HEZEUM

OWNERS MANUAL
SHORT TUBE NEWTONIAN EQUATORIAL REFLECTOR TELESCOPE

D=130MM F=650MM

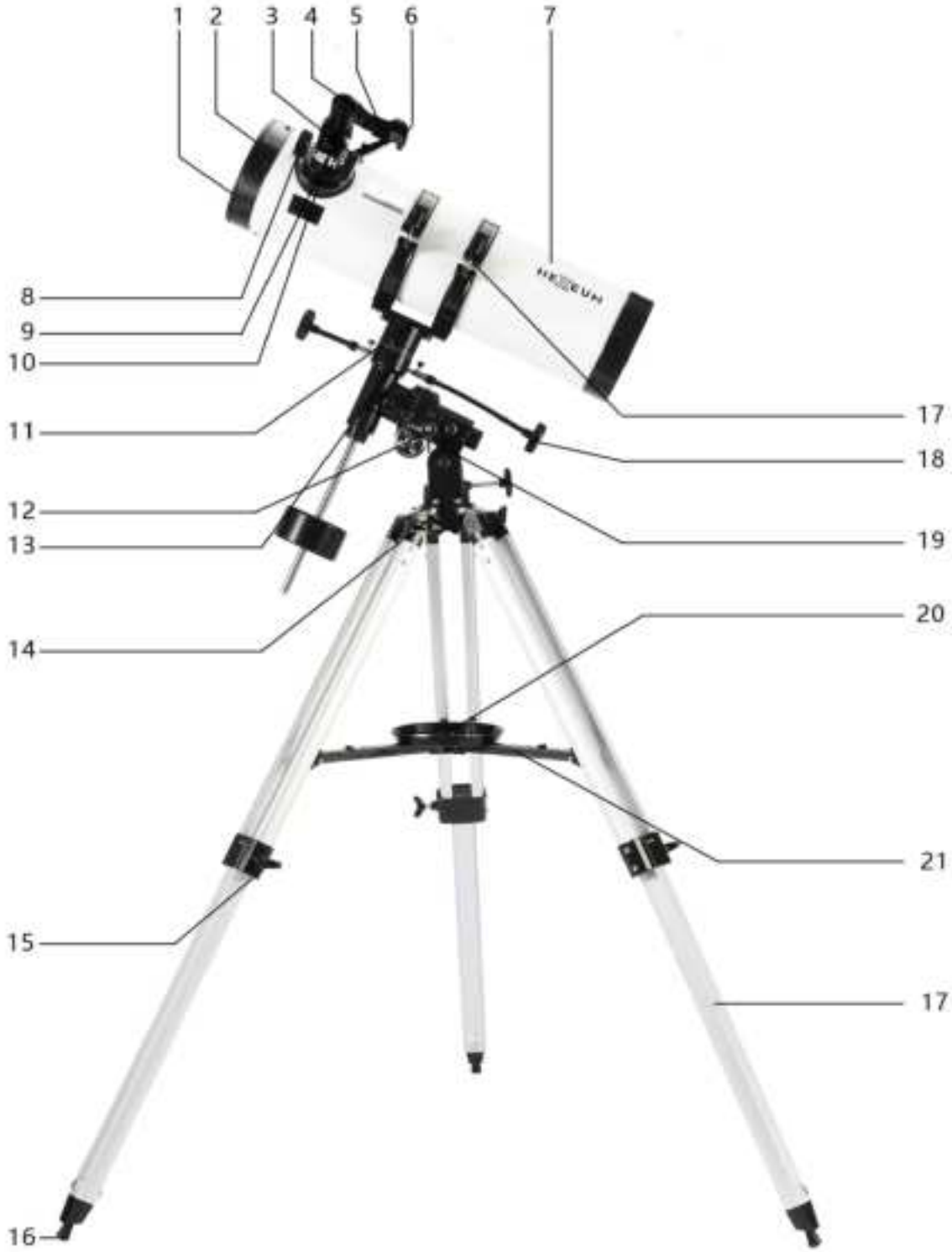
WARNING

• DIRECT OBSERVATION OF THE SUN WITH NAKED EYES AND IMPROPERLY FILTERED TELESCOPES IS PROHIBITED, WHICH WILL LEAD TO PERMANENT VISUAL IMPAIRMENT.

