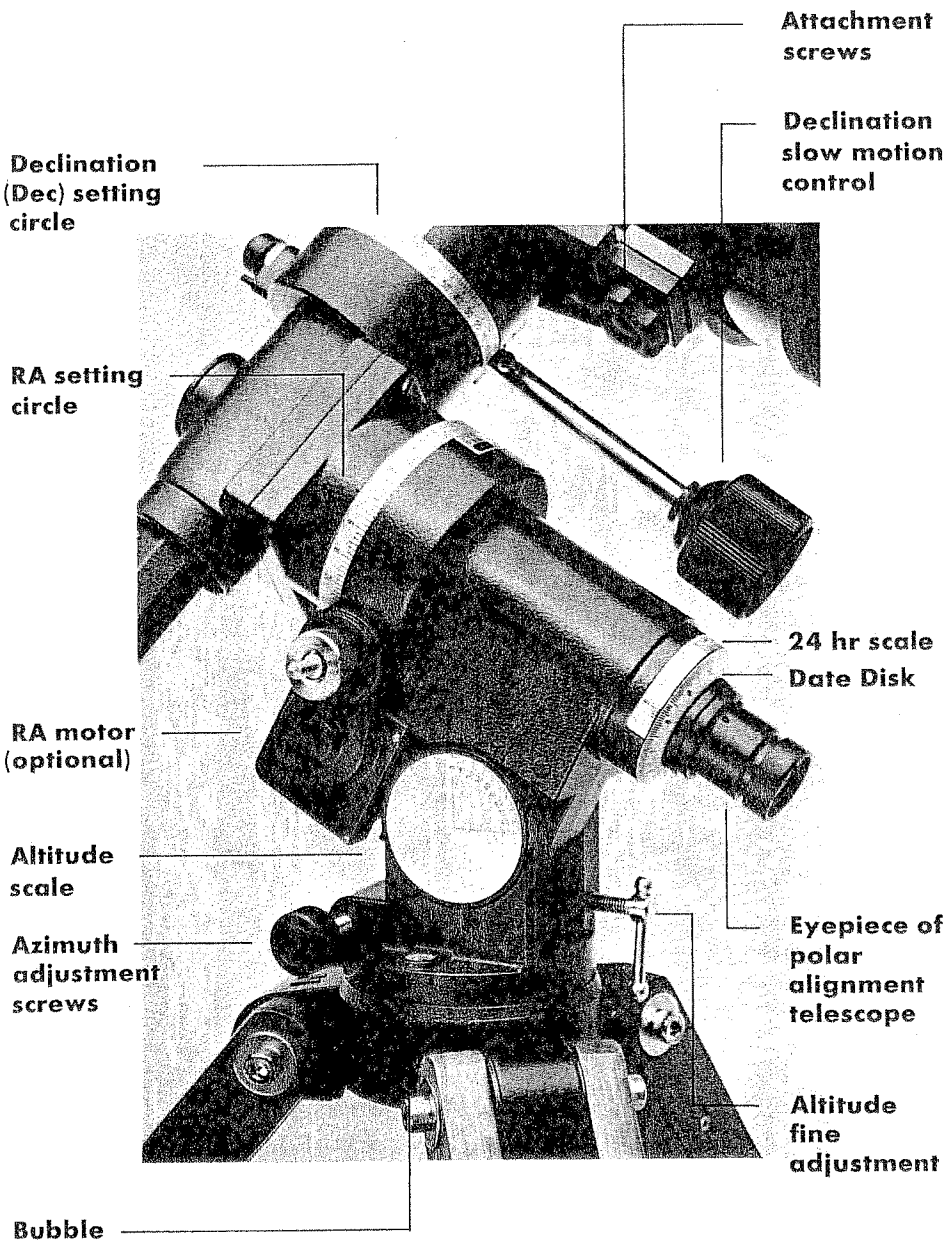


CELESTRON®

CELESTRON INT'L
2835 COLUMBIA STREET
TORRANCE, CA 90503

REFRACTOR
TELESCOPES
SP-C SERIES
INSTRUCTIONS

Super Polaris Mount



SP-C Series Refractor Telescopes

SP-C80.....	80mm aperture...f/11.4
	(910mm focal length) #21024
SP-C80F....	80mm aperture...f/ 8.0
	(640mm focal length) #21020
SP-C90.....	90mm aperture...f/11.1
	(1000mm focal length) #21014
SP-C90F....	90mm aperture...f/ 9.0
	(810mm focal length) #21015
SP-C102...	102mm aperture...f/ 9.8
	(1000mm focal length) #21012
SP-C102F..	102mm aperture...f/ 8.8
	(900mm focal length) #21013

