

# 10" **TELEPORT**

The Telescoping Telescope

## Owners Manual



**Carry the Stars in Your Hand**

# ***THE TELEPORT***

*is designed and made by*

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# **TELEPORT 10”**

## **The Telescoping Telescope**

### **Owners Manual, V3.0**

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*As you read this manual, watch for the following symbols:*

 **Caution!**

► *Tip*

*Note: Observation*

*Also included with your telescope are manuals for the Rigel Quickfinder and the Protostar Diagonal Mount, plus certificates for the Protostar quartz secondary mirror and the Zambuto Optical primary mirror.*

# Overview



**Fig. 1: The 10" Teleport closed**





**Fig. 2: The 10" Teleport open**


\*optional

# Handling & Safety

The Teleport is a precise, lightweight, very portable 10" reflecting telescope. It has a "Newtonian" optical system and an altazimuth or "Dobsonian" type mounting. Many aspects of it are more advanced than other telescopes of this general type, and special techniques are needed for proper operation. Be sure to read and follow the instructions in this manual to insure best results and avoid damage.

 **Never aim a telescope toward the sun!** This is extremely dangerous. A 10" mirror gathers about 1,000 times as much light as your eye, and a *split-second look can cause permanent blindness*. Never attempt to view the sun unless you understand the procedures and have fitted the Teleport aperture with a proper solar filter. Never place any telescope so sunlight can strike the mirror, now or as the earth turns. This can focus the sun's heat in the scope causing serious damage and possibly fire.

 **Watch your back!** The Teleport is light for a 10" telescope. Still, it should be handled with appropriate care, especially if you have any physical limitations, such as a back problem. Use proper lifting techniques: lift with your legs, not your back, and avoid bending or twisting in an awkward way.

 **Handle with care!** The Teleport is a precision optical instrument. Always lower it gently onto hard surfaces. Always keep it upright unless following instructions in this manual requiring otherwise. When open the Teleport may be carried with one hand by the mirror box crossmember (Fig. 3). When closed, carry it by the strap on the top plate only when walking evenly (Fig. 4). Never swing it or pull sideways on the strap! This could pull the plate loose, causing it to fall.

When you need more control of the scope, either open or closed, grasp it with both hands through the altitude rings (Fig. 5). This is the proper way to place it into a vehicle or to maneuver it in similar situations. Openings under the cover side tabs allow access for your hands even with the cover on.



Fig. 3: Carrying the open scope with one hand



Fig. 4: Walking evenly with the closed scope level



Fig. 5: Controlling the scope by both altitude rings

# Unpacking

## Unpacking your scope

1. Cut the tape on the box top flaps and fold them open. Remove the top foam pad and orient the box so the Teleport logo on the top of the cover is right-reading from your position.
2. Slide a hand down each side of the cover about two inches and insert your fingers below the cover flaps and into the altitude rings until you feel a solid grip (see Fig. 5, page 3).
3. Grasp both rings firmly, lift the Teleport straight up out of the box and set it down gently upright.
4. Save the shipping container in case you ever need to ship your scope.

## Removing and Storing the Slip Cover

The Teleport cover is designed to protect your telescope from sun, airborne particulates, and dew or brief, light rain. It is not intended to withstand prolonged or heavy rain. If such conditions occur, move your telescope to shelter.

1. Pull the flaps around the cover lid loose from their velcro taps and fold the lid back.
2. Grasp the cover by the side openings and lift it off.
3. Fold the body of the cover flat (Fig. 6).
4. Fold in half along the corner seams (Fig 7).
5. Fold horizontally up into the lid (Fig. 8).
6. Pull the lid flaps around the folded body and press the velcro tabs in place (Fig. 9).
7. Align the folded cover on the lower front of the scope and press it onto the velcro strip provided.

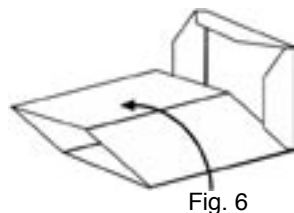


Fig. 6

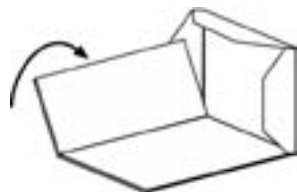


Fig. 7



Fig. 8

1. Pull the cover away from the velcro, unfold and orient it over the scope.
2. With the lid up, slide it onto the scope until its body covers the body of the scope. Close the lid and press the velcro tabs in place on front and sides (Fig. 9).
3. The top of the cover may be lifted to access the top plate strap for carrying the scope straight and level. The side tabs allow access to the altitude rings for more controlled movement such as in and out of a vehicle, through doorways, on stairs, etc.



