

Orion® Observer II 60mm Altazimuth Refractor

#10278



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Congratulations on your purchase of an Orion telescope. Your new Observer II 60mm Altazimuth Refractor is a terrific starter instrument for exploring the exotic wonders of the night sky. Designed to be lightweight and easy to use, it will provide many hours of enjoyment for the whole family.

If you have never owned a telescope before, we would like to welcome you to amateur astronomy. Take some time to familiarize yourself with the night sky. Learn to recognize the patterns of stars in the major constellations. With a little practice, a little patience, and a reasonably dark sky away from city lights, you'll find your telescope to be a never-ending source of wonder, exploration, and relaxation.

These instructions will help you set up, properly use, and care for your telescope. Please read them over thoroughly before getting started.

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WARNING: *Never look directly at the Sun through your telescope—even for an instant—without a professionally made solar filter that completely covers the front of the instrument, or permanent eye damage could result. Young children should use this telescope only with adult supervision.*

1. Parts

Part	Quantity
A – Tripod legs	3
B – Leg lock knob	3
C – Yoke mount	1
D – Hex-head tripod mounting bolt, with washer and wing nut	3
E – Tripod leg brace	1
F – Accessory tray	1
G – Telescope optical tube	1
H – Yoke knobs	2
I – Micro-motion rod	1
J – Anchor screw	1
K – Screwdriver tool	1
L – Red dot finder scope	1
M – Mirror diagonal	1
N – 25mm Kellner eyepiece	1
O – 10mm Kellner eyepiece	1
P – Dust cover	1

2. Assembly

Refer to **Figures 1** and **2** and the parts list at left for identification of specific parts during assembly.

1. Thread a leg lock knob (B) into each tripod leg (A) as shown in **Figure 3**, and tighten. Do not over-tighten the leg lock knobs or you may damage the collar they are attached to.
2. Now attach the tripod leg brace (E) to the three aluminum tripod legs (A) using the screws in the brace attachment brackets (**Figure 4**). Remove the nut and the screw from the bracket, then insert one of the brace struts into the bracket, lining up the holes to allow the screw to be inserted through the bracket and strut. Make sure the leg brace is oriented so that the threaded hole in the center is facing up. Then thread the nut on the exposed end of the screw and tighten – finger tight should be good enough.
3. With the leg brace attached to all three tripod legs, attach the tripod legs to the altazimuth yoke mount (C). Three hex-head bolts (D) with washers and wing nuts are provided for this purpose. Note that the bolts should be inserted from the side of the leg that has the hex-shaped hole, so that the bolt head seats in the hex-shaped hole (**Figure 5a**). The washer, then the wing nut are placed on the opposite side on the exposed end of the bolt (5b).
4. Now stand the tripod upright, spreading the legs apart so the accessory tray can be installed.
5. Attach the accessory tray (F) to the tripod leg brace (E) (**Figure 6**). Rotate the tray clockwise to thread the screw on the underside of the tray into the threaded socket in the center of the tripod leg brace.

The tripod and mount are now fully assembled (**Figure 7**). Next you will attach the telescope optical tube to the altazimuth yoke mount.

6. With the optical tube (G) oriented relative to the yoke mount (C) as shown in **Figure 8**, line up the holes in the attachment plates on the side of the optical tube with the holes in the ends of the yoke mount (8a). Then secure the optical tube to the mount by inserting a yoke knob (H) through the hole on each side of the yoke and thread them into the attachment plates on the optical tube (8b). They



