Company Seven
Astro-Optics Division

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Celestron 5, Celestron 8 Instruction Manual

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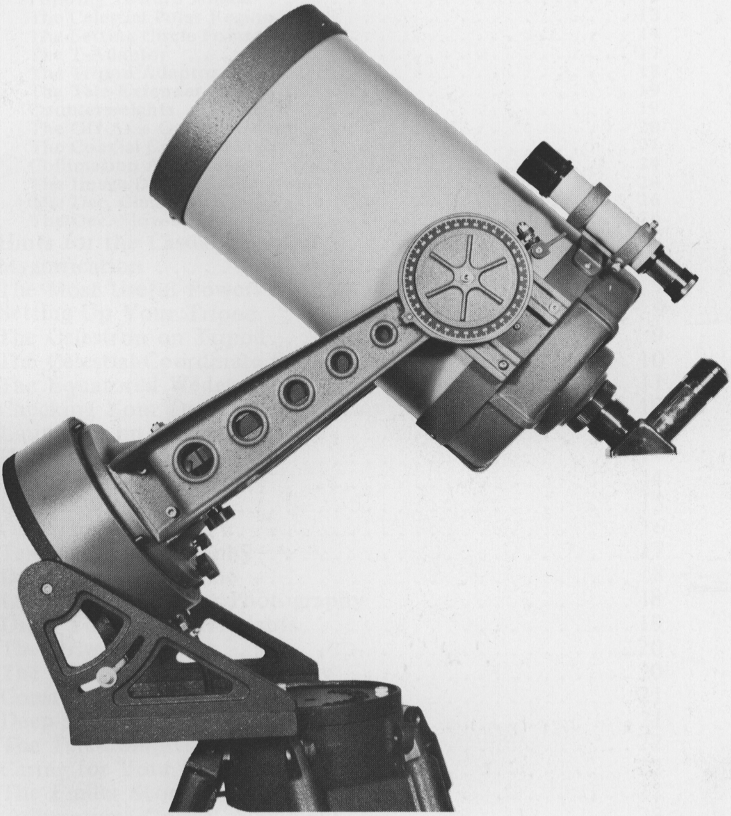
Celestron® 5
Celestron® 8



Instruction Manual

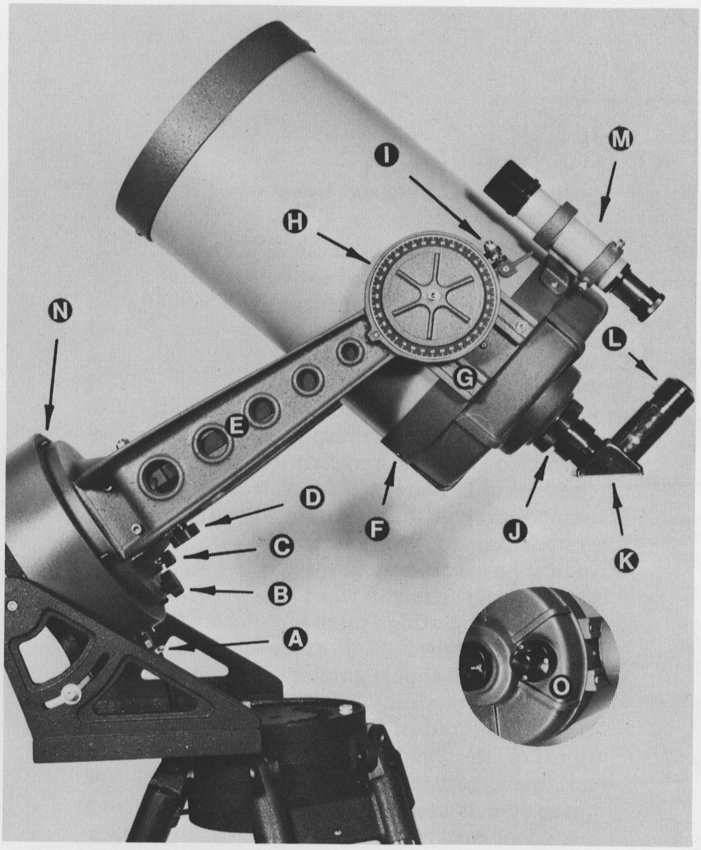
IMPORTANT
Read first two sections
before using your telescope

Cover Photo: Celestron 8 mounted on equatorial wedge

Contents

Testing and Guarantee

The optical components of Celestron Telescopes are manufactured to such exacting standards that good performance could be achieved simply by randomly assembling them into a telescope. But we aren't satisfied with just good performance. Each of our systems is set up in a laser collimator capable of detecting 1/100th wave errors. Then we aspherize the secondary mirror to bring each system to an optical null. Our optical guarantee is as follows: Using a point source at infinity (star test) and with the system properly collimated, a knife edge shall indicate a clean optical null. The shadow bands shall appear straight when tested with a 100-line Ronchi grating (three lines intercepting the cone). The intra- and extra-focal diffraction patterns shall appear similar with regard to the central obstruction when using a 12½-mm ocular with the out-of-focus blur circle filling one-third of the field. Further, each Celestron is serialized, registered and guaranteed to be free from defects in material and workmanship for a period of one year subject to repair or replacement at our factory.



The Basic Celestron

(A) clock drive plug, (B) right ascension slow-motion knob, (C) right ascension clamp, (D) declination slow-motion knob, (E) fork tine, (F) rear cell accessory hole, (G) tube saddle, (H) declination setting circle, (I) declination clamp, (J) visual back, (K) star diagonal, (L) ocular, (M) finder scope, (N) right ascension setting circle, (O) focus knob.

The Basic Celestron

Inside your carrying case, you'll find the following standard accessories along with your Celestron: a lens cap, a visual back, two oculars, a star diagonal, a cord for your electric clock drive, a set of Allen wrenches and a packet of Allen bolts and screws.

As we refer to these and other accessories, and to the various components of your Celestron, consult the illustration of the basic Celestron or check the appropriate illustration listed in the table of contents.

Having removed your Celestron from its case, you are ready for your first look. In selecting an object for observation, try to select one that is fairly bright and close – one that may be viewed without sighting through window glass, haze or heat waves. We want your first impression to be a good one.

To raise the tube of your Celestron into viewing position, release the clamp at the top of the fork tine nearest the finder scope. This clamp is called the "declination (Dec.) slow-motion clamp," for reasons we'll get to later. Raise the tube and relock the clamp.

DO NOT MOVE THE TELESCOPE TUBE MANUALLY UP OR DOWN WHILE THE DEC. CLAMP IS LOCKED.

At the base of your Celestron is another clamp. Unlock it, grasp one of the fork tines and swivel the tube in the general direction you'll be looking. Then re-lock the clamp. This clamp is called the "right ascension (R.A.) clamp."

DO NOT MOVE THE TELESCOPE TUBE MANUALLY SIDEWAYS WHEN THE R.A. CLAMP IS LOCKED.

Remove the plastic cap at the back of your telescope. (This protects the optics inside when no ocular is inserted.) Thread the visual back onto the rear-cell opening, insert your star diagonal into the visual back and place a 25mm ocular in the star diagonal.

Once you've selected an object of interest, sight in on it through the finder scope. You might have to hunt for the object a little to get it into the main field of your telescope, because the finder scope and your main optics have been aligned for infinity.

To center the object of interest on the cross hairs of the finder, use the two knurled knobs at the base of the telescope. The knob beside the R.A. clamp is the "R.A. slow-motion control," and it moves the telescope tube horizontally. If this control is hard to turn, loosen the R.A. clamp a bit.

The knob at the base of the fork tine raises and lowers the tube. It operates only when the Dec. clamp is locked, and moves the tube appreciably only when it is turned through quite a few revolutions. This knob is called the "Dec. slow-motion control."

DO NOT FORCE THE DEC. SLOW-MOTION KNOB TO TURN. THE TANGENT ARM WHICH IT MOVES (INSIDE THE FORK TINE) MAY HAVE REACHED THE END OF ITS TRAVEL. IF SO, RETURN THE ARM TO THE CENTER OF THE SCREW, RELEASE THE DEC. CLAMP AND RE-SET THE TUBE MANUALLY.

The focus control for your Celestron is the knob to the right of the visual back. Turning this knob moves the primary mirror with respect to the secondary mirror and focuses your telescope. Once you've found focus for a particular object, you focus on closer objects by turning the knob to the right, and you focus on more distant objects by turning the knob to the left.

A single turn of the focus knob moves the primary a very short distance, thus providing extremely sensitive control of focus. Therefore, it will take a considerable number of turns of the focus knob to travel between widely separated focuses. The range of focus for the Celestron 5 is from approximately 15 feet to infinity and beyond, and the range of focus for the Celestron 8 is from approximately 25 feet to infinity and beyond.

Because the Celestron has a large range of focal travel, there might be a tendency for you to get lost on the focal travel if you are focusing on a dim object. The remedy is to find a brighter object at about the same distance as the desired object, focus on the brighter object, then re-aim the telescope at your object of interest and focus.

In focusing your telescope at high power, you may notice that the image shifts slightly. For the focus mechanism of the Celestron an image displacement of about one-third of the field is normal at high power.

Hints for the Casual Observer

NEVER ATTEMPT TO LOOK AT THE SUN THROUGH YOUR CELESTRON OR ITS FINDER SCOPE WITHOUT THE PROPER PROFESSIONALLY MADE SOLAR OBSERVING EQUIPMENT! INSTANT AND PERMANENT EYE DAMAGE WILL BE SUSTAINED – EVEN DURING AN ECLIPSE OF THE SUN. (See the section on *Observing the Sun.)*

An ocular inserted directly into the visual back of your Celestron produces images with "up-and-down" and "left-and-right" reversed, just as in your finder scope. A star diagonal turns the images right-side-up but leaves them mirror-reversed. For "naturally oriented" images, a Porro prism is required. (See our catalog.)

