Galaxy G1 Measuring System

User Manual

CONTENTS

Chapter 1 Brief Introduction

Read this chapter, and you will have a brief knowledge of South Company and Galaxy G1 measurement system.

§ 1.1 Introduction

Welcome to South Surveying&Mapping Instruments Co., Ltd, which is China's leading GPS RTK instrument production and sales enterprises, has been committed to spread the international advanced GPS mapping survey techniques and products to the users.

This manual takes Galaxy G1 measuring system for example, to explain how to install, set up and uses the RTK system as well as the use of the accessories. We recommend that you read these instructions carefully before using the instrument.

SOUTH Galaxy G1, new generation integrated RTK system with smaller size and innovative design, leads the direction of new generation RTK with excellent performance, provides high-efficiency and intelligent surveying experience to customers. It isn't simply smaller, it does better in everywhere.

§ 1.2 Production functions

Control Survey: dual-band (dual-frequency) system static measurements can accurately complete the high-precision deformation observation, photo-control point measurement.

Highway Survey: quickly complete the encryption of the control points, road

topographic mapping, cross-section measurement, profile measurement with EGStar.

CORS Application: provide more stable and convenient data link for field operations. It is seamlessly compatible with all types of domestic CORS applications.

Data acquisition measurement: perfect match South's various measurement software to do quick and easy data acquisition.

Stakeout shot: large-scale point, line, plane lofting.

Electric Power Measurement: power line measurement orientation, ranging, angle calculation.

Marine application: oceanographic research, dredging, piling, inserted row, making the marine operations more convenient and easy.

§ 1.3 Features

Innovative structure design: Galaxy G1, with smaller size and innovative design, the weight is only 970g, built with magnesium alloy materials. And the top edge is design to decrease harm for receiver in case of fall down to ground.

Dual mode Bluetooth: SOUTH Galaxy G1 is equipped with Bluetooth 4.0 module, which is first to adopt this technology to support communication with smartphone, tablet PC etc, to make sure Bluetooth communication more stable.

Tilt centering and electronic bubble: The internal tilt compensator and electronic bubble can correct the coordinate result automatically at the points with tile angel and tile direction.

NFC function: The internal NFC module can make the complicated Bluetooth communication more easy and simple.

Full constellation support: Equipped with most advanced GNSS boards, Galaxy G1 system can track most signal from all kinds of running satellite constellation, especially support B1,B2 and B3 signal from COMPASS, also get position result with only COMPASS signal.

Smart and Open Platform: SOUTH Galaxy G1 is based on smart platform and powerful structure, which can make system work faster and more stable, less power consumption, also support smart voice guide and smart diagnosis etc.

Cloud service: The function enable realize online upgrade and register, remote diagnosis in real-time.

Advanced datalink module: SOUTH Galaxy G1 adopts new and excellent datalink system, which is compatible with current radio protocols in the market, also supports all kinds of network types to access CORS seamlessly.

§1.4 Accessories &Components

Rover station standard configuration

Mainframe

antennas

S10 controller

Measuring tape

Mainframe charger

Mainframe batteries

Tribrach&connector

Bracket for controllers

Retractable pole

multi-function communication cable

Base station standard configuration

Mainframe

Antennas

25w radio

Multiple communication cable

Battery charger

Batteries

Tribrach & connector

Communication cable

Transmission antenna

Support pole

Frequency-change line

Measuring tape

Chapter 2 GalaxyG1 Measuring System

Reading this chapter, you can grasp the components, installation and the function of Galaxy G1 measuring system.

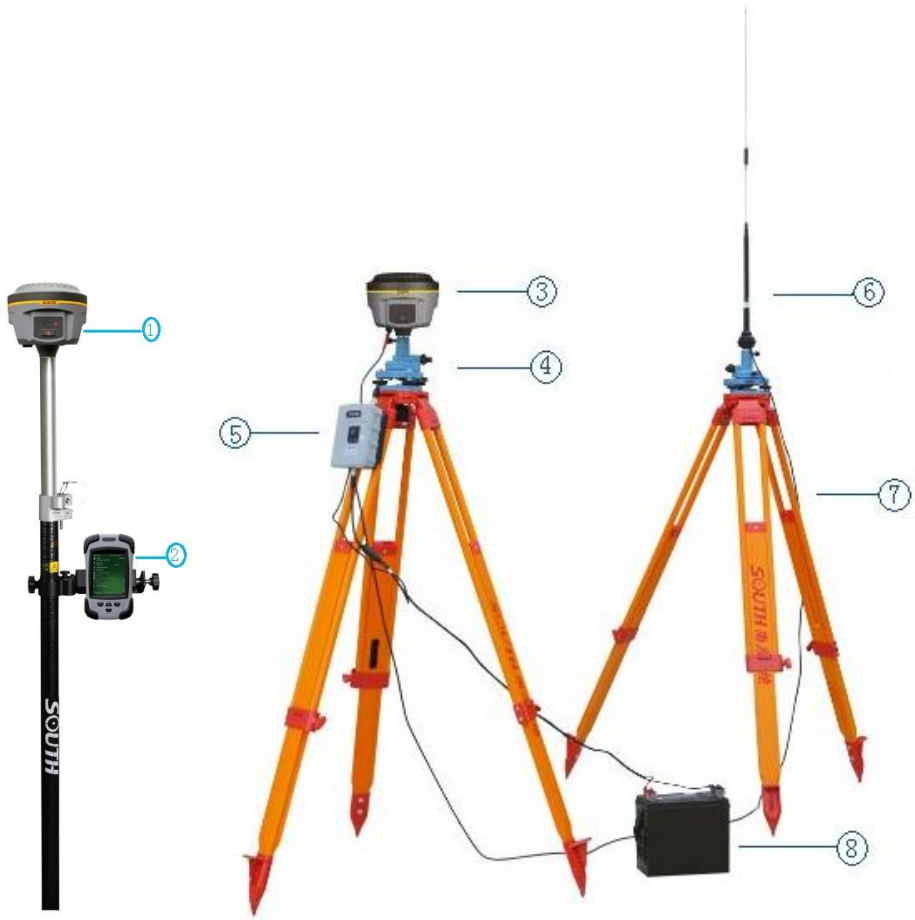


Figure 2-1

① Rover ② Controller ③Base
④ Tribrach ⑤ Radio ⑥Radio Antenna
⑦ Tripod ⑧Battery

§2.1 Galaxy G1 Mainframe

§2.1.1 The mainframe appearance

The mainframe is a flat cylindrical, 112mm in height, 129mm in diameter, the height from the rubber seal ring to the bottom is 60mm. The front side is the buttons and indicator panel. The bottom of the instrument is radio and network interface, as well as the battery compartment and other interfaces; there is a string of bar code number, which is the mainframe machine number.

Front Panel

Figure 2-2

① Top cover ②Protection rubber ring ③Indicator light
④ Power Key ⑤Bottom

Back Panel

Figure 2-3

① Battery compartment cover ②NFC label ③ Compartment locker

Mainframe Serial number: for registration, and identify the mainframe and the corresponding connection with the handheld.

§2.1.2 Bottom interfaces

Figure 2-4

① Compartment snap-fit： for locking the battery compartment cover

② SN label

③ Screw hole: fix the mainframe to the tribrach or the pole

④ Beeper: broadcast voice messages

⑤ UHF/GPRS socket: connect UHF/GPRS antenna

⑥ 5-pin cable socket: connect power cable

⑦ 7-pin data cable socket: connect data cable

5-pin interface: for connecting to the external Radio or external power;

7-pin serial port: used to connect to computer to transfer data, or handheld;

GPRS interface: Install the GPRS (GSM/CDMA/3G optional) network antennas;

UHF interface: Install UHF radio antenna;

§2.1.3 Indicator panel

a) Galaxy G1 mainframe indicator still has two meanings:

The indicator for mode switching and working modes;

The indicator for mainframe self-check state;

b) In order to let you have a better understanding of the specific meaning of the indicator in the two states, we will describe in detail.

Galaxy G1 indication panel has been re-designed with 3 LED indicators, simply and clearly indicates the various status, as shown below:

Figure 2-5

①3 indicator lights ②Power key

The following are the meanings of some typical lights:

Indicator	Status	Meaning
POWER 	on	Normal voltage, built-in battery 7.4v
	blink	Low battery
Satellite 	blink	Number of satellite lock, cycle once every 5 seconds
Bluetooth 	off	Handheld disconnected
	on	Handheld connected
Signal/data 	blink	Static mode: flashing in accordance with the setting sampling interval when recording data
	on	Base or rover mode: built-in module receives strong signal
	blink	Base or rover mode: built-in module receives weak signal
	off	Base or rover mode: built-in module receives no signal

Table 2-1

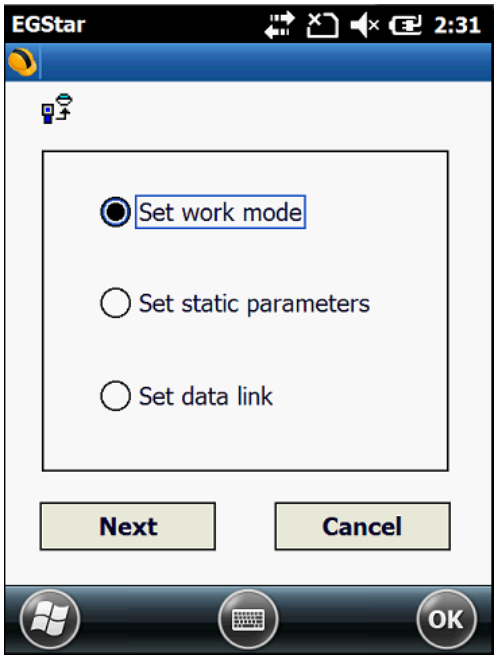
§2.1.4 Mode check and switching

Mode check

In more work mode, press power key once, there is voice message to remind current work status.

Mode switching

After power on receiver, use data collector to connect the receiver, then configure the work mode and data link mode.



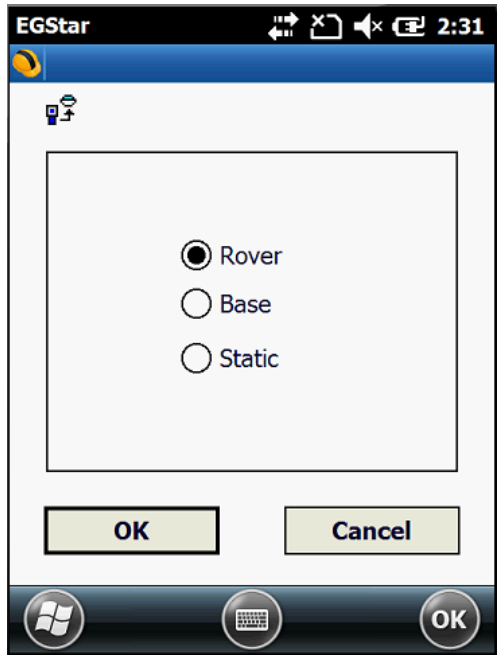


Figure 2-6

§2.1.5 Self -check

If the mainframe indicator is abnormal or not working properly, you can use the automatic detection function, which is mainframe self-check.

Power on, press and hold the <Power> button about 8 seconds, until the BT light turns on again and along with the beeping from receiver, then release the button to and the receiver starts performing the self-check.

If all the function parts pass, there is voice message to remind, wait a few seconds, the instrument will turns off automatically.

If the self-check isn't passed, there is also voice message to remind, and instrument will stay in the status of the self-check, results to identify the problem.

The meaning of the lights during self-check

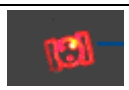
Indicator	Status	Meaning
	on	Receiver is performing the self-check
	on	OEM board self-check is passed
	off	OEM board self-check isn't passed
	on	GPRS/GSM module part self-check is passed
	off	GPRS/GSM module part self-check isn't passed
	on	Internal radio module self- check is passed
	off	Internal radio module self- check isn't passed

Table 2-2

§2.2 Handheld controller S10

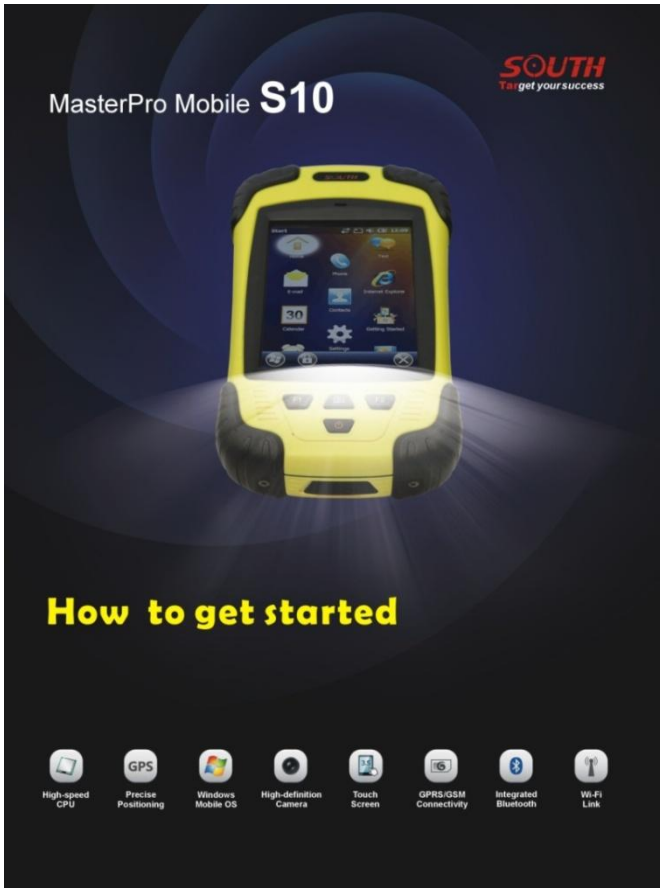


Figure 2-7

§2.2.1 Basic introduction to the handheld

Here takes S10 for example (If you want to know more about Psion controller, please refer to the manual for Psion controller), appearance of S10:

