OWNER'S MANUAL

PORTABLE 70MM AZ TELESCOPE WITH SMARTPHONE ADAPTER

ZHUMELL 70MMx400MM TELESCOPE

Model #ZHUN005-1

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.

ENJOYING YOUR **ZHUMELL TELESCOPE**

PARTS **LIST**

- Optical Tube Assembly (OTA)
- Finderscope
- Finderscope Mounting Bracket
- Erect Image Diagonal Prism
- 20mm & 10mm Eyepieces
- Aluminum Tripod
- Smartphone Adapter
- Travel Bag

CARING FOR YOUR **ZHUMELL 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 70mmx400mm telescope is built with the highest quality optics and top-notch construction to provide years of reliable functionality, but will require proper care.

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.

SPECIFICATIONS FOR YOUR **ZHUMELL TELESCOPE**

OPTICAL TUBE ASSEMBLY

Type	Refractor
Aperture (mm)	70
Focal Length (mm)	400mm
Limiting Magnitude	11.75
Focal Ratio	f/5.7
Eyepiece Format	1.25”
Finderscope	5x24 Optical Finderscope
Mount Type	Alt-azimuth (Photo Tripod Style)

TELESCOPE ASSEMBLY

Unbox and gather the pieces of your telescope.

1. Extend all three tripod legs to a comfortable working height and tighten all three clamps securely. Separate the legs until the cross-section in the middle lays flat. Make sure the top of the tripod is leveled before moving on.
2. Loosen the top right knob by turning it counterclockwise. Tilt the tripod platform up 90°.
3. Screw the ¼-20 knob on the mount into the hole on the bottom of the telescope tube.
4. Lower the tripod platform back to its normal position and tighten the knob to lock it in place.
5. Insert the silver tube of the star diagonal into the focuser of the telescope and secure it in place using the silver set screws on the focuser.
6. Choose the lowest-power eyepiece (20mm included) and place it in the diagonal prism, silver side first. Secure it in place with the thumbscrew on the diagonal prism.

You are now ready to begin using your telescope!

VIEWING THROUGH YOUR **ZHUMELL TELESCOPE**

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

Using your finderscope will help you locate celestial bodies 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 telescope and viewing celestial objects. Follow these steps to properly set up and align your finderscope.

1. Locate a distant daytime object and center it in the low power (20 mm) eyepiece in the main telescope.
2. Look through the eyepiece end of the finderscope and take notice of the position of the same object.
3. Without moving the main telescope, turn the adjustment thumbscrews located around the finderscope bracket until the crosshairs of the finderscope are centered on the object chosen with the main telescope.
4. If the image through the finderscope is out of focus, rotate the eyepiece of the finderscope for a clear view.

ADJUSTMENTS

Your telescope can be maneuvered along two axes, altitude and azimuth.

The up and down (altitude) is controlled by the pan handle. The side-to-side (azimuth) motion is controlled by the azimuth locking knob. Both knobs are loosened when turned counterclockwise and tightened when turned clockwise. When both knobs are loose, you can find objects easily and then lock the controls.

USING YOUR **ZHUMELL SMARTPHONE ADAPTER**

1. Open the eyepiece clamp and place it around the body of the eyepiece. Tighten the clamp unit it is secure.
2. Use the phone clamp knob to open the phone holder until your phone fits inside. Tighten it to secure your phone in place.
3. Turn on the phone and open your camera app. Make sure the flash is turned off.
4. Loosen the knob on the bottom of the adapter that secures the phone clamp to the eyepiece clamp. Slide the phone clamp up and down and rotate it left and right until your camera is looking down through the eyepiece of the telescope. Tighten the knob on the bottom of the adapter to secure it in place.
5. Use the telescopes focuser to adjust focus of your camera. Snap the image using your app.

COOL VIEWS WITH YOUR **ZHUMELL TELESCOPE**

THE MOON

As you set out to begin viewing, one of the easiest and most enjoyable objects to check out is the moon. Finding the moon and adjusting to view it is a good way to acquaint yourself with the movements of your telescope.

Practice using the azimuth and altitude adjustments to bring the moon into the center of your view. Focus your view by turning the knobs located on the smaller end of the OTA. Once you've located the moon and successfully focused your telescope on it, experiment with focusing and your different eyepieces. This will help familiarize you with the different results you can get from your telescope.

THE PLANETS

Once you've used your telescope to view the moon, you should be familiar with the basic telescope 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.

ASTRONOMY FORMULAS FOR YOUR **ZHUMELL TELESCOPE**

MAGNIFICATION

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

$$\text{Magnification (x)} = \frac{\text{Telescope Focal Length (mm)}}{\text{Eyepiece Focal Length (mm)}}$$

Ex: 20mm Eyepiece with a 70mm x 400mm telescope
Magnification = 400mm/20mm
Magnification = 20X

FOCAL RATIO

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

$$\text{Focal Ratio} = \frac{\text{Telescope Focal Length (mm)}}{\text{Aperture of Telescope (mm)}}$$

Ex: Focal Ratio of a 70mm x 400mm telescope
Focal Ratio (f/x)= 400mm/70mm
Focal Ratio (f/x)= f/5.7

LIMITING MAGNITUDE

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

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

Ex: Limiting Magnitude of a 70mm x 400mm telescope.

Limiting Magnitude = 7.5 + 5LOG (7cm)
Limiting Magnitude = 7.5 + (5 x 0.85)
Limiting Magnitude = 11.75

RESOLVING POWER

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

$$\text{Resolving Power} = \frac{4.56}{\text{Aperture (inches)}}$$

Ex: Resolving Power of a 70mm x 400mm telescope.
Aperture (in.) = 70mm/25.4 = 2.76 in.
Resolving Power = 4.56/2.76 in.
Resolving Power = 1.65 seconds of arc

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 the 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.

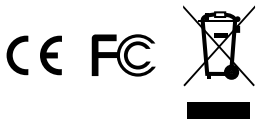
FOCAL RATIO
The focal ratio of a telescope is a description of the relationship between the focal length and objective lens size of a telescope. Visually, a smaller focal ratio (also called f-stop) provides a wider field of view. Photographically, the lower the f-stop, the shorter the exposure time needed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



FCC NOTE: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

Product design and specifications are subject to change without prior notification.
This product is designed and intended for use by those 14 years of age and older.