INSTRUCTION MANUAL

Orion® StarBlast™ 6 Astro Reflector Telescope

#10016

ORION® TELESCOPES & BINOCULARS
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Congratulations on your purchase of the Orion StarBlast 6 Astro Reflector telescope. 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.

With its high-quality 6" parabolic reflector optics and precision-engineered mechanics, the StarBlast 6 is an immensely capable astronomical instrument. Your telescope will arrive almost fully assembled out of the box! Only the visual accessories need to be installed.

This compact but powerful telescope is designed with portability in mind. Wherever you take it, we're sure you and your family and friends will love scanning the night sky for its many hidden treasures.

The following instructions will help you to get the maximum performance from your new telescope, please read them thoroughly.

Figure 1. Components of the StarBlast 6 Astro Reflector telescope

Table of Contents

I. Parts List

- Optical tube with tube rings and dovetail plate
- Base
- 25mm Plossl eyepiece, 1.25"
- 10mm Plossl eyepiece, 1.25"
- Red dot finder scope
- Eyepiece rack and mounting screws (x2)
- Dust cap
- DeepMap 600
- MoonMap 260
- Smartphone photo adapter (not shown)

When unpacking the telescope it is suggested that you save the internal packaging. In the unlikely event the product needs to be returned, the shipping materials can be reused to ensure it arrives safely at its destination. Make sure all the parts listed in the Parts List and shown in **Figure 1** are present.

II. Setting Up the Telescope

Your new StarBlast 6 telescope arrives already assembled, except for a few accessories. Carefully remove the assembled telescope from the shipping box and set it upright on its base. Remove the plastic bag from the telescope. To remove the tissue paper from the optical tube you will need to open up the tube rings. Make sure you do this in such a way that the optical tube will not drop out and get damaged. It may be best to remove the optical tube from the base before attempting to open the tube rings. Just loosen the saddle lock knob while holding on to the optical tube, then slide or lift the dovetail mounting bar out of the saddle.

***** NOTE**: The optical tube finish depicted in this manual is darker (black) than the finish on the final production telescope, which is gray.***

> **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.***

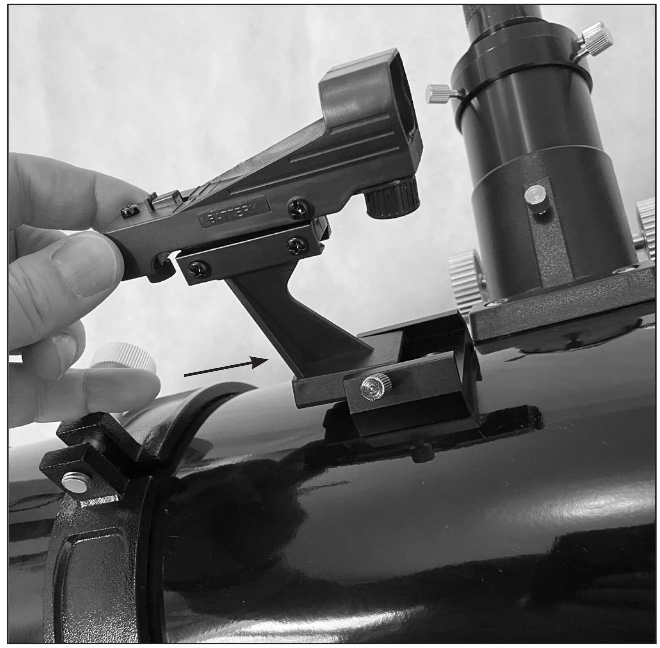

Figure 2. Slide the foot of the red dot scope into the dovetail shoe on the telescope tube, as shown. Then tighten the thumbscrew.

Install the Red Dot Scope

To install the red dot scope simply slide its dovetail mounting bracket into the telescope's dovetail base, then tighten the thumbscrew on the base to secure the mounting bracket (**Figure 2**). Remove the plastic tab sticking out from the battery compartment and discard it. This allows the electronic circuit of the red dot scope to receive power from the installed 3V battery.

Attach the Eyepiece Rack

Find the two pilot holes in the side braces and attach the eyepiece rack with the included wood screws using a Phillips screwdriver (**Figure 3**).

Insert an Eyepiece

The StarBlast 6 comes with two quality 1.25" Plossl eyepieces: one of 25mm focal length and the other of 10mm focal length. More information about the eyepieces are provided later in this manual.

Insert an eyepiece directly into the focuser (**Figure 4**). First remove the cap from the focuser and loosen the thumbscrew on the 1.25" adapter to provide clearance for the eyepiece barrel. Then insert the barrel of the eyepiece into the 1.25" adapter and lightly retighten the thumbscrew to secure it in place.

Adjusting the Eyepiece/Focuser Orientation

To view through the StarBlast 6 comfortably, you can adjust the orientation of the focuser to a convenient angle by rotating the optical tube within the tube rings. To do this, first loosen the two tube ring clamp knobs (**Figure 5**) by a couple of turns. Now, grasp the front end of the tube with one hand and the back of the tube with your other hand and rotate it until the focuser is where you want it. Then retighten the clamp knobs to secure the optical tube in that position.