Figure 1. The parts of the Observer II 60mm Altaz telescope

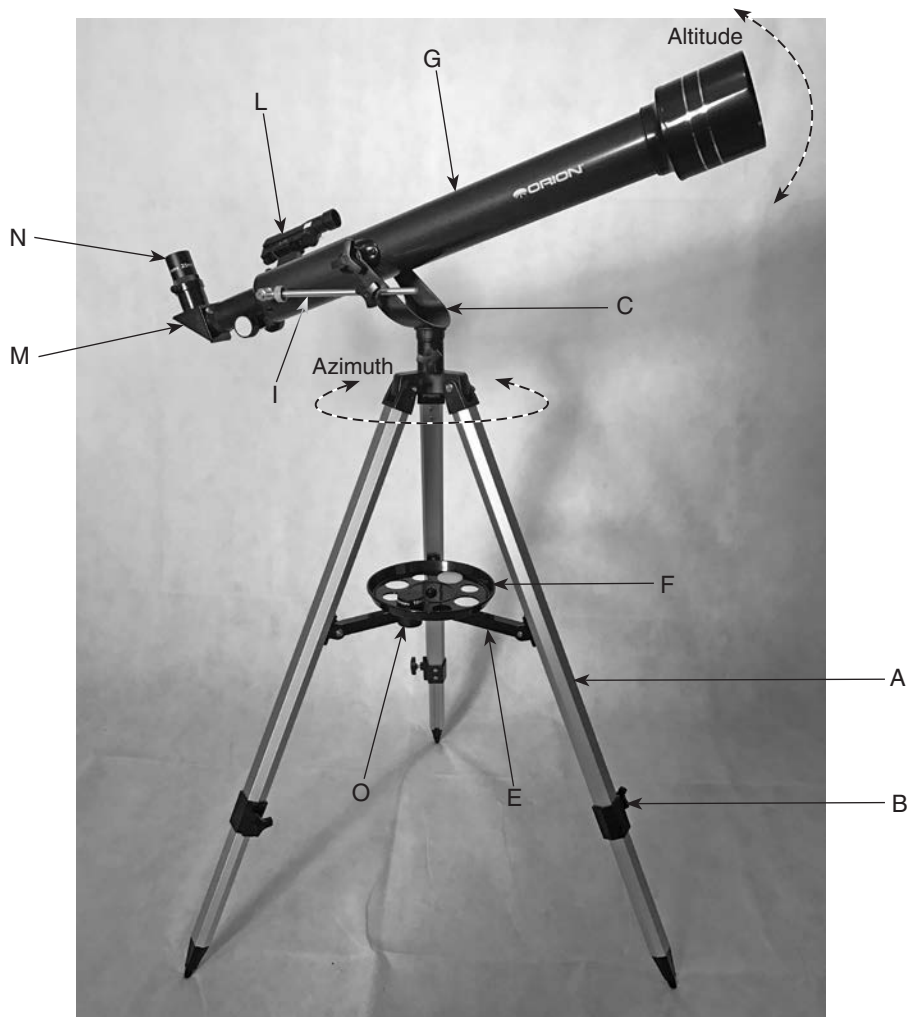


Figure 2. The fully assembled Observer II 60mm Altaz telescope

should be reasonably tight but still allow movement of the telescope up and down with gentle force.

7. Insert the altitude micro-motion rod (I) through the hole in the metal receptacle on the yoke mount (**Figure 9a**). You may have to unthread the altitude lock knob a few turns to provide clearance for the rod). Then attach the other end of the rod to the metal anchor cylinder using the anchor screw (J) provided (**Figure 9b**). Use the supplied screwdriver tool (K) to tighten the screw
9. Finally, insert the 25mm eyepiece (N) into the focuser (take the dust cap off the focuser first) and secure it by lightly tightening the thumbscrew on the focuser (**Figure 11**).
8. Install the red dot finder scope (L) on the optical tube. Do this by orienting the finder scope as shown in **Figure 10** and sliding the bracket foot into the finder scope base until it clicks. (To remove the finder scope, press the small tab at the back of the base and slide the bracket out.)

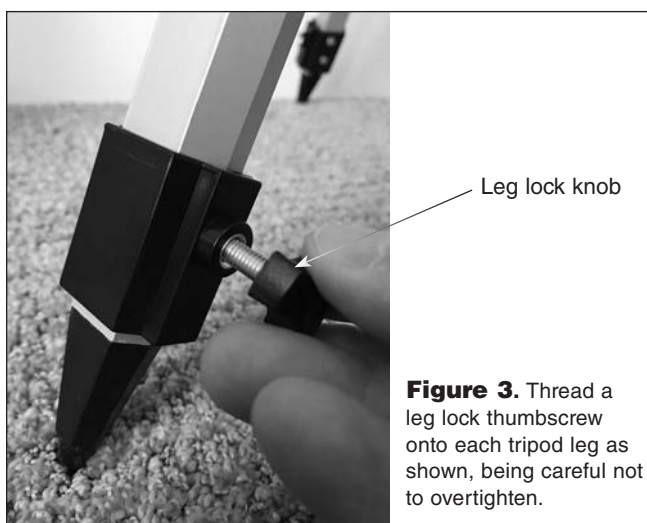


Figure 3. Thread a leg lock thumbscrew onto each tripod leg as shown, being careful not to overtighten.

9. Now remove the small dust cap from the focuser drawtube, and first insert the mirror diagonal (M) into the drawtube, making sure that the thumbscrew on the drawtube collar is backed out enough to allow the diagonal's barrel to slide into the drawtube. Then tighten the thumbscrew.
10. Finally, insert the 25mm eyepiece (N) into the diagonal and secure it by lightly tightening the thumbscrew on the diagonal (**Figure 11**).

The telescope is now completely assembled! Before it can be effectively used, however, there are a couple of things to do to prepare the telescope for operation.

