

Instruction Manual

POLE FINDER

NS-10 mk II



Kernel Hardware Engineering, Inc. Japan

[Overview]

- © This is an electronic compass that supports polar alignment of portable equatorial mounts during astronomical observation and photography.
- © Equipped with a 9-axis sensor, it allows for quick and easy setting of the equatorial mount's polar axis (towards Polaris) at the set latitude.
- © It is suitable for wide-field and constellation photography with relatively short exposure times. For long exposures and photography with long focal length lenses, highly accurate adjustments using a polar alignment scope, etc., are necessary.

[Precautions]

- © If this product is brought from a cold place, condensation may occur. If condensation occurs, please allow it to dry naturally or leave it in the same environment for a long time until the condensation disappears before use.
- © Do not operate this product in the rain, when water droplets are present, or with wet hands.
- © Please note in advance that our company shall not be held responsible for any damages or loss of profits caused by external factors such as malfunction, incorrect operation, defects, power outages of this product, or any claims from third parties.

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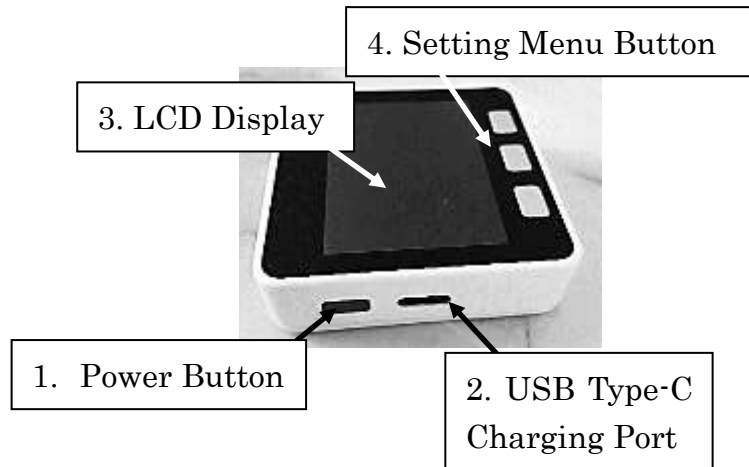
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*Please use the large and small labels on the back of the main unit, case, fixed plate, etc.

[Names and Functions of Each Part]

■ NS-10 mk II Main Unit

1. Power Button
2. USB Type-C Charging Port
3. LCD Display
4. Setting Menu Button



■ Display

1. Start Screen
2. Sensor Calibration Screen
3. Main Screen



1. Start Screen



2. Sensor Calibration Screen



3. Main Screen

1. Charging the Internal Battery

Connect the included USB Type-C cable to the USB Type-C connector on the side of the NS-10 mk II main unit. Connect the USB connector at the other end of the USB cable to a USB power adapter or portable USB battery, etc., to start charging.

When an external power source is connected via the USB cable, the display screen of the main unit will automatically switch in the order of NS-10 mk II Start Screen (several seconds) → Sensor Calibration Screen (60-second wait)

→ Main Screen, and charging will begin.

The battery charging status and remaining battery level can be checked in the lower right display of the Main Screen.

The power turns on automatically during charging, and it cannot be turned off.

[About Charging Indication and Battery Level]

You can check the charging status on the Main Screen display of the NS-10 mk II main unit.

Screen Display	Battery Status
Charging	Charging
Full Charge	Charging Complete
100%	Fully Charged
75%	Approx. 80% Remaining
50%	Approx. 50% Remaining
25%	Approx. 20% Remaining
0%	Low Battery

◎ Be sure to charge the battery when you first purchase the product or if it has not been used for a while.

◎ If the charging or full charge indication does not appear during charging, or if the main unit temperature is high, immediately stop using it and contact our company.

◎ Leaving the battery in a fully discharged state for a long period may shorten its lifespan.

◎ The internal battery is a consumable item. Deterioration will progress even if it is stored without use.

◎ As deterioration progresses, the operating time of the main unit on a full charge will shorten.

2 Turning the Power On/Off

Press the power button once.

The display will show the Start Screen (several seconds) → Sensor Calibration Screen (60-second wait) → Main Screen in this order.

Press the power button twice in quick succession to turn off the power.

3 Calibrating the Magnetic Sensor

After turning on the power and the Sensor Calibration screen appears, slowly rotate the main unit around each of the X, Y, and Z axes at least three times (time limit: 60 seconds).

