

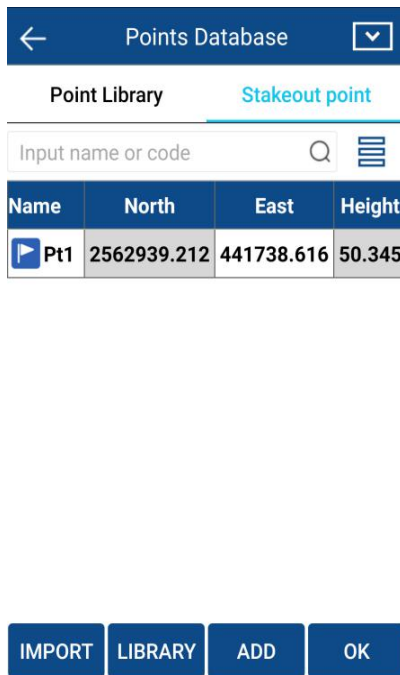


Figure 3.11-1

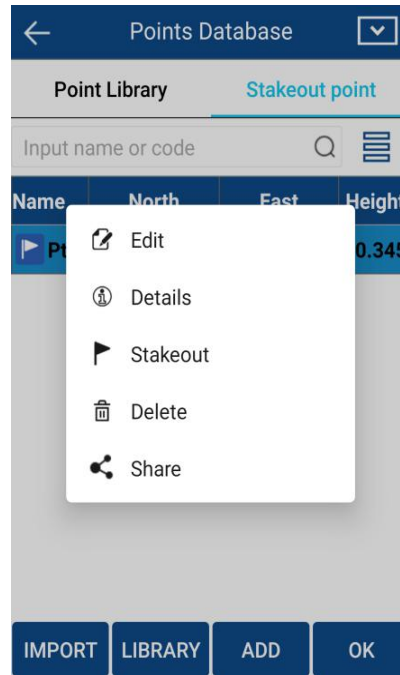


Figure 3.11-2



Figure 3.11-3

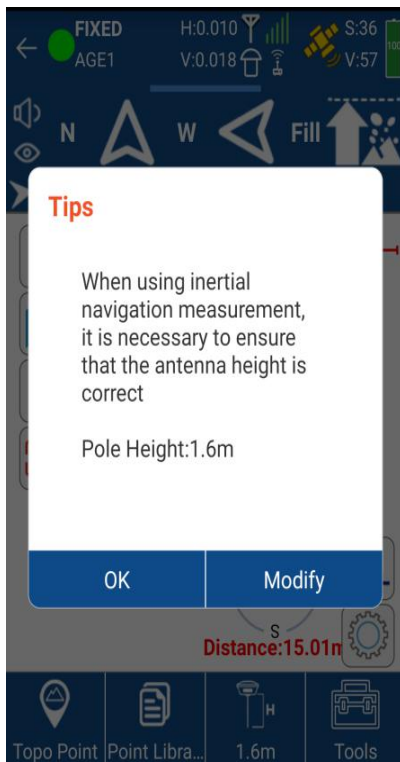


Figure 3.11-4

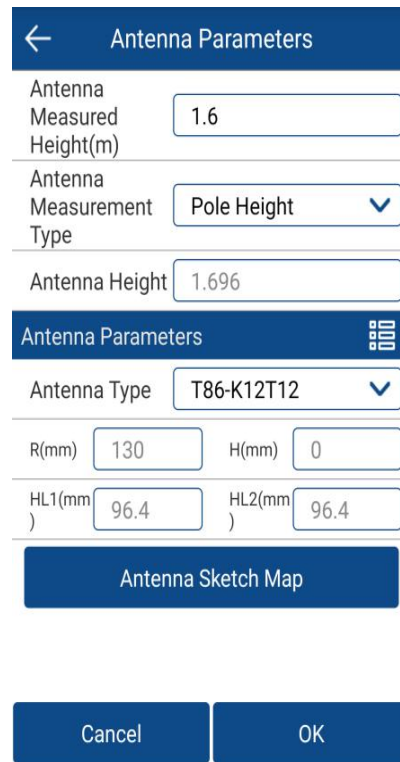


Figure 3.11-5



Figure 3.11-6

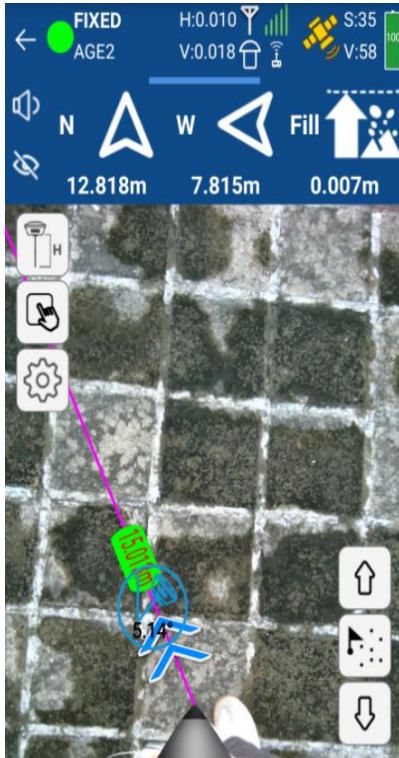


Figure 3.11-7



Figure 3.11-8



Figure 3.11-9

3.12 Localization

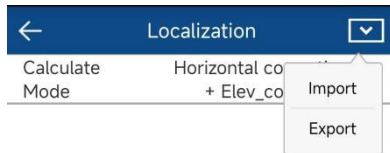
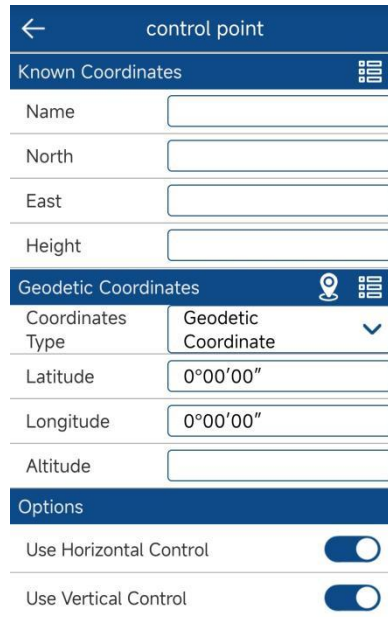
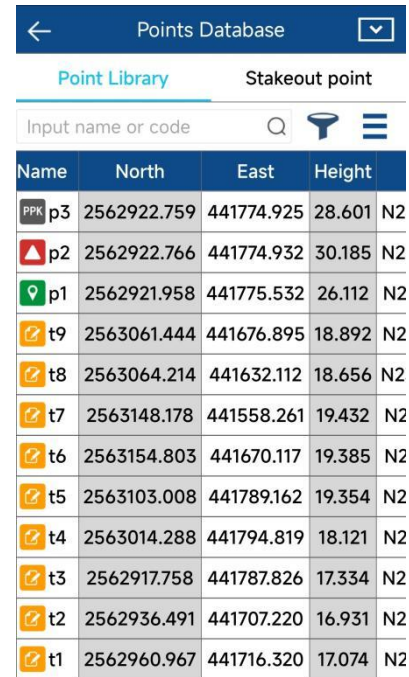
Click [**Project**]-> [**Localization**], as shown in Figure 3.12-1. You can import control point parameters in various formats or export control point data into files for use with third-party software. The high-precision position obtained by the software from the GNSS device is the latitude and longitude coordinates of satellite positioning, but in actual project operations, the plane coordinates on the ground are ultimately required for survey and application. If the customer has coordinates conversion parameters, the coordinate system parameter values can be set directly in the coordinate system (details 2.3). If the customer does not have specific coordinate system parameters, but has corresponding latitude and longitude coordinates and plane coordinates, we call them control points. In the case of control point data, this function can be used to calculate the conversion parameters and apply them to project operations.

