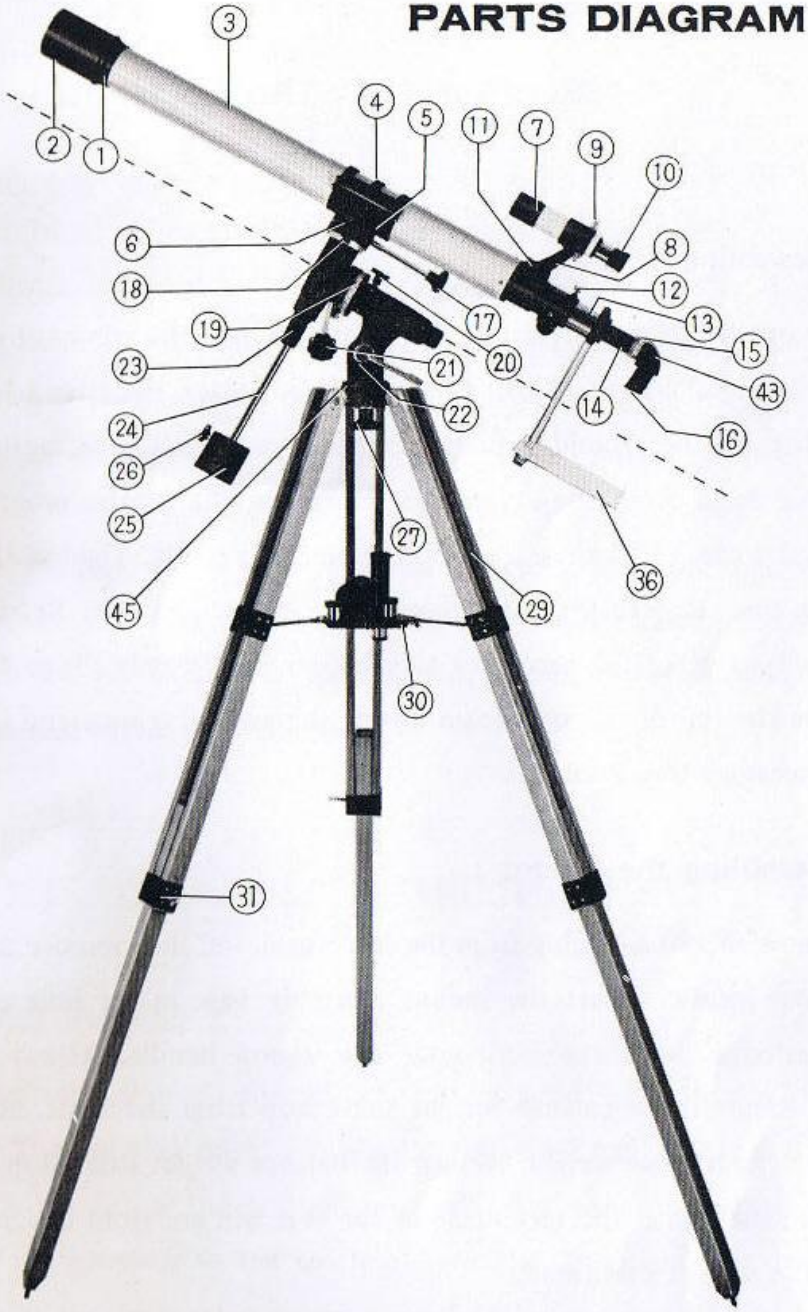
INSTRUCTION

ASTRONOMICAL TELESCOPE

EQUATORIAL MODEL



PARTS DIAGRAM



. Objective Lens Frame
. Sun Shade
. Main Tube (body)
. Body Tube Holder
. Declination Attachment
. Declination Circle
. Sighting Scope
. Sighting Scope Holder
. Sighting Scope Collimating Screws
. Cross Hair Eyepiece
. Sighting Scope Holder Locking Screw
. Draw Tube Locking Screw
. Draw Tube
. Eyepiece Holder
. Eyepiece Holder Chuck
16. Eyepiece
17. Declination Fine Control
18. Declination Clamp
19. Hour Circle
20. Right Ascension Clamp
21. Right Ascension Fine Control
22. Polar Axis Clamp Bolt
23. Balance Weight Shaft Stop
24. Balance Weight Shaft
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26. Balance Weight Setting Screw
27. Horizontal Axis Clamp Handle
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29. Wooden Tripod
30. Accessory Tray
31. Wing Nut
32. Sun Screen Holder Rod
33. End Cap
34. Sun Screen Holder
36. Sun Projection Screen
37. Instruction Booklet
38. Mount Assembly
39. Mount Base
40. Camera Mount
41. Barlow Lens
42. Illuminator
43. Diagonal Prism
44. Erecting Prism
45. Azimuth Circle

