Celestron® 5

OPERATING MANUAL $1.00

Celestron® 8

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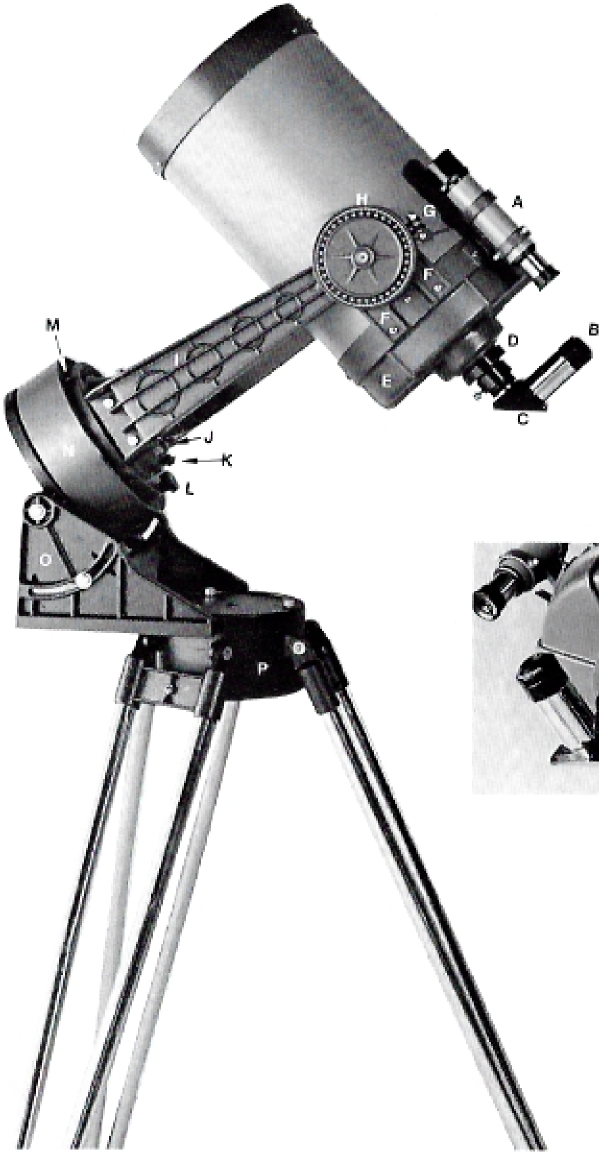
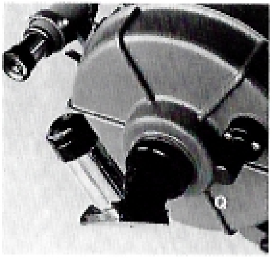




The Celestron Telescope

(A) Finderscope (B) Ocular (C) Star diagonal (D) Visual back (E) Rear cell (F) Tube saddle (G) Declination clamp (H) Declination setting circle (I) Fork tine (J) Declination slow-motion knob (K) Right ascension clamp (L) Manual right ascension control knob (M) Right ascension setting circle (N) Drive base (O) Wedge (P) Tripod (Q) Focusing knob

Front and Back Cover Photos shot with Celestron C 5 and C 8 Printed in U.S.A.

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, and a packet of bolts.

As we refer to these and other accessories, and to the various components of your Celestron, consult the illustration of the Celestron telescope or check the detail illustrations in the appropriate sections of this manual.

The Special Coating Group

The special coating group consists of r agnesium flouride anti-reflection coatings on both sides of the Schmidt corrector plate. These coatings increase light transmission and contrast slightly and ensure that you'll get the maximum performance from your Celestron. The coating is as durable as the coating on a fine camera lens and will last a lifetime if given reasonable care (see the section on "Lens Care and Cleaning"). If you ordered these optional coatings, the telescope tube will have a special coating label. Also, the Schmidt corrector will have a characteristic slight bluish tint of MgF_2.

Your First Look

Having removed your Celestron from its case, you are ready for your first look.

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

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'd like 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 finderscope. 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.

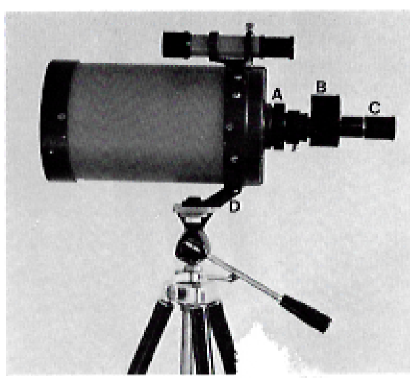
At the base of your Celestron is another clamp. Unlock it, grasp one of the fork tines and swivel the tube in the general direction you'll be looking. Then re-lock the clamp. This clamp is called the "right ascension (R.A.) clamp."

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.

The ocular is held in the diagonal by spring tension. If it is difficult to insert the ocula , loosen the tension by pulling the rim of the eyepiece tube outward. Conversely, if the ocular fits too loosely, squeeze in the rim of the eyepiece tube until it's just tight enough to keep the ocular from falling out when the diagonal is inverted. Some diagonals may hold the oculars in with a thumb screw.

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 finderscope. A star diagonal turns the images right-side-up but leaves them mirror-reversed. For "naturally oriented" images, a Porro prism is



The Porro Pri

(A) Visual back (B) Porro Pris ocular (D) C5 photo tripod adapter

required. The Porro pri n, which is intended for terrestrial vie ing only, inserts into the visual back in place of the star diagonal.

Once you've selected an object of interest, sight in on it through the finderscope. You might have to hunt for the object a little to get it into the main field of your telescope because the finderscope 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 clockwise, and on more distant objects by turning the knob counterclockwise.

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 near focus and infinity. 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 [illegible] on the focal travel if you are focusi[illegible] dim object. The remedy is to fin[illegible]ghter object, focus on the brighte[illegible], 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.

Magnification

The C5 is supplied with .96" O.D. oculars and the C8 is supplied with 1¼" O.D. oculars. The only difference in these oculars is the barrel diameter. The field-of-view through either size ocular of a given focal length is identical.

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
40mm	—	50x
32mm	—	65x
25mm	50x	80x
20mm	—	100x
18mm	70x	115x
12mm	105x	165x
9mm	140x	220x
7mm	180x	285x
6mm	210x	335x
5mm	250x	400x
4mm	315x	500x

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 (attainable only when the atmospheric "seeing" is very good) is about 60x per inch of aperture. For the Celestron 5, this is about 300x; for the Celestron 8, it is about 480x.

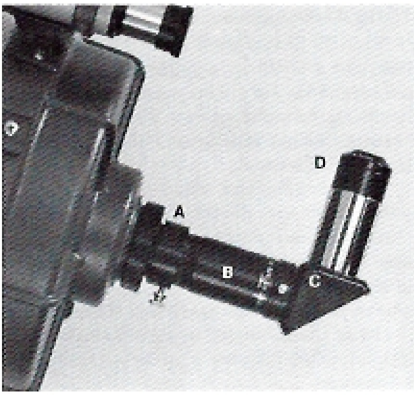
The lower limit of magnification is about 3x or 4x per inch of aperture. For the Celestron 5, this is about 20x; for the Celestron 8, about 32x. During the day, the lower limit of magnification is higher – about 40x for the Celestron 5 and about 64x for the Celestron 8. For this reason, the 40mm ocular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

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.

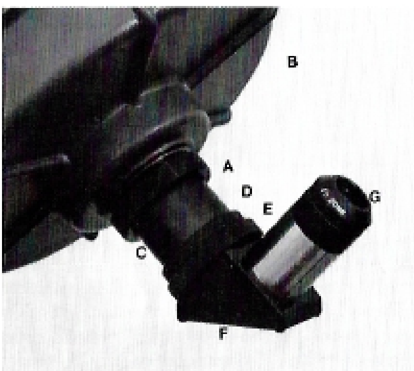
Ocular Bushings

Expanding Bushing-96" to 1¼"-allows the use of .96" oculars with 1¼" Diagonal, Porro Prism, etc.

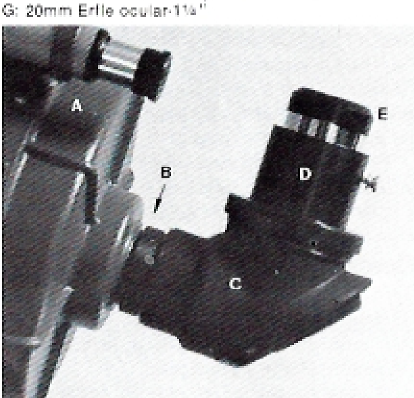
Reducing Bushing-1¼" to .96"-allows the use of Celestron 1¼" oculars and some other manufacturers 1¼" oculars with .96" diagonals, Porro Prisms, etc. The ocular is unscrewed and the ocular section is screwed into the reducing bushing.



The Barlow Lens
(A) Visual back (B) Barlow lens (C) Star diagonal (D) Ocular



RFA (Rich Field Adaptor)
RFA installed on C8 A: Slip ring of RFA, B: Celestron Rear Cell, C: 750mm T-adaptor, D: Tele-compressor lens, E: RFA Threaded ring, F: RFA Diagonal, G: 20mm Erfle ocular-1¼"



The Giant Star Diagonal
(A) Rear cell (B) Slip ring (C) Giant diagonal (D) 2" ocular adapter (E) 2" ocular. When using 1-1/4" or .96" oculars, remove the 2" ocular adapter and thread on the reducer plate and a visual back with ocular.

The Barlow Lens

The range of magnification of any given set of oculars may be increased with the use of a Barlow lens. The Celestron 2x Barlow will double the power of any of our oculars and will also comfortably increase the eye-relief distance. This accessory inserts into the visual back and accepts the star diagonal (or Porro prism) and ocular.

RFA (Rich Field Adaptor)

The Celestron RFA utilizes a high quality positive achromat lens to compress the light cone exiting from the rear cell of a Celestron. The RFA will alter the optical properties of a Celestron telescope so that the f/ratio is ½ the normal Celestron f/ratio. You will then be using a telescope with an f/5 focal ratio. This doubles the field of view for a given ocular and increases the brightness by a factor of 4.

The RFA is made up of several components whose specifications and dimensions are critical. A special custom T-adaptor is used, to mount the device on the back of a Celestron, a Tele-Compressor lens is threaded on the T-adaptor, then a custom threaded ring is attached to the Tele-Compressor lens, and finally the 20mm Erfle ocular is inserted in the diagonal.

Optimum performance on most objects will come from using the new wide-field 20mm Erfle ocular supplied with the RFA. The RFA is also fully compatible with the Celestron LPR Filter. The LPR Filter and RFA make a spectacular combination for deep-sky observing under less than ideal conditions.