Click [**Add**], as shown in Figure 3.12-2. You can either manually enter a control point or import it from the coordinate point library, as shown in Figure 3.12-3. In the control point list, select the data item to modify, edit and delete the control point parameters, as shown in Figure 3.12-4.

After editing the control point parameters, calculate the conversion parameters for the control points. Click [Calculation Method] to pop up the conversion parameter condition settings, as shown in Figure 3.12-5. Coordinate conversion methods include plane correction, vertical correction, elevation fitting and seven parameters, which can be all or part of the combination. As long as the corresponding accuracy is achieved within the accuracy range, the calculated conversion parameters are considered to be available. The plane correction model includes four parameters and horizontal adjustment. The elevation fitting method includes

weighted average, plane fitting, surface fitting and vertical adjustment. Usually, if the operating range is very wide, seven parameters are needed to meet the accuracy requirements of all control points. If the operating range is relatively small, plane correction can usually achieve the corresponding accuracy.

After configuring the calculation conditions, click [Calculate] to view the conversion parameters and the residuals of each control point, as shown in Figure 3.12-6. After calculating the conversion parameters, you can export the calculation report for project review. If the conversion parameters meet the requirements, apply them to the project to proceed with surveying tasks.

Point Library		Stakeout point		
Name	North	East	Height	
PPK p3	2562922.759	441774.925	28.601	N2
p2	2562922.766	441774.932	30.185	N2
p1	2562921.958	441775.532	26.112	N2
t9	2563061.444	441676.895	18.892	N2
t8	2563064.214	441632.112	18.656	N2
t7	2563148.178	441558.261	19.432	N2
t6	2563154.803	441670.117	19.385	N2
t5	2563103.008	441789.162	19.354	N2
t4	2563014.288	441794.819	18.121	N2
t3	2562917.758	441787.826	17.334	N2
t2	2562936.491	441707.220	16.931	N2
t1	2562960.967	441716.320	17.074	N2





Figure 3.12-1

Figure 3.12-2

Figure 3.12-3

← Localization

Calculate Mode Horizontal correction + Elev_correction >

No.	1	Name	t1
Horizontal...	0	Vertical...	0
Use Hori...	Use	Use Vert...	Use

No.	2	Name	t2
Horizontal...	0	Vertical...	0
Use Hori...	Use	Use Vert...	Use

No.	3	Name	t3
Horizontal...	0	Vertical...	0
Use Hori...	Use	Use Vert...	Use

Add Edit Delete Calculate

Figure 3.12-4

← Localization Settings

Convert Method Horizontal correction + Elev_correction

Horizontal correction Model Horizontal Adjustment

Vertical Control Automatic Selection

Horizontal Accuracy Limit 0.1

Vertical Accuracy Limit 0.1

Cancel OK

Figure 3.12-5

← GPS Parameters Report

Ellipsoid Parameter ^

Ellipsoid Name CGCS2000

Semimajor axis 6378137

1/f 298.257

Projections Parameter ^

Projections Mode Transverse Mercator

Central Meridian E114°00'00"

False Northing 0

False Easting 500000

Scale Factor 1

Projection Height 0

Latitude of Origin N0°00'00"

Standard Parallel 1 N0°00'00"

Standard Parallel 2 N0°00'00"

Four-Parameter/Horizontal Adjustment ^

Translate Northing 15.91112

Translate Easting -38.007505

Rotation 174°54'03.0964"

