

# Orion® ED Triplet Carbon Fiber Apochromatic Refractors

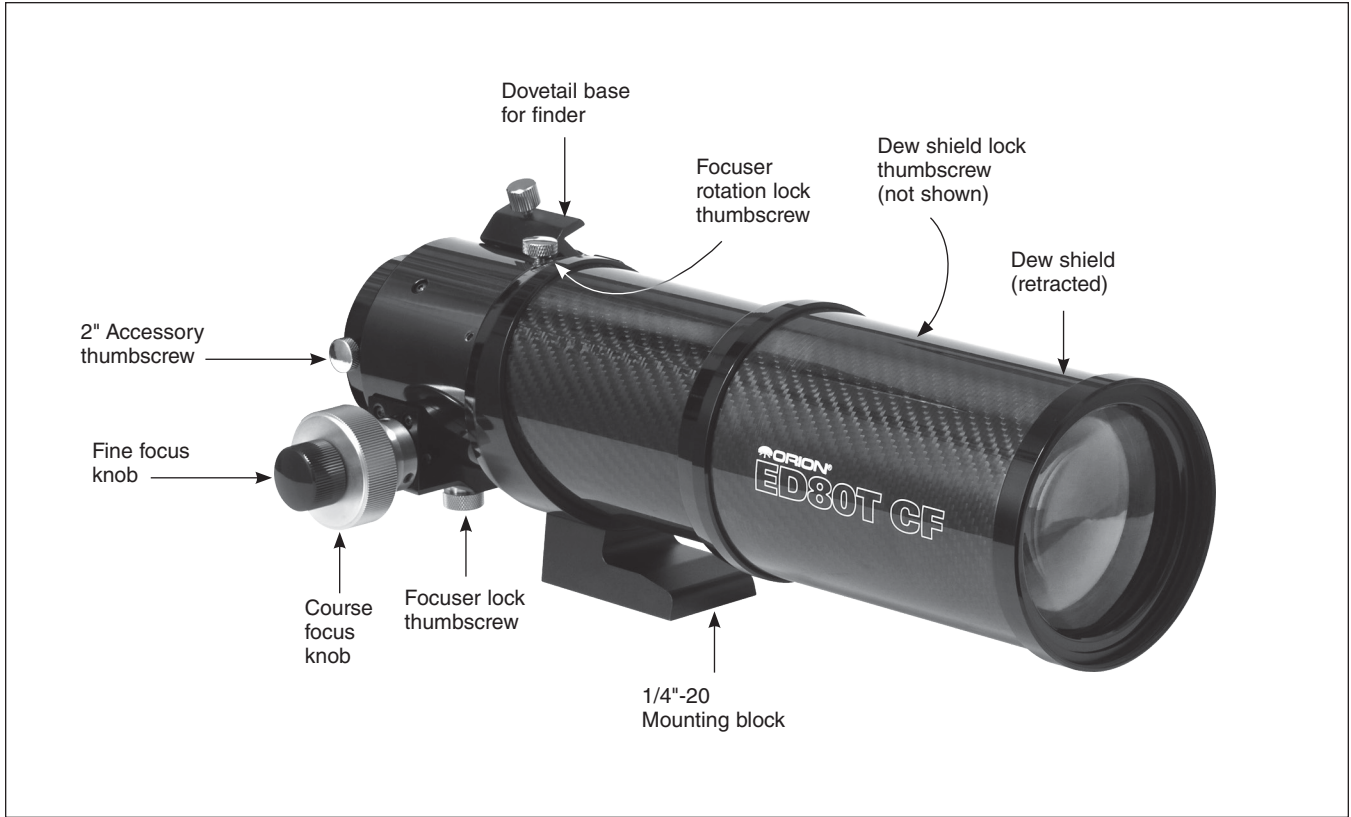
ED80T CF #9534

ED102T CF #9530

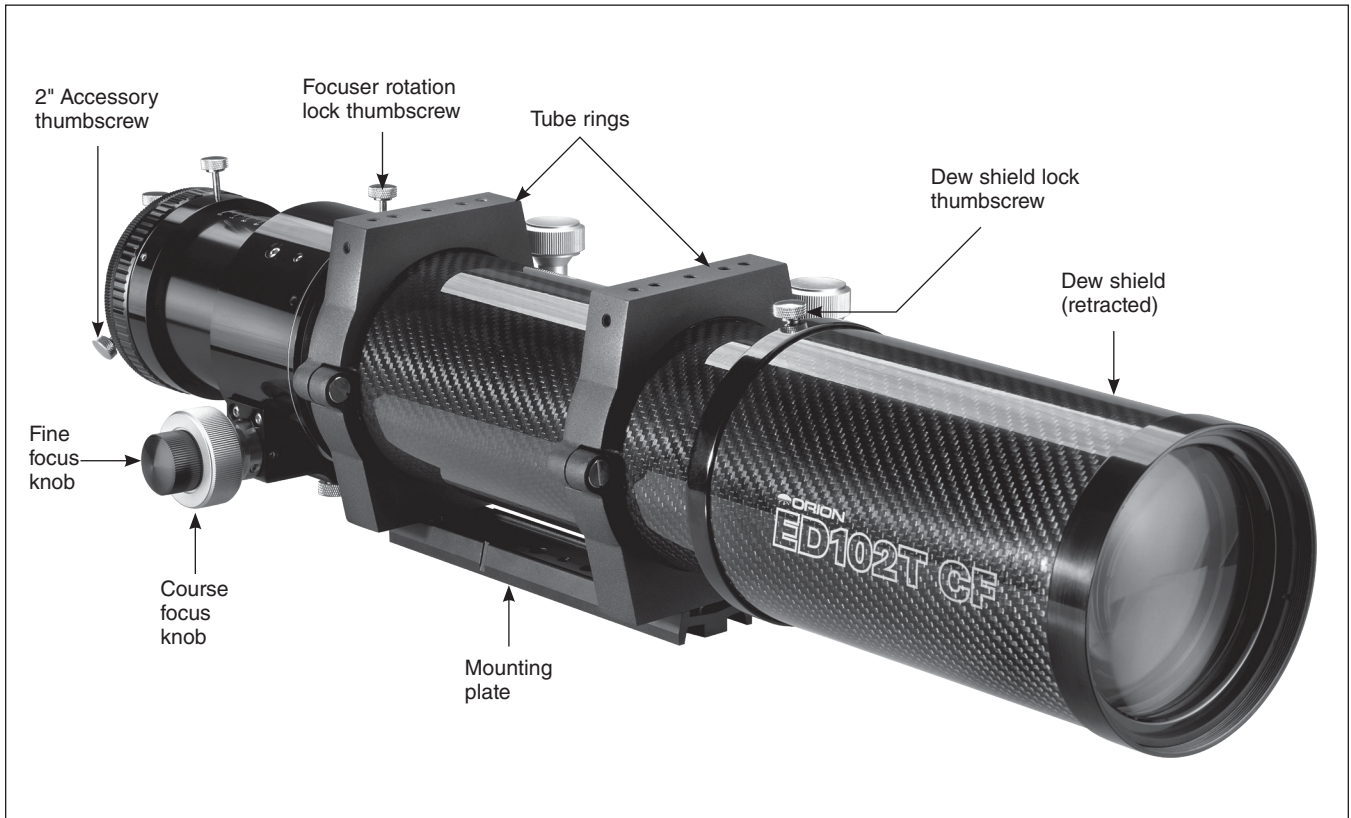


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**Figure 1.1.** The 80mm ED80T CF Apochromatic Refractor optical tube.



**Figure 1.2.** The 102mm ED102T CF Apochromatic Refractor optical tube.

*Congratulations on your purchase of an Orion ED Triplet Carbon Fiber Refractor. Your telescope has been designed with high quality precision optics and excellent mechanical construction. The dual-speed (11:1) Crayford focuser will make getting sharp images a breeze and reduce image shift to almost zero. The three element objective lens offers excellent color correction. These instructions will help you set up and use your telescope.*

## Parts List

### ED80T CF

Optical tube assembly  
Threaded metal objective cap  
1.25" eyepiece adapter  
5mm hex key  
Hard carrying case

### ED102T CF

Optical tube assembly  
Threaded metal objective cap  
1.25" eyepiece adapter  
Tube rings  
Dovetail mounting plate  
4mm hex key

## Getting Started

The ED Triplet Carbon Fiber (ED T CF) refractors come fully assembled from the factory. The telescope's optics have been assembled and collimated at the factory, so you should not have to make any adjustments to them.

