SingularXYZ

Orion ONE

GNSS Receiver

User Manual

V1.0, modified on 2024.12.26

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Technical Assistant

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.

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Chapter 1 Introduction

The SingularXYZ Orion ONE GNSS Receiver (hereinafter O1) User Guide is aimed to help you get familiar with the O1 receiver and start your project effectively. We highly recommend you to read this manual before surveying, even you have used other GNSS RTK receivers before.

1.1 About Orion ONE

With high precision GNSS module inside, Orion ONE GNSS receiver can be applied in RTK mode with all GNSS constellations. Orion ONE 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.

To make surveying smarter, SingularXYZ has added a starlight-grade camera and a precise laser module to the Orion ONE GNSS receiver, achieving deep fusion of multiple sensors.

While shrinking the device to the palm size, Orion ONE provides an advanced GNSS engine, immersive AR stakeout, non-contact laser surveying, 60° tilt IMU, 15km enhanced UHF, and rich features to empower your tasks.

1.2 Receiver Features

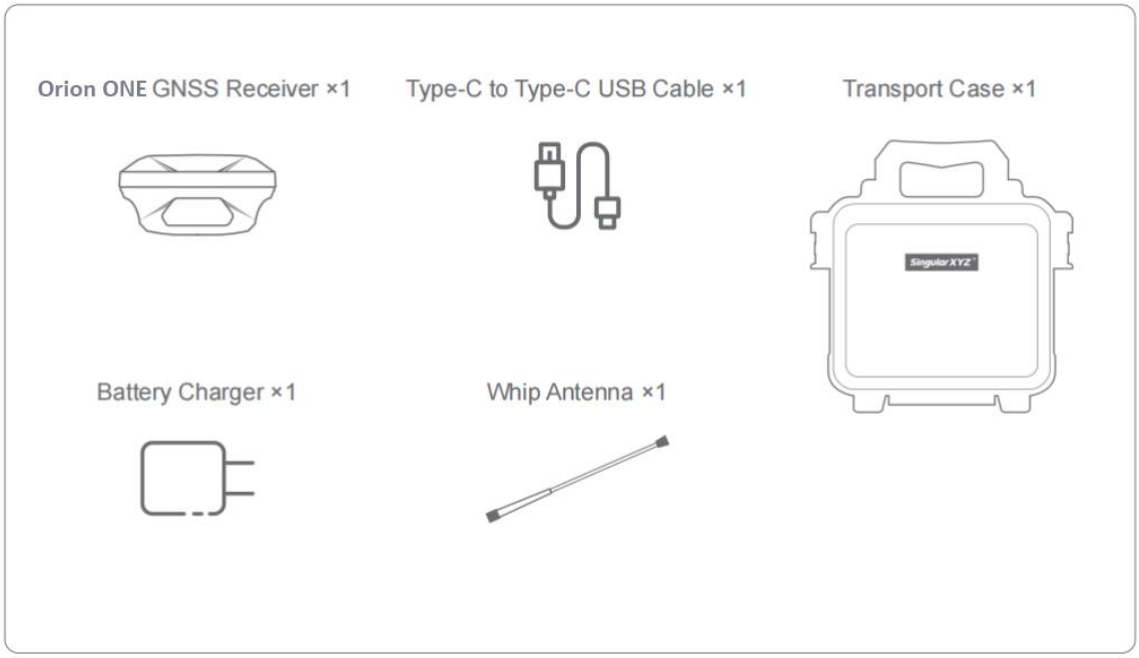
The SingularXYZ O1 GNSS Receiver key features:

- Ultra small and super light
- Size: Φ107mm*58.7mm
- Weight: 547g
- 1408 channels of simultaneously signal tracking
- Fast charging via Type-C interface
- Cable-free Bluetooth wireless technology
- IP67 waterproof & dustproof
- Full base/rover interoperability
- Integrated IMU sensor
- Starlight-grade Camera, HD Capture in Weak Light Environment
- Laser Injection Power: 2mW~3mW

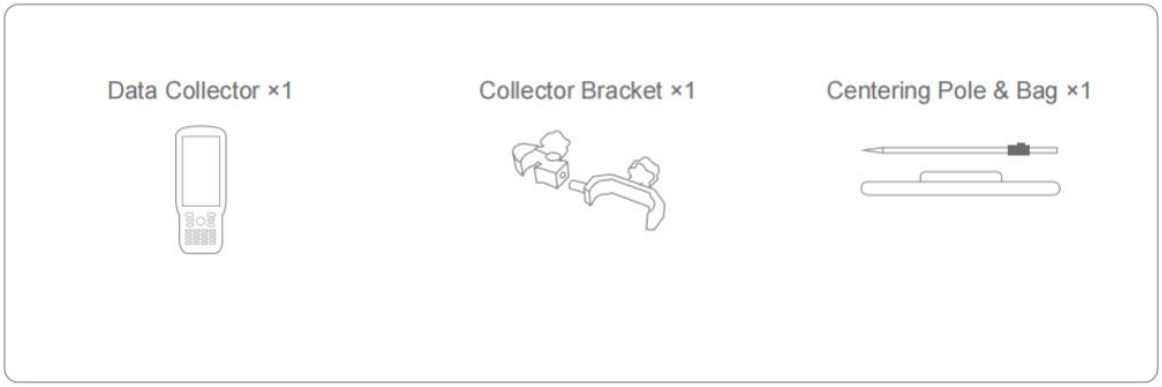
1.3 O1 Packing List

This section provides overall O1 receiver packing list, including standard supplies and optional kits based on your requirements.

Standard



Options For Rover



Chapter 2 User Interface

This chapter provides general information on environmental requirements, setup, power supply and connection of the O1 receiver.

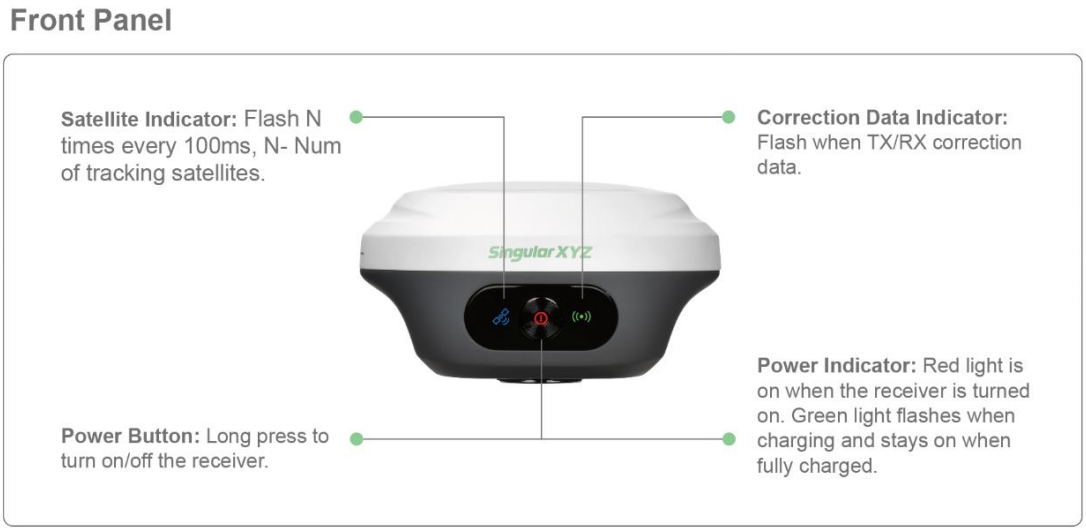
2.1 Environmental Requirements

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: -55°C to +85°C
- Out of corrosive fluids and gases
- With a clear view of sky

2.2 Front Panel

Receiver front panel contains 3 indicator LEDs and 1 Power button.



2.3 Back View

The rear of the Orion ONE contains a laser transmitter and a laser receiver.

2.4 Lower Housing

Receiver lower housing contains a Type-C port, TNC connector and a camera.

2.5 Power Supply

The receiver is equipped with internal batteries.

- 4200 mAh, up to 12 hours working time
- Fast charge of 3 hours charging time

Chapter 3 RTK Workflow

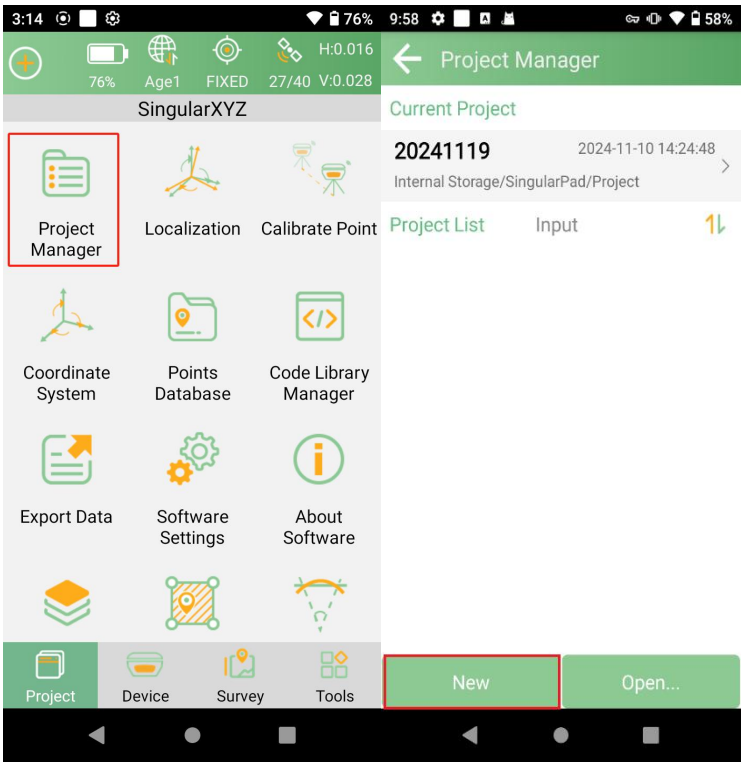
This chapter introduces how to conduct RTK Survey with SingularPad Software. SingularPad is professional Android-based surveying software developed by SingularXYZ team. SingularPad is fully functional as a field surveying software, equipped with complete work modes and necessary functions for surveyors. If you need post-processing software, please contact the support email at <support@singularxyz.com> for assistance.

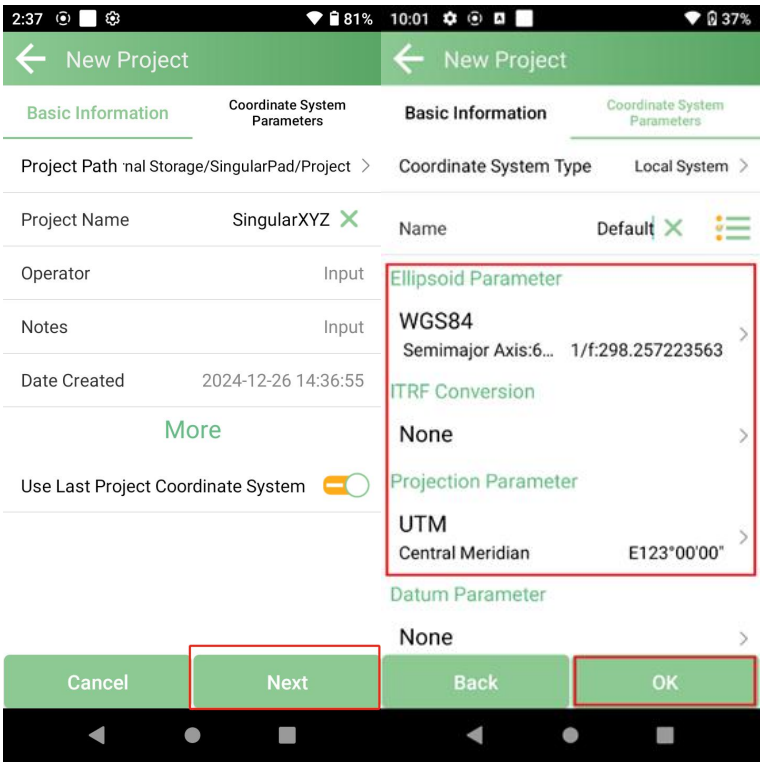
3.1 Installation of SingularPad

SingularPad has been pre-installed on SingularXYZ data collector before shipping, if you want to download on your own device, please contact with us.

3.2 Create a New Project

Click ***Project Manager***, click the ***New*** to create a new project file and input project name, set coordinates systems parameters and click ***OK*** to save the project.

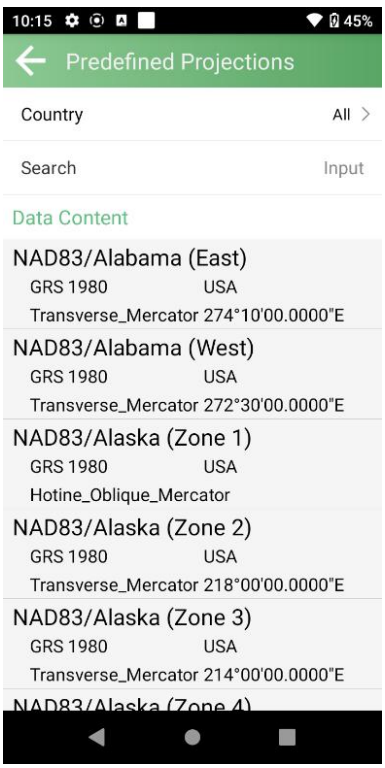




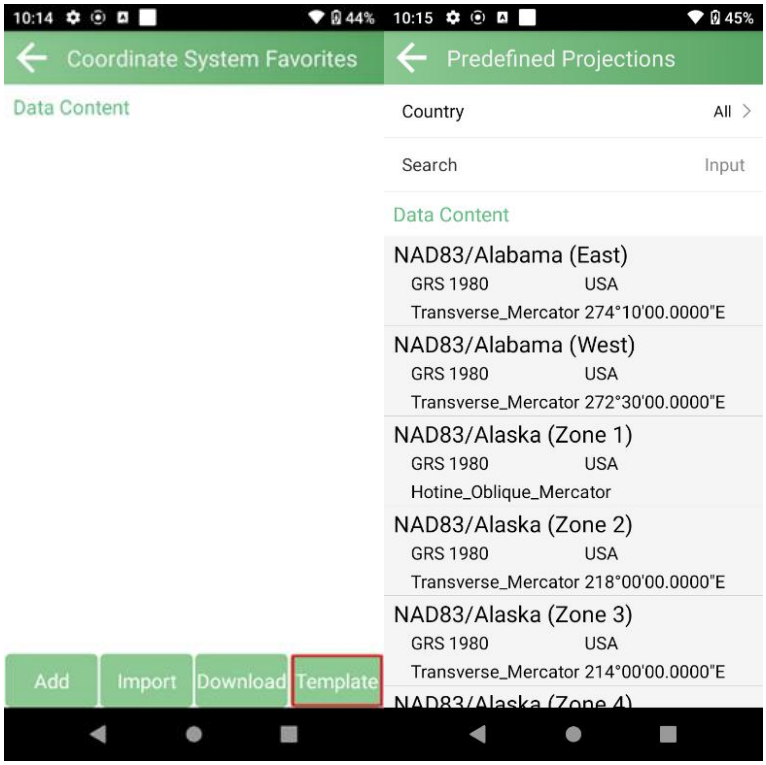
Our software has added many countries' coordinate systems, you can find what you need by country name or coordinate system name.

The following steps give an example of how to find predefined coordinate systems of our singularpad software.

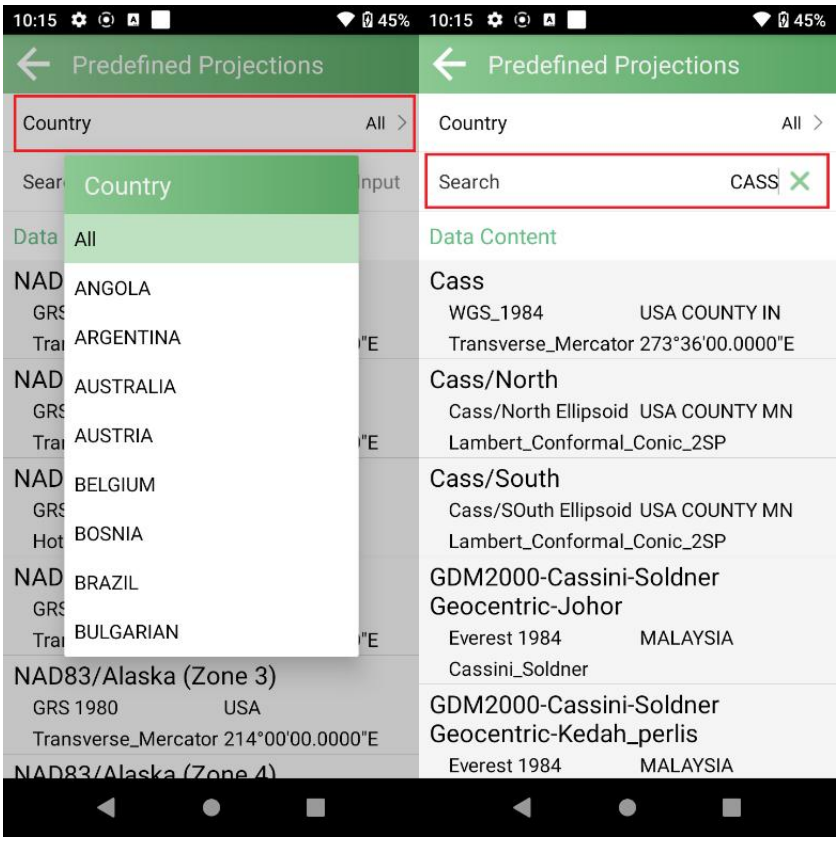
Click the button located after ***Name*** in Coordinate System Parameters interface.



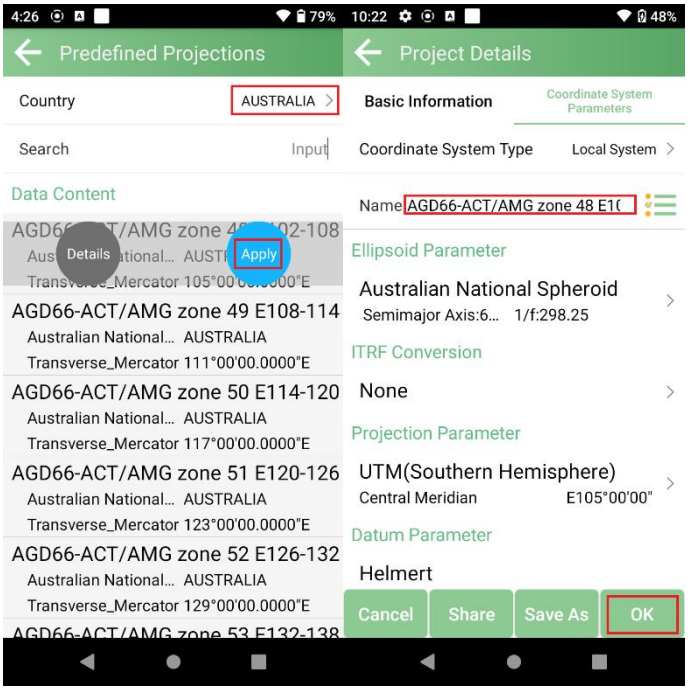
In the Coordinate System Favorites interface, click the ***Template*** below to enter the Predefined Projections interface.



