iRTK5 Smart GNSS RTK System

User Manual

Manual Revision

Revision Date	Revision Level	Description
Mar., 2018	1	iRTK5 GNSS RTK System User Guide A1
July. 2019	2	iRTK5 GNSS RTK System User Guide A2

iRTK5

Smart GNSS RTK System
User Manual

Preface

Introduction

Welcome to the Hi-Target iRTK5 receiver. This introduction describes how to use this product.

Experience Requirement

In order to help you use Hi-Target series products better, Hi-Target suggests you carefully read the instructions. If you are unfamiliar with the products, please refer to *http://www.hi-target.com.cn/.*

Tips for Safe Uses

Notice: The contents here are special operations and need your special attention. Please read them carefully.

Warning: The contents here generally are very important. Wrong operation may damage the machine, lose data, even break the system and endanger your safety.

Exclusions

Before using the product, please read these operating instructions carefully, they will help you to use it better. Hi-Target Surveying Instrument Co., Ltd assumes no responsibility if you fail to operate the product according to the instructions, or operate wrongly due to misunderstanding the instructions.

Hi-Target is committed to constantly perfecting product functions and performance, improving service quality and reserves the rights to change these operating instructions without notice.

We have checked the contents of the instructions and the software & hardware, without eliminating the possibility of deviation. The pictures in the operating instructions are for reference only. In case of non-conformity with products, the products shall prevail.

Technology and Service

If you have any technical issues, please call Hi-Target technology department for help, we will answer your question.

Relevant Information

You can obtain this introduction by:

1. After purchasing Hi-Target products, you will find this manual in the instrument container to guide you on operating the instrument.
2. Log onto the Hi-Target official website, download the electronic version introduction at *Partners → Partner Center*.

Advice

If you have any suggestions for this product, please email *info@hi-target.com.cn.* Your feedback information will help us to improve the product and service.

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Chapter 1

Overview

This chapter contains:

- Foreword
- Features

1.1 Foreword

iRTK5 is the new high-quality GNSS receiver of Hi-Target, benefiting from the next-generation GNSS engine, supporting the *PPP service*, *XTRa technology*, *calibration-free tilt survey*. It has full band support for cellular mobile networks (LTE, WCDMA, EDGE, GPRS, GSM), and supports most of the radio protocols on an internal UHF transceiver radio.

iRTK5 has an innovative design, a magnesium alloy structure and the Linux 3.2.0 operating system. The HD OLED color touch screen with better graphics is operational in rain. These make iRTK5 an industry-leading GNSS RTK surveying solution.

1.2 Features

1. With the next-generation GNSS engine BD990, the new intelligent iRTK5 provides an intelligent and integrated solution for surveying and mapping.

2. It supports full constellation and multiple channels with Maxwell7 technology and four-star tri-band solution, providing the position quickly and reliably.

3. It supports the PPP service (optional). There is no need to set up a base station or connect CORS to achieve accurate real-time centimeter-level positioning of stand-alone.

4. It supports XTRa technology, making measurement more continuous and reducing wait time.

5. It supports the calibration-free tilt survey, with high precision IMU measurement module.

6. With the built-in WEB management system, it supports monitoring in real-time and configuration principal machine.

7. The HD OLED color touch screen with better graphics is operational in rain.

8. With 16GB internal storage, 4G full Netcom communication and 4G network antenna, it supports OTG function and OTG function.

9. It has a 360° omnidirectional radio antenna and internal UHF radio built-in multi-protocol radio, and 4W large transmit power. The rover station supports network relay and radio relay;

10. It supports WiFi, Bluetooth and NFC.

11. Built-in gravity acceleration sensor (electronic bubble);

12. With a 6800mAh lithium-ion rechargeable and removable smart battery, it supports a quick charge and power display with the LED.

13. Stronger with innovative designs and a magnesium alloy structure.

14. Double format storage of static data (*.GNS / RINEX).

15. With the new-generation controller iHand30, it supports 4G, WiFi, OTG, quick charge and so on.

16. HDL multi-protocol radio, compatible with imported brands, supports external radio, network relay and radio relay;

17. With the new Hi-Survey software with new UI, it supports multiple base maps and so on.

Chapter 2

Product Introduction

This chapter contains:

- Hardware structure
- Button & LED
- Touch display
- Web management system
- Static measurement
- Real Time Kinematic (RTK) surveying
- Tilt survey
- PPP service (optional)
- XTRa technology
- Firmware upgrade

2.1 Hardware structure

The product appearance is divided into three parts, including the upper cover, bottom cover and control panel.

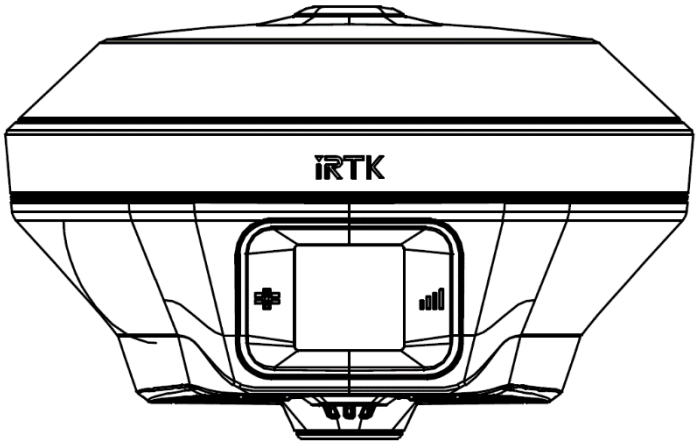


Figure 2-1-1 Front

2.1.1 Upper cover

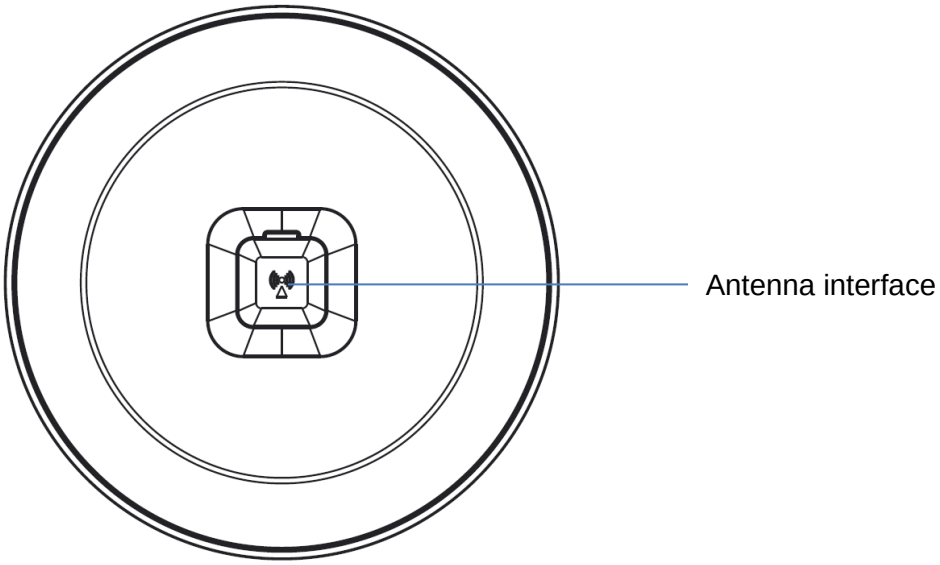


Figure 2-1-2 Upper cover

Antenna interface: connect the radio antenna while using the built-in radio mode. When using the built-in network mode in a poor signal network environment, you can use the antenna interface to connect the external 4G antenna (the iRTK5 has built-in 4G antenna, but you need to use the external 4G antenna in a poor signal network environment, and choose the external antenna mode when using Hi-Survey software or WEB interface).

2.1.2 Bottom cover

The bottom cover includes a 5-pin socket, a power light & button, a Mini USB socket, a speaker, a battery compartment, a connection screw, etc.

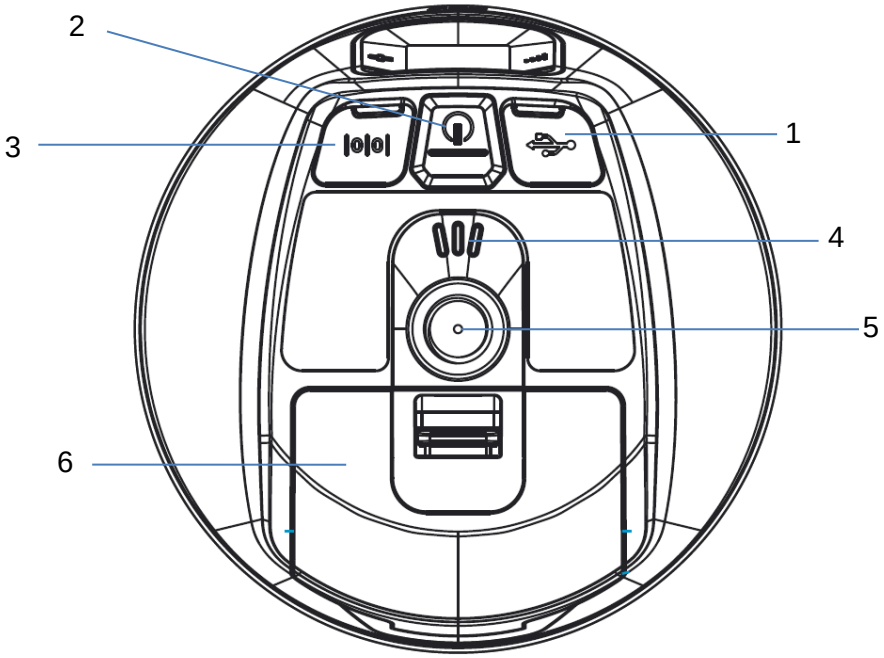


Figure 2-1-3 Bottom cover

1-USB socket	2-Power light & button	3-Five-pin socket
4-Speaker	5-Connection screw	6-Battery compartment cover

- USB socket: connect the iRTK5 with external devices, to upgrade firmware and download static data. It can also be used as the USB to serial port, in special working modes (you need to install the driver). It supports OTG.

- Five-pin socket: for external data linking and external power supply.

- Connection screw: for fixing the instrument to the base or a pole.

- Battery compartment cover: dustproof and waterproof.