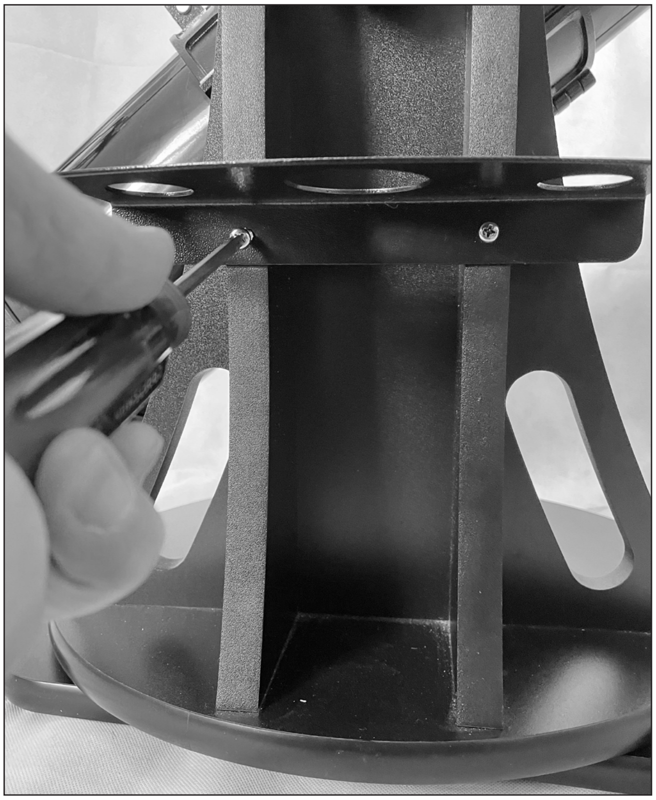

Figure 3. Find the pilot holes in the side braces of the base and attach the eyepiece rack with the two wood screws provided. You will need a Phillips screwdriver to do this.

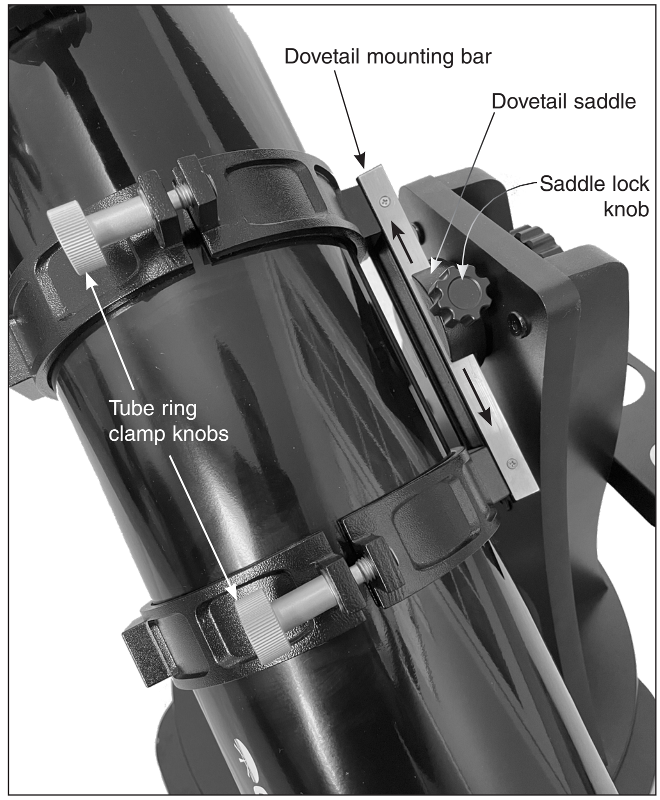

Figure 5. The tube rings and dovetail mounting bar hold the telescope optical tube on the base. Slide the telescope forward or back in the saddle by loosening the saddle lock knob.

Balance the Optical Tube

The optical tube should be balanced on the mount so that it does not freely rotate on its own when pointed at a target. The easiest way to balance the tube is to simply slide the dovetail mounting bar attached to the tube rings forward or back in the dovetail saddle (**Figure 5**). You just loosen the saddle clamp knob, then move the telescope forward or back. Retighten the clamp knob and check the balance. Alternatively, you could move the optical tube within the tube rings by loosening the tube ring clamp knobs a little, then slide the telescope forward or back in the tube rings until balance is achieved. Then retighten the clamp knobs.

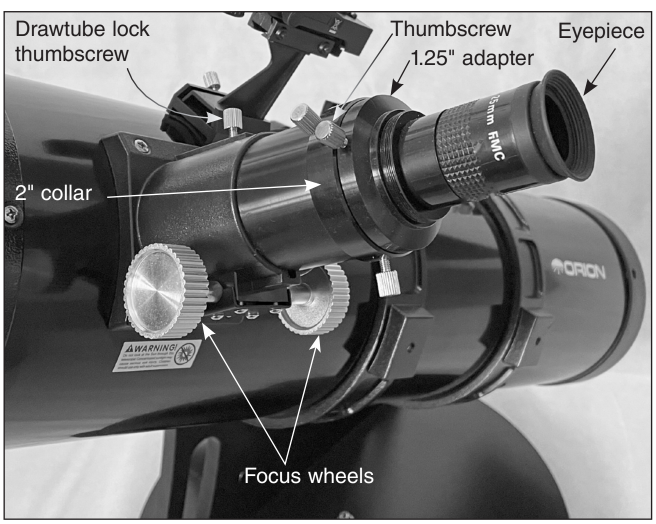

Figure 4. Insert an eyepiece into the focuser and secure it by lightly tightening the thumbscrew..

