ASTRO-PHYSICS, INC

11250 Forest Hills Road
Rockford, IL 61115
Phone (815) 282-1513
Fax (815) 282 9847

07/10/97

Dear Amateur Astronomer:

Thank you for your interest in Astro-Physics. We have attempted to provide extensive specifications and technical information as well as helpful suggestions to aid in the selection of your instrument. Color snapshots and illustrations are included to provide you with a visual image of our equipment. We hope that you find our brochure informative and welcome any feedback regarding its content.

Astro-Physics is a professional optical and mechanical production facility for the discriminating observer. If you have developed an eye for high-contrast, high-resolution optics, then you may wish to consider an Astro-Physics refractor. Over the years, we have gained an excellent reputation worldwide for the quality of our optics and mountings. We take the time and effort to produce the surface figure on our lenses required to achieve the visual and photographic performance that our customers require.

At this time, we are pleased to accept new orders for the 130 f6 StarFire EDF. Unfortuantely our current production of the 105 EDF Travelers and 155 StarFire EDF/EDFS has been sold out and we are unable to accept new orders at this time. If you would like to be notified when we open orders for the next production run, please give us a call or write a note. We have not planned any new production runs in 1997 for the 130 f8 StarFire EDT, 180 f9 StarFire EDT, and 180 f7 StarFire EDF. We have determined that the 180mm instruments will be too expensive to produce in the foreseeable future.

The 800 German Equatorial Mount has been sold out and is no longer available. As always, we will continue to support the 800 mounts in the field and all of our refractors past and present.

At the present time, this is our estimated delivery schedule for new orders:

105 f6 Traveler EDFS	production is sold out, cannot accept new orders
130 f6 StarFire EDF	March 1998
155 f7 StarFire EDF/EDFS	production is sold out, cannot accept new orders
400 Equatorial Mount	October 1997
600E Equatorial Mount	February 1998
900 Equatorial Mount	September 1997
1200 Equatorial Mount	November 1997

Again, thank you for reviewing our literature. If you have any questions, please write or give us a call.

Sincerely,
Marjorie Christen
Vice President

Requested New brochure 11/11/99

BROCHURE NEWSLETTER

UP TO THE MINUTE DEVELOPMENTS AT ASTRO-PHYSICS

PRODUCT NEWS

ASTRO-PHYSICS MAXBRIGHT 2" DIAGONAL (PMDMAX)

We are excited to introduce our new MAXBRIGHT 2" mirror diagonal. Several unique features separate our diagonal from others on the marrket. Dialectric coatings provide reflectivity above 99% over the entire 4000 to 7000 Å photo-visual range and are the most durable, cleanable coatings available today. The diagonal also features our popular brass locking ring; baffled, flat back interior and are threaded fro 48mm filters.

ZEISS 1.25" ABBE ORTHOSCOPIC EYEPIECE SET (ZEISSAO)

Zeiss Abbe Orthoscopic Oculars are available once again from Zeiss Jena. We are offering a set including the 4,6,10,16 and 25mm oculars with a walnut case. Please note that the 34mm ocular is available as a separate item. The walnut case will accommodate all six eyepieces.

34 mm ZEISS 1.25" ABBE ORTHOSCOPIC EYEPIECE (ZEISS34)

The 34mm is a new issue in the Zeiss Abbe Orthoscopic eyepiece series. This focal length was not offered previously.

WALNUT CASE FOR ZEISS EYEPIECE SET (ZEISSBOX)

This custom walnut case is velvet-lined with molded inserts for all six Zeiss Abbe Orthoscopic Oculars. All eyepiece sets will include this case and a limited number of cases are available for collectors who may already own some of the oculars.

KENDRICK 12 VOLT, 17 AMP HOUR BATTERY WITH 110 VOLT RECHARGER (KDR171)

This 17 amp battery will allow you to operate your mount or Kendrick Dew Remover system for longer periods without recharging than a 12 amp battery. Each battery comes with a 110 volt recharger, soft pack carrying case with should.er strap, are fused and have a cigarette lighter jack. It weighs 13 lbs. and has dimensions of 8"W x 4"D x 8"H.

KENDRICK 12 VOLT, 17 AMP HOUR BATTERY WITH 220 VOLT RECHARGER (KDR172)

This is the same battery described above with a 220 volt recharger for our overseas customers.

8X50 RIGHT ANGLE AND STRAIGHT-THROUGH FINDERS, 80X900MM GUIDESCOPES

We are unable to accept orders for these items at this time. We anticipate that these products will be available later in the year. The Quick Release Brackets and 3.9" Guidescope Rings are available and can be used with all 7x50, 8x50 or 9x63 finders that we know of.

MAKE A FASHION STATEMENT

In response to many requests, we now offer royal blue Astro-Physics T-shirts, sweatshirts and caps emblazoned with a bright white design sure to make you the fashion hit of your next star party. The 9 oz. sweatshirts are great for cool evenings and the caps keep the sun from your eyes during your daylight activities. These items are listed toward the end of our price list.

EXPERT PROCESSING OF YOUR CHERISHED ASTROPHOTOS

Tony and Daphne Hallas now operate a photoprocessing lab devoted to astrophotography. Let these experts extract the best images possible from your negatives. For information, write or call: Astro Photo, Tony & Daphne Hallas, 165 Alto Drive, Oak View, CA 93022 . Phone: 805-649-1001.

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ASTRO-PHYSICS, INC, 11250 Forest Hills Road, Rockford, IL 61115
Phone: 815-282-151302-2197

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ASTRO-PHYSICS, INC

ASTRO-PHYSICS has been developing telescopes and accessories for the advanced amateur since 1975. We now offer an extensive line of precision telescopes and mountings, all with outstanding performance for a variety of observing needs. If you have decided that refractors fit your requirements, you will find our line of Apochromats to have the highest performance of any refractor on the market. Our telescopes were developed with the active observer in mind. We have concentrated on those things that make observing a joy: sharp high-resolution optics, rugged vibration-free mountings and easy to use effective accessories.

HISTORICAL PERSPECTIVE

Astro-Physics has been at the forefront of optical design for more than a decade. In the early 1980s, Mr. Roland Christen, founder and president of Astro-Physics, introduced the first high performance affordable apochromats to the amateur market. These early Astro-Physics refractors were quite revolutionary and were a major influence in the rebirth of refractors.

The more common achromats available at that time showed significant chromatic aberration even with focal lengths of f15. They were (and still are) very long and awkward, particularly if portability to a dark sky site is desired. Both 5"f15 or 6"f15 doublet tube assemblies (focal lengths of 75 and 90 inches respectively) require a substantial mount on a tall pier or tripod to accommodate the length of the instrument and counteract the torque reaction that is inevitable when the breezes blow. The chromatic aberration coupled with the enormous size and weight of these instruments and their mountings deterred many amateurs from using refractors larger than 4" in the 1960s and 70s.

As an avid amateur astronomer, Roland was dissatisfied with the telescopes that were available in the 1970s. He knew that even the achromats of the day showed snappier images than his 8"SCT, but he wanted a shorter scope which could be used for photography as well as high definition planetary images. Over a period of several years, he designed and built several refractors with shorter focal lengths using a triplet design. The color correction was very good even as short as f6.

In the 1980s and 90s, Astro-Physics' optical designs evolved several times and with each new design, new levels of performance were achieved. The quality of construction of the tube assemblies, sophistication of the mounts and range of accessories have also improved each year.

In 1992, we were very proud to introduce our line of refractor lenses which incorporated synthetic fluorite ED glass in various optical designs. This optical material has further revolutionized the modern refractor by all but eliminating the last vestiges of false color in fast refractors.

Since the early 90s, we have expanded our production facilities with the most modern CNC production equipment available. This includes computer automated lathes and machining center complete with a CAD-CAM design center. We have also installed one of the most advanced optical production systems in the world, the Opticam SX, a computer automated precison-lens generator originally developed to produce high-end military and space optics.

ASTRO-PHYSICS DESIGN PHILOSOPHY

At Astro-Physics, we are fully committed to the production and development of amateur telescopes and accessories. Our goal is to produce the highest possible quality components and keep them affordable to the average amateur. Amateur telescopes are the only product that we produce; we do not get sidetracked into commercial or military projects. Most of our technical and production staff are amateur astronomers themselves, so they understand the unique needs of our customers. We strive to build almost every part from scratch at our own facility in Rockford, Illinois. This includes not only the individual optics, but also the critical gears, circuit boards and components right down to the knobs and fittings.

APOCHROMATIC LENS DESIGN

Our objectives are APOCHROMATIC, which means that the images are essentially free of false color, both visually and photographically. We have chosen the most advanced synthetic fluorite E.D. glass to be the heart of our optical designs because of its excellent light transmission and superior correction of all the monochromatic and polychromatic aberrations. There are many less expensive E.D. (Extra low Dispersion) glasses on the market which can be used to make refractor lenses. The most commonly used E.D. materials only partially correct the secondary spectrum errors, while the least expensive versions are little better than traditional crowns used in old fashioned doublets. Lenses made from these materials can provide satisfactory views for some individuals, but those amateurs who demand that last bit of contrast and definition will find there is no satisfaction in using a lens made from cheaper materials.

The StarFire EDF design was originally developed for our 6" astrograph. We found it to perform superbly as a visual planetary instrument and therefore converted all of our lenses to that design, including the 105 Traveler. The views are extraordinary. The superb color correction of these EDFs surpasses the fluorite doublets, particularly in the far violet part of the spectrum where Technical Pan films have their highest sensitivity. Our latest designs have excellent infrared corrections to 10,000 Angstroms, making them very suitable for CCD imaging.

The fast focal ratio of the StarFire EDF design is particularly attractive to amateurs who long to achieve superb, wide field astrophotos. For avid astrophotographers, we offer these EDF refractors with giant 4" focusers to allow coverage of very large film formats with minimal vignetting. In the hands of knowledgeable astrophotographers, these instruments can produce superb, professional astrophotos of all their favorite deep-sky objects. Images are so sharp, it takes 30" x 40" enlargements to resolve the finest details.

We also offer several models with the EDFS designation that incorporate the 2.7" focuser. These refractors are for those amateurs who desire the ultimate portable, versatile refractor, but who do not require the larger focuser.

One of the important advantages of a short focal length is that the mounting can be smaller, lighter and more compact. The result is a highly portable refractor system with superior imaging qualities, ideal for a wide variety of astronomical work from high-power lunar/planetary to deep sky astrophotography.

MOUNTINGS

Astro-Physics mountings are designed for solid stability under a variety of observing conditions. At the same time, the mounts are truly portable so that amateurs can transport them to their favorite dark-sky site and set them up quickly and accurately. The mountings break down into manageable sizes, but when set up, they are extremely rugged and steady platforms. We have also developed a very accurate worm gear set to insure smooth, effortless tracking of celestial objects for all visual and photographic purposes.

To achieve these performance criteria, we combined the latest technology with time-tested design concepts. The basic mounting configuration was engineered with proper vibration and strength of materials criteria. As in a good building design, all loads are channeled into massive load-bearing cross sections to their final destination - the ground. This is done in a way that minimizes weight and size while maximizing rigidity. To this stability, we have added a drive that is accurate and sophisticated enough for the most demanding application. We started with a custom-manufactured fine-pitch worm gear and added a high-resolution stepper motor with a quartz micro-drive push-

button controller that makes tracking the stars a snap, even for beginners.

ACCESSORIES

To these basic telescope components, we have added a whole list of accessories that make our telescopes versatile. From camera adapters to telecompressors, we have carefully designed them for their functionality and compatibility. They are all tested and proven in the field under actual observing conditions.

ASTRO-PHYSICS FACILITIES AND STAFF

In September 1990, our dream of moving into a new, specially designed facility came true. Since Astro-Physics is one of the few telescope companies that actually make most of the items in their product line, we needed a building that would allow us to perform each function in the most efficient manner. Over the years, we have assembled a staff of talented, skilled craftspeople dedicated to producing very high quality products. They take personal pride in their accomplishments and in your satisfaction.

OPTICAL PRODUCTION

We manufacture all of our telescopes in our modern optical facility, so our telescope optics are 100% AMERICAN-MADE. We use only precision "A" grade optical glass, which has high light transmission characteristics and is free of striae and imperfection.

All optical surfaces are polished on pitch and hand-corrected. Each lens is tested, polished and retested repeatedly throughout the production process. We continue until the desired performance is achieved.

In 1995, we installed a new Opticam SX computerized microgrind system to our optical department. Originally developed at the University of Rochester Optics Laboratory for advancing optical technology in America, the Opticam system completely eliminates all traditional tooling and fixturing needed for fabricating precision optics. A raw glass blank is loaded into the machine, and a finished, ready to polish lens element results in only 25 minutes. All this is accomplished without grinding components or grit. The glass surfaces are rough and fine ground, edged and optically centered with a series of special bound diamond tools. Tool motions are computer controlled with 100 nanometer resolution. Almost any spherical surface can be generated, convex or concave, as well as the most complicated aspheric that can be described by a mathematical expression. This is all done in a clean, temperature controlled environment that ensures the highest possible accuracy and precision in the final product.

Where the opticians used to spend an inordinate amount of time in the dirty, time consuming job of grinding, they can now concentrate much more time on polishing and figuring the optical surfaces. The Opticam SX facility is just one example of the total commitment we have at Astro-Physics to the hobby of amateur astronomy.

As part of our overall Quality Program, Astro-Physics installed a Fitzeau interferometer that allows us to measure the wavefront error of a lens during the final figuring phases. The lens is held in a special multi-point flotation cell in a vertical orientation to simulate actual observing conditions. The interferometer uses two wavelengths of light, yellow and green, to fully characterize lens aberrations.

The interferometer is used as part of the lens making process, not just as a final quality assurance check. Lenses are finished one at a time until they meet or exceed our quality standards. A lens is finished when it displays a wavefront accuracy of $\lambda/50$ RMS (Strehl Ratio of 98.4%). This is well within the diffraction limit, and a lens with this smooth of a wavefront will be a superb planetary objective.

DESIGN ENGINEERING

We are fortunate to have on our staff one of the most capable of all amateur telescope designers in the world today. His experience goes back more than 30 years and includes refractors, reflectors, Cassegrains and mountings of every size and description. What begins as drawings and calculations on the computer screen eventually ends up in the hands of our top grade machinist as a finely crafted work of art. Our CAD-CAM system is so sophisticated that every surface of a part is fine machined and de-burred automatically. Even parts that are buried deep inside an assembly and may never be seen by anyone are fully machined, de-burred and finished to a high degree with no rough edges or saw marks to mar the integrity of the final product.

MACHINING CAPABILITIES

Most of our components are machined in-house on our ultra-modern 3-axis CNC (computerized numerical control) lathe and CNC machining center. Our highly skilled machinists maintain very accurate tolerances so that parts fit together precisely with no slop. As a result, our mountings are very rigid and our focusers are smooth with no wobble.

TUBE ASSEMBLY

Tube assemblies are now fully machined, complete with machined-in baffles, on our CNC lathe. This insures that all mechanical components from the focuser to the lens cell are accurately held in perfect optical alignment. The tubes are finished with a high quality polyurethane automotive paint on the outside, and a flat black finish on the inside.

MOUNT ASSEMBLY

Our mount assembly department is staffed by highly experienced professional telescope makers who are also advanced users and observers. Consequently, they understand how a precision mounting should feel and be adjusted. This experience is brought to the construction of each mounting. The components of our hand controllers are carefully soldered to the circuit boards and tested prior to shipment. Circuit boards and electronic components are purchased to the more rugged industrial specs instead of the cheaper consumer specs so common in inferior equipment. The components of our telescope drives will perform properly from the coldest Arctic to the hottest desert conditions that an amateur is likely to experience.

PACKING AND SHIPPING

When you receive your order, you will discover that a great deal of care was given to the safe packing of each item. It is very rare that any item is damaged during shipment.

OFFICE PERSONNEL

The office staff will be your primary source of information regarding products and prices, estimated delivery dates and the status of your order. If we can be of assistance to you in any way, please ask.

Astro-Physics offers unique, unobstructed, highly corrected optical systems designed to give a lifetime of observing pleasure. When choosing a telescope, we encourage you to compare, side by side, optical and mechanical qualities with scopes of similar and even greater size.

ASTRO-PHYSICS, INC

11250 Forest Hills Road
Rockford, IL 61115-8238
U.S.A.
Phone: 815-282-1513
Fax: 815-282-9847

ASTRO-PHYSICS APOCHROMATIC REFRACTORS

OPTICAL DESIGN

The optical design of all lenses currently in production is patterned after the 6" EDF astrograph objective. The EDF design uses synthetic fluorite, FPL53, which has excellent optical, mechanical and thermal properties. Although it is the most expensive E.D. optical glass currently available, its singular ability to bring a wide spectrum of colors to a common focus places it several notches above the nearest rival. The two mating crowns that make up the final triplet assembly are chosen to compliment the E.D.'s optical characteristics as closely as possible, resulting in a well corrected spectrum range spanning 6000 Angstroms. While the color correction was originally chosen for photographic emulsions, these lenses are especially well corrected for the critical visual colors from red to violet. This makes them superb planetary instruments, easily rivaling and outperforming the old long focus doublets.

OPTICAL PRODUCTION AND TESTING STANDARDS

Every production run starts with optical glass purchased to our specifications. Each blank is tested by our suppliers to meet H3 optical quality standards and is individually serialized and accompanied by an interferogram. This level of precision is 50 times tighter than that normally guaranteed by the glass manufacturers in a precision annealed pressed blank. We have found it necessary to specify this high purity in order to guarantee that every optic we produce will meet our final quality standard.

These blanks are then processed in our Opticam SX microgrinding facility and polished by experienced opticians. Each surface is polished to a fine sphere and tested by test plate interferometry. Three elements are then matched and assembled as a set. Final figuring on the front and rear surfaces is done using our green light Fitzeau interferometer which checks the wavefront accuracy. The interferometer immediately shows when a polishing lap is worn when zones develop on the glass surfaces. A new lap can then be made without guesswork to again produce a smooth surface.

To achieve the highest possible surface accuracies, we employ Supersmooth techniques. One of our principal opticians specialized in this polishing technique before joining us at Astro-Physics. Supersmooth surfaces were originally made on first surface mirrors used in ring laser gyros. While it was mainly to prevent scattered noise in the laser light, this technique also produces very accurate surface profiles. Producing a Supersmooth surface is not easy, since the pitch laps have to be continually monitored and re-made as they wear. The polishing compound is a special liquid that can only be used in the final stages of correction. The result of this time consuming method is that individual surfaces can be fabricated with errors on the order of 1/30 wave P-V and a typical triplet apochromat containing six optical surfaces will have wavefront errors smaller than 1/50 wave RMS at 543.5nm in the green.

The finished lens is then coated and assembled in a precision cell which is fully temperature compensated. The cell is attached to the tube assembly and the optical alignment is checked at high power on an artificial star. The lens is serialized and all test data including final interferogram are stored in a computer file along with the customer's name. Our success with Supersmooth techniques and the use of H3 quality blanks allows us to guarantee that all production lenses will meet the 1/50 RMS (98.4% Strehl ratio) minimum limit.

CONSTRUCTION OF THE TUBE ASSEMBLY

The mechanical construction of Astro-Physics refractors makes the scopes completely trouble-free and keeps the optics permanently aligned. Their gorgeous tube assemblies are precision machined in our shop with modern CNC equipment. There are no fragile die casts in these telescopes. Our expert machinists transform solid, aircraft-quality aluminum into a fully baffled tube assembly with a large number of knife-edge baffles. This eliminates as much stray light as possible for maximum contrast at the eyepiece. The exterior finish of the tubes and dewcaps will retain their deep, lustrous beauty for many years.

We have incorporated several significant improvements to the tube assembly to make it easier to transport and set up in the field. The dewcap slides over the lens cell for more compact storage. An aluminum dust cover protects the optical surface when not in use, and a foam-fitted carrying case will help retain the beauty of your tube assembly for years. You will appreciate the unique design and fine craftsmanship of these fine telescopes.

ASTRO-PHYSICS 2.7" FOCUSER (27FOCU)

Our superb Astro-Physics focuser is a very finely crafted unit with several unique features. The components are machined to extremely high tolerances, assuring that there is no wiggle between the drawtube and housing. More than a dozen knife-edge baffles are machined into the wall of the drawtube and painted flat black in order to maximize contrast by essentially eliminating any internal reflections. The inside diameter (I.D.) of the drawtube is 2.7" which allows the avid astrophotographer to use a medium-format camera to capture images in a 2.25" x 2.25" format with minimal vignetting. The helical rack and pinion provides smooth motion, free of backlash or wobble, for precision focusing. Our machined aluminum knobs were designed with comfortable, firm handling in mind. The adapter thumbscrews are substantial and easy to grasp.

Brass locking rings are an important feature of our focuser. We realize that many of our customers use a variety of heavy and expensive accessories including 2 lb. eyepieces, 35mm and medium-format cameras, binocular viewers, etc. So, we designed our focuser with recessed brass locking rings at each thumbscrew location. As you tighten the thumbscrew, the brass locking ring clamps onto the part that has been inserted. Consequently, your focuser drawtube, and 2" and 1.25" accessories are held securely in place. As an added advantage, the brass will not mar the surface of your accessories.

This focuser is included with all of our StarFire refractors (except those with a 4" Focuser) . The 2.7" focuser is also a first class choice for the do-it-yourselfer who takes pride in constructing his own tube assembly.

- All components are machined of high quality aluminum. Housing is black anodized
- Brass locking rings to secure focuser drawtube, 2" and 1.25" accessories
- 2" adapter is aluminum, black anodized, screws into focuser drawtube, brass locking ring, thumbscrew
- 1.25" adapter is aluminum, black anodized, slips into 2" adapter or 2" diagonal, brass locking ring, thumbscrew, threaded for 48mm filters
- Focuser extension is aluminum, black anodized, threads into focuser drawtube, knife-edge baffles, 2.5" length, use for straight-through viewing
- Inside diameter of focuser draw tube is 2.7"
- Focus travel with the 2" adapter is 4.4"
- Focus travel with telecompressor is 5.0"
- Overall length of the focuser when fully racked in with 2" adapter is 4.8"
- Overall length of the focuser when fully racked in with 1.25" adapter is 5.25"

We invite you to compare the optical performance and mechanical construction of any other scope of comparable size on the market today. You will find that the Astro-Physics apochromatic refractors are the finest, most versatile scopes of their size. Just ask our customers. worldwide.

ASTRO-PHYSICS

105 F6 TRAVELER EDFS - 4.1" aperture (105EDFS)

Imagine an apo refractor with a 105mm (4.1") aperture, focal ratio of f6, in a tube assembly that has an overall length of 19"! The 105 Traveler is the culmination of years of optical research by Roland Christen of Astro-Physics aimed at developing a very fast and portable telescope that will allow you to enjoy sharp, high-contrast images wherever you go.

The Traveler is an awesome performer both at night and during the day due to the superb figure of the lens and extremely efficient design of the optical system. Based on light gathering area alone, the Traveler has 36% more light grasp than a 3.5" Maksutov and 10% more light grasp than a 100mm refractor.

During the daytime, delicate detail and vivid colors of flowers and wildlife are a true joy to observe. When viewing at night, the high light transmission of the extremely pure optical glass becomes immediately apparent. With a 2" widefield eyepiece, we have seen the entire Veil Nebula, including the very faint inner region, all in one eyepiece field of view. The North American Nebula region is so bright and clear, it looks like a deep-sky astrophoto. Pop in a high power eyepiece, and you will be rewarded with truly stunning views of the Moon and planets. Jupiter will amaze you with sharp resolution of the bands, festoons, white ovals and the Great Red Spot. This scope shows detail on Saturn and Mars that rival views in much larger instruments.

The Traveler is a fabulous astrograph. With a Pentax 6 x 7cm camera coupled with our 2.7" field flattener specifically designed for this instrument (67PF46), you can capture 5.6 x 6.6 degrees of stunning star fields, clusters and nebulas at f6! If a faster focal ratio in a 35mm format is desired, use our Telecompressor (27TVPH) for f4.5, or our 2x Barlow (BAR2X0) for f12 exposures.

Please refer to the "Astro-Physics Apochromatic Refractors" section for specific information regarding the optical design and mechanical construction of this fine refractor.

Pairing the Traveler with the 400 German Equatorial (400QMD) will assure your greatest enjoyment of astronomy. The dual axis drive keeps the object that you are viewing in the center of the eyepiece allowing you to relax and enjoy the fine detail. Nature studies are most easily accomplished with an alt-azimuth mount such as the TeleVue Gibraltar .

Whether traveling to exotic eclipse locations, your favorite camping spot, bird watching expeditions or just into your backyard, this little gem will provide you with hours of observing pleasure.