Notice:

1. If you don't use the five-pin socket and USB interface, please cover the rubber plug to protect from dust and water.

2. When the speaker is flooded, the sound may be silent or hoarse, but it will return to normal after drying.

2.1.3 Control panel

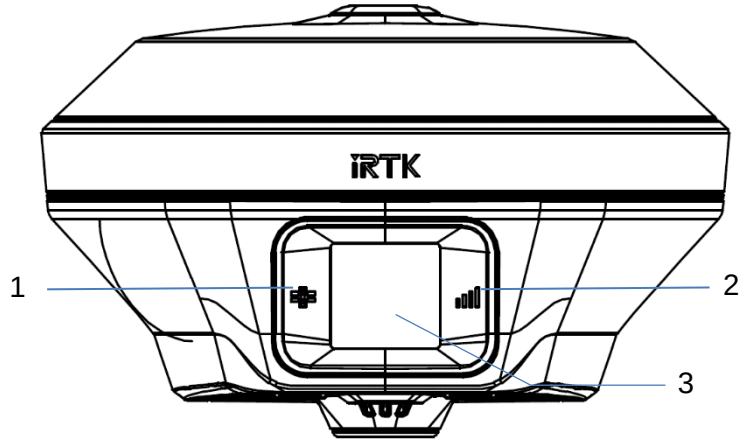


Figure 2-1-4 Control panel

1-Satellite LED 2-Data LED 3-OLED touch screen

2.2 Button & LED

2.2.1 Button

Table 2-2-1 Button function description

Function	Description
Power-on	Press the button for 1 second.
Power-off	Press the button for at least 3 seconds.
OLED display switch	Double click the power button to open or close the OLED display.
Forced shutdown （Execution in case of crash）	Press the power button for at least 12 seconds.
Check the current status	Click the power button to voice broadcast the current working status.

2.2.2 LED

When the screen display is on:

The power LED, data LED and satellite LED will be off.

When the screen display is off:

The power LED, data LED and satellite LED will work according to the current receiver's status.

Table 2-2-2 LED function description

Item	Status	Description
Power LED	Long-term lighting	Power sufficient
	Flash	Battery low
Data LED	Flash	1. RTK mode: flash at the differential data interval. 2. Static mode Sampling interval >1S: flash at the sampling interval; Sampling interval ≤1S: flash once per second.
	Off	1. RTK mode: no differential data. 2. Static mode: sampling has not started.
Satellite LED	Long-term lighting	Satellite tracked
	Flash	Satellite not tracked

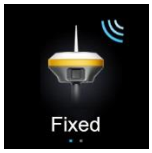
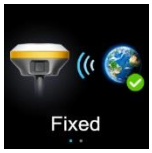
2.3 Touch screen display

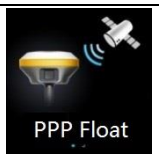
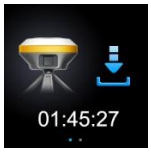
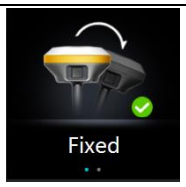
The receiver has a 1.3-inch 240*240 high-resolution touch screen to support touch operation. Double-click the power button to turn off the OLED display, and double-click the power button again, or click the screen, to resume the OLED display.

2.3.1 Status interface

The receiver will display the current working status when it's powered on. The status interface consists of icons and text.

Table 2-3-1 Status interface function description

Status	Icons	Text description
Internal UHF base		Displays in a cycle with the current channel, differential data format and current power.
Internal GSM base		Unconnected to network: Shows the status of the network. Connected to network: Displays in a cycle with the differential data format and current power.
External radio base		Displays in a cycle with the differential data format and current power.
Internal UHF rover		Shows the solution status.
Internal GSM rover		Unconnected to network: Shows the status of the network. Connected to network: Shows the solution status.
External radio rover		Shows the solution status.
Data collector internet rover		Shows the solution status.

PPP Service (Optional)		Shows the solution status.
Static mode		Shows the static collection duration.
Tilt survey		Shows tilt survey initialization.

2.3.2 Stand-by interface

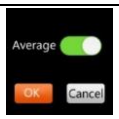
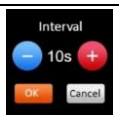
The screen will go on stand-by screen if there is no operation for more than 60s, and then turn off after 5 minutes. Double-click the power button or click the screen to resume the OLED display and show the status.

Table 2-3-2 Stand-by screen

Icons	Description
	Shows the external power supply icon and local time, when using the 5-pin (such as on external device base mode). Only shows the power icon when not tracked.
	Shows the power icon and local time when using the lithium battery. Only shows the power icon when not tracked.

2.3.3 Settings interface

Table 2-3-3 Settings interface

Function	Description	Picture
Settings interface	Left slide on the state interface to enter the settings interface.	
Base settings	Click Base on the settings interface to enter the base settings. Press OK, it will set the base by using the coordinates measured smoothly and send the RTCM3.2 as differential data. If you don't set the average, it will set the base by using the last coordinate.	
Static	Click Static on the settings interface to enter the static settings. If the static recording has not started, you can set the interval as 1s/5s/10s/30s. If it has started, the screen will display the "Stop?" two choices "OK" and "Cancel", and you can click OK to stop and return to the interval settings interface.	
Reset	Click "Reset" in setting interface to reset the motherboard, after click "OK" there will be the pop-up window displaying "Resetting "; If success, the OLED display "Reset motherboard successful", and it will jump to the status interface after 2 seconds; If failed, the OLED displays "Reset motherboard failed", and it will jump to the status interface after 2 seconds.	
Restore	Click Restore to enter the restore interface. Click Yes to restart the iRTK5 and do the OTA firmware update.	
OTG	Insert the OTG data cable and insert the USB disk to directly copy the static data in receiver. The OLED screen displays the folders of last two days, the upper right corner of the folder icon shows the number of files which are not downloaded under this folder, up to 99, it will show "..." if more than 99.	

2.4 Web management system

iRTK5 has a built-in WEB Management System for real-time controlling and free configuration of the receiver. The device Wi-Fi name is the S/N, you can connect it with the controller or phone (without a password), and then input the IP address 192.168.20.1, in the browser, to log into the WEB management system.

2.4.1 Main menu

After logging into the WEB management system, you can click Start to enter the main menu interface. The main menu contains the drop-down menu with each option.

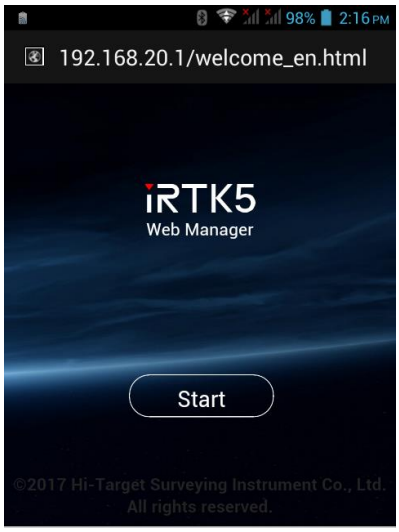


Figure 2-4-1 Welcome page

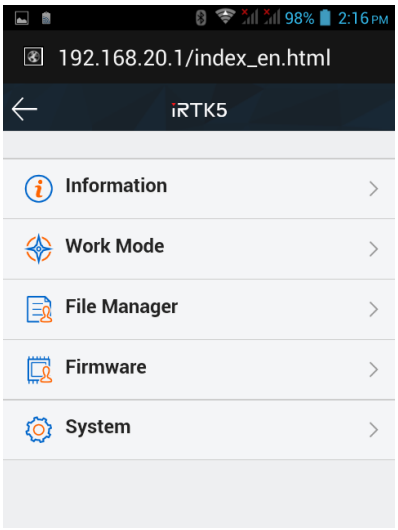


Figure 2-4-2 Main menu

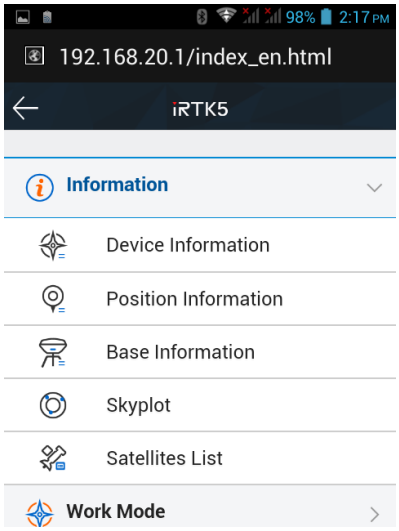


Figure 2-4-3 Information

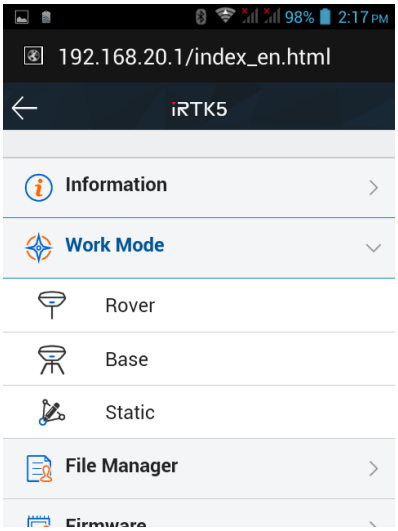


Figure 2-4-4 Work mode

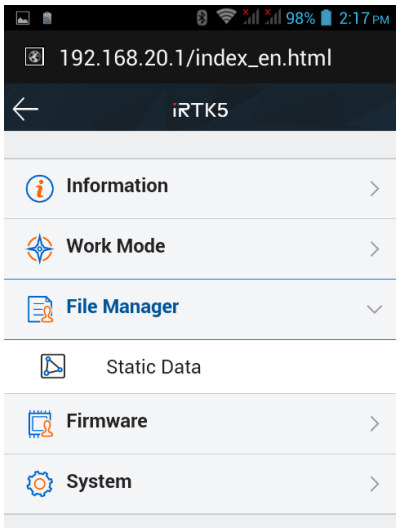


Figure 2-4-5 File manager

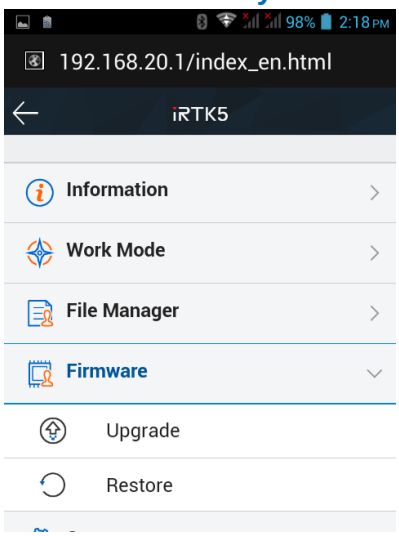


Figure 2-4-6 Firmware

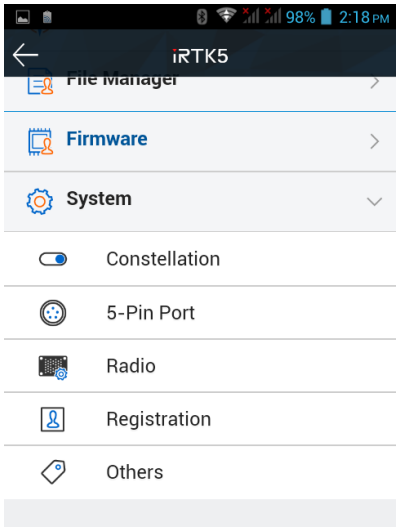


Figure 2-4-7 System

Table 2-4-1 Menu description

Main menu	Sub-menu	Description
Information	Device information	Device model, version, registration information, etc.
	Position information	Coordinates, satellite tracking, solution state, etc.
	Base information	Coordinates and distance to the base.
	Skyplot	Check the skyplot.
	Satellites list	Satellite tracking information.
Work mode	Rover	Data link and parameter settings of the rover.
	Base	Data link and parameter settings of the base.
	Static	Static measurement parameter settings.
File manager	Static data	Download, delete and format static data.

