

Company Seven

Astro-Optics Division

TELEVUE NP127is TELESCOPE

OPERATING GUIDE

2010 PRODUCTION MODEL



Above: NP127is telescope at Company Seven

Description/overview at: http://www.company7.com/televue/telescopes/tv127is_2010.html

Cover Photo: Copyright Company Seven

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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. Nearly thirty 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 flatfield, fast focal ratio, and unobstructed system lent itself perfect for testing eyepieces.

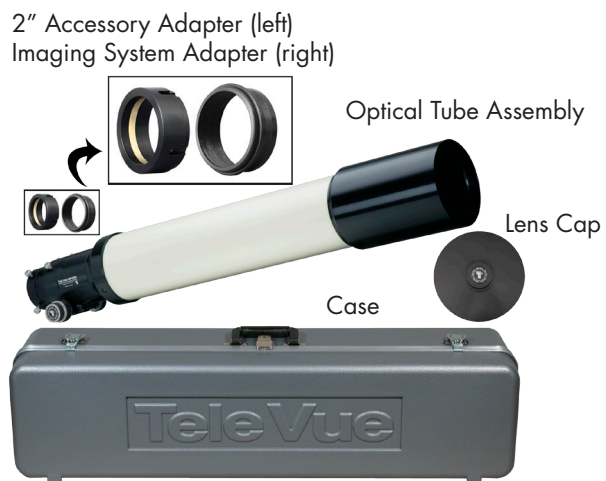
The 5" f/4 MPT (Multi-Purpose Telescope) with its fast speed and wide, flat field, led to a series of continuous improvements, primarily in color correction. The "Halley Commemorative," 4" f/5.5 started the parade where more advanced glasses including special dispersion, fluorite and fluorite substitute glasses brought steady improvements. The 4" f/5 Genesis employed fluorite in the rear doublet, and the subsequent SDF and TeleVue-101 versions at f/5.4 brought us even closer to perfection. Maintaining this fast f/5.4 speed while reducing tube length in a totally new design with new glasses allowed virtually ideal color correction and improved field flatness in this, the ideal form culminating the 20 year refinement toward perfection with the Nagler-Petzval 101, 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. The "is" designation denotes Imaging System, TeleVue telescopes with specific mechanical advantages for photography. TeleVue offers a series of accessories in conjunction with each optical system so you are assured 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.

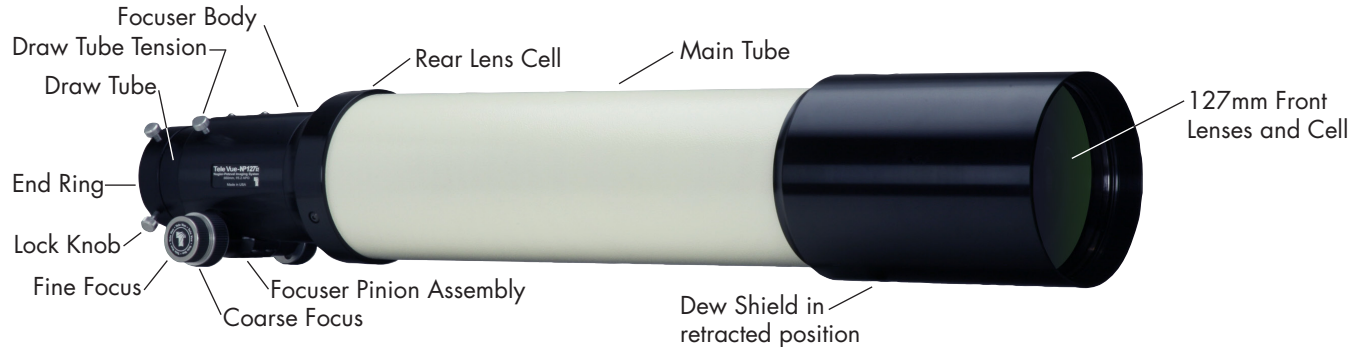


WARNING: NEVER try to look at the sun or point the telescope toward or near the sun without professional solar observing equipment rigidly secured in front of the objective lens. When observing the sun with the proper filters, remove any sighting devices such as Starbeam from the telescope. Use only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



