

High Precision GNSS Receiver EX30

Quick Start Guide

2026-06-26

Version Revision Approval Record

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1 Overview of EX30

1.1 Product Introduction

The Excavator Leveling Instrument EX30 (hereinafter referred to as EX30) is a portable high-precision leveling instrument specially designed for excavators, equipped with the visual intelligent operation software XFIX. The device lowers the barrier to construction operations, enables a single operator to complete the work independently, effectively improves construction accuracy, and reduces labor and time costs. It is a professional intelligent tool for excavator earthmoving operations.

The EX30 is equipped with a multi-satellite high-precision positioning module, capable of real-time collecting full-angle posture data of the excavator boom and arm, achieving uninterrupted centimeter-level positioning guidance. Multi-satellite joint calculation significantly reduces the limitations that complex terrain environments impose on positioning performance. The device has a built-in 9600 mAh large-capