



LS100THa

Congratulations and thank you on your purchase of a Lunt Solar Systems solar filter or telescope! The Lunt Solar Systems are a new generation of solar viewing instruments utilizing the most current technologies to provide the highest quality contrast and resolution in their class.

If you are new to solar observing you may want to access our web page or Lunt Solar on Yahoo Groups to get information from more experienced users as to the subtly of improved performance for each type of instrument.

Warning

- There are inherent dangers when looking at the Sun thru any instrument. Lunt Solar Systems has taken your safety very seriously in the design of our systems. With safety being the highest priority we ask that you read and understand the operation of your telescope or filter system prior to use. NEVER attempt to disassemble the system. Do NOT use your system if it is in some way compromised due to mishandling or damage. Please contact the factory with ANY questions or concerns regarding the safe use of your instrument.
- Never look at the Sun with your naked eye or with a telescope that is not specifically designed to do so. Permanent and irreversible eye damage may result.
- Check that all filters are installed correctly and are free of any surface contamination that may compromise performance and/or potentially damage the surface of the optic when exposed to the Sun. ie: fingerprints. Perform a routine safety check before each viewing session.
- Never leave the solar telescope unsupervised while pointed at the Sun. People who are not familiar with the correct operating procedures of the system may inadvertently remove the diagonal or remove the filter itself not being aware of the integrated safety features of each.
- The Lunt Solar filter/telescopes are NOT interchangeable with competitor products.
- Always be aware that you are viewing in direct sunlight. Take necessary precautions to protect yourself from sunburn and heat exposure.

Handling

A Lunt Solar Systems solar filter or telescope houses many optical elements that are all pre-aligned and fixed at the factory. There are no user serviceable parts inside the scope. The telescope or filter should NEVER be taken apart. This will not only void your warranty leading to costly repairs, it can only serve to further damage the instrument and compromise its safety.

Most Lunt Solar Systems filters and telescopes house a delicate optical element referred to as an Etalon. These etalons are suspended in the filter housing in an effort to both protect it and isolate it from outside influences, which could de-tune the etalon filter. Extensive research has been done to assure the best performance of what is essentially the "heart" of the system while protecting it from the day-to-day bumps, jarring, and vibrations of normal use.

However, the instrument should NEVER be subjected to shock due to being dropped. Mis-handling of the filters system will cause the etalon to de-contact (not covered under warranty) and will render the instrument useless until repaired.

The instrument should be stored in its original packaging. As with any precision optical instrument it should be kept in as low a humidity area as possible.

With proper handling and care the filter should last a lifetime.

Cleaning

As with most telescopes and equipment there will be a build up of dust and debris on the lens and mechanical components after sitting out all day.

For those who are familiar with cleaning telescopes we recommend you use the same techniques.

For those who are new to the care of these instruments we can offer the following guidelines.

- Blow off loose dust and dirt using a clean dry air source at low volume. Do NOT use shop compressed air, which contains oil and will further contaminate the instrument.
- Stubborn particulates can be brushed from the surface with a static free lens brush. Use gentle sweeping motions.
- Fingerprints and smudges can be removed using lens tissue or a Kleenex type tissue product. Fold the tissue or cloth to make a "pad", apply a cleaning product to the end of the pad dampening it evenly (do not apply solution to the lens), wipe in circular motion starting at the center and working around the edge and off in one complete motion. Be firm, but do NOT rub. Blow lightly to help remove residual solution before it "spots" the surface. Residual dust from the cloth can be blown off.
- Consult your local dealer or call Lunt Solar Systems with any questions or concerns.
- Do NOT use Acetone or strong degreaser type products, household cleaning agents, paper towels, tissues with added scent or color (plain tissues only), or bleach or acidic products which will damage the anodized surfaces.

What am I looking at?

The Sun is active on a daily basis. During solar maximum the Sun will put on awe inspiring displays that include x-class flares, prominences, surface filaments, etc...

Here is a brief overview of those terms, which will help the observer explain what they have seen.

