INSTRUCTION MANUAL

Orion®
SkyView™ Deluxe
Equatorial Mount

#9400

ORION
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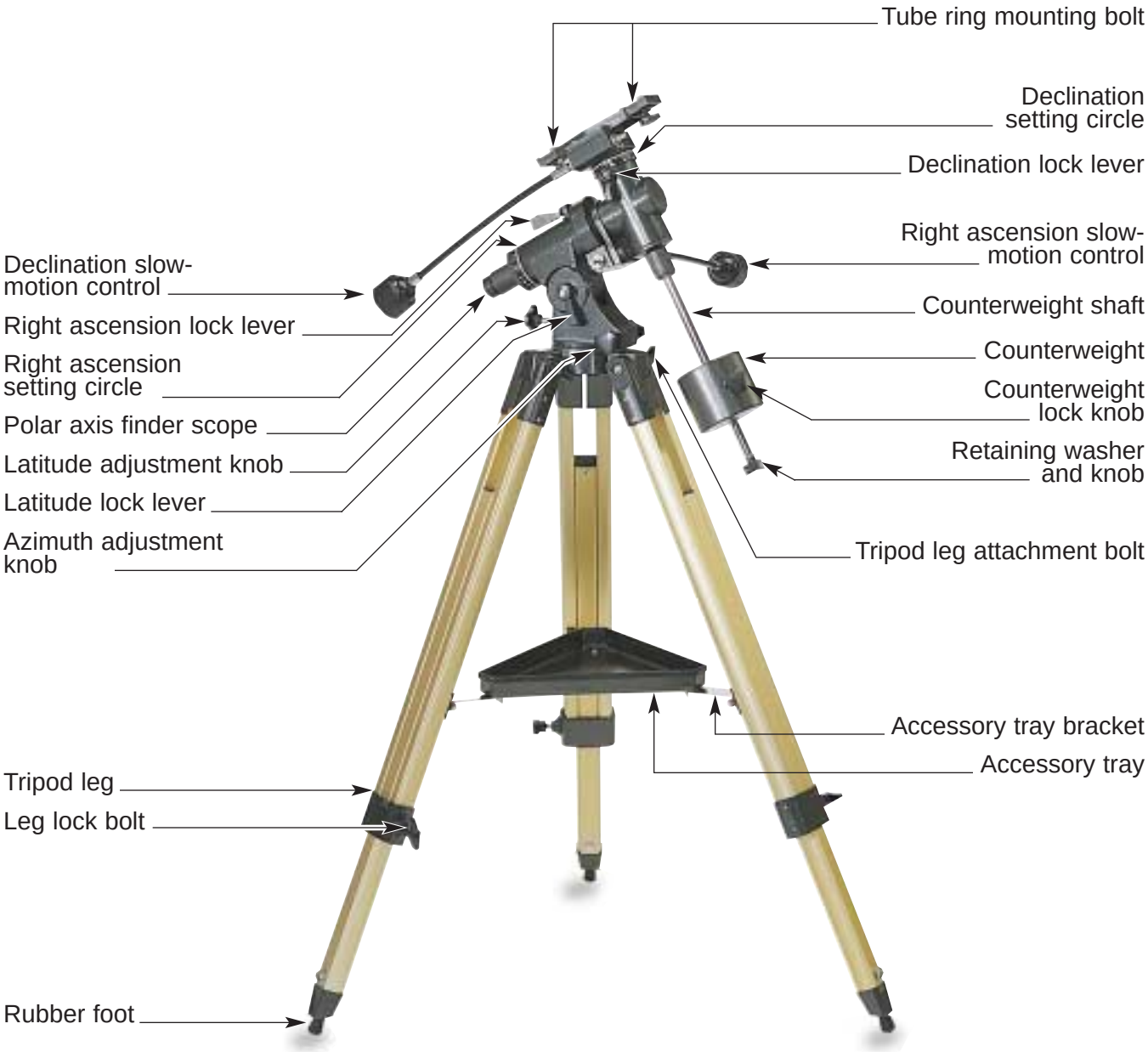


Figure 1. SkyView Deluxe EQ Mount Parts Diagram

Congratulations on your purchase of a quality Orion product. Your new SkyView Deluxe Equatorial Mount offers solid stability, mechanical precision, and the versatility to accommodate a variety of different small to medium-sized telescope tubes. It features a heavy-duty equatorial head with fully enclosed 360° worm gears and a built-in polar axis finder scope to allow quick alignment of the mount for effortless star-tracking. The setting circles will enable you to locate objects by their cataloged celestial coordinates. We're sure that the SkyView Deluxe Equatorial Mount will make your observing sessions easier and more productive.

