SinoGNSS®
By ComNav Technology Ltd.

T300 GNSS Receiver

User Guide

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Corporate office

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Trademark notice

FCC Notice

SinoGNSS® T300 GNSS receivers comply with the limits for a Class B digital device, pursuant to the Part 15 of the FCC rules when it is used in the Portable Mode.
Operation is subject to the following two conditions:
(1) This device may not cause harmful interference;
(2) It must accept any interference received, including interference that may cause undesired operation.

Copyright Notice

Technical Assistance

If you have any question and can't find the answer in this manual, please contact your local dealer from which you purchased the T300 receiver. Alternatively, request technical support from ComNav Technology Website: *www.comnavtech.com* or technical support email: *support@comnavtech.com*. Your feedback about this Guide will help us to improve it with future revisions. Please email your comments to: *support@comnavtech.com*.

Safety Information

Before using the receiver, please make sure that you have read and understood this user Guide, as well as the safety requirements.

- Connect your devices strictly based on this User guide
- Install the GNSS receiver in a location that minimizes vibration and moisture
- Avoid falling to ground, or colliding with other items

- Do not rotate 7-pin Lemo port
- Do not cover the radio, keep a sound ventilation environment
- To reduce radiation, please keep above 2 meters away from the radio station
- Take lighting protection measures when installing antennas
- Change the cable if damaged

Related Regulations

The receiver contains integral Bluetooth® wireless technology and UHF. Regulations regarding the use of the datalink vary greatly from country to country. In some countries, the unit can be used without obtaining an end-user license. But in some countries the administrative permissions are required. For license information, please consult your local dealer.

Use and Care

The receiver can withstand the rough treatment that typically occurs in the field. However, the receiver is high-precision electronic equipment and should be treated with reasonable care.

Warning and Caution

An absence of specific alerts does not mean that there are no safety risks involved. A Warning or Caution information is intended to minimize the risk of personal injury and/or damage to the equipment.

WARNING-A Warning alerts you to a potential risk of serious injury to your person and/or damage to the equipment, because of improper operations or wrong settings of the equipment.
CAUTION- A Caution alerts you to a possible risk of damage to the equipment and/or data loss.

Warranty Notice

ComNav Technology does not warranty devices damage because of force majeure (lighting, high voltage or collision).
ComNav Technology does not warranty the disassembled devices.

CONTENTS

1 Introduction

The SinoGNSS® T300 GNSS Receiver User Guide is aimed to help you get familiar with the T300 receiver and start your project effectively. We highly recommend you to read this manual before surveying, even though you have used other Global Positioning System (GPS) receivers before.

1.1 About the receiver

With SinoGNSS® QUAN™ algorithm, T300 GNSS receiver can be applied in RTK mode with all GNSS constellations. T300 receiver has ultra-small size and strong anti-interference ability to make it possible to work even in harsh environments. It is the ideal RTK/GNSS product for surveyors.

1.2 Receiver Features

The SinoGNSS® T300 GNSS Receiver key features:

- Ultra small and super light
  - Size (W × H): 15.8cm × 7.5cm
  - Weight: 0.95kg (including 2 batteries)
- 256 channels of simultaneously tracked satellite signals
- Increased measurement traceability with SinoGNSS® QUAN™ algorithm technology
- Hot swap battery design
- Cable-free Bluetooth wireless technology
- Keypad with on/off buttons and LED indicators for power, radio, Bluetooth, and satellite tracking
- IP67 waterproof
- Full base/rover interoperability
- Integrated receiving & transmitting radio
- Integrated 3G module, support Ntrip and Point to Point/Points protocols
- Support long baseline E-RTK™ (Beidou B3 signal is included in RTK calculate engine)

1.3 T300 Receiver parts list

This section provides overall T300 receiver parts list, including basic supplies and customized kits based on your requirements.

1.3.1 Basic Supply kit

SinoGNSS® T300 GNSS Receiver Basic Supply kit contains two receivers and related accessories.

Item	Picture
2* Kits T300 Receivers	
1*GNSS Connector	
2*7-pin Lemo to RS232 Cable	
2* 7-pin Lemo to USB Cable	
External Power Cable	
2* Whip Antenna (UHF)	
1*2m-Range Pole with yellow bag	
4* Lithium-ion Battery	

2* Battery Charger	
ALL STAR Controller (with battery and TF card inside)	
USB Data Cable of Controller	
Controller Charger and Cable	
Controller Bracket	

Optional accessories:

Double Bubbles Tribrach with High Adapter	
1* 30cm Extension bar	

1.3.2 Optional Datalink kit

This kit is necessary for long distance radio communication, shown in the following figures:

Item	Picture
External Radio	

PDL to T300 Datalink cable	
Configuration cable	
Datalink Antenna	
External Power Cable	
Aluminum Bracket	
Extension Bar	

1.3.3 Transport Cases

Standard transport Case is designed for containing Basic supply kit of one SinoGNSS® T300 GNSS Receiver.

Base

Rover

The optional choice is provided to have capacity of two kits of T300 receivers.

2 Setting up the receiver

This chapter provides general information on environmental requirements, setup, power supply and connection of the T300 receiver.

2.1 Environmental requirements

To keep the receiver with a reliable performance, it is better to use the receiver in safe environmental conditions:

- Operating temperature: -40°C to +65°C
- Storage temperature: -45°C to +85°C
- Out of corrosive fluids and gases
- With a clear view of sky

2.2 Front panel

Receiver front panel contains five indicator light emitting diodes (LEDs), Power button and record button. The indicator LEDs show the status of power, radio, satellite tracking, Internal 3G and Raw Data Recording. For detailed information, see *chapter 3.2*.

2.3 Lower housing

Receiver lower housing contains a serial port, UHF radio antenna connection, two removable battery compartments (slots for SIM and memory card are located inside of battery compartment A), and a threaded insert.

2.4 Power supply

T300 GNSS receiver supports internal batteries and external power input.

2.4.1 Internal batteries

The receiver is equipped with two rechargeable Lithium-ion batteries, which can be removed for charging. The T300 receiver adopts the hot swap battery design that provides you an effective survey workflow. The internal batteries typically provide about 8-hour operating time as a rover, and about 3.5-hour operating time if operated as a base station with internal UHF Tx (transmit at 1-2 watts). However, this operating time varies based on environmental conditions.

- Battery Safety

Charge and use the battery only in strict accordance with the instructions below:

- Do not use or charge the battery if it appears to be damaged. Signs of damage include, but are not limited to, discoloration, warping, and leaking battery fluid.
- Do not expose the battery to fire, high temperature, or direct sunlight.
- Do not immerse the battery in water.
- Do not use or store the battery inside a vehicle during hot weather.
- Do not drop or puncture the battery.
- Do not open the battery or short-circuit its contacts.

- Charging the Lithium-ion Battery

Although a dual battery charge is provided, the lithium-ion battery is supplied partially charged. To charge the battery, first remove the battery from the receiver, and then place it in the battery charger, which is connected to AC power. Please obey the following instructions when charging your batteries:

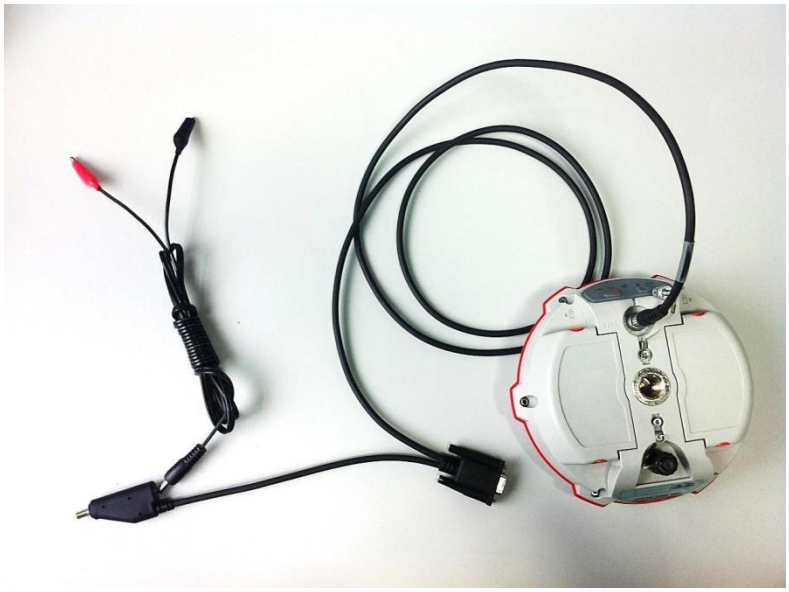
- Charge the battery completely before using it for the first time.
- Fully charge takes approximately 6 hours per battery at room temperature.
- If the battery has been stored for a long time, charge it before your field work.
- Re-charge the battery at least every three months if it is to be stored for long

time.
● Storage of the Lithium-ion Battery – Do not keep batteries inside the receiver if the receiver not used for long time. – Keep batteries in dry conditions. – Take out the batteries from receiver for shipment.
● Dispose of the Lithium-ion Battery – Discharge a Lithium-ion battery before dispose of it. – Dispose of batteries is an environmentally sensitive manner, and adhere to any local and national regulations concerning battery disposing or recycling.

WARNING – Do not damage the rechargeable Lithium-ion battery. A damaged battery can cause an explosion or fire, and can result in personal injury and/or property damage.

2.4.2 External Power Supply

The receiver is connected to an external power supply through a lemo to RS232 cable, and make sure that the red alligator clip is connected to the positive of external power supply, black one to negative. Over-voltage function cannot protect your T300 receiver if reverse connection.



Tip: The power consumption will be increasing if the base station transmits correction data through internal UHF in the RTK mode; therefore, we strongly suggest using external power (7-28 volt DC) for the base station.

2.5 Pole-mounted setup

To mount the receiver on a range pole as the figure shown below:

- Thread the receiver onto the range pole
- Mount the controller bracket to the pole
- Install the controller into the bracket

Tip: Do not tightly clamp the controller on the Range Pole.

3 General Operation

This chapter introduces all controls for the general operation, including button functions and all LED behaviors on the front panel.

3.1 Button functions

There are two buttons on the front panel, power button and record button.

- Power button:

Press the power button for about 1 second to turn on the receiver;

To turn off the receiver, long press the button for 3-4 seconds until all LEDs off.

- Record button:

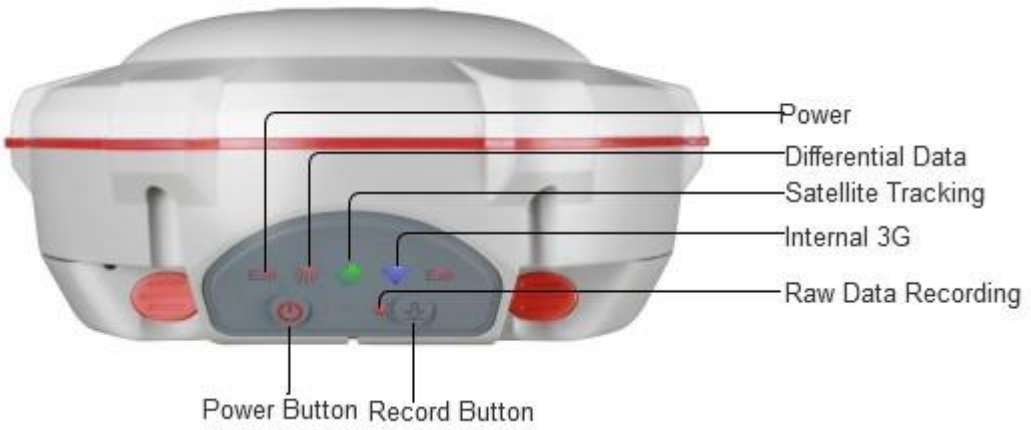
Switch to static mode：Long press the record button for about 2 seconds, release immediately when hearing beep from receiver;

Switch to RTK mode: press the button until Raw Data recording LED off.

Tip: The record button only works when receiving satellite signals

3.2 LED behavior

The LEDs on the front panel indicate receiver working status. Generally, a lit or slowly flashing indicates normal operation, and an unlit LED indicates that no operation is occurring. The following figure and table define each possible LED state:



LEDs	States	Description
Power	Lit	Enough power
	Flashing	Low power
Differential Data	Flashes once per second	Receiving/transmitting differential data
Satellite Tracking	Fast flashing	No satellite received
	Flashes N times every 5 seconds	Received N satellite signals
Internal 3G	Flashes in blue color	GPRS function is working
Raw Data recording	Flashes according to the selected sample interval	1) Sample interval varies from 20Hz to 60s. 2) Flashing 1/s simultaneously with differential light if internal memory is run off

Power LEDs:
Power supply: 1) Two power LEDs are on if using the external power supply; 2) Only power LED of working battery will be on if using the internal battery.
Low battery: 1) Power LED will flash with beep only with one battery; 2) if with two batteries, the power LED of low battery will flash, and swapped to another battery when it is run off.

4 Static survey

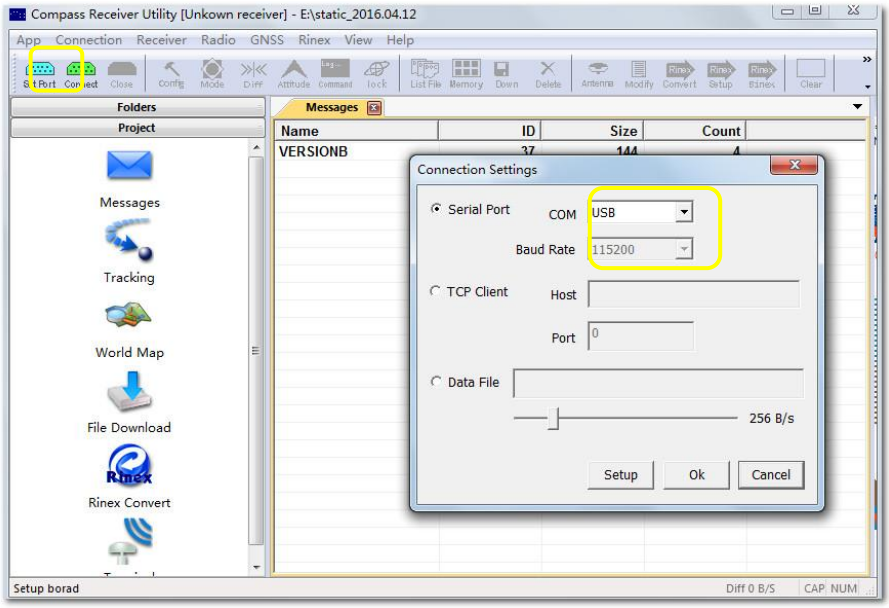
This chapter describes static survey through T300 receiver and CRU software. For static survey, there is no control to change settings through the front panel of T300 receivers, it only can be configured by external software (Compass Receiver Utility): 1) Receiver configurations; 2) check receiver settings and status; 3) save and output raw observation data; 4) convert data into Rinex format.

4.1 Receiver Configuration

1. Download and install CRU software from (ensure the driver is properly installed in your PC):

http://www.comnavtech.com/download.asp?bigclassid=28

2. Connect the receiver and your PC through 7-pin lemo to USB cable.
3. Turn on your T300 receiver and click ***set port*** in CRU -> ***USB*** in the serial port option -> enter proper baud rate -> click ***OK*** to complete receiver connection. The SN of receiver will appear in the title bar if connected successfully.



