

Orion® SkyQuest™ XT12 IntelliScope® #9988



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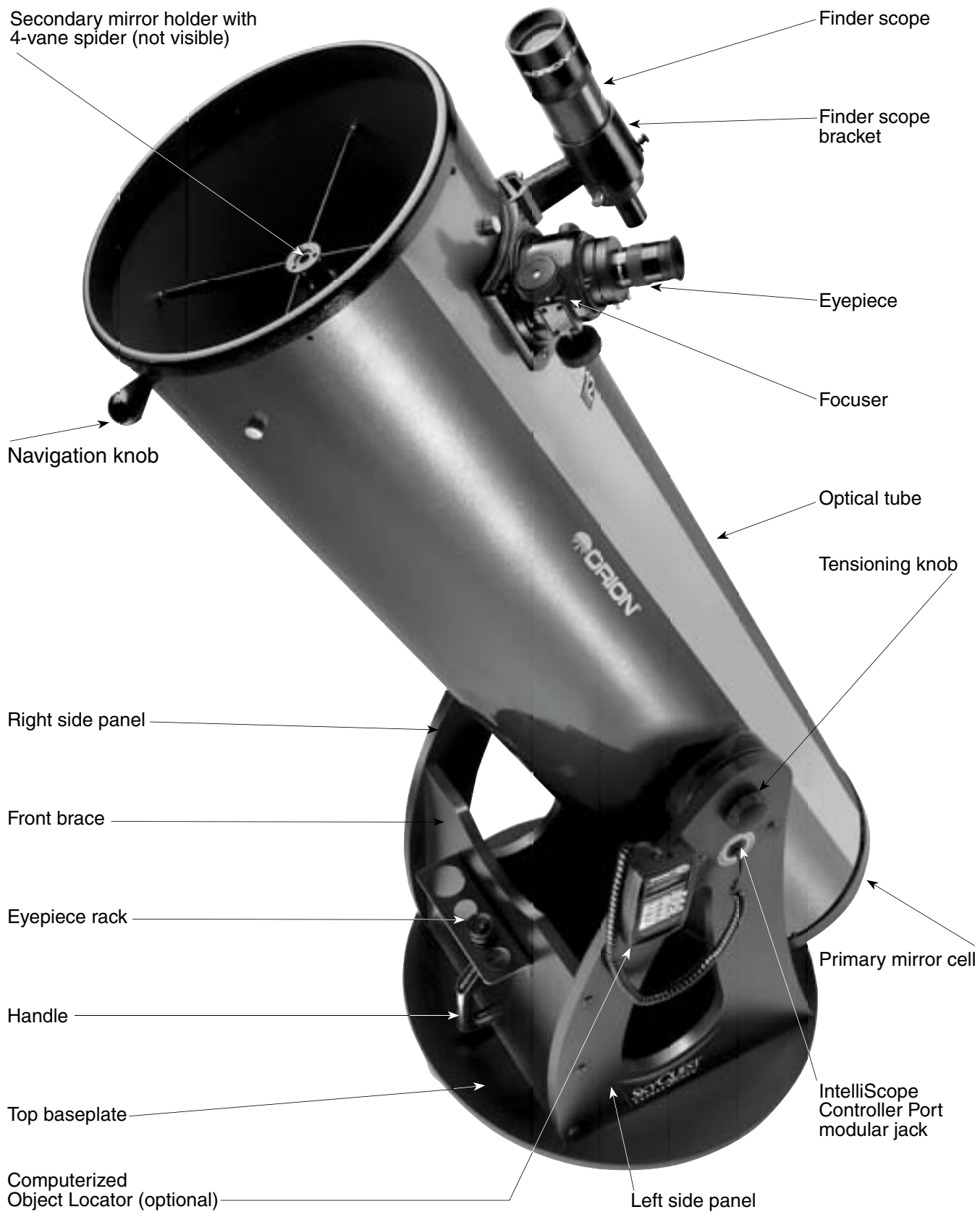


Figure 1. The SkyQuest XT12 IntelliScope

Congratulations on your purchase of an Orion SkyQuest XT12 IntelliScope Dobsonian. It is a high-performance astronomical instrument designed to provide dazzling views of celestial objects and unprecedented ease of use. With the addition of the optional IntelliScope Computerized Object Locator (controller), you gain the ability to locate and view thousands of celestial objects with the push of a button. Searching for objects is a thing of the past, as the IntelliScope's high-resolution digital encoders find them for you — in seconds. It's so easy!

Even if you decide not to purchase the optional IntelliScope controller, your SkyQuest telescope will provide years of stargazing enjoyment, thanks to its large-aperture, precision optics; its innovative, user-friendly design; and its complement of outstanding features and accessories. We hope you enjoy your journey through the universe!

Please read these instructions thoroughly before beginning assembly and subsequent use of the telescope.

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WARNING: *Never look directly at the Sun through your telescope or its finder scope—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.*

1. Unpacking

The telescope is packed in three boxes, one containing the optical tube assembly and accessories, another containing the unassembled Dobsonian base, and the last containing the primary mirror in its cell. Be careful unpacking the boxes. We recommend keeping the original packaging. In the event that the telescope needs to be shipped to another location, or returned to Orion for warranty repair, having the proper packaging will help ensure that your telescope will survive the journey intact.

Make sure all the parts in the Parts List below are present. Be sure to check boxes carefully, as some parts are small. If anything appears to be missing or broken, immediately call Orion Customer Support (800-676-1343) or email sales@telescope.com for assistance.

Parts List

Box #1: Optical Tube Assembly and Accessories

Qty.	Description
1	Optical tube assembly
1	Dust cover
1	25mm Sirius Plössl eyepiece, 1.25" barrel diameter
1	10mm Sirius Plössl eyepiece, 1.25" barrel diameter
1	9x50 finder scope
1	Finder scope bracket with O-ring
1	Collimation cap
1	4-Hole eyepiece rack
2	Eyepiece rack mounting wood screws (length 3/4")
2	Tensioning/Retaining knobs
1	Tensioning knob nylon washer (white)
1	Tensioning knob metal washer
1	Nylon retaining knob spacer (black)
1	Handle
2	Handle mounting hex-head screws
2	Handle mounting screw washers
1	Crescent wrench
1	Azimuth encoder board
1	Encoder connector board
1	Encoder disk

Box #2: Dobsonian Base

Qty	Description
1	Left panel
1	Right panel
1	Front brace
1	Top baseplate
1	Ground baseplate
12	Base assembly wood screws (length 2", black)

- 1 Hex key (size 4mm)
- 3 Plastic feet
- 3 Feet attachment wood screws (length 1")
- 5 Encoder board mounting wood screws
- 1 Brass bushing
- 1 Azimuth axis hex-head screw (length 2.25")
- 2 Fender washers (diameter 1")
- 1 Hex lock nut
- 4 Altitude bearing cylinders
- 4 Altitude bearing cylinder screws (length 1.5", black)
- 1 Vertical stop knob
- 3 Flat washers (2x1/16" thick, 1x1/32" thick)

Box #3: Primary Mirror and Cell

Qty	Description
1	Primary mirror
1	Mirror cell
3	Collimation knobs
3	Nylon washers
3	Springs

2. Assembly

Now that you have unpacked the boxes and familiarized yourself with all the parts in front of you, it's time to begin assembly.

Assembly of the Optical Tube

In order to prevent damage to the primary mirror in shipment, it is shipped in its cell separately from the optical tube. To install the mirror cell into the optical tube, the rear end ring attached to the optical tube must first be removed. This is done by unthreading and removing the six Phillips-head screws that connect the end ring to the tube (Figure 2), and then pulling the end ring off of the tube.



Figure 2. To remove the rear end ring, unthread the six screws that connect it to the tube.

Warning: Once the rear end ring is removed from the tube, the raw edge of the tube itself will be exposed. Be careful not to cut or otherwise hurt yourself on the tube's edge. Also be careful not to pinch yourself when attaching the assembled mirror cell onto the tube.

Next, assemble the rear end ring to the mirror cell. Find a clean, flat surface, and turn the mirror cell over so that the mirror is facing downwards. Place the three springs onto the three exposed threaded shafts (Figure 3). Lower the end ring onto the mirror cell so the threaded shafts pass through it, and the end ring rests on the springs (Figure 4). Add a nylon washer to each collimation knob and thread the collimation knobs through the end ring and onto the threaded shafts (Figure 5). Make sure the knobs have at least three full turns of engagement on the shafts. The mirror cell is now ready to be installed into the tube.



Figure 3. Place the three springs on the exposed threaded shafts of the mirror cell.



Figure 4. Lower the rear end ring onto the mirror cell so that the threaded shafts pass through the end ring, and the end ring rests on the springs.



Figure 5. Thread the collimation thumbnuts, with nylon washers attached, through the rear end ring and onto the threaded shafts. Make sure the thumbnuts have at least three full turns of engagement on the shafts.

