

STARFIELD

INSTRUCTION MANUAL



STARFIELD HORIZON SERIES 70mm TELESCOPE

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THANK YOU

Thank you for your purchase of a Starfield Horizon Series 70mm Telescope. Your Starfield Horizon Series is built with the highest-quality optics and materials to provide years of reliable operation and discovery. Starfield telescopes are precision astronomical instruments designed for ease of use and versatility in their application. Proper care should be given when using any telescope. Some technical knowledge of optical properties and stellar movements are helpful to enhance your experience.

HORIZON SERIES SPECIFICATIONS

SPECIFICATIONS	
Telescope Type	Refractor
Aperture	70 mm (2.8")
Focal Length	700 mm
Focal Ratio	F/10
Optical Coating	Fully Multi Coated
Finder Scope	Red Dot (Reflex)
Eyepiece 1	25 mm - 1.25" (28x)
Eyepiece 2	10 mm - 1.25" (70x)
Barlow Lens	3x
Lowest Magnification	28x
Highest Magnification	210x
Highest Useful Magnification	175x
Moon Filter	No
Mount	Altazimuth
Telescope and Tripod Weight	8.8 Lbs / 4 kg

WARNING

- Do not use telescope or finder scope to look at the sun without an appropriate solar filter. Doing so will cause permanent and irreversible eye damage.
- Never use an eyepiece filter as a solar filter. Only solar filters will completely cover the opening of the optical tube and provide proper eye protection.
- Ensure proper tightening of screw before beginning operation of the telescope.
- Do not drop or shake your telescope as doing so will damage the optics, harm you or the people around you.
- Please use caution when loosening the adjustment knobs to ensure no damage is caused to the optical tube assembly.

ASSEMBLY - PARTS LIST & INITIAL SETUP

ASSEMBLY

This section covers the assembly instructions for your Horizon Series 70mm telescope. The telescope should be set up indoors for the first time so that it is easy to identify the various parts and familiarize yourself with the correct assembly procedure before setting it up outdoors.

Unpack and lay out all of the parts in a large, clear area where you will have room to assemble the pieces. Verify that all parts and accessories are present using the list below and Figure 1 for reference.

PARTS

1. Objective Lens
2. Mounting Plate
3. Tripod Head Platform
4. Tripod Legs
5. Accessory Tray (See Figure 3)
6. Tripod Pan Handle
7. Focus Knob
8. 45° Diagonal, 1.25"
9. Eyepieces - 2 included (25mm & 10mm)
10. Focusing Tube
11. Red Dot Finder scope
12. Telescope Optical Tube
13. 3x Barlow Lens (See Figure 12)

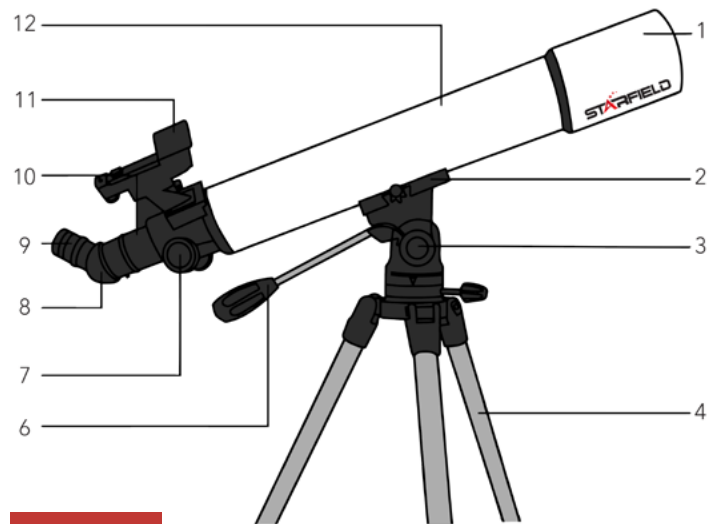


Figure 1

SETUP

1. Fully extend the legs of the tripod apart.
2. Place the telescope tube by sliding it over the tripod platform (Figure 2). Tighten the tripod platform screw firmly.
3. Place the accessory tray on the tripod center brace so that the hole is aligned in the center and rotate the tray until the tabs on its three points fit into the brackets on each arm (Figure 3). It may be a little hard to turn at first, don't worry this is normal.
4. Remove the caps from the telescope.

