



Banff-VL Visual & Laser GNSS Receiver User Manual

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This is the V1.0 (Dec, 2024) revision of the BANFF GNSS Receiver User Guide. It cannot be copied or translated into any language without the written permission of 3AGEOCANADA.

1 INTRODUCTION

The 3AG Banff-VL Visual & Laser GNSS Receiver User Manual is aimed to help you get familiar with the GNSS receiver and start your project effectively. We highly recommend you to read this manual before start your surveying, even you have used other GNSS RTK receivers before.

1.1 Environmental Requirements

Operating Temperature : - 30 °C to +65 °C

- Storage Temperature : - 55 °C to +85 °C
- Humidity : 100% Non-condensing
- Waterproof & Dustproof : IP67, fully protected against dust and water,
- suitable for harsh environments. Drop Resistance : Designed to withstand a 2-meter drop onto concrete.

1.2 About Banff-VL

The Banff-VL GNSS receiver integrates photogrammetry, laser measurement, and AR stakeout functions. It combines powerful performance, seamless connectivity, and user-friendly design, making it the ideal tool for achieving accurate, reliable results in a wide range of surveying and mapping applications.

Key Features:

Full-Constellation Support:

- Banff-VL supports Full-Constellation satellite tracking with 1408 channels, enabling simultaneous tracking of GPS, BDS, GLONASS, Galileo, QZSS, IRNSS, and SBAS. This ensures centimeter-level positioning accuracy across a variety of environments.

Next-Gen IMU:

- Equipped with a next-generation Inertial Measurement Unit (IMU), Banff-VL enhances reliability in various surveying tasks, including pole surveying, AR stakeout, laser surveying, and visual surveying, offering greater stability and precision.

Enhanced UHF Communication:

- With enhanced UHF capabilities, Banff-VL can reach up to 15 km in optimal conditions, minimizing the need for external radios and ensuring stable communication over long distances.

Versatile Connectivity:

- Banff-VL supports a wide range of connectivity options, including Bluetooth, Wi-Fi, NFC, and USB, allowing for flexible interaction with the devices to suit different needs and workflows.

12-Hour Battery Life:

- Powered by a 6600mAh built-in battery, Banff-VL offers an impressive 12+ hours of continuous working time, while the fast 3.5-hour charging time ensures minimal downtime for your field operations.

Web UI Access:

- Access Banff-VL via Wi-Fi through an intuitive web interface to configure work modes, download data, perform firmware upgrades, and monitor device status remotely, making it easier than ever to manage your device on-site.

1.3 Front Panel

The Banff-VL contains three indicator LEDs and one power button on the front panel.



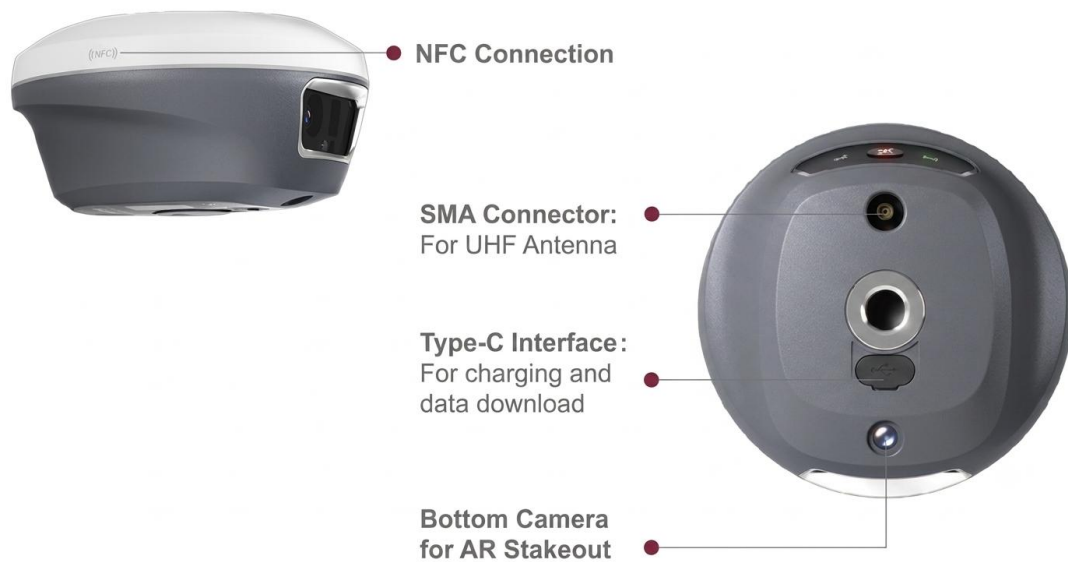
1.4 Back View

The receiver has a laser receiver and laser emitter on its back, as well as a camera for photogrammetry.



1.5 Lower Housing

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



1.6 Power Supply

The Receiver is equipped with internal batteries. - 6600 mAh, up to 12 hours working time - Fast charge of 3.5 hours charging time © 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.

2 RTK WORKFLOW

This chapter introduces how to conduct RTK surveying with GeoPad Software. GeoPad is a professional Android-based surveying software developed by 3AG team. GeoPad 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 GeoPad

GeoPad has been pre-installed on 3AG data collector before shipping, if you want to download on your own device, please contact 3AG team to obtain the installation package.

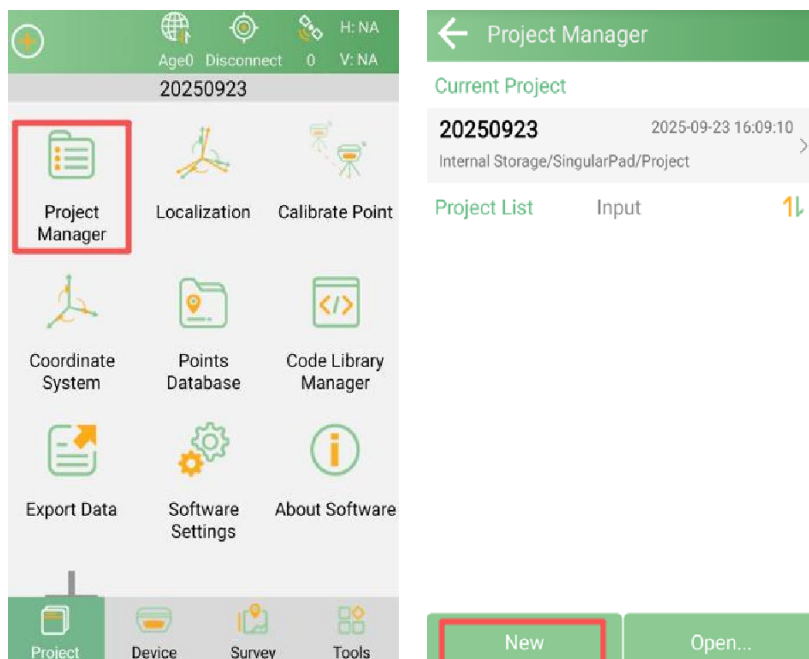
2.1.2 Software Registration

After the software is installed, you can check your software registration status (network connection required) by following steps: Go to Project >>> About Software and check the Expiration Date . -If it shows 2999-12-31 , this indicates a permanent registration of the software. , -If it shows Inactivated please click Software Activation , then enter the permanent license to register and activate all software functions.



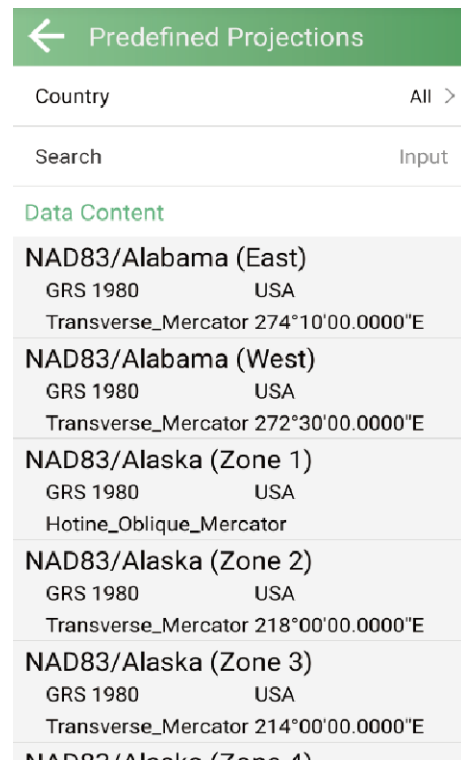
2.2 Create a New Project

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

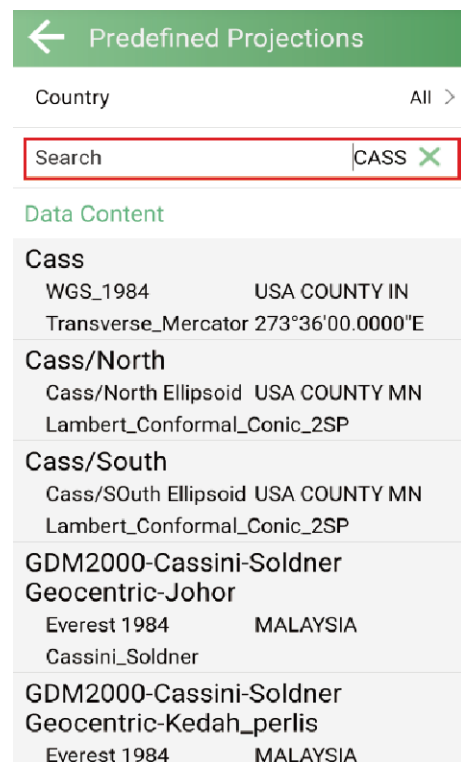
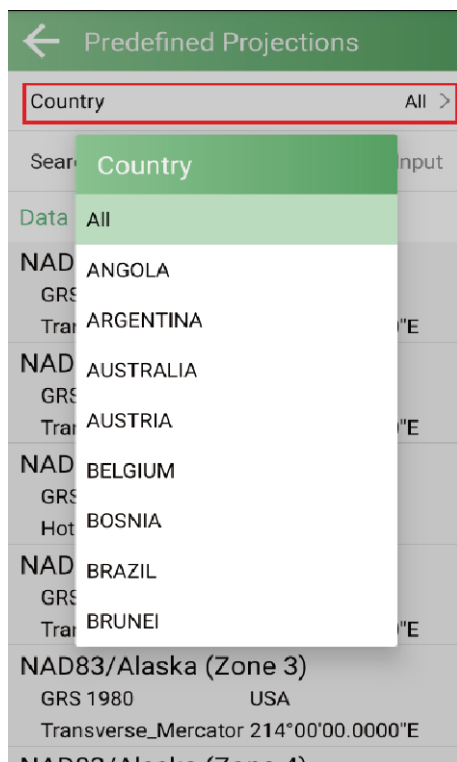


GeoPad includes many countries' coordinate systems, you can find what you need by country name or coordinate system name. The following steps give an example of how to find predefined coordinate systems in GeoPad. Click the button located after in Coordinate System Parameters interface. Name

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 desired coordinate system.



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

2.3 Device Connection

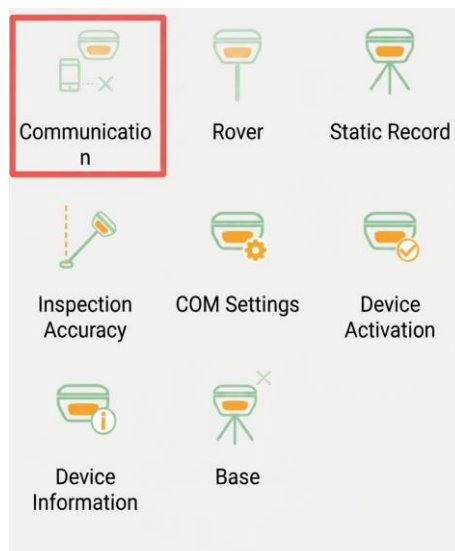
2.3.1 NFC Connection

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

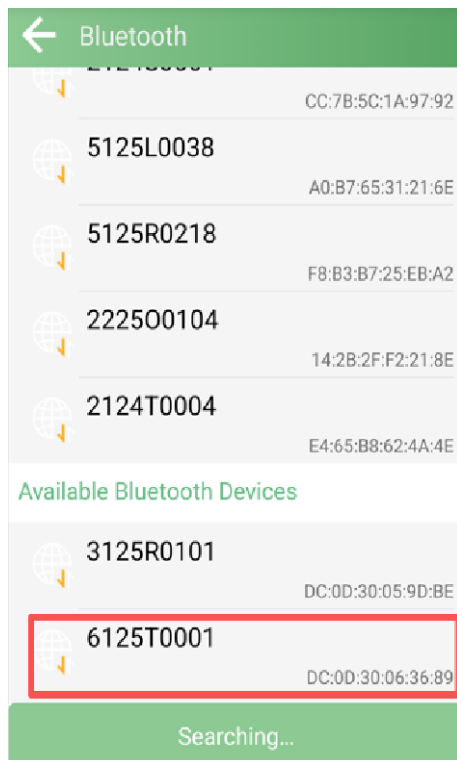


2.3.2 Bluetooth Connection

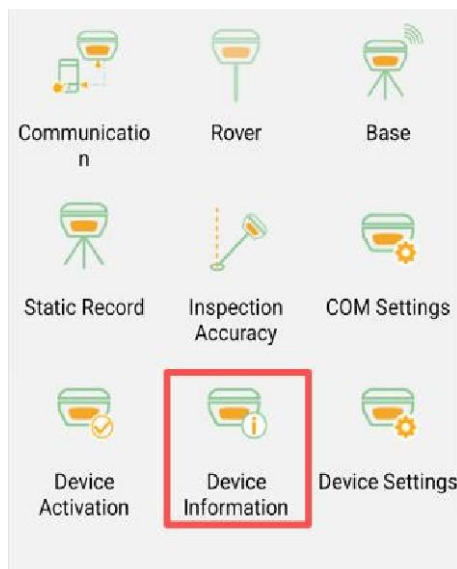
After creating a new project, switch to interface, click . Device Communication



Select the corresponding parameters according to the following requirements : Device Type: GNSS Device Manufacturer. Click Currently Paired Device to find the serial number (SN) of your Banff-VL receiver. Click Connect .



After connecting Banff-VL receiver, you can check the information of the receiver (like firmware version) in Device Information .



Tips:

If you fail to connect with receiver through GeoPad, 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 GeoPad software and perform the pairing process again.

2.4 About Device Registration

The device can only function properly if it is in an activated state. Please check the device's expiration date in Device Activation. -If the Expiration Date shows 21250101 , the device is permanently licensed and valid indefinitely. -If the displayed date has expired , a registration code is required for registration, please contact 3AG team to obtain a license code. Then enter the it to register, ensuring the device functions properly.

← Device Activation

Device Information

Device SN H1-6125T0001

Expiration Date 21250101

Enter License

0 1 2 3 A B 4 5 6 C D 7 8 9 E F Backspace

Activate

2.5 Concepts About RTK

2.5.1 Overview

RTK(Real-Time Kinematic) is a positioning technique used to improve the accuracy of a standalone GNSS receiver. A conventional GNSS receiver, like the one in a smartphone, could only provides the position accuracy within 2–4 meters (7– 3 feet). RTK technology enhances this accuracy to the centimeter level. 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.

2.5.2 High Real-Time Precise

Two receivers are used in RTK. One of them is stationary, the other moves freely. These receivers are referred to as the base station and rover. The base station is

installed at a fixed, known location and continuously transmits correction data to the rover. 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.

