SingularXYZ®

Sfaira ONE Series
GNSS RECEIVER

User Manual

SingularXYZ Intelligent Technology Ltd.

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This is the V2.0 (Nov, 2024) revision of the Sfaira ONE GNSS Receiver User Guide. It cannot be copied or translated into any language without the written permission of SingularXYZ.

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.

Support Email: support@singularxyz.com
Support Skype: Support.SingularXYZ

Please include your device's serial number (SN), order information, and screenshots or videos of the issue in your email. This will help us analyze your problem more quickly and assist you in resolving it.

If you have any suggestions about this manual, please also contact our team. Your feedback on this manual will help us improve it with future revisions.

Safety Information

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

- Connect your devices strictly based on this User Guide
- Install the GNSS receiver in a location that minimizes vibration and moisture
- Avoid falling to ground, or colliding with other items
- Ensure the charger's output voltage does not exceed 5.5V.

Use and Care

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

Warning and Caution

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

WARNING – A Warning alerts you to a potential risk of serious personal injury and/or damage to the equipment, because of improper operations or wrong settings of the equipment.

CAUTION – A Caution alerts you to a possible risk of damage to the equipment and/or data loss.

Warranty Notice

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

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Model Comparison

The only difference between the Sfaira One and Sfaira One Plus is that the Plus model has an upgraded IMU function that enables tilt surveying, all other configurations are the same. Neither model supports fast charging.

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1 INTRODUCTION

The SingularXYZ Sfaira ONE Series GNSS Receiver User Manual is aimed to help you get familiar with the Sfaira ONE Series GNSS Receiver (hereinafter as Sfaira ONE) 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 Overview

Sfaira ONE Series GNSS receivers include two models – Sfaira ONE and Sfaira ONE Plus. Both models are equipped with a high-precision GNSS engine that can simultaneously track GPS, BDS, GLONASS, Galileo & QZSS, providing stable and accurate centimeter-level positioning. The ultra-compact size and strong anti-interference ability of Sfaira ONE Series make it possible to work even in harsh environments. It is an ideal RTK/GNSS product for surveyors.

1.2 Receiver Features

Key Features of the Sfaira ONE Series GNSS Receiver:

- Ultra-compact size of Φ50 mm × 149 mm and lightweight at 409 g.
- Operates continuously for over 16 hours under high-intensity use.
- Support up to 60° tilt surveying (Plus model only)
- Cable-free Bluetooth wireless technology
- 1408 channels of simultaneously signal tracking
- Centimeter level accuracy
- IP65 waterproof and dustproof
- Designed to survive a 1.5m drop onto concrete

1.3 Packing List

- Sfaira ONE Series GNSS Receiver *1
- USB-Type C Cable*1

Sfaira ONE Series GNSS Receiver

USB-Type C Cable

1.4 Front panel

⚠ Caution

For safe charging, always ensure the charger's output voltage does not exceed 5.5V, as higher voltage may damage the device.

1.4.1 Indicator Light Description

Indicators	State	Description
Power Indicator	Green light flashes	Charging in power on/off state
	Green light on	Fully charged in power on/off state
	Red light on	Power on
Satellite Indicator	Red light on	Flash N times every 5s N: Number of tracking satellites

2 SETUP OF THE SFAIRA ONE

2.1 Environment Requirements

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

- Operating temperature: -45℃ to +75℃
- Storage temperature: -55℃ to +85℃
- Out of corrosive fluids and gases
- With a clear view of sky
- Do not expose to water for a long time

3 CONNECT WITH SINGULARPAD SOFTWARE

3.1 Install SingularPad Software

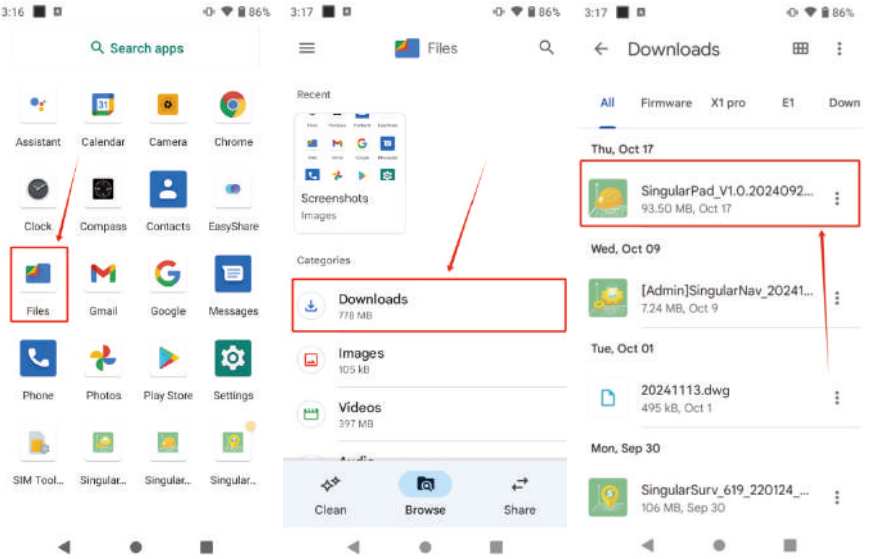
SingularPad is a field software designed to configure the Sfaira ONE Series GNSS receivers and to conduct all subsequent surveying tasks.

Where to Find the software?

1. For Packages Without a Data Collector
The software installation package is provided on the USB drive included with the shipment. Copy the SingularPad APK to your Android device and install it.

2. For Packages With a Data Collector
The SingularPad software is typically pre-installed before shipping. If you find it is not installed upon receipt, please refer to the following installation instructions.

- Navigate to the main menu, then go to <**Files**>;
- Enter the <**Downloads**>, We will provide the installation package here;
- Click the APK file to install.



> ⓘ **NOTE**
>
> If the installation package is not found in this folder, please contact us using the provided contact details.

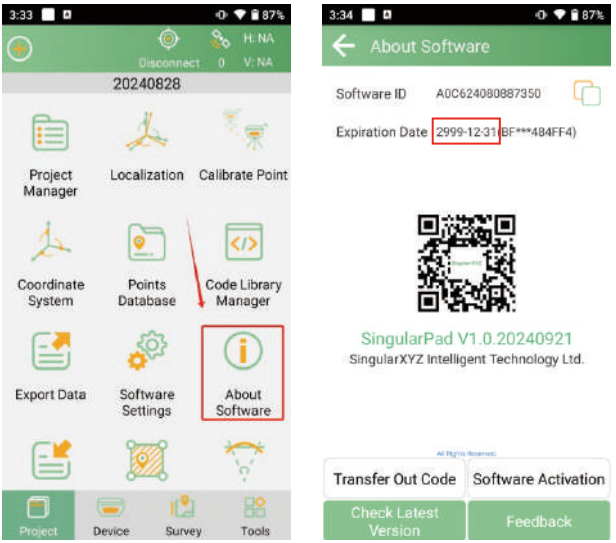
3.2 Software Registration

After the software is installed, you can check your software registration status (network connection required) by following these steps:

Go to **Project** >> **About Software** and check the Expiration Date.

- If it shows **2999-12-31**, this indicates a permanent registration.
- If it shows Inactivated, please click **Software Activation**, then enter the permanent license to register and activate all software functions.

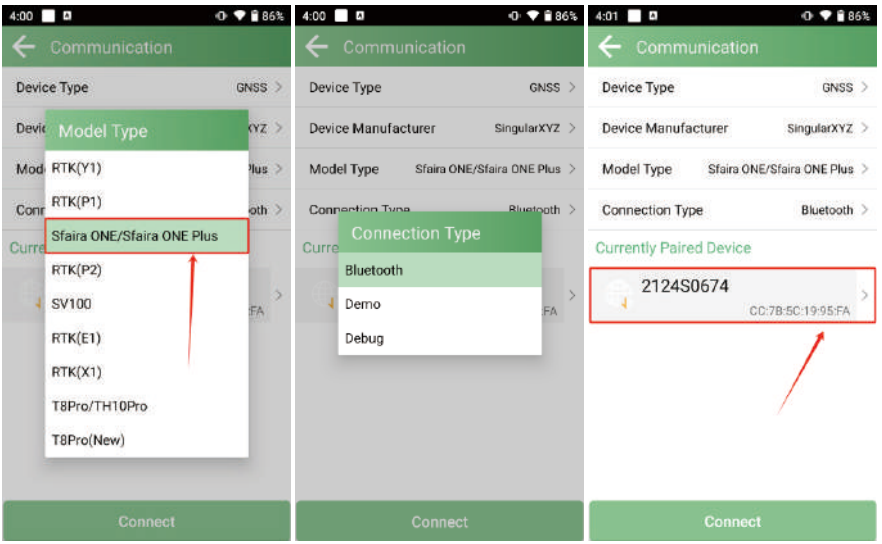
> ⓘ **NOTE**
>
> If you don't have an activation code, please contact our sales or support team, providing your order details and software ID to obtain it.

