

X100
HIGH-PRECISION GUIDANCE
SYSTEM FOR BULLDOZERS

Please read the instruction manual carefully before using this product

Please keep this manual properly

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1. System components

1.1 Hardware Illustration



Rover



Base



Antenna



Radio Antenna and antenna suction cup



Magnetic base of satellite antenna



GNSS Cable



4G Antenna



UHF Whip Antenna

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Power Adapter

1.2 Package list

Number	Name	Quantity
1	P300 Plus GNSS Tablet	1
2	AT360 Antenna	2
3	GNSS Antenna Cable(SMA-J/TNC-J,5m)	2
4	Antenna suction cup (extension rod 70mm)	2
5	Vehicle radio antenna 450-470MHz (5m)	1
6	7-Pin to DB9 Cable	1
7	DC power cord group	1
8	P300 Mini Flat bracket (60mm)	1
9	Hexagon flange self drilling self tapping screw st4.8 * 30	4
10	Hexagon socket cap screw M5 * 12	4
11	∅ 5 spring washer	4
12	Voltage converter (24V to 12V)	1
13	Carry Case	1

1.3 Schematic diagram of system composition



Figure 1-1 Schematic diagram of system composition

2. Base Installation

2.1 Environment

When working in the same project, the installation position of the Base needs to be same, and you should use the fixed position mode; It cannot be installed where there is a shield above, for example: under trees, high-voltage lines, buildings, etc. It is recommended to install it in a stable position without shelter and open above the container / security Pavilion / Project Department plank house and other buildings.

2.2 The following conditions need to be met:

- (1) The surroundings of the Base shall be dry and ventilated.
- (2) There are no obstructions around and above the satellite antenna.
- (3) The base and the rover shall be visible.

3. GNSS Tablet Installation

3.1 Device Description

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The GNSS on-board tablet provides GNSS positioning, data calculation, system human-computer interaction and other functions, which is mainly used to display the position, attitude and operation information of the roller&shovel in real time and guide the operators to carry out leveling operations; At the same time, upload the construction data to the background in real time to supervise the whole process of construction.

3.2 Installation

1. The positioning and heading antennas shall be installed on both sides of the shovel respectively. The positioning antenna is installed on the left side of the shovel, and the heading antenna is installed on the right side of the shovel.
2. After installation, please check whether the installation is firm, and make sure that the antenna stable.
3. The radio antenna is placed on the top of the cab.
4. Install the antenna cable to the tablet according to the back interface tips. Install the power cable to Lemo B.

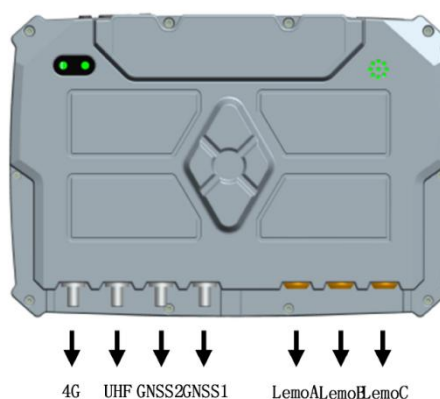


Figure 3-1 Back of the tablet

4. Software

4.1 Software Installation

Click the software installer (grader * * *. APK), click “next” and install according to the instructions. After a few seconds, the application is installed, click “finish” to exit the current interface, and click open to enter the software.

4.2 Software Interface

After installation, when you enter the software for the first time, the software will apply for relevant permissions. Click the “agree” button to complete the authorization. After entering the software, each interface is shown as follows:

SinoGNSS X100 LEVELING SYSTEM



Figure 4-2-1 Main Interface

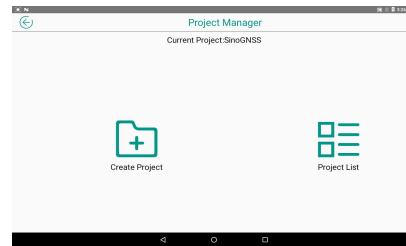


Figure 4-2-2 Project Management

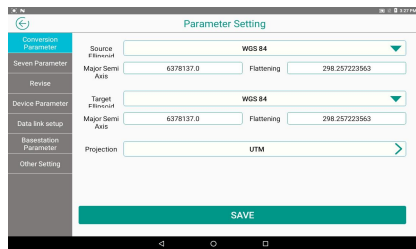


Figure 4-2-3 Parameter Settings

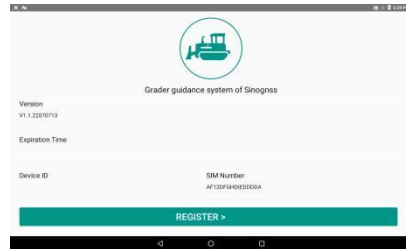


Figure 4-2-4 About

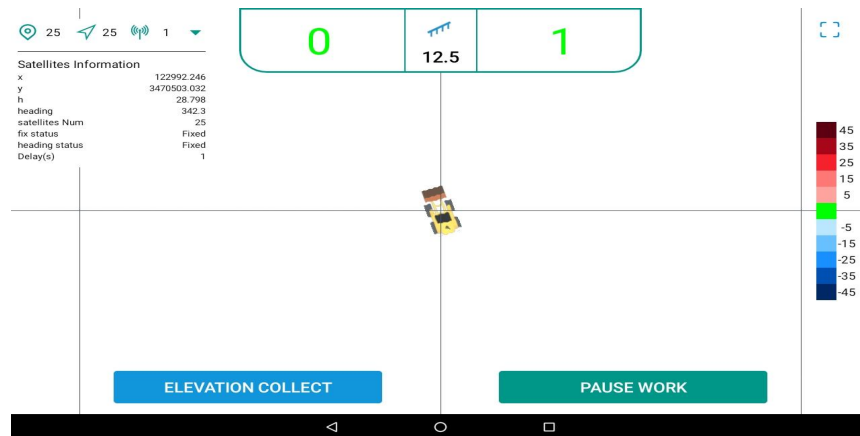


Figure 4-2-5 Working Interface

Positioning Status Icon List:

Icon	Description
	Abnormal Positioning
	Fixed Positioning
	Abnormal Heading
	Fixed Heading
	Abnormal Diff(>10s)
	Diff is good
	The elevation is higher than the target elevation, and the shovel

SinoGNSS X100 LEVELING SYSTEM

	needs to move down
⬆	The elevation is lower than the target elevation, and the shovel needs to move down

4.3 Wizard

Start the software, and the main page of the software is as follows:

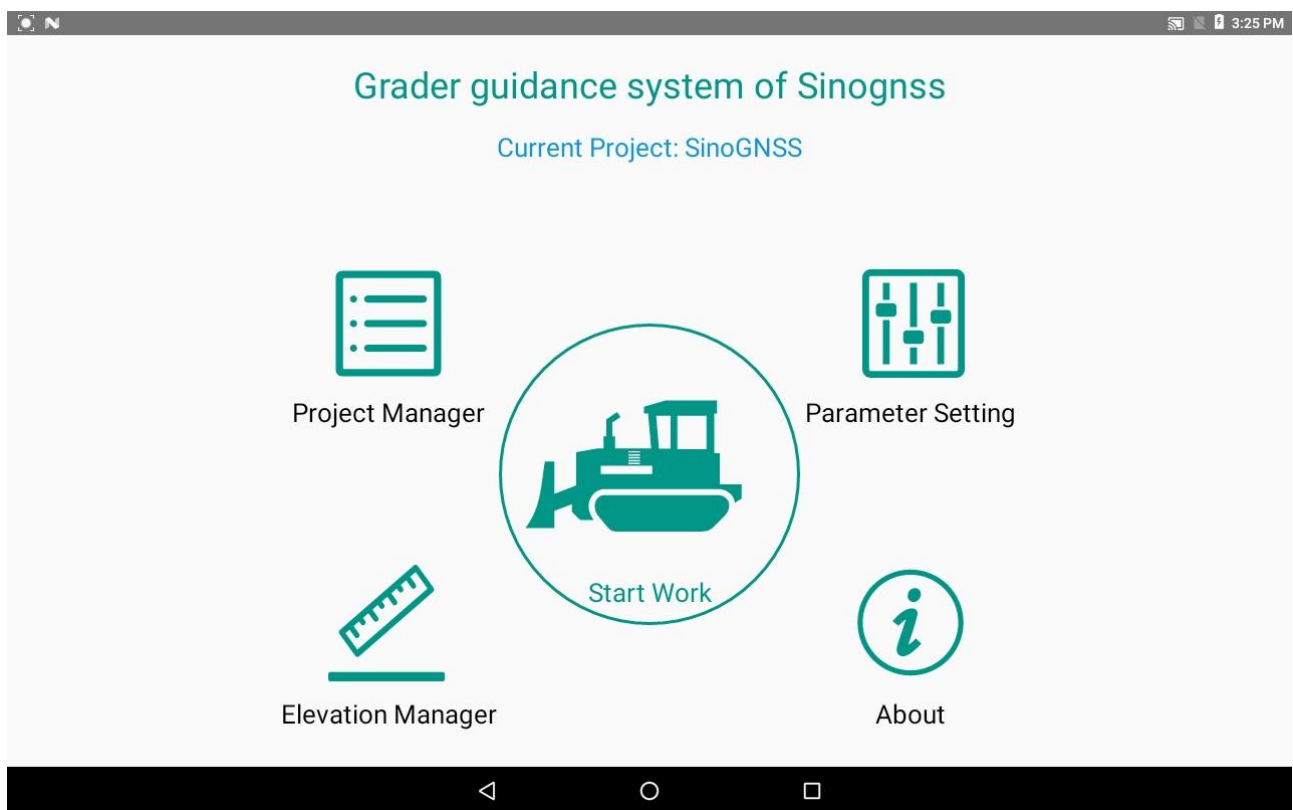


Figure 4-3-1 Main Interface

4.3.1 Parameter Settings

Click “Parameter Setting” to set the parameter.

The screenshot displays the 'Parameter Setting' interface of the SinoGNSS X100 LEVELING SYSTEM. On the left is a vertical sidebar menu with the following items: 'Conversion Parameter' (highlighted in blue), 'Seven Parameter', 'Revise', 'Device Parameter', 'Data link setup', 'Basestation Parameter', and 'Other Setting'. The main content area is titled 'Parameter Setting' and features a back arrow icon in the top left corner. It contains two sets of parameters for Source and Target Ellipsoids, and a Projection setting. The Source Ellipsoid is set to 'WGS 84', the Major Semi Axis is '6378137.0', and the Flattening is '298.257223563'. The Target Ellipsoid is also set to 'WGS 84', with the same Major Semi Axis and Flattening values. The Projection is set to 'UTM'. A large green 'SAVE' button is positioned at the bottom of the main area. The top status bar shows the time as 3:27 PM.

Parameter	Value
Source Ellipsoid	WGS 84
Major Semi Axis	6378137.0
Flattening	298.257223563
Target Ellipsoid	WGS 84
Major Semi Axis	6378137.0
Flattening	298.257223563
Projection	UTM

Figure 4-3-2 Parameter Setting

4.3.1.1 Conversion Parameter

Click "Conversion Parameter" to set the Ellipsoid and the Projection, set the Source Ellipsoid, Target Ellipsoid and Projection according to the need. The follow Figure shows the default settings; If there is no special requirement, you can use the default parameter to work.

Parameter Setting

Conversion Parameter

Source Ellipsoid: WGS 84

Major Semi Axis: 6378137.0

Flattening: 298.257223563

Target Ellipsoid: WGS 84

Major Semi Axis: 6378137.0

Flattening: 298.257223563

Projection: UTM

SAVE

Figure 4-3-3 Conversion Parameter

We support the following Projection now:

选择投影

- ☐ TM
- ☒ UTM
- ☐ Hotine Oblique Mercator(A)
- ☐ Hotine Oblique Mercator(B)
- ☐ Lambert Conformal Conic 1 Parallel
- ☐ Lambert Conformal Conic 1 Parallel
- ☐ Cassini-Soldner
- ☐ Oblique Stereographic(Double)
- ☐ Oblique Stereographic(Double)

Figure 4-3-4 Projection

When you finished the parameter setting, click “SAVE” to complete.