Whenever possible, avoid sighting through mist, fog, haze or heat waves. No telescope can cut through these visual obstructions.

At night, seek out dark, steady skies for celestial observing. Very dark skies are best for nebulae and galaxies, and very steady skies are best for the Moon and the planets. If you find a dim nebula difficult to see, try averting your vision – glancing to the side in your field of view – or moving the field of view back and forth slightly.

DEW MAY BE WIPED OFF THE CORRECTOR PLATE WITH A *WHITE* KLEENEX AND *GENTLE* WIPES ONLY IF THE PLATE IS COMPLETELY FREE OF ABRASIVE PARTICLES AND DIRT. A PORTABLE HAIRDRYER IS HANDY FOR REMOVING DEW.

Magnification

To determine the visual magnification of your telescope, divide its focal length by the focal length of the ocular you are using. The effective Cassegrain focal length of the Celestron 5 is 1,250mm and the focal length of the Celestron 8 is 2,000mm.

Using the following oculars gives approximately the following powers with your telescope:

Ocular	C5	C8
50mm*	–	40X
40	–	50
25	50X	80
18	70	111
12	100	160
9	139	222
6	208	333
4	312	–

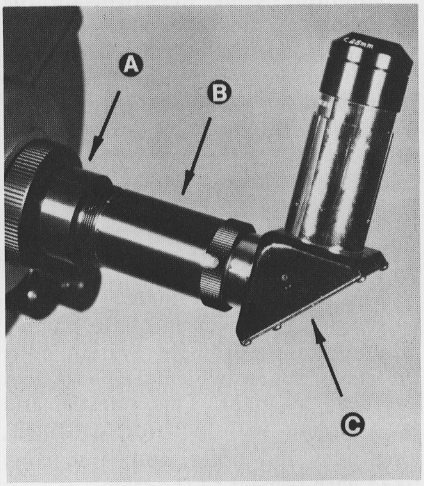
**The Celestron 50mm Plossl requires the Celestron giant 2-inch-diameter star diagonal. This unit couples to the rear cell just as the "T" adaptor does.*

There are upper and lower limits of magnification for your telescope. These limits are determined by the laws of optics and the nature of the human eye.

The upper limit of magnification is about 60X per inch of aperture. For the Celestron 5, this is about 300X; for the Celestron 8, it is about 480X.

The lower limit of magnification is about 3X or 4X per inch of aperture. For the Celestron 5, this is about 20X; for the Celestron 8, about 32X. During the day, the lower limit of magnification is higher – about 40X for the Celestron 5 and about 64X for the Celestron 8. For this reason, the 40mm ocular supplied with the Celestron 8 should be used mainly at night.

The range of magnification of any given set of oculars may be increased with the use of a Barlow lens. The Celestron Barlow will double the power of any of our oculars and also comfortably increase the eye-relief distance. However, there is some sacrifice of image quality. This accessory inserts into the visual back and accepts either star diagonal or ocular.



The Barlow Lens
(A) visual back, (B) Barlow lens, (C) star diagonal and ocular.

The Most Useful Powers

The utility of any given magnification will depend upon your subject's apparent size, its apparent brightness and the seeing conditions. High powers tend to decrease image brightness, diminish the field of view and magnify air turbulence.

For most purposes, the Celestron 5 is best as a daytime telescope in the range of 50X to 100X, and the Celestron 8 is best between 80X and 160X.

At 50X or 80X, your Celestron will also just frame the full Moon and most of the star clusters. It is within this range of magnification, too, that most nebulae and galaxies are best seen. Incidentally, the magnitudes of nebulae and galaxies are usually listed as the magnitudes these objects would have if their images were compressed into the size of a single stellar image. So you can expect that a third-magnitude star cluster, nebula or comet will not be as easy to see as a third-magnitude star.

Planets, lunar craters, some of the globular clusters and a few of the planetary and diffuse nebulae will stand more magnification if the seeing permits. These will be pleasing objects through the Celestron 5 at 100X or so, and through the Celestron 8 at about 160X.

For observing the Moon and planets in great detail, or for studying the really challenging double stars, you'll have to go to higher power. Here, the Celestron 5 will do well between 150X and 200X, and the Celestron 8 will perform well between 240X and 320X.

Setting Up your Tripod

The Celestron Locked-Triangle Tripod is offered as an optional accessory for those who require the ultimate stability in a portable tripod.

To set up your tripod, stand it on its head, remove the elastic band and let down the legs one by one, making sure the tensioner bars remain under the legs. Grasp two of the legs near the tripod head and lift upward. The tensioner bars will move toward each other and when they meet, the tripod will stand by itself.

To lock the tripod legs in place, open the lock plate of the tensioner coupler and hook the tensioner bars into the slots in the coupler.

Tension adjustments are provided for your tripod. To increase the tension, advance the Allen-head bolts in the cross bars at the top of the tripod legs and re-tighten the lock nuts.

The Celestron on Tripod

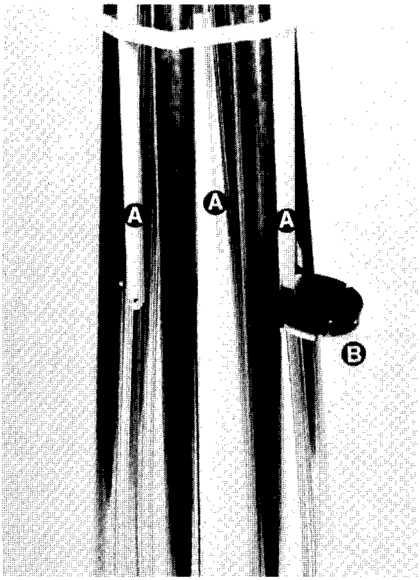
Your Celestron may be mounted directly to the Locked-Triangle Tripod. In this configuration, your telescope is known as an "alt-azimuth" telescope.

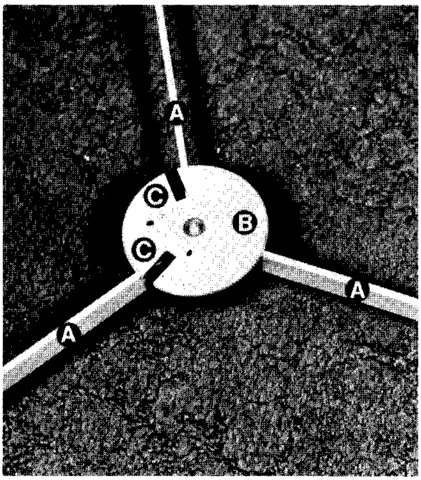
To mount the Celestron 5 alt-az, align the three threaded holes under the base with the three holes at the top of the tripod head, and thread in the three 5/16-18 X 1" screws supplied with your instrument. Tighten with the appropriate Allen Wrench.

To mount the Celestron 8 alt-az

requires one bolt: 3/8-16 X 1-3/4". Thread the bolt up through the tripod head into the center hole in the base of your Celestron 8.

While the alt-az configuration is suitable for terrestrial observing, it is an awkward configuration for celestial observing – requiring two adjustments, vertical and horizontal, to track





The Locked-Triangle Tripod
ABOVE: (A) tensioner bars, (B) tensioner coupler. BELOW: (A) tensioner bars, (B) lock plate, (C) coupler slots.

celestial objects in their apparent motion across the night sky. More suitable is the configuration of the equatorial telescope.

Mounting your Celestron on the Celestron equatorial wedge converts your telescope to an equatorial telescope. This permits you to track celestial objects across the sky with a single rotating motion. It also permits you to find objects in the sky by using the celestial-coordinate system that astronomers use.

The Celestial-Coordinate System

The celestial-coordinate system is an imaginary projection of the Earth's geographical coordinate system onto the starry sphere which seems to turn overhead at night. This celestial grid is complete with equator, latitudes, longitudes and poles, and it remains fixed with respect to the stars.

(Actually, the celestial-coordinate system is being displaced very slowly with respect to the stars, because the Earth's axis is very slowly changing the direction of its point. This effect is slight, however, and in any case is being continually accounted for as new star atlases are published.)

The celestial equator is a full 360^{o} circle bisecting the celestial sphere into the Northern Celestial Hemisphere and the Southern Celestial Hemisphere. Like the Earth's equator, it is the prime parallel of latitude and is designated 0^{o}. The celestial equator passes through the constellations Orion, Aquila, Virgo and Hydra.

The celestial parallels of latitude are called "coordinates of declination (Dec.)," and like the Earth's latitudes they are named for their angular distance from the equator. These distances are measured in degrees, minutes and seconds of arc. Declinations north of the celestial equator are "+", and declinations south are "–". The poles are at 90^{o}.

The celestial parallels of longitude are called "coordinates of right ascension (R.A.)," and like the Earth's longitudes they extend from pole to pole. There are 24 major R.A. coordinates, evenly spaced around the equator, one every 15°.

Like the Earth's longitudes, R.A. coordinates are a measure of time as well as angular distance. We speak, for example, of the Earth's major longitudes as being separated by 15°, but we can also say they are separated by one hour of time because the Earth rotates once every 24 hours. The same principle applies to celestial longitudes since the celestial sphere appears to rotate once every 24 hours.

Astronomers prefer the time designation for R.A. coordinates even though the coordinates denote locations on the celestial sphere, because this makes it easier to tell how long it will be before a particular star will be at a particular place in the sky.

