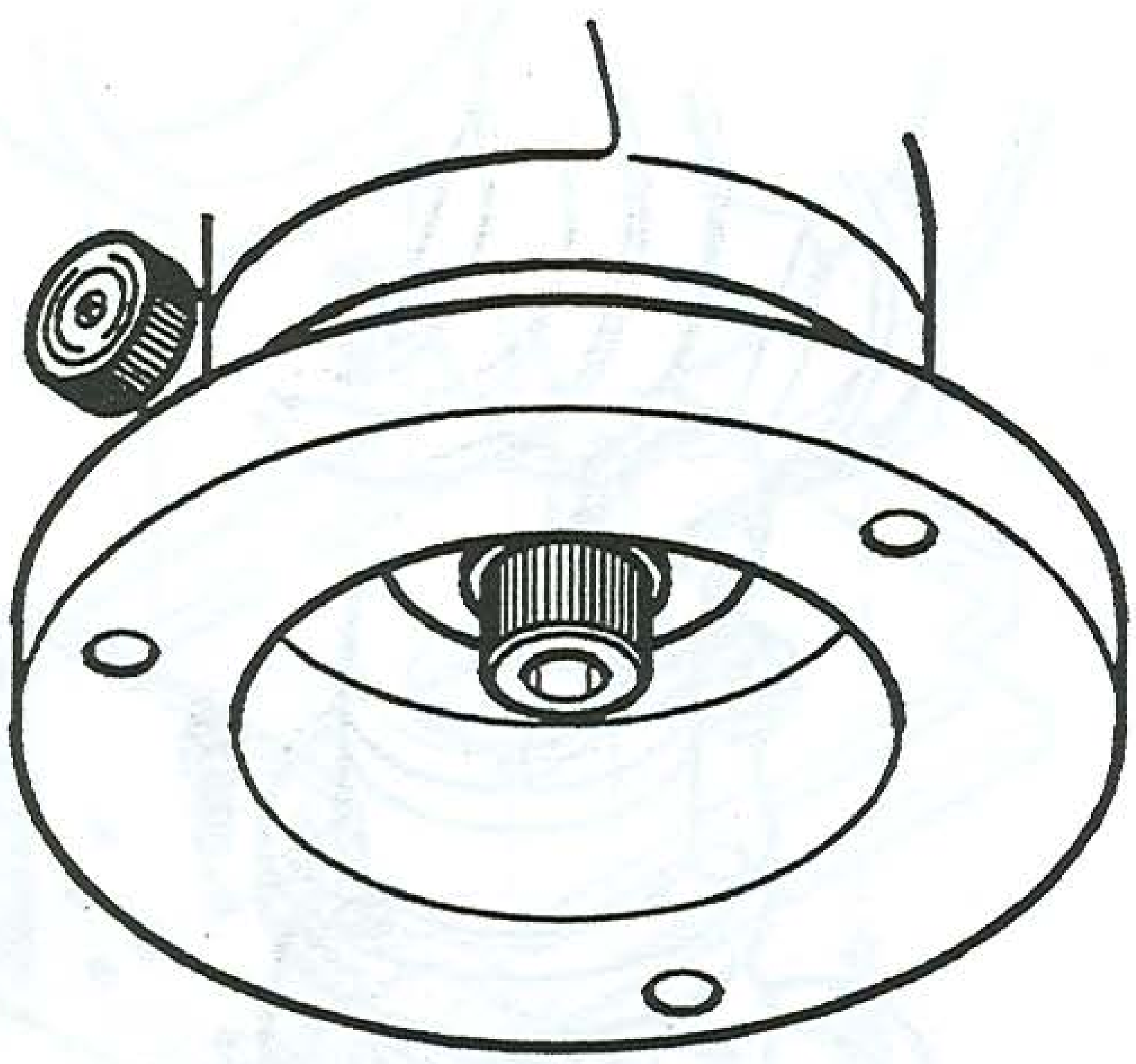
1. The NJP mount has been precisely adjusted at the factory and is ruggedly built. Nontheless, great care should be taken when the mount is transported. Due to its weight (55lbs.), the mount should be transported in its original carton or a case optionally available to prevent damage.

2. The NJP uses special lubricants, which will last for a long time. In the unlikely event the NJP needs lubrication, please contact your local dealers for instructions.

3. Avoid using the NJP on a windy night. Dust can be blown into the gear train and cause damage to the precise gears.

4. The gear spacing has been precisely set before the mount was shipped. Do not adjust any of the screws shown to the right. Moving any of these will change the precise spacing necessary for the pricise tracking the mount produces. Should any of these screws loosen, contact your local dealer for readjustment.





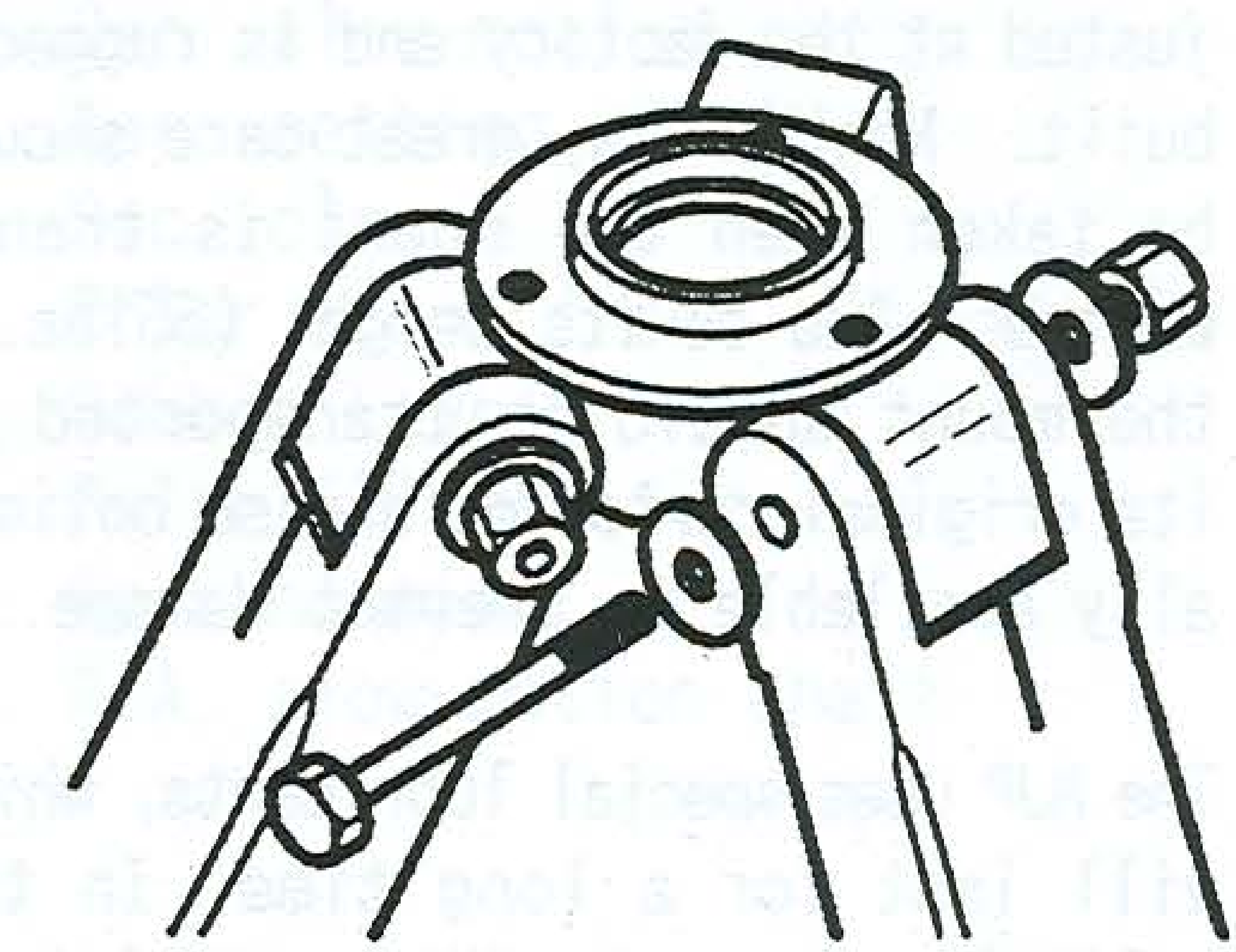
5. The locking bolt at the base of the mount has been set to allow easy azimuth movement for polar alignment. This adjustment allows the mount to adjusted smoothly without any wobble, which could affect the alignment process.

6. Do not loosen any other screws, which could cause the troubles to operate the mount properly. Should any questions arise as to the operation of the mount, please contact your local dealer who will assist you in way possible.

Assembly and Setting Up

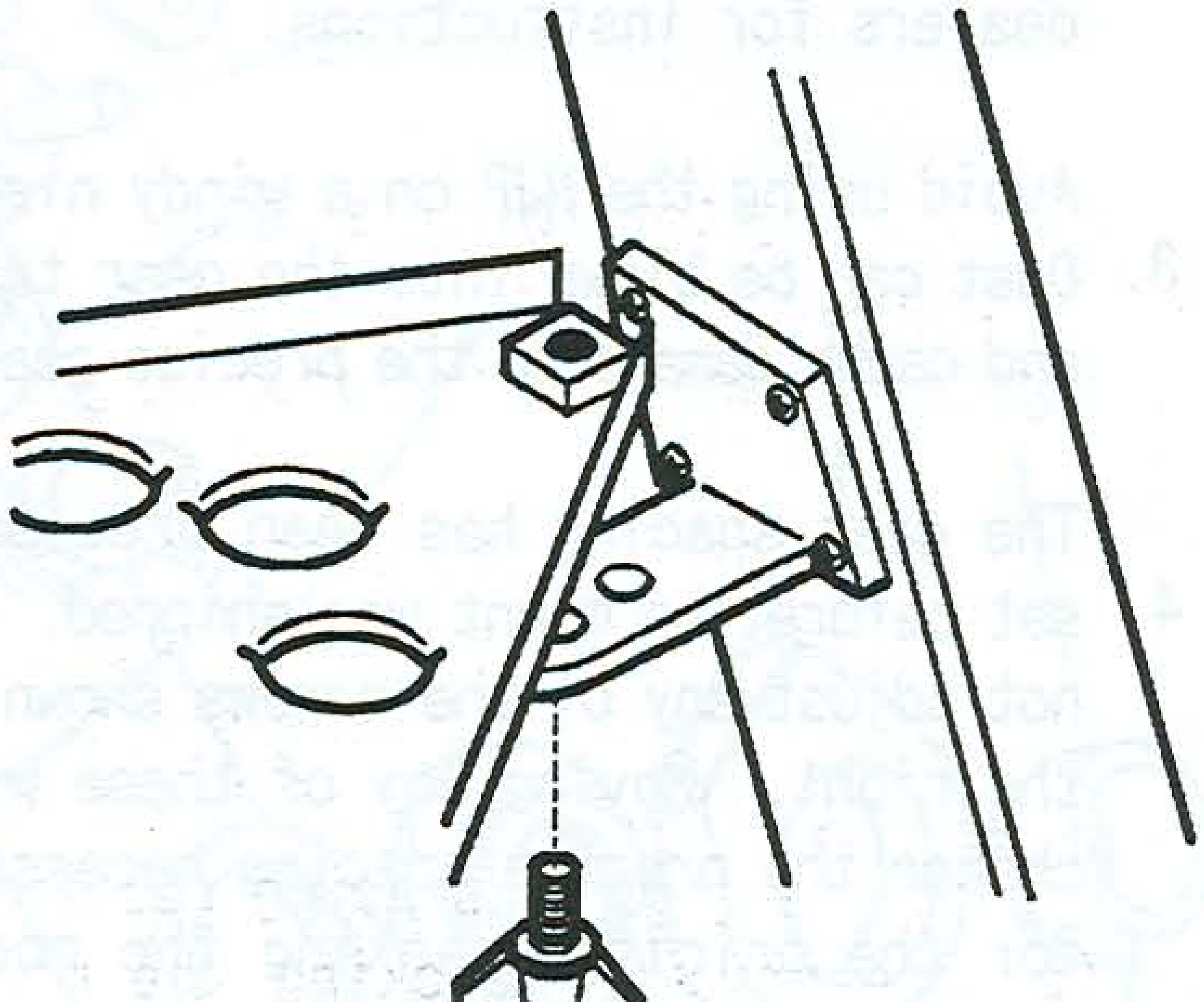
Tripod

Assemble the tripod as shown in the illustration to the right and insert the Shimano clamps into the legs. Be certain that the tripod tray mounting brackets are facing inward.



