



C5 Spotting Scope - #52291

Instruction Manual

A spotting scope is nothing more than a telescope that is designed to look around the Earth. Unlike astronomical telescopes, which produce inverted or reverted images, spotting scopes produce correctly oriented images. Celestron offers several different models, each of which uses the highest quality optics to produce the best possible images. All models have rugged, durable housings to give you a lifetime of pleasure with a minimal amount of maintenance.

Your Celestron spotting scope is designed to give you hours of fun and rewarding observations. There are, however, a few things to consider before using your spotting scope that will ensure your safety and protect your equipment.

- Never look directly at the Sun with the naked eye or with your spotting scope. Permanent and irreversible eye damage may result.
- Never use your spotting scope to project an image of the Sun onto any surface. Internal heat build-up can damage your spotting scope and/or any accessories attached to it.
- Never use an eyepiece solar filter or a Herschel wedge. Internal heat build-up inside your spotting scope can cause these devices to crack or break, allowing unfiltered sunlight to pass through to the eye.
- Never leave your spotting scope unsupervised, either when children are present or adults who may not be familiar with the correct operating procedures of your spotting scope.
- Never point your spotting scope at the Sun unless you have the proper solar filter. We recommend Celestron solar filters only. Don't take chances -- use Celestron filters for safety and performance! When using your spotting scope with the proper solar filter, ALWAYS cover the finderscope. Although small in aperture, this instrument has enough light gathering power to possibly cause permanent and irreversible eye damage. In addition, the image projected by the finder is hot enough to burn skin and clothing.

Assembly

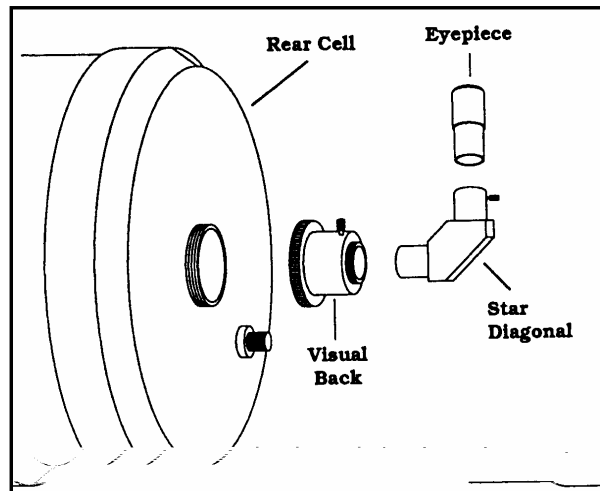
This section covers the correct set up and operating procedures for your Celestron C5 spotting scope and includes information on visual and photographic observations. The C5 spotting scope uses a combination of mirrors and lenses to produce an image. Such an optical system is known as a compound lens. This particular design, known as a Schmidt-Cassegrain, is one of the most compact and rugged optical systems on the market today. The C5 (#52219) comes standard with the following accessories:

- 25mm Plossl Eyepiece 1.25" (48x)
- 6x30 Erect Image Finderscope
- 45° Erect Image Diagonal - 1.25"
- Photo Tripod Adapter block
- Nylon Water Resistant Case
- Lens Cap

The Erect Image Diagonal

The diagonal is a prism that diverts the light at a right angle from the light path of the spotting scope. The C5 spotting scope comes with an erect image diagonal that is designed for terrestrial viewing. To attach the diagonal:

1. Turn the thumbscrew on the visual back until its tip no longer extends into (i.e., obstructs) the inner diameter of the visual back.
2. Slide the chrome portion of the diagonal into the visual back.
3. Tighten the thumbscrew on the visual back to hold the diagonal in place.



If you wish to change the orientation of the diagonal, loosen the thumbscrew on the visual back until the diagonal rotates freely. Rotate the diagonal to the desired position and tighten the thumbscrew.

