

Orion[®] Apex[™] Maksutov-Cassegrain Optical Tube Assemblies[™]

#9820 Apex 90mm #9823 Apex 102mm #9825 Apex 127mm



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Customer Support (800) 676-1343
E-mail: support@telescope.com
Corporate Offices (831) 763-7000
89 Hangar Way, Watsonville, CA 95076

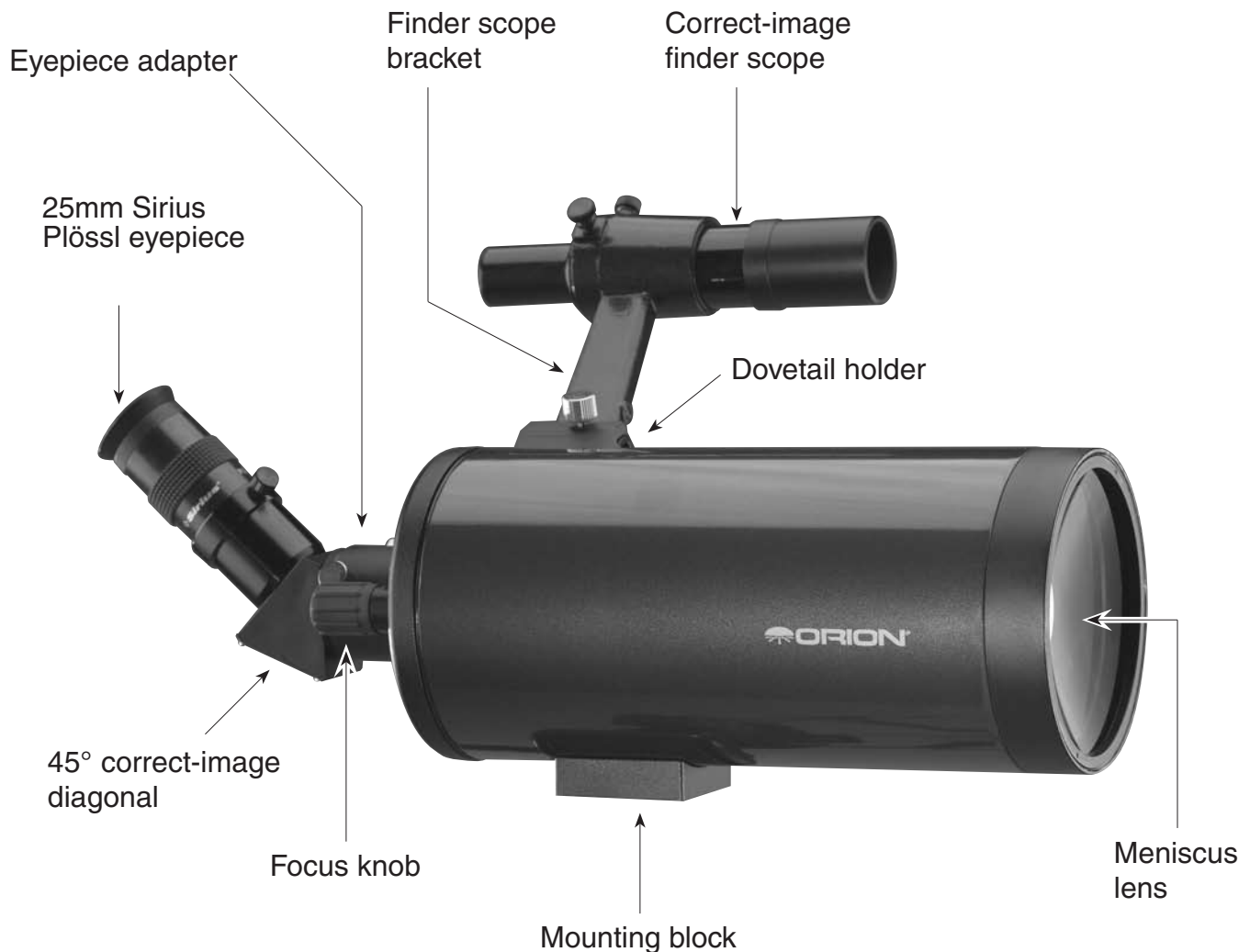


Figure 1: The Apex Maksutov-Cassegrain optical tube assembly parts diagram. The Apex 102mm is shown, but all models have similar components.