• DO NOT USE A TELESCOPE TO PROJECT THE SUN DIRECTLY ONTO ANY PLANE. THE FOCUSED BEAM MAY BE DAMAGED
AN OPTICAL ELEMENT IN A TELESCOPE.

• DO NOT USE THE SOLAR FILTER PLACED IN THE FRONT OF THE EYEPIECE, AND DO NOT USE THE HERSCHEL WITHOUT SAFETY CERTIFICATION
TO OBSERVE THE SUN THROUGH THE ZENITH OF A PRISM. THE FOCUSING EFFECT OF THE TELESCOPE MAY LEAD TO SEVERE HEAT ABSORPTION AND BURST. AFTER THE EXPLOSION, THE SUNLIGHT WILL ENTER THE HUMAN EYE WITHOUT FILTERING AND CAUSE DAMAGE.

• DO NOT NEGLECT THE MANAGEMENT OF THE TELESCOPE. ADULTS WHO ARE FAMILIAR WITH THE OPERATION SHALL BE ON SITE DURING OPERATION, ESPECIALLY
IN THE PRESENCE OF CHILDREN.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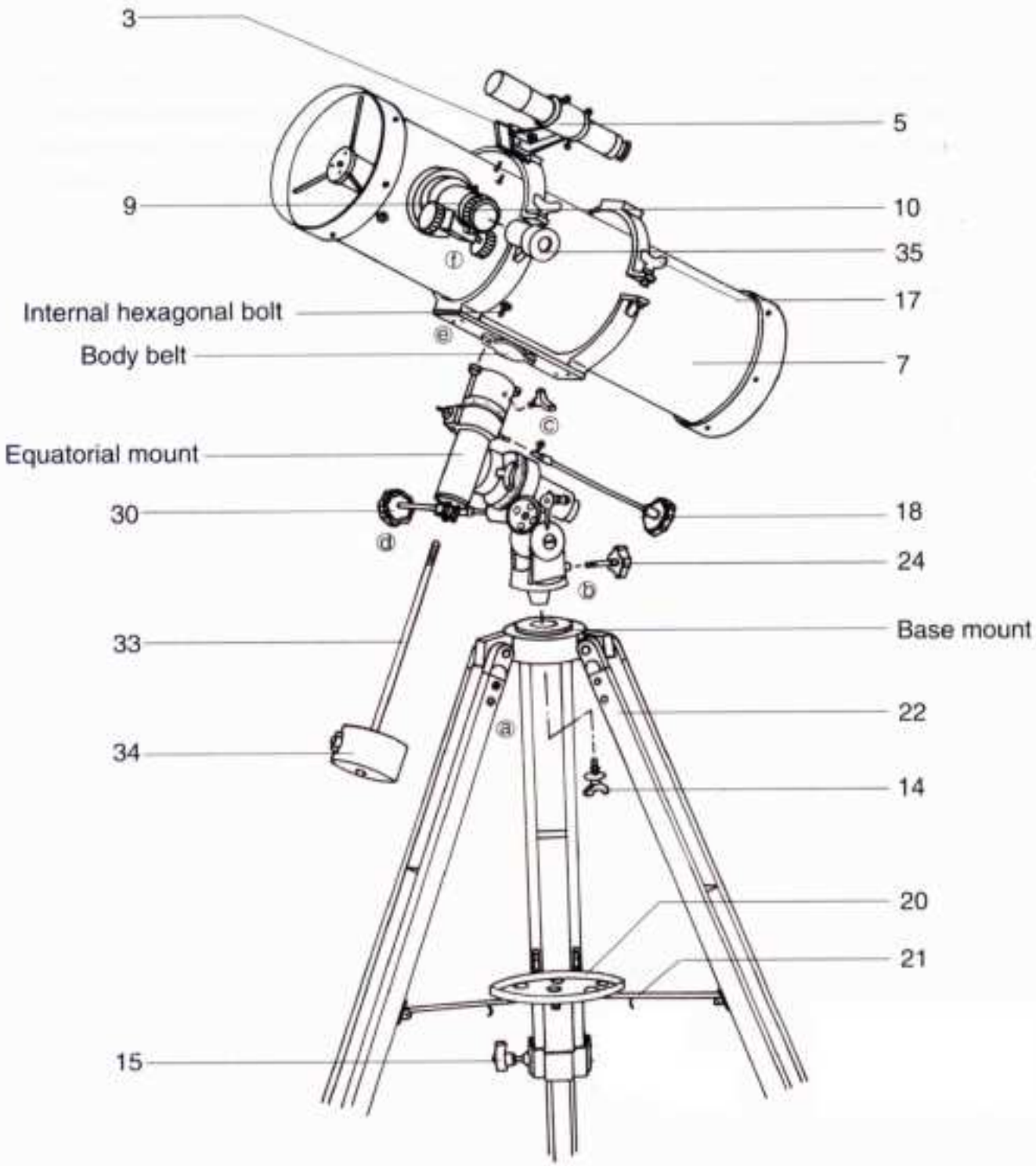
1.Open End of Tube
2.Diagonal Mirror(inside)
3.Nuts for Sight Scope Bracket
4.Sight Scope
5.Sight Scope Bracket
6.Sight Scope Eyepiece
7.Main Tube
8.Focusing Knob
9.Focusing Tube
10.Eyepiece Adapter
11.Declination Clamp Screw
12.Right Ascension Clamp Screw
13.Clock Drive Gear
14.Horizontal Axis Clamp Screw
15.Clamp Screw for Tripod Leg
16.Rubber Tips
17.Clamp Handle
18.Declination Flexible Cable Control
19.Polor Axis
20.Accessory Tray
21.Accessory Tray Brackets
22.Tripod Leg
23.Main Mirror(inside)
24.Polor Axis Auxiliary Screw
25.Polor Axis Clamp Screw
26.Aligning Screw for Sight Scope
27.Declination Circle
28.Declination Attachment
29.Hour Circle
30.Right Ascension Flexible Cable Control
31.Right Ascension Attachment
32.Latitude Scale
33.Balance Shaft
34.Balance Weight
35.Eyepiece
36.Moon filter