These instructions will help you set up and properly use your equatorial mount. Please read them over thoroughly before getting started.

Table of Contents

1. PARTS LIST

Qty.	Description
1	German-type equatorial mount
1	Polar axis finder scope
2	Slow-motion control cables
1	Counterweight
1	Counterweight shaft
3	Tripod legs
1	Tripod accessory tray
3	Accessory tray screws and wing nuts

2. ASSEMBLY

Carefully open all of the boxes in the shipping container. Make sure all the parts listed in section 1 are present. Save the boxes and packaging material. In the unlikely event that you need to return the equatorial mount, you must use the original packaging.

Assembling the mount for the first time should take about 10 minutes. No tools are needed. All bolts should be tightened securely to eliminate flexing and wobbling, but only tighten them "finger tight." Be careful not to over-tighten so as not to strip the threads. Refer to Figure 1 during the assembly process.

WARNING: ***Never look at the Sun through the polar axis finder scope, or permanent eye damage or blindness could result. For your safety, keep the polar axis finder scope capped during daylight hours. Children should use this mount only under adult supervision.***

1. Lay the equatorial mount on its side. Attach the tripod legs one at a time to the base of the mount by sliding the tripod leg attachment bolt into the slot in the mount and lightly tightening the knob finger-tight. Note that the hinged accessory tray bracket on each leg should face inward.
2. Tighten the leg lock bolts at the base of the legs. For now, keep the legs at their shortest (fully retracted) length; you can extend them to a more desirable length later, after the scope is completely assembled.
3. With the tripod legs now attached to the equatorial mount, stand the tripod upright (be careful!) and spread the legs apart enough to attach the accessory tray to the three hinged tray brackets on the legs. The brackets should be positioned underneath the tray. Use the three small accessory tray screws and wing nuts provided. Do not tighten the wing nuts yet.
4. Now, with the accessory tray attached loosely, spread the tripod legs apart as far as they will go, until the accessory tray brackets are taut. Then tighten the wing nuts.
5. Next, tighten the tripod leg attachment bolts at the base of the equatorial mount, so that the legs are securely fastened.
6. Remove the retaining knob and washers from the bottom end of the counterweight shaft. Slide the counterweight onto the shaft, then replace the washers and the retaining knob. The washers and knob will prevent the counterweights from slipping off the shaft and possibly onto your foot if the counterweight lock knobs should come loose!
7. At the top end of the counterweight shaft, note the knurled shaft collar. Rotate it so as much of the threaded end of the shaft as possible is visible. Now, with the counterweight lock knob loose, grip the counterweight with one hand and thread the shaft into the equatorial mount (at the base of declination axis) with the other hand. When it is threaded as far in as it will go, twist the shaft collar clockwise to secure the shaft. Position the counterweight about halfway up the shaft and tighten the counterweight lock knob.
8. Orient the equatorial mount as it appears in Figure 1, at a latitude of about 40°, i.e., so the pointer next to the gold-colored latitude scale is pointing to the hash mark at 40. To do this, loosen the latitude lock lever (on the side of the mount opposite the gold latitude scale), and turn the latitude adjustment knob until the pointer and the 40 line up. Then tighten the latitude lock lever. Also tighten the declination (Dec.) and right ascension (R.A.) lock levers.
9. Remove the caps from the narrow end of the polar scope and the polar scope port in the equatorial mount. Insert the narrow end of the polar scope into the open port. While gripping the wide end of the polar scope (but not the eyepiece at the very end), thread it clockwise into the port until it is secure.
10. Now attach the two slow-motion cables to the R.A. and Dec. worm gear shafts of the equatorial mount by positioning the setscrew on the end of the cable over the indented slot on the worm gear shaft, then tightening the setscrew. The cables can be attached to either end of the shafts, whichever is most convenient for you.