Welcome to a new world of adventure! Your Apex Maksutov-Cassegrain (Mak-Cass) telescope is a fine-quality instrument designed for both daytime terrestrial viewing and nighttime stargazing. Compact, portable, and easy to use, this versatile scope will provide many hours of enjoyment for the whole family.

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.*

These instructions will help you set up and properly use and care for your telescope. Please read them over thoroughly before getting started.

Parts List

Qty.	Description
1	Optical tube assembly
1	25mm Sirius Plössl eyepiece
1	45° correct-image diagonal
1	Correct-image finder scope
1	Finder scope bracket
1	Soft carry case
1	Optical tube dust cover

Getting Started

The Apex telescopes come nearly fully assembled from the factory. The optics have been installed and collimated, so you should not have to make any adjustments to them. Open the box and inspect the contents to make sure all of the parts listed above are present. Refer to Figure 1 to see what the parts look like, and how they will connect together; the Apex 102mm is shown, but all models have similar components.

Please keep the original shipping box. In the unlikely event you should 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.

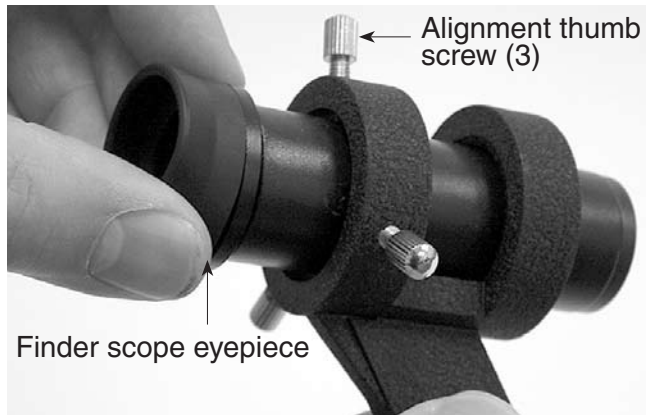


Figure 2: Insert the 6x20 finder scope into the bracket's rings so that it is oriented as shown.

Installing the Accessories

Apex 90mm:

To place the finder scope in the finder scope bracket, first unthread the three alignment thumb screws on the bracket until the screw ends are flush with the inside of the bracket's ring. Insert the finder scope into the bracket so that the eyepiece end of the finder scope (the end with the rubber eyeguard) is closest to the bracket's alignment thumb screws (see Figure 2). Secure the finder scope in place by tightening the three alignment thumbscrews.

Apex 102mm and 127mm:

To place the finder scope in the finder scope bracket, first unthread the two black nylon alignment screws until the screw ends are flush with the inside of the bracket's cylinder. 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. Insert the eyepiece end (narrow end) of the finder scope into the end of the bracket's cylinder that does not have the alignment screws, while pulling the spring-loaded tensioner on the bracket with your fingers (see Figure 3). 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 alignment screws a couple of turns each to secure the finder scope in place.

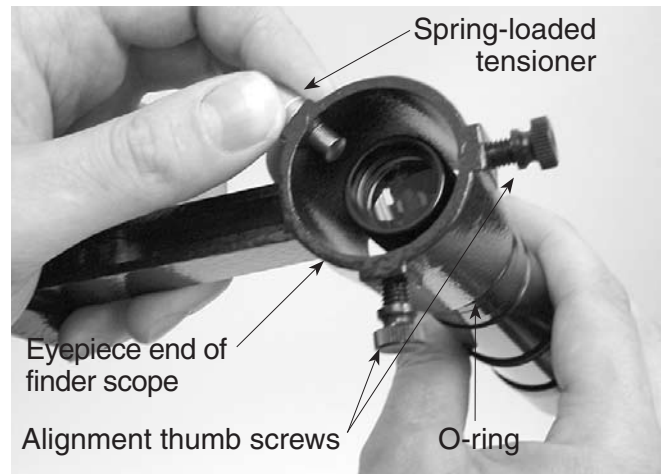


Figure 3: To install the 6x26 finder scope in the finder scope bracket, pull the spring-loaded tensioner while inserting the eyepiece end of the finder scope into the bracket.

All models:

Connect the finder scope bracket to the dovetail holder on the optical tube with the thumb screw on the holder. Insert the 45° diagonal into the eyepiece adapter and secure it with the thumb screws on the eyepiece adapter. Insert an eyepiece into the diagonal and tighten the thumb screws on the diagonal.

