

**14.5"**  
**TELEPORT**  
*The Telescoping Telescope*

**Owners Manual**



**Carry the Stars in Your Hand**

# **THE TELEPORT**

*is designed and hand-crafted by*

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# **TELEPORT 14.5"**

## **The Telescoping Telescope**

### **Owners Manual 1.1**

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



**Caution!**

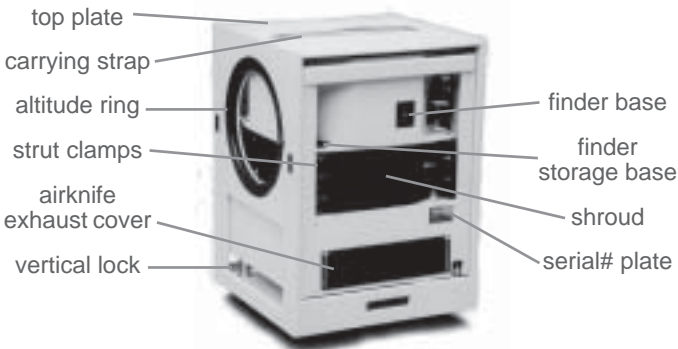
*Tip*

**Note: Observation**

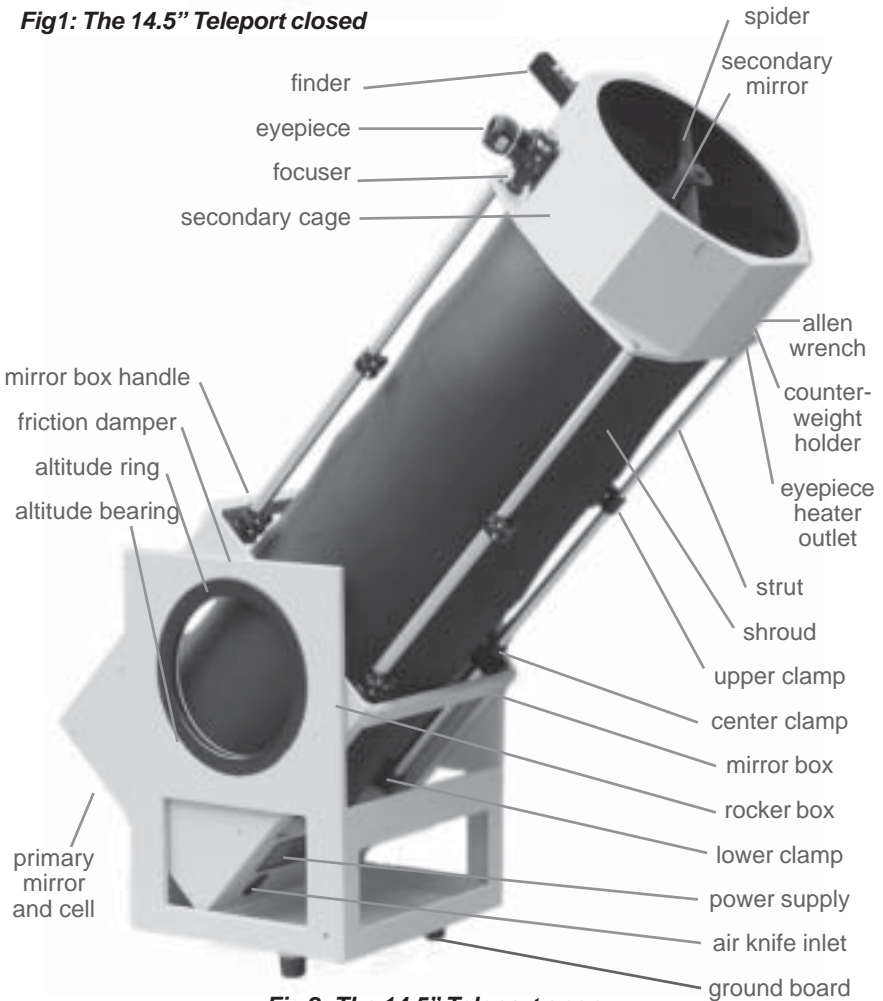
Enclosed with your telescope you will also find:

1. A user's manual for your Protostar Diagonal Mount Assembly
2. Certification data for your Zambuto primary mirror
3. A user's manual for Sky Commander, if ordered.

# Overview




**Fig1: The 14.5" Teleport closed**





**Fig2: The 14.5" Teleport open**

# Handling & Safety

Your Teleport is a precise, lightweight, very portable 14.5" 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 type, and some 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 14.5" mirror gathers about 2,000 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 lightweight for a 14.5" 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. For long distances, use the wheel or get a friend to help.