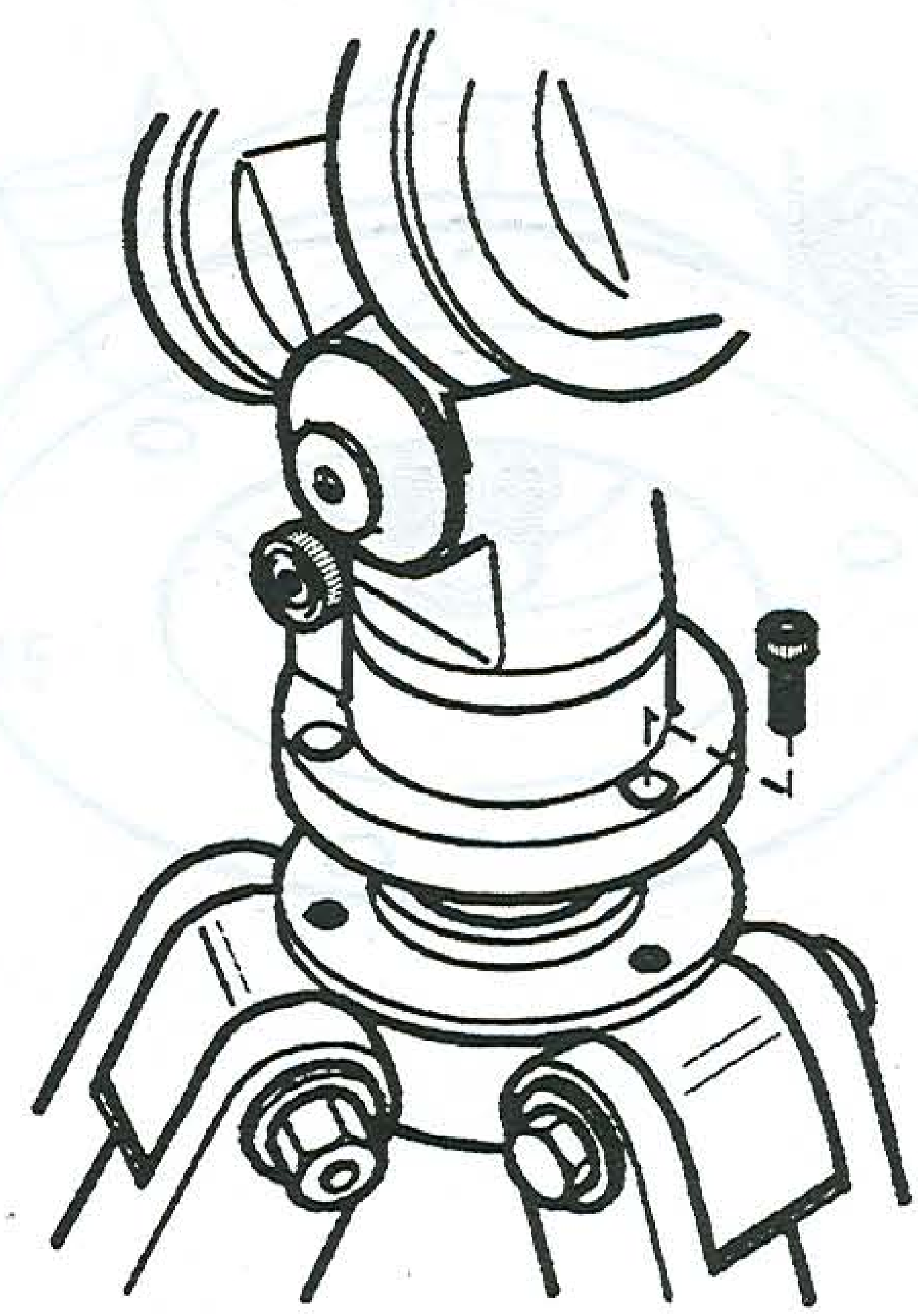
Tripod Tray

Loosen the Shimano clamps to move the tripod legs outward to allow the tripod tray to be set in place. Align the holes in the brackets with the threaded nuts in the tray. Set the legs in the widest position to give the maximum stability to the mount. After the tray has been firmly attached and adjusted, tighten the clamps.



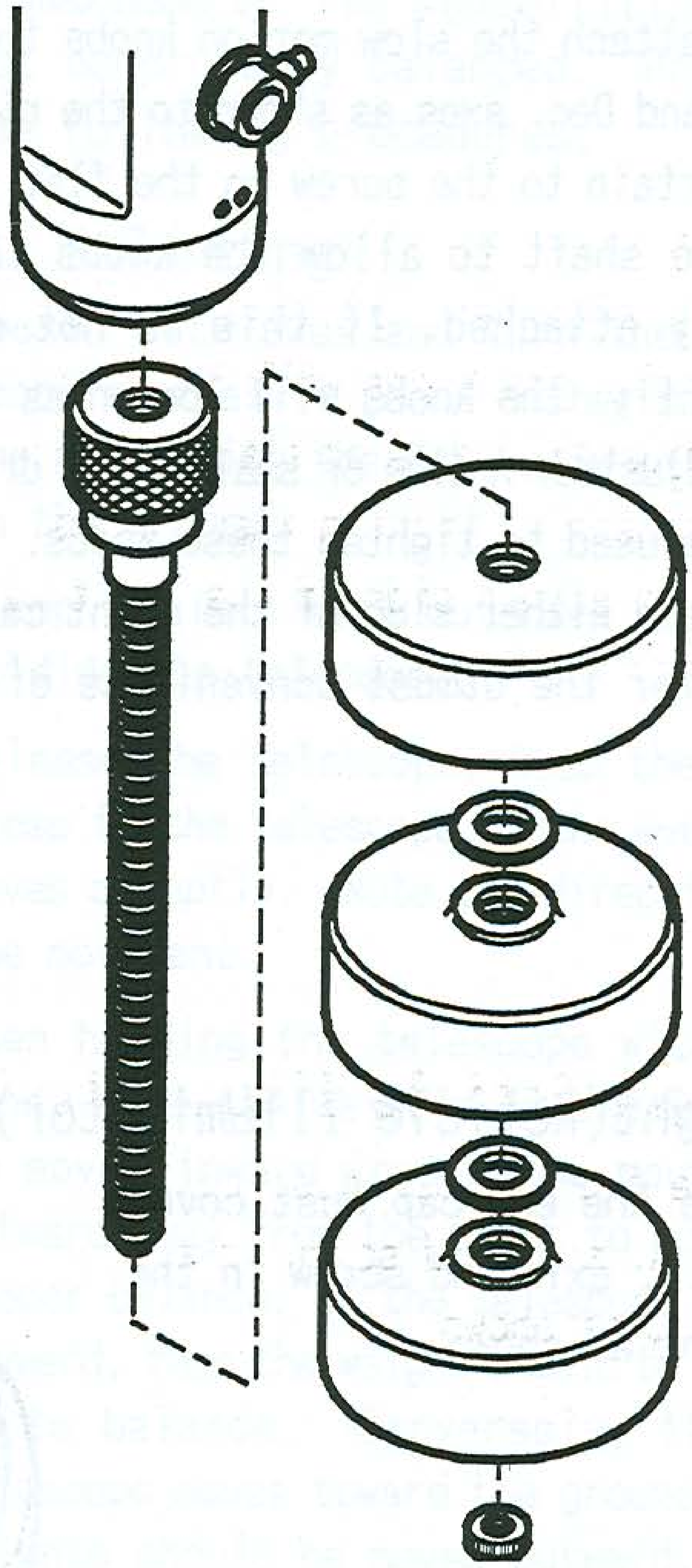
Mount

Set up the assembled tripod so that one of the legs is pointing North. Then place the mount on the tripod and align the holes of the mount with the holes in the tripod adapter. Attach the mount with the 10mm bolts provided for this purpose using the Allen wrench included with the mount. It is best to hand-tighten the bolts before using the wrench. The hole alignment can be easily adjusted to give the best alignment for the insertion of the bolts. See the illustration to the right.

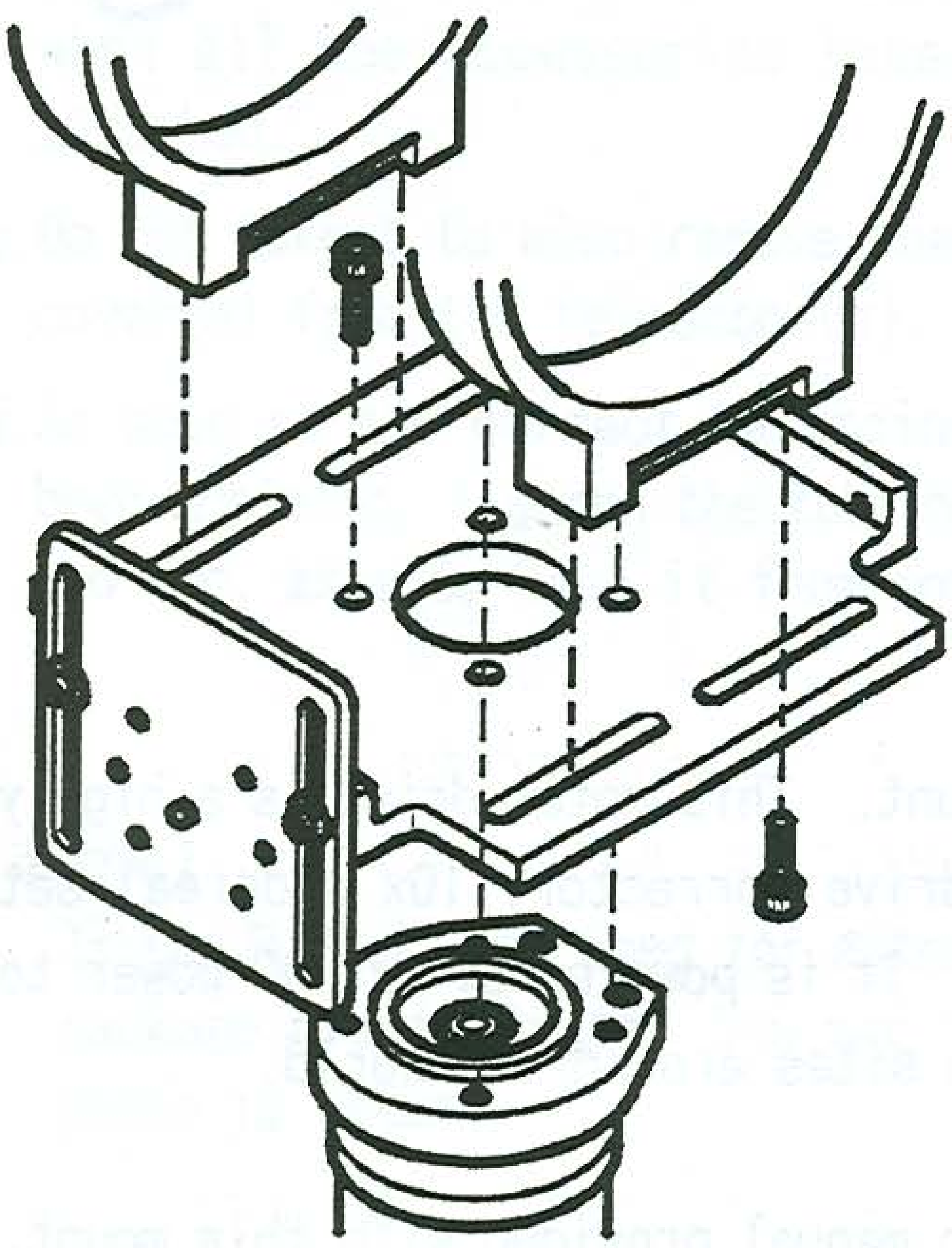


Counter-Weight Shaft and Counter-Weight

Screw in the Dec. counter-weight shaft into the Dec. housing and firmly tighten it by grapsing the knurled ring at the end of the shaft. Loosen the R.A. clamp so that the shaft points to the ground. Remove the safety nut. Then screw the counter-weight onto the shaft. Face the side of the weight that has the thread recessed to make the threading process easier. Slowly screw on the weights and be certain to place the rubber washer in between the weights to keep them from jamming together when they make contact with each other.



After all the weights have been attached, replace the safety nut at the end of the shaft. The counter-weight is rather heavy, 6.5kg(14.3lbs.), so great care should be taken when the weight is screwed onto the shaft and especially when it is removed. When the weight leaves the shaft,it will drop adruptly. It is a good idea to use both hand to remove the weight. Remove the counter-weight shaft from the mount by using the knurled ring.



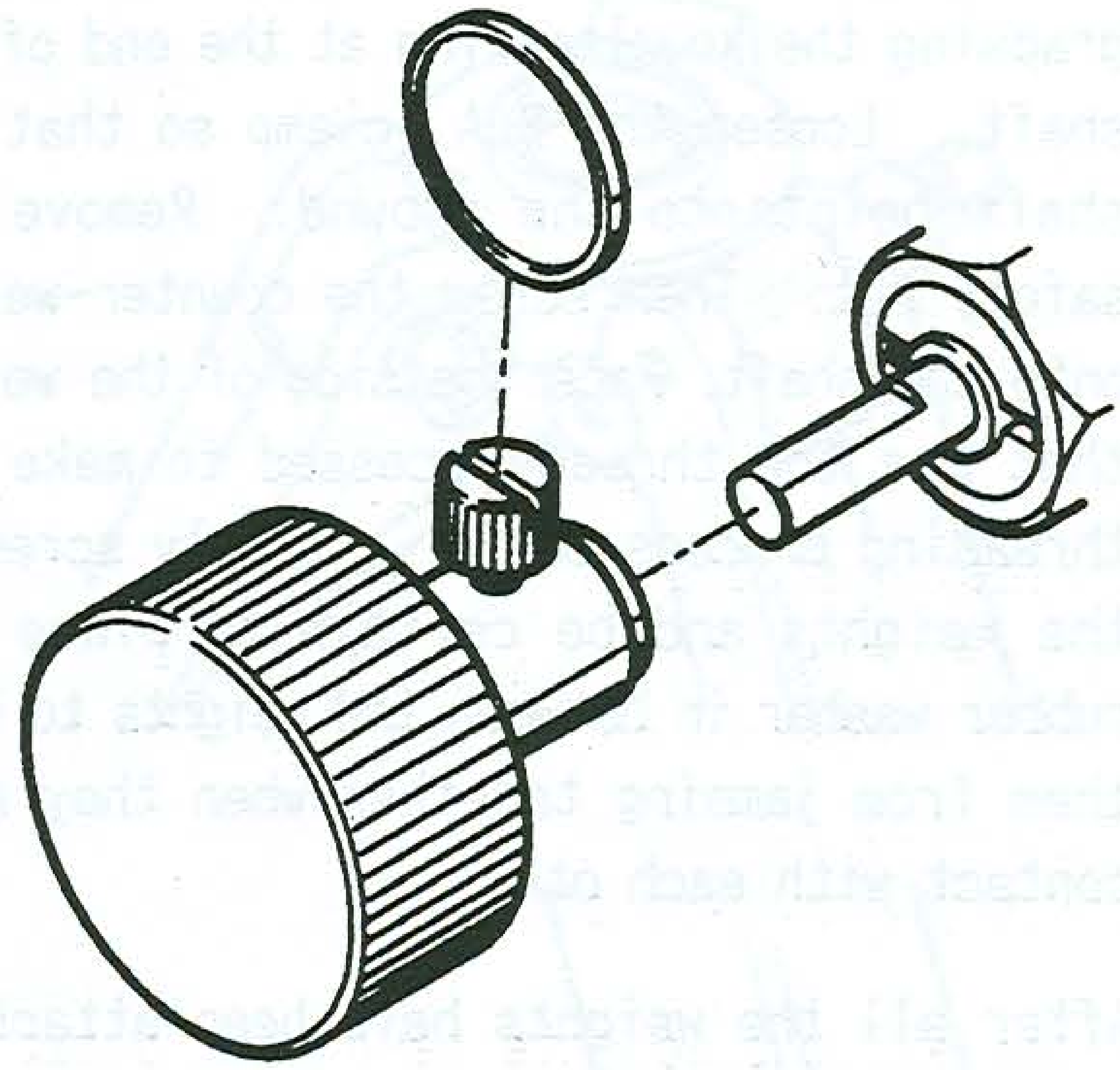
Tube Holder and Accessary Plate

The top of the Dec. housing is made to accept a number of accessory plates for various Takahashi tube assemblies.