The Eyepiece

The eyepiece, or ocular, is the optical element that magnifies the image focused by the spotting scope. The eyepiece fits into either the visual back directly or the erect image diagonal. To install an ocular:

1. Loosen the thumbscrew on the star diagonal (or erect image diagonal) so it does not obstruct the inner diameter of the eyepiece end of the diagonal.
2. Slide the chrome portion of the eyepiece into the star diagonal (or erect image diagonal).
3. Tighten the thumbscrew to hold the eyepiece in place.

To remove the eyepiece, loosen the thumbscrew on the star diagonal and slide the eyepiece out.

Eyepieces are commonly referred to by focal length and barrel diameter. The focal length of each eyepiece is printed on the eyepiece barrel. The longer the focal length (i.e., the larger the number) the lower the eyepiece power or magnification; and the shorter the focal length (i.e., the smaller the number) the higher the magnification. Generally, you will use low-to-moderate power when viewing. For more information on how to determine power, see the section on "Calculating Magnification."

Barrel diameter is the diameter of the barrel that slides into the diagonal or visual back. The C5 spotting scope use eyepieces with a standard 1-1/4" barrel diameter.

Finderscope

The C5 spotting scope come standard with a terrestrial (erect image) 6x30 finder. The purpose of the finder is to locate objects that might otherwise be overlooked in the narrow, higher power field of view of the spotting scope.

Attaching the Finder to the Bracket

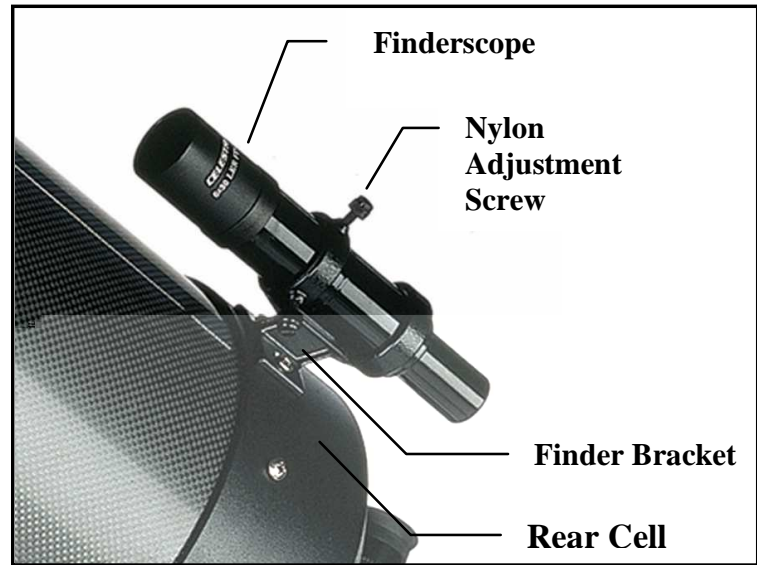
1. Unthread the three screws in the finder bracket. until the ends are flush with the inner diameter of the bracket ring. **Do not thread them in completely or they will interfere with the placement of the finder.**

2. Slide the rubber O-ring onto the back (eyepiece end) of the finder.

3. Position the O-ring on the main body of the finder so that it is toward the front (i.e., objective) end of the finder.

4. Slide the finder, eyepiece end first, into the front ring of the bracket. Push it back until the O-ring is snug inside the front ring of the bracket.

5. Hand tighten the three set screws until snug.



To align the finder, please see the section on “Aligning the Finder.”

The C5 spotting scope will attach to any photographic tripod with a 1/4x20 threaded screw. The C5 attaches to the tripod via a photo tripod adapter block that has three 1/4x20 holes. To attach the C5 to a photographic tripod:

1. Place any of the 1/4x20 holes in the photo tripod adapter block over the 1/4x20 screw on your photographic tripod.
2. Tighten the 1/4x20 screw to hold the C5 firmly in place.

If the telescope/spotting scope is not properly balanced, try using one of the other holes in the photo tripod adapter block. Once mounted on the photographic tripod, you are ready to use your C5 spotting scope.

