T20Pro GNSS RECEIVER USER GUIDE

V1.0

TokNav Information Technology Co., Ltd.

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Certificate

This product has been tested and found to comply with European Council Directive 2014/53/EU, thereby satisfying the requirements for CE Marking and sale within the European Economic Area (EEA).

FCC warning:

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Any Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

-Reorient or relocate the receiving antenna.

-Increase the separation between the equipment and receiver.

-Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.

-Consult the dealer or an experienced radio/TV technician for help.

Revision History

Revised Edition	Revision History	Date
V1.0	Initial Release	2023-06-02

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Ⅰ. Before You Start

Dear customers,

Thank you for purchasing our device. Before you start, please carefully read the following:

1. This user guide is for your device only. If the actual situation does not match with the situation in the user guide, the actual situation shall prevail.

2. For safety and instructions on how to use this device, please carefully read the precautions, exemptions from responsibility and instructions in the user guide.

3. The information in this user guide is subject to change without notice. We reserve the right to change or improve the device as well the content in the user guide without further notification.

1.1 Precautions for Safe Operation

For the safety of your products, operators and others, please read this part carefully before using your product.

Precautions can be divided into the following levels according to the degree of loss or injury under negligence or negligence circumstances:

Warning: Precautions requiring special attention. Ignoring this indication may result in death or serious injury to the operator.

Caution: Precautions mainly for informing, such as supplementary instructions and using limitations. Ignoring this indication may result in personal injury or property damage.

1.1.1 Warning

1. Do not disassemble and open the device by yourself. Only TokNav Information Technology authorized distributors can disassemble or rebuild the device.

2. Please do not cover the charger when charging.

3. Please do not use a wet charger, defective power cable, socket or plug, or any power cable not recommended by TokNav Information Technology. Using such cables may result in fire or electric shock.

4. Keep the device away from burning gas or liquid, and avoid placing it in an open flame or high-temperature environment. This may cause an explosion..

5. Avoid short-circuiting the battery to prevent the risk of fire..

6. To prevent potential performance degradation, avoid severe electrostatic discharge, which may lead to issues like automatic opening/closing.

1.1.2 Caution

1. Please fix the device firmly on the pole.

2. To avoid accidental damage, use only original accessories. Using non-original accessories may result in device damage.

3. When transporting, please try to reduce the vibration of the equipment.

4. Do not touch the device with wet hands. Otherwise, electric shock may occur.

5. Please do not stand or sit on the carrying case, and avoid turning it over, as it may cause damage to the device.

1.2 Exemption from Liability

You should follow all operating instructions and periodically check the performance of this equipment.

We disclaim all liability for any damages and lost profits caused by:

1. False or Intentional Use or Misuse.

2. Any irresistible natural disasters, such as earthquakes, storms, floods, etc.

3. Data change, data loss, business interruption, etc.

4. Delivery errors.

5. Use non-original accessories.

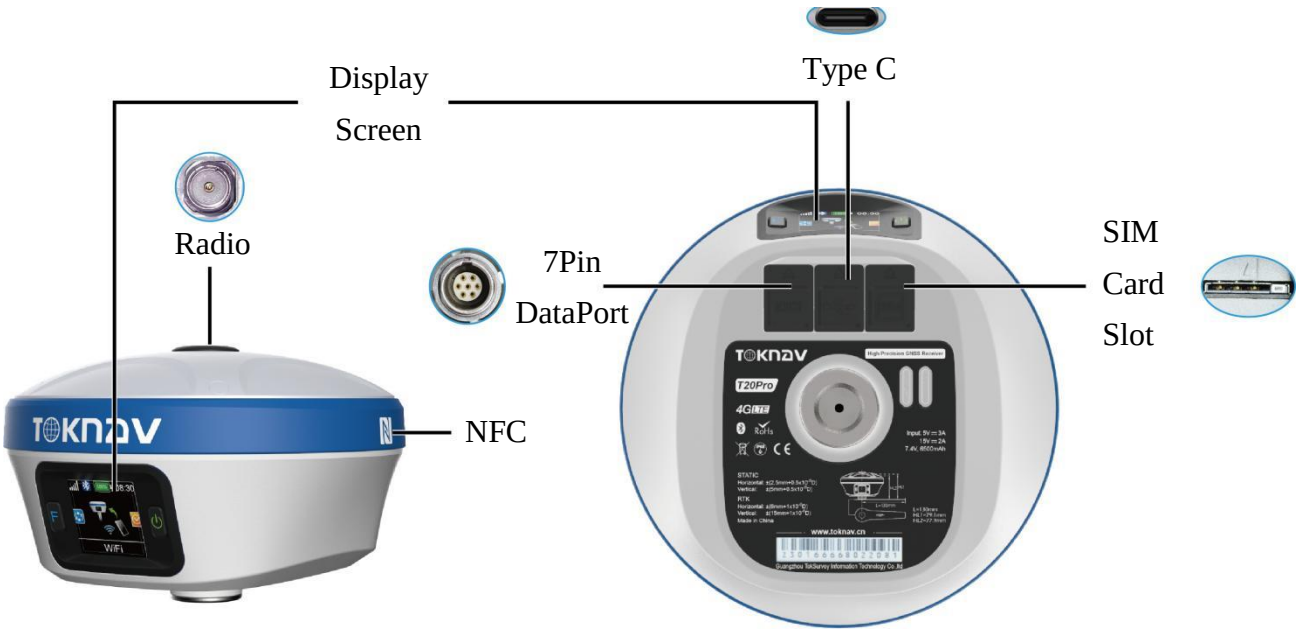
6. Operations not described in the user guide.

Ⅱ. T20Pro At a Glance

The body of the T20Pro is designed with magnesium alloy material, which is durable and has better heat dissipation effect, and weighs only 900g. It supports IP68 dustproof and waterproof, and can work continuously for 20 hours when fully charged.

2.1 Appearance

The main body of T20Pro is as follows:

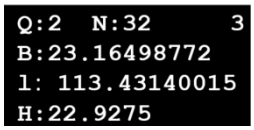


Projects	Function	Role or Status
	1.Battery level broadcast 2.On/Off Key 3.Configure confirmation	Short press to broadcast power; Long press to turn on/off; Short press to confirm the configuration item in configuration mode.
	Setting, next, back	After booting: Short press to broadcast working status Long press to enter configuration mode In configuration mode: Short press to switch configuration items Long press to cancel the configuration

	Network status	The mobile network is not turned on.
	Network status	The mobile network online.
	Bluetooth status	when Bluetooth is not connected.
	Bluetooth status	when Bluetooth is connected.
	Battery information	The remaining battery of the device.
	Battery information	The device battery is charging.
	Local time	UTC+Zone
	7Pin DataPort	RS232 serial port, baud rate support 1200, 2400, 4800, 9600, 19200, 38400, 115200 and 230400bps.
	Type C charging port	Supports up to 18W PD fast charging, see 2.5.
	SIM Card Slot	Support for the whole Netcom, see 2.4 for operation.
	Radio	Low power: 1W High power: 5W

2.2 Display Screen

The screen switches to display the current mode, data link and positioning status information of the device in 5 seconds.

Display Screen	Display information	Details
	Mode	Rover/Base/Static
	Data link	Bluetooth/Built-in Network/Built-in Radio
	GNSS status	Positioning status, Number of used satellites, Latitude, Longitude, Ellipsoid height.

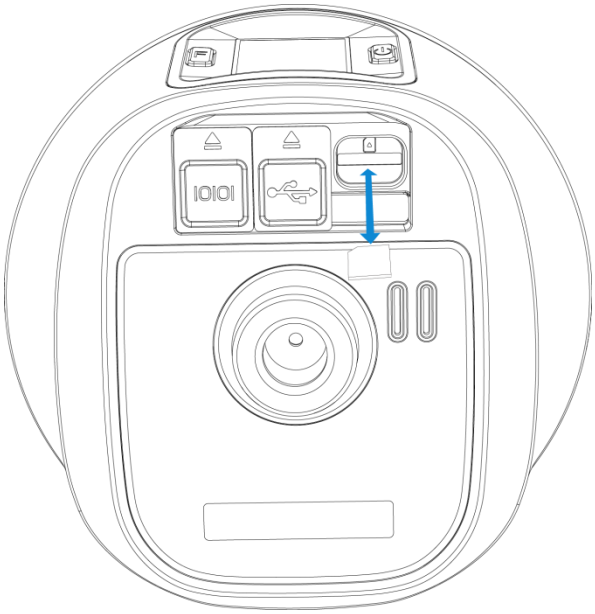
2.3 Power on And Off

Power on: Press and hold the power button for 3 seconds until the buzzer "beeps". Release the button, the device starts to power on, and the panel light flashes. The device will not start until the buzzer emits a "beep" 3 times.

Shutdown: Press and hold the power button for 3 seconds until the buzzer "beeps". Release the button and the device starts to shut down. Unit will power off until all panel lights go out.

Forced shutdown: In case of unexpected failure, press and hold the power button for 10 seconds, and the device will automatically shut down.

2.4 Insert A SIM Card



The device supports network working mode. Insert SIM card:

1. Open the rubber cover;

2. Insert the SIM card into the slot according to the instructions (with the chip facing towards the bottom center and the notch aligned with the card slot);

3. Cover the rubber sleeve.

2.5 Charge the Battery

The device is equipped with a Type-C charger that supports up to 18W PD fast charging.

It takes 4 hours to fully charge the battery:

1. Red light: The battery is charging.

2. Green indicator light: The battery is fully charged.

To charge the battery, open the type-C cover, connect one end of the data cable to the type-C interface, and the other end to the charger.

Note: For the safety of your device, please use the standard adapter in the package or a 3C-certified brand adapter to charge the host.

2.6 Install the Radio Antenna

The antenna is required when the datalink is set to internal radio.

To attach radio antenna, open the cover of UHF radio and install the radio antenna.

2.7 Packing Checklist

After the user receives and unpacks the box, please press the list in the form to check whether all accessories and equipment are present.

Num	Name	Model	Quantity	Image	Remark
1	GNSS receiver	T20Pro	1		Standard
2	450-470M radio antenna	AT0038	1		Standard
3	USB 3.0 to type-c cable	L0602-1	1		Standard
4	European 5V/2A USB power adapter (fast charging)	CG0025	1		Standard
5	Base connector	BB0031	1		Optional

6	Altimeter	BB0039	1		Optional
7	T20Pro yellow toolbox mobile station packaging		1		Optional
8	30 cm extension rod (yellow)	BBO036	1		Optional
9	Thin hand (5 inches) - with touch pen	DP0031	1		Optional
10	Book shelf	BB0037	1		Optional
11	7-pin to USB and serial ports	L0609-15	1		Optional

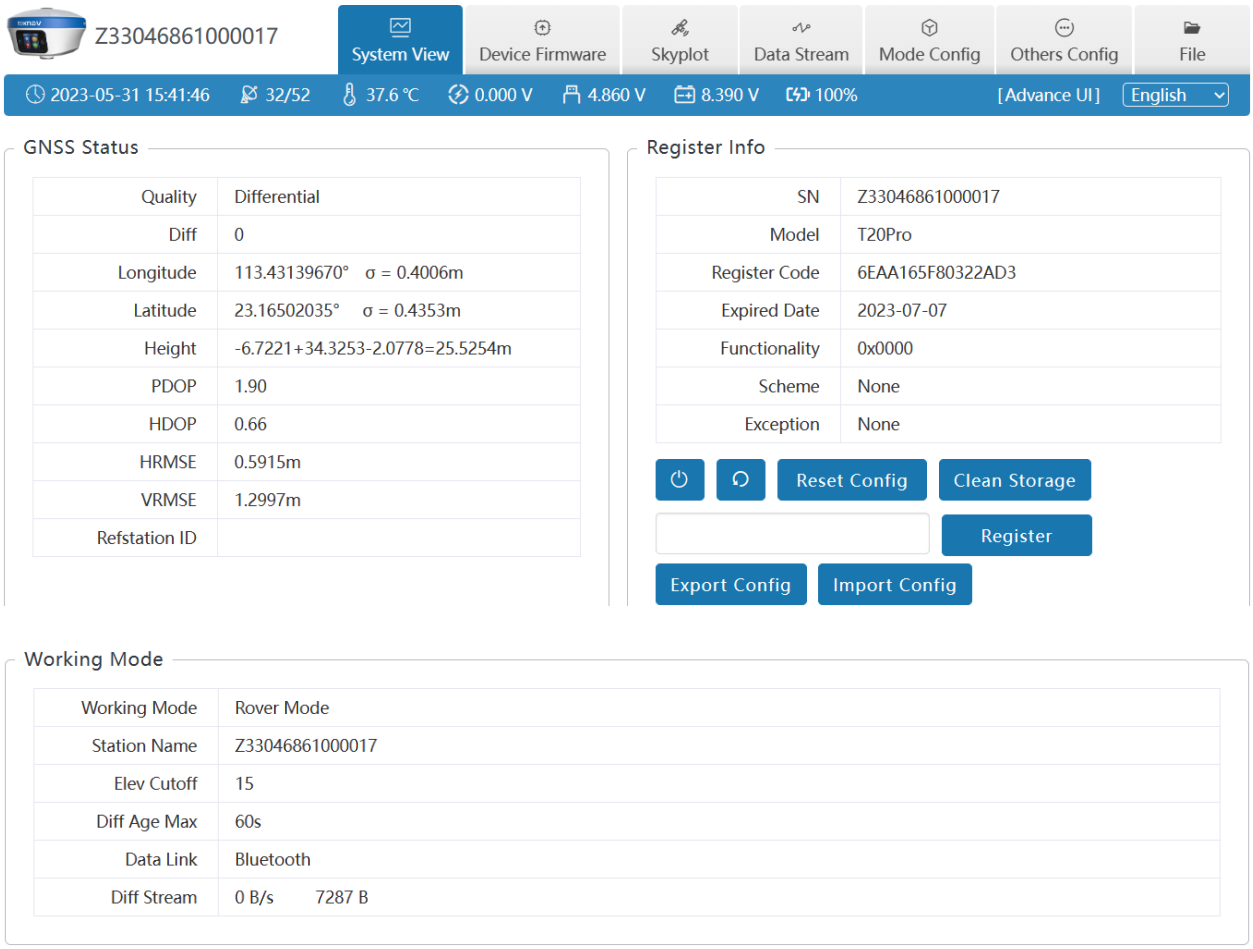
Ⅲ. Web UI

The device WIFI can be used as a hotspot, allowing connection from a PC, smartphone, or tablet. Once connected, you can manage the working status, change the working mode, configure basic settings, download raw data, update firmware and register devices, etc.

Take the interface of your PC as an example, enter the Web UI, and perform the following operations:

1. Use the computer to find the WIFI hotspot of the device. The hotspot name is the device's serial number, and the default password is empty.

2. Open a web browser and enter the IP address 10.10.10.10. The following interface displays:



Meaning of icons arranged horizontally above the interface:

39/42	39.3 ℃	0.042 V	5.326 V	4.271 V	100%
Satellite Used/Tracked	Temperature	External Voltage	Supply Voltage	Battery Voltage	Battery Info

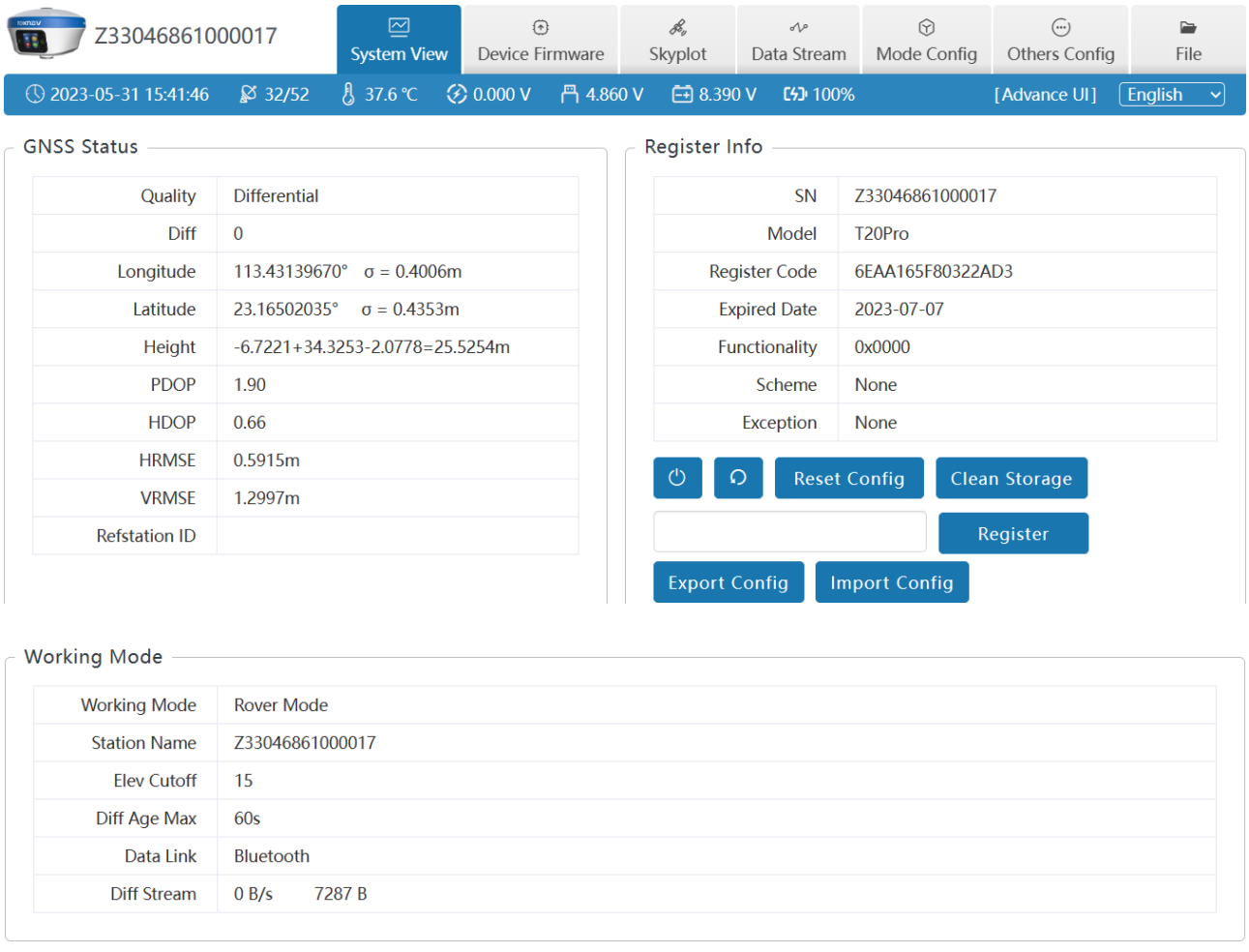
3.1 System View

① **GNSS Status:** Quality, Latitude, Longitude, Height, Satellite, Ref station ID;

② **Register Info:** SN, Expired Date, Scheme, Exception;

The registration code is a valid time code that authorizes the location function of the device. When it is found that the registration code has expired and the device positioning function is unavailable, we can obtain a new registration code from the supplier by providing the device SN, and enter it on this page and click [Register] to register.

③ **Working Mode:** Working Mode, Elev Cutoff, Data Link.



