

Instruction Manual

omegon



Omegon® AC 90/1000 EQ-2

English version 2.2015 Rev A

The Omegon® 90/1000 EQ-2

Congratulations on the purchase of the new Omegon® 90/1000 EQ-2. This telescope will give you hours of fun, with its all optical glass achromatic lens it is the ideal companion to start in the world of amateur astronomy. With this telescope you will be able to see the craters on the Moon, star clusters, the Jupiter disc features and its Galilean moons and the rings of Saturn.

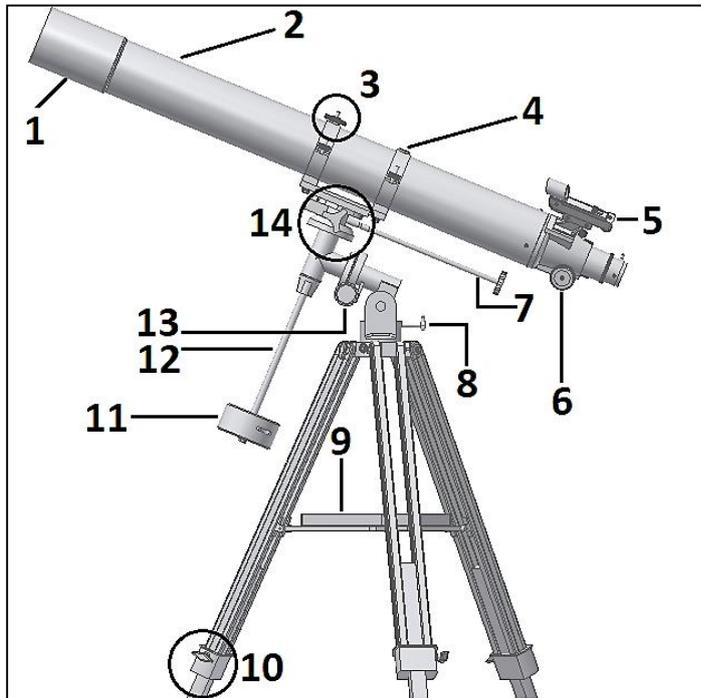


Figure 1. Parts list.

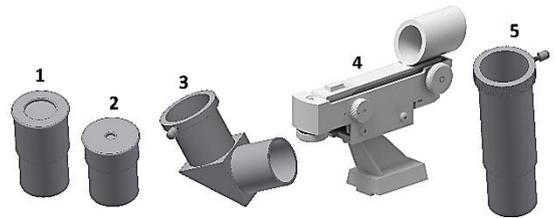
Figure 1. Mount parts description.

- | | |
|-------------------------|-------------------------------|
| 1- Dew-shield; | 8- Latitude/alt. adjustment; |
| 2- Optical tube; | 9- Accessory tray; |
| 3- Camera thread; | 10- Leg fixing knob; |
| 4- Tube ring; | 11- Counterweight; |
| 5- Red-dot finderscope; | 12- Counterweight-shaft; |
| 6- Focuser wheel; | 13- Right Ascension handle; |
| 7- Declination handle; | 14- Declination locking knob; |

1. Included parts.

We have included several accessories that will make the use of the telescope easier and fun, please take a look at the list of the parts so you can identify them in the future.

1. & 2. Two eyepieces 1.25" (31.75mm); a Plössl 25mm and a Plössl 6.3mm eyepiece;
3. 1.25" Diagonal Mirror;
4. Red-dot finderscope;
5. 2x magnification Barlow Lens.



2. Getting Started. It is very simple to get started. Here is how the telescope works. The telescope should point to the object being observed. The front lens (inside the dew-shield #1 - figure 1) gathers the object's light and directs it to the eyepiece (on the focuser side #6 - figure 1). Rotate the focuser knob to obtain a focused image. At the focuser one can use the supplied accessories. Different accessory combinations give different results, such as different image magnifications or correct image. All this will be explained in more detail on the next pages. **3. Assembly.** Start by setting up the tripod – figure 2. Open the tripod legs as shown place the tripod accessory tray and use the three thumbscrews to fix it (figure 3). Adjust the legs extension – figure 4. Extend them and fix using the three fixing knobs. Place the equatorial head on top of the tripod - Figure 5, and fix it. Next thread the counterweight shaft by threading it to the Right Ascension (R.A.) axis – figure 6. Don't forget to thread the foot-saver (screw at end of shaft) after sliding-in the counterweight. Install both R.A. and Dec. handles – figure 7. Place the optical tube by on the mount – figure 8 – and thread both ring screws. Install the diagonal and eyepiece (don't forget to tighten the focuser and finderscope fixing screws – figure 9). Release the R.A. locking knob (not shown) slide the counterweight along the counterweight shaft to balance the telescope then do the same for the Dec. axis – figure 11. Balancing is important so that the mount does not wear out. Telescope operation is also easier with a balanced optical tube.

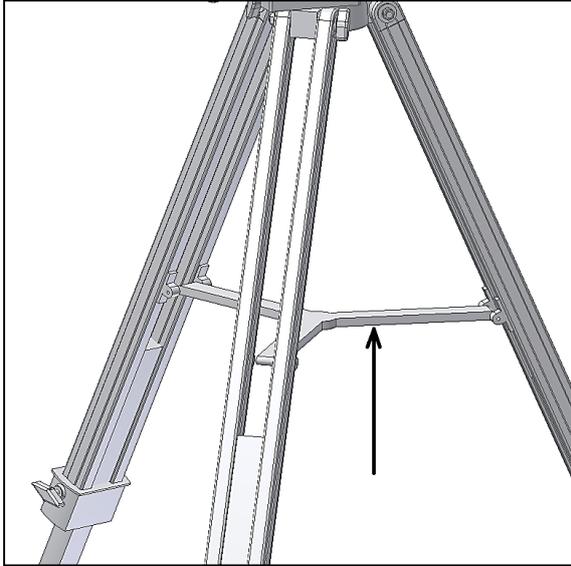


Figure 2. Tripod assembly.

