SingularXYZ

SingularSurv

Surveying Software User Guide

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Proprietary Notice

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If you have any questions that can't be solved in this manual, please contact your local SingularXYZ distribution partner. Alternatively, request technical support from SingularXYZ Intelligent Technology Ltd.

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Your feedback on this manual will help us improve it with future revisions.

Context

Chapter1 Introduction

SingularSurv is an easy-to-use Android-based surveying software developed by SingularXYZ Intelligent Technology Ltd. SingularSurv is a pragmatic survey software with complete working mode and surveyors essential features. Projection/benchmark configuration, GSM/ radio /PDA CORS working mode, measuring point/lofting /CAD sketch /COGO calculation and etc. can be found in SingularSurv.

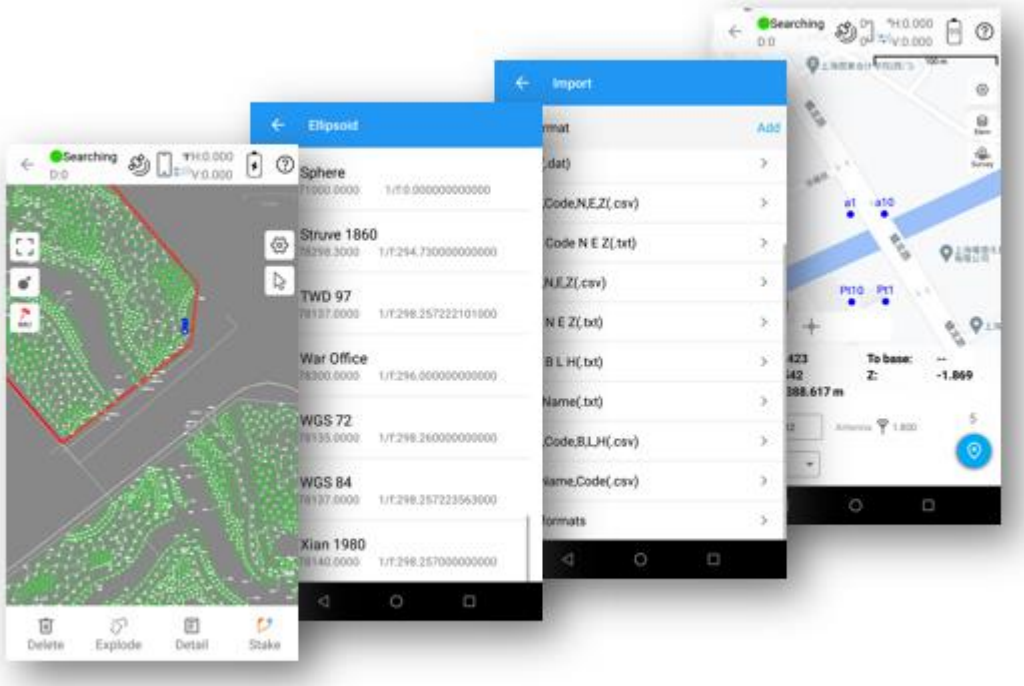
1.1Installation environments

SingularSurv is available, you can connect us to download https://www.singularxyz.com
SingularSurv can only run in Android operating system, and the Android device specification should be at least or better than the ones listed below：

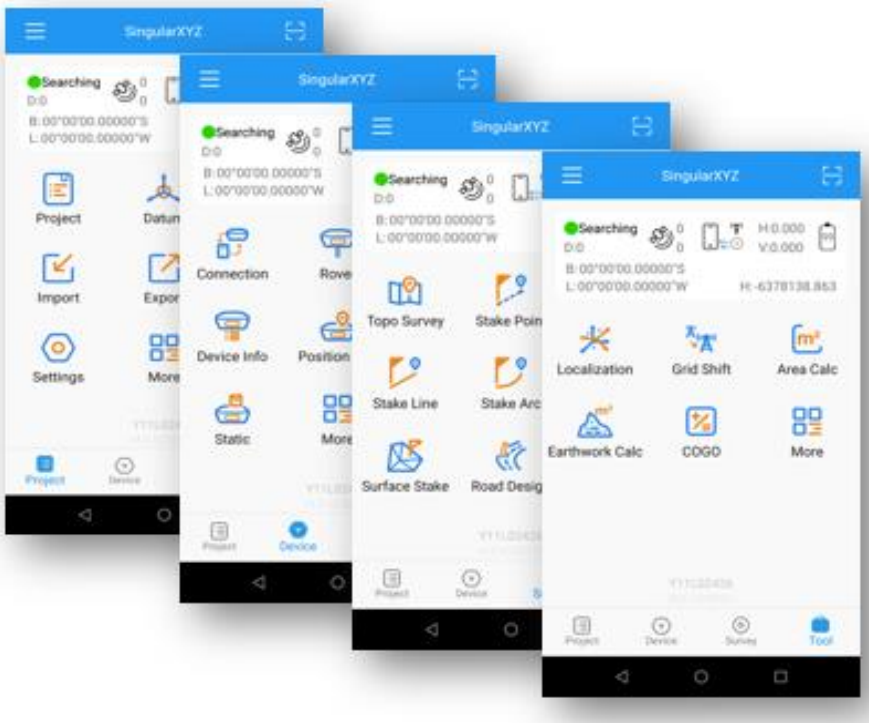
- CPU: core 2.1 GHz (currently support ARM cortex only)
- At least 4G RAM
- Android System version: ≥4.2
- Screen: 4.5 inches
- Screen resolution: 960*640
- Hardware: Bluetooth/Wi-Fi/GPRS

1.2UserInterface

SingularSurv has user-friendly interfaces, which provide you a convenient and effective surveying experience. SingularSurv get rid of bloated features are designed to get started quickly and meet all the needs of the whole process of surveying and mapping.



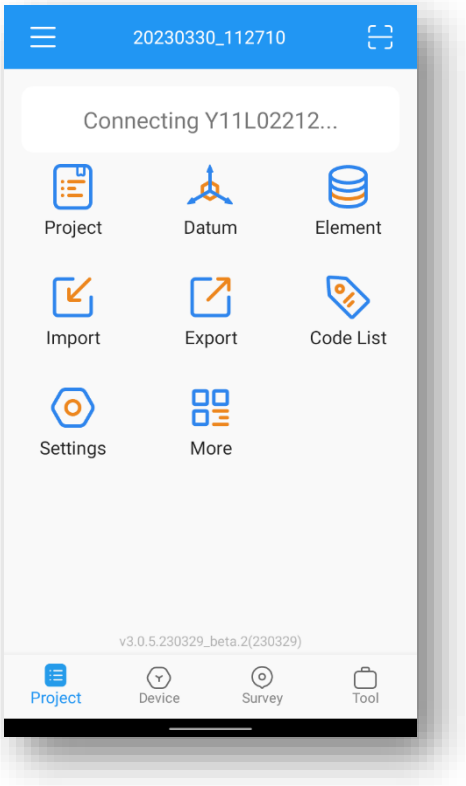
And users can customize the information display content and measurement function menu according to their own usage scenarios, so that the software can better meet the needs of their own applications.
There are four main interfaces, Project, Device, Survey and Tools interface. Each main interface includes different functions.



Chapter2 Project Interface

2.1 Project interface

The interface mainly includes Project Manager, Datum, Element, Import/Export data, Code List , Settings and More. Next, I will explain the functions of each interface and how to use them.



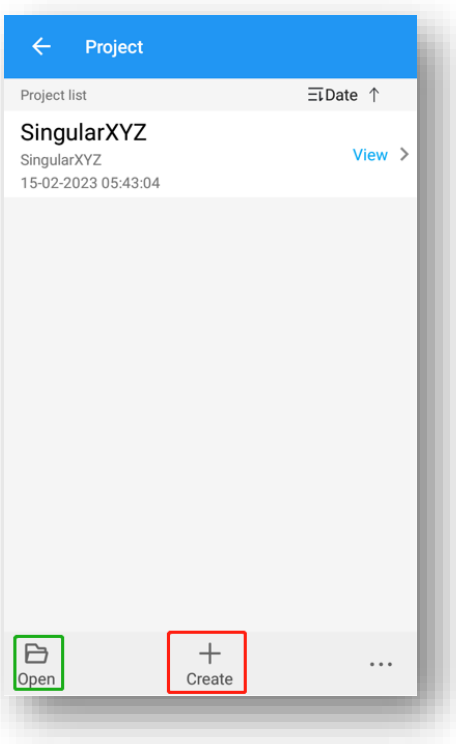
Project: Click project manager, click the Create button in the lower middle of the screen and input project name,set coordinate systems parameters and click the Datum button and you have Use Last project;Datum store; Scan QR code three options.Click Code List button to choose Code system

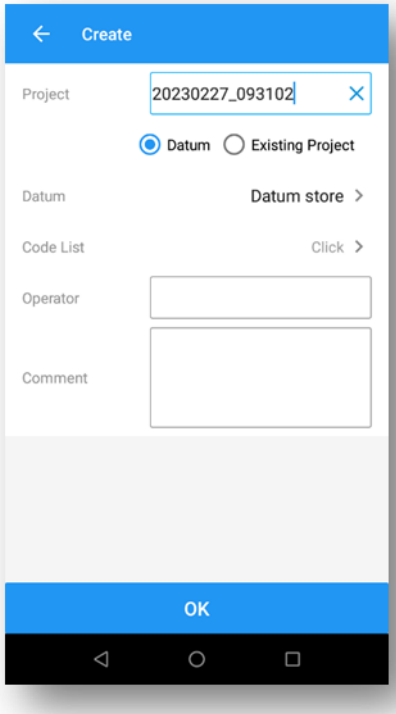
How to create a user defined datum: If you cannot find datum you want in the list, follow instructions below to add one: select ellipsoid para, projection para, datum para, and input horizon adjustment, vertical adjustment and local offsets based on your request. Save and apply it. Meanwhile you can share the coordinate system with your workmates.

You can create a new project by click the create button, You can type in the name of the project whatever you want and enter your own datum parameters, or keep them the same as the existing project. You can easily enter parameters by scanning the QR code also.

There are many predefined datum systems in datum store. In the idealized version of how the user work is when workers open the software create a new project choose a datum he/she want, but if their has

not the datum system you need ,contact us and we can add in. In addition, there are other functions such as the code list operator and the remarks box.





