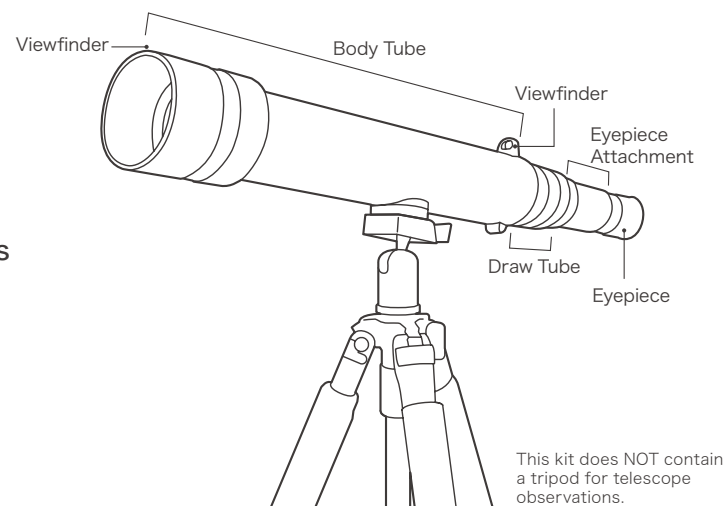


NAOJ Telescope kit

Assemble Instructions

This NAOJ Telescope kit requires some assembly. Follow these instructions to complete the telescope and observe many kinds of celestial objects.



⚠ Precautions

- This kit includes a small screwdriver, the only tool necessary for assembly.
- This kit contains several very small parts. Be careful not to drop or lose any parts.
- This kit contains optical lenses. Handle the lenses with care to avoid damaging or dirtying them. Scratches or stains on the translucent surfaces of the lenses may interfere with detailed observations.
If the surfaces do become dirty, clean them gently with a cleaner for cameras or eyeglasses in order to avoid scratching them.
- This kit does NOT contain a tripod for telescope observations. The telescope can be mounted to most still/video camera tripods.
- For your own safety and the safety of the telescope, please read the Important Notes at the end of this document before using.
- Adult supervision is strongly suggested for children when using the telescope.

Warning Indications about Product Liability

Please read this section with your parent or teacher.

⚠ WARNING

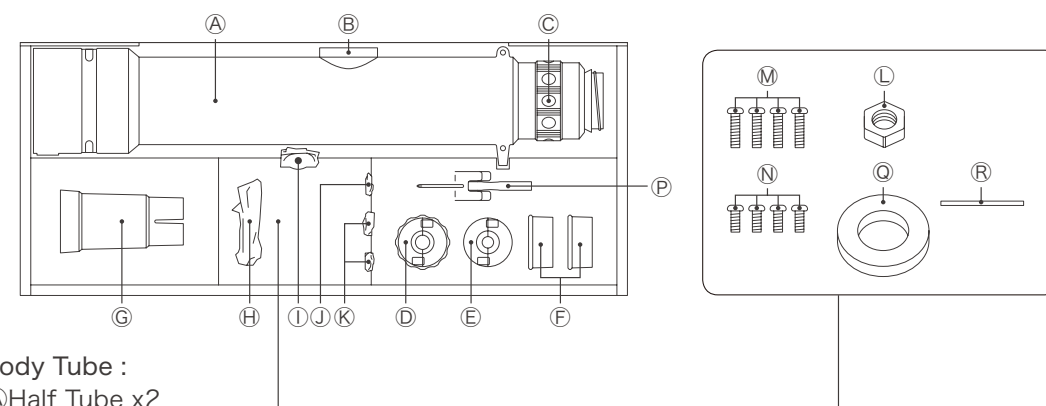
- NEVER observe the Sun with this telescope. Extremely strong sunlight can cause serious damage to your eyes, possibly inducing permanent blindness.
- Do NOT put this telescope in direct sunshine. It could accidentally focus the Sun's rays and start a fire.

⚠ NOTICE

- Do NOT walk while using this telescope. You may trip or collide with a person or object resulting in injury.
- Keep this telescope stable. If the telescope falls it may cause injury to people or damage to the telescope itself.
- Keep a close eye on children to prevent them from placing the lenses or other small parts into their mouths.
- The included screwdriver has a sharp tip. Handle with care.