4.3.1.2 Seven Parameter

Click “Seven Parameter” to set the seven parameter:

Parameter Setting

Enable ☐

Dx(m)	0.0
Dy(m)	0.0
Dz(m)	0.0
RX(\"	0.0
RY(\"	0.0
RZ(\"	0.0
k(ppm)	1.0

REQUEST PARAMETER > SAVE

Figure 4-3-5 Seven Parameter

If you need to calculate the parameter, you can click “REQUEST PARAMETER”, check on the “Seven parameter”, Follow the instruction on the interface to enter the designed coordinates of the control point and collect the measurement coordinates , click “CALCULATE” to complete.

Content ☐ Seven Parameter ☐ Revise Plane ☐ Revise Elevation

Coordinate1	East coordinate x	North coordinate y	Standard high h				COLLECT
Coordinate2	East coordinate x	North coordinate y	Standard high h				COLLECT
Coordinate3	East coordinate x	North coordinate y	Standard high h				COLLECT

ADD POINTS DELETE POINTS CALCULATE

Figure 4-3-6 Request Parameter

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After entering or calculating the “SEVEN PARAMETER”, check on “enable”, click “SAVE” to complete.

4.3.1.3 Revise

Click “Revise” to enter the Plane and Elevation-fit banding interface.

Parameter Setting

Revise Plane ☐ Revise Elevation ☐

REVISE PLANE

North Origin East Origin

North Offset East Offset

Rotate Scale Factor

REVISE ELEVATION-FIT BANDING

A0 A1 A2

x0(m) y0(m)

REQUEST PARAMETER > **SAVE**

Figure 4-3-7 Revise

For the project which has Revise-Parameter, you should enter the parameters directly. And for the project which don't have Designed Revise-Parameter, you should click “REQUEST PARAMETER” to enter the Calculation Page:

Content ☐ Seven Parameter ☐ Revise Plane ☐ Revise Elevation

Coordinate1 **COLLECT**

Coordinate2 **COLLECT**

Coordinate3 **COLLECT**

ADD POINTS **DELETE POINTS** **CALCULATE**

Figure 4-3-8 Request Parameter

SinoGNSS X100 LEVELING SYSTEM

- ① Check on the “Revise Plane”, “Revise Elevation” box, follow the instruction on the interface to enter the designed coordinate of the control point and collect the measurement coordinates, You can add and delete the points by “ADD POINTS” and “DELETE POINTS”.Click CALCULATE to complete.
- ② After entering or calculating the “SEVEN PARAMETER”, check on “enable”, click”SAVE” to complete.

4.3.1.4 Device Parameter

Click”Device Parameter” to set the parameter of the vehicle.

The screenshot displays the 'Parameter Setting' screen of the SinoGNSS X100 Leveling System. On the left, a vertical menu lists various settings: 'Conversion Parameter', 'Seven Parameter', 'Revise', 'Device Parameter' (which is currently selected and highlighted in blue), 'Data link setup', 'Basestation Parameter', and 'Other Setting'. The main content area is titled 'Parameter Setting' and features three input fields: 'Shovel width(m)' with the value '4.000', 'Antenna height difference(m)' with the value '0.000', and 'Differential seat angle' with the value '0.000'. To the right of the 'Differential seat angle' field is a blue button labeled 'ONEKEY GET'. At the bottom of the main area is a large green button labeled 'SAVE'. The interface is displayed on a mobile device, as indicated by the status bar at the top showing the time as 3:41 PM and the Android navigation bar at the bottom.

Figure 4-3-9 Device Parameter

- 1) Enter the Shovel Width.
- 2) To eliminate the elevation error and the angle error of the manual installation, after installing the antenna, click “ONE KEY GET” to get the Antenna Installation Error, then click SAVE to finish. The Operation interface is as follow:

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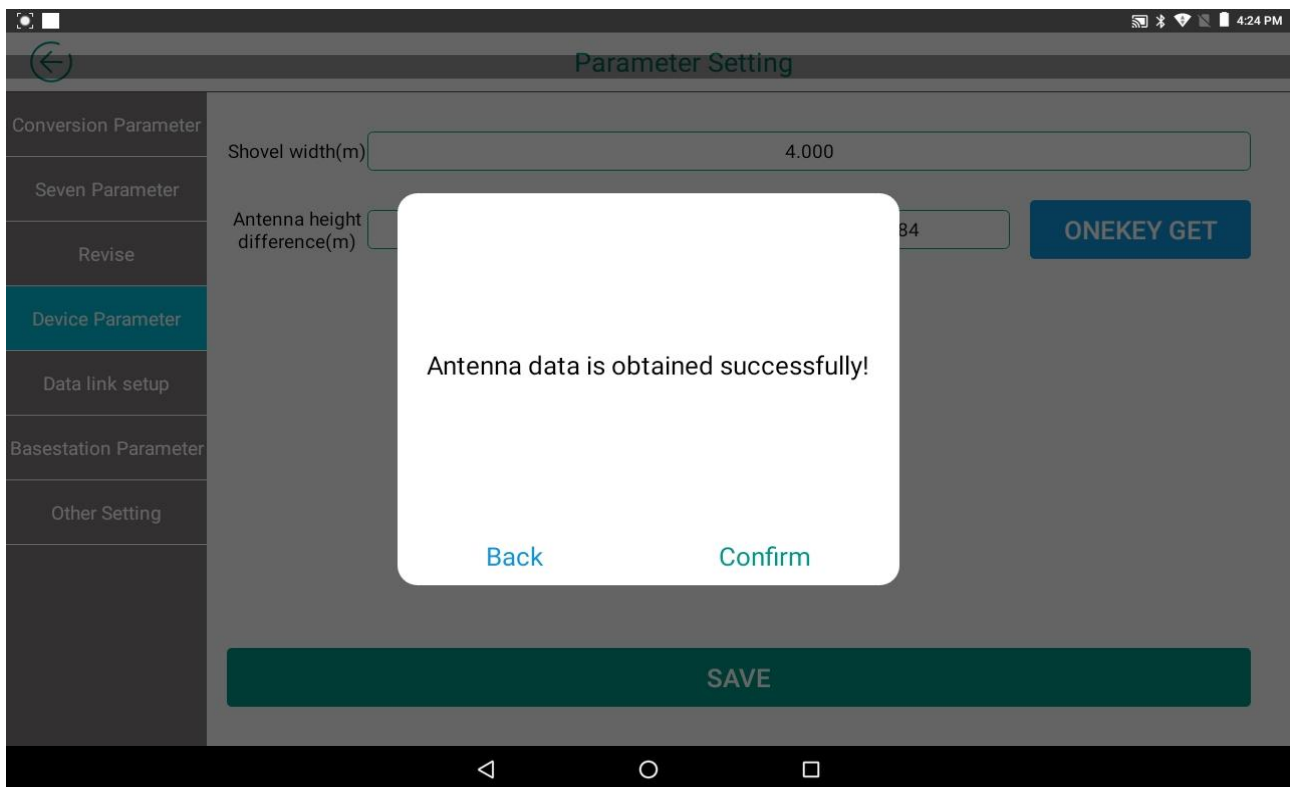


Figure 4-3-10 Get Device Parameter

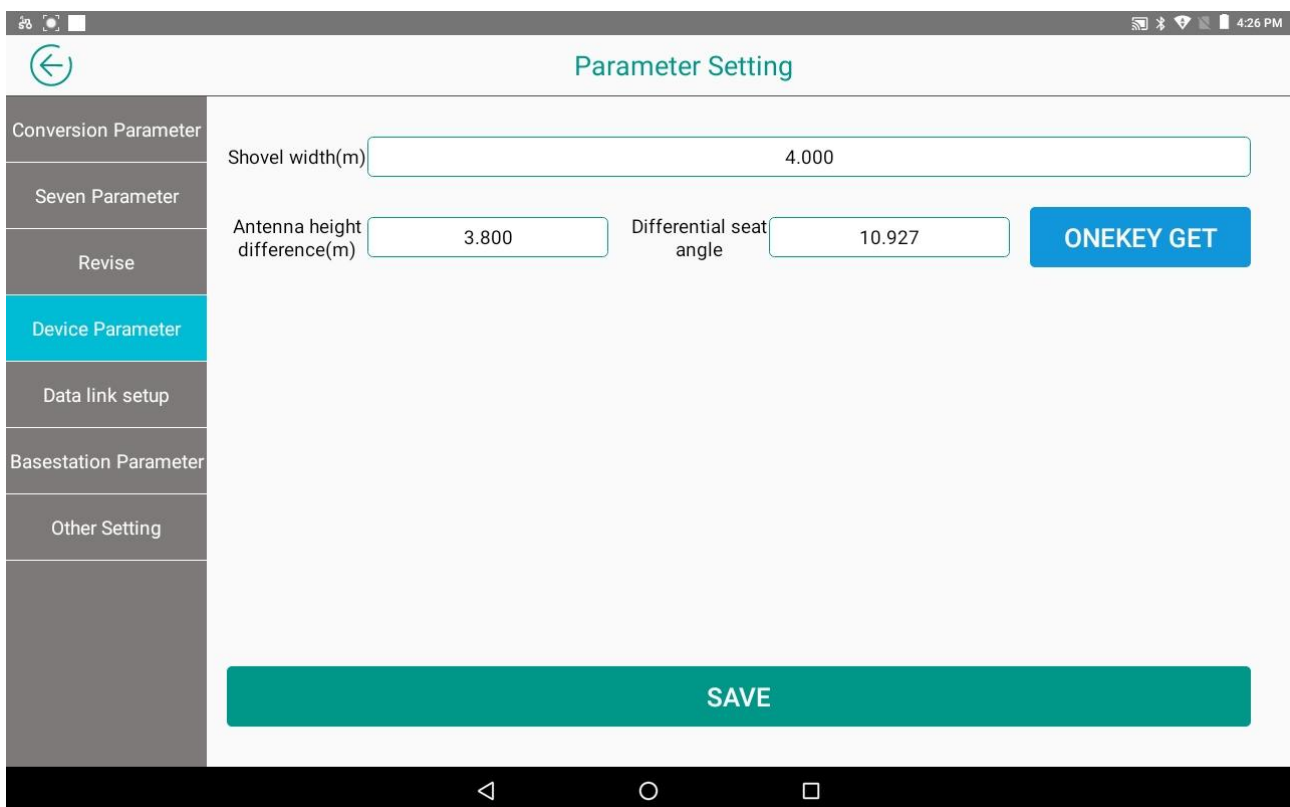


Figure 4-3-11 Save Device Parameter

4.3.1.5 Data Link Setup

Click "Data link setup", to connect to the base:

The screenshot shows the 'Parameter Setting' interface of the SinoGNSS X100 Leveling System. On the left is a vertical menu with options: Conversion Parameter, Seven Parameter, Revise, Device Parameter, Data link setup (highlighted in blue), Basestation Parameter, and Other Setting. The main area is titled 'Parameter Setting' and contains the following settings:

- Data link: A dropdown menu set to 'RADIO'.
- Protocol: A dropdown menu set to 'TRANSPARENT'.
- Channel: A dropdown menu set to '2'.
- Frequency: A text input field set to '455.0500', flanked by minus and plus icons.
- Fix Status: A button labeled 'Invalid'.
- Heading status: A button labeled 'Invalid'.
- Delay(s): A text input field set to '0'.

At the bottom of the main area is a large green button labeled 'SAVE'. The bottom of the screen shows a standard Android navigation bar with back, home, and recent apps icons.

