SingularXYZ

Sfaira ONE GNSS Receiver
User Manual

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Corporate Office

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Technical Assistant

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

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

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 UserGuide
- Install the GNSS receiver in a location that minimizes vibration andmoisture
- Avoid falling to ground, or colliding with otheritems
- Do not rotate 7-pin Lemo port
- Do not cover the radio, keep a sound ventilation environment
- To reduce radiation, please keep above 2 meters away from the radiostation
- Take lighting protection measures when installing antennas
- Change the cable if damaged

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 reasonablecare.

Warning and Caution

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

WARNING- A Warning alerts you to a potential risk ofserious 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 disassembleddevices.

CONTENTS

1 Introduction

The SingularXYZ Sfaira ONE GNSS Receiver User Manual is aimed to help you get familiar with the Sfaira ONE GNSS 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 Overview

Sfaira ONE GSS receiver is equipped with a high-precision GNSS engine which can simultaneously track GPS, BDS, GLONASS, Galileo & QZSS, providing stable and accurate centimeter-level positioning. Sfaira ONE receiver has ultra-small size and strong anti-interference ability to make it possible to work even in hash environments. It is an ideal RTK/GNSS product for surveyors.

1.2 Receiver features

The Sfaira ONE GNSS Receiver key features:

- Portable: Φ50 mm ×149 mm Ultra small size and 409g super light
- Can work at high intensity continuously for more than 16 hours
- Cable-free Bluetooth wireless technology
- 1408 channels of simultaneously signal tracking
- Centimeter level accuracy
- IP65 waterproof
- Designed to survive a 1.5m drop onto concrete

1.3 System Composition

- Sfaira ONE GNSS Receiver *1

Sfaira ONE GNSS Receiver

- USB-Type C Cable*1

USB-Type C Cable

2 Setup of the Sfaira ONE

2.1 Environment Requirements

To keep the receiver with a reliable performance, it is better 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

2.2 Power supply

The Sfaira ONE GNSS receiver comes with a large 4800mAh rechargeable Lithium-ion battery that supports Type-C charging.The internal battery provides you an effective survey workflow with about 16-hours operating times as a rover. However, this operating time varies based on environmental conditions.

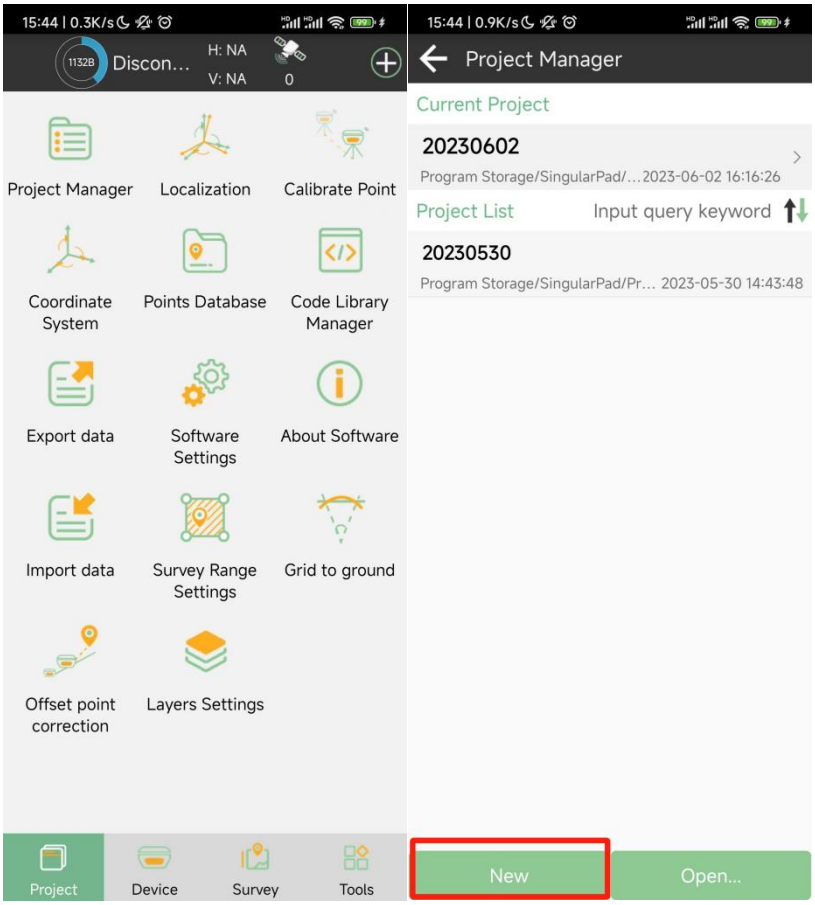
• Receiver Safety Charge and use the Receiver only in strict accordance with the instructions below: – Do not use or charge the Receiver if it appears to be damaged. Signs of damage include, but are not limited to, discoloration, warping, and leaking Receiver fluid. – Do not expose the Receiver to fire, high temperature, or direct sunlight. – Do not immerse the Receiver in water. – Do not use or store the Receiver inside a vehicle during hot weather. – Do not drop or puncture the Receiver. – Do not open the Receiver or short-circuit its contacts.
- Charging the Lithium-ion Receiver Please use Type C cable for charging. Please obey the following instructions when charging your batteries: – Charge the Receiver completely before using it for the first time. – Fully charge takes approximately 2 hours per Receiver at room temperature. – If the Receiver has been stored for a long time, charge it before your fieldwork. – Re-charge the Receiver at least every three months if it is to be stored for long time.
- Storage of the Lithium-ion Receiver – Keep receiver in dry and room temperature conditions.

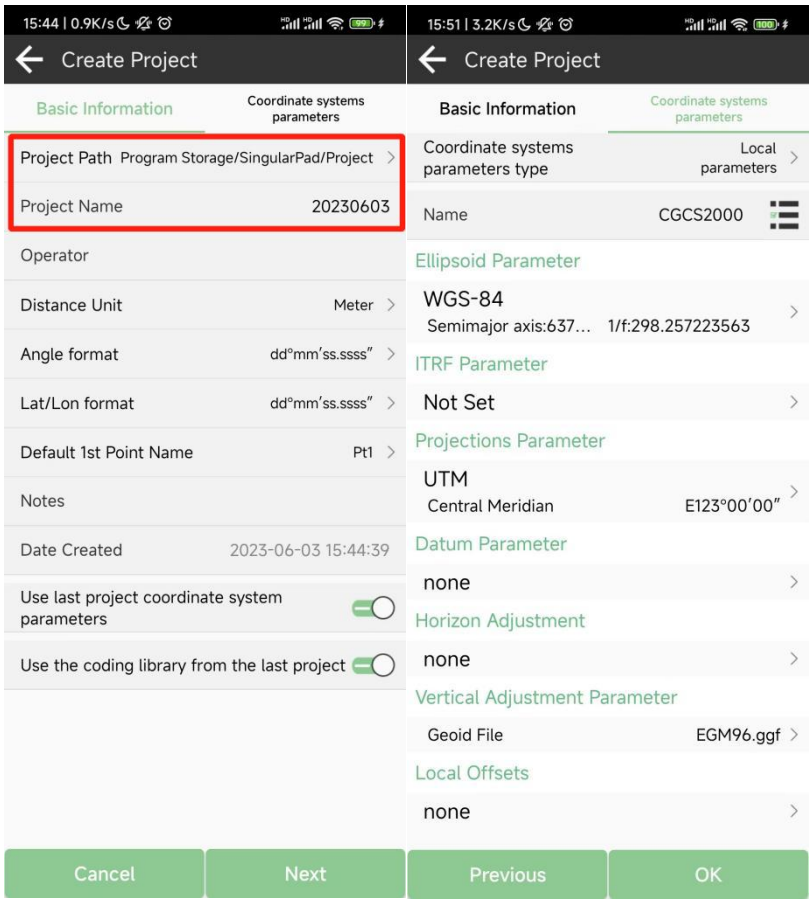
Power light status:
Power on and not charging: keep red when power is more than 10%, flash red when less than 10%.
Charging: Keep green when it is fully charged, flash green when it is charging.

3 Connect with SingularPad

3.1 Create a new project

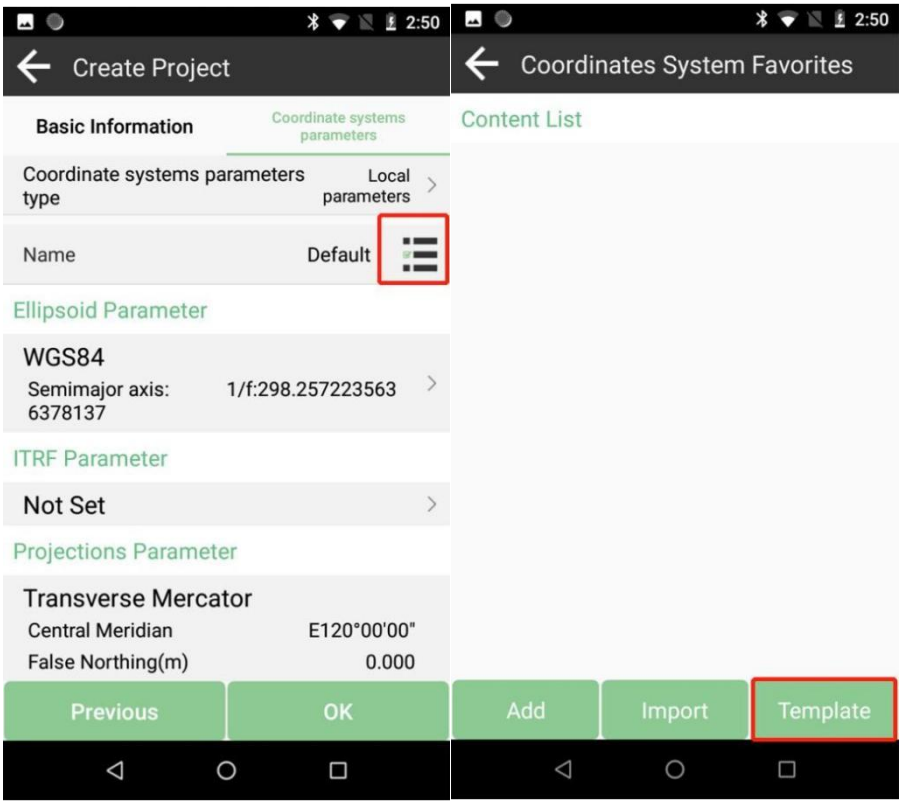
Click Project Manager, click the New button in the lower left corner of the screen and input project name, set coordinate systems parameters and save the project. In Project Manager interface, you can click previous projects in the Project List to remove or open it.

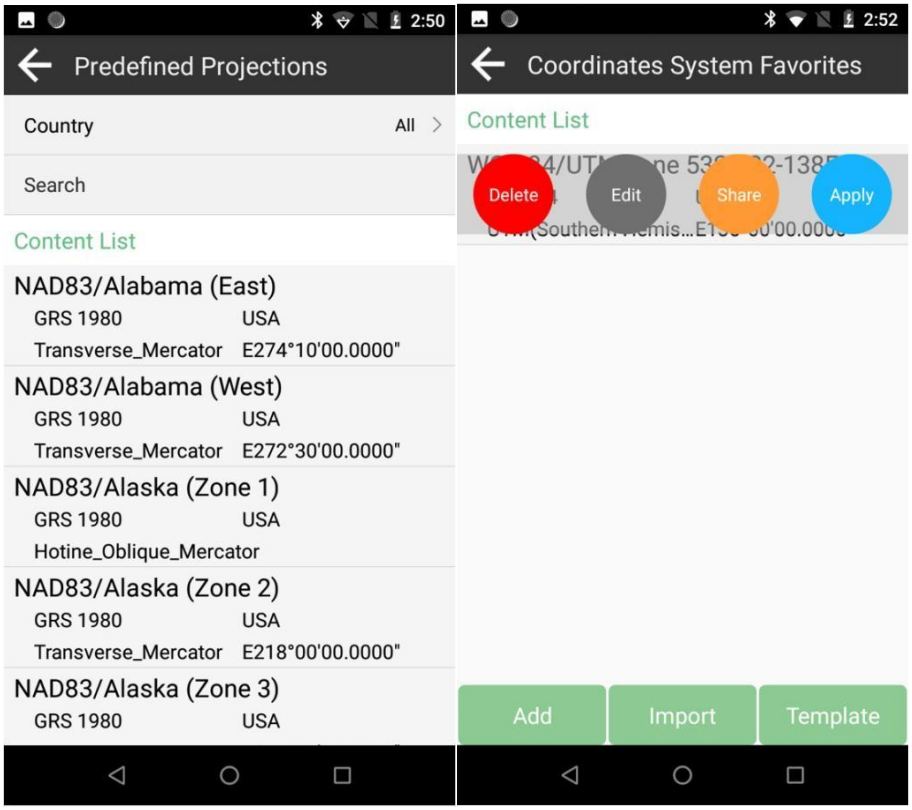




If you have added one project, you can click the project name in the main interface to check the current project details, including Project Name, Project Path and Coordinate systems parameters. And you can edit it.

