

Refractor Telescope



78-77100 and 78-79100

Instruction Manual



78-77100 and 78-79100 Astronomical Telescope

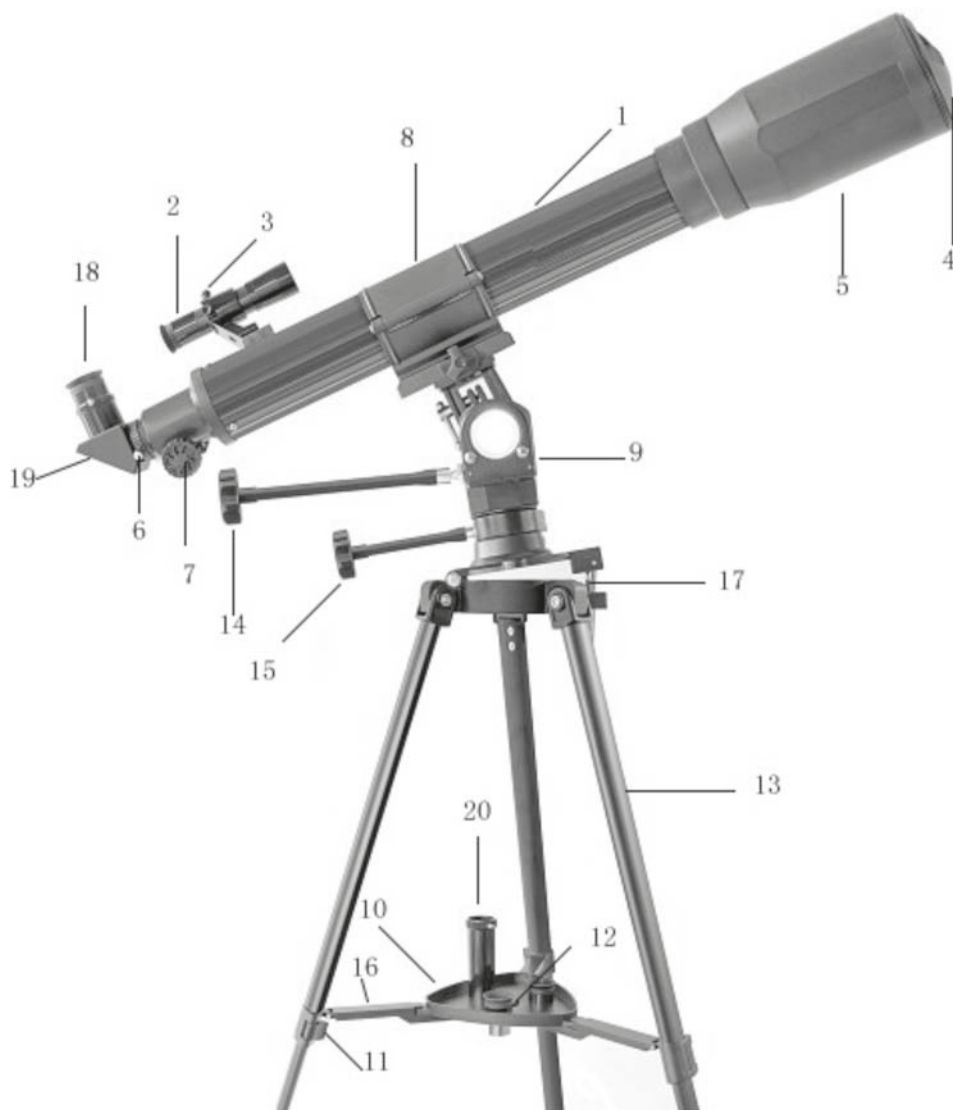


Figure 1

Figure 2



figure 3

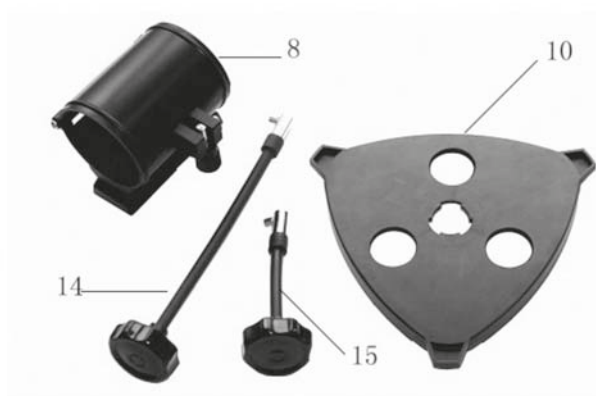


Fig. 4



Fig. 8



Fig. 9



Fig. 10



Fig. 14a



Fig. 6



Fig. 5



Fig. 7

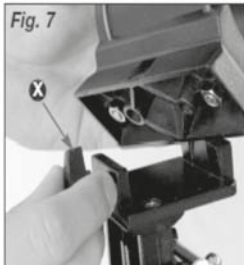


Fig. 6



Fig. 14b



Fig. 12



Fig. 13

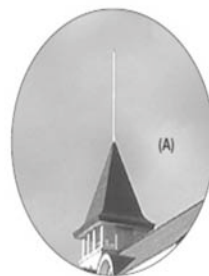
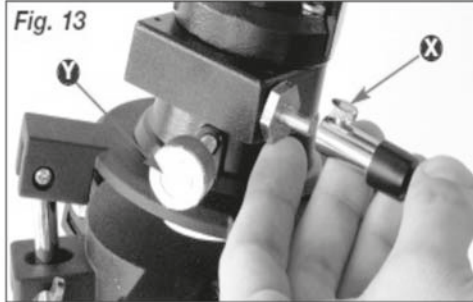
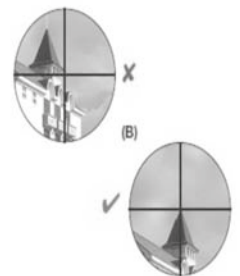


Fig. 11



All parts (Fig. 1-3)

- _1 Telescope tube
- _2 Viewfinder scope
- _3 Adjusting-screws (viewfinder)
- _4 Tube opening
- _5 Objective
- _6 Eyepiece connection
- _7 Focus wheel
- _8 Tube rings
- 9 Tripod head (mounting)
- 10 Accessory tray
- _11 Adjusting-screws (tripod)
- _12 Fixing bracket (accessories tray)
- _13 Tripod legs
- _14 Flexible shaft for elevation adjustment
- 15 Flexible shaft for azimuth adjustment
- _16 Tripod brace
- _17 Latitude adjustment
- _18 3 eyepieces ($\varnothing 31.7\text{mm} / 1\frac{1}{4}"$) $f=20\text{mm}$ $f = 9\text{mm}$ $f = 4\text{mm}$
- _19 Star diagonal prism
- _20 barlow lens 3x

Parts (Fig. 15): Mounting

- A** Vertical clamp
- B** Incline plate
- C** Declination axis
- D** Flexible adjustment shaft
- E** Flexible shaft (declination axis)
- F** Focussing wheel



Part I – Setup

1. General/Location:

Before you begin construction, you must choose a suitable location for your telescope.

It will help you, if you build this appliance in a place, where you have a clear view of the skies, a stable footing and sufficient space around you.

Remove all the parts from the packaging first. Check, using the diagram, whether all the parts are there.

Important: Only do the screws up finger tight and avoid over tightening them.