ASSEMBLING INSTRUCTION

1. Assembling Tripod :

Remove the tripod from the styrofoam. Loosen the wing nut and slide out the legs to equal length. Tighten wing nut, and place the tripod legs alongside each other on the ground with the accessory tray holder facing up. Take out the tripod head from the styrofoam. Place the slit of the mount base onto the tripod head and run a long bolt through the slits. Tighten the bolt with the wing nut. Repeat the process with the other two legs. Be sure to fasten the tripod to make the accessory tray holder level evenly. Take the accessory tray from the top of the styrofoam layers. Remove wing nuts and refasten them to the accessory tray holder.

2. Assembling the Mount :

Remove mount assembly from the styrofoam, and then remove the horizontal axis clamp handle. Insert the mount assembly base in the hole of the tripod head. Fasten it with the horizontal axis clamp handle. Attach fine motion control. Remove the balance weight shaft stop from the shaft, and insert the shaft into the balance weight. Return the balance weight shaft stop to the shaft. Screw the shaft into the receptacle as far as it will go. Hold it tight by turning the balance weight shaft stop.

3. Attaching Telescope :

Open the body tube holder. Place the telescope in the tube holder at its balance point. After attaching the sighting scope, the sun shade, and the eyepiece holder, re-balance the body tube in its holder. Also, readjust counter weight to attain correct balance. Improper balance will result not only in uneven movement, but also in uneven wearing of gears during many years of use. Careful attention should be paid to balancing the instrument before making observation.

4. Attaching Accessories :

To attach eyepieces, diagonal prism, or barlow lens, loosen the eyepiece holder chuck. Insert the respective parts into the eyepiece holder, and tighten the chuck. Inside the chuck there is a tapered plastic ring. By turning the chuck, this plastic ring is squeezed to hold the eyepiece tight. This method of holding eyepieces is ideal as it does not hurt the eyepiece tubes. In case this ring is tightened too much before you insert the eyepiece, the ring may not go back to its original circumference when the chuck is released. Therefore, if you find it difficult to insert the eyepiece, open this ring with your finger tip. To attach the sighting scope, slide the sighting scope holder base into the receptacle as far as it will go. Tighten the sighting scope holder locking screw carefully to avoid accidental breakage by dropping.

OPERATING INSTRUCTION

1. Terrestrial Viewing :

The image seen through the telescope is reversed - ie, upside down and left to right. The erecting prism reverses the terrestrial image so that it may be seen right side up. Screw the erecting prism directly into the end of the draw tube. Attach the eyepiece to the erecting prism. Set the polar axis straight up, and by adjusting the declination clamp, bring the telescope parallel to the ground. To move the telescope horizontally, loosen the declination clamp. For small movements, use the fine motion controls.

2. Astronomical Viewing :

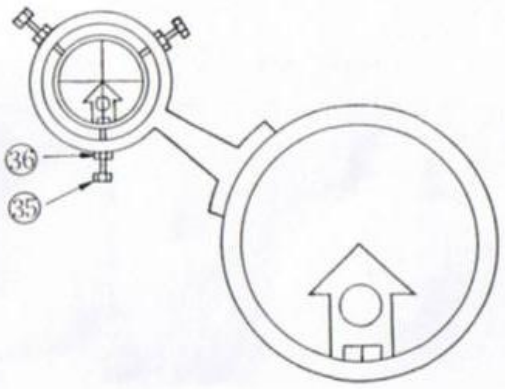
a) Collimating Sighting Scope: The sighting scope is a low-powered wide field telescope which aids in locating objects to be viewed with the main telescope. It is focussed by turning the objective lens right or left to adjust



for individual eye. To turn the objective lens left, release the locking ring first. When the adjustment has been made, fasten it with locking ring. The eyepiece has a built-in cross hair reticle, which permits an object to be centered in the field of view. Before the sighting scope is used, it is necessary to carefully align its optical axis to the main telescope. In daylight select a well-defined distant object such as a chimney or the top of a chruch roof. Using H-20mm eyepiece, center the object in the field of view of the



