



## GALILEOSCOPE ASSEMBLY INSTRUCTIONS

To begin, open the exterior box flaps to reveal the interior box. Under one flap, but not the other, you'll find two holes, as shown at right. Place a finger and thumb in the holes and pull out the interior box.



Parts are stacked in several layers. First you'll see a sheet with assembly instructions and a little plastic bag containing a paper sticker, a metal nut, and four rubber rings. Remove these and place them on a work table. Then lift out the top layer of cardboard and set it aside. The box now looks like this:



Note that the tube in the middle has a plastic bag tucked inside, containing multiple layers of white foam. Pull out the bag and remove the foam. You'll see that it separates into two blocks, one thick and heavy, the other thin and light. The thick, heavy block contains a large round lens wrapped in tissue paper. The thin, light block is secured by two pieces of transparent tape. Carefully cut or remove one piece of tape so that one layer of foam unfolds from the others, revealing six small lenses nested inside under a sheet of tissue paper. Set both foam blocks containing the lenses next to the other small parts on the table.



United Nations : International  
Educational, Scientific and : Astronomical  
Cultural Organization : Union

Next, lift out the middle layer of cardboard and the parts attached to it — *but do not remove the parts from the cardboard yet*. Place the cardboard with the parts still attached on the table.

At the bottom of the box you'll now see a large sheet of tissue paper. Remove it to reveal the last two parts — the long plastic tubes labeled A in the following photo. Remove these from the box and set them on the table next to the other parts. You should now have an arrangement similar to this:



#### Parts List (in order of assembly)

- |   |   |
|---|---|
| <b>A</b> – telescope main tube halves (2) | <b>K</b> – main eyepiece barrel halves (2)      |
| <b>B</b> – V-block bases/stands (2)       | <b>L</b> – auxiliary eyepiece barrel halves (2) |
| <b>C</b> – 50-mm glass objective lens     | <b>M</b> – small main eyepiece lenses (4)       |
| <b>D</b> – ¼-20 tripod nut                | <b>N</b> – tiny, thin eyepiece ring/field stop  |
| <b>E</b> – focuser tube halves (2)        | <b>O</b> – large main eyepiece clamp ring       |
| <b>F</b> – small main-tube clamp ring     | <b>P</b> – small eyepiece clamp rings (2)       |
| <b>G</b> – small rubber O-rings (2)       | <b>Q</b> – tiny auxiliary eyepiece lenses (2)   |
| <b>H</b> – Sun-warning sticker            | <b>R</b> – Barlow lens tube                     |
| <b>I</b> – large lens shade/dew cap       | <b>S</b> – auxiliary eyepiece cap               |
| <b>J</b> – large rubber O-rings (2)       |   |

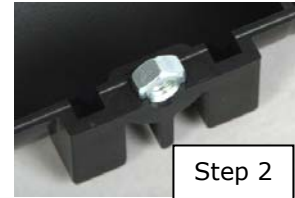
Step 1. Lay one of the telescope main tube halves (**A**) on a table or on the two V-block bases/stands (**B**). Examine the 50-mm (2-inch) diameter objective lens (**C**); handle the lens only by the edges, preferably while using a piece of the tissue paper



Step 1

it was wrapped in. Note that the objective is actually two lenses cemented together. One lens is thinner, and the other is thicker. Insert the objective lens into the groove at the front (wide) end of the telescope main tube half so that the thinner lens points forward, out of the telescope, as shown at left.

Step 2. Insert the ¼-20 tripod nut (D) into the slot in the middle of the telescope main tube half. To seat the nut securely, make sure it is oriented as shown at right, with one of its "points" (not one of its flat sides) facing up.



Step 2



Step 3

Step 3. Lay the two focuser tube halves (E) on the table, oriented with their interiors facing up. Note that one end of each tube is rough on the inside, and the other end is smooth. (On one tube half, the smooth end has two U-shaped cutouts; they're at bottom left in the adjacent photo.) Orient the tube halves so that the two smooth ends match and the two rough ends match, as shown at left.