105mm Traveler EDF, 400 German Equatorial with Encoders, Adjustable Aluminum Tripod and other accessories

SPECIFICATIONS

Color correction:	Less than 0.01% focus variation from 405nm to 706nm (r to h wavelengths)
Clear aperture:1	105mm (4.1")
Focal length:	610mm (24") (actually f5.8)
Resolution:	1.1 arc seconds
Coatings:	Multi-layer, overall transmission greater than 97% in peak visual wavelengths
Magnification range:	12x to 400x
Tube assembly:	Black finish, 19" aluminum tube, fully baffled, permanently aligned cell construction; flat black interior, engraved focuser
Focuser type:	2.7" I.D. Astro-Physics rack & pinion focuser, 4.5" travel; 2" and 1.25" adapters; 2.5" extension
Telescope length:	48cm (19") w/ dewcap fully retracted
Weight with dewcap:	9 lbs. (4 kg)
Carrying-case type:	Custom padded soft case
Case outside dimensions:	21" x 10.8" x 7" (53cm x 27cm x 18cm)
Weight of case:	3.5 lbs. (1.6 kg)
35mm prime-focus field:	2.3 x 3.2 degrees @ f5.8
35mm telecompressor field:	2.9 x 4.1 degrees @ f4.5
35mm field with 2x Barlow:	1.1 x 1.6 degrees @ f11.6
6x 7cm prime focus field:	5.6 x 6.5 degrees @ f5.8

Specifications subject to change without notice.

ASTRO-PHYSICS

130 F6 STARFIRE EDFS - 5.1" aperture (130EDFS)

At last - an easy to use amateur telescope that can produce exquisite astrophotos with almost no effort and show excellent planetary images as well.

- Short tube length and light weight for easy portability
- Advanced optical design produces superb color correction
- Fast optics for deep-sky observing, astrophotography and CCD
- Field flattener available for 6x7cm photography

130mm StarFire EDF, 400 German Equatorial with Encoders, Hardwood Tripod and other accessories

FEATURES OF THE OPTICS

- Very high correction of spherical and chromatic aberrations
- Visual and photographic focus is identical, eliminating the need for light-absorbing filters
- Clear, colorfree glass types result in brighter, more contrasty images
- Stunning lunar/planetary and deep-sky views
- Ideal for 35mm and medium-format deep-sky astrophotography and CCD imaging
- High-resolution optics are a good match for fine-grained Technical Pan emulsions.

FEATURES OF THE TUBE ASSEMBLY

- Felt-lined dewcap slides over cell for storage
- Fully baffled tube and focuser assures highest contrast
- Giant 2.7" focuser allows coverage of 6 x 7cm formats
- 2" and 1.25" adapters with brass locking ring, 2.5" extension
- Beautifully machined parts and expertly finished in hard polyurethane paint or black anodized
- Aluminum lens cover to protect against dust
- Sturdy foam-padded carrying case

SPECIFICATIONS

Color correction:	Less than 0.01% focus variation from 405nm to 706nm (r to h wavelengths).
Clear aperture:	130mm (5.12")
Focal length:	780mm (30.7")
Resolution:	0.87 arc seconds
Coatings:	Multi-layer, overall transmission greater than 97% in peak visual wavelengths
Magnification range:	22x to 500x
Tube assembly:	White, 5.5" aluminum tube, baffled, flat black interior, engraved push-pull lens cell
Focuser type:	2.7" I.D. Astro-Physics rack & pinion focuser, 4.5" travel; 2" and 1.25" adapters; 2.5" extension
Telescope length:	724mm (28.5") w/ dewcap fully retracted
Weight with dewcap:	15 lbs. (6.8 kg)
Carrying-case type:	Wood case with grey vinyl covering and foam-lined interior
Case outside dimensions:	31" x 9" x 9" (79 cm x 23 cm x 23 cm)
Weight of case:	14 lbs. (6.4 kg)
35mm prime-focus field:	1.7 x 2.4 degrees @ f6
35mm telecompressor field:	2.3 x 3.3 degrees @ f4.5
35mm field with 2x Barlow:	0.9 x 1.2 degrees @ f12
6x 7cm prime focus field:	4.4 x 5.1 degrees @ f6

Specifications subject to change without notice.

ASTRO-PHYSICS

155mm f7 STARFIRE EDFS - 6.1" aperture (155EDFS)

ULTRA-PORTABLE WITH 2.7" FOCUSER

Although we originally designed the 155mm f7 StarFire EDF (6.1" aperture) featuring our gigantic focuser and field flattener with the avid astrophotographer in mind, we have come to appreciate the versatility of this instrument. At the urging of our customers, we now offer the same excellent 155mm f7 lens in a lighter weight tube assembly with our 2.7" focuser.

We continue to be amazed at the compact size of this instrument. At last, a 6.1" refractor with an overall length of 40" (with dewcap retracted). This is less than half the length of an f15 and approximately a foot shorter than an f9! In fact, it is about the same length as a 130mm f8, but with an inch more of aperture! You can transport it in a smaller car, store it in less space, invest in a smaller mount and shorter pier/tripod. This instrument is the fulfillment of the astronomer's dream for a truly portable 6.1" refractor.

The EDF is superb as a visual instrument. It is easily capable of high-power observations of the moon and planets. Secondary spectrum is totally absent at any power which allows you to discriminate the subtle color variations on the surface of the planets. Deep-sky views are equally impressive due to the very high transmission of the three glass types. Performance will rival larger obstructed systems because the contrast is excellent. Individual stars of globular clusters are sharply etched against velvet black skies. A beautiful sight!

This refractor can, of course, be used photographically with a 35mm camera at prime focus with only a simple camera adapter or at a fast f5.2 with the optional flat- field telecompressor. A single element field flattener is available for the Pentax 6 x 7 medium-format camera, however the field is vignetted in the corners due to the restrictions of the 2.7" focuser (full coverage requires the 4" focuser/4" field flattener combination). The 2.7" focuser is interchangeable with the 4" model should you choose at some time in the future to upgrade to the full EDF package.

Please refer to the "Astro-Physics Apochromatic Refractor" section for specifc information regarding the optical design and mechanical construciton of this fine refractor.

Several mount choices are available for the 155 StarFire EDFS refractor. Many of our customers have chosen the 600E mount and hardwood tripod combination for its light weight and easy portability. These astronomers are primarily interested in visual astronomy and occasional astrophotography. For more serious astrophotographers, the 900 or 1200 German Equatorials would provide a more solid base of support in conditions of light wind.

ASTRONOMY TEST REPORT

In the test report entitled "Astro-Physics Refractors Big & Small", in the September 1993 issue of Astronomy, Alan Dyer described the performance of the 155mm f7 EDF during his winter observing sessions. Please note that the article referred to this instrument as an EDT.

"Optical performance of the 155EDT was impressive. It produced nary a trace of false color even on Venus. Equally impressive, this scope provided superb images as soon as it was set outside. Even in sub-freezing temperatures, image quality, though not perfect at first, was surprisingly sharp from the start. In cold weather, after a modest settle-down time of 30 minutes, in-focus star images were textbook Airy disks with a well-defined first diffraction ring and a trace of a second outer ring. There was no sign of spherical aberration, lens figure changes, heat plumes, or distorted Airy disks due to tube turbulance."

We couldn't have said it better ourselves.

155mm StarFire EDFS with 2.7" focuser, 600E German Equatorial, Hardwood tripod and accessories

SPECIFICATIONS:

Color correction :	Less than 0.01% focus variation from 405nm to 706nm (r to h wavelengths)
Clear aperture :	155mm (6.1")
Focal length :	1085mm (43") efl
Resolution :	0.74 arc second
Coatings:	Multi-layer, overall transmission greater than 97% in peak visual wavelengths
Magnification range :	20x to 600x
Tube assembly :	White, 6.5" aluminum tube, baffled, flat black interior, push-pull lens cell, engraved retaining ring
Focuser type :	2.7" I.D. Astro-Physics rack & pinion focuser, 4.5" travel, 2.7", 2" and 1.25" adapters, 2.5" extension
Telescope length :	1041mm (41") with dewcap fully retracted
Tube weight :	23 lb
Carrying Case:	Foam-fitted, vinyl-covered plywood case
35mm Photographic field at prime focus :	1.3 x 1.8 degrees @ f7
35mm Photographic field with Telecompressor:	1.7 x 2.4 degrees @ f5.2
35mm Photographic field with 2x Barlow :	0.6 x 0.9 degrees @ f14
6 x 7 cm Photographic field at prime focus :	3.2 x 3.7 degrees @ f7 (vignetted)

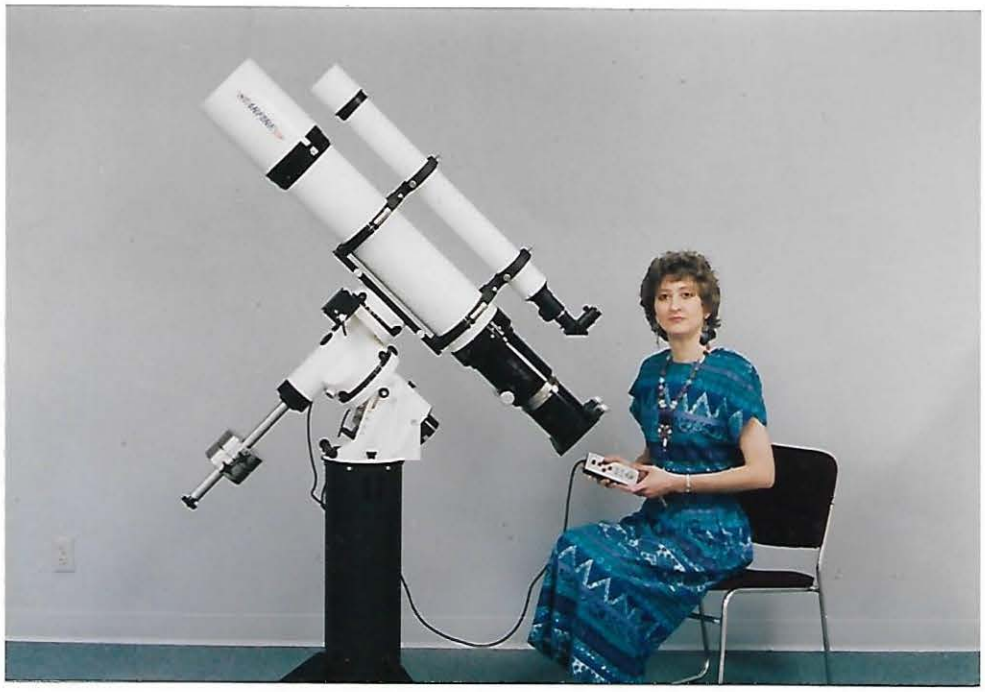
ASTRO-PHYSICS

155mm f7 STARFIRE EDF - 6.1" aperture (155EDF)

ASTROGRAPH WITH 4" FOCUSER AND 4" FIELD FLATTENER

This 155mm f7 StarFire EDF (6.1" aperture) was designed to be the ultimate astrograph while providing uncompromising visual performance. Outstanding photographs published in *Sky & Telescope, Astronomy* and various international astronomy magazines can only hint at the detail of the original prints and negatives. The 30" x 40" prints of the Lagoon/ Trifid and Horsehead Nebulas that are on display in our showroom show incredible pinpoint star images from one side of the print to the other with no sign of image degradation. Truly amazing! Photographic spot diameters measure 15-20 microns over a 5 degree field (4" circle). The fast f7 focal ratio captures elusive and faint deep-sky objects easily with incredible detail. This lens has outperformed mirror type astrographs twice its size, as we had predicted.

The EDF is superb as a visual instrument as well. It is easily capable of high-power observations of the moon and planets. Secondary spectrum is nearly absent at any power. Deep-sky views are equally impressive due to the very high transmission of the three glass types.



155mm StarFire EDF with 4" Focuser, 900 German Equatorial, with encoders, prototype short pier and astrocamera, 80mm Guidescope and other accessories

In the astrographic configuration, the lens is a 5-element design in 2 groups (3 elements in front, 2 in rear). The heart of the front triplet apochromatic lens is an ED glass and 2 crowns. This combination totally eliminates all secondary spectrum, coma and spherical aberration. The rear lens is a 2-element field flattener that eliminates astigmatism and field curvature. In the visual configuration, the rear 2-element lens is removed and replaced with a standard visual adapter. This adapter allows all our usual accessories to be attached, as well as all standard 2" and 1.25" oculars.

The tube assembly comes fully baffled for a 5 degree 4" field. The giant 4" focuser is silky smooth and can be locked for long time-exposure astrophotography. Although it is possible to attach your own custom-made film holder, we have determined that the most practical camera back is the Pentax 6 x 7cm medium-format camera. Field coverage is 3 x 3.5 degrees. After 4 years of field research, we've chosen this camera because it holds the film critically flat without the use of special vacuum attachments. This is not the case with other, less expensive film backs. The Pentax allows the user to critically focus directly on the ground glass with a high- power magnifier, assuring the highest possible resolution.

Another feature is the extra large opening and minimum back distance to the film plane which minimizes the inevitable vignetting of the light in the extreme corners of the format. All the important color and black/ white films are available in the 120 format, which is not the case with large formats. It is for these reasons that we have standardized on the Pentax 6 x 7 and offer all the attachments necessary to use with the 155mm EDF.

The Astro-Physics giant 4" focuser is truly versatile. The 4" ID of the drawtube will allow maximum coverage of the Pentax 6 x 7 cm negative for medium format photography. The inside of the drawtube has a series of knife-edge baffles for maximum contrast. When you wish to use your 35mm camera with the Astro-Physics telecompressor (27TVPH) for even faster exposures (f5.2), you can attach the 2.7" reducer and camera adapter (PFC—) and you are ready to go. The 2" and 1.25" adapters will allow you to use all of our standard accessories to maximize your visual and photographic applications.

Either the 900 or 1200 German Equatorials are recommended for astrophotography, depending on your requirements for portability and the amount of wind you are likely to encounter at your photographic site.

SPECIFICATIONS

Color correction :	Less than 0.01% focus variation from 405nm to 706nm (r to h wavelengths)
Clear aperture :	155mm (6.1")
Focal length :	1085mm (43") efl
Resolution :	0.74 arc second
Coatings:	Multi-layer, overall transmission greater than 97% in peak visual wavelengths
Magnification range :	20x to 600x
Tube assembly :	White, 6.5" aluminum tube, baffled, flat black interior, push-pull lens cell, engraved retaining ring
Focuser type :	4.0" I.D. Astro-Physics rack & pinion focuser, 4.5" travel, 2.7", 2" and 1.25" adapters, 2.5" extension
Telescope length :	1041mm (41") with dewcap fully retracted
Tube weight :	27 lbs
Field Flattener:	4" diameter 2-element with multi-coatings
Carrying Case:	Foam-fitted, vinyl-covered plywood case
35mm Photographic field at prime focus :	1.3 x 1.8 degrees @ f7
35mm Photographic field with Telecompressor:	1.7 x 2.4 degrees @ f5.2
35mm Photographic field with 2x Barlow :	0.6 x 0.9 degrees @ f14
6 x 7 cm Photographic field at prime focus :	3.2 x 3.7 degrees @ f7
Maximum Photographic Field :	5 degrees, 4 inch circle

ASTRO-PHYSICS

400 GERMAN EQUATORIAL MOUNT WITH QUARTZ MICRO-DRIVE (400QMD)

TIGHT, COMPACT, STRONG

SMOOTH, SOLID PERFORMANCE

The two most important considerations in mount design and construction are maximum strength/rigidity for a given size and accuracy of the drive system. Without this basic foundation, all other features of a mount are just superfluous frills. The Astro-Physics 400 Equatorial was engineered to be a compact, firm platform for your high-resolution instrument. Whether your interests are purely visual or include astrophotography, a steady image in the eyepiece or camera viewfinder is extremely important.

The 400 is constructed of the highest quality components to provide you with years of observing pleasure. All parts are precisely machined on our computerized CNC lathe and machining center using solid or thick wall aluminum and stainless steel. Machining tolerances are very high to achieve a tight, solid fit of all components. There are no thin wall, weak, porous die castings as in most other mounts of comparable size. We avoid the use of any carbon steel shafts or plated steel fasteners because they will deteriorate with time. This mount will not rust or bind up and will retain its appearance and function throughout the years.

Both axes respond to fingertip pressure with unparalleled smoothness. Built-in clutches can be disengaged for ultra-smooth sweeping or locked for astrophotography. The worm gears, motors and drive components are enclosed to protect them from dirt and dust. With the 105 Traveler, the 400 mount damps out in one second when mounted on the lightweight aluminum tripod.

Your 400 mount can grow with your skills and interests in astronomy. You can enjoy the visual pursuits of astronomy with the mount as it is, or enhance your ease of locating objects with our optional encoders and JMI digital setting circles. If you plan to take astrophotos, you will be pleased with the solid stability and inherent accurate tracking capability of the drive system. The hand controller contains a plug-in for the Santa Barbara Instrument Group (SBIG) Star Tracker/Imaging Systems. These units will allow you to auto-guide astronomical photos and explore CCD imaging. Please refer to the information sheets that describe these options more fully.

When coupled with the options described separately, the 400 German Equatorial mount will be your portable observatory. This handy mount can be lifted easily into your backyard, packed conveniently into your car or carried aboard an airliner for travel to another hemisphere.

FEATURES

- Precision machined aluminum with radiused edges
- Gears and motors are fully enclosed
- Gear in declination axis allows full 360 degree continuous rotation; scope can move through zenith for photography
- 2.5" (6.4cm) hollow right-ascension and declination shafts maximize strength at minimum weight
- Large thrust bearings form ultra-stable thrust surfaces for tremendous rigidity in a small package
- Right-ascension shaft threaded for optional polar scope allows quick, accurate polar alignment in the field
- Removable stainless steel counterweight shaft for compact storage
- Engraved setting circles with Porter Slip Ring Design; polar axis ring is driven; it follows the stars without needing to be reset each time you look at a new object
- Fine altitude and azimuth adjustments for quickly and accurately zeroing in on the pole in the field
- Black anodized finish will retain its lustrous beauty for years
- Base fits into 6" diameter pier with 0.083" wall thickness.

SPECIFICATIONS OF EQUATORIAL HEAD

Worm wheel:	3",192 teeth fine-pitched bronze wheel
Worm gear:	Stainless steel
Latitude range:	10 to 64 degrees
Azimuth adjustment:	Approximately 25 degrees
Setting circles:	Porter Slip Ring design
Right ascension:	10 minute increments, pointer engraved both Northern/Southern
Declination:	1 degree increments, pointer
Capacity:	Will accommodate refractors up to 5" reflectors to 6", Cassegrains to 8"
Weight of equatorial head:	21 lbs (9.5 kg)

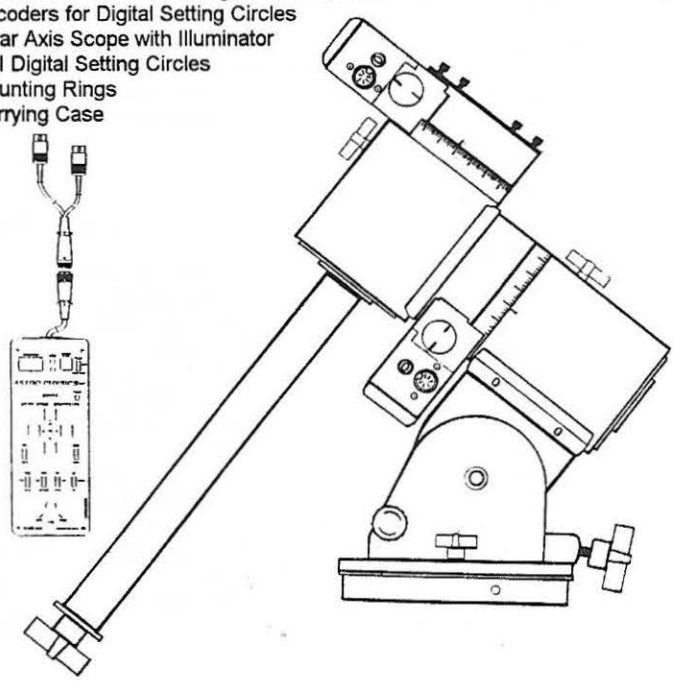
SPECIFICATIONS OF QUARTZ MICRO-DRIVE

- High-resolution stepper motors in both axes
- Quartz micro-drive controller
- PEM - Permanent Error Memory correction
- Declination backlash control
- R.A. and declination reversing switches for correct object orientation and movement in eyepiece.
- Power output to plug in guiding reticle or other accessory
- Adjustable brightness control for guiding reticle
- Plug-in for SBIG ST-4, ST-6, ST-7 and ST-8 Star Tracker Imaging Systems
- Locking plug connection for power cord

Dimensions of controller:	7.25" x 3" x 0.9"
Drive rates:	King sidereal, solar, lunar
Guiding/slewing rates:	0.25x, 0.5x, 1x, 8x, 16x
Hemisphere:	Northern/Southern switch
Power Consumption:	0.45 amps at normal rates
Power requirements:	12 VDC
Suggested power sources:	Portable battery pack, auto battery, power inverter for 110 volts

AVAILABLE OPTIONS

Please see the accompanying information sheets for descriptions:
SBIG ST-4, ST-6, ST-7, ST-8 CCD Star Tracker/Imaging System
Mounting Plates: FP1500, DOVE08, DOVE15, DOVELM
Adjustable Hardwood Tripod with shelf and carrying case
Lightweight Davis & Sanford Adjustable Aluminum Tripod
12 Amp-hr, 12 Volt Rechargeable Battery Pack
Portable Pier - 6" dia.,- heights 48", 54" or 62"
Stainless Steel Counterweights- 6 lbs., 9 lbs.
Encoders for Digital Setting Circles
Polar Axis Scope with Illuminator
JMI Digital Setting Circles
Mounting Rings
Carrying Case



ASTRO-PHYSICS

600E GERMAN EQUATORIAL WITH QUARTZ MICRO-DRIVE (600EQMD)

The Astro-Physics 600E German Equatorial mount offers many fine features to provide superb performance in a compact, portable package. It was engineered to provide a firm, steady platform for your high-resolution instrument. Both axes respond to fingertip pressure with no hint of backlash. Built-in clutches can be disengaged for ultra-smooth sweeping or locked for astro-photography.

The 600E is constructed of the highest quality components to provide you with years of observing pleasure. All parts are machined of aluminum and stainless steel. We avoid the use of any carbon steel shafts or plated-steel fasteners because they will deteriorate with time. This mount will not rust or bind up and will retain its appearance and function throughout the years.

Rigid aluminum castings enclose the worm gears and the right-ascension and declination motors. Drive components are protected from dirt and dust, extraneous wires and gearing are eliminated, and the overall appearance is enhanced.

Fine-pitch, precision gears are the heart of the drive system. These gears are cut with Class AA hobbs on a highly accurate gear cutting machine. High-resolution stepper motors deliver 150 inch-oz. torque with a fraction of the power required by normal synchronous motor-drive corrector systems. Designed for the utmost in convenience, this drive system operates from a portable battery pack or the cigarette lighter of your automobile.

Included in the hand control is a choice of drive rates for lunar, solar, and sidereal tracking. A reversing switch for declination allows the 4 button controller to be properly oriented on both sides of the meridian. The fine-guiding rate is designed for accurate tracking of guidestars at very high powers. The slew rate can be used for leisurely cruising on the lunar surface or for rapidly centering objects in the field of view.

Over the years, our mounts and drive systems have functioned reliably in the coldest environments of Canada, Norway and remote Alaska. The circuitry of our controller has been proven since the mid-1970s and is comprised of the highest-quality military spec components. We have seen many of our competitors' controllers constructed with flimsy, hygroscopic (water absorbing) circuit boards, components rated for indoor use, and poor solder connections. Astro-Physics controllers will stand up to the humidity and temperature extremes common to many observing locations.

When coupled with the options described separately, the 600E will be your portable observatory for home or dark-sky site. Within minutes, you will be assembled and polar-aligned, ready to enjoy the wonders of the night sky.