Scale 46.08128383656768

Original

Save Apply

Figure 3.12-6

3.13 Calibrate Point

Click [**Project**]-> [**Calibrate Point**], as shown in Figure 3.13-1. In actual applications, GNSS equipment obtains high-precision positioning by combining differential data from the base station with positioning calculations. Here we know the coordinate position of base station. In fact, the high-precision position output by GNSS equipment is relative to the base station's coordinates. In actual application, in addition to some users using differential data of CORS reference station, there are also quite a few users using differential data of base station transmitted by their own GNSS equipment. When using self-built base stations, a project may involve starting the base station multiple times. When initiating the base station, the starting position and starting coordinates of base station may change, and the starting coordinates may not be correct. Without calibration, the coordinates measured by the rover may be inconsistent—for example, the same point might yield different coordinates when using different base station data. Therefore, when the rover receives new base station differential data for surveying, it needs to perform point calibration so that the coordinates obtained by software match the coordinates obtained by connecting to the last base station. After the starting coordinates or starting position of the base station changes, a known position needs to be used to calibrate the coordinates correctly.

Click [**Base Point Calibration**], as shown in Figure 3.13-2, and click  to select a known point in the coordinate point library (use the coordinates measured by the base station at a certain location last time). Then click [Calculate] and apply.

Click [**Marker Point Calibration**], as shown in Figure 3.13-3, and click  to select a known point in the coordinate point library (use the coordinates measured by the base station at a certain location last time). Then place the GNSS device at the location of the known point. Click  to measure a new positioning point, and calculate the deviation value. Click [Apply], and the coordinates received by the software will match the coordinates measured last time.

When the base station coordinates change, the system will prompt you to perform recalibration. If the coordinates change when receiving differential data from a self-built base station, point calibration for the base station is required.

Note: A CORS reference station is a long-term fixed station whose position and coordinates remain constant. Although received coordinates may vary slightly, they are still accurate and do not require translation calibration.

← Calibrate Point	
Base Point Calibration	>
Marker Point Calibration	>
dX	0
dY	0
dH	0

← Calibrate Point	
Known Point Coordinates 	
North	2562960.967
East	441716.32
Height	17.074
Current Base Coordinates	
Latitude	23°09'54.484426
Longitude	113°25'51.930324
Altitude	56.624
Antenna Parameters	0m, Height to phase center >
Result	
Shift dX	21.646
Shift dY	-28.374
Shift dZ	-39.55

← Calibrate Point	
Known Point Coordinates 	
North	2562960.967
East	441716.32
Height	17.074
Current WGS84 Coordinates 	
Latitude	23°09'53.953632
Longitude	113°25'52.998492
Altitude	28.409
Result	
Shift dX	37.975
Shift dY	-58.757
Shift dZ	-11.335

Clear	OK
-------	----

Base Information	Calculate	Apply
------------------	-----------	-------

Cancel	Apply
--------	-------

Figure 3.13-1

Figure 3.13-2

Figure 3.13-3

3.14 Coordinate Point Library

Click [**Project**]-> [**Points Database**], as shown in Figure 3.14- 1. Here you can view and manage the point data in the project, including adding, editing, deleting, and importing.



Click the upper right corner , as shown in Figure 3.14-2, to switch the display style of point information.

Click [Add], as shown in Figure 3.14-3, to manually enter the point name, code and corresponding coordinates.

Click [Import], as shown in Figure 3.14-4, select the file format of the point data to be imported, and then select the data file to complete the data import.

Select the coordinate point and click [Edit], as shown in Figure 3.14-5, you can edit and modify the name and code of the coordinate point.

Click the upper right corner , as shown in Figure 3.14-6, to filter the point type.

Click the upper right corner  and an operation pop-up will appear, as shown in Figure 3.14-1. You can perform batch deletion, data statistics, sorting and other functions as needed.