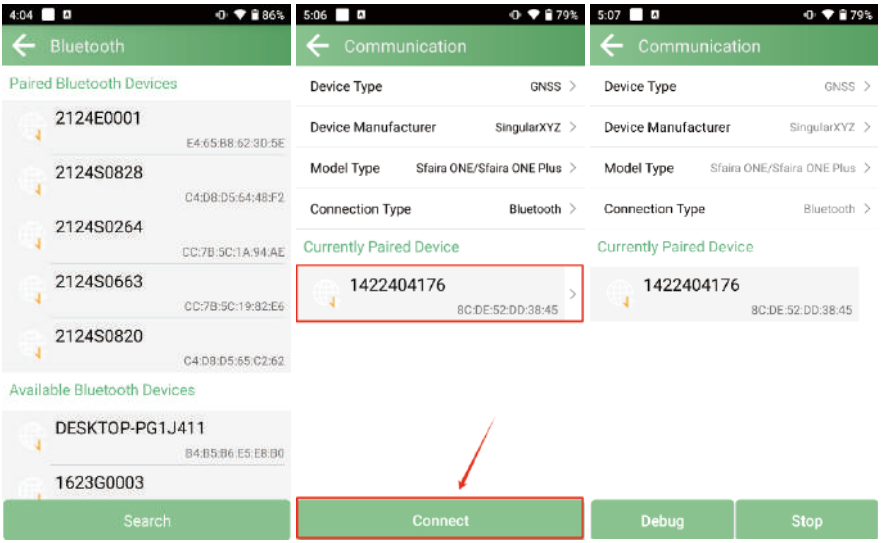


3.3 Device Connection

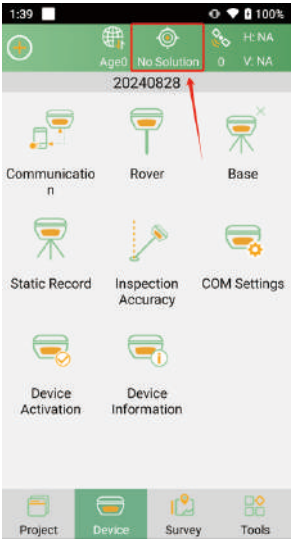
After the device is turned on, please connect SingularPad with SingularXYZ Sfaira ONE receivers.

Open SingularPad software, go to **Device** >> **Communication** and select the **Model Type** as **Sfaira ONE/Sfaira ONE Plus** and the **Connection Type** as **Bluetooth**. Click the device list to search for your Sfaira ONE serial number and click **Connect**.





After connecting to the receiver, if <No Solution> is displayed in the top status bar, it may indicate that the <Model Type> does not match. Please verify this and switch to <Sfaira ONE/ Sfaira ONE Plus>and reconnect the device.

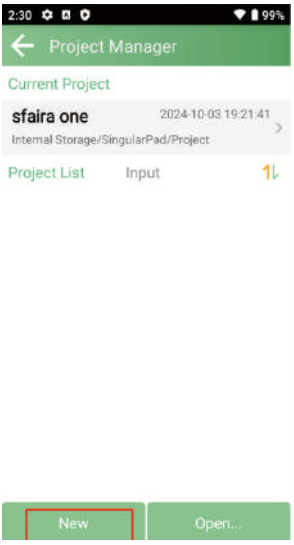


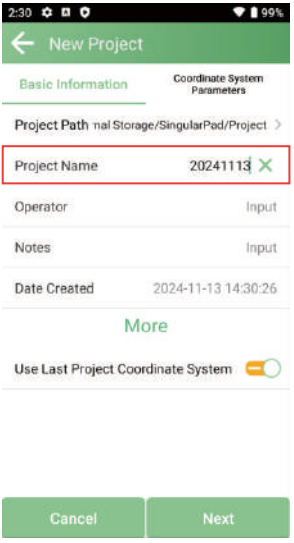
TIP

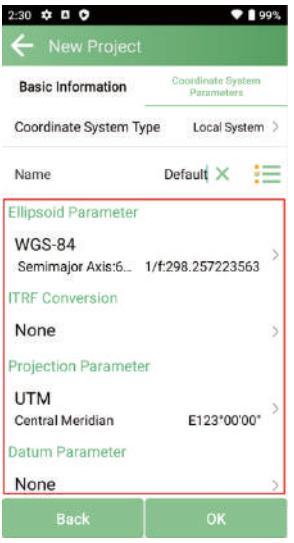
If you fail to connect to the receiver through SingularPad, go to system Bluetooth setting interface of your Android device to make sure Bluetooth is paired successfully.
In some cases, you may need to forget the paired device, restart the receiver or software, and then pair again.

3.4 Create A New Project

Click **Project** >> **Project Manager**, click the **New** button in the lower left corner of the interface. Input project name, set coordinate systems parameters and save the project.



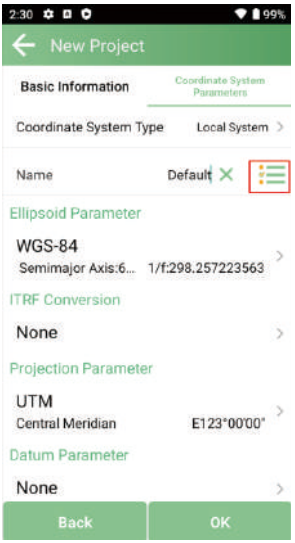




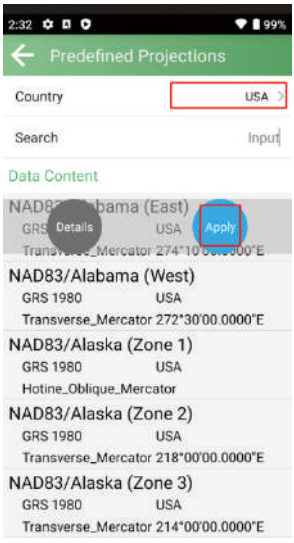
Our software has added many countries' coordinate systems, you can find what you need by country name or coordinate system name.

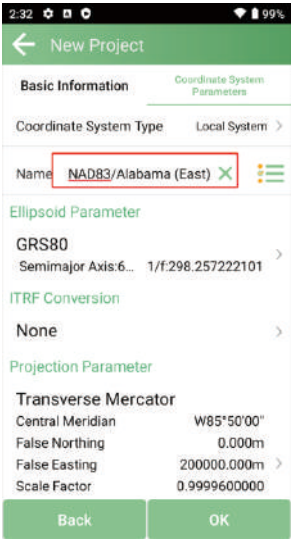
The following steps give an example of how to find predefined coordinate systems in singularpad software.

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

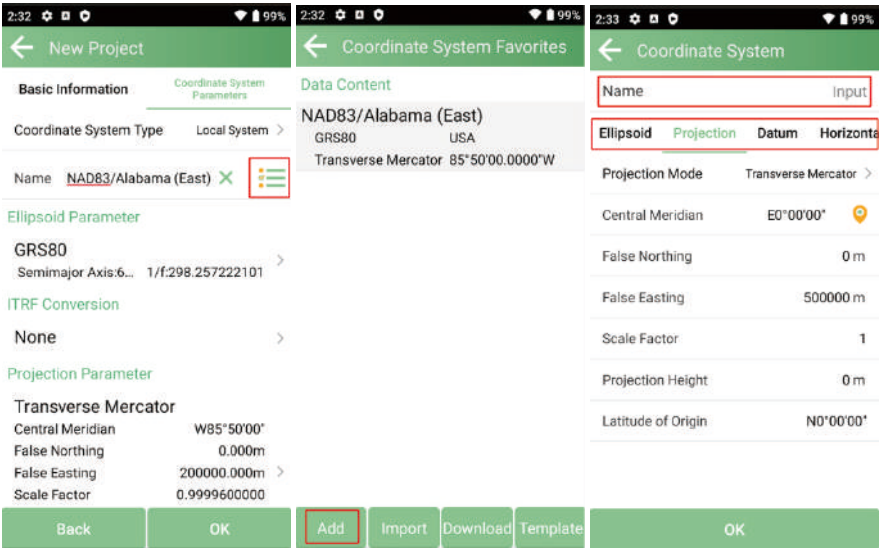


After finding the required coordinate system, click **Apply** to add it to coordinate system parameters, click **OK** to apply it to the current project.