FEATURES

- Virgin aluminum sand castings, precision hollow cast and machined for light weight and rigidity
- Gears and motors are fully enclosed
- Quartz micro-drive with 12 Volt Controller
- Gear in declination axis allows full 360 degree continuous rotation; scope can move through zenith for photography
- Large thrust bearings form ultra-stable thrust surfaces for tremendous rigidity in a small package
- Hollow right-ascension and declination shafts maximize strength at minimum weight
- Right-ascension shaft threaded for optional polar scope for quick, accurate polar alignment in the field
- Removable stainless steel counterweight shaft for compact storage
- Engraved setting circles with Porter Slip Ring Design; polar-axis ring is driven; it follows the stars without needing to be reset each time you look at a new object
- Fine altitude and azimuth adjustments for quickly and accurately zeroing in on the pole in the field

SPECIFICATIONS OF EQUATORIAL HEAD

Worm wheel:	4" fine pitched bronze wheel
Worm gear:	Stainless steel
Latitude range:	15 to 57 degrees
Azimuth adjustment:	Approximately 17 degrees
Setting circles:	Porter Slip Ring design
Right ascension:	10-minute increments, 2-minute vernier
Declination:	1-degree increments, pointer
Capacity:	Will accommodate refractors up to 6" f9, reflectors to 8", Cassegrains to 10"
Weight of equatorial head:	27 lbs (12.3 kg)

SPECIFICATIONS OF QUARTZ MICRO-DRIVE

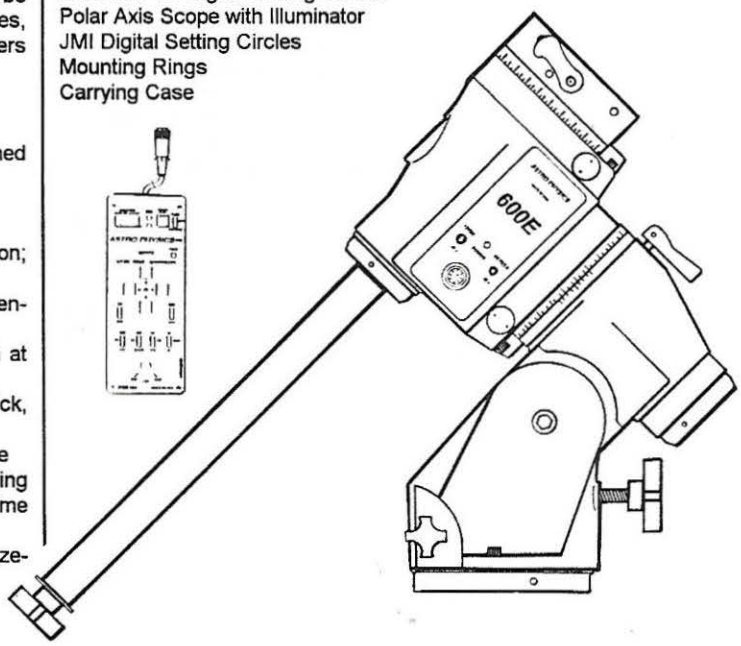
- High-resolution stepper motors in both axes
- Quartz micro-drive controller
- PEM - Permanent Error Memory correction
- Declination backlash control
- R.A. and declination reversing switches for correct object orientation and movement in eyepiece
- Power output to plug in guiding reticle or other accessory
- Adjustable brightness control for guiding reticle
- Plug-in for SBIG ST-4, ST-6, ST-7 and ST-8 Star Tracker/ Imaging Systems
- Locking plug connection for power cord

Dimensions of controller:	7.25" x 3" x 0.9"
Drive rates:	King sidereal, solar, lunar
Guiding/ slewing rates:	0.25x, 0.5x,1x,8x,16x
Hemisphere:	Northern/ Southern switch
Power consumption:	0.45 amps at normal rates
Power requirements:	12 VDC
Suggested power sources:	Portable battery pack, auto battery, power inverter for 110 volts

AVAILABLE OPTIONS

Please see the accompanying information for descriptions:

Portable Pier - 6" diameter (.083" wall thickness) heights 48", 54" ,62"
SBIG ST-4, ST-6, ST-7, ST-8 CCD Star Tracker/Imaging System
Mounting Plates: FP1500, DOVE08, DOVE15, DOVELM
Adjustable Hardwood Tripod with shelf and carrying case
12 Amp-hr, 12 Volt Rechargeable Battery Pack
Stainless Steel Counterweights- 6 lbs., 9 lbs.
Encoders for Digital Setting Circles
Polar Axis Scope with Illuminator
JMI Digital Setting Circles
Mounting Rings
Carrying Case



ASTRO-PHYSICS

900 GERMAN EQUATORIAL MOUNT

WITH QUARTZ MICRO-DRIVE AND BUILT-IN DIGITAL ENCODERS (900QMD)

Modern CNC machining methods inspired our mount designer to carve out the excess material in both axes of the 900 German Equatorial while retaining a heavily ribbed structure for internal strength and rigidity. A unique dovetail was machined into the mating surfaces of the R.A. and Dec axes. This feature allows quick and easy assembly in the field without any tools. The 900 mount is truly a marvel of engineering - maximum strength and rigidity with minimum weight. The quartz micro-drive will satisfy the requirements of the sophisticated, advanced astrophotographer, yet is easy for the casual, visual observer to use.

FEATURES

- All machined mounting made from aluminum barstock
- Precision 7.2" gear in right-ascension, 6" gear in declination
- Dual Axis pulse motors with 12 Volt quartz micro-drive controller
- Ball bearing races
- Removable 1.875" stainless steel counterweight shaft
- Polar and declination axes come apart quickly without tools for lightweight easy handling and ease of transport
- Right-ascension shaft threaded for optional polar scope for quick, accurate alignment in the field
- Fine altitude and azimuth adjustments for quickly and accurately zeroing in on the pole in the field
- Setting circles with Porter Slip Ring Design; polar-axis ring is driven; it follows the stars without needing to be reset each time you look at a new object
- Both axes have built-in high-resolution encoders for use with popular digital setting circles (phono plug connection required)
- Ready to go with CCD Star Tracker/ Imaging Systems
- Base fits into 8" outside diameter pier with 0.125" wall thickness

SPECIFICATIONS OF EQUATORIAL HEAD

R.A. worm wheel:	7.2", 225 tooth aluminum
Declination worm wheel:	6", 225 tooth aluminum
Worm gears:	Brass
R.A. thrust surface	7.0" diameter
Declination thrust surface	6.0" diameter
R.A. shaft	2.2" diameter
Declination shaft	1.75" diameter
Latitude range:	19 to 68 degrees with polar scope, 0-19 lower latitude wedge available
Azimuth adjustment:	Approximately 14 degrees
Setting circles:	Porter Slip Ring design
Right ascension:	4-minute increments, pointer
Declination:	1-degree increments, pointer
High resolution encoders:	4000 step encoders, each axis
Weight of equatorial head:	38 lbs (17.3 kg), disassembles into two manageable pieces, declination axis with saddle plate is 16 lbs., right ascension axis is 22 lbs. Weight of counterweight shaft is additional 10 lbs.

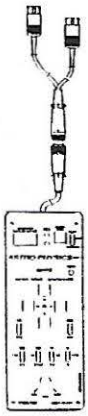
SPECIFICATIONS OF QUARTZ MICRO-DRIVE

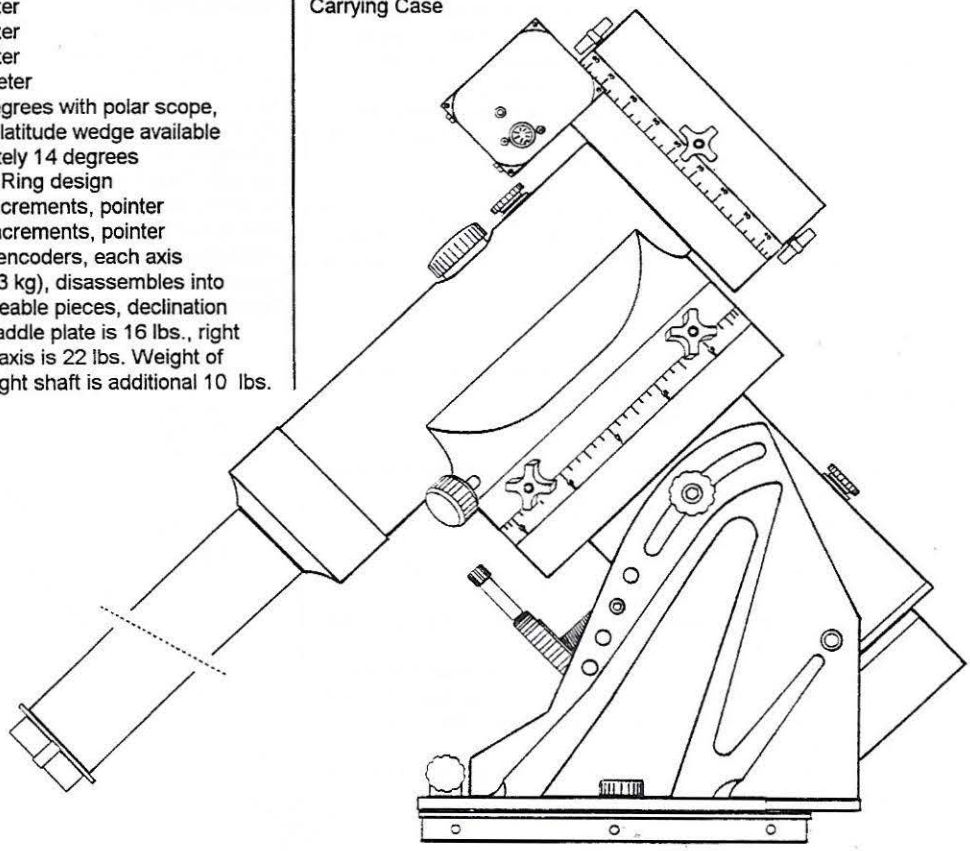
- High-resolution stepper motors in both axes
- Quartz micro-drive controller
- PEM - Permanent Error Memory correction
- Declination backlash control
- R.A. and declination reversing switches for correct object orientation and movement in eyepiece
- Power output to plug in guiding reticle or other accessory
- Adjustable brightness control for guiding reticle
- Plug-in for SBIG ST-4, ST-6, ST-7 and ST-8 Star Tracker/ Imaging Systems
- Locking plug connection for power cord

Dimensions of controller:	7.25" x 3" x 0.9"
Drive rates:	King sidereal, solar, lunar
Guiding/ Slewing rates:	0.25x, 0.5x,1x,8x,16x
Hemisphere:	Northern/ Southern switch
Power consumption:	0.45 amps at normal rates
Power requirements:	12 VDC
Suggested power sources:	Portable battery pack, auto battery, power inverter for 110 volts

AVAILABLE OPTIONS

Please see accompanying information sheets for description
SBIG ST-4, ST-6 , ST-7, ST-8 CCD Star Tracker/ Imaging System
Mounting Plates- FP1800, DOVE15, DOVELM, 900RP
12 Amp-hr, 12 Volt Rechargeable Battery Pack
Portable Pier - 8" diameter, heights 48",54",62
Stainless Steel Counterweights - 10 or 18 lbs.
Cable for SBIG ST-4, ST-6, ST-7, ST-8
Pier Accessory Trays and Support Bar
0-19 degree Lower Latitude Wedge
Polar Axis Scope with Illuminator
JMI Digital Setting Circles
Mounting Rings
Carrying Case





ASTRO-PHYSICS

1200 GERMAN EQUATORIAL MOUNT

WITH QUARTZ MICRO-DRIVE AND BUILT-IN DIGITAL ENCODERS (1200QMD)

A truly massive equatorial head, the model 1200 German Equatorial fits the bill for those needing a truly rigid mounting. Motions are smooth and positive in RA and Dec with the hand controller or when manually moving the telescope. Shafts ride in preloaded ball bearings and the axes float on large roller thrust bearings. The 1200 equatorial is equally at home as a permanent observaotry, as well as a portable mounting for a remote star party thanks to the ease with which the two axes come apart. This is the perfect mount for a large refractor, Newtonian, Cassegrain or astrograph.

FEATURES

- All machined mounting made from aluminum barstock
- Precision 10.3" gear in right-ascension, 7.2" gear in declination
- Dual Axis pulse motors with 12 Volt quartz micro-drive controller
- Hollow 3.35" right ascension shaft and 2.36" declination shaft maximize strength at minimum weight
- Both axes set in precision preloaded ball bearings
- Right-ascension shaft threaded for optional polar scope for quick, accurate polar alignment in the field
- Removable 1.875" counterweight shaft can hold up to seven 18 lb. counterweights
- Polar and declination axes come apart quickly without tools for lightweight easy handling and ease of transport
- Fine altitude and azimuth adjustments for quickly and accurately zeroing in on the pole in the field
- Setting circles with Porter Slip Ring Design; polar-axis ring is driven; it follows the stars without needing to be reset each time you look at a new object
- Both axes have built-in high-resolution encoders for use with popular digital setting circles (phono plug connection required)
- Ready to go with CCD Star Tracker/ Imaging Systems
- Base fits into 10" diameter pier with 0.094" wall thickness

SPECIFICATIONS OF EQUATORIAL HEAD

R.A. worm wheel:	10.3", 225 tooth aluminum
Declination worm wheel:	7.2", 225 tooth aluminum
Worm gear:	Brass
Latitude range:	19 to 68 degrees with polar scope,
Azimuth adjustment:	Approximately 14 degrees
Setting circles:	Porter Slip Ring design
Right ascension:	4-minute increments, pointer
Declination:	1-degree increments, pointer
High resolution encoders:	4000 step encoders, each axis
Capacity:	150 lbs.
Weight of equatorial head:	78 lbs (30.9 kg), disassembles into two manageable pieces, declination axis with saddle plate is 36 lbs., right ascension axis is 42 lbs. Weight of counterweight shaft is an additional 14 lbs.

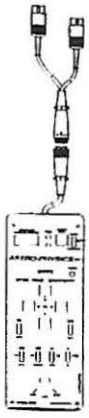
SPECIFICATIONS OF QUARTZ MICRO-DRIVE

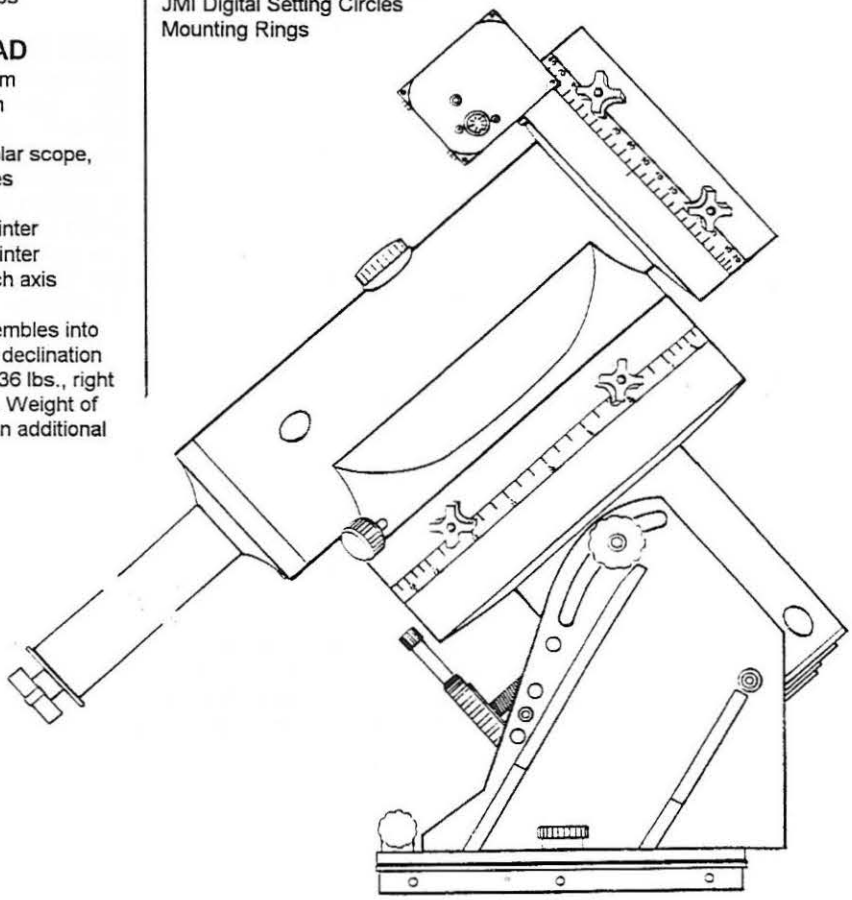
- High-resolution stepper motors in both axes
- Quartz micro-drive controller
- PEM - Permanent Error Memory correction
- Declination backlash control
- R.A. and declination reversing switches for correct object orientation and movement in eyepiece
- Power output to plug in guiding reticle or other accessory
- Adjustable brightness control for guiding reticle
- Plug-in for SBIG ST-4, ST-6, ST-7 and ST-8 Star Tracker/ Imaging Systems
- Locking plug connection for power cord

Dimensions of controller:	7.25" x 3" x 0.9"
Drive rates:	King sidereal, solar, lunar
Guiding/ Slewing rates:	0.25x 0.5x, 1x, 8x,16x
Hemisphere:	Northern/ Southern switch
Power consumption:	0.45 amps at normal rates
Power requirements:	12 VDC
Suggested power sources:	Portable battery pack, auto battery, power inverter for 110 volts

AVAILABLE OPTIONS

Please see accompanying information sheets for description
SBIG ST-4 , ST-6, ST-7, ST-8 CCD Star Tracker/ Imaging System
Portable Piers - 10" diameter - heights 48", 54", 62"
12 Amp-hr, 12-Volt Rechargeable Battery Pack
Mounting Plates - FP1200, DOVELM, 1200RP
Stainless Steel Counterweights - 10 or 18 lbs.
Pier Accessory Trays and Support Bar
Polar Axis Scope with Illuminator
JMI Digital Setting Circles
Mounting Rings



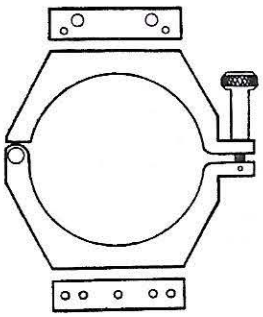


MOUNT ACCESSORIES

MOUNTING RINGS (55RING, 60RING, 65RING, 80RING)

Astro-Physics mounting rings attach to the cradle plate of the mount and hold your tube assembly firmly in place. The unique ring design allows you to support your guidescope, camera or other accessories requiring a flat mounting surface. These rings feature a hinged assembly with thumbscrew closure. They are felt-lined to prevent marring of your tube.

The base of the mounting rings are drilled and tapped for 1/4-20 screws. The hole patterns fit the following mounts: Astro-Physics 400, 600E, 800, 900 and 1200 mounts; Carton alt-azimuth; Vixen DX and Super Polaris; and the TeleVue Systems mount. The top of the rings are drilled for our piggyback camera bracket and guidescope rings. Please order the size that corresponds to the outside dimension of your tube assembly: 5.5", 6.0", 6.5", 8.0"



Top of rings:
Pairs of 10-32 and M8 holes for guidescope rings, piggyback camera bracket, 8" and 15" dovetail plates.

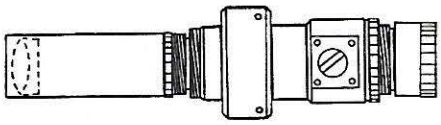
Bottom of rings:
1/4-20 holes drilled for several popular mounts.

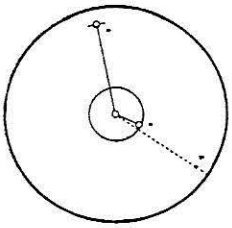
POLAR AXIS SCOPE WITH ILLUMINATOR (PASILL)

The polar axis scope will allow you to quickly align your mount on the pole stars to ensure greater tracking accuracy throughout your observing session. The unit threads into the base of the polar axis of the 400, 600E, 800, 900 and 1200 equatorial heads. The illuminator can be attached to the polar axis scope enabling you to see the reticle clearly. On-off control and adjustable intensity. Operates with batteries.

Specifications:

Magnification	5 x
Achromatic objective	20mm
Eyepiece	K22mm (Diopter adjustable)
Field of view	8 degrees
Rated Voltage	3VDC
Power consumption	16mA
Light	red LED
Battery	Button type: two Varta V76 PX or equivalent





Reticle of polar axis scope

The secret to quick polar alignment is an easy to use reticle that shows the positions of several stars in the region of Polaris. Line up these stars in just minutes and you are ready to go.

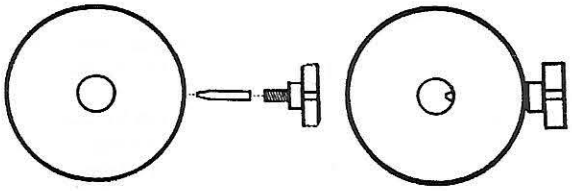
STAINLESS STEEL COUNTERWEIGHTS- 400, 600E, 800

Our counterweights are precision machined from 303 stainless steel. A bronze sleeve is press fit into the center hole to prevent marring of your counterweight shaft as you adjust the position of your counterweights. The weights slip easily onto the counterweight shaft and are secured in position with a large hand knob/brass pin assembly. The brass pin will not mar your shaft.

Keep in mind that you can adjust the position of the weights to counterbalance varying loads. However, the addition of a guidescope, camera and other heavy accessories may necessitate an additional counterweight. If you plan to mount your catadioptric, Newtonian or any other scope, figure that you will need a counterweight total equal to approximately 80% of your tube assembly weight. We recommend the following combinations of weights for our refractors:

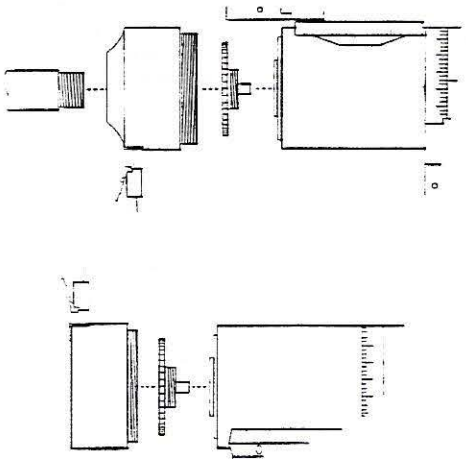
6 lb. COUNTERWEIGHT (6SLCWT) - For 400, 600E, 800 mounts
9 lb. COUNTERWEIGHT (9SLCWT) - For 400, 600E, 800 mounts
105 Traveler EDF Tube Assembly - one 9 lb. weight
130 StarFire EDF Tube Assembly - one each 6 and 9 lb. weight
155 StarFire EDF Tube Assembly (2.7") - two 9 lb. weights

10 lb. COUNTERWEIGHT (10SCWT) - for 900 and 1200 mounts
18 lb. COUNTERWEIGHT (18SCWT) - for 900 and 1200 mounts
155 StarFire EDF Tube Assembly (2.7") - one 18 lb. weight
155 StarFire EDF Tube Assembly (4.0")-one 10 and 18 lb. weight
180 StarFire EDT Tube Assembly - two 18 lb. weights
180 StarFire EDF Tube Assembly (4.0") -two 18 lb. weights



HIGH RESOLUTION MOUNTED ENCODERS

Our mounted encoders will allow you to use digital setting circles with your Astro-Physics mounts. The high-resolution encoders are enclosed in machined aluminum housings that were designed to look like an integral part of your mount, rather than an after-market add-on. The encoders read the movements of the shaft directly. One encoder is mounted securely to the declination axis just above the counterweight shaft and the other to the polar axis housing. You can order your new mount with the encoders or upgrade your present 400, 600E and 800 German Equatorial Mounts. Illustration of 400 Mount encoder attachments



MOUNT ACCESSORIES

PORTABLE PIERS

These piers feature a unique tension design that combines rugged construction with light weight while eliminating flexure and annoying vibrations. Legs and tension rods attach without hardware, allowing field assembly in seconds. Stainless steel tension rods do not interfere when the telescope is pointed at the zenith. Turnbuckles allow you to tighten the rods and are the secret to the firm base of support that this pier provides. The center posts are constructed of aluminum tubing, the base construction is aluminum and steel and the legs are steel.

Pier for 400 and 600 E Mounts

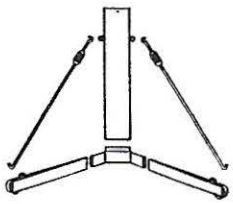
part nos.	6X48PP	6X54PP	6X62PP
height of pier	48"	54"	62"
diameter of post	6"	6"	6"
length of legs	24.5"	24.5"	24.5"
weight of pier post	7 lbs	8 lbs	9 lbs
weight of pier base	6 lbs	6 lbs	6 lbs
weight of each leg	5 lbs	5 lbs	5 lbs
weight of 3 struts	5 lbs	5 lbs	5 lbs
total weight assembled	32 lbs	33 lbs	34 lbs

Pier for 800 and 900 Mounts

part nos.	8X48PP	8X54PP	8X62PP
height of pier	48"	54"	62"
diameter of post	8"	8"	8"
length of legs	25"	25"	25"
weight of pier post	14 lbs	16 lbs	18 lbs
weight of pier base	11 lbs	11 lbs	11 lbs
weight of each leg	6.5 lbs	6.5 lbs	6.5 lbs
weight of 3 struts	5 lbs	5 lbs	5 lbs
total weight assembled	49.5 lbs	51.5 lbs	53.5 lbs

Pier for 1200 Mount

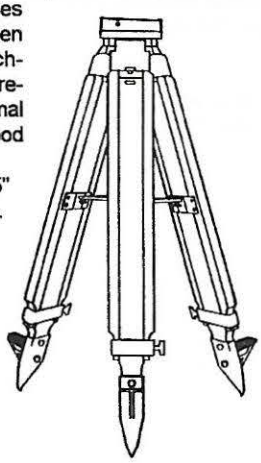
part nos.	10X48P	10X54P	10X62P
height of pier	48"	54"	62"
diameter of post	10"	10"	10"l
length of legs	25"	25"	25"
weight of pier post	15 lbs	17 lbs	19 lbs
weight of pier base	18 lbs	18 lbs	18 lbs
weight of each leg	6.5 lbs	6.5 lbs	6.5 lbs
weight of 3 struts	5 lbs	5 lbs	5 lbs
total weight assembled	57.5 lbs	59.5 lbs	61.5 lbs



ADJUSTABLE WOOD TRIPOD (AWT000)- 400,600E

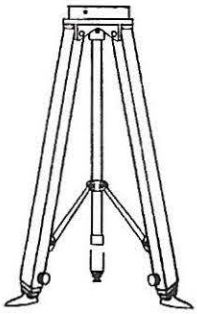
This superb hardwood tripod surpasses any portable tripod that we have seen anywhere. The unique method of attaching the legs to the tripod top was carefully engineered so that there is minimal side to side movement. The tripod comes with fabric carrying case.