You may use any 1¼" O.D. ocular in the RFA; however, many long focal length oculars supplied by other manufacturers may exhibit some vignetting. The RFA will double the field of view of any Celestron 1¼" O.D. ocular (except the 40mm) without any vignetting. You may notice some aberration near the edge of the field when using the RFA. This is normal and much less objectionable than the coma inherent in every short-focus reflecting telescope.

The Giant Diagonal

The optional giant star diagonal uses a collimatable, silver-coated mirror (rather than a prism) to reflect light into the ocular, thus minimizing light loss and distortion. It may be repositioned to any comfortable viewing position by means of the slip-ring, which attaches directly to the rear cell of the C5 or C8. The giant diagonal may be used with 2", 1¼", or .96" oculars. It is desirable to use counterweights to rebalance your Celestron when the giant diagonal is attached (see the section on the counterweight set).

2″ O.D. Oculars

Used with the Celestron giant star diagonal, these optional oculars provide spectacular, low-power, wide-field views of the sky. Specifications follow:

Ocular	C5 Mag./Field	C8 Mag./Field
60mm Kellner	20x / 1.9°	35x / 1.2°
50mm Plossl	25x / 1.6°	40x / 1.0°
40mm Ortho	30x / 1.3°	50x / 0.8°
32mm Erfle	40x / 1.4°	65x / 0.9°

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.

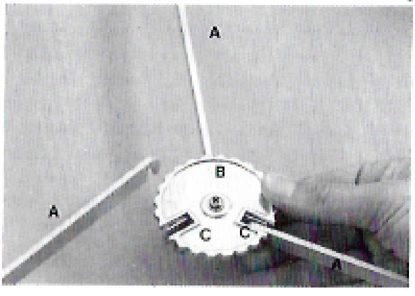
To lock the tripod legs in place, open the lock plate of the tensioner coupler and hook the tensioner bars into the slots in the coupler.

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

Be sure to use the supplied rubber feet on the tips of the tripod legs whenever you use the telescope on a hard surface, like a concrete patio or driveway. These feet help damp out any unwanted vibrations.

The Celestron on Tripod

Your Celestron may be mounted directly



The Locked-Triangle Tripod
(A) Tensioner bars (B) Lock plate (C) Coupler slots

to the Locked-Triangle Tripod. In this configuration, your telescope is known as an "alt-azimuth" telescope.

To mount the Celestron alt-az requires one 10-24 x 1″ bolt and washer. Thread the bolt up through the center of the tripod head into the center hole in the base of your Celestron.

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

Mounting your Celestron on the optional 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 Equatorial Wedge

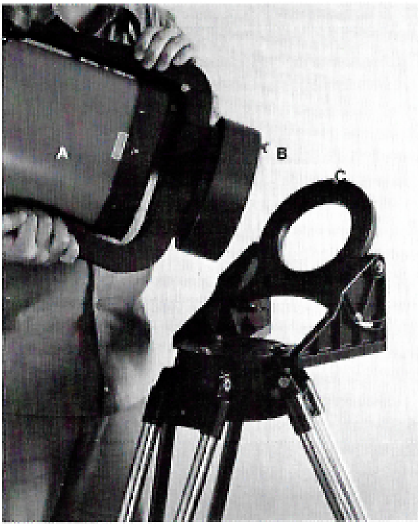
If you ordered the equatorial wedge, it will come assembled but you will have to adjust it so that your Celestron will point to the celestial pole (see the section on "Lining Up on the Pole").

To mount the wedge on the Celestron tripod, center the three slotted holes in the wedge base over the three holes in the tripod head, and thread in the three 5/16-18 x 1″ bolts that are supplied with the tripod.

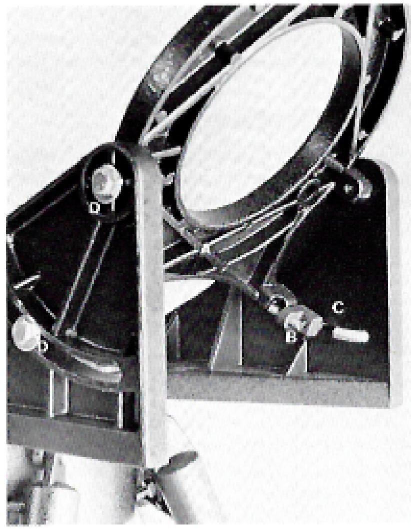
To mount your Celestron on the wedge, thread one of the three ⅜-16 x 1″ bolts partially into the base of your telescope and, cradling the instrument in one arm, slide its base onto the tilt plate so that the bolt slips into the slot in the plate. This bolt will hold the Celestron while you move the drive base to line up the wedge holes with the threaded holes in the base of the telescope. If the anti-vibration gasket makes it difficult to reposition the drive base, lift the base slightly when aligning the holes.

After the holes are aligned, tighten the bolt and thread the two remaining bolts into the remaining two holes in the base of your telescope.

When mounted on the wedge, the C5's polar axis may be pointed at the pole from any location in the world between the latitudes of 0° (the Equator) and 64°. For the C8, this range is from 8° to 64° (with the latitude adjuster installed this range is 11°-64° with either the C5 or C8).



Mounting Your Celestron on the Wedge
(A) Telescope (B) Bolt, partially threaded into the drive base (C) Wedge slot



Adjusting the Wedge
(A) Tilt plate (B) Adjusting screw (C) Latitude adjuster (D) Tilt plate bolts (on both sides of wedge)

Adjusting the Wedge

The equatorial wedge is supplied with a latitude adjuster to make small adjustments in elevation easy to accomplish. Fine adjustments will normally be made when the telescope is mounted on the wedge and tripod. First, position the adjusting screw on the latitude adjuster up against the tilt plate. This will prevent the wedge and telescope from moving until you're ready to adjust it. Now loosen the tilt plate bolts on each side of the wedge. You may now use the adjusting screw to make small changes in elevation. Tighten the wedge bolts after the latitude adjustments are completed.

Small changes in azimuth may be accomplished by *loosening* the wedge-to-tripod bolts and moving the wedge in the desired direction. Tighten the bolts after the adjustment is complete.

These fine adjustments will permit you to tilt the polar axis of your Celestron so that it accurately points to the North Celestial Pole.

If you use your Celestron on a level surface (so the tripod and wedge are level), you won't have to change the wedge's elevation adjustment (once it's properly set) unless you observe from a different geographical location.

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° 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°. 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°.

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 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 cross a particular north-south line 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.

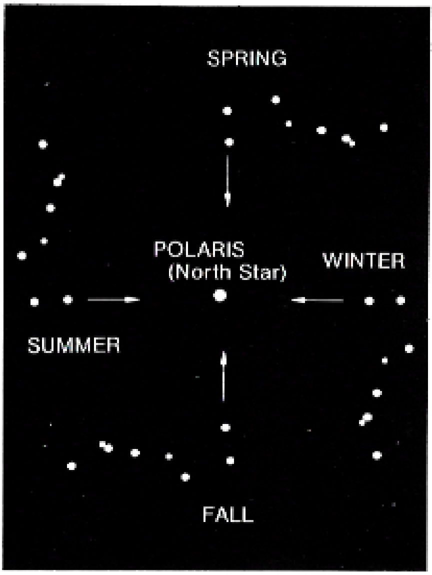
Given the celestial-coordinate system, it now becomes possible to find celestial objects by translating their celestial coordinates into telescope point. For this, your Celestron comes equipped with setting circles. The dial at the base of your telescope is the setting circle for R.A. The dials at the 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 and pointed the polar axis of your telescope toward the North Celestial Pole.

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 rotate your telescope in right ascension.

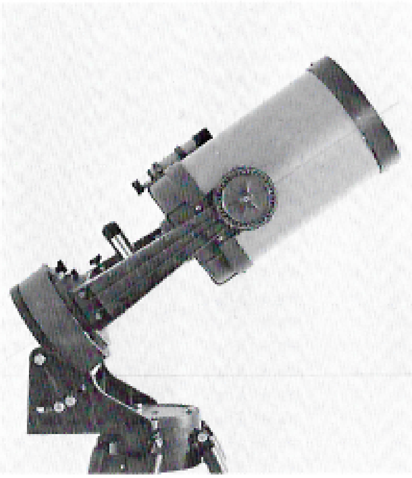
For casual visual observing, a simple polar alignment on the north star, Polaris, is adequate. Polaris, which is within 1° of the true north celestial pole, is easy to find. The pointer stars in the bowl of the Big Dipper point straight to Polaris (see the diagram of the Celestial Polar Region).

Tilt the telescope tube until the declination circle reads 90°, lock the Dec. clamp, and then move the tripod and adjust the wedge until Polaris is in the center of the field of view. (Refer to the section on "Adjusting the Wedge" to find the procedure for making fine adjustments to the wedge.) The telescope is now ready to be used. The circles will read to within approximately one-degree accuracy and the drive will keep an object in the field of view for a considerable period of time.



Finding the Big Dipper

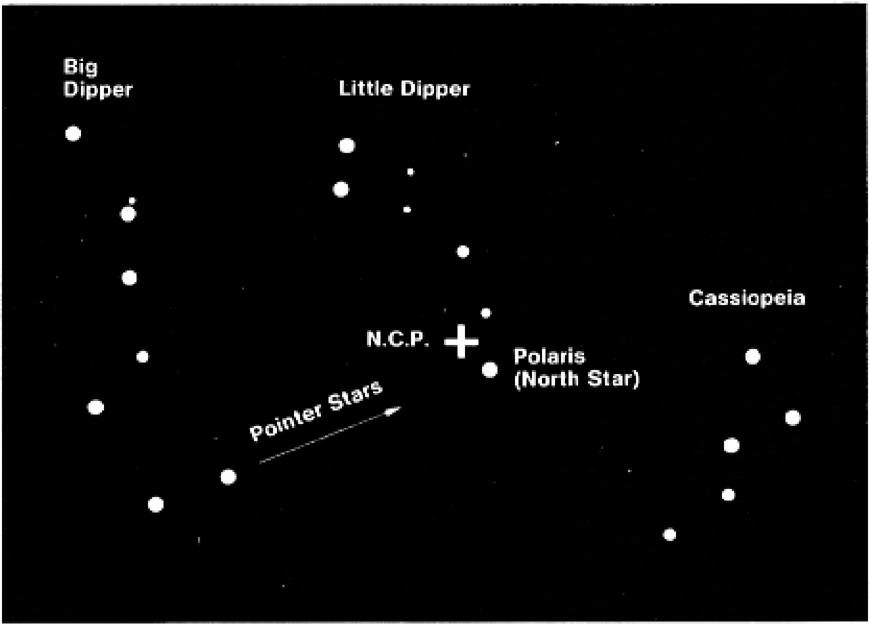
Because the Big Dipper appears to revolve around Polaris, it will be found in different locations depending upon the season and the time of the night. Face north and look for the Big Dipper (and Polaris) in the positions shown above in early evening, local time. It takes 6 hours for the Big Dipper to revolve the 90° from one of the indicated positions to the next.