Assembling the SkyQuest XT12 IntelliScope mirror cell to the tube can be a bit tricky. This is because the large diameter and thin aluminum of the tube will cause the tube to become somewhat out of round once the rear end ring is removed.

To assemble the mirror cell to the tube, stand the tube up vertically so that the raw edge of the tube is facing upwards. Line up the threaded holes in the edge of the mirror cell end ring with the holes in the end of the tube. Then, lower the mirror cell onto the tube so that one side of the end ring is fully seated onto the tube (Figure 6). Now, look along the perimeter of the tube, and you will notice a bulge in the tube that prevents the mirror cell from fully seating on the tube (Figure 7). Position your body so that your chest is pressing against this bulge, and hug the telescope with your left hand so that the tube becomes round. With your right hand, gently tap down the side of the mirror cell that needs to be seated, and the entire mirror cell should seat onto the tube (Figure 8). Replace the six Phillips-head screws that connect the rear end ring to the tube.



Figure 6. Lower the assembled mirror cell onto the tube so one side of the end ring is seated on the tube edge. The threaded attachment holes in the end ring should also be lined up with the through holes in the end of the tube



Figure 7. Locate the area of tube that is bulging out and preventing the mirror cell from fully seating.



Figure 8. Hug the tube so that your chest pushes against the bulge, and a gentle tap should fully seat the mirror cell onto the tube.

Assembly of the Dobsonian Base

Refer to Figure 9 during base assembly. The base need only be assembled once, unless you disassemble it for long-term storage. The assembly process takes about 30 minutes and requires, in addition to the supplied tools, a Phillips screwdriver, and two adjustable crescent wrenches. You can substitute a 10mm crescent wrench for one of the adjustable crescent wrenches, or use a pair of pliers.

The azimuth encoder board and other encoder items should be installed, even if you do not plan to use the optional Computerized Object Locator. The smooth motion of the telescope depends on the installation of these parts.

When tightening screws, tighten them until firm, but be careful not to strip the holes by over-tightening. If you use an electric screwdriver, do final tightening with a standard screwdriver to avoid stripping.

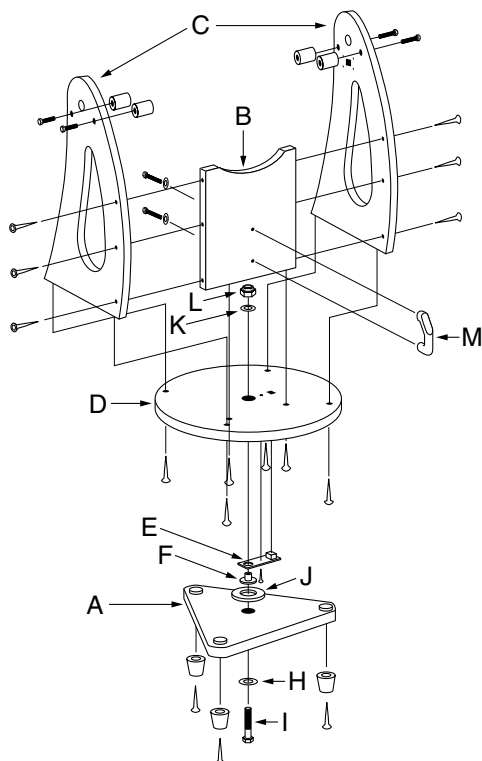


Figure 9. Exploded view of the Dobsonian base.

1. With a Phillips screwdriver, screw the plastic feet into the underside of the ground baseplate (A) using the self-tapping wood screws provided. Insert the screws through the feet and thread them into the predrilled starter holes.
2. Loosely attach the front brace (B) to the two side panels (C) with six of the base assembly screws in the predrilled holes. Use the 4mm hex key to tighten the screws. The side panels should be oriented so the SkyQuest IntelliScope labels are facing outward. Do not completely tighten the screws yet.
3. Connect the two side panels (C) with the front brace attached to the top baseplate (D) with the remaining six base assembly screws in the predrilled holes. The side of the baseplate with the pilot hole near the square-shaped cutout should be facing downwards. Tighten all six screws firmly.
4. Tighten the six base assembly screws installed in step 2.
5. Attach the azimuth encoder board (E) to the underside of the top baseplate (D). Insert the modular jack on the encoder board into the square-shaped hole in the baseplate and align the encoder board so that the small slotted hole in the board lines up with the predrilled starter hole, and the large hole lines up with the central hole in the baseplate (Figure 10). Thread an encoder board mounting screw into the predrilled starter hole with a Phillips screwdriver and tighten until just tight.
6. Place one fender washer (H) onto the azimuth axis screw (I). Then push the screw up through the hole in the ground baseplate (A). Then slide the encoder disk (J), flat side down, onto the azimuth axis screw.
7. Place the brass bushing (F) onto the azimuth axis screw (I) so that the wide end of the bushing is closest to the

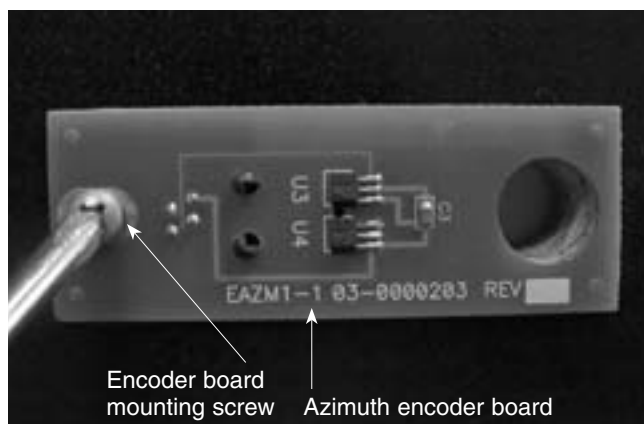


Figure 10. To install the azimuth encoder board, line up the large hole in the encoder board with the central hole in the top baseplate.

- encoder disk (J). Seat the bushing onto the encoder disk so that the registration feature on the bushing goes into the hole in the encoder disk. You may need to move the encoder disk around on the azimuth axis screw a bit in order for the bushing to seat properly.
8. Carefully position the top baseplate (D) over the ground baseplate (A) and lower it so the brass bushing (F) goes into in the center hole of the top baseplate. Place the remaining fender washer (K) onto the shaft of the azimuth axis screw, then thread the hex lock nut (L) onto the end of the azimuth axis screw and tighten it finger tight, for now.
9. To tighten the azimuth axis screw (I) and hex lock nut (L), tilt the assembled Dobsonian base at a slight angle to lift the ground baseplate off the ground. Now, with one wrench (or pliers) hold the head of the azimuth axis screw still while turning the hex lock nut with the other wrench. Figure 11 shows this being done. Tighten the hex lock nut just until the top fender washer is no longer moving freely, then tighten the hex nut 3/16-1/4 turn beyond that. This ensures proper spacing between the encoder disk and the azimuth encoder board.
10. Attach the handle (M) to the front brace (B) with the two handle mounting hex-head screws. Place one washer on each screw, then press the handle against the front brace (the end of the handle with the logo should be facing upwards). Thread the screws from the inside of the base into the handle until tight using the supplied crescent wrench.
11. Line up one of the altitude bearing cylinders with one of the four bearing cylinder holes on the interior of the side panels. The beveled end of the cylinder should be facing away from the side panel. Push a bearing cylinder screw through the side panel and bearing cylinder. Then thread it into the built-in hex nut on the cylinder with a Phillips head screwdriver (Figure 12). Repeat this for the remaining three bearing cylinders.
12. Attach the encoder connector board to the interior surface of the left side panel. Place the board against the side panel so that the modular jack fits into the square-shaped hole and thread four encoder board mounting screws through the connector board and into the predrilled holes in the side panel until tight (Figure 13).



Figure 11. To connect the baseplates, tilt them only slightly, as shown. Do not place them on their side. **(a)** Use one wrench (or pliers) to hold the hex nut steady **(b)** while turning the hex head of the azimuth axis screw with another wrench.

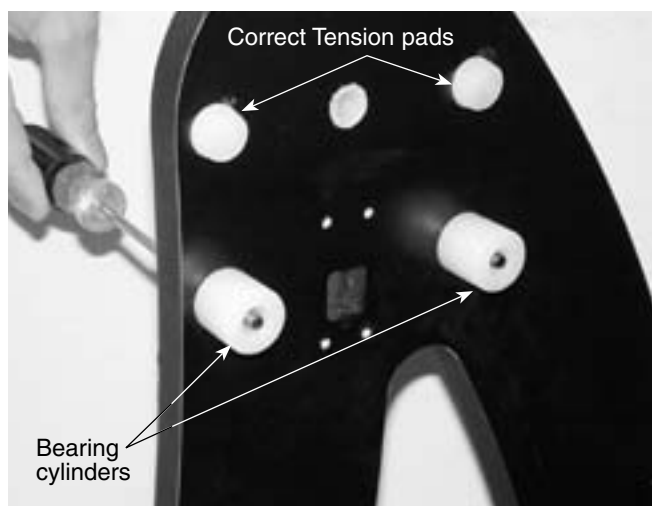


Figure 12. Push a bearing cylinder screw through the side panel and thread it into the altitude bearing cylinder. The beveled end of the cylinder should be facing away from the side panel.