Special plates are avail for the FCT-150 and FS-152. These plates are provided with keyways that allow the instrument to be shifted right or left to make balancing easier when extra instrumentation is added to the mount.

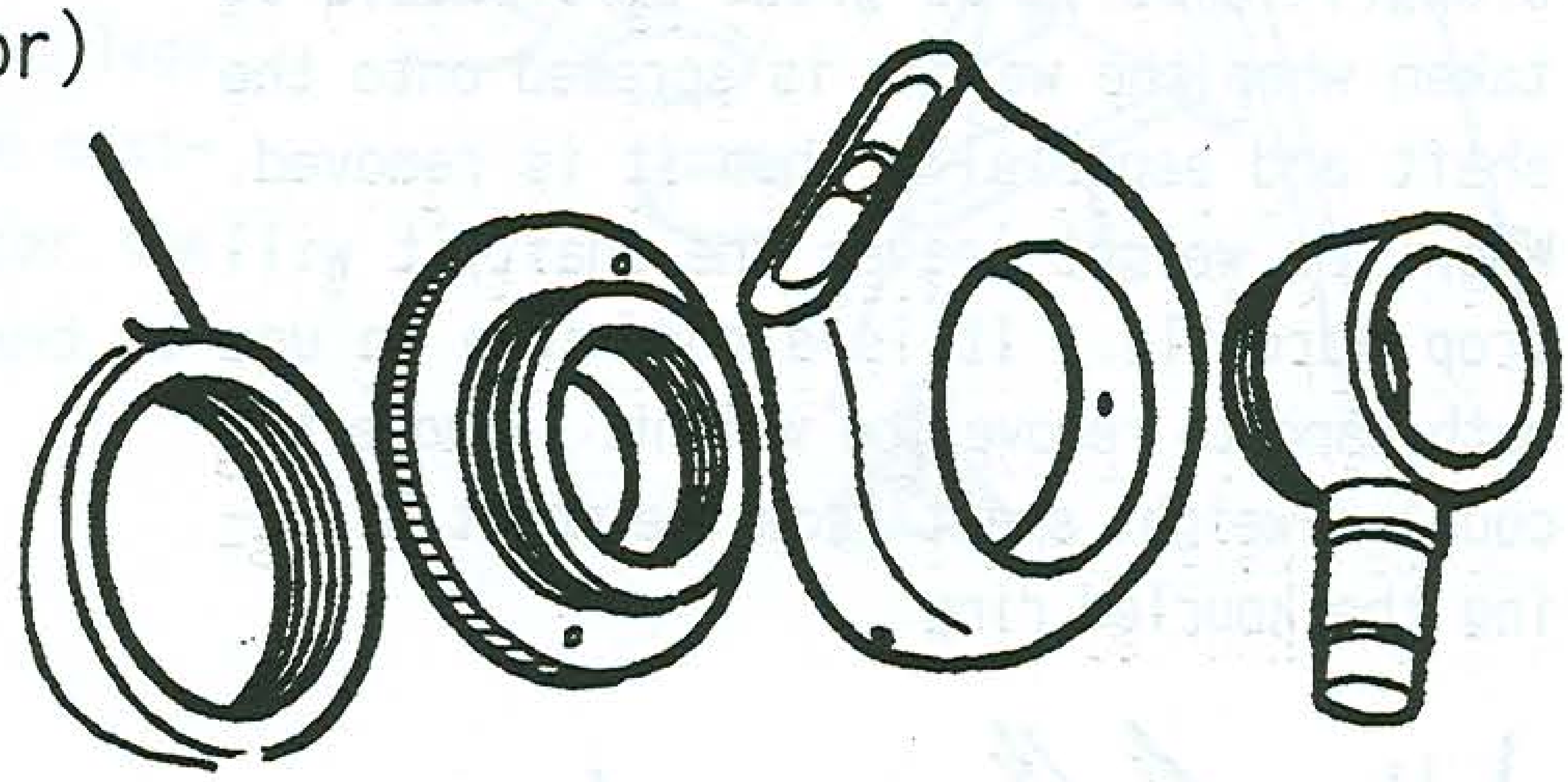
Slow-Motion Knobs

Now, attach the slow motion knobs to the R.A. and Dec. axes as shown to the right. Be certain to the screw on the flat side of the shaft to allow the knobs to be firmly attached. If this is not done correctly, the knobs will loosen as they are adjusted. A dime or small screw driver can be used to tighten these knobs. The shaft on either side of the mount can be used for the utmost convenience of the user.



P-Light(Reticle Illuminator)

Remove the end cap dust cover the R.A. axis and screw in the P-light as shown.



Bubble Level

A bubble level is provided to insure accurate polar alignment of the NJP mount on uneven ground.

Motor Drive System

The PD-7 motor drive is used to drive the NJP mount. This motor drive is a highly accurate dual axis system. It has built-in a drive corrector, 10x sidereal set motion and a connector for the ST-4 auto guider. It is powered by 12V DC power to enable the user to transport the mount to remote sites around the World.

For further details refer to the PD-7 instruction manual provided with this mount.

Balancing

Before the NJP mount can be used to the maximum of its capabilities, the instrument package to be carried must be properly balanced. Precise balancing can be achieved using the following procedures.

Dec. Balancing

a. Unclamp the R.A./Dec. axes so that the telescope can be turned and placed parallel to the ground. Then lock the R.A. clamp while holding the tube to prevent it from swinging if it is severely out of balance.

b. Move the hand off of the tube keeping it close in the event of an adrupt movement. Notice the direction of any movement. If there is movement, slightly loosen the tube holder placing one hand on the tube and the other on the tube holder and move the telescope in either direction until it balances. (Note: It is important to attach all the accessories, cameras, guide scopes, etc. to the tube before attempting to balance the package. If this is not done,then the instrument package will have to be re-balanced when all the accessories have been attached.

c. Do not forget to also remove the lens cover(s) from the telescope(s).

d. As soon as the correct balancing has been achieved, tighten the tube holder and Dec. axis to keep it from moving.

R.A. Balancing

a. Loosen both axes and turn the telescope so that it is on either side of the mount with the Dec. axis parallel to the ground.

b. Clamp the Dec. axis but keep one hand holding the telescope.

c. Release the telescope, keep the hand close to the telescope in the event it moves adruptly. Note the direction of the movement.

d. Then holding the telescope with one hand, move the weights (turning them to move) inward toward the mount or outward away from the mount to achieve proper balance. If the telescope moves skyward, then the weight should be moved in to balance. Conversely, if the telescope moves toward the ground, the weights should be moved outward.

e. As soon as proper balance has been achieved, unclamp both axes and move the telescope to all the possible observing positions for the evening to see if there is any movement when the telescope is released. If there is no movement in any of these positions, then correct balance has been achieved.

【Note】

If the NJP will be used for astrophotography, it is a good idea to balance the package precisely for the arc that the telescope will track over when the photo is taken.

Gross and Slow-Motion

There are two ways in which an object can be centered in the field of view, by gross and slow motions of the NJP mount.

Gross Movement

Placing an object is the field of view is achieved by first unclamping both axes of the mount. Using the finder, move the telescope (gross movement) until the object is placed on the crosshair of the finder.

Tighten the R.A. and Dec. clamps as shown to maintain the position of the telescope in the sky. Do not forget to turn on the drive motor.
If not, the object will begin to drift off the center of the crosshair and out of the field of view.

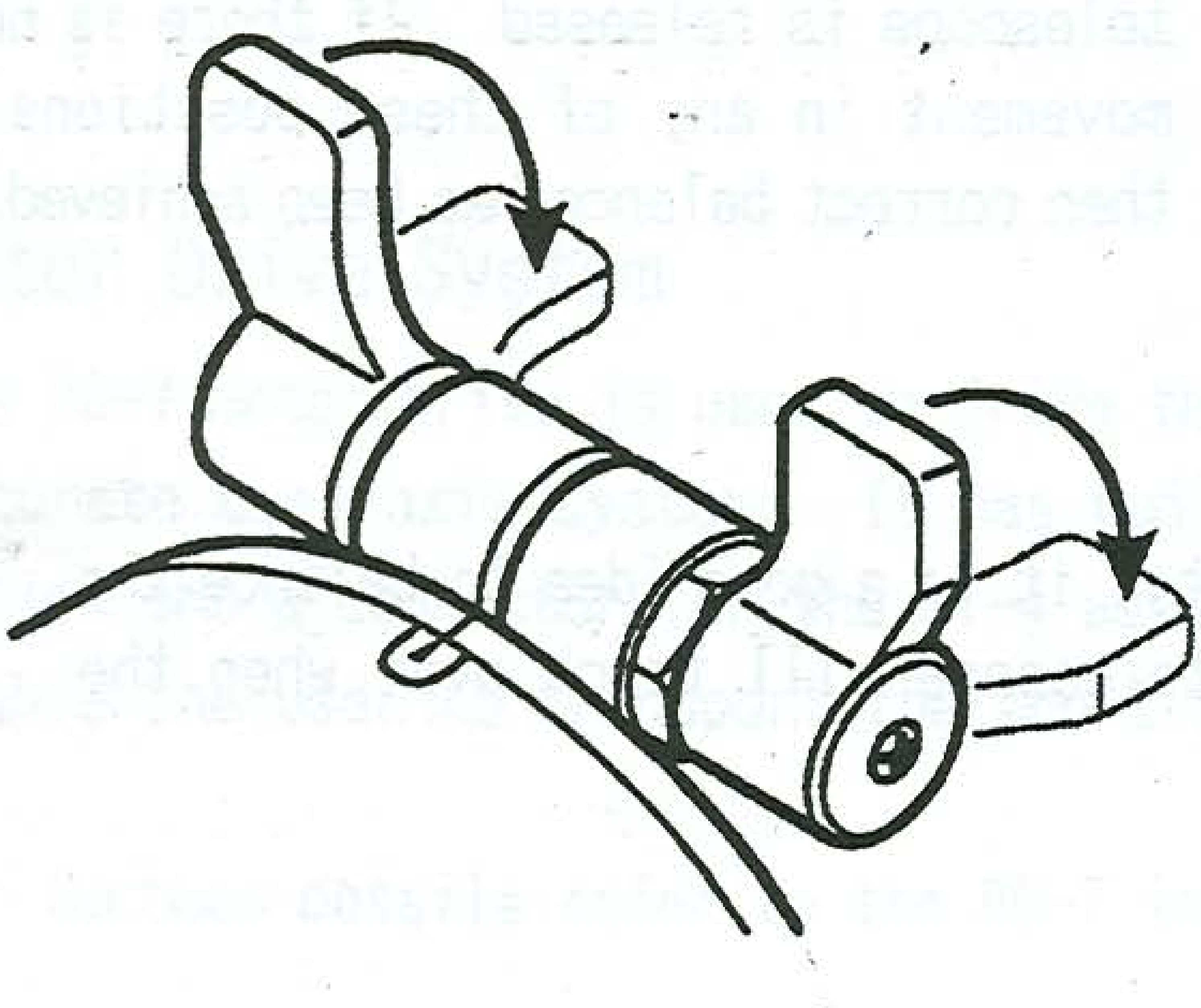
This gross movement should place the object in the field of view of the telescope. It is a good idea to use a low power ocular with the widest field of view to make the centering process easier.