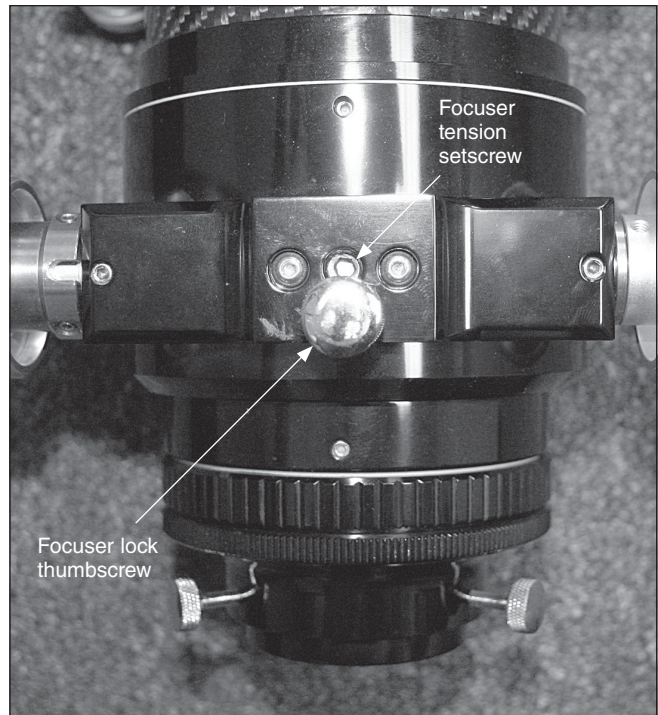
Please keep the original shipping box. In the unlikely event you need to ship the telescope back to Orion for warranty repair service, you should use the original packaging. The box also makes a very good container for storing the telescope when it is not in use.

## Functions and Features

The ED T CF refractors have several features designed to maximize the use and enjoyment of your telescope. When you have become familiar with all of the functions of your ED T CF refractor, you will be ready to begin using your new telescope under the night sky!

### Retractable Dew Shield

All ED T CF refractors feature a retractable dew shield (Figure 1.1-1.2) which allows the telescope to become more compact for storage. The dew shield's primary purpose is to prevent dew (water condensation) from forming on the lens during cold and humid nights. The dew shield is also useful for reduc-



**Figure 2.** Locate the focuser tension set screw to change the tension for heavier loads.

ing glare under unwanted outside lights. To extend the dew shield, remove the optical tube dust cover by unthreading it counter clockwise, then loosen the dew shield lock thumbscrew. Pull the dew shield outward until it stops and retighten the dew shield lock thumbscrew.

### Dual-Speed Crayford Focuser

The ED T CF refractors come equipped with dual-speed Crayford focuser (2" for the ED80T CF and 3" for the ED102CF). The Crayford design allows for smooth, precise focusing without the image shift that rack-and-pinion designs experience.

For quick focusing of your ED T CF refractor, the two larger silver focus knobs will provide a coarse focus. For more precise focusing, as needed for applications such as critical high power planetary observing and digital imaging, the smaller black focus knob (Figure 1.1-1.2) offers fine focus adjustment. The fine focus knob rotates eleven times to one single rotation of the coarse focus knobs, making an 11:1 ratio for extremely precise focusing.

If you find that the focus adjustment is too hard to turn or if the drawtube slips under the weight of your eyepiece or camera, you can make adjustments to the focuser tension by using the focuser tension set screw located on the bottom side of the focuser (Figure 2). Make adjustments to this set screw until the focuser motion feels smooth and holds in place when you have obtained focus. It may be necessary to make adjustments when the weight of your accessories change significantly.

### 3" Dual-Speed Crayford Focuser For the ED102T CF

The ED102 T CF features a large 3" format focuser to support imaging cameras with a greater imaging area. The visual back of the focuser steps down to a standard 2", however, the wider opening of the focuser and baffling system of the ED102T CF yields greater field illumination to support 35mm or larger format cameras. Additionally, the focuser supports very heavy payloads such as a large format CCD camera, filter wheel, and other accessories.

#### Focuser Rotation

The focuser assembly on the ED T CF refractors have the ability to be rotated. Under normal use, you should not have to rotate the focuser, since the eyepiece and diagonal can be rotated instead. However, focuser rotation can be beneficial for changing the camera orientation while imaging. Additionally, this feature can allow you to keep the focus knobs parallel to the ground no matter how your telescope is positioned.

