

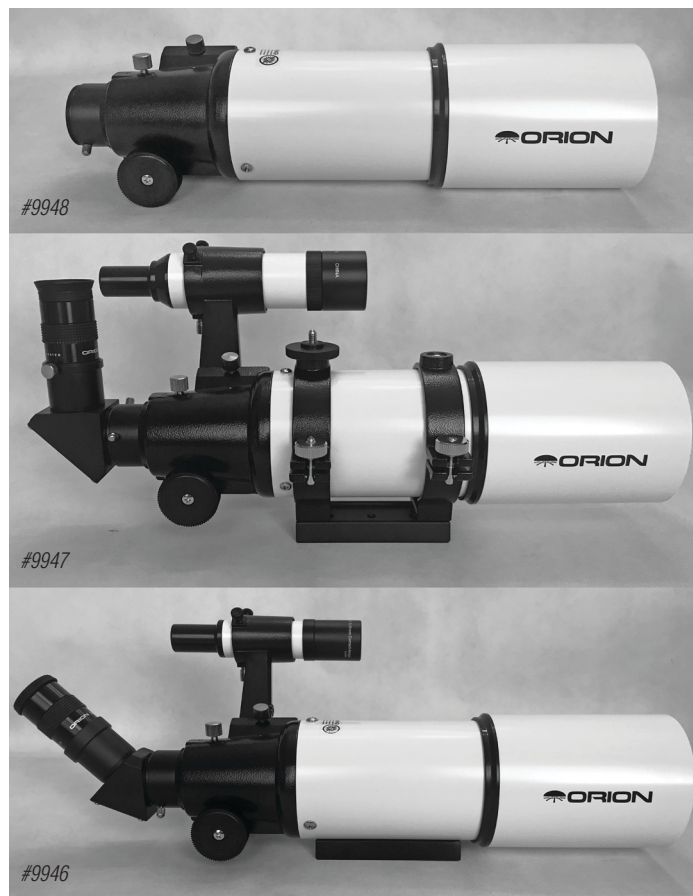
INSTRUCTION MANUAL

Orion ShortTube™ 80 Refractor Optical Tube Assemblies

#9948 ST80 OTA only

#9947 ST80-A (Astronomical)

#9946 ST80-T (Terrestrial)



**ORION**
TELESCOPES & BINOCULARS
AN EMPLOYEE-OWNED COMPANY

Corporate Offices: 89 Hangar Way, Watsonville CA 95076 - USA
Toll Free USA & Canada: (800) 447-1001
International: +1(831) 763-7000
Customer Support: support@telescope.com

Copyright © 2020 Orion Telescopes & Binoculars. All Rights Reserved. No part of this product instruction or any of its contents may be reproduced, copied, modified or adapted, without the prior written consent of Orion Telescopes & Binoculars.

Congratulations on your purchase of an Orion ShortTube 80 Refractor Optical Tube Assembly! This versatile, time-tested rich-field refractor excels for a wide variety of applications, both celestial and terrestrial. Compact, portable, and easy to use, The ShortTube 80 will provide many hours of enjoyment for novice and experienced astronomers alike.

This manual covers three different configurations of ShortTube 80 OTA: the ST80 (OTA) without any accessories; the ST80-A, configured for comfortable astronomical observation; and the ST80-T, optimized for terrestrial viewing. The first part of the manual contains information that pertains to all three configurations. After that are sections devoted to each model specifically.

Contents

I. General Information	2
II. The ShortTube 80 OTA (#9948)	3
III. ShortTube 80-A (#9947)	3
IV. ShortTube 80-T (#9946)	6

I. General Information

Collimation

The optical elements of all ShortTube 80 telescopes are precisely aligned (collimated) at the factory to provide the sharpest images possible. No further optical adjustment is necessary.