Fig. 9

# Opening

*Opening the Teleport takes less than a minute, once you are familiar with the procedure. It's very easy, but improperly performing some steps can cause collimation error and poor image quality, or even damage. Practice the steps exactly to form good habits right from the start.*

## Remove the Top Plate

1. Orient the scope so you face the power supply and can read the label on the top plate.
2. Grasp inside the left altitude ring opening with your left hand, and the left end of the carrying strap with your right.
3. Keep the top plate horizontal, and pull your two hands apart just enough for the top plate to clear the slot in the left side of the rocker box (Fig. 10) when you push it to the right.
4. Tilt the left side of the top plate up just enough to clear the top of the rocker box and move the plate to the left until it is out of the right slot (Fig. 11).



Fig. 10: Yes



Fig. 11: Yes



**Never tilt the left side of the top plate up more than an inch (Fig. 12). The tremendous leverage you have on the slot could split the top edge of the rocker box!**

5. Place the top plate, with the strap vertical, on the right side of the scope. Align their edges and press the velcro tabs together.



Fig. 12: NO!

## Extend and Clamp the Struts

*Note: The struts move slowly because of the precise fit of their sections. You will feel significant resistance.*

1. Stand in front of the scope, facing the power supply.
2. Insert the fingertips of both hands into the top opening of the secondary cage and grasp it at about 3 and 9 o'clock (Fig. 13).
3. Lift slowly with both hands to extend the scope until it reaches its full height and you feel a positive stop.
4. Grasp the top sections of the near left and far right struts and tug firmly up again to the positive stop.
5. While you maintain continuous upward tension, grasp the top sections of both near struts and give them another tug up to their positive stops.
6. Continue to hold and lift firmly with your left hand and release the right strut section.



Fig. 13: Grasp the secondary cage



Fig. 14: Holding two near struts

6. Use your right hand to tighten both of the near left strut clamps (Fig. 15) just comfortably finger tight.
7. Grasp the near right strut upper section firmly with your right hand and hold it up to its positive stop position.
8. Continue lifting firmly with your right hand while you tighten both of that struts clamps with your left.
9. Rotate the scope 180°, grasp both near upper strut sections and lift them together until you feel their positive stops.
10. Repeat the lift and tighten procedure first for the left strut then for the right.
11. Move the Quickfinder from its storage position to the secondary cage (see “Mounting” on page 9)
12. Check and adjust the collimation as required (page 7) before inserting an eyepiece into the focuser and observing.



Fig. 15: Tighten both clamps on each strut

## Opening Tips

- *Tighten the clamps just enough for stability. If clamps are properly tightened, loosening them by about a turn is enough to allow the scope to close*
- *Holding the struts extended to their stops insures proper alignment of the secondary cage. Do this well and the collimation will usually be close. For full image quality, careful collimation is essential (see next page)*

*Note: When opening the Teleport after unpacking from shipping, back off all the collimation knobs (Fig. 16) four full turns before proceeding to collimation (next page).*

**⚠ \*Do not loosen the cell post screws (Fig. 16). The post orientations are critical and should never be changed.**

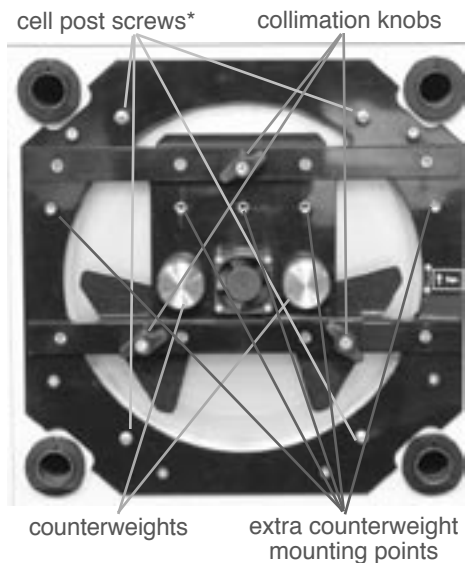


Fig 16: The mirror cell



# Collimation

*Any optical system must be properly collimated for best image quality. Collimation procedures can become a bit involved, as indicated by the many articles and books in telescope literature. The design and construction of the Teleport leaves only two variables that will normally need to be checked, namely the angles of both mirrors. The Protostar Diagonal Mount Assembly manual enclosed has diagrams showing the visual appearance of mirrors before and after collimation.*

## Laser Collimation

The fastest and easiest way to collimate your scope is with a Teleport Laser Collimator or other laser collimation tool. Briefly, this procedure is:

1. Insert the collimator into the focuser.
2. Adjust the secondary alignment screws so the laser spot falls inside the ring in the center of the primary mirror.
3. Adjust the primary collimation screws so the returning beam falls back onto the source in the center of the collimator face.

► *Details of this procedure are in the instructions for the Teleport Laser Collimator.*

## Other Collimation Tools

Collimation can also be done with optical tools, including a sight tube, Cheshire eyepiece, and autocollimator.

These and a manual are available from Tectron Telescopes, 352-490-9101, <http://www.amateurastronomy.com>, [tomclark@amateurastronomy.com](mailto:tomclark@amateurastronomy.com).

