

## Orion® VersaGo E-Series 90mm Altazimuth Refractor

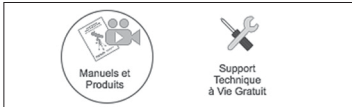
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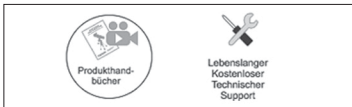


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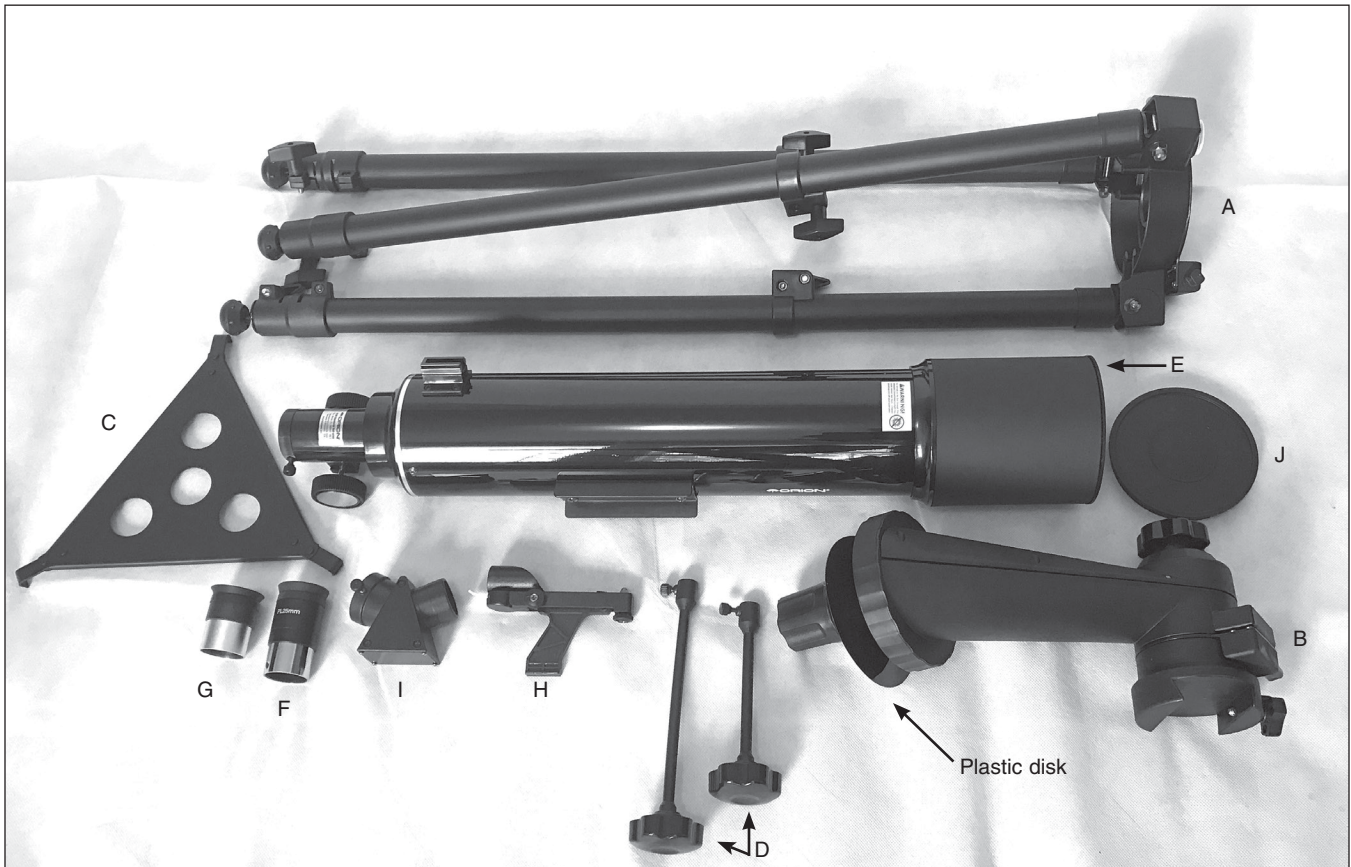
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**Congratulations on your purchase of a quality Orion product.** The VersaGo E-Series 90mm Altazimuth Refractor is a versatile and easy-to-use telescope designed for exploring scenic daytime vistas as well as scanning the night skies for celestial treasures.