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

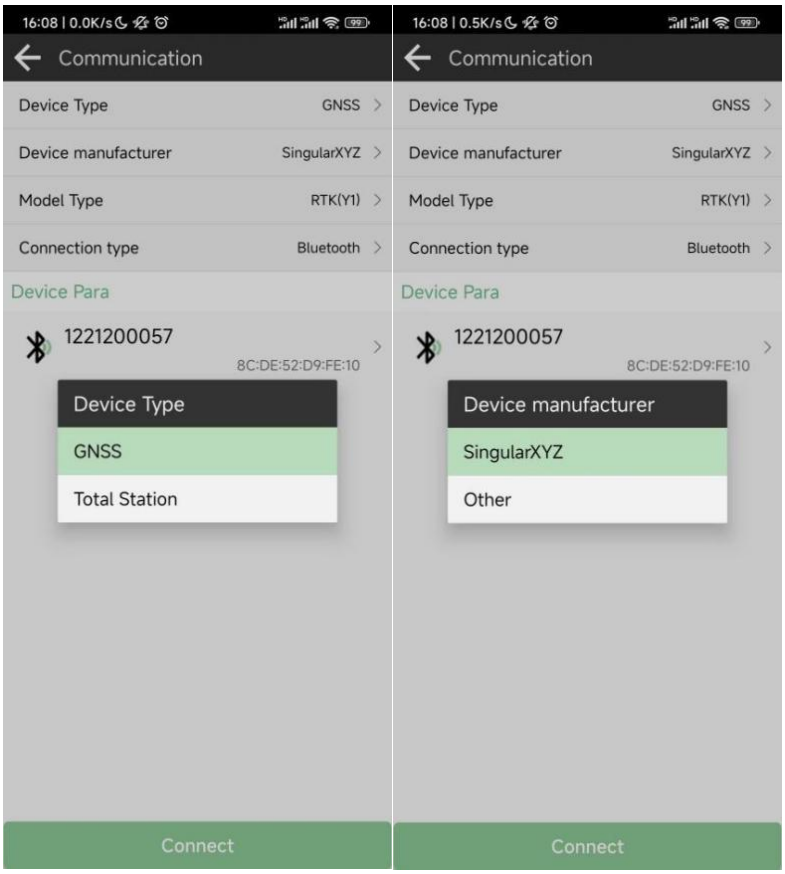


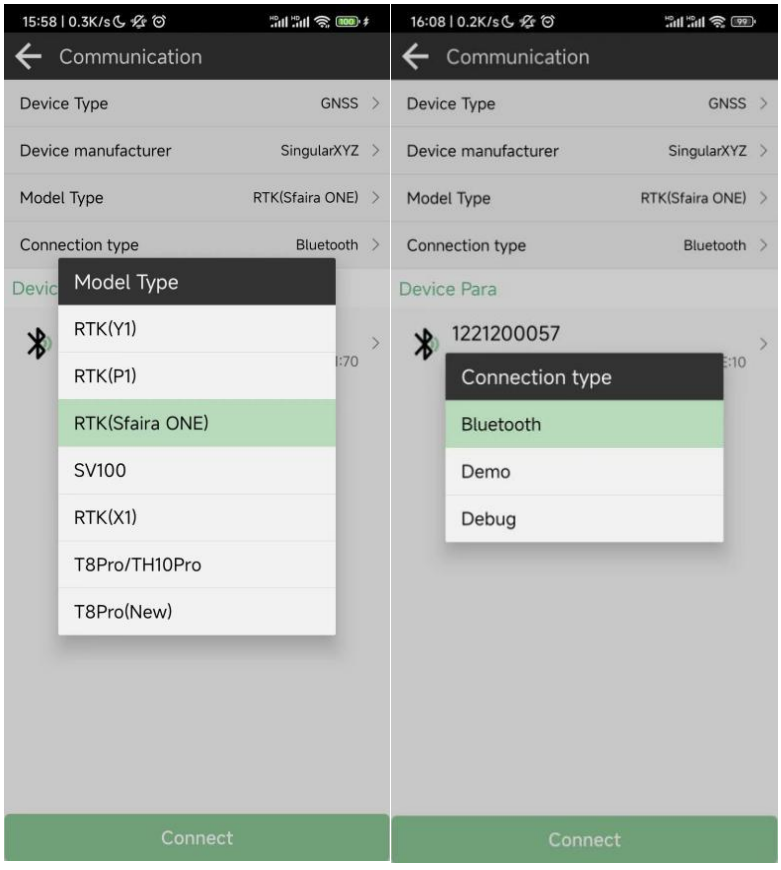


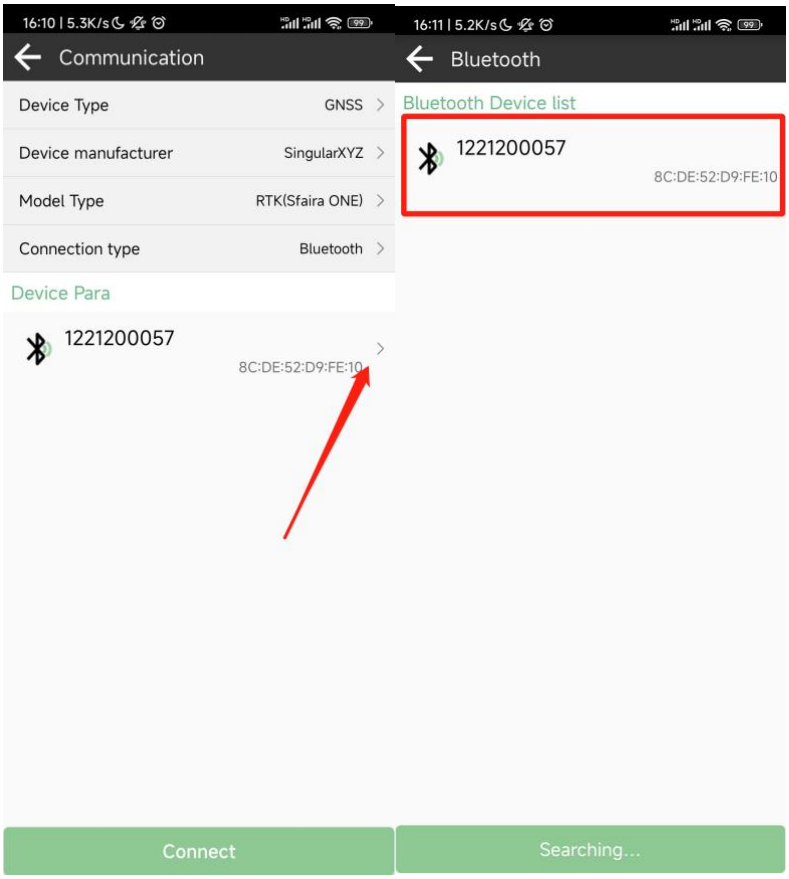
3.2 Connect to receiver

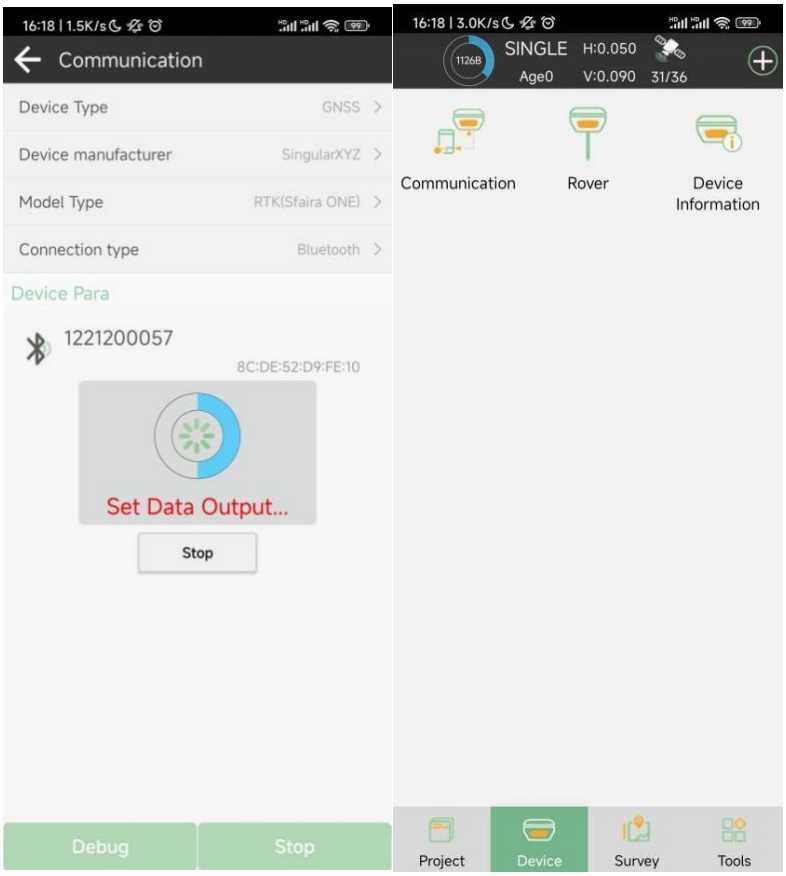
After creating a new project, switch to Device, click Connection. You can connect SingularPad

with SingularXYZ Sfaira ONE receivers. You should choose the follow types, search and connect the Bluetooth of Sfaira ONE：







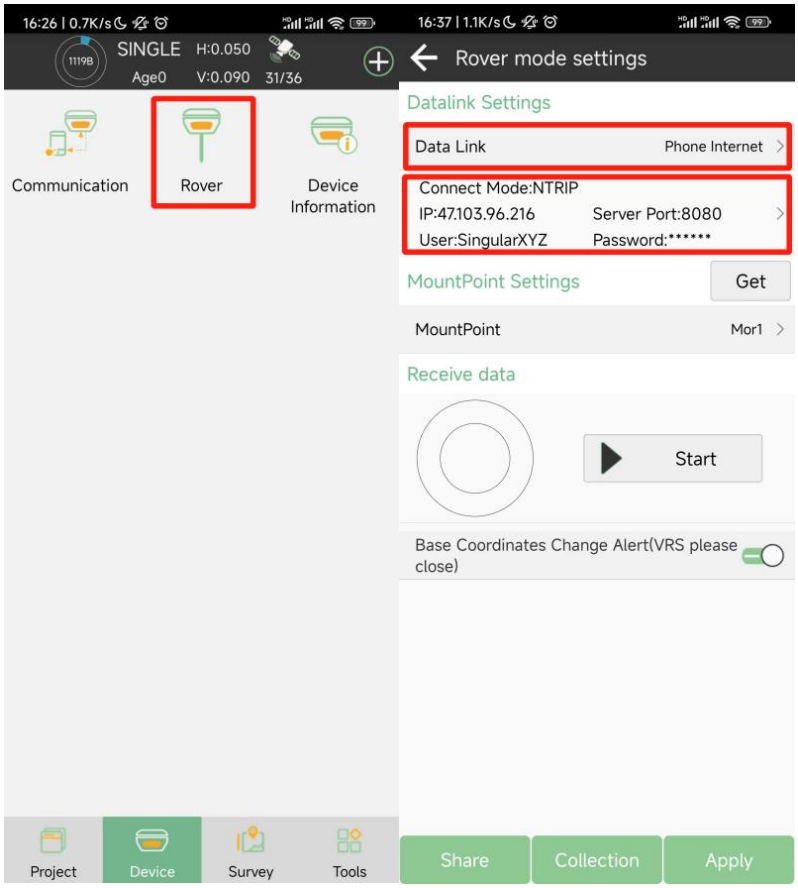


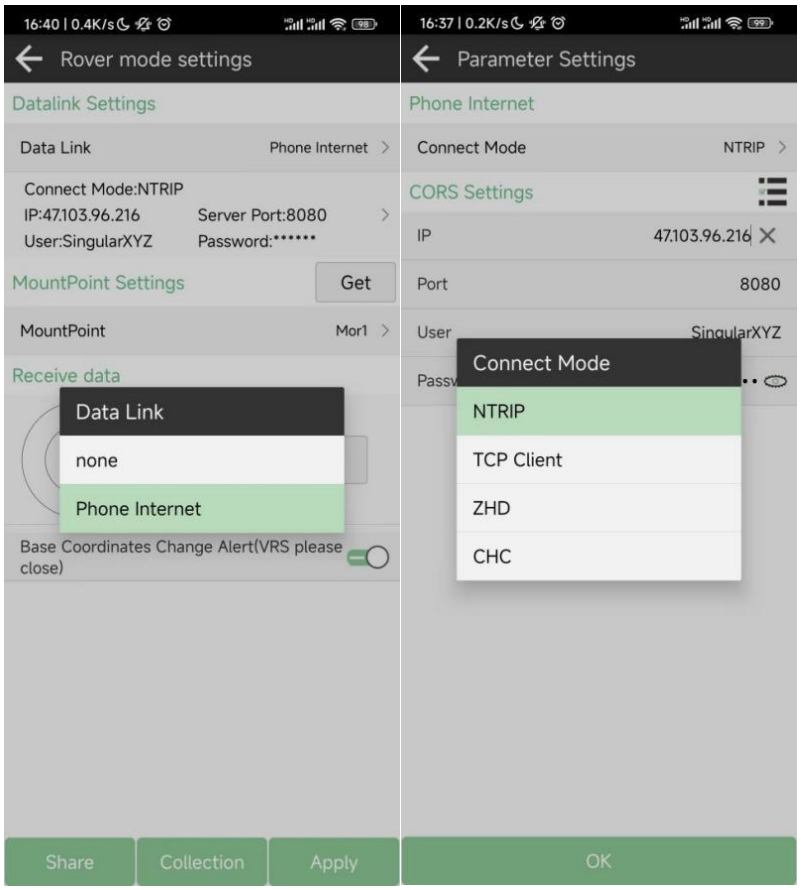
Tips: If you failed to connect with receiver through SingularPad, you can just follow prompt info to go into the device Bluetooth setting interface to make sure Bluetooth paired successfully.

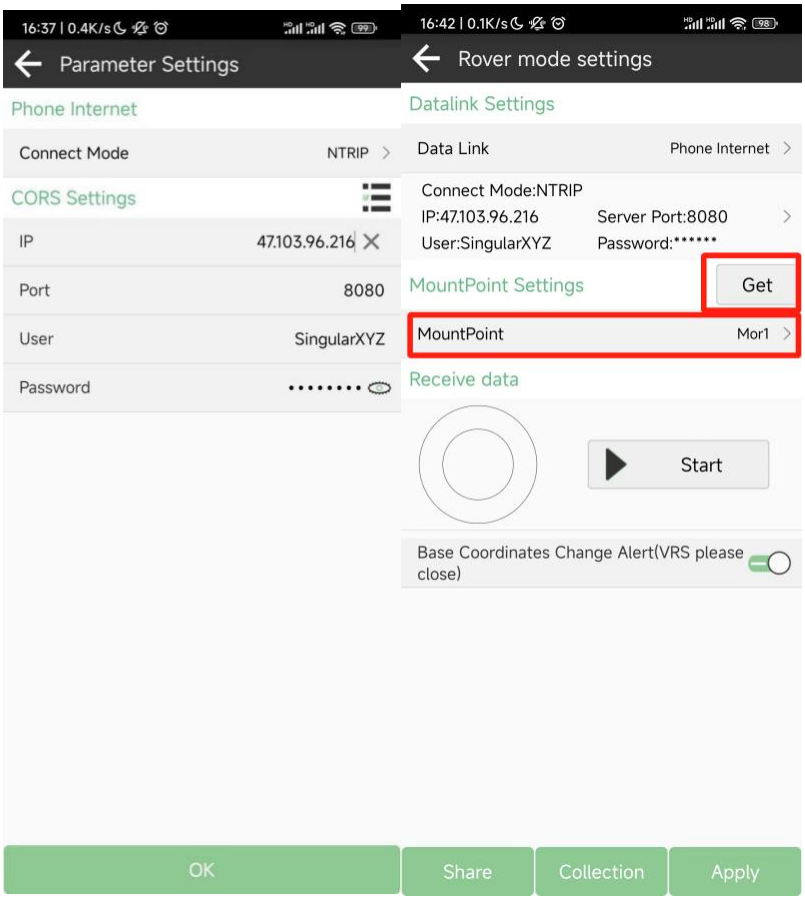
Sometimes you need forget the device Bluetooth, restart the receiver or software and get pair again.