To rotate the focuser, loosen the focuser rotation lock screw (Figure 3) counter-clockwise. Gently rotate the focuser to the desired orientation. Lock the focuser in place by turning the focus rotation lock ring clockwise. If you find the focuser is too difficult to rotate, you may have to also loosen the three socket head screws around the focuser with a 1.5mm hex key (not included). Leave the three socket head screws with slight tension, but do not over tighten them.

#### Using 1.25" and 2" Accessories

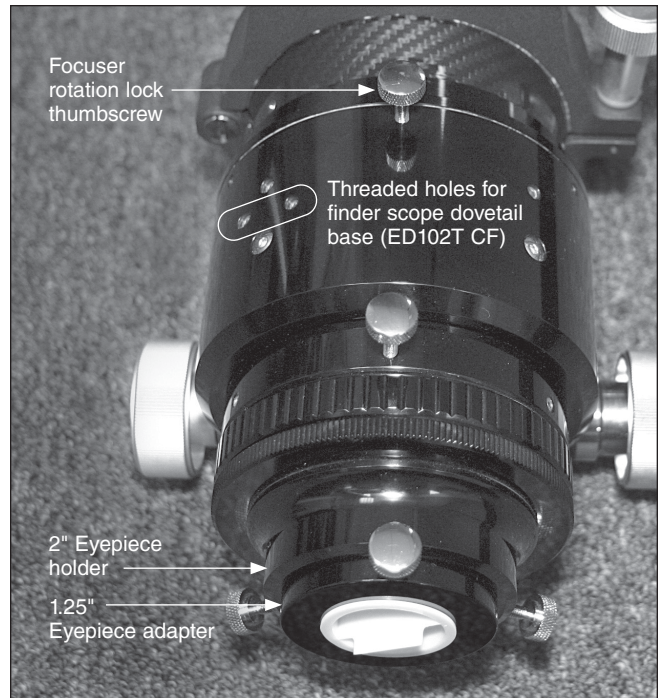
Your ED T CF refractor can accommodate both 1.25" and 2" accessories, including just about any eyepiece, diagonal, or camera. The Crayford focuser has a 2" eyepiece holder with a 1.25" eyepiece adapter installed (Figure 3). Both the 2" eyepiece holder and 1.25" eyepiece adapter feature a brass compression ring to hold your accessories in place without marking them. The telescope must be used with either a diagonal or extension tube in order for the eyepiece to reach focus. In most cases, you will be using a 90° star diagonal for visual use with an eyepiece.

To attach a 1.25" diagonal or extension tube to your telescope:

1. Remove the dust cap from the 1.25" eyepiece adapter.
2. Insert the barrel of your diagonal or extension tube into the 1.25" eyepiece adapter.
3. Secure the barrel in place by firmly tightening the thumbscrew on the 1.25" eyepiece adapter.

To attach a 2" diagonal or extension tube to your telescope:

1. Loosen the thumbscrews on the focuser's 2" eyepiece holder and remove the 1.25" eyepiece adapter.
2. Insert the barrel of your diagonal or extension tube into the 2" eyepiece holder.
3. Secure the barrel in place by firmly tightening the thumbscrews.



**Figure 3.** Rotatable focuser.

#### Finder Scope Compatibility

The included finder scope dovetail base on the ED80T CF is ready to accept any Orion finder scope (Figure 1.1). The ED102T CF does not include a finder scope dovetail base; however, it is available optionally from Orion and directly fits the holes in the ED102T CF (Figure 3).

To insert a finder scope onto your ED T CF refractor, slide the finder scope bracket into the finder scope dovetail base and secure it in place by tightening the thumbscrew(s) on the dovetail base.

## Operating the ED T CF Refractor

Now that you have become familiar with the different features and functions of your ED T CF refractor, you are ready to begin using your new telescope outside under a starry night. The ED T CF refractors are essentially ready to begin observing with immediately. There is a small period of time where the internal temperature of the telescope must match the outside temperature to obtain the best image quality. This only takes a few minutes. Typically, the ED T CF will have reached outside temperature by the time the telescope is setup.