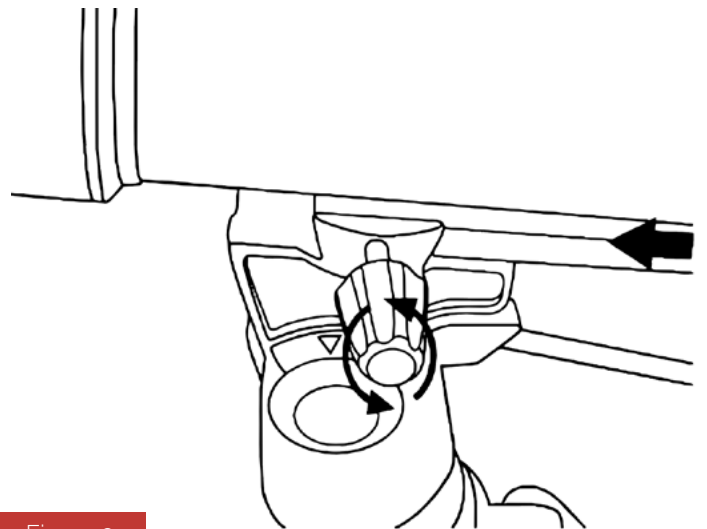


Figure 2

Important: Both telescope front caps need to be removed, not just the small center cap.

ASSEMBLY - INSTALLING THE DIAGONAL, EYEPIECE & FINDER SCOPE

Tip: To improve the stability of the system, take a plastic bag and add some weight in it (you can use any heavy item, some books or even rocks). Attach the bag to a wire underneath your telescope's accessory tray (Figure 3). This way your telescope even more stable.

Unpack and lay out all of the parts in a large, clear area where you will have room to assemble the pieces. Verify that all parts and accessories are present using the list below and Figure 1 for reference.

The diagonal is a prism that diverts the light at a specific angle to the light path of the telescope. This allows you to observe in a position that is more comfortable than if you had to look straight through. Your telescope comes with a diagonal that reflects the light at a 45° angle.

To install the diagonal:

1. Remove the caps from both sides of the diagonal.
2. Loosen the setscrews on the back of the focuser.
3. Insert the chrome barrel end of the diagonal all the way into the rear opening of the telescope tube (Figure 4), then tighten the thumb screw. You can rotate the diagonal to any position by loosening the setscrews.

Eyepieces are multi-lens components that allow you to achieve different magnifications with your telescope. You cannot start observing with just a telescope and no eyepieces. Your telescope comes with two eyepieces, a low power eyepiece (25 mm) and a high power eyepiece (10 mm). Whenever you set up your telescope, always start with the 25 mm eyepiece. Once you have your target centered in the 25 mm eyepiece, you can switch to your 10 mm eyepiece to get a more detailed view.

To install the eyepiece:

1. Loosen the setscrews on the open end of the diagonal.
2. Put the chrome barrel end of one of the eyepieces into the diagonal and tighten the thumb screw to secure the eyepiece (Figure 5). We recommend starting with the 25 mm eyepiece.
3. The eyepieces can be changed to other focal lengths by reversing the procedure above.

To see the sharpest image possible, you need to focus by looking through the eyepiece and slowly turning the focusing knobs (see Figure 5) until you find the sharpest image.

Locating objects simply by looking through the telescope is very difficult. A finder scope is a device that helps you manually point the telescope and locate the desired object more easily. This finder scope has a reflex sight that uses a red LED to project a red dot into the round glass.

When you look through the finder, you will see the red dot overlaid on your target. The first time you mount the telescope, you must align the finder with the telescope optic tube. We recommend that you do this step during the day because it will be much easier.

