NATIONAL GEOGRAPHIC

6+
80-51050
EN

RF360MM

50 MM PORTABLE REFRACTOR WITH PANHANDLE MOUNT

INSTRUCTION MANUAL

⚠ WARNING:
SUN HAZARD – Never look directly at the sun with this device.

⚠ WARNING:
CHOKING HAZARD – Small parts. Not for children under 3 years.

⚠ WARNING:
The lens contains lead that may be harmful. Wash hands after touching.

⚠ WARNING:
This product can expose you to chemicals including lead, which is known to the State of California to cause cancer. For more information go to www.P65Warnings.ca.gov.

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IMPORTANT SAFETY INSTRUCTIONS

READ AND FOLLOW THE INSTRUCTIONS BEFORE USE.
KEEP THESE INSTRUCTIONS FOR LATER USE.

• **SUN WARNING: WARNING: NEVER ATTEMPT TO OBSERVE THE SUN WITH THIS DEVICE! OBSERVING THE SUN – EVEN FOR A MOMENT – WILL CAUSE INSTANT AND IRREVERSIBLE DAMAGE TO YOUR EYE OR EVEN BLINDNESS.** EYE DAMAGE IS OFTEN PAINLESS, SO THERE IS NO WARNING TO THE OBSERVER THAT THE DAMAGE HAS OCCURRED UNTIL IT IS TOO LATE. DO NOT POINT THE DEVICE AT OR NEAR THE SUN. DO NOT LOOK THROUGH THE DEVICE AS IT IS MOVING. CHILDREN SHOULD ALWAYS HAVE ADULT SUPERVISION WHILE OBSERVING.

• **RESPECT PRIVACY:** WHEN USING THIS DEVICE, RESPECT THE PRIVACY OF OTHER PEOPLE. FOR EXAMPLE, DO NOT USE IT TO LOOK INTO PEOPLE'S HOMES.

• **CHOKING HAZARD:** CHILDREN SHOULD ONLY USE DEVICE UNDER ADULT SUPERVISION. KEEP PACKAGING MATERIALS LIKE PLASTIC BAGS AND RUBBER BANDS OUT OF THE REACH OF CHILDREN AS THESE MATERIALS POSE A CHOKING HAZARD.

• **RISK OF BLINDNESS:** NEVER USE THIS DEVICE TO LOOK DIRECTLY AT THE SUN OR IN THE DIRECT PROXIMITY OF THE SUN. DOING SO MAY RESULT IN A PERMANENT LOSS OF VISION.

• **RISK OF FIRE:** DO NOT PLACE DEVICE, PARTICULARLY THE LENSES, IN DIRECT SUNLIGHT. THE CONCENTRATION OF LIGHT RAYS COULD CAUSE A FIRE.

• **DO NOT DISASSEMBLE THIS DEVICE:** IN THE EVENT OF A DEFECT, PLEASE CONTACT YOUR DEALER. THE DEALER WILL CONTACT THE CUSTOMER SERVICE DEPARTMENT AND CAN SEND THE DEVICE IN TO BE REPAIRED IF NECESSARY.

• **DO NOT SUBJECT THE DEVICE TO TEMPERATURES EXCEEDING 60 °C (140 °F).**

• **DISPOSAL:** KEEP PACKAGING MATERIALS, LIKE PLASTIC BAGS AND RUBBER BANDS, AWAY FROM CHILDREN AS THEY A POSE A RISK OF SUFFOCATION. DISPOSE OF PACKAGING MATERIALS AS LEGALLY REQUIRED. CONSULT THE LOCAL AUTHORITY ON THE MATTER IF NECESSARY AND RECYCLE MATERIALS WHEN POSSIBLE.

• THE WEEE SYMBOL IF PRESENT INDICATES THAT THIS ITEM CONTAINS ELECTRICAL OR ELECTRONIC COMPONENTS WHICH MUST BE COLLECTED AND DISPOSED OF SEPARATELY.

• NEVER DISPOSE OF ELECTRICAL OR ELECTRONIC WASTE IN GENERAL MUNICIPAL WASTE. COLLECT AND DISPOSE OF SUCH WASTE SEPARATELY.

• MAKE USE OF THE RETURN AND COLLECTION SYSTEMS AVAILABLE TO YOU, OR YOUR LOCAL RECYCLING PROGRAM. CONTACT YOUR LOCAL AUTHORITY OR PLACE OF PURCHASE TO FIND OUT WHAT SCHEMES ARE AVAILABLE.

