TMC20
Installation Instruction

Excavator
Guidance System

Content

User Instructions

User Instructions

1. Before using this product, please read all the materials provided carefully to understand its operation methods and precautions.
2. Do not disassemble any cables related to the system when the power is on.
3. Strictly follow the manual's requirements when connecting devices. Avoid pulling, twisting, or excessively bending data cables, as this may cause pin or wire breakage, leading to poor contact or system malfunction.
4. When powering the system, ensure the power supply meets the requirements (voltage: 12–24V, rated current ⩾5A).
5. Do not continue using damaged cables. Replace them promptly to avoid operational issues or additional losses.
6. Damage caused by force majeure (e.g., lightning strikes, high voltage, collisions) is not covered under the company's free warranty service.
7. Do not disassemble the product casing; unauthorized disassembly voids the warranty.

User Instructions

1. Basic Principle

(1) Familiarize yourself with the product and its operational requirements before use. Follow both the manual and the general health and safety regulations of your region.

(2) Adhere to accident prevention measures, safety protocols, labor protection standards, medical guidelines, and traffic rules.

(3) Seek professional advice on product operation to avoid malfunctions or accidents.

(4) Upon delivery, ensure you receive the inventory list and user manual, and follow the company's technical guidance for installation and operation.

2. Basic Principle

(1) Operators must be proficient in excavator operation and capable of handling emergencies while operating the system.

(2) Operators must fully understand excavator tasks and know how to flexibly use system functions in different scenarios.

(3) Operators should be familiar with hardware/software installation and operation principles and capable of troubleshooting common issues safely.

(4) Individuals under 18 or with physical/mental impairments that hinder safe operation are prohibited from operating the machinery.

3. Pre-Operation Preparation

(1) Inspect the excavator's surroundings for obstacles or hazards. Ensure the work area is clear of unauthorized personnel.

(2) Perform daily maintenance checks for loose, missing, or worn components, as well as dirt accumulation.

(3) Operators must be familiar with the product's controls and functions.

4. Installation Precautions

(1)Correctly connect GNSS antenna and IMU cables, securing them with cable ties to prevent damage from pulling or squeezing.

1. Product Introduction

1.1 Manual Overview

This manual provides comprehensive guidance for the installation and operation of the TMC20 System. It includes:

◎A complete list of required components.
◎Detailed descriptions of each component's functionality.
◎Step-by-step software operation instructions.
◎Technical specifications and performance parameters.

1.2 Product Overview

The TMC20 Excavator Guidance System, developed by TOKNAV, is a high-precision, high-performance solution for intelligent excavation guidance. It consists of:

◎GNSS high-precision positioning antenna
◎10.1-inch high-brightness display terminal
◎Attitude sensor (IMU)

1.3 Product Features

The system can be adapted to various types of excavating machinery, achieving precise guidance of excavator operations, achieving the purpose of efficient operation, and solving the problem of visual limitations. It is an auxiliary tool for ordinary site leveling, trenching, slope brushing, and pond sludge removal, etc.

1.3.1 System Features

(1) RTK dynamic accuracy: ±2.5 cm, supports multi-frequency high-precision positioning and orientation.

(2)Built-in global communication module: Ensures internet connectivity with power-loss data recovery.

(3)Industrial-grade design: Complies with IP67 standards, suitable for harsh outdoor environments.

(4)Advanced IMU: Integrates a high-performance microprocessor and filtering algorithms for stable, precise measurements.

(5)Real-time display: Shows bucket deviation from design values for accurate guidance.

(6)Multi-view display: Provides top, side, and front views to overcome blind spots during excavation.

(7)Multiple operation modes: Supports leveling, trenching, slope grading, dike construction, and more.

(8)Visual and audio alerts: Immediate feedback for operational errors.

1.3.2 System Benefits

(1) Improved efficiency

The system assists operators in completing excavation tasks more quickly and accurately. Through real-time positioning and navigation, operators can accurately control the position and depth of the excavator, avoiding errors that may occur with traditional manual operations, while reducing damage and rework caused by misoperation.

(2) Cost reduction

It can reduce labor costs and energy consumption. Operators can complete tasks more quickly, reducing the construction period, thereby reducing labor costs during construction. In

1. Product Introduction

addition, precise navigation and operation can reduce material waste and loss, further reducing costs.

(3) Enhanced safety

It can help operators avoid potential dangerous situations, set up operation areas, prevent excavators from entering dangerous areas, and provide real-time warnings and reminders to help operators take timely measures to ensure safety during construction.

(4) Comprehensive Adaptability

In complex construction environments, such as trenching operations and pond sludge removal, operating excavators may be more difficult due to visual obstructions. The system can help operators better cope with these complex situations through real-time positioning and navigation, ensuring the successful completion of construction tasks.

(5) Data logging

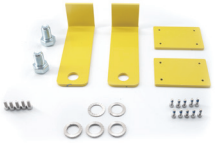
It usually records relevant data during the construction process, such as excavation depth and location information. This data can be used for control and management of the construction process and can also serve as a basis for subsequent construction analysis, helping to optimize construction processes and improve efficiency.

2. Equipment List

2.1 Onboard Components

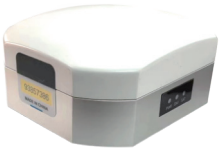
No.	Name	Quantity	Picture
1	Tablet	1	
2	Radio Antenna	1	
3	GNSS Antenna	2	
4	Satellite Antenna Cable 1	1	
5	Satellite Antenna Cable 2	1	

2. Equipment List

No.	Name	Quantity	Picture
6	Satellite Antenna Extension	1	
7	In-vehicle controller	1	
8	Main Cable	1	
9	Gyroscope 1	1	
10	Gyroscope 2	1	
11	Gyroscope Extension Cable 1	1	
12	Gyroscope Extension Cable 2	1	
13	RAM Mount	1	
14	Installation Kit	1	

2. Equipment List

2.2 Base Station Components (Optional)

No.	Name	Quantity	Picture
1	Receiver	1	
2	Radio Antenna	1	
3	Power Cable	1	
4	Extension Pole	1	
5	Mounting Plate	1	

3. Key Components

3.1 Tablet Kit

The SPRING2 10S-1 Tablet is the system's core, handling data processing, algorithm execution, and user interaction.

No.	Name	Quantity	Picture
1	Tablet	1	
2	Tablet bracket	1	

3. Key Components

3.3 Satellite Antenna Kit

Receive satellite data which is then sent to the tablet's board card for positioning and orientation calculation.

No.	Name	Quantity	Picture
1	GNSS Antenna	1	
2	Satellite Antenna Cable 1	1	
3	Satellite Antenna Cable 2	1	
4	Satellite Antenna Extension	1	

3. Key Components

3.4 IMU Kit

Collect attitude changes during the excavator's operation.