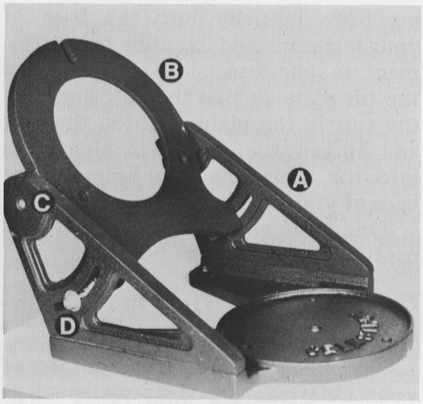
So, R.A. coordinates are marked off in units of time eastward from an arbitrary point in the constellation Pisces. The prime R.A. coordinate which passes through this point is designated "0 hours 0 minutes 0 seconds." All other coordinates are named for the number of hours, minutes and seconds that they lag behind this coordinate after it passes overhead moving westward.

Given the celestial-coordinate system, it now becomes possible to find celestial objects by translating their celestial coordinates into telescope point. For this, your Celestron comes equipped with setting circles. The dial at the base of your telescope is the setting circle for R.A. The dials at the top of the fork tines are your setting circles for Dec. You can use these circles to acquire celestial objects once you have properly mounted your Celestron on its equatorial wedge (or pier) and pointed the polar axis of your telescope toward the North Celestial Pole.

The Equatorial Wedge

If you ordered the equatorial wedge, you received a packet of 10 Allen-head screws and bolts.

In the Celestron 5 packet are six large bolts (5/16-18 X 1") and four screws (1/4-20 X 1").



The Equatorial Wedge (Celestron 8)

(A) wedge base, (B) tilt plate, (C) ¼-20 X ¾" screw, (D) ¼-20 X 1" screw.

The Celestron 8 packet is identical except that three of the 5/16-18 X 1" bolts above have been replaced with three 3/8-16 X 1" bolts.

The 1/4-20 screws and washers will be used to assemble your equatorial wedge. The bolts will be used to mount your wedge on your tripod and to mount your Celestron on your wedge.

To assemble your wedge, press-fit the tilt plate, slotted edge up, between the sides of the wedge. Align the holes at the top of the wedge with the top holes in the side of the tilt plate. Insert the two 1/4-20 x 3/4" screws.

Thread the other two 1/4-20 screws through the flat washers into the bottom holes in the side of the tilt plate. The bottom of the tilt plate now describes an arc as it moves between the sides of the wedge. This movement will permit you to tilt the polar axis of your Celestron so that it points to the North Celestial Pole.

To mount the wedge on the Celestron tripod, center the three holes in the wedge base over the three holes in the tripod head and thread in three 5/16-18 X 1" screws.

To mount your Celestron on the wedge, thread one of the three remaining bolts partially into the base of your telescope and, cradling the instrument in one arm, slide its base onto the tilt plate so that the bolt slips into the slot in the plate. Tighten the bolt and thread the two remaining bolts into the remaining two holes in the base of your telescope.

One more adjustment and you'll be ready to line up on the pole.

Checking Your Dec. Setting Circles

The declination setting circles of your Celestron are factory-aligned so that the 90°-90° line on each parallels the optical axis of your telescope. As a result, when the optical axis of your telescope is parallel to the polar axis of your telescope, the Dec. pointer on the fork tine at the bottom of the Dec. circle should give a reading of 90°.

This is important enough to double check and there is an easy way to do this. If the 90-90 line is parallel to the optical axis, then the two symmetrically opposite 80-80 lines, the two symmetrically opposite 70-70 lines, etc., will make equal angles with the optical axis.

To check this, first orient your telescope tube with the finder scope up. Then center an object such as a light atop a tower a mile or two away in the field of your main optics. Note the Dec. reading on one of the circles. Now tumble the telescope tube in both R.A. and Dec. until the finder is under the tube and you have the same light centered in the field again. Note the Dec. reading (on the same circle). It should be the same as before.

If the reading is not the same, you'll have to rotate the circle back to its proper position. The correct position will be such that the coordinate exactly halfway between your first and second readings is opposite the Dec. pointer. This will also be the correct reading for your other Dec. circle.

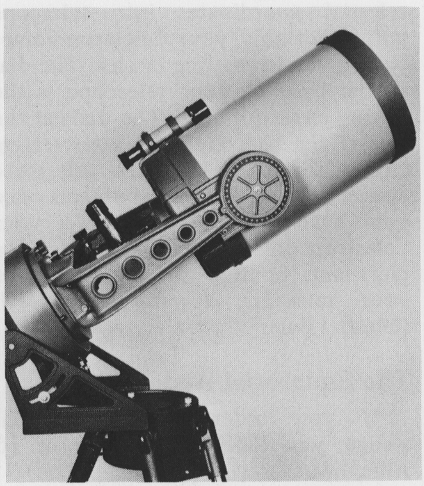
The Dec. circle is held in position by a circular retainer plate, which is held in place by a small Allen screw at its center. Loosen the screw before trying to rotate the circle, and after setting the circle, tighten the screw so the circle can't rotate.

Lining Up on the Pole

The celestial pole is that imaginary point on the celestial sphere toward which the Earth's axis of rotation points. It is around this point that the stars appear to move nightly – their paths being concentric circles with the celestial pole at the center. If the polar axis of your telescope points directly at the celestial pole, then a star at any declination may be kept centered in the field of your telescope simply by rotating the telescope in right ascension, or by letting the electric clock drive of your telescope rotate for you in right ascension.

To line up on the pole, you line up on Polaris, the North Star, and adjust your Dec. circles accordingly. The Declination of this star is $+89.1^{\circ}$. It lies just off the pole, on the opposite side of the pole from the Big Dipper.

Polaris is easy to spot. The two stars at the front of the bowl of the Big Dipper point right to it. Using the distance between these two stars as your yardstick, mark off about five lengths across the sky in the direction



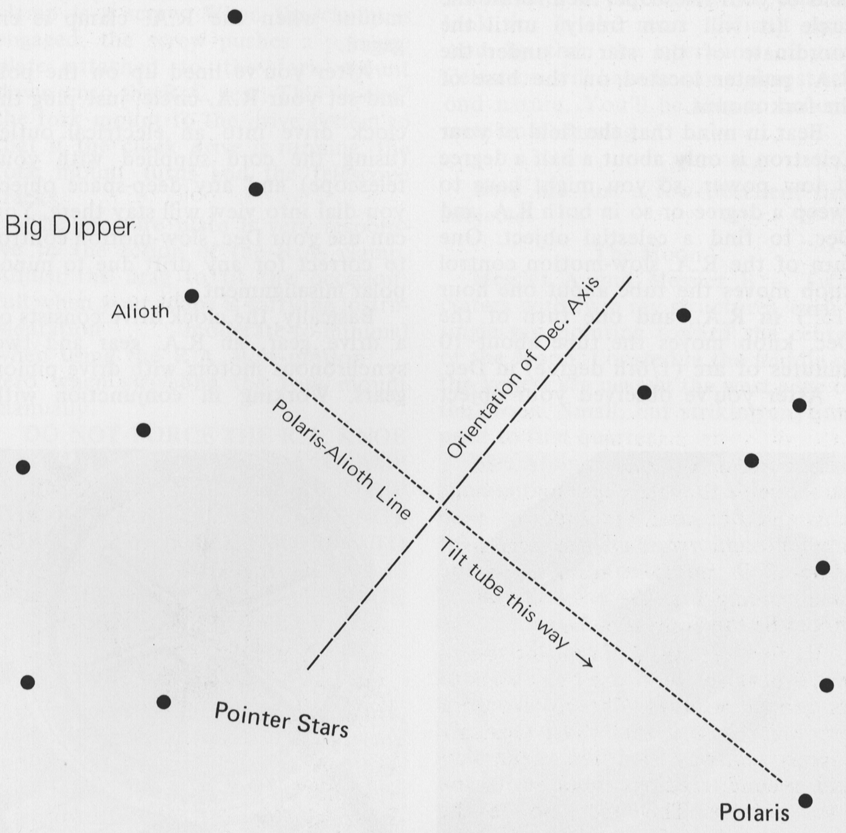
Pointing Toward Polaris

going from the bottom of the Dipper bowl to the top of the Dipper bowl. You'll spot a bright, second-magnitude star. This is Polaris.

To line up on Polaris, tilt your telescope tube upward so the declination setting circles read +90°. Move your tripod and tilt your equatorial wedge tilt plate until your telescope is pointing in the general direction of Polaris.

Now look for the Big Dipper and find the third star in its handle (the third star from the end of the handle). This is Alioth. Swivel the fork of your telescope until the declination axis is at right angles to an imaginary line drawn from Polaris to Alioth. Then tilt the telescope tube *away* from the Big Dipper slightly until your Dec. setting circles read +89.1°.

Having made sure beforehand that your finder scope is aligned for infinity with the main optics of your telescope, the task now is to center Polaris exactly on the cross hairs of your finder. Turn your tripod, adjust your tilt plate and, if necessary, place shims under the feet of your tripod or swivel your fork tines very slightly – until Polaris is dead-center on the cross hairs. The more accurately you do this, the more accurately you'll be lined up on the pole.



The Celestial Polar Region

The two stars in the front of the bowl of the Big Dipper point right to Polaris. The imaginary lines on this drawing represent an easy way to line up on the pole. Consult "Lining Up on the Pole."

Using Your Setting Circles

On the R.A. setting circle, each of the 24 hours of R.A. is divided into 12 intervals of five minutes each. On the Dec. circles, each graduation represents one degree. Declination readings between your $+90^{\circ}$ pole setting and the 0°-0° equator line are "+" and readings on the other side of the 0-0 line are "–".

Once you've lined up on the pole and set your R.A. setting circle, you'll be able to use the setting circle readings to translate the star-atlas coordinates of a celestial object into telescope point. To set the R.A. setting circle, center a star of known R.A. in the field of your telescope, then rotate the circle (it will turn freely) until the coordinate of the star is under the R.A. pointer located on the base of the fork mount.