• ELECTRICAL AND ELECTRONIC EQUIPMENT CONTAINS HAZARDOUS SUBSTANCES WHICH, WHEN DISPOSED OF INCORRECTLY, MAY LEAK INTO THE GROUND. THIS CAN CONTRIBUTE TO SOIL AND WATER POLLUTION WHICH IS HAZARDOUS TO HUMAN HEALTH, AND ENDANGER WILDLIFE.

• IT IS ESSENTIAL THAT CONSUMERS LOOK TO RE-USE OR RECYCLE ELECTRICAL OR ELECTRONIC WASTE TO AVOID IT GOING TO LANDFILL SITES OR INCINERATION WITHOUT TREATMENT.

Customer Service: Call 1-866-252-3811

Parts Overview

1. 50mm Objective Lens
2. Panhandle Mount
3. Tripod
4. Optical Tube Assembly with Dew Shield
5. Focus Wheel
6. Diagonal
7. 0.965” Eyepieces (H12.5 mm & H20 mm)

Available Downloads Visit:
www.esmanuals.com

How To Set Up
Assembly:
Note: We recommend assembling your telescope for the first time in the daylight or in a lit room so that you can familiarize yourself with assembly steps and all components.

1. Open the tripod until the tripod spreaders are fully extended. To set the tripod height, unlatch the hinged locking mechanisms on each leg and extend or retract the leg to the desired setting. When the tripod is the proper height, relatch any open locking mechanisms on each leg before attaching the telescope tube.

2. Thread the panhandle clockwise onto the mount head.

3. Set the telescope tube on the mount head so that the thread is aligned with the locking screw in the center of the mounting plate. Secure the tube to the mount by tightening the locking screw until it is secure. Be careful not to over-tighten the locking screw.

4. Insert the diagonal into the focuser and secure it by tightening the thumbscrews.

5. Place your chosen eyepiece into the diagonal. We recommend starting with the 20mm because it will provide the widest field of view. **Note: Using the telescope without the diagonal could result in not being able to focus on the object. Most rich-field telescopes are designed to include the diagonal in their focal point. So the length of the diagonal is necessary for the light to get to the proper focal point.**

Eye view

View with regular eyepiece & diagonal

Using Your Telescope:
After you have assembled your telescope, you are ready to start observing. Put the 20mm eyepiece into the diagonal to get the widest field of view. This wider field of view will make it easier to locate and track objects at a magnification of 18x.

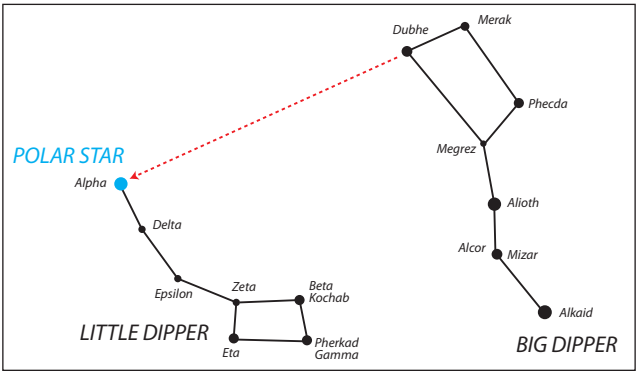
Focal Length	Eyepiece	Magnification
360 mm	**20 mm**	18x
360 mm	**12.5 mm**	28.8x

To move the telescope from side to side, loosen the locking screw on the side of the mount and use the panhandle to slowly turn the telescope until your target comes into view in the eyepiece. When you have the telescope in your desired position, tighten the locking screw to hold the position. To move the telescope up and down, slightly loosen the panhandle by turning it counter-clockwise. Slowly angle the telescope up or down until your target comes into view in the eyepiece. Secure the telescope in position by tightening the panhandle. It is important to remember that the rotation of the Earth means objects move out of your eyepiece fairly quickly so you will probably have to change the orientation of your telescope frequently during an observing session.

To get a closer look at an object, take out the 20mm eyepiece and replace it with the 12.5mm eyepiece. This will increase the magnification to 28.8x.

Observing Tips:
Star hopping
Star hopping is a technique used by amateur astronomers to navigate the night sky. By using easily recognizable constellations and asterisms as a guide, an observer can locate stars and other objects.

