

# REFRACTOR TELESCOPE TAL-75R



INSTRUCTION MANUAL



# Contents

|  | Page |
|--|------|
| <input type="checkbox"/> <b>General instructions</b> . . . . .         | 3    |
| <input type="checkbox"/> <b>Specifications</b> . . . . .               | 4    |
| <input type="checkbox"/> <b>Delivery set</b> . . . . .                 | 5    |
| <input type="checkbox"/> <b>Design of telescope</b> . . . . .          | 6    |
| <input type="checkbox"/> <b>Preparation for observations</b> . . . . . | 9    |
| Assembling of telescope. . . . .                                       | 9    |
| Polar axis balance. . . . .  | 10   |
| Inclination axis balance. . . . .                                      | 10   |
| Adjustment of optical axes. . . . .                                    | 11   |
| Telescope alignment at the celestial pole . . . . .                    | 12   |
| <input type="checkbox"/> <b>Observations</b> . . . . .                 | 13   |
| Visual observations . . . . .  | 13   |
| Photographic observations . . . . .                                    | 16   |
| <input type="checkbox"/> <b>Maintenance</b> . . . . .                  | 17   |
| <input type="checkbox"/> <b>Telescope alignment</b> . . . . .          | 18   |
| <input type="checkbox"/> <b>Storage</b> . . . . .                      | 19   |
| <input type="checkbox"/> <b>Acceptance certificate</b> . . . . .       | 20   |

**Due to continuous development and improvement of telescope, there can be insignificant changes in design, which are not reflected in this publication.**

# General instructions

## **Warning!**

**To avoid eyes injury, do not look at the Sun without black light filter on the telescope!**

**Children can look through the telescope under the adult's control only.**

- ❑ Telescope TAL-75R (hereafter referred to as the telescope) is designed for visual observation and photographing of celestial objects.
- ❑ The telescope can be used for individual observations by amateur astronomers in the schools and in the astronomy study groups.
- ❑ The telescope can operate in an open air environment within a temperature range of +30° C to -30° C and relative humidity up to 80% under fair weather.
- ❑ When buying a telescope, pay you attention to the integrity of packaging, which is provided with manufacturer's seals. After opening the packaging, check the complete set, indicated in the list of enclosure.
- ❑ Read the instructions carefully before mounting and using your telescope.

**With suggestions, please contact:**

**FSUE PA "Novosibirsk Instrument-Making Plant",  
630049, Novosibirsk, Dusi Kovalchuk street, 179/2,  
Marketing Department, tel/fax: +7(383) 225-58-96,  
+7(383) 226-17-82,**

**e-mail: npz@ngs.ru; www.npzoptics.ru.**

**Moscow Office, tel/fax +7(495) 482-17-03,  
e-mail: nbelousova@rambler.ru.**

**Saints-Petersburg Office,  
tel/fax +7(812) 324-70-55**

**Krasnoyarsk Office,  
tel/fax: +7(3912) 22-74-80, 27-53-20,  
e-mail:optica@ktk.ru.**

# Specifications

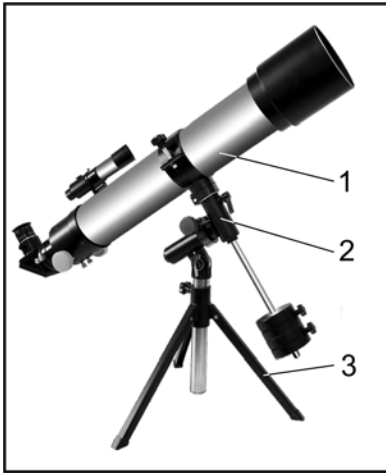
| Name                                   | Value             |
|--|-------------------|
| <b>Objective lens diameter, mm</b>     | 75                |
| <b>Focal length, mm</b>                | 600               |
| <b>Magnification, x:</b>               |                   |
| with eyepiece ( $f'=12.5$ mm)          | 50                |
| with eyepiece and Barlow lens          | 100               |
| with eyepiece, Barlow lens and bushing | 150               |
| <b>Field of view:</b>                  |                   |
| with eyepiece ( $f'=12.5$ mm)          | 1 °               |
| with eyepiece and Barlow lens          | 0 °30 '           |
| with eyepiece, Barlow lens and bushing | 0 °20 '           |
| <b>Resolution limit</b>                | 1.8"              |
| <b>Limiting stellar magnitude</b>      | 11.2 <sup>m</sup> |
| <b>Rotation angle of telescope:</b>    |                   |
| in right ascension                     | 360° (24 h)       |
| in declination                         | ±90°              |
| <b>Latitude adjustment range</b>       | 0...90°           |
| <b>Minimum observation distance, m</b> | 25                |
| <b>Dimensions, mm:</b>                 |                   |
| OTA* length                            | 640               |
| telescope height in operating position | 600               |
| <b>Telescope weight, kg</b>            | 4.5               |