2. Setup - tripod

The tripod legs are pre-installed and already connected to the tripod head (illustration 5, X) and tripod spider (illustration 1, 16). Remove the tripod from it's packaging and place it upright with the feet at the base. Take two of the legs and carefully pull them apart until they are in the fully open position. The entire weight of the tripod rests on one leg during this procedure. Then set the tripod upright again.

The entire tripod weights rests on one leg here. Then set the tripod upright again. Now extend each individual tripod leg to the desired length (see illustration 4) and undo the fastening clips for this purpose (illustration 1+4, 11) (total of 3). Tighten the fastening clips and place the tripod on a hard flat surface

HINT:

A small spirit level, placed on the accessory tray, may help you to setup you telescope in level.



3. Setup – accessory tray:

Three accessories tray (illustrations 1, 3, and 10) is inserted with the flat side down centrally on the tripod spider (illustration 1, 16) and mounted in place by turning clockwise once (60°) (illustration 5). The three fittings of the accessories tray must be aligned with the tripod spider retaining fittings and fixed in place by them.

4. Setup – tube:

To mount the telescope tube (Fig. 1, 1) you undo the screw on the tube ring (Fig. 6, X) and open up the ring.

Now you place the tube in the centre of ring and close the ring up.

HINT:

A small spirit level, placed on the accessory tray, may help you to setup you telescope in level.

Now secure the mounting by tightening the screw.

Place the tube including clip with the objective opening facing north on the mounting. Fasten the tube holder using the clamping screw to the mount head (illustration 7).