No.	Name	Quantity	Picture
1	Gyroscope 1	1	
2	Gyroscope 2	1	
3	Gyroscope Extension Cable 1	1	
4	Gyroscope Extension Cable 2	1	

4. Installation Guide

4.1 Tablet Installation

Secure the tablet in the cab using the RAM mount for easy operator access.

4. Installation Guide

4.2 GNSS Antenna Installation

◎Weld the antenna mounting plates to the left side of the boom and arm.
◎Connect the boom antenna to ANT1 and the arm antenna to ANT2.

Notes:
◎Both antennas must be installed on the excavator's left side for visibility.
◎The boom antenna is generally installed horizontally in the middle of the boom.
◎More cable is reserved to prevent damage to the equipment when the stick rotates. The installation position of the antenna and the two rotation points on the stick are on the same line.
◎The following figure shows the antenna mounting plate and antenna fixing bolts and other accessories.

4. Installation Guide

4.3 Gyroscope Installation

The gyroscope mounting plate is welded to the connection between the stick and the bucket rotation, and the gyroscope is fixed to the mounting plate with a screw.
Gyroscope 1 is installed on the stick, and the gyroscope is installed on the connection between the stick and the bucket rotation.

Note:
(1)More length of the gyroscope cable is reserved to prevent damage to the hardware when the stick and bucket rotate.
(2)The connector of Gyroscope 2 faces the stick position, facilitating cable installation.
(3)The gyroscope is installed in a position that does not affect the operation of the excavator which is better in the middle of the stick.
(4)Gyroscope mounting plate and fixing screws, etc.

4.4 Other Notes

(1) The controller can be placed in a place on the right side of the driver's seat in the cab that does not affect the driver's work.
(2) The radio antenna can be installed on the top of the cab.
(3) Equipment connection diagram

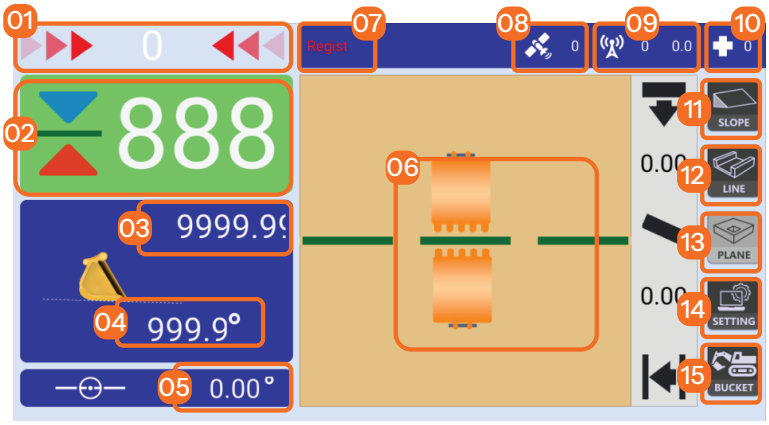
5. Software Introduction

5.1 Launching the Software

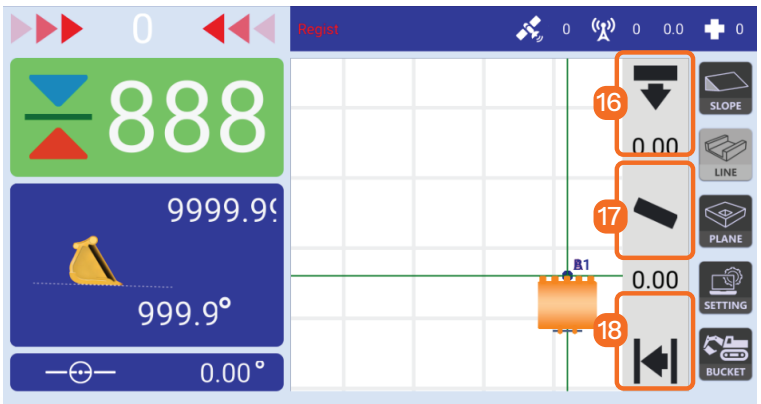
Method 1: Tap the Excavator GNSS icon on the desktop.
Method 2: Open the Android menu → Select Excavator GNSS.

After opening the software, you can enter the main interface of the software, as shown in the figure: (The main interface will be slightly different because of settings, operations, etc.)

5.2 Main Interface Icons



(1) Bucket lateral offset
(2) Fill/Dig volume
(3) Real-time bucket elevation
(4) Reference plane elevation
(5) Bucket angle
(6) Navigation view
(7) Registration prompt
(8) Satellite count (tap to access base station settings)
(9) RTK status (normal status: 4; age ⩽3 seconds)
(10) Heading status (typically 4 or 5)
(11) Slop Cutting mode
(12) Slope Trench Mode
(13) Planar & Fill and Dig Mode
(14) Real-time Parameters
(15) Calibration Settings

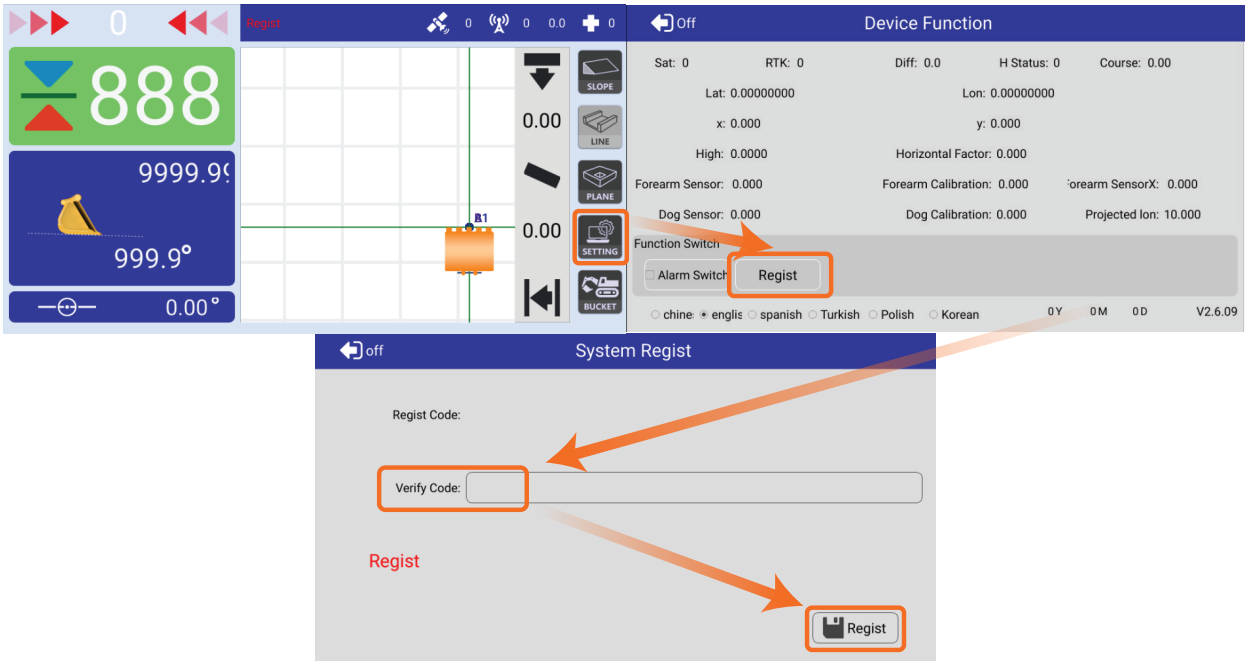


Additional Icons for Special Modes:
(16) Design fill/cut volume
(17) Design slope
(18) Lateral offset toggle

