

# Orion® SpaceProbe™ II 76mm Altazimuth Reflector

## #10277

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*Congratulations on your purchase of an Orion telescope. Your new SpaceProbe II 76mm Altazimuth Reflector 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.

## Table of Contents

Parts .....	2
Assembly .....	2
Preparing the Telescope for Operation .....	4
Astronomical Observing .....	5
Aligning the Mirrors (Collimation).....	9
Telescope Care and Maintenance .....	10
Worthwhile Optional Accessories .....	11
Specifications .....	11

**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.*

## Parts

Part	Quantity
A – Tripod legs	3
B – Hex-head tripod mounting bolts	3
C – Washers	3
D – Wing nuts	3
E – Leg lock thumbscrew	3
F – Accessory tray	1
G – Altazimuth yoke mount	1
H – Azimuth lock knob	1*
I – Telescope optical tube	1
J – Altitude lock knob (same as H and E)	1
K – Tripod leg brace	1
L – Red dot finder scope	1
M – Dust cover	1
N – 25mm Kellner eyepiece	1
O – 10mm Kellner eyepiece	1
P – Yoke knobs	2

\* May come pre-installed.

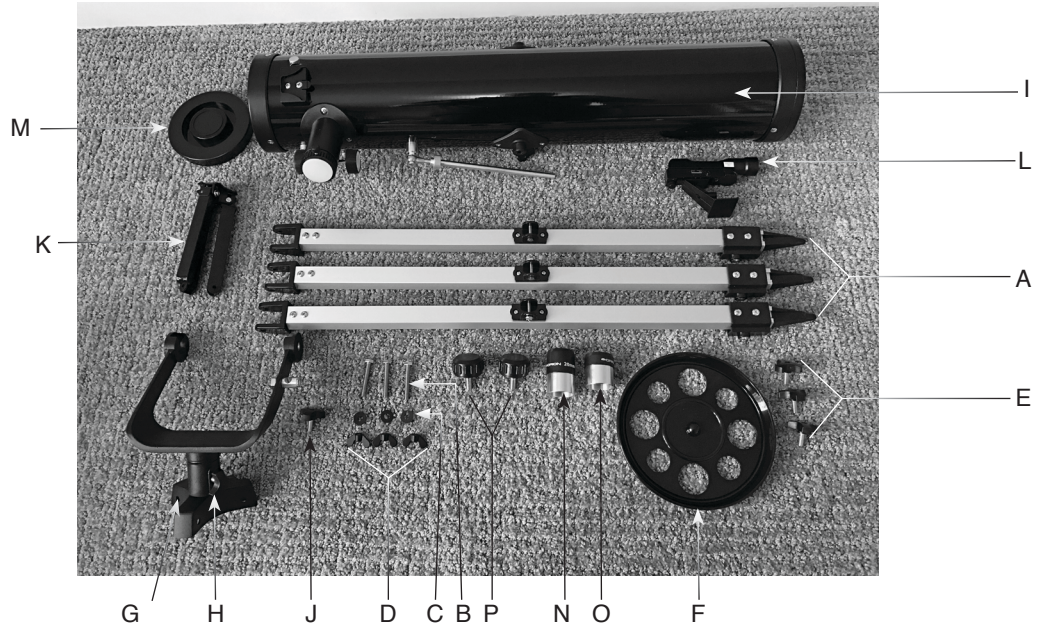
## Assembly

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

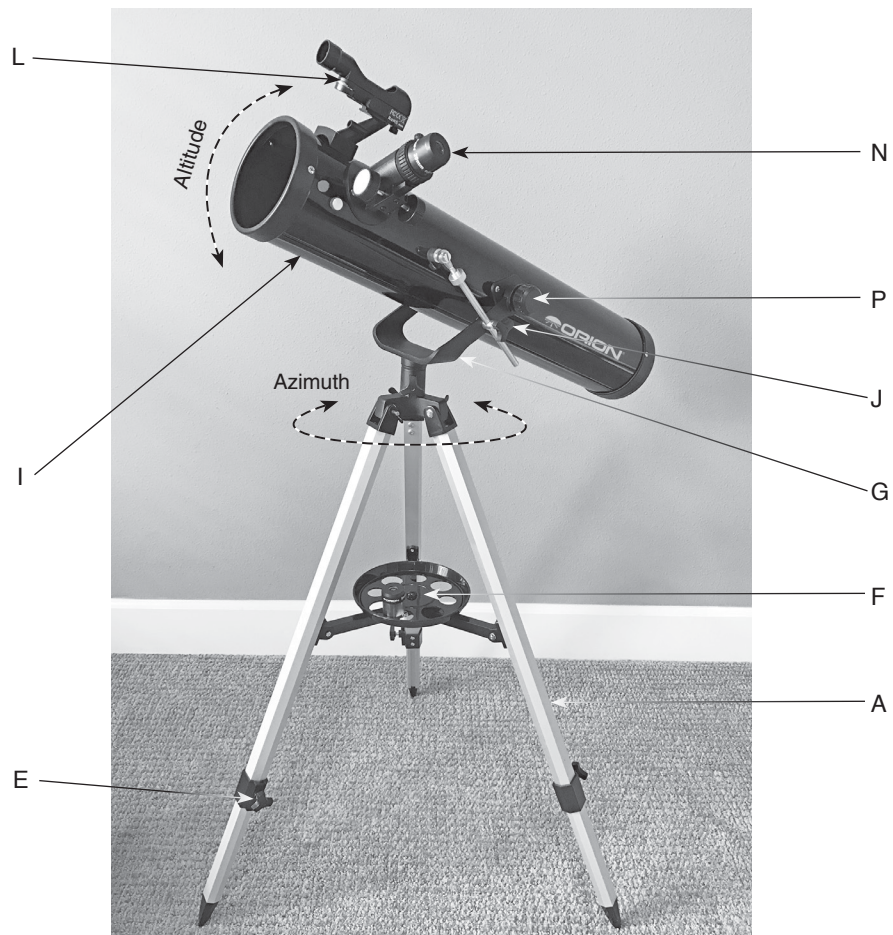
1. Thread a leg lock thumbscrew (E) into each tripod leg (A) as shown in **Figure 3**, and tighten. **Do not over-tighten the leg lock thumbscrews or you may damage the collar they are attached to.**
