INSTRUCTION MANUAL

Orion® StarShoot™ Video Eyepiece

#52174 / #52176

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Welcome to a new world of adventure. Your new StarShoot Solar System Video Eyepiece (SSVE) is capable of displaying detailed, full-color video of astronomical objects in our solar system. The planets, Moon, and Sun (with optional solar filter) can all be imaged to create spectacular views on your TV Screen. The SSVE can even be used during the day to take images of terrestrial subjects. You'll find that this inexpensive, yet capable and easy to use camera will enhance all of your journeys with your telescope.

Please read this instruction manual before attempting to use the camera.

Parts List

- StarShoot Video Eyepiece (SSVE)
- 9V power adapter

System Requirements (refer to Figure 1)

Telescope

The SSVE can be used with virtually any telescope that is compatible with 1.25" format eyepieces. The camera simply is inserted into a focuser in the same way as a standard eyepiece (Figure 1). If you use a star diagonal, you should remove it. If your telescope does not have enough inward focus travel, you will need to use an optional 1.25" Barlow lens to extend the telescope's focal plane to the camera's imaging plane.

For most types of astro-imaging with the SSVE, using a telescope with a focal length of at least 1000mm is recommended. Otherwise, the image scale may be too small. To increase the effective focal length of your system, use a Barlow lens or other type of tele-extender lens.

Mount

While using an equatorial (EQ) mount is recommended to achieve the best results, one is not absolutely required for general imaging with the SSVE. Since the maximum exposure time is only a fraction of a second, astronomical objects will not drift significantly through a telescope attached to an altazimuth mount or Dobsonian base during single image captures. Use a sturdy mount that is appropriately sized for the telescope tube being used.

Figure 1. To use the SSVE, a telescope, mount and viewing/recording device that accepts RCA composite input such as TV, Camcorder, DVR and VCR.

For obtaining the best planetary images, however, we do recommend an equatorial mount. Planetary imaging requires combining many individual images, and having an equatorial mount will prevent the planet from drifting out of the field of view of the camera during the time it takes to acquire the large number of images necessary. A motor drive (single-axis) is recommended too, so you can track the target object as you transmit live images to your laptop or PC.

Video can be recorded via standard VCR's, DVR's or Camcorder's equipped with a composite RCA input. Movie files can then be downloaded to a PC for image processing.

Image Processing Software

http://www.astronomie.be/registax

http://www.avistack.de

Website links are provided above to download popular free Image processing software to be used with your image files to enhance your astro Images.

Image Processing Software such as RegiStax or AviStack can Align and Stack (combine) hundreds of individual images into a single resultant image and per-

form some additional image processing to bring out subtle details or to make the image appear more pleasing overall.

Both software applications are a recommended addition to any astro-imagers arsenal of image processing software.

Getting Started During Daylight

We recommend using the SSVE for the first time during the day. This way, you can become familiar with the camera and its functions without having to stumble around in the dark. Set up your telescope and mount so the optical tube is pointing at an object at least a couple of hundred feet away. Insert an eyepiece and focus as you normally would.

To obtain first images with the SSVE, follow these step-by-step instructions:

1. Plug the 9v Power adapter into the SSVE.
2. Plug the RCA composite output from the SSVE into your viewing device (TV, DVR, VCR, Camcorder).
3. To connect the camera to the telescope, simply replace the telescope's 1.25" eyepiece with the camera. Make sure the securing thumbscrew on the focuser drawtube is tightened after the camera is inserted.
4. You will now need to refocus the camera for the centered object. Focusing will be the hardest thing to learn in the initial stages. If the daytime image brightness is still too bright to produce an acceptable image on your computer screen, you may need to stop-down the aperture of your telescope.
5. Look at the **Live Video Window** on the screen and adjust the focus knob accordingly to determine best image focus.

Note: The camera's field of view is fairly small. It is approximately equivalent to the field of view through the telescope when looking through a typical (i.e. not wide-field) 5mm Ultrascopic eyepiece.

6. Image orientation can be changed by rotating the camera within the focuser drawtube. Simply loosen the thumbscrew on the drawtube and rotate the camera until the desired image orientation is achieved. Retighten the thumbscrew on the focuser drawtube when done. You may need to slightly refocus (using the telescope's focus knob) if the focuser drawtube has moved a bit inward or outward when the camera was rotated.
7. If you have attached a VCR, DVR or Camcorder you can now record a video of the live view.

You have now taken your first images with the SSVE! This simple method of imaging is exactly how the camera is used to capture terrestrial subjects during daylight hours. Close-up images of birds and other wildlife or faraway vistas can all be obtained in this way with the SSVE. Solar images can also be taken during the day with an optional full-aperture solar filter over the front of the telescope.

Take some time to use the camera during the day to become familiar and comfortable with its basic operation.