## Collimation and Opening

Become comfortable with quick and accurate collimation of the Teleport to take full advantage of its high quality optics. Understanding the collimation procedures will help point out any problems you may have with proper opening techniques.

If you find, after opening your scope, that the collimation is far off from the last time it was used, chances are you failed to get one or more struts fully extended either this time or the last. (Prior collimation may have partially compensated for this error, but performance will never be as good as if the scope is properly opened then collimated). If it appears way off, loosen all 8 clamps and partially close the Teleport and re-open it, being sure to reach full strut extension, before collimating.

► *The feedback provided by a quick check of collimation after opening your scope will help you perfect your opening technique. When you become proficient at this, you will find that your scope's collimation is very close every time. "Close" means that the laser spots on both the primary mirror and the collimator face are no more than a few millimeters from center.*

# Closing

*Closing the Teleport is quite easy, but several small details will make a difference. As with the opening procedure, perform the steps in a precise and consistent way, practicing to make it easier and to minimize the potential for an accident.*

## Prepare and Lower the Secondary Cage

1. Aim the scope straight up, and turn it so the finder is facing you.
2. Remove the finder and clip it in the storage position.
3. Remove the eyepiece, place it in the drawer, and close the drawer.
4. Slide the focuser inward to its lowest position and tighten the knurled eyepiece lock screw so it will not fall out during transport.
5. Grasp the top section of the left strut with your left hand and loosen its upper and lower clamps by about 1/2 turn with your right hand.
6. Reversing hands, repeat step 5 for the right strut.
7. Rotate the scope 180° and repeat step 5 and 6 for the other two struts.
8. Grasp the secondary cage inside its top opening with both hands and lower it into the mirror box while keeping the scope pointed fully vertical (the mirror box should stay against the rocker box front plate.)



**Form the habit of always holding one of the upper strut sections or the secondary cage. Never release it after loosening the clamps until you have lowered it gently and fully into the mirror box!**

## Install the Top Plate

1. With the scope turned so the power supply faces you, grasp the top plate at the lower end of its strap and lift it out, bottom first, from the velcro on the side of the rocker box.
2. Hold it horizontal over the scope and rest its left edge on top of the rocker box left side.
3. Align and insert its right edge into the right side rocker box slot. Use the same caution here as when opening. Never pull up on the plate while it is inserted into only one slot.
4. Grasp the left altitude ring through its opening and pull it to the left while pulling the strap to the right just enough for the plate to clear the left rocker box side.
5. Lower the left side of the plate to align with the slot and release the rocker box side so it will close onto the plate.
6. Push the rocker box sides in to insure the plate is fully into both slots before lifting the scope by its strap.

# Quickfinder

*The Teleport's Rigel Systems Quickfinder lets you easily place a particular object or sky area in the eyepiece field. It is easier to use than conventional finder scopes that have a more limited field or a reversed image or both.*

## Mounting

1. With the Teleport open and vertical, stand behind it and locate the Quickfinder in its storage position in the lower rear opening of the rocker box.
2. At the left end of the Quickfinder, press the button with your thumb and rock the right end away from you to release it from the baseplate (Fig. 17)
3. Locate the other baseplate at the top edge of the secondary cage. Hold the Quickfinder tilted 45° forward and slip the front (long) tab into the forward slot in the baseplate.
4. While pressing the thumb button, rotate the Quickfinder toward the plate and release the button so the clip locks into the slot at the rear of the baseplate.



Fig. 17: Finder storage

## On/Off and Brightness

Turn the Quickfinder on by turning the black knob on its lower front (Fig. 18). It will click on and will increase in brightness as it is turned clockwise. At first, turn it fully clockwise and look through the opening near the top of the finder so you see the two red rings. Turn down the brightness to the lowest level that lets you see the two red rings (1/2 and 2 degrees) against the sky you have. (Setting the rings too bright can make it hard to see dim stars.)



Fig. 18: Brightness control

## Pulse

Adjust the small white knob (Fig. 19), beside the black brightness knob, to control the duration of on- and off-time for pulsing, or set for continuous on as you prefer. (I find that on- and off-times of a few seconds let me see the faintest stars while it's off, and align accurately while it's on.)



Fig. 19: Pulse control

## Finding Objects

Look directly at the star or other object, or the area of the sky you want to aim at. Keeping both eyes open, move your head and the Teleport so that the Quickfinder window comes between one eye and where you want to aim. Position it so the object or area is centered in the circles.

## Quickfinder Alignment

1. With a long focal length eyepiece (about 40mm if possible) in place, follow the above procedure to aim the Teleport at a bright star. (Polaris is good, since it moves so slowly through the field.)
2. Look through the eyepiece. If the star is not in the field, sweep the scope in that area of the sky until it appears, and then center it.
3. Look through the finder with both eyes open and adjust the three white screws (Fig. 20) to shift the red rings so the star is centered. Use care to avoid moving the scope when you do this.
4. Check the eyepiece field to see the star is still centered, and repeat as needed.
5. To improve the alignment accuracy, change to a medium power eyepiece (about 10mm) and repeat the procedure.