Keep the dust cap over the front end of the telescope when it is not in use. It is also a good idea to cover the eyepiece; use the cover cap that came with it.

Mounting the Telescope on a Tripod

The Apex Maksutov-Cassegrain optical tube assemblies can be mounted on any standard camera tripod that has a 1/4"-20 stud. The stud threads into the block on the underside of the telescope's optical tube (see Figure 4). Alternatively, the telescopes can be attached to an altazimuth or equatorial mount equipped with a 1/4"-20 adapter. For the Apex 127mm, there are several threaded holes in the mounting block; use the one that will best balance the telescope on the tripod or mount.

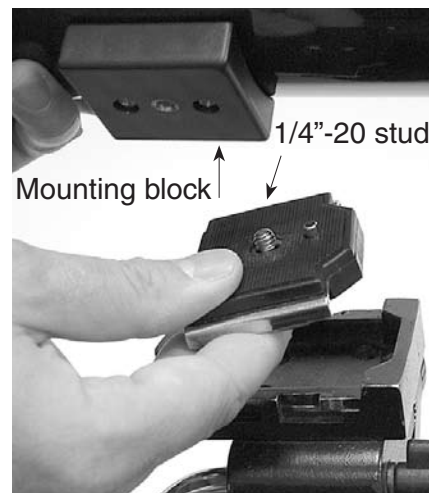


Figure 4: The 1/4"-20 stud on standard camera tripods will thread into the mounting block on the underside of the Apex telescopes. The Orion Paragon HD-F2 tripod shown utilizes a quick-release shoe to connect the telescope to the tripod.

Camera tripods or altazimuth mounts are desirable for terrestrial (land) viewing because they allow simple vertical and horizontal movement of the telescope. An equatorial mount is desirable for astronomical viewing because it allows easy tracking of celestial objects as the Earth rotates. Also, the setting circles on the mount enable you to locate objects by their celestial coordinates (right ascension and declination), which can be found in many observing books and star atlases.

Focusing

Point the telescope so the front end is aimed in the general direction of an object you wish to view. When you first look in the eyepiece, the image you see may be fuzzy, or out of focus. If so, gently turn the focus knob with your fingers until the image becomes sharp. 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. You will have to readjust the focus when aiming at subjects of varying distances, or after changing eyepieces.

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

Do You Wear 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 find out 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 your eyes are astigmatic, images will probably appear the best with glasses on. This is because a telescope's focuser can accommodate for nearsightedness or farsightedness, but not astigmatism. If you have to wear your glasses while observing and cannot see the entire field of view, you may want to purchase additional eyepieces that have longer eye relief.

Aligning the Finder Scope

The Apex 90mm comes with a 6x20 correct-image finder scope, while the Apex 102mm and 127mm both come with a 6x26 correct-image finder scope. (The first number indicates magnification, and the second number indicates the aperture in millimeters.) The finder scope makes it easier to locate the subject you want to observe in the telescope, because the finder scope has a much wider field of view. Unlike most finder scopes, images viewed in the correct-image finder scope will appear oriented the same as the naked eye, which makes finding objects even easier. The 45° correct-image diagonal provides a naked eye orientation for images in the main telescope, so the view in the finder scope and main telescope will be oriented the same, which is a great convenience.

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 25mm eyepiece into the 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. Position 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 on the finder scope's crosshairs? If not, hopefully it will be visible somewhere in the field of view, so only fine adjustment of the finder scope bracket's alignment thumb screws will be needed. Otherwise you'll have to make coarser adjustments to the alignment thumb screws to redirect the aim of the finder scope.

Use the alignment thumb screws to center the object on the crosshairs of the finder scope. Then look again into the telescope's eyepiece and see if it is still centered there too. If it isn't, repeat the entire process, making sure not to move the telescope while adjusting the alignment of the finder scope.

Finder scopes can come out of alignment during transport of the telescope, so check its alignment before each observing session.

If, when looking through the finder scope, you notice that the image is fuzzy, you will need to focus the finder scope for your eyes. For the 6x20 finder scope of the Apex 90mm this is done by rotating the finder's eyepiece. For the 6x26 finder of the Apex 102mm and 127mm, this is done by first loosening the lock ring that is located behind the finder's objective lens cell (see Figure 5). Once the lock ring is loosened, thread the objective lens cell in or out until the image appears sharp. Then, retighten the lock ring behind the lens cell. The finder scope is now focused, and should not need focusing again for your eyes.