3.2 Device Firmware

① **Device Info:** SN, Hardware, GNSS Type, GNSS Hardware;

② **System Version:** System, GNSS Firmware, INS Firmware, Firmware.

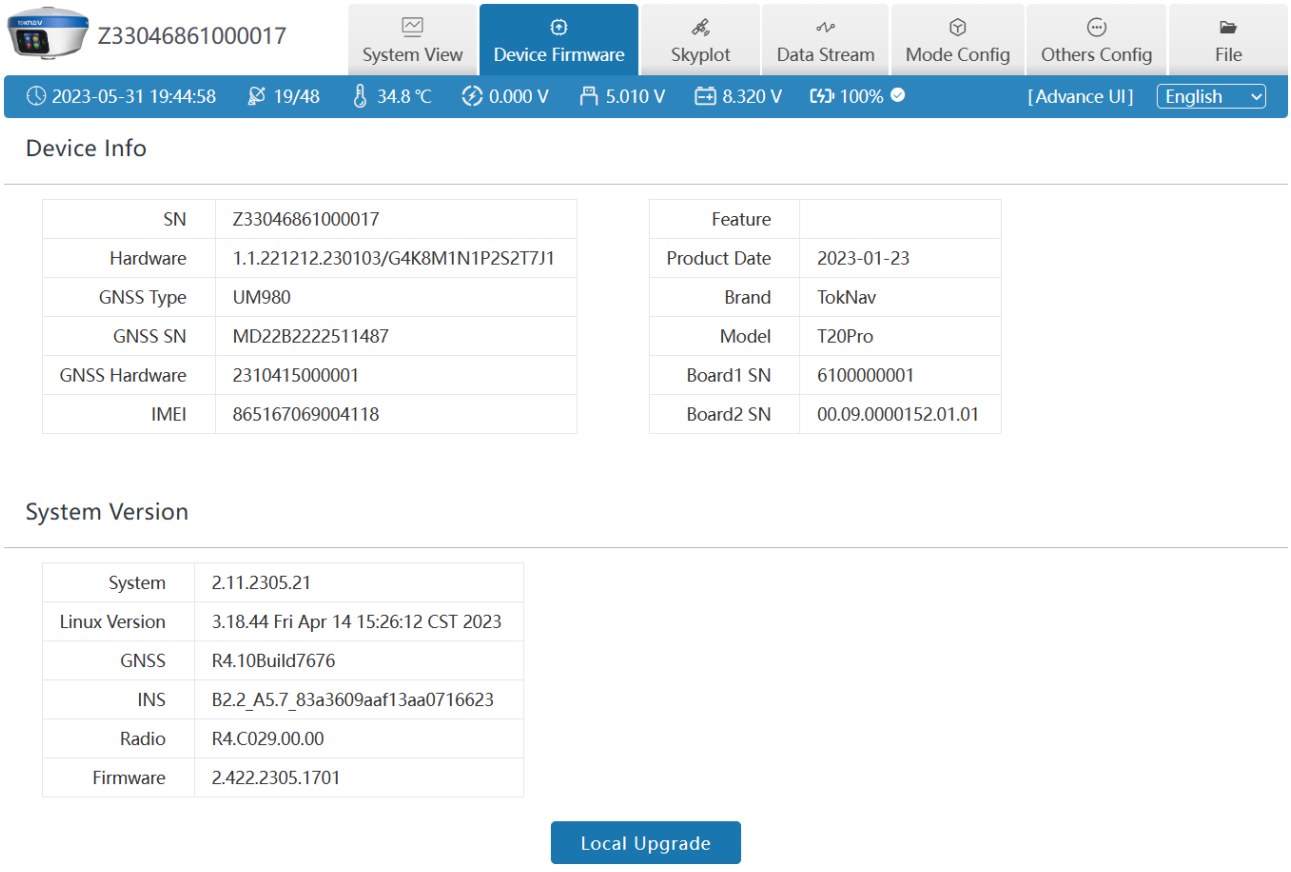
Click Upgrade Firmware below to automatically identify and upgrade the positioning board firmware, tilt module firmware, and device firmware. There will be a prompt below during the upgrade process, and the device will restart after the upgrade is complete. The operation steps are as follows:

1. Click [Upgrade Firmware];

2. Select the correct device firmware in the pop-up window, flash the firmware and wait for the device to restart;

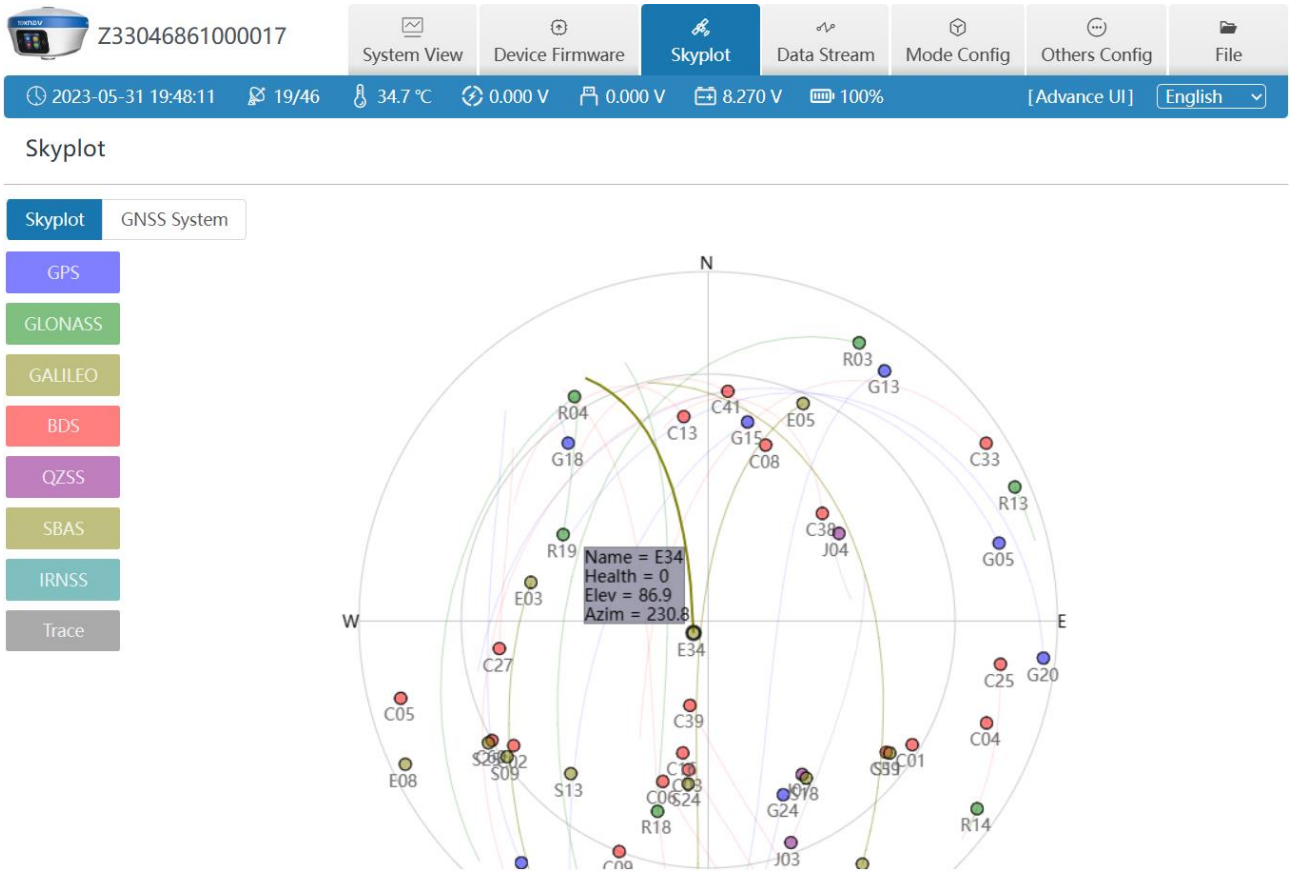
3. After the restart is complete, the firmware upgrade is finished;

4. Reconnect the device WiFi, enter the WebUI, and check whether the firmware has been upgraded successfully.



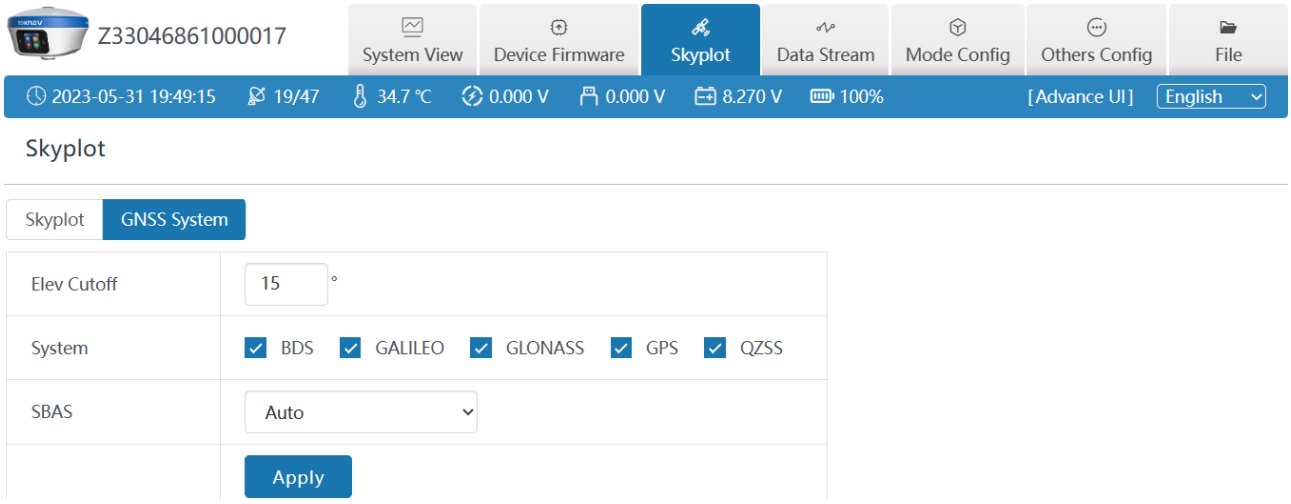
3.3 Skyplot

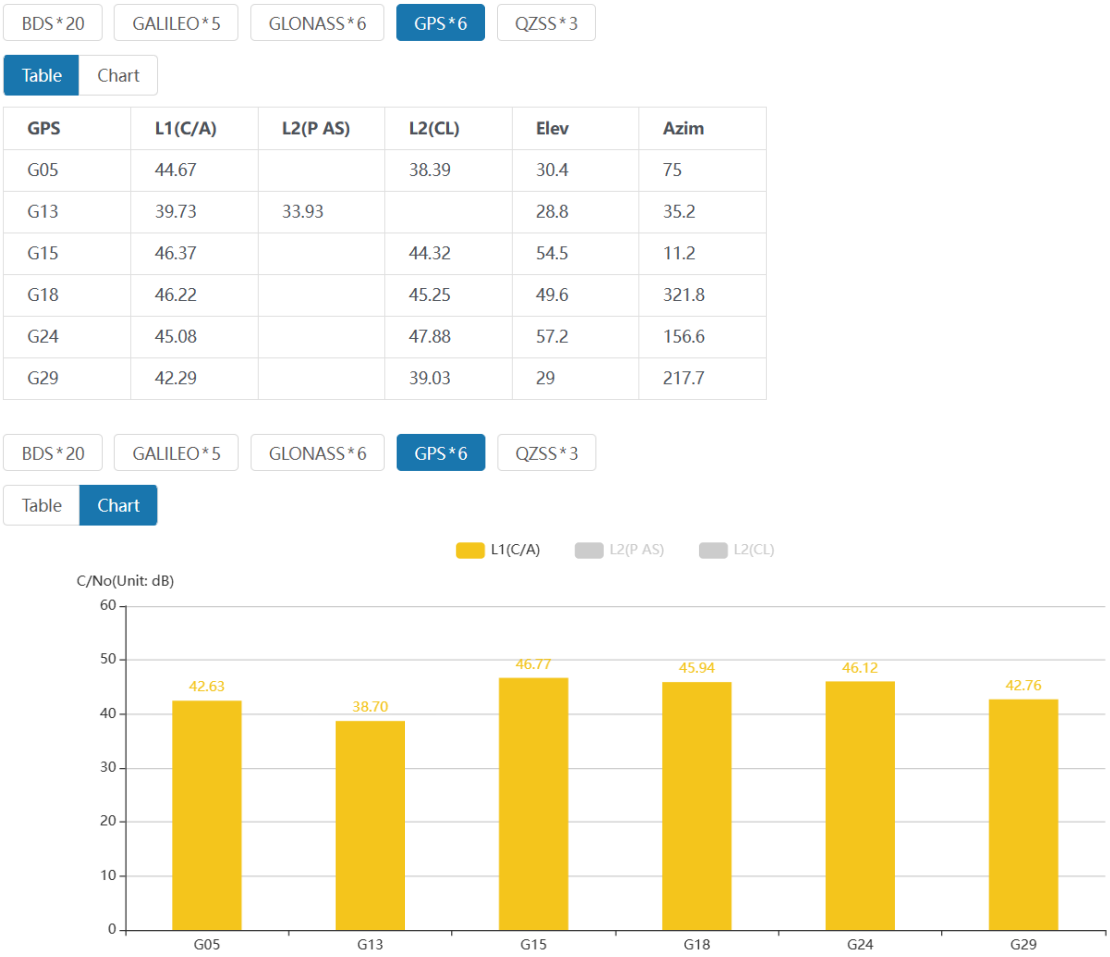
① **Skyplot:** Trace, Name, Health, Elev, Azim;



② **GNSS System:** Elev Cutoff, System, Table, Chart.

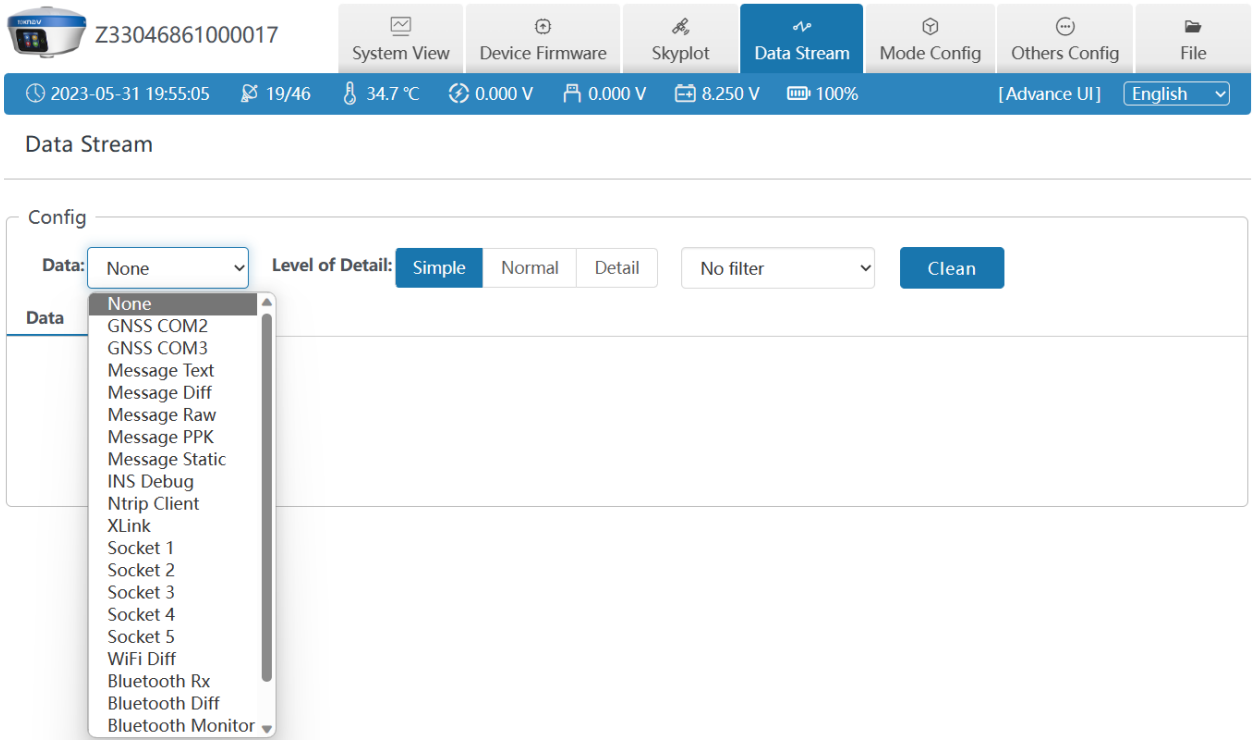
If it is found that the device receives fewer satellites under normal environment, you can enter this page to check whether all satellite systems have been turned on.