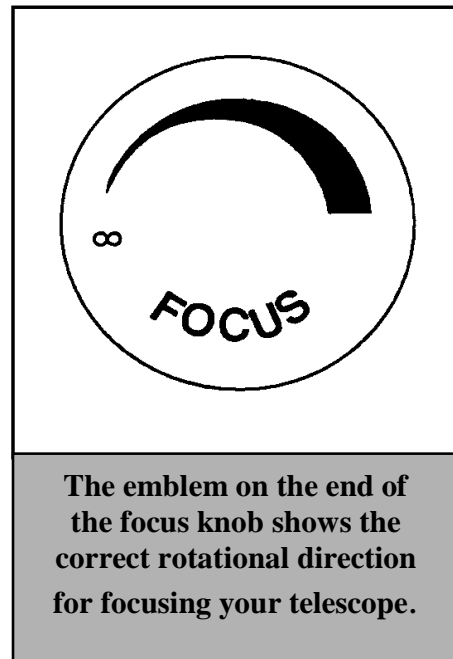
Following is pertinent technical information for the Celestron C5 spotting scope that you may find useful.

- 5" aperture (125mm) f/10
- Focal length — 1250mm (50")
- Schmidt-Cassegrain optical system
Resolution 0.9 arc sec.
- Tube — 11" long
- Weight (with mount) — 6 pounds

- 6x30 finder
- Highest useful magnification — 300x
- Lowest useful magnification — 23x
- Limiting magnitude (visual) — 13
- Near Focus — Approximately 20'
- Angular field of view with standard eyepiece: 1.04°
- Angular field of view using optional Reducer/Corrector lens: 1.7°
- Lens cover
- Starbright XLT coatings — XLT coating on corrector yield greater light transmission and provides greater reflectivity on primary and secondary mirrors

Once your spotting scope is fully assembled, you are ready for your first look. This section deals with the basics of your spotting scopes operation.

The Celestron C5 spotting scope focusing mechanism controls the position of the primary mirror which is mounted on a sleeve that slides back and forth on the primary baffle tube. The focusing knob, which moves the primary mirror, is on the rear cell of the C5 to the right of the diagonal and eyepiece. Turn the focusing knob until the image is sharp. If the knob will not turn, the primary mirror has reached the end of its travel on the focusing mechanism. Turn the knob in the opposite direction until the image is sharp. Once an image is in focus, turn the knob clockwise to focus on a closer object and counterclockwise for a more distant object. A single turn of the focusing knob moves the primary mirror only slightly. Therefore, it will take many turns (about 40) to go from close focus (approximately 20 feet) to infinity. For astronomical viewing, out-of-focus star images are very diffuse making them difficult, if not impossible, to see. If you turn the focus knob too quickly, you can go right through focus without seeing the image. For best results, your first astronomical target should be a bright object (like the Moon) so that the image is visible even when out of focus.



The Celestron C5 comes with a 6x30mm finder that helps in aiming at distant objects that are hard to find in the narrow field of the spotting scope. The first number used to describe the finder is the power while the second number is the diameter of the objective lens in millimeters. This means the 6x30 finder is 6

power and has a 30mm objective lens. Incidentally, power is always compared to the unaided human eye. So an 8 power finder magnifies images eight times more than the human eye.

To make the alignment process a little easier, you should perform this task in the daytime when it is easier to locate objects in the spotting scope without the finder. To align the finder:

1. Choose a conspicuous object that is in excess of one mile away. This will eliminate any possible parallax effect.
2. Point your spotting scope at the object you selected and center it in the main optics of the spotting scope.
3. Check the finder to see where your alignment target is located in the field of view.
4. Adjust the screws on the finder bracket, tightening one while loosening another, until the cross hairs are centered on the target.
5. Tighten each set screw a quarter of a turn to ensure that they will not come loose easily.

