SingularXYZ®

E1 Series

GNSS RECEIVER

User Manual



SingularXYZ Intelligent Technology Ltd.

Dear Users,

Thank you for choosing SingularXYZ E1 Series GNSS Receiver. We recommend that you spend some time reading this User Manual in order to have a full understand of this product and get started easily.

Please read the following important factors carefully.

• RTK rover (Network Rover mode): The E1 Series can be used as a GNSS RTK rover. In this mode, you need to get the RTK corrections via internet (3/4G) in NTRIP protocol.

• RTK rover (UHF/radio rover mode): The E1 Series can be used as a RTK rover with the UHF mode suppose you have the existing base which can work with the radio protocols that the E1 Series supports.

• RTK Base station mode: You can setup the E1 Series as the base and stream the correction data via UHF. The E1 supports most common UHF/radio protocols in the market.

• Static mode: The E1 Series can be used as static mode to collect GNSS raw data for post processing.

Related Regulations

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

Technical Assistant

If you have any questions and can't find the answer in this manual, please contact your local dealer from which you purchased the E1 Series receiver. Alternatively, request technical support from SingularXYZ .

You can also scan the following QR code to access to SingularXYZ Product User Manual folder and download the E1 Series User Manual.

Website www.singularxyz.com
Email support@singularxyz.com
WhatsApp +8618055477026

User Manual Folder

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SingularXYZ® E1 Series GNSS receivers comply with the limits for a Class B digital device, pursuant to the Part 15 of the FCC rules when it is used in the Portable Mode.
Operation is subject to the following two conditions:
(1)This device may not cause harmful interference;
(2)It must accept any interference received, including interference that may cause undesired operation.

Copyright Notice

This is the V1.0 (Nov, 2025) revision of the E1 Series GNSS Receiver User Guide. It can not be copied or translated into any language without the written permission of SingularXYZ.

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.

Safety Information

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

- Connect your devices strictly based on this User Guide
- Install the GNSS receiver in a location that minimizes vibration and moisture
- Avoid falling to ground, or colliding with other items
- Do not cover the radio, keep a sound ventilation environment
- Take lighting protection measures when installing antennas
- Change the cable if damaged

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1 INTRODUCTION

The SingularXYZ E1 Series GNSS Receiver (hereinafter E1 Series) User Guide is aimed to help you get familiar with the E1 Series 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 the Receiver

As a full-featured RTK solution, the E1 Series is designed to deliver outstanding performance while maintaining a compact and lightweight design. It offers comprehensive enhancements in key aspects such as multiple work modes, 60° tilt IMU, 15km extended-range UHF, and a built-in web interface, all packed into one of the smallest RTK bodies in its class—helping reduce your field workload without compromising functionality.

To meet the diverse needs of different users, the E1 Series is available in three models:

- **E1 Standard** – Standard device with powerful measurement performance and centimeter-level accuracy.

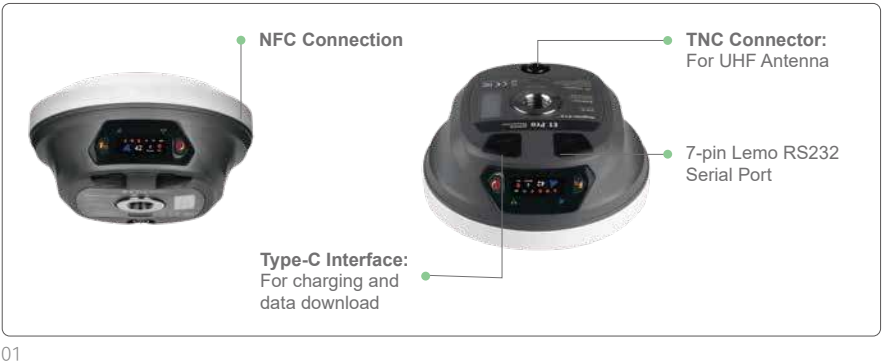
- **E1 Pro** – Adds a 1.1″ color screen for intuitive status monitoring and front-panel configuration.

- **E1 Lite** – Doesn't support USB data transmission and cannot open Bluetooth and WiFi at the same time, but perfectly perform basic measurement work.

1.2 Lower housing

Receiver lower housing contains a serial port, a USB port and a TNC connector for UHF whip antenna connection.

Receiver Interfaces



⚠**IMPORTANT NOTICE:**

If the receiver is not used for an extended period, it is recommended to charge it every three months to prevent potential damage to the lithium battery cells.

1.3 Front panel

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

Front Panel



Indicators	Description	
	Satellite Tracking Indicator	Flash N times every 5s N: Number of tracking satellites
Fn	**Static & Network Indicator**	Yellow light flashes: recording static data
	Function Button	For E1 & E1 Lite: Press twice in succession to start/stop static data recording For E1 Pro: Short press to switch and press twice in succession to turn on/off function
	Correction Data Indicator	Flash when TX/RX correction data Base: flashes once a second Rover: flashes multiple times a second
	Power Indicator	Red light on: receiver on Red light flashes: power low Green light flashes: charging Green light on: fully charged
	Power Button	Long press to turn on/off the receiver

ⓘ **NOTE** When the device's battery level is below 10%, it will automatically shut down because of power protection. Please charge before use.

2 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.

2.1 About Software

2.1.1 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 us, or you can download the latest version of the software from the official website. - https://www.singularxyz.com

2.1.2 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 shows "Inactivated" or displays the current date or one month after, the software is not permanently activated and will expire on that date, 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.



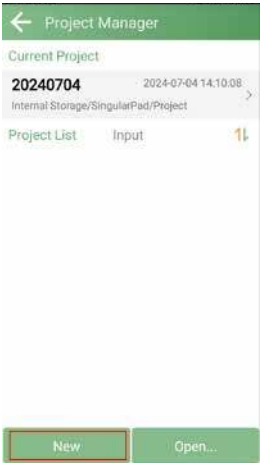


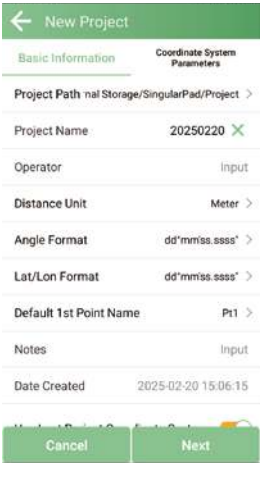
2.2 Create a New Project

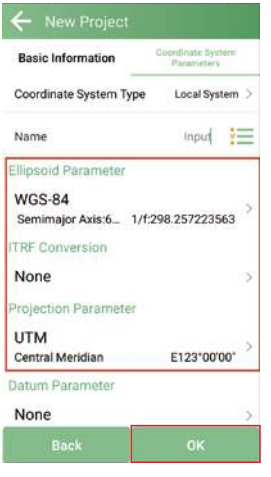
2.2.1 Installation of SingularPad

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.









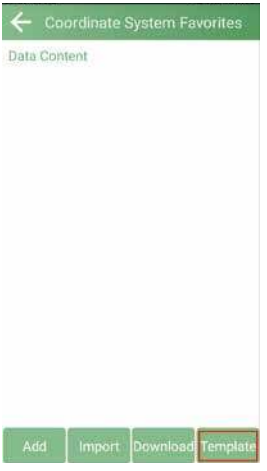
> **NOTE**
>
> Our software has added coordinate systems for most countries. You can find the coordinate system you need by filtering the country name or searching the coordinate system name.

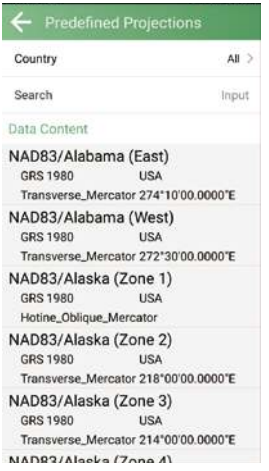
The following steps give an example of how to find the predefined coordinate system you need in SingularPad software.

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



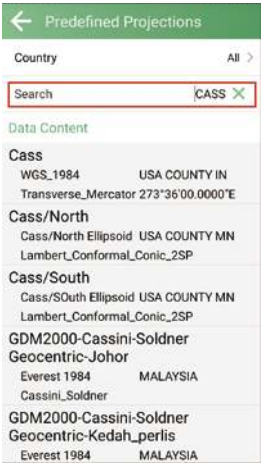
In the Coordinate System Favorites interface, click the **Template** below to enter the Predefined Projections interface.





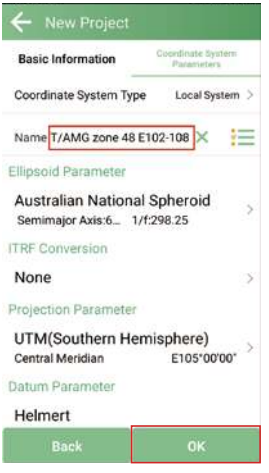
Click **Country** to select the country name or enter a keyword after **Search** to find it.





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

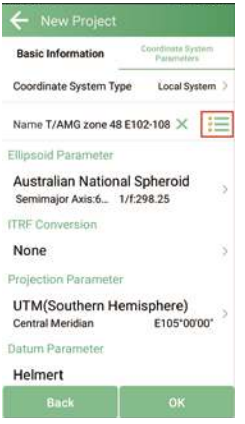




2.2.2 Add/Import new coordinate system

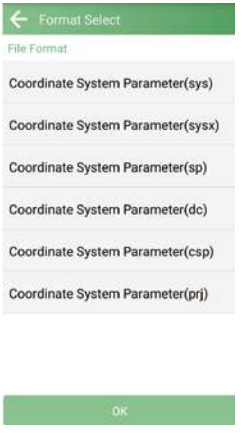
If you can't find what you need in Predefined Projections, you can click **Add** or **Import** to create new coordinate system.