6. Software Operation

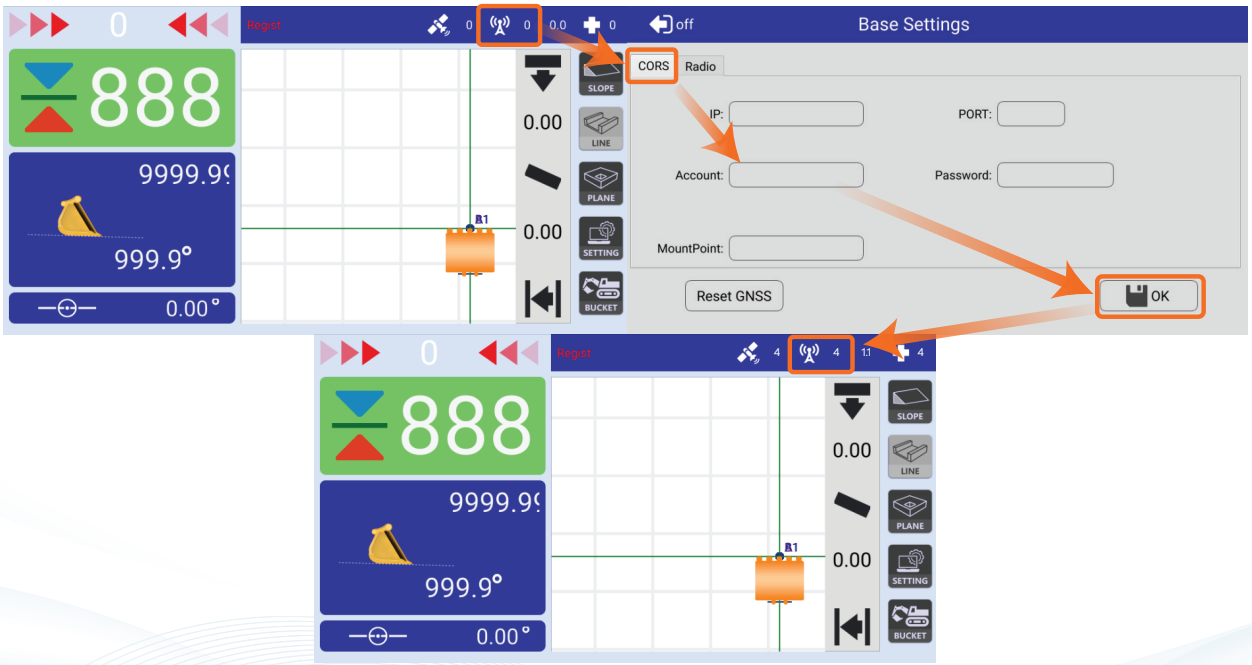
6.1 Registration

Navigate to Real-Time Parameters → Registration.
Enter the registration code (provided by sales/support).
Click Register.
Note: The registration code can be obtained from sales or technical personnel.



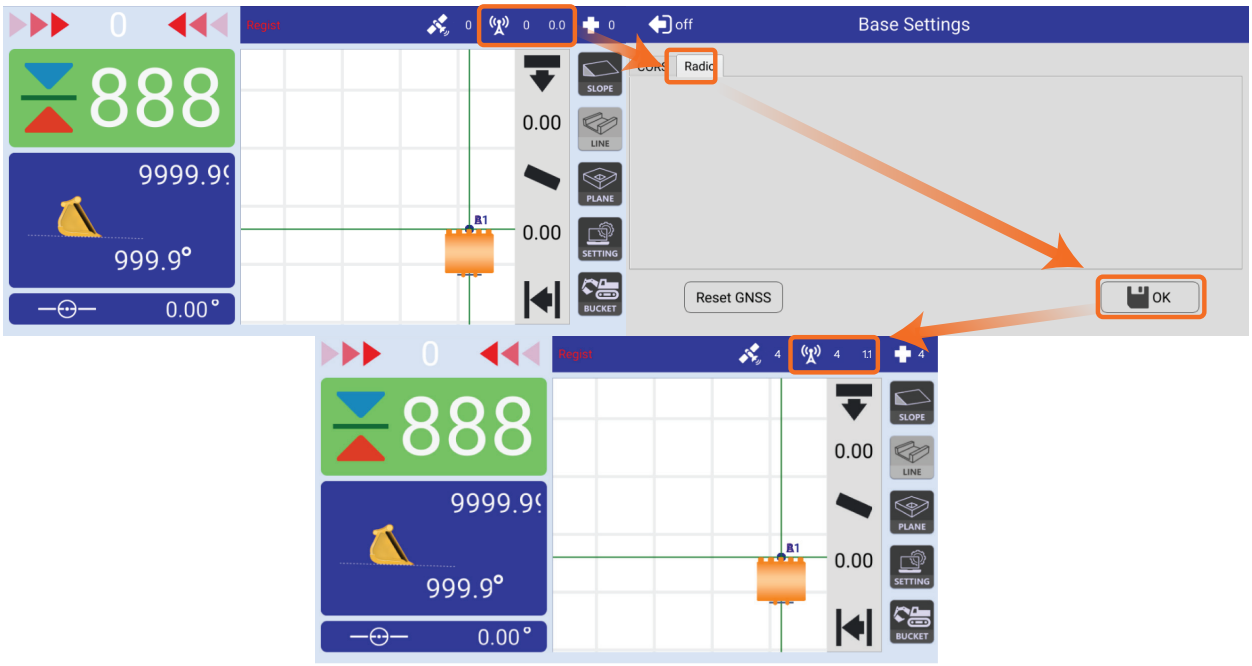
6.2 Base Station Setup

Option 1: CORS Mode
Tap the RTK status icon → Select CORS.
Enter IP, port, account, password, and mount point.
Click OK. Status "4" indicates success.
Note: The value X.X behind the Differential Status represents how many seconds it has been since the last reception of differential data from the base station.