2. Now attach the tripod leg brace (K) to the three aluminum tripod legs (A) using the screws in the brace attachment brackets (**Figure 4**). Remove the nut and the screw from the bracket, 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 (G). Three hex-head bolts (B) with washers (C) and wing nuts (D) 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 (K) (**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 (I) oriented relative to the yoke mount (G) as shown in **Figure 8**, slide the altitude micro-motion rod into its receptacle on the side of the yoke (**Figure 8a**). Then place the optical tube into the yoke so that the altitude castings on the side of the optical tube slide into the grooves of the yoke (**8b**). To secure the optical tube to the mount, insert the yoke knobs (P) through the holes on each side of the yoke and thread them into the altitude castings on the optical tube (**8c**). They should be reasonably tight but still allow movement of the telescope up and down with gentle force.



**Figure 1.** The parts of the SpaceProbe II 76mm Altazimuth Reflector telescope.

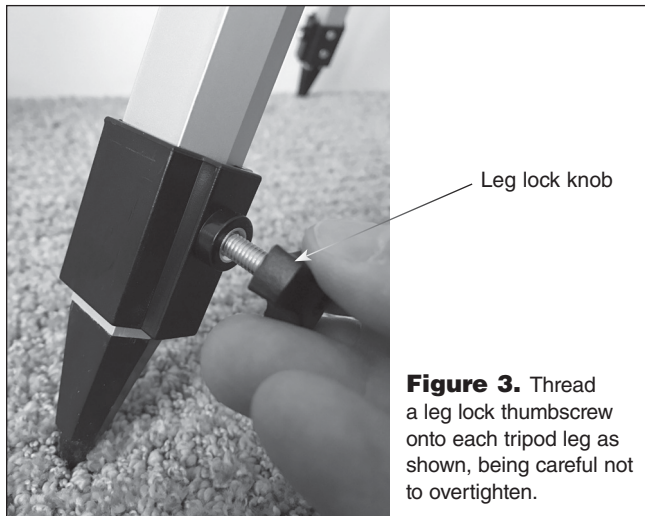


**Figure 2.** The SpaceProbe II 76mm Altazimuth Reflector telescope fully assembled..

- Thread the altitude lock knob (J) into its receptacle on the side of the yoke mount and tighten it (**Figure 9**).
- 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.)
- 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**).