List of Parts

First of all, check to see that your package contains all the necessary parts.



- **Body Tube :**
 - Ⓐ Half Tube x2
 - Ⓑ Lock Ring
- **Draw Tube :**
 - Ⓒ Half Tube x2
- **Eyepieces :**
 - Ⓓ Eyepiece (large)
 - Ⓔ Eyepiece (small)
 - Ⓕ Eye Pad x2
 - Ⓖ Eyepiece Attachment
- **Optical Parts :**
 - Ⓗ Primary Lens
 - Ⓜ Ⓜ Eyepiece Lens set (large)
 - Ⓚ Ⓚ Eyepiece Lens set (small) x2

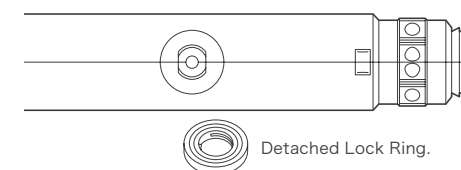
- **Assembly Tools:**
 - Ⓛ Tripod Connection Nut
 - Ⓜ Screws (long) x4
 - Ⓝ Screws (short) x4
 - Ⓟ Screwdriver
 - Ⓠ Guide Ring for camera
 - Ⓡ Luminous Sticker

Assembly Procedure 1 [Telescope Body]

1 Preparation of Tube Parts

The body parts come pre-assembled, but you will need to disassemble them to install components inside.

1. Turn the screw-type Lock RingⒷ to detach.
2. The two halves of the Body TubeⒶ and the Draw TubeⒸ should separate easily.



2 Mounting the Primary Lens

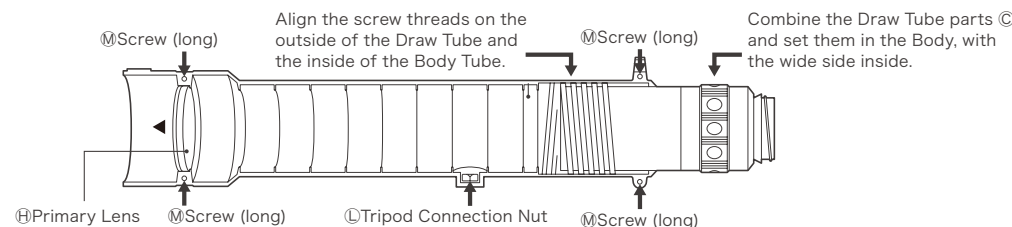
※Handle the lens with extra care so as not to scratch or dirty it.

1. First of all, determine the front side of the Primary Lens[Ⓗ].
This is actually a compound lens with two components. The thinner, more curved component is on the front side.
2. Put half of the Body Tube[Ⓐ] on the table with the inside facing up.
3. Mount the Primary Lens[Ⓗ] at the slot engraved on the inside of the hood (wider part).
Confirm the orientation of the lens.

The thinner half of the doublet lens faces forward.



■ Positions of the Primary Lens, Tripod Connection Nut, and Screws (long).



3 Mounting the Tripod Connection Nut

Place the Tripod Connection Nut[Ⓛ] into the hexagon shaped pit.

4 Assembling the Draw Tube

1. Fit the two sides of the Draw Tube[Ⓒ] together.
2. Set the assembled Draw Tube[Ⓒ] in the Body Tube[Ⓐ].
Let the grip of the Draw Tube stick out, and fit the screw threads on the outside of the Draw Tube into the threads on the inside of the Body Tube.

5 Finishing the Telescope Tube

1. Fit the left side of the Body Tube[Ⓐ] over the right half.
Take care not to let the lens or the nut shift out of position.
2. Attach the Lock Ring[Ⓓ] to the bottom of the Body Tube[Ⓐ] to join the parts.
3. Insert four screws (long)[Ⓜ] in the holes marked in the picture and tighten to hold the parts of the Body Tube[Ⓐ] firmly together.

Assembly Procedure 2 [Eyepieces]

1 Combination of Lenses

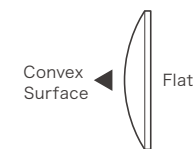
This kit contains the parts for two eyepieces.
Please check the combination of lenses and Housing parts.