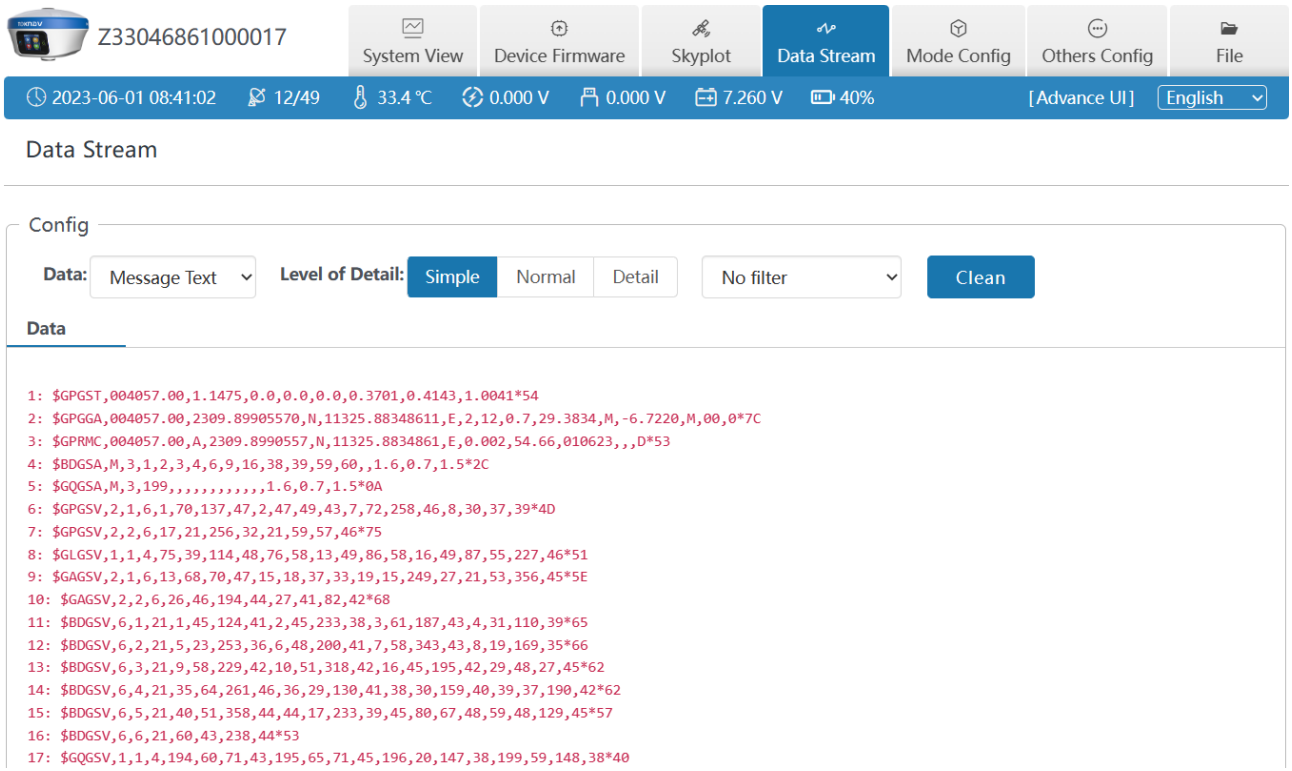
3.4 Data Stream

The data stream is mainly used to debug data information; you can view the current data status, as shown in the following below:

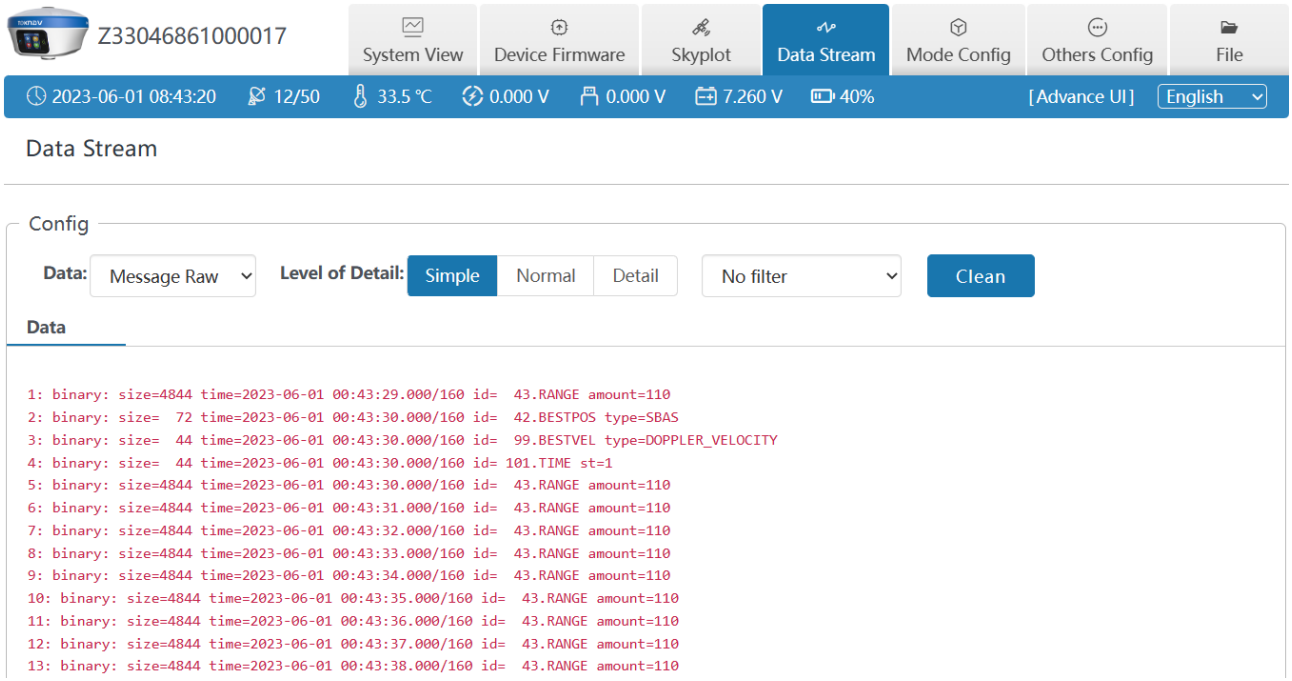


For example:

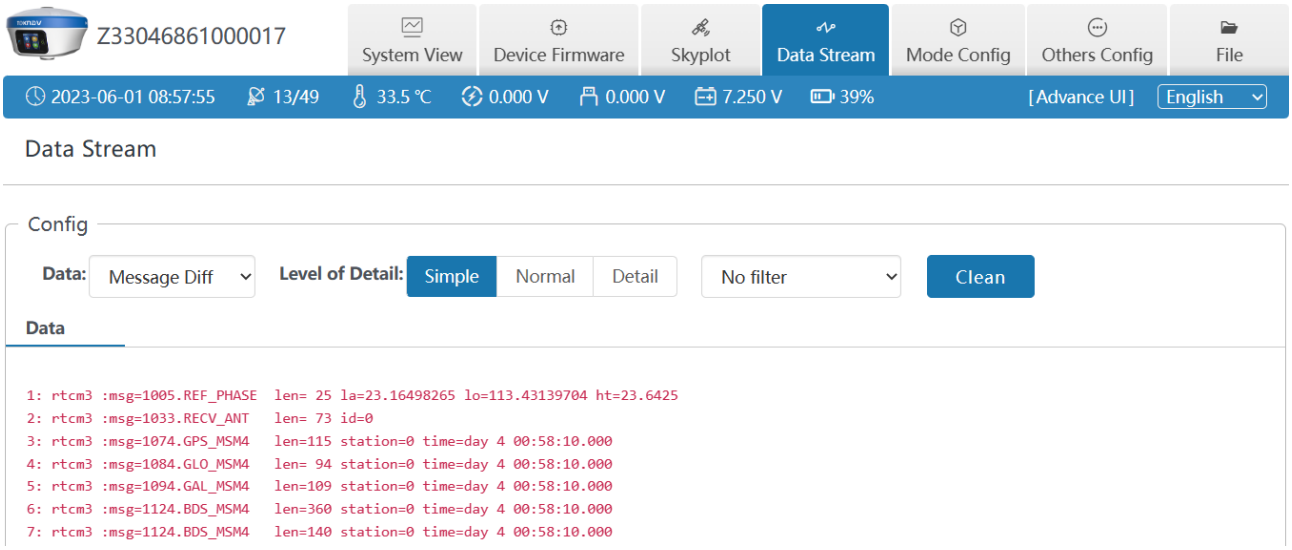
1. Message Text: see 3.9 in this section for the configuration of text data.



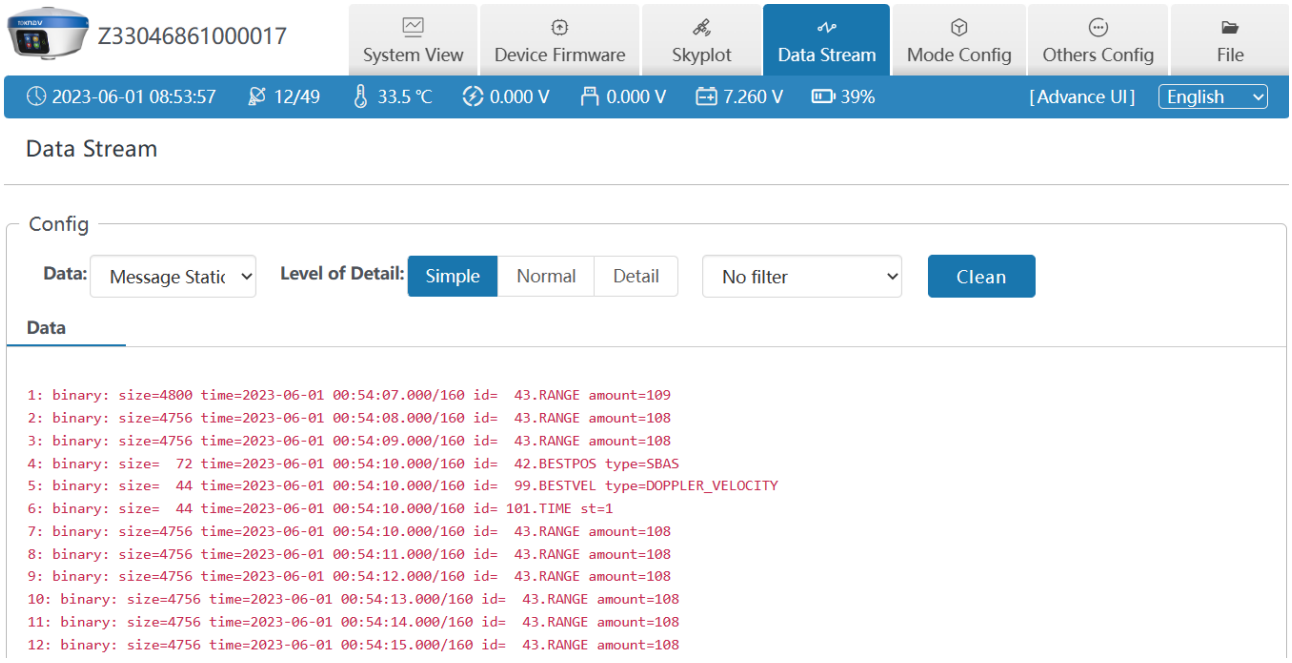
2. Message Raw



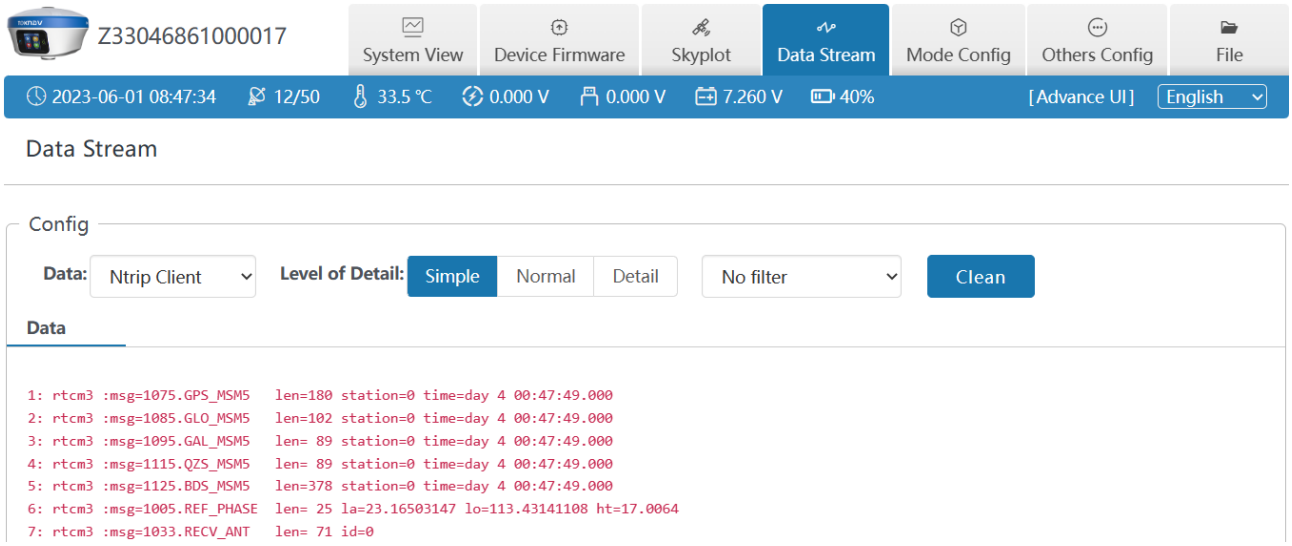
3. Message Diff: when the device is the base station, you can check whether there is differential data output here.



4. Message Static: When the device is static mode, you can check whether there is static data output here.



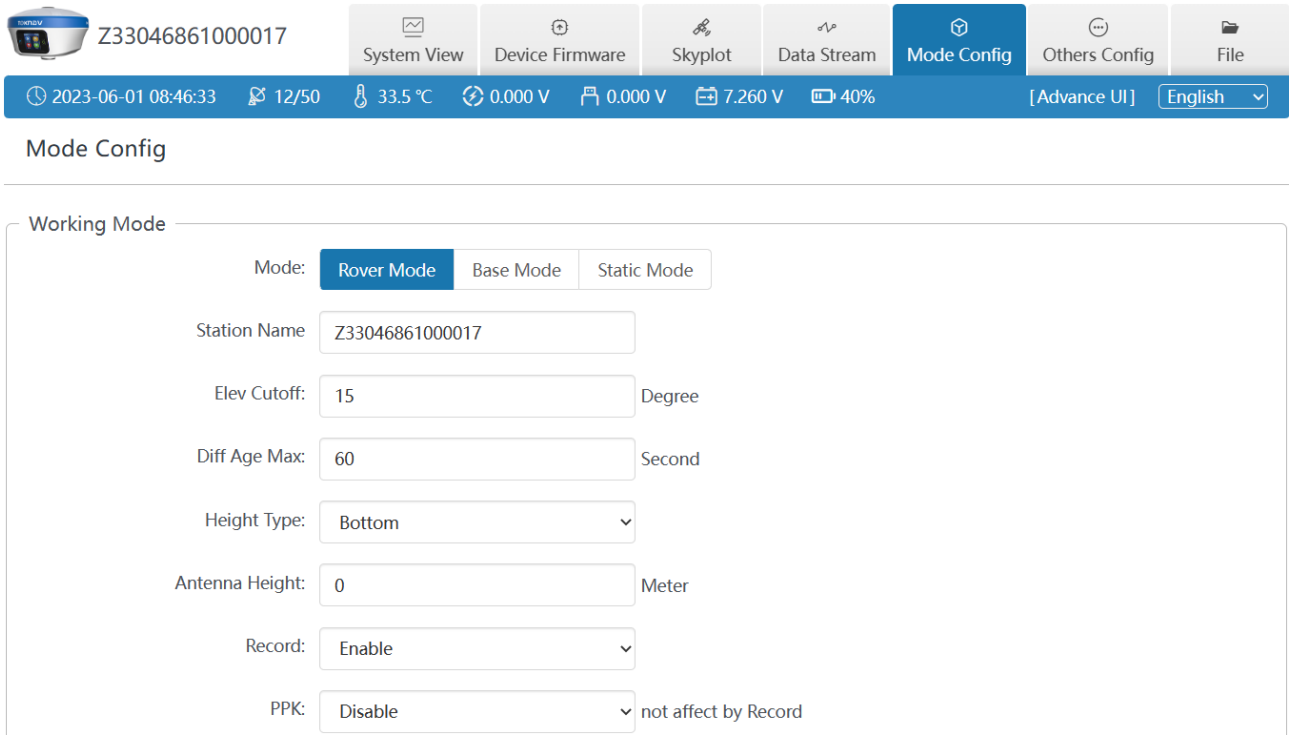
5. Ntrip Client: When the device is set as a rover station and uses Ntrip Client to obtain differential data, you can check whether there is differential data output here



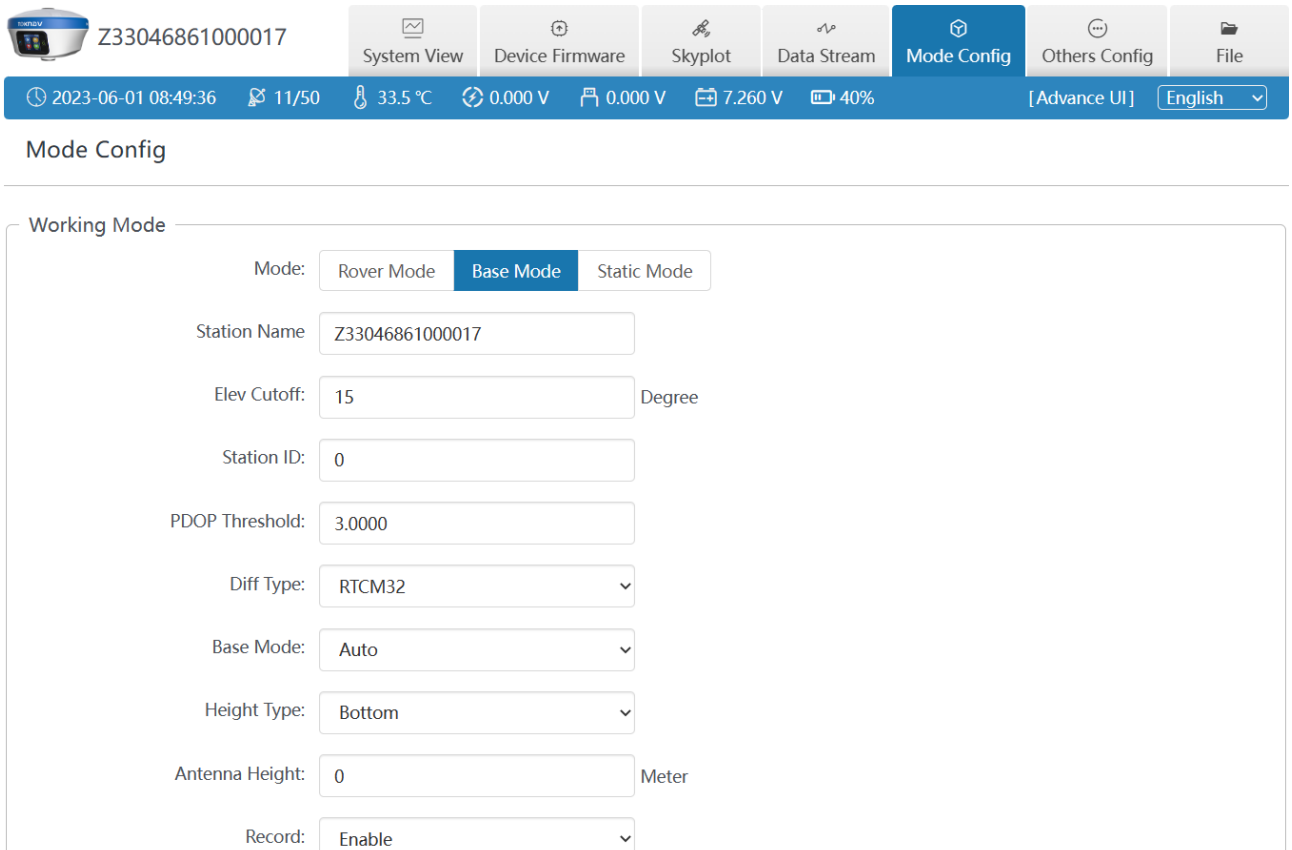
3.5 Mode Config

① **Working Mode:** You can choose Rover Mode/ Base Mode/ Static Mode, and select the Elev Cutoff at the same time;

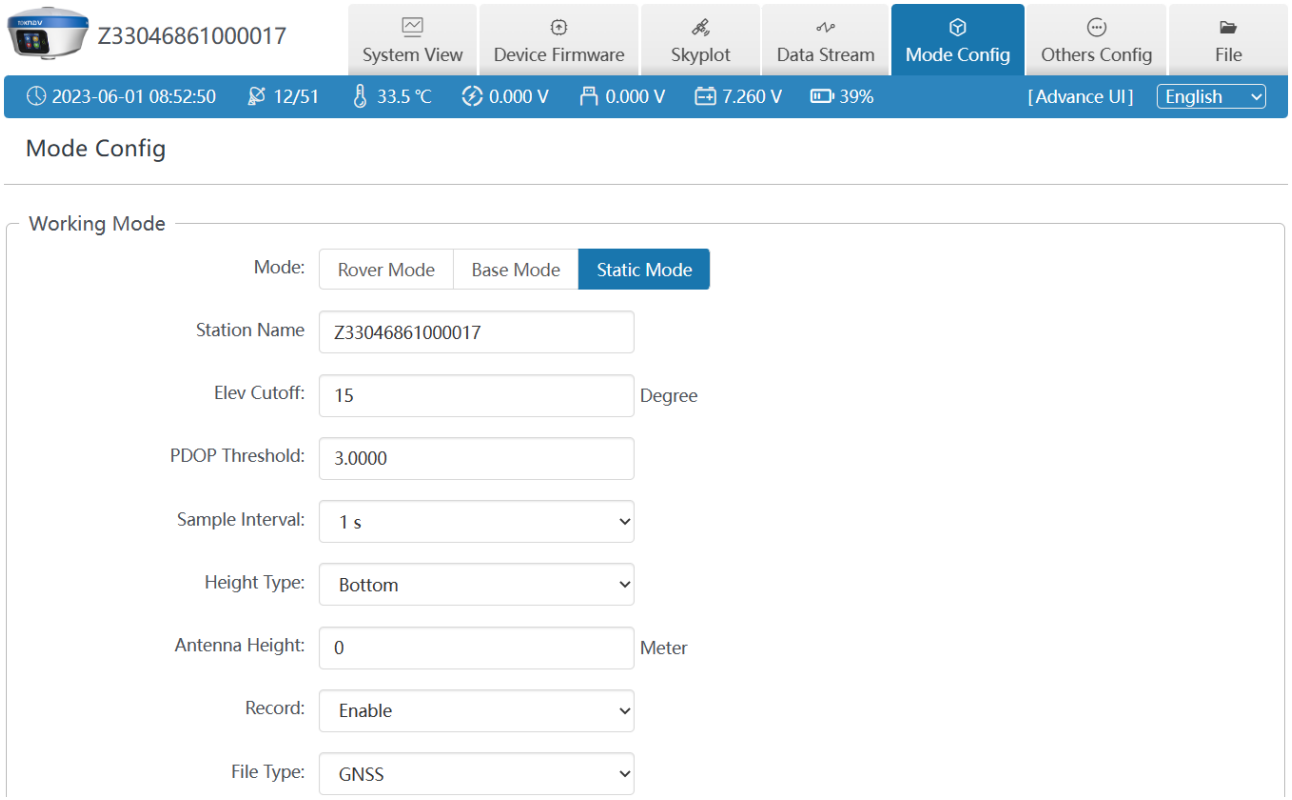
1. Rover Mode: the following parameters (Station Name, Elev Cutoff, Diff Age Max, Height Type, Antenna Height, Record, PPK) can be configured.



