

TeleVue®-NP127is Operating Guide

660mm f/5.2 IMAGING SYSTEM 4-ELEMENT APO REFRACTOR

Thank you for purchasing the TeleVue-NP127is. It has been our pleasure to craft this fine instrument for you. Over forty years ago, Al Nagler received a U.S. patent for a fast, refracting telescope design based on Josef Petzval's portrait camera lens concept. Petzval's design uses widely spaced doublets to produce a flat focal plane over a relatively narrow field of view, just the sort of field a fast telescope can see. Nagler's combination of flat-field, fast focal ratio, and unobstructed system lent itself perfectly for testing eyepieces.

The 5" f/4 MPT (Multi-Purpose Telescope) with its fast speed, wide and flat field, led to a series of continuous improvements, primarily in color correction. The "Halley Commemorative," 4" f/5.5 Renaissance started the parade where more advanced glasses including special dispersion, fluorite and fluorite substitute glasses brought steady improvements. The 4" f/5 Genesis employed fluorite in the rear doublet and the f/5.4 SDF and subsequent TeleVue-101 versions brought us closer to perfection, and NP127 with an even faster f/5.2 speed. The TeleVue-NP127is refines the original NP127 with the addition of a more robust, larger focuser now standard with 10:1 reduction.

TeleVue's "is" designation denotes instruments capable of accepting Imaging System photographic accessories. TeleVue has designed this series of accessories in conjunction with each optical system so you are ensured of compatibility and maximum performance. While the NP127is maintains all the visual prowess of the previous NP127, the larger rear elements and larger focuser along with a host of proprietary Imaging System accessories, make it ideally suited for the CCD imager.

WARNING: NEVER try to look at the sun or point the telescope toward or near the sun without professional solar observing equipment rigidly secured in front of the objective lens. When observing the sun with the proper filters, remove any sighting devices such as Starbeam from the telescope. Use only the TeleVue

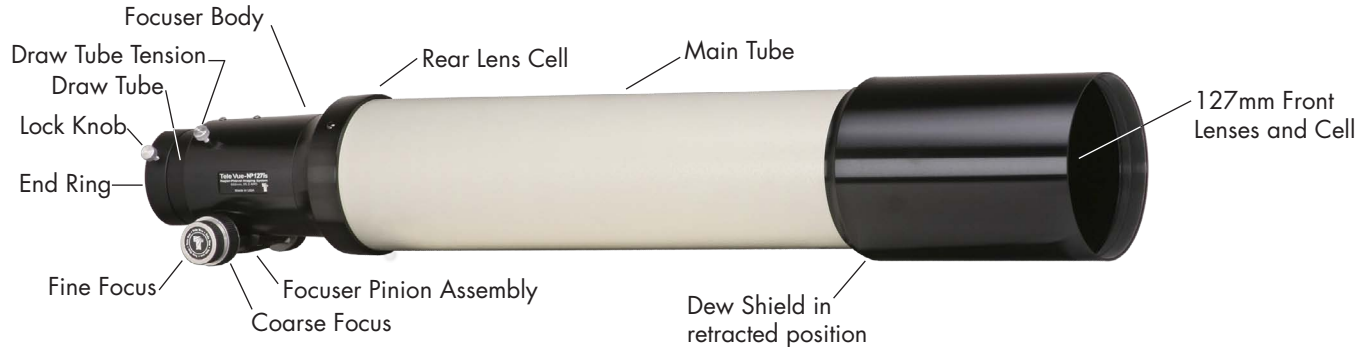


Sol Searcher to find the sun. Instant and permanent eye damage may result from viewing the sun directly, even during a solar eclipse, or when viewing through thin clouds, or when the sun is near the horizon.



Standard Features - Optical tube assembly includes: captive sliding dew shield, 2.4" focuser with Focusmate 10:1 reduction, tilt adjustment end ring, screw-on metal lens cover, 2" Accessory Adapter, Imaging System Adapter, custom hard-shell case, Allen Keys for end ring tilt adjustment.

1.0 Getting Acquainted with the Tele Vue-NP127is



1.1 Optical tube assembly

The NP optical design contains four elements consisting of two widely spaced, air-spaced doublet groups. The forward group of lenses are contained in a stainless steel lens cell. The cell attaches to the main tube via three alignment screws. The front cell is encased within the sliding dew shield. The rear doublet, making up the rest of the 4-element objective, is larger in diameter than the previous NP127 and provides additional illumination at the edge of the field. This benefit is especially useful for large format CCD chips which are extremely sensitive to light fall-off. The rear lens group is housed in the cell between the back of the tube and the focuser. Never stick any long objects into the focuser or you could hit the rear-most lens surface.

1.2 Focuser

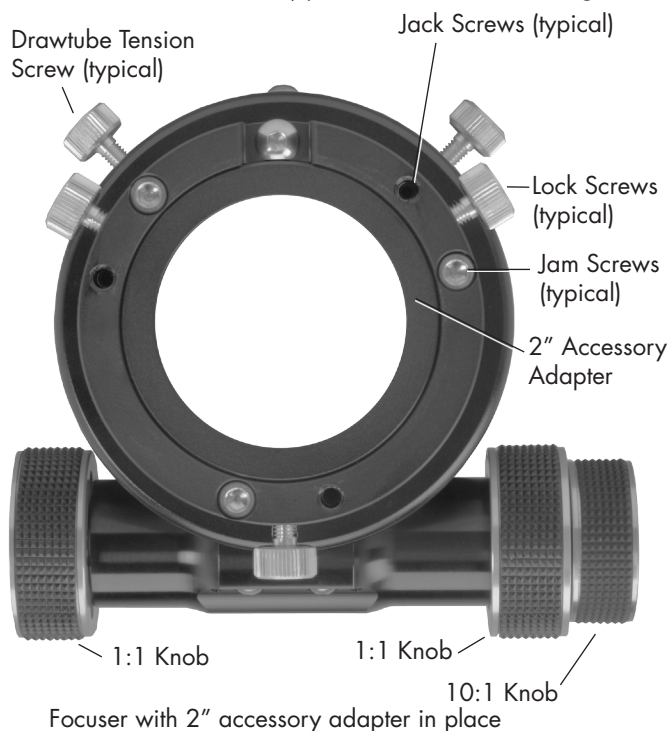
The 2.4" output side of the NP127is focuser is designed to pass all of the field rays exiting the rear elements of the objective, as the forward end of the draw tube has a 3" internal diameter. A larger focuser, therefore, lends no additional illumination benefit.