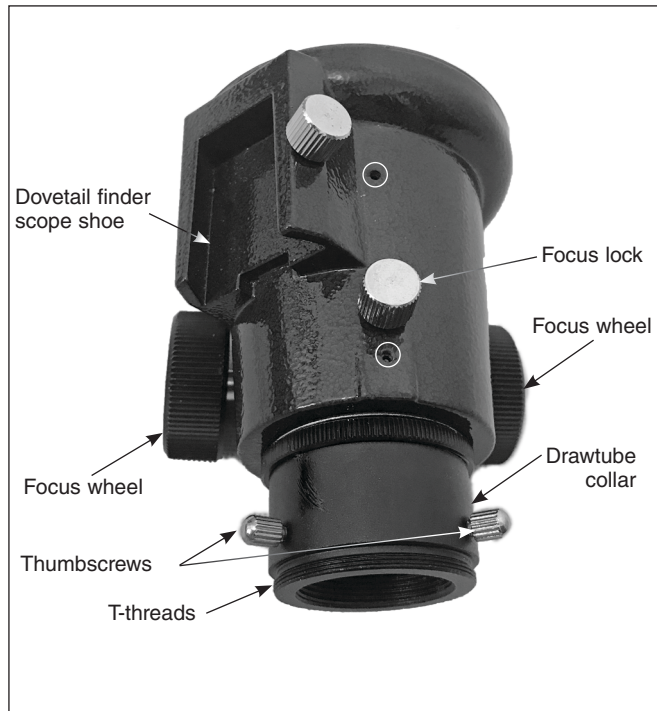


Figure 1. The 1.25" rack-and-pinion focuser of the ShortTube 80.

Focusing the Telescope

The ShortTube 80 is outfitted with a 1.25" rack and pinion focuser. To focus the image you will use the black focus wheels (**Figure 1**). Assuming you have installed a diagonal and eyepiece to acquire a target image, turn the focus wheels to rack the focuser drawtube in and out, changing the focal distance of the light path. To ensure the sharpest focus go slightly past your perceived focus point and then reverse directions until you have a sharp focus.

You will have to readjust the focus when aiming at subjects of varying distances, or after changing eyepieces. Make sure the focus lock thumbscrew is loosened before focusing. After focusing, you can tighten it to lock the telescope's focus into place if desired.

1.25" Drawtube Collar

The ShortTube 80's focuser drawtube is equipped with a 1.25" collar (**Figure 1**) into which a diagonal or other 1.25" accessories are secured. Loosen the two thumbscrews and insert the accessory's barrel into the drawtube collar until it stops, then secure it in place by re-tightening the thumbscrews. The male threads on the end of the collar are T-threads (M42). Any accessory with a female T-thread such as many commercially available CCD and CMOS imagers and T-rings for SLR/DSLR camera bodies can be coupled to the ShortTube 80 by threading it directly onto the collar (**Figure 2**). This method is often preferred over inserting a camera's nosepiece barrel into the collar and securing it with the thumbscrews because thread coupling provides a firmer connection.

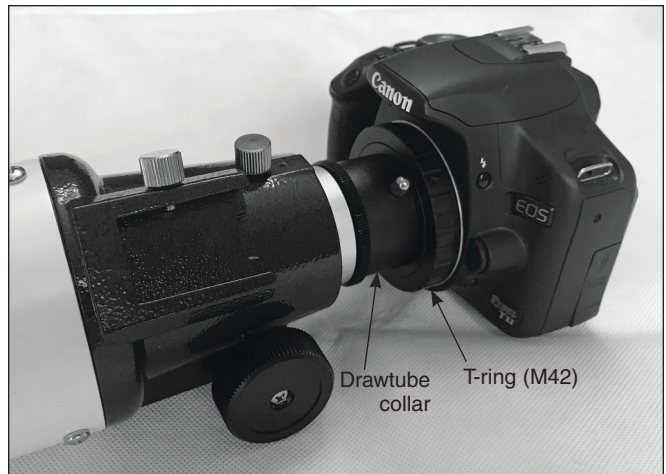


Figure 2. A DSLR camera can be attached directly to the ShortTube 80's drawtube collar with the use of a T-ring (sold separately) for your particular camera.

WARNING: Do NOT look at the Sun without a professionally made solar filter on the telescope; serious eye damage may result if you look at the Sun with any unfiltered optical instrument. Do not leave the telescope unsupervised around children. Always cover the lenses when leaving the telescope in direct sunlight.

