



# NEW HAMPSHIRE ASTRONOMICAL SOCIETY

## LIBRARY TELESCOPE PROGRAM

*“The best thing that we’re put here for’s to see;  
The strongest thing that’s given us to see with’s a telescope.  
Someone in every town seems to me owes it to the town to keep one.  
In Littleton it may as well be me.”*

Those words from Robert Frost’s poem, “The Star Splitter” so eloquently summarize the idea behind NHAS’s Library Telescope Program.

The New Hampshire Astronomical Society, and particularly its Education-Outreach Committee, started placing telescopes and educational materials in selected libraries in NH beginning in Dec 2008. Our goals: to help foster scientific literacy and to stimulate the interest in astronomy, enable people who have never looked through a telescope the chance to experience the excitement that comes from discovery and to provide a valuable asset for the library along with NHAS assistance in maintenance.

From a humble beginning of two scopes placed in 2008, the program has grown beyond our expectations to include more than 70 libraries in New Hampshire. Placing the telescopes in local public libraries instead of schools, allows greater general access to the scope since they can be put into circulation just as book.

Where applicable, a local Club member will act as a foster parent to the scope. He or she will periodically clean and adjust the telescope, and act as a local astronomical resource to the library patrons. Additionally, a library member or student from a local school could be engaged as an apprentice astronomer to provide needed care to the scope.

The NHAS has selected the “StarBlast 4.5 inch Astronomical Telescope” for the libraries, along with a zoom eye piece and supportive material. We have re-written the instruction manual and provide a laminated, spiral-bound 4 by 6 inch copy with each scope. The NHAS modified telescope is easy to use and robust. There is nothing to assemble. It has a wooden base, not the usual spindly tripod legs. The telescope is of manageable size, but has a relatively large optical tube. This means that the Moon and deep sky objects will show far more detail than one could see with the common “beginners” telescope. It also has a large field of view that allows the object to stay in the eyepiece longer.

This is a quality instrument, reviewed by a number of astronomical publications and found quite worthy. Funding for the scopes has come from a variety of sources: the NHAS general budget, some specific donations from members, the public through donations at Sky Watches, and library patrons interested in giving something to their communities. While we have presented a few libraries with outright gifts, the majority of the libraries have opted to purchase their telescope with their own funds, accepting the Club’s guidance and support.

The Library Scope Project continues to be very well received. Each participating library typically has a waiting list for their telescopes, and has setup book displays with the telescope as a centerpiece. We at NHAS are very proud of the success of the program and are delighted to provide an opportunity to further share our love of the night sky in this unique way. Thank you for visiting and taking an interest in our work. Please feel free to copy this program and the materials about the project (attribution would be appreciated). Let us know about your thoughts regarding the LTP and if you start one of your own.



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### **Modifications made to the Orion StarBlast 4.5 to make it more “Library Friendly”**

**For use by any astronomy club wishing to start their own  
Library Telescope Loaner Programs**

Courtesy of the New Hampshire Astronomical Society  
<http://www.nhastro.com/> <https://www.facebook.com/LibraryTelescopeProgram>

**Improvements as of  
April, 2016  
based upon what we learn from experience.**

### **Why the StarBlast 4.5 is a good loaner telescope.**

Having looked at the available “entry level” telescopes that might be suitable as a loaner for a state wide Library Telescope Program, we narrowed down the criteria to roughly this list:

- 1) It should not frustrate people.
- 2) It should take little time to set up.
- 3) It should not require extensive training which leaves out the classic German equatorial and fork mounts.
- 4) Good optics, with a wide field of view, so people don't have to chase objects.
- 5) It must be relatively inexpensive.
- 6) It must be durable.
- 7) It should be portable and relatively self-contained, with few parts to lose.
- 8) It should be stable, leaving out spindly tripods, which are what one gets with low cost.
- 9) It should have a decent finder scope because people will need to star-hop to dim objects.

A lot of Dobsonian mounted reflectors fit this description, but, the StarBlast 4.5 gives it in a short tube (18inches) and weighs only 13 lbs.

Most people are not malicious, but many, particularly children (or those who tend to act like children) like to explore and fiddle with things. We encourage exploration; it's the fiddling we try to minimize. The SB 4.5 is a very nice telescope with good optics, a large-aperture, easy to carry and easy to adjust. It's 3 out of 4 stars as a loaner scope to non-astronomically skilled people, who comprise our target audience. It's the “easy to adjust” part that will get people into trouble.