The NP127is is shipped in its "visual" configuration. The 2" Accessory Adapter sits within the 2.4" inside diameter of the drawtube.

Thumb screws pass through both the drawtube and adapter to cinch a brass clamp ring around 2" accessories. With three thumb screws there is enough holding power for the heaviest of visual accessories!

The two tension screws on the top of the focuser body can be adjusted to add resistance when using heavy equipment. These tension screws tighten against a brass clamp ring, which then cinches down on the Teflon sleeve in which the draw tube slides. For photography it is not necessary to tighten beyond the need to keep a camera stationary but we do recommend to tighten them in unison to avoid any focus shift. Note that even when sufficiently tight, the focuser knobs can still drive the draw tube.

The end ring can be adjusted (and locked) to compensate for any tilt effects seen in CCD



imaging. Lock screws in the end of the draw tube tighten against either the taper of the Imaging System Adapter or brass clamp ring within the 2" Accessory Adapter.

Operation of the rack and pinion focuser is via the 10:1 ratio Focusmate on the right side or either of the 1:1 knobs. You might consider the optional Focusmate Driver for vibration-free focus control.

2.0 Mounting Options and Set Up

The telescope tube diameter is 5". The dual ring MRS-5000 is suited for photography and CCD imaging with a variety of adapter plates that can be bolted to the base plate. The base plate also bolts to the Tele Vue Gibraltar-HD5 Alt-Az mount if a more travel-friendly, visual use mount is desired. Each tube ring has two machined channels with #10-32 threaded holes for mounting accessories. A central bar spans across the top of the two rings for added stability.

The bottom of each tube rings has a 1/4-20 hole to accept a mounting stud or screw. Telescope balance is achieved by unlocking the "bat handle" screws and sliding the tube fore or aft. Once the O.T.A. is repositioned, retighten the bat handle screws.



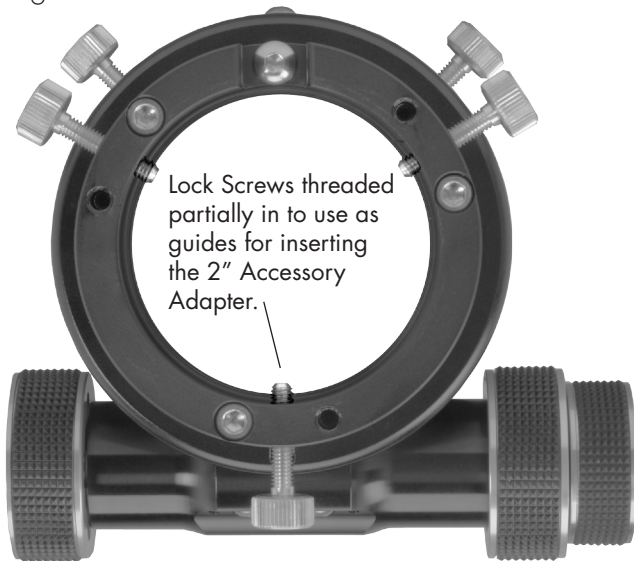
MRS-5000

3.0 Visual Observing Set Up

As previously mentioned, the NP127is is shipped in its "visual" configuration. If you have removed the 2" Accessory Adapter and would like to re-install it, loosen the three end ring lock screws sufficiently to remove any accessory that may be in place. However, do not retract them fully into the end ring. By allowing them to protrude into the body (note photo below), they act as locators. Looking at the 2" Accessory Adapter, note the three grooves with holes machined 120° apart. The grooves help index the holes in the adapter to the three thumb screw arrangement in the end ring. This will ease installation in the dark. Insert the 2" Accessory Adapter into the end of the focuser. If

it does not go all the way in, rotate the adapter. When the grooves in the adapter align with the protruding screws, the adapter will seat fully into the focuser. Tighten the three screws a few turns so they enter the holes in the adapter. The lock screws will now act against the brass clamp ring in the 2" Accessory Adapter.

Slip a Tele Vue 2" Everbrite diagonal into the focuser and tighten the lock screws. You will now be able to reach focus with any Tele Vue eyepiece. **IMPORTANT CAUTION:** When replacing the orange plastic plug into the 2" Accessory Adapter, push it in far enough to seat. Do not use the lock screws to clamp the plug in place as the clamp screws will distort the brass clamp ring in the 2" accessory adapter.



Focuser set to accept 2" Accessory Adapter

3.1 Eyepieces

With its wide, highly corrected, flat field and fast f/ratio, the NP127is puts eyepieces to the test. This scope demonstrates the superiority of Tele Vue eyepiece performance and, with a range of 12x to 220x (if the atmosphere allows) there is a magnification for all purposes. See chart at the end of this manual or call Tele Vue for recommendations. In general, we suggest choosing low and medium power eyepieces in ratios of field stop diameters. For example, factors of 1.4 or 2.0. When choosing higher power eyepieces, use ratios of magnification.