Fig. 20: Finder alignment

## Storage

Be sure to remove the finder from the secondary cage baseplate and place it on its storage baseplate before closing your scope.

## Battery

The Rigel Quickfinder uses a BR2032 or CR2032 three-volt lithium battery, or equivalent. These are readily available in the photo departments of department or electronics stores. To replace the battery, remove the Quickfinder from its base, push out the battery and slip in the new one, being careful to get the polarity correct.

## Dew Prevention

If conditions cause dew formation on the Quickfinder window, plug one end of its power cord into its jack and the other end into one of the two jacks on the secondary cage. A small amount of heat will be generated at the base of the finder window to help prevent the dew formation (Fig. 21).

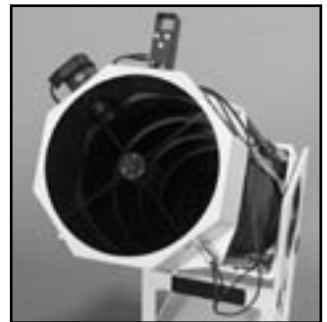


Fig 21: Quickfinder heating for dew prevention

# Eyepieces & Focuser

*The Teleport's 2" focuser and 1.25" adapter allow the use of many different eyepieces with a wide range of features, quality and price. I have evaluated many of the better types for use with the Teleport. As a group, I have found none as good overall as the Pentax XW series.*

## Pentax XW Eyepieces

Desirable attributes of the Pentax XW series include:

1. Ideal selection of focal lengths in logical steps throughout the range.
2. Full 20mm eye relief in all focal lengths
3. Wide 70° apparent field of view—wide but not too wide
4. High brightness, contrast, and sharpness.
5. Weights closely matched throughout the entire set.
6. Parfocal to a very close tolerance.
7. Very effective, adjustable rubber eye cups.

Tradeoffs are cost and very slight edge astigmatism, which I find to be acceptable. The following table applies to the 10" Teleport:

Focal Length	Eye Relief	Apparent Field	Magnification	True Field
40 mm	20 mm	70°	32 x	2.18°
30 mm	20 mm	70°	42 x	1.67°
20 mm	20 mm	70°	64 x	1.09°
14 mm	20 mm	70°	91 x	0.77°
10 mm	20 mm	70°	127 x	0.55°
07 mm	20 mm	70°	181 x	0.39°
05 mm	20 mm	70°	254 x	0.28°
3.5 mm	20 mm	70°	363 x	0.19°

My usual set (Fig. 22) is the 40, 20, 10, and 5, although poor seeing often precludes using the 5 mm or even the 7 mm. The 40 mm is my finder scope. I keep a Teleport adapter on each 1.25" eyepiece, all set parfocal. This allows switching eyepieces without using an adapter and with little need to refocus. The drawer is held by a light friction catch so you can open it without moving the scope. (Adjust it with a small screwdriver.)

**⚠ Careful opening the eyepiece drawer. Do not pull it all the way out!**

**⚠ Never tilt the scope so the drawer can slide out. If you need to tilt the scope, be sure you tilt it the other way.**

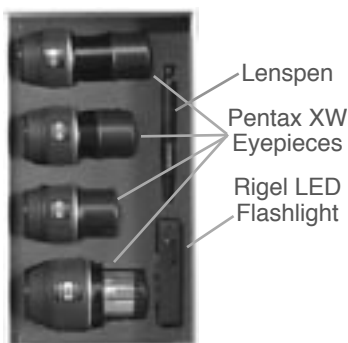


Fig. 22: Accessories Drawer

## Eyepiece Weight

Experienced observers may already have a preferred set of eyepieces. Most of these can be used with the Teleport, though some may impose problems. Wide variation in their weight effects the balance, as with any small scope. The Teleport is supplied with three counterweights that can be attached to the mirror cell on the bottom of the scope or to the secondary cage on the top. You can do this by feeling down or up force needed to move the scope. Keeping it slightly nose heavy will reduce its tendency to drift up when you remove an eyepiece to change it.

Adjust the friction damping screws over the altitude bearings by with the allen wrench from the cage holder to achieve the desired feel. Remove any vertical play felt when you lift the scope, but avoid excess tightening. That could interfere with the smooth easy motion that is part of the joy of using the Teleport.



Fig. 23: adjusting friction damping

## Eyepiece Focal Plane Location

Some eyepiece designs require a large change in the focuser position. The Teleport focuser has, of necessity, a limited range of travel. Additional out-travel can be effected by sliding the eyepiece partway out and locking it with the screw.