 **Handle with care!** The Teleport is a precision optical instrument. Always keep it upright unless following instructions in this manual requiring otherwise. When open, the Teleport may be carried by the mirror box handle (Fig 3). For greater control, open or closed, it should be carried with both hands by the altitude rings (Fig 4). The strap on the top plate (Fig 5) is only for carrying the closed scope when walking. *Never swing the scope by this strap or pull sideways on it! This could pull the plate loose, causing the telescope to fall.* See "Transport" on page 13.

When handling the Teleport in a manner that requires sideways movement, such as climbing steps or placing it onto a car seat, grasp the scope securely with both hands, one in each altitude ring. Openings in the cover are provided under the side tabs. Always lower it gently onto hard surfaces.



Fig 3: Lifting the open Teleport



Fig 4: Lifting the Teleport by the altitude bearings for control



Fig 5: Moving the open Teleport on its wheels

# Unpacking

## Unpacking your scope

Unless you are very tall and strong, this should be done by two people.

1. With the box flaps open and the top foam pad removed, orient the box so the Telemetry logo on the top of the cover is right-reading.
2. Slide a hand down each side about four inches and insert your fingers below the cover flaps and into the altitude rings (see Fig 4, page 5)
3. Grasp both rings firmly, lift the Telemetry straight up out of the box and set it down gently.

## Removing and Storing the Slip Cover

The Telemetry 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 top loose from their velcro tabs and fold the top 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 (Fig 8) up into the lid
6. Pull the top flaps around the folded body and press the velcro tabs in place (Fig 9).
7. Store the folded cover out of the way, or it may be used as a seat cushion

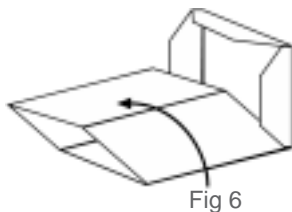


Fig 6

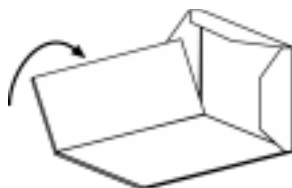


Fig 7



Fig 8



Fig 9


## Replacing the Slip Cover

1. Pull the cover away from the velcro, unfold it and orient it over the scope.
2. With the lid up, slide it onto the scope. Close the lid and press the velcro tabs in place on front and sides
2. The top may be lifted to access the handle for straight level carrying. 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.

# Installing the Mirror

## Installing the Mirror

The Teleport is simply closed for routine transport and opened again for use. When it was packed for shipping, the primary mirror was packed separately and must be installed prior to use. The installation procedure will familiarize you with adjustments of the mirror support system. You will need a 7/16" wrench and a 5/32" Allen.

 **Important: Without the mirror the scope will not be balanced.**  
**When open, do not allow it to tilt without holding it.**

Set up a support for the secondary cage to rest on, such as a chair. When the support is ready, open the scope per instructions on page 9-10. Unlock the scope from its vertical position and carefully lean it over to rest the secondary cage on the support. Place an eyepiece into the focuser so it will balance after the mirror is installed.

1. Remove the mirror cell following steps 1-4 on page 24, then return to step 2 below.
2. Be sure all three collimation bolts are set so they extend only about 1mm above the cell surface, and place the cell face up on a table (Fig 10).
3. The top center post (without the strap) should be loose and free to turn. Rotate it and notice that it is eccentric. Orient it so it is nearest the edge of the cell (farther from the mirror).
4. Pull the mirror sling away to clear the space for the mirror. Stretch the fan cord so it passes over the cell edge between the cell and the sling.
5. Unpack the mirror from its container. Handle it with care, touching only the edges and bottom.
6. Note the mirror orientation. The top edge is engraved with the name "Zambuto" and the serial number. It will be installed with the "#" mark aligned with the top cell post (Fig 11).
7. Place the mirror in the cell in this orientation so it fits within the three posts, and so that the three triangles attached to the mirror back rest on the collimation bolts.
8. Slide the cell so the top cell post overhangs the table edge slightly. Look underneath and rotate the mirror, if needed, so the top triangle is centered over the top collimation bolt.
9. Peel away the liner strip from the tape on the bottom edge of the mirror. Pull the strap so it is taut against the fixed (no lock nut) cell post. Align the strap along the center of the mirror edge and press it against the tape. The other half of the strap will be slack at this time.