There are some predrilled holes on the right side panel (opposite the panel that holds the encoder connector board). These holes will be used to mount parts that come with the optional IntelliScope controller. If you purchased the IntelliScope controller, you will want to follow the installation instructions in the controller's manual at this time.

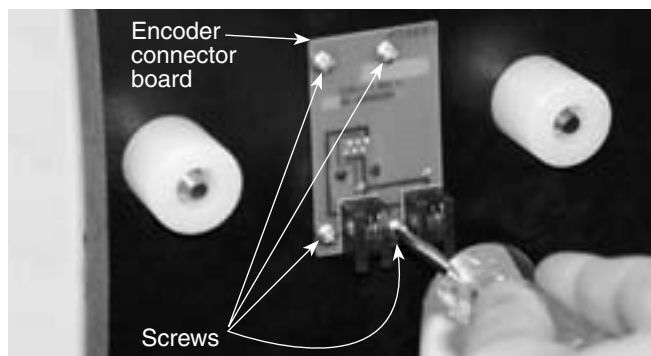


Figure 13. Attach the encoder connector board with four of the encoder board mounting screws.

Installing the Vertical Stop

Place the three flat washers onto the shaft of the vertical stop screw. Thread the vertical stop into the threaded insert on the inside of the front panel until tight (Figure 14). The position of the vertical stop is adjusted by adding or removing washers. This is important when using the optional IntelliScope Computerized Object Locator, since the optical tube must be exactly vertical during the alignment procedure.

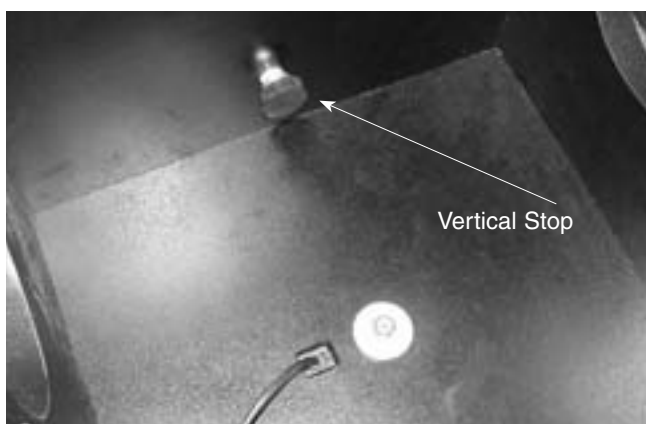


Figure 14. Thread the vertical stop, with washers attached, into the threaded insert in the front brace.

Installing the Eyepiece Rack

The aluminum eyepiece rack is a standard accessory on SkyQuest IntelliScope Dobsonians. It holds three 1.25" eyepieces and one 2" eyepiece in a convenient place on the base, within easy reach while you're observing. A 1.25" barlow lens also can be held in the rack. A few inches down from the top of the front brace panel you will notice two predrilled starter holes, about 6" apart. Thread the black wood screws into the starter holes with a Phillips screwdriver. Now "keyhole" the eyepiece rack onto the wood screws and continue tightening the screws (Figure 15). If you want to remove the rack, be certain the screws are loose enough so that you can lift the rack and remove it through the larger part of the keyholes. If you want to have the rack permanently attached, tighten the screws firmly.



Figure 15. Using the two supplied screws, install the aluminum eyepiece rack in the predrilled holes near the top of the front baseplate.

Placing the Optical Tube on the Dobsonian Base

Lift the optical tube and gently place it into the Dobsonian base so that the altitude bearings on either side of the tube rest on the bearing cylinders. Be careful when doing this, as the optical tube is somewhat heavy and unwieldy. Orient the optical tube as shown in Figure 16. Make certain that the optical tube does not get hung up on the vertical stop or the CorrecTension pads as you put it in place. Also make certain not to angle the tube so its altitude bearings can strike the encoder connector board and potentially damage it. Once on the bearing cylinders, the tube should pivot freely up and down with gentle hand pressure. Note that the tube will not yet be properly balanced, since the eyepiece and finder scope are not in place, and the CorrecTension system has not been installed.

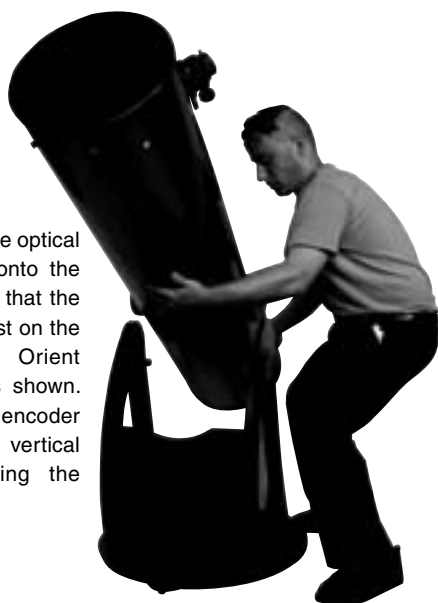


Figure 16. Lift the optical tube and place it onto the Dobsonian base so that the altitude bearings rest on the bearing cylinders. Orient the optical tube as shown. Do not bump the encoder connector board or vertical stop when installing the optical tube.

Installing the CorrecTension Friction Optimization System

An exciting feature of the SkyQuest IntelliScope Dobsonian is the redesigned CorrecTension (XT) system. Because of their relatively light weight, smaller Dobsonians (under 16") have always been plagued by insufficient friction on the altitude bearing surfaces. As a result, such telescopes move up and down much too freely. This causes problems when the observer tries to accurately center and track an object for viewing, especially at higher powers. Also, the telescope becomes very sensitive to balance, requiring additional equipment such as counterweight systems or springs to compensate.

SkyQuest Intelliscope Dobsonians employ a simple yet effective remedy for the friction problem that obviates the need for such cumbersome countermeasures. CorrecTension Friction Optimization utilizes a simple “disc brake” to apply the correct level of tension to the altitude bearings. With the XT system, you can change eyepieces or add a barlow lens without having to tediously adjust the telescope’s balance as you would with other Dobsonians. The altitude friction can be made equal to the azimuth friction, ensuring optimal performance.

To install the XT system, follow these steps while referring to Figures 17 and 18:

1. Select one of the retaining/tensioning knobs and slide the metal washer onto shaft, followed by the white nylon washer (you will need to thread this washer onto the shaft). This knob will now be known as the tensioning knob. Push the shaft of the tensioning knob through the hole in the side panel that has the IntelliScope port (Figure 17). Thread the knob into the altitude bearing until the CorrecTension pads on the interior surface of the side panel just touch the side of the altitude bearing on the optical tube.



Figure 17. The tensioning knob, with the metal and nylon washers, goes on the side of the base with the IntelliScope port. The tensioning knob should be tightened until the CorrecTension pads just touch the telescope’s altitude bearing.

2. Place the black nylon retaining knob spacer on the shaft of the remaining retaining/tensioning knob. This knob will

now be known as the retaining knob. Push the shaft of the retaining knob through the hole in the side panel opposite the one the retaining knob is in (Figure 18). Thread the knob into the altitude bearing as far as it will go. There will be a gap of about 1/2" between the side panel and the altitude bearing; this is where the altitude encoder of the IntelliScope object locator will go.



Figure 18. The retaining knob with the nylon spacer is installed on the side of the base that does not have the IntelliScope port.

The CorrecTension system is now installed. If you wish to remove the optical tube from the base, you will first need to unthread and remove both the knobs.

Installing the Finder Scope

SkyQuest IntelliScope Dobsonians come with a high-quality, large-aperture 9x50 achromatic crosshair finder scope (Figure 19a) as standard equipment. This greatly aids in finding objects to view in the night sky.