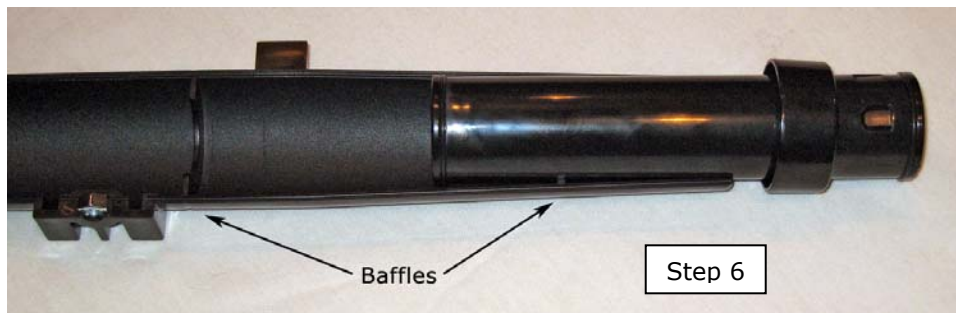
Step 4. Join the two focuser tube halves and hold them together. Slide the small main-tube clamp ring (F) onto the focuser tube, with the wider end of the ring facing away from the end of the tube with the two U-shaped cutouts.

Step 5. Secure the two ends of the focuser tube with the two small rubber O-rings (G), which fit in grooves around each end of the tube.



Steps 4 &amp; 5

Step 6. Lay the completed focuser tube assembly into the back (narrow) end of the telescope main tube that's resting on the table or in the V-block bases/stands. As shown in the photo below, make sure that the end of the focuser tube with the two U-shaped cutouts is protruding out the back (narrow) end of the telescope main tube, along with the main-tube clamp ring, and that the other end of the focuser tube lies between the two baffles closest to the narrow end of the main telescope tube.



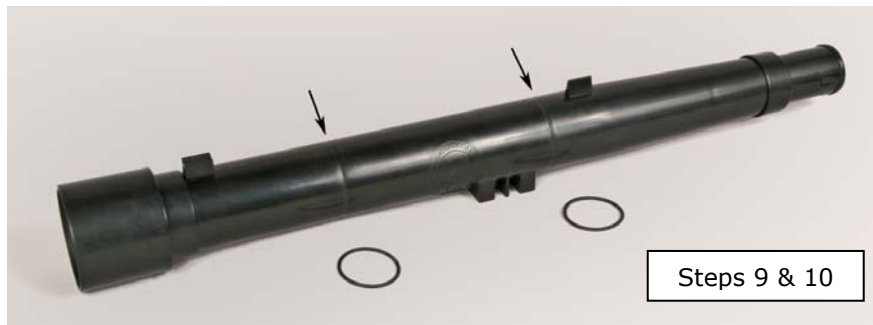
Step 6

**Step 7.** Peel the backing off the Sun-warning sticker (**H**) and affix the sticker to the second half of the telescope main tube (**A**), about 25 mm (1 inch) from the narrow end, as shown in the next photo.

**Step 8.** Place the second half of the main tube over the first half (the one already on the table or in the V-blocks/stands). Make sure the objective lens and ¼-20 tripod nut fit securely into their slots in the top half of the tube.



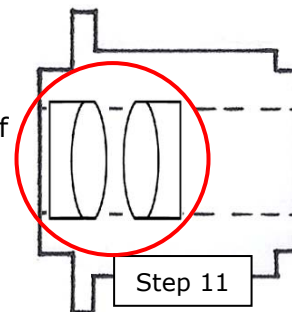
**Step 9.** Secure the two halves of the body together by sliding the small main-tube clamp ring (**F**) onto the back and the large lens shade/dew cap (**I**) onto the front. Your Galileoscope should now look like this:



**Step 10 (optional):** Place the two large O-rings (**J**) around the telescope main tube, in the channels provided for this purpose (indicated by arrows in the photo above). These will hold your Galileoscope together more securely. If you decide to do this, remove the lens shade/dew cap first, then replace it, and be careful not to tear the O-rings when stretching them over the two sighting posts on the top of the tube.

