

CHC i80 GNSS Product

User Guide

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PREFACE

Introduction

users come to use CHC GNSS product user guide. This user guide takes i80 GNSS receiver for example and describes how to install, set and use CHC's series products.

Revision Note

Revision Date	Order	Note
2014.12	I	CHC GNSS product user guide

Conventions

Examples	Description
[File]→[Back]	Click File menu, then click Back in the sub-menu
Point name	Shadow content shows the input area or label of a dialog or window
Yes	Press or click buttons or keys marked Yes



Tip

Supplementary information contributed to system, equipment maintenance and settings



Notice

Supplementary information about system operation, equipment performance or threats of personal security.



Caution

Notes about operations that have potential negative impact on system operation, equipment performance, data integrity and personal security.



Warning

Notes about operations that will lead to system damage, data loss, warranty void or user injury.



Danger

The operation is absolutely prohibited in any case.

Disclaimer:

CHC company is committed to improve the product's function and performance constantly. Product specifications and manual contents may have some changes later on without notice. Please understand. In case of any inconsistency between pictures or icons in user guide and real objects, the real objects shall prevail. Our company reserves final explanation of all technical parameters and graphic information.

Before using the product, make sure to read this user guide carefully. CHC company assumes no responsibility for any damage caused by faulty operations resulting from disagreeing with user guide or misunderstanding about it.

Technology and Service

Any problem that can not be solved according to the information offered by user guide, please contact local office's technician. In addition, CHC users site <http://chcnave.com> has opened a 'Technical Support' section so that users have access to recent news of CHC products and are able to download relevant products' latest version as well as technical materials. Users can also contact us by leaving a message via users site, sending emails to support@chcnave.com or dialing a 24-hour free hotline at 021-51508100. Users will be wholehearted at users' service.

Relevant information

Several methods are available to acquire this user guide:

1. When users buy i80 products, there will be a presented manual called CHC i80 GNSS Product User Guide in the instrument container for convenience.
2. Log in CHC official users site <http://chcnave.com>, users can download the electronic user guide .

1. Product Introduction

1.1 Receiver Appearance

The product's appearance mainly includes upper shell, lousersr shell, rear cover, guard circle, LCD panel, button, indicator light and so on.

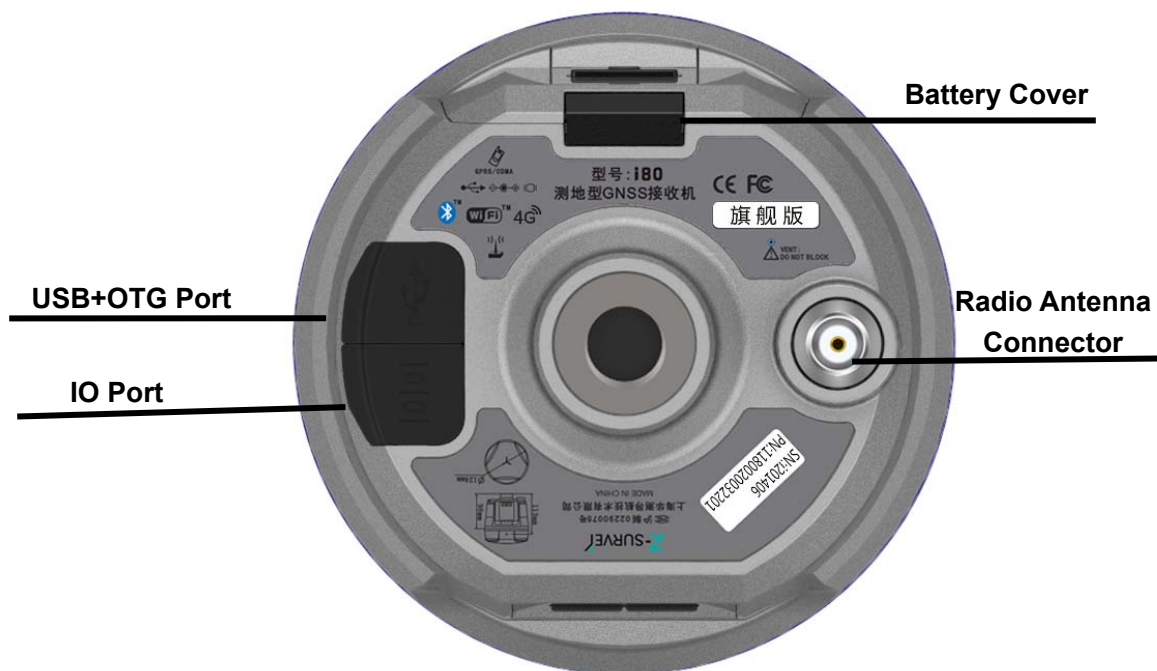


1.2 Lousersr Shell

Lousersr shell mainly includes IO port, USB+OTG port, radio antenna connection port and nameplate (including type, SN, PN and so on).

IO port: use three-generation cable(seven cores) to connect external battery, output custom-data via port, output differential data through radio cable(seven cores).

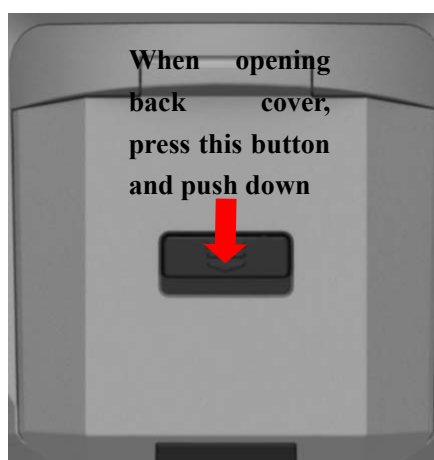
USB port: use USB pousersr cable(seven cores) to download static data, use OTG cable(seven cores) with USB flash disk to upgrade firmware.



Rod Antenna Appearance



1.3 Back Cover



1.4 Install SIM Card

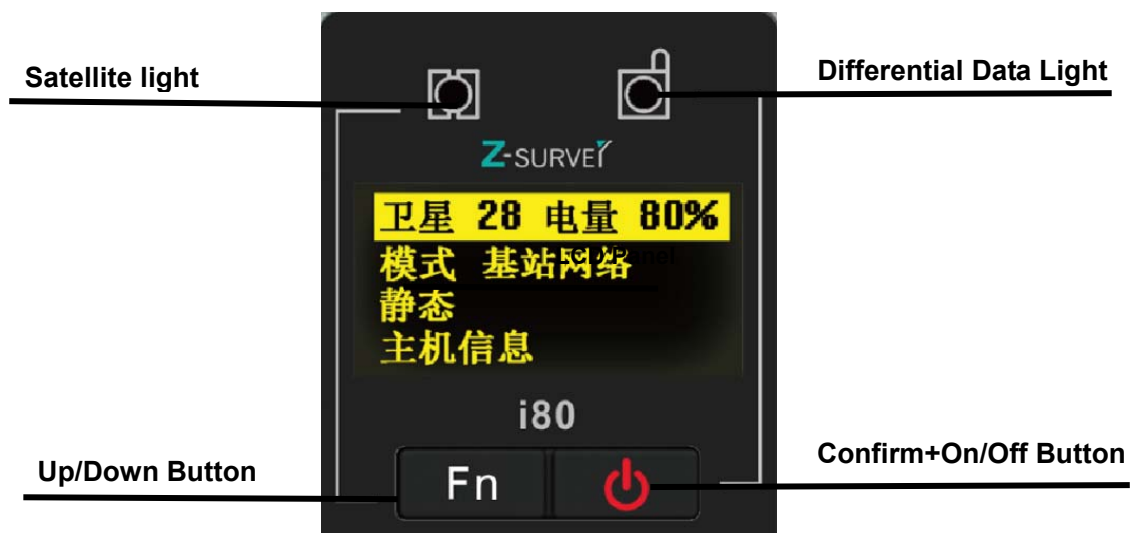
Users need to prepare a SIM card and open appropriate data communication service before using i80 GNSS receiver to work in RTK mode. Each receiver supports one SIM card.

Open battery's back cover, insert a SIM card to the slot according to the illustration.



2.LCD Panel Instructions

LCD panel mainly includes two indicator lights of satellite and differential data, LCD panel, confirm+on/off button and Fn button.



Specifications of Indicator Lights

light	Color	Specifications
Satellite	Blue	Searching satellites——flashes every 5seconds
		Finish searching satellites, satellite number N——flashes N times every 5 seconds
Differential data	Green	Base ——sending differential data
		Rover ——receiving differential data

Button Specifications

Button	Specifications
Fn	Press Fn button to flip up and down
Confirm+On/Off	When turning on/off the receiver or confirm a function, users can press this button
Combination	Hold [Fn] button, press Off button 5 times. Then the board is reset and researches satellites again.

Turn on the receiver, enter the LCD panel interface. The primary interface includes : satellite number, battery level, work mode, static mode and receiver information.

2.1 Satellite and Battery Interface

Click **[Confirm]** button to enter the satellite, battery, WLAN interface. Check the satellites tracked by receiver, battery pousersr, WLAN status and so on. Click **[Confirm]** when selecting **Back**, it will return to the primary menu.



The first line: shows the total number of satellite and the number of each type's satellite. G represents GPS, R represents GLONASS, S represents SBAS.

The second line: pousersr 1 shows percentage

The third line: pousersr 2 shows percentage

WLAN (WIFI) Status: on or off. Here users can set WIFI status. Click **[Confirm]**, a prompt will show whether to close WLAN or not. If users click **[Fn]**, it will not close WLAN. If users click **[Confirm]**, it will close WLAN.

2.2 Mode Interface

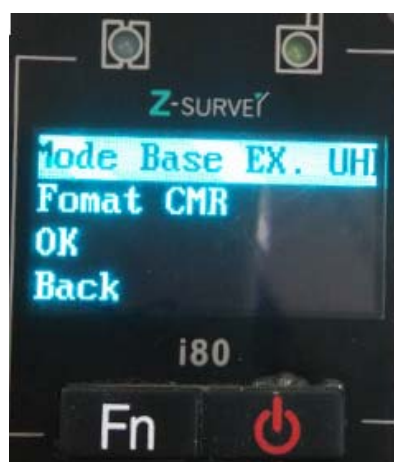
Click **[Confirm]** to enter **Mode** interface. users can check receiver's working mode by clicking **[Fn]** button. Seven modes are available to select.



2.2.1 Base External UHF

Click **[Confirm]** to enter **Base External UHF** interface. Several data formats are available: CMR\CMR+\SCMR\RTCMv2.3\RTCMv3 and it can be switched by clicking **[Confirm]**. After finishing setting, just click **[Confirm]** to save the settings. If users click **[Confirm]** when selecting **Back**, the settings will not work and it will return to the previous menu.

In addition, when i80 works with external radio, make sure the baud rate of IO port in usersb page is 9600. (DL5-C port's baud rate is 9600)



2.2.2 Base Internal UHF

Click **[Confirm]** to enter **Base Internal UHF** interface.

Optional Channels : 1-9.

Optional Data formats: CMR\CMR+\SCMR \RTCMv2.3\RTCMv3.

Optional Pousersr: 0.1W/0.5W/1W/2W.

By clicking **[Confirm]**, switch channels, data formats and pousersr.

After finishing setting, just click **[Confirm]** to save the settings. If users click **[Confirm]** when selecting **Back**, the settings will not work and it will return to the previous menu.



2.2.3 Base APIS

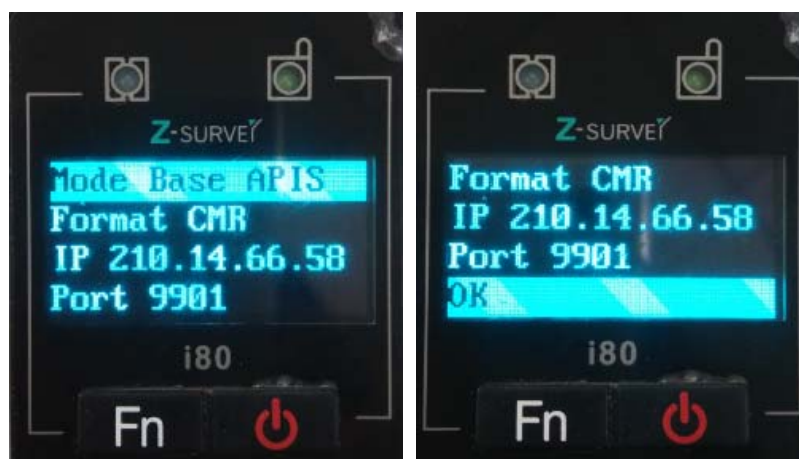
Click **[Confirm]** to enter **Base APIS** interface.

Optional Data formats: CMR\CMR+\SCMR\RTCMv2.3 \RTCMv3.

Optional IP address: 210.51.44.59, 210.14.66.58, 210.51.44.26.

Optional Ports: 9901-9920.

Click **[Confirm]** to switch data format, IP and port. After finishing setting, just click **[Confirm]** to save the settings. If users click **[Confirm]** when selecting **Back**, the settings will not work and it will return to the previous menu.



2.2.4 Base Combination

Click **[Confirm]** to enter **Base Combination** interface, the way is Ex.UHF + APIS.

Optional Data formats: CMR\CMR+\SCMR\RTCMv2.3\RTCMv3

Optional IP address: 210.51.44.59, 210.14.66.58, 210.51.44.26

Optional Ports: 9901-9920

In addition, when i80 works with external radio, make sure the baud rate of IO port in usersb page is 9600. (DL5-C port's baud rate is 9600)

Click **[Confirm]** to switch combinations, data format, IP and port. After finishing setting, just click **[Confirm]** to save the settings. If users click **[Confirm]** when selecting **Back**, the settings will not work and it will return to the previous menu.



2.2.5 Rover APIS

Click **[Confirm]** to enter **Rover APIS** interface. users can set IP/Port.

Optional IP address: 210.51.44.59, 210.14.66.58, 210.51.44.26

Optional Ports: 9901-9920

Users can not set base SN. If users want to use rover's network, users need to set p in LandStar6. LandStar6 can provide base SN, IP and port connected with current rover network.

After finishing setting, just click **[Confirm]** to save the settings. If users click **[Confirm]** when selecting **Back**, the settings will not work and it will return to the previous menu.



2.2.6 Rover CORS

Click **[Confirm]** to enter Rover CORS interface, which shows current CORS status: Login/Not login. Users need to use LandStar6 to configure and log in.

After finishing setting, just click **[Confirm]** to save the settings. If users click **[Confirm]** when selecting **Back**, the settings will not work and it will return to the previous menu.



2.2.7 Rover UHF

Click **[Confirm]** to enter **Rover UHF** interface. users can set radio channels.

Optional Channels: 1--9. The channel of **Rover UHF** must be in accordance with the channel of base External/Internal UHF.

After finishing setting, just click **[Confirm]** to save the settings. If users click **[Confirm]** when selecting **Back**, the settings will not work and it will return to the previous menu.



2.3 Static Interface

Click **[Confirm]** to enter **Static** interface, set static status, sample interval and elevation mask angle. After setting, click **[Confirm]** and it will start recording static data.

This interface can set static status: on/off, sample interval: 1s/2s/5s/10s/15s, mask angle: 0 degree or 13 degree. If it is required to turn on static status, make sure that **usersb Settings --Data Recording interface record 1-- Modify--Duration Time** should be set to be required time which is set to be 1440min in factory settings.(more details are available in chapter 7.4)



2.4 Receiver Information Interface

Click **[Confirm]** to enter **Receiver Information** interface. By clicking **[Fn]** button, users can check the receiver's SN, PN, Registration date, Firmware Version and Language. Click **[Confirm]** when selecting **Back**, return to previous menu.



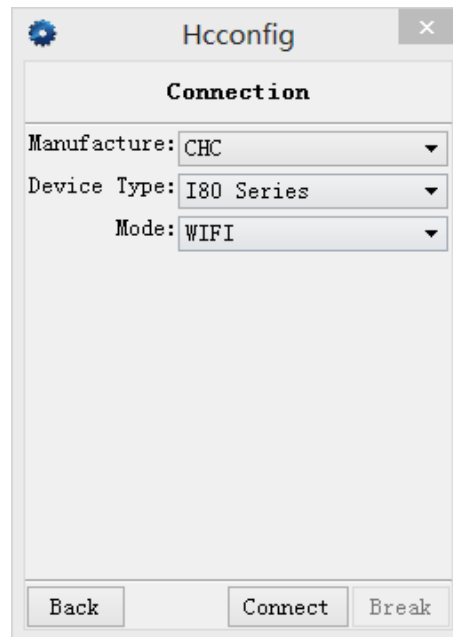
Above is the setup instructions on the LCD panel. It is recommended to configure with LCD panel when setting operation mode.

