INSTRUCTION MANUAL

Orion® 10" Ritchey-Chrétien Optical Tube Assembly

#8961

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IN 380 Rev. A 04/10

Figure 1: The Ritchey-Chrétien Optical Tube.

Congratulations on your purchase of an Orion Ritchey-Chrétien astrograph! Astroimaging demands high contrast and center to edge image sharpness. The Ritchey-Chrétien optical system features precision hyperbolic quartz mirrors with an impressive reflectivity rating of no less than 94%. These highly corrected optics offer virtually coma-free performance; and multiple knife-edge baffles provide images with superb contrast. These design features will offer a lifetime of outstanding performance for imaging and visual applications. The Ritchey-Chrétien is a member of the Cassegrain family of telescopes. This unique design offers large-diameter optics while maintaining very short tube lengths, making them extremely portable and versatile.

Parts List

1 Optical Tube Assembly

1 2" Extension ring

2 1" Extension rings

1 Collimation Eyepiece

1 Battery Pack (for cooling fans)

Unpacking Your Telescope

Use care when unpacking the shipping carton. We recommend keeping the boxes 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.

Your new telescope arrives double-boxed (Figures 2a-c). Make certain you are opening from the top of the box to access the accessories packaged in the Styrofoam shell. To access the optical tube simply grasp the Styrofoam piece and lift it out of the box and set it aside for the time being. Once all items have been removed from the box take a moment to confirm that all pieces are present and intact. Refer to the Parts List above to aid in identifying the various pieces.

Setting Up Your Telescope

Your Ritchey-Chrétien optical tube comes ready to use right out of the box. The focuser is attached to the optical tube and ready to accept either visual or photographic accessories. Also included are three individual extension rings (Figure 1). These extension rings are provided to allow multiple visual or photographic accessories to reach focus. These are designed to thread directly onto the optical tube. Therefore, the focuser will need to be removed before attaching the necessary extension rings. It may be useful to experiment with different combinations during the day before heading out into the field. Choose a target over ½ mile away to ensure you are simulating distant focus.

Figures 2a-c: Unpacking the Optical Tube.

If the focuser drawtube is fully extended and you are still unable to achieve focus you will need to install one or more of these extension rings. They are to be installed in-between the focuser and optical tube. In order to install the necessary extension ring(s) you will need to first remove the focuser from the optical tube. Be careful not to cross-thread these pieces when re-attaching adapters.

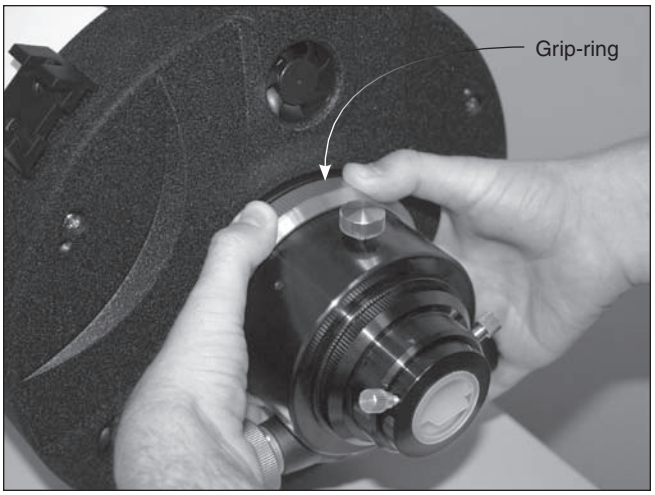

Figure 3: Removing the focuser.

1. Remove the focuser by gently turning the knurled silver grip-ring with the both hands (Figure 3). Turn counter-clockwise to loosen.
2. Attach the extension ring of choice to the backend of the tube. The optical tube has external (male) threads. Subsequently you will use the end of the ring with internal (female) threads to attach.
3. The exposed threads on the back of the extension tubes match that on the OTA to install additional extension rings or to reattach the focuser.
4. Once you have added the desired number of extension rings re-attach the focuser by aligning the silver grip-ring over the exposed extension ring threads and tighten by carefully turning clockwise.

The wide variety of astronomical equipment available will require that you add or remove some or all of the extension rings. Individual setups will require different combinations of extension rings be used. In general, visual applications will require further extension than imaging. The examples listed and pictured on the following page (Figures 4a-d) are of common scenarios. Some setups may require combinations different from those listed below.