Fig 10: The mirror cell



Fig 11: Mirror orientation

10. With the top cell post turned so it is still as far from the mirror edge as possible, hold its screw with the Allen wrench while tightening the mock nut securely with the 7/16" wrench (Fig 12).
11. Lift the cell with the mounted mirror, hold it near the rear of the mirror box and plug in the fan cord (an assistant makes this easier). Place the cord under the strut so it will be out of the optical path.
12. Pass the mirror and cell posts through the mirror box opening. Some wiggling may be needed to pass the cell posts through the three cutouts.
13. Hold the cell securely in place, align its mounting holes with those in the mirror box and install the six mounting screws and washers, all finger-tight (Fig 12).
14. Tighten the six mounting screws securely with a 5/32" Allen wrench.
15. It is now safe to tilt the scope up from the support. To complete the installation of your mirror, adjust the mirror sling.

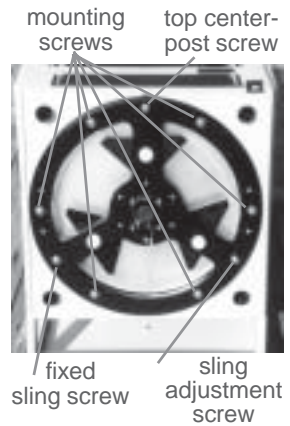


Fig 12: The mirror installed

## Adjusting the Mirror Sling

When the mirror is initially installed, and perhaps later, the mirror sling will need to be adjusted to be sure the mirror is floating freely in the cell. This eliminates image distortion due to stresses on the mirror. You will need a 7/16" wrench and a 5/32" Allen wrench.

1. With the scope aimed near horizontal, loosen the lock nut on the lower right cell post just a bit (Fig 13). Turn the post screw back and forth with the Allen wrench so the mirror lifts up from the bottom posts and contacts the top post. Note the range of movement.
2. Hold the mirror near the top limit of this range with the Allen while you tighten the lock nut securely.
3. Aim the scope about 30 degrees up from horizontal and push forward on each of the black triangles in turn (Fig 14). If the top one doesn't return easily the sling is too tight and the mirror is binding on the top cell post. If either of the lower ones fails to return easily the sling is too loose and the mirror is dragging on one or both of the bottom cell posts.
4. Readjust the sling, if needed, so the mirror moves freely and check again. The top cell post is eccentric to allow adjustment of its clearance from the mirror, if needed (Fig. 15).



Fig 13: Adjusting the sling



Fig 14: Testing the sling adjustment



Fig 15: The top post

Collimate the scope per instructions on page 12 prior to use.



# 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, reducing the image quality. It can also cause poor stability, and **even damage**. Practice the steps **exactly** to form good habits right from the start.

## Remove the Top Plate

1. Orient the scope to read the caution label on the top plate.
2. Grasp inside the left altitude ring opening with your left hand, and then 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 16) when you push it to the right. Use your left hand to limit how high the left edge of the plate can lift.
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 17).



Fig 16 - Yes



Fig 17 - Yes

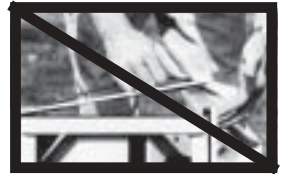




Fig 18 - NO!

 **Never tilt the left side of the top plate up more than an inch (Fig 18). The tremendous leverage you have on the slot could split the top edge of the rocker box!**

5. Place the top plate on the right side of the scope about an inch above the ground, align the velcro, and press it in place.

## Extend and Clamp the Struts

 **When opening or closing the Teleport, never release it completely unless at least one strut has *all three* clamps locked, or it may fall and be damaged!**

1. 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 19).
2. Lift up smoothly and evenly with both hands, stretching the shroud and extending the scope to its full height.
3. Still holding the secondary cage with your right hand fingertips, move your left hand to grasp the near left strut upper section, the your right to grasp the far right upper strut section.



Fig 19: Grasp the secondary cage



Fig 20: Tighten the clamps

4. Lift firmly with both hands, and hold the near left strut extended firmly against the stops with your left hand while tightening all three left strut clamps with your right (Fig 20).

*Access to the lower clamps is easiest through the mirror box opening when it faces you.*

5. Grasp the near right strut upper section firmly with your right hand, and again hold upward firmly against the stops.
6. Continue to lift firmly with your right hand and turn each of the three right strut clamps 3/4 turn with your left to tighten it.
7. Rotate the scope 180°, and repeat steps 4, 5, & 6, again holding up firmly on the top strut section so it is fully extended to its stop while you tighten the clamps.
8. Press each strut away from its U-shaped fitting (Fig 21) and slide its strut-lock disc fully up (Fig 22).