2.5.3 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. The technology is called NTRIP (Networked Transport of

RTCM via Internet Protocol). 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 NTRIP subscription fees.

2.6 Quick Setup Your Receiver

With the help of this section, you can easily configure your Banff-VL and achieve accurate positioning for your subsequent surveying 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 - Network required	PDA CORS - RTK correction service subscription / CORS	Centimeter level
Mode account needed	No network or RTK correction service needed	- SBAS	SBAS
Mode Submeter level coverage required	PPP Mode	No network or RTK correction service needed	10 - 20 cm
Static Mode	Millimeter level ≥ 3 GNSS units required for stable triangulation network		

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

2.6.1 Internal Radio Mode (3AG Base + Banff-VL Rover)

If you've purchased one unit of 3AG RTK Base. and one Banff-VL GNSS receiver as rover, you can conduct internal radio work mode. During configuration, you need to connect your PDA device or data collector to the base and rover respectively. When work as a Base station, GeoPad supports transmit the correction data in Internal Radio mode. Internal Radio: This mode uses internal radio to transmit the correction data from Base.

- 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.
- Baud rate: 4800, 9600, 11000, 12000, 15000, 18000, 19200, 115200.
- Power: High and low (low power will reduce the transmission range).

Tips:

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.

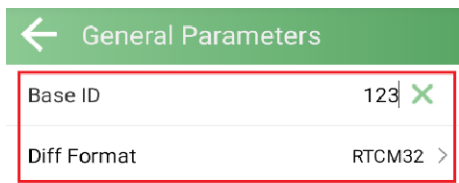
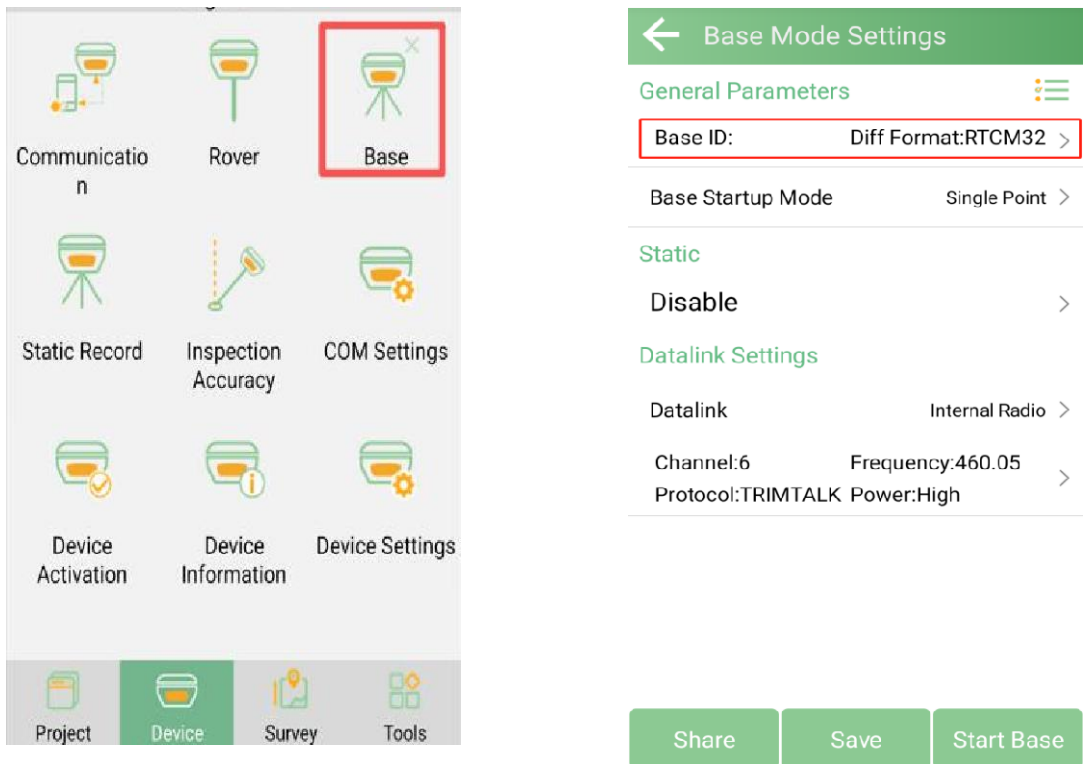
- Interference: high-power radar, TV, cellular towers, power lines or electrical facilities. The following steps give an example of how to configure internal radio base mode.

Note:

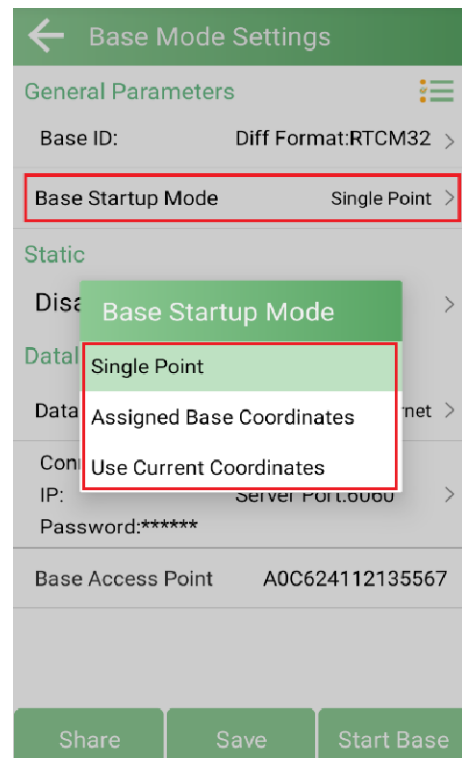
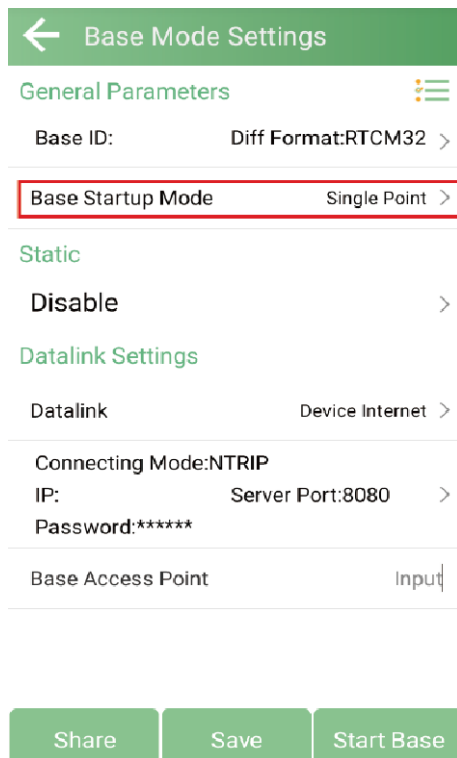
Set Internal Radio Work Mode:

Connect the whip antenna to both your base station and rover. The Banff-VL is equipped with non-contact laser surveying and camera AR stakeout capabilities and is commonly used as a rover for

surveys. The Banff-BASE recommended as the base choices for Banff-VL rovers due to their reliable GNSS, communications and durability features. 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.

←

Base Mode Settings

General Parameters

Base ID:

Diff Format:RTCM32

>

Base Startup Mode

Assigned Base Coordinates

>

B:N0°00'00"

H:-1.844m

>

L:E0°00'00"

Ant. H:1.844m

>

Static

Disable

>

Datalink

Internal Radio

>

Channel:[1]455.05

Protocol:CSS

>

Power:High

Baud Rate:11000

>

Base Startup Mode

Single Point

Assigned Base Coordinates

Use Current Coordinates

Share

Save

Start Base

←

Base Mode Settings

General Parameters

Base ID:

Diff Format:RTCM32

>

Base Startup Mode

Assigned Base Coordinates

>

B:N0°00'00"

H:-1.844m

>

L:E0°00'00"

Ant. H:1.844m

>

Static

Disable

>

Datalink Settings

Datalink

Internal Radio

>

Channel:[1]455.05

Protocol:CSS

>

Power:High

Baud Rate:11000

>

Share

Save

Start Base

←

Assigned Base Coordinates

Assigned Base Coordinates

Name

Pt5297

Latitude

31°10'00.9290"N

>

Longitude

121°17'22.9420"E

>

Altitude

12.699

Antenna Parameters

Antenna Measuring Height

1.8 m

Antenna Measuring Type

Pole Height

>

Antenna Height

1.844 m

OK

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.

Banff-VL Visual & Laser GNSS Receiver User Manual

← 61% Age0 AUTONOMO... 11/11 V:5.599			
Name	Pt5298	✕ Code	Input ⋮
Layer	0 >		1.6+0.000m >
B	31°09'59.7807"N	N	3449326.243
L	121°17'21.2784"E	E	336954.164
H	33.968	Elev	33.968
Tilt Angle		178°35'51.1519"	
Dist. to Ref		None	

← 61% Age0 AUTONOMO... 11/11 V:5.599			
Name	Pt5298	✕ Code	Input ⋮
Layer	0 >		1.6+0.000m >
B	31°09'59.7807"N	N	3449326.243
L	121°17'21.2784"E	E	336954.164
H	33.968	Elev	33.968
Tilt Angle		178°35'51.1519"	
Dist. to Ref		None	



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

← Assigned Base Coordinates

Assigned Base Coordinates

Latitude 0°00'00.0000"N
 Longitude 0°00'00.0000"E >
 Altitude -1.602

Antenna Parameters

Antenna Measuring Height 1.8 m
 Antenna Measuring Type ⋮
 Antenna Measuring Height 1.44 m

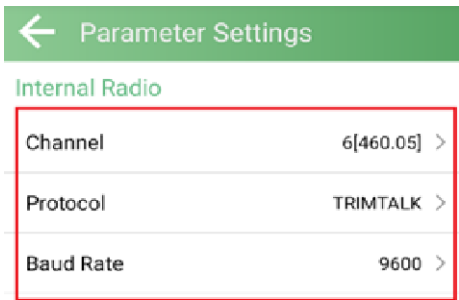
Pole Height
 Slant Height
 Phase Center Height

OK

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. 4. Set Data Link as Internal Radio .

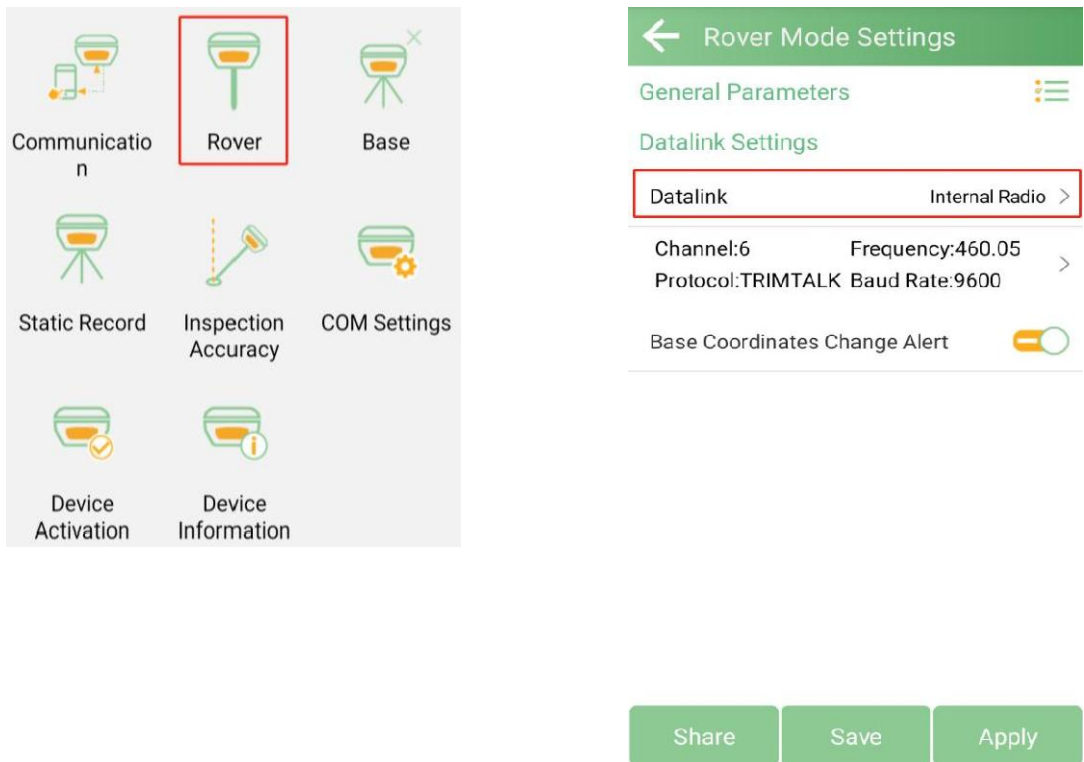
Set parameter settings, Channel, Frequency, Protocol, Baud Rate and Power.



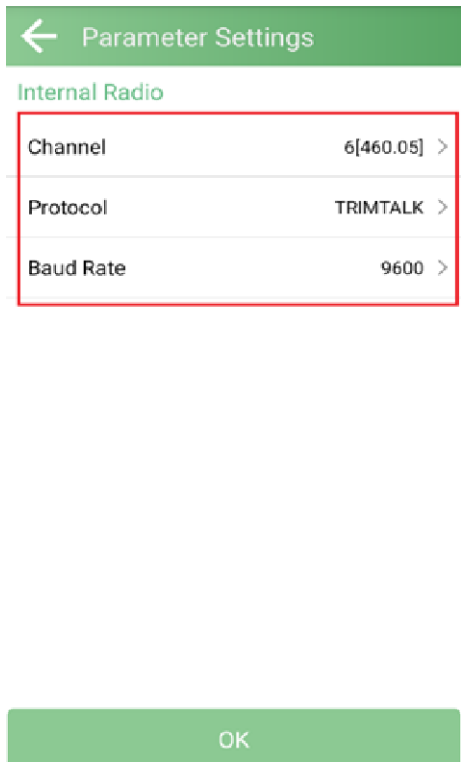
5. When start Base succeed, it will show as below in GeoPad.



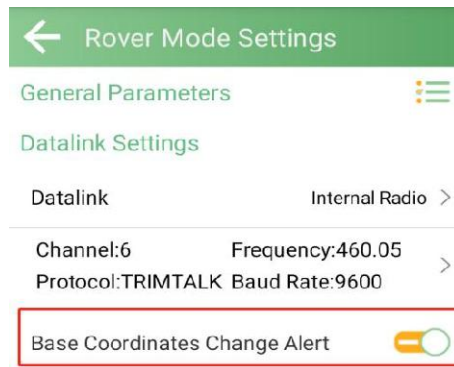
Note: After base settings, please disconnect the base device and then search for the SN of rover to connect and configure the rover device. Select the same protocol and frequency with the Base. The following steps give an example of how to configure internal radio rover mode. 1. Go to Device >>> Rover . Set Data Link as Internal Radio .