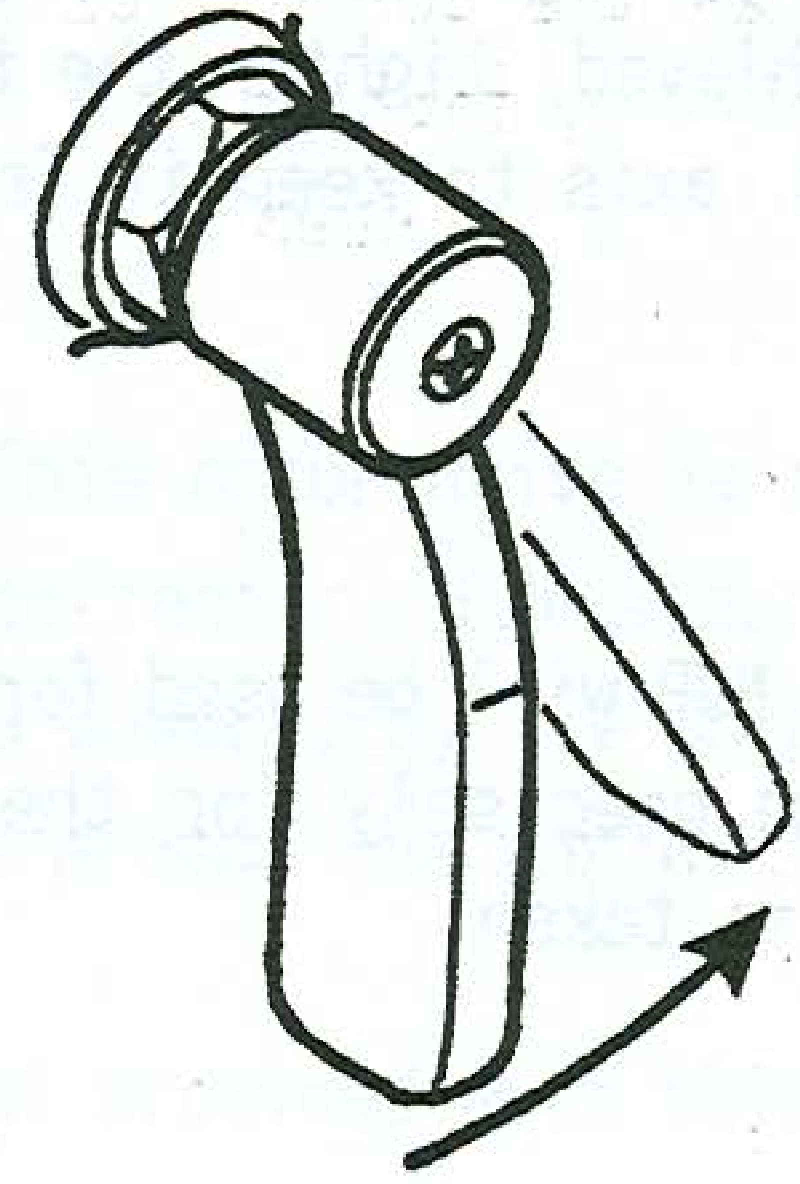
As soon as the object is placed in the field of view, then the slow motion controls can be used to center the object which will allow higher magnification to be used.

Slow Motion Controls

Now that the object has been placed in the field of view, the slow motion controls of the NJP mount (electric or mechanical) can be used to center the object.

1. Attach the slow motion knobs to the mount.
2. Loosen the knurled clutch knobs on both axes.
3. Then by turning the slow motion control in tandem, center the object. Re-tighten the clutches beginning with the R.A.
4. Now observe the object and if further centering is desired, flip the speed switch on the motor control to High Speed.
5. By pressing the R.A. and Dec. buttons precisely center the object.
   If further is needed, especially at high magnification, flip the switch to normal and use the drive corrector function of the motor control. (The complete functions of the electric slow motions is more fully explained in the PD-7 instructions.)





Altitude and Azimuth Adjustments

The NJP has integral altitude and azimuth adjustments built in to allow polar alignment within 2'(arc minutes) of the celestial pole. Using the drift method, which is used when astrophotos will be taken, you can use these same adjustments to precisely align the NJP.

Azimuth Adjustment

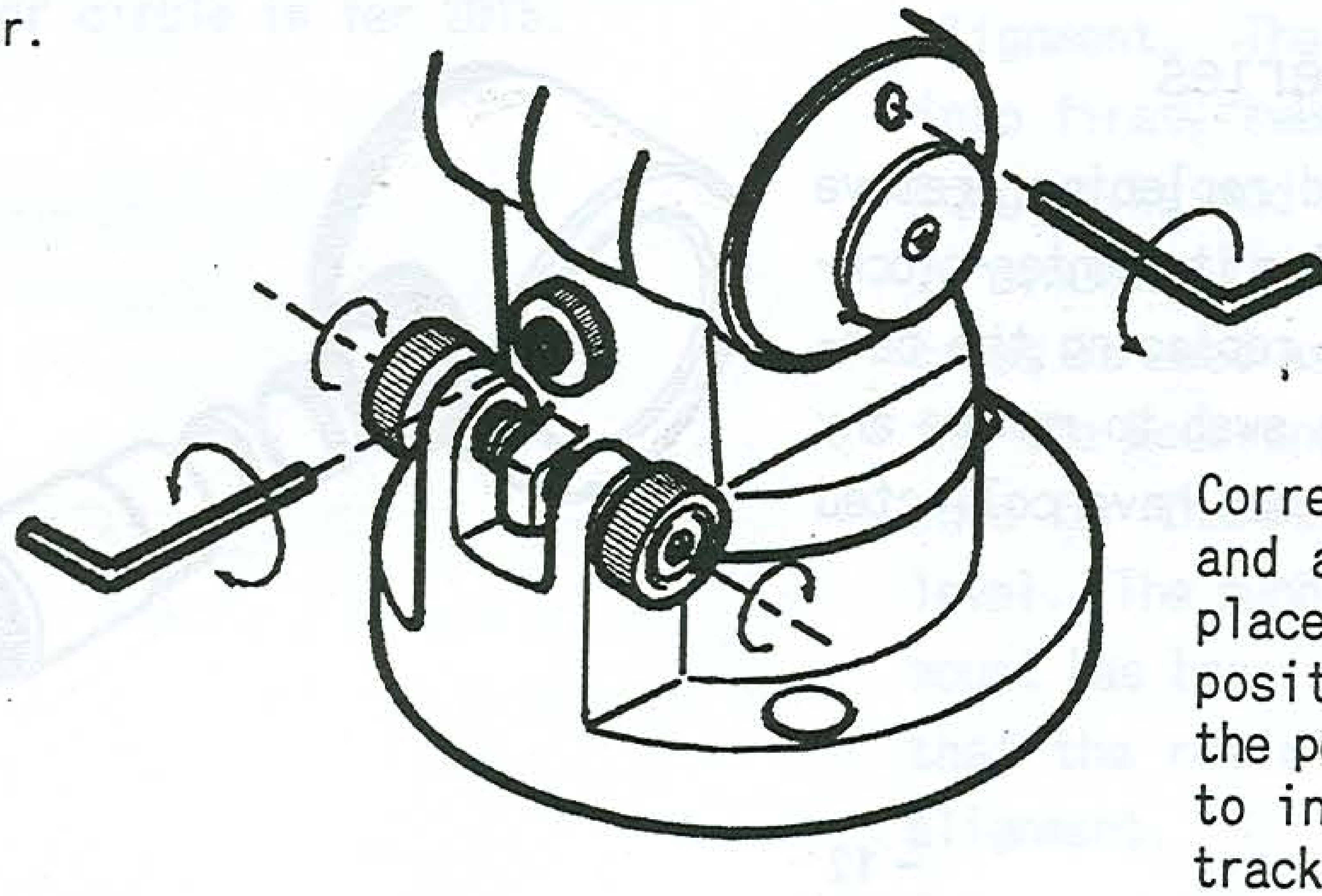
The azimuth control knobs are located at the rear of the mount. They are used to adjust the mount in azimuth, right or left, in the field of view of the polar alignment telescope.

1. Loosen the knobs as shown in the diagram below by turning them in opposite directions,the left one clockwise and the right one counter clockwise.
2. Then to move the mount in either direction, turn the knobs either clockwise will move Polaris to the right when viewed through the polar telescope and the opposite will occur when the knobs are turned counter clockwise. This is due to the fact that the image in the polar alignment telescope is inverted. (Upside down and backwards)
3. When Polaris has been moved to the correct position, tighten the knobs by turning them in the opposite direction, the left one counter clockwise and the right clockwise. If this move Polaris too far, repeat step #2 to place it in the correct place then retighten. With a little practice, the tighening process will become easier.

Altitude Adjustment

The altitude adjustment will move Polaris up or down in the field of the polar alignment telescope.

1. Loosen the altitude adjusting screw and the altitude clamp located on the right side of the NJP when viewing north as shown below with an Allen wrench and back off the altitude lock nut.
2. After backing off the lock nut, insert the Allen wrench into the altitude adjusting screw and turn it in the desired direction.
   Elevating the mount will make Polaris more down in the field of view and lowering it will have the opposite effect. Turning the screw clockwise will elevate the mount and turning the screw clockwise will depress the mount.
3. As soon as Polaris has been placed in the correct position in the reticle of the polar telescope, tighten the altitude lock nut and carefully tighten the lock screw on the side of the mount.

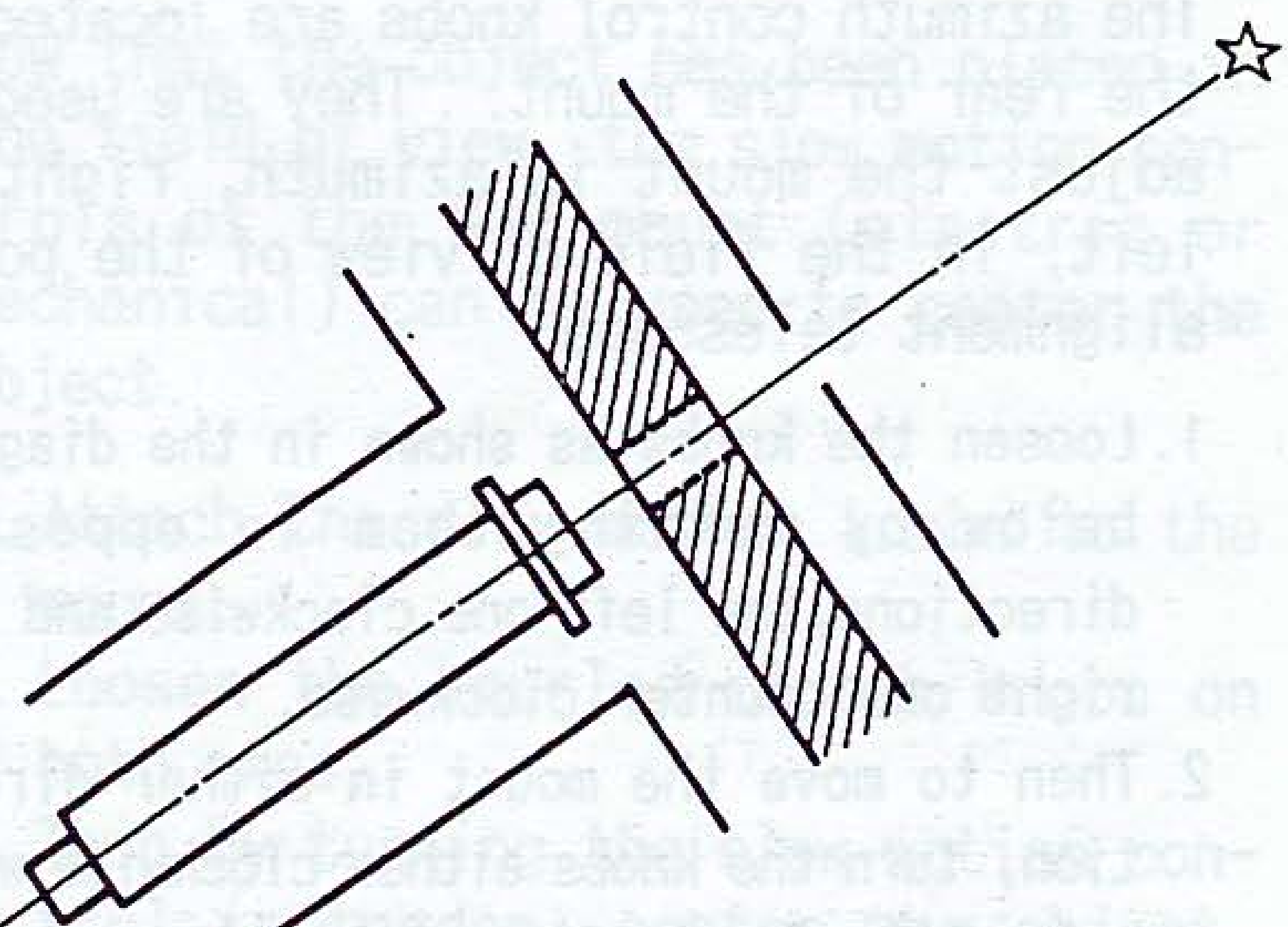


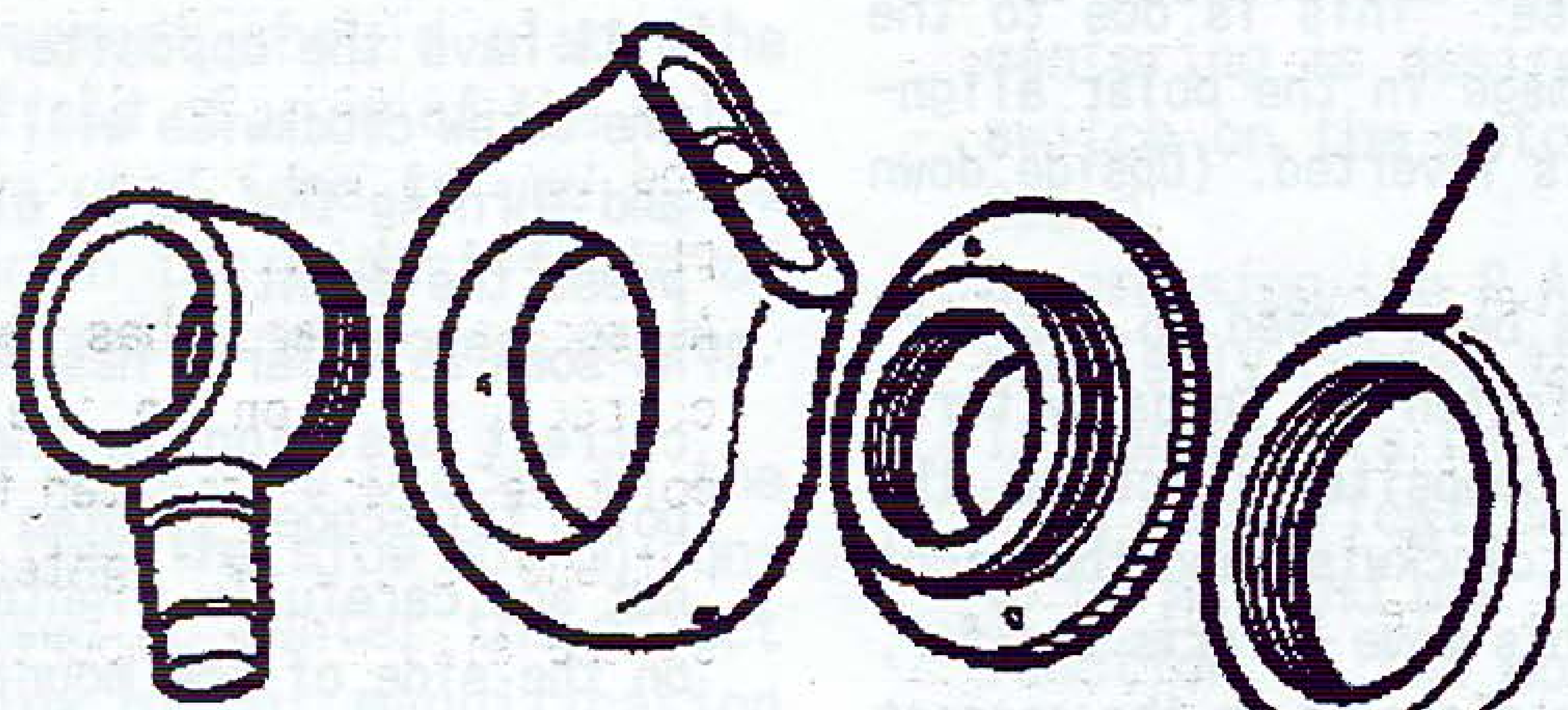
Correct use of the altitude and azimuth adjusters will place Polaris in the correct position in the reticle of the polar alignment telescope to insure the most accurate tracking for the NJP mount.

