INSTRUCTION MANUAL

Orion®
GoScope™ 70

#9794 Portable Altazimuth Refractor Telescope

Figure 1. The GoScope 70.

ORION®
TELESCOPES & BINOCULARS
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Congratulations on your purchase of an Orion telescope. Your new GoScope 70 is the most portable telescope system ever developed by Orion. Since it fits completely in its included backpack case, you can take the GoScope on camping trips, day hikes, the beach, sporting events, vacations, and anywhere else you want to bring it. Great for daytime spotting or nighttime stargazing, the GoScope offers the entire family new worlds of fun.

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

Parts List

Optical tube assembly

Tripod

45° erect-image diagonal

20mm eyepiece

10mm eyepiece

EZ Finder II reflex sight

Objective lens cover

Backpack carry case

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.***

Assembly

Carefully remove all of the items from the shipping box. Make sure all the parts listed in the parts list are present. Save all boxes and packaging material. In the unlikely event you need to return the telescope, you should use the original packaging.

Assembling the telescope is very easy and quick to do. No tools are required. During assembly (and anytime for that matter), do not touch the any of the lenses of the telescope, eyepieces, or finder scope with your fingers. The optical surfaces can become dirty or damaged if touched. Never remove any lens assembly from its housing for any reason, or the product warranty and return policy will be voided.

Refer to Figure 1 during assembly.

1. Spread the legs of the tripod, and extend them to the desired length. Extend the legs by disengaging the leg clamps and pulling the leg sections out. Re-engage the clamps when done.
2. Remove the quick-release shoe from the top of the tripod. To do this, you must first push the quick-release lever (Figure 2a).
3. Attach the quick-release shoe to the mounting block on the GoScope optical tube (Figure 2b). Thread the stud on the shoe into the threaded hole in the mounting block. Use the knurled edge of the screw on the underside of the shoe to secure it to the tube. You can use a small flathead screw driver or the edge of a coin to firmly tighten the connection.
4. Attach the 45° erect-image diagonal to the optical tube. First remove the caps from the diagonal and unthread the cover on the rear of the GoScope. The knurled ring on the diagonal connects to the threads on the rear of the GoScope (Figure 3). Tighten this ring firmly. If you wish to change the orientation of the diagonal for a more comfortable viewing angle, you must first loosen the knurled ring on the diagonal. Rotate the diagonal to the desired viewing angle, and retighten the knurled ring to lock the diagonal into place.

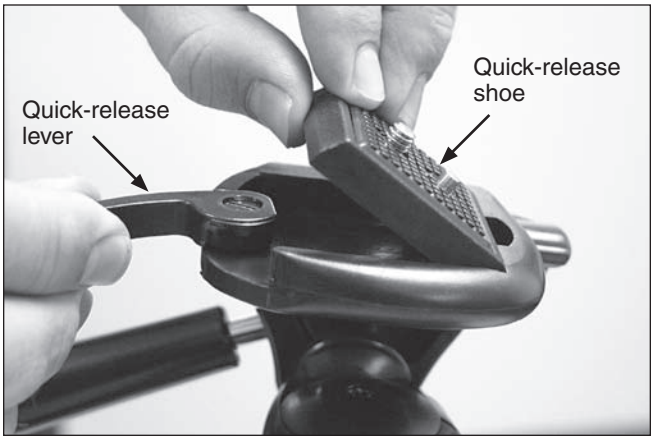

Figure 2a. Remove the quick-release shoe from the tripod by pushing the quick-release lever while simultaneously lifting the quick release shoe with the other hand.

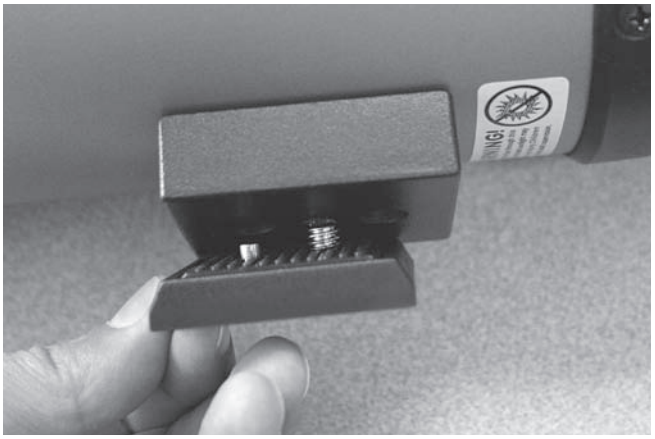

Figure 2b. Orient the quick-release shoe relative to the mounting block as shown.