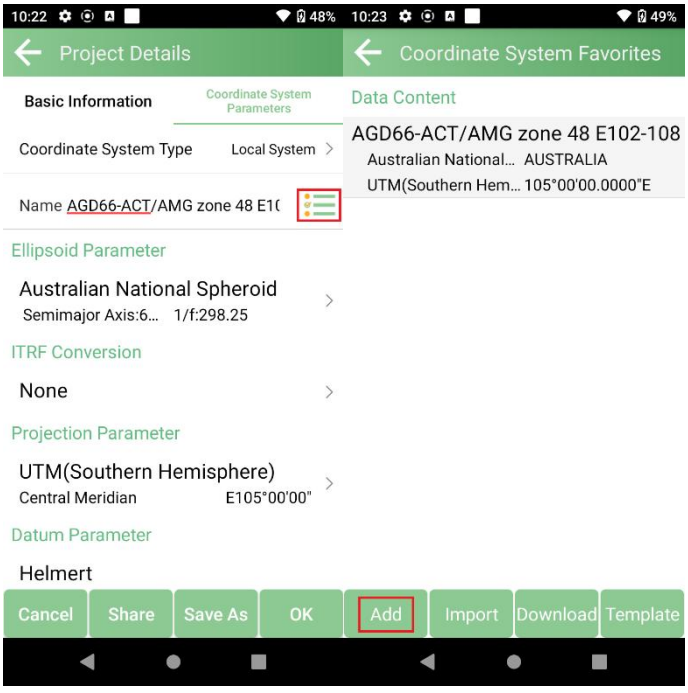
Click ***Country*** to select the country name or enter a keyword after ***Search*** to find it.

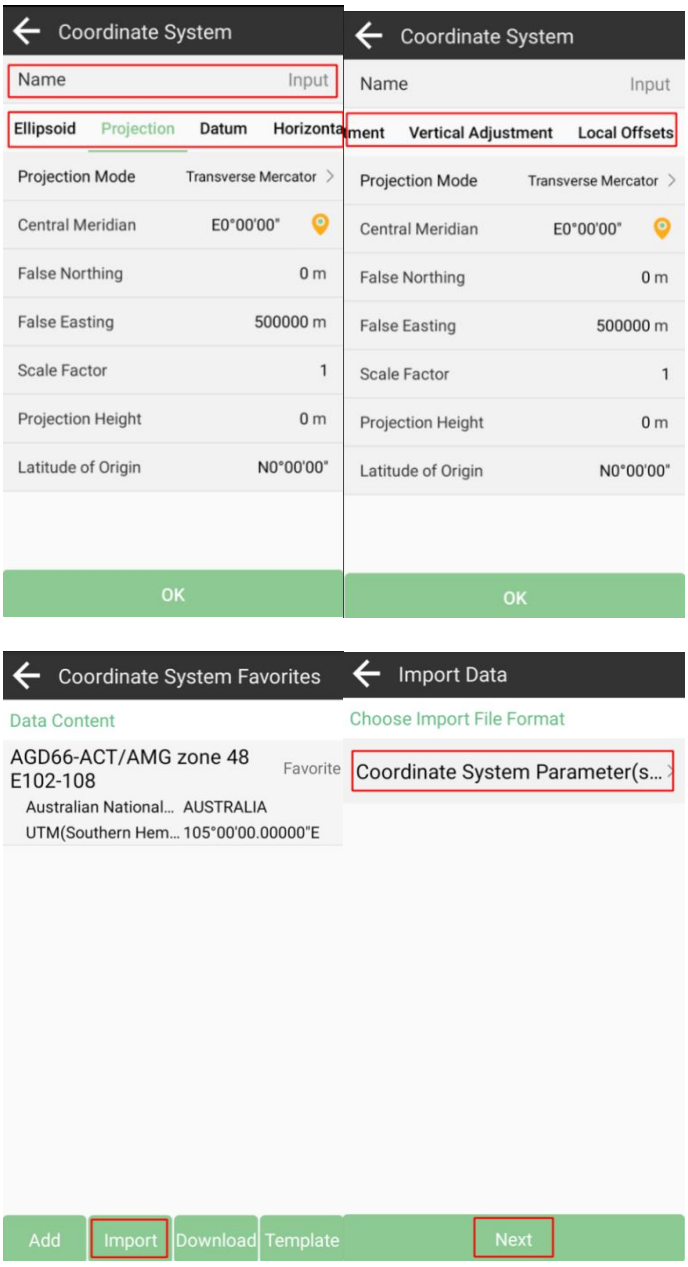


After finding the required coordinate system, click ***Apply*** to add it to coordinate system parameters, click ***OK*** to apply it to the current project.



If you don't find what you need in Predefined Projections, you can click ***Add*** or ***Import*** to create new coordinate system.





3.3 Device Connection

3.3.1 NFC Connection

Equipped with an NFC chip, users can easily connect the O1 receiver to the data collector with just one touch, as shown in the figure below.

3.3.2 Bluetooth Connection

After creating a new project, switch to ***Device*** interface, click ***Communication***.

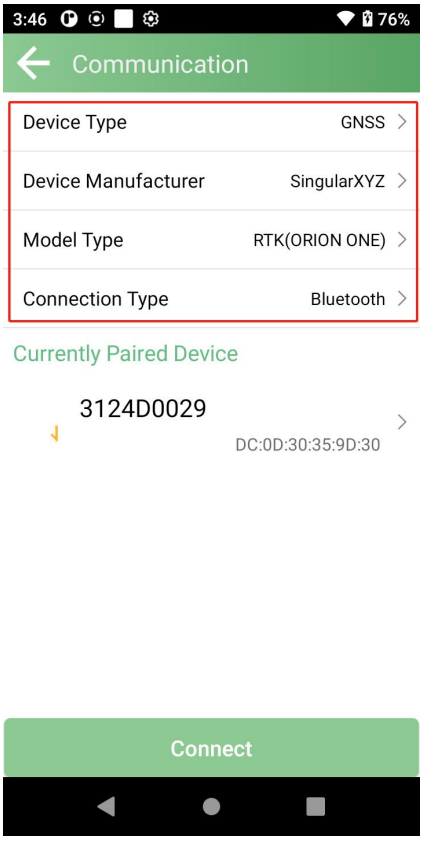
Select the corresponding parameters according to the following requirements

Device Type: GNSS

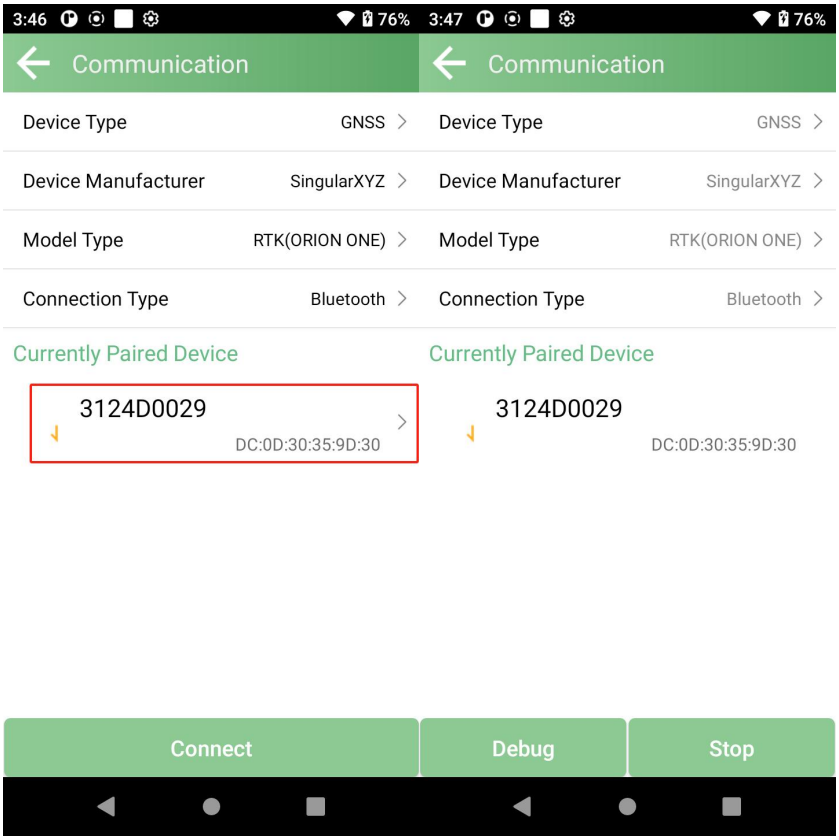
Device Manufacturer: SingularXYZ

Mode Type: RTK (Orion ONE)

Connection Type: Bluetooth

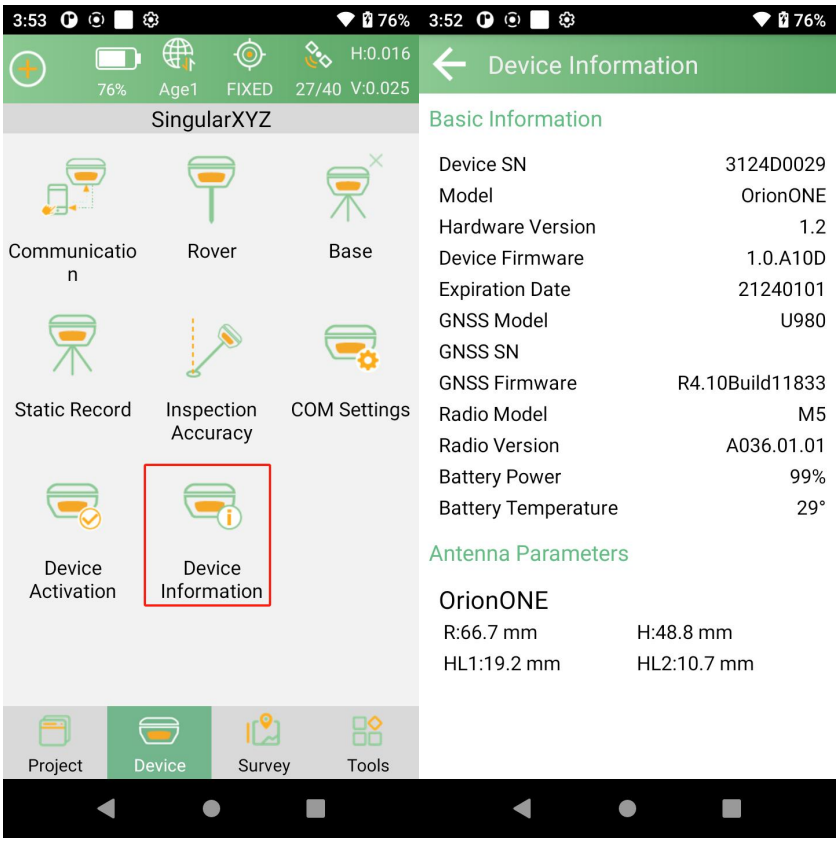


Make sure controller Bluetooth turned on, click below Currently Paired Device to find SN of your O1 receiver. Click ***Connect***.



After connecting O1 receiver, you can check the information of the receiver (like firmware version) in

Device Information.



Tips: If you fail to connect with receiver through SingularPad, you can follow the prompts to enter the system Bluetooth settings interface of the PDA/data collector to ensure that the Bluetooth pairing is successful. Sometimes you need to cancel the device Bluetooth pairing, restart the receiver or SingularPad software and pair again.

3.4 Quick setup O1 receiver

Please follow the instructions below to quickly set up your O1 receiver according to the kit type you purchased.

For O1 Base & Rover Kit

Refer to Section 3.4.1 Internal Radio Mode for detailed setup instructions.

For O1 Rover Kit

Refer to Section 3.4.2 PDA CORS Mode for detailed setup instructions.

Ensure that you follow the appropriate section based on your kit to achieve

optimal performance of your O1 receiver.

3.4.1 Mode 1 – Internal Radio Mode(O1 Base + O1 Rover)

Equipped with an NFC chip, users can easily connect the O1 receiver to the data collector with just one

touch, as shown in the figure below.

If you've purchased 2 units of O1 GNSS receiver, please select one O1 as base and the other as rover. During configuration, you need to connect your PDA device or data collector to the base and rover respectively.

When work as a Base station, SingularPad supports transmit the correction data in Internal Radio mode.

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

Tip: Orion ONE GNSS receiver has two radio versions, U and LU version. U version radio supports many radio protocols whether base or rover, but data transmission distance can only reach 3-5 kilometers under ideal environment; LU version radio only supports CSS radio protocol when set as base, and also supports many radio protocols including CSS radio when set as rover, but data transmission distance can reach 10-15 kilometers under ideal environment. Please contact the sales to confirm which radio version to purchase.

- Protocol: U supports TRIMTALK, TRIMMK3, TT450S, TRANSEOT, SATEL and LU supports only CSS for base transmission
- Frequency: select a channel or customize a frequency, the range of frequency is 410-470MHz.
- Baud rate: 9600 and 19200. This option is to set the baud rate of lemo port.
- Power: High and low (low power will reduce the RTK range)

Tips: Condition of the base station setup

Environment:

Clear outdoor sky view, free from obstructions

Place GPS and radio antennas as high as possible to reduce signal

interference and increase range

Avoid:

Obstacles: buildings, vehicles, towers, trees, etc.

Interference: high-power radar, TV, cellular towers, power lines or

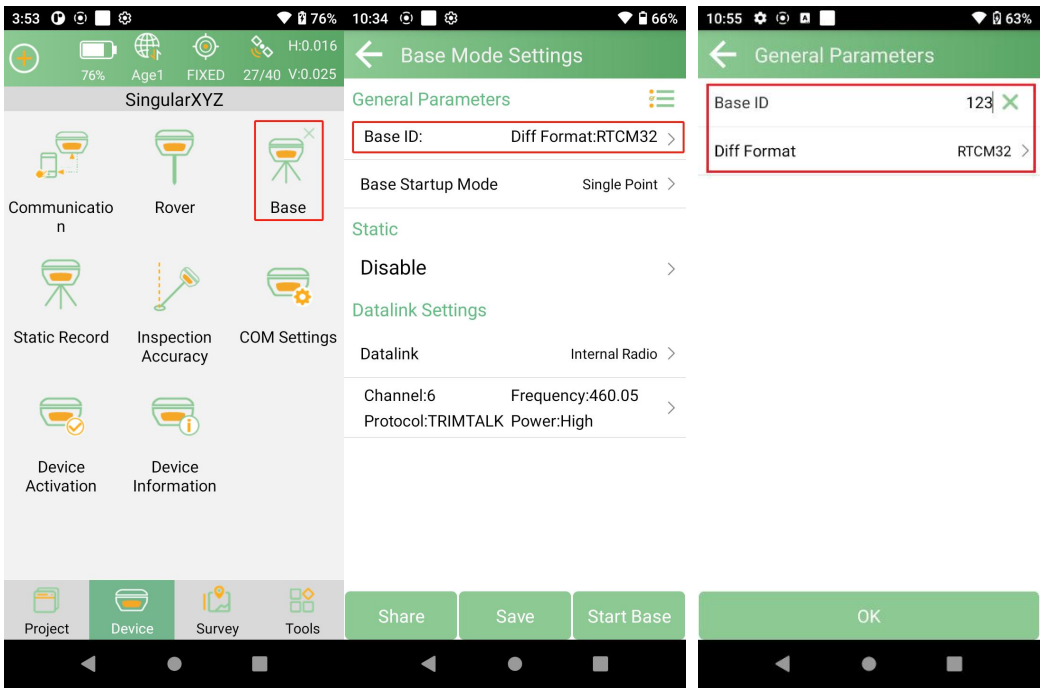
electrical facilities

The following steps give an example of how to configure internal radio base mode.

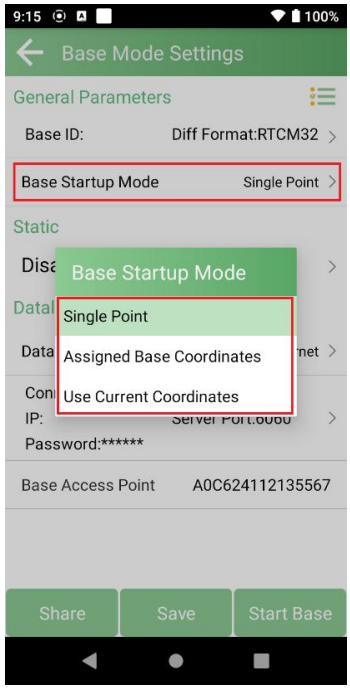
NOTE:

Remember connect the whip antenna to both your base station and rover when you set internal radio work mode.

1. Go to ***Device*** >> ***Base***. Set ***Base ID*** and choose the ***Diff Mode*** firstly.



2. Click Base Startup Mode to select the base startup way



Single Point: Start the base station at unknown coordinates

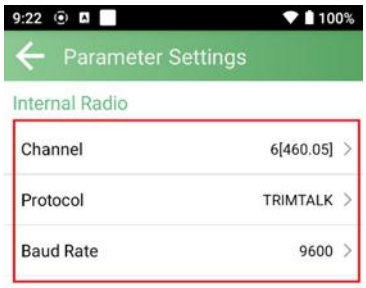
Assigned Base Coordinates: Start the base station at known coordinates, and you need to enter the latitude, longitude and the height

Use Current Coordinates: Automatically start the base station at current coordinates.

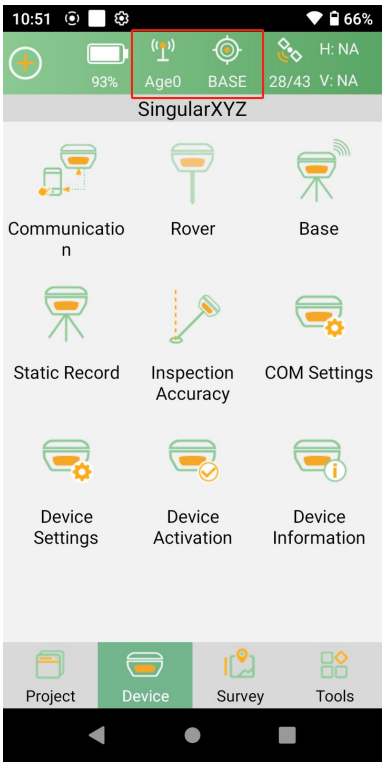
Note: Please setup the base station at a known point. Select Base Startup Mode as Assigned Base

Coordinates and input the known point coordinates. Make sure the current coordinates of the instrument is within 50 meters of the known point coordinates.

3. Set ***Data Link*** as ***Internal Radio***. Set parameter settings, Channel, Frequency, Protocol, Baud Rate and Power.



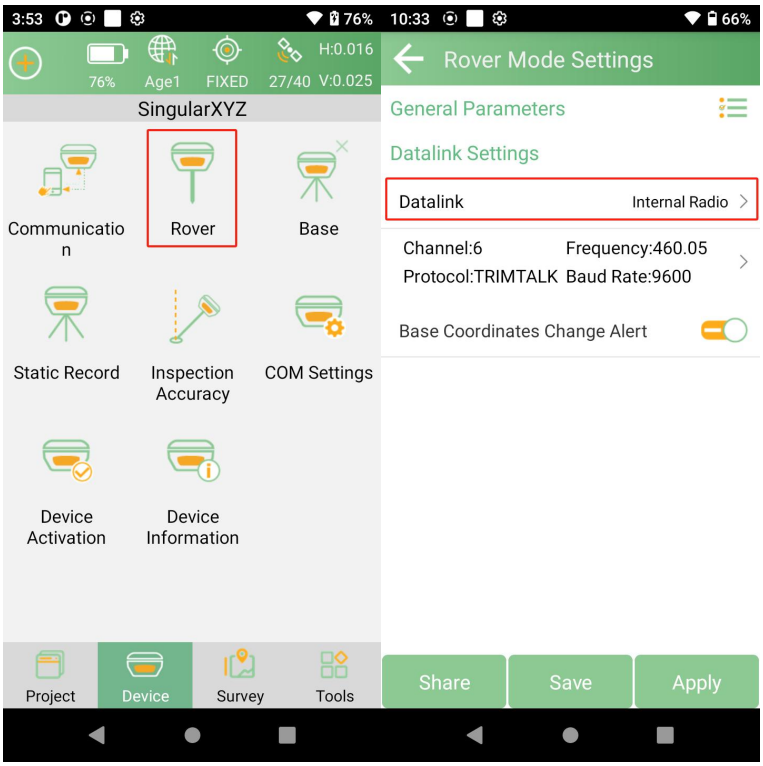
4. When start Base succeed, it will show as below in SingularPad.