9. Move the finder from its storage position to the secondary cage (details on page 14)
10. Put an eyepiece fully into the focuser, and lock it.
11. Press down firmly on the lift handle above the vertical lock and pull the lock up to allow the scope to tilt forward (Fig 23).



Fig 21



Fig 22

The strut-lock disc



Fig 23:  
Releasing the vertical lock

**⚠ Caution! If the mirror is not in place the scope will not balance. Tilt it only onto a support.**

The first time may take some doing, but with practice it will become and quick and easy.

## Opening Tips

*If a strut hangs and prevents full extension, its middle section has rotated while the scope was closed (Fig 24). Rotate it to align the top clamp over the bottom one (Fig 25), then finish opening.*

*Holding the struts extended to their stops insures proper alignment of the secondary cage. Do this well and the collimation should be close. For full image quality, especially lunar and planetary observing, it is best to collimate the Teleport before use (see page 12.)*



Fig 24:  
Clamps rotated



Fig 25:  
Clamps aligned

# 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. Set the Vertical Lock (see Fig 21, page 10.)
3. Remove the finder and clip it in the storage base (see page 15.)
4. Remove the eyepiece and store it appropriately.
5. Lower the focuser all the way down.
6. Grasp the top section of the left strut with your left hand and turn all three of its clamps 1/4 turn with your right to loosen them.
7. Reverse hands and repeat step 4 for the right strut.
8. Rotate the scope 180° and repeat 4-5 for the other two struts. *Be sure to support the secondary cage by holding up on the top section of a strut or on the secondary cage itself at all times.*
9. Grasp the secondary cage inside its top opening with both hands and lower it into the mirror box. A wiggle may sometimes be needed to help the struts retract fully.



**Caution! Form the habit of always holding one of the upper strut sections. Never release the upper cage after loosening the clamps until you have lowered it gently 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.



**Caution! Be careful when lifting the scope by this strap. Use it only for carrying straight and level, and never jerk or pull sideways on it. Use the altitude ring openings for complex scope movement.**

# 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.*

## Optical Collimation Tools

Collimation can be done with optical tools, including a *sight tube*, *Cheshire eyepiece*, and *autocollimator*. These are available from *Tectron Telescopes*, <http://www.amateurastronomy.com/tools.html>, 352-490-9101, [tom@amateurastronomy.com](mailto:tom@amateurastronomy.com). Details of the procedures for these tools are in their manual and are also covered in the Protostar Diagonal Mount Assembly manual enclosed. Its diagrams show the visual appearance of the 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.*

## Collimation and Opening

Become comfortable with 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 12 clamps, partially close the Teleport and reopen 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.*

# Transport

## Using the Wheels Open

The Teleport is easier and more comfortable to move on its wheels when open. Be sure to engage the Vertical Lock before mounting the wheels, and disengage it only after they are removed. It is best to lay the scope horizontal before mounting the wheels when it is open (Fig 26).

While it is possible to mount the wheels and leave the scope standing upright

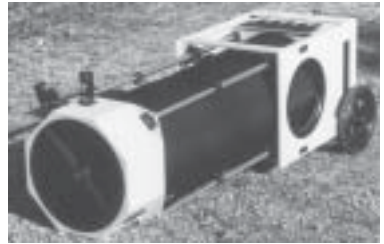


*Fig 27: Upright position not recommended*

(Fig 27), I don't recommend that. If the ground slopes and you position the wheels on the uphill side, it can tip enough to fall over.

Even on level ground, the eyepiece can fall out if it is not locked in.

It's far safer to tip it forward and lay it down flat. Then lift the corner over a wheel-mounting hole, insert the mounting bolt through the wheel hub and turn it firmly finger-tight (Fig 28). Repeat for the other wheel. If you leave the scope temporarily with



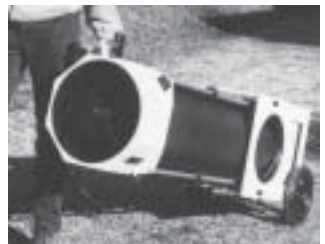
*Fig 26: Lay the scope horizontal*

the wheels in place, leave it horizontal, not vertical.