4.2 Prime Focus

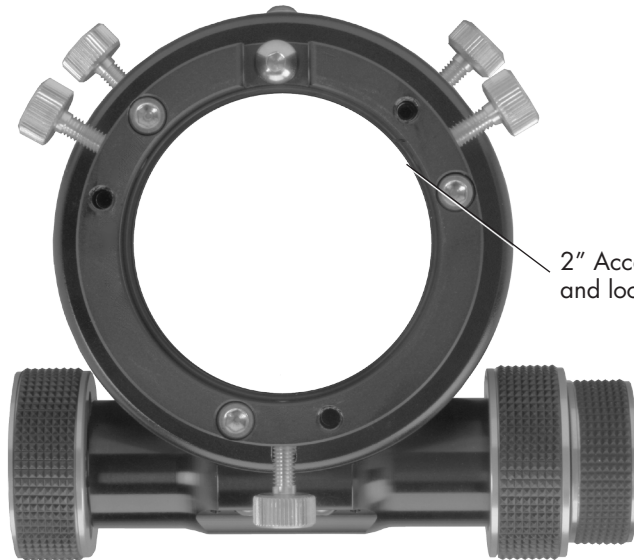
3.2 Finders

We particularly recommend using the Starbeam (SRT-2010) unit power finder and Sol-Searcher (SSF-1006), which attaches to the Tube Rings. The case has a cutout for the Starbeam. The Quick Release Universal Finder Bracket (QFM-1008) can hold a traditional 50mm finderscope and also attaches to the mount ring channels.

4.0 Photographic Set Up and the Tele Vue Imaging System

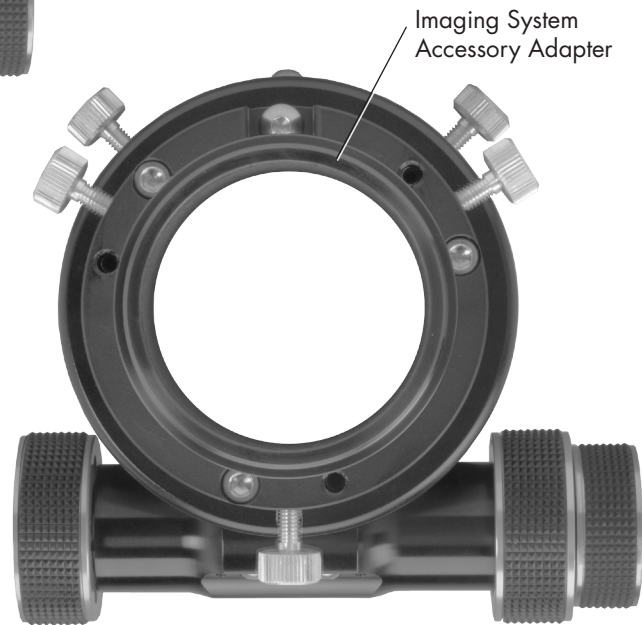
Tele Vue Imaging System Accessories provide solid threaded connections between components. To use these accessories requires the insertion of the Imaging System Adapter (ISA) into the focuser. You will find the ISA in the left side of the telescopes case. To install the ISA, first back off the three Lock Screws far enough to pull the 2" Accessory Adapter out from the drawtube to reveal the 2.4" diameter. Store the adapter in the case.

You will then need to back out the screws further so their ends are flush with the inside diameter of the End Ring. Insert the ISA and tighten the three Lock Screws located equidistant around the end ring.



2" Accessory Adapter removed and lock screws backed out.

Visual adapter removed.

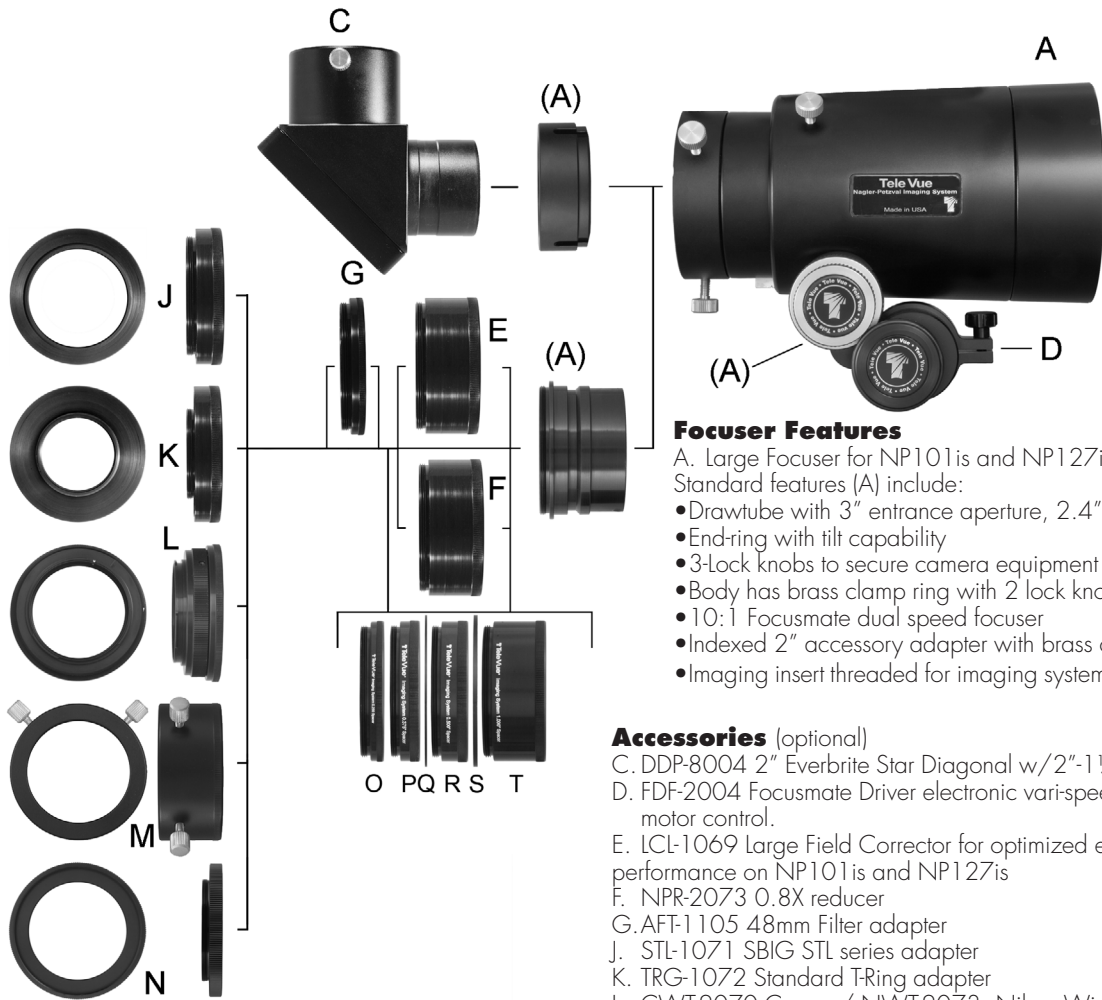


Imaging System Accessory Adapter

Arrangement for imaging.