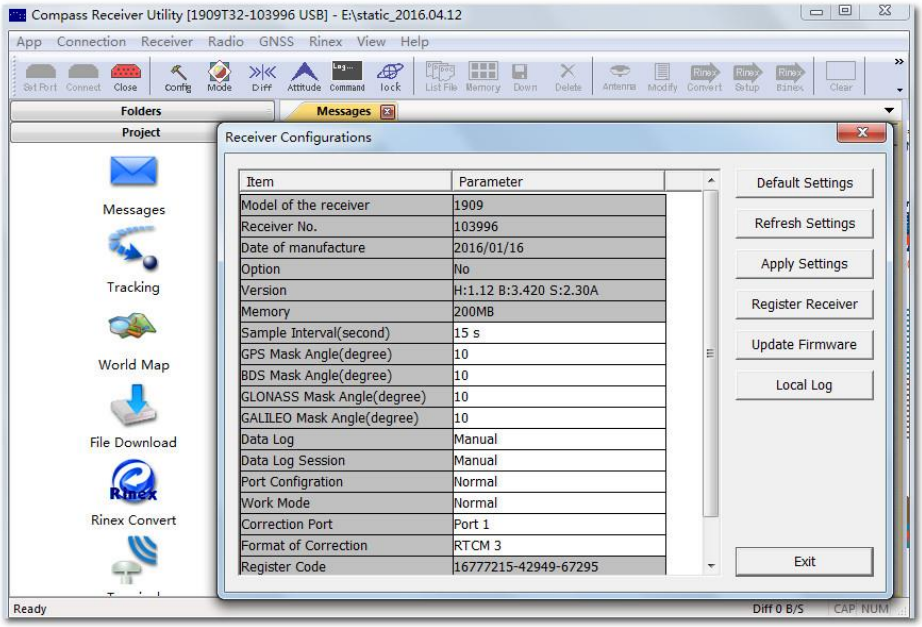
Tips: two types of cable are provided in your package,

1) we recommended use 7-pin Lemo to USB cable to configure the receiver and raw observation data downloading;

2) with 7-pin Lemo to RS232 cable, you can connect T300 receiver with external power or firmware upgrade.

4. Click ***Config*** to configure the receiver:

- **Sample Interval**: change the sample interval of observations, the maximum data rate is 20 Hz, the minimum is one observation per minute.
- **Mask angle**: disable the receiver to track satellites that below the mask angle. You can set mask angle values for different constellations, which can reduce serious multipath influence or low SNR.
- **Data Log**: logging data manually or automatically.
- **Data Log Session**: 1) Manual means that the receiver keeps recording data in one file until the receiver is turned off or its memory runs out; 2) if set to 1\2\3\4\12 hours, the data recorded will be saved in to a file every 1\2\3\4\12 hours.



5. Complete all configurations and click ***Apply Settings*** to save settings. Exit and restart the receiver to activate configurations.

4.2 Static Data Collection

Static survey is mainly used for the control survey. To reach millimeter accuracy, follow guidelines below:

- At least 3 GNSS receivers are required to form a stable triangulation network.
- It is better to set Data Log Session as manual on the known point.
- Power off the receiver before moving to other observation site.
- To quickly post-process static observation raw data, write down the station name, receiver SN, antenna height, start and end time for each observation site.

4.3 Static data management

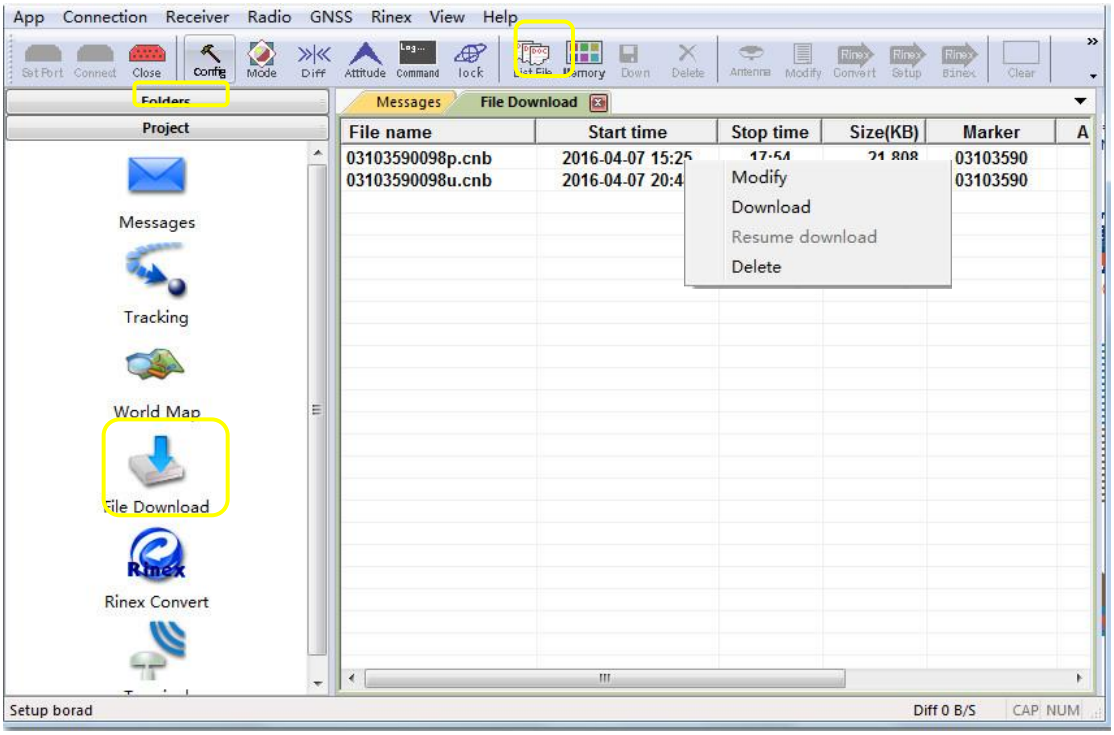
This section consists of raw data download, RINEX format conversion and memory management for T300 receiver.

4.3.1 Raw Data Download

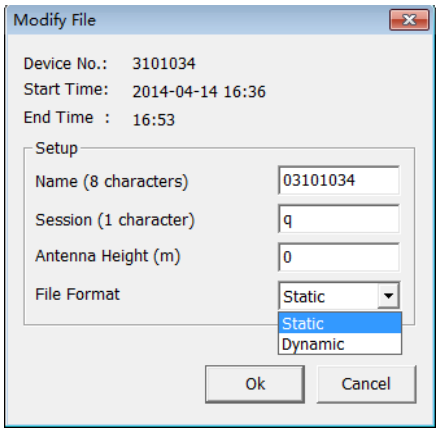
The raw observation data is commonly saved in internal memory of T300 receiver, download data from receiver to your PC through CRU software.

1. Connect the T300 receiver to your PC as described before (*see Chapter 4.1*).
2. Click ***Folders*** to select download path
3. Click ***File Download*** in project menu to check all raw data on main window, or

click ***List File*** to refresh raw data list.



4. Right-click on the file name to modify, download or delete the raw observation data.



- Modify: Only Station Marker and Antenna height can be modified.

- Click ***Download*** to save raw observation data in download path.
- Click ***Delete*** to remove raw data from the receiver.

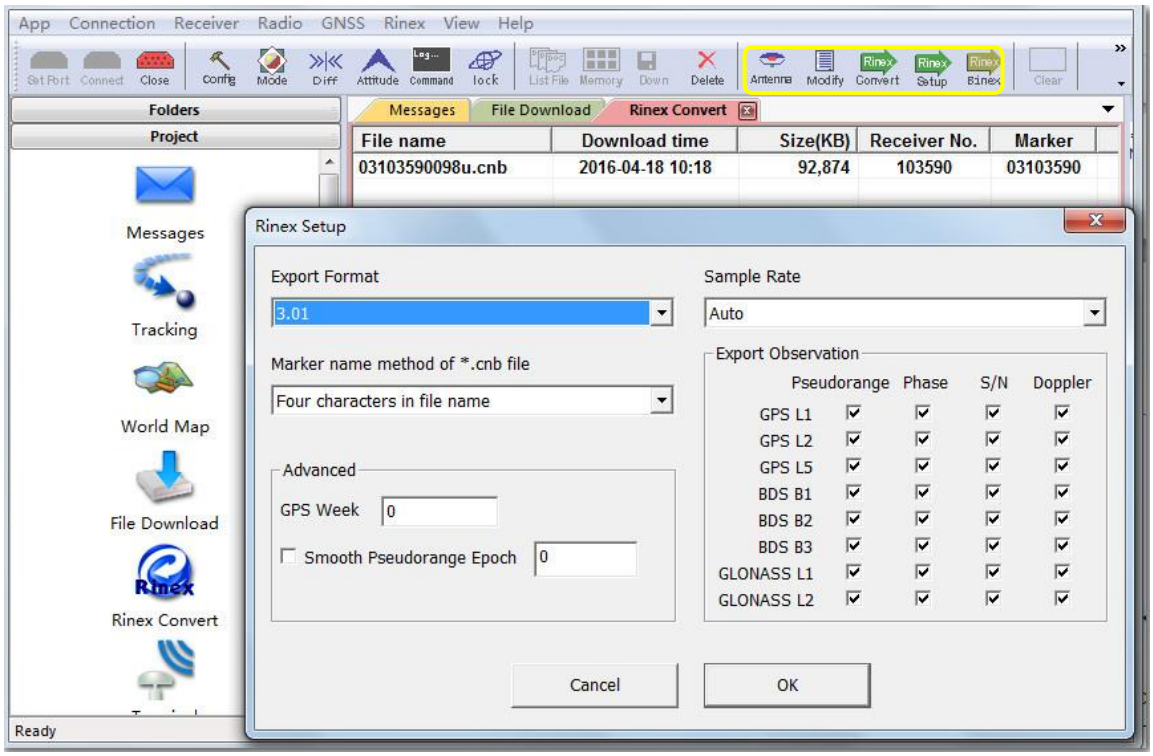
4.3.2 Convert to RINEX

After downloading raw observation data to your PC, go to 

to convert from ComNav binary format (*.cnb) to RINEX.

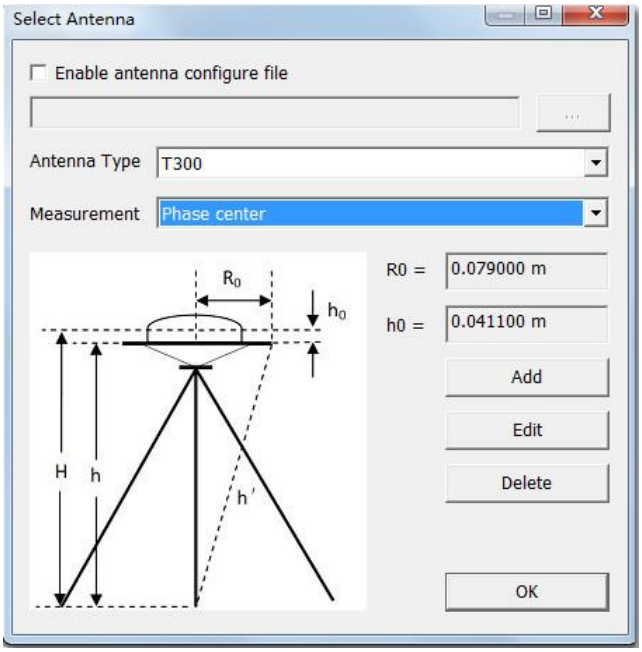
- Click 

in standard toolbar to change Convert Settings, mainly export format and export observation information.



Tip: In some Post Processing software, the BeiDou observations cannot be processed, you can uncheck the BeiDou B1,B2,B3 observations.

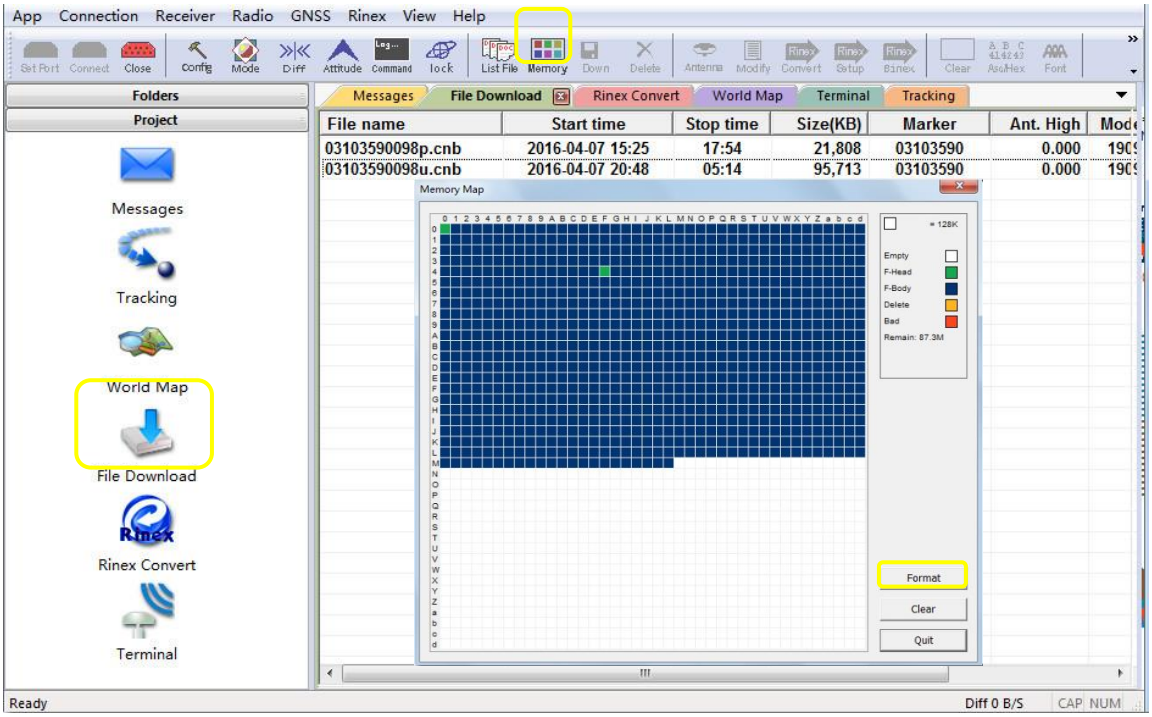
- Click  to select the Antenna Type and Measurement. If you cannot find T300 antenna, 1) input the value of R0 (horizontal offset from measurement mark to phase center) and h0 (vertical offset from measurement mark to phase center), R0 is 0.079m and h0 is 0.0411m respectively for T300 receiver; 2) or check Enable antenna configure file to select ***Antennas.ini*** file to select Antenna type again. You can also add, edit and delete antenna types based on your requirement.



- Then click  to convert to RINEX, the RINEX data will be save in the same path as raw observation data.

4.3.3 Memory Management

The receiver will stop recording raw data if the internal memory runs out, the differential LED and data logging LED will flash simultaneously with 2-second interval. In this case, you need to format the internal memory before starting another static survey, as shown in the following figure.



Tip: 1) long press the power button and the recording button simultaneously to clear internal memory if you are conducting surveys. 2) To download observation data if saved in the

memory card, connect the receiver to your PC through Lemo to USB cable, and copy the data file out.

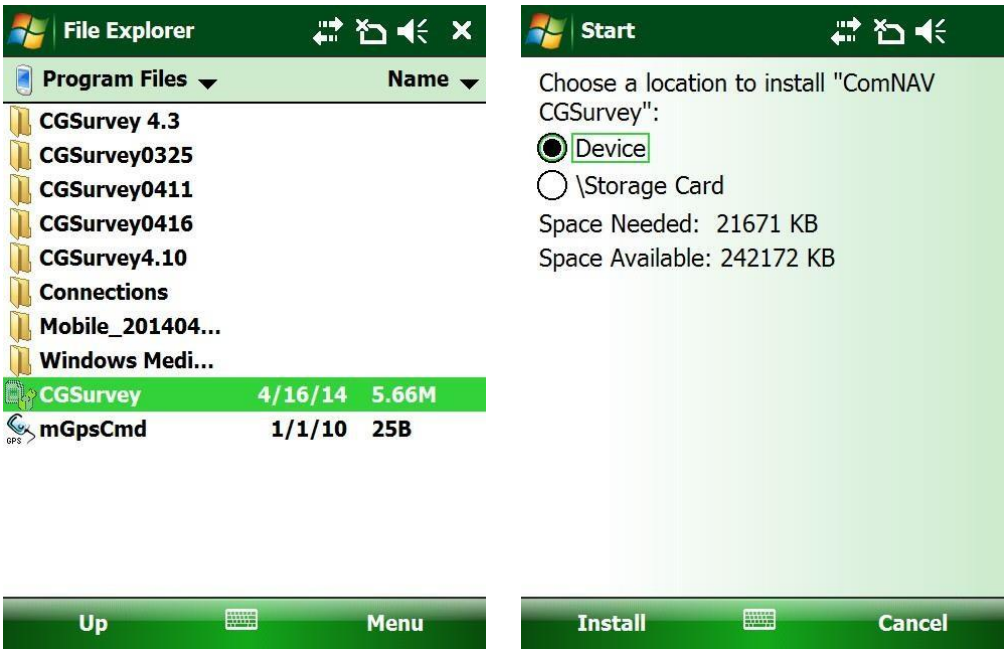
5 Real-Time Kinematic Survey (RTK)

This chapter introduces how to conduct RTK Survey with CGSurvey software, including software installation, start a new project, receiver connection and RTK working modes (radio, CORS and GPRS).