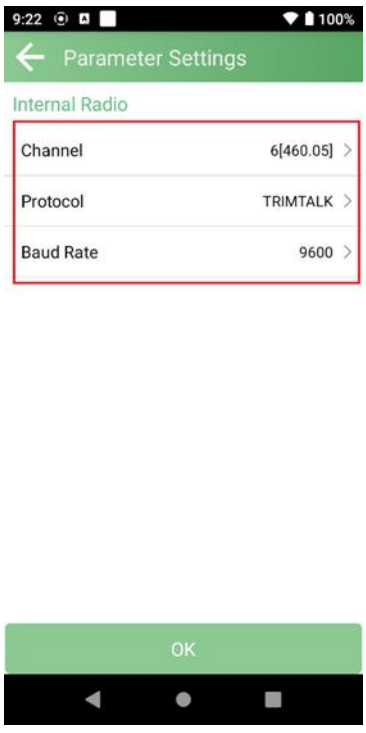
After base settings, please disconnect the base device and then search for the SN of rover to connect and configure the rover device. Select the same protocol and frequency with the Base.

The following steps give an example of how to configure internal radio rover mode.

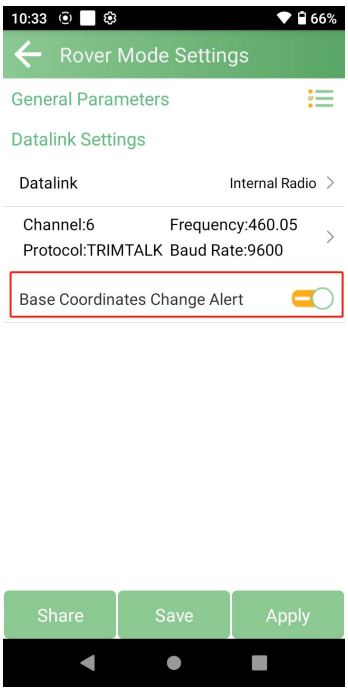
1. Go to ***Device*** >> ***Rover***. Set ***Data Link*** as ***Internal Radio***.



2. ***Parameter Settings***. Set Channel, Frequency and Protocol the same as the Base.

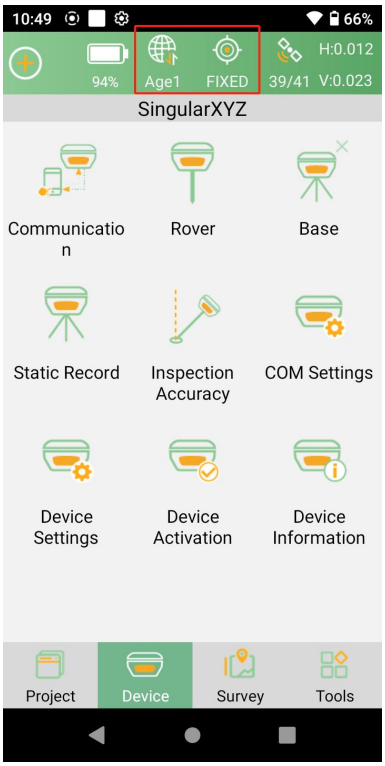


3. ***Base Coordinates Change Alert***: SingularPad will alert when the base station coordinates change while you are working. This may be because the rover is mistakenly connected to another base station or the base station has been moved.



4. Click ***Apply*** to start the Rover mode.

After completing the configuration, please check the RTK status in the top status bar. Once the status changes to "FIXED" and the differential delay "age" is within the range of 1-2 seconds, you have obtained reliable centimeter-level RTK positioning.



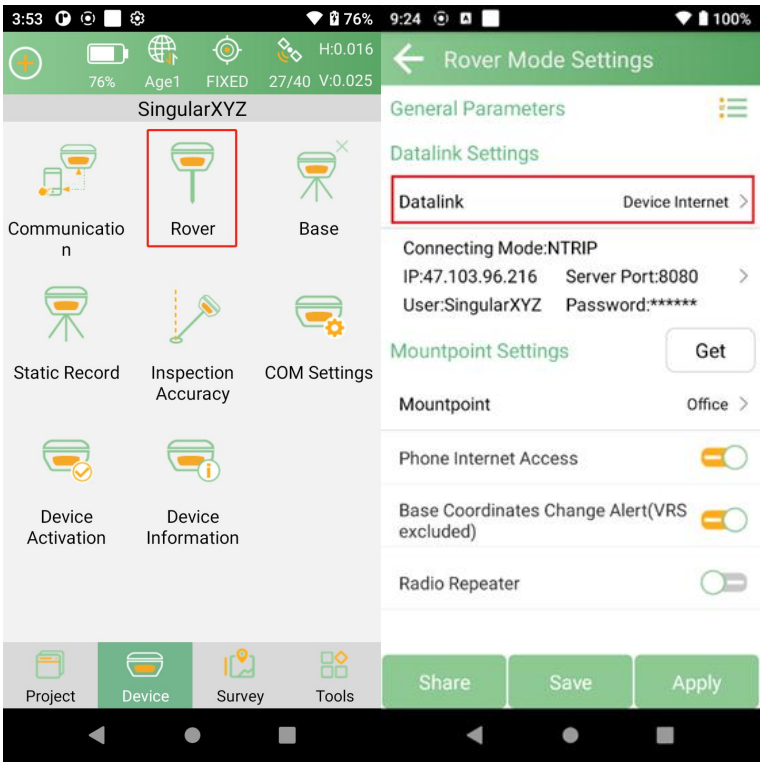
3.4.2 Mode 2 – PDA CORS Mode(Single O1 Rover)

Equipped with an NFC chip, users can easily connect the O1 receiver to the data collector with just one touch, as shown in the figure below.

When works as a rover, SingularPad supports receive the correction data in Phone Internet Mode.

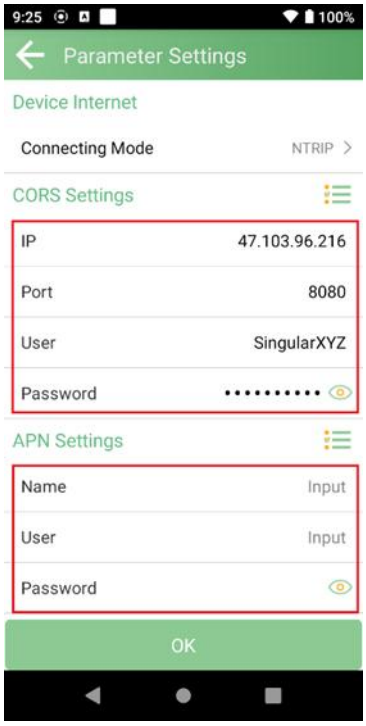
Phone Internet: This mode uses the phone internet to transmit the correction data from Base to Rover. Please make sure the PDA device is in good network conditions, such as 4G (SC200 data collector can obtain a 4G network signal by inserting a SIM card), WiFi or hot spot.

1. Go to ***Device*** >> ***Rover***. Set ***Data Link*** as ***Phone Internet***.



2. Set ***Connect Mode***, for O1 receiver supports NTRIP and TCP Client.

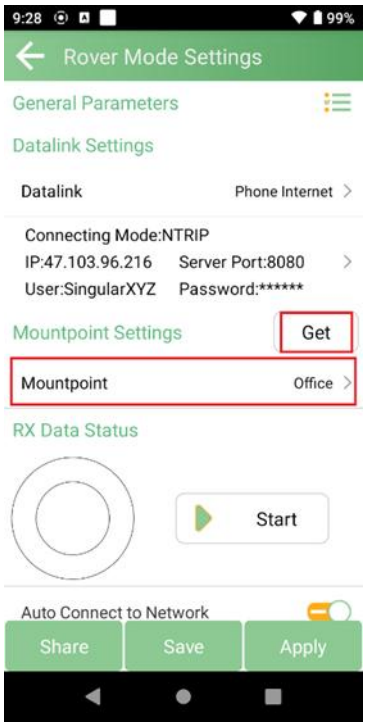
CORS Settings. Input the server IP, Port, User and Password in the CORS Settings.



Note:

The IP & port in the picture is only for example, please enter your local CORS account instead. You can purchase a third party RTK corrections service account in your local area to obtain an RTK FIX solution.

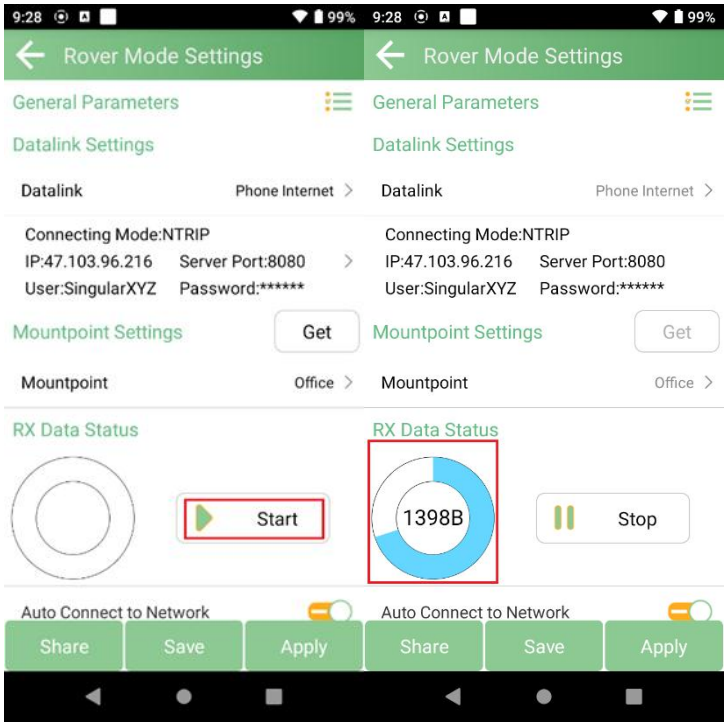
3. Click ***Get*** button on the right to get the mountpoint list and choose the mountpoint.



Note:

The mount point "Office" in the figure is an example. Please find out the appropriate mount point via the website of your local NTRIP/CORS provider. Make sure that the baseline doesn't exceed 50km.

4. Click ***Start*** button on the right to receive data from CORS/RTK correction service. Then you can see the rover is receiving data.



5. ***Auto connect to network***: When this option is opened, SingularPad will connect to network automatically so that user don't need to click start to connect network.

6. ***Base Coordinates Change Alert***: SingularPad will alert when you connect with different base station. When you are using VRS, please do not turn this on.

7. Click ***Apply*** to start the rover mode. After completing the configuration, please check the RTK status in

the top status bar. Once the status changes to "FIXED" and the differential delay “age” is within the range of 1-2 seconds, you have obtained reliable centimeter-level RTK positioning.

Chapter 4 RTK Survey-field Data Collect

This section describes the basic survey functions of SingularPad, including Point Survey, Laser Survey, Point Stakeout, AR Visual Stakeout, CAD Mapping and etc.

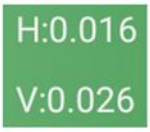
4.1 SingularPad Top Status Bar Introduction

After completing your O1 RTK setup, check current RTK solution status at the top pf the SingularPad software.

RTK Solution Status	Description
FIXED	E1 is receiving RTK corrections stably and obtaining a Fixed RTK solution with centimeter-level accuracy.
AUTONOMOUS	Single-point satellite positioning without receiving RTK correction data. The accuracy is around meter-level.
DGNSS	E1 received corrections from the base/CORS, but it needs more time to calculate due to environmental interference or correction data quality. The accuracy is around decimeter-level.
FLOAT	E1 receives corrections from the base/CORS, but due to obstructions or magnetic field interference the signal reception is not very stable and the accuracy is sub-meter level.

The satellite icon shows calculated satellites number/tracked satellites number. You can click it to check satellite map and more information.

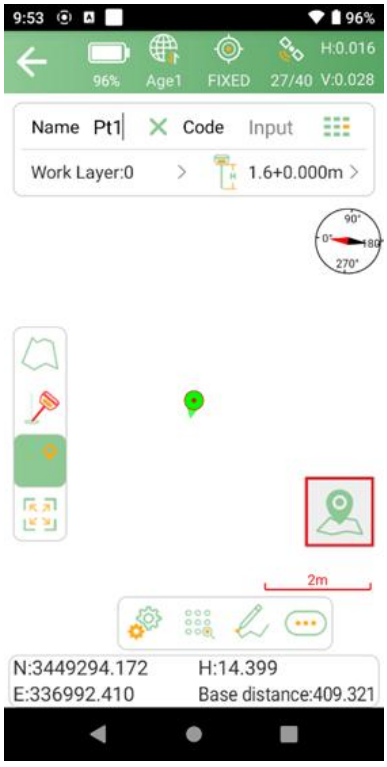
Age means the time since the last differential data was received.
When connecting to a CORS account for measurement work, please ensure the ***Age*** is within the range of 1-2.
When using the radio mode for measurement work, please ensure the ***Age*** is within the range of 2-5.
A high ***Age*** will result in poor measurement point accuracy.



There are HRMS and VRMS on the top of the interface, click it you can check more details.

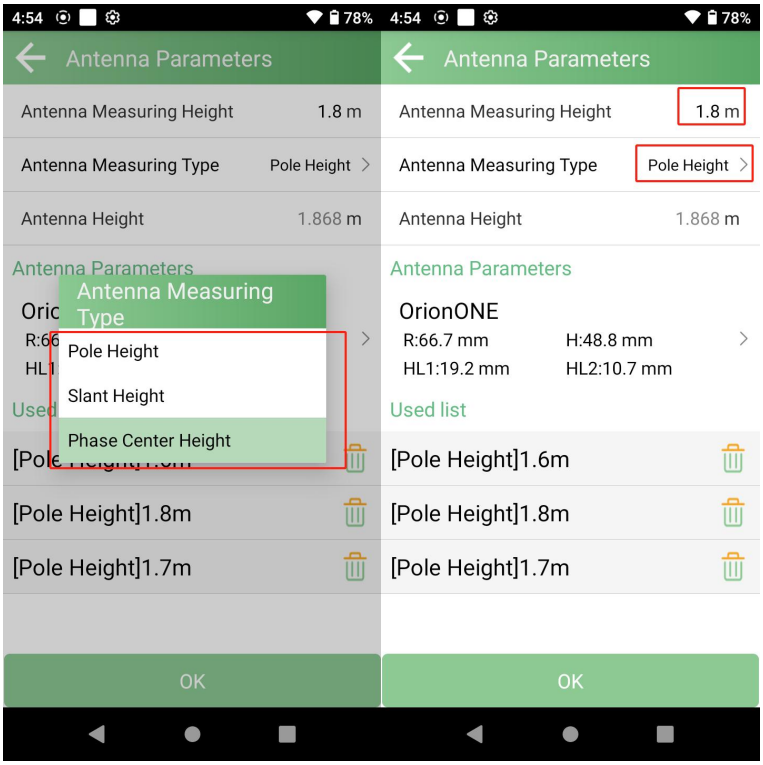
4.2 Point Survey

In the Survey interface, click ***Point Survey*** and enter point name, code and antenna height, then click  to measure a point.



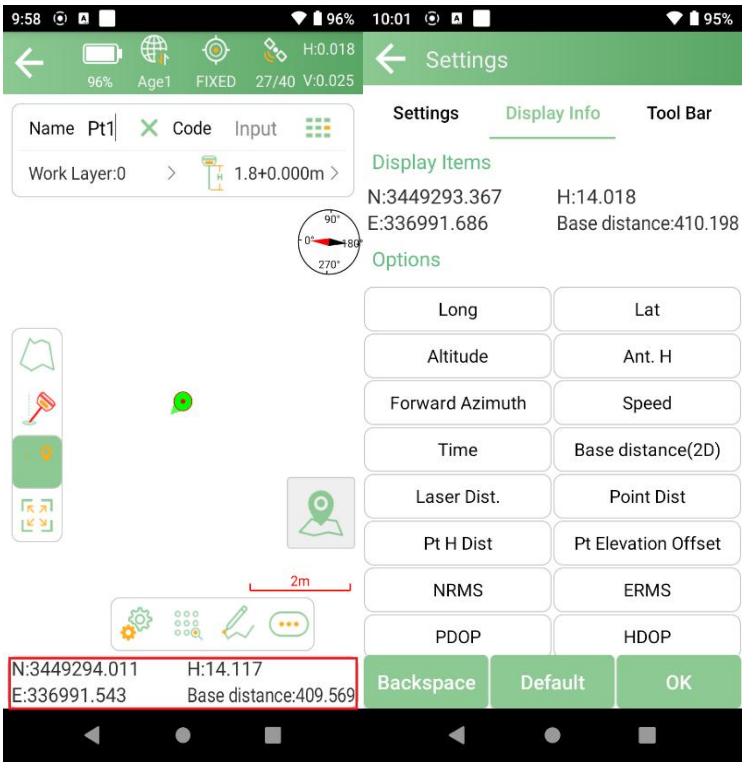
Note:

Our software supports 3 antenna measuring types.



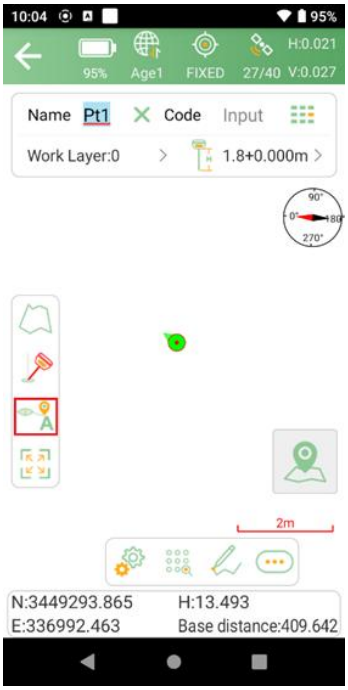
Pole Height: Typically, select the Antenna Measuring Type as Pole Height and enter the height of your centering pole.

In the floating window of the survey interface, you can see the display information. The default display information is NEH and Base distance, and click the floating window you can set them as you need. You can also click  to enter the display information settings interface and select the information you need to display. Except default display information, SingularPad supports Longitude, Latitude, Altitude, etc.



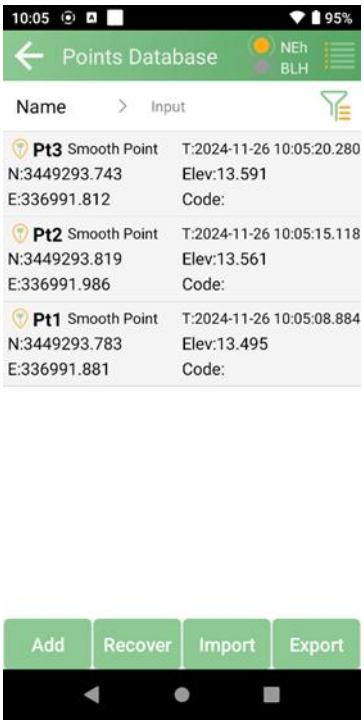
- Click  to select different map types or do map calibration. SingularPad supports Google Map (Standard Map/Satellite Map), OpenStreetMap and WMS Map.

- Click  to jump to map center.



