V90 Plus GNSS RTK System Getting Started

HI-TARGET

Hi-Target Surveying Instrument Co., Ltd

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Content

Preface

In order to help you better use Hi-Target series products, Hi-Target suggests you carefully reading the instruction. If you are unfamiliar with V90 Plus products, please refer to www.hi-target.com.cn/en/

Tips for safe use

	Note: the contents here are generally special operations, needed to paid special attention on. Please read the contents carefully.
	Warning: the contents here generally are very important so please read it carefully in case of failing to operate based on warning contents which would damage the machine, lose the data, break down the system and bring risk to user's health.

Exclusions

Before using the products, please carefully read the operating instruction, and it will help you better use the product. Hi-Target Surveying Instrument Co., Ltd will not assume the responsibilities if you fail to operate the product according to the requirements in operating instruction, or operate the product wrongly because of failing to understand the operating instruction.

Hi-Target is committed to constantly perfect product functions and performance, improve service quality and reserve the rights to change the contents in operating instruction without separate notice. We have checked the consistency between contents in instruction and software & hardware. Pictures in operating instruction are only used for reference.

CHAPTER

1

Products Introductions

- Preface
- Product characteristics
- Introductions to V90 Plus GNSS receiver
- Introductions to iHand20 controller
- Cautions for use

1. Products Introductions

1.1 Preface

V90 Plus is a new type of GNSS receiver used for measurement pushed forward by Hi-Target recently. With a hi-tech, fully integrated design, the conveniently sized V90 Plus is one of the most flexible choices for any measuring task. Built-in Linux3.2.0 operating system, pre-loaded multiple smart applications such as tilt surveying, electronic bubble calibration, NFC and voice DIY, LEDs enable you to monitor satellite tracking, radio reception, data logging status, Wi-Fi status, and power. Bluetooth wireless technology provides cable-free communications between the receiver and controller.V90 Plus GNSS system provides surveyor industry-leading GNSS solutions.

(!) Warning:

the instruction represents no standard configuration. The articles within the box can be adjusted according to different user requirements. The specific configuration shall be subject to the outgoing list upon purchasing. The suggestions before using the machine: check whether the product package is damaged; please open the package carefully and confirm whether the articles are consistent with outgoing list; in case of loss or damage in the product and its accessories, please immediately contact with local office or dealers; please carefully read the operating instruction before carrying, transporting and using the product.

1.2 Product characteristics

Small and lightweight

◇Only weighs 950g.

◇Measures Diameter 153mm x Height 83mm.

Multi-constellation Tracking

◇220 tracking channels

◇Supports GPS, GLONASS, GALILEO, BDS, SBAS

◇NGS approved full-band GNSS antenna

Smart Application

◇Offers tilt survey with a maximum tilt angle of 30 degrees.

◇Supports electronic bubble calibration

◇The internal NFC module makes Bluetooth communication quick and easy.

◇Intelligent voice assistance guides field operations. Voice can be DIY.

◇Standard Rinex data and HI-TARGET raw data recorded simultaneously.

Optional Transceiver UHF Radio

◇The transceiver UHF radio enables switchable working modes between base and rover.

◇Three types of internal UHF radio provide different frequencies based on users requirements. The Pacific Crest TrimTalk© internal UHF radio is compatible with other radios.

Multi-network Connection

◇Powered by high-capacity (5000mAh) Li-ion battery to ensure full day operation

◇Supports WIFI

Powerful Battery

◇Powered by high-capacity (5000mAh) Li-ion battery to ensure full day operation

Rugged Design

◇IP67 dustproof and waterproof

◇Able to survive a 3-meter natural fall onto concrete

1.3 Introductions to V90 Plus GNSS receiver

V90 Plus hardware structure

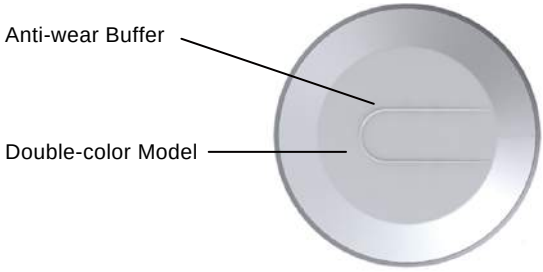
Hardware Schematic Diagram

1. Guard Circle 2. Control Panel 3. 3G/UHF antenna interface
4. Bottom Cover 5. Upper Cover

V90 Plus mainly consists of three parts, the upper cover, bottom cover and the control panel.

In the middle of the mainframe is the control panel which contains a power button and three indicator lamps. The only power button can complete all function Settings and three indicator lamps are satellite lamp (single green lamp), power lamp (bi-color lamp of red and green) and status lamp (bi-color lamp of red and green) from the left to the right.

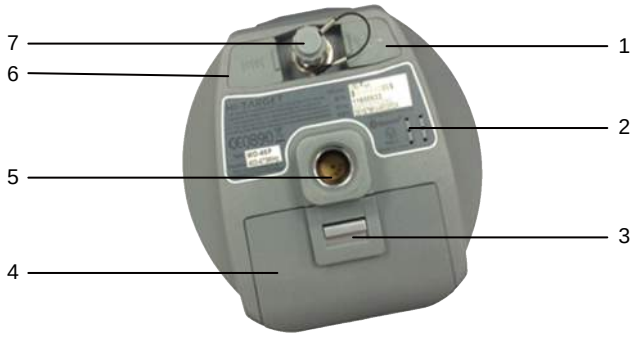
Upper Cover



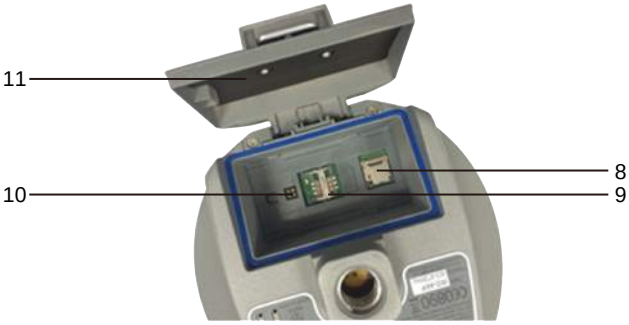
U-type anti-wear buffer can effective avoid the instrument from scratches.

Double-color model makes the structure clear and appearance beautiful.

Bottom Cover



Bottom



Inside of the battery compartment

1. USB interface and protective plug （it is used to export data and upgrade firmware）
2. Speaker (timely operate the instrument and broadcast the status with voice)
3. Metal buckle
4. Battery compartment
5. Connecting screw hole（it is used to fasten the instrument to base or centering rod）
6. 5-pin socket and protective plug (it is used to output NMEA -0183 and link external radio and external power)
7. Antenna port and protective plug (Connect transceiver antenna for receiving and transmitting differential signal.)

8. SD card slot (it is used to place SD card, which can store massive static data)

9. SIM card slot power seat (when communicating with GSM data, it is used to place SIM card.)

10. Spring contacts (it is used to connect the lithium battery and host)

11. Battery cover

! Cautions:

1. When 5-core socket is not in use, please cover them with the plug.

2. When water enters into the speaker, it is likely that the speaker is silent or hoarse. The voice can recover after the speaker is dry.

Antenna

3G/GPRS antenna（short）

UHF built-in radio antenna（long）

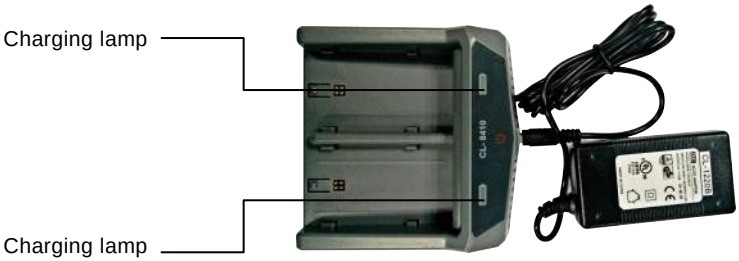
! Receiver equipped with UHF built-in radio antenna and 3G/GPRS antenna. According to different work mode, select the right antenna type. When using the “UHF base station "/" UHF rover station "mode, please use the UHF built-in radio antenna; when using the “GSM base station "/" GSM rover station ", please use the 3G/GPRS antenna.

Batteries

The receiver has one rechargeable Lithium-ion battery, which can be removed for charging. You can also connect the receiver to an external power source through 5-pin socket.

Recharge

BL-5000 lithium battery shall use Hi-Target CL-8410 lithium battery charger to charge. About 7 hours of charging time CL-8410 charger is designed with charge lamp. The lamp is red during charging process and turns green upon finishing charging. The battery is full continue charging for another 1-1.5 hours.



1.4 Introductions to iHand20 controller

Front of handheld controller

The front of iHand20 handheld controller includes touch screen, keyboard and microphone.

◆ **Touch screen:** Multipoint capacitive touch screen with touch pen, which supports Chinese and English input.

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

◆ **Microphone:** Internal microphone can be used for field collection of voice message.

Reverse side of handheld controller

There are camera, battery cover, belt, trumpet, etc. on the reverse side of iHand20 handheld controller.

- **Camera:** Used for field collection of image information.
- **Battery cover:** Internal removable lithium battery.
- **Belt Buckle:** Connect the belt to prevent sliding down.
- **Speaker:** Conduct real-time voice broadcast for the instrument operation and status.

Side of handheld controller

Fig.2- 3

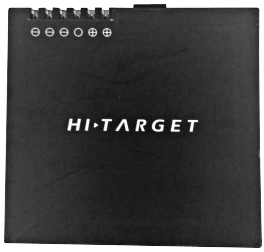
- **Mini USB:** Used for connecting USB data line and iHand20 handheld controller.
- **Audio port:** Used for connecting headphone cable and iHand20 handheld controller.

Warnings: In case of not using audio port or Mini USB, please close the rubber cover so as to achieving waterproof and dustproof.

Handheld controller accessories

Charger

Battery

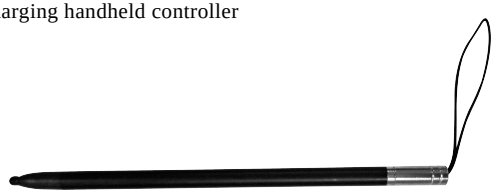


Lithium battery: 3.7V /6300mAh

Data line

Connect to the USB port of computer, and used for download of data Connect to the USB port of charger and used for charging handheld controller

Touch pen



In case of using touch pen to operate the handheld controller, it is required to start the function of "handwriting pen", and open the handheld controller's [system setting] → [auxiliary function] → check [handwriting pen]

Operation of handheld controller

Keyboard

Most settings and operations of Hi-Target iHand20 handheld controller can be completed by the touch pen, and commonly used operations can be completed by keyboard. Appearance and functions of keyboard are introduced briefly as follows.

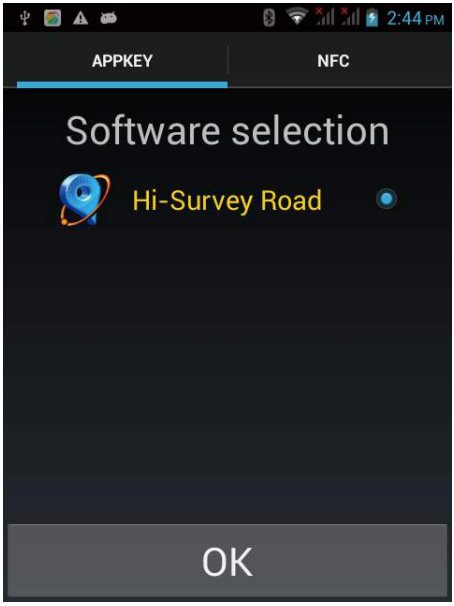
Keyboard include: Back, OK, Power, APP, Fn, Collect, Camera, etc. on button board of iHand20.

Back: Delete or exit the operation of current window.

OK: Confirmation.

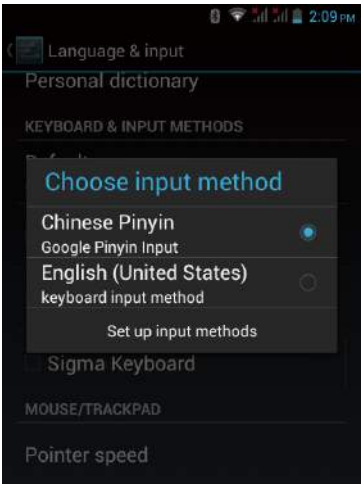
Power: Press it for above 3s for power on/ power off/reboot. Under the power on status, press power button for 1s to turn off / turn on the screen backlight. **Press it for 10s to forced shutdown when the controller is crash.**

APP: Quick start of Hi-Survey software, press button APP for a long time for the Road popup, then select "Hi-Survey Road" and click [Ok]. And the software selected this time can be started quickly only by pressing key APP next time.



Cautions: When installing Hi-Survey Road for the first time, it is necessary to press key APP for 3s for software quick start selection settings. Otherwise, corresponding software cannot be started quickly by only pressing button APP.

Fn button: Press Fn button for 3s and popup interface of input method switch so as to achieve fast switch of input method. In case of [physical button input method], only press Fn button to switch over input methods of Chinese Pinyin ,strokes, digitals and letters under input status.



Collect button: Collect data by manual operation.

Camera button: Press it for a short time to enter into photograph interface; Press it for 3s on the non-camera interface to start up/shut down flashlight function.

Screenshot function: Press "VOL-" and power button simultaneously for 3s, screen capture will be kept in the file of "Mobile phone storage→ Pictures→ Screenshots".

! Cautions:

1. When the iHand20 handheld controller is not used in the work, please turn off the backlight for saving electric quantity and prolonging the working time.

2. Only the image collection interface supports the shortcuts operation. In order to avoid the input conflict of input box, the text interface does not support shortcuts operation.

(1)Average collection shortcut is Key "7";

(2) Indirect measurement shortcut is Key "8".

Model of iHand20 handheld controller battery and charger

Name	Model
Lithium battery	BL-6300A
Charger	CL-6300A

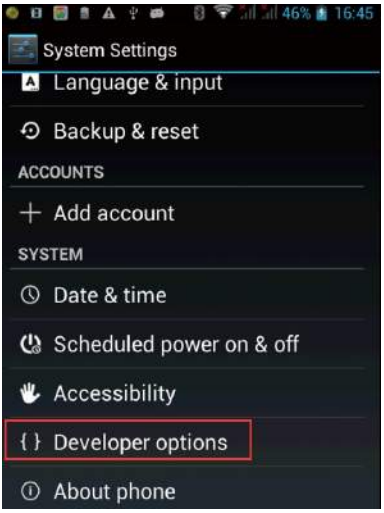
Data download

Connect handheld controller to computer

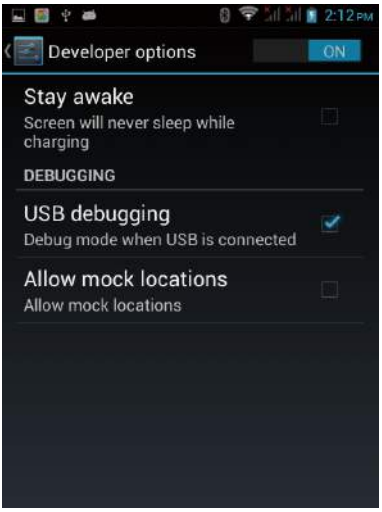
1. Connect handheld controller to computer by supporting USB data line, and pull down the notice column and click USB computer connection [open USB storage].