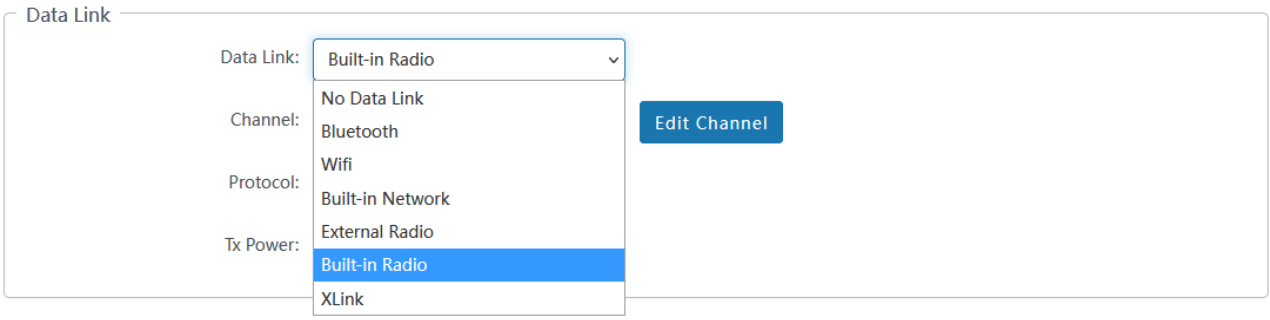
2. Base Mode: the following parameters (Station Name, Elev Cutoff, Station ID, PDOP Threshold, Diff Type, Base Mode, Height Type, Antenna Height, Record) can be configured.



3. Static Mode: the following parameters (Station Name, Elev Cutoff, PDOP Threshold, Sample Interval, Height Type, Antenna Height, Record) can be configured.



② **Data link:** You can choose No Data link/ Bluetooth/ Wifi/ Built-in Network/ Built-in Radio/ External Radio/ XLink.



1. Bluetooth: the device obtains the differential data of tSurvey software accessed by the manual network through Bluetooth connection to the manual;

2. Built-in Network: the device receives or sends data through the built-in network. To select this data link, first insert the SIM card into the device;

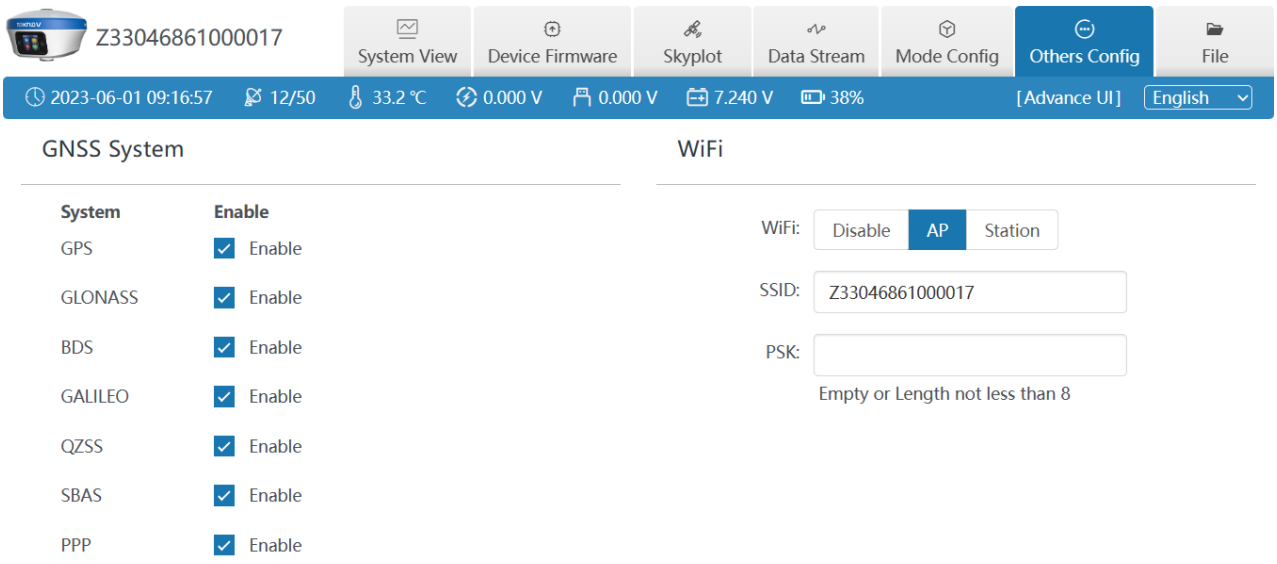
3. Built-in Radio: the device receives data through the built-in radio. To select this data link, first connect the radio antenna to the device.

3.6 Others Config

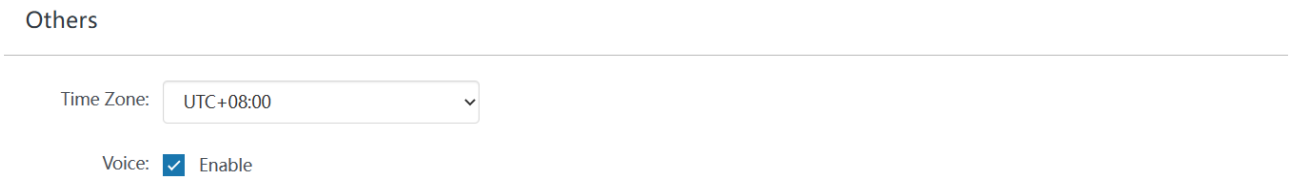
① **GNSS System:** The small box behind a single point can turn on or off the corresponding satellite system;

② **WIFI:** You can choose three types of Disable/AP/Station, and you can set the WIFI name and password by yourself;

Note: when the device WIFI is used as the Station, you can access the network by entering the name and password of the external hotspot.

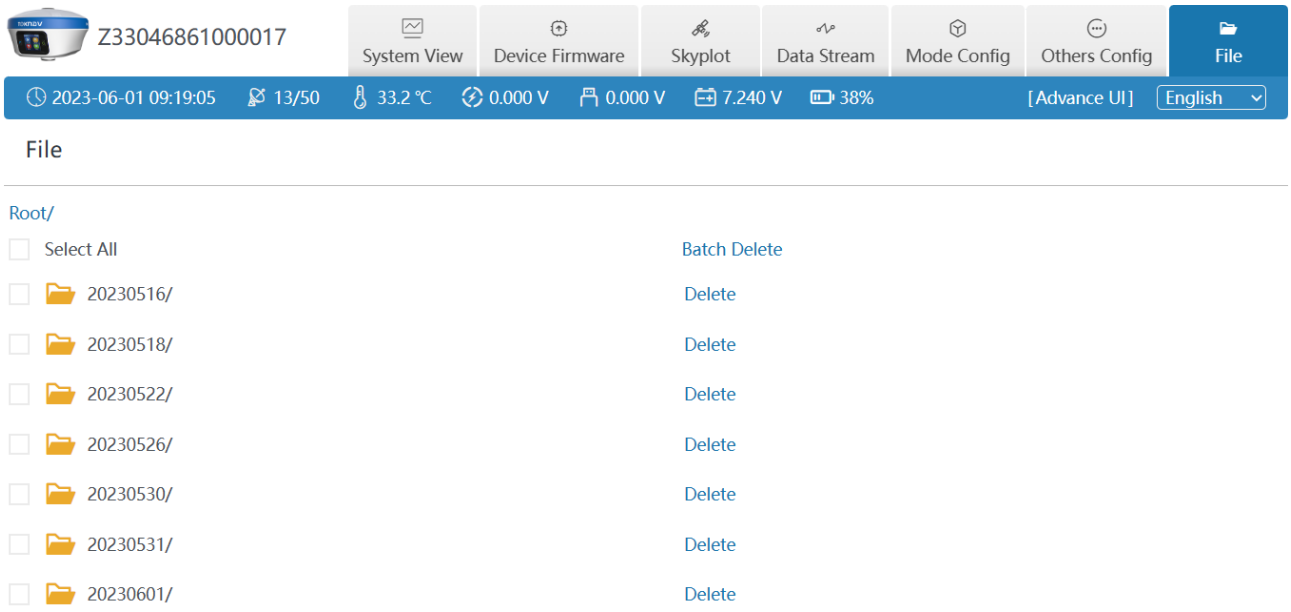


③ **Others:** Time Zone, Voice.



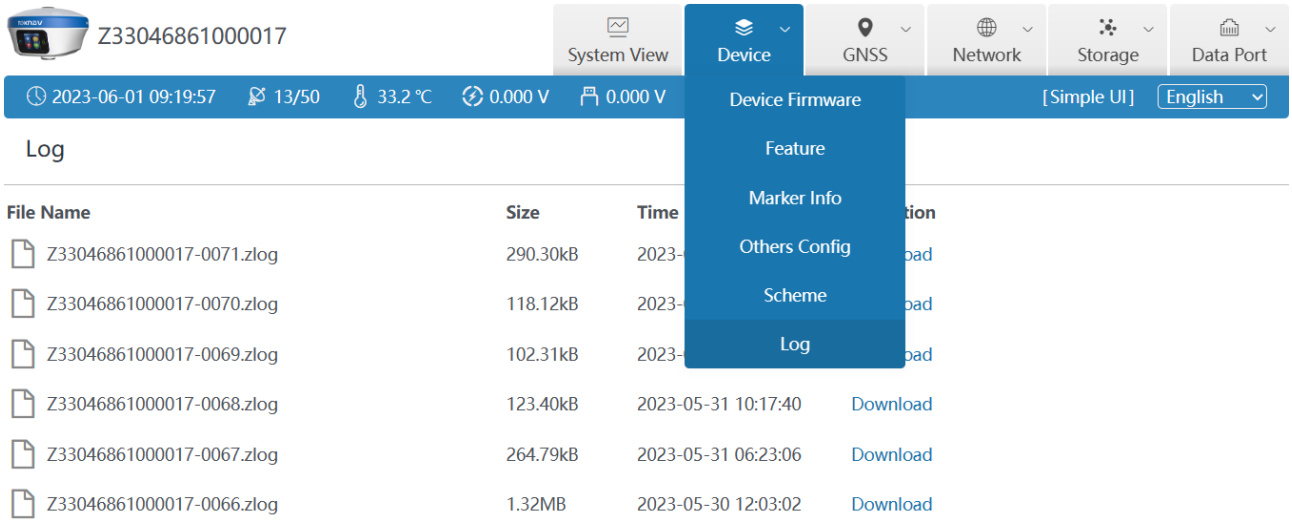
3.7 File

File management can delete and download data of each channel in batches, as shown below:



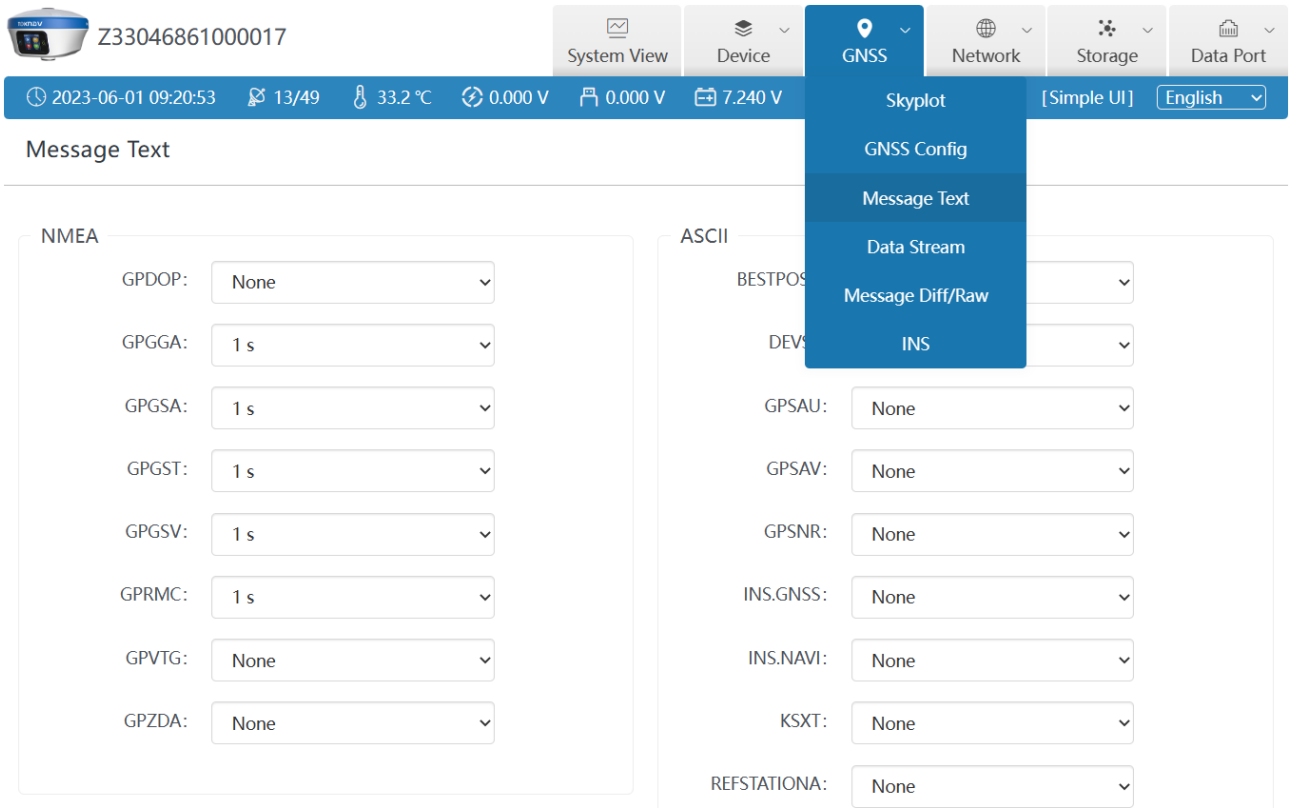
3.8 Log

It provides the download of the operation log of the device. When the device experiences abnormal behavior during use, you can download the log generated at the corresponding time here to the supplier for troubleshooting. As shown below:



3.9 Message Text

You can set the type and frequency of output data in text format, as shown below. After configuration, you can check whether there is corresponding text data output in 3.4 of this section.