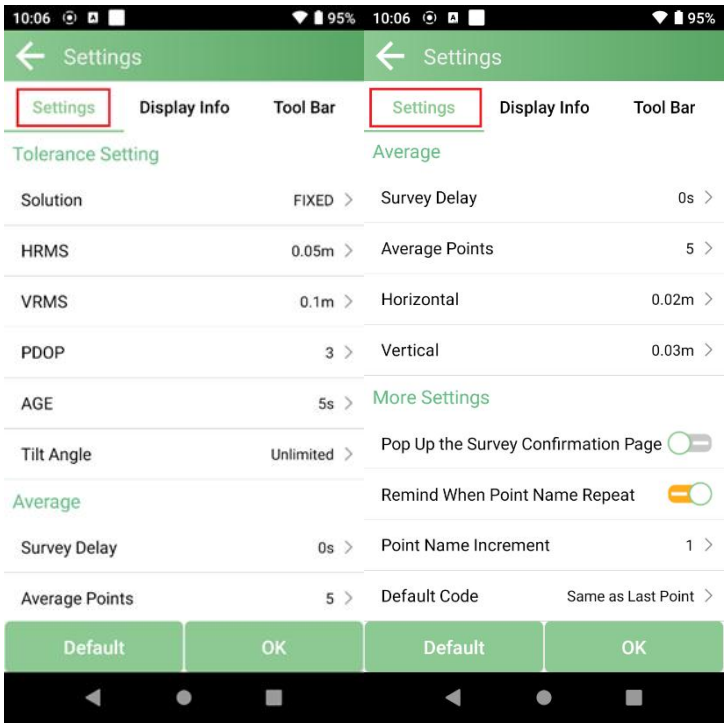
- Click  to show the all points on the interface.

- Click  to enter the point database and view the coordinates of the measured points. You can add, recover, import and export data. After selecting a point, you can view the details and take notes or take photos.



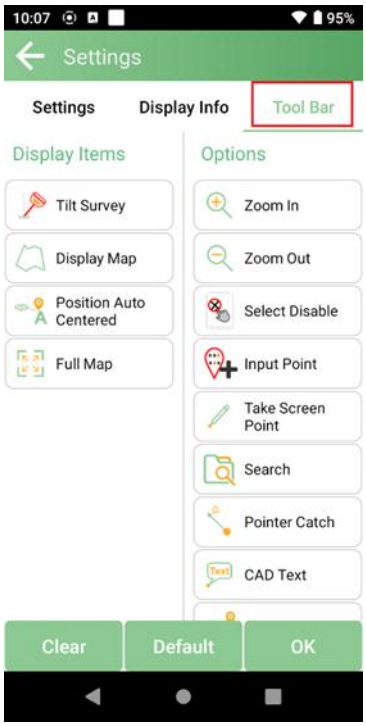
- Click  to enter Settings interface

In ***Settings*** interface, you can modify ***Tolerance Setting*** such as solution limit, HRMS limit, VRMS limit and etc. and modify ***Smooth*** parameters and configure ***Settings*** options.



In ***Display Info*** interface, you can set the display information to the floating window, such as longitude, latitude, altitude, etc.

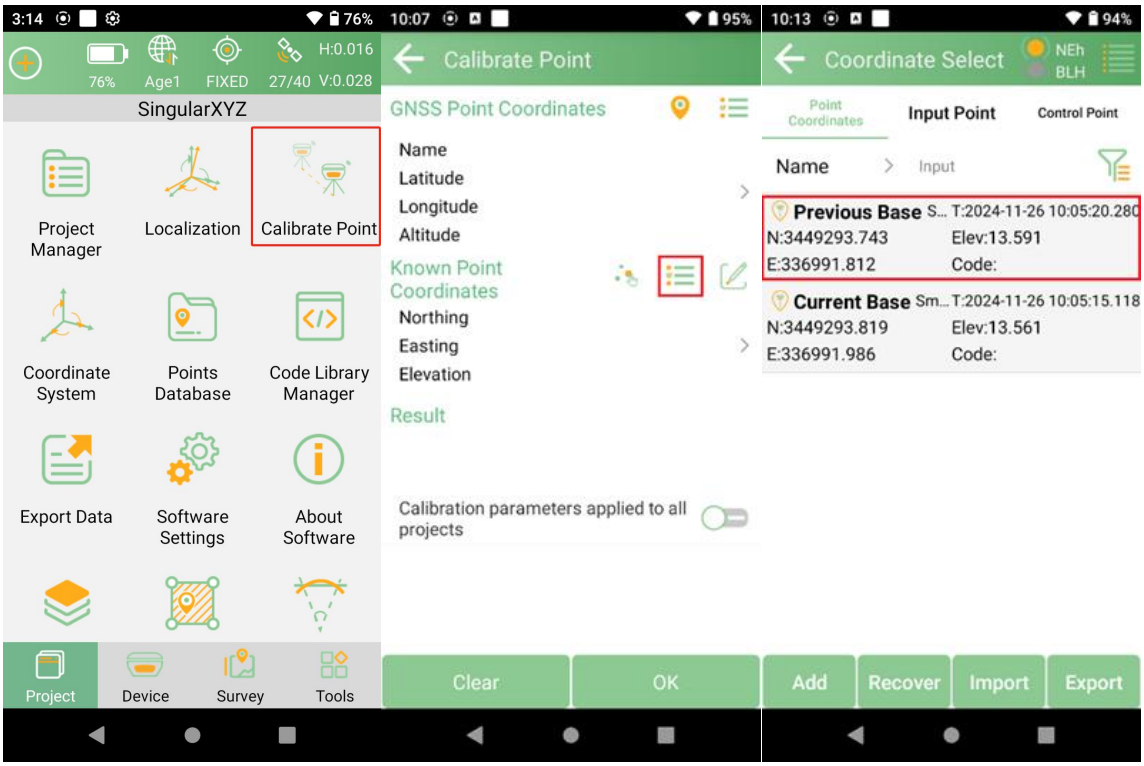
In ***Tool Bar*** interface, you can add or delete options that displayed on the point survey interface. You can customize the interface layout to suit your usage habits.



4.3 Calibrate Point

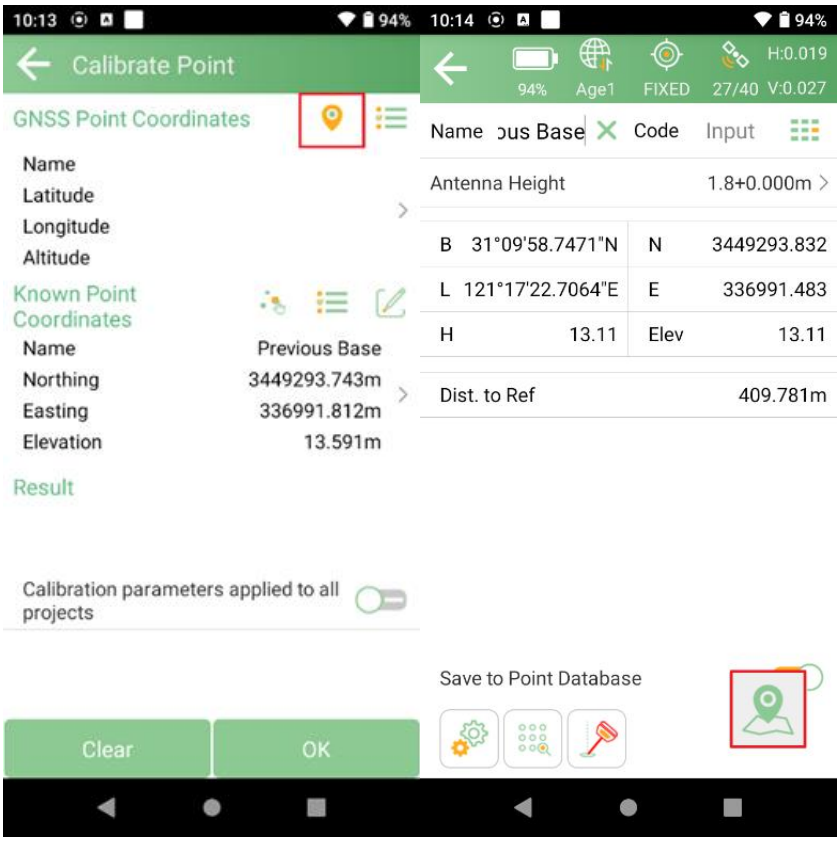
When changing the position of the base station, there will be offsets between surveying points base on different base stations. Users can use the Calibrate Point to calibrate the offset.

Go to ***Project*** > ***Calibrate Point***. Add a point measured under the previous base station as ***Known Point Coordinates***, and measure the same point under current base station as ***GNSS Point Coordinates***.

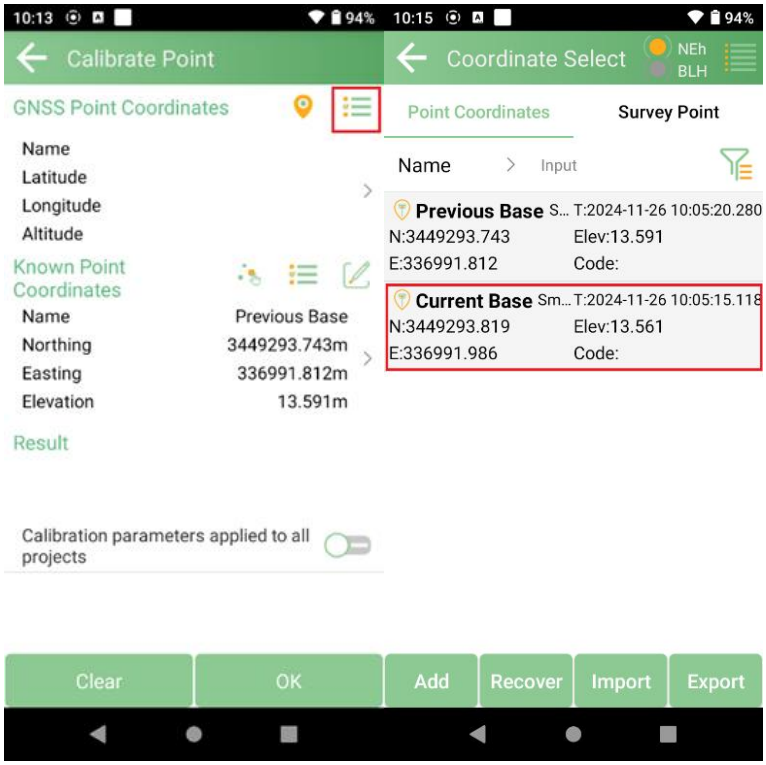


For the GNSS Point Coordinates, you can click the surveying icon to measure under the current base directly.

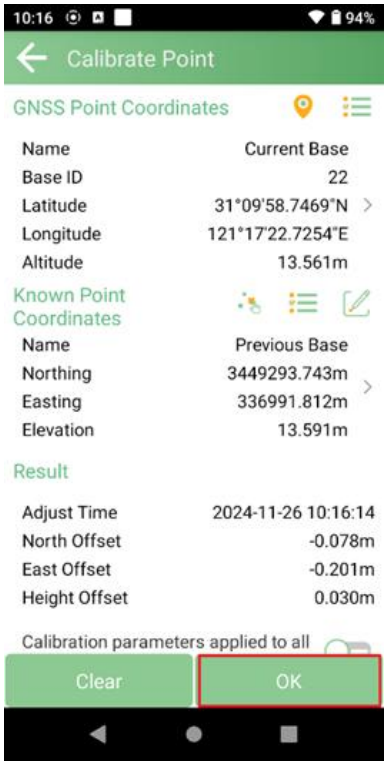
Note: Please confirm the RTK status is FIXED.



Or measure the GNSS point under the current base station in advance and click to select from the point database.



Then click ***OK*** to complete the Calibrate Point.



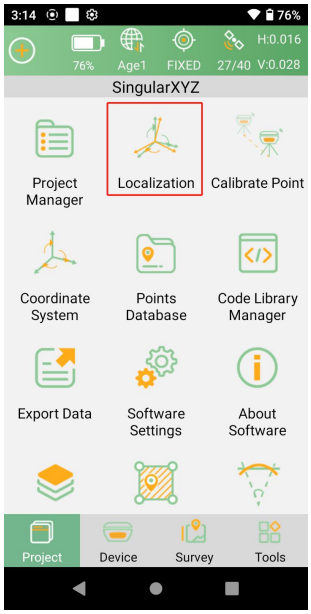
4.4 Localization

When starting a new project, if you are using the local small-scale coordinate system, you can use this function to transform the geodetic coordinates system to your local system.

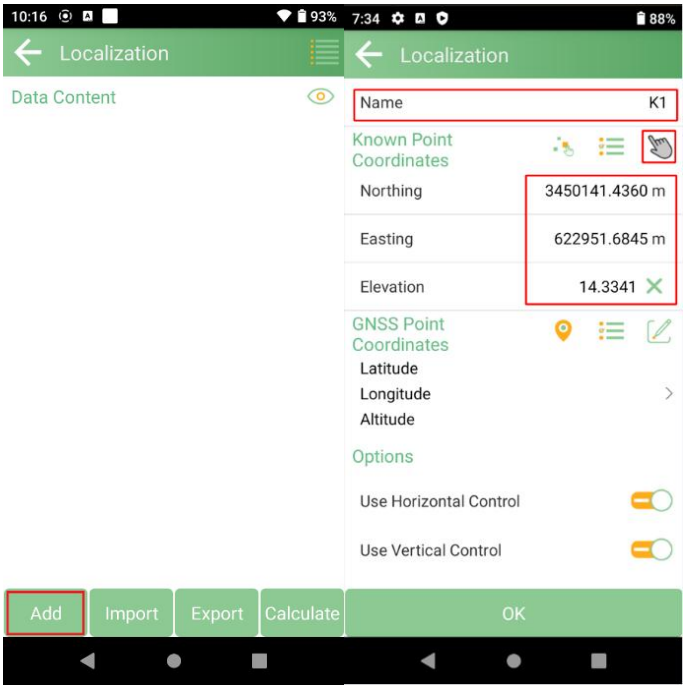
Go to ***Project*** > ***Localization***, add at least 3 pairs of points for the Localization.

Note:

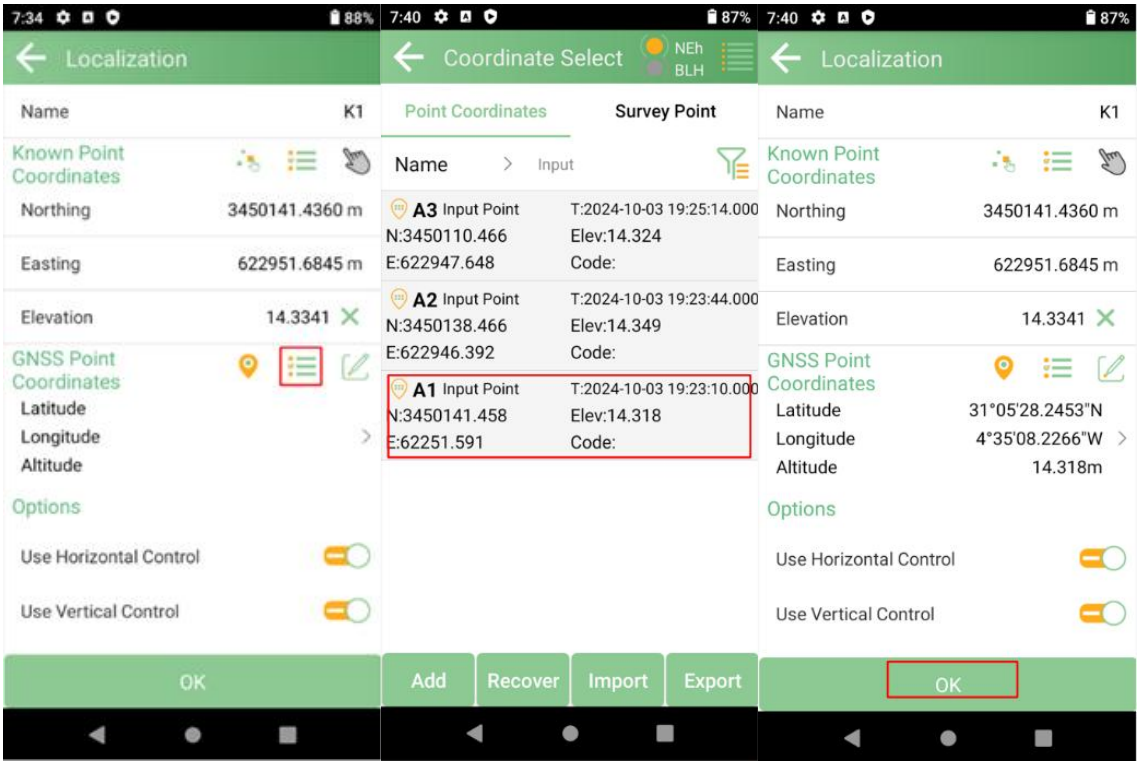
A pair of points are the known local coordinates and the surveying coordinates of the same point.



Click ***Add*** to add the corresponding pairs. Input the Known Point Coordinates.

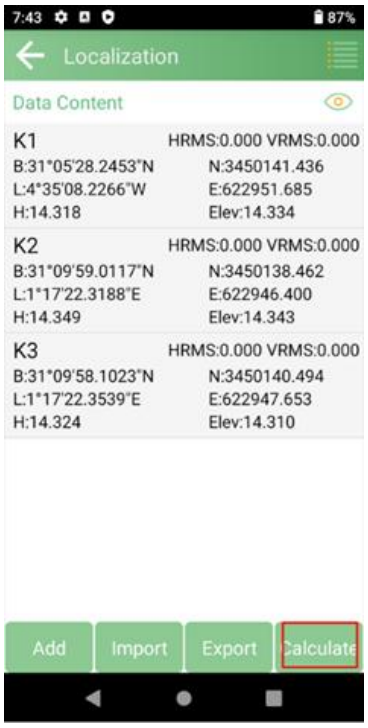


Then select the corresponding GNSS coordinates of the known point.

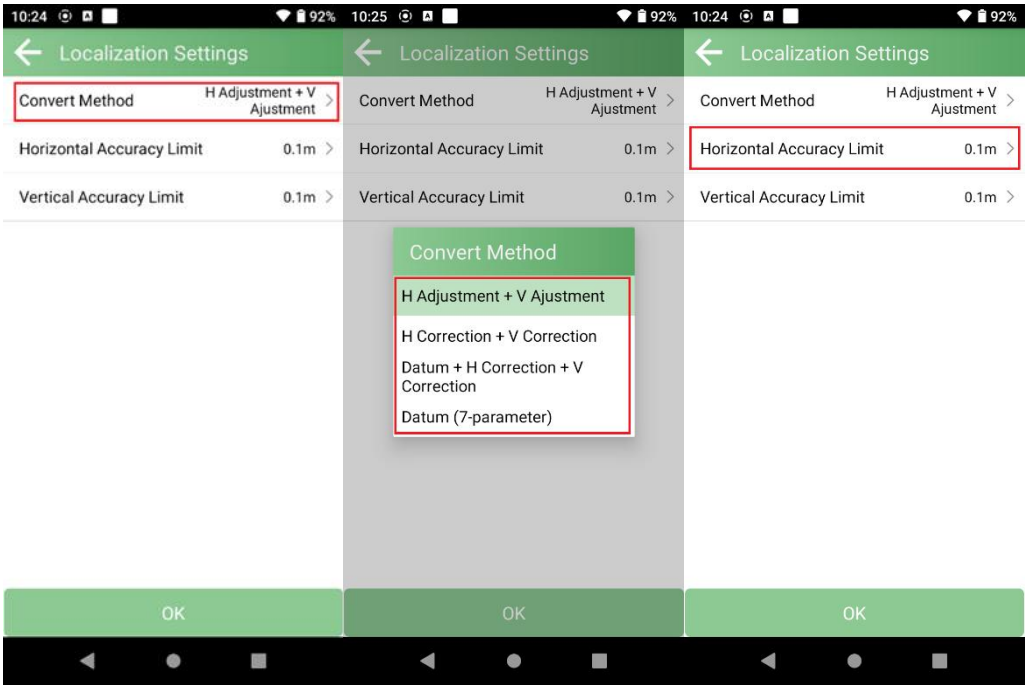


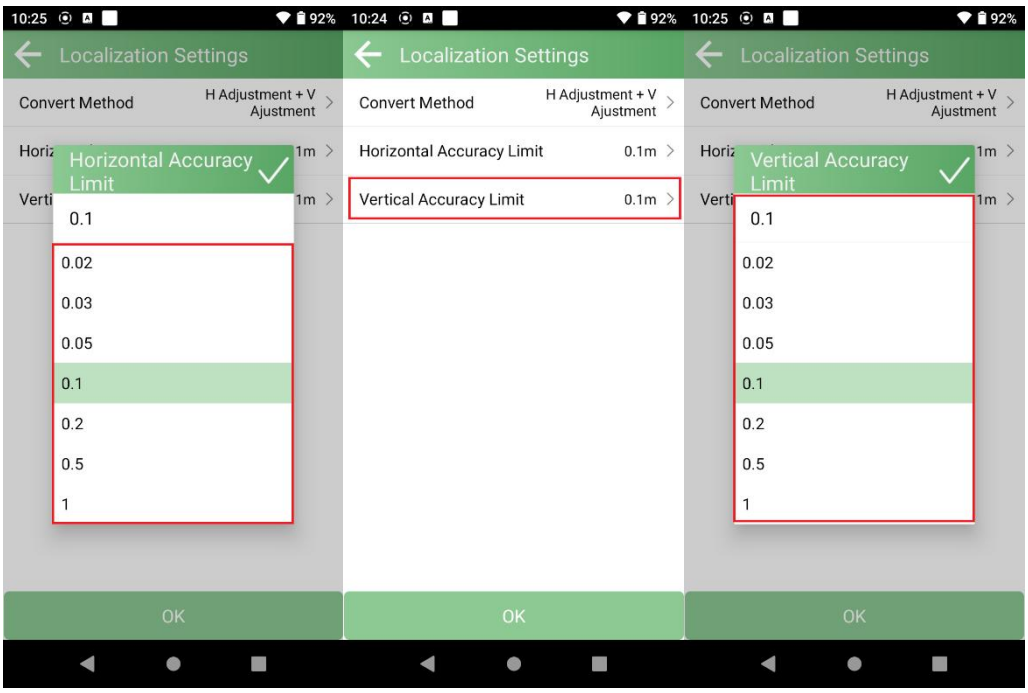
Add the remaining point pairs in sequence. You can also enter the known point in point database in advance and select the input points.