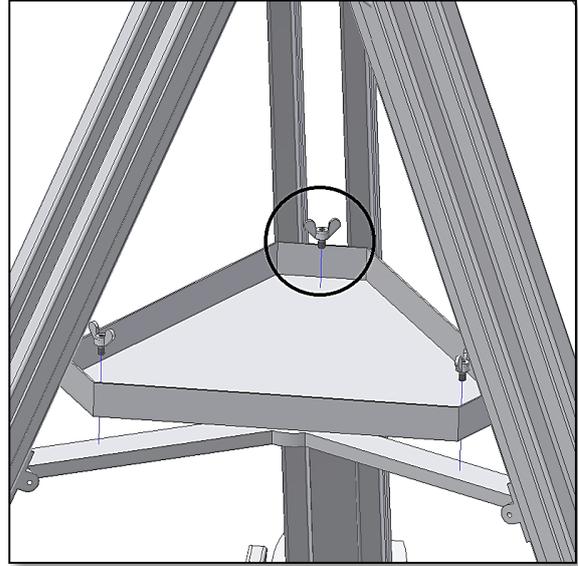


Figure 3. Tray placement.

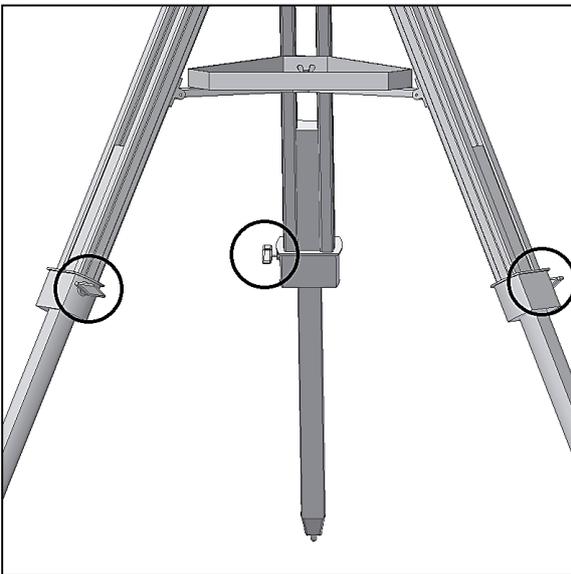


Figure 4. Adjust tripod's extension.

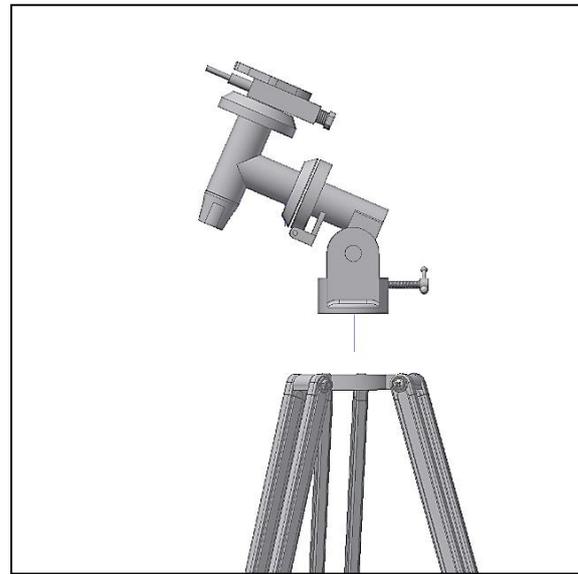


Figure 5. Place the equatorial mount and fix it.

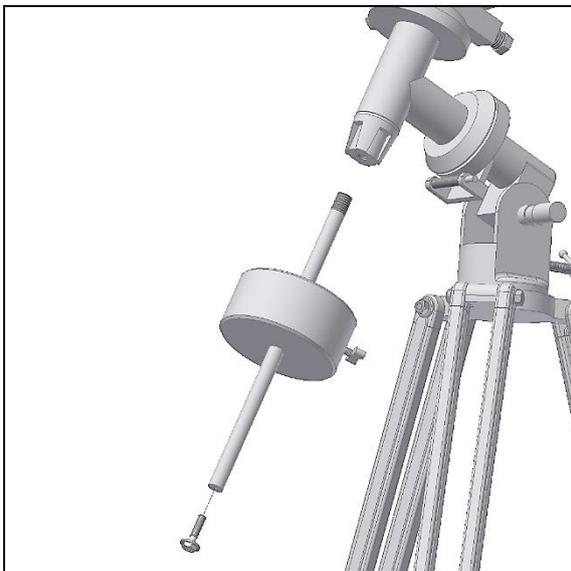


Figure 6. Thread the counterweight shaft.

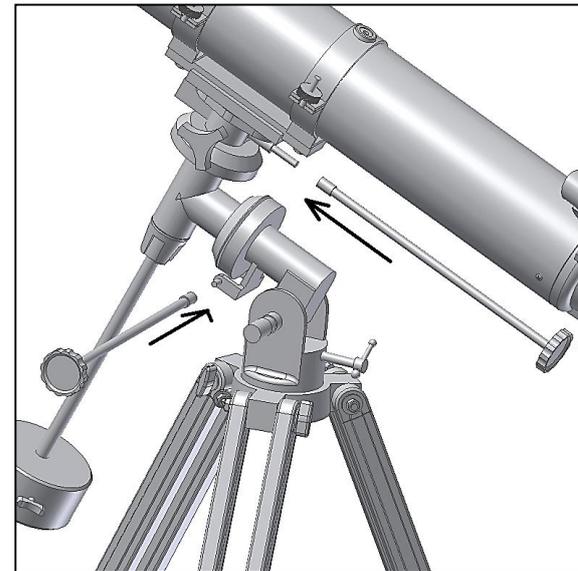


Figure 7. Place the two R.A. and Dec. handles and fix it.

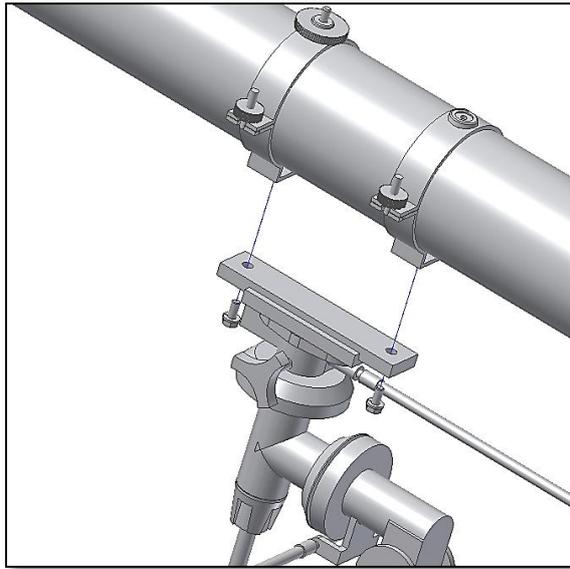


Figure 8. Tube placement.