\*Optical tube assembly

# Delivery set

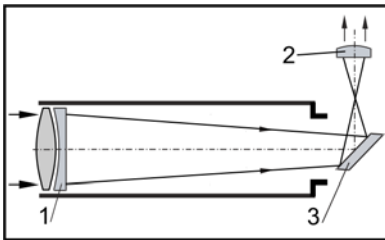
| No. | Name   | Quantity |
|-----|--|----------|
| 1   | <b>Telescope</b>                             | 1        |
| 2   | <b>Finder</b>                                | 1        |
| 3   | <b>Counterweight</b>                         | 2        |
| 4   | <b>Eyepiece (f = 12.5 mm)</b>                | 1        |
| 5   | <b>Barlow Lens 2<sup>x</sup></b>             | 1        |
| 6   | <b>Bushing</b>                               | 1        |
| 7   | <b>Yellow light filter</b>                   | 1        |
| 8   | <b>Box</b>                                   | 1        |
| 9   | List of enclosure                            | 1        |
|     | <b>Instruction manual</b>                    | 1        |
|     | <b>Supplementary accessories</b>             |          |
|     | Pillar C57                                   | –        |
|     | Prism for direct observations PP-45° (1.25") | –        |
|     | Eyepieces (1.25"):                           |          |
|     | f = 6.3 mm                                   | –        |
|     | f = 10 mm                                    | –        |
|     | f = 17 mm                                    | –        |
|     | f = 20 mm                                    | –        |
|     | f = 32 mm                                    | –        |
|     | f = 40 mm                                    | –        |
|     | Sun light filter (black)                     | –        |
|     | Light filters M28.5x0.6:                     |          |
|     | neutral                                      | –        |
|     | blue   | –        |
|     | red  | –        |
|     | green  | –        |

# Design of telescope



- The telescope consists of three main parts: optical tube assembly (OTA) (1), parallactic mount(2), and a tripod(3).

**The optical tube** is a basic component of the telescope. It includes all main optical units such as an objective lens and an eyepiece unit.



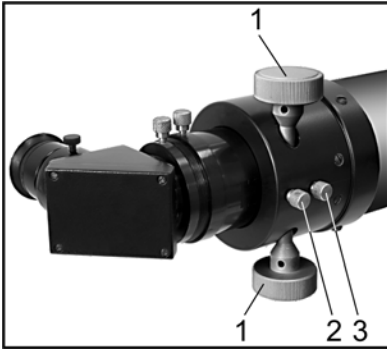
- The telescope refers to the refractors by the type of its optical system. A parallel beam of light enters the telescope tube and using an achromatic objective lens (1) is projected in the focal plane of the eyepiece (2).

- For comfort observations the eyepiece unit is inclined on  $90^\circ$  relatively to the optical axis of the telescope with help of flat diagonal mirror (3).

- Using a diagonal mirror allows to get a direct image of objects with their mirroring.

Using a telescope without the diagonal mirror gives inverted image.

- A standard set includes an eyepiece, a Barlow lens and a bushing, which allow observing celestial objects with various power of magnification.