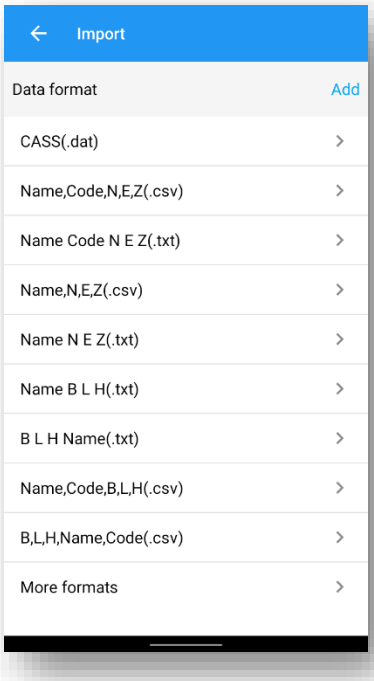
Click ok button to enter the details interface, here set more parameters, source ellipsoid, target ellipsoid, projection, seven parameters, H. rms V. rms, grid correction, again, if you don't have the parameters you want, contact us and our support team will help you add them. Click OK and wait a few seconds before the task is created.

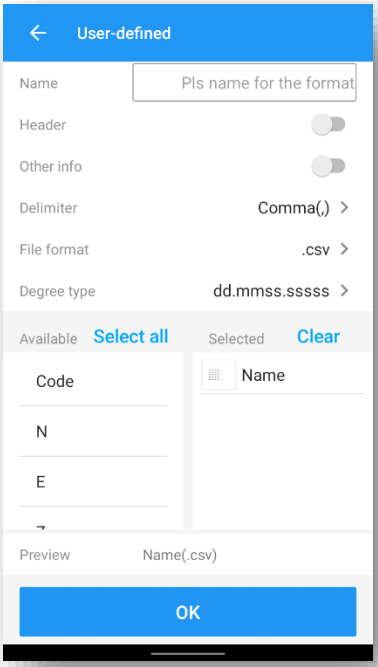
Datum: In this interface you can set a number of benchmarks, just as you did when you first created the project, If you want to change the coordinate parameters during the task, you don't have to create a new project folder, you can do so here.

Element: Point dataset, in this interface you store the measurement points at work, as well as the external import points. You can easily view the information of the points, input known points and stake out quickly. Click coordinate type you can switch coordinate system. In addition, there are general features such as search, display point details, and so on.

Import: This interface has a powerful import function, there are a variety of predefined file formats for you to choose from, support the common txt, csv, etc. Import points file(including CASS, Local coordinates, Geodetic coordinates, RW5,FG RAW, Google Earth file and NETCAD format, PXY file and Carlson coordinate file). If you do not meet your needs you can click Add bottun to set your own format.

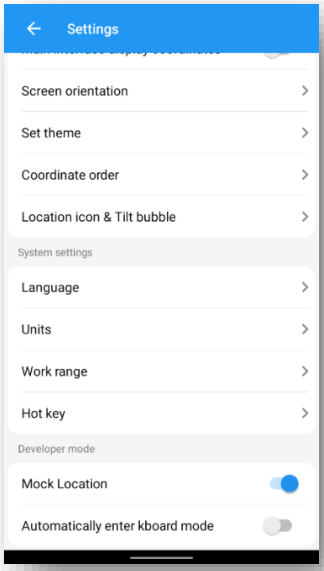
Export: This interface also has a powerful export feature, :CASS,local Coordinates and Geodetic coordinates,CAD,SHP,Google Earth file (based on WGS84 or Local) etc. you can also export measurement report and stake point report. which allows you to select a variety of predefined file formats and supports customer customization.



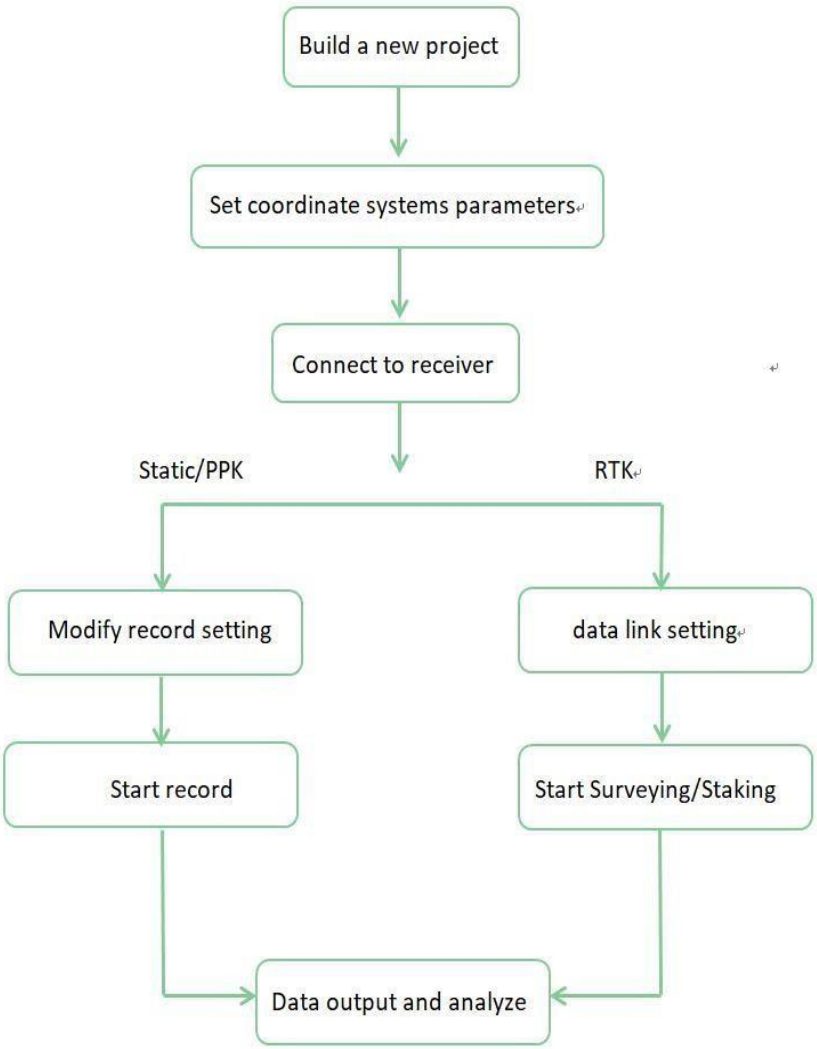


Code List: This function is mainly used in CAD mapping. Various ICONS of points, lines and surfaces are predefined in Code List, so that users can draw pictures conveniently.

Settings: There are some general software Settings, whether to automatically connect to the receiver, the voice engine, the main interface theme, Screen orientation,Coordinate order,Location icon& Tilt bubble,System settings,Developer mode.



More: This interface has some useful little features. First up is Workflow, a quick guide for beginners. Follow the tutorial to get started with your measurement work step by step. This figure shows the workflow of your survey though SingularSurv.



Surface function can support users to select points from the coordinate point library to form the surface, support external input and preview lofting and calculate the area.

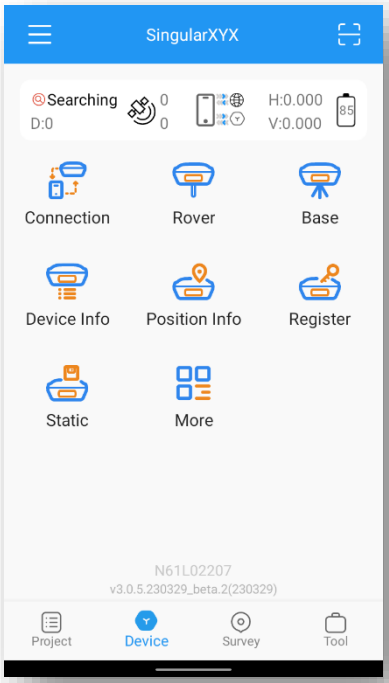
The Rinex Convert function provides customers with the ability to convert cnb files to Rinex format.

You can easily manage GIS points, lines and polygon in the Features interface.

Chapter3 Device interface

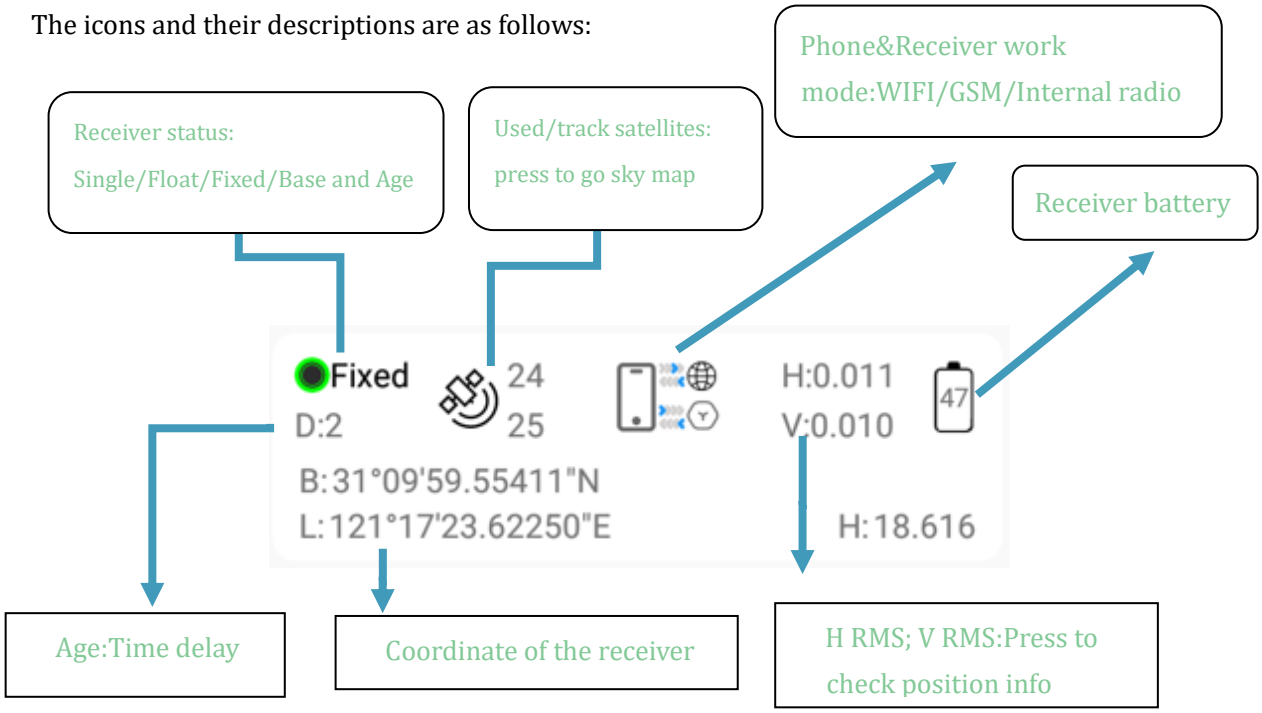
3.1 Floating window

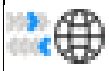
This interface is related to setup the GNSS in RTK mode, and check the receiver information.