2. If it is required to synchronously operate handheld controller or install and use third-party software to debug data on the computer, "USB debugging" function shall be ticked. Turn on the handheld controller, and click [System Settings]→[Developer options]→[USB debugging] on the desktop menu.

Click[System Settings]



[Developer options]



[USB debugging]

3. In the popup debugging window, click [OK] to complete the connection between handheld controller and computer.

4. In the computer, file operations between handheld controller and computer can be conducted by [Portable Devices].

1.5 Cautions for use

Environmental Requirements

The receiver shall operate in dry working environment regardless of waterproof materials. In order to advance the stability and service cycle of receiver, the receiver shall be prevented from extreme environment, such as:

◆Moisture

◆Temperatures above 65 degrees centigrade

◆Below - 40 degrees centigrade

◆Corrosive liquids or gases

Electronic Jamming

The receiver shall not be installed in the place near to strong electric power and interference signal, such as:

◆Oil duct (spark plugs)

◆Generator

◆Battery-operated motor cycle

◆DC-AC power supply changeover equipment

◆Signal transmitting station (tower)

◆Power supply

Battery safety

(!) Warnings:

1. Must use battery and charger configured by manufacturer, and do not throw them into the fire or use the metallic short-circuit electrode.

2. For the first usage, there is a certain electric quantity in the battery generally. Therefore, the battery shall not be charged until the electric quantity is used up. And it shall be charged for 12 hours for the first three times and later it can be charged normally. Each charging time shall not be more than 24 hours.

3. Do not use or charge the battery if it appears to be damaged. Signs of damage include, but are not limited to, discoloration, warping, and leaking battery fluid.

4. If the service life of the battery is shortened obviously, please stop using the battery. It indicates that the battery has been aged , please replace it with new one.

CHAPTER

2

Basic Operation

- Button operation
- LED indicator lamp
- WIFI password setting
- Static data collecting (By button operation)

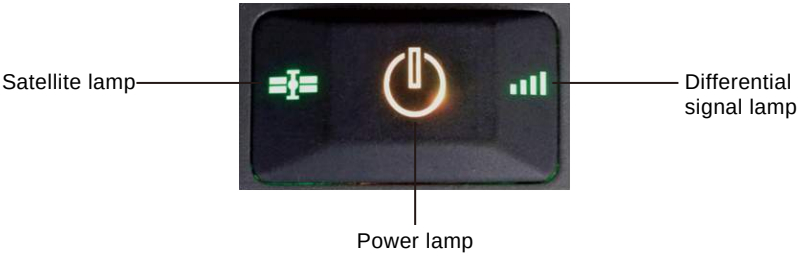
2. Basic Operation

2.1 Button operation

V90 Plus adopts optimized and simplified design, button operation with control panel is more convenient and concise.

1. Control panel

Most settings and operations of V90 Plus Receiver can be conducted by power button, below is control panel.



2. Button functions

Functions	Detailed description
Power on	Press power button for 1s to power on.
Power off	Long press power button (3s≤long press time≤6s) when voice prompts "dingdong" and release button to power off.
Auto-set base	In power off status, long press power button for 6s when voice prompts "set base automatically", then release it ; the receiver will automatically set base mode.
Work mode switch	Double click power button enter work mode switch, every double click will switch to another work mode .
Work mode confirmation	Single click to confirm the current work mode
Reset main board	In power on status, long press power button for more than 6s when voice prompts the second "dingdong", then release it .
Mandatory power off	In power on status ,long press power button for more than 8 s.

3. Power on/off

Press power button for 1s to power on. Long press power button (3s≤long press time≤6s) when voice prompts "dingdong" and release button to power off.

4. Reset main board

In power on status, long press power button for more than 6s when voice prompts the second "dingdong", then release it.

5. Auto-set base station

In power off status, long press power button for 6s when voice prompts "set base automatically", then release it, the receiver will automatically set base mode.

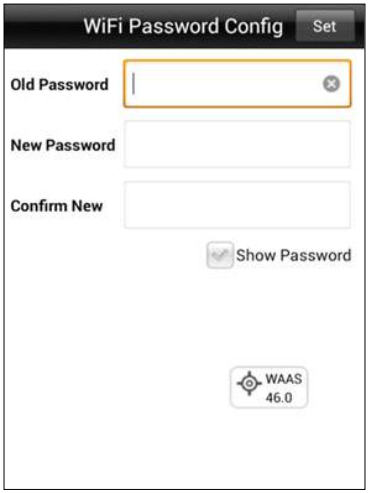
2.2 LED indicator lamp

Lamp	Status	Description
Power lamp(yellow)	Always on	In normal voltage Battery＞7.6V External power supply＞12.6V
Power lamp(red)	Always on	In normal voltage 7.2V＜battery＜7.6V 11V＜external power supply＜12.6V
	Slow flash	Low voltage：battery≤7.2V External≤11V
	Fast flash	Power status hints: once or four times of one min
Differential signal lamp（green for status）	Off	No GSM/WiFi connection
	Always on	GSM/WiFi module connect to server successfully
	Slow flash	GSM/WiFi module connect to internet successfully
	Fast flash	GSM/WiFi module is connecting to internet server
Differential signal lamp(red for status)	Slow flash	1.Receiving or transmitting data (only receiving data for rover while transmitting for base) 2. collecting static data in static mode
	Off	Communication failure, no data output

Satellite led (green)	Always on	More than 4 satellites tracked successfully
	Slow flash	Lose satellites and try re-track
	Off	1. mother board error resulting in no data output while resetting receiver 2. mother board error resulting in no data output while in static mode
	Anomaly flash of 3 lamps	Reset main board or static collecting error (Insufficient storage space)

2.3 WIFI password setting

V90 Plus receiver can used as WiFi hotspot, support user-defined password (Factory default password:12345678)



! Cautions:

1.See WiFi factory default password in attached list1

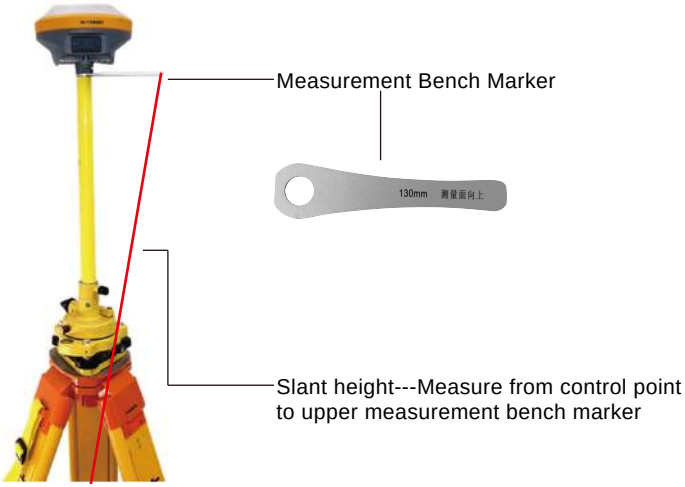
2.If you forget your password, you can reset your password by"GNSS Receiver Manager V1.0.3", relative operation see in Appendix.

2.4 Static data collecting

V90 Plus GNSS Receiver can collect static data. relative operations are as below.

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

2. Measure the height of receiver for three times, on condition that the difference of each measuring is less than 3mm and the final height of the receiver should be the average height. Below is the schematic.



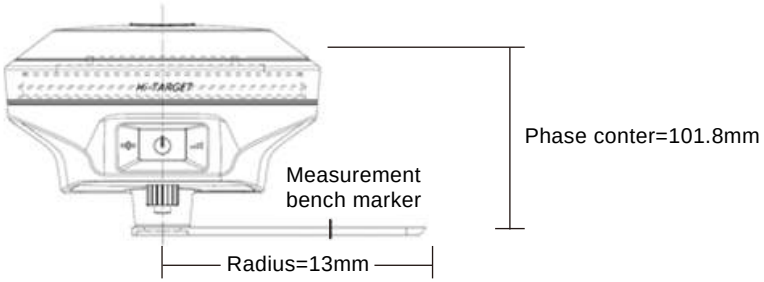
Notice:

1. Instrument height should be measured from control point to the upper of measurement bench marker.

2. The height of phase center is 0.1018 meter.

3. The measurement bench marker radius is 0.130 meter.

Below is the schematic.



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

4. Press power button to power on and double click power button to set static collecting mode; then single click power button to confirm it.

Notice:

The satellite lamp flashing means the receiver is searching the satellites. The satellites are fixed once the satellite lamp stays lit on. Status lamp flashes due to your collection interval set, which means a epoch will be collected every flashes.

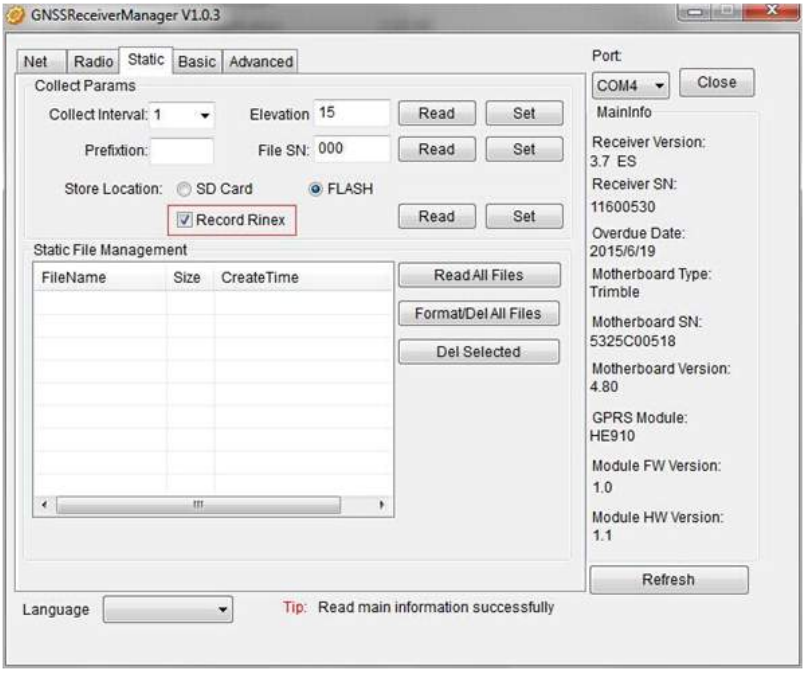
5. Turn off the receiver after static data collected and record the turn off time.

6. Download and post-process static data.

Caution:

Don't move the tri-brach or change the collecting set while the receiver is collecting data.

V90 Plus default settings will not record Rinex format data .Users can change relative settings by GNSS Receiver Manager software. Below is the GNSS Receiver Manager software interface.



CHAPTER

3

Hi-Survey

- Project settings
- Data collecting
- Staking out
- Data exporting
- Auto-backup function in Hi-Survey

3. Hi-Survey

3.1 Project settings

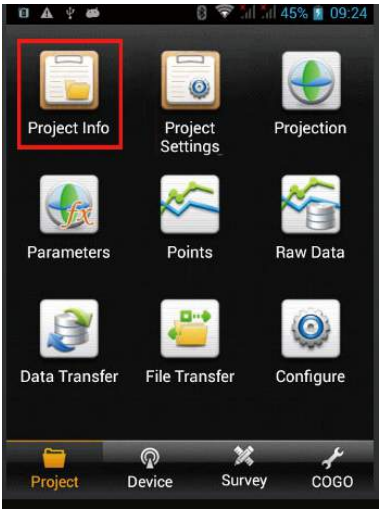
- New project
- Project settings
- Device connecting
- Base setting
- Rove setting

1. New project

After new project is built before the measurement, the collected data will be saved in the project. When building new project, relevant setting needs to be conducted, for example, setting of project information, and coordinate system, etc..

Specific procedures as follows:

	1.Single-click "Hi-Survey" to open it



2. "Project Info": New project can be built and the existing project can be opened or deleted.

3.Input project name in "Name" box->click "OK";

(Note: The name of new project shall not be the same as the name of old projects)

2. Project settings

Project settings include coordinate system and other parameters settings.

For measurement, coordinate system must be configured, because it is related to the accuracy of coordinate. There are two methods to set the coordinate system.

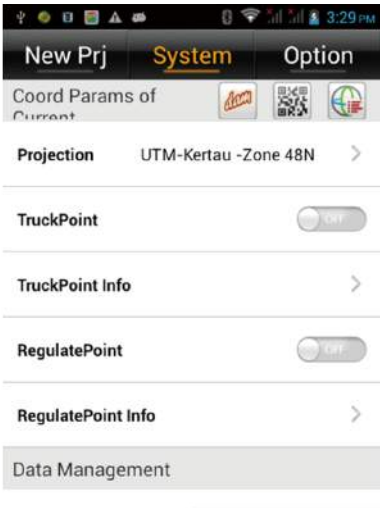
A. build a new coordinate system, including ellipsoid projection and ellipsoid transformation parameters, etc.

B&C. Import existing coordinate system.

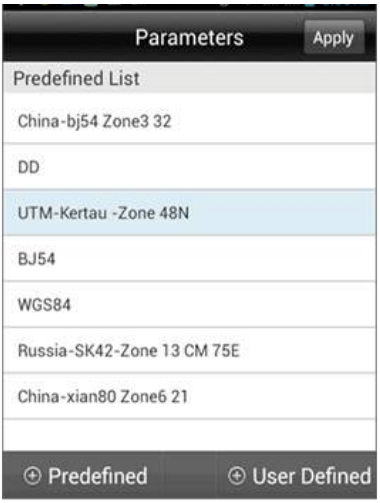
	1.Click Project Settings: including settings of project and coordinate system information
	2. Enter settings interface

A. Build a coordinate system

(1) Click "Projection"->  ->User Defined



1.Click "  " to enter into the setting interface.



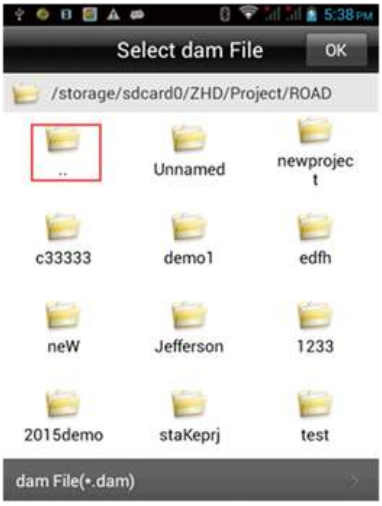
2. User Defined: User can conduct settings according to local parameter.