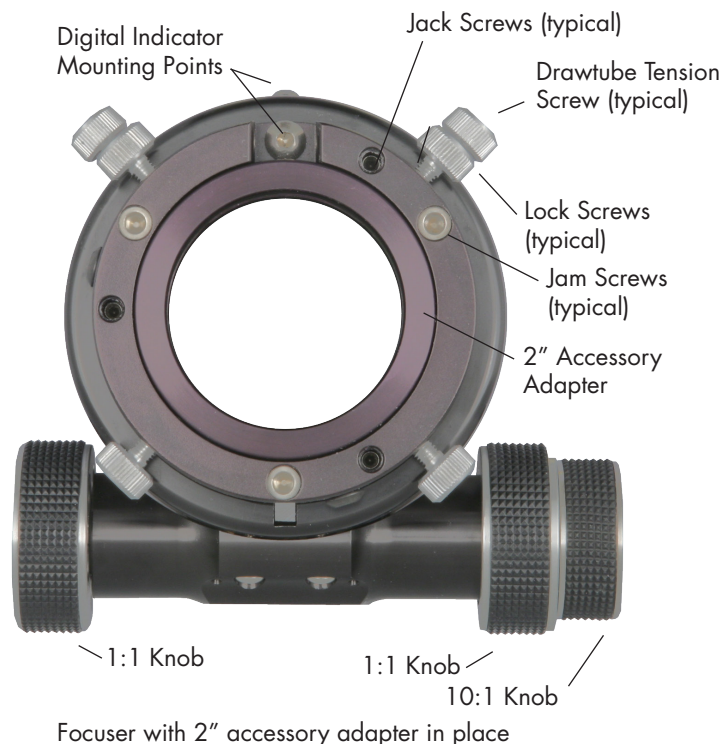
1.1 Optical tube assembly

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 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 that threads between the back of the tube and the focuser. Never stick any long objects into the focuser or you will 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. Four thumb screws pass through both the drawtube and adapter to cinch a brass clamp ring around 2" accessories. With four 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. There are two configurations for the lock screws: visual using four screws, and imaging using three screws.

The threaded holes on top of the focuser body accept the Digital Indicator Kit.

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 Gibraltar5 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 the tube rings have 1/4-20 holes to accept mounting studs or screws. 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 four 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 four grooves with holes machined 90° apart. The grooves help index the holes in the adapter to the four 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 four 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 330x (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. (See reference chart in the "Choosing Your Eyepieces" article.)

3.2 Finders

We particularly recommend using the Starbeam reflex sight (part# SFT-2003), 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.

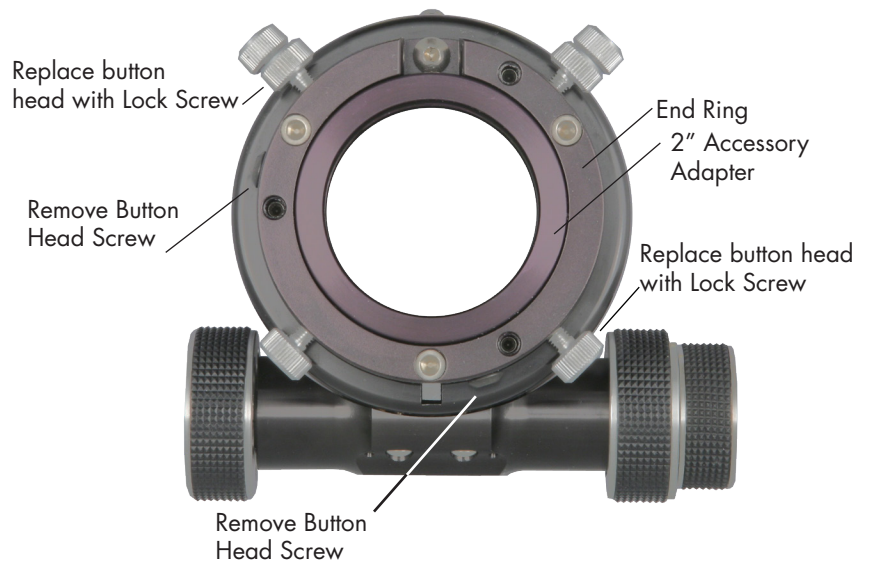
4.0 Photographic Set Up and the Tele Vue Imaging System

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 accessory compartment in the lid of the telescopes case. To install the ISA, first back off the four 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 accessory compartment 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.