Recommended height:	42"-55"
Weight:	18 lbs.
Maximum diameter:	6"
Minimum length:	45"



DAVIS AND SANFORD TRIPOD (SDS400) - 400

The adjustable Davis and Sanford (Tiffin) tripod is offered for light weight, compact transport. The legs retract and fold into a relatively small unit. It is recommended as the primary tripod for the 400 mount and 105 Traveler (or similar sized instruments). While it is not our first choice for the 400 mount and our 130mm refractors, it's a very portable option for people who plan to transport their equipment as airline baggage for observing in exotic locations (or on a business trip). This is the tripod that we transported by air to Baja, Mexico for the solar eclipse in 1991.



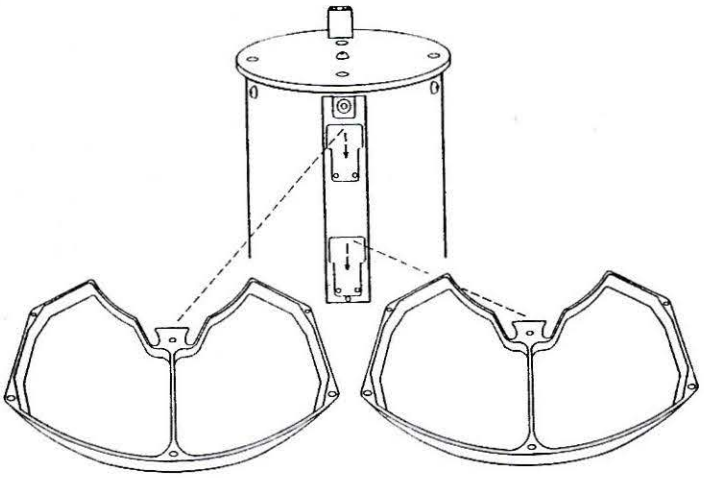
The tripod is constructed of black anodized aluminum and black painted aluminum castings.

Possible height:	29"-51"
Recommended height:	29"-45"
Weight:	11 lbs.
Maximum diameter:	6.5"
Minimum length:	40"

SUPPORT BAR FOR PIER ACCESSORY TRAYS (TRAYSB) - for all piers
ACCESSORY TRAY FOR 6 & 8" DIAMETER PIERS (TRAY08)
ACCESSORY TRAY FOR 10" DIAMETER PIERS (TRAY10)

The support bar attaches to the holes at the top of the pier post and can hold 2 trays, one above the other. These handy trays will keep accessories close at hand during your observing sessions. In addition to serving as a storage shelf, the top tray will protect items in the bottom tray from dew. Each tray spans 1/3 of the pier (8" and 10" diameter piers), so you can construct a complete circular tray around the pier post with just three trays and three support bars. For the ultimate system, we suggest six trays and three support bars, two complete levels around the post.

Although you can use the TRAY08 tray for the 6" pier, it will not fit flush against the post. This does not affect its function, but you are limited to four trays with this pier.

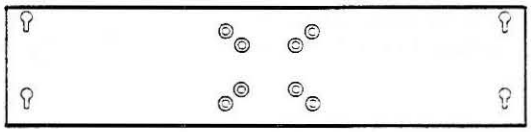


MOUNT ACCESSORIES

Note: Refer to section "Dovetail Plates & Sliding Bars" for additional mounting plate choices. The plates below were not designed to be used as accessory plates.

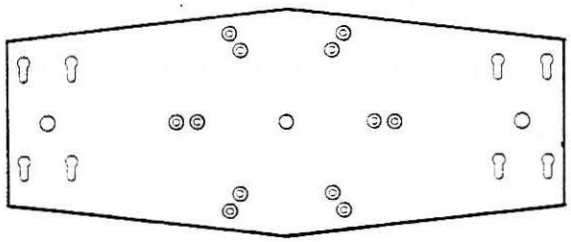
15" FLAT MOUNTING PLATE (FP1500) - 400, 600E

This machined aluminum mounting plate measures 15" x 4.6" x 0.5". Two keyhole slots that measure 3.2" between centers are provided at each end of the plate. The distance between these pairs of holes is 13.75". You can drill additional holes to suit your needs. The plate weighs 3.3 lbs.



18" FLAT MOUNTING PLATE (FP1800) - 900, 1200

A larger machined aluminum plate is available for the 900 or 1200 mounts. It is 18" long and 7.5" at its widest point in the center The width of the plate tapers to 5.5" at each end. Four pairs of keyhole slots that measure 3.2" between centers are provided. The two inner pairs are 13.75" apart and the outer two pairs are 17" apart. You can drill additional holes to suit your needs. The plate weighs 6.2 lbs.

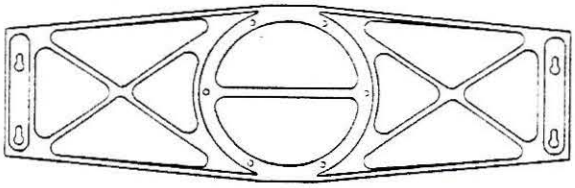


15" RIBBED MOUNTING PLATE (900RP) - 900

Our CNC machining center started with thick aluminum plate and carved out the excess material leaving a strong rib support structure. The finished plate is 0.75" thick, 15" long and 6.5" at its widest point. The width of the plate tapers to 4.75". At each end, a pair of keyhole slots that measure 3.2" between centers are provided at each end. The distance between these pairs of holes is 13.75". Due to the ribbed structure, you may not be able to drill additional holes to suit your mounting rings. The plate weighs 2.3" lbs.

24" RIBBED PLATE (1200RP) - 1200

For larger instruments, the ribbed structure of this plate provides the maximum support. Again, we start with thick aluminum plate and carve a strong rib structure. The final result is 1.5" thick, 24" long and 7.6" at its widest point. The width of the plate tapers to 5.5" at each end.. A pair of keyhole slots that measure 3.2" between centers are provided at each end. The distance between these pairs of holes is 23". Due to the ribbed structure, you may not be able to drill additional holes to suit your mounting rings. The plate weighs an amazing 9.5 lbs. This is a view of the rib structure on the underside of the 24" plate.



PORTABLE RECHARGEABLE 12 V BATTERY PACK (PRBP12)

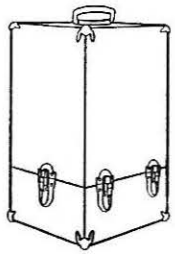
The 12 amp portable battery pack is the ideal power source to have when you are observing in the field. Just plug the connector into the base of your mount to power your drives and electronic accessories. This unit is completely maintenance free, safe and can be operated in any position. The battery pack is easily recharged by the self-contained charger which inserts into the battery pack and plugs into a 110 wall outlet. Since it has no memory, it will recharge fully every time without a loss of capacity (unlike ni-cad batteries).

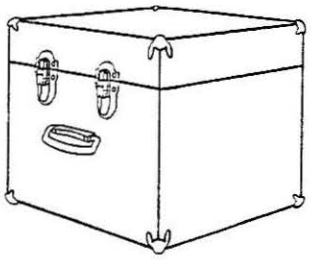
We recommend separate batteries for your mount, CCD Star Tracker/Imaging Unit or Kendrick Dew Removers since the latter two items draw a fair amount of power.

900 MOUNT CARRYING CASES (2CC900)

These carrying cases will allow you to transport your mounting in a protective and attractive manner. If you habitually organize your mount components in these cases, you will be sure to have all of your parts and tools when you arrive at your observing site. Please note that these cases were not designed for airline transport. The polar axis, declination axis, cradle plate, hex rings and counterweight shaft all disassemble quickly for packing. The 900 mount is packed in a set of two vinyl covered cases. One case holds the polar axis assembly and the second case holds the declination axis with the cradle plate, hand control, power cords, polar axis scope and two counterweights and a few tools.

	dimensions L x W x H	weight of case w/o mount
900 Polar Axis Case	to be determined	
Declination Axis Case	to be determined	

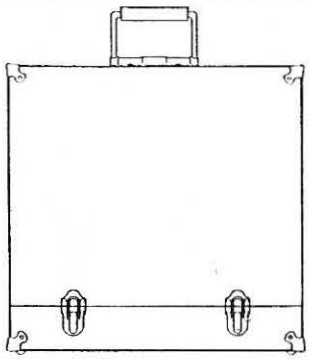




400 AND 600E MOUNT CARRYING CASE (1CC002)

The case for these two mounts is constructed of wood with a grey vinyl covering. For convenience, you do not have to change the latitude adjustment to fit into the case (you do with die cut cases) You can leave some mounting plates attached. The cases are handy for every-day use. Not suitable for airline travel.

	dimensions L x W x H	weight of case w/o mount
400 with 8" or 15" Dovetail or 600E with 8" Dovetail	18.5" x 11.5" x 21"	18 lbs



DOVETAIL PLATES & SLIDING BARS

To use as mounting or accessory plates

Dovetail plates add a new level of convenience and ease of use to our mounts and tube assemblies. These are a few of the handy applications:

- Aid in rebalancing your scope after switching from featherweight orthoscopics to hefty 2 lb. eyepieces or camera back
- Quickly interchanging scopes when used as a mounting plate
- Quickly interchanging accessories when used as an accessory plate

Although listed separately, the dovetail plates and sliding bars are used together (the exception is the 7" sliding bar when used as a stationary mounting plate). The narrow sliding bar moves within the channel of the dovetail plate until the desired position is achieved. Tightening the knobs of the dovetail plate secures the sliding bar.

Dovetail plates:

- The knobs have machined brass tips to protect the sliding bar
- Built-in safety feature to prevent the sliding bar from slipping completely through the dovetail plate if the knobs are accidentally loosened.
- Very easy to insert and remove sliding bars

Sliding bars:

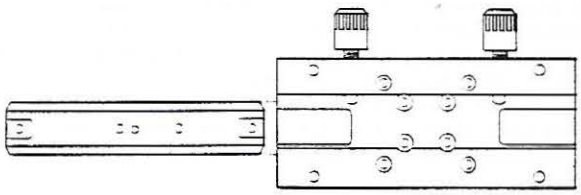
- Multiple holes allow a variety of items to be attached.

8" DOVETAIL PLATE (DOVE08) *needs 7" sliding bar*

This versatile plate is suited for the 105 f6 Traveler and 130 refractors (we prefer the 15" dovetail plate for most applications of the 130 f8 StarFire EDT) and other short instruments. Use with the SB0800 sliding bar which is sold separately. Repositioning the sliding bar will aid in adjusting the balance of your instrument.

Mounting cradle plate - Attach to either the 400 or 600E German equatorial mounts.

Accessory plate - Attach to the top of our Astro-Physics mounting rings (diameters 5"-8"). For the 105 Traveler EDT use the Traveler dovetail accessory plate.



7" SLIDING BAR (SB0800) *usually needs DOVE08 or ACPLTR*

These are a few of the possible uses:

Attach mounting rings - 105 Traveler EDT, 130 StarFire EDT or EDF, TeleVue Genesis or Renaissance refractors or other similar instruments. Use with 8" Dovetail Plate.

Attach accessories - 60x700mm guidescope with 3.4" guidescope rings, piggyback camera bracket, quick release bracket for 8x50 finder, TeleVue Starbeam or Quik-Point Finder. Use with either 8" dovetail plate or Traveler dovetail accessory plate

Attach mounting rings - 105 Traveler EDT. The bar functions as stationary mounting plate for either a heavy-duty camera tripod or TeleVue Gibraltar mount. The bar does not "slide" when used in this manner.

10" SLIDING BAR (SB1000) *may need DOVE08*

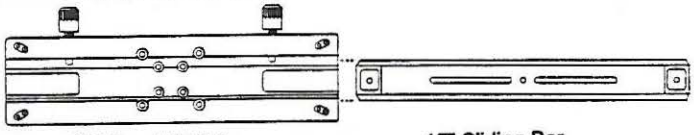
Can be used the same as the 7" Sliding Bar with two additional functions. You will need the extra length to counterbalance the Traveler when doing eyepiece projection. Also, the bar has an additional pair of holes that allows you to balance the Traveler on the Gibraltar with heavy eyepieces.

15" DOVETAIL PLATE (DOVE15) *needs 15" sliding bar*

The 15" version of our dovetail plate is suited for the 130 f8 StarFire EDT, 155 f7 StarFire EDF, Celestron or Meade 8" SCTs, ARO Maksutovs and other instruments of similar size. Use with the SB1500 sliding bar which is sold separately. These are some of the applications:

Mounting cradle plate - Attach to either the 400, 600E or 900 German equatorial mounts.

Accessory plate - Attach to the top of our Astro-Physics mounting rings (diameters 5"-8").



15" Dovetail Plate 15" Sliding Bar

15" SLIDING BARS (SB1500) *needs 15" dovetail plate*

These are a few of the possible uses:

Attach mounting rings - 130 StarFire EDT, 155 f7 StarFire EDF or any rings with flat mounting surface and 1/4-20 hole .

Attach to tube assembly - ARO Maksutovs and other similar instruments.

Attach accessories - 60x700mm guidescope with 3.4" guidescope rings, 80x900mm guidescope with 3.9" guidescope rings, piggyback camera bracket, quick release bracket for 8x50 finder, TeleVue Starbeam or Quik-Point Finder,

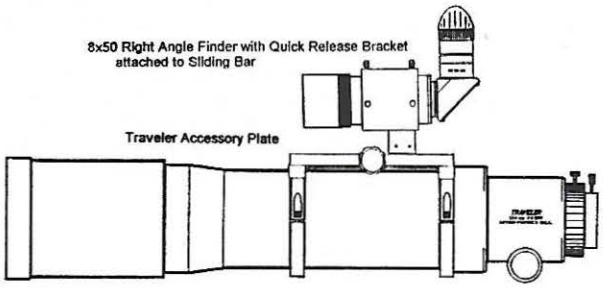
15" SLIDING BAR FOR 8" SCTs (SB15SC) *needs 15" dovetail plate*

Attach this bar to your Meade or Celestron 8" Schmidt-Cassegrain.

TRAVELER DOVETAIL ACCESSORY PLATE (ACPLTR) *needs 7" sliding bar*

Mount this accessory plate atop your Traveler to enable you to use the 8x50 right-angle or straight-through finders with our quick release bracket (please note that quick release brackets shipped prior to June 1994 cannot be used in this manner), 3.4" guidescope rings, piggyback camera bracket and TeleVue Starbeam. or Quik-Point Finder. The plate measures 2.75"x7" and weighs only 8 oz.

Please note that the Traveler mounting rings must be 6.3" apart (center to center) to accommodate this plate. If your scope is mounted in any of the following configurations, the correct spacing will be achieved: Astro-Physics 400/600E mounts with 8" dovetail plate, Vixen DX mount, Celestron (Vixen) Super Polaris or Great Polaris mounts, TeleVue Gibraltar mount with our 7" sliding bar as a mounting plate, very heavy-duty camera tripod with 7" sliding bar as a mounting plate.



DOVETAIL FOR LOSMANDY D SERIES PLATE (DOVELM)

This Astro-Physics plate attaches to the 400, 600E, 900 and 1200 mounts. If you already own the Losmandy D series plate (comes with most C11s), this is the dovetail for you. Features the same locking knobs and excellent construction as our other dovetails.

SANTA BARBARA INSTRUMENT GROUP

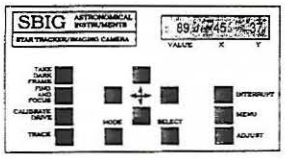
SBIG ST-4 CCD STAR TRACKER/IMAGING (ST4IBM or ST4MAC)

If you plan to take long exposure astrophotos, we recommend the ST-4 from Santa Barbara Instrument Group (SBIG). It is a dual purpose CCD based instrument that functions as either a star tracker or imaging camera. The star tracker function is most exciting to us. The CCD detector is mounted on the focuser of your guide telescope or primary telescope (if using an off-axis guider). After you select the guide star that you wish to use, the ST-4 centers the image on a pixel and holds that star in position by constantly monitoring it and sending correction signals to the telescope drive immediately. Your right ascension or declination motors will then be activated automatically to make the appropriate corrections. All of this happens in split seconds, with greater accuracy than is possible with manual guiding.

Astro-Physics German Equatorial mounts are ideally suited for the ST-4. Since the gear accuracy is excellent, only minor corrections are needed, mostly to compensate for slight inaccuracies in polar alignment.

ST-4 CCD Head

Instrument Panel



SBIG ST-6A CCD IMAGING CAMERA (ST6IBM)

If your primary interest is CCD imaging, you may wish to consider the ST-6 model. The ST-6 is a second generation cooled CCD camera with approximately 9 times the detector area of the model ST-4. It uses a CCD with a resolution of 375 x 242 pixels. The pixel size is 23 x 27 microns and the total array is 8.6 x 6.5 millimeters. Its 16 bit dynamic range and low internal noise make it well suited for very low surface brightness objects with large surface areas. The system includes a thermoelectrically cooled CCD head, separate processor/power supply case, cables for power and RS-232 computer interface, Track & Accumulate function, plus extensive imaging, photometry and astrometry software, and Operating Manual.

SBIG ST-7 AND ST-8 CCD IMAGING CAMERAS (ST7IBM, ST8IBM)

These imaging cameras contain two CCD detectors; one for guiding and the other for collecting the image. They are mounted in close proximity, both focused at the same plane. This allows the imaging CCD to integrate while the PC uses the guiding CCD to correct the telescope. Using separate CCD for guiding allows 100% of the primary CCD to be used to collect the image. The telescope correction rate and limiting guide star magnitude can be independently selected.

Both imaging cameras utilize a Kodak CCD detector with 9 micron square pixels plus on-chip binning to support 18 and 27 micron pixels, for improved image quality with longer focal length telescopes. The model ST-7 has a format of 768 x 512 pixels (active area of 32mm squared) and the model ST-8 1536 x 1024 pixels (active area of 127mm squared).

Both imaging cameras include an electromechanical shutter, 16 bit A/D, temperature control with all of the electronics integrated into the CCD head, and are furnished with a high speed parallel interface allowing acquisition rates 20 times faster than a serial port. Both cameras are furnished with DOS and Windows software and generate truly remarkable imagery. SBIG has determined that carefully guided exposures exceeding one hour are possible.

JIM'S MOBILE INCORPORATED (JMI)

DIGITAL SETTING CIRCLES

Available for 400, 600E, 800, 900 and 1200 mounts.

If you live in a suburban environment where star hopping is very difficult, you will appreciate the ease of using digital setting circles. Spend more time observing and less time hunting for objects. These computer units can easily guide you to any of hundreds or even thousands of objects. You don't have to know where they are or even have a star chart handy.

Simply turn the computer on, sight two stars (one if you are polar aligned), and you are ready to explore the universe as never before. You don't need to polar-align, or level your telescope. You don't have to define your latitude, longitude or even the date or time!

Select any object in the internal database and with the press of a key, view detailed information such as Right Ascension and Declination, magnitude, size, common name, constellation, object type and Sky Atlas (TM) chart number reference. Then simply move your telescope in the direction indicated by the arrows until the angles decrease to zero. The telescope will now be pointed at the selected object!

The three dedicated computer units offered by JMI share many common features. Those which are listed here are present in each of the units. Refer to descriptions of each unit for additional features.

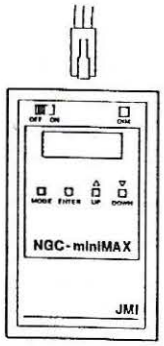
- Red LED display with selectable brightness for easy reading both under the stars and in full daylight
- 24 hour operation from single 9V alkaline battery (at dimmest setting)
- Real-time display of telescope's current Right Ascension and Declination (Epoch 2000.0)
- Event timer - useful for timing astrophotographs to the second
- Operate between -10 degrees C (14 degrees F) and +50 degrees C (122 degrees F)
- Can track slew rates of up to 60 degrees per second or more. (Note that these are passive units; they don't move the telescope.)
- Low battery and encoder error detection.

Choose the model with the features that you prefer.

NGC-microMAX (MICMAX)

After a simple two star alignment, the NGC-microMAX computer will display your telescope's current right ascension and declination for use in locating objects at known locations (this information can be obtained from star charts, books and periodicals). Additionally, the positions of all 110 Messier objects (these are some of the brightest deep-sky objects) are permanently stored in the computer's memory to enable them to be located quickly by beginner or expert alike. Modes: R.A. & DEC, Catalog, Guide, Star Fix, Align

NGC-miniMAX (MINMAX)



This is a dedicated computer with an internal database of 3,900 objects including most NGC/IC objects to about 13th magnitude and planets. It actually knows where your telescope is pointed at all times and can guide you to any object in its database. You can even add your own objects. The NGC-miniMAX offers multilingual capabilities! English * French * German * Italian * Spanish. Modes: R.A. & DEC, Catalog, Guide, Timer, Star Fix, Align, Polar Align

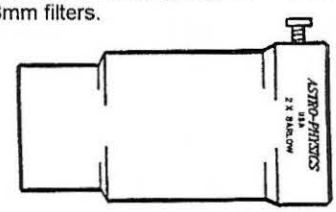
NGC-MAX (NGCMAX)

JMI's top-of-the-line in dedicated computer. This unit has an incredible 12,100 object database including all NGC and IC objects to 16th magnitude, 360 other non-stellar objects, 928 stars, planets and 28 user identified objects. The RS-232C serial interface can be used with The_Sky software. Includes an Identify Mode which identifies unfamiliar objects and finds objects near the current position. Modes: R.A. & DEC, Catalog, Guide, Timer, Star Fix, Align, Polar Align, Identify

ACCESSORIES

2" 2X PHOTO-VISUAL BARLOW AMPLIFIER (BAR2X0)

This custom-made accessory doubles the focal length of the objective for high-power photo-visual observation. The 2-element design uses special glasses to preserve the fine color correction of the main objective. The optical elements are hand-corrected and precision centered to insure that no aberrations are introduced into the system. The large optics will accept both 1.25 and 2 inch oculars and will cover a 2 inch photographic field with pinpoint images to the edge. Four baffles are machined into the barrel to eliminate internal reflections. The Barlow also features a brass locking ring as described for the 2.7" focuser Accepts 48mm filters.



FLAT FIELD VISUAL-PHOTOGRAPHIC TELECOMPRESSOR (0.75X) (27TVPH)

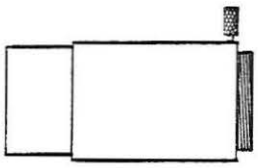
We have increased the versatility of our telecompressor by designing it for both visual and photographic applications. Slip in a 2" diagonal with your favorite eyepiece or your camera adapter with camera. The effective focal length will be 0.74x the focal length of the instrument. Deep-sky objects are recorded on film in a fraction of the time needed at prime focus. This well-corrected accessory lens preserves the high contrast and superb color correction of the main objective. A must for the serious astrophotographer. Threaded for 58mm filters. Please note that you must purchase the camera adapter with t-ring separately.

CAMERA ADAPTER WITH T-RING FOR 35mm CAMERA (PFC - - -, *last 3 letters indicate t-ring)*

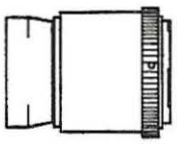
This camera adapter allows you to attach your 35mm camera to any focuser that accepts 2" slip-in accessories. It is machined of aluminum and black anodized. The camera adapter is threaded for the popular 48mm filters. Please specify the type of camera you plan to use.

EYEPIECE PROJECTION TELE-EXTENDER (CEP000)

You can use the camera adapter alone for prime focus astrophotography or insert your favorite eyepiece into the eyepiece projection tele-extender to achieve higher powers and closer views of your object. The assembly consists of a 2" prime-focus camera adapter threaded for the popular 48mm filters, and a removable 1.25" eyepiece projection assembly with a brass locking ring to hold your eyepieces firmly in place.



