OWNER'S MANUAL
ECLIPSE TELESCOPE

ZHUMELL ECLIPSE 114 WITH MOTOR DRIVE REFLECTOR TELESCOPE

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Zhumell customers know that there are plenty of ways to experience the world. They also understand that, however you choose to explore it, the best experience is one that fully immerses you in the world's most striking details.

That's where our optics products come in. We strive to put high-performance products in the hands of our customers so that they can experience the world up close, with their own eyes.

With Zhumell, you get field-tested, precision-crafted optics at the best possible value. So even if you're just starting out as an amateur birder or astronomer, you don't have to settle for entry-level products. Zhumell customers enjoy life's pursuits, hobbies, and adventures in rich, colorful detail- the kind of detail that only high-performance optics can produce.

At Zhumell, we design our binoculars, telescopes, and spotting scopes for discerning, price-conscious users who are uncompromising on quality. If you're looking for accessibly priced optics that will bring your world within reach, you're looking for Zhumell.

Enjoy the eclipse.

ENJOYING YOUR
ZHUMELL ECLIPSE TELESCOPE

CARING FOR YOUR
ZHUMELL ECLIPSE TELESCOPE

Zhumell telescopes are precision astronomical instruments designed for ease of use and versatility in their application. As with any telescope, Zhumell telescopes require some technical knowledge of stellar movement and optical properties. We have provided basic instructions for telescope use and astronomical viewing in this manual.

Your Zhumell Eclipse 114 Reflector Telescope is built with the highest-quality optics and top-notch construction to provide years of reliable functionality, but will require proper care.

If, after reading this manual, you still have questions about your Zhumell telescope, please visit http://www.zhumell.com for more helpful tips and contact information. Our customer service representatives are available to address any problems you encounter with your telescope. Please let us know about your experiences; we would like to hear your feedback. **Enjoy your Zhumell.**

WARNINGS

- Do not use telescope or finderscope to look at the sun without an appropriate solar filter. Doing so will cause permanent and irreversible eye damage.
- Never use an eyepiece filter as a solar filter. Only solar filters will completely cover the opening of the optical tube and provide proper eye protection.
- Make sure no screws are loose before using telescope.
- Do not drop or shake your telescope as doing so may damage the optics, or harm you or the people around you.

CLEANING AND MAINTENANCE

A telescope is carefully aligned during construction, and great care should be taken to maintain this alignment over the life of the telescope. Cleaning should be done as little as possible and then only with mild soap solution and a soft, lint-free cloth. Do not rub elements when cleaning. Blot optical components gently and allow telescope to air-dry. Store telescope in its box or in a telescope case when not in use. Do not use pure alcohol or solvents to clean any parts of the telescope. Do not remove optical elements from the telescope as doing so may affect the alignment of optical components when reassembled. If telescope needs realignment, contact Zhumell or another professional.

1. Brush telescope optics with camelhair brush or blow off dust with an ear syringe (can be purchased at any pharmacy). Do not use a commercial photographic lens cleaner.

2. Remove organic materials (e.g. fingerprints) with short gentle strokes using soft white tissue paper and a solution of three parts distilled water and one part isopropyl alcohol. You may also add one drop of biodegradable dish soap to one pint of the homemade solution. Do not use lotioned or scented tissues as they could damage the optics of your telescope.

3. Wipe down the outside of your telescope with a dry cloth to remove condensation prior to packing up your telescope. Do not wipe any of the optical surfaces. Instead, allow the optics to dry naturally in warm indoor air prior to packing up your telescope.

4. Protect your telescope from excessive heat. For example, do not store your telescope in a sealed car on a warm day. Excessive storage temperatures can damage your telescope.

COLLIMATION

Periodically, you will find that it is necessary to align the optical components of your telescope. This procedure is called collimation. There is no collimator included with the Eclipse 114, but regular collimation is recommended for optimum telescope usage.

1. Remove the eyepiece from the eyepiece holder and insert laser collimator into eyepiece holder. Secure the laser collimator by tightening thumbscrew.

2. Turn the thumbscrew located on the side of the collimator to turn on the collimator.

3. Look through the hole in the side of collimator to see where the laser is reflected onto the reticle. If you cannot see the laser reflected back onto the reticle, align the secondary mirror by adjusting the secondary mirror collimation screws until the laser is reflected onto the inside of the collimator.

4. Loosen the 3 locking screws on the bottom of the optical tube (the thin ones that stick farther out from the back of the mirror).