P-Light(Reticle Illuminator)

The P-light (reticle illuminator) is used to illuminate the reticle of the polar alignment telescope using the method below.

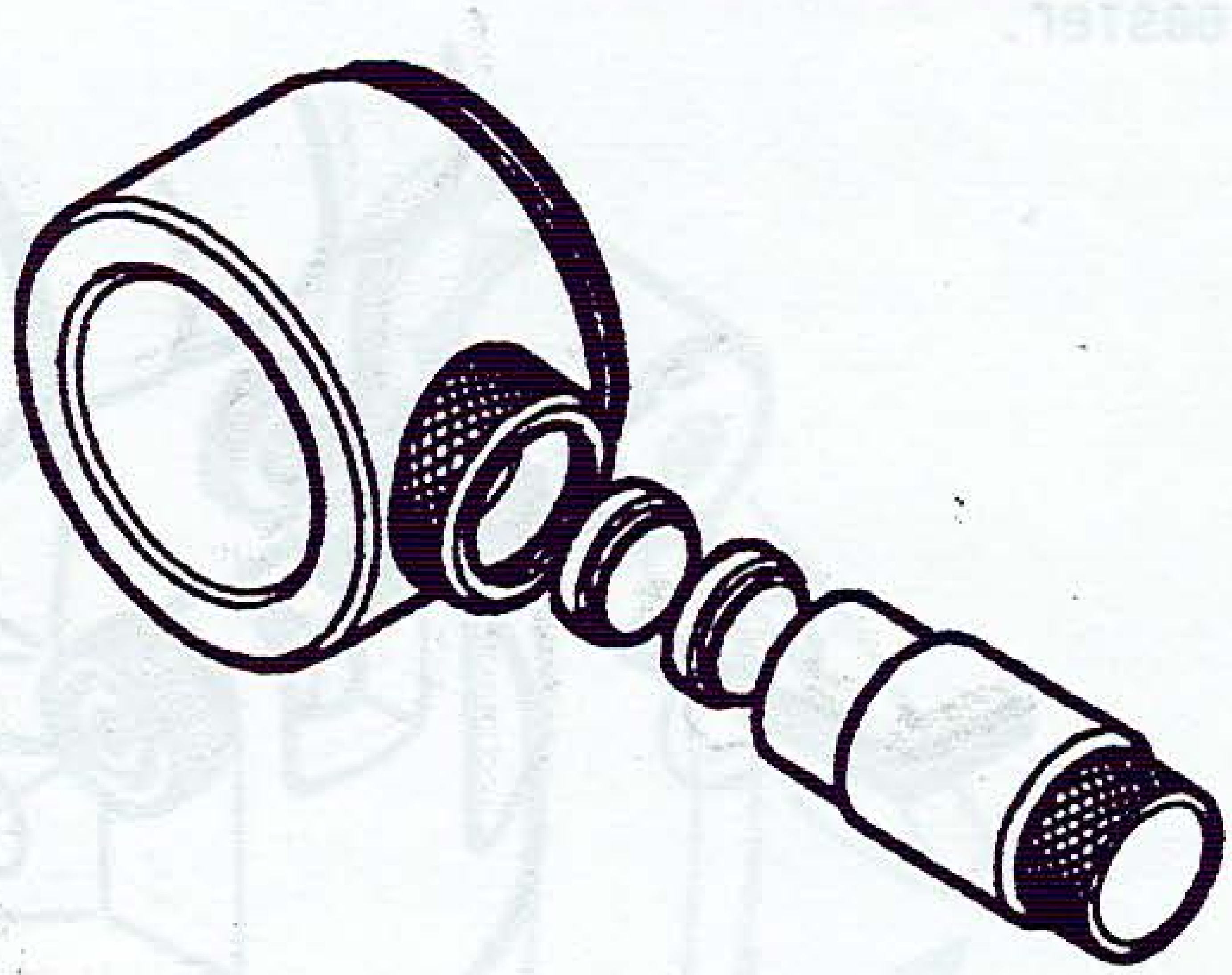
1. Remove the R.A. polar alignment cap and screw in the illuminator.
2. Loosen the R.A. clamp and rotate the R.A. axis until the bubble level is centered. Turn the knob on the illuminator until
3. the light clicks on. Adjust the brightness with the knob to suit the observer's eye. It is best to illuminate the reticle sufficiently to make it easy to see Polaris and the reticle against a black sky.





Replacing the Batteries

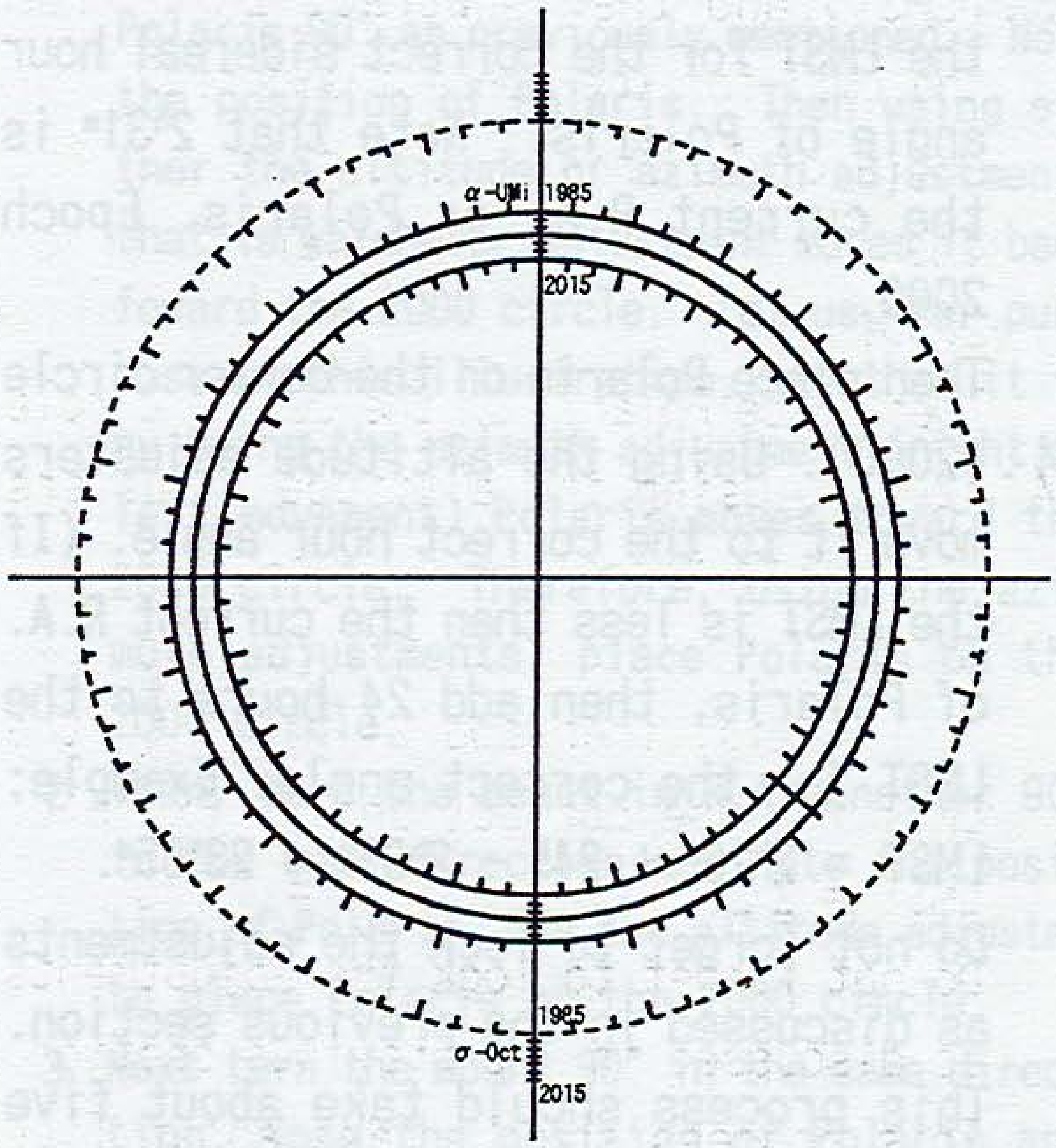
When the batteries need replacing, remove the battery case by turning it counter-clockwise as shown. Before replacing the batteries use a dry cotton swab to remove any dirt or corrosion that may have collected on the contacts.



Polar Alignment Telescope

The NJP mount has a highly accurate polar alignment telescope set into the polar axis. This telescope when correctly used will place Polaris within 2' (arc minutes) of the celestial pole. Accurate polar alignment can be made in either Hemisphere using Polaris (α -Umi) in the Norther Hemisphere or Sigma Octans (σ -Oct) in the Southern Hemisphere. Refer to the reticle pattern to the right.

The precession circle and scales for Polaris and Sigma Octans cover the years from 1985 to 2015. The outer circles indicate the elongation in 1985 between the south celestial pole and Sigma Octans. Above the point where the vertical line of the cross in the reticle crosses the circle for Sigma, there are six incremental lines drawn. They represent the years 1999 (dotted line), 1995, 2000, 2005, 2010 and 2015. The three solid inner circles represent the precession of Polaris toward the North celestial pole whereas the opposite is true of Sigma. The outer circle represents the year 1985, the next hash mark on the vertical line represents 1990, 1995. The middle circle is 2000, then 2005, 2010 and inner circle is for 2015.

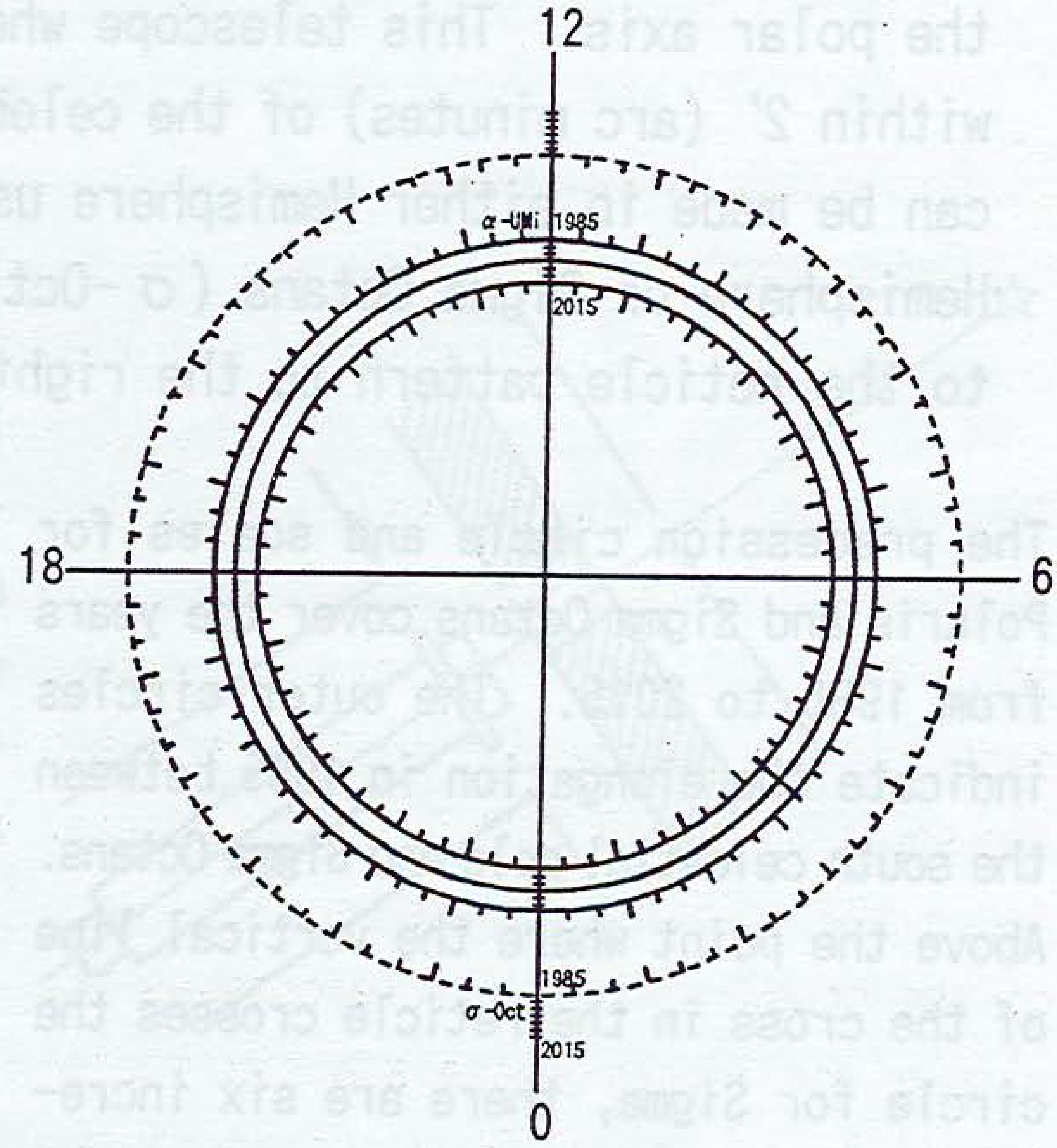


Placing Polaris in the correct position on the reticle is discussed in Polar Alignment. The hour circle is divided into first, twenty-four hours, and the long marks and then into increments of 20 minutes, the shorter hash marks. The cross is used as a reference for dividing the hour angle as well as a reference for the reticle to indicate it is level. The bubble level attached to the mount has been set to indicate the fact that the reticle is level for proper alignment.