Firmware	Upgrade	Select and upgrade the firmware.
	Restore	Restore the system.
System	Constellation	Switches of the satellite tracking.
	5-pin port	Output settings of the 5-pin port.
	Radio	Radio frequency settings.
	Registration	Device registration and information.
	Reset	Reset the motherboard
	Others	Switch of the static RINEX and voice changes.

2.4.2 Information view

1. Device information

Includes the main device information: device model, S/N, firmware version, battery power, work mode, configuration parameters, etc.

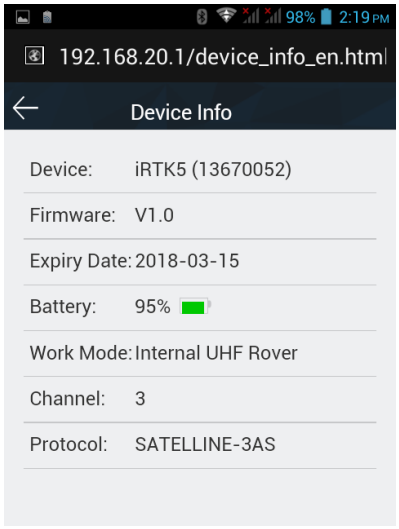


Figure 2-4-8 Device info

2. Position information

Includes the device position, satellites, solution state, latency, PDOP and time.

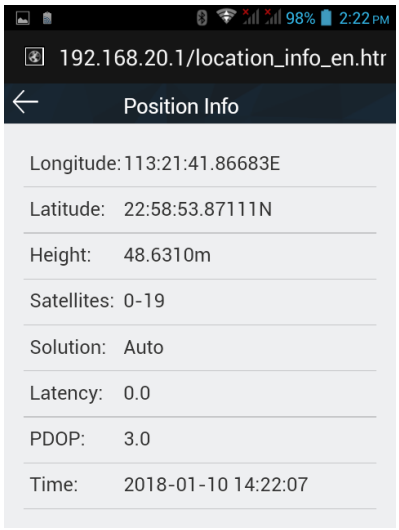


Figure 2-4-9 Position info

3. Base information

Includes the coordinates and distance of the base when in the rover mode.

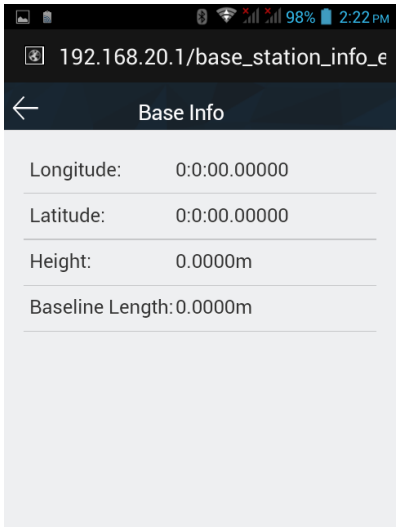


Figure 2-4-10 Base info

4. Sky plot

Includes the sky plot with the ability to switch to different constellations.

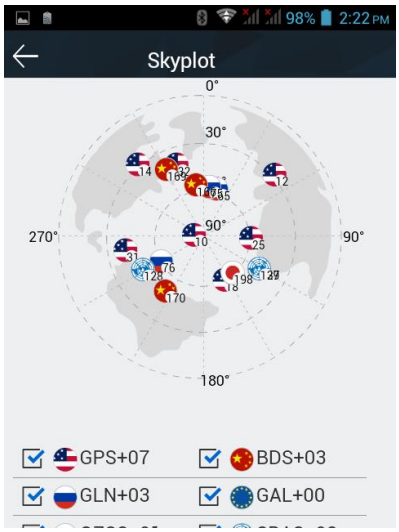
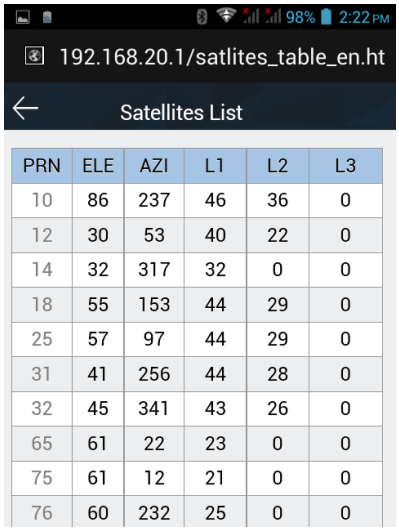


Figure 2-4-11 Sky plot

5. Satellites list

Shows the satellites' tracked information.



PRN	ELE	AZI	L1	L2	L3
10	86	237	46	36	0
12	30	53	40	22	0
14	32	317	32	0	0
18	55	153	44	29	0
25	57	97	44	29	0
31	41	256	44	28	0
32	45	341	43	26	0
65	61	22	23	0	0
75	61	12	21	0	0
76	60	232	25	0	0

Figure 2-4-12 Satellites list

2.4.3 Work mode

1. Rover

Set up the data link and parameters of the rover. Rover station data link mode includes: Internal UHF, Internal GSM, External and PPP (optional function)

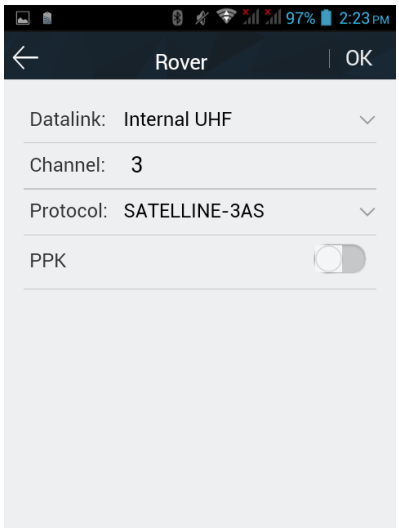


Figure 2-4-13 Rover

2. Base

Set up the data link and parameters of the base and get the point coordinates by averaging. The base data link mode includes: *Internal UHF, Internal GSM* and *External radio*.

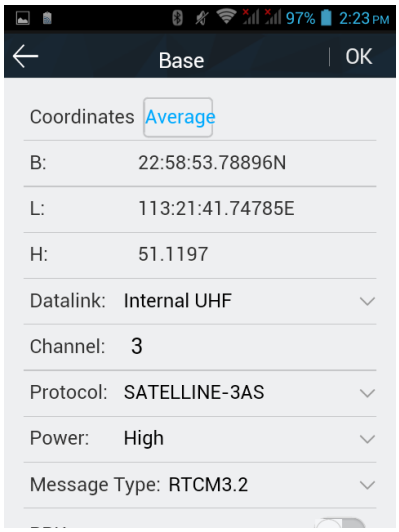


Figure 2-4-14 Base

3. Static

Set up the file name and parameters of the static collection. (Note: after ticking “Static Mode”, you can only cancel in the Base or Rover mode.)

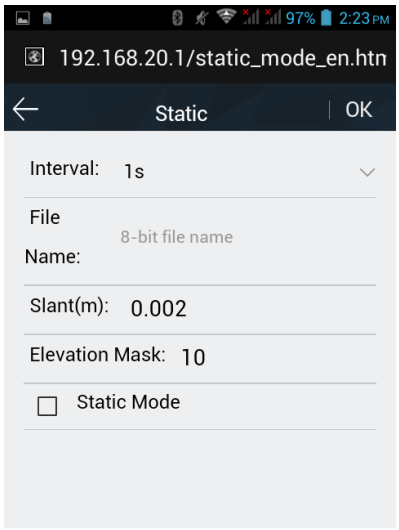


Figure 2-4-15 Static

2.4.4 File management

Static data: to show static data files - it supports *Download* and *Delete* options.

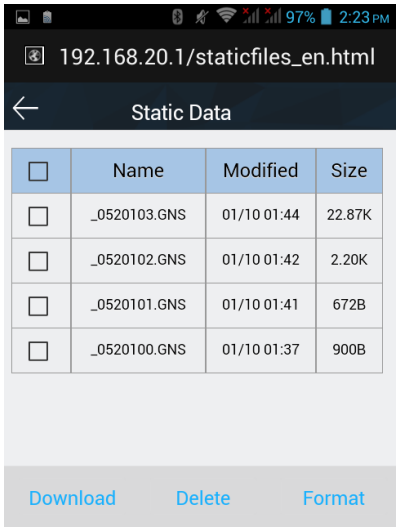


Figure 2-4-16 Static data

2.4.5 Firmware management

1. Upgrade

Display specific device version information. Click *Select*, choose the upgrade package, then click *Start Upgrade*, the receiver will automatically detect the upgrade package and upgrade

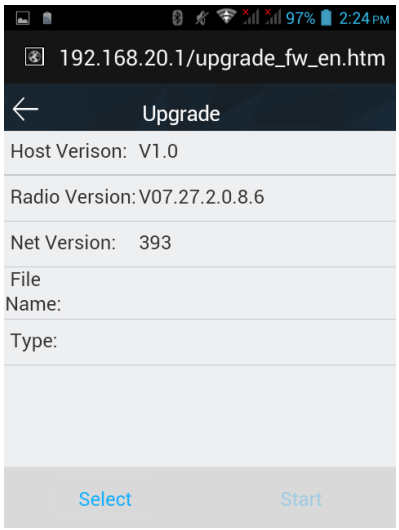


Figure 2-4-17 Upgrade

2. Restore

Restart the iRTK5 and do the OTA firmware update.

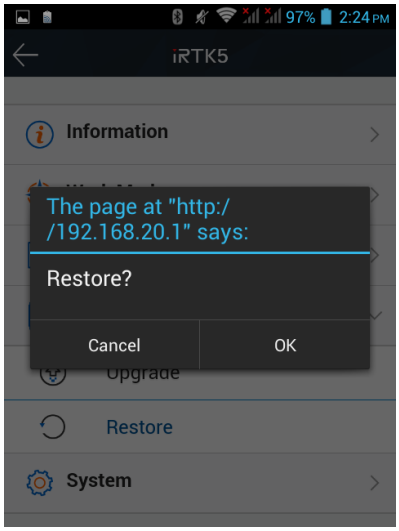


Figure 2-4-18 Restore

2.4.6 System settings

1. Constellation

Switches of the satellite tracking.

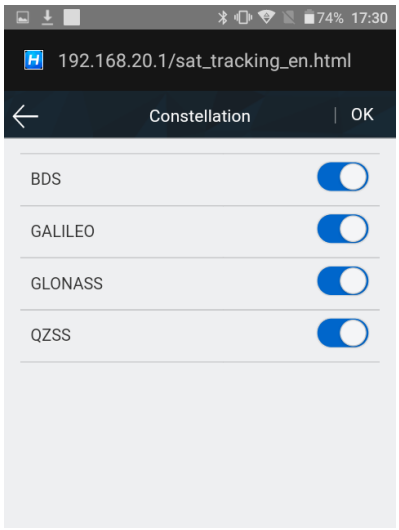


Figure 2-4-19 Constellation

2. 5-pin port

Message type switches and output frequency adjustments (1Hz, 2Hz and 5Hz).