3. Radio Work Mode

3.1 PDA WIFI and Bluetooth connection

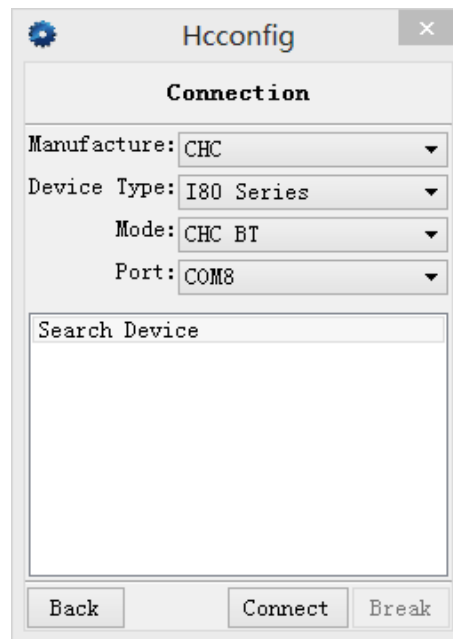
1.Using WIFI to Connect

Start PDA, enter the main interface→click **[Settings]**→**[Connections]**→**[Wi-Fi]**, then find the required receiver's SN, input WIFI password, the default password is 12345678, click **[Finish]**. After connection, open **Hconfig** software, select **I80 Series** for **Device Type**, select **WIFI** for **Mode**, then click **[Connect]** and users just finish the WIFI connection. (the WIFI mode is suggested)



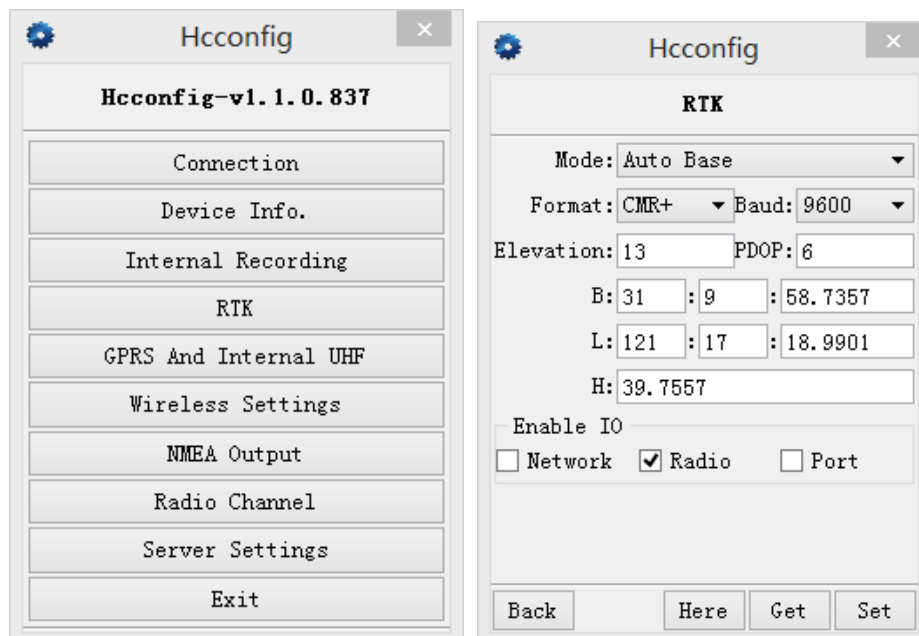
2.Using Bluetooth to Connect

Open the Hconfig software, select **I80 Series** for **Device Type**, select **CHC BT** for **Mode**, then click **[Search Device]** in the interface,.when users find the Bluetooth device, select it, then click **[Connect]**.



3.2 Radio Base Setting

After connected to WIFI or Bluetooth, click **[RTK]**, select **Auto Base** for the **Mode**, after selecting the message type, click **[set]**.



To enable IO option, many combinations can be applied. Four common combinations are listed as follows: Network+Port, Port, Radio, Network.

Users need to tick the little box in front of [Radio] to activate radio mode.

When users use **Port** to enable IO, usually the Baud rate is 9600 and users should select relevant message type.

When users choose **Auto Base**, the mode is Auto Base. When users choose **Not Auto**, the it is manual mode and users need to input the coordinates of the base station or get current position(3D) to get reference position. Click **[set]**, then configuration of IO is successful.

After finishing setting, users need to go back to break the Bluetooth connection if Bluetooth is connected. Users don't need to break connection if it's WIFI connection.

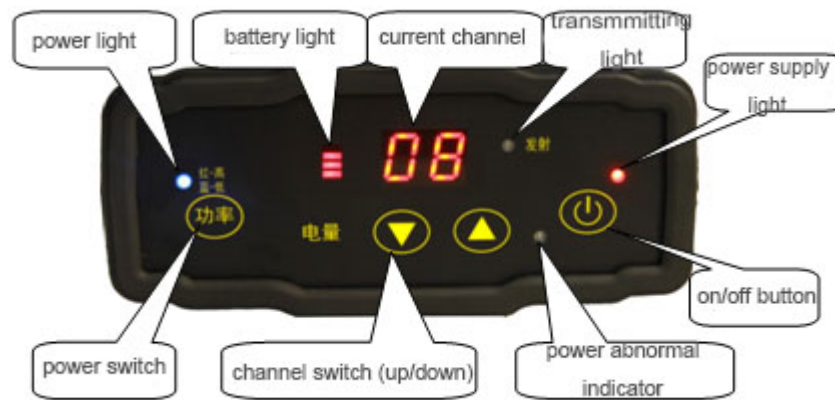


Notice 1. If users use Bluetooth connection, users must break it. Otherwise, it will bind the station by default after rebooting the base station, which will result in that the base fails to transmit differential signals.

2.If the base is set to Auto Base, it will start working wherever connected to radio after the boot without any other setting, which is convenient and efficient.

3.3 DL5-C Radio Setting

When operating in radio mode, users can use the on-off button on the radio panel to turn on the radio, use channel switch button and pousersr switch button to set the pousersr and frequency.



Notes: Each channel corresponds to only one frequency. Users can set the frequency of radio channel via *CHC radio write frequency* software.

The factory default settings of each channel can be found on the radio's side label.

CHANNEL	0	1	2	3	4
FREQUENCY MHz	455.050	456.050	456.550	457.050	458.050
CHANNEL	5	6	7	8	9
FREQUENCY MHz	459.050	460.050	461.050	462.050	462.550

Use **[Pousersr switch]** button to set the radio pousersr. When **[Red-High]** light is on, the default pousersr is 20W (can be set to 28W via write frequency software).

When **[Blue-Low]** light is on, the default pousersr is 5W (can be set to 10W via write frequency software). The pousersr is related to operating distance. In general, it is set to **[Blue-Low]** and the default pousersr is 5W. The operating distance in open areas can be arrived at 10 kilometers. The higher the pousersr is, the longer the operating distance will be. Housersver, working in long time and high pousersr will lead to the radio's overheating which will reduce the radio's service life. Therefore, it's recommended to use the pousersr as low as possible.

When starting the base station successfully (the green light of the base flashes per second) and the cable is in normal conditions, the indicator light will flash per second, which

indicates that the data is being transmitted regularly.

Notice

Once the radio channel of base is changed, the rover is required to change to the corresponding channel. Otherwise, the rover.

3.4 Rover Operation

In Radio mode, if the base transmits data successfully, the rover will receive differential signals. Users can check it by the differential data light. If it flashes per second, it indicates that the rover has received differential signals. If the PDA doesn't show **Fix** or **Float**, users need to reboot the rover and check relevant settings.

Open Landstar6, enter Bluetooth or WIFI mode by clicking **[Device]** at the main menu.

1.using WIFI connection

Start the PDA, enter the main interface→click **[Settings]**→ **[Connections]**→ **[Wi-Fi]**, then find the required receiver's SN, input network key, the default key is 12345678, click **[Finish]**. After connection, open Landstar6, enter WIFI connection by clicking **[Device]** at the main menu. Select **i80 Series** for **Device Type**, select **WIFI** for **Connection**, select **[Rover]** for **Connection Type**, then click **[finish📶]** (WIFI mode is recommended)

LandStar6

123-DeviceConnection

Current Device R000402

Manufacturer CHC

Device Type I80 Series

Connection WIFI

Port COM 2

Baudrate 9600

Antenna Type CHCi80

Connection Type

☐ Base ☒ Rover

☐ Auto Connect Next Time

2. Using Bluetooth connection

Click **[Device]** and enter the connection. Select **Bluetooth** for **Connection** , click  and select the SN number corresponding to the rover. Select **I80 Series** for **Device Type**, select **[Rover]** for **Connection Type**, select virtual serial port which supporting the Bluetooth connection in PDA hardware(usually com5, com8 or com9), then click **[finish]** 

LandStar6

123-DeviceConnection

Current Device R000402

Manufacturer CHC

Device Type I80 Series

Connection Bluetooth

Port COM 8

Baudrate 9600

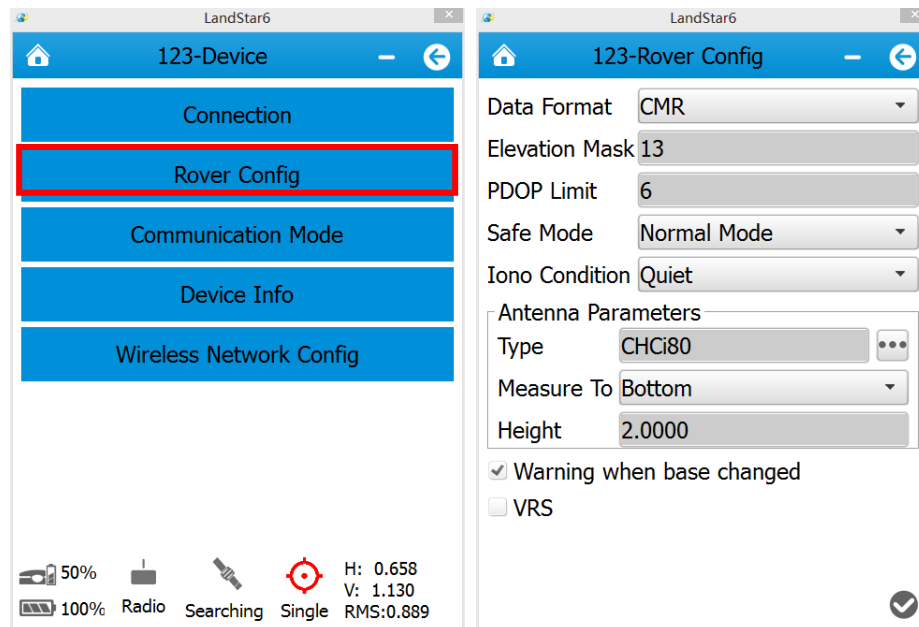
Antenna Type CHCi80

Connection Type

☐ Base ☒ Rover

☒ Auto Connect Next Time

After connection, click **[Rover Config]**, then set the rover's differential format, antenna type and other information, then click **[finish]**.



Data format: including CMR, RTCM3.X, RTD, SCMR(three constellations) and so on. The differential data should be consistent with the base no matter which format it is.

Elevation Mask: the angle between the satellite region edge tracked by the receiver and the horizontal line. It means the receiver does not track satellites in this range. The mask value is generally set to 13 degrees, but can be changed according to the satellite distribution and the receiver's operating region.

PDOP Limit: Position Dilution of Precision, which is attributed to the satellite geometry distribution. The better the satellite distribution degree is, the higher the position accuracy will be (smaller values represents higher accuracy). The default value is 6.

Safe Mode: including **Normal Mode** and **Reliable Mode**.

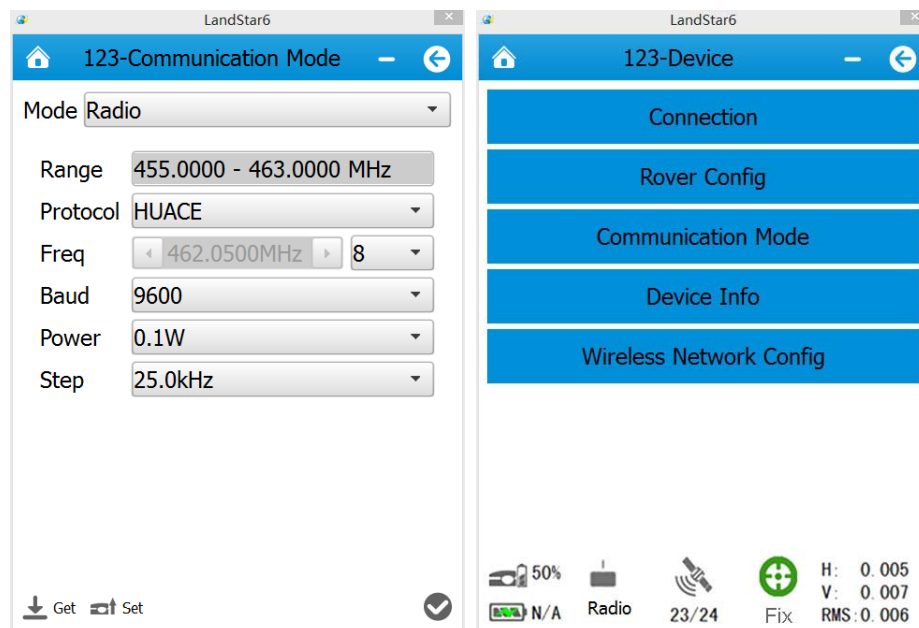
Iono Condition: including **Quiet**, **Normal** and **Disturbed**.

Antenna type: including A300, A100, X300, X90, X91 and so on. Click  on the right of **Type** column. Among those types, A300 and A100 are the external antennas of X60.

Measure to: including Bottom, Middle and Phase Center. It should be selected according to antenna height.

Height: distance from the receiver antenna to the ground point. Coordinate with **Measure To** to set specific numerical values.

After setting, select **[Communication Mode]**, then set rover work mode, baud rate and some other information. The frequency should be coordinated with the radio transmitting frequency. 1-9 is the fixed frequency channel, 0 is the custom channel and users can set frequencies.



When the rover has received differential signals, there will be a RTK initializing process:
Single→Float→Fix.

4. GPRS Mode

When using GPRS Mode, it is necessary to provide a mobile card with GPRS net traffic. Traffic package varies in different regions. So users need to contact with local mobile provider in order to select an appropriate package.

GPRS traffic of approximately two hours is 1 megabyte (associated with the number of satellites and the network environment). users can calculate overall traffic according to operation time in a month in order to open a monthly package.

4.1 Demands Of Base Construction

Base station should be set up in open areas, which is beneficial for receiving satellites' signals. Make sure that mobile communication network exists in the area.

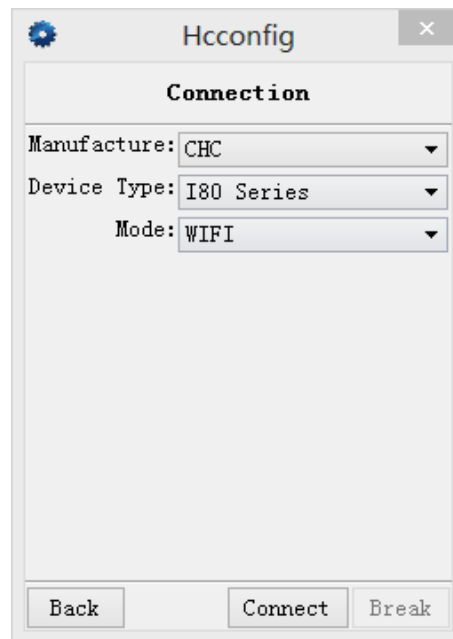
Base station should not be set up in too low position in order to prevent human disturbance.

Base station should be leveled as much as possible(users are required to centralize and level the instrument when the base is located in a known point).

4.2 Base Settings

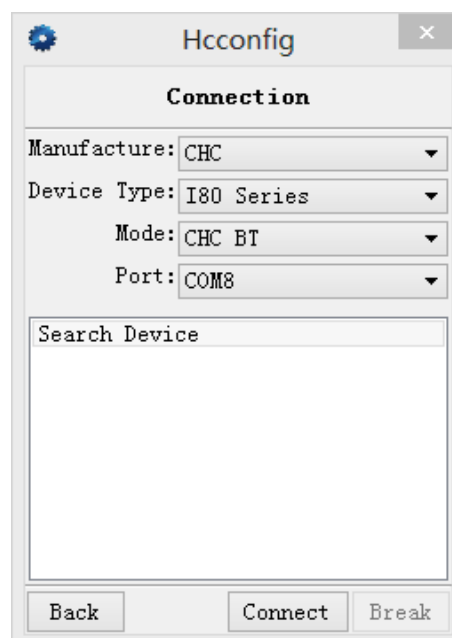
1.Using WIFI to connect

Start PDA, enter the main interface→click **[Settings]**→**[Connections]**→**[Wi-Fi]**, then find the required receiver's SN, input network key, the default key is 12345678, click **[Finish]**. After connection, open **Hconfig** software, select **I80 Series** for **Device Type**, select **WIFI** for **Mode**, then click **[Connect]** and users just finish the WIFI connection. (WIFI mode is suggested)

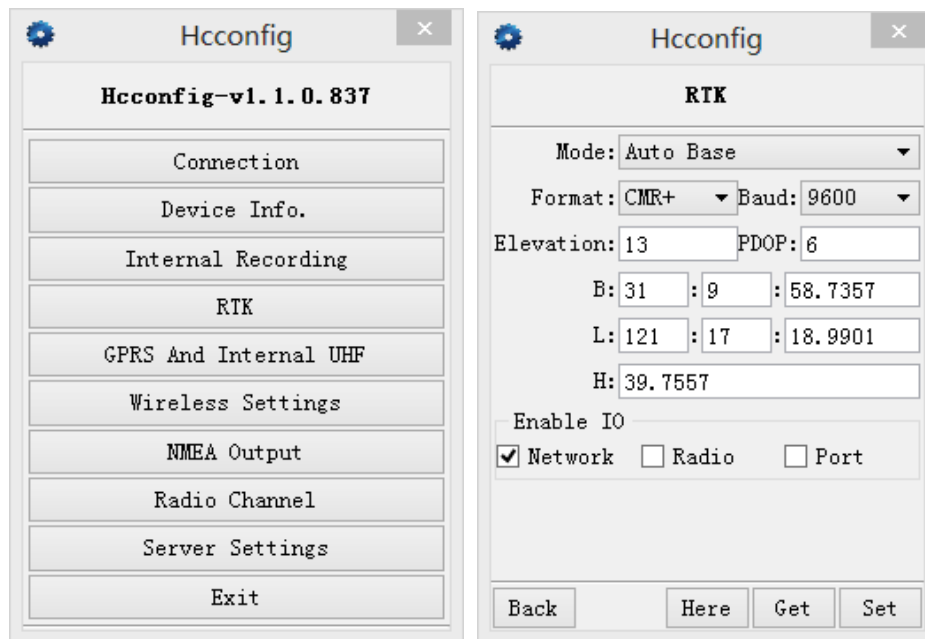


2.Using Bluetooth to Connect

Open **Hcconfig** software, select **I80 Series** for **Device Type**, select **CHC BT** for **Mode**, then click **[Search Device]** in the interface,when users find the Bluetooth device, select it, then click **[Connect]**.