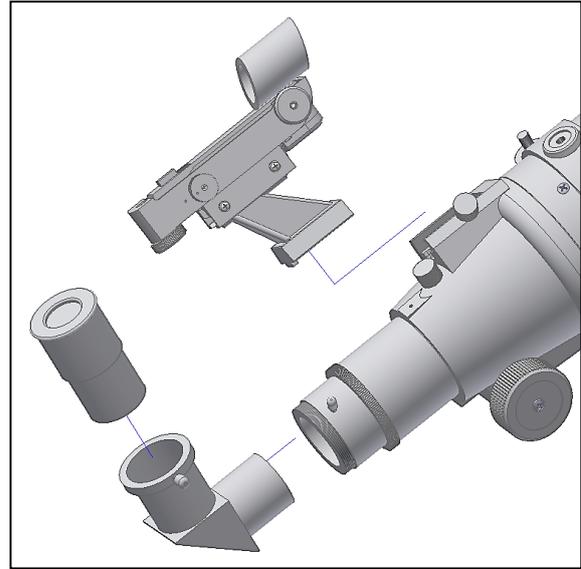


Figure 9. Install the supplied accessories.



Figure 10. Balance the telescope tube R.A. axis.

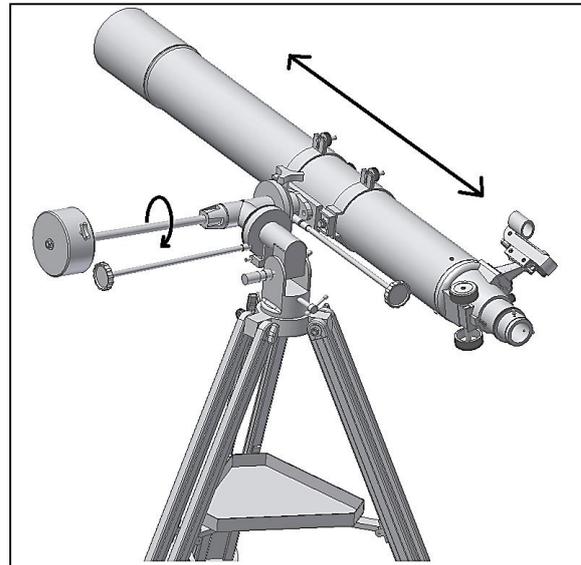
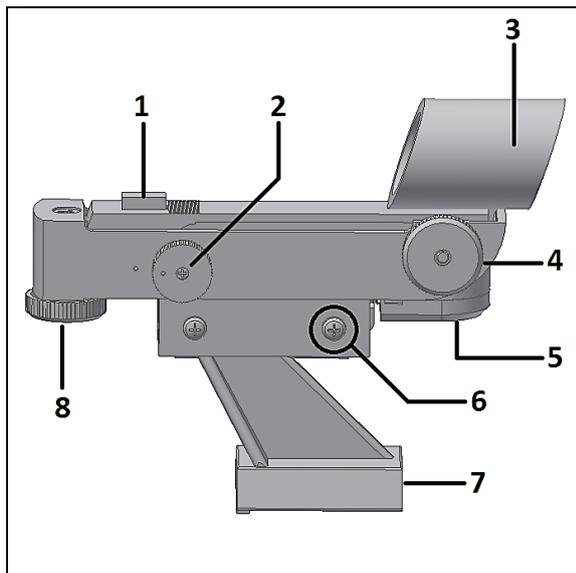


Figure 11. Balance the telescope tube Dec. axis.

4. Start using your Omegon® 90/1000 EQ-2 telescope. Point the telescope to a distant object during the day. It is important to do this during daylight, so that you get familiarized with the telescope operation. A good target is a church tower, a chimney or a distant mountain peak. Make an eyepiece and diagonal are installed and securely fixed. Rotate the focuser knob, so that the focuser tube moves in and out. Do this slowly. We suggest that you start by racking the focuser all the way in and slowly move it out. With the PLössl 25mm eyepiece you should be able to get a focused (sharp) image easily. For night use we suggest starting with an easy object. The Moon is a big object easy to point at and train telescope pointing. We suggest to use the Moon as a first target before going to explore other more difficult objects like galaxies or nebulae. **5. The Finderscope.** Before we mentioned the finderscope as a valuable tool to point the telescope at an object. To use the telescope properly, the telescope and the finderscope must be aligned. The image obtained through the finderscope has a much broader field of view than that of the telescope. The finderscope acts as an aiming device to the telescope. Even to point to the Moon it is necessary for the finderscope to be accurately aligned with the telescope. Please take a look on how the finderscope works in the next pages.

5.1. Knowing your finderscope.



Finderscope main features

- 1- Red-dot case;
- 2- Potentiometer ON/OFF switch;
- 3- Optical window;
- 4- Azimuth adjustment knob;
- 5- Battery compartment (1x battery CR2032);
- 6- Base fixing screws;
- 7- Finderscope bracket;
- 8- Altitude adjustment knob.

5.2. Getting Started.

The finderscope is powered by a coin shaped battery CR2032 (supplied). For battery protection a plastic protection is placed between the battery and the battery contact. Remove the plastic protection by securing the finderscope

Figure 12. Finderscope main features.

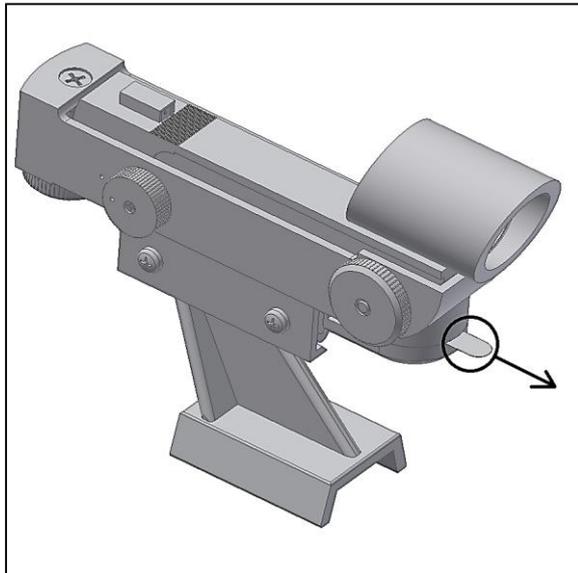


Figure 13. Remove plastic protection.