We have found that three point suspension is best to hold the ISA flat and firm against the end ring. This will require you to remove the two button-head Allen screws from the end ring with the supplied Allen key. These button-head screws are found below (to the left of) the upper-left and lower-right Lock Screws. Move the two nearest Lock Screws into these newly revealed holes. You may remove the lower-left Lock Screw or simply leave it in place so it is not lost. Make sure all screws are backed out enough so that they do not protrude into the focuser.

Insert the ISA and tighten the three Lock Screws located at 1:00, 5:30, and 9:30 (if you imagine the end of drawtube as the face of a clock).

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 diagram 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.



Conversion from visual (top) to imaging (bottom) configurations. Remove Button Head screws with supplied Allen key. Move the two closest Lock Screws into the open holes. Remove 4th, unused Lock Screw.



3-Point Lock Screw arrangement for imaging.

LCL-1069 Large Field Corrector

- Optimizes edge of field performance. Recommended for 35mm CCDs (43mm diagonal) and larger.

NPR-1073 – 0.8x Reducer for NP and NPis series telescopes

- Recommended for increasing field with APS size formats (27mm diagonal)

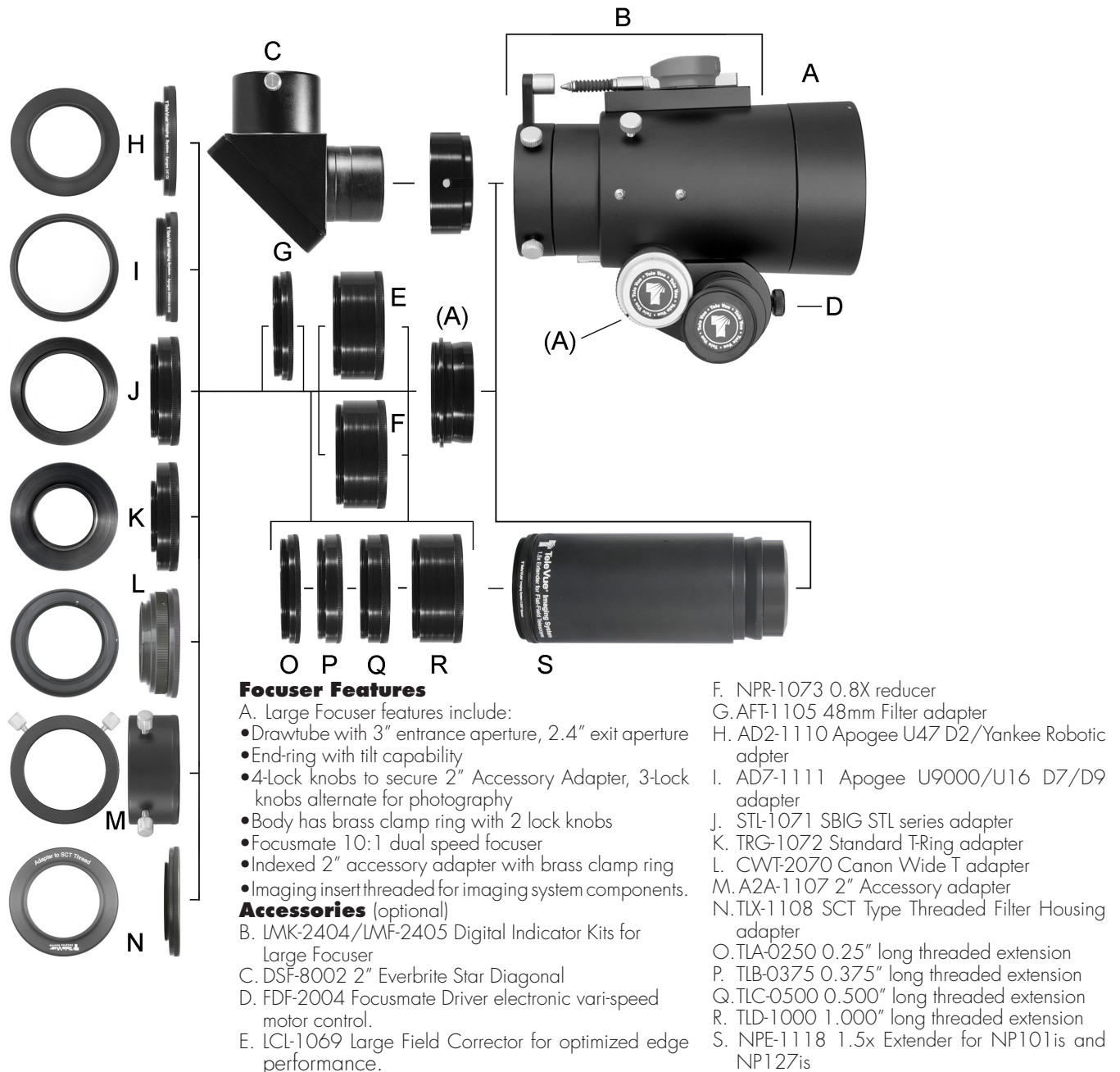
- Constructed to fit both standard 2" focuser NP scopes (RAD-1074 required) and the threaded "NPis" accessories on the input end. Requires either CWT-2070, STL-1071, or TRG-1072 to connect to camera.