With the spotting scope fully assembled and all the accessories attached, you are

To use your C5 spotting scope visually:

1. Find a distant object that is fairly bright.
2. Insert a low power eyepiece (one with a long focal length — 25 to 30mm) into the spotting scope.
3. Adjust the tripod until the C5 is pointed in the direction of the object you selected.
4. Locate the object in your finder.
5. Move the C5 until the object is centered in the finder.
6. Look through the main optics and the object will be there (if you aligned the finder first).

Once you have found the object, you will most likely need to focus. If the object is moving, leave the adjustment clamps loose so that you can pan easily. Try using different optional eyepieces to see how the field changes with various magnifications.

You can change the power of your Celestron C5 spotting scope just by changing the eyepiece (ocular). To determine the magnification of your Celestron C5, simply divide the focal length of the spotting scope by the focal length of the eyepiece used. In equation format, the formula looks like this:

$$\text{Magnification} = \frac{\text{Focal Length of Spotting Scope (mm)}}{\text{Focal Length of Eyepiece (mm)}}$$

Let's say, for example, that you are using a 26mm eyepiece. To determine the magnification, you simply divide the focal length of your C5 (1250mm) by the focal length of the eyepiece (26mm). Dividing 1250 by 26 yields a magnification of 48 power.

Although the power is variable, each instrument — under average skies — has a limit to the highest useful magnification. The general rule is that 60 power can be used for every inch of aperture. For example, the C5 is 5" in diameter. Multiplying 5 by 60 gives a maximum useful magnification of 300 power. Although this is the maximum useful magnification, most observing is done

between 20 to 35 power for every inch of aperture which is 100 to 175 times for the C5.

Determining the field of view is important if you want to get an idea of the angular size of the object you are observing. To calculate the actual field of view, divide the apparent field of the eyepiece (supplied by the eyepiece manufacturer) by the magnification. In equation format, the formula looks like this:

$$\text{True Field} = \frac{\text{Apparent Field of Eyepiece (in degrees)}}{\text{Magnification}}$$

As you can see, before determining the field of view, you must first calculate the magnification. Using the example in the previous section, we can determine the field of view using the same 26mm eyepiece. The 25mm Plossl eyepiece has an apparent field of view of 52°. Divide the 52° apparent field by the magnification, which is 50 power. This yields an actual field of 1.04°.

To convert degrees to feet at 1,000 yards, which is more useful for terrestrial observing, simply multiply by 52.5. Continuing with our example, multiplying the angular field 1.04° by 52.5 produces a linear field width of 54.6 feet at a distance of one thousand yards.

The apparent field of each eyepiece that Celestron manufactures is found in the Celestron Accessory Catalog (#93685).

When working with any optical instrument, there are a few things to remember to ensure you get the best possible image.

- Never look through window glass. Glass found in household windows is optically imperfect and, as a result, may vary in thickness from one part of a window to the next. This inconsistency can and will affect the ability to focus your spotting scope. In most cases you will not be able to achieve a truly sharp image. In some cases, you may actually see a double image.
- Never look across or over objects that are producing heat waves. This includes asphalt parking lots on hot summer days or building rooftops.
- Hazy skies, fog, and mist can also make it difficult to focus when viewing terrestrially. The amount of detail seen under these conditions is greatly reduced. Also, when photographing under these conditions, the processed film may come out a little grainier than normal with lower contrast.

- When using your C5 as a telephoto lens, the split screen or microprism focuser of the 35mm SLR camera may “black out.” This is common with all long focal length lenses. If this happens, use the ground glass portion of your focusing screen. To achieve a very sharp focus, consider using a focusing magnifier. (These are readily available from your local camera store.)
- If you wear corrective lenses (specifically glasses), you may want to remove them when observing with an eyepiece attached to your C5. When using a camera, however, you should always wear corrective lenses to ensure the sharpest possible focus. If you have astigmatism, corrective lenses should be worn at all times.