Calculating Magnification (Power)

To calculate the magnification, or power, of a telescope with an eyepiece, simply divide the focal length of the telescope by the focal length of the eyepiece:

$$\text{Magnification} = \text{telescope focal length} \div \text{eyepiece focal length}$$

For example, the Apex 102mm, which has a focal length of 1300mm, used in combination with the supplied 25mm eyepiece, yields a power of:

$$1300 \div 25 = 52x.$$

It is desirable to have a range of eyepieces of different focal lengths to allow viewing over a range of magnifications. It is not uncommon for an observer to own five or more eyepieces. Orion offers many different eyepieces of varying focal lengths, so check the catalog or website for a wide selection of additional eyepieces to choose from.

Every telescope has a useful limit of power of about 2x per millimeter of aperture (i.e. 204 x for the Apex 102mm). Claims of higher power by some telescope manufacturers are a misleading advertising gimmick and should be dismissed. Keep in mind that at higher powers, an image will always be dimmer

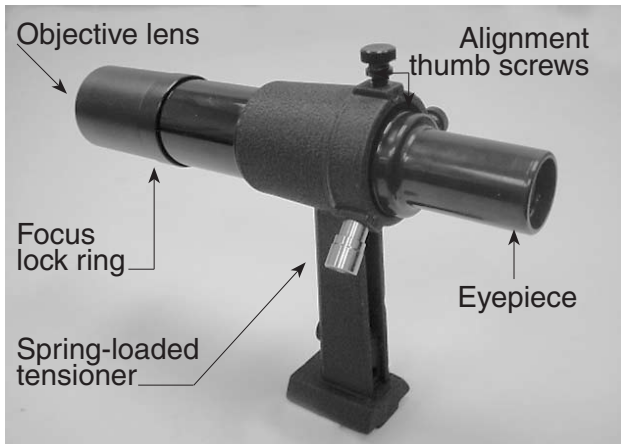


Figure 5. The 6x26 correct-image finder scope and bracket.

and less sharp (this is a fundamental law of optics). The steadiness of the air (the “seeing”) can also limit how much magnification an image can tolerate.

Always start viewing with your lowest-power (longest focal length) eyepiece in the telescope. It’s best to begin observing with the lowest-power eyepiece, because it will typically provide the widest true field of view, which will make finding and centering objects much easier. After you have located and centered an object, 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, 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, overmagnified image.

Terrestrial Viewing

For land viewing, it’s best to stick with low power eyepieces that yield a magnification under 100x. At higher powers, images rapidly lose sharpness and clarity due to “heat waves” caused by Sun-heated air.

Remember to aim well clear of the Sun, unless the front of the telescope is fitted with a professionally made solar filter and the finder scope is covered with foil or some other completely opaque material.

The Apex telescopes are capable of focusing on objects that are quite close, so you can view fine details of objects that are nearby. Try focusing on a flower or insect at close distance to enter a normally unseen microscopic world. Check the specifications at the end of this manual for the closest focusing distance for each of the Apex models.

Astronomical Viewing

When choosing a location for nighttime stargazing, make it as far away from city lights as possible. Light-polluted skies greatly reduce what can be seen with the telescope. Also, give your eyes at least 20 minutes to dark-adapt to the night sky. You’ll be surprised at how many more stars you will see! Use a red flashlight, to see what you’re doing at the telescope,

or to read star charts. Red light will not spoil your dark-adapted night vision as readily as white light will.

To find celestial objects with your telescope, you first need to become reasonably familiar with the night sky. Unless you know how to recognize the constellation Orion, for instance, you won’t have much luck locating the Orion Nebula. A simple planisphere, or star wheel, can be a valuable tool for learning the constellations and seeing which ones are visible in the sky on a given night. A good star chart or atlas, like the Orion DeepMap 600, can come in handy for helping locate interesting objects among the dizzying multitude of stars overhead. Except for the Moon and the brighter planets, it is pretty time-consuming and frustrating to hunt for objects randomly, without knowing where to look. It is best to have specific targets in mind before you begin looking through the eyepiece.

