SinoGNSS®
By ComNav Technology Ltd.

P6 Handheld

High Precision Version

User Guide



Version 2.0
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1 Introduction

The SinoGNSS® P6H Handheld User Guide is aimed to help you get familiar with the P6H Handheld and start your project effectively. We highly recommend you to read this manual before surveying, even you have used other Global Positioning System (GPS) receivers before.

1.1 About the P6H Handheld

With SinoGNSS® Quantum™ algorithm, P6H Handheld can be applied in RTK mode with all GNSS constellations. P6H Handheld 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 P6H Handheld features

The SinoGNSS® P6H Handheld key features:

• Ultrasmall and super light

- Size: 226.5*83*24mm

- Weight: 384g

• Drop Test Survive from a 1.5m drop

• IP67 dustproof and waterproof

• LCD 6’’HD 720*1080 Sunlight readable

• Satellite Bei Dou/ GPS/GLONASS/ GALILEO/ QZSS / SBAS

• Integrated high precision GNSS antenna

• Increased measurement traceability with SinoGNSS® Quantum™ algorithm technology

• Cable-free Bluetooth wireless technology

• Integrated WIFI module

• External Interface USB, OTG

• Battery 6800mAh

• Operating System: Android 12

• ROM/RAM: 64GB/4GB

1.3 P6H Handheld parts list

Item	Picture
P6H Handheld	
USB cable	
Charger	
Quick start guide	

2 Setting up the P6H Handheld

This chapter provides general information on environmental requirements, setup, power supply and connection of the P6H Handheld.

2.1 Environment requirements

To keep the receiver with a reliable performance, it is better to use P6H Handheld in safe environmental conditions:

• Operating temperature: -25°C to +60°C

• Storage temperature: -40°C to +70°C

• Out of corrosive fluids and gases

• With a clear view of sky

2.2 Front Panel

On the front of the P6H Handheld, there are some buttons for operation



2.3 Power supply

P6H Handheld supports external power input.

The P6H Handheld need USB cable and charger to charge.

Tip: If you only use a USB cable or use an unmatched USB cable and charger, it may cause slow charging.

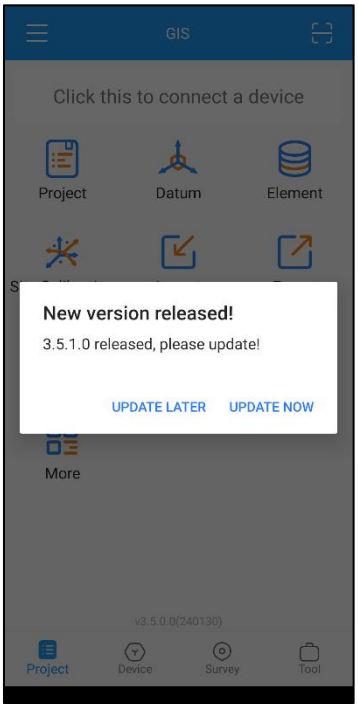
3 Real-Time Kinematic Survey (RTK)

This chapter introduces how to conduct RTK Survey with Survey Master Software, including software installation, start a new project, receiver connection and RTK working mode.

3.1 Installation of Survey Master

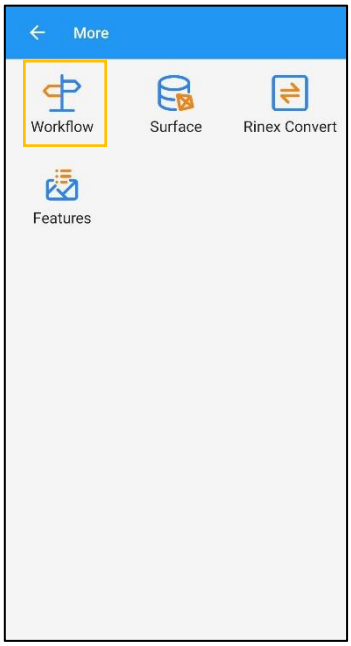
Our equipment is always installed with the latest software before shipping.

If there is a version update, the software will prompt you to download and install the new version when it is networked.



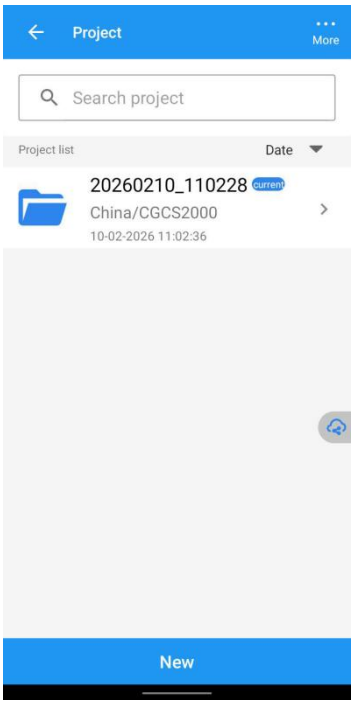
3.2 Wizard function in Survey Master

Follow the Wizard, you can quickly learn the general workflow of Survey Master, also you can quick start your survey by this function no matter you are experienced one or new user.

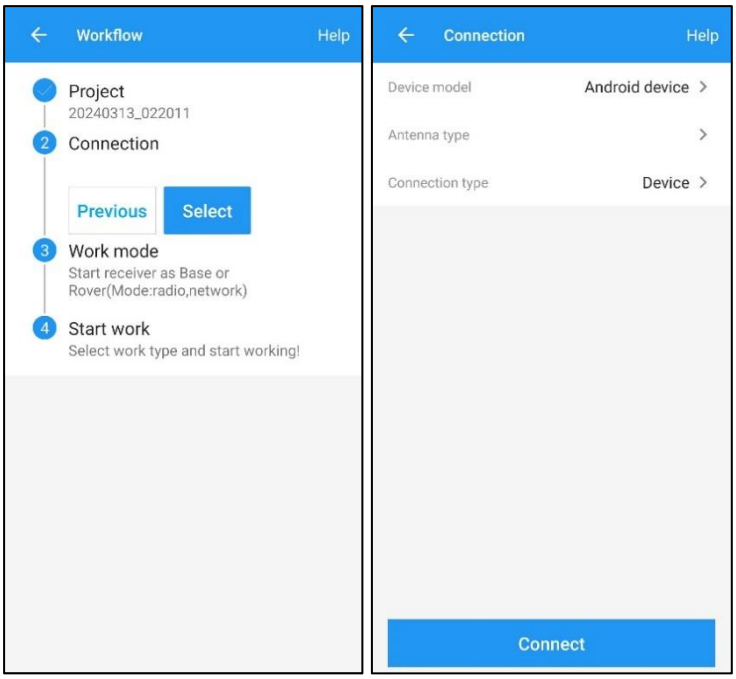


In Project menu, tap Workflow.

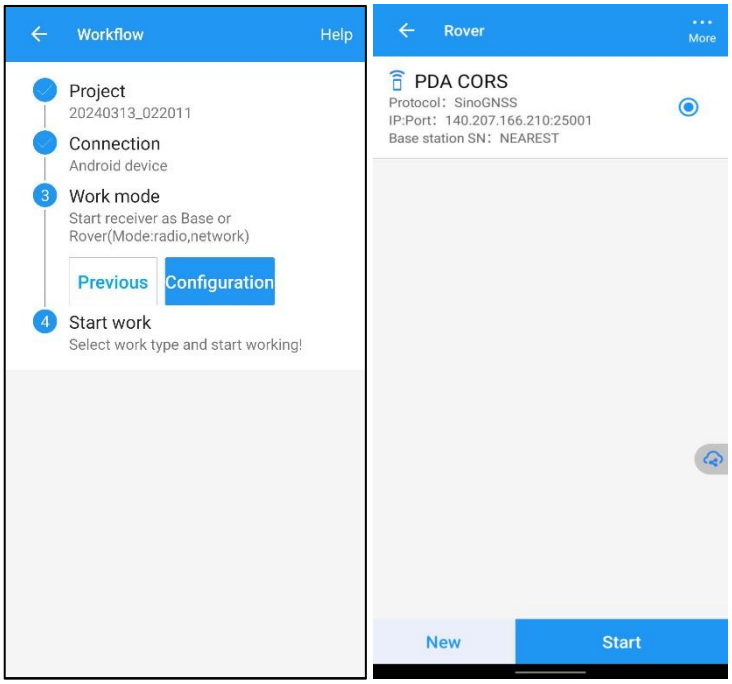
1.*Project*: Click ***Select*** to go into Project interface to create or select a project.



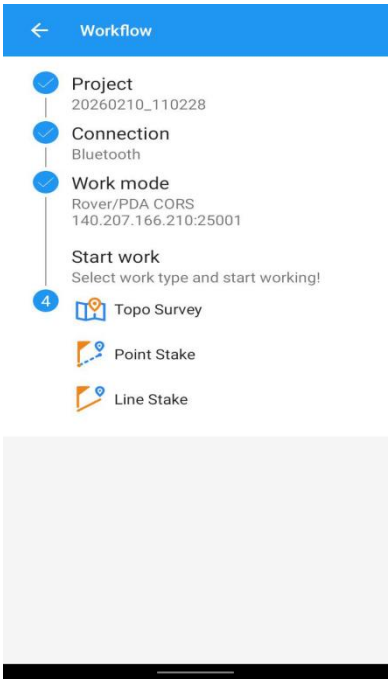
2.*Connection*: Click ***Select*** to go into Bluetooth connection interface.



3.***Work mode***: Click ***Select*** to go into Quick Setup interface to start your P6H Handheld as Rover.

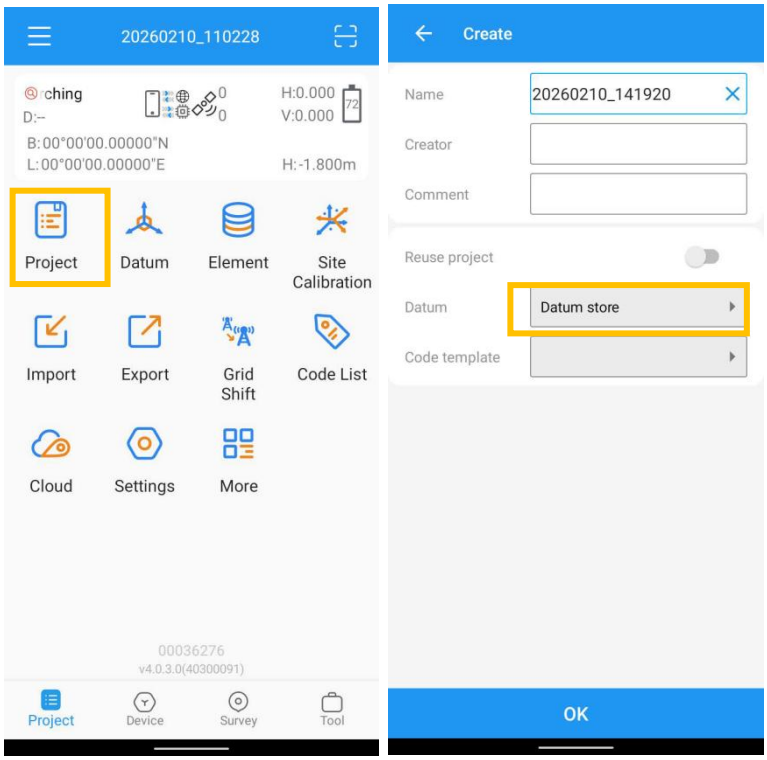


After you start your P6H Handheld as Rover, you can start work directly of topo survey or stakeout.

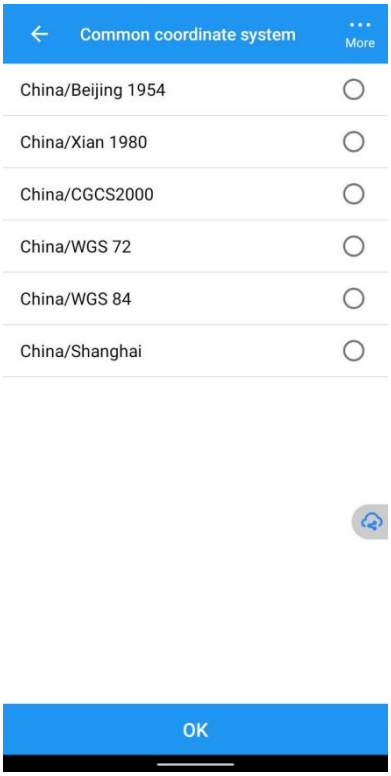


3.3 Start a New Project

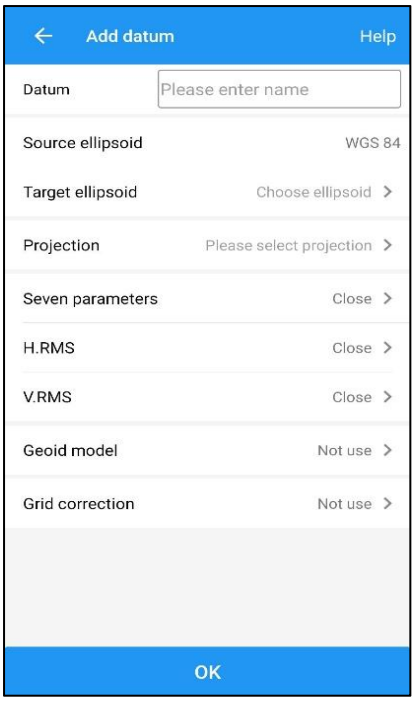
Click ***Project***, you can create a new project. Choose a datum in Datum store.