(One element of the objective lens in the SP-C80F, 90F, and 102F is made of CaF₂ (fluorite) for supreme color correction and the ultimate in high contrast images for the perfectionist).

Specifications and standard features

SP-C80, SP-C80F, SP-C90, SP-C90F, SP-102, SP-C102F

Precision German Equatorial Mounting:
 Right Ascension (RA) and Declination (Dec) slow motion controls
 Polar alignment scope and az-alt adjustments
 RA and Dec setting circles
 Adjustable counterweight
 Adjustable tripod with accessory tray

Precision Tube Assembly:
 Fully baffled field (shielded from stray light)
 6 X 30 adjustable finder scope
 Rack-and-pinion focusing
 1.25" star diagonal and eyepiece
 Fully coated optics
 26mm multicoated Plossl eyepiece

All of the SP-C refractor telescopes offer good views of all types of astronomical objects, especially our own solar system neighbors, the Moon and planets. These telescopes perform to the theoretical limit to give detailed views of Venus, Mars, Jupiter, Saturn and the Moon. You can also view dozens of deep sky objects such as star clusters, gaseous nebulae, and galaxies. However, NEVER POINT THIS TELESCOPE NEAR THE SUN. You will risk permanently damaging your telescope and you will blind yourself if you look through the telescope!

Assembly of SP-C Series Refractors

First you will assemble the contents of the shipping containers into three major sections: the tripod assembly, the mounting, and the tube assembly. This will take about 20 minutes and need never be repeated. From then on it will take only a minute or two to assemble these 3 sections into the completed telescope. Disassembly is then as simple as separating the 3 sections.

First-time assembly should be done indoors on a large cleared table (except the tripod, which should stand on the floor). Open the shipping container and remove these parts. Lay them carefully on the table top and verify that all are present:

- A. A triangular accessory box containing:
 - 1. (3) Allen wrenches
 - 2. (3) Wing nuts
 - 3. Knob
 - 4. 1¼ inch star diagonal
 - 5. Polar alignment finder illuminator assembly
 - 6. 26mm Plossl eyepiece

- B. Set in styrofoam cutouts:
 - 1. Shaft extension with knob on end
 - 2. Declination counterweight shaft
- C. German equatorial mounting
- D. Counterweight
- E. Telescope tube assembly including:
 - 1. Lens cap
 - 2. Finder scope
 - 3. 2 mounting rings around tube
 - 4. Eyepiece focuser with 1.25" eyepiece adapter
- F. Tripod
- G. Tripod accessory tray
- H. Warranty and accessory information

Assembly of the tripod section

- 1 Spread the legs of the tripod and set the tripod upright on the floor.
- 2 Set the tripod accessory tray, concave side up, on the tripod leg braces, with the bolts in the tray going downward through the appropriate holes.
- 3 Secure the accessory tray by attaching the wingnuts to the bolts protruding through the underside of the leg braces.
- 4 Using the largest allen wrench, tighten the top of the tripod legs to the tripod head by tightening the bolts on both sides of the top of the legs.

Assembly of the mounting

- 5 Turn the azimuth adjusting knobs to make a .5" or larger gap between the ends of the azimuth adjustment bolts (seen from the underside of the mounting).
- 6 Place the mounting on the top of the tripod so that the gap fits over the azimuth north reference post.
- 7 Secure the equatorial mount to the tripod head, finger tight. This bolt secures the partially assembled mounting section to the tripod.