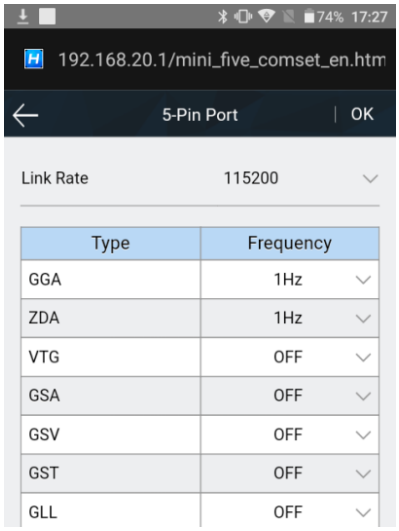


Figure 2-4-20 5-pin port

3. Radio

Radio module

You can select the radio modulation protocol (HI-TARGET, TRIMTALK450S, SOUTH, CHC) to customize the channel frequency of the radio channel 100-115.

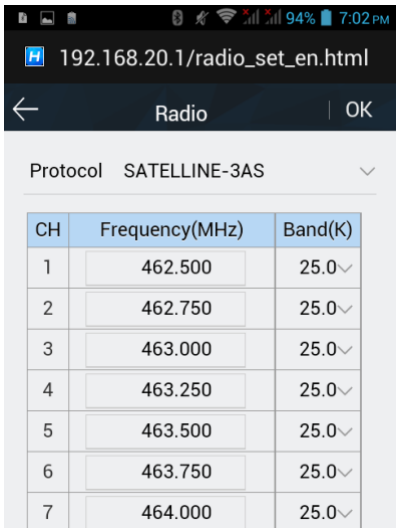


Figure 2-4-21 Radio

4. Registration

Includes registration information, serial number, etc. Provides online registration.

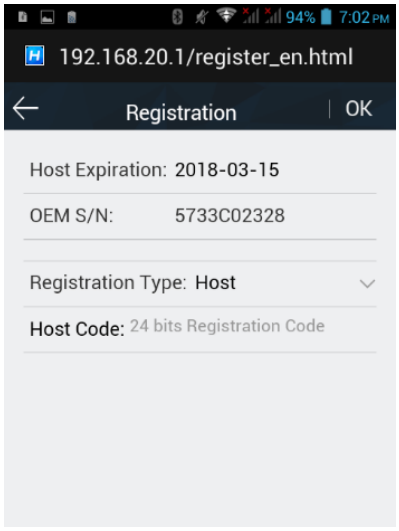


Figure 2-4-22 Registration

5. Reset

Reset the motherboard.

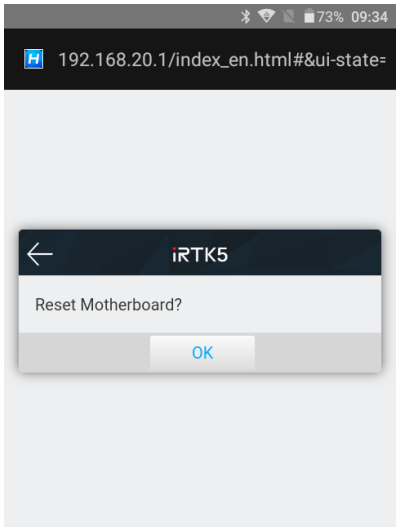


Figure 2-4-23 Reset

6. Others

Static RINEX switch and device volume adjustment.

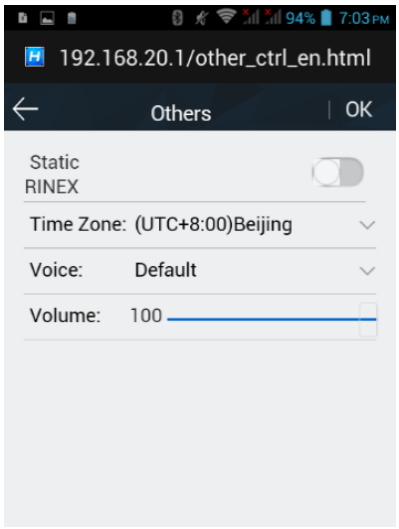


Figure 2-4-24 Others

2.5 Static mode

2.5.1 Static settings

There are three ways to set up the device to work in the static mode:

1. OLED - Static settings - to set up static mode;

2. Hi-Survey software - Static interface - to set up static or temporary static mode;

3. WEB Interface - Work Mode - to set up static or temporary static mode.

After doing the settings, the OLED will display the static data collection interface, and the static measurement data will be saved in the host's memory card. Users can download the static data file to the computer as needed, and then use the static post-processing software (HGO data processing software package) to process the data.

2.5.2 Static data collection steps

1. Set up the receiver on a control point, centering and leveling carefully.

2. Measure the height of the receiver three times, ensuring that the difference of each measurement is less than 3mm. The final height of the receiver should be the average height. The height of the receiver is measured from the center of the measuring point, to the top of the benchmark of the receiver. The radius of the iRTK5 receiver benchmark is 0.130m, and the phase center is 0.0790m high.

3. Record the point name, S/N, receiver height and beginning time.

4. Press the power button to power on and set up the static collecting mode.

5. Turn off the receiver after static data is collected and record the turn off time.

6. Download and post-process the static collection data.

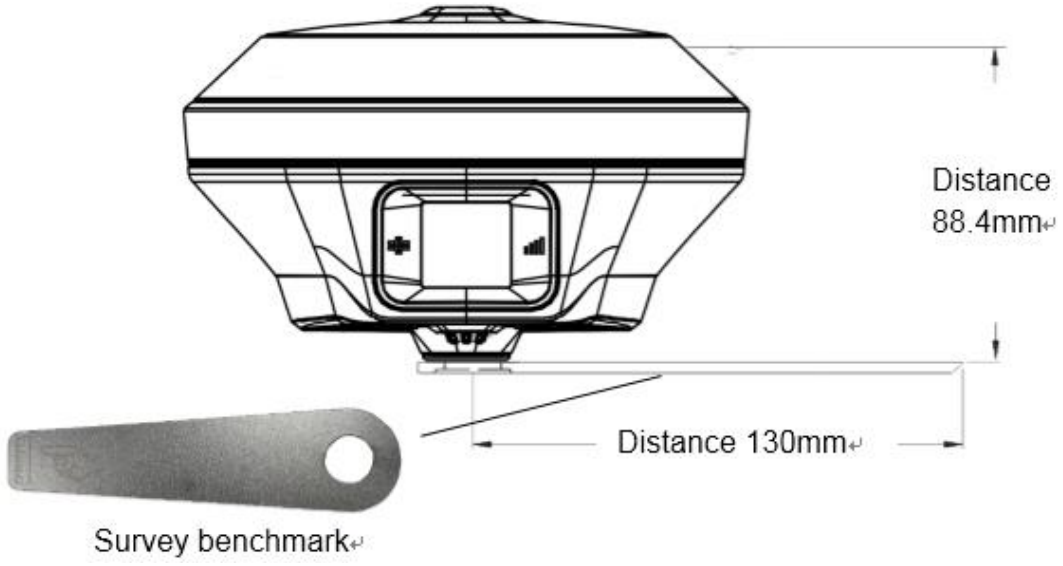


Figure 2-5-1 Measure the antenna height

Notice: Don't move the tripod or change the collecting set while the receiver is collecting data.

2.5.3 Static data download

1. Download the static data by USB cable

Connect the receiver with computer by the Mini USB data cable, and copy the static data to computer. The static measurement data is in the *gnss* folder of the static drive.

Figure 2-5-2 Static drive

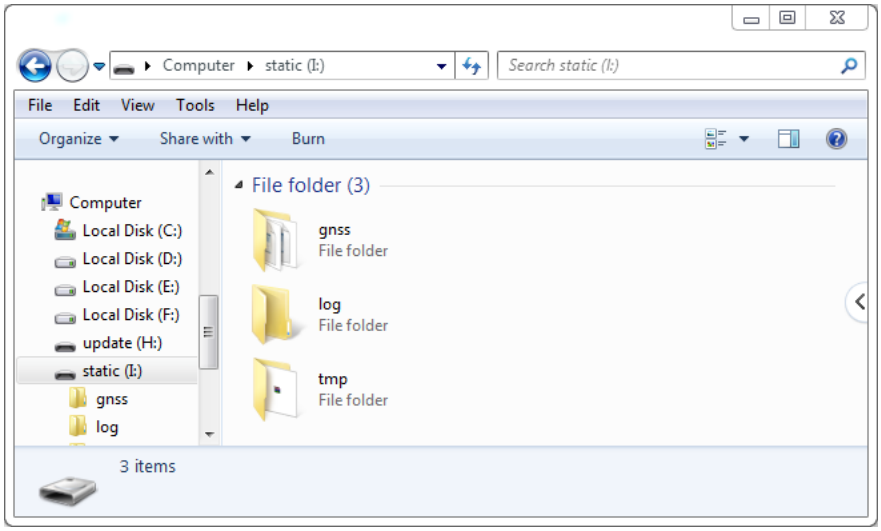


Figure 2-5-3 GNSS folder

2. Download via OTG and a USB flash disk

Insert the OTG cable first, then insert the USB flash disk, and you can copy the static data directly by choosing it.

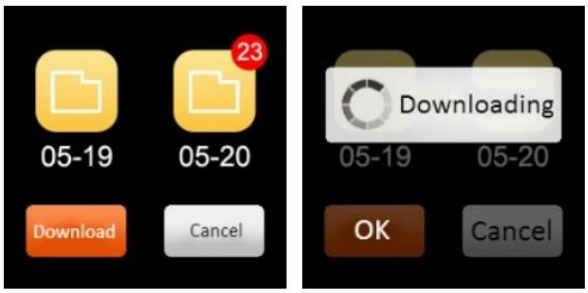


Figure 2-5-4 OTG download

3. Download in WEB management system

4. The device Wi-Fi name is the S/N, you can connect it with the controller or phone (without a password), and then input the IP address 192.168.20.1 in the browser, to log into the WEB management system. Then, open the file manager interface, and select the static file that needs to be exported. Click Download, the file can be downloaded to the phone.