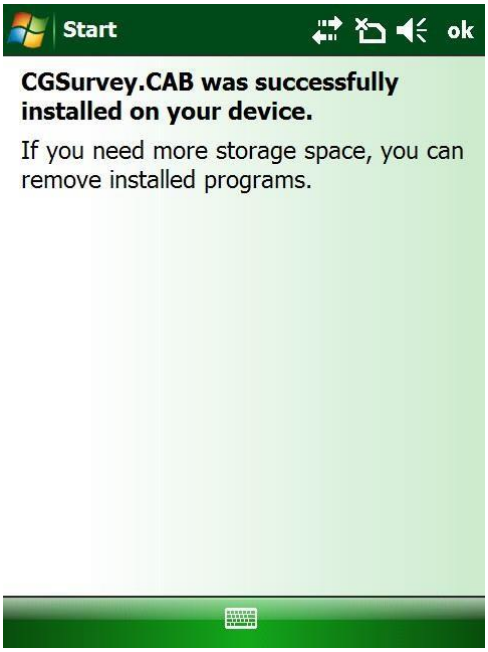
5.1 Installation of CGSurvey Software

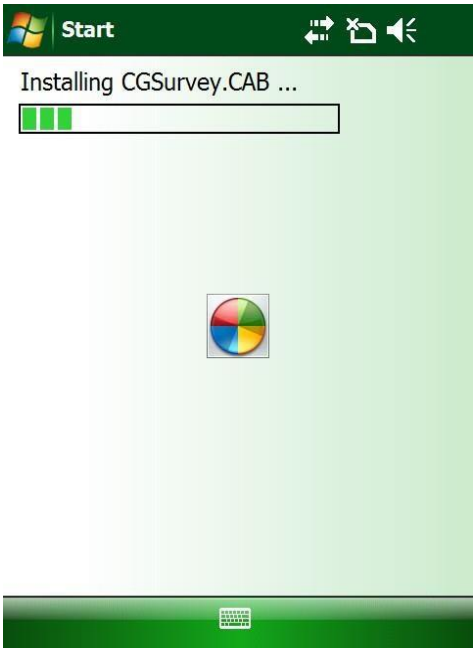
Install Microsoft Windows Mobile Device Center or Microsoft ActiveSync on your PC properly, download via:

http://windows.microsoft.com/en-us/windows/downloads



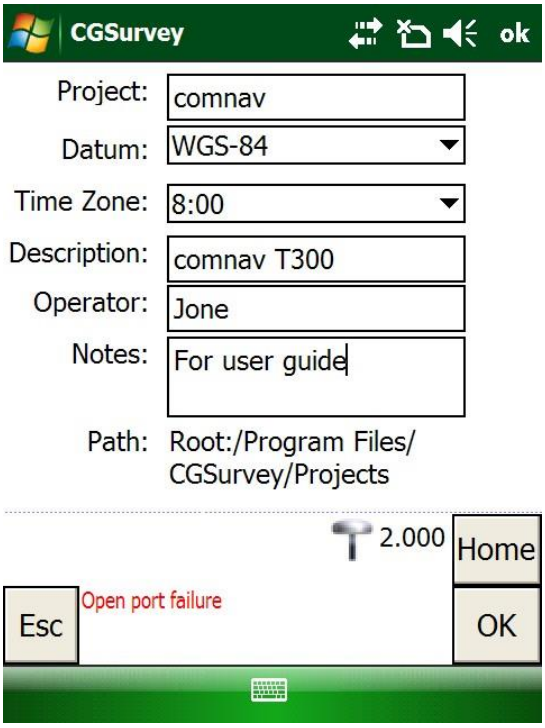
Then, copy the software package to the controller folder, Program Files folder is recommended. Tap ***Start***->***File Explorer***->***Program Files*** in your controller:





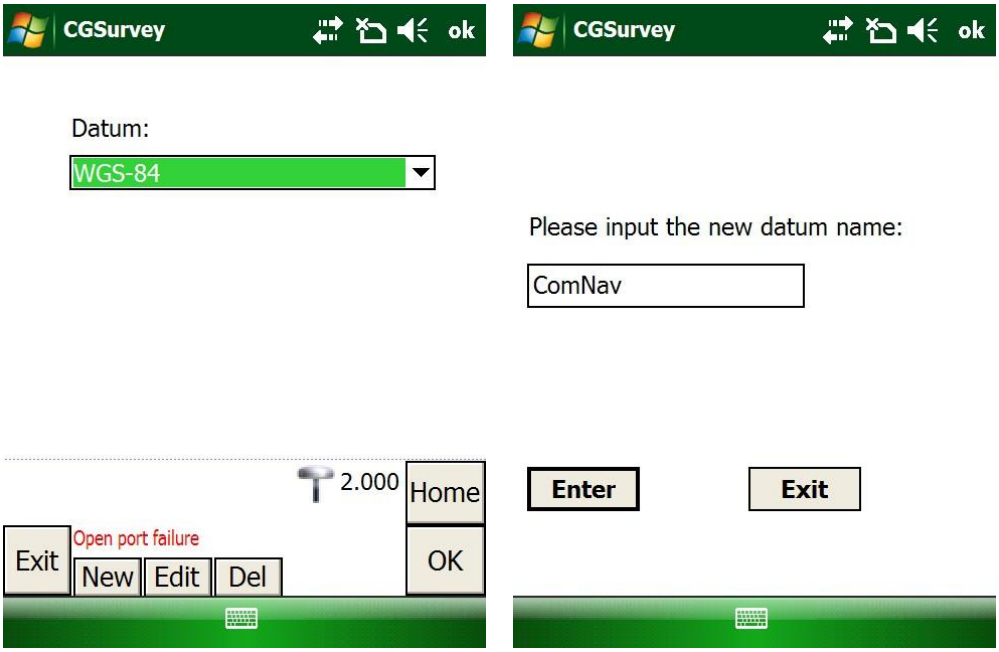
5.2 Start a New Project

1. Click ***Start*** to open CGSurvey, start a new project based on instructions below:

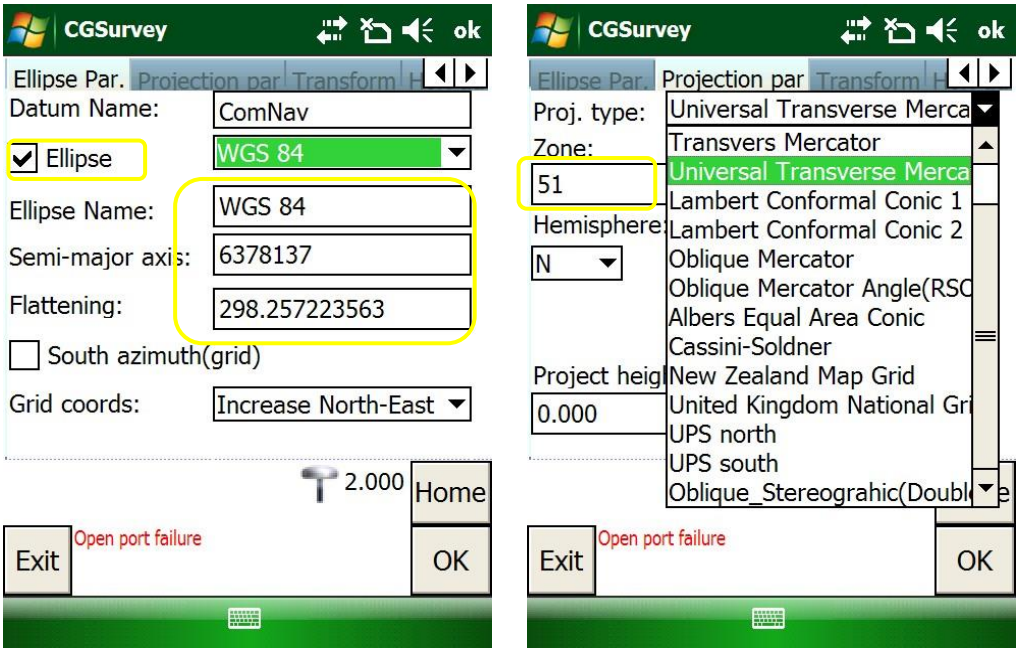


- ***File*** -> ***New Project***, input project name, Datum, Local Time Zone and basic information shown in figure -> ***OK*** to start a new project.

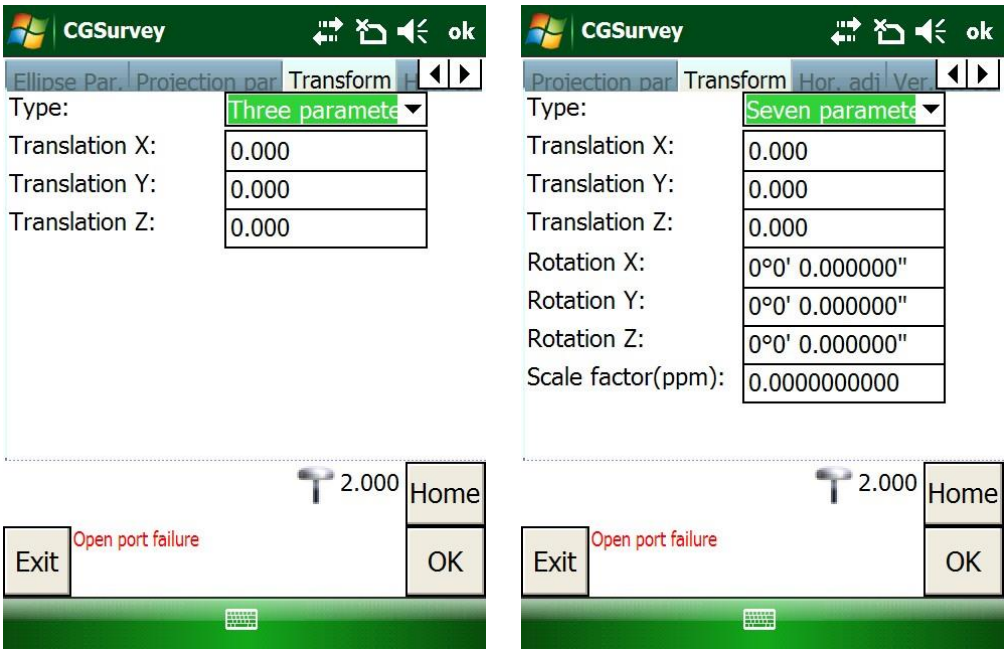
2. To add a new Datum if you cannot find the coordinate system you need. Go to ***Config***->***Datum Manager*** -> click ***New*** and input Datum name.



3. In **Ellipse Par**, select the existing ellipsoid or create a new ellipsoid by inputting parameters; In **Projection par**, choose a proper projection type and input the corresponding parameters.



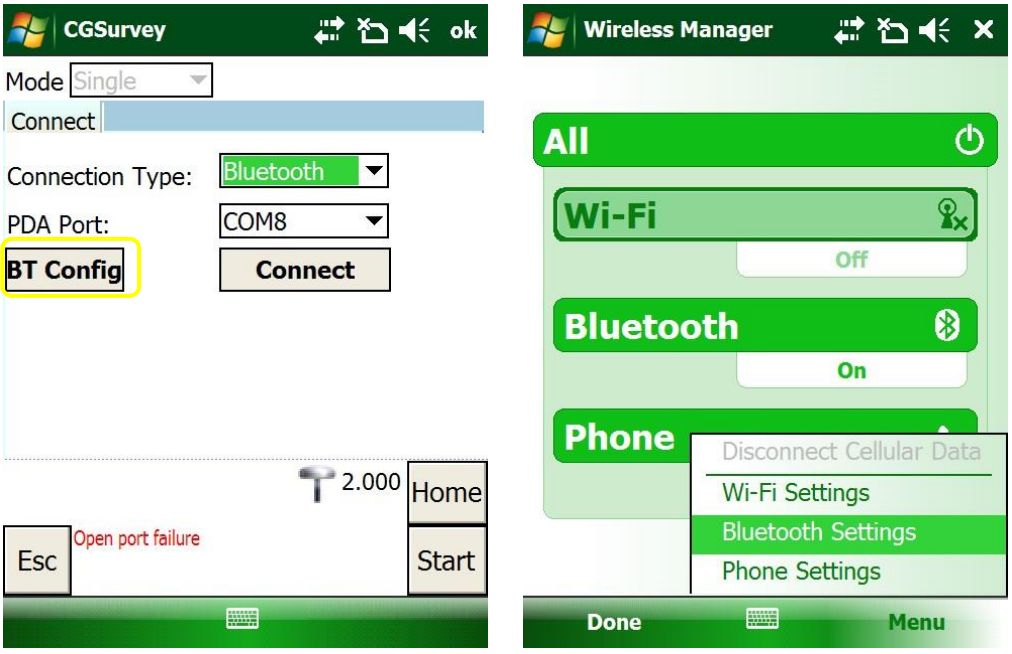
4. To enter 3 or 7 parameters, you have to login as administrator. Go to ***Config*** -> ***Administrator*** -> ***Login*** (user/password: ***admin/admin***).



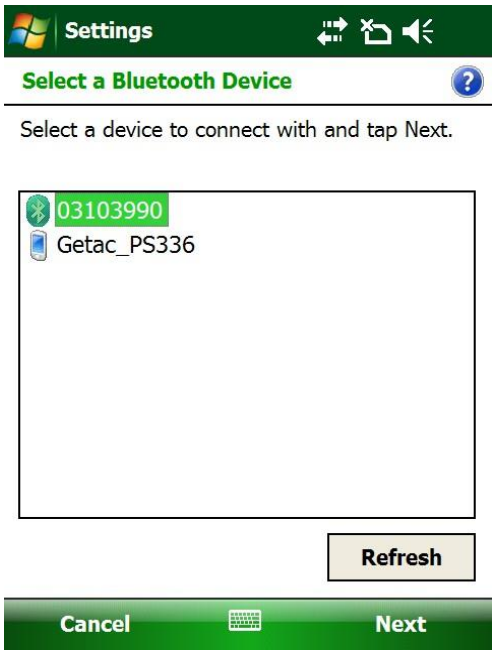
5.For Horizontal and Vertical Adjustment, it will be shown after ***Site Calibration*** (*see chapter 6.5.1*).

5.3 Bluetooth connection

1. To connect your controller to the T300 receiver, click ***Config*** -> ***Work Mode*** -> ***BT Config*** -> turn Bluetooth On -> click ***menu*** -> ***Bluetooth Settings***.