Notice: Any question about “Users Defined” pleases contact technical support

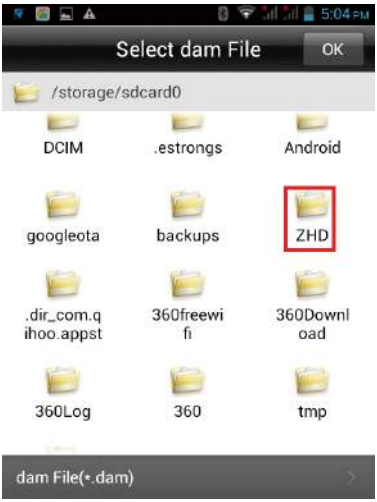
B. Add existing coordinate system files

1) Click "  " ->Select .dam File; Click "  " to return the parent directory. Path: SD Card ->ZHD->Geo Path ->select .dam file (take the addition of DD. dam for example) ->click "OK".

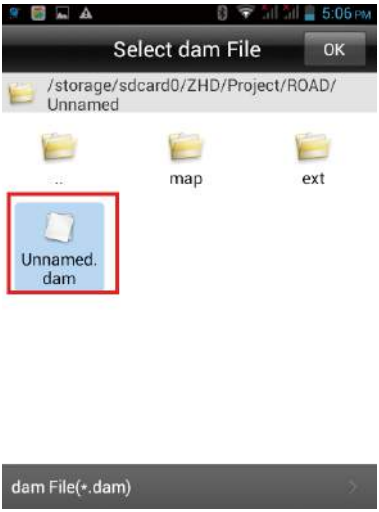
1. Click "  "to add created dam system file.



2. Select dam File ;click "  "



3. Click" " to return to the parent directory.

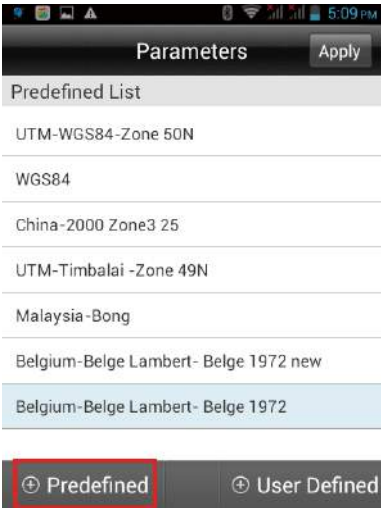


4. Select coordinate system files, with the suffix of .dam. And click "OK" to complete the selection.

C.Add coordinate system files (Hi-Survey software BYO)

The software adds many coordinate systems all over the world intelligently for reference and selection.

1.Return to " " interface



2. Click "Predefined" Select the continent and countries where you are located

3.select the file and Click "Apply" to apply it current project.

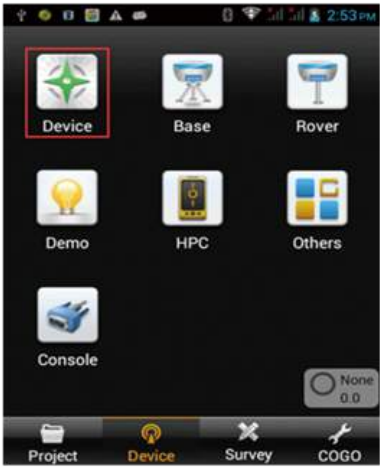
3. Device connecting

V90 Plus as a new generation of intelligent GNSS receiver, its connection ways with iHand20 become various .receiver can connect iHand20 by Bluetooth or WiFi.

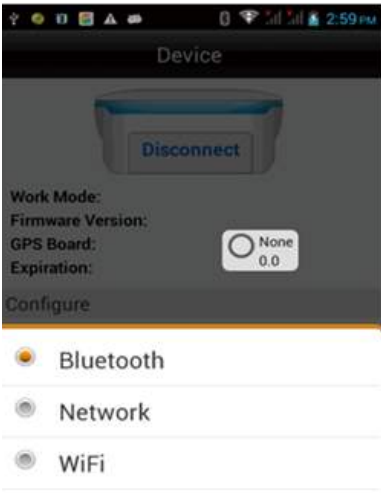
Notice: NFC used to quickly establish Bluetooth connection.

Bluetooth connection

Receiver is connected with handheld controller by Bluetooth, therefore, it is necessary to do this step before the operation. If conducting RTK under the mode of UHF , two sets of receiver Bluetooth shall be configured at least(one for Base and one for Rover).

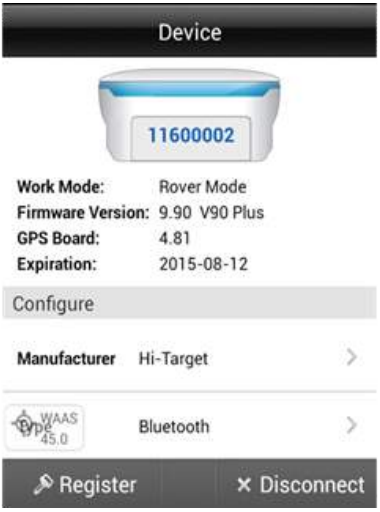


1. Click "Device" to connect receiver to handheld controller



2. Select the connection type "Bluetooth"

3. Select S/N code of the device to be connected->input Bluetooth PIN"1234";



4. After connection, the interface will display current work mode, firmware version, firmware version of GPS main -board and log-on message, etc..

WiFi connection

V90 Plus can be connected with iHand20 by WiFi. Connection steps are as below.

1. Power on iHand20 and run Hi-Survey software.
2. Run V90 Plus WiFi function, and click "others".
3. Choose "Receiver Settings"
4. Launch Wifi;
5. Click "Device"->Choose "Wifi"->Click" Connect"
6. Launch iHand20 WiFi, and search receiver's WiFi name.
7. Choose receiver and input WiFi password(Note: Original password is 12345678), and click "Connect".
8. iHand20 connect with receiver successfully.
9. Back to "Device" interface, Click "Connect"
10. Connected.

(!) Notice: Before WiFi connecting , please connect receiver by Bluetooth and turn on the “WiFi Swither” switch in Receiver Settings .

Only in Bluetooth connected mode that WiFi password can be modified.

Modify WiFi password procedure as below shows

1.Click "Others"->Receiver settings;

2. Choose "Wifi Hotsot Password Set";

3. Input "Old Password" and "New Password" and "Confirm New", Click "Set".

(!) Notice: WiFi password can be modified.

Only in Bluetooth connected mode that WiFi password can be modified

NFC(Near Field Communication)

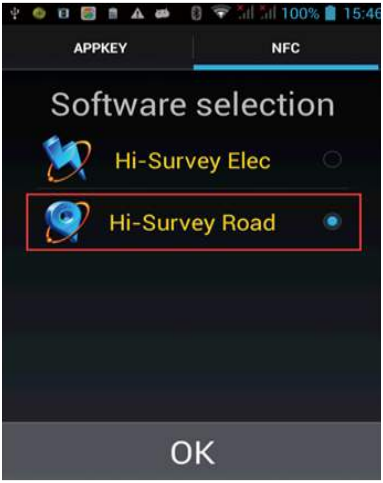
NFC used to quickly establish Bluetooth connection.

Steps.

1. Long press "APP" button.
2. Choose "Hi-Survey Road"->Click "NFC"->Click "OK".
3. Take iHand20 NFC response area close to receiver's NFC response area.

Detail operations as below show

1. Long press "APP" button.



2. Choose "Hi-Survey Road"->Click "NFC"->Click "OK".

3. Take iHand20 NFC response area close to receiver's NFC response area.

4. Base setting

Base operation guidelines

Base parameters settings in Hi-Survey

Base operation guidelines

For good performance, read the following guidelines, Below will describes best practices for setting up the base, and outlines the precautions that users need to take to protect the GNSS receiver.

1. Set up tripod centered on the control point, mount tri-branch adaptor and height extension pole.

2. Screw GNSS receiver onto the height extension pole.

3. Level and plumb GNSS receiver over control point.

4. Instrument height should be measured from control point to the upper of measurement bench marker. (See diagram in chapter 2)

Notice: Ensure to place the GNSS receiver in a stable and secure location, and make sure no interference source disturb or disrupt differential signal transmission. Such as electrical tower etc..

Base parameters settings in Hi-Survey

(1) Connecting base

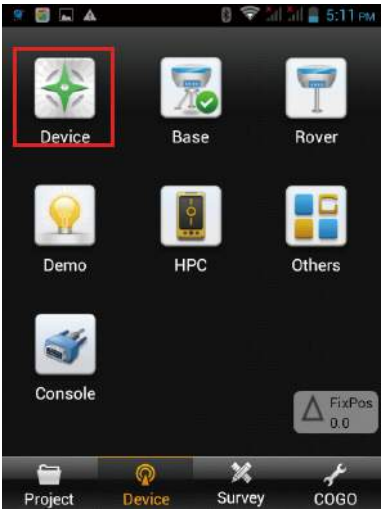
(2) Setting Base coordinate

(3)Setting data link

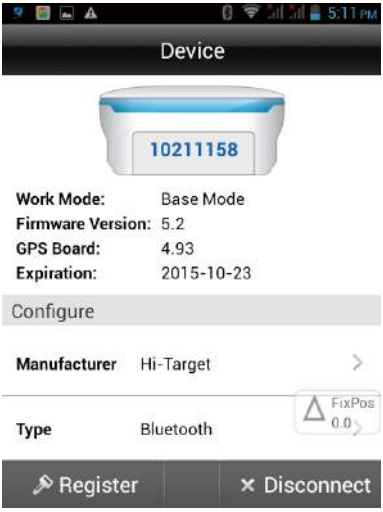
Setting parameter of Base after connected.

Including: coordinate of Base, communication mode, difference scheme, etc.. Base is responsible for transmitting difference to the Rover so as to conduct real-time kinematic. The Base can be set by iHand20 after receiver Bluetooth has been connected.

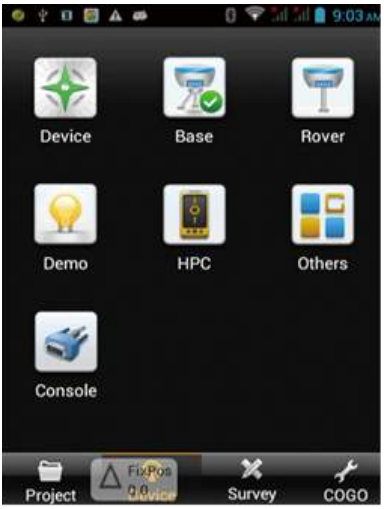
(1) Connecting base



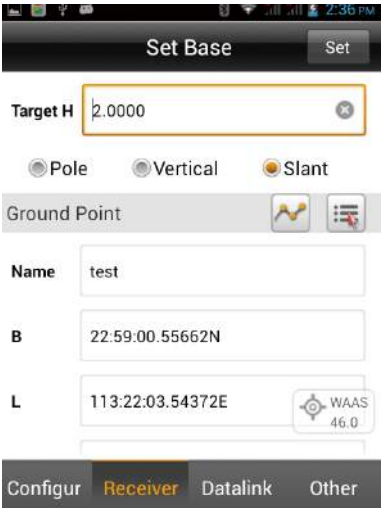
1.Open software "Main interface" ->Device



2.Confirm current connected GPS receiver (take 11600002 for example)



3. For example: Set 11600002 as Base;



4. Select "type of antenna" ->input "target height"(Target H)

Notes: Select type of antenna according to the type of receiver

Notice:

Pole height ---Reading from scale of centering rod .

Slant height---Measuring from control point to Measurement bench marker.

Slant height is normally used for the Base and pole height is commonly used for the Rover.

(2)There are three methods to set "coordinate of Base":

A. Input with known point.

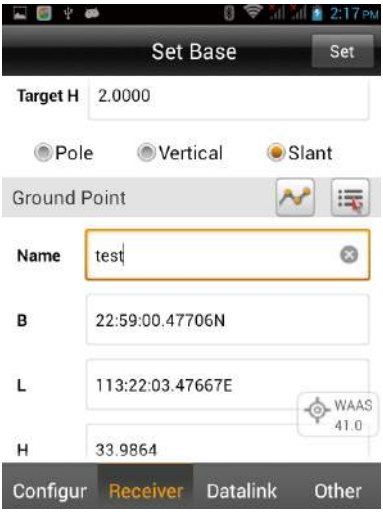
B. Get by average.

C. Select from the point library;

A. Input with known point.

1) Ensure accuracy of coordinate of Base;

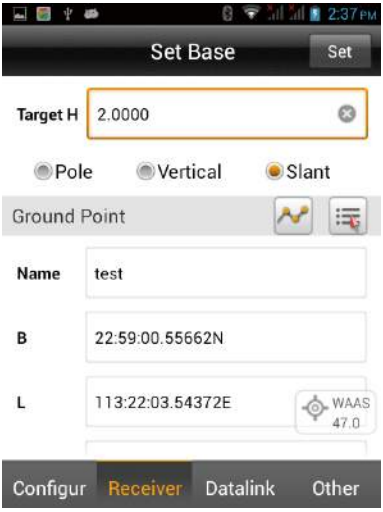
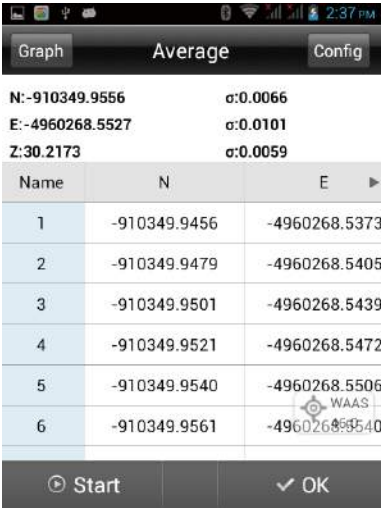
2) Select "geodetic coordinates BLH" or "local coordinates NEZ". (Take BLH for example)



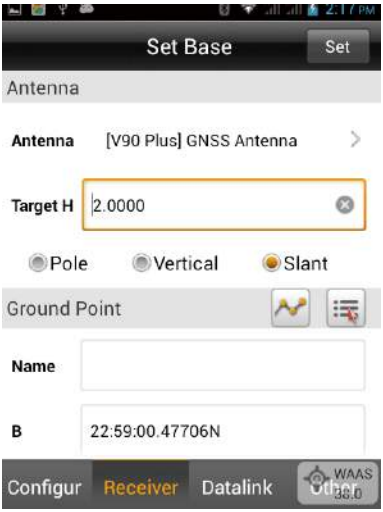
Select "geodetic coordinates BLH" or "local coordinates NEZ". (Take BLH for example)

B. Get by average

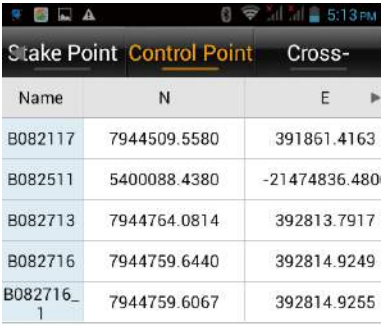
1) Click" " "->Click "OK" to obtain position of Base.