5. Align the laser to the center of the reticle by adjusting the 3 primary mirror adjustment screws (the thick screws in the back of the mirror). Do not over-turn these screws (max of ¼ turn at a time).

6. Tighten the 3 locking screws on bottom of optical tube to lock the primary mirror into place.

OPTICAL TUBE ASSEMBLY

Type	Refractor
Aperture (mm)	114
Focal Length	1000
Limiting Magnitude	12.78
Focal Ratio	f/8.8
Eyepiece Format	1.25”
Finderscope	6×30
Mount Type	Equatorial

MOUNT ASSEMBLY

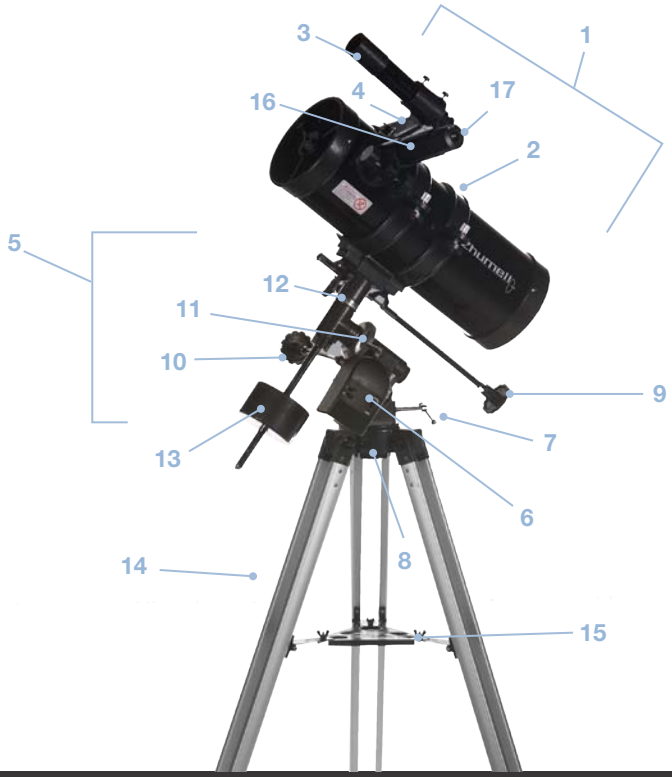
Materials	Aluminum
R.A. Adjustment	Manual Worm Gear
Dec. Adjustment	Manual Worm Gear
Clock Drive Axis	R.A.
Clock Drive Power	2 - 9V Batteries

PARTS LIST FOR YOUR
ZHUMELL ECLIPSE TELESCOPE

- Optical Tube Assembly (OTA)
- OTA Mounting Bracket
- 6x30 Finderscope
- Finderscope Mounting Bracket
- Equatorial Mount
- Adjustable Speed Motor Drive
- Right Ascension and Declination Adjustment Cables
- Counterweight (with rod)
- Aluminum Tripod
- Accessory Tray
- Eyepiece Extender
- 9mm and 20mm Kellner Eyepieces

LEGEND FOR YOUR
ZHUMELL ECLIPSE TELESCOPE

1. Optical Tube Assembly (OTA)
2. OTA Mounting Bracket
3. Finderscope
4. Finderscope Mounting Bracket
5. Equatorial Mount
6. Adjustable Speed Motor Drive
7. Latitudinal Adjustment Screw
8. Base Mount Screw
9. Declination Adjustment Cable
10. Right Ascension Adjustment Cable
11. Hour Circle
12. Declination Circle
13. Counterweight
14. Aluminum Tripod
15. Accessory Tray
16. Eyepiece Adapter
17. Eyepiece



① TRIPOD ASSEMBLY

STEP 1: Spread out the Tripod legs so that it can stand on its own. Attach the Accessory Tray to the three connection points on the Tripod legs. Tighten using the thumbscrews on the attachment points.

STEP 2: Extend each leg one at a time using the large screws at the midpoint of the leg. Tighten each leg at a height where you will be able to stand comfortably during the rest of assembly (just above waist-high). Make sure they are tightened evenly so that the top of the Tripod is parallel to the ground.

② ATTACHING THE EQUATORIAL MOUNT

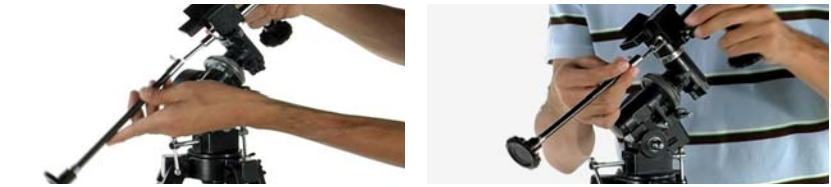
STEP 1: Remove the Base Mount Screw from the bottom of the mount, leaving the attached washer in place. Insert the mount into the hole in the middle of the tripod, and tighten underneath using the Base Mount Screw.