Import: If you have a coordinate system file, you can choose this method to directly import the coordinate system that you need.

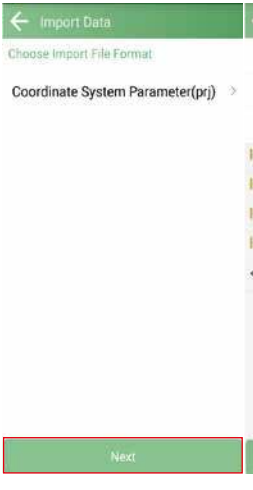


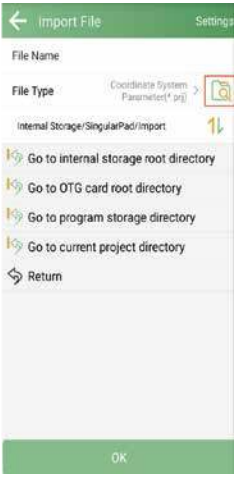
1. Click **"Import"**, then choose Import File Format. Our software supports direct import of coordinate system files in .sys, .sysx, .sp, .dc, .csp, and .prj formats.





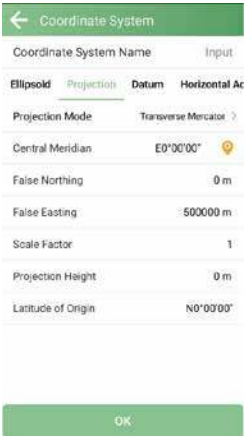
1.2. Click **"Next"** after you select the format, Click the button in the File Type column to automatically find the coordinate system file in that format, and then click the coordinate system file to successfully import the coordinate system.





Add: If you need to manually add a coordinate system, you have to enter the corresponding parameters including: **Ellipsoid** and **Projection**, etc.













NOTE

Click **"vertical adjustment"** and add a geoid file. You can also download it from the following website. https://forms.trimble.com/globalTRLTAB.aspx?Nav=Collection-37882

2.3 Device connection

2.3.1 NFC connection

Equipped with an NFC chip, users can easily connect the E1 Series receiver to the data collector with just one touch, as shown in the figure on the right.



2.3.2 Bluetooth connection

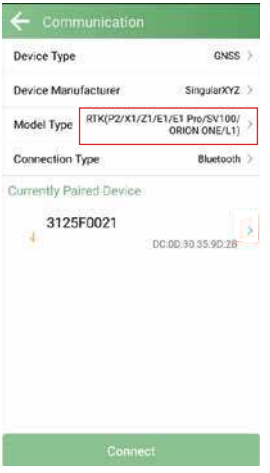
After creating a new project, switch to **Device** interface, click **Communication.**

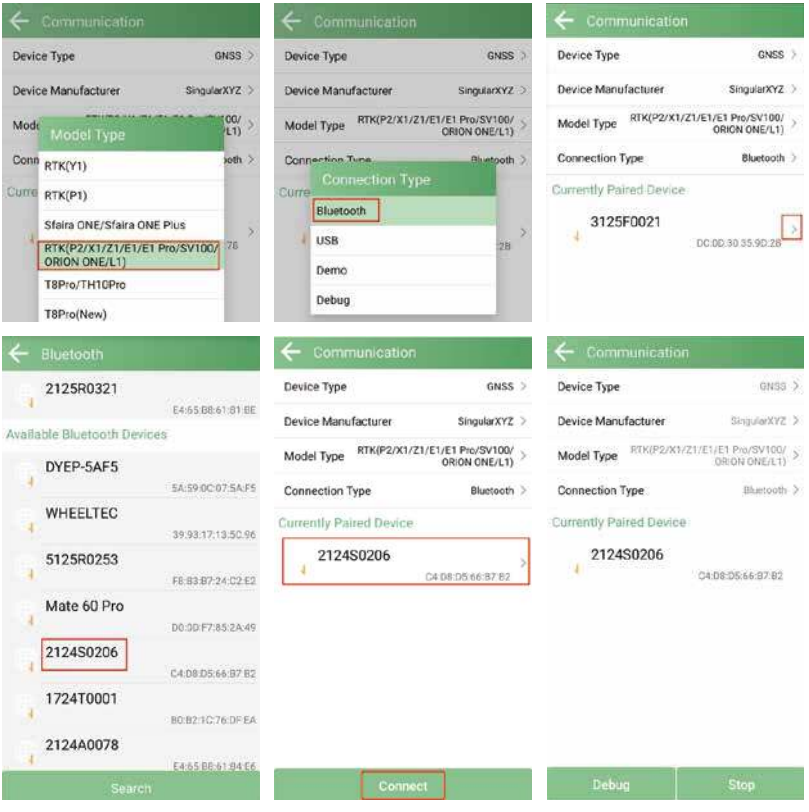
Select the corresponding parameters according to the following requirements

Device Type: GNSS
Device Manufacturer: SingularXYZ
Mode Type: **RTK (P2/E1/Z1/E1/ E1 Pro/SV100/ORION ONE/L1)**
Connection Type: Bluetooth

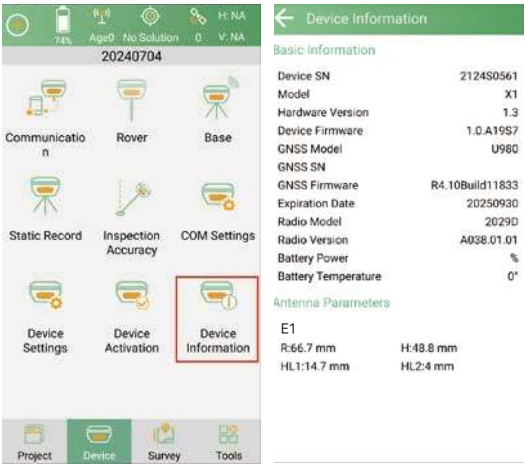
Make sure the controller Bluetooth is turned on, click Current Paired Devices below to find the SN of the E1 Series receiver. Click **Connect.**







After connecting E1 Series receiver, you can check the information of the receiver (like firmware version) in **Device Information**.



When “No Data” or “No Solution” Appears

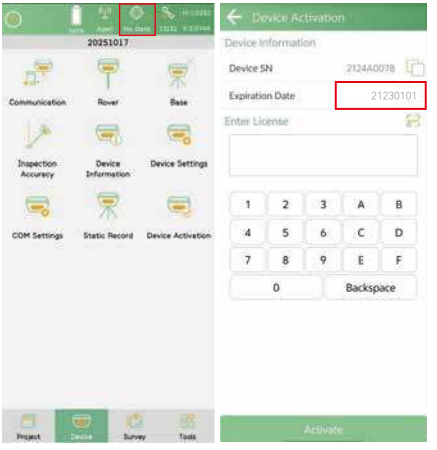
If “<No Data>” is displayed in the top status bar:

It means the device has not been activated or the activation has expired.

To check, connect the device and go to “Device Activation.”

If the activation date is not shown as 21230101, the device is not activated.

Please contact our technical support team — we will help you activate the device permanently and free of charge.

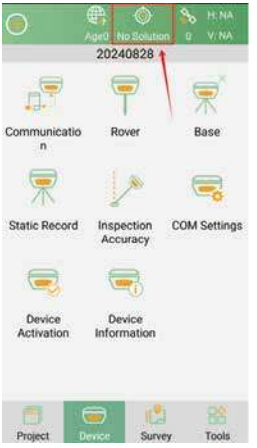


If “<No Solution>” is displayed in the top status bar:

It means the receiver is connected to the wrong device type or it is indoors without satellite signals.

Please check the device type setting in the communication interface and make sure you’ve selected the correct model (e.g., RTK P2 / X1 / Z1 / E1 / E1 Pro / SV100 / ORION-ONE / L1).

If the model is correct, move outdoors to ensure a clear view of the sky for satellite searching.



TIP

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.

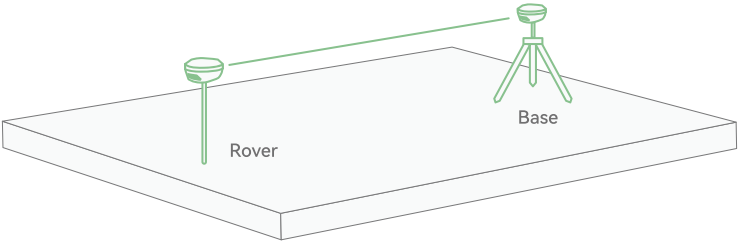
2.4 Concepts About RTK

2.4.1 Overview

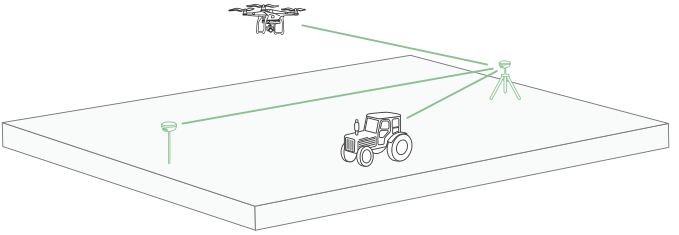
RTK is a technique used to improve the accuracy of a standalone GNSS receiver. Traditional GNSS receivers, like the one in a smartphone, could only determine the position with 2–4 meters (7– 3 feet) accuracy. RTK can give you centimeter accuracy. GNSS receivers measure how long it takes for a signal 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.