5. Setup – eyepiece:

Two eyepieces (Fig. 1+2, 18) and a star diagonal prism (Fig. 1+2, 19) are supplied as standard with this telescope.

With the eyepieces, you can decide which magnification you want for your telescope.

Before you insert the eyepiece and the star diagonal prism, you must remove the dust-protection-cap from the eyepiece connection tube (Fig. 1, 6).

Loosen the screw (Fig. 8, X) on the eyepiece connection tube and insert the star diagonal prism. Retighten the screw (Fig. 8, X) on the eyepiece connection tube.



Repeat the same process on the star diagonal screw (Fig. 9, X) and insert 20mm eyepiece in the star diagonal prism and retightened.

Make sure that the eyepiece is pointing vertically upwards.

Otherwise loosen the screw (Fig. 8, X) on the eyepiece connection tube and rotate the star diagonal prism into the vertical position.

6. Setup – viewfinder assembly and alignment

The view finder and its holding device are pre-assembled and included in the packaging

Push the foot of the viewfinder holding device completely into the telescope barrel base (illustration 10). The holding device will click into place. Make sure that the viewfinder lens faces the barrel opening.

There are two clamping screws (black) on the holding device (illustration 1, 3) plus a spring-loaded counter screw (silver). The black clamping screws are now to be screwed in until resistance is felt. This affixes the viewfinder barrel in place.

Before you start any observation it is essential the finderscope be adjusted. The finderscope and main telescope must have identical positioning.

To align them proceed as follows:

take the 20 mm eyepiece, insert it in the zenith mirror and align the main telescope with an easily found and identified earthly object such (illustration 11, church tower top, house gable). The distance should be at least 200m – 300m meters. Place the object dead centre of the eyepiece vision field. The image is vertical but inverted. The finderscope image is vertical and correctly shown. Turn (right/left) one of the two finderscope adjustment screws



whilst looking through the finderscope. Continue until the finderscope hairlines are at exactly the position that corresponds to the view through the main telescope eyepiece.

Focussing the finderscope:

turn the front lens barrel (illustration 10, X) left one or two turns. You can then set the countererrng separately. Look through the finderscope and focus on a distant object. Turn the front lens barrel part either way until the focus is good. Now turn the countererrng toward the lens barrel.

7. Setup – protection-caps:

In order to protect the inside of your telescope from dust and filth, the tube opening is protected by a dust-protection-cap (Fig. 12, X). For observation remove the cap from the opening.

8. Setup - flexible shafts

To ease precise adjustment of the declination and right ascension axes flexible shafts are installed in the holding devices of both axes provided for the purpose (illustration 13, X).

The long flexible shaft is mounted parallel to the telescope barrel (illustration 1, 14). It is secured in place with a clamping screw in the axis notch provided.

The short flexible shaft (illustration 1, 15) is mounted laterally. It is secured in place with a clamping screw in the axis notch provided.

Your telescope is now ready for use.

Part II – Handling

1. Handling – telescope mount:

Your telescope mount is of a new type allowing you to make two different types of observation.



A: Azimuth = ideal for terrestrial use.

B: Parallactic = ideal for celestial observation.

Re A.

In azimuth use the telescope is moved horizontally and vertically.

1. Undo the polar vertical clamping screw (illustration 14a, X) and lower the incline plate until it is horizontal (to the stop). Retighten the polar height fastening screw.

2. Undo the vertical clamp (illustration 15 A) and move the main tube to a horizontal position. The re-tighten the clamps.

The telescope can now be moved horizontally and vertically using the flexible shafts (illustration 1, 14+15).

HINT:

The latitude of your observation site can be found in maps or in the internet. A good source of information is www.heavens-above.com. After checking “anonymous user” > “select” you may choose your land and city.

Re B.

2. Handling. Night use.

A dark site is very important at night as light would interfere with observation focus and detail visibility.

Allow your eyes to adjust to the darkness after leaving a lighted room. After about 20 minutes you can begin celestial observation.

Do not use the telescope from within enclosed spaces. Position your telescope and accessories about 30 minutes before observing to ensure temperature compensation in the main tube.

Make sure the telescope is on a flat stable surface.

3. Setup - alignment - basic siting.

Undo the polar height clamping screw (illustration 14a X) and



move the inclined plate (illustration 15 B) to the latitude of your location using the holding rod table as a rough guide. Turn the tripod so that the N mark faces north. The top of the inclined plate should also face north (illustration 14b). The latitude setting rod (illustration 14a Y) points south.