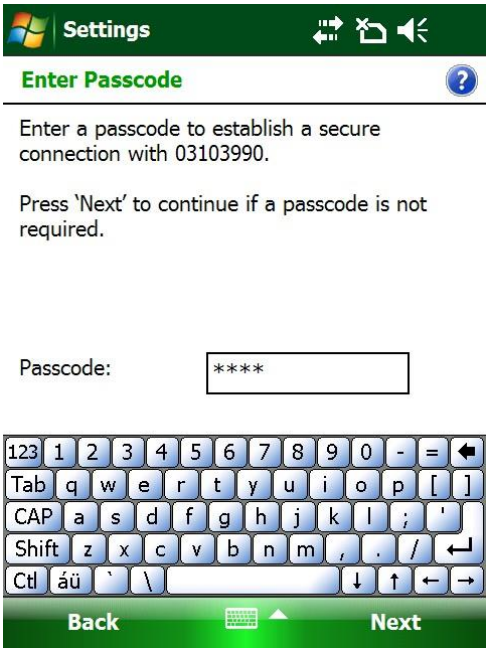


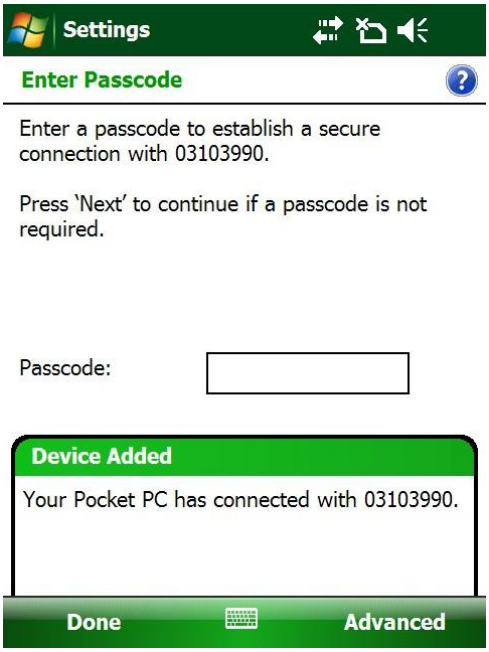
2. In Devices tab, click ***Add new device*** to search the Bluetooth device -> select corresponding SN number of the receiver -> click ***Next***.



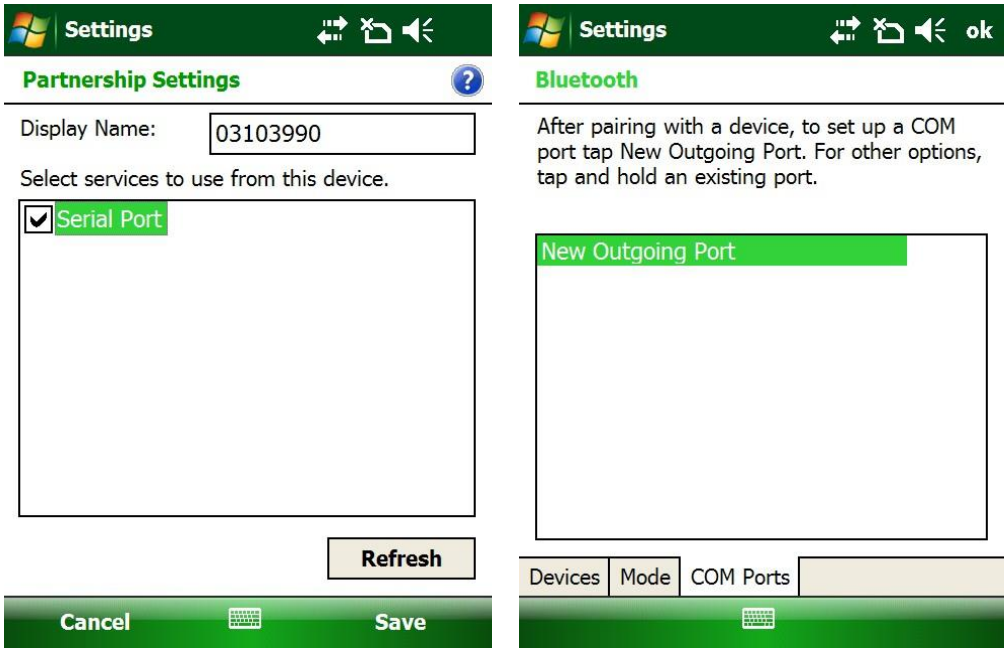
Tip: Make sure T300 receiver is powered on before searching devices.

3. Input the passcode '0000' and click ***Next*** -> ***Advanced***.

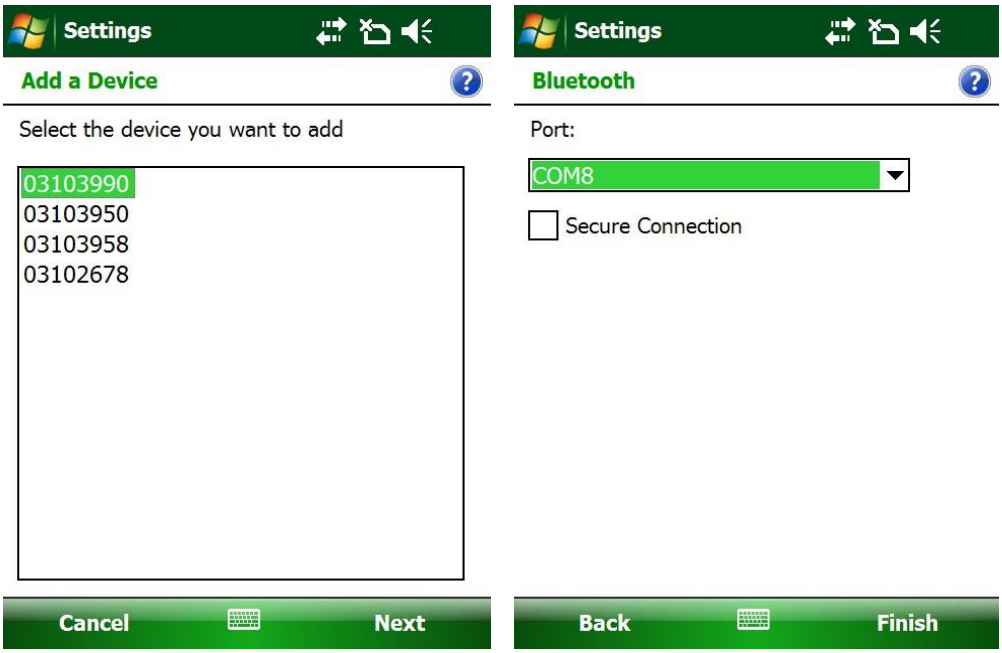




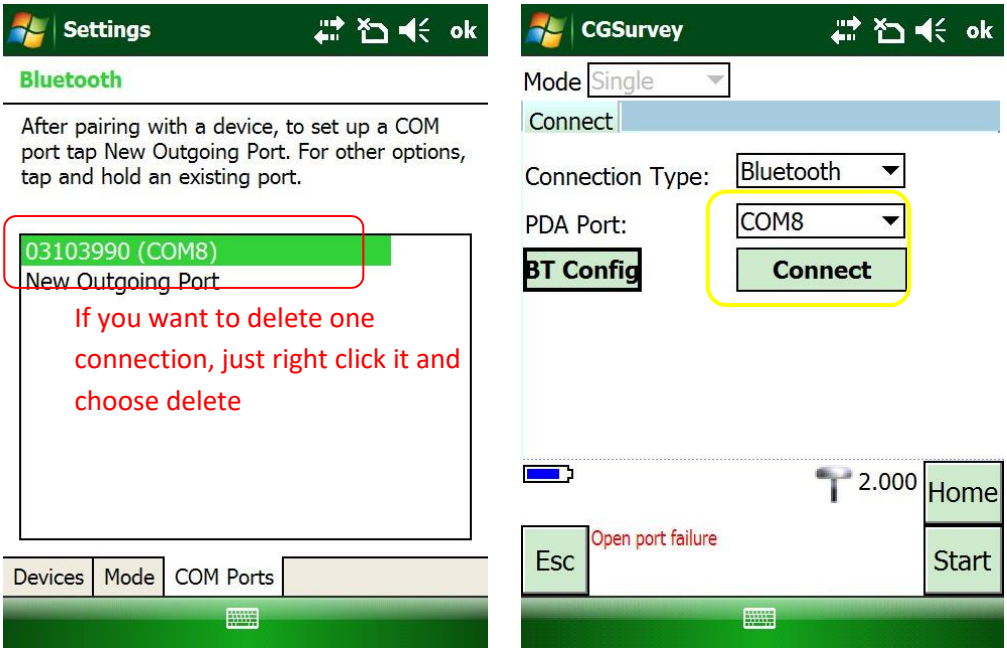
4. Check ***Serial Port*** -> click ***Save***. Then go to ***COM Ports*** tab, click ***new outgoing port*** to set up a COM port to your receiver.



5. Select proper SN of the receiver -> click ***Next*** -> choose a COM port (uncheck Secure Connection) -> ***Finish***.



6. The SN and corresponding COM port are shown in COM ports tab, click ***OK*** -> ***Done*** to come back to work mode window. Select the same ports as you set up before -> click ***Connect***.



Note: Go to COM Ports tab to modify or delete Bluetooth connection with receivers, the COM Ports cannot be allocated again if deleted in Devices tab.

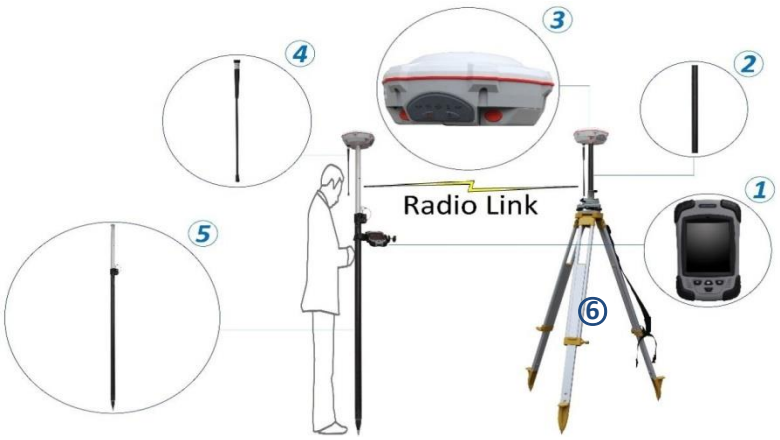
*Warning: When need to delete one COM port for connecting another device, you **MUST** delete it in **COM Ports** interface firstly. IF you just delete device's SN in **Devices** without delete it in **COM ports**, this COM port will never be used (unless reinstall the software).*

Tips: Our R100 controller support COM5, COM8 and COM9 as Bluetooth port, while our R200 controller support COM7, COM8 and COM9.

7. After connected successfully, the position status will be showed (H, V, RMS). Then you can set up T300 receiver with the required survey mode and style based on instructions below.

5.4 Internal Radio Mode

The T300 GNSS receiver supports transmit & receive the correction data in internal radio mode. To conduct the RTK survey in internal radio mode, it requires:



① A controller with software installed
② An extension bar
③ Two units of T300 GNSS receiver
④ Two Whip Antennas
⑤ A range Pole with bracket
⑥ Tripod and tribrach

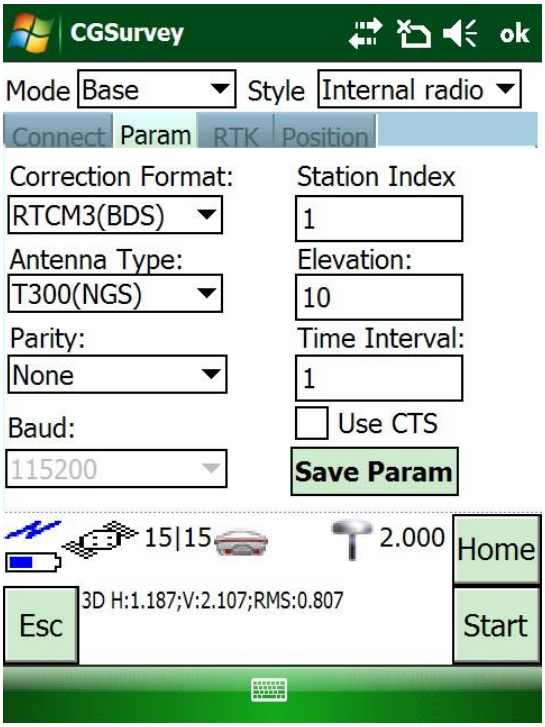
Tip: The external power supply is recommended when T300 set as a base station.

More: Aim improving the radius of survey work, we can change the base receiver's Whip Antenna to External Antenna. Any others don't need to change.

① T300 GNSS Receiver
② External Antenna

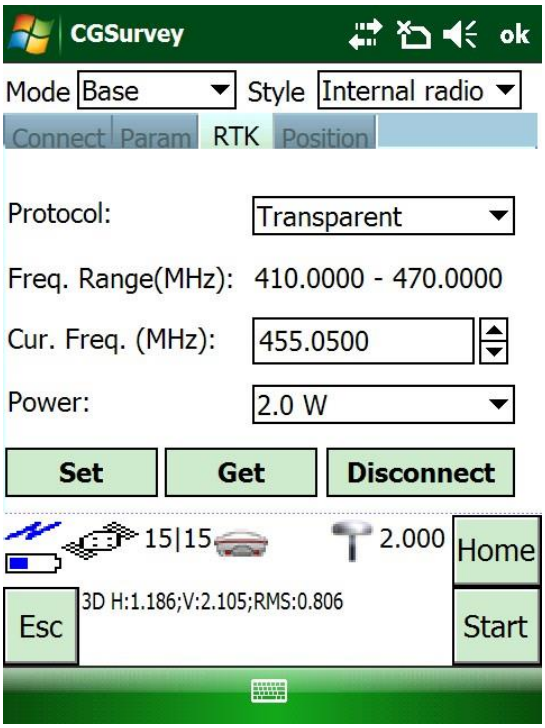
5.4.1 Start Base Station by CGSurvey

Firstly, build Bluetooth connection between the T300 receiver and your controller as showed in *Chapter 5.3*.
Secondly, modify parameters including correction format, antenna type and communication protocols:



Parameter:

- Select RTCM3(BDS) as correction format, otherwise choose RTCM3 if you are not in the coverage area of Beidou.
- Select T300 as Antenna type.
- Click ***Save Param***



RTK:

- Select ***Transparent*** as Protocol (transmitting & receiving mode)

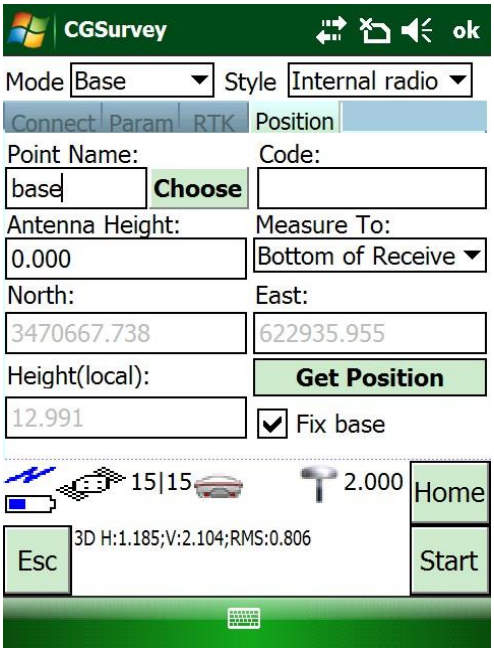
- Set proper frequency and Power

Tip: If you use external antenna in internal radio mode, you'd better set Power as 2.0 W.

- Click ***Set***

For Position tab, you can:

- Start Base from a known point: 1) Enter the coordinates of known point in ***Edit*** (main menu) -> ***Points*** (check Control Point); 2) Input Point Name and click ***Choose*** to select the known point.
- Start base from an unknown point: Enter the Point Name and click ***Get Position*** to get the current coordinates as the base station.
- Check ***Fix Base***, and click ***Start*** to complete the configuration.



To input antenna height, three measuring ways are introduced:

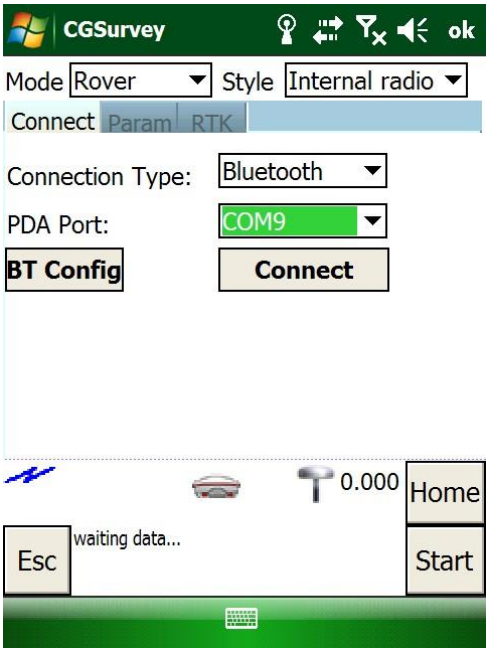
- Bottom of Receiver: measure from the bottom of receiver to the control point.
- Phase center: measure from the phase center of receiver to the control point.
- Notch of Receiver: measure from the mark of receiver to the control point.