III. Using Your Telescope

It is best to get a feel for the basic functions of the StarBlast 6 during the day, before observing astronomical objects at night. This way you will not have to fumble around trying to orient yourself in the dark! Find a spot outdoors where you have plenty of room to move around the telescope, and where you have a clear view of some object or vista that is at least 1/4-mile away. It is not critical that the base be exactly level, but it should be placed on somewhat flat ground or pavement to ensure smooth movement of the telescope.

Remember, never point the telescope at or near the Sun without using a proper solar filter over the front aperture! Permanent eye damage could result.

Altitude and Azimuth Motions

The altazimuth base of the StarBlast 6 permits motion of the telescope along two axes: altitude (up/down) and azimuth (left/right) (**Figure 6**). Simply take hold of the top end of the tube and move it left or right and up or down. Both motions can be made simultaneously and in a continuous manner for easy aiming. Move the telescope gently—let it glide. In this way you can point the telescope to any position in the night sky, from horizon to horizon.

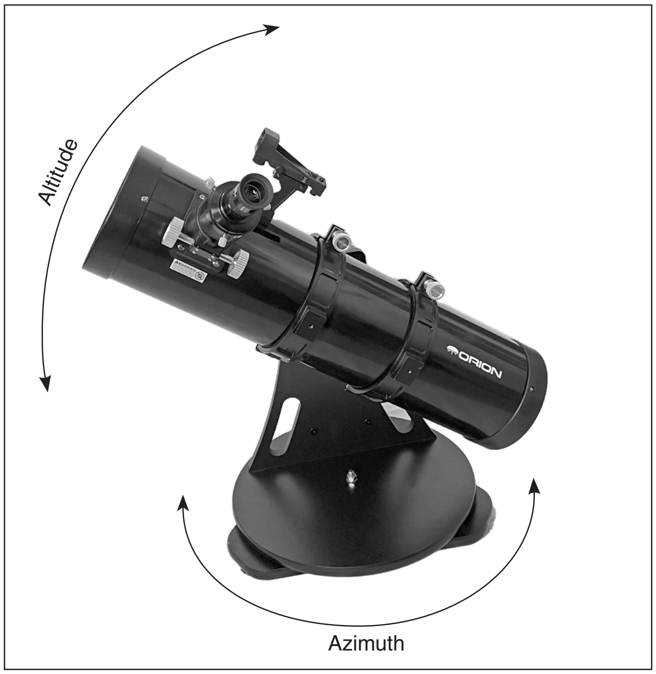

Figure 6. The StarBlast 6 has two axes of motion: altitude (up/down) and azimuth (left/right).

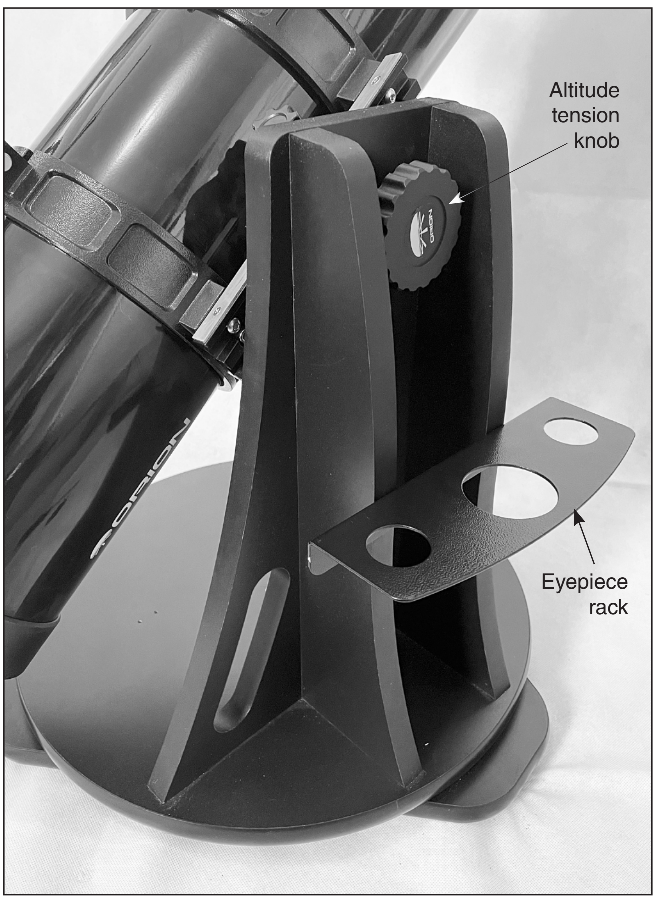

Figure 7. Set the desired amount of tension for vertical rotation of the optical tube by tightening or loosening the altitude tension knob.

When you're observing an astronomical object, it will drift across the eyepiece's field of view over time due to the Earth's rotation. Before it drifts out of the field of view, just grasp the front of the telescope and give it a gentle pull or nudge to re-center the object in the eyepiece.

The altitude axis rotation tension is adjustable with the altitude tension adjustment knob (**Figure 7**). You want sufficient friction of motion to keep the telescope from rotating too freely, which can make it difficult to land on and stay aimed at an object you wish to view. However, if you apply too much tension the telescope will be difficult to move smoothly and in small increments needed to center an object in the eyepiece for viewing. Turn the tension adjustment knob to set the right amount of friction.

The rotation tension of the azimuth axis is set at the factory and should allow smooth, easy rotation of the base to the left or right.