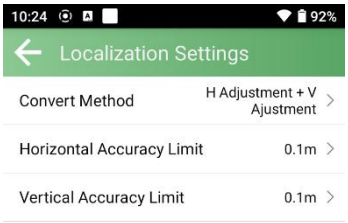
After adding all the point pairs, click ***Calculate***.

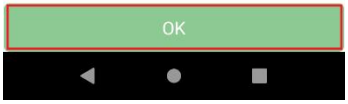


Select the convert method and the accuracy limit according to your project requirements.

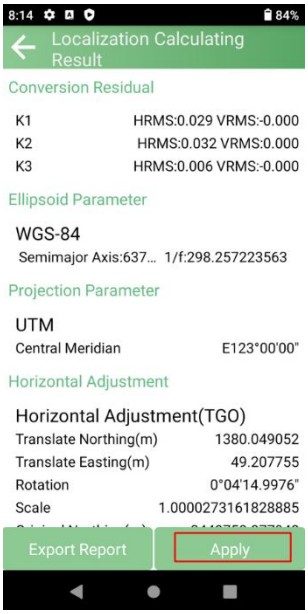








You can click Export Report to save the projected coordinate system parameters. Click ***Apply*** to apply the localization.



4.5 Tilt Survey

The O1 GNSS receiver has a built-in IMU module that supports tilt surveying up to 60°. The system will accurately calculate the actual offset based on the tilt angle, reducing the user's burden on centering pole at each measurement.

The tilt function option  will appear in each survey/stakeout function interface. You can click to turn this function on/off.

Tilt initialization is required when using it for the first time or when its calibration expires.

The following steps give an example of how to use tilt survey.

1. Open IMU: Go to survey >> Point Survey >> click the  button to open.

After clicking the tilt IMU button, the system will prompt you to check the antenna information, please check whether the antenna height is correct.

2. Initialization

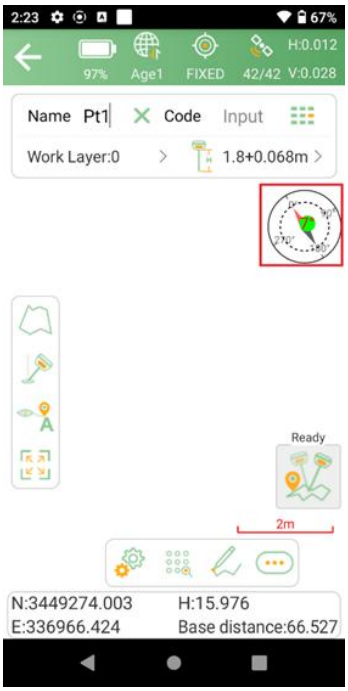
After clicking the IMU button, you can follow the guidance on the interface to complete it.

During operation, ensure that the receiver can search for satellites and obtain a fixed RTK solution.

Note: If the receiver is powered off or reset, it will need to be reinitialized.

In survey interface, you can find the bubble and angle value showing how you tilt the pole in real time. To ensure the accuracy, please keep the tilt angle less than 60°. When the pole tilts within 60°, the built-in

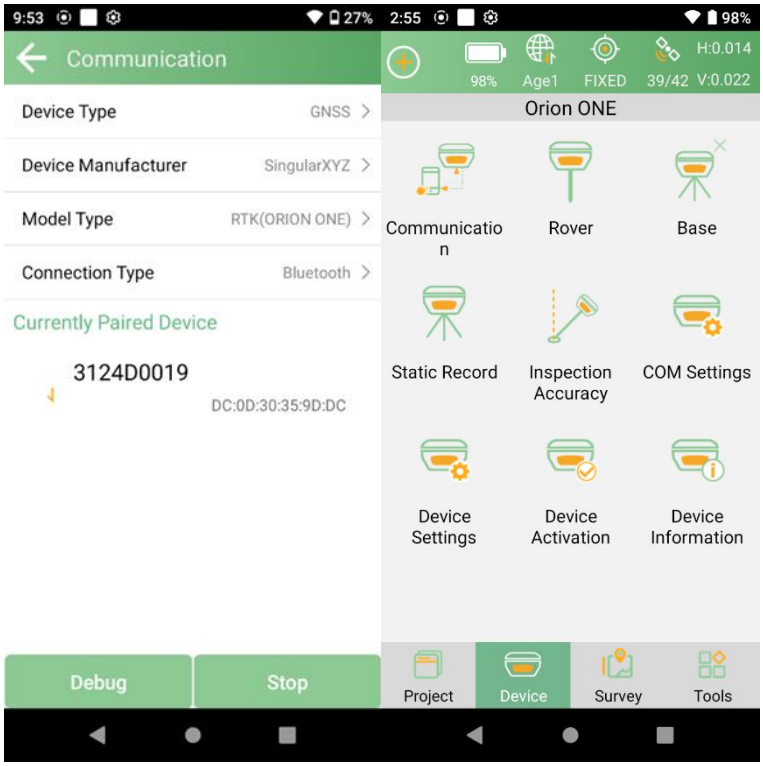
IMU precisely calculates the actual offset, the accuracy of which can be accurate to ±2.5cm.



Tips: Do not shake or rotate the receiver violently, otherwise you need to re-initialize.

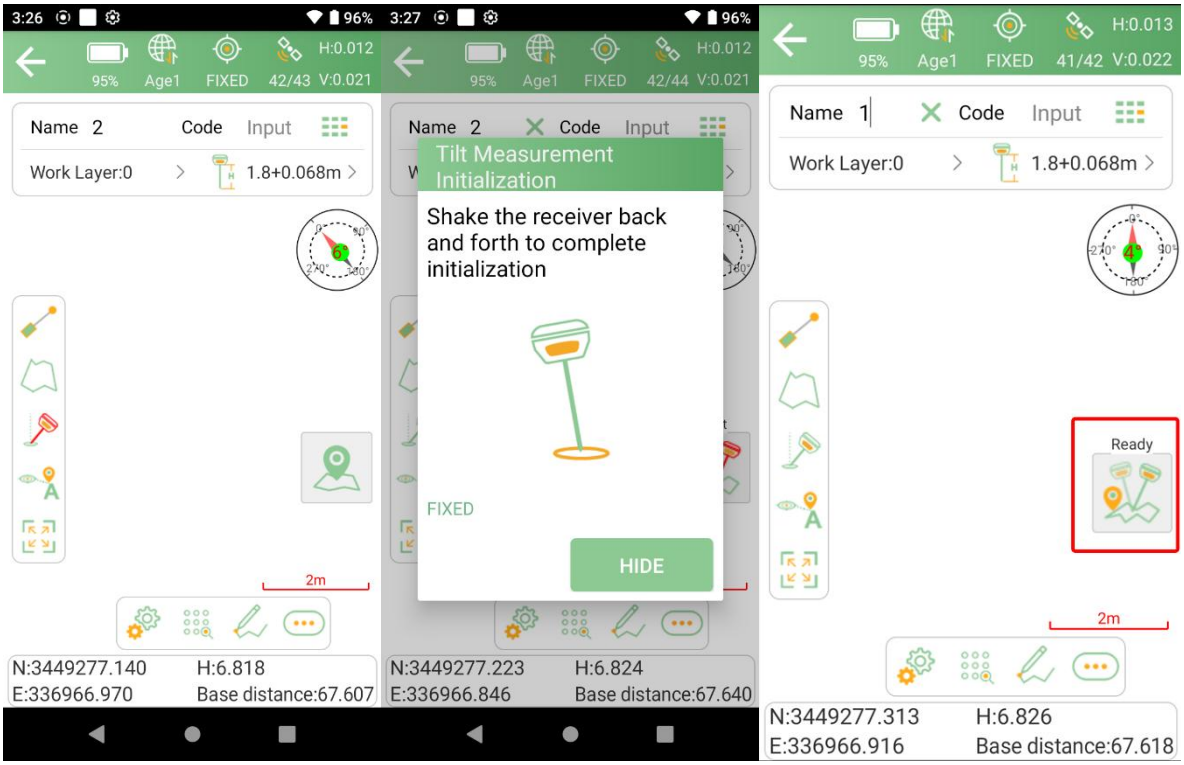
4.6 *Laser Survey*

1. Connect Orion ONE receiver to SingularPad software via Bluetooth and ensure a fixed RTK solution.



2. Before using laser surveying, you need to complete IMU initialization for O1 according to the software prompts. When the IMU icon shows Ready, the accuracy of the laser surveying is accurate.

Tips: Laser surveying is based on IMU, so shake it more times to ensure that the IMU is initialized successfully.



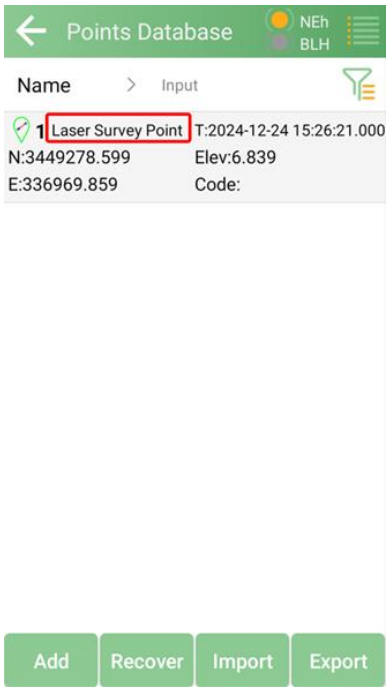
3. Turn on the laser surveying function in the Point Survey interface.

Then the O1 laser can be clearly seen.

Tips: It is recommended to use a bipod for laser survey to reduce the shaking caused by human factors and lead to inaccurate precision.

4. Now click the measure button and you can perform laser survey normally. The points measured using

the laser can be viewed in the Points Database(Please refer to section 4.14 to find it).



Tips: The laser of O1 can reach a distance of about hundreds of meters, but it does not mean that it can measure so far. Generally speaking, 3-5 meters is the best accuracy.

4.7 Detail Survey

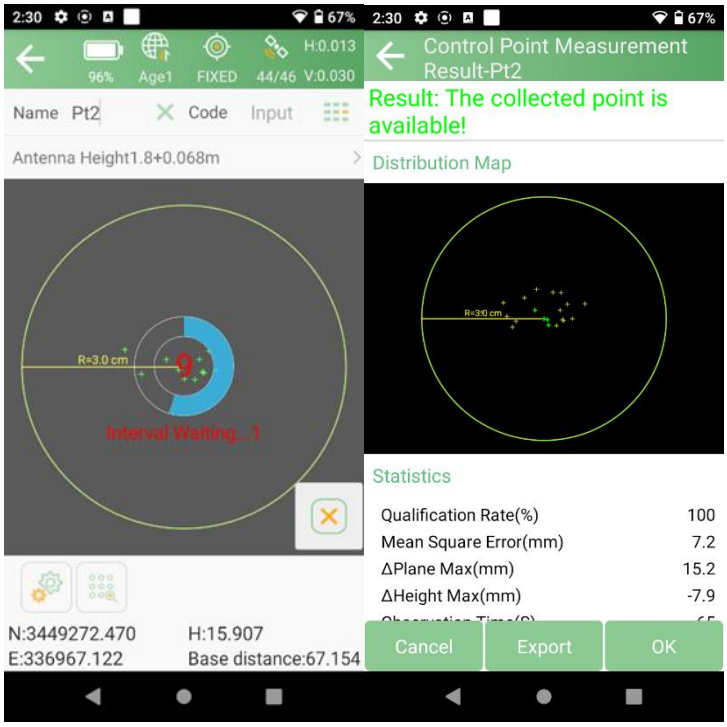
After completing your O1 RTK setup, check current RTK solution status at the top pf the SingularPad software.

In detail survey interface, both local coordinates and Latitude/Longitude will be displayed when measuring.

- Click  to start or stop collecting data
- Click  to set settings, display info and tool bar.
- Click  to check point database; you can add note, info, arrow drawing and photo.
- Click  to open IMU to do tilt survey.
- Click  to open Fast Code Survey. You can input Remark and Code into it, then click the button that just created to start quick-collecting.

4.8 Control Point Survey

By measuring the coordinates of the same point multiple times and taking the average, you can get more accurate coordinates. This function is usually used to measure control points.

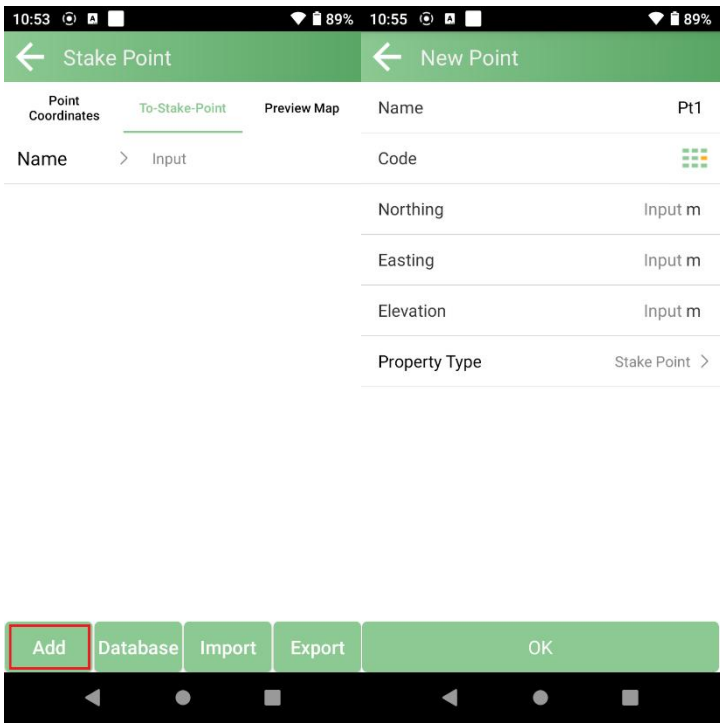


- Click  to start or  stop collecting data.
- Click  to set settings, display info and tool bar.
- Click  to check point database; you can add note, info, arrow drawing and photo.

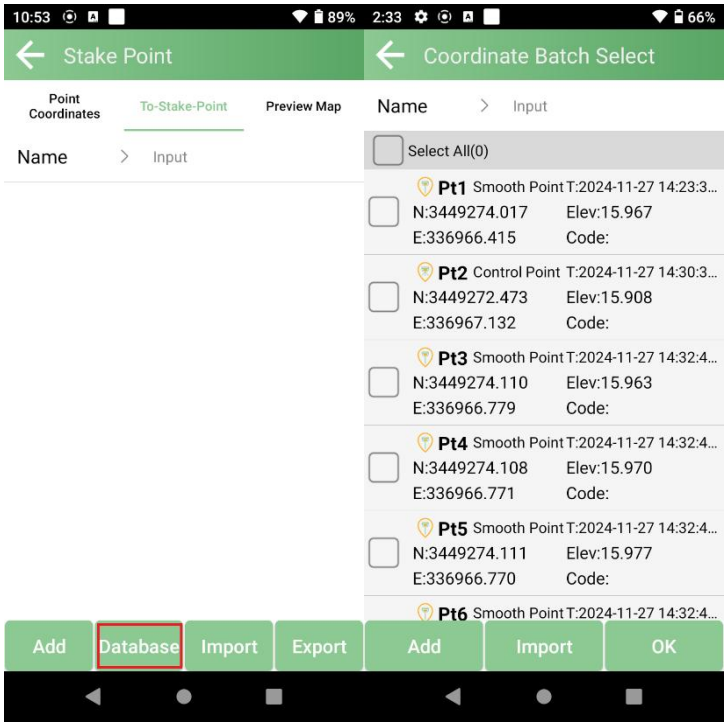
4.9 Point Stakeout

Go to ***Stake point*** interface, add or import the point coordinates you need to stake out, you can also click Button Library to select from the point database.

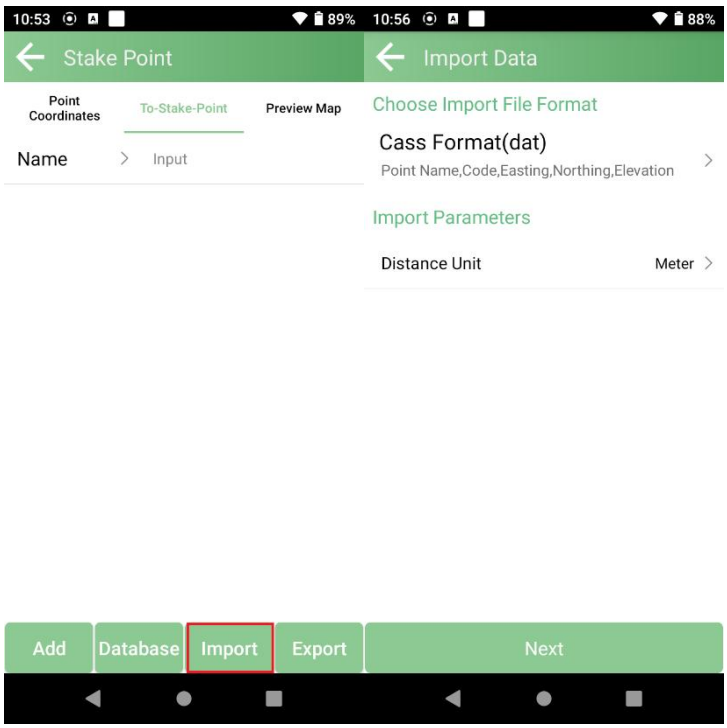
- Click ***Add*** to input coordinates



- Click button library to choose one.



- Click Import to import point data in different file types. You can also define a new format according to your needs.