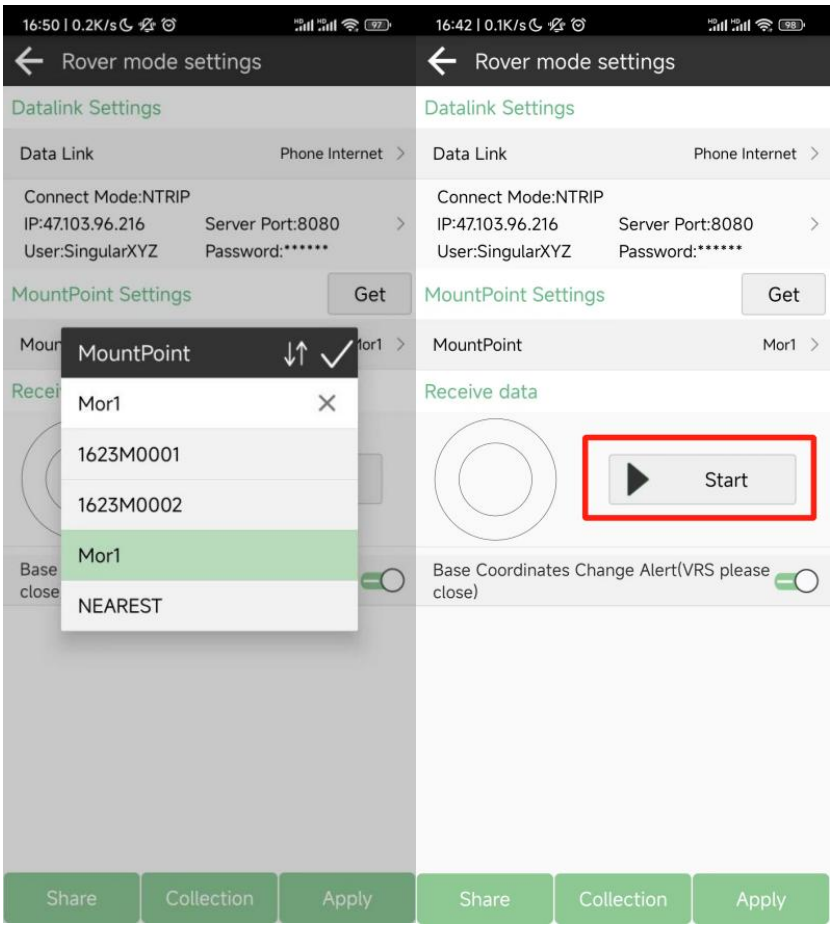
3.3 Quick Setup Your Receiver

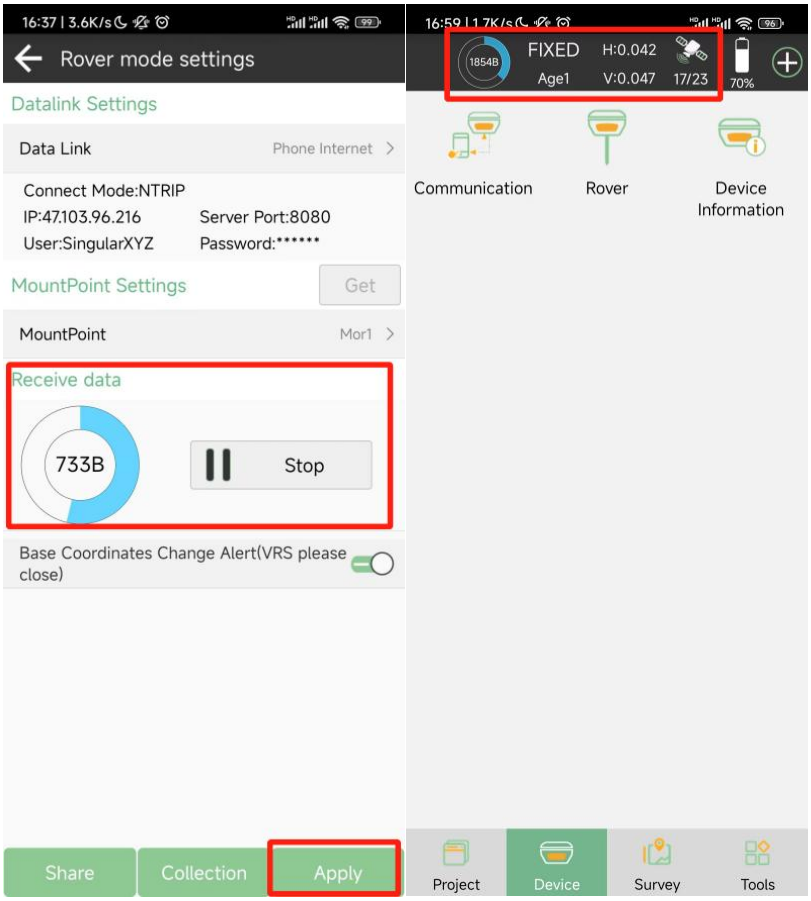
Sfaira ONE can only be used as rover in Phone Internet mode. You can set it in Rover, set the Data link as Phone Internet, Connect mode as NTRIP, enter the IP address, Poirt, User and Password of you CORS. Click get to get the mount point, and then select the mount point and click start, you can determine whether the connection is successful by whether you have received data, if you receive the data, then click Apply, the position status will change to Fixed.




16:40 | 0.4K/s
Rover mode settings
Datalink Settings
Data Link
Phone Internet
Connect Mode:NTRIP
IP:47.103.96.216
Server Port:8080
User:SingularXYZ
Password:******
MountPoint Settings
Get
MountPoint
Mor1
Receive data
Data Link
none
Phone Internet
Base Coordinates Change Alert(VRS please close)
Share
Collection
Apply
16:37 | 0.2K/s
Parameter Settings
Phone Internet
Connect Mode
NTRIP
CORS Settings
IP
47.103.96.216
Port
8080
User
SingularXYZ
Connect Mode
NTRIP
TCP Client
ZHD
CHC
OK

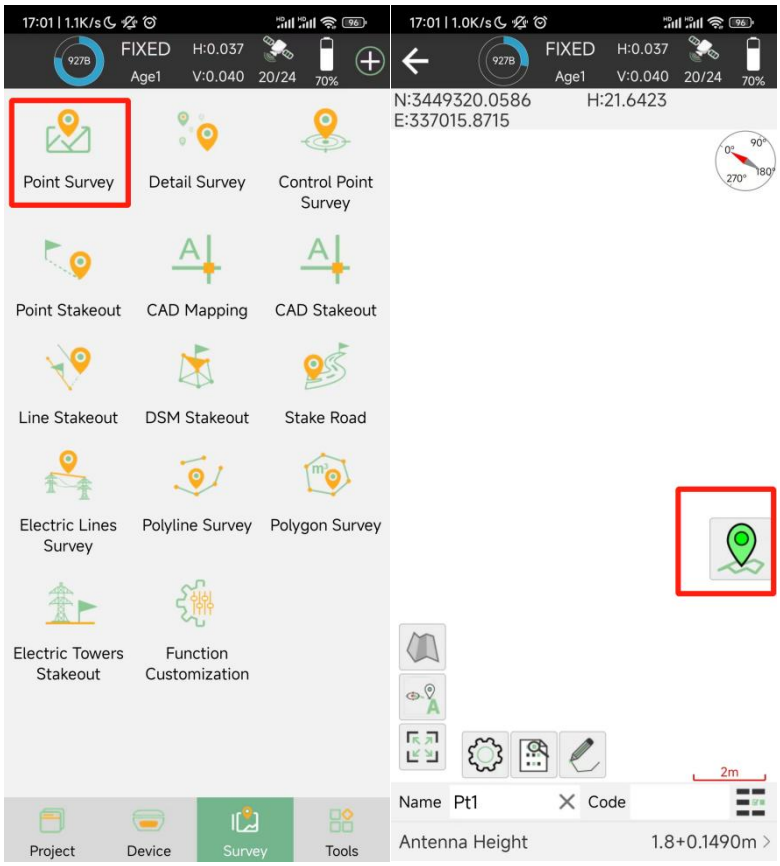

16:37 | 0.4K/s
Parameter Settings
Phone Internet
Connect Mode
NTRIP
CORS Settings
IP
47.103.96.216
Port
8080
User
SingularXYZ
Password
OK
16:42 | 0.1K/s
Rover mode settings
Datalink Settings
Data Link
Phone Internet
Connect Mode:NTRIP
IP:47.103.96.216
Server Port:8080
User:SingularXYZ
Password:******
MountPoint Settings
Get
MountPoint
Mor1
Receive data
Start
Base Coordinates Change Alert(VRS please close)
Share
Collection
Apply


16:50 | 0.2K/s
Rover mode settings
Datalink Settings
Data Link
Phone Internet
Connect Mode:NTRIP
IP:47.103.96.216
Server Port:8080
User:SingularXYZ
Password:******
MountPoint Settings
Get
MountPoint
Mor1
1623M0001
1623M0002
Mor1
NEAREST
Base close
Share
Collection
Apply
16:42 | 0.1K/s
Rover mode settings
Datalink Settings
Data Link
Phone Internet
Connect Mode:NTRIP
IP:47.103.96.216
Server Port:8080
User:SingularXYZ
Password:******
MountPoint Settings
Get
MountPoint
Mor1
Receive data
Start
Base Coordinates Change Alert(VRS please close)
Share
Collection
Apply

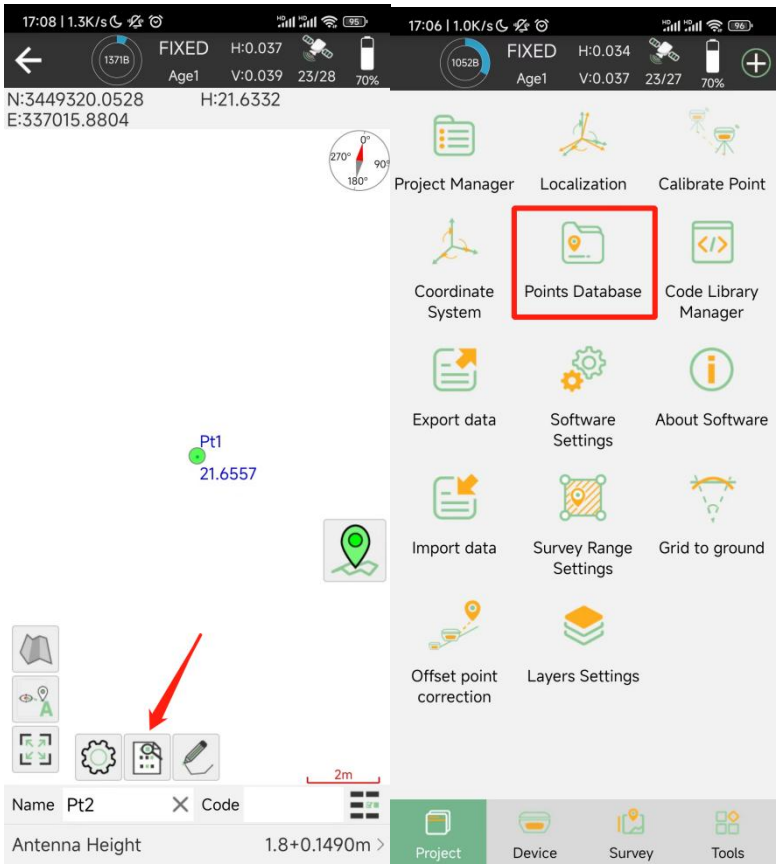

16:37 | 3.6K/s
Rover mode settings
Datalink Settings
Data Link
Phone Internet
Connect Mode:NTRIP
IP:47.103.96.216
Server Port:8080
User:SingularXYZ
Password:******
MountPoint Settings
Get
MountPoint
Mor1
Receive data
733B
Stop
Base Coordinates Change Alert(VRS please close)
Share
Collection
Apply
FIXED
H:0.042
Age1
V:0.047
17/23
70%
Communication
Rover
Device Information
Project
Device
Survey
Tools