To use an Orion StarShoot Deep Space imager use three inches worth of the supplied extension rings to reach focus. For DSLR use – and most visual applications – 2" worth of extension will be required. Larger 2" eyepieces may only require one inch of extension.

Focusing the Telescope

One of the exciting new features of the Orion Ritchey-Chrétien optical tubes is the inclusion of the new dual-speed (10:1) 3" linear bearing Crayford focuser (Figure 5). Instead of the traditional Crayford-style focuser – which uses a roller tensioned against the drawtube – the new linear bearing focuser has a track on the drawtube with beveled edges and rollers within "grooves" along the edges. This allows you to more effectively lock down the focuser with heavy payloads such as a large eyepiece, a DSLR, or a large CCD Imager and further reduc-

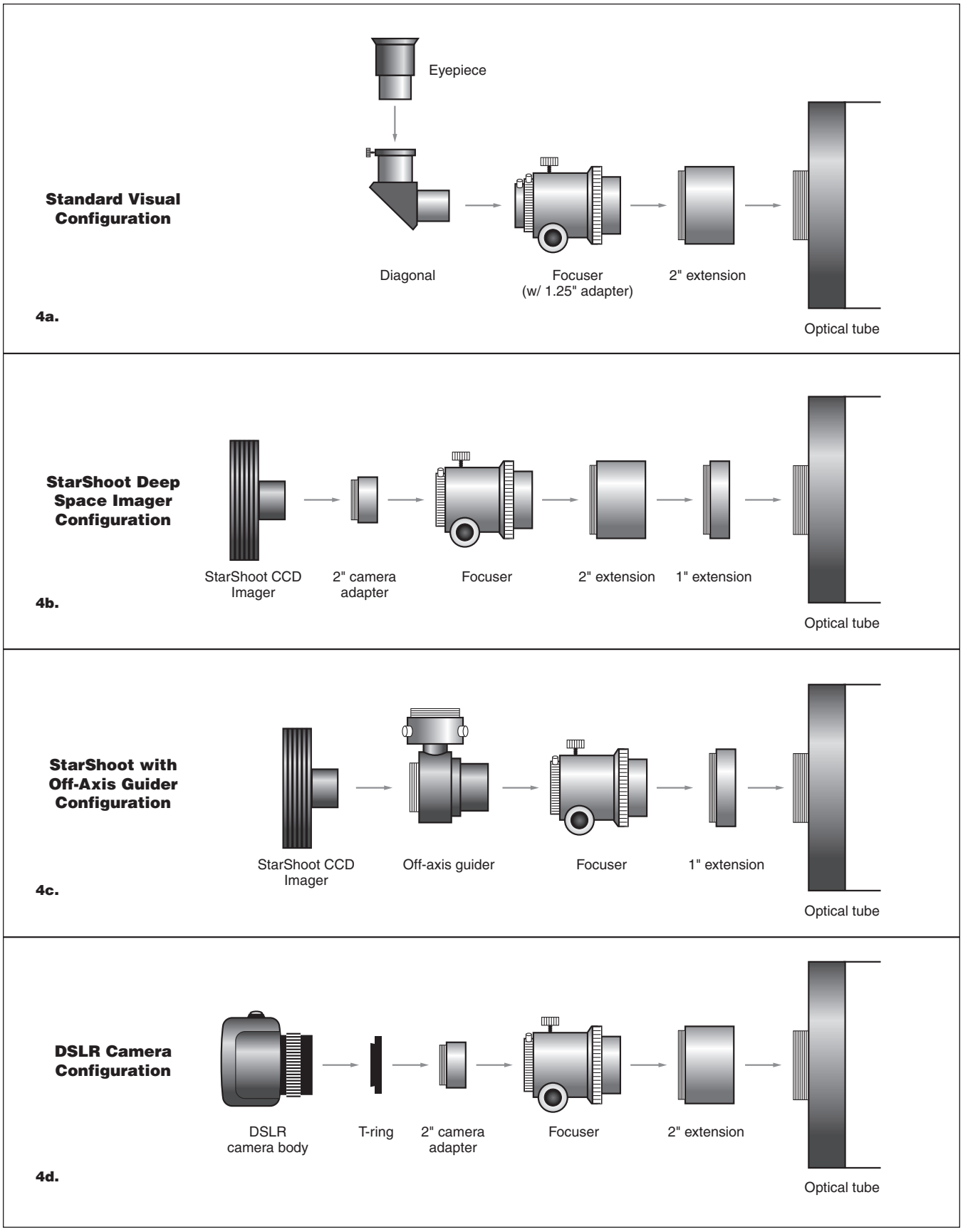

Figure 4a-d: Possible accessory configurations using the Ritchey-Chrétien OTA.