- 8 Lightly tighten the 2 azimuth adjustment knobs so the mounting does not rotate freely on the tripod (azimuth motion).
- 9 Rotate the large 8-sided grip on the top end of the counterweight shaft to expose the threads on the end of the shaft.
- 10 Attach the counterweight shaft to the mounting by screwing the threaded end into the threaded hole in the bottom end of the Dec assembly. Snug tightly by turning the 8-sided grip firmly.
- 11 Using the mid-size allen wrench, remove the counterweight safety limit stop from the bottom end of the counterweight shaft.
- 12 Back off the counterweight locking knob on the counterweight and slide the counterweight onto the counterweight shaft with the locking knob toward the Dec assembly.
- 13 Re-attach the counterweight safety limit stop to the end of the counterweight shaft (below the counterweight).
- 14 Tighten the counterweight locking knob with the counterweight at the bottom of the counterweight shaft (against the safety limit stop).
- 15 Attach the RA slow motion knob to the RA slow motion post protruding from either side of the RA housing of the mounting (align the set screw in the knob with the flat spot on the post and tighten the set screw).
- 16 Attach the Dec slow motion extension knob to the Dec slow motion post protruding from one side of the upper part of the Dec housing of the mounting (align the set screw in the knob with the flat spot on the post and tighten the set screw).
- 17 Loosen the Dec friction lever, rotate the instrument platform at the top end of the Dec housing until the Dec slow motion

extension knob is at its lowest possible position, and retighten the Dec friction lever.

(From now on, the entire mounting can be attached to (or removed from) the tripod by means of the knob on the underside of the tripod head).

Assembly of the tube assembly

- 18 Remove the knobs from the flats on the bottoms of the tube rings that hold the optical tube assembly.
- 19 Rotate the tube rings so that the flat attachment surfaces are aligned with the focusing knobs.
- 20 With the upper tube ring at about the midpoint along the tube, space the tube rings to match the spacing on the instrument platform and attach the tube assembly to the mounting by bolting the tube rings to the instrument platform at the top end of the Dec housing with the knobs you previously removed from the tube rings.
- 21 Remove the caps from the 1.25" star diagonal (in the triangular accessory box) and from the 1.25" eyepiece adapter (in the focuser) and insert the star diagonal into the 1.25" eyepiece adapter. Secure the star diagonal in the adapter with the knurled knob on the adapter.
- 22 Remove the dustcaps from the eyepiece and secure the eyepiece in the star diagonal with the knurled knob on the side of the star diagonal.
- 23 Loosen the Dec friction lever and point the tube at the horizon with the counterweight at its lowest position.
- 24 Slide the tube forward and backward in the tube rings until the tube is balanced in Dec (when tube is equally easy to move north or south in Dec). Tighten the tube rings around the tube by tightening the

- knobs on the side of the tube rings near the instrument platform.
- 25 Loosen the RA friction lever, move the telescope in RA until the counterweight shaft is horizontal, and then move the tube in Dec to point at the horizon (north or south). Tighten the Dec friction lever, but be sure to leave the RA friction lever in its full loose position.
 - 26 Hold the counterweight shaft horizontal and slide the counterweight back and forth until the telescope is balanced around the RA axis (when the end of the counterweight shaft is equally easy to move in either direction (up or down)). Firmly tighten the counterweight locking knob so the counterweight cannot slide on the shaft.

(From now on, the tube assembly may be attached to (or removed from) the mounting without rebalancing).

- 27 If you wish to raise or lower the height of the mounting to make observing more comfortable, loosen the 2 wingnuts near the bottom of each tripod leg, adjust the length of the center section, and retighten the wingnuts. Extend the legs only as far as necessary to make using your telescope comfortable; the less you extend the tripod legs, the more sturdy and free of vibration your telescope will be.
- 28 Remove the lens cap from the front of the tube and from both ends of the finder-scope.
- 29 Point the telescope at a familiar object that is at least 100 yards away. Center and focus the telescope on a recognizable part of the object.