Your SkyView Deluxe Equatorial Mount is now set up and ready to use.

3. Attaching A Telescope

The SkyView Deluxe Equatorial Mount is designed to hold small to mid-size telescopes weighing up to about 13 lbs. For heavier telescopes, the mount may not provide sufficient stability for steady imaging. Any type of telescope can be mounted on the SkyView Deluxe Equatorial Mount, including refractors, Newtonian reflectors, and catadioptrics, provided a proper adapter or set of tube rings is available to couple the tube to the mount.

Orion carries a variety of differently sized tube rings and a 1/4"-20 mounting adapter designed exclusively to fit the SkyView Deluxe mount. One of these items may fit the telescope tube you wish to mount. See the list of Suggested Accessories at the end of these instructions, or check the Orion print or online catalogs for currently available mounting accessories.

4. Balancing the Telescope

Once the telescope is attached to the equatorial mount, the next step is to balance the telescope. Proper balance is required to insure smooth movement of the telescope on both axes of the equatorial mount.

If you attach your telescope with a 1/4"-20 adapter, it may not be possible to balance the scope precisely with respect to the declination axis, because the telescope cannot be moved back and forth as it can when tube rings are used. Some 1/4"-20 adapters have a slot or more than one hole through which the threaded post can be set, allowing some limited adjustment of the telescope's position for balancing.

Assuming you will be using tube rings, we will first balance the telescope with respect to the R.A. axis, then the Dec. axis.

1. Keeping one hand on the telescope optical tube, loosen the R.A. lock lever. Make sure the Dec. lock lever is locked, for now. The telescope should now be able to rotate freely about the R.A. axis. Rotate it until the counterweight shaft is parallel to the ground (i.e., horizontal).
2. Now loosen the counterweight lock knob and slide the weight along the shaft until it exactly counterbalances the telescope. That's the point at which the shaft remains horizontal even when you let go of the telescope with both hands. If you position the counterweight all the way at the end of the shaft (near the retaining knob and washer) and it still does not counterbalance the telescope, you will need to purchase an additional counterweight (Orion part number #9413). Retighten the counterweight lock lever. The telescope is now balanced on the R.A. axis.
3. To balance the telescope on the Dec. axis, first tighten the R.A. lock lever, with the counterweight shaft still in the horizontal position.
4. With one hand on the telescope optical tube, loosen the Dec. lock lever. The telescope should now be able to rotate freely about the Dec. axis. Loosen the tube ring clamps a few turns until you can slide the telescope tube forward and back inside the rings (this can be aided by using a slight twisting motion on the optical tube while you push or pull on it). Position the telescope so that it remains

horizontal when you carefully let go with both hands. This is the balance point for the Dec. axis. Before clamping the rings tight again, rotate the telescope so the eyepiece is at a convenient angle for viewing (this is not possible if using a 1/4"-20 mounting adapter).

The telescope is now balanced on both axes. Now when you loosen the lock lever on one or both axes and manually point the telescope, it should move without resistance and should not drift from where you point it.

5. Using the Equatorial Mount

When you look at the night sky, you no doubt have noticed that the stars appear to move slowly from east to west over time. That apparent motion is caused by the Earth's rotation (from west to east). An equatorial mount is designed to compensate for that motion, allowing you to easily "track" the movement of astronomical objects, thereby keeping them from drifting out of the telescope's field of view while you're observing. This is accomplished by slowly rotating the telescope on its right ascension (polar) axis, using only the R.A. slow-motion cable. But first the R.A. axis of the mount must be aligned with the Earth's rotational (polar) axis—a process called polar alignment. Refer to Figure 2 for a close-up look at the various parts of the SkyView Deluxe Equatorial Mount.

Approximate Polar Alignment

For Northern Hemisphere observers, approximate polar alignment is achieved by pointing the mount's R.A. axis at the North Star, or Polaris. It lies within 1° of the north celestial pole (NCP), which is an extension of the Earth's rotational axis out into space. Stars in the Northern Hemisphere appear to revolve around Polaris.

To find Polaris in the sky, look north and locate the pattern of the Big Dipper (Figure 3). The two stars at the end of the "bowl" of the Big Dipper point right to Polaris.