*Fig 28: Mounting the wheels, open scope*

To move it around, just grasp the strut section near the focuser and lead it wherever you want to go (Fig 29). It's quite easy to move that way, and your other hand is free to carry an eyepiece case or whatever. Saying "Heel!" in a nice tone of voice seems to cause it to follow better.



*Fig 29: Transporting on the wheels while open*

To move it up or down stairs, handle it as you would a two-wheeled cart. Stand in front facing the secondary cage opening and grasp both struts where they attach. Keep it square to the stairs, and stay straight above it regardless of whether you are ascending or descending. Be gentle, one step at a time, and you can negotiate surprisingly difficult places. The two-handed method is also in order on very uneven ground.

## Using the Wheels Closed

The wheels may also be mounted and used to move the Teleport in the closed position. If closed, it should be left upright for wheel installation. Lift each of the two corners over the wheel mounting holes in turn while inserting the wheel bolt and turning it firmly finger tight (Fig 30).

To move the scope on its wheels while closed, grasp it securely by the mirror box handle, used to lift it when open. Do not use the strap on the top plate, as that risks pulling the plate out should you get it out of balance and pull sharply sideways. It may work, but is a potential hazard and is not recommended.

Hold the handle and tilt the scope over past its balance point, and keep it there while rolling it as you would luggage equipped with wheels. Without an extending handle, it is very short and can tip quickly. It's best to keep it tilted to the low side of the balance point. If you allow it to go up too far, it will try to suddenly tip upright, and also roll sideways. It can hit rather hard if you fail to maintain control.



*Fig 30: Mounting the wheels, closed scope.*

# The Finder

*The Teleport's Rigel Systems finder 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 finder in its storage position on the secondary cage.
2. At the left end of the finder, press the button with your thumb and rock the right end forward to release it from the baseplate (Fig 31)
3. Locate the other baseplate at the top edge of the secondary cage. Hold the finder tilted 45° forward and slip the front (long) tab into the forward slot in the baseplate.
4. While pressing the thumb button, rotate the finder toward the plate and release the button so the clip locks into the slot at the rear of the baseplate (Fig 32).



Fig 31:  
Finder storage



Fig 32: Mounting  
the finder

## On/Off and Brightness

Turn the finder on by rotating the small black knob on its lower front (Fig 33). It will click to turn 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 the brightness down 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 33: Brightness control

## Pulse

Adjust the small white knob (Fig 34), 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 34: 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 the Teleport so that the finder comes between one eye and where you want to aim. Position it so the object or area is centered in the circles.

## Finder 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 35) 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. For better alignment accuracy, change to a medium/high power eyepiece (about 10mm) and repeat the procedure.



*Fig 35: Finder alignment*

## Storage

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

## Battery

The Rigel Finder 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, remove the finder from its base, push out the battery and slip in the new one, being careful to get the polarity correct.



# Focuser & Eyepieces

## Focuser

The 14.5" Teleport comes equipped with a Starlight Instruments 2" Feathertouch Crayford focuser. With dual coarse focus and a single, smooth fine focus that falls under your thumb as you guide the scope (Fig 36) this focuser is a perfect match for this telescope.



Fig 36: The Focuser

The Feathertouch focuser, with 1.25" adapter, allows for the use of many different eyepieces. Many types are available with a wide range of features, quality and price, and you may have your own favorites. To select a complete set in one family, my preference is for the Pentax XL series. The broadest high quality selection overall is from TeleVue

## Pentax Eyepieces

Desirable attributes of the Pentax XL 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 65° apparent field of view—which I find ideal (the 28mm is 55°)
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.

Trade-offs are cost and slight edge astigmatism, which I find acceptable. The following table lists the focal lengths available, with their magnifications and fields with the 14.5" Teleport:

Focal Length	Eye Relief	Apparent Field	Magnification	True Field
40.0 mm	20 mm	65°	44 x	1.58°
28.0 mm	20 mm	55°	54 x	0.93°
21.0 mm	20 mm	65°	79 x	0.82°
14.0 mm	20 mm	65°	118 x	0.55°
10.5 mm	20 mm	65°	158 x	0.41°
7.0 mm	20 mm	65°	237 x	0.27°
5.2 mm	20 mm	65°	319 x	0.20°

My usual set includes the 40, 21, 10.5, and 5.2. For certain objects, however, the 14 and the 7 are ideal. Seeing conditions often preclude the use of the 5.2, and sometimes even the 7. It can be used a bit more

often, but doesn't provide quite the detail of the 5.2 when seeing is really good. The view through the 40mm is spectacular on extended objects. Its 1.5° field makes a finder scope unnecessary.