2.4.2 High real-time precision

Two receivers are used in RTK. One of them is stationary, another moves freely. They are called base station and rover.



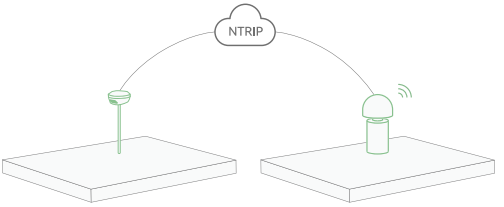
The base's mission is to stay in one place and send corrections to a moving receiver. Rover uses that data to achieve centimeter precise position. Any number of rovers can connect to one base if their input settings match the base's output.



2.4.3 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.



2.5 Quick Setup Your Receiver

With the help of this section, you can easily configure your E1 Series and achieve accurate positioning for your subsequent tasks. This chapter introduces four work modes, allowing you to select the one that best suits your working conditions and accuracy requirements.

Work Mode	Use Conditions	Accuracy
Radio Mode	-Two GPS RTK units (base and rover) required	Centimeter level
PDA CORS Mode	- Network required - 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
Static Mode	≥3 GNSS units required for stable triangulation network adjustment	Millimeter level

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

2.5.1 Internal Radio Mode (E1-Series Base + E1-Series Rover)

If you've purchased 2 units of E1-Series GNSS receiver, please select one E1-Series 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.

- Protocol: Supports CSS, TRIMTALK, TRIMMK3, TT450S, TRANSEOT and SATEL.
- Frequency: select a channel or customize a frequency, the range of frequency is 410-470 MHz
- Power: High and low (low power will reduce the transmission range)
- Different protocols support different baud rates

Protocol	Baud Rate
TRIMTALK	4800, 9600
TRIMMK3	4800, 19200
TRANSEOT	4800, 9600
SOUTH	4800, 9600, 19200
SATEL	9600, 19200
CSS	11000, 12000, 15000. 18000

TIP **Condition of the base station setup**

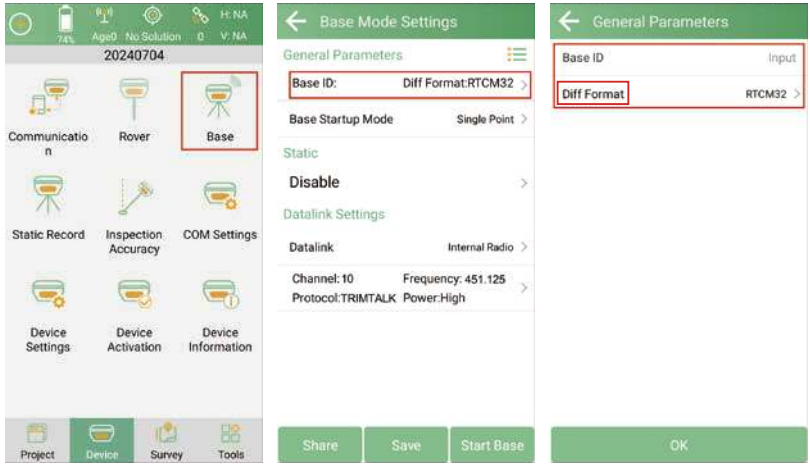
Ideal Environment:
- Clear outdoor sky view, free from obstructions
- Place GPS and radio antennas as high as possible to reduce signal interference and increase range

Avoid:
- Obstacles: buildings, vehicles, towers, trees, etc.
- Interference: high-power radar, TV, cellular towers, power lines or electrical facilities

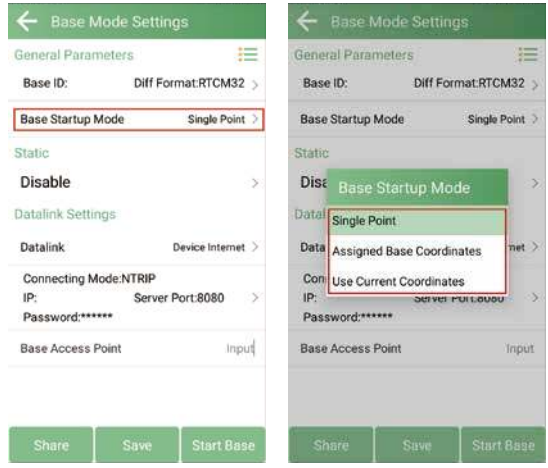
The following steps give an example of how to configure internal radio base mode.

> **NOTE**
> Set Internal Radio Work Mode: Connect the whip antenna to both your base station and rover.

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



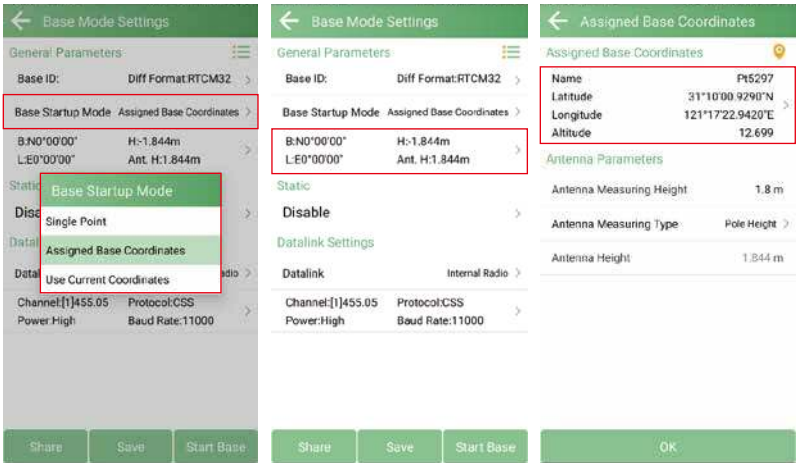
2.Click Base Startup Mode to select the base startup way.



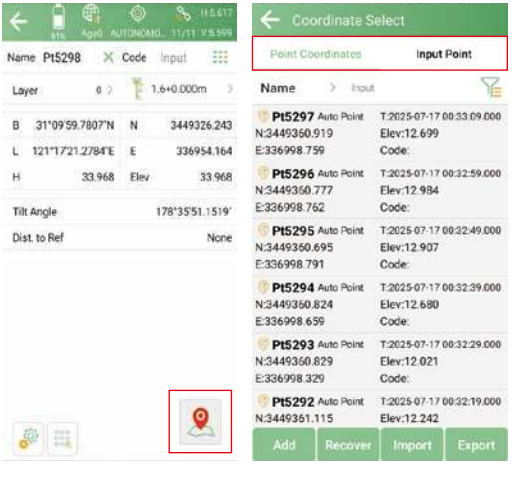
Single Point: Start the base station at unknown coordinates
Assigned Base Coordinates: Start the base station at known coordinates, and you need to enter the latitude, longitude and the height
Use Current Coordinates: Automatically start the base station at the current coordinates.

> **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.
> Otherwise, you will need to conduct **3.3 Calibrate Point** after or before surveying.

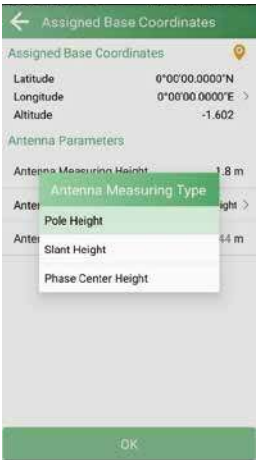
Typically, select **Base Startup Mode** as **Assigned Base Coordinates** and start the base station at known coordinates.



You can assign the coordinates from point database (input points/measured points) or click the survey icon to measure the current base location directly. Always use the same coordinates when starting base at the same location.



After setting the base coordinates, set the **Antenna Parameters** for accurate elevation. Click to select **Antenna Measuring Type**, there are three main types:



Pole Height: Pole height is the vertical height from the receiver bottom to the ground point. If you are using a range pole with bipod for base set up, you can fill the pole scale reading as the software **Antenna Measurement Height** when the pole is perpendicular.

Slant Height: If you are using a tripod to set up the device, you can measure the distance from ground point to antenna slant height measurement mark (marked in the figure below). Fill the reading into the **Antenna Measurement Height**, then the software will calculate the actual height.



Phase Center Height: The phase center height is the distance from the ground point to the antenna phase center, but the antenna phase center is a virtual point of the instrument's electromagnetic wave, and cannot be measured directly.

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. ▶



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

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

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







◀ 2. Parameter **Setting**: Set channel, Frequency and Protocol the same as the base station.

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. Now you can proceed to **3.2 Point Survey** to start surveying.

2.5.2 PDA CORS Rover Mode (single E1-Series Rover)

You can choose from the following configuration options depending on your working environment and available resources.

Network Base Options:

- **Local RTK Service/CORS:** You can obtain a local CORS/RTK Service account to get RTK corrections. Typically, the account includes **IP address, port, mountpoint, username,** and **password** for accessing correction data.