To place the finder scope in the finder scope bracket, first unthread the two black nylon screws until the ends are flush with the inside of the bracket. Place the rubber O-ring that comes on the base of the bracket over the body of the finder scope until it seats into the slot on the middle of the finder scope. Slide the eyepiece end (narrow end) of the finder scope into the bracket as shown while pulling the chrome, spring-

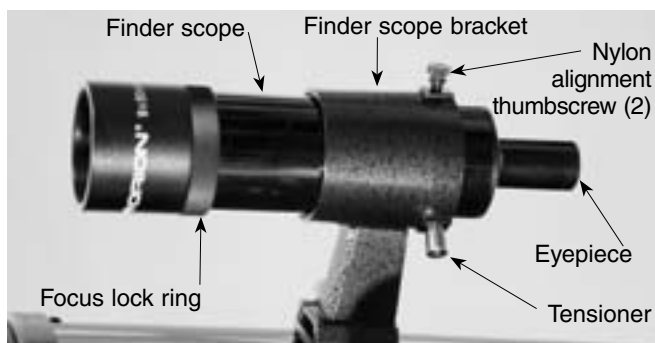


Figure 19a. The 9x50 finder scope and bracket.

loaded tensioner on the bracket with your fingers (Figure 19b). Push the finder scope through the bracket until the O-ring seats just inside the front opening of the bracket. Now, release the tensioner and tighten the two black nylon screws a couple of turns each to secure the finder scope in place. Insert the base of the finder scope bracket into the dovetail holder located adjacent to the telescope's focuser. Lock the bracket into position by tightening the knurled thumbscrew on the dovetail holder.



Figure 19b. Pull back on the tensioner and slide the finder scope into its bracket until the O-ring is seated in the bracket's ring.

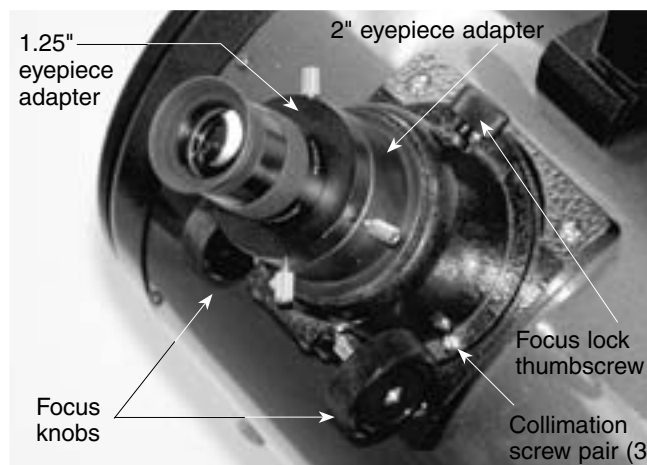


Figure 20. The 2" focuser of the SkyQuest XT12 IntelliScope.

Inserting an Eyepiece

The final step in the assembly process is to insert an eyepiece into the telescope's focuser. First, take the cover cap off the focuser drawtube.

Loosen the thumbscrew on the 1.25" eyepiece adapter (Figure 20). Do not loosen the two thumbscrews on the 2" eyepiece adapter. Insert the supplied 25mm Sirius Plössl eyepiece, and secure it by retightening the thumbscrew on the

1.25" eyepiece adapter. The other eyepiece can be placed in the eyepiece rack until it is needed.

The basic assembly of your SkyQuest IntelliScope Dobsonian is now complete. It should appear as shown in Figure 1. The dust cap on the front of the telescope tube should always remain in place when the telescope is not in use. It is also a good idea to store eyepieces in an eyepiece case and to replace the cover caps on the focuser and finder scope when the telescope is idle.

3. Aligning (Collimating) the Optical System

To get the sharpest images, your telescope's optical system must be in precise alignment. The process of aligning the primary and secondary mirrors with each other and with the mechanical axis of the telescope is called collimating. Collimating is relatively easy to do and can be done in daylight or at night.

Because the primary mirror is shipped separately from the optical tube, the telescope's optics must be collimated before it can be used. Most of the adjustments will be to the tilt of the primary mirror, as the secondary mirror has been pre-aligned at the factory. It is also good idea to check the collimation (optical alignment) of your telescope before each observing session and make any necessary adjustments.

To check collimation, remove the eyepiece and look down the focuser drawtube. You should see the secondary mirror centered in the drawtube, as well as the reflection of the primary mirror centered in the secondary mirror, and the reflection of the secondary mirror (and your eye) centered in the reflection of the primary mirror, as depicted in Figure 21a. If anything is off-center, as in Figure 21b, proceed with the following collimation procedure.

The Collimation Cap and Mirror Center Mark

Your SkyQuest XT12 IntelliScope comes with a collimation cap. This is a simple cap that fits on the focuser drawtube like a dust cap, but has a hole in the center and a reflective inner surface. The cap helps center your eye so that collimating is easier to perform. Figures 21b through 21e assume you have the collimation cap in place.

As an additional aid in collimating, the primary mirror of the SkyQuest XT12 IntelliScope has a tiny adhesive ring marking its exact center. This center ring will not affect the images you see when observing with the telescope in any way (since it lies directly in the shadow of the secondary mirror), but will greatly facilitate collimating when using the supplied collimation cap or other, more sophisticated collimation devices such as the Orion LaserMate Laser Collimator.

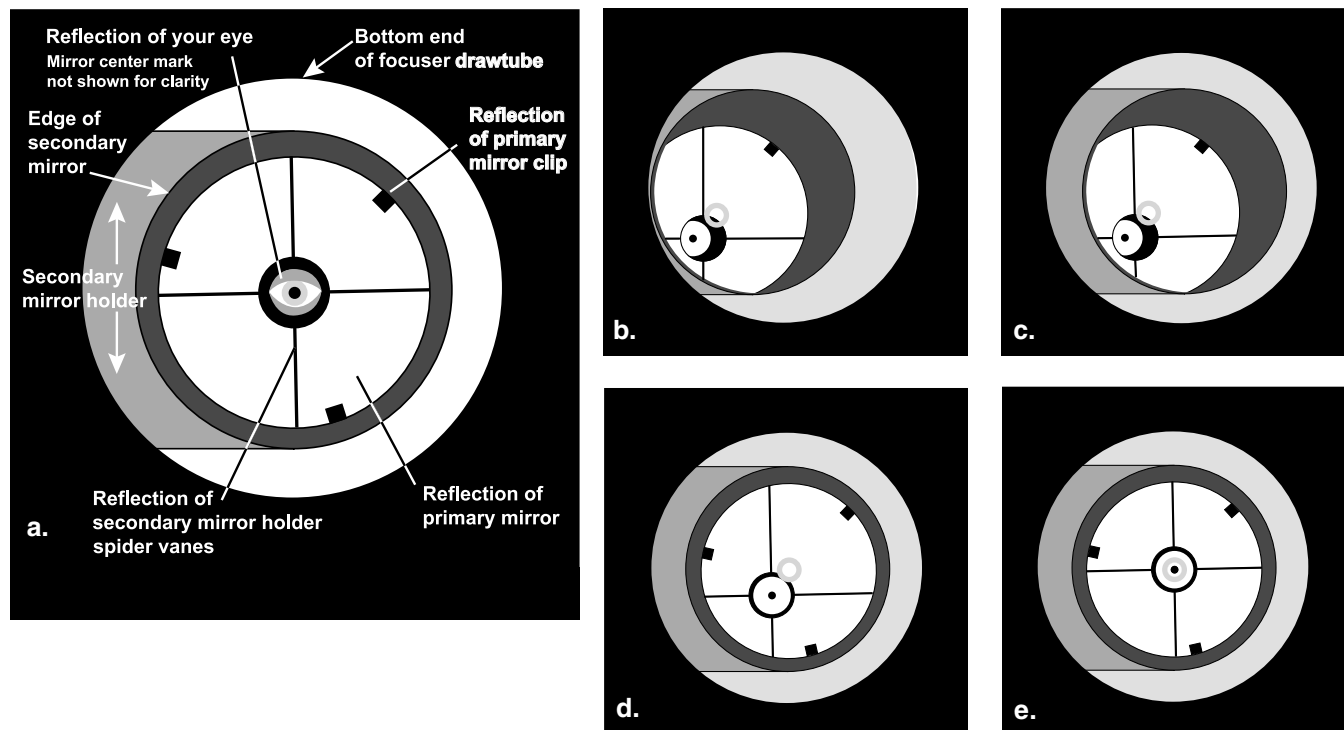


Figure 21. Collimating the optics. (a) When the mirrors are properly aligned, the view down the focuser drawtube should look like this. (b) With the collimation cap in place, if the optics are out of alignment, the view might look something like this. (c) Here, the secondary mirror is centered under the focuser, but it needs to be adjusted (tilted) so that the entire primary mirror is visible. (d) The secondary mirror is correctly aligned, but the primary mirror still needs adjustment. When the primary mirror is correctly aligned, the "dot" will be centered, as in (e).

Preparing the Telescope for Collimating

Once you get the hang of collimating, you will be able to do it quickly even in the dark.

For now, it is best to collimate in daylight, preferably in a brightly lit room and aimed at a white wall. It is recommended that the telescope tube be oriented horizontally. This will prevent any parts from the secondary mirror from falling down onto the primary mirror and causing damage, should something come loose when you are making adjustments. Place a sheet of white paper inside the optical tube directly opposite the focuser. This will provide a bright “background” when viewing into the focuser. When properly set up for collimation, your telescope should resemble Figure 22.

Figure 22. The SkyQuest IntelliScope properly set up for collimation. Note the white paper placed across from the focuser, and the level angle of the optical tube. Ideally, the telescope should be pointing at a white wall.