Observers in the Southern Hemisphere aren't so fortunate to have a bright star so near the south celestial pole (SCP). The star Sigma Octantis lies about 1° from the SCP, but it is barely visible with the naked eye (magnitude 5.5).

For general visual observation, an approximate polar alignment is sufficient.

1. Level the equatorial mount by adjusting the length of the three tripod legs.
2. Loosen the latitude lock lever. Turn the latitude adjustment knob and tilt the mount until the pointer on the latitude scale is set at the latitude of your observing site. If you don't know your latitude, consult a geographical atlas to find it. For example, if your latitude is 35° North, set the pointer to +35. Then retighten the latitude lock lever. The latitude setting should not have to be adjusted again unless you move to a different viewing location some distance away.
3. Loosen the Dec. lock lever and rotate the telescope optical tube until it is parallel with the R.A. axis. The pointer on the Dec. setting circle should read 90°. Retighten the Dec. lock lever.
4. Lift and rotate the tripod so that the telescope tube (and R.A. axis) points roughly at Polaris. If you cannot see Polaris directly from your observing site, consult a compass and rotate the tripod so that the telescope points North.

The equatorial mount is now polar-aligned for casual observing. More precise polar alignment is required for astrophotography.

Polar Aligning Using the Polar Axis Finder

One of the unique features of your new SkyView Deluxe mount is the polar axis finder scope. It fits conveniently inside the equatorial mount, and contains a tiny star map that makes precise polar alignment quick and easy. To use the polar axis finder scope, follow these instructions:

1. Approximately polar-align the mount as outlined in the procedure above.
2. Remove the caps that cover the polar finder (one on the polar finder's eyepiece and one on the equatorial mount). Focus the polar finder by rotating its eyepiece. Now, sight Polaris in the polar axis finder scope. If you have followed the approximate polar alignment procedure accurately, Polaris will probably be within the field of view. If it is not, move the tripod left-to-right, and adjust the latitude up and down until Polaris is somewhere within the field of view of the polar axis finder scope.
3. Shine a red flashlight down the front end of the polar finder to illuminate the reticle within the field of view. Make sure the flashlight shines in at an angle, so as not to block the polar finder's field of view. It may be helpful to have a friend hold the flashlight while you look through the polar finder. Note the constellations Cassiopeia and Ursa Major (the Big Dipper) in the reticle (ignore the constellation Octans, as this is provided for Southern Hemisphere observers). They do not appear to scale, but they indicate the general positions of Cassiopeia and Ursa Major relative to Polaris and the north celestial pole (which is indicated by the cross at the center of the reticle). Next, the reticle must be rotated so the constellations depicted match their current orientation in the sky when viewed with the naked eye. To do this, release the R.A. lock lever and rotate the main telescope about the R.A. axis until the reticle is oriented with the sky. You may need to reposition the telescope about the declination axis so the telescope does not bump the mount. Once the reticle is correctly oriented, use the R.A. lock lever to secure the main telescope's position.
4. Now, use the azimuth and latitude adjustment knobs on the mount to position the star Polaris inside the tiny circle marked "Polaris" in the polar finder's reticle. You must first release the latitude lock lever and loosen the bolt that connects the equatorial head to the tripod (underneath the equatorial mount). Once Polaris is properly positioned within the reticle, lock the latitude lock lever and retighten

the bolt that connects the equatorial head to the tripod. You are now precisely polar-aligned.

If you do not have a clear view of Polaris from your observing site, you will not be able to use the polar axis finder scope to accurately polar align the telescope.

Note: From this point on in your observing session, you should not make any further adjustments in the azimuth or the latitude of the mount, nor should you move the tripod. Doing so will nullify the polar alignment. The telescope should be moved only about its R.A. and Dec. axes.

Tracking Celestial Objects

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

Optional Motor Drives for Automatic Tracking and Astrophotography

An optional DC motor drive (Orion AccuTrack SVD, #7825) can be mounted on the R.A. axis of the SkyView Deluxe Equatorial Mount to provide hands-free tracking. Objects will then remain stationary in the field of view without any manual adjustment of the R.A. slow-motion control. A dual-axis motor drive system with hand controller is also available for doing long-exposure astrophotography.