③ CONNECTING MOTOR DRIVE TO EQUATORIAL MOUNT

STEP 1: Remove the silver bolt head and washer located in the middle of the mount. Slide the L-shaped bracket on the Motor Drive over the exposed bolt and screw the washer and bolt head securely over.

STEP 2: Loosen thumbscrew on the second (straight) bracket on the Motor Drive and slide onto corresponding bolt about 2.5 inches up the mount. Securely fastening the Motor Drive in both of these locations is essential to proper function.

④ CONNECTING THE ADJUSTMENT CABLES TO THE EQUATORIAL MOUNT



STEP 1: Loosen the thumbscrew on the longer cable. This is the Right Ascension Adjustment Cable. Slide it over the exposed bolt nearest the top of the mount and tighten with the attached thumbscrew. When in place, it should be facing downward at an angle.

STEP 2: Loosen the thumbscrew on the shorter cable. This is the Declination Adjustment cable. Slide it over the exposed bolt directly opposite the Motor Drive assembly and tighten with the attached thumbscrew. When in place, it should be facing outward, parallel to the ground.

⑤ CONNECTING THE COUNTERWEIGHT

STEP 1: Slide the connecting rod through the Counterweight body and tighten using the attached thumbscrew.

STEP 2: Screw the connecting rod into the mount. When in place, it should not move and should be facing downward at an angle.

6 CONNECTING THE OTA RINGS TO THE ATTACHMENT PLATE



STEP 1: One at a time, remove the butterfly screws on each OTA Ring and slide into the hole on the attachment plate. Tighten the butterfly screw on the other side of the plate until the ring is secure. Make sure both rings are in place and tightened before moving on.


STEP 2: Remove the thumbscrews holding the OTA Rings shut and open both rings completely.

7 ATTACHING THE OTA


STEP 1: Place the OTA gently inside the OTA Rings. The side with the focuser and finderscope-mount screws should be above the rings, with the finderscope-mount screws facing straight up. Fine-tuning adjustments to position can be made later.


STEP 2: While supporting the OTA with your hand, close and tighten the OTA Rings over the entire assembly. Double-check that these connections are secure before moving on - damage to the OTA is likely to be irreparable.

8 ATTACHING THE FINDERSCOPE


STEP 1: Locate the two screws on top of the OTA and remove the heads. Attach the Finderscope Bracket using the two exposed screws and fasten securely with the heads.



STEP 2: Slide the Finderscope into the Finderscope Bracket with the smaller end pointing downwards. Fasten into place using the three thumbscrews on the Finderscope Bracket. Fine-tuning adjustments can be made later.

9 ATTACHING THE EYEPIECE EXTENDER

STEP 1: Expose the threaded silver part of the focuser by turning the attached knob. Screw the Eyepiece Extender onto the threads until secure.

10 ATTACHING THE EYEPIECE EXTENDER

STEP 1: You will need to attach an eyepiece to use your telescope. Choose one of the included eyepieces and slide it into the Eyepiece Extender, silver side first. Secure the connection using the thumbscrew on the Eyepiece Extender. Your telescope is ready to use!

VIEWING THROUGH YOUR
ZHUMELL ECLIPSE TELESCOPE

Never look at the sun without using a solar filter. Do not use a regular eyepiece as a solar filter. When using a solar filter, do not remove the full lenscap, view only through the small opening. Looking at the sun without proper use of a solar filter can cause permanent eye damage, included blindness.

When viewing through the telescope, the image will appear to be upside-down and inverted. This is normal and is a result of the optical system design. It can be corrected by using an erecting prism when viewing, but it is not necessary to do so.

Using your finderscope will help you locate celestial objects much more quickly as the finderscope is equipped with a wider field of view than your telescope. To simplify focusing while viewing, start with the lowest power magnification and work up to the desired power.

When viewing faint deep-sky objects, images will not show color. The human eye is not able to distinguish the differences in color found in such dim images. The lack of color is due to human anatomy, not any limitations of telescope construction.

CHECKING AND ALIGNING YOUR FINDERSCOPE

Finderscope alignment is the first step to fine-tuning your Eclipse 114 setup and viewing celestial objects. Follow these steps to properly set up and align your finderscope.