6. Software Operation

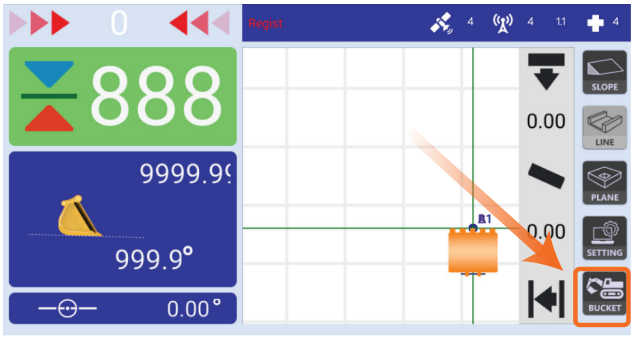
Option 2: Radio Mode
Tap the RTK status icon → Select Radio.
Click OK. Status "4" indicates success.

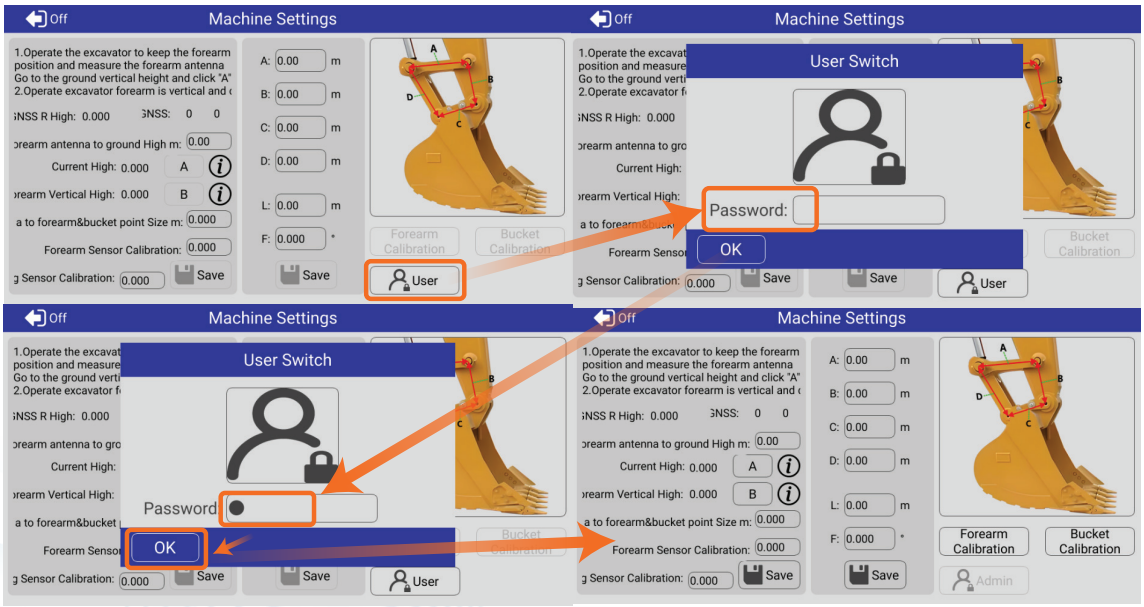


6.3 Device Calibration

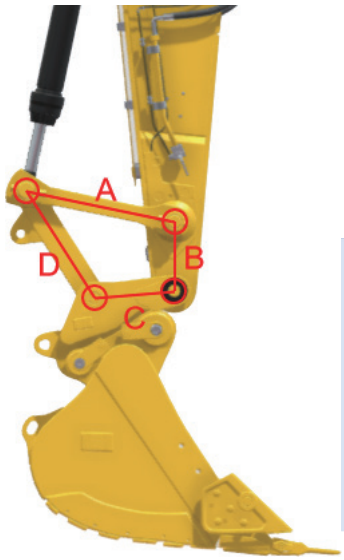
Prerequisite: Park the excavator on level ground.

Click the User button, then enter the password: 1, in the password box, click Confirm to unlock the calibration content in the interface.



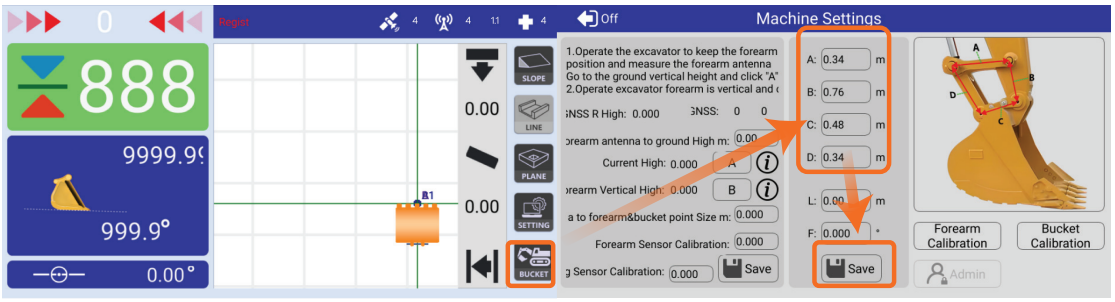


6. Software Operation

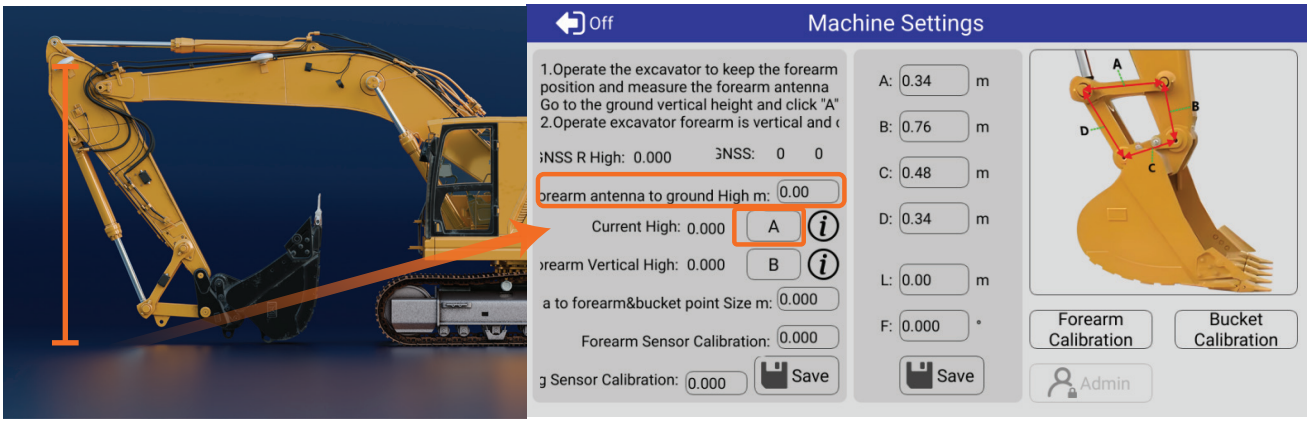


(1) Bucket Dimensions
Measure lengths A, B, C, D as shown.