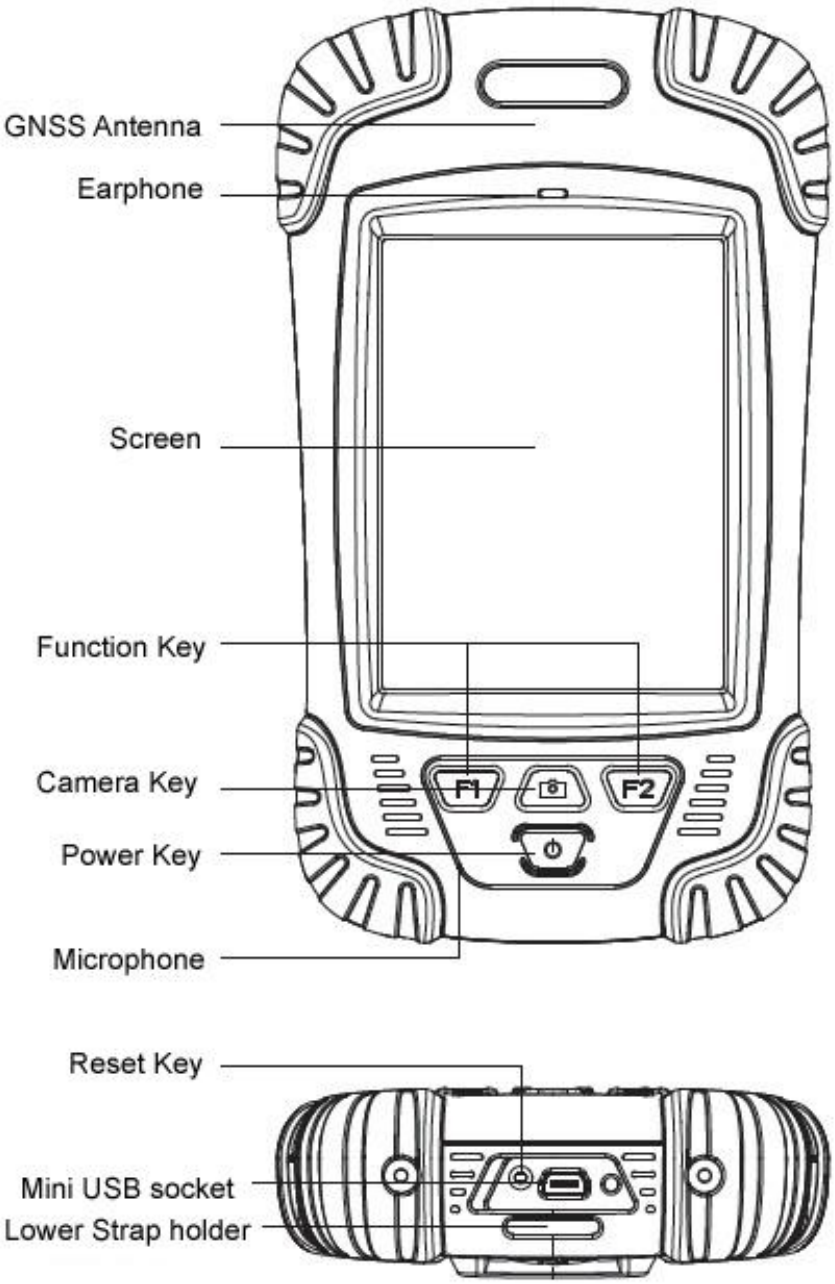


Figure 2-8

Standard Configuration	Description
Li-ion Battery	3.7V/ 3000 mA/h
Strap	Black, 180*12mm
Touch Pen	Black, 12.7mm
USB data cable	1.5m
USB Charger	5V/1A
Disc	

Table 2-3

1. Charging

Connect the charger with collector by the USB Link cable to recharge.

Main Screen (Upper right corner) will show the Charging Icon in power off (on) status.(Once you connect Collector with PC to recharge; the charging time will be longer).

2. Installing Battery, SIM Card and Storage Card

Turn the lock up straight and rotate it anticlockwise, you can take off the battery cover.

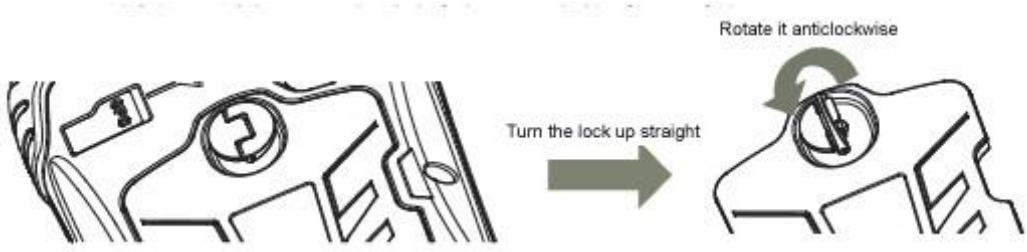


Figure 2-9

There are two sockets upon the battery position, left is for SIM Card and right is for Storage Card.

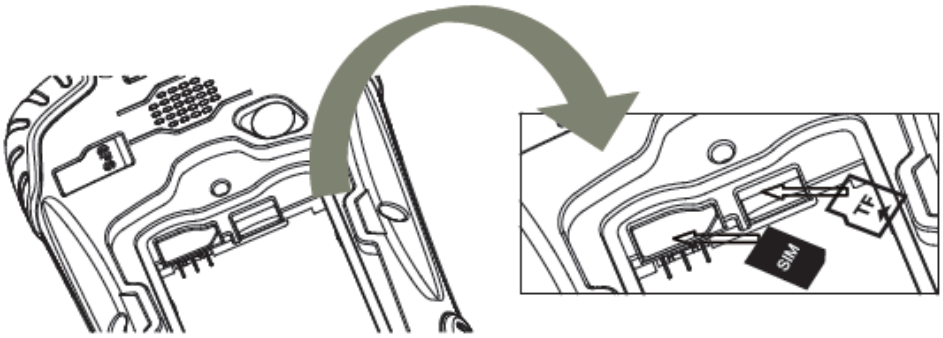


Figure 2-10

Installing the battery, turn the lock clockwise to the end.

(SIM Card: The Missing Angle Corner of SIM Card will be at the lower right corner)

3. Power on/off

Make sure that the battery is fully charged or you can connect the Collector to PC via the USB Cable. (Collector should be with battery).

Press Power Key for 3-5 seconds to power on/off.

(If there is no any response from Collector or other unusual situations happened, press the Reset Key besides the USB socket in the bottom of Collector with the Touch Screen Pen).

4. Connect to PC

Make sure that you've installed **Microsoft ActiveSync 4.5** or higher version, if your computer equipped with win7 or win8 system, please make sure that you have installed **Windows Mobile Device Center** program.

Connect the Collector to PC via the Mini USB Data Cable.

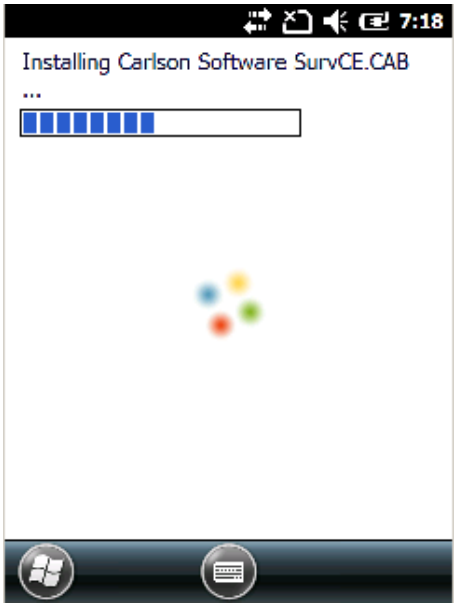
Connection will be preceded automatically by Microsoft ActiveSync. Icon will turn green and an interface of Setting will come out, you can just click "Cancel".

After this, you can manage and edit the data in Collector.

5. Installing Program

Make sure that collector is synchronized with PC. Run the Installation file at PC side.

If the installation program is also suitable for collector, you can copy the installation program into collector to install. You can just copy the folder into collector when you need.



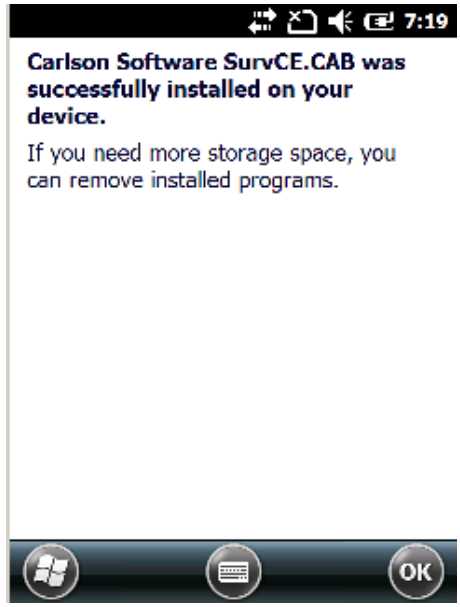


Figure 2-11

(The two operations: Upper→ Equipment, Lower→ Storage Card)

We suggest you installing programs into Flash Memory and save data into Storage Card.

6. How to use GPS

If you want to check the working status of GPS via checking or collecting software, please set the COM port to COM6 and the baud rate to 57600.

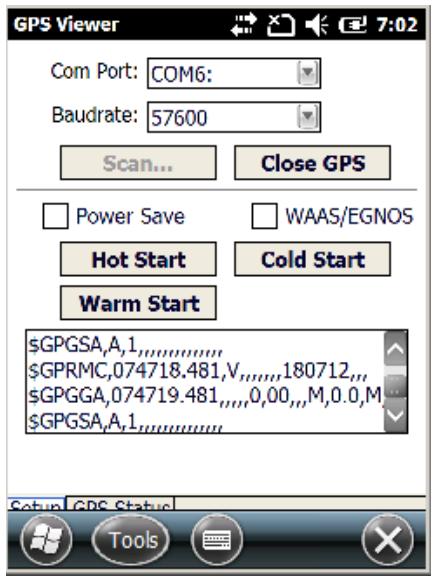


Figure 2-12

7. Camera

Get into the Camera Mode by pressing the Camera Key for 3 or more seconds.

Press Camera Key to take a photo and click "OK" on the screen to save.

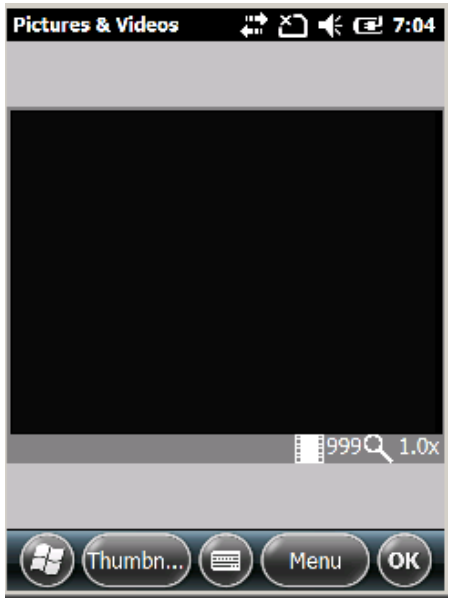
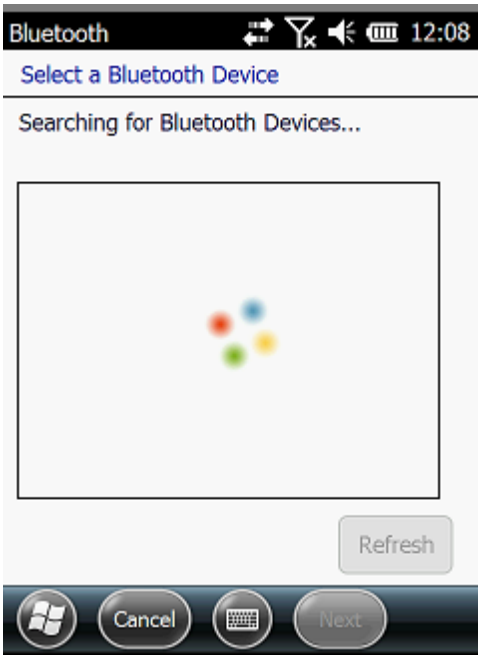


Figure 2-13

Note: If you want to know more information about S10, Please refer to S10 manual.