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



3. Base Coordinates Change Alert : GeoPad 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.

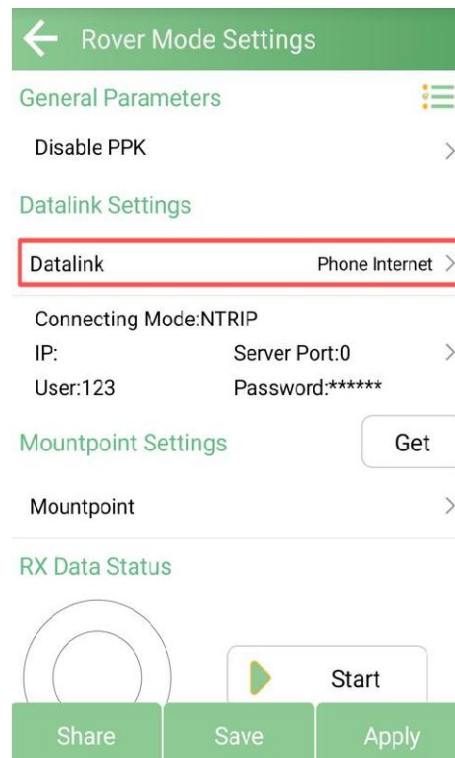
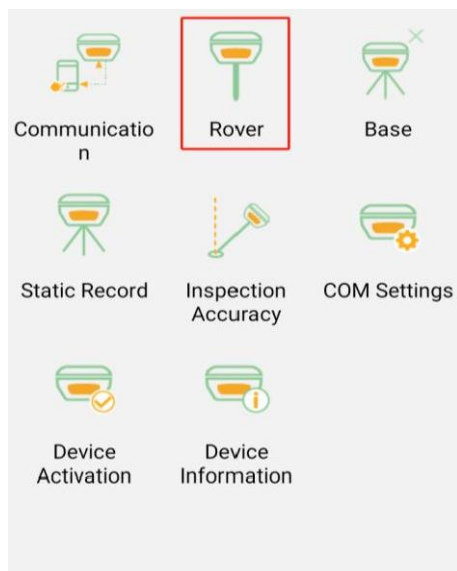


4. Click Apply to start the Rover mode. After completing the configuration, please check the RTK status in the top status bar. Once the status changes to “FIXED” and the differential delay “Age” is within the range of 1-2 seconds, you have obtained reliable centimeter- level RTK positioning Now you can proceed to 3.2 Point Survey to start . surveying.

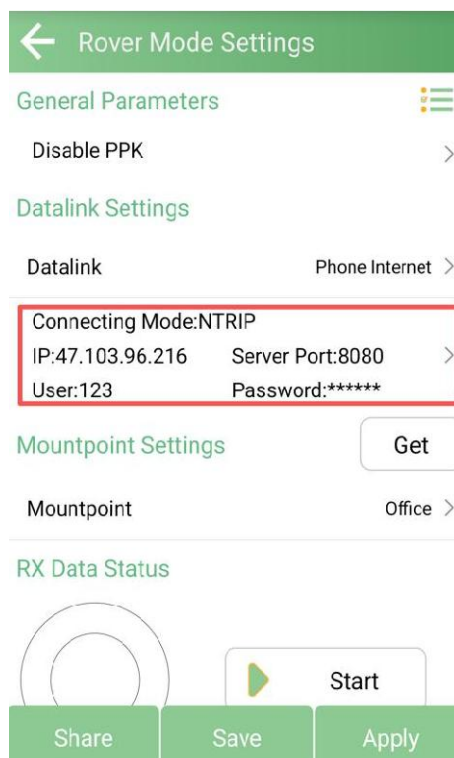


2.6.2 PDA CORS Mode (Single Banff-VL Rover)

When works as a rover, GeoPad 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), Wi-Fi or hot spot. Go to Device >>> Rover . Set Data Link as Phone Internet .

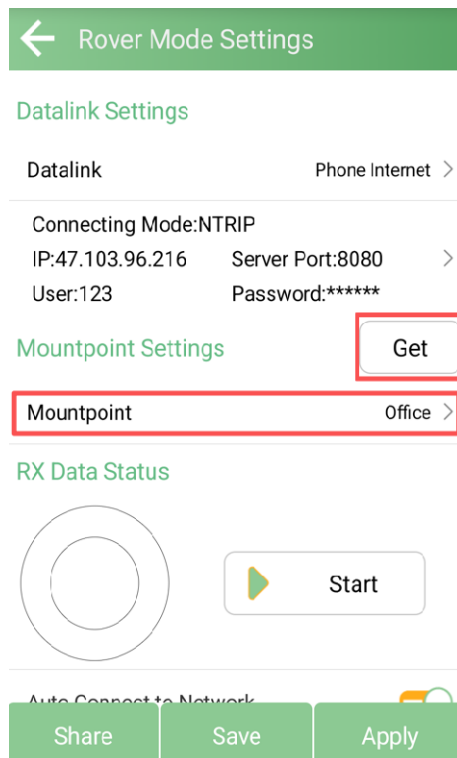


Set Connect Mode , for Banff-VL receiver supports NTRIP and TCP Client. Input the server IP, Port, User and Password in the CORS Settings .



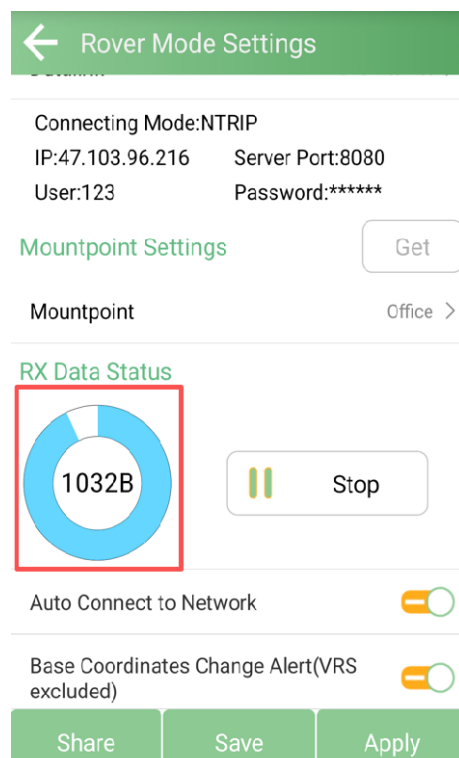
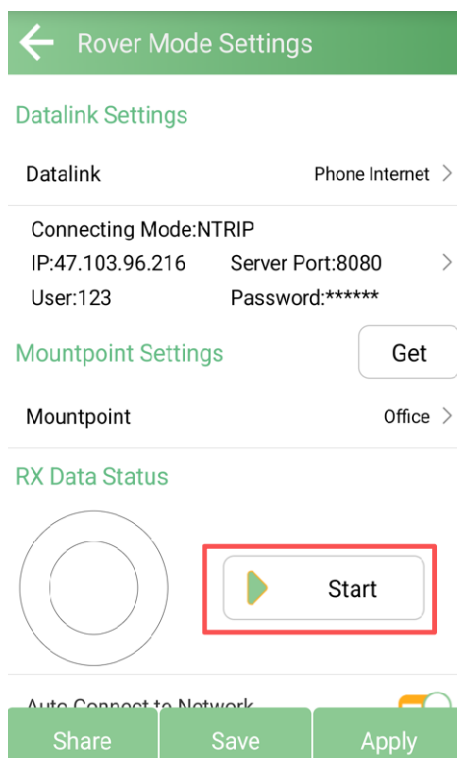
Note:

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. 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. If you are unable to obtain a mountpoint, it may be due to a problem with your account. Please check if the IP address and port are entered correctly, or confirm with your local NTRIP/CORS provider whether the account is available. 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. Auto connect to network : When this option is opened, GeoPad will connect to network automatically so that user don't need to click start to connect network.

← Rover Mode Settings

Connecting Mode:NTRIP
IP:47.103.96.216 Server Port:8080
User:123 Password:*****

Mountpoint Settings Get

Mountpoint Office >

RX Data Status

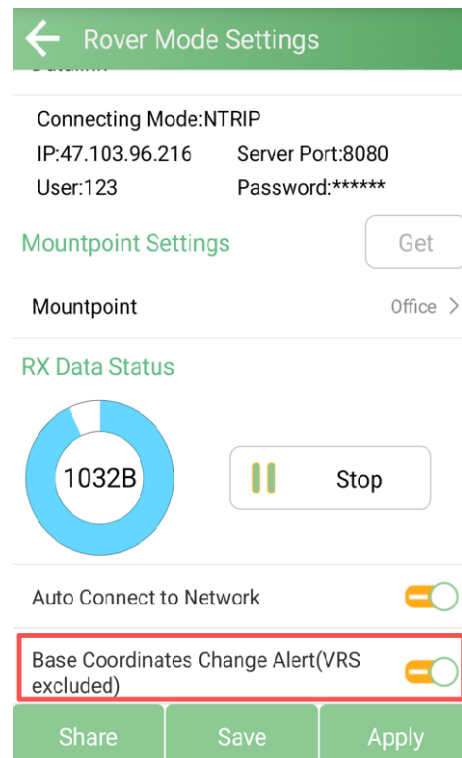
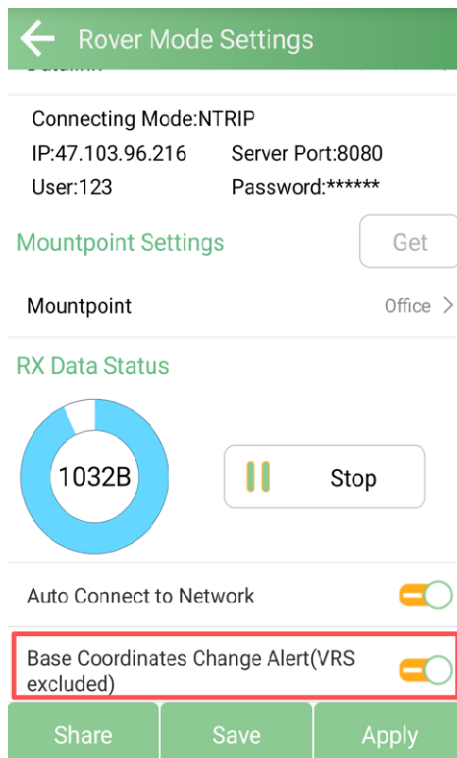
1032B ⏸ Stop

Auto Connect to Network ☒

Base Coordinates Change Alert(VRS excluded) ☐

Share Save Apply

Base Coordinates Change Alert : GeoPad will alert when you connect with different base station. When you are using VRS, please don't turn this on.

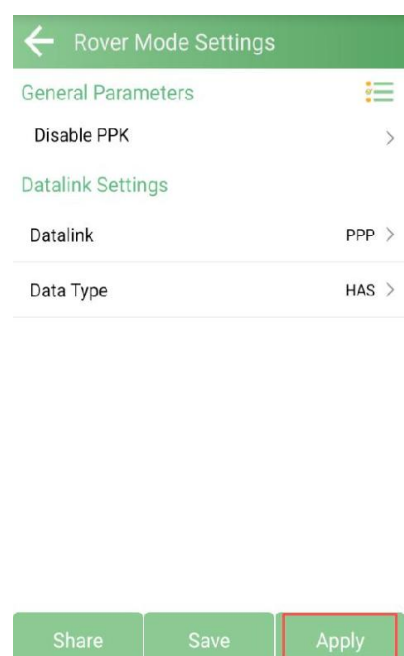
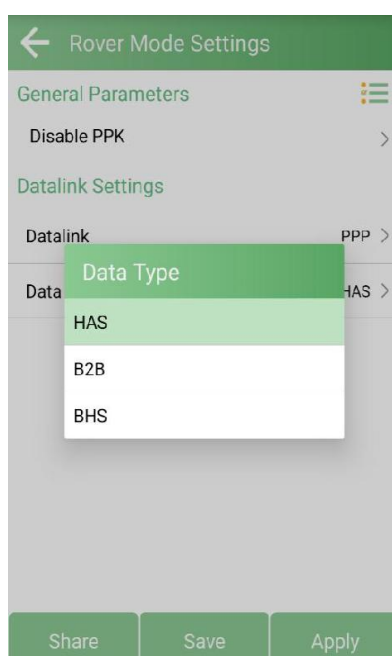
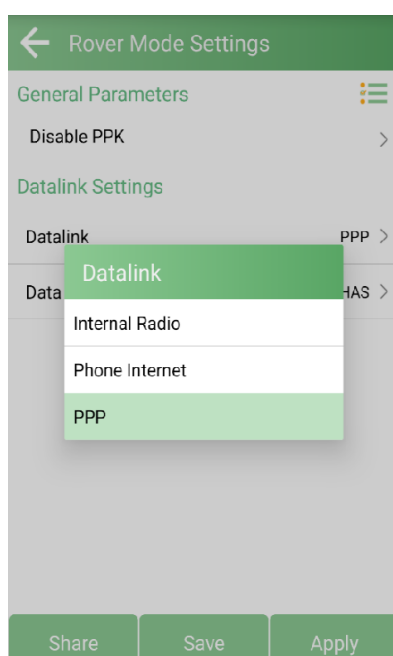


Click Apply to start the rover mode. After completing the configuration, please check the RTK status in the top status bar. Once the status changes to "FIXED" and the differential delay "Age" is within the range of 1-2 seconds, you have obtained reliable centimeter-level RTK positioning.

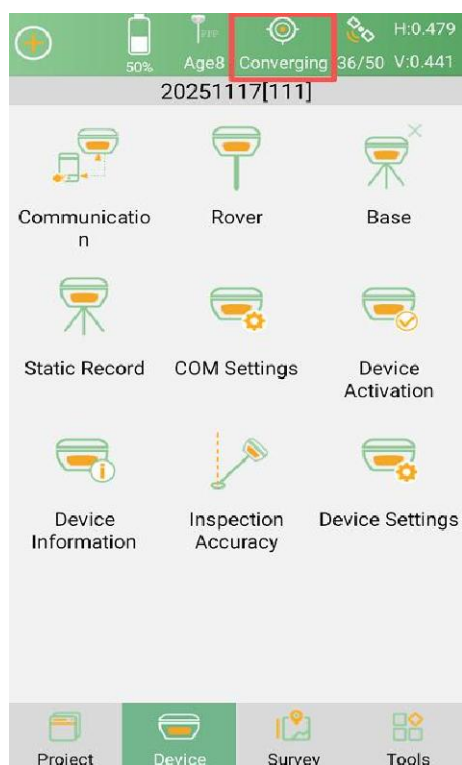


2.6.3 PPP Mode

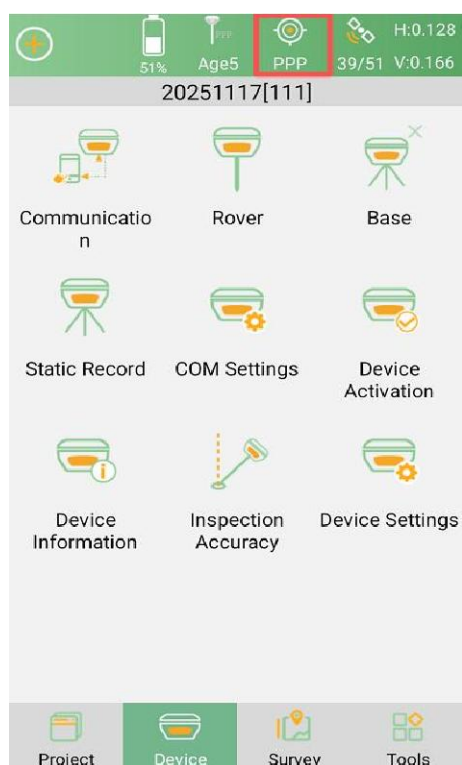
Enter Device >>> Rover , select Datalink as PPP , and you can choose Data Type as HAS, B2B, BHS, then click Apply .



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.

