
Orion[®] CC6 and CC8 f/12 Classical Cassegrain Telescopes

#52138 CC6

#52139 CC8



#52138



#52139

 **ORION[®]**
TELESCOPES & BINOCULARS

Providing Exceptional Consumer Optical Products Since 1975

Customer Support:

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Corporate Offices:

89 Hangar Way, Watsonville CA 95076 - USA

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Congratulations on your purchase of an Orion Classical Cassegrain telescope. These compact but long-focal-length telescopes are designed for high-power viewing and imaging performance. Sporting an optical design comprising a parabolic primary mirror and a hyperbolic secondary mirror – both made from thermally stable quartz glass – the Classical Cassegrains offer high-resolution images with zero image shift, no front glass element to dew up, and a compact form factor that does not require a gigantic mount. Particularly well suited for both visual observation and imaging of solar system subjects, but also of smaller deep-space objects, the CC6 and CC8 provide a welcome alternative to the myriad low-power, wide-field optical systems so common today. Enjoy your new telescope!

Unpacking Your Telescope

Use care when unpacking the shipping carton. We recommend keeping the box and all original packaging materials. In the event that the telescope needs to be shipped to another location, or returned for warranty repair, having the proper packaging will ensure that your telescope will survive the journey intact. Returns for refund or exchange will not be accepted without all of the original packaging. Make sure that all the items listed in the Parts List below are present.

Parts List

Part	Quantity
Optical tube assembly	1
2" Extension ring	1
1" Extension rings	2
Quick collimation cap	1
Dust cover	1

The Focuser

Orion Classical Cassegrain telescopes come standard with a machined, all-aluminum, dual-speed focuser. The CC6 features a 2" Crayford focuser equipped with a removable 1.25" adapter (**Figure 1A**). The CC8 has a 2" linear-bearing Crayford focuser, which has a stabilizing track on the underside of the drawtube that provides extra rigidity for carrying heavy payloads (**Figure 2**). Drawtube flexure is virtually eliminated by stabilizing the drawtube within the focuser housing. Both focusers have a 10:1 fine focus adjustment. Every 10 turns of the small knob equals a single turn of the large knob, to enable the micro-adjustment necessary for the sharpest images possible. Use the coarse focus knob to adjust the telescope until your object is as close to focus as possible, then make fine adjustments with the black outside knob.

Each focuser is also equipped with both a tension adjustment knob for the drawtube and a drawtube locking knob. For the CC6 both knobs are on the underside of the focuser (**Figure 1B**), whereas on the CC8 the tension adjustment knob is on the underside of the focuser while the larger locking knob is on top (**Figure 2**). We recommend keeping the tension adjustment knob fairly tight at all times as this will minimize drawtube flexure and slippage.

The focuser can be rotated to a desired angle prior to final focusing for astrophotographic framing or to position the focus knobs at a convenient orientation by slightly loosening the focuser attachment collar (turning it counterclockwise), then rotating the focuser to the desired position, then retightening the collar.

Extension Rings

Included with your telescope are three thread-on extension rings (**Figure 3**). These extension rings are provided to allow multiple visual or photographic accessories to reach focus, depending on their backfocus requirements. They are designed for installation individually or in combination between the optical tube and the focuser to take up unneeded backfocus. Refer to the Specifications at the end of this manual for the native backfocus distance of the CC6 and CC8.

If the focuser drawtube is fully extended and you are still unable to achieve focus you will need to install one or more extension rings. To do so you must first remove the focuser from the optical tube by rotating the focuser attachment collar counterclockwise. Once you have threaded the desired length of extension rings onto the male threads on the telescope tube, re-attach the focuser by aligning the silver attachment collar over the exposed extension ring threads and tighten by turning clockwise (**Figure 4**). It may be useful to experiment with different combinations during the day before heading out into the field at night. Choose a target over ½ mile away to ensure you are simulating infinity focus. The goal is to reach focus with as little extension of the focuser drawtube as possible, to avoid drawtube flexure.