- Select a Predefined datum: You can select datum directly from the list.



- Create a User defined datum: If you cannot find datum you want in the list, follow instructions below to add one: select Ellipsoid, Projection for your datum, and even seven parameters, based on your request.

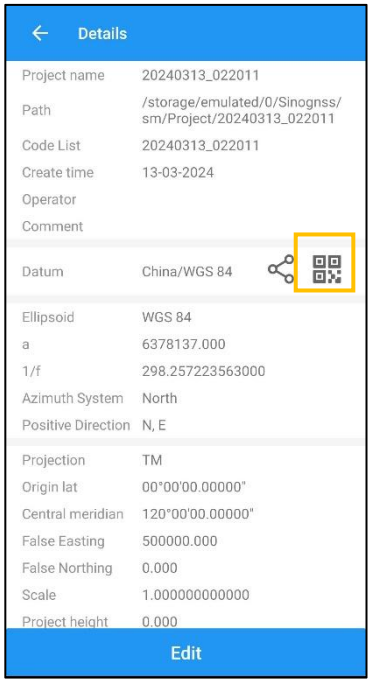


Tip1:If asked username and password for seven parameters, enter ***admin admin***

Tip2: For H.RMS and V.RMS, it will show if do ***Site Calibration****.*

- Share Datum via QR code.

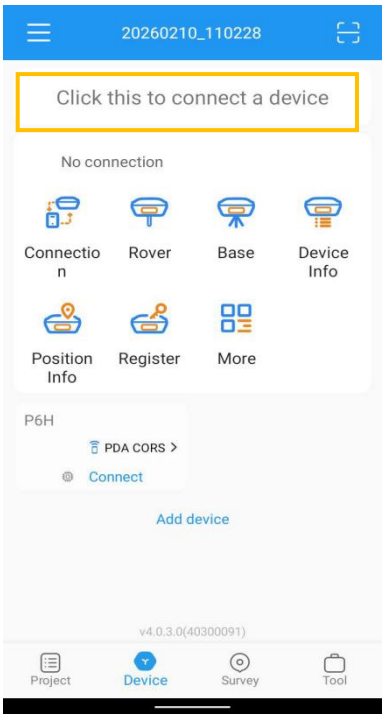
- After you build a project, press the project name, it will generate a QR code. Users can use the Scan function in the main interface to access the coordinate system.



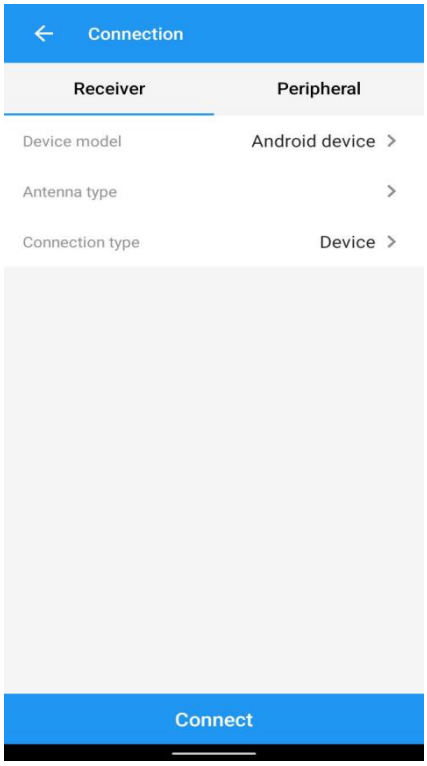
3.4 Device connection

To connect Survey Master with P6H Handheld, switch to ***Device*** interface.

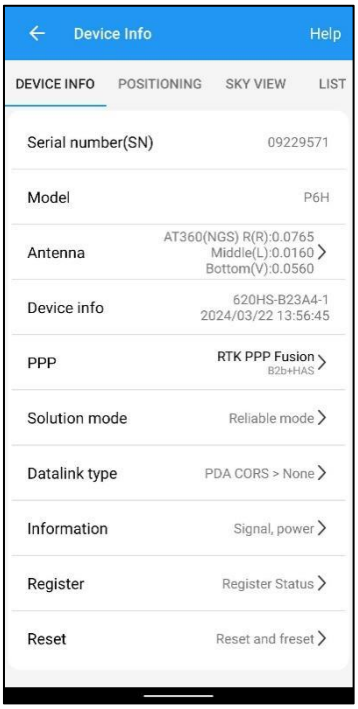
- You can connect to the built-in card by clicking "click connect" at the top of the main screen.



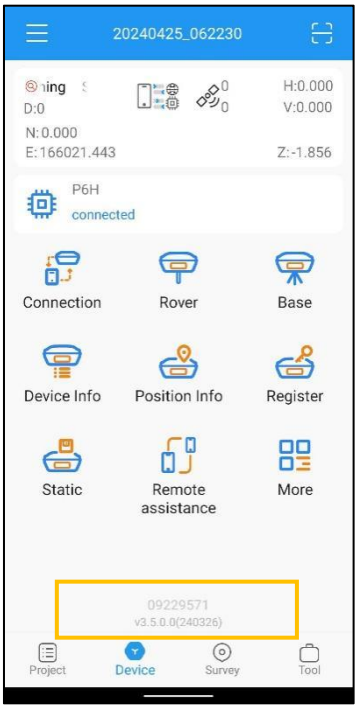
- You can also tap **Connection** to go into connection interface, click Device model: Android device—select connect type: Device.



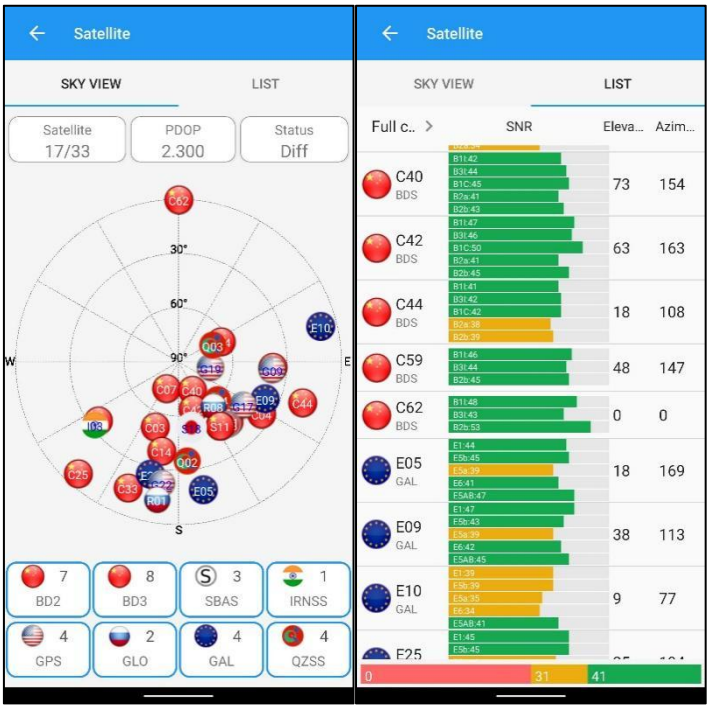
After connecting the P6H Handheld, you can check the device version in ***Device Info.***



After connected successfully, the bottom will show the board SN.



Click on the satellite, you can see the SKY VIEW, SNR list.



3.5 PDA CORS Mode

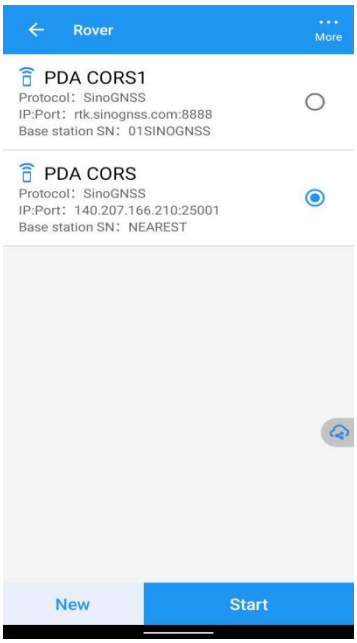
Without setting up your own base stations, the P6H Handheld can receive correction data transmitted from continuously operating reference station via PDA's GPRS or WIFI. To do GIS survey in PDA CORS mode, it requires:

Configure the Rover as below:

- Make sure your P6H Handheld can access to internet via SIM card or Wi-Fi, then turn on Survey Master Software.
- Build connection, Click ***Device*** -> ***Rover*** -> ***PDA CORS.***
- Enter CORS ***DNS/IP address*** and ***port***-> Click ***Source List*** and select the proper source -> enter ***User*** and ***password***.



After configuring the PDA CORS, need to check if the status is "**Fixed**".



Tip: ComNav technology provides a free static server address ***140.207.166.210:25001****, anyone can upload CORS data as long as abide by the agreement.*

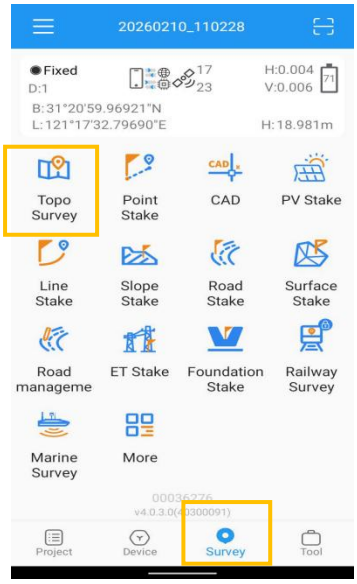
4 Basic Survey Functions

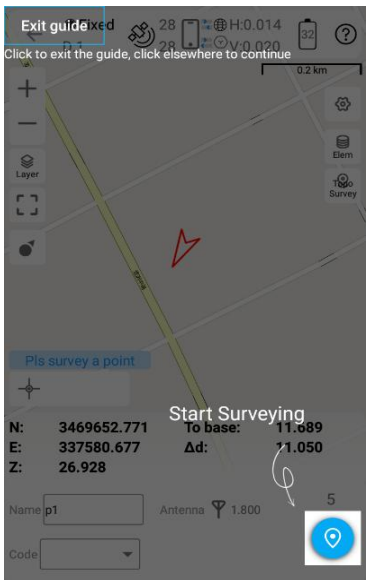
This section describes the basic survey functions of Survey Master, including Topo survey, Auto survey, Area survey, Feature survey, PPK, Point stake.

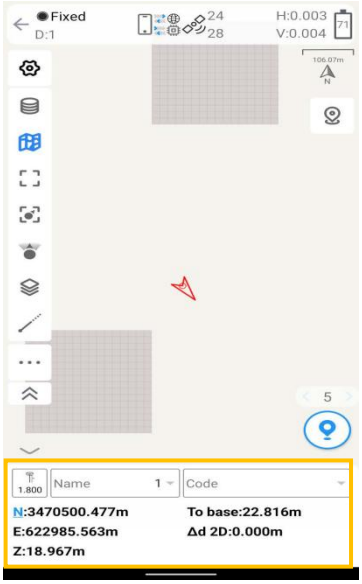
4.1 Topo survey

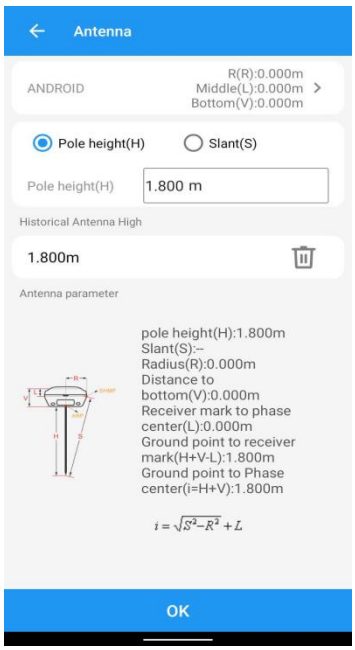
Click Topo Survey-> enter point name, ->click  to start or stop collecting data.