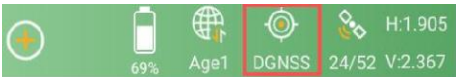
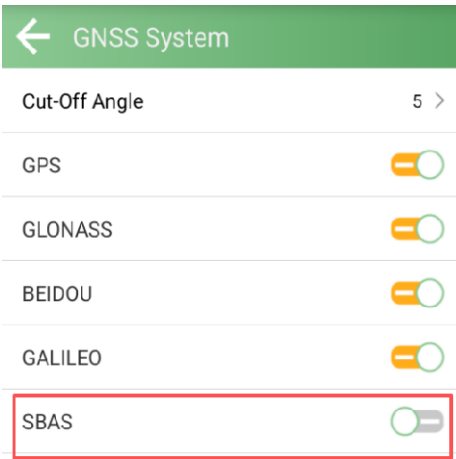
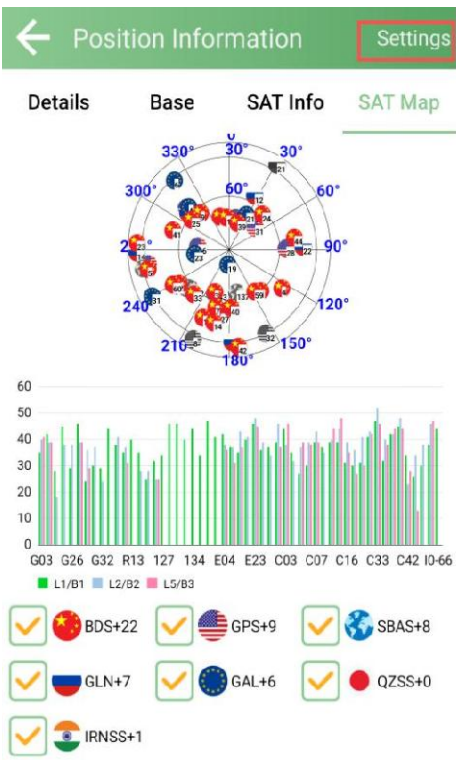
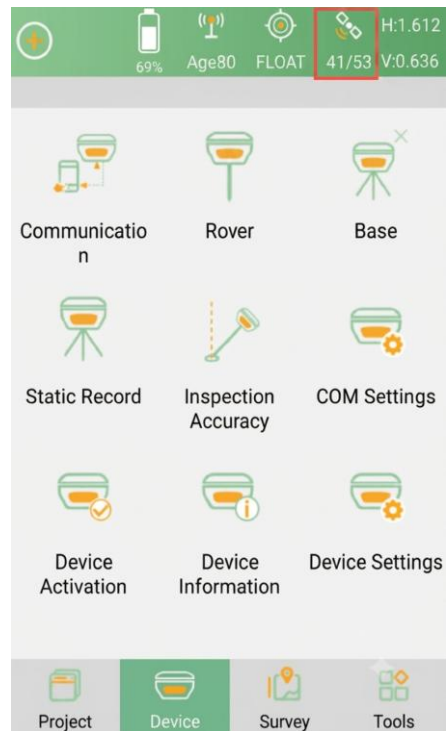


After the positioning state changes to PPP mode, you can then conduct surveying tasks.



2.6.4 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 GeoPad, 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 GeoPad Top Status Bar Introduction

After completing your Banff-VL RTK setup, check current RTK solution status at the top of the GeoPad software.



RTK Solution Status Description



Banff-VL 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.



Banff-VL 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.

Note:

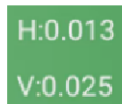
If you are using radio mode communication and the location status displays " AUTONOMOUS ," this is likely because the radio parameter settings of the Base station and the Rover are inconsistent. Please go back and check the parameter settings to ensure that the channel, protocol, and baud rate used by the Base station and the Rover are the same.



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.

Note:

If you connect the device but the software shows 0 satellites being detected, this is most likely because the device is not activated. Please refer to section 2.4 About Device Registration for details.

3.2 Point Survey

In the Survey interface, click Point Survey and enter point name, code and

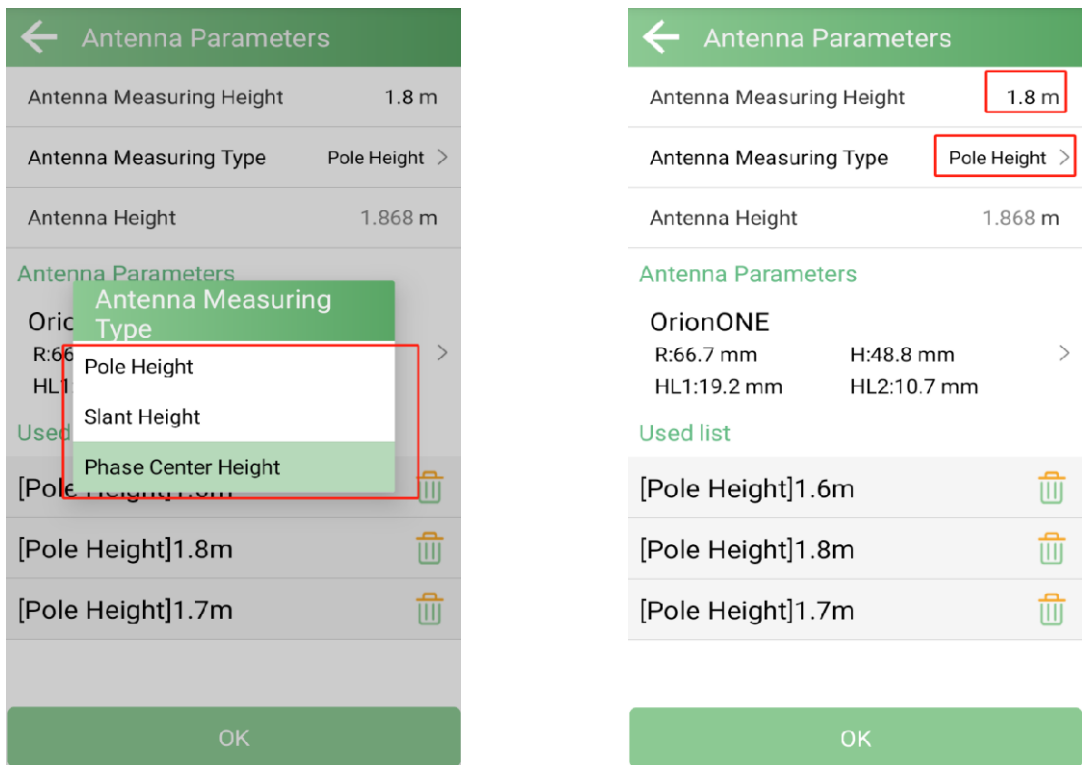


antenna height, then click to measure a point.



Note:

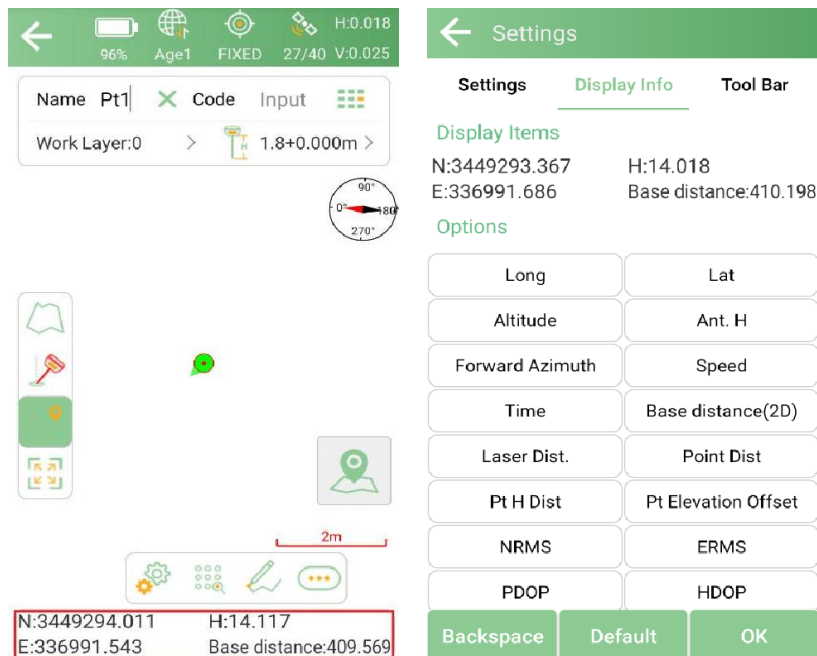
Our software supports 3 antenna measuring types. please refer to chapter 2.6.1 Internal Radio Mode for details.



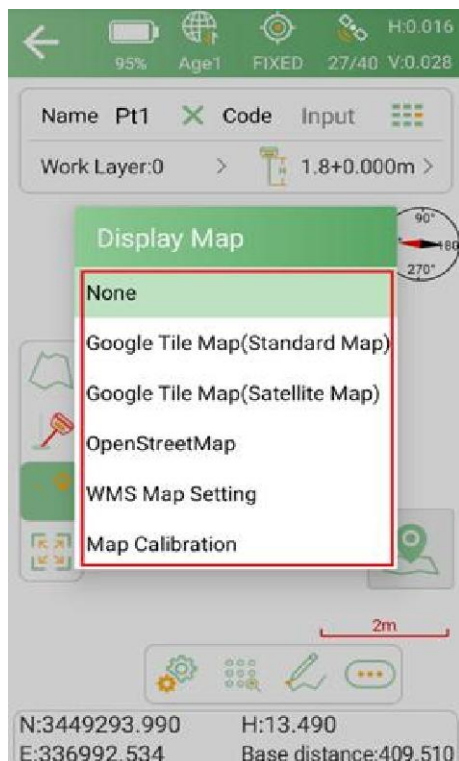
Pole Height: Typically, select the Antenna Measuring Type as Pole Height and enter the height of your centering pole. In the floating window of the survey interface, you can see the display information. The default display information is NEH and Base distance, and click



the floating window you can set them as you need. You can also click to enter the display information settings interface and select the information you need to display. Except default display information, GeoPad supports Longitude, Latitude, Altitude, etc.



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



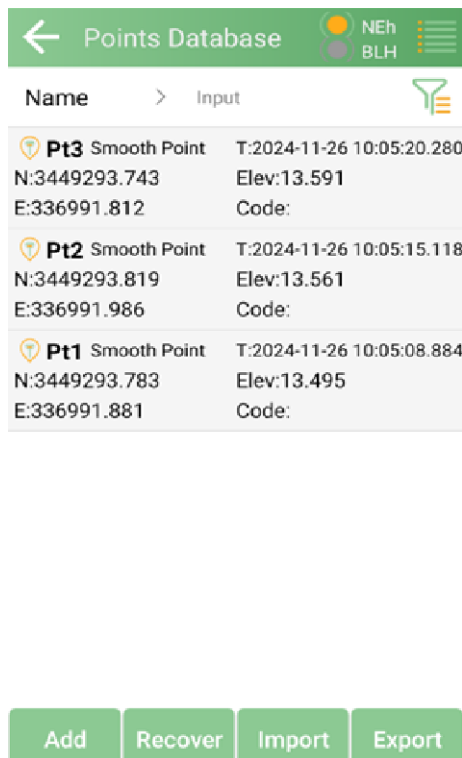
- Click to jump to map center.



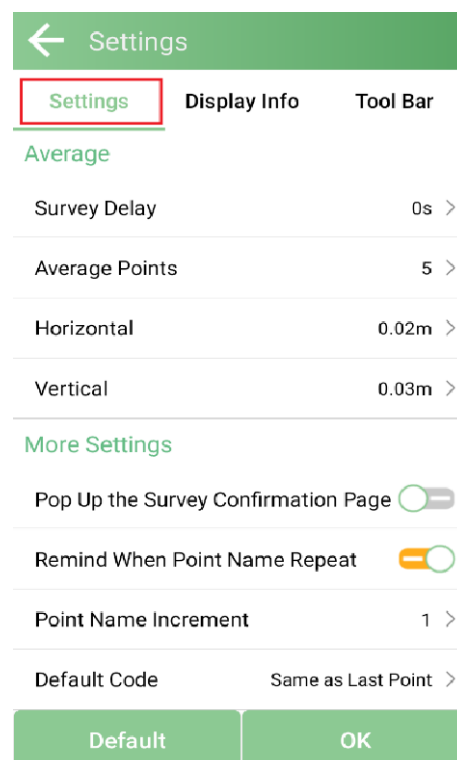
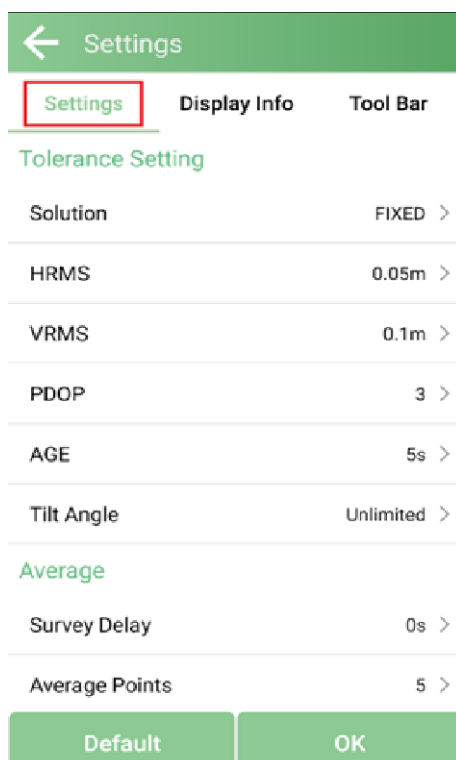
- Click to show the all points on the interface.



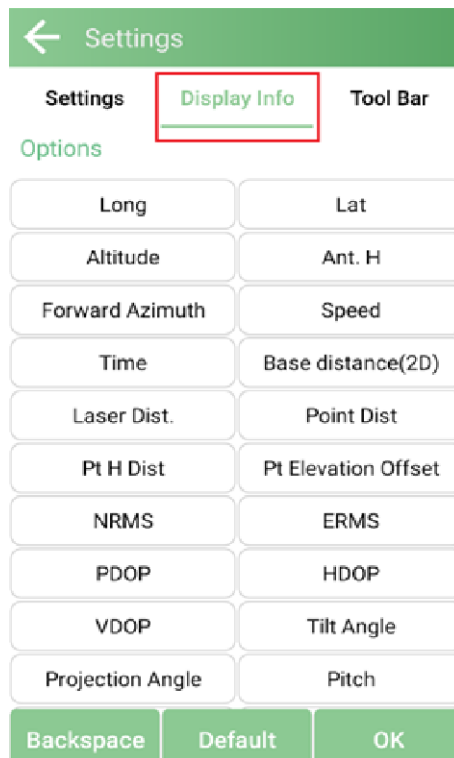
- Click to enter the point database and view the coordinates of the measured points. You can add, recover, import and export data. After selecting a point, you can view the details and take notes or take photos.



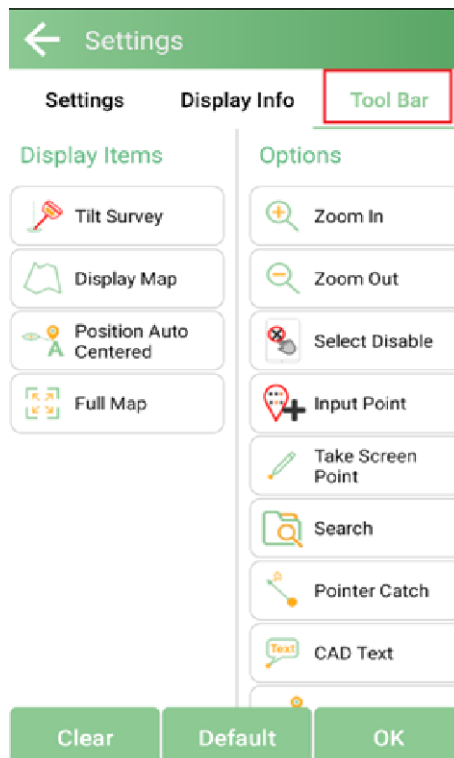
- Click to enter Settings interface In Settings interface, you can modify Tolerance Setting such as solution limit, HRMS limit, VRMS limit and etc. and modify Smooth parameters and configure Settings options.