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



**Figure 1.** Included parts of the VersaGo E-Series Mount

## Included Parts

Unpack all of the parts and lay them out in your workspace. Make sure all the parts listed below and shown in **Figure 1** are present. Save the shipping box and packaging material. In the unlikely event that you need to return the mount, you must use the original packaging. Initial assembly of the mount is easy and should take only about 15 minutes.

**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 List

- |   |                                      |
|---|--------------------------------------|
| A | Tripod                               |
| B | Altazimuth arm                       |
| C | Accessory tray and leg brace         |
| D | Micro-motion cables (short and long) |
| E | Optical tube                         |
| F | 25mm Plossl eyepiece, 1.25"          |
| G | 10mm Plossl eyepiece, 1.25"          |
| H | Red dot finder scope                 |
| I | 45-degree correct-image diagonal     |
| J | Dust cap                             |
| K | MoonMap 260 (not shown in Fig. 1)    |

# 1. Assembly

1. Stand the tripod (A) upright and spread the legs apart a little. Keep the tripod legs at their shortest (fully retracted) length for now; you can extend them to a more desirable length later, after the mount is fully assembled.
2. To attach the accessory tray (C), place a hooked tab on one of the three corners of the tray over the screw in the leg collar, as shown in **Figure 2A**. Connect the tray to the other two legs in the same manner (**2B**), then tighten all three of the tray lock knobs (**2C**) to secure the tray in place.
3. Now you'll install the altazimuth arm (B) onto the tripod. Remove the azimuth tension knob and washer from the center shaft on the bottom of the arm. Then place the base of the arm on the tripod's mounting platform, inserting the center shaft into the hole in the tripod's mounting platform. (**NOTE: The large plastic disk, which is identified in Figure 1, goes between the mounting arm and the tripod's mounting platform.**) Then replace the washer and azimuth tension knob to secure the arm in place (**Figure 3**).
4. Attach the two micro-motion cables (D). The shorter of the two is usually preferred for the altitude axis and the longer one for the azimuth axis. Loosen the thumbscrew at the end of the cable, then line up the cable end so that the thumbscrew is over the flat side of the axle on each axis (**Figure 4**). Press the cable end over the axle, then tighten the thumbscrew to secure the cable in place. The thumbscrew should protrude down into the dimple in the axle, to insure that the cable will not slip off the axle. Once attached the micro-motion cables should appear as in **Figure 5**.

## Attaching the Telescope Optical Tube to the Mount

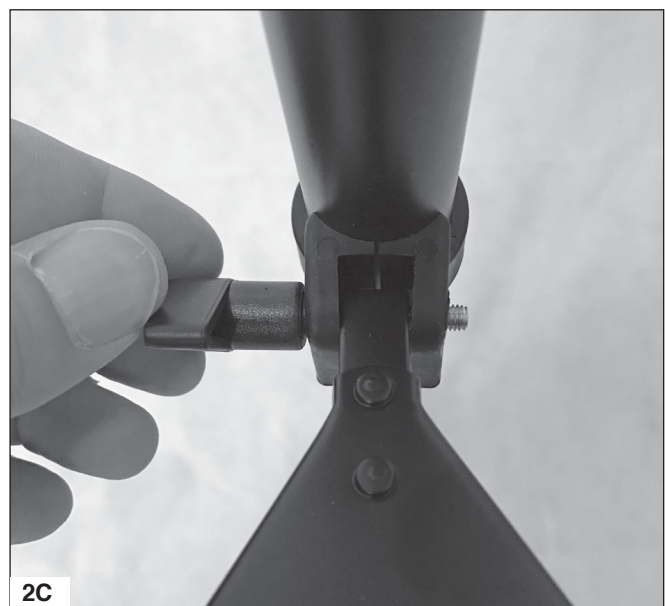
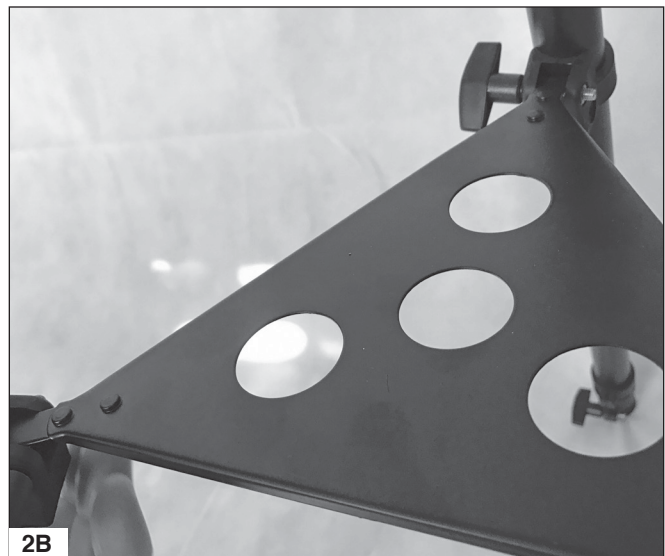
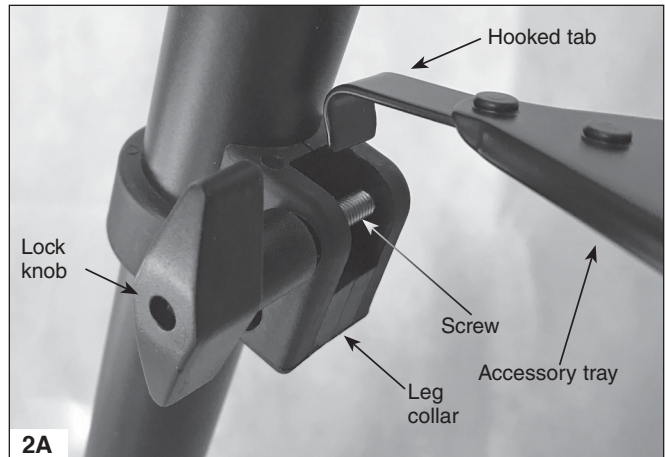
The E-Series Altazimuth Mount features a dovetail mounting saddle that accommodates Vixen-style mounting bars (**Figure 6A**). Slide the dovetail bar attached to the side of the optical tube into the saddle, then secure it in place by tightening the saddle lock knob (**Figure 6B**). (You may have to loosen the saddle lock knob a little before attempting to slide in the dovetail bar, to allow clearance for the bar.)