	1. Click" "
	2. Click "OK" to obtain position of Base.

C. Obtain from point library



1. Click" "

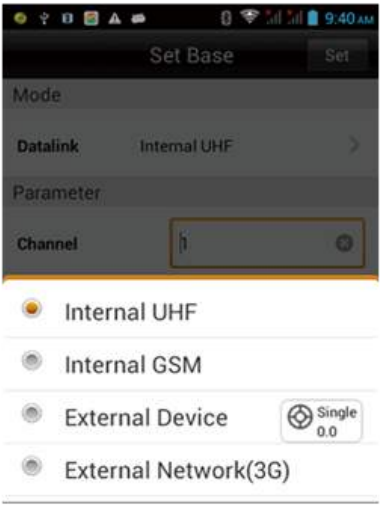


2. In the point library, there are "original data" and "control point" data, etc. for optional.

(3) Set data chain, including

A. "Internal UHF", B."Internal GSM" (Omitted), C."External Device"

1. Click "Datalink"



2. There are 4 kinds of data chain, which are Internal UHF, Internal GSM, External Device and External Network(3G).

A. "Internal UHF"

1) Data link->select "Internal UHF"

2) Set "Chanel", "Sky Baud rate", "Power", etc.

Data-link : Internal UHF(for example)

Channel: 0-116 channels (DDTR-type instrument transceiver) for optional, 0-32 channels (PCC transceiver)

Sky Baud rate: Choosing transmit rate at 19200 or 9600

Power: low, medium and high power.

Notice: Transceiver type, sky Baud rate and channel of Base and Rover must be same.

3) Other settings (including difference scheme and elevation cutoff angle, etc.)

Notice: sCMRx, RTCM3.2 support BDS differential signal .

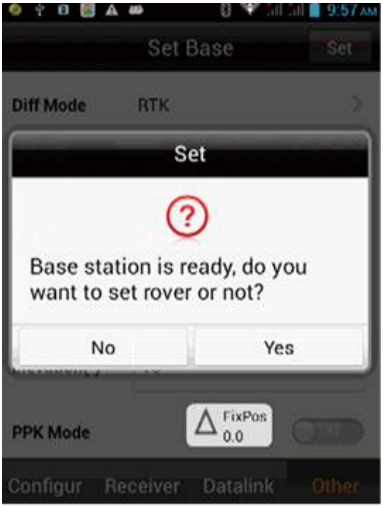
Difference mode

Including RTK, RTD and RT20. RTK is defaulted and RTD refers to code difference, Message type(Message Type): RTCA, RTCM (2.X), RTCM (3.0), CMR, NovAtel and sCMRx

Elevation mask:can be adjustable within 5-20 degrees.

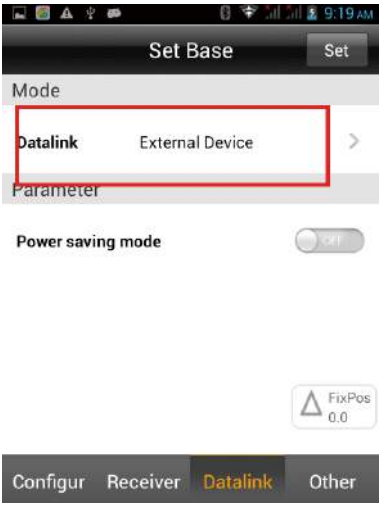
(Base is in conformity with Rover)

4) Click "Set" to complete the setting of Base

	Click "Set" to complete the setting of Base
	If the setting of Base is completed, the software prompts "setting of Rover".

C. "External Device"

1) Datalink-> select "External Device";



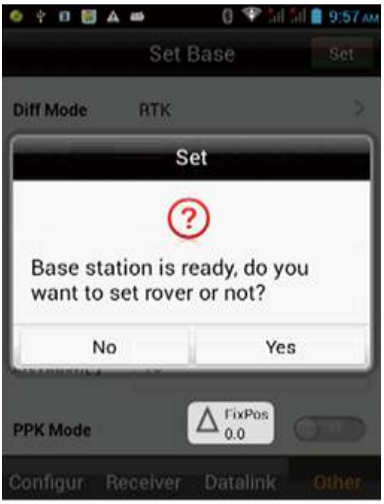
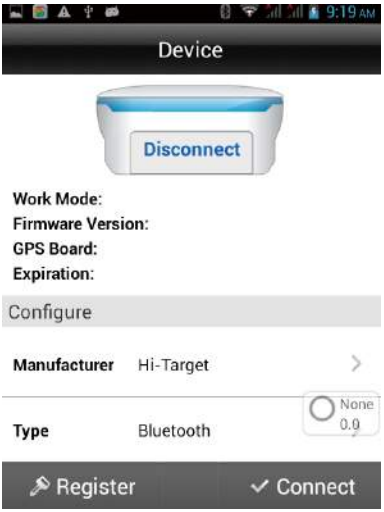
1. When Base data chain selects "External Device", channel of transceiver will be determined by the external device.

2. Other settings Same as UHF setting method.

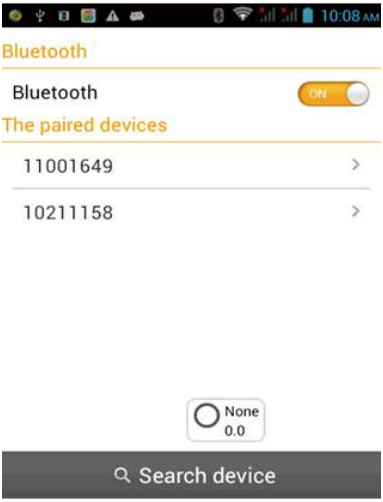
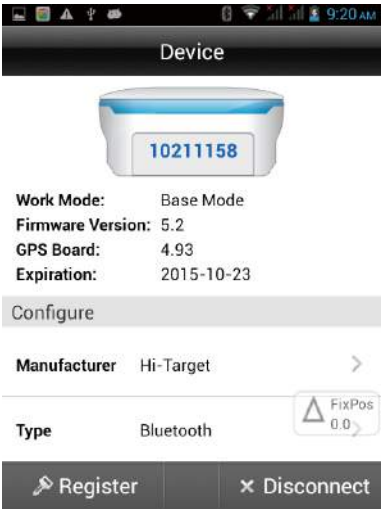
3. Click "Set" to complete the setting of Base.

5. Rover setting

(1) After completing setting of Base, enter into "setting of Rover" ->select "Yes"->click "Connect" to set the Rover.

	1.Click "Yes" to jump to setting of Rover
	2.Click "Connect"

(2) Click "Connect" and select receiver equipped with Bluetooth

	If the device has not been equipped with the Bluetooth, please refer to above "Bluetooth connection" method for configuration.
	The connected instrument can display fuselage number (Such as: 10211158)

(3) Set Rover "Data-link", including "Channel" and "Sky Baud rate", etc. and click "Set" to complete the setting of the Rover.

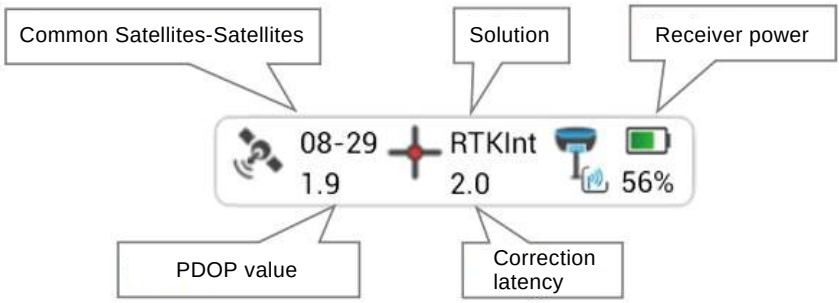
Data-link: Internal UHF

Conformity with Base(take 6 for example)

Conformity with Base(take 19200 for example)

(4) When Base communicates with the Rover successfully and differential lamp (middle lamp) in both Base and Rover flash red.

6. Floating box



"Solution state": It is mainly divided into the following several modes (except for fixed coordinate, precision is arranged from high level to low level):The given point refers to fixed coordinate (Base) → RTK fixed solution → RTK float solution → RTD solution → single point positioning →no solution type(indicates: no GNSS data)

"Correction latency": Refers to calculating time after Rover receives the signal from Base.

"PDOP value": Intensity factor of space geometry where the satellite is distributed. Generally, the better the satellite distribution is, the smaller the PDOP value is. Generally, the value is less than 3 as the more ideal state.

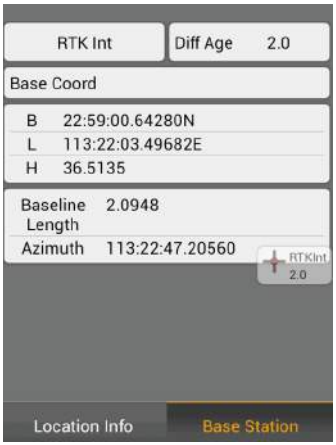
"Number of visible satellites": Number of satellite received by receiver, at least 5 satellites required by RTK work.

"Number of public satellites": Base hasn't it and only Rover has it after receiving the difference data. It refers to the satellite used for calculation when the Base and Rover participate in the searching of ambiguity of whole cycles at the same time, which are generally more than 5 so as to ensure normal work.

Click the satellite icon in the floating window to rapidly check detailed information of current connected receiver satellite.

(1) Position information

Display position information of current point, including position, speed, solution state and time, etc..



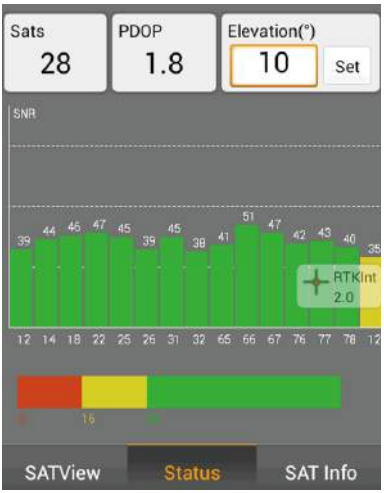
(2) Stellar map

◇ Distribution situation of projection position of satellite can be viewed. Roundness refers to GPS satellite and SBAS satellite, square refers to GLONASS and BDS satellite. GPS: Prn value is 1-32; GLONASS: Prn value is 65-96; BDS: Prn value is 161-197.

◇ View elevation cut-off angle of GNSS satellite and click "Set" to set the elevation cutoff angle of receiving satellite.

	Satellite view Input elevation cutoff angle in "Elevation (◦)" and click "Set" to set the elevation cutoff angle of receiving satellite.

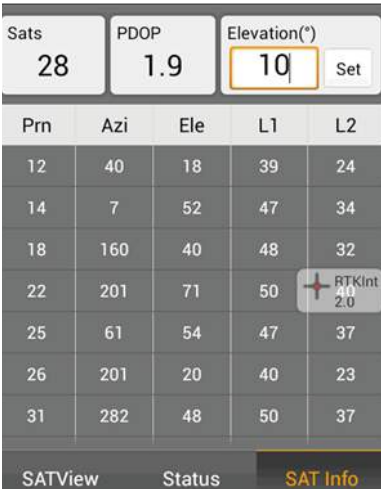
Click "Status", and give the color according to L1 carrier signal to noise ratio of satellite: orange<=15, yellow<=35, green>35As shown in the following figure:



Click "Status"

(3) Signal-to-noise ratio figure of satellite:

Prn refers to number of satellite; Azi refers to azimuth angle of satellite; Ele refers to satellite elevation, L1 refers to signal to noise ratio of L1, and L2 refers to signal to noise ratio of L2.



Click "SAT Info", and Prn refers to number of satellite, L1 refers to signal to noise ratio of L1, L2 refers to signal to noise ratio of L2 .

3.2 Data collecting

■ Single-point collection

■ Average collection

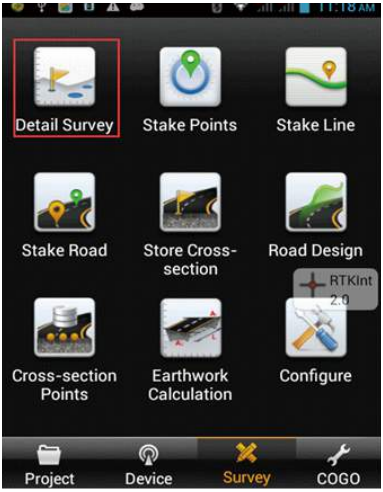
■ Automatic collection

■ E-bubble(electronic bubble) centered Auto-collection

■ Tilt survey

After the settings for the above project and Base as well as Rover are completed successfully, enter into data collection interface for collection. Corresponding collection methods can be selected according to different demands.

The steps entering into the collection interface: Survey->Detail Survey;

	Click "Survey"->Detail Survey

	Detail Survey

1. Single-point collection

Single-point collection means collecting the data of each point by manual operation.

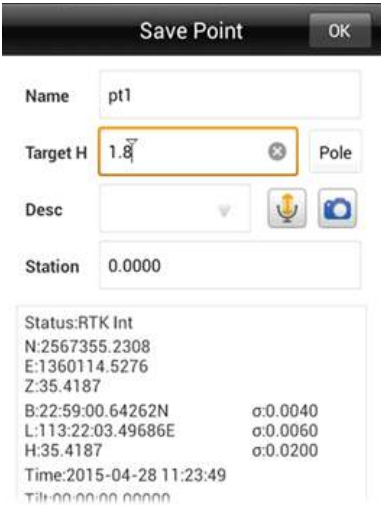
(1) Click "  "->"  "

	Click "  "

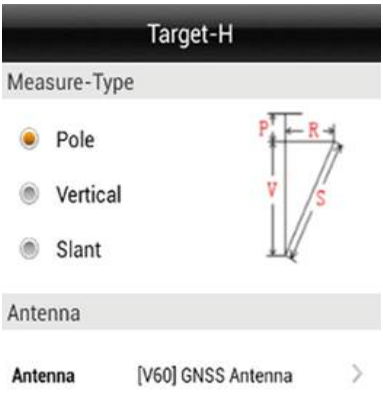
Click " "

(Single Press " " on the keyboard can also collect point)

(2) Input information of collection point, including point name, target height (the first point needs to be measured and the next points can be defaulted) and point position description (non-input optional).Click "OK" to complete the collection of the point.



Name: Input the point name.