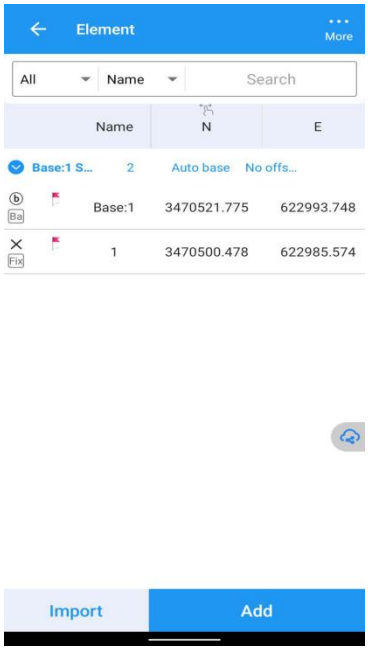
- You can quickly change antenna height in the survey interface.
- Tap ***Elem*** to check point coordinates.
- Tap ***Layer*** to show the layers you want display on map.

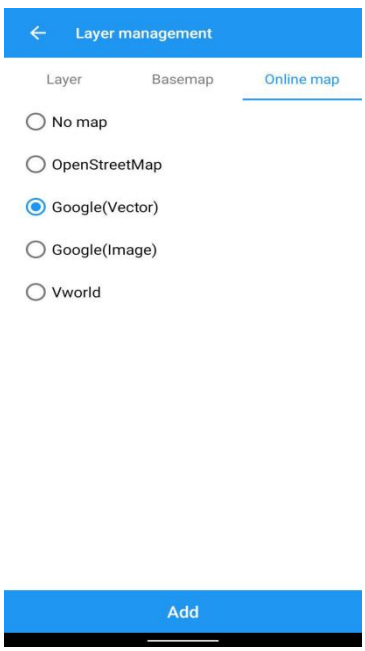






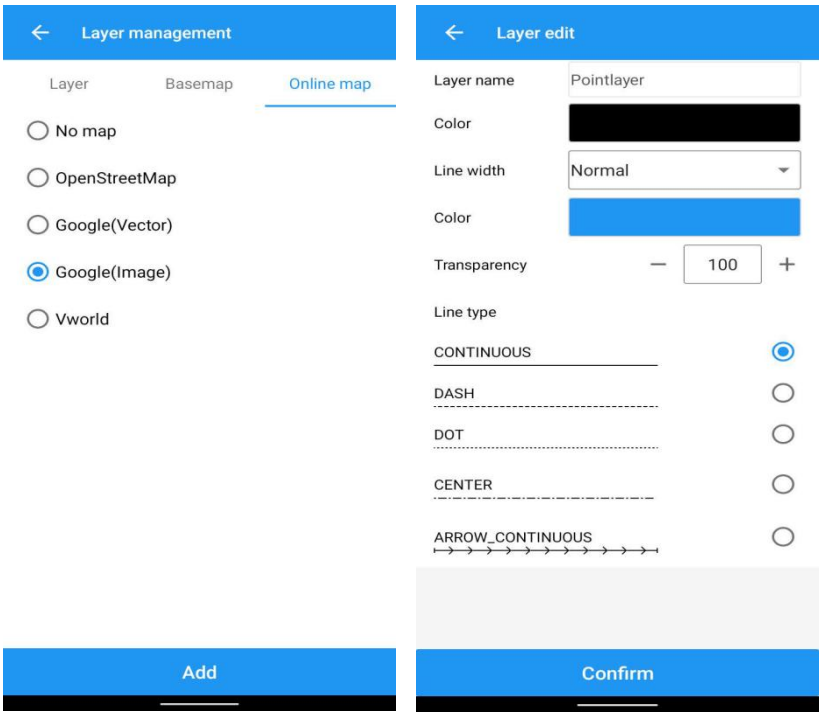




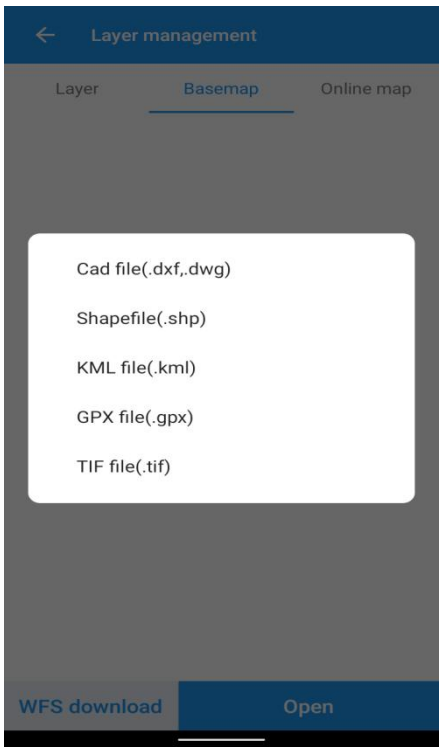


- : Click this to show the whole points on the interface.
- : If the arrow is out of sight on the interface, you can click this to locate the receiver position, then the arrow will be shown on the interface.

Here users can set the display map: OpenStreeMap/Google(Vector)/Google(Image)



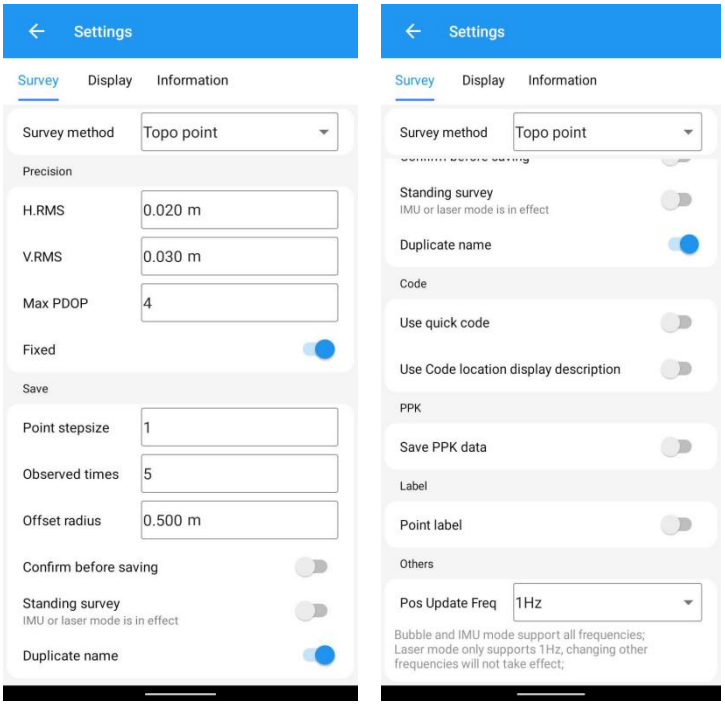
- In Basemap, you can tap Open. Open shapefile(.shp)、CAD file(.dxf, .dwg)、KML file(.kml)、GPX file(.gpx) or TIF file(.tif), it will search all CAD or shape files in your controller, you can enter the file name to find quickly; When you select the CAD file, you are allowed to set its unit.



- ***Down/Up***: Click the change the background layers display order.
- ***Delete***: Choose a background layer in the list then delete it.
- ***Edit***: When you import the CAD or shape file as the background layer, you can select one to edit it.

4.1.1Survey settings

- Fixed: only fixed result can be saved
- Duplicate name: allow point name same
- Confirm before saving: prompts the user to confirm their changes before saving them
- Save PPK data: PPK data is stored while measuring
- RMS: point accuracy need higher than the value
- Offset radius: point cannot offset bigger than the value during measure
- Occupation time: measure times for one point
- Point step size: for point name

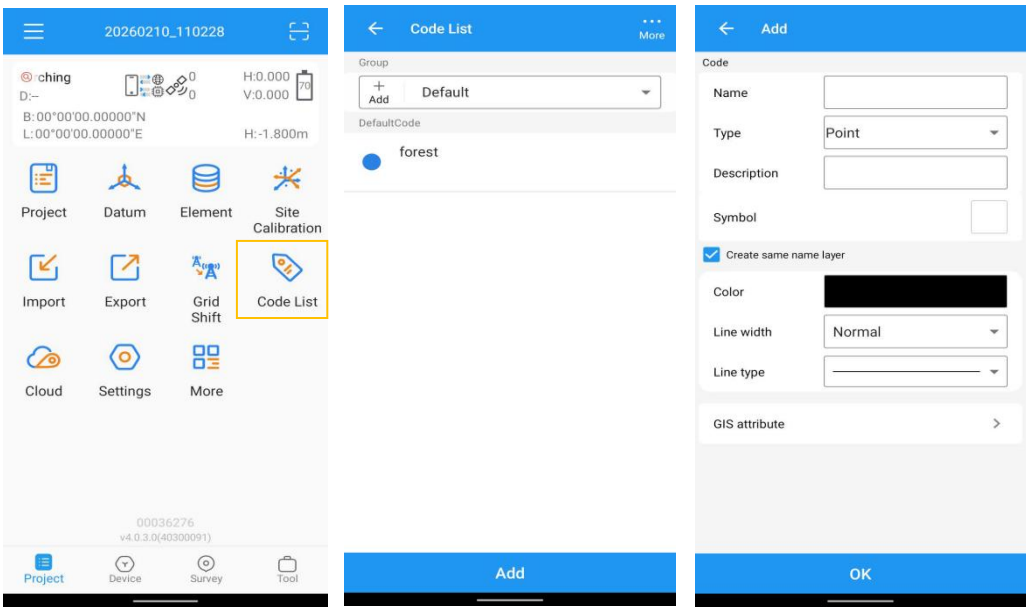


4.2 Feature Survey (GIS Survey)

Feature Survey is a very practical function in GIS measurement. Users can measure points, lines and surfaces in feature survey by editing code and attributes, and record different attribute parameters of feature objects. It can also be real time drawing them into a graph. If you use the code that you add, the feature will show the same color and style of the code. After the feature survey, the result map can be output into SHP format data and imported into the third-party GIS software for spatial analysis and statistics.

1.Set code list and attributes:

If you don’t have a code list, you can modify current code list and add the code, if you add a code list before, you can choose this code list when you create a new project.



Modify: You can modify the current code list, supports modify previous code detail and add a new code to it.

• Import: select the TXT code list file which you need to import.

• Add: Add a code list

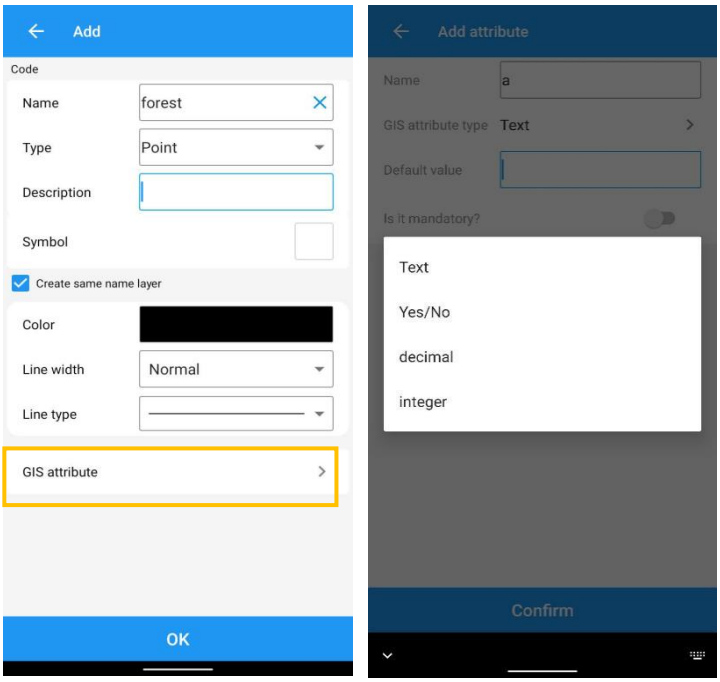
• Apply: choose one code list to apply to current task code list.

• Delete: delete the code list, you can delete the code list or delete the current task code list.

• Export: Export *.txt file of the code list.

When you add/modify point/line/polygon code, you can select “GIS attribute”. Then you can edit/add attributes for the code.

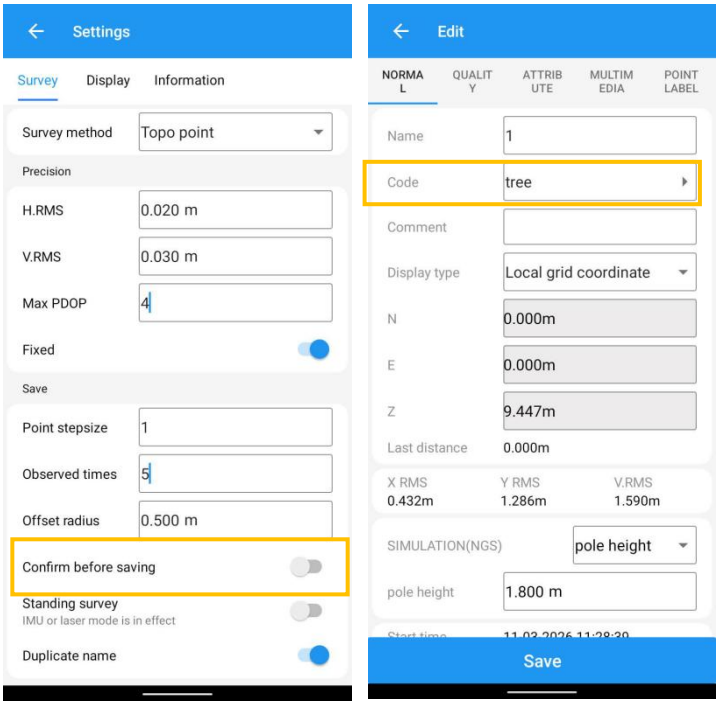
You can edit attribute name, select GIS attribute type as Text, YES/No, Decimal, and integer. You can also set “Default value” for the attributes, select “is it mandatory” or add some “Predefined value” for the attribute.