3. Preparing the Telescope for Operation

Aligning and Using the Red Dot Finder Scope

The included red dot finder scope (L) (**Figure 12**) makes pointing your telescope almost as easy as pointing your fin-

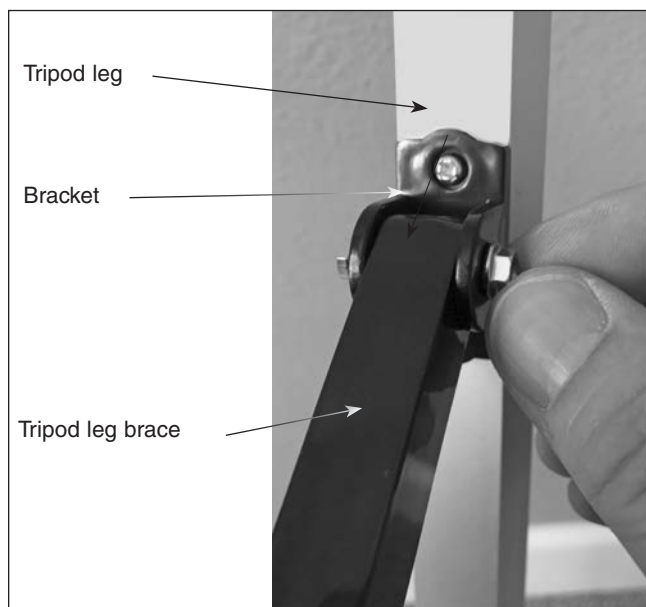


Figure 4. Attach the tripod leg brace to the bracket on each tripod leg.

ger! It's a non-magnifying aiming device that superimposes a tiny LED red dot on the sky, showing exactly where the telescope is pointed. It permits easy object targeting prior to observation in the higher-power main telescope.

Before you can use the red dot finder scope, you must remove the small plastic tab sticking out from the battery compartment (**Figure 12**). Doing so will allow the pre-installed 3V CR-2032 button cell battery to make contact with the finder scope's electronic circuitry to power the finder's red LED illuminator. The tab can then be discarded.

To use the red dot finder scope properly, it must be aligned with the main telescope. This is easiest to do during daylight hours, before observing at night. Follow this procedure:

1. First, remove the dust cover (P) from the front of the telescope.
2. With the 25mm eyepiece already installed from step 10 above, point the telescope at a well-defined land target (e.g., the top of a telephone pole) that's at least a quarter mile away. When pointing the telescope, be sure to loosen the azimuth lock knob and micro-motion lock knob (for coarse movement in altitude) to allow the telescope to rotate freely about both axes.
3. Center the target in the eyepiece.

Note: The image in the eyepiece will appear mirror reversed. This is normal for refractor telescopes used with a standard star diagonal.

4. Turn on the red dot finder scope by sliding the power switch to ON (refer to **Figure 12**). The "1" position provides dim illumination while the "2" position provides brighter illu-

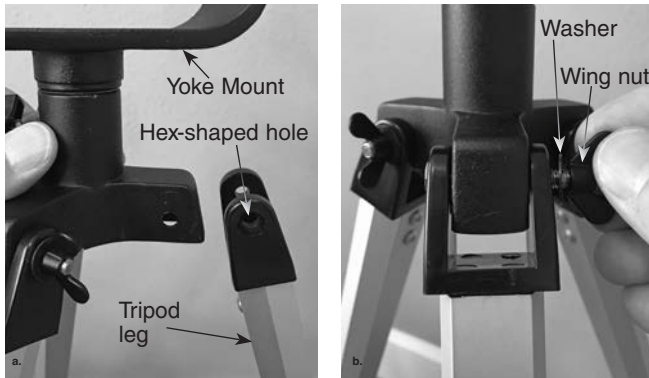


Figure 5. a) Attach the three tripod legs to the yoke mount, making sure the bolt's hex-shaped head seats in the hex-shaped recess of the tripod leg. b) Place a washer and wing nut on the exposed end of the bolt.

mination. Typically the dimmer setting is used under dark skies and the brighter setting is used under light-polluted skies or in daylight. Position your eye at a comfortable distance from the rear of the unit. Look through the rear of the finder scope with both eyes open to see the illuminated red dot. The target object should appear in the field of view somewhere near the red dot.

5. You'll want to center the target object on the red dot. To do so, without moving the telescope, use the finder scope's vertical and horizontal adjustment knobs (shown in **Figure 12**) to position the red dot on the object.
6. When the red dot is centered on the distant object, check to make sure the object is still centered in the telescope's eyepiece. If it isn't, re-center it then adjust the finder scope's alignment again. When the object is centered in the telescope eyepiece and on the finder scope's red dot, the finder scope is properly aligned with the telescope. The red dot finder scope's alignment should be checked before every observing session.