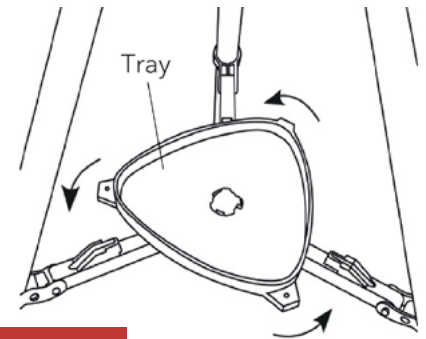


Figure 3

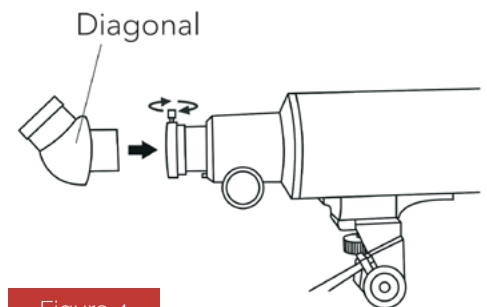


Figure 4

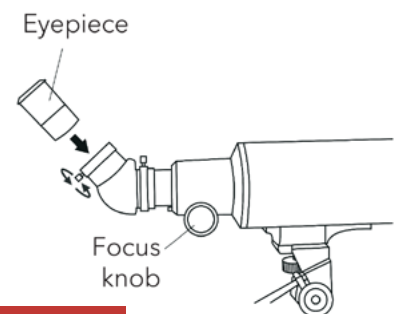


Figure 5

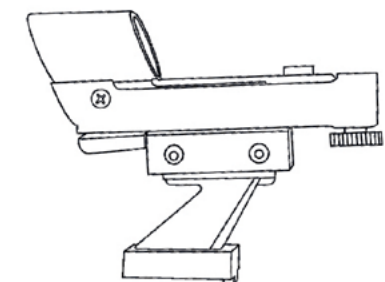


Figure 6

ASSEMBLY - ALIGNING THE FINDER SCOPE

To install and replace the battery:

Turn the finder over, you will see the battery compartment that is located under the red dot sight (Figure 7). Using a small screwdriver or fingernail, gently lift the cover up to remove it. Place the battery in the compartment, under the contact tab, making sure the positive battery terminal (the side marked " + ") is pointing up toward the spring contact. Replace the battery cover.

Note: This finder uses a CRI 632 3V battery. If the battery runs out, you can find a replacement battery at Amazon or clock and watch shop. We recommend a CRI 632 3V lithium battery (Panasonic, Energizer or similar).

To install the red dot finder:

1. Locate the finder scope bracket on the telescope and loosen its screw (Figure 8).
2. Slide the finder into the bracket.
3. Tighten the screw with your fingers to secure it in place.

The red dot is produced by a light-emitting diode (LED); it is not a laser beam which means it cannot damage either your eye or the finder eyepiece.

To align the red dot finder:

1. Locate a distant daytime fixed object that is at least half a mile away (or 800 meters). Land objects during the daytime are a good way to get familiar with the functions and operations of the telescope. You can target the top of a telephone pole, a tower, a rooftop or a building.
2. Using the low power (25 mm) eyepiece, aim the main telescope to the selected target (Figure 9). It might appear blurry, turn the focus knob located near the rear of the telescope (see Figure 8) to try to get it as sharp as possible.
3. When the main telescope is pointing at the selected target, lock the tripod and the telescope position to make sure it doesn't move. If you accidentally move your telescope, center the object again through the eyepiece.
4. Once the object is centered in your 25 mm eyepiece, turn the finder on by turning the power switch wheel to ON, located on the side of the finder (Figure 7).
5. Place your eye about 10-20 cm behind the finder, look through the finder sight and locate the position of the object itself, it should be within the finder's field of view (Figure 9)
6. Without moving the telescope, use the two adjustment wheels on the right side and under the finder (Figure 10). One controls the left-right movement of the cross-hair, while the other controls the up-down movement. Adjust both until the red dot appears on the same object you are looking at in the 25 mm eyepiece (Figure 11).

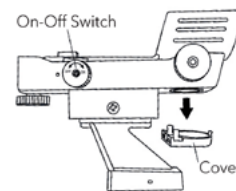


Figure 7

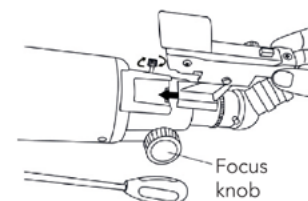


Figure 8

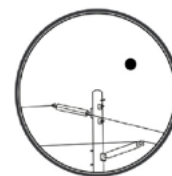


Figure 9

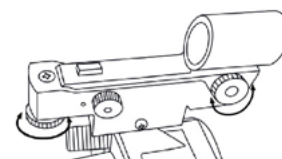


Figure 10

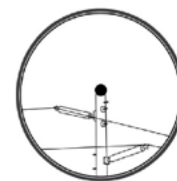


Figure 11

Important: Once the finder alignment process has been completed, remember to turn the finder off by turning the wheel to OFF. It is important not to leave the finder on when not in use so as not to wear out the battery.