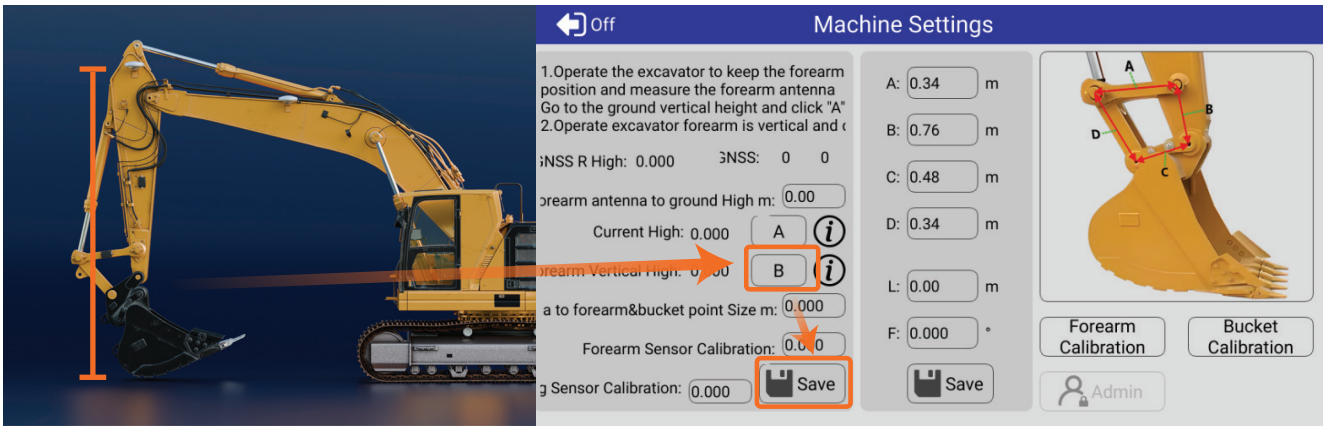
Enter values in the settings and save.



(2) Stick Dimensions
◎Measure the vertical distance from the stick antenna to the ground.
◎Click A to record the antenna elevation.

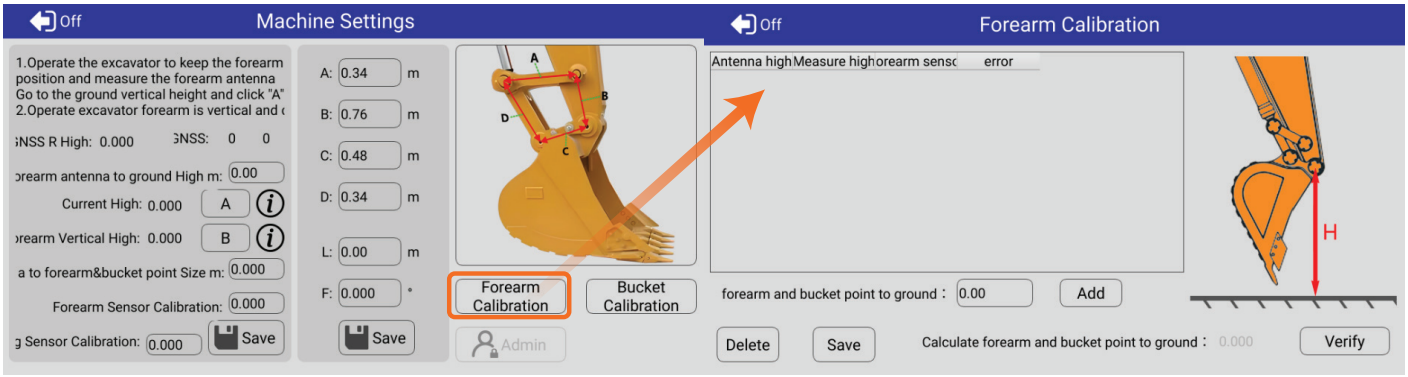


◎Position the stick vertically (90°) and click B → Save.

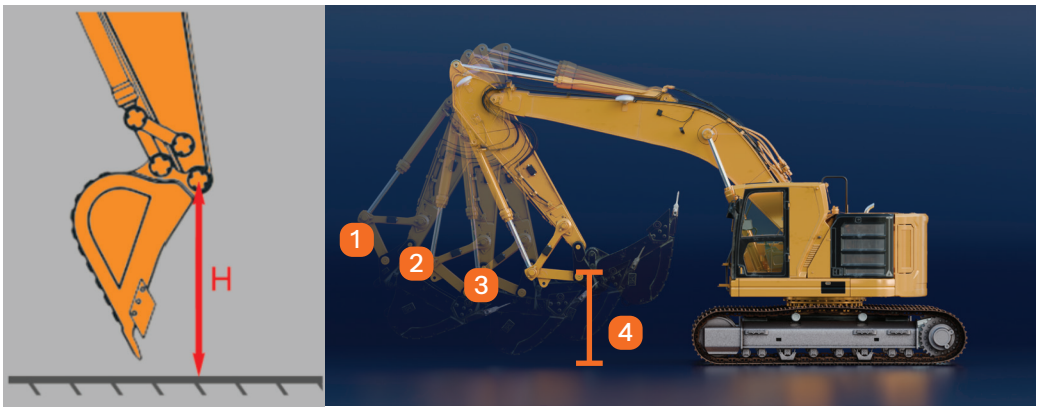


6. Software Operation

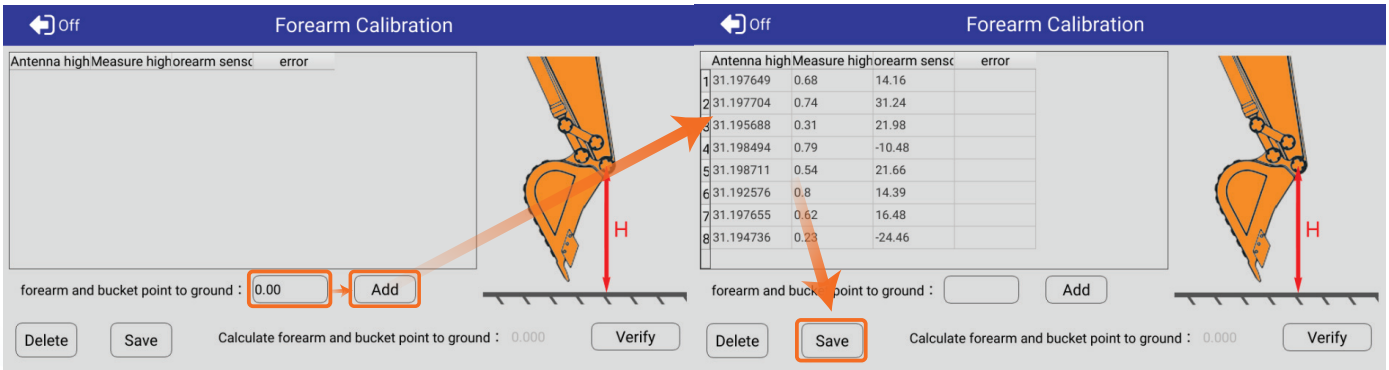
(3) Stick Calibration
Click the Stick Calibration button to enter the calibration interface.