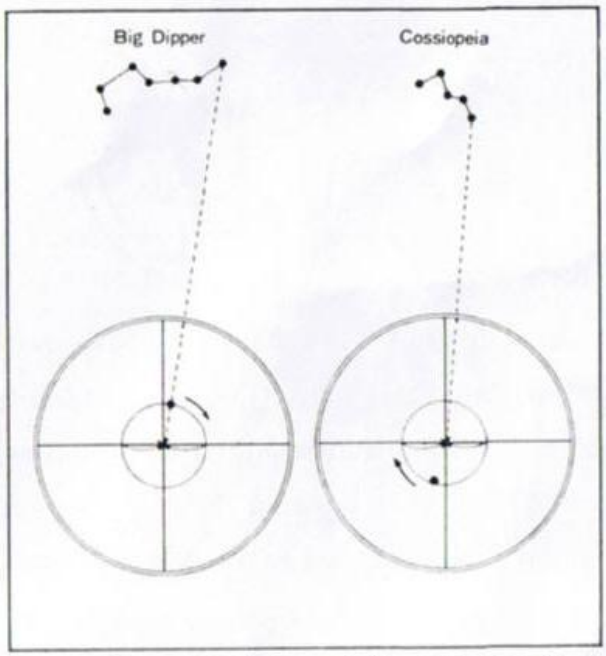




telescope. Loosen and tighten three collimating screws until the center of the cross hair intersects the same object in the main telescope. Change the eyepiece to higher magnification and re-adjust the collimation of the sighting scope. Once the image has been centered under the highest magnification in the telescope and it is also centered in the sighting scope, your telescope is aligned.

b) Aligning the Polar Axis: Equatorial telescopes are designed to move not only in one direction, but also to follow the diurnal movement of celestial bodies. In order to do this, it is necessary to align the polar axis to the celestial axis (Earth's Axis). After having set up the telescope, loosen the declination axis clamp and turn the telescope around until the arrow points at 90° on the declination circle scale. Proceed by tightening the declination axis clamp. Once this has been done, the telescope should be parallel to the polar axis. Loosen the horizontal axis clamp handle, and turn the telescope until the objective end faces towards the North. This can be done by approximate sighting on the Pole Star (Polaris) or by use of a compass to find magnetic north. Look up the latitude of your area in a geographical atlas. Turn the Polar Axis lamp handles and set the latitude scale to the correct latitude for your area. Aim the sighting scope to Polaris. Celestial north is about 1° off from the Polaris, so a slight adjustment might be necessary, if you wish precise adjustment. The 6X30 sighting scope of your telescope has a field of view of 6°, which means that

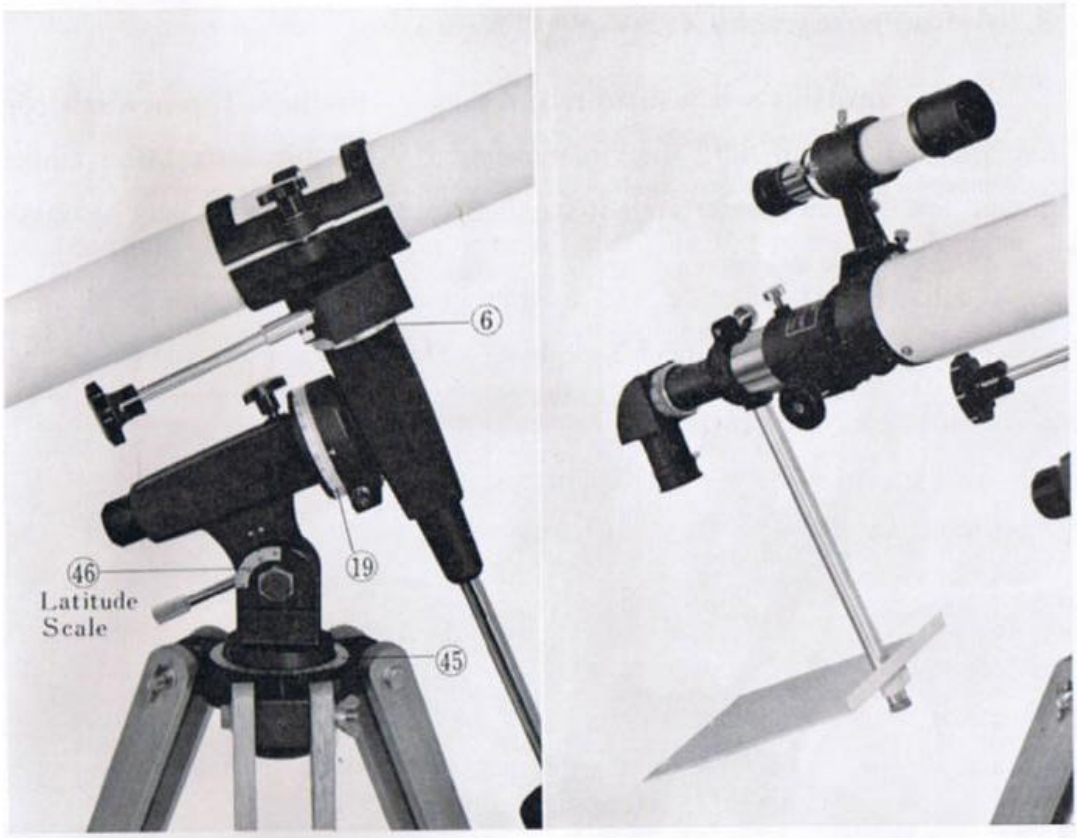
the adjustment of 1/6 of the field of the sighting scope is 1°. After adjusting the polar axis, make sure it is well tightened.