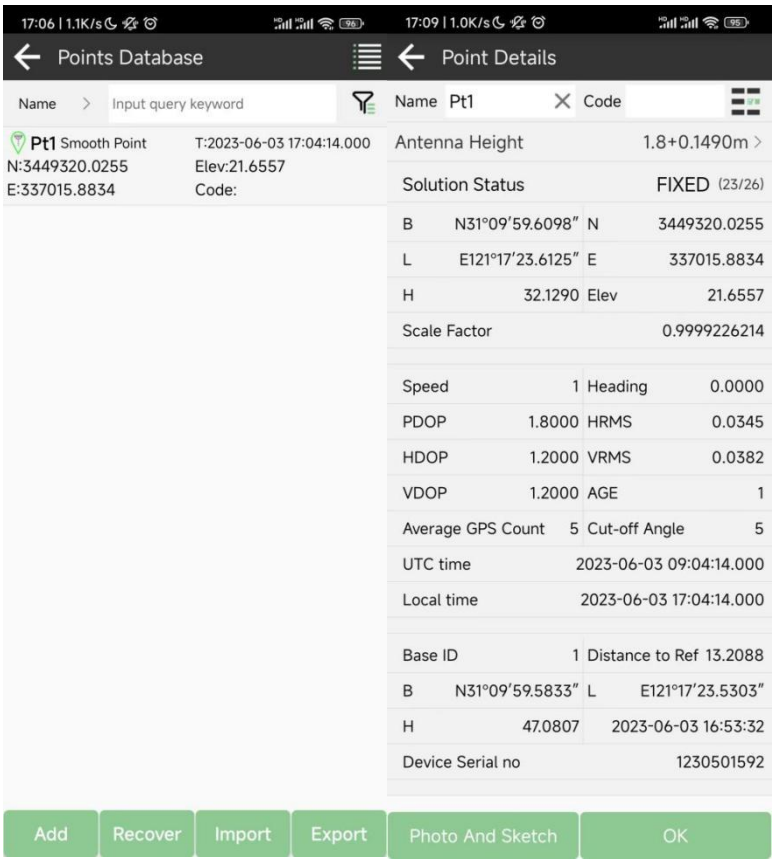
3.4 Survey

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

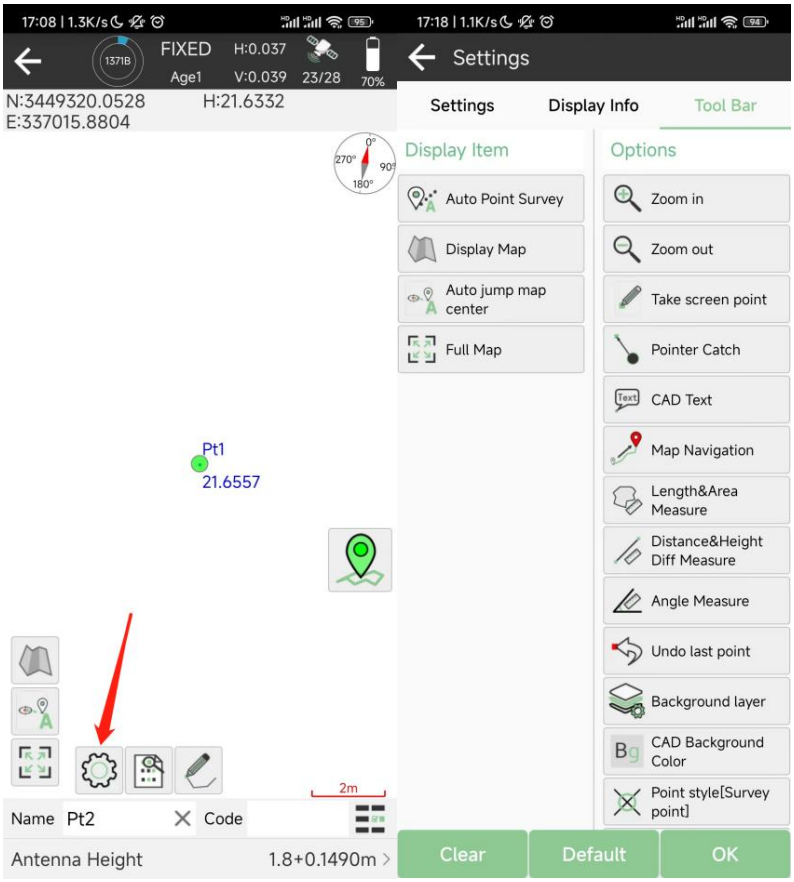


In the Point Database, you can see the point you surveyed.



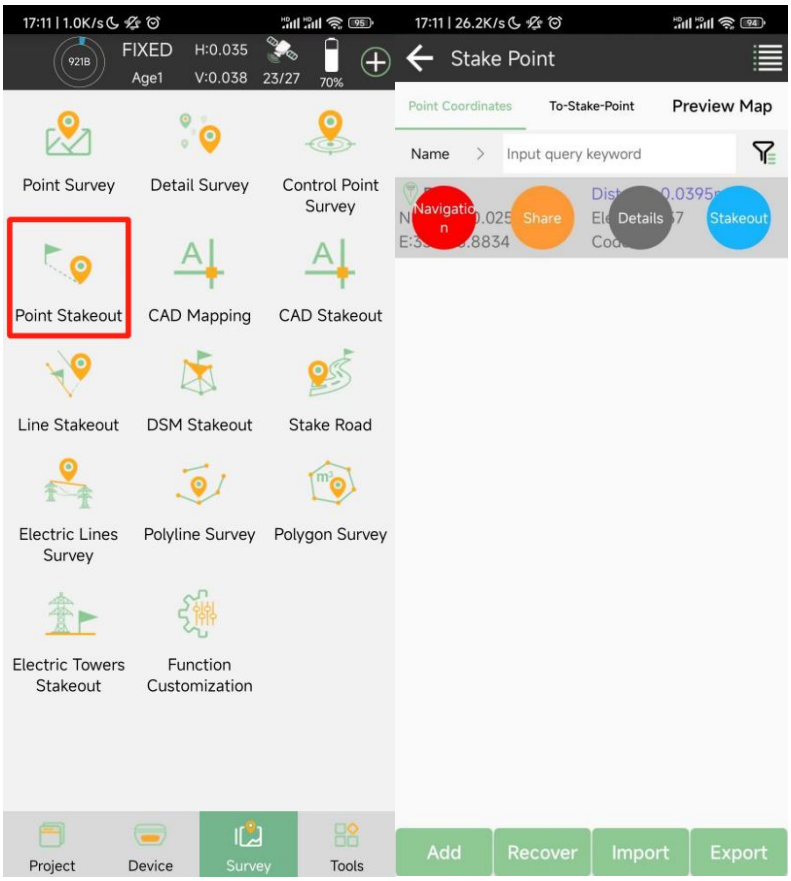


Besides common point survey, there are many other survey mode you can choose, you can find them at Settings>Tool Bar, you can click the option and click OK to add it on the survey interface.

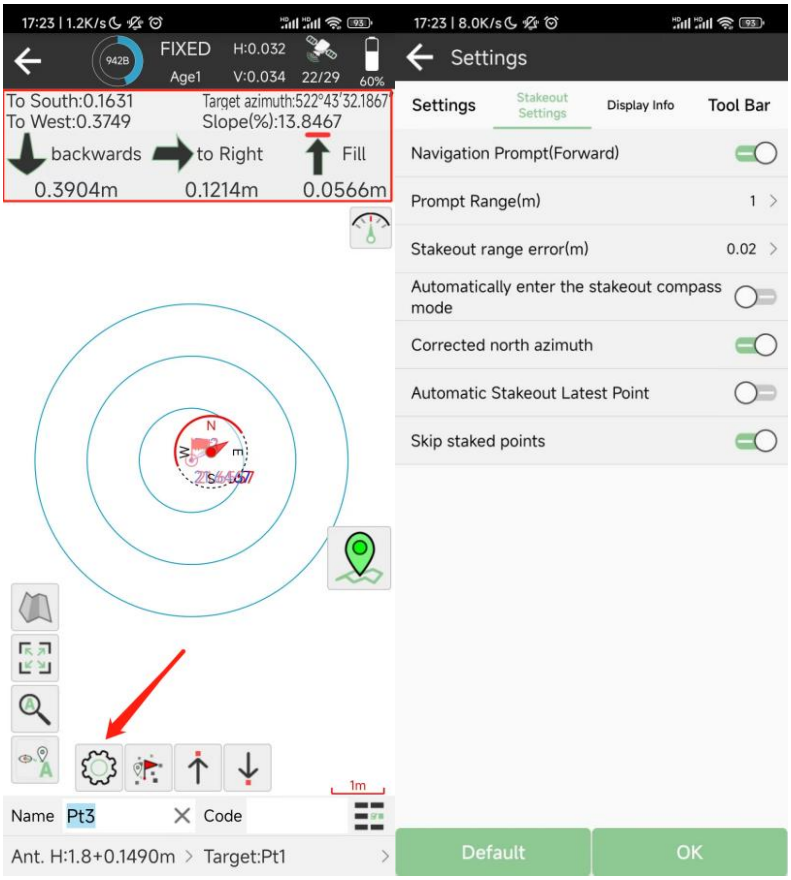


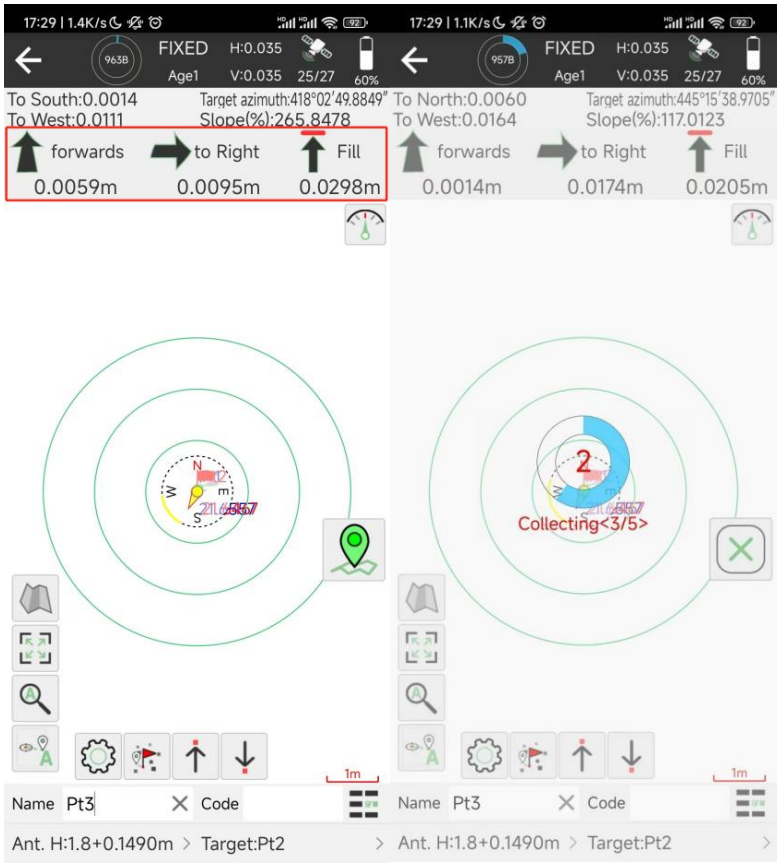
3.5 Stake Out

Go to point stake out interface, you can choose the point in the point database to stake out. You can add or import the point coordinates you need in point database.



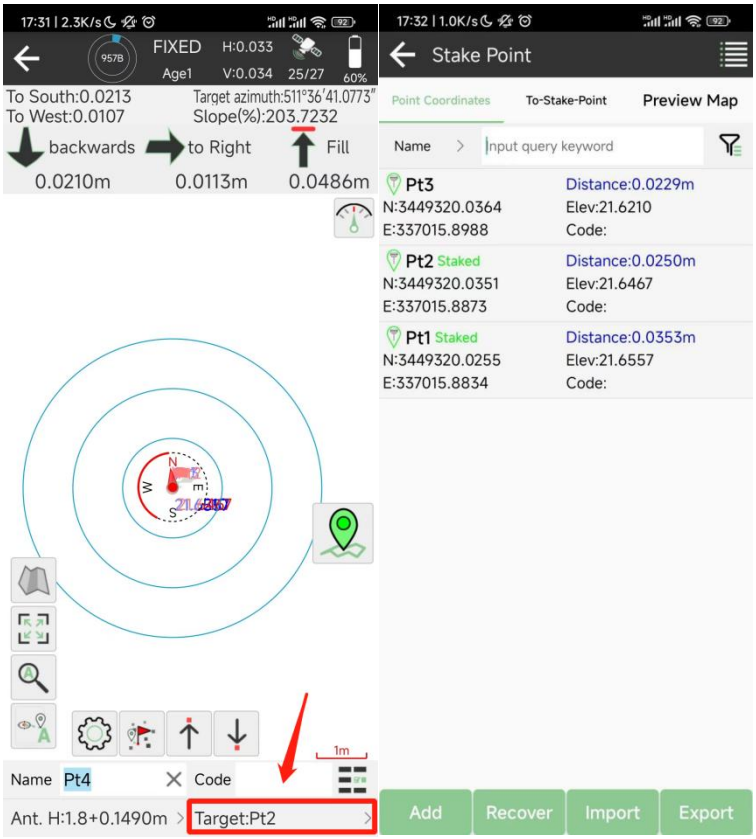
Choose a point to stake, SingularPad provides a navigation map when staking points/lines. If you are close to the target point enough, it will alarm you based on the alarm range you set.





- Click  to start or stop stake points
- Click  to scale automatically
- Click  to jump to lasted point
- Click  to jump to next point
- Click  to jump to previous point
- Click  to set stakeout settings, display info and tool bar, you can edit the prompt range and range error
- Click  to open compass

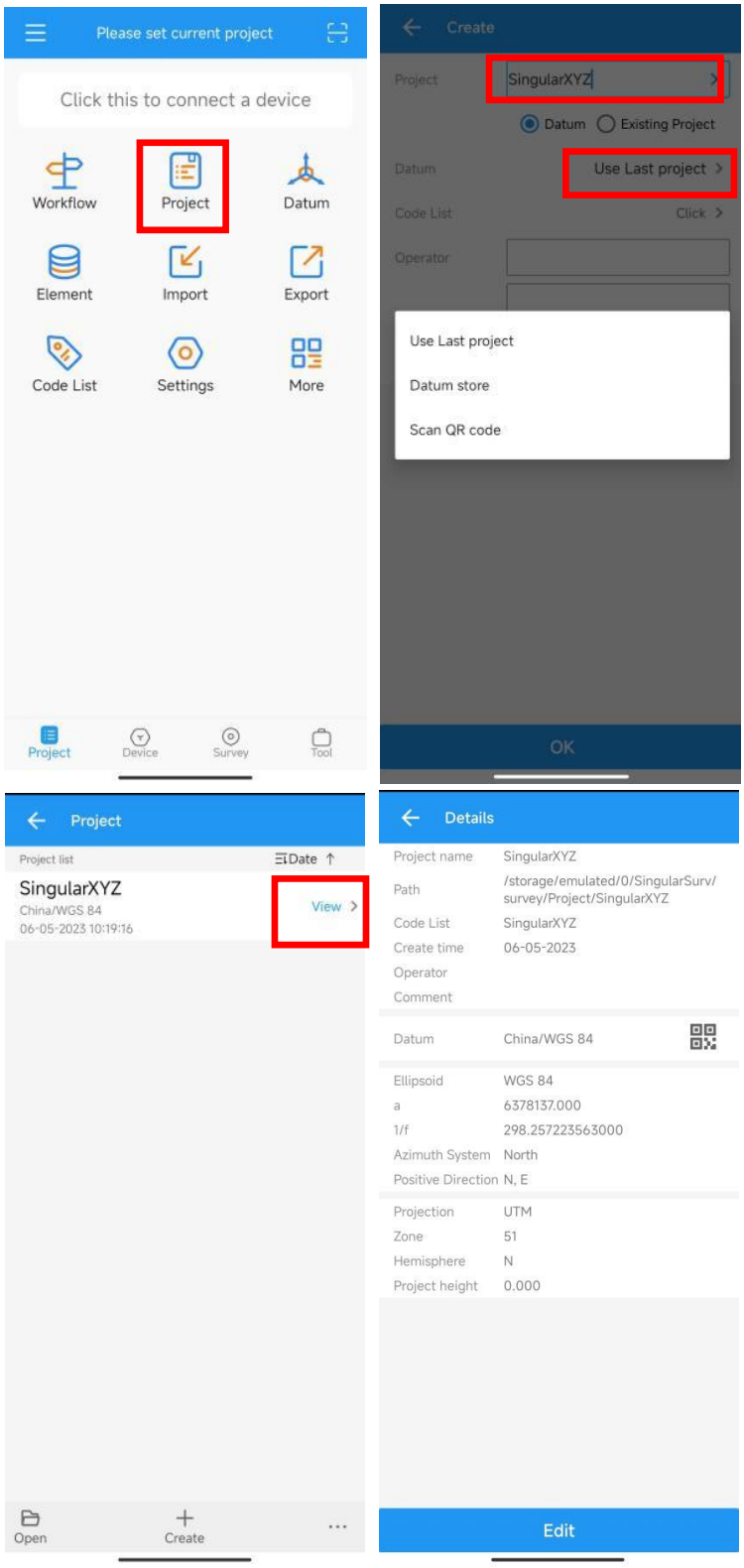
You can click the Target:Point in the lower right corner to change the point you stake out.