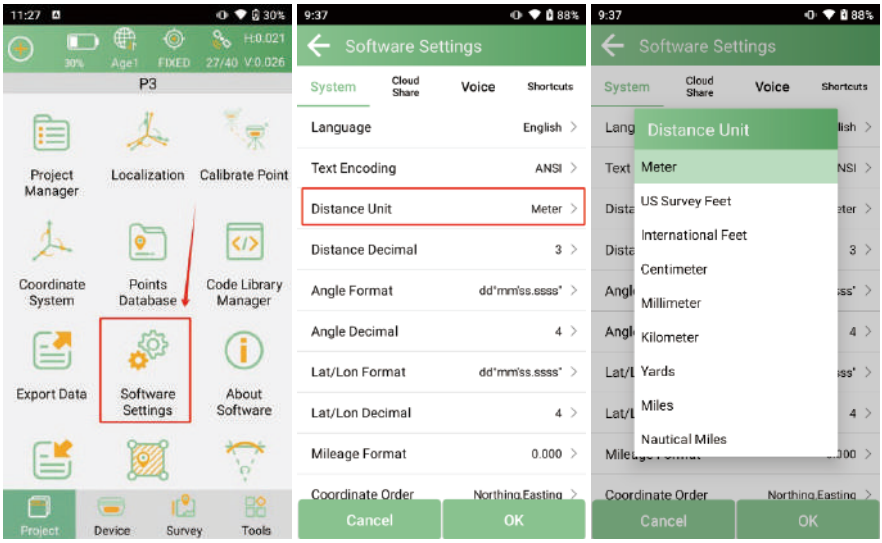
If you can't find what you need in Predefined Projections, you can click **Add** or **Import** to create new coordinate system.



If you need to **change the measurement units** in your project, follow the steps below.

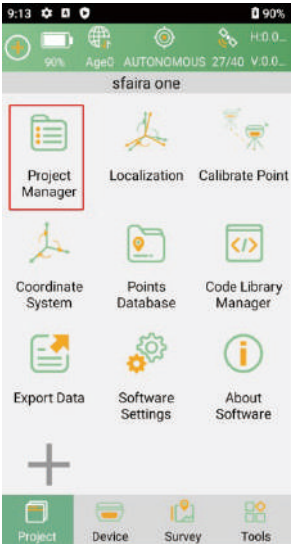
Solution 1: Change units for the current project

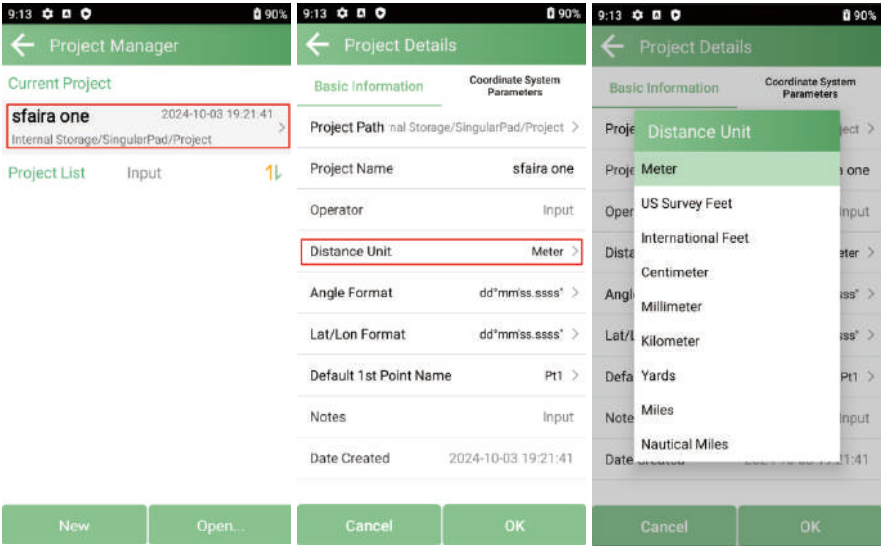
Go to **Project** >> **Software Settings** >> **System**, then select the distance unit and angle formats according to your need.



Solution 2: Change units for different projects

If you have multiple project files, go to **Project** >> **Project Manager**, select the project you need from the project list, and then choose the required units under Basic Information. Click **OK** to confirm.

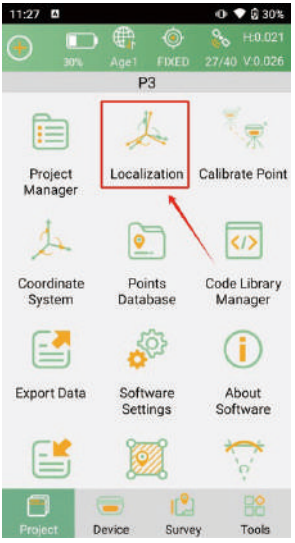




3.5 Localization

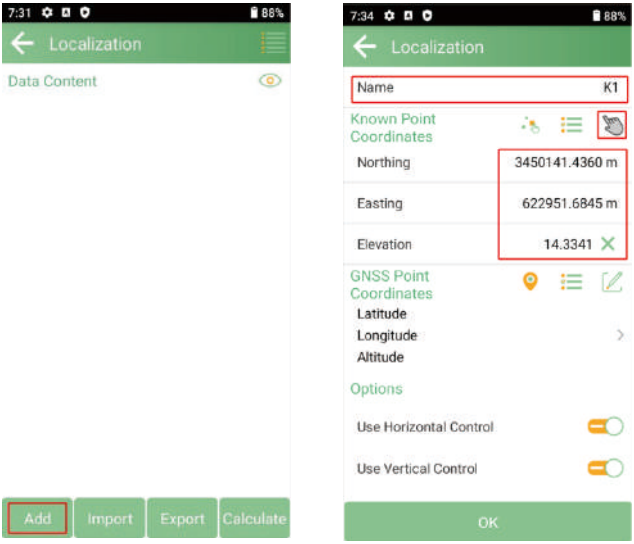
When starting a new project, if you are using the local small-scale coordinate system, you can use this function to transform the geodetic coordinates system to your local system.

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

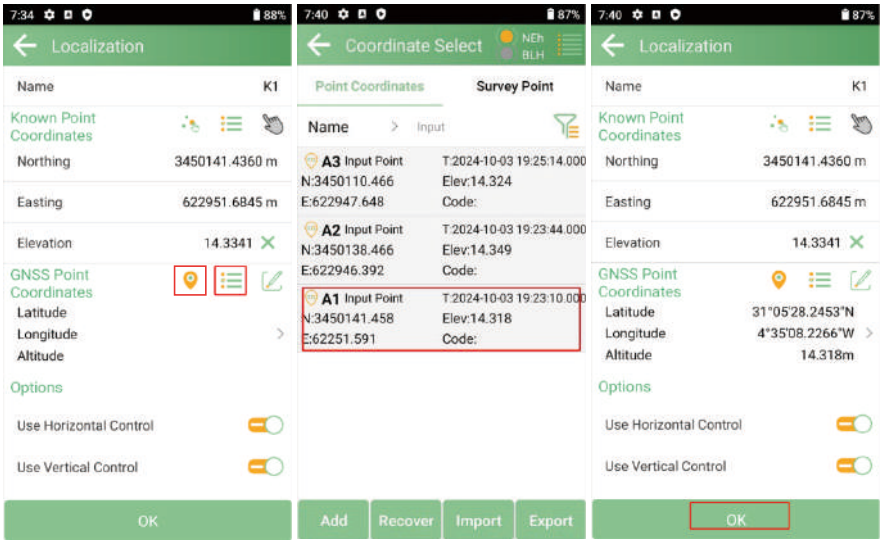


> **NOTE**
> A pair of points are the known local coordinates and the surveying coordinates of the same point.

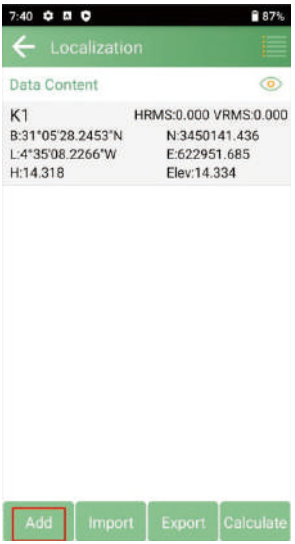
Click **Add** to add the corresponding pairs. Input the Known Point Coordinates.