For example, Polaris, which is commonly referred to as The North Star, can be located quickly using star hopping. First, find the Big Dipper asterism in the Ursa Major constellation. The popular pattern is defined by seven stars, and the two stars on the front edge of the Big Dipper's "bowl" are Merak and Dubhe. Next, draw an imaginary line from the bottom star (Merak) on this front edge through the top star (Dubhe) on the front edge. Follow the line to the first bright star you see. That should be Polaris. Finally, to verify your finding, locate the Little Dipper asterism. Polaris is the anchor star at the end of the Little Dipper's "handle."



Possible Objects For Observation:
Terrestrial Objects

To view terrestrial objects, install the diagonal into the focuser, insert the H20mm eyepiece into the diagonal and turn the focuser until the image is clear. After mastering the H20mm eyepiece, switch to the H12.5mm eyepiece and practice scanning and focusing. Choose several terrestrial objects to practice focusing on — such as the ones pictured on the right. As you are exploring, NEVER point your telescope at or near the Sun due to serious risk of blindness.

Simulated images

Terrestrial Images

H20mm H12.5mm

The Moon
Diameter: 3,476 km
Distance: Approximately 384,401 km
The Moon is the Earth's only natural satellite, and it is the second brightest object in the sky (after the Sun). Although it is our closest neighbor, a lot of people have never really taken a good long like at the Moon. With your telescope, you should be able to see several interesting lunar features. These include lunar maria, which appear as vast plains, and some of the larger craters. The best views will be found along the terminator, which is the edge where the visible and shadowed portions of the Moon meet.

The Moon

H20mm H12.5mm

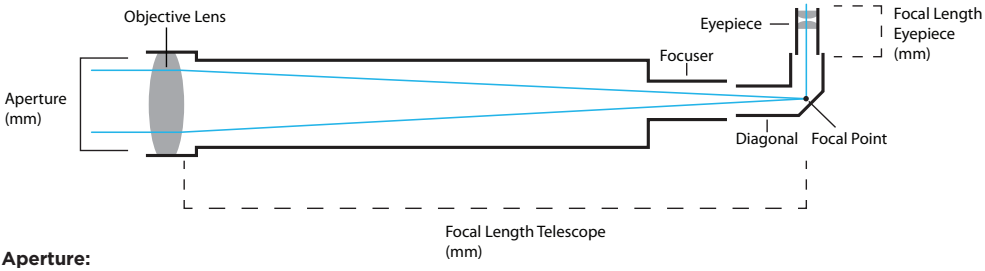
Cleaning:
Your telescope is a precision optical device and keeping the optics free of dust and dirt is crucial for optimal performance. To clean the lenses (objective and eyepiece) use only a photo-grade soft brush or a lint-free cloth, like a microfiber cloth. Do not press down too hard while cleaning, as this might scratch the lens. Ask your parents to help if your telescope is really dirty. If necessary, the cleaning cloth can be moistened with an optical glass cleaning fluid and the lens wiped clean using very little pressure. **The eyepiece is NOT waterproof so do not spray fluids directly onto the glass or dip it in water. Never use harsh detergents! After you have finished cleaning an eyepiece, allow it to fully dry before storing.**

Make sure your telescope is always protected against dust and dirt. After use, leave it in a warm room to dry off before storing.

Troubleshooting Guide:

Problem	Solution
No picture	Remove dust protection cap.
Blurred picture	Adjust focus using focus wheel.
No focus possible	Wait for temperature to balance out.
Bad quality	Never observe through a glass surface such as a window.
Despite using star diagonal prism the picture is “crooked”	The star diagonal prism should be vertical in the eyepiece connection.

Telescope Terms to Know:

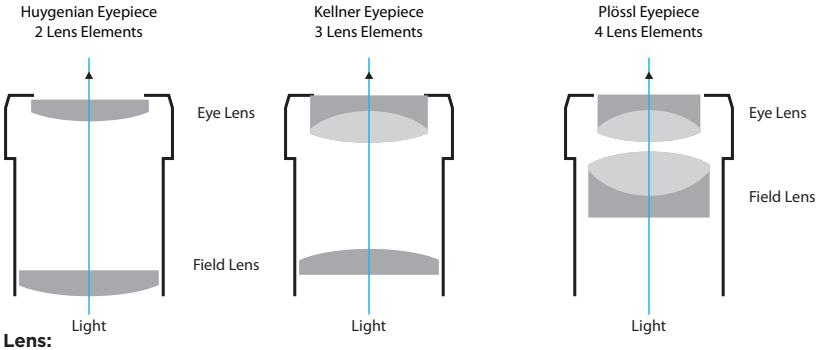


Aperture:
This figure, which is usually expressed in millimeters, is the diameter of a telescope's light-gathering surface (objective lens in a refractor or primary mirror in a reflector). Aperture is the key factor in determining the brightness and sharpness of the image.