The following are the formats of several common message text:

GPGGA	$GPGGA,<1>,<2>,<3>,<4>,<5>,<6>,<7>,<8>,<9>,M,<10>,M,<11>,<12>*hh
<1>	UTC time, hhmmss (hour minute second) format, 8 hours different from Beijing time
<2>	Latitude ddmm.mmmm (degrees and minutes) format (the previous 0 will also be transmitted)
<3>	Latitude Hemisphere N (Northern Hemisphere) or S (Southern Hemisphere)
<4>	Longitude dddmm.mmmm (degrees and minutes) format
<5>	Longitude Hemisphere E (East Longitude) or W (West Longitude)

<6>	GPS status: 0=no positioning, 1=single point positioning, 2=SBAS differential positioning, 4=RTK fixed solution, 5=RTK floating point solution, 6=inertial navigation positioning
<7>	The number of satellites (00~12) using the solution position
<8>	HDOP horizontal precision factor (0.5~99.9)
<9>	Altitude (- 9999.9~99999.9)
<10>	Height of earth ellipsoid relative to geoid
<11>	Differential time (the number of seconds since the last differential signal was received. If it is not differential positioning, it will be null)
<12>	Differential station ID No. 0000~4095 (the previous 0 will also be transmitted, otherwise it will be null)

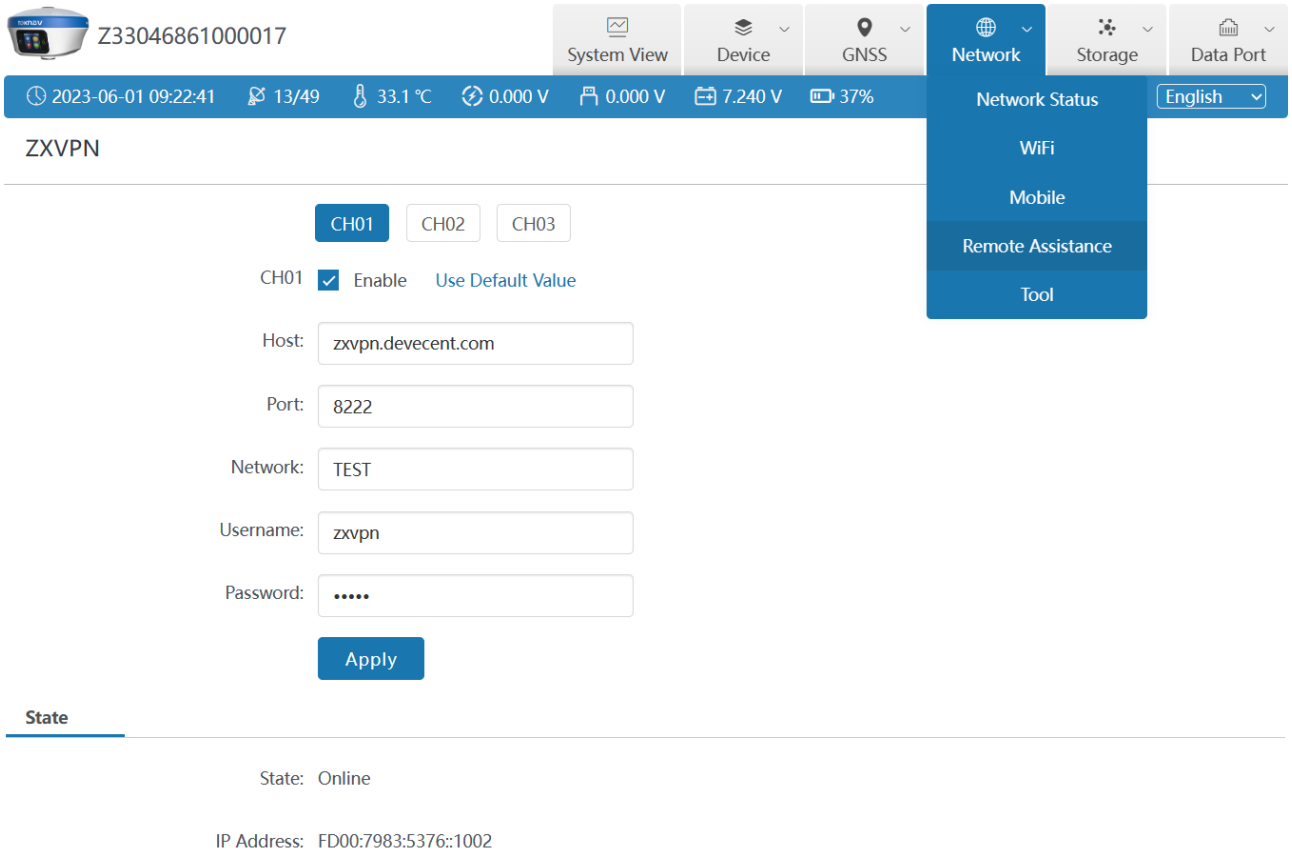
GPGSA	$GPGSA,<1>,<2>,<3>,<3>,<3>,<3>,<3>,<3>,<3>,<3>,<3>,<4>,<5>,<6>*hh
<1>	Mode, M=manual, A=automatic
<2>	Positioning type, 1=no positioning, 2=2D positioning, 3=3D positioning
<3>	PRN code (pseudo-random noise code), the satellite number (01~32, the previous 0 will also be transmitted) being used to calculate the position.
<4>	PDOP position precision factor (0.5~99.9). The spatial geometric intensity factor of satellite distribution. Generally, the better the satellite distribution is, the smaller the PDOP value is, which is generally less than 3.
<5>	HDOP horizontal precision factor (0.5~99.9)
<6>	VDOP vertical precision factor (0.5~99.9)

GPGSV	$GPGSV,<1>,<2>,<3>,<4>,<5>,<6>,<7>,…<4>,<5>,<6>,<7>*hh
<1>	Total number of GSV statements
<2>	Number of GSV in this sentence
<3>	Total number of visible satellites (00~12, the previous 0 will also be transmitted)
<4>	PRN code (pseudo-random noise code) (01~32, the previous 0 will also be transmitted), which can be understood as satellite number.
<5>	Satellite elevation (00~90 degrees, the front 0 will also be transmitted)
<6>	Satellite azimuth (000~359 degrees, the front 0 will also be transmitted)
<7>	Signal to noise ratio (00~99dB, empty when no satellite is tracked, and the previous 0 will also be transmitted), 50 is better.

3.10 Remote Assistance

ZXVPN can provide a virtual LAN, connect the device to the server, and conduct WEBUI access in the background to provide corresponding remote technical support and services. The operation steps are as follows:

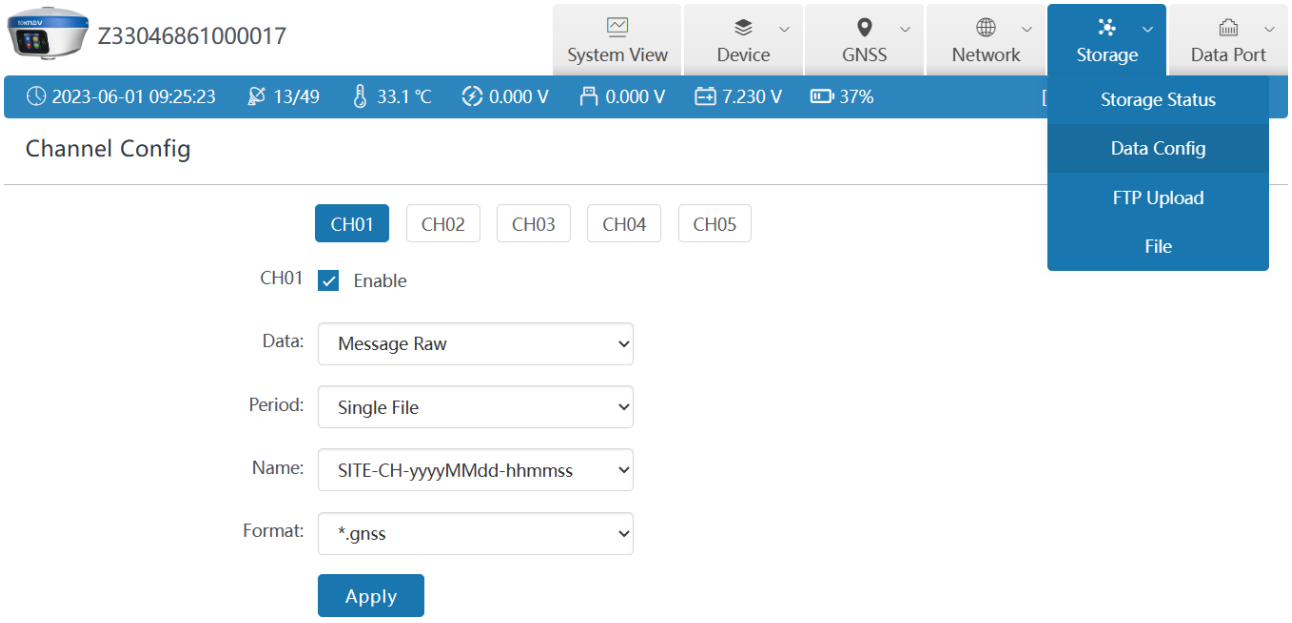
1. Insert the mobile network card into the device;
2. Open the mobile network and confirm that the mobile network is online;
3. Click [Use Default Value] to apply.



3.11 Data Config

The device has 24G storage space (recyclable storage) and supports five channels (CH01/CH02/CH03/CH04/CH05) to save various files, as shown in the figure below. We can configure the data source, file period, file name and file format of each channel for storage as required.

Note: Do not change the mode after the device data configuration is completed, or the default storage configuration will be restored.



Data:

- None
- GNSS COM2
- Message Text
- Message Diff
- Message Raw
- Message PPK
- Message Static
- INS Debug
- Ntrip Client
- XLink
- Socket 1

Period:

- Single File
- 1 hour
- 2 hours
- 3 hours
- 4 hours
- 6 hours
- 8 hours
- 12 hours
- 24 hours

Name:

- SN-CH-yyyyMMdd-hhmmss
- SN-yyyyMMdd-hhmmss
- SITE-SSSS-yyyyMMdd-hhmmss
- yyyyMMddhhmmss
- SSSSDOYX
- SITEDOYhhmm
- SITEDOYX
- SITEDOYXmm
- SITEDOYhh
- SITE-CH-yyyyMMdd-hhmmss

Format:

- *.gnss
- *.data
- *.txt
- *.dev
- RINEX2.10
- RINEX2.11
- RINEX3.02
- RINEX3.03
- RINEX3.04
- RINEX3.04 (.D)
- RINEX3.04 (.gz)

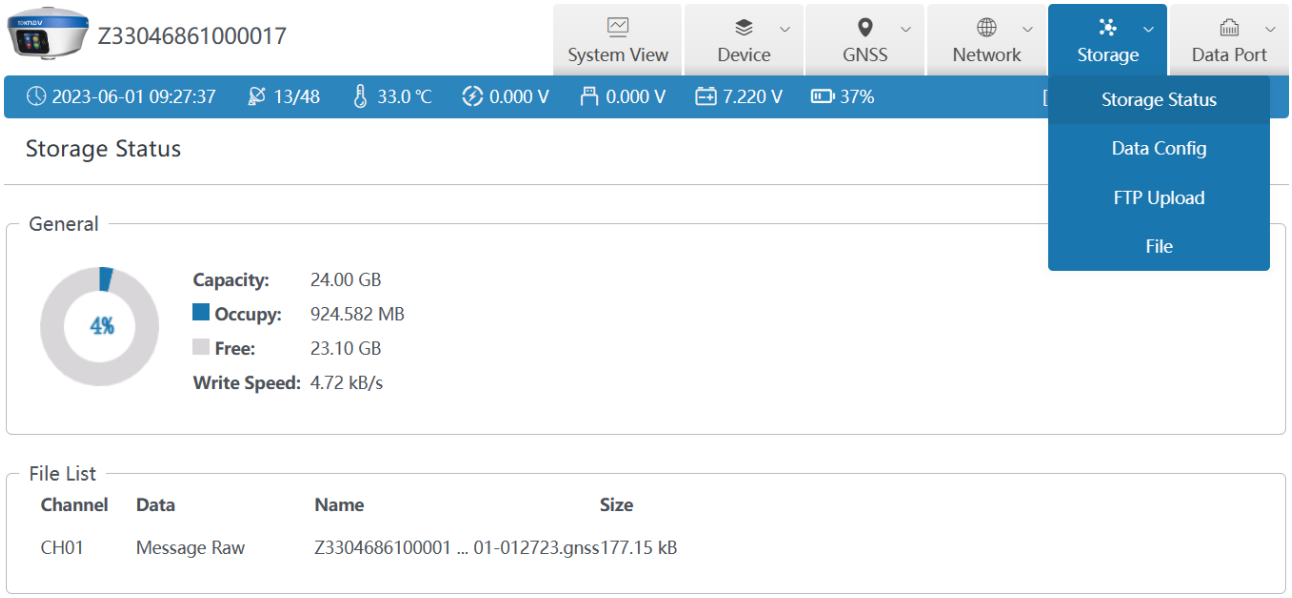
File name naming rules:

1.The time in file name is converted from GPS time directly.		Assume GPS leap second is 18, Time Zone offset is +08:00, Then 00:00:18 means 08:00:00 of local lime.	
2.Key words in file name			
yyyy	=> year	DOY	=> day of year, 000~366
MM	=> month, 01~12	X	=> hour, a~x, 0 when one file per day
dd	=> day, 01~31	SN	=> Serial Number
hh	=> hour, 00~23	SITE	=> Marker Name
mm	=> minute, 00~59	SSSS	=> Marker Number
ss	=> second, 00~59		

When the device is set as rover station, base station or static mode, the device will automatically configure the corresponding channel for data storage by default.

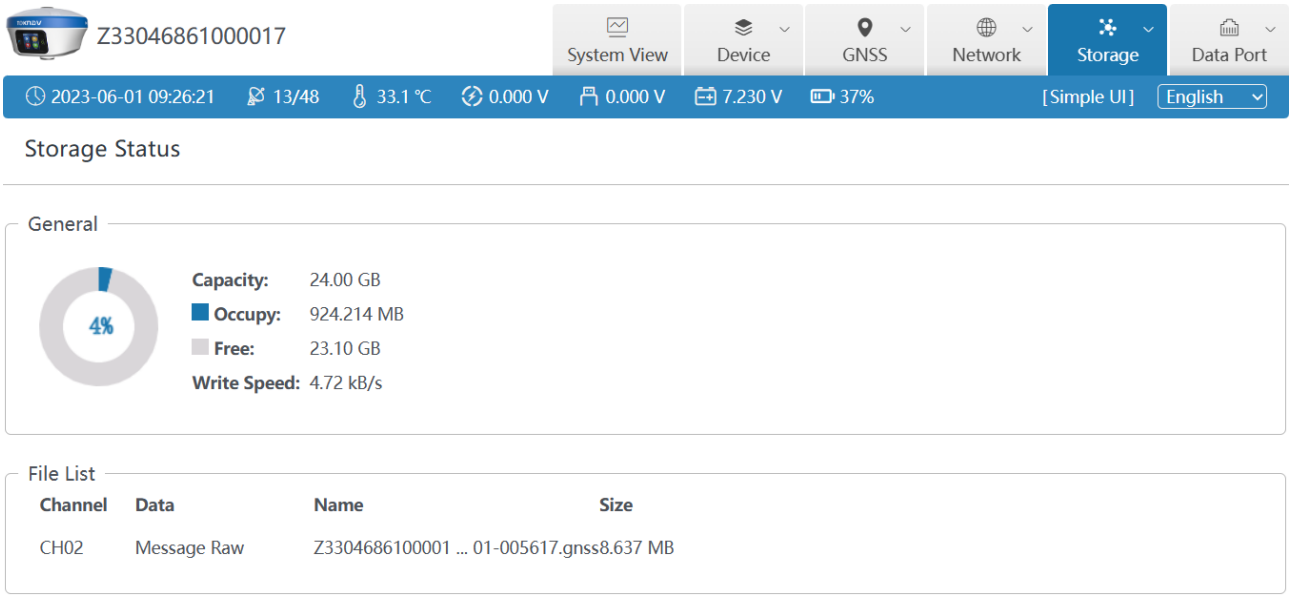
1. Rover (CH01)

When the device is set as a rover station, the device will automatically configure CH01 to store and locate the original data by default. If PPK is enabled, CH05 will also be automatically configured by default to store post positioning data, as shown in the following figure.



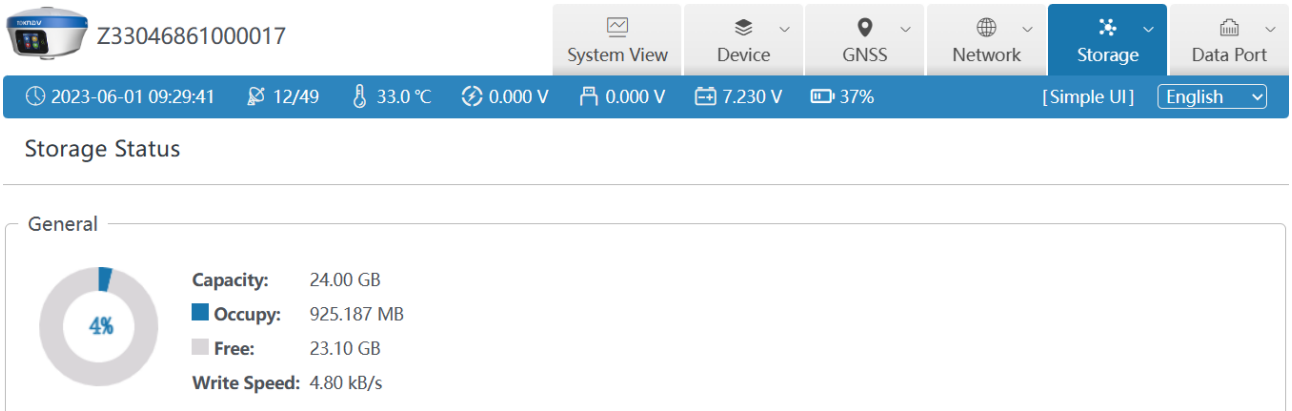
2. Base (CH02)

When the device is set as the reference station, the device will automatically configure CH02 to store and locate the original data by default. If PPK is enabled, CH05 will also be automatically configured by default to store location post-processing data, as shown in the following figure.

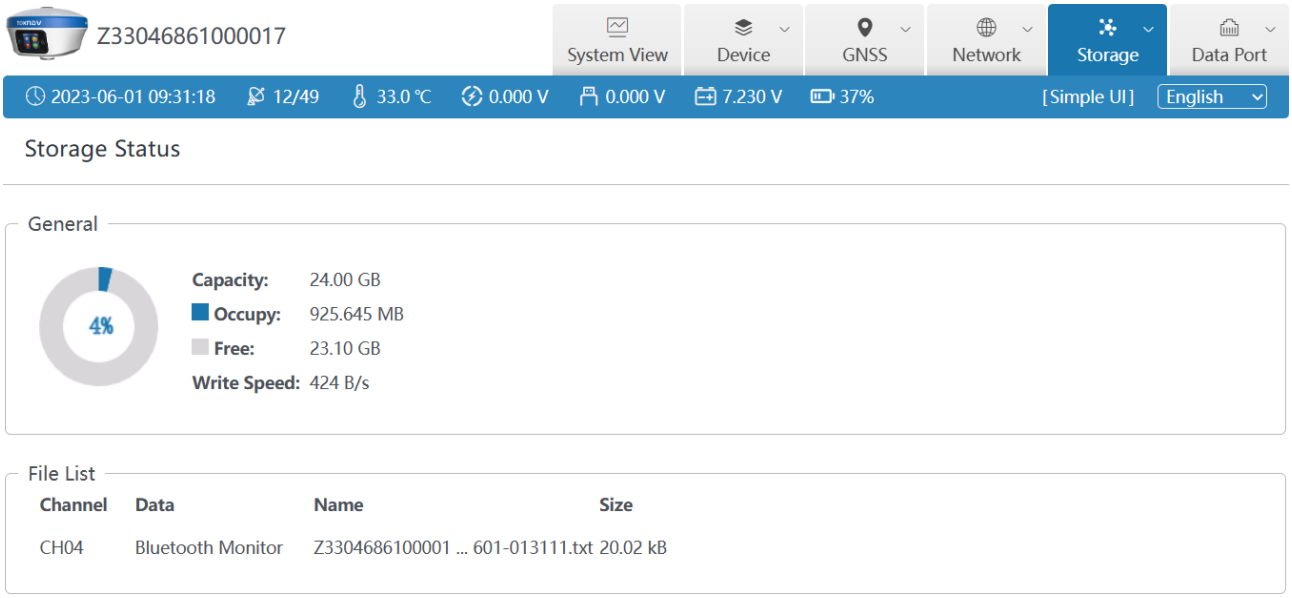


3. Static (CH03)

When the device is set to the static mode, the device will automatically configure CH03 to store static positioning data by default, as shown in the following figure.



Note: Whenever the tSurvey software connects to the device through Bluetooth, the device will automatically configure CH04 to store Bluetooth monitor data. If there is any problem with the settings of the Bluetooth connection device, you can download the recorded Bluetooth monitor data for troubleshooting.



IV. tSurvey Basic Operations

It describes the basic operations to start using the device.

4.1 DP0031 Data Controller

The DP0031 TD-LTE wireless computer is a rugged, multi-function wireless computer designed with a 5-inch sunlight readable HD touch screen and alphanumeric keypad, equipped with a powerful octa-core processor and Android operating system for perfect adaptability with measuring handbook software. The DP0031 TD-LTE has professional IP68 grade protection, which is suitable for harsh outdoor environments. The large-capacity lithium battery can guarantee more than 10 hours of field work and complete multiple survey tasks throughout the day.