§2.2.2 Blue-tooth connection

The short-range wireless Bluetooth communication facilities are for the wireless exchange of information among a variety of Bluetooth-enabled devices. Tap on the Start menu (Settings) → (control panel) to open (Bluetooth Device Manager). tap on the(scanning device) after setting the Bluetooth device, and the surrounding Bluetooth devices will be listed in the search list. And then input the passcode 1234 to have pair between controller and receiver. As shown below:



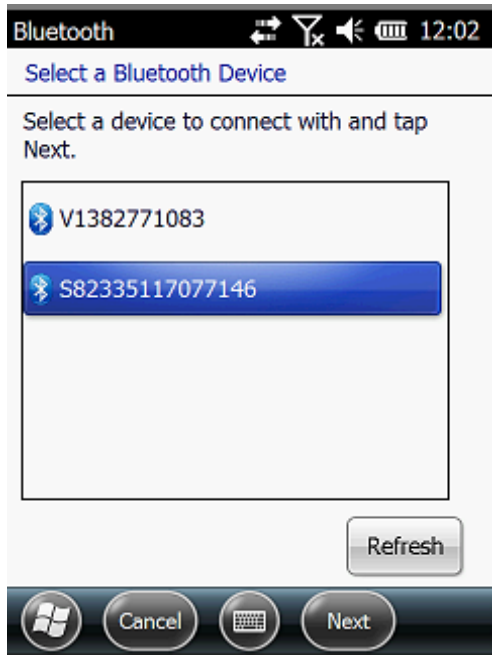


Figure 2-14

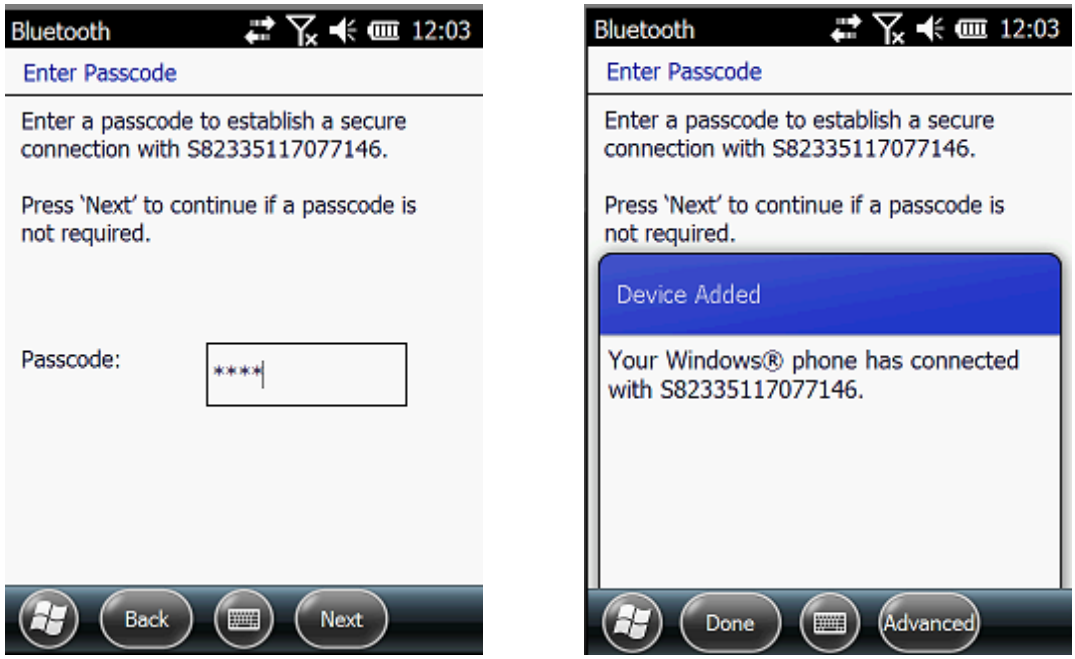


Figure 2-15

After the pair, select an available com port for the receiver (usually COM 8 and COM 5 are OK). As shown below:

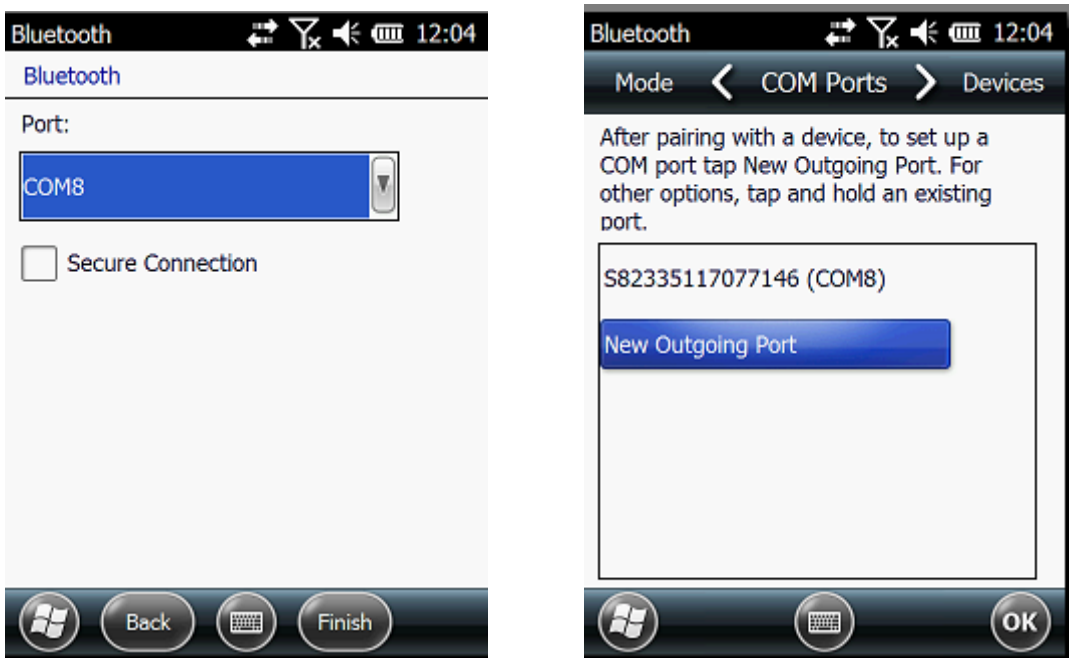


Figure 2-16

After the establishment of the virtual serial port, other applications can use the serial port for data communication with a Bluetooth device.

§2.2.3 Software installation and connecting

Professional surveying and mapping software are made for measurement applications for different industry:"EGStar", "Power Star", "Mapping Star", "Navigation Star" and so on. Here takes EGStar for example:

EGStar is the specific software for G1 measuring system, mainly for the collection and calculation of the measuring points.

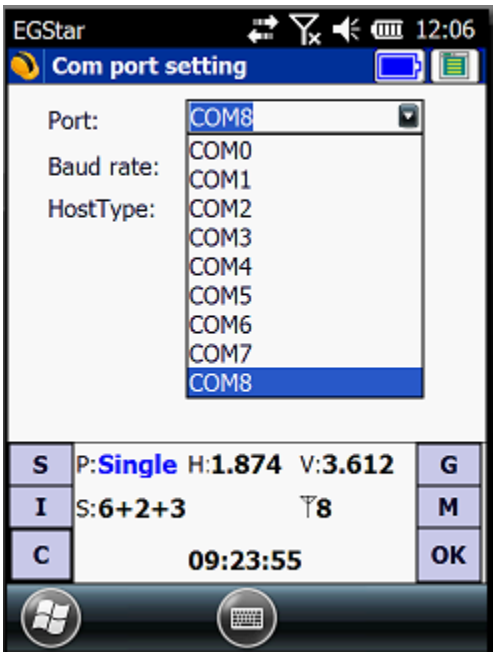
Before installing of EGStar, you need to install Microsoft Active Sync. After installing it on your computer, connect handheld to computer with a cable, and install EGStar into the handheld, at the same time, keep the mainframe power on, then set as follows:

Open EGStar software and enter the main interface. Click "OK" on the "prompt" window.

Figure 2-17

1. "Configure" → "Port Config", in the "Port Configuration "dialog box, select the port "COM8 ", with the same serial number which you use to connect the Bluetooth serial port service. Click "OK." If the connection is successful, the

status bar will display related data. If there is barrier, exit EGStar to reconnect (If the above settings are correct, then link directly). Handheld connecting with the host PC can do the follow-up measurement.



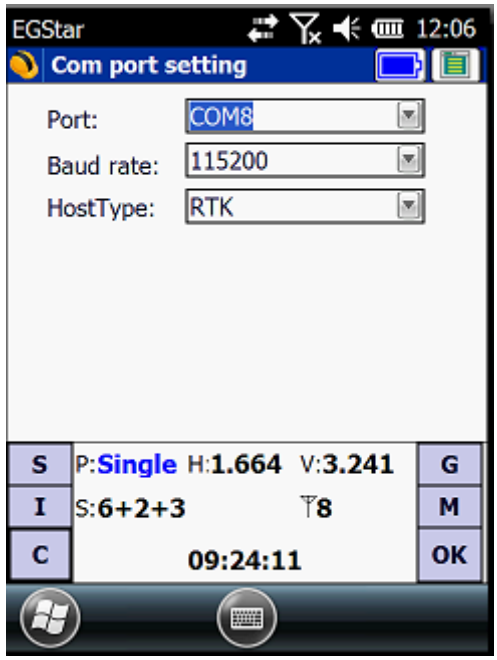


Figure 2-18

2. Or go to “Bluetooth Manager”, in this interface tap on “Search” button and the controller will search the surrounding Bluetooth devices, select the correct serial number from the list and click on “Connect” button, controller will connect to receiver without setting any COM port. If the prompt message “Bluetooth connect success” appears, that means that controller has successfully connected with receiver, then please check the Bluetooth indicator on receiver.

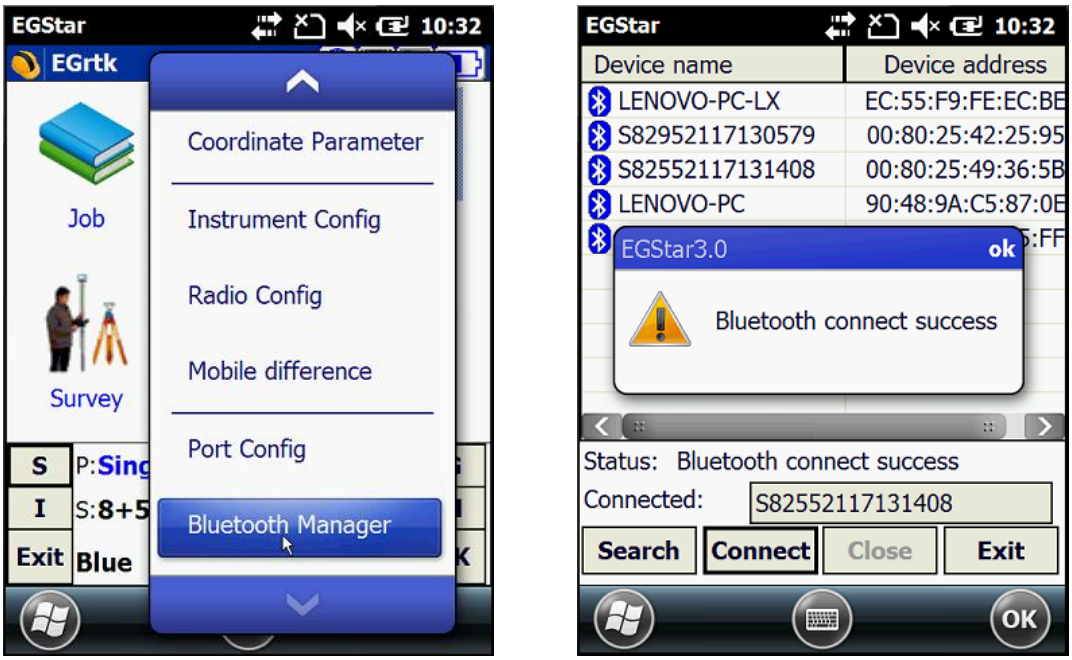


Figure 2-19

§2.3 External Radio

§2.3.1 Radio features:

The radio GDL20 is a high-speed semi-manual wireless data transmission radio, whose air transfer rate can be up to 19200 bps and the RF transmitter power is larger, used in Southern RTK measurement system.

Radio GDL20 adopts GMSK modulation, 19200bps transfer rate, low bit error rate. RF frequency can cover 450-470MHz band. Data transmission mode of GDL20 is transparent mode, that is, the received data is sent to the RTK GPS system unchanged.

Radio GDL20 data interface is a standard RS-232 interface, which can be connected to any RS-232 terminal equipment for data exchange.

GDL20 digital radio research employs advanced radio frequency technology,

digital signal processing technology and baseband processing technology, carefully selected high quality components to organize production, to ensure the long-term stable and reliable operation;

Have a forward error correction control, digital error correction function.

It has eight transmitting and receiving channels. Can be changed according to the actual use of the channel frequency, transmit power adjustable interval is 0.5MHz

Channel number	Frequency（450-470MHz）
Channel 1	463.125
Channel 2	464.125
Channel 3	465.125
Channel 4	466.125
Channel 5	463.625
Channel 6	464.625
Channel 7	465.625
Channel 8	466.625

Table 2-4

§2.3.2 Radio appearance

Figure 2-20

① Control panel ②SN number

§2.3.3 Radio interface and panel

Mainframe Interface: 5-pin jack for connecting a GPS receiver and power supply

Figure 2-21 5-pin port

Antenna interface： For connecting the transmitter antenna

Figure 2-22 Antenna interface

Control Panel: control panel lights display the status of the radio, the key operation is simple and convenient, one-to-one interface can effectively prevent connection errors.

Figure 2-23 Control panel

① Channel indicator light.

② Power indicator light,

③ ON / OFF power key: This key controls the unit's power switch. The red light on the left indicates the power status of the machine.

④ TX red light indicator: This indicator flashes once per second means that the radio is transmitting data with the transmitting interval in 1 second;

⑤ AMP PWR indicator: Indicates the level of radio power, light on indicates low-power, light off indicates high-power

⑥ CHANNEL button: By pressing this switch, you can switch channels 1-8.

Power switch (Shown in picture below): switch to adjust the radio power, AMP PWR lights on the panel indicate the radio power level, light on indicates low power, lights off high power.

Figure 2-24 Power switch

§2.3.4 Radio transmitting antenna

The UHF transmitting antenna is particularly suitable for field use, the receiving antenna is 450MHz Omni-directional antenna, light and durable.

Figure 2-25 Radio antenna

§2.3.5 Application Notice

The battery power is too low: When the flashing channel indicator appears on the control panel, which means the lack of battery power, replace the battery in time, otherwise there would be data link unstable or unable to launch.

GDL20 radio power supply: voltage 12-15V (typical 13.8V) RF transmitter power 25W, current 7.0A.

Radio transmits power: radio transmits power based on the voltage of the power supply, check the voltage before use.

High and low power use: use low-power transmitter when low power can satisfy the operation as high-power transmitter will exponentially consume battery power, excessive use will reduce battery life. Install the radio station as high as possible.

Power corrugated coefficient: power ripple coefficient must be less than 40mV, the smaller the ripple factor is, the smaller will the beam spectrum be and the

higher communication quality will be.

Power Connection: Power of positive and negative connected correctly.

Electromagnetic environment: Before using the radio, it is better to perform electromagnetic environment measurement, to avoid the communications blackout.

Radio match antenna: the basic parameters of the antenna selection are the band width, frequency, gain, directivity, impedance, VSWR and other indexes .Usually the effective bandwidth of the antenna is 3-5MHz,antenna selecting should be based on the frequency bands used by the to be selected channel. For the long-distance transmission, it is better to use a directional antenna and high-gain antenna, and pay attention to the impedance of the antenna and feeder to match with the Radio GDL20 antenna interface (50 ohms).