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

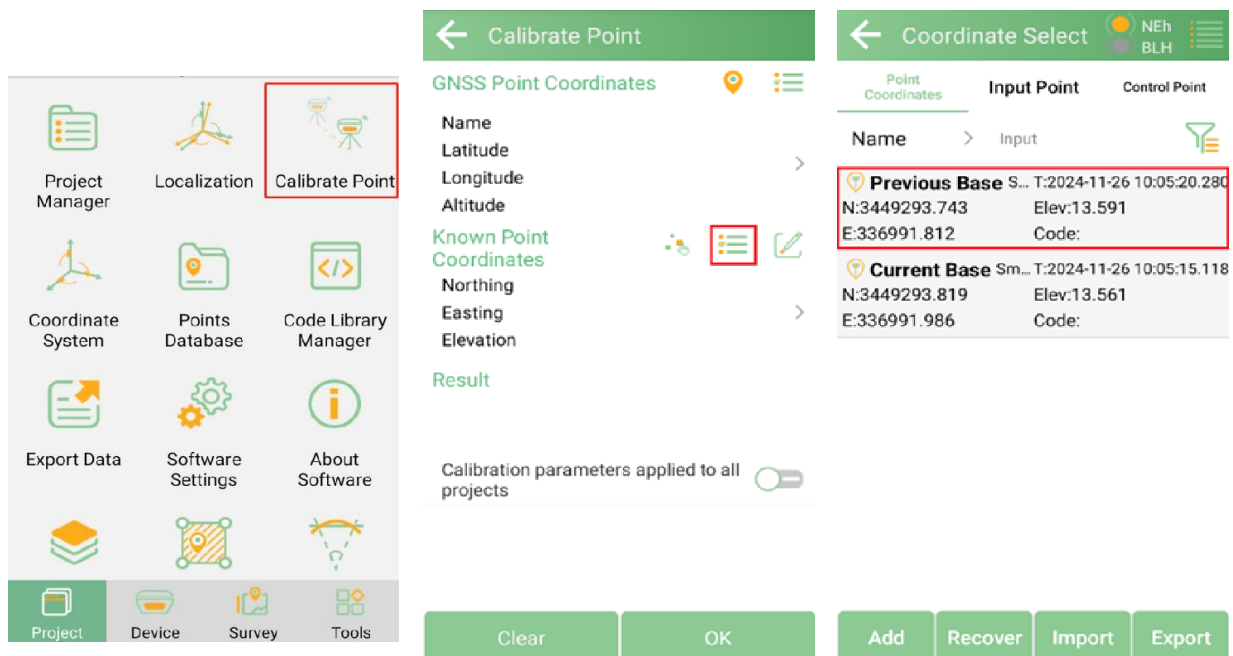


In Tool Bar interface, you can add or delete options that displayed on the point survey interface. You can customize the interface layout to suit your usage habits.

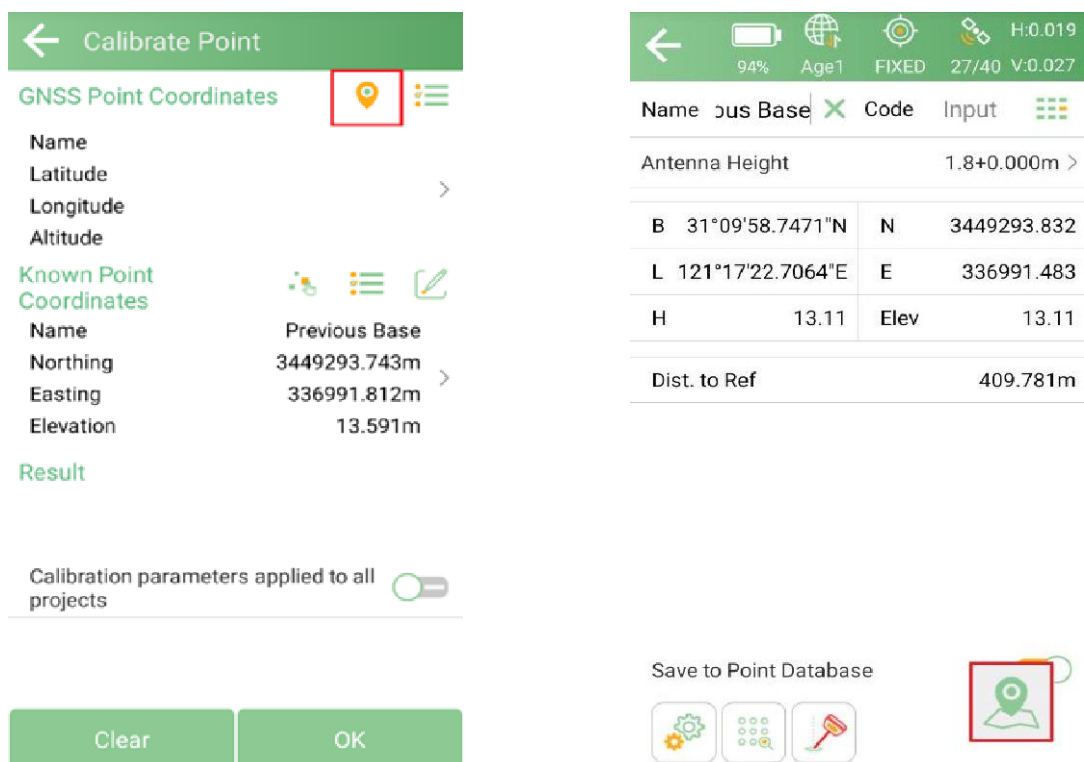


3.3 Calibrate Point

When changing the position of the base station, there will be offsets between surveying points base on different base stations. Users can use the Calibrate Point to calibrate the offset. Go to Project >>> Calibrate Point . Add a point measured under the previous base station as Known Point Coordinates , and measure the same point under current base station as GNSS Point Coordinates .



For the GNSS Point Coordinates, you can click the surveying icon to measure under the current base directly. Note: Please confirm the RTK status is FIXED.



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

←

Calibrate Point

GNSS Point Coordinates

📍

☰

Name

Latitude

Longitude

Altitude

Known Point Coordinates

📍

☰

✎

Name

Northing

Easting

Elevation

Previous Base

3449293.743m

336991.812m

13.591m

Result

Calibration parameters applied to all projects

🔍

Clear

OK

←

Coordinate Select

NEh

BLH

☰

Point Coordinates

Survey Point

Name

>

Input

🔍

📍 Previous Base

S... T:2024-11-26 10:05:20.280

N:3449293.743 Elev:13.591

E:336991.812 Code:

📍 Current Base

Sm... T:2024-11-26 10:05:15.118

N:3449293.819 Elev:13.561

E:336991.986 Code:

Add

Recover

Import

Export

Then click OK to complete the Calibrate Point.

←

Calibrate Point

GNSS Point Coordinates

📍

☰

Name

Base ID

Latitude

Longitude

Altitude

Current Base

22

31°09'58.7469"N

121°17'22.7254"E

13.561m

Known Point Coordinates

📍

☰

✎

Name

Northing

Easting

Elevation

Previous Base

3449293.743m

336991.812m

13.591m

Result

Adjust Time

North Offset

East Offset

Height Offset

2024-11-26 10:16:14

-0.078m

-0.201m

0.030m

Calibration parameters applied to all

🔍

Clear

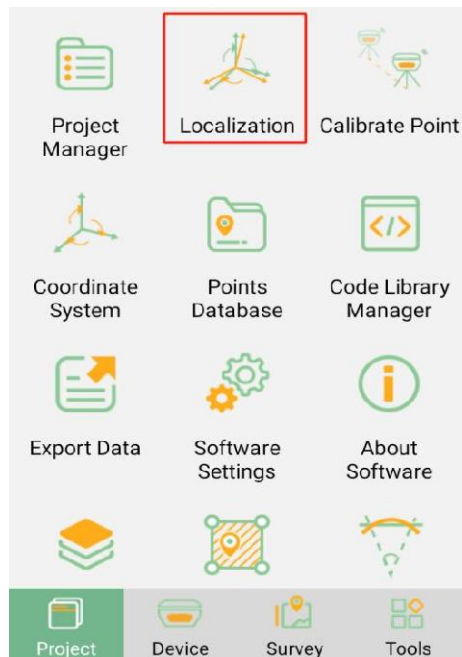
OK

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. Input the Known Point Coordinates .

← Localization

Data Content

Add

Import

Export

Calculate

← Localization

Name

K1

Known Point Coordinates

Northing

3450141.4360 m

Easting

622951.6845 m

Elevation

14.3341

GNSS Point Coordinates

Latitude

Longitude

Altitude

Options

Use Horizontal Control

Use Vertical Control

OK

Then select the corresponding GNSS coordinates of the known point.

← Localization

Name

K1

Known Point Coordinates

Northing

3450141.4360 m

Easting

622951.6845 m

Elevation

14.3341 X

GNSS Point Coordinates

Latitude

Longitude

Altitude

Options

Use Horizontal Control

Use Vertical Control

OK

← Coordinate Select

NEh

BLH

Point Coordinates

Survey Point

Name

> Input

A3 Input Point

T:2024-10-03 19:25:14.000

N:3450110.466

E:622947.648

Elev:14.324

Code:

A2 Input Point

T:2024-10-03 19:23:44.000

N:3450138.466

E:622946.392

Elev:14.349

Code:

A1 Input Point

T:2024-10-03 19:23:10.000

N:3450141.458

E:62251.591

Elev:14.318

Code:

Add

Recover

Import

Export

← Localization

Name

K1

Known Point Coordinates

Northing

3450141.4360 m

Easting

622951.6845 m

Elevation

14.3341 X

GNSS Point Coordinates

Latitude

Longitude

Altitude

Options

Use Horizontal Control

Use Vertical Control

OK

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

← Localization

Data Content

K1

HRMS:0.000 VRMS:0.000

B:31°05'28.2453"N

N:3450141.436

L:4°35'08.2266"W

E:622951.685

H:14.318

Elev:14.334

Add

Import

Export

Calculate

After adding all the point pairs, click Calculate .

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←

Localization

Data Content

K1	HRMS:0.000 VRMS:0.000
B:31°05'28.2453"N	N:3450141.436
L:4°35'08.2266"W	E:622951.685
H:14.318	Elev:14.334
K2	HRMS:0.000 VRMS:0.000
B:31°09'59.0117"N	N:3450138.462
L:1°17'22.3188"E	E:622946.400
H:14.349	Elev:14.343
K3	HRMS:0.000 VRMS:0.000
B:31°09'58.1023"N	N:3450140.494
L:1°17'22.3539"E	E:622947.653
H:14.324	Elev:14.310

Add

Import

Export

Calculate

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

←

Localization Settings

Convert Method	H Adjustment + V Adjustment >
Horizontal Accuracy Limit	0.1m >
Vertical Accuracy Limit	0.1m >

OK

←

Localization Settings

Convert Method	H Adjustment + V Adjustment >
Horizontal Accuracy Limit	0.1m >
Vertical Accuracy Limit	0.1m >

Convert Method

H Adjustment + V Adjustment

H Correction + V Correction

Datum + H Correction + V Correction

Datum (7-parameter)

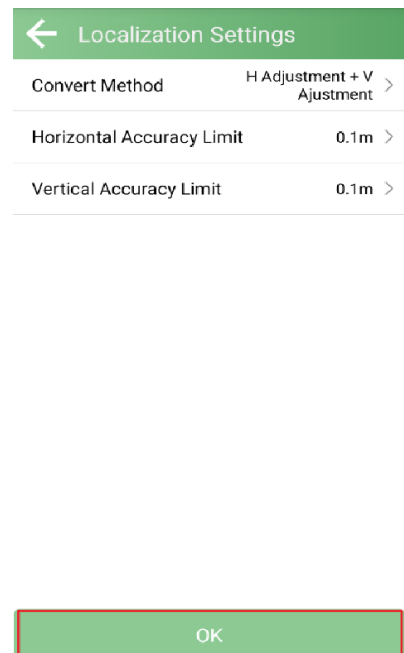
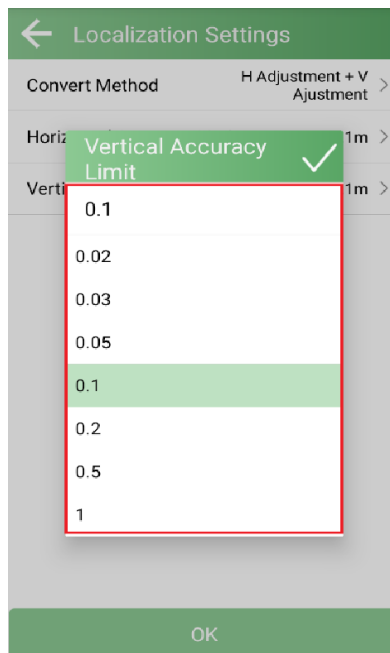
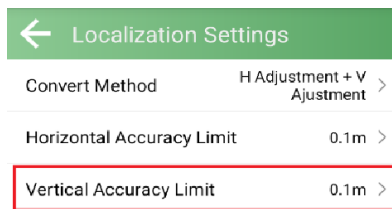
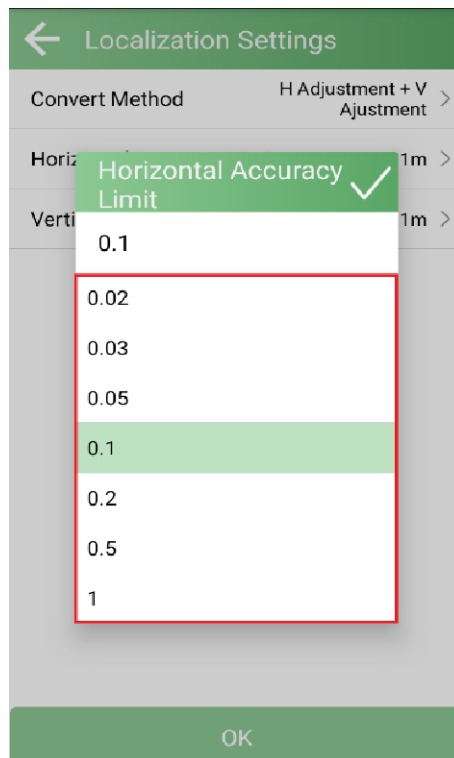
OK

←

Localization Settings

Convert Method	H Adjustment + V Adjustment >
Horizontal Accuracy Limit	0.1m >
Vertical Accuracy Limit	0.1m >

OK



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

←

Localization Calculating Result

Conversion Residual

K1

HRMS:0.029 VRMS:-0.000

K2

HRMS:0.032 VRMS:0.000

K3

HRMS:0.006 VRMS:-0.000

Ellipsoid Parameter

WGS-84

Semimajor Axis:637... 1/f:298.257223563

Projection Parameter

UTM

Central Meridian

E123°00'00"

Horizontal Adjustment

Horizontal Adjustment(TGO)

Translate Northing(m)

1380.049052

Translate Easting(m)

49.207755

Rotation

0°04'14.9976"