- | | |
|--|---|
| ● Eyepiece (large) : Magnification 16X | ● Eyepiece (small) : Magnification 66X |
| Ⓓ Eyepiece (large) | Ⓔ Eyepiece (small) |
| ① $\phi 20\text{mm}$ Flat-Convex lens + | Ⓚ $\phi 8\text{mm}$ Convex-Convex lens (2 pieces) |
| Ⓜ $\phi 10\text{mm}$ Flat-Convex lens | The convex sides should be facing each other. |
| The convex surface of each lens should face forward. | Ⓕ Eye Pad (interchangeable) |
| Ⓕ Eye Pad (interchangeable) | |

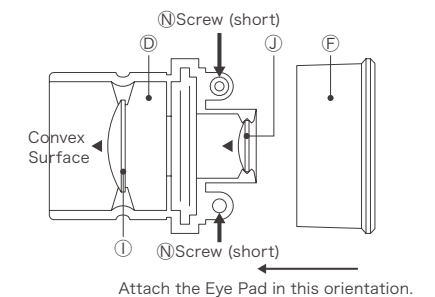
2 Assembling the Eyepieces

※Handle the lenses with extra care so as not to scratch or dirty them.

1. First, determine the sides of the lenses. Each lens has a flat side and a convex (bulged) side. If you place a lens in the wrong orientation, the telescope will not work correctly.
2. Disassemble the combined Eyepiece Housings[Ⓓ] and [Ⓔ], and mount the two lenses for each in the slots engraved inside of them. Refer to the figure carefully.
In Eyepiece[Ⓓ] (large), the convex side of both lenses faces toward the wide opening of the Housing. In Eyepiece[Ⓔ] (small), the two lenses' convex sides should face inside toward each other.
3. Fit the two sides of the eyepiece housings together.
Take care not to let the lenses shift out of position.
4. Insert two screws (short)[Ⓝ] in the holes on each eyepiece marked in the picture and tighten to hold the parts of the Eyepieces firmly together.
5. Attach the Eye Pad[Ⓕ] to the tip of each eyepiece.

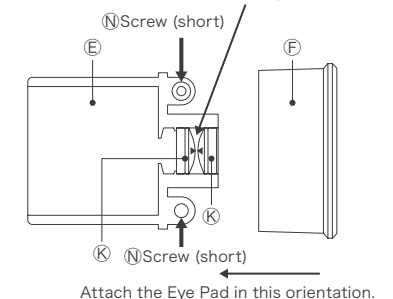


■ Eyepiece (large)



■ Eyepiece (small)

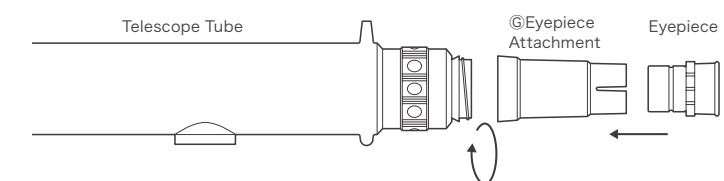
The larger curvature sides should be facing each other.



Assembly Procedure 3 [Attaching an Eyepiece to the Telescope Tube]

1 Eyepiece Attachment

Screw the Eyepiece Attachment[Ⓒ] onto the end of the Telescope Tube.
Screw in to place. (Do not over-tighten.)



2 Changing the Eyepiece

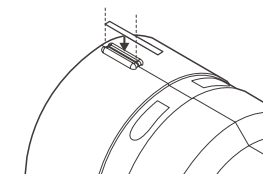
Push the Eyepiece into the Attachment[Ⓒ]. To detach, just pull it out.
This set contains two Eyepieces with different magnifications.

- Eyepiece (large) : Magnification 16X
- Eyepiece (small) : Magnification 66X

Assembly Procedure 4 [Making the Viewfinder easier to use]

The Viewfinder of this telescope consists of a "Front Sight" and a "Rear Sight". Putting a luminous sticker on the Front Sight will make it more visible in dark places.

- The "Front Sight" is the protrusion on the tip of the hood. Refer to the figure to place the reflective sticker.
- The Luminous Sticker is longer than the protrusion, so let it extend out on the near side (towards the Eyepiece).



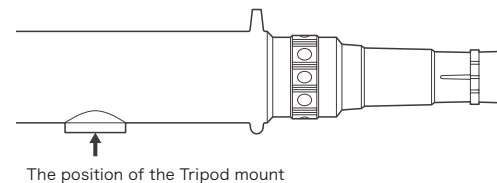
Assembly Procedure 5 [Tripod]

It is necessary to use a tripod for stable observations.