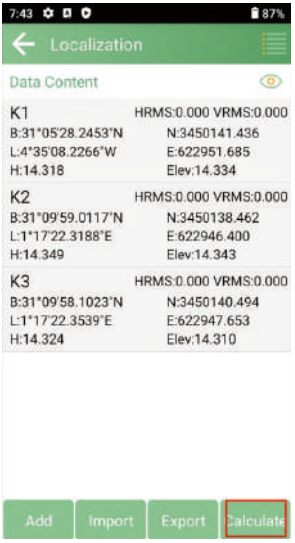
You can click the survey button to measure the GNSS point directly. Or measure these points in advance and click the list button to select the corresponding GNSS coordinates of the known point.



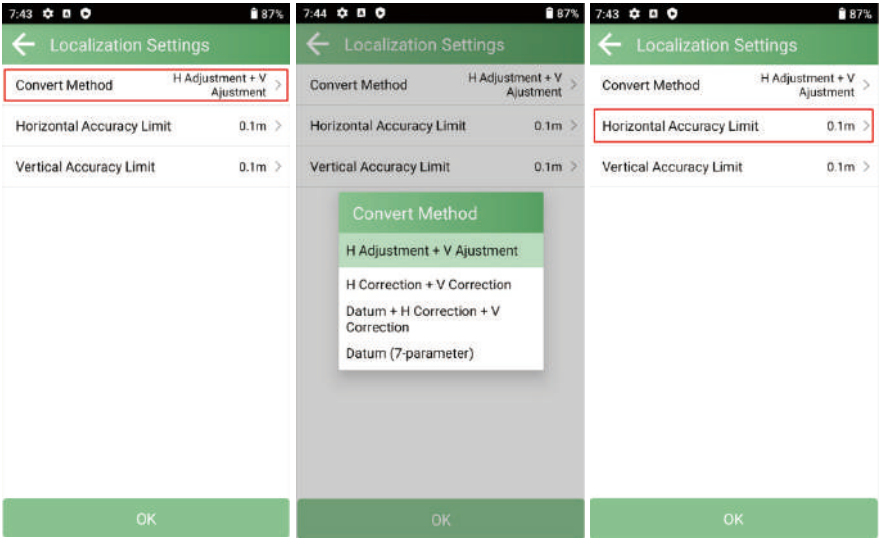
Add the remaining point pairs in sequence. You can also enter the known point in point database in advance and select the input points.

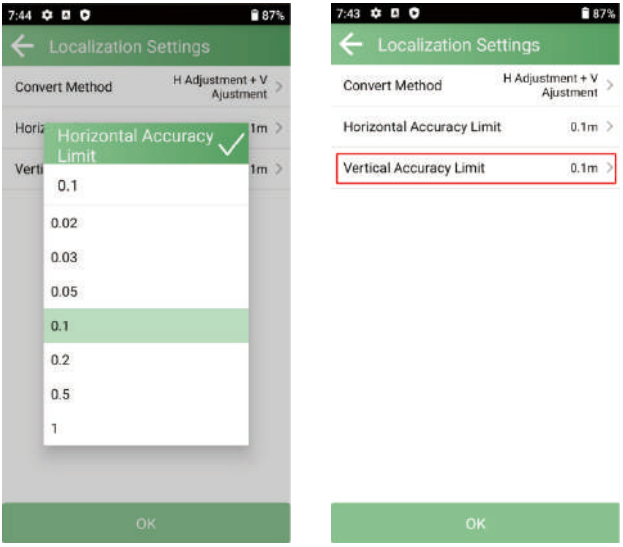


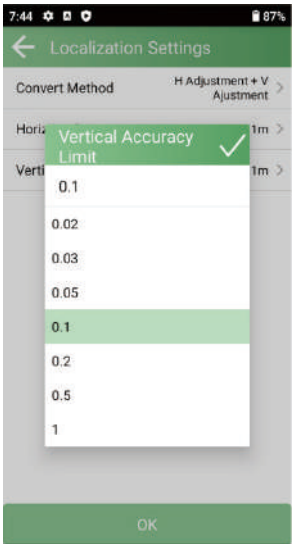
After adding all the point pairs, click **Calculate**.

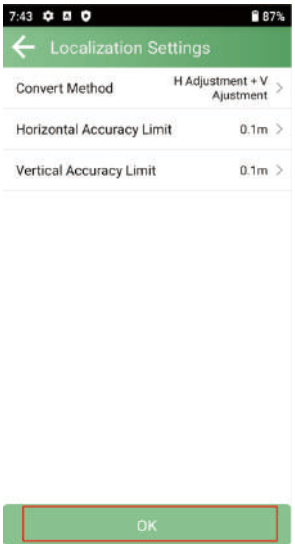


Select the convert method and the accuracy limit according to your project requirements.









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

3.6 How RTK works

3.6.1 OVERVIEW

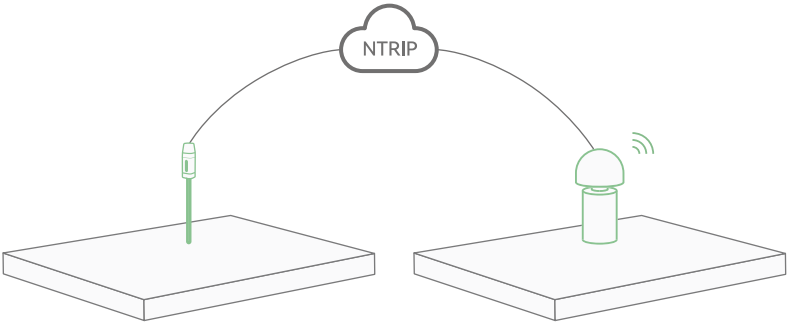
RTK is a technique used to improve the accuracy of a standalone GNSS receiver. Tradition-al GNSS receivers, like the one in a smartphone, could only determine the position with 2–4 meters (7– 3 feet) accuracy. RTK can give you centimeter accuracy.

GNSS receivers measure how long it takes for a signal to travel from a satellite to the receiver. Transmitted signals travel through the ionosphere and atmosphere and are slowed down and perturbed on the way. For example, travel time on a cloudy day and in clear sky conditions would be different. That is why it is difficult for a standalone receiver to precisely determine its position. RTK is a technology that solves this issue.

3.6.2 CORRECTIONS OVER NTRIP

You do not necessarily need a second unit for RTK all the time. Usually, there are local services that share base corrections over the Internet. This technology is called NTRIP. NTRIP is a good option for areas with strong 3G/LTE coverage and a vast network of NTRIP bases nearby. In other cases, using the second receiver as a local base station has two advantages:

- Autonomy in remote areas as there's no need in the Internet connection;
- Independency from local providers, no additional fees by NTRIP service.



3.7 Quick Setup Your Receiver

With the help of this section, you can easily configure your Sfaira ONE Series and achieve accurate positioning for your subsequent tasks. This chapter introduces three work modes, allowing you to select the one that best suits your working conditions and accuracy requirements.

Work Mode	Use Conditions	Accuracy
Internet CORS Mode	- Network required - Local RTK correction service subscription / CORS account needed	Centimeter level
PPP Mode	No network or RTK correction service needed	10 - 20 cm
SBAS Mode	- No network or RTK correction service needed - SBAS coverage required	Submeter level

Note: The cost and coverage area of the CORS service depend on your local service provider.