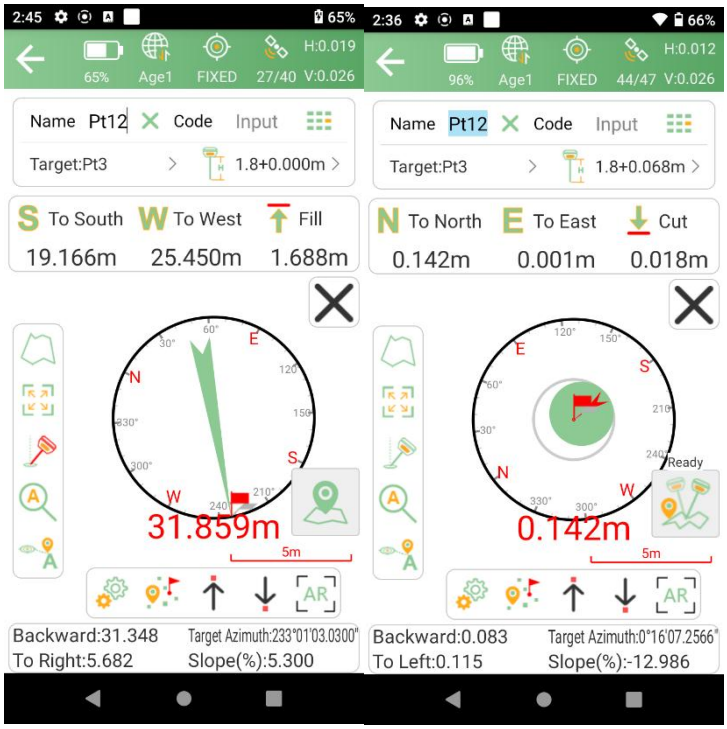
Select a point to stake out. SingularPad provides a navigation map while staking out points/lines. The software alerts you when you approach the target point to the set range value.

For O1 receivers, you can use the IMU stakeout feature. In IMU stakeout, you can turn on the IMU feature

without keeping the receiver perpendicular to the ground. The maximum tilt angle is 60°.

There is a direction prompt on the floating window.

- Click  to start or stop stake points
- Click  to open or close IMU
- Click  to scale automatically to full map
- Click  to jump to current point
- Click  to jump to next point
- Click  to jump to previous point
- Click  to set stake out settings, display info and tool bar, you can edit the prompt range and range error
- Click  to open compass



4.10 *Visual AR Stakeout*

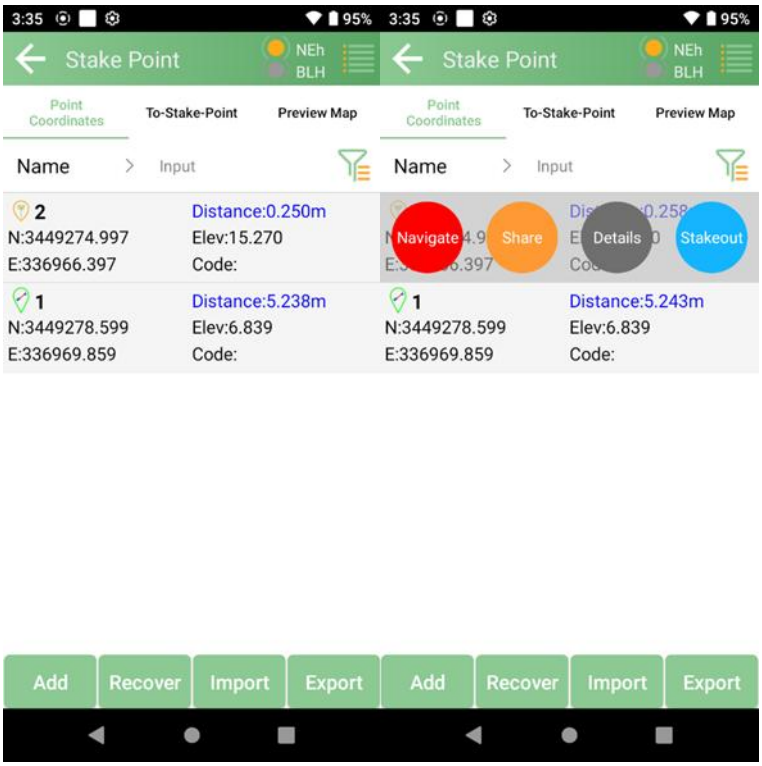
After completing your O1 RTK setup, check current RTK solution status at the top pf the SingularPad software.

1. Get a fix solution.

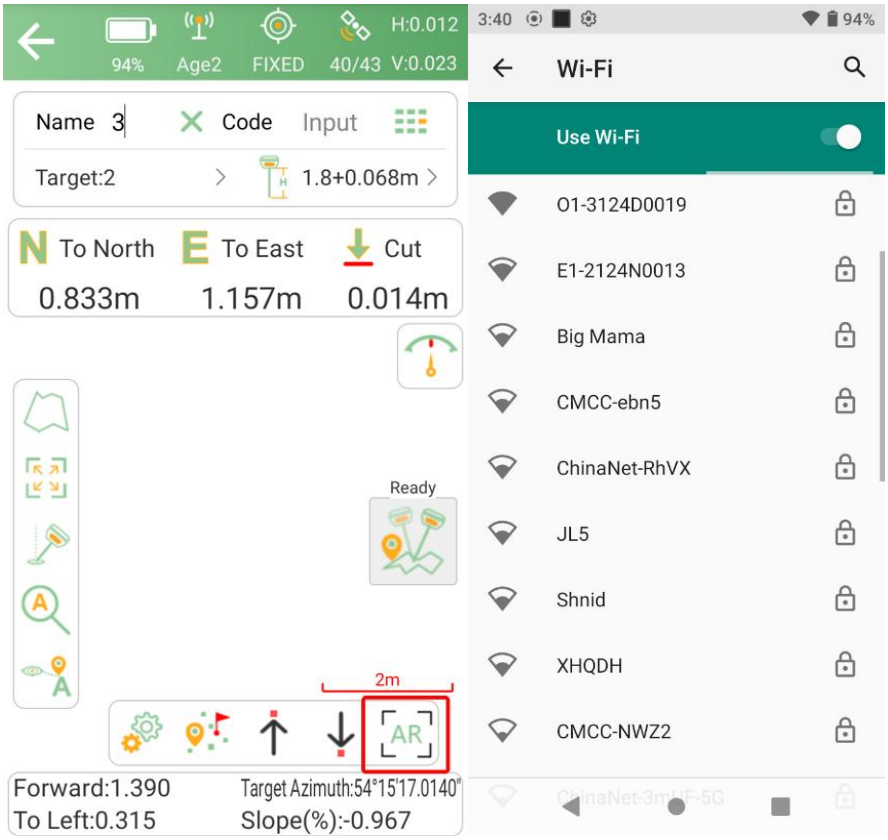
When using Visual AR Stakeout, you need to connect to O1's WIFI. So if you are using CORS (using Phone Internet to obtain the network), please insert a SIM card into the controller instead of connecting the controller to WIFI or hotpot. If you are using radio communication (no network required), you don't need to consider these.

2. Using Visual AR Stakeout also requires IMU initialization.

3. After importing or entering stakeout points, enter the staking interface.



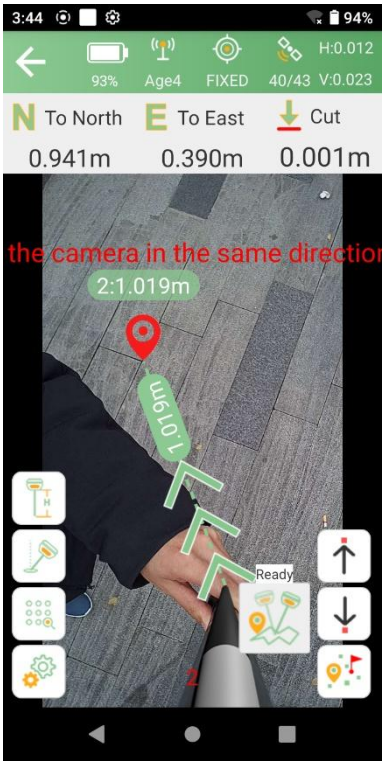
Then click the AR staking icon, and the controller will automatically jump to WIFI connection interface. Select O1 from the WIFI list and enter the password 12345678 to connect. After connecting, return to the stakeout interface to see the image in the O1 camera



4. Follow the software prompts to ensure the receiver is facing backwards. The software will prompt

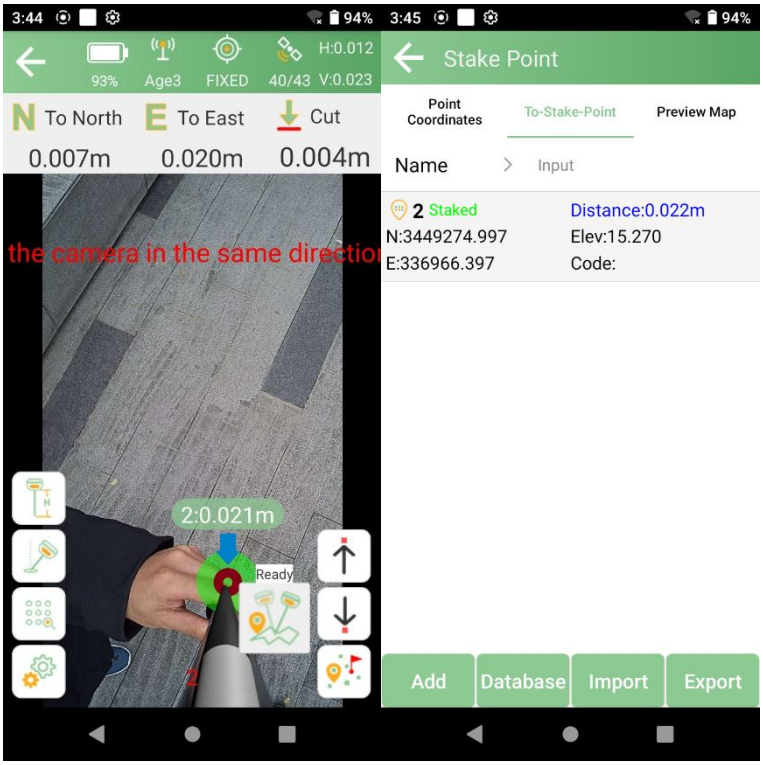
you the location of the stakeout point based on the camera

When you approach the point to be staked, the software will mark the location on the screen.



At this time, align the tip of the rod with the position of the stakeout point. Then click the survey button

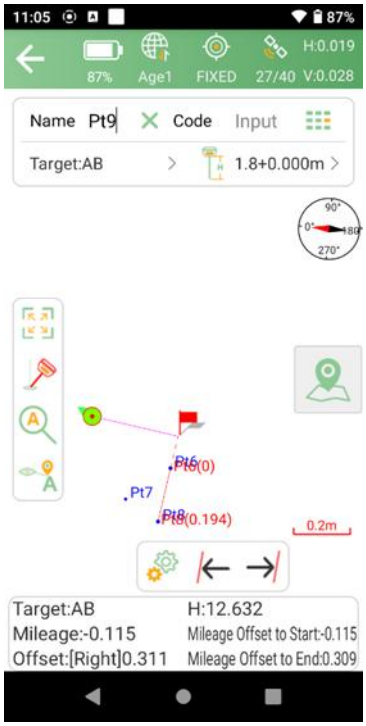
to stake out.



4.11 Line Stakeout

Go into Line Stake interface, add or import lines you need to stake out.

- Click Add to input line parameters
- Click Import to import point data in different file types. You can also define a new format according to your needs.

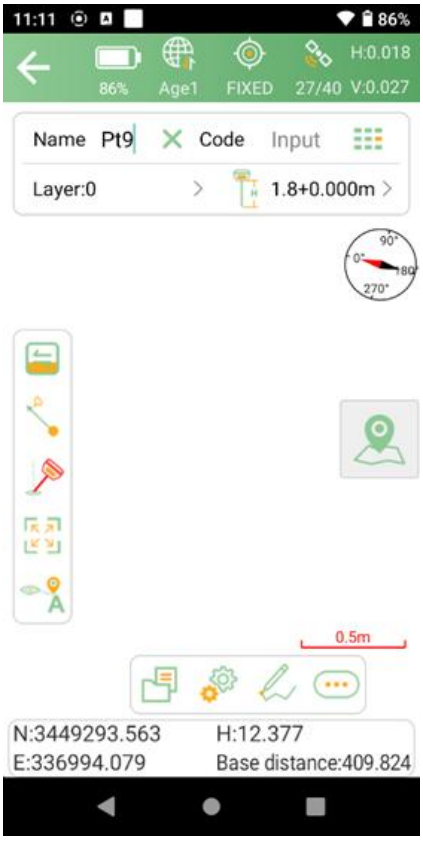


Choose a line to stakeout, set Offset, Cross-Section Slop and Stakeout by Pile-to-Pile Coordinate parameters.

- Click  to jump to next line
- Click  to jump to previous line

4.12 CAD Mapping and Stakeout

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

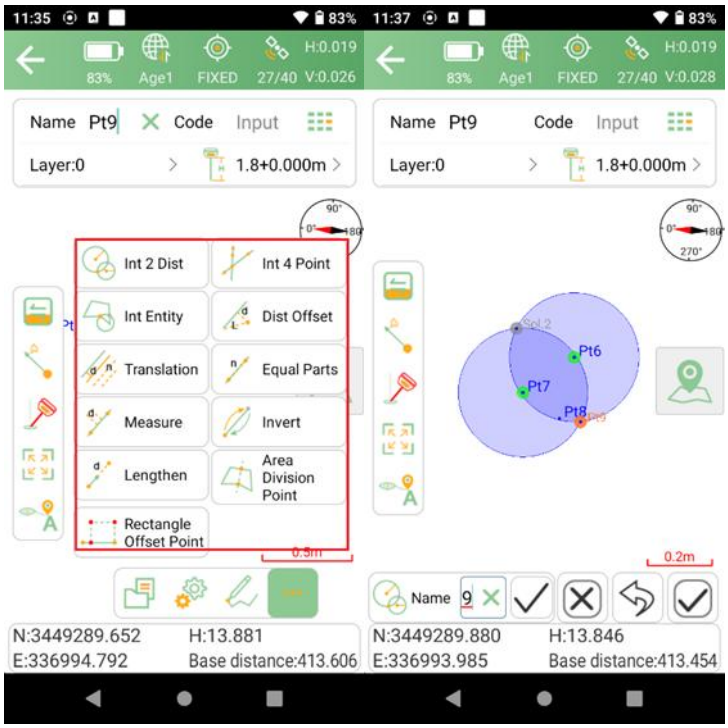


- Click  to create or import a CAD file, supporting *.dxf, *.dwg format.

- Click  to draw features, there are 12 types and methods you can choose, follow the prompts

and draw.

- Click  on the Find tools. They can help you to work smoothly. For example, to find the intersection points of neighboring circles.



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 stakeout.

- Setting: Set the method of stake out, offset distance, interval etc.
- Start station: If you set the start station as 5m, then the final mileage will plus5m.
- Offset: If you set the offset 5m, then you will stake the line 5m away from the line you choose. The plus and minus represent different sides of the line.
- Setting out by pile by coordinate: including station number, station distance and segment
- 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.
- Segment: For example, if you set the segment as 4, then you will stake the line at 4 segments, every segment length is the same.
- Station number: You will stake the line at the station at each interval point. You can stake it out according to the direction.
- Key node: It will stake out the line with starting point, ending point, midpoint, fold point, etc.

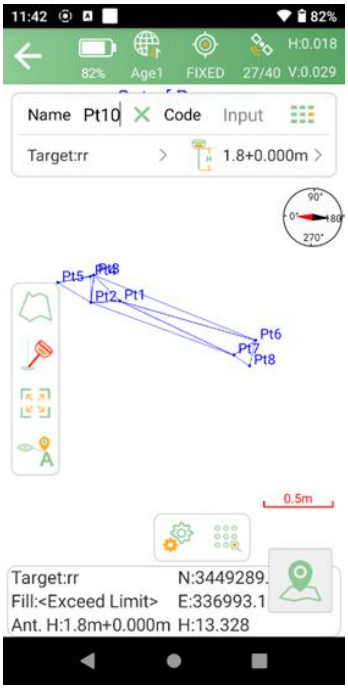
4.13 DSM Stakeout

You can stakeout a surface by staking out elevation of each point on the surface.

If you haven't used a surface file before, you need to create one by adding, importing, or selecting from the database.

You can get a preview map of the surface after adding points and don't forget to save it.

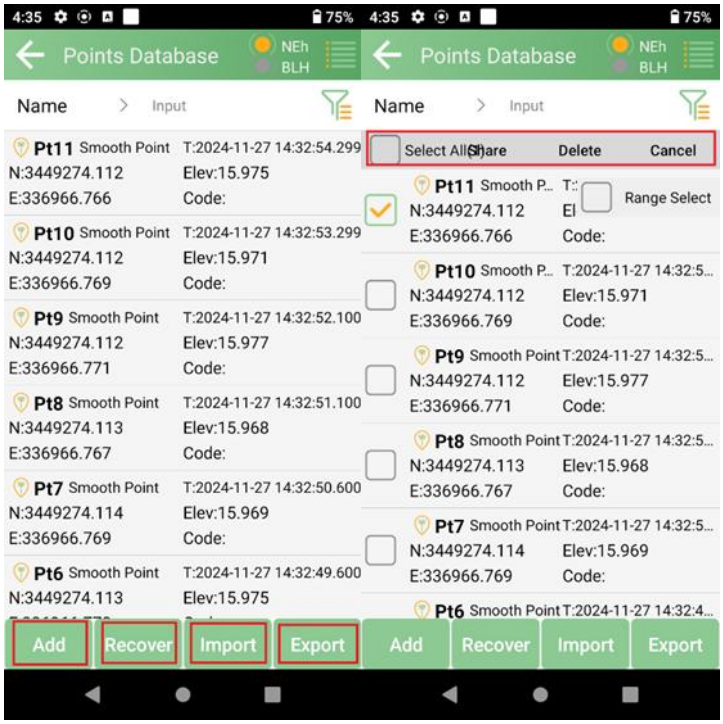
At the content list interface, you can find the surfaces you created, and you can edit, share and stake them.



If the current position is not within the design surface, it will prompt "Out of surface!". If the current position is within the design surface, it will show the fill or excavation value.

4.14 Points Database

The points, which are surveyed, staked, added, imported, and input from display map, will be stored in point database. The surveyed points will be shown under one base while surveying. Also, no matter where you need to select a point, all the points of the database are available.



- Add: Support to add Input Point, and display type supports local coordinate and geodetic coordinate
- Recover: After deleting the points, you can recover them in deleted points interface
- Import: Import points by different formats of files
- Export: Export points by different formats of files
- Search: Enter the name of the point you want share or delete

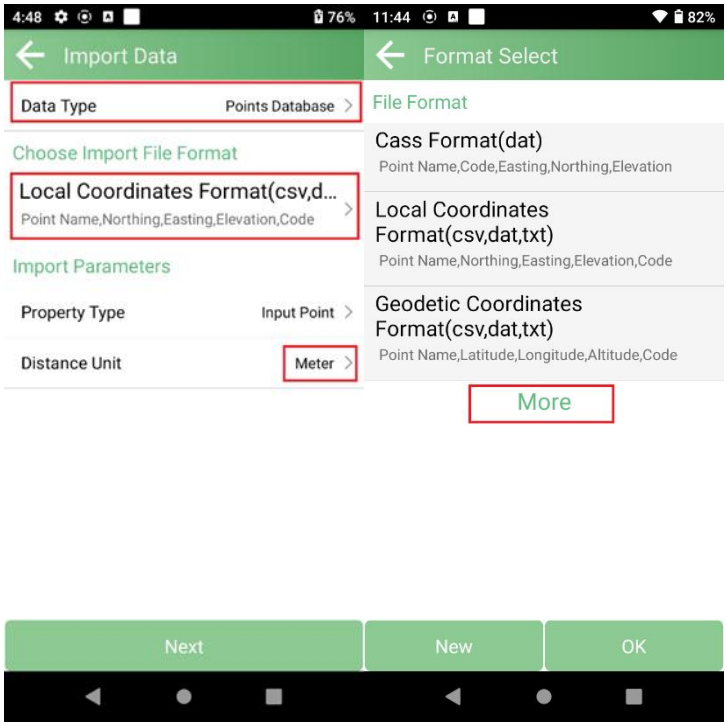
Tap any point to view the detailed information. The information includes antenna height, solution status, WGS84 Coordinate, local grid coordinate, base id and measure time. If the point has been calibrated, the offset parameters will be displayed.