There are two pairs of eyepiece barrel halves. The wider pair (**K**), with the larger central opening, is for the main eyepiece, which gives a magnification of 25x. The narrower pair (**L**), with the smaller central opening, is for the auxiliary eyepiece, which serves two different purposes about which we'll say more below.

**Step 11.** Examine the four main eyepiece lenses (**M**), which are about 14 mm (a little over a half inch) in diameter. As before, it is best to handle the lenses with the supplied tissue paper, touching only their edges, to avoid fingerprints. Two of the lenses are flat on one side and concave — curved inward — on the other side. The other two lenses are convex — curved outward — on both sides. Take one of each type of lens and place them together as shown at right. Repeat with the other two main eyepiece lenses.



**Step 12.** Take one half of the main eyepiece barrel (**K**). Insert the two eyepiece lens pairs into the appropriately sized slots of the barrel. Be sure the flat sides of the lens pairs point away from each other (that is, toward the ends of the eyepiece barrel).



**Step 13.** Insert the tiny, thin eyepiece ring/field stop (**N**) into the thin slot in the main eyepiece barrel half.\* You should now have something that looks like the photo at right.



Step 14

**Step 14.** Join the second half of the main eyepiece barrel (**K**) with the first half (the one you just assembled), taking care that the lenses and field-stop ring fit into the appropriate slots on the second half as you bring the halves together. Secure the two halves with the large main eyepiece clamp ring (**O**), which goes on the end closest to the lenses, and one of the small ones (**P**), which goes on the other end. All the parts of the main eyepiece described in steps 11 to 14 are shown at left.



Steps 12 &amp; 13

**Step 15.** Insert the eyepiece fully into the end of the focuser tube, as shown in the following sequence of photos:



Step 15

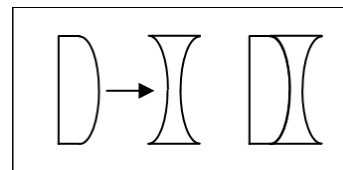
\*You may omit the tiny, thin eyepiece ring/field stop in Step 13. Omitting the field stop will produce a slightly wider field of view. But the edge will be "ragged," and the outer parts of the image may not be in sharp focus when the rest of the image is.

## ASSEMBLING THE BARLOW LENS & GALILEAN EYEPIECE

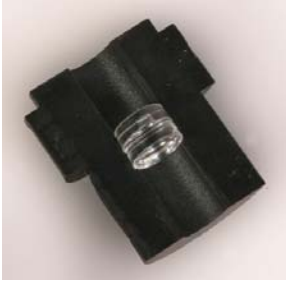
Your Galileoscope can be used in multiple configurations. With the main eyepiece, it yields a magnification of 25x and a true field of about  $1\frac{1}{2}^\circ$ , the width of three full Moons. With the auxiliary eyepiece parts, you can assemble a 2x Barlow lens, which will double the magnification to 50x but show a smaller amount of the sky in your field of view. Or you can make a 17x Galilean eyepiece. While the main eyepiece (with or without the Barlow lens) gives an upside-down image, the Galilean eyepiece produces a right-side-up image but a very narrow field of view. You may find it difficult to observe with the Galilean eyepiece, but it will let you appreciate what Galileo himself saw through his telescopes 400 years ago!

### The Barlow Lens

**Step 16.** Find the two smallest lenses (**Q**), with diameters of about 10 mm (about  $\frac{3}{8}$  inch). One is thin in the middle — both sides are concave, or curved inward. The other



lens has one flat side and one convex (curved outward) side. Place them together as shown in the preceding illustration.