USING THE TELESCOPE, FINDING OBJECTS & FOCUSING

With an aligned finder scope, look through the finder scope and center the desired object. You should now be able to see it through the eyepiece of the telescope. If necessary, adjust the horizontal adjustment and vertical to re-position the telescope so that the desired object can be centered.

Remember to start with the 25 mm eyepiece and, once you have an object centered in the telescope, you can change it to the 10 mm or use a Barlow lens to have a more magnified image. You can also use the phone adapter and your phone's zoom to get a more detailed image (see section Phone Adapter).

To focus your Horizon Series 70mm turn the focus knob located near the rear of the telescope (see Figure 12). Turning the knob counterclockwise allows you to focus on an object that is farther than the one you are currently observing. Turning the knob clockwise from you allows you to focus on an object closer than the one you are currently observing.

Your telescope also comes with a 3x Barlow lens which triples the magnifying power of each eyepiece. However, the greatly magnified images should only be used under ideal conditions (see the next section of this manual, Calculating Magnification). To use the Barlow lens remove the eyepiece and insert the Barlow into the diagonal. Then insert an eyepiece into the Barlow lens for viewing (Figure 12).

Note: We do not recommend using the 3x Barlow lens right at the beginning of your observing sessions, but once you've used your telescope with just an eyepiece and want to get a more detailed image of your target.

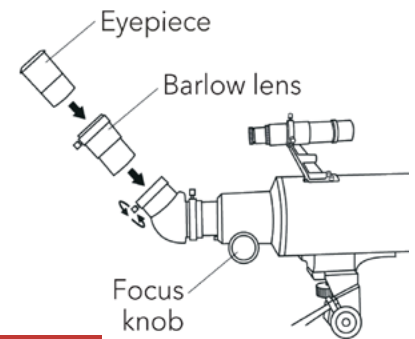


Figure 12

You can change the power of your telescope just by changing the eyepiece (ocular). To determine the magnification of your telescope, simply divide the focal length of the telescope by the focal length of the eyepiece used. In equation format, the formula looks like this:

Let's say, for example, you are using the 25 mm eyepiece that came with your telescope. To determine the magnification you divide the focal length of your telescope (the Horizon Series for this example has a focal length of 700 mm) by the focal length of the eyepiece, 25 mm. Dividing 700 by 25 yields a magnification of 28x.

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

Although the power is variable, every telescope under average skies has a limit to the highest useful magnification. The general rule is 2.5x power can be used for every millimeter (mm) of aperture (or 50x power for every inch of aperture). For example, the Horizon Series 70mm is 70 mm in diameter. Multiplying 2.5 by 70 gives a maximum useful magnification up to 175 power. Although this is the maximum useful magnification, most of your observing will be done at low powers which generate images of better quality (brighter and sharper).

The following magnification levels can be achieved when using the included 25 mm and 10 mm eyepiece and with the 3x Barlow lens:

Telescope Focal Length	Eyepiece Focal Length	Magnification	Magnification with 3x Barlow Lens
700 mm	10 mm	70x	210x
700 mm	25 mm	28x	84x

USING THE PHONE ADAPTER

Note: Higher powers are used mainly planetary and deep sky observing, where you can greatly enlarge the image, but remember that the contrast and brightness will be very low due to the high magnification. When using the 10 mm eyepiece together with the 3x Barlow lens, the telescope gives extremely high power and can be used on rare occasions - you will achieve the power but the image will be darker with lower contrast because you will have magnified it to almost the maximum possible. For the brightest images with the highest contrast levels, use lower powers.

Your telescope comes with our phone adapter to take pictures of the many beautiful celestial objects that you will find in the night sky. It's a very simple accessory that will allow your phone to align easily with your telescope. It will fit almost every smartphone available on the market, and it can also be used in other optical instruments such as binoculars, monoculars and spotting scopes (not just telescopes).

Note: This phone adapter may not work with all telescope accessories. The phone adapter requires the eyepiece or ocular lens to have a solid, unyielding surface (see Figure 15). Some accessories will have small rubber eye cups around them, which could interfere with the performance of this phone adapter.