The position of Polaris and the Celestial North

c) **Adjusting Hour Circle:** Spot a star the right ascension of which you know. Turn the hour circle until the pointer comes to the right ascension of that particular star. Having done this, the right ascension circle (hour circle) is set in that particular direction. In order to spot a star of lesser magnitude, which is very difficult to pinpoint, first try to locate a bright star near the star you wish to view. Adjust the hour circle, and then try to locate the desired star by using the hour and the declination circles.

d) **Lunar Observation:** One of the most exciting objects amateur astronomers enjoy observing is the moon. The best time for lunar observation is not when the moon is full but when the moon is in its half stage. The reason for this is that at full moon the glare is too strong and it makes the view appear flat. At half-moon the sun's light reflects on the moon's mountains and craters more clearly thus giving a more distinct view. However, in case the observation is being made at full moon, use the moon glass to reduce the glare.



e) **Solar Observation:** When making solar observation, it is not necessary to have a sighting scope. You should remove the sighting scope first by loosening the locking screw. Attach the sun projection screen to the telescope. Take off a cap screw at one end of the shaft and attach sun projection screem (white plate). Re-attach the cap screw to the shaft. To aim at the sun, focus the shadow of the telescope on the ground. Adjust the direction of the telescope until the shadow of the telescope becomes the smallest round circle. Focus the telescope with rack & pinion. This is the most convenient and safest way to observe the sun. In case you want to observe the sun directly, use sun glass to protect your eyes. **Never forget to use the sun glass as serious damage may occur if your naked eyes are accidentally exposed to the sun's rays.** Also, be sure to remove the sighting scope for direct solar observation. This is to prevent any accidental exposure of the naked eye to the sun's rays passing through the sighting scope.

3. Astro-Photography :

Serious amateurs will wish to record their observations. This new telescope has been designed to fulfil the requirements of such enthusiasts. Delux Camera mount and Camera adapter are not standard accessory, but they may be obtainable through your dealer.