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.

## Preparing the Telescope for Operation



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

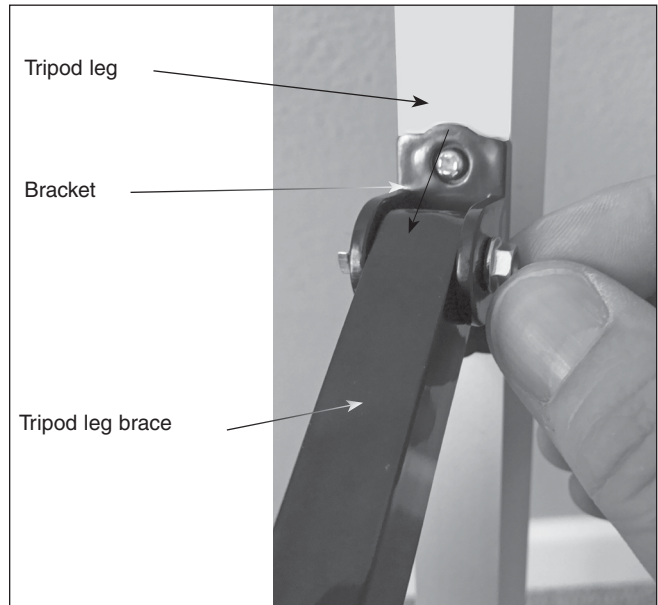
### Aligning and Using the Red Dot Finder Scope

The included red dot finder scope (L) (**Figure 12**) makes pointing your telescope almost as easy as pointing your finger! 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:

- First, remove the dust cover (M) from the front of the telescope.

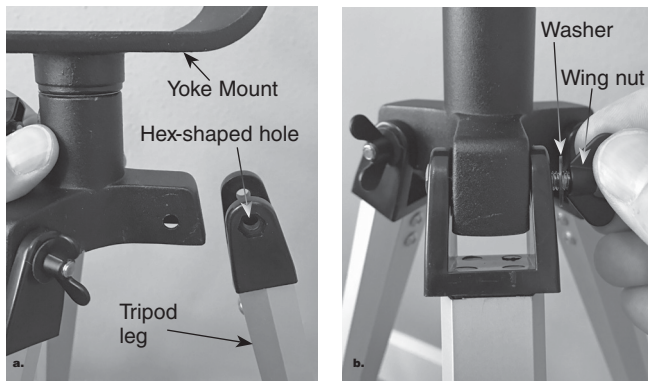


**Figure 4.** Attach the tripod leg brace to the bracket on each tripod leg.

- With the 25mm eyepiece already in the focuser from step 9 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.
- Center the target in the eyepiece.

**Note:** The image in the eyepiece will appear rotated or upside down. This is normal for reflector telescopes, and is why they are not recommended for daytime terrestrial use.

- 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 illumination. 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.
- 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.
- 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.



**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.

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

The SpaceProbe II 76mm Altazimuth Reflector 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 telescope can be difficult, the SpaceProbe II 76mm 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