Astronomical Imaging

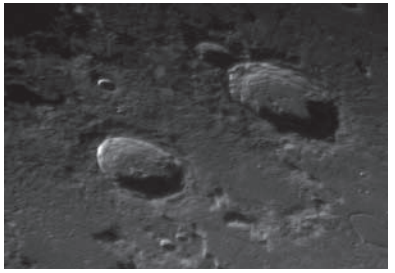


Figure 2. The moon's surface detail looks the best along the terminator.

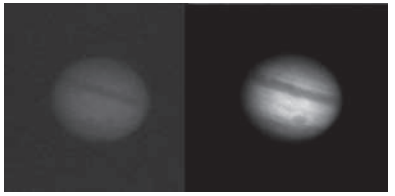


Figure 3. (left) Jupiter live image. (right) 500 frames Aligned, stacked and enhanced using Registax Image Processing Software. Image taken with Orion 180mm Mak-Cass telescope.

Now that you're familiar with basic camera operation, it's time to take the SSVE out at night under the stars to capture some astronomical images. We recommend starting with the Moon, as it is easy to acquire into the camera's field of view, and typically does not require stacking of multiple exposures as planetary images do.

Imaging the Moon

Imaging the Moon is much like imaging terrestrial objects during the day. Since the exposure is very short, it is not critical that the telescope be precisely polar aligned.

When the moon is past half full, it is hard to get detail due to the tremendous glare off of the lunar surface. Most detail, even on a sliver of a moon, will be at the terminator (that tiny thin line between the shadow and light, see Figure 2). To get more of the moon in the image, a focal reducer will need to be used. For close-ups of craters use a Barlow lens (see "Using Focal Reducers and Barlow Lenses").

Imaging Planets

The best planetary images will be obtained by stacking (combining) many individual images in order to improve image contrast, brightness, and detail.

A great way to obtain images for stacking is to take several seconds of video of the planet, then break the video into individual frames for stacking. Since the SSVE has a frame rate of 30 frames per second (NTSC) or 25 frames per second (PAL), you can literally obtain hundreds of images for stacking in seconds! You save time by taking one video instead of dozens of individual pictures!

Since you will be taking multiple images over a period of time, it is important you have a decent polar alignment in order to keep the planet within the field of view of the camera. To this end, having a motor drive (at least single-axis) will

also be helpful. Otherwise, you will periodically need to rotate the R.A. slow-motion knob to keep the planet within the camera's field.

Tips

Focusing

One of the hardest things to do in planetary imaging is achieving good focus. You can make this process easier by simply watching the **Live Video** on your display device to focus. Depending upon the viewing conditions you may notice that the image goes in and out of focus this is due to viewing conditions. This is to be expected and one of the reasons why post processing software can bring out the best in your captured images. Focus as best as possible with the average frame being at best focus to ensure more in focus frames than out of focus. Image processing software can then be used to select the best frames to combine for best results.

Refocus often throughout your imaging session. This ensures at least some of your images will have an excellent focus. It is also not uncommon for telescope movements to alter the focus slightly, so be sure to refocus for any new astro-imaging targets.

Choosing a Site for Astro-imaging

Once you have a focused image, you may find your image shifting and washed out. This can be caused by many environmental factors. Poor seeing (movement of molecules in the air, such as heat rising) and poor transparency (moisture, smoke, or other sky contaminants) will all serve to reduce image quality. That is why most major astronomical telescopes are on high mountains in thin air, to get above much of the seeing and transparency problems. Also, wind will move your telescope and affect images. Your eyes viewing through an eyepiece can change slightly to compensate for disturbances like these, but the camera cannot. Keep these factors in mind when choosing an observing site for astronomical imaging.

For the best astro-images, we recommend finding a location with dry air, some altitude, and away from city or streetlights. Even a nearby hilltop in the countryside can provide better viewing conditions than many convenient backyard locations.

Using Focal Reducers and Barlow Lenses

Focal reducers serve to decrease the focal length of your telescope. This increases the field of view seen by the camera (decreases camera magnification). This can be useful for obtaining images of wider objects, such as the full Moon or a landscape vista.

Barlow lenses, or other tele-extenders, increase the focal length of your telescope, which makes the camera field of view narrower (increases camera magnification). This is useful for high-power planetary images. Keep in mind that

when the focal length is doubled, the image will become four times dimmer, so a longer exposure may be necessary.

For best planetary imaging, you should shoot with an effective focal ratio (telescope focal length ÷ telescope aperture) of f/20 or greater. This will give you a good combination of image brightness and image scale for planets. For most telescopes, a Barlow lens will be required to obtain this focal ratio. For example, Schmidt-Cassegrain telescopes usually have a focal ratio of f/10. A 2x Barlow lens doubles the effective focal length of the telescope, which makes the focal ratio f/20. Similarly, a 3x Barlow lens will yield of focal ratio of f/30. You can also try using multiple Barlows to obtain even greater effective focal ratios. There is a limit to how large a focal ratio your telescope and seeing conditions can handle, however. Experimentation will be needed to see what your telescope is capable of in the seeing conditions on a given night. If the image appears somewhat dim and fuzzy on the computer screen, you may want to consider removing the Barlow lens.