Network Rover Options:

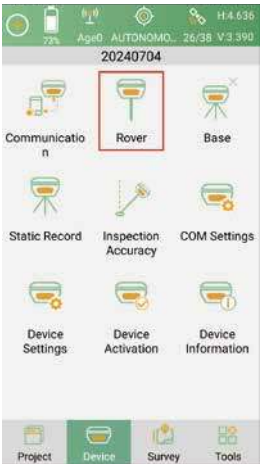
- **PDA CORS Rover Mode** (All E1 models): Receive RTK corrections via the **mobile network of your data collector,** smartphone, tablet, or other Android PDA device.

> ⓘ **NOTE**
> Make sure the data collector or mobile device you're using has an active internet connection.

When work as a Network 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/SC300 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 to the Phone Internet.





2. Set **Connecting mode** as NTRIP.

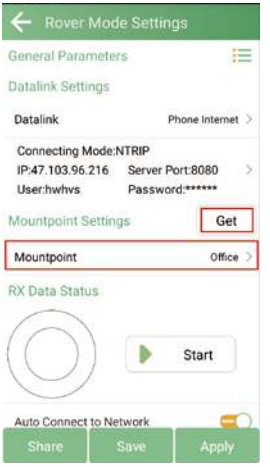
CORS Settings: Input the server IP, Port, User and Password in the CORS Settings.





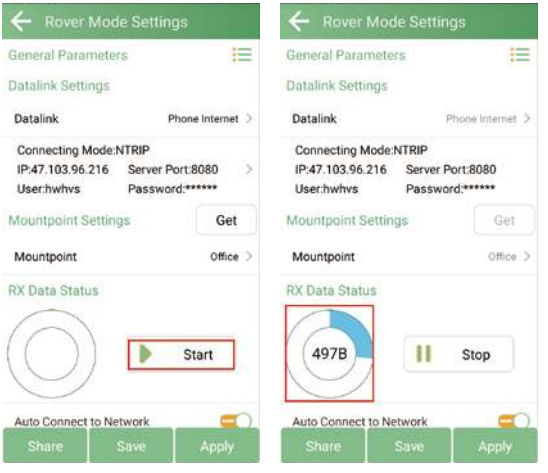
> ⓘ **NOTE**
>
> **The IP & port in the picture is only for example,** please enter your local CORS account instead.
>
> You can purchase a third party RTK corrections service account in your local area to obtain an RTK FIX solution.

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.



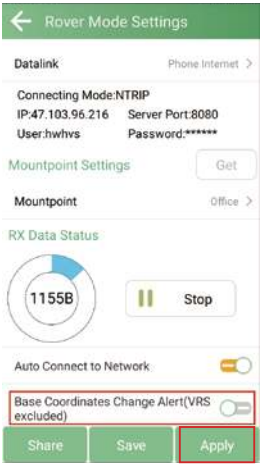
> ⓘ **NOTE**
> If you have clicked **Start** but there is no response in RX Data Status, please check the parameter information above.

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.

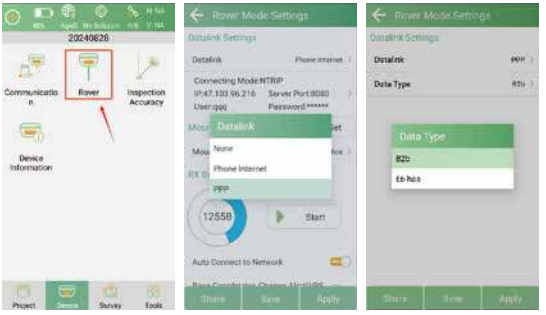
7.Click **Apply** to start the Rover mode.



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. Now you can proceed to **3.2 Point Survey** to start surveying.

2.5.3 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.

2.5.4 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**.



After configuration, you can see the positioning state in the top status bar will change to **DGNSS**, you can then conduct surveying tasks.



3 RTK SURVEY – FIELD DATA COLLECT

This section describes the basic survey functions of SingularPad, including Point Survey, Calibrate Point, Localization, Tilt Survey, Point Stakeout and etc. Before RTK survey, you need to connect to the receiver and get a fixed solution.

3.1 SingularPad Top Status Bar Introduction

After completing your E1 Series RTK setup, check current RTK solution status at the top of the SingularPad software.



RTK solution status	Description
	E1 Series is receiving RTK corrections stably and obtaining a Fixed RTK solution with centimeter-level accuracy.
	Single-point satellite positioning without receiving RTK correction data. The accuracy is around meter-level.
	E1 Series 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.

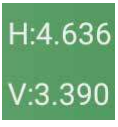


Age means the time since the last differential data was received.

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.

3.2 Point Survey

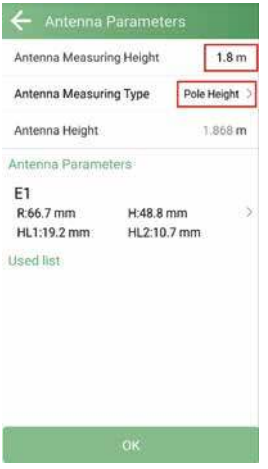
In the Survey interface, click **Point Survey** and enter point **Name**, **Code** and **Antenna Height**, then click to start or stop collecting data.



NOTE

Our software supports 3 antenna measuring types, please refer to chapter 2.5.1 for details.

Pole Height: Typically in rover mode, 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.

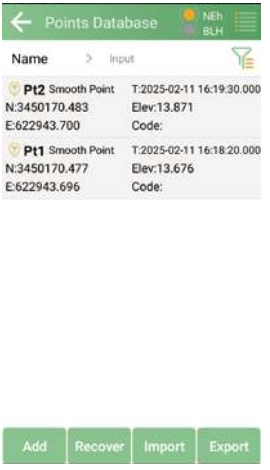


• Click to jump to map center.

• Click to show the all points on the interface.

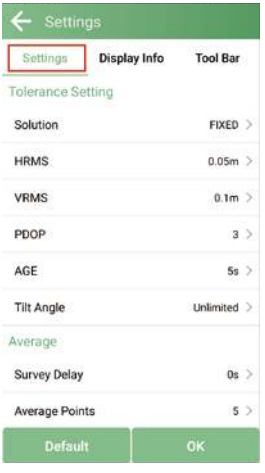
• Click to enter the point database and view the coordinates of the measured points. You can add, recover, import and export data. After selecting a point, you can view the details and take notes or take photos.

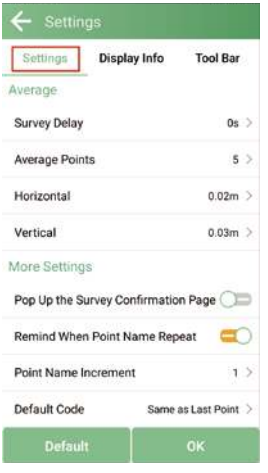




• Click  to enter Settings interface

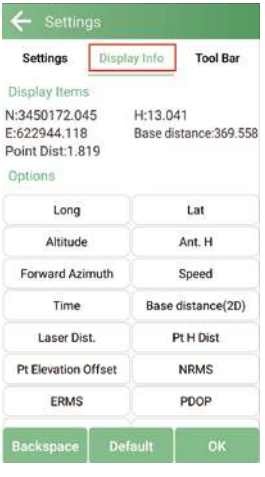
In **Settings** interface, you can modify **Tolerance Setting** such as solution limit, HRMS limit, VRMS limit and etc. and modify **Smooth** parameters and other **Settings** options.

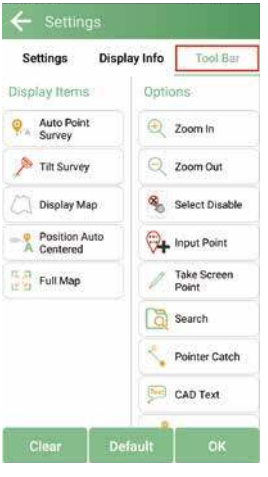




In **Display Info** interface, you can set the display information to the floating window, such as longitude, latitude, altitude, etc.

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.

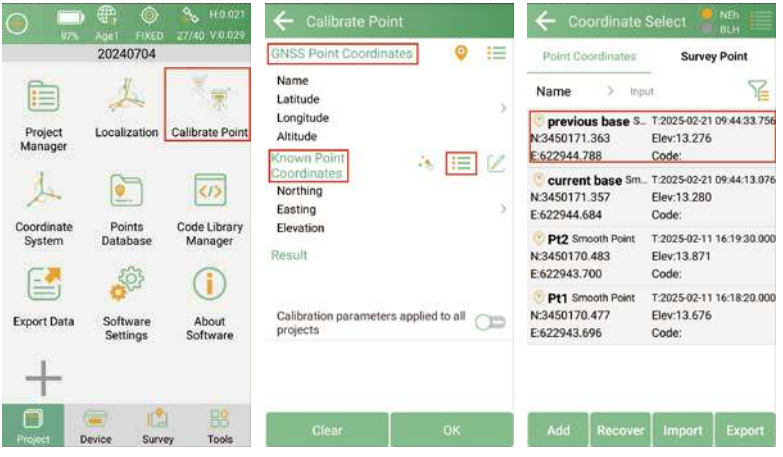




3.3 Calibrate Point

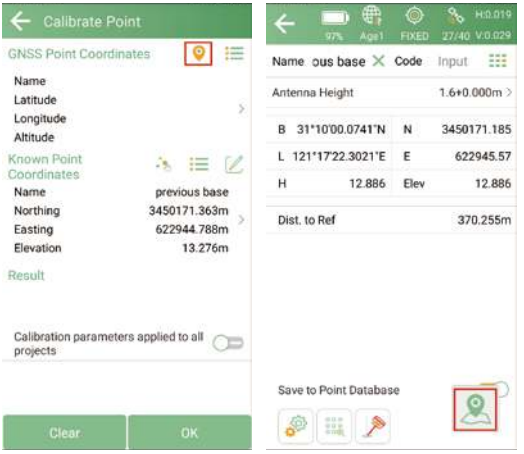
When changing the position of the base station, there will be offsets between surveying points under different base stations. Users can use the Calibrate Point to calibrate the offset.