- Communication: Connect receiver
- Rover: Setup receiver work as rover
- Base: Setup receiver work as base
- Device info: Show firmware, hardware, status and so on
- Register: Receiver registration permanent code or temporary code
- Static : Record raw data

The icons and their descriptions are as follows:



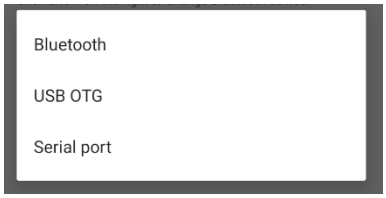
Icon	Description
	Indicates the receiver battery power
	24: number of the satellites used. 25: number of the satellites tracked;
	Rover internal radio mode
	Rover device internet mode

d

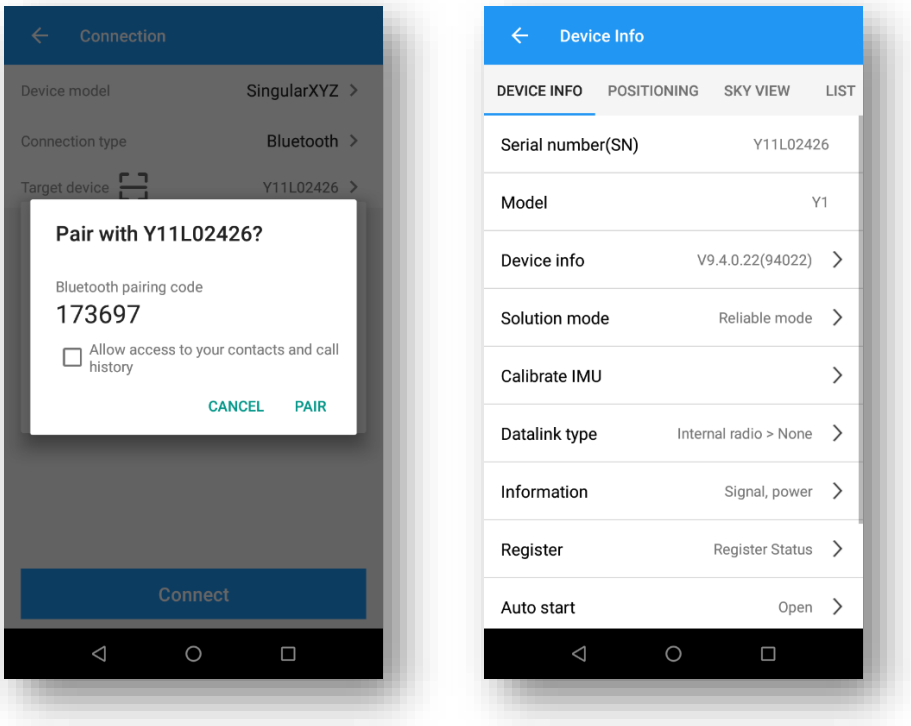
Status	Description
NONE	The receiver is searching the satellites.
SINGLE	Single positioning solution.
FLOAT	The whole week ambiguity is not fixed.
FIXED	The whole week ambiguity is fixed, high accuracy.
BASE	The base is setup successfully
Age	The diff delay,represent the diff delay value
H:... V:...	Horizontal RMS,Vertical RMS

3.2 Connection

You can connect SingularSurv with SingularXYZ Y1 GNSS receivers or choose Simulated Device and Controller. There are three connection types: Bluetooth, USB ORG and Serial port.



Bluetooth: After connecting SingularXYZ receiver, you can check some information of receiver (like firmware version) in Device Info. And some functions are only available for specified device. After connected successfully, the floating window will show the positioning status.

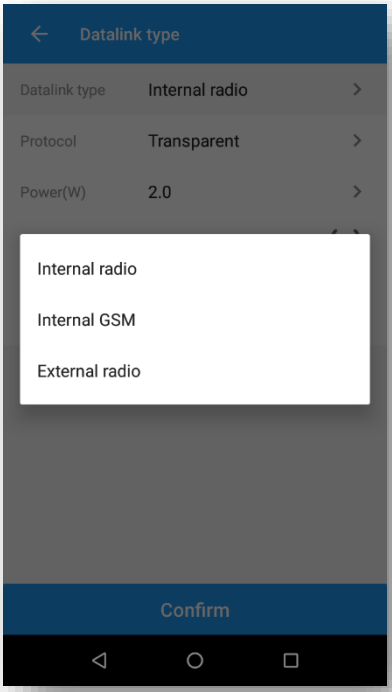


Tips: If you failed to connect with receiver through SingularSurv, you can just follow prompt info to go into the device Bluetooth setting interface to make sure Bluetooth paired successfully. Sometimes you need forget the device Bluetooth, restart the receiver or software and get pair again.

Demo: Simulate connecting SingularPad. On this model, some functions will not work.

3.3 Base & Rover

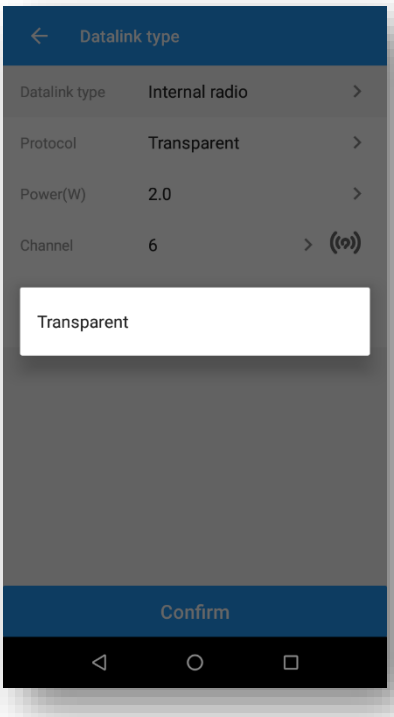
In SingularSurv . you need only one step to start your receiver: Choose work mode and apply. There are some default work modes, three for Base and three for Rover. Choose one mode; you can check the detailed information. If the default work mode suits for you, you can just click Apply to start your receiver. Usually, you need to add one mode yourself.
There are three modes you can choose, Device Internet, Internal Radio and External radio

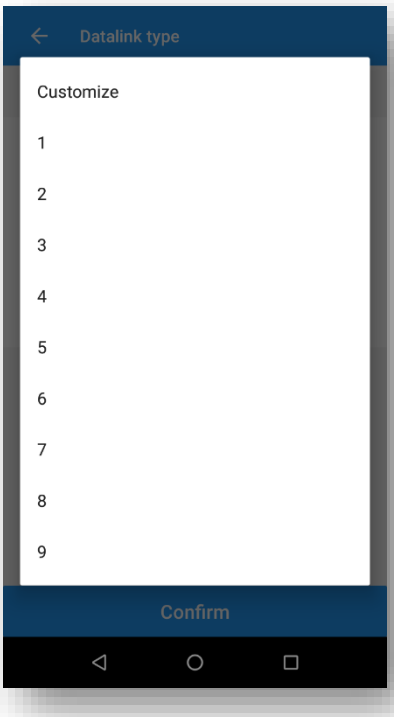


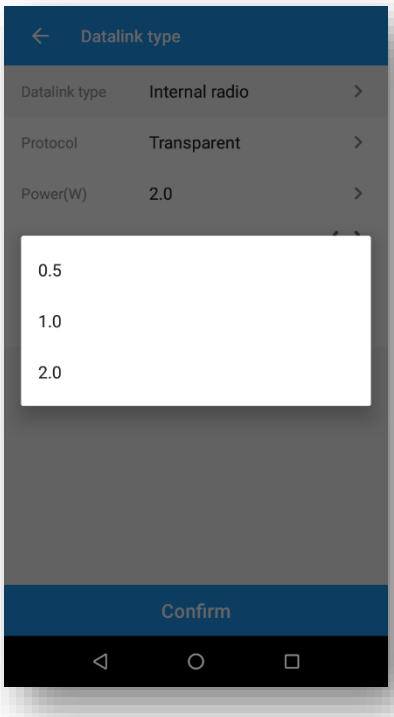
3.3.1Start your receiver as Base

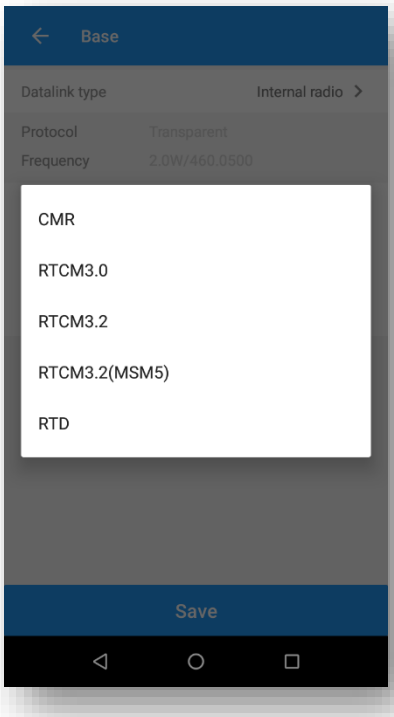
There are three modes you can choose, Device Internet, Internal Radio and External radio.
Internal Radio: This mode uses internal radio to transmit the correction data from Base to Rover. You need to set Base and Rover with same protocol and frequency.
The following steps give an example of internal radio transmission.