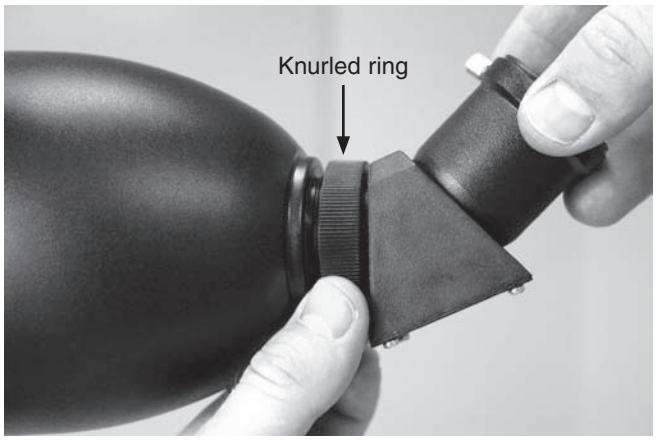

Figure 3. The knurled ring of the diagonal connects to the threads on the rear of the GoScope. To change the viewing angle, loosen the knurled ring, rotate the diagonal, then retighten the ring.

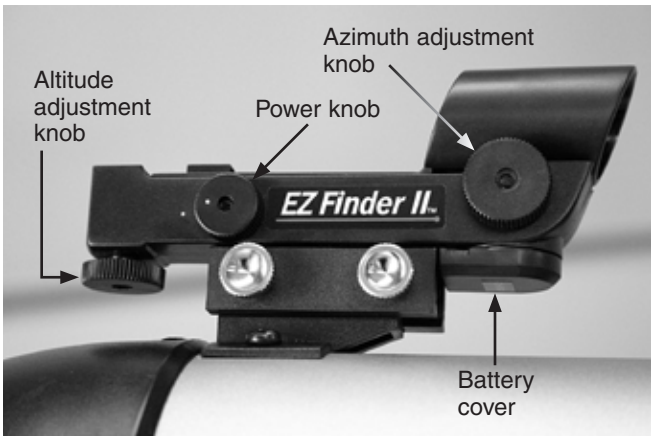

Figure 4. The EZ Finder II reflex sight.

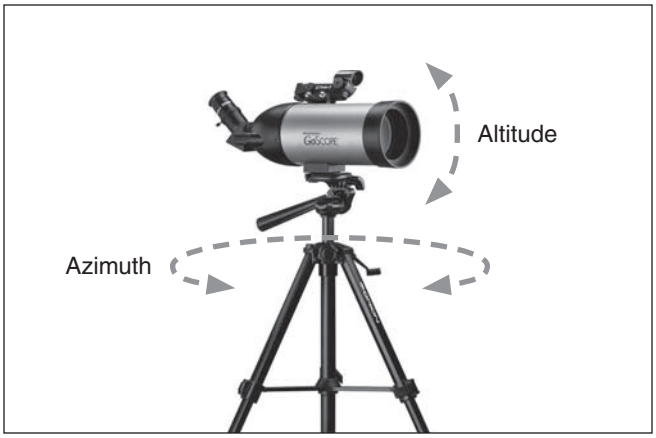

Figure 5. The GoScope tripod moves about two axes of motion: altitude (up-and-down) and azimuth (left-to-right).

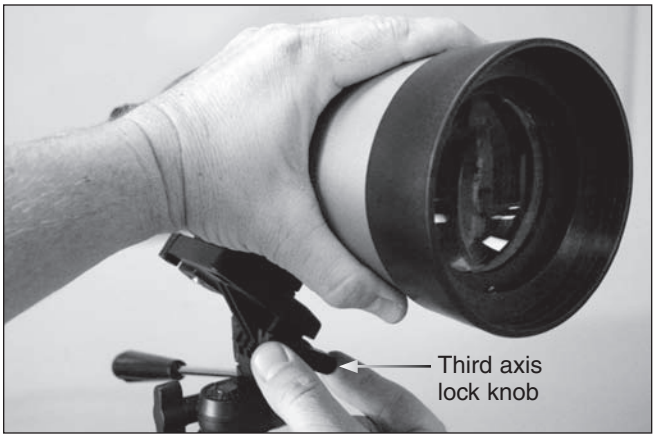

Figure 6. The tripod's third axis of motion is rarely, if ever, used.