## 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 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.

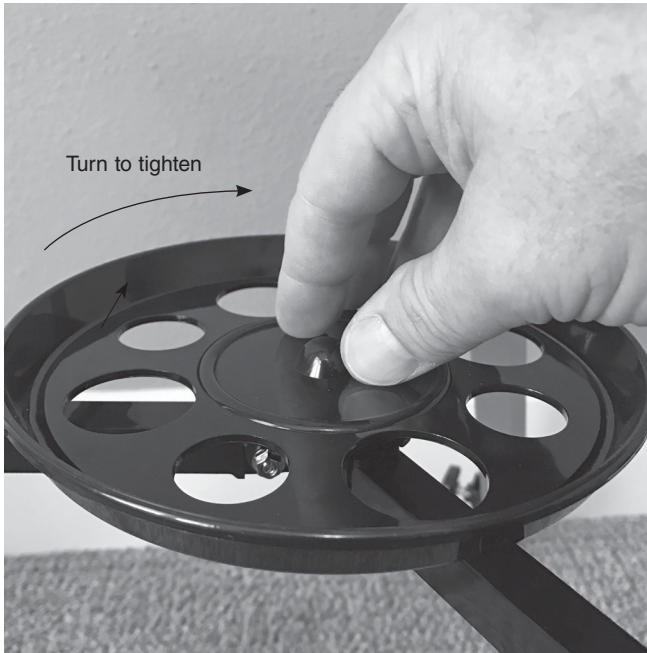
### Let Your Eyes Dark-Adapt

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



**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.

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 SpaceProbe II 76mm reflector 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:

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



**Figure 7.** The assembled altazimuth mount and tripod.

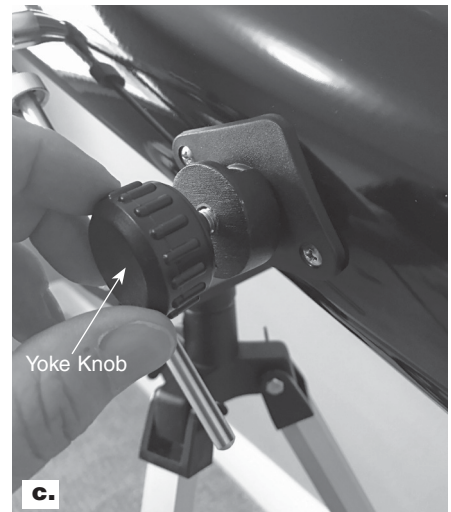
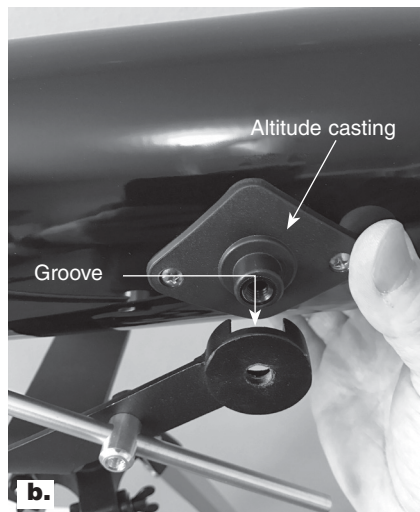
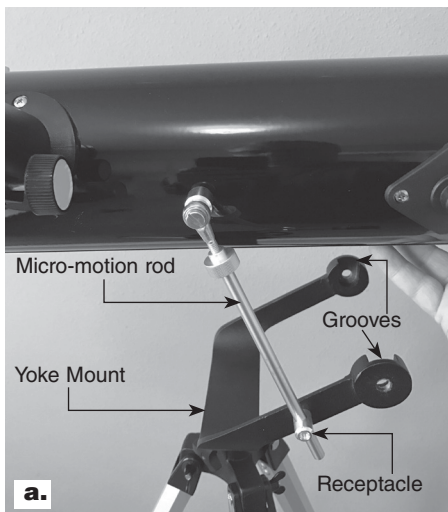
For example, the SpaceProbe II 76mm reflector has a focal length of 700mm, which when used with the supplied 25mm eyepiece yields:

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

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 SpaceProbe II 76mm reflector has an aperture (primary mirror diameter) of 76mm, or 3.0 inches,



**Figure 8.** Installing the optical tube on the mount. **a)** Slide the micro-motion rod into the metal receptacle. **b)** Place the altitude castings on the optical tube in the grooves of the yoke. **c)** Install the yoke knobs.

so the maximum magnification would be about 150x (3 x 50). This level of magnification assumes you have ideal atmospheric conditions for observing (which is seldom the case).

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!



**Figure 9.** Thread in the altitude lock knob.

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 microly 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.