1. Insert the lowest-power eyepiece into the Eyepiece Extender. Focus eyepiece to view an easily recognizable, stationary distant object like a sign or lightpole.

2. Look through the finderscope, but be careful not to move the telescope in any way. Adjust the finderscope focus by turning the eyepiece of the finderscope back and forth until the image is in focus. Check to see if the object viewed through your telescope eyepiece is lined up at the center of the finderscope crosshairs. If not, your finderscope must be re-aligned.

3. To align your finderscope, slightly loosen the thumbscrews which on the finderscope bracket. Gently move the finderscope until the crosshairs are centered on your object. Tighten the thumbscrews to secure the finderscope in this position. It may take many tries to get it exactly right, but it will make finding objects much, much easier when you're ready to use your telescope.

USING THE MOTOR DRIVE

The motor drive included with your Eclipse 114 telescope is designed to track the movement of stars so you don't have to. As long as your telescope is properly polar aligned and the motor drive is properly used, it will help keep stars in your field of view during long periods of viewing. When trying it out, don't worry if it you do not immediately see the telescope moving - stars appear to move very slowly and the motion of your scope will be subtle. To test if your motor drive is working, aim your telescope at a stationary object and turn on the motor drive. After 15 minutes, look through your telescope again - if it is no longer pointing exactly where you originally aimed it, the motor drive is working.

MOTOR DRIVE SETTINGS

The motor drive features two controls that must be set depending on your viewing location. The N-S Switch (North-South) is the hemisphere switch. Northern Hemisphere viewers should set the switch to N and Southern Hemisphere views should set the switch to S. The Speed setting should be adjusted while viewing to help keep stars centered in your field of view. This setting will need to be adjusted for each different celestial object you view. As a general rule, the further from the celestial pole (closer to the horizon) an viewed object is, the faster it will appear to move and the faster the Speed setting on the motor drive will need to be.

MANUAL ADJUSTMENT WITH MOTOR DRIVE

The motor drive on your telescope should only be used for the subtle motions needed to follow viewed objects. To point your telescope at a different object elsewhere in the sky, you must disengage the motor drive. To do so, loosen the thumbscrew on the motor drive R.A. (Right Ascension) adjustment cable. This is the longer cable that is pointed towards the ground. Disengaging the motor drive by loosening the R.A. axis will prevent bending and breaking of the R.A. adjustment cable, which will break the motor drive mechanism. When you are ready to re-engage the motor drive, simply tighten the thumbscrew on the R.A. adjustment cable and turn the motor drive on.

BEGINNING OBSERVATION - THE MOON

As you set out to begin viewing, one of the easiest and most enjoyable objects to look at is the moon. Finding the moon and adjusting to view it is a good way to acquaint yourself with the movements of your telescope. Follow these steps carefully to gain a basic understanding of the adjustments you can make to your scope.

To aim your telescope at the moon, you will have to adjust both the Right Ascension and Declination. One at a time, make the following adjustments.

- Loosen the Base Mount Screw and swivel the telescope until it is pointed in the direction of the moon. This is adjusting the Right Ascension.
- Loosen the Latitudinal Adjustment Screws (large silver screws near the base of your mount) and adjust the angle of your telescope until it is pointing up at the moon. This is adjusting the Declination.

While looking through the eyepiece, use the R.A. and Declination adjustment cables to make smaller, more precise adjustments to the position of your telescope. For best results, only adjust one axis at a time.

The adjustment cables feature stops which allow and a limited degree of adjustment. To move past a stop, loosen the clamp for the axis you would like to move and rotate the optical tube assembly past the stop. Be sure to retighten the clamps before viewing.

If you notice resistance while moving the Optical Tube Assembly, try adjusting the counterweight position up or down to properly balance the telescope. The OTA should move very easily and smoothly - never try and force the OTA to move as this can permanently damage your telescope.

Once you've located the moon and successfully pointed your telescope at it, experiment with focusing and your different eyepieces. This will help familiarize you with the different results you can get from your telescope.

INTERMEDIATE OBSERVATION - PLANETS

Once you've used your telescope to view the moon, you should be familiar with the basic movements and adjustments you need. Next stop: the planets. Not all the planets are visible from one area at one time, so you'll need to do a little research before you begin. There are a number of online resources helpful for discovering what planets and objects should be visible in your area on any given night.