Scale

1.0000273161828885

Export Report

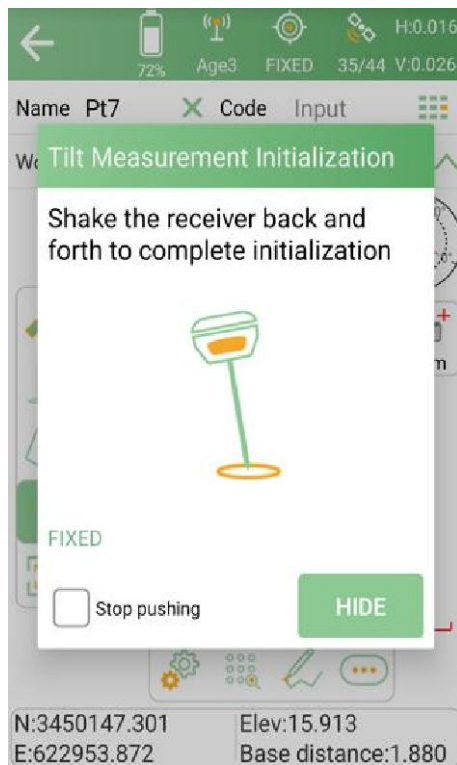
Apply

3.5 *Laser Survey*

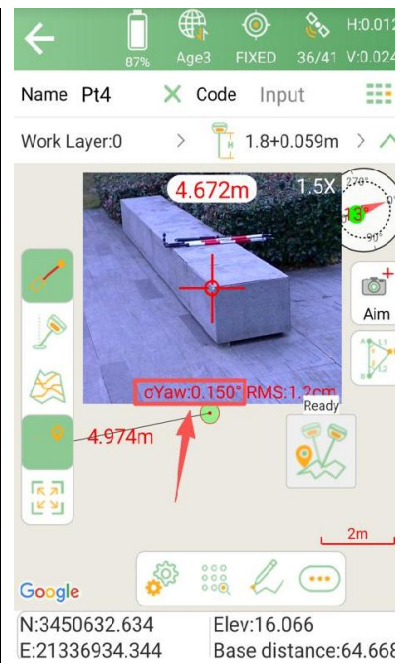
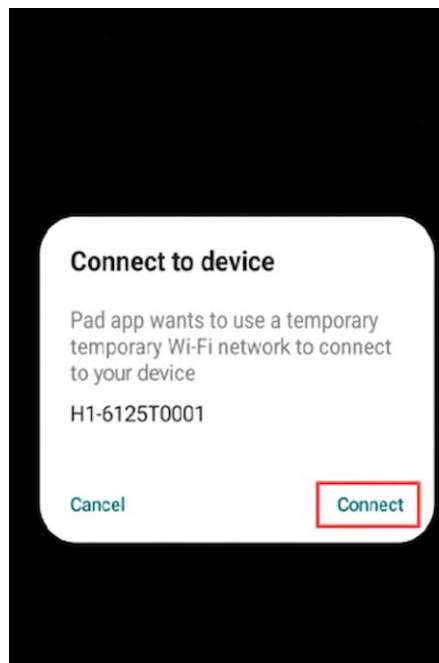
Connect Banff-VL receiver to GeoPad software via Bluetooth and ensure a fixed RTK solution is achieved.



Before performing laser surveying, you need to complete IMU initialization of Banff-VL according to the software prompts. When the survey status icon shows Ready , the accuracy of the laser surveying meets the requirements. Tips: Laser surveying is based on IMU, so shake it more times than usual to ensure that the IMU is initialized successfully.



Turn on the laser surveying function in the Point Survey interface. After you click the Aim icon, the controller will automatically connect to the device's Wi-Fi. Then, the Banff-VL laser can be clearly seen, and the rear camera will be activated. And, you can zoom in and out on the screen to change the camera magnification, with a maximum zoom level of 5x. Once the camera is enabled, you will then see a red crosshair will appear in the image window, and a standard deviation value will be displayed at the bottom of the window. To ensure the accuracy, laser survey should be performed when the standard deviation is less than 0.2. If the standard deviation exceeds 0.2, it is recommended to hold the vertical centering pole and walk a few steps, then stop and check if the standard deviation has decreased.



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



Now click the measure button and you can perform laser survey normally. Measured points using the laser can be viewed in the Points Database (Please refer to section 3.15 Point Database). You can view the corresponding photo of that point in Photo and Sketch , where annotations and markings can be added.

← Points Database

Name	Input
Pt4 Laser Point	T:2025-12-18 16:48:17.000 N:3450632.665 Elev:16.068 E:21336934.337 Code:
Pt3 Tilt Point	T:2025-12-11 17:09:35.600 N:3450594.999 Elev:9.138 E:21336784.829 Code:
Pt2 Tilt Point	T:2025-12-11 17:09:02.400 N:3450595.007 Elev:9.151 E:21336784.830 Code:
Pt1 Tilt Point	T:2025-12-11 17:03:42.200 N:3450603.527 Elev:9.283 E:21336798.480 Code:

Add Recover Import Export

← Point Details

Name Pt4 Code Input

Layer 0 >

B	31°09'57.4063"N	N	3450632.665m
L	121°17'23.0357"E	E	21336934.337m
H	16.068m	Elev	16.068m
Tilt Angle		13°51'41.4629"	
Projection Angle		172°41'52.03"	
Scale Factor		1.0003253376	
Laser Dist.	4.675m	Azimuth	259°26'18.30"
Horizontal Dist	4.976m	Elev. Offset	0.477m
Local Time		2025-12-18 16:48:17.000	

Photo And Sketch OK

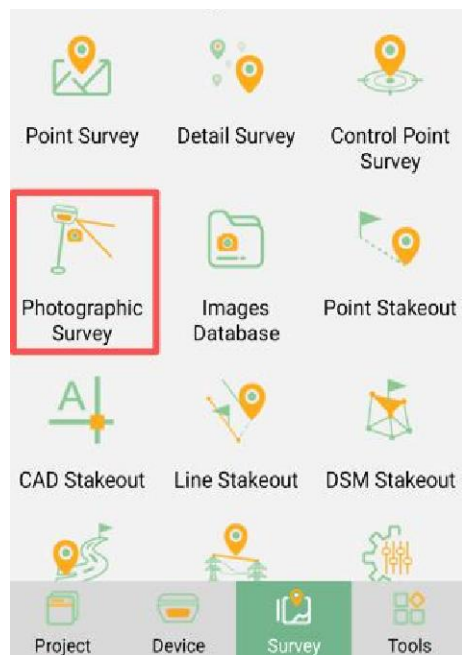
← Photo And Sketch-Pt4

Cancel OK

Tips: The laser of Banff-VL can reach a distance of about hundreds of meters, but it does not mean that effective measurement accuracy at those ranges. For optimal accuracy, laser surveying is recommended to use within approximately 10 meters.

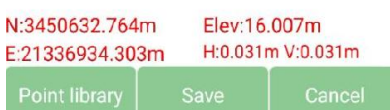
3.6 *Photographic Survey — Visual Survey*

Banff-VL supports photogrammetric measurement with a centimeter-level accuracy. When the positioning status shows as FIXED and the Age value is around 1-4 seconds, you can start measuring. Go to Survey >>> Photographic Survey to enter the photogrammetry module.



The pole height needs to be set before shooting begins. When " Ready " is displayed on the screen, you can tap the shutter button below to take pictures. During image acquisition, you need to slowly move the device. The device will automatically take pictures, or you can manually take pictures by clicking the button to the right of the shutter button at the bottom of the screen. After images are captured, you can drag the cursor on the screen to the point on

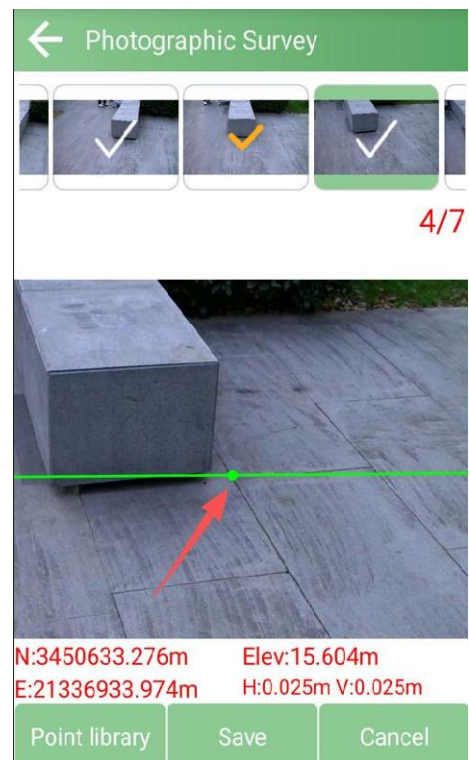
the image you want to measure, and the coordinates of that point will be displayed at the bottom of the screen. You can click Save to save the point. Once you have taken a sufficient number of pictures (at least five images are required), tap the shutter button again to stop taking pictures. The captured images will then be stored as a Task, and you can view the coordinates of points of interest within these pictures.



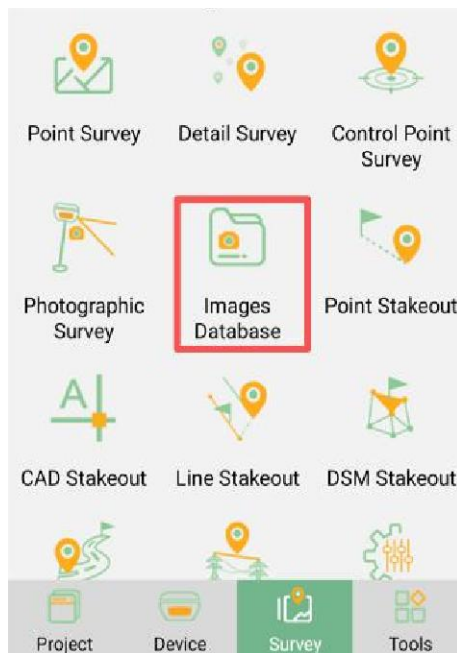


Additionally, other images marked with a “ ✓ ” indicate that the coordinates of that point are also present in that image.

When you need to select a point on another image, please click Cancel first to deselect the current point, then select a new point.



After the measurement is complete, you can also view the pictures you just took in Survey >>> Images Database .



Note:

-When using the Banff-VL photogrammetry module, please note the following guidelines: 1. Ensure the area to be measured is present in every captured image. 2. Do not move the receiver too quickly during image acquisition. 3. At least five images should be taken per task, capturing more images makes coordinate calculation easier. 4. Avoid moving people or objects within the camera's field of view. 5. Areas without obvious feature points (including glass, water surfaces, or similar scenes) may not be measurable. 6. Photogrammetry cannot be performed under low-light conditions. -If you encounter problems with the IMU or the camera function is unavailable during use, it's most likely because the IMU registration validity period has expired. In this case, you need to contact your sales representative to obtain a registration code.

3.7 Tilt Survey

The Banff-VL 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.



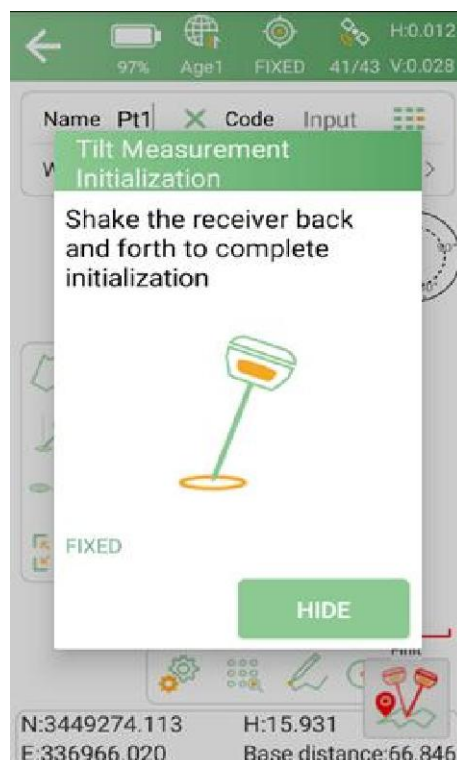
The tilt function option will appear in each survey/stakeout function interface. You can click to turn this function on/off. Tilt initialization is required when using it for the first time or when its calibration expires. The following steps give an example of how to use tilt survey.



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.



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 $\pm 2.5\text{cm}$.



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

3.8 Detail Survey

After completing your Banff-VL RTK setup, check current RTK solution status at the top of the GeoPad software. In detail survey interface, both local coordinates and Latitude/Longitude will be displayed when measuring.



- Click to start or stop collecting data



- Click to set settings, display info and tool bar.



- Click to check point database; you can add note, info, arrow drawing and photo.



- Click to open IMU to do tilt survey.



- Click to open Fast Code Survey. You can input Remark and Code into it, then click the button that just created to start quick-collecting.

Name	Pt2	Code	Input
Antenna Height	1.8+0.068m		
B	31°09'58.0908"N	N	3449274.006
L	121°17'21.7717"E	E	336966.42
H	15.981	Elev	15.981
Tilt Angle	4°25'01.2929"		
Projection Angle	252°52'56.5372"		
Dist. to Ref	66.731m		

3.9 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.

Control Point Measurement Result-Pt2

Result: The collected point is available!

Distribution Map

Statistics

Qualification Rate(%)	100
Mean Square Error(mm)	7.2
ΔPlane Max(mm)	15.2
ΔHeight Max(mm)	-7.9
Observation Time(s)	65

Cancel Export OK

- 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.

3.10 Point Stakeout

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

- Click Add to input coordinates

← Stake Point

Point Coordinates

To-Stake-Point

Preview Map

Name

>

Input

← New Point

Name	Pt1
Code	
Northing	Input m
Easting	Input m
Elevation	Input m
Property Type	Stake Point >

Add

Database

Import

Export

OK

- Click Database to choose one.

← Stake Point

Point Coordinates

To-Stake-Point

Preview Map

Name

> Input

Add

Database

Import

Export

← Coordinate Batch Select

Name

> Input

☐ Select All(0)

Pt1

Smooth Point T:2024-11-27 14:23:3...

N:3449274.017

Elev:15.967

E:336966.415

Code:

Pt2

Control Point T:2024-11-27 14:30:3...

N:3449272.473

Elev:15.908

E:336967.132

Code:

Pt3

Smooth Point T:2024-11-27 14:32:4...

N:3449274.110

Elev:15.963

E:336966.779

Code:

Pt4

Smooth Point T:2024-11-27 14:32:4...

N:3449274.108

Elev:15.970

E:336966.771

Code:

Pt5

Smooth Point T:2024-11-27 14:32:4...

N:3449274.111

Elev:15.977

E:336966.770

Code:

Pt6

Smooth Point T:2024-11-27 14:32:4...