As mentioned previously (but it's worth repeating), the SpaceProbe II 76mm reflector is not suitable for daytime terrestrial viewing because the image seen in the eyepiece will be rotated – which is normal for reflector type telescopes. But in space there is no right-side-up!

### Objects to Observe

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

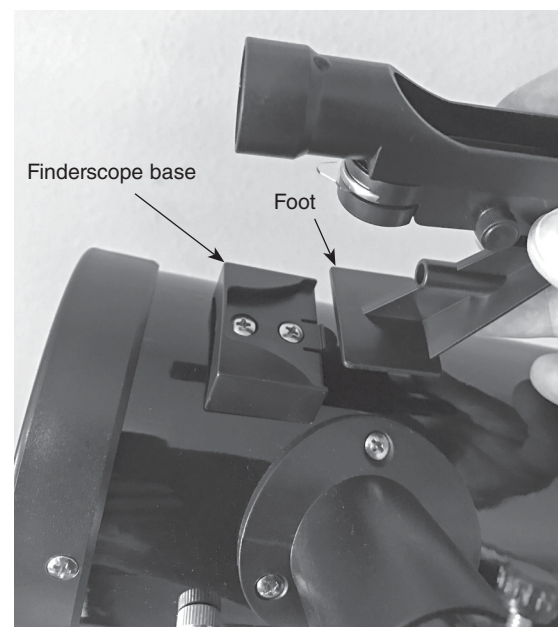
#### A. The Moon

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.

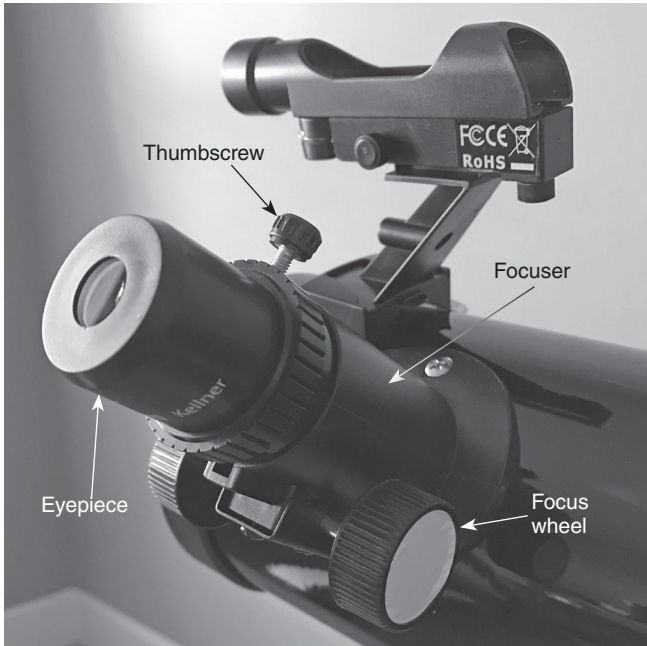
Use an optional Moon filter to dim the Moon when it is very bright. It simply threads onto the bottom of the eyepieces (you must first remove the eyepiece from the focuser to attach a filter). You'll find that the Moon filter improves viewing comfort, and helps to bring out subtle features on the lunar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

#### B. The Planets

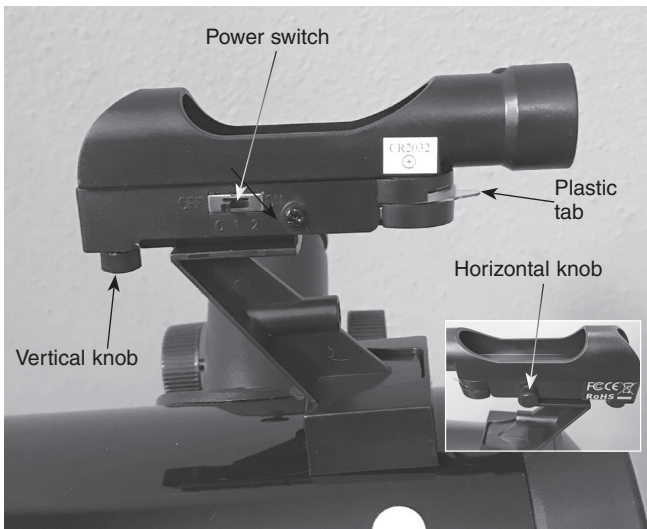
The planets don't stay put like the stars, so to find them you should refer to the monthly star charts at OrionTelescopes.com, or to charts published monthly in *Astronomy*, *Sky &*