Polar Aligning on Polaris
When the declination pointer reads 90°, the optical axis is parallel to the polar axis. At this setting, if Polaris is visible through the telescope, the polar axis of your Celestron is aligned on Polaris.

If you would like to achieve a more accurate polar alignment *after* aligning on Polaris, repoint the telescope at a bright star near the celestial equator. Look up that star's right ascension in a star atlas (or use the Alphabetical Listing of Bright Stars at the back of this manual) and move the R.A. setting circle until the R.A. pointer is indicating that right ascension. Now turn your Celestron in R.A. until in indicates the R.A. of Polaris (this is currently 2 hr. 10 min.) and lock the R.A. clamp. Now move the tube (only in declination) until the declination pointer indicates 90°. From this point, continue moving the tube in the direction *away* from the Big Dipper (i.e., toward Cassiopeia) until the declination reads +89.2°, the declination of Polaris. Lock the declination clamp. Now move the tripod and adjust the wedge until Polaris is centered in the field of view.

The telescope will now be aligned well enough for you to try deep sky photography using exposure times of up to 15 minutes or so without significant mistracking.



The Celestial Polar Region
The two stars in the front of the bowl of the Big Dipper point straight to Polaris. Polaris is less than 1° from the true North Celestial Pole (N.C.P.). Cassiopeia is the "W" shaped constellation on the side of the pole opposite the Big Dipper. See "Lining Up on the Pole".

Precise Polar Alignment for Astrophotography

This precise alignment method is desirable *only* if you intend to try long exposure, guided astrophotography. The advantages are that there will be no image drift in declination, there will be no star trailing caused by field rotation, the tracking will be more accurate, and your setting circles will read very accurately. Because it eliminates the need to make corrections in declination during long exposure astrophotography, it allows you to concentrate on R.A. corrections.

After the quick alignment methods described previously, you will need an illuminated reticle eyepiece for this more precise method. A Barlow lens will also speed the procedure considerably.

Insert the illuminated reticle (and Barlow if used) and repoint the telescope at a fairly bright star near where the meridian and the celestial equator intersect (perferably within ±½ hour R.A. of the meridian and ±5° of the celestial equator) and monitor the declination drift (ignore any drift in R.A.).

a. If the star drifts *south*, the polar axis points too far *east*.

b. If the star drifts *north*, the polar axis points too far *west*.

Move the telescope's polar axis in the appropriate direction until the north or south drift stops. Accuracy of this adjustment will be increased if you use the highest possible magnification and allow the telescope to track for a period of time.

Now repoint the telescope at a fairly bright star near the eastern horizon and near the celestial equator (the star should be at least 20° above the horizon and ±5° from the celestial equator).

a. If the star drifts *south*, the polar axis points too *low*.

b. If the star drifts *north*, the polar axis points too *high*.

Again, monitor only the declination drift using high magnification over a period of time. After you have made the necessary adjustments to stop the declination drift, you will have achieved a highly accurate polar alignment.

The same procedure may also be employed by Southern Hemisphere observers, but the directions of drift will be reversed.

The Electric 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 (the power cord receptacle is located on the bottom of the drive base), 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.

In order to start your Celestron tracking an object, the R.A. clamp must be fully engaged.

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

Do not expect to see movement when the drive is operating. Since the fork mount makes only one revolution in 24 hours, it is equivalent to *half* the rate of movement of the *hour* hand on a standard clock.

Using Your Setting Circles

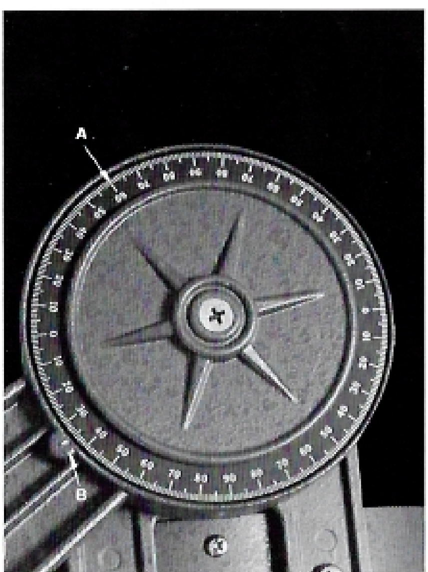
The right ascension (R.A.) setting circle is located near the top of the drive base of your telescope. Every one of the 24 hours of R.A. is divided into 12 intervals of 5 minutes each.

A declination (Dec.) setting circle is located near the top of each fork tine. Each graduation on the Dec. circles represents one degree.

Declination readings between your +90° 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 (see the alphabetical star listing at the back of this manual), then rotate the circle (it will turn

Reading the R.A. Setting Circle
(A) The R.A. Setting Circle (B) The Meridian indicator (C) The R.A. pointer, which is indicating 9 hours 35 minutes. The difference between the Meridian and R.A. readings indicates that the object being viewed is 55 min. (13-3/4°) from the Meridian.



Reading the Dec. Setting Circle
(A) The Dec. Setting Circle (B) The Declination pointer, which is indicating 35°

freely) until the coordinate of the star is under one of the two R.A. pointers located at the base of the fork mount.

Use whichever R.A. pointer is most convenient to see. Remember that after setting the R.A. with one pointer that the other pointer will read 12 hours off. If you switch from one R.A. pointer to the other, you will have to allow for this (or reset the circle using the other pointer).

Now that the R.A. circle is set, use a star atlas to look up the coordinates of the object you wish to observe. Rotate the fork mounting until the R.A. of the object you selected is indicated and lock the R.A. clamp.

Next, move the telescope tube in declination until the proper declination is indicated and lock the clamp.

Use your lowest power eyepiece when trying to locate a celestial object. Bear in mind that the field of your Celestron is less than one degree at low power, so you might have to "sweep" a little in both R.A. and Dec. to bring the object into view. The manual slow-motion controls of your Celestron are ideal for this purpose.

If you don't find the object quickly, check your finderscope. Most objects will be visible through it and you'll be able to quickly center the object in the field of view.

After you've observed your object for awhile and decide to seek out another object, just release the clamps and move the telescope until the proper coordinates are indicated. As long as you use your Celestron with the clock drive operating, your R.A. circle will read correctly.

If electrical power is not available, you can still use the setting circles. Just before seeking out your next object, re-set your R.A. circle to the R.A. of the object you've been observing. Then use your circles in the normal way, repointing as quickly as possible.

Giant Finderscopes

For deep-sky observers who want the additional light grasp of a larger-than-standard finder, an optional 6 x 30 finder is available for the C5, and a 10 x 40 for the C8.

New brackets are supplied to accommodate these finders. The 6 x 30 fits in place of the standard C5 finder, so first remove the existing unit — bracket and all — from the C5, and save the attaching screws. Then insert the new finder and O-ring into the bracket provided, and attach the entire assembly to the telescope with the screws removed previously.

The 10 x 40 unit for the C8 mounts to the top accessory holes in the back casting, with screws provided, so the standard finder may be left in place, if you wish. If you do remove it, *do not use the long mounting screws from the 6 x 30 to plug the holes.* Damage to the primary mirror could result. Instead, use the short screws you remove from the top accessory holes as plugs. Note also if you wish to store your C8 in its carrying case, the large finder and bracket should be removed.

Right-Angle Finderscopes

For Celestron owners who want the comfort of right-angle viewing in locating objects near the zenith, we now offer an optional 5 x 24 finder for the C5 and a 6 x 30 finder for the C8 – both fitted with diagonal prisms.

The finders fit the existing finder brackets. To install either unit, first remove the standard finder by removing the three alignment screws and pulling the finder through the bracket rings from the front. Then remove the objective lens from the new finder, place the rubber "O"-ring (supplied) over the tube, and slide the finder tube into the bracket rings from the rear. Work the O-ring in between the front ring of the bracket and the finder tube, reinstall the objective lens, and then align the finder to the main telescope to complete the installation.

If dew condenses on the corrector lens, use a portable electric hair dryer to remove the dew. A brief blast of warm air should clear the dew for a reasonable length of time.

A dew cap you might construct of thin cardboard or plastic material will help prevent dew from forming. This dew cap should extend outward at least 10 inches from the corrector lens to be effective.

As a last resort, IF THE CORRECTOR LENS IS COMPLETELY FREE OF ABRASIVE PARTICLES AND DIRT, DEW MAY BE *GENTLY* WIPED OFF WITH A *WHITE* KLEENEX. Use extreme care whenever wiping (or cleaning) the corrector lens. Small dirt particles can cause hairline scratches on the lens.

If dew forms on the corrector when you bring the telescope indoors after using it, *do not* wipe off the dew. Let your Celestron warm up gradually – until the dew disappears – before replacing it in its case. No residue will be left when the dew dries (dew will not harm the lenses).

Try to avoid viewing through windows, either opened or closed. The resulting distortion or turbulence may cause the images to be blurry. Some window glass is so bad that it's impossible to focus the telescope when looking through the window.

Whenever possible, avoid sighting through heat waves, over the roof of a house or building, or over a large paved parking lot. It's preferrable to observe from a grass or dirt-covered location rather than a paved driveway or patio.

Using Your Celestron

You now own a portable, large-aperture, high performance telescope of extreme versatility and usability.

To obtain the best performance from this or any other telescope, you must allow sufficient time for the instrument to adjust to the prevailing outdoor temperature. If the outdoor temperature is very low and the instrument has been stored in a heated building, the "cooling-off" period may be as long as 45 minutes for your Celestron. The telescope may be used during this period, but satisfactory results will be obtained only at low power.

Very warm or very cold temperatures will not harm your Celestron. In very cold climates it is advisable to plug in the drive system as soon as possible.

Observing With Your Celestron

Celestial observing is a learned skill – the more observing experience you acquire, the more detail you'll see. Take your time when observing. Look for a period of time rather than just taking a quick glance at the object.

Get into a comfortable observing position and try to relax as much as possible. When viewing, try keeping your unused eye open also. This will avoid the eye strain caused by squinting.

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.

As stated earlier, high power observing of the Moon, planets, or close double stars requires steady, stable atmospheric conditions. When observing the Moon or planets, you'll quickly note (by the amount of detail you see) that the seeing conditions vary considerably with time. During periods of good seeing, highly detailed views will amply reward your patience.

"Seeing" is termed good when atmospheric turbulence is at a minimum. You can determine this with the naked eye by observing how much the stars appear to twinkle. When the stars shine with a steady glow (rather than twinkle) the seeing is steady. A slight haze or fog often indicates periods when the atmosphere is stable.