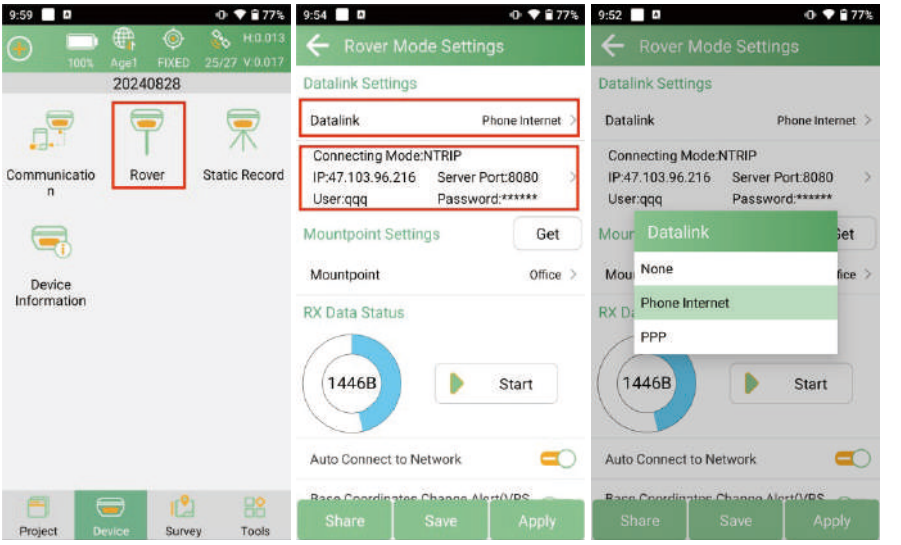
3.7.1 INTERNET CORS MODE

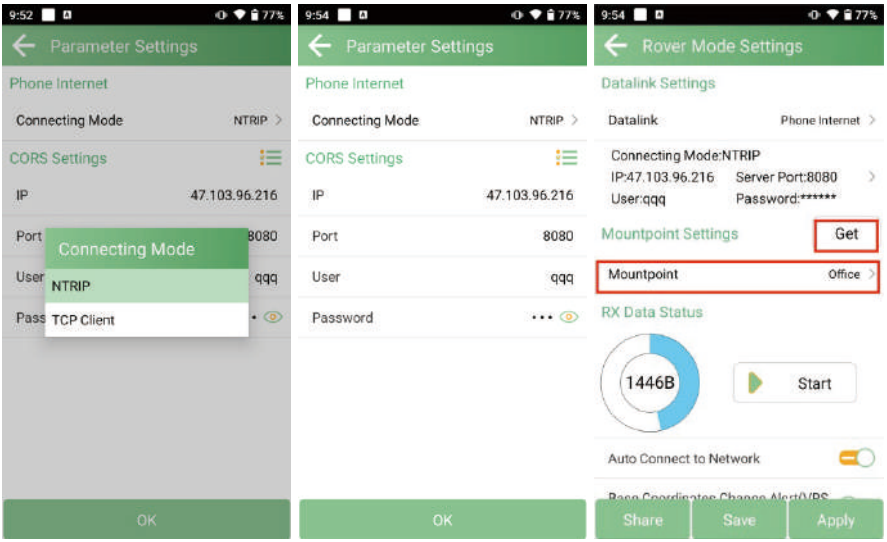
Sfaira ONE can only be used as rover in **Phone Internet mode** (this means your data collector, smart phone or other Android device needs to be connected to the internet).

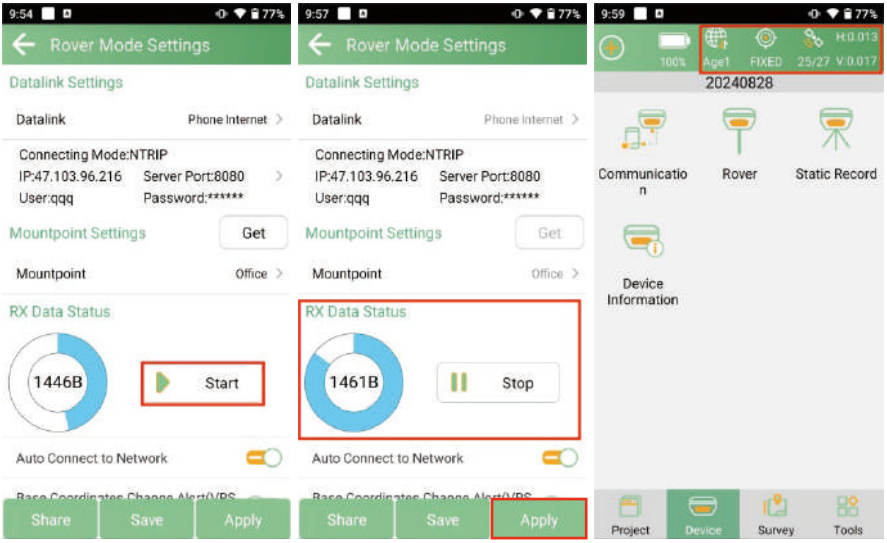
After device connection, go to Device >> Rover, set the **Data link** as **Phone Internet** and Connect Mode as **NTRIP**, enter your CORS account/ RTK correction service subscription, including the **IP address**, **Port, User** and **Password**.

Click **Get** to get the mount point list, then select the mount point you need and click **Start** and **Apply**.

Notes: The CORS account / NTRIP Service shown in the image is for example purposes only. Please enter your own account details here.





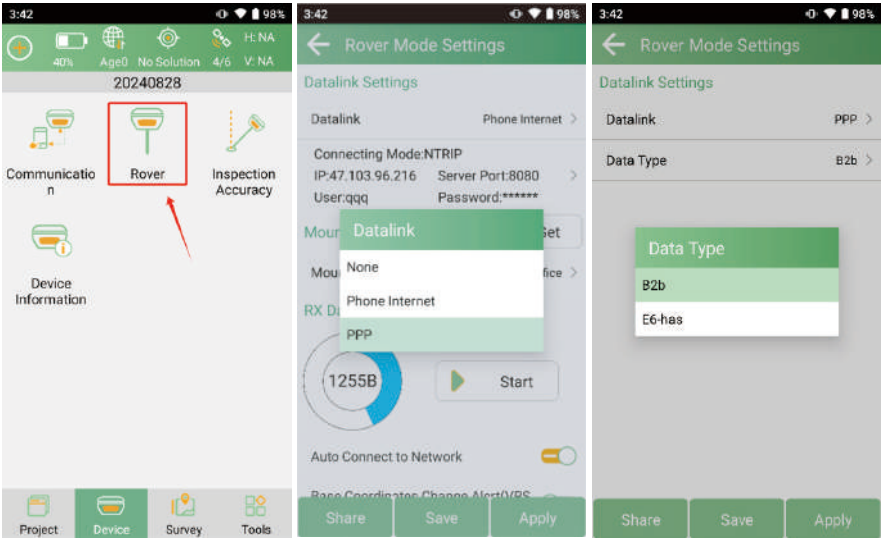


NOTE

If you have clicked **Start** but there is no response in RX Data Status, please check the parameter information above.

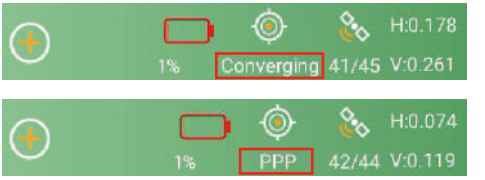
3.7.2 PPP MODE

Enter **Device** >> **Rover**, select **Datalink** as **PPP**, and you can choose **Data Type** between B2b and E6-has, then click **Apply**.



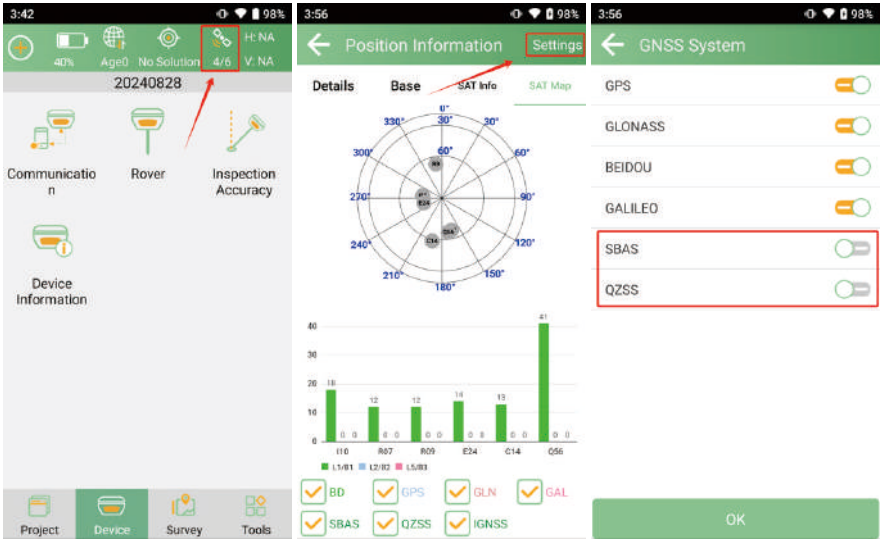
After configuration, the PPP mode will take around 10 minutes converging to typical accuracy. You can see the positioning state in the top status bar will change and remain in **Converging** for around 10 minutes.

After the positioning state changes to **PPP** mode, you can then conduct surveying tasks.



3.7.3 SBAS MODE

Click the satellite icon in the top status bar to enter the Position Information interface, then click Settings on the top right corner. Enable **SBAS** and click **OK**.



3.8 SingularPad Top Status Bar Introduction

	This icon displays the current battery level of the device.
	Age means the time since the last differential data was received. When connecting to a CORS account for surveying work, please ensure the “age” is within the range of 1-2. A high “age” will result in poor surveying point accuracy.