It's Key features:

- 5" sunlight-readable HD touchscreen;
- Octa-core 2.0GHz CPU;
- Pre-installed with Android 8.1 operating system
- 4GB RAM + 64GB ROM;
- 5 Megapixel front + 13 Megapixel rear camera;
- IP68 protection, waterproof/shockproof/dustproof;

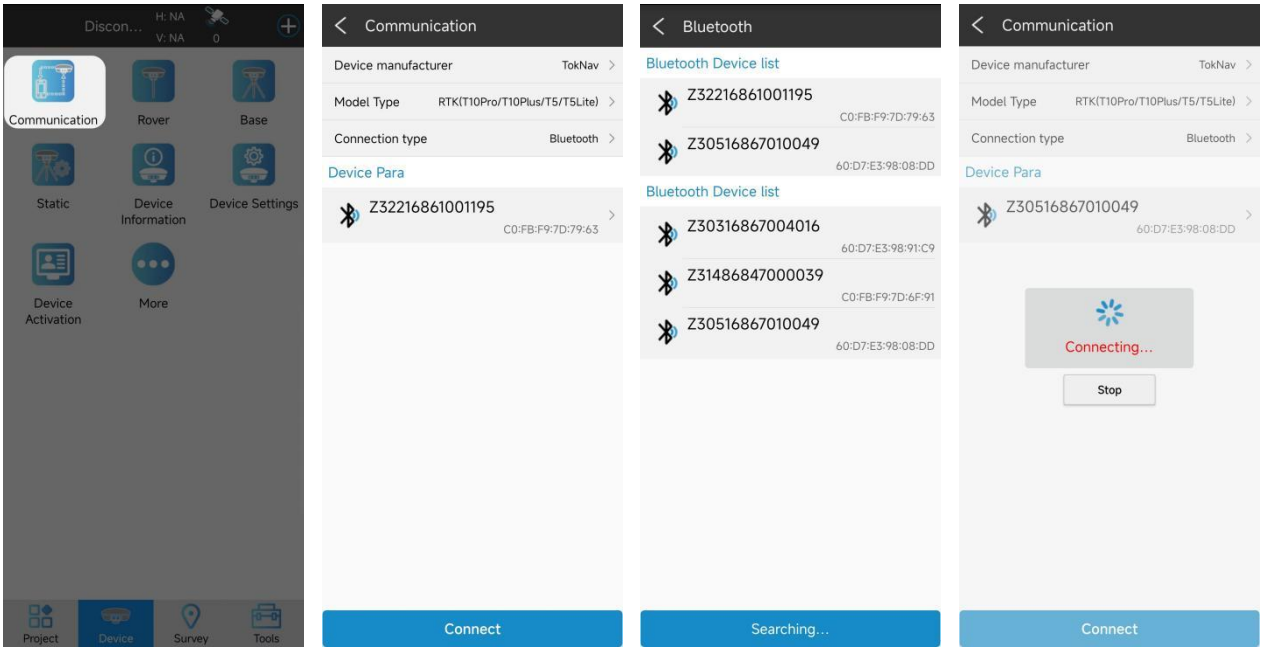
- Wi-Fi, Bluetooth, NFC;
- 4G all-network support;
- 7000 mAh battery with 14 hours of battery life;
- Universal Type-C connector;
- Charging time: less than 4 hours (fast charging).

4.2 Communication

Operation: Device → Communication

The device manufacturer selects [TokNav], the device type defaults to [RTK(T20Pro/T20Plus/T5/T5Lite/T20/T20Pro)], and the connection type selects [Bluetooth].

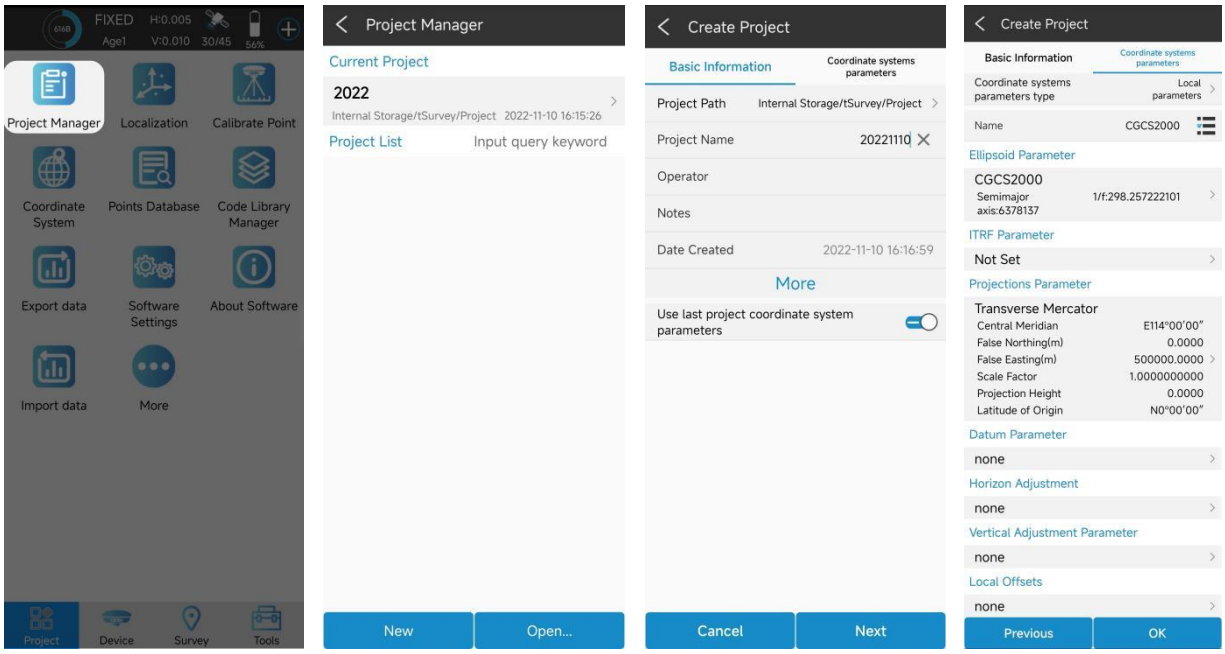
Click the Bluetooth name in the device parameters to jump to the device search interface, find the Bluetooth name of the corresponding device in the available devices (the default is the device computer number) and click to automatically return to the communication setting interface. Click Connect to pop up the connection progress box, indicating that the connection is in progress. After successful connection, automatically return to the main interface of the instrument. If the Bluetooth name of the corresponding device is not found in the available devices, click Search, switch to Refresh, and click Refresh.



4.3 New Project

Action: Project → Project Manager → New

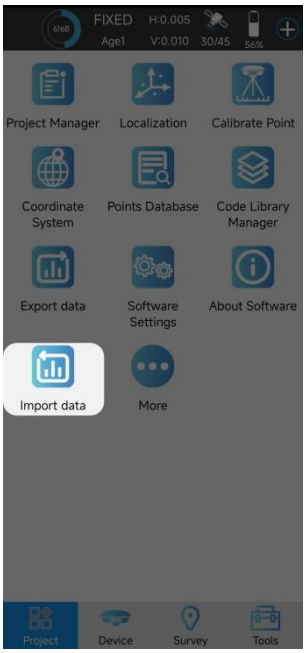
Enter the name of the item. Others are additional information and can be left blank. Fill in by default or according to actual data. Click [Next].Jump to the coordinate system parameter interface. The ellipsoid parameter in China is CGCS2000, projected by Gauss by default. For other parameters, you can set the coordinate system according to the actual operation requirements.

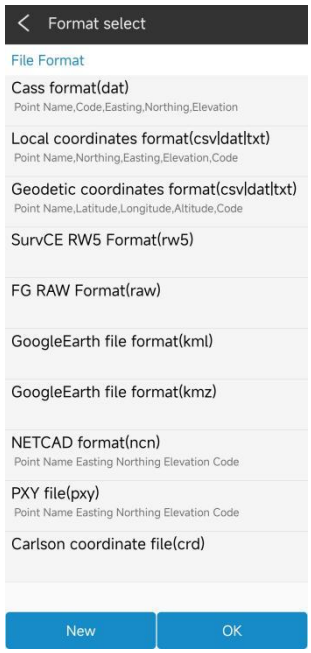


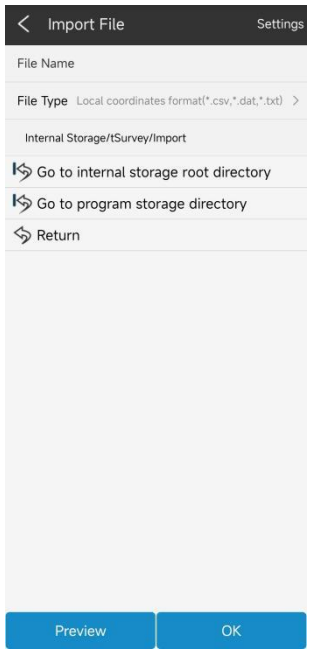
4.4 Import Data

Actions: Project → Import Data

Copy the data file to be imported to the internal storage of the notebook, select the data type, length unit, angle format and data format, click Next, go to the storage directory, select the corresponding file, and click OK.



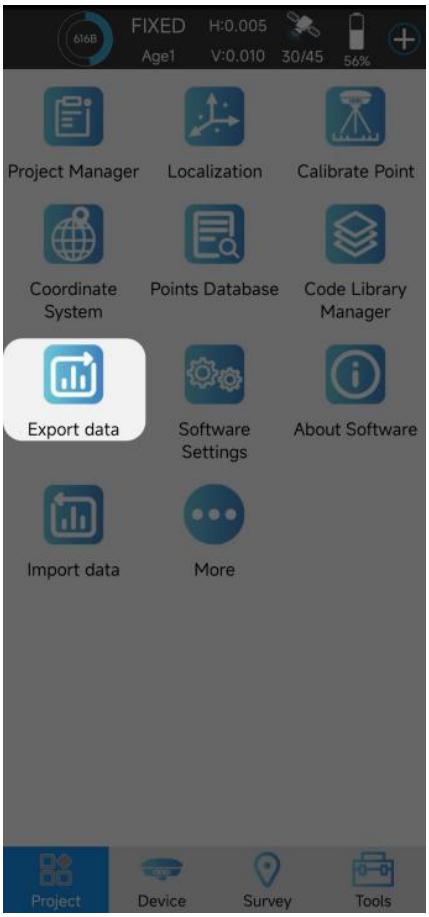


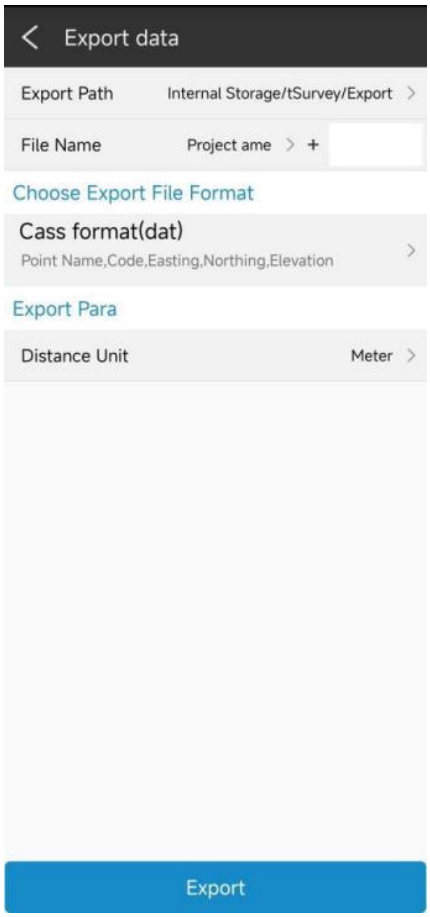


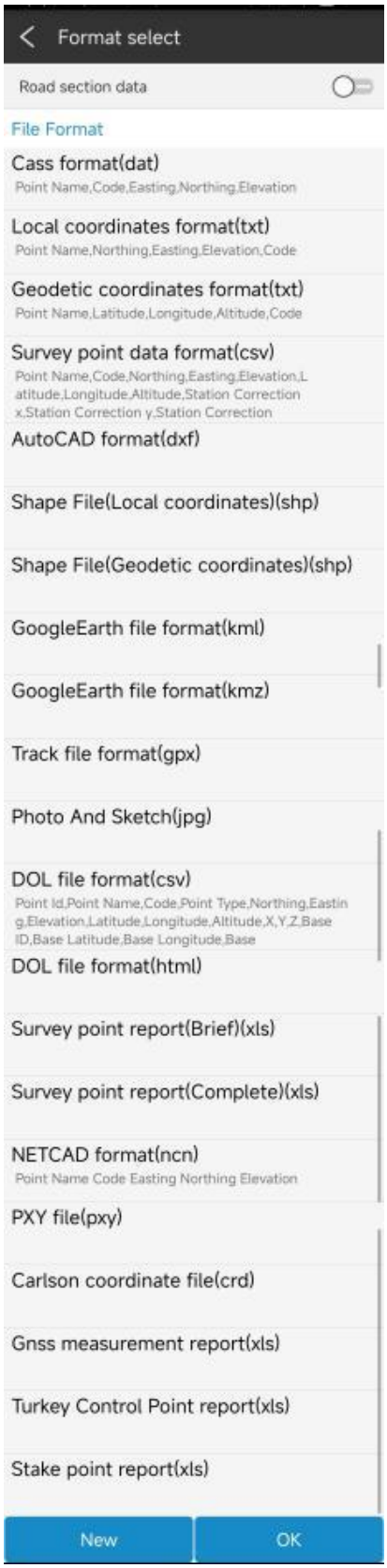
4.5 Export Data

Operation: Project→ Export Data

Confirmation export path, input file name, select length unit, angle format and data format, click export to export data file.







4.6 Localization

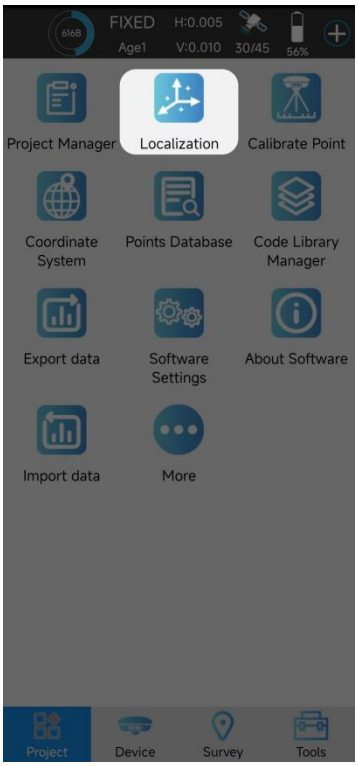
Example: four-parameter conversion.

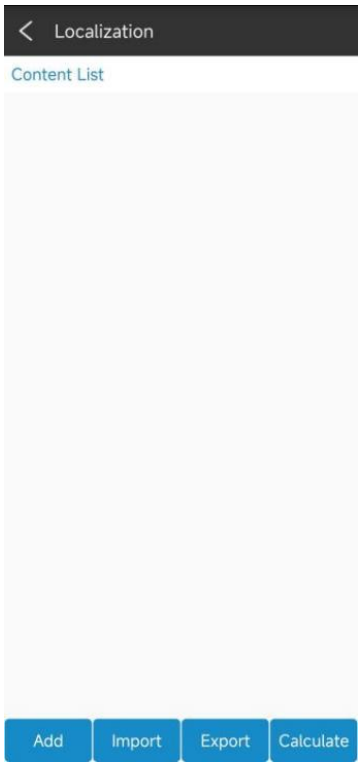
Correctly configure the rover station to obtain fixed state, click [Collect Point] to measure two known control points in the survey area.

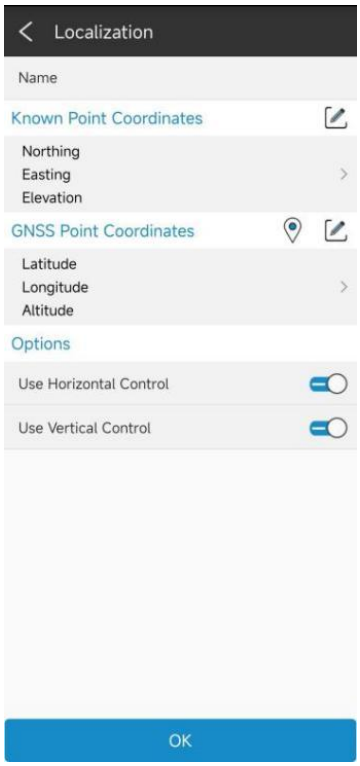
Operation: Project → Localization

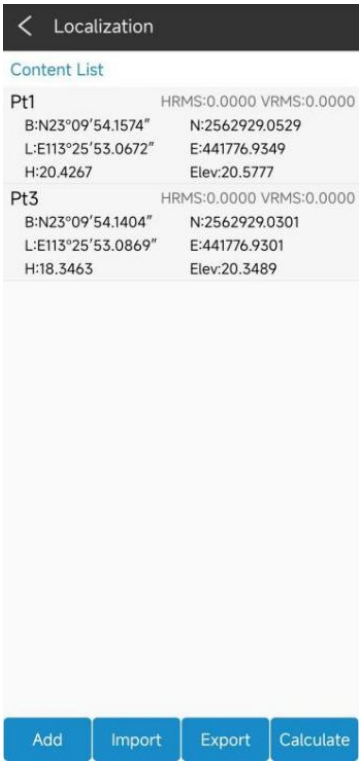
Localization is a special design of software, which is designed for specific survey work in China. When the survey is carried out in the same operation area, the position of the base station is changed due to moving the base station or re-erecting the base station, so it is necessary to calculate the translation parameters of the base station on the basis of using four or seven parameters, that is, only one common control point is used to calculate the difference between two sets of coordinate systems.

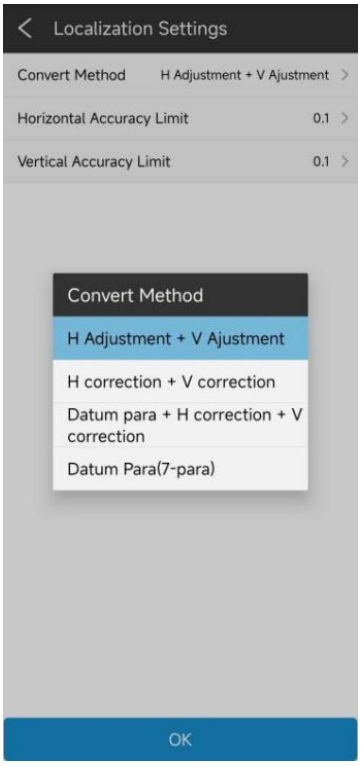
Select Item → Calculate Conversion Parameters, first click the Add button at the lower left corner, enter the name, fill in the coordinates and whether to enable the option on the page to be jumped to, click OK to automatically return to the previous page, then click the calculation button at the lower right corner, select the coordinate conversion method, horizontal precision limit and elevation precision limit on the page to be jumped to, click OK to obtain the conversion parameter calculation result, and click Apply.