There are two methods for polar alignment in the Northern Hemisphere

The fist method is as follows:

1. Level the reticle.
2. Turn on the reticle illuminator and set the brightness to illuminate the reticle but not too intense to obscure the field stars especially Polaris.
3. Determine the local mean sidereal time (LMST) and then subtract 2^h31^m from the LMST for the correct sidereal hour angle of Polaris. Note that 2^h31^m is the current R.A. or Polaris. Epoch 2000.
4. Then place Polaris on the center circle (2000). Using the altitude adjusters move it to the correct hour angle. (If the LMST is less than the current R.A. of Polaris, then add 24 hours to the LMST for the correct angle. Example: LMST = $2^h26^m + 24^h - 2^h31^m = 23^h55^m$.
Do not forget to lock the adjustments as discussed in the previous section. This process should take about five minutes.



If you are unable to determine the LMST for your location, then there is a second, less accurate method for polar alignment.

It is imperative that the elevation lock screw be loosened before attempting to polar align the NJP. If this set screw is not loosened, the mount will not elevate or depress.

(A planisphere can be used to determine the LMST for any location.)

【Note】

The sidereal hour angles have been added for convenience and as a learning aid. These numbers do not actually appear on the reticle.
Zero hours will always be located at the botton and 12 o'clock will always be located at the top.

Step 1. Follow the first two steps of the first method.

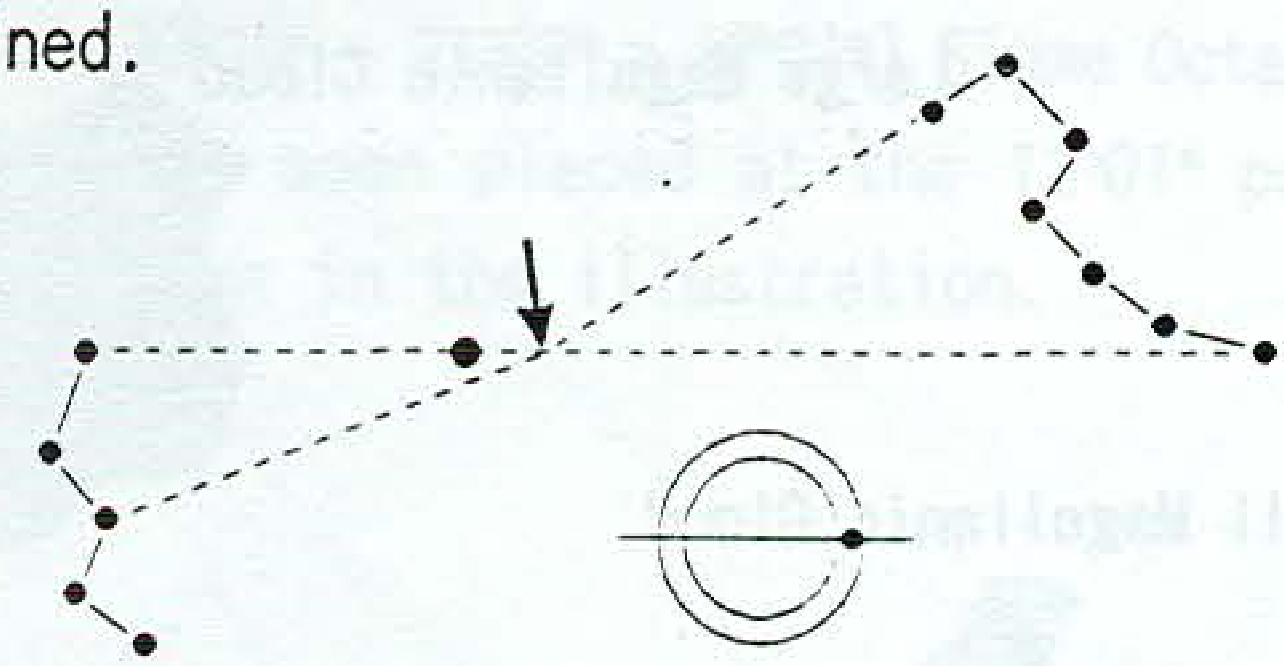
Step 2. Look through the polar alignment telescope keeping both eyes open.

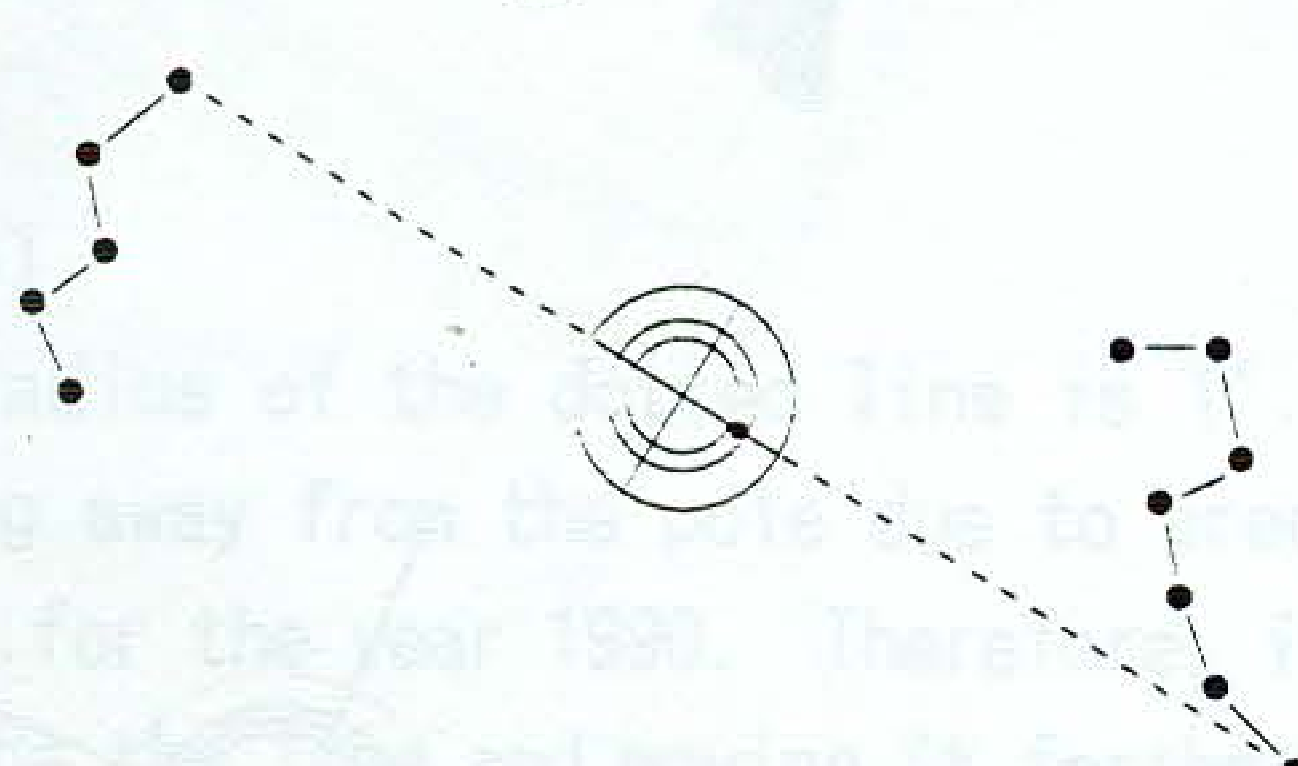
Step 3. With both eyes open, place Polaris on the same side of the reticle as the last star in the handle of the Big Dipper in a direct line with the star in Cassiopeia as shown in the illustration below.

The illumination gives as exact representation of the positioning of Polaris to achieve polar alignment. The true position of Polaris in the sky is opposite to the last star in the handle. It is placed on the opposite side in the reticle because the image in the polar telescope in inverted (upside down and backwards).

Be certain to place Polaris in the year 2000 circle of the reticle. Refer to the illustration on page 13.

Polaris can be moved to the correct position by using the altitude and azimuth adjustments built into the NJP mount. Please refer to page 11 where their use is explained.





The accuracy of this method can be tested by noting the position of Polaris on the 2000 circle and then by turning the R.A. axis 90° in either direction. If the polar alignment is accurate, Polaris will remain on the 2000 circle. If not, use following method to precisely place Polaris in the reticle. (Note: remove the telescope, tube holder, counter weights and counter weight shaft from the mount. This will allow the mount to be rotate 360°.

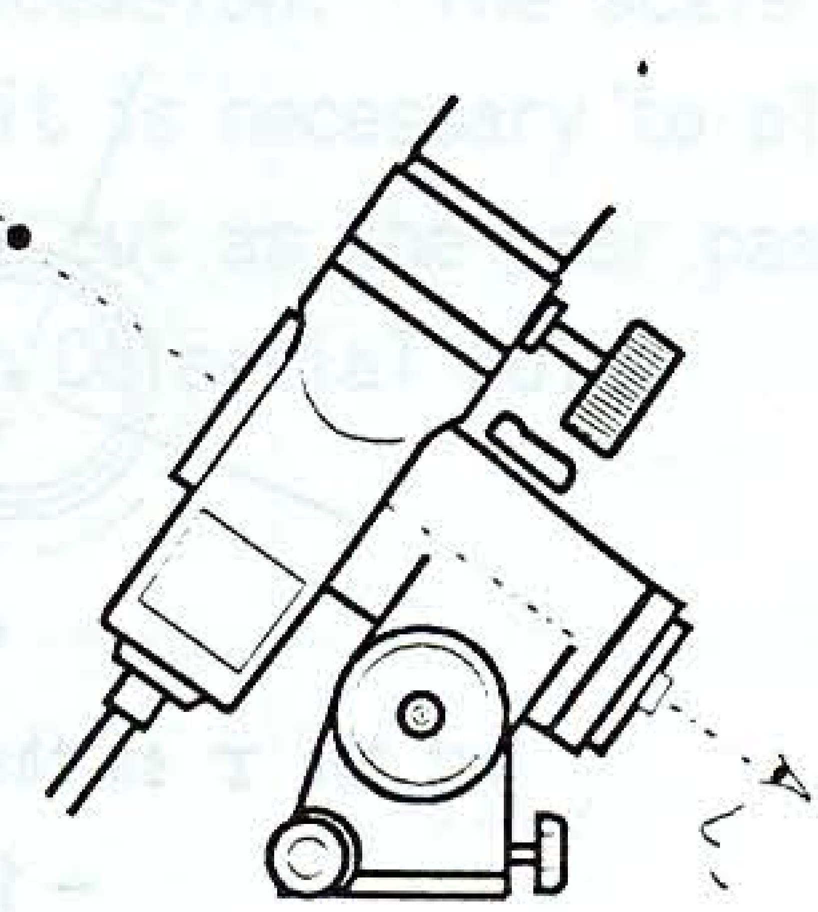
1 .Turn the R.A. axis of the mount to move Polaris 90° as previously mentioned. Note the position of Polaris. Then using either the altitude or azimuth adjustment, that is whichever adjustment moves it back foward the 2000 circle. Let us, for purpose of this illustration, say that it is by using the azimuth adjustment (right to left movement) Polaris moves toward the 2000 circle. Therefore, using the azimuth adjustments, place Polaris on the 2000 circle.

2 .Then, turn the mount in R.A. another 90° in the same direction and note the position of Polaris. Use the altitude adjuster to place Polaris on the 2000 circle.

3 .Next turn the mount 90° in the same direction. Note the position of Polaris and move it with the azimuth adjuster.

4 .Keep this 90° movement alternately corrcting with the azimuth and altitude adjusters until Polaris remains on the 2000 circle when the mount is turned 360°.

With practice this method will become easier.



