

ESSENTIAL STEM TOOLS

TELESCOPE

INSTRUCTION MANUAL



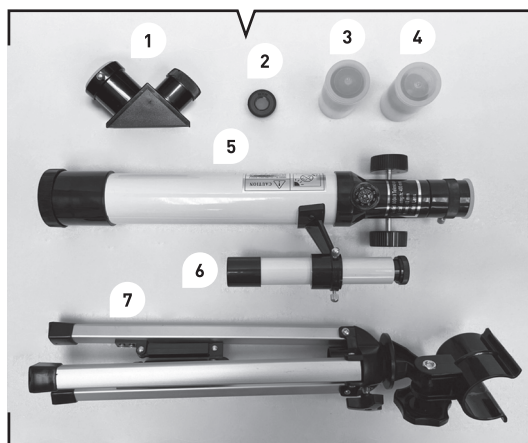
THAMES & KOSMOS



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CONTENTS

What's included:



Good to know!

If you are missing any parts, please contact Thames & Kosmos technical support.

Checklist:

✓	No.	Description	Qty.
<input type="radio"/>	1	Diagonal mirror	1
<input type="radio"/>	2	Moon filter (lunar filter)	1
<input type="radio"/>	3	Low-power eyepiece (20 mm)	1
<input type="radio"/>	4	High-power eyepiece (4 mm)	1
<input type="radio"/>	5	Telescope tube	1
<input type="radio"/>	6	Finderscope	1
<input type="radio"/>	7	Tripod	1

INTRODUCTION

With this telescope, you can explore the night sky and study natural objects all around us right here on Earth. This telescope has been designed to provide views of the moon's craters, Jupiter's major moons, and Saturn's rings, as well as dozens of galaxies, star clusters, and nebulae. As a terrestrial (land) telescope, it delivers great views of mountains, valleys, and many other features of the world around us. You can also use it to study animals from afar. To obtain the best performance from your telescope, please read this manual carefully and completely.

To be sure that this optical instrument is handled correctly, it is essential to pay careful attention to the instructions and tips provided in this manual. In particular, please read and follow the safety information to the right. To view the night sky, you may sometimes need to work at a time or in a place requiring adult supervision. When observing the stars outside, appropriate tools and equipment are advisable (depending on the weather and season, this could mean warm clothing, some hot cocoa, a red-light flashlight, and maybe a star wheel or star map app). We hope you have lots of fun with this telescope!

Safety Information

WARNING! Never look directly into the sun — whether with your naked eye, or with the telescope or its viewfinder! You could blind yourself!

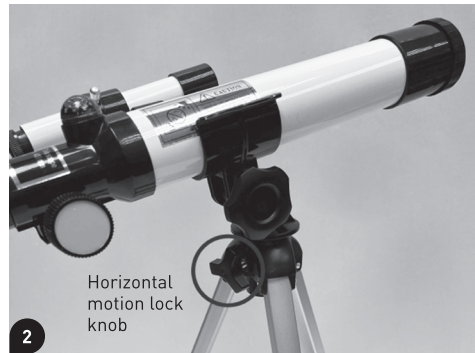
Never inadvertently leave the telescope and its viewfinder in the sun — it could start a fire!

WARNING! Not suitable for children under 3 years. Choking hazard — small parts may be swallowed or inhaled.

Keep the packaging and instructions as they contain important information.

TELESCOPE ASSEMBLY

- Carefully remove all of the parts from their cardboard boxes, lay them on a table, and check to make sure you have everything listed in the checklist on the previous page. The **tripod** holds the telescope for you and helps you keep it pointed at the exact part of the sky you want to look at. The **telescope** itself is the long tube with a glass lens at the front. The rear, narrower end, which is the end into which you look, is where you will insert various other glass lenses and other accessories.
- Spread the three legs of the tabletop tripod apart and gently press down on the center of the tripod support struts until they lock into place. (See Fig. 1)
- Carefully push the telescope tube down into the tube attachment bracket until it is firmly held in place.
- To turn the telescope tube from side to side, loosen the **horizontal motion lock knob** and turn the telescope tube to the desired direction. Then tighten the knob again. (See Fig. 2)
- To turn the telescope tube up and down, loosen the **altitude lock knob** and turn the telescope tube to the desired direction. Then tighten the knob again. (See Fig. 3)
- Loosen the small screw on the side of the **focus tube** by turning it counter-clockwise. Remove the white plastic dust cover from the focus tube. Remove the two plastic dust covers from the **diagonal mirror**. Insert the shorter tube (the one without the screw) of the diagonal mirror into the focus tube so that the opposite tube is facing upward. Tighten the small screw on the side of the focus tube to hold the diagonal mirror secure. Insert the **eyepiece** into the diagonal mirror. It is recommended that you start with the **low-power eyepiece**. Tighten the screw by turning it clockwise to hold the eyepiece securely in place (See Fig. 4).
- Use the **moon filter** to reduce the moon's bright glare for improved viewing of the moon. It is screwed into the eyepiece. (See Fig. 5)