CAUTION:UNDER NO CIRCUMSTANCE SHOULD OBSERVER LOOK DIRECTLY AT THE SUN THROUGH THE FINDER SCOPE AS DIRECT OBSERVATION OF THE SUN WILL BE DANGEROUS TO YOUR EYES.

Attaching the Telescope



Attaching the aluminum tripod telescope(see Fig.3)

1.Remove the aluminum tripod(22)from the box,separately extend them to suitable length from up to down and tighten the thumb screws(15)for tripod legs.

2.Spread the tripod legs,put accessory tray(20)on the accessory tray bracket(21) and Turn the accerroty tray(20) locking it on accessory tray bracker(21)the slot.

3.Remove equatorial mount from the box.Loosen the various locking mechanisms(clamp serws 11,12,24,and 25).Adjust equatorial mount to the position as shown in Fis.3,tighten all the clamp screws and insert the end part of the equatorial mount into the central hole of base mount with a horizontal axis clamp screw(14) .

4.Screw the polar axis auxiliary screw(24)into the spiral hole as shown in Fig.3c.

5.Aim the flexible cables(18,30)at the flat end of worm to fit them together and fasten the screw(see Fig.3d)

6.Thread the balance shaft(33)through the central hole of balance weight(34).With one hand hugging the balance weight,the balance shaft is screwed into the female receptacle located at the declination shaft by the other hand(see Fig.3e).The position of the weight can be changed by slipping it back and forth,making it possible to balance the telescope.Move the weight to suitable place and fasten it with the set screw.

7.Take off the body belt from the main tube(taking on a hugging look)and locate it on the equatorial mount with the internal hexagonal bolt by internal hexagonal wrench(see Fig.3f).

8.Unlock the clamp handle for body belt(17),place the main tube(7) in the body belt and lock it in place.

9.Screw the eyepiece adapter(10)into the rack and pinion focusing tube(9),take off the dust cap,remove the lower power eyepiece to the eyepiece adapter(10),tightening the set screws (see Fig.3g).

10.Unscrew the two nuts(3)on the telescope.Place the sighting scope bracket(5)on the main tube(7)as indicated in Fig.3h,then attach the nuts.

OPERATING INSTRUCTIONS

Read Carefully before Attempting Telescope Observations.

A telescope is an optical and mechanical instrument of great precision.Handled with care and respect,it will provide many years of excellent service .This booklet is designed to furnish you with information on this telescope's structure,specifications,and the use of proper operating techniques.

WHAT IS A TELESCOPE?