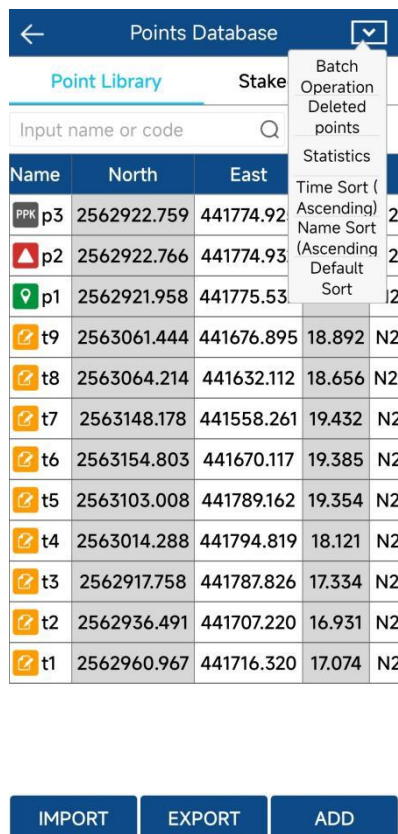


Figure 3.14-1

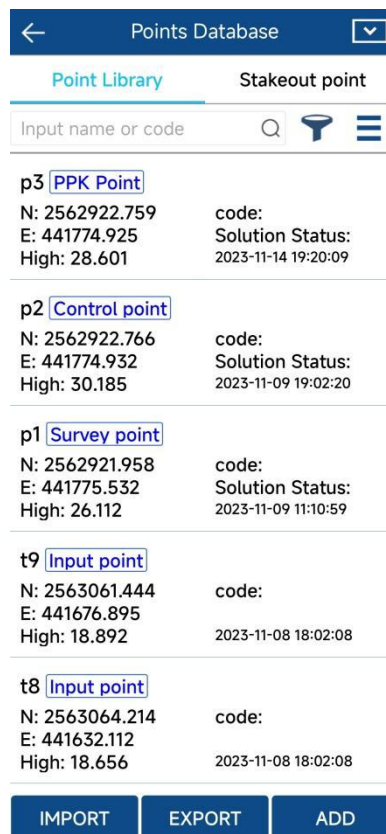


Figure 3.14-2

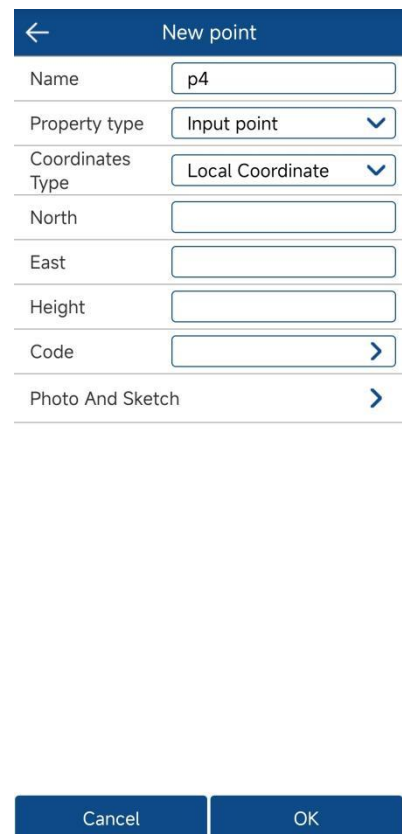


Figure 3.14-3



Import File

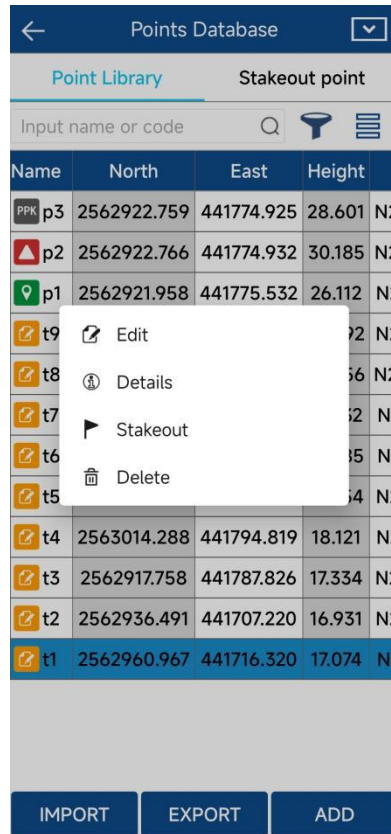
File Format: Local Coordinate(.csv|.dat|.txt) ▼