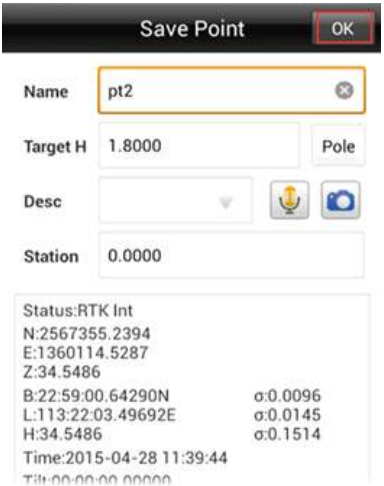
Target H: Target height (determined according to actual height), including three kinds: Pole, Vertical and Slant.

2. Average collection

That is averaging for the multi-measurement value of coordinate for each point.

1. Click "  "

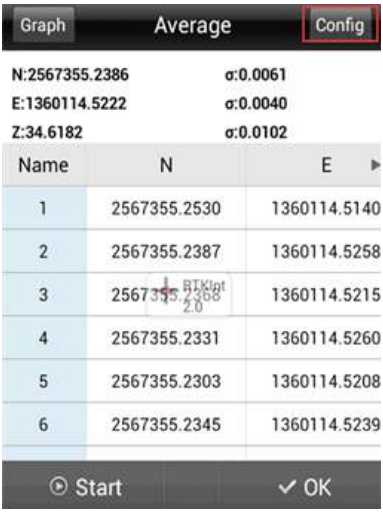
2.After the average collection, click "OK"



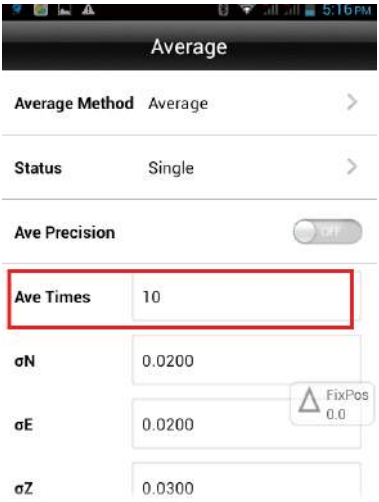
3.Input information of point name (Name), Target Height (Target H), Description (Desc) and Station After inputting, click "OK"

4.At the moment, the point will be saved

Setting method of average collection:



1.Click "Config" to enter into average collection setting interface.



2. Available to set the average times.

3. Automatic collection

Point measurement will be recorded automatically according to the configured record condition.

1.Click " ▶ "to start automatic collection.

2. Collection setting, including sampling interval (time or distance), point name and number, etc.(user-defined available)

3. Click "OK" to start collection.

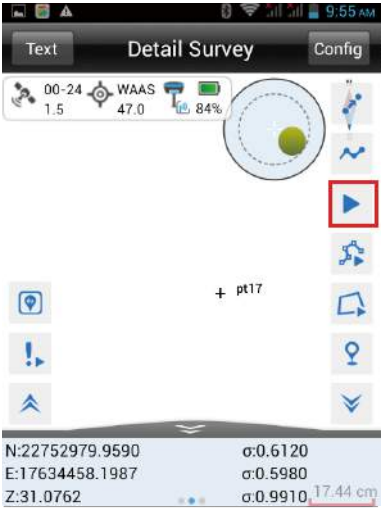
The collected point can be stored automatically.

4. Click " ⏸ " to stop automatic collection;

4. E-bubble centered Auto-collection

When users open the electronic bubble calibration function, users can choose e-bubble（electronic

bubble) auto-survey mode and collect data automatically when e-bubble is centering. That innovative function makes surveying work more efficient and greatly convenient for surveyor's operation.



1.Go to survey interface and choose "Auto collect ▶ "

2. Bubble Is Center chosen and click "OK" start collecting.

3. When the electronic bubble is center it will auto collected (It is very convenient).

5.Tilt survey

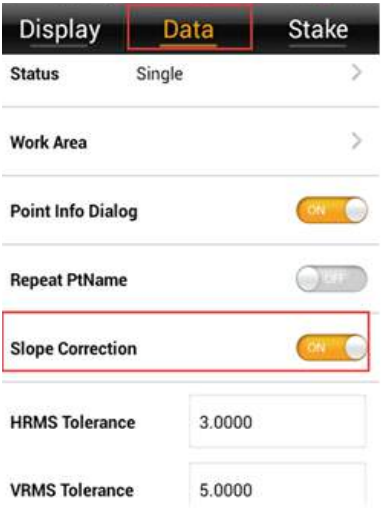
After Electronic bubble calibration, direction sensor calibration and attitude deviation calibration are successful, then begin to do Tilt survey.

Tilt survey condition: Tilt within 20 degrees under motionless state.

(1) Open "Slope correction"

Detail Survey-> Config

Data -> open "Slope Correction"



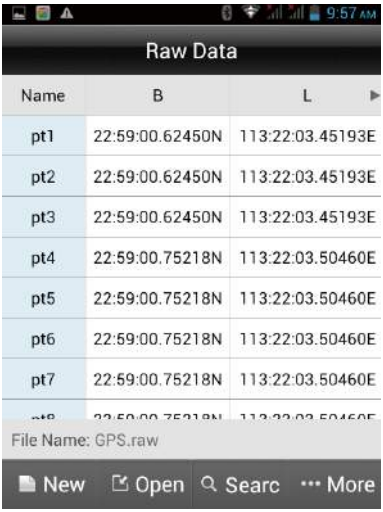
（If "off" the "Slope Correction", software will not make slope correction.）

(2) Start to record point

(3) Add slope correction process.

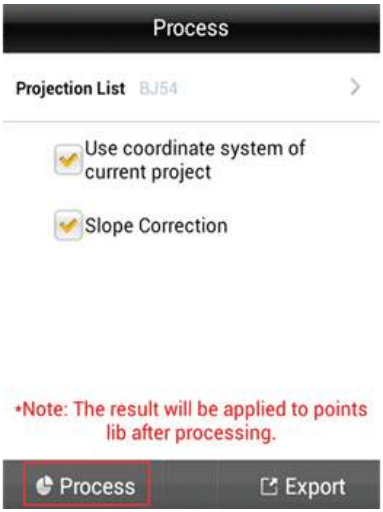
a. Click "Raw Data"-> Choose "Proce (Process)"

1.Click "Raw Data"



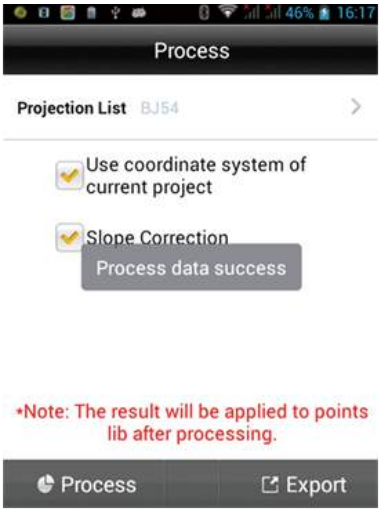
2.Choose "Proce"

b. Choose "Slope Correction"-> Process, then make a correction and upgrade the coordinate points.



1.Choose "Slope Correction"->

Process



2. Process data success.

Notice:

1. Tilt survey angle must less than 30°, otherwise the inclination correction will not satisfy users
2. Before ending tilt survey, please conduct "Process" and software will make a correction and upgrade the coordinate points.
3. The result will be applied to points lib after processing but not the Raw data.

6. View all collected points

1.Click "Project"->Points

in the software main interface

2.Inquire the point library

3.3 Stake out

■ Point Staking

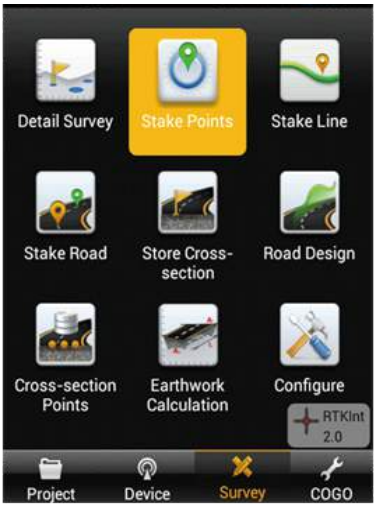
■ Line Staking

■ Dxf Staking

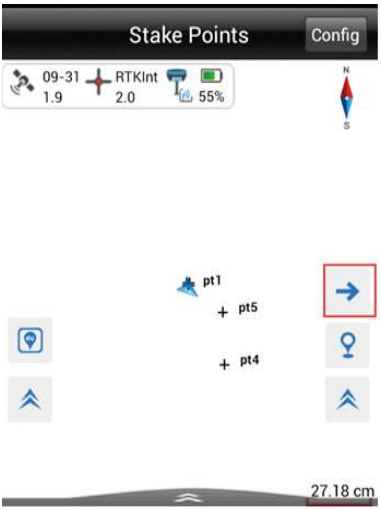
Staking, refers to mark the plane position and elevation of buildings and structures planned and designed on the design drawing on the ground with certain measuring method according to required precision as the basis of construction.

Confirm coordinate system of staking coordinate file before lofting and if coordinate system is inconsistent, the staking will fail.

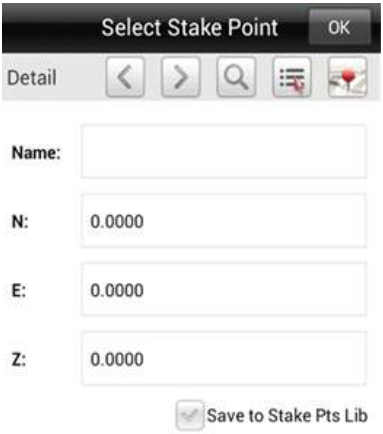
1. Point Staking



1.Click "Survey" and select "Stake Points" (Enter into stake point interface)



2. Click" → "(enter into point selection interface)



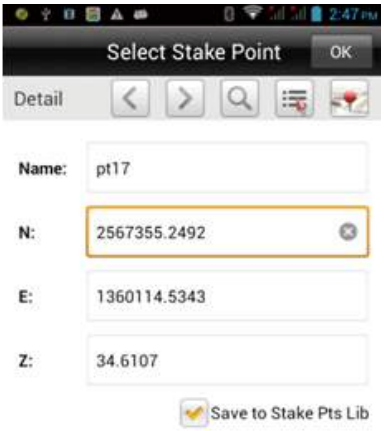
Enter into "Select Stake Point" interface

This step has three point selection methods (Choose either), namely,

A. Input coordinate; B. Select from coordinate library; C. Select from graph.

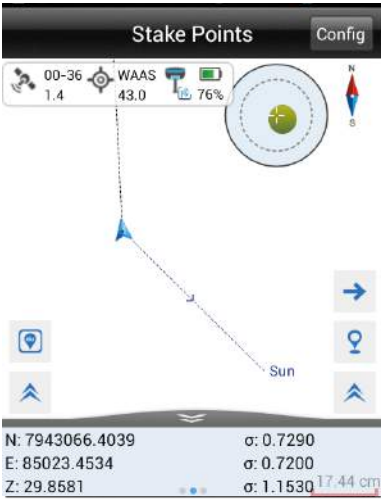
A. Directly input coordinate

1) Input "Name"->Input" NEZ "coordinate->Click "OK"

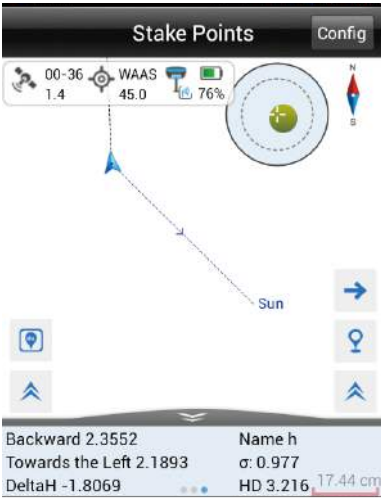


Input the point's name and coordinate, tick "Save to Stake Pts Lib" to save the coordinate of input point into the stake point library.

2) Add the input coordinate point to "Stake points list"->Click "OK" to start stake.



Start staking-out



Stake interface Backward: Southward

Towards the Right: Eastward

Delta H: Altitude difference between stake coordinate and actual position

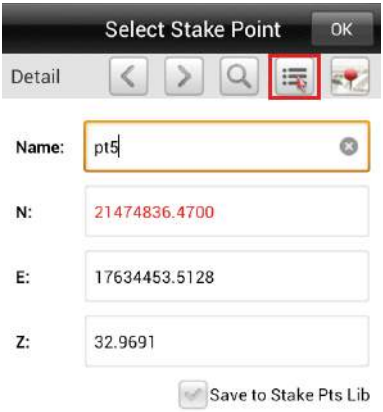
Name : name of stake point

σ: Relative precision

HD: Horizontal Distance

B. Select from coordinate library.

1) Input keyword of point name ->click "  "->Coordinate point->select coordinate point;

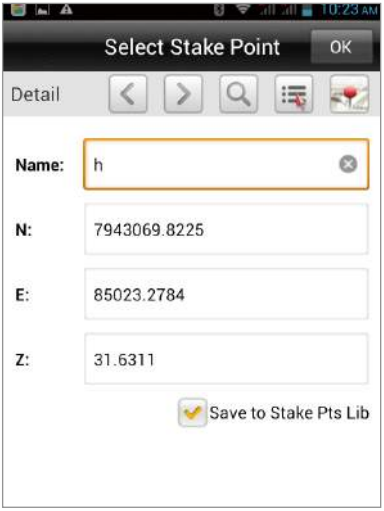


Input keyword of point name (look up keyword of point name)

Click "  " to jump into point library

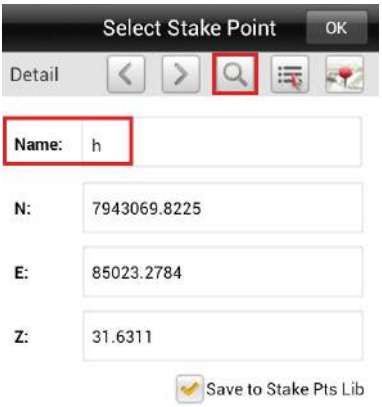
select coordinate point.

2) Tick Save to stake Pts Lib->Click "ok"

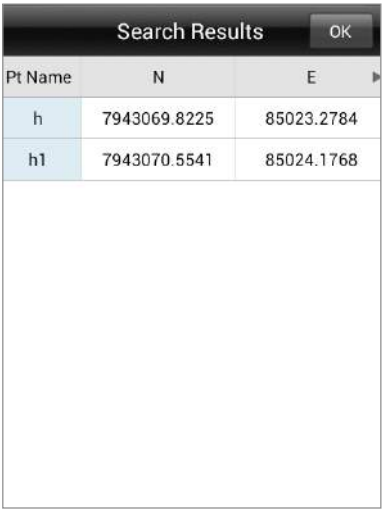


Tick Save to stake Pts Lib->click "OK", add the coordinate point from the "Point Library" to the "Stake Point Library".

3) Input keyword->Click " " of point name in "Name"



Click " " of point name in "Name"



Inquire result, select the required point and click "OK" to start stake.