Depending on what equipment you use to observe or image with, you may need to add one or more of the included extension rings. For instance, for visual observation with a typical 1.25" star diagonal and 1.25" eyepiece, you will need 2" of extension (two 1" rings or one 2" ring) between the tube and the focuser. In our imaging tests with the CC6 and CC8, using an Orion StarShoot Solar System camera and also using a star diagonal, the same 2" of extension was required (**Figure 5**). To use the same camera without a star diagonal – directly inserted

WARNING: Never look directly at the Sun through your telescope—even for an instant—without a professionally made solar filter that completely covers the front of the instrument, or permanent eye damage could result. Young children should use this telescope only with adult supervision.

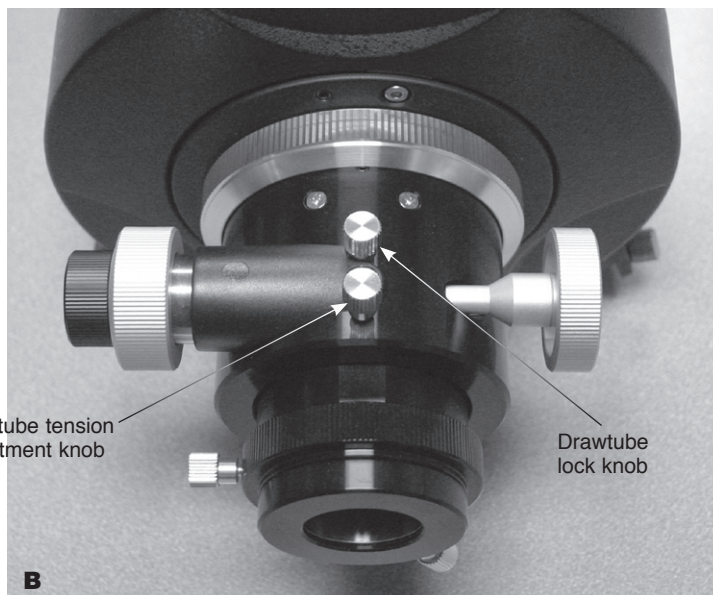
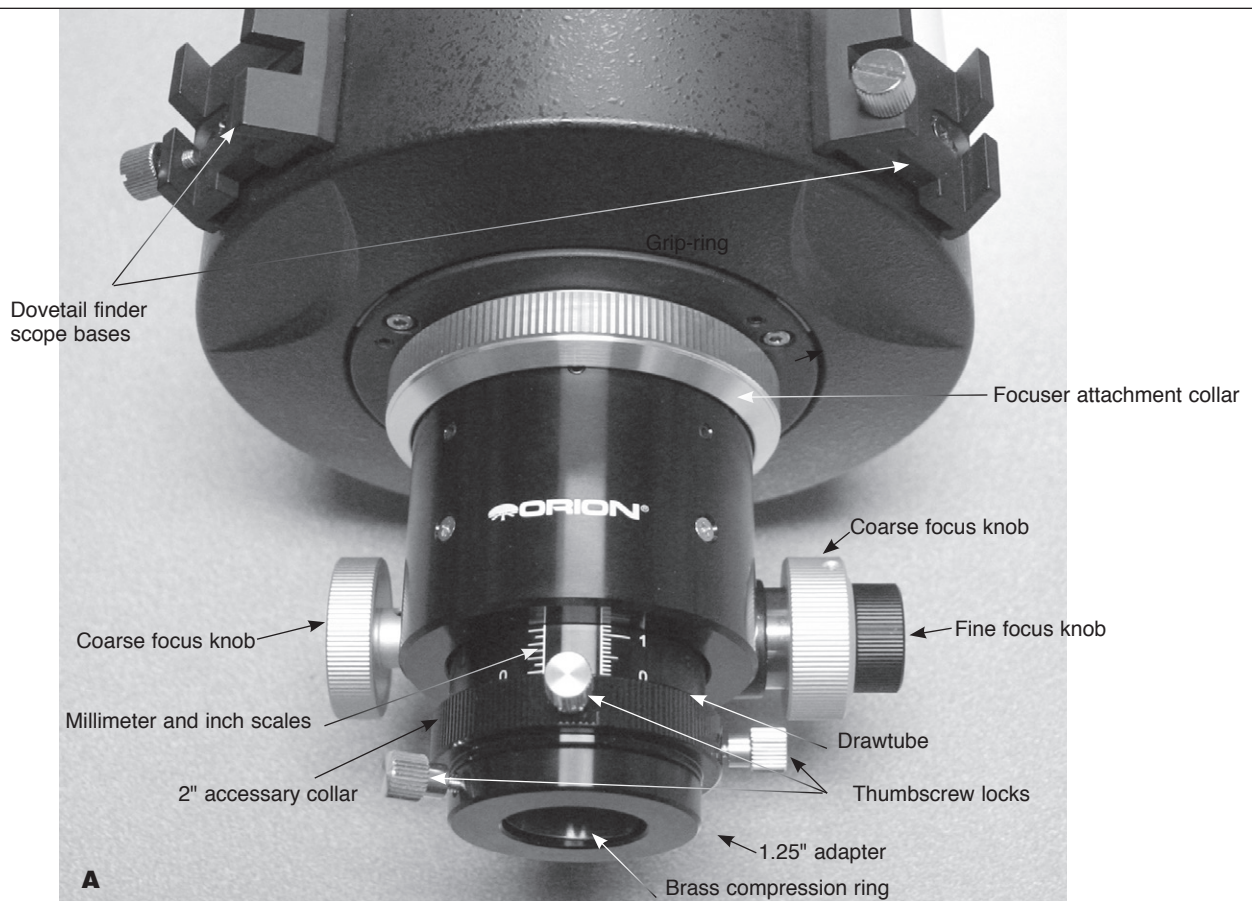