Using the finderscope

Due to the fact that a telescope has a narrow field of view by design, it can be challenging to locate a particular star or planet. For this reason, the telescope is fitted with a low-power, wide-field, miniature telescope called a **finderscope**. Always use your finderscope to locate the object you want to view first. The finderscope should be aligned with the main telescope tube before you begin using the telescope, so that both scopes are positioned to always provide exactly the same angle and view.

Note: Objects in the finderscope are upside down. This is normal for all astronomical telescopes.

Complete the following steps in daylight:

1. Insert the 20-mm eyepiece into the diagonal mirror. Look at an easily recognizable, stationary object that is at least 300 feet away. Slightly loosen the horizontal motion lock knob and the altitude lock knob. Move the telescope tube until the object is in the center of the field of view. Then bring the image into focus.
2. Firmly retighten the horizontal motion lock knob and the altitude lock knob so that the telescope is locked in position.
3. Look through the finderscope. If the object is not visible or centered in the finderscope, simply loosen one of the three small adjusting screws holding the finderscope and reposition the finderscope until the object is centered within the X-shaped crosshairs.
4. You may need to repeat this procedure to ensure a perfect alignment.



The altazimuth mount

Your telescope has an **altazimuth mount**. “Alt” refers to altitude, the vertical movement of the telescope, while “azimuth” refers to the horizontal movement.

To change the angle of the telescope’s optical tube, simply loosen the altitude lock knob. Adjust the position of the optical tube and retighten the altitude lock knob.

To change the horizontal direction of the telescope tube, loosen the horizontal motion lock knob, move the telescope tube, and retighten the horizontal motion lock knob.

The compass

Your telescope is equipped with a liquid-filled **compass** that can be used to take direction bearings from your viewing site to your viewed subject.

The compass has two direction indicators. On the top of the compass ball are the letters N, E, S, and W in a circle. The orange arrow in the middle of the circle always points toward the magnetic north pole, and the letters in the circle indicate the four cardinal directions: north, east, south, and west.

Around the outside of the compass ball is another set of letters showing N, E, S, and W, along with NE (northeast), SE (southeast), SW (southwest), and NW (northwest). When observed from the eyepiece location these outer letters indicate the direction in which the telescope is pointing.

Note: Do not leave the telescope in below freezing temperatures as this may cause the liquid inside the compass to freeze and damage the compass.



USING YOUR TELESCOPE

Making astronomical observations

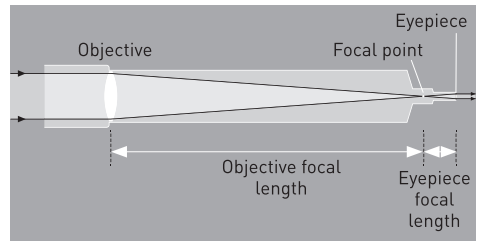
1. Take your telescope outside. Viewing objects through closed or open windows is not recommended. Your view can be distorted by reflections in the glass of a closed window or by air currents of differing temperatures passing through an open window.
2. Let your telescope adjust to the outside temperature. Your telescope will perform much better if the temperature of the lenses and the air inside the tube are the same as the outside temperature. It may take up to 30 minutes to equalize the temperatures when the difference in temperatures is extreme.
3. Find a location far from glaring light. If you live in an urban area, your view will probably improve the farther you move away from the city lights. The light pollution of a town or city can dramatically reduce the telescope's performance and viewing capabilities.
4. Remove the large, round plastic dust cover from the front of your telescope.
5. We recommend starting your viewing with the 20-mm eyepiece because it gives you the widest angle and brightest, sharpest views.
6. When possible, avoid sudden temperature changes, as the moisture in the air will condense on the objective lens. Should this occur after bringing your telescope inside, leave the lens cap off the objective lens, tilt the objective (front) lens face down, and allow the telescope to reach room temperature.