Positioning state		Autonomous means single-point satellite positioning without receiving RTK correction data. The accuracy is around meter-level.
		Sfaira ONE series receiver 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.
		Sfaira ONE series receiver is receiving RTK corrections stably and obtaining a Fixed RTK solution with centimeter-level accuracy.
		The satellite icon shows calculated satellites number/tracked satellites number. You can click it to check satellite map and more information.
		There are HRMS and VRMS on the top of the interface, click it for more details.

3.9 Point Survey

The Sfaira One series receiver offers two surveying modes:

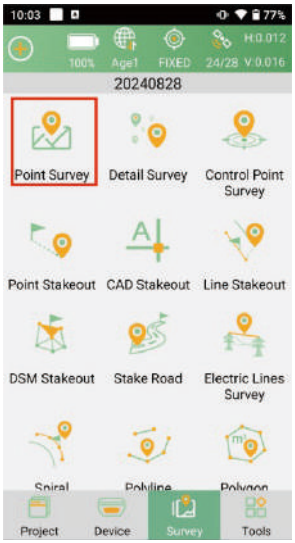
• Handheld Surveying: This mode is suitable when only planar data is needed, with no requirement for elevation data.

• Pole-based Surveying: This mode is designed for professional surveying, where coordinates of North, East, and height are required.

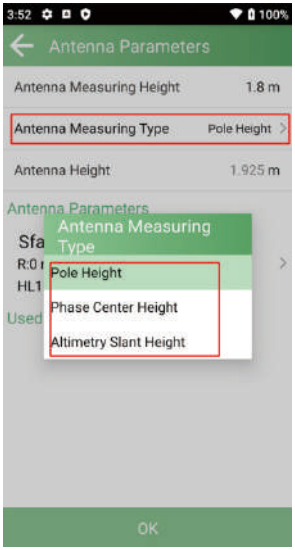
> **NOTE**
>
> When using a pole, the Sfaira One model requires the bubble level to be centered for accurate measurements. However, with the Sfaira One Plus, the IMU function can be enabled, allowing measurements to be taken with up to a 60-degree tilt, without the need for the bubble to be centered.

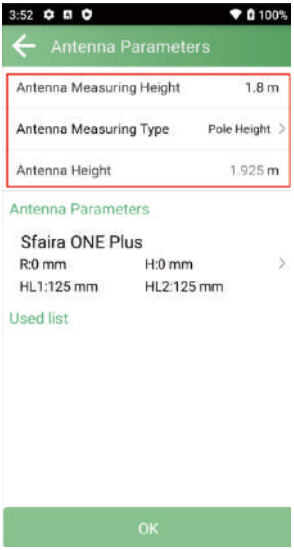
3.9.1 FOR SFAIRA ONE MODEL

In the Survey interface, click **Point Survey**>> enter point name, code and antenna height, then click to start or stop collecting data.



Note: SingularPad software supports 3 antenna measuring types.

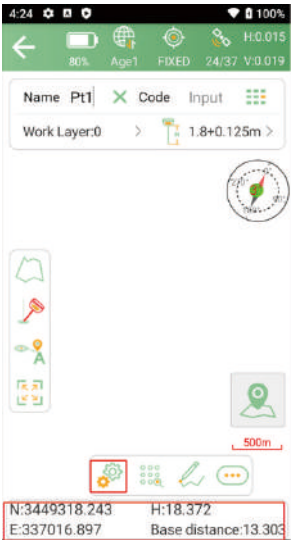




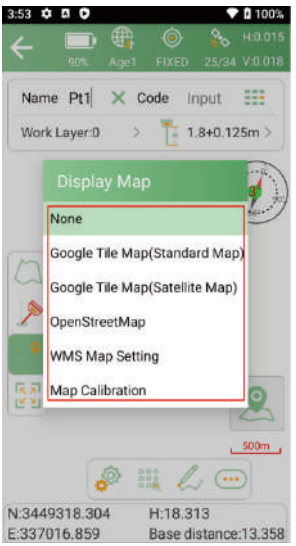
Pole Height: Typically, select the Antenna Measuring Type as Pole Height and enter the height of your centering pole.

In the bottom information bar 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.



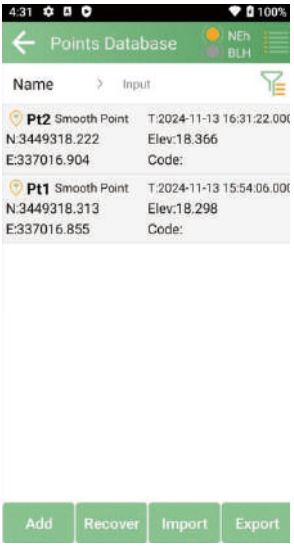
• Click to select different map types or do map calibration. SingularPad supports Google Map (Standard Map/Satellite Map), OpenStreetMap and WMS Map.



• Click to jump to map center

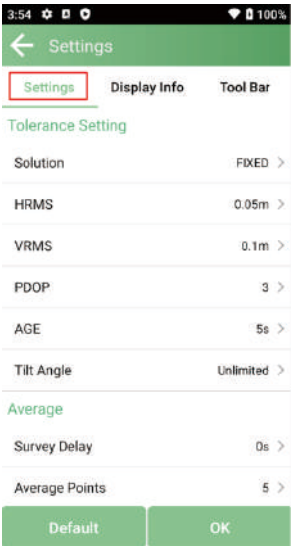
• Click to show the all points on the interface

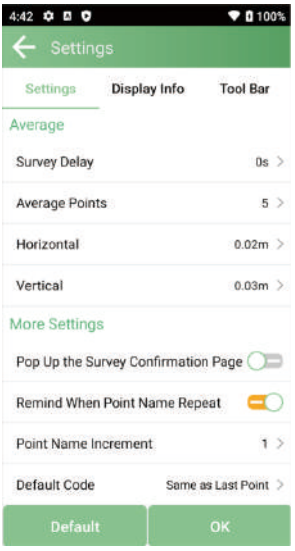
• Click to enter the point database and view the coordinates of the measured points. You can add, recover, import and export data. After selecting a point, you can view the details and take notes or take photos.



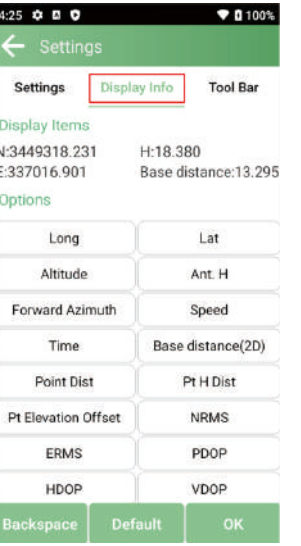
• Click to enter Settings interface.

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.

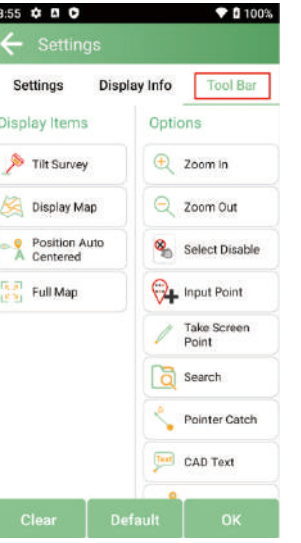




In **Display Info** interface, you can set the display information to the floating window, such as longitude, latitude, altitude, etc.



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.

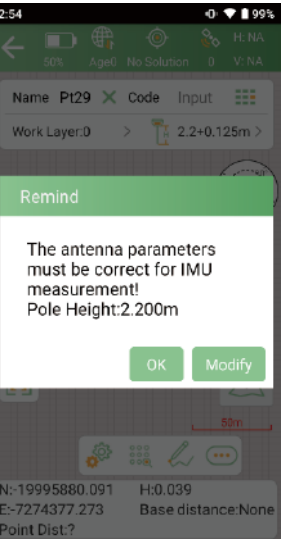


3.9.2 For Sfaira ONE Plus Model

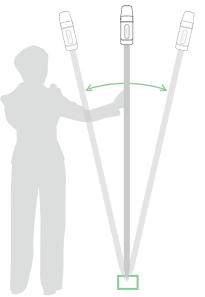
If you are using the Sfaira ONE Plus model, the device is equipped with the IMU function that supports up to 60° tilt surveying. You can follow the steps below to initialize and activate the IMU function.