4. Setting latitude.

Determine latitude of your location using a street map, atlas or the Internet. Germany is between 54° (Flensburg) and 48° (Munich) degrees of latitude.

Undo the polar height adjustment clamping (illustration 14 X) and set the angled plate until the figure on the latitude adjustment rod (illustration 14 Y) is that of your location, e.g. 51°

5. Turn the declination axis (illustration 15 C) incl. telescope mount 90° .

Set the tube the right way round (see illustration / marking) in the mounting and tighten the clamping screw. The telescope eyepiece projection now points to the ground and the lens to the polar star. Undo the latitude setting clamping and the DEC axis in that sequence and get the polar star in the middle of the eyepiece field of vision. Then re-tighten the clamping. The tripod may not now be moved or adjusted again as this would misalign it. The telescope is now correctly aligned. This procedure is essential so that celestial objects are tracked.

6. Tracking and observation positionin

Tilt the main telescope (main tube) 90° (illustration 15 C). Turn it 180° to the right or left until the objective lens shows skywards.

Tighten all clamping (illustration 13 Y + illustration 15 A) so that



tracking can be done using the flexible shaft.

Manual use of the hours axis (R.A. axis) via the flexible shaft (illustration 15 D) compensates for the earth's rotation so that objects remain always in the eyepiece visual field. If you want to move to another object undo the clamping (illustration 13 Y + illustration 15 A), rotate the main tube appropriately and then re-tighten the clamping. Fine adjustment is done using the flexible shaft (illustration 1 14+15).

7. Handling – Viewfinder:

The telescope is now roughly aligned and adjusted.

In order to obtain a comfortable observation position, you should loosen the screws at the tube mounting (Fig. 1, 8), so that you can rotate the telescope tube. Bring the eyepiece and the view-finder into a position in which is comfortable for you to look through both.

The fine alignment is done by using the finder scope. Look through the finder scope and centre Polaris (Fig. 16) in the middle of the finder scope (Fig. 17).

For fine adjustments use the flexible handles of the horary axis (Fig. 15, D) and of the declination axis (Fig. 15, E).

8. Handling - Observation:

After you have located the pole star in the viewfinder, if you look through the eyepiece, the pole star will be visible.

If necessary, you can with help of the flexible handles align the star more exactly, just as you can adjust the definition by using the focussing wheel (Fig. 15, F).

Furthermore, you can now, by changing the eyepiece, increase the magnification. Note that the magnification of the stars can hardly be seen.



HINT:

Eyepieces enlarge the (not directly visible) picture of the telescope's prime focus. The less the eyepiece's focal lengths is , the stronger is the magnification. So various eyepieces are needed to reach different magnifications. Begin every observation with a low magnification (20mm eyepiece).

9. Handling – Find a star:

Initially it will be difficult for you to find your bearings in the firmament, since the stars and the constellations are always moving and according to season, date and time their position in the heavens will change. The pole star is the exception. It is a fixed star and the starting point for all star maps.

At the beginning, you should look at some well known constellations and star groups order that are visible the whole year over. The position of the heavenly bodies is however dependent on date and time.

If you have aligned your telescope accurately on one of these stars, you will find that it has vanished your visual field after a few minutes. To even out this effect, you must turn the flexible handle (Fig. 15, D) the horary axis and your telescope will follow the trajectory of this star.

10. Handling – Accessories:

Your telescope comes with three eyepieces (Fig. 2, 18).

By interchanging the eyepieces you can alter the magnification of your telescope.

Hint:

Focal length telescope : Focal length Eyepiece = Magnification



$$700 \text{ mm} : 20 \text{ mm} = 35 \times$$

$$900 \text{ mm} : 20 \text{ mm} = 45 \times$$

$$700 \text{ mm} : 9 \text{ mm} = 67 \times$$

$$900 \text{ mm} : 9 \text{ mm} = 100 \times$$

$$700 \text{ mm} : 4 \text{ mm} = 175 \times$$

$$900 \text{ mm} : 4 \text{ mm} = 225 \times$$

The star diagonal prism (Fig. 2+18, 19) causes a picture reversal (mirror wrong) and is put into the telescope before viewing the earth.