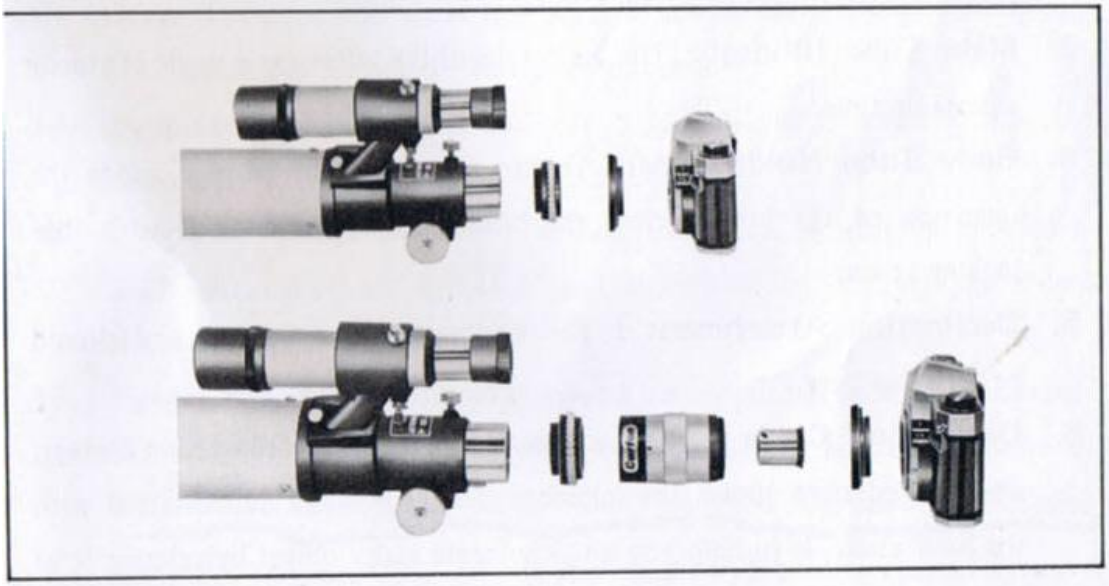


a) **Photography with Equatorial Mount:** Celestial bodies are constantly moving around the polar axis in a circle, and this is called diurnal movement. In order to take photos of long exposure time, it is imperative to mount the camera on the equatorial mount. First remove the sighting scope; then attach the camera mount to your camera by screwing the holder's screw into the camera. See that your camera faces forward. Depending on the field of the camera, the main tube may become an obstacle. In such a case mount the camera a little off-axis, not parallel to the main telescope. Attach it to the telescope where the sighting scope has been located. Make sure to tighten the locking screw in order to prevent accidental dropping and damaging of your precious camera. Unscrew and remove the eyepiece of

the sighting scope. This RAMSDEN type eyepiece of 22mm focal length has a built-in cross hair reticle. Use this eyepiece with the main telescope. When using the main telescope as a sighting scope, guide the telescope and the camera. Direct the camera to the object you want to photograph and continue by finding a nearby bright star with the telescope. Pinpoint the object star to a corner of the crossed hair. Maneuver the telescope in such a way that the star remains in a fixed position in the corner.

b) **Photography through the Telescope:** To take a magnified photo, use a camera adapter. This camera adapter has a thread which fits the single reflex camera ASAHI Pentax, YASHICA J, CONTAX, EDIXA, MIRANDA, PETRI, or PRAKTICA.

c) **The Photo with an Eyepiece:** Insert an eyepiece in the eyepiece holder of the camera adapter. Push the eyepiece as far as it will go and make sure it is tight. Turn the knurled ring and observe that the eyepiece moves forward and backward. Note that when taking a photo, the magnification of the image changes depending on the position of the eyepiece. When you bring the eyepiece closer to the camera, the magnification grows smaller, and when you bring it farther from the camera, the magnification



increases. Select a suitable magnification by changing the eyepiece and by changing its position, while viewing the object through the finder of the single reflex camera. After focussing is done, tighten the draw tube locking screw to prevent it from slipping and going out of focus.

d) **Direct Photo without Eyepiece:** The magnified photo can be taken also without using the eyepiece. Remove the eyepiece container part of the camera adapter, and use only the adapter ring to connect the telescope and the camera. This method of photography is most suitable for taking photos of the moon.

PARTS & ACCESSORIES

1. **Objective Lens Frame:** This lens frame contains the achromatic objective lens. The adjustment of the optical axis of the objective lens is a very delicate operation, and it is done by experts at the factory, so it is not recommended for an amateur to take them apart.
2. **Sun Shade :** This is also called a "dew cap", and it reduces the chance of dew forming on the lens surface. Attach it to the main tube. Sometimes it is advisable to have extensions of it. You can easily make them by just having a rolled sheet of paper painted black inside.
3. **Main Tube (Body) :** The main tube of the telescope is made of sturdy aluminum tube.
4. **Body Tube Holder :** After finding the center of balance, place the telescope on the holder, close the holder lid, and tighten it with the locking screw.
5. **Declination Attachment :** The declination fine control rod should be attached here.
6. **Declination Circle :** This is a metal ring which is graduated in degrees, and located right under the telescope. Its purpose, in coordination with the hour circle, is to help you quickly locate a sky object by relating it to

a well known and easily located star.

7. **Sighting Scope :** The sighting scope is a small wide field 6X30mm telescope with a cross hair eyepiece which assists in locating any particular object quickly with the use of the main telescope.
8. **Sighting Scope Holder :** To attach the sighting scope to the main telescope, slide the base of the sighting scope holder into the receptacle.
9. **Sighting Scope Collimating Screws :** By adjusting three collimating screws, the sighting scope should be aligned to the optical axis of the main telescope.
10. **Cross Hair Eyepiece :** This RAMSDEN type eyepiece of R-22mm can be removed from the sighting scope by unscrewing it. It can be used with the main telescope, and its cross hair eyepiece can be useful when taking Astronomical Photographs.
11. **Sighting Scope Holder Locking Screw :** After mounting the sighting scope to the main telescope, tighten the locking screw to prevent the sighting scope from dropping.
12. **Draw Tube Locking Screw :** This locking screw is provided to stop the draw tube from slipping when a heavy camera is mounted. Keep it free in other occasions.
13. **Draw Tube :** The draw tube can be moved back and forth to bring focus by simply turning the rack & pinion handle.
14. **Eyepiece Holder :** The eyepiece holder should be screwed into the draw tube.
15. **Eyepiece Holder Chuck :** Release the chuck by turning it counter-clockwise, insert an eyepiece, and tighten it by turning the chuck clockwise.
16. **Eyepiece :** Three different eyepieces are supplied as standard equipment for this telescope. Also, supplied is a cross hair reticule eyepiece of R-22mm in the sighting scope which can also be used in the main telescope. The magnification you can obtain with these eyepieces is related

to the focal length of the objective lens, and the formula is as follows:

$$\frac{\text{Focal length of objective lens}}{\text{Focal length of eyepiece}} = \text{Magnification}$$