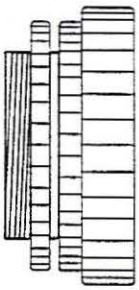
Eyepiece Projection



Camera Adapter

2.7" FIELD FLATTENER WITH CAMERA ADAPTER FOR PENTAX 6 x 7 cm CAMERA (67PF46, 67PF56, 67PF58, 67PF69, 67PF79)

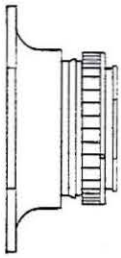
This accessory allows you to couple the medium-format Pentax camera to your StarFire telescope for truly superb wide field photographs. The built-in field 2.7" field flattener lens produces sharp star images over the entire format. Enlargements of 16"x20" are possible without fuzzy images or loss of detail.



67PH46 - 105 Traveler
67PF56 - 130 StarFire EDF
67PF58 - 130 StarFire EDT, 155 StarFire EDFS, Star130ED, Star12ED, 5"f8 StarFire, Standard
67PF69 - 155 StarFire EDT, previous 6"f9 and Star155ED
67PF79 - 180 StarFire EDT, 7"f9 StarFire

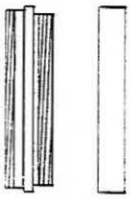
35MM CAMERA ADAPTER WITH T-RING TO USE WITH ABOVE FIELD FLATTENER (67R - - -, *last 3 letters indicate t-ring)*

Use this adapter with the prime focus field flatteners to obtain the best results with your 35mm camera. The t-ring is included. Please specify the t-ring that you wish to use. The part can be used only with field flatteners shipped after May 1994. If you have an earlier model field flattener, please call.



GELATIN FILTER HOLDER FOR 2.7" FIELD FLATTENER ABOVE (27GEL1 and 27GEL2)

This two piece filter holder was designed to hold gelatin filter sheets which may be used for deep-sky tricolor photography. Clear aperture of the filter is 2.35" (60mm). Purchase gelatin filter sheets from a camera store, cut into a circle approximately 2.5" in diameter and install. We suggest that you purchase a separate filter holder for each color filter that you plan to use. 27GEL2 part fits all field flatteners shipped after May 1994. If you have an earlier model, we offer part # 27GEL1 with a slightly different thread.

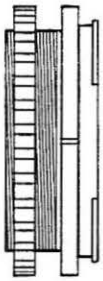


GELATIN FILTER HOLDER FOR 4" FIELD FLATTENER (40GEL1)

Same as above to fit 4" Field Flatteners.

6X7 PENTAX CAMERA ADAPTER FOR USE WITH TELECOMPRESSOR (ADA67P)

This adapter allows you to use the Telecompressor (27TVPH) with your Pentax 6 x 7 Camera . Your image circle will be approximately 2" fully illuminated.

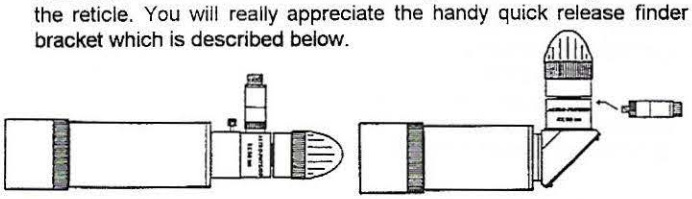


ACCESSORIES

8x50 RIGHT-ANGLE OR STRAIGHT-THROUGH FINDERS WITH ILLUMINATED RETICLE AND QUICK RELEASE BRACKET (850RAI or 850STI)

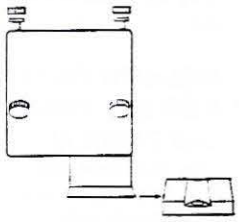
Our imported finders feature a unique eyepiece with crosshairs in the center of the field which can be illuminated with the matching self-contained, battery-powered LED. The 1.25" diagonal and eyepiece provide a wide 5.6° field of view to assist you in locating your favorite objects.

Both finders are black and include a dustcover for the lens and a built-in dewcap. The right-angle finder has a rubber eyecup and the straight-through model includes a dustcover for the eyepiece. The rheostat control on the illuminator allows you to control brightness of the reticle. You will really appreciate the handy quick release finder bracket which is described below.



QUICK RELEASE FINDER BRACKET (850QRB)

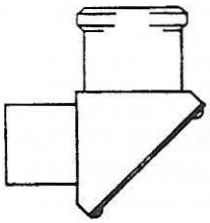
The quick release finder bracket was developed by Astro-Physics to make your life easier. Now, you can attach and detach your finder in seconds while retaining the alignment. The base of the bracket mounts onto the predrilled holes of your Astro-Physics refractor. The remainder of the assembly with the finderscope slips into the groove of the base bracket and tightens quickly with two thumbscrews. Now you are ready to go! There are no mounting screws to get lost in the grass or snow and your fingers won't freeze as you struggle with tools. To use with the Traveler accessory plate (ACPLTR), attach the bracket part to the 7" sliding bar (SB0800) .This accessory is a must!



You may even want to consider purchasing extra bases that you can mount permanently on your other telescopes. This will allow you to use the same bracket and finder interchangeably.

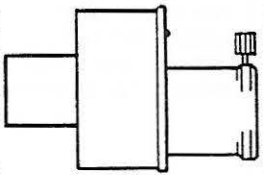
1.25" AMICI PRISM DIAGONAL (APD125)

This right-angle diagonal contains a roof prism erecting system which allows normal orientation of the subject in your eyepiece. No more inverted or upside-down images! Terrestrial viewing is more enjoyable when using the Amici or Porro prism diagonal with your favorite eyepiece. Amici prism diagonals are not recommended for astronomical use.



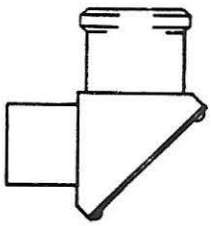
1.25" PORRO PRISM DIAGONAL (PPS125)

The Porro prism diagonal provides straight-through viewing. Image orientation of the subject in your eyepiece is normal so it is easy to observe deer grazing in a distant meadow. Recommended for daytime nature use of your refractor when straight-through viewing is preferred. Porro prism diagonals are not recommended for astronomical use.



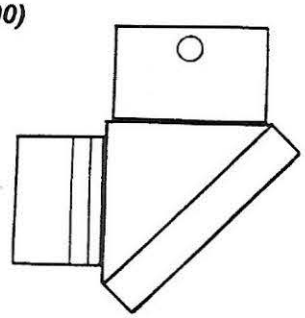
1.25" PRISM DIAGONAL (PRD125)

Right-angle diagonal prisms are fully coated and accept 1.25" eyepieces. Image orientation when used with a refractor is right side up with left/right reversal. Prism diagonals are not recommended for fast (f6) refractors.



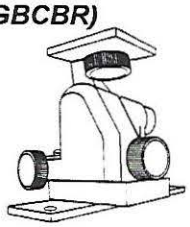
2" MIRROR DIAGONAL (PMD200)

If you own or plan to add the popular 2" widefield eyepieces to your collection, you will need a high quality 2" diagonal. This precision diagonal can also be used with 1.25" eyepieces when used with an adapter. Please note that while the adapter is NOT included with the purchase of the diagonal, you can either use the 1.25" adapter that is included with our 2.7" Astro-Physics focuser or purchase it as a separate item. The diagonal is threaded for 48mm filters.



PIGGYBACK CAMERA BRACKET (PGBCBR)

The unique micro-adjust knobs allow you to frame star fields easily in 2 axes. The camera bracket comes with a flat base and screws that enable you to attach it to the predrilled rings on the top of our mounting rings. Attach your favorite camera with wide-field lens and take some terrific Milky Way shots.



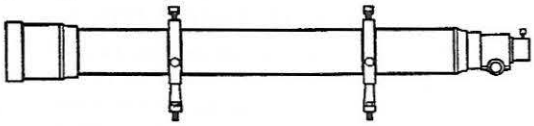
PIGGYBACK CAMERA BRACKET (PGBCNB)

Same as the above bracket without the flat base. Attach to the 7" sliding bar (SB0800) to use with the Traveler accessory plate (ACPLTR).

80 x 900 mm GUIDESCOPE (80GUID)
3.9" GUIDESCOPE RINGS (GR3900)

For serious astrophotography, a full 80mm f11 (3.1" aperture) provides bright star images to facilitate guiding. Our imported guidescope includes a fine achromatic lens coupled with a smooth 1.25" helical rack and pinion focuser with a full 5.5" of travel. A dewcap and dustcover are included. Two half-inch wide aluminum bands are attached to the optical tube in order to protect the finish from marring, the position is adjustable.

Choose the 3.9" I.D. guidescope rings (sold separately) which mounts onto these aluminum bands. The three alignment thumbscrews are adjusted to position the scope. You will need to purchase a 1.25" diagonal if you do not wish to guide straight through. For manual guiding, we suggest a 12.5mm illuminated eyepiece and 3x Barlow. For autoguiding, use the ST-4.



60 x 700mm GUIDESCOPE (60GUID)
3.4" GUIDESCOPE RINGS (GR3400 or GR34FB)

This 60mm (2.4") f11.6 guidescope is ideally suited for the 105 f6 Traveler and 130 f6 StarFire EDF. It features a 1.25" helical rack & pinion focuser with locking screw and adjustable protective rings. You can use standard 1.25" guiding eyepieces or an ST-4 autoguider! A real plus for a guidescope this size.

Choose a pair of 3.4" I.D. guidescope rings (sold separately) with three alignment thumbscrews. GR34FB attaches directly to the top of our mounting rings, GR3400 attaches to the 7" sliding bar (SB0800) for use with either the Traveler accessory plate (ACPLTR) or 8" Dovetail plate (DOVE08).

ASTRO-PHYSICS 2" MAXBRIGHT DIAGONAL (PMDMAX)

The Astro-Physics 2" Maxbright Diagonal was designed with several unique features to provide optimum performance and years of use.

Dialectric Coatings

The Astro-Physics 2" diagonal has a very high-tech dialectric coating that was developed originally for military optics used in hostile environments such as blowing desert sand. There is no aluminum or other reflective metal used. The reflective surface consists of 52 layers of thin film oxides, similar to those used in anti-reflection coatings. The coatings are deposited by an electron beam evaporator at a high temperature.

Reflectivity - Reflectivity is above 99% over the entire 4000 to 7000 Å photo-visual range. Thin film coatings have extremely low surface scatter compared to aluminum or enhanced aluminum coatings. Examination with a laser source shows approximately a 5 fold improvement in surface scatter.

Durability - The coating is extremely durable compared to metal coatings and can be cleaned repeatedly.

Brass Locking Ring

Our customers have appreciated the brass locking ring on our adapters and 2" Barlow and have urged us to develop a diagonal with this feature. The recessed brass ring is under the thumbscrew location. As you tighten the thumbscrew, the brass locking ring clamps onto your eyepiece. This provides a more secure grip for your expensive eyepieces than the head of a single screw can provide. As an added advantage, the brass will not mar the surface of your accessories.

Baffled Flat Black Interior

Allows maximal light transmission.

Threaded for 48mm Filters

If you thread your filters directly into the diagonal, you can change eyepieces with ease without changing the filter.

CLEANING INSTRUCTIONS:

1. Remove the 4 screws holding the mirror housing to the back of the diagonal. Do not remove the mirror from its aluminum housing to clean it.
2. Blow any large, loose bits of foreign matter from the surface of the mirror with an air bulb. Stubborn particles can be removed with a soft camel's hair brush.
3. Place a few drops of a mild soap solution of dishwashing liquid diluted with water and wipe in a circular motion toward the outside of the mirror. It is advisable to use soft cotton swabs or white facial tissue and little or no pressure. Although these are hard coatings, they can be damaged by hard rubbing if there are tiny abrasive dirt particles on the glass.
4. Follow immediately with a denatured alcohol wetted tissue (removes fingerprints) and a final swipe with an acetone wetted tissue (removes stains). The acetone also leaves the surface in an anti-static state which will help to prevent dust attraction.
5. Finally, little bits of dust or lint can be blown off with an air bulb.
6. Remember that these coatings are significantly more durable than aluminum, enhanced aluminum or silver coatings, however they are not indestructible. Please use common sense when cleaning.

4/7/97

ZEISS ABBE ORTHOSCOPIC EYEPIECES

Design

The design of Orthoscopic eyepieces dates back to the 1800s when Ernst Abbe first designed them to be used for accurate measurements of linear distance on microscopic slides. The term "orthoscopic" is used to denote an eyepiece that has no barrel or pincushion distortion, so that an object has the same size anywhere in the field. The design uses a triplet field lens and a singlet eyelens.

The modern Zeiss Abbe Orthoscopic series uses high index Lanthanum glass to reduce the already low off-axis aberrations present in a good orthoscopic design. When used with a high quality telescope of f7 or longer focal ratio, the images of planets will appear clean and free of color fringing from the center to the edge of the field.

The apparent field of view of each of the oculars is 45°, except for the 34mm which has a 40° field. In side by side comparisons, the fields actually appear to be equal or slightly larger than Plössl oculars advertised with 50° fields. The oculars are parfocal and threaded for standard 1.25" filters.

Coatings

Each of the 4 air-glass surfaces is multi-coated with the Zeiss patented "T" coating to achieve the highest possible light-transmission and contrast. It is in this area where the Zeiss Abbe orthoscopic has no equal. The total measured light transmission (including the internal glass absorption losses) exceeds 97%. For high-power planetary observers, this means that planets appear bright and sharp-edged with none of the gray-white haze surrounding the ball of the planet as is common in less expensive oculars. The visual impression is striking. It is almost as if a thin veil has been lifted, revealing the most subtle contrast features more clearly. There is a similar effect for deep-sky observers using the longer focus, low-power Zeiss orthoscopics. Even though the fields are not spectacular, the enhanced contrast of faint objects really is worth it.

Recommended Users

These eyepieces are designed primarily for lunar/planetary users who need the last ounce of contrast to pick out subtle contrast features.

Secondarily, these eyepieces work extremely well for deep-sky observers who are looking for maximum image brightness and high contrast of faint objects rather than extreme fields of view. As such, these oculars will appeal more to the experienced observers with top-notch equipment.

Availability

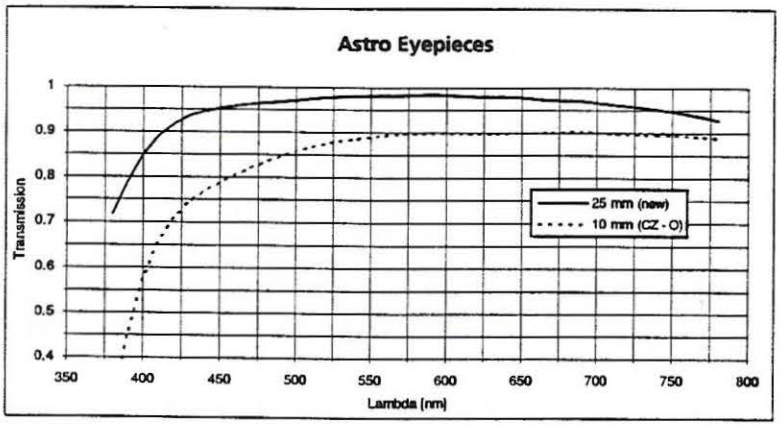
Zeiss introduced Abbe orthoscopics several years ago when the factory in Jena, Germany produced astronomical instruments for amateurs. At that time, the 4,6,10,16, and 25mm focal lengths were offered. When Zeiss dissolved their amateur telescope division in the Fall of 1995, production of these eyepieces was discontinued along with the rest of their instruments.

Late last year, Thomas Baader of Baader Planetarium in Germany commissioned a special production run of four hundred sets of oculars. This production introduces the new 34mm Abbe orthoscopic not available in previously. Astro-Physics will have one hundred sets available for the U.S. market, delivered at intervals throughout 1997. The first shipment arrived in April. At this time, we do not know if Zeiss will produce additional eyepieces for 1998.

In honor of this special production, we are offering a velvet-lined walnut eyepiece case with the inscription "Carl Zeiss Abbe Orthoscopic Oculars." All eyepiece sets will include this case and a limited number of cases are available for collectors who may already own some of the oculars. The case was designed to accommodate all 6 oculars of the complete set.

TECHNICAL SPECIFICATIONS

Barrel diameter	1.25" (31.8mm)
Focal lengths	4, 6, 10, 16, 25, 34 mm
Lens elements	4 (triplet field lens and singlet eyelens)
Anti-reflection coatings	Zeiss "T" multi-coat on each surface
Transmission	=>97%
Field of view	45° (A34=40°)
Parfocal	Yes



Transmission curve of an Abbe eyepiece compared with an Zeiss orthoscopic eyepiece

PRICING

ZEISSA0	Zeiss Abbe Orthoscopic Set - 4,6,10,16,25mm with Walnut Case Sold as a set only, no individual sales	1,180.
ZEISS34	Zeiss Abbe Orthoscopic - 34mm (new issue)	240.
ZEISSBOX	Walnut Eyepiece Case for collectors who already own the 5 original eyepieces. The case will also accommodate the new 34mm	50.

Limit: Two sets per customer.
Special note: The walnut cases will be available in the first week of May. If you wish, we can ship your oculars now and the case when it is available.

SOLAR FILTERS AND ACCESSORIES

Our sun is the most dynamic, ever-changing astronomical object, offering new surprises each day, varying even from one hour to the next. Yet, oddly enough, most astronomers do not observe the sun at all. Astro-Physics now offers a line of the finest solar accessories available on the market today. We invite you to explore this fascinating aspect of astronomy.

Unfiltered sun can easily damage eyes and instruments. For solar observing, use only safe, solar filters in front of the main telescope objective. Do not use eyepiece solar filters alone because the concentrated heat at the eyepiece may cause the filter to break, allowing the full magnified intensity of the sun to reach your eyes. Always supervise children who are observing the sun.

Observations of the Sun in white light

Amateur telescopes, when aimed directly at the sun, concentrate the brilliant light to such an extent that serious damage would occur to the retina with even a quick glance into the eyepiece. Unfortunately, most commercially available glass filters severely distort the wavefront entering the telescope, with a resultant loss of fine detail and contrast. There is a way to reduce the light energy for safe viewing while at the same time preserving the high contrast and resolution of your objective lens.

We have developed a high quality glass solar filter with a chrome coating that can be used both visually (with an accessory eyepiece filter), or photographically for high resolution studies of the sun's surface. These filters are sufficiently accurate to reveal intricate sunspot features and fine solar granulation. Filters are coated with 3 layers of chrome that is calibrated to let a sufficient amount of light through for high speed photography. More light will pass than is normally used for visual observations. As a result, faster shutter speeds are possible, useful for capturing moments of good seeing. For safe, comfortable visual observations, one simply screws the companion neutral density filter into the eyepiece adapter. No heat buildup will occur in the eyepiece optics because the main solar energy has been essentially eliminated by the main filter.

Observations of the Sun in Hydrogen light

To observe the sun in the red light of hydrogen, a special filter system must be used to isolate the H-alpha line. Hydrogen-alpha multi-layer interference filters reject all visible light except for a specified wavelength band in the red (hydrogen) portion of the spectrum. Various types of filters are differentiated by the number of angstroms or sub-angstroms that the filter allows to pass. The smaller the number of angstroms, the narrower the band width which is centered on the H-alpha line at 6562.8 angstroms. Depending on the width of the band, you can observe wispy, dramatic prominences in bold relief against the blackness of space, as well as surface features including dark filament swirls, magnetic storm lines, explosive solar flares, plage, spicules and fine chromospheric network in stark contrast to the sun's brilliant red surface.

PROMINENCE FILTERS:

If your primary interest is photographing the prominences, it is best to use a fairly wide bandwidth filter to get maximum light energy. The advantage is that high shutter speeds are possible, effectively freezing the seeing. Surface structures on the sun are completely lost, and because the sun's light is so bright an occulting disc must be used to eliminate the resulting glare. The 1.5 Å Prominence Viewer from Baader Planetarium has been specially designed to capture the prominences in all their breathtaking detail. With its wide bandpass, the prominences are bold, bright and dramatic.

NARROW BAND FILTERS:

For detailed viewing of active regions on the solar disk as well as prominences off the disk, a narrow band filter is essential, Bandwidths greater than 0.8Å are useless for showing surface detail, while bandwidths narrower than 0.5Å will not show prominences well. We offer the superb line of Daystar filters and accessories because they are proven to be the best in the world for high resolution studies of the sun. The sub-angstrom H-alpha filters from Daystar offer incredible detail of active surface regions, with good views of the prominences. The narrower the band pass, the higher the contrast of surface regions. University, ATM and T- Scanner models are all available in bandpasses of 0.8Å, 0.7Å, 0.6Å, and 0.5Å. Please refer to the description below.

ENERGY REJECTION FILTERS:

All H-alpha systems require an energy rejection filter to be placed over the front aperture to block the intense ultraviolet (U.V.) light from the sun which would otherwise bleach the main filter in a short time and render it useless. The energy rejection filter must be of the same high optical quality as the main lens, otherwise you will not be able to resolve the fine detail in the prominences or on the sun's surface. Our filters are made from Schott RG610 red filter glass. They are polished and tested interferometrically to 1/4 wave peak-to-valley minimum, and are guaranteed to give the highest definition and contrast possible. The filters are mounted in a machined aluminum cell that fits over the front of the objective cell.

ASTRO-PHYSICS PHOTOGRAPHIC GLASS WHITE LIGHT FILTER

Our full aperture white light glass filters are crafted by European opticians of fine-annealed 10mm plane-parallel glass, polished better than lambda/4 and chrome coated to density 3.3. The filter is mounted in a machined aluminum cell which fits over the lens cell. We also provide a grey 1.8 ND (Neutral Density) filter for 2" eyepieces which is used in conjunction with the primary photographic filter for visual observation. This eyepiece filter is coated with MgF_2 on both sides. The glass white light filter comes with protective aluminum dustcovers for both sides.

Note: I regret that we are unable to obtain these filters at this time. Since I am hopeful that we can offer them in the future, we will leave this information in the brochure.

ADVANTAGES:

- Sunspots show penumbral detail that resembles fine eyelashes.
- A motor driven mount and polar alignment are helpful, but not critical.

CONSIDERATION

- :Prominences and H-alpha surface detail cannot be seen.

part nos.

PWL105 - 105 Traveler
PWL130 - 130 StarFire EDT and EDF, Star130ED
PWL155 - 155 StarFire EDT and EDF
PWL180 - 180 StarFire EDT and EDF

1.5 Å HYDROGEN-ALPHA PROMINENCE VIEWER FROM BAADER PLANETARIUM

The H-alpha filter in this Prominence Viewer passes red light of 6562.8 Angstroms which is strongly emitted by the sun's chromosphere and prominences. The transmission characteristics of the filter are provided on the spectrophotometer tracing included with each unit.

It is wonderous to observe delicately shaped prominences appear, change shape, blow out into the corona, and disappear- all in slow motion.