We recommend:

Recommend that you use plug-in battery which is more than 12/36Ah,the use of maintain a regulated current of 10A during the operation.

Recommend that you charge it in time, do not overuse the battery, otherwise it will reduce battery life.

Recommend that you replace the batteries after six months to a year, to ensure the radio distance.

§2.4 Mainframe accessories

§2.4.1 Instrument Case

The convenient RTK carrying case is customized for surveying workers; it has strong abrasive resistance and waterproofness. Meanwhile the unique backpack design reduces the heavy burden of field work.

The inner layer of the black soft bag is filled with anti-collision foam, the host and other accessories can be dispersed and embedded; Compact, durable, can effectively prevent the impact, easy to clean.

Figure 2-26

§2.4.2 Battery and charger

The standard configuration includes two batteries and charger:

The system indicator CHARGE turns red when the battery is being charged, the only indicator FULL turns green when charging is completed.

Li-ion battery and battery charger:

Figure 2-27 Charger& Adapter

§2.4.3 Differential antennas

Figure 2-28 GPRS antenna& UHF antenna

The differential antennas are as shown above; UHF differential antenna is needed in UHF built-in radio base station mode and UHF built-in radio rover station mode.

§2.4.4 Multi-function data line

Radio Y-data line: multi-purpose cable is a "Y"-shaped cable used to connect the

base station mainframe (5-pin red jack), transmitting stations (black jack) and external battery (red and black clip) for power supply and data transmission.

Figure 2-29 Power Cable

Mainframe multi-function data lines: the role of multi-purpose communications cable is to connect the receiver to the host computer, for the transmission of static data and the host firmware upgrade.

Figure 2-30 Data cable

§2.4.5 Other accessories

Other accessories include rover station centering rod, handheld bracket base point, connectors and measuring tape.

Note: The models and types of instrument accessories will vary with the instrument upgrade.

Chapter 3 Operations

Reading this chapter, you can grasp in detail how to use the G1 measurement to do system static, RTK operations.

GPS measurement operation scheme refers to the operating scheme used to determine the relative position between the stations with the help of GPS technology. Point coordinate precision obtained is not the same; its operating methods and observation time are also different, thus having different range of applications. GNSS receiver operating program is divided into two types: static measurement and RTK dynamic measurement (including the base station and rover station).

Test environment requirements:

(1) Observation stations (ie, the receiving antenna settlements) should stay away from high-power radio transmitters and high voltage transmission lines in order to avoid the magnetic field around the GPS satellite signal interference. Receiver antenna and its distance shall not be less than 200 m;

(2) Observation stations should not be near to the large area waters or objects which can strongly reflect (or absorb) electromagnetic wave to weaken the effects of multi-path;

(3) Observation stations should be located in places where the receiving device can be installed easily, and good vision available. Elevation angle of obstacles in view should generally be greater than 10° to 15°, in order to weaken the effects of troposphere refraction;

(4)Observation stations should be selected in a convenient place, and easy to use other means of measuring, joint measurement and expansion;

(5) For the long baseline GPS network, should also consider the vicinity good communication facilities (telephone and telegraph, post and

telecommunications) and power supply, for power between the stations and equipments.

§3.1 Static operating

§3.1.1 Static Measurements Profile

Static measurements:

GPS positioning measurement by installed three (or more) GNSS receivers to perform simultaneous observation and determine the relative position between the stations.

Scope:

The establishment of a national geodetic control network (second or less);

The establishment of precision engineering control network, such as bridge measurement, tunnel measurements, etc;

The establishment of a variety of encryption control network, such as city measurements, Drawing Point measurement, road surveying, demarcation measurements.

For the GPS measurements of small and medium-sized cities, towns, as well as mapping, cadastral, land information, real estate, geophysical exploration, surveying, construction and other control measurement, should meet the accuracy requirements of the D, E grade GPS measurements.

§3.1.2 Operating procedures

Pre-measurement

Project approval

Program design

Construction design

Surveying and mapping data collection and arrangement

Instrument test, test

Reconnaissance, choice of site, buried stone

Measurement

Operating team stationed in

Satellite status Forecast

Observation planning

Dispatch of operation and field work observation

After the measurement

Data transmission, dump, backup,

Baseline Solution and quality control

Network adjustment (data processing, analysis) and quality control

Finishing results, technical summary

Project acceptance

§3.1.3 Field operation notes:

1)Static mode of Galaxy G1 receiver only to set in EGStar software or other software (Such as Field Genius or SurvCE), please refer to the EGStar manual for more information.

2)Set up a tripod on the control point, leveling and centering strictly on the measuring point.

3)Measure the instrument height three times, the difference of the results shall not be more than 3 mm, and average the results. The instrument height should be measured from the center of the control point to the mark line on the instrument.(Refer to §3.4)

4)Record instrument number, point name, instrument height, and start time.

5)Power on, confirm the static mode, the mainframe begins to search satellites and satellite lights begin to flash. Recording condition reached, the status light flashes in accordance with the set sampling interval, flashing once indicates the acquisition of an epoch.

6)After the test, the mainframe shut down, and then begins data transmission and data processing (data transmission sees Chapter IV, data processing, please read another manual GPS data processing software operation manual).

§3.1.4 GPS net design

1) GPS net generally constitutes a closed figure by independent observation edge, such as a triangle, polygon or annexed line, to increase the checking conditions, and improve the reliability of the network.

2) The points of the GPS network should coincide as close as possible with that

of the original ground control network. Coincidence point generally should not be less than three (should perform leveling conjunction when not enough) and should be evenly distributed in the network in order to reliably determine the transformation parameters between the GPS and Ground Networks.

3) The points of the GPS network coinciding with the leveling points should be considered. Non-coincidence point should generally perform leveling conjunction method (or methods of equivalent accuracy), or set a certain density leveling conjunction point in the network, to provide information for the study of the geoid.

4) In order to facilitate the observation and perform leveling conjunction, GPS outlets should generally be located in unobscured and easy -to -reach places.

5) In order to facilitate the classical leveling conjunction or extension, emplace near the outlet a good view orientation point, to establish leveling conjunction direction. The distance between the point and the station should generally be greater than 300 meters.

6) According to the different purpose of GPS measurements, the independent observations edge of GPS network should be certain geometry. The basic forms of the graph are as follows: triangular network, ring network, stellate network.

§ 3.2 RTK operations (Radio mode)

Real-time dynamic measurements, referred to as RTK.

RTK technology is the real-time dynamic differential carrier phase positioning technology, combining global satellite navigation and positioning technology with data communication technology which includes base station and rover station. Base station transmits the data by radio or network to the rover station, which will perform differential analysis, thus providing real-time coordinates of the measurement point in the specified coordinate system.

Depending on the modes of transmission of the differential signal, RTK is divided into the radio mode and network mode.

This section first describes the radio mode, as shown below:

Figure 3-1 Base mode with External Radio

§3.2.1 Set up the Base Station

Base station shall be set up in the broad view, unobscured and higher places; avoid the vicinity of the high-voltage power transmission equipment and the transmitting and receiving antennas of radio communication equipment, the shade of trees, and the sides of waters, all of which will produce different degrees of impact on the GPS signal reception and emission of radio signals.

1) The receiver is set to the base station with external radio mode;

2) Set up tripods, the tripod on which to put the radio antenna should be placed at a higher point, the least distance between the two tripods should be 3metres.

3) fix the base and the base station receiver, (if set at a known point, a strict leveling should be done), power on the base station receiver.

4) Install the radio transmitting antenna, hang the radio on the tripod, place the storage battery at the bottom of the radio station.

5) Connect the radio, mainframe and battery with the multi-function cable, which is a "Y"-shaped cable used to connect the base station mainframe (5-pin red jack), transmitting radio (black jack) and external battery (red and black clip).Playing the role of power supply and data-transmission.

Important:

Please check the red dot on the five-pin port when you use the multifunction cable, aligning the red dot with the red mark on the mainframe will help it insert easily. Follow the same instruction when connecting to the radio.

§3.2.2 Start the base station

The first time you start the base station, you need to set the start parameters, set as follows:

1）Connect to the base station with EGStar in the handheld (Refer to §2.2.3)

2）Operation: Config → Instrument Config → Base Setting (the mainframe should be in base mode)

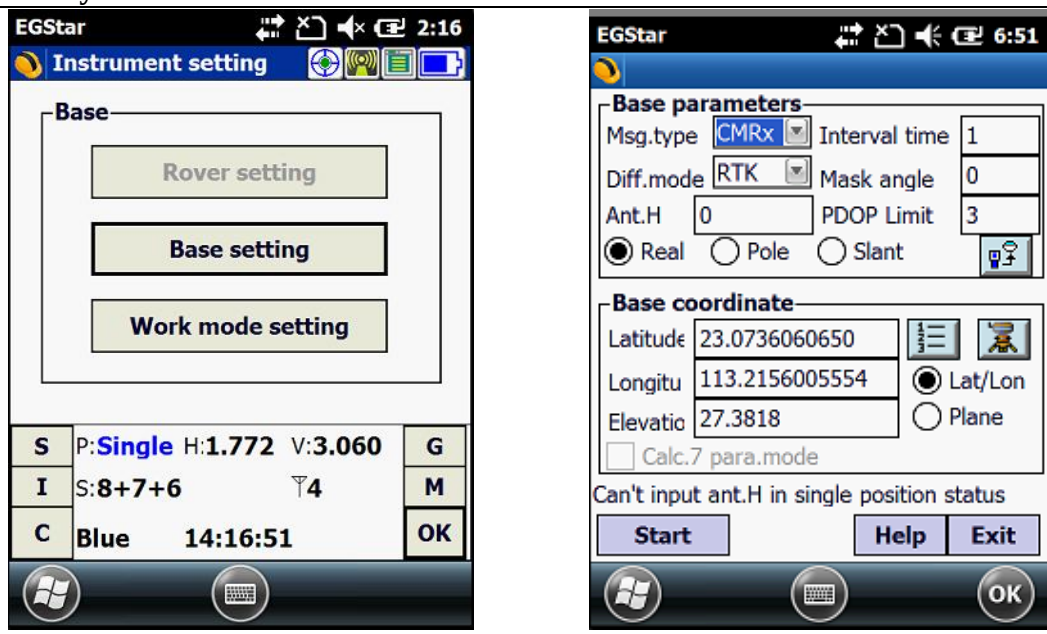


Figure 3-2

3）Set the base station parameters. Normally you only need to set difference mode（that is Diff.mode） in parameter settings while others using the default parameters. After setting click , the Base station setting finish.

4）After setting the parameters, click "Start" (in general, the Base station are arbitrarily set up, Base coordinates do not need to be input)

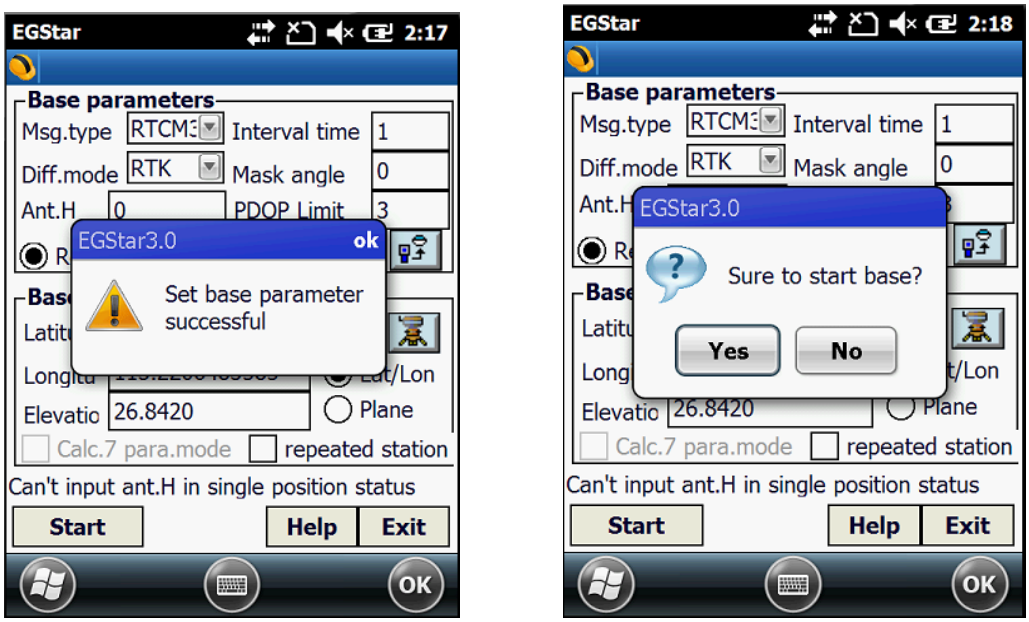


Figure 3-3

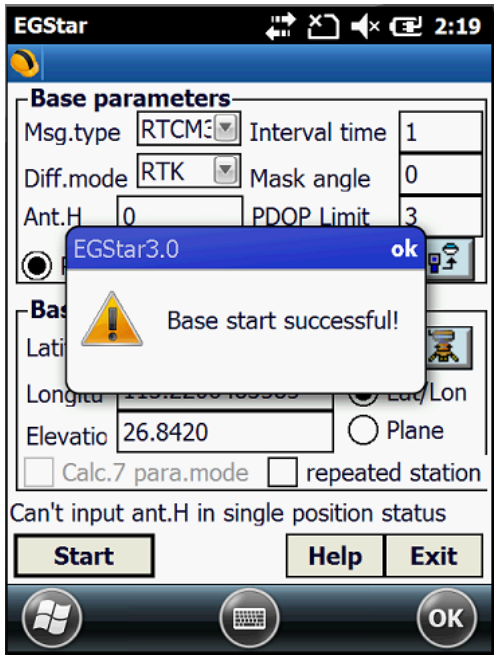


Figure 3-4

Note: If you start the base station successfully the first time, you can directly open the Base station mainframe and it will operate automatically if you don't want to change the configuration.

5）The radio channel setting

Set the radio channel on control panel of the external radio.