Visual Adapter removed and the three lock screws are made flush with the end ring. Insert the Imaging System Adapter and tighten the three lock screws.

The Imaging System's threaded accessories provide a variety of options for camera adaptation and focal length variation. The goal of Tele Vue's Imaging System is to let you pursue your astrophotographic passion with ease, by providing accessories designed to work together. The following summary of parts and pictorial diagrams will help you understand each part's use and its sequence in the chain. Please note that spacing requirements of any particular camera will need to be met by the appropriate Imaging System spacer or combination of spacers.



Focuser Features

- A. Large Focuser for NP101is and NP127is
 Standard features (A) include:
- Drawtube with 3" entrance aperture, 2.4" exit aperture
 - End-ring with tilt capability
 - 3-Lock knobs to secure camera equipment or 2" adapter
 - Body has brass clamp ring with 2 lock knobs
 - 10:1 Focusmate dual speed focuser
 - Indexed 2" accessory adapter with brass clamp ring
 - Imaging insert threaded for imaging system components.

Accessories (optional)

- C. DDP-8004 2" Everbrite Star Diagonal w/2"-1 1/4" Adapter
- D. FDF-2004 Focusmate Driver electronic vari-speed motor control.
- E. LCL-1069 Large Field Corrector for optimized edge performance on NP101is and NP127is
- F. NPR-2073 0.8X reducer
- G. AFT-1105 48mm Filter adapter
- J. STL-1071 SBIG STL series adapter
- K. TRG-1072 Standard T-Ring adapter
- L. CWT-2070 Canon / NWT-2073 Nikon Wide T adapter
- M. A2A-1107 2" Accessory adapter
- N. M54-1073 M54 Camera Adapter
- O. TLA-0250 0.25" long threaded extension
- P. TLB-0375 0.375" long threaded extension
- Q. TLF-0040 0.040" spacer
- R. TLC-0500 0.500" long threaded extension
- S. TLG-0080 0.080" spacer
- T. TLD-1000 1.000" long threaded extension

LCL-1069 Large Field Corrector

- Optimizes edge of field performance. Recommended for 35mm CCDs (43mm diagonal) and larger plus cameras with pixel sizes < 6µm.

NPR-2073 – 0.8x Reducer for NP and NPis series telescopes

- Designed to enlarge the field of all NP scopes for up to full-frame (43mm diagonal) imaging and is a replacement for the previous NPR-1073 0.8x for up to APS size (27mm diagonal) formats
- Constructed to fit both standard 2" focuser NP scopes (RAD-1074 required) and the threaded "NPis" Accessories on the input end. Requires additional Imaging System rings to connect to imaging train.

STL-1071 – SBIG STL series camera adapter

- This adapter is sized to thread directly onto the STL series cameras and mates with I.S. Accessories.

TRG-1072 – Standard T-ring adapter

- This is the most restrictive of adapters in terms of vignetting as it has the smallest inside diameter. Recommended for use with APS size or smaller formats.

CWT-2070 – Canon / NWT-2073 – Nikon Wide T Adapter

- Mates Canon EOS or Nikon F-mount body with Imaging System Accessories.
- Eliminates the inner portion of Canon and Nikon T-rings to provide a larger diameter opening for reduced vignetting.

A2A-1107 – 2" Accessory Adapter

- Use for cameras with 2" nosepiece or any other 2" accessory.
- Dual thumb-screws and clamp ring for positive locking.

M54-1073 M54 Camera Adapter

- Used for full-frame cameras with M54 x 0.75mm threads.
- Can also connect to filter wheels with M54 threads.

AFT-1105 – 48mm Filter adapter

- Allows use of 48mm filters in the system.
- Best if used closest to the chip to minimize any vignetting
- Adds 0.25" of spacing.

TIA-0250 – 0.250" (6.4mm) Spacer

TIB-0375 – 0.375" (9.5mm) Spacer

TIC-0500 – 0.500" (12.7mm) Spacer

TLD-1000 – 1.000" (25.4mm) Spacer

TIF-0040 – 0.040" (1mm) Spacer

TIG-0080 – 0.080" (2mm) Spacer

TLS-2245 – Set of all six spacer rings.

- Threaded coupling provides the necessary distance for proper spacing of field lenses to CCD chip. Required spacers will vary depending on camera specifications. 0.040" and 0.080" rings fit between the threaded spacers.

- Black anodized aluminum with anti-reflection threads for maximum contrast.

4.1 Adjustable Position End Ring

The tilt of the End Ring is pre-set to ensure the end surface is parallel with the focal plane. If you see tilt errors in your images, the optical axis can be changed to compensate.

To determine which way to tilt the End Ring, it is necessary to focus on the part of the image that comes to focus first when racking out the focuser from its "in" position. That will permit adjusting, or "jacking," the End Ring "out" to match that focus point in other parts of the field.

You will need to remove your camera equipment, including the Imaging System Adapter to adjust the tilt of the End Ring. Slightly loosen the three Jamb Screws located on the face of the End Ring with the appropriate Allen key. Then, "jack" the End Ring to the desired position using the appropriate Allen key Jack Screws. Note: when adjusting the jack screws, make very slight turns as a ¼ turn equals a longitudinal movement of 198 microns at the screw. Tighten the Jamb Screws against the End Ring and reinstall your camera. Some trial and error imaging will be necessary, so it is best to carry out any adjustment during an imaging session.