Figure 4-3-12 Data Link Setup

There are 2 ways to get the correction data: internal radio and CORS. You can choose the proper correction data according to your need.

This screenshot shows the same 'Parameter Setting' interface as Figure 4-3-12, but with a modal dialog box open over the 'Data link' dropdown. The dialog is titled 'Select Data Link' and contains three radio button options:

- ☒ Radio
- ☐ Network
- ☐ SinoNet

The background settings (Protocol: TRANSPARENT, Channel: 2, Frequency: 455.0500, Fix Status: Invalid, Heading status: Invalid, Delay(s): 0) and the 'SAVE' button are visible behind the dialog. The bottom Android navigation bar is also present.

Figure 4-3-13 Data Link Setup

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1) Click “Internal radio” to enter the Radio Rover mode and configure the protocol and frequency, click “SAVE” to complete the setting.

After configuration, please check the “Fix status”, “Heading status” and “Difference ages” to confirm the current working status.

The screenshot shows the 'Parameter Setting' interface of the SinoGNSS X100 Leveling System. On the left is a vertical menu with options: 'Conversion Parameter', 'Seven Parameter', 'Revise', 'Device Parameter', 'Data link setup' (highlighted in blue), 'Basestation Parameter', and 'Other Setting'. The main area is titled 'Parameter Setting' and contains the following configuration options:

- Data link:** A dropdown menu set to 'RADIO'.
- Protocol:** A dropdown menu set to 'TRANSPARENT'.
- Channel:** A dropdown menu set to '2'.
- Frequency:** A numeric input field set to '455.0500', flanked by minus and plus icons for adjustment.
- Fix Status:** A button labeled 'Invalid'.
- Heading status:** A button labeled 'Invalid'.
- Delay(s):** A numeric input field set to '0'.

At the bottom of the main area is a large green button labeled 'SAVE'. The bottom of the screen shows the Android navigation bar with back, home, and recent apps icons.

Figure 4-3-14 Data Link Setup-Radio

2) Click “Network” to configure the network CORS

Input the IP address and Port

Choose the Mount Point you want

Enter the user name and password of the CORS.

Click “SAVE” to connect to the CORS.

After configuration, please check the “fix status”, “heading status” and “Difference ages” to confirm whether the connection is good.

Parameter Setting

Conversion Parameter

Seven Parameter

Revise

Device Parameter

Data link setup

Basestation Parameter

Other Setting

Data link: NETWORK

IP: 123.345.789.123

Port: 8001

Source List: RTCM33_GRCE

User name:

Password:

Fix Status: ☐ Heading status: ☐ Difference ages: ☐

SAVE

Figure 4-3-15 Data Link Setup - CORS

4.3.1.6 Other Setting

Choose “Other Setting”, “THRESHOLD VALUE” to configure the Threshold value, you can modify, add or delete the threshold value, and click “SAVE” to complete.

Parameter Setting

Conversion Parameter

Seven Parameter

Revise

Device Parameter

Data link setup

Basestation Parameter

Other Setting

THRESHOLD VALUE

Figure 4-3-18 Other Setting

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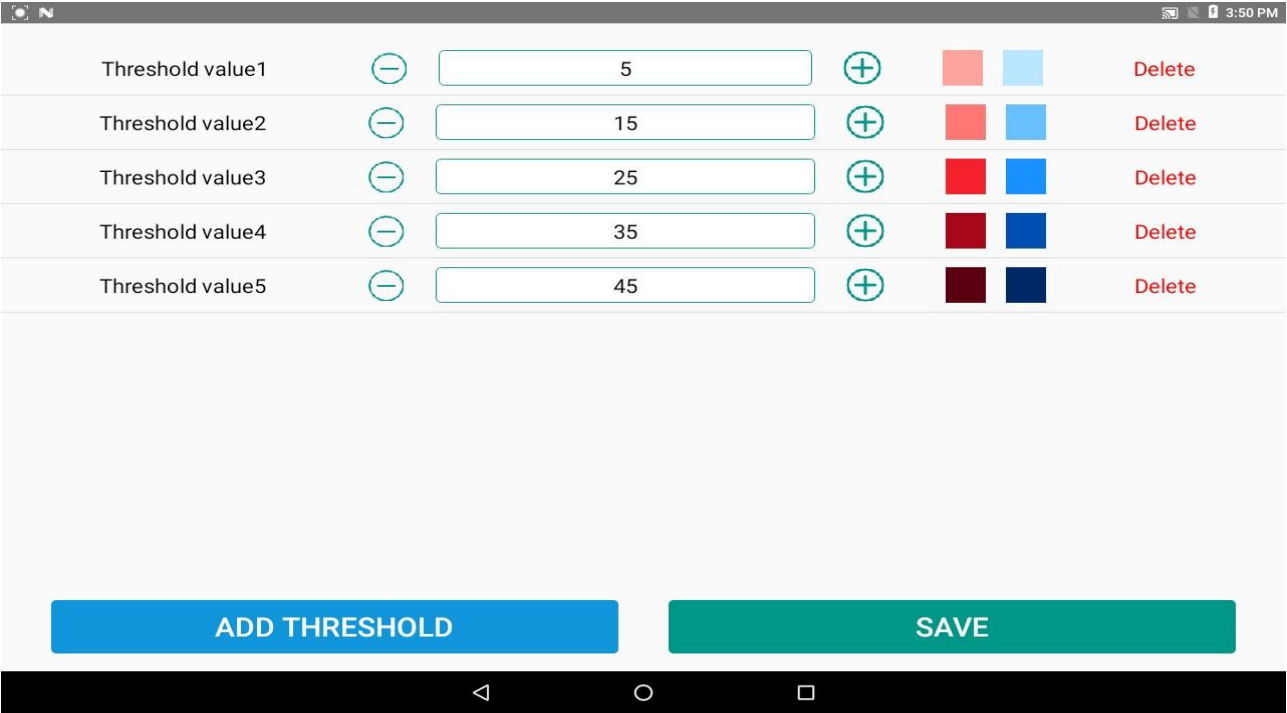


Figure 4-3-19 Threshold Value

4.3.2 Project Management

Click “Project Manager” to create a new project or open an old project. Click ”Create Project”to create a new project, the project you created will be saved in the Project List, you can click open to open the project.

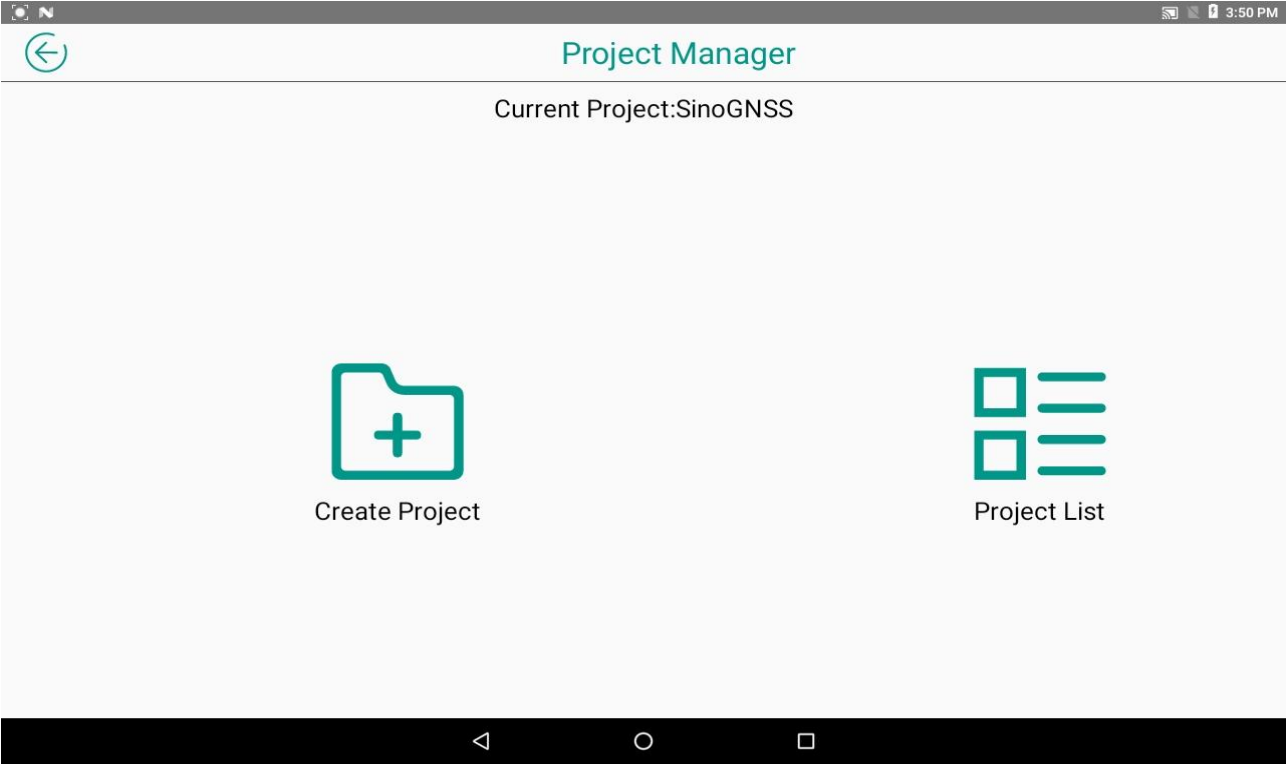


Figure 4-3-20 Project Manager

4.3.2.1 Create a project

Click “Create Project” to enter the Project Interface:

The screenshot displays the 'Create Project' screen. At the top, there is a back arrow icon and the title 'Create Project'. Below the title, the 'Project Path' is set to '/storage/emulated/0/Sinognss/grader'. The 'Project Name' field is empty, with a placeholder text 'Please enter project name (numbers or letters)'. The 'BaseHigh' field is set to '0.000'. To the right of the 'BaseHigh' field is a blue button labeled 'ELEVATION COLLECT'. At the bottom of the form is a large green button labeled 'CREATE'. The interface is displayed on a mobile device, as indicated by the Android navigation bar at the bottom.

Figure 4-3-21 Create Project

Enter the project name, the project name can be any combination of numbers and letters.

If the target elevation is Known, you can enter the target elevation directly.

If the target elevation is unknown, you can click “ELEVATION COLLECT” to get a target elevation. There are 2 ways to collect the elevation, the “Control Point” and the “Triangulation”.