(Focal Reducers and Barlow lenses available through Orion, check the catalog or OrionTelescopes.com).

Filters

For some types of planetary imaging, you may want to use color filters to bring out subtle details. Any standard Orion 1.25" filter will thread into the front of the SSVE's barrel. Try using different color filters on a planet to see which filters help best show planetary details.

Neutral-density Moon filters and variable-polarizer filters are useful to reduce the glare from the moon. They can also be used to reduce the glare from Venus.

Solar Filters

Warning: Always use a full aperture solar filter when viewing the sun.

With a properly fitting full-aperture solar filter attached to your telescope, you can use the SSVE to take images of the Sun and the sunspots on its surface.

(Filters available through Orion, check the catalog or OrionTelescopes.com for more information).

Flip Mirror

As easy as flipping a switch, the Imaging Flip Mirror enables the astrophotographer to find, center and focus a target visually with a 1.25" telescope eyepiece, then photograph it with a CCD camera. All without swapping out any equipment. It's a real timer saver, making the normally tedious task of focusing with the CCD camera alone easier and quicker. (available through Orion, check the catalog or OrionTelescopes.com for more information).

Figure 4. Use software to assemble individual frames to create a higher resolution image. Image taken using Orion Apex 90mm Mak-Cass telescope and Orion 0.5x Focal reducer. 10 Individual images assembled In Adobe Photoshop.

Things to Do

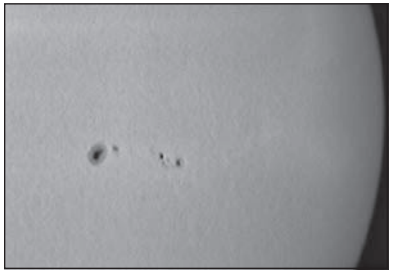


Figure 5. Image taken using Orion Apex 90mm Mak-Cass telescope. 100 frames Processed using RegiStax.

Moon

Learn your way around our closest celestial neighbor.

- Image the craters, mountains and valleys.
- Image the different phases from New moon to Full Moon
- Image the detail at the terminator
- Create a moon mosaic (Figure 4)

Planets

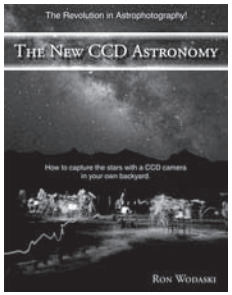
- Take a movie of the position of the great red spot of Jupiter during the Gas Giant's <10 hour day.
- Image Jupiter's moons and their shadows as they transit across the Gas Giant
- Follow in Galileo's footsteps by Imaging the different phases of Venus

Solar

- Using a full aperture Solar Filter to image sunspots (Figure 5)

Terrestrial

- Image animals from a far distance so as not to disturb feeding and nesting spots



Recommended Reading

(Books available through Orion, check the catalog or OrionTelescopes.com for more information).

Specifications

Sensor	OMM Vision Color CMOS sensor
Sensor size	1/3"
Number of pixels	NTSC 510 x 496 pixel layout, PAL 628 x 586 pixel layout; 0.3 megapixel resolution
Pixel size	9.2µm x 7.2µm
Video frame rate	NTSC 30 frames/second, PAL 25 frames/second
A/D conversion	8 bit
IR filter	Yes
Connection	Standard Composite RCA Video Out
Barrel	1.25" threaded for filters

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Changes of modifications not expressly approved by the party responsible for compliance could void the userís authority to operate the equipment.

Note: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

Reorient or relocate the receiving antenna.

Increase the separation between the equipment and receiver.

Connect the equipment into an output on a circuit different from that to which the receiver in connected.

Consult the dealer or an experienced radio/TV technician for help.

A shielded cable must be used when connecting a peripheral to the serial ports.

One-Year Limited Warranty

This Orion StarShoot Video Eyepiece is warranted against defects in materials or workmanship for a period of one year from the date of purchase. This warranty is for the benefit of the original retail purchaser only. During this warranty period Orion Telescopes & Binoculars will repair or replace, at Orion's option, any warranted instrument that proves to be defective, provided it is returned postage paid to: Orion Warranty Repair, 89 Hangar Way, Watsonville, CA 95076. If the product is not registered, proof of purchase (such as a copy of the original invoice) is required.

This warranty does not apply if, in Orion's judgment, the instrument has been abused, mishandled, or modified, nor does it apply to normal wear and tear. This warranty gives you specific legal rights, and you may also have other rights, which vary from state to state. For further warranty service information, contact: Customer Service Department, Orion Telescopes & Binoculars, 89 Hangar Way, Watsonville, CA 95076; (800) 676-1343.

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