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



**Figure 11.** Eyepiece is shown installed in the focuser.

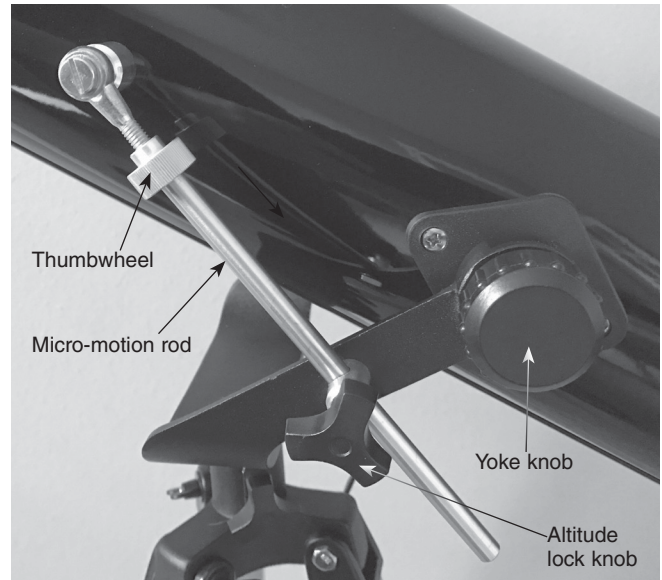


**Figure 12.** The red dot finder scope has vertical and (inset) horizontal adjustment knobs for aligning it with the telescope.

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.



**Figure 13.** The micro-motion rod and thumbwheel allow fine altitude pointing control.

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.



## Aligning the Mirrors (Collimation)

Collimation is the process of adjusting the optics of a telescope so they are precisely aligned with one another and with the telescope tube. For this reflector telescope, the primary and secondary mirrors must be in precise alignment. Your telescope's optics were aligned at the factory, and should not need much or any adjustment unless the telescope is handled roughly. Accurate mirror alignment is important to ensure the peak performance of your telescope, so it should be checked occasionally. With practice, collimating is relatively easy to do and can be done in daylight.

It helps to perform the collimation procedure in a brightly lit room with the telescope pointed toward a bright surface, such as a light-colored wall. Placing a piece of white paper in the telescope tube opposite the focuser (i.e., on the other side of the secondary mirror from the focuser) will also be helpful. You will need a Phillips screwdriver to adjust the mirrors.

To check your telescope's collimation, remove the eyepiece and look down the focuser. You should see the secondary mirror centered in the focuser, as well as the reflection of the primary mirror centered in the secondary mirror, and the reflection of the secondary mirror (and your eye) centered in the reflection of the primary mirror, as in **Figure 14a**. Got all that? Review it again carefully, and compare what you see to **Figure 14a**. If anything is off-center, proceed with the following collimation procedure.

**Note:** Precise collimation is best achieved by using an optional collimating tool, such as a quick-collimation cap, a Cheshire

eyepiece, or a laser collimator. Check our website for available collimating tools. Figures 14b through 14d assume that you have an optional Cheshire eyepiece or collimation cap in the focuser.