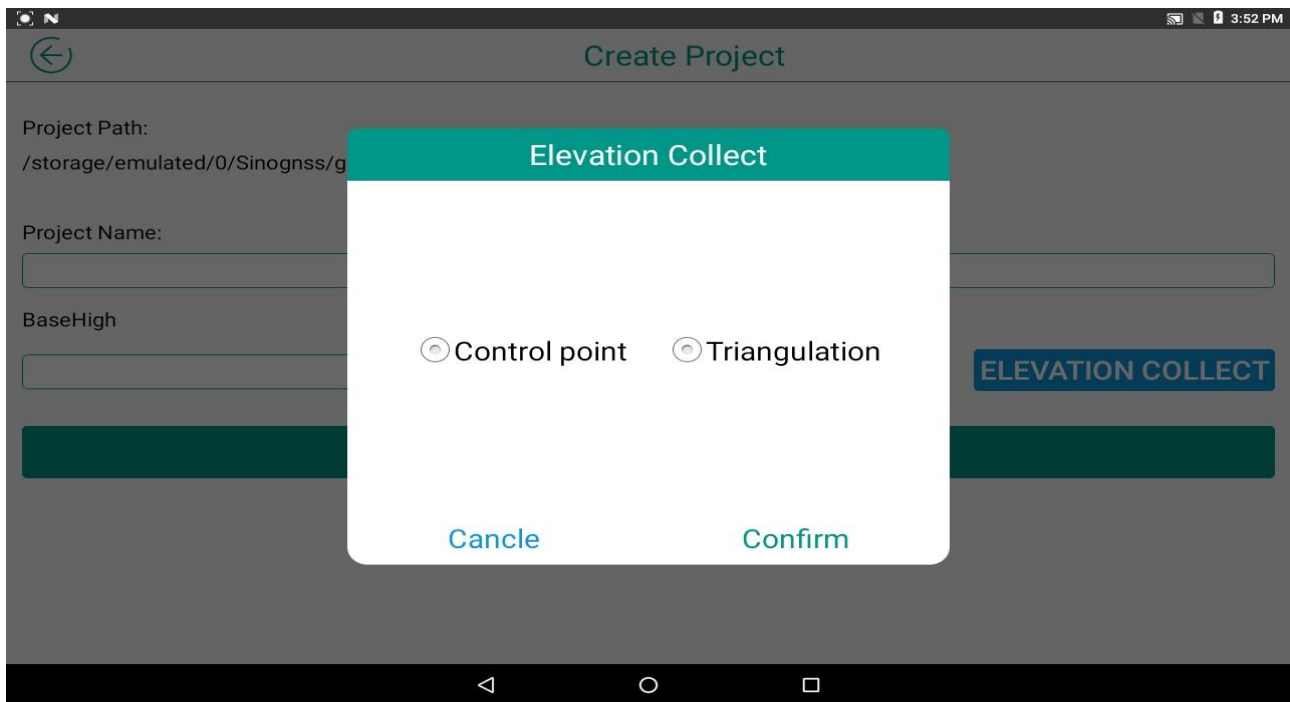


Figure 4-3-22 Elevation Collect

1) The Control Point Elevation Collection Means there are control points in the working area, you can move the shovel to the control point to collect the elevation.

Select "Control Point", click "OK", put the shovel on the control point, click "Collection" to survey the elevation of the control point.

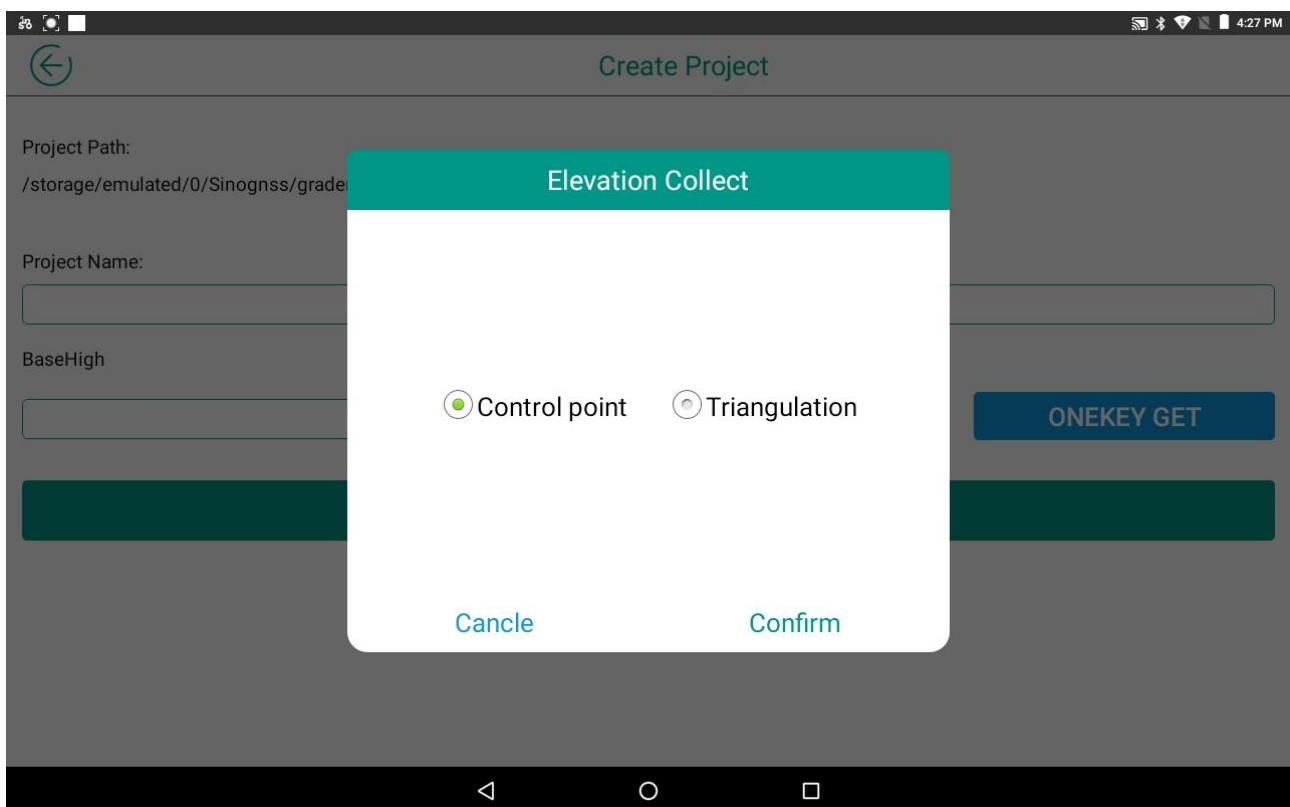


Figure 4-3-23 Control Point

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2) The Triangulation Elevation Collect means there is no control point in the working area, you should drive the car and collect the elevation of the terrain. After the collection, the software will calculate the target elevation. Select “Triangulation” and confirm.

Put the shovel on the ground of the working area, click “Next”, the software will collect the current elevation for 5 second.

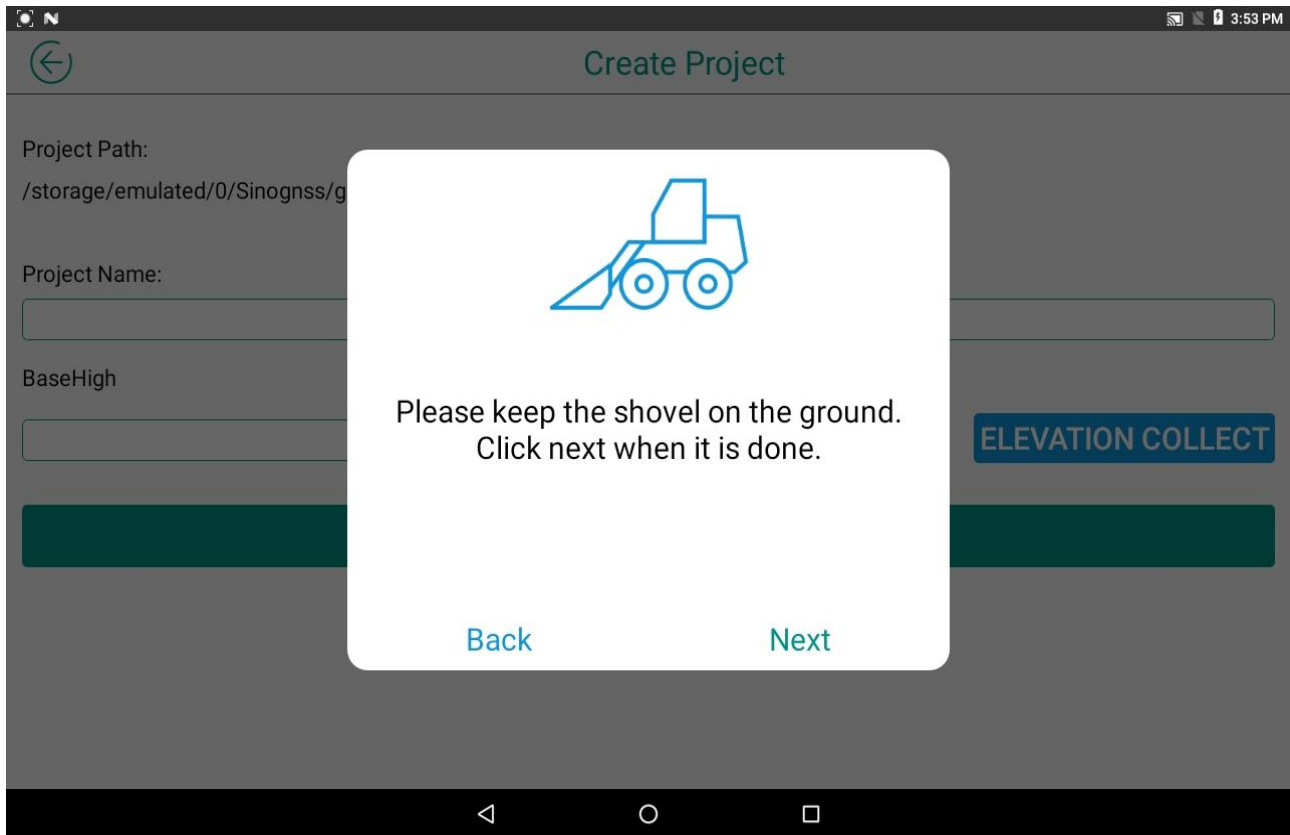


Figure 4-3-24 Triangulation-1

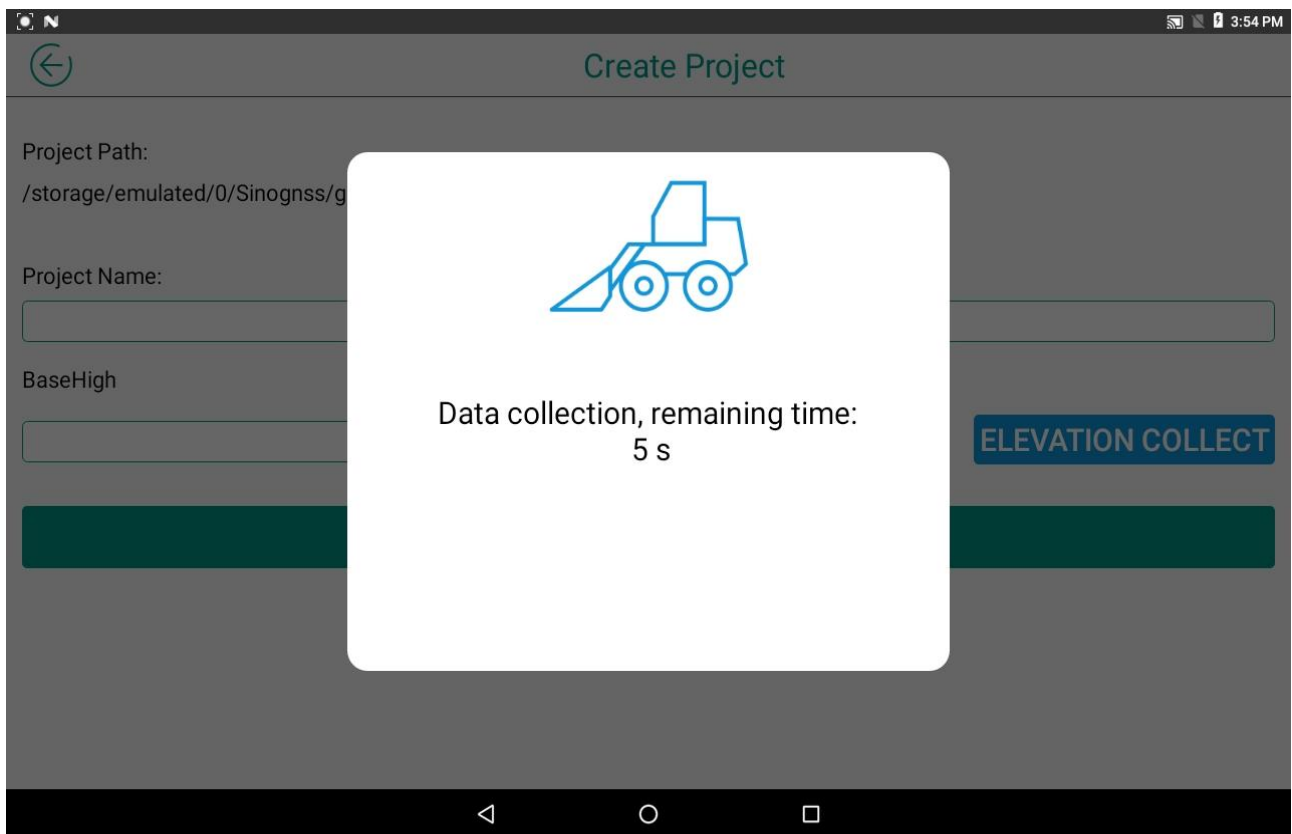


Figure 4-3-25 Triangulation-2

Lift the shovel to a ride height, click “Next” to collect the elevation, it will take 5 seconds.