Sensor Calibration is a process to calibrate the built-in geomagnetic sensor to match the surrounding environment. If there are magnetic metals or devices that generate magnetism nearby, it will not indicate the correct direction. If the magnetic field strength display on the Main Screen turns yellow or red, please move to a different location.

If you will be using the device in the same location and environment in the future, you can skip the Sensor Calibration. Press the Skip left menu button when the Sensor Calibration screen is displayed to finish the magnetic sensor calibration.

4 Calibrating the Angle Sensor

Place the main unit on a level surface.

Press the Setting right menu button on the Main Screen to display the Horizontal Calibration screen. Press the HORIZONTAL center menu button and immediately release your finger from the menu button. Also, do not touch the main unit during this calibration. "Finish" will be displayed, and the angle sensor calibration will be completed. Press the RETURN left menu button to return to the Main Screen.

Angle sensor calibration is usually sufficient to perform once after purchase. If you suspect an error in the horizontal display, perform the calibration again.

5 Adjusting the LCD Screen Brightness

Press the Setting right menu button on the Main Screen to display the LCD Brightness screen. Press the BRIGHTNESS right menu button to adjust to your desired brightness. Each press of the BRIGHTNESS right menu button will decrease the brightness setting. After reaching the lowest setting, it will return to the highest setting. Press the RETURN left menu button to return to the Main Screen.

6 Setting Magnetic Declination and Latitude

Set the magnetic declination dM and latitude Lat corresponding to your usage location. Press the dM left menu button on the Main Screen to display the dM screen. Use the UP/DOWN center and right menu buttons to set the magnetic declination of your location.

Magnetic Declination (dM) Setting

Magnetic declination is the angle of difference between magnetic north and true north. You can check the latest magnetic declination and latitude for the country. For example in Japan, the information can be seen on the Geospatial Information Authority of Japan website.

<http://maps.gsi.go.jp/>

Magnetic Declination and Latitude of Major Prefectural Capitals in Japan

Declination	dM (°)	Latitude Lat (°)
Sapporo	+9.3	+43.0
Sendai	+8.1	+38.3
Tokyo	+7.2	+35.7
Nagoya	+7.4	+35.2
Kanazawa	+8.0	+36.6
Osaka	+7.2	+34.7
Tokushima	+7.2	+34.1
Hiroshima	+7.3	+34.4
Fukuoka	+7.2	+33.6
Kagoshima	+6.4	+31.6
Okinawa	+5.0	+26.2

For example, in the United States, magnetic declination can be obtained from the NOAA website. Open the NOAA Magnetic Field Calculator:

<https://www.ngdc.noaa.gov/geomag/calculators/magcalc.shtml>

Enter the latitude and longitude of your location.

Select the current date or enter a specific date if needed.

Click the "Calculate" button to execute the calculation.

The declination value will be displayed in degrees ($^{\circ}$), indicating east (E) or west (W).

In this device, set the value using the following rule:

West declination (W): Set as a positive (+) value

East declination (E): Set as a negative (-) value

Use the UP / DOWN buttons to adjust the value.

Increase or decrease the number until the desired value is reached.

Stop pressing the buttons to complete the setting.

Examples:

San Francisco: approx. 13° (E) \rightarrow set to -13

New York: approx. 12° (W) \rightarrow set to +12

Latitude (Lat) Setting

Set the latitude of your location using the following rule:

Northern Hemisphere (N): Positive (+)

Southern Hemisphere (S): Negative (-)

Use the UP / DOWN buttons to adjust the value.

Increase or decrease the number until the desired value is reached.

Stop pressing the buttons to complete the setting.

7 Attaching the Fixed Plate

Sandwich the fixed plate between your portable equatorial mount and the tripod, and insert the tripod screw through the hole in the plate for attachment.

Choose a direction where the placement of the NS-10 mk II main unit will not interfere with the equatorial mount, etc. Adjust the fixed plate so that the top of the NS-10 mk II main unit (top of the screen) is oriented towards the polar axis of the equatorial mount, and then firmly tighten the tripod screw to secure it.

8 Polar Alignment

Turn on the power of the NS-10 mk II main unit and place it so that the front of the main unit is against the wall of the U-shaped part of the fixed plate. Adjust the tripod or fine-adjustment platform so that the two ● markers on the screen graphic overlap at the intersection of each axis. When each ● marker completely overlaps at the intersection of each axis, the POLE and PITCH display values will match the preset magnetic declination and latitude values, and the ROLL value will be 0 (horizontal).

After completing the polar alignment, turn off the power of the main unit by pressing the power button twice in quick succession.