NPE-1118 1.5x Extender for NP127is

- Increases focal length to 990mm.

STL-1071 – SBIG STL series camera adapter

- This adapter is sized to thread directly onto the STL series cameras and mates with Imaging System accessories.



TRG-1072 – Standard T-ring adapter

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

CWT-2070 – Canon Wide T Adapter

- Adapts Imaging System Accessories to Canon DSLRs. Includes Canon Bayonette mount.
- Eliminates the inner portion of Canon Trings to provide a larger diameter opening for reduced vignetting.

AD2-1110 – Apogee U47-D2 Camera Adapter

AD7-1111 – Apogee U9000/U16-D7/9 Adapter

A2A-1107 – 2" Accessory Adapter

- Use for cameras with 2" nosepiece or any other 2" accessory. (Extension tubes may be required to reach focus.)

- Dual thumb-screws and clamp ring for positive locking.

TLX-1108 – SCT Type Thread for filter wheel housings such as the True Technology Custom Wheel

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.

TLA-0250 – 0.250" (6.4mm) Extension Tube

TLB-0375 – 0.375" (9.5mm) Extension Tube

TLC-0500 – 0.500" (12.7mm) Extension Tube

TLD-1000 – 1.000" (25.4mm) Extension Tube

TLF-0040 – 0.040" (1.0mm) Spacer

TLG-0080 – 0.080" (2.0mm) Spacer

TLS-1121 – Set of TLF-0040 and TLG-0080.

TLS-2245 – Set of all six.

- Threaded coupling provides the necessary distance for proper spacing of field lenses to chip.

Required spacers will vary depending on camera specifications.

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

Component Recommendations for Top Performance at Prime Focus								
	Recommended Maximum CCD/film diagonal	Speed	Focal Length	Field of View	Camera Connector	Additional spacer to match 55mm reference	Accessory Lens	Spacer length from focuser drawtube
1	30mm (APS size)	f/5.2	660mm	2.6°	T-ring (TRG-1072) or Wide T-Ring (CWT-2070)	X	X	2.375" (2) TLD-1000 (1) TLB-0375
2	30mm (APS size)	f/4.2	528mm	3.2°	T-ring (TRG-1072) or Wide T-Ring (CWT-2070)	X	0.8x Reducer (NPR-1073)	0.5" TLC-0500
3	40mm (SBIG STL series cameras)	f/5.2	660mm	Will vary with camera	SBIG STL Series (STL-1071)	0.875" (1) TLC-0500 (1) TLB0375	Large Field Corrector (LCL-1069)	1.5" (1) TLD-1000 (1) TLC-0500
4	Apogee Cameras with D2 or D7 Lids	f/5.2	660mm	Will vary with camera	AD2-1110 AD7-1111	1.250" (1) TLD-1000 (1) TLA-0250	Large Field Corrector (LCL-1069)	1.375" (1) TLD-1000 (1) TLB-0375
5	40mm (35mm Film)	f/5.2	660mm	3.5°	T-ring (TRG-1072) or Wide T-Ring (CWT-2070)	0.25" TLA-0250	Large Field Corrector (LCL-1069)	1.5" (1) TLD-1000 (1) TLC-0500

4.1 Adjustable Position End Ring

The tilt of the End Ring to the optical axis can be changed to compensate for any tilt errors you may see in your photography. The telescope is aligned with the End Ring locked firmly against the end of the draw tube. In this way you are always assured of a reference point to return to if necessary.

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 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. 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 necessary adjustment during an imaging session.

4.2 Prime Focus

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 with T-ring, appropriate T-ring adapter, Extension Spacers, Imaging System adapter, telescope.

To obtain the best edge sharpness with CCD chips 30mm or larger, use the Large Field Corrector (LCL-1069) in the configuration listed on page 6.