Deep sky observing (of nebulae and galaxies) is not nearly as affected by seeing conditions as is lunar and planetary viewing. Here the most important factors are the transparency of the atmosphere and the darkness of your observing site. We can't over-emphasize the advantage of observing deep-sky objects from a dark-sky location away from city lights. Some very faint, deep sky objects are *undetectable* unless the sky is very dark. Even the light of the moon is great enough to hamper observing, so the best deep sky observing times are when the moon is below the horizon.

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.

Also, your eye will *not* be able to detect color at these low-light levels, so expect nebulae and galaxies to be faint smoke-like, grayish objects.

The human eye is most efficient at detecting faint objects when it is fully dark-adapted. This usually takes at least 15 minutes in a very dark location. If you use a red filter over your flashlight, it will help preserve your night vision when you do need light to read a star chart or setting circle.

Specific observing hints follow:

The Moon

The Moon is best viewed during its partial phases and at its highest point in the sky. More detail is visible along the terminator — the light/dark line that indicates lunar sunrise or sunset — as opposed to the rest of the disc.

High power viewing with the C5 (at 150x to 200x) or C8 (160x to 320x) will require steady seeing conditions.

If you find that the lunar image is too bright for comfortable viewing, a yellow filter or a neutral density filter will help reduce the glare (see the section on eyepiece thread-in filters).

The Planets

Because the planets move with respect to the stellar background, their positions are always changing. Refer to the astronomical magazines listed at the back of this manual for their current locations.

The planets are best viewed when they're at their highest elevation above the horizon (straight up is best) and at moderate magnification. With the C5, this is about 100x to 150x. With the C8, use 115x to 225x. Steady seeing conditions are required to see the really fine detail.

MERCURY and VENUS — each is best viewed when at greatest eastern (or western) elongation when the planet is at its highest point above the horizon after sunset or before sunrise. Because of the proximity to the horizon, seeing will be poor and viewing difficult. No surface detail is visible, but you'll be able to watch each planet go through phases like the moon.

MARS — Detailed views of Mars are only possible when the planet is near opposition. For Mars, these oppositions occur every two years and fifty days, on the average.

Orange or red filters reduce glare and help increase the contrast of Martian surface features. A blue filter is useful for emphasizing the atmospheric features of Mars (see the section on eyepiece thread-in filters).

JUPITER — During many months of each year, Jupiter is easily visible. Through the C5 or C8, the cloud belts, red spot, and Galilean satellites are easily visible.

A blue filter helps to increase the contrast of the cloud belts and the Great Red Spot as well as reduce glare.

SATURN — Like Jupiter, Saturn is visible for many months each year. With the C5 or C8, Saturn's magnificent ring system is instantly obvious.

Star Clusters

Star clusters fall into the two general categories: open star clusters (sometimes called Galactic Clusters) and globular star clusters.

Open clusters are loosely arranged groups of stars, often not too distinctive from the background stars. Since they are relatively large groupings, they are best seen through low-power (25x to 50x), wide-field oculars from dark-sky locations (see the section on 2″ O.D. oculars).

Globular star clusters are tightly-packed, spherically shaped groups of many thousands of stars. Low to moderate power (50x to 160x) will show these objects to best advantage.

Nebulae

Nebulae, or glowing clouds of gas, fall into two distinct categories: small, bright, planetary nebulae and the large, bright, diffuse (or emission) nebulae.

Planetary nebulae are relatively small clouds of expanding gases and are believed to be the remnants of stellar explosions. Most shine with a greenish glow and have a round or elliptical shape.

Planetary nebulae are best seen when using moderate magnification (100x to 225x) from dark sky locations. To see some of the really faint details, try averting your vision. Averted vision is glancing off to the side of the field-of-view instead of looking directly at the object of interest.

Diffuse nebulae are vast, irregularly shaped clouds of rarified gas. They are called "bright" because they are spurred into luminescence by radiation from nearby stars or because they reflect the light of nearby stars.

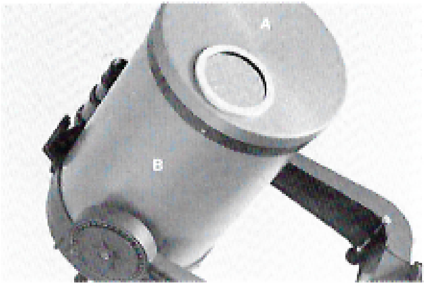
Galaxies

Galaxies are vast, remote "island universes," each composed of many millions of stars. They exist in a variety of sizes and regular and irregular shapes, and most are faint, therefore, they are best seen from a dark sky location. Large galaxies (or clusters of galaxies) are best seen when using low-power, wide-field oculars such as the Celestron 2″ O.D. oculars. Small galaxies are better seen when using moderate magnification (100x to 225x).

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 MAY RESULT—EVEN DURING AN ECLIPSE OF THE SUN.



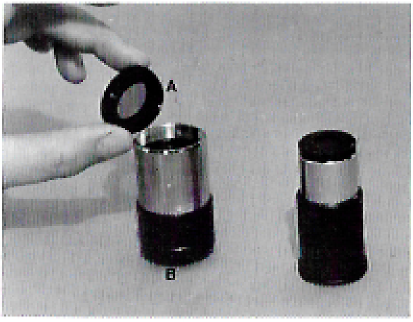
The Off-Axis Solar Filter
(A) Solar Filter (B) Telescope

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 Celestron as a full aperture filter or a stopped-down, off-axis filter. The off-axis model compromises resolution somewhat, but is less expensive. The filters are made of optical glass coated with Inconel and 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. Do not leave your scope unattended during an observing session, and, 3. Always cap the finderscope so the heat from the Sun's rays doesn't damage the delicate cross hairs (you can use the rear cell dust cap or an eyepiece box for this purpose, or finder cap.)

Other filters may be used with the Celestron filter to reduce the brightness of the solar image even further. A neutral density filter, which can be threaded into the inside of the ocular, is included in our thread-in filter set. (By themselves, these filters give insufficient protection for solar observation!)

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.



Eyepiece Filters
(A) Eyepiece thread-in filter (B) Eyepiece (ocular)

Eyepiece Thread-in Filters

These filters, which thread into the eyepieces, will improve your views of many celestial objects. Their main purposes are to decrease glare and improve contrast. All have sufficient blocking density to reduce glare and subject brightness, but the #96 Neutral Density is preferred for this purpose because it leaves colors unaltered. To increase subject contrast, choose the filter which comes closest to being the complement of subject color you wish to observe, e.g., a yellow filter will always help cut through bluish sky haze. Some specific suggestions follow, but you may wish to experiment further on your own.

#3N5 Yellow – Mainly a filter for lunar work. Especially useful for improving contrast and reducing irradiation between features of varying brillance. Also valuable for penetrating the atmospheres of Jupiter, Saturn or Mars since it reduces scattered blue light.

#21 Orange – Does what the yellow filter does, only more so. Brings out structure in Jupiter's belts and Saturn's bands, allows intermediate probing of Martian atmosphere, and increases contrast between Martian maria and deserts.

#47 Violet – For studies of Venus in particular. Increases contrast of upper atmospheric clouds. Also useful in detecting clouds over Martian polar caps.

#58 Green – Excellent for increasing contrast of the Martian polar caps, low-flying Martian clouds and yellowish Martian dust storms. Good, too, for studies of low-contrast, blue and red Jovian features, and for studies of Venus.

#80A Blue – Primarily for studying features in upper atmospheres, such as Jupiter's Great Red Spot or the festoons in Jupiter's belts. Also useful as a moon filter under dark skies.

LPR (Light Pollution Rejection) Filter

Makes bright light polluted skies appear darker by refecting radiation from mercury and sodium lights. Allows maximum transmission of the important wavelengths of Hydrogen Alpha, Hydrogen Beta, Doubly Ionized Oxygen, and Singly Ionized Nitrogen. Thus you can enjoy emission nebulae [galaxies and star clusters with associated nebulosity] from urban locations. Models #3 and #4 screw into oculars like the eyepiece filter set. Model #1 threads on the back of the C5 or C8 and accepts all visual and photographic accessories.

When using the LPR filter for astrophotography you will have to increase your exposure time by a factor of two or three to record stellar objects to the same density as without the LPR filter. Emission nebulae will be recorded to the same density on your film in approximately the same time with or without the LPR filter.

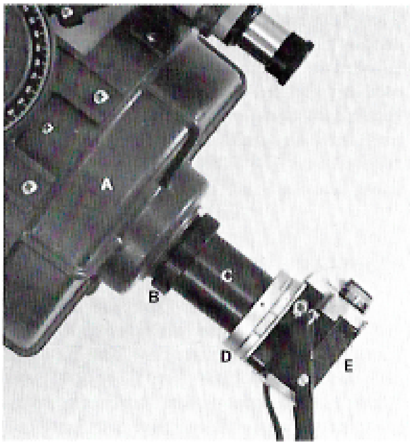
Due to the spectral response of a typical Celestron LPR filter, the light from an emission nebulae that is transmitted through to your film (or eye when used in a visual mode) is largely unchanged in its quality (spectrum). This means that color photography will yield an image of nearly natural color balance. Your choice of film and its reciprocity characteristics may alter the color balance more than the LPR filter. Other apparent color changes can be caused by the lack of artificial radiation, background continuum, and minor nebular emissions that are filtered out by the LPR filter.

Filter Adapters

These allow the use of eyepiece and LPR thread in filters with non-standard threaded oculars or non-threaded oculars of other manufacturers. It also allows you to change any ocular without having to change filters each time. Comes in sizes of .96" and 1-1/4".

Telephotography With Your Celestron

Most 35mm single-lens-reflex cameras with fully removable lenses and focal plane shutters can be coupled to your Celestron with our camera adapters. Celestron camera adapters convert your scope to the universal "T"-adapter system used by photographers. With this system, the "T" adapter replaces the visual back and the "T" camera ring couples your camera



The T-Adapter
(A) Rear cell (B) Slip ring (C) T-adapter (D) T-ring (E) Camera body

(minus lens) to the "T" adapter. The "T" adapter places the film plane of your camera at Cassegrain focus and its slip-ring lets you orient your camera body as desired.

Celestron offers T-rings for most of the popular 35mm SLR cameras. An even larger variety of T-rings may be obtained at most camera stores. Larger-format cameras may be coupled with special custom adapters made at your local machine shop.

Virtually all terrestrial photography with the C5 or C8 is accomplished with these adapters. 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 1/15th to 1/1000th of a second for general daytime use.

Most 35mm SLR cameras with behind-the-lens metering systems have special procedures for metering with non-automatic lenses. Consult your camera instruction manual for the "stopped-down" metering procedure. Note: Camera light metering systems will *not* indicate the proper exposure for astronomical photographs.

