ASTRONOMY TECHNOLOGY TODAY

Your Complete Guide to Astronomical Equipment

THE SKY-WATCHER USA HERITAGE 150 TABLETOP DOBSONIAN
APM/LZOS 115MM F/7 APO • THE SOFTWARE BISQUE PARAMOUNT MYT

THE SKY-WATCHER USA HERITAGE 150 TABLETOP DOBSONIAN

Volume 15 • Issue 8 $6.00 US

ATT

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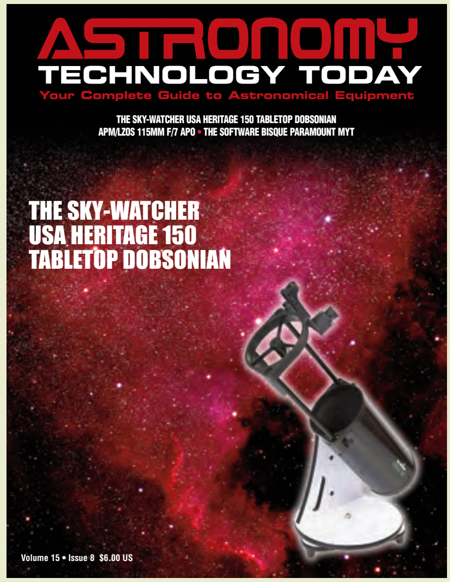
One the cover is the Sky-Watcher USA Heritage 150 Tabletop Dobsonian, a small powerhouse of a telescope suitable for any enthusiast, as Dr. James Dire can attest to in his article. The background astroimage was taken by Thomas Fowler with the 115mm APM/LZOS. The image of the North American Nebula was taken with the 115mm APM/LZOS using a modified Canon 6D, Riccati 0.75x flattener/focal reducer, MGEN-3 autoguider, stack of 4 images, total 840s, processing with Photoshop and Astroflat Pro.



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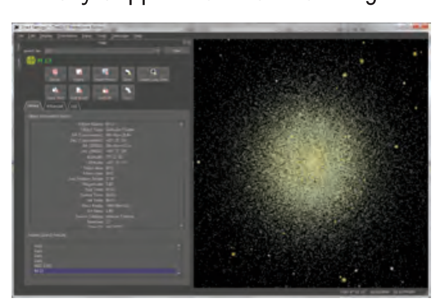

ATT Contributing Writers

James Dire has an M.S. degree in physics from the University of Central Florida and M.A. and Ph.D. degrees from The Johns Hopkins University, both in planetary science. He has been a professor of physics astronomy at several colleges and universities. He most recently served as the president of Methodist College in Peoria, Illinois. He has played a key role in several observatory projects including the Powell Observatory in Louisburg, KS, which houses a 30-inch (0.75-m) Newtonian; the Naval Academy observatory with an 8-inch (0.20-m) Alvin Clark refractor; and he built the Coast Guard Academy Astronomical Observatory in Stonington, CT, which houses a 20-inch (0.51-m) Ritchey Chrétien Cassegrain.

Thomas B. Fowler has been involved in astronomy since 1960 (he is shown in the picture from 1961). He is the author of over one hundred articles, many reviews for Cloudy Nights, and four books, including a book on astronomy equipment and techniques, The View Through Your Telescope and How to Make it Better (2020). He has given presentations to the Northern Virginia Astronomy Club and the TriState Astronomers. He is an independent consultant on technology to the U.S. government and Adjunct Professor of Engineering at George Mason University. He has lectured widely on science, technology and philosophy. His doctorate from George Washington University is in system theory. He also owns 3 telescopes and too much other astronomy equipment to think about!

Stuart Parkerson has been the publisher of Astronomy Technology Today since its inception in 2006. While working primarily in the background of the company's magazine and website business operations, he has recently taken a more active role in contributing content covering industry news and other company centric topics.

Richard S. Wright, Jr. is a Contributing Editor for Sky and Telescope and a software developer by profession specializing in computer graphics technologies at LunarG Inc. Richard is also a consulting engineer and imaging specialist for Software Bisque. A lifelong amateur astronomer, Richard first experimented with a webcam and black-and-white film images of the Moon in the 1990s, and he subsequently became hopelessly addicted to astrophotography. Currently, he seeks treatment at his dark sky camp/observatory in Okeechobee, Florida, whenever he can.

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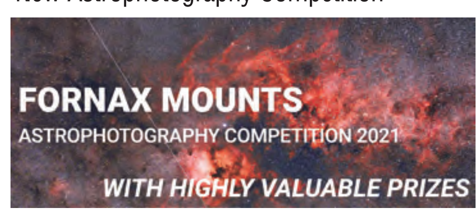

THE SKY-WATCHER USA HERITAGE 150 TABLETOP DOBSONIAN

By Dr. James R. Dire

I have seen myriad tabletop telescopes in my day ranging from 3 to 4.5 inches in aperture. But I have never seen a 6-inch tabletop telescope. So when Sky-Watcher USA asked me to review their Heritage 150 Tabletop Dobsonian telescope, I couldn't pass up the opportunity.