“Play” in the Focuser Drawtube? Here’s How to Adjust it Out

If your telescope that has a little bit of “play,” or looseness, in the focuser drawtube, rest assured that you can make a quick adjustment to remove it. Ideally, you don’t want any drawtube play as it could produce some shifting of the image in the eyepiece as you rack the focuser in or out using the focus wheels. Such play could also throw a sharp image out of focus.

If you feel any wiggling of the drawtube in the focuser housing when you grab the end of the drawtube and tug it up and down, then do the following. You will need a 1.5mm metric Allen key to make this adjustment.

Locate the two tiny holes on the top of the focuser (circled in **Figure 1**). Insert the end of a 1.5mm Allen key into the hole closest to the focus wheels and turn the setscrew clockwise about 1/8 of a turn. Now try tugging the drawtube up and down again. Usually that 1/8 turn of tightening does the trick, but if there is still some looseness in the drawtube, tighten the setscrew another 1/8 turn. You could also try tightening the other setscrew 1/8 turn as well, but usually it only requires tightening one. You should only have to make this adjustment once.

Care and Maintenance

If you give your ShortTube 80 reasonable care, it will last a lifetime. Store it in a clean, dry, dust-free place, safe from rapid changes in temperature and humidity. Keep the dust cover on the front of the telescope when it is not in use. The ShortTube 80 OTA requires very little mechanical maintenance. The optical tube is aluminum 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 can be wiped off with a soft cloth and a household cleaner such as Formula 409.

Cleaning Lenses

Any quality optical lens cleaning tissue and optical lens cleaning fluid specifically designed for multi-coated optics can be used to clean the telescope’s objective lens. Never use regular glass cleaner or cleaning fluid designed for eyeglasses. Before cleaning with fluid and tissue, 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. Clean only a small area at a time, using a fresh lens tissue on each area. Never reuse tissues.

II. The ShortTube 80 OTA (#9948)

This version of the ShortTube 80 does not include any accessories, thus allowing you to customize it with the accessories of your choice. Many people use this model as a guide scope for astrophotography. For attachment to a telescope for this purpose, you will need tube rings (90mm diameter) or guide scope rings, and a dovetail mounting bar, which are sold separately.



Figure 3. The ShortTube 80 OTA makes a popular guide scope for astrophotography.

To achieve focus with an eyepiece, a diagonal or extension tube may be required. The same goes for achieving focus with a guide camera, for which we recommend a 1.25" extension tube. For the latter, insert the extension tube barrel into the drawtube collar and lock it down with the two thumbscrews. Then insert the 1.25" nosepiece of the guide camera into the extension tube and secure it with the thumbscrew(s).

Specifications

Objective lens:	Achromatic doublet, air-spaced
Objective lens coatings:	Multi-coated
Aperture:	80mm
Focal length:	400mm
Focal ratio:	f/5
Focuser:	Rack-and-pinion, 1.25", accepts camera T-ring
Drawtube travel:	61mm
Backfocus distance (from end of drawtube collar):	114.9mm
Optical tube length:	15"
Optical tube diameter:	90.4mm
Assembled weight:	2 lbs., 11 oz.

III. ShortTube 80-A (#9947)

Parts List

Optical tube assembly, with tube rings and dovetail bar installed
25mm Sirius Plossl 1.25" eyepiece (16x)
10mm Sirius Plossl 1.25" eyepiece (40x)
90° Mirror star diagonal, 1.25"
8x40 Finder scope
Finder scope bracket with O-ring
Objective lens cap
Hex key (5mm)