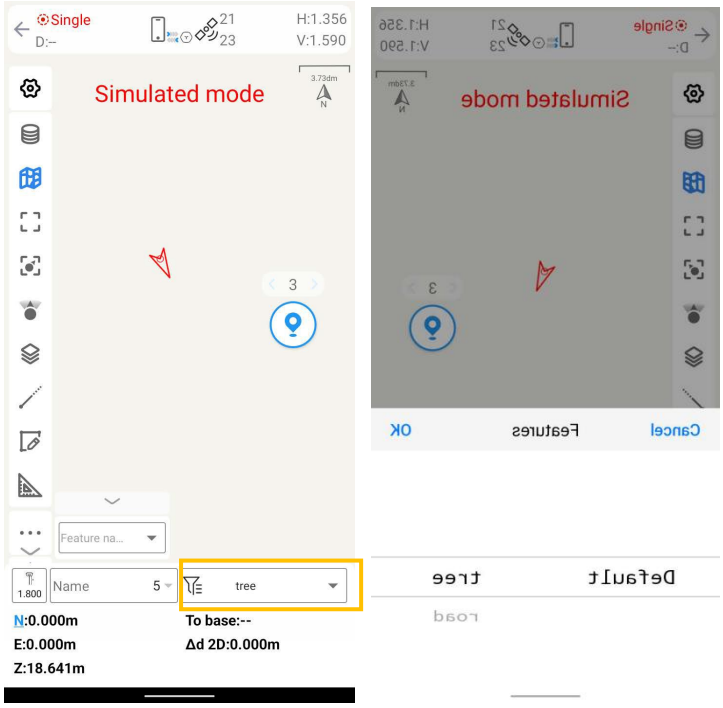
Tip: apply the code list to current task code list, it will plus current code list and the new code list. When you delete the current task code list, it will become zero for point/line/polygon, then you can apply a completely new one.

2. Choose the code and go survey:

If you want to edit attributes for each feature, you need to click “Confirm before saving” in survey setting. After surveying, the information about the object automatically pops up. In this case, you can edit the attributes in the GIS attributes TAB. After finishing, click Save to save the coordinates and attributes of the object.

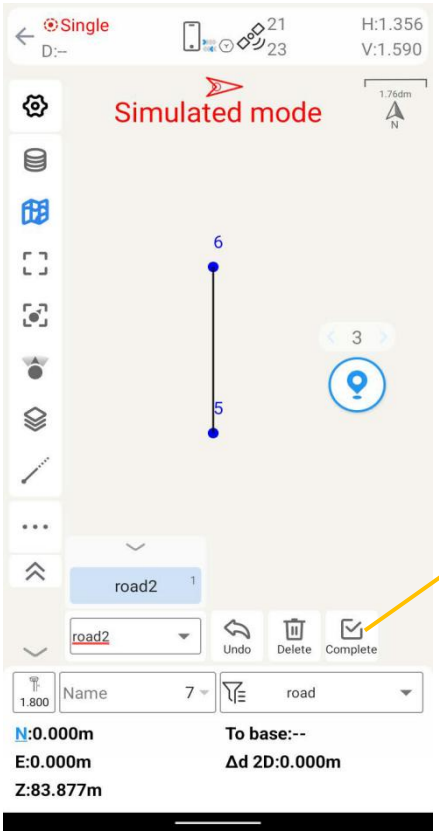


Users can survey the features by selecting code.



3. Real time drawing:

Click , it will prompt to complete the line or polygon survey. The line and polygon will show the same color and style of code in the feature survey interface.



: Finish the current feature survey, the feature will be stored in the ***Features***;

Undo: Undo the last measured point;

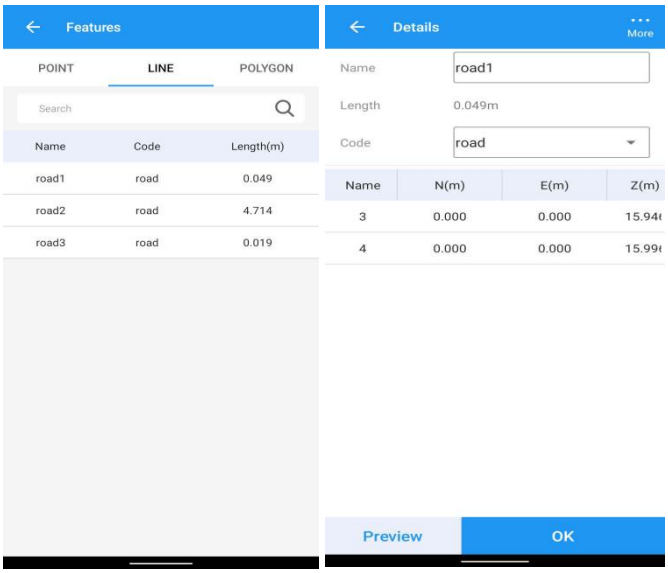
Delete: Delete current surveying

Tip: If you want to draw a line or polygon, you need to survey all the point in the line and polygon.

Be sure the points are all the same code. After these, you can automatically draw.

4. Check and manage the features:

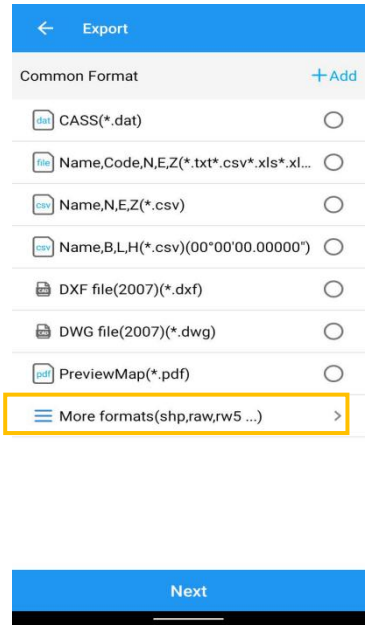
Click Features in the Project interface, you can delete or see the details of the feature what you selected. Including check the point of feature and preview it.

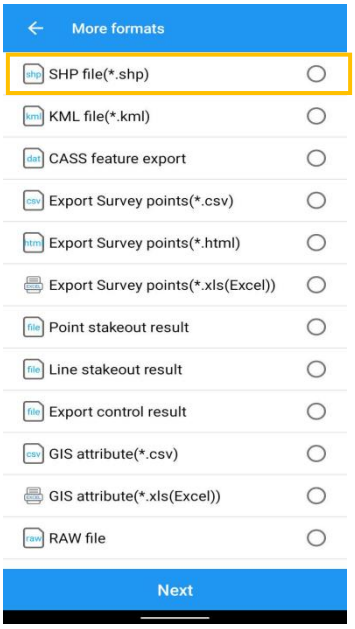


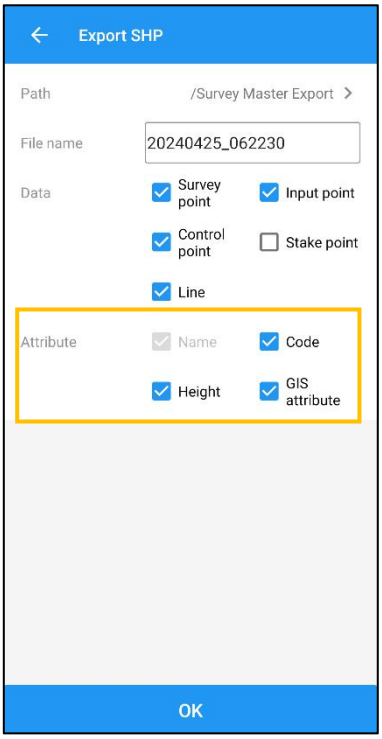
5.Export the features and attributes:

After surveying, user can export data and attributes.

Tap Export in Project interface, select Export SHP, select data and attributes you need. The default export path is …/Survey Master Export, and the previous saved file will be shown below, you can also click Upper folder to change to any other path. Later you can load the SHP in other third party GIS software.

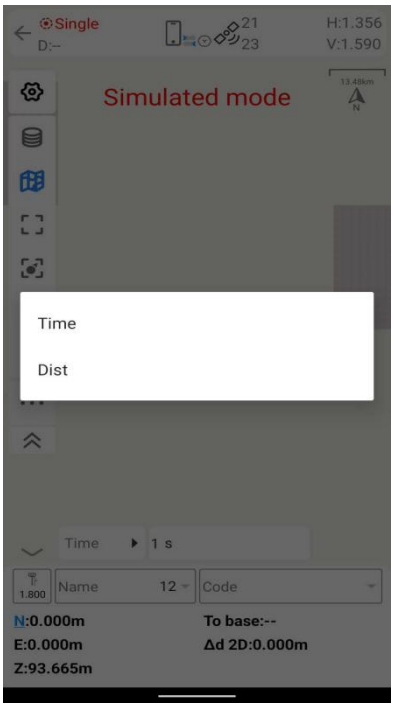






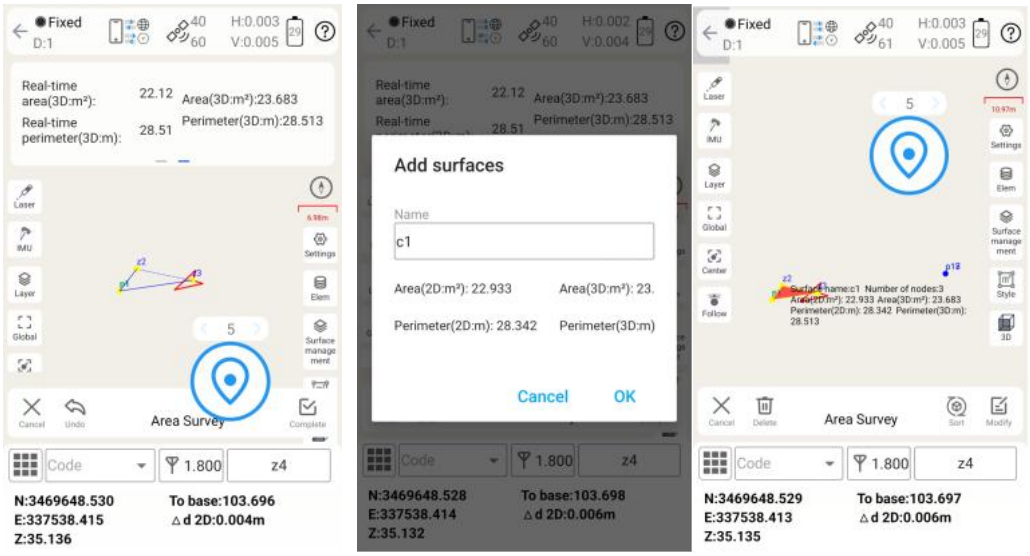
4.3 Auto survey/Area survey

For Auto survey, it supports automatic and continuous survey according to Time or Distance.



For Area survey, it can compute area directly after getting points.

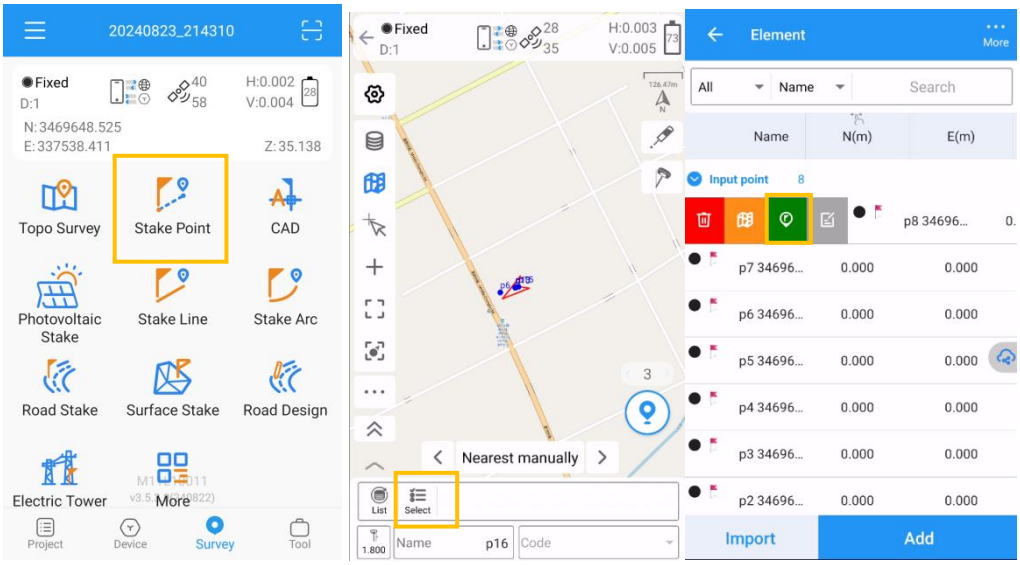
Press Points, it will show the coordinate information, press Calc, it will show the area result, press Shape, it will show the shape on map.