## Installing the Accessories

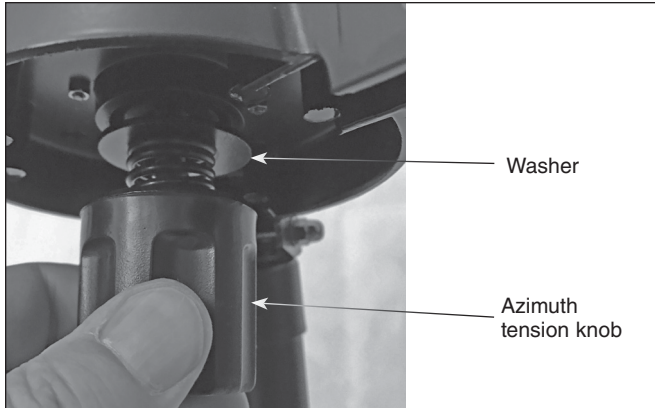
With the tube now securely attached to the mounting arm, install the red dot finder scope (H) on the optical tube. Do this by orienting the finder scope as shown in **Figure 7** and slide the bracket foot back into the finder scope base as far as it will go.

Now insert the correct-image diagonal (I) into the focuser drawtube and tighten the thumbscrew on the drawtube collar. Then insert the 25mm eyepiece (F) into the diagonal (**Figure 8**).

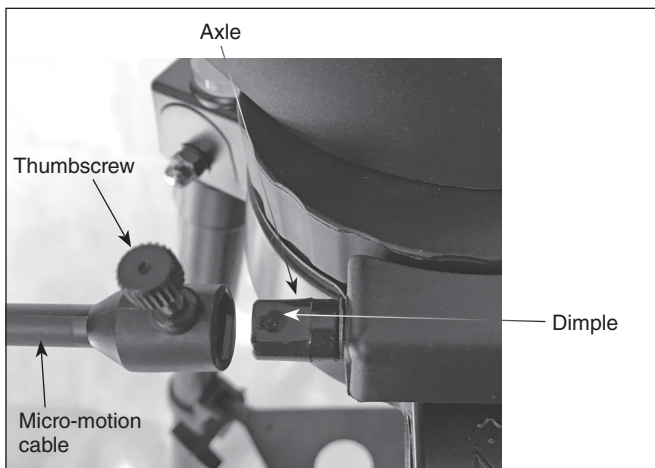
The telescope is now completely assembled and should appear as in **Figure 9**! Before it can be effectively used, however, there are a couple of things to do to prepare the telescope for operation.