Prime focus photography involves attaching a camera, without its lens, to the telescope. In this method the telescope becomes the camera's lens. In the case of the NP127is, it is a 660mm focal length, f/5.2 telephoto. It is the focal length of the telescope in combination with the diagonal dimension of the CCD chip or film frame that will determine the amount of field your photograph will cover. The shorter the focal length or larger the diagonal dimension, the greater the field that will be recorded.

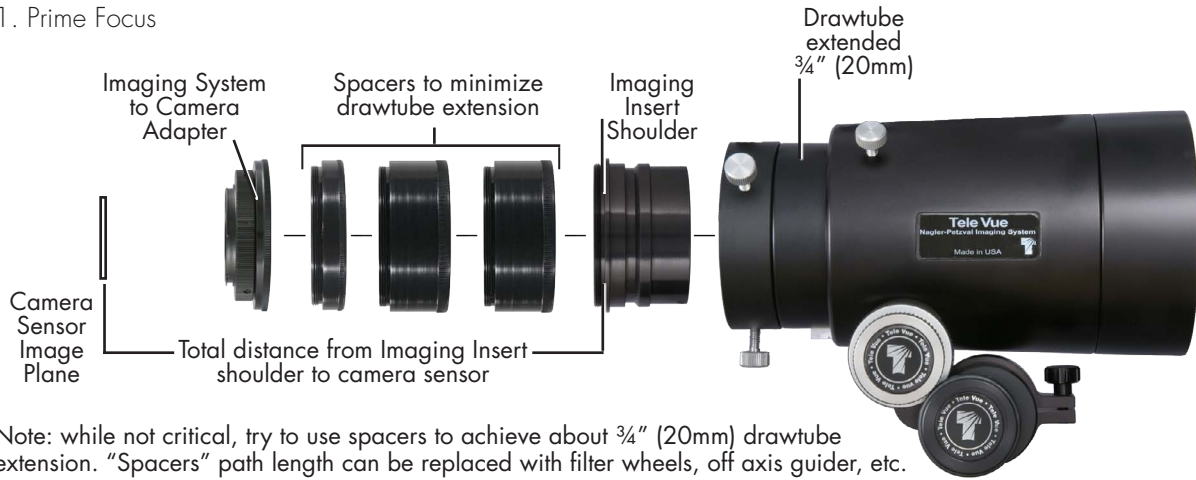
The parts necessary for Prime Focus photography are: camera body, accessories (filter wheel / drawer, off axis guider, etc.) appropriate Imaging System adapter, Large Field Corrector or 0.8x reducer with Extension Spacers to achieve proper back focus, drawtube Extension Spacers to limit drawtube extension to approximately 0.75" (20mm), the Imaging System adapter, and telescope. See the following diagrams for a visual explanation.

Large Field Corrector Usage. To obtain the best edge sharpness with 35mm or larger formats or in all

Camera Setup Examples

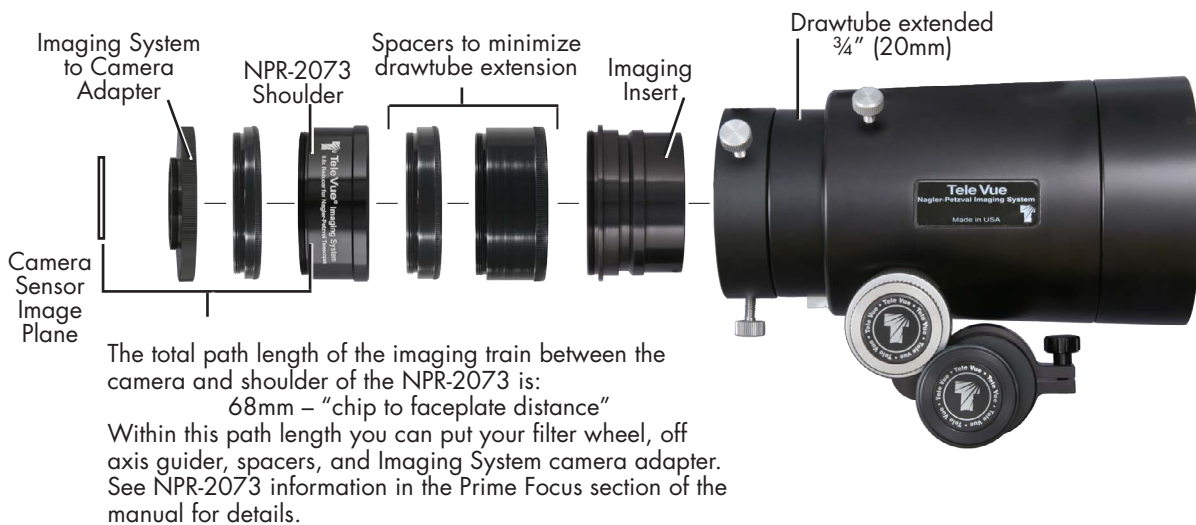
In the examples here, spacings shown are for illustrative purposes: your spacing will be unique. For instances where accessory lenses are not used, spacers will only determine focus position and therefore are not critical.