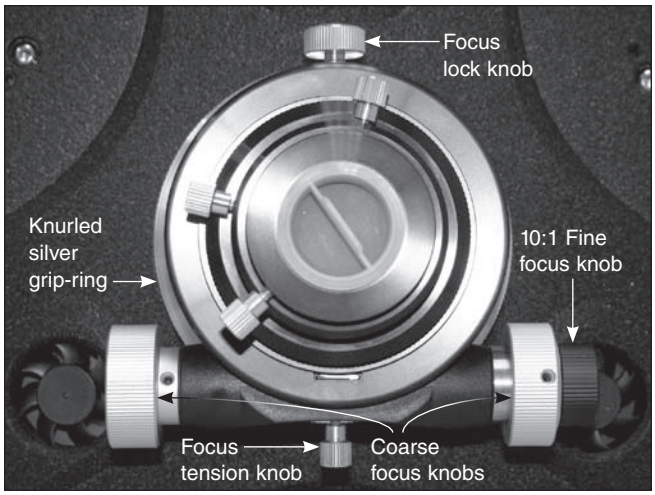

Figure 5: Details of the linear bearing Crayford focuser.

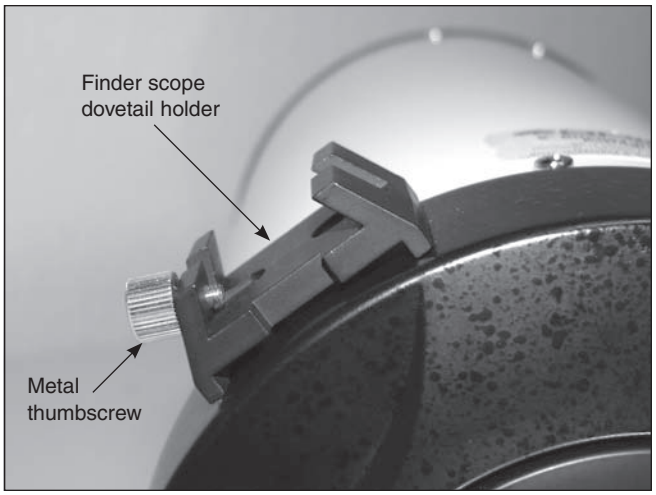

Figure 6: Finder scope dovetail base.

es image shift by stabilizing the drawtube within the focuser housing.

The 3" drawtube results in a larger image circle and a fully illuminated field on the imaging sensor of all imagers; including DSLR's and large format CCD imagers. The focuser has 50mm of drawtube travel and a total back focus of 150mm from the rear of the 2" adapter. This generous amount will allow comprehensive use of the accessories preferred by serious astroimagers, including filter wheels, autoguiders, and adaptive optics guiding systems such as the Orion SteadyStar.

For astronomical viewing, out-of-focus star images are very diffuse, making them difficult to see. If you turn the focus knob too quickly, you can go right through focus without seeing the image. To avoid this problem, your first astronomical target should be a bright object (like the Moon or a planet) so that the image is visible even when out of focus. There is also 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.

Attaching a Finder Scope

A finder scope is a small, wide-field telescope used to help locate and center objects in the main field of your telescope. A finder scope usually has a built-in crosshair reticle that shows the optical center of the finder's field of view. On some models the center is indicated with an LED display.

A finder scope dovetail holder has been pre-installed on your Ritchey-Chrétien optical tube assembly making it easy to use any Orion finder and many others using a similar bracket (Figure 6). Installing a finder scope is very simple:

1. Loosen the metal thumbscrew on the side of the dovetail base.
2. Insert the bracket into the dovetail from the back of the telescope, until it stops.
3. When the finder bracket is securely in place retighten the metal thumbscrew.