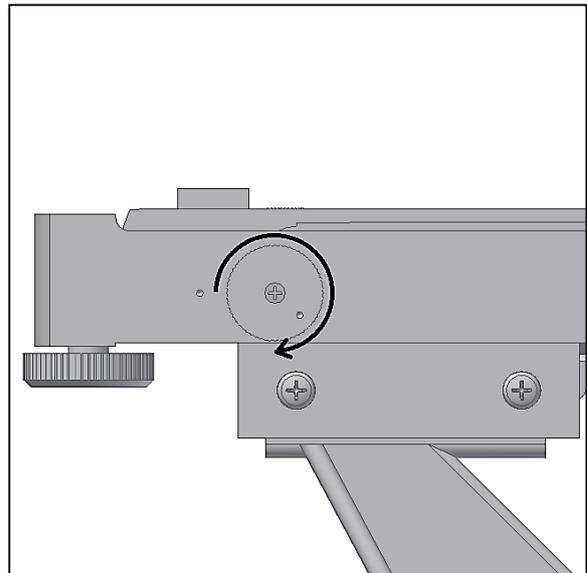


Figure 14. Turn power ON by rotating potentiometer.

with one hand and then pulling firmly the outstanding plastic tip (figure 2). The plastic protection should be completely removed and discarded. Turn power on by rotating the potentiometer to its ON position as shown in figure 3 (you will hear a click when ON), rotate all the way to get maximum power. When powered, the red-dot point on the red-dot case (#1 – figure1) lights (figure 4 and figure 5). A small red point is projected on the optical window (#3 – figure 1). This red point, when aligned with the telescope, allows precise pointing to objects. To precise align the finderscope with the telescope both the altitude and azimuth (#8 and #4 figure 1) adjustment knobs need to be adjusted (figure 6 and figure 7) – please see detail instructions on how to align in page 3. To power off the finderscope just turn the potentiometer counter-clockwise until you hear a click – red-dot dims until off (figure 8). Place the finderscope's bracket in the telescope's finderbase and tighten it securely. Use a low power eyepiece to align the finderscope.

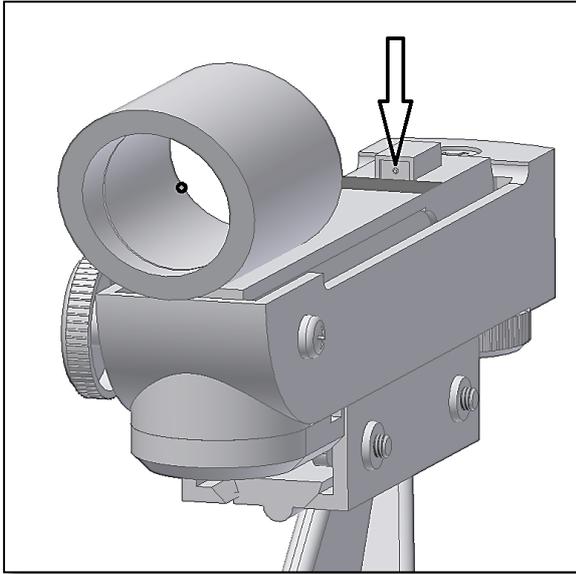


Figure 15. Red-dot lights when ON.

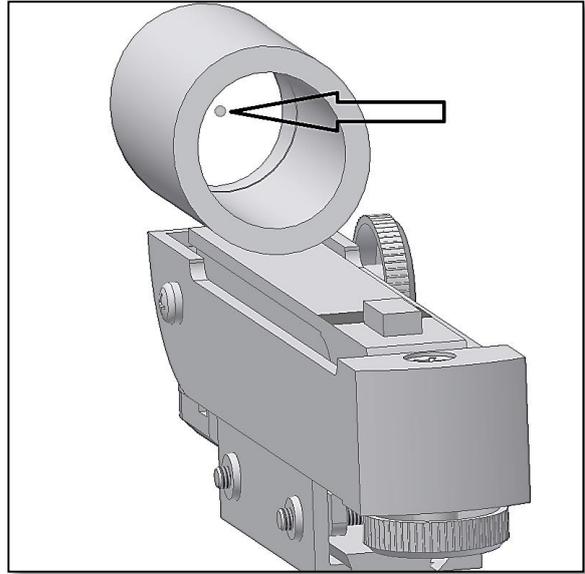


Figure 16. A red-dot is projected on the optical window.

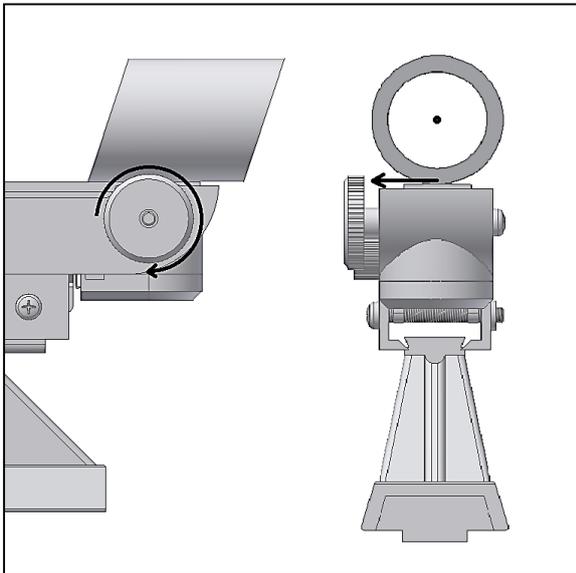


Figure 17. Turn azimuth adjustment knob to align finder.

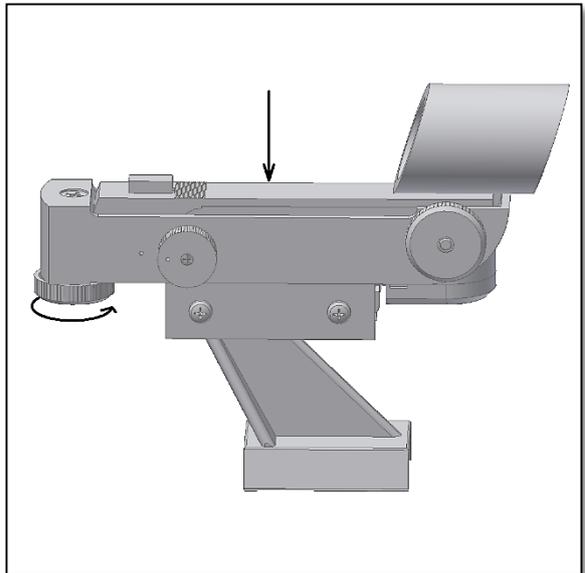


Figure 18. Turn altitude adjustment knob to align finder.