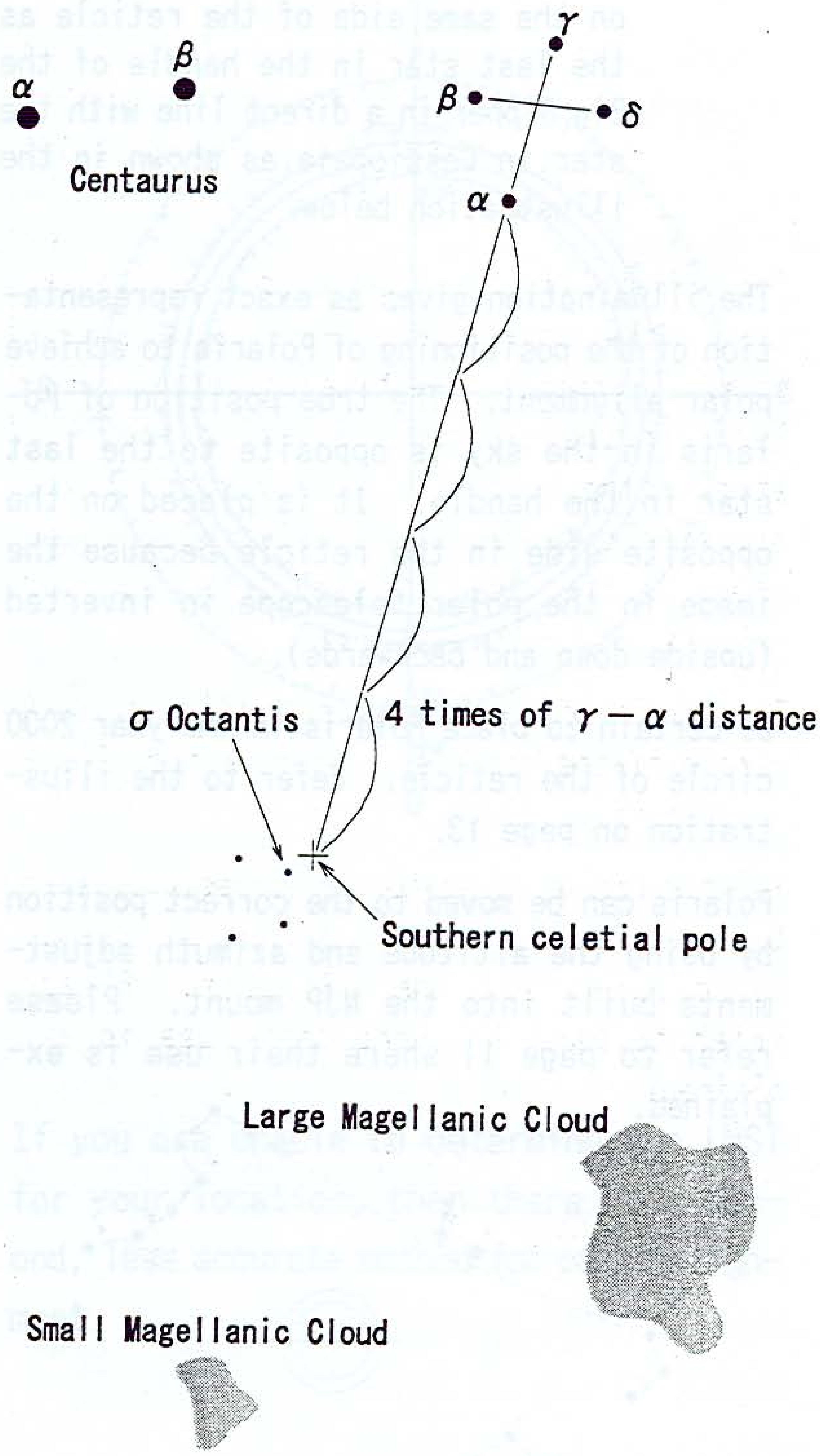
Polar Alignment in the Southern Hemisphere

When the NJP mount is used in the Southern Hemisphere, the star σ (Sigma) in the constellation Octans is used to polar align.

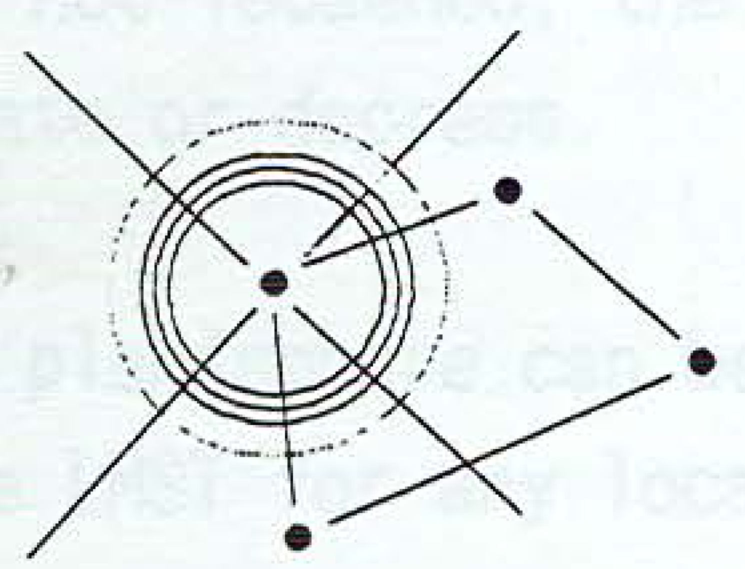
There are no bright stars near the south celestial pole to use as references. Therefore, use the following method to locate Sigma in Octans.

First, locate the Southern Cross or Archenar and locate Sigma. For example, extend a line through the star α and γ in the Southern Cross or by knowing the relative position of the Magellanic Clouds, you can get approximate location of the South Pole.

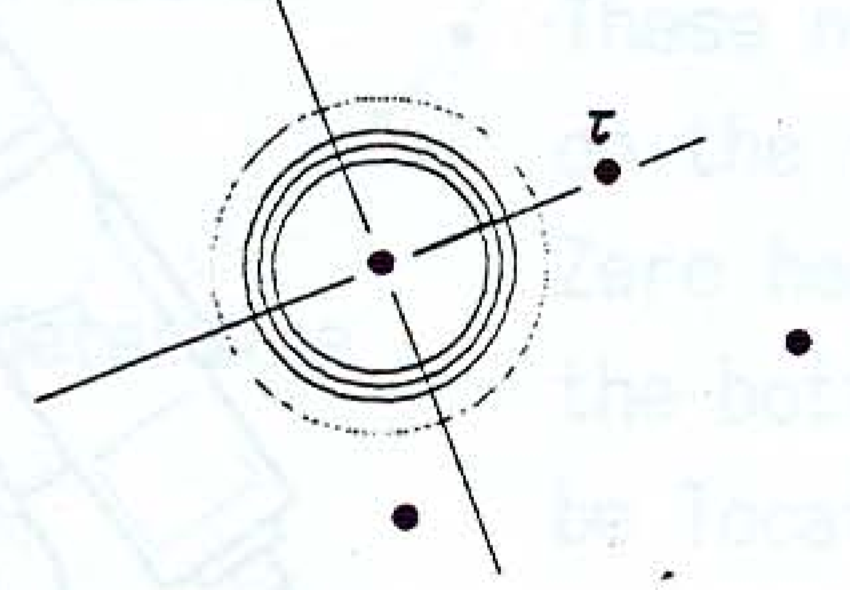
It will be some help to place the star σ Octans in the field of view of the polar alignment telescope. This process will be made easier, if a binocular is used to check the field stars that include σ Octantis.



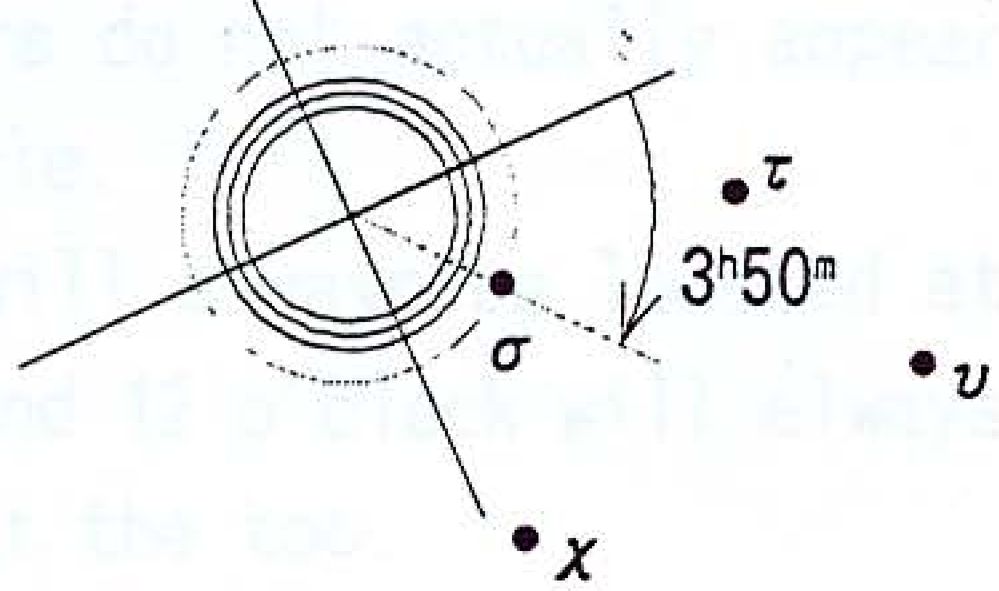
1. When you have located σ Octantis, loosen the altitude adjuster and bring the 4 stars, σ-τ-υ-χ, which from a trapzoid, in the field of the polar finder.
2. Move σ in Octans to the center of the polar finder.
3. Loosen the R.A. clamp and turn the axis so that you can place the 5th magnitude star τ or χ forming a trapezoid on either one of the crosshairs of the polar finder. Then tighten the clamp.
4. By using the azimuth and altitue adjusters, move σ to the outside dotted line and place it at the 2h50m position clockwise position or if χ is used, place it at 3h20m position counter clockwise.



guide the σ the center



put the τ on the cross-line

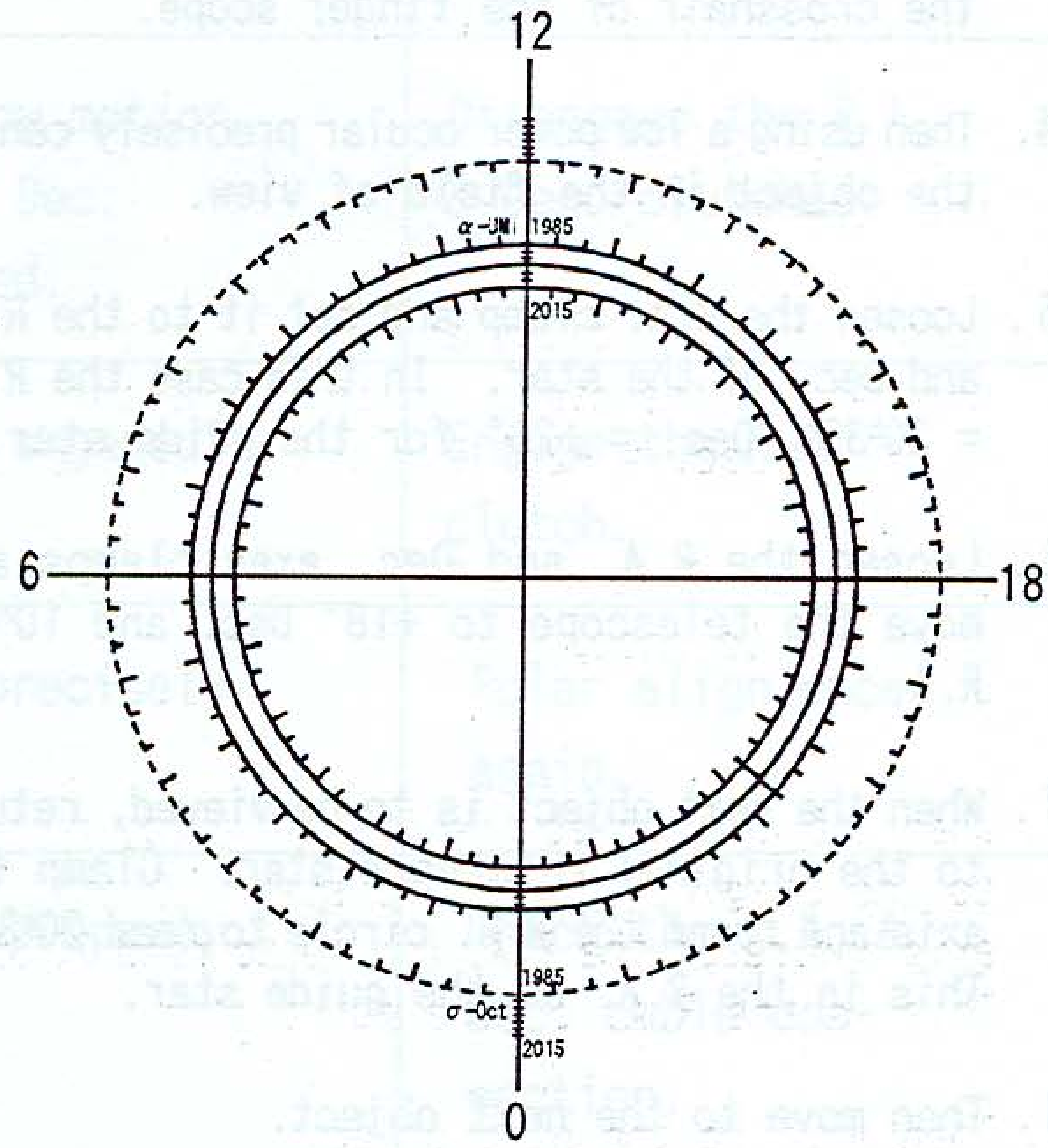


guide the σ outside the dotted circle

The NJP can be used in the Souther Hemisphere. Be certain that the N/S switch has been moved to the S position. The reference star used in the reticle is σ in the constellation Octans. Please note that when the reticle is used in the Souther Hemisphere, the hour angles are reversed. Keep this in mind when placing σ in the reticle.

Step 1. Center the bubble in the bubble level.