A. The Moon

The Moon, with its rocky, cratered surface, is one of the easiest and most interesting subjects to observe with your telescope. The myriad craters, rilles, and jagged mountain formations offer endless fascination. The best time to observe the Moon is during a partial phase, that is, when the Moon is not full. During partial phases, shadows cast by crater walls and mountain peaks along the border between the dark and light portions of the lunar disk highlight the surface relief. A full Moon is too bright and devoid of surface shadows to yield a pleasing view. Try using a Moon filter to dim the Moon when it is too bright; it simply threads onto the bottom of the eyepiece.

B. The Planets

The planets don’t stay put like stars do (planets don’t have fixed R.A. and Dec. coordinates), so you will have to refer to Sky Calendar at our website, www.telescope.com, or to charts published monthly in *Astronomy*, *Sky & Telescope*, or other astronomy references to locate them. Venus, Mars, Jupiter, and Saturn are the brightest objects in the sky after the Sun and the Moon. All four of these planets are not normally visible in the sky at one time, but chances are one or two of them will be.

JUPITER The largest planet, Jupiter, is a great subject to observe. 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. If atmospheric conditions are good, you may be able to resolve thin cloud bands on the planet’s disk.

SATURN The ringed planet is a breathtaking sight when it is well positioned. 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. You may probably see a tiny, bright “star” close by; that’s Saturn’s brightest 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 If atmospheric conditions are good, you may be able to see some subtle surface detail on the Red Planet, possibly even the polar ice cap. Mars makes a close approach to Earth every two years; during those approaches its disk is larger and thus more favorable for viewing.

C. Stars

Stars will appear like twinkling points of light in the telescope. Even the largest telescopes cannot magnify stars to appear as anything more than points of light. 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 the image of a star slightly can help bring out its color.

D. Deep-Sky Objects

Under dark skies, you can observe a number of brighter deep-sky objects with the Apex telescopes, including gaseous nebulas, open and globular star clusters, and the brighter galaxies. Most deep-sky objects are very faint, so 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. Don't expect these objects to appear like the photographs you see in books and magazines; most will look like dim gray “ghosts.” (Our eyes are not sensitive enough to see color in deep-sky objects except in few of the brightest ones.) But as you become more experienced and your observing skills improve, you will be able to coax out more and more intricate details.

Photography

When coupled to a 35mm single-lens reflex camera, the Apex becomes a telephoto lens. For terrestrial or astronomical photography, you need only a T-ring for your specific camera model. The T-ring attaches to your camera and threads onto the Apex's eyepiece adapter (see Figure 6).

Use the camera's viewfinder to frame the picture. Use the telescope's focuser to focus the image. You may want to consider using a remote shutter release instead of the shutter release on the camera; touching the camera can vibrate the

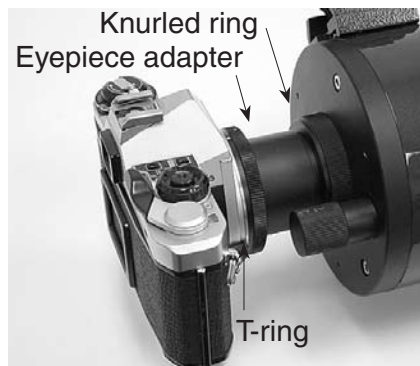


Figure 6: A T-ring is all that is needed to connect a 35mm SLR camera to the Apex telescopes; it threads onto the eyepiece adapter with eyepiece and diagonal removed.

system and blur the resulting photographic image on the film. Also, be sure to use a solid tripod.

If you would like to change the orientation of the camera relative to the telescope, do so by first loosening the knurled ring located in front of the eyepiece adapter (see Figure 6). You can then rotate the camera (and eyepiece adapter) to the desired orientation. Retighten the knurled ring when done.

Care & Maintenance

Transporting and Storing

The included soft carry case provides an excellent way to transport and store the optical tube and its accessories. To place the optical tube in the case, the eyepiece, diagonal, finder scope and bracket must be removed from the tube. When removing the eyepiece and diagonal, remember to first loosen the securing thumb screws. The finder scope and bracket can be removed together by loosening the thumb screw on the tube's dovetail holder. Cover the front of the optical tube with the dust cover and the rear opening of the eyepiece adapter with its cap. Now place the tube in the case's main compartment. The finder scope and bracket can also be placed in the main compartment. Use the included removable padded divider or padded tray to separate the finder scope and bracket from the optical tube. The Apex 90mm and Apex 102mm come with one small padded divider and one padded tray. The Apex 127mm comes with one padded tray only. The padded tray will be on the bottom of the main compartment of the case when it is shipped to you. For the Apex 90mm, use the small divider to separate the finder scope and bracket from the optical tube. For the Apex 102mm and Apex 127mm, position the padded tray on top of the optical tube; the finder scope and bracket can be stored on top of the tray so they will not damage the tube. The eyepiece and diagonal should be covered with their caps and placed in the external compartments of the case.