Components:

1. Prominence viewer body, consisting of a four/five section cylinder which houses:
   - Aspheric relay lens with teflon sockets for the occulting cones
   - Adjustable iris diaphragm to minimize scattered light in the system
   - Multi-coated projection lens array in conjunction with the H-alpha filter with a bandpass of 1.5Å
   - Two extension tubes (use one or two as needed)
2. Six (6) occulting cones of varying diameters that individually provide an artificial solar eclipse within the instrument. Since the relative size of the sun varies throughout the year, you will select the cone of the proper size. A pair of tweezers and gloves are included to manipulate the cones.
3. VIP Excenter- for visual and photographic use. Allows you to view or photograph prominences at the edge of the field or center them. A large spring-loaded tension ring with three adjustment screws allows sensitive tension adjustment depending on the connected observing system (i.e, diagonal/eyepiece or camera). Includes sliding focus t-adapter (you thread your camera adapter directly) that also serves as a 1.25" visual back. This system is essential for higher visual magnification and serious photographic work.
4. Adapter for 1.25" oculars
5. Calibration curve for your H-alpha filter with bandpass and maximum transmission.
6. Carrying case

In addition, you will need:

- visual: 1.25" star diagonal and eyepieces (we suggest 24mm TeleVue Widefield)
- photographic: camera adapter, and 35mm camera

OPTIONAL ACCESSORIES: Projection eyepiece PII and M43 extension tubes (two tubes)

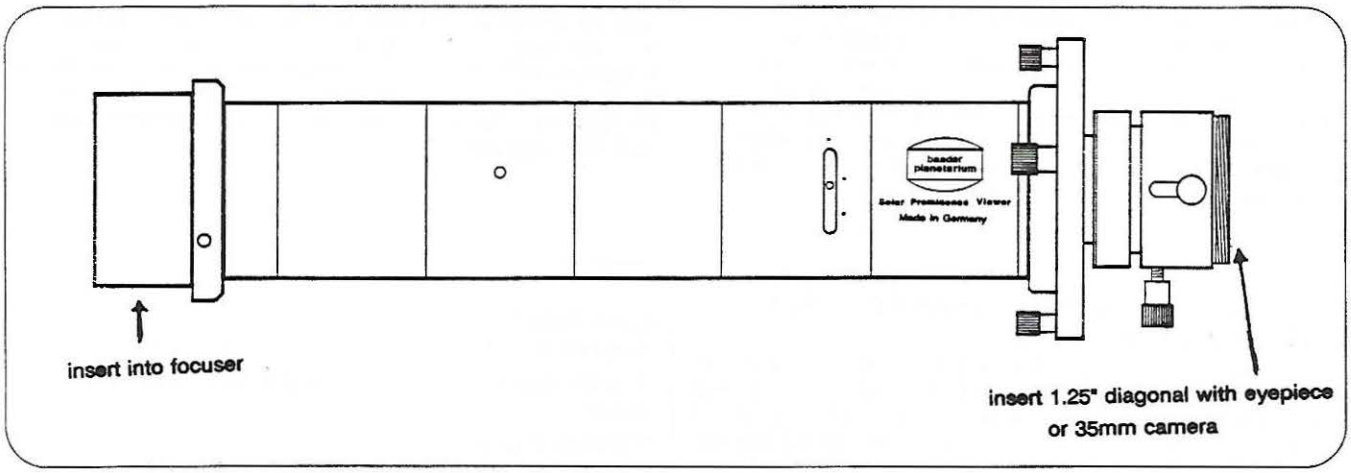
ADVANTAGES:

- Observation with up to 130mm aperture
- The H-alpha bandpass filter is fully blocked from X-ray to deep infrared wavelengths
- This filter has over 30% transmission. Prominences appear bright, showing brilliant detail out to the finest "splashes."
- Fast photographic exposure times 1/250-1/500 of a second, effectively freezing the motion of the prominence and atmospheric seeing effects.
- Does not require heating of H-alpha filter and is ready to go as soon as you are set up
- Wider bandpass to emphasize prominences
- You will record Doppler shifted components of prominences automatically.

CONSIDERATIONS:

- Must be used with refractor, mirror systems scatter light which lowers contrast.
- Must use tilt mechanism (included) for colder temperatures
- Requires perfect polar alignment and sturdy mount with solar tracking rate. It is important that the disc of the sun remains covered by the occulting cone
- Not readily interchangeable with other refractors. The occulting cones are customized for the focal length of the instrument. If you plan to use the Prominence Viewer with more than one refractor, you will need occulting disks for each focal length.
- Cannot be used easily with long focus refractors exceeding 1500mm

Available for the following refractors: All Astro-Physics refractors, Celestron 80mm f=910 Firstscope, Celestron 102mm refractor
See price list for part numbers.



RED ENERGY REJECTION FILTER SCHOTT RG610

Filter thickness 10mm, polished to 1/4 wave peak-to-valley in transmission. Made specifically to reduce the intense U.V. light from the sun when using H-alpha filters, our red energy rejection filters are available in 100mm 130mm diameter sizes. The machined aluminum cells will fit over the front of the objective cell of our 105 Traveler, Star12ED and 130mm doublets and triplets. In addition, these filters are available for our larger telescopes for reduced aperture viewing with DayStar filters and Prominence Viewers. The red energy rejection filter comes with protective aluminum dustcovers for both sides.

Note: Availability of these filters is limited. Please call for current status.

DAYSTAR T-SCANNER

The T-Scanner is fabricated to the same standards of quality and safety as the world recognized Daystar ATM and UNIVERSITY model H-alpha systems. The T-Scanner requires no power input and is completely portable.

In operation, the T-Scanner takes advantage of the fact that all optical interference filters will shift towards the shorter wavelengths when tilted. Therefore, the filter is fabricated with the passband a few angstroms to the red side of the H-alpha line, i.e. 6565 A. When the control knob is turned, the filter is tilted and the passband (fringe) scans across the solar image showing H-alpha features.

The filter's 30mm (1.8") clear aperture allows full disk H-alpha feature and prominence observations when used with telescopes having focal lengths of 118" and less. Telescopes with longer focal lengths and resulting larger solar image diameter only need to be guided to the solar active area of interest.

When ordering your T-Scanner, request the front cover with the female t-thread.

The T-Scanner requires a nominal f30 beam. This is accomplished with the Astro-Physics TELECENTRIC BARLOW SYSTEM as described below or with a DayStar red energy prefilter of an appropriate aperture to result in a nominal f30 beam. For instance, if the focal length is 1016mm (as in our 130mm f8 StarFire EDT), an f30 beam is achieved with a 1.3" aperture. (Actually DayStar provides 2" aperture masks for 4" refractors). The full aperture of the 130EDT can be used with our Telecentric Barlow System.

ADVANTAGES:
- Shows prominences and surface features of the sun
- Economical, high quality subangstrom H-alpha filter from Daystar
- No heating unit, no electrical power is required for the filter
- Does not need time to warm up
- Can be used visually and photographically

CONSIDERATIONS:
- Works best within a specific range of temperatures, this may limit viewing during cold months in northern climates
- Filter is fine-tuned by a tilting mechanism. If the filter is off band, parts of the image may appear out of the pass band

DAYSTAR UNIVERSITY AND ATM H-ALPHA SUB-ANGSTROM FILTERS

Two DayStar H-alpha solar filter series are available, the ATM and UNIVERSITY; both feature 32mm clear aperture.

The ATM model filters are fabricated with instrument quality components and will meet the needs of most amateur solar astronomers. They are designed primarily for visual disk feature observations and prominence photography. Passband tuning is accomplished by a built-in heater which requires 110V AC power.

The UNIVERSITY model filters are fabricated with the finest filtering components and meet the rigid imaging and photographic requirements of professional institutions.

When ordering the UNIVERSITY and ATM filters, specify the female T-thread end plates for both sides. Astro-Physics offers a custom 2" adapter that will allow use of 2" accessories.

As with the T-SCANNER model, the UNIVERSITY and ATM filter requires a nominal f30 beam. This is accomplished with the Astro-Physics SOLAR SYSTEM as described below or with a DayStar red energy prefilter of an appropriate aperture to result in a nominal f30 beam. For instance, if the focal length is 1016mm (as in our 130mm f8 StarFire EDT), an f30 beam is achieved with a 1.3" aperture. (Actually DayStar provides 2" aperture masks for 4" refractors). Full aperture operation up to 130mm can be accomplished with our Telecentric Barlow System.

Recommendations from DayStar Filter Corporation: If your primary interest is bright prominence, but you also want to know what's happening on the disk, the 0.8 angstrom filter will do the job nicely.

The 0.7 angstrom bandwidth filter is a good intermediate choice. The red prominences stand out briskly against the dark sky and the disk features have good contrast. This filter is a popular for general work and as a teaching aid.

The 0.6 angstrom bandwidth filter provides excellent contrast and is great for detailed studies of active regions. The prominences are quite visible and easily photographed. A good choice for educators and is a popular choice for general work.

The 0.5 angstrom bandwidth filter provides SUPERB disk feature contrast and used with telescopes having one arc-second resolution or better will provide visual and photographic results comparable to professional observatory quality. Prominences are subdued.

NOTE: The bandwidths indicated are maximum.

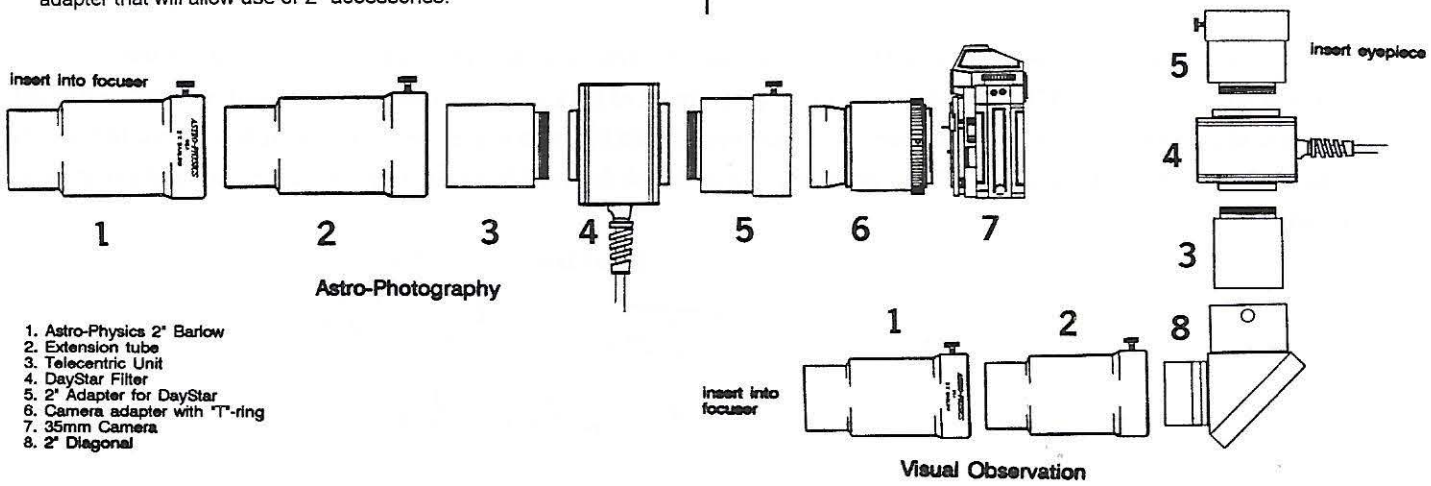
ADVANTAGES:
- Shows prominences and surface features of the sun
- Can be used visually and photographically
- Polar alignment is recommended but not critical

CONSIDERATIONS:
- Requires heating unit powered by AC power source
- Unit may take 1/2 hour to one hour to be on band (depending on temperature)
- More expensive than T-Scanner

TELECENTRIC BARLOW SYSTEM TO USE WITH DAYSTAR H-ALPHA FILTERS

Normally, the required f30 beam is accomplished by stopping down the aperture of the scope. The Telecentric Barlow System will provide the longer f ratio using the full aperture of your 4" or 5" refractor. Six inch and larger scopes will be limited to 5" (130mm) to allow the full disk of the sun to be seen.

Components of Solar System:
1. 2" Barlow - The Astro-Physics barlow features four baffles machined into the barlow, flat black interior, and a brass locking ring. This versatile photo-visual accessory can also be used for daytime terrestrial viewing and nighttime astronomy.
2. Telecentric Unit - This optical component is used in conjunction with the 2x Barlow to increase the effective focal length and make the light rays nearly parallel for the DayStar Filter.
3. Extension tube with brass locking ring
4. Adapter for DayStar filter which enables use of 2" eyepieces.



1. Astro-Physics 2" Barlow
2. Extension tube
3. Telecentric Unit
4. DayStar Filter
5. 2" Adapter for DayStar
6. Camera adapter with "T"-ring
7. 35mm Camera
8. 2" Diagonal

3-10-92

Dear Roland and Marjorie,

We feel we should share our experiences with you using your refractors.

Six years ago we bought our first refractor, a 5" f6 to do 35mm wide field photography. This was before ED glass and multi-coatings. It became apparent that a 35mm negative from this telescope could be enlarged to 20 "x 24" prints and still look sharp. There were color problems with the brighter blue stars but the faint ones were mere pin pricks.

One evening Daphne and I did a duo photograph of the North American Nebula - she with the refractor and I with a 10" Newtonian. Both instruments were f/6. We exposed identical film for 45 minutes. When the film was processed, we were surprised to see that the film exposed in the refractor had more contrast and more density! A lot more light was getting through the refractor and with much less flare. It was obvious the refractor has certain superior characteristics as an astrograph.

Time has progressed and with it refractor technology. We became the first recipients of your 6" f/7.5 ED Triplet refractor set up to expose 6 x 7 cm negatives. Some characteristics were immediately obvious. Visually, it was like looking through a reflector, there was no color fringing, even at high powers! Unlike two-element ED designs that don't correct the far blue and ultra violet, the ED triplet had no halo around bright blue stars visually, and most important, photographically! Indeed, the single most significant improvement with the ED triplet was the far blue-ultraviolet correction because, as you know, film is the most sensitive to these colors! Stars now were so microscopic on the film that only a 30" x 40" enlargement revealed the true resolution of the lens.

There seem to be some rumors that the ED triplet does not stabilize and suffers from thermal problems. During the time we have had this lens and under some very cold nights on Mt. Pinos, we have never noticed any degradation of image. Furthermore, even while we are polar aligning and the scope is cooling down, our target star exhibits classic diffraction patterns at 275 power. As we would with any telescope, we allow it to cool down in order to maintain critical focus over 2.5 hour exposures.

The light transmission of the ED triplet is phenomenal. Looking through the elements is like looking through air. The advanced multi-coatings reduce light absorption to almost nothing. Since the third element only blocks 1% of the light, we feel the advantages of the triplet design are enormous, especially if you plan to do photography. Indeed, it is a prerequisite unless you enjoy using a minus violet filter to suppress the far blue and ultraviolet. We had ghosting problems with the use of filters so the ED triplet was like an answered prayer.

It's really unfortunate that Mt. Pinetubo messed up the atmosphere ... alot of our projects are now on hold until it clears up a little more.

We are very enthusiastic about the 6" ED triplet we own and can't wait to use it again. In its 2 years of use, we have made magazine covers and "Images" in *Sky & Telescope* and a lot of 16" x 20" prints that have been well received. Although substantial effort is done in the dark room, we could never even begin to make these photographs without the superb telescope you created for us. For this, we thank you and look forward to many years of interesting and progressive results.

Clear skies! (someday)

Tony Hall

Daphne Mount

DEAR ASTRO-FOLKS:

"ASTRO-PHYSICS REFRACTORS BIG & SMALL"

Excerpts from product review in **Astronomy,** September 1993, pp. 62-67

Instruments featured: 105mm f6 Traveler EDT, 155mm f7 StarFire EDT, 400, 600E and 1200 German Equatorial Mounts

"Astro-Physics' new line of refractors promises high-resolution, color-free optics on solid mountings. Our testing found they amply delivered on that promise.

... Each of the three mounts I examined was an outstanding example of fine craftsmanship. Assembly was quick and convenient. Fit and finish were superb. The motions were smooth, the locks firm and solid. And the all-important steadiness of the mountings was as good as I've seen on any mountings of similar size and load-carrying capacity.

... The optical quality of the Traveler proved superb. Images of even the brightest objects - tough tests such as Venus and the limb of the moon - were completely color-free, a remarkable achievement in an f5.8 refractor and a tribute to how far lens technology has come in the past few years. There was no sign of spherical aberration or on-axis astigmatism. Star images looked textbook perfect in focus and on either side of focus. The fully multicoated optics also provided very bright images for the aperture.

... Optical performance of the 155EDT was impressive. It produced nary a trace of false color even on Venus. Equally impressive, this scope provided superb images as soon as it was set outside. Even in sub-freezing temperatures, image quality, though not perfect at first, was surprisingly sharp from the start. In cold weather, after a modest settle-down time of 30 minutes, in-focus star images were textbook Airy disks with a well-defined first diffraction ring and a trace of a second outer ring. There was no sign of spherical aberration, lens figure changes, heat plumes, or distorted Airy disks due to tube turbulence.

... The current selection of apochromatic refractors on the market is enough to make any lover of fine telescopes drool. The Astro-Physics units I tested proved to be first-class instruments made to exacting standards of performance. Fitted with optional guidescopes, refractors like these have been used to create some of the finest astrophotos ever taken.

The limited production numbers and high demand for Astro-Physics telescopes have produced waits of several months to a year for many models, but if you are looking for some of the finest instruments on the telescope market today, the wait may be worth it." Alan Dyer, Astronomy

105mm f6 TRAVELER EDT

"As observers lined up for a peek the reaction was -over and over again- 'But it's such a small scope .. that's amazing.' Everyone loved the smooth focuser and the stars snapping into crisp pinpoint focus.

The North America Nebula [35mm Panoptic 18x, O-III filter] caused a sensation. The whole thing along with most of the Pelican was so clearly seen that some of us thought we could detect the striations that show up in photos. It was by far my best view ever of this object. One veteran who has a [name deleted 8" and 14" SCT] said 'this is the first time I have ever really seen this object in 25 years of observing.'

Veil Nebula [35mm Panoptic 18x, O-III filter] was equally spectacular showing both sides (brightly) along with the faint wedge in between. Filamentary detail in the two main sections was easy to see even at this low power...

This is a marvelous telescope. Once more units are in the field you should be swamped with orders. There must be several thousand serious amateurs who would regard this as a perfect primary or secondary telescope." Name withheld on request

105mm f6 TRAVELER EDT

"From my suburban backyard, observed NGC6207 (magnitude 11.6 galaxy near M13) as well as NGC7331; beat out a 13" Dobsonian in observing M85, demonstrating that contrast can be more important than sheer light grasp; M42 a fabulous sight with glowy tendrils and sharply defined. Structure at 70x; NGC 457 and NGC 7789 resolved at 70x, the latter into an incredible sprinkling of tiny, faint pinpoint stars. From dark sites in Virginia, have seen NGC 7293 (the Helix nebula) and, inexplicably, NGC 931 -- listed as a magnitude 13.9 galaxy that theoretically should not have been visible in such a small instrument."

Image quality far surpasses 8" SCT and 10"/13" (name deleted). Similar resolution and brightness as a good 6" f10 Newtonian (custom)." S.S., PA

105mm f6 TRAVELER EDT

The Traveler easily outperforms my [other 4" apo refractor], especially at high powers. The quality of construction is also much better, especially the light baffles and the large, rock solid focuser.

The Traveler 105 is a great scope, both optically and mechanically. I can highly recommend it to anyone who wants an excellent, portable refractor. " E.S., Florida

105 TRAVELER EDT

"Thank you for creating the beautiful Traveler telescope for me. The scope and 400 series mounting head with adjustable wood tripod arrived a short while ago. I would like to take this opportunity to express my feelings about this system...

The fit and finish of the scope, mounting head and tripod are exquisite. The machining is completely first rate! This type of quality seems to be getting harder to find every day. (Perhaps Astro-Physics is hiring all of the great engineers and machinists in this country.) In this area, I feel qualified to state my opinion as my profession is the sale of highly engineered and machined products. Based on all of the units I've seen, Astro-Physics is a line with which I am happy to be associated. You obviously take a great deal of pride and care in all aspects of telescope manufacture. ...

Under the stars the Traveler really shines... Several times I have seen six stars in the Trapezium. There are many examples of the awesome capabilities of this handy scope; terrific detail in Saturn, the moons of Jupiter, and wonderful gossamer quality to any number of nebula.

130mm f8 STARFIRE EDT

"The new StarFire 130 EDT arrived a few days ago. It was a joy to unpack it and to set it up: it looks beautiful and bears testimony of exquisite craftsmanship throughout. Yesterday the sky cleared up and the telescope got 'first light.' I was out under the stars for many hours - looking , testing and also comparing the new instrument with other telescopes. Yet I soon realized that there was no reason to use any other instruments: the StarFire simply was superior. Deep sky views with 9mm and 7mm Nagler eyepieces was sharper, cleaner and more contrasty than I have ever seen. And best of all: With this instrument the problem of spurious colour in the refractors definitively is gone- incredible! Jupiter was quite a show at all magnifications I tried (50x up to 290x with no image breakdown). What amazed me not the least was how bright its disk looks, also at high magnifications, with the colors in the belt system readily visible. There was a wealth of detail, much more than I could have drawn, though the seeing was somewhat unsteady. In short: it was a totally satisfying night of observing. Thanks for a superb instrument... I consider the StarFire EDT design a milestone and a great gift to the community of amateur astronomers. Y.T., Denmark

130mm f8 STARFIRE EDT

"I am enthusiastic of the 130mm StarFire EDT: the optics are superb, I can put on it every kind of eyepieces, even 3mm Plossl Clave and Barlow 2x to an equivalent focal length of 1,5mm without any distortion or secondary spectrum...I intend to buy from you another bigger, the 7" or 8"..." C.G., Italy

130mm f8 STARFIRE EDT

" I always get a good crowd at observing sessions. I wouldn't trade it for anything else I've ever looked thru....

As you already know, I am a real nit-picker, and I don't hesitate to pick up the phone and bug Marge when I have a real or imagined problem. Your attitude toward service has been super, and your technical assistance has been great...

I would recommend any of your products without hesitating based on my experiences of the last 3 years..." S.E., WI

130mm f8 STARFIRE EDT

"Solar photographs showing detail of almost 1 arc second in photo" G.G., IL

130mm f8 STARFIRE EDT

"From 'First Light' through the 130EDT my quest for the PERFECT observing instrument was over. My time spent with my new REFRACTOR under the stars are no less then a literal religious experience. The spectacular vistas laid out before my eyes were unlike any other I have had the opportunity to experience before. To relate to you what I now see regularly with my 130EDT, with statements like 'Star Points literally with no dimensions', 'or super planetary images with unbelievable amounts of detail and sharpness' do not cover the full spectrum of satisfaction regarding what I actually see with the 130EDT. Familiar objects viewed through the refractor such as the Dumbbell, Ring, M81 & M 82, BlackEye, and the Whirlpool, M13, M3 to name a few, are simply incredible!!! The inky black sky boarding an absolutely crisp image of the core of M13, my Cassegrain could never reveal this much detail, not on any night and no matter how far up/north I went. Jupiter and Saturn fill the 9mm Nagler with detail I would not dare imagine possible. Many of my Astro/Buddies have said the same thing and have come away from the eyepiece with the same sort of opinions and thoughts. C.S. Canada

130mm f8 STARFIRE EDT

"It blows everything else away in terms of sharpness and contrast, and compares favorably in light grasp with 8 inch SCT's... I am truly impressed with your quality and commitment to excellence, rare indeed in the economic climate of the country today. Surely your reputation will be remembered in the history of telescope makers ..."J.L.., New Jersey

130mm f8 STARFIRE EDT

"Thanks again! for making a excellent telescope available to "average" guys like me. Besides the excellent lens I like the focuser, I really like the focuser! The lens is beautiful and never ceases to amaze me even in my light polluted backyard.

Crispness and contrast is a fair trade off for large aperture and mushy stars. I finally know what that perfect star looks like. I enjoy the way the image 'snaps' into focus." P.B., Iowa

130mm f8 STARFIRE EDT

"My first night out with the new scope can be summed up in just one word: "heaven." Stars finally, at whatever magnification, looked like stars: bright points of colorful light. Jupiter was bright and clear, with no apparent chromatic aberration. I found, and thoroughly enjoyed, the Owl Nebula on my first try, something I hadn't been able to do with any of my earlier purchases even after hours of searching.

So thank you for manufacturing such a wonderful instrument; I am a completely happy customer. Is the StarFire the 'perfect' telescope? Well, it doesn't weigh less than a pound, cost $1.49, and show distant objects like the 200 inch Palomar, so no, it's not perfect. But is it as good as the present state of the art allows? I think so." T.L., Maine

130mm f8 STARFIRE EDT

"The contrast afforded by your optics allows me to routinely observe planetary detail which before would only reveal itself in momentary glimpses. The ability to distinguish color is also exceptional. And there is no false coloring or image ghosting what-so-ever. Venus is a hard white crescent with NO purple halo that I can detect. Views of the moon are completely free of that yellow fringe common with lesser quality "apochromatic" designs. Even with the poor seeing from my backyard many faint objects show details I would normally expect only under much better skies. The quality of the mechanical workmanship is a joy to behold. Every aspect of the design assures a solid mounting, super smooth focusing, and no wobble between parts that don't mate perfectly. My great grandchildren will also be pleased when they inherit this telescope.