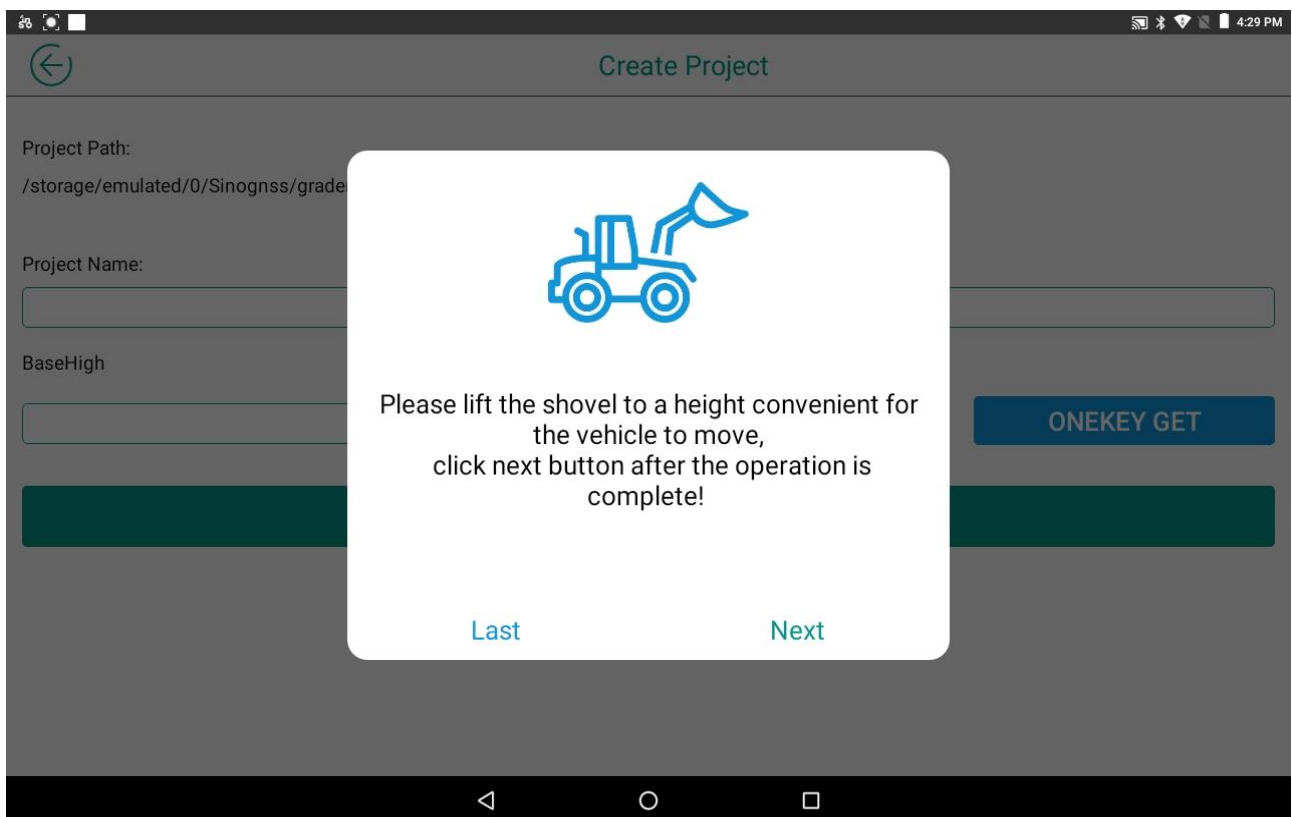


Figure4-3-26 Triangulation-3

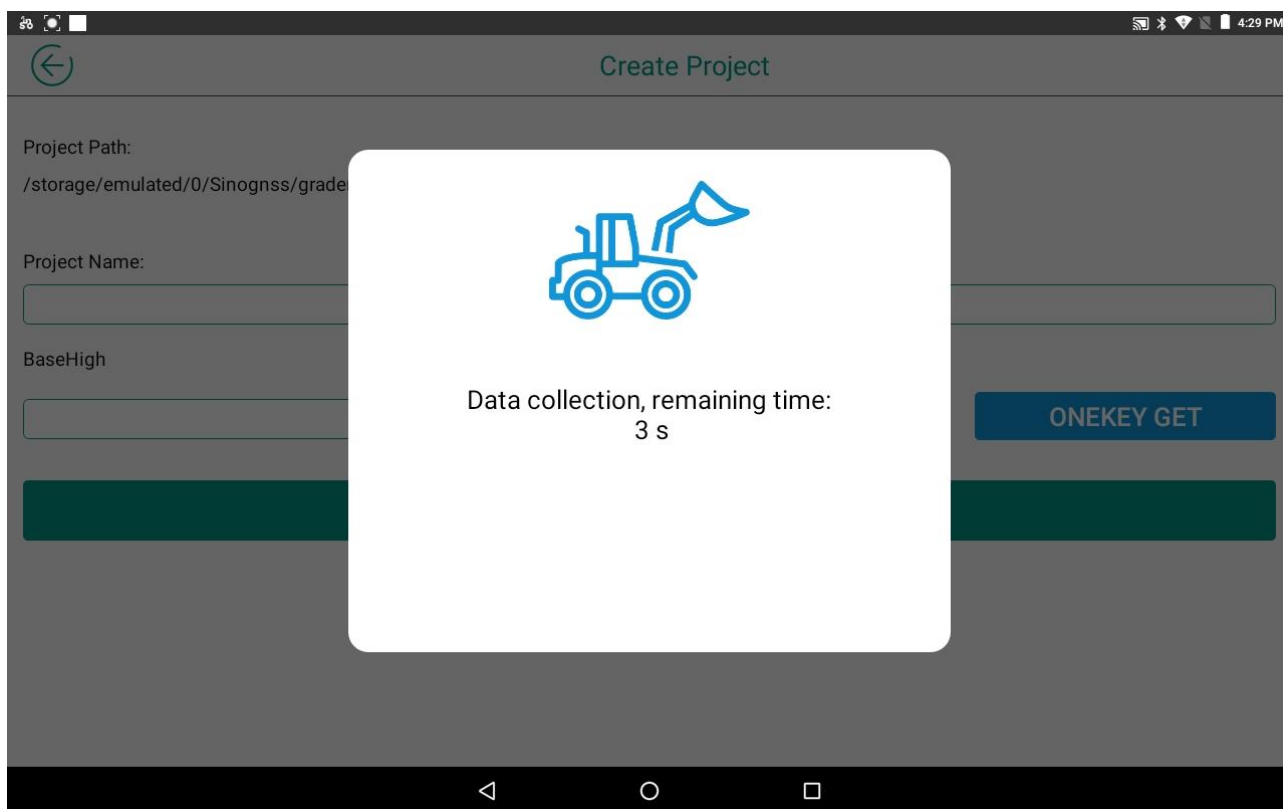


Figure 4-3-27 Triangulation-4

After the collection, keep the shovel at the ride height, click “start collect”, then drive the car to collect the elevation of the terrain.

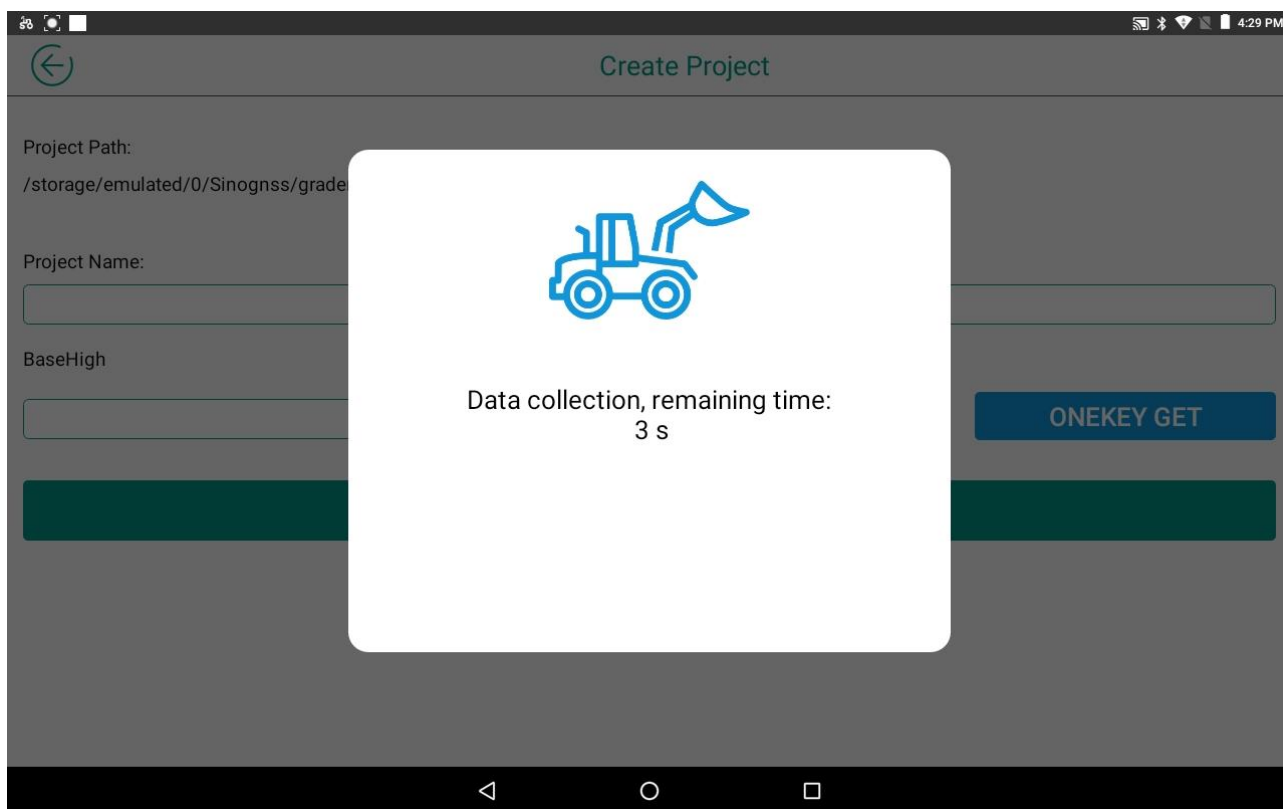


Figure 4-3-28 Triangulation-5

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You can select a route to collect the elevation of the working area, when the collection is finished, click “Stop Collect ” to complete the collection.