1. Prime Focus

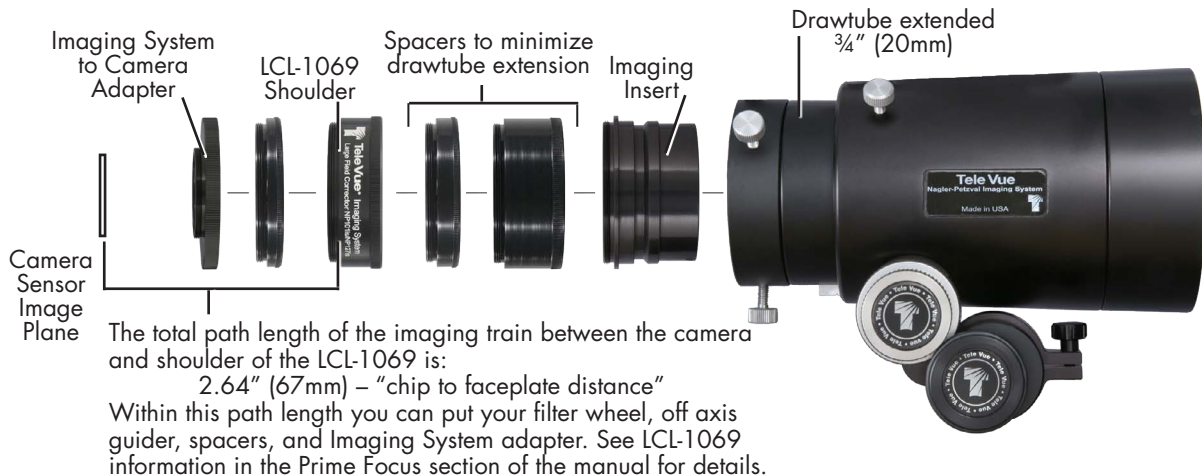


Note: while not critical, try to use spacers to achieve about $\frac{3}{4}$ " (20mm) drawtube extension. "Spacers" path length can be replaced with filter wheels, off axis guider, etc.

2. One Shot Color or DSLR Camera with 0.8X Reducer (NPR-2073)



3. Full-Frame Camera with Large Field Corrector (LCL-1069)



sensor formats when the sensor pixels are $< 6 \mu\text{m}$, you must use the Large Field Corrector (LCL-1069). For optimum performance, the distance from the base of the male thread on the camera-facing side of the LCL-1069 to the camera sensor must be **2.64"**. In order to determine how much Back Focal Length (BFL) you need to maintain between the camera face and LCL-1069, you need to know the distance from the chip to the faceplate of the camera. This should be specified in the camera's documentation; call your camera's manufacturer if it is not. Simply subtract "chip to faceplate" distance from **2.64"** to get the spacing required from the Large Field Corrector to your camera faceplate. If accessories such as filters wheels or off axis guiders are used, their path length must also be deducted from the **2.64"** figure.

Since there are tolerances in all manufactured parts, it may be necessary to vary the spacing slightly from the nominally calculated value. Should your star images in the four corners look equally slightly elongated, try using the next smallest increment of threaded spacer with either the 0.040" (TLF-0040), 0.080" (TLG-0080), or both in between the threaded spacers to fine tune the image.

4.2a) 0.8x Reducer (NPR-2073) Usage. To gain more field with chips up to full-frame, use the 0.8x Reducer (NPR-2073). For One Shot Color and DSLR cameras, use a Back Focal Length (BFL) of **68mm**. In the case of imaging in full-frame monochrome with LRGB or HST palette filters, a BFL of **50mm** should be used (this includes a +1mm shift required for a single 3mm filter). If your imaging stack exceeds **50mm** due to accessories, then use the **68mm** distance. Just subtract either of these distances from the "chip to faceplate" distance to get the spacing required from NPR-2073 to your camera faceplate. If accessories such as filters wheels or off axis guiders are used, their path length must also be deducted from the 68mm figure. For all setups, use Extension Spacers to minimize draw tube outtravel to no more than $\frac{3}{4}$ " (20mm). See NPR-2073 instruction sheet for details.

4.2b) Special Note for ZWO Usage. ZWO instructions are standardized on producing an imaging stack with 55mm Back Focal Length using their various cameras, filter wheels, Off Axis Guiders, and adapter rings. In order to properly back space the sensor behind our optical accessories, simply subtract 55mm from our recommended spacing distance and add back 1mm for every 3mm of filter thickness. Using our 2.64" (67mm) spacing example for the Large Field Corrector with a 3mm filter, the math is as follows: $67\text{mm} - 55\text{mm} + 1\text{mm} = 13\text{mm}$ of additional spacing is required. Our TRG-1072 (M42x0.75mm) or M54-1073 (M54x0.75mm) adapters (6.6mm of path) will connect to the telescope end of the ZWO 55mm stack (in some cases use ZWO's M48-M42 zero path length converter). Next, simply thread on our TLA-0250 (6.4mm of path) to space the camera sensor to the required path length.

Likewise, employing ZWO's 55mm stack with the 0.8x Reducer (NPR-2073), requires use of the 68mm back focus option in all cases as the 50mm option is not possible. This spacing with a 3mm thick filter requires: $68\text{mm} - 55\text{mm} + 1\text{mm} = 14\text{mm}$ more spacing. Pairing our TRG-1072 or M54-1073 (6.6mm of path) adapters with the TLA-0250 (6.4mm of path) and TLF-0400 (1mm of path) exactly makes up that 14mm requirement.

4.2c) To gain more magnification, the 2x (PMT-2200) and 4x (PMT-4201) Powermates are recommended for best performance. Start by inserting the 2" Accessory Adapter into the end of the focuser. (Since increasing the magnification will reduce the field, the large opening provided by the Imaging System Adapter is of no benefit.) The arrangement of parts necessary is: camera with a T-ring attached, Powermate with corresponding T-ring adapter (PTR-2200 or PTR-4201) attached, 3.5" Extension Tube (X3C-0009), to make up focus travel, and telescope.

If you prefer to use the threaded I.S. adapters, you would need three 1" spacers (3x TLD-1000) plus the 2" Accessory Adapter (A2A-1107). Start by inserting the ISA into the end of the focuser. The arrangement of parts necessary is: camera with a T-ring attached, Powermate with corresponding T-ring adapter (PTR-2200 or PTR-4201) attached, 2" Accessory Adapter (A2A-1107) and three 1" spacers (3x TLD-1000) to make up focus travel, and telescope.

There are certainly a variety of ways of setting up the Tele Vue-NP127is for photography!