Figure 1. A) The 6" Classical Cassegrain's Crayford focuser, top view. B) Both the drawtube tensioning and lock knobs are located on the underside of the focuser.

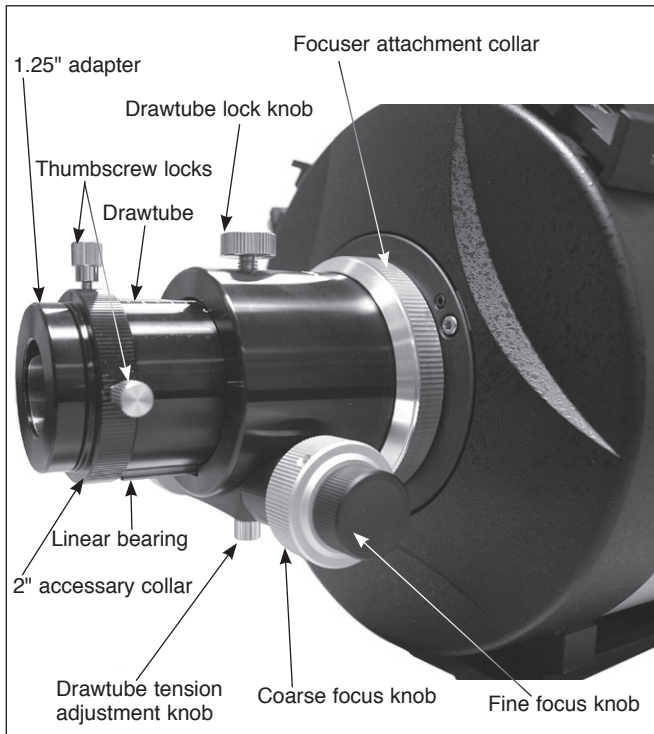


Figure 2. The linear bearing Crayford focuser on the 8" Classical Cassegrain provides extra drawtube rigidity to support heavier camera loads.



Figure 3. Each Classical Cassegrain comes with one 2" and two 1" glare-threaded extension rings.

into the 1.25" adapter – required use of all three extension rings (100mm total) to reach focus. The backfocus distance of your camera's sensor as well as the other components in your imaging train, e.g., focal reducer or flattener, filter wheel, or off-axis guider, will influence how much extension you will need to add between the tube and the focuser in order to reach focus.