We make a number of modifications to the SB 4.5 that help protect the scope from idle hands, and generally make it easier to use. The following modifications have worked well for us.





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### **Replace the collimation knobs at the rear of the Optical Tube Assembly (OTA).**

**Why?** The collimation or alignment of the mirrors with the eyepiece is beyond the scope, so to speak, of the instruction manual and the vast majority of the library patrons. It is best left to the “Caretakers”\* to do. So, we remove the locking knobs, as they don’t really do much, and replace the collimation knobs with locking-nuts that are much harder to move with fingers.

\*”Caretakers”... When applicable, a local Club member acts as a caretaker to the scope. He or she will periodically clean and adjust the telescope, and act as a local astronomical resource to the library patrons. Additionally, a library member or student from a local school could be engaged as an apprentice astronomer to provide needed care to the scope.

### **Tools you will need:**

- Mirror cleaning supplies: The Doc Clay Cleaning Kit from O.P.T.
- <http://www.optcorp.com/product.aspx?pid=9794&kw=spckit&st=3>
- #2 Philips head screwdriver
- 8mm nut driver, socket or wrench
- 15/64 drill bit & drill
- 2mm Allen wrench, with a white piece of tape flagged to its shaft (to help in finding it when you drop it.)
- Red Loctite

### **Parts you will need:**

- 5mm X 30 mm flathead Stainless Steel screws - 3 pieces needed.
  - Self locking Stainless Steel hex nuts w/5mm thread. (this uses the 8mm wrench) - 3 pieces needed.
  - Flat Stainless Steel Washers, #10 – 3 pieces needed.
- 1) Remove the three small screws that hold the primary mirror cell to the OTA and remove the cell, placing it mirror down on something clean.
  - 2) Remove the six chrome knobs that one uses to adjust the mirror and throw them out.
  - 3) Lift off the back of the cell. Drill out the three smaller holes with the 15/64 bit. The new bolts will go through these holes. Place it aside.
  - 4) Remove the cardboard circle and throw it out. It just gets wet with dew and keeps the mirror from reaching ambient temperature.
  - 5) Turn the mirror over and remove the six screws that hold the mirror retaining clips, and set aside.
  - 6) Remove the mirror and avoid leaving finger prints on the mirror!
  - 7) Remove the three Philips-head screws that are under the mirror, and replace them with three 5mm x 30mm flat-head screws while leaving the three springs in place. Use a dab of quick set epoxy under the head of the





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screws.

- 8) Place the cell back on the mirror holder, putting the new bolts through the newly widened holes. Then place a washer over the bolt and thread a lock-nut over each of the screws until the plastic insert starts to engage.
- 9) Reassemble the mirror and its retaining clips. Tighten until just snug, and then back off a pinch.
- 10) Check that the mirror is clean\*, and replace the mirror cell into the OTA, (mindful of the notch fitting the OTA seam) securing it with the three small screws.
- 11) Don't collimate the main mirror just yet. Give the epoxy used in step 7 to dry. Use the 2mm Allen wrench to adjust the secondary.

*\*NOTE: If you find the mirror is not clean, please follow the instructions in the cleaning kit, or go to [http://sctscopes.net/ASO\\_Cleaning\\_System.rtf](http://sctscopes.net/ASO_Cleaning_System.rtf)\**

### Modifications to the Base:

**Why?** The stock bearings tend to be “gritty” and the image will not be smooth and will jerk while viewing. The staples that hold them are sometimes sticking up a bit thereby further aggravating the problem. A smoothly turning scope makes for happier patrons. If the scope feels OK to you, you can skip this section.

(Note that we have stopped performing this procedure as Orion's stock base has been good lately.)

### Tools that you will need:

- Two wrenches
- One pair of pliers

### Parts that you will need:

- Blue plastic furniture sliders (We recommend “Magic Sliders 1 Sliding disks w/adhesive” Stock #9216) A total of six pieces will be needed.

- 1) Remove the eyepiece holder and tighten the screws to fill the holes in the upright part.
- 2) Remove the pivot bolt with a wrench on the bottom and another at the top. Then lift off the upper part of the telescope base.
- 3) Remove the three rectangular white plastic bearing pads on the bottom section of the base. Throw them out. (The staples used to hold them might need pulling, hence the pliers.)
- 4) Replace the bearing pads with the light-blue furniture pads. Install them in about the same place and place the other three near the pivot. Throw out the plastic washer.
- 5) Reassemble the base.