17:31 | 2.3K/s
FIXED
H:0.033
Age1
V:0.034
25/27
60%
To South:0.0213
To West:0.0107
Target azimuth:511°36'41.0773"
Slope(%):203.7232
backwards
to Right
Fill
0.0210m
0.0113m
0.0486m
1m
Name Pt4
Code
Ant. H:1.8+0.1490m
Target:Pt2
17:32 | 1.0K/s
Stake Point
Point Coordinates
To-Stake-Point
Preview Map
Name
Input query keyword
Pt3
Distance:0.0229m
N:3449320.0364
Elev:21.6210
E:337015.8988
Code:
Pt2 Staked
Distance:0.0250m
N:3449320.0351
Elev:21.6467
E:337015.8873
Code:
Pt1 Staked
Distance:0.0353m
N:3449320.0255
Elev:21.6557
E:337015.8834
Code:
Add
Recover
Import
Export

4 RTK Workflow In SingularSurv

4.1 Create a new project

Click Project, set project name and select project datum

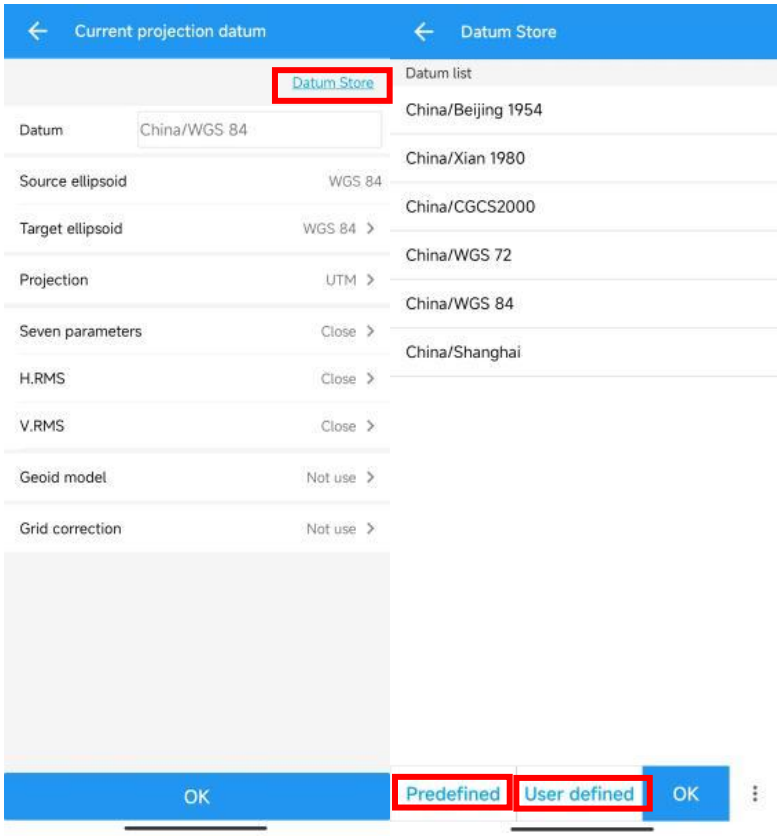


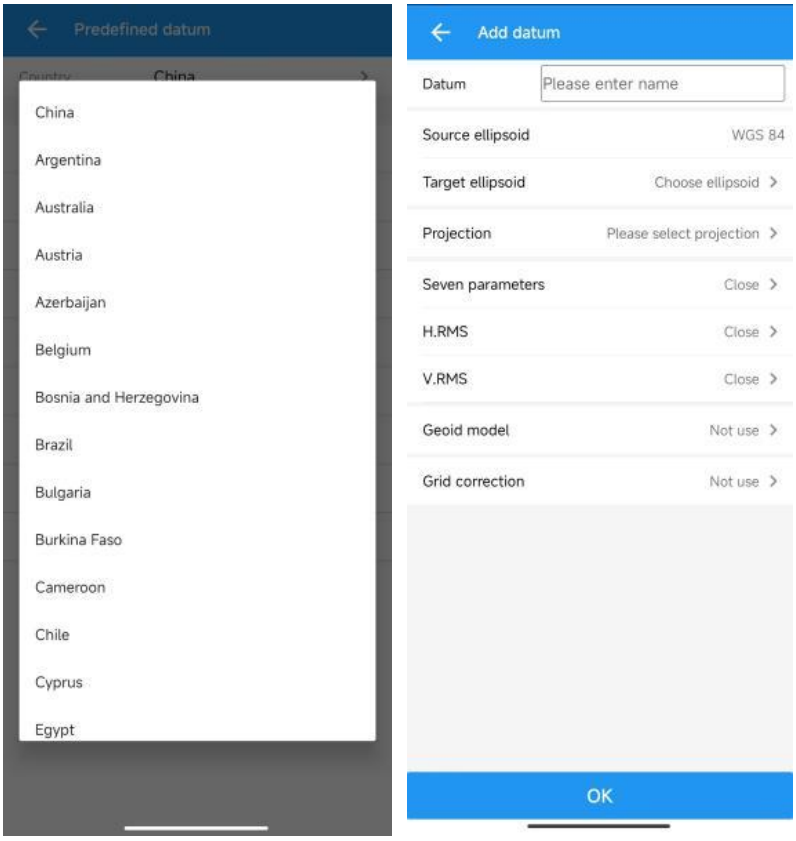
In Project interface, you can click Create to add a new project or click Open to open the previous project.

If you have added one project, you can click View or click the project name in the main interface to check the current project details, including Project name, store path, and datum parameters. Click the QR to share your datum information to others. Besides, click Edit to change the datum parameters, also, you can change in the Datum interface.

To edit datum parameters, SingularSurv supports three methods: Use last project, Datum store, Scan QR code.

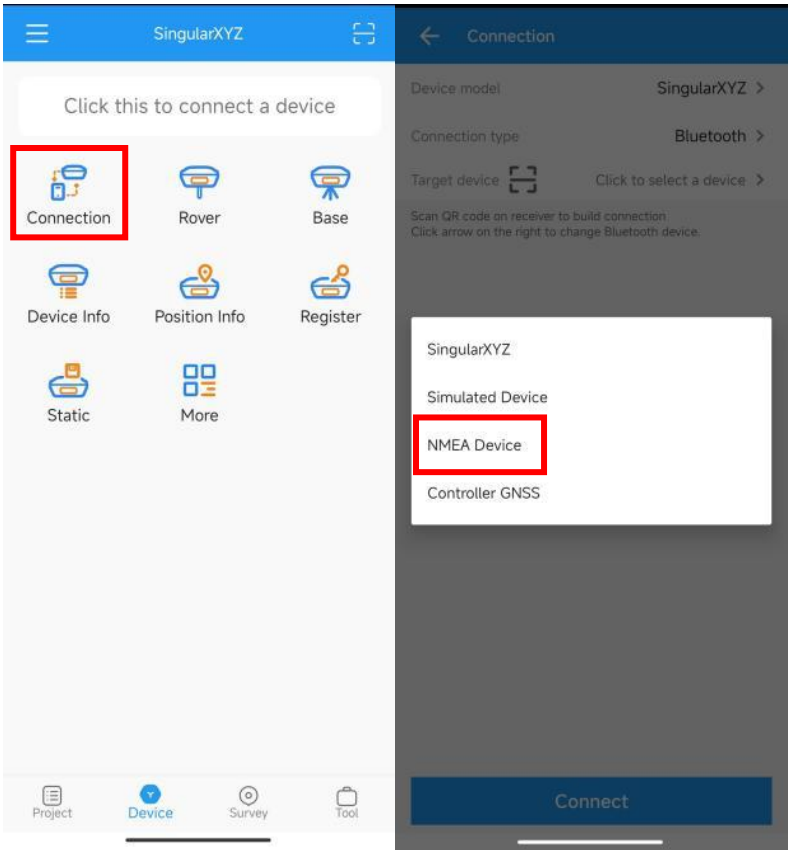
- Use Last project: If you have added datum before, then you can choose to use the datum of last project for current project.
- Scan QR code: Support to get the datum from other users.
- Datum store->Select a Predefined datum: You can select datum directly from the list. SingularSurv currently has 49 countries datum and will add more afterwards. Create a User defined datum: If you cannot find datum you want in the list, follow instructions below to add one: select Source ellipsoid, Target ellipsoid, Projection for your datum, and even seven parameters, geoid model based on your request.

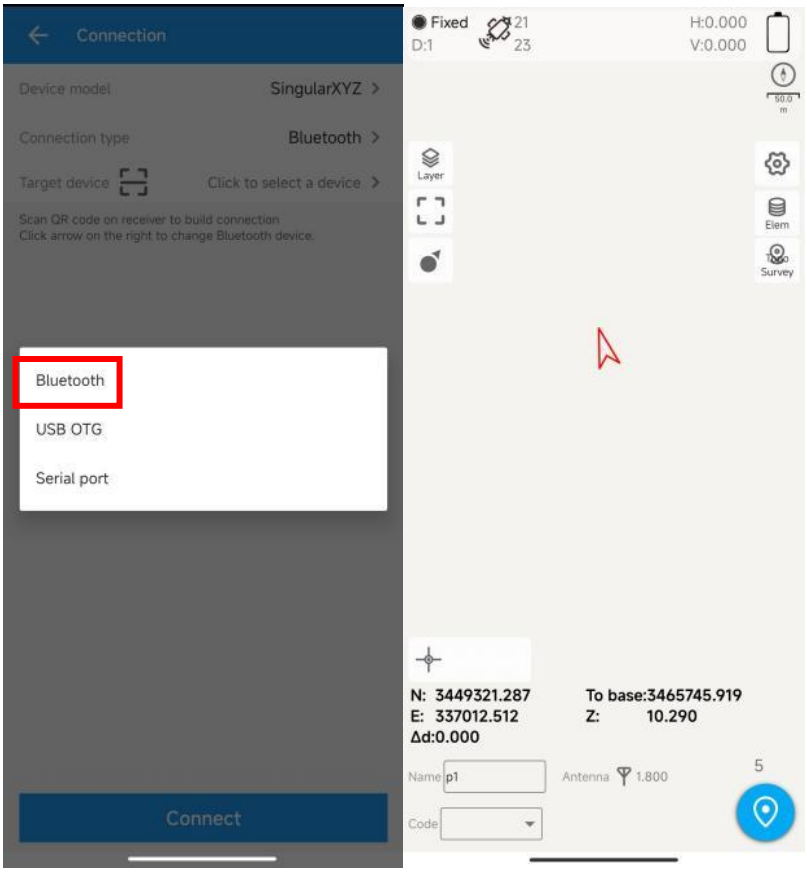




4.2 Connect to receiver

After creating a new project, switch to Device, tap Connection. Choose NMEA Device as Device model, choose Bluetooth as Connection type, click to select the Sfaira ONE Bluetooth to connect, the Bluetooth number is its SN.





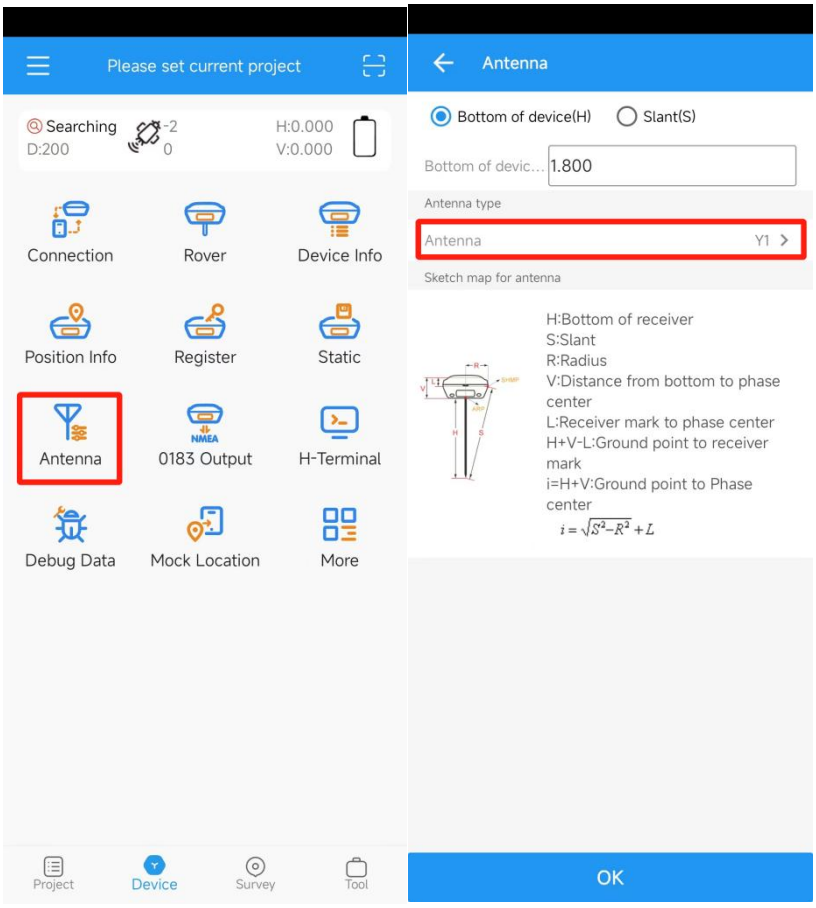
After connected successfully, the top will show the positioning status.