At the end of your observing session, be sure to slide the power switch on the red dot finder scope to OFF to preserve battery life.

Understanding the "Altazimuth" Mount

Observer II 60mm Altazimuth Refractor features an "altazimuth" mount, which permits motion along two perpendicular axes: **altitude** (up/down) and **azimuth** (left/right) (see **Figure 2**). This makes pointing the telescope easy and intuitive. To move the telescope in the azimuth direction, loosen the azimuth lock knob, take hold of the telescope and gently rotate it to the desired position. Then re-tighten the azimuth lock knob. To move the telescope in the altitude direction, loosen the altitude lock knob then move the tube up or down to the desired position. Then retighten the altitude lock knob. If the telescope moves too freely in the altitude direction, then tighten up the yoke knobs a bit. Of course, you can move the telescope in altitude and azimuth simultaneously by loosening both of the lock knobs.

Because making fine-adjustments in the altitude of the tele-

scope can be difficult, the Observer II 60mm comes equipped with an altitude micro-motion rod and thumbwheel (**Figure 13**). After making coarse altitude adjustments by moving the tube by hand, you can then move the telescope incrementally by turning the micro-motion rod's thumbwheel (the altitude lock knob must be tightened for this). The telescope will move a very small amount either up or down, depending on which direction you turn the thumbwheel. Fine motion can be helpful when centering an object in the eyepiece

4. Astronomical Observing

For many, this will be your first foray into the exciting world of amateur astronomy. The following information and observing tips will help get you started.

Choosing an Observing Site

When selecting a location for observing, get as far away as possible from direct artificial light such as street lights, porch lights, and automobile headlights. The glare from these lights will greatly impair your dark-adapted night vision. Set up on a grass or dirt surface, not asphalt, because asphalt radiates more heat. Heat disturbs the surrounding air and degrades the images seen through the telescope. Avoid viewing over rooftops and chimneys, as they often have warm air currents rising from them. Similarly, avoid observing from indoors through an open (or closed) window, because the temperature difference between the indoor and outdoor air will cause image blurring and distortion.

If at all possible, escape the light-polluted city sky and head for darker country skies. You'll be amazed at how many more stars and deep-sky objects are visible in a dark sky!

"Seeing" and Transparency

Atmospheric conditions vary significantly from night to night. "Seeing" refers to the steadiness of the Earth's atmosphere at a given time. In conditions of poor seeing, atmospheric turbulence causes objects viewed through the telescope to "boil." If you look up at the sky and stars are twinkling noticeably, the seeing is poor and you will be limited to viewing at lower magnifications. At higher magnifications, images will not focus clearly. Fine details on the planets and Moon will likely not be visible.

In conditions of good seeing, star twinkling is minimal and images appear steady in the eyepiece. Seeing is best overhead, worst at the horizon. Also, seeing generally gets better after midnight, when much of the heat absorbed by the Earth during the day has radiated off into space.

Especially important for observing faint objects is good "transparency"—air free of moisture, smoke, and dust. All tend to scatter light, which reduces an object's brightness. Transparency is judged by the magnitude of the faintest stars you can see with the unaided eye (5th or 6th magnitude is desirable).

Cooling the Telescope

All optical instruments need time to reach "thermal equilibrium." The bigger the instrument and the larger the temperature



Figure 6. Thread the accessory tray onto the tripod leg brace; the screw on the underside of the tray threads into the socket in the center of the brace.

change, the more time is needed. Allow at least 30 minutes for your telescope to acclimate to the temperature outdoors before you start observing with it.

Let Your Eyes Dark-Adapt

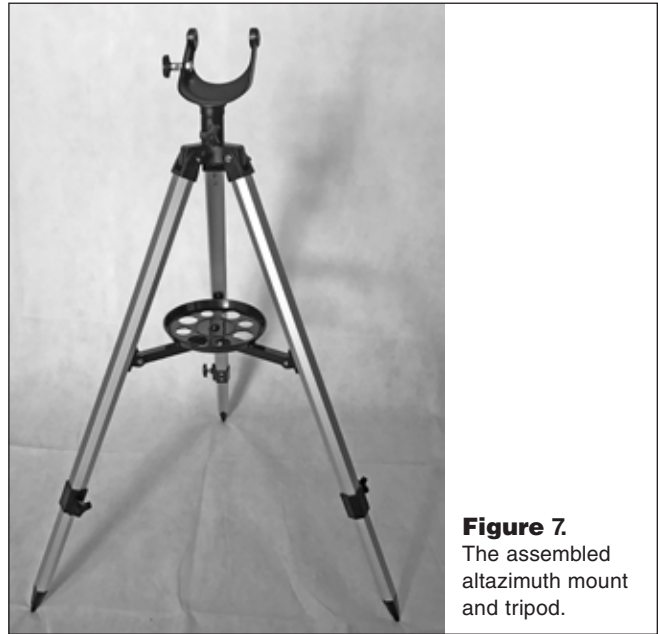
Don't expect to go from a lighted house into the darkness of the outdoors at night and immediately see faint nebulas, galaxies, and star clusters—or even very many stars, for that matter. Your eyes take about 30 minutes to reach perhaps 80% of their full dark-adapted sensitivity. As your eyes become dark-adapted, more stars will glimmer into view and you'll be able to see fainter details in objects you view in your telescope.