Bear in mind that the field of your Celestron is only about a half a degree at low power, so you might have to sweep a degree or so in both R.A. and Dec. to find a celestial object. One turn of the R.A. slow-motion control knob moves the tube about one hour (15°) in R.A., and one turn of the Dec. knob moves the tube about 10 minutes of arc (1/6th degree) in Dec.

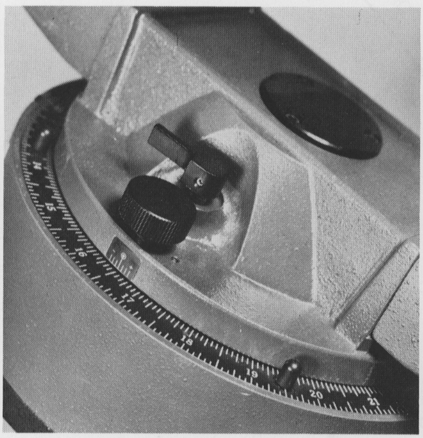
After you've observed your object for a while and decide to seek out another object, remember to re-set your R.A. circle before dialing the new coordinates. Just use the R.A. of the object you've been observing. Of course, if you're using your electric clock drive, you'll not have to make this adjustment.

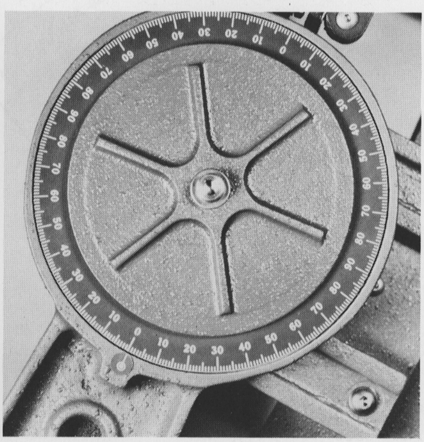
The Electric Clock Drive

Installed in the base of your Celestron is a precision motor drive system. This system acts as a 24-hour clock that keeps time with the stars. It rotates your R.A. setting circle westward at the same rate that the stars appear to move. It also rotates your fork mount when the R.A. clamp is engaged.

After you've lined up on the pole and set your R.A. circle, just plug the clock drive into an electrical outlet (using the cord supplied with your telescope) and any deep-space object you dial into view will stay there. You can use your Dec. slow-motion control to correct for any drift due to minor polar misalignment.

Basically, the clock drive consists of a drive gear, an R.A. gear and two synchronous motors with drive pinion gears. Working in conjunction with





The Setting Circle Pointers

LEFT: Above the R.A. setting circle, the R.A. pointer, reading 16 hours, 30 minutes.
RIGHT: Below the Dec. circle, the Dec. pointer reading 0.5°.

this system are the R.A. slow-motion control and the R.A. clamp.

The drive gear – a large spur gear free to turn around a polar shaft – is rotated by the pinion gears of the two synchronous motors under the base of your telescope. Above and rigidly coupled to the drive gear is the R.A. gear. This gear turns when the drive gear turns.

Extending down out of the R.A. slow-motion knob is a pinion gear which meshes with the R.A. gear. When you turn the R.A. knob, this pinion travels the circumference of the R.A. gear, causing the fork mount to rotate readily, if the R.A. clamp is not engaged.

Extending down from the R.A. clamp is a screw. When the clamp is engaged, the screw pushes a pressure plate attached to the fork mount down onto the R.A. gear. This "locks" the fork mount to the drive system so that if the clock drive is running, the fork mount turns and the telescope tracks.

The pressure plate is very responsive to the action of the R.A. clamp. Adjust the drag to fit the occasion: full when your scope is carrying instrumentation ... moderate-to-minimal when using the R.A. slow-motion ... zero when swiveling the fork mount manually.

DO NOT FORCE THE R.A. KNOB TO TURN WHEN THE R.A. CLAMP IS ENGAGED. THIS MIGHT STRIP THE R.A. PINION. ALSO, DO NOT FORCE THE FORK MOUNT TO SWIVEL WHEN THE R.A. CLAMP IS ENGAGED. THIS WILL CAUSE THE PRESSURE PLATE TO WEAR.

Using Your Celestron

You now own a large-aperture, high-performance telescope of extreme compactness, versatility and usability. Remember, however, that no telescope is a substitute for knowledge, experience, patience, visual acuity and – in the case of stargazing – clear, dark, steady skies.

To avoid unnecessary disillusionment with your instrument, or yourself as an observer, we sincerely urge you to take the time to set up an observing program with sensible goals. Then cultivate the patience to follow through with the program, step by step.

If you're a beginning nature observer, for example, you might start out by setting up a feedbox for birds or squirrels just beyond the near focus of your telescope. After you've become used to the features of your subjects at close range, you'll better appreciate what your telescope reveals of them at greater distances.

If you're a beginning celestial observer, start off with the easier objects. After you know what these look like, you'll have a better idea of what to look for in the more difficult ones. And by then the operation of your Celestron will have become almost second nature. You'll be able to concentrate on observing.

Here are just a few excellent first subjects:

The Moon

Messier A and Messier B – Twin craters with twin ray structures, each a single ray pointing toward the center of the Moon. Located in the middle of the largest sea nearest the west edge of the Moon. Small, but striking anytime prior to first quarter.

The Alpine Valley – an enormous, apparently flat feature that seems to have been gouged straight through a towering chain of mountains near the north edge of the Moon. The mountains, called the Alps, circle south out of the lunar dark around first quarter.

The Straight Wall – An 80-mile-long cliff about 800 feet high. Roughly parallel to the lunar north-south line, it is located in the largest sea nearest the south edge of the Moon. Just after first quarter, this feature and the two listed above can be well seen at the same time.

The Planets

The celestial coordinates of these objects (which move daily with respect to the stellar background) will be found in the astronomical magazines listed at the back of this manual.

Mars – The closest planet beyond Earth's orbit. Its ruddy surface is marked by both permanent and changing features. Especially interesting: the polar caps that advance and retreat, and the occasional dust storms that cloud the surface of the planet. Mars rotates perceptibly in a few hours.

Jupiter – Largest and most awesome of the planets. Though a thousand times larger than Earth, it spins twice as fast. Its bulging disc boasts a multitude of windswept belts and a titanic Red Spot that rotates with the planet. Four bright moons orbit Jupiter, and occasionally one will cast its shadow onto the planet.

Saturn – Prince of the planets. Crowned with a magnificent system of concentric rings, Saturn is one of the most fascinating of the planets. Look for the shadow of its globe on the rings. In 1980, the rings will be displayed edgewise to us and seem to disappear.

Star Clusters

M 35 – No. 35 in comet-hunter Messier's list of nebulous objects. A large, bright open cluster in Gemini at the foot of the westernmost twin. With your unaided eye, M 35 is barely visible. With your Celestron at low power, this object is a swarm of glittering stars that fills the field. Sharp eyes might detect a smaller, fainter cluster at the southwest edge of M 35, which is highest in the evening sky in February. (R.A. 6h 06m, Dec. +24° 21')

M 13 – The Great Globular Cluster in Hercules. By far, the finest globular cluster in northern skies, and beautifully framed at low power. Notice the star lanes radiating outward from its glowing core. M 13 stands at the zenith in July. (R.A. 16h 40m, Dec. +36° 33')

NGC 869, NGC 884 – The 869th and 884th objects listed in Dreyer's *New General Catalogue*. Together these two naked-eye, open clusters are known as the Double Cluster in Perseus. Look for the contrasting stellar hues. You'll have to sweep a half a degree or so to explore this object, which is highest in the sky in December. (R.A. 2h 17m, Dec. +56° 54')

Nebulae

M 42 – The Great Nebula in Orion. Probably the finest telescopic object in the heavens. A vast cloud of swirling gases surrounding the quadruple star in the middle of Orion's sword. North of M 42 is M 43, another part of the same nebula. Try your higher powers on these objects. They're well placed in the evening sky in January. (R.A. 5h 32m, Dec. -5° 25')

M 8 – The Lagoon Nebula. This star-studded nebulosity lies just north of the "spout of the Teapot" in Sagittarius. Celestron 8 owners, look for the dark "bay" that gave this object its name, just west of the open cluster imbedded in the nebula. M 8 is highest in the sky in August. (R.A. 18h 00m, Dec. -24° 23')

Observing the Sun

Our Sun, the nearest star, is a truly exciting celestial object. Its boiling, granulated surface occasionally displays the magnetic storms we know as sunspots. Against the background of its disc, Mercury and Venus sometimes pass in transit, as does the Moon during a solar eclipse.

BUT WE REPEAT: NEVER LOOK AT THE SUN THROUGH YOUR CELESTRON OR ITS FINDER SCOPE WITHOUT HAVING EQUIPPED YOUR INSTRUMENT WITH THE PROPER PROFESSIONALLY MADE SOLAR FILTER SYSTEM! INSTANT AND IRREVERSIBLE EYE DAMAGE WILL RESULT – EVEN DURING AN ECLIPSE OF THE SUN.

The safest type of solar filter is the glass-window type that slips over the front cell of your telescope. This type is available from us as a full-aperture filter or a stopped-down, off-axis filter. The off-axis model compromises resolution somewhat, but is less expensive. Both models reduce the intensity of the solar radiation to 1/100th of 1% at all wavelengths.

The Celestron solar filter permits extended observation of the Sun in complete safety and comfort. When observing with this accessory, however, be certain to take the following precautions: 1.) be sure to place the filter snugly over the front cell of your telescope, 2.) caution your guests not to bump the telescope, 3.) do not leave your scope unattended during an observing session, and 4.) always cap the finder scope so the heat from the Sun's rays doesn't damage the delicate cross hairs. Use the plastic rear-cell cap to cap the finder.

Other filters may be used with the Celestron solar filter to reduce the brightness of the solar image even further. Neutral density filters, which can be threaded into the inside of your eyepiece, are available from astronomical supply houses. (By themselves, these filters give insufficient protection for solar observation! They may, however, be used by themselves to reduce the glare of the full Moon.)