5. Insert the 20mm eyepiece into the diagonal (remove the caps from the eyepiece). Secure the eyepiece with the thumbscrew on the diagonal.
6. Connect the EZ Finder II reflex sight to its bracket on the telescope tube. Loosen the two knurled silver thumbscrews on the reflex sight, and slide its base onto the rail on top of the bracket. The reflex sight should be oriented on the GoScope as shown in Figure 4. Retighten the knurled silver thumbscrews so the EZ Finder II is firmly connected to its bracket.
7. Re-connect the tripod's quick-release shoe, now with the GoScope attached, to the tripod. Push the quick-release lever to allow the shoe to seat onto the tripod head.

Your telescope is now fully assembled and should resemble Figure 1.

Using the Tripod

The tripod allows motion of the telescope either left-to-right (azimuth) or up-and-down (altitude) (Figure 5). To move the telescope in azimuth, first loosen the azimuth lock knob (Figure 1). You do not need to completely loosen this knob, as having some tension makes pointing the telescope easier. To move the telescope in altitude, first rotate the tripod handle (Figure 1) counterclockwise. Again, do not completely loosen the handle, or the telescope will move too freely and become difficult to point.

Once the telescope is pointing where you wish, you can re-tighten the azimuth lock knob and rotate the handle clockwise to lock the tripod position into place.

For additional tripod height, you can extend the elevator shaft of the tripod. First loosen the elevator shaft lock knob, and use the hand crank to raise or lower the telescope to the desired height (Figure 1). Tighten the lock knob firmly when done.

The tripod also has a third axis of motion, as the telescope can be rotated 90° to the left about the axis parallel to the telescope's body. Because this is a photo tripod, this feature allows you to rotate a camera from portrait to landscape mode. This feature will rarely, if ever, be used with a telescope. However, if you wish to rotate the telescope in this way, first loosen the third axis lock knob (Figure 6), make your adjustment and retighten the knob.

Focusing the Telescope

With the 20mm eyepiece inserted into the diagonal, move the telescope so the front end is pointing in the general direction of an object at least 1/4-mile away. Now with your fingers, slowly rotate the focus knob until the object comes into sharp focus. Go a little bit beyond sharp focus until the image starts to blur again, then reverse the rotation of the knob, just to make sure you've hit the exact focus point.

Do You Wear Eyeglasses?

If you wear eyeglasses, you may be able to keep them on while you observe. In order to do this, the eyepiece must have enough "eye relief" to allow you to see the entire field of view with glasses on. You can try this by looking through the eyepiece first with your glasses on and then with them off, and see if the glasses restrict the view to only a portion of the full field. Fold down the rubber eyeguard on the eyepiece in order to get your glasses (and eye) as close to the eyepiece lens as possible. If the glasses do restrict the field of view, you may be able to observe with your glasses off by just refocusing the telescope by the needed amount.

If your eyes are astigmatic, images will probably appear the best with glasses on. This is because a telescope's focuser can accommodate for nearsightedness or farsightedness, but not astigmatism. If you have to wear your glasses while observing and cannot see the entire field of view, you may want to consider purchasing additional eyepieces that have longer eye relief.

Operating the EZ Finder II Reflex Sight

The EZ Finder II reflex sight (Figure 4) makes pointing your telescope almost as easy as pointing your finger! It's a non-magnifying aiming device that superimposes a tiny red dot on the sky, showing exactly where the telescope is pointed.

The EZ Finder II works by projecting a tiny red dot (it's not a laser beam) onto a lens mounted in the front of the unit. When you look through the reflex sight, the red dot will appear to float in space. The red dot is produced by a light-emitting diode (LED) near the rear of the sight. A 3-volt lithium battery provides the power for the diode.

Remove the clear plastic tab near the battery cover; this tab prevents the batteries from accidentally being drained during shipment. Turn the power knob clockwise 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. Position your eye at a comfortable distance from the back of the sight. The intensity of the dot is adjusted by turning 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 daylight.

At the end of your observing session, be sure to turn the power knob counterclockwise until it clicks off. When the two white dots on the EZ Finder II's body and power knob are lined up, the EZ Finder II is turned off.