To see what you're doing in the darkness, use a red-filtered flashlight rather than a white light. Red light does not spoil your eyes' dark adaptation like white light does. A flashlight with a red LED light is ideal. Beware, too, that nearby porch, streetlights, and car headlights will ruin your night vision.

Eyepiece Selection

Magnification, or power, is determined by the focal length of the telescope and the focal length of the eyepiece being used. Therefore, by using eyepieces of different focal lengths, the resultant magnification can be varied. It is quite common for an observer to own five or more eyepieces to access a wide range of magnifications. This allows the observer to choose the best eyepiece to use depending on the object being viewed and viewing conditions. Your Observer II 60mm refractor comes with 25mm (N) and 10mm (O) Kellner eyepieces, which will suffice nicely to begin with. You can purchase additional eyepieces later if you wish to have more magnification options.

Magnification is calculated as follows:



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

For example, the Observer II 60mm refractor has a focal length of 700mm, which when used with the supplied 25mm eyepiece yields:

$$700\text{mm} / 25\text{mm} = 28\text{x}$$

The magnification provided by the 10mm eyepiece is:

$$700\text{mm} / 10\text{mm} = 70\text{x}$$

The maximum attainable magnification for a telescope is directly related to how much light it can gather. The larger the aperture, the more magnification is possible. In general, a figure of 50x per inch of aperture is the maximum attainable for most telescopes. Going beyond that will yield simply blurry, unsatisfactory views. Your Observer II 60mm refractor has an aperture (primary mirror diameter) of 60mm, or 2.4 inches, so the maximum magnification would be about 118x (2.4 x 50). This level of magnification assumes you have ideal atmospheric conditions for observing (which is seldom the case).

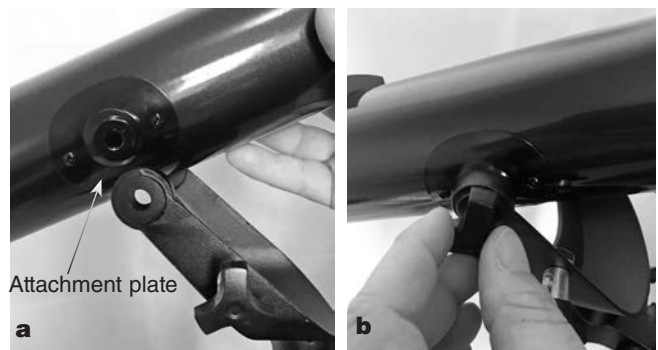


Figure 8. a) Place the optical tube in the yoke mount, lining up the holes in the tube's attachment plates with those in the yoke mount. **b)** Thread the yoke knob into the threaded hole in the attachment plates.

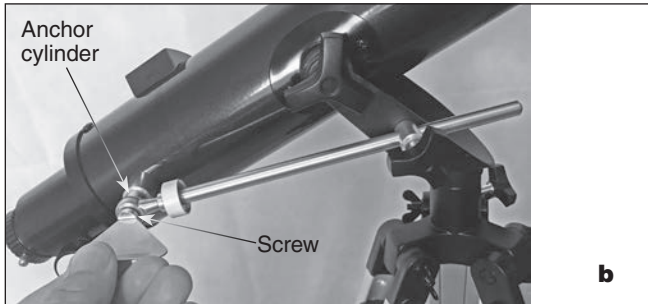
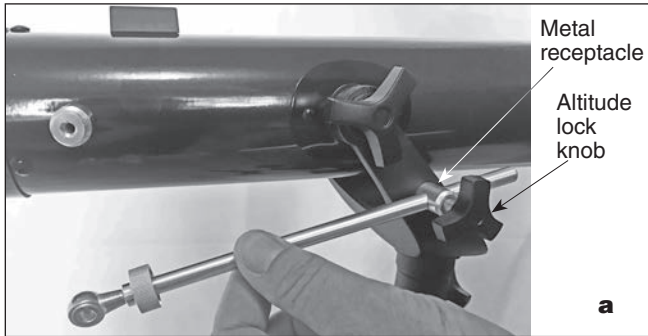


Figure 9. a) Insert the micro-motion rod through the hole in the metal receptacle on the yoke mount. **b)** Attach the other end of the rod to the anchor cylinder on the optical tube.