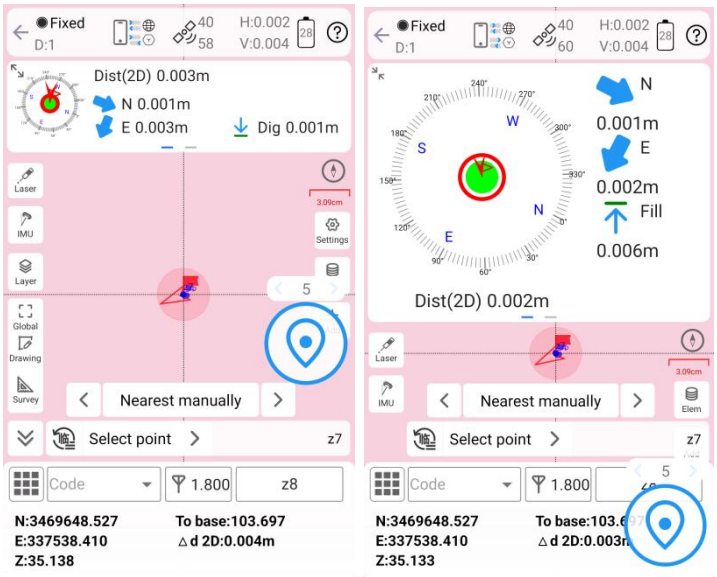


4.4 Stake points/lines

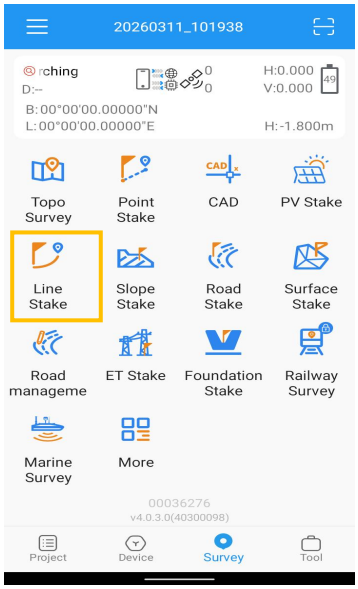
Go into ***Stake point*** interface, click to choose a point and tap ***Stake***. Survey Master provides a navigation map when staking points/lines. If you are close to the target point enough, it will alarm you based on the alarm range you set.

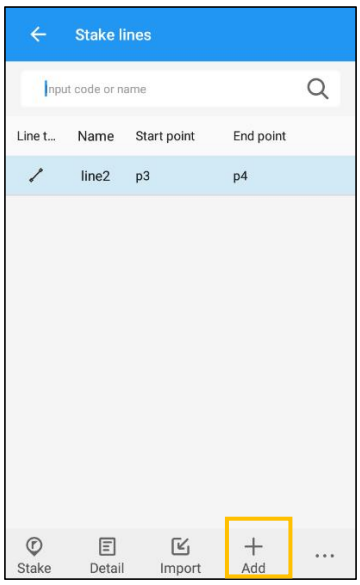
Enter the point name and code based on your requirements, then click .

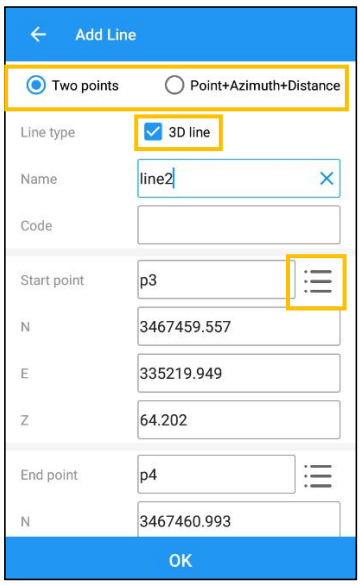


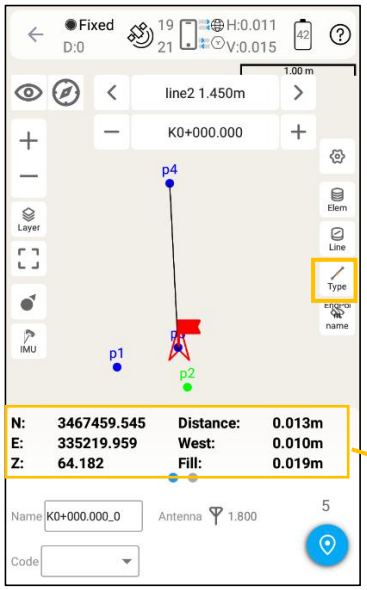


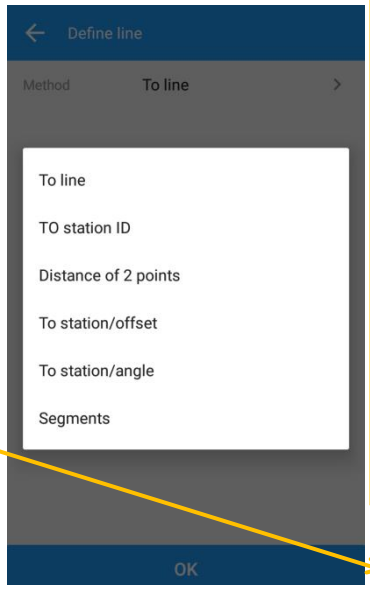
For staking lines, click  -> add line (Two points or Point + Azimuth + Distance) -> click  -> Choose one line and click Stake. The default method to stake is “To line”, press method to choose a method you want.











- 3D line: Yes: the line will have height value; No: the line height value is 0.
- To line: show shortest way to find a point on line;
- To station ID: stake points on line by defined interval;
- Distance of 2 points: show distance of current location to the line's start point and end point;
- Segment: Stake on line by defined segment value.

Swipe left or right for more information

4.5 PPK

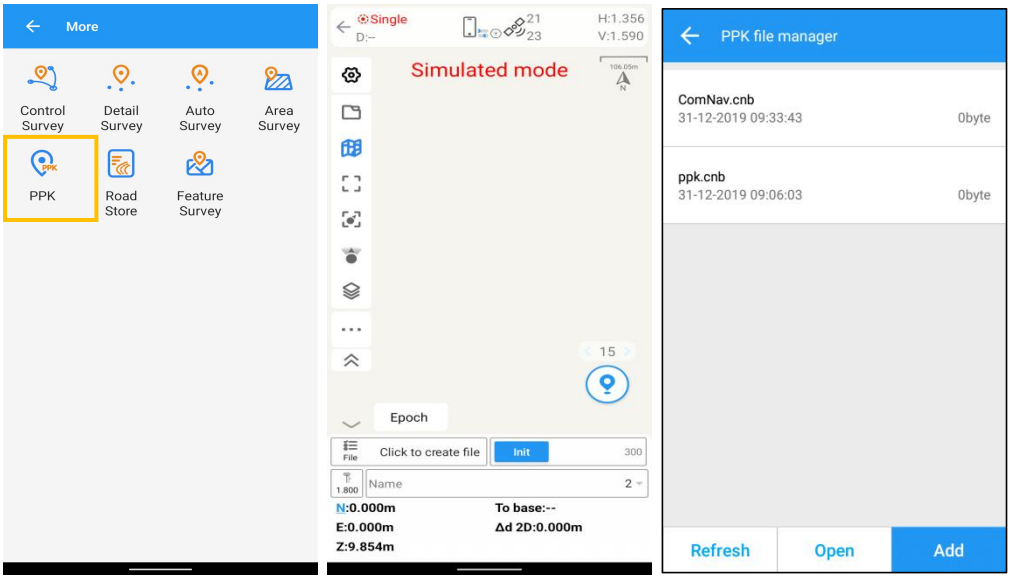
PPK (post processing kinetic) is the unique function of survey master, which is used for post-processing dynamic measurements.

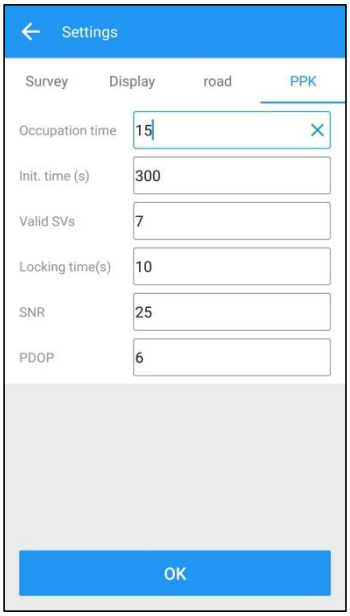
You can set one receiver as base for static data recording and set P6H as rover for ppk survey.

1. Click More in survey interface -> click PPK->choose or create a PPK file.

2. Go to settings, configure PPK settings based on your requirements.

3. To get stable epoch, click Init to initialize ->click to start PPK survey.





You can also use ppk function when doing topo survey

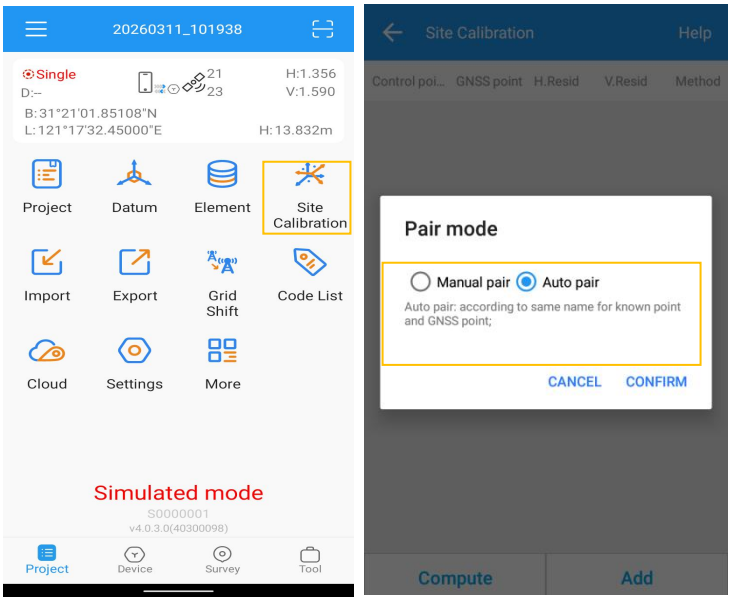
Click setting in topo survey interface->PPK->Save PPK data.

4.6 Site calibration/Grid Shift

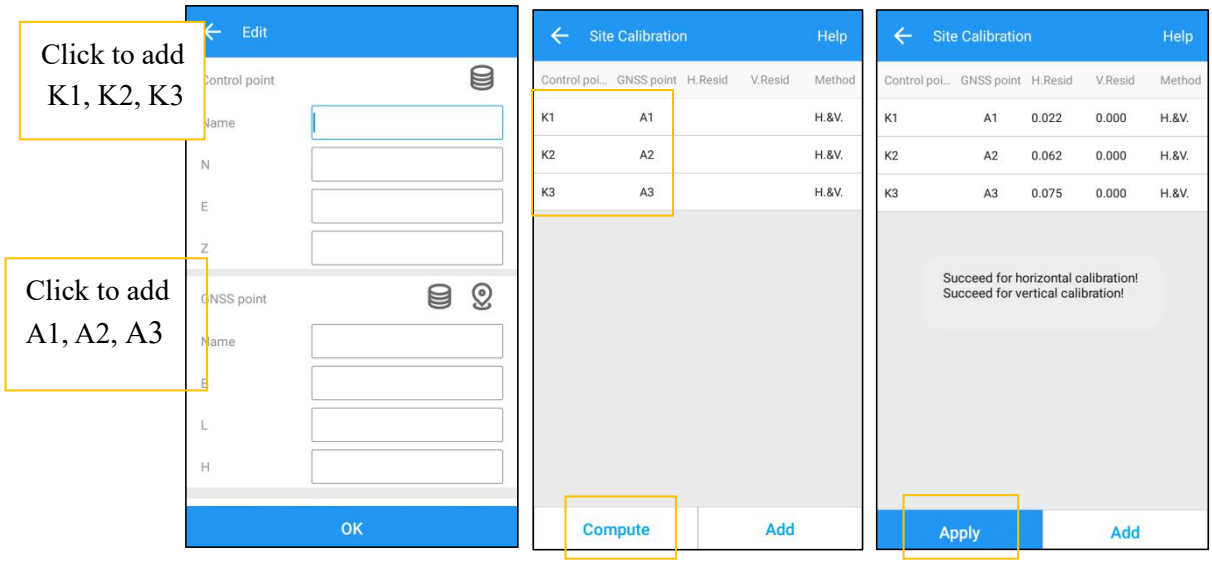
4.6.1Site calibration

Site calibration is commonly needed once in one project, and all the points will be collected based on calibrated datum system.