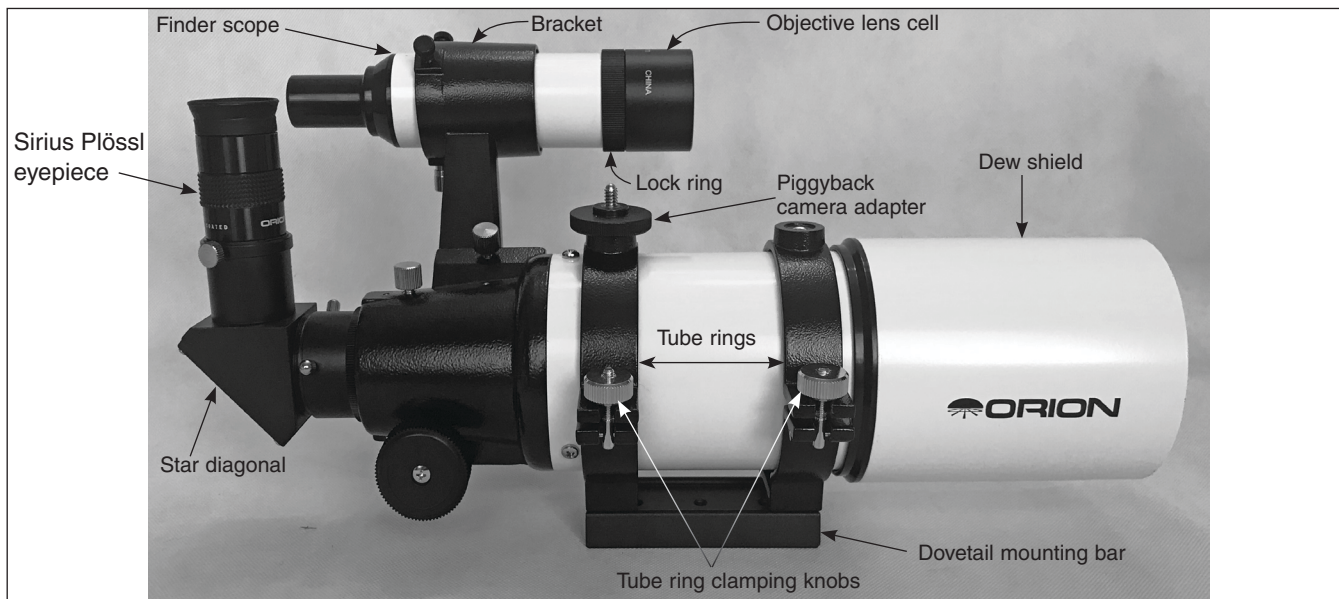


Figure 4. The ShortTube 80-A is outfitted for astronomical viewing.

Installing the Finder Scope

The ShortTube 80-A comes with an 8x40 achromatic crosshair finder scope (see **Figure 4**). The 8x40 descriptor means it has 8x magnifying power and a 40mm aperture. To place the finder scope in the finder scope bracket (**Figure 5**), first unthread the two black nylon thumbscrews until the screw ends are flush with the inside diameter of the bracket. Place the 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 end of the bracket's cylinder opposite the adjustment screws while pulling the chrome, spring-loaded tensioner on the bracket with your fingers. Push the finder scope through the bracket until the O-ring seats just inside the front opening of the bracket's cylinder. Now, release the tensioner and tighten the two black nylon screws a couple of turns each to secure the finder scope in place. Secure the bracket to the dovetail shoe on the optical tube with the knurled thumbscrew on the dovetail shoe (**Figure 6**).

Installing the Diagonal and Eyepiece

Insert the chrome barrel of the star diagonal into the eyepiece holder and secure it with the two knurled thumbscrews. Then insert the 25mm or 10mm eyepiece into the diagonal and tighten it with the two thumbscrews on the diagonal.

Mounting the Telescope

The Vixen-style dovetail mounting bar coupled to the tube rings allows attachment of the telescope to any mount that has a compatible Vixen-style dovetail saddle or to a tripod equipped with a 1/4"-20 post. For the latter, thread the tripod's 1/4"-20 post directly into one of the threaded holes on the bottom of the dovetail mounting bar.

Image Orientation

The image in the telescope will appear reversed left to right. This is normal for astronomical telescopes that utilize a star diagonal. The finder scope view will appear rotated 180° (**Figure 7**).

Aligning the Finder Scope

The finder scope is so named because it makes it easier to find the subject you want to observe in the main telescope. That's because the finder scope has a much wider field of view than that of the main telescope. Before you use the finder scope, it must be precisely aligned with the telescope, so they both point to exactly the same spot.