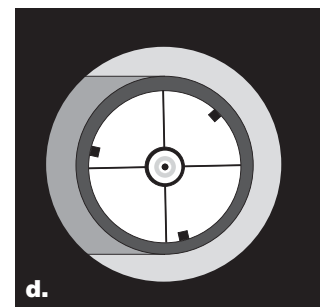
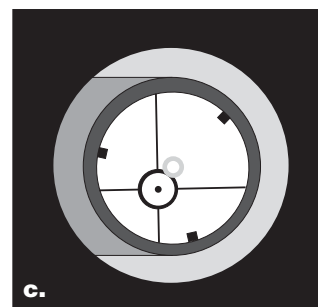
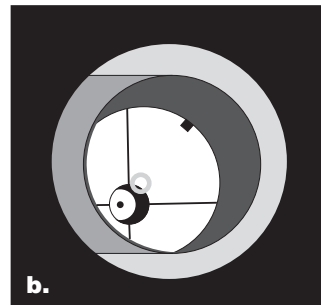
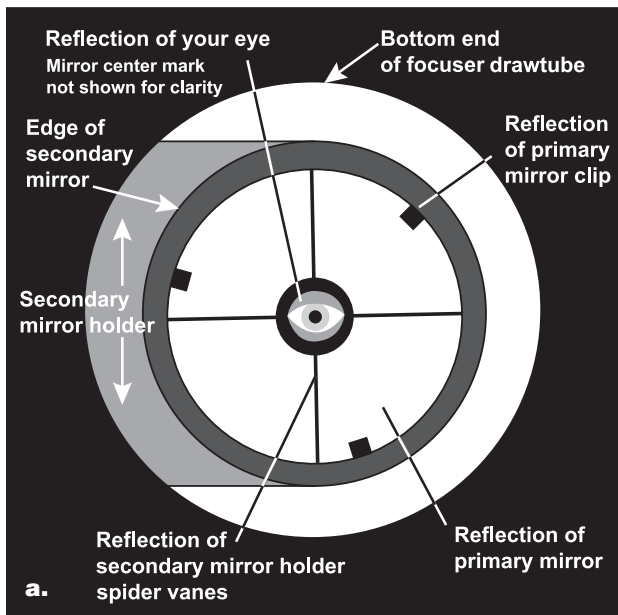
### Primary Mirror Center Mark

You may have noticed that your SpaceProbe II 76mm reflector has a tiny ring (sticker) in the exact center of the primary mirror. This "center mark" allows you to achieve a very precise collimation of the primary mirror; you don't have to guess where the center of the mirror is, which is important in the collimation process. This center mark is especially useful when using an optional collimating device, such as Orion's LaserMate Deluxe II laser collimator.

**NOTE:** The center ring sticker should not be removed from the primary mirror. Because it lies directly in the shadow of the secondary mirror, its presence in no way adversely affects the optical performance of the telescope or the image quality. That might seem counter-intuitive, but it's true! Leave it in place.

### Aligning the Secondary Mirror

Align the secondary mirror first. Look down the focuser at the secondary (diagonal) mirror. If the entire primary mirror reflection is not visible in the secondary mirror, as in **Figure 14b**, you will need to adjust the tilt of the secondary mirror. This is done by alternately loosening one of the three secondary mirror alignment screws with a Phillips screwdriver then tightening the other two (**Figure 15**). The goal is to center the primary mirror reflection in the secondary mirror, as in **Figure 14c**. Don't worry that the reflection of the secondary mirror (the smallest circle) is off-center. You will fix that in the next step. It will take some trial and error to determine which screws to



**Figure 14.** Collimating the optics. **a)** When the mirrors are properly aligned, the view down the focuser drawtube should look like this. **b)** If the optics are out of alignment, the view might look something like this (with a collimation cap or Cheshire eyepiece in place). Here, only part of the primary mirror is visible in the secondary mirror, so the secondary mirror needs to be adjusted (tilted). **c)** Here the secondary mirror is correctly aligned because the entire primary mirror is visible in it. But the reflection of the secondary mirror is off-center. So the primary mirror still needs adjustment. **d)** Now the primary mirror is correctly aligned, so the secondary mirror is centered.

loosen and tighten to move the reflection of the primary mirror to the center of the secondary mirror. But be patient and you'll get it.

### Aligning the Primary Mirror

The final adjustment is made to the primary mirror. It will need adjustment if, as in **Figure 14c**, the reflection of the primary mirror is centered in the secondary mirror, but the small reflection of the secondary mirror is off-center. The tilt of the primary mirror is adjusted using the three pairs of collimation screws on the back end of the optical tube (**Figure 16**).