Understanding the Setting Circles

The setting circles on an equatorial mount enable you to locate celestial objects by their "celestial coordinates." Every object resides in a specific location on the "celestial sphere." That location is denoted by two numbers: its right ascension (R.A.) and declination (Dec.). In the same way, every location on Earth can be described by its longitude and latitude. R.A. is similar to longitude on Earth, and Dec. is similar to latitude. The R.A. and Dec. values for celestial objects can be found in any star atlas or star catalog.

The R.A. setting circle is scaled in hours, from 1 through 24, with small hash marks in between representing 10-minute increments (there are 60 minutes in 1 hour of R.A.). The Dec. setting circle is scaled in degrees (there are 60 arc-minutes in 1 degree of declination).

So, the coordinates for the Orion Nebula listed in a star atlas will look like this:

R.A. 5h 35.4m Dec. –5° 27'

That's 5 hours and 35.4 minutes in right ascension, and –5 degrees and 27 arc-minutes in declination (the negative sign denotes south of the celestial equator).

Before you can use the setting circles to locate objects, the mount must be precisely polar aligned, and the setting circles must be calibrated.

Calibrating the Declination Setting Circle

1. Loosen the Dec. lock lever and position the telescope as accurately as possible in declination so that it is parallel to the R.A. axis of the equatorial mount. Re-tighten the lock lever.
2. Rotate the Dec. setting circle until the pointer reads exactly 90°.

Calibrating the Right Ascension Setting Circle

1. Identify a bright star near the celestial equator and look up its coordinates in a star atlas.
2. Loosen the R.A. and Dec. lock levers on the equatorial mount, so the telescope optical tube can move freely.
3. Point the telescope at the bright star near the celestial equator whose coordinates you know. This information can be taken from any star chart. Center the star in the telescope's field of view. Lock the R.A. and Dec. lock levers.
4. Rotate the R.A. setting circle so the pointer indicates the R.A. listed for that object in the star atlas.

Finding Objects With the Setting Circles

Now that both setting circles are calibrated, look up in a star atlas the coordinates of an object you wish to view.

1. Loosen the Dec. lock lever and rotate the telescope until the Dec. value from the star atlas matches the reading on the Dec. setting circle. Retighten the lock lever.
2. Loosen the R.A. lock lever and rotate the telescope until the R.A. value from the star atlas matches the reading on the R.A. setting circle. Retighten the lock lever.

Most setting circles are not accurate enough to put an object dead-center in your finder scope's field of view, but they'll get you close, assuming the equatorial mount is accurately polar aligned. The R.A. setting circle must be recalibrated every time you wish to locate a new object. Do so by calibrating the setting circle for the centered object before moving on to the next one.

Confused About Pointing the Telescope?

Beginners occasionally experience some confusion about how to point the telescope overhead or in other directions. In Figure 1 the telescope is pointed north, as it would be during polar alignment. The counterweight shaft is oriented downward. But it will not look like that when the telescope is pointed in other directions. Let's say you want to view an object that is directly overhead, at the zenith. How do you do it?

One thing you DO NOT do is make any adjustment to the latitude adjustment knob. That will nullify the mount's polar alignment. Remember, once the mount is polar-aligned, the telescope should be moved only on the R.A. and Dec. axes. To point the scope overhead, first loosen the R.A. lock lever and rotate the telescope on the R.A. axis until the counterweight shaft is horizontal (parallel to the ground). Then loosen the Dec. lock lever and rotate the telescope until it is pointing straight overhead. The counterweight shaft is still horizontal. Then retighten both lock levers.

Similarly, to point the telescope directly south, the counterweight shaft should again be horizontal. Then you simply rotate the scope on the Dec. axis until it points in the south direction.

What if you need to aim the telescope directly north, but at an object that is nearer to the horizon than Polaris? You can't do it with the counterweight shaft pointing down as pictured in Figure 1. Again, you have to rotate the scope in R.A. so that the counterweight shaft is positioned horizontally. Then rotate the scope in Dec. so it points to where you want it near the horizon.

To point the telescope to the east or west, or in other directions, you rotate the telescope on its R.A. and Dec. axes. Depending on the altitude of the object you want to observe, the counterweight shaft will be oriented somewhere between vertical and horizontal.

The key things to remember when pointing the telescope is that a) you only move it in R.A. and Dec., not in azimuth or latitude (altitude), and b) the counterweight and shaft will not always appear as it does in Figure 1. In fact, it almost never will!