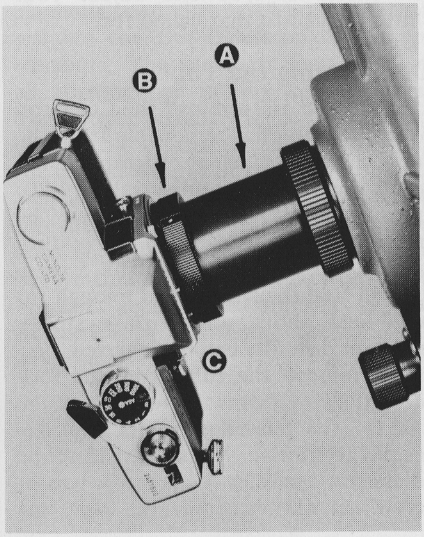
An alternative way to view the solar disc is by projecting its image through your Celestron onto a white card. While this permits more than one person to view the Sun at the same time, we don't recommend it because the projected image is inferior and because the resultant heat buildup in your scope will damage your secondary mirror and eyepiece if the projection time exceeds 60 seconds.

We caution against the use of Herschel prisms, sun diagonals, eyepiece solar filters and the like. The elements of these accessories have been known to separate or fracture as the intense solar radiation builds up at their location in an optical system.

Terrestrial Photography

Virtually any 35mm single-lens-reflex camera with a fully removable lens and a focal plane shutter can be coupled to your Celestron with the Celestron camera adaptors. Larger-format cameras can be coupled with special custom adaptors made at your local machine shop.

The standard Celestron camera adaptors convert your scope to the universal "T"-adaptor system used by photographers. With this system, the "T" adaptor replaces the visual back and the "T" camera ring couples your camera (minus lens) to the "T" adaptor. The "T" adaptor places the film plane of your camera at Cassegrain focus and its slip-ring lets you orient your camera body as desired.



The T-Adaptor
(A) T-adaptor, (B) camera ring, (C) camera minus lens.

Here the Celestron 5 and Celestron 8 have magnifications of 25X and 40X respectively (compared to the magnification of your 50mm camera lens), and the f/10 photographic speed of your telescope allows shutter speeds ranging from 1/250th to 1/2000th of a second for general daytime use. This photographic configuration can be used for small-scale lunar or planetary photographs as well as terrestrial shots.

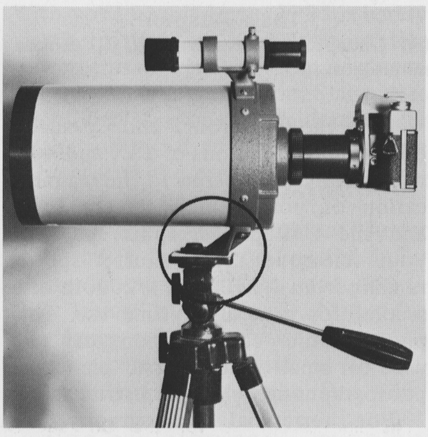
For terrestrial photography, an SLR with a behind-the-lens meter is best, but most such light meters are designed to operate with an f/1.8 lens wide open. You can compensate for this by changing the ASA setting on your camera. You'll have to experiment a little, but you might start out with the ASA dial set for about three times the actual ASA rating of the film being used.

If your camera doesn't have a built-in meter, then use an incident light meter. In taking pictures of distant objects illuminated by sunlight, assume that the lighting is the same where you are and take a meter reading of the unprotected Sun rays. Set the meter at f/10 and adjust your shutter speed to that called for.

Demounting the Tube

The tube assembly of the Celestron 5 or Celestron 8 is removable from the fork mount for telephotography, and using the Celestron universal (1/4-20) tripod adaptor, the tube can be mounted on any standard heavy-duty tripod or monopod. Celestron 5 owners will find their tube light enough for hand-held shots, and with a steady hand good results can be achieved.

To remove the tube from the fork mount, swing down the telescope tube and lay the telescope on its side. Remove the four screws holding the tube to the tube saddles. Loosen the pair of screws at the base of the fork tine



The Tripod Adaptor (Celestron 5)

The Celestron tube assembly demounts from the fork and can be coupled to any standard heavy duty tripod via the tripod adaptor as shown above.

nearest you. Then gently pull the tine toward you and slide out the tube, taking care not to scratch the paint. Cover the holes in the rear cell with tape to protect your optics.

IF YOU PREFER TO REPLACE THE SADDLE SCREWS IN THE DEMOUNTED TUBE, THREAD THEM IN NO MORE THAN 2-1/2 TURNS. OTHERWISE THE SCREWS WILL PROTRUDE TOO FAR INTO THE TUBE AND DAMAGE THE PRIMARY MIRROR.

To couple the Celestron tripod adaptor to your telescope tube, remove the two screws at the bottom of the rear cell, center the holes of the adaptor over the two resulting holes and thread in the two screws provided with your adaptor kit.

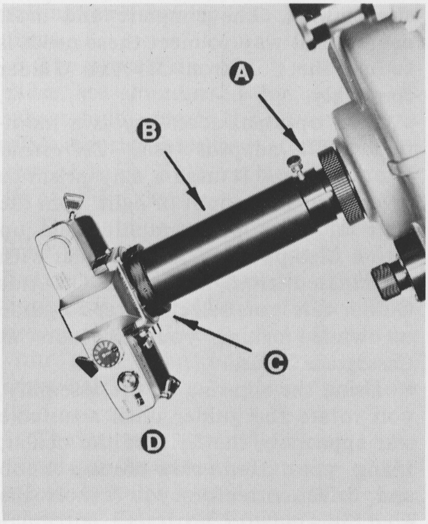
WHEN YOU REMOVE THE TRIPOD ADAPTOR FROM YOUR TUBE, DO NOT REPLACE THE ADAPTOR SCREWS IN THE REAR CELL. REPLACE THE REAR CELL SCREWS.

Lunar and Planetary Photography

Although Cassegrain-focus photography is useful for small-scale renderings of the Moon and planets, there will be times when you'll prefer "high-power" photography of these objects. For this, we offer the Tele-Extender.

The Tele-Extender is a tube that lets you space back your camera so you can insert an ocular in the visual back ahead of the camera body. The Tele-Extender tube fits over the ocular and threads onto the visual back. Your camera is coupled to the other end of the Tele-Extender via your camera ring.

Here the ocular acts as an enlarging lens, projecting a magnified Cassegrain-focus image onto the film. With this setup, you can increase the effective focal length (e.f.l.) of your telescope three to 16 times. For example, using the Tele-Extender, a 25mm ocular gives a 3X enlargement of the Cass-focus image scale and a 12mm ocular gives an 8X enlargement.



The Tele-Extender

(A) visual back, in which an ocular (not shown) is inserted, (B) Tele-Extender tube, which fits over the ocular and threads onto the visual back, (C) camera ring, (D) camera minus lens.

Using the Tele-Extender, your times of exposure will range from about 1/10th second to about 15 seconds, as compared to the faster shutter speeds used at Cassegrain focus. Photographing the Moon at Cassegrain focus, for example, your shutter speed might be 1/200th second with High-Speed Ektachrome. But projecting with a 25mm ocular, you'd be shooting in the neighborhood of 1/10th sec.

Exposures of the planets will be somewhat longer. With High-Speed Ektachrome and a 12mm ocular, your times of exposure for Jupiter or Saturn will range from about 1/2 second to about five seconds. With Kodachrome-X, a slower film, your exposures will range from about seven seconds to about 15 seconds. With faster black-and-white film, your exposures will be briefer.

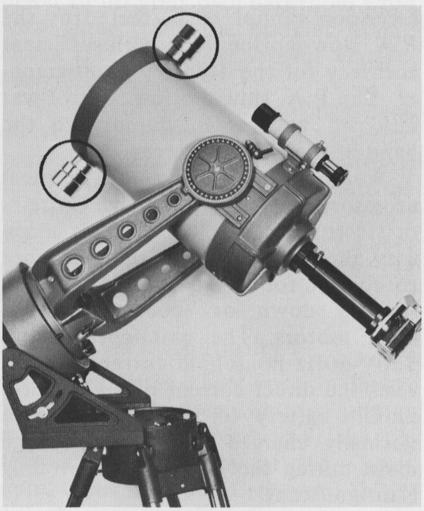
Remember, even professional astrophotographers have to take many pictures to get one good one. So don't be disappointed if your first photographic efforts aren't exactly what you had hoped for.

Using Your Counterweights

The added weight and torque produced by the Tele-Extender and camera body unbalance the tube and fork assembly of the Celestron. The balance must be restored if your clock drive is to work properly. For this, we offer a counter-weight set as an optional accessory.

The two-pound set of counterweights for the Celestron 5 has four elements, and the 3-3/4-pound set of weights for the Celestron 8 has six elements. The elements may be used all together or in any combination. The proper weight will be determined by the tilt of the telescope tube and the camera weight or other equipment.

The Celestron 5 counterweights are threaded onto a bracket which slips onto the front cell of your telescope. Before threading the weights onto the bracket, secure the bracket to the front cell by tightening the recessed Allen screw.



Counterweights (Celestron 8)

The counterweights for the C8 may be threaded into either one of the two accessory holes in the front cell.

The Celestron 8 counterweights are threaded into either of the two accessory holes in the front cell of your telescope. Remove one of the screws and thread on the weights.

The Drive Corrector

While lunar and planetary photographs are essentially snapshots, time exposures are required to photograph star clusters, nebulae and galaxies. At the f/10 photographic speed of your Celestron, exposures of deep-sky objects will range from 10 minutes to an hour or more.