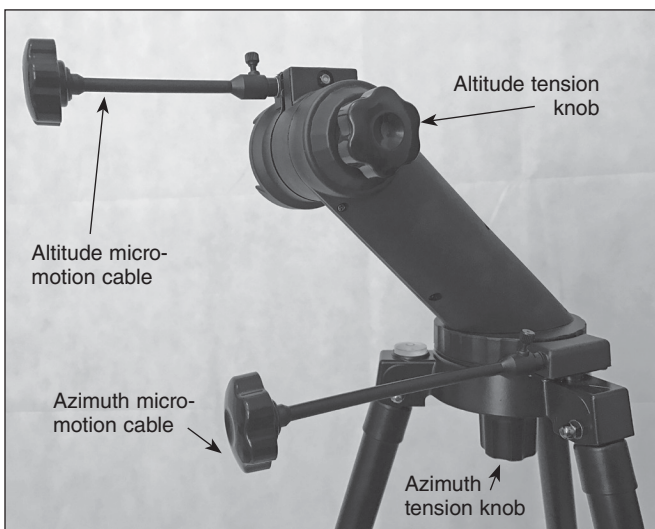
**Figure 2.** A) Hook the tray corner over the screw in the leg collar, B) Repeat for the other two legs, then C) Tighten all three tray lock knobs



**Figure 3.** Secure the altazimuth arm to the tripod with the washer and azimuth tension knob.



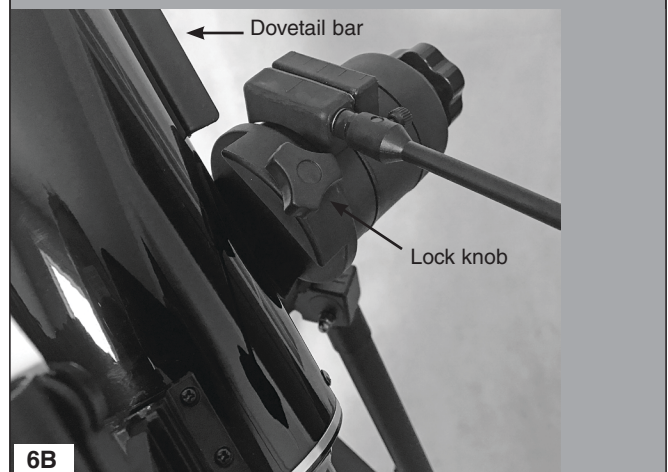
**Figure 4.** When attaching the micro-motion cables, make sure the thumbscrew is directly over the dimple on the flat side of the axle.



**Figure 5.** The mount has two large tension knobs and two micro-motion cables to allow precise movement of your instrument.

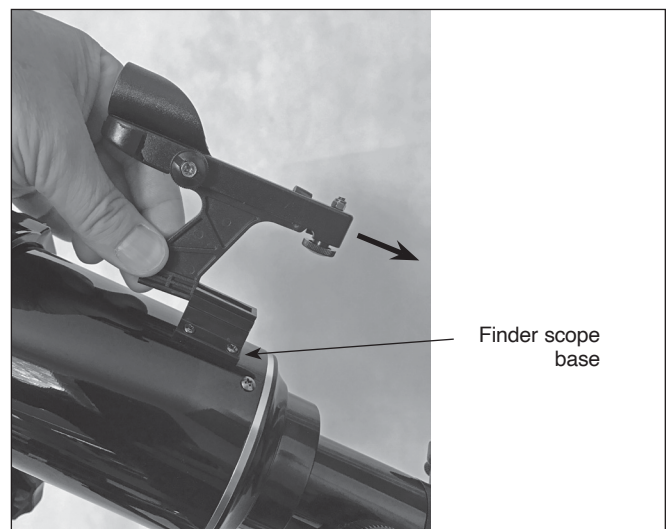


**6A**



**6B**

**Figure 6. A)** The dovetail saddle **B)** Slide the dovetail bar on the optical tube into the saddle of the mounting arm, then tighten the lock knob to secure the instrument onto the mount.