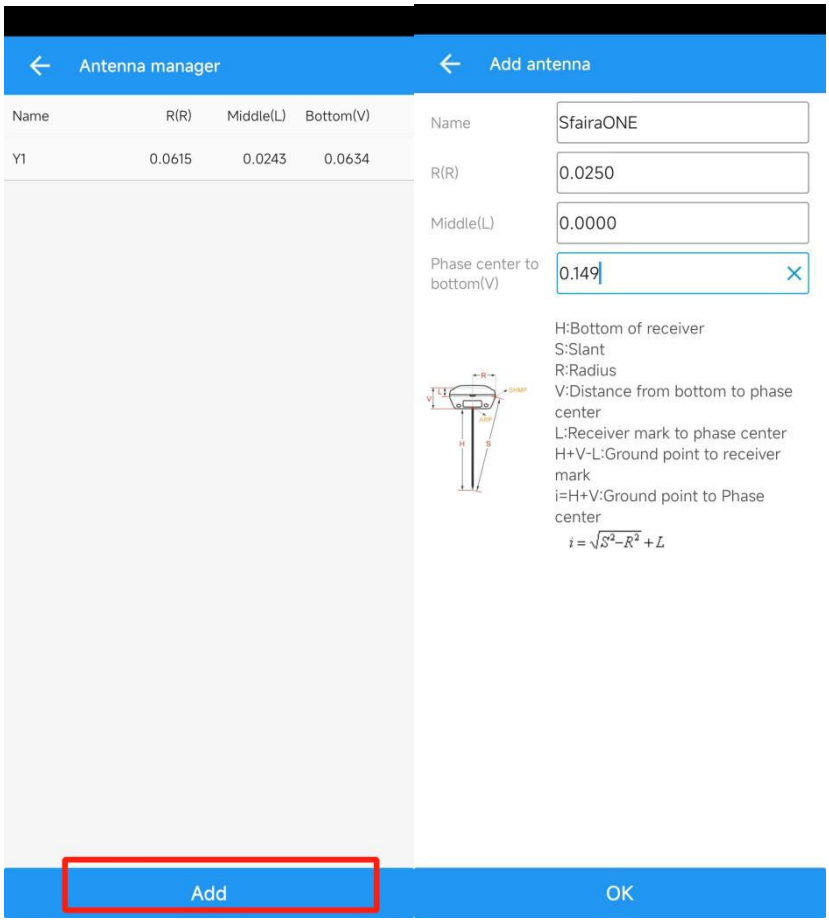
Tips: If you failed to connect with receiver through SingularSurv, you can just follow prompt info to go into the device Bluetooth setting interface to make sure Bluetooth paired successfully. Sometimes you need restart the receiver or SingularSurv.

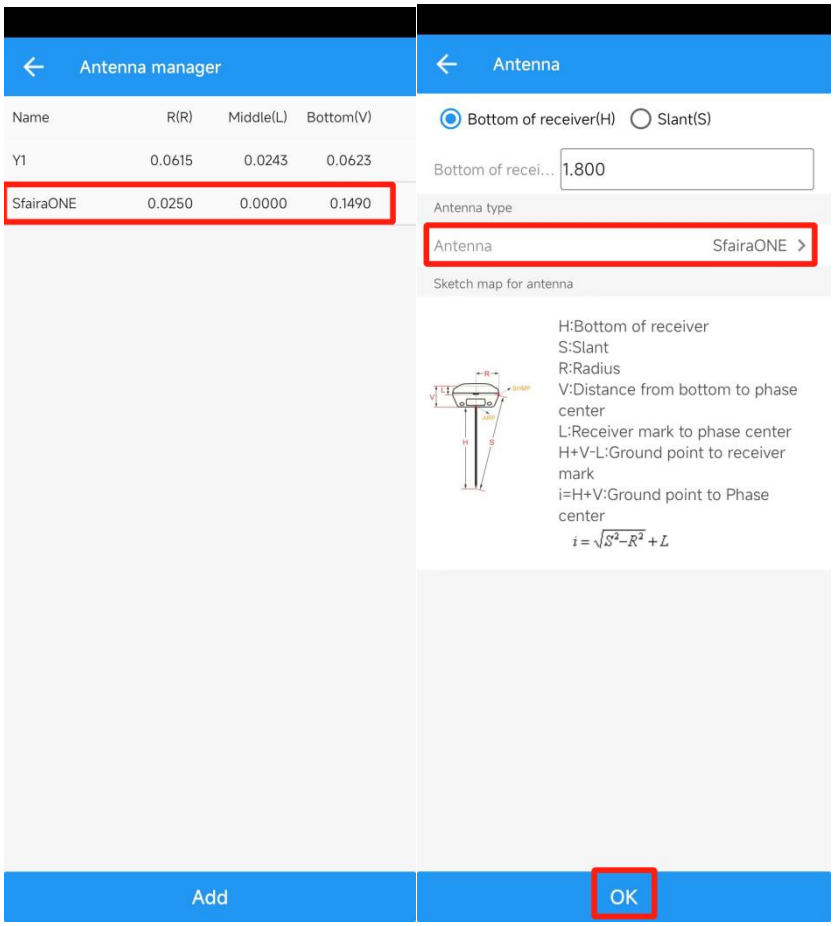
4.3 Quick Setup Your Receiver

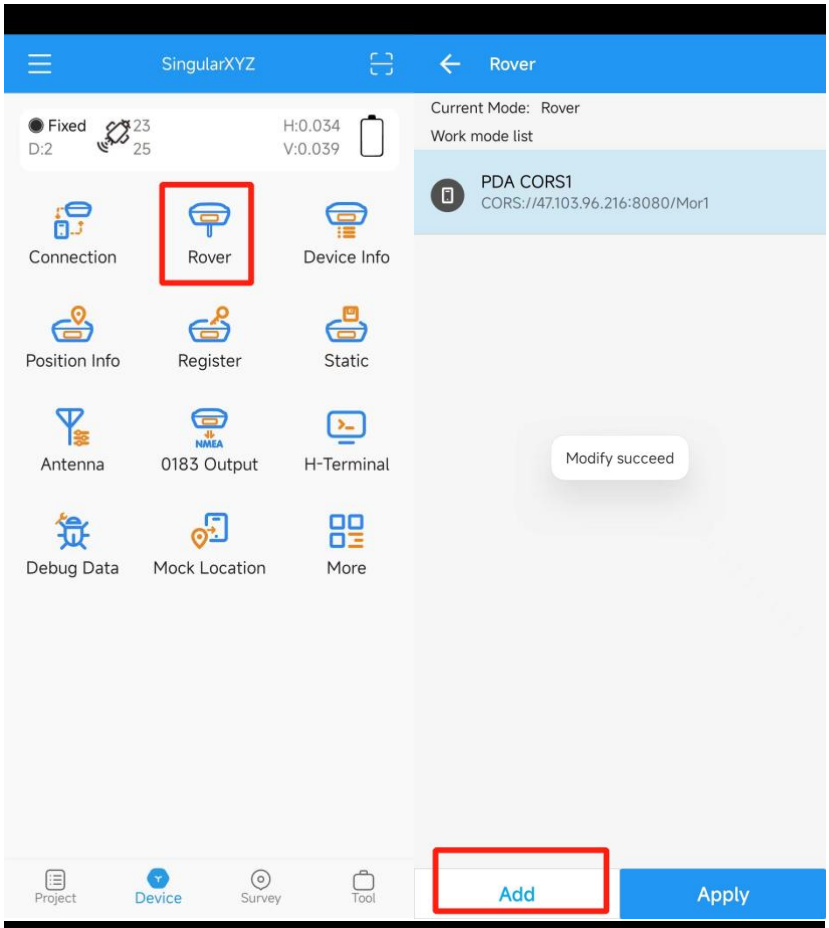
You should add an antenna model for Sfaira ONE, the antenna L1 offset parameter is :149mm, you should add a model for Sfaira ONE and choose it.

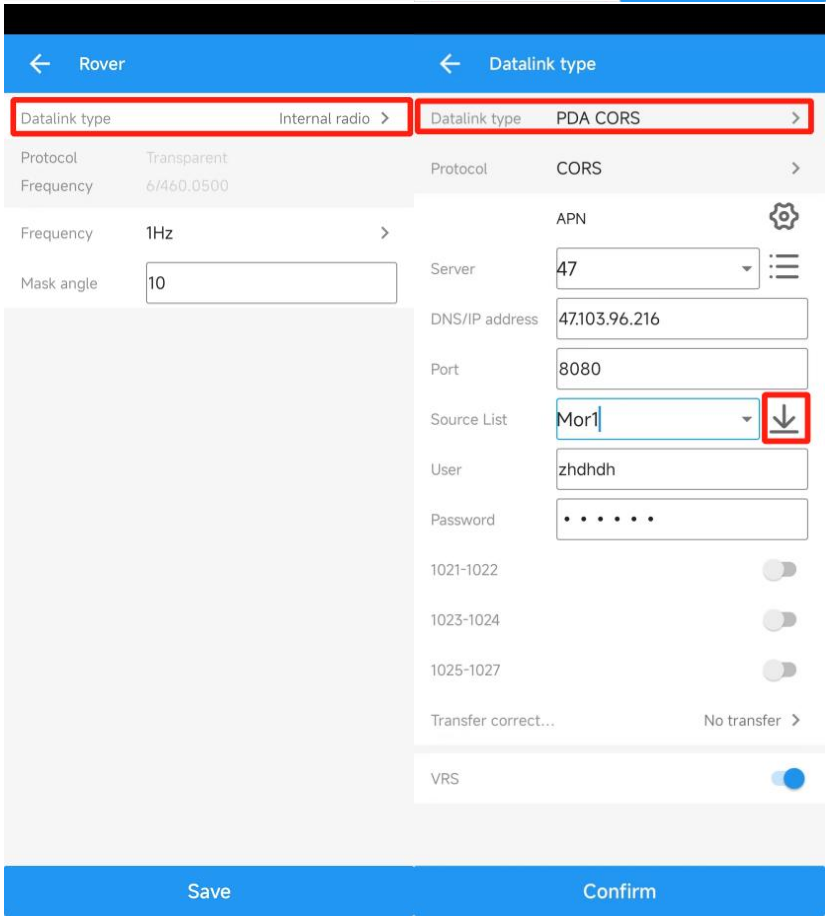
Go to Device>Rover to setup your Sfira ONE. You should click add to add a work mode. Choose the PDA CORS as Data link type, enter the ip address, port, user and password, click get to get the mount point, select the base. Click confirm and OK to save the work mode, click apply to apply the work, when it is applied successfully, please back to the main interface to check the RTK status.

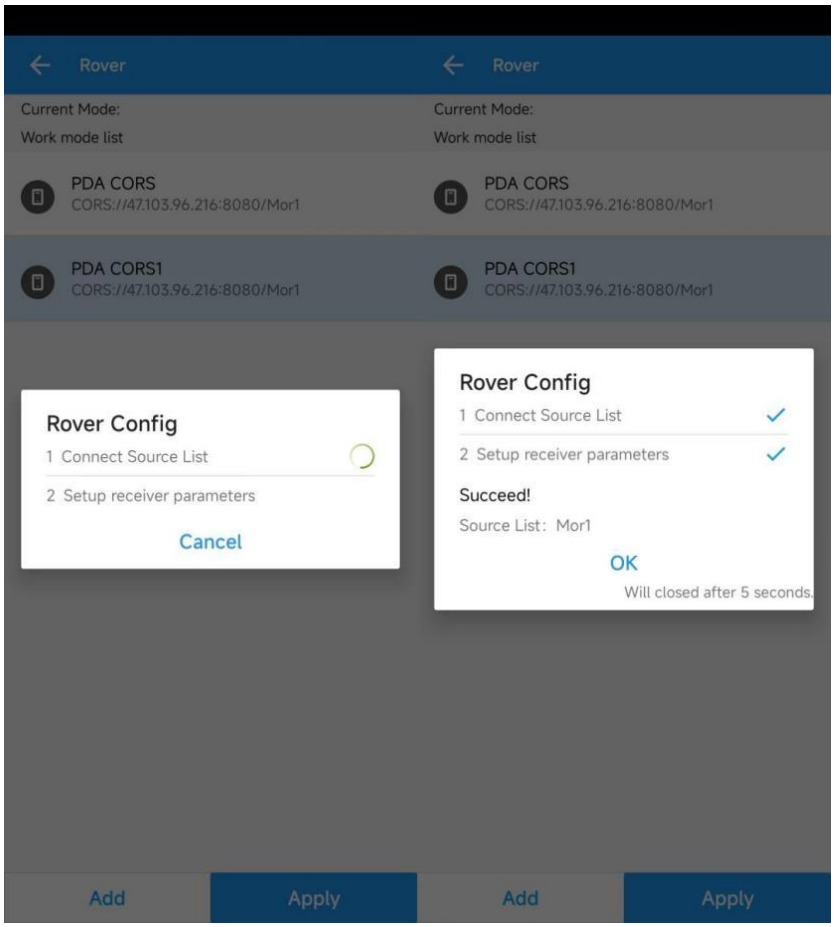



Antenna manager
Name R(R) Middle(L) Bottom(V)
Y1 0.0615 0.0243 0.0634
Add
Add antenna
Name SfairaONE
R(R) 0.0250
Middle(L) 0.0000
Phase center to bottom(V) 0.149
H:Bottom of receiver
S:Slant
R:Radius
V:Distance from bottom to phase center
L:Receiver mark to phase center
H+V-L:Ground point to receiver mark
i=H+V:Ground point to Phase center
$i=\sqrt{S^2-R^2}+L$
OK


Antenna manager
Name R(R) Middle(L) Bottom(V)
Y1 0.0615 0.0243 0.0623
SfairaONE 0.0250 0.0000 0.1490
Add
Antenna
Bottom of receiver(H) Slant(S)
Bottom of recei... 1.800
Antenna type
Antenna SfairaONE
Sketch map for antenna
H:Bottom of receiver
S:Slant
R:Radius
V:Distance from bottom to phase center
L:Receiver mark to phase center
H+V-L:Ground point to receiver mark
i=H+V:Ground point to Phase center
$i=\sqrt{S^2-R^2}+L$
OK