Focusing the Telescope

The StarBlast 6 comes equipped with a 2" rack-and-pinion focuser (**Figure 4**). The large 2" format focuser allows use of 2" or 1.25" eyepieces. To insert a 1.25" eyepiece, first remove the cap from the 1.25" adapter. Loosen the thumbscrew on the 1.25" adapter, then insert the eyepiece into the adapter and secure it by tightening the thumbscrew.

To insert an optional 2" eyepiece, first loosen the three thumbscrews on the 2" accessory collar and remove the 1.25" adapter from the collar (**Figure 8**). Then insert the 2" eyepiece barrel into the 2" collar all the way. Retighten the three thumbscrews.

To focus, move the telescope so the front (open) end is pointing in the general direction of an object at least 1/4-mile away. Now, with your fingers, slowly rotate one of the focusing knobs (see **Figure 8**) until the object comes into sharp focus. Go a little bit beyond sharp focus until the image just starts to blur

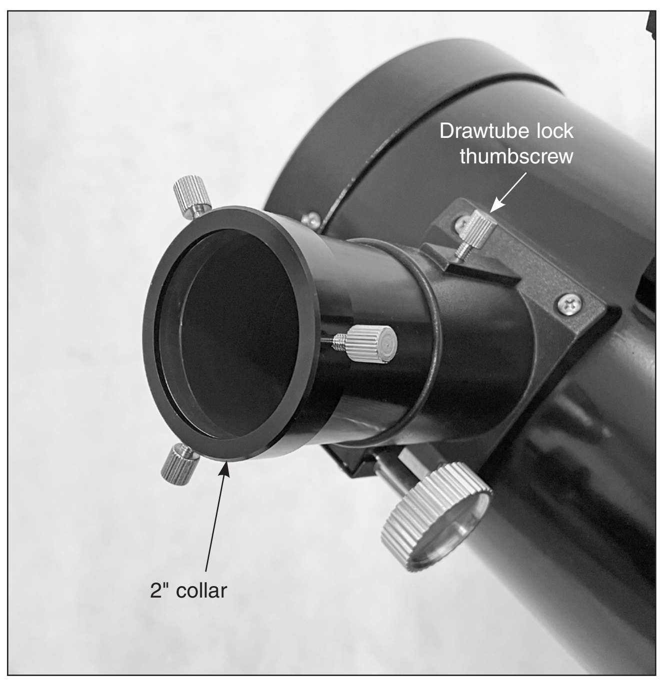

Figure 8. To use an optional 2" eyepiece or 2" barlow lens, remove the 1.25" adapter by loosening the three thumbscrews on the 2" collar. This picture shows the 2" collar with the 1.25" adapter removed.

again, then reverse the rotation of the knob, just to make sure you've hit the exact focus point.

If you have trouble focusing, rotate the focus knob so the drawtube is in as far as it will go. Now look through the eyepiece while slowly rotating the focus knob in the opposite direction. You should soon see the point at which focus is reached.

On the top of the focuser is a thumbscrew (see **Figure 4**). It can be tightened to lock the drawtube once you've achieved focus, if desired. This is not normally necessary, though, unless you're using an unusually heavy eyepiece with perhaps a Barlow lens and their weight causes the drawtube to slip downward. The locking thumbscrew could prevent any such slippage.

Note: The image in your telescope will appear rotated, or upside down. This is normal for reflector telescopes and is why ***reflectors are not recommended for daytime terrestrial viewing.***

Aligning and Using the Red Dot Finder Scope

The included red dot scope (**Figure 9**) makes pointing your telescope almost as easy as pointing your finger. It permits easy object targeting prior to observation in the higher-power main telescope. It superimposes a red dot generated by an internal LED light on the sky, showing right where your telescope is pointed (**Figure 10**).

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

Turn the power knob (**Figure 9**) until you hear the "click" indicating that power has been turned on. Look through the back of the reflex sight with both eyes open to see the red dot inside the sight tube. Position your eye at a comfortable distance from the back of the unit. The brightness of the dot is adjusted by rotating the power knob. For best results when stargazing, use the dimmest possible setting that allows you to see the dot without difficulty. Typically a dimmer setting is used under dark skies and a bright setting is used under light-polluted skies or in daylight.

Aligning the Red Dot Scope

To use the red dot finder scope properly, it must be aligned with the main telescope. When it is properly aligned with the telescope, an object that is centered on reflex sight's red dot should also appear in the center of the field of view in the telescope's eyepiece. Alignment is easiest to do during daylight hours, before observing at night. Follow this procedure:

1. First, remove the dust cover from the front of the telescope.
2. With the 25mm eyepiece installed in the focuser, 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.
3. Center the target in the telescope eyepiece.

Next, you will also center the target object on the red dot scope's red dot. Without moving the telescope, use the red dot scope's altitude and azimuth adjustment knobs (shown in **Figure 9**) to position the red dot on the object.

4. 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 red dot scope's alignment again. When the object is centered in both the telescope eyepiece and the red dot scope, the red dot scope is properly aligned with the telescope.

At the end of your observing session, be sure to turn the power knob on red dot finder scope OFF (hear the click) to preserve battery life. Once aligned, the red dot scope will usually hold its alignment even after being removed and reattached. Otherwise, only minimal realignment will be needed.