5.0 Additional Accessories

5.1) The Focusmate Driver for the NP127is (FDF-2004) electronically drives the fine focus knob of the Focusmate in steps of approximately 0.0005" per button click. With the button depressed, the motor drives the Focusmate continuously without vibration transferred to the system. Motor speed is variable. The motor has a standard phone jack that will accept a cord of any length.

For remote focusing options, we suggest contacting Starlight Instruments or Optec for their offerings. While there may be other options available we cannot guarantee a direct fit to our pinion assembly.

5.2) The NP127is package (TVP-5056) is designed for visual use of this scope. It includes the 5" Ring Mount set with top and bottom plates (the top plate and rings take accessories and the bottom plate is drilled to mate to a variety of mounts or mounting adapter plates), 2" 90° Everbrite Diagonal (99% reflection across visual spectrum) with 2" to 1 1/4" adapter, and 18.2-mm Delite eyepiece, with 20mm eye-relief, that yields 1.7° true field of view at 36x in this scope.



TVP-5056 Package

6.0 Caring for your NP127is

The Tele Vue-NP127is requires no special care. Treat it as you would any fine camera lens. Use the lens cap when the telescope is being stored or not in use. The captive dew shield provides protection from glare, helps protect the lens from dust or spray blown in by the wind and minimizes dew formation on the lens.

If dew forms on the lens during cold weather, it is best to use a hair dryer (on the lowest setting) to gently warm it away. A few specks of dust will have no effect on image quality and may be gently blown off with a squeeze bulb. Do not use compressed air cans to blow dust off optical surfaces.

To prevent dew formation when bringing the scope in from the cold, we advise to close the cold scope in its case before bringing it into the warm indoors. Do not open the case until the scope has come up to room temperature.

Fingerprints, however should be cleaned off. Though the anti-reflection coatings are durable, they are easily scratched. The simplest cleaning method is to moisten (not soak) a very soft, lint-free tissue, cloth, "Q-Tip" or surgical cotton with a lens or glass cleaner and gently whisk away the stain. Do not apply any solutions directly to the glass surfaces. After every cleaning stroke, use a fresh applicator. The fewer strokes the better! Any residual "film" will not affect visual performance.

Collimation of your Tele Vue-NP127is has been locked at the factory. With reasonable care it will remain aligned. However, rough handling or improper packaging for shipment can cause misalignment. **WARNING:** The button head screws in the front lens cell are filled with epoxy. Loosening these screws will cause misalignment. If necessary, contact Tele Vue for re-collimation.

Your star diagonal employs a first-surface mirror. Like all first-surface mirrors, it should be cleaned only when absolutely necessary. First blow loose dust away with a squeeze bulb. **CAUTION:** Do not clean the mirror with water or water based cleaners such as Windex or any other commercial lens cleaners; this is not a lens. All contain too much water and will leave stains. Moisten a "Q-Tip" with pure acetone, methanol or Isopropyl alcohol, reagent grade. Clean gently using only the weight of the cotton swab. Use light pressure and never rub. Slight residual stains or dust have no visible effects in observing.

The tube is powder-coated for durability and can be waxed with any nonabrasive car wax. Black anodized surfaces can be cleaned with Windex. If you have any questions about the care, operation or performance of your Tele Vue-NP101is, please call us at (845) 469-4551 from 9:30 am to 5:00 pm EST.

7.0 Warranty

Tele Vue telescopes are warranted to be free of manufacturing or workmanship defects for 5 (five) years from the date of purchase, to the original owner. Please return the warranty card as validation of your ownership and for easy identification. If your Tele Vue telescope requires warranty service, please call Tele Vue to discuss the problem, upon which you will receive a return authorization. NO RETURNS ARE ACCEPTED WITHOUT PRIOR AUTHORIZATION. A copy of your sales receipt maybe requested if you have not submitted your warranty registration material.

The warranty does NOT include: collimation, defects caused by mishandling, defects of subjective nature, or coverage for any telescope purchased through an unauthorized Tele Vue dealer. However, for claims of telescopes arriving out of collimation you must contact Tele Vue Optics within 30 days from date of delivery, verifiable by sales receipt.

Warranty work will be performed at Tele Vue's discretion and may only be performed by Tele Vue Optics or Tele Vue authorized agent. The telescope must be shipped in its case with proper inner and outer packaging. Shipping and insurance charges are the purchaser's responsibility.

8.0 Specifications

Type	4-element, flat field, APO refractor, Fully Multi-Coated
Clear Aperture	5 inches (127mm)
Aperture Gain	329, compared to a 7mm exit pupil
Focal Length	660mm
Focal Ratio	f/5.2
Resolution (visual)	0.9 arc-sec. (Dawes Limit for a 5 inch aperture)
Resolution (photographic)	277 line pairs per mm
Magnification	12x to 330x using Tele Vue eyepieces
Field, Visual	4° at 12x (55Pl) or 16x (41Pan)
Focuser	2.4-inch, rack and pinion type
Diagonal	Optional 2-inch 99% reflective dielectric coating, with 1 1/4" adapter
Finder	Optional Starbeam, Quick-Release Finder Bracket (50mm Finderscope not included), or low power eyepiece.
Mounting	Optional adjustable mount ring set with mounting plate for Gibraltar5 Mount
Weight	14.6 lbs. (tube assembly) 28 lbs. in case, 32 lbs. shipping
Length	33-inches (O.T.A. only)
Accessories	included as standard: custom fitted case, screw-on lens cover, sliding dew (glare) shield, 2" Accessory Adapter, Imaging Systems Adapter
Tube	Powder-coated aluminum

Specifications subject to change without notice.

Tele Vue recommends choosing low and medium power eyepieces in ratios of field stop diameters. For example, factors of 1.4 or 2.0. When choosing higher power eyepieces, use ratios of magnification.