Alignment is easiest to do in daylight, rather than at night under the stars. First, insert the lowest-power (25mm) eyepiece into the main telescope's focuser. Then point the telescope at a discrete object such as the top of a telephone pole or a street sign that is at least a quarter-mile away. Move the telescope so the target object appears in the very center of the field of view when you look into the eyepiece. Now look through the finder scope. Is the object centered in the finder scope's field of view, i.e., on the crosshairs? If not, hopefully it will be visible somewhere in the field of view, so only fine adjustment of the two black nylon alignment screws will be needed. Otherwise you'll have to make coarser adjustments to the alignment screws to redirect the aim of the finder scope. Use the two alignment screws to center the object on the crosshairs of the finder scope. Then look again into the main telescope's eyepiece and see if it is still centered there as well. If it isn't, repeat the entire process, making sure not to move the main telescope while adjusting the alignment of the finder scope. Finder scopes can come out of alignment during transport of the telescope, so check the alignment before each observing session.

Focusing the Finder Scope

If, when looking through the finder scope, you notice that the images appear out of focus, you will need to refocus the



Figure 5. Inserting the finder scope into the finder scope bracket.

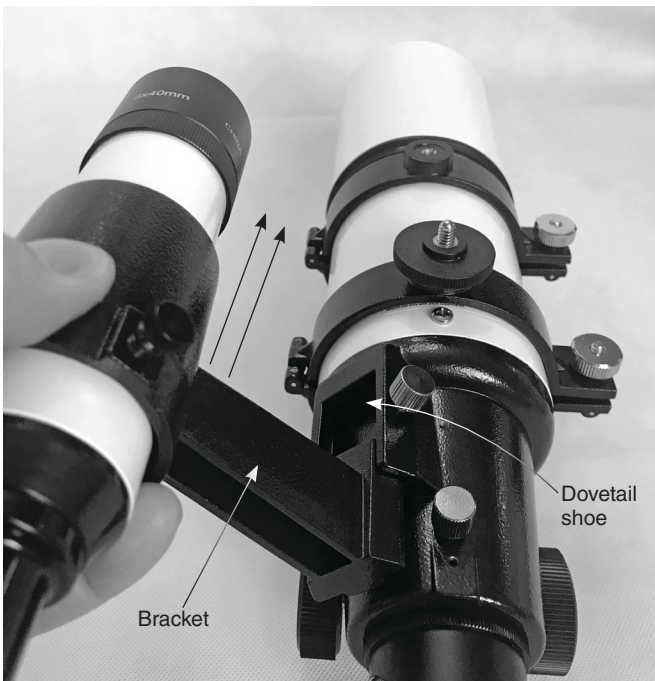


Figure 6. To install the finder scope, slide the bracket foot forward in the dovetail shoe, then tighten the thumbscrew on the shoe.

finder scope for your eyes. First loosen the lock ring located behind the objective lens cell on the body of the finder scope (see **Figure 4**). Back the lock ring off by a few turns, for now. Refocus the finder scope on a distant object by threading the objective lens cell in or out of 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.

Piggyback Camera Adapter

The ST80-A comes with a piggyback camera adapter installed on one of the tube rings (**Figure 4**). It comprises a ¼"-20 post and a knurled disk. You can mount a DSLR or mirrorless camera equipped with a lens to ride "piggyback" on the ShortTube



Figure 7. Images through the ShortTube 80-A with its star diagonal in place will be reversed from left-to-right. Images through the finder scope will appear upside-down and backwards (rotated 180°).

80 to take wide-field photographs. To install the camera onto the piggyback adapter, set the ¼"-20 socket on the bottom of the camera onto the adapter's threaded post and rotate the camera a few turns. Then rotate the knurled disk counterclockwise until it meets the camera bottom. Tighten the disk against the camera bottom. Note that you may have to first remove and rotate the whole tube ring assembly so that the piggyback adapter is in front, to avoid any contact between the camera and the finder scope.

Specifications

Objective lens:	Achromatic doublet, air-spaced
Objective lens coatings:	Multi-coated
Aperture:	80mm
Focal length:	400mm
Focal ratio:	f/5
Focuser:	Rack-and-pinion, 1.25", accepts camera T-ring
Drawtube travel:	61mm
Backfocus distance (from end of drawtube collar):	114.9mm
Optical tube length:	15"
Optical tube diameter:	90.4mm
Tube rings:	Pair of 90mm ID rings
Mounting bar:	Vixen-style, 110mm length
Finder scope:	8x40 achromatic, crosshair
Eyepieces:	25mm (16x) and 10mm (40x) Sirius Plossl, 1.25"; barrels threaded for Orion filters
Star diagonal:	Mirror type, 90 degrees, 1.25"; barrel threaded for Orion filters
Assembled weight:	4 lbs., 10.6 oz.