Step 2. Determine the local mean sideral time (LMST) and then subsutract 21^h09^m from the answer. This is the R.A. of σ Octans. Sigma Octantis is a 5th magnitude star and should be easy to locate with some practice. Example: If the LMST is 9^h10^m, then substract 21^h09^m. The answer is 12^h01^m.
Note: When the LMST is less than 21^h09^m, adds 24^h to the LMST and then substract 21^h09^m from the total to determine the sidereal hour angle of σ Octantis. ($9^h10^m + 24h = 33^h10^m$/ $33^h10^m - 21^h09^m = 12^h01^m$) Sigma Octantis has been placed at the 12^h01^m position in the illustration.

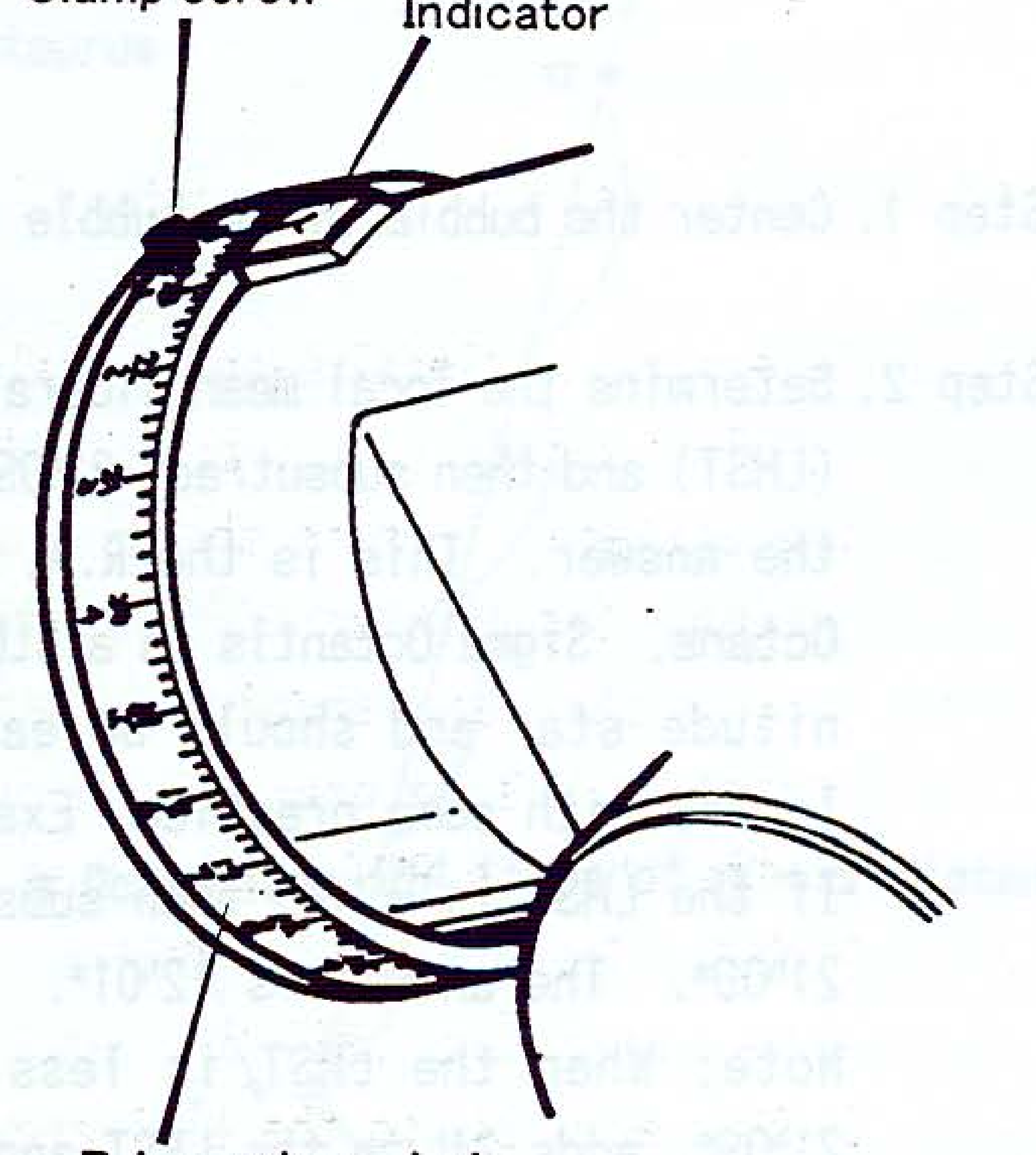


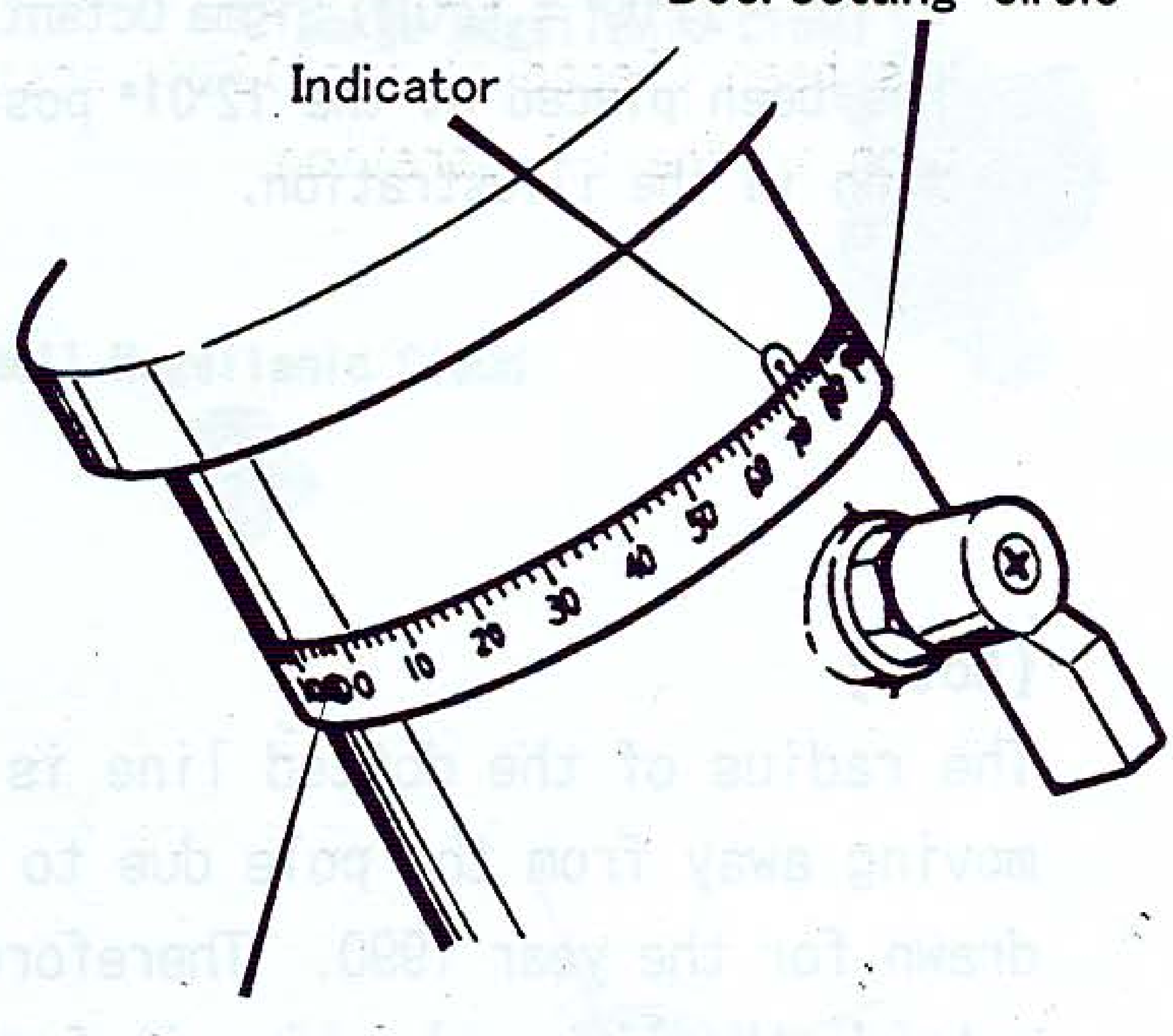
【Note】
The radius of the dotted line is 1°. The South Pole star is gradually moving away from the pole due to precession. The scale dotted line was drawn for the year 1990. Therefore, it is necessary to place Sigma Octans outside the line and moving it further out as the year passes. Coversely, Polaris is moving closer to the North Celestial Pole.

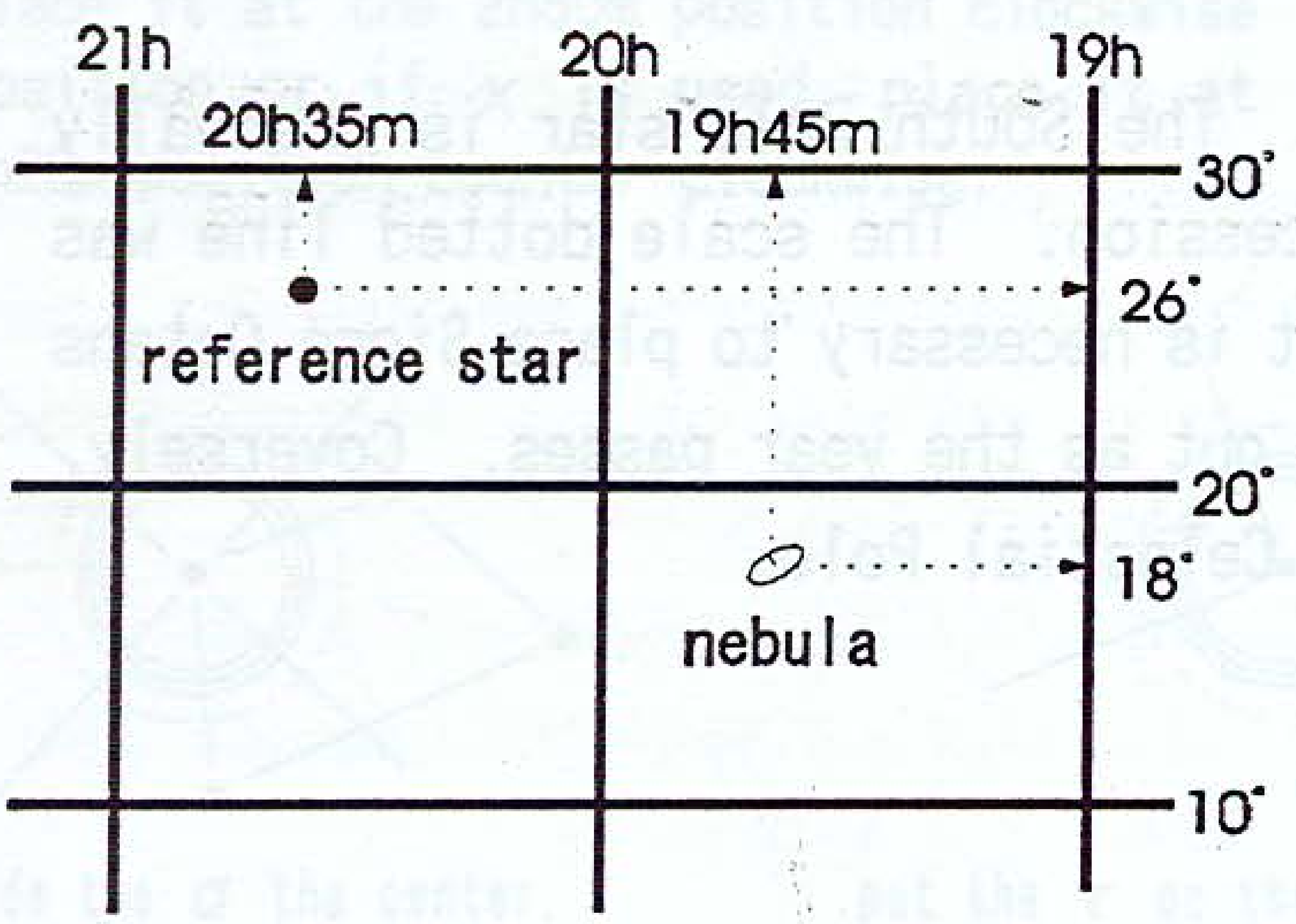
How to use the setting circle

If you want to locate an object that cannot be seen in the finder, then setting circles can be used to locate this object.

1. Precisely align the mount.
2. Obtain the position of the desired object (a nebula) from a chart or star catalogue and a bright star that is visible as a reference star.
3. Place the reference star in the center of the crosshair of the finder scope.
4. Then using a low power ocular precisely center the object in the field of view.
5. Loosen the R.A. clamp and set it to the R.A. and Dec. of the star. In this case the R.A. = 20^h35^m, Dec. = +26° for the guide star.
6. Loosen the R.A. and Dec. axes clamps and move the telescope to +18° Dec. and 10^h45^m R.A.
7. When the next object is to be viewed, return to the original reference star. Clamp the axis and reset the R.A. circle to read 20^h35^m. This is the R.A. of the guide star.
8. Then move to the next object.
9. Repeat this returning to the original reference star to reset the R.A. circle. This is necessary due to the fact that the R.A. circle is not driven to directly read the current R.A.







Trouble shooting

Symptom	Check Points	Remedy
Equatorial head rattles	Check the following: Clamps, bolts, altitude clamp, tripod locking bolts and the locking bolts for the equatiral head.	Tighten all bolts.
Slow motion control does not move smoothly	Do not turn the slow motion while the R.A. and Dec. clutches are engaged.	Disengage the R.A. & Dec. clutches.
Mount does not track accuratly	Is the R.A. clutch engaged?	Engage the R.A. clutch.
	Is the polar axis precisely aligned?	Polar align once again.
	Is the motor drive properly connected?	Check the R.A. & Dec. cable con-nection.
	Is the battery valtage below 12V DC?	Keep the battery warm in cold weather & recharge after every use.