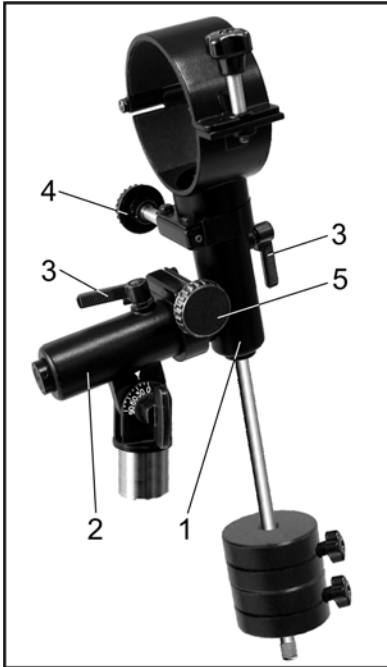


- ❑ The OTA supplied with a finder, that makes easier the searching for celestial objects.
- ❑ All lenses surfaces are covered with multilayer antireflection coating.
- ❑ The eyepiece unit includes a focusing device with an eyepiece tube.
- ❑ Focusing device of friction-type consists of an axis with handwheels (1), which help to shift the eyepiece tube.
- ❑ The smoothness of eyepiece shifting is provided by a screw (2).
- ❑ Screw (3) is intended for fixation of eyepiece tube in a defined position.



**The tripod** is intended for setting of parallactic mount with telescope optical tube. The tripod has a possibility of height adjustment.

- ❑ Screw (1) provides the fixation of defined height.



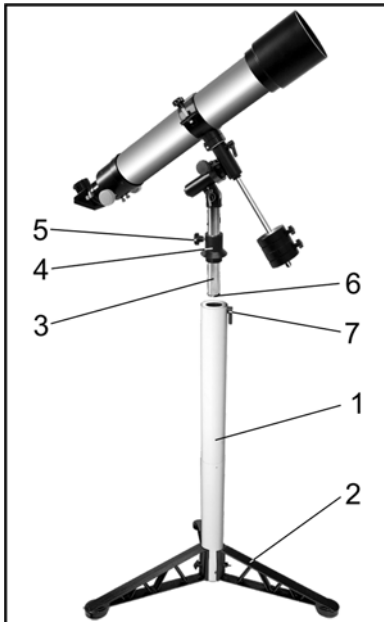
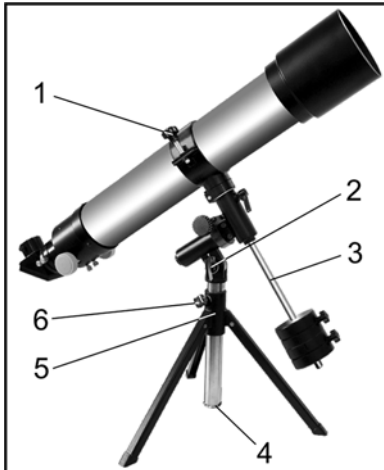
**The parallactic mount** is intended for pointing the telescope at the celestial objects and tracking their diurnal motion.

- ❑ Mount consists of inclination axis (1) with counterweights and polar axis (2).
- ❑ Rough pointing of the telescope tube by both axes fulfills by tube rotation when the handles (3) are loosen.
- ❑ Sharp pointing is carried out by the help of the handwheels (4), (5).

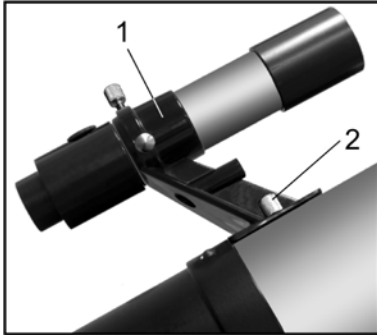


# Preparation for observations

## Assembling of telescope



- ❑ Remove the telescope from its packaging. Release the clamp screw (1), shift the telescope tube to the middle position and secure it with the screw.
- ❑ Loosen the handle on the latitude mount (2), turn the tripod in operation position and secure it.
- ❑ Extend the tripod and place the telescope on the flat hard surface. Screw the axis with counterweights (3).
- ❑ When using the pillar C57, unfasten stopper (4), unscrew handwheel (6) and take off the tripod (5).
  
- ❑ Remove the pillar (1) and legs (2) from their packaging and with the help of captive screws attach three legs to the foot-end of the pillar. The legs should bear against the pillar. Swing of the pillar in its legs is unacceptable.
- ❑ Put the hub (4) of the pillar (1) on the tube (3), tighten the handwheel (5) and stopper (6), insert the mount into the pillar (1) and fix it by the handle (7).



- ❑ Mount the bracket with finder (1) on the telescope tube. Fasten the bracket with two screws (2).