[Name],[North],[East],[Height],[Code]

Property type: Input point ▼

Format Manager OK

Figure 3.14-4



Points Database

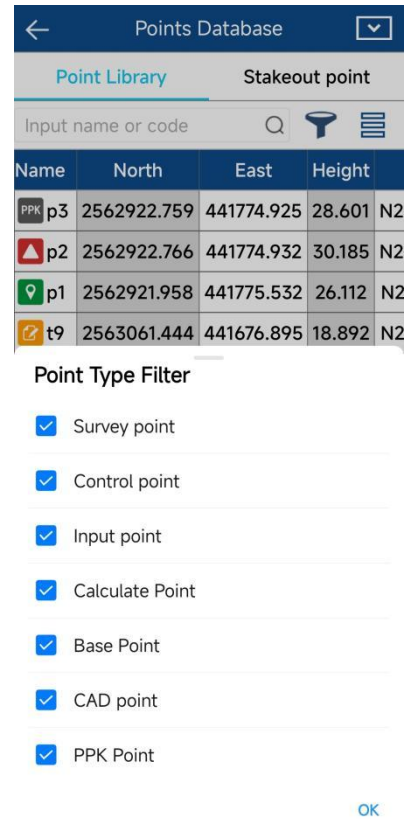
Point Library Stakeout point

Input name or code

Name	North	East	Height	
PPK p3	2562922.759	441774.925	28.601	N2
p2	2562922.766	441774.932	30.185	N2
p1	2562921.958	441775.532	26.112	N2
t9				N2
t8				N2
t7				N2
t6				N2
t5				N2
t4	2563014.288	441794.819	18.121	N2
t3	2562917.758	441787.826	17.334	N2
t2	2562936.491	441707.220	16.931	N2
t1	2562960.967	441716.320	17.074	N2

IMPORT EXPORT ADD

Figure 3.14-5



Points Database

Point Library Stakeout point

Input name or code

Name	North	East	Height	
PPK p3	2562922.759	441774.925	28.601	N2
p2	2562922.766	441774.932	30.185	N2
p1	2562921.958	441775.532	26.112	N2
t9	2563061.444	441676.895	18.892	N2

Point Type Filter

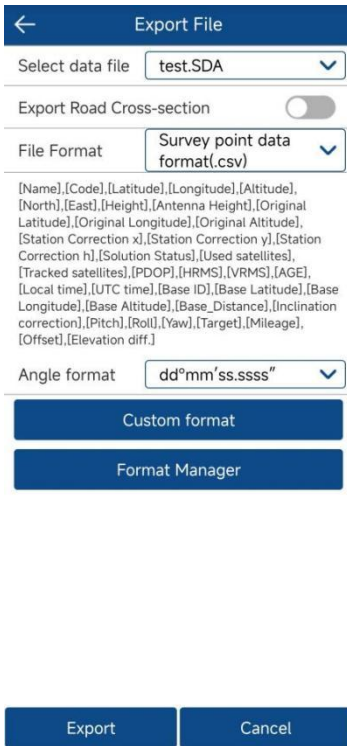
- ☒ Survey point
- ☒ Control point
- ☒ Input point
- ☒ Calculate Point
- ☒ Base Point
- ☒ CAD point
- ☒ PPK Point

OK

Figure 3.14-6

3.15 Export File

Click [**Project**]-> [**Export File**], as shown in Figure 3.15-1, and select the type, file format, and angle format of the exported data as needed. Click [Format Manager], as shown in Figure 3.15-2, select the file format of the data to be exported, and click [OK]. Click [Use-defined Format], as shown in Figure 3.15-3, to manually create and edit the export data format.