#### Connecting the ED80T CF Tripod or Telescope Mount

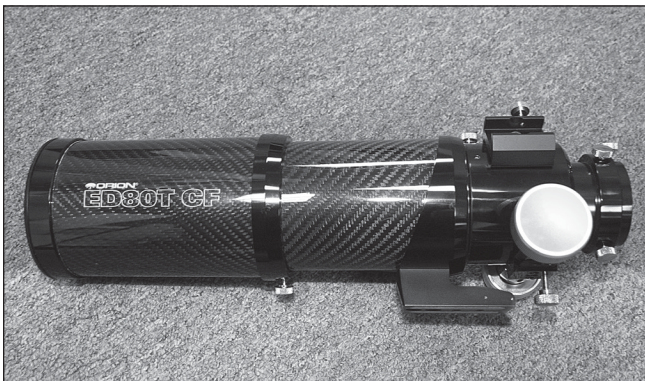
The ED80T CF has a built-in mounting block ready to connect to a sturdy camera tripod or telescope mount (Figure 1.1). The mounting block is threaded to accept a common 1/4"-20 stud found on almost any camera tripod. To connect the ED80T



**Figure 4.1.** The stock orientation of the ED80T CF mounting block.



**Figure 4.2.** Using the included 5mm hex key, remove the 2 socket head screws to reverse the orientation of the mounting block to balance the telescope for heavier accessories.



**Figure 4.3.** Orientation of the mounting block when reversed to balance the telescope for heavier accessories.

CF to a camera tripod, simply screw the 1/4"-20 stud found on your camera tripod to the underside of the mounting block. The mounting block also functions as a dovetail plate which is compatible with many Orion telescope mounts. The dovetail plate is also compatible with many other mounts. To connect the ED80T CF to a telescope mount, loosen the attachment screw(s) on the mount's dovetail holder until the screw(s) provides enough clearance for the dovetail mounting plate. Align the mounting block with the dovetail holder and slide it for-

ward. Tighten the attachment screw(s) on the dovetail holder of the mount.

If you are using a camera tripod or telescope mount and need additional balance adjustment, the orientation of the mounting block can be reversed. This is especially helpful when using heavy accessories, such as 2" eyepieces or DSLR cameras. To reverse the orientation of the mounting block, remove the two socket head screws (using the included 5mm hex key) that attaches the mounting block to the telescope tube and turn the block around 180° (Figure 4.1-4.3). Once the mounting block orientation has been reversed, reattach the two socket head screws.

### Connecting the ED102T CF to a Telescope Mount

The ED102T CF refractor includes a preinstalled pair of tube rings and a dovetail mounting plate, ready to attach to a heavy-duty telescope mount. The dovetail plate is compatible with many Orion telescope mounts. The dovetail plate is also compatible with many other available mounts. To connect the ED102T CF to a mount, loosen the attachment screw(s) on the mount's dovetail holder until the screw(s) provide enough clearance for the dovetail mounting plate. Carefully place the dovetail plate flat against the top surface of the dovetail holder of the mount and tighten the attachment screw(s) securely.

Balancing the ED102T CF can be achieved by sliding the dovetail mounting plate forward or backward within the mount's dovetail holder. You can also move the telescope forward or backward within the tube rings. The tube rings offer the most adjustment range. Loosen the tube ring clamps slightly and slide the telescope tube forward or backward as needed to reach optimum balance, then retighten the tube ring clamps.

### Using Different Eyepieces

The ED T CF refractors work well with virtually any 1.25" or 2" eyepiece. Because the ED T CF refractors implement high-quality ED optics, the eyepieces you use should also have excellent, fully multi-coated optics to utilize the full performance of the telescope.

It is desirable to have a range of eyepieces of different focal lengths, to allow viewing over a range of magnifications. To calculate the magnification, or power, of a telescope, simply divide the focal length of the telescope by the focal length of the eyepiece:

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

If all outside viewing conditions are ideal, every telescope with good optics supports a maximum of about 60x per inch, or 2.4x per millimeter, of aperture. Keep in mind that at higher powers, an image will always be dimmer and less sharp (this is a fundamental law of optics). In most cases the steadiness of the air (the "seeing") will limit how much magnification the scope can tolerate, rather than the telescope itself.

Always start viewing with your lowest-power (longest focal length) eyepiece in the telescope. After you have located and observed the object with it, you can try switching to a higher-power eyepiece to ferret out more detail, if atmospheric conditions permit. If the image you see is not crisp and steady,

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reduce the magnification by switching to a longer focal length eyepiece. As a general rule, a small but well-resolved image will show more detail and provide a more enjoyable view than a dim and fuzzy, over-magnified image.