Because of the high magnification of the Celestron, special care is required to keep vibration from affecting the sharpness of your photos. The telescope should always be mounted on a sturdy tripod. Use an air release cable (as opposed to a metal spring-type cable) or the camera's self-timer to release the shutter. If it's practical, manually retract the camera's instant-return mirror prior to making the exposure (allow sufficient time for any vibrations to damp out).

Focus very carefully and use a focusing magnifier, if possible. If your camera has an interchangeable focusing screen, check your camera instruction manual to find out which optional focusing screen is best to use with a long focal length, f/10 lens. If you normally wear eyeglasses, be sure to wear them when focusing.

Of course, never attempt to photograph through a window or through heat waves.

Series VI Drop-In Filters

For telephotography under typical daylight conditions, it is sometimes advisable to use photographic filters to increase the contrast between subject and background, to gain a more natural rendition of colors, and so forth. The Celestron Series VI Drop-In Filter Set is designed to permit such flexibility in making exposures.

This filter set consists of six ring-mounted, optical glass filters. These fit into the rear-cell recess at the back of your Celestron, ahead of the T-adapter, and are held in place by the adapter when it is threaded onto the lens. The six filters in this set include a #1A, #8, #11, #25, #80A and #96.

The #1A is a "Skylight" filter, designed primarily for color work. It is salmon-pink in color and reduces the bluishness of shaded, overcast, distant or aerial scenes. No exposure compensation is required.

The #8 is a yellow filter for black-and-white work. It gives a good gray scale for natural clouds, sunsets, marine scenes, foliage, and portraits against the sky. Increase your exposure time by a factor of 2.

The #11 is a yellowish-green filter, for black-and-white work also. It lightens flowers and foliage, enhancing their texture in sunlight. It also darkens the sky background for portraits against the sky while generally yielding the most natural skin-tone rendition with panchromatic B&W films. Increase exposure time by a factor of 4.

The #25, another filter for black-and-white work, is a red filter that produces spectacular cloud pictures, reduces haze in shots of distant landscapes and dramatically

Series VI Filters & Tripod Adapter
(A) Series VI filter (B) Rear cell (C) C8 photo tripod adapter

emphasizes the texture of wood, stone, sand, and snow. Increase exposure time by a factor of 8.

The #80A is a blue filter for color conversion. You can use it to expose daylight-type films to incandescent or photoflood lighting (3200°K) indoors or out, avoiding the overall reddish cast that results without some such filtration. For daylight photography, it produces interesting effects by emphasizing atmospheric haze and fog. Increase exposure time by a factor of 4.

The #96 is a neutral-density filter for black-and-white or color work. Use it when you need to reduce exposures — for example, when you're shooting a brilliant subject with a high-speed film, or when you want to decrease shutter speed to pan with a moving subject and produce a blurred background. Increase exposure time by a factor of 2½.

The T-to-C Adapter

This accessory is offered for the many movie camera enthusiasts who wish to record the action at a distance.

Used in conjunction with a Celestron T-Adapter, it couples almost all 16mm movie cameras, most video cameras, and some of the more expensive and sophisticated Super 8 cameras (those with removable lenses) to the back of your Celestron.

Aside from making distant action accessible, this device provides for convenient group observing with a TV camera and video monitor.

Because of the weight, bulk, and vibration of a movie or video camera, we strongly advise fabricating a solid mounting bracket to couple the camera rigidly to the back casting of your Celestron. For additional information on motion-picture photography, and suggestions for bracket design, request our 750/1250mm Telephoto Operating Manual (price $1.00).

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 (¼-20) photo tripod adapter, the tube can be mounted on any standard heavy-duty tripod or monopod.

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 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 2½ TURNS. OTHERWISE THE SCREWS WILL PROTRUDE TOO FAR INTO THE TUBE AND DAMAGE THE PRIMARY MIRROR.

To couple the Celestron 5 photo tripod adapter to your telescope tube, remove the two screws at the bottom of the rear cell, center the holes of the adapter over the two resulting holes and thread in the two screws provided with your adapter kit.

WHEN YOU REMOVE THE PHOTO TRIPOD ADAPTER FROM YOUR TUBE, DO NOT REPLACE THE ADAPTER SCREWS IN THE REAR CELL OR MIRROR DAMAGE MAY RESULT. USE THE SCREWS YOU ORIGINALLY REMOVED.

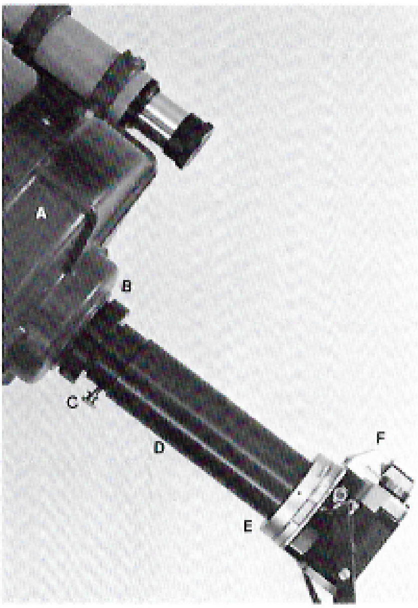
The Celestron 8 photo tripod adapter attaches in the holes left where the tube saddle screws were removed.

Solar Photography

By adding the Celestron solar filter and attaching your camera using the T-adapter and T-ring, you may safely make highly detailed photographs of sunspot groups in black and white or in full, natural color. With the off-axis solar filter and readily available color films, exposure times will range from 1/8 second for ASA 64 films to 1/15 second for ASA 200 films. If you use the full aperture solar filter, the exposure times will be 1/60 second and 1/125th second respectively.

Manually retract your camera's instant return mirror, if possible, and use an air release cable to trip the shutter. Your Celestron should be set-up to track the solar disc if the exposure time exceeds 1/60 second.

The tele-extender may be used with a 25mm ocular for extreme close-ups of sunspot groups (see the section on the tele-extender for the best photographic technique to use). With ASA 200 film, use an exposure time of about 1/4 second with the full aperture filter.



The Tele-Extender
(A) Rear cell (B) Visual back (C) Set screw (D) Tele-extender (E) T-ring (F) Camera body

Lunar and Planetary Photography

Using the standard T-adapter and T-ring, you can photograph the entire lunar disc at one time at the Cassegrain focus of the Celestron. Depending upon the phase of the moon, exposure times on ASA 64 color film will range from 1/8 second at crescent phase to 1/125 second at full moon. If the exposure time is 1/60 second or less, it won't be necessary to have the drive system of your Celestron operating.

Focus carefully (it helps to use a focusing magnifier) on craters near the terminator. Manually retract your camera's instant return mirror, if possible, and use an air-release cable to minimize vibration when you trip the camera's shutter.

The Tele-Extender

Although Cassegrain-focus photography is great for small-scale renderings of the moon and planets, extremely long effective focal length (EFL's) are necessary to photograph finer details and to get a reasonably large planetary image on film. To enable you to obtain these long EFL's, Celestron offers the optional tele-extender.

This particular photographic configuration is known as the "eyepiece-projection" method. Here the ocular acts as an enlarging lens, projecting a magnified Cassegrain-focus image onto the film. The effective focal length may be varied by replacing the ocular with one of a different focal length. The most useful oculars for eyepiece-projection are the 25mm, 18mm, and 12mm. (Refer to the Reference Table at the back of this manual for the calculated EFL's and f numbers).

To attach the tele-extender, thread the visual back onto the Celestron's rear cell. Next, insert an ocular and *tighten the set screw firmly*. (This will prevent the ocular from falling out later and damaging your camera.) Now thread the tele-extender over the ocular onto the visual back. Finally, thread your camera with the T-ring onto the tele-extender.

Now locate the object you wish to photograph, attach sufficient counterweights to balance the scope, plug in the electric drive (your Celestron has to be lined up on the pole) and fully engage the R.A. clamp so that the telescope will track the object.

Focus very carefully. If the object is too dim for easy focusing, try focusing on a bright, nearby star and then moving the telescope back to the desired object. If your camera has interchangeable focusing screens, change to a perfectly clear (aerial image) screen. This results in a significant improvement in apparent image brightness and makes focusing much easier and more precise.

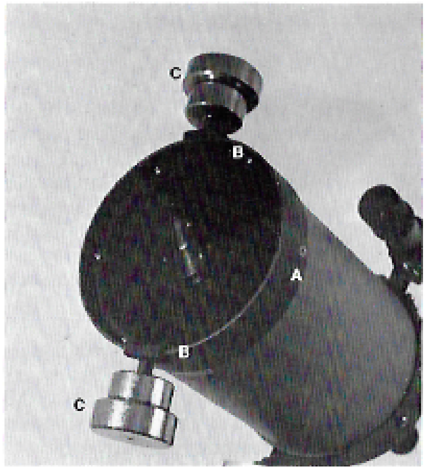
You'll have to be extremely careful not to induce any vibrations when you release the camera shutter. The best way to do this is to use the "black card" technique. Here a black card (large enough to completely cover the front lens of the telescope) serves as a vibration-free shutter.

This procedure is as follows: with the camera attached and focused and the telescope tracking the subject, completely cover the front lens (without actually touching the telescope) with the black card. Lock the camera shutter open—a locking cable release is handy for this—let go of the cable release and wait a few seconds for all vibrations to damp out. Quickly remove the card for the desired length of time, then quickly replace the card in front of the scope. Again, be careful not to touch the telescope. After you close the camera shutter you may remove the black card and advance the film for the next exposure.

Exposure times will vary greatly depending upon subject brightness, the EFL and resulting f-number, and film sensitivity (ASA rating). For example, when using the tele-extender with an 18mm ocular and ASA 200 film, the exposure time for Jupiter and the lunar terminator is approximately 1 to 2 seconds; for Saturn, about 4 seconds; for Mars at a "close" opposition, about ½ second; and for Venus, about 1/15 second. If you're using a different ocular (which will give a different f-number), remember that the exposure time will vary with the square of the f-numbers.

Successful high magnification photography is extremely dependent on steady seeing conditions. Therefore, shoot only when the seeing is steady.

Don't be disappointed if your first photographic efforts aren't all that you had hoped for. Remember, even professional astronomers have to take many pictures in order to get one really good one.



The C5 Counterweights
(A) Front cell (B) Counterweight bracket (C) Counterweights

The Counterweight Set

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 counterweight set as an optional accessory.

The two-pound set of counterweights for the Celestron 5 has four elements, and the 3¾-pound set of weights for the Celestron 8 has six elements. The elements may be used all together or in any combination.

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 set screw.

The Celestron 8 counterweights are threaded into either (or both) of the two accessory holes in the front cell of your telescope. Remove the plug-up screws and thread on the weights (use only the center screw).