- Set the radio channel, there are eight channels to choose from；
- Set the radio power, if the working distance is not far, and interference is low, you can choose the low power transmitting；
- If the radio is successfully transmitted, the TX indicator will flash at intervals；

§3.2.3 Set up rover station

After verifying the successful transmitting of the Base station, you can start the erection of the rover station. The steps are as follows:

1) Set the receiver to the rover station radio mode;

2) Open the rover station mainframe, fix it on the centering rod of the carbon fiber pole, and screw on the UHF differential antenna;

3）Install the handheld bracket and the handheld；

Figure 3-5 Rover station

§3.2.4 Set rover station

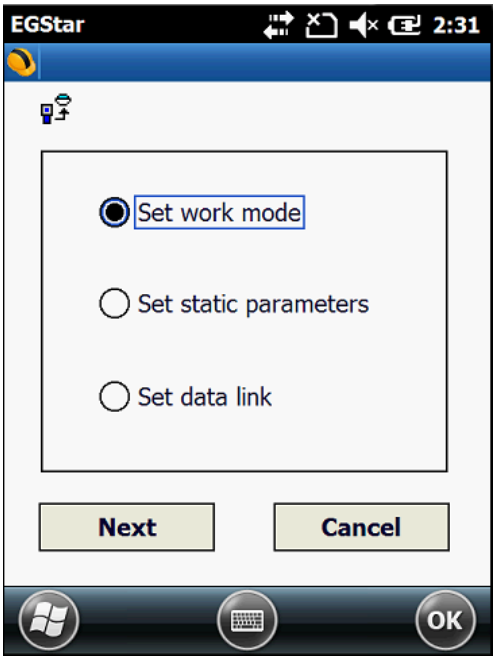
Set the rover station after installing the Rover station to achieve a fixed solution state, follow these steps:

1）Connect the handheld and the EGStar(see § 2.2.3)

2）Rover station settings: Config → Instrument Config → work mode setting (switch the mainframe work mode into rover station mode and the data link to

be internal radio mode)

3) Channel settings: Config → Radio Config → Radio channel setting, switch the radio channel to the same with the Base channel;



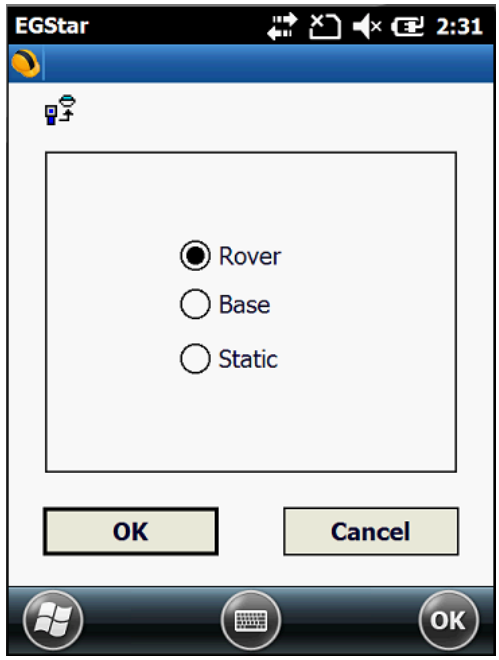


Figure 3-6

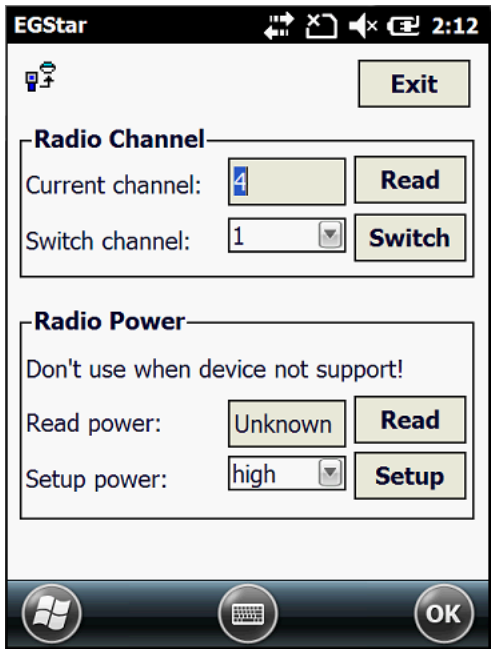


Figure 3-7

Setting finished, after the Rover station reaches the fixed solution, you can see the high-precision coordinates in the handheld. The follow-up new construction and conversion parameters please refer to the other manual <<EGStar 3.0 User Manual >>

§3.3 RTK operations（GPRS mode）

The main difference between RTK GPRS mode and Radio mode is the network transmission of differential data. Therefore the erection is similar to the radio mode, the setting of EGstar is much different, and the introduction is as follows:

Figure 3-8

§3.3.1 Base and Rover installation

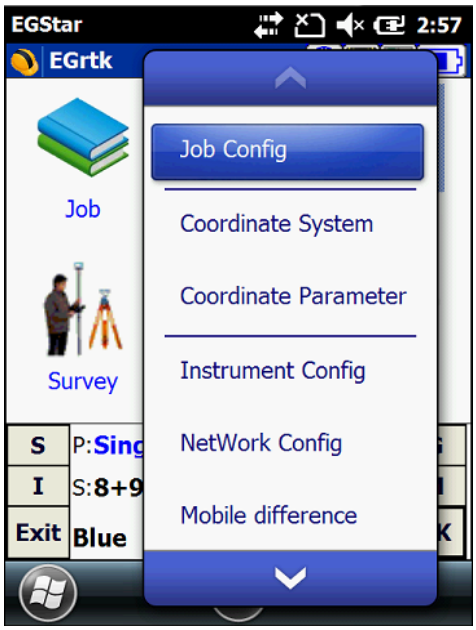
RTK network mode and radio mode is different on the transmission mode, so the installation is in a similar way, except that:

1) When the Base station is switched to the Base GPRS mode, needn't to install external radio, you need to install the GPRS differential antenna;
2) When the Rover station is switched to the Rover GPRS mode, you need to install the GPRS differential antenna.

§3.3.2 Base and Rover settings

The setting of RTK GPRS Base station is the same with Rover station, you can first set Base station and then Rover and the steps are as follows:

1) Setup: Config →GPRS Config
2) New network link should be added here, click "Add" to enter the setting interface.



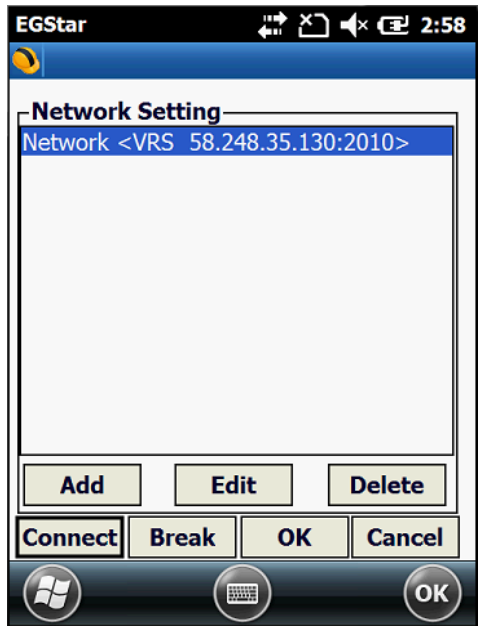
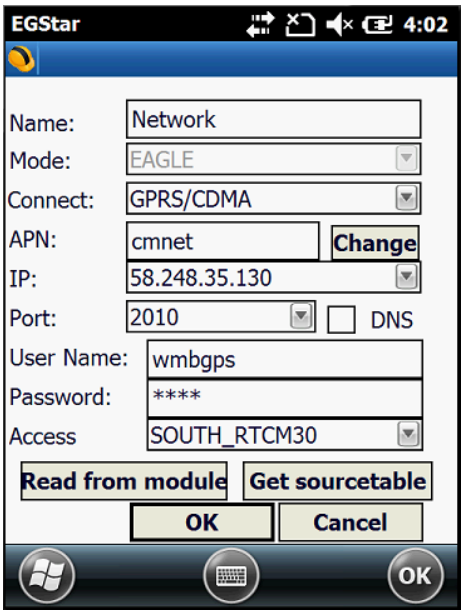


Figure 3-9



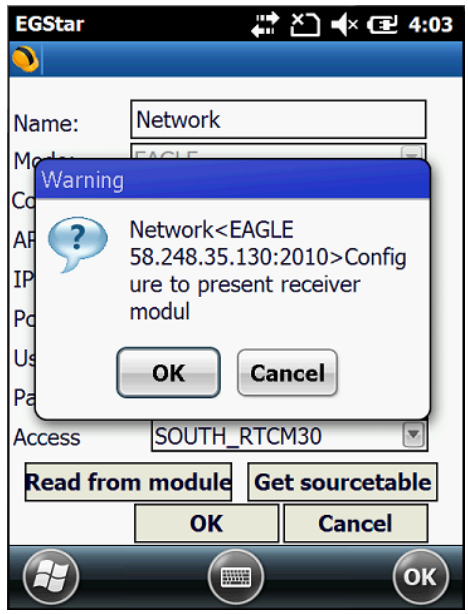


Figure 3-10

Note:"Read from module" is a function used to read the stored message in the system which is set by the receiver via GPRS link. Click "Read from module", the previous message will be filled in the "Access" field：

3) Enter the network configuration information in turn, select "Eagle" for the Base station, in "Access" please enter machine number or customize.

After setting, click "OK." and enter parameter configuration phase. And then click "OK" to return to the network configuration interface. Then click on "Connect" button to enter the EGStar initial interface, after connecting to network, click on "OK" and return to EGStar main interface.

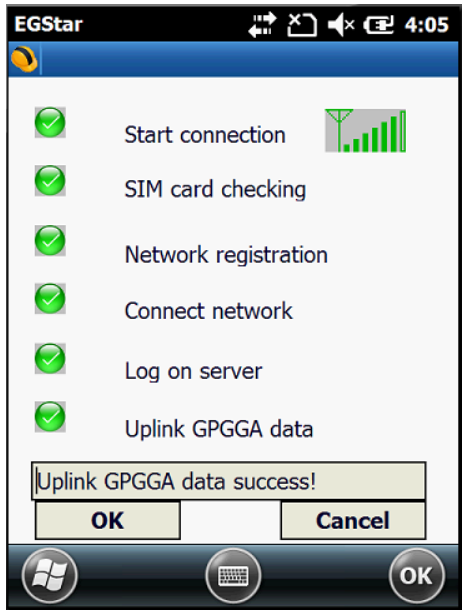
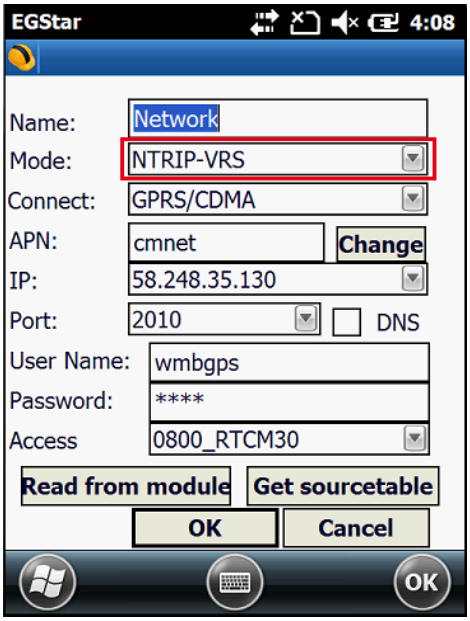


Figure 3-11

Note: The Rover station's connection with CORS is similar to Base GPRS mode, except the option of VRS-NTRIP, see the picture as below, input the IP and port for your local CORS network and the assigned username and password, hten click on "Get Sourcetable" to obtain mountpoints from server, and pick a correct one to access. Specific procedure please refer to <<EGStar3.0 user manual>>



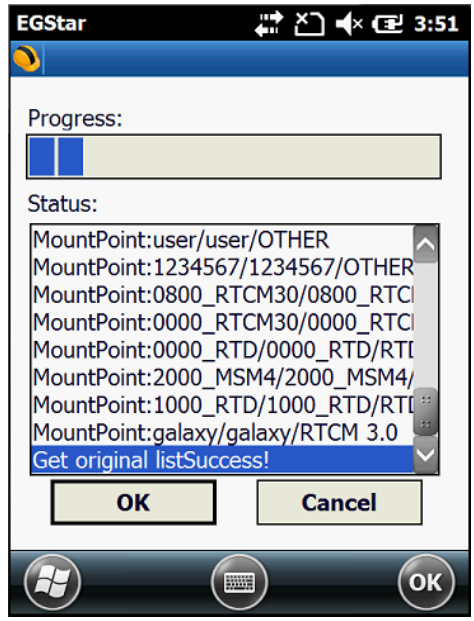
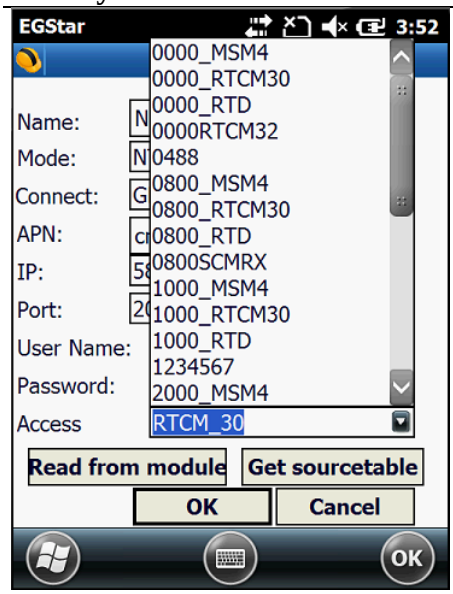


Figure 3-12



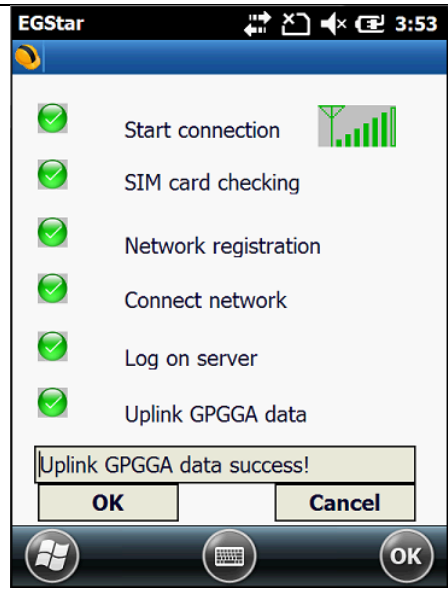


Figure 3-13

§3.3.3 Electronic bubble

1. Start electronic bubble

   In the main interface, click the calibration setting button on the top of the interface, you will enter the setting interface.