4.15 Data Export/Import

SingularPad supports to export/ import data including grid coordinate, Lat/Lon coordinate with various data format, and supports importing *.dat/*.csv/*.kml file and exporting result of *.dxf/*.kml/*.shp/*.xls/*.csv.

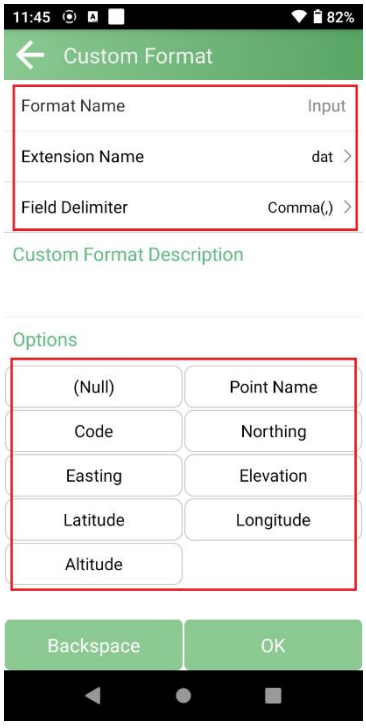
4.15.1 Import points data

Tap Import data in project interface, there are some predefined data formats, click More to get more predefined formats.



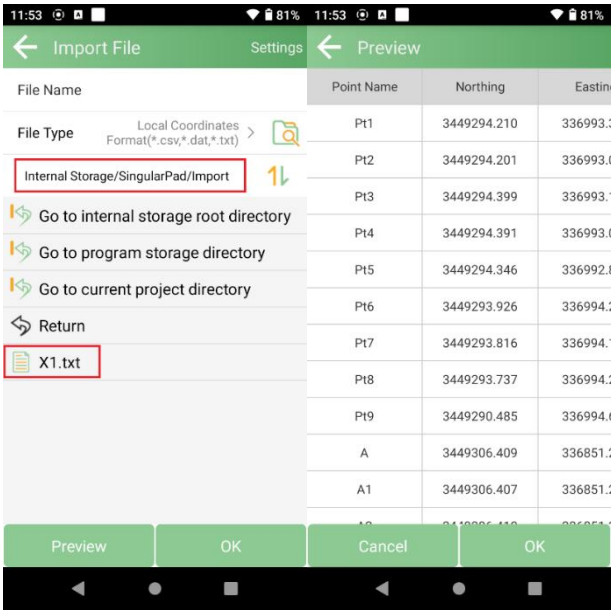
- Data Type: support point database, transformation parameters file and code library
- Import File Format: support *.csv, *.dat, *.txt, *.kml, etc.
- Distance Unit: support meter, US survey feet and international feet

Besides, you can click now to create a User defined type.



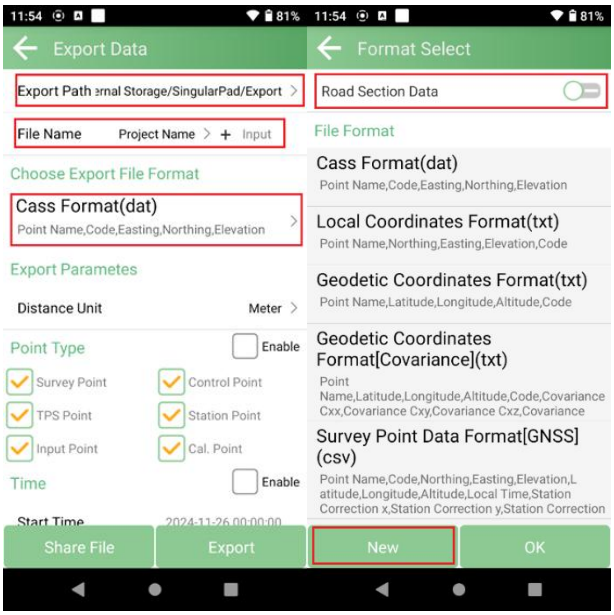
- Format name: Enter the name for the format
- Extension name: support *.csv, *.dat, *.txt, *xlsx format
- Delimiter: support comma (,), semicolon (;), space ( ), tab (Tab)

Click to choose elements in the options list, click backspace to eliminate the previous element selected. The elements include: code, northing, easting, elevation, latitude, longitude, altitude. Choose one format to import data. The default export path is internal storage/ SingularPad/import. You can also change to any other path where the file is. Click preview to take an inspection whether the format is right.



4.15.2 Export points data

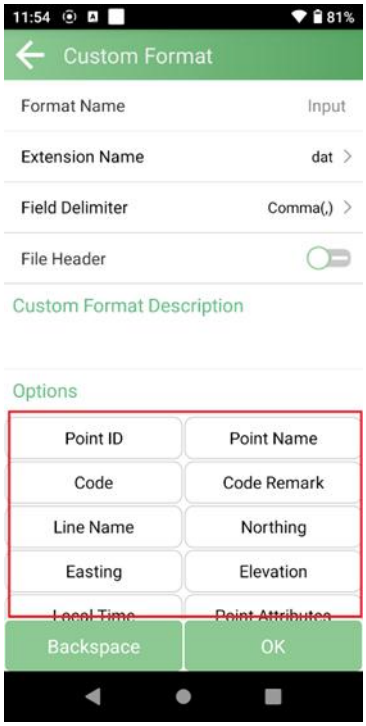
Tap Export in Project interface to export point data. Also, click More formats to export the survey points in various formats like stake points/ lines, DXF, SHP, KML, RAW, RW5, HTML, CASS feature result.



- Export Path: the default export path is internal storage/SingularPad/export; you can also change to any other path where the file is
- File Name: support project name, operator,data, data time
- Export File Format: support *.csv, *.dat, *.txt, *kml, etc.
- Distance Unit: support meter, US survey feet and international feet
- Road section data: open to export road section data

Besides, you can click New to create a user defined type. The elements include: id, name , code, latitude, longitude, altitude, northing, easting, elevation, N, E, Z, type, local time, UTC time, solution status, AGE, max delay, min delay, use satellites, tracked satellites, cut-off angle, mount point, measurement method, repeat, start data, end time, RMS, HRMS, VRMS, PDOP, VDOP, speed, heading, antenna type, measuring type, measuring height, antenna height, base id, base latitude, base longitude, base altitude, distance to ref, original latitude, original longitude, original altitude, undulation height, station correction h, inclination correction, pitch, roll, yaw, inclined angle, projected angle, stakeout type, target, station, offset, north diff, east diff, elevation diff.

For the points, lines and polygons you surveyed in point survey, you can export dxf file, then you can edit them in third party CAD software, or import to base map to check, or import to CAD to stake. Choose the data that you want to export including survey point, input point, control point, stake point, line and polygon, and the layer properties include name, code and height.



Chapter 5 Static Survey

This chapter describes how to conduct static survey through O1 receiver and SingularXYZ Converter software. For static survey, O1 supports 3 data formats: binary XYZ, Rinex 3.02 and Rinex 3.04. SingularXYZ binary format (*.XYZ) is a raw observation data format and you can convert it to RINEX format via SingularXYZ Converter Software. (Contact SingularXYZ support team for the tool).

If you need post-processing software, please contact the support email at <support@singularxyz.com> for assistance

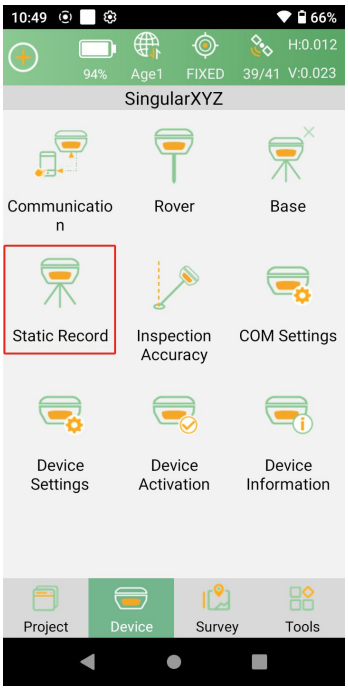
5.1 Static Data Collection

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

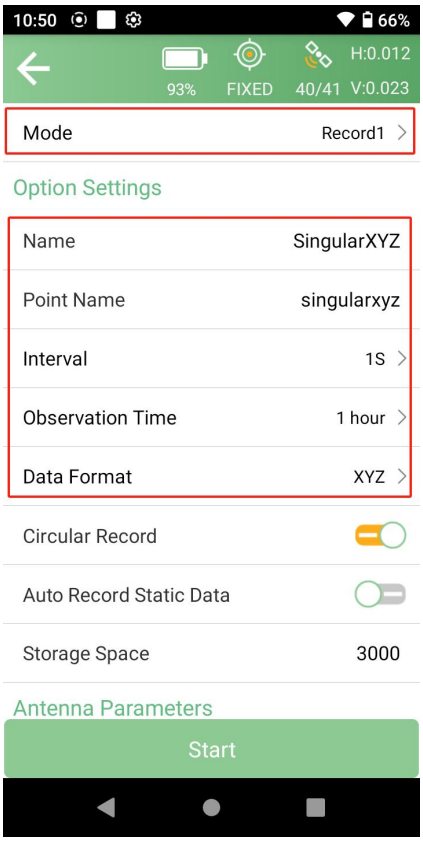
- At least 3 GNSS receivers are required to form a stable triangulation network.
- It is better to collect static data on the known point.
- Power off the receiver before moving to other observation site.
- For the convenience of post-process static observation raw data, record the station name, receiver SN, antenna height, start and end time for each observation site.

The following steps give an example of static survey.

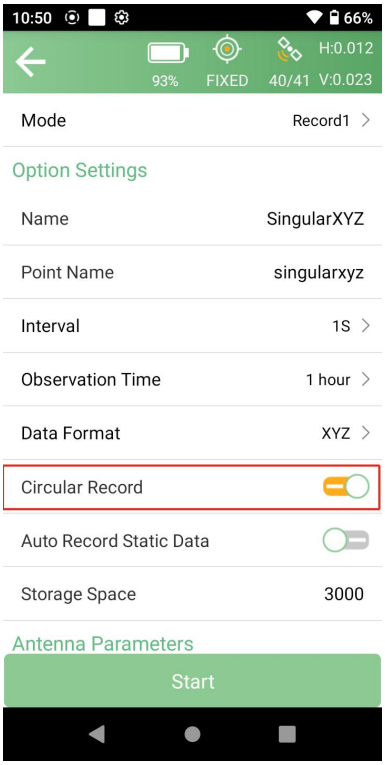
1. Go to ***Device*** >> ***Static and collect points***. Choose the Record mode, there are two record modes and they can record static data at the same time.



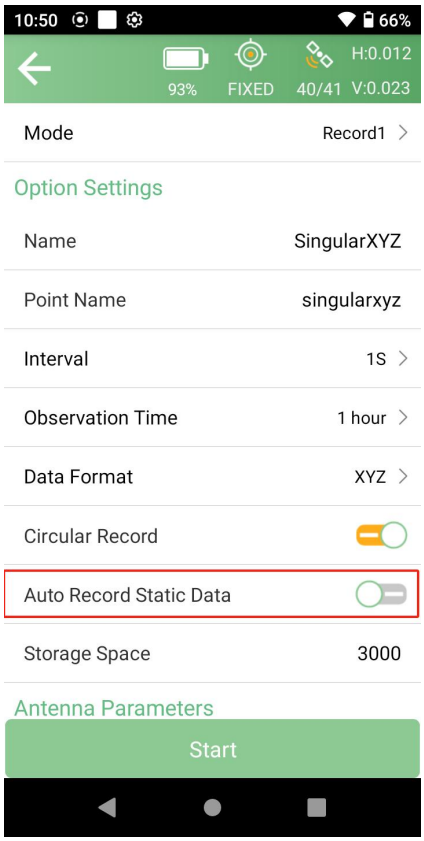
2. Options Settings interface: Input Record name and Point name. Set the Collection Interval, Observation Time and Data Format.



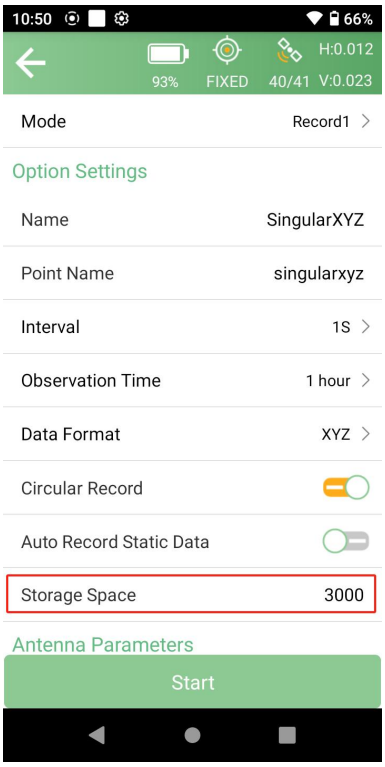
3. Turn on/off the ***Loop Record*** according to your needs. If this option is turned on, the receiver will delete the earliest recorded data to keep recording when the record space is full.



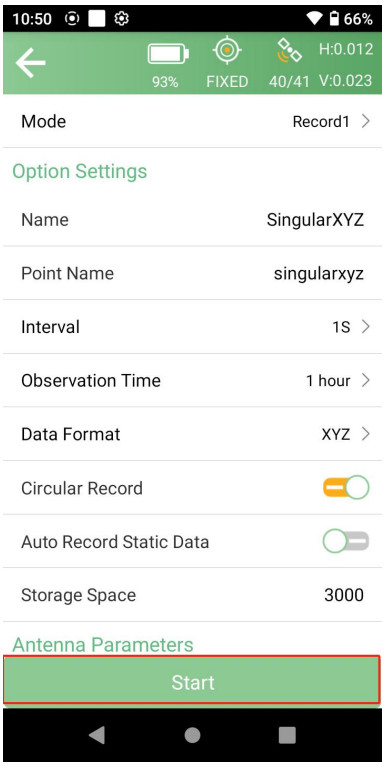
4. Turn on/off the ***Auto Record Static*** according to your needs. If this option is turned on, the receiver automatically records static data after it is power on.



5. Set the ***Record Space*** in the end (unit: MB). It will limit the amount of data that receiver record.

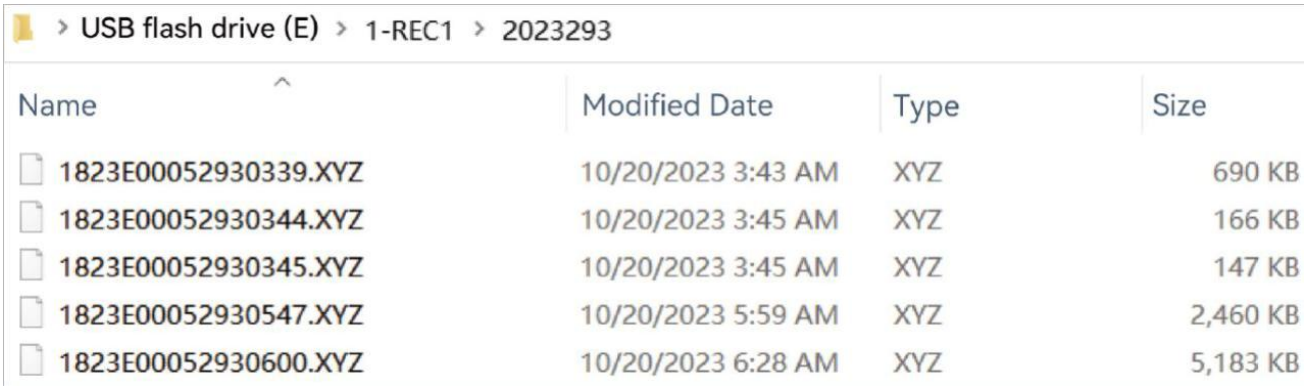


6. Click ***Start*** to start static survey.



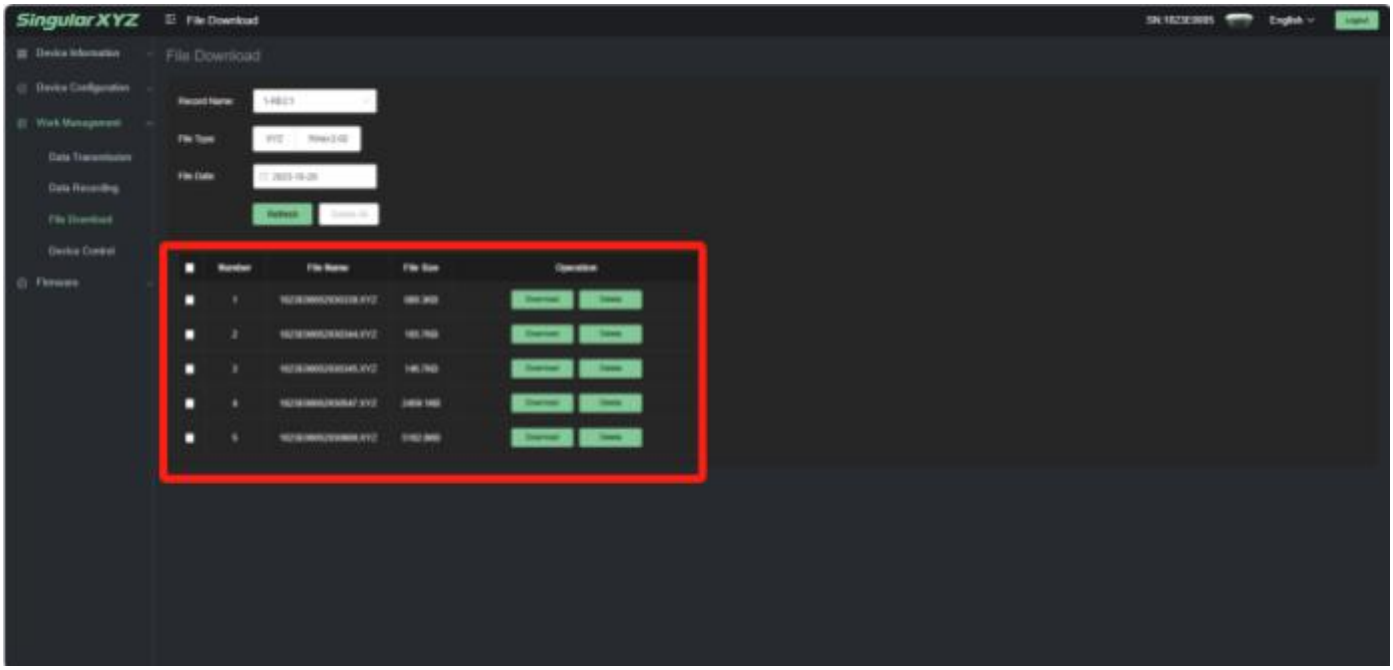
5.2 Static Data Download

The raw observation data is saved in internal memory of O1 receiver, when connected with PC via TYPE-C cable, the O1 receiver can work as a USB Flash Disk, which means you can copy the static data to PC directly.



In addition, you can download the static data via WebUI, connect your PC or phone to the WiFi of the O1 receiver (WLAN name: the SN of O1) and log in the web page in browser via IP 192.168.10.12 (Username: admin, Passwords: admin).

Go to ***Work management*** >> ***File Download***, select the corresponding record name, file type and date to filter and download the static data.