### **Imaging with the ED T CF Refractors**

The ED T CF refractors make very capable astrographs for your CCD or DSLR camera. To attach a DSLR camera, all you will need is the appropriate T-ring for the make and model of your camera, a 2" prime focus camera adapter, and 2" extension tube (available from Orion). Simply attach the T-ring to the camera body and thread the 2" prime focus camera adapter into the T-ring. Insert the barrel of the camera adapter into the 2" eyepiece holder on the ED T CF focuser, and secure it with the thumbscrew.

The ED T CF refractors were designed to reach focus with both DSLR and CCD cameras and additional accessories like filter wheels and flip mirrors. Because of this, you will need an extension tube to reach focus if you are only attaching the camera without additional accessories.

Imaging equipment is sometimes heavier than a diagonal and eyepiece. The dual-speed Crayford focuser is capable of handling the weight of your CCD or DSLR camera. Adding tension to the focuser drawtube will increase the amount of weight the focuser can handle. Install your camera onto the focuser during the day. Check the focuser for any slippage. If the focuser drawtube slips under the weight of the camera, you will need to add more tension to the focuser by tightening the focus tension set screw (Figure 2).

## **Care & Maintenance**

Give your telescope reasonable care and it will last a lifetime. When not in use, keep its dust cover on as well as the dust cap on the eyepiece opening. Keep the telescope inside its packaging when not in use. Store it indoors or in a dry garage. Do not leave the telescope outside except when using it. If a scratch appears on the tube, it will not harm the telescope.

Smudges on the tube can be wiped off with standard household cleaners.

### **Dew**

When you are ready to pack up your telescope at the end of the night, avoid immediately storing it if you encountered heavy dew and the telescope is damp. Instead, bring the telescope inside and allow the moisture on the telescope to evaporate. If dew forms on the objective lens, then leave the dust cover off of the telescope until all the moisture has evaporated. Once the telescope has completely dried out, place it back in storage.

### **Cleaning Optical Surfaces**

In general, your telescope will only need to be cleaned on a very minimal basis. Dust particles on the objective lens do not effect the optical quality of your ED T CF. Loose dust can simply be blown off with air, using a compressed air can or blower bulb (available from Orion). Any remaining dust is best left alone, unless the build up is extreme. Finger prints and water marks should be cleaned from your telescope's objective lens. Any quality optical lens tissue and cleaning fluid specifically designed for multi-coated optics can be used to clean the telescope's objective lens as well as the lenses of your eyepieces and 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, or lightly brush the lens with a soft camel hair brush. 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.

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## Specifications

### **ED80T CF Apochromatic Refractor**

Optical tube: Carbon Fiber

Objective lens: Apochromatic, air-spaced triplet, including one lens made of FPL-53 ED glass

Objective lens coating: Fully multi-coated

Lens cell: Machined aluminum

Focal length: 480mm

Focal ratio: f/6

Focuser: 2" Dual Speed 11:1 Crayford, accepts 1.25" or 2" accessories

Focuser maximum load capacity: 2.7 kg (6 lbs)

Maximum backfocus: 127mm (5")

Baffling: 2 knife-edge black-painted steel baffles

Mounting: 1/4"-20 mounting block and dovetail plate

Weight: 2.49 kg (5.5 lbs).

Length: 37.8cm (14.9") with dew shield retracted

### **ED102T CF Apochromatic Refractor**

Optical tube: Carbon Fiber

Objective lens: Apochromatic, air-spaced triplet, including one lens made of FPL-53 ED glass

Objective lens coating: Fully multi-coated

Lens cell: Machined aluminum

Focal length: 714mm

Focal ratio: f/7

Focuser: 3" Dual Speed 11:1 Crayford, accepts 1.25" or 2" accessories

Focuser maximum load capacity: 4.5 kg (10 lbs)

Maximum backfocus: 127mm (5")

Baffling: 3 knife-edge black-painted steel baffles

Mounting: Dovetail plate

Weight: 5.4 kg (11.8 lbs.)

Length: 62.9cm (24.8") with dew shield retracted

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## 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](http://www.OrionTelescopes.com/warranty).



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