Replacing the Battery

Should the red dot finder scope's battery ever die, replacement 3-volt CR2032 lithium batteries are available from many retail outlets. Push the battery tray out with your fingertip from the side labeled "PUSH", then pull it the rest of the way out from the other side. Remove the old battery and replace it with a fresh one, positive (+) side facing up. Then slide the battery tray back in by pushing the side of the tray labeled "BATTERY" into the slot.

Aiming/Pointing the Telescope

Now that the red dot finder scope is aligned, the telescope can be quickly and accurately pointed at anything you wish to observe. The red dot finer scope has a much wider field of view than the telescope's eyepiece, and therefore it is much easier to first center an object in the red dot finder scope. Then the object will also be centered in the telescope's field of view.

Start by once again moving the telescope until it is pointed in the general direction of the object you want to see. Some observers find it convenient to sight along the optical tube to do this. Now, look in the red dot scope. If your general aim is accurate, the object should appear somewhere in the red dot scope's field of view. Make small adjustments to the telescope's position until the object is centered on the red dot. Now, look in the telescope's eyepiece and enjoy the view!

Tracking Celestial Objects

When you observe a celestial object through the telescope, you'll see it drift slowly across the field of view. To keep it in the field, assuming your equatorial mount is polar aligned, just turn the R.A. slow-motion control cable clockwise. The Dec. slow-motion control cable is not needed for tracking. Objects will appear to move faster at higher magnifications, because the field of view is narrower.

Determining Magnification

Magnification, or power, is determined by the focal length of the telescope and the focal length of the eyepiece. By using eyepieces of different focal lengths, the resultant magnification can be varied. Magnification is calculated as follows:

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

For example, to calculate the magnification of the StarBlast 6 with the supplied 25mm Plossl eyepiece, divide the focal length of 750mm by 25mm:

$$\frac{750\text{mm}}{25\text{mm}} = 30\text{X}$$

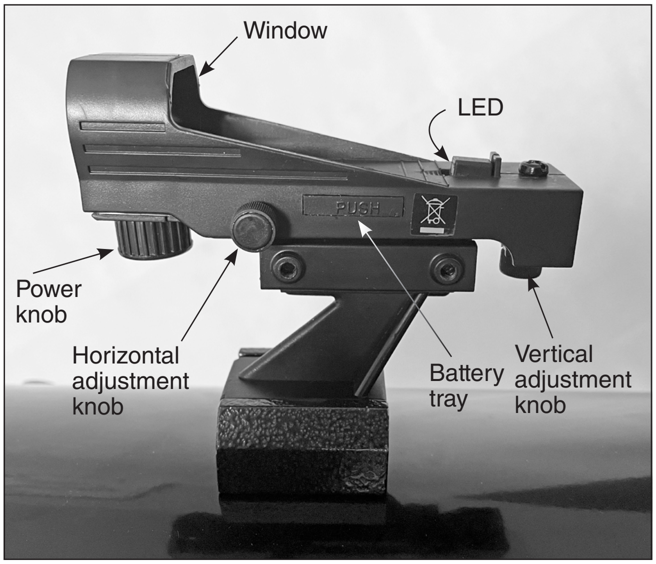

Figure 9. The red dot scope should be aligned with the main telescope using the horizontal and vertical adjustments knobs.

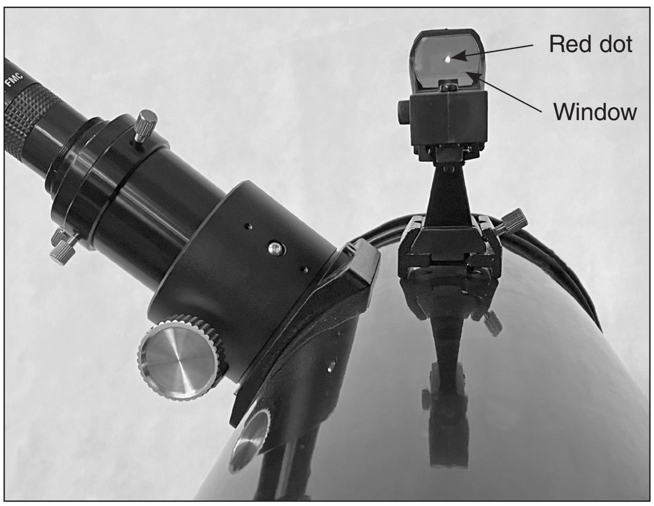

Figure 10. The red dot scope projects a small red dot on a viewing window, showing exactly where the main telescope is pointing.

Using the 10mm Plossl eyepiece provides higher magnification:

$$\frac{750\text{mm}}{10\text{mm}} = 75\text{X}$$

Other telescope eyepieces of different focal lengths can be purchased to achieve higher or lower powers as desired. It is quite common for an observer to own five or more eyepieces to access a wide range of magnifications.

We recommend starting a viewing session by inserting your lowest-power (longest focal length) eyepiece to locate and center the target object. Low magnification yields a wide field of view, which shows a larger area of sky in the eyepiece. This makes finding and centering an object much easier. Trying to find and center objects with a high power (narrow field of view) eyepiece is like trying to find a needle in a haystack! Once you've centered the object in the eyepiece, you can switch to a higher magnification (shorter focal length) eyepiece, if you wish. This is recommended for small and bright objects, like planets and double stars. The Moon also takes higher magnifications well. The best rule of thumb with eyepiece selection is to start with a low power, wide-field eyepiece, and then work your way up in magnification. If the object looks better, try an even higher magnification eyepiece. If the object looks worse, then back off the magnification a little by using a lower-power eyepiece.