Technicians need to measure the height of the connection point between the stick and the bucket from the ground as shown in the figure.

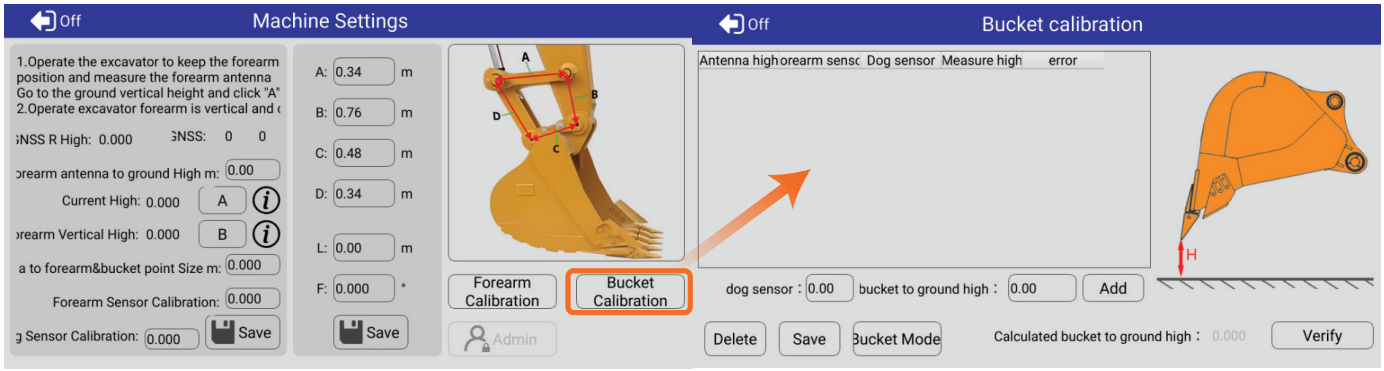


Technicians need to add the measured height to the calibration interface each time, and then measure the next height. At least measure 4 times and then click the Save button to complete the stick calibration.

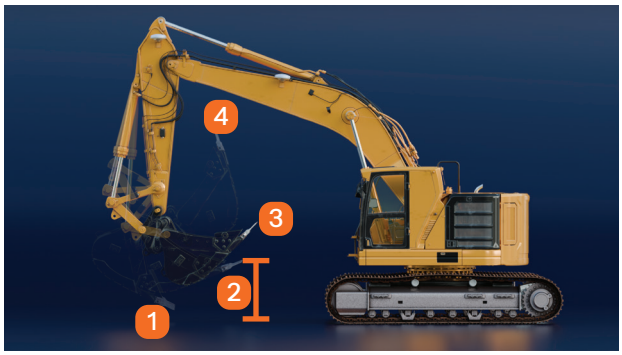


6. Software Operation

(4) Bucket Calibration
Click the Bucket Calibration button to enter the calibration interface.

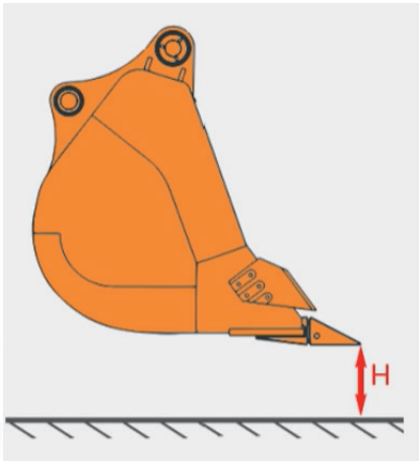


Technicians need to measure four sets of data, each set containing four measurement results, a total of 16 results.
The four sets of data are measurements when the stick is in different positions:



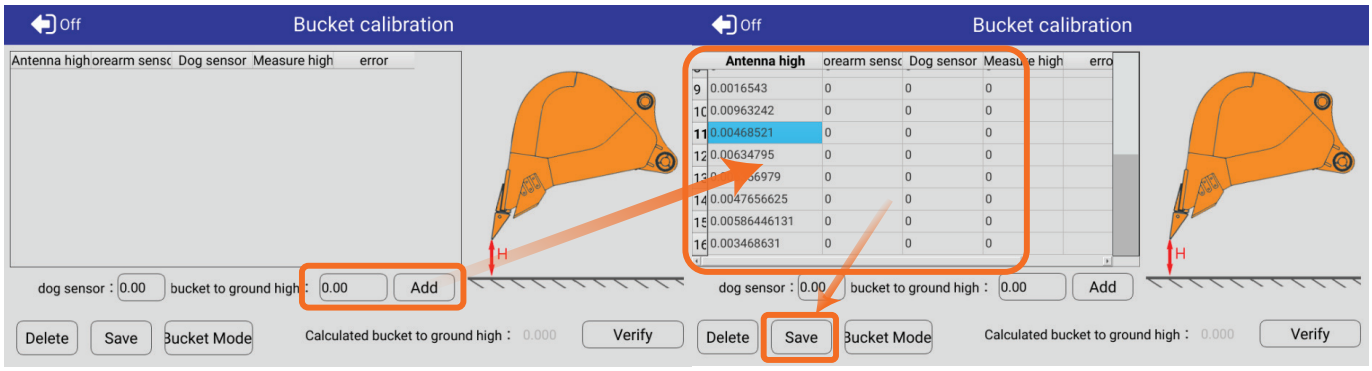
Each set of data needs to measure 4 times the distance of the bucket from the ground at different angles of the bucket.

Technicians need to measure the height of the bucket from the ground as shown in the figure.



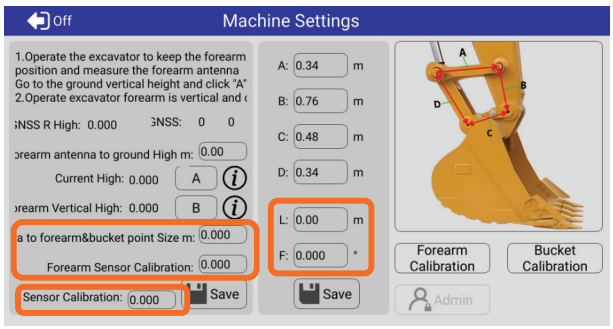
6. Software Operation

Technicians need to add the measured height to the calibration interface each time, and then measure the next height. After measuring 16 parameters, click the Save button to complete the bucket calibration.