To determine how many weights should be used, point the telescope (with camera attached) at the object to be photographed and add weights until the Celestron will remain in that position with the R.A. clamp disengaged. (It isn't mandatory for the telescope to be perfectly balanced about the declination axis.)

Guided Astrophotography

The drive system in your Celestron turns the telescope at about the same average speed as the celestial sphere (one revolution per day). Even though this drive will keep an object in the field-of-view for many hours, no telescope drive can keep an object *exactly* positioned over a long period of time.

The primary cause of this minor tracking error is known as right ascension periodicity and is caused by minute variations in the drive gears. Because of the high power of the telescope, even an extremely small variation can cause noticeable image movement. Other factors affecting tracking accuracy include: atmospheric refraction, which causes the apparent speed of an object to change as its angle above the horizon changes; short-period variations in 110 volt 60 Hz commercial power; improper balancing of the telescope, and polar misalignment.

Since lunar and planetary photographs are essentially snapshots, the basic drive rate is accurate enough to track these objects during the relatively short exposures. Photographs of nebulae, galaxies, and star clusters, on the other hand, require long time exposures to record satisfactorily on film. This means that the deep sky astrophotographer must make manual drive corrections in addition to the basic telescope drive rate *during the entire exposure*. Guiding is accomplished with the optional drive corrector and off-axis guiding system. Without this additional photographic guiding, stellar images usually appear as zig-zag lines on film.

Constellation Photography

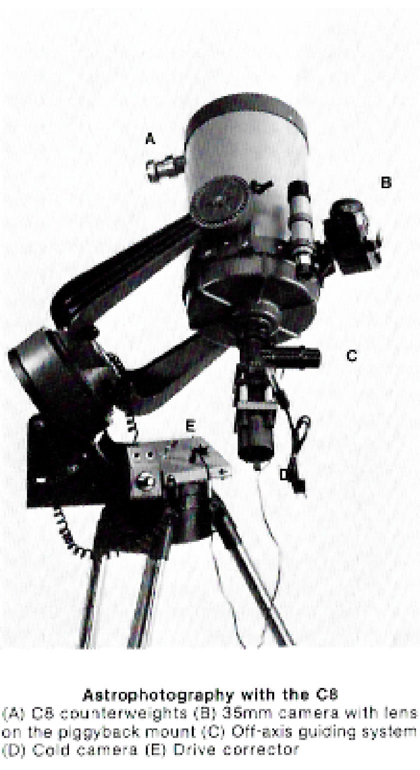
This is the simplest form of deep sky photography. To photograph the constellations, you simply mount your camera with lens "piggyback" on your telescope.

The optional piggyback mount makes it easy to attach your camera to the top of the telescope. To couple the piggyback mount to the telescope, remove the two screws at the bottom (or top of the C8) of the rear cell, center the holes of the piggyback mount over the resulting holes, and thread-in the two screws supplied with the unit. Do not remove any of the other screws.

WHEN YOU REMOVE THE PIGGYBACK MOUNT FROM THE TELESCOPE, *DO NOT* REPLACE THE PIGGYBACK MOUNT SCREWS IN THE REAR CELL OR MIRROR DAMAGE WILL RESULT. USE THE ORIGINAL REAR CELL SCREWS.

The telescope will serve as a stable guiding platform. Make your exposures with either the 55mm lens of your camera or a telephoto lens. Guide with an illuminated reticle eyepiece inserted directly into the star diagonal of your Celestron.

Surprisingly dramatic wide-angle celestial 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 ten minutes. When you can guide without error for 20 or 25 minutes, move up to a telephoto lens.



Astrophotography with the C8
(A) C8 counterweights (B) 35mm camera with lens on the piggyback mount (C) Off-axis guiding system (D) Cold camera (E) Drive corrector

Deep Sky Photography

With a little experience in lunar and planetary and constellation photography, you'll be ready to try 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 at 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.

Because of this problem, Kodak makes special 103a series spectroscopic films (i.e., low reciprocity failure) specifically for astrophotography. These films, 103aE (red sensitive), 103aO (blue sensitive), and 103aF (panchromatic) are available from several companies that advertise in the astronomical magazines listed at the back of this manual. Type 103aO is best for galaxies and reflection nebulae; 103aE is best for diffuse (emission) and planetary nebulae; 103aF is good for all deep sky objects.

Exposure times will vary greatly depending upon film sensitivity, atmospheric transparency, and subject brightness. As a starting point (when using the spectroscopic films mentioned above), try the following exposure times: star clusters and bright planetary nebulae — 10 to 15 minutes; diffuse nebulae — 30 to 45 minutes; faint galaxies — 45 to 60 minutes.

The Off-Axis Guiding System

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 Guiding System. This optional accessory uses a tiny prism to divert light from a star at 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 the Cassegrain focus.

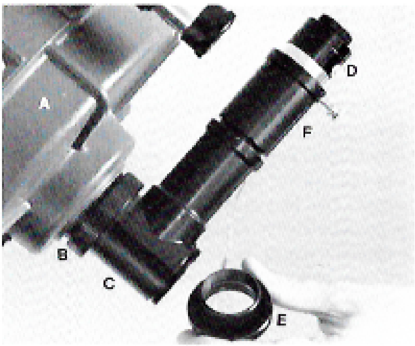
Attach the guider to the rear cell of the Celestron and couple your camera body with the proper T-ring. Using the slip-ring of the guider, rotate the unit until a suitably bright star appears in the field of the ocular.

The task of finding a guide star in the field of the guiding eyepiece will be greatly simplified if you use the following technique:

After attaching your camera, locating the object, and focusing, look through the *finder* telescope for a suitable guide star near the subject. Loosen the slip-ring of the guider and rotate the guider until the eyepiece "neck" is pointing in the same direction as the guide star appears to be through the finderscope. Only a small amount of additional searching will be necessary to get the guide star you've selected centered in the field of the guiding eyepiece.

Chances are that if you can't see a potential guide star through the finderscope, it will be too faint to use successfully.

Focus on the guide star by raising or lowering the guiding ocular. You should



The Off-Axis Guiding System
(A) Rear cell (B) Slip ring (C) Guider body (D) Illuminated reticle ocular. Also shown is the Tele-compressor (E) And its eyepiece extender (F).

focus the image of your subject on the ground glass of the camera before focusing the guiding ocular.

Using the declination slow-motion control and the optional drive corrector, your task is to keep the guide star centered on the intersection of the cross hairs for the duration of the exposure. Many people find it helpful to orient the cross hairs so that movement along one cross hair is in R.A. and movement along the other is in declination.

The cross hairs of the guiding ocular are illuminated by a red LED, which is held in the eyepiece by the set screw at the side of the housing.

The bulb is powered by a 9-volt 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 ocular no more than necessary.

The Drive Corrector

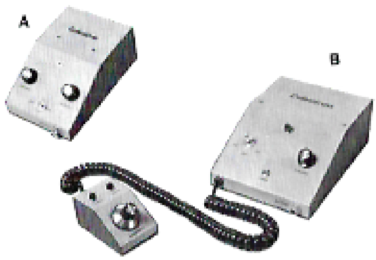
The Celestron Drive Corrector makes it possible for deep sky photographers to correct for image drift in R.A. by speeding up or slowing down the telescope's drive motor. Located on the remote control paddle, the fast (85 Hz)button increases the drive speed by 42% and the slow (35 Hz) button decreases the speed by 42%. In addition, a vernier control allows you to dial in other rates you may desire — lunar, sidereal or planetary.

Also included is a low-voltage white map-and-chart light that may also be used for illuminating the cross hairs of the finderscope or of the Celestron guiding eyepiece. Its brightness is controlled by a rheostat on the front panel of the unit.

The drive corrector, which is rated for up to 20 watts output, operates on 110 volt 60 Hz household current (unless ordered differently). It will also provide stable 110 volt 60 Hz current from a 12 volt DC automobile battery. Battery terminal and cigarette lighter connecting cables are included. For a normally charged battery, the drain during an entire evening is insignificant.

Operating instructions are supplied with the drive corrector.

Note: It is normal (and harmless) for your drive system to run somewhat noisier when using the drive corrector. The slight buzzing results from the drive corrector's wave output form — square rather than sinusoidal.



(A) DC Inverter (B) Drive corrector

The DC Inverter

For those individuals who are not interested in long exposure astrophotography but would like to operate their telescope from a 12 volt DC power source, Celestron offers the DC Inverter. Its basic function is to provide a stable source of 110 volt AC power for clock drive operation from a car battery or any 12 volt DC source. The inverter also includes a variable-speed control and low-voltage map-and-chart light with a rheostat control.

As with the drive corrector, it is normal for the drive to run somewhat noisier when using the inverter.

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 Tele-Compressor, the Cold Camera, and the Schmidt Camera.

The Tele-Compressor reduces by one-half the effective focal length of your Celestron. It, therefore, increases 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 .9 inch in diameter on the negative for the C8 and a .5 inch diameter circular format for the C5.

The Tele-Compressor is a converging lens mounted in a housing that threads onto the back of the 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.

The Celestron-Williams Cold Camera

Due to the insensitivity of certain films to faint light, photography of dim, nebulous objects at the Cassegrain focus of the Celestron requires long exposure times. Because of reciprocity failure in films, doubling the exposure time will not double the image density on the negative. This means that fainter objects require disproportionately longer exposure times to record satisfactorily on film. Color films are even less sensitive to faint light than black and white films and require even longer exposure times. Additionally, the color balance of color films can change radically during long exposures.

To help solve these problems, Celestron offers the optional cold camera. The cold camera greatly increases film sensitivity (3 to 6 times for color films and up to 15 times for B&W) and practically eliminates any shift in color balance.

The cold camera increases film speed by chilling the film to sub-zero temperature thereby greatly reducing reciprocity failure. The cold camera, which uses dry ice for cooling, is available in 35mm format and couples to the off-axis guiding system.

The cold camera makes it possible to obtain spectacular color photos similar to those seen reproduced in astronomy magazines and text books. The only limitations are your photo techniques and guiding ability.