To find a planet, you must first locate it with the naked eye. Once you've got its general location, point your telescope in that direction and center the planet in the crosshairs of your finderscope. Once the planet is lined up in the finderscope, begin to view the planet through your telescope using the lowest power (longest focal length) eyepiece. You may need to make slight adjustments to the telescope aim and you will need to focus the eyepiece to bring the planet into full view.

For a closer look at the planet, replace the low-powered eyepiece with a higher-powered one and refocus your telescope.

GETTING STARTED - ADJUSTMENTS

Star charts and the setting circles are the key to taking your celestial observation to the next step. They will allow you to find any known celestial objects your telescope can see. By using the measurements listed on the mount and the coordinates provided in a star chart, you will be able to find stars, planets, nebulae, and galaxies. But before you can properly use the Right Ascension and Declination coordinate system to find these objects, you will need to Polar Align your telescope.

Before you begin Polar Alignment of your telescope, take a moment to familiarize yourself with the various alignment scales and adjustments on your Equatorial Mount. You can adjust Declination and Right Ascension (astronomical equivalents to latitude and longitude), both in large-scale movements and slow-motion fine-tuning movements. The procedure for each is explained below.

- Large-scale movement along the longitudinal axis (Right Ascension) is achieved using the Mount Base Screw. This is the lowermost knob on your mount. Loosen the mount base screw and turn the entire mount assembly and OTA together to face your telescope in a general direction. Once your telescope is facing that direction, tighten the mount base screw securely

- Broad movement along the latitudinal axis (Declination) is achieved using the Latitudinal Adjustment Screws. These are the two large silver screws near the bottom of your mount. Adjust declination by loosening the screws, raising or lowering the angle of your scope, and re-tightening the screws.

Use these large-scale movements to point your telescope in the general direction of the object you are viewing. Use the following fine-tuned adjustments to perfectly center it in your view for accurate tracking.

- The larger silver circle on your mount is the Hour Circle, which shows the exact Right Ascension of your telescope position. Once you've set the general position by rotating the entire OTA on the Mount Base Screw, fine-tuned adjustments to Right Ascension can be made using the Right Ascension Adjustment Cable and your position can be seen on the Hour Circle. R.A. is measured in 0 to 24 hours.

- Nearer the base of your mount is the Declination Scale. After setting the telescope angle using the Latitudinal Adjustment Screws, the fine-tuned adjustments can be made using the Declination Adjustment Cable. Declination is measured from 0° to 90° each direction.

Before beginning polar alignment, it is important to ensure that the base of your mount is level. If the base is not level by even the smallest degree, your measurements will be off and alignment will be much more difficult.

POLAR ALIGNMENT

Polar Alignment uses easy-to-find stars to help you find the center of the celestial sphere. All of your coordinates (R.A. and Dec.) are calculated using this center as a reference point, so exact alignment is absolutely necessary. The process varies depending on which Hemisphere you will be setting up. Both are described below, here's what you'll need -

For Northern Hemisphere viewing, you will need to familiarize yourself with the locations of a few key constellations and stars.

Knowing the location of Polaris (the North Star) and the constellations Ursa Major (the Big Dipper) and Cassiopeia (the Queen) will allow you to properly align your telescope.

For Southern Hemisphere viewing, you will need to use a star chart to find stars near the meridian and the celestial equator in order to use the star-drift method for polar alignment.

NORTHERN HEMISPHERE

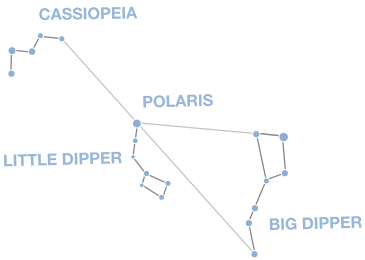
1. To align your telescope in the Northern Hemisphere, begin by locating Polaris. Most people prefer to use the Big Dipper to "point" at Polaris. The two stars which make up the edge of the dipper in the Big Dipper will roughly "point" at Polaris. You can also use the star at the end of the handle of the Big Dipper and the star on the edge on the shallower end of Cassiopeia to draw a line through Polaris. Only move on to the next step when you have successfully located Polaris.

2. Loosen the thumbscrew on the Declination Adjustment Cable. Lower the OTA so that the arrow in the Declination Scale points at 0°. Once the arrow points at 0°, the OTA is aligned with the mount's polar axis. Retighten the thumbscrew.

3. Loosen the Mount Base Screw enough to allow the mount assembly to turn. Then turn the Mount Assembly and the OTA together until the front of the telescope faces north. You can use a compass to find magnetic north and then line up with Polaris (celestial north) or you can line up the front of the telescope with Polaris by imagining a straight line running from Polaris down to the horizon.