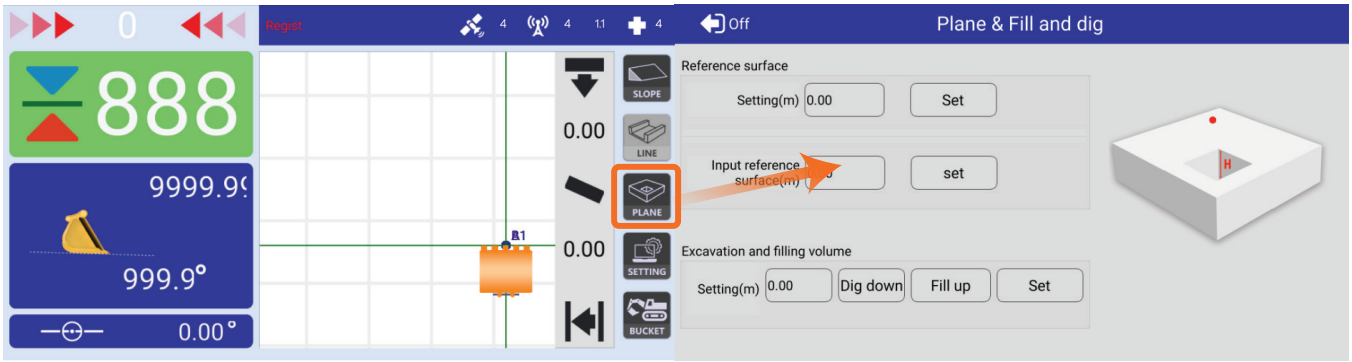
Note: When the stick is in different positions, try to ensure that the bucket does not touch the ground when rotating.

(5) Parameter Calculation
After calibration is complete, contact the technician to obtain these five values.



6.4.1 Planar & Fill and Dig

Click the Planar & Fill and Dig button on the main interface to enter the settings interface.

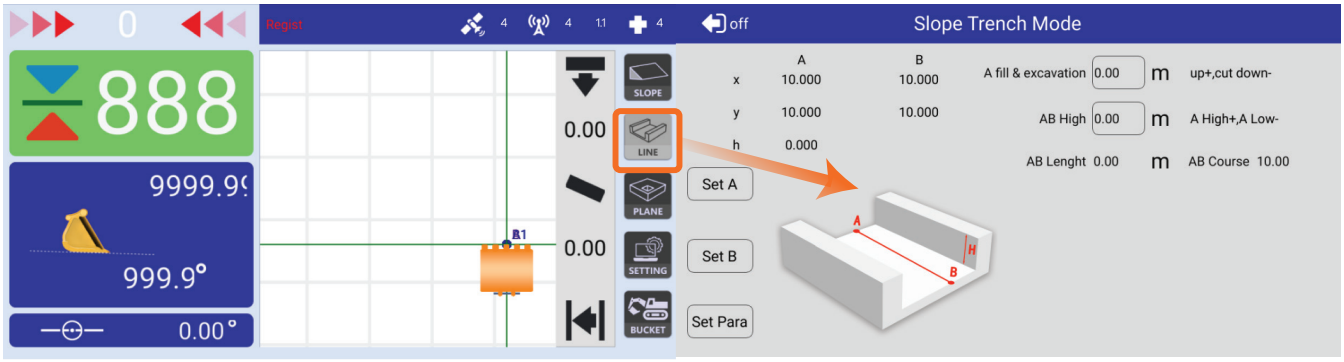


Step 1: Place the bucket in a suitable position and click the Reference Surface Setup button.
Step 2: Set the fill and dig height.
Step 3: Choose the appropriate operation method, either digging down or filling up.
Step 4: Set the volume of dig down/fill up.
Step 5: Click the “Off” button to proceed with operation guidance in leveling mode.

6. Software Operation

6.4.2 Slope Trench Mode

Click the Slope Trench Mode button to enter the settings interface.



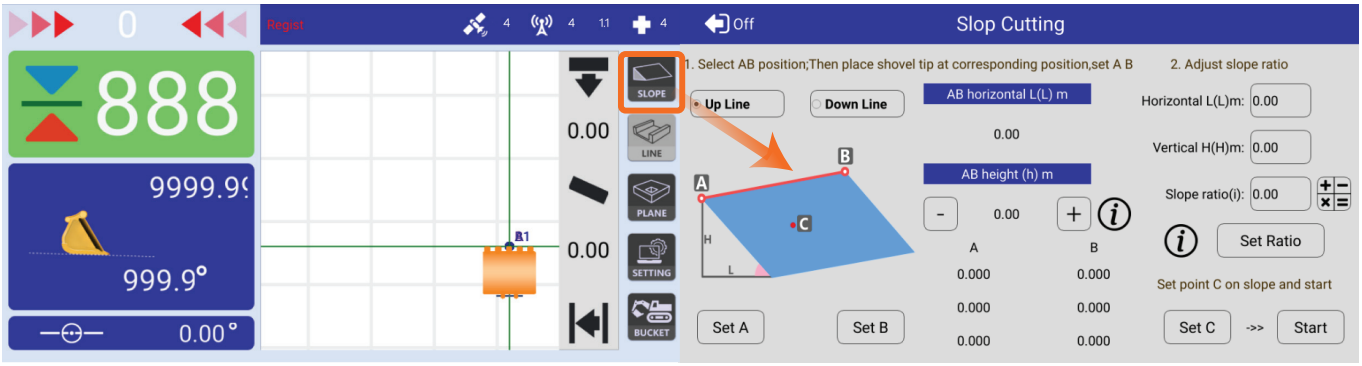
Step 1: Place the bucket in a suitable position and set A.
Step 2: Move the excavator to the B area, place the bucket at point B, and set B.
Step 3: Set the fill/dig quantity at point A.
Step 4: Set the height difference between points A and B.
Step 5: Click the Set Para button.
Step 6: Click the “Off” button to proceed with operation guidance in slope trench mode.

Note:
When setting A fill & excavation, note that a positive value means digging down, and a negative value means filling up.
When setting AB height, note that a positive value means point A is higher than point B, and a negative value means point A is lower than point B.

6. Software Operation

6.4.3 Slop Cutting Mode

Click the Slop Cutting Mode button to enter the settings interface.