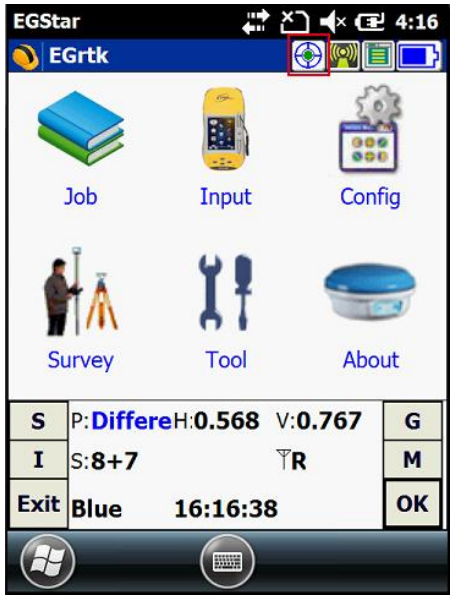


Figure 3-14 Main interface

Mark on the checkbox of “Bubble” option in the setting interface, click ‘OK’ return to Point survey interface, you can see the electronic bubble on the upper left of the screen.

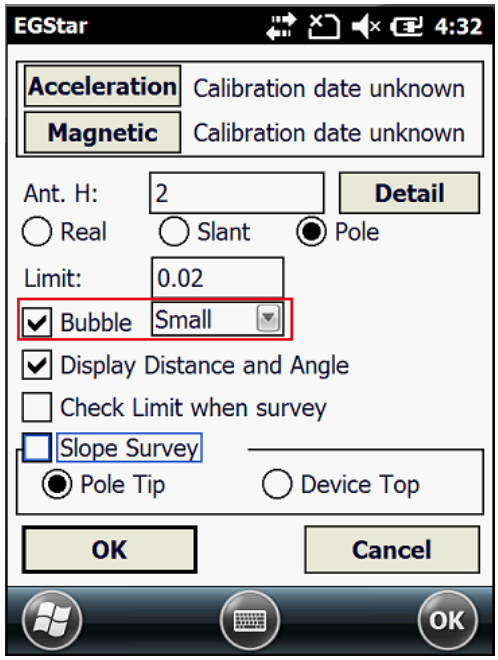
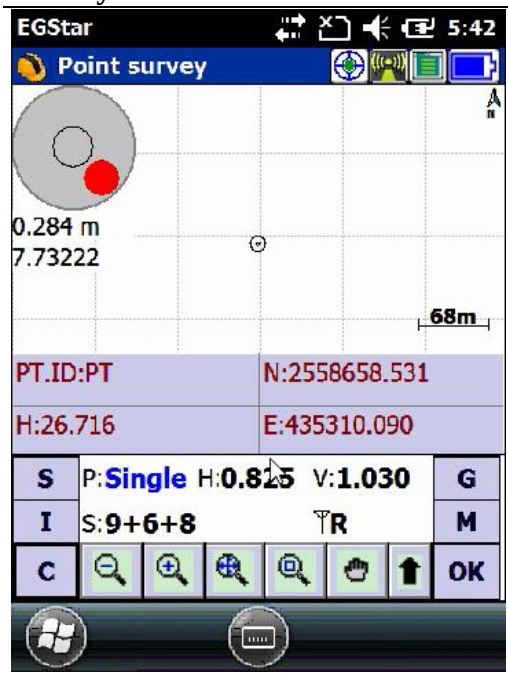
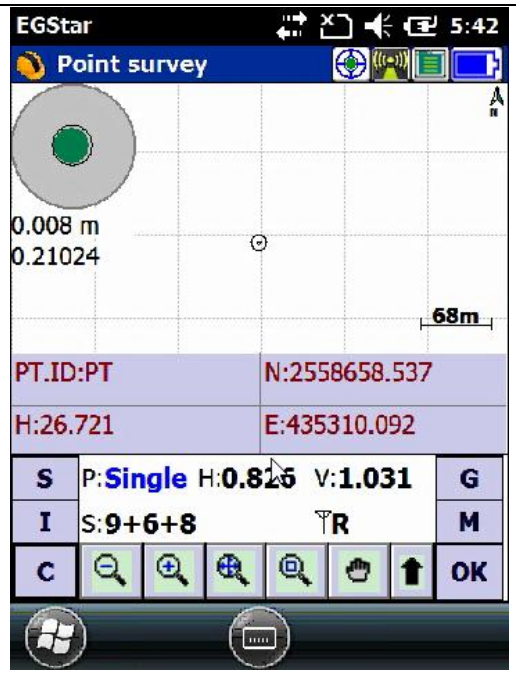


Figure 3-15 Calibration setting

2. The use of electronic bubble
3. Swing the carbon fiber pole, until the electronic bubble is centered, the bubble will turn to green color from red in the meantime, and you can collect the points now.



Not level



Level

Figure 3-16

§3.3.4 Tilt survey

Galaxy G1 supports tilt survey function, but you need acceleration calibration and magnetic calibration before use.

1. Acceleration calibration

Get into calibration interface by clicking on calibration setting button on the top of the screen. See the picture as following.

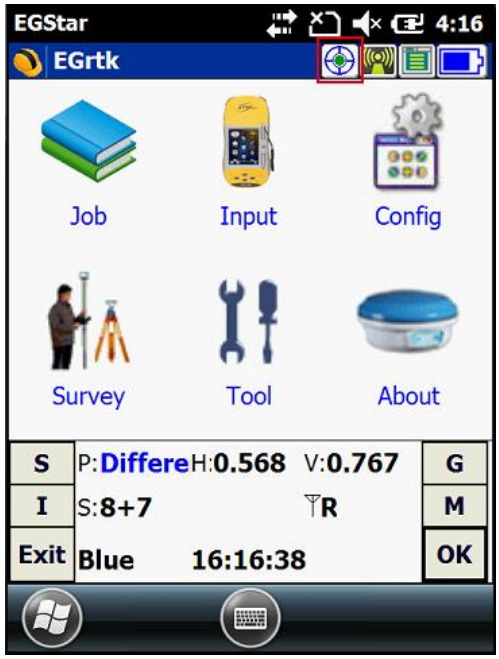


Figure 3-17 Main interface

Click “Acceleration” in the calibration setting interface,

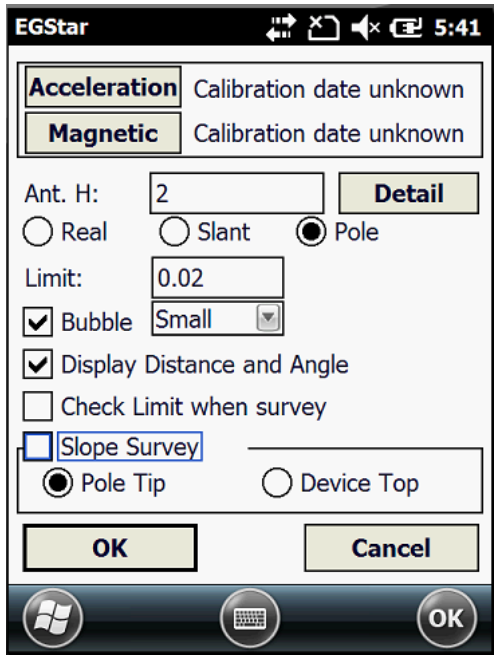
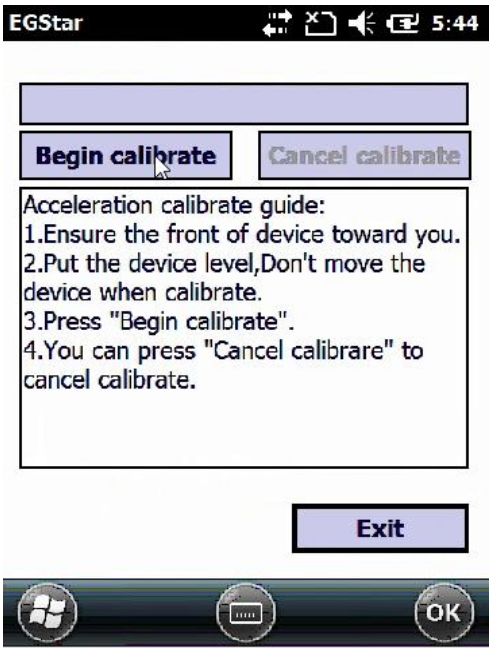
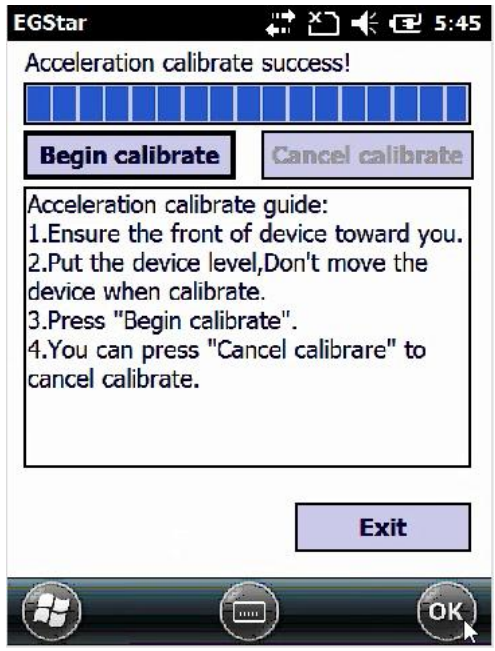


Figure 3-18 Calibration setting

In the acceleration calibration interface, make sure the device is level, hold and click “Begin calibrate” start to calibrate, until it’s finished.



Calibrating



Calibrated

Figure 3-19

2. Magnetic calibration

In the calibration setting interface, click “Magnetic” to enter the magnetic calibration interface.

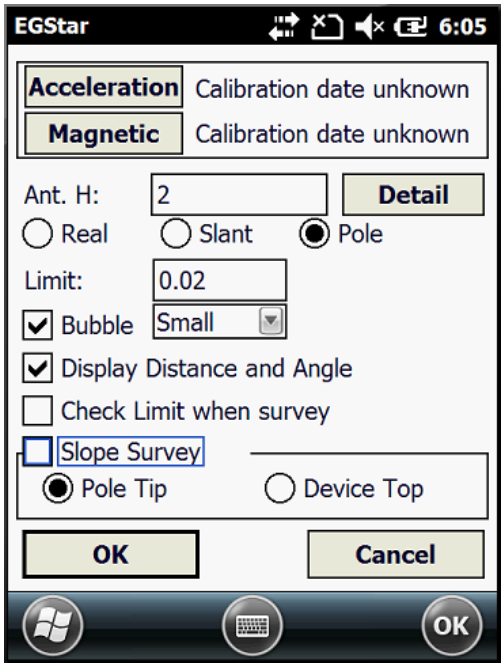
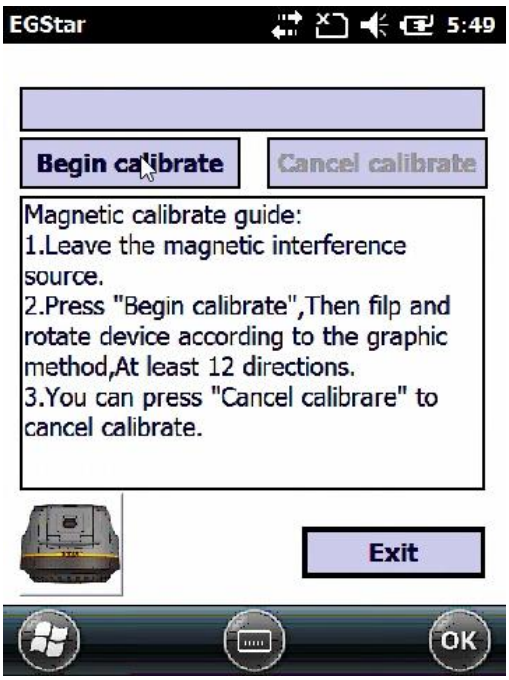
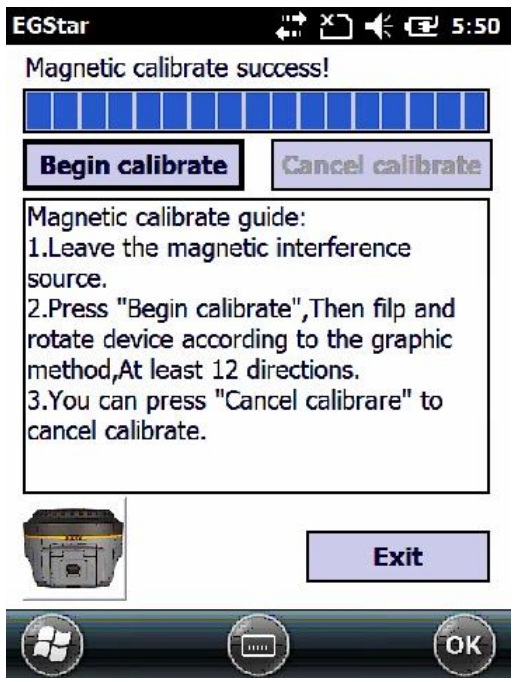


Figure 3-20 Calibraton setting

In the megnetic calibration interface, click “Begin calibrate”, then flip and rotate the G1 according to the sketch map on the left bottom of the screen (you can also draw “∞” after G1 is connected to the carbon fiber pole), until the calibration is finished 100%.



Calibrating



Calibrated

Figure 3-21

3. Tilt survey

After you finish the calibration, you can start tilt survey, this function can correct the slant coordinates to the normal coordinates within 30° angle of inclination.

§3.4 The antenna height measuring

The antenna height is related to static operations and RTK operations, the following is the introduction separately.