**Figure 7.** Slide the red dot finder scope's bracket into its base.



**Figure 8.** Install the diagonal and an eyepiece in the focuser as shown.



**Figure 9.** The fully assembled VersaGo E-Series 90mm Altazimuth Refractor

## Preparing the Telescope for Operation

### Aligning and Using the Red Dot Finder Scope

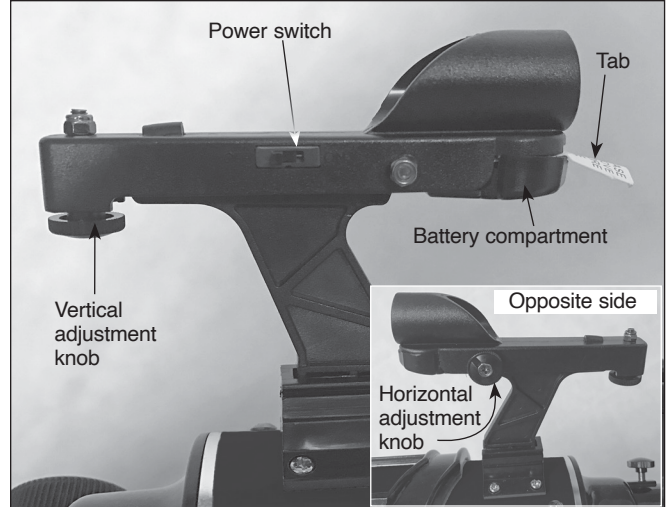
The included red dot finder scope (H) makes pointing your telescope almost as easy as pointing your finger! It's a non-magnifying aiming device that superimposes a tiny LED-illuminated red dot on the sky, showing exactly where the telescope is pointed. It permits easy object targeting prior to observation in the higher-power main telescope.

Before you can use the red dot finder scope, you must remove the tab sticking out from the battery compartment (**Figure 10**).

Doing so will allow the pre-installed 3V CR-2032 button cell battery to make contact with the finder scope's electronic circuitry to power the finder's red LED illuminator. The tab can then be discarded.

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

1. First, remove the dust cap (J) from the front of the telescope.
2. With the star diagonal and 25mm eyepiece already in place, 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. Center the target in the eyepiece by moving the optical tube by hand, with the altitude and azimuth tension knobs slightly loosened to allow easy movement in both axes), then by turning the slow-motion cables as needed to center the target object.
3. Now that a distant target is centered in the main telescope's eyepiece, turn on the red dot finder scope by sliding the power switch to ON (refer to **Figure 10**). Position your eye at a comfortable distance from the rear of the unit. Look through the round window of the finder scope with both eyes open to see the illuminated red dot. The target object



**Figure 10.** The red dot finder scope has vertical and (inset) horizontal adjustment knobs for aligning it with the telescope.

should appear in the field of view somewhere near the red dot.

**NOTE:** This finder has two brightness settings. When the switch is set all the way over to the ON position, the red dot is brightest. But in between the OFF and ON positions is a middle setting in which the red dot is dim. Typically the dim setting is used under dark skies and the brighter setting is used under light-polluted skies or in daylight.

4. 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 10**) to position the red dot on the object.
5. When the red dot is centered on the distant object, check to make sure the object is still centered in the telescope's eyepiece. If it isn't, re-center it then adjust the finder scope's alignment again. When the object is centered in the telescope eyepiece and on the finder scope's red dot, the finder scope is properly aligned with the telescope. The red dot finder scope's alignment should be checked before every observing session.

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

## 2. Using the VersaGo E-Series Mount

The VersaGo E-Series mount allows motion in two axes: altitude (up and down) and azimuth (left and right). Hence, the VersaGo E-Series is an "altazimuth" mount. To make coarse movements of your instrument, loosen the azimuth tension knob and/or the altitude tension knob (see **Figure 5**) to slew the instrument to your target. Then lightly retighten the knob(s). When set to the

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proper tension – not too tight and not too loose — you should be able to move the instrument without having to adjust the tension knobs each time. The friction will be sufficient to allow the instrument to move but also to stay put when you let go of it to observe. To make finer directional adjustments to the instrument, turn the hand knobs on the micro-motion cables.

The azimuth axis is rotatable 360 degrees and the altitude axis has 180 degrees of motion.

### **Tripod Height Adjustment**

There is a leg extension segment on each tripod leg to allow quick height adjustment. Simply loosen the winged leg lock knobs half a turn or so, extend the leg to the desired length, then retighten the winged knobs.

### **Tripod Feet**

Note that at the bottom of each tripod leg is a rubber foot. If desired, the foot can be retracted by rotating it clockwise to expose a metal spike, when needed for extra grip on slippery surfaces. If the spikes are not needed, rotate the rubber foot counterclockwise until the spike is recessed in the foot and no longer protruding.