If a 1.25" eyepiece you use frequently requires a lot of out-travel, consider using an adapter that extends it. Also, a recessed adapter may allow a 1.25" eyepiece to go farther in than the focuser top surface. Within limits, custom adapters are possible in order to parfocalize unmatched eyepieces. If you have a particular need here, contact me for a quote.

## Focuser

The Kineoptics HC-2 focuser offers smooth, fast operation. Keep the rotating tube clean and tighten the tension screw in the base just enough to keep the tube from sliding when your heaviest eyepiece is aimed low. This is done with the same allen wrench used to collimate the secondary mirror and to adjust the altitude bearing tension.

Coarse focus by pushing or pulling to slide it. Point the eyepiece lock screw forward when doing this and you will be able to use it for fine focusing by grasping the secondary cage opening so your thumb falls on the lock screw (Fig. 24).

Guide the scope and fine focus by pushing or pulling your thumb. Not moving your whole hand back and forth avoids unwanted movement of the scope.



Fig. 24: Focusing

# Electrical

## The NiMH Power Supply

Your Teleport is equipped with a rechargeable power supply that provides 12 volt power for the mirror fan and for the secondary and eyepiece and Quickfinder heaters. The fan helps produce quicker temperature equilibration of the primary mirror and the heaters can help reduce dew formation problems on the optical surfaces.

The power supply in the front of the mirror box contains a special pack of Nickel Metal Hydride batteries. When fully charged, they will run the mirror fan about 50 hours, the secondary heater about 20, and the eyepiece heater about 10. Keep these numbers in mind for an idea of when you may need to recharge them. A charge will usually provide for several nights of observing, but this will vary widely depending on conditions.

The power supply includes a 3A std. 1-1/4" fuse. If it will not provide power or take a charge (next section), remove the four screws that hold it to the mirror box. Check the fuse, accessible at the end opening of the black cover and replace it if required.

It powers the mirror fan (Fig 25) and the secondary heater (Fig. 26). An LED in the secondary hub glows when its heat is on. Turn on power to these only as required to avoid depleting the batteries. Outlets on the secondary cage are for a Kendrick eyepiece heater cord and Quickfinder heater cord. A Y-splitter cord from Radio Shack can be used if heat is also needed for the Sky Commander display.

### Recharging the Power Supply

The charger supplied with your scope is designed to recharge the supply at the proper rate and to the correct level. Never use any other source of power to recharge it. At full charge its voltage is about 14.5. It will do its job down to about 11 volts.

To recharge the supply, plug the charger into a standard 120 volt AC outlet and plug its RCA cord into either of the jacks on the secondary cage. About 14 hours is required to recharge it fully from a completely depleted condition, but longer charging will not hurt it. If your scope is unused for long periods, recharge it about every 1-2 months.

These procedures will help your battery pack achieve a long and healthy life. Properly handled, the pack has a rated life of 10 years or longer.



Fig. 25: Fan switch on primary mirror cell



Fig. 26: Secondary cage outlets and heater switch

## Mirror Fan

The mirror fan speeds up the cooling or warming of the primary mirror when the Teleport has been stored in warmer or colder conditions. While changing temperature, the mirror will distort, reducing image quality. If the mirror temperature differs from the ambient temperature by even 3-4 degrees, the image quality will be degraded by the presence of a boundary layer of air on its surface. If you wish to observe right away, switch the fan on when you set up the scope (fig. 25, page 13). If the temperature change is very small or you won't observe until much later, leave it off. The fan will actually increase the amount of mirror distortion at first, since it increases its rate of temperature change. The benefit is that it approaches final temperature and full image quality in less time. Turn the fan off once the mirror is stabilized, usually less than an hour, but possibly longer with large changes in temperature. If a sudden change in temperature occurs while observing, the fan may be used again as needed.

## Secondary Heat

Atmospheric conditions will often cause dew to form on surfaces at night, especially those radiating their heat toward the dark sky. If this seems imminent, switch the secondary heat on before dew begins to form. Once significant dew has formed on the secondary, some time may be needed to remove it. Under light dew conditions, operate the heater only part time to conserve the batteries. A red LED in the spider hub indicates when the heater is on and reminds you to turn it off when closing the scope.

## Eyepiece and Quickfinder Heat

Dew may also form on eyepieces or on the Quickfinder beam plate. To reduce eyepiece dew, plug the Kendrick eyepiece heater into one of the outlets on the secondary cage and wrap it snugly around the eyepiece (Fig. 27). To reduce Quickfinder dewing, plug the RCA cord between the other outlet and the jack on the Quickfinder.

These heaters are on when they are plugged in, so do not leave them plugged in when not needed. The eyepiece heater power draw is quite high and it will deplete your batteries much more quickly than the other accessories. If dewing is heavy and you are using more than one eyepiece, it may help to keep those not in use in your pockets (Note: 31mm Naglers may not fit :- ) ).