Aligning the Secondary Mirror

With the collimation cap in place, look through the hole in the cap at the secondary (diagonal) mirror. Ignore the reflections for the time being. The secondary mirror itself should be centered in the focuser drawtube, in the direction parallel to the length of the telescope. If it isn't, as in Figure 21b, it must be adjusted. This adjustment will rarely, if ever need to be done.

Using a 2mm hex key, loosen the three small alignment set screws in the center hub of the 4-vaned spider several turns. Now keep the mirror's holder stationary (be careful not to touch the surface of the mirrors), while turning the center screw with a Phillips head screwdriver (see Figure 23). Turning the screw clockwise will move the secondary mirror toward the front opening of the optical tube, while turning the screw counter-clockwise will move the secondary mirror toward the primary mirror.

Note: When making these adjustments, be careful not to stress the spider vanes or they may bend.

When the secondary mirror is centered in the focuser drawtube, rotate the secondary mirror holder until the reflection of the primary mirror is as centered in the secondary mirror as possible. It may not be perfectly centered, but that is OK. Now tighten the three small alignment screws equally to secure the secondary mirror in that position.

If the entire primary mirror reflection is not visible in the secondary mirror, as in Figure 21c, you will need to adjust the tilt of the secondary mirror. This is done by alternately loosening one of the three alignment set screws while tightening the other two, as depicted in Figure 24. Do not make excessive turns of these set screws or force them past their normal travel. A simple 1/2 turn of the screw can dramatically change the tilt of the mirror. The goal is to center the primary mirror reflection in the secondary mirror, as in Figure 21d. Don't worry that the reflection of the secondary mirror (the smallest circle, with the collimation cap “dot” in the center) is off-center. You will fix that in the next step.



Figure 23. To center the secondary mirror under the focuser, hold the mirror holder in place with one hand while adjusting the center bolt with a Phillips screwdriver. Do not touch the mirror's surface!



Figure 24. Adjust the tilt of the secondary mirror by loosening or tightening the three alignment set screws with a 2mm hex key.

Aligning the Primary Mirror

The final adjustment is made to the primary mirror. It will need adjustment if, as in Figure 21d, the secondary mirror is centered under the focuser and the reflection of the primary mirror is centered in the secondary mirror, but the small reflection of the secondary mirror (with the “dot” of the collimation cap) is off-center.

The tilt of the primary mirror is adjusted with the three large spring-loaded collimation knobs on the back end of the optical tube (bottom of the primary mirror cell). The three smaller thumbscrews lock the mirror’s position in place. These thumbscrews must be loosened before any collimation adjustments can be made to the primary mirror.

To start, turn the smaller thumbscrews counterclockwise a few turns each (Figure 25). Use a screwdriver in the slots, if necessary.



Figure 25. The three small thumbscrews that lock the primary mirror in place must first be loosened before any adjustments can be made.

Now, try tightening or loosening one of the larger collimation knobs (Figure 26). Look into the focuser and see if the secondary mirror reflection has moved closer to the center of the primary mirror. You can easily determine this with the collimation cap and mirror center mark by simply watching to see if the “dot” of the collimation cap is moving closer or further away from the “ring” on the center of the primary mirror. If turning the one knob does not seem to bring the dot closer to the ring, try using one of the other collimation knobs. It will take some trial and error using all three knobs to properly align the primary mirror. Over time you will get the feel for which collimation screws to turn to move the image in a given direction.

When you have the dot centered as much as is possible in the ring, your primary mirror is collimated. The view through the collimation cap should resemble Figure 21e. Re-tighten the locking thumbscrews.

A simple star test will tell you whether the optics are accurately collimated.



Figure 26. The tilt of the primary mirror is adjusted by turning one or more of the three collimation knobs.

Star-Testing the Telescope

When it is dark, point the telescope at a bright star high in the sky and center it in the eyepiece’s field of view. Slowly defocus the image with the focusing knob. If the telescope is correctly collimated, the expanding disk should be a perfect circle (Figure 27). If the image is unsymmetrical, the telescope is out of collimation. The dark shadow cast by the secondary mirror should appear in the very center of the out-of-focus circle, like the hole in a doughnut. If the “hole” appears off-center, the telescope is out of collimation.

If you try the star test and the bright star you have selected is not accurately centered in the eyepiece, then the optics will always appear out of collimation, even though they may be perfectly aligned. It is critical to keep the star centered, so over time you will need to make slight corrections to the telescope’s position in order to account for the sky’s apparent motion.

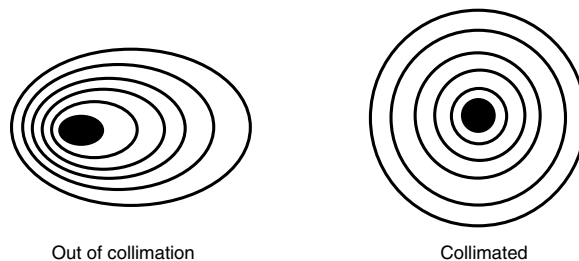


Figure 27. A star test will determine if a telescope’s optics are properly collimated. An unfocused view of a bright star through the eyepiece should appear as illustrated on the right if the optics are perfectly collimated. If the circle is unsymmetrical, as in the illustration on the left, the telescope needs collimation.

Note About the 2”s Focuser

The 2” focuser of the SkyQuest XT12 IntelliScope can be collimated using three pairs of push-pull screws located at the base of the focuser (Figure 20). The focuser was collimated at the factory, however, and should not need to be adjusted. Focuser collimating is only required under very rare circumstances, but has been made available for this telescope should such a need arise.

4. Using Your Telescope

One of the great benefits of the SkyQuest XT IntelliScope Dobsonian is its ability to point to more than 14,000 celestial objects, when used with the optional IntelliScope Computerized Object Locator (controller). Use of the controller is completely optional, and your telescope will function perfectly well without it. However, the controller will greatly enhance your observing experience by enabling you to quickly and precisely locate even very faint objects. For more about IntelliScope controller functionality, see Section 6.

Before using your SkyQuest telescope for the first time at night, we recommend getting a feel for its basic functions during daylight hours. Find a spot outdoors where you have a clear view of some object or landmark that is at least 1/4-mile away. It is not critical that the base be exactly level, but it should be placed on somewhat flat ground or pavement to ensure smooth movement of the telescope.

Remember, never point the telescope at or near the Sun without using a proper solar filter over the front aperture!

Altitude and Azimuth Motion

The SkyQuest's Dobsonian base permits smooth motion of the telescope along two axes: altitude (up/down) and azimuth (left/right) (Figure 28). For altitude motion, the altitude bearings on the telescope tube glide on pairs of bearing cylinders made from ultra-high molecular weight (UHMW) polyethylene. For azimuth motion, the top baseplate moves on three Teflon bearing pads attached to the ground baseplate.

To move the telescope, simply take hold of the navigation knob and gently move the tube up or down and left or right as desired. Both motions can be made simultaneously and in a continuous manner for easy aiming. When the telescope is pointed high in altitude, rotating the tube in azimuth can cause the base to “tip” because of the reduced leverage. In this case it is helpful to place your other hand on the base or the optical tube to help “guide” the tube.

Setting the Altitude Tension Level

The telescope should move smoothly with just gentle hand pressure. While azimuth friction is not adjustable, the altitude friction can be adjusted to the desired level by turning the altitude tension knob (Figure 17). Note that the altitude tension knob is the knob just above the IntelliScope Controller Port. The knob on the opposite side of the base is merely a retaining knob; it does not affect altitude tension.

Adjustable tension is a feature of the SkyQuest's exclusive springless CorrecTension Friction Optimization system. CorrecTension adds just the right amount of friction to keep the telescope tube in proper balance, even when other accessories are added on, such as a barlow lens or a heavier eyepiece.

A good way to set the altitude tension is to point the telescope at about a 45° angle. Loosen the altitude tension knob until the front of the optical tube starts to drift upward. As it does so, tighten the tension knob just enough to make the tube stop drifting (Figure 29). The motion should be ideal -- not too stiff, not too loose.



Figure 28. The SkyQuest IntelliScope has two axes of motion; altitude (up/down) and azimuth (left/right).

You will want to be able to “track” the motion of celestial objects while viewing them by making small movements of the telescope without experiencing jerking (too much tension) or overshooting of the desired position (too little tension).



Figure 29. Adjust the tensioning knob until the altitude balance is just right. The telescope should move easily in altitude without drifting when you let go.

Focusing the Telescope

With the 25mm Sirius Plössl eyepiece in the focuser and secured with the thumbscrew(s), move the telescope so the front (open) end is pointing in the general direction of an object at least 1/4-mile away. Now, with your fingers, slowly rotate one of the focusing knobs until the object comes into sharp focus. Go a little bit beyond sharp focus until the image just starts to blur again, then reverse the rotation of the knob, just to make sure you've hit the exact focus point.