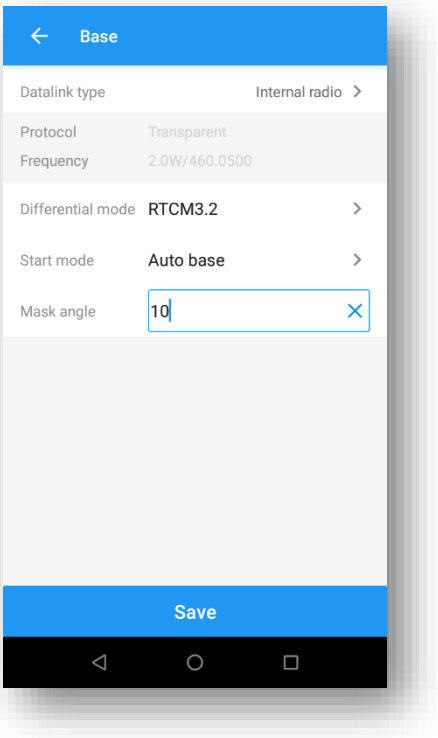
- Protocol: Supports Transparent,MAC, South or TT450S for Base transmission
- Frequency: select a channel or customize a frequency, the range of frequency is 400-480MHz
- Power:Supports 0.5W, 1W or 2W


Datalink type
Datalink type
Internal radio
Protocol
Transparent
Power(W)
2.0
Channel
6
Transparent
Confirm


Datalink type
Customize
1
2
3
4
5
6
7
8
9
Confirm

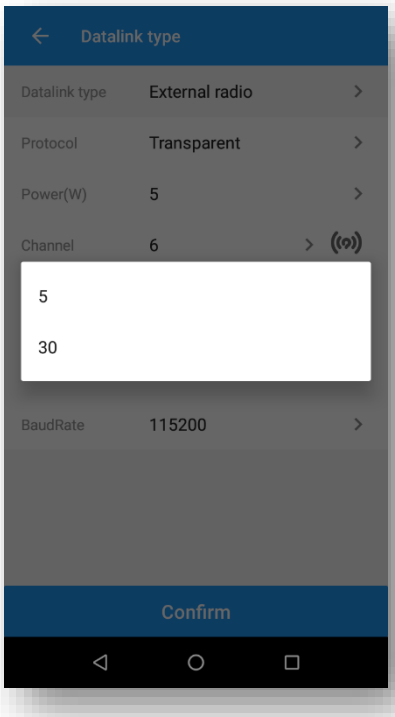

Datalink type
Datalink type
Internal radio
Protocol
Transparent
Power(W)
2.0
0.5
1.0
2.0
Confirm

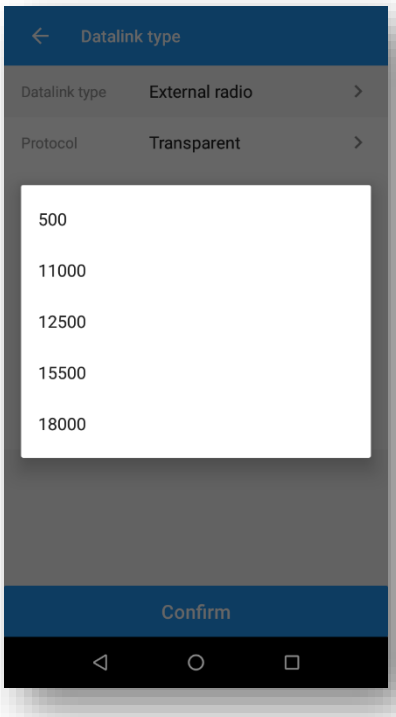

Base
Datalink type
Internal radio
Protocol
Transparent
Frequency
2.0W/460.0500
CMR
RTCM3.0
RTCM3.2
RTCM3.2(MSM5)
RTD
Save

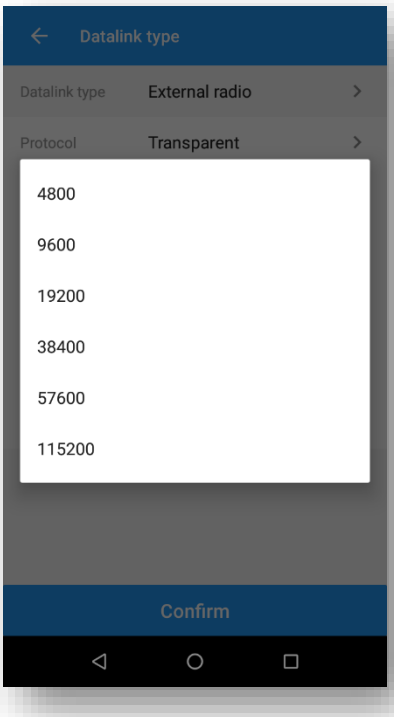


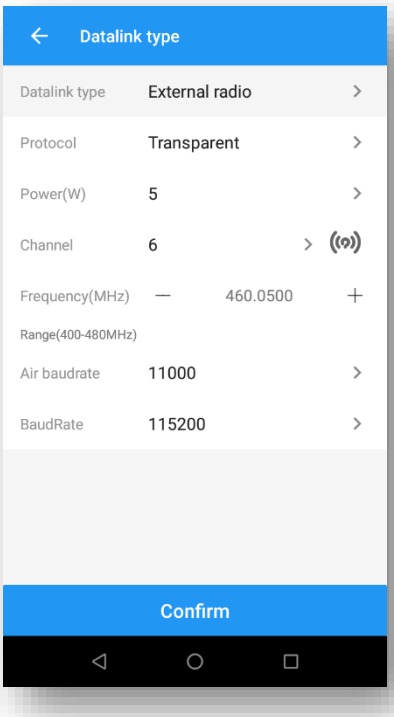
External Radio: This mode uses external radio to transmit the correction data from Base to Rover. You need set Base and Rover with same protocol and frequency.

The steps to start external radio mode is similar with internal radio mode, but you need select the protocol and frequency on the external radio, not In SingularSurv.



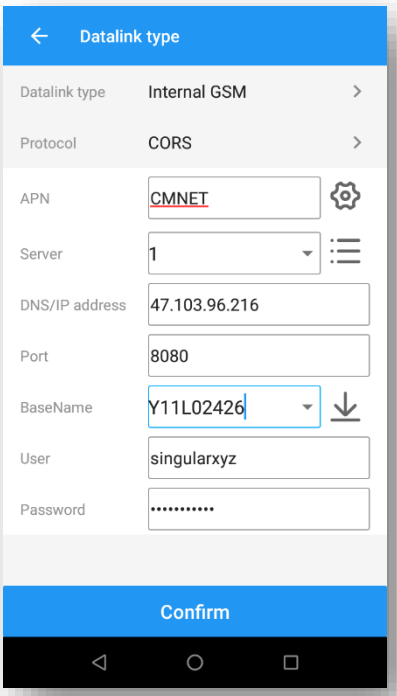






- Baud rate: This option is to set the baud rate of lemo port.

Internal GSM: This mode uses GPRS (internet data) to transmit the correction data from Base to Rover. You need insert a SIM card to Base, set the Base to log on server (with static IP address), and the Rover receives the correction data by Ntrip protocol. The following figures show an example of Base configuration with internal GSM transmission.



3.3.2 Start your receiver as Rover

This chapter shows how to start receiver as rover with Internal Radio, Device Internet and Phone Internet mode.

Internal Radio: Select the same protocol and frequency with the Base receiver, and then the receiver status will turn single to be fixed. The following steps show an example of internal radio.

Device Internet/Phone Internet: For Device Internet mode, we need insert a SIM card to receiver, for Phone Internet mode, we need make sure controller can access to Internet. You should input the server IP and Port. In addition, enter User (login name) and Password to get mountpoint.

The protocol supports NTRIP, TCP Client

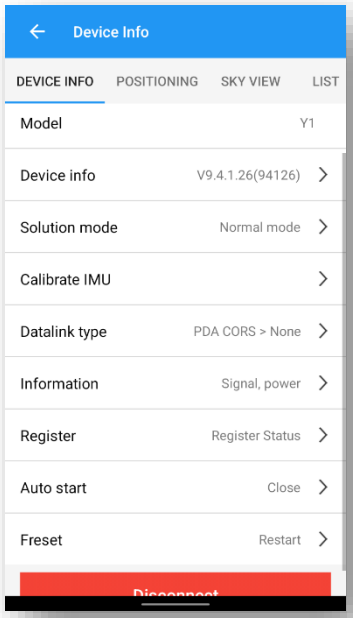
- NTRIP: This is a common Ntrip protocol; you need to set the username and password.

And Device Internet mode only supports Ntrip protocol.

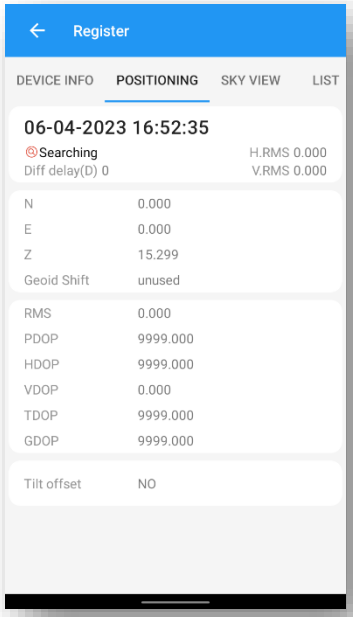
- TCP: This is used to directly obtain the corrections transmitted by TCP protocol.

3.3.3 Receiver configuration

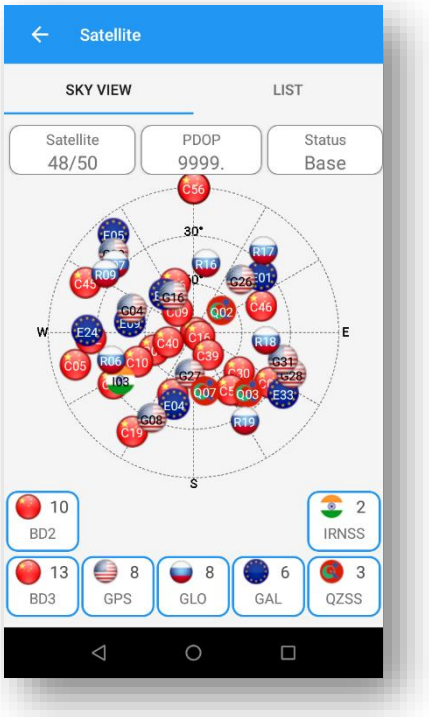
Device Info: In this interface, the receiver information such as Serial number, Device info, Solution mode is displayed. You can set the calibration IMU here to check datalink parameters, check the battery status of the receiver, enter the registration interface to restore factory Settings and other Settings



Positioning: Positioning interface provide you to check receiver work mode and positioning information.