After connecting Bluetooth, click **[RTK]**, select **Auto Base** for **Mode**, after selecting the message type, click **[set]**.



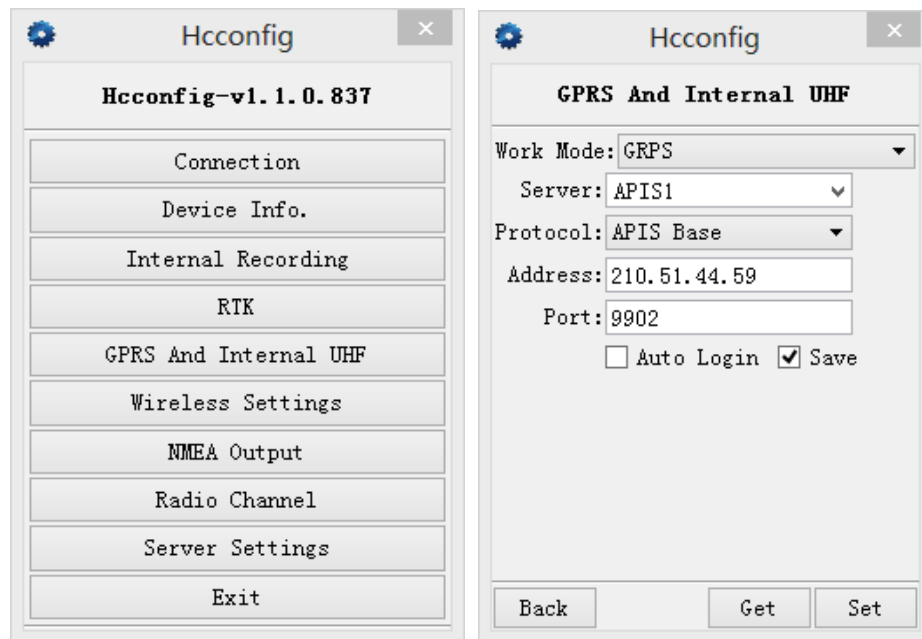
To enable IO option, several combinations can be applied. Four common combinations are listed as follows: Network+Port, Port, Radio, Network.

Users need to tick the little box in front of [Network] to activate GPRS mode.

When users use **Port** to enable IO, usually the Baud rate is 9600 and users should select its relevant message type.

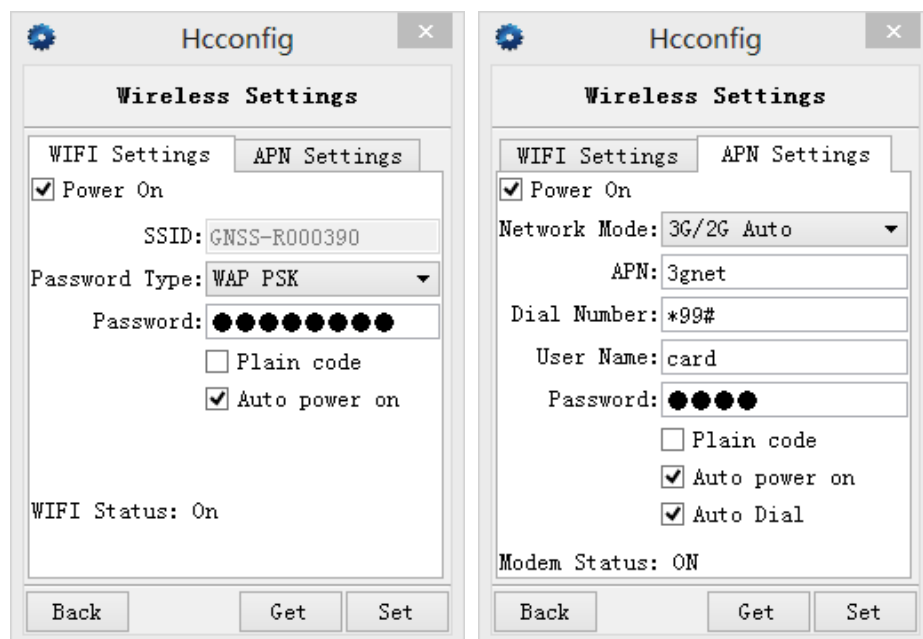
When users choose **Auto Base**, then the mode is Auto Base. When users choose **Not Auto**, then the mode is manual mode and users need to input the coordinates of the base station or get current single position in order to acquire the reference coordinates of the base. Click **[set]** and IO configuration is successful.

After setting the mode to **Auto Base**, select **[GPRS and Internal UHF]**, set mode of the base, select **APIS** for **Protocol**, input the server's name, IP, port, then click **[Set]**.



4.2.1 Wireless Settings

Here is network mode. Click **[Wireless network Config]→[APN setting]**. Set network dialing parameters as shown below, check **Auto pousersr on** and **Auto Dial** (LandStar6 can also do the settings). When GPRS has dialed up successfully, set some network parameters in **GPRS and Internal UHF** interface, then just log in successfully.



After setting, users need to go back to break the Bluetooth if Bluetooth is connected, then restart the receiver. Users don't need to do break connection if it's WIFI connection mode.

The base will transmit differential signals automatically after searching satellites. After start base successfully, the differential data light will flash per second.

Shanghai CHC Navigation Company offers IP addresses and port numbers to users for free. After starting the base, the data will be forwarded via a previously set server automatically. Therefore, once a rover is bound to the base, base data will be accessible.

Notes:

In order to guarantee that user's data is forwarded smoothly, four common servers have been set by CHC across the country:

211 Server IP: 211.144.120.97, Port 9902, targeted at users in southusersstern and northusersstern regions of China.

210 Server IP: 210.51.44.26, Port 9902, targeted at users in eastern and southern regions of China.

210 Server IP: 210.14.66.58, Port 9901-9920, targeted at users in northern and northeastern regions of China.

210 Server IP: 210.51.44.59, Port 9901-9920, can be used nationwide.

(Some changes about the above contents can be found in the latest news given by CHC Technical Department)

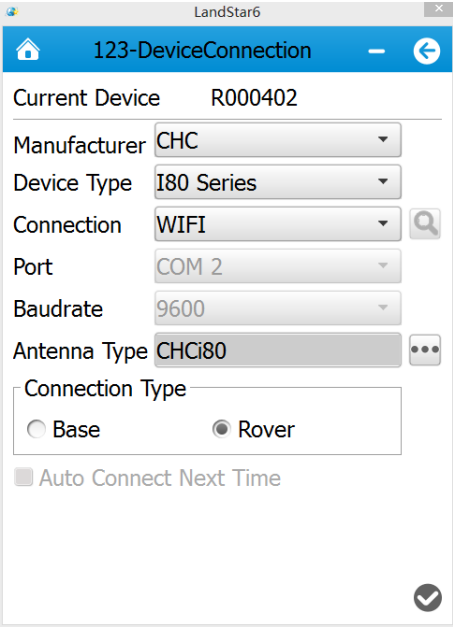
4.3 Rover Operation

In Radio mode, if the base transmits data successfully, the rover will receive differential signals. It can be checked by the differential data light. If it flashes per second, it indicates that the rover has received differential signals. If the PDA doesn't show **Fix** or **Float**, users need to reboot rover and check relevant settings.

Open Landstar6, enter Bluetooth or WIFI mode by clicking **[Device]** at the main menu.

1.using WIFI connection

Start the PDA, enter the main interface→click **[Settings]**→ **[Connections]**→ **[Wi-Fi]**, then find the required receiver's SN, input WIFI password, the default password is 12345678, click **[Finish]**. After connection, open Landstar6, enter WIFI connection by clicking **[Device]** at the main menu. Select **I80 Series** for **Device Type**, select **WIFI** for **Connection**, select **[Rover]** for **Connection Type**, then click **[finish]** (WIFI mode is suggested)



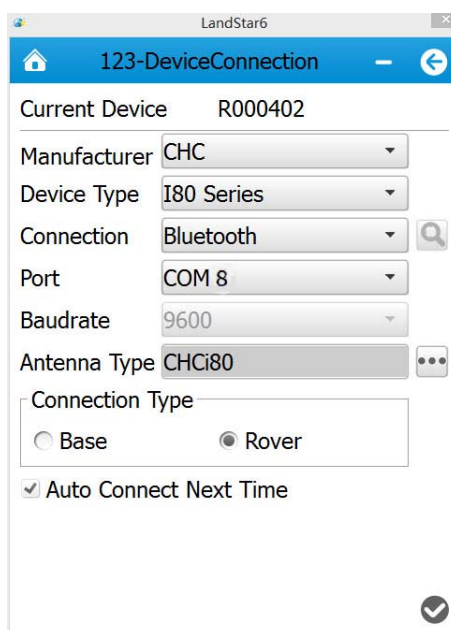
The screenshot shows the 'LandStar6' application window with the title '123-DeviceConnection'. The interface includes the following fields and options:

- Current Device:** R000402
- Manufacturer:** CHC (dropdown menu)
- Device Type:** I80 Series (dropdown menu)
- Connection:** WIFI (dropdown menu with a search icon to the right)
- Port:** COM 2 (dropdown menu)
- Baudrate:** 9600 (dropdown menu)
- Antenna Type:** CHCi80 (dropdown menu with a three-dot menu icon to the right)
- Connection Type:** Radio buttons for **Base** and **Rover** (Rover is selected)
- Auto Connect Next Time:** A checkbox that is currently unchecked

A checkmark icon is visible in the bottom right corner of the window.

2. Using Bluetooth connection

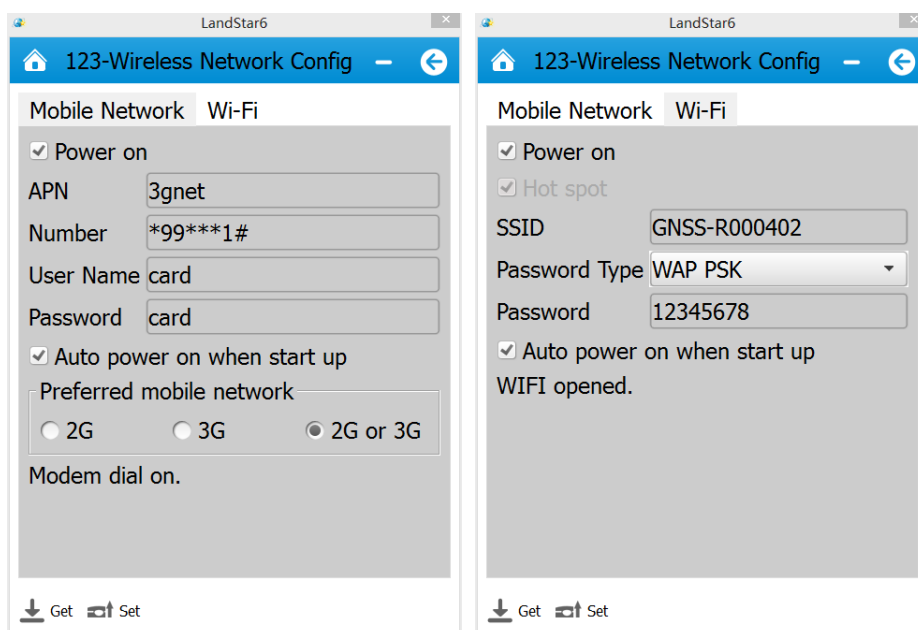
Click **[Device]** and enter the connection. Select **Bluetooth** for **Connection**, click  and select the SN number corresponding to the rover. Select **I80 Series** for **Device Type**, select **[Rover]** for **Connection Type**, select virtual serial port which supporting the Bluetooth connection in PDA hardware(usually com5, com8 or com9), then click **[finish]**



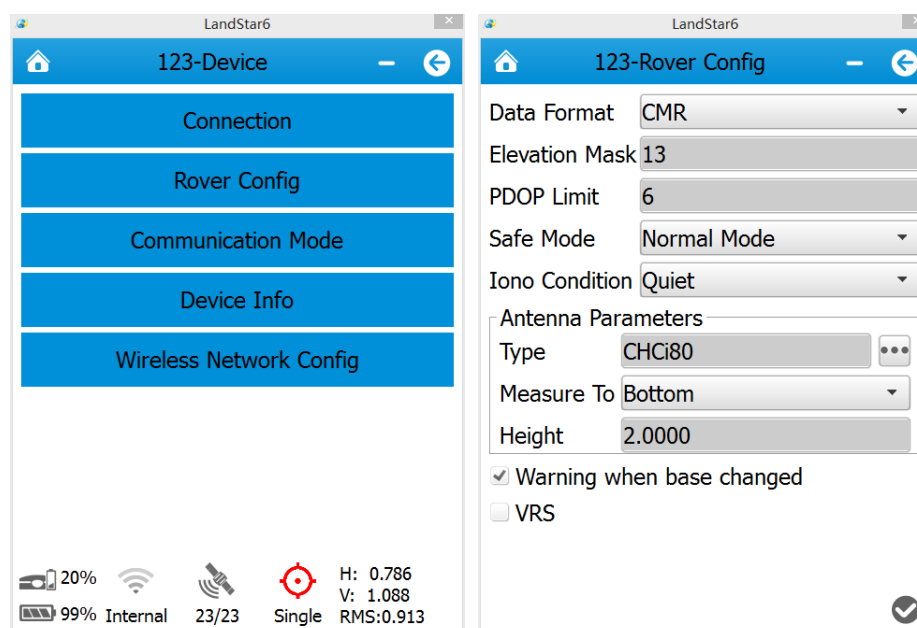
4.3.1 GPRS Status

Use Landstar6 to connect the receiver. In the process of the base or the rover using network, if the rover's network is not open, the sever is definitely unable to log in. So the first thing to do is to open mobile network, the specific opening method is shown as follows:

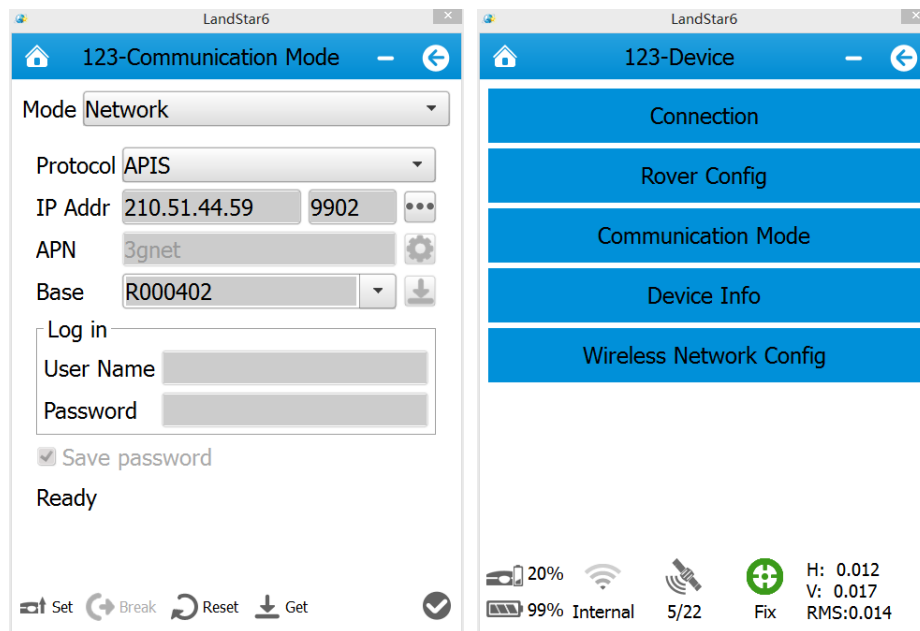
After connecting PDA to the receiver, select **[Device]**→**[Wireless Network Config]**, check **Pousersr on** , select **2G or 3G**, then click **[Set]**, there will be a prompt window showing that the mobile network is started successfully. If using LCD panel to set the network, the operation can be skipped. If the function does not work, users can check details in usersb pages.(More details can be found in chapter **7.6**)



After opening mobile network, click **[Rover Config]** to set the rover's differential format, antenna type and some other information, then click **[finish]**.



After setting differential format, select **[Communication Mode]**, select **APIS** for **Protocol**, input APIS server's name, IP address, port number, click **[Set]** and it will log in. The status area on the interface will show **Logged On**, then click **[finish]**.



Base is the S/N number of the base bound with the rover.

Return to the initial interface of LandStar6. Data light flashes normally when the rover's receiving , and rover has been started successfully.

5. CORS mode operations

The CHC GNSS receiver is completely compatible with all CORS systems. When accessing local CORS system, some preparations need to be made:

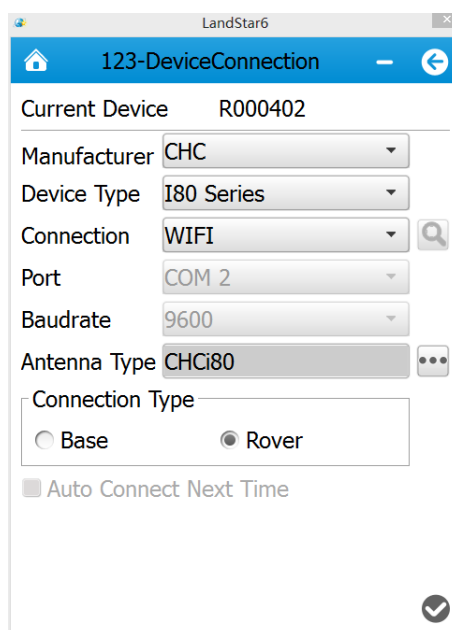
- 1.Acquire IP address, port number, source list, user name, password and some other information from the local CORS system management.
- 2.Handle a mobile card and open GPRS net traffic. GPRS traffic of approximately two hours is 1 megabyte (associated with the number of satellites and the network environment). users can calculate overall traffic according to the operation time in a month and have a monthly package(some CORS centers directly provide mobile cards).