Export File

Select data file: test.SDA

Export Road Cross-section: ☐

File Format: Survey point data format(.csv)

[Name],[Code],[Latitude],[Longitude],[Altitude],[North],[East],[Height],[Antenna Height],[Original Latitude],[Original Longitude],[Original Altitude],[Station Correction x],[Station Correction y],[Station Correction h],[Solution Status],[Used satellites],[Tracked satellites],[PDOP],[HRMS],[VRMS],[AGE],[Local time],[UTC time],[Base ID],[Base Latitude],[Base Longitude],[Base Altitude],[Base Distance],[Inclination correction],[Pitch],[Roll],[Yaw],[Target],[Mileage],[Offset],[Elevation diff.]

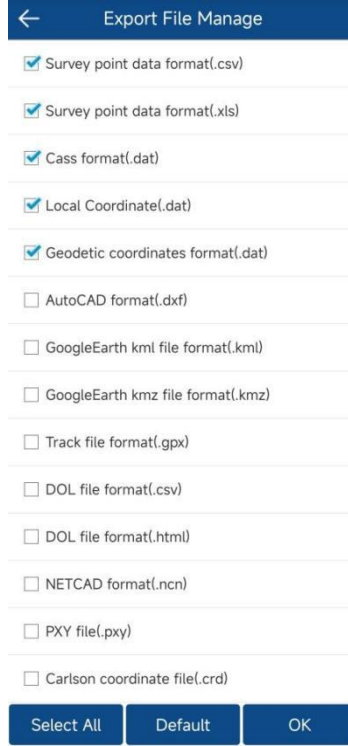
Angle format: dd°mm'ss.ssss"

Custom format

Format Manager

Export Cancel

Figure 3.15-1



Export File Manage

☒ Survey point data format(.csv)

☒ Survey point data format(.xls)

☒ Cass format(.dat)

☒ Local Coordinate(.dat)

☒ Geodetic coordinates format(.dat)

☐ AutoCAD format(.dxf)

☐ GoogleEarth kml file format(.kml)

☐ GoogleEarth kmz file format(.kmz)

☐ Track file format(.gpx)

☐ DOL file format(.csv)

☐ DOL file format(.html)

☐ NETCAD format(.ncn)

☐ PXY file(.pxy)

☐ Carlson coordinate file(.crd)

Select All Default OK

Figure 3.15-2



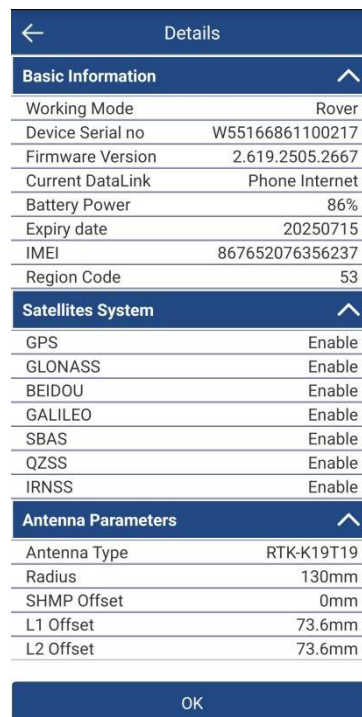
User-defined format

New Edit Delete

Figure 3.15-3

3.16 Device Information

Click [**Device**]-> [**Device Information**], as shown in Figure 3.16, to view basic information such as the GNSS device's working mode, device serial number, firmware version, battery power, expiry date, satellite system, antenna parameters, etc.