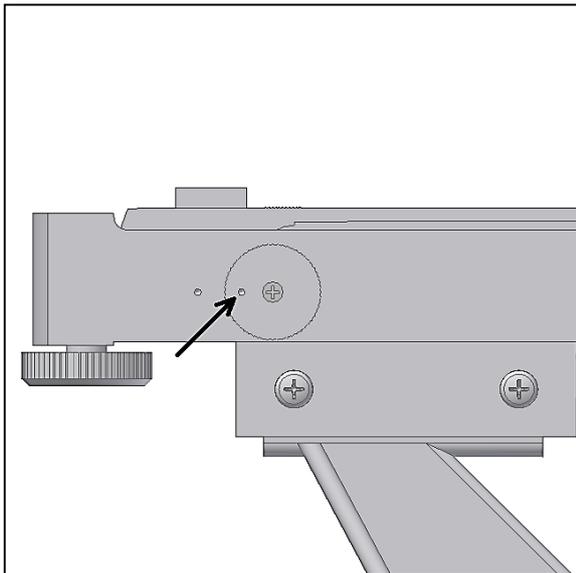


Figure 19. Turn potentiometer OFF.

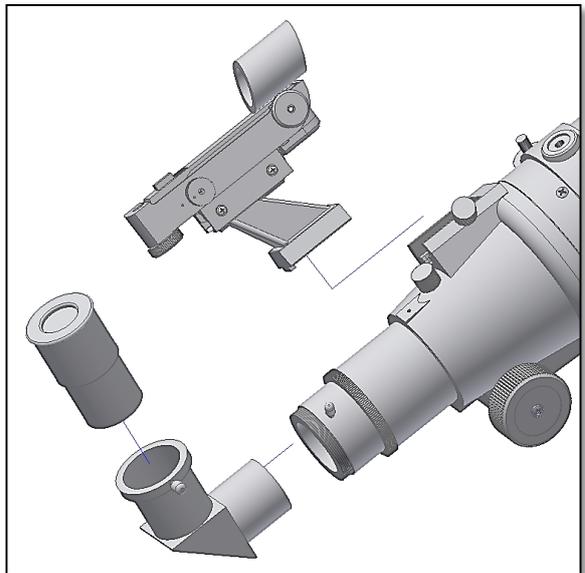


Figure 20. Insert finderscope and eyepiece in the

5.3. Aligning the Finderscope

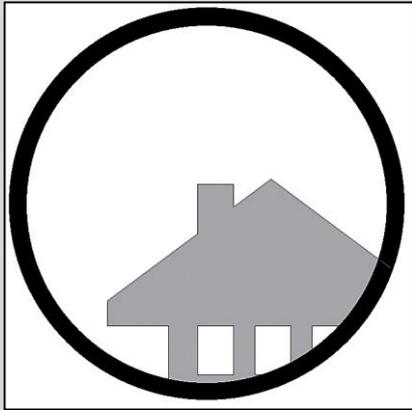


Figure 21. A distant object is centered at the telescope's field of view. In this example we have a house with a chimney. The chimney is the reference point to place at the center of the field of view. We first look through the telescope with the lowest magnification possible, so we have the widest field of view.

STEP 1

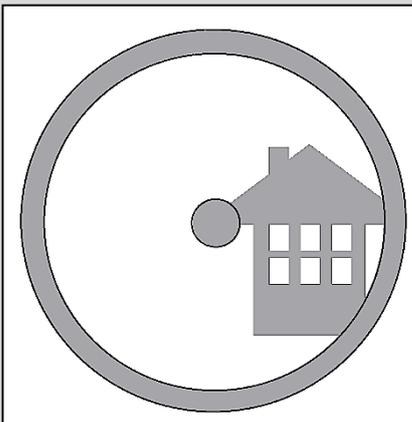


Figure 22. Looking through the finderscope (it should be powered ON) we see the same building, but in this case the red dot and chimney are not centered. We adjust the finderscope using the two altitude and azimuth knobs so that the finderscope red point moves slightly until it matches the chimney. This is enough to correct the objects position in the finderscope. Trial and error is required to get a satisfactory result.

STEP 2

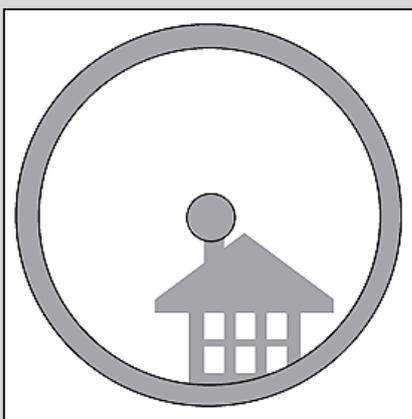


Figure 23. After playing with the two finderscope thumbscrews and some trial and error, we get the finderscope red dot close to the center (in this case the chimney). The finderscope is now ready to use!

STEP 3

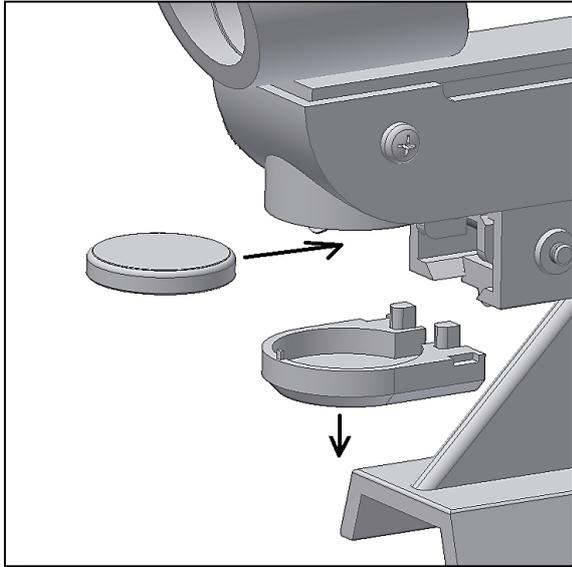


Figure 24. Remove battery.