If you have trouble focusing, rotate the focusing knob so the drawtube is in as far as it will go. Now look through the eyepiece while slowly rotating the focusing knob in the opposite direction. You should soon see the point at which focus is reached.

The thumb screw on the top of the body of the focuser (Figure 20) will lock the focuser drawtube in place once the telescope is properly focused. Before focusing, remember to first loosen this thumb screw. Do not loosen the thumb screw too much as there must be some tension to keep the drawtube secure within the focuser.

If you find the drawtube tension when focusing is either too tight (focus knob is difficult to turn) or too loose (image shifts when focusing), you can adjust it by tightening or loosening the two drawtube tensioning set screws on the focuser. These are the two small set screws located on either side of the focus lock thumb screw. Adjusting these set screws requires a 1.5mm hex key.

Note About the Focuser Drawtube Lock Knob

The focusers of the SkyQuest XT12 IntelliScope feature a drawtube lock knob. There are times when you may want to lock the drawtube to preserve the focus setting (such as when using certain afocal photographic attachments). This is done by turning the focus lock knob (Figure 20) clockwise until it is tight. The focus setting will now be locked. When you need to adjust the focus again, be sure to loosen the lock knob.

Viewing with Eyeglasses

If you wear eyeglasses, you may be able to keep them on while you observe, if your eyepieces have enough eye relief to allow you to see the whole field of view. 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. If they do, you can easily observe with your glasses off by just refocusing the telescope the needed amount. If you suffer from severe astigmatism, however, you may find images noticeably sharper with your glasses on.

Aligning the Finder Scope

The finder scope must be aligned accurately with the telescope for proper use. To align it, first aim the main telescope in the general direction of an object at least 1/4-mile away - the top of a telephone pole, a chimney, etc. Position that object in the center of the telescope's eyepiece.

The finder scope uses a spring-loaded bracket that makes alignment of the finderscope very easy. As you turn either of the thumbscrews, the spring in the bracket's tensioner moves in and out to keep the finder scope secure in the bracket.

Note: The image in both the finder scope and the main telescope will appear upside-down (rotated 180°). This is normal for finder scopes and reflector telescopes (see Figure 30).

Now look through the finder scope. Ideally, the object should be within the field of view. If not then coarse adjustments to the alignment thumbscrews will be needed. Once the image



Naked-eye view



View through finder scope and telescope

Figure 30. The view through a standard finder scope and reflector telescope is upside down. This is true for the SkyQuest XT12 IntelliScope and its finder scope as well.

is in the finder scope's field of view, you will now use the alignment thumbscrews to center the object on the intersection of the crosshairs. By loosening one alignment thumbscrew, you change the line of sight of the finder scope. Continue making adjustments to the alignment thumbscrews until the image in both the finder scope and the telescope's eyepiece is exactly centered.

Check the alignment by moving the telescope to another object and fixing the finder scope's crosshairs on the exact point you want to look at. Then look through the telescope's eyepiece to see if that point is centered in the field of view. If it is, the job is done. If not, make the necessary adjustments until the two images match up.

The finder scope alignment should be checked before every observing session. This can easily be done at night, before viewing through the telescope. Choose any bright star or planet, center the object in the telescope eyepiece, and then adjust the finder scope's alignment thumb screws until the star or planet is also centered on the finder's crosshairs. The finder scope is an invaluable tool for locating objects in the night sky.

Focusing the Finder Scope

The finder scope with your SkyQuest XT12 IntelliScope has adjustable focus. If the images in the finder appear somewhat out of focus, you will need to refocus the finder scope for your vision. Loosen the lock ring located behind the objective lens cell on the body of the finder scope (see Figure 19a). Back the lock ring off by a few turns, for now. Focus the finder scope on a distant object by threading the objective lens cell in or out on the finder scope body. Precise focusing will be achieved by focusing the finder scope on a bright star. Once the image appears sharp, retighten the lock ring behind the objective lens cell. The finder scope's focus should not need to be adjusted again.

Aiming/Pointing the Telescope

With the finder scope aligned, the telescope can be quickly and accurately pointed at anything you wish to observe. The finder scope has a much wider field of view than the telescope's eyepiece, and therefore it is much easier to find and center an object in the finder scope. Then, if the finder scope is accurately aligned, the object will also be centered in the telescope's field of view.

Start by once again moving the telescope until it is pointed in the general direction of the object you want to see. Some observers find it convenient to sight along the tube to do this. Now, look in the finder scope. If your general aim is accurate, the object should appear somewhere in the field of view. Make small adjustments to the telescope's position until the object is centered on the finder's crosshairs. Now, look in the telescope's eyepiece and enjoy the view!

Some objects are too faint to be seen with the small aperture of the finder scope. In those cases, you will need to interpolate your position using stars as guideposts. A star map will help you in doing so.

Magnification

Now that the object you want to view is centered in the 25mm eyepiece, you may want to increase the magnification to get a closer view. Loosen the thumbscrew on the focuser drawtube and remove the eyepiece. Place it in the eyepiece rack, if you wish. Insert the 10mm eyepiece in the focuser then tighten the thumbscrew. If you were careful not to bump the telescope, the object should still be visible in the field of view. Notice that the object being viewed is now larger, but somewhat dimmer.

Magnification, or power, is determined by the focal length of the telescope and the focal length of the eyepiece. Therefore, by using eyepieces of different focal lengths, the resultant magnification can be varied.

Magnification is calculated as follows:

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

The SkyQuest XT12 IntelliScope has a focal length of 1500mm. So, the magnification with the supplied 25mm eyepiece is:

$$\frac{1500 \text{ mm}}{25 \text{ mm}} = 60\times$$

The magnification provided by the 10mm eyepiece is:

$$\frac{1500 \text{ mm}}{10 \text{ mm}} = 150\times$$

The maximum attainable magnification for a telescope is directly related to how much light its optics can collect. A telescope with more light-collecting area, or aperture, can yield higher magnifications than a smaller-aperture telescope. The maximum practical magnification for any telescope, regardless of optical design, is about 60x per inch of aperture. This translates to about 720x for the SkyQuest XT12 IntelliScope.

Of course, such magnification will only yield reasonable images if atmospheric conditions are favorable.

More typically, useful magnifications will be limited to 200x or less, regardless of aperture. This is because the Earth's atmosphere distorts light as it passes through. On nights of good "seeing," the atmosphere will be still and will yield the least amount of distortion. On nights of poor seeing, the atmosphere will be turbulent, which means different densities of air are rapidly mixing. This causes significant distortion of the incoming light, which prevents sharp views at high magnifications.

Keep in mind that as magnification is increased, the brightness of the object being viewed will decrease; this is an inherent principle of the physics of optics 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!

Use of 2" Eyepieces

The SkyQuest XT12 IntelliScope is designed to accept eyepieces with a barrel diameter of either 1.25" or 2". At low magnifications, 2" eyepieces can provide a wider field of view than standard 1.25" eyepieces. A wider field can be desirable for viewing extended deep-sky objects that are too large to fit within a narrower field of view.

To use 2" eyepieces, simply loosen the two large thumbscrews on the 2" adapter (Figure 20). Once these thumbscrews are loosened, the 1.25" adapter comes off, exposing the 2" diameter focuser drawtube. Now, insert a 2" eyepiece into the drawtube and secure with the two thumbscrews loosened previously, and you're ready to observe.

Tube Balance

SkyQuest IntelliScope Dobsonians are designed to balance with standard supplied accessories, such as an eyepiece and a finder scope. But what if you want to use a larger finder scope or a heavier eyepiece? Traditional Dobsonian designs require the user to compensate by adding weight to the opposite end of the telescope tube. Such counterweighting systems can be expensive and unwieldy. The CorrecTension system of the SkyQuest IntelliScope Dobsonians, however, solves the finicky balance problem. The brake pads press against the altitude bearings on the optical tube and increase the friction. With CorrecTension, the added weight of front-end loads will not adversely affect the balance of the telescope. Simply tighten the tensioning knob to balance any extra load.

Transporting the Telescope

Even though it is a larger-aperture instrument, transporting the SkyQuest XT12 IntelliScope is relatively easy. The optical tube uncouples from the base and each component can be carried separately. The base even has a handle for your convenience.

To remove the optical tube from the base, simply unthread **Note: If you choose to thread the knobs back into the altitude bearings after removing the optical tube from the base, be careful not to bend the knobs when transporting the telescope.**

the retaining and tensioning knobs until they are free of the base and tube (make certain the spacer does not fall off the retaining knob). Then, using both hands, carefully lift the tube off the base. The tube is somewhat heavy, so don't hesitate to have a friend help lift the tube, if necessary. Do not use the navigation knob as a carry handle! It is not designed to support the weight of the telescope tube and could break off or damage the tube.