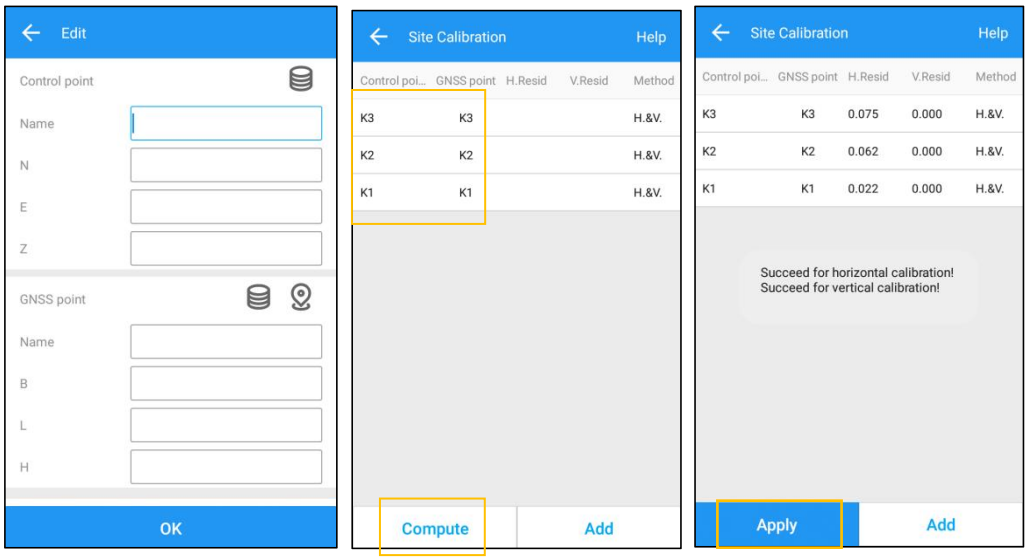
1. Choose manual pair or auto pair.



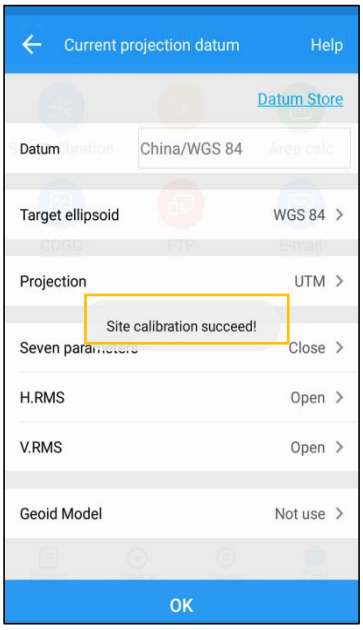
2. If you choose manual pair, you can directly enter at least three groups' point to compute. Click add to add points. (for example, take K1,K2,K3 as known points, take A1,A2,A3 as measured points) After click ***Compute*** to calculate, the software will calibrate automatically.



3. If you choose auto pair, it will auto compute according to the same name for known point and measured point. After click ***Compute*** to calculate, the software will calibrate automatically.



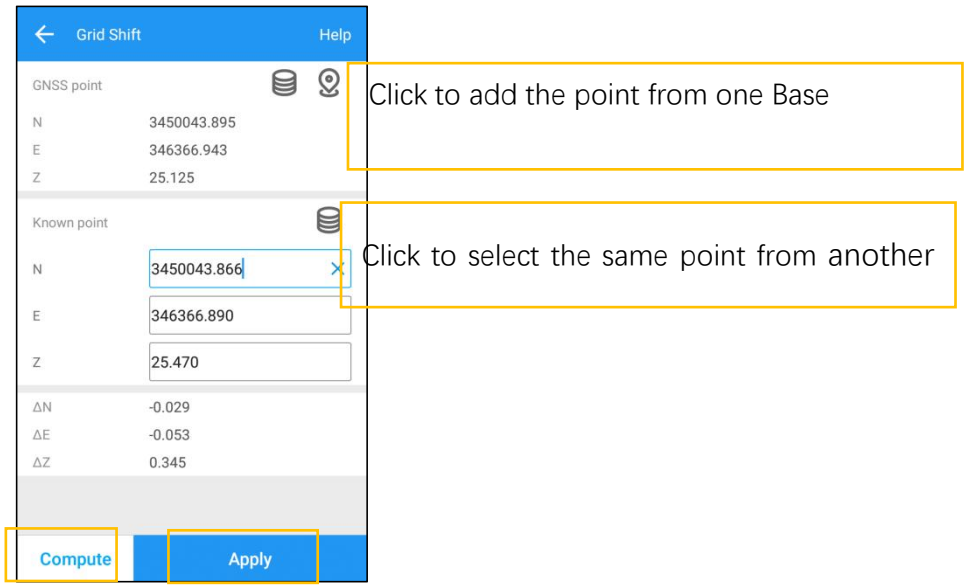
4. Click ***Apply*** to confirm to replace datum. The value of H.Resid and V.Resid should meet the requirement (H.Resid ≤ 0.015m, and V.Resid ≤ 0.02m)



4.6.2 Grid Shift

Grid reset function is applied when you need to change the position of Base station in the same project.

Click ***Grid Shift*** in Survey interface -> add current Base point and target Base point -> Click ***Compute*** -> ***Apply*** to complete grid shift.



4.7 Calculate

In tool interface, you can calculate points/lines/angle directly on field.

• Angular transformation: Angular type transform;

• Two points: Calculate two points distance;

• Point to: Distance from point to one line;

• Offset point: Calculate point with azimuth and distance;

• Deflection angle: Calculate angle of two lines;

• Calculate: Calculate point from angle bisector;

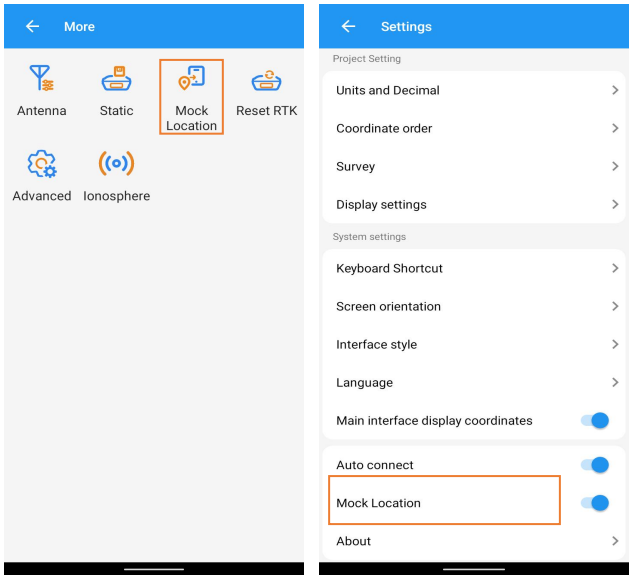
• Points from line: Calculate points on line by distance or segment;

• Point average: Calculate average from points;

4.8 Mock location

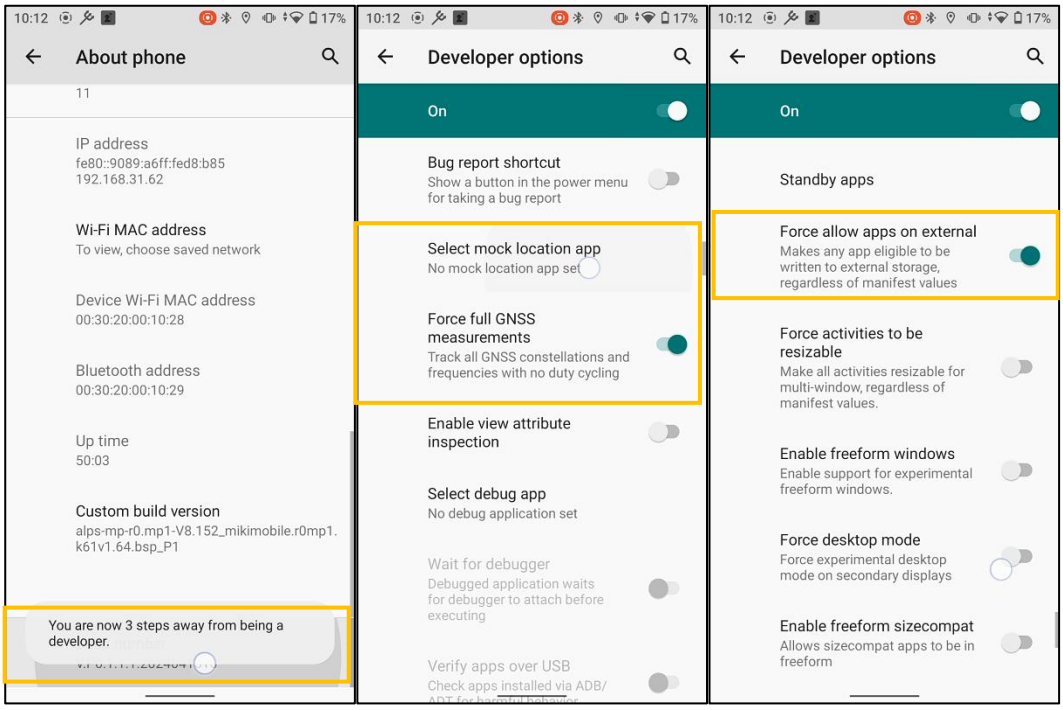
Mock Location is a function for sharing the Survey Master accuracy to your controller/smart phone, so that ComNav receiver can work with third party software. The function is suitable for users who prefer some third-party software rather than Survey Master, then can take ComNav receiver and their own software to conduct work.

For users who need RTK accuracy, please get RTK fixed firstly, then go **Project→Settings**, check **Mock Location** option, and leave Survey Master Software run in background.



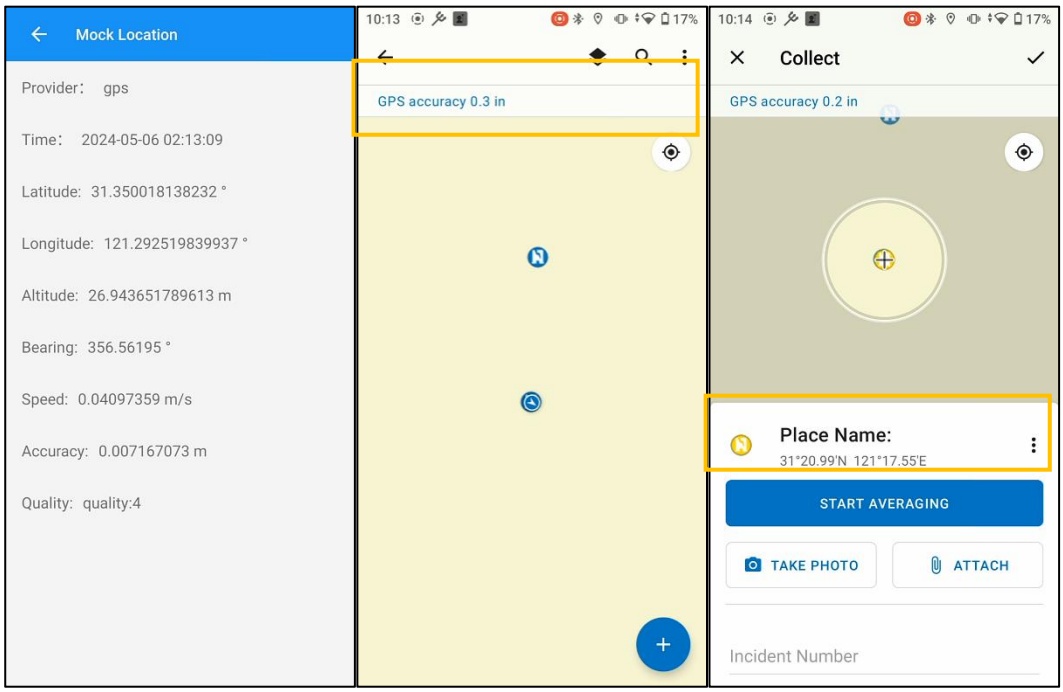
For many Android devices, they can get position from internal GPS/GNSS chip and Wi-Fi network but not accurate (generally less than 10 meters), so you need to enable mock location on to get position from Survey Master.