1. Use a general-purpose tripod for a still/video camera[†]. Tighten the tripod mount screw into the Tripod Connection Nut[Ⓐ] (B) on the bottom of the telescope.

[†] standard 1/4" mount screw size

2. Set the tripod on a level, solid floor. Spread the tripod legs fully apart and adjust the height to a height suitable for observation.



How to use this Telescope 1 [Focus]

You need to focus the telescope to observe objects.

Focus by adjusting the position of the Eyepiece based on the distance to the target.

1. Attach Eyepiece (large) (lower magnification) to the Telescope and point it at a distant location.

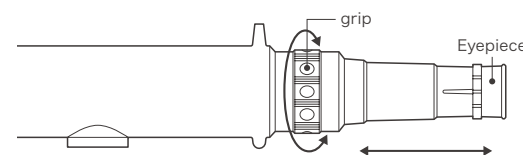
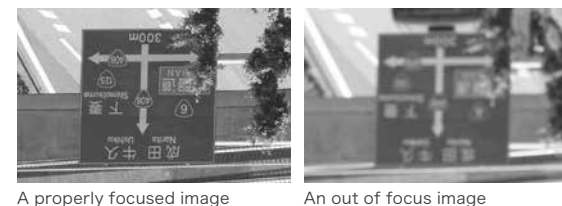
⚠ If you use this telescope outside during the daytime, be careful NOT to point the telescope near the Sun.

An image seen correctly through an astronomical telescope is inverted (rotated 180 degrees). Do not worry about this.

2. Point the telescope at a distant object, such as a sign board or a chimney, then rotate the grip of the Draw Tube until you get a sharp image. Be careful not to force the Draw Tube.

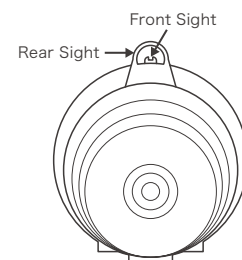
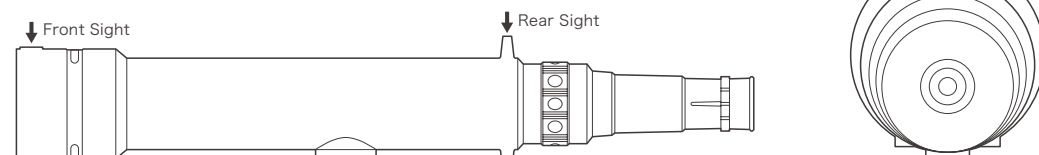
A telescope cannot focus on nearby objects. Please observe objects at least 5 meters or so away.

3. If you cannot get the right focus, even by adjusting the Draw Tube, please check if all the lenses are assembled in the correct positions and orientations.



How to use this Telescope 2 [Viewfinder]

A telescope with a high magnification has a narrow FOV so that pointing it at the target is not easy. A Viewfinder can help you aim. The Viewfinder of this telescope consists of a "Front Sight" (a protrusion on the tip of the hood) and a "Rear Sight" (a sighting ring at the back of the body tube).



1. Look into the Rear Sight ring from behind.
2. Watch the target object through the center of the Rear Sight ring, and align the Front Sight marker in-line between the Rear Sight and the target. If the luminous sticker on the Front Sight loses its glow, illuminate it with a flashlight for a while to recharge it. You should try not to look at the flashlight because it can dazzle your eyes and interfere with the observations.
3. After aligning the telescope properly with the Viewfinder, the target will appear in the FOV of the telescope.

※To master the use of the Viewfinder practice on obvious objects, such as distant buildings.

How to use this Telescope 3 [Eyepieces]

The magnification of the telescope can be changed by exchanging eyepieces[†]. The image condition changes according to the magnification.

	magnification	field-of-view	brightness
Eyepiece (large)	16X/lower	wider	brighter
Eyepiece (small)	66X/higher	narrower	dimmer

[†] The magnification value is calculated as the primary lens focal length divided by the eyepiece focal length.

Selecting the appropriate eyepiece (magnification) is important for good observations.