Aligning the EZ Finder II Reflex Sight

When the EZ Finder II 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 of the telescope's eyepiece. Alignment of the sight is easiest during daylight, before observing at night.

1. Aim the telescope at a distant object such as a telephone pole or roof chimney and center it in the telescope's eyepiece. The object should be at least 1/4 mile away. Now, with the EZ Finder II turned on, look though it. The object will appear in the field of view near the red dot.
2. Without moving the main telescope, use the EZ Finder II's azimuth (left/right) and altitude (up/down) adjustment knobs (Figure 4) to center the red dot on the object in the eyepiece.
3. When the red dot is centered on the distant object, check to make sure that the object is still centered in the telescope's field of view. If not, re-center it and adjust the EZ Finder II's alignment again. When the object is centered in the eyepiece and on the reflex sight's red dot, the EZ Finder II is properly aligned with the telescope and is ready to be used.

The EZ Finder II alignment should be checked before every observing session. Choose any distant target (during the day) or bright star (at night), center the object in the telescope's eyepiece, then adjust the knobs until the object is centered on the red dot of the reflex sight.

Replacing the Battery

Should the battery ever die, replacement 3-volt lithium batteries are available from many retail outlets. Remove the old battery by inserting a small flat-head screwdriver into the slot on the battery cover (Figure 4) and gently prying open the cover. Then carefully pull back on the retaining clip and remove the old battery. Do not over bend the retaining clip. Then slide the new battery under the battery lead with the positive (+) side facing down and replace the battery cover.

Magnification & Eyepieces

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. The GoScope comes with two eyepieces, which will suffice nicely to get started.

Magnification is calculated as follows:

$$\frac{\textbf{Telescope Focal Length}}{\textbf{Eyepiece Focal Length}} = \textbf{Magnification}$$

For example, the GoScope has a focal length of 350mm, which when used with the supplied 20mm eyepiece yields:

$$\frac{350mm}{20mm} = 17.5x$$

The magnification provided by the 10mm eyepiece is:

$$\frac{350mm}{10mm} = 35x$$

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 2x per millimeter of aperture is the maximum attainable for most telescopes. Your GoScope has an aperture of 70 millimeters, so the maximum magnification would be about 140x. This level of magnification assumes you have ideal conditions for viewing.

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!

Start by centering the object you wish to see in the 20mm eyepiece. Then you may want to increase the magnification to get a closer view. If the object is off-center (i.e., it is near the edge of the field of view) you will lose it when you increase magnification, since the field of view will be narrower with the higher-powered eyepiece.

To change eyepieces, first loosen the securing thumbscrew on the diagonal. Then carefully lift the eyepiece out of the holder. Do not tug or pull the eyepiece to the side, as this will knock the telescope off its target. Replace the eyepiece with the new one by sliding it gently into the holder. Re-tighten the thumbscrew, and refocus for your new magnification.

Terrestrial Viewing

Most users will use their GoScope extensively for viewing terrestrial (Earth-based) objects during daylight hours. It excels for viewing birds, wildlife, sporting events, vistas, or anything else you want to see close-up.

Remember to aim well clear of the Sun, unless the front of the telescope is fitted with a professionally made solar filter (available from Orion). Otherwise, permanent eye damage could result. Children should use the GoScope only with adult supervision.

Astronomical Observation

The GoScope also is a good telescope for casual stargazing. It can show much more than what is visible on Earth during the day. Once the Sun sets, there are literally thousands of objects in the night sky that can be inspected more closely. For many, this will be the first foray into the exciting world of amateur astronomy. The following information and observing tips will help you get 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 heat which 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 with your eyes, and the stars are twinkling noticeably, then the seeing is bad and you will be limited to viewing with low magnifications. Planetary and Moon observing may also be poor.

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 (brightness) of the faintest stars you can see with the unaided eye (6th magnitude or fainter 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. For optimal performance, allow at least 30 minutes for your telescope to cool to the temperature outdoors.

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 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, or you can cover the front of a regular incandescent flashlight with red cellophane or paper. Be aware, that nearby porch and streetlights and car headlights will ruin your night vision too.

Tracking Celestial Objects

When you observe a celestial object through the telescope, you'll see it drift slowly across the field of view. This is due to the rotation of the Earth. To keep it in the field, you will need to periodically update the telescope's position in altitude and azimuth. Objects will appear to move faster at higher magnifications, because the field of view is 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 NASA 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 except in a few of the brightest ones.