SingularXYZ
Fixed
D:2
23
25
H:0.034
V:0.039
Connection
Rover
Device Info
Position Info
Register
Static
Antenna
0183 Output
H-Terminal
Debug Data
Mock Location
More
Project
Device
Survey
Tool
Rover
Current Mode: Rover
Work mode list
PDA CORS1
CORS://47.103.96.216:8080/Mor1
Modify succeed
Add
Apply


Rover
Datalink type
Internal radio
Protocol
Transparent
Frequency
6/460.0500
Frequency
1Hz
Mask angle
10
Save
Datalink type
Datalink type
PDA CORS
Protocol
CORS
APN
Server
47
DNS/IP address
47.103.96.216
Port
8080
Source List
Mor1
User
zhdhdh
Password
1021-1022
1023-1024
1025-1027
Transfer correct...
No transfer
VRS
Confirm



4.4 Survey

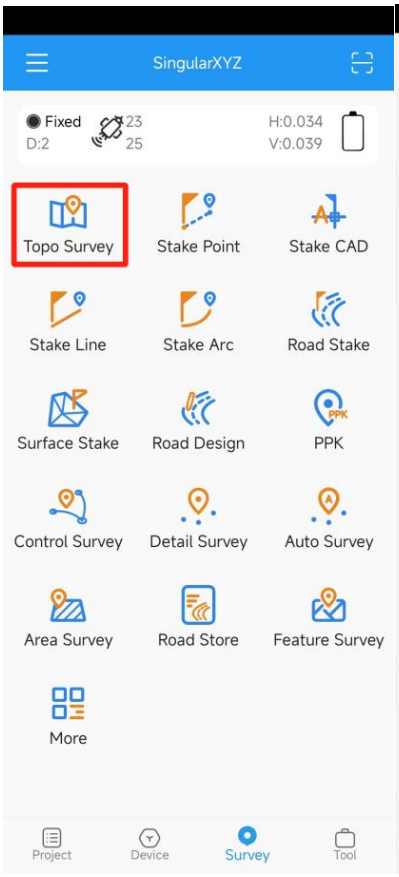
When you get the fixed solution, you can go to survey, go to survey> Topo survey, enter point name, ->click to start or stop collecting data. You can check

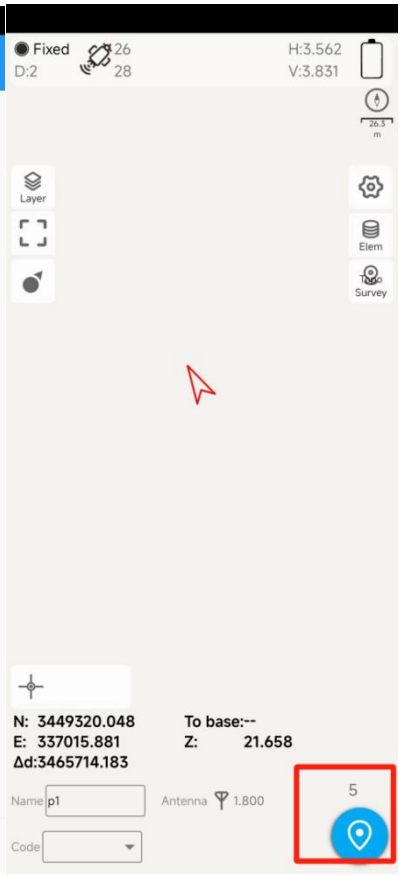
- You can quickly change antenna height in the survey interface.
- Tap ***Elem*** to check point coordinates you surveyed.
- Tap ***Layer*** to show the layers: google map/google satellite/DXF/SHP

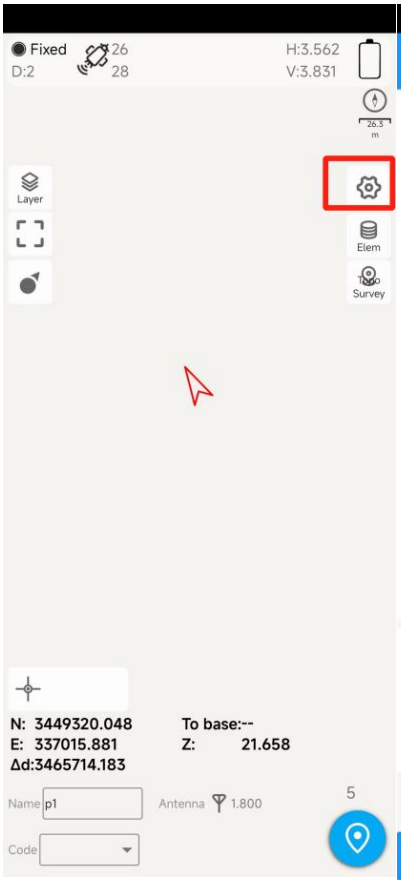
: Click this to show the whole points on the interface.

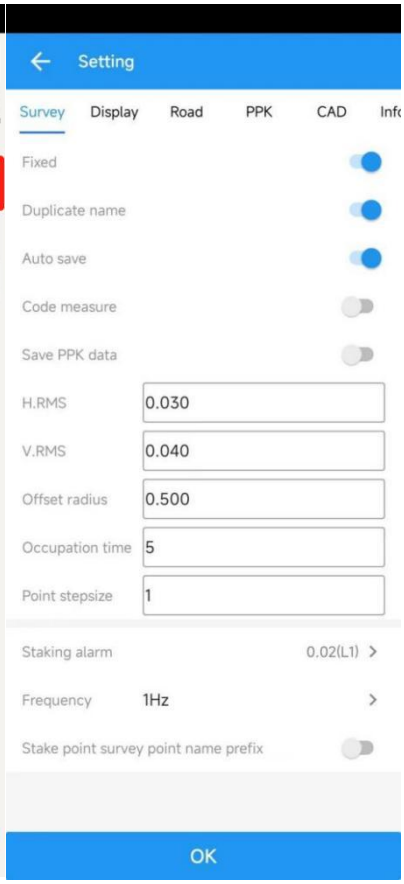
: If the arrow is out of sight on the interface, you can click this to locate the receiver position, then the arrow will be shown on the interface.

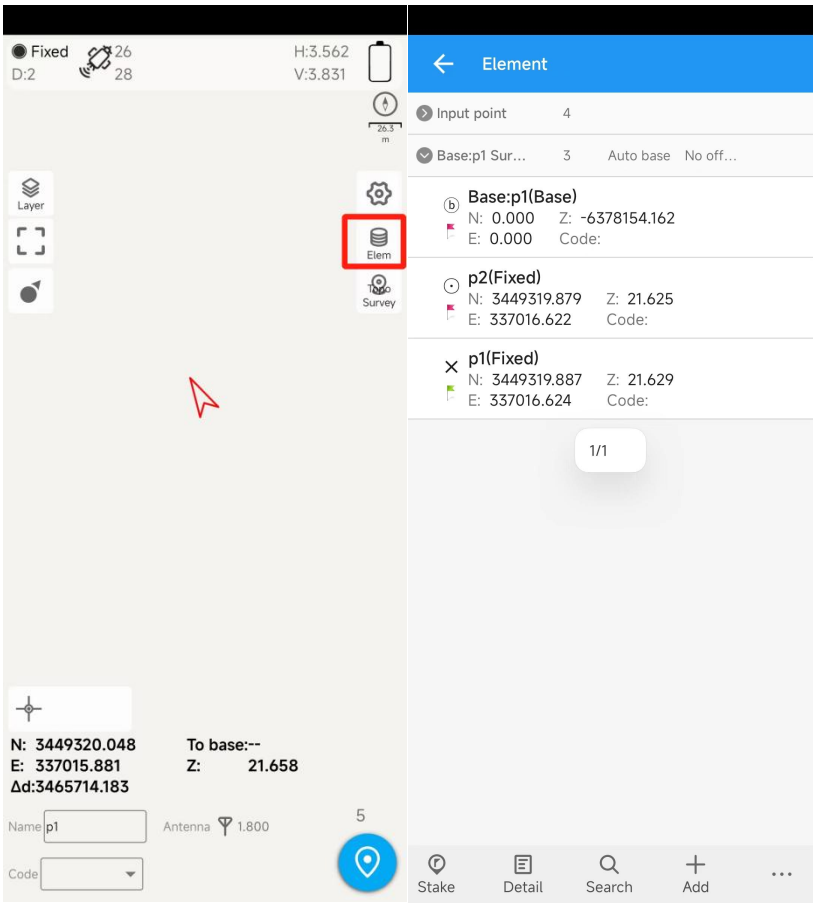
: You should set the measurement parameters, such as RMS limit, Occupation time, etc


SingularXYZ
Fixed
D:2
23
25
H:0.034
V:0.039
Topo Survey
Stake Point
Stake CAD
Stake Line
Stake Arc
Road Stake
Surface Stake
Road Design
PPK
Control Survey
Detail Survey
Auto Survey
Area Survey
Road Store
Feature Survey
More
Project
Device
Survey
Tool


Fixed
D:2
26
28
H:3.562
V:3.831
Layer
Elem
Survey
N: 3449320.048
E: 337015.881
Δd:3465714.183
To base:--
Z: 21.658
Name p1
Antenna 1.800
Code
5

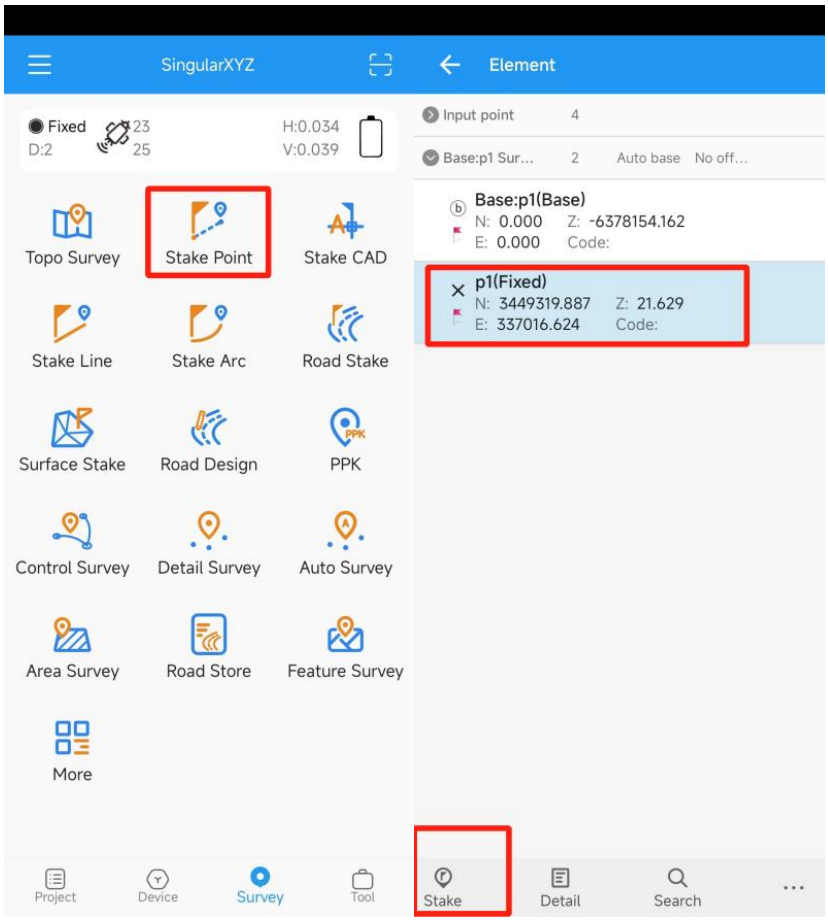

Fixed
D:2
26
28
H:3.562
V:3.831
Layer
Elem
Survey
N: 3449320.048
E: 337015.881
Δd:3465714.183
To base:--
Z: 21.658
Name p1
Antenna 1.800
Code
5

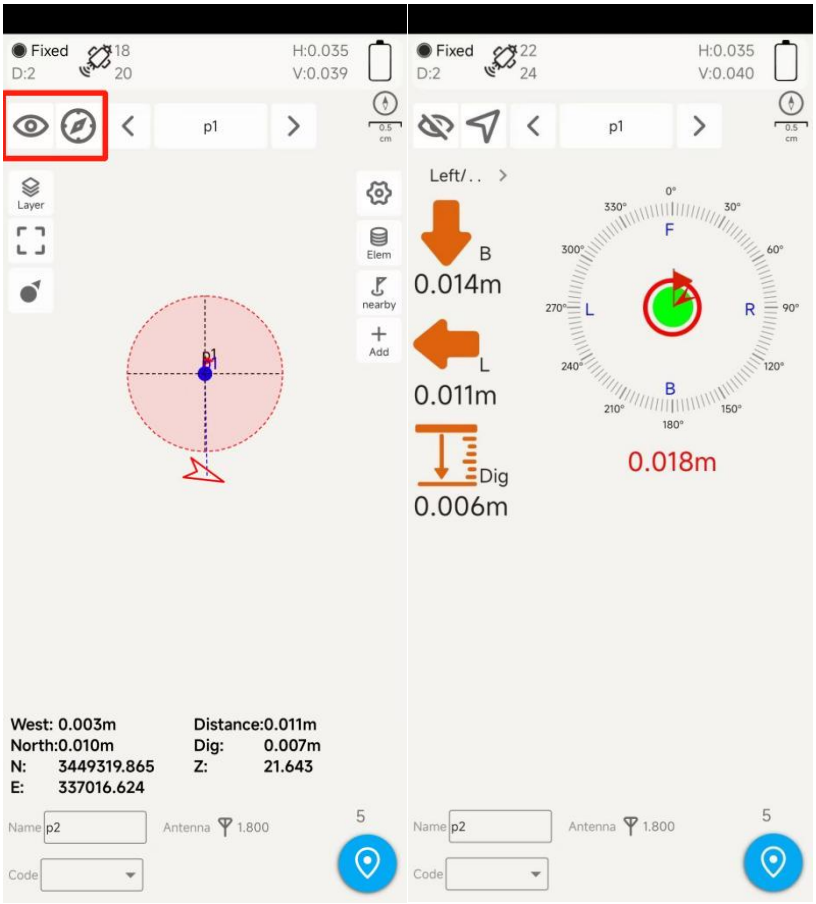

Setting
Survey
Display
Road
PPK
CAD
Fixed
Duplicate name
Auto save
Code measure
Save PPK data
H.RMS
0.030
V.RMS
0.040
Offset radius
0.500
Occupation time
5
Point stepsize
1
Staking alarm
0.02(L1)
Frequency
1Hz
Stake point survey point name prefix
OK