## Paracorr

Any F/4.5 Newtonian can benefit by the use of the Televue Optics Paracorr. It significantly widens the "sweet spot" of the field

## 1 1/4" Adapter

Note that this has an orientation key to align it with the eyepiece lock screw.

## Accommodating Other Eyepieces

### Balance

Experienced observers may already have a preferred set of eyepieces and most of these can be used with the Teleport. Wide variation in weight effects the balance. The Teleport is supplied with four balancing weights that can be attached to the mirror cell on the bottom of the scope or to the secondary cage on the top. It can accept up to 10 weights on the cell or 3 on the cage. For heavier eyepieces, you may need to place one or more of the counterweights on the mirror cell. For very light ones, you may need to place one or more on the secondary cage.

If the scope is still unbalanced, you can increase the friction damping of the altitude bearings by adjusting the screws above of the altitude rings (Fig 37) with the small Allen wrench. Avoid excess tightening which would interfere with the smooth easy motion that is part of the joy of using the Teleport.



*Fig 37: Adjusting altitude damping*

### Focal Plane Location

Most eyepieces have a focal plane location fairly close to the surface that seats onto the focuser. Unfortunately, some designs may vary widely from this, requiring a large change in the focuser position. The focuser is low-profile for optimum image quality and 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.

The focal plane can be moved by shifting the struts, but this should be done only if absolutely necessary (see "Service" on page 26).

# Observing

*Every observer has 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. With smooth, easy motions, using it quickly becomes very intuitive. It's like looking directly at the object, but with two 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 vary widely with conditions. The thin mirror and open air flow of the Teleport and its unique three-fan cooling system can reduce equilibration time significantly. Nothing can eliminate it completely.

For fastest mirror cooling, open the airknife exhaust cover, turn both front and rear fans on and tilt the scope to horizontal. After equilibration you may turn the fans off. See page 22 for details.

## 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 200x) 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.

### **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)

# Electrical

## Power Supply

Your Teleport is equipped with a power supply, fan, and secondary and eyepiece heaters. These enhance your observing under certain conditions by quicker temperature equilibration of the primary mirror and reduction of dew formation problems.

The power supply is in the front of the mirror box. It contains 8 “C” size alkaline batteries. These are readily available and offer maximum energy relative to weight and cost. They will run the mirror fans for about 50 hours, the secondary heater about 30, and the eyepiece heater about 15. Keep these numbers in mind for an idea of when you may need to replace them. A spare set is recommended.

Sliding switches on the face of the power supply turn on the mirror-back fan, the front (airknife) fans and secondary heat when slid to the right. Always slide them back to the left when not needed. Leaving any of them on when storing your scope will deplete the batteries. The external outlet in the front of the power supply is for a standard Kendrick eyepiece heater. It will function when plugged in only if the secondary heat is switched on.

## Changing Batteries

1. To remove the power supply, loosen the four philips screws at the corners (Fig 38).
2. Tilt the power supply and pull it out slightly to access the cords from the mirror fan and secondary heater, and unplug them.
3. The batteries are in a holder with an additional cover flap for extra security and to stop reflections. Lift up the loose (bottom) side of the flap to expose the batteries (Fig 39).
4. Remove the batteries and replace with fresh “C” size alkalines, in proper orientation as shown.
5. Replace the cover flap over the batteries so that its lower edge extends down to the bottom edge of the power supply plate where will become trapped against the mirror box.
6. Hold the supply close to the opening and plug in the cords.
7. Be sure that the battery cover flap has its lower edge trapped between the power supply plate and the mirror box while you install and tighten the four phillips screws.



Fig 38: Power Supply Cover



Fig 39: Removing Batteries

## The Mirror Cooling System

The mirror cooling system 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, so the faster it reaches equilibrium the sooner you'll get the best possible images for the conditions at hand.

### The Cooling System

The first component of the mirror cooling system is the mirror-back fan on the bottom of the scope (Fig 40), which increases the airflow across the back of the mirror.

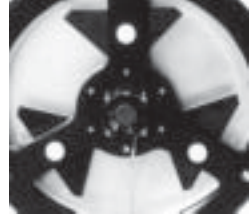


Fig 40: Mirror-back fan

The mirror front surface is cooled by the airknife, which works to break up distortion caused by thermal gradients near the mirror surface. Its dual fans pull air in at the front of the scope (Fig 41), blow it across the front of the mirror and exhaust it out the back (Fig 42).