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, marias, 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 also 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 Sky Calendar at OrionTelescopes.com, or to charts published monthly in Astronomy, Sky & Telescope, or other astronomy magazines. Venus, Mars, Jupiter, and Saturn are the brightest objects in the sky after the Sun and the Moon. Other planets may be visible but will likely appear star-like. Because planets are quite small in apparent size, optional higher-power eyepieces are recommended and often needed for detailed observations. Not all the planets are generally visible at any one time.

C. The Stars

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

D. 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.

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 or atlas will come in handy for helping locate interesting deep-sky objects to view within the constellations.

Do not expect these subjects to appear like the photographs you see in books and magazines; 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 subtle details and structure.

Transporting the Telescope

The GoScope was designed for observers who want a telescope that is easy to transport. The entire telescope, including the optical tube and tripod, will fit into the provided backpack carry case. This makes the GoScope incredibly portable.

To use the backpack, you will need to disassemble the telescope system from the tripod. Remove the EZ Finder II from its bracket and place it into the front pocket of the backpack. Unthread the diagonal from the telescope and place it and the eyepieces into the front pocket too (Figure 7a). Disengage the quick-release shoe from the tripod, and remove the optical tube from the tripod. Place the tube into one of the main compartments of the backpack. Retract the tripod legs and elevator shaft, and place the tripod into the other backpack compartment (Figure 7b). Your GoScope is now ready to go!

It is a good idea to place all caps and dust covers on the optical tube, diagonal, and eyepieces before placing them into the backpack. This ensures the optical surfaces will remain clean and dust-free.

Care and Maintenance

If you give your telescope reasonable care, it will last a lifetime. Store it in a clean, dry, dust-free place, safe from rapid changes in temperature and humidity. Do not store the telescope outdoors, although storage in a garage or shed is OK. Keep the dust caps and covers on when not in use.

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 exterior lens surfaces of the GoScope's objective lens, eyepiece, and reflex sight. 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 or compressed air. 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. For the large surface of the objective lens, clean only a small area at a time, using a fresh lens tissue on each area. Never reuse tissues.

Specifications

Objective lens:	Achromatic, air-spaced, fully coated
Aperture:	70mm
Focal length:	350mm
Focal ratio:	f/5
Diagonal:	45° correct-image prism, accepts 1.25" eyepieces
Eyepieces:	20mm eyepiece (17.5x) and 10mm eyepiece (35x), fully coated, 1.25", threaded for Orion filters
Finder scope:	EZ Finder II reflex sight
Tripod:	3-way pan head, adjustable height
Tripod height range:	15.5" to 52.5"
Case:	Backpack carry case included
Total weight:	5 lbs. 13.5 oz.

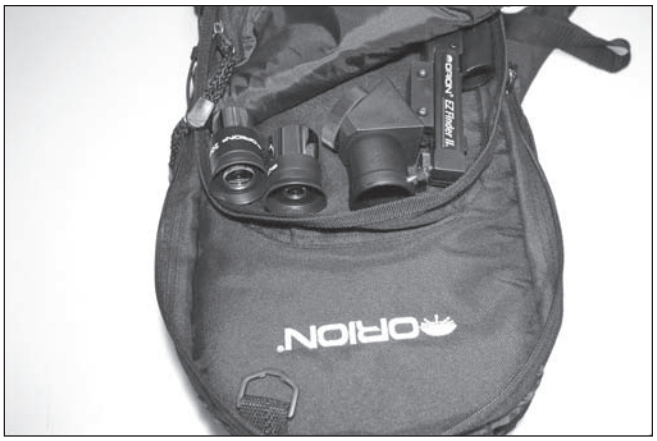

Figure 7a. The supplied GoScope accessories can be stored and transported in the outer pocket.

Figure 7b. The GoScope disassembled and in its backpack carry case.

One-Year Limited Warranty

This Orion GoScope 70 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 to: Orion Warranty Repair, 89 Hangar Way, Watsonville, CA 95076. If the product is not registered, proof of purchase (such as a copy of the original invoice) is required.

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, and you may also have other rights, which vary from state to state. For further warranty service information, contact: Customer Service Department, Orion Telescopes & Binoculars, 89 Hangar Way, Watsonville, CA 95076; (800)-676-1343.

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