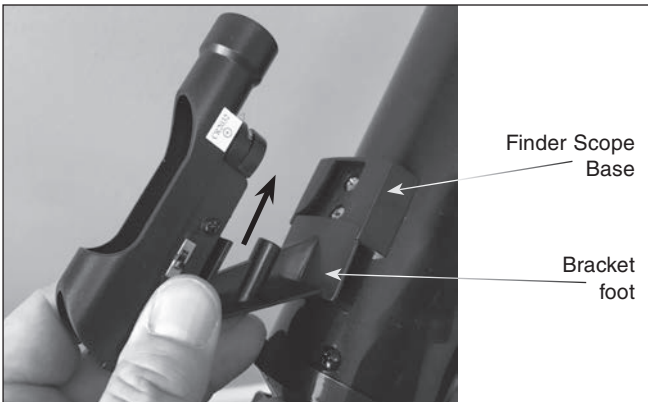


Figure 10. Insert the red dot finder scope's bracket into the base near the focuser as shown.

Keep in mind that as you increase magnification, the brightness of the object viewed will decrease; this is an inherent principle of the laws of physics and cannot be avoided. If magnification is doubled, an image appears four times dimmer. If magnification is tripled, image brightness is reduced by a factor of nine!

So start by using the 25mm eyepiece, then try switching to the 10mm eyepiece later if you want to boost the magnification.

Focusing the Telescope

To focus the telescope, turn the focus wheels (see **Figure 11**) forward or back until you see your target object (e.g., stars, the Moon, etc.) in the eyepiece. Then make finer adjustments until the image is sharp. If you're having trouble achieving initial focus, rack the focuser drawtube all the way in using the focus wheels, then while looking into the eyepiece slowly turn

the focus wheels so that the drawtube extends outward. Keep going until you see your target object come into focus. Note that when you change eyepieces you may have to adjust the focus a bit to get a sharp image with the newly inserted eyepiece.

What to Expect

So what will you see with your telescope? You should be able to see bands on Jupiter, the rings of Saturn, craters on the Moon, the waxing and waning phases of Venus, and many bright deep-sky objects. Do not expect to see color in nebulae and galaxies as you do in astrophotographs, though. Our eyes are not sensitive enough to see color in faint deep-sky objects. But as you become more experienced and your observing skills get sharper, you will be able to ferret out more and more subtle details and structure from dim objects.

To use the Observer II 60mm refractor for daytime terrestrial viewing, you may want to purchase an optional "correct image" 1.25" diagonal, as it will render a normal, non mirror-reversed view.

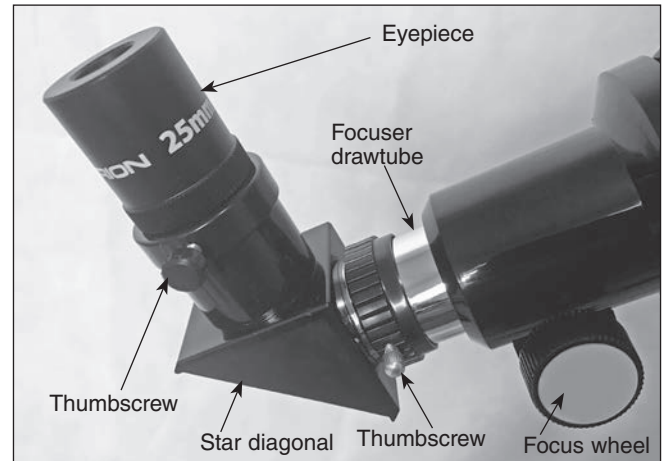


Figure 11. Secure the star diagonal in the focuser drawtube with the thumbscrew on the drawtube collar, then install the eyepiece in the diagonal.

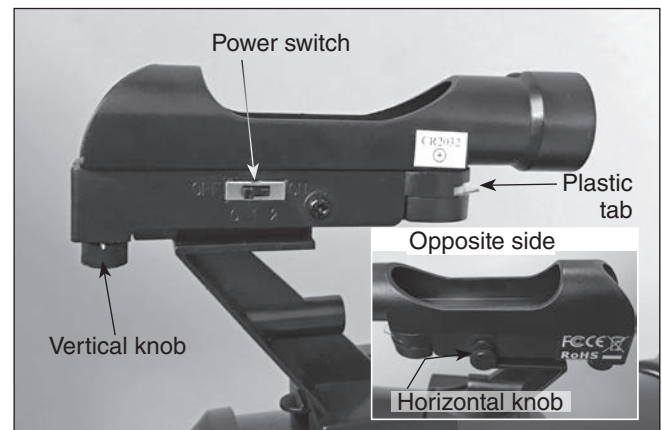


Figure 12. The red dot finder scope has vertical and (inset) horizontal adjustment knobs for aligning it with the telescope.