In order to see an upright and sidecorrect picture, you may use the erecting lens. Loosen the locking screw (Fig. 8, X) and remove the diagonal mirror from the eyepiece holder (Fig. 1, 6). Now put the erecting lens (Fig. 2, 20) in place and retighten the locking screw. At last, put an eyepiece in place and tighten the locking screw (Fig. 9, X).

11. Handling – Dismantling:

After a hopefully interesting and successful observation, it is recommended that you store the entire telescope in a dry, well aired area. On some telescopes the tripod and mount can easily be separated. The adjustments to the mount will remain intact. Don't forget to put the dust-protection-caps onto the tube opening and onto the eyepiece connection. Also, you should stow all the eyepieces and optical accessories into their corresponding receptacles.

HINT:

The erecting lens is not recommended for astronomical observations. Only use the diagonal mirror here. To observe landscapes, you may use the erecting lens.

12. Handling – Care:

Your telescope is a high-quality optical appliance. Therefore you



should avoid your telescope coming into contact with dust or moisture. Avoid putting fingerprints on the lens.

If dirt or dust have nevertheless accumulated on your telescope, you should first remove it with a soft brush. Then clean the soiled area with a soft, lint-free cloth.

The best way to remove fingerprints from the optical surfaces is with a lint free, soft cloth, which you have previously treated with some alcohol. Even better is the use of compressed air from a can.

If your telescope has collected dust or moisture internally, do not try to clean it yourself but return it directly to your local specialist.

Don't clean the telescope's optics too often. Doing this, may result in damaged coatings. If your telescope should have become dusty from the inside, don't attempt to clean it on your own but consult your local dealer or Meade centre of your country.

Appendix

1. Possible observation targets

In the following, we like to present to you a choice of very interesting and easy-to-find celestial objects. On the depending pictures at the end of the manual you will see how they will appear in the eyepiece of your telescope:

The moon (Fig. 20)

The moon is the only natural satellite of the earth.

Diameter: 3,476 km

Distance: 384,000 km (average)

The moon is well-known since thousands of years. He is the second-brightest celestial object after the sun. Because the moon circles around the earth, he changes periodically its inclination to the sun; therefore we see changing phases. The time



for one complete lunation is 29.5 days (709 hours).

Constellation Orion: The great Orion nebula / M 42 (Fig. 21)

Right Ascension: 05h 33' (hours : minutes)

Declination: -05° 25' (Degrees : minutes)

Though it is 1,500 light years away, the Orion nebula (M 42) is the brightest nebula object at the sky – visible even with naked eyes and a worthwhile object for telescopes of all kinds and sizes.

HINT:

It consists of a gigantic cloud of hydrogen gas with a diameter of hundreds of light years, taking a field on the sky of 10°.

Constellation Lyra: The Ring Nebula / M 57 (Fig. 22)

Right Ascension: 18h 52'

Declination: +32° 58'

Distance: 4,100 light years

The famous Ring Nebula is often called the prototype of planetary nebulae; he belongs to the northern hemisphere summer sky's pieces of splendour. Recent investigations have shown that he is a ring of light-emitting matter that surrounds its central star (only visible in bigger telescopes). If one could look onto its top, he would see a structure like the Dumbbell Nebular / M 27.

Constellation Vulpecula (little fox):

The Dumbbell Nebula / M 27 (Fig. 23)

Right Ascension: 19h 59'

Declination: +22° 43'

Distance: 1,250 light years

The Dumbbell Nebula / M 27 was the first planetary nebula ever found. On July 12th, 1764, Charles Messier discovered this new and fascinating class of objects. We can see it directly from its



equatorial pane. If it could be viewed from top, we would appear like the Ring Nebula / M 57. This Object can even be viewed at average weather conditions at low magnifications.

2. Technical Data

Design: achromatic refracting telescope with 2 lenses

Focal length: 700 mm/900mm

Lens diameter: 70 mm

Magnification: 35 - 67 - 175 X 45-100-225X (depending on eyepiece).

Viewfinder: 6x25

Mount: III Diameter latitude meter

aluminium tripod.

3. Troubleshooting:

Mistakes: Help:

No picture Remove dust protection cap and sunbathe-shield from the objective opening.

Blurred picture Adjust focus using focus ring

No focus possible Wait for temperature to balance out

Bad picture Never observe through a glass surface

Viewing object visible Adjust finder (See Part I: in the finder, but not 6. Construction) through the telescope

Heaviness in the flexible Telescope not balanced handles on the axis over the shaft

Despite using star The star diagonal prism diagonal prism should be vertical in the picture is the eyepiece connection“crooked”