When putting the SkyQuest XT12 IntelliScope into a vehicle, common sense prevails. It is especially important that the optical tube does not get knocked around; this can cause the optics to become misaligned, and could dent the tube. We recommend transporting and storing the tube assembly in an optional padded case for proper protection.

5. Astronomical Observing

The SkyQuest XT12 IntelliScope provides prodigious capability for observing the many wonders of the heavens, from the major planets to deep-space nebulae and galaxies. In this section we give you some observing tips and briefly summarize what you can expect to see.

A. Selecting an Observing Site

Since most astronomical objects are faint, observing them from dark skies will give you the best views. While some objects, such as the planets and Moon, are bright enough to see clearly even from light-polluted city skies, for nebulae, galaxies, and most star clusters, the less ambient light there is to reduce contrast, the better.

When it isn't possible or convenient to get out of town to a pitch-black observing location, try to set up in a spot that is removed from street and building lights and that has a clear view of a large portion of the sky. For observing faint deep-sky objects, choose a moonless night. Use of a light-pollution filter can mitigate the effects of background sky brightness, enhancing the view of faint objects.

B. Seeing and Transparency

Atmospheric conditions play a huge part in quality of viewing. Light from stars and other celestial objects must travel through miles of Earth's atmosphere to reach our eyes. The air in the atmosphere will refract and bend the light. Atmospheric turbulence will worsen the effects of refraction, which can cause the image you see in your telescope to be unstable. The steadiness of the atmosphere is called "seeing."

In conditions of good "seeing," star twinkling is minimal and objects appear steady in the eyepiece. Seeing is best overhead, worst at the horizon. Also, seeing generally gets better later in the evening as much of the heat absorbed by the Earth during the day has radiated off into space. In conditions of bad seeing, stars will twinkle and objects will appear unsteady and blurry in the telescope.

"Transparency" is the clarity of the atmosphere, which can be adversely affected by the presence of moisture, smoke, and dust. All tend to scatter light, which reduces an object's brightness. Good transparency is desirable for astronomical

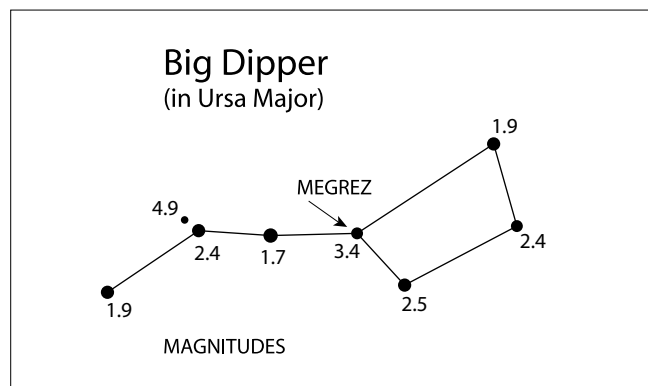


Figure 31. Megrez connects the Big Dipper's handle to its "pan". It is a good guide to judging the "seeing" conditions. If you cannot see Megrez (a 3.4-magnitude star) then transparency is poor.

observing, especially for viewing faint objects.

One good measure of transparency is by how many stars you can see with your unaided eyes. If you cannot see stars of magnitude 3.5 or dimmer then transparency is poor. Magnitude is a measure of how bright a star is. The brighter a star, the lower its magnitude. A good star to remember for this is Megrez (magnitude 3.4), which is the star in the Big Dipper that connects the handle to the "dipper." If you cannot see Megrez, then you have fog, haze, clouds, smog, light pollution or other conditions that are hindering your viewing (see Figure 31).

C. Cooling the Telescope

All optical instruments need time to reach "thermal equilibrium" to achieve maximum stability of the lenses and mirrors, which is essential for peak performance. Images will be unstable if the optics are not in equilibrium with the outdoor temperature. When moved from a warm indoor location outside to cooler air (or vice-versa), a telescope needs time to cool to the outdoor temperature. The bigger the instrument and the larger the temperature change, the more time will be needed.

Allow at least 30 minutes for your telescope to equilibrate. If the temperature difference between indoors and outdoors is more than 40°, allow an hour or more. In the winter, storing the telescope outdoors in a shed or garage greatly reduces the amount of time needed for the optics to stabilize. It also is a good idea to keep the telescope covered until the Sun sets so the tube does not heat greatly above the temperature of the outside air.

The SkyQuest XT12 IntelliScope is designed to accept an optional Cooling Accelerator Fan. When attached to the rear cell of the telescope, the fan hastens the equilibration of the primary mirror to ambient temperature.

D. Let Your Eyes Dark-Adapt

Do not 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. Many observers notice improvements after several hours of total darkness. As

your eyes become dark-adapted, more stars will glimmer into view and you will be able to see fainter details in objects you view in your telescope. Exposing your eyes to very bright daylight for extended periods of time can adversely affect your night vision for days. So give yourself at least a little while to get used to the dark before you begin observing.

To see what you are 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. Dim light is preferable to bright light. Beware, too, that nearby porch and streetlights and automobile headlights will spoil your night vision.

Eyepiece Selection

By using eyepieces of different focal lengths, it is possible to attain many different magnifications with your telescope. The telescope comes with two high-quality Sirius Plössl eyepieces: a 25mm focal length, which provides a magnification of 60x, and a 10mm focal length, which provides a magnification of 150x. Other eyepieces can be used to achieve higher or lower powers. 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. At least to begin with, the two supplied eyepieces will suffice nicely.

Whatever you choose to view, always start by inserting your lowest-power (longest focal length) eyepiece to locate and center the object. Low magnification yields a wide field of view, which shows a larger area of sky in the eyepiece. This makes acquiring and centering an object much easier. If you try to find and center objects with high power (narrow field of view), it's like trying to find a needle in a haystack!

Once you've centered the object in the eyepiece, you can switch to higher magnification (shorter focal length eyepiece), if you wish. This is especially recommended for small and bright objects like planets and double stars. The Moon also takes higher magnifications well.

Deep-sky objects, however, typically look better at medium or low magnifications. This is because many of them are quite faint, yet have some extent (apparent width). Deep-sky objects will often disappear at higher magnifications, since greater magnification inherently yields dimmer images. This is not the case for all deep-sky objects, however. Many galaxies are quite small, yet are somewhat bright, so higher power may show more detail.

The best rule of thumb with eyepiece selection is to start with a low power, wide field, and then work your way up in magnification. If the object looks better, try an even higher magnification. If the object looks worse, then back off the magnification a little by using a lower power eyepiece.

Astronomical Objects

Now that you are all setup and ready to go, one critical decision must be made: what to look at?

A. The Moon

With its rocky and cratered surface, the Moon is one of the most interesting and easy subjects to view with your telescope. The best time to view it is during its partial phases when shadows fall on the craters and canyon walls to give them definition. While the full moon may look like a tempting target, it is not optimal for viewing! The light is too bright and surface definition is low.

Even at partial phases the Moon is very bright. Use of an optional Moon filter helps to dim the glare. It simply threads onto the bottom of the eyepiece. You'll find the Moon filter improves viewing comfort, and helps bring out the subtle features of the lunar surface.

B. The Sun

You can change your nighttime telescope into a daytime Sun viewer by installing an optional 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. Also, be sure to cover the finder scope, or better yet, remove it altogether.*

C. The Planets

The planets don't stay put like the stars, so to find them you should refer to Sky Calendar at our website telescope.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. Your SkyQuest IntelliScope is capable of showing you these planets in some detail. Other planets may be visible but will likely appear starlike. 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.

JUPITER The largest planet, Jupiter, is a great subject for observation. You can see the disk of the giant planet and watch the ever-changing positions of its four largest moons: Io, Callisto, Europa, and Ganymede. Higher power eyepieces should bring out the cloud bands on the planet's disk.

SATURN The ringed planet is a breathtaking sight. The tilt angle of the rings varies over a period of many years; sometimes they are seen edge-on, while at other times they are broadside and look like giant "ears" on each side of Saturn's disk. A steady atmosphere (good seeing) is necessary for a good view. Look closely and you may see the Cassini division, a thin, dark gap in the rings. You should also see one or more of Saturn's moons, which look like faint stars. The brightest is the moon Titan.

VENUS At its brightest, Venus is the most luminous object in

the sky, excluding the Sun and the Moon. It is so bright that sometimes it is visible to the naked eye during full daylight! Ironically, Venus appears as a thin crescent, not a full disk, when at its peak brightness. Because it is so close to the Sun, it never wanders too far from the morning or evening horizon. No surface markings can be seen on Venus, which is always shrouded in dense clouds.

MARS The Red Planet makes a close approach to Earth every two years. Observing Mars is most favorable at these times. You should see a salmon-colored disk with some distinct dark patches, and you may be able to spot a whitish polar ice cap. To see surface detail on Mars, you will need a high power eyepiece and very steady air!

D. The Stars

Stars will appear as tiny points of light. Even powerful telescopes cannot magnify stars to appear as anything more than pinpoints. 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.