6. Suggested Accessories

Call our Customer Service department at (800) 447-1001 for availability and current prices. Mention the stock numbers indicated in the parentheses.

1/4"- 20 Adapter (#3800)

This accessory bolts to the top of the equatorial head and provides a threaded post on which to mount a camera or telescope that utilizes a standard "quarter-twenty" thread.

Tube Mounting Rings

These quality cast-aluminum rings are custom-made for use with the SkyView Equatorial Mount. They are hinged for easy installation of the telescope tube and are lined with felt to prevent scratching of the telescope. Check the outer diameter of your telescope; if it matches the inner diameter (I.D.) of the rings, then the rings will fit. Price is for a set of two rings.

For 90mm Refractor (I.D. 3.5"-3.75") (#9410)

For 4.5" Reflector (I.D. 5.3"-5.5") (#9411)

For 6" Reflector (I.D. 7.0"-7.3") (#9412)

AccuTrack SVD DC Motor Drive (#7825)

This is a small electric motor that attaches to the right ascension worm gear shaft of the equatorial mount. It turns the gear on the R.A. axis at the same rate that the Earth rotates on its axis, thereby following, or "tracking," the apparent motion of the stars. Automatic tracking keeps objects from drifting out of the field of view while you're observing. Runs on one 9-volt alkaline battery (included).