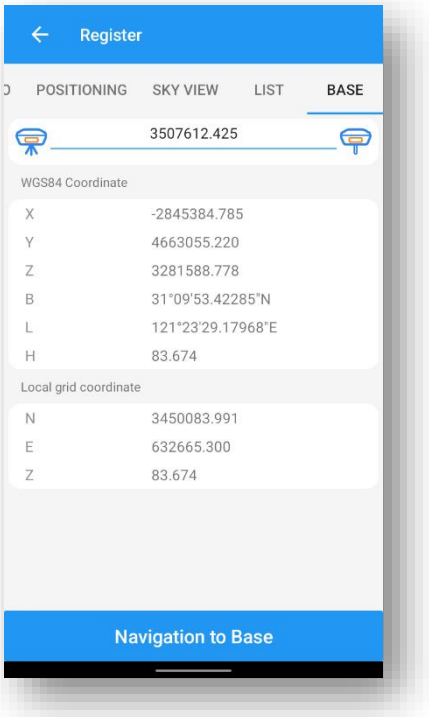


SKY VIEW: Sky view provide a convenient interface of polar coordinate system of satellite distribution in space



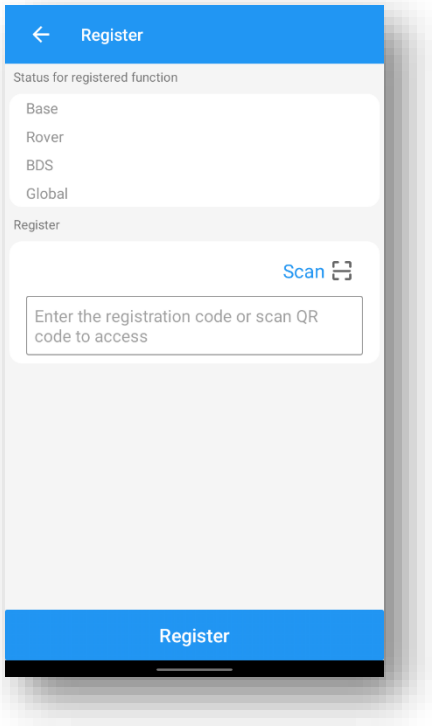
In list interface you can see the detail information about each satellite , such as SNR and positioning in sky.

Base: Base interface provide you check the distance between rover and base. In addition, there are coordinate system information



Get in navigation system by click ‘’Navigation to Base’’ button.

Register: Where the device activation code is entered. You can also view the registration status of the device. There are two activation methods: First, scan the QR code; second, manually enter the activation code. If the registration period of the device expires, please contact the dealer to obtain it.



More: Here are many tiny tool for you. In antenna interface input antenna information , a Y1 antenna parameter is build in customization is allowed here.

NMEA 0183 Output: A useful software for you to output NMEA format data in receiver. You can check different boxes as required.

External radio: When you start as external radio mode config your receiver are allowed here. You can set baud rate and other parameters.

H-Terminal: Debug mode. In this interface you can communication with GNSS module directly

FW upgrade: You can upgrade the firmware or manually select the firmware version to install the version that suits you. When upgrading firmware, be careful to keep the receiver fully charge.

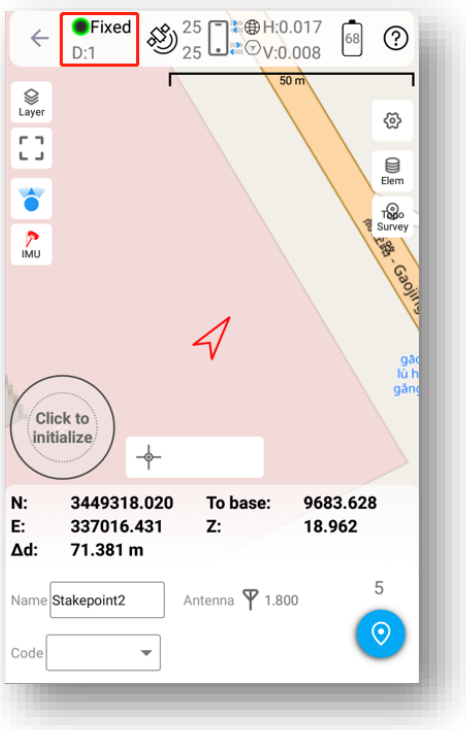
Chapter4 Survey interface

This interface contains all survey modes, such as the most used function Point Survey. Point Survey, Point Stake out and Stake Road function.

- Topo survey: Measure points.
- Detail Survey: Show local gird coordinate and Lat, Lon coordinate.
- Control Point Survey: Measure control points.
- Point Stakeout: Stakeout points.
- CAD: Import dxf or dwg file; edit layers and choose points/lines to stake out.
- Line Stakeout: Stake out elevation in an area.
- Road Stakeout: Edit roads and Stake out them.

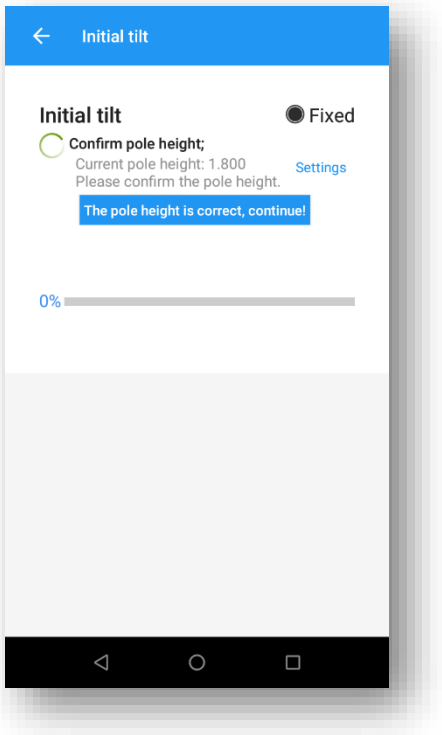
4.1 Point survey

In the Survey interface, click Point Survey-> enter point name, code and antenna height



->click  to start or stop collecting data. Tilt Survey option will appear when receiver supports for tilt survey, it is available for SingularXYZ Y1 GNSS receiver. When the pole tilts within 60°, the built-in sensor based tilt measurement system precisely calculates the actual offset according to angle, which can not only meets the requirement of high precision measurement, but also relieves the users from continually checking whether the pole is plumb.

When using it for the first time, you should follow the interface prompts to initialize the IMU module; it will take you a few seconds. You have been confirmed the antenna information, and it is correct.



If calibration expired or you first use the receiver, tap Calibrate and follow the guidance until succeed. During operation, make receiver can search the satellites. The angle should be less than 60°, for more accuracy, angle less than 30°will be better. When the pole tilts within 60°, the built-in sensor based IMU precisely calculates the actual offset, which accuracy can up to 2.5 cm.

If you power off the receiver or reset it, need to initialize again. After open IMU button, you can follow the guidance in interface to complete it. When you click IMU button to initialize, it will prompt you to confirm the pole height, default pole height is 1.8 meters. During operation, make receiver search satellites and get a fixed

Of course, you can get some information from the floating window, like coordinate and base distance.

Click , it will auto jump map center.

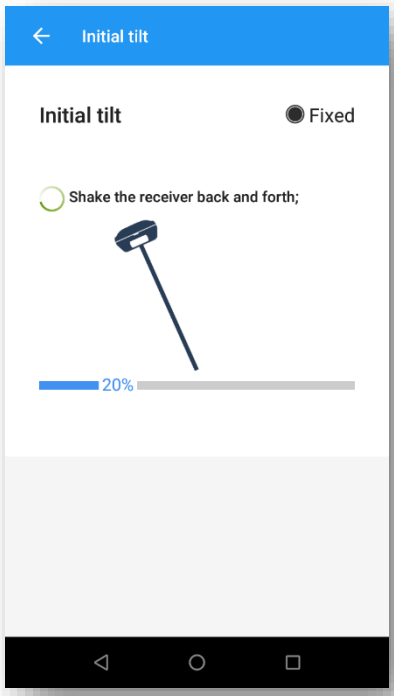
Click Layer , Layer management World map, Tiandi map(image), OpenStreetMap, Google(Vector) and Google(Image).

Click to show the whole points on the interface.

Click IMU to open/close IMU.

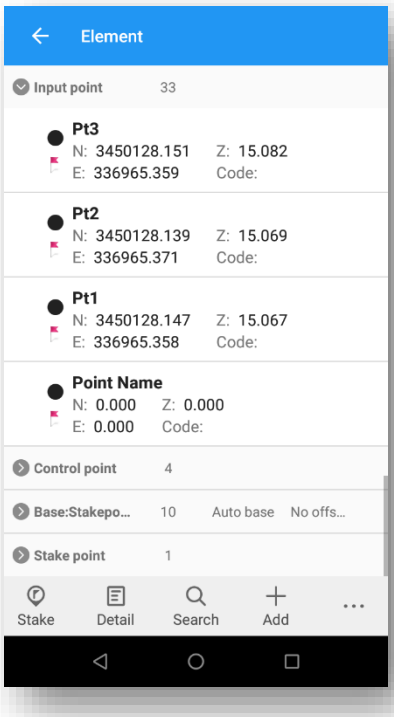
Click 

here to initialize IMU.

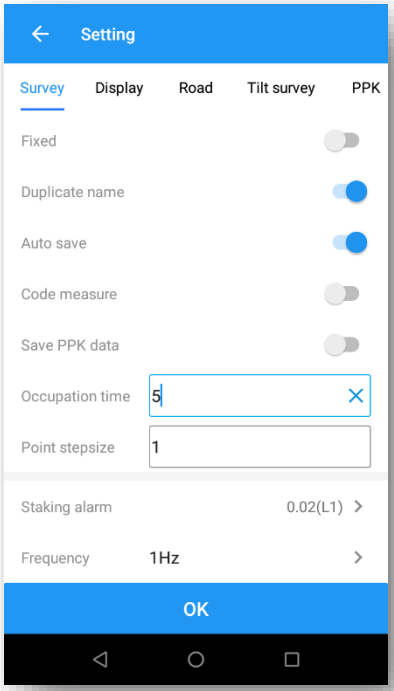


Click 

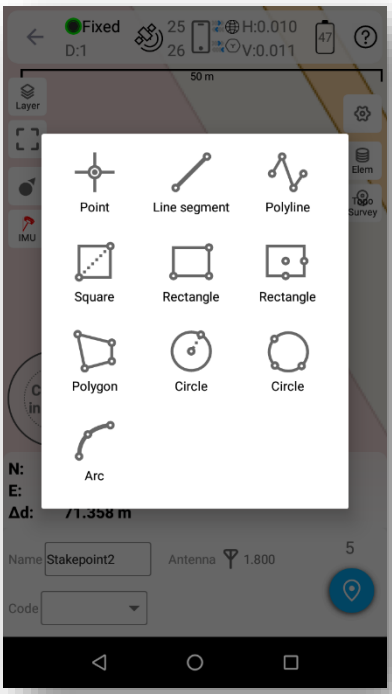
to check point coordinates, you can add, recover, import, and export the data. After you choose a point, you can check the details and take notes or photos .



Click  to set settings, display info and tool bar, in setting interface, you can edit receiver parameter, such as solution limit, HRMS limit, VRMS limit; in display info interface, you can add information to floating window you want below the interface; in tool bar interface, you can add or delete options to point survey interface. You can customize the interface to meet whatever layout needs you might have.