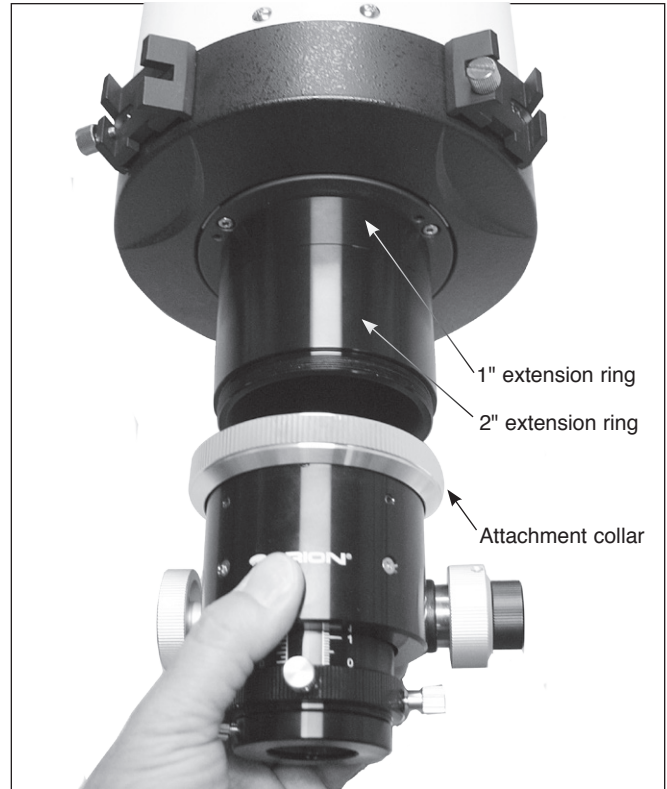


Figure 4. Extension rings are installed between the telescope's rear cell and the focuser, to take up unneeded backfocus.

Attaching Optional Finder Scopes and Guiding Solutions

The Orion Classical Cassegrains feature two dovetail finder scope bases on opposite sides of the telescopes' vertical mid-line (**Figure 6**), to allow maximum versatility of placement for optional finder scopes, reflex sights, or a mini guidescope. Having two dovetail bases gives you the option of placing a finder scope on either the left or right side of the focuser, depending on your preference, or of mounting both a red-dot sight and a traditional achromatic finder scope on the telescope simultaneously. For imaging, you may even wish to install a small guidescope such as the Orion 60mm Multi-Use Guide Scope in one of the dovetail bases along with a reflex sight or another finder scope for visual use in the other. The choice is yours!

The CC8 also features a slotted V-style universal dovetail bar on top of the tube (**Figure 6**), custom designed by Orion, to allow mounting of a guidescope or a DSLR camera for piggyback photography, or even a second, piggybacked telescope for visual use or imaging. You will have to remove the bar to install the screws (sold separately) needed to attach your accessory. Remove the bar by removing the four socket head cap screws on the ends of the bar with a 5mm or 3/16" Allen wrench. Then reattach the bar once your accessory is firmly attached to the bar.

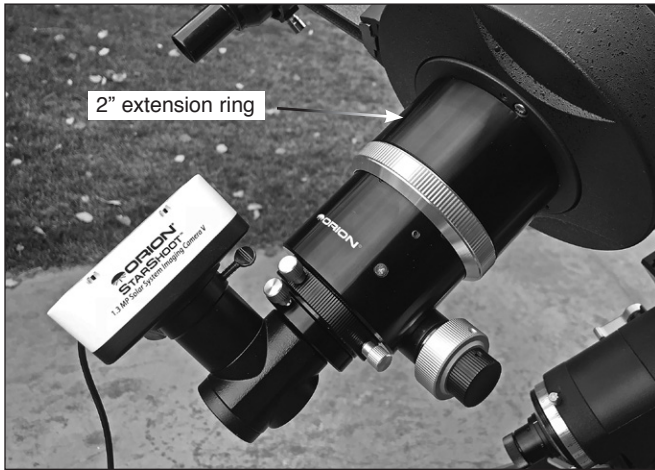


Figure 5. Reaching focus with a solar system camera in this configuration requires addition of the 2" extension ring (or two 1" extension rings).



Figure 6. The Orion Classical Cassegrains are equipped with two dovetail finder scope bases. The CC8, shown here, also has a dovetail bar on top for mounting a guide scope or a second telescope.