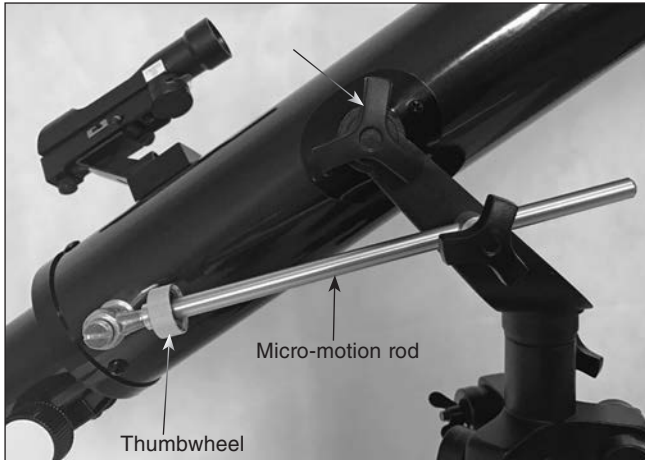


Figure 13. The micro-motion rod and thumb wheel allow fine altitude pointing control.

Objects to Observe

Now that you are all set up and ready to go, what is there to look at in the night sky?

A. The Moon

With its rocky surface, the Moon is one of the easiest and most interesting objects to view with your telescope. Lunar craters, maria, and even mountain ranges can all be clearly seen from a distance of 238,000 miles away! With its ever-changing phases, you'll get a new view of the Moon every night. The best time to observe our one and only natural satellite is during a partial phase, that is, when the Moon is not full. During partial phases, shadows are cast on the surface, which reveal more detail, especially right along the border between the dark and light portions of the disk (called the "terminator"). A full Moon is too bright and devoid of surface shadows to yield a pleasing view. Make sure to observe the Moon when it is well above the horizon to get the sharpest images.

Use an optional Moon filter to dim the Moon when it is very bright. It simply threads onto the bottom of the eyepieces (you must first remove the eyepiece from the focuser to attach a filter); see **Figure 14**. You'll find that the Moon filter improves viewing comfort and helps to bring out subtle features on the lunar surface.

B. The Planets

The planets don't stay put like the stars, so to find them you should refer to the monthly star charts at OrionTelescopes.com, or to charts published monthly in *Astronomy*, *Sky & Telescope*, or other astronomy magazines. Venus, Mars, Jupiter, and Saturn are the brightest objects in the sky after the Sun and the Moon. Other planets may be visible but will likely appear star-like. Because planets are quite small in apparent size, optional higher-power eyepieces or a Barlow lens are recommended and often needed for detailed observations.

C. The Sun

You can change your nighttime telescope into a daytime Sun viewer by installing an optional full-aperture solar filter over

the front opening of the telescope. The primary attraction is sunspots, which change shape, appearance, and location daily. Sunspots are directly related to magnetic activity in the Sun. Many observers like to make drawings of sunspots to monitor how the Sun is changing from day to day.

Note: Do not look at the Sun with any optical instrument without a professionally made solar filter, or permanent eye damage could result.

D. The Stars

Stars will appear like twinkling points of light. Even powerful telescopes cannot magnify stars to appear as more than a point of light. You can, however, enjoy the different colors of the stars and locate many pretty double and multiple stars. The famous "Double-Double" in the constellation Lyra and the gorgeous two-color double star Albireo in Cygnus are favorites. Defocusing a star slightly can help bring out its color.

E. Deep-Sky Objects

Under dark skies, you can observe a wealth of fascinating deep-sky objects, including gaseous nebulas, open and globular star clusters, and different types of galaxies. Most deep-sky objects are very faint, so it is important you find an observing site well away from light pollution.

To find deep-sky objects with your telescope, you first need to become reasonably familiar with the night sky. Unless you know how to recognize the constellation Orion, for instance, you won't have much luck locating the Orion Nebula. A simple planisphere, or star wheel, can be a valuable tool for learning the constellations and seeing which ones are visible in the sky on a given night. Once you have identified a few constellations, a good star chart, atlas, or astronomy app will come in handy for helping locate interesting deep-sky objects to view within the constellations.