5.1 Rover operations

Open Landstar6, enter Bluetooth or WIFI mode by clicking **[Device]** at the main menu.

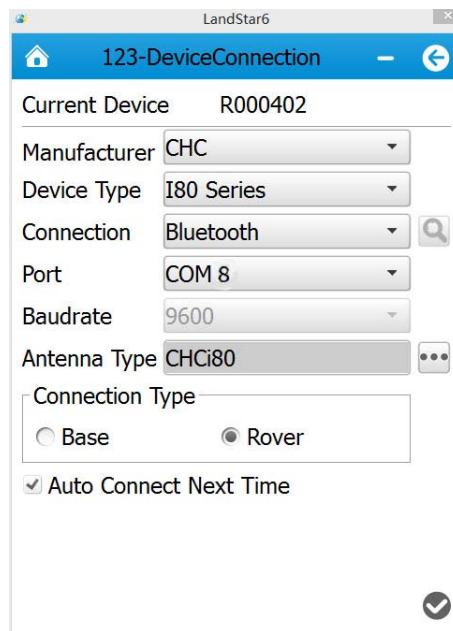
1.using WIFI connection

Start the PDA, enter the main interface→[**Settings**]→[**Connections**]→[**Wi-Fi**], then find the required receiver's SN, input the WIFI password, the default password is 12345678, click [**Finish**]. After connection, open Landstar6, enter WIFI connection by clicking [**Device**] at the main menu. Select **I80 Series** for **Device Type**, select **WIFI** for **Connection**, select [**Rover**] for **Connection Type**, then click [**finish**👉] (WIFI mode is suggested)



2. Using Bluetooth connection

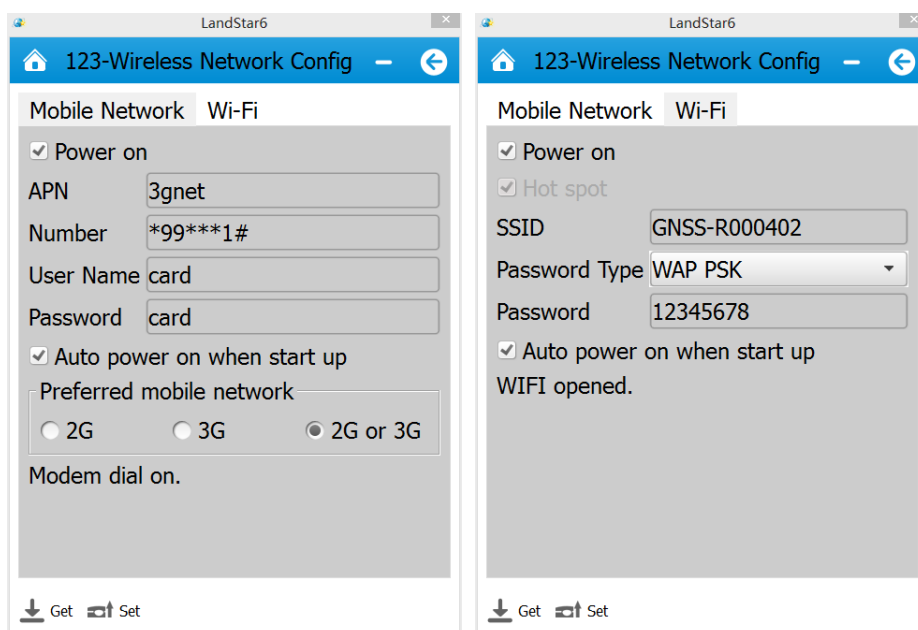
Click [**Device**]→[**Connection**]. Select **Bluetooth** for **Connection Style**, click 🔍 and select the SN number corresponding to the rover. Select **I80 Series** for **Device Type**, select [**Rover**] for **Connection**, select virtual serial port which supporting the Bluetooth connection in PDA hardware(usually com5, com8 or com9), then click [**finish**👉].



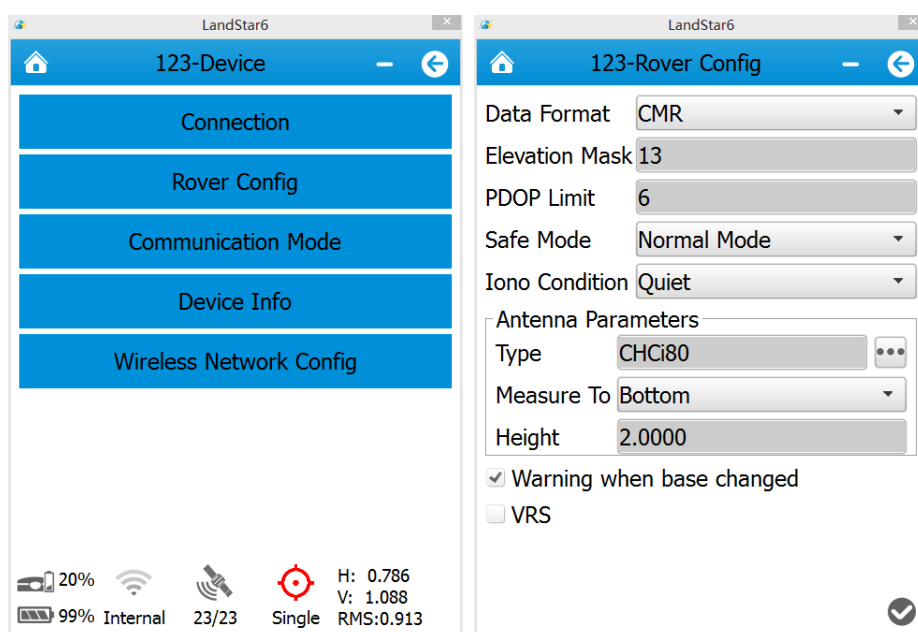
5.1.1 GPRS Status

Use Landstar6 to connect the receiver. In the process of the base or the rover using network, if the rover's network is not open, the sever is definitely unable to log in. So the first thing to do is to open mobile network, the specific opening method is shown as follows:

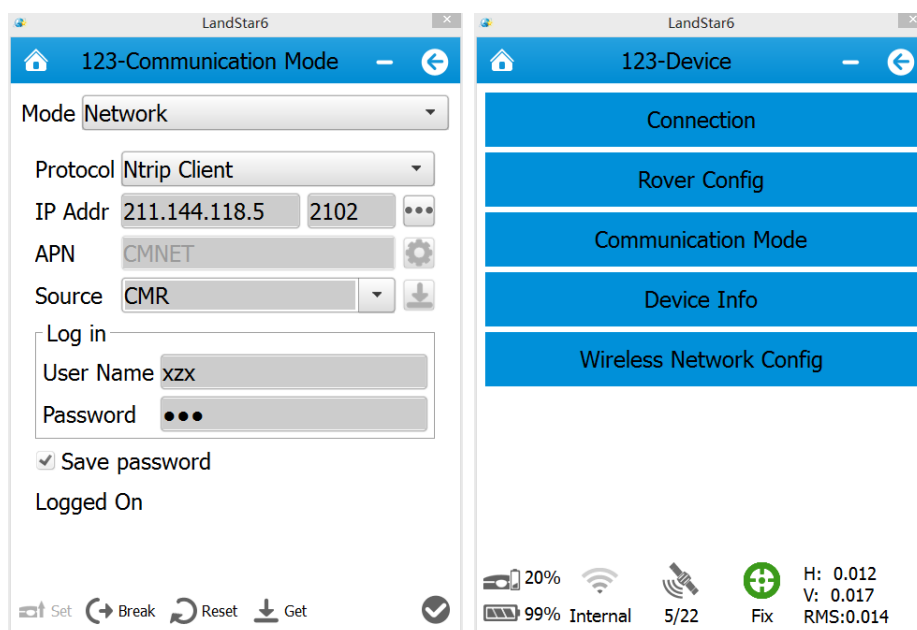
After connecting PDA to the receiver, select **[Device]**→**[Wireless Network Config]**, check **Pousersr on** , select **2G or 3G**, then click **[Set]**, there will be a prompt window showing that the mobile network is started successfully. If using LCD panel to set the network, the operation can be skipped. If the function does not work, users can check details in usersb pages.(More details can be found in chapter **7.6**)



After opening mobile network, click **[Rover Config]** to set the rover's differential format, antenna type and some other information, then click **[finish👍]**.



After setting differential format, select **[Communication Mode]**, select **CORS(Ntrip Client)** for **Protocol**, input the source list, user name and password offered by CORS center, click **[Set]**. The status area on the interface will show **Logged On**, then click **[finish👍]**.



Go back to the initial interface of Landstar6. Data light flashes normally when the rover's receiving, and rover has been started successfully.

6. Survey

Users can start measurement when the rover is in **Fix** status. Open LanStar6, click **[Survey]**→**[Point Survey]**. In practice, users usually use local coordinates. When the rover has got fix solution, the recorded points in LandStar6 are plane coordinates that have not been converted. If users want to get coordinates in line with previous researches, **Point Adjust** is required to be done to acquire conversion parameters or users can use **7 Parameters** directly.

6.1 Assisted Measurement System

6.1.1 Bubble, Compass Calibration

If users need to use auto tilt survey(compensation point measurement), some settings need to be done.

1. Enter **Point Survey** interface, then click **[Set **], as shown in figure1

2. Ebubble Calibration

Select **[Ebubble Option]**. (users had better carry out the operation outdoors and prepare a level base. Centralize and level the base, set the instrument on the base. When the instrument has searched satellites, the calibration result will be better. Besides, users had better keep leveling in the calibration process.)

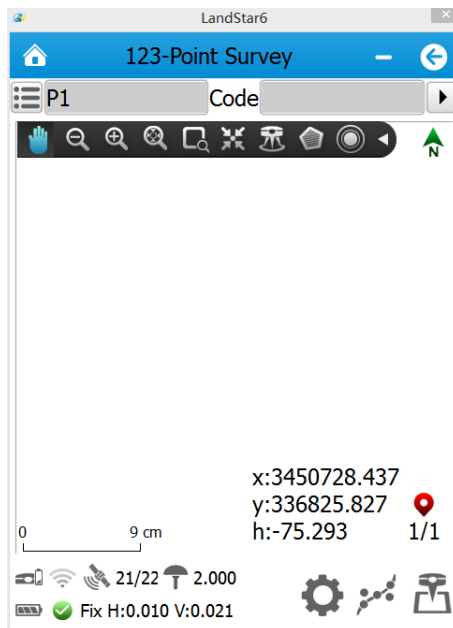


Figure 1

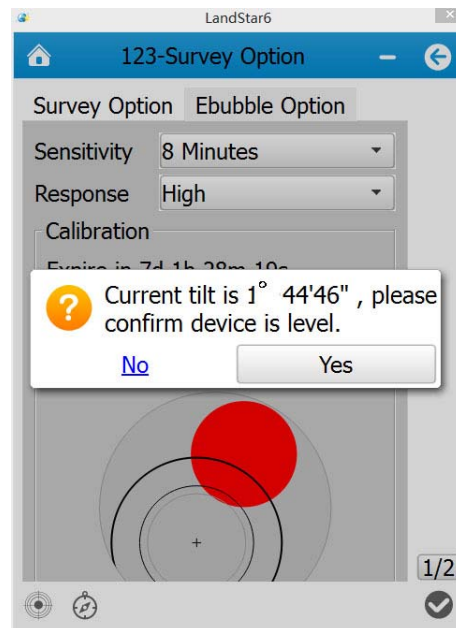


Figure 2

 **Ebubble:** when clicking this button, there will be a prompt about offset information(Figure 2). The tilt angle must be within 2 degrees or the calibration can not be done. Then click **[Yes]**, and Ebubble calibration starts. When the Ebubble is green in the center, users have just finished Ebubble calibration.

3. Compass Calibration

After finishing Ebubble Calibration, click the compass icon  in the bottom-left of the interface(as shown in figure 3). Then select **[Yes]**, an interface will pop up (as shown in figure 4). (users had better do the operation outdoors)

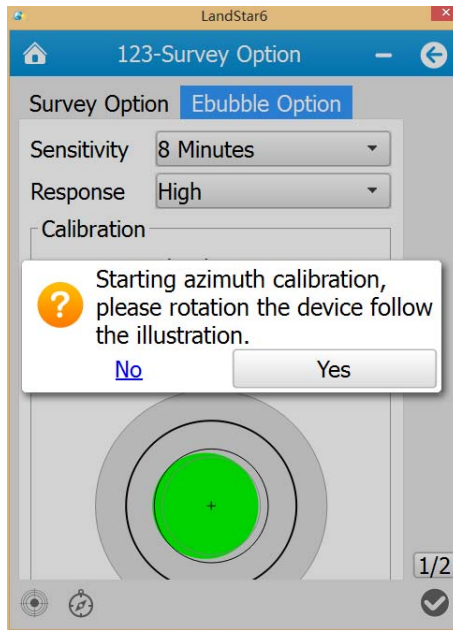


Figure 3

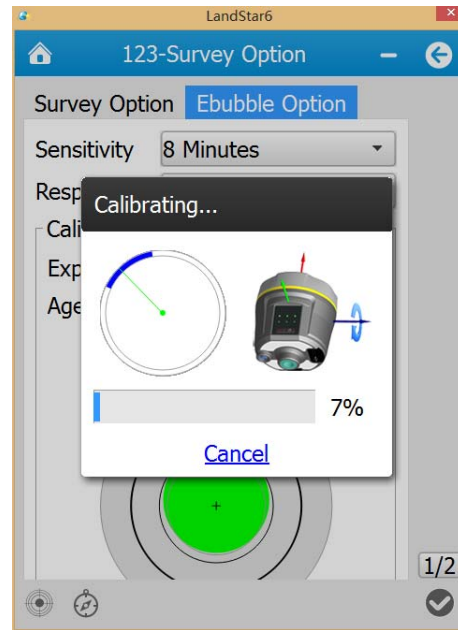


Figure 4

Rotate the device follow the instruction of figure 4. The blue part represents directions that have been adjusted.(In rotation, try to keep the device rotating around coaxial lines)

When blue parts spread over the circle (progress bar shows 50%), the instrument has finished blue calibration. The interface will remind users to rotate around the red axis(as shown in figure 6). When the progress bar shows 100%(as shown in figure 6), users have finished the calibration.

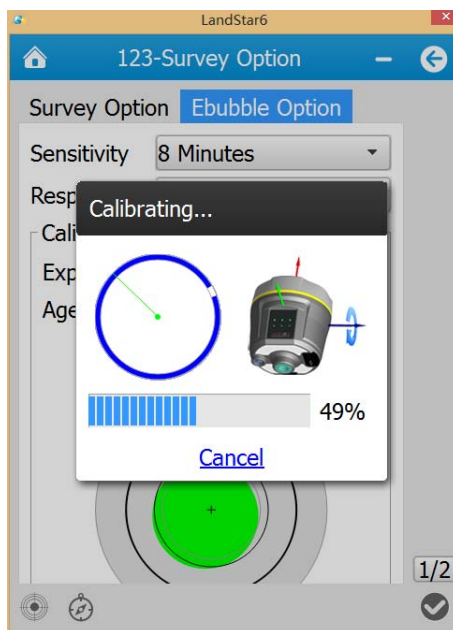


Figure 5

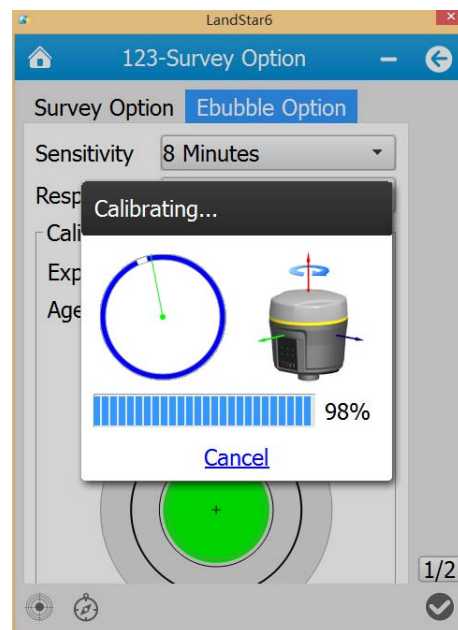


Figure 6

4. After bubble and compass calibration, select **[Survey Option]** and set relevant parameters.

LandStar6

123-Survey Option

Survey Option Ebubble Option

Config Name Topo Point

Obs Count 5

Precision Limit

Horizontal(m) 0.030

Vertical(m) 0.040

☒ Fixed Solution

☒ Abort on movement 0.5

☐ Auto measure ☐ Tilt warning

Tilt Tolerance 0.020m

Name Step 1

Frequency 1HZ

1/2

☒

Config Name: selections of survey point types, currently it supports Topo Point, Control Point and Quick Point.

Obs Count: By default, Topo Point is 5, Control Point is 10 and Quick Point is 1.

Precision limit: By default, Topo Point and Control Point's horizontal precision limit is 0.03m, vertical precision limit is 0.04m. Quick Point's horizontal precision limit is 0.1m and vertical precision limit is 0.2m. They can be modified manually.

Fixed Solution: when users check the box of Fixed Solution, the measuring can be done only in fix status. If users need to survey in single or float status, do on check the box.

Abort on movement: the default value is 0.5m which can be modified.

Tilt Tolerance: the default value is 0.02m which can be modified. The range is from 0.001m to 1m.