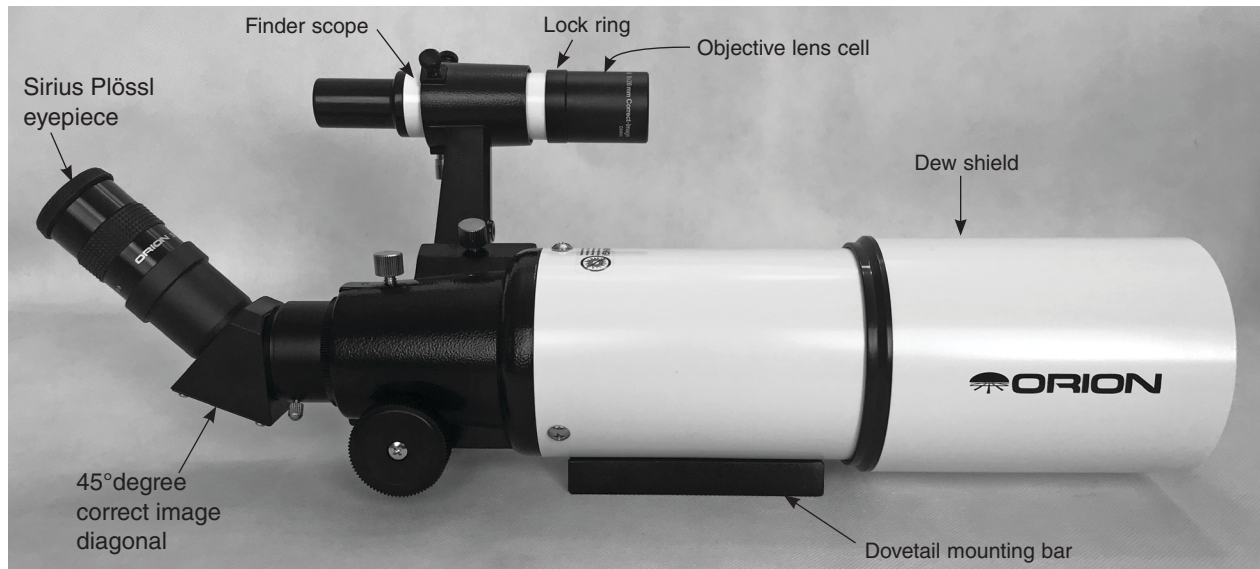


Figure 8. With its correct-image diagonal and correct-image finder scope, the ShortTube 80-T is outfitted nicely for terrestrial viewing.

IV. ShortTube 80-T (#9946)

Parts List

Optical tube assembly

25mm Sirius Plossl 1.25" eyepiece (16x)

10mm Sirius Plossl 1.25" eyepiece (40x)

45° Correct-image diagonal, 1.25"

6x26 correct-image finder scope

Finder scope bracket with O-ring

Objective lens cap

Installing the Finder Scope

The ShortTube 80-T is equipped primarily for daytime terrestrial viewing, but can also be used for astronomical viewing. The telescope comes with a 6x26 correct-image finder scope, which provides a “normally” oriented image, unlike a standard finder scope which provides a rotated image. The 6x26 descriptor means it has 6x magnifying power and a 26mm clear aperture.

To place the finder scope in the finder scope bracket (**Figure 5**), first unthread the two black nylon thumbscrews until the screw ends are flush with the inside diameter of the bracket. Place the 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 end of the bracket’s cylinder opposite the adjustment screws while pulling the chrome, spring-loaded tensioner on the bracket with your fingers. Push the finder scope through the bracket until the O-ring seats just inside the front opening of the bracket’s cylinder. Now, release the tensioner and tighten the two black nylon screws a couple of turns each to secure the finder scope in place. Secure the bracket to

the dovetail shoe on the optical tube with the knurled thumbscrew on the dovetail shoe.