Figure 14. The Kellner eyepieces have barrels threaded to accept optional Orion 1.25" filters. A Moon filter is useful for cutting glare and revealing more detail on the lunar surface.

5. Telescope Care and Maintenance

If you give your telescope reasonable care, it will last a lifetime. Store it in a clean, dry, dust-free place, safe from rapid changes in temperature and humidity. Do not store the telescope outdoors, although storage in a garage or shed is OK. Small components like eyepieces and other accessories should be kept in a protective box or storage case. Keep the dust cover (P) on the front of the telescope when it is not in use.

Your refractor telescope requires very little mechanical maintenance. The optical tube has a smooth painted finish that is fairly scratch-resistant. If a scratch does appear on the tube, it will not harm the telescope. If you wish, you may apply some auto touch-up paint to the scratch. Smudges on the tube can be wiped off with a soft cloth and household cleaning fluid.

Cleaning Optics

You should not have to clean the telescope's lens very often. Keeping the dust cap on when the telescope is not in use will help prevent dust from accumulating on the lens. Even a little dust on the lens will not affect the optical performance in any way. If you feel the lens needs to be cleaned, follow these guidelines:

Any quality optical lens cleaning tissue and optical lens cleaning fluid specifically designed for multi-coated optics can be used to clean the lenses of your telescope and eyepieces. Never use regular glass cleaner or cleaning fluid designed for eyeglasses. Before cleaning, remove any loose particles or dust from the lens with a blower bulb or soft brush. Then apply some cleaning fluid to a tissue, never directly on the optics. Wipe the lens gently in a circular motion, then remove any excess fluid with a fresh lens tissue. Oily fingerprints and smudges may be removed using this method. Use caution; rubbing too hard may scratch the lens. On larger lenses, clean only a small area at a time, using a fresh lens tissue on each area. Never reuse tissues.

When bringing the telescope inside after an evening's viewing it is normal for moisture to accumulate on the lenses due to the change in temperature. We suggest leaving the telescope and eyepieces uncovered overnight to allow the condensation to evaporate.

6. Worthwhile Optional Accessories

- **Moon Filter** – A 1.25" Moon filter will cut down the strong glare of sunlight reflected from the Moon, making Moon viewing more comfortable and revealing more surface detail. The filter threads into the bottom of the Kellner eyepieces that came with your telescope (**Figure 14**).
- **Barlow Lens** – A 2x Barlow lens doubles the magnifying power of any eyepiece it's used with, giving you a big power boost to get in closer to your target object. You just insert it between the diagonal and the eyepiece.
- **Correct-Image Diagonal** -- Also called an "erect-image" diagonal, this accessory will provide a correctly oriented

view through the telescope, which is recommended for daytime terrestrial viewing.

- **Planisphere** – A nifty "star wheel" that shows what stars and constellations are visible in the sky at any time of any night. Just set the date and time see a mini representation of your local night sky. Great for identifying what you see and planning an evening's observing session.
- **Star Map** – More detailed than a planisphere, a star map is essential for locating interesting celestial objects to observe with your telescope. Nowadays many mobile astronomy apps feature customizable star maps that you can access on your smartphone or tablet while you're at the telescope.

Orion carries these and many other useful accessories to help enhance your viewing experience with your telescope. Visit our website at www.OrionTelescopes.com.

7. Specifications

Optical tube: Aluminum

Objective lens diameter: 60mm

Objective lens: Air-spaced doublet, anti-reflection coated

Focal length: 700mm

Focal ratio: f/11.7

Focuser: Rack and pinion, 1.25"

Eyepieces: 25mm and 10mm Kellner eyepieces, 1.25"

Magnification: 28x (with 25mm) and 70x (with 10mm)

Tripod: Aluminum tube legs, black

Mount: Altazimuth yoke, fine adjustment for altitude

Star diagonal: Mirror, 1.25"

Finder scope: Red dot reflex sight

Total instrument weight: 4 lbs. 4.8 oz

One-Year Limited Warranty

This Orion product is warranted against defects in materials or workmanship for a period of one year from the date of purchase. This warranty is for the benefit of the original retail purchaser only. During this warranty period Orion Telescopes & Binoculars will repair or replace, at Orion's option, any warranted instrument that proves to be defective, provided it is returned postage paid. Proof of purchase (such as a copy of the original receipt) is required. This warranty is only valid in the country of purchase.

This warranty does not apply if, in Orion's judgment, the instrument has been abused, mishandled, or modified, nor does it apply to normal wear and tear. This warranty gives you specific legal rights. It is not intended to remove or restrict your other legal rights under applicable local consumer law; your state or national statutory consumer rights governing the sale of consumer goods remain fully applicable.

For further warranty information, please visit www.OrionTelescopes.com/warranty.

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