*Note: Uncheck **Fix Base** to start Base station in Auto Base mode, which means that the receiver can get current coordinates and broadcast correction data automatically.*

- Click ***OK*** to save configuration
- Check the differential LED in the front panel, flashing once per second means that the base station is transmitting correction data.

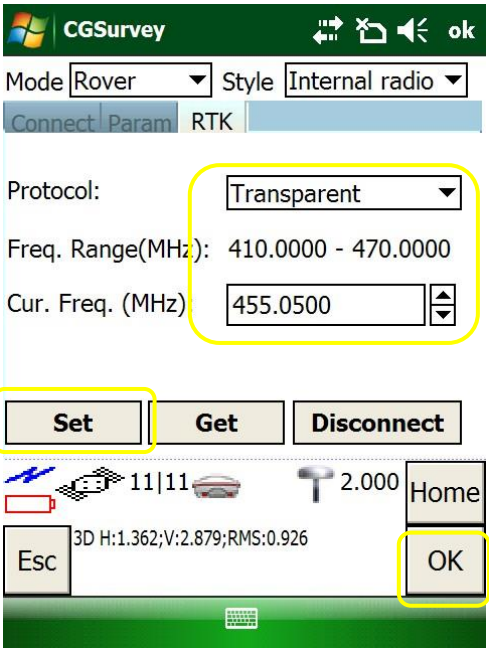
5.4.2 Start Rover Station by CGSurvey

Connect your controller to T300 receiver based on *Chapter 5.3*, and allocate the Rover another COM port that different from the Base.



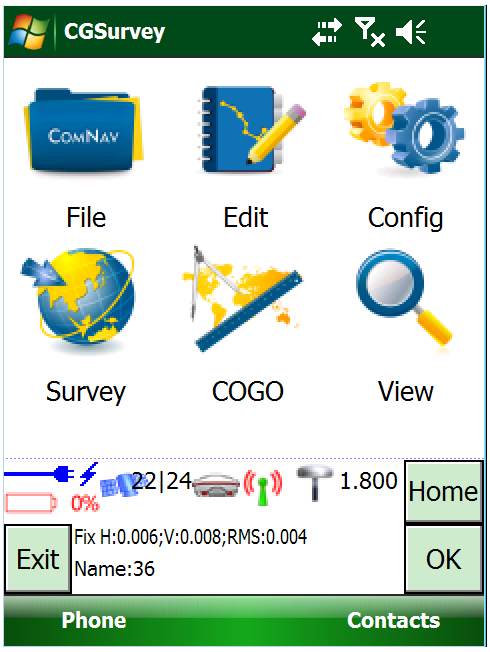
Connect:

- Click ***Config*** -> ***Work Mode*** -> select ***Rover*** as Mode and ***Internal radio*** as Style.
- Select the PDA port you set for the rover
- Click ***Connect***



RTK:

- To achieve a successful data link, set the same protocol and frequency as the base.
- Click ***Set*** -> ***OK*** -> ***Start*** to complete the configuration.



- indicates that the Rover is set up successfully.
- Check the differential LED in the front panel, flashing once per second means that the rover station is receiving correction data.

The following table shows the specification of T300 Internal Radio:

Radio parameter	Specifications
Frequency range	450-470MHz（default）
Protocol	Transmit mode: Transparent/TT450S Receiving mode: MAC (compatible with CHC protocol), TT450S, Transparent EOT and south protocol.
Airlink rate	9600 bps
Bandwidth	25kbps
Power	0.5, 1, 2 Watt adjustable
Work distance	1-5km, depends on power supply and environment condition

5.5 External radio mode

The external radio mode can extend RTK working distance, which is ideal for areas with high constructions or strong signal interference. To set up external radio mode, it requires:

- Base station

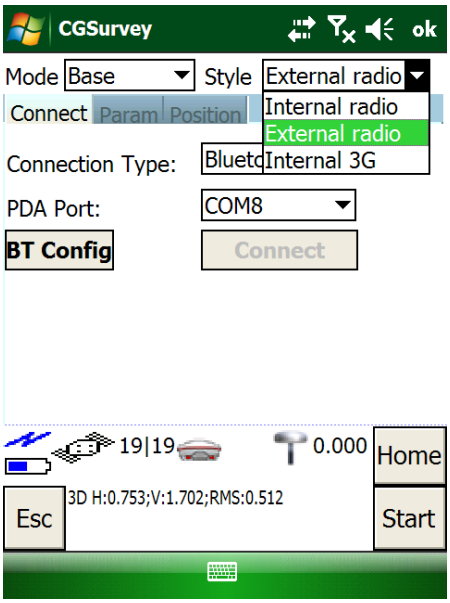
① An external radio
② An external power supply
③ A long whip antenna
④ Transmission cables
⑤ A T300 receiver
⑥ Tripod and tribrach

Tip: 1) See Appendix A for detailed definition of 7-pin Lemo cable that connects the T300 receiver and external radio; 2) See Appendix B for the operating information of PDL.

Warning: 1) You MUST connect PDL to external antenna firstly and supply power next, otherwise the PDL will have a risk of burnout; 2) You'd better put it in a shelter when raining, because it's not water-proof.

- Rover

① A T300 receiver
② A Whip Antenna
③ A controller with software installed
④ A range Pole with bracket



- After connecting Base station with external radio, select ***External radio*** as Style.
- Be sure to set the same band rate as your PDL (default value is 38400, you also can change in ***Param tab*** based on your PDL).

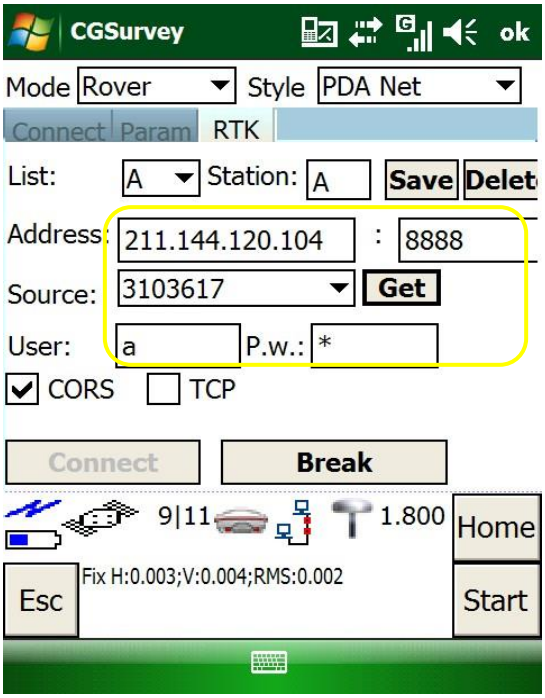
5.6 PDA Net Mode

Without setting up your own base stations, the T300 GNSS receiver can receive correction data transmitted from continuously operating reference station via PDA's GPRS or WIFI. To do RTK survey in PDA CORS mode, it requires:

① A T300 receiver
② A controller with SIM card (see *Appendix C* for internet setting)
③ A range Pole with bracket

To start rover station:

1. Connect your controller to the internet via WIFI or GPRS, and run CGSurvey software.
2. Build Bluetooth connection as showed in *chapter 5.3*, Click ***Config*** -> ***Work Mode***, -> select ***Rover*** and ***PDA Net***.
3. Change the parameters including Base index, antenna type and height based on your requirement.



RTK:

- Enter CORS IP and port -> Click ***Get*** to acquire Source List (select the proper source) -> enter ***User name*** and ***password*** -> click ***Connect*** -> ***Start*** to receive correction data.

- Click ***Save*** to add CORS station to list, which provides a quick acquisition.

5.7 Internal GPRS Mode

For Internal GPRS mode, the T300 receiver supports Point to Point/Points, Ntrip client and Phone Call mode. To acquire the APN (access point number) from the mobile service provider, you need to insert a SIM card into the T300 receiver. It commonly acquires the APN from the mobile network provider, otherwise try to get via:*http://www.hw-group.com/products/HWg-Ares/HWg-Ares_GSM_APN_en.html#top*

5.7.1 Point to Point/Points mode (P to PS mode)

In point to point mode, the correction data is transmitted from the base station to the Server, then rovers can log on the Server to get the correction data. Therefore, SIM cards are required both in the base and rover.

Firstly, configure the base station as below:

For the base station:

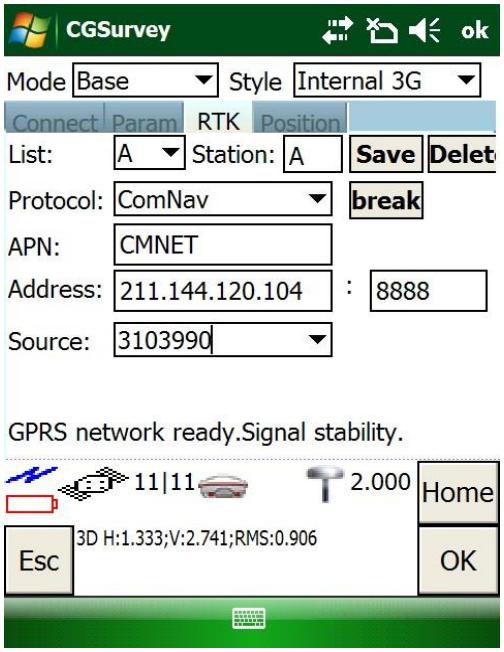
- Enter proper Protocol, APN, IP Address and Port.
- Sourcelist: It's recommended set as the SN of the base.
- Click ***Get*** to acquire current coordinates in Position Tab

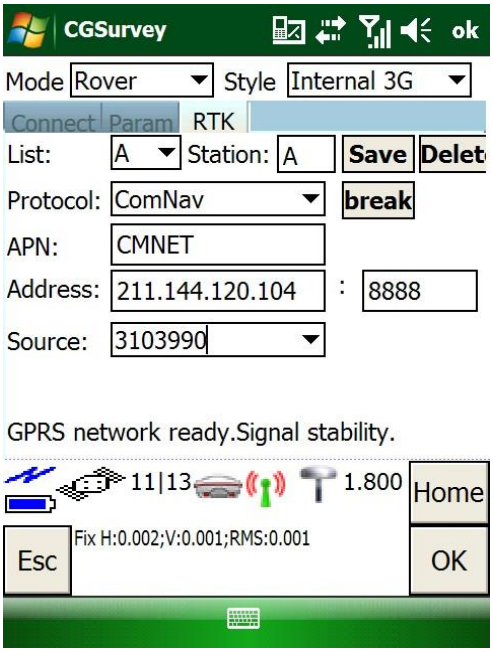
After successfully starting the base station:

1) The differential LED (yellow) flashes 1/s, which means the base is broadcasting correction data;

2) The flashing Internal 3G LED (blue) shows that the correction data is transferred via GPRS network.

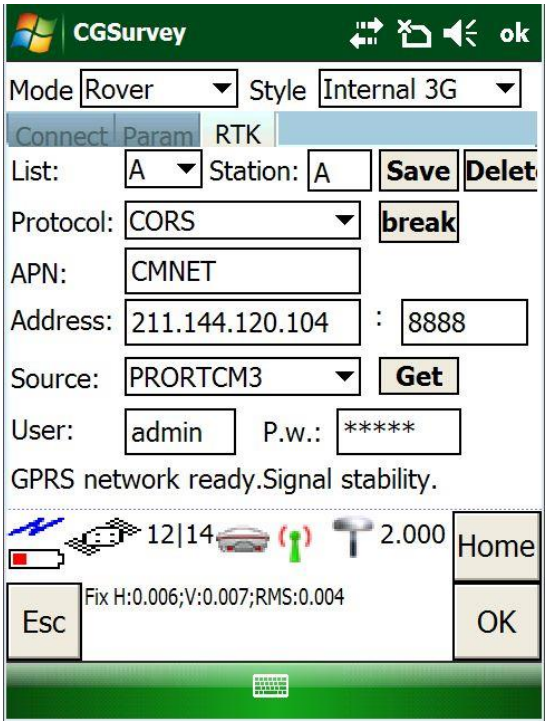
For the rover, select the same protocol, APN, address and Source as the base -> click ***OK*** when GPRS network ready.





5.7.2 Internal 3G Ntrip client mode

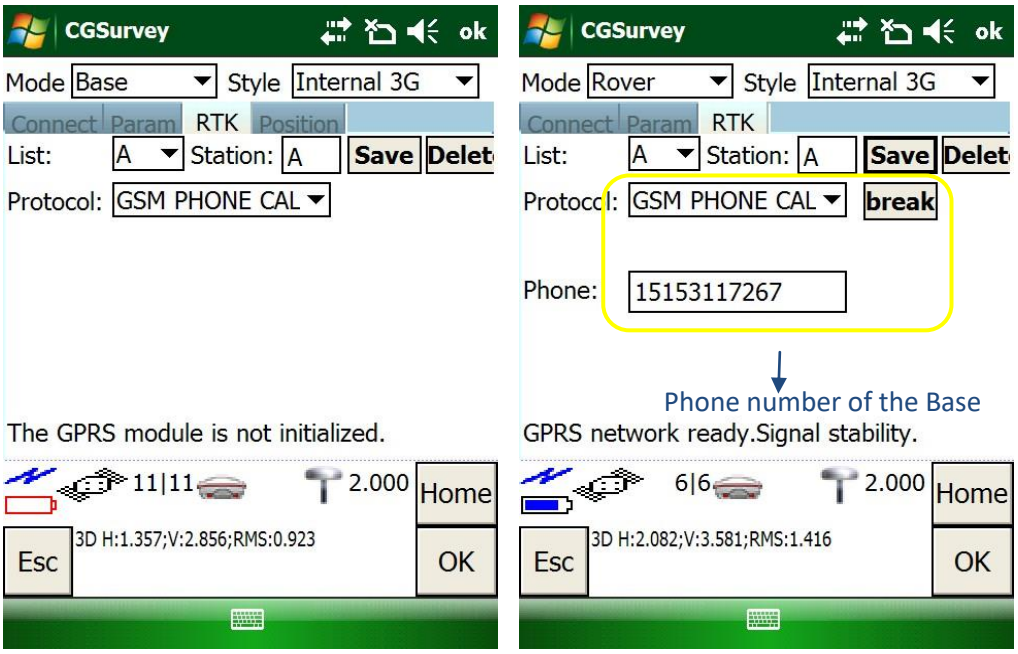
For Ntrip client mode, rover station acquires correction data from Ntrip(CORS) server. Do configurations as following figures:



- Select CORS as the protocol; enter proper APN, Address and IP.
- Click ***Get*** to get source list (select the proper source) -> ***OK*** to acquire correction data.

5.7.3 Phone call mode

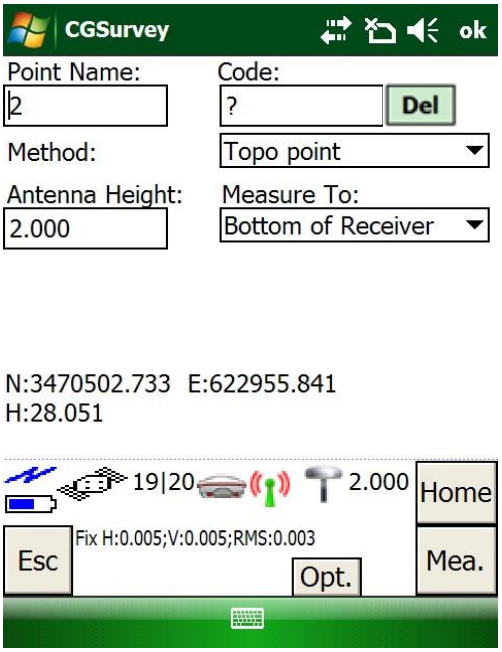
Two SIM cards are required in phone call mode, select ***Internal 3G*** -> ***GSM PHONE CALL*** Protocol for the Base and Rover, settings are shown below:



6 Basic Survey Functions

This section describes the basic survey functions of CGSruvey, including point measurement, Topo survey, staking, site calibration, import and export measured points.