Add

Import

OK

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

← Stake Point

Point Coordinates

To-Stake-Point

Preview Map

Name

> Input

Add

Database

Import

Export

← Import Data

Choose Import File Format

Cass Format(dat)

Point Name,Code,Easting,Northing,Elevation

>

Import Parameters

Distance Unit

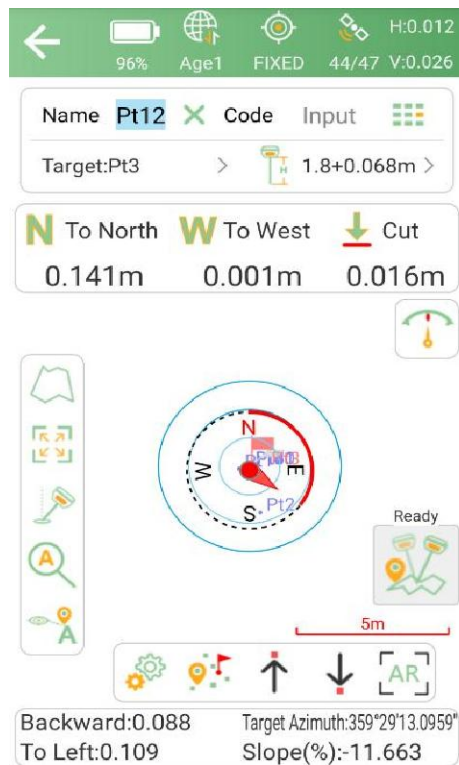
Meter

>

Next

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

receivers, you can use the IMU stakeout feature. In IMU stakeout, you can turn on the IMU feature without keeping the receiver perpendicular to the ground. The maximum tilt angle is 60°.



There is a direction prompt on the floating window.



- Click to start or stop stake points



- Click to open or close IMU



- Click to scale automatically to full map



- Click to jump to current point



Click to jump to next point

-



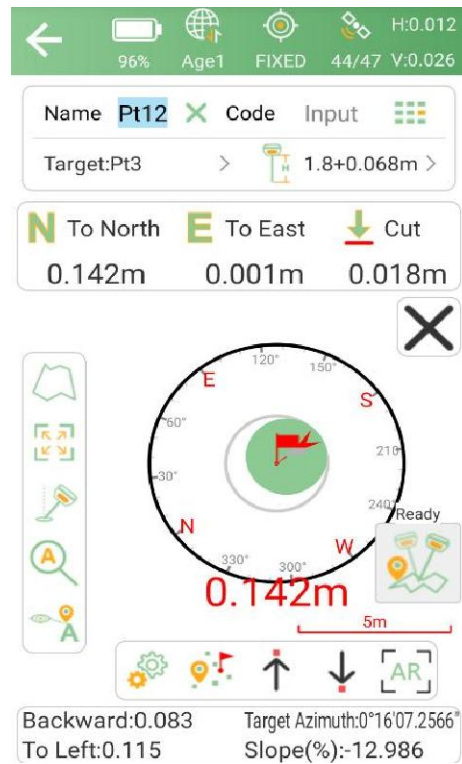
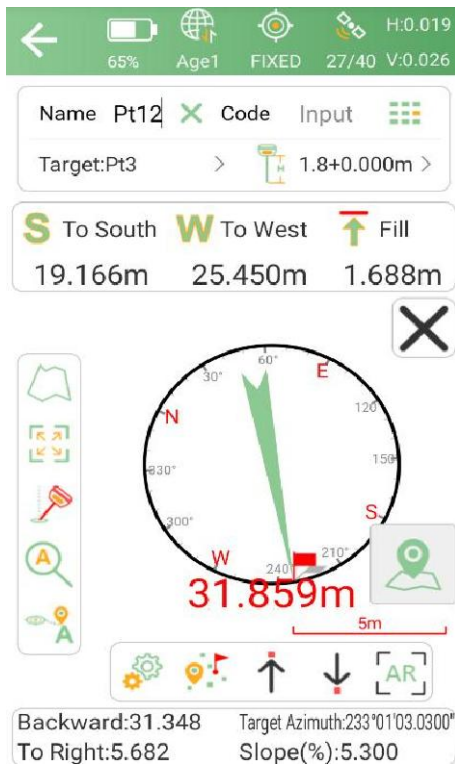
- Click to jump to previous point



- Click to set stake out settings, display info and tool bar, you can edit the prompt range and range error



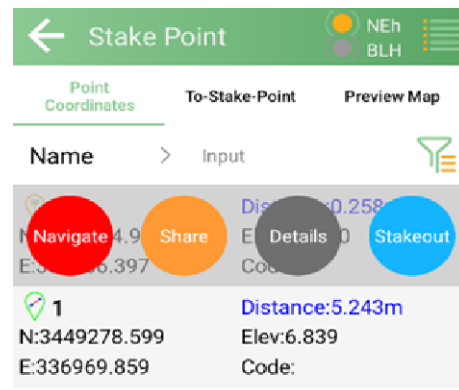
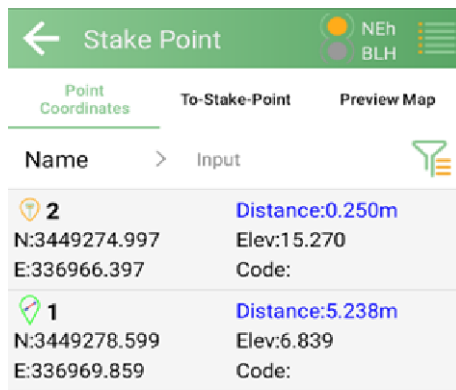
- Click to open compass



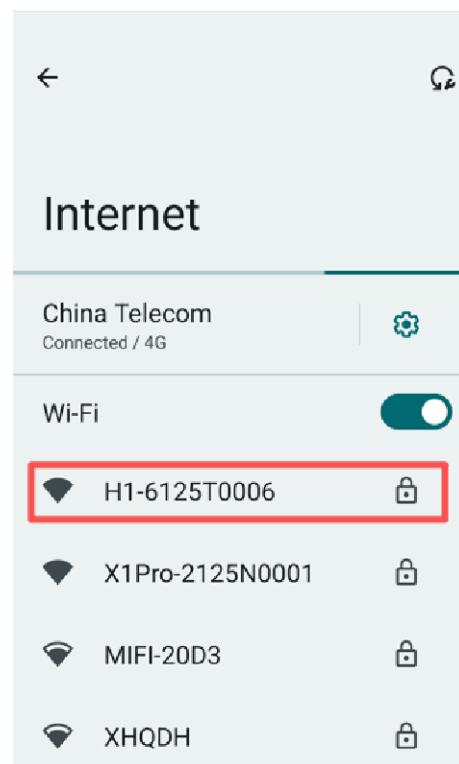
3.11 *Visual AR Stakeout*

After completing your Banff-VL RTK setup, check current RTK solution status at the top of the GeoPad software. Get a fix solution: When using Visual AR Stakeout, you need to connect to Banff-VL's Wi-Fi. If you are using CORS (using Phone Internet to obtain the network), please insert a SIM card into the controller instead of connecting the controller to Wi-Fi or Hot Spots. If you are using radio communication (no network required), no additional network configuration is needed. The AR stakeout function uses the Wi-Fi connection to transmit visual data.

Go to Survey >>> Stakeout Point , you can import points (refer to the previous section), or select existing points, and then click Stakeout . After importing or entering stakeout points, enter the staking interface.



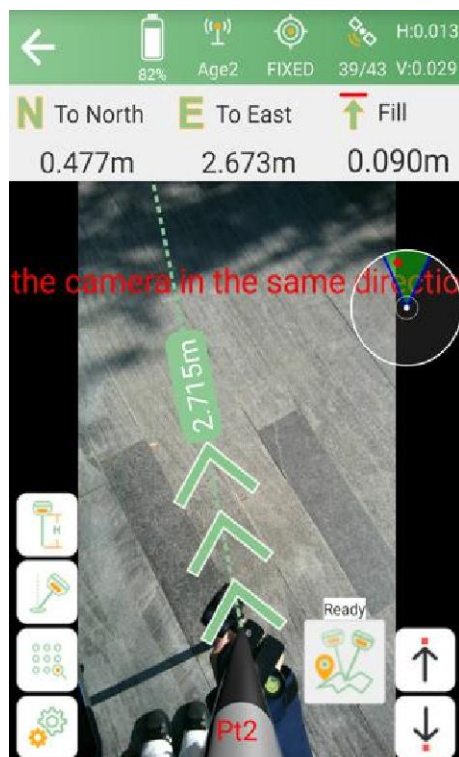
Then click the AR staking icon , the controller will automatically connect to the Banff-VL device's Wi-Fi . Then the Banff-VL's rear camera will be activated .



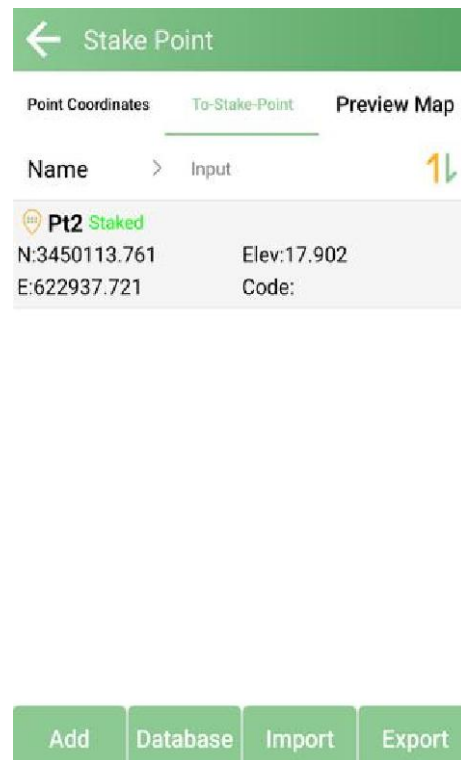
Follow the software prompts to ensure the receiver is facing backward. The rear camera will then be activated, and the software will display the specific location of the stakeout point overlaid on the camera view, providing AR guidance.



When you are within 3m of the stakeout point, the camera view will automatically switch from the rear camera to the bottom camera for better AR guidance.

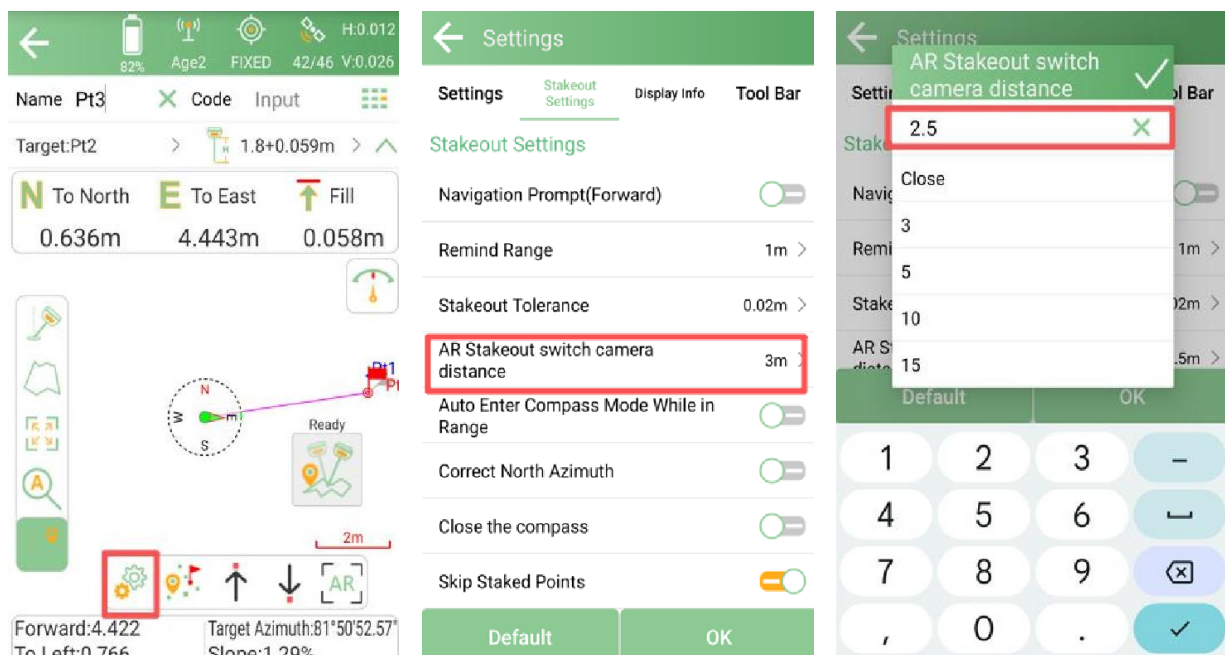


When you approach the point to be staked, the software will mark its location on the screen. At this time, align the tip of the pole with the position of the stakeout point. Then click the survey button to stake out.



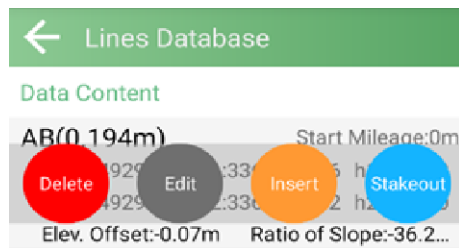
Note :

The distance at which the rear camera switches to the bottom camera can be manually adjusted. Go to Stakeout Point , click Settings >>> Stakeout Settings >>> AR Stakeout switch camera distance . You can choose a preset distance or add one manually. Click OK to apply the setting.



3.12 Line Stakeout

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



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



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



- Click to jump to next line



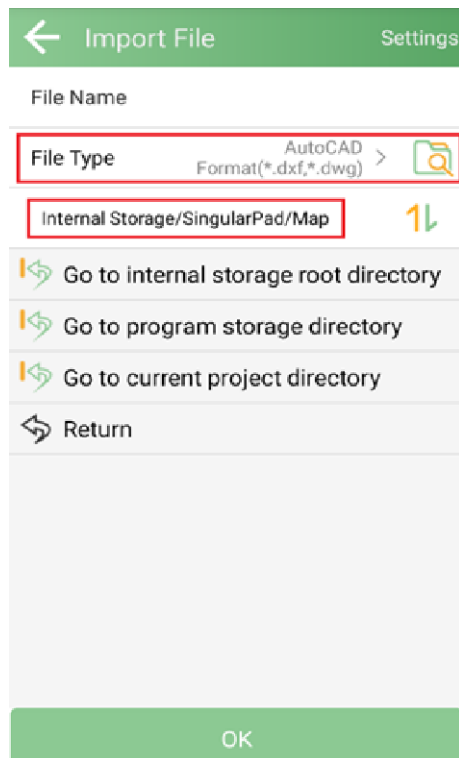
- Click to jump to previous line

3.13 CAD Mapping and Stakeout

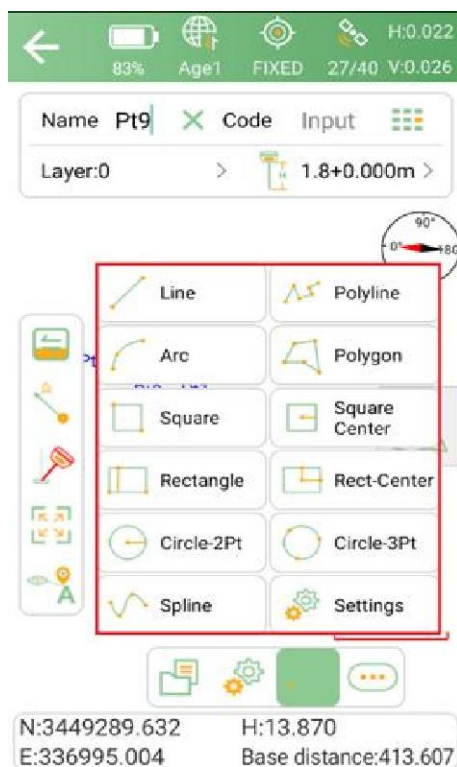
When using this function for the first time, the CAD interface has no layers and floating window to display the features you need to stake.