Magnification Limits

Every telescope has a useful magnification limit of about 2x per millimeter of aperture. This translates to a limit of 304x for the StarBlast 6 (152mm aperture). Some telescope manufacturers will use misleading claims of ultra-high magnifications: "See distant galaxies at 640X!" While such magnifications are technically possible, the actual image at that magnification would be a dim, indistinct blur. Low and moderate magnifications are what give the best views. A small but bright and crisply detailed image is always better than a dim, blurry, over-magnified one.

Image Orientation

The image in the eyepiece will appear rotated (upside down) in the StarBlast 6. This is normal for reflector telescopes. But this is also why reflector telescopes are not recommended for daytime terrestrial use. For astronomical viewing the orientation of the image matters little, as there is no "right side up" in space!

On or Off the Ground? Your Choice

One of the great qualities of the StarBlast 6 is its conveniently compact, portable size. The cutouts in the side panel make a perfect carrying handle for taking the StarBlast wherever you want to go. You may find that the most comfortable way to use the telescope is while sitting down or kneeling on the ground next to it. If you wish to raise the telescope off the ground a bit so that it can be used while standing or sitting in a chair, then setting it on a platform such as a picnic table, a milk crate, or sturdy camping table might be just the ticket.

IV. Astronomical Observing

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. 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!

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 20 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 lights, street lights, and car headlights will ruin your night vision.

"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 (6th magnitude or fainter is desirable). If you cannot see stars of magnitude 3.5 or dimmer then conditions are poor. Magnitude is a measure of how bright a star is – the brighter a star is, the lower its magnitude will be. A good star to remember for this is Megrez (mag. 3.4), which is the star in the "Big Dipper" connecting the handle to the "dipper". If you cannot see Megrez, then you have fog, haze, clouds, smog, or other conditions that are hindering your viewing. (See **Figure 11**.)

Tracking Celestial Objects

The Earth is constantly rotating about its polar axis, completing one full rotation every 24 hours; this is what defines a "day". We do not feel the Earth rotating, but we see it at night from the apparent movement of stars from east to west. When you observe any astronomical object, you are watching a moving target. This means the telescope's position must be continuously adjusted over time to keep a celestial object in the field of view. This is called "tracking" the object. It's easy to do with the StarBlast 6 because of its smooth motions on both axes. As the object moves off toward the edge of the eyepiece's field of view, just lightly nudge or tug the telescope to re-center the object. Objects appear to move across the field of view faster at higher magnifications. This is because the field of view becomes narrower.

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 of Venus, and many bright deep-sky objects. Do not expect to see color as you do in Hubble Space Telescope photos, since those are taken with long-exposure cameras and have "false color" added. Our eyes are not sensitive enough to see color in deep-sky objects. But remember that you are seeing these objects using your own telescope with your own eyes, in real time. And that's pretty cool!

V. Objects to Observe

Now that you are all set up and ready to go, one critical decision must be made: what to look at?

A. The Moon

With its rocky surface, the Moon is one of the easiest and most interesting targets 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 the included Moon Filter to dim the Moon when it is very bright. It simply threads onto the bottom of the eyepiece barrel. You'll find that a Moon filter improves viewing comfort, and also helps to bring out subtle features on the lunar surface.

B. 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.

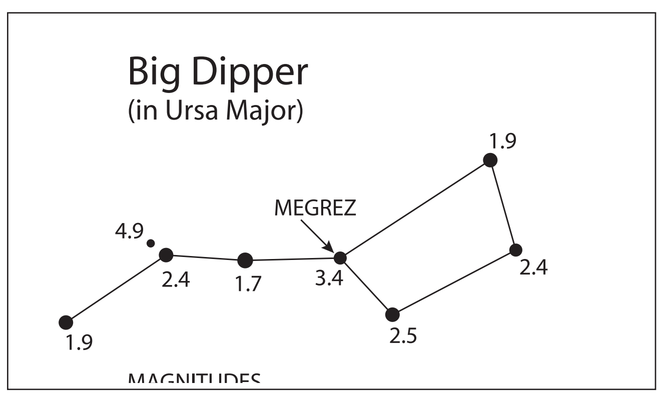

Figure 11. Megrez connects the Big Dipper's "handle" to its "pan." If you cannot see Megrez, a magnitude 3.4 star, then the viewing conditions are poor.

Important Note: *Do not look at the Sun with this telescope without a professionally made solar filter installed on the front opening, or permanent eye damage or blindness could result! Do not use the red dot scope when solar viewing, either.*

C. The Planets

Planets, being in our own solar system and having their own orbits, do not stay at "fixed" locations like the stars do. So to find them you should refer to Sky Calendar at our website (telescope.com), or to charts published monthly in Astronomy or Sky & Telescope magazines, or on astronomy websites. Venus, 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, you will need to use high power. Not all the planets are generally visible at any one time.

JUPITER: The largest planet, Jupiter, is a great subject for observation. You can see the disk of the giant planet and watch the ever-changing positions of its four largest moons -- Io, Callisto, Europa, and Ganymede.

SATURN: The ringed planet is a breathtaking sight when it is well positioned. The tilt angle of the rings varies over a period of many years; sometimes they are seen edge-on, while at other times they are broadside and look like giant "ears" on each side of Saturn's disk. A steady atmosphere (good seeing) is necessary for a good view. You will probably see a bright "star" close by, which is Saturn's brightest moon, Titan.