The recommendations in the chart and diagrams are specifically for SLR (digital or film), Apogee and SBIG STL series cameras. If you have a different camera, you will need to determine the spacing necessary to achieve reference distance from the seat of the Large Field Corrector to the CCD chip. These spacers will be added between the seat of the Large Field Corrector and the face of your camera. Check the Tele Vue website for on-going camera updates.

To start, 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. The equation is simply $2.6'' - \text{Chip to faceplate distance} = \text{additional spacer length required}$. There is enough tolerance in this value that using threaded Imaging System extension tubes along with 0.040" and 0.080" spacers to bring you as close as possible will work fine.

4.2a) To gain more field with chips APS size and smaller, use the 0.8x Reducer (NPR-1073). While the reducer can be used with larger formats, noticeable vignetting will occur. The standard technique of "flat fielding" should compensate. The arrangement of parts necessary for Prime Focus photography with the 0.8x Reducer is: camera with T-ring, appropriate T-ring adapter, NPR-1073, Extension Spacers to minimize draw tube out-travel, Imaging System adapter, telescope. The equation to figure the proper spacing between the 0.8X Reducer and the CCD chip is: $2.44'' - \text{Chip to faceplate distance} = \text{additional spacer length required}$.

4.2b) 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), telescope.

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



5.0 Imaging System Focus Accessories

5.1 All Tele Vue telescopes with rack and pinion focusers now permit the photographer to index focus position to within 0.0005" by means of a digital indicator. Mounting points are provided on top of the focuser body and end of the draw tube for easy installation of the various Digital Indicator Kits. Using the Digital Indicator provides a convenient way of finding best focus, returning to it, or checking that it hasn't changed.

Choose either the 10 Micron (0.0004") Indicator Kit (LMK-2404) or the 1 micron Indicator Kit (LMF-2405) depending on the accuracy desired. Both indicators have 0.5" motion ranges and accept an RS-232 output cable for displaying readout on computer. The 10 foot long RS-232 Output Cable (RSC-2320) permits remote indicator readout on computer screen via downloadable

software from the Tele Vue website (www.TeleVue.com). The cable also provides power to the indicator.

5.2 The Focusmate Driver for the NP127is (FDV-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. Remote control is possible. Contact Tele Vue for further details.

5.3 The Tele Vue Imaging System comes full circle when you add the Focusmaster (FMU-2319) to your system. The Focusmaster is the communication gate way for the Digital Indicator Kit and the Focusmate Driver to become a "closed-loop" focusing system with your camera and camera control software. Converge focus quickly on the base of the "V" curve to within a micron when using our 1-micron indicator... you just can't do this by hand!

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.

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 can cause misalignment. **WARNING:** Do not loosen the button head screws in the front or rear lens cells as this will cause misalignment. If necessary, contact Tele Vue for re-collimation.

The tube is powder-coated for durability and requires no special care. Black anodized surfaces can be cleaned with Windex. If you have any questions about the care, operation or performance of your Tele Vue-NP127is, 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.

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.

Warranty work will be performed at Tele Vue's discretion and may only be performed by Tele Vue Optics. The telescope must be shipped in its case with proper inner and outer packaging. Return 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 (55PI) 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-NP127is
2" Eyepieces for wide True Fields**

Focal Length (mm)	Type	Product Code	Apparent Field (°)	Field Stop Dia. (mm)	Eye Relief (mm)	Weight lb.	Mag.	True Field (deg.)	Exit Pupil (mm)	# of Elem.	Dioptrx Ready
55	Plossl	EPL-55.0	50	46.0	38	1.3	12.0	4.0	10.6	4	Y
41	Panoptic	EPO-41.0	68	46.0	27	2.1	16.1	4.0	7.9	6	Y
31	Nagler Type 5	EN5-31.0	82	42.0	19	2.2	21.3	3.6	6.0	6	Y
35	Panoptic	EPO-35.0	68	38.7	24	1.6	18.9	3.4	6.7	6	Y
21	Ethos	ETH-21.0	100	36.2	15	2.3	31.4	3.1	4.0	-	Y
26	Nagler Type 5	EN5-26.0	68	35.0	16	1.5	25.4	3.0	5.0	6	Y
22	Nagler Type 4	EN4-22.0	82	31.1	19	1.5	30.0	2.7	4.2	7	Y
27	Panoptic	EPO-27.0	68	30.5	19	1.1	24.4	2.6	5.2	6	Y
17	Ethos	ETH-17.0	100	29.6	15	1.6	38.8	2.6	3.3	-	Y
20	Nagler Type 5	EN5-20.0	82	27.4	12	1.0	33.0	2.4	3.8	8	Y*
17	Nagler Type 4	EN4-17.0	82	24.3	17	1.6	38.8	2.1	3.3	7	Y