Installing the Diagonal and Eyepiece

The 45-degree correct-image diagonal produces a normally oriented image in the telescope’s eyepiece, which is a must for daytime terrestrial viewing. Install the chrome barrel of the diagonal into the eyepiece holder and secure it with the two knurled thumbscrews. Then insert the 25mm or 10mm Sirius Plossl eyepiece into the diagonal and secure it in place with the thumbscrew on the diagonal.

Mounting the Telescope

The ST80-T is equipped with a built-in dovetail mounting bar on the bottom of the tube. This mounting bar is compatible with any altazimuth or equatorial mount with a Vixen-type dovetail saddle. In addition the bar has threaded ¼”-20 holes on its underside that allow attachment to a standard photographic tripod via its ¼”-20 post. For terrestrial viewing an altazimuth telescope mount or photographic tripod is recommended for easier maneuvering of the telescope. For astronomical use, you might want to consider swapping the 45-degree diagonal with a 90-degree “star” diagonal (sold separately), which provides a more convenient viewing angle for overhead targets.

Image Orientation

With the ST80-T the image seen in the telescope and in the finder scope will both be oriented “normally” – that is, similar to the view with just your eyes. Should you replace the 45-degree correct-image diagonal with an optional 90-degree star diagonal as mentioned above, the view through the telescope would become mirror-reversed.

Aligning the Finder Scope

The finder scope is so named because it makes it easier to find the subject you want to observe in the main telescope. That's because the finder scope has a much wider field of view than that of the main telescope. Before you use the finder scope, it must be precisely aligned with the telescope, so they both point to exactly the same spot.

Alignment is easiest to do in daylight, rather than at night under the stars. First, insert the lowest-power (25mm) eyepiece into the main telescope's focuser. Then point the telescope at a discrete object such as the top of a telephone pole or a street sign that is at least a quarter-mile away. Move the telescope so the target object appears in the very center of the field of view when you look into the eyepiece. Now look through the finder scope. Is the object centered in the finder scope's field of view, i.e., on the crosshairs? If not, hopefully it will be visible somewhere in the field of view, so only fine adjustment of the two black nylon alignment screws will be needed. Otherwise you'll have to make coarser adjustments to the alignment screws to redirect the aim of the finder scope. Use the two alignment screws to center the object on the crosshairs of the finder scope. Then look again into the main telescope's eyepiece and see if it is still centered there as well. If it isn't, repeat the entire process, making sure not to move the main telescope while adjusting the alignment of the finder scope. Finder scopes can come out of alignment during transport of the telescope, so check the alignment before each observing session.

Focusing the Finder Scope

If, when looking through the finder scope, you notice that the images appear out of focus, you will need to refocus the finder scope for your eyes. First loosen the lock ring located behind the objective lens cell on the body of the finder scope (see **Figure 8**). Back the lock ring off by a few turns, for now. Refocus the finder scope on a distant object by threading the objective lens cell in or out of 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.

Specifications

Objective lens:	Achromatic doublet, air-spaced
Objective lens coatings:	Multi-coated
Aperture:	80mm
Focal length:	400mm
Focal ratio:	f/5
Focuser:	Rack-and-pinion, 1.25", accepts camera T-ring
Drawtube travel:	61mm
Backfocus distance (from end of drawtube collar):	114.9mm
Optical tube length:	15"
Optical tube diameter:	90.4mm
Mounting bar:	Vixen-style, 110mm length, pre-installed on tube
Finder scope:	6x26 correct-image, crosshair
Eyepieces:	25mm (16x) and 10mm (40x) Sirius Plossl, 1.25"; threaded for Orion filters
Star diagonal:	Prism type (image erecting), 45 degrees, 1.25"; threaded for Orion filters
Assembled weight:	3 lbs., 13.3 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.



Corporate Offices: 89 Hangar Way, Watsonville CA 95076 - USA
Toll Free USA & Canada: (800) 447-1001
International: +1(831) 763-7000
Customer Support: support@telescope.com

Copyright © 2020 Orion Telescopes & Binoculars. All Rights Reserved. No part of this product instruction or any of its contents may be reproduced, copied, modified or adapted, without the prior written consent of Orion Telescopes & Binoculars.