- 30 Tighten the RA and Dec friction levers.
- 31 Using the RA and Dec slow motion knobs, EXACTLY center a specific part of the object.
- 32 Look through the finderscope and see if the same part of the object is centered as in the main telescope. If not, use the finderscope alignment thumbscrews to center the finder scope on the identical spot as the main telescope. Use the following procedure for aligning the finderscope:
 - a Back off all 3 alignment thumbscrew lock nuts.
 - b While looking through the finder scope, adjust the alignment thumbscrews until the crosshairs in the finderscope exactly center on the same point that is centered in the main telescope.
 - c Tighten all 3 alignment thumbscrew lock nuts. Make sure that this does not move the crosshairs from the correct point.

Setting up and taking down of your telescope

Your telescope is now assembled and ready to use. To take it down, simply remove the 2 knobs that secure the tube assembly to the mounting and lift the tube assembly off the mounting. Then loosen the single knob on the underside of the tripod head and lift the mounting off the tripod. Your telescope is now in 3 easy-to-assemble/disassemble sections.

Operation of your SP-C Series Refractor

The basic function of any telescope is to let you see objects more clearly and closer up than with your unaided eye. It does this by collecting more light and by magnifying the image to give you a close view and more detail. The SP-C Series

Refractors have 80mm, 90mm, and 102mm aperture objective lenses which gather about 130, 165 and 212 times more light than your eyes when they are thoroughly dark-adapted. With the 26mm Plossl eyepiece supplied with your telescope, objects will be magnified between 25 and 38 times, depending on which model you have. You can compute the magnification of any eyepiece with your telescope by dividing the focal length of your telescope by the focal length of the eyepiece. For example, the SP-C80 instrument has a focal length of 910mm. By dividing 910 by 26 (the focal length of the standard 26mm Plossl eyepiece) you arrive at the correct magnification of 35X.

The following chart shows the magnification you will get with each of the SP-C Series refractors with several Celestron eyepieces that work especially well with these telescopes:

	(1.25" PLOSSL EYEPIECES)				
	45mm	36mm	26mm	17mm	10mm
SP-C80	20	25	35	54	91
SP-C80F	14	18	25	38	64
SP-C90	22	28	38	59	100
SP-C90F	18	22	31	48	81
SP-C102	22	28	38	59	100
SP-C102F	20	25	35	53	90

	(1.25" ERFLE EYEPIECES)				
	32mm	28mm	24mm	20mm	16mm
SP-C80	28	33	38	46	57
SP-C80F	20	23	27	32	40
SP-C90	31	36	42	50	63
SP-C90F	25	29	34	40	50
SP-C102	31	36	42	50	63
SP-C102F	28	32	37	45	56

All the preceding magnification values are approximately TRIPLED when used with Celestron's deluxe 2X Barlow lens (optional accessory) between the star diagonal and the 1.25" adapter. Similarly, any Barlow lens used in this manner with your SP-C Series refractor will increase the magnification about 1.5 times as much as specified on the Barlow lens. If you remove the star diagonal from the telescope (so the eyepiece goes directly into the Barlow lens), then the increase in magnification will be as specified on the Barlow lens.

By no means do you need to purchase all of these eyepieces! We suggest one or two plus a high quality 2-3X Barlow lens. A good choice of accessory eyepieces would be a 16mm Erfle or 10mm Plossl along with the Barlow lens. If you wish to do a lot of low power, wide field observing, then you might also consider either the 32mm Erfle, or else the 36mm or 45mm Plossl eyepiece.

Your first look

Your first look through your telescope should be of a bright, easily seen object such as the Moon or a distant land-based object such as a tree or a building (at least 100 yards away). DO NOT LOOK AT THE SUN! Make sure the lens cap and eyepiece covers are removed and the eyepiece is locked in the star diagonal. Now look through the eyepiece and turn the focusing knobs until you see a sharply focused image. You can scan the area around this object by loosening the RA and Dec friction clamps and manually moving the telescope, or by tightening the friction clamps and using the slow motion knobs (the slow motion knobs

operate only when the friction clamps are tightened).

Land-based objects at different distances will require different focus positions, but all astronomical objects will have the same focus position, infinity. When focusing on any object, best results will be obtained if you pass back and forth through focus a couple of times before settling on a final focus position.