**Step 17.** Place the lens pair into the slot in one half of the auxiliary eyepiece barrel (**L**), which is narrower and has a smaller central opening than the main eyepiece barrel. Be sure the lens that is thin in the middle faces the narrow/bottom of the barrel, as shown at left.

**Step 18.** Join the second half of the auxiliary eyepiece barrel to the first half, taking care that the lenses fit into the slot on the second half as you bring the two halves together.

**Step 19.** Secure the wide/top end of the barrel with the second small eyepiece clamp ring (**P**); you used the first such ring in Step 14 above.

**Step 20.** Insert the narrow/bottom end of the barrel all the way into the narrow end of the Barlow tube (**R**). You'll have an assembly that looks like the one at left in the next photo.



**Step 21.** Insert the main eyepiece (at right in the adjacent photo) as far into the wide end of the Barlow tube as it will go. You'll now have an assembly that looks like the one shown at right.



**Step 22.** Insert the Barlow-lens-and-main-eyepiece assembly into the focuser of your Galileoscope to enjoy a view with a magnification of 50x, enough power to show the rings of Saturn clearly!

### The Galilean Eyepiece

**Step 23.** Remove the auxiliary eyepiece barrel from the narrow end of the Barlow tube and set the Barlow tube aside.



**Step 24.** Place the auxiliary eyepiece cap (**S**), shown on the right in the photo at left, over the narrow end of the auxiliary eyepiece barrel. You'll now have a Galilean eyepiece, as shown at right.



**Step 25.** Insert the Galilean eyepiece into the focuser tube of the telescope.

### Focusing the Galileoscope

To focus the Galileoscope, slide the focuser tube forward or back while looking into the eyepiece. Fine focus adjustments are easier to make if you twist the focuser tube slightly as you slide it in or out.

## Aiming the Galileoscope

Sight along the top of the tube. Your observing target should line up with the tip of the rear (single) post and the tips of the front (V-notched, double) post, as indicated at right, where the target is simulated by a red dot.



## Using the Galileoscope on a Tripod



Because a telescope gives a highly magnified view, the tiniest vibration looks like a major earthquake in the eyepiece. Even at 25x, and especially at 50x, the Galileoscope needs to be firmly attached to something stable.

Because the instrument is so lightweight, an inexpensive photo tripod — the type you'll find at most discount stores — should be sufficient. The tripod should have a pan head that moves smoothly in altitude (up-down) and azimuth (left-right), so that you can aim the telescope anywhere in the sky and make small adjustments without jerking it around.

The included 1/4-20 mounting nut on the bottom of the Galileoscope will fit any standard photo tripod. If you plan to use the Galileoscope while standing up — sitting in a chair is more comfortable! — we recommend attaching it to a tripod that extends to a height of at least 150 cm (60 inches). Otherwise, you'll find it difficult to get your head under the eyepiece when the telescope is pointed high in the sky.

## Additional Eyepieces

Because the Galileoscope has a 1¼-inch-diameter focuser tube, it can accept any commercial eyepiece with a 1¼-inch barrel — the most common type. But because the focuser is held in place by friction, rather than by gears or other mechanisms, only relatively small, lightweight eyepieces are suitable for use with the Galileoscope. Many such eyepieces are available in the amateur-astronomy marketplace, affording you the option of many different combinations of magnification and field of view.

## Star Diagonals

The Galileoscope is designed for straight-through viewing. There is not enough "in focus" to permit the use of a star diagonal, a common accessory that goes between the telescope and eyepiece and enables you to avoid having to crane your neck when observing celestial objects high overhead. As noted above, we recommend sitting in a chair with the telescope on a tripod that can be extended to a good height. That way, observing objects high in the sky will be comfortable without a star diagonal.

## More Information

Visit [www.galileoscope.org](http://www.galileoscope.org) for the latest information and to download free observing guides and educational activities.