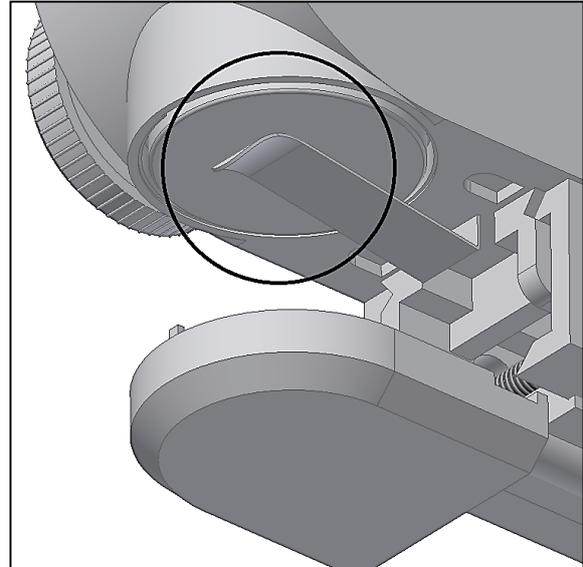


Figure 25. Place battery.

5.4. Replacing the battery. The red-dot needs to be bright enough to be seen during the observation. After some hours of use the brightness may dim until it no longer can be seen. The battery needs to be replaced. Turn the potentiometer OFF. Now remove the battery cap and the battery from battery compartment and replace by a new battery (figure 9 and 10). Make sure the battery clip has a solid contact with the batter base. Place the plastic battery cap back to protect the battery. Turn the potentiometer on and check if the red-dot is now brighter. When not in use the finderscope should always be powered OFF to prolong battery's life.

6. How to use the equatorial mount. The equatorial mount is a powerful tool for astronomical observation. The main purpose of an equatorial mount is to accurately point a telescope to a certain object. There are two axis in the equatorial mount. A R.A. axis and a Dec. axis. The telescope's tube sits on the Dec axis. Please take a look at the main parts of the equatorial mount.

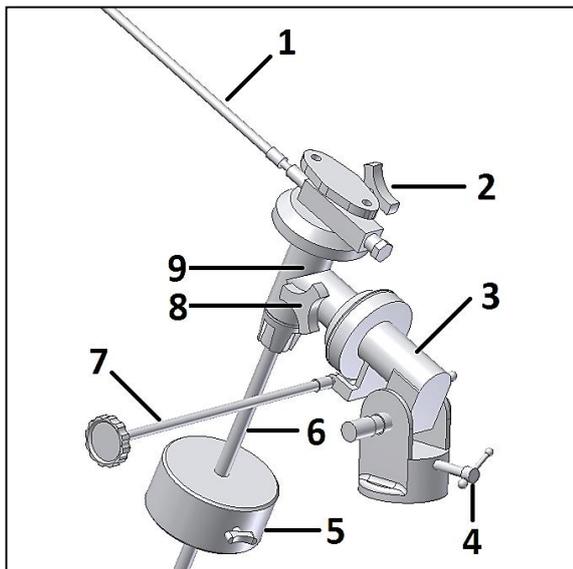


Figure 26. Mount's main features.

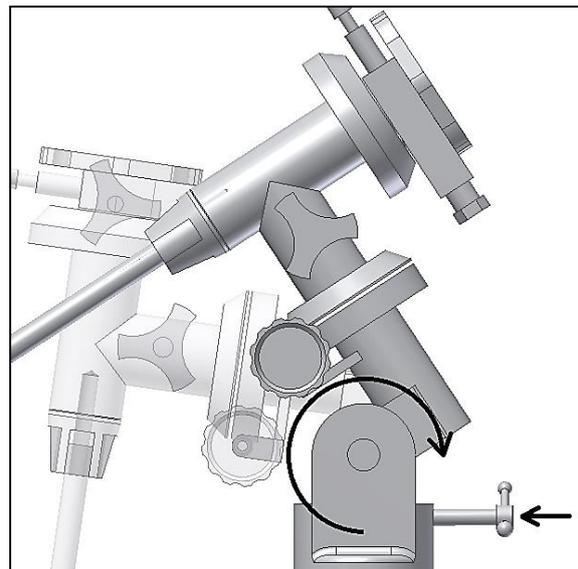


Figure 27. Adjust inclination.

Equatorial mount parts description

- | | | |
|---------------------------------|----------------------------|------------------------|
| 1- Declination Handle | 2- Declination Fixing Knob | 3- R.A. Axis |
| 4- Latitude/altitude adjustment | 5- Counterweight | 6- Counterweight shaft |
| 7- R.A. Handle | 8- R.A. Fixing Knob | 9- Dec. Axis |

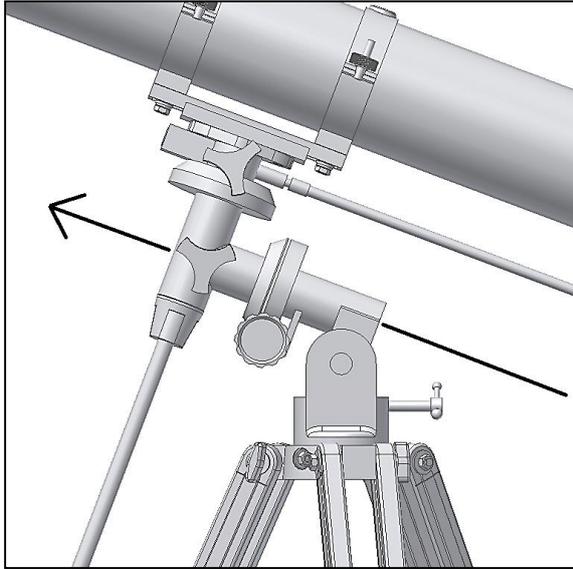


Figure 28. R.A. Axis.