Your Celestron C5 can be used for both terrestrial and astronomical photography. Your C5 has a fixed aperture and, as a result, a fixed f/ratio. To properly expose your subjects photographically, you need to set your shutter speed accordingly. Most 35mm single lens reflex (SLR) cameras offer through-the-lens metering that lets you know if your picture is under or overexposed. This is important for terrestrial photography where exposure times are measured in fractions of a second.

To reduce vibration when tripping the shutter, use a cable release. Releasing the shutter manually can cause vibration, something that produces blurred photos. A cable release allows you to keep your hands clear of the camera and spotting scope, thus reducing the possibility of shaking the spotting scope. Mechanical shutter releases can be used, though air-type releases are

While the C5 spotting scope requires little maintenance, there are a few things to remember that will ensure your spotting scope performs at its best.

Occasionally, dust and/or moisture may build up on the corrector plate of your C5. Special care should be taken when cleaning any instrument so as not to damage the optics.

If dust has built up on the corrector plate, remove it with a brush (made of camel’s hair) or a can of pressurized air. Spray at an angle to the lens for approximately two to four seconds. Then, use an optical cleaning solution and white tissue paper to remove any remaining debris. Apply the solution to the tissue and then apply the tissue paper to the lens. Low pressure strokes should go from the center of the corrector to the outer portion. **Do NOT rub in circles!**

You can use a commercially made lens cleaner or mix your own. A good cleaning solution is isopropyl alcohol mixed with distilled water. The solution

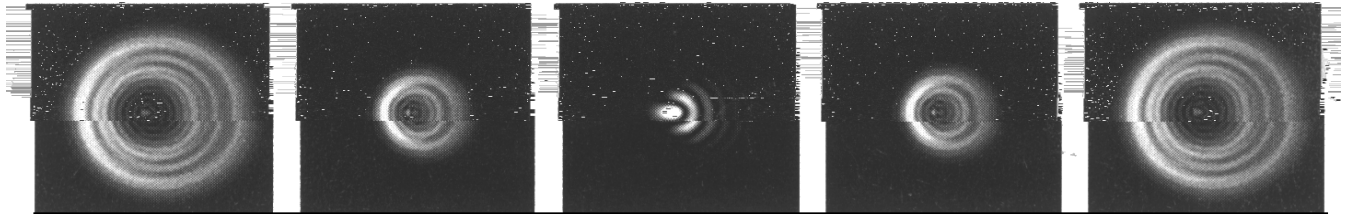
should be 60% isopropyl alcohol and 40% distilled water. Or, liquid dish soap diluted with water (a couple of drops per one quart of water) can be used.

Occasionally, you may experience dew build-up on the corrector plate of your C5 during an observing session. If you want to continue observing, the dew must be removed, either with a Celestron Lens Shade / Dew Cap or by pointing the spotting scope at the ground until the dew has evaporated.

If moisture condenses on the inside of the corrector, place the spotting scope in a dust-free environment and point it down. Remove the accessories from the rear cell of the spotting scope to allow the moisture to evaporate from the optical tube.

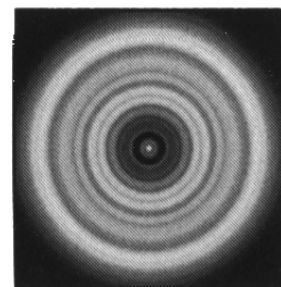
To minimize the need to clean your spotting scope, replace all lens covers once you have finished using it. Since the rear cell .00821(c)5.325n5153(o)]TJ 2593(e)1/R1033 0 0 cm
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To verify collimation, view a star near the zenith. Use a medium to high power ocular — 12mm to 6mm focal length. It is important to center a star in the center of the field to judge collimation. Slowly cross in and out of focus and judge the symmetry of the star. If you see a systematic skewing of the star to one side, then re-collimation is needed.



Even though the star pattern appears the same on both sides of focus, they are asymmetric. The dark obstruction is skewed off to the left side of the diffraction pattern indicating poor collimation.