Details

Basic Information

Working Mode	Rover
Device Serial no	W55166861100217
Firmware Version	2.619.2505.2667
Current DataLink	Phone Internet
Battery Power	86%
Expiry date	20250715
IMEI	867652076356237
Region Code	53

Satellites System

GPS	Enable
GLONASS	Enable
BEIDOU	Enable
GALILEO	Enable
SBAS	Enable
QZSS	Enable
IRNSS	Enable

Antenna Parameters

Antenna Type	RTK-K19T19
Radius	130mm
SHMP Offset	0mm
L1 Offset	73.6mm
L2 Offset	73.6mm

OK

Figure 3.16

4 Device Activation and Software Registration

4.1 Device Activation

Click [**Device**] -> [**Device Activation**], as shown in Figure 4.1, to view the device serial number and expiry date. If the GNSS device has expired, you can obtain the registration code from the dealer and authorize the device here.

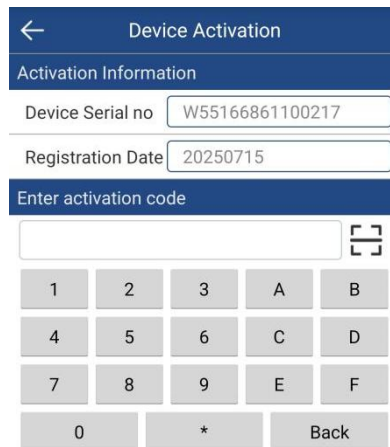



Figure 4.1

4.2 Software Activation

Click [**Project**]->[**About Software**], as shown in Figure 4.2-1 , to view the software version information and registration authorization information.

Click [**Check for new versions**], if there is a new version, the new version update information will pop up, click [Update] to update the software to the latest version. If there is no new version, it will prompt that it is already the latest version.

Click [**Software Registration**] to go to the software registration interface, as shown in Figure 4.2-2, to view the activation ID and expiry date.

When you install the software for the first time, click [Online Activation] to activate it for three months of free trial.



Click [**Manual Code Activation**], as shown in Figure 4.2-3. Enter the authorization code here or scan the QR code of the authorization code to activate the software.

If you need to replace the controller, click [Transfer activation code] on the old controller, then go to the software registration page on the new controller and input the transferred activation code to activate the software.



Figure 4.2-1



Figure 4.2-2

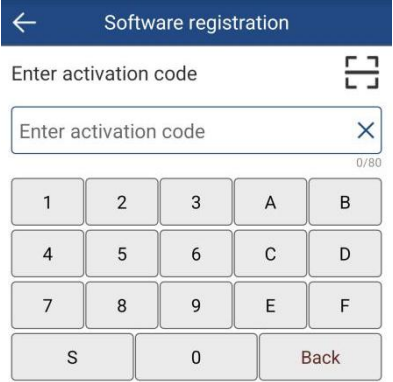


Figure 4.2-3



5 Built-in Radio

The **AL16** is equipped with a 1Watt digital radio that supports integrated transmission and reception. Users can choose from three transmission power levels: low power (1W) and high power (1W).

Note: Each time you set the data link to the built-in radio, you need to install the radio antenna in advance. Please open the UHF radio cover on the bottom of the device and then install the antenna.

Radio Protocol

The device currently supports the following 12 radio protocols, which you can change according to your needs.



5.1 Default Channel Frequency

The device has 16 default channel frequencies, and the frequency of each channel can be customized.

aisle	Frequency/MHz
1	463.125
2	464.125
3	465.125
4	466.125

5	463.625
6	464.625
7	465.625
8	466.625
9	463.375
10	464.375
11	465.375
12	466.375
13	463.875
14	464.875
15	465.875
16	466.875

Federal Communications Commission (FCC) Statement

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 interference received, including interference that may cause undesired operation.

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 interference to 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.

Warning: Changes or modifications made to this device not expressly approved by **Shanghai Archimedes Innovation Technology Co., Ltd.** may void the FCC authorization to operate this device.

Note: The manufacturer is not responsible for any radio or TV interference caused by unauthorized modifications to this equipment. Such modifications could void the user's authority to operate the equipment.

RF exposure statement:

The transmitter must not be colocated or operated in conjunction with any other antenna or transmitter. This equipment complies with the FCC RF radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with a Minimum distance of 20cm between the radiator and any part of your body.