## Polar axis balance

To provide a smooth motion of parallactic mount axes drives and comfort of observation, the balancing of the telescopes is required.



- ❑ Set the polar axis in the horizontal position ( $0^\circ$  on the latitude scale).
- ❑ Release the handle, that fixes the polar axis, and by shifting the load along the counterweight axis find an equilibrium position of the telescope.
- ❑ Secure the polar axis.

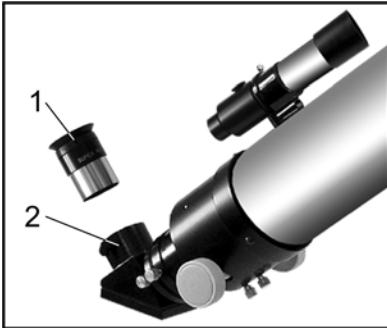
## Inclination axis balance

- ❑ Set the inclination axis in the horizontal position.
- ❑ Release the handle, that fixes the inclination axis.
- ❑ Shifting the telescope in the clamp, find an equilibrium position.
- ❑ Secure the inclination axis.

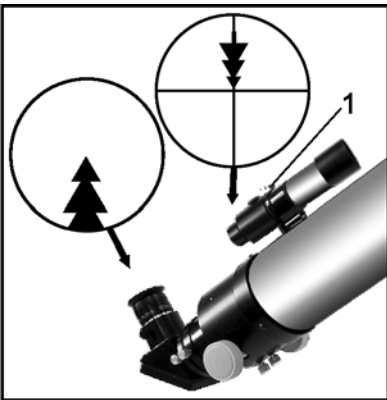
## Adjustment of optical axes

Telescope has large magnifications and consequently – small fields of view. It complicates the search of objects in the sky that is why the telescope is provided with optical finder with large field of view. With the help of the finder you can easily find necessary object in the sky and then observe it in the field of view of the telescope.

For this purpose you should adjust the parallelism of optical axes of telescope tube and optical finder.



- ❑ Insert the eyepiece  $f' = 12.5 \text{ mm}$  (1) in the eyepiece tube (2).



- ❑ Point the telescope at a distant object.
- ❑ Set the image of chosen object in the centre of field of view. Fix this position of telescope.
- ❑ Set the image of chosen object in the crosshairs of finder's reticle with the help of three adjusting screws (1).

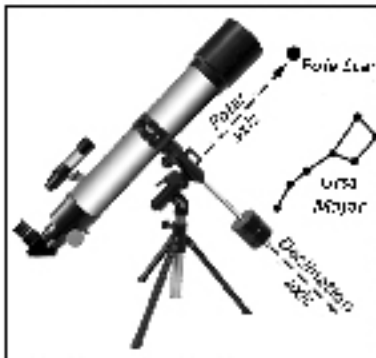
In future it will be enough to check the co-alignment of optical axes of the telescope and the finder prior to start of observation.

## Telescope alignment at the celestial pole

Due to the Earth's rotation, celestial sphere performs a full circle in twenty-four hours. As a result, the celestial object in the field of view of the telescope will constantly move and go out of the field of view and the higher telescope magnification – the faster this movement. Setting the polar axis of parallactic mount parallel to the axis of Earth rotation considerably simplifies the tracking.



- ❑ Set the polar axis of parallactic mount at the area latitude on a scale of latitudes with the help of the clamp screw (1).
- ❑ For the rigid fixation of the polar axis of mount, tighten the clamp screw with a wrench with the mouth size of 13 mm, if necessary.



- ❑ Set the tripod with the telescope in a way that an imaginary line that extends the polar axis, would be pointed at the Pole Star. Thus, the polar axis of mount will be parallel to the axis of the Earth rotation. The tripod should remain in this position during all time of observation.
- ❑ Diurnal motion of the celestial sphere is adjusted by the handwheel (5) (see "Design of telescope", p. 8).
- ❑ Correct the movement of the object in the field of view in declination (the object rises or falls) with the handwheel (4).

# Observations

At high magnifications, along with increase of visual sizes of the object there is a growth of noises of atmosphere, which appears as roughness and blurring of images of distant objects, blink and blurring of stellar images.

Observations in the cold weather are possible when all parts of the telescope reached thermal equilibrium with the ambient air.