Mounting the Telescope

Orion Classical Cassegrains each have a dovetail mounting bar running along the bottom of the optical tube for rigid attachment to a compatible equatorial mount saddle plate. The CC6 has a narrow, V-style bar while the CC8 includes a wide D-plate style bar. The long length of the dovetail bars makes it easy to balance the telescope on the declination axis by sliding the scope forward or back before locking it down.

Cooling the Telescope

Before observing or photographing with your Classical Cassegrain, you should let it equilibrate to the outdoor temperature for an hour or more. This will reduce thermal air currents inside the telescope that could soften or blur your images, whether you're doing visual observing or astrophotography.

Collimating the Classical Cassegrain

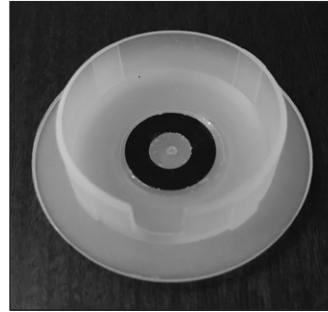


Figure 7. The included quick-collimation cap aids in the precise alignment of the optics. An even better choice is to purchase a Cheshire collimating eyepiece.

The optics in your new Classical Cassegrain optical tube have been aligned at the factory. However, rough handling during transit may warrant periodic re-adjustments. We have precisely center marked the secondary mirror with a small adhesive ring to aid in collimation. This ring does not affect the view through the telescope, so it should NOT be removed. You will need the quick-collimation cap (**Figure 7**) that came with your telescope or (better) a Cheshire eyepiece to check and adjust collimation. We recommend doing the collimation during daytime. It can be done indoors or outside.

1. Remove any extension rings and attach the focuser directly to the optical tube.
2. For indoor collimation, set up your telescope in a well-lit room with the telescope oriented horizontally, and point it at a light colored wall. For outdoor collimation, point the telescope toward the sky but keep the telescope as close to horizontal as possible.
3. Insert the collimation cap or Cheshire eyepiece into the focuser via the included 1.25" adapter. If using a Cheshire eyepiece, make sure that the 45° reflecting surface of the Cheshire is aimed at a bright source of light, like a ceiling light or a clear sky outdoors.
4. Look through the collimation cap/Cheshire eyepiece. If using a Cheshire eyepiece you should see a small black dot and a dark ring within a larger bright circle. The dot is the hole of your Cheshire eyepiece. The dark ring is the center mark on the secondary mirror. And the bright circle is the reflective 45-degree surface of the Cheshire. The larger black circle outside that is the secondary mirror holder. (**Figure 8A**).

If your scope is in good collimation, the black dot will be dead center in the dark ring, which will in turn be centered in the bright circle. If that's the case, no further adjustments to the secondary mirror will be necessary. The optical axis is denoted by a thin white circle on the outer edge. You can disregard that for the time being; it will be covered in the following section.

If the view looks something like **Figure 8B** — with the dot of the collimation eyepiece NOT centered in the secondary center ring — you will need to adjust the three collimation setscrews at the front of the secondary mirror holder (**Figure 9**). This will