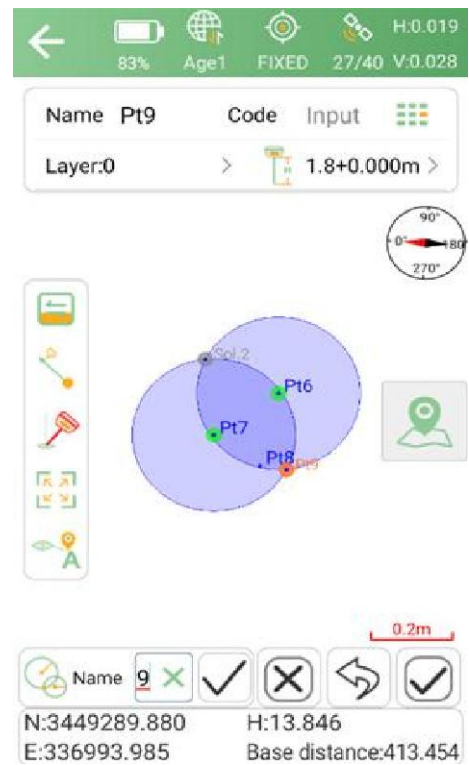
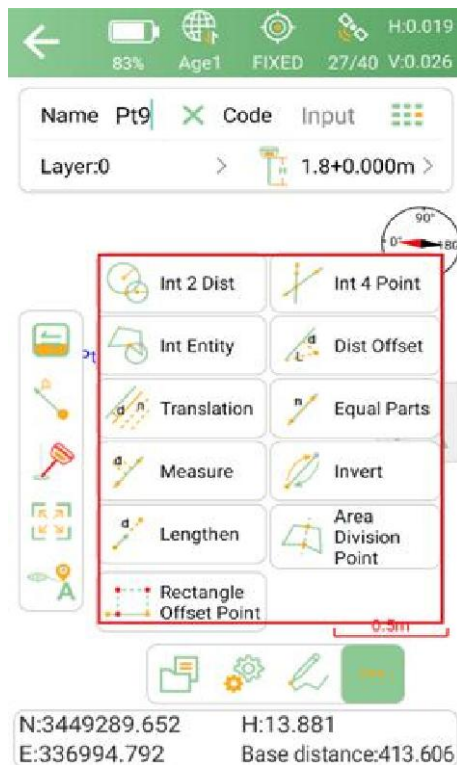
- Click to create or import a CAD file, supporting *.dxf, *.dwg format.



- 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.



In the CAD interface, you can choose a feature you want to stake, it will show up in blue. You can know the details about it, including length, start point, end point and center point. And choose the way to stakeout.

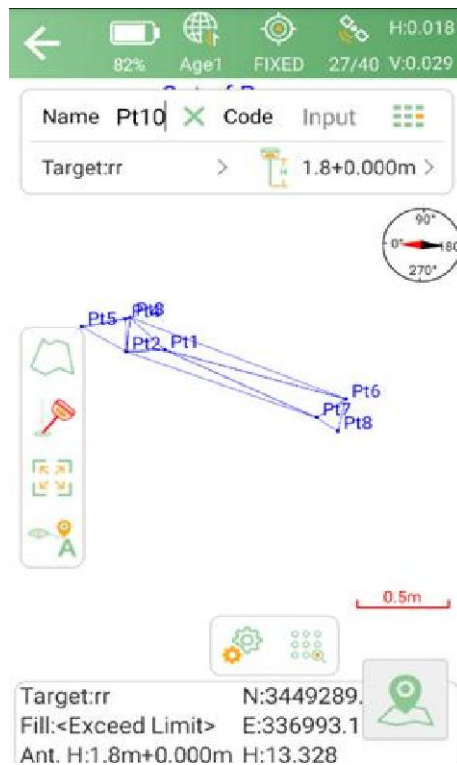
- Setting: Set the method of stake out, offset distance, interval etc.
- Start station: If you set the start station as 5m, then the final mileage will plus 5m.
- Offset: If you set the offset 5m, then you will stake the line 5m away from the line you choose. The plus and minus represent different sides of the line.
- Setting out by pile by coordinate: including station number, station distance and segment
- Station distance: Stake the line at a specified distance, for example, if the line is 40m, you set the specified distance as 8m, then you will stake the line at 8m distance every segment.
- Segment: For example, if you set the segment as 4, then you will stake the line

at 4 segments, every segment length is the same.

- Station number: You will stake the line at the station at each interval point. You can stake it out according to the direction.
- Key node: It will stake out the line with starting point, ending point, midpoint, fold point, etc.

3.14 DSM Stakeout

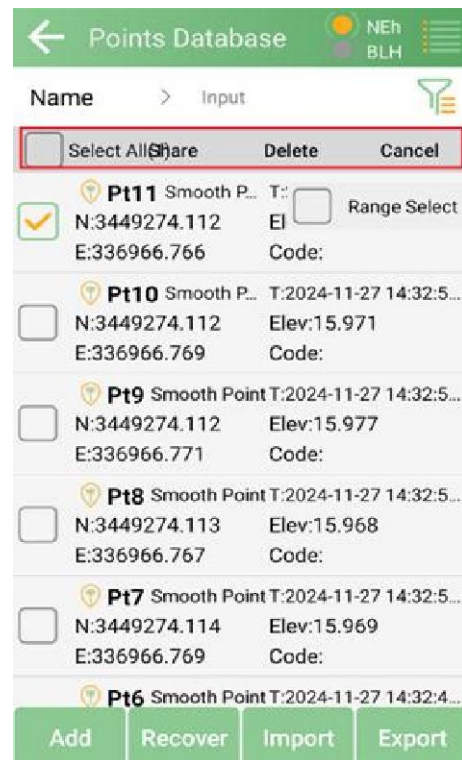
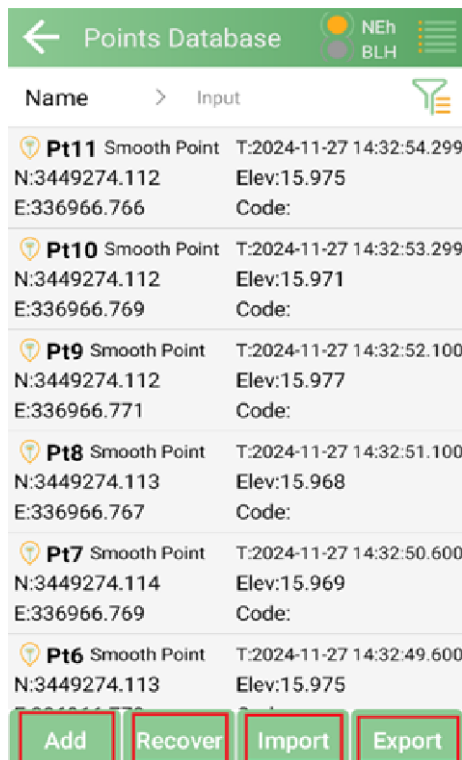
You can stakeout a surface by staking out elevation of each point on the surface. If you haven't used a surface file before, you need to create one by adding, importing, or selecting from the database. You can get a preview map of the surface after adding points and don't forget to save it. At the content list interface, you can find the surfaces you created, and you can edit, share and stake them.



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

3.15 Point 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 to share or delete

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

Point Details

Name
Pt7

Code
Input

Antenna Height
1.8+0.068m
>

Solution

FIXED (44/46)

B

31°09'58.0945"N

N

3449274.114m

L

121°17'21.7848"E

E

336966.769m

H

15.969m

Elev

15.969m

Scale Factor
0.9999253493

Speed

1

Heading

0.000

PDOP

0.900

HRMS

0.012m

HDOP

0.400

VRMS

0.029m

VDOP

0.800

AGE

1

Average Points

5

Cut-Off Angle

5

UTC Time

2024-11-27 06:32:50.600

Photo And Sketch

OK

3.16 Data Import/Export

GeoPad 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.

3.16.1 Import Points Data

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

← Import Data

Data Type Points Database >

Choose Import File Format

Local Coordinates Format(csv,d...
Point Name,Northing,Easting,Elevation,Code >

Import Parameters

Property Type Input Point >

Distance Unit Meter >

← Format Select

File Format

Cass Format(dat)
Point Name,Code,Easting,Northing,Elevation

Local Coordinates
Format(csv,dat,txt)
Point Name,Northing,Easting,Elevation,Code

Geodetic Coordinates
Format(csv,dat,txt)
Point Name,Latitude,Longitude,Altitude,Code

More

Next

New OK

- Data Type: support point database, transformation parameters file and code library
- Import File Format: support *.csv, *.dat, *.txt, *.kml, etc.
- Distance Unit: support meter, US survey feet and international feet Besides, you can click now to create a User defined type.

← Custom Format

Format Name Input

Extension Name dat >

Field Delimiter Comma(.) >

Custom Format Description

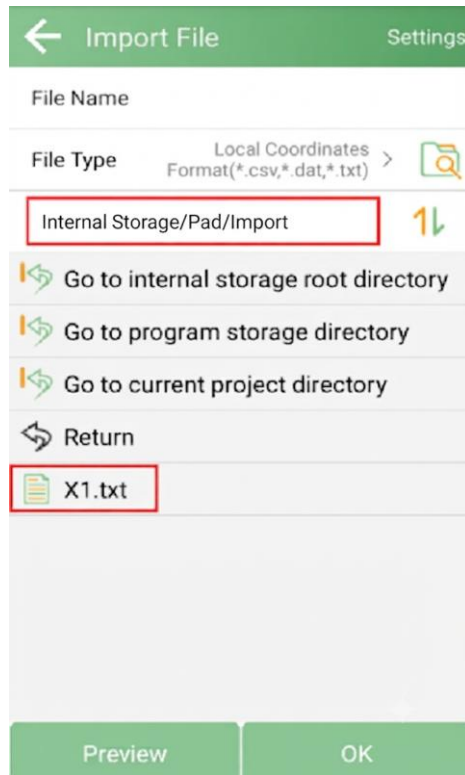
Options

(Null)	Point Name
Code	Northing
Easting	Elevation
Latitude	Longitude
Altitude	

Backspace OK

- 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/ GeoPad/Import. You can also change to any other path where the file is. Click preview to take an inspection whether the format is right.



Point Name	Northing	Easting
Pt1	3449294.210	336993.1
Pt2	3449294.201	336993.1
Pt3	3449294.399	336993.1
Pt4	3449294.391	336993.1
Pt5	3449294.346	336992.1
Pt6	3449293.926	336994.1
Pt7	3449293.816	336994.1
Pt8	3449293.737	336994.1
Pt9	3449290.485	336994.1
A	3449306.409	336851.1
A1	3449306.407	336851.1

3.16.2 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.

Options Settings interface: Input Record name and Point name. Set the Collection Interval,

Observation Time and Data Format.

← Export Data

Export Path Internal Storage/Pad/Export >

File Name Project Name > + Input

Choose Export File Format

Cass Format(.dat)
Point Name,Code,Easting,Northing,Elevation >

Export Parameters

Distance Unit Meter >

Point Type ☐ Enable

☒ Survey Point ☒ Control Point

☒ TPS Point ☒ Station Point

☒ Input Point ☒ Cal. Point

Time ☐ Enable

Start Time 2024-11-26 00:00:00

Share File Export

← Format Select

Road Section Data ☐

File Format

Cass Format(.dat)
Point Name,Code,Easting,Northing,Elevation

Local Coordinates Format(.txt)
Point Name,Northing,Easting,Elevation,Code

Geodetic Coordinates Format(.txt)
Point Name,Latitude,Longitude,Altitude,Code

Geodetic Coordinates Format[Covariance](.txt)
Point Name,Latitude,Longitude,Altitude,Code,Covariance Cxx,Covariance Cxy,Covariance Cxz,Covariance

Survey Point Data Format[GNSS](.csv)
Point Name,Code,Northing,Easting,Elevation,Latitude,Longitude,Altitude,Local Time,Station Correction x,Station Correction y,Station Correction

New OK

- Export Path: the default export path is internal storage/Pad/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.

←

Custom Format

Format Name

Input

Extension Name

dat >

Field Delimiter

Comma(,) >

File Header

☐

Custom Format Description

Options

Point ID	Point Name
Code	Code Remark
Line Name	Northing
Easting	Elevation
Local Time	Point Attributes

Backspace

OK

4 STATIC SURVEY

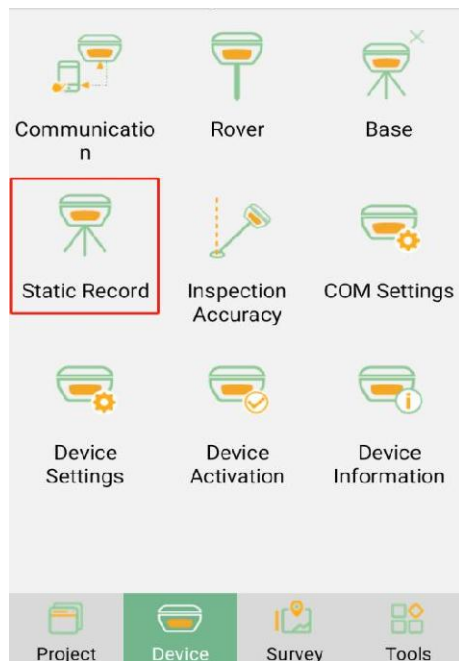
This chapter describes how to conduct static survey through Banff-VL receiver.

For static survey, Banff-VL supports 3 data formats: binary XYZ, Rinex 3.02 and Rinex 3.04. 3AG binary format (*.XYZ) is a raw observation data format and you can convert it to RINEX format.

4.1 Static Data Collection

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

- At least 3 GNSS receivers are required to form a stable triangulation network.
- It is better to collect static data on the known point.
- Power off the receiver before moving to other observation site.
- For the convenience of post-process static observation raw data, record the station name, receiver SN, antenna height, start and end time for each observation site. The following steps give an example of static survey: 1. Go to Device >>> Static and collect points . Choose the Record mode, there are two record modes and they can record static data at the same time.



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

The Options Settings interface is shown with a green header bar containing a back arrow, battery status (93%), mode (FIXED), signal strength (40/41), and coordinates (H:0.012, V:0.023). Below the header, the 'Mode' is set to 'Record1'. The 'Option Settings' section is highlighted with a red box and contains the following configuration options:

Name	Test
Point Name	P1
Interval	1S >
Observation Time	1 hour >
Data Format	XYZ >

Below the 'Option Settings' section, there are three more options:

- Circular Record: Toggled on (orange switch).
- Auto Record Static Data: Toggled off (grey switch).
- Storage Space: 3000

The 'Antenna Parameters' section is visible at the bottom, with a green 'Start' button.

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 record space is full.

Observation Time	1 hour >
Data Format	XYZ >
Circular Record	☐
Auto Record Static Data	☐

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

Observation Time	1 hour >
Data Format	XYZ >
Circular Record	☐
Auto Record Static Data	☐

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

Observation Time	1 hour >
Data Format	XYZ >
Circular Record	☐
Auto Record Static Data	☐
Storage Space	3000

Antenna Parameters

Start

6. Click Start to start static survey.

Auto Record Static Data	☐
Storage Space	3000

Antenna Parameters

Start

4.2 Static Data Download

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

 > USB flash drive (E) > 1-REC1 > 2023293			
Name	Modified Date	Type	Size
 1823E00052930339.XYZ	10/20/2023 3:43 AM	XYZ	690 KB
 1823E00052930344.XYZ	10/20/2023 3:45 AM	XYZ	166 KB
 1823E00052930345.XYZ	10/20/2023 3:45 AM	XYZ	147 KB
 1823E00052930547.XYZ	10/20/2023 5:59 AM	XYZ	2,460 KB
 1823E00052930600.XYZ	10/20/2023 6:28 AM	XYZ	5,183 KB