A telescope is an optical system designed to magnify distant objects.The telescope you have purchased is called a REFLECTOR TELESCOPE.It consists of an open tube with a curved mirror at the bottom.The open end of the tube is pointed at the object in the sky and the entering light rays strike the mirror at bottom.The rays,reflected from the mirror,strike a second mirror called a diagonal. As a result of the curvature of the main mirror,the light rays are bent to meet at a point.The mirror in a reflector telescope must be painstakingly ground to the proper curvature to achieve the correct focal point.The purpose of the diagonal mirror, which is located a short distance before the focal point,is to reflect the light rays toward the side of the tube where an eyepiece magnifies the image for you .This telescope has an equatorial mount. It is extremely versatile because it allows the telescope to move in all directions.Thus,it is possible for your telescope to track a star's movement across the sky in the same path that the star seems to take(called diurnal movement).It has flexible cable controls(18 and 30),which make it possible to move the telescope while you are looking through it.

FOCUSING THE TELESCOPE AND ALIGNING THE CROSSHAIR SIGHTING SCOPE

1 .Focusing(see Fig.4)

Leave the telescope in the same position as when assembling (terrestrial position,Fig.3).

Loosen the two set screws attached to the eyepiece adaptor(10)on the main telescope tube.

Remove the lowest power eyepiece (PL25mm)and attach it to the eyepiece adapter, tightening the set screws.Aim the telescope at a distant object in the daytime...such as the comer of a building, telephone pole,etc.Rack the focusing knob(8) back and forth until the object is in sharp focus.

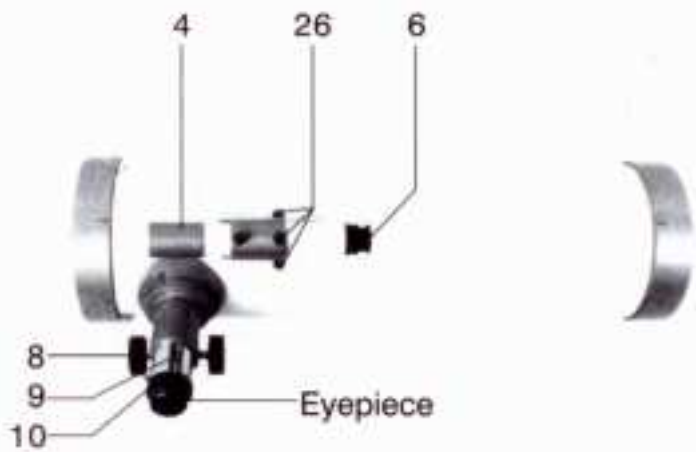


Fig.4

Ⅱ .ALIGNING THE CROSSHAIR SIGHTING SCOPE

With the telescope in sharp focus,look into the sighting scope(4).If the sighting scope(4)is not in focus,turn the eyepiece(6)around on its thread until the views is sharp and clear.If the object you see in the main telescope is not in the center of the sighting scope cross hairs, do the following:Tighten and loosen the three screws(26)in the bracket,causing the sighting scope to move up or down, side to side,or diagonally.When the objects is dead center in the cross hairs, your sighting scope is adjusted. Repeat this process by replacing the lower power eyepiece with the another higher eyepiece .Once the image centered under highest magnificalion in the telescope is also centered in the sighting scope,your sighting scope aligned.It may now be used for rapid location of the sky objects you want to study in the telescope. On rare occasions,the sighting scope might have to be readjusted.

Note 1:Whenever locating an objece,always use the finder scope first in finder scope position...as it has a wide field of the view and will speed up your roughly adjustment tremendously.
Note 2:Always start with the lowest power eyepiece in the telesccope tube and work up to the power you want...making the necessary focusing adjustment as you change eyepieces.
Note 3:Do not be disturbed that the image you see is upside down and from left to right.This is a normal situation with astronomical telescopes. By simply inserting the erecting prism(option),the image will straighten itself out for terrestrial use.

Eyepieces and Magnification

This telescope is supplied with two different eyepieces(PL6.5mm and PL25mm).The power of each particular eyepiece is directly related to the focal length of the telescope which is 650mm(when synthesized by the correcting lens).However,generally the power of each eyepiece is related to the focal length of the objective mirror of the telescope. The formula is as follows:

$$\frac{\text{Focal length of the telescope}}{\text{Focal length of eyepiece}} = \text{Magnification}$$

As an example,your PL6.5mm eyepiece will show a magnification of:

$$\frac{650\text{mm}}{6.5\text{mm}} = 100\text{X Magnification}$$

USING YOUR TELESCOPE ASTRONOMICALLY

Before learning the technical details of this telescope,you will find that you can now enjoy observing the stars,the planets,the moon and the sun with your present knowledge.Loosen the declination axis clamp screw(11),the right ascension clamp screw(12),and the polar axis clamp screw(25).