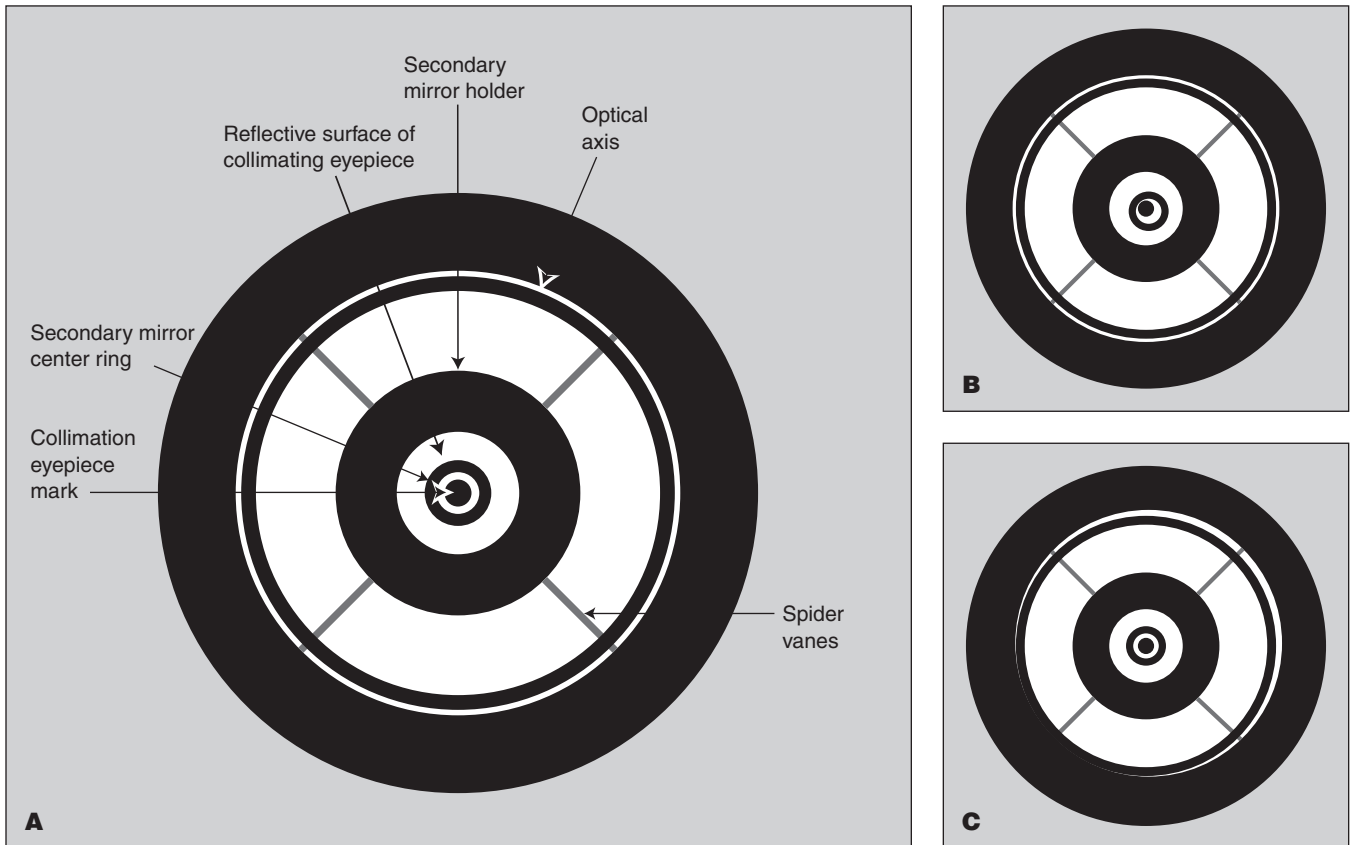


Figure 8. The view through a Cheshire collimating eyepiece (not to scale). A) The optics in perfect alignment. B) The secondary mirror slightly out of alignment. C) The optical axis out of alignment.

adjust the tilt of the secondary, changing the relative position of the secondary center ring when peering through the collimation eyepiece.

Secondary Mirror Adjustment

NOTE: Only adjust the three screws around the perimeter of the holder -- do not adjust the center screw! (Figure 9). Adjusting the center screw can cause the secondary mirror to fall off and will not be covered under warranty.

A 4mm hex key is required to perform collimation on the secondary mirror (Figure 9). When adjusting one of these screws you will need to make counter-adjustments to the other two. Therefore, if you are loosening one screw you will need to tighten the other two. At the end of the process you want all three collimation mirror to be reasonably tight so the secondary mirror won't shift while the scope is in use.

Always start by loosening one screw. Adjust the screws only very slightly -- by no more than 1/10 turn at a time, and one screw at a time before checking the view through the Cheshire again to see how things changed. Only tiny adjustments should

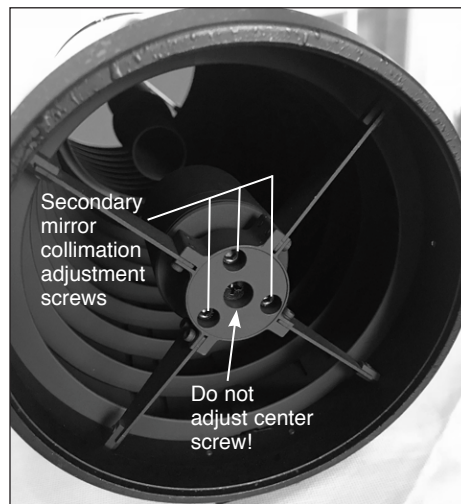


Figure 9. The secondary mirror collimation adjustment screws. A 4mm hex key is required.