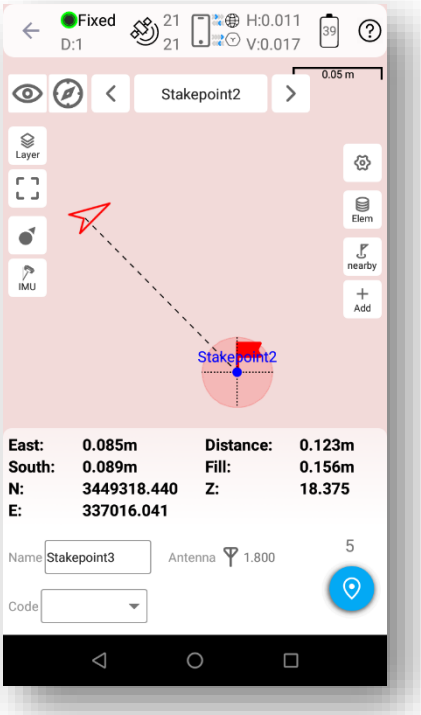


Click  to slect point, line or polygon you want to mapping.



4.2.1 Point stakeout

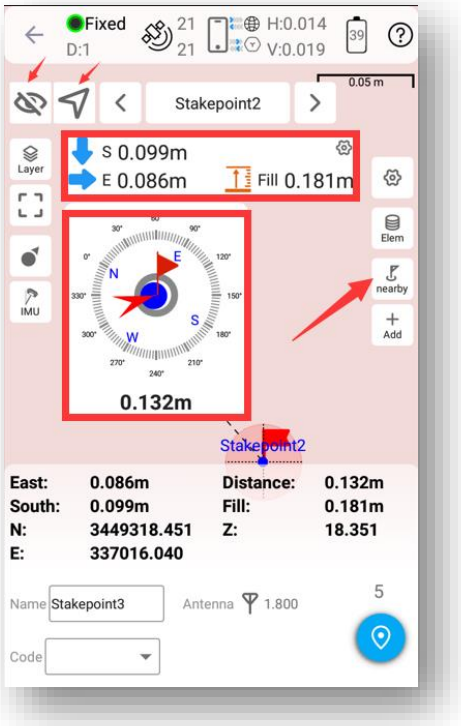
Go into Stake point interface, add or import the point coordinates you need to stakeout, of course you can choose from the button library.



- Click Add to input coordinates.

Click Import to get coordinates with different kinds of files; you can also define a new form. Choose a point to stake, SingularSurv provides a navigation map when staking points/lines. If you are close to the target point enough, it will alarm you based on the alarm range you set. For Y1 receiver, you can use IMU staking function. In the IMU staking, you can open IMU function, and don't need to keep the receiver vertical to the ground, and the tilt angle supports maximum to 60 degrees.

- There is a direction prompt on the floating window



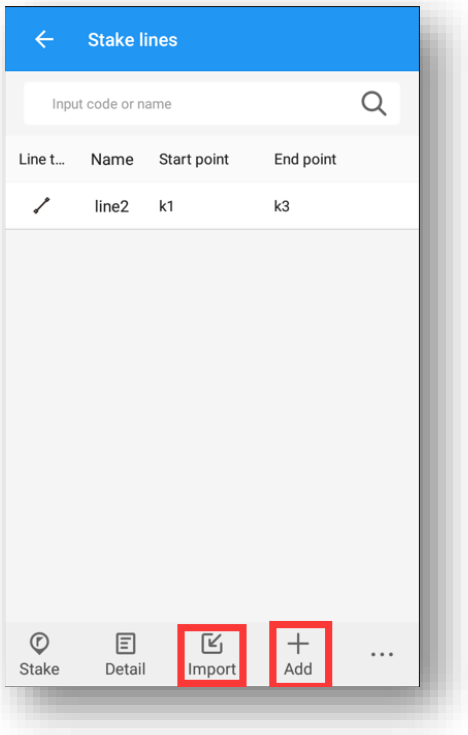
- Click , to start or stop stake points.
- Click IMU , to open or close IMU.
- Click nearby , jump to lasted point.
- Click , jump to next point.
- Click ,jump to previous point.

- Click  to set stakeout settings, display info and tool bar, you can edit the prompt range and range error .

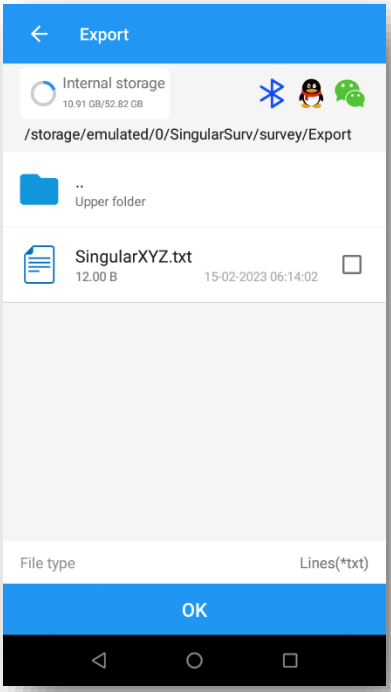
4.2.2 Line stakeout

Go into Stake line interface, add or import lines you need to stakeout.

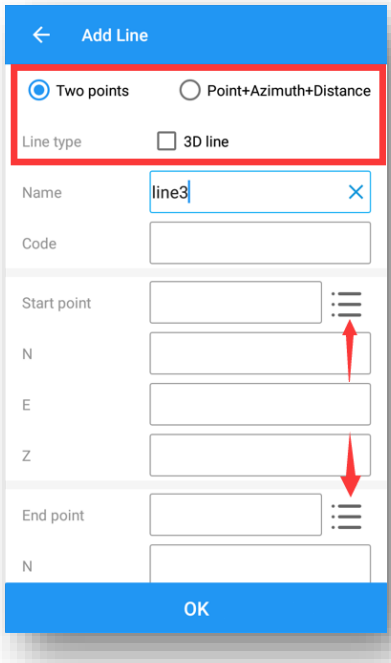
- Click Add to input line parameters, there are two types you can choose.



Click Import to get coordinates with different kinds of files; you can also define a new format.



Click here to select the method of composition line: Two points, Point + Azimuth + Distance. You can also check the 3D line box.



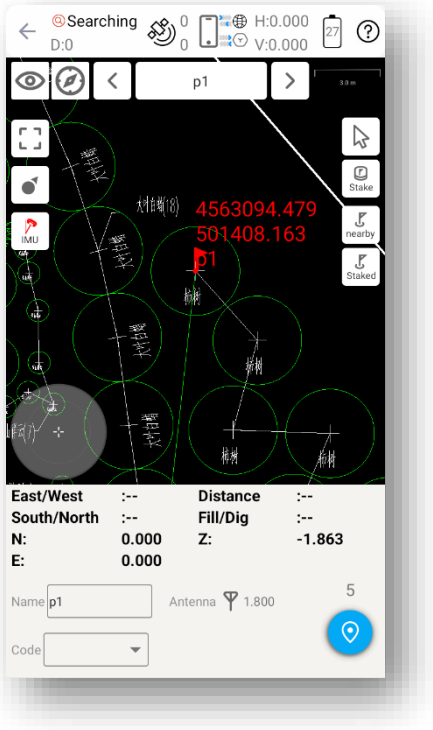
Choose a line to shake, set calculation mode and interval.

Click ,jump to next line.

Click ,jump to previous line.

4.3 CAD mapping and stakeout

When using for the first time, the CAD interface has no layers and floating window to display the features you need to stake.



In the CAD interface, you can choose a feature you want to stake, it will show up in blue. You can know the details about it, including length, start point, end point and center point. And choose the way to stake.

- Setting: Set the method of stakeout, offset distance, interval etc.
- Start station: If you set the start station as 5m, then final mileage will plus 5m.
- Offset: If you set the offset 5m, then you will stake the line 5m away from the line you choose.

Plus and minus represent different sides of the line.

- Setting out by pile by coordinate: including station number, station distance and segment

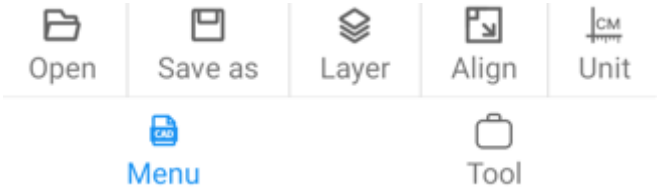
1.Station distance: Stake the line at a specified distance, for example, if the line is 40m, you set the specified distance as 8m. Then you will stake the line at 8m distance every segment

2.Segment: For example, if you set the line segment as 4, then you will stake the line at 4 segments, every segment length is the same.

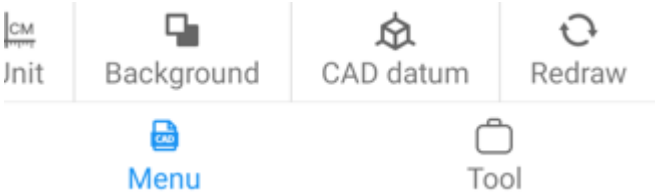
3.Station number: You will stake the line at the station at each interval point You can stake it out according to the direction.

4.key node: It will stakeout the line with starting point, ending point, midpoint, fold point, etc.

5.To stake road alignment, first you need design the road, including the broken station, center line, vertical profile, standard cross section and slop. You can design it by editing or importing.

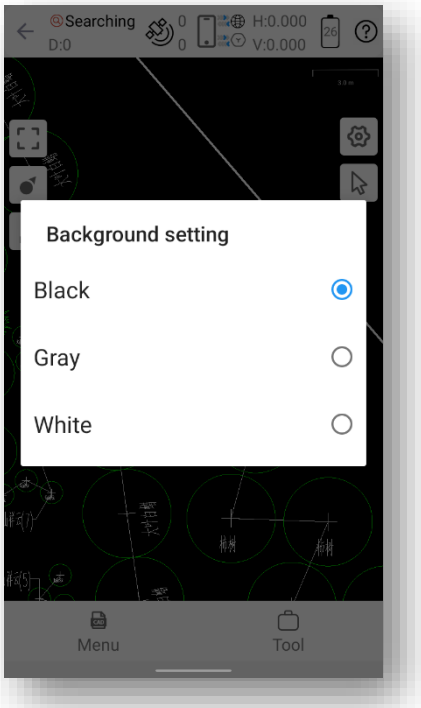


Click Menu to Open / Save /Layer / Align /Unit.