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### Replacing the eyepieces with a Celestron Zoon 8-24

**Why?** We like to have the scope as an All-In-One package, with little to drop and get lost or broken. Also, the stock eyepieces are mediocre and are something else about which to worry. The use of this relatively inexpensive zoom eyepiece reduces the risk of loss and makes magnification changes much easier. The zoom lets a patron focus on finding the object of their desire in low power and then framing the object for the best view. We also replace the thumb screws on the focuser, to minimize fiddling. We can avoid using a Moon filter by *stopping the aperture down* using the dust cover with a modest modification.

#### Tools that you will need:

- 3mm dia x 8mm long .50 pitch stainless socket button head screws (two)
- An Allen wrench for tightening the eyepiece set screws. Flag the wrenches with red tape.



#### Parts that you will need:

- Celestron 8-24mm Zoom eyepiece
- 8" nylon Mason's line string
- Epoxy Glue - Fast setting
- Velcro "Spots" (1" by 3/4")

- 1) Remove the black ring attached to the Chrome focuser tube and take out the two eye piece retaining knobs. Replace them with the 3mm Button Head Cap Screws. Tighten them up with the red flagged Allen wrench.
- 2) Place some "Loctite 425" on the threads of the focuser tube and the ring and reassemble. This will help keep the eyepiece attached to the focuser. "Loctite 425" is compatible with plastics.
- 3) Remove the silver tube from the base of the zoom eyepiece. Put Loctite 425 on the threads and reassemble. The upper portion of the eyepiece also can be disassembled, so carefully use some Loctite 425 on that, too. (*Note: Some thread locking glues seem to eat the plastic, hence the use of the Loctite 425.*)
- 4) Secure the zoom eyepiece in the focuser and tighten the screws to hold it firmly in place. (You may prefer to do this after collimation.)
- 5) Drill a hole in the center of the zoom lens cover that is just big enough to fit the string. Tie a knot in the end under the cap, and a slip knot on the other end. Loop the slip knot over the finder scope base and tighten. This is like the "Idiot Strings" people use to keep track of their mittens.
- 6) Drill a 2 inch hole in the dust cover. Place the hole saw next to the ridge on the inside of the dust cover, centered at the top of the cover. Drill through and trim the waste plastic. Insert a 2" auto access cover. These can be removed by a soft push from the inside.





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- 7) Drill a hole in the main dust cover's center. Do the same with the little cover. Thread a string through and tie this off to the knob on the vertical support of the base. Put a hook side of white Velcro on the dust cover and a Loop piece on the base. This allows the patron to hold the cover on the base and the string keeps it from wandering.

### **Install the Finder Scope with AA Battery pack and double sided tape**

The EZ Finder II is a good finder scope, but for a lending telescope, we thought we could make some improvements that would make it more "User Friendly".

The first issue was the tendency of the finder to wiggle on the two screws that hold it in place. Two thin strips of Scotch Outdoor Mounting Tape tape placed on the two mounting surfaces fixed the problem very well.

Second, the battery is hard to change for some people, and tends to drain quickly when the finder is left on. We originally stuck a AA battery pack to the OTA and wired the leads to replace the button battery. Then we tried sticking the battery pack to the side of the finder scope. This works much better, as one can remove the entire finder scope for service or replacement.

The third issue concerns how the leads are connected to the battery terminals inside the finder scope. We tried soldering, screws, double sided tape, and replacing the battery with various "fillers" to hold the wires in place.

Building on the efforts from the Southern Maine Astronomers, the following seems to work very well.



First, we remove the label on the left side to increase adhesion.





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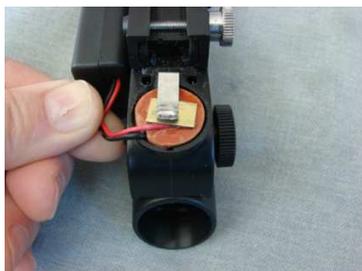
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Then we use two layers of Scotch Outdoor Mounting Tape to affix the battery pack to the side of the finder scope.



Next, we cut a notch in the left side of the battery cover. This keeps the wires away from the sharp edges of the battery clip. A dremmel tool works very well for creating the notch.