How your telescope works

It is also important to understand how your telescope works.

When humans are in the dark, our pupils grow larger in order to take in (or gather) as much light as possible. That's exactly what a telescope does — it gathers light — with the main differences being that its “pupil” (the **objective lens**) is a lot larger than our pupils and the objective's diameter always remains the same. The light of an observation target enters the objective and is concentrated at the **focal point**. With the use of a second lens (the **eyepiece lens**) that functions like a magnifying lens, you can view the observation target's image created at the focal point.



If you divide the **objective focal length** by the **eyepiece focal length**, it gives you the telescope's **magnification power**. Bright observation targets, such as the Moon or planets, can handle greater magnification than fainter ones.

When you look through the eyepiece, you can only see a very small portion of the sky. The greater the magnification, the smaller that portion will be. With the finderscope, on the other hand, you can survey a relatively large area. That is why it's easier to orient toward the observation target with the finderscope than with the telescope.

ADDITIONAL INFORMATION

About magnification power

The **magnification power** of a telescope tells you how much an image is enlarged or how big and close it appears to the viewer. The focal length of the eyepiece, along with the focal length of the telescope, determines the magnification power. To calculate the power of your telescope with any particular eyepiece, simply divide the focal length of the telescope (400 mm) by the focal length of the eyepiece (indicated in "mm" on the eyepiece collar).

Example:

$$\frac{400\text{-mm focal length (tube)}}{4\text{-mm focal length (eyepiece)}} = 100\text{x magnification power}$$

The 3x Barlow lens and interchangeable eyepieces provide the following magnifications:

<u>Eyepiece</u>	<u>Magnification power</u>
4-mm	100x
20-mm	20x

The level of magnification required depends on the object being observed. A lower magnification power and a wider field of view are advisable for the observation of galaxies and nebulae. The highest magnification power should be used for highly detailed observations of the moon, Jupiter, Saturn, or any object that is quite bright.

Care and cleaning

The optical components of a telescope will get dirty over time. Dirt or dust on a lens should be removed with the utmost care. A considerable amount of dirt or dust would have to accumulate on the optical surface before your view would be compromised.

1. Keeping dust caps on during storage and transportation will reduce dust accumulation.
2. Condensation may collect on the optical surfaces when the telescope is not in use. Remove the dust caps and allow the moisture to evaporate naturally. Point the telescope downward to minimize the accumulation of airborne dust.
3. Once all of the moisture has evaporated, replace the dust caps.
4. Filtered, compressed air may be used to remove surface dust from lenses and mirrors. Remove the dust cap and the dew shield. Once removed, point the can away from the lens and gently expel some air and any condensation or dust that has accumulated on the discharge tube. Spray the lens or mirror with short bursts of air to carefully remove the dust particles. Do not hold the trigger of the compressed air can for extended periods because propellant from the can might escape and damage the optical surface.
5. If, after several attempts, you cannot remove the particles, take the telescope to an optical professional for cleaning.
6. If you keep the dust caps on your telescope when it is not in use and avoid handling the lenses or mirrors, only minimal optical maintenance of your telescope should be required. Extensive cleaning is usually only necessary every few years.

WHAT TO LOOK FOR IN THE NIGHT SKY

There is a whole universe of objects you could view at night, so where do you start? We recommend starting with the most prominent objects first.

The moon

The moon is the easiest target to find at night. When the moon is in full position, it bathes the night with a silvery light that washes the sky of all but the brightest objects. The best time to view the moon is not when it is full, but rather when it is less than half full. The dividing line between dark and light on the moon, called the terminator, shows the best detail in the craters and mountains.