To use the phone adapter:

1. Once your telescope is assembled and ready to use, center it in your target and focus the image.
2. Lock the tripod and the telescope position. This has to be done before attaching the phone adapter, or the weight of your phone will move the telescope's position.
3. Adjust the length of the adapter to the phone and tighten the screw until the phone is secure (Figure 13).
4. Align the small circle hole of the adapter with the phone's camera and tighten its screw (Figure 14). They must be centered.
5. The adapter is now ready to use. Attach to your telescope's eyepiece and rotate the main wheel until it attaches to the eyepiece (Figure 15).
6. Once they are attached, open your phone's camera and make sure it is aligned with your telescope. You should see a circle in the center of your phone. If that's not the case, make sure the small circle hole of the adapter is aligned with the phone's camera (step 4).
7. You might need to refocus the telescope looking through your phone's camera to get the sharpest image possible.

Note: We do not recommend using the phone adapter with the 3x Barlow lens. The magnification will be higher but you will lose most of the image quality. It will also be difficult to take pictures without moving the image. You may find useful buying a camera remote control.

Important: Zoom in with your mobile phone to get a full-size image (full screen) instead of a circle.

The tripod of a telescope cannot be too high because it would lose a lot of stability and make celestial observation considerably more difficult. This is why we recommend sitting down when using your telescope. You can rotate the diagonal prism to the side towards where you are sitting to make it easier to use the telescope while sitting down (Figure 16).

We recommend getting a specific chair or stool for telescopes or camping, which are usually light and easy to carry. Ideally, it should be foldable and height adjustable to achieve the right height in the various positions the telescope points to.

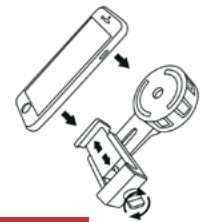


Figure 13

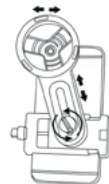


Figure 14

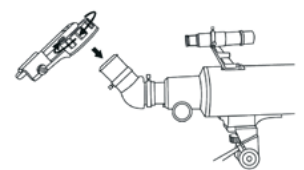


Figure 15



Figure 16

CELESTIAL OBSERVING

Now you are ready to take your telescope out at night and do some real observing!

Let's start with the Moon. The Moon takes about one month to go through a complete phase cycle, from New Moon to Full Moon and back again. Try observing it at different points during this cycle.

While you can observe the Moon any time it is visible in the night sky, the best time to view it is from two days after a New Moon up to a few days before a Full Moon. During this period, you will be able to see the most detail in craters and lunar mountain ranges. Consult a calendar to find out when the next New Moon will be.

Unlike fixed targets on the ground, astronomical objects appear to move across the sky due to Earth's rotation. When you look at a celestial object in your telescope, such as the Moon, it will slowly drift across the field of view of your eyepiece. To keep the object centered in the field of view, you will have to adjust the telescope direction.

Lunar Observing Hints:

To increase contrast and bring out detail on the lunar surface, use optional filters. See section Useful Optional Accessories for more information.

Other fascinating targets include the five naked eye planets. You can see Venus go through its lunar-like phases. Mars can reveal a host of surface detail and one, if not both, of its polar caps. You may be able to see the rings of Jupiter and the great Red Spot (if it is visible at the time you are observing). In addition, you will also be able to see the moons of Jupiter as they orbit the giant planet. Saturn, with its beautiful rings, is visible at moderate power.

Deep sky objects are those celestial bodies outside the boundaries of our solar system. They include star clusters, planetary nebulae, diffuse nebulae, double stars, and other galaxies outside our Milky Way. Unlike the Sun, the Moon, and our five major planets, most objects in the deep sky are not visible to the naked eye. Most of them are very large. So, an average power eyepiece is all you need to observe them.

Astronomical Observation Tip:

Remember that atmospheric conditions are often the limiting factor on the amount of planetary detail that will be visible. Therefore, avoid observing the planets if they are low on the horizon or when they are directly above a source of radiant heat, such as a roof or chimney. To observe the bodies in the deep sky you should make sure that the sky is as dark as possible. The further you are from city lights, the better you will see these objects in your eyepiece.

Although overlooked by many amateur astronomers, solar observation is both rewarding and fun. However, because the Sun is so bright, special precautions must be taken when observing our star so as not to damage your eyes or your telescope.

For safe solar viewing, use a proper solar filter that reduces the intensity of the Sun's light, making it safe to view. With a filter you can see sunspots as they move across the solar disk and faculae, which are bright patches seen near the Sun's edge.