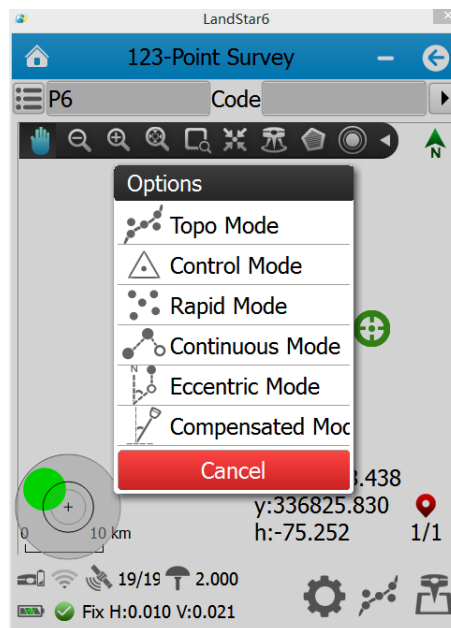
Frequency: 1Hz, 2Hz and 5Hz.

Use PPK: it will support PPK mode when checking the box.

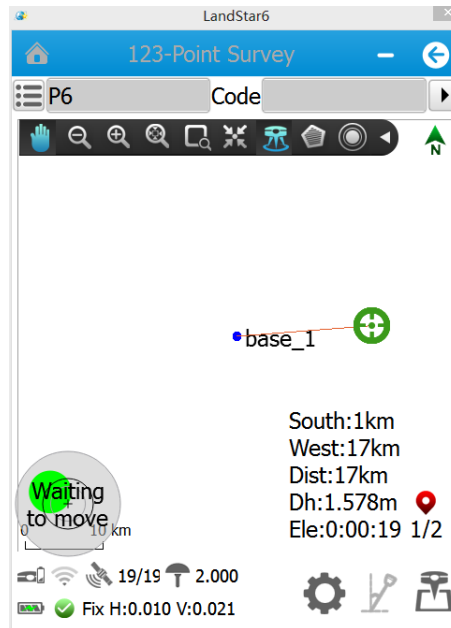
Save Track: after checking the box, users need to set the track file's name and saving path. The software will save the track data file automatically.

6.1.2 Measurement methods

After finishing the above operations, enter **Point Survey** interface. Click the diagram  and select **Compensated Mode**. Have the bottom of the centering rod aimed at the survey point, tilt the centering rod (the tilt angle should be less than or equal to 30 degrees), then click **[Begin **]. The software will save the converted three-dimensional coordinates of the correct point position.



If users want to use Auto Measure, just check the box in front of **Auto Measure** in **[Survey Option]**. Any other operations refer to the guides.



Waiting to move: tilt the centering rod (the tilt angle should be more than 5 degrees), shift to the next point.

Waiting for level: level the receiver.

Waiting for stable: keep leveling status for more than 2 seconds

Surveying: wait for the measurement to complete. There will be prompt tone when starting or finishing measurement.

If users want to continue to survey points, just repeat the above operations. If users want to exit, just click **[Back🏠]**.

If users do not check **Auto Measure**, then the mode is **[Normal Measurement Mode]** which does not need to adjust Ebubble and users can click **[Survey📐]** directly.

6.2 New Project

Open LandStar6.0, click **[Project]→[Proj.Management]→[New➕]** to enter **New Project Wizard**.

First step: input Project Name, Created By, Date time and so on. Then click **[Next👉]**.

Second step: access to coordinate system template and select one system. Users usually

can select their required coordinates in the default coordinate system list. If none of coordinate system in the template can be used, users can select **[default(from template)]**.

The left window, titled 'LandStar-NewProject', shows a form with the following fields: 'Project name' (CHC), 'Created by' (empty), 'Date time' (2014-12-22), and 'Time zone' (+8:00). There is a checkbox for 'Follow other projects' and a table with one row containing '1', '123', and '2014-12-22 15:46:17'. The right window, titled 'LandStar-CrsManager', shows a list of coordinate systems: 'default(from template)', 'Beijing-54', 'Xian-80', 'CGCS-2000', 'WGS 84', 'Tainwan 2-TM', 'Peng Hu Islands', and 'Taiwan Island'.

Third step: click **[Next]**, and set Ellipsoid parameters. Users can select Ellipsoid Name from the drop-down list. **a** and **1/f** are two ellipsoid parameters corresponding to the selected ellipsoid. The displayed values are default values.

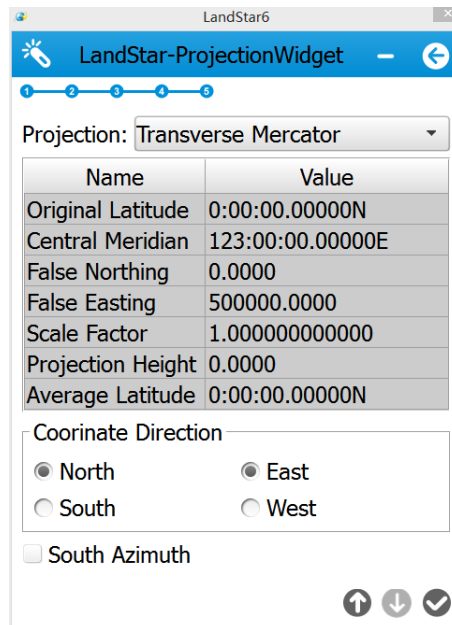
Fourth step: click **[Next]**, and set basic parameters by selecting one model. **Model** contains three types, including NONE, Bursa 7 Parameter and Molodensky 3 Parameter.

The left window, titled 'LandStar-EllipsoidWidget', shows a form with the following fields: 'Name' (Beijing-54), 'a' (6378245.000000), and '1/f' (298.300000). The right window, titled 'LandStar-DatumWidget', shows a form with the following fields: 'Model' (NONE) and a table with two columns, 'Name' and 'Value'.

Fifth step: click **[Next]**, and set projection parameters. Users can select their required

projection from **Projection** drop-down list. **Coordinate Direction** is **North** and **East** by default. Users can adjust coordinate direction by selecting **South Azimuth**.

Finally, click [Finish✔], and users have finished creating a new project. Return to the main interface.



6.3 Confirm Coordinate Parameters

Open LandStar6.0, click **[Project]→[CRS Params]**, select a required coordinate system according to known points. Generally speaking, local coordinate system in China usually uses Beijing-54 Ellipsoid. But all users need to do is to modify its central meridian (in Standard Beijing-54 Ellipsoid, users must calculate 3 degree strap's or 6 degree strap's central meridian according to known coordinates). users do not need to set **[Transf]**, **[Plane Adjust]** and **[Height Adjust]**. After point calibration, parameters will be saved automatically. **Ellips** interface is shown in figure 1, including **Name**, **a** and **1/f**. According to different areas, select a corresponding ellipsoid from Name drop-down list. **a** and **1/f** are default values and there is no necessity to change them.

Projection interface and parameters of each model are shown in figure 2. Users can select

different projection models. Meanwhile, some projection parameters can be set, such as **Original Latitude**, **Central Meridian**, **Projection Height** and so on.

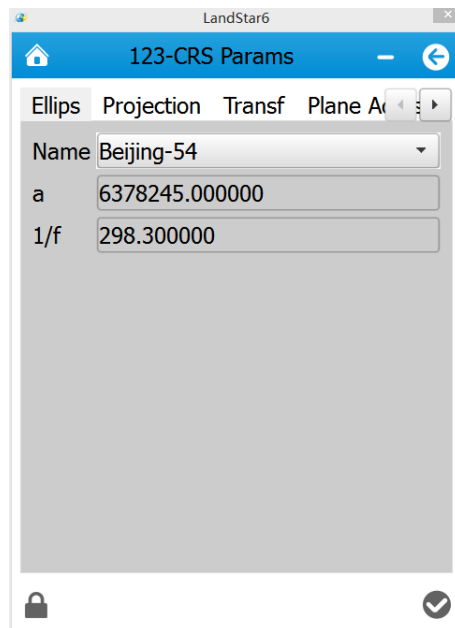


Figure 1

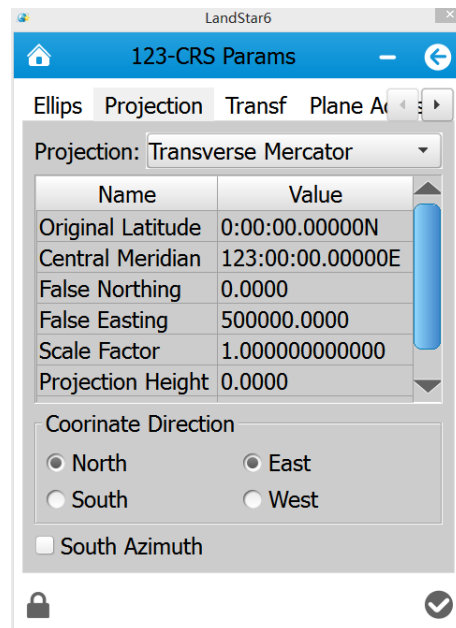
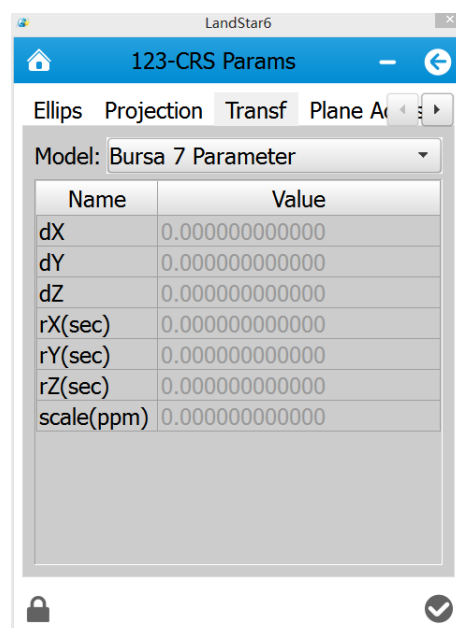
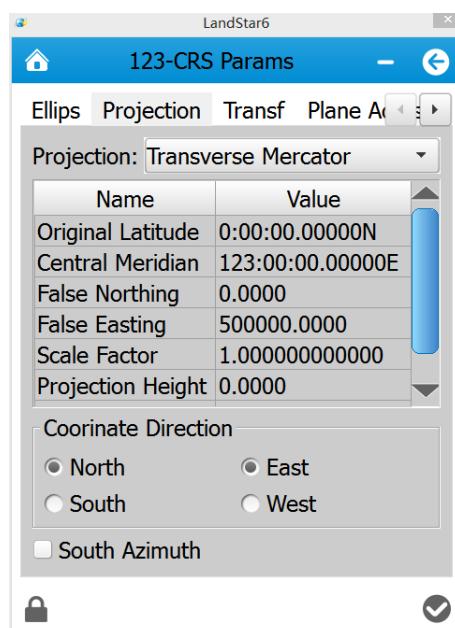


Figure 2

6.3.1 Bursa 7 Parameter Application

Open LandStar 6.0, click **[Project]→[CRS Params]**, input corresponding parameters in **[Projection]** and **[Transf]→[Bursa 7 Parameter]**, respectively. In **[Plane Adjust]** and **[Height Adjust]** options, just select **None**. Finally click **[Finish ✓]** button.



6.3.2 Bursa 7 Parameter Calculation

In the main menu, click **[COGO]**→**[Parameter Cal]** to calculate 7 parameters and 3 parameters. At least three pairs of coordinate points should be provided when calculating 7 parameters. At least one pair of coordinate points should be provided when calculating 3 parameters and 4 parameters.

Add+: users are able to select GNSS coordinates and known coordinates via this button.

Remove×: In coordinate data list, select one coordinate point. Then click this button, and the point is just removed.

Details☰: In coordinate data list, select one coordinate point. Click this button, and users can check specific information of GNSS points and known points.

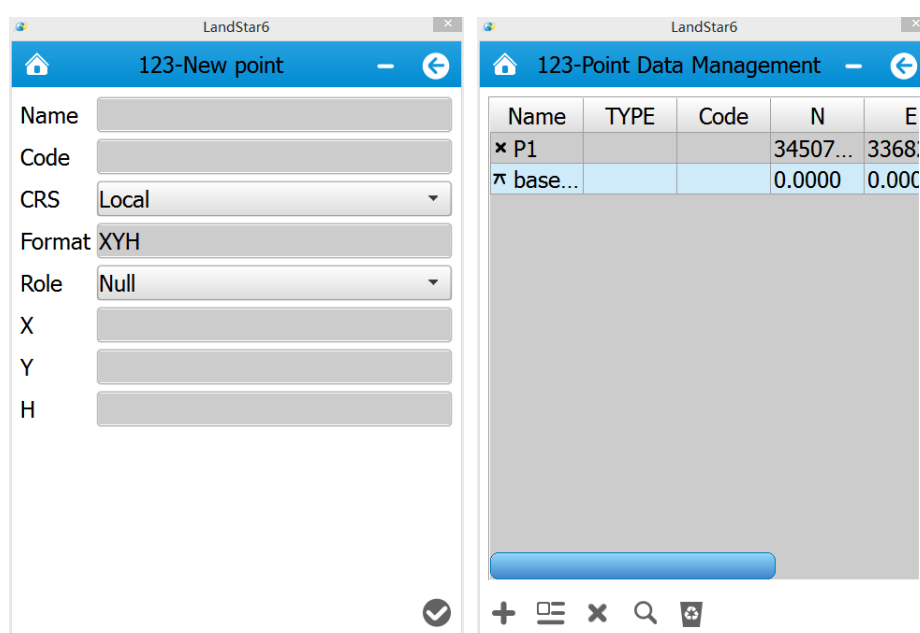


Tip:

The software has the function of 7 parameter encryption. Before using this function, users need to log in as an administrator. Click , the initial **user name** is admin, **password** is 123456. Only after logging in successfully, users are able to check and modify the 7 parameters.

6.4 Type Known Points

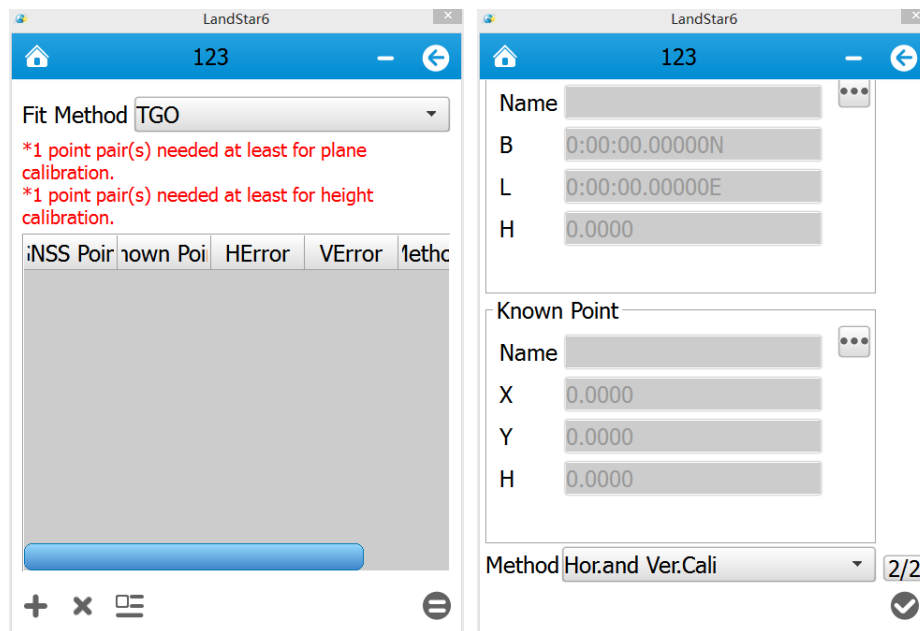
Open landStar6, in the main menu, click **[Data]→[Point Management]**. Then click **[New+]** to create new points. Some attribute values need to be set, including Name, Code, CRS (including Local and WGS84), Format(can not be set), Role (including Null, to Stake Out and Control), X, Y, H (or B, L, H). Among them, Code is non-mandatory. After setting above values, click **[OK✔]** and users have just created one point.



Name	TYPE	Code	N	E
✕ P1			34507...	3368...
π base...			0.0000	0.0000

6.5 Point Adjust

Open LandStar6, in the menu, click **[Survey]→[Point Adjust]**. Then click **[Add+]** and select GNSS points and known points. Select **Hor.and Ver.Cali** for **Method**. **Fit Method** is **Fixed Difference** by default which can be changed according to the real situation. It is better to add more than three pairs of points.



Click **[Calculate]**, there will be a prompt **Replace the project's current calibration parameters?** If users click **[Yes]**, current calculated calibration parameters will be applied to the coordinate parameters, which will come into operation against the whole project. There will also be a calibration parameter interface so that users are accessible to check plane calibration parameters and height calibration parameters. Otherwise, if users click **[NO]**, the parameters will show zero results.

Fit Method: currently supporting Fixed difference, Plane fitting, Curved surface fitting and TGO

Add⁺: add calibration points, GNSS points and known points, as shown in figure. Besides, select **Method: Hor.Cali, Ver.Cali, Hor.Cali and Ver.Cali**

Remove^x: remove the selected calibration point

Details[≡]: check information of the selected calibration point

Notice

1. Only when three or more than three control points are involved in the horizontal Point Calibration, there will be horizontal residual error which is usually within 0.015m. Only when four or more than four control points are involved in the vertical Point Calibration, there will be vertical residual error which is usually within 0.02m.

2. After point calibration, users can start measuring directly.
3. Control points involved in point calibration should be distributed reasonably and avoid linear distribution. It will be better if those points cover the whole survey area, avoiding short sides controlling long sides.

6.6 Base Shift

It takes several days or even longer time to measure or stake out in each survey area. In order to avoid repeated point calibration or troublesomely erecting the base on the same known point everyday, users can do **Base Shift** before starting surveying everyday(at this point, the base can be erected at random or set to **Auto Base**, but the rover's operation is a process that is finding a measured point and moving to that).