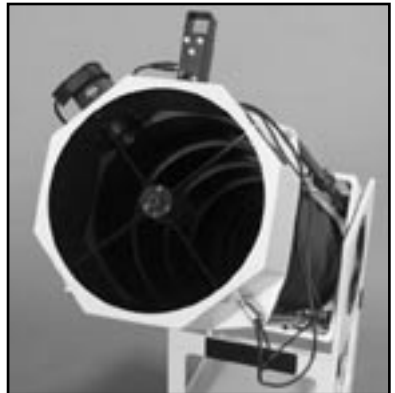


Fig. 27: Heating the eyepiece and Quickfinder



# Accessories

## Eyepiece Adapter

You may place this in the focuser when 1.25" eyepieces are to be used. I prefer to use one on each 1.25 eyepiece and tighten its nylon screws so it stays with the eyepiece to make all eyepieces 2". The set screw in the flange opening can be set to control how far into the adapter each eyepiece goes to make it parfocal with your 2" eyepiece. This works well for the Pentax XW series and others that are close to parfocal but not for eyepieces with very different focal plane locations.

## Extension Light Shield

This can help block a streetlight or other such source from the eyepiece field. It is held by four Velcro tabs on the secondary cage, usually opposite the focuser. Depending on your eyepiece drawer contents, you may be able to fold it and store it there under the foam. Use care when pulling it from the Velcro to avoid damage to the thin hinge material.

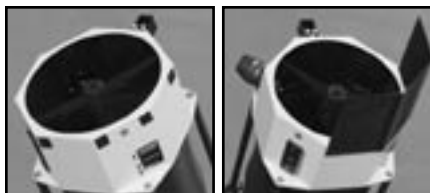


Fig. 28: Extension light shield  
Tabs on Cage      Shield In Place

## Sky Commander

This can be stored inverted and attached to the Velcro tab in between the foam pads in the lower front opening of the rocker box (Fig. 2). A rubber band around its coiled up cord lets you store it there as well. In use, it attaches to the Velcro at the top front corner of the rocker box (Fig 26) and the cord plugs into it and the encoder connectors in the altitude ring and lower front rocker box openings. You may want to hand hold it during actual use to avoid moving the scope. See the Sky Commander manual for operating instructions.



Fig. 29: Sky Commander

## Aperture Mask and Solar Filter

The aperture mask will decrease image brightness and eliminate the diffraction spikes of the spider vanes. With the cover plate over the mask opening (Fig. 30) and the filter in the storage position it can be used as a dust cover with the scope open. See the instruction sheet with the aperture mask and filter for details. Never try to observe the sun without following the instructions on that sheet. Never attempt to use the Quickfinder to locate the sun. With practice, the shadow of the telescope on the ground can be used for this quite well.



Fig. 30: Mask with cover plate to block dust



Fig. 31: Mask used to reduce aperture



Fig. 32: Mask with solar filter in place

# Observing Tips

*Experienced observers have favorite methods and objects. Many excellent books are available to help the beginner become familiar with the sky and learn the procedures for studying it. Here we present a few suggestions regarding the use of the Teleport, leaving the broad view of observing up to you and your chosen reference materials.*

The Teleport is designed to give the observer a direct connection to the universe, imposing a minimum of technology between the user and the objects observed. Without digital readouts, “go-to” databases, etc., but with smooth, easy motions, using it quickly becomes very intuitive. It’s like looking directly at the object, but with a thousand times the light grasp of the unaided eye, and with the magnification best for the object to be viewed. Here are some tips:

## Setup

### **Find a solid foundation**

Always place the Teleport on a solid surface, such as the earth, gravel, concrete, etc. Be sure each of the three feet rests on the surface, and that the ground board between the feet does not. Tall grass will cause instability, and a surface such as a wood deck may flex when anyone moves on it, including when you shift your weight at the eyepiece.

### **Allow time for your mirror to reach thermal equilibrium.**

While changing temperature, even a low-expansion Pyrex mirror changes shape. The image quality will be poor until it stabilizes. This can be a matter of a few minutes, but can be more under extreme changes. The thin mirror and open air flow of the Teleport minimize this, and the fan can reduce the equilibration time still more. Nothing can eliminate it completely, so be patient to get the best images.

## Sky Conditions

### **Get to the darkest site you can.**

Take advantage of the portability of the Teleport. Of course there will be times you may want to observe in areas of substantial light pollution. Artificial lights and the moon still allow reasonable viewing of bright objects like planets and the moon, but will greatly diminish your ability to see those dim “faint fuzzies.” Filters can help.

### **Learn to work with the sky conditions that exist.**

What you view, and the magnification you can use effectively will generally be limited by the “seeing” at the time. Upper atmospheric cells of varying temperatures bend the light passing through them, causing the image to shimmer, or just blur without apparent movement. Lower magnification will be required when seeing is poor. Expect to use high powers, (above 120x) a limited percentage of the time, depending on your observing site, season, frontal passages, etc.