4) Start staking-out

Stake interface

(indicate position of target point)

Backward: Southward

Towards the Right: Eastward

Delta H: Altitude difference between stake coordinate and actual position

Name : Name of stake point

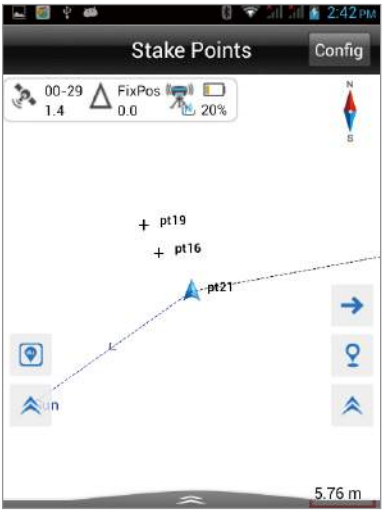
σ: Relative precision

HD: Horizontal Distance

C. Select from graph.

1) Click "  "Select stake point on Map. Click "  ", the software can extract the coordinate of stake point library automatically in the positive sequence or negative sequence for stake.

2) Click "OK" to start staking-out



Start staking-out

Stake interface

(indicate position of target point)

Backward: Southward

Towards the Right: Eastward

Delta H: Altitude difference between stake coordinate and actual position

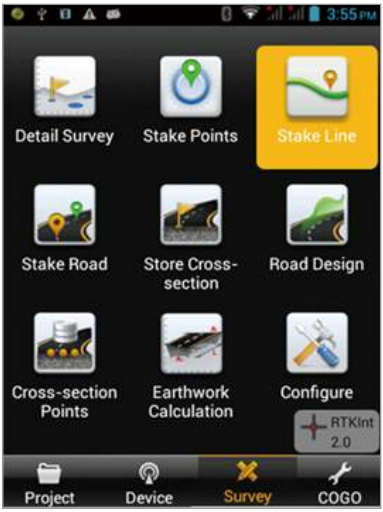
Name: Name of stake point

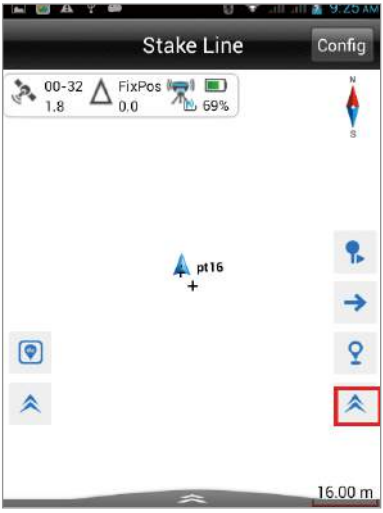
σ: Relative precision

HD: Horizontal Distance

2. Line staking

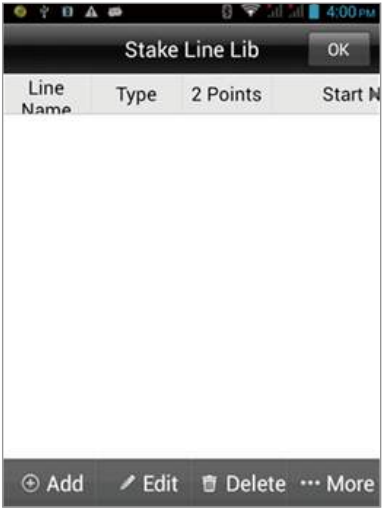
1. Stake line from line library.





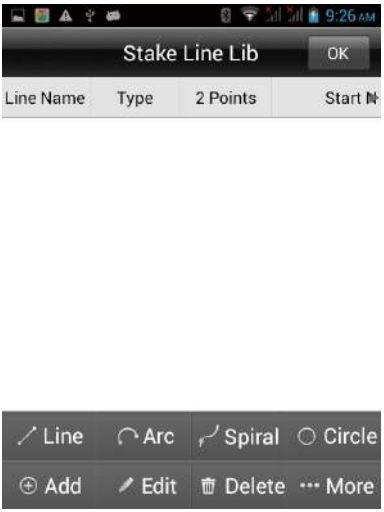
1. Click "Survey"->"Stake Line"->Click" " to enter into the stake line interface;

Click "Survey"->"Stake Line"



2. Click " " "-> Click "Add"

2. Define straight line: There are 2 methods to define the straight line, See as below shows.



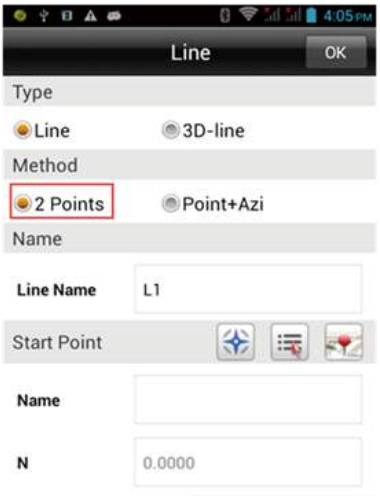
There are 2 methods to define the straight line (select one according to situation),

A. "2Points to define the line"

B. "One point + Azimuth angle"

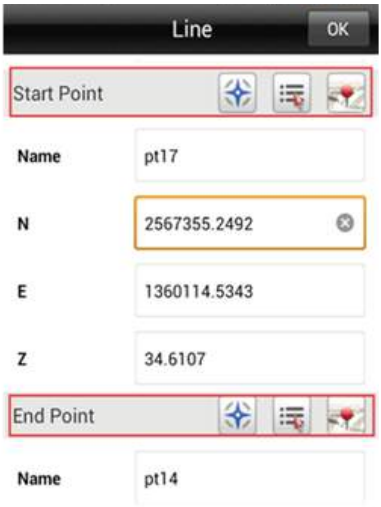
A. "2Points to define the line"

1) Select "2Points"->Input "Line Name" ->Select "Start Point" and "End Point" ->Click "OK"



1.Tick "2Points" to define the straight line;

"2Points to define the straight line" need two elements of "Start Point" and "End Point".(Adding method shall be in conformity with the method to add the stake coordinate point in the "Stake Point").



2.Select "Start Point" and "End Point" and click "OK"

2) At the moment, the straight line is added successfully, which also can be edited and deleted, etc.

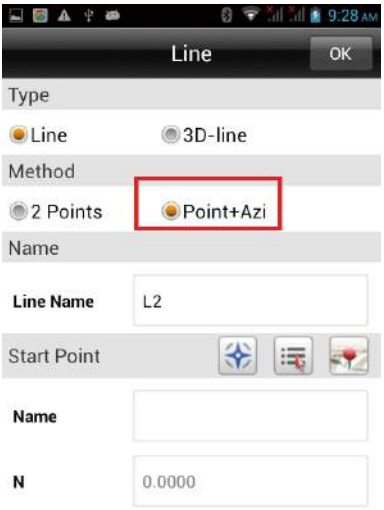
1.The added straight line can be viewed in the interface.

2. Selected line can be edited and deleted

B. "One point + Azimuth angle"

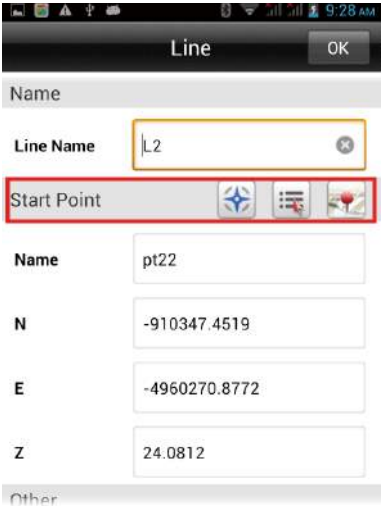
1) Click "Add"->line->"Point + Azi"

1.Click "Add"->line

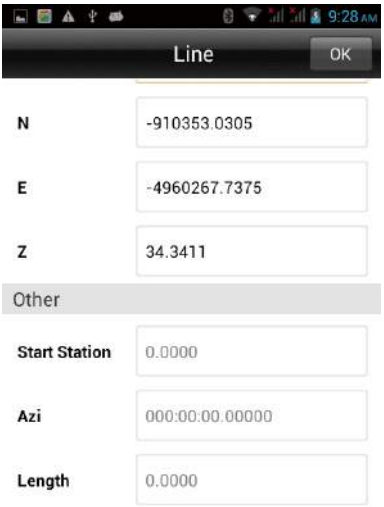


2. Tick "Point + Azi"

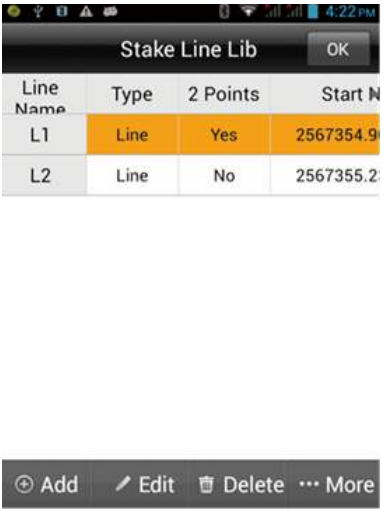
2) Select "Start point"->Input "Azi"->Click "Length" to input length of stake line->Click "OK" to complete the addition of straight line;



1.Input the name of straight line and add coordinate and azimuth angle of "Start Point".



2. When extract the coordinate of one point from the point library, input azimuth angle (Azi) of straight line and start station. Length refers to length of stake straight line.



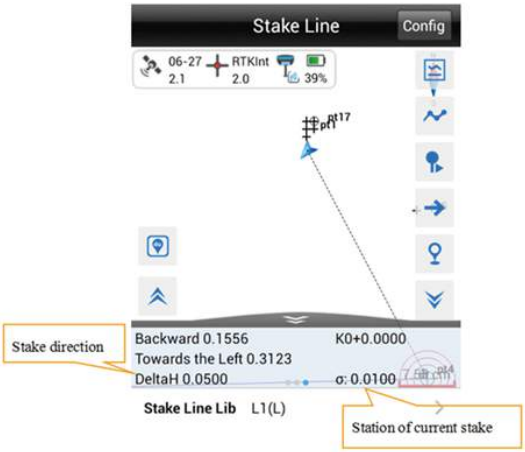
3. If added successfully, the added straight line can be displayed.

3. Start to stake after adding the stake straight line successfully.

(1) Click " → "->click "Milestone" to input milestone of point to be staked->click "OK" to enter into the stake interface.

Cautions: Where the milestone and offset can be accumulated automatically according to the increment.

1.Stake Interface: Including stake direction.



2.Stake direction: Prompt direction of target location. Station of current stake: Refers to current milestone of stake

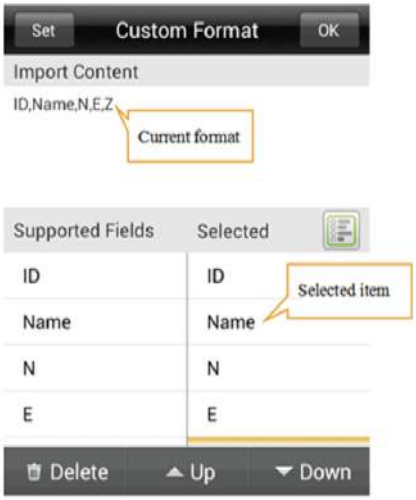
(2) Click " → " again to enter into next point station in which station and offset can be accumulated automatically based on increment.

3. Dxf file staking

1. Importing Dxf file as below shows.

	1.Under "Project" of the main interface>Data Transfer;
	2.Select Stake Point->Import;

3.Select "Dxf" file to be imported -> click "OK"



4. Click "Blank" part->select import format, such as (Name,N,E,Z, etc.), and click "OK" to complete the import.

3.4 Data Export

Data achievement export supports the following format: *.txt, *.CSV, *.dxf, (shp File)*.shp and (Excel File)*.csv.

The export procedures are as follows.

1.Click" Data Transfer"

2.Select "Export" and Input name of File->Select Export Format->Select Saving Path

4. Select file format (take *.dxf for example) ->click "OK" to complete data export.

Export format of file includes(8kinds):

User-defined(*.txt),

User-defined(*.CSV),

DxfFile(*.dxf),

ShpFile(*.shp),

Excel File(*.CSV),

South cass7.0(*.dat),

Scsg2000(*.dat),

PREGEO(*.dat).

3.5 Auto-backup function in Hi-Survey

Project is auto restored in Hi-Survey. External SD card is used for important data backup (Including: Raw data, project file, coordinate system or encryption QR code file).

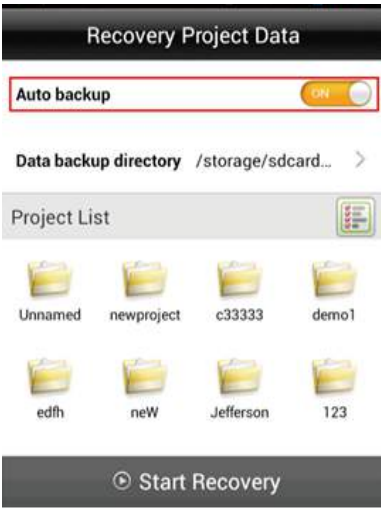
There are two kinds of backup, one is when users is setting project info he can click the auto-backup in advance; Another is when users is deleting project file and choose "Backup" in the delete massage box.

1. Auto-backup function

(1)Project Info->Recov->Click" Auto backup"

	1.Choose "Project Info"

2. Select "Recov"



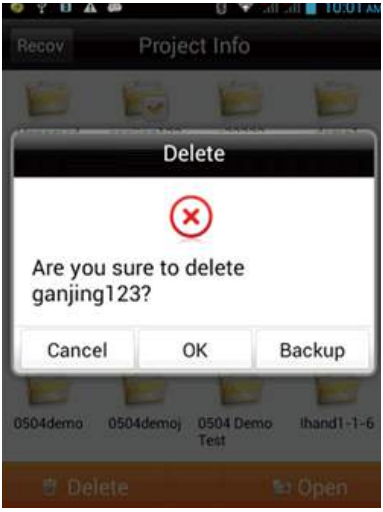
3. Open "Auto backup"

Notice: The path of backup file:external SD card /ZHD-Bak/Project/Road.

2. Backup before delete

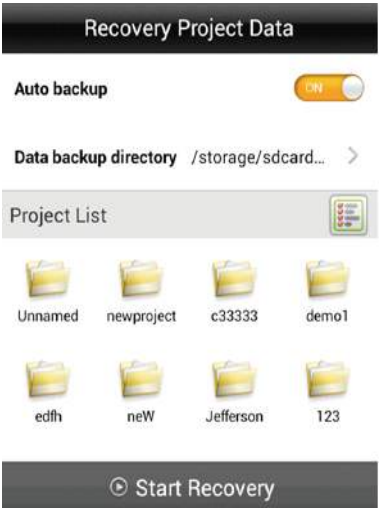
Backup before delete means users backup project file into external SD card before delete project file .The path of backup file:external SD card /ZHD-Bak/Project/Road.