Re-adjust your telescope so that it is in the poition as shown in fig.1.Loosen the horizontal clamp screw(14)so that you can swing the telescope in a circle.Attach the lower power eye-piece.

THE MOON AND THE STARS

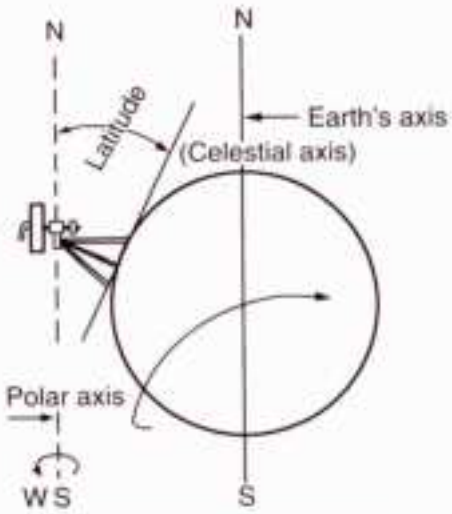
If you are viewing at night, you will get most fun out of looking at the moon and its surface.Aim the sighting scope so that the moon is in the center of the crosshairs.Tighten all clamp screws.The main telescope is now directly aimed at the moon.Focus the telescope as described previously.With your hands on the two flexible cable controls(18,30) you will find that you can move the telescope in any direction as you study the moon's surface.Try this with the moon filter screwed into the eyepiece and without the moon filter screwed in .The design of the two cable controls is such that the telescope can be swung a limited distance before the clamps must be loosened for further movement.Do not try to force the movement of the telescope past the automatic stops on the controls.To go past a stop position,loosen the necessary clamp screw and shift the telescope manually before re-tightening the clamp.The balance weight should be adjusted up or down depending upon the position the telescope is in.You will find that if the balance weight is correctly adjusted, the telescope will move on any axis(with the appropriate clamp screw loosened)with the slightest touch of the finger.

At this point,try the more powerful eyepieces in your observation the details of the moon.After looking at the moon,you will probably want to look at some of the more well known constellations(like the big dipper).The stars will appear like flickering dots of light.This is the case with even the more powerful telescopes.

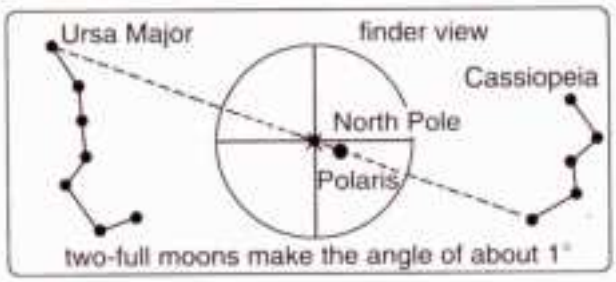
Your daily paper will probably tell you the location of the planets and the times that they are in your area on any particulay day. See if you can find one of these planets.Try Venus first,as it is the brightest object in the heavens(discounting the moon and sun) at most times of the year.The planets will tend to appear like flat discs through your telescope and you will probably be quite surprised by the rapidity with which they move across the sky. If you aim your telescope at a planet and walk away for five or ten minutes, you are likely to find that the planet has moved out of the telecope's field when you get back.

USING THE SETTING CIRCLES TO LOCATE STARS

Since this equatorial telescope is designed to move in any direction,it can be set to track the apparent movements of celestial bodies across the sky.This movement of celestial bodies is in the direction opposite to that of the earth's rotation and is around the earth's axis or celestial axis (Fig.5). By simply aiming the telescope polar axis (19) at celestial North, you will automatically place the telescope in parallel with the earth's axis and thus be able to locate stars in the sky based on information in star charts and star atlases. In simple language you aim your telescope dead center in the celestial sphere...that point in the sky that is like the hub of a wheel and does not appear to move. The angle of declination is simply 90° minus the angle away from this hub.Celestial North is 90° . If you were at the North Pole,you would point your telescope straight up to aim at celestial North. To compensate for your position on the round earth, the polar axis(19) is set in one of two simple ways.(see Fig.6)



Polar Axis and Earth's Axis
Fig.5



1)Set up the telescope at night.Loosen the declination axis clamp screw(11)and turn the telescope around until the arrow points at 90° on the declination scale. Tighten the declination clamp lever. The telescope is now in parallel with the polar axis.