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**.

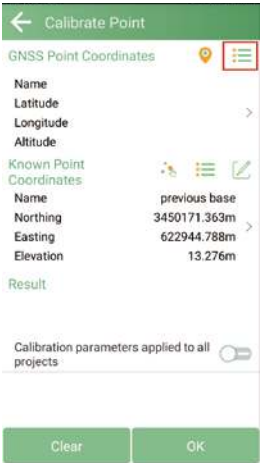


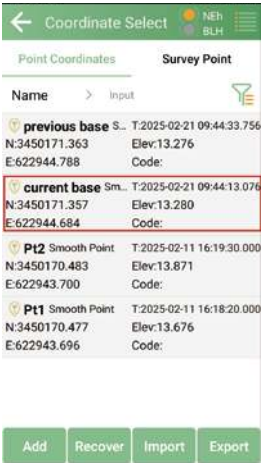
For the GNSS Point Coordinates, you can click the surveying icon to measure under the current base directly.

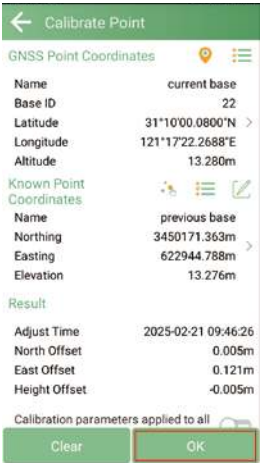
> **NOTE** Please confirm the RTK status is FIXED.



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







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

3.4 Localization

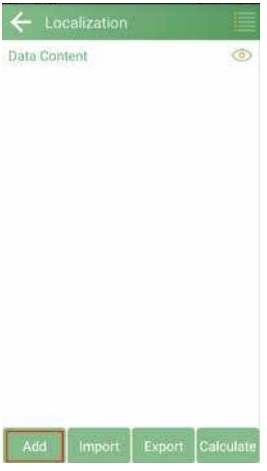
When starting a new project, if you are using the local small-scale coordinate system, you can use this function to transform the geodetic coordinates system to your local system.

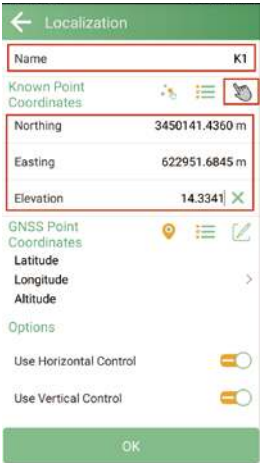
Go to **Project** > **Localization**, add at least 3 pairs of points for the Localization.



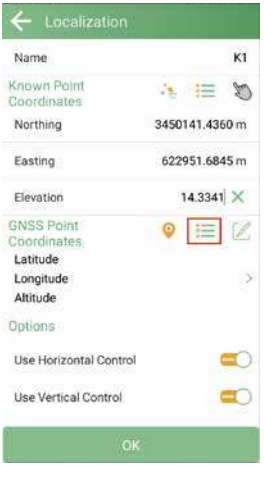
> **NOTE**
>
> A pair of points are the known local coordinates and the surveying coordinates of the same point.

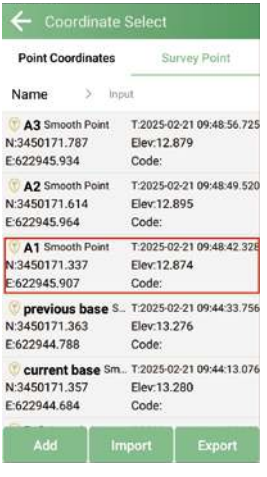
Click **Add** to add the corresponding pairs. Firstly, input the Known Point Coordinates. ▶

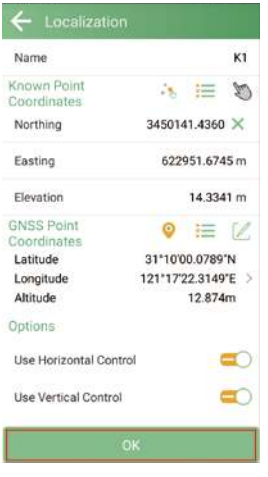




Then select the corresponding GNSS coordinates of the known point. ▼





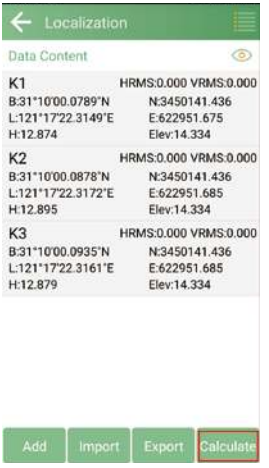




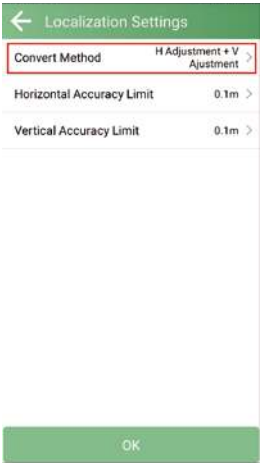
Add the remaining point pairs in sequence. You can also enter the known point in point database in advance and select the input points.

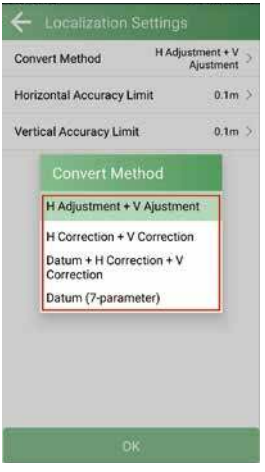


After adding all the point pairs, click **Calculate**.

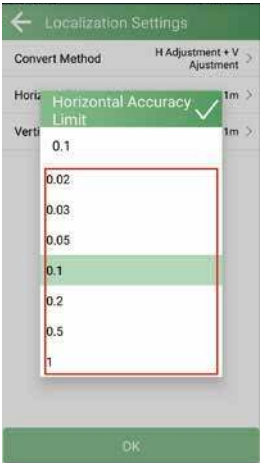


Select the convert method and the accuracy limit according to your project requirements.

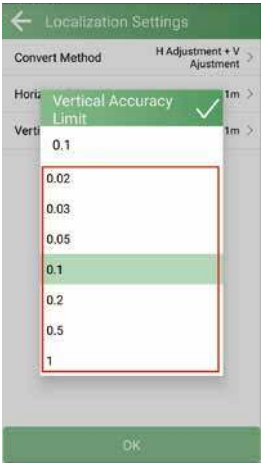














You can click Export Report to save the projected coordinate system parameters. Click **Apply** to apply the localization.



3.5 Tilt Survey

The E1-Series 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.

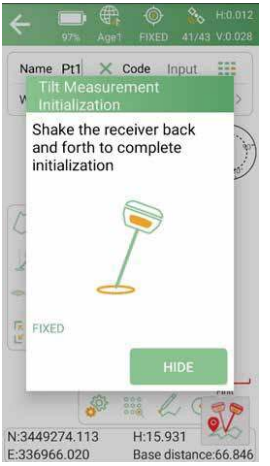


2. Initialization

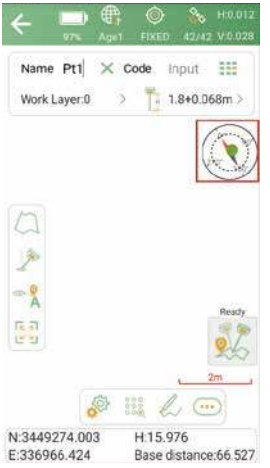
After clicking the IMU button, you can follow the guidance on the interface to complete it.

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.



NOTE

If rapid rotation, falling and other violent movements cause IMU status loss, it needs to be reinitialized – shaking the pole for about 5 seconds.

3.6 Detail Survey

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, into, arrow drawing and photo.
- Click to open IMU to do tilt survey.
- Click to open Fast Code Survey. You can create code buttons by inputting Remark and Code, then click the button to start quick-collecting.

3.7 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.

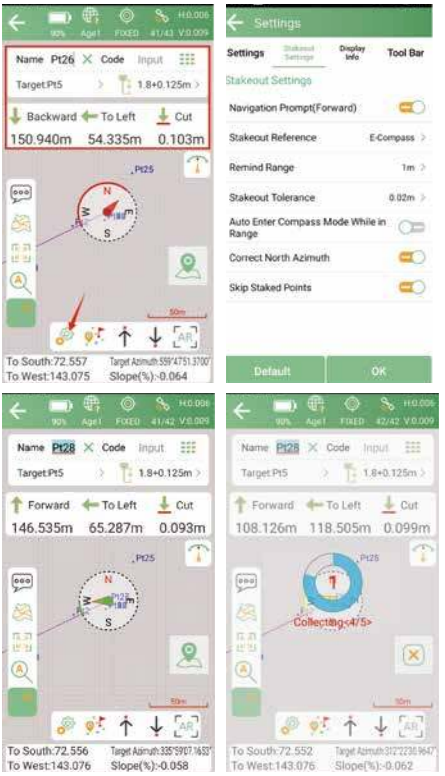
3.8 Point Stakeout

Go to **Point Stakeout** interface, you can select a point from the point database to **Stakeout**. 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.