be required to achieve collimation. This will also aid in the prevention of accidentally putting the telescope grossly out of collimation. With each tiny tweak of a screw, make a mental note of which way and how far the center dot moved, as that will inform which screw to turn next and by how much. Experiment with different combinations of loosening/tightening the three screws

one by one until the collimation eyepiece's black dot is centered in the dark ring of the secondary mirror. The correct alignment of the secondary mirror is critical in determining if the optical axis requires alignment. Be sure you have properly aligned the secondary mirror before proceeding to the next step.

Optical Axis (Primary Mirror) Adjustment

The optical axis is denoted by a thin outline of light (white) around the perimeter of the view through the collimation cap or Cheshire eyepiece (**Figure 8A**). If this outline is not a perfect circle of uniform thickness, as in **8C**, that's an indication that the optical axis (primary mirror) needs adjustment. This adjustment will require 3mm and 2.5mm hex keys.

Note that there are three pairs of screws on the rear cell of the optical tube where the focuser attaches (**Figure 10**). Each pair consists of a small black screw and a larger chrome screw. The small black screws are merely locking screws, which you should loosen before adjusting the mirror's tilt. The larger chrome screws are spring-loaded collimation screws that actually adjust the tilt of the primary mirror. Turn these collimation screws only a fraction of a turn at a time. Turn one and check the view through the Cheshire to see if it improved the white optical axis ring. Keep tweaking the collimation screws, each time checking the optical axis ring, until it is concentric and uniform in width. Then tighten the three lock setscrews to fix the mirror in that position.

After adjusting the optical axis, re-check the collimation of the secondary mirror and make any necessary adjustments, then recheck the optical axis collimation. Optical axis collimation will not need to be performed very often, if ever.

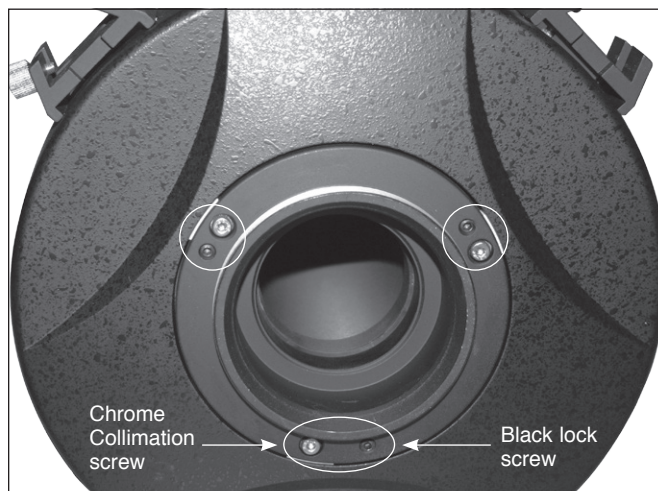


Figure 10. Three pairs of collimation screws on the rear cell allow adjustment of the optical axis, if needed.

Star Testing

A star test can be performed to confirm the collimation accuracy of the telescope. The adjustment procedure on the telescope is the same as described above; testing, however, will be done in the night sky using a real star and you will not use the collimation cap or Cheshire eyepiece.

Choose a star close to the zenith (straight overhead) rather than at the horizon to minimize atmospheric distortions. Using Polaris as your target star can be helpful as minimal drift adjustments will be required.

It is recommended that you not use a star diagonal while performing this procedure. Rather, place an eyepiece directly into the 1.25" adapter in the focuser. It should be an eyepiece that provides moderate to high magnification. You may need to add all three of the extension rings in front of the focuser to be able to reach focus. Center the star in the field of view. Slowly defocus the image with the focusing knob until you can see a series of concentric diffraction rings form around the dark disk in the center. That dark disk is the shadow of the secondary mirror. In a well collimated telescope, the diffraction rings should appear round and concentric, with the dark disk exactly in the center (**Figure 11**). If the dark central disk is off center, the scope is out of collimation. Adjust the collimation of the secondary mirror and, only if necessary, the primary mirror while monitoring the defocused star until the dark central disk is exactly centered in the diffraction rings.