The specific explanation is shown as follows:

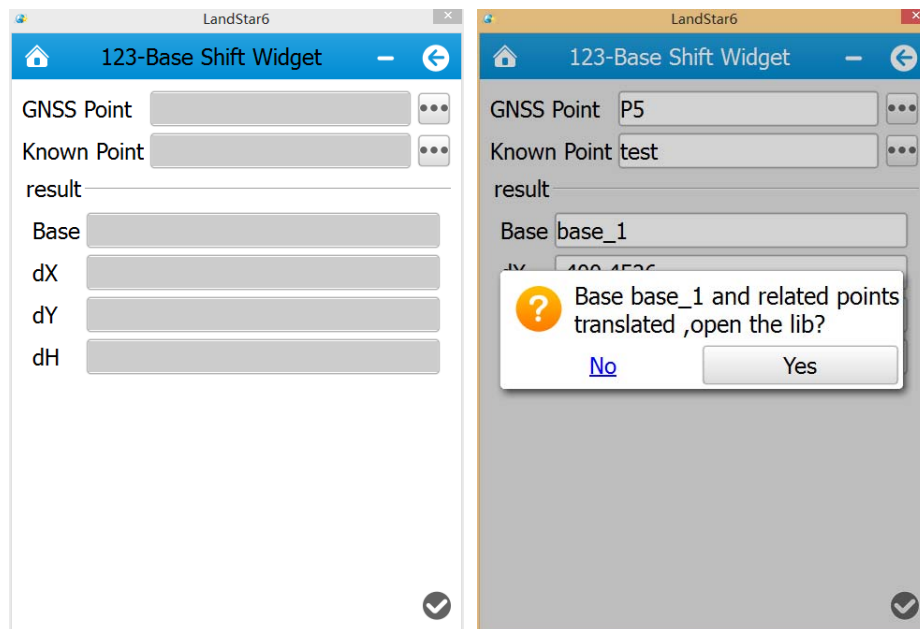
After users erect bases repeatedly, the software will orderly name the bases Base 1, Base 2, Base 3 and so on

The rover's coordinates are based on the base's original coordinates which will change as a result of moving the base, so users need to reset local coordinates every time moving the base.

Open LandStar6, in the main menu, click **[Survey]→[Base Shift]** to enter **Base Shift** interface. It is necessary to shift base when the base moves or needs restarting because of erecting on an unknown point. Users need to find a known point and measure its coordinates to calculate the shift data. Then apply the shift data and make it function on all survey points in current coordinate system. Make sure the two bases' coordinates have the same reference coordinate system.

Enter **Base Shift** interface, select known points from **[Known Point]** Library, click **[GNSS Point]** Library to select the same point surveyed just now. The software will calculate the

shift data. Click **[Yes✔]**, the software will prompt: **Base base_1 and related points translated, open the lib?** Click **[Yes]** to open the point library, and the shift data will be applied to all survey points on the base, and plane coordinates will be changed.



6.7 Data Export

Open LandStar6, in the main menu, click **[Project]→[Export]**, according to the required data format, export data. Then connect PDA with PC(users need to install Microsoft sync software or USB Drive first), click **[Mobile]→[My Windows Mobile Device]→[My Documents]**, and just copy out the documents.

1.CASS Format

Export Points' Type includes Input, Survey, Stake out and Calculate. Select an export path and input a file name, then click **[Yes✔]** (see figure 1).

2.Custom Format

Select export points' type, file type and path(txt, csv and various fixed arrangements are for selection, which will meet the requirements of most clients. Users can also define their own file formats via configuration). Input file name, then click **[Yes]**, the software will show whether the file has been saved successfully(see figure 2).

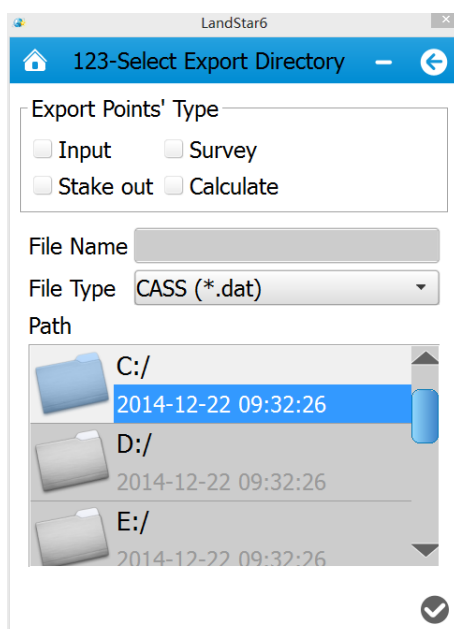


Figure 1

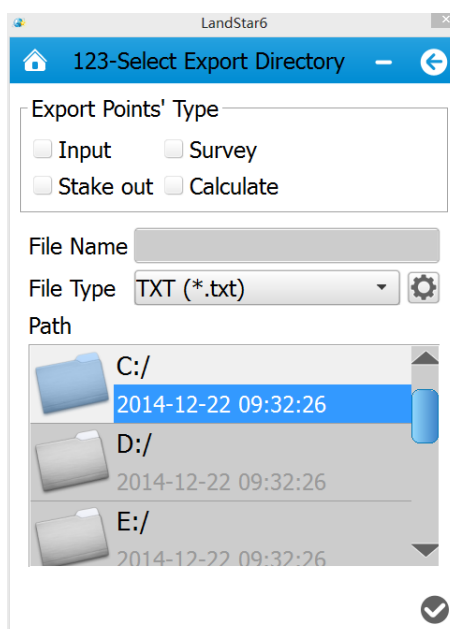
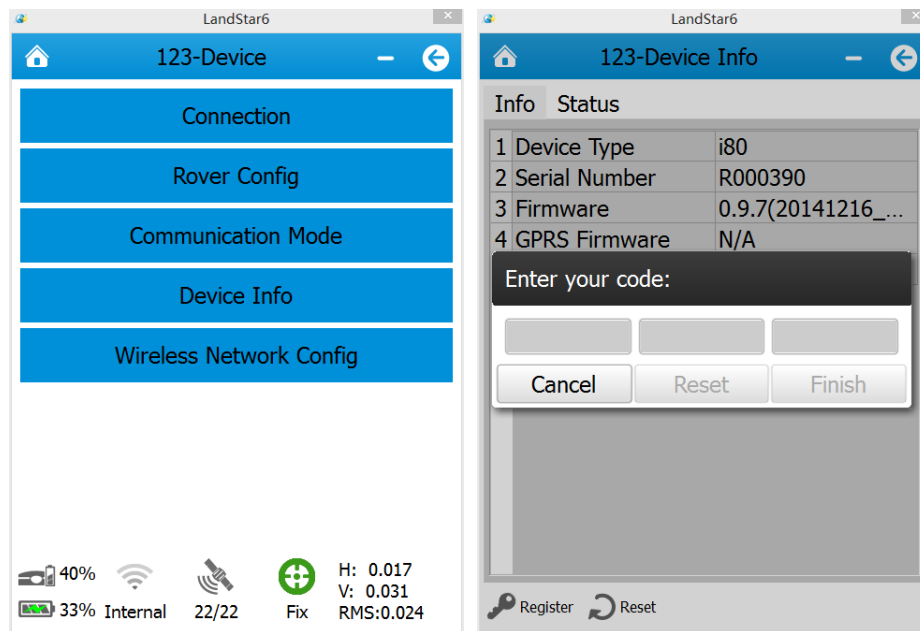


Figure 2

6.8 Receiver Registration

If the software prompts Registration Code Expired, users need to register the receiver. Open LandStar6, in the main menu, click **[Device]**→**[Device Info]**→**[Register]**, an input box will pop up. users need to contact Shanghai CHC Navigation Company or agents to acquire the registration code.



7. Webpage configuration system

Open the explorer on the Internet (Google and IE explorer are suggested), input the receiver's IP address and press Enter, users will enter the login interface.

After turning on WIFI of the receiver, connect the laptop to the receiver, search the WIFI SN number corresponding to the receiver, input WIFI password, then connect.

Next, open the explorer on the Internet (Google and IE explorer are suggested), enter in the URL: 192.168.1.1, input user name: admin, password: password, then click **[Login]** as shown below.

i80 System

Login Account:

admin

Password:

.....

☐ remember me

Login

Please Use Chrome, IE10+ or Safari to Open

After logging in, users will enter the following interface:

7.1 Receiver status interface

The receiver status includes the receiver's position, operation, Google Map and some other relevant information.

振兴中华 测绘天下

i80

SN:R000402

Status

Position

Operation

Google Map

Position

Position	DOP
Longitude: 121°17'19.05502007"(East)	PDOP: Fail
Latitude: 31°9'58.49273665"(North)	HDOP: Fail
Height: 36.321	VDOP: Fail
Type: 3D	TDOP: Fail

Satellite Used

Satellite Number: 25Piece

GPS(9): 24,18,15,21,22,25,14,12,31

SBAS(0):

GLON(6): 15,2,3,4,13,14

BDS(10): 9,2,5,10,14,1,7,3,4,6

GALILEO(0):

Tracked Satellites

Satellite Number: 25Piece

GPS(9): 24,18,15,21,22,25,14,12,31

SBAS(0):

GLON(6): 15,2,3,4,13,14

BDS(10): 9,2,5,10,14,1,7,3,4,6

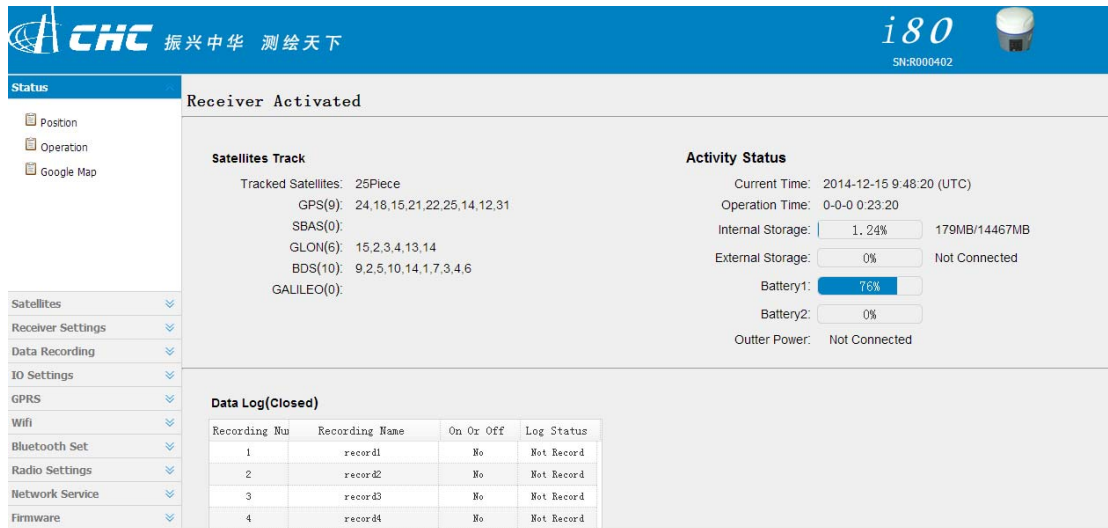
GALILEO(0):

Receiver Clock

GPS Week: Fail

GPS second: Fail

The receiver position interface shows the receiver's current position, DOP values, satellites used, tracked satellites and receiver clock.



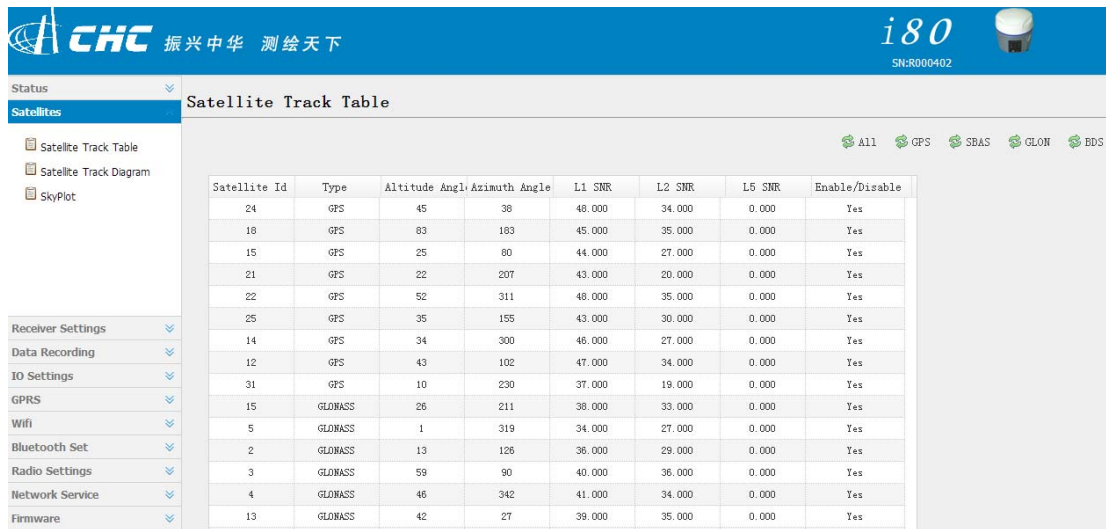
In **Operation** interface, users can check the satellite information that the receiver tracks and uses, current UTC time, operation time, internal storage and external storage, battery level, whether to access outter pousersr, and static data recording status.

Google Map: on the interface of Google Map, it shows the current location.

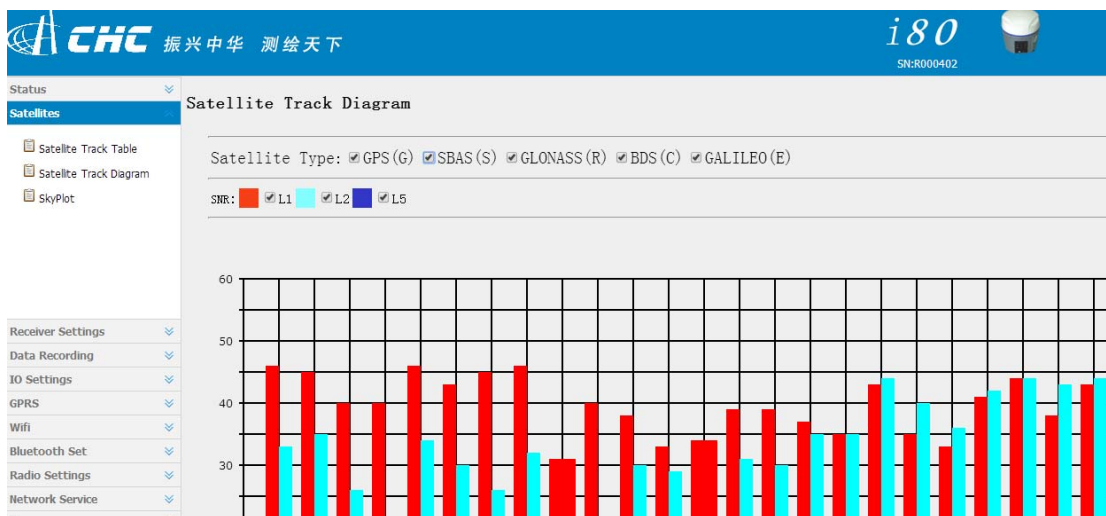
7.2 Satellite interface

On the satellite interface, users can see satellites that the receiver has tracked. Tables and diagrams are applied to show each satellite's relevant information, including satellite Id, type, altitude angle, azimuth angle, L1 SNR, L2 SNR, L5 SNR, enable or disable and so on.

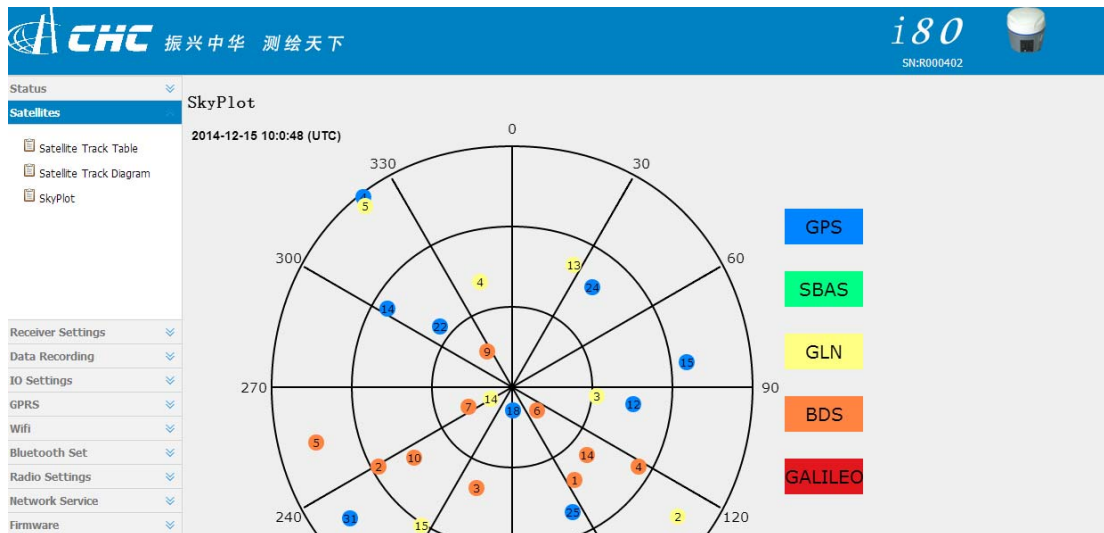
Satellite Track Table:



Satellite Track Diagram: In Satellite Track Diagram, users can check satellite information with iconic presentation. Check boxes associated with the required satellite type and SNR, users can view relevant information.



Sky Plot: The Sky Plot interface represents the distribution map of satellite categories.



7.3 Receiver settings interface

On the setting interface, users can check relevant information about receiver settings. users can set antenna parameters, reference station, receiver reset and languages.

Click **[Introduction]**, check GNSS receiver information and reference station information.



Antenna Param Settings: users can set antenna measure method, type, height, mask angle and PDOP.