The Heritage 150 is a 150mm (slightly under 6 inches) f/5 collapsible Newtonian optical tube attached to a one-armed Dobsonian mount. The focal length of the telescope is 750mm. The entire telescope with all of the accessories attached weighs just less than 24 pounds.

The telescope arrived packed in a study cardboard box (**Image 1**). The telescope was packed inside an interior box (**Image 2**), which contained copious Styrofoam surrounding the telescope to protect it during transport. The telescope was contained in a large plastic bag inside the box to keep it dust free. The telescope's accessories were enclosed in bubble wrap and packed in a small cardboard box inside the main box.

Image 1 - The Sky-Watcher Heritage 150 is shipped in a sturdy cardboard box.

Image 3 shows the telescope immediately after removal from its box. The optical tube assembly (OTA) has a cover to keep dust out when not in use. The cover has a removable cap providing an off-axis 40mm opening for viewing the Moon, since brighter phases may be too bright for comfort using the full aperture. The telescope tube has a Vixen-style dovetail plate, which clamps onto the arm of the Dobsonian mount. The dovetail plate is long enough to provide ample adjustment for balancing the fully

Image 2 – The interior box is nicely decorated and well padded to keep the telescope protected during shipping.

extended OTA.

The Dobsonian base has Teflon bearings for smooth azimuthal motion. The altitude axis has equally smooth motion and a tension knob to ensure the telescope stays at the desired altitude. The base of the telescope has three vibration dampening rubber feet, which also keep the telescope from sliding across a smooth tabletop when manually slewing the telescope.

To test the telescope, I took it to a dark site at Tuckahoe State Park in Maryland, east of the Chesapeake Bay (**Image 4**). A picnic table provided the perfect tabletop to operate the telescope. Although the field was surrounded on all sides by tall trees, Polaris was visible in the north and the gas giant planets Jupiter and Saturn easily cleared the trees to the south as they transited. The sky was cloud free, the seeing was well under two arcseconds, and the transparency was slightly above average with all stars in the Little Dipper visible naked eye.

Image 4 shows the telescope fully extended and ready for operation. The OTA is around 30 inches in length and when pointed towards the zenith, the telescope extends 35 inches above the tabletop. The truss half of the OTA uses two poles that lock into place with plastic hand-turned clamps. With only two poles, a shroud would not work to keep dew off the optics. Care must also be taken when swapping eyepieces in the dark to not drop one into the tube, which would damage the primary mirror. The semi-truss design does allow for rapid cooling of the optics! In the image, note the shield at the top of the OTA opposite of the focuser. It does a great job of keeping stray light from reaching the eyepiece.

The telescope comes with two eyepieces (**Image 5**), a 25mm (30x) Plössl and a 10mm (75x) Plössl. I carried my own heavy-duty Plössl eyepieces of the same focal length with me to test against the Heritage 150 eyepieces. To my surprise, I could tell no different in performance!

Also shown in Image 5 is a collimation tool. It is essentially a 1.25-inch focuser cap with a hole in the center. The telescope's manual, included in the box with the telescope, contains great instructions on how the collimate the optics. I find whenever I transport a Newtonian in my car, I always have to collimate the telescope when I set it up. This night was no different.

A closer view of the focuser appears in **Image 6**. The telescope has a helical focuser with two locking screws to hold any 1.25-inch-barrel eyepiece. The focuser does not have a large travel range, but it easily focused the two provided eyepieces and others I used to test it. Image 6 also shows the red dot finder that comes with the telescope. It requires a small Phillips screwdriver to attach it to the OTA. It has two-hand-turned knobs to align it parallel to the telescope and a variable brightness power switch.

Image 3 – The Heritage 150 right out of the box.

Image 4 - The Heritage 150 is a tabletop telescope. Here it is shown fully expanded with a 25mm eyepiece and the red dot finder attached. Note the two hand-tightened clamps that hold the upper assembly poles in place when fully expanded.

Image 5 - The telescope comes with a 25mm (30x) Plössl eyepiece, a 10mm (75x) Plössl eyepiece and a collimation tool.

The red dot finder works great.

I did find dew easily formed on the red dot finder, the eyepieces, and the secondary mirror. So having a blow dryer at hand is a must when observing when the humidity is high.

The primary mirror and secondary assembly are also visible in Image 6. The primary mirror is center marked with a black circular sticker (unfortunately not captured well in this image.) I used my personal laser collimator to align the mirrors. A 1.5mm Allen wrench is required to adjust the secondary mirror. I aligned the secondary mirror first, then the primary.

The primary mirror collimation knobs are visible in **Image 7**. The three smaller-diameter thumbscrews are first backed out to allow the mirror to tilt. The three larger-diameter thumbscrews are used to adjust the primary mirror collimation. After collimated, the smaller-diameter thumbscrews are lightly hand-tightened to hold the mirror in place. Collimation took a few minutes. I verified the collimation with the provided collimation cap and then did a star test after twilight ended. Each test showed the collimation was perfect.