### Reaching Equilibrium

If you wish to observe right away, for fastest equilibrium set up the scope, aim it horizontal, open the airknife exhaust cover (Fig 43) and switch both fans on. If the temperature change is very small or you won't be observing until much later, leave the fans off and allow the scope to equilibrate slowly.



Fig 41: Airknife intake fans

The fans will actually increase the amount of mirror distortion at first, since the rate of temperature change is increased. There may also be some degradation of the image at high power due to vibration.

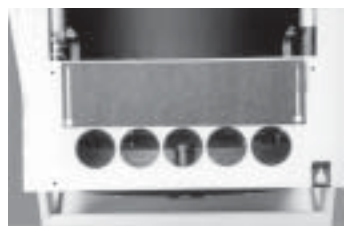


Fig 42: Airknife exhaust

Turn the fans off once the mirror is stabilized, usually a half hour to an hour, perhaps longer with large changes in temperature. If a sudden change in temperature occurs while observing, the cooling system may be used again as needed. Again, fastest equilibrium is reached with the scope close to horizontal.



Fig 43: Opening the airknife exhaust cover

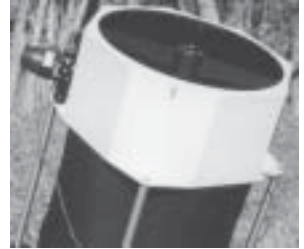
## Secondary Heat

Atmospheric conditions will often cause dew to form on surfaces at night, especially those able to radiate 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, considerable 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.

## Eyepiece Heater

Dew may also form on eyepieces or on the finder beam plate. A Kendrick eyepiece heater may be plugged into the outlet on the secondary cage opposite the focuser. To minimize dew formation, wrap the heater snugly around the eyepiece (Fig 44), moving it part time to the finder if needed. (The finder element may also be wiped gently with tissue if needed. It is not an expensive optical surface like the secondary mirror or eyepiece.)



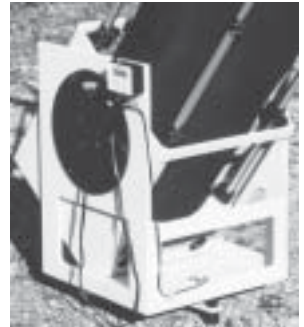
*Fig 44: heating the eyepiece*

The eyepiece heater is on whenever it is plugged in and the Secondary Heat switch on the power supply is on. Do not leave it plugged in when not needed – its power draw is much higher than the secondary heater or fan. If dewing is heavy and you are using more than one eyepiece, it may help to keep those not in use in a warm place (31mm Naglers may not fit in your pocket).

## Sky Commander Option

With the scope open and tilted over about 45 degrees, plug the longer cable into the azimuth connector in the bottom of the rocker box. Slip the cable into the clip to keep it out of the way of the mirror box.

Plug the shorter cable into the altitude connector in the right side altitude ring. Slip the cable into the clip, leaving a small amount of slack, and check to see the scope can swing through the full altitude range without interference (Fig 45). The cables should not drag the ground.



*Fig 45: Sky Commander cable routing*

Plug the large connector for both cables into the Sky Commander, and place it on the Velcro at the top right corner of the rocker box when not actually using it. See the Sky Commander manual for instructions on its operation.

If the cables are in place when you mount the wheels to move the scope, loop them over and down into the mirror box beside the shroud. Be sure the cable from the azimuth connector is dressed into the clip to prevent it being caught by the wheel.

# Cleaning

## Cleaning the Primary

Protect your mirror by keeping your telescope closed when not in use, so that cleaning will be needed very infrequently. 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 5/32" Allen wrench, remove the six screws holding the mirror cell (Fig 46). **Be sure to hold the cell securely while removing the last ones. It is HEAVY!**
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 proves sufficient, skip to step 19.
7. If washing is required, first slide the cell so the top post overhangs the edge of the table about an inch.
8. Loosen it's lock nut fully so the post is loose.
9. Peel the strap loose from the tape on the mirror edge, tilt the top post slightly, and lift the mirror out. (The three support triangles will remain attached to the back of the mirror)
10. Place it face up in a clean sink and run warm water to cover it.
11. 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.
12. Pour most of the cleaning solution over the mirror surface.
13. 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.
14. Rinse thoroughly with running warm water, lifting and tilting the mirror to rinse the back, then finally the front surface again.
15. Pour a cup or so of distilled water over the surface then drain it off and stand the mirror on edge on a clean towel.