4. Loosen the Latitudinal Adjustment Screws and raise your telescope until it is pointed at Polaris. Use the focused eyepiece and make fine-tuned adjustments using the Declination Adjustment Cable until Polaris is in the center of the viewfinder. Once your telescope is aligned to Polaris, the number on the latitude scale should match the latitude of your viewing location exactly. If there is a difference between the latitude of your viewing location and the number on the latitude scale, check to make sure that your tripod is level and continue adjustment.

5. Your telescope is now polar-aligned, or set with the North Star as "zero". All adjustments you make to find other celestial objects will be based off of this location. **Happy hunting!**



SOUTHERN HEMISPHERE & STAR-DRIFT POLAR ALIGNMENT

Polar alignment in the Southern Hemisphere is more difficult than in the Northern Hemisphere because there is no corresponding pole star to Polaris. Because of this, Southern Hemisphere polar alignment is a two-step process. First, a rough alignment must be made based on your viewing location. Then, a star drift can be used to fine-tune your alignment.

ROUGH ALIGNMENT

Begin by roughly aligning your telescope to the pole by using the mount's latitudinal scale. Set the declination scale to 0° to align the OTA with the mount's polar axis. Check the latitude of your viewing location and set the latitude scale to the same number. For example, if you were viewing from Sydney, Australia, you would point your telescope due south and set your latitude adjustment to 34°, since Sydney lies at 34°S latitude. This will point you approximately at the southern celestial pole.

STAR DRIFT ALIGNMENT

Star Drift Alignment is more precise than Polar Star Alignment, but can be more difficult for a newer telescope user. Once you polar-align using the star drift method a few times, it will get easier, but the first few attempts make take considerable time and effort. For general-purpose viewing, the rough alignment described above may prove to be sufficient. Star drift alignment as described below can be used for more accurate alignment, and is described using a standard eyepiece without an erecting prism.

1. After rough alignment, loosen the Latitudinal Adjustment Screws and lower your telescope until the scale reads 90°, then retighten the screw. Loosen the Mount Base Screw and rotate the telescope so that it points 6 hours away from the celestial pole and retighten the screws. You may need to remove the R.A. Adjustment Cable in order to move the telescope freely. Your telescope should now be pointing roughly where the meridian and celestial equator intersect.

2. Find a bright star in the viewfinder of your telescope and use the R.A. and Declination adjustment cables to center it precisely in the crosshairs. Work up to your most powerful eyepiece, centering the star in the viewfinder each time you replace the eyepiece.

3. Engage the motor drive by tightening the thumbscrew that connects it to the R.A. axis of the mount. Turn on the motor drive, ensuring that it is set to the correct hemisphere setting. Let the motor drive run for about 5 minutes.

4. Look into your eyepiece after the motor drive has been running for about 5 minutes and note which direction the star has drifted. If the star has drifted to the right, the mount is pointed too far to the west. If the star has drifted to the left, the mount is pointing too far to the east. Reverse these directions if you are aligning in the Northern Hemisphere using this method. To make your correction, loosen the Mount Base Screw and re-center the star in the eyepiece. Any drifting up and down in the eyepiece is a result of your motor drive speed setting and can be corrected by adjusting the motor drive speed.

5. Disengage the motor drive. Loosen the Mount Base Screw and rotate the telescope back 6 hours (opposite the direction you rotated it in Step 1). Find another bright star in the viewfinder and center it in the crosshairs. Work up to the highest power eyepiece and continue to center the star as you did with the previous star. Re-engage the motor drive, turn it on, and let it run for another 5 minutes.

6. Check to see which way this second star has drifted. Repeat the adjustments made in Step 4 on this second star. Be sure that it is precisely centered, and remember that any drifting up or down means adjusting your motor drive speed.

7. Repeat Steps 2 - 6 until you are satisfied with the alignment of your telescope. Each time you make adjustments and find a new star, you should notice the drift getting smaller and smaller. The more closely you polar-align your telescope, the more accurately it will track stars. **Happy Hunting!**

FINDING CELESTIAL OBJECTS

Once your telescope is polar-aligned, you must set the hour circle in order to use the measurements listed on the mount to find celestial objects. With the hour circle properly set, you will be able to use the coordinates listed on star charts to find the objects you want to view. Setting the hour circle will require that you recognize and be able to find a star other than the one(s) used for initial polar alignment.