This means that the deep-sky photographer must contend with a factor that is of little concern to the visual observer or to the planetary photographer who has lined up properly with the celestial pole. This factor is image drift. Image drift is caused by misalignment with the pole, by atmospheric scintillation and by long-period irregularities which are inherent in the mechanics of any clock drive.

Image drift in declination can be corrected with the Dec. slow-motion control knob, but image drift in right ascension cannot be corrected by the R.A. slow-motion knob with sufficient accuracy for the deep-sky photographer. The R.A. slow-motion control was designed to respond rapidly to the hand of the visual observer.

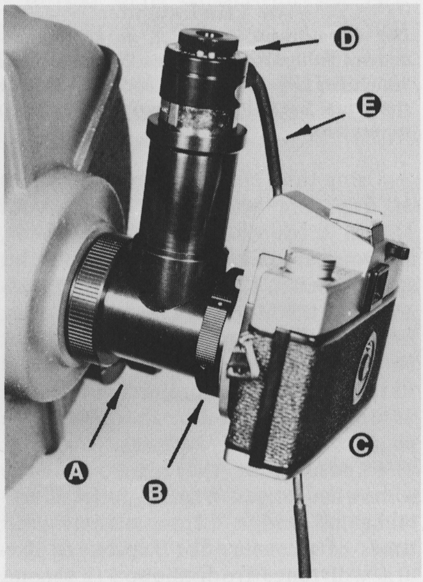
We therefore offer as an optional accessory the Celestron Drive Corrector (instructions included). This accessory allows the deep-sky photographer to correct for image drift in R.A. by slowing down or speeding up his drive motors. The unit operates on 110V-60Hz household current or converts the direct current of a 12V automobile battery to 110V-60Hz. For a normally charged battery, the charge drain during the course of an evening is insignificant.

The Off-Axis Guider Assembly

To guide your telescope through a time exposure, you need a way to establish an in-the-field reference for image drift. You also need a way to guide at a much higher power than is equivalent to the image scale you're shooting at. The simplest and most economical way to meet these needs is to use the Celestron Off-Axis Guider Assembly.

This optional accessory is a modified "T" adaptor (see *Terrestrial Photography*). It uses a tiny prism to divert a small amount of light from the edge of your photographic field up into a high-power 12.5mm ocular with illuminated cross hairs. The Off-Axis Guider lets you select a star to guide on while making your exposure at Cassegrain focus.

Using the slip-ring of the assembly, you rotate the guider until a suitable star appears in the field of the ocular. Using your Dec. slow-motion knob and drive corrector, you center the



The Off-Axis Guider Assembly
(A) off-axis guider, (B) camera ring, (C) camera minus lens, (D) illuminated reticle ocular, (E) power cord to battery pack.

star on the cross hairs. Your task will be to keep the star centered until you finish your exposure.

Note: The image of your photographic subject is focused on the ground glass of your camera. The image of the guide star is focused by raising or lowering the guiding eyepiece.

The cross hairs of the guiding eyepiece are illuminated by a grain-of-wheat bulb, which is held in the eyepiece by the set screw at the side of the housing. Bulb replacements may be obtained from us.

The guiding-eyepiece bulb is powered by a D-cell battery pack, which has an on-off switch with a variable brightness control. Adjust the brightness of your bulb to a level suitable for your guide star, but illuminate the cross hairs of the eyepiece no more than necessary.

The battery pack slips into a clip which can be mounted at any of the accessory holes in the rear cell of your telescope. Celestron 5 owners will have to attach this clip to the outside of their fork mount if they use the coaxial camera mount for constellation photography.

Constellation Photography

This is the simplest form of deep-sky photography. To photograph the constellations, you simply mount your camera with lens "piggyback" on your telescope. The telescope serves as a stable guiding platform and you make your exposures with either the 50mm lens of your camera or a telephoto lens. You guide with an illuminated reticle eyepiece inserted directly into the visual back of your telescope or into a star diagonal.

Surprisingly dramatic wide-angle portraits are possible with this technique using photographic speeds of f/2 or so. Moreover, the smaller image scales will let you "hide" some of the guiding errors that would show up at the larger image scale of your Celestron. In short, constellation photography is a good way to practice your guiding. Start out with your 50mm lens and exposures of five or 10 minutes. When you can guide without error for 20 or 25 minutes, move up to a telephoto lens.

Hint: Some good deep-sky films include H&W Control (ASA 80), Plus-

The Coaxial Camera Mount
For constellation photography, you can mount your camera with lens "piggyback" on your Celestron via the rear-cell coaxial camera mount.

X, Tri-X, GAF 200 and GAF 500. Even better are the films in the Kodak Spectroscopic Film Series, but be prepared to do your own darkroom work with these. (See the booklet *Kodak Plates and Films for Science and Industry.)*

To mount your camera piggyback on your Celestron, use the Celestron coaxial camera mount. This optional accessory couples to your telescope just like the Celestron tripod adaptor does. (See *Demounting the Tube,* especially the note about replacing the screws.)

Deep-Sky Photography

With a little experience in lunar, planetary and constellation photography, you'll be ready to take on deep-sky photography at the Cassegrain focus of your Celestron. Deep-sky photography is a fascinating and highly rewarding experience, but you'll have to do a lot of experimenting to duplicate the amateur astrophotographs published in *Astronomy* or *Sky and Telescope.*

Here are a few basic guidelines for the beginner:

The brightness of stellar and nebulous images at the focal plane is not governed by the same rule. The brightness of a star is determined by the square of the aperture of your telescope. A star is four times brighter in a two-inch telescope than it is in a one-inch telescope. But a nebula is not necessarily four times brighter.

The brightness of nebulae depends on the square of the focal ratio or f/number of your telescope. This is because nebulae – and many star clusters too – appear in your telescope as virtually uninterrupted areas of light, not point sources. The larger your f/number, the dimmer the images of these objects. A nebula is four times brighter at f/5 than it is at f/10.

The brightness of celestial images as they appear on film depends on another factor too: film speed or ASA rating. A film rated ASA 400 is four times faster, or more sensitive to light, than a film rated ASA 100.

Does this mean, then, that if you see a picture of a nebula made at f/5 with a 10-minute exposure on ASA 100 film you can get the same image density at f/10 in a 10-minute exposure on ASA 400 film? You'll probably get a similar density, if you use a film of the same "color" and if the atmospheric conditions are equivalent. Your film, however, will be faster and grainier, so you'll lose some detail.

Well, what about making a 40-minute exposure at f/10 with the same type of ASA 100 film used in the original photo? Here, you'll probably get less image density because of reciprocity failure. This is the inability of film to respond as well to low levels of light over long periods of time as it does to higher levels of light over shorter periods of time.

With these guidelines, you can enter the exciting realm of deep-sky photography.

The Tele-Compressor

To be able to decrease your exposure time in deep-sky photography and yet retain the same image density on film is to be able to reduce the effects of atmospheric scintillation and guiding errors on your photographs. For this, we offer several photographic accessories: the Schmidt Camera (instructions included), the Cold Camera (instructions included) and the Tele-Compressor.

The Tele-Compressor reduces by one-half the effective focal length of your Celestron. It, therefore, doubles the photographic speed of your instrument (to f/5) and lets you reduce to one-fourth the exposure time for a given image density. With this accessory, your image scale is also reduced, by a factor of two, resulting in a circular format about 1.1 inches in diameter with the C 8 and about .6 inches with the C 5.

The Tele-Compressor is a converging lens mounted in a housing that threads onto the back of your "T" adaptor or onto the back of your Off-Axis Guider. The housing accepts your camera ring and camera body.

Since the Tele-Compressor lens mounts behind the prism of the Off-Axis Guider, the guiding eyepiece will focus at a position further away than normal. To accommodate this change, an eyepiece extender is supplied.

Excellent results have been achieved with the Tele-Compressor. Using the Celestron 8 and Kodak Spectroscopic Film, strikingly detailed exposures have been made in from 15 to 30 minutes of such galaxies as M 33, M 74, M 81, M 82, NGC 253 and NGC 2403.

Caring for your Celestron

This is one of the most maintenance-free telescopes ever manufactured. But from time to time, adjustments will be needed, and always there are certain precautions that must be taken.

THIS IS ONE OF THE MOST IMPORTANT PARTS OF THE MANUAL. PLEASE READ IT CAREFULLY.

The Finder Scope

The finder scope should be aligned with your main optics for the distance at which you are observing. You align the finder with the three screws on its holder bracket, but before aligning the finder you should check to make sure your telescope has retained its factory-set collimation (see next section).

The focus of your finder has been adjusted for infinity. If your eyesight calls for a different focus, you can change the focus by screwing the objective housing (not the eyepiece end) back and forth. Unlock the knurled ring at the back of the housing before trying to rotate the housing.

Collimation

More than half of all telescopes perform poorly because their owners are not acquainted with the technique of collimation – the technique of aligning telescope optics. Your Celestron was collimated at the factory, but if it is jarred severely or undergoes sustained jostling, it might have to be re-collimated.

Collimation simply means that the optical centers of the optical elements of your telescope all lie on its optical axis, and that the optical elements are square-on with each other, or perpendicular to the optical axis.

THE ONLY COLLIMATION ADJUSTMENT THAT IS NECESSARY, OR POSSIBLE, WITH YOUR CELESTRON IS THE TILT ADJUSTMENT OF THE SECONDARY MIRROR.

To check collimation, you'll need a proper light source. A bright star near the zenith is best (to minimize atmospheric scintillation), but Polaris will do also. Terrestrial observers can use a bright "hot spot" about 400 feet away with the Sun low and at their back. A small bright reflection from a telephone pole insulator or a piece of automobile chrome will do.

During collimation, incidentally, your telescope should be in thermal equilibrium with its surroundings. If you transport the instrument between very great temperature extremes, allow about 45 minutes for it to reach equilibrium.