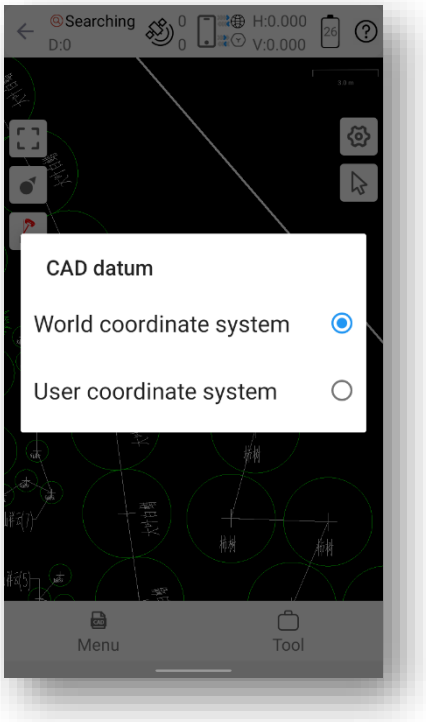


Click Redraw to Redraw.

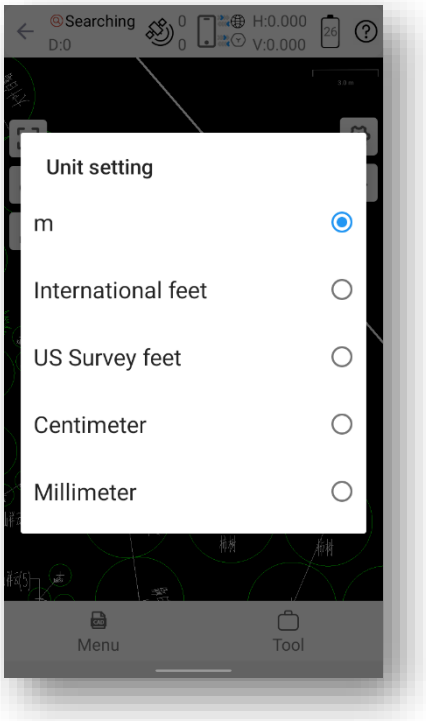
Click tool to set Capture mode.



Click Background to setting Black/ Gray/White.



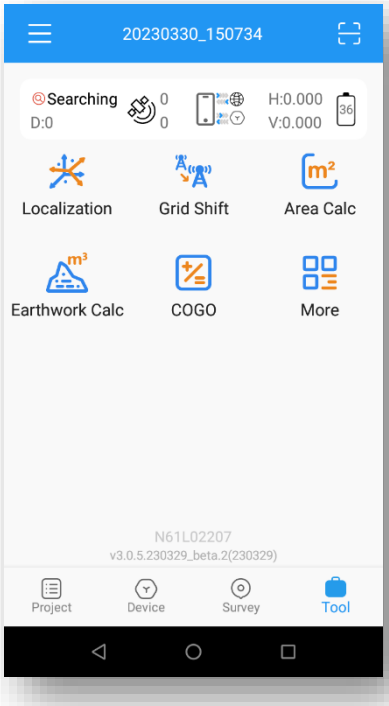
CAD datum World coordinate system/User coordinate system.



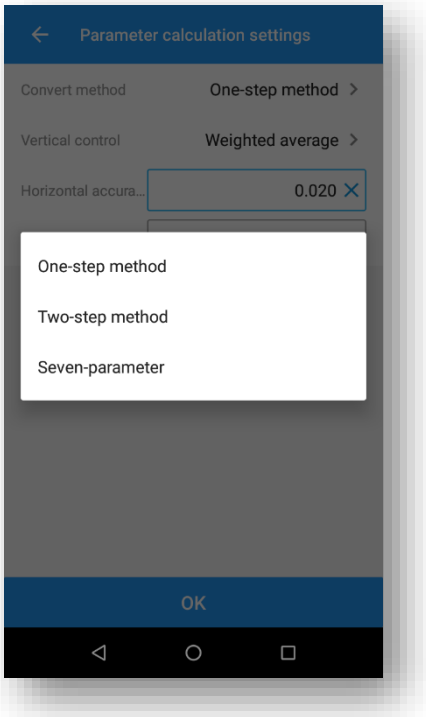
Unit setting m/ International feet/US Survey feet/Centimeter/ Millimeter.

Chapter5 Tool interface

This interface provide you some very useful tool, I will introduction for you one by one.



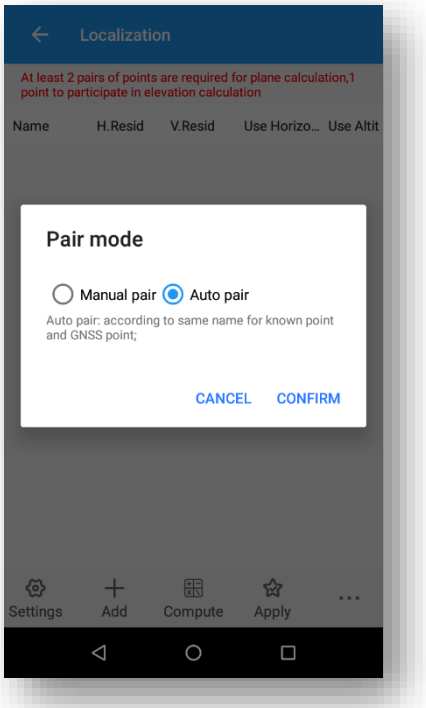
Localization: When your coordinate system is inconsistent with the standard coordinate system, or when you want to convert points measured in different coordinate systems to each other. At least 2 pairs of points are required for plane calculation, 1 point to participate in elevation calculation. You can choose convert method In parameter calculation settings interface. There are one-step method two-step method and seven-parameter method. In general, seven-parameter model. The one-step method is four parameter model .It need at least two points for the X-axis and Y-axis increments The rotation Angle of the X-axis and Y-axis, of course an axis scaling factor. Suitable for small range and low precision scenes.



The seven-parameter model is the most accurate. It requires at least three points. The so-called seven-parameter model refers to three coordinate increments, three axis rotation angles, and a scale factor. Suitable for large scale and high precision requirements of 15km or more.

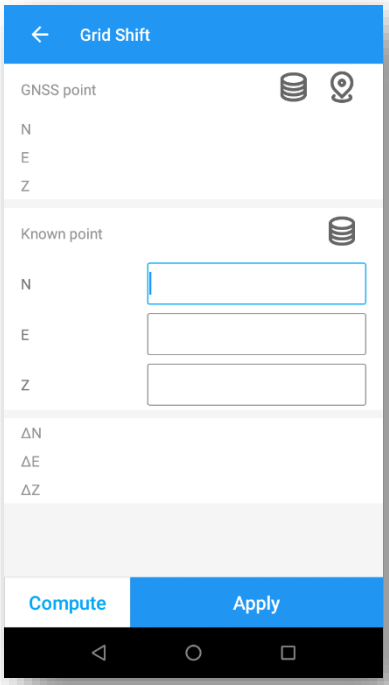
The two-step method combine one-step method and seven parameter simultaneously. It also puts pressure on computing capacity.

In addition, you can set thresholds for horizontal and vertical accuracy too.

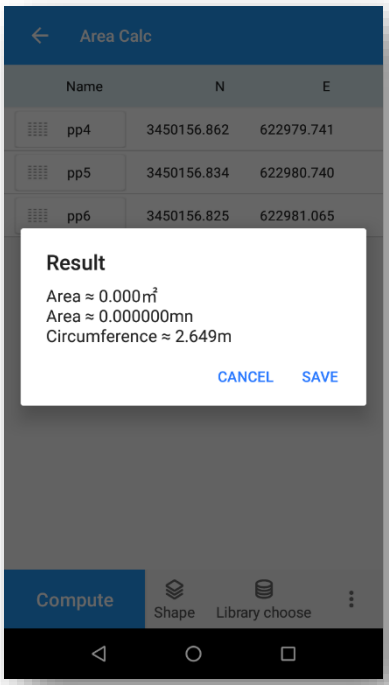


Click add button get into pair mode ,auto pair matching according to same name for known point and GNSS automatically; If point name does not matching that well do it manually.

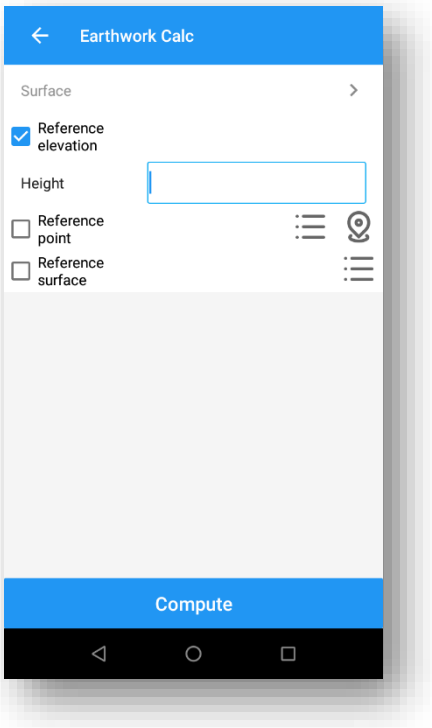
Click compute to start calculation and apply it.



Grid Shift: Grid Shift is used when you measure different base stations for two times and need to calculate the measurement points under two datum points to the same datum.

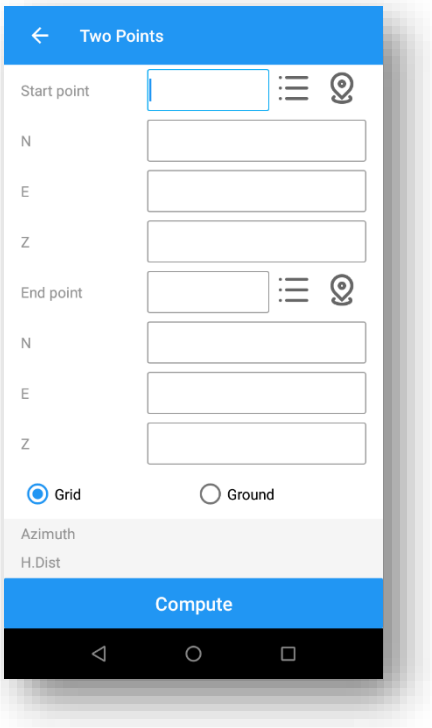


Area Calc: A very useful tool for area calculate: As you know three points determine a surface, you need choose at least three points in element or choose shape file .