Click to start or stop staking points

Click to turn on or off IMU

Click to automatically zoom to the full image

Click to jump to the current point

Click to jump to the next point

Click to jump to the previous point

Click to set up the slide-out settings, display information and toolbar, you can edit the prompt range and range error

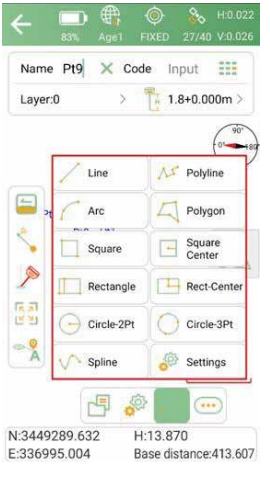
3.9 CAD Mapping and Stakeout

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.



3.10 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.

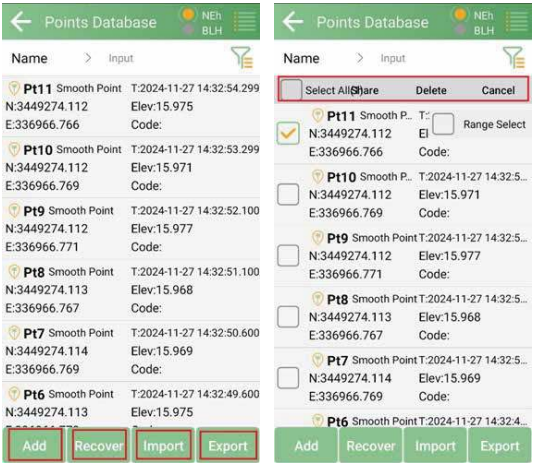
• Add: Support to add Input Point, and display type supports local coordinate and geodetic coordinate

• Recover: After deleting the points, you can recover them in deleted points interface

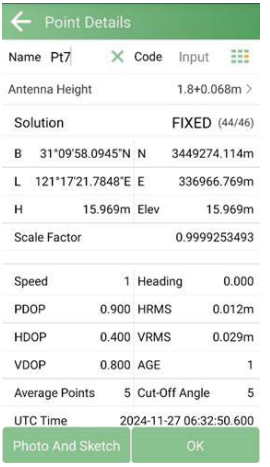
• Import: Import points by different formats of files

• 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.



3.11 Data Export/Import

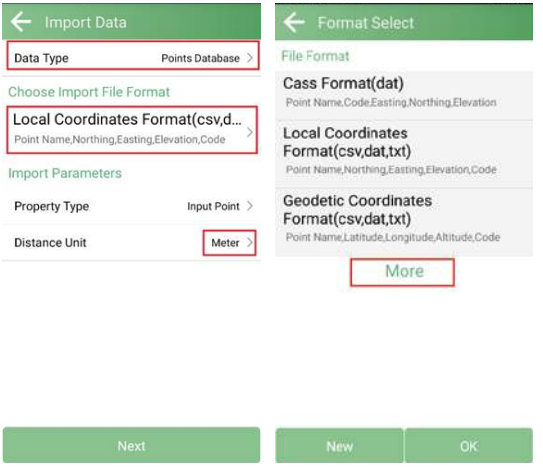
SingularPad supports to export/ import data including grid coordinate, Lat/Lon coordinate with various data format, and supports importing *.dat/*.csv/*.kml file and exporting result of *.dxf/*.kml/*.shp/*.xls/*.csv.

3.11.1 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 New to create a User defined type.

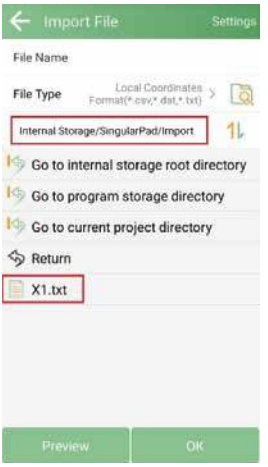


- Format name: Enter the name for the format
- Extension name: support *.csv, *.dat, *.txt, *xlsx format
- Delimiter: support comma (,), semicolon (;), space ( ), tab (Tab)



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.



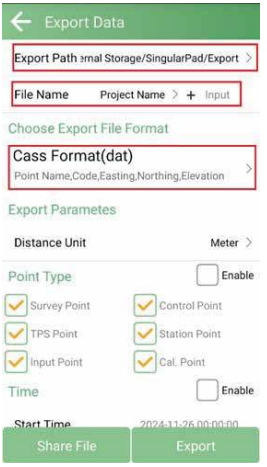


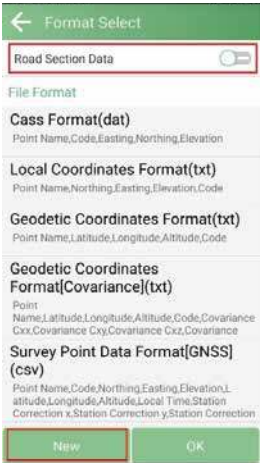


3.11.2 Export points data

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.

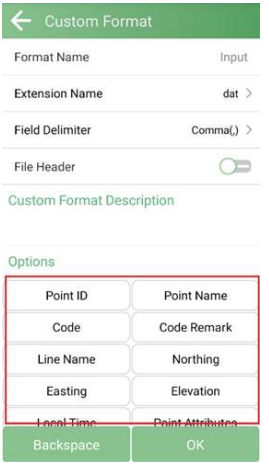
- Export Path: the default export path is internal storage/SingularPad/export; you can also change to any other path where the file is
- File Name: support project name, operator,data, data time
- Export File Format: support *.csv, *.dat, *.txt, *kml, etc.
- Distance Unit: support meter, US survey feet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



4 STATIC SURVEY

This chapter describes how to conduct static survey through E1 Series receiver and SingularXYZ Converter software. For static survey, E1 Series supports SingularXYZ binary format (*.XYZ), which is a raw observation data format. 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.

4.1 Static Data Collection

Static survey is mainly used for the control point survey. To reach millimeter accuracy, please follow tips 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.

For convenient operation, you can start recording static data by double-pressing the function button in the front panel. The flashing yellow light on the function button indicates that static data recording has begun at a 1Hz frequency.

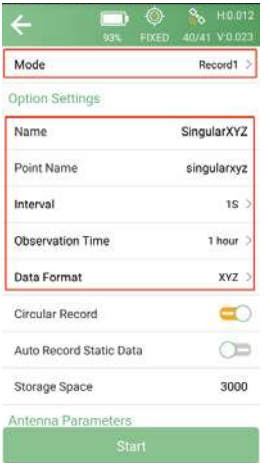
If you need to do more detailed settings about static survey, please follow these steps to configure them in the SingularPad software.

1. Go to **Device** >> **Static Record** for static settings.



2. Choose the Record mode. There are two record modes and they can record static data at the same time.

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



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

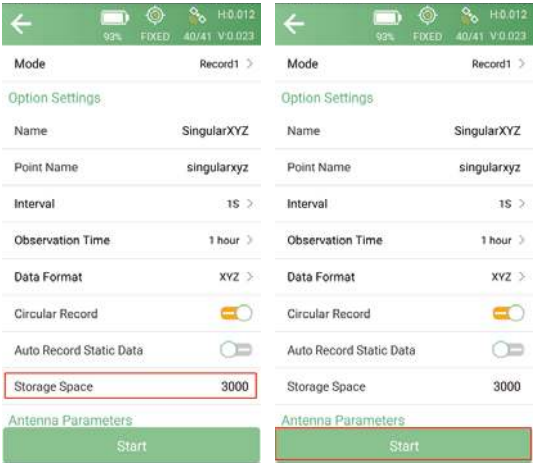


4.Turn on/off the **Auto Record Static Data** according to your needs. If this option is turned on, the receiver will automatically record static data after it is power on.



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

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

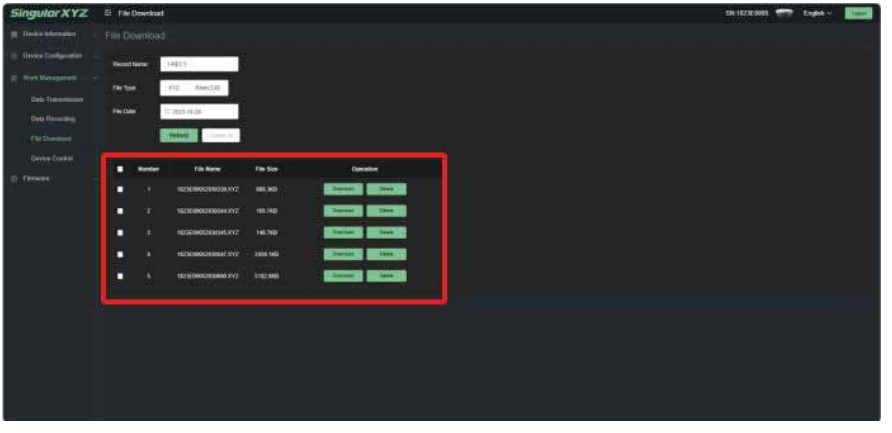


4.2 Static Data Download

The raw observation data is saved in the internal memory of the E1 Series receiver, The specific steps to download the static data from the E1 Series receiver are as follows:

Refer to Chapter 5.1 Access the web interface to go to the E1 Series web page.