17. **Declination Fine Control :** This is attached to the declination attachment by a thumb screw. Small adjustment of the declination axis is controlled here.
18. **Declination Clamp :** Release it when making rough (coarse) adjustment and tighten it when only small adjustment are needed.
19. **Hour Circle :** The hour circle is graduated from 0 to 24 hours, and can be turned around the polar axis by hand. Adjust the ring to the particular time of observation when necessary.
20. **Right Ascension Clamp :** Release the clamp, make rough adjustment of the telescope, and tighten the clamp again.
21. **Right Ascension Fine Control :** This control is of very special importance as it functions in tracking diurnal movement of celestial objects.
22. **Polar Axis Clamp Bolt :** After locating the celestial North, be sure to tighten this clamp so that there will be not slipping during observation.
23. **Balance Weight Shaft Stop :** Be sure to tighten this after screwing the balance weight shaft as far as it will go.
24. **Balance Weight Shaft :** Tighten it firm to the mount in order to prevent accidental dropping of the heavy weight on your toe.
25. **Balance Weight :** This is also called "counter weight" or "counter poise". You can adjust the balance of the telescope by moving the weight up or down.
26. **Balance Weight Setting Screw :** Tighten this screw to set the weight at the desired position.
27. **Horizontal Axis Clamp Handle :** To move the telescope horizontally, loosen the clamp.
28. **Tripod Head :** After setting up the telescope and the mount, tighten the tripod again by thumb screw.

29. **Wooden Tripod :** Sturdy wooden tripod is extensible to your desired length.

30. **Accessory Tray :** Fasten the three bolts and nuts tightly for maximum stability.

31. **Tripod Thumb Screw :** Tighten it firm to avoid slipping tripod.

36. **Sun Projection Screen :** The use of this is explained in the SOLAR OBSERVATION section. Remove the end cap of the sun screen rod, and attach the white sun projection screen.

40. **Camera Mount :** This is available as an optional accessory. The use of this camera mount is explained in the ASTRO-PHOTOGRAPHY section, but in coordination with the cross hair eyepiece R-22mm from the sighting scope, it is useful in taking long exposure photography. Be sure to tighten the locking screw to prevent it from dropping.

41. **Barlow Lens :** This is an amplifier which doubles the magnification.

42. **Illuminator :** This is a handy accessory for observation at night. The magnetized bottom lid sticks to the accessory tray. Open the bottom lid, and insert two penlight batteries (size AA). Switch on and off and see if the light works. If the bulb burns out, replacement is by removing the green lamp shade. Not a standard accessory.

43. **Diagonal Prism :** This indispensable accessory helps in observing stars in the Zenith (sky right overhead), without acquiring a neck stiff thus it is sometimes called Zenith prism.

44. **Erecting Prism :** This image erecter for terrestrial use should be directly screwed onto the draw tube.

45. **Azimuth Circle :** This indicates directions.

46. **Latitude Scale :** This corresponds to the latitude of your location, and it serves in quickly locating the approximate position of the Pole Star (Polaris).

47. **Sun Glass :** You should never look at the sun directly without using this sun glass. This sun glass should be screwed into the back of the

eyepiece.

48. **Moon Glass :** When the moon is full, use this glass to reduce the glare from the reflection. This is not available as a standard accessory.

49. **Camera Adapter :** This also is available as an optional accessory. Insert one eyepiece into the eyepiece holder. Turn the knurled outside ring and note the movement of the eyepiece set in the adapter. When it is closest to the camera, the image becomes smaller but sharper, and when it is distant from the camera, the image becomes magnified. Eyepieces with a longer flange part, will have to be set at the end farthest from the camera. When taking photos without eyepiece, remove the front ring only from the adapter and mount the camera directly on the draw tube.