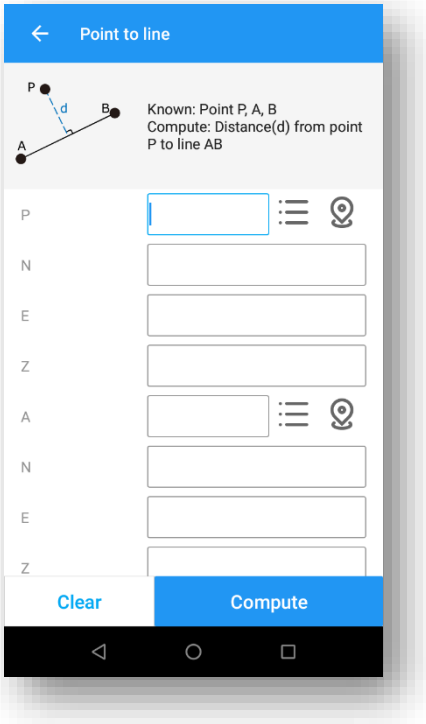
Earthwork calc: Choose reference elevation height reference point and surface as you need. Click compute button calculate the number of earth works that need to be dug or filled.

COGO: It integrates many small calculations in the engineering process.
Angular transformation can do Angle format conversion.

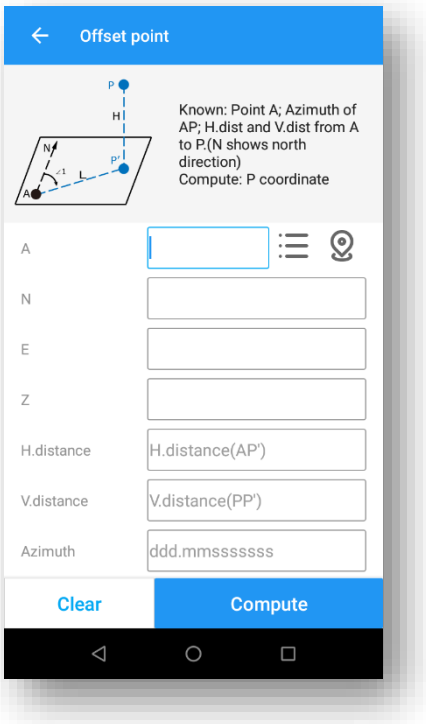


Two points calculate the distance and Azimuth Angle.

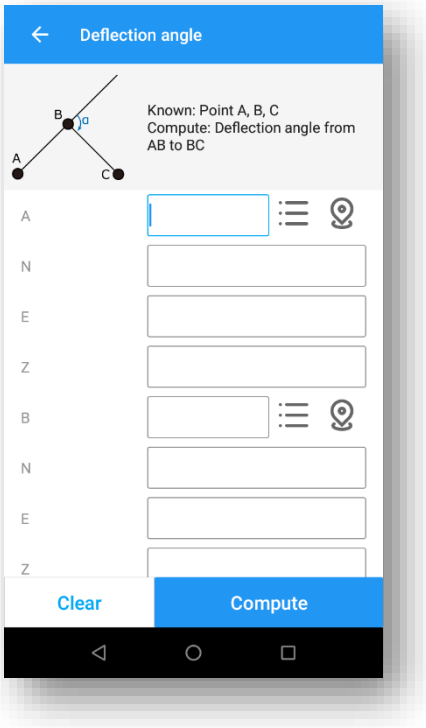
Grid to ground only supported in UTM



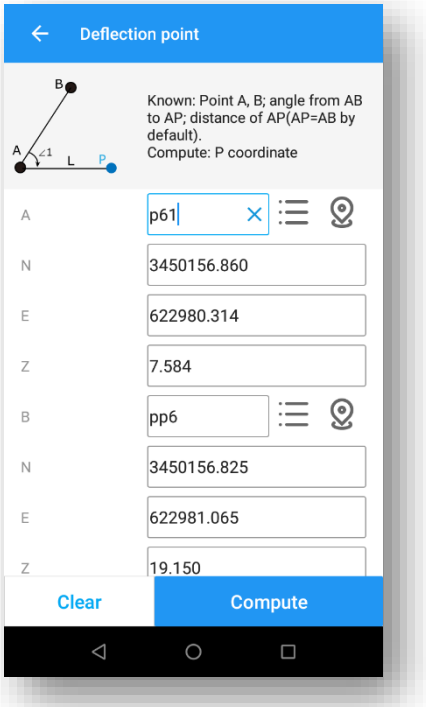
Point to line calculate the distance between point P and line AB



Offset point Calculate the coordinates of point p in three dimensions You need to know the coordinates of A, the azimuth of AP and the horizontal distance and elevation difference of AP.

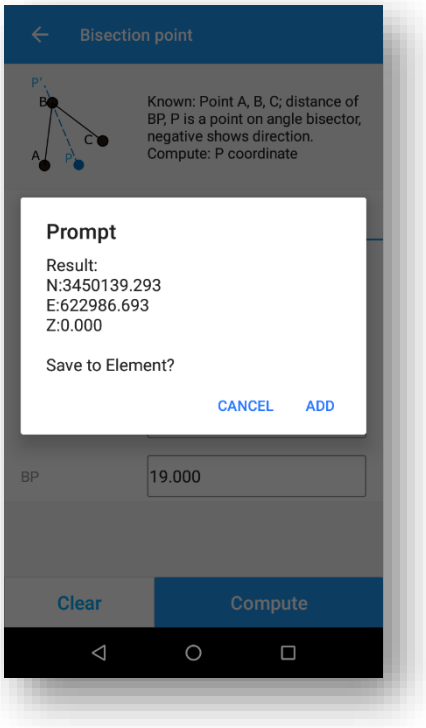


Deflection angle Given the coordinates of point A point B and point C, calculate the deflection Angle of line AB to line BC

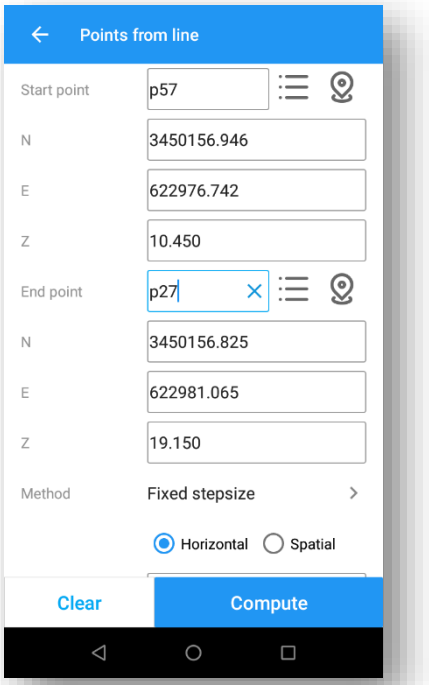


Deflection point We know the rotation Angle from points A, B\AB to AP, and the distance AP from point A to point P (AP is the distance AB by default). Calculation: Coordinates of point P.

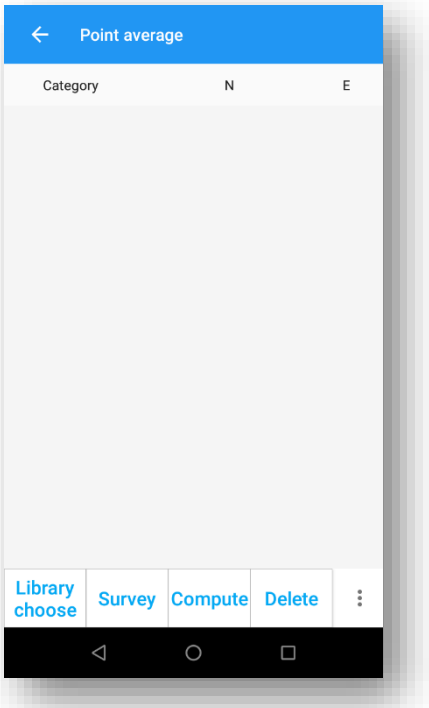
Intersection point Given: Points A,B,C,D Calculate: coordinates of the intersection of AB and CD.



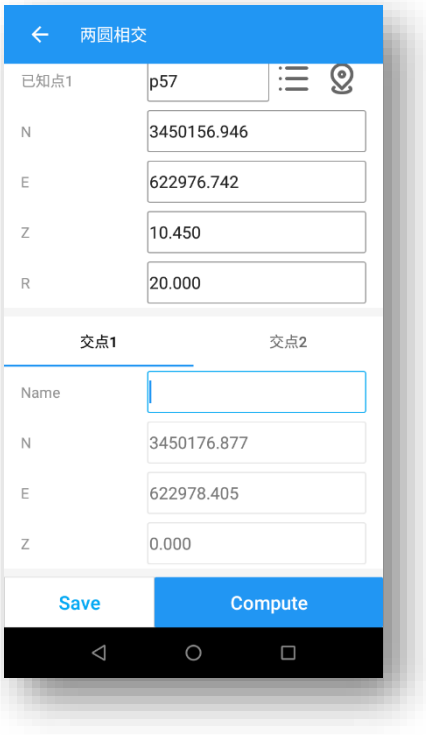
Bisection point Given points A, B, C and B, P distance is BP, P is a point on Angle ABC bisector, BP negative means P is on the reverse extension of the bisector; Calculation: Point P.



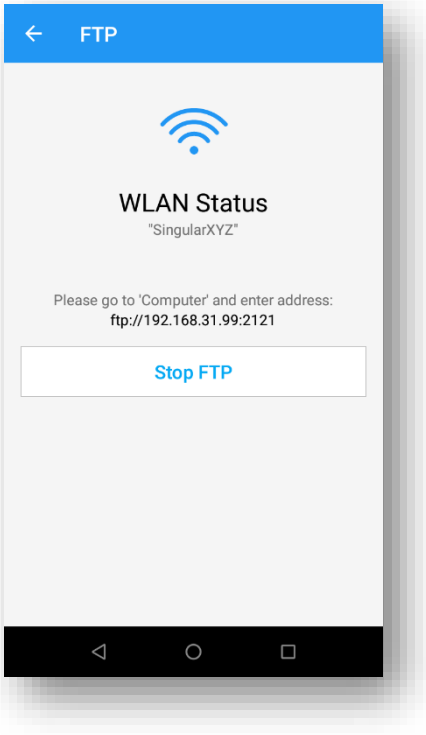
Points from line Given a line intercepts points on the line by dividing steps.



Point average Select the measurement point and decide whether to add it to the coordinate point library.



Two circles Given the center coordinates and radius of circles A and B, calculate the coordinates of the intersection of the two circles.



More: FTP (File Transfer Protocol) is a network protocol for transmitting files between computers over Transmission Control Protocol/Internet Protocol (TCP/IP) connections. Within the TCP/IP suite, FTP is considered an application layer protocol.