Antenna height is actually the vertical height of the phase center to ground

measurement point, measurement methods of antenna height in dynamic mode includes pole height, vertical height and slant height;

- **Pole height**: the height of the centering pole, which can be read from the pole scale;
- **Vertical Height**: the vertical height from the ground to the bottom of the main mainframe + antenna phase center to the bottom of the mainframe;
- **Slant height**: measure to the middle of the rubber ring, In the hand-held software, select the antenna height mode to the slant height, then input the value;

Static mode antenna height measurement: measure from the ground to the middle of the mainframe rubber ring; select the appropriate type of antenna in the post-processing software.

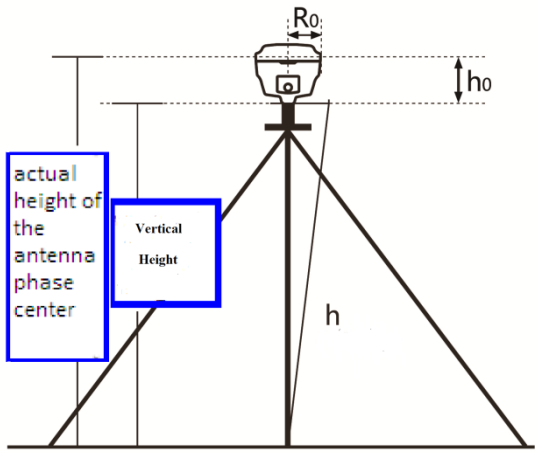


Figure 3-22

Chapter 4 Connecting to PC

Reading this chapter, you can grasp in detail how to connect Galaxy G1 to the computer for data transfer, and the mainframe setting.

§4.1 Mainframe data transfer

The receiver document management of Galaxy G1 uses U disc storage, plug and play, does not need to download the program, directly drag and download. The multi-function data cable is used to download, connect one end to USB, the other end to the 7-pin socket at the bottom of the mainframe. After connected, there will be a new drive on the computer, like a flash disk, can copy the appropriate file directly.

Figure 4-1

Open the "Removable Disk" you can see the data and system files in the mainframe memory

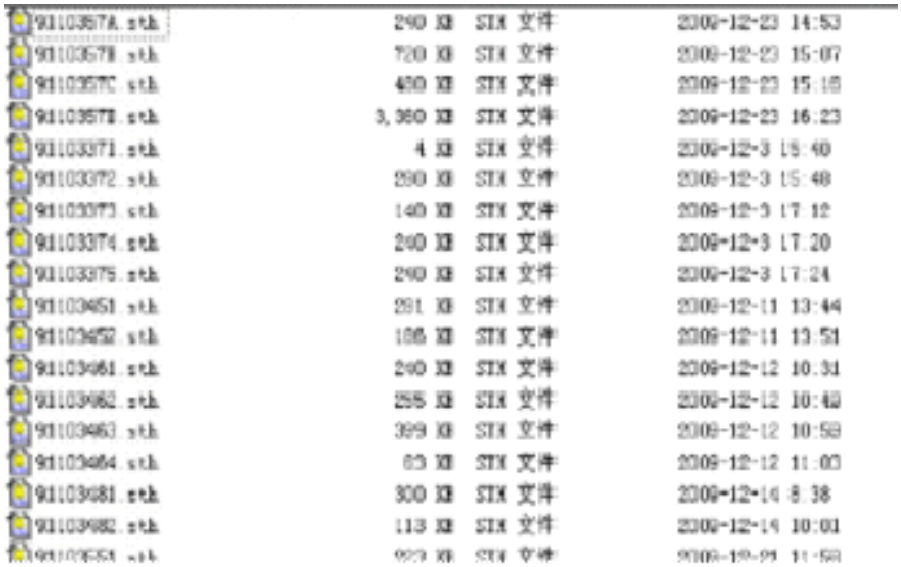


Figure 4-2

As shown in figure, STH file is the data files acquired by Galaxy G1 mainframe, the modification time is the end of the data collection time. The original files can be copied directly to the PC, you can also download INStar to copy data to PC, using the INStar software to modify the file name and the antenna height, and the next section will introduce the INStar in detail.

§4.2 INStar Operation

INStar is a multi-functional setting tool, which can perform data transfer, firmware upgrades, parameter settings, radio settings, network settings, mainframe register. This tool is simple and easy.

Install INStar to the computer

- Perform “Data Output” and “Parameter settings” via USB port；
- Via serial port, the function options are “Radio Settings, Network Settings, Receiver Register. Both can do firmware upgrades;

✧ ***Important Note***

When using USB, you must open INStar first; otherwise it cannot connect to the mainframe!

INStar is software to help you configure RTK, to communicate INStar with receivers, you need L997Y \L797Y cable (depends on the receiver) to connect receivers along with PC.

There are 6 functions.

Figure 4-3

Data Output: to copy static data from receiver (USB port);

Firmware Update: to upgrade firmware for receiver (COM port);

Parameter Setting: to configure some basic collection parameters of receiver (USB port);

Radio Setting: to configure radio module of receiver (COM port, radio direct-on mode);

Network Setting: to configure network module of receiver (COM port, network direct-on mode)

Receiver Register: to input register code (COM port);

§4.2.1 Data Output

Power on G1 receiver and run INStar program first, and then connect it to PC with L797Y USB port, the receiver type and SN will show at the bottom.

Figure 4-4

Go into **Data Output**, you can see the data stored in the receiver. Select the data you need and output target, then you can output the data in STH format or in Rinex format.

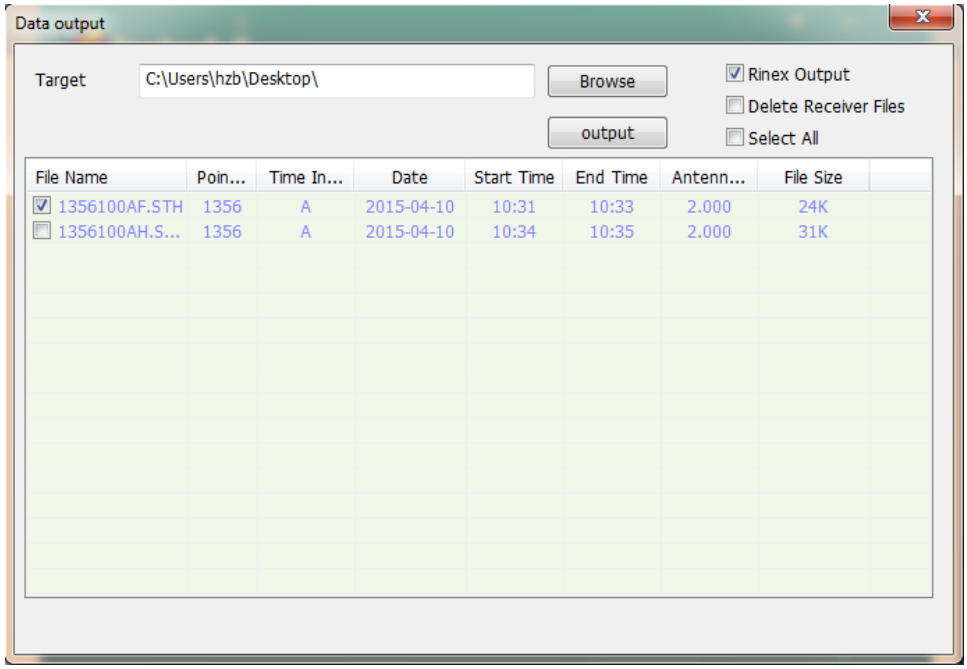


Figure 4-5

§4.2.2 Firmware update

Power off the receiver and connect it to PC with L797Y COM port

Click **Browse** to find the update firmware

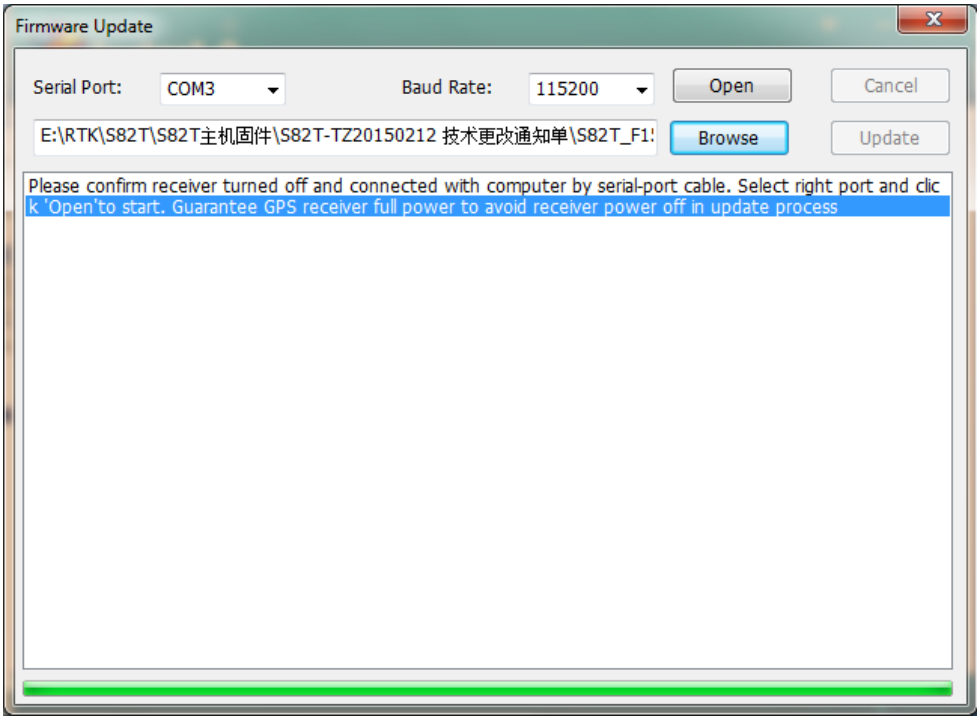


Figure 4-6

Select the right port and baud rate 115200, click on **Open** button, then power on the receiver according to the prompt message in message box.

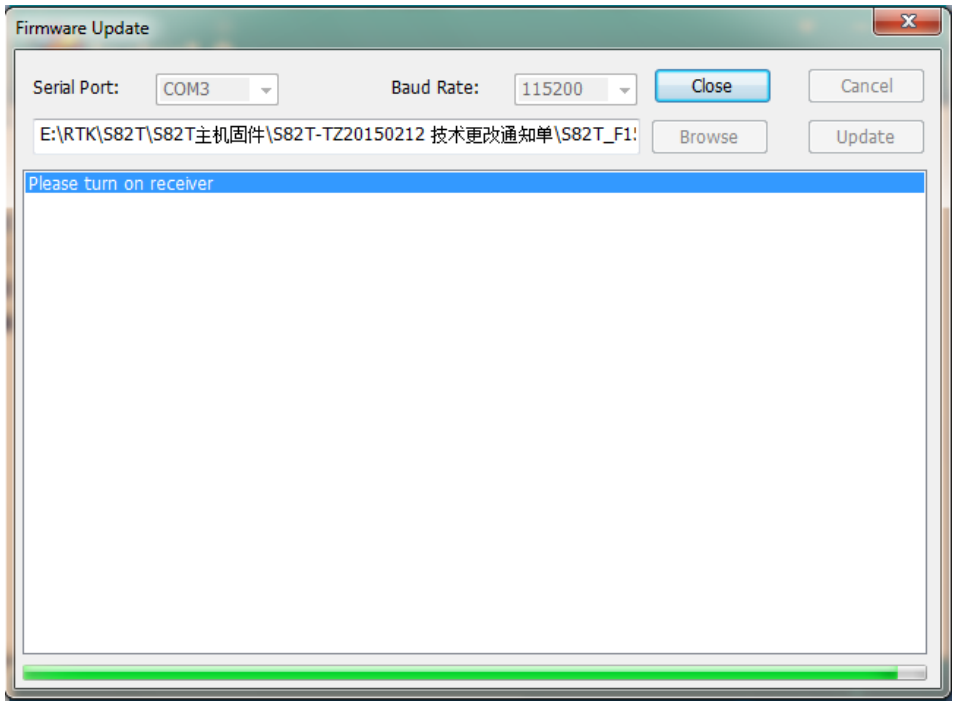


Figure 4-7

At this moment, you can see the progress bar grows up during the programming.

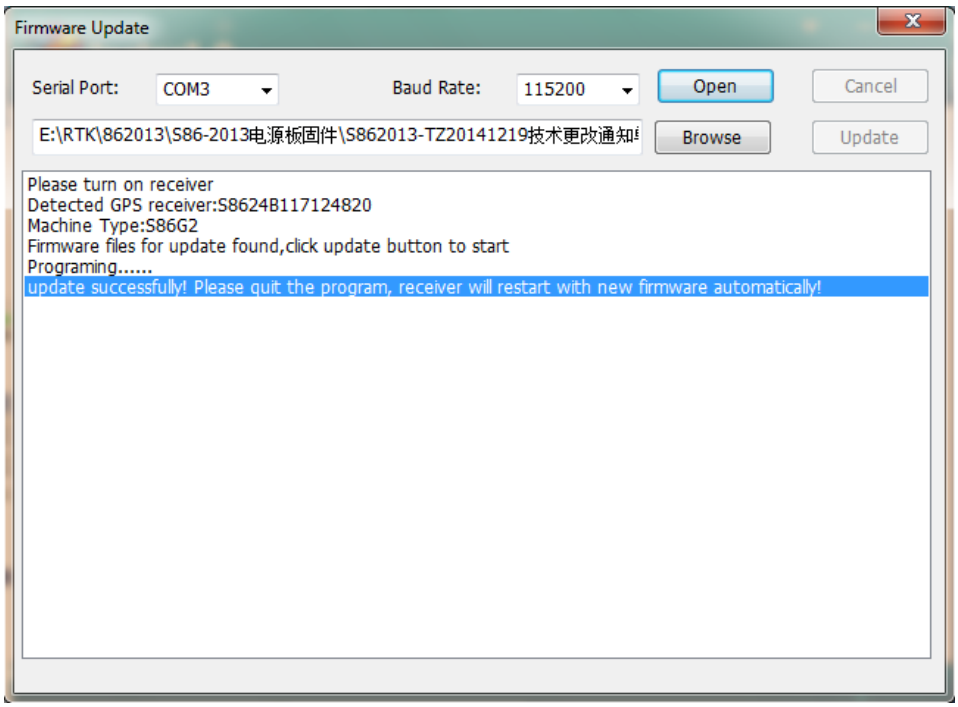


Figure 4-8

After finishing update the firmware, the receiver will restart automatically.