The screenshot displays the 'Antenna Param Settings' window in the CHC i80 software. The left sidebar contains a tree view with the following items: Status, Satellites, Receiver Settings (selected), Data Recording, IO Settings, GPRS, Wifi, Bluetooth Set, Radio Settings, Network Service, and Firmware. Under 'Receiver Settings', there are sub-items: Introduction, Antenna Param Settings (selected), Reference Station Settings, Receiver Reset, and Languages. The main area is titled 'Antenna Param Settings' and contains the following fields:

- Measure Method: Antenna Phase Center (dropdown)
- Antenna Type: CHCA300GNSS (dropdown)
- Antenna Height: 2.0000 (text input) (Meter)
- Mask Angle: 13 (text input)
- PDOP Setting: 6 (text input)

A 'Save' button is located at the bottom of the main area.

7.3.1 Reference Station Settings

When setting reference station, users can set the mode to Manual Base, Auto Base and Auto Rover. Users can also set the coordinates of the reference station and support Sample for Average.

Several methods can be used to input the coordinates of the reference station. Users can click **[Acquire Current Position]** to set the location of the reference station, which is not accurate because it is the coordinates of the antenna phase center measured in signal status. If users have known the coordinates of the antenna phase center, just input the information manually.

In Sample for Average, the positioning limits are divided into Single Solution Coordinates and Fix Solution Coordinates. Single means users can collect reference coordinates just in single status while Fix means users can do that only in fix status. Sample Amount is the total amount users set to be collected. Click **[start]**, the system will take the average of collected data and fill into the reference position column above automatically. The progress bar represents the percentage of current collected numbers and total numbers. Click **[Save]** to save current settings.

Reference Station Settings

Reference Station Mode:

Reference Height:

Reference Latitude: ° ' " ☐ S ☒ N

Reference Longitude: ° ' " ☒ E ☐ W

☒ Acquire Current Position

Sample for Average: ☐ Single Solution Coordinates ☐ Fixed Solution Coordinates

Positioning Limit: ☐ Single Solution Coordinates ☐ Fixed Solution Coordinates

Sampling Amount: ☒ Start ☒ Stop

Receiver reset: click **[Receiver Reset]**, users can restart receiver, clear satellite information, back to default setting and turn off receiver. Restart Receiver means rebooting the receiver. Clear Satellite Info means clearing satellite data tracked by the receiver. Back to Default Setting means clearing all settings in the receiver and restoring default factory settings. Turn Off Receiver means shutting down the receiver.

Languages: It supports switching language on the interface. Now it supports conversion between English and Chinese.

7.4 Data recording

Data recording is mainly used to record, download and push the receiver's static data.

Log Settings

Log Status: ☐ Closed ☒ ON ☐ OFF

Auto Record Or Not: ☐ Yes ☒ No

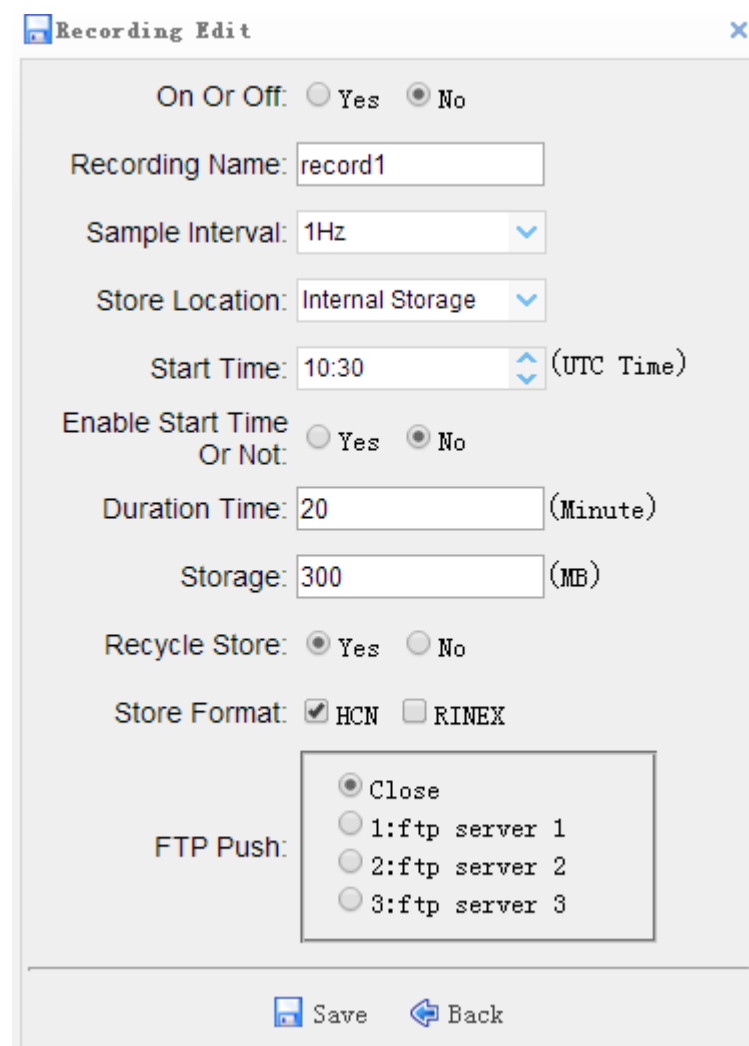
Store Info		
	Position	Total Storage
1	Internal Storage	1440TMB
2	External Storage	0MB

Record Info				
Recording Number	Recording Name	On Or Off	Log Status	Modify
1	record1	No	Not Record	Modify Clear Detail
2	record2	No	Not Record	Modify Clear Detail
3	record3	No	Not Record	Modify Clear Detail
4	record4	No	Not Record	Modify Clear Detail
5	record5	No	Not Record	Modify Clear Detail

Log Status can turn on or turn off the whole data records. When Log Status is open, all threads can not be edited.

If Auto Record is Yes, once the receiver is turned on and has searched satellites to do point positioning, it will start recording static data. The storage is divided into internal and external storage. **Internal Storage** means the receiver stores capacity itself and the specific value is given by the receiver. **External Storage** is the inserted mobile hard disk. **Total Storage** and **Free Space** depend on the conditions of hard disk. **Recording Info** has eight recording threads and multiple threads can be set to store data at the same time.

In **Recording info**, click **[Modify]** to modify any record, the interface is shown as follows:



The image shows a 'Recording Edit' dialog box with the following fields and options:

- On Or Off:** Radio buttons for Yes and No. 'No' is selected.
- Recording Name:** Text input field containing 'record1'.
- Sample Interval:** Dropdown menu showing '1Hz'.
- Store Location:** Dropdown menu showing 'Internal Storage'.
- Start Time:** Time selection field showing '10:30' with a '(UTC Time)' label.
- Enable Start Time Or Not:** Radio buttons for Yes and No. 'No' is selected.
- Duration Time:** Text input field showing '20' with a '(Minute)' label.
- Storage:** Text input field showing '300' with a '(MB)' label.
- Recycle Store:** Radio buttons for Yes and No. 'Yes' is selected.
- Store Format:** Checkboxes for HCN (checked) and RINEX.
- FTP Push:** A group box containing radio buttons for 'Close', '1:ftp server 1', '2:ftp server 2', and '3:ftp server 3'. 'Close' is selected.
- Buttons:** 'Save' and 'Back' buttons at the bottom.

The graphic is clicking single modify button:

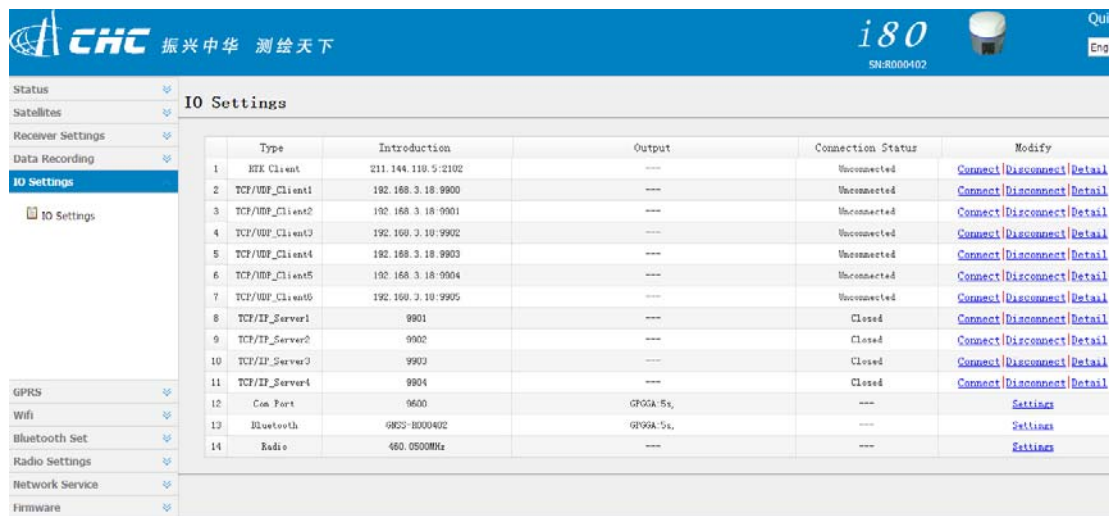
1. **On or Off:** show whether this thread is on or not
2. **Recording Name:** show this record's name.
3. **Sample Interval:** from 20Hz to 1MIN (at present, it only supports 1Hz, 5s, 10s, 15s, 30s and 60s).
4. **Store Location:** internal or external storage.
5. **Start Time:** represent that timing can start storage.
6. **Enable Start Time Or Not:** **[Yes]** or **[No]** button represents whether the previous item **Start Time** will function. If Yes, it will start recording according to the set time, or it will start at once.
7. **Duration Time:** the duration.
8. **Storage:** the reserved memory space for the current thread.
9. **Recycle Store:** when exceeding the set memory space, it will cover the early data of the thread automatically.
10. **Storage Format:** Support HCN and RINEX.
11. **FTP push:** the current thread data will be set to sever push.

FTP push setting: three FTP servers can be set respectively in the FTP push setting menu. Click the pop-up window, and users can set the server IP, port, remote directory, sever description, use name, password and so on. FTP push can set the required sever to be pushed. If users don't need this function, click **[Back]** button.

FTP Push Recording: users can see a record list of FTP push in this menu.

Data Download: In this menu, the internal storage of i80 can be accessed by means of FTP. All the static data stored by i80 threads can be found in **repo** folder and can be downloaded by users. Both of the initial user name and password are **ftp** and can be modified in the **Web Service**→**FTP service**.

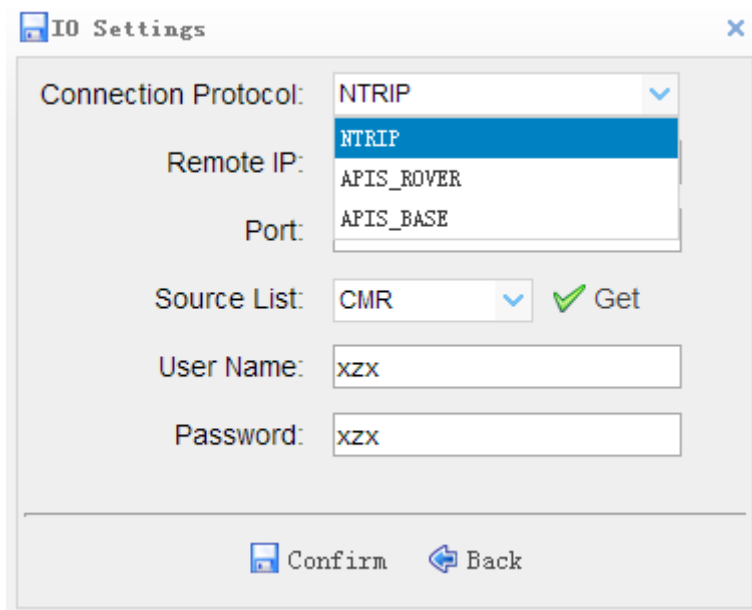
7.5 IO settings



The screenshot shows the CHC i80 software interface. The top bar includes the CHC logo, the slogan "振兴中华 测绘天下", the model "i80", and a "Quit" button. The left sidebar contains a menu with options: Status, Satellites, Receiver Settings, Data Recording, **IO Settings** (selected), GPRS, Wifi, Bluetooth Set, Radio Settings, Network Service, and Firmware. The main area displays the "IO Settings" window, which contains a table of network connections.

	Type	Introduction	Output	Connection Status	Modify
1	RTK Client	211.144.119.5:2102	----	Unconnected	Connect Disconnect Detail
2	TCP/UDP_Client1	192.168.3.18:9900	----	Unconnected	Connect Disconnect Detail
3	TCP/UDP_Client2	192.168.3.18:9901	----	Unconnected	Connect Disconnect Detail
4	TCP/UDP_Client3	192.168.3.18:9902	----	Unconnected	Connect Disconnect Detail
5	TCP/UDP_Client4	192.168.3.18:9903	----	Unconnected	Connect Disconnect Detail
6	TCP/UDP_Client5	192.168.3.18:9904	----	Unconnected	Connect Disconnect Detail
7	TCP/UDP_Client6	192.168.3.18:9905	----	Unconnected	Connect Disconnect Detail
8	TCP/IP_Server1	9901	----	Closed	Connect Disconnect Detail
9	TCP/IP_Server2	9902	----	Closed	Connect Disconnect Detail
10	TCP/IP_Server3	9903	----	Closed	Connect Disconnect Detail
11	TCP/IP_Server4	9904	----	Closed	Connect Disconnect Detail
12	Com Port	9600	GT0GA:5s	----	Settings
13	Bluetooth	9800:8000402	GT0GA:5s	----	Settings
14	Radio	460.0500MHz	----	----	Settings

RTK Client: In RTK Client, NTRIP, APIS_ROVER and APIS_BASE support CORS, network 1+n rover and network 1+n base, respectively. (At this point, it is necessary to turn on the mobile network and connect it in chapter 8.6)

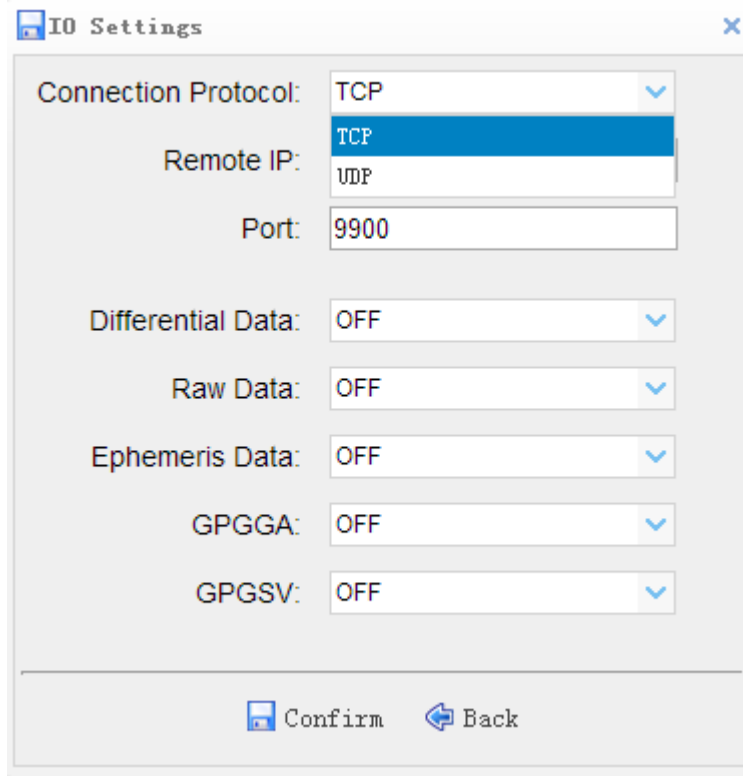


The screenshot shows the "IO Settings" dialog box. It contains the following fields and options:

- Connection Protocol:** A dropdown menu with "NTRIP" selected.
- Remote IP:** A text input field with "NTRIP" entered.
- Port:** A text input field with "APIS_BASE" entered.
- Source List:** A dropdown menu with "CMR" selected, followed by a green checkmark and the text "Get".
- User Name:** A text input field with "xzx" entered.
- Password:** A text input field with "xzx" entered.
- Buttons:** "Confirm" and "Back" buttons at the bottom.

In NTRIP, login CORS through stated remote IP, port, source list, user name and password. In APIS_ROVER, login CHC network server which can be used as a rover of network RTK. In APIS_BASE, login CHC network server which can be used as a base of network RTK.

TCP/UDP_Client :



I0 Settings

Connection Protocol: TCP

Remote IP:

Port: 9900

Differential Data: OFF

Raw Data: OFF

Ephemeris Data: OFF

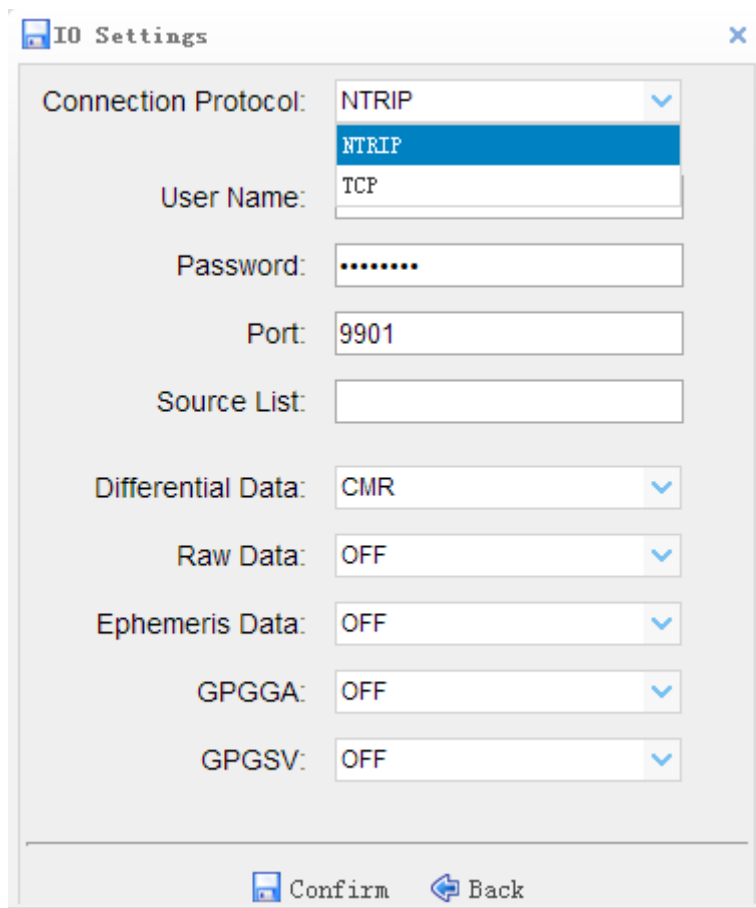
GPGLA: OFF

GPGLV: OFF

Confirm Back

- 1.In TCP/UDP_Client, two protocols can be selected: TCP and UDP.
- 2.Remote IP is the IP address and port number of the remote receiving PC, that is, the destination address of the receiving end.
- 3.In Port number, set data send ports.
- 4.Differential data, raw data, ephemeris data, GPGLA and GPGLV are the individual output types supported by the machine. users can set whether to output those data and the output frequency.
- 5.After setting parameters, click **[Confirm]** under the page to save current settings. The data entry can not be edited in the process of sending data and users can check the details about settings when clicking **[Details]** button.