The moon, near its first quarter phase, provides the most dramatic view of all astronomical objects. Even with the low power eyepiece supplied with your telescope, you can see a wealth of detail on the surface of the Moon, including craters, mountains, lava flows, and numerous bright and dark markings. With higher powers (up to about 6 times the magnification of your 26mm eyepiece), smaller and smaller features can be seen down to a couple of miles in diameter.

The rings of Saturn and even the small, dark division in the rings (Cassini's Division), will be visible when seeing conditions are good (the atmosphere is steady). You will also be able to see four of Jupiter's moons at times, and cloud markings in Jupiter's atmosphere. Other interesting objects are the polar caps of Mars, and the phases of Venus. There are dozens of deep sky objects within the reach of your telescope, many of which are very impressive when viewed on a clear, dark night. The best deep sky objects to look for first include:

- M42--Great Nebula in Orion
- M31--Andromeda Galaxy
- M45--Pleiades Open Cluster

- M13--Globular Cluster in Hercules
- M57--Ring Nebula in Lyra
- M27--Dumbbell Nebula in Vulpecula
- M22--Globular Cluster in Sagittarius
- M81--Galaxy in Ursa Major
- M82--Galaxy in Ursa Major
- M44--Beehive Cluster in Cancer
- M35--Open Cluster in Gemini
- Double Cluster in Perseus

You can also find dozens of interesting double stars, some very close together, like the double double in Lyra, and some very colorful like Alberio, the gold/blue pair in Cygnus.

Aligning your mounting with the earth's axis

Because the earth rotates on its axis, all astronomical objects seem to rise and set each day. Everyone is familiar with this phenomenon as it applies to the sun, causing the daily cycle of sunrise and sunset, but it also applies to all other astronomical objects. Though this motion seems very slow to the unaided eye, it is magnified by your telescope to the point that objects drift through the field of view in only a few minutes with the standard eyepiece and in as little as 30 seconds with optional higher power eyepieces. You can keep objects centered in the field by slowly moving the telescope manually with the friction levers unclamped or by turning the slow motion knobs with the friction levers tightened. If you align your telescope mounting with the earth's axis, you will make this process easier by limiting the required motion to only the RA axis. When aligned, the optional battery-powered clock drive will automatically keep objects centered in the field once you find them.

To align the RA axis of your mounting with the earth's axis, follow these steps:

- 1 Locate Polaris (the North Star) in the sky and point the RA axis of the telescope in the direction of the North Star.
- 2 Adjust the tripod legs until the bubble level on the top left side of the tripod head indicates the tripod is level. To center the bubble, extend the tripod leg opposite the side of the circle the bubble is nearest.
- 3 Loosen the altitude adjustment clamping knobs on the bottom side of the mounting and, using the altitude adjustment lever on the rear of the mount, set the pointer on the RA housing to your latitude on the altitude indicator.
- 4 Remove the caps from the polar alignment finder (one is located at the bottom (south) end of the RA axis and the other on the Dec housing in line with the RA axis).
- 5 Point your telescope to 0 degrees declination, using the Dec setting circle. Look through the polar alignment scope, and using the azimuth adjustment knobs, bring Polaris (the North Star) to approximately the center of the field. You may find that for visual observing this is good enough, and skip the rest of the alignment procedure. But if you want the setting circles to be highly accurate, or if you are planning to do astronomical photography, you must complete the rest of the polar alignment procedure.
- 6 Look at a map or atlas that shows the longitude of your observing site. Determine how far east or west of the nearest standard line of longitude you are (standard lines of longitude are multiples of 15 degrees; 90, 105, 120,

135, 150, for example). Set the distance east or west of the nearest standard line of longitude on the "date disc" (just above the polar alignment telescope eyepiece) at the white reference line.

- 7 Move the telescope in RA until today's date on the "date disc" is adjacent to the current STANDARD time on the adjacent 24-hour time strip numbered 18h through 06h (be sure not to use daylight savings time; it is one hour too high). Tighten the RA friction lever.
- 8 Install the polar alignment field illuminator into the polar alignment hole in the Dec housing and turn it on. Look through the polar alignment telescope and precisely center Polaris in the small circle on the circular reticle line by adjusting the altitude and azimuth of the telescope with the altitude and azimuth adjustment controls. When Polaris is properly centered, lock the altitude and azimuth with the appropriate controls and be sure that Polaris is still centered in the small circle. Remove and store the field illuminator, making sure you turn it off first.