Now, using your 25mm eyepiece, defocus the telescope so the out-of-focus blur circle of your light source occupies about a third of the field of view. If the shadow of the central obstruction (secondary housing) is not perfectly centered inside the blur circle, your telescope is out of collimation. (Even if the shadow appears centered, read on.)

To adjust collimation, use your slow-motion controls to re-point the telescope so that you move the blur circle to the edge of the field in the direction that the shadow is off-center. Then, using the three Allen screws at the edge of the secondary housing, bring the blur circle back to the center of the field.

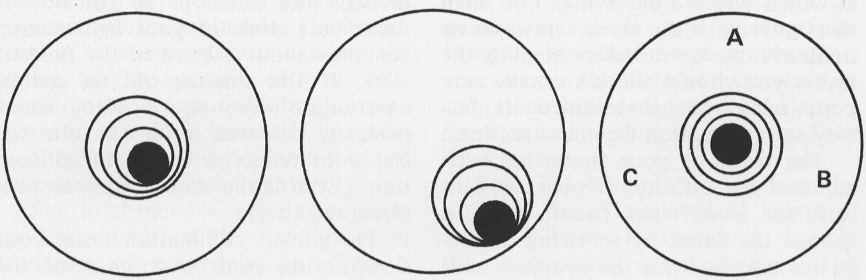
Tighten the screw/s in the direction that the shadow is off center and loosen the other screw/s, tightening the screw/s to finger-tight only. Repeat this process until the blur circle is again at the center of the field.

CAUTION: THE TILT ADJUSTMENTS OF THE SECONDARY ARE VERY SENSITIVE. GENERALLY, A TENTH OF A TURN WILL COMPLETELY CHANGE THE COLLIMATION. DO NOT FORCE THESE SCREWS. BE SURE TO KEEP AT LEAST ONE SCREW UNDER TENSION AT ALL TIMES SO THE SECONDARY DOESN'T ROTATE ON ITS SUPPORT. DO NOT TURN OR ADJUST THE CENTER SCREW ON THE SECONDARY HOUSING. THIS HOLDS THE SECONDARY MIRROR IN PLACE!

With the blur circle again centered in the field, you might find that the shadow of the central obstruction is still off-center a bit. Repeat the collimation process until the shadow is perfectly centered within the circle.

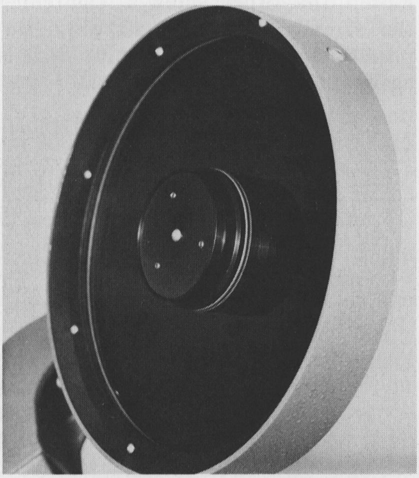
Then, using successively higher-powered oculars, until you reach the highest powered ocular you will be using, repeat the collimation process as necessary. Collimation at the higher powers (6mm up) is best accomplished with the telescope in focus, if the seeing is good.

Collimating in focus, you will be



The Image During Collimation

LEFT: Blur circle in the center of the field of your telescope. Secondary shadow within the circle is off-center. Your scope is out of collimation. MIDDLE: To re-collimate, re-point your telescope to move blur circle to edge of field in direction shadow is off center. RIGHT: Then move circle back to center of field by tightening and loosening appropriate collimation screws. Here you tighten screw B and loosen A and C. (The screws are oriented as seen from the back of your telescope.)



Collimation Adjustments

Collimation of the Celestron is accomplished simply by adjusting the three outer screws on the secondary housing. DO NOT FORCE THESE SCREWS. The adjustments are very sensitive.

observing the Airy Disc instead of the shadow of the central obstruction. This will appear as a bright ball with a single diffraction ring around it. When the ball is exactly centered inside the ring, your telescope is collimated.

Lens Care and Cleaning

When your telescope is not in use, place the lens cap on the front cell, cap the rear-cell opening and store the telescope in your carrying case. Do this regularly and your telescope should never have to be cleaned internally or have to have its mirrors re-aluminized.

The corrector lens should be cleaned only when necessary. To remove loose dust or dirt particles, use a can of pressurized air or a camel's hair brush. Then a photographic lens cleanser may be used with white "Kleenex" or a non-silicone photographic lens tissue to clean your corrector.

DO NOT CLEAN THE CORRECTOR WITH VIGOROUS CIRCULAR MOTIONS! USE A NUMBER OF TISSUES, AND TAKE A SINGLE, GENTLE WIPE FROM THE CENTER OUT WITH EACH TISSUE.

Optics coated with magnesium fluoride are best given special care. A good cleaning solution is 1/3 isopropyl alcohol, 2/3 distilled water and two drops of biodegradable liquid dish detergent. (Soap by itself will leave a film.)

Be sure to store your oculars and other visual accessories in a dust-free environment when they are not in use. Celestron oculars have a thin anti-reflection coating. If they need cleaning, use the formula above. You can form a little brush out of a piece of white "Kleenex" tissue to get to the edges of the lenses.

In cleaning the optics of your Celestron, you might notice hairline sleeks or tiny pits on the optical surfaces of the primary, secondary or corrector. There is no cause for alarm. These do not affect the optical performance of your telescope.

Also, if moisture has settled out onto your optics, and you are examining them at night with a flashlight, you might notice streaks on the elements produced during final cleaning. Again, there is no cause for alarm. These do not affect the optical quality of your telescope.

NOTE ON THE FLASHLIGHT TEST – The reflectivity of the mirrors of your Celestron is typically 94%. The transmission of the corrector is about 95% at each surface. This means that 6% of the light impinging at each mirror surface is scattered and 5% of the light transmitted at each surface of the corrector is scattered.

If you use a high-intensity beam at night on these surfaces, so that the beam isn't played directly into your eye and the pupil remains essentially dark-adapted, then this small amount of scatter appears much larger than it is. Under these conditions, even perfect optics will appear "terrible."

Demounting the Optics

If by chance the inside of the corrector needs cleaning, follow these instructions. Be careful!! Not only is the corrector plate very thin, it must be replaced in exactly the same orientation it was prior to removal. This is for reasons of collimation and also because both corrector and secondary mirror are position-matched for optical performance with respect to the primary.

To remove the corrector, point the telescope tube upward and remove the corrector retainer ring. The Celestron 8 retainer ring is held in place by eight screws. The Celestron 5 retainer ring threads into and out of the front cell. Use the two holes in the ring as leverage points.

On removing the corrector retainer, you'll see a code number etched onto the edge of the corrector. You'll also see some cork shims between the edge of the corrector and the front-cell ledge. These shims protect the corrector from shock and hold its optical center over the optical axis of your scope.

Before removing the corrector, index on the inside of the front cell the precise positions of the corrector code number and each shim. Remove and number-code the shims with their index marks. The corrector may now be lifted out for cleaning.

With the corrector removed, you may reach inside the tube to clean the primary mirror. Use the cleaning solution recommended above.

When replacing the corrector, align its code number with the proper index mark and return each shim to its proper position. When replacing the Celestron 8 corrector retainer, tighten the screws down gradually, in round-robin fashion, to finger-tight only. When replacing the Celestron 5 corrector retainer, make sure it doesn't become cross-threaded.

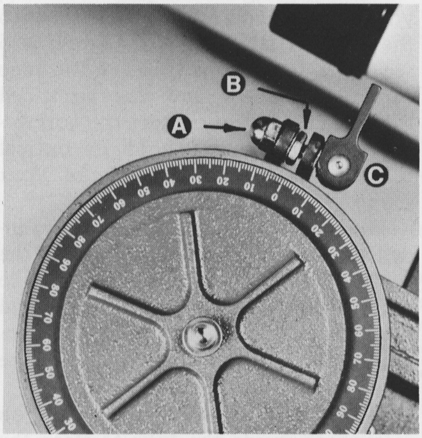
Adjusting the R.A. Clamp

The pressure plate activated by the R.A. clamp is subject to wear over a period of time.

To tighten the R.A. clamp, remove the clamp lever and tighten the exposed screw so that you can't rotate the fork tines manually but can just barely rotate them using the R.A. slow-motion knob. Replace the clamp lever in the lock position, with it pointing to the left. When you unlock the clamp, the tines should swivel with a barely perceptible amount of drag.

Adjusting the Dec. Clamp

Over a period of time, the Dec. clamp at the top of the fork tine may become too loose. To tighten the clamp, loosen the lock nut that holds the acorn-head screw in position, advance the screw and tighten the lock nut.

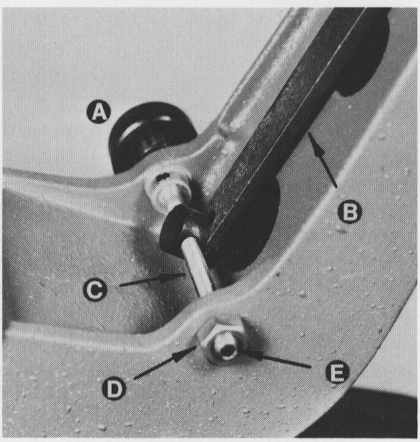


The Dec. Clamp
(A) acorn-head screw, (B) lock nut, (C) clamp lever.

Adjusting the Dec. Slow-Motion

Over a period of time, the action of the Dec. slow-motion control knob may become too loose.

To tighten the Dec. slow-motion control, loosen the lock nut at the end of the tangent screw and advance the cone-point screw until the Dec. control is tight enough. Hold the cone-point screw in the desired position with your Allen wrench and tighten the lock nut with a crescent wrench.



The Dec. Slow-Motion
(A) Dec. slow-motion knob, (B) tangent arm, (C) tangent screw, (D) lock nut, (E) cone-point screw.