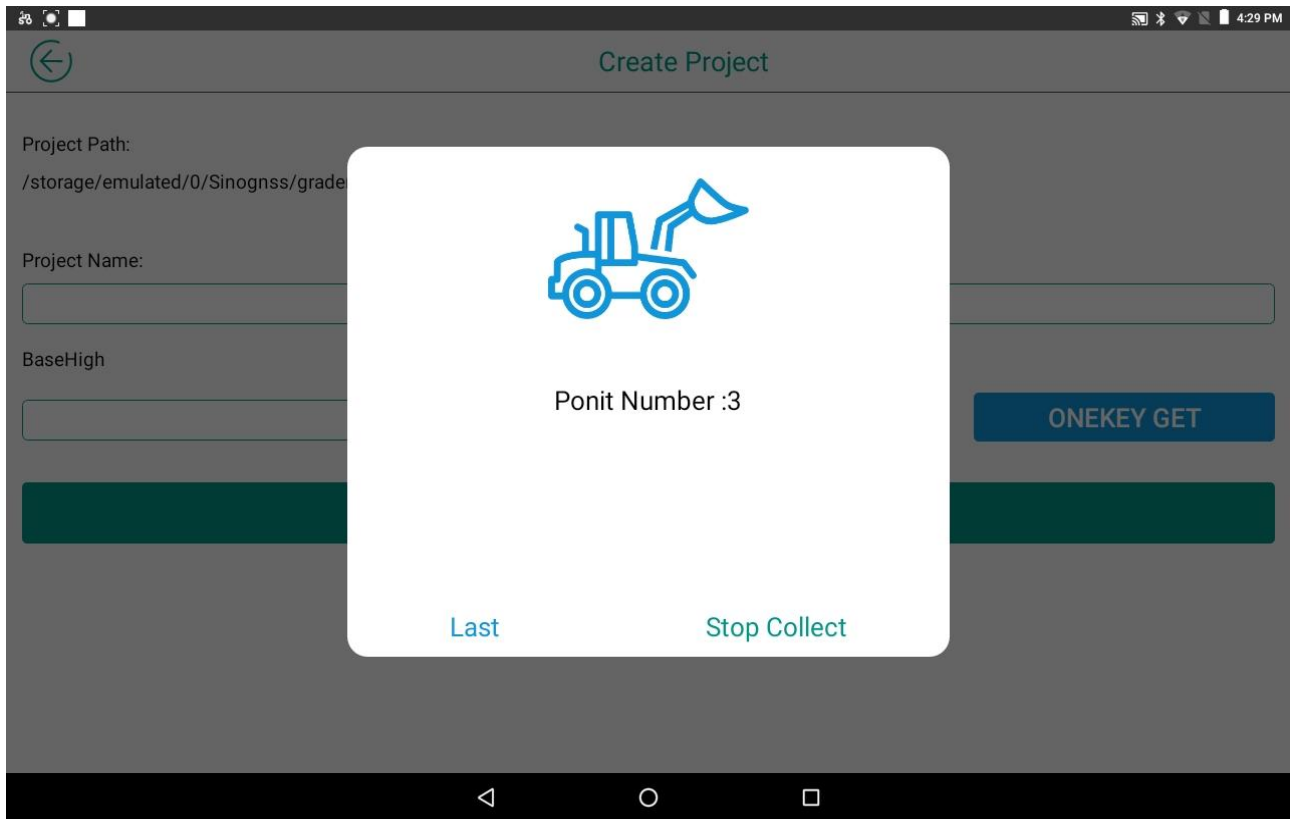


Figure 4-3-29 Triangulation-5

After the collection, you can get the target elevation. (it is calculated by the elevation of the route, it may change depending on the route)

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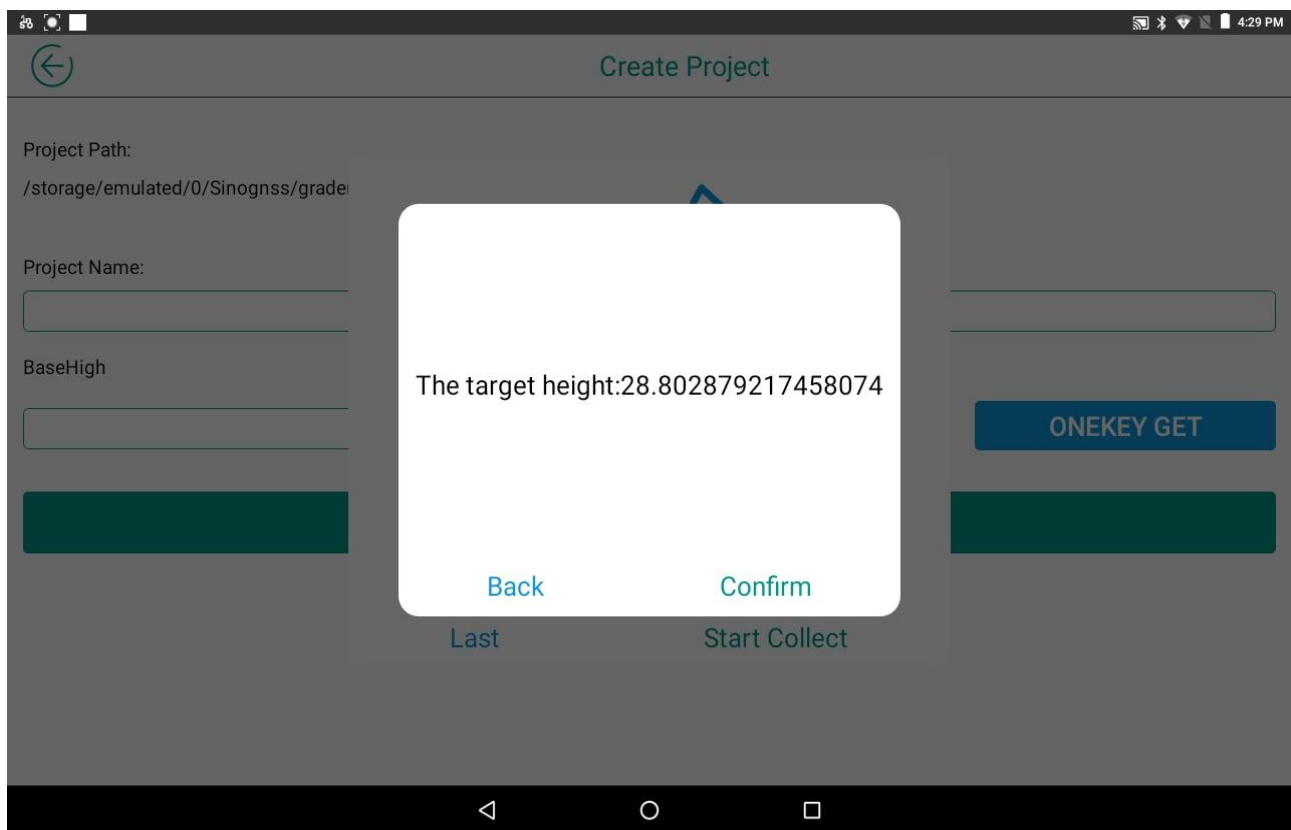


Figure 4-3-31 Target Elevation

Click “OK”, the elevation will show in the project.

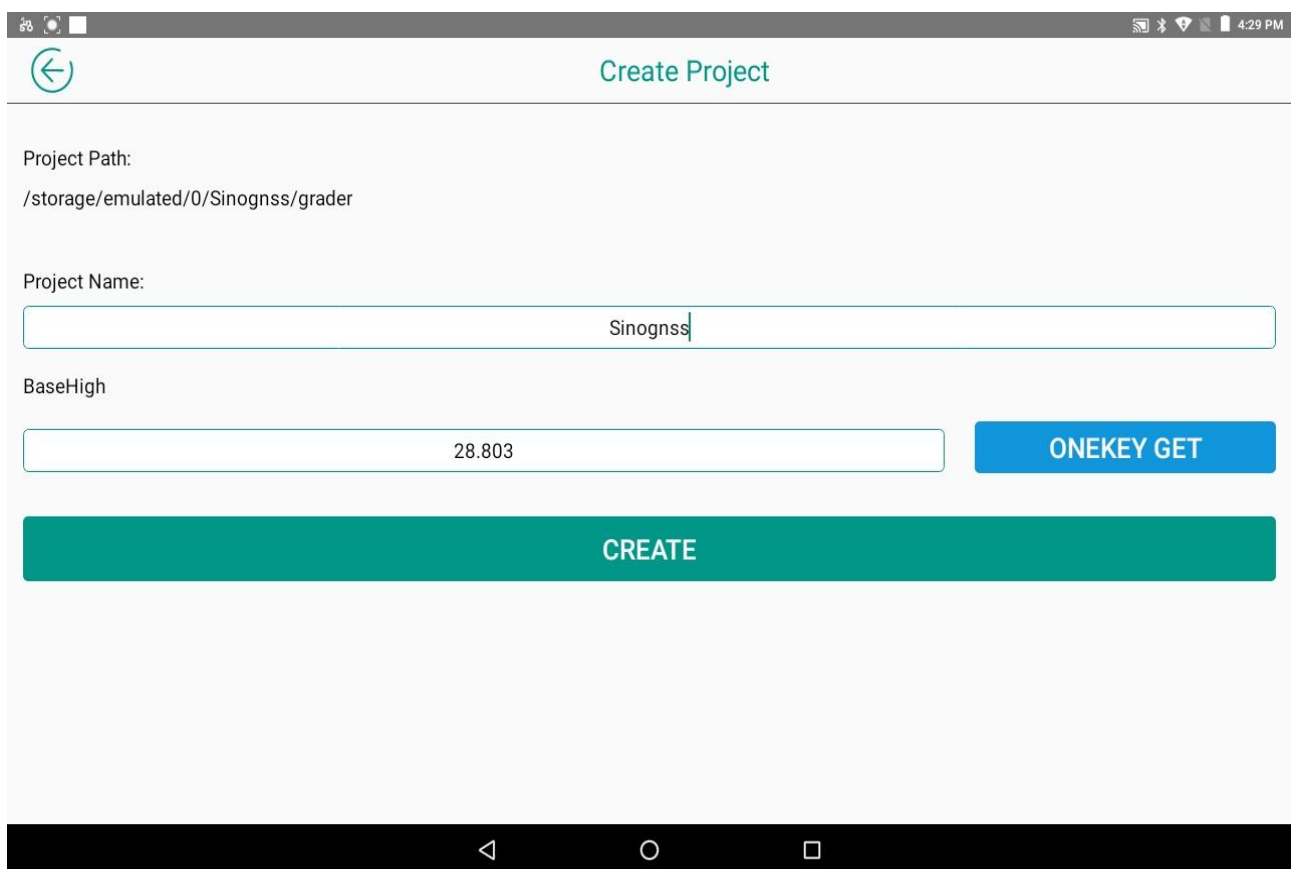


Figure 4-3-32 Create a new project

Click “CREATA” to complete.