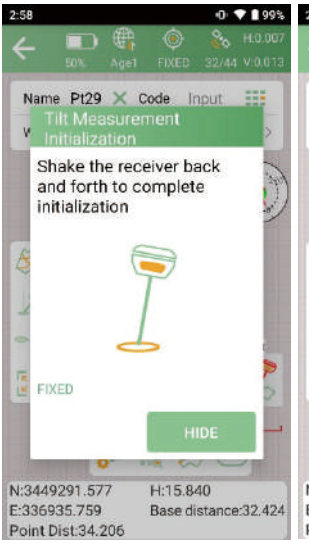
In the survey interface, click point survey, then click the button to turn on the tilt IMU survey function.

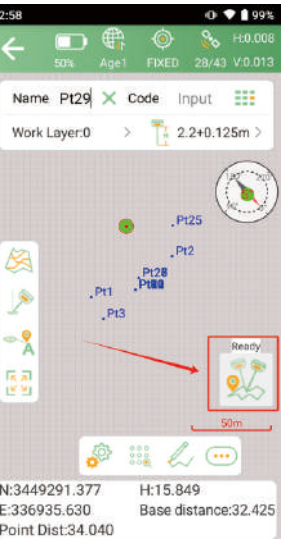
After clicking the tilt IMU button, the system will prompt you to check the antenna information, please check whether the antenna height is correct. (Please refer to 3.9.1 about how to set antenna height)



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.
When finished, the survey button will change to the tilt survey button.







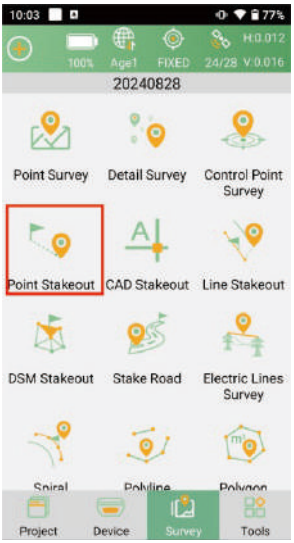
Enter point name and click the button to do survey.

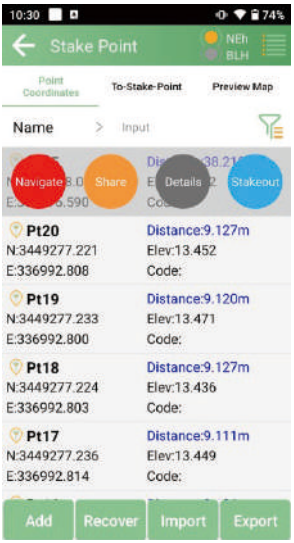
> **NOTE**
> After enabling the IMU function, avoid quickly rotating the device, dropping it, or turning it off and on again, as these actions will require re-initializing the IMU.

After turn on the tilt IMU function, please refer to chapter 3.9.1 to conduct point survey.

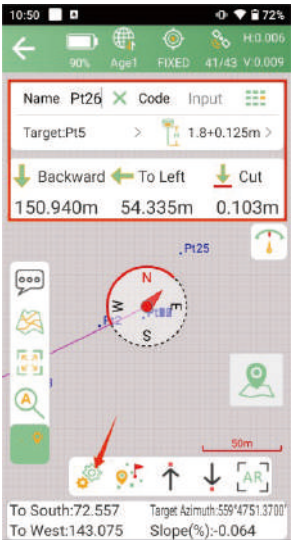
3.10 Stake out

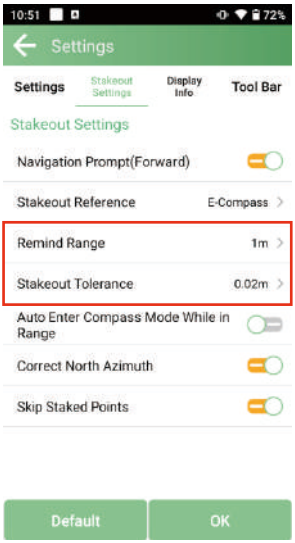
Go to Point Stakeout interface, you can select a point from the point database to stake out. You can add or import the required point coordinates into the point database.

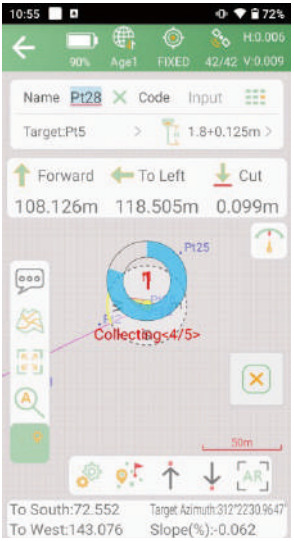




Select a point to stake, and follow the prompt on the navigation map for staking points/lines. Once you get close enough to the target point, it will alarm you based on the alarm range you have set.

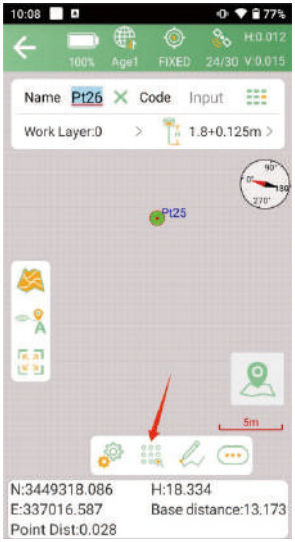


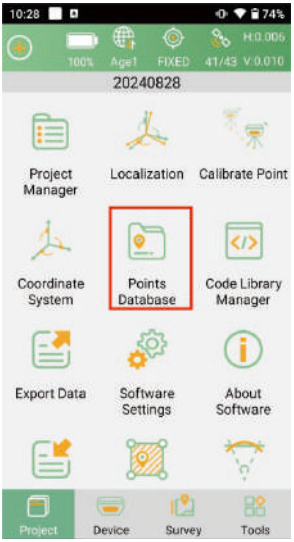




3.11 Points Database

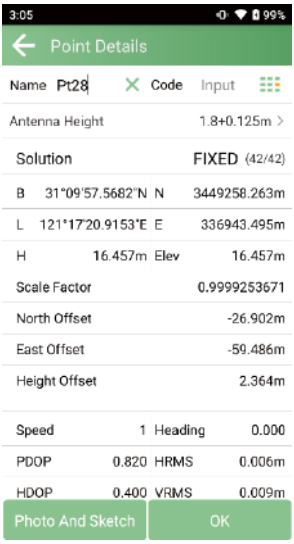
Go to **Project** >> **Points Database**, all points that are surveyed, staked, added, imported or input from display map will be stored in the point database. Surveyed points will be categorized under different base stations while surveying. Additionally, all points in the database are accessible whenever you need to select a point.





- 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 need to 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.

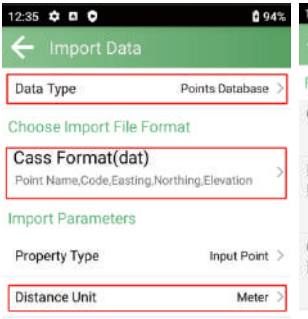


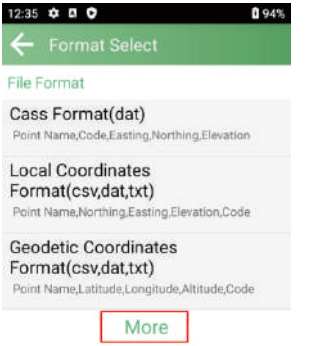
3.12 Data Export/Import

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.

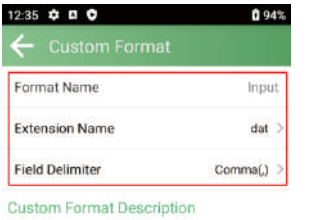
3.12.1 IMPORT POINT DATA

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



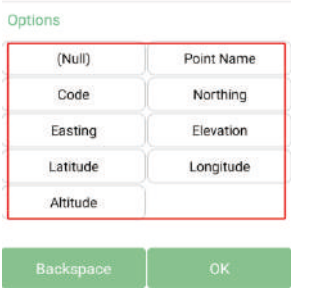


- Data Type: support point database, transformation parameters file and code library.
- Import File Format: support *.csv, *.dat, *.txt, *.kml, etc.
- Distance Unit: support meter, US survey feet and international feet.