- Firstly open **Settings** on your controller/smart phone.
- Scroll down to bottom and select **About Phone**.
- Scroll down and find **Build Number** option, **click seven time**s on Build Number to make sure you are in developer mode.
- Also in Settings, select **System**, then find **Developer Options** and open it.
- Normally, you just need to enable Allow mock locations on. And in some devices, you need Select mock location app, then select Survey Master Software.



You can run the Mock location function to share location information with third-party GIS software.

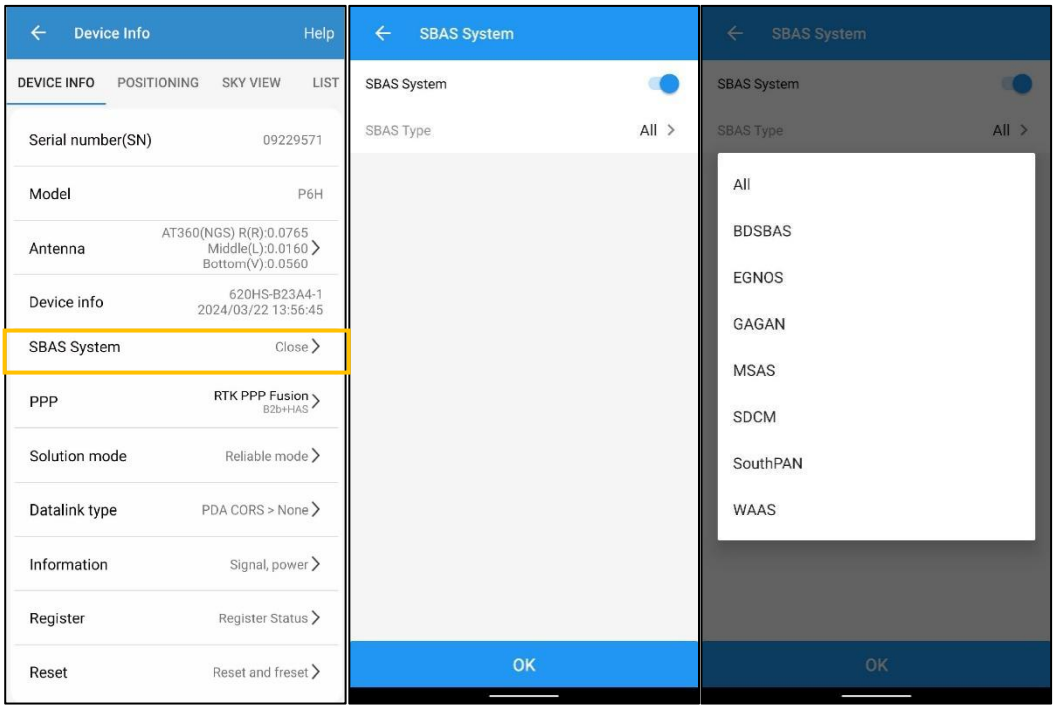
- Open the GIS software. For example: GIS collector, Mapit, Qfield.
- You can see the accuracy in the software.(Pictures show the usage in ArcGIS Collector)



4.9 SBAS

The SBAS function is applicable to the areas where there is no 4G signal, the differential data cannot be obtained to obtain a fixed solution, and there is SBAS service coverage.

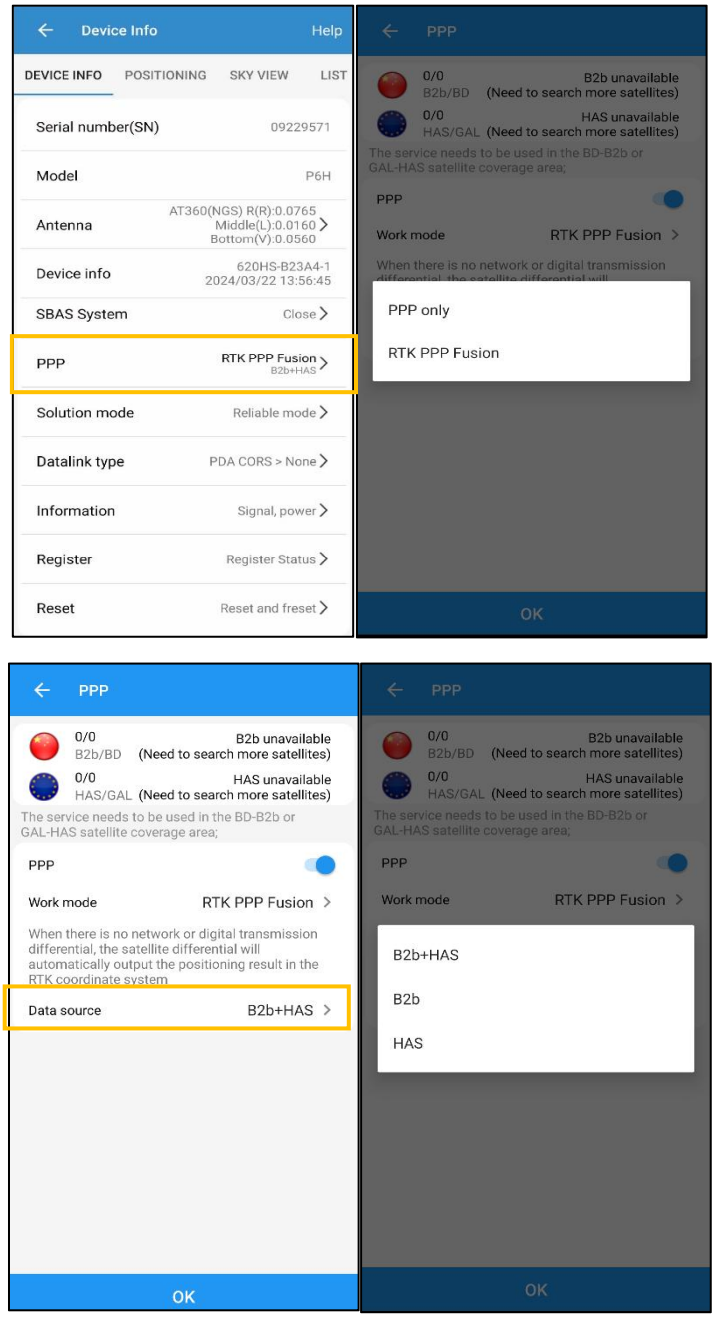
Connect to P6H, open Device info -> select SBAS System->turn on SBAS function and select the system.



4.10 PPP

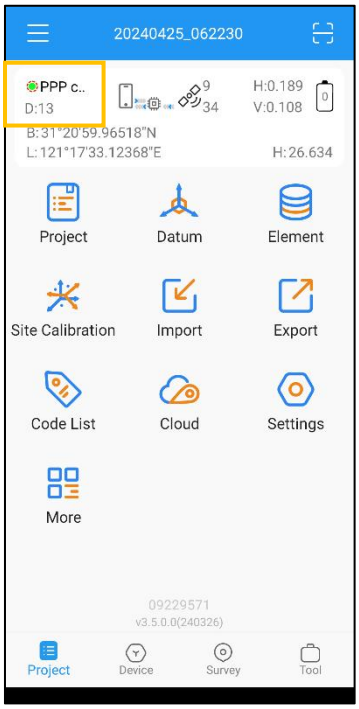
The ppp function is suitable for areas with open environment but no 4G network and CORS coverage.

We now support 2 ppp mode: only ppp and ppp rtk fusion.



For only ppp, you need to wait for 15 to 20 minutes convergence time, after that, it will shows ppp.

For ppp rtk fusion, when the fixed solution is obtained, ppp convergence will be synchronized. When the convergence is complete, once the differential data is disconnected, it will immediately enter the ppp fixed state, and continue to provide high-precision positioning information.



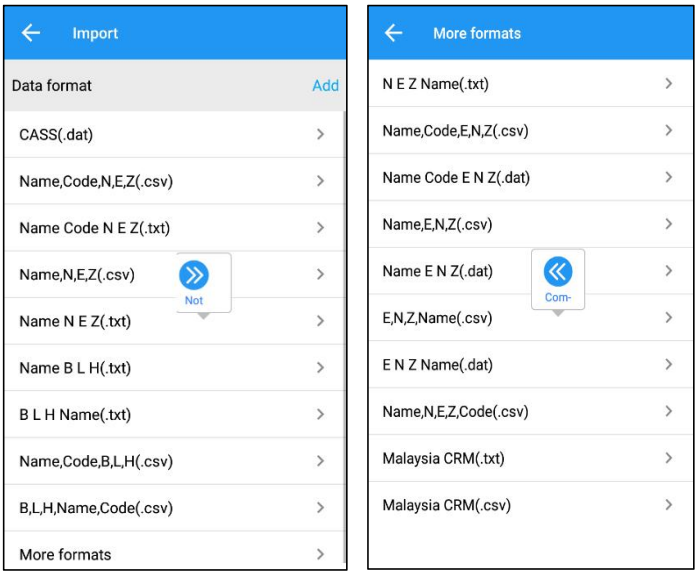
5 Data Import/Export

Survey Master supports to import/export data including grid coordinate, Lat/Lon coordinate with various data format, support import DXF/DWG file and export result of DXF/KML, etc.

5.1 Import

Tap ***Import*** in project interface, there are some predefined data formats, click ***More formats*** to get more predefined formats. Besides, you can click ***Add*** to create a User-defined type.

Slide right the predefined data format that you don't use often, you can move this format to the More formats page; also, you can move the data format of More formats page to the previous page where stored the formats you usually use.



• Name: Enter the name for the format

• Delimiter: support Comma(,), Space( ), Semicolon(;)

• File format: support *.csv, *.dat, *.txt format

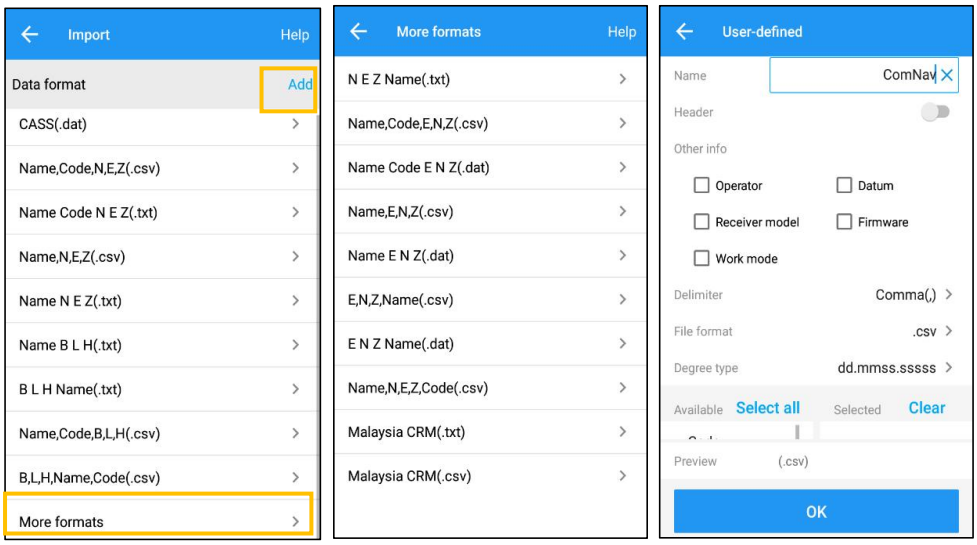
Click ***Select all*** to choose all elements, Click ***Clear*** to eliminate all elements selected. The elements include: code, name, N, E, Z, B, L, H, X RMS, Y RMS, V.RMS, status, start time, occupation time, diff age, base ID, total AntHgt, Antenna height, measure type, antenna name, ending time, comment, RMS, PDOP, HDOP, VDOP, TDOP, GDOP, total SV, used SV, elevation, tilt offset, tilt angle, tilt distance

Tip: The format you defined will also be saved to Export interface.

Choose one format to import data.

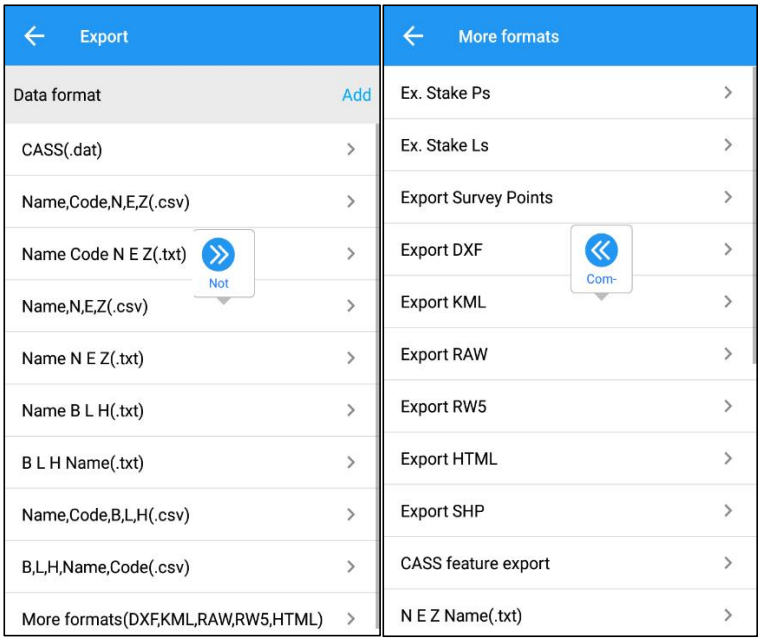
• The default Import path is ***…/Survey Master Export***, you can also click ***Upper folder*** to change to any other path where the file is.