The Celestron Schmidt Camera

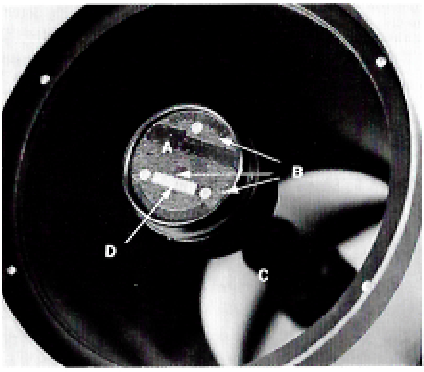
The ultimate optional accessory for *wide-field* high resolution photography is the Celestron Schmidt Camera. Its extreme photographic speed allows you to photograph the heavens with readily available color and B&W films using relatively short exposure times. Its large photographic field allows you to capture, in intricate detail on a single negative:

- The entire North America Nebula and and companion, the Pelican Nebula, with their red fluorescence and ink-black patches of dust.
- Both halves of the Veil Nebula, with their blue and rose-pink traceries set against the starry background of the northern Milky Way.
- All of the Double Cluster in Perseus, with its fiery orange super-giants scattered throughout and its hundreds of outliers.
- The complete spiral of the Andromeda Galaxy, its dust lanes backlit by the pale yellow glow from within and by the presence of young blue-hot stars from without.
- The Orion Nebula and the Horsehead Nebula, with their dark clouds of obscuring matter etched sharply onto their pastel red, yellow and blue luminosities.
- All of the Pleiades, blazing like sapphires and enveloped in the blue, brushstroke nebulosity familiar to all readers of textbooks in astronomy. And these are only the beginning.

The 5½" Schmidt camera easily mounts on the Celestron 8 telescope using existing mounting holes. The 8" Schmidt Camera can be mounted in the fork mount of the C8. Request the publication, "*Schmidt Camera Operating Manual*" (price $1.00) for complete mounting and operating instructions.

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 there are certain precautions that must be taken.



Collimation Adjusting Screws
(A) Secondary mirror housing (B) Collimation adjusting screws (C) Schmidt corrector plate (D) Serial Number

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.

Contrary to popular belief, collimation is a relatively simple procedure. Collimation simply means that the optical centers of 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 sixth 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 your 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 set 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! MORE RECENTLY MANUFACTURED UNITS USE A PLASTIC MATERIAL FOR THE SECONDARY HOUSING WHICH GIVES BETTER THERMAL CHARACTERISTICS AND NO CENTER SCREW IS ON THESE UNITS.

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 power 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 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, 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 need to have its mirrors realuminized.

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 cleaner 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 flouride are best given special care. A good cleaning solution is ⅓ isopropyl alcohol, ⅔ distilled water and two drops of biodegradable liquid dish detergent per each quart of solution. (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-reflective 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 the edges of the lenses.

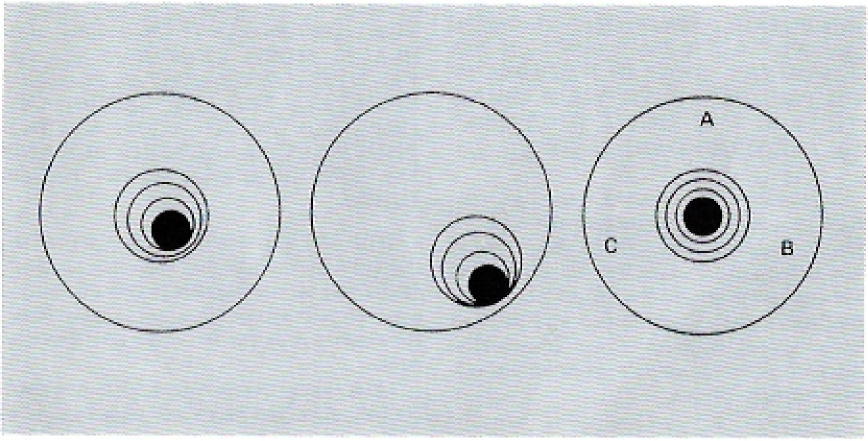
In cleaning the optics of your Celestron, you might notice hairline sleeks or tiny pits on the optical surfaces of the primary, secondary or corrector. There is no cause for alarm. These do not affect the optical performance of your telescope and are considered normal with large aperture optics.

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 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



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 recollimate, 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.)

reflected 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."

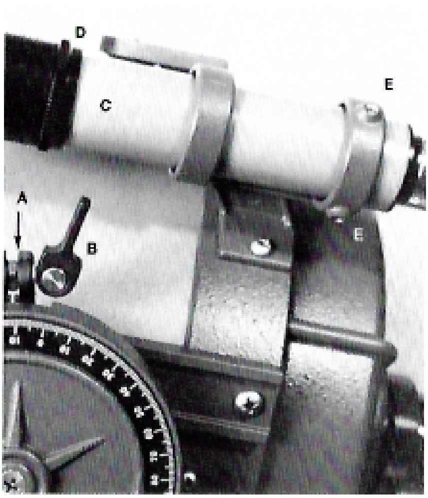
Adjusting the R.A. Clamp

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

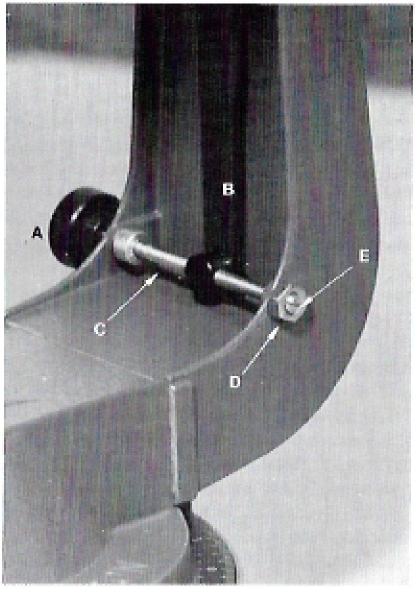
To tighten the R.A. clamp, remove the clamp lever and tighten the exposed screw (using a screwdriver) so that you can't rotate the fork tines manually but can just barely rotate them using the R.A. slow-motion knob. Replace the clamp lever in the lock position, with it pointing to the left. When you 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, advance the clamp and tighten the lock nut.



Finderscope and Dec. Clamp Adjustments
(A) Lock nut (B) Dec. clamp lever (C) Finderscope objective (D) Lock ring (E) Aligning screws



The Dec. Slow-Motion
(A) Dec. slow-motion knob (B) Tangent arm (C) Tangent screw (D) Lock nut (E) Cone-point screw

Adjusting the Dec. Slow-Motion

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

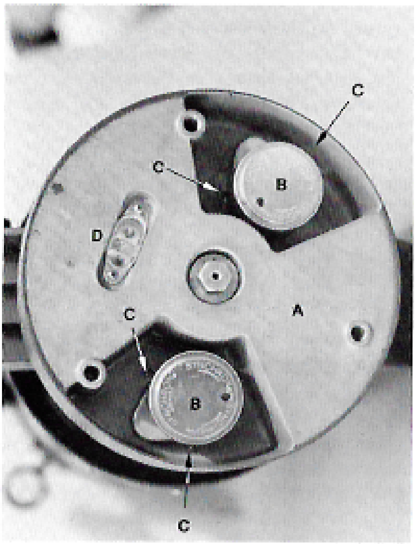
To tighten the Dec. slow-motion control, loosen the lock nut at the end of the tangent screw and advance the cone-point screw until the Dec. control is tight enough. Hold the cone-point screw in the desired position with a screwdriver and tighten the lock nut with a wrench.

Checking Your Dec. Setting Circles

The declination setting circles of your Celestron should be aligned so that the 90°-90° line on each parallels the optical axis of your telescope. When the optical axis of your telescope is parallel to the polar axis of your telescope, the Dec. circle should give a reading of 90° (if necessary, make this adjustment, approximately, before proceeding).

To set the circles accurately, first orient your telescope tube with the finderscope up. Then center an object such as a star or a planet 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 star 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. For the greatest accuracy, repeat this procedure until the identical reading is obtained after the tube is tumbled. 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 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.



The Electric Drive Motors
(A) Bottom of drive base (B) Drive motors (C) Motor mounting screws (D) Power cord receptacle

Adjusting the 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 (greater than 5' on right accention circle).

To tighten the engagement of a motor gear, disengage R.A. clamp, loosen the two screws holding it in place, push the small end of the motor toward the center of the telescope and retighten the screws. It may help to wedge a screwdriver in to push the motor toward the center of the drive base. (Caution—just to move and not pry). To loosen the engagement of a motor gear, press the motor away from the center of the telescope slightly.

The Finderscope

The finderscope should be aligned with your main optics for the distance at which you are observing. The finder may be aligned by using the three screws on its holder bracket to position the finder's cross hairs over the object that is centered in the main optics of your Celestron.

The focus of the finderscope has been set at infinity. If your eyesight calls for a different focus, you can change the focus by unthreading the knurled lock-ring at the back of the objective housing and then turning the objective housing until the view appears sharp. Retighten the lock-ring after you've adjusted the focus.

Returning Your Instrument for Service

Rarely is it necessary to return a Celestron for service. If ever a problem does occur, it probably can be solved by telephone or mail. So, if you encounter a problem not covered by this manual, call or write us first before returning your telescope. If it is decided that you should return your instrument, be sure to include a covering letter fully detailing the problem and also include your name, address and phone number.

Appendix I
Basic Telescope Specifications*

CELESTRON	5	8
Clear Aperture	5"	8"
Light Grasp (compared to unaided eye)	188x	800x
Cassegrain Focal Length	50"	80"
Magnification Range	30-300x	50-500x
Resolution (Dawes Limit)	0.9 arc sec	0.6 arc sec
Lines Per mm	197	210
Mirror Coatings	enhanced aluminum	enhanced aluminum
Faintest Stellar Magnitude	13	14
Photographic Speed (focal ratio)	f/10	f/10
Image Scale	1.12°/inch	.72°/inch
Field (35mm format)		
at 30 ft.	7"	4.5"
at 100 ft.	23.5"	15.2"
at 1,000 ft.	19.6'	12.6'
Illuminated Field	1.8" circle	2.75" circle
Near Focus	15'	25'
Secondary Obstruction	2" (16%)	2¾" (12%)
Finderscope	5x-24mm	6x-30mm
Eyepieces: C5-.96" O.D.	25mm-50x	40mm-50x
C8-1¼" O.D.	12mm-100x	25mm-80x
Star Diagonal	24.5mm (.96")	1¼"
Setting Circle Diameter		
R.A. (driven)	8"	8"
Dec.	4"	4"
Drive Gear Diameter	6" spur	6" spur
Polaris Axis Diameter	1⅜" tapered	1⅜" tapered
Electric Clock Drive (110v, 60Hz unless otherwise specified)	6 watts	6 watts
Slow Motions	Manual	Manual
Photographic Accessories	Optional	Optional
Weight	13 lbs.	21 lbs.
Size – Swung Down	8"x9"x18"	9"x13"x24"
Carrying Case	9"x12"x24"	13"x16"x30"
Shipping Weight	28 lbs.	43 lbs.

*Specifications may be changed without notification or obligation to existing equipment.