(1) Choose delete project file and long press it in "Project info"

	1.Choose delete project file and long press it in "Project info"
	2. Select "Backup" in delete message prompt box

3. Data Recovery

1.Click "Recov" in "Project Info"



2.Long press to choose backup file ,

" " represent all selected

After selected file, Click " Start Recovery "

4. Backup/ Recovery path: external SD card /ZHD-Bak/Project/Road.

View backup file: File Manager->SD card->ZHD-Bak->Project->Road

	File Manager->SD card->ZHD-Bak->Project->Road

Notice:

1. External SD card is necessary before users backup project file.
2. All the backup operations are over version 1.0.2.

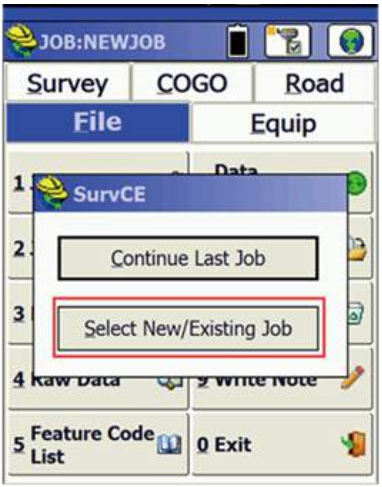
CHAPTER

4

Simplified Operation of SurvCE

4.Simplified Operation of SurvCE

1. Open "SurvCE" software



Select "Select New/Existing Job" to jump for selecting to open existing project or newly established project.

Input Project Name

Then Click "✓".

2. After project establishment, enter into "Setting" in the coordinate system. There are two ways:

A. Import existing coordinate system.

B. User-defined coordinate system.

A. Import existing coordinate system.

Click "Add Predefined"->Select coordinate system->Click" " to complete the addition of coordinate system.

	Click "Add Predefined"
	Click " " to complete the addition of coordinate system

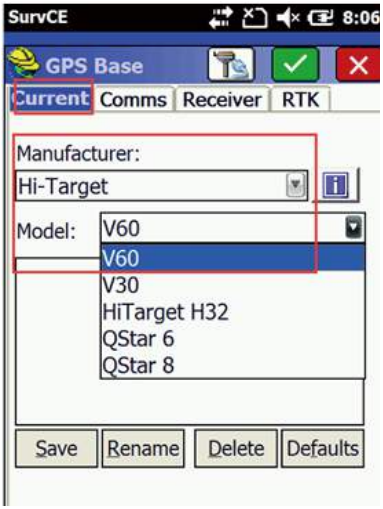
B. User-defined coordinate system

Coordinate system can also be manually modified.

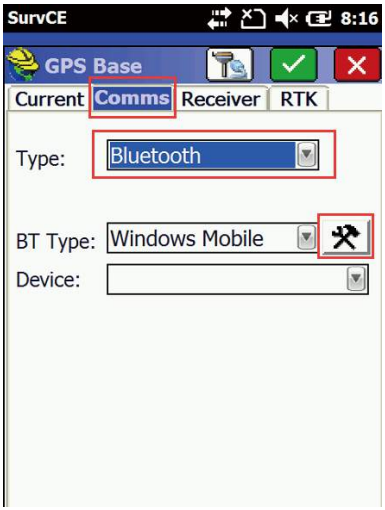
3. Connect instrument and set Base

The connection between controller and receiver is established by Bluetooth.

1) Click "Equip"->GPS Base

	Interface of GPS Base setting:
	Manufacturer: Select "Hi-Target" Model (optional): Select corresponding model Model drop-down box for selection

2) Click "Comms"->Type: Bluetooth->click  ->Find Device-(Search for Bluetooth device)



Click "Comms" -> Type: Bluetooth

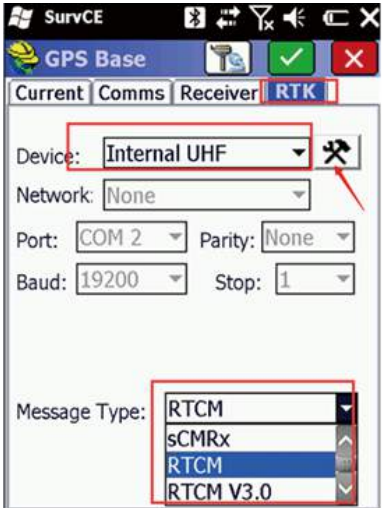
Click"  "->Find Device
(Search for bluetooth device)

3) Select instrument as "Base">Set Device PIN>click " ", at the moment, the Bluetooth connection is successful.

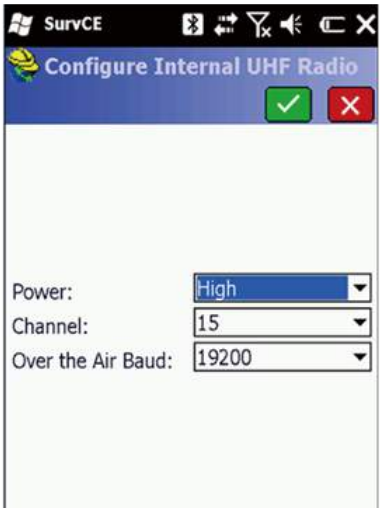
Select S/N of instrument as "Base", click" " "

Set Device PIN, Input "1234" Click " " to complete the connection

4) Click "RTK" to configure Base



(Take built-in UHF for example) ->set difference scheme-> , configure power, transceiver channel and air Baud rate



Click" " enter into transceiver setting

click" " to complete

5) For obtaining coordinates of Base

click "Read From GPS"->smooth obtaining ->click "Yes"

	Average setting "By Number" or "By Time in min" for optional

4. Set Rover

The procedures to set rover are similar as to base.

Note:

1. When receiver works in UHF mode, settings should be exactly same as the Base

2. When receiving the correction from Network, the parameters of VRS should be input to the rover correctly.

CHAPTER

5

Trouble Shooting

- Reset operation
- Restore the iHand20 to factory settings
- USB virtual serial port driver installation
- Firmware update
- Modify PCC radio with GM-xxPx management software

5.Trouble Shooting

5.1 Reset operation

When the Bluetooth is not connected, satellite searching fails and network connection fails, the operation can be conducted in case that instrument restarting does not work.

Reset receiver : In power on status ,long press power button(3s≤long press time≤6s) when voice prompts first "dingdong" ,release power button to power off ,and press 1s to power on.

Reset mainboard : In power on mode, long press power button for more than 6s, when voice prompts the second "dingdong" then release power button . (Purpose: Restore the mainboard to the initial mode.)

5.2 Restore the iHand20 to factory settings

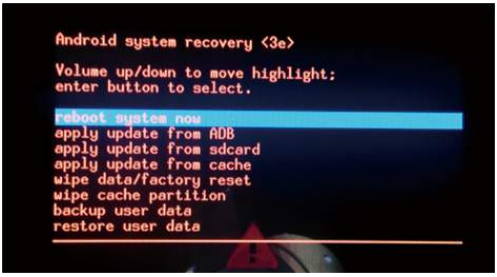
These steps can help to solve the situation when the instrument appears unresponsive or crash.

Procedures :

1. Enter recovery mode

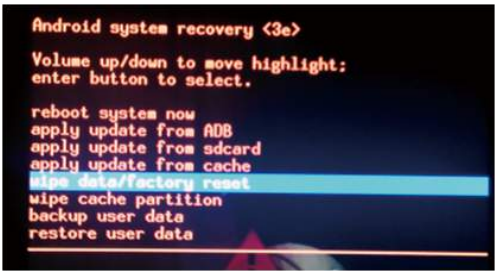
(1)Shutdown the controller, long press both " VOL + and ⏻ " keys . Then the controller will be into recovery mode.

(2) Press [camera] to enter the following interface.



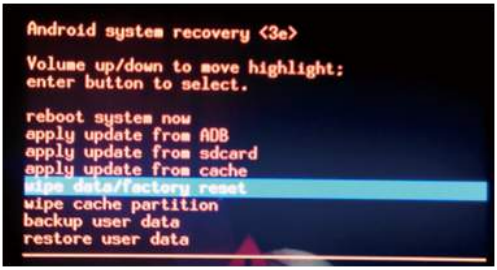
2. Wipe user data:

Press "VOL + & VOL −"keys to move the cursor and highlight "wipe data/factory reset", and then press [power] to enter the following interface.



3. Move the cursor and highlight" yes—delete all user data" ,than press [power] to confirm and delete the user data.

4. Move the cursor and highlight" wipe cache partition" , press [power] to confirm and wipe cache partition.



5. Highlight “reboot system now”, press to confirm and restart the phone.

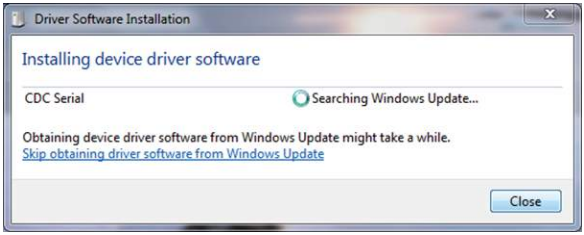
5.3 USB virtual serial port driver installation

Installation steps are as follows.

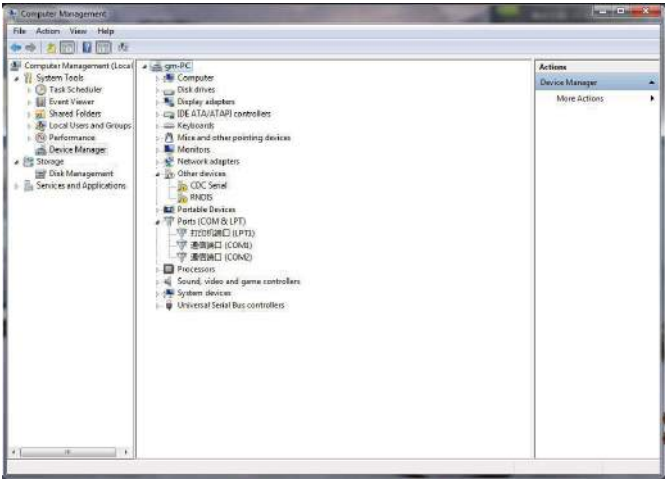
1. Confirm to open the virtual serial port driver function, users can view and check these settings by iHand20.

2. Connect receiver with PC by micro USB cable and install the driver. The driver file support Windows 7 32 bit, Windows XP 32 bit, other system need to be tested.

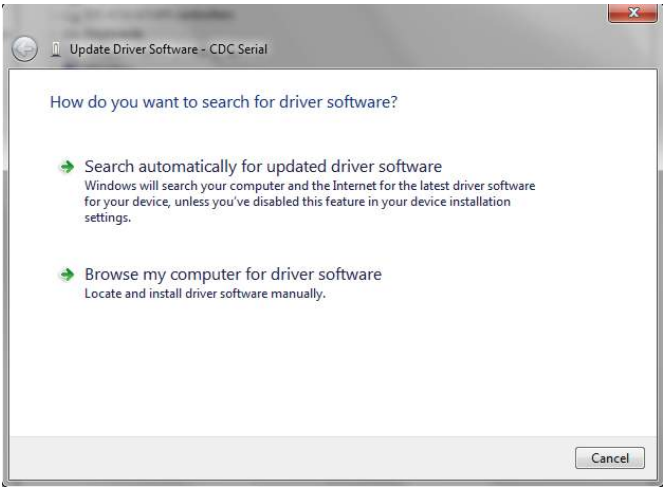
3. After connected, It will prompt "Installing device driver software".



4. Choose "Skip obtaining driver software from Windows update" and open "Computer management"; In "Other devices" choose the "CDC Serial"



5. Right click "CDC Serial" and choose "Upgrade Driver Software" and select"linux_cdc_seial.inf " then click next.



6. If searched the effective software, the pop-up window will appear, and choose "Install this driver software anyway".

7. Successfully updated information will show as below.

5.4 Firmware update

Receiver's firmware updating steps are showed as below.

1. Power on V90 Plus GNSS receiver, connect receiver with PC by manufacture equipped USB cable. Then open "My Computer" ," update "disk will display.

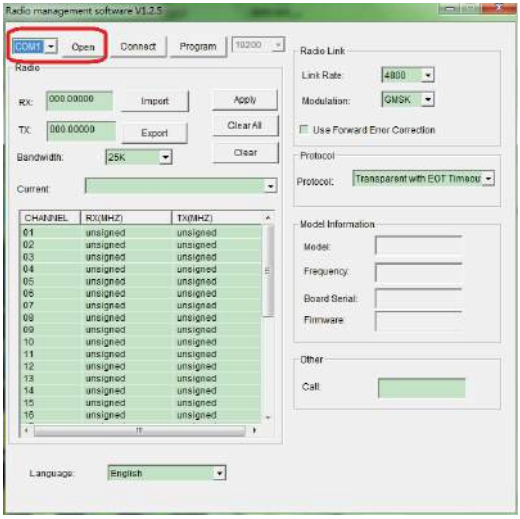
2. Copy the firmware to "update" disk, remove it and disconnect USB cable, restart GNSS receiver.
3. Restart the process of upgrading will have corresponding voice prompts, if update failed please contact the technician for help.

5.5 Modify PCC radio with GM-xxPx management software

For PCC radio, users can modify the channel parameters and communication protocol by GM-xxPx management software.
Procedure shows as below

1. Connect GNSS receiver radio with GM-xxPx management software

Connect V90 Plus to computer then choose the correct COM port ->Open-> Connect;



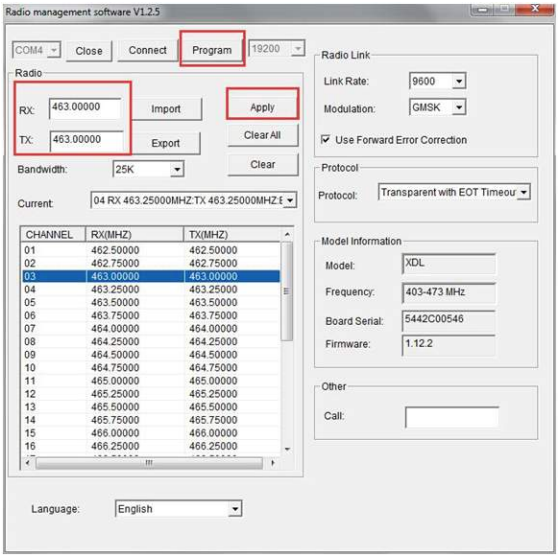
2. Modify radio parameters

There are two ways to modify the radio parameters which including Bandwidth，Channels，Radio Link and Protocol.