Your telescope is now accurately aligned with the earth's rotational axis and you will find that your setting circles (and optional clock drive) will operate with high accuracy.

Slow motion control

To move the telescope through large distances, loosen the RA and Dec friction clamps and point the telescope to the approximate section of the sky by hand. For centering and scanning small areas of the sky, tighten the friction levers and turn the slow motion control knobs to move the telescope to center and track objects.

Using setting circles

The Right Ascension (RA) setting circle is located on the north (upper) end of the RA housing of the equatorial mount. The Declination (Dec) setting circle is located under the tube cradle (instrument platform). To use the setting circles to find a particular star, you must first have polar aligned your telescope. Center a familiar bright star, whose coordinates you know or find in a book or star atlas, in the field of view and tighten the RA and Dec friction levers. Turn the RA setting circle so that the RA indicated by the pointer is the correct RA for the star you have selected. The Dec setting circle will normally not need any adjustment, but check to be sure and adjust it too if necessary. Now that the setting circles are set, you can move the telescope until the RA and Dec coordinates of an object you want to observe are aligned with the pointers and find the object in a low power field of view. Use the slow motion controls to exactly center the object if desired. Before you move your telescope to a new object, reset the RA circle to the correct RA of the current object. This is necessary to compensate for the earth's rotation during the time you have been pointing at the current object. If you forget, you will find the next object is to the west of the position indicated by the RA circle by an amount equal to the time since you last set the RA circle.

Taking pictures through your telescope

You can use your telescope as a long focus (high power) telephoto lens by attaching a 35mm camera body (without the camera lens) to the rack-and-pinion focuser with Celestron's prime focus T-

adapter (part #93634) or projection T-adapter (part #93647). These adapters attach directly to the eyepiece focuser, so you will have to remove the 1.25" eyepiece adapter and star diagonal before attaching the camera. Look through the viewfinder of your camera and focus with the rack-and-pinion focuser. You will have to vary the camera shutter speed to obtain properly exposed pictures, since there is no means to set the f-stop on the telescope. Never point your telescope near the sun or you will blind yourself and/or ruin your camera.

Care of your telescope

Your telescope has been designed to be maintenance-free. The only normal care you need show your telescope is common sense: keep all optical surfaces covered (lens caps for all accessible optical surfaces are supplied), avoid dropping the instrument or subjecting it to significant mechanical shock, and avoid spilling liquids on the telescope. With this simple care, you will find that it takes a long period of use (usually more than a year), before a significant buildup of dust and/or film will occur on the objective lens. Because eyepieces are handled more often and come into contact with body acid and dust from eyelashes fairly often, they will probably need more frequent cleaning. When it is time to clean any of your optics, follow these guidelines:

- use only optical lens cleaning fluid and lens tissue (available at camera stores).
- before using fluid, remove dust particles with a camel's hair brush or pressurized air.

---when cleaning with fluid, use only gentle, long strokes with moistened tissue.

The non-optical parts of your telescope may be cleaned when desired with a very slightly damp, soft cloth.

**Accessories for
your telescope**

- 1 Battery-powered RA motor with hand control. Automatically tracks objects as they rise and set, and allows quick centering with 2X and 8X push buttons and reverse switch. (#93811)
- 2 Battery-powered RA and Dec motor with 4-button hand paddle. (#93810)
- 3 Computer control system for automatic pointing to coordinates that you specify, or to one of about 200 selected objects stored in its internal memory. (#93797)
- 4 Extra eyepieces for different magnification:
 - 10mm eyepiece (#93311)
 - 16mm " (#93320)
 - 17mm " (#93313)
 - 20mm " (#93321)
 - 24mm " (#93322)
 - 26mm " (#93315)
 - 28mm " (#93323)
 - 32mm " (#93324)
 - 36mm " (#93316)
 - 45mm " (#93317)
- 5 Eyepiece filter set. (#93541)
- 6 Optics cleaning kit. (#93592)
- 7 60mm guide scope. (#91017)