VENUS: At its brightest, Venus is the most luminous object in the sky, excluding the Sun and the Moon. It is so bright that sometimes it is visible to the naked eye during full daylight! Ironically, Venus appears as a thin crescent, not a full disk, when at its peak brightness. Because it is so close to the Sun, it never wanders too far from the morning or evening horizon. No surface markings can be seen on Venus, which is always shrouded in dense clouds.

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 gorgeous two-color double star Albireo in Cygnus is a favorite. Defocusing a star slightly can help to 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 a variety of different types of galaxies. Most deep-sky objects are very faint, so it is important that you find an observing site well away from light pollution. Take plenty of time to let your eyes adjust to the darkness. Do not expect these subjects to appear like the photographs you see in books and on the internet; most will look like dim gray smudges. Our eyes are not sensitive enough to see color in 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.

To find deep sky objects in the sky, it is best to consult a star chart, planetarium program or app, or a planisphere. These guides will help you locate the brightest and best deep-sky objects for viewing with your telescope. You can also try low-power scanning of the Milky Way. Pop in the 25mm eyepiece and just cruise through the "star clouds" of our galaxy. You'll be amazed at the rich fields of stars and objects you'll see! The Milky Way is best observed on summer and winter evenings.

VI 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 okay. Small components like eyepieces and other accessories should be kept in a protective box or storage case. Keep the dust cover on the front of the telescope when it is not in use.

VII. Specifications

Optical design	Newtonian reflector
Primary mirror figure	Parabolic
Primary mirror coating	Aluminum with SiO2 overcoat
Secondary mirror	53mm minor axis diameter
Secondary mirror coating	Aluminum with SiO2 overcoat
Aperture	152mm
Focal length	750mm
Focal ratio	f/5
Central obstruction diameter	49.8mm
Focuser	Rack and pinion, 1.25"
Base	MDF material with laminate finish
Mounting saddle	Vixen-style dovetail with clamp knob
Optical tube mounting adapter	Vixen-style dovetail bar
Eyepieces	25mm Plossl design, 1.25", fully multi-coated
	10mm Plossl design, 1.25", fully coated
Magnification with supplied	
eyepieces	30x (25mm) and 75x (10mm)
Finder scope	Red dot reflex sight (3V lithium ion battery included)
Weight, assembled telescope	22 lbs., 1 oz.
Optical tube length	27"
Base dimensions	18" x 18" x 18"

Appendix A

Collimation – Aligning the Optics

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 adjustment unless the telescope is handled roughly. Accurate mirror alignment is important to ensure the sharpest possible images viewed through 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. The telescope tube should be oriented horizontally (parallel to the ground). 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 (see **Figure 12**). You will need a Phillips screwdriver to perform the collimation.

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 13A**. Got all that? Review it again carefully, and compare what you see to **Figure 13A**. 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 13B through 13D *assume that you have an optional Cheshire eyepiece or collimation cap in the focuser.

Primary Mirror Center Mark

You may have noticed that your StarBlast 6 has a small adhesive ring in the 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. The center mark is especially useful when using an optional collimating device.

Note: The adhesive ring 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 13B**, you will need to adjust the tilt of the secondary mirror. This is done by alternately loosening one of the three secondary

Figure 12. Before collimating your telescope, place a piece of white paper inside the optical tube opposite the focuser. Make sure the telescope tube is oriented parallel to the ground during the collimation process. [StarBlast 4.5 Astro Reflector pictured]

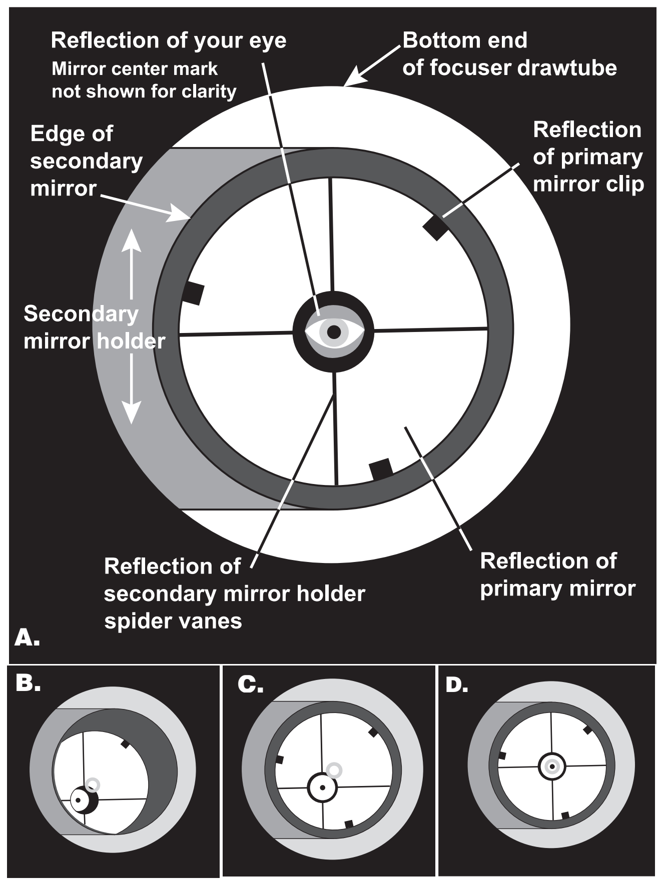

Figure 13. Collimating the optics. **(A)** When the mirrors are properly aligned, the view down the focuser drawtube should look like this. **(B)** Here, only part of the primary mirror is visible in the secondary mirror, so the secondary mirror needs to be adjusted (tilted). **(C)** Here the secondary 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.