1. While looking through a medium to high power eyepiece, de-focus a bright star until a ring pattern with a dark shadow appears (see figure 8-2). Center the de-focused star and notice in which direction the central shadow is skewed.
2. Place your finger along the edge of the front cell of the telescope (be careful not to touch the corrector plate), pointing towards the collimation screws. The shadow of your finger should be visible when looking into the eyepiece. Rotate your finger around the tube edge until its shadow is seen closest to the narrowest portion of the rings (i.e. the same direction in which the central shadow is skewed).
3. Locate the collimation screw closest to where your finger is positioned. This will be the collimation screw you will need to adjust first. (If your finger is positioned exactly between two of the collimation screws, then you will need to adjust the screw opposite where your finger is located).
4. Use the hand control buttons to move the de-focused star image to the edge of the field of view, in the same direction that the central obstruction of the star image is skewed.
5. While looking through the eyepiece, use an Allen wrench to turn the collimation screw you located in step 2 and 3. Usually a tenth of a turn is enough to notice a change in collimation. If the star image moves out of the field of view in the direction that the central shadow is skewed, than you are turning the collimation screw the wrong way. Turn the screw in the opposite direction, so that the star image is moving towards the center of the field of view.
6. If while turning you notice that the screws get very loose, then simply tighten the other two screws by the same amount.



A collimated telescope should appear symmetrical with the central obstruction centered in the star's diffraction pattern.

Conversely, if the collimation screw gets too tight, then loosen the other two screws by the same amount.

7. Once the star image is in the center of the field of view, check to see if the rings are concentric. If the central obstruction is still skewed in the same direction, then continue turning the screw(s) in the same direction. If you find that the ring pattern is skewed in a different direction, then simply repeat steps 2 through 6 as described above for the new direction.

Perfect collimation will yield a star image very symmetrical just inside and outside of focus. In addition, perfect collimation delivers the optimal optical performance specifications that your telescope is built to achieve.

If seeing (i.e., air steadiness) is turbulent, collimation is difficult to judge. Wait until a better night if it is turbulent or aim to a steadier part of the sky. A steadier part of the sky is judged by steady versus twinkling stars.

NOTE: THE ADJUSTMENT SCREWS ON THE SECONDARY MIRROR ARE VERY SENSITIVE. USUALLY A TENTH OF A TURN WILL COMPLETELY CHANGE THE COLLIMATION OF THE SPOTTING SCOPE. DO NOT FORCE THESE SCREWS IF THEY WILL NOT TURN. IF TIGHTENING ONE SCREW IN THE DIRECTION YOU NEED TO GO IS DIFFICULT, SIMPLY LOOSEN THE OTHER TWO SCREWS BY EQUAL AMOUNTS TO BRING ABOUT THE SAME CHANGE. DO NOT BE INTIMIDATED BY TOUCHING UP COLLIMATION AS NEEDED TO ACHIEVE OPTIMAL HIGH-RESOLUTION VIEWS. IT IS WORTH THE TROUBLE!!!!

The following is a partial list of optional accessories available for your Celestron C5 spotting scope. You will find that additional accessories enhance your viewing pleasure and expand the usefulness of your spotting scope.

Barlow Lens - A Barlow lens is a negative lens that increases the focal length of a telescope. Used with any eyepiece, it doubles the magnification of that eyepiece. Celestron offers two Barlow lens in the 1-1/4" size for the C5. The 2x Ultima Barlow (#93506) is a compact triplet design that is fully multicoated for maximum light transmission and parfocal when used with the Ultima eyepieces. Model #93507 is a compact achromatic Barlow lens that is under three inches long and weighs only 4 oz. It works very well with all Celestron eyepieces.

CD-ROM (93700) - Celestron and Software Bisque have joined together to present this comprehensive CD-ROM called *The Sky™ Level 1 - from Celestron*. It features a 10,000 object database, 75 color images, horizontal projection, custom sky chart printing, zoom capability and more! A fun, useful and educational product. PC format.