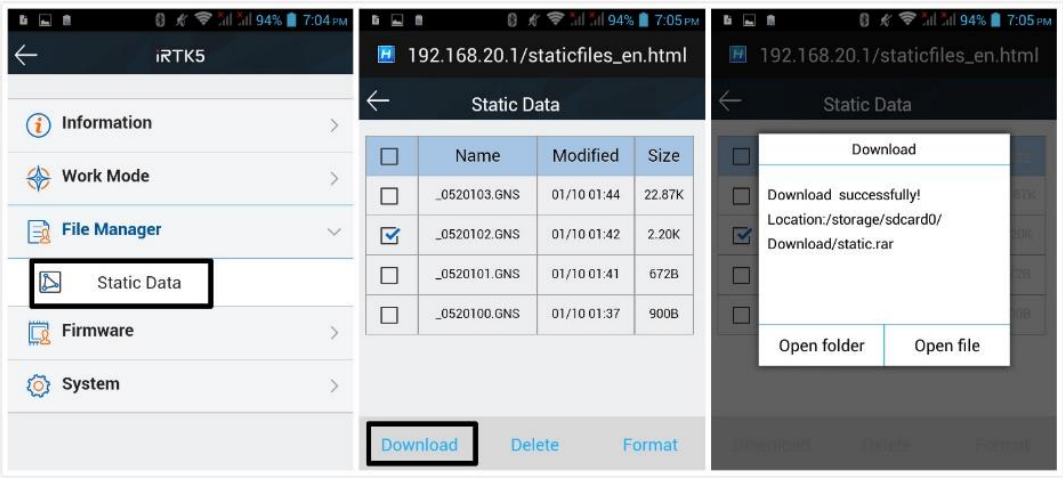


Figure 2-5-5 WEB download

2.6 Dynamic RTK measurement

2.6.1 Set the Base

Dynamic RTK measurement can be divided into radio mode (internal UHF, external radio) and network mode depending on how the differential signal is transmitted.

2.6.2 Set up the receiver

Set up the receiver at a stable known or unknown point. In order to search for more satellites with high-quality signal, the base station should generally be placed in an open field of view, avoiding large buildings and slabs at locations with elevation angle greater than 15 degrees, keeping away from strong signal reflections such as houses, hillsides and large areas of water and high-power equipment (high-voltage lines, radios, transformers, etc.). At the same time, to make the differential signal spread farther, the base station should generally be placed at a higher position.

2.6.3 Device connection

Run Hi-Survey software in the controller, and enter the *Device* interface. Connect via Bluetooth or WiFi.

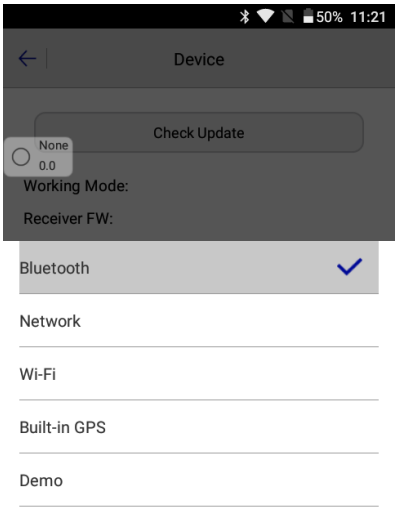
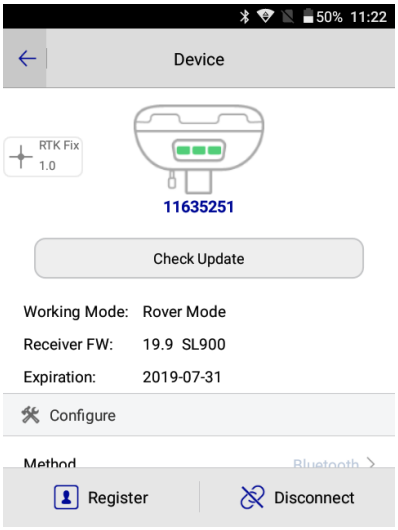


Figure 2-6-1 Bluetooth connection



2-6-2 Device information

2.6.4 Set the Base

The base station parameters include setting the height of the target, coordinates, working mode and corresponding parameters, correction type, elevation mask, etc. After completing the parameter settings, click the *Set* button in the upper right corner, and the software prompts "*Base station is ready, do you want to set Rover now*".

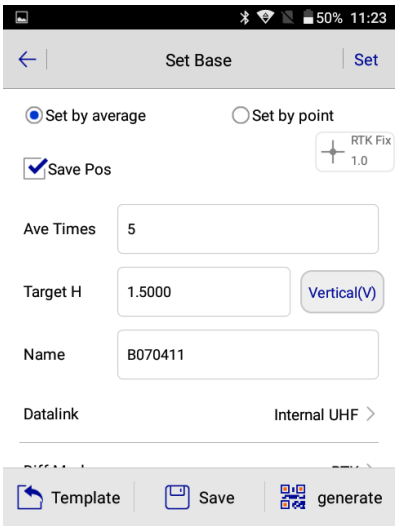
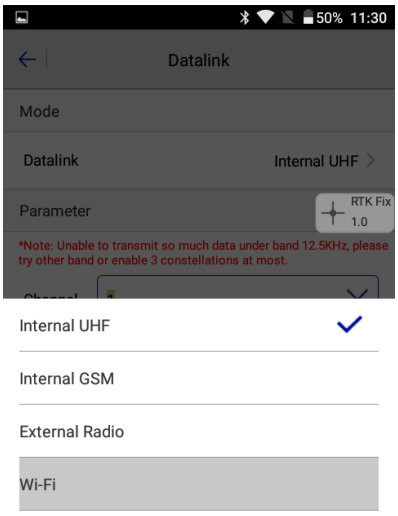


Figure 2-6-3 Set the Base



2-6-4 Datalink of Base

Please refer to Chapter 3 of the *YFZ-2014-1925_Hi-Survey Software User's Guide B8* for the detailed settings of the base station.

2.6.5 Set the Rover

The Rover receiver is fixed on the telescopic centering pole, and the controller is fixed on the controller carrier which is connected to the centering pole. The Rover station settings are basically the same as the base station, mainly including the working mode setting, elevation mask, etc. The difference is that the working mode of Rover station adds another "*Data Collector Internet*".

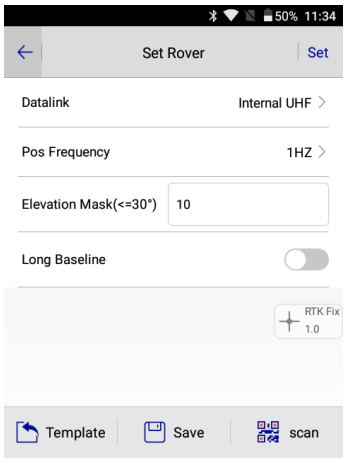
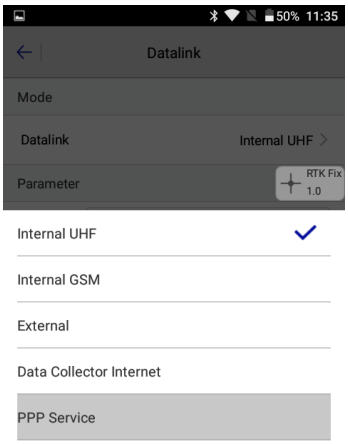


Figure 2-6-3 Set the Rover

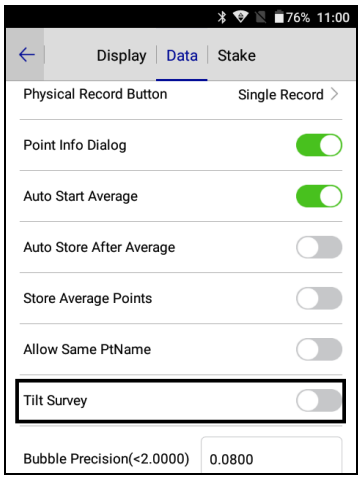


2-6-4 Datalink of Rover

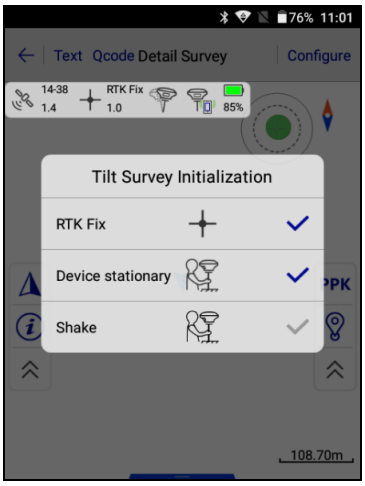
Please refer to Chapter 3 of the *YFZ-2014-1925_Hi-Survey Software User's Guide B8* for the detailed settings of the Rover station.

2.7 Calibration-free tilt survey

Connect the receiver in Hi-Survey software to open the *Tilt Survey* in the *Survey→Surveying→Configure→Data* interface. Click the tilt survey icon, and follow the prompt on the interface of Hi-Survey to finish the initialization.



2-7-1 Tilt survey



2-7-2 Initialization

①Device stationary

When the receiver gets fixed solution, keep the receiver static until *Device stationary* is marked with ✓;

②Shake

After finish *Device stationary*, shake the receiver back and forth (once every 1 second) to perform a shake for initialization, until *Shake* is marked with ✓;

When all the initialization items are ticked, the receiver will prompt *Tilt compensation started* and the tilt survey icon is illuminated which means the tilt survey initialization is completed, and you can perform the tilt survey on the receiver.

Notice:

1. Make sure that the actual pole height is consistent with the set pole height before tilt survey.
2. When turning on the "Tilt Survey" switch, initialization operation is needed before normal use.
3. To meet the operational needs of most users, the maximum measurement angle of tilt survey is 70°.
4. The receiver will prompt Tilt compensation stopped after 30 sec to ensure the measurement accuracy. Shake the receiver slightly when the prompting occurs.
5. To ensure measurement accuracy, do not rotate the receiver quickly during the tilt survey's working process.
6. The data quality will be reduced in the occlusion environment. Please use tilt survey in an open environment if you have higher accuracy requirements.

2.8 PPP service (optional)

2.8.1 Register and authorization

PPP service is an optional function of the new iRTK5 and extra cost will be charged for the service. Authorization can be obtained via register on Hi-Survey software or WEB UI.

Notice: In order to experience the PPP service better, please do survey work in the open environment.

2.9 XTRa technology(optional)

The XTRa technology function is mainly to solve temporary interruption issue in the data link settings. When the RTK correction is interrupted, the receiver can recognize the data link exception fleetly and

change into this mode immediately to keep RTK cm-level accuracy. In a word, it can solve the difficulties of the data link interruption.

Notice:

1. Fixed solution need to be kept 15mins-20mins, and then the receiver can enter into “Measurement with data link interruption”
2. This mode can only keep 4mins.

2.10 Firmware upgrade

2.10.1 Upgrade by USB cable

Steps to upgrading the firmware by USB cable：

1. Turn on the receiver, connect the receiver and computer with the cable attached. It will show the update drive after clicking the computer;

2. Copy the firmware (download from our official website or get it from the technical team) to the update drive. Disconnect the computer and receiver, and restart the receiver;

3. There will be different prompt voices of upgrade successes or failures. If it fails, please contact our technical team.

Figure 2-10-1 Update drive

2.10.2 Upgrade by OTG and USB flash disk

Copy the firmware to the USB flash disk, and connect the USB disk to the receiver with the OTG cable. When the prompt voice asks to upgrade or not, click *Yes*.

2.10.3 Upgrade by WEB management system

Copy the firmware to the controller or phone, and connect it to the receiver by Wifi. The name of Wifi is the S/N of the device. Input *192.168.20.1* to log in, click firmware upgrade - folder - file to choose the firmware, then click start to upgrade the firmware.