I brought my 132mm f/7 apochromatic refractor with me to compare views with the Heritage 150 (**Image 8**). To a first order approximation, the two scopes were comparable in size and focal length, although my APO OTA cost ten times as much as the Heritage 150.

Notice in Image 8 while waiting for it to get dark, I used the cover of the telescope to protect the primary mirror from dust or potential dropping something down it. The telescope was already cooled to ambient temperature, so it did not require further airflow in the tube at this time.

To compare the two telescopes, I used the same eyepiece in each going back and forth. My first target was Saturn near the meridian in the south. With the Heritage 150's 25mm eyepiece, Saturn was crisp with Titan easily visible. Although the telescope has a focal ratio of f/5, I detected very little coma with this eyepiece.

Moving up to higher power with the

Image 6 - This view shows the primary mirror, the secondary mirror assembly, the helical focuser, and the red dot finder attached to its base at the top of the telescope.

10mm eyepiece, the Cassini division stood out and some dark bands on Saturn were visible. At this power I had to nudge the Dob every 30-45 seconds to keep Saturn centered. I slewed and nudged the telescope by gripping the ring holding the spider. I avoided grabbing the truss poles since they had a thin layer of grease on them. The view in the APO was comparable if not slightly better. But the difference was negligible. The APO, riding a polar aligned German equatorial mount kept Saturn centered at any power.

My next target with the 25mm eyepiece was Jupiter. Three moons were visible with multiple belts and zones clearly resolved. I suspect Io was transiting the planet. Switching to the 10mm eyepiece confirmed my hunch as I could make out Io in front of Jupiter and it's shadow cast on Jupiter's cloud tops.

Wanting more power, I pulled out my 5mm Nagler eyepiece, which gave 150x in the Heritage 150. The telescope held that power quite well and nudging it to keep the planet centered was not that difficult. The extra magnification, with the arcsecond seeing, made Jupiter and Saturn exceptional treats.

My next target was M13. Both telescopes delivered comparable light from the globular cluster to the eyepiece. With the 10mm eyepiece, the contrast was slightly better in the APO and I could resolve more stars. But the 150mm Dob did not disappoint!

Other targets included M11, M92, M57, M31 and M33. Both telescopes resolved Epsilon Lyrae, but as expected the APO did a better job. Refractors in general are better at splitting binary stars than reflectors due diffraction caused by secondary mirror assemblies and spiders in reflectors.

The Heritage 150 cannot be used with a solar filter since too much stray sunlight would enter the tube around the filter. You could feasibly use it with an appropriate eyepiece to project an image of the sun onto a screen to see sunspots or watch an eclipse. [See Making the Most of an Eclipse, Astronomy Technology Today, 11, 5 p. 46.]

Normally, photography through a Dobsonian telescope is impossible since the telescope does not track objects as the Earth rotates. However, exposures of the Moon are typically short enough to work for this type of telescope. So I attached a 1.25-inch noseplug with a T-ring to my canons EOS T3i camera (**Image 9**) to experiment taking Moon images through the Heritage 150.

Normally with Newtonians, there is not enough back focus to get a camera in focus. In the past I would drill new holes on the OTA and move the primary mirror an inch or two closer to the secondary. Since the Heritage 150 is collapsible, all I had to do was lower the fully expanded upper assembly to move the secondary mirror closer to the primary.

After some trial and error, I found lowering the poles two inches allowed me to focus the camera perfectly when the camera was attached to the focuser. Then I removed the camera and recollimated the optics in this new position, before returning the camera to the focuser for imaging. I also rebalanced the OTA by moving the dovetail plate up in the clamp. The red dot finder did a great job of helping me center the Moon on the camera frame.

To take images, I used a shutter release cable with my Canon camera. I also used the mirror lock up feature in the camera. The first push on the cable release locks up the mirror. After allowing the vibration from the mirror flip to dampen out, the second push on the cable release exposes the image. I used the camera's "Live View" feature zoomed in on craters at the Moon's terminator to get the perfect focus.

Image 10 shows a full frame image of the Moon taken through the Heritage 150. The camera was set at ISO 200 and the exposure was 1/250 s. The entire process of setting up the telescope, attaching the camera to find the rough distance to lower the truss poles, collimating the optics and taking this Moon image took me about 20 minutes. The results were well worth the effort!

Image 7 - The primary mirror has plenty of ventilation for cooling it to ambient temperature. The primary mirror collimation knobs are visible. Also note the dovetail plate, its locking knob, and the large altitude tension knob on the outside of the Dobsonian cradle.

Image 8 - The author compared views in the Heritage 150 with views in a 132mm apochromatic refractor.

Image 9 - Lunar photography can be done with the Heritage 150 using a DSLR camera with a T-ring and a 1.25-inch noseplug.

Image 10 - Picture of the Moon taken through the Heritage 150 using the Canon EOS T3i camera.

Overall, I was quite impressed with the capabilities of this 150mm tabletop telescope. There is not a lighter Newtonian telescope with this size aperture on the market. It's easy to transport and use and provides great views. It's one of the best telescopes available for under $300! ATT