1 1/4" Eyepieces for wide True Fields

40	Plossl	EPL-40.0	43	27.0	28	0.4	16.5	2.3	7.7	4	Y
32	Plossl	EPL-32.0	50	27.0	22	0.4	20.6	2.3	6.2	4	Y
24	Panoptic	EPO-24.0	68	27.0	15	0.5	27.5	2.3	4.6	6	Y*
13	Ethos	ETH-13.0	100	22.3	15	1.2	50.8	1.9	2.5	-	Y
16	Nagler Type 5	EN5-16.0	82	22.1	10	0.4	41.3	1.9	3.1	6	N
19	Panoptic	EPO-19.0	68	21.3	13	0.4	34.7	1.8	3.7	6	Y*
25	Plossl	EAP-25.0	50	21.2	17	0.3	26.4	1.8	4.8	4	N
18	Radian	ERD-18.0	60	18.3	20	0.5	36.7	1.6	3.5	6	Y
10	Ethos	ETH-10.0	100	17.7	15	1.1	66.0	1.5	1.9	-	Y
13	Nagler Type 6	EN6-13.0	82	17.6	12	0.5	50.8	1.5	2.5	7	Y*
20	Plossl	EAP-20.0	50	17.1	14	0.2	33.0	1.5	3.8	4	N
12	Nagler Type 4	EN4-12.0	82	17.1	17	1.1	55.0	1.5	2.3	6	Y

1 1/4" Eyepieces for Medium Powers

11	Nagler Type 6	EN6-11.0	82	14.9	12	0.4	60.0	1.3	2.1	7	Y*
14	Radian	ERD-14.0	60	14.4	20	0.5	47.1	1.3	2.7	6	Y
15	Plossl	EAP-15.0	50	12.6	10	0.2	44.0	1.1	2.9	4	N
9	Nagler Type 6	EN6-09.0	82	12.4	12	0.4	73.3	1.1	1.7	7	Y*
11	Plossl	EAP-11.0	50	9.1	8	0.1	60.0	0.8	2.1	4	N

1 1/4" Eyepieces for Higher Powers

8	Ethos	ETH-08.0	100	13.9	15	1.0	82.5	1.2	1.5	-	Y
6	Ethos	ETH-06.0	100	10.4	15	1.0	110.0	0.9	1.2	-	Y
7	Nagler Type 6	EN6-07.0	82	9.7	12	0.5	94.3	0.8	1.3	7	Y*
8	Radian	ERD-08.0	60	8.3	20	0.6	82.5	0.7	1.5	6	Y
3.7	Ethos	ETH-03.7	100	7.0	15	1.1	178.4	0.6	0.7	-	Y
5	Nagler Type 6	EN6-05.0	82	7.0	12	0.5	132.0	0.6	1.0	7	Y*
8	Plossl	EAP-08.0	50	6.5	6	0.1	82.5	0.6	1.5	4	N
6	Radian	ERD-06.0	60	6.3	20	0.8	110.0	0.5	1.2	7	Y
5	Radian	ERD-05.0	60	5.3	20	0.8	132.0	0.5	1.0	7	Y
3.5	Nagler Type 6	EN6-03.5	82	4.8	12	0.5	188.6	0.7	0.7	7	Y*
4	Radian	ERD-04.0	60	4.2	20	0.8	165.0	0.4	0.8	7	Y
2.5	Nagler Type 6	EN6-02.5	82	3.4	12	0.5	264.0	0.3	0.5	7	Y*
3	Radian	ERD-03.0	60	3.3	20	0.8	220.0	0.3	0.6	7	Y

1 1/4" Zoom Eyepiece for Medium and High Powers

At 6	Nagler Zoom	ENZ-0306	50	5.1	10	0.3	110	0.4	1.2	5	N
At 3				2.6			220	0.2	0.6		
At 4	Nagler Zoom	ENZ-0204	50	2.5	10	0.4	165	0.2	0.8	5	N
At 2				1.3			330	0.1	0.4		

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

*Indicates additional Dioptrx Adapter required