2.10.4 Remote online upgrade

It supports the remote firmware upgrade. Make sure the host has been connected to the internet (with the usable SIM card). When detecting that there is a motherboard or host firmware higher than the current version of the host on the server, the host will send the firmware information to the Hi-Survey

software. Click the Update button on the Hi-Survey pop-up window to start the upgrade. Select the host to automatically restart and upgrade the host or motherboard firmware to complete it. Or click Device → Check Update in Hi-Survey software to check it.

Notice:

1. After the download failed, if the network recovers within two minutes, it will resume downloading; otherwise, it will exit the firmware upgrade detection.
2. It is not allowed to forcibly power off during the upgrade. If the power is forcibly cut off, the instrument may be damaged and the instrument may be abnormal.

Chapter 3

Technical parameters

This chapter contains:

- Technical parameters

Table 3-1-1 Technical parameters

Configuration		Detailed indicators
GNSS Configuration	Satellite signals tracked simultaneously	Channels:336
		BeiDou: B1, B2, B3
		GPS: L1C/A, L2C, L2E, L5
		GLONASS: L1C/A, L2C/A, L3 CDMA
		GALILEO: E1, E5A, E5B, E5AltBOC, E6
		SBAS: L1C/A, L5
		QZSS, WAAS, MSAS, GAGAN, IRNSS
		PPP service(optional)
		XTRa technology
	Output format	ASCII: NMEA-0183, binary data
	Positioning output frequency	1~50Hz
	Static data format	GNS and RINEX
	Message type	CMR, RTCM2.X, RTCM3.0, RTCM3.2
	Network model	VRS, FKP, MAC; support NTRIP
System Configuration	Operating system	Linux
	Data storage	Circulating 16GB internal storage; records GNS and RINEX formats simultaneously
Accuracy and Reliability[1]	RTK	Horizontal: ±（8+1×10-6D）mm (D is the distance between the measuring points)
	Static	Horizontal: ±（2.5+0.5×10-6D）mm (D is the distance between the measuring points)
	DGPS	Horizontal: ±0.25m+1ppm Vertical: ±0.50m+1ppm
	SBAS	0.5m
	Initialization time	<10s
	Initialization reliability	>99.99%
Connector	External connector	5-pin socket, USB socket, SMA port and SIM card slot

Communication	Cellular mobile	Internal 4G mobile network: TDD-LTE, FDD-LTE, WCDMA, EDGE, GPRS, GSM
	WiFi	802.11 b/g access point and client mode, WiFi hotspot available
	Bluetooth	Bluetooth® 4.0/2.1+EDR, 2.4GHz
	Internal radio	Built in Transceiver Radio
		Transmitting power: 1W/2W/4W adjustable
		Frequency: 403MHz-473MHz
		Protocol: HI-TARGET, TRIMTALK450S, TRIMMARKⅢ, TRANSEOT, SOUTH, CHC, SATEL.
		Channel: 116 channels, 100~115 channels are configurable)
	External radio	HDL radio
		Transmitting power: 10W/30W adjustable, Frequency: 403~473MHz
		Protocol: HI-TARGET, TRIMTALK450S, TRIMMARKⅢ, TRANSEOT
		Communication: built-in 4G network communication, WIFI, Bluetooth, NFC
		Channel: 48 channels (16 of which are configurable)
		Working mode: external radio, network relay, radio relay
Sensor	Electronic bubble	Intelligent levelling
	Calibration-free tilt survey[2]	Tilt correction system will continue to monitor the inclination of the centering rod, and compensate to correct the coordinates Built-in high-precision inertial navigation, automatic attitude compensation, no need for correction, anti-magnetic interference, and accuracy is 2~3 cm (within 30 degrees).
	Temperature sensor	Intelligent temperature control
User Interface	Button	Single button
	Touch screen	Industrial OLED color screen (240 * 240); capacitive touch, waterproof, supports glove operation
	LED Lamp	Satellite lamp, signal lamp, power light
Application Function	Advanced function	OTG, NFC, WebUI, USB firmware upgrade, network delay, radio delay.
	Intelligence application	Intelligent voice, self-test function, intelligent battery, battery quick charge.
	Remote service	Message delivery, remote upgrade, remote control.

Physical	Internal battery	6800mAh lithium-ion battery with charge display, RTK rover (network) ⩾10 hours[3]
	External power	6-28V DC external power input (5-pin port) with over-discharge protection
	Dimensions	Φ158mm×98mm
	Weight	⩽1.3kg (includes battery)
	Power consumption	4.3W (static mode)
	Materials	The shell is made of magnesium alloy material
Environment	Water/dustproof	IP67
	Free fall	Designed to survive a 2m natural fall onto concrete
	Humidity	100%, condensing
	Operation temperature	-40℃~+75℃
	Storage temperature	-50℃~+85℃

Notice:

1. Measurement accuracy and reliability are affected by many factors, including the satellite's geometric distribution, number of satellites, observation time, satellite ephemeris, ionospheric conditions and multipath.
2. Tilt measurement accuracy is disturbed by many factors, including external electromagnetic interference, pre- calibration precautions, and panel orientation.
3. Battery working time is related to work environment, working temperature and battery life.

Chapter 4

Interfaces and Accessories

This chapter contains:

- SIM card installation
- Data cable
- Antenna
- Benchmark
- Battery & charger

4.1 SIM card installation

iRTK5 receiver supports Nano SIM card, the SIM card installation method is as follows:

1. Remove the battery cover and battery, exposing the SIM card slot.

2. Insert the SIM card according to the illustration at the bottom of the battery compartment (put the gap inside and the chip facing down).

Figure 4-1-1 SIM card installation

4.2 Data cable

1. Mini USB data cable: to connect the iRTK5 host and the computer to upgrade the firmware and download static data.

Figure 4-2-1 Mini USB data cable

2. Five-pin data cable (DG-3): to connect the host and external radio to transmit differential data.

Figure 4-2-2 Five-pin data cable

3. OTG cable: for USB flash disk's OTG firmware upgrade and static data download.

Figure 4-2-3 OTG cable

4.3 Antenna

There is one standard radio antenna and one 4G antenna, you can select the appropriate antenna according to the operation mode. The UHF radio antenna is used in the internal UHF mode, and the external 4G antenna is used in the internal GSM mode.

Figure 4-3-1 4G antenna(above) and radio antenna(below)

4.4 Benchmark

The benchmark is used to measure the height of the instrument.

Figure 4-4-1 Benchmark

4.5 Battery & charger

1. Battery: the host is equipped with the 6800mAh/7.4V intelligent lithium battery, with a power indicator function.

Figure 4-5-1 Battery

There are 4 indicator lights in all:

Table 4-5-1 indicator lights description

Operation	Battery power	LED indicator
Charging	0-25%	LED 1 flashes, the flashing frequency is 1Hz.
	25%-50%	LED 1 is in long-term lighting; LED 2 flashes, the flashing frequency is 1Hz.
	50%-75%	LED 1 and 2 are in long-term lighting; LED 3 flashes, the flashing frequency is 1Hz.
	75%-100%	LED 1, 2 and 3 are in long-term lighting; LED 4 flashes, the flashing frequency is 1Hz.
	Full (trickle charge)	All LED lights off. (charging current ⩽150mA).

2. Charger: use the standard charger to charge the battery, the indicator will turn off when the battery is fully charged.

Figure 4-5-2 Battery charger

Chapter 5

iHand30 Controller

This chapter contains:

- Introduction
- Appearance
- Controller accessories
- Operation
- Application

5.1 Introduction

5.1.1 Foreword

The iHand30 controller is a professional data collector, based on the Android system. Using a combination of physical buttons and touch screen to operate, the default input languages are Chinese and English, and it supports multiple languages. The industrial-standard design can withstand 1.2 meters drop to a cement floor, is IP67 waterproof and dustproof standard to adapt to a complex operating environment. At the same time, the super capacity lithium battery can handle all weather requirements.

The iHand30 controller configures 3.7 inches 640 * 480 highlighted OLED; 1.5GHZ, quad-core 64-bit CPU; and 16GB ROM +2 GB RAM memory. It has a built-in Micro SD card slot, and maximum support 128GB expansion card (it only supports FAT32 format SD card, the NTFS format SD card cannot be supported); dual card dual stand-by, and supports the entire 4G network. With the Android 6.0 operating system, the interface is optimized and easy to use.

5.1.2 Features

1. Industrial-standard design, with IP67 it can withstand a 1.2 meters drop to a cement floor and adapt to a complex operating environment.

2. Highlighted OLED, the OLED screen is normally readable under strong sunlight.

3. Supports Bluetooth, Wi-Fi and 4G，which is convenient to carry out a variety of wireless data transmissions with the receiver. Wi-Fi and 4G can be used at the same time. Refer to the Hi-Survey Road Software User's Guide for more details.

4. Internal 8 million pixel camera: for field collection of image information.

5. Internal removable large capacity lithium battery for more than 15 hours of work.

6. Internal NFC chip, supports NFC data transmission for a rapid connection between the RTK and hand-held controller.

7. Fast charge technology: for a rapid battery charge.

8. Full keyboard input method.

9. Local online upgrade to facilitate quick changes.

5.1.3 Caution

Although the iHand30 hand-held controller is made with chemical and impact resistant materials, it needs to be carefully used and maintained, and should be kept in a dry environment. In order to improve the stability and usage cycle of the iHand30 hand-held controller, please avoid exposing it to extreme environments, such as humidity, high temperatures, low temperatures, corrosive liquids or gases, etc.

Notice: The iHand30 hand-held controller must be used within the temperature range from -20℃ to 55℃

5.2 Appearance

5.2.1 Front of the controller

The front of the iHand30 controller includes a touch screen, keyboard microphone and indictor light.

Figure 5-2-1 iHand30 controller

1- Indictor lights 2- Microphone 3- Touch screen 4- Keyboard

- Touch screen: multipoint capacitive touch screen with touch pen (open the touch pen function: Settings - Accessibility - Handwriting pen), which supports Chinese and English input.

- Keyboard: direction control, switch between Chinese and English, data collection, volume control, power on, power off and other functions.

- Microphone: the internal microphone can be used for field collection of voice messages.

- Indicator lights: from left to right: signal lamp, state lamp, power indicator.

5.2.2 Reverse side of the controller

There is a camera, battery cover, belt, NFC, trumpet, etc. on the reverse of the controller.

Figure 5-2-2 the backside of the iHand30

1- Camera 2- Battery cover 3- Trumpet 4- NFC 5- Belt hole

- Camera: used for field collection of images.

- Battery cover: with an internal removable lithium battery.

- Belt hole: connect the belt to prevent it sliding down.

- Trumpet: conduct real-time voice broadcasts for instrument operation and status.

- NFC: supports NFC data transmission to achieve rapid connection between RTK and the hand-held controller.

5.2.3 Side of the controller

Figure 5-2-3 the port of iHand30

1- Waterproof & dustproof rubber cover 2- Audio port 3- USB port

- USB port: for connecting the USB data line and the controller.