2)Loosen the horizontal screw(14)and turn the telescope until the open end faces due North. This can be done by an approximate sighting on the Pole Star(Polaris)or by the use of a compass to find magnetic north.
True North is then found by directing the telescope at the Pole Star, as magnetic North is slightly away from the true North.

Ploar Axis Adjustment
Fig.6

3) Look up the latitude of your area in any geographical atlas. Loosen the polar axis screw(25) and set the latitude scale 32 to the correct latitude for your area. Aim the finder scope at the Ploe Star. You will probably notice that Polaris(the Pole Star) is not dead center in the crosshair finder scope. This is probably because your telescope is not absolutely level with the ground. Loosen the horizontal axis screw again and turn the telescope so that it is directly aimed at the Pole Star.Clamp both screws tight. Polaris is 1° off the North celestial pole. Therefore, the sighting of stars will have to be slightly adjusted as you locate them in the heavens.(see Fig.5-2)

To Locate Any Star in the Heavens Quickly

With the telescope set as described in the Heavens previous section,look up the declination of any star in the chart that comes with this telescope.For instance,the bright star Vega is located plus 38° 44 minutes declination.Loosen the declination screw(11).Swing the telescope around the declination axis to 38° and lock it in there.This sets the telescope to make a circle around the pole star with an angle of approximately 52° from Polaris(90°—38°).The star chart that is found in the book that accompanies this telescope will simplify this job of locating the stars tremendously.The sky is divided like a big 24 hour clock with minutes and seconds. You will notice on the chart that the Big Dipper (Ursa Major)is located from approximately 11 hours through 13 hours 45 minutes.Since Vega is located at 18 hours 35 minutes,by the simple process of swinging the telescope along the right ascension axis a bit past 1/4 turn to the right from the two pointer stars(at around 11 hours)of the Big Dipper.you will be near the constellation Lyra and the bright star Vega.(Note:these two pointer stars aim almost directly at Polaris,making it rather easy to locate the center of the celestial sphere).

After locating the pointer stars of the Big Dipper, loosen the right ascension clamp screw (12). Swing the telescope around so that the barrel of the telescope is on a line with the two pointer stars of the Big Dipper (and, of course, Polaris). Your telescope is now aimed at an approximate right ascension of 11 hours. Clamp the right ascension screw. Turn the hour circle (29) so that the pointer is on 11 hours. You have now set the telescope so that it is coordinated with and celestial clock for your location at this particular moment. Turn the knurled knob on the right ascension attachment (31) so that the telescope moves approximately one quarter turn to the right, until the pointer is a bit past 18 hours 30 minutes on the hour circle. Look through the finder scope.

The bright star close to the center of the crosshairs is Vega. Using the declination (18) and right ascension (30) flexible cable controls as you look through the sighting scope, make your final adjustments so that Vega is centered in the crosshairs. Now focus, using the main telescope. If the mount hits against itself, loosen the declination clamp, swivel the telescope to clear the mount, and reset the declination pointer. The division of the sky into a 24 hour clock is, of course, based on the earth's rotation...which divides the day into 24 hours.

Each star is located at a right ascension of from 0 to 24 hours--(just like in a 24 hour clock). Each star is also located so many degrees from a flat, imaginary planet at the North Pole. It is called the angle of declination. Due celestial North would be straight up from the North Pole, or 90°.
It is essential to always start out with the lowest power eyepiece when locating a star. Once the star is found, the more powerful eyepieces with smaller fields of view may be used to greater advantage.

ACCESSORIES AND THEIR USES

Moon Filter

Because there is a great deal of reflected glare when the full moon is observed, the addition of the moon filter will remove this glare and make it possible to sharpen surface details. At other times, this filter is unnecessary and a sharper image can be obtained without it. The moon filter is screwed into the eyepiece in the same way that the sunfilter is added.