Objective Lens:
The objective lens is the main light-gathering component of a refractor telescope. It is actually composed of several lens elements.

Diagonal:
This accessory houses a mirror that deflects the ray of light 90 degrees. With a horizontal telescope tube, this device deflects the light upwards so that you can comfortably observe by looking downwards into the eyepiece. The image in a standard diagonal mirror appears upright, but rotated around its vertical axis (mirror image). To get an image without this rotation, you will need to use a special diagonal with an erect image prism.

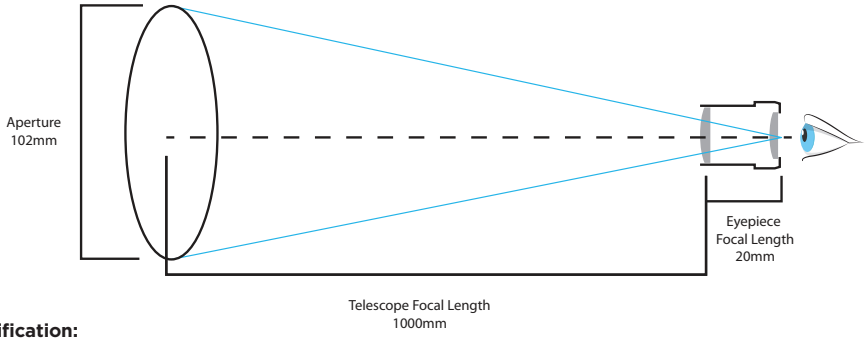
Eyepiece:
An eyepiece is an optical accessory comprised of several lens elements. It determines the magnification of a particular observing setup.



Barlow Lens:
A Barlow lens effectively increases the focal length of a telescope. It is inserted between the eyepiece and the focuser/diagonal (depending on the optical setup) and multiplies the magnification power of the eyepiece.
For example, a 2x Barlow will double the magnification of a particular eyepiece.

Focal length (Telescope):
The focal length is the distance in millimeters between the objective lens or primary mirror and the point at which entering light rays converge — otherwise known as the focal point. The focal lengths of the telescope tube and the eyepiece are used to determine magnification.

Focal length (Eyepiece):
The focal length is the distance in millimeters between the center of the first lens element in an eyepiece and the focal point. The focal lengths of the telescope tube and the eyepiece are used to determine magnification. Short eyepiece focal lengths produce higher magnifications than long eyepiece focal lengths.



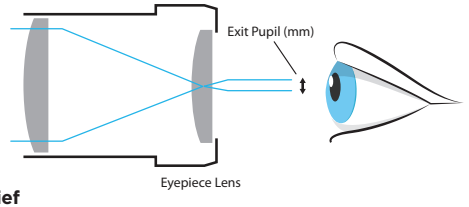
Magnification:
The magnification corresponds to the difference between observation with the naked eye and observation through a magnifying device like a telescope. If a telescope configuration has a magnification of 30x, then an object viewed through the telescope will appear 30 times larger than it would with the naked eye. To calculate the magnification of your telescope setup, divide the focal length of the telescope tube by the focal length of the eyepiece. For example, a 20mm eyepiece in a telescope with a 1000mm focal length will result in 50x power, which will make the object appear 50 times larger. If you change the eyepiece, the power goes up or down accordingly.

$$\text{Magnification} = \frac{\text{Telescope Focal Length}}{\text{Eyepiece Focal Length}}$$

Focal ratio
The focal ratio of a telescope is determined by dividing the telescope's focal length by its aperture (usually expressed in millimeters). It plays a key role in determining a telescope's field of view and significantly impacts imaging time in astrophotography. For example, a telescope with a focal length of 1000mm and a 100mm clear aperture has a focal ratio of f/10.