Adjusting the Clock Drive Motors

The gears of the clock drive motors must be properly engaged with the drive gear of your telescope. If the gears are too loosely engaged, the result is backlash; if they are too tightly engaged, the result can be an irregular drive.

To check for loose engagement, lock the R.A. clamp and gently jog the fork tines back and forth in R.A. If your R.A. clamp is properly adjusted and there is play in the tines, your clock drive gear engagement is too loose.

To tighten the engagement of a motor gear, loosen the two Allen screws holding it in place, push the small end of the motor toward the center of the telescope and re-tighten the screws. To loosen the engagement of a motor gear, press the motor away from the center of the telescope slightly.

Returning Your Instrument for Service

Rarely is it necessary to return a Celestron for service. Most problems can be solved by telephone or mail. So, if you encounter a problem not covered by this manual, call or write us or our regional representative first before returning your telescope. If it is decided that you should return your instrument, then be sure to send a covering letter fully detailing the problem and our recommendations.

Basic Telescope Specifications

CELESTRON	5	8
Clear Aperture	5"	8"
Light Grasp (compared to unaided eye)	188X	510X
Cassegrain Focal Length	50"	80"
Useful Magnification	30-300X	50-500X
Resolution (theoretical limit)	0.8 arc sec 197 lines/mm	0.5 arc sec 210 lines/mm
Airy Disk Brilliance Factor at 160X (compared to 3½")	4.2X	27.5X
Faintest Stellar Magnitude	13.5	14.4
Photographic Speed	f/10	f/10
Image Scale (Field of View)	1.12°/inch	.72°/inch
Field at 30 ft. 35mm format, 100 ft. Long Dimen. 1,000 ft.	7" 23.5" 19.6'	4.5" 15.2" 12.6'
Unvignetted Field	1.8" circle	2.75" circle
Near Focus	15'	25'
Secondary Obstruction	2"	2¾"
Finderscope	5X – 24mm	6X – 30mm
Eyepieces	25mm – 50X 12mm – 100X	40mm – 50X 25mm – 80X
Star Diagonal	24.5mm (0.96")	1¼"
Setting Circle Diameter R.A. Dec.	6¼" 4"	8" 4"
Drive Gear Dia.	4½" Spur	6" Spur
Clock Power (110V, 60Hz)	6 Watts	6 Watts
Slow Motions	Manual	Manual
Photographic Accessories	Optional	Optional
Weight	12 lbs.	23 lbs.
Size–Swung Down	7" X 8" X 16"	9" X 12" X 22"
Carrying Case	8" X 12" X 24"	12" X 16" X 30"
Shipping Weight	25 lbs.	50 lbs.

AIRY DISC – The image of a point source of light in a lens or mirror system. Consists of small bright disc surrounded by concentric and successively fainter rings of light. Caused by diffraction.

APERTURE – In astronomy, the greatest usable diameter of your telescope optics. Photographers sometimes use the term to mean F/NUMBER.

ATMOSPHERIC SCINTILLATION – The twinkling of stars, the apparent oscillation of stellar images, the apparent rippling of planets and nebulae. Due to the unsteadiness of the air above us.

CASSEGRAIN FOCUS – The main focus of a Cassegrain system. The focus produced by the secondary mirror as it intercepts the light from the primary mirror inside of prime focus.

DECLINATION AXIS – The axis around which the tube of an EQUATORIAL TELESCOPE rotates when moving in declination. It is perpendicular to the POLAR AXIS. The Dec. axis of the Celestron passes through the centers of the Dec. circles.

EFFECTIVE FOCAL LENGTH – Also, equivalent focal length or e.f.l. A term applied to multi-element optical systems, especially optically folded systems. It is the focal length of the single optical element that would give the same magnification or image scale as the multi-element system in question.

EQUATORIAL TELESCOPE – A telescope with two perpendicular axes of tube rotation: a POLAR AXIS and a DECLINATION AXIS. When the polar axis points toward the celestial pole, the telescope tube rotates around the polar axis in right ascension and around the declination axis in declination.

EYE RELIEF – The greatest distance from an ocular at which the full field of view is visible.

F/NUMBER – Also, focal ratio. In photography, photographic speed. It is focal length divided by APERTURE and is a measure of image brightness at the focal plane.

IMAGE SCALE – The photographic equivalent of visual magnification. It is proportional to focal length. To find the length of one-degree-wide image on film, for example, multiply your focal length by the tangent of 1° or 0.01746.

OPTICAL AXIS – An imaginary line drawn from the eye of an observer through an optical system to the object being viewed in the center of the field.

POLAR AXIS – The axis around which the tube of an EQUATORIAL TELESCOPE rotates in right ascension. It is perpendicular to the DECLINATION AXIS. The polar axis of the Celestron passes through the center of the R.A. circle at right angles to the plane of the circle.

SEEING – Observing conditions. Determined by ATMOSPHERIC SCINTILLATION, by the transparency of the air and, at night, by the brightness of the sky.

Recommended Reading

Numerous excellent works are available in the fields of astronomy or photography from the following publishers or distributors:

Eastman Kodak Company
Rochester, N.Y. 14650
Ask for "Index to Kodak Information"

OPTICA b/c Company
4100 Mac Arthur Blvd.
Oakland, Calif. 94619
Ask for "Publications & AVA"
Enclose 50 cents.

Herbert A. Luft
69-11 229th St.
Oakland Gardens, N.Y. 11364
Ask for "List of Astronomical Literature."

Sky Publishing Corporation
49-50-51 Bay State Rd.
Cambridge, Mass. 02138
Ask for "Scanning the Skies."

Of special interest are the works in the following list. They are aimed mainly at the beginning or intermediate amateur astronomer, but the professional astronomy educator will also find them useful.

THE STARS

Moore, Patrick, *The Atlas of the Universe.* Rand McNally and Co., 1970.

Rey, H.A., *The Stars: A New Way to See Them.* Houghton Mifflin, 1970.

TELESCOPES

Brown, Sam, *All About Telescopes.* Sky Publishing, 1967.

Page, T. and Page, L.W., eds., *Telescopes: How to Make Them and Use Them.* Sky Publishing, 1966.

OPTICS

Sears, F.W., *Optics.* Addison-Wesley, 1958.

PHOTOGRAPHY

Keene, George T., *Star Gazing with Telescope and Camera.* Optica b/c, 1967.

Kodak Plates and Films for Science and Industry. Kodak, 1967.

Life Library of Photography. Time-Life Books, 1970.

HANDBOOKS

Menzel, Donald H., *A Field Guide to the Stars and Planets.* Houghton Mifflin, 1964.

Norton, A.P. and Inglis, J.G., *Norton's Star Atlas and Telescope Handbook.* Sky Publishing, 1973.

Sidgwick, J.B., *Amateur Astronomer's Handbook.* Faber, 1971.

ATLASES

Atler, Dinsmore, *Lunar Atlas.* Dover, 1968.

Becvar, Antonin, *Atlas of the Heavens.* Sky Publishing, 1962.

Vehrenberg, Hans, *Atlas of Deep-Sky Splendors.* Sky Publishing, 1971.

MAPS

The Moon. National Geographic Society, 1969.

The Red Planet Mars. National Geographic Society, 1973.

The Stars. Universum Karten 3. Hallwag, 1973. (Berne, Switzerland)

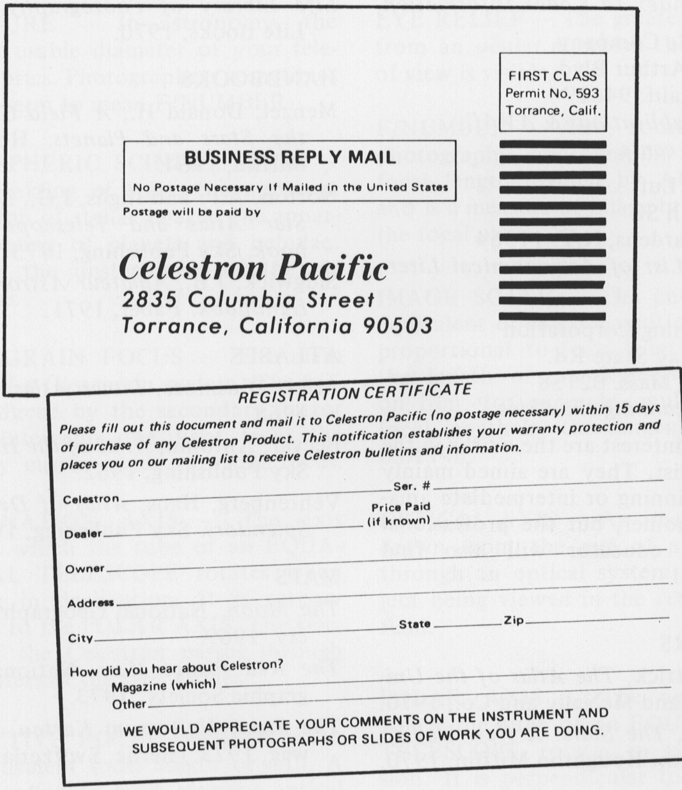
MAGAZINES

Astronomy. Address Circulation Services, 640 North LaSalle St., 6th Floor, Chicago, Ill. 60610.

Photographic. Address Petersen Publishing Co., 8490 Sunset Blvd., Los Angeles, Calif. 90069.

Sky and Telescope. Address Sky Publishing Co., 49-50-51 Bay State Rd., Cambridge, Mass. 02138.

A Reminder



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Magazine (which) ______
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WE WOULD APPRECIATE YOUR COMMENTS ON THE INSTRUMENT AND SUBSEQUENT PHOTOGRAPHS OR SLIDES OF WORK YOU ARE DOING.

With your telescope, you received a registration card. Please fill it out and mail it as soon as possible to protect your warranty.

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