1) Manually modify

Choose radio->input "RX" and "RY"-> Apply->Program;

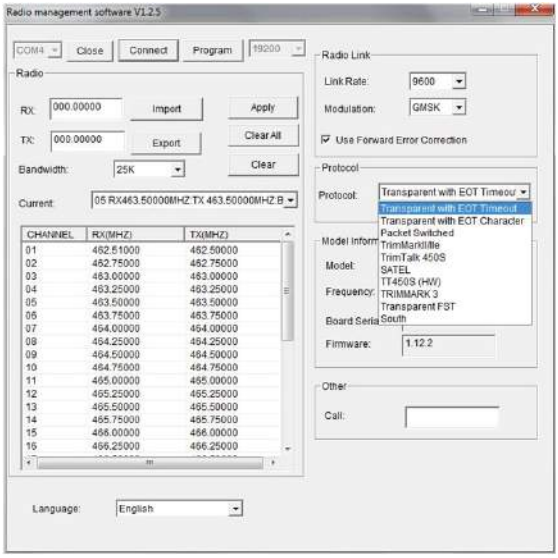
The other parameters can be modified in the corresponding selection box.



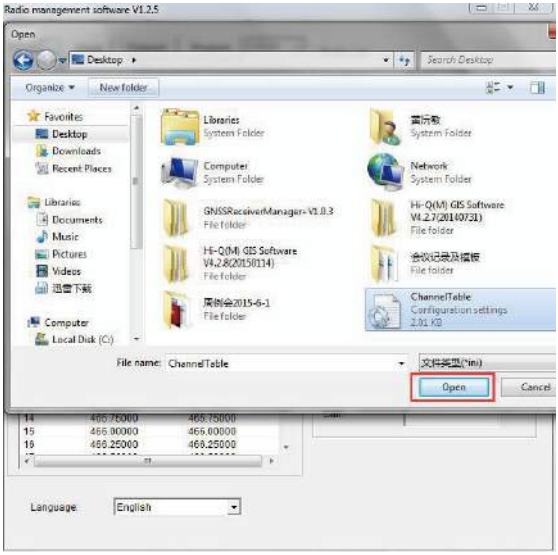
After modified the channel parameters, please restart the GNSS receiver.

2) Radio parameters can also be imported from a sheet file (*.ini) which contains all the parameters and can be automatically applied.

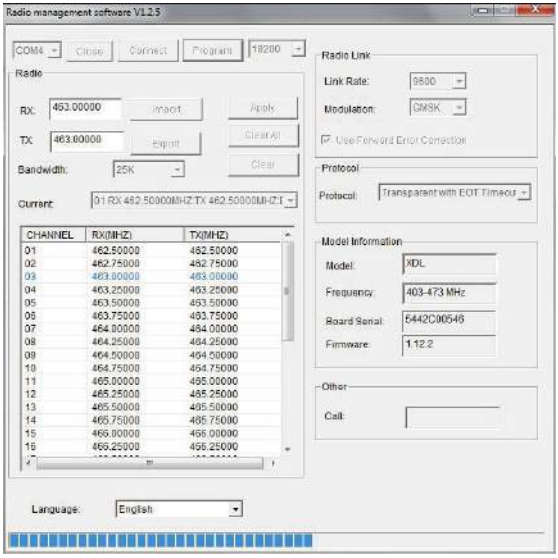
(1) Click "Import"



(2) Choose file->Open (File format: *.ini)



(3) Click" Program"



(4) Set parameters Ok!

Note:

1. When the parameters modification is OK, you can export it into parameter sheet (*.ini) file then import and apply it to other receivers.

2. Please restart the GNSS receiver after conducted.

CHAPTER

6

Technical Parameters

- GNSS receiver
- Communication
- Controller

6.Technical Parameters

6.1 GNSS receiver

Satellite Signals Tracked Simultaneously

220 Channels	
GPS	Simultaneous L1C/A, L2C, L2E, L5
GLONASS	Simultaneous L1C/A, L1P, L2C/A (GLONASS M only), L2P
SBAS	Simultaneous L1 C/A, L5
Galileo	Simultaneous L1 BOC, E5A, E5B, E5AltBOC(optional)
BDS	B1, B2
QZSS	L1 C/A, L1 SAIF, L2C, L5

Receiver Precision

Static and Fast Static GNSS Surveying	
Horizontal	2.5mm+0.5ppm RMS
Vertical	5mm+0.5ppm RMS
Initialization time	Typically ＜10s
Initialization reliability	Typically > 99.9%
Post Processing Kinematic(PPK / Stop & Go) GNSS Surveying	
Horizontal	1cm+1ppm RMS
Vertical	2.5cm+1ppm RMS
Initialization time	Typically 10 minutes for base while 5 minutes for rover
Initialization reliability	Typically > 99.9%
Real Time Kinematic (RTK) Surveying	
Single Baseline	
Horizontal	8mm+1ppm RMS
Vertical	15mm+1ppm RMS
Network RTK	
Horizontal	8mm+0.5ppm RMS
Vertical	15mm+0.5ppm RMS
Initialization time	Typically < 8seconds

Initialization reliability	Typically > 99.9%
Code Differential GNSS Positioning	
Horizontal	25cm+1ppm RMS
Vertical	50cm+1ppm RMS
SBAS	0.50m Horizontal, 0.85m Vertical

Hardware

Physical	
Dimensions (W x H)	153mm x 83mm (6.02inch x 3.27inch)
Weight	≤1.0kg without internal battery
Operating temperature	-40℃to +65℃ (-40℉ to +149℉)
Storage temperature	-40℃ to +75℃(-40℉ to +167℉)
Humidity	100%, considering
Water/dustproof	IP67 dustproof, protected from temporary immersion to depth of 1m (3.28ft).
Shock and vibration	Designed to survive a 3m(9.84ft) natural fall onto concrete.
Electrical	
Power	6V to 28V DC external power input
Power consumption	≤3.5W
Automatic switching between internal power and external power Rechargeable, removable 7.4V, 5000mAh Lithium-ion battery in internal battery compartment	
Internal Battery Life	
Static	12hours
RTK base	8 hours
RTK rover	(UHF/GPRS/3G) 8-10 hours
I/O Interface	
1 x Bluetooth, WIFI,NFC interface	1 x RS232 serial port
1 x Radio Module	1 x DC power input (5-pin)
1 x WCDMA communication module	1x SIM Card slot
1 x standard mini USB2.0 port	1x SD Card slot

1 x TNC antenna connector	1x built-in lithium battery interface
Tilt Survey System	
Electronic Bubble	

System Configuration

CPU	AM3352CotexA8 Platform
Storage	16GB Internal storage (Support up to 32GB external SD card)
Record GNS and RINEX format simultaneously	
Data Formats	
Difference transmits format	sCMRx、CMR、CMR+、RTCM 2.1、2.2、2.3、3.0、3.1、3.2
Navigation outputs format(Binary)	GSOF
Navigation outputs format(ASCII)	NMEA-0183 GSV, AVR, RMC, HDT, VGK, VHD, ROT, GGK, GGA, GSA, ZDA, VTG, GST, PJT, PJK, BPQ, GLL, GRS, GBS
output frequency	1Hz positioning output, up to 20Hz

6.2 Communication

Network Communication	
Fully integrated, fully sealed internal WCDMA, compatible with GPRS, GSM	
WIFI frequency is 2.4G, supports 802.11b/g/n protocol	
Network RTK (via CORS) range20-50km	
HI-TARGET Internal UHF Radio(Standard)	
Frequency	450~470MHz with 116 channels
Transmitting power	0.5W, 1W, 2W adjustable
Transmitting speed	9.6Kbps, 19.2Kbps
Working range	3~5km typical, 8~10kmoptimal
Pacific Crest XDL Micro Internal UHF Radio	
Frequency	403~473MHz

Transmitting power	0.5W, 2W adjustable
Transmitting speed	Up to 19.2Kbps
Support most of radio communication protocol	
Working range	3~5km typical, 8~10km optimal
HI-TARGET External UHF Radio (Standard)	
Frequency	460MHz with 116 channels
Transmitting power	5W, 10W, 20W, 30W adjustable
Transmitting speed	Up to 19.2Kbps
Working range	8~10km typical, 15~20km optimal
Pacific Crest ADL Vantage Pro External UHF Radio	
Frequency	390~430MHz or 430~470MHz
Transmitting power	4W to 35W adjustable
Transmitting speed	Up to 19.2Kbps
Support most of radio communication protocol	
Working range	8~10km typical, 15~20km optimal

6.3 Controller

iHand20 specification		
◇ ID description		
	handheld Type	Android professional data collecter
	Dimension	see the appearance design for details
	Weight	see the appearance design for details
	Keypad backlight	white
◇ Basic Parameter		
	handheld Bands	card1：support 7 frequences，incleude W850/1900/2100，GSM 850/900/1800/1900 card2：support 4 frequences，incleude GSM850/900/1800/1900
	waterproof&dustproof prevent	IP68 （6 level dustproof, 8 level waterproof)
	dropping	1.2 meters concrete floor free falling
	Keypad	with keypad（see the appearance design for details）
	Dual Sim Dual Standby	support
	Touch Lens	multipoint capacitive touch screen，with a stylus, can be used with all kinds of gloves in winter

	LCD Parameter	COM37H3M77ULC high-light LCD （3.7 inch，can be read under the Sun,640*480）
	Camera	8 million automatic focus AF
	Flash Light	High light Flash LED
	Processor	MT6589，1.2 G, 4 core
	Memory	4GB ROM+1GBRAM
	Storage Card	support T-Flash storagecard；support 32GB Micro-SD extend storage
	working time	>10 hours[LCD brightest+bluetooth or WIFI openning, running Hi-Survey software]
	Standby time	maximun 900 hours (GSM Page9, or WCDMA DRX=256)
	Battery Capacity	more than 6000mA,easy to disassembly, easy to charge
	WiFi(WLAN)	IEEE 802.11b/g/n,Wapi,AP（from more than 30 meters under the condition of without occlusion）
	Bluetooth	support V4.1(LE)（from more than 15 meters under the condition of without occlusion）
	GPS navigation	support GPS and AGPS
	G-Sensor Gavity sensor	support
	Compass	support
	FM	support
	Barometer	support
	Proximity-Sensor	support
	Light-Sensor	support
	Gyro	support
	RFID	support

◇ Network	
GSM	
EDGE	support
Speech	FR, HR, EFR, AMR(Narrow Band),AMR WB
GPRS functionality	GPRS Class 12
WCDMA	
HSPA	support（HSPA）
USIM support	support
Maximum Downlink Data Rate	42 Mbps
Maximum Uplink Data Rate	11.5Mbps
IMEI	need to be marked
◇ Main Camera	
Pixel	8M pixel
Camera technology	CMOS
Auto Focus	support
Picture Size	Max 3296*2460
Zoom	Digital zoom 4X
Video	Support video capture, simultaneity audio record
Flash light	High light Flash Light
◇ Main Feature	
System connector	5 pin Mini USB
Audio Jack	3.5 Audio Jack for Audio
USIM support	support
T Flash Card	support
◇ Software OS	
Software OS	Android 4.2
Miracast	support
Videon Phone	support
◇ Language options available	
Default language pack	Chinese/English
◇ Environment	
working tempreture	-30℃--55℃
storage tempreture	-30℃--65℃

CHAPTER

7

Socket and Main Accessories

- Preface
- Difference antenna
- Controller

7.Socket and Main Accessories

7.1 Preface

The chapter will introduce the appearance and application of main interface of receiver and accessories. The following equipment does not represent all users purchased V90 Plus. According to different configurations, the specific configuration shall be subject to the delivery order upon purchasing.

7.2 Difference antenna

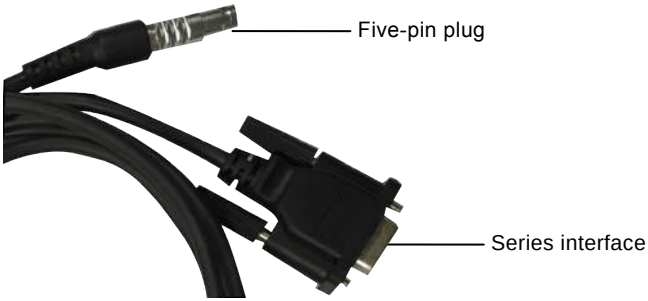
UHF base mode and UHF rover mode shall use difference antenna. The difference antenna of UHF base mode is used to transmit UHF difference signal. The difference antenna of UHF rover mode is used to receive UHF difference signal. 3G mode shall use 3G short antenna as right.

Difference antenna installation :

Grasp the fixed nut in bottom of different antenna with hand to install clockwise. On the contrary, dismantle difference antenna anticlockwise.

Warning: when installing difference antenna, it shall rotate the fixed nut in bottom of difference antenna with hand rather that grasping the upper side of difference antenna, or it will break off the difference antenna.

Data Cable



Five-pin plug: connect Five-pin socket of receiver

Serial interface: it is used to connect with computer serial port, update receiver firmware, set the receiver, manage static data and set the radio.

Warning:

1. when connecting various plugs of receiver, it shall align the red point in line joint at the red point in receiver socket, or it will damage the receiver socket and plugs of various lines.
2. When plug out the plug, directly grasp the sliding collar and pull out the plug with effort. It shall not rotate the plug.
3. After using the cable, it shall place the cable in the place difficult for extrusion, in order to prevent damaging the plug. When installing the difference antenna, it shall rotate the fixed nut in bottom of difference antenna with hand, rather than grasping the upper side to rotate, or the difference antenna will be in bad contact and influence the operating range.

DDTHPB External Radio

DDTHPB external radio is a type of radio improving the performance of relay radio UH-3000. DDTHPB radio has all functions of URS relay radio. Compared to other radios, it is also functional in power transposition protection. Even though the external power is connected wrongly, DDTHPB radio will not be burn out.

1. Field intensity/power voltage indicator D1

2. Dibit nixie tube indicator D2 3. Send-receive indicator light D3

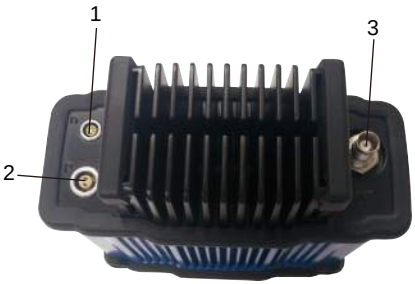
4. Power/warning indicator D4 5. Key K4 (power on-off key)

6. Key K4 (channel increasing key) 7. Key K3 (channel decreasing key)

8. Key K2 (electric quantity checking key)

9. Key K1 (power toggle key) 10. Power indicator light D5

DDTHPB radio interface:



1. Base host to radio cable interface

2. External power interface

3. Transmitting antenna interface

As for the specific operations of DDTHPB external radio, please refer to its manual.

Annexed Table 1 Defaulted Frequency Table upon Delivery

The user may change defaulted frequency of 16 channels of the radio.

Table 1 Defaulted frequency table of 16 channels in radio

Channel	Frequency（MHZ）	Channel	Frequency（MHZ）
0	466.825	8	466.625
1	463.125	9	463.325
2	464.125	A	464.325
3	465.125	B	465.325
4	466.125	C	466.325
5	463.625	D	463.825
6	464.625	E	464.825
7	465.625	F	465.825