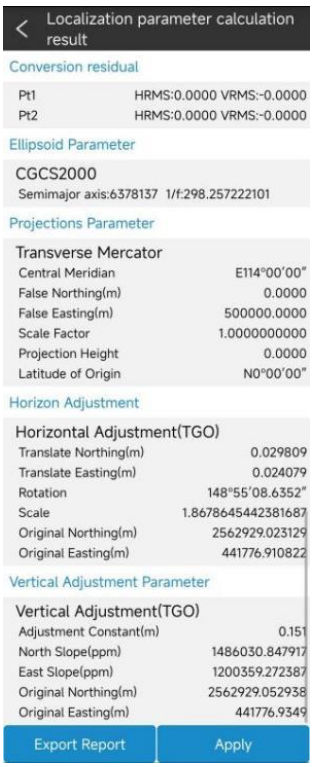












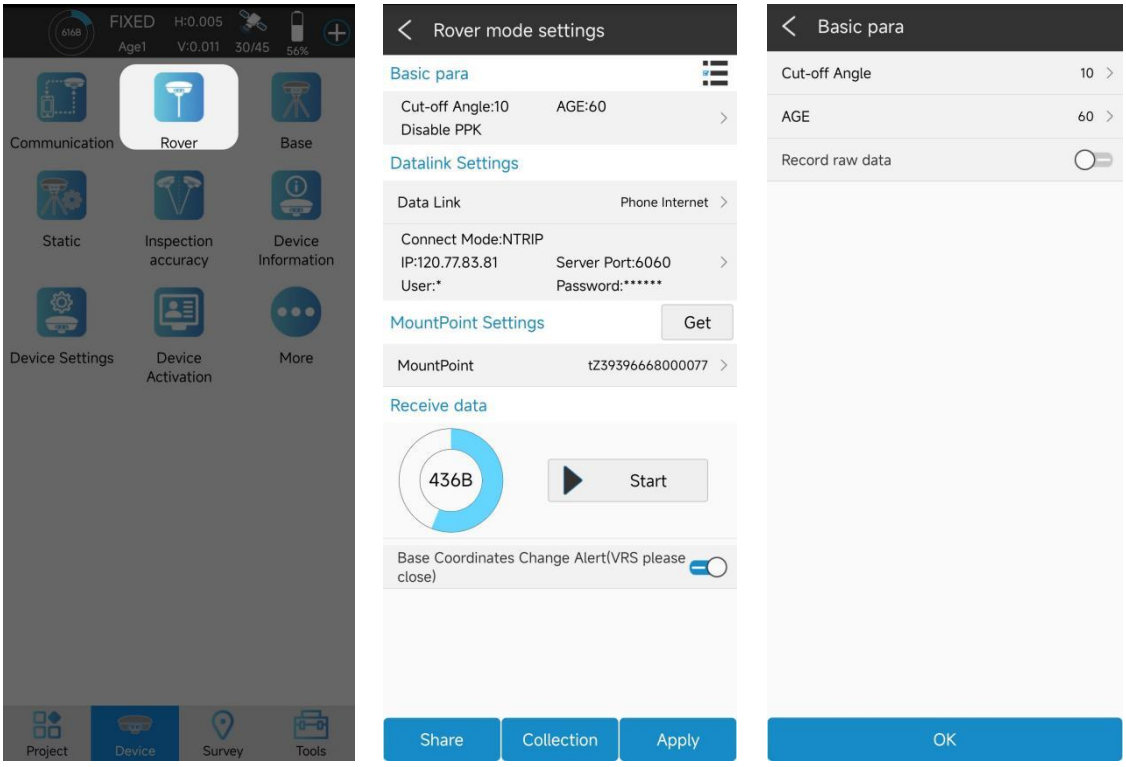
Note: In the parameter report, the plane conversion parameters and elevation conversion parameters can be checked.

The scale parameter is generally infinitely close to 1. If the value does not match, please check the operation whether there is any operation error or coordinate error in the process.

4.7 Rover Mode Setting

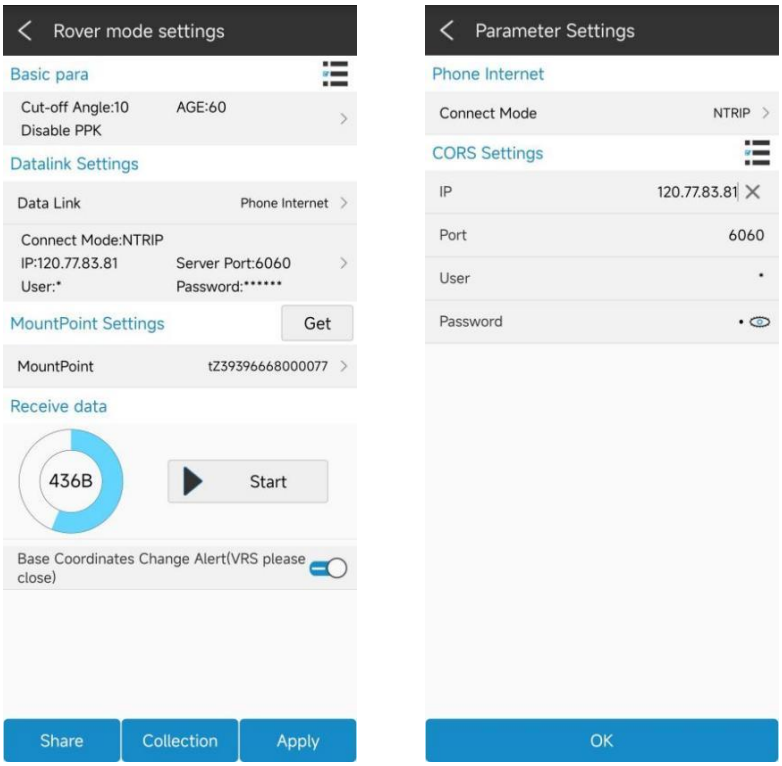
Operation: Device → Rover

Set basic parameters such as height cut-off angle, differential delay and whether PPK is enabled. Click "Data Link" to select the required data link.



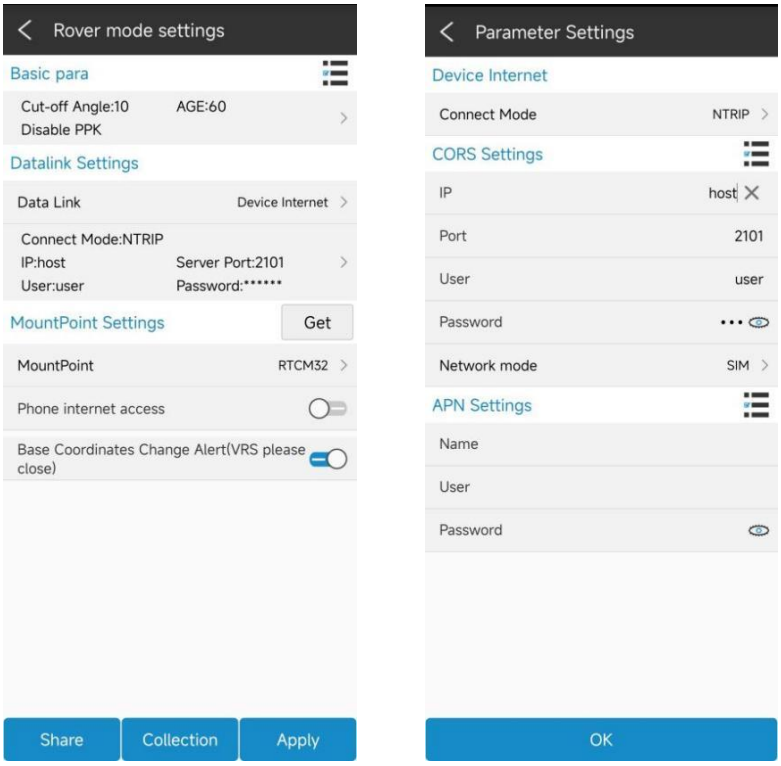
4.7.1 Phone Internet Data Link

Select "Manual network" for data link, enter parameter setting, select connection mode and CORS setting, click "OK" to automatically return to rover station setting interface, click "Get ", select access point base station, click" Start "or" Apply ", return to instrument main page to check whether the solution is fixed.



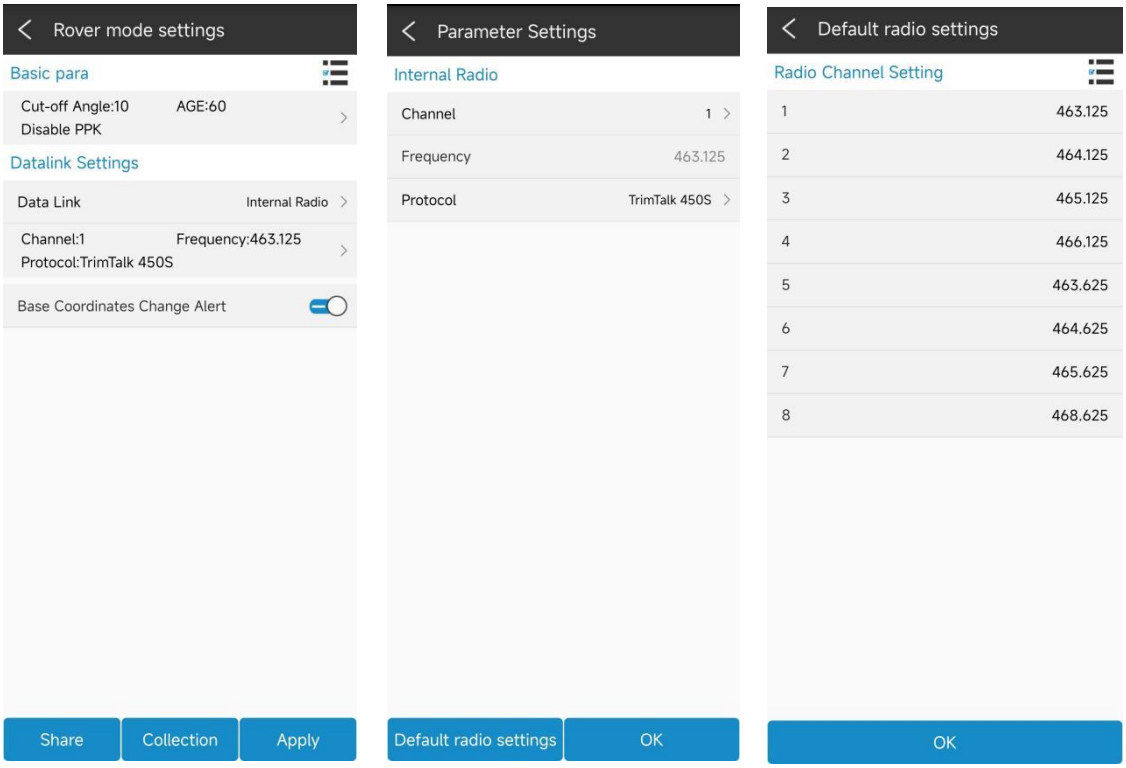
4.7.2 Device Internet Data Link

Insert the SIM card into the device, select "device Network" for the data link, enter the parameter setting, select the connection mode, CORS setting and APN setting, click "OK" to automatically return to the rover station setting interface, click "Get ", select the access point base station, click "Apply" to automatically return to the instrument main page to check whether the solution is fixed.



4.7.3 Internal Radio Data Link

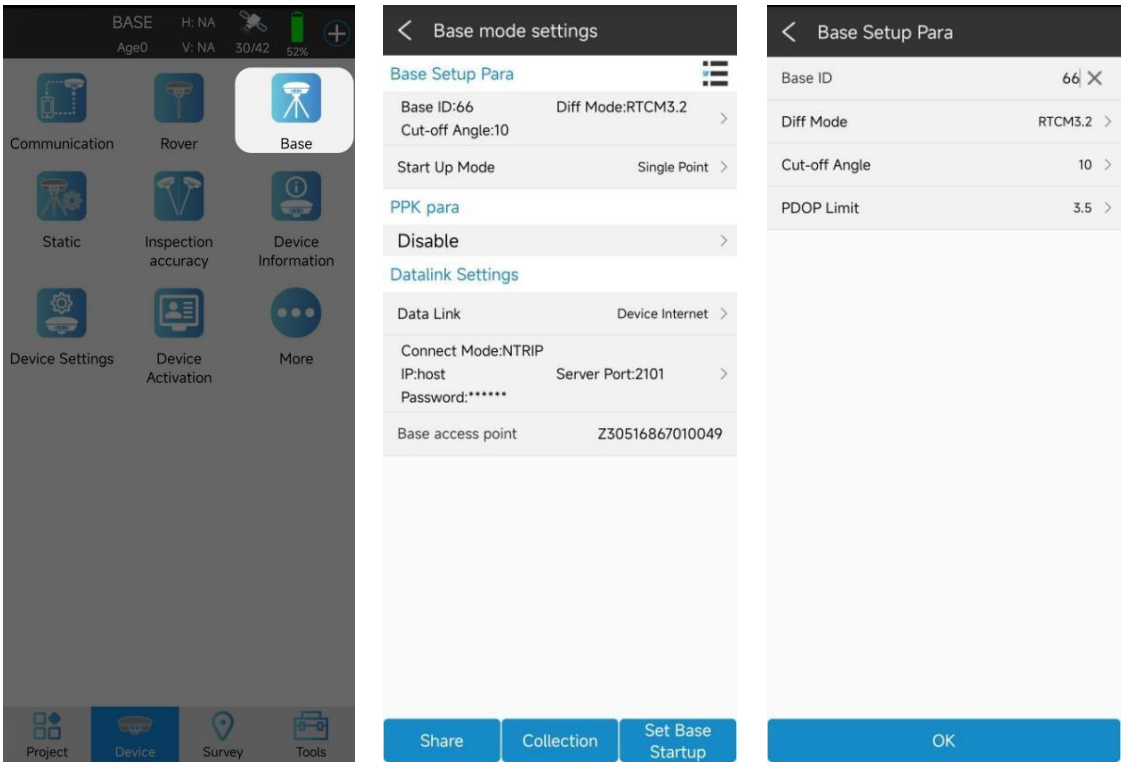
Plug in the radio antenna of the device, select "built-in radio station" for the data link, enter the parameter setting, click "Default radio station setting" in the lower left corner to configure the radio station channel, select the channel and protocol content, click "OK" to automatically return to the rover station setting interface, click "Application" to automatically return to the main page of the instrument to check whether the solution is fixed.



4.8 Base Mode Setting

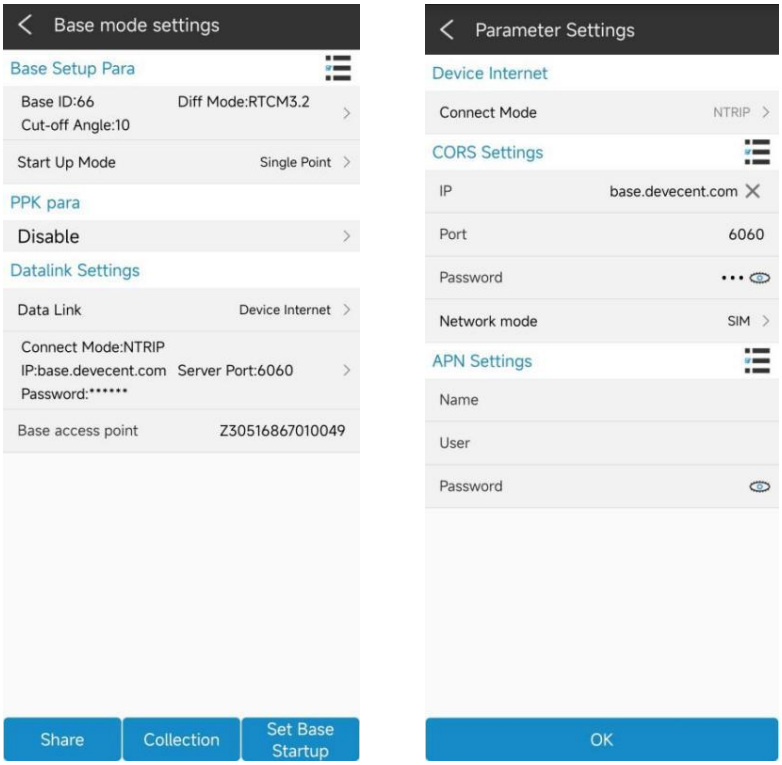
Operation: Device → Base

Enter base ID, set differential mode, altitude cutoff angle, PDOP limit, start mode parameter, whether to enable PPK, click "Data Link ", and select the required data link.



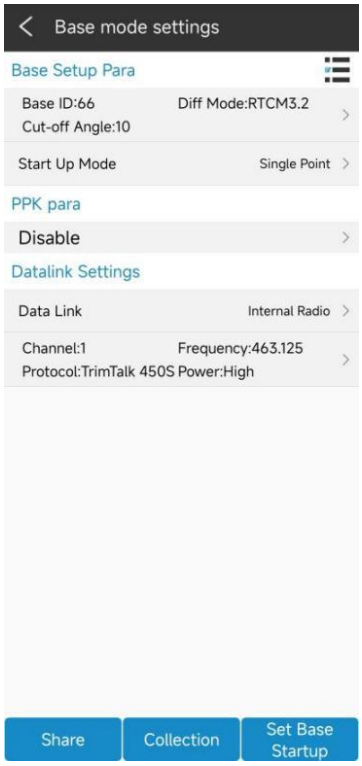
4.8.1 Device Internet Data Link

Insert the SIM card into the device, select "device Network" for the data link, enter the parameter setting, select CORS setting and APN setting, click "OK" to automatically return to the reference station setting interface, the base station access point is the machine number by default, click "Start Base Station" to automatically return to the instrument main page and check whether the base station is started.



4.8.2 Internal Radio Data Link

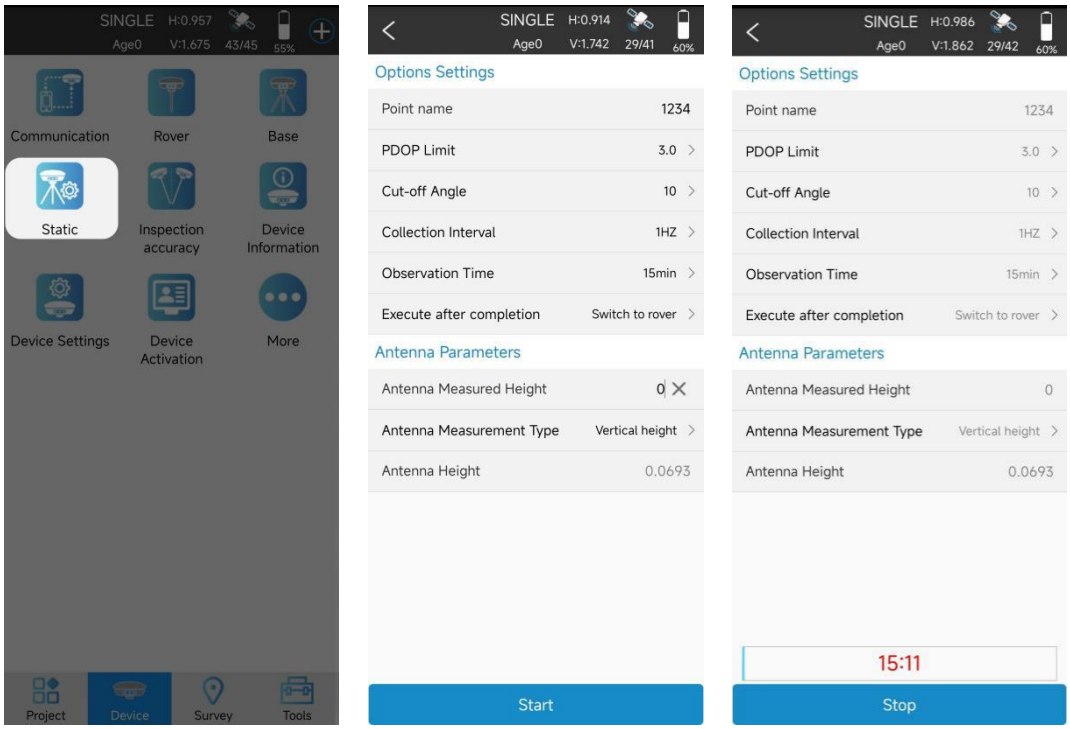
Plug in the radio antenna of the device, select "Built-in radio" for the data link, enter the parameter setting, click "Default radio setting" at the lower left corner to configure the radio channel, select the channel and protocol content, click "OK ", and automatically return to the reference station setting interface, click" Start base station ", and automatically return to the instrument main page to check whether the base station is started.