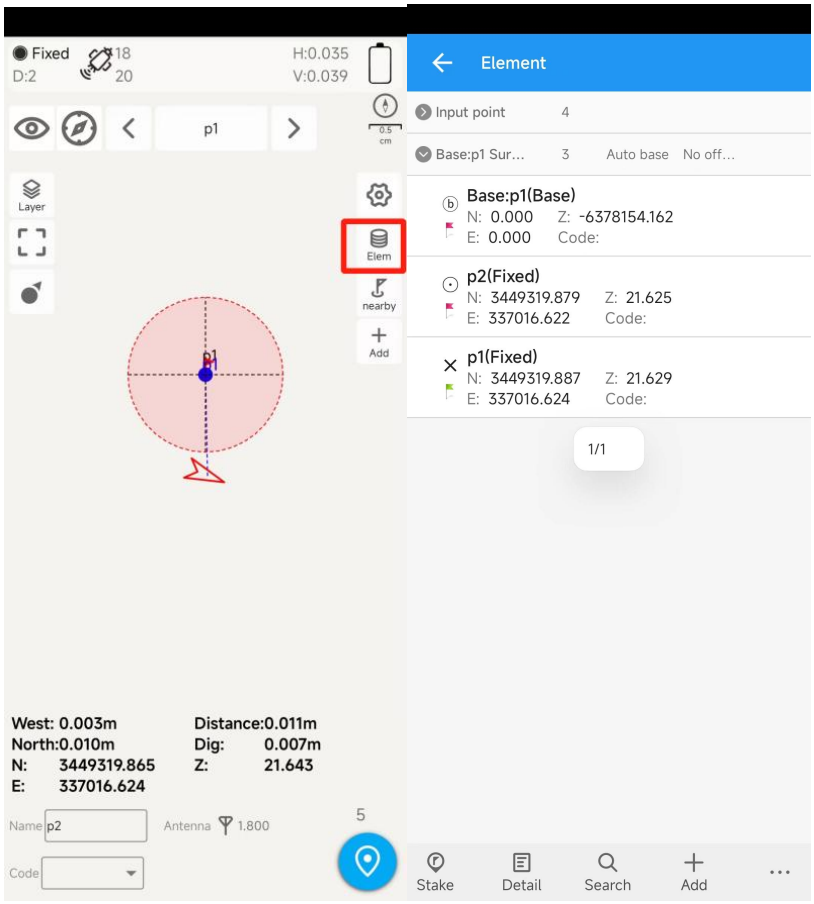


4.5 Stake Out

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


SingularXYZ
Fixed
D:2
23
25
H:0.034
V:0.039
Topo Survey
Stake Point
Stake CAD
Stake Line
Stake Arc
Road Stake
Surface Stake
Road Design
PPK
Control Survey
Detail Survey
Auto Survey
Area Survey
Road Store
Feature Survey
More
Project
Device
Survey
Tool
Element
Input point
4
Base:p1 Sur...
2
Auto base
No off...
Base:p1(Base)
N: 0.000
Z: -6378154.162
E: 0.000
Code:
p1(Fixed)
N: 3449319.887
Z: 21.629
E: 337016.624
Code:
Stake
Detail
Search


Fixed
D:2
18
20
H:0.035
V:0.039
p1
Layer
Elem
nearby
Add
p1
West: 0.003m
North:0.010m
N: 3449319.865
E: 337016.624
Distance:0.011m
Dig: 0.007m
Z: 21.643
Name p2
Antenna 1.800
Code
5
Fixed
D:2
22
24
H:0.035
V:0.040
p1
Left/..
B
0.014m
L
0.011m
Dig
0.006m
0°
30°
60°
90°
120°
150°
180°
210°
240°
270°
300°
330°
F
R
B
L
0.018m
Name p2
Antenna 1.800
Code
5


Fixed
D:2
18
20
H:0.035
V:0.039
p1
Layer
Elem
nearby
Add
p1
West: 0.003m
North:0.010m
N: 3449319.865
E: 337016.624
Distance:0.011m
Dig: 0.007m
Z: 21.643
Name p2
Antenna 1.800
Code
5
Element
Input point 4
Base:p1 Sur... 3 Auto base No off...
Base:p1(Base)
N: 0.000 Z: -6378154.162
E: 0.000 Code:
p2(Fixed)
N: 3449319.879 Z: 21.625
E: 337016.622 Code:
p1(Fixed)
N: 3449319.887 Z: 21.629
E: 337016.624 Code:
1/1
Stake
Detail
Search
Add

5 Connect with GIS Software

The Sfaira ONE receiver is very suitable for GIS measurement. Compared to ordinary receivers, it has smaller size, lighter weight, and retains powerful performance. If you want to use Sfaira ONE and other GIS software for measurement, please follow the following steps. Let's take Qfield as an example.

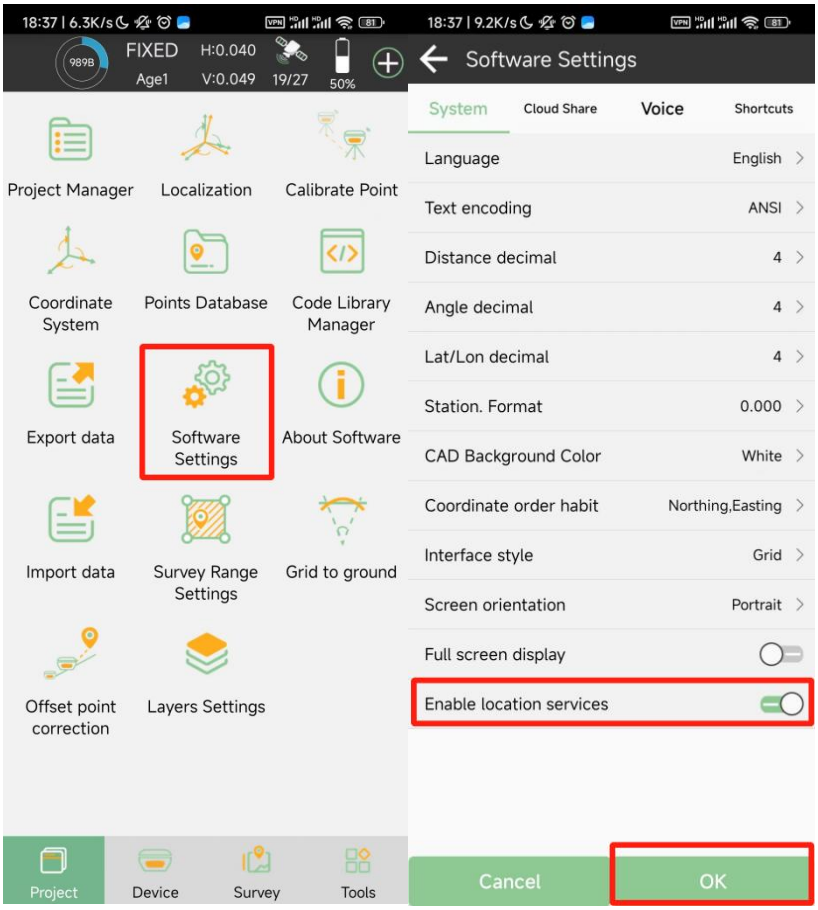
First, you should connect Sfaira ONE with SingularPad, and setup it to get a fixed solution.

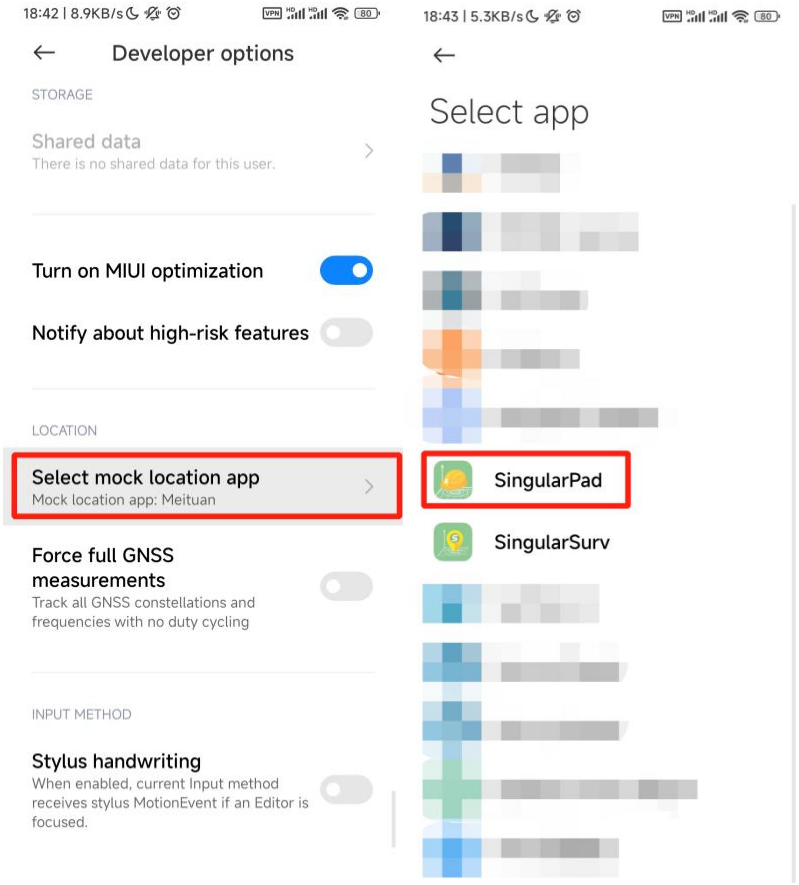
Second, In the software setting, enable the location services, it will share the high precision positioning data to the controller.

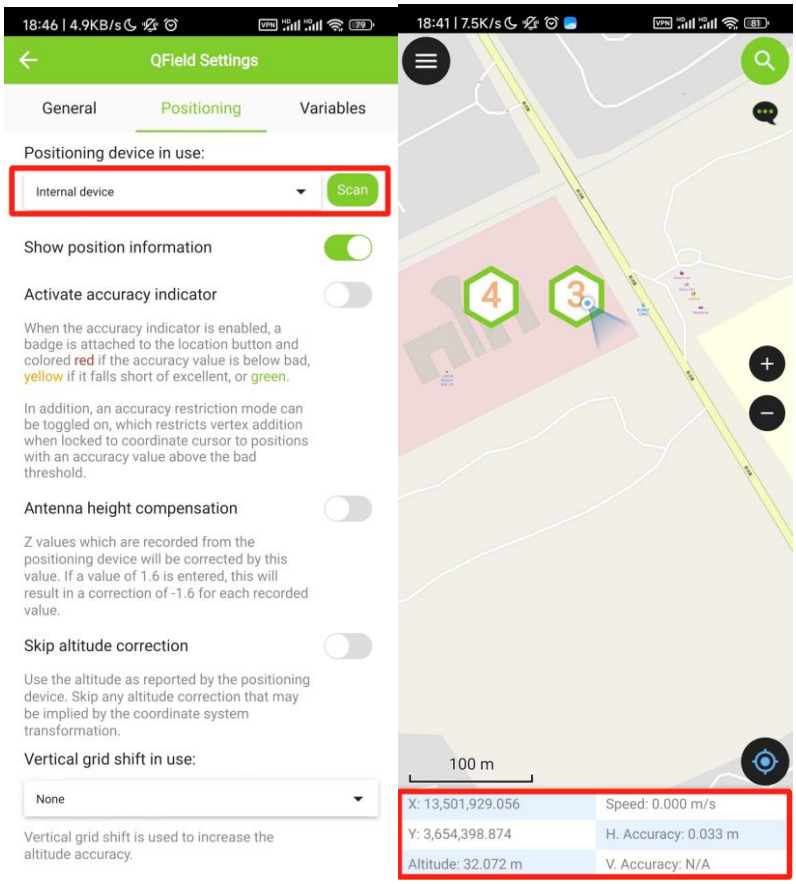
Go to the system settings of your controller, click the system version 5 times to open the developer option. In the developer option, there is a function Select mock location app, this function will use the position from the app as the position of controller, and you should select SingularPad.

After that, you can go to Qfield, choose the Positioning Device as internal device, it will use the position of the controller which is RTK fixed position from the Sfaira one.

Then you can do your GIS work.




18:42 | 8.9KB/s
Developer options
STORAGE
Shared data
There is no shared data for this user.
Turn on MIUI optimization
Notify about high-risk features
LOCATION
Select mock location app
Mock location app: Meituan
Force full GNSS measurements
Track all GNSS constellations and frequencies with no duty cycling
INPUT METHOD
Stylus handwriting
When enabled, current Input method receives stylus MotionEvent if an Editor is focused.
18:43 | 5.3KB/s
Select app
SingularPad
SingularSurv


18:46 | 4.9KB/s
QField Settings
General
Positioning
Variables
Positioning device in use:
Internal device
Scan
Show position information
Activate accuracy indicator
When the accuracy indicator is enabled, a badge is attached to the location button and colored red if the accuracy value is below bad, yellow if it falls short of excellent, or green.
In addition, an accuracy restriction mode can be toggled on, which restricts vertex addition when locked to coordinate cursor to positions with an accuracy value above the bad threshold.
Antenna height compensation
Z values which are recorded from the positioning device will be corrected by this value. If a value of 1.6 is entered, this will result in a correction of -1.6 for each recorded value.
Skip altitude correction
Use the altitude as reported by the positioning device. Skip any altitude correction that may be implied by the coordinate system transformation.
Vertical grid shift in use:
None
Vertical grid shift is used to increase the altitude accuracy.
18:41 | 7.5K/s
4
3
100 m
X: 13,501,929.056
Speed: 0.000 m/s
Y: 3,654,398.874
H. Accuracy: 0.033 m
Altitude: 32.072 m
V. Accuracy: N/A

FCC Warning

This device complies with part 15 of the FCC rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any inte rference received, including interference that may cause undesired operation.

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

NOTE: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interferenceto radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

Radiation Exposure Statement

The device has been evaluated to meet general RF exposure requirement. The device can be used in portable exposure condition without restriction.