Flexible Cable Controls(18,30)

These controls are designed in such a way that even with all clamps tight, it is possible to move the telescope in any direction by using these cables. Thus, you may observe the stars, the planets, the moon, the sun in their apparent movements across the sky by slight turns of these controls and without the necessity of tightening and loosening the telescope clamps.

Declination Circle(27)

This declination circle is mounted on the bearing board. 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.

Latitude Scale(32)

This scale is mounted along the polar axis under the polar axis clamp lever (24). It is a metal disk graduated in degrees of latitude. Set at the latitude of your geographical area, it helps aim the telescope quickly at the Pole Star(Polars), so that the telescope is pointed directly at celestial North and is in parallel with the earth's axis.

Hour Circle(29)

The hour circle is mounted on the shaft of the polar axis, above the worm wheel for the right ascension axis(31). It is a circle graduated from 0 to 24 hours. It can be turned around the polar axis by hand. Its purpose, in coordination with the declination circle, is to locate a sky object by relating it to a well known and easily located star. It has double hour indicator so that you can easily find the location of a sky object even if the telescope is rotated either clockwise or counter-clockwise.

HINTS FOR EFFECTIVE OBSERVATION

When the telescope is first brought out doors, into the air, and the air is colder than the indoor temperature, allow a few minutes before using the telescope...as the difference in temperature will cause a condensation of moisture on the lenses. This will disappear in 15-20 minutes.

If you accidentally perspire or touch the eyepiece with your eyelid or finger, wipe the eyepiece gently with a lintless cloth to prevent a blurred image.

It takes close to 30 minutes for our pupils to dilate (widen) and adjust to darkness. You will be able to see much dimmer objects after 1/2 hour of telescope use at night.

MAINTENANCE OF THE TELESCOPE

As a precision optical and mechanical instrument, the telescope must be handled with utmost care. When not in use, store it in the box. Lenses and mirrors must be cleaned as carefully and rarely as possible to avoid accuracy and performance being affected. Optical elements must never be taken out of their mount by an inexperienced person. When it becomes necessary to clean the lenses or mirrors, a cleaning solution, no stronger than mild soap and water, in combination with a soft, lint-free cloth should be gently applied to the optical surface without rubbing. A thorough rinse in clear water should follow and the optical element is not rubbed dry but allowed, instead, to air dry. The use of solvents such as xylene and alcohol for cleaning purposes is not recommended, Eyepieces should be cared for and cleaned like any other optical element, Eyepieces are constructed so that they can be taken apart. The inexperienced person should not attempt this because the lenses of the eyepiece are carefully alighed during manufacture and careless handling could lead to unfortunate mishaps. Another maintenance problem, peculiar to this reflector, involves the metallic coating of the mirror. With normal exposure and use, the metallic coating will eventually wear away. Recoating is a job for the professional, not for the amateur.

SPECIFICATIONS

OPTICAL EFFECT

Objective mirror	:	Concave mirror, hard-coated
Lens clear aperture	:	130 mm
Focal length	:	650 mm
Resolving power	:	0.93"
Faintest discernible stars	:	12M
Magnification	:	26x,100x

F= 650mm

Eyepiece	Magnification	Exit Pupil Aperture	Brightness	Visual Field	
				Actual	Apparent
PL25mm	26x	5mm	25	1° 36′	40°
PL6.5mm	100x	1.5mm	2.25	26′	41°

STANDARD ACCESSORIES

Objective	:	Aperture D= 130mm Focal Length F= 650mm
Eyepiece	:	PL6.5mm,PL25mm
Sight scope	:	6X30mm
Mount	:	ET-8 Equatorial
Tripod	:	Aluminum
Accessories	:	Moon filter(31.75mm), Flexible cables (two pieces), Balance weight, Accessory tray, New 2x Barlow lens

MECHANICAL EFFECT

Focusing	:	Rack and pinion focusing
Mount	:	Equatorial mount
Tube length	:	573 mm

Care of the Mirrors

The main and diagonal mirrors should not be cleaned or touched by hands because they are highly aluminized to give brilliant reflectivity. If the telescope is always stored in the box when not in use, there should be no problem with dust collecting on the mirror surfaces.
If for any reason they have to be cleaned,use a fine camel's hair brush or a soft,lint-free cloth. With normal exposure and use,the metallic coating will eventually wear away.