(Caution) If the magnetic field strength display turns yellow or red, it indicates that there is a strong magnetic source near the main unit. Reset the main unit (press the power button once) and perform Sensor Calibration very close to that location. If the issue persists, change the position of the main unit.

Frequently Asked Questions

Q: Can I use it overseas?

A: The POLE FINDER NS-10 mkII supports latitudes from -10° to $+85^{\circ}$. It works perfectly across the Northern Hemisphere, but in the Southern Hemisphere, it is limited to latitudes north of 10° S.

Q: Why do readings change after each calibration?

A: ● ☹ Movement of nearby metal objects

● ☹ Operation of electronic devices

● ☹ Presence of magnetized items nearby

✳ To ensure stable readings, follow these tips:

- Turn off nearby electronic devices before use.
- Keep magnetic or metal items away from the unit.

Following these steps ensures more consistent and accurate measurements.

Q: Any tips for best performance?

A: To achieve optimal performance, follow these steps before and during use:

- ● Fully charge the unit before use.
- ● Calibrate the magnetic sensor before use.
- ● Minimize magnetic interference from the mount.

Following these steps will help you achieve reliable polar alignment every time.

Q: How accurate is the POLE FINDER NS-10 mkII?

A: Verified using an equatorial mount equipped with a polar scope (Kenko Tokina's SkyMemo S). The alignment error was within $\pm 0.3^\circ$ (verified through expert testing).

When using a 50mm lens, no noticeable drift was observed during a 5-minute exposure (verified through user testing).

However, for long-exposure or long-focal-length photography, we recommend fine-tuning polar alignment using a polar scope, guide scope, or main telescope after the initial alignment with the NS-10 mkII to achieve higher precision.

Q: What is the battery capacity?

A: Due to its compact design, the built-in battery has a limited capacity. A full charge provides approximately 30 minutes of continuous operation.

Note on Power-Off Mode: Even when the power is turned off, a small amount of standby current is still consumed. The battery may gradually discharge over time, so please fully recharge it before each use.

Note on Cold Weather Use: Battery performance may decrease in cold environments, such as during winter nights. If you plan to use the unit multiple times in one night, we recommend keeping a portable power bank on hand.

However, do not perform polar alignment while charging. The charging current may affect the magnetic sensor and reduce measurement accuracy.

Q: Can it be used with equatorial mounts other than portable ones?

A: The POLE FINDER NS-10 mkII is not limited to portable equatorial mounts. It can also be used with standard-sized equatorial mounts without any issues. However, please confirm in advance whether the included Fixed plate is compatible with your equipment.

Q: About the compatibility of the Fixed plate

A: The included Fixed plate may not fit certain equatorial mounts, especially those other than specific portable types. However, as long as the device can be installed so that its main body is roughly parallel (or perpendicular) to the mount's rotation axis, it will perform properly.

When necessary, you may secure the device using double-sided tape or other creative methods.

Depending on the type of mount or base, additional adjustments may be required. Please consider the following methods:

- Attach a rubber sheet to the plate for improved grip.
- Drill additional holes in the plate if needed.
- Create a custom Fixed plate suited to your setup.

If there is an offset or tilt between the mount and plate surfaces, you can compensate in the following ways:

- Adjust the latitude setting accordingly (for example, if the mount is tilted 30° in a region with latitude 35° , set $35 - 30 = 5^\circ$).
- Modify the plate to correct the tilt.

With these methods, you can achieve stable installation and maintain accurate alignment performance.

[Specifications]

Product Name	POLE FINDER NS-10 mk II
Azimuth Range	-45° to +45°
Latitude Range	-10° to 85°
Horizontal Range	-10° to +10°
Display LCD	320 x 240 Color TFT LCD
Internal Battery	3.7 V / 150 mAh
Operation Time	Approx. 1 hour (full-charge, min. brightness)
Charging Power Input	5V~5.5 V / 500 mA (via USB Type-C)
Operating Temperature	5°C to 35°C
Operating Humidity	20% to 80% (no condensation)
Storage Temperature	-10°C to 50°C
Storage Humidity	10% to 90% (no condensation)
Dimensions	Main Unit: 54×54×15mm Fixed Plate: 80×180×1.5 mm
Weight	Main Unit: 35 g, Fixed Plate: 55g
Warranty Period	1 year from the date of purchase (excluding battery degradation)

Kernel Hardware Engineering, Inc.

Address: 2-51 Oaki-cho, Nakamura-ku, Nagoya City, 453-0042 Japan

Phone: +81-52-300-8742

URL: <https://www.khe.jp/>