6.1 Measuring Points

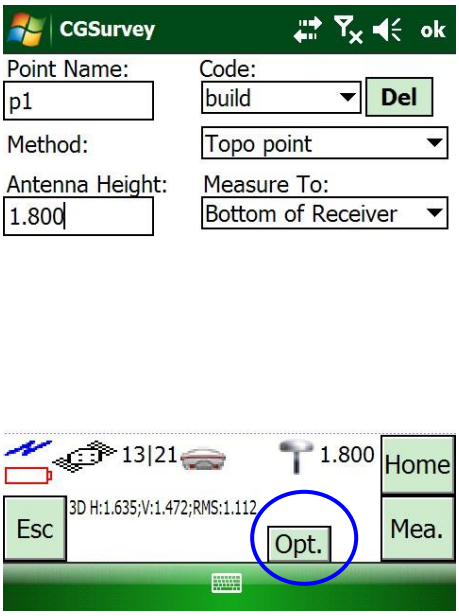


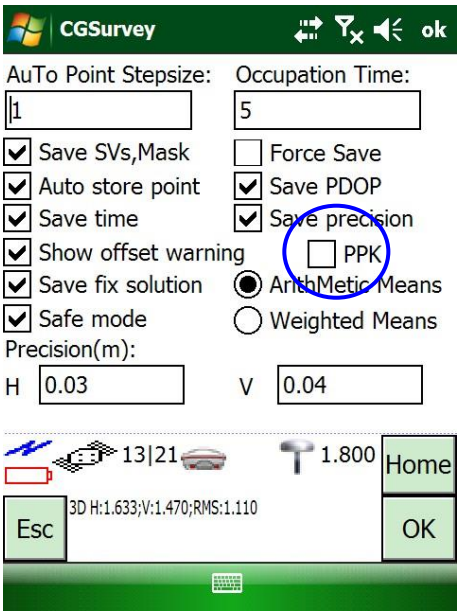
- Click ***Survey*** -> ***Measure Points***, then you can measure points.
- Enter point name, antenna height and survey mode, then click ***Mea. (Or Press F2 button)*** to start your survey. The point coordinates will be saved in your controller.

6.2 PPK

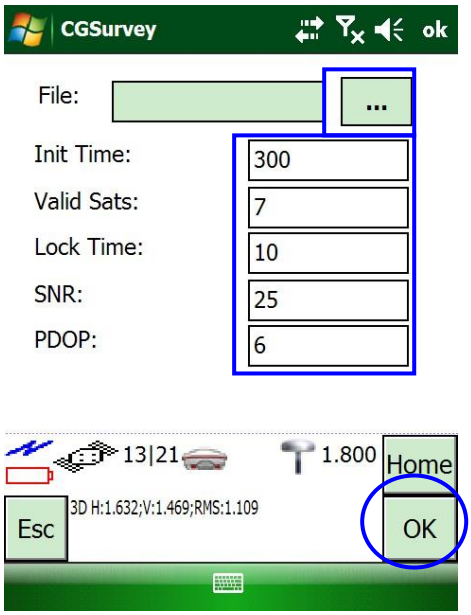
PPK is a special part in Measuring Points function, which apply to the survey that cannot do RTK. The rover survey dynamic data and another receiver record static data, and then do PPK processing in Compass Solution software.

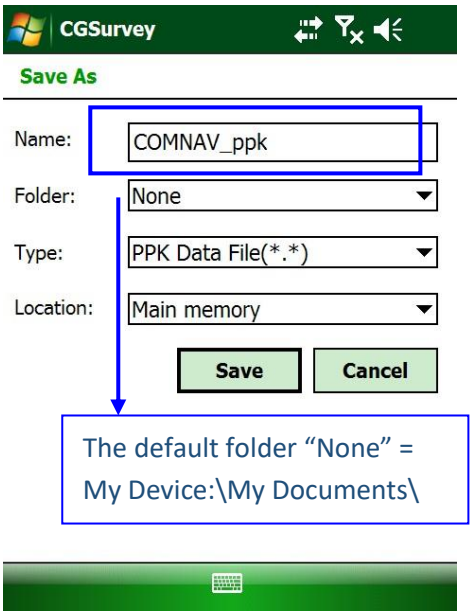
- Click Opt., and choose PPK mode.



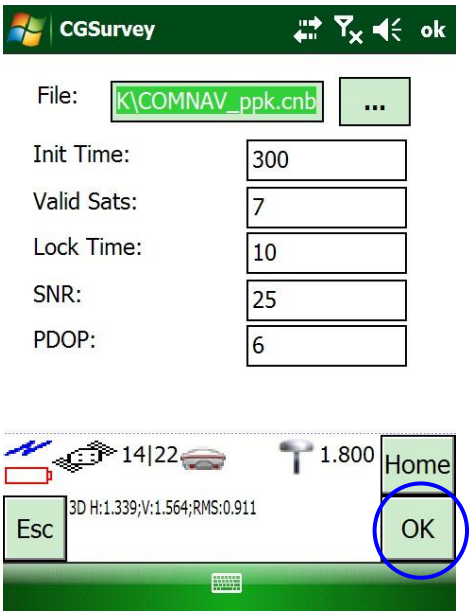


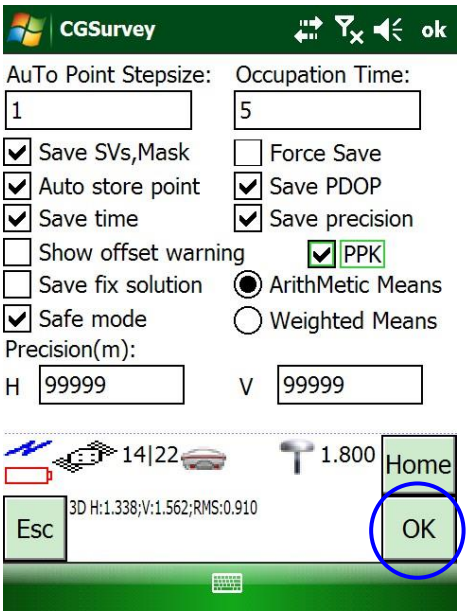
- Choose file name and path, and adjust Init Time, Valid Sats, Lock Time, SNR, PDOP by requirement. Click ***OK***.



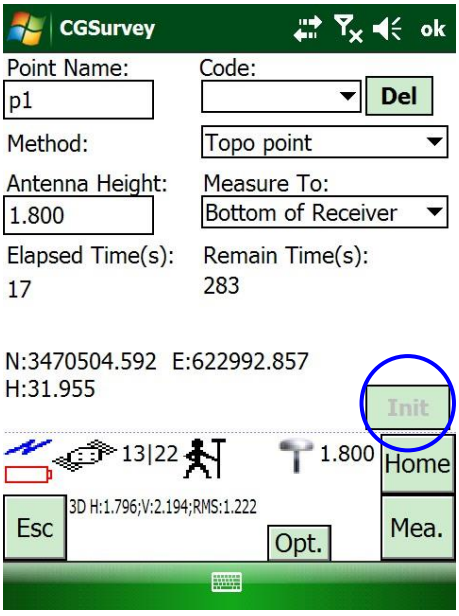


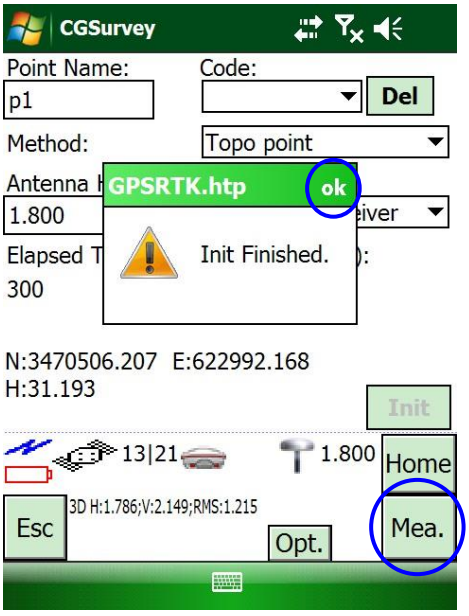
- Check configuration information and click ***OK***.





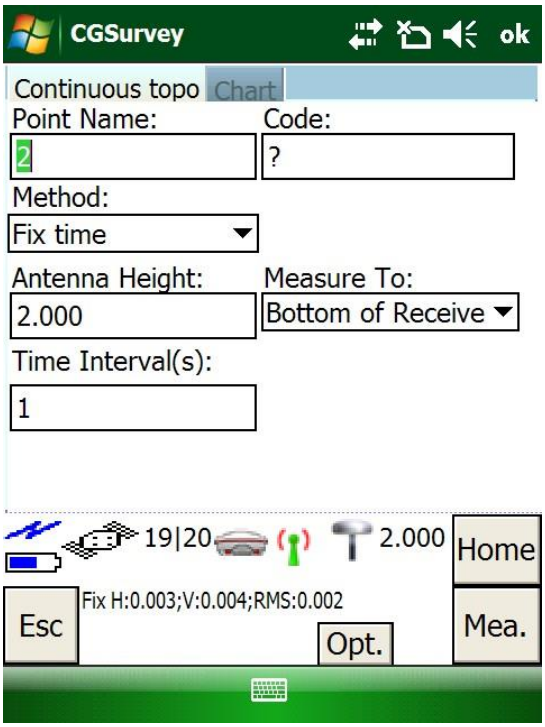
- Click Init to make PPK initialization. After that just click Mea. as normal measurement.





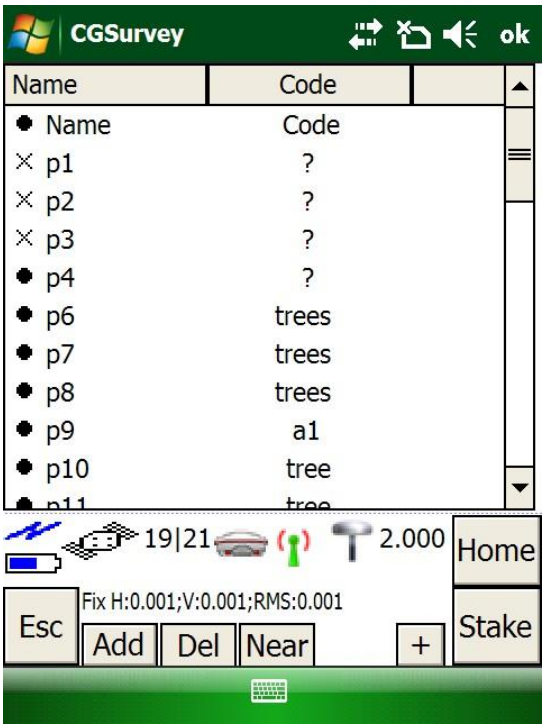
- Export data to PC, and using Compass Solution software to do PPK with concurrent static data. You can find the .cnb file in corresponding folder.

6.3 Continuous Topo

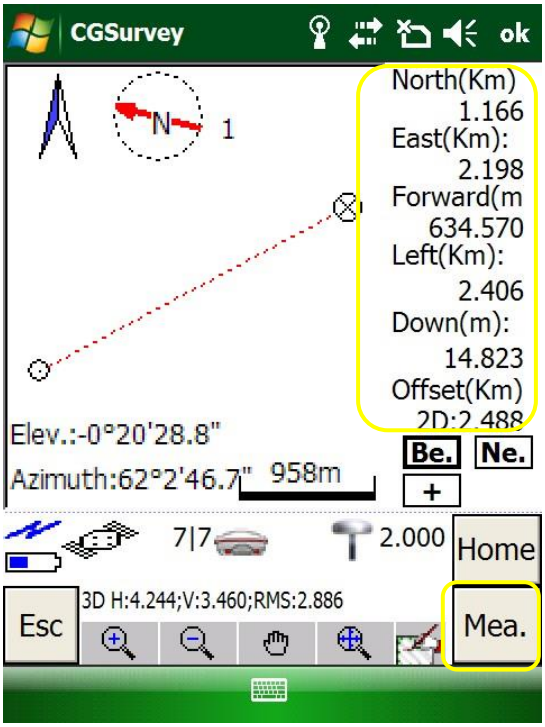


- Click ***Survey*** -> ***Continuous Topo*** to measure points continuously.
- It provides 4 different Methods to measure points: Fix Time, Fix Distance, Time and Distance, Time or Distance.

6.4 Staking out Points

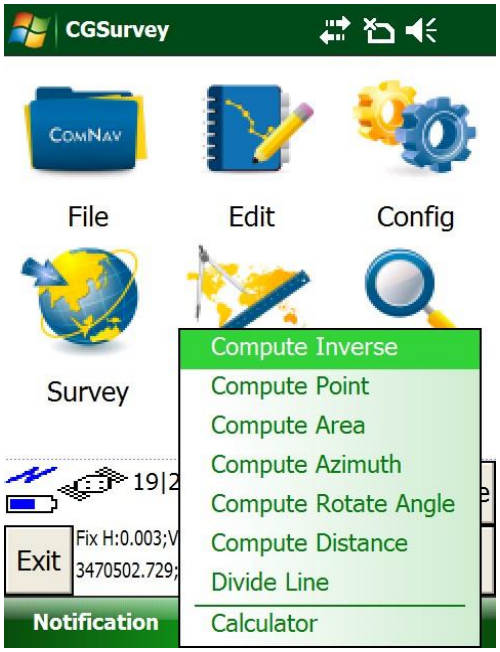


- Click ***Survey*** -> ***Stake Points***-> ***Add*** to add stake-out points to the points list.
- Then select the point name you want to stake and click **Stake**.



- It shows the navigation from the current position to the target point.
- It will alarm you if the receiver gets closer to the target stake-out position. Click ***Mea.*** to stake out points.

6.5 Cogo



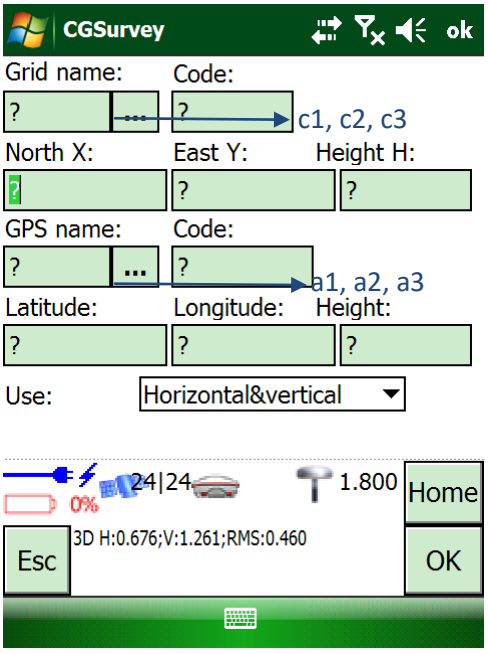
- The function of COGO in CGSurvey includes ***Compute inverse***, ***Compute point***, ***Compute area***, ***Compute azimuth***, ***Compute rotate angle***, ***Compute distance***, ***Divide line*** and ***Calculator***.

6.6 Localization-- Site Calibration and Reset Grid

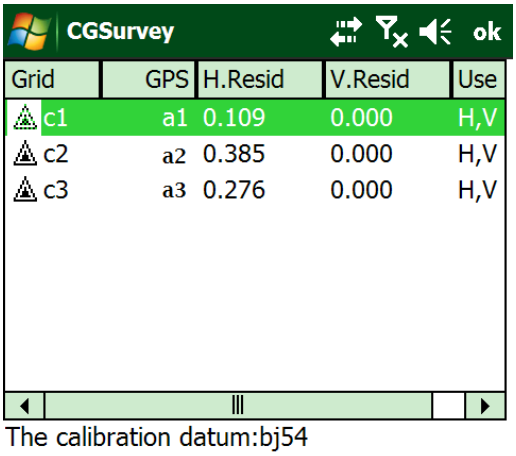
6.6.1 Site Calibration

Site calibration is applied to convert projection from WGS 84 to Local coordinate system. To conduct site calibration:

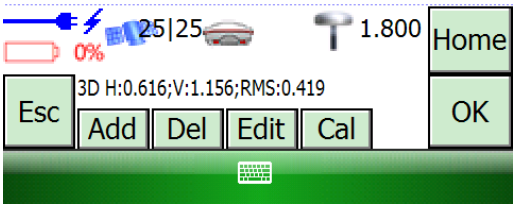
1. Import all known points (c1, c2, c3) into controller (see *chapter 6.7*).
2. Start base station successfully, measure all the known points by the rover (a1, a2, a3).