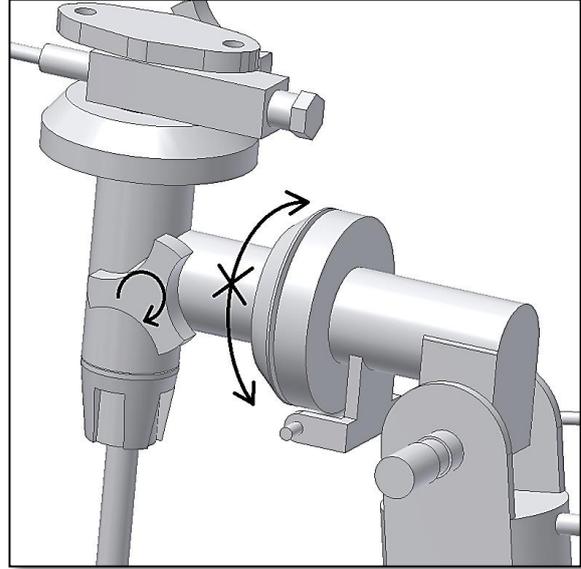


Figure 29. Locking the R.A. axis.

There are two axis in the eq. mount. One is the **R.A. (Right Ascension) axis** as shown in fig. 28. This means the telescope can rotate around this axis. The R.A. should point north to Polaris. Tracking is made using the R.A. axis. To lock the rotation the locking R.A. knob should be used (fig. 29). The second axis is the **Dec (Declination) axis** – fig. 30. To lock this axis use the Dec locking knob as shown in figure 31.

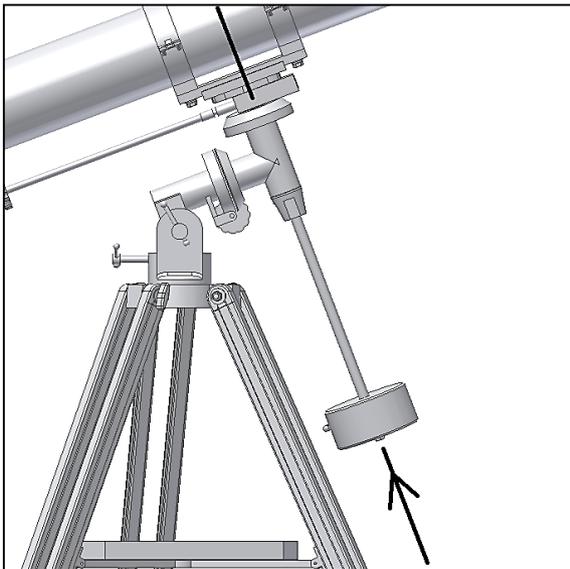


Figure 30. Dec. Axis.

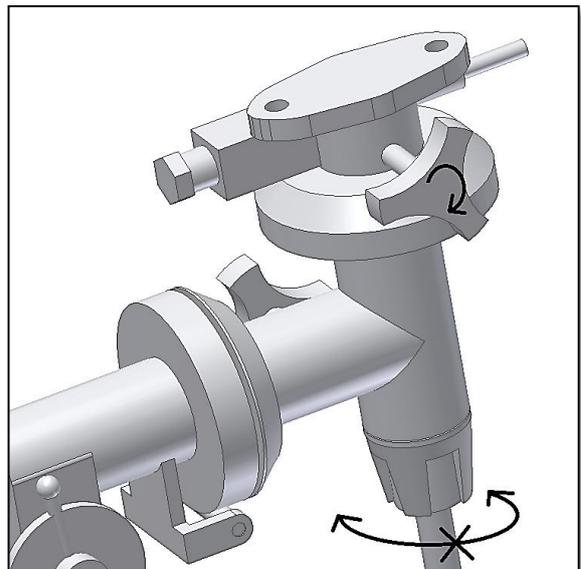


Figure 31. Locking the Dec. Axis.

6.1. What is tracking?

Star's positions rotate, slowly but surely, in the night sky. This is caused by the Earth's rotation. Every 24 hours the Earth make a complete turn. So does the night sky. This means that, when observing through a telescope, the stars will move away from the field of view after a few seconds. This is even more evident when using high power eyepieces. They go away quite easily from the field of view.

Use the Dec and R.A. handles to precise point the telescope. Make sure the axis are securely locked.

To keep a star in the centre of the field of view tracking is required. Tracking can be done manually or by a motor. Manual tracking can be done using the tow Dec and R.A. handles. They allow small

corrections to be made in each axis. However this is not the recommend procedure to track an object. The mount should be placed in station i.e. aligned in such a way that only the R.A. is required to turn to track a star. **6.2. How to set the mount in station.** Point the telescope's R.A. axis to

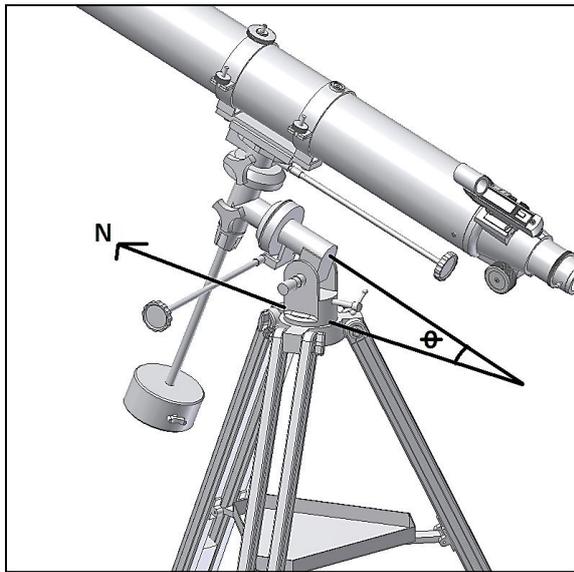


Figure 3. Mount points north.

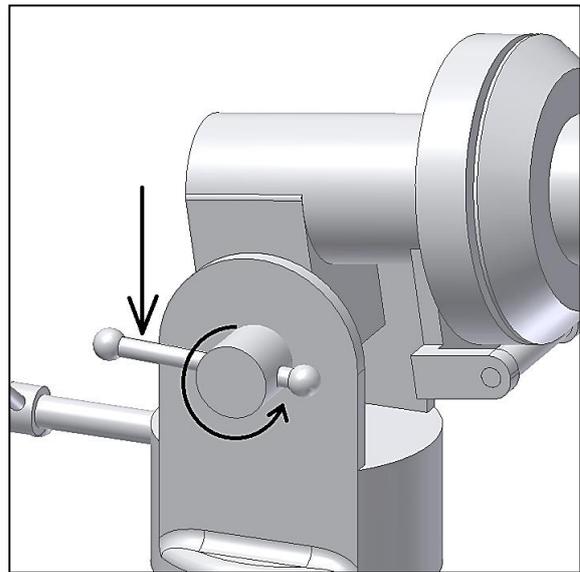


Figure 33. Release altitude break and adjust inclination.