§4.2.3 Parameter setting

As the same with operating on data output, power on the receiver and run INStar program first, then connect it with L797Y USB port

In **Parameter Setting**, you can edit the mask angle and sample interval in static survey and differential message type, data link, whether to record raw data in dynamic survey.

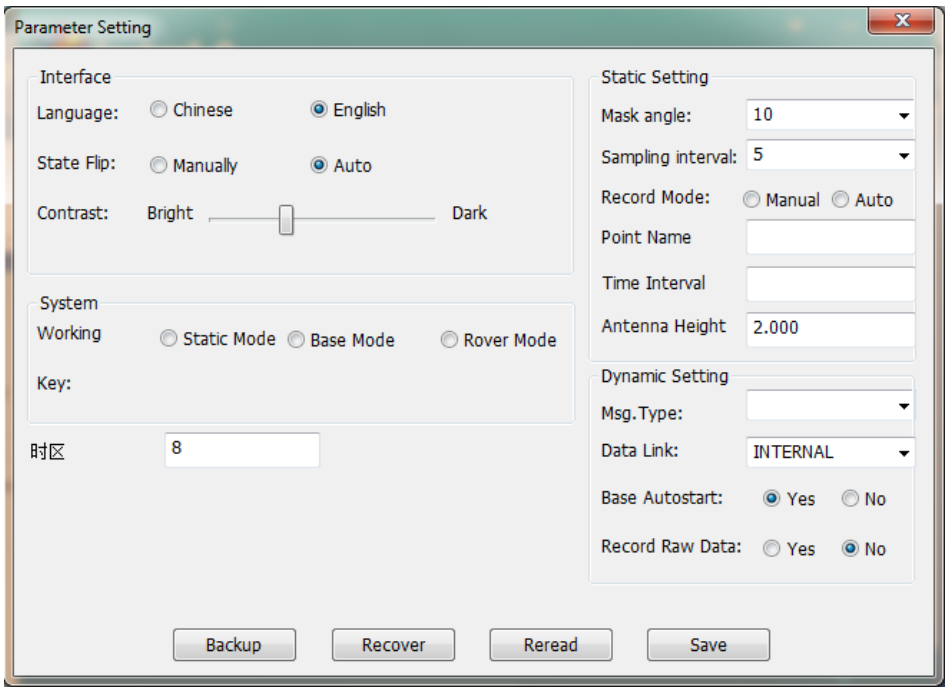


Figure 4-9

§4.2.4 Radio setting

Power on the receiver and switch it to radio mode, connect to PC through L797Y COM port, select the right port and baud rate 19200, then click on **Open** button you can read the radio frequency and current channel, switch channel, setting configuration.

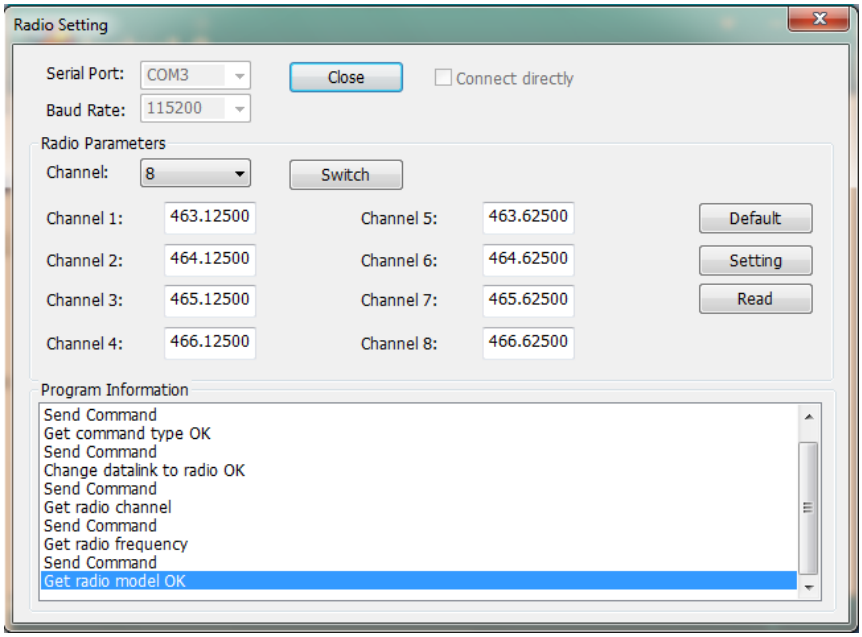


Figure 4-10

§4.2.5 Receiver register

Power on the receiver and connect to PC with L797Y COM port, and then input register 36 bits code directly

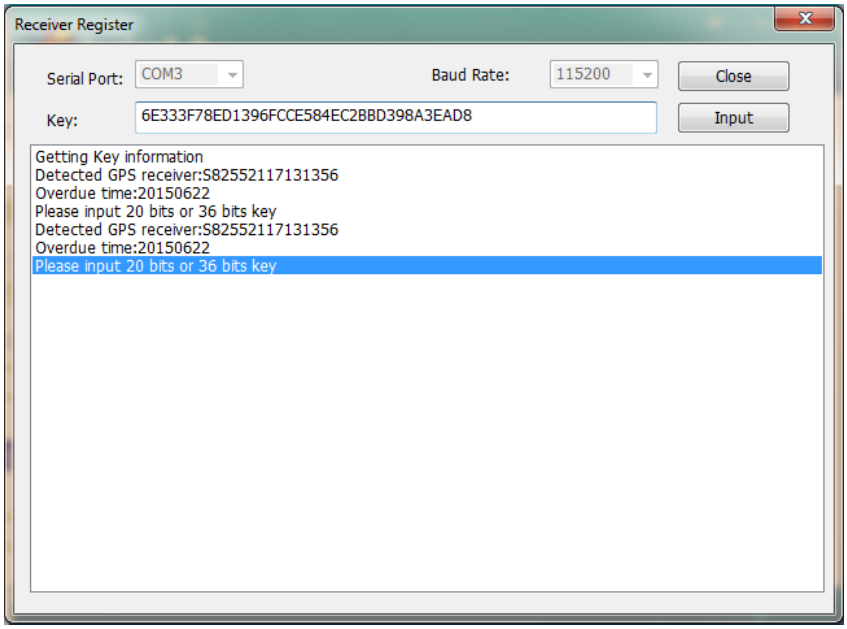


Figure 4-11

Appendix A Galaxy G1 main technical specifications

GNSS features	
220 channels	
GPS	L1C/A、L1C、L2C、L2E、L5
GLONASS	L1C/A、L1P、L2C/A、L2P、L3
SBAS	L1C/A、L5（for SBAS satellite supporting L5）
Galileo	GIOVE-A and GIOVE-B、E1、E5A、E5B
The whole constellation receiver technology ,support all existing and planned GNSS constellation signals	
Highly reliable carrier tracking technology, greatly improves the accuracy of the carrier, to provide users with high-quality original observation data	
intelligent dynamic sensitivity positioning technology, adapt to a variety of environmental transformation, suitable for worse, more long-range positioning environment	
High-precision positioning processing engine	
Intelligent solutions	
Positioning output frequency	1Hz~50Hz
initialization time	<10 sec
Initialization reliability	＞99.99%
Data Format	
Differential format support	CMR、CMR+、CMRx、RTCM2.1、RTCM2.2、RTCM2.3、RTCM3.0、RTCM3.1,RTCM3.2
Output format support	NMEA 0183、PJK Horizontal coordinates, binary code
GPRS support	VRS、FKP、MAC，support NTRIP
Accuracy specifications	
Static Horizontal accuracy	2.5mm+0.5ppm RMS

Static vertical accuracy	5mm+0.5ppm RMS
RTK Horizontal accuracy	8mm+1ppm RMS
RTK vertical accuracy	15mm+1ppm RMS
Code differential positioning accuracy	0.45m（CEP）
Stand-alone positioning accuracy	1.5m（CEP）
Data link communication	
Built-in transmitting Radio	South transceiver built-in radio, typical operating distance of 5km
UHF data link	South high-end radio module, SMT assembly, high integration, and enhance the operational distance of the radio. Support, TrimTalk, PCC EOT, South protocol.
GPRS data link	GPRS (3G) network communication module, Internationally accepted, automatic landing network, compatible with various CORS system access
External data link	Optional external GPRS dual-mode communication module, free to switch to adapt to various work environment
Bluetooth	Support Bluetooth 4.0 standard, 2.1 + EDR standard
Data storage	
4G solid-state flash memory +4G SD card (expandable), data dual card backup	
High-speed USB plug-and-play without installing drivers, directly connect a computer to transfer data	
Input and output interfaces	
One external UHF/GPRS antenna interface	

One five-pin differential data port	
One7-pin data transmission port	
Electrical, physical characteristics	
Battery	Single battery capacity 3400mAH ,standard two batteries
Voltage	7.4V
power consumption	2W
Mainframe size	Diameter 129mm, height 112mm
weight	0.97kg（battery included）
Operation interface	
Button operation	Visualization, convenient
Indicator	3 indicators
Environmental Characteristics	
waterproof	IP67 standard, protect from temporary immersion to depth of 1m
dustproof	IP67 standard, protect from dust
shockproof	Survive a 2m free drop
Operating temperature	－45℃~60℃
Storage temperature	－55℃~85℃

Table 4-1 specifications

Appendix B GDL-20 radio technical specifications

General specifications	
Frequency bands	450-470MHz
Channel interval	0.5MHz
Channel transfer rate	19200bps
Channel number	8
Frequency Stability	±2.0ppm
Modulation mode	GMSK
Antenna impedance	50Ω
Ambient temperature	-25°C～60°C
Humidity	10-90% relative humidity, non-condensing
Receiver Specifications	
Receiver sensitivity	≤0.25μV(12dB SINAD)
Adjacent Channel Selectivity	≥65dB
Modulation signal frequency deviation	≤±5.1KHz
Intermodulation Rejection Ratio	≥65dB
Audio distortion	≤3%
Transmitter indicators	
RF output power	10W/25W Switchable
Adjacent Channel Rejection Ratio	≥65dB
Spurious frequency components	≤4μW
Residual FM	≤-35dB
Remaining AM	≤2%
Carrier frequency modulation mode	TWO PIN
RS-232 interface	

rate	19200bps can be set
Data stream	1 start bit, 8 data bits, no parity (parity bit can be set), 1 stop bit
power	DC power supply
voltage	12-15V, the typical of 13.8V, the voltage of the power supply will affect the size of the RF power of the transmitter
Power consumption	
Receiver standby current	≤100mA
The machine operating current of the transmitter	8A
voltage	13.8V
power	15W/25W

Table 4-2

Appendix C Technical Terms

Ambiguity: unknown quantity is the integer number of cycles of the carrier phase measured from the satellite to the receiver.
Baseline: The connection line of the two measurement points, on which to receive GPS signals and collect observation data simultaneously.
Broadcast ephemeris: message released by the satellite demodulator satellite orbit parameters.
SNR (Signal-to-noise ratio): an endpoint signal power to noise power ratio.
Cycle skipping: interfere loop skips a few cycles from a balanced point, and stabilize in the new equilibrium point, this make the phase integer number of cycles to generate an error.
Carrier: As the carrier, Frequency, amplitude or phase modulation of the modulated wave by a known reference value.
C / A code: GPS coarse / acquisition code, modulate the pseudo-random binary code for the 1023 bit duplex, the bit rate of which is 023MHz, and code repetition period of 1ms.
Difference measurement: GPS measurements employ cross-satellite cross-receiver and cross-epoch.
Difference Positioning: the method of determining the relative coordinates between two or more receiver by tracking the same GPS signal.
Geometric dilution of precision: Describe the contribution of satellite geometry errors factor in dynamic positioning
Eccentricity: $e=\sqrt{\frac{a^2-b^2}{b^2}}$ where a, b of the semi-major axis and semi-minor axis.
Ellipsoid: mathematical graphics formed when an ellipse moves around the minor axis of rotation in Geodetic Survey.
Ephemeris: the position of celestial bodies over time parameters.
Flattening: $f=\frac{1}{a}(a-b)=1-\sqrt{(1-e^2)}$
a is the semi-major axis, b is the semi-minor axis, e is the eccentricity.
Geoid: similar to the mean sea level and extends to the mainland special planes. Geoid everywhere perpendicular to the direction of gravity.
Ionosphere delay: delay of radio waves through the ionosphere (non-uniform dispersion medium)

L-band: The radio frequency range of 390-1550MHz.

Multipath error: the positioning error caused by the interference between two or more radio signal propagation path.

Observing session: the use of two or more receivers at the same time to collect GPS data period.

Pseudo Range: GPS receiver in the time required to copy the code aligned with the received GPS code offset and multiplied by the speed of light to calculate the distance. This time offset is the difference between the signal reception time (time series of the receiver) and the signal emission time (satellite time series).

Receiver channel: GPS receiver RF mixer and IF channel, can receive and track satellites two carrier signals.

Satellite configuration: the configuration status of the satellite with respect to a specific user or a group of users within a specific time.

Static position: do not consider the point of measurement of the movement of the receiver.

FCC Statement

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

-- Reorient or relocate the receiving antenna.

-- Increase the separation between the equipment and receiver.

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

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

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions:

(1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

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

This equipment is in compliance with the essential requirements and other relevant provisions of Directive 1999/5/EC.

Use the GNSS RECEIVER in the environment with the temperature between -45°C and 60°C.

CAUTION: RISK OF EXPLOSION IF BATTERY IS REPLACED BY AN INCORRECT TYPE. DISPOSE OF USED BATTERIES ACCORDING TO THE INSTRUCTIONS.

The device complies with RF specifications when the device used at 0cm from the user's body

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