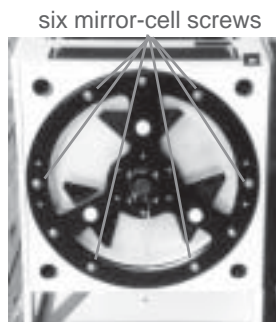


Fig 46: Mirror cell



16. With clean dry compressed air, blow the water off the mirror, including the rear triangles. If you don't have an air source, allow the mirror to stand until dry. Distilled water is **important** without compressed air.
17. Replace the mirror in the cell in its original orientation (serial number at the top) and press the strap tape against the mirror edge.
18. Install the top post, orient it with the screw head mark to the outside, and tighten the nut.
19. Hold the cell near the rear of the mirror box and plug in the fan cord.
20. 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.
21. Install the six screws, leaving them slightly loose until all are started.
22. Firmly tighten all six screws.
23. Check the mirror sling adjustment per instructions on page 8.
24. Collimate the scope per instructions on page 12.

## Cleaning the Secondary

(Refer also to the Protostar Manual included with your Teleport)

1. Carefully note the secondary mirror shroud orientation. 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. The back surface of the mirror will be coated with heat transfer compound. Scrape it off the mirror and return it to the center opening of the foam pad. **Don't get it on the mirror surface.**
8. Wipe any remaining compound from the back of the mirror.
9. Clean and dry per the same procedure as the primary.
10. Place the clean, dry mirror onto the heat transfer compound on the pad.
11. 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
12. Slide the mount stem through the spider hub and to 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.
13. Install the lock nut and tighten gently with the wrench, about 1/6 turn beyond finger tight.
14. Restore the orientation of the mirror shroud as accurately as possible (this is important!)
15. Collimate the scope per instructions on page 12.

# Service

*Instructions for some procedures follow. For other service questions, just send an email or give me a call!*

## Cleaning

Clean the optics only when really necessary, following the instructions in the prior section.

Wipe the laminated bearing surfaces and the remainder of the scope with a damp cloth, then a clean, dry one.

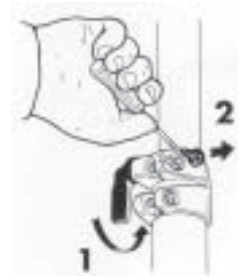
## Nuts and Bolts

Periodically check all fasteners for proper tightness to insure stability and top performance. The Allen screws holding the secondary cage to the struts deserve particular attention. Do not overtighten screws, particularly those threaded into the Apple Ply structures.

### Strut Clamp Adjustment

With wear, strut clamp force may change and can easily be adjusted. If the clamp lever does not firmly lock the strut, it is necessary to adjust the tension.

1. Place the lever in the unlocked position.
2. Pry off the plastic cliplock washer (Fig 47)
3. Use a socket wrench to slightly tighten the nut opposite the clamp lever—one sixth turn is normally sufficient.
4. Replace the plastic cliplock washer.



*Fig 47: clamp adjustment*

### Strut Length Adjustment

If you use eyepieces with a focal plane location far from the eyepiece seating surface, you may exceed the travel range of the focuser. That may be moved a few millimeters by shifting the strut locations. Do this only if really necessary, and do not be tempted to change it routinely. It must be carefully done, matching the location of all struts to keep the scope square.

A strut may be shifted slightly by loosening the 4 set screws holding the bottom section in the mirror box. The range of movement is very limited. Do not move the bottom of the strut section higher than the bottom surface of the mirror box. Do not extend it more than about 9mm below the bottom to avoid interference with the rocker box bottom. Use a gauge to match the positions, and retighten all four screws. **Do not overtighten! This could bend the struts.**

# Specifications

Dimensions	19.5"w x 19"d x 28"h
Primary Structures	Apple Ply, 6-15mm
Finish	Polane T catalyzed polyurethane coating
Other Structures	Delrin acetal, ABS, Teflon, laminate, lycra spandex, etc.
Weight	68lb.
Primary Mirror	14.5" F/4.5 fine annealed Pryex, 10:1 Zambuto Optical serial# _____
Mirror Cell	9-point Delrin, Acrylic & Apple Ply
Secondary Mirror	Protostar 2.6" elliptical flat with enhanced Al coating & heater
Focuser	Starlight Instruments 2" Feathertouch Crayford, 1.25" adapter
Finder	Rigel Systems unit-power LED
Cover	200D coated nylon and polyethylene
Batteries	Main Power Supply: 8 "C" size alkaline Finder: 1 BR2032 or CR2032 3V Li

# **TELEPORT**

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