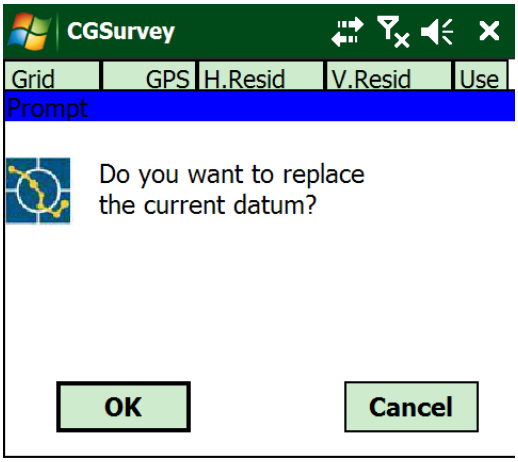
3. Click ***Edit*** -> ***Site Calibration*** -> ***Add*** to pair known points with measured points (c1->a1, c2->a2, c3->a3).

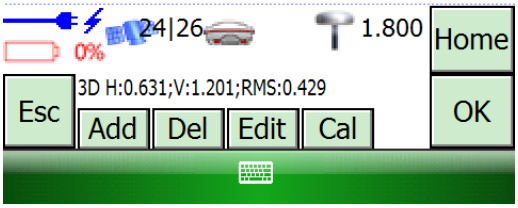


The calibration datum:bj54



4. After adding all the points in the list, click ***Cal*** button, the software will calibrate all the points inputted (ensure Max H.Resid < 0.015m, Max V.Resid < 0.02m).

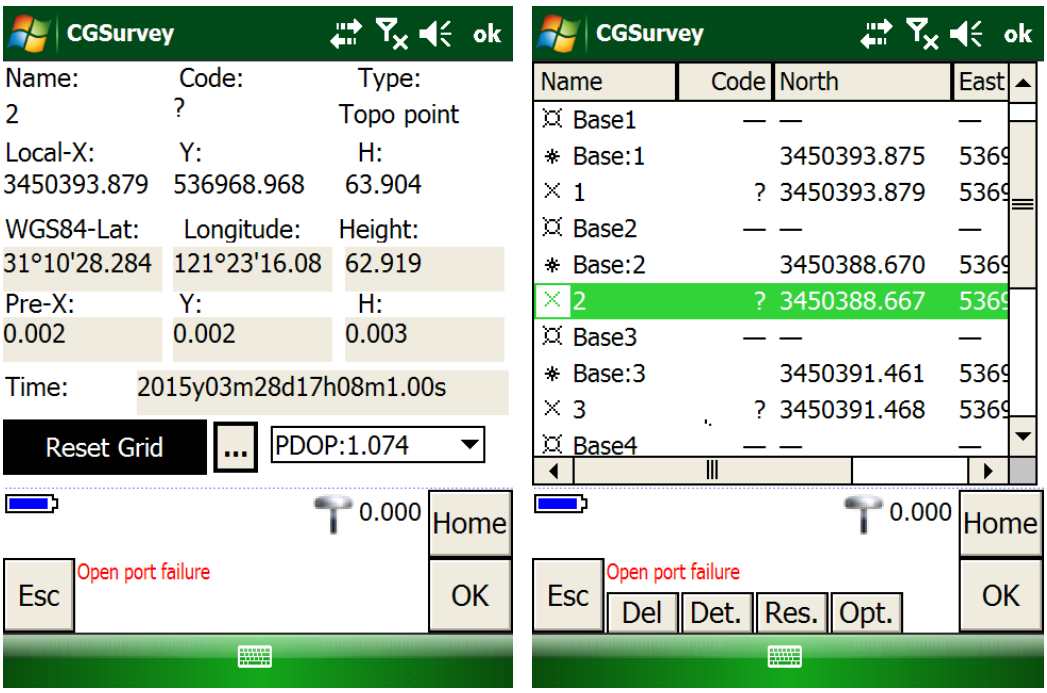




5. Click ***OK*** to complete site calibration.

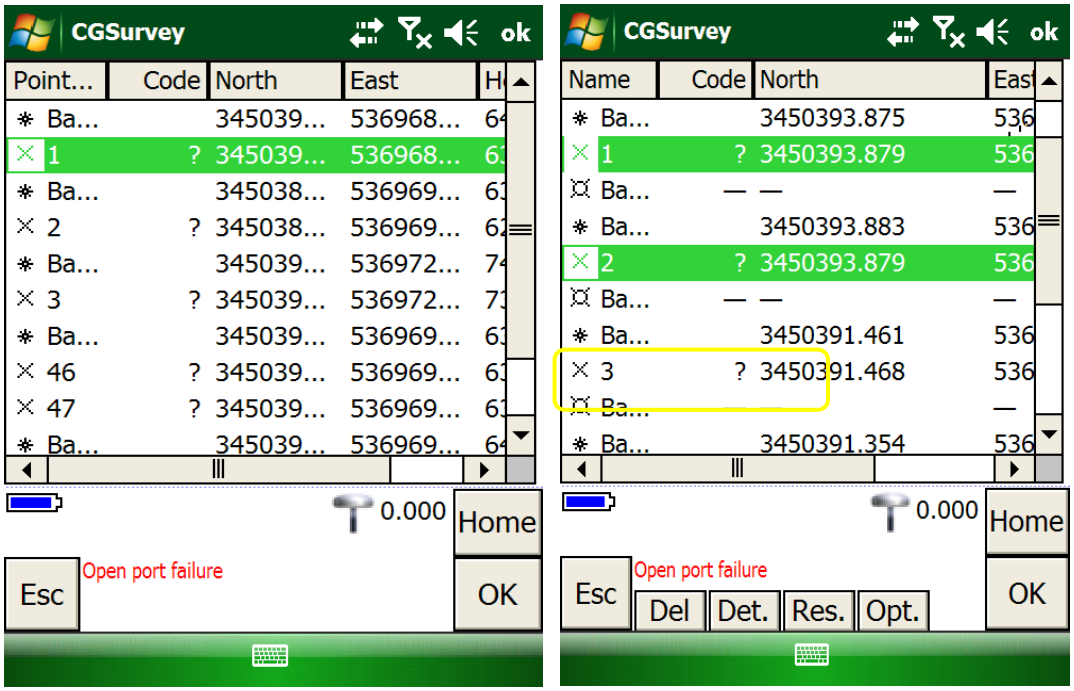
6.6.2 Reset Grid Function

Grid Reset function is applied when you need to change the position of base station in the same project. The following example shows that reset point 2 based on point 1 (known point).



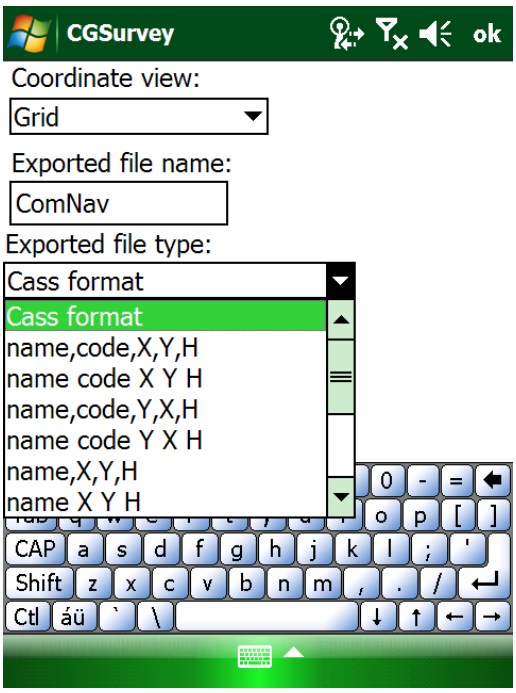
1. Click ***Edit*** -> ***Element Manager*** -> ***point manager*** -> double-click on the point you need to reset (Point 2).

2. Click ***Reset Grid*** to add the known point (Point 1) -> ***OK*** to finish Grid Reset.



6.7 Export Points to your PC

The measured data can be exported directly from CGSurvey to your PC with a wide range of exported file type.



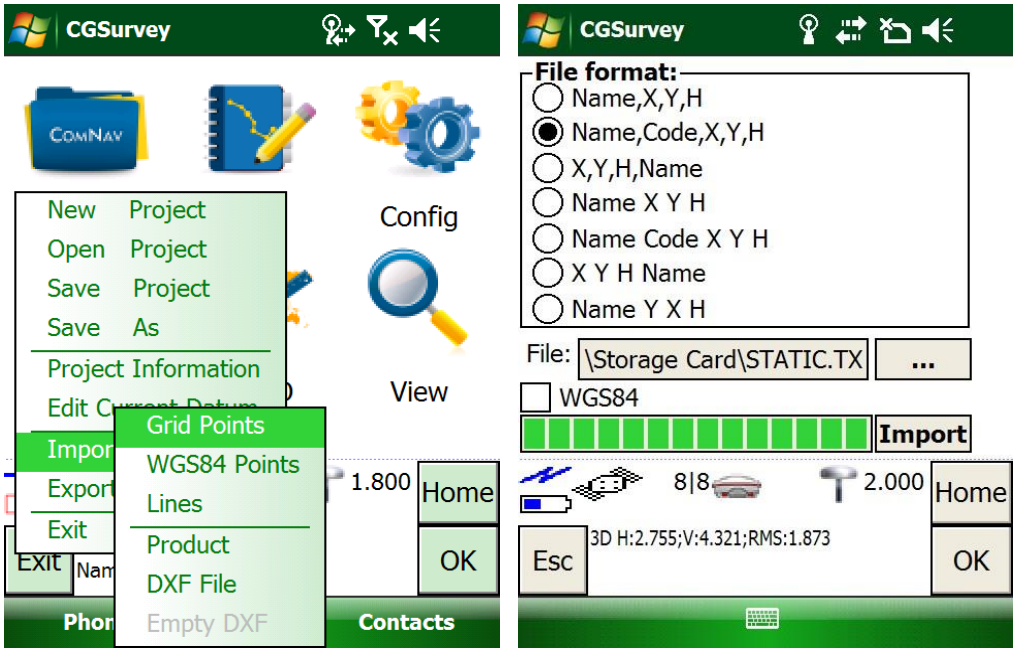
- Go to ***File*** -> ***Export*** -> **points**, select the coordinate frame, give the new file a name and choose a file type > **OK**.

- Connect the Controller to your PC through the USB cable, the exported result will be saved in the path:***YourController\\\Program Files\CGSurvey\Project***.

6.8 Import Points to Current project

To import points:

- Prepare the points file with right format (*.txt or *.csv) .
- Connect the Controller to your PC through USB cable.
- Copy the points file to Controller root directory.
- Then, open CGSurvey on your controller -> click ***File*** -> ***Import*** -> ***Grid point***-> select proper file format -> select the file in root directory -> ***Import*** -> ***OK***.



7 Specifications

Signal Tracking

•256 channels with simultaneously tracked satellite signals

-GPS: L1, L2, L2C, L5

-BeiDou: B1, B2, B3

-GLONASS: L1, L2

-SBAS: WAAS, EGNOS, MSAS, GAGAN

Performance Specifications

•Cold start: <50 s

•Warm start: <30 s

•Hot start: <15 s

•Initialization time: <10 s

•Signal re-acquisition: <2 s

•Initialization reliability: >99.9%

Positioning Specifications

•Post Processing Static

-Horizontal: 2.5 mm + 0.5 ppm RMS

-Vertical: 5 mm + 0.5 ppm RMS

•Real Time Kinematic

-Horizontal: 8 mm + 1 ppm RMS

•E-RTK[1] (baseline<100 km)

-Horizontal: 0.2 m + 1 ppm RMS

-Vertical: 0.4 m + 1 ppm RMS

•Code differential GNSS positioning

-Horizontal: 0.25 m+ 1 ppm RMS

-Vertical: 0.5 m + 1 ppm RMS

•SBAS: Typically <1 m 3D RMS

•Standalone: <1.5 m 3D RMS

Communications

•1 Serial port (7 pin Lemo) Baud rates up to 921,600 bps

•UHF modem[2]: Tx/Rx with full frequency range from 410-470 MHz [3]

-Transmit power: 0.5-2W adjustable

-Range: 1-5 km [4]

•3G module

-2 Bands GSM|GPRS EDGE 900/1800 MHz

-2 Bands UMTS| HSPA 900/2100 MHz

Support GSM, Point to Point/Points and NTRIP

•Position data output rates: 1Hz, 2Hz, 5Hz, 10Hz

•5 LEDs (indicating Power, Satellite Tracking, GPRS Status and Differential Data)

•Bluetooth® : V 2.X protocol, work compatible with Windows OS and Android

Data Format

Correction data I/O:

-RTCM 2.X, 3.X, CMR (GPS only), CMR+ (GPS only)

•Position data output:

-ASCII: NMEA-0183 GSV, RMC, HDT, VHD, GGA, GSA, ZDA, VTG, GST, PJK, PTNL

-ComNav Binary update to 20Hz

Physical

•Size(W×H): 15.8 cm × 7.5 cm

•Weight: 0.95 kg (include 2 batteries)

Environmental

•Operating temperature: -40 °C to + 65 °C (40 °F to 149 °F)

• Storage temperature: -40 °C to + 85 °C (40 °F to 185 °F)

•Humidity: 100% condensation

•Waterproof and dust proof: IP67 protected from temporary one meter immersion, floats.

•Shock: survives a 2 meter drop on to concrete

Electrical and Memory

•Input voltage: 5-27 VDC

•Power consumption: 2.85 W (3 constellations)[5]

•Li-ion battery capacity: 2 × 1800 mAh, up to 8 hours typically

•Memory: 256 MB internal with up to 16 GB pluggable memory card

Software

•ComNav field data collection software CGSurvey

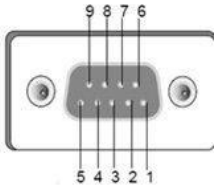
•Carlson SurvCE field data collection software (optional)

•MicroSurvey FieldGenius field data collection software (optional)

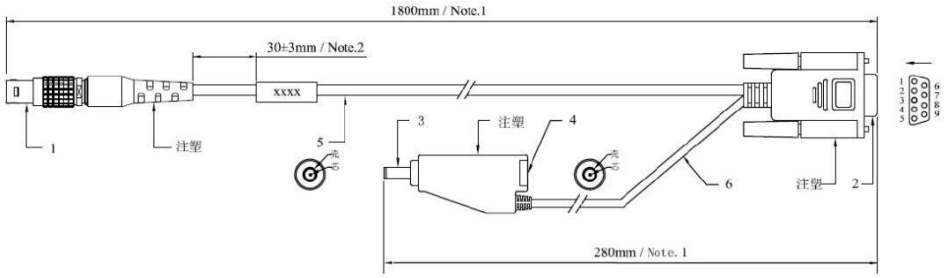
1.E-RTK, BeiDou B3 signal used in RTK calculate engine; concern the current situation, this mode can be used in APAC; 2.ComNav Technology will remove UHF modern according to different country's regulation; 3 .410-470 MHz, 3 frequency range, 410-430, 430-450, 450-470 4.Radio work distance is related with many environment factors, the maximum distance is 5 km in very optimised situation; 5.Power consumption will increase if using internal UHF as transmitter.