Thanks for making a fine product. It has helped to return the "amour" to my amateur pursuits." P.S. , Washington

130mm f8 STARFIRE EDT

This is my first telescope after many years without one. However, I did not wish to go through what so many amateurs do, i.e. buying and selling a string of scopes that they are never really happy with. I also desired a scope that would still be a fine instrument in 30 years, in other words, a long term prospect. I feel satisfied that the StarFire meets all my needs. J.B. Australia

130mm f8 STARFIRE EDT

"Observing Moon is an interesting sight; all I saw was sharpness, clarity and contrast. Mostly white, gray, and black with no smearing or glare whatsoever. Saturn is an experience that every observer should see; at about 113 to 226 power; I saw Ring C as well as A and B, Cassini's division, and subtle colored shadings. With 40mm Wide Field TeleVue eyepiece, Pleiades and Double Cluster displayed as whole object, in sharp diamonds-like across the field of the view. In deep sky observing, Great Nebula in Orion really shines in greenish color, studded with four diamonds of Trapezium. With aid of nebula filter, I saw Blinking, Dumbell, Crab, Eskimo, Helix Pelican, North America, Ring, Rosette, Veil, and without filter, numerous nebulae, clusters, galaxies, and multiple stars were enjoyable to observed. P.L., Massachusetts

130mm f8 STARFIRE EDT

My name is Contini Stefano and I'm your customer since 1990. I own an Astro-Physics 130 EDT refractor and some accessories to take astronomical observations and photos. I really don't know how to thank you for the excellent refractors that you build and the huge visual and photographic satisfactions that they give to me. I operate in these sector with another your customer, Mr. Zinelli Alberto, that own an EDF 6.1"f7. Mr. Zinelli and me have obtained really excellent photos with the EDT and EDF refractors. The 130 EDT and, particularly, the 155EDF are trullytwo excellent telescopes. Many of ours photos have been published on the great Italian astronomical reviews (l' Astronomia, Nuovo ORIONE, and Astronomia V.A.I.), and we intend to collect them in a photographic atlas to publish. I think that we will send you some copy of these photos soon, so to have your opinion. " C.S., Italy

180mm f9 STARFIRE EDT

"I've observed Mars since January and am simply astounded at the images I am getting, views of Martian detail have a clarity and are surpassing any I've previously observed. (I very much like this scope). This winter the gas clouds of Orion were brighter with blacker sky than I'm used to - pure "delight." and JUPITER. It's quite a show. I didn't expect this much detail. It's hard to pass up a clear night anymore. R. O, Maryland

180mm f9 STARFIRE EDT

" I am truly delighted with every aspect of the equipment you sent me - the workmanship is first class and the views are startling in their clarity." B.G., Australia

180mm f9 STARFIRE EDT

"I love the 1200 mount and the 7.1" EDT is incredible. On first light, with seeing at a 7 out of 10, I could count, with a barlow and a 4.8mm Nagler, six ring divisions on Saturn and substantial detail on the surface and pole areas. I had my 20" Dob with (name deleted) optics out and was amazed at how close M42 looked in the 7.1" to the 20". I know that it's not supposed to be that way but the much higher

resolution really boosts the visibility of extended objects." D.S, Missouri (note: I am sure that he meant "contrast " rather than "resolution")

180mm f9 STARFIRE EDT

"Thank you for the 180mm Apochromatic refractor you have made for me, it performs very well, the images are almost perfects and we have enjoyed it in many observationes... This is the instrument we have always dreamed and we enjoy to look at the sky with it. We are two friends with many instruments: binocular, Newtonians (12",20" equatorial, and 30" alt-azimuth) but nobody gives so pure images on Moon, Planets, double-stars and Sun." G.C., Italy

180mm f9 STARFIRE EDT

"I'm writing to thank you for producing your outstanding telescope equipment. As you can see in the accompanying vewspaper article, I was priviliged to observe and sketch the dark feature imparted on Jupiter by fragment "A" fo Comet Shoemaker-Levy 9 on 16 July 1994 at approximately 8 P.M. E.D.T., a couple of hours prior to the confirming HST images broadcast on TV.

Without the superb optics of my 7" StarFire I seriously doubt that I would have been able to discern this subtle feature near the Western limb of Jupiter at sunset. To say I was thrilled would be a gross understatement.." J.S., PA.

180mm f9 STARFIRE EDT

"I recently received my 180 EDT refractor. It is truly an impressive instrument to look at. The fit and finish is superb. Looking through it is equally as impressive. Diffraction rings are perfect and very high contrast views of Jupiter. I am sending some CCD images of Comet S/L-9 impact sites on Jupiter which I took with an SBIG ST-4 CCD camera. ... Thank you very much for a really fine instrument. I am really proud to see an instrument of this quality and at a reasonable cost made in the USA! " D.H., GA.

6" STARFIRE EDF f7.5

"Well... If you had made a bet with me about five years ago that I would be raving about the performance of a refractor I would have put heavy money up against such an eventuality!

I took the 6-inch f/7.5 EDF out this last new moon to check it out and to make the first photos with it (First Light!). The negatives remain to be developed but the visual performance was absolutely incredible !!!!!!!

The seeing was about 8.5/10... First thing we looked at for some hard optical testing was Vega. The inside-and -outside-of-focus diffraction patterns were identical and showed NO COLOR AT ALL on the EDF !!! ...Absolutely fantastic !!!

Thank you so much for this wonderful instrument !!! Congratulations on your optical prowess !!! B.W., California (noted astrophotographer and author)

155mm f7 STARFIRE EDF

"The EDF 155 f/7 is just arrived a few days ago and it looks beautiful and fantastic craftsmanship. I am very happy." A.Z., Italy

6" STARFIRE EDF F7.5

At Riverside 1992, some very critical Japanese observers and some equally critical American [name of prominent Japanese telescope company deleted] user-observers trained Jack C.'s 6"EDF on Vega and tried their darndest to find color and couldn't. The Japanese were highly impressed and the [deleted telescope company] owners finally mumbled that the A-P refractor was definitely better. My wife wondered why I wanted the 6.1" when I had an excellent 5", turned to me after looking at the Whirlpool galaxy through Jack's scope and said "Now, I understand" and supported me fully in fulfilling my dream of obtaining the 6.1"EDT. By the way, she is a very hard sell, but seeing is believing + she is definitely now a believer." R.A., California (Mr. A. owned a 5"f8 refractor with an Astro-Physics StarFire lens).

400 GERMAN EQUATORIAL MOUNT

I am writing to let you know how happy I am with my 400 mount. The quality is outstanding, the mechanical workmanship is excellent, and the electronics work great! ... I am currently saving up for one of your telescopes as well. Keep up the good work! D.F., Illinois

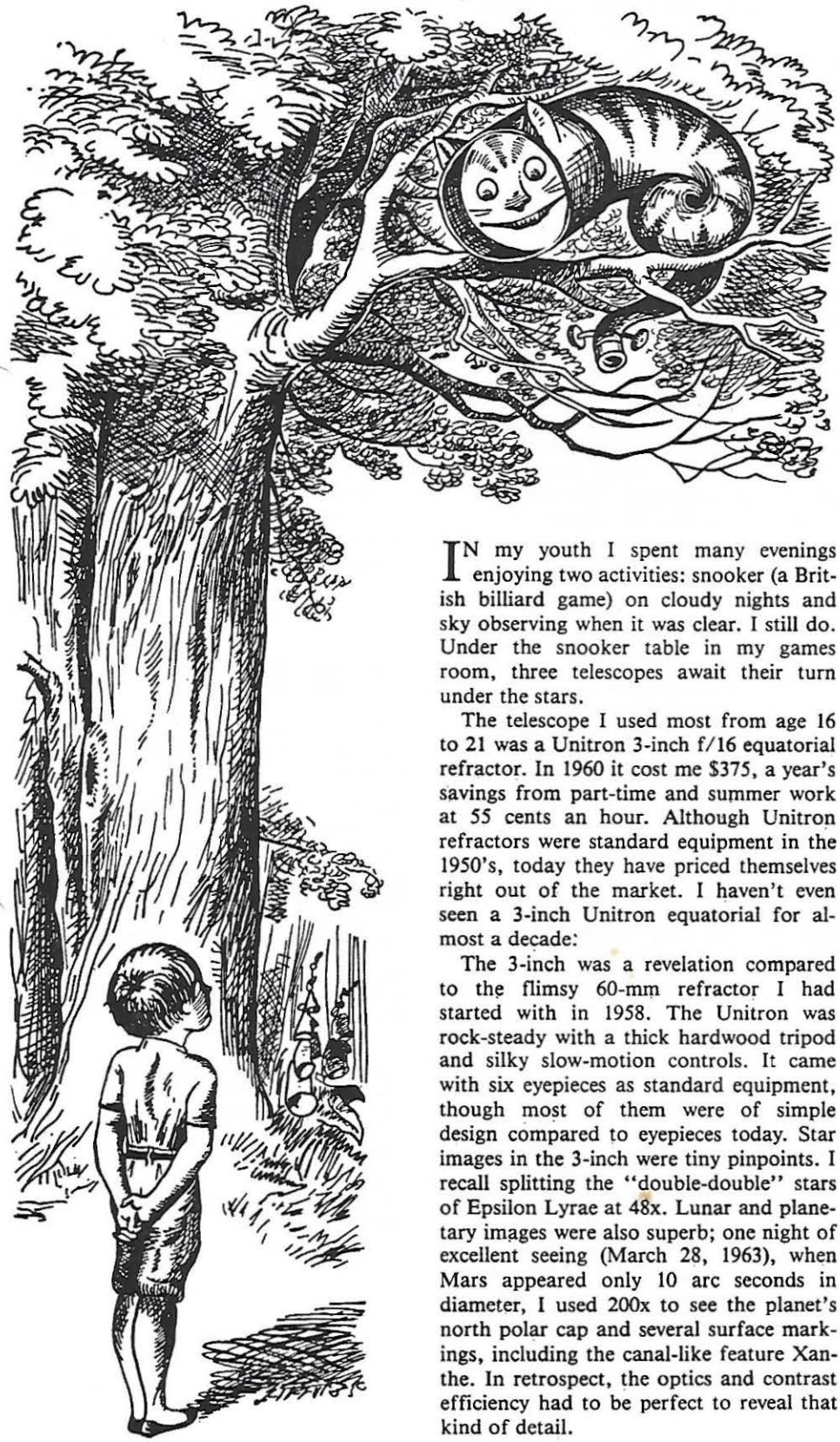
600 GERMAN EQUATORIAL MOUNT

"This scope has been and continues to be subject to probably some of the most rigorous usage of any scope and mount anywhere. I attempt religiously to observe the sky every clear night during our dark season here and that usually means deep cold, even down to -60 degrees F. Regardless of conditions, the scope and mount have always functioned in a flawless, silky smooth, ultra-stable manner. I have never come across any other man-made thing which works so reliably at these extreme subzero temperatures. I have kept the pier and mount where a telescope belongs (outside, under open sky) continuously since obtaining it four (4) years ago, and have transported it a great deal, as well." D.C. Alaska

Amateur Astronomers

Conducted by Stephen James O'Meara

ADVENTURES IN REFRACTORLAND



IN my youth I spent many evenings enjoying two activities: snooker (a British billiard game) on cloudy nights and sky observing when it was clear. I still do. Under the snooker table in my games room, three telescopes await their turn under the stars.

The telescope I used most from age 16 to 21 was a Unitron 3-inch f/16 equatorial refractor. In 1960 it cost me $375, a year's savings from part-time and summer work at 55 cents an hour. Although Unitron refractors were standard equipment in the 1950's, today they have priced themselves right out of the market. I haven't even seen a 3-inch Unitron equatorial for almost a decade.

The 3-inch was a revelation compared to the flimsy 60-mm refractor I had started with in 1958. The Unitron was rock-steady with a thick hardwood tripod and silky slow-motion controls. It came with six eyepieces as standard equipment, though most of them were of simple design compared to eyepieces today. Star images in the 3-inch were tiny pinpoints. I recall splitting the "double-double" stars of Epsilon Lyrae at 48x. Lunar and planetary images were also superb; one night of excellent seeing (March 28, 1963), when Mars appeared only 10 arc seconds in diameter, I used 200x to see the planet's north polar cap and several surface markings, including the canal-like feature Xanthe. In retrospect, the optics and contrast efficiency had to be perfect to reveal that kind of detail.

Furthermore, the exceptionally long f/16 focal ratio reduced chromatic aberration almost to zero. Only on Venus did a tinge of purple emerge. Today such performance is sometimes called apochromatic. I remember being shocked when I finally got to peek through bigger refractors and saw the violet haloes around Jupiter, Saturn, and brighter stars.

But I was even more dismayed by the erratic performance of the Newtonians used by most of my colleagues. Their telescopes ranged from a 6-inch f/10 that produced pinpoint stars and excellent planetary detail to pitiful telescopes that could never be properly focused. At the time I was unaware of the devastating effects of improper collimation, tube currents, and large-aperture seeing limitations that plague Newtonians. I attributed it all to poor optics.

Regardless, that experience led me to purchase a larger refractor — a 7-inch f/17 built by Harold Brown of Toronto. I bought it from a local amateur for $200 in 1966; the owner regarded it as a white elephant and was glad to remove it from his garage. It had been used on a pier in the open for years, protected by a boat cover. The mount was, in effect, a rusted piece of yard sculpture. I could only salvage the counterweight. Likewise, the focuser was trash.

Over the past 30 years, my observing started with refractors and has come full circle.

A few months later, however, it came to life in my roll-off-roof observatory in suburban Toronto. The "Big Eye," as everyone called it, was the largest refractor in amateur hands in Canada. But as we all learn sooner or later in the backyard astronomy game, big isn't necessarily better. Anything moderately bright through the 7-inch was adorned with a purple wreath. The homemade objective also suffered from astigmatism. To eliminate most of it I had to diaphragm the objective to 5¼ inches, which made it a fine f/23 system. In any case, two years later a large shopping center was built about a mile away, greatly reducing the observatory's effectiveness. In 1969 I sold everything.

From 1970 to 1983 I purchased and sold a variety of Newtonians, Schmidt-Cassegrains, and Maksutovs. Although I enjoyed them all, none gave razor-sharp images like the old Unitron. I wasn't

about to return to small aperture. But why couldn't the performance of the 3-inch be scaled up to larger instruments? That bothered me.

Theoretically, an unobstructed optical system is the optimum design, and among amateur instruments available commercially that means the refractor. Furthermore, small imperfections in a lens' figure introduce far less aberration into the image than mirror defects. But the refractor's nemesis is chromatic aberration, which skyrockets as aperture increases. A 6-inch f/10 refractor has more than 30 times as much as a 3-inch f/15. To produce the same color-free images as the 3-inch, the 6 must have its chromatic affliction reduced by 97 percent.

In the late 1970's I heard about Takahashi's new fluorite refractors with exceptional color correction. More recently, other manufacturers have offered similar instruments. Fluorite, when used as one of the full-aperture elements in a doublet objective, eliminates false color to below the visual threshold, even on Venus. Four-inch models marketed by Takahashi and Celestron are superb performers — expensive but worth it for the purist. However, the cost of 5-inch or larger versions remains astronomical.

By 1984 another option had appeared on the scene: apochromatic refractors by Illinois-based Astro-Physics. These telescopes have triplet objectives that virtually overcome chromatic aberration. In 1985 I ordered a 5-inch f/12. After my first night with that telescope, I knew the quest was over. Here was a telescope that acted like a scaled-up version of my old 3-inch Unitron. After a few months of observations with it, I couldn't resist ordering a family of three shorter focal ratio Astro-Physics refractors: a 4-inch f/6.5, 5½-inch f/7, and a 7-inch f/9.

Apochromatic refractors offer a new level of observing experience for the purist with money.

The 4- and 5½-inch refractors perform as well as the 5-inch f/12, though the former has a bit more residual color and the latter a shade less due to more exotic glass. Their shorter tubes make them excellent field telescopes. The 4-inch is particularly versatile atop a Celestron Super Polaris mount. It fits in my Firebird and can be set up in about three minutes to provide perfectly framed views of the Pleiades at 20x or sharp images of the planets at 150x.

The 7-inch took 20 months to arrive, but it was worth the wait. The Astro-Physics design so effectively suppresses chromatic aberration it's as if the refractor has been reinvented. The Starfire series is virtually color-free. There remains a touch of false color that can be seen in stringent tests. For example, in my 7-inch a bit of spurious blue appears around Vega and a vague touch of blue around Venus. I have not seen chromatic aberration on other planets or the Moon.

Despite its low altitude from Canada, Saturn looked particularly impressive last year through the 7-inch. Cassini's division was obvious all the way around. I may have glimpsed Encke's too. Saturn's disk displayed several pale belts in addition to the conspicuous North Equatorial Belt, which contained some threshold detail. In the spring of 1988, gibbous Mars, only 9 arc seconds in apparent diameter, revealed a huge south polar cap, Syrtis Major, and Libya in average seeing. By opposition time the detail was overwhelming — more than I could draw. I was delighted to see, for example, the forking of Tithonius Lacus, which might represent detection of 75-mile-wide features on the planet.

In deep-sky tests, three experienced observers judged the 7-inch to be about equal to a good 10-inch f/5.6 Newtonian in showing faint objects. It was considered superior in revealing fine details such as dust lanes in galaxies and individual stars in the cores of globular clusters. At 180x the great cluster in Hercules (M13) became a mass of tiny stellar points. Planetary performance was no contest. And at 40x the 1°.6 field was stunning, framing the galaxies M81, M82, and NGC 3077 in Ursa Major beautifully.

Of course the comparison was partly unfair in that the refractor cost several times as much as the Newtonian. But it does demonstrate the several-inch advantage gained by unobstructed high-contrast optics that transmit about 97 percent of the light entering the lens.

The Astro-Physics refractors cost between $300 and $500 per inch of aperture (tube assembly only), which is less than some manufacturers charge for traditional refractors. Fluorites start at about $400 per inch; some models are well over $1,000 per inch. Tele Vue's Genesis refractor has a fluorite corrector only, and its performance is, I'm told by those who have tested it, comparable to true fluorites and the Starfires.

Yet why pay $3,000 for an equatorially mounted 5-inch apochromatic refractor when you can get a fully loaded 8-inch Schmidt-Cassegrain or a 17-inch Dobsonian for the same outlay? Why, indeed?

Since this is a blatantly biased personal account, all I can write is why I have been smitten by apochromatic refractors. To me, telescope viewing is primarily an aesthetic experience — a private journey in time and space. Stars look like tiny pinpoints to the unaided eye, and that's the way I want my telescope to show them. Planets should appear as sharp-edged globes that focus to perfect clarity when the seeing is good. A faint star and a faint galaxy should always look completely different. In wide-field viewing the images should be in focus over the entire field.

Those are my (extremely high) criteria for a pleasurable observing experience. I don't want to see fuzz, flares, and waviness caused by mediocre optics or incessant tube currents. I want images as close to the real thing as possible. Now that I am seeing them in my new refractorland, I'm spending more time than ever at the eyepiece. You may not agree with my priorities. I expect that most amateur astronomers won't. Apochromatics aren't as compact as Schmidt-Cassegrains, nor can they compete with the brute aperture of large Newtonians. But they come closest to my idea of a perfect telescope.

TERENCE DICKINSON
Box 10
Yarker, Ont. K0K 3N0
Canada

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Sky Publishing

Mr.Dickinson is a former editor of Astronomy magazine. He has authored several books about astronomy:

The Backyard Astronomer's Guide (with Alan Dyer, Camden House)
Nightwatch (Camden House)
Exploring the Moon and the Solar System
Sky Guide (with Sam Brown, Camden House)
Mag 6 Star Atlas (w/ V.Costanzo & G.F. Chaple, Edmund Scientific)
Halley's Comet: Mysterious Visitor From Outer Space (Edmund Scientific)
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Camden House Publishing Ltd.
7 Queen Victoria Road
Camden East, Ontario
K0K 1J0
Canada

Edmund Scientific
101 E. Gloucester Pike
Barrington, NJ 08007
U.S.A.

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ASTRO-PHYSICS REFRACTORS

		Price
105EDFS	105mm f6 Traveler EDF Triplet Apochromat Tube Assembly, 2.7" Focuser, Carrying Case, Mounting Rings	N/A
130EDFS	130mm f6 StarFire EDF Triplet Apochromat Tube Assembly, 2.7" Focuser, Carrying Case	2,995
155EDFS	155mm f7 StarFire EDF Triplet Apochromat Tube Assembly, 2.7" Focuser, Carrying Case	4,495
155EDF	155mm f7 StarFire EDF Triplet Apochromat Tube Assembly, 4" Focuser, 4" Field Flattener, Carrying Case	6,400

ASTRO-PHYSICS GERMAN EQUATORIAL MOUNTS

400QMD	400 German Equatorial Head with Quartz Micro-Drive Controller. Need to add mounting plate. Choose: DOVE08, DOVE15, FP1500 or DOVELM	1,790
ENC400	High Resolution Mounted Encoders for 400 German Equatorial Head (to use with Digital Setting Circles)	260
600EQMD	600E German Equatorial Head with Quartz Micro-Drive Controller. Need to add mounting plate. Choose: DOVE08, DOVE15, FP1500 or DOVELM	2,530
ENC600	High Resolution Mounted Encoders for 600E German Equatorial Head (to use with Digital Setting Circles)	260
6ENMOD	Modify previous 600E German Equatorial Mount to attach encoders (shipping not included)	150
900QMD	900 German Equatorial Head with Quartz Micro-Drive Controller, Built-in Encoders. Need to add mounting plate. Choose: DOVE15, DOVELM, 900RP or FP1800	3,595
900WDG	Wedge for 900 Mount, allows for use in 0-19 or 68-86 Degrees Latitude	210
1200QMD	1200 German Equatorial Head with Quartz Micro-Drive Controller, Built-in Encoders. Need to add mounting plate. Choose: DOVELM, 1200RP or FP1800	4,995
GIBASH	TeleVue Gibraltar Mount with Ash Tripod (needs SB1000 to mount Traveler)	490
GIBWAL	TeleVue Gibraltar Mount with Walnut Tripod (needs SB1000 to mount Traveler)	615
GIBAST	TeleVue Gibraltar Mount with Sky Tour and Ash Tripod (needs SB1000 to mount Traveler)	1,180
GIBWST	TeleVue Gibraltar Mount with Sky Tour and Walnut Tripod (needs SB1000 to mount Traveler)	1,300
FP1500	15" Flat Mounting Plate for 400 and 600E Mounts - all Astro-Physics refractors, except Traveler and 130EDFS	50
FP1800	18" Flat Mounting Plate for 900 and 1200 Mounts - all Astro-Physics refractors except Traveler and 130EDF	90
DOVE08	8" Dovetail Mounting Plate for 400 and 600E Mounts (needs SB0800 or SB1000 sliding bar), need Q4047 to use w/900	85
DOVEEM	8" Dovetail Mounting Plate with Adapter for Takahashi EM-10 Mount (needs SB0800 or SB1000 sliding bar)	105
DOVESP	8" Dovetail Mounting Plate with Adapters for Super Polaris Mount (needs SB0800 or SB1000 sliding bar)	105
Q4047	Adapter to use DOVE08 with 900 Mount (needs DOVE08 and SB0800 or SB1000)	50
DOVE15	15" Dovetail Mounting Plate for 400, 600E and 900 Mounts (needs SB1500 sliding bar)	95
DOVELM	Dovetail Mounting Plate to fit Losmandy D series Dovetail for 400, 600E, 900, 1200 Mounts (allows mounting of SCTs)	95
900RP	15" Ribbed Mounting Plate for 900 Mount for all Astro-Physics refractors, except Traveler and 130EDF	120
1200RP	24" Ribbed Mounting Plate for 1200 Mount for 180EDT/EDF and 206EDF	295
	We also carry Losmandy Dovetail Plates for Meade and Celestron SCTs. Call for prices	
SB0800	7" Sliding Bar/Mounting Adapter - Multi-use (To use with DOVE08 for 105 Traveler, TeleVue Genesis SDF, TeleVue Renaissance refractors) (To mount Traveler on heavy-duty camera tripod, 1/4-20 threaded center hole)	25
SB1000	10" Sliding Bar/Mounting Plate for Traveler doing Eyepiece Projection or to attach Traveler to Gibraltar mount	25
SB1500	15" Sliding Bar for 120-155mm refractors, ARO Maksutovs and many other scopes (needs DOVE15)	35
SB15SC	15" Sliding Bar for 8"SCTs (needs DOVE15)	80
6SLCWT	6 lb. Stainless Counterweight with hand knob for 400, 600E, and 800 Mounts	75
9SLCWT	9 lb. Stainless Counterweight with hand knob for 400, 600E, and 800 Mounts	90
10SCWT	10 lb. Stainless Counterweight with hand knob for 900 and 1200 Mounts	110
18SCWT	18 lb. Stainless Counterweight with hand knob for 900 and 1200 Mounts	135
PRBP12	12 Volt, 12 Amp Hour Portable Rechargeable Battery Pack with Charger and Carrying Case	115
KDR171	Kendrick 12 Volt, 17 Amp Hour Portable Rechargeable Battery Pack w/ Charger and Carrying Case, Charger for 110 Volts	130
KDR172	Kendrick 12 Volt, 17 Amp Hour Portable Rechargeable Battery Pack w/ Charger and Carrying Case, Charger for 220 Volts	140
PASILL	Polar Axis Scope with Illuminator - use with 400, 600E, 800, 900 and 1200 Mounts	250
CORD01	Cord to power Pentax 6x7 Camera directly from our 400, 600E, 900 and 1200 Mounts	45
CORD02	Cord to power Pentax 6x7 Camera directly from previous model 600 and all 800 Mounts	65
55RING	5.5" Hexagonal Mounting Rings (for 130 StarFire EDT/EDF or other telescope tubes of 5.5" diameter), per pair	150
60RING	6.0" Hexagonal Mounting Rings (for telescope tubes of 6" diameter), per pair	165
65RING	6.5" Hexagonal Mounting Rings (for 155 StarFire EDT/ EDF & other telescopes of 6.5" diameter), per pair	165
80RING	8.0" Mounting Rings (for 180 StarFire EDT/EDF and 206mm StarFire EDF & other telescopes of 8" diameter), per pair	250
SDS400	Lightweight Adjustable Davis & Sanford Tripod with adapter for 400 mount (105 Traveler EDT and 130EDFS)	290
AWT000	Adjustable Hardwood Tripod with adapter for 400 or 600E mount with carrying bag	450
6X48PP	48" Portable Pier for 400 and 600E Mount (6" outer diameter)	390
6X54PP	54" Portable Pier for 400 and 600E Mount (6" outer diameter)	400
6X62PP	62" Portable Pier for 400 and 600E Mount (6" outer diameter)	410
8X48PP	48" Portable Pier for 800 and 900 Mounts (8" outer diameter)	510
8X54PP	54" Portable Pier for 800 and 900 Mounts (8" outer diameter)	530