NOTE: It is important when checking or adjusting the collimation using a star, that the star be positioned in the center of the eyepiece's field of view. If it isn't, 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 may need to make slight corrections to the telescope's position.

Care and Cleaning of the Optics

Do not disassemble the telescope, including to clean the mirror. A small amount of dust and particulates on the mirrors' surfaces will not affect performance. In the event internal cleaning is necessary the telescope should be shipped to Orion Telescopes & Binoculars for service. This telescope does not contain user-serviceable parts and disassembly of the components will void the warranty. When not in use, please use the supplied dust cap(s) to keep dust and particulates out of the tube and off the optics.

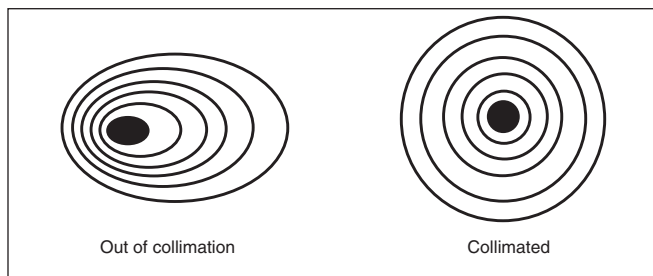


Figure 12. A de-focused view of a bright star through an eyepiece. Proper collimation will show concentric, symmetrical diffraction rings with a dark spot exactly in the center, as in the image on the right. If the spot is off-center, the scope needs collimation.

Specifications

	CC6	CC8
Optical configuration:	Classical Cassegrain	Classical Cassegrain
Primary mirror figure:	Paraboloid	Paraboloid
Secondary mirror figure:	Hyperboloid	Hyperboloid
Mirror material:	Quartz (SiO ₂)	Quartz (SiO ₂)
Mirror coating:	Enhanced, 96% with SiO ₂ overcoat	Enhanced, 96% with SiO ₂ overcoat
Focuser:	Dual-speed (10:1) Crayford, 2" (with 1.25" adapter)	Dual-speed (10:1) Crayford, 2" (with 1.25" adapter)
Drawtube travel:	41mm (laser-engraved millimeter scale)	50mm (laser-engraved millimeter scale)
Baffles:	8 internal knife-edge baffles	11 internal knife-edge baffles
Optical tube material:	Rolled steel	Rolled steel
Aperture:	152mm (6")	200mm (7.9")
Focal length:	1836mm	2400mm
Focal ratio:	f/12	f/12
Secondary mirror diameter:	50mm	60mm
Central obstruction:	58.5mm (38%, linear)	68.5mm (34%, linear)
Backfocus distance:	157.2mm (from end of 2" focuser collar)	166mm (from end of 2" focuser collar)
Mounting plate:	V-style mounting plate	D plate (bottom); V-style plate (top)
Finder scope base:	Two dovetail bases	Two dovetail bases
Tube length:	20.5" (including focuser)	25" (including focuser)
Extension rings:	One 2" ring and two 1" rings	One 2" ring and two 1" rings
Weight:	12 lbs.	18 lbs. 4 oz.

One-Year Limited Warranty

This Orion product is warranted against defects in materials or workmanship for a period of one year from the date of purchase. This warranty is for the benefit of the original retail purchaser only. During this warranty period Orion Telescopes & Binoculars will repair or replace, at Orion's option, any warranted instrument that proves to be defective, provided it is returned postage paid. Proof of purchase (such as a copy of the original receipt) is required. This warranty is only valid in the country of purchase.

This warranty does not apply if, in Orion's judgment, the instrument has been abused, mishandled, or modified, nor does it apply to normal wear and tear. This warranty gives you specific legal rights. It is not intended to remove or restrict your other legal rights under applicable local consumer law; your state or national statutory consumer rights governing the sale of consumer goods remain fully applicable.

For further warranty information, please visit www.OrionTelescopes.com/warranty.

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