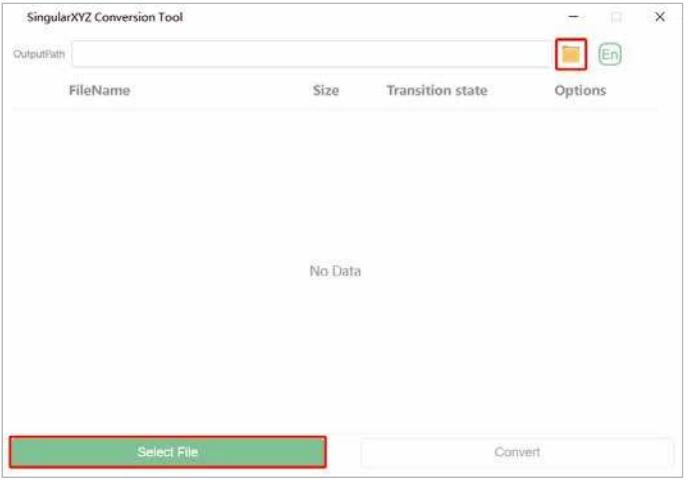
Go to **Work management** >> **File Download**, select the corresponding record name, file type and date to filter and download the static data.



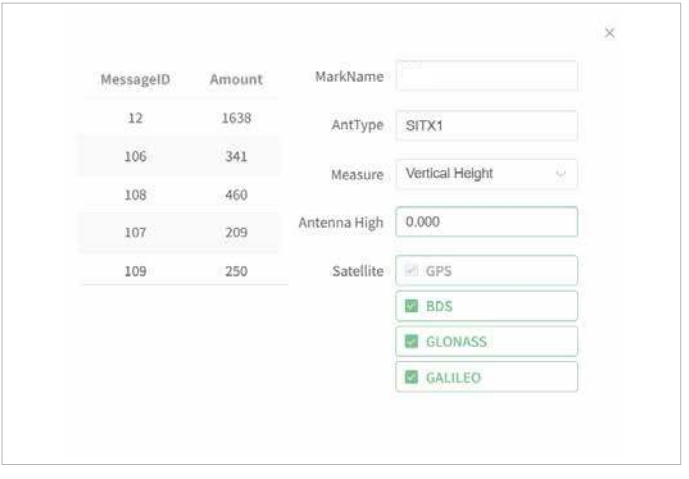
4.3 RINEX Convert

After download raw observation data to PC, you can convert the data format from SingularXYZ binary format (*.XYZ) to Rinex in SingularXYZ Converter software. The following steps give an example of Rinex convert.

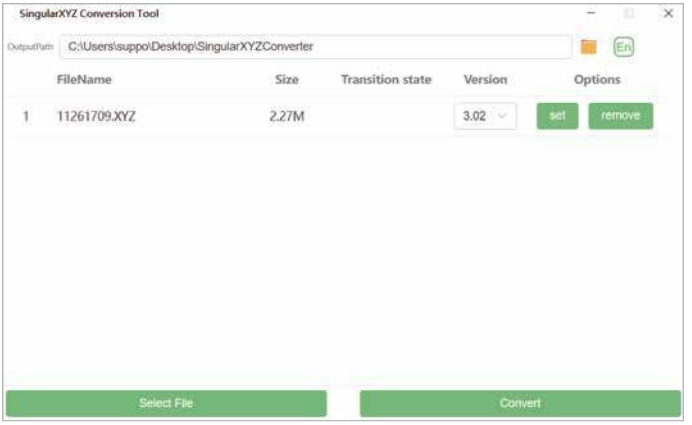
1. Start SingularXYZ Converter software.
2. Click the **file folder icon** to set the output path and click **Select File** to import the binary file.



3. After importing the binary file, click set and input the marker name and choose the measure type of antenna height. The antenna type (AntType) of E1 Series will be automatically identified as SITX1.



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



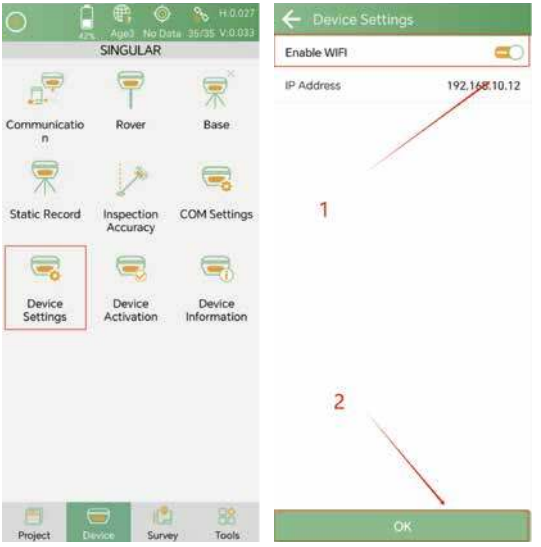
> **NOTE**
> The output path and GNSS raw data storage path must contain only English letters and numbers.

5 WEB UI INTRODUCTION

This chapter mainly introduces the function of Web UI.

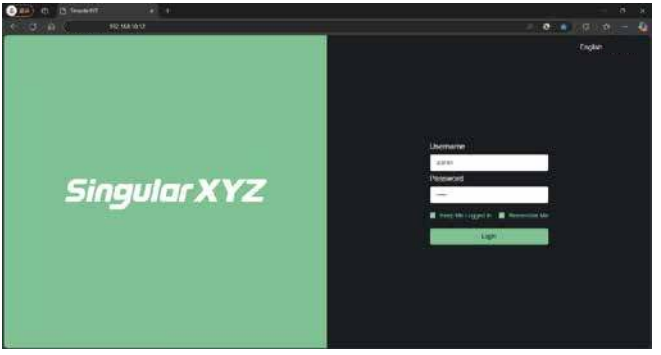
5.1 Access the web interface

After you connect E1 Series GNSS Receiver to SingularPad via Bluetooth, go to Device >> Device Settings. Keep the default IP address and enable WIFI, click OK.



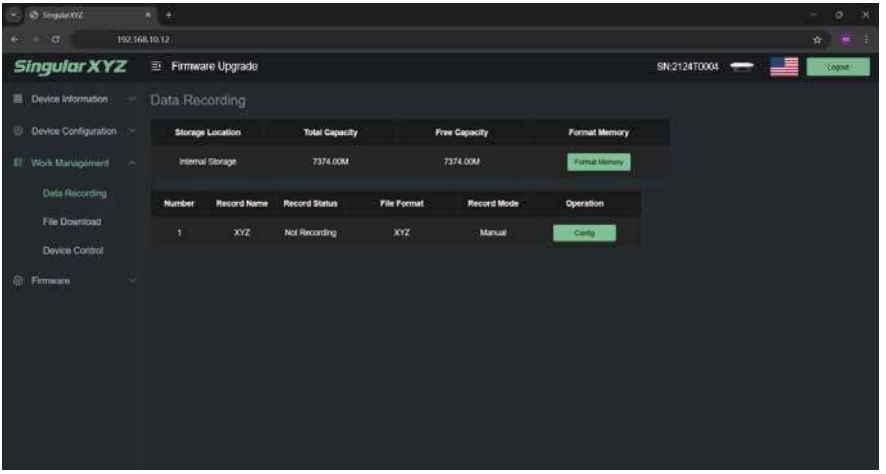
> **NOTE**
> The E1 Series receiver defaults to having Bluetooth enabled and Wi-Fi disabled upon startup. Bluetooth and Wi-Fi cannot coexist simultaneously. Therefore, to use Wi-Fi, you need to enable it through the PAD software. After restarting the device or configuring it via the web interface, Bluetooth will be re-enabled. Above are the steps to enable Wi-Fi.

Connect PC or mobile devices to E1 Series WiFi (Name: **SN of** E1 Series, Password: **12345678**). Open browser and enter the web page via IP **192.168.10.12** (Username: **admin**, Password: **admin**).

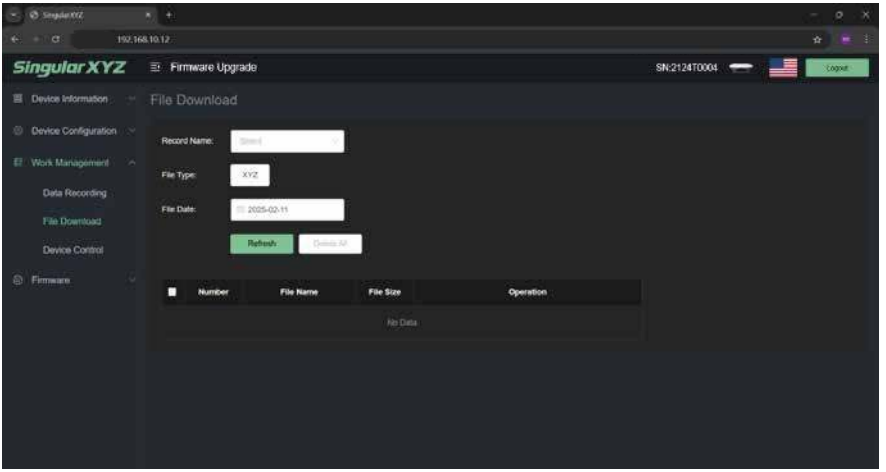


5.2 Work Management

In Data Recording, you can set the parameters of the collected static data and start record. You can also format memory in this interface.