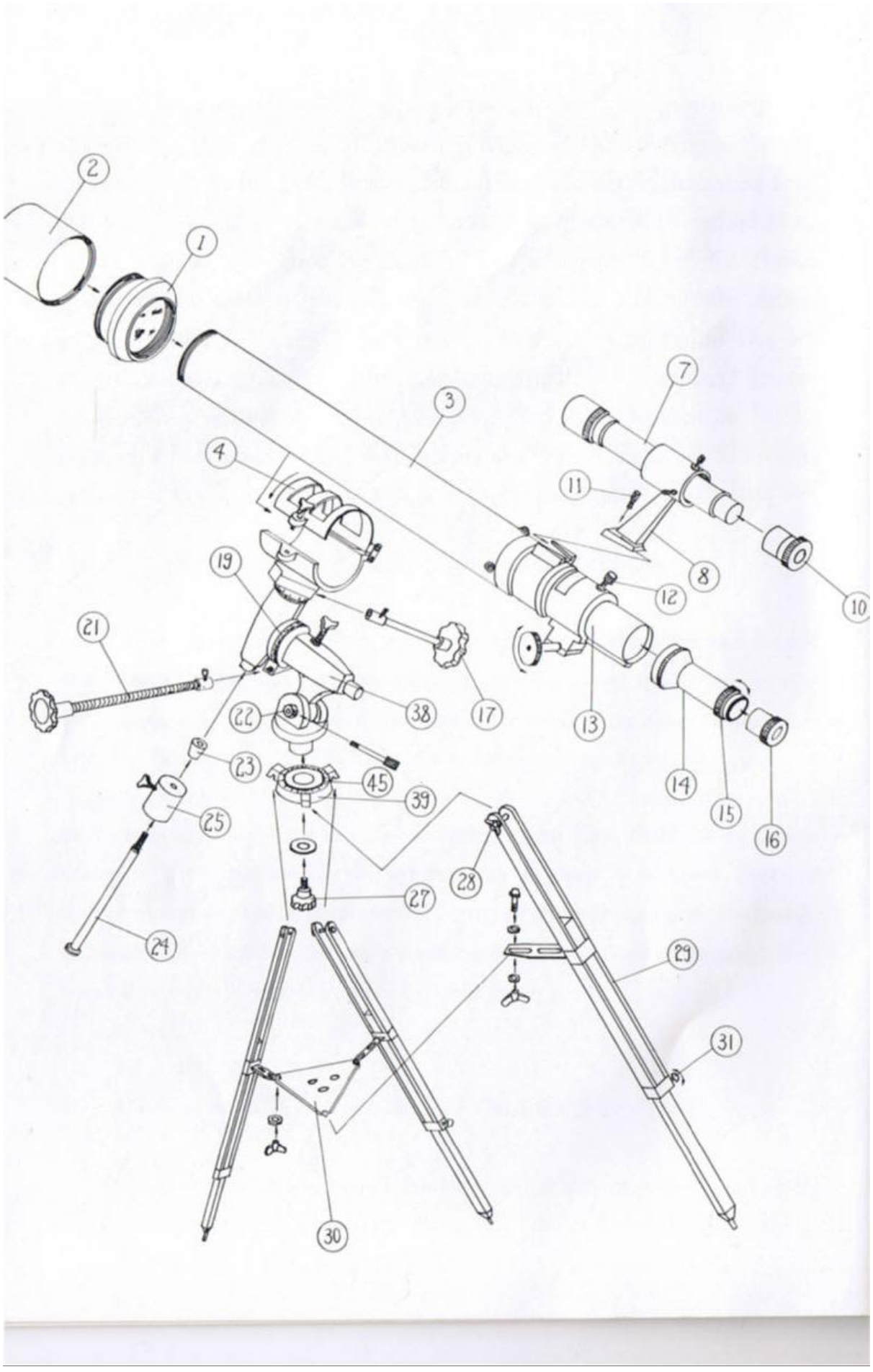
HINTS FOR EFFECTIVE OBSERVATION

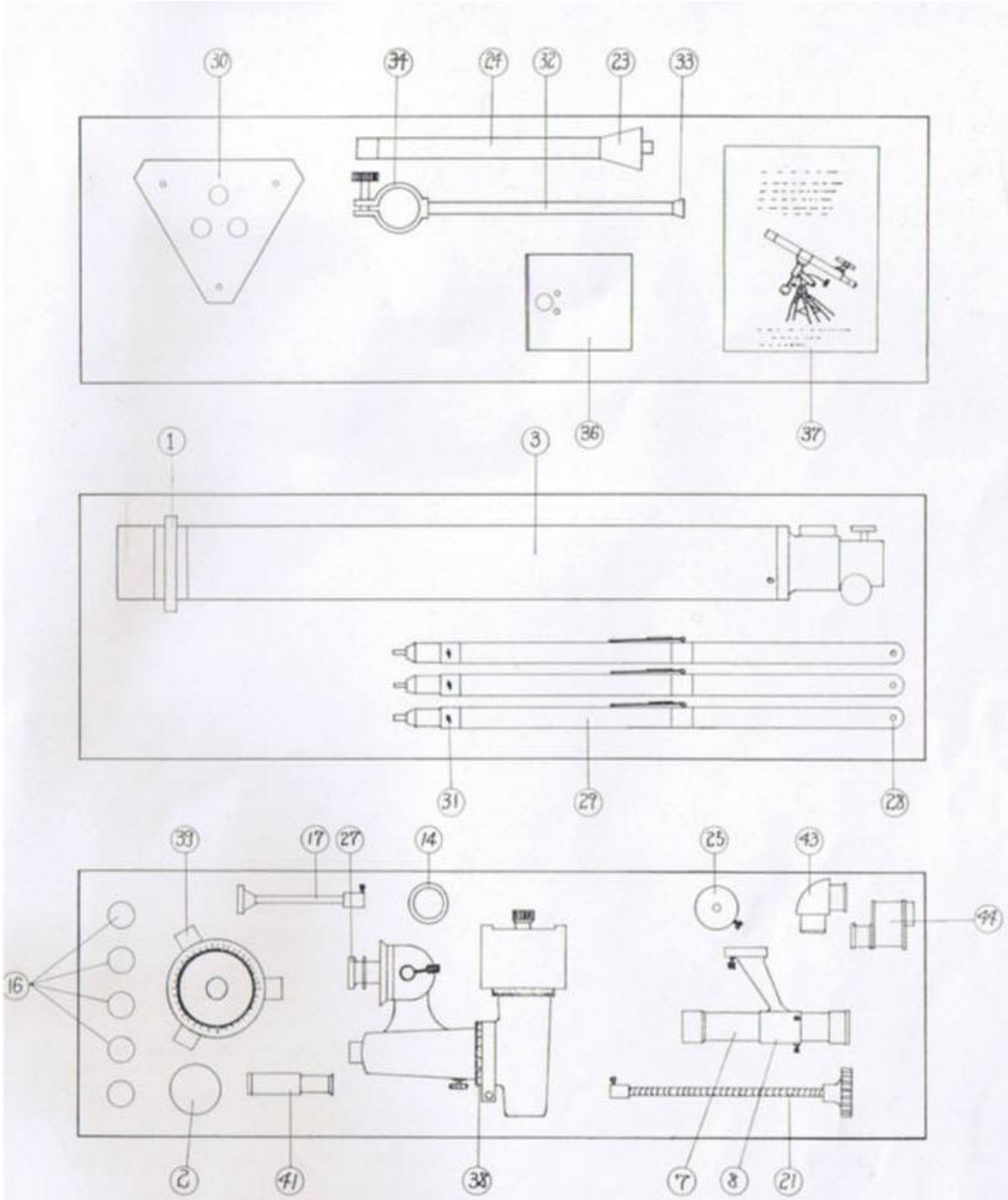
The air out-doors is usually colder than the air in-doors. For this reason, whenever you desire to use your telescope out-doors, you should let the telescope cool for sometime until the temperature of air in the tube becomes equal to the air outside. The difference in temperature produces air currents in the tube which disturb observation. Sometimes, the difference in temperature even produces dew on the lens, and in such a case it takes 15 to 20 minutes to disappear. If you accidentally perspire or touch the eyepeice with your eyelid or finger, wipe the eyepiece gently with a lintless cloth to prevent a blurred image. It takes some 30 minutes for one's pupils to widen and adjust to darkness, after which time one will be able to see dim objects better.

MAINTENANCE OF TELESCOPE

The astronomical telescope is a precision optical and mechanical instrument. If handled with proper care it will give a life time of pleasure as well as top

quality service to its user. When not in use, store it in the case. Lenses must be cleaned as carefully and as rarely as possible to maintain their accuracy and good performance. Optical elements must never be taken out of their mount by an inexperienced person. When it becomes necessary to clean the lenses, a soft camel's hair brush should be used to brush off dust. Never rub the optical surface without first dusting off thoroughly, as tiny particles of dirt scratch the soft surface of optical lenses easily. When a lens needs further cleaning beyond brushing, use a clean cotton cloth with a few drops of ether or grain alcohol on it. Wipe the lenses very gently. Dust and moisture are the worst enemies of the telescope, the user should store it in its case and in a dry, dust free place. Some dessicant is helpful if packed with the instrument in the box.


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