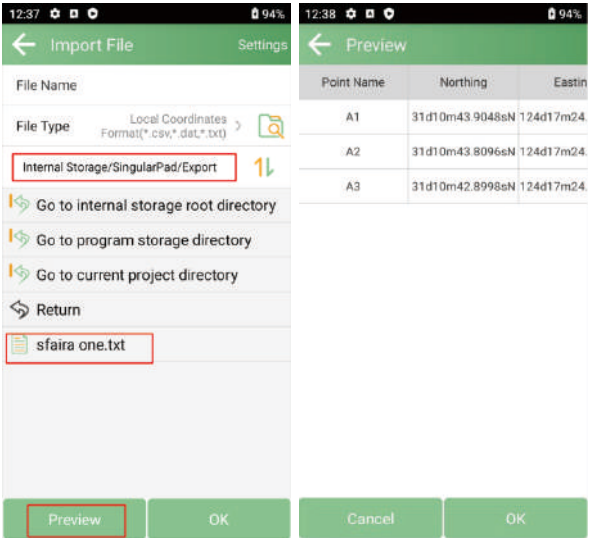
Besides, you can click new to create a User defined type.

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



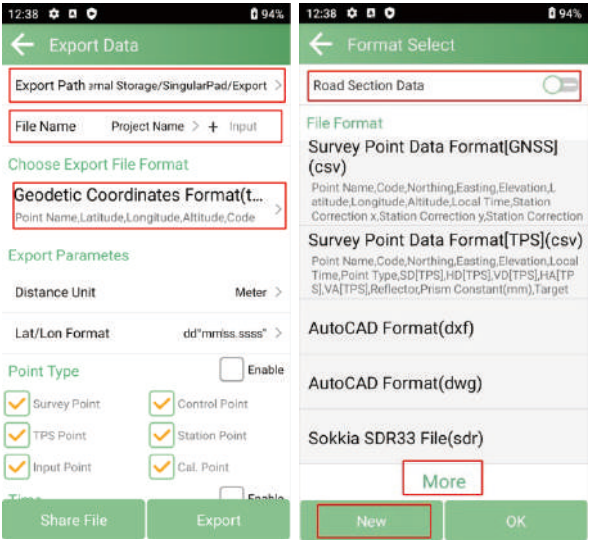
Click to choose elements in the options list, click backspace to eliminate the previous element selected. The elements include: code, northing, easting, elevation, latitude, longitude, altitude.

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.

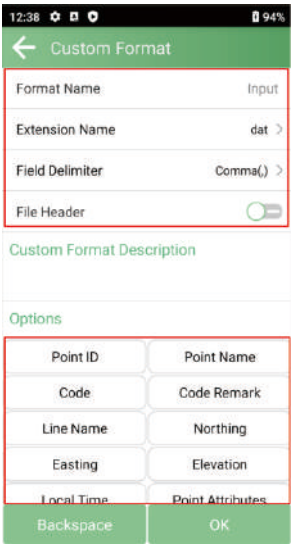


3.12.2 EXPORT POINT DATA

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.

4 TROUBLESHOOTING

If you encounter any issues not addressed in this manual, please contact our support team for assistance. In this chapter, we will outline the basic information you need to provide to help our support team understand and resolve your issue quickly.

Please send the following information to our support team for further assistance.

- Serial number of your Sfaira ONE Series device
- Problem description with supplementary video/screenshots
- Debug logs and project file.

4.1 How To Find Serial Number

The serial number is a unique combination of numbers and letters assigned to your Sfaira ONE series receiver.

Find serial number

Find the serial number of your Sfaira One as shown in the image below.

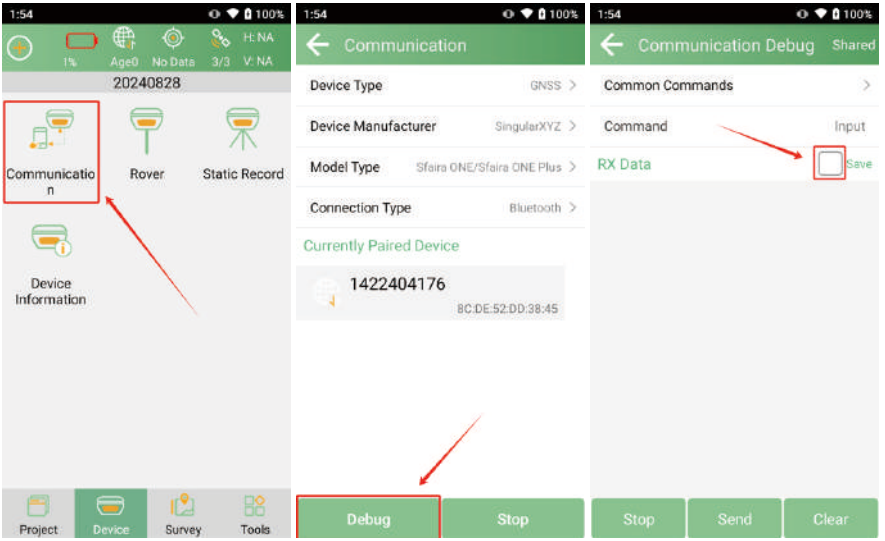
4.2 How To Get Debug Data & Project File

4.2.1 Save Debug File

The Debug data provides information about your current Sfaira ONE internal state, helping support team facilitate troubleshooting.

After connecting the device, you can access the Debug section.

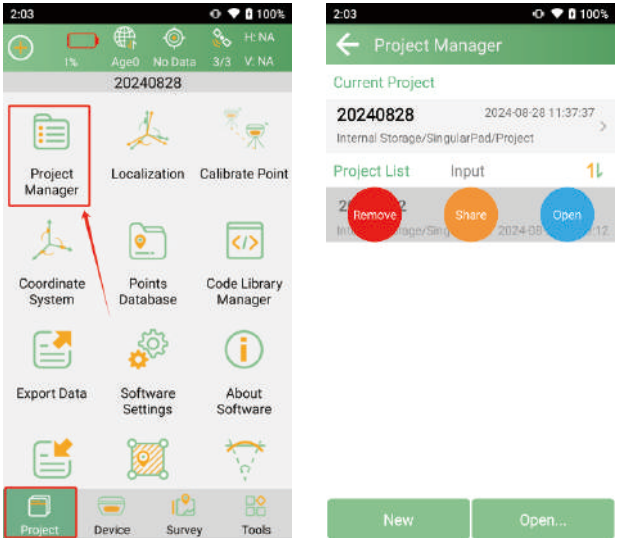
Enter **Device**>>**Communication**>>**Debug**, then enable Save option to save debug file, which will be stored in the System folder (/SingularPad/Debug).



4.2.2 Share Project File

The project file and its parameters will also help us identify the issue. You can share your project with us by following these steps:

Enter **Project**>>**Project Manager**, select your project and click Share.



5 GLOSSARY

Age Of Corrections

Age of corrections, or Age of differential (AOD) is a measure of how old the corrections sent to the receiver are. It is calculated by subtracting the time when the correction message has been generated from the current receiver time. The standard Age of Differential for RTK is normally 1-3 seconds.

Antenna Phase Center

Antenna Phase Center could be referred to as the antenna's source of radiation. All GNSS measurements referred to the phase center. The phase center does not correspond to the physical center of the antenna and its real position depends on the direction of the coming radio signal. In addition, every band has its own phase center respectively.

Base

Base is one of the receivers that act as a reference station in RTK or PPK scenarios. It is a static unit with the determined coordinates that sends corrections to the moving unit or rover. If the base is set over the known point, it provides absolute accuracy.

Baseline

Baseline is the distance between a rover and a base. If the baseline is bigger than recommended, the solution will be less accurate, the fix time will be longer or it won't be calculated at all.

Base Output

Base output is the data sent by a base station to a rover. It contains corrections to improve the accuracy of positioning information. In the SingularPAD app, on the Base output screen, you can set up how your base sends corrections in the following ways: NTRIP, Bluetooth, or LoRa. And support the base output in the RTCM3 format.

Corrections

The corrections are the data that is used to eliminate ionospheric and tropospheric delays, and satellite clock errors. The static base transmits corrections to the moving rover in the RTK scenario.

Rover

Rover is one of the two GNSS receivers that is used for collecting data in RTK or PPK scenarios. Rover is a moving unit: the surveyor uses rover to record the points, while rover receives the corrections from the static base.

CORS/NTRIP SERVER

Continuously Operating Reference Stations or CORS network is the network of the static stations that provide exact GNSS data (carrier phase, code range, etc) and corrections as well. Surveyors can access this information to increase the accuracy of their post-processed survey data or to work in RTK on site.

PPP

Precise Point Positioning or PPP is a technique used for determining the centimeter-level accurate coordinates of the point. The receiver put over a point is recording data for a certain period. Then this data is sent to the PPP services.

QZSS

QZSS stands for Quasi-Zenith Satellite System—the Japanese satellite system. It primarily serves the Asia-Pacific region, with a particular focus on Japan's needs for precise and reliable positioning information. The first satellite was launched on September 11, 2010, and became operational in 2018.

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