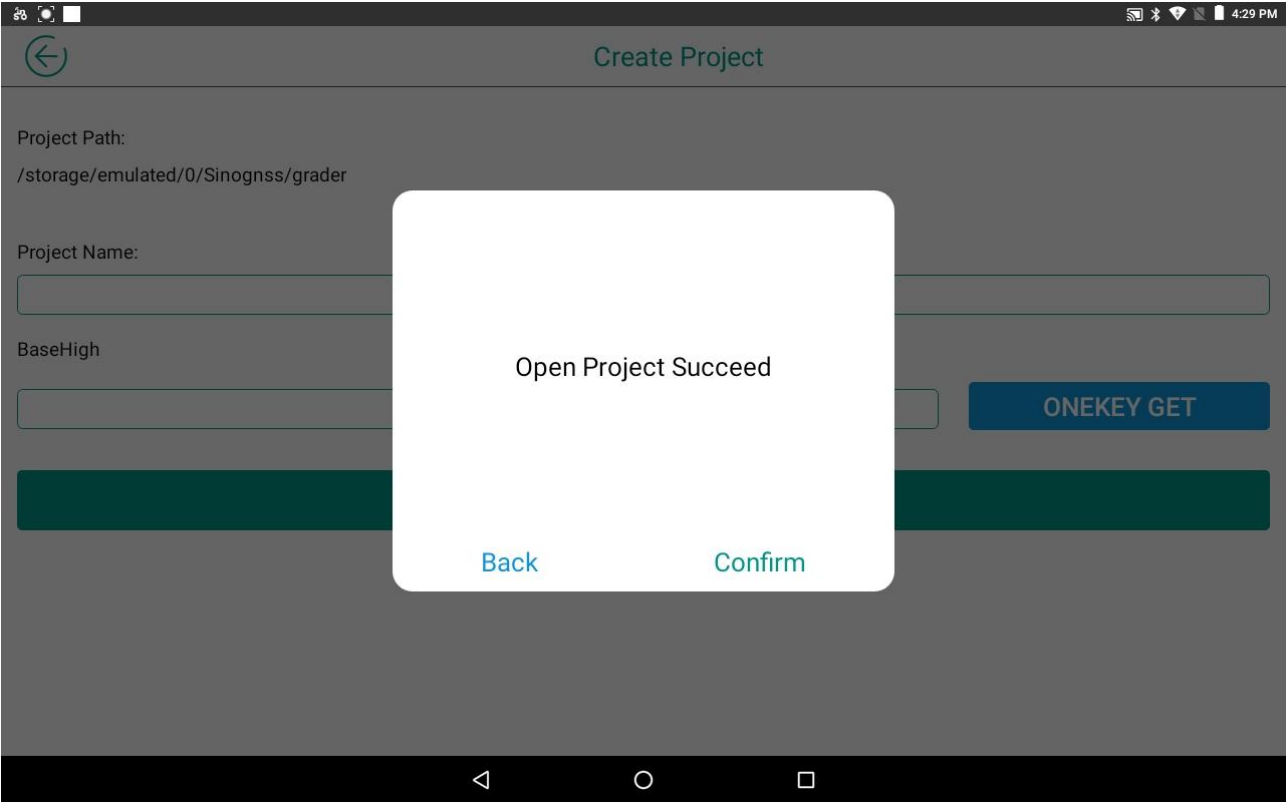
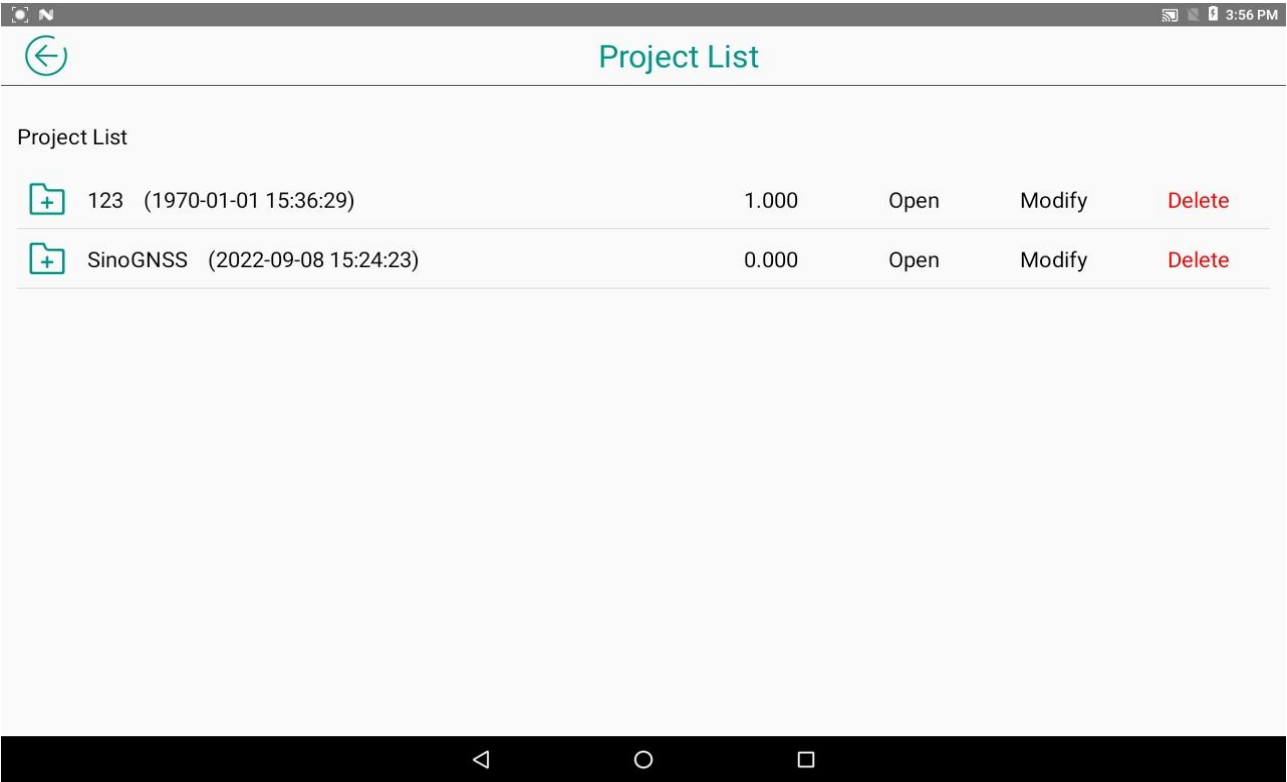


Figure 4-3-32 Complete a new projec

4.3.2.2 Project List

Click “Project List” to view the established project.



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Figure 4-3-33 Project List

Click “Open” to set it as the current project.

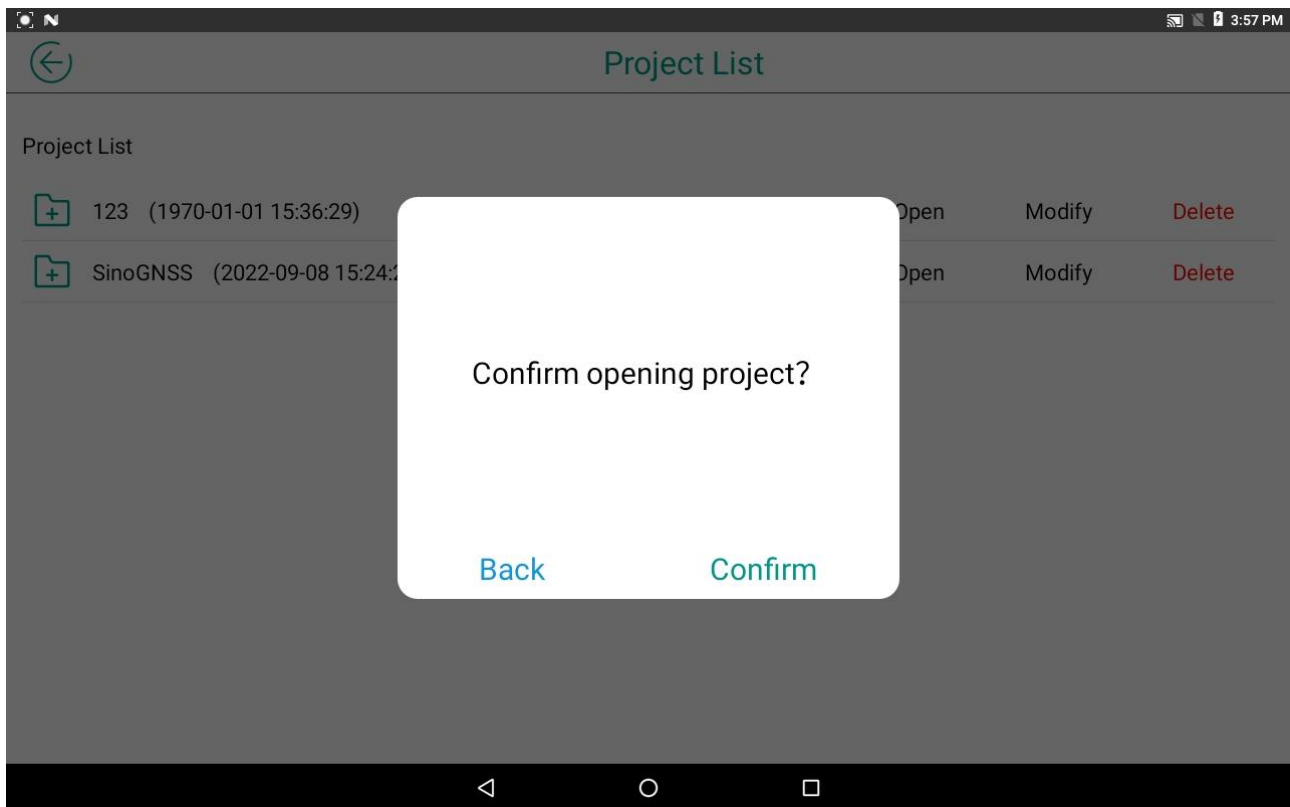


Figure 4-3-34 Open the project

It will switch to the Home interface after you click “confirm” .