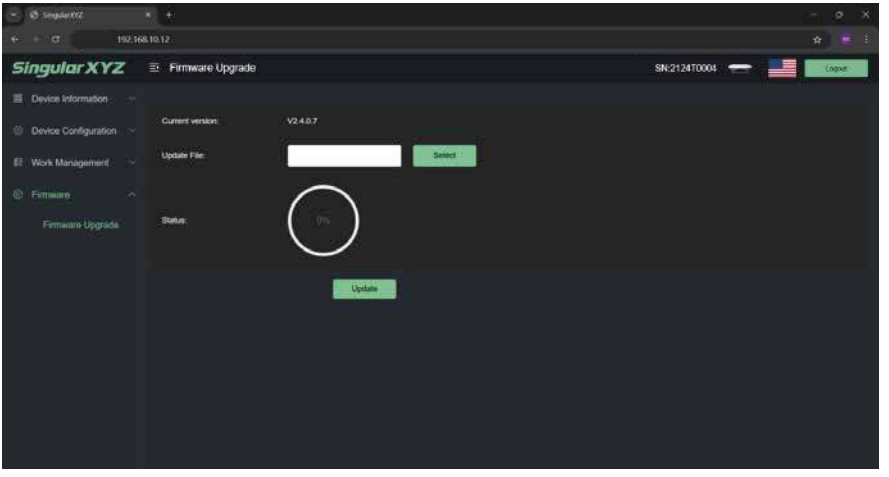
In file download, you can download recorded static data.



5.3 Firmware Upgrade

This function interface is used to upgrade the firmware version of the device.

1. Select the firmware (*.bin file) in this interface and click Update to update the firmware.
2. After the upload complete, the device will automatically restart and the upgrade is finished.



> **NOTE**
>
> The firmware files of the E1 Series (E1 Lite / E1 / E1 Pro) are not interchangeable. Each model requires its own specific firmware package.
>
> If you need to upgrade the firmware, please contact our technical support team at support@singularxyz.com or leave a message on our official website. We will provide you with the correct firmware file and detailed upgrade guidance.
>
> You may also refer to Section "**7.3 Update The Device Firmware**" for instructions on how to download the appropriate firmware file from our website.

6 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 E1 Series device
- Problem description with supplementary video/screenshots
- Debug logs and project file

6.1 How To Find Serial Number

The serial number is a unique combination of numbers and letters assigned to your E1 Series receiver.

Find Serial Number

Find the serial number of your E1 Series as shown in the image below.



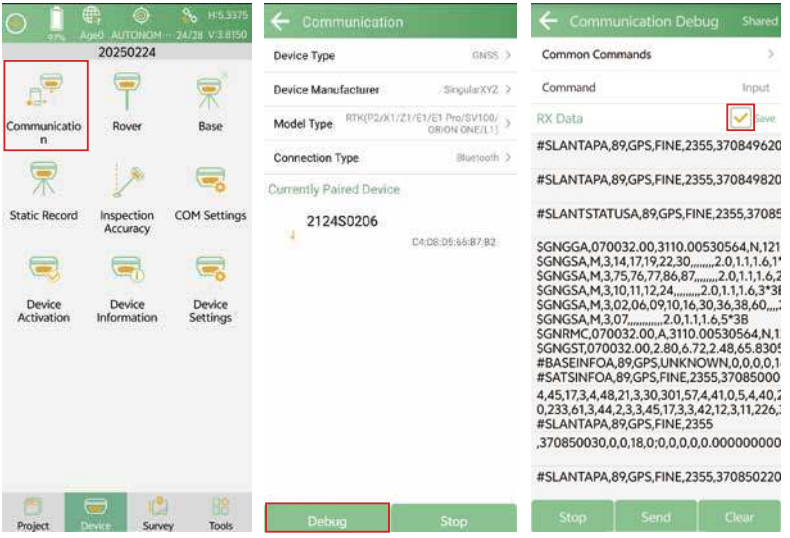
6.2 How To Get Debug Data & Project File

6.2.1 Save Debug File

The Debug data provides information about your current E1 Series 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).



6.2.2 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.





7 FREQUENTLY ASKED QUESTIONS

7.1 The Data Collector Doesn't Recognize The Sim Card

Make sure that this SIM card can access the Internet normally on other devices, then go to Settings, click Network & internet.

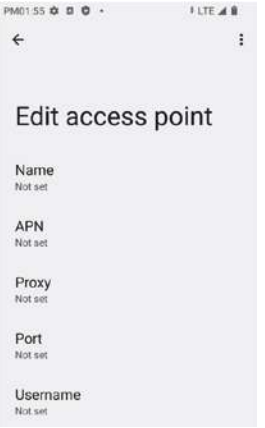
Enter the mobile network interface.

There is an Access Point Names at the bottom, click it to enter this page.



Then click the Add button in the upper right corner and enter the parameters provided by the operator.(The following images use the SC60 as an example.)





If you are using SC200, you need to click the More button and select New APN.





7.2 Can't Get Fixed Solution

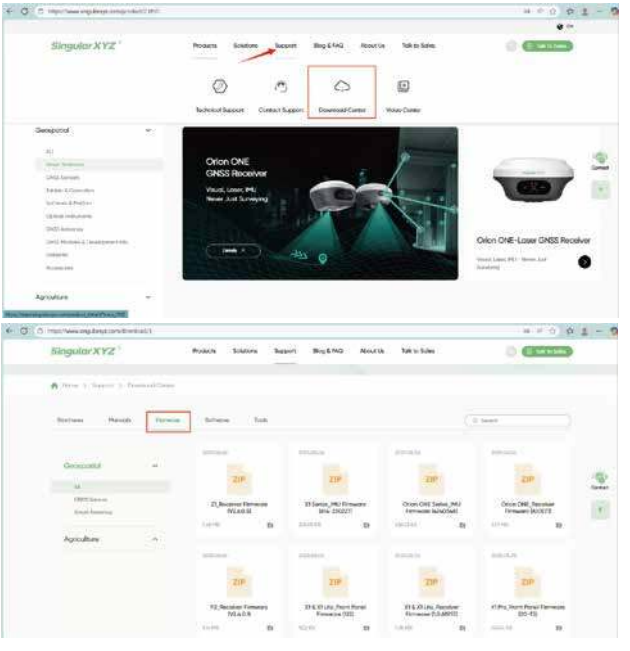
First, Place the device outdoors and as far away from obstructions and interference sources as possible.

When using Internal Radio mode, make sure the base station is started successfully. After connecting to the base station, the status bar will show **"BASE"** in the SingularPAD software so that means the startup is successful. You also need to ensure that the radio configuration of the rover is exactly the same as the base station.
When using Ntrip service, make sure that the Rover is successfully connected to the Ntrip service and the data is Transmitting.

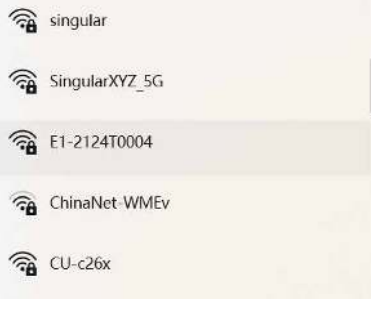
7.3 Update The Device Firmware

First, visit our official website to download the latest firmware for your corresponding device.
Please note: E1 and E1 Pro use the X1 firmware, while E1 Lite uses the Z1 firmware.

Official website: https://www.singularxyz.com



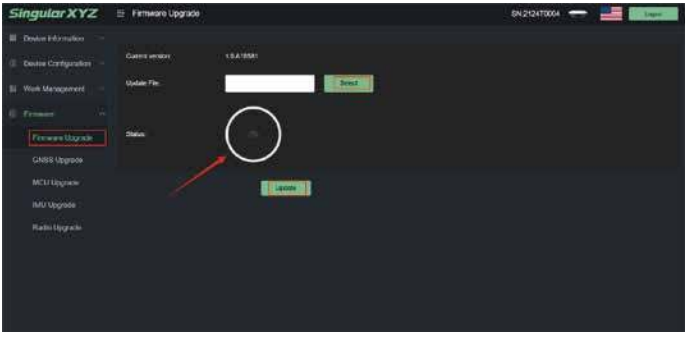
Then turn on the E1 device and connect to its Wi-Fi. On your phone, data collector, or computer, search for the Wi-Fi network named after the **E1 device's SN (serial number).** The password is **12345678.**



After connecting, enter the website **192.168.10.12** in your browser. The Username and Password are both **admin.**



After successfully entering the web page, select Firmware upgrade in the options on the left and select the firmware to update.



Ensure that the device has sufficient remaining power before upgrading. Do not perform any operations during the upgrade until the web page prompts that the upgrade is successful. After the upgrade is successful, the device will automatically restart.

WARRANTY CARD

If you meet any issues during usage, please contact SingularXYZ support team or your local SingularXYZ distributor partner for supporting and debugging first.

Product Model: _____

Serial Number: _____

Date of Shipment: _____

Customer Name: _____

Address: _____

Address: _____

To request warranty service, please contact your local SingularXYZ distributor or our support team at:

support@singularxyz.com
Support.SingularXYZ

Warning and Caution

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

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

Warranty Notice

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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