Eyepieces - Like telescopes, eyepieces come in a variety of designs. Each design has its own advantages and disadvantages. For the 1-1/4" barrel diameter there are four different eyepiece designs available.

- **OMNI Plössl** - Plössl eyepieces have a 4-element lens designed for low-to-high power observing. The Plössls offer razor sharp views across the entire field, even at the edges! In the 1-1/4" barrel diameter, they are available in the following focal lengths: 4mm, 6mm, 9mm, 12.5mm, 15mm, 20mm, 25mm, 32mm and 40mm.
- **X-Cel** - This 6 element design allows each X-Cel Eyepiece to have 20mm of eye relief, 55° field of view and more than 25mm of lens aperture (even with the 2.3mm). In order to maintain razor sharp, color corrected images across its 55° field of view, extra-low dispersion glass is used for the most highly curved optical elements. The excellent refractive properties of these high grade optical elements, make the X-Cel line especially well suited for high magnification planetary viewing where sharp, color-free views are most appreciated. X-Cel eyepiece come in the following focal lengths: 2.3mm, 5mm, 8mm, 10mm, 12.5mm, 18mm, 21mm, 25mm.



Night Vision Flashlight - (#93588) - Celestron's premium model for astronomy, using two red LEDs to preserve night vision better than red filters or other devices. Brightness is adjustable. Operates on a single 9 volt battery (included).

Moon Filter (94119-A) - Celestron's Moon Filter is an economical eyepiece filter for reducing the brightness of the moon and improving contrast, so greater detail can be observed on the lunar surface. The clear aperture is 21mm and the transmission is about 18%.

Photographic Tripod (#93606) - Even at low power, your C5 Spotting Scope produces too much power to hand hold. For the best results, use a stable platform like the Celestron Photographic Tripod. This tripod has an oil fluid pan head for smooth panning. The quick release head allows you to attach and remove the C5 quick and easily. It is extremely lightweight and rigid.

Reducer/Corrector (#94175) - This lens reduces the focal length of the telescope by 37%, making your spotting scope a 787.5mm f/6.3 instrument. In addition, this unique lens also corrects inherent aberrations to produce crisp images all the way across the field when used visually. When used photographically, there is some vignetting that produces a 26mm circular image on the processed film.

Sky Map (#93722) - Celestron Sky Maps are the ideal teaching guide for learning the night sky. You wouldn't set off on a road trip without a road map, and you don't need to try to navigate the night sky without a map either. Even if you already know your way around the major constellations, these maps can help you locate all kinds of fascinating objects.

Skylight Filter (#93621) - The Skylight filter is used on the Celestron C5 spotting scope as a dust seal. The filter threads onto the rear cell of your telescope. All other accessories, both visual and photographic (with the exception of Barlow lenses), thread onto the skylight filter. The light loss caused by this filter is minimal.

Star Diagonal (94115-A) - A Star Diagonal lets you view objects that are at a 90 degree angle from the direction the telescope is pointing, thereby allowing comfortable viewing when pointed near the zenith (i.e. directly overhead). The resulting image is right side up, but will be reversed from left to right.

T-Adapter (#93633-A) - T-Adapter (with additional T-Ring) allows you to attach your 35mm SLR camera to the rear cell of your Celestron C5. This turns

your C5 into a 1250mm telephoto lens perfect for terrestrial photography and short exposure lunar photography.

T-Ring - The T-Ring couples your 35mm SLR camera body to the T-Adapter, radial guider, or tele-extender. This accessory is mandatory if you want to do photography through the telescope. Each camera make (i.e., Minolta, Nikon, Pentax, etc.) has its own unique mount and therefore, its own T-Ring. Celestron has 8 different models for 35mm cameras.

Vibration Suppression Pads (#93503) - These pads rest between the ground and tripod feet. They reduce the amplitude and vibration time of your telescope when shaken by the wind or an accidental bump. This accessory is a must for long exposure prime focus photography.

A full description of all Celestron accessories can be found in the Celestron accessory catalog (#93685).



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