Solar Observing Tips:

1. The best time to observe the Sun is in the early morning or late afternoon when the air is cooler.
2. To center the Sun without looking into the eyepiece, watch the shadow of the telescope tube until it forms a circular shadow.
3. It is best to remove the finder scope from the telescope to prevent someone from looking through it because it will not have a sun filter.

NOTES ON OBSERVING, TELESCOPE CLEANING & MAINTENANCE

While observing through the telescope avoid touching the eyepiece or placing the tripod on uneven ground. Vibrations can cause the image in the telescopic field of view to move.

Observing through a window is not recommended because the window glass will distort images considerably. And an open window can be even worse, because warmer indoor air will escape out the window, causing turbulence which also affects images.

Have in mind that astronomy is an outdoor activity. When setting up your telescope outdoors, allow it to reach the surrounding temperature before observing. Waiting 10 to 20 minutes before using it will be enough.

When observing at night allow a few minutes for your eyes to become "dark adapted" prior to observations. Use a red light flashlight or headlamp to protect your night vision when reading star maps, or inspecting components of the telescope.

Avoid looking across objects that produce heat waves, such as asphalt parking lots during the day. Images viewed may appear blurry or distorted.

Looking at or near the sun will cause instant and irreversible damage to your eye(s). Eye damage is often painless, there is no warning to the observer that the damage has occurred until it is too late. Do not point the telescope at or near the sun without taking the precautions needed. Children should always have an adult supervising when using this telescope.

CAUTION: NEVER LOOK DIRECTLY AT THE SUN WITH THE NAKED EYE OR WITH A TELESCOPE UNLESS YOU HAVE THE PROPER SOLAR FILTER AND OTHER NECESSARY EQUIPMENT. PERMANENT AND IRREVERSIBLE EYE DAMAGE MAY RESULT.

If you give your telescope reasonable care, it will last a lifetime. It should rarely need any maintenance work. Store it in a clean, dry, dust-free place, safe from rapid changes in temperature and humidity.

Do not store the telescope outdoors. Small components like eyepieces and other accessories should be kept in its protective transport bag. Keep the dust cover on the telescope when it is not in use.

Cleaning Optics:

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.

ADDITIONAL OPTIONAL ACCESSORIES AND WARRANTY INFORMATION

2x Barlow Lens - A Barlow 2x increases 2 times the magnification of any eyepiece it is used with. Having a 2x Barlow lens will be very useful to combine with the eyepieces already included. This Barlow lens is ideal for deep sky observation (Figure 17).

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. With the Horizon Series 70mm we recommend a 25% transmission Moon filter, which will let through 25% of the light (Figure 18). A 25% transmission Moon filter is great up to around a 4" aperture of your telescope (100 mm aperture). Anything bigger than that and you should be choosing a 13% filter.

Planetary Filters - Although we recommend starting with a 25% moon filter for your Horizon Series 70mm telescope, there are also color filters that will enhance your planetary observation. There are many different types of color filters, you can look for a set of 4 or 5 filters that will work for planets and nebulae.

Headlamp - The red light of a headlamp (Figure 19) is ideal for using the telescope or reading star maps, it will help you see in the dark without losing the adapted night vision that your eyes adapt. Any white light source such as a mobile phone will make your eyes lose this adapted night vision in a fraction of a second. In addition, a headlamp will allow you to keep your hands free.

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.

Astronomy Binoculars - Getting yourself a pair of astronomy binoculars it's going to be a great complement for your night sky observation.

Warranty Information:

The Starfield Horizon Series 70mm telescope is warranted against defects in materials or workmanship for a period of one year from the date of purchase. This warranty does not include damage caused by abuse, improper handling, installation, maintenance, normal wear-and-tear, unauthorized repairs or modifications and tampering in anyway. This warranty is limited to the original purchaser and is not transferable. This warranty covers only one replacement during its period. Starfield Optics reserves the right to replace or repair.

Should you have questions about your Starfield telescope, please visit www.starfieldoptics.com for more information.



Figure 17

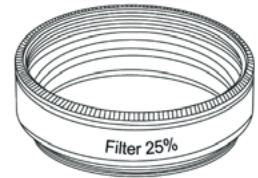


Figure 18



Figure 19

STARFIELD

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