- Prominences: These look like eruptions from the disk (edge) of the Sun. Prominences can be small spiky looking details, or large cloud like detail with fine feather like internal features. They are, in fact, ionized hydrogen emissions being projected from the limb. Prominences are anchored to the Sun's surface in the mesosphere, and extend outwards into the Sun's troposphere.
- Filaments: These are string like features on the surface of the Sun. At high resolution they take on a 3D effect due to the cooler aspect of the filament contrasted against the bright, hotter, Sun. They are actually prominences being viewed against the surface.
- Spicules: A spicule is a dynamic jet of about 500km diameter on the Sun. It moves upwards at about 20 km/s from the photosphere. Father Angelo Secchi of the Vatican Observatory in Rome discovered them in 1877. The chromosphere is entirely composed of spicules. These features can be seen as "fur" around the edge of the disk.
- Plage: This is a bright region in the chromosphere of the Sun, typically found in regions of the chromosphere near sunspots. The plage regions map closely to the faculae in the photosphere below, but the latter have much smaller spatial scales. Accordingly plage occurs most visibly near a sunspot region. Faculae have a strong influence on the solar

constant, and the more readily detectable because chromospheric plage areas traditionally are used to monitor this influence. In this context "active network" consists of plage-like brightening extending away from active regions, as their magnetism appears to diffuse into the quiet Sun, but constrained to follow the network boundaries.

- **Solar Flares:** A solar flare is a violent explosion in the Sun's atmosphere. Solar flares take place in the solar corona and chromospheres, heating plasma to tens of millions of Kelvin and accelerating electron, protons, and heavier ions to near the speed of light. They produce electromagnetic radiation across the electromagnetic spectrum at all wavelengths from long-wave radio to the shortest wavelength gamma rays. Most flares occur in active regions around sunspots, where intense magnetic fields emerge from the Sun's surface into the corona. Flares are powered by the sudden (timescales of minutes to tens of minutes) release of magnetic energy stored in the corona.
- **Chromosphere:** The chromosphere is a thin layer of the Sun's atmosphere just above the photosphere, roughly 10,000 kilometers deep (approximating to, if a little less than, the diameter of the Earth). The chromosphere is more visually transparent than the photosphere. The name comes from the fact that it has a reddish color, as the visual spectrum of the chromosphere is dominated by the deep red H-alpha spectral line of hydrogen.

Overview of the LS100T Hydrogen-alpha

The LS100THa is a complete Solar Telescope. The refractor-based system has a precision aligned singlet chromatical lens with a 100mm aperture. The front singlet lens reduce half the stray light of an achromat, it fully eliminates the possibility for on axis coma, astigmatism, de-centering aberrations and provides with the matched collimation lens set a full spherical corrected flat-field Solar-Telescope. The focal length is 800mm providing a ~7.25 mm image thru the 34mm blocking filter. Fine adjustment is achieved with a Star Light Feather Touch focuser with 10:1 reduction standard. An internal etalon with tune adjustment allows for a <0.70 Angstrom bandpass.

What is delivered with the system?

- Optical tube assembly with 2" Feather Touch Focuser (with instructions) and a set of clamshell style mounting rings.
- 12" Dovetail Mounting Plate.
- B3400 blocking filter assembly.
- Tele Vue Sol Searcher
- Metal transport case with die cut foam insert.
- Warranty card. Please fill out and return to activate your warranty.
- Instruction manual.

What accessories are recommended?

- Eyepieces. Simple eyepieces with narrow field of view are recommended. (25mm thru 8mm)
- Sun block, a Lunt Solar hat, and a nice comfortable light colored chair.

Note:

- During shipping the tension screw on the feather touch may become loose. Simply tighten the screw as required or refer to the Starlight Instrument instructions that are provided.

Okay let's get started...

Safety First!

- **Always check any telescope or filter before use. Do not use any telescope or filter that appears to be damaged. Verify that all glass and filters are in place. Contact Lunt Solar with any questions before use!**
- **The Blocking Filter diagonal must ALWAYS be used with the Lunt Telescope or Filter. Lunt Filters and Blocking Filters are NOT interchangeable with products from other vendors.**

So you have your LS100THa setup on a mount. Let's take a look!