There can be the nights with poor images of celestial bodies because of not serene atmosphere. It is possible that at this time you will not be able to observe details of the planets and the Moon under such conditions.

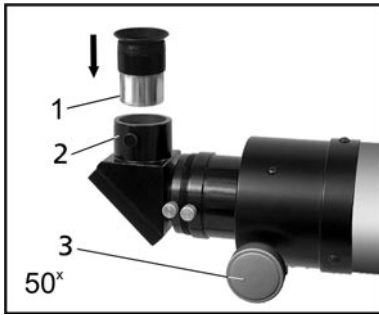
Observations with the telescope through the window are meaningless as an uneven surface of window glass distorts images.

Cover or replace the telescope into a room when work is finished and to protect it against precipitations.

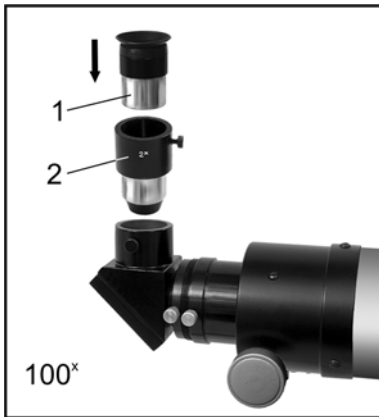
---

## Visual observations

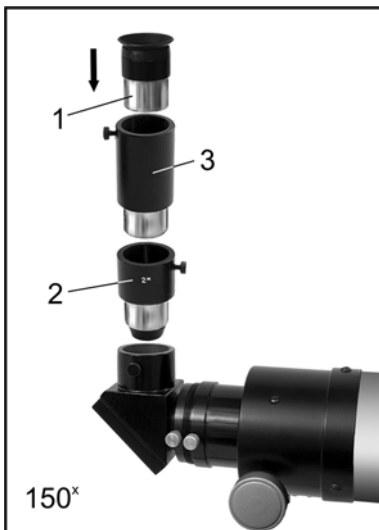
- Choose the sky object interest you. Point the telescope tube in the direction of the object. Using a finder system, find an image of this object in the tube's field of view and set the object in the centre of the field of view with the help of the viewing handwheels.



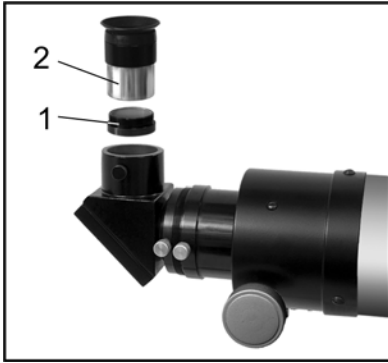
- Insert the eyepiece (1) into the eyepiece tube (2). With the help of handwheels (3) of focusing device, achieve the best sharpness of the image.



- Using eyepiece (1), Barlow lens (2) and bushing (3), you can get different magnifications (see “Specifications”, p. 4).



- Minimum magnification is used when a large field of view is needed. For example, during observations of star clusters, nebulas, comets and Moon surveys.
- Maximum magnification gives possibility to observe some details on the Moon and planets, separate binary stars and elements of star clusters.



- ❑ To eliminate chromatism during the bright objects observing use a yellow light filter (1), installed into the eyepiece (2).



- ❑ For sun observations, use solar light filter (1), mounted on the objective lens (2).

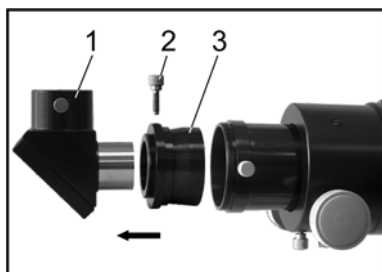
**Warning!**

**To avoid eyes injury, it is expressly forbidden to look through the telescope at the Sun without solar (black) light filter on it!**

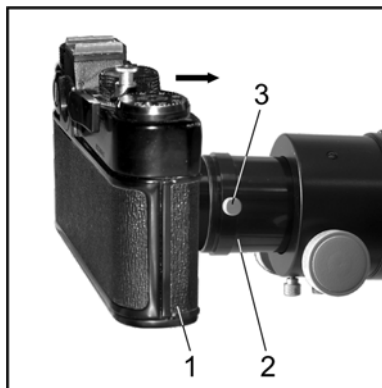
## Photographic observations

Use a miniature reflex camera with an objective's thread M42x0.75 to take pictures of celestial objects.