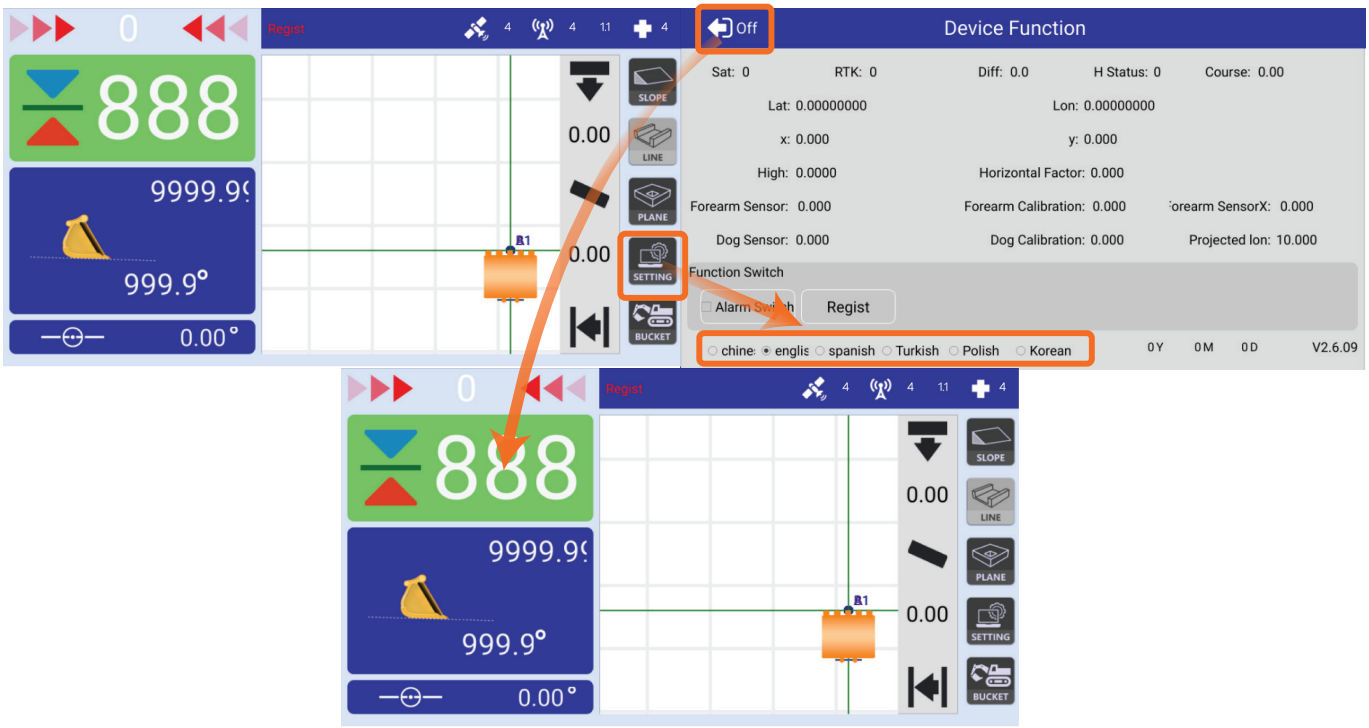
Step 1: select the collection position of the slope opening line.
Step 2: Move the excavator to the A area, place the bucket at point A, and click the Point A Setup button.
Step 3: Move the excavator to the B area, place the bucket at point B, and click the Point B Setup button.
Step 4: Enter the slope ratio, H, and L values.
Step 5: Click the Set Slope Ratio button.
Step 6: Place the bucket at any position on the slope as shown in the figure, and click the Point C Setup button.
Step 7: Click the “Start” button to proceed with operation guidance in Slop Cutting Mode.

Note:
The slope ratio = H/L, retain two decimal places.
AB height is used to adjust the height difference between points A and B.

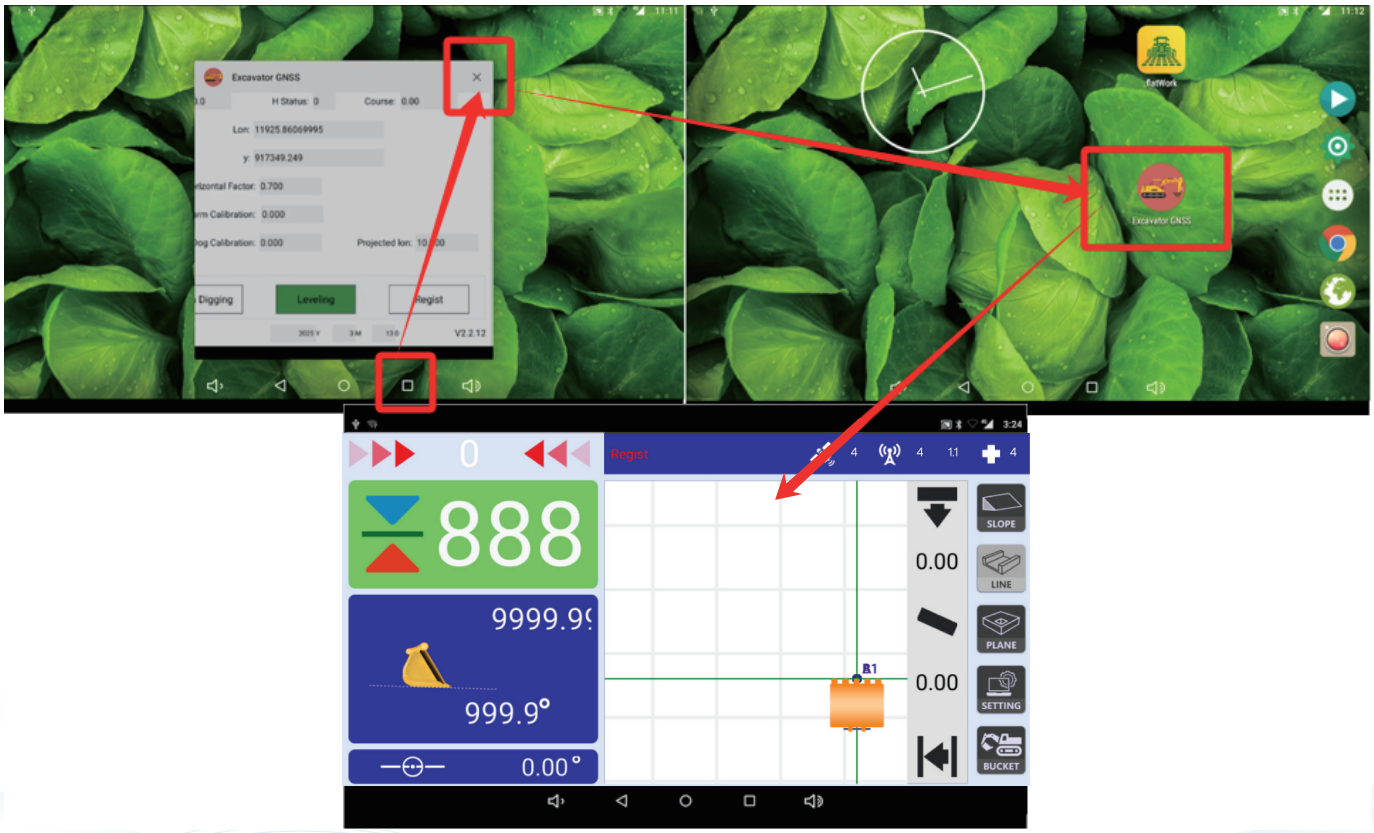
7. Other Functions

7.1 Language Switching

Step 1: Click the Real-Time Parameters button to enter the device function interface, select the appropriate language, and then click the “Off” button to return to the main interface.



Step 2: First, click the button to enter device background, then shut down the software and finally, click the software icon again to complete the language switching.



7. Other Functions

7.2 Real-Time Parameters

The first part is the real-time parameters of the equipment's satellites and gyroscopes, mainly provided for R&D personnel to check problems.
The second part is the switch to turn off the alarm prompt, which is default to open.