Adjusting the tilt of the mirror requires a “push-pull” technique involving adjustment of one or more pairs of collimation screws. With a Phillips screwdriver, loosen one of the screws one full turn, and then tighten the adjacent screw (the one right next to it) until it is tight. Look into the focuser and see if the secondary

mirror reflection has moved closer to the center of the primary. You can tell this easily by simply watching to see if the “dot” of the Cheshire eyepiece or collimation cap is moving closer or farther away from the ring on the center of the primary mirror. Repeat this process on the other two sets of collimation screws, if necessary. Again, it will take a little trial and error to get a feel for how to tilt the mirror in this way. When you have the dot centered as much as possible in the ring, your primary mirror is collimated. The view through the collimation cap should resemble **Figure 14d**. Make sure all the collimation screws are tight (but do not overtighten), to secure the mirror tilt. A simple star test will tell you whether the optics are accurately collimated.

### Star-Testing the Telescope

When it is dark, point the telescope at a bright star and accurately center it in the eyepiece's field of view. Slowly de-focus the image with the focusing knob. If the telescope is correctly collimated, the expanding disk should be a perfect circle (**Figure 17**). If the image is unsymmetrical, the scope is out of collimation. The dark shadow cast by the secondary mirror should appear in the very center of the out-of-focus circle, like the hole in a donut. If the “hole” appears off-center, the telescope is out of collimation. If you try the star test and the bright star you have selected is not accurately centered in the eyepiece, the optics will always appear out of collimation, even though they may be perfectly aligned. It is critical to keep the star centered, so over time you will need to make slight corrections to the telescope's position in order to account for the sky's apparent motion.



**Figure 15.** Adjust the tilt of the secondary mirror by adjusting the three alignment screws with a Phillips screwdriver.

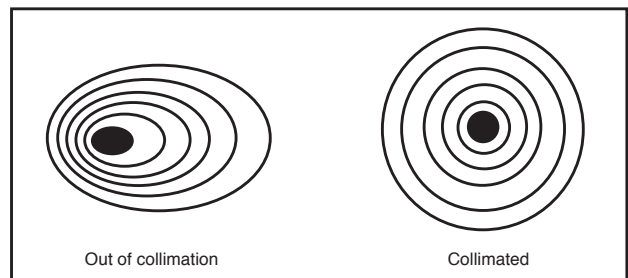


**Figure 16.** Align the primary mirror by adjusting the three pairs of “push/pull” screws on the back end of the optical tube.

## 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 (M) on the front of the telescope when it is not in use.

Your reflector 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.



**Figure 17.** A star test will determine if the telescope's optics are properly collimated.



**Figure 18.** 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.

### Cleaning Optics

You should not have to clean the telescope's mirrors. Covering the telescope with the dust cap when it is not in use will help prevent dust from accumulating on the mirrors. Even a little dust on the mirror surfaces will not affect the optical performance in any way. If you feel the mirrors need to be cleaned, please contact Orion Customer Service at 800-676-1343 for guidance.

To clean the eyepiece lenses, any quality optical lens cleaning tissue and optical lens cleaning fluid specifically designed for multi-coated optics can be used. 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 optics due to the change in temperature. We suggest leaving the telescope and eyepieces uncovered overnight to allow the condensation to evaporate.

## 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 18**).

- 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.
- 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](http://www.OrionTelescopes.com).

## Specifications

**Optical tube material:** Rolled steel

**Primary mirror diameter:** 76mm (3.0")

**Primary mirror coating:** Aluminum with silicon dioxide (SiO<sub>2</sub>) overcoat

**Secondary mirror minor axis diameter:** 19.9mm

**Focal length:** 700mm

**Focal ratio:** f/9.2

**Focuser:** Rack-and-pinion, accepts 1.25" accessories

**Eyepieces:** 25mm and 10mm Kellner, antireflection coated, 1.25" barrel diameter, threaded for Orion filters

**Eyepiece magnification:** 28x (with 25mm eyepiece) and 70x (with 10mm eyepiece)

**Finder scope:** Red dot finder scope

**Mount:** Altazimuth yoke

**Tripod:** Aluminum

**Total instrument weight:** 7.0 lbs.

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## 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](http://www.OrionTelescopes.com/warranty).



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