8X62PP	62" Portable Pier for 800 and 900 Mounts (8" outer diameter)	550
10X48P	48" Portable Pier for 1200 Mount (10" outer diameter)	550
10X54P	54" Portable Pier for 1200 Mount (10" outer diameter)	570
10X62P	62" Portable Pier for 1200 Mount (10" outer diameter)	590
TRAY08	Pier Accessory Tray for 8" diameter pier (needs TRAYSB)	79
TRAY10	Pier Accessory Tray for 10" diameter pier (needs TRAYSB)	89
TRAYSB	Support Bar for Pier Accessory Tray for 8" and 10" diameter piers (needs TRAY08 or TRAY10), supports 2 trays per bar	41
1CC002	Carrying Case for 400 Mount with DOVE15 attached or 600E Mount with DOVE08 (must remove DOVE15)	155

SANTA BARBARA INSTRUMENT GROUP (SBIG)

ST4IBM	ST-4 CCD Star Tracker/Imaging Camera for IBM compatible computer with B2	990
ST4MAC	ST-4 CCD Star Tracker/Imaging Camera for Macintosh computer	990
ST6IBM	ST-6 Second Generation CCD Imaging Camera for IBM compatible computer	2,650
ST7IBM	ST-7 Self-Guided CCD Imaging Camera for IBM compatible computer	2,650
ST8IBM	ST-8 Self-Guided CCD Imaging Camera for IBM compatible computer	6,450
CABTIC	Tracking Interface Cable for SBIG units to interface with our Quartz Micro-Drive Controller (DB15 female connector & plug for use with RJ-11-4 modular jack)	30

JIM'S MOBILE INC. (JMI) COMPUTERIZED DIGITAL SETTING CIRCLES

MICMAX	NGC-microMAX, 245 object database, computer and Y-cable, does not include mounted encoders	224
MINMAX	miniMAX, 3900 object database, computer and Y-cable, does not include mounted encoders	324
NGCMAX	NGC-MAX, 12,100 object database, RS-232 port, computer and Y-cable, does not include mounted encoders	504
CABJMI	Y-Cable for use with our Encoders and other Digital Setting Circles (2 plugs for use with RJ-11-4 modular jacks and 1 plug for use with RJ-45 modular jack)	20

ACCESSORIES

27FOCU	2.7" Focuser (for telescope makers), 2" and 1.25" adapters and 2.5" long extension	350
PRD125	1.25" Prism Diagonal	44
APD125	1.25" Amici Prism Erecting Diagonal (90 degree viewing, low-power daytime only)	80
PPS125	1.25" Porro Prism Erecting Diagonal (straight-through viewing, low-power daytime only)	95
PMD200	TeleVue 2" Precision Mirror Diagonal	200
PMDMAX	MAXBRIGHT 2" Mirror Diagonal with Dialectric coating	290
BARBIN	3x Barlow Amplifier for Zeiss/Baader Planetarium Binocular Viewer	140
ZBINOB	Bayonet for Zeiss Binocular Viewer (need for straight-through viewing)	48
ADA202	Adapter that allows BARBIN to be used as a 2x Barlow for viewing without the Binocular Viewer	45
BAR2X0	2" Photo-Visual Barlow Amplifier (2x)	185
BLW3X0	TeleVue 3x Barlow (1.25")	110
27TVPH	2.7" Flat Field Photo-Visual Telecompressor (0.75x) (must use with Prime Focus Camera Adapter listed below)	250
ADA67P	6x7cm Pentax Camera Adapter for use with Telecompressor	60
PFCCAN	Prime Focus Camera Adapter with "T" ring for Canon 35mm camera (except EOS)	55
PFCEOS	Prime Focus Camera Adapter with "T" ring for Canon EOS 35mm camera	70
PFCKON	Prime Focus Camera Adapter with "T" ring for Konica 35mm camera	55
PFCMAF	Prime Focus Camera Adapter with "T" ring for Minolta Autofocus (AF) 35mm camera	70
PFCMAX	Prime Focus Camera Adapter with "T" ring for Minolta Maxxum,7000 35mm camera	55
PFCMIN	Prime Focus Camera Adapter with "T" ring for Minolta 35mm camera (except Maxxum, 7000 and AF models)	55
PFCNIK	Prime Focus Camera Adapter with "T" ring for Nikon 35mm camera	55
PFCOLY	Prime Focus Camera Adapter with "T" ring for Olympus 35mm camera	55
PFCPTK	Prime Focus Camera Adapter with "T" ring for Pentax K 35mm camera	55
PFCPTS	Prime Focus Camera Adapter with "T" ring for Pentax Screw 35mm camera	55
PFCYAF	Prime Focus Camera Adapter with "T" ring for Yashica Autofocus (AF)	70
CEP000	Eyepiece Projection Unit (must use with Prime Focus Camera Adapter listed above)	30
PGBCBR	Piggyback Camera Bracket with flat base, attach to top of mounting rings (except Traveler)	88
PGBCNB	Piggyback Camera Bracket without base, attach to SB0800, SB1000, SB1500 or your camera tripod	75
67PF46	2.7" Field Flattener w/ 6x7cm Pentax Prime Focus Camera Adapter - 105 Traveler EDT	475
67PF56	2.7" Field Flattener w/ 6x7cm Pentax Prime Focus Camera Adapter - 130 StarFire EDF	475
67PF58	2.7" Field Flattener w/ 6x7cm Pentax Prime Focus Camera Adapter - 130 StarFire EDT, 155 StarFire EDF, Star12ED & Star130	475
67PF69	2.7" Field Flattener w/ 6x7cm Pentax Prime Focus Camera Adapter - 155 StarFire EDT, previous 6"f9 and Star155 ED	475
67PF79	2.7" Field Flattener w/ 6x7cm Pentax Prime Focus Camera Adapter - 180 StarFire EDT and previous 7"f9 StarFire	475

Note regarding camera adapters below: If you received your 6x7cm Pentax Prime Focus Camera Adapter with Field Flattener prior to May 1994, you will need new aluminum parts to use the 35mm adapter.

67RCAN	35mm Camera Adapter with T-ring for Canon cameras (except EOS) to be used with 2.7" Field Flatteners for Pentax 6x7	55
67REOS	35mm Camera Adapter with T-ring for Canon EOS camera to be used with 2.7" Field Flatteners for Pentax 6x7	70
67RKON	35mm Camera Adapter with T-ring for Konica camera to be used with 2.7" Field Flatteners for Pentax 6x7	55
67RMAF	35mm Camera Adapter with T-ring for Minolta Autofocus (AF) camera to be used with 2.7" Field Flattener for Pentax 6x7	70
67RMAX	35mm Camera Adapter with T-ring for Minolta Maxxum camera to be used with 2.7" Field Flatteners for Pentax 6x7	55
67RMIN	35mm Camera Adapter with T-ring for Minolta camera to be used with 2.7" Field Flatteners for Pentax 6x7	55
67RNIK	35mm Camera Adapter with T-ring for Nikon camera to be used with 2.7" Field Flatteners for Pentax 6x7	55
67ROLY	35mm Camera Adapter with T-ring for Olympus camera to be used with 2.7" Field Flatteners for Pentax 6x7	55
67RPTK	35mm Camera Adapter with T-ring for Pentax camera with K mount to be used with 2.7" Field Flatteners for Pentax 6x7	55
67RPTS	35mm Camera Adapter with T-ring for Pentax camera w/ screw mount to be used with 2.7" Field Flatteners for Pentax 6x7	55
67RYAF	35mm Camera Adapter with T-ring for Yashica Autofocus (AF) camera to be used with 2.7" Field Flatteners for Pentax 6x7	70

40GEL1	Gelatin Filter Holder for 4" Field Flatteners - use these for tricolor photography, gelatin filters not included	45
27GEL1	Gelatin Filter Holder for 2.7" Field Flattener (parts 67PF58, 67PF69, 67PF79) shipped prior to May '94	35
27GEL2	Gelatin Filter Holder for 2.7" Field Flattener (parts 67PF46, 67PF56, 67PF58, 67PF69, 67PF79) shipped after May '94	35
850RAI	8x50 Right-Angle Finder with Illuminated Reticle and Quick Release Bracket	N/A
850STI	8x50 Straight-through Finder with Illuminated Reticle and Quick Release Bracket	N/A
850QRB	Quick Release Bracket for your 8x50 Finder	60
QRBASE	Extra Base for Quick Release Bracket, StarBeam (with A3251), or Qwik Point (with A3251)	25
A3251	Finder Bracket Male Dovetail Base (needs QRBASE) - for use with StarBeam or Qwik Point	20
STARMD	TeleVue Starbeam with flat base and Male Dovetail Base (includes A3251, needs QRBASE, SB0800 or SB1500)	205
QWIKMD	TeleVue Qwik Point Finder with Male Dovetail Base (includes A3251, needs QRBASE, SB0800 or SB1500)	60
SB0800	Adapter Plate to mount Traveler on heavy-duty tripod, 1/4-20 threaded center hole (also used as sliding bar for DOVE08)	25
80GUID	80x900mm Guidescope (white) with 1.25" rack & pinion, locking screw, dewcap, dewcap cover (rings separate)	N/A
60GUID	60x700mm Guidescope (black) with 1.25" rack & pinion, locking screw, dewcap, dewcap cover (rings separate)	350
GR3900	Guidescope Rings for 80mm Guidescope, 3.9" I.D. per pair	88
GR3400	Guidescope Rings for 60mm Guidescope, 3.4" I.D. per pair (attach to SB0800 or SB1500 sliding bars)	78
GR34FB	Guidescope Rings for 60mm Guidescope, 3.4" I.D. with flat base, per pair (attach to top of our mounting rings, except Traveler)	93
ACPLTR	Traveler Dovetail Accessory Plate (use with SB0800) - attaches to top of Traveler mounting rings	85
DOVE08	8" Dovetail Plate - for accessories (use with SB0800) - attaches to top of mounting rings, except Traveler	85
SB0800	7" Sliding Bar/Mounting Adapter - with multiple holes to attach accessories (use with either ACPLTR or DOVE08) (attach accessories: GR3400, PGBCNB, 850RAI, 850STI, 850QRB, STARBT and other items wih 1/4-20 thread)	25
DOVE15	15" Dovetail Plate - for accessories (use with SB1500) - attaches to top of mounting rings except Traveler & 130EDF	95
SB1500	15" Sliding Bar with multiple holes to attach accessories (use with DOVE15) (attach accessories: GR3900, GR3400, PGBCNB, 850RAI, 850STI, 850QRB, STARBT)	35

KENDRICK DEW REMOVER SYSTEM

KDRCON	Kendrick Dew Remover DC Controller	67
KDR120	120v Converter for Kendrick DC Controller	62
KDR220	220v Converter for Kendrick DC Controller	62
KDR171	Kendrick 12 Volt, 17 Amp Hour Portable Rechargeable Battery Pack w/ Charger and Carrying Case, Charger for 110 Volts	130
KDR172	Kendrick 12 Volt, 17 Amp Hour Portable Rechargeable Battery Pack w/ Charger and Carrying Case, Charger for 220 Volts	140
KDRALL	Alligator Clip for Kendrick DC Controller, attach to car or marine battery	12
KDRTEL	Kendrick Dew Remover Heater for Telrad	23
KDRSME	Kendrick Dew Remover Heater for .965" and 1.25" Eyepieces	35
KDRLGE	Kendrick Dew Remover Heater for 1.25" and 2" Eyepieces	37
KDR002	Kendrick Dew Remover Heater for 8x50 Finder, 60mm Guidescope or extra large 2" Eyepieces	39
KDR003	Kendrick Dew Remover 3" Heater for 80mm Guidescope	42
KDR004	Kendrick Dew Remover 4" Heater for our 105 Traveler EDT and previous 4" aperture	45
KDR005	Kendrick Dew Remover 5" Heater for our 127-130mm apertures (5"-5.1")	47
KDR5/6	Kendrick Dew Remover 5.5"/6.5" Heater for our 152-155mm apertures (6"- 6.1")	50
KDR7/8	Kendrick Dew Remover 7"/8" Heater for our 178-180mm apertures (7-7.1")	52
KDR009	Kendrick Dew Remover 9" Heater for our 206mm aperture (8.1")	55
KDR011	Kendrick Dew Remover 10/11 Heater for 10" and 11" Schmidt-Cassegrains	62
KDR012	Kendrick Dew Remover 12" Heater for 12" Schmidt-Cassegrains	72
KDR014	Kendrick Dew Remover 14" Heater for 14" and 16" Schmidt-Cassegrains	82

LUMICON FILTERS

OF0048	Oxygen-III Filter, 48mm premium - very faint planetary & diffuse nebulae	185
UHCF48	UHC Filter, 48mm premium - nebulae, developed for light polluted areas	185
DSF048	DEEP-SKY Filter, 48mm premium - galaxies and star clusters, astrophotography	185

SOLAR ACCESSORIES

BPPV1524	Baader Planetarium 1.5 Å Prominence Viewer with Excenter - 105EDT (must be used with 2x Barlow)	2,235
BPPV1530	Baader Planetarium 1.5 Å Prominence Viewer with Excenter - 130EDFS	2,235
BPPV1540	Baader Planetarium 1.5 Å Prominence Viewer with Excenter - 130EDT, 155EDF, 155EDFS	2,235
BPPV1549	Baader Planetarium 1.5 Å Prominence Viewer with Excenter - 180EDF	CALL
BPPV1554	Baader Planetarium 1.5 Å Prominence Viewer with Excenter - 155EDT	2,835
BPPV1563	Baader Planetarium 1.5 Å Prominence Viewer with Excenter - 180EDT	3,190
ERP105	105mm aperture Energy Rejection Prefilter for Prominence Viewer and DayStar Filters (for 105 Traveler)	N/A
ERP130	130mm aperture Energy Rejection Prefilter for Prominence Viewer and DayStar Filters (for 130 EDT)	N/A
ERP155	130mm aperture Energy Rejection Prefilter for Prominence Viewer and DayStar Filters (for 155 EDT)	N/A
ERP180	130mm aperture Energy Rejection Prefilter for Prominence Viewer and DayStar Filters (for 180EDT)	N/A
	COMPLETE TELECENTRIC BARLOW SYSTEM for DayStar H-alpha filter, includes Astro-Physics 2" Barlow (2x), Telecentric unit, extension tube, 2" adapter for DayStar	403
BAR2X0	2" Photo-Visual Barlow Amplifier (2x)	185
TELEUN	Telecentric Unit	140
EXTTLR	Extension tube with brass locking ring	45
2ALRDS	2" Adapter for DayStar filter, with brass locking ring	33

DSATM8	DayStar H-alpha ATM 0.8 angstrom Filter (must be used with energy rejection prefilter)	1,950
DSATM7	DayStar H-alpha ATM 0.7 angstrom Filter (must be used with energy rejection prefilter)	2,235
DSATM6	DayStar H-alpha ATM 0.6 angstrom Filter (must be used with energy rejection prefilter)	2,630
DSATM5	DayStar H-alpha ATM 0.5 angstrom Filter (must be used with energy rejection prefilter)	3,145
DSUNI8	DayStar H-alpha UNIVERSITY 0.8 angstrom Filter (must be used with energy rejection prefilter)	3,190
DSUNI7	DayStar H-alpha UNIVERSITY 0.7 angstrom Filter (must be used with energy rejection prefilter)	3,640
DSUNI6	DayStar H-alpha UNIVERSITY 0.6 angstrom Filter (must be used with energy rejection prefilter)	4,160
DSUNI5	DayStar H-alpha UNIVERSITY 0.5 angstrom Filter (must be used with energy rejection prefilter)	4,810
DSTSC8	DayStar T-Scanner 0.8 angstrom FIlter (must be used with energy rejection prefilter)	1,135
DSTSC7	DayStar T-Scanner 0.7 angstrom Filter (must be used with energy rejection prefilter)	1,360
DSTSC6	DayStar T-Scanner 0.6 angstrom Filter (must be used with energy rejection prefilter)	1,645
DSTSC5	DayStar T-Scanner 0.5 angstrom Filter (must be used with energy rejection prefilter)	1,980
PWL105	105mm Photographic White Light Glass Filter, 3.3 density, includes 1.8 ND grey filter for visual use	N/A
PWL130	130mm Photographic White Light Glass Filter, 3.3 density, includes 1.8 ND grey filter for visual use	N/A
PWL155	155mm Photographic White Light Glass Filter, 3.3 density, includes 1.8 ND grey filter for visual use	N/A
PWL180	180mm Photographic White Light Glass Filter, 3.3 density, includes 1.8 ND grey filter for visual use	N/A

TELEVUE EYEPIECES

		Price
EAP080	8mm Plossl (1.25")	98
EAP110	11mm Plossl (1.25")	98
EAP150	15mm Plossl (1.25")	98
EAP200	20mm Plossl (1.25")	108
EAP250	25mm Plossl (1.25")	108
EPL105	10.5mm Plossl (1.25")	88
EPL130	13mm Plossl (1.25")	88
EPL320	32mm Plossl (1.25")	120
EPL400	40mm Plossl (1.25")	120
EPL550	55mm Plossl (2")	240
ENA048	4.8mm Nagler (1.25")	185
ENA070	7mm Nagler (1.25")	234
ENA090	9mm Nagler (2"/1.25")	250
ENA130	13mm Nagler (2"/1.25")	330
EN2200	20mm Nagler Type 2 (2")	395
EN2160	16mm Nagler Type 2 (2"/1.25")	320
EN2120	12mm Nagler Type 2 (2"/1.25")	300
EPO150	15mm Panoptic (1.25")	226
EPO190	19mm Panoptic (1.25")	255
EPO220	22mm Panoptic (2"/1.25")	295
EPO270	27mm Panoptic (2")	325
EPO350	35mm Panoptic (2")	365

ZEISS ABBE ORTHOSCOPIC EYEPIECES

ZEISSAO	Zeiss 1.25" Abbe Orthoscopic Eyepiece Set - 4,6,10,16 and 25mm, Walnut Case with custom insert for all 6 eyepieces	1,180
ZEISS34	34mm Zeiss 1.25" Abbe Orthoscopic Eyepiece. New Abbe eyepiece, not previously available. Fits into walnut case.	240
ZEISSBOX	Walnut Eyepiece Case for collectors who already own 1.25" Abbe eyepieces, has custom insert for all 6 eyepieces	50

BE THE HEIGHT OF FASHION WITH ASTRO-PHYSICS

TSHIRT	Astro-Physics T-shirt, heavyweight, 50/50 cotton poly blend, specify medium, large or X-large	11
SSHIRT	Astro-Physics Sweatshirt, 9 oz., 50/50 cotton poly blend, specify medium, large or X-large	20
APCAPS	Astro-Physics Cap, adjustable size, specify solid poplin or partial mesh	8

SUGGESTED COMBINATIONS

These are a few of the possible combinations, please call if you have any questions.

105 Traveler EDT, Case, Rings, 400 Mount, 8" Dovetail Plate, 7" Sliding Bar, one 9 lb. Cwt, D & S Tripod	N/A
105 Traveler EDT, Case, Rings, 400 Mount, 8" Dovetail Plate, 7" Sliding Bar, one 9 lb. Cwt, Hardwood Tripod	N/A
130 f6 StarFire EDF, Case, 5.5" Rings, 400 Mount, 8" Dovetail Plate, 7" Sliding Bar, 6 lb. Cwt, 9 lb. Cwt., Hardwood Tripod	5,660
130 f6 StarFire EDF, Case, 5.5" Rings, 600E Mount, 8" Dovetail Plate, 7" Sliding Bar, 6 lb. Cwt., 9 lb. Cwt., Hardwood Tripod	6,400
155 StarFire EDF with 2.7" Focuser, Case, 6.5" Rings, 600E Mount, 15" Dovetail Plate, 15" Sliding Bar, two 9 lb. Cwts, Hardwood Tripod	7,950
155 StarFire EDF with 4" Focuser, 4" Field Flattener, 6.5" Rings, 900 Mount with Digital Encoders, 15" Ribbed Plate, one 18 lb. Cwt, one 10 lb. Cwt, 48" Pier	11,035
155 StarFire EDF with 4" Focuser, 4" Field Flattener, 6.5" Rings, 1200 Mount with Digital Encloders, 18" Flat Plate, one 18 lb. Cwt, one 10 lb. Cwt, 48" pier	12,465

ASTRO-PHYSICS, INC

11250 Forest Hills Road, Rockford, IL USA 61115-8238

Phone: 815-282-1513, Fax: 815-282-9847

ASTRO-PHYSICS

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DESIGN
Our research and development program is an ongoing effort to improve our product line. We reserve the right to incorporate design changes and improvements to your order.

SELECTING YOUR REFRACTOR
Prior to your purchase, please take the time to carefully calculate the total weights and dimensions of your refractor, mounting and pier. Weights and measurements have been included in this brochure for your convenience. We suggest that you draw your desired scope on graph paper to gain an accurate perspective. We recognize that "portability" is a relative term and ask you to carefully assess your needs.

DEALERS
Company Seven is the only dealer in the U.S. that maintains a display of our refractors, mounts and accessories on the showroom floor. Marty Cohen is one of the most knowledgeable people in the astronomy business. If you are in Maryland, Virginia, Pennsylvania, Delaware or the District of Columbia; I encourage you to visit Company Seven to see our products and talk to Marty. Contact Company Seven,14300-117 Cherry Lane Ct., Laurel, MD 20707, Phone: 301-953-2000

DELIVERY SCHEDULE
Refractors: We have earned a reputation for very high optical quality and performance. As a result, our refractor production runs are usually sold out before they are completed. Please contact us for the present delivery schedule of a particular telescope.
Mounts: We have increased our mount production capabilities in an effort to assure continued availability of our mounts. Please contact us for current delivery information.
Accessories: Most Astro-Physics accessories are in stock and can be shipped within 10 days following your order.

ORDERING INFORMATION
If sending or faxing your order, please use the order form included with our brochure Include your complete street address, work and home phone numbers. Phone orders are welcome as well. All orders will be confirmed by return mail.

METHOD OF PAYMENT
If you order items with long delivery times, we require a deposit equal to 50% of the value of your order. This will guarantee the current price at the time of delivery. The balance of payment will be due shortly before shipment. Personal checks are fine for deposits, however, a cashier's check or money order may be required for the final payment. You may charge your order or place your deposit with Visa or Mastercard. If the items that you order are not in stock, we will require a 50% deposit to process the order. As always, this guarantees the price obtained at the time of the order. Please note that if you make your payment via credit card and cancel your order at a later date the refund will be applied as a credit to your card.

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Illinois residents must include the current sales tax (presently 6.25%) with their final payment.

FREIGHT AND INSURANCE
All prices include freight and insurance to the 48 continental states via UPS Ground Service (United Parcel Service). UPS delivery to Alaska, Hawaii and Puerto Rico is made by 2nd Day Air and will require an additional charge.

COATINGS
We apply high quality multi-layer anti-reflection coatings, however all coatings are subject to damage as a result of abrasive dust and excessive or improper cleaning. Special care is required to maintain the effectiveness and appearance of the coatings. Consequently, we regret that we cannot provide any kind of guarantee for the coatings.

CANCELLATIONS
Customers may cancel their orders at any time for a full, prompt refund. Please send your request in writing for our records.

RETURNS
We guarantee that you will be completely delighted with your purchase. If you are not satisfied with any item, please return it to us in original condition, shipping prepaid, within 30 days after delivery. We will either correct any problems, replace the item or issue a refund. Assuming that the item is in original condition, the full amount will be refunded less the original shipping costs.

If you have any questions, please write or call:

ASTRO-PHYSICS, INC.
11250 Forest Hills Road
Rockford, IL 61115, U.S.A.
Phone: 815-282-1513 Fax: 815-282-9847