The planets

The planets, our solar system companions, range in size and substance from moon-size rocky bodies to giant gas balls, which could hold Earth 1,000 times over. To find the planets, you will need information about their times of visibility. An astronomy magazine or app will give you the locations of the planets as they change position from month to month. The Internet is also an excellent source of information, offering star charts, maps, and more! The popular and more familiar constellations often provide the easiest landmarks to help find the planet's locations and paths of orbit. Most people have looked up at the sky at night and seen some of the planets without even realizing it. A planet looks like a bright star but does not twinkle like a star does; it looks like a tiny ball. Venus, Mars, Jupiter, and Saturn are the easiest planets to view. Mercury is dimmer, usually below the horizon, and more challenging to find.

Each of the planets provides interesting views. Venus is covered with clouds so all that is visible is an extremely bright light, the brightest next to the moon. However, Venus, like the moon, goes through phases. As it travels around the sun, different areas of its surface are illuminated, producing crescent shapes of varying sizes. Mars is the red planet. When it is above the horizon, it is noticeably red and stands out like a beacon in the night sky. The apparent brightness of Mars varies as the planet orbits around the sun and throughout its period of visibility, it will look

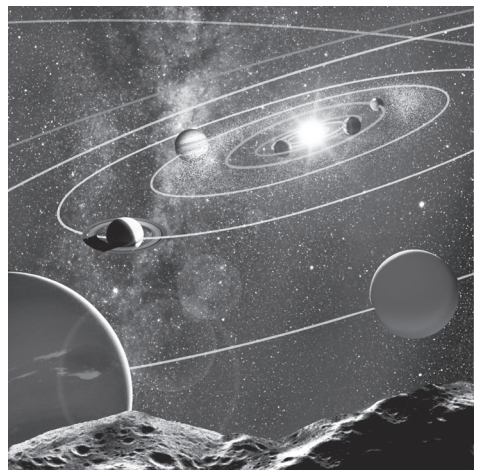
brighter or dimmer depending on its distance from Earth.

Jupiter is the largest planet in our solar system and the second brightest next to Venus. Jupiter has many moons, four of which are often visible through your telescope when viewing conditions permit. As you watch them throughout the evening, you will see that they change position relative to each other and to Jupiter. It is possible with careful planning to actually see one of the moons disappear either in front of or behind Jupiter as it orbits around the planet. Another great feature of Jupiter is its cloud belts. Jupiter is alive with weather activity and its clouds have formed over time into belts visible through telescopes in the right atmospheric conditions.

Saturn, the second-largest planet, is not as bright as Jupiter, and so its moons are not as visible through small telescopes. The large rings that encircle Saturn are spectacular to observe, however. The planet and its rings appear pale yellow. The major division in the rings, the Cassini division, is possible to see if you keep the telescope firmly in position.

Uranus and Neptune are the last of the solar system's gas giants. They do not provide as spectacular a sight as Jupiter or Saturn, but are nonetheless rewarding to see.

Beyond our solar system there are many more objects to be found. Galaxies, nebulae, and star clusters abound!



FREQUENTLY ASKED QUESTIONS

1. How far can I see with a telescope?

If you stand outside and look up at the night sky on a clear evening, you can see hundreds of stars without the aid of your telescope. The telescope is a light-gathering instrument that magnifies the view — providing significantly more detail and unveiling more stars, nebulae, and celestial objects. With the aid of a telescope, you will be able to enjoy exciting views of Saturn's rings, Jupiter's major moons, the Orion Nebula, and much more.

2. Why can't I see anything through my telescope?

A. If you see only gray or black when looking through your telescope, even after searching for an object to view, it is very likely that you are using an eyepiece that is too powerful. To solve this problem always start with the lowest power eyepiece first, and only insert the higher power eyepiece after you have located an object and have some more experience focusing.

B. The lens cap is still in place!

3. When I use my high-power eyepiece, everything looks much darker. Why?

As magnification in a telescope increases, brightness diminishes. Conversely, brightness increases when magnification is reduced. If an image appears too dark or unclear, use a lower-powered eyepiece. Views of small, bright objects are superior to those of large, dark, or blurry ones! Atmospheric conditions, air currents, as well as light and air pollution also affect viewing quality.

4. As I look through my telescope, objects in the sky appear to move. Why is that?

The constant rotation of the Earth makes things appear to move. Lower-power eyepieces will reduce this effect of movement considerably and allow you to observe an object for a longer duration before you have to readjust your telescope.

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