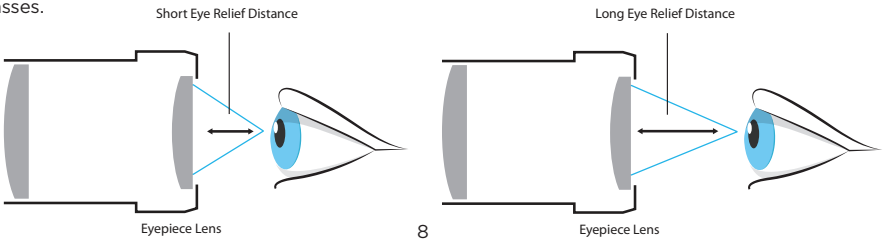
$$\text{Focal Ratio} = \frac{\text{Telescope Focal Length}}{\text{Telescope Aperture}}$$

Exit Pupil
The exit pupil is the diameter of the beam of light coming out of the eyepiece. To calculate exit pupil, divide the focal length of your eyepiece by your telescope's focal ratio. For example, if you use a 20mm eyepiece with an f/5 telescope, the exit pupil would be 4mm.

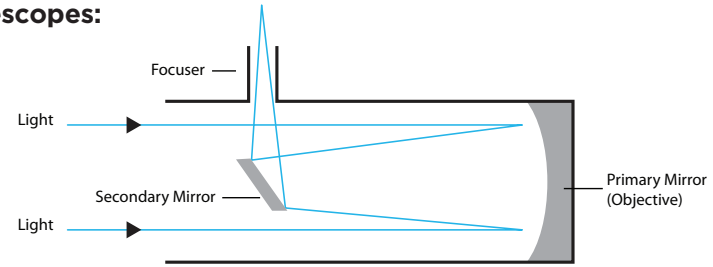


$$\text{Exit Pupil} = \frac{\text{Eyepiece Focal Length}}{\text{Telescope Focal Ratio}}$$

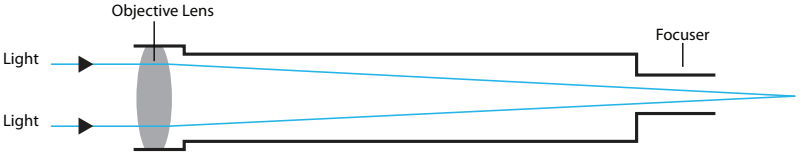
Eye Relief
Eye relief is all about a comfortable viewing experience because it is the distance at which you need to position your eye from the eyepiece's outermost surface to enjoy the full field of view. This characteristic is of special concern to observers who wear glasses to correct an astigmatism, because a long enough eye relief is necessary to allow room
for glasses.



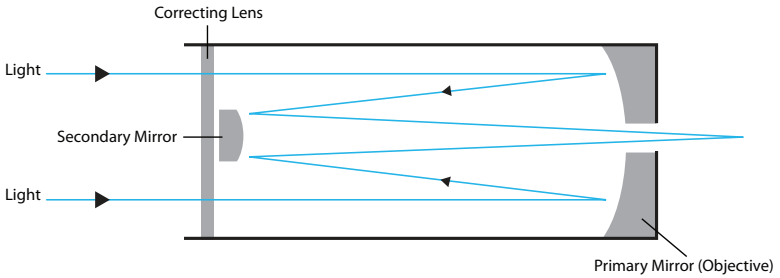
Types Of Telescopes:



Reflector
A reflector telescope uses mirrors to gather and focus light. Light enters the telescope through its open front end and travels to the concave primary mirror at the back. From there the light is reflected back up the tube to a flat secondary mirror, which sits at a 45° angle in relation to the eyepiece. Light bounces off of this secondary mirror and out through the eyepiece. A reflector's views will be upside down therefore it should only be used for astronomical observing because "up" and "down" are irrelevant in space.



Refractor:
A refracting telescope uses a collection of lenses to gather and focus light. A refractor's views will be upside down if a diagonal is not in use. A standard diagonal will generate a "right side up" image, however, it will rotate the image on the vertical axis (mirror image). To get the "right side up" image without the rotation, you will need to use a special diagonal with an erect image prism.



Catadioptric:
A catadioptric telescope uses a combination of mirrors and lenses to gather and focus light. Popular catadioptric designs include the Maksutov-Cassegrain and Schmidt-Cassegrain.

Notes:

Notes:

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Contents, colors and specifications may vary.

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