- Audio port: for connecting the headphone cable and the controller.

Notice: When not using the audio port or Mini USB, please close the rubber cover to make it waterproof and dustproof.

5.3 Controller accessories

5.3.1 Charger

Figure 5-3-1 Charger

Charger: 5V--3A/9V--2.7A/12V--2A

Type: A824A-120200U-CN2

5.3.2 Battery

Figure 5-3-2 Battery

Lithium battery: 3.7V /5200mAh

5.3.3 Data cable

Figure 5-3-3 Data cable

USB data cable: connect to the USB port of a computer, for download of data; connect to the USB port of the charger for charging the controller.

5.3.4 Touch pen

Figure 5-3-4 Touch pen

Touch pen: located on the strap of the controller.

5.4 Operation

5.4.1 Keyboard

Most settings and operations of the iHand30 hand-held controller can be completed by the touch pen, and commonly used operations can be completed on the keyboard. Appearance and functions of the keyboard are as follows.

iHand30 keyboard includes: Back, OK, Power, APP, Fn, Collect, etc.

Figure 5-4-1 Keyboard

1- Home	2- Menu	3- APP	4- Fn	5- Power	6- Back
7- Collect	8- OK	9- Delete	10- Space	11- Enter	12- Shift

- Back: cancel or exit the operation of the current window.

- OK: confirmation.

- Power: press it for over 3secs to power on/off. Press it for 1sec to turn off /on the screen backlight in the power on status.

- APP: quick start of the APP. The default is Hi-Survey Road software.

- Fn: when inputting, short press this key to cycle the input method (Chinese Pinyin/ English letter abc/ English association en/ number 123). In any interface, long press this button to pop-up the selection box to switch the system input method.

- Collect button: collect data by manual operation.

- Shift: switch key of the input function.

- Fn + direction up/ down key: volume increase/ decrease.

- Screenshot function: pull down the screen at the top menu, select the screenshot options, and the screen capture will be kept in the folder of Mobile phone storage→Pictures→ Screenshots. (note: iHand30 does not set the shortcuts screenshot function).

Notice: When the iHand30 hand-held controller is not used, please turn off the backlight to save electricity and prolong working time.

5.4.2 Battery installation and dis-assembly

1. Installation and dis-assembly of the battery

Installation:

Step1: the metal contact parts of the battery are placed upwards in the cell tank.

Figure 5-4-2 Installation of Battery

Step2: press the bottom of the battery.

Figure 5-4-3 Installation of the battery

Dis-assembly: pull up the bottom of battery

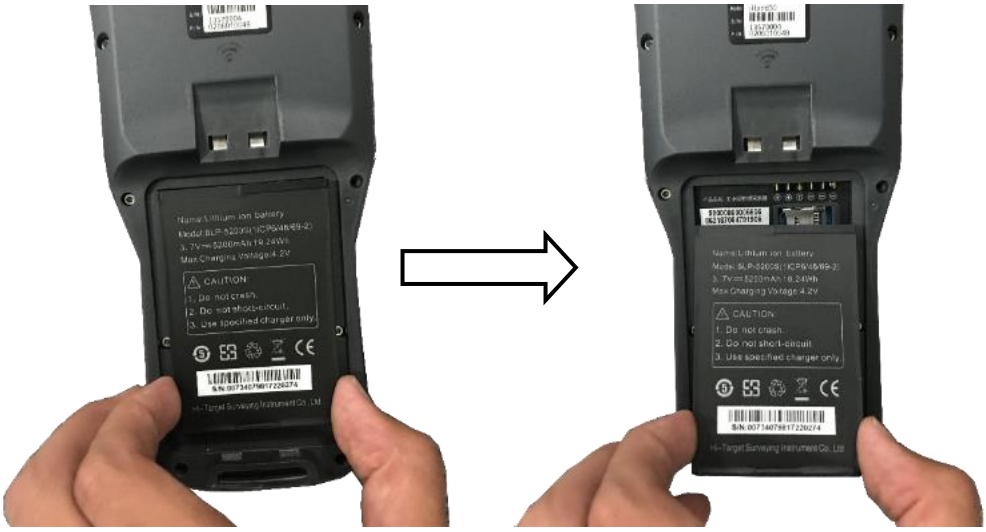


Figure 5-4-4 Dis-assembly of the battery

2. Installation and dis-assembly of the battery cover

Installation:

Step1: insert the two raised tabs of the battery cover into the corresponding slots.

Figure 5-4-5 Battery cover

Step2: press the battery cover tightly, press the black button.

Figure 5-4-6 Lock the battery cover

Dis-assembly: push up the black button of the battery cover, and pull up the battery cover.

Figure 5-4-7 Battery cover

Figure 5-4-8 Lock the battery cover

5.4.3 Power system

1. The battery and charger model of the iHand30 hand-held controller

Table 5-4-1 the battery and charger model

Name	Model
Lithium battery	BLP-5200S
Charger	A824A-120200U-CN2

2. Charge

The special charger should be within a certain temperature range when charging, and a certain charge time is required. Specific use methods and requirements: use the special charger of the controller to charge in the temperature range of 10℃-40℃. There is a certain amount of electricity in the battery on

first use, let the power completely run out from the first charge, then the first three times you will need to charge for 3 hours. After that, the iHand30 supports fast charging with the original charger and the charge time is then less than 3 hours. If the battery is not used often, it must be charged once every two months.

Notice:

1. Please use the configured battery and charger, do not put battery into fire or metal short circuit electrode.
2. If the battery is hot, deformed, leaks, has an odour or any other abnormalities during use, charging or storage, please replace it
3. If the using time is obviously shortened, please stop using the battery. Please replace with a new battery

5.4.4 SIM card setting

The iHand30 hand-held controller supports DSDS, the default card is SIM1. Both SIM1 and SIM2 support full network 4G.

1. Installation of the SIM card

Step1: remove the battery cover, remove the battery, and expose the SIM card slot. Slot 1: Micro SIM card; slot 2: standard SIM card.

Step2: put the SIM card into the slot with the front side (metal contact side) down.

Figure 5-4-9 Installation of SIM card

2. Network: Settings → Data usage.

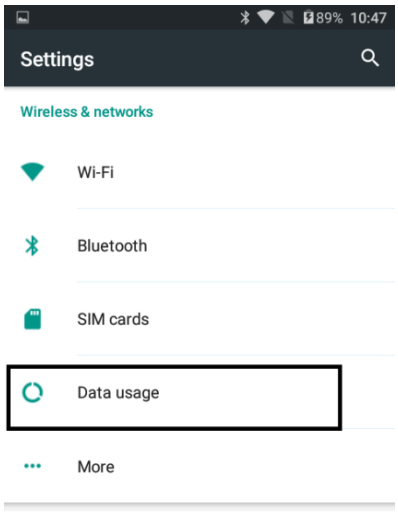


Figure 5-4-10 Data usage

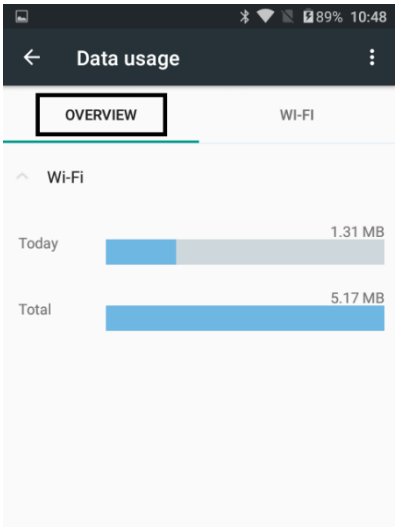


Figure 5-4-11 Overview of data

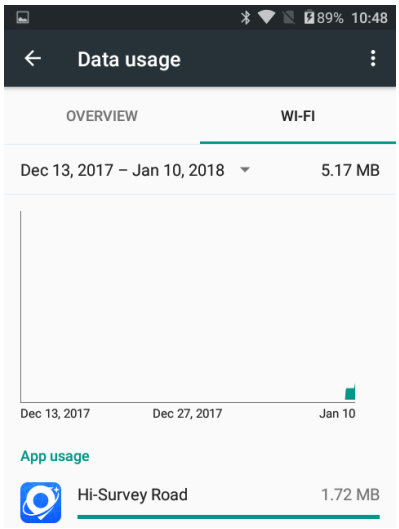


Figure 5-4-12 Cellular data network

5.4.5 Installation of the Micro SD card

The Micro SD card can save collected data and program files.

Notice: Micro SD card（TF card）is an external storage card, usually used in mobile phones and PDAs. If you buy this, please note the difference to ordinary SD cards. The volume of the ordinary SD card is larger than the Micro SD card, and is not suitable for the iHand30 hand-held controller.

Step1: remove the battery cover, remove the battery, and expose the Micro SD card slot.

Step2: push down the metal sheet and open it.

Figure 5-4-13 Micro SD slot

Step3: Put Micro SD card into the slot (metal contact side down).

Figure 5-4-14 Installation of Micro SD card

Step4: push down the metal sheet and close it.

Figure 5-4-15 Installation of Micro SD card

5.4.6 Power on/off

In the off state, long press the power button for 3 seconds, it will power on.

Figure 5-4-16 The interface of the iHand30 screen

In the *power on* state, long press the power button for 3 seconds, it will prompt to shut down and to confirm, click Power off.

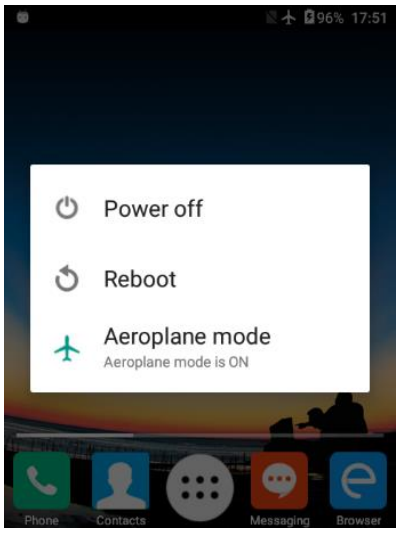


Figure 5-4-17 Power off

5.5 Application

5.5.1 Connecting the controller to computer

1. Connect the controller to computer via the USB data cable.

2. Transfer files: pull down the notice column and click USB for charging.

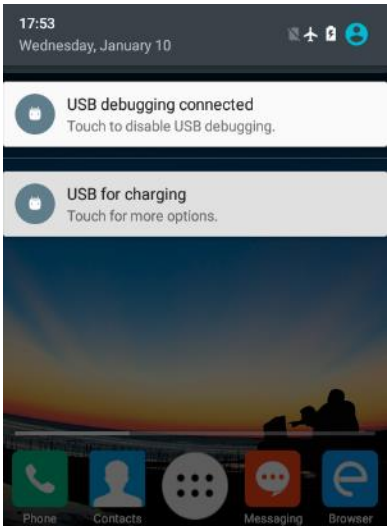


Figure 5-5-1 USB connected

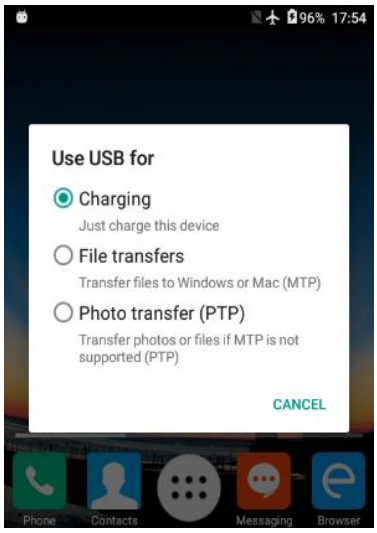


Figure 5-5-2 Charging

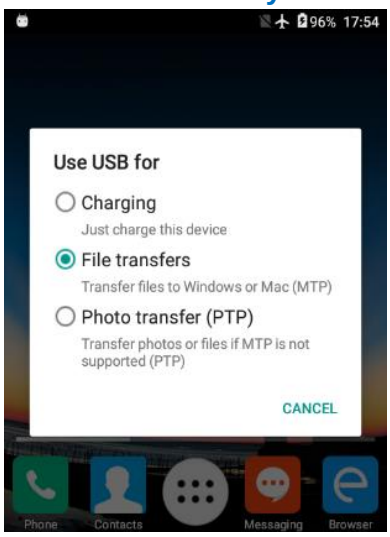


Figure 5-5-3 File transfers

3. Connect the PC version mobile phone assistant: open the hand-held controller, click Setting → Developer options → USB debugging.