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.

Cleaning the tube

Your Apex Maksutov-Cassegrain telescope 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. If you wish, you may apply some auto touch-up paint to the scratch. Smudges on the tube can be wiped off with a soft cloth and a household cleaner such as Windex or 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 Apex's front meniscus lens or 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. For the large surface of the meniscus lens, clean only a small area at a time, using a fresh lens tissue on each area. Never reuse tissues.

Specifications

#9820 Apex 90mm OTA

Optical design: Maksutov-Cassegrain

Aperture: 90mm

Effective focal length: 1250mm

Focal ratio: f/13.9

Central obstruction diameter: 29mm

Primary mirror coating: Aluminum with overcoat

Meniscus lens coating: Anti-reflection multi-coatings on both sides of lens

Eyepiece adapter: Accepts 1.25" format accessories, camera t-threads

Eyepiece: 25mm Sirius Plossl, fully coated with multi-coatings, 1.25" format

Magnification with supplied eyepiece: 50x

Actual field of view with supplied eyepiece: 0.96°

Diagonal: 45° correct-image diagonal, 1.25" format

Near focus (with supplied eyepiece and diagonal):
Approximately 13.5 feet

Finder scope: 6x magnification, 20mm aperture, correct-image, achromatic, 6.2° field

Optical tube mounting block: Fits standard photo-style tripods

Case: Deluxe carry case for optical tube included

Weight: 3.7 lbs

Length: 10.5" (without eyepiece or diagonal attached)

#9823 Apex 102mm OTA

Optical design: Maksutov-Cassegrain

Aperture: 102mm

Effective focal length: 1300mm

Focal ratio: f/12.7

Central obstruction diameter: 31mm

Primary mirror coating: Aluminum with overcoat

Meniscus lens coating: Anti-reflection multi-coatings on both sides of lens

Eyepiece adapter: Accepts 1.25" format accessories, camera t-threads

Eyepiece: 25mm Sirius Plossl, fully coated with multi-coatings, 1.25" format

Magnification with supplied eyepiece: 52x

Actual field of view with supplied eyepiece: 0.92°

Diagonal: 45° correct-image diagonal, 1.25" format

Near focus (with supplied eyepiece and diagonal):
Approximately 11 feet

Finder scope: 6x magnification, 26mm aperture, correct-image, achromatic, 6.3° field

Optical tube mounting block: Fits standard photo-style tripods

Case: Deluxe carry case for optical tube included

Weight: 4.8 lbs

Length: 12.0" (without eyepiece or diagonal attached)

#9825 Apex 127mm OTA

Optical design: Maksutov-Cassegrain

Aperture: 127mm

Effective focal length: 1540mm

Focal ratio: f/12.1

Central obstruction diameter: 39mm

Primary mirror coating: Aluminum with overcoat

Meniscus lens coating: Anti-reflection multi-coatings on both sides of lens

Eyepiece adapter: Accepts 1.25" format accessories, camera t-threads

Eyepiece: 25mm Sirius Plossl, fully coated with multi-coatings, 1.25" format

Magnification with supplied eyepiece: 62x

Actual field of view with supplied eyepiece: 0.77°

Diagonal: 45° correct-image diagonal, 1.25" format

Near focus (with supplied eyepiece and diagonal):
Approximately 27 feet

Finder scope: 6x magnification, 26mm aperture, correct-image, achromatic, 6.3° field

Optical tube mounting block: Fits standard photo-style tripods

Case: Deluxe carry case for optical tube included

Weight: 8.6 lbs

Length: 14.5" (without eyepiece or diagonal attached)

One-Year Limited Warranty

The Apex Maksutov-Cassagrain Optical Tube Assemblies are 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, 89 Hangar Way, Watsonville, CA 95076; (800) 676-1343.

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