## Viewing

### **Begin with lower power.**

If you are not an experienced observer, use eyepieces in the 20-40 mm focal length range to make finding objects easier. The wider field is more likely to contain what you are looking for, and moving the scope while viewing is much less critical. As you become more experienced, you will be better able to use higher powers.

### **Learn “which way is up”.**

Newtonian optical systems produce an inverted and reversed image, so when you move the scope, the image moves the opposite way. Think of it as pushing the object, not the scope, and you will quickly adjust to the reverse motions.

### **Learn to follow as the earth turns.**

Objects will follow circular paths east to west. Remember that your scope will need to move in that same direction to keep them in view. Learn to move the scope along both axes as needed so that when you release it, the object will slowly drift through the center of the field as the earth rotates.

### **Areas of the Sky**

Images of objects nearer the horizon will be adversely affected by the increased travel of the light through the atmosphere. Objects are best when viewed higher in the sky.

A special situation exists with the sky area directly overhead. This is often referred to by users of altazimuth telescopes as “Dobson’s Hole”. Movement of a telescope about its vertical (azimuth) axis is more difficult here than other parts of the sky because the lever arm used to turn it in azimuth is almost zero. Learn to twist, rather than push the scope in this part of the sky, and you will reduce the difficulty. A firm grasp in the opening of the secondary cage will help.

## **Recommended References**

*Nightwatch* by Terrence Dickinson (Camden House; Camden East, Ontario; revised edition, 1993)

*The Sky: A User’s Guide* by David H. Levy (Cambridge; New York; 1991)

*The Universe From Your Backyard* by David J. Eicher (Cambridge; New York; 1988)

*The Backyard Astronomer’s Guide* by Terrence Dickinson & Alan Dyer (Camden House; Camden East, Ontario; 1991)

# Mirror Cleaning

## Cleaning the Primary

Protect your mirror by keeping your telescope closed when not in use, so that cleaning will be needed very infrequently. The aperture mask can be a dust cover for an open scope (see page 17). Over time, you will see an accumulation of dirt, but it will have less effect on the image quality than you would expect. (Under some lighting conditions, such as with a flashlight aimed at the mirror in the dark, even a fairly clean mirror can look terrible.)

With proper care, cleaning should be needed only after extended use. When finally required, proceed as follows:

1. Open the Teleport, place an eyepiece in the focuser for balance, and tilt the scope almost horizontal.
2. Place a support under the secondary cage and tilt the scope until the cage rests on it. (When the mirror is removed, the scope will be unbalanced and could fall.)
3. With a philips screwdriver, remove the six flat philips screws holding the mirror cell (Fig. 33). Hold the cell securely while removing the last ones. **\*DO NOT loosen the panhead cell post screws!**
4. Lift the cell away enough to reach into the mirror box, and unplug the fan cord.
5. Place the cell on a table and blow loose dust away with clean compressed air.
6. If the air cleaning is sufficient, skip to 15.
7. If washing is required, remove the screws and flanges from the two lower posts (Fig. 34-35).
8. Lift the mirror carefully from the cell and place it face up in a clean sink. Run warm water to cover the mirror face.
9. Prepare a cleaning solution of three drops of mild hand dishwashing detergent in about a cup of warm water. Stir thoroughly to dissolve the detergent.
10. Pour most of the cleaning solution over the mirror surface.
11. Dip a cotton ball in the remaining cleaning solution and swab the mirror surface gently in a circular motion. Work from the center to the edge, being sure to not miss any of it.
12. Rinse thoroughly with running warm water, lifting and tilting the mirror to rinse the back, then finally the front surface again.
13. Pour a cup or so of distilled water over the surface then drain it off and

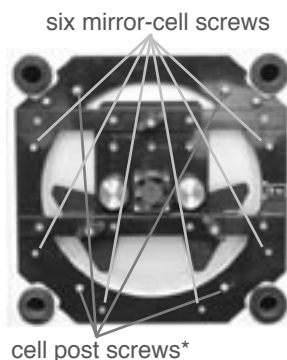


Fig. 33: Mirror cell



Fig. 34: Lower Posts with flanges



Fig. 35: Lower Posts with flanges removed

- stand the mirror on edge on a clean towel.
14. If you have a source of clean dry compressed air, blow the water off the mirror, beginning with the back and rear triangles and finishing with the front surface.
  15. Replace the mirror in the cell in its original orientation, with the two edge fittings aligned with the two lower post flanges. Tighten the screws to the two lower posts.
  16. Hold the cell near the rear of the mirror box and plug in the fan cord, tucking it under the strut.
  17. Align the posts with the holes in the mirror box opening and place the cell flat against the rear of the box with the screw holes aligned.
  18. Install the six screws, leaving them slightly loose until all are started.
  19. Tighten the six screws until snug. **Avoid cross threading!**
  20. Collimate per the instructions on page 7.