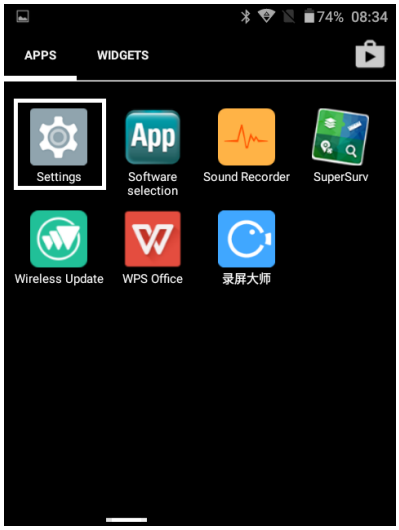


Figure 5-5-4 Settings

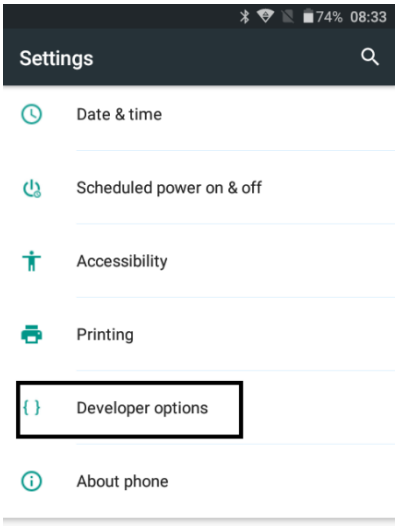


Figure 5-5-5 Developer options

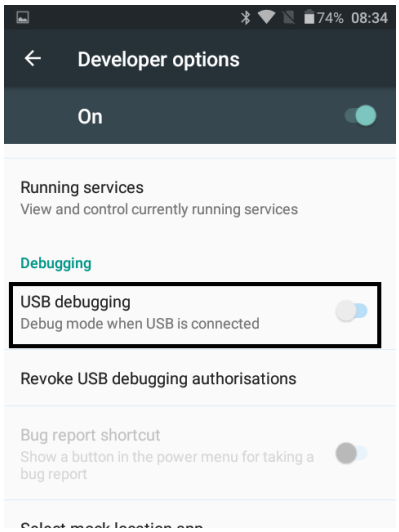


Figure 5-5-6 USB debugging

5.5.2 Upgrade method

iHand30 controller supports two methods for upgrading, local upgrade and wireless upgrade.

1. Local upgrade of iHand30 controller (download the firmware from the Hi-Target official website first).

Step1: copy the upgrade firmware to the SD directory.

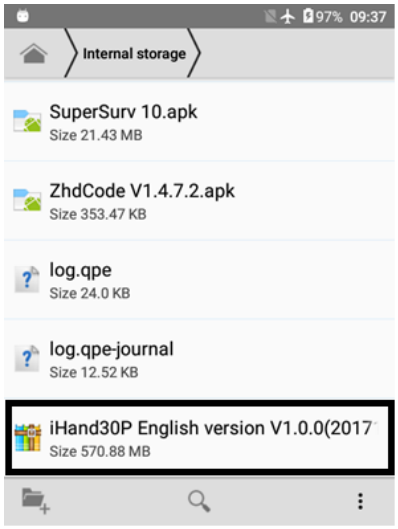


Figure 5-5-7 Upgrade patch

Step2: choose the *Wireless Update* App.

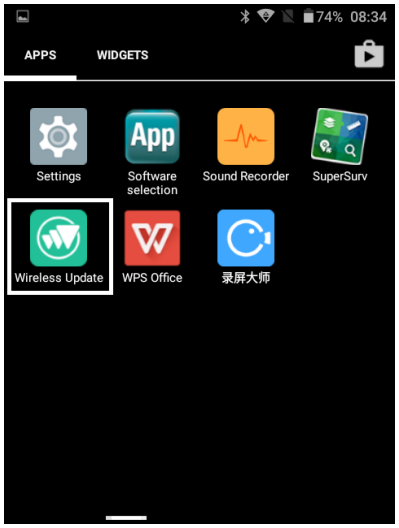


Figure 5-5-8 Update App

Step3: open the *Wireless Update* App, as shown below.

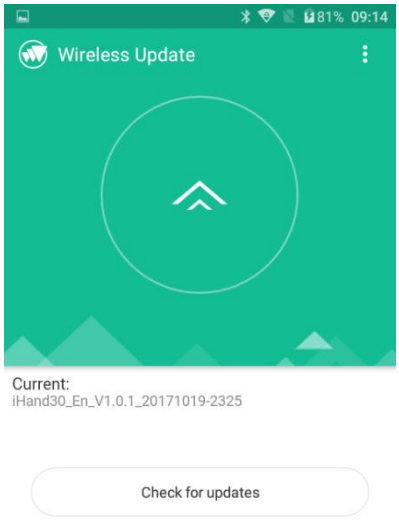


Figure 5-5-9 Interface of the update

Step4: click the top right menu selection in the interface, and choose *Local updates*.

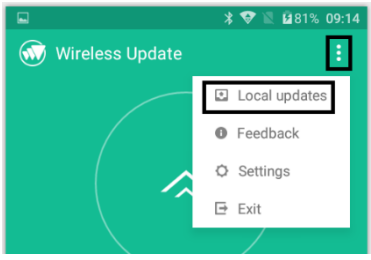


Figure 5-5-10 Local updates

Step5: enter the interface.

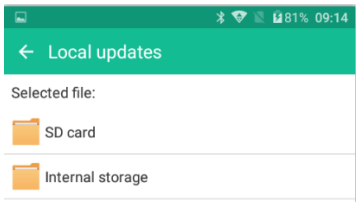


Figure 5-5-11 Local updates

Step6: select the *Internal storage* file, then select the update firmware.

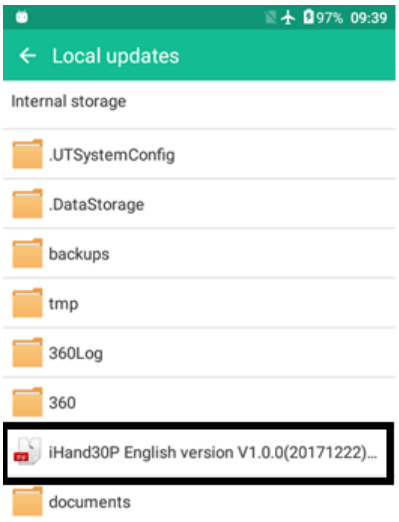


Figure 5-5-12 Choose the firmware

Step7: after selecting the upgrade firmware, click *Install Now*.

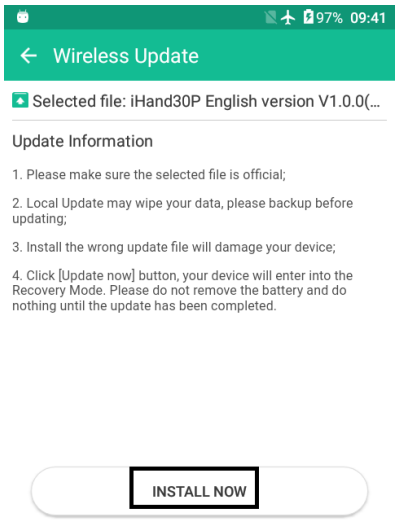


Figure 5-5-13 Install

Step8: the system will restart and begin to update.

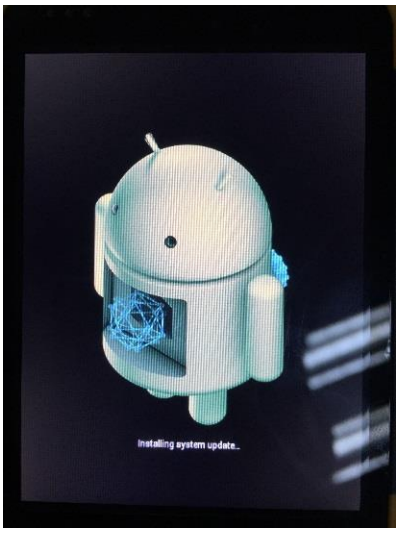


Figure 5-5-14 Interface of upgrade

2. Wireless update

Step1: select the *Wireless Update* App.

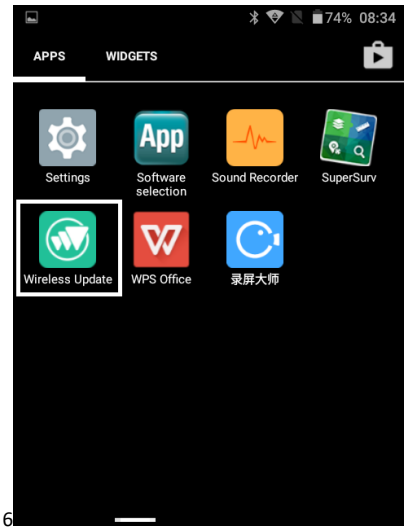


Figure 5-5-15 Update App

Step2: after entering the Wireless update App, if there is a new version, the interface will show it and display the update. The complete update content will appear if you draw up the screen.

Step3: click Download, the firmware update patch will be downloaded.

Step4: when the system upgrade package is downloaded, come out of the prompt window, and click Confirm. Special attention should be paid here. After clicking, it's forbidden to operate of the device.

Step5: after completing step 4, the device will enter the upgrade interface, waiting for the progress bar to reach the full grid that completes the system wireless upgrade.

Step6: when the upgrade is completed, the device will restart automatically, repeat steps 1 and 2 to check whether the update is complete, then finish it.

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