Cooling Fans

There are three 1.5" DC powered fans built into the rear cell of the 10" Ritchey-Chrétien telescope (Figure 8). These will reduce the time it takes to achieve thermal equilibrium of the primary mirror. Having your optics at the same ambient temperature as your surroundings will eliminate tube currents and allow you to achieve a sharper focused image. The fans can be powered by 8 AA batteries (not included) using the supplied battery pack, or and external 12 V field battery such as the Orion Dynamo Pro. It is suggested to power the cooling fans 45 minutes to an hour prior to viewing or imaging with the Ritchey-Chrétien. You may need to allow additional time for cooling if there is a substantial temperature difference between the storage and viewing environments. Once the telescope has achieved thermal equilibrium you can power off the cooling fans to reduce vibration.

Collimating the Ritchey-Chrétien

Your new Ritchey-Chrétien optical tube has been aligned at the factory. However, rough handling during transit may require periodic re-adjustments. We have center-marked the secondary mirror and included a collimation eyepiece to aid in this process.

Using the Collimating Eyepiece

This is the recommend procedure for most users. Setup your telescope in a well lit room pointed horizontally. It is best to remove the lens cover and point the telescope at a white (or light colored) wall. Remove all of the extension rings and attach the focuser directly to the optical tube. Insert the collimation eyepiece into the focuser using the 1.25" eyepiece adapter. When peering through the collimation eyepiece you should see a small black dot centered within a donut-like ring. The black dot is the mark of the collimation eyepiece and the ring is the center target on the secondary mirror. The big white circle outside that is the reflected surface of the col-

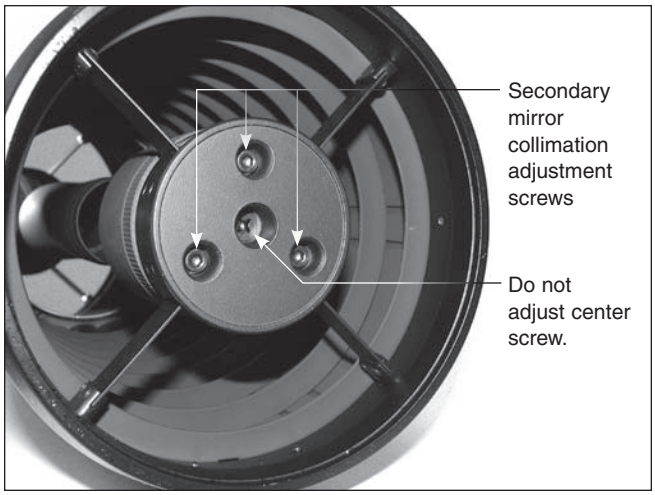

Figure 7: The secondary mirror collimation adjustment screws.

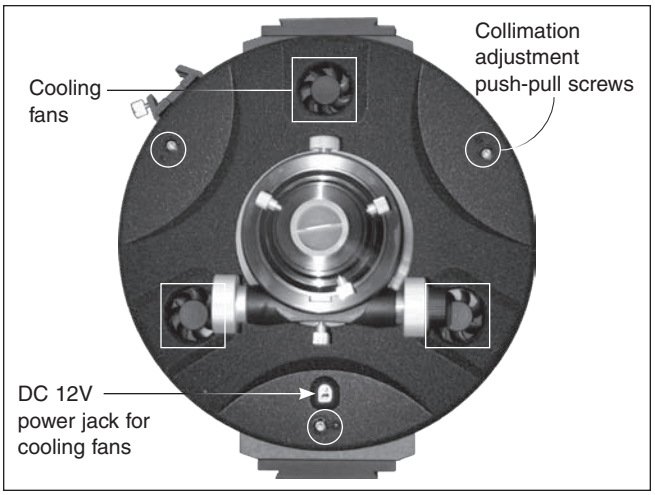

Figure 8: The Ritchey-Chrétien 10" OTA primary adjustment screws and cooling fans.

limation eyepiece and the larger black circle outside that is the secondary holder. 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 this is aligned as in Figure 9a, no further adjustments will be necessary. If it appears as in figure 9b*** – with the dot of the collimation eyepiece not centered in the secondary center mark – use the three collimation screws at the front of the secondary mirror holder. This will adjust the tilt of the secondary changing the relative position of the secondary mark when peering through the collimation eyepiece.