- Place a ~25mm eyepiece in the focus end so you have the largest field of view to look at.
- Pull the diagonal slide tube out about 50mm.
- Put the focus tube at about 50% of travel.
- If you do not have a Sol Searcher you can use the shadow cast by the Sun on the front objective cell against the clamshell. Center one on the other and you should be close.
- Look thru the eyepiece. You should see a fuzzy red ball? If not, make sure you have removed the dust cap from the front. Try to re-align the shadows or the Sol Searcher and look again. After some trial and error the Sun should appear in the eyepiece. Once the Sun is centered now is a good time to do a final adjustment to that Sol Searcher.
- **Focus:** I am amazed how many people walk up to a solar telescope and take a quick look thru without ever focusing. Course focus is achieved by moving the diagonal drawtube in and out. Medium focus is achieved using the larger knobs on either side of the focuser assembly. Fine focus is achieved with the 10:1 reduction (smaller Gold knob). The fine focus is often too fine for visual use, but comes in very handy if you are imaging. Focus so that the edge of the Sun is as sharp as possible.
- **Tuning:** On the side of the scope is a large black cylinder. This cylinder is the tuning system for the LS100T. We will explain how it works later, but for now we will simply describe how to bring 656.28nm wavelength on band. The black handle of the cylinder system has a 4 start thread attaching it to the brass cylinder body. Unscrew the black handle completely. There may be some resistance and a faint pop as the air enters the cylinder. This is normal. This has reset the system for your altitude. Carefully re-thread the handle onto the body and engage the threads about one turn. While looking thru the eyepiece gently turn the black handle onto the cylinder body. There will be little resistance at first, but as the pressure in the cylinder builds the resistance will increase slightly. As you turn the cylinder you should see features come into view thru the eyepiece. Continued turning will result in the wavelength shifting thru 656.28nm and detail will begin to disappear. Fine-tune the cylinder for the best performance.
- A few details regarding the pressure tune system. The amount of pressure being supplied to the etalon cavity is minimal. It is the equivalent of going from -500ft below sea level to about 10,000ft. Or a few PSI. There is NO risk of explosion. We are dealing with only a fraction of 1 atmosphere. When not in use we recommend that you release the pressure by simply backing off the black handle from the cylinder body. If the system unthreads completely, simply thread it back on 1 turn. It is not necessary to re-set the system every time it is used. Re-setting may only be required if the system has been sitting for a long period of time.
- Re-Focus. When you feel you have tuned effectively, re-focus the telescope. The finer details should come into view. Try to relax the eye while observing and let the details come to you.
- Change the eyepiece. When you have a good feel for observing at lower magnifications try to increase the magnifications in small steps. Place an interesting artifact in the

center of the field. Replace the ~25mm with a ~12mm eyepiece. Look thru the eyepiece and re-focus carefully. The image has dimmed slightly due to higher magnification but the details should be easier to see. You can push the magnification as seeing conditions allow. At any point you can return to the 25mm, re-align the system and try again.

- Note: The larger the aperture of the Solar Telescope, the more effect that conditions have on the ability to pull detail. Seeing conditions will deteriorate rapidly due to cloud cover, wind, heat, etc.. However, during good seeing conditions the larger aperture will always out perform the smaller one but during bad seeing conditions the smaller aperture will often perform better.

Visit our website at www.luntsolarsystems.com for tips and insight on how you can get more out of your Solar Telescope. Topics that will soon be covered include:

- Imaging: Just how does one go about taking a picture?
- Double-stacking: You'll hear a lot about the advantages of double-stacking your system.
- Contrast Enhancement: Tips on how to fine-tune your system for maximum contrast and resolution.
- Future Accessories and Upgrades.

A few more definitions

- Hydrogen-alpha: The wavelength of light in the spectrum that these scopes allow you to look at. Centered at 656.28nm.
- Bandpass: The width of light at a given wavelength that is allowed to pass. The LS100THa is <0.75 Angstroms. As bandpass is reduced more surface detail of the Sun can be resolved. This can be accomplished thru double-stacking.
- Angstrom: The unit of measurement for light. 1 Angstrom = 0.1nm.
- Etalon: A resonating cavity produced thru the fabrication of highly precise optical surfaces.