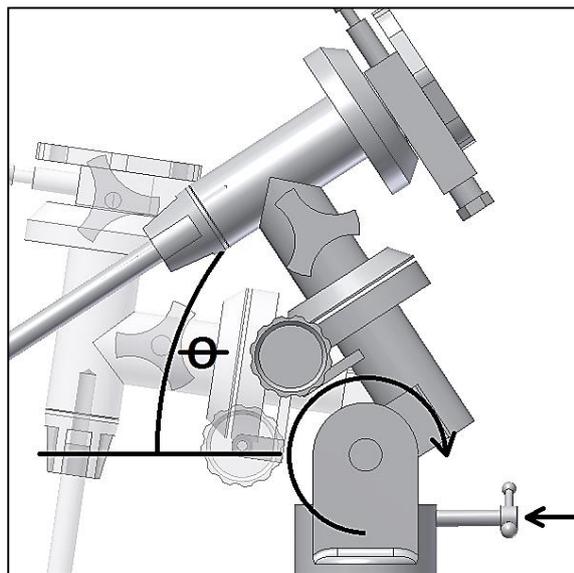


Figure 34. Adjust inclination to latitude.

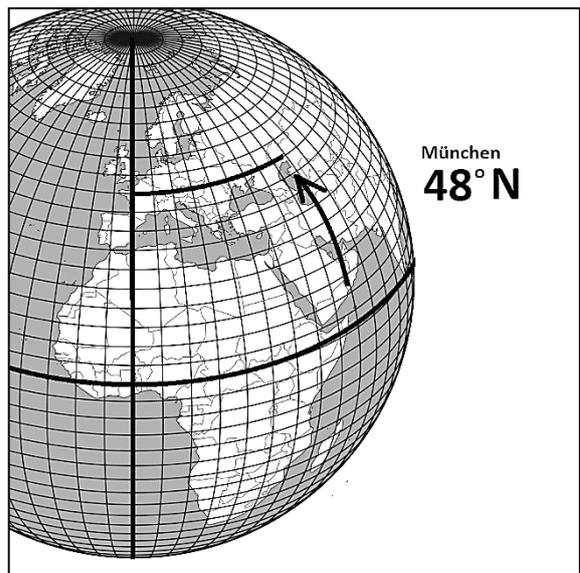


Figure 35. Check your latitude.

north. Release the altitude break figure 33 so that the R.A. inclination can be adjusted. Rotate the latitude adjustment so that the inclination of the mount is the same as the latitude of observers. For an observer in Munich the latitude is 48 degrees. The inclination angle (Θ) should be approximately 48 degrees. Make sure to re-tighten the altitude break. Now that the mount is pointing north and has the observer's location latitude your mount is set on station. This mean that the mount should not be moved during observation. The two R.A. and Dec. axis can be used to position and point the telescope to any part of the sky.

The altitude/latitude adjustment should NOT be used when observing. Continuous use can cause wear or even break the knob.

7. Using the accessories, a bit of math to understand how all it works.

Using the accessories is easy and fun. To change magnification simply swap eyepieces. To get more magnification simply use the barlow lens. But how does all of this work?

7.1. Power (magnification)

Your telescope has a focal length of 1000mm. This is approximately the distance between the telescope lens and its focal point (very similar to the distance between the focus point of a loupe and the loupe lens). This is a very important feature, that allows to determine several interesting facts such as magnification.

The magnification is determined by the telescope's focal length and the used eyepiece. You probably noticed that the two supplied eyepieces are Plössl 25mm and Plössl 10mm. This means that the Plössl 25mm is a 25mm focal length eyepiece while the Plössl 10mm is a 10mm focal length eyepiece.

To determine the magnification just divide the telescope's focal length by the eyepiece's focal length. Let's give an example for our telescope and the supplied eyepieces:

Telescope's focal length is 1000mm.
Plössl 25 eyepiece's focal length is 25mm.

$$\frac{1000mm}{25mm} = 40 \text{ power}$$

This means that the Plössl 25mm eyepiece provides a 40x power (magnification). This seems low, but when you try it, you will see a bright image with some (very good) details.

7.2. Barlow Lens

The barlow lens is a very interesting device. It is a negative lens, that multiplies the telescope's focal length. So a 2x Barlow multiplies the original focal length by 2x, in this case $1000mm \times 2 = 2000mm$.

A 3x Barlow lens multiplies by 3x.

Your telescope is supplied with a 2x Barlow lens. When used with the Plössl 25mm eyepiece you get 2x the power obtained before $40 \text{ power} \times 2x \text{ Barlow} = 80 \text{ power}$

7.3. Erecting lens (not included)

The erecting lens gets you an upright image view with the telescope. It also adds some power like the barlow lens. The Erecting Lens provides an extra 1.5x power.

7.4. Diagonal Mirror

This diverts the light coming from the telescope to an angle of 45 or 90 degrees. It is useful because it provides a more comfortable position when observing.

Here are some examples on how to use the accessories.

Some possible accessory combinations

	Terrestrial View	Moon	Deep Sky	Jupiter and Saturn
Barlow Lens 2x				Yes
Plössl 25mm Eyepiece			Yes	Yes
Plössl 6.3mm Eyepiece		Yes		
Power	<i>Does not apply</i>	<i>153x</i>	<i>40x</i>	<i>80x</i>

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8. What can be seen with this telescope?

Below you will find some examples of what you can expect to see when using this telescope.



8.1. The Moon is one of the most spectacular objects to be seen through a telescope. Even a small telescope will reveal high detail of the Moon's surface. You will be able to see the craters on the Moon's surface and other features like the Mare. The moon is a very bright object. It is better to observe it when the Moon is not full. Try the crescent Moon and look for features along the terminator (between illuminated and dark surfaces).



8.2. Jupiter is the biggest planet of our solar system. It is also one of the favorite targets for beginners. Galileo was able to discover that the four tiny dots that turn around the planet were in fact part of Jupiter's system of moons. With this telescope you will not only be able to see Jupiter's planet disc with its two major discernible bands, but also its biggest moons, Io, Europa, Ganymedes and Callisto.



8.3. The "lord of the rings" of the night skies, Saturn is by far the most popular target for small telescopes. Saturn's rings are discernible even at 60x magnification. In a very good night you will be able to see the Cassini's division (the darker band on the Saturn's rings).