Secondary Adjustment

NOTE: Only adjust the three screws around the perimeter of the holder. Do not adjust the center screw. Adjusting the center screw can cause the secondary mirror to fall off and will not be covered under warranty (Figure 7).

A 4mm hex key is required to perform collimation on the secondary mirror. When adjusting one of these screws you will need to make equal counter-adjustments to the other two. Therefore, if you are tightening one screw you will need to loosen, by an equal amount, the other two. When the process is complete you should have tension against all three screws. Adjust the screws by no more than ¼ turn at a time. Only minor adjustments should be required to achieve collimation. This will also aid in the prevention of accidently putting the telescope grossly out of collimation in the event adjustments are made incorrectly. Experiment with different combinations until the collimation eyepiece mark is centered in the center mark of the secondary mirror. The correct alignment of the secondary mirror is critical in determining if the optical axis requires alignment. Be certain you have properly aligned the secondary mirror before proceeding to the next step.

Primary Mirror Adjustment

These adjustments will require a 3mm and 2.5mm hex key. There are three sets of "push-pull" screws on the back-end of the optical tube where the focuser attaches (Figure 8).

Each set consists of a smaller black screw and a larger chrome screw; these must be adjusted in tandem. Loosen one and tighten the other to make changes to the optical axis. This will adjust the tilt of the optical axis in relation to the secondary mirror. When properly aligned you will see a very thin concentric outer white circle around the perimeter of your view through the collimation eyepiece. This procedure will require only micro-adjustments, if any.

Star Testing

An optional star test can be performed to confirm the collimation accuracy of the telescope. The adjustment procedure on the telescope is the same as using the Collimation eyepiece; testing, however, will be done in the night sky. This method is more difficult as you will need to keep your target star centered in your field of view. Furthermore, seeing conditions will affect the end result. Keeping the star *precisely* centered in the field of view is critical to avoid false negatives. It is suggested that you 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.