SETTING THE HOUR CIRCLE

To set the hour circle, choose an easily identifiable star for which you know the coordinates. In the Northern Hemisphere, a reliable choice is Dubhe. Dubhe is the pointer star in the Big Dipper closest to Polaris and lies at 58°42' Dec., 11h23m R.A. In the Southern Hemisphere, a good choice is the star Acrux. Acrux is the closest star to the southern celestial pole in the Southern Cross and lies at -63°15' Dec., 12h33m R.A.

1. Loosen the Latitudinal Adjustment Screws and raise the telescope to the nearest degree of declination to the star you will be viewing (58°for Dubhe, -63°for Acrux). Retighten the screw to keep this declination in place.

2. Loosen the Mount Base Screw and rotate the telescope on the R.A. axis until the star you're using is near the center of the Finderscope. Tighten the screws to hold the R.A. axis in place.

3. Center the star in the eyepiece using fine-tune adjustments with the R.A. and Declination Adjustment Cables. Once it sits in the exact center of your viewfinder, turn the hour circle until the arrow points at the appropriate measurement for the star you're viewing (11h23m for Dubhe, 12h33m for Acrux). This sets the hour circle to the appropriate setting for your viewing location and time.

USING SETTING CIRCLES

With your telescope polar aligned and the hour circle accurately set, you can now begin to locate celestial objects of your choice using star charts. Helpful star charts are readily available in astronomy books or on the web. A star chart normally consists of a map and an ephemeris. The map will tell you, depending on your location and the time of here, what you will be able to view and provide recommendations for objects with ideal viewing conditions. The ephemeris will tell you the celestial coordinates of the object you choose. Once you've selected an object, use the hour circle and the declination circle to point your telescope quickly and accurately. Remember - make large-scale adjustments using the Base Mount Screw and Latitudinal Adjustment Screws, and fine-tuned adjustments using the R.A and Declination adjustment cables.

USING MOTOR DRIVE

Once you've centered your telescope on a celestial object and begin observing it, remember that it will move through the night sky. Engage your motor drive once focused on an object and it will follow the objects movements for extended viewing.

MAGNIFICATION

To determine the magnification of a telescope and eyepiece combinantion, divide the telescope focal length be the eyepiece focal length.

Magnification (x) = Telescope Focal Length (mm)/Eyepiece Focal Length (mm)

Ex: 20mm Eyepiece with a 114x1000mm telescope.
Magnification = 1000mm/20mm
Magnification = 50x

FOCAL RATIO

To determine the focal ratio of a telescope, divide the focal length of the telescope by the aperture.

Focal Ratio (f/x)= Telescope Focal Length (mm)/Aperture (mm)

Ex: Focal Ratio of a 114x1000mm telescope.
Focal Ratio (f/x)= 1000mm/114mm
Focal Ratio (f/x)= f/8.8

LIMITING MAGNITUDE

To determine the limiting magnitude of a telescope, use the aperture in the following formula for an approximation.

Limiting Magnitude = 7.5 + 5LOG(Aperture in cm)

Ex: Limiting Magnitude of a 114x1000mm telescope.

Limiting Magnitude = 7.5 + 5LOG(11.4cm)
Limiting Magnitude = 7.5 + (5 x 1.057)
Limiting Magnitude = 12.785

RESOLVING POWER

To determine the resolving power of a telescope under ideal conditions, divide the aperture into 4.56.

Resolving Power = 4.56/Aperture (in inches)

Ex: Resolving Power of a 114x1000mm telescope.
Aperture (in.) = 114mm/25.4 = 4.49
Resolving Power = 4.56/4.49in.
Resolving Power = 1.02

ASTRONOMY TERMINOLOGY

DECLINATION (DEC.) - The astronomical equivalent of latitude. Declination describes the angle of a celestial object above or below the celestial equator. The sky over the northern hemisphere has a positive declination. The sky over the Southern hemisphere has a negative declination. For example, Polaris (the North Star) which lies nearly directly over the North Pole, has a declination value of 90°.

RIGHT ASCENSION (R.A.) -
The astronomical equivalent of longitude. Right ascension measures the degree of distance of a star to the east of where the ecliptic crosses the celestial equator. R.A. is measured in hours, minutes, and seconds as opposed to degrees. It is different than the term "meridian", which is used in referring to lines of longitude. Right ascension is referred to in "hour circles". There are 24 hour circles of right ascension which run from the north to south celestial poles.