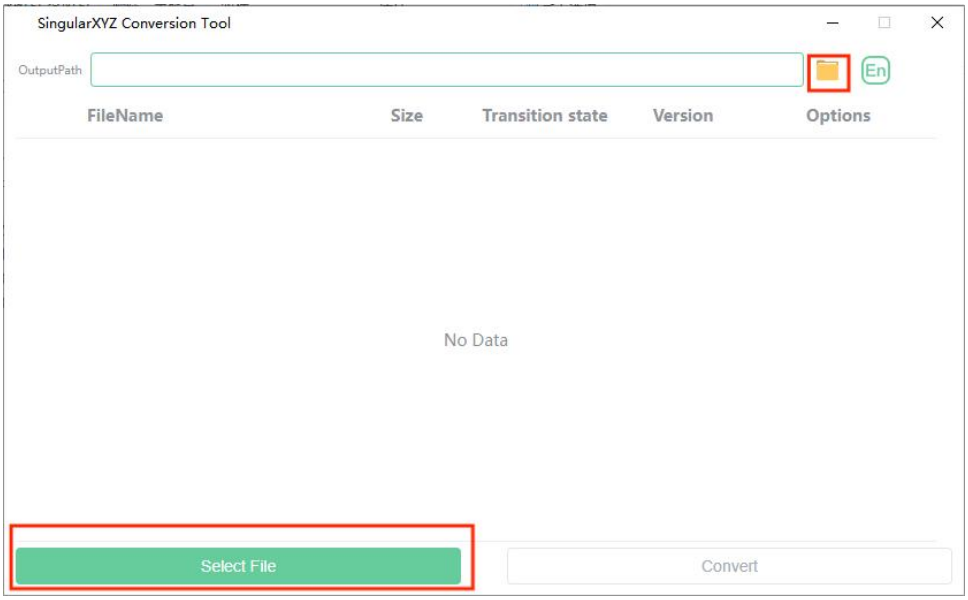
5.3 RINEX Convert

The raw observation data is saved in internal memory of O1 receiver, when connected with PC via TYPE-C cable, the O1 receiver can work as a USB Flash Disk, which means you can copy the static data to PC directly.

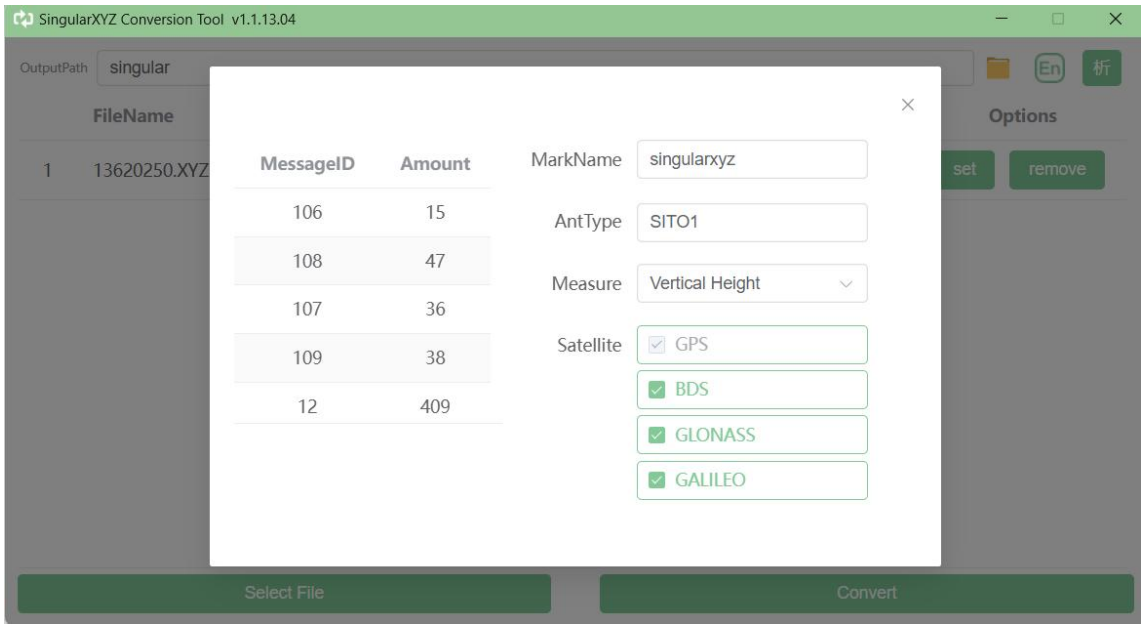
After copy raw observation data to PC, you can convert the data from SingularXYZ binary format (*.XYZ) to Rinex in SingularXYZ Converter software.

The following steps give an example of Rinex convert.

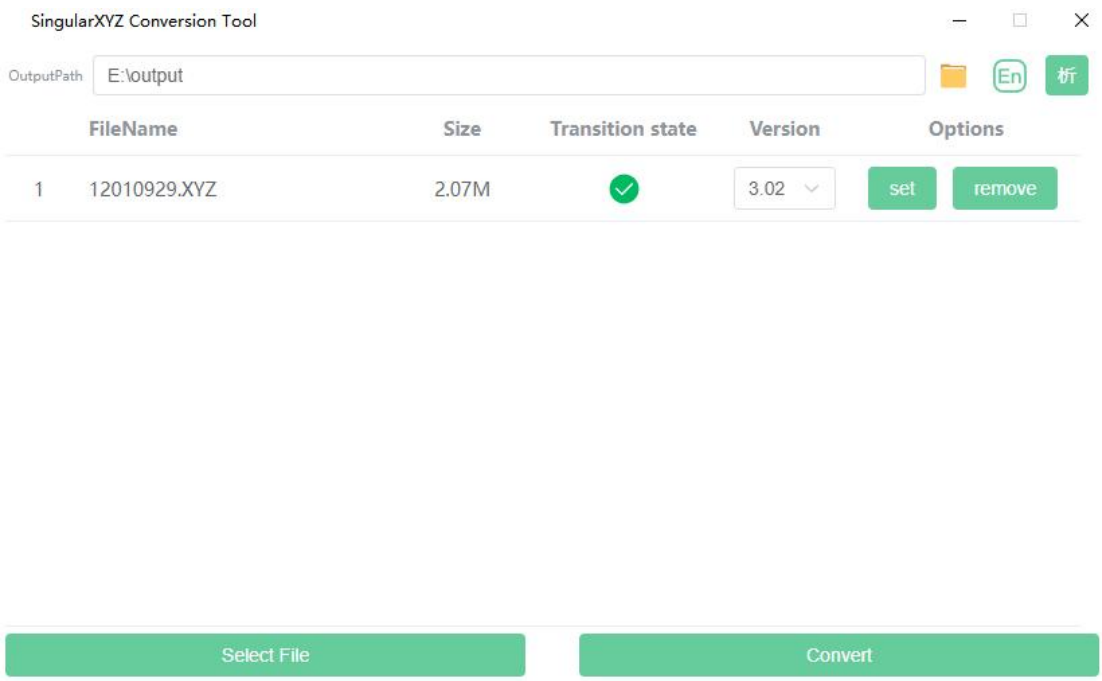
1. Start SingularXYZ Converter software.
2. Set the output path and select to import the binary file.



3. After import the binary file, click set then input the marker name and choose the measure type of antenna height, and the antenna type is automatically identified as SITE 1 for O1 receiver



4. Click ***convert*** to start convert XYZ to Rinex, and the Rinex files will be output to the output file path.



Note:

The output path of the conversion software and the storage path of the files to be converted can only contain English letters and numbers.

Chapter 6 Device Upgrade

This chapter describes how to upgrade the firmware of the Orion ONE receiver. If you need some software and firmware that you don't have, please contact the technical team.

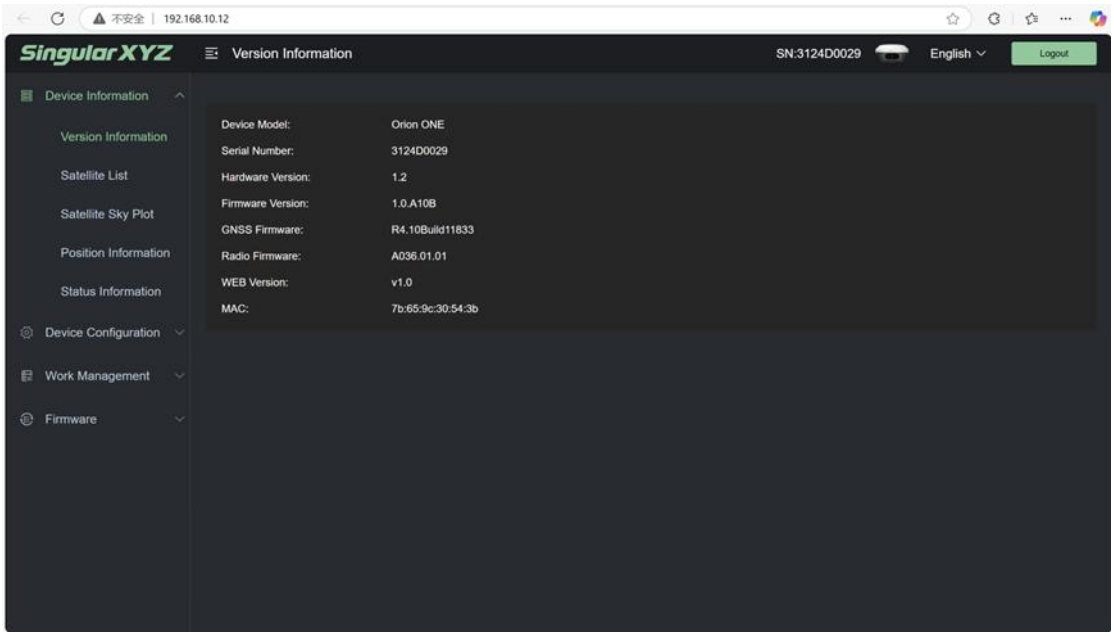
6.1 Firmware Upgrade

1. Power on the receiver and connect the computer to the receiver's WiFi.

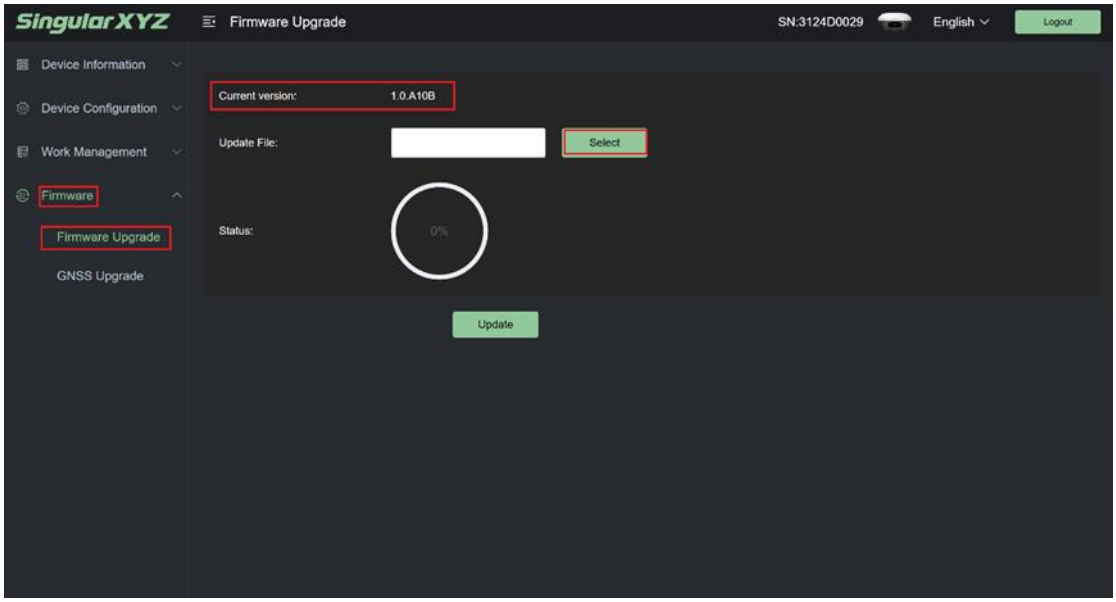
   WIFI password: 12345678.

2. Open the browser and enter 192.168.10.12 to access the device's web interface.

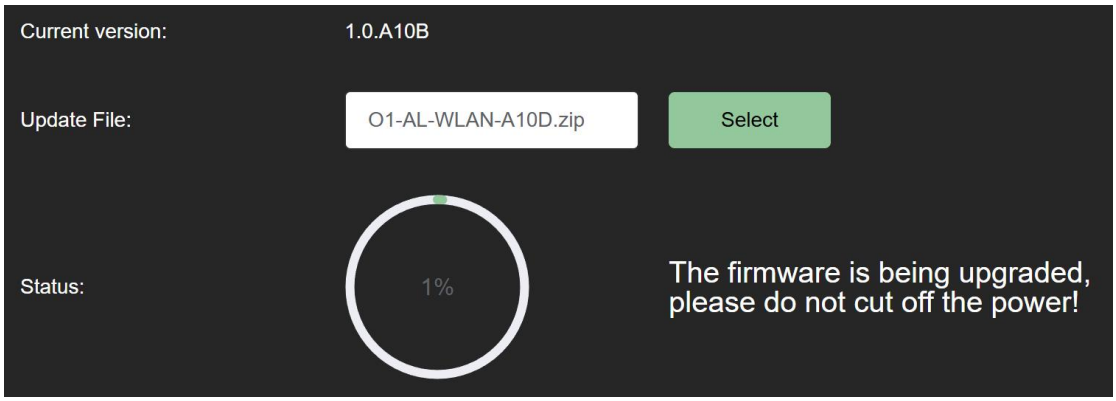
   Username: admin, Password: admin.

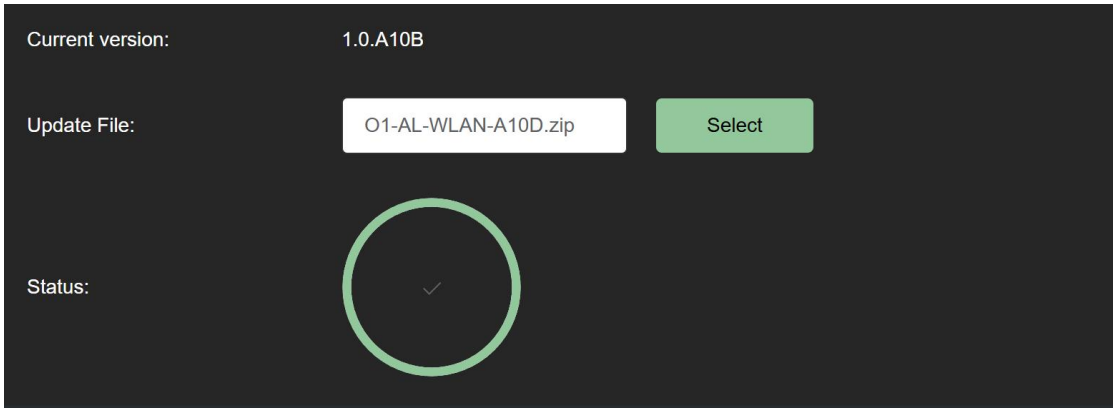


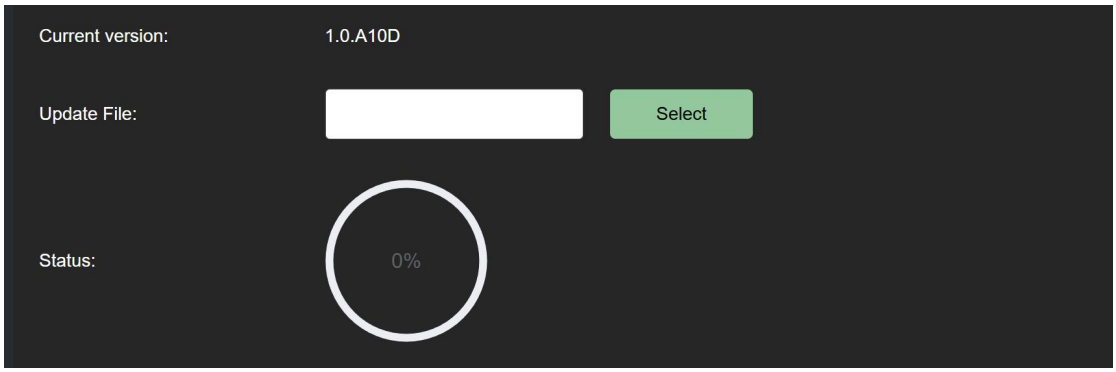
3. Click "Firmware" to enter the firmware upgrade interface, where you can check the current firmware version of the device, select the corresponding version file, and perform the upgrade.



4. After selecting the upgrade file, click "Upgrade" to start the upgrade process. Once the upgrade is complete, the device will automatically restart. After restarting, you can check if the upgrade was successful.

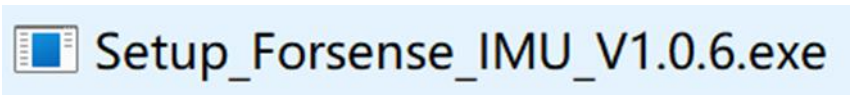




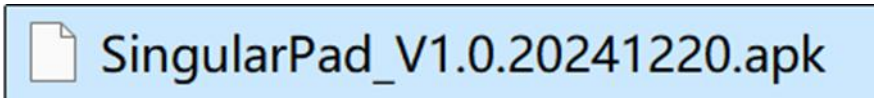


6.2 IMU Upgrade

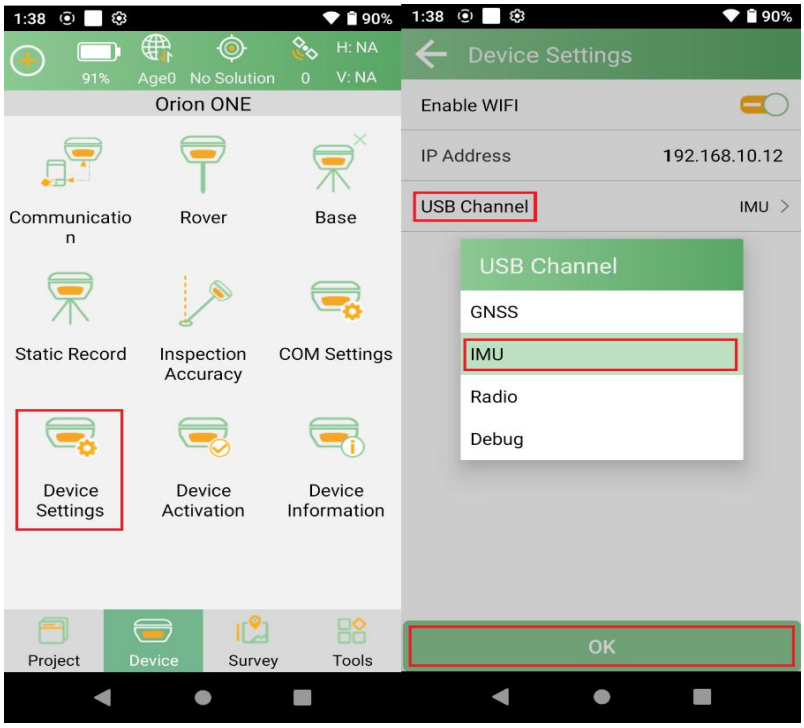
1. Install the Setup_Forsense_IMU_V1.0.6.exe software on the computer.



Check the software version to make sure it is after December 20th.



2. Power on the ORION ONE receiver, and connect the receiver to the SingularPad software via Bluetooth. Enter the Device Settings interface in the PAD software, select "IMU" for the USB Channel, and click OK.



3. Use a Type-c to USB cable to connect the ORION ONE receiver to the computer, and open the **Forsense_IMU_V1.0.6** software on the computer.

4. In the software, select the corresponding COM port for the receiver, set the baud rate to 921600, and click "Connect".

In the upgrade operation prompt, click "Open File" and select the IMU upgrade firmware **IMU-230227.firmware**.

Click Upgrade Button to start upgrade.

When the progress bar is complete, it indicates that the upgrade is done.

Restart the ORION ONE receiver to complete the upgrade.