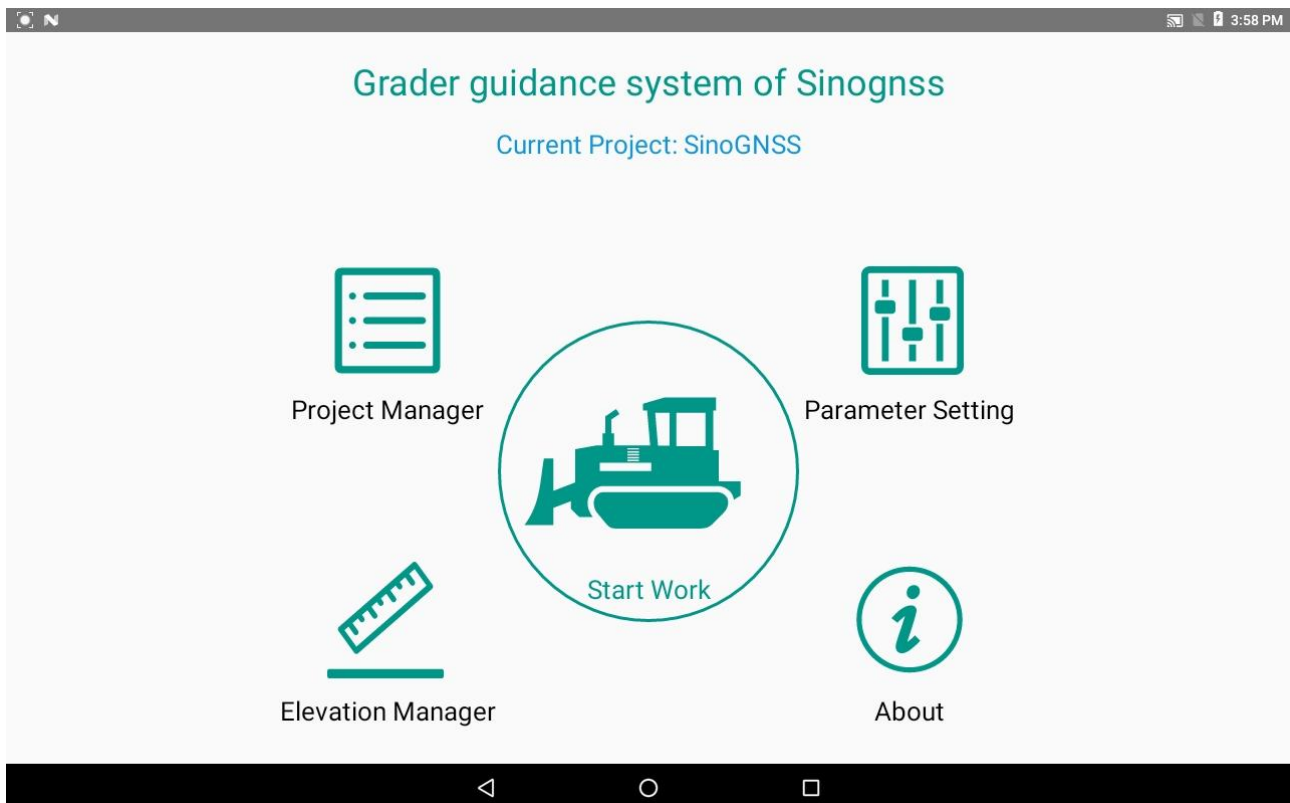


Figure 4-3-35 Project Manager

Click “Modify” you can modify the target elevation of the project

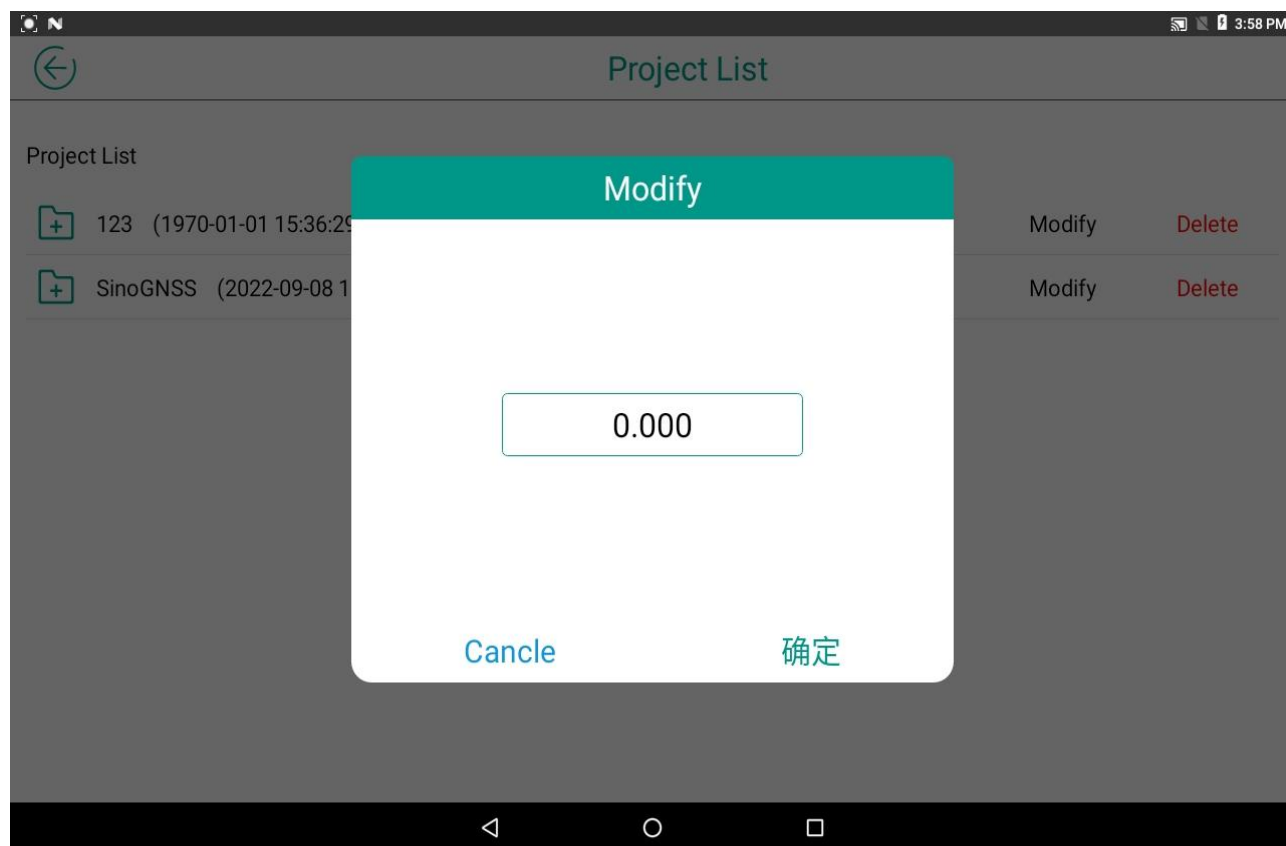


Figure 4-3-36 Modify the Target Elevation

Click “Delete” to delete the project.

4.3.3 Work

Click “Start Work” to enter to the working interface.

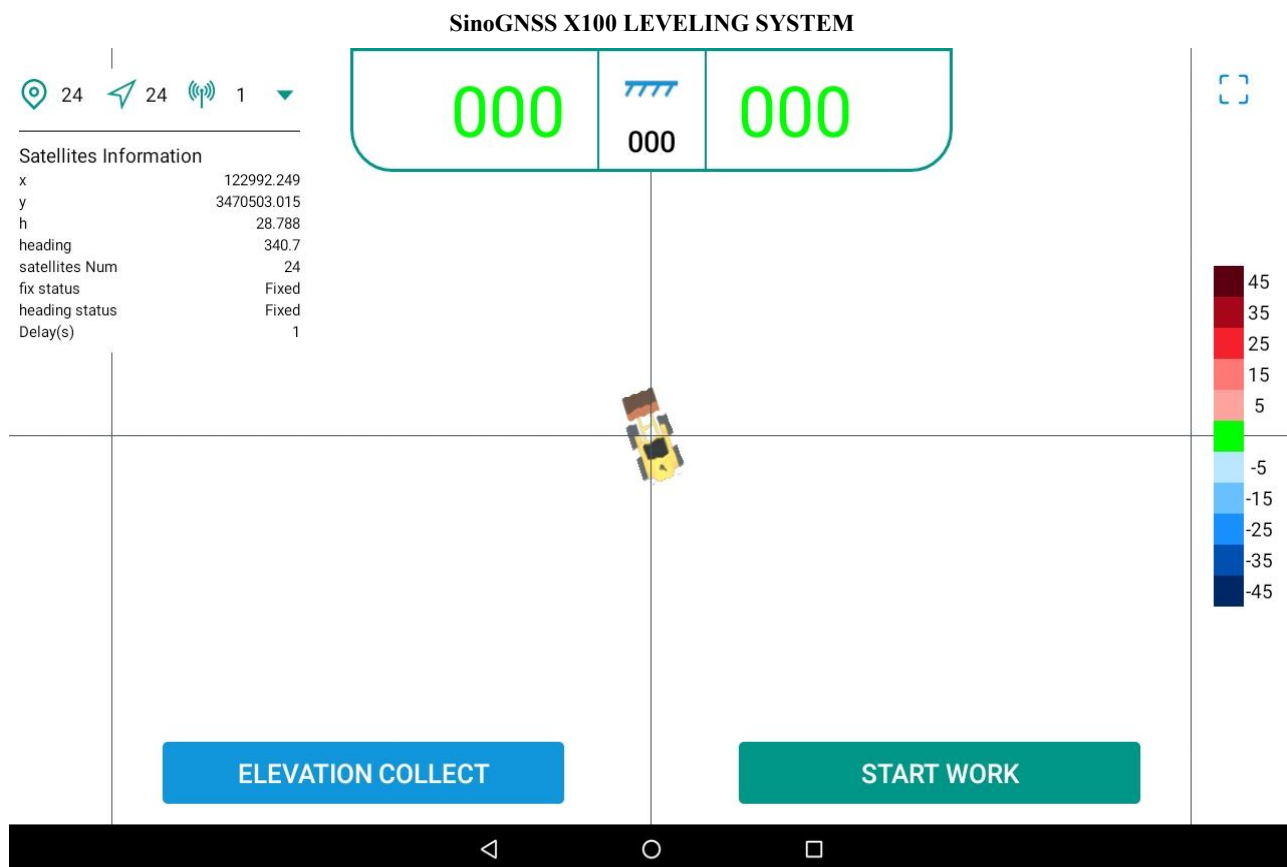


Figure 4-3-37 Working Interface-1

The Elevation Difference between the current position and the target elevation will be shown in the screen to guide the driver. The lift and right difference will be shown respectively.

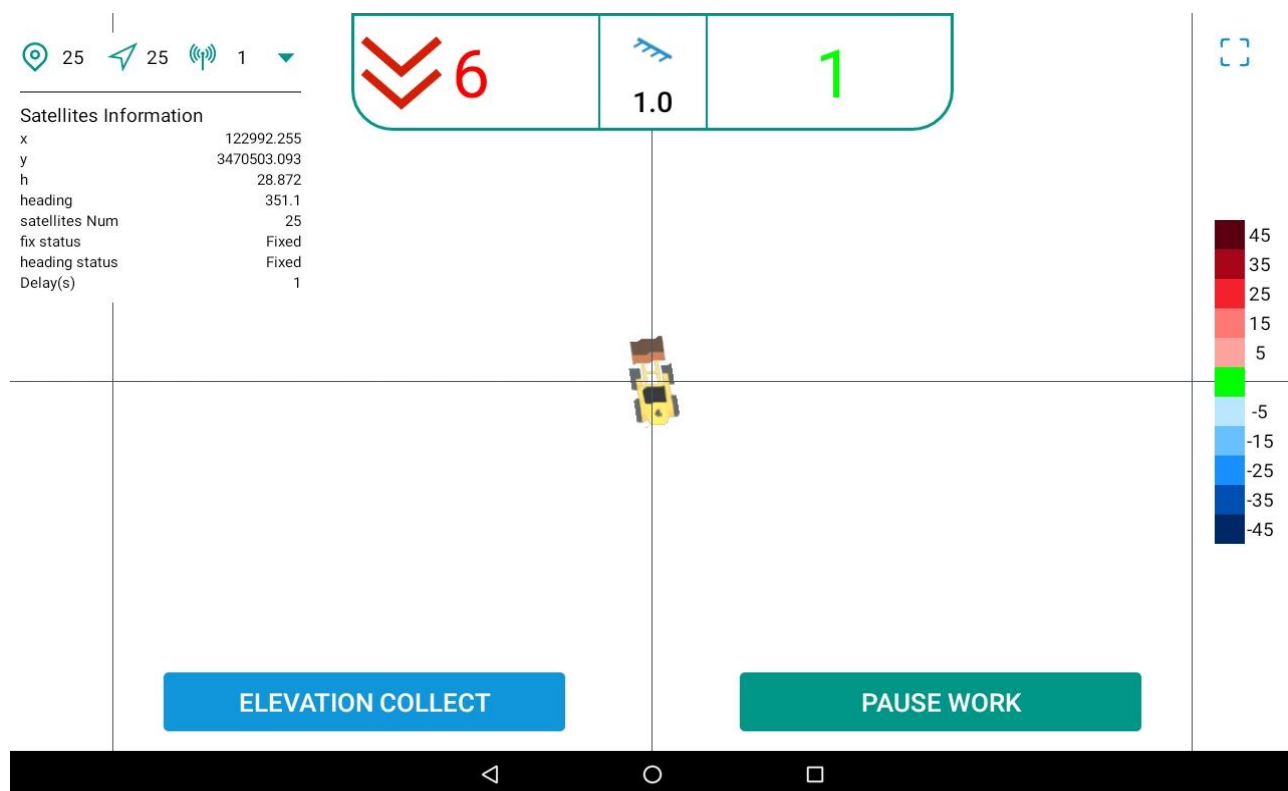


Figure 4-3-38 Working Interface-2

5. FAQ

5.1 The Tablet can't be turned on

Please check if the power adapter and the 7-pin rs232 cable are damaged. Please confirm the power supply is good.

5.2 The satellites searched are too less

- 1) Check if there is any obstruction on the GNSS Antenna.
- 2) Check if the GNSS cable is loosen, you can unplug and plug in again.
- 3) Check if there are interference.

5.3 Abnormal Positioning

- 1) Check the cable connection of the positioning antenna.
- 2) Check if the Base works normally.
- 3) Check if the protocol and the frequency are correct.
- 4) Checking the environment of the antenna.

5.4 Abnormal Heading

Check if the cable connection is correct.

Check the environment of the heading antenna.

5.5 Diff error

Check if there is interference between the base and the rover, you can change a frequency if it is occupied.

5.6 Base Changed

Please check if you connect to the different base.