E. Deep-Sky Objects

Under dark skies, you can observe a wealth of fascinating deep-sky objects; that is, objects that reside outside of our solar system. These include gaseous nebulae, open and globular star clusters, and a variety of different types of galaxies. The large aperture of the SkyQuest XT12 IntelliScope is particularly well suited to gathering light, which is critical for observing these usually faint celestial entities. For deep-sky observing it is important that you find an observing site well away from light pollution. Take plenty of time to let your eyes adjust to the darkness. 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 from these fascinating objects.

Beginners are often surprised to discover that the deep-sky objects they see through the eyepiece of a telescope are mostly grayish, not colorful like those you see in long-exposure photographs. The reason is that our eyes are not sensitive to color in faint light. Still, there is something very special about seeing an astronomical object in real time with your own eyes — “live,” if not in living color.

Note About Astrophotography

The SkyQuest XT12 IntelliScope is designed for visual, not photographic use. The Dobsonian mount is not an equatorial-type mount, so it cannot be motor driven for long exposure astrophotography. The telescope has also been optically optimized for visual use, since photographic optimization degrades visual performance.

With that in mind, however, it is possible to do some simple astrophotography with a SkyQuest XT12 IntelliScope. With the use of afocal photography techniques (where the camera is simply put right up to the eyepiece to take a picture) and digital cameras, it is possible to take pictures of bright objects.

Certain photograph aids, such as the Orion SteadyPix, can help in taking photos by the afocal method.

6. Optional IntelliScope Computerized Object Locator

Perhaps the most exciting feature of the SkyQuest XT12 IntelliScope is its compatibility with the optional IntelliScope Computerized Object Locator (controller). When plugged into the IntelliScope port on the telescope’s base, the IntelliScope controller enables the user to point the telescope quickly and effortlessly to more than 14,000 celestial objects with the push of a button. After a simple two-star alignment procedure, you just select an object to view from the intuitive keypad, then read the guide arrows on the controller’s illuminated liquid crystal display and move the telescope in the corresponding direction. In seconds, the object will be waiting in the telescope’s field of view, ready to observe. It’s that simple!

Even without the optional IntelliScope controller, the SkyQuest XT12 IntelliScope provides a tremendous observing experience. But addition of the controller provides a whole new level of convenience and capability, as you’re able to locate and view more objects in an evening that you ever could before.

The IntelliScope controller works by communicating electronically with a pair of high-resolution, 9,216-step digital encoders, one of which will reside on one of the telescope’s side bearings (this encoder is included with the optional IntelliScope controller), the other of which you installed during assembly of the base. The encoders allow highly precise positioning of the telescope to coordinates programmed into the IntelliScope controller’s database for each object. Since the telescope is not dependent on motors for movement, you can point the telescope at your target much more quickly (and quietly!) than other computerized telescopes can — and without guzzling all those batteries in the process.

The IntelliScope database includes:

- 7,840 objects from the Revised New General Catalog
- 5,386 objects from the Index Catalog
- 110 objects from the Messier Catalog
- 837 selected stars (mostly double, multiple, and variable stars)
- 8 planets
- 99 user-programmable objects

With the user-friendly IntelliScope controller, there are many ways to locate an object. If you know its catalog number (NGC or Messier number, for instance), you can enter it using the illuminated keypad buttons. Or you can press one of the object-category buttons (Cluster, Nebula, Galaxy, etc.) to access a list of objects by type. For a tour of the best objects visible in a given month, you just press the Tour button. Another great feature of the IntelliScope is the ability to identify an “unknown” object in the field of view — just press

the ID button. You can even add up to 99 objects of your own choosing to the IntelliScope controller's database.

The backlit, two-line liquid crystal display on the controller shows you the object's catalog number, its common name if it has one, the constellation in which it resides, its right ascension and declination coordinates, the object type, magnitude, angular size, as well as a brief description in scrolling text.

The two guide arrows and associated "navigation numbers" tell you in what direction to move the telescope to pinpoint an object's location. As the telescope approaches the object's location, the numbers get progressively smaller. When the navigation numbers reach 0, the telescope will be pointed right at the object! You just look into the eyepiece and enjoy the view!

The IntelliScope Computerized Object Locator is a wonderful convenience for both the novice and experienced observer. It can be added at any time to turn your SkyQuest IntelliScope into a fully computerized "smart scope" that will expand your observing horizons in ways you never imagined. It is well worth the modest investment!

7. 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. 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 not in use.

Your SkyQuest XT12 IntelliScope requires very little mechanical maintenance. The optical tube is steel and has a smooth painted finish that is fairly scratch-resistant. If a scratch does appear on the tube, it will not harm the telescope. Smudges on the tube or base can be wiped off with a soft cloth and a household cleaner.

Cleaning Eyepiece Lenses

Any quality optical lens cleaning tissue and optical lens cleaning fluid specifically designed for multi-coated optics can be used to clean the exposed lenses of your eyepieces or finder scope. Never use regular glass cleaner or cleaning fluid designed for eyeglasses. Before cleaning with fluid and tissue, however, 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. On larger lenses, clean only a small area at a time, using a fresh lens tissue on each area. Never reuse tissues.

Cleaning Mirrors

You should not have to clean the telescope's mirrors very often; normally once every few years or so. Covering the telescope with the dust cover when it is not in use will prevent dust from accumulating on the mirrors. Improper cleaning can

scratch mirror coatings, so the fewer times you have to clean the mirrors, the better. Small specks of dust or flecks of paint have virtually no adverse effect on the visual performance of the telescope.

The large primary mirror and the elliptical secondary mirror of your telescope are front-surface aluminized and over-coated with hard silicon dioxide, which prevents the aluminum from oxidizing. These coatings normally last through many years of use before requiring re-coating (which is easily done).

To clean the secondary mirror, you will need to remove it from the telescope. Before doing so, orient the telescope tube horizontally so that nothing accidentally falls down and hits the primary mirror. Hold the secondary mirror holder stationary while loosening the center Phillips-head screw. Handle the mirror by its holder; do not touch the mirror surface itself. Once the mirror (still in its holder) is removed from the tube, follow the same procedure described below for cleaning the primary mirror. You do not need to remove the secondary mirror from its holder when cleaning.

To clean the primary mirror, you must carefully remove the mirror cell from the telescope. To do this remove the six screws on the side of the tube near the rear end ring. You do not need to remove the collimation screws on the bottom of the mirror cell. Remove the entire mirror cell from the tube. You will notice the primary mirror is held down with three clips fastened by two screws each. Loosen the screws and remove the clips. There are also three nylon-tipped set screws that support and retain the mirror's edge. These set screws are located on the perimeter of the mirror cell. Use a small flat-head screwdriver to loosen each of these set screws a few turns.

You may now remove the mirror from the mirror cell. Do not touch the surface of the mirror with your fingers; lift it carefully by the edge. Set the mirror, aluminized face up, on a clean, soft towel. Fill a clean sink free of abrasive cleanser with room-temperature water, a few drops of liquid dishwashing detergent, and if possible a capful of 100% isopropyl alcohol. Submerge the mirror (aluminized face up) in the water and let it soak for a few minutes (or hours if it's a very dirty mirror). Wipe the mirror under water with clean cotton balls, using extremely light pressure and stroking in a straight line across the mirror. Use one ball for each wipe across the mirror. Then rinse the mirror under a stream of lukewarm water. Any particles on the surface can be swabbed gently with a series of cotton balls, each used just one time. Dry the mirror in a stream of air (a "blower bulb" works great), or remove any stray drops of water with the corner of a paper towel. Water will run off a clean surface. Cover the mirror surface with a tissue, and leave the mirror in a warm area until it is completely dry before reassembling the telescope.

8. Specifications

Primary mirror: 305mm diameter, Pyrex, parabolic, center- marked

Focal length: 1500mm

Focal ratio: f/4.9

Focuser: Rack-and-pinion. accepts 2" and 1.25" eyepieces

Altitude bearing diameter: 5.75"

Optical tube material: Rolled steel

Azimuth pad material: Teflon

Altitude bearing material: Ultra-high molecular weight (UHMW) polyethylene

Eyepieces: 25mm & 10mm Sirius Plössl, multi-coated, 1.25" barrel diameter

Eyepiece magnifications: 60x and 150x

Finder scope: 9x power, 50mm aperture, achromat, crosshairs, 5° field of view

Eyepiece rack: Holds three 1.25" eyepieces and one 2" eyepiece

Mirror coatings: Aluminum with SiO₂ overcoat

Minor axis of secondary mirror: 70mm

Optical tube weight: 50 lbs.

Base weight: 33 lbs.

Tube length: 58"

Tube outer diameter: 14"

IntelliScope Computerized Object Locator: Optional

One-Year Limited Warranty

This Orion SkyQuest XT12 IntelliScope Dobsonian Reflecting Telescope 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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