CAUTION

For shipping purposes,the protective paper is stuck on some parts such as yoke screw, focusing knob,flexible cable handle.etc……
Remove this paper when assembling your telescope.

CAUTION

WHEN OBSERVING THE SUN WITH THE SUN FILTER.DO NOT USE FULL APERTURE OF THE TELESCOPE.LOOK AT THE SUN THROUGH A SMALL WINDOW OF THE DUST CAP.

A SIMPLE WAY TO AIM AT THE SUN

UNDER NO CIRCUMSTANCE SHOULD OBSERVER LOOK DIRECTLY AT THE SUN WITHOUT THE SUN FILTER BECAUSE THE SUN IS SO POWERFUL AND CAN DAMAGE HIS EYES.

DO NOT USE THE FINDER SCOPE TO AIM AT THE SUN.

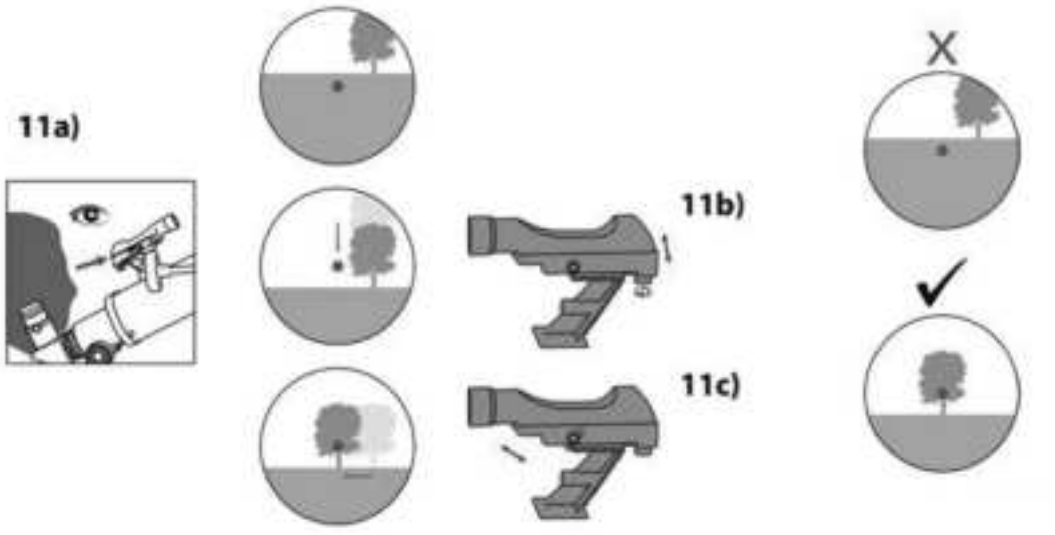
1. Using the sun filter It is necessary for observer to study the sun through a telescope with a sun filter. The sun filter should be screwed into the eyepiece before the eyepiece is inserted into the draw tube.Face the end of the telescope toward the sun. The main shadow of the telescope will get smaller as tube is aimed more directly at the sun. When the shadow of the main tube is smallest, the telescope is then aimed directly at the sun. Now attach the eyepiece and sun filter, and you are ready to focus on the sun. Most of the sun's activities take place at the edge of the sun. Using the flexible cable controls, circle the telescope around the sun, noting the irregular edges as the flames leap into the heavens. Dark spots on the sun's surface are the sun spots you have heard so much about.

2. Using the sun projection screen

Remove the shaft, the screen and the locking ring attachment from the box. Insert the shaft into the locking ring attachment and slide the shaft onto the screen with the white side of the screen facing up. Tighten the set screw. Mount the screen onto the eyepiece end of the focusing cell with the locking ring attachment. Make sure that the sun's image appear on the screen before you tighten the set screw.

DO NOT LOOK THROUGH THE EYEPIECE···the retina of the eye can be seriously burned if this is done. Face the telescope toward the sun. The main shadow of the telescope will get smaller and smaller and then become a ring when the tube is aimed directly at the sun. Now attach the eyepiece and focus the telescope so that the sun's image is sharply projected on the screen. By moving the screen forth, you will get a small, but much sharper image. Using the flexible cable controls, circle the telescope around the sun, noting the irregular edges as the flames leap into the heavens. Dark spots on the sun's surface are the sun spots you have heard so much about.

CELLPHONE HOLDER



RED DOT FINDERSCOPE