Appendix A: 7-Pin Lemo definition

The following figures show the definition of 7-pin lemo, and the structure of 7-pin Lemo to RS232 Cable:

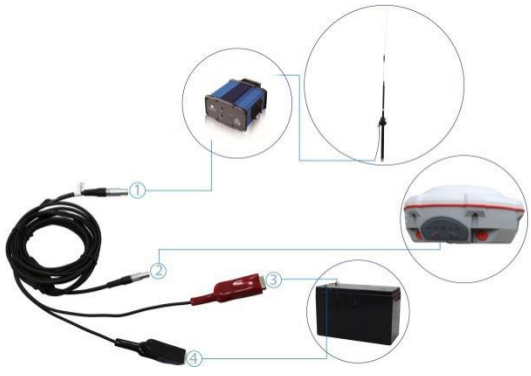


7 pin Lemo	Description
1	Signal GND
2	GND
3	TX data out (TXD)
4	NONE
5	NONE
6	Power In (+)
7	Serial data in (RXD)



Appendix B: Setting up of PDL

1. To set up external radio mode, connect all devices through provided cables according to the figure below:



① 5-pin LEMO port connected to the PDL

② 7-pin LEMO port connected to T300 receiver

③ Red alligator clip connected to the positive of power supply

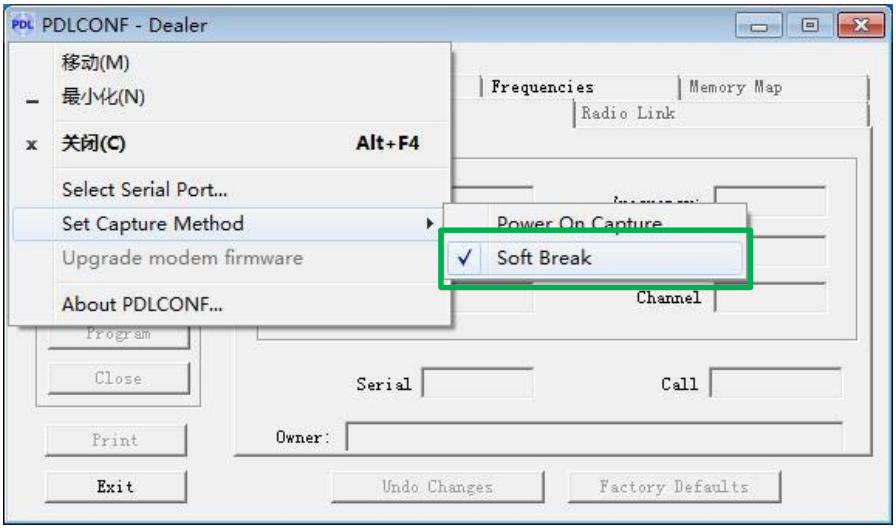
④ Black alligator clip connected to the negative of power supply

2. The default frequency of PDL:

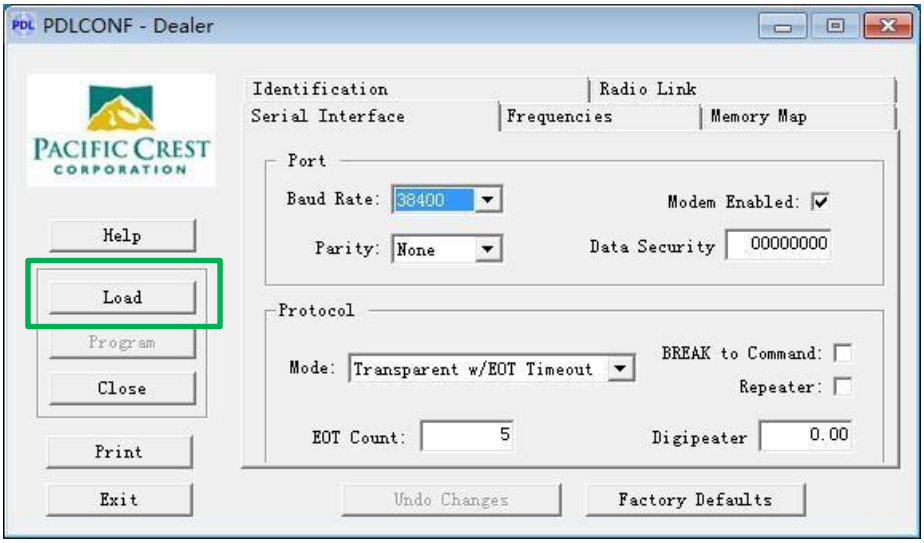
Channel	Frequency（MHz）	Channel	Frequency（MHz）
0	458.050	4	462.050
1	459.050	5	463.050
2	460.050	6	464.050
3	461.050	7	465.050

3. Follow instructions to configure PDL:

1) Power on the PDL and Connect to your PC with Lemo to RS232 cable.
2) Install PDL configuration software -> select the proper serial port -> right-click on the status bar -> Set Capture Method -> Soft Break.

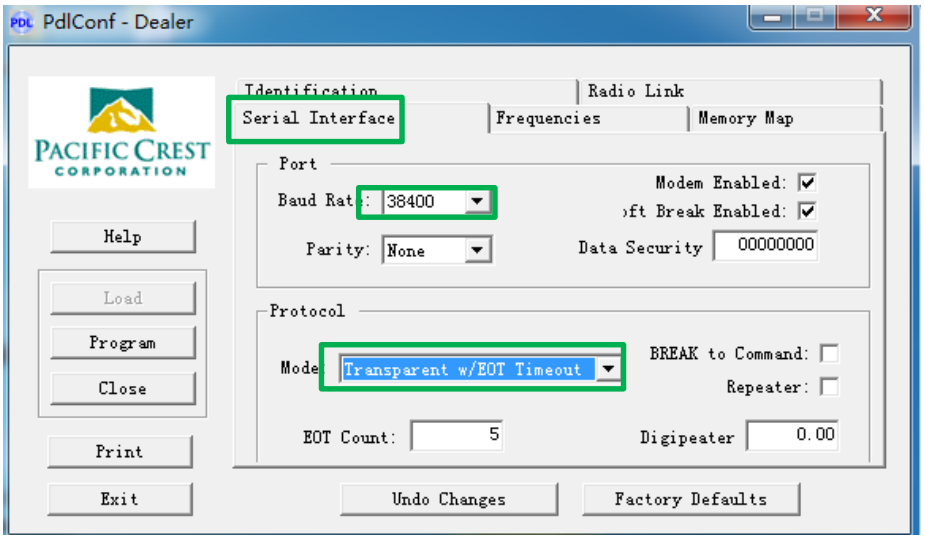


3) Click **Load** button to check current settings

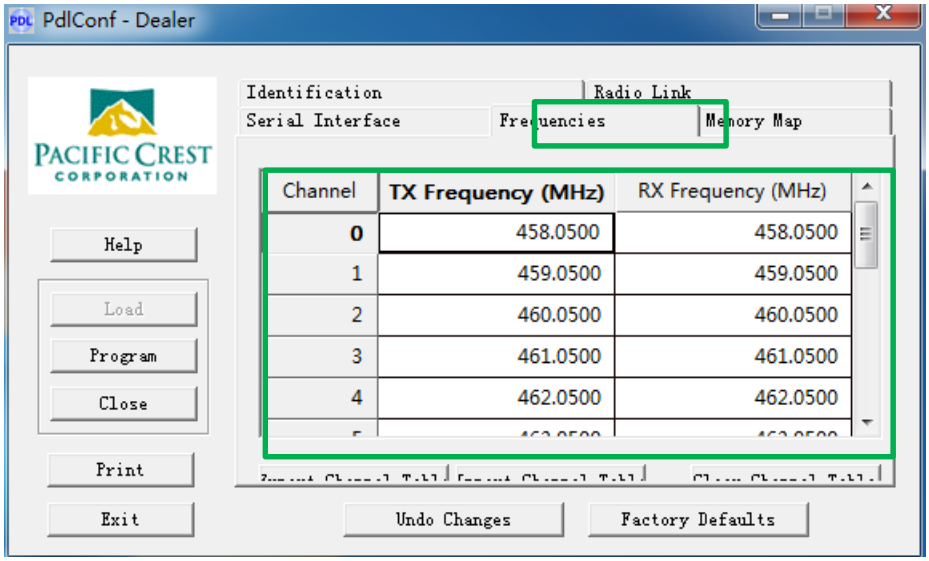


4) In ***Serial Interface***, set the Baud Rate (default 38400bps) and Protocol

Mode. The T300 receiver supports two protocols: Transparent w/EOT Timeout and Transparent w/EOT Timeout.



5) In Frequencies, change the output frequencies of PDL based on your requirements -> click ***Program*** to save all the settings -> **Exit** to complete PDL configuration.

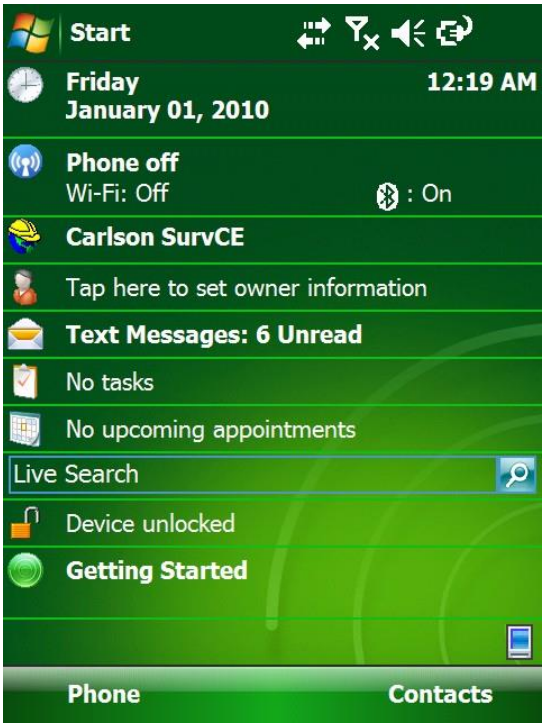


Appendix C: Connect your controller to the Internet

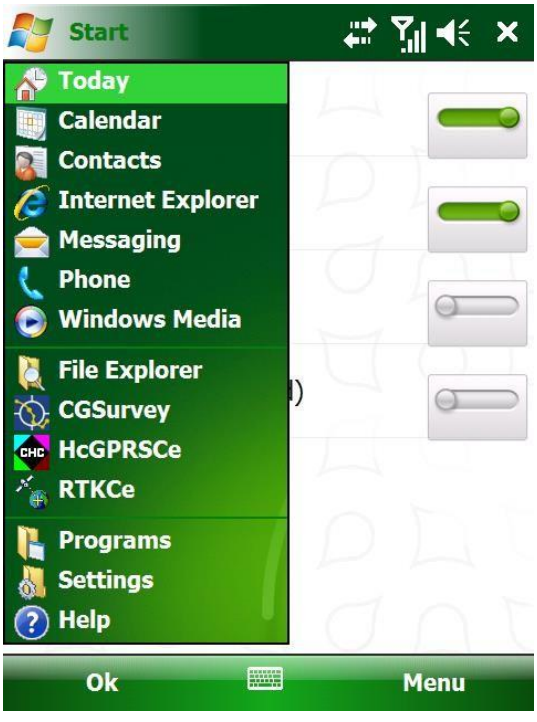
To connect to the internet, you can use GPRS mode or through WI-FI.

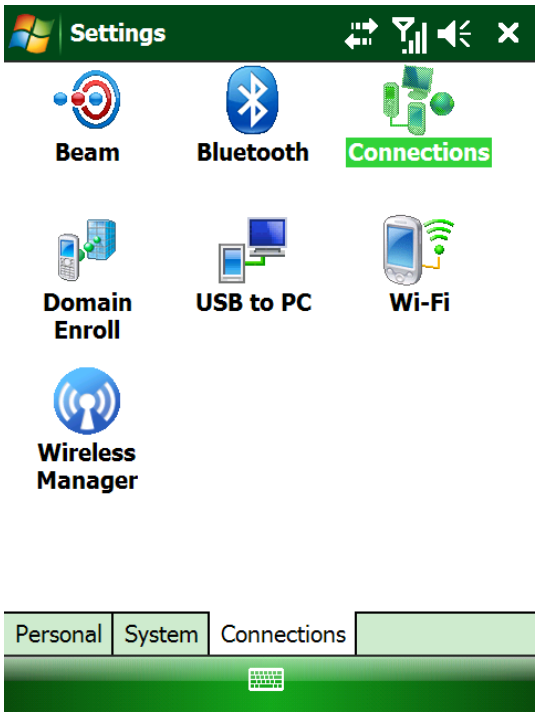
For GSM/GPRS connection:

- Insert SIM card into your controller, and turn Phone mode on.

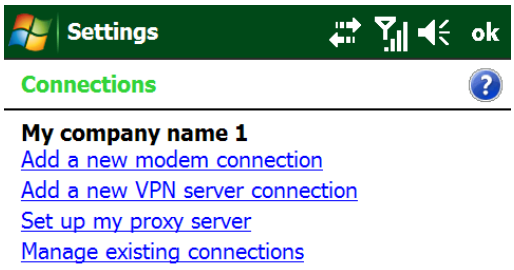


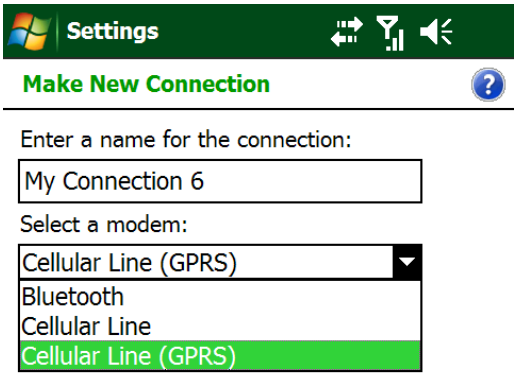
- Go to **Settings**, then **Connections**.

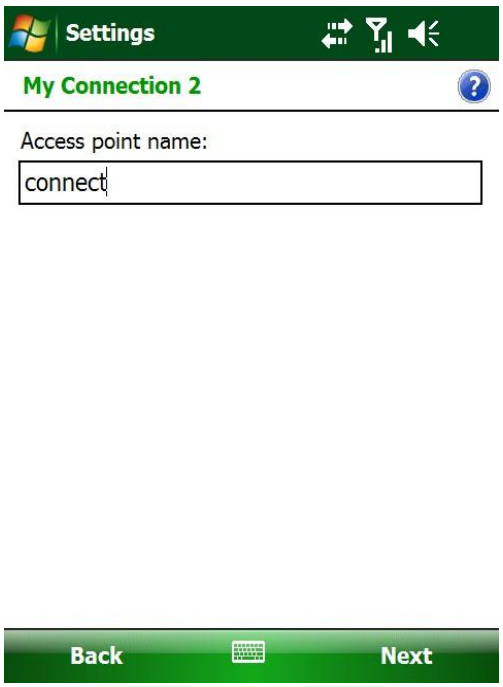




- Add a new modem connection at first time, enter a name for the connection as you like and choose **Cellular Line (GPRS)**. Then click several **Next** and finish (no need to key in).







Tip:  turns to  when the Internet connected.

For WIFI connection:
Open WIFI in wireless manager -> enter password of WIFI to connect

Appendix D: Physical Parameter of Modules inside of T300

1. Radio module

   Frequency Range: 450Mhz-470Mhz Default
   410Mhz-450Mhz Optional

   Modulation: GMSK

   Power: 0.5W, 1W, 2W Configurable

2. Bluetooth Module

   Frequency Range: 2.402Ghz-2.480Ghz

   RF Power(Max): 4dBm

   Band Width: 2Mhz

3. 3G Module

   TX Output Power (Max)

Band	Power Class
GSM900	4 (2W)
DCS1800	1 (1W)
EDGE,900Mhz	E2 (0.5W)
EDGE, 1800MHz	Class E2 (0.4W)
WCDMA FDD B1.B8	Class 3 (0.25W)

   Sensitivity

Band	Typical	Note
GSM900	-109dBm	BER Class II<2.44%
DCS1800	-110dBm	BER Class II<2.44%
WCDMA FDD B1	-111dBm	BER<0.1%
WCDMA FDD B8	-110dBm	BER<0.1%