mirror alignment screws then lightly tightening the other two (**Figure 14**), using a Phillips screwdriver. Be sure to loosen a screw as the first step, followed by light tightening of the other(s). And turn the screws by only 1/8 turn or less at a given time as you make adjustments. The goal is to center the primary mirror reflection in the secondary mirror, as in **Figure 13C**. 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 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 13C**, 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 three spring-loaded collimation knobs and three smaller Phillips screws on the back end of the optical tube (**Figure 15**). First loosen the three lock screws a turn or so. Then tighten one of the collimation knobs about a quarter turn and see if the secondary mirror reflection has moved closer to the center of the primary. If it moved farther away then try loosening the same collimation knob a bit. Repeat this process on the other two sets of collimation screws, if necessary, adjusting them one way or the other and seeing if the secondary mirror reflection moves closer to the center of the primary mirror reflection. It will take a little trial and error to get a feel for how to tilt the mirror in this way. When the center hole in your collimating tool is centered as much as possible on the reflection of the adhesive dot on the primary mirror, your primary mirror is collimated. The view through the collimation cap should resemble **Figure 13D**. Then, very lightly tighten the three lock screws so that the primary mirror stays in that position. 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 16**). 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 may need to make slight corrections to the telescope's position in order to keep the star in the center of the field of view. A good star to point at for a star test is Polaris, the North Star, because its position does not move significantly over time.

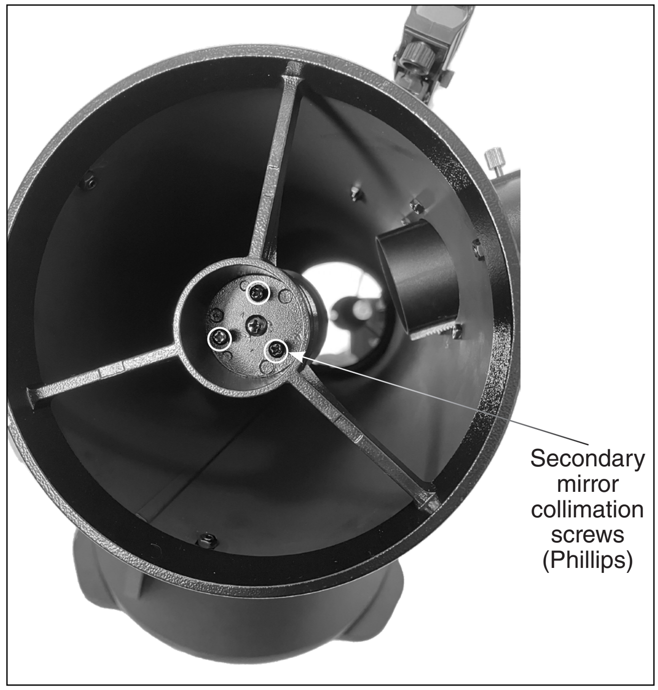

Figure 14. Use a Phillips screwdriver to adjust the three secondary mirror collimation screws.

Figure 15. The optical tube's rear cell has three pairs of collimation screws for adjusting the tilt of the primary mirror. The large knobs are the spring-loaded collimation knobs while the smaller Phillips screws are the locking screws.

Appendix B

Cleaning the Optics

Cleaning Lenses

Any quality optical lens cleaning tissue and optical lens cleaning fluid specifically designed for multi-coated optics can be used to clean the exposed lenses of your eyepieces. Never use regular glass cleaner or cleaning fluid designed for eyeglasses. Before cleaning with fluid and tissue, blow any loose particles off the lens with a blower bulb. Then apply some cleaning fluid to a tissue, never directly on the optics. Wipe the lens gently in a circular motion, applying only very slight pressure, 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.

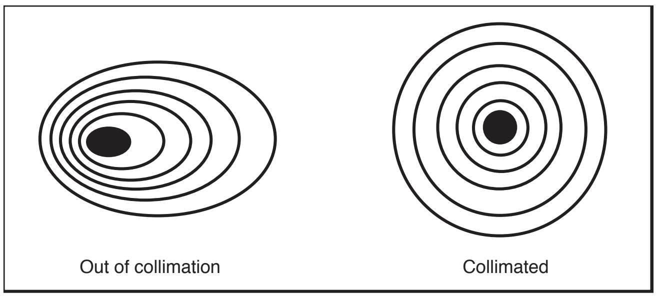

Figure 16. A star test will determine if the telescope's optics are properly collimated.

Cleaning Mirrors

You should not have to clean the StarBlast 6's primary mirror very often, if ever. Covering the telescope with the dust caps on the front opening and on the focuser when not in use will help prevent dust from accumulating on the mirrors. When bringing the telescope inside after an evening's viewing it is normal for moisture to accumulate on the mirror due to the change in temperature. We suggest leaving it uncovered overnight to allow this condensation to evaporate. Improper cleaning can scratch mirror coatings, so the fewer times you have to clean the mirrors, the better. Small specks of dust or flecks of paint on the mirror have virtually no effect on the visual performance of the telescope.

If you believe your telescope primary mirror needs cleaning, please email us at: support@telescope.com or contact Orion Technical Support at (800) 676-1343.

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.

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