Tele Vue-NP127is											
Focal Length (mm)	Type	Product Code	Apparent Field (deg)	Field Stop Dia. (mm)	Eye Relief (mm)	Weight (lb.)	Mag.	True Field (deg)	Exit Pupil (mm)	# of Elem.	Dioptrx Ready
2" Eyepieces for Wide True Fields											
55	Plössl	EPL-55.0†	50	46.0	38	1.1	12.0	3.99	10.6	4	Y
41	Panoptic	EPO-41.0	68	46.0	27	2.1	16.1	3.99	7.9	6	Y
31	Nagler 5	EN5-31.0	82	42.0	19	2.2	21.3	3.65	6.0	6	Y
35	Panoptic	EPO-35.0	68	38.7	24	1.6	18.9	3.36	6.7	6	Y
21	Ethos	ETH-21.0	100	36.2	15	2.3	31.4	3.14	4.0	-	Y
22	Nagler 4	EN4-22.0	82	31.1	19	1.5	30.0	2.70	4.2	7	Y
27	Panoptic	EPO-27.0	68	30.5	19	1.0	24.4	2.65	5.2	6	Y
17	Ethos	ETH-17.0	100	29.6	15	1.6	38.8	2.57	3.3	-	Y
1 1/4" Eyepieces for Wide True Fields											
40	Plössl	EPL-40.0	43	27.0	28	0.4	16.5	2.34	7.7	4	Y
32	Plössl	EPL-32.0	50	27.0	22	0.4	20.6	2.34	6.2	4	Y
24	Panoptic	EPO-24.0	68	27.0	15	0.5	27.5	2.34	4.6	6	Y*
13	Ethos	ETH-13.0	100	22.3	15	1.3	50.8	1.94	2.5	-	Y
16	Nagler 5	EN5-16.0	82	22.1	10	0.4	41.3	1.92	3.1	6	N
19	Panoptic	EPO-19.0	68	21.3	13	0.4	34.7	1.85	3.7	6	Y*
25	Plössl	EAP-25.0	50	21.2	17	0.3	26.4	1.84	4.8	4	N
17.3	Delos	EDL-17.3	72	21.2	20	0.9	38.2	1.84	3.3	-	Y
18.2	DeLite	EDE-18.2	62	19.1	20	0.5	36.3	1.66	3.5	-	Y
10	Ethos	ETH-10.0	100	17.7	15	1.1	66.0	1.54	1.9	-	Y
13	Nagler 6	EN6-13.0	82	17.6	12	0.4	50.8	1.53	2.5	7	Y*
14	Delos	EDL-14.0	72	17.3	20	0.9	47.1	1.50	2.7	-	Y
20	Plössl	EAP-20.0	50	17.1	14	0.2	33.0	1.48	3.8	4	N
11	Apollo (disc)	EAL-11.0	85	16.2	18	1.4	60.0	1.41	2.1	-	Y
15	DeLite	EDE-15.0	62	16.0	20	0.5	44.0	1.39	2.9	-	Y
1 1/4" Eyepieces for Medium Powers											
12	Delos	EDL-12.0	72	15.0	20	0.9	55.0	1.30	2.3	-	Y
13	DeLite	EDE-13.0	62	13.8	20	0.5	50.8	1.20	2.5	-	Y
10	Delos	EDL-10.0	72	12.7	20	0.9	66.0	1.10	1.9	-	Y
15	Plössl	EAP-15.0	50	12.6	10	0.2	44.0	1.09	2.9	4	N
9	Nagler 6	EN6-09.0	82	12.4	12	0.4	73.3	1.08	1.7	7	Y*
11	DeLite	EDE-11.0	62	11.7	20	0.4	60.0	1.02	2.1	-	Y
9	DeLite	EDE-09.0	62	9.6	20	0.5	73.3	0.83	1.7	-	Y
11	Plössl	EAP-11.0	50	9.1	8	0.1	60.0	0.79	2.1	4	N
1 1/4" Eyepieces for Higher Powers											
8	Ethos	ETH-08.0	100	13.9	15	1.0	82.5	1.21	1.5	-	Y
6	Ethos	ETH-06.0	100	10.4	15	1.0	110.0	0.90	1.2	-	Y
8	Delos	EDL-08.0	72	9.9	20	1.0	82.5	0.86	1.5	-	Y
7	Nagler 6	EN6-07.0	82	9.7	12	0.5	94.3	0.84	1.3	7	Y*
4.7	Ethos SX	ETH-04.7	110	8.9	15	1.3	140.4	0.78	0.9	-	Y
6	Delos	EDL-06.0	72	7.6	20	1.0	110.0	0.66	1.2	-	Y
7	DeLite	EDE-07.0	62	7.5	20	0.5	94.3	0.65	1.3	-	Y
3.7	Ethos SX	ETH-03.7	110	7.0	15	1.1	178.4	0.61	0.7	-	Y
5	Nagler 6	EN6-05.0	82	7.0	12	0.5	132.0	0.61	1.0	7	Y*
8	Plössl	EAP-08.0	50	6.5	6	0.1	82.5	0.56	1.5	4	N
4.5	Delos	EDL-04.5	72	5.6	20	1.1	146.7	0.49	0.9	-	Y
5	DeLite	EDE-05.0	62	5.3	20	0.5	132.0	0.46	1.0	-	Y
3.5	Nagler 6	EN6-03.5	82	4.8	12	0.5	188.6	0.42	0.7	7	Y*
3.5	Delos	EDL-03.5	72	4.4	20	1.1	188.6	0.38	0.7	-	Y
4	DeLite	EDE-04.0	62	4.3	20	0.5	165.0	0.37	0.8	-	Y
3	DeLite	EDE-03.0	62	3.2	20	0.5	220.0	0.28	0.6	-	Y
1 1/4" Zoom Eyepieces for Medium and Higher Powers											
6-3	Nagler Zoom	ENZ-0306	50	5.1-2.6	10	0.3	110.0-220.0	0.44-0.23	1.2-0.6	5	N

NOTE: True Field in degrees = (Field Stop dia./Telescope Focal Length) X 57.3°

*Indicates additional Dioptrx Adapter required