To operate with other photo cameras, use adjusting rings, selling in the specialty stores.



- ❑ To mount a camera on the telescope, take off deflecting mirror (1), screw (2) and bushing (3).
- ❑ Unscrew the camera objective lens.
- ❑ Screw the bushing into the camera.



- ❑ Insert the camera (1) with bushing into the eyepiece tube (2) and secure them by the screw (3).
- ❑ Perform the shooting of bright objects that need a second exposure (the best object is the Moon). Otherwise, pictures will be blurry due to the diurnal rotation of the celestial sphere.
- ❑ It is necessary to use a special bracket (not included in the delivery set) when working with a digital or video cameras.
- ❑ Long-time exposure is needed for taking pictures of weakly glowing objects (separate stars, nebulas). This astrophotography is possible with the use of the parallactic mount with a clock electric drive at polar axis (TAL-1M, TAL-150K) and special off-axis guide GV-12.5



# Maintenance

In order to keep the telescope in good operating condition it is necessary to check it's technical state and fulfil maintenance.

- ❑ Keep the telescope clean and protect it against physical damage to provide no-failure operation of the telescope.
- ❑ Periodically wipe off the dust from the metal surfaces with clean soft napkins, then wipe them by the napkin wet with acid-free Vaseline and dry with napkin.
- ❑ Wipe the objective's and eyepiece's lenses with a dry linen napkin. To remove oil spots use a cotton wad wet with alcohol.
- ❑ Conduct the cleaning of the diagonal mirror surface without pressure by cotton wad wet with ether, having removed all the dust by a soft lens brush first to avoid thin scratches.
- ❑ In idle position the telescope tube should be permanently closed with lid and the eyepiece tube – with plug.

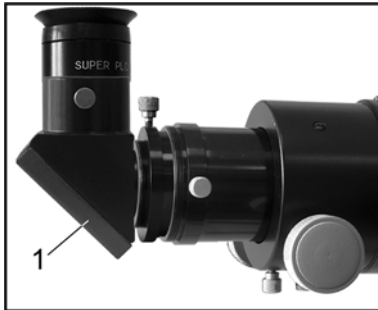
Cleaning of the telescope optical components requires caution and accuracy. Perform it only in case of emergency.

**Optics self-cleaning and disassembling of the telescope are permitted ONLY after the warranty period.**

# Telescope alignment

**Resort to disassembling and alignment of the optics follows in cases of emergency and ONLY after the warranty period.**

**The necessity in additional alignment of the telescope can appear after optics cleaning or accidental misalignment.**



Set the eyepiece with Barlow lens and bushing into the eyepiece tube to provide maximum power of magnification.

Point the telescope to any star of  $4^m$ – $5^m$  stellar magnitude.

Untightening the screws, take off a cover (1) and with the help of four screws by shifting a diagonal mirror achieve a diffraction image of a star of concentric form.

Diffraction image must have a round core and no more than two rings.

Gaps and form disturbances of the core and ring are not allowed.

If the weather does not allow to get the clear diffraction image of the star, perform an adjustment, orienting at a slightly out-of-focus image, and the energy should be spread equally around the core.

Such operations require certain skills and qualification.

# Storage

- ❑ It is necessary to store the telescope in a dry heated place with a temperature range of +5° to +40°C and relative humidity up to 80%.
- ❑ Avoid impacts and sharp shocks of telescope.
- ❑ It is prohibited to store acids, alkalis or any chemical materials, emitting moisture or active chemical gases and vapor.

# Acceptance certificate

Telescope TAL-75R, serial No. \_\_\_\_\_,  
parallactic mount, serial No. \_\_\_\_\_ ,  
are fit for operation.

**Date of issue** \_\_\_\_\_ **20** г.

Signatures \_\_\_\_\_

Free retail price.

Manufacturer:  
FSUE PA “Novosibirsk Instrument-Making Plant”  
Dusi Kovalchuk, 179/2,  
Novosibirsk, 630049,  
Russia  
[www.npzoptics.com](http://www.npzoptics.com)