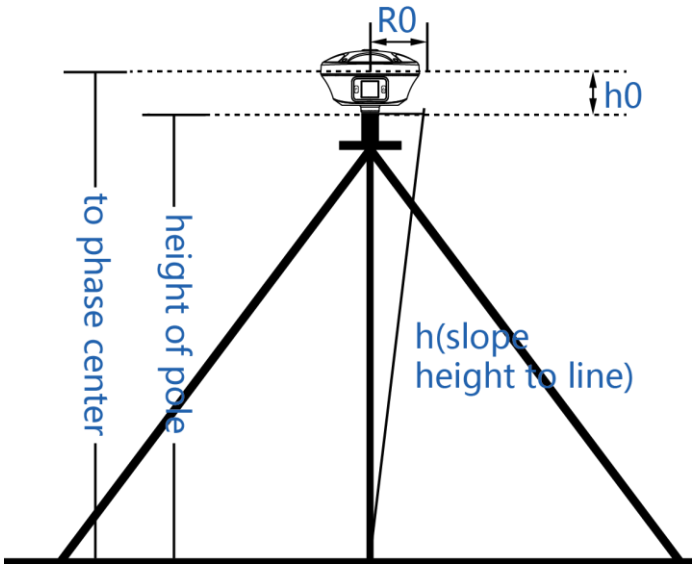


4.9 Static Mode Setting

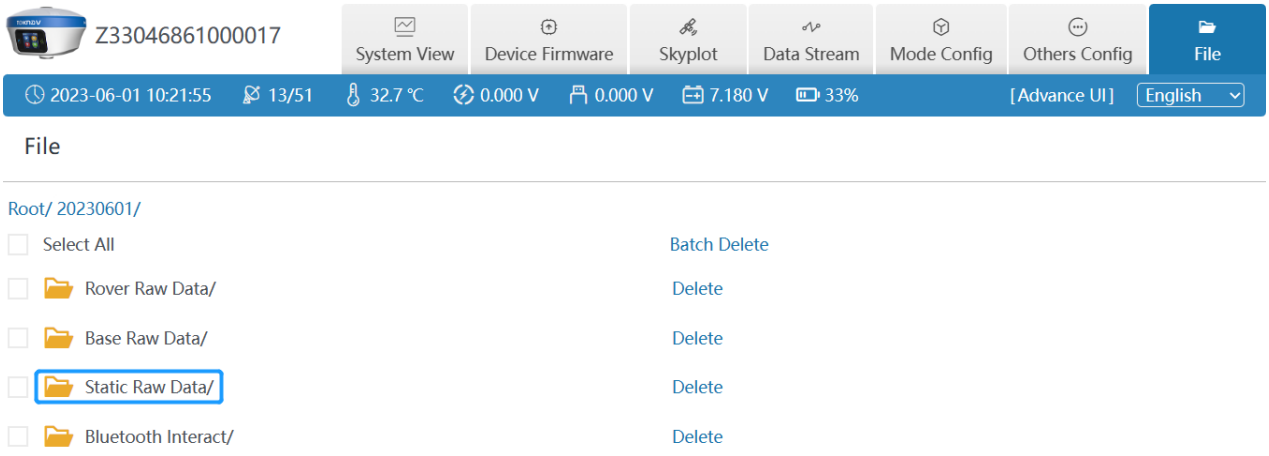
Operation: Device → Static

Set options such as point name (the default is the equipment number), PDOP limit, altitude cut-off angle, acquisition interval, observation time, and operation after completion, input antenna survey to take altitude, select antenna survey mode, click "Start", switch to "Stop", and "Wait for recording" change to countdown to start static data acquisition. Click "Stop" to finish static data collection.





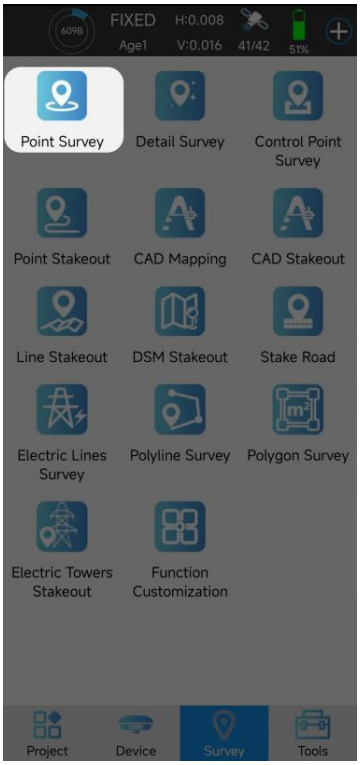
Log in to the device web page (see Ⅲ WebUI for details), click [File]. Find the folder corresponding to the time to download the static data.

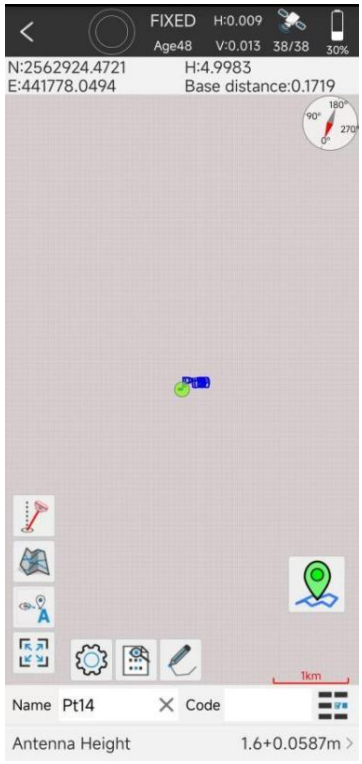


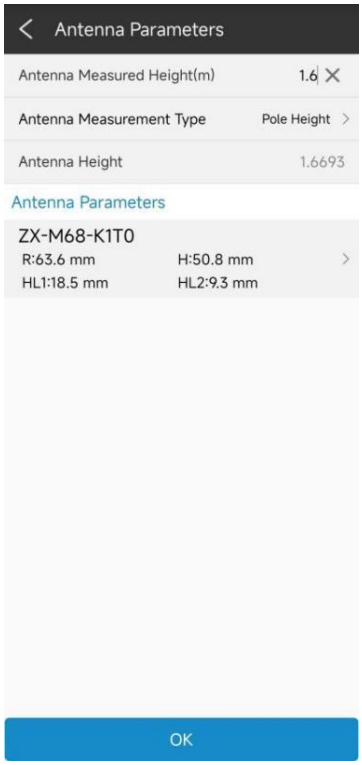
4.10 Point Survey

Operation: Survey → Point Survey

Open the point survey page, and view the current power of the device in the upper right of the survey display interface. Amount, CORS connection status, positioning accuracy (H: horizontal accuracy and, V: elevation accuracy), satellite information status, the following column displays the current optimal position of the device (north coordinate, east coordinate, elevation, base station distance and other information), and the bottom of the interface displays the name, code and antenna height to be collected (click to set antenna parameters).



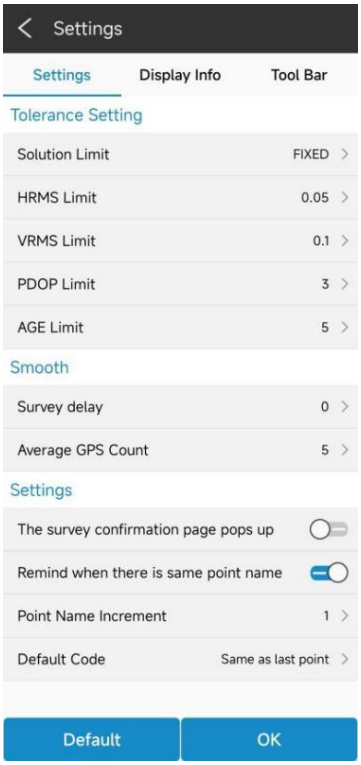




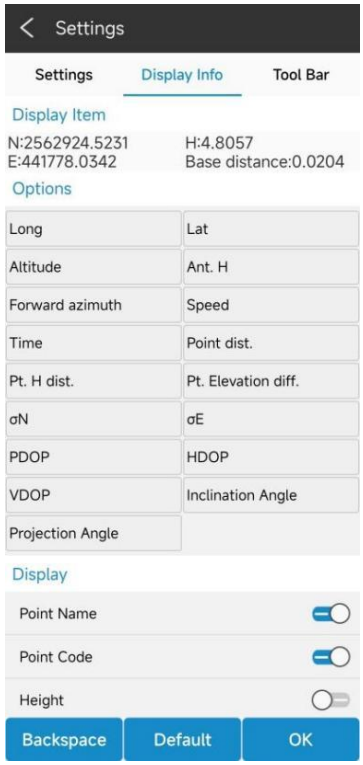
Each icon in the point survey page has the following meaning:

	Click this icon to automatically center the current anchor point.
	Click the icon to display the network map.
	Click this icon to display all survey points in the view.

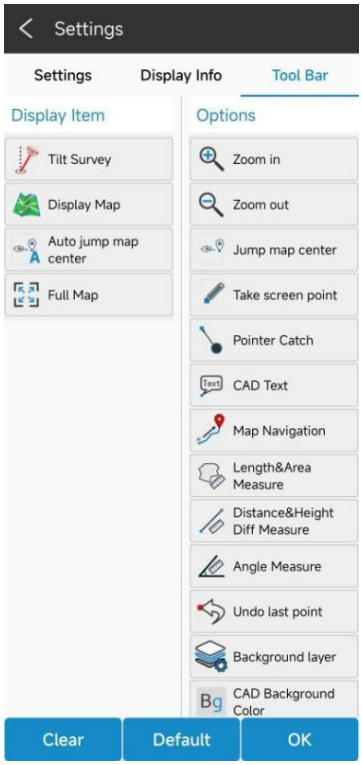
	Click this icon to turn tilt survey on or off.
	Click the icon to set acquisition parameters, information display and function menu.
	Click this icon to view the coordinate point library of the current project and the collected point coordinates, which are the same as the function of "coordinate point library" in "project ".
	Click the icon to collect point, line, surface and other data.



Picture Settings



Picture Display Info



Picture Tool Bar

4.11 Tilt Survey

Operation: Survey → Point Survey

The tilt survey function requires a tilt module on the device. The device with this function can:

1. The accuracy of the device machine can be maintained within 2cm within the range of 60 °inclination;

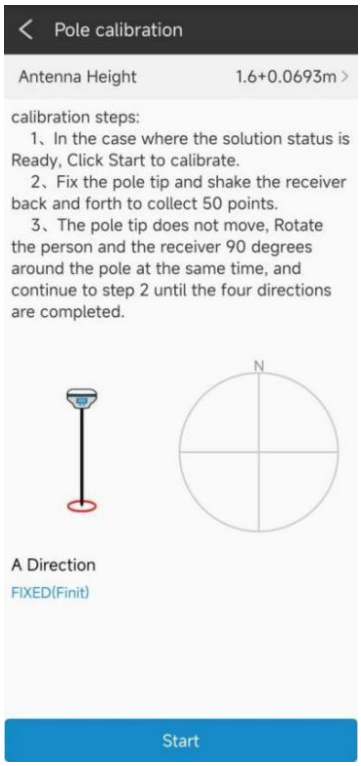
2. The calibration process is simple, just shake the centering rod in place;

3. Support calibration of centering rod, and eliminate survey error caused by curvature of centering rod.

Open the point survey page, click the bottom column to input the antenna height parameter (height of the centering rod), and then light up the tilt survey icon at the lower left corner, that is, turn on the tilt survey function. The icon is green when it is turned on. At this time, the device needs to shake the centering rod 5~10S according to the pop-up window prompt under the fixed state, until the icon turns green , the tilt survey can be performed.

When using the tilt survey for the first time, the alignment rod needs to be calibrated to eliminate the alignment rod curvature band for the error. Click "Device"→ click "Inspection accuracy" →click "Pole calibration", then set the antenna height parameter, and calibrate the centering rod according to the calibration steps and pop-up prompt.

For the same device and the same centering rod, the centering rod calibration only needs to be carried out once, and the centering rod calibration can be eliminated when the matching is kept unchanged.



Precautions:

1. When the tilt survey is started, sometimes with the movement and rotation, the tilt icon will change from green to red. At this time, the centering rod needs to shake according to the prompt, and the sampling can be carried out until the icon turns green;

2. In the process of inclination survey, if the inclination is greater than 60 °, it will indicate that the inclination is too large, and the accuracy of the collected points cannot be guaranteed within 2cm;

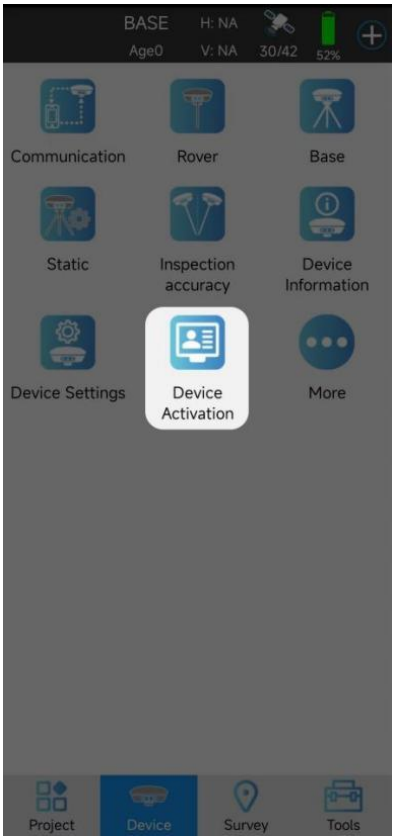
3. To calibrate the centering rod, set the antenna height parameter first, otherwise the calibration data will be wrong;

4. Initialization of tilt survey can be completed only when it is in fixed solution state.

4.12 Device Activation

Operation: Device → Device Activation

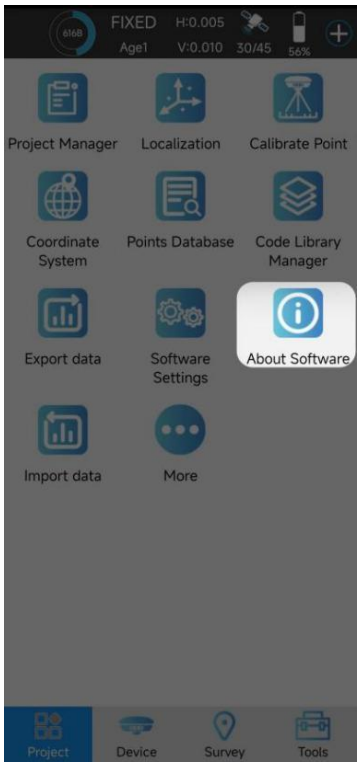
After the device Bluetooth connection is successful, you need to confirm whether the device registration code is valid. If it has expired, you need to register. Click "Device"→ "Device Activation" to query the valid time of the device registration code. If it has expired, you need to input or scan the new device registration code.



4.13 Software Activation

Operation: Project → About Software

In the process of using the software, you need to pay attention to the expiration date of the software. If it has expired, you need to activate. Click "Project"→ "About Software" to query the software expiration time. If it has expired, click Software Activation and enter or scan a new software activation code on the jump page.



V. Technical Indicator

Item		Specification	remarks
Hardware		Qualcomm Cortex-A7	
OS		Linux	
GNSS	GPS	L1C/A, L1C, L2P(Y), L2C, L5	
	GLONASS	L1, L2, L3	
	BDS	B1I, B2I, B3I, B1C, B2a, B2b	
	GALILEO	E1, E5a, E5b, E6	
	QZSS	L1, L2, L5	
	SBAS	L1	
	NavIC(IRNSS)*	L5*	IRNSS support in future
	Channel	1408	
	Data format	NMEA-0183	
	Correction I / O Protocol	RTCM3.X	
	Data update frequency	20Hz(max)	
	Recapture Time	<1s	
	Cold Boot	≤40s	
POSITIONING ACCURACY	Single(RMS)	Horizontal : 1.5m Vertical : 2.5m	
	DGPS(RMS)	Horizontal : 0.4m Vertical : 0.8m	
	RTK(RMS)	Horizontal :±(8mm+1ppm) Vertical :±(15mm+1ppm)	
	Time Accuracy(RMS)	20ns	
	Static Accuracy(RMS)	Horizontal :±(2.5mm+0.5ppm) Vertical :±(5mm+0.5ppm)	
	Speed Accuracy(RMS)	0.03m/s	
	Tilt compensation Accuracy(within 60°)	≤2cm	
SYSTEM	Bluetooth	BR+EDR+BLE	
	WIFI	802.11 b/g/n	
	Network	LTE FDD: B2/B4/B5/B7/B12/B13/B25/B26 LTE TDD: B38/B41 WCDMA: B2/B4/B5 GSM: 850MHz PCS: 1900MHz	
	Data Radio	Frequency : 410~470MHz Protocol : TRIMTALK, TRIMMK3, SOUTH, TRANSEOT RF transmit power : 1W/5W Air baud rate : 9600 / 19200bps	
	Storage	32GB, User Storage Space 24GB	
INDICATOR	Power Indicator	Show power status	
	Bluetooth Indicator	Show Bluetooth status	
	Network Indicator	Show network signal status	
	Satellite Indicator	Show position status	
	Data link Indicator	Show differential signal status	
BATTERY	Battery	7.4V, 6500mAh	
	Work time	More than 18 hours (Typical, Rover, GSM)	The static working mode supports continuous data collection for 26 hours under full power
	Charge	USB PD 15V/2A 5V/3A	Support fast charging adapter and adaptively and dynamically adjust

			charging current
ENVIRONMENTAL	Work Temperature	-20℃~+60℃	
	Storage Temperature	-40℃~+85℃	
	Shock	Withstand 1.5M pole drop	
	Protection	IP68	
PHYSICAL	Material	Magnesium alloy main body, ABS/PC top cover	
	Dimension	Φ143.5mm*90.7mm	
	Weight	≤0.90kg	
A Full Set	M68K Device	1 SET	
	USB power adapter	1 PCS	
	USB A To Type-C	1 PCS	
	Radio Antenna	1 PCS	

The antenna(s) used for this transmitter must be installed to provide a separation distance of at least 80 cm from all persons and must not be collocated or operating in conjunction with any other antenna or transmitter, End-Users must be provided with transmitter operation conditions for satisfying RF exposure compliance.

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