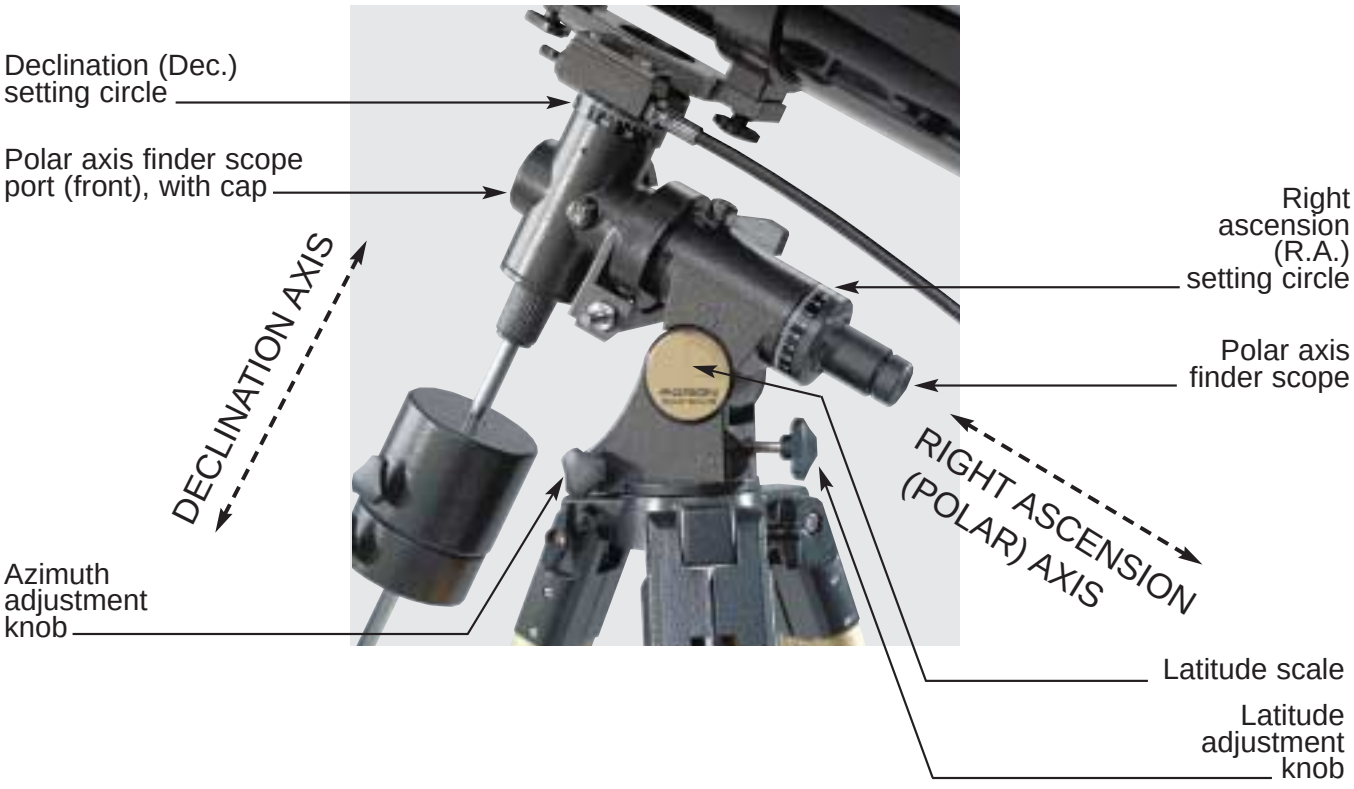
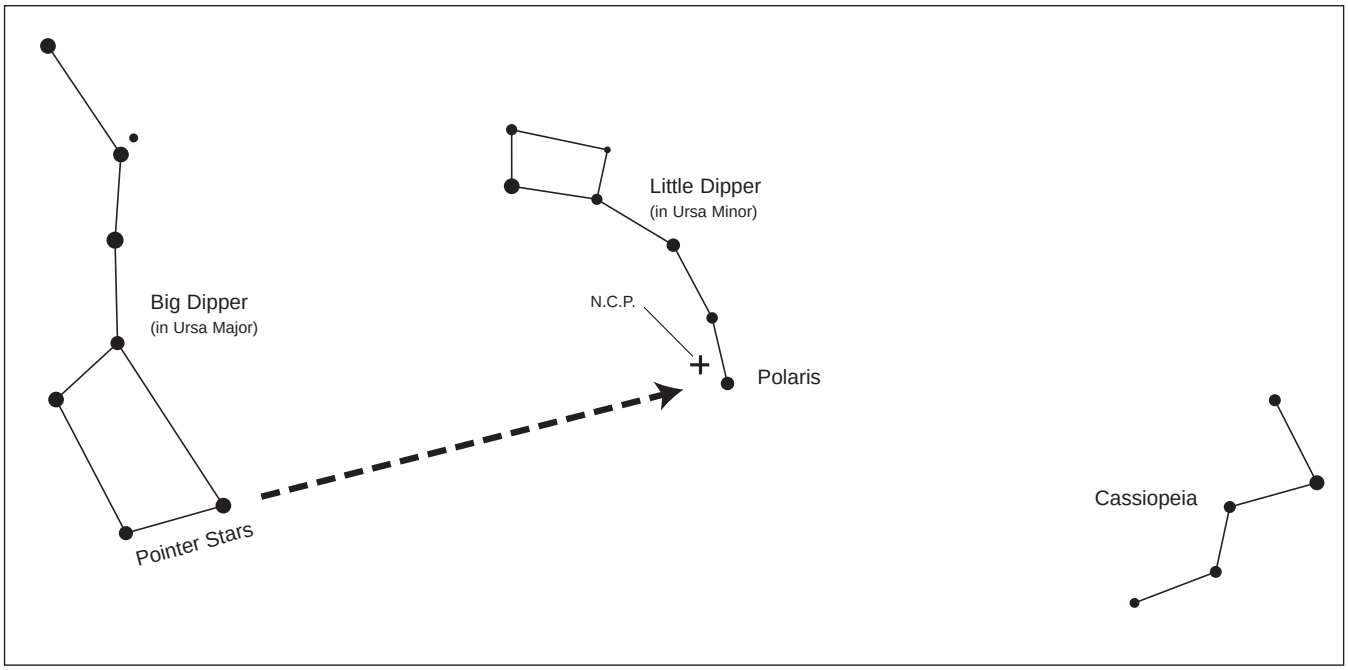


Figure 2. Close-up of Equatorial Mount.



To find Polaris in the night sky, look north and find the Big Dipper. Extend an imaginary line from the two “Pointer Stars” in the bowl of the Big Dipper. Go about 5 times the distance between those stars and you’ll reach Polaris, which lies within 1° of the north celestial pole (NCP).

Figure 3. Finding Polaris in the night sky.

One-Year Limited Warranty

This Orion SkyView Deluxe EQ Mount 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, P. O. Box 1815, Santa Cruz, CA 95061; (800) 676-1343.

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