- When first pointing the telescope at an object, use the Eyepiece (large) with the lower magnification because its wider FOV makes it easier to find the object.
- To observe bright, compact objects in detail, the Eyepiece (small) with the higher magnification is more effective.
- In contrast, to observe faint, extended objects, the Eyepiece (large) is better because of its wider FOV and brighter image.

The detail specifications of the Eyepieces are written at the end of this document.

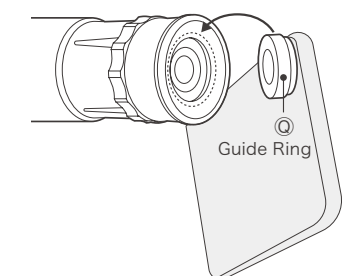
How to use this Telescope 4 [Shooting Photos]

This kit includes a guide ring for a small camera to help you shoot photos through the telescope.

1. Attach the Guide Ring[Ⓐ] to your smartphone camera or web camera with adhesive tape.
2. Fit the Guide Ring[Ⓐ] into the depression of the Eyepiece to align them. Then shoot photos.

※Depending on the object image conditions, you may need to adjust the camera settings (sensitivity, exposure, and so on.)

- When your hand trembles while holding the smartphone, it disturbs the shooting. Try to damp the trembling by resting your elbows on a stable place or folding your arms tightly to your sides.
- Functions to lock the focus and/or brightness (AE/AF lock), can be useful if available on your camera.



Let's Begin the Observation of Heavenly Bodies

⚠ Important Notes (For Safe Observations)

Above all things, you should pay attention to the safety of yourself and your surroundings.

- **NEVER observe the Sun** with this telescope. Extremely strong sunlight can cause serious damage to your eyes, possibly inducing permanent blindness. The excessive heat from observing the Sun can also damage the telescope and degrade its performance.
- Choose an observation site with a level, solid floor. Mount the telescope on a stable tripod. Pay attention to conditions that may interfere with safe observations, such as strong winds that could knock over the telescope.
- Choose an open space and keep your surrounding clear so as not to collide with other people or obstacles.
- During observations on dark evenings, stay aware of your own safety. Also pay attention so as not to cause any trouble for other people.

■ Observe the Moon!

Large and obvious, the Moon is an excellent target for beginning observers. The Moon's shape and moonrise times change every day.

First, use the Eyepiece (large) and observe at low magnification.

1. Mount the telescope on the tripod and set it up in a location where the Moon is visible. Check that the telescope is stable.
2. Adjust the tripod height for easy observations.
3. Turn the telescope roughly toward the Moon, then use the Viewfinder to fine tune the pointing.
4. Focus on the Moon by rotating the draw tube.
5. After you find the right focus, try observing different parts of the Moon.

The Moon, which does not shine by itself, is visible only because of the sunlight reflecting from its surface.

You can see this clearly when you observe the terminator between the sunlit and shadowed areas. You can also see rough terrain (craters, etc.).

After you master targeting and focusing, try observing other objects.

Acknowledgements

The NAOJ Telescope kit was developed by the National Astronomical Observatory of Japan (NAOJ) "One Family, One Telescope" project. This project aims to deliver a safe and affordable telescope for astronomy education to classrooms in Japan and around the world. This project was realized with the generous support of 272 crowdfunding supporters including Mr. Norio Sasanuma. We believe this project will realize our hopes of fostering children's interest in the Universe and inspire humanity to greater achievements through astronomy.

■ More Information about this Telescope

Besides this manual, you can find more information for setup and usage of the telescope on the internet. This manual is also available in downloadable format.

"You are GALILEO" Project
<http://kimigali.jp/index-e.html>

■ Specifications

Primary lens : Achromatic doublet / Diameter 50 mm / Focal length 399 mm

Magnification : 16X / 66X (interchangeable eyepieces)

Body length : 450 mm (490 mm at maximum extension)

Body diameter : 67 mm at the widest point (excluding protrusions)

Body Weight : 265g

Eyepiece (large) : Heugens-type, 25 mm, 16X

Eyepiece (small) : Plössl-type, 6 mm, 66X

■ Contact

National Astronomical Observatory of Japan

2-21-1 Osawa, Mitaka, Tokyo, JAPAN +81-422-34-3929

Contact address: NAOJ-TELESCOPE@prcml.mtk.nao.ac.jp

Notes