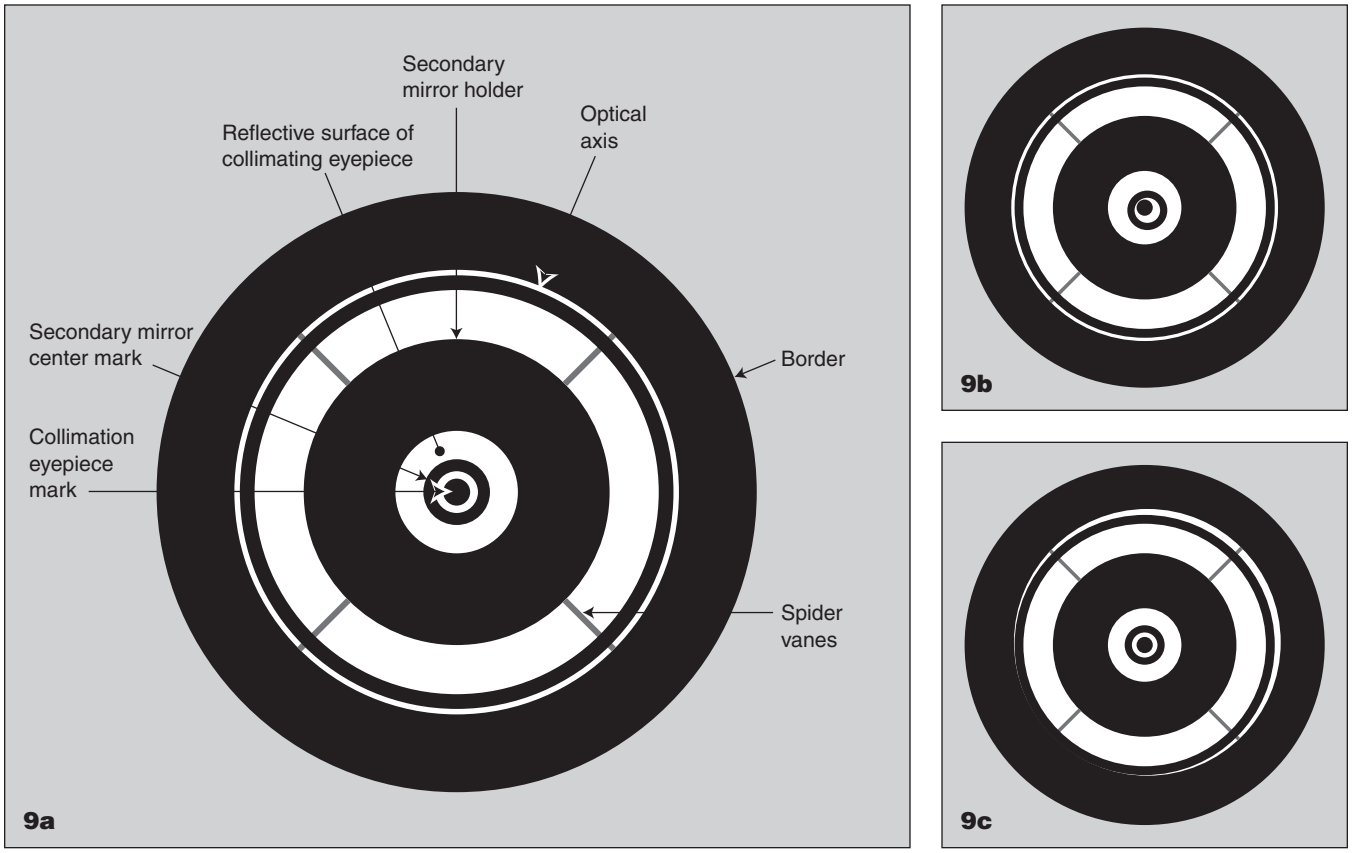

Figure 9a-c: The view through the collimating eyepiece (not to scale). Figure 9a shows the Ritchey-Chrétien aligned with all components identified. Figure 9b shows the secondary out of alignment. Figure 9c shows the optical axis out of alignment.

Center a bright star in your field of view using moderate to high magnification. Place your eyepiece directly into the focuser. Do not use a star diagonal while performing this procedure. In a well collimated telescope, a defocused star image should appear symmetrical, with the dark central obstruction centered in the star's ring pattern (Figure 10).

Care and Cleaning of the Optics

Do not disassemble the Ritchey-Chrétien for any reason, including to clean the mirror. A small amount of dust and particulates on the mirror's surface will not affect performance. In the event internal cleaning is necessary the telescope should be shipped to Orion Telescopes and Binoculars for service. This telescope does not contain user-servicable 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 mirror.

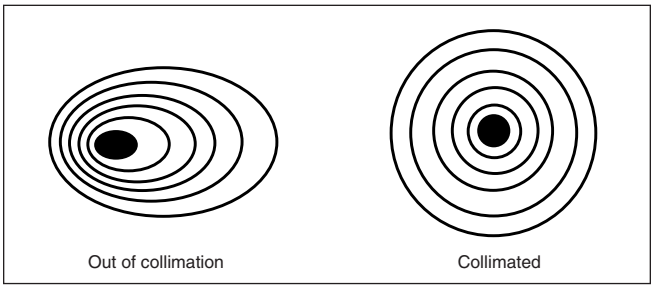

Figure 10: An unfocused view of a bright star through the eyepiece. Proper collimation will show a symmetrical diffraction pattern such as the one on the right. If the circles are unsymmetrical the scope needs collimation.

Specifications

10" f/8

Optical tube material:	Steel
Optical configuration:	Ritchey-Chrétien
Figure:	Hyperbolic
Mirror material:	Quartz
Mirror coating:	Enhanced, no less than 94% with SiO_2 Overcoat
Focuser:	Machined Aluminum 3" Dual-Speed (10:1) Linear Bearing Crayford
Focus travel:	50mm
Back focus:	150mm
Cooling fan:	3 total 1.5" diameter 12v DC
Accessories:	Accepts 2" & 1.25"
Baffles:	9 knife-edge computer positioned baffles plus internal micro-baffles along primary mirror baffle tube and secondary mirror light shield
Optical tube:	Steel
Aperture:	250mm (9.8")
Focal length:	2000 mm
Focal ratio:	f/8
Secondary center marked:	Yes
Secondary mirror minor axis:	105mm
Central Obstruction:	111mm; 44% obstruction by diameter
Length:	29"
Diameter 11.8"	
Weight:	34.5 lbs.

One-Year Limited Warranty

The Orion Ritchey-Chrétien 10" Optical Tube Assembly 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. Proof of purchase (such as a copy of the original receipt) 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: Orion Customer Service (800) 676-1343; support@telescope.com.

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