## Cleaning the Secondary

This should be required very infrequently. Refer also to the Protostar Manual included with your Teleport.

1. Loosen the secondary mount center nut a turn with a 9/16" wrench.
2. Hold the secondary mirror assembly with one hand and remove the nut with the other.
3. Slide the assembly down enough to allow access to the tiny heater wire connector between the mount and the spider hub and unplug it.
4. Remove the assembly completely from the scope.
5. Hold the assembly so the mirror surface is horizontal, facing up, and remove the two shroud screws.
6. Slide the shroud off, then lift the mirror away from its mount.
7. Clean and dry per the same procedure as the primary.
8. Place the clean, dry mirror onto the mount with the foam pad between.
9. Slide the shroud on so its rim is just snug on the mirror edge, as it was before removal. Insert and tighten the two shroud screws
10. Slide the mount stem through the spider hub and plug in the heater connector. Rotate the assembly carefully to tuck the wire between the hub and mirror mount and align the three detents in the clutch plate with the three collimation screws.
11. Install the lock nut and tighten gently with the wrench, about 1/6 turn beyond finger tight.
12. Beginning with an even gap between the hub and the mirror mount, adjust the rotation of the secondary mirror. If using a laser, turn the mount so the spot on the primary is as centered as well as possible before adjusting the three screws in the hub. If the gap between the hub and the secondary mount gets very uneven, the rotation is still wrong and the mount has been tilted to compensate. Make the gap even, then rotate the mount for close collimation. Fine tune collimation by a *small* adjustment of the screws.

# Service

*Instructions for some procedures follow. For other service not covered below, please send me an email with your question.*

## Other Cleaning

Wipe the laminated bearing surfaces and the rest of the scope with a damp cloth, then a clean, dry one. If azimuth motion is stiff, clean the azimuth laminate ring. You can further reduce drag by applying a coat of auto wax, such as Simonize, buffing it off thoroughly.

If the altitude eventually need cleaning, remove the six screws holding each altitude ring to the mirror box using a stubby phillips. Have someone hold up the mirror box while you remove the last ones. Clean the teflon pad surfaces and the ring laminate, wax and buff if desired. Back off the altitude damping screws then press the teflon dampers up to re-install the rings. Rotate the rings to align the screw holes with those in the mirror box, re-install and tighten all twelve screws.

## Nuts and Bolts

Periodically check fasteners for proper tightness. Do not overtighten screws, particularly those threaded into the Apple Ply structures. Pay particular attention to the four button head Allen screws that hold the secondary cage to the upper strut sections.

## Carbon Fiber Struts

These very precise and somewhat complex. No service is normally necessary beyond keeping them clean, and any attempt at unsupervised disassembly may be asking for trouble. If you have observed in dusty conditions, wipe them with a clean dry cloth before closing your scope to prevent grit from getting between the close fitting sections. If further cleaning is ever needed, using a silicone lubricant spray and wipe it off thoroughly with a dry cloth before closing the scope.

## Reversing the Layout

If you prefer the focuser on the left, interchange it with the cover plate then rotate the secondary mirror and collimate. Caution: Follow the Protostar secondary assembly instructions regarding the hidden power connector to avoid damage. You may need to trim out some flocking under the cover plate with an exacto knife. Note the extensions of the drawer stop screw and nylon catch screw in the rocker box. Interchange them, reset their extensions, and adjust the nylon screw for the proper friction. To reverse the Sky Commander, change the plate to the left side, the connector to the alternate holes, and the tangent arm locator pin. Reset "dec" from "Rev" to "Norm" per the Sky Commander Manual.

# Specifications

<b>Dimensions</b>	Closed: 14"w x 15"d x 27"h Eyepiece height open at zenith: 52"
<b>Primary Structures</b>	Apple Ply, 3-12mm
<b>Finish</b>	Polane T catalyzed polyurethane
<b>Other Structures</b>	Carbon fiber, Delrin acetal, ABS, Teflon, laminate, lycra spandex, etc.
<b>Weight</b>	34 lb
<b>Primary Mirror</b>	10" f/5 fine annealed Pyrex 9:1 Zambuto Optical Serial # TP10- _____
<b>Mirror Cell</b>	9-point Delrin acetal with teflon bearings
<b>Secondary Mirror</b>	Protostar 1.83" ULS quartz flat, with enhanced coating, Serial # _____
<b>Focuser</b>	Kineoptics HC-2 helical Crayford 2" with parfocalizing 1.25" adapter
<b>Finder</b>	Rigel Systems Quickfinder with heater Battery: BR2032 or CR2032, 3V Li
<b>Cover</b>	200D coated nylon and polyethylene
<b>Electrical</b>	12 VDC, 4 AH NiMH cell pack, with calibrated charger for 120 VAC
<b>Notes:</b>	

# **TELEPORT**

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