We use a 3/4x1/8 inch rubber disc as an insulator and 1/2 x 1/4 x .016 brass strips that we solder to the battery box wires. We buy both from our local hardware store. The brass comes in 1/2" x 12"x.016 strips and the rubber is an automotive product that comes in a 4"x4"x1/16 pad. We cut both to the dimensions above.



After trimming the wires to length, we solder the brass strips to the wires and use super glue to fasten one of the strips to the rubber insulator. Use of needle nose pliers to hold the brass strip in place while the super glue dries. (helps to keep fingers from sticking together). then the rubber pad with contacts is put in place with the red lead on top of the pad, under the battery clip. We only glue the positive brass strip to the rubber so that the assembly makes best contact top and bottom.

Finally, the cover is replaced with the wires exiting through the notch.







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- 4) Use the lighter to melt the belt ends near the buckle to prevent the ends from fraying.
- 5) Attach the pack to the upright part of the mount.
- 6) Place the Lens-pen, Moon filter, instruction book\* and the Constellation Pocket Guide (see below) into the pack. In the little zippered pocket in the back, place the collimation cap that came with the telescope along with a spare set of batteries for the finder scope. Store the batteries in a plastic bag.

### Printed Material

\*The Instruction book is a spiral bound, plastic laminated, edited version of the Orion instruction sheets. As the formatting is different from this article, it will be presented separately. The 18 page booklet is printed on 9 (4 by 6 inch) unlined index cards. The lamination keeps the booklet dry when out under the dew forming night sky. Staples, Kinko's, or other office supply houses, will, for a small fee, laminate and spiral bind the instructions. It is important that the holes for the binding are through the laminate only and not through the 4 by 6 card stock. (NOTE: If the holes for the binding DO hit the paper then dew will, over time cause the ink to wick across the paper thereby making it look like a chromatogram. Do try to keep the overall width of the book to about 6 ¼" so it will fit in the pouch.

### Things to include:

The **National Audubon Society's "Pocket Guide to Constellations of the Northern Skies"** is a great book. It allows one to locate the constellations by season and by direction. It then lets you look up a particular constellation and find the deep sky objects within that constellation. What is best is that it also fits nicely into the Waistpack! We have clipped off the upper right hand corner of the book through to page 34. This allows one to "thumb" quickly to the section about seasonal skies. We have also clipped the bottom right corner to page 68 which allows one to thumb through the constellations section.

### Placed on the base of the telescope:

*This telescope is "fostered" by*

### **The New Hampshire Astronomical Society**

The NHAS is a state chartered non-profit educational organization, promoting public awareness of astronomy. We hold public sky watches, demonstrations, presentations, and discussions, all free of charge.

Visit <http://nhastro.com/> for a calendar of events, information, newsletter and links to astronomy-related sites. Or, send an e-mail to [info@nhastro.com/](mailto:info@nhastro.com/)

Join our free public skywatch on the first Friday of the month, weather permitting, at the McAuliffe-Shepard Discovery Center in Concord, NH. <http://www.starhop.com/>

The Club is also providing the Library with ongoing support in education and maintenance of the telescope. We hope you enjoy using the telescope.



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The magnification chart can be placed near the eye piece and formatted as you'd like.

Eyepiece Chart for Star Blast 4.5		
f/ = <u>4</u>		114
focal length	<u>450.0</u>	True Field
Eyepiece	Power	Deg - min
6	75	0.42
10	45	1.09
17	26	1.58
25	18	2.53

The Sun warning can be placed on the base:



### Items for the “Library Telescope Project” Package

StarBlast 4.5 Telescope - Purchased from Orion Telescope <http://www.telescope.com/>

Orion Mini Pro Cleaning Tool

Celestron 8-24mm Zoom eyepiece - Purchased from OPT <http://www.optcorp.com/>

#### Items from local retail stores:

National Audubon Society Pocket Guide Constellations ISBN: 0-679-77998-1

AA Battery holder - Radio Shack # 270-408

"Red"/White 3-LED Brinkman Headlamp (Ace Hardware, Home Depot, etc.)

Belt pack for holding eyepieces (We get ours at Wal-Mart: Outdoor Products, Waist Pack Sling, “Marilyn”)



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**From the NHAS:**

Laminated and spiral bound instructions

Miscellaneous parts & tools