Appendix II
C5/C8 Reference Table

Celestron 5

		with Tele-Extender		
Focal Length of Ocular	Visual Magnification	f No.	E.F.L. (mm)	Photographic Magnification*
6mm	210x	f/285	36195mm	725x
9mm	140x	f/190	24130mm	475x
12mm	105x	f/140	17780mm	350x
18mm	70x	f/90	11430mm	225x
25mm	50x	f/60	7620mm	155x

Celestron 8

		with Tele-Extender		
Focal Length of Ocular	Visual Magnification	f No.	E.F.L. (mm)	Photographic Magnification*
6mm	335x	f/285	57910mm	1165x
9mm	220x	f/190	38610mm	760x
12mm	165x	f/140	28450mm	560x
18mm	115x	f/90	18290mm	360x
25mm	80x	f/60	12190mm	250x
40mm	50x	f/35	7110mm	140x

*Compared to normal 50mm camera lens.

Appendix III
Alphabetical Listing of Bright Stars

Star	Constellation	Apparent Magnitude	1970 Position R.A. (h/m)	1970 Position Dec. (°/')
Achernar	Eridanus	0.6	0137	−5724
Acrux	Crux	1.4	1225	−6259
Aldebaran	Taurus	1.1	0434	+1627
Altair	Aquila	0.9	1949	+0847
Antares	Scorpius	1.2	1628	−2622
Arcturus	Bootes	0.2	1414	+1921
Bellatrix	Orion	1.7	0524	+0619
Betelgeuse	Orion	0.1	0554	+0724
Canopus	Carina	−0.9	0623	−5241
Capella	Auriga	0.2	0514	+4558
Deneb	Cygnus	1.3	2040	+4510
Fomalhaut	Piscis Aust.	1.3	2266	−2947
Pollux	Gemini	1.2	0743	+2805
Procyon	Canis Minor	0.5	0738	+0518
Regulus	Leo	1.3	1007	+1208
Rigel	Orion	0.3	0513	−0814
Rigil Kent	Centaurus	0.1	1438	−6043
Sirius	Canis Major	−.16	0644	−1640
Spica	Virgo	1.2	1323	−1100
Tureis	Carina	2.2	0916	−5909
Vega	Lyra	0.1	1836	+3836

Appendix IV
The Messier Catalog

Designation	1970 Coordinates R.A. (h/m)	1970 Coordinates Dec. (°/')	Con.	Mag.	Type Object	Comments
M1	0533	+2200	Tau	8	P. Neb.	*
M2	2132	−0058	Agr	6	Gl. Cl.	
M3	1341	+2832	CVn	6	Gl. Cl.	*
M4	1622	−2627	Sco	6	Gl. Cl.	
M5	1517	+0212	Ser C	6	Gl. Cl.	*
M6	1738	−3212	Sco	5	Op. Cl.	
M7	1752	−3448	Sco	5	Op. Cl.	
M8	1802	−2420	Sgr	7	D. Neb.	*
M9	1717	−1829	Oph	7	Gl. Cl.	
M10	1656	−0404	Oph	7	Gl. Cl.	
M11	1849	−0618	Sct	6	Op. Cl.	*
M12	1646	−0154	Oph	7	Gl. Cl.	
M13	1641	+3630	Her	6	Gl. Cl.	*
M14	1736	−0314	Oph	8	Gl. Cl.	
M15	2132	+1202	Peg	6	Gl. Cl.	
M16	1817	−1347	Ser	6	Op. Cl.	*
M17	1818	−1611	Sgr	8	D. Neb.	*
M18	1818	−1708	Sgr	8	Op. Cl.	
M19	1701	−2613	Oph	7	Gl. Cl.	
M20	1800	−2302	Sgr	6	D. Neb.	*
M21	1803	−2230	Sgr	7	Op. Cl.	
M22	1834	−2537	Sgr	6	Gl. Cl.	*
M23	1755	−1901	Sgr	7	Op. Cl.	
M24	1817	−1826	Sgr	5	Op. Cl.	
M25	1830	−1916	Sgr	–	Op. Cl.	
M26	1844	−0926	Sct	9	Op. Cl.	
M27	1958	+2238	Vul	8	P. Neb.	*
M28	1823	−2453	Sgr	7	Gl. Cl.	
M29	2023	+3825	Cyg	7	Op. Cl.	
M30	2139	−2320	Cap	8	Gl. Cl.	
M31	0041	+4107	And	5	Sp. Gx.	*
M32	0041	+4043	And	9	El. Gx.	
M33	0132	+3030	Tri	7	Sp. Gx.	
M34	0240	+4239	Per	6	Op. Cl.	
M35	0607	+2420	Gem	5	Op. Cl.	
M36	0533	+3408	Aur	6	Op. Cl.	
M37	0550	+3233	Aur	6	Op. Cl.	
M38	0527	+3549	Aur	7	Op. Cl.	
M39	2132	+4818	Cyg	6	Op. Cl.	
M40	–	–	–	–	–	

M41	0646	−2044	CMa	5	Op. Cl.	
M42	0534	−0524	Orion	6	D. Neb.	*
M43	0534	−0517	Orion	9	D. Neb.	
M44	0638	+1948	Cnc	4	Op. Cl.	*
M45	0345	+2402	Tau	2	Op. Cl.	*
M46	0741	−1445	Pup	6	Op. Cl.	
M47	-	-	-	-	-	
M48	0812	−0148	Hya	-	Op. Cl.	
M49	1228	+0809	Vir	9	El. Gx.	
M50	0702	−0818	Mon	6	Op. Cl.	
M51	1329	+4721	CVn	8	Sp. Gx.	*
M52	2323	+6126	Cas	7	Op. Cl.	
M53	1312	+1820	Com	8	Gl. Cl.	
M54	1853	−3031	Sgr	8	Gl. Cl.	
M55	1938	−3100	Sgr	6	Gl. Cl.	
M56	1916	+3007	Lyr	8	Gl. Cl.	
M57	1853	+3300	Lyr	9	P. Neb.	*
M58	1235	+1158	Vir	9	Sp. Gx.	
M59	1241	+1148	Vir	10	El. Gx.	
M60	1242	+1143	Vir	9	El. Gx.	
M61	1220	+0438	Vir	10	Sp. Gx.	
M62	1659	−3005	Oph	7	Gl. Cl.	
M63	1315	+4211	CVn	10	Sp. Gx.	
M64	1255	+2141	Com	9	Sp. Gx.	*
M65	1117	+1317	Leo	9	Sp. Gx.	*
M66	1119	+1310	Leo	8	Sp. Gx.	*
M67	0849	+1155	Cnc	6	Op. Cl.	
M68	1238	−2636	Hya	8	Gl. Cl.	
M69	1829	−3222	Sgr	9	Gl. Cl.	
M70	1841	−3220	Sgr	10	Gl. Cl.	
M71	1952	+1836	Sga	9	Gl. Cl.	
M72	2052	−1239	Aqr	10	Gl. Cl.	
M73	-	-	-	-	-	
M74	0135	+1538	Psc	10	Sp. Gx.	
M75	2004	−2201	Sgr	8	Gl. Cl.	
M76	0140	+5125	Per	12	P. Neb.	
M77	0241	−0009	Cet	9	Sp. Gx.	
M78	0545	+0003	Ori	10	D. Neb.	
M79	0523	−2433	Lip	8	Gl. Cl.	
M80	1615	−2255	Sco	8	Gl. Cl.	
M81	0954	+6912	UMa	8	Sp. Gx.	*
M82	0954	+6950	UMa	9	Sp. Gx.	*
M83	1335	−2943	Hya	10	Sp. Gx.	
M84	1224	+1303	Vir	9	El. Gx.	
M85	1224	+1821	Com	9	El. Gx.	
M86	1225	+1306	Vir	10	El. Gx.	
M87	1229	+1233	Vir	9	El. Gx.	
M88	1231	+1435	Com	10	Sp. Gx.	
M89	1234	+1243	Vir	10	El. Gx.	
M90	1234	+1319	Vir	10	Sp. Gx.	
M91	-	-	-	-	-	
M92	1717	+4311	Her	6	Gl. Cl.	
M93	0742	−2348	Pup	6	Op. Cl.	
M94	1250	+4117	CVn	8	Sp. Gx.	
M95	1042	+1152	Leo	10	Sp. Gx.	
M96	1045	+1159	Leo	9	Sp. Gx.	
M97	1113	+5512	UMa	12	P. Neb.	*
M98	1212	+1504	Com	11	Sp. Gx.	
M99	1217	+1435	Com	10	Sp. Gx.	
M100	1221	+1559	Com	11	Sp. Gx.	
M101	1402	+5429	UMa	10	Sp. Gx.	
M102	1506	+5557	Dra	11	Sp. Gx.	
M103	0131	+6033	Cas	7	Op. Cl.	
M104	1238	−1128	Vir	9	Sp. Gx.	*
M105	1046	+1245	Leo	9	Sp. Gx.	
M106	1218	+4728	CVn	7	Sp. Gx.	
M107	1631	−1259	Oph	9	Gl. Cl.	
M108	1110	+5551	UMa	10	Sp. Gx.	
M109	1156	+5332	UMa	11	Sp. Gx.	

Sp. Gx.-Spiral Galaxy, El. Gx.-Elliptical Galaxy, Op. Cl.-Open Cluster, Gl. Cl.-Globular Cluster, P. Neb.-Planetary Nebula, D. Neb.-Diffuse Nebula.

*Denotes well-known objects of special interest.

Appendix V
Recommended Reading

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

Eastman Kodak Company, Dept. 454
Rochester, New York 14650
Ask for "Index to Kodak Information"

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

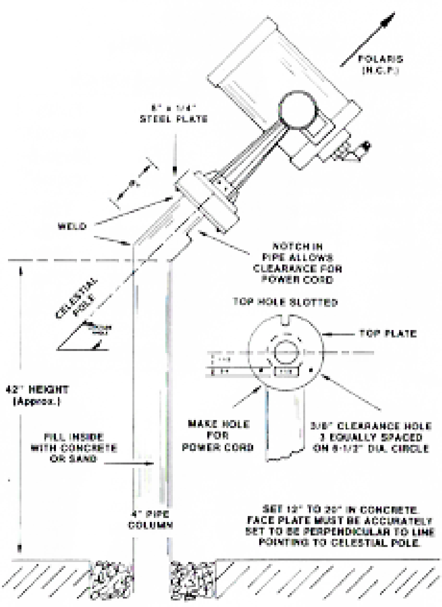
Sky Publishing Corporation
49-50-51 Bay State Rd.
Cambridge, Mass. 02138
Ask for "Scanning the Skies."

MAGAZINES

Astronomy
411 E. Mason St., 6th Flr.
Milwaukee, WI 53202

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

Appendix VI
Celestron C5/C8 Permanent Pier Plans



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