• Point type: support Input point, Control point, Stake point



5.2 Export

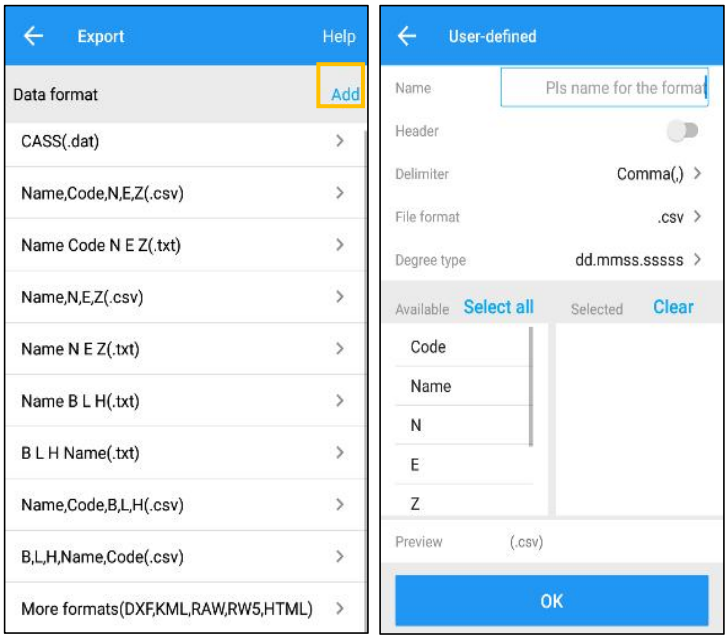
Tap ***Export*** in Project interface to export simple data of survey points. Also, click ***More formats*** to export the survey points with detailed information or other formats like stake points/lines, DXF, SHP, KML, RAW, RW5, HTML, CASS feature result. Same with Import result, long press the predefined data format to select the interface you want to place.



- File format: support *.csv, *.dat, *.txt format. Choose one format to export data.
- Select: support Survey point, Control point, Input point, Stake point, Base, also, you can set the date, name, code of data to specific export.

The default export path is …***/Survey Master Export***, and the previous saved file will

be shown below, you can also click ***Upper folder*** to change to any other path.



For the points, lines and polygons you surveyed in Topo survey and Feature survey, you can click ***Export DXF*** to export dxf file, then you can edit them in third party CAD software, or import to ***Basemap*** to check, or import to ***Stake CAD*** to stake. Choose the data that you want to export including survey point, input point, control point, stake point, base, line and polygon, and the layer properties includes name, code and height, the default text height is 0.5.

6 Register P6H and firmware upgrade via Survey Master

6.1 Register P6H

Normally, the register code is like this:

FUNCTIONREG:2207453726-3851620954-0949162572-0697504466-0613618189-0027539229

Note: The length of code may different according to different requirements.

Following shows three methods to register the receiver.

- Register Function

For register function, you need only enter the number.

2207453726-3851620954-0949162572-0697504466-0613618189-0027539229

➢ QR code

You can also use scan function to scan the QR code.

➢ Register via commands

You need copy the whole code, include the word '**FUNCTIONREG**:'

FUNCTIONREG:2207453726-3851620954-0949162572-0697504466-0613618189-0027539229

Send command: LOG REGLIST

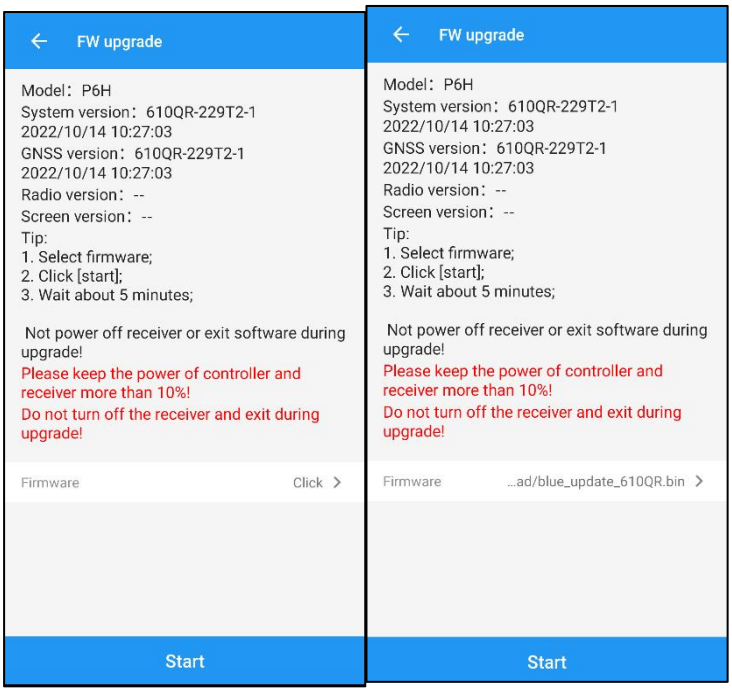
To check receiver register status.

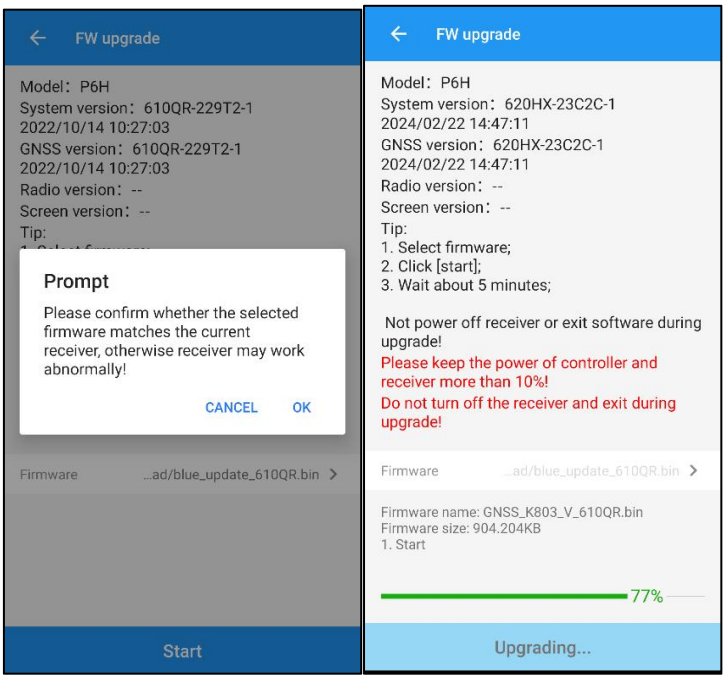
6.2 Firmware upgrade

1. Copy the firmware to the memory of the P6H.

2. Open the Survey Master software, choose "**FW upgrade**", click "**Click**", select ***the folder where your firmware is placed***, click "**OK**" and then click "**start**".

3.Device will disconnect after the upgrade is complete.



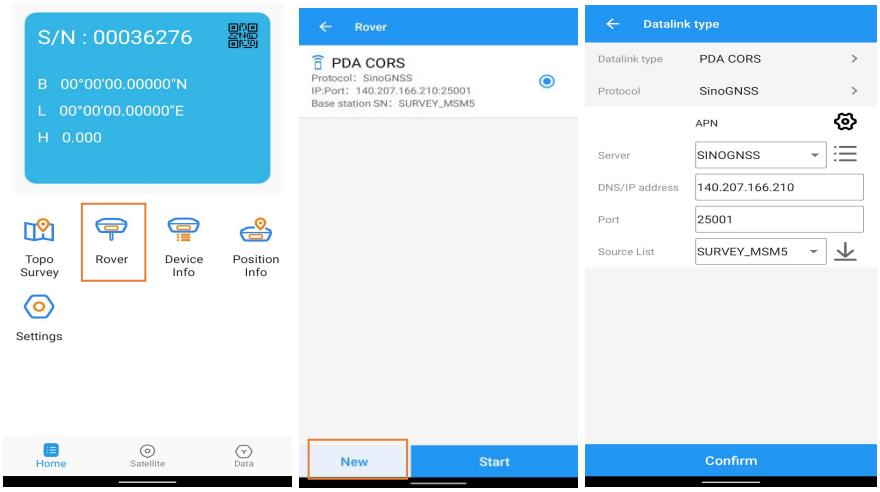


7 Use GNSS TOOL to share coordinate

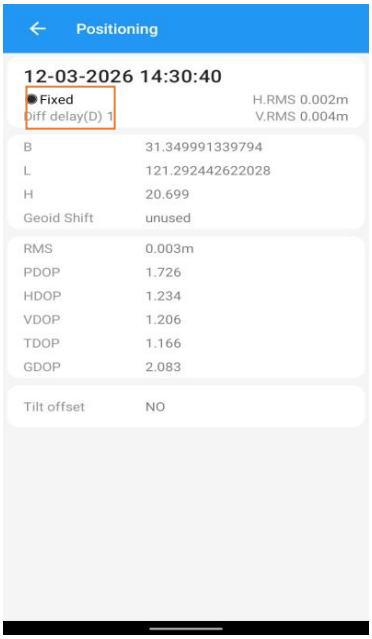
In addition to using the mock location feature of the Survey Master software to share high-precision coordinates to third party GIS software, you can also use the GNSS TOOL software to share high-precision coordinates to third party GIS software.

The device will connect automatically when you open GNSS TOOL. The P6H working mode (PDACORS) can be configured in the same way as in Survey Master.

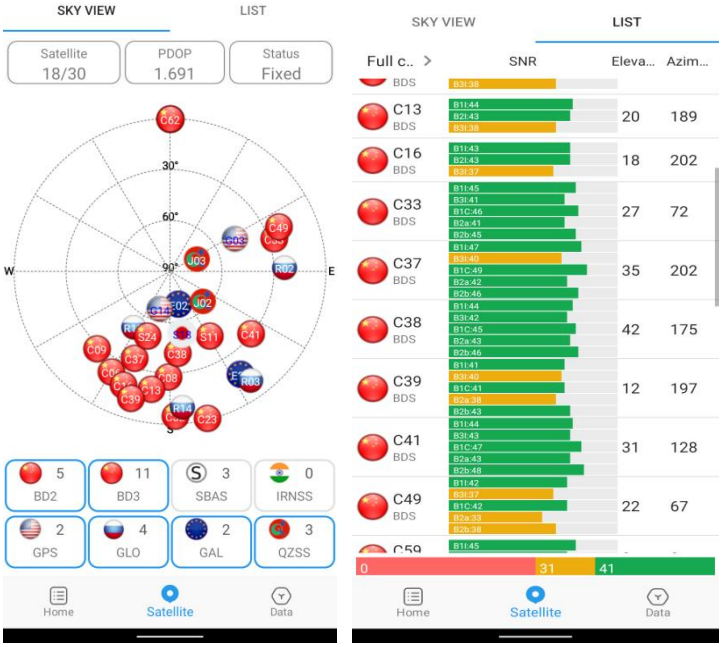
Click Rover -> PDA CORS, Enter CORS DNS/IP address and port-> Click Source List and select the proper source -> enter User and password.



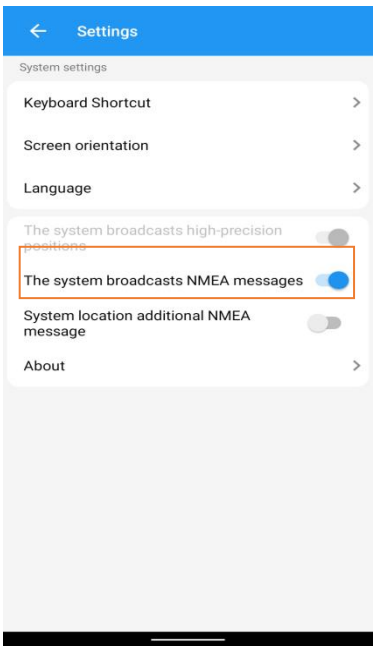
After configuring the PDA CORS, need to check if the status is “Fixed” in Position Info. At this time the software can open in the background, other programs can use high-precision positioning.



Click on the satellite to view the number of stars and SNR.



When enabled “The system broadcasts NMEA messages”, GNSS Tool will broadcast complete NMEA sentences (e.g., GPRMC, GPGGA) to the system, allowing professional GIS software to parse them for high-precision positioning, satellite status, and timing data. Turn on this switch if you need to obtain complete NMEA data.



If you want to send some commands, you can send them in H-terminal.