CELESTIAL EQUATOR - The celestial equator is the line of declination which lies directly above the Earth's equator. The celestial equator lies halfway between the north and south celestial poles and serves as the 0° point in measuring declination.

ECLIPTIC - The ecliptic is the apparent path of the sun through the sky over the course of the year. Since we view the sun from different angles throughout the year, it appears to move in relation to other stars. The vernal (spring) and autumnal (fall) equinoxes lie at the points where the ecliptic intersects the celestial equator. The vernal equinox is where right ascension is at 0h (hours). The autumnal equinox can be found at 12h R.A.

ZENITH - The zenith is the point in the celestial sphere directly above your head. The zenith varies depending upon your location. In general, the declination point of your zenith is equal to the latitude at which you are standing on Earth.

EPHEMERIS - The ephemeris of a planet or the sun or the moon is a table giving the coordinates of the object at regular intervals of time.
The coordinates will be listed using declination and right ascension. Other information such as distance and magnitude may be listed in ephemerides (plural of ephemeris).

ALTITUDE - The altitude of a celestial object is the angular distance of that object above the horizon. The maximum possible altitude is the altitude of an object at the zenith, 90°. The altitude of an object on the horizon is 0°. Altitude is measured from your point of observation and does not directly correlate to points on the celestial sphere.

AZIMUTH - Azimuth is the angular distance around the horizon measured eastward in degrees from the North Horizon Point. Thus, the North Horizon Point lies at an azimuth of 0°, while the East Horizon Point lies at 90°, and the South Horizon Point at 180°. Azimuth is measured from the point of observation and does not directly correspond to points on the celestial sphere.

ANGULAR DISTANCE - Angular distance is the size of the angle through which a telescope tube or binocular aiming at one object must be turned in order to aim at another object. If you must rotate the equipment from the zenith to the horizon, the angular distance between the two points would be 90°.

TELESCOPE TERMINOLOGY

OBJECTIVE - The objective is the front lens of a telescope. The listed measurement for objective lenses is the lens diameter. A larger objective allows more light to enter a telescope and provides a brighter image. The objective diameter is also sometimes referred to as the aperture of a telescope.

FOCAL LENGTH - The focal length of a telescope is the distance from the point where light enters a telescope (the objective) to the point where the image is in focus. In telescopes with the same size objective, a longer focal length will provide higher magnification and a smaller field of view.

MAGNIFICATION - The magnification of a telescope is determined by the relationship between the focal length of the telescope and the focal length of the eyepiece used. A greater difference in these focal lengths results in a greater the magnification of the telescope. Every telescope has a maximum useful magnification of about 60 times the diameter of the objective in inches. Magnification beyond the maximum useful magnification will provide dim, low-contrast images.

FOCAL RATIO - The focal ratio of a telescope is a description of the relationship between the focal length and objective lens size of a telescope. Visually, a smaller focal ratio (also called f-stop) provides a wider field of view. Photographically, the lower the f-stop, the shorter the exposure time needed to capture an object on film.

LIMITING MAGNITUDE - The limiting magnitude of a telescope describes the faintest object you can see with a telescope. The magnitude of a star describes its brightness. The larger the magnitude of an object, the fainter it appears to be. The brightest stars have a magnitude of 0 or less.

RESOLVING POWER - The resolving power, or Dawes' Limit, of a telescope is the ability to view closely spaced objects through a telescope. The resolving power of a telescope is measured in seconds of arc. The smaller the resolving power, the better you will be able to separate binary stars when viewing through your telescope.

ABERRATION - Aberrations are degradations in image, which can occur due to optical system design or improper alignment of optical system components. The most common types of aberration are chromatic aberration, spherical aberration, coma, astigmatism, and field curvature.

COLLIMATION - Collimation is the alignment of optical components within an optical system. Improper collimation will distort an image and may result in aberrations present in the image. Most reflector telescopes have collimation adjustments which can be made in order to reduce aberrations and image distortion. Refractor telescopes do not require collimation nearly as often as reflector telescopes.

WARRANTY

Zhumell products are designed to provide you with the highest quality and best value available, which is why we're proud to offer a world-class warranty on all of our products. All Zhumell telescopes are covered by a 3-year no-fault warranty.

To obtain warranty service, the damaged equipment must be returned to Zhumell. Our Customer Care associates will be happy to assist you in completing this return to get your Zhumell in working order as quickly as possible. There is a $25 surcharge associated with warranty returns to cover return shipping and handling.

For more information, contact information, and to download the Zhumell Warranty Return Form, please visit **http://www.zhumell.com.**

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