TCP/IP_Server:



IO Settings

Connection Protocol: NTRIP

User Name: TCP

Password:

Port: 9901

Source List:

Differential Data: CMR

Raw Data: OFF

Ephemeris Data: OFF

GPGGA: OFF

GPGLSV: OFF

Confirm Back

Connection protocol supports Ntrip and TCP protocol. When using Ntrip protocol, users can get data by logging in i80 directly.

Com Port: to set output baud rate. Differential data, initial data, ephemeris data, GPGGA and GPGLSV are the individual output types supported by the machine. users can set whether to output those data and the output frequency. If exporting differential data, users need to set the mode to **Auto Base** or **Not Auto** and set baud rate to 9600 when using external radio.

Bluetooth: to set data output baud rate. Differential data, initial data, ephemeris data, GPGGA and GPGLSV are the individual output data types supported by the machine. users can set whether to output those data and the output frequency. If exporting differential data, users need to set the mode to **Auto Base** or **Not Auto**.

Radio: Internal radio sends differential data. users need to set the mode to **Auto Base** or

Not Auto. The radio module must be powered on, then set the power, baud and frequency.(More details are available in 7.9)

7.6 GPRS

Network Info: network info shows power status, network mode, connection protocol, signal strength, SIM status and dialing status.

Network set: mainly to set GPRS model status, auto start, network mode (generally users select **[2G/3G Auto]**), parameter settings and so on.

The screenshot displays the CHC i80 web interface. The top header features the CHC logo, the slogan '振兴中华 测绘天下', the model 'i80', and the serial number 'SN:R000402'. A sidebar on the left contains a menu with items: Status, Satellites, Receiver Settings, Data Recording, IO Settings, GPRS (highlighted), Network Info, Network Set, Wifi, Bluetooth Set, Radio Settings, Network Service, and Firmware. The main content area is divided into sections for GPRS configuration. The 'Auto Start' section has radio buttons for 'Yes' and 'No'. The 'Network Mode' section has radio buttons for '2G Only', '3G Only', and '2G/3G Auto'. The 'Dialing Status' section shows 'Fail' and buttons for 'Connect' and 'Disconnect'. The 'Auto Connect' section has radio buttons for 'Yes' and 'No'. Below these are input fields for 'APN', 'Initializing String', 'Dialing String', 'User Name', and 'Password', each with a 'Fail' status indicator. A 'Save' button is located at the bottom of the settings area.

7.7Wifi

Wifi Info: show power status, password and so on.

Wifi Settings: to set power status, auto start, password and so on

CHC 振兴中华 测绘天下

i80 SN:R000402

Status

Satellites

Receiver Settings

Data Recording

IO Settings

GPRS

Wifi

Wifi Info

Wifi Settings

Bluetooth Set

Radio Settings

Network Service

Firmware

Wifi Settings

Power Status: ON OFF

Auto Start: Yes No

Wifi Mode: Access Point

SSID: GNSS-R000402

Encrypt Type: WAP

Password:

Start

7.8 Bluetooth Set

Bluetooth Set: including local name, MAC address, visible and PIN. The default PIN is 1234 (no changes)

CHC 振兴中华 测绘天下

i80 SN:R000402

Status

Satellites

Receiver Settings

Data Recording

IO Settings

GPRS

Wifi

Bluetooth Set

Bluetooth Set

Radio Settings

Network Service

Firmware

Bluetooth Set

Local Name: GNSS-R000402

MAC Address: 00:17:E9:DF:EF:2C

Visible: Yes No

PIN: 1234

Save

7.9 Radio setting

Radio Info: shows radio type, radio power, OTA baud rate, radio frequency and so on.

Radio setting: to set radio status, auto start, radio power, frequency and so on. When using web page setting alone and the radio function is required, users need to turn on **Radio Status** and **Auto Start**. If the radio in IO setting is required to be used, the premises are also turning on radio status, setting appropriate frequency, power and so on.

The screenshot displays the CHC i80 web interface. The top header features the CHC logo and the slogan '振兴中华 测绘天下' (Revitalize China, Survey the World). The user's device is identified as 'i80' with serial number 'SN:R000402'. The left sidebar lists various configuration categories, with 'Radio Settings' currently selected. The main panel shows the following settings:

- Radio Status:** ON (indicated by a green dot and 'ON' text, with 'OFF' as an alternative).
- Auto Start:** Yes (selected with a radio button, 'No' is also available).
- Radio Protocol:** CHC (selected from a dropdown menu).
- Radio Spacing:** 25 (KHz) (selected from a dropdown menu).
- OTA Baud Rate:** 9600 (selected from a dropdown menu).
- Radio Power:** 0.1W (selected from a dropdown menu).
- Radio Frequency:** 6 (selected from a dropdown menu) and 460.0500 (455MHz-463MHz) (text input field).

A 'Save' button is located at the bottom of the settings section.

7.10 Network service

Network service includes:

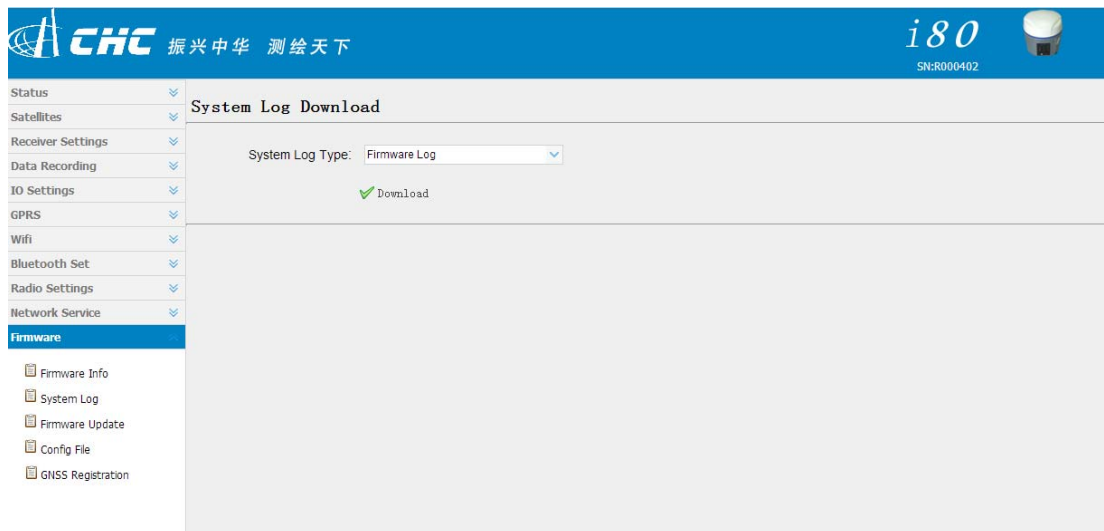
HTTP: HTTP port number is 80 by default, **no changes**.

FTP service: FTP service can set the machine's FTP storage, user name and password.

7.11 Firmware

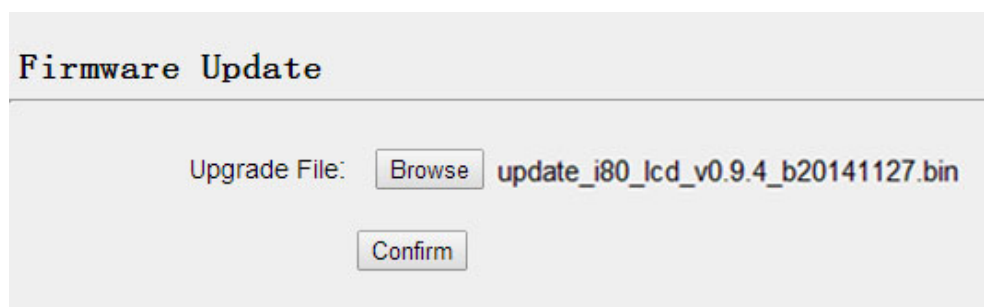
Firmware Info: **Firmware Info** interface shows information about the firmware's current type, release time, description and so on.

System log: running log of system firmware can be downloaded, which is convenient for developers to analyze problems.



7.11.1 Firmware Update

Firmware update interface supports web firmware upgrade. Select **[Browse]** to add corresponding BIN file, then click **[Confirm]** to upgrade.



After the completion of update, the receiver has finished the firmware upgrade.

7.11.2 USB flash disk

1. Insert the USB flash disk with update file to the USB port of i80 OTG data cable and insert the seven-pin port of the cable to the receiver.



2. Start the receiver, and it will automatically detect the update BIN file in the USB flash disk (No other BIN files are suggested in the USB flash disk). Select **[Yes]**, and the firmware is updating.



3. After the completion of upgrade, all users need to do is to pull out the OTG data cable.

7.12 Config File

In **Config File** interface, current settings can be saved as config files to download and the saved config file can also be loaded.

7.12.1 GNSS Registration

GNSS Registration interface will realize the registration function to the receiver.

GNSS Registration

Receiver ID:

Registration Limit:

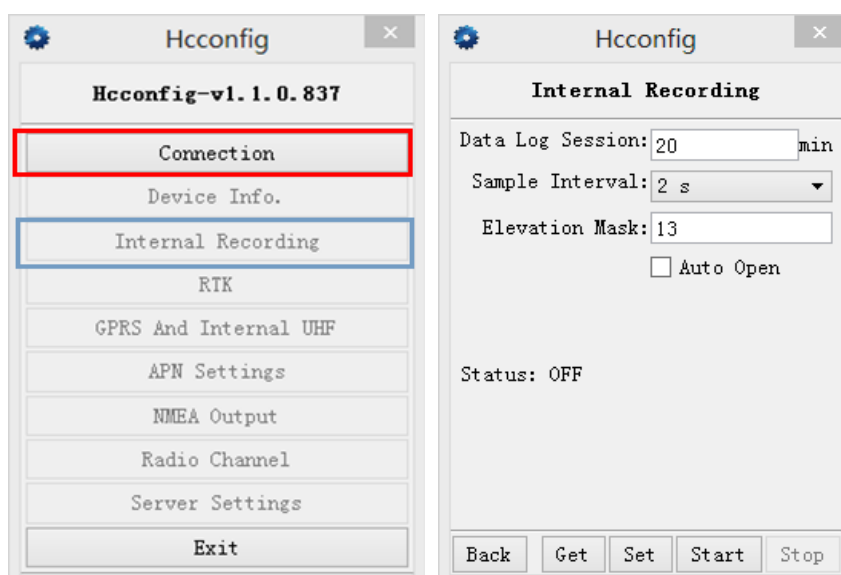
Registration Code:

 Registration

8. Static Mode Operation

8.1 Office Setting

Open Hcconfig software, connect the receiver, then click **[Internal Recording]** on the main interface and enter into the static setting interface. Set several parameters as shown in the picture, then click **[Set]**.



Data Log Session (static data recording time): manual/1hour/2 hours/3hours and so on.

Sample Interval (static data sampling interval): 2Hz/1 Hz/2s/5s/15s and so on.

Elevation Mask: 13 degree by default (can be modified)

[Back]:back to main menu

[Get]: get current receiver's static parameters

[Set]: write current parameters to the receiver

[Start]:send orders to make the receiver start collecting static data

[Stop]: send orders to make the receiver end collection and save the data.

(Control Panel is suggested to be used to set the parameters.)

9. Main Specifications

1.GNSS characteristics

- Smallest GNSS receiver in domestic market
- MEMS precise tilt sensor for auto • compensation within 30° slant and 2m height[®].
- WIFI function supports 150m distance Mobile Internet[®] and 108Mbps GPRS
- Linux OS
- Embedded web interface, supporting MT settings
- 4G high speed network
- Dual battery auto switch seamlessly for whole • day field work
- All-satellite-system support, 220channels with simultaneously tracked satellites signals
- Unfiltered and unsmoothed pseudorange observation data applied in low noise, low multipath error, low time domain correlation and high dynamic response. Within 1 Hz bandwidth, the precision is more accurate than 1mm.
- Supporting SNR in dB-Hz, reliable low-elevation SV tracking technology.

2. Measurement Accuracy

- High Static Accuracy

Horizontal accuracy: $\pm(3+ 0.1 \times 10^{-6} \times D)$ mm

Vertical accuracy: $\pm(3.5+0.4\times10^{-6}\times D)$ mm

- Static and Rapid Static accuracy

Horizontal accuracy: : $\pm(3+0.5\times10^{-6}\times D)$ mm

Vertical accuracy: $\pm(5 + 0.5\times10^{-6}\times D)$ mm

- RTK Accuracy

Horizontal Accuracy: $\pm(8 + 1.0\times10^{-6}\times D)$ mm

Vertical Accuracy: $\pm(15+ 1.0\times10^{-6}\times D)$ mm

- CORS RTK Accuracy

Horizontal Accuracy: $\pm(8 + 0.5\times10^{-6}\times D)$ mm

Vertical Accuracy: $\pm(15+ 0.5\times10^{-6}\times D)$ mm

Single-point Positioning Accuracy: 1.5m

Code Differential Positioning Accuracy: 0.45m

Initialization time:5s

Initialization reliability:>99.99%

3.Electrical

- Power consumption: 3.2W
- Li-ion battery capacity:6800mAh (6600mAh)
- Battery voltage: 7.4V
- Battery life: 1000 times charging and discharging process
- Battery operating time[®]: typical 12 hours in RTK mode, external power can be connected,
- dual battery auto switch
- External power: 12-36VDC

4.Physical

- Size(W×H):124×140mm
- weight:<1.5kg (with battery)
- Texture: magnesium alloy
- Appearance: streamline cylinder, LED screen
- Built-in: precision MEMS tilt sensor
- Feature: waterproof and breathable membrane

5.Storage and Record

- Storage format: HCN, RINEX
- Internal storage: 32G, extended up to 64G
- Raw data recording rate:1Hz, others are for selection
- Data transmission mode:GPS device mounts as a USB hard drive

6.Environmental Parameter

- Operating temperature: -45°C ~ +75°C
- Storage temperature:-55°C ~ +85°C
- Humidity: 100%condensation
- Waterproof and dust proof: IP68 standard
- Shock: survive a 3-meter drop on to concrete

7.I/O port

- 1x UHF antenna port
- 1x 7-pin LEMO port,for power supply, data download, USB update.
- 1x 7-pin serial port, for power supply and correction output.
- 1x SIM slot

8.Screen

- LED screen(show satellites, battery level, host mode, static information and so on)
- Visualization setting(host mode, radio frequency, server's IP address and differential format)
- Indicator(one satellite light, one differential light)

9.Button

1x Power button and 1x FN button

10.Network Function

- Wifi: 802.11 B/G/N, supporting AP
- GSM: 3.75G (extended up to 4G), built-in modem, HSPA+ 21Mbps(download), 5.76Mbps(upload).

WCDMA850/900/1700/1900/2100

EDGE/GPRS/GSM 850/900/1800/1900

- Multimode Bluetooth: supporting iphone, ipad, completely compatible with

Android, Windows Mobile, IOS and Win7/Win8 OS

- 24-hour Shanghai, Beijing multiple networks support for free

11.UHF Radio

Built-in high performance radio(standard)

Supporting PDL radio, supporting protocols: TT450S and Transparent

12. Data Format

- RTCM2.X、RTCM3.X
- CMR、CMR+
- RTCA
- NMEA0183、PJK plane coordinates, binary code
- NTRIP protocol

Notes:

- ① : Tilt survey accuracy varies lightly with slant angles
- ② : Operating range may be affected by obstacles, magnetic field, electric field and so on
- ③ : Battery operating time varies with working mode

The above parameters are reserved to refer to i80 flagship version.

FCC interference statement:

This equipment has been designed to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules in the Portable Mode. These limits are designed to provide reasonable protection against harmful interference in a residential installation.

Operation is subject to the following two conditions: (1) this device may not cause harmful interference and (2) this device must accept any interference received, including interference that may cause undesired operation.

Note:

THE GRANTEE IS NOT RESPONSIBLE FOR ANY CHANGES OR MODIFICATIONS NOT EXPRESSLY APPROVED BY THE PARTY RESPONSIBLE FOR COMP

LIANCE. SUCH MODIFICATIONS COULD VOID THE USER'S AUTHORITY TO OPERATE THE EQUIPMENT

This product has been tested and found to comply with the limits for Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This product generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications.

However, there is no guarantee that interference will not occur in a particular installation. If this product does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to

try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

RF Exposure Statement:

For the product, under normal use condition is at least 50cm away from the body of the user, the user must keep at least 50cm distance to the product.