### **Accessory Tray**

The triangular accessory tray acts as a tripod leg brace as well as a storage rack for 1.25" telescope eyepieces or accessories. The four holes in the tray accommodate the barrels of 1.25" accessories.

## **3. 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 magni-

fications. 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 nebulae, galaxies, and star clusters—or even very many stars, for that matter. Your eyes take about 30 minutes to reach perhaps 80% of their full dark-adapted sensitivity. As your eyes become dark-adapted, more stars will glimmer into view and you’ll be able to see fainter details in objects you view in your telescope.

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

### **Eyepiece Selection**

Magnification, or power, is determined by the focal length of the telescope and the focal length of the eyepiece being used. Therefore, by using eyepieces of different focal lengths, the resultant magnification can be varied. It is quite common for an observer to own five or more eyepieces to access a wide range of magnifications. This allows the observer to choose the best eyepiece to use depending on the object being viewed and viewing conditions. Your VersaGo E-Series 90mm refractor comes with 25mm and 10mm 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:

$$\frac{600 \text{ mm}}{25 \text{ mm}} = 24x$$

**For example**, the VersaGo E-Series 90mm has a focal length of 600mm, which when used with the supplied 25mm eyepiece yields:

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$$\frac{600 \text{ mm}}{10 \text{ mm}} = 60x$$

The magnification provided by the 10mm eyepiece is:

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

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 *VersaGo E-Series 90mm refractor* has an aperture of 90mm, or 3.5 inches, so the maximum magnification would be about 175x (3.5 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!

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 (**Figure 8**) forward or back until you see your target object (e.g., stars, the Moon, etc.) in the eyepiece. Then make finer adjustments until the image is sharp. If you're having trouble achieving initial focus, rack the focuser drawtube all the way in using the focus wheels, then while looking into the eyepiece slowly turn the focus wheels so that the drawtube extends outward. Keep going until you see your target object come into focus. Note that when you change eyepieces you may have to adjust the focus a bit to get a sharp image with the newly inserted eyepiece.

### What to Expect

So what will you see with your telescope? The *VersaGo E-Series 90mm Altazimuth Refractor* provides great views both in daytime and at night. The 45-degree correct-image diagonal provides a normal, right-side-up image, which is important for daytime terrestrial viewing. For nighttime viewing of celestial objects, while there is no "right side up" in space, the normal, upright orientation will make moving the telescope to, say, center an object in the eyepiece very intuitive. However, if you would prefer a 90-degree "star" diagonal for a more comfortable viewing position when observing objects overhead, one can be purchased separately. Note, though, that a standard star diagonal will render a mirror reversed image in the eyepiece, rather than a correctly oriented image. So we do not recommend a star diagonal for terrestrial viewing.

For celestial viewing, 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 such as star clusters and nebulas. Do not expect to see colors in faint objects as you do in photographs, however. Most galaxies and nebulas will appear gray in color. Unlike a camera, which can record colors of faint objects in long exposures, our eyes are not sensitive enough to see such color except in a few of the brightest ones.

## Celestial Objects to Observe

### 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 & 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 starlike. Because planets are quite small in apparent size, optional higher-power eyepieces or a Barlow lens are recommended and often needed for detailed observations.

### 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.

**IMPORTANT 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

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“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.

Do not expect these objects 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 except in a few of the brightest ones. But as you become more experienced and your observing skills get sharper, you will be able to ferret out more and more sub-tle details and structure.

## 4. 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 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.

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

### Cleaning Optics

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

time, using a fresh lens tissue on each area. Never reuse tissues.

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

## 5. Specifications

Objective lens:	90mm (3.5") diameter, achromatic
Effective focal length:	600mm
Focal ratio:	f/6.7
Lens coatings:	Fully antireflection coated
Focuser:	Rack-and-pinion, accepts 1.25" accessories
Eyepieces:	25mm and 10mm Plossls, 1.25" barrel diameter, threaded for Orion filters
Eyepiece coatings:	Fully antireflection coated
Diagonal:	45-degree correct-image, 1.25"
Eyepiece magnification:	24x (with 25mm eyepiece) and 60x (with 10mm eyepiece)
Finder scope:	Red dot finder scope, two brightness levels
Mount:	Single-arm altazimuth
Azimuth range:	360 degrees
Altitude range:	180 degrees
Tripod:	Aluminum
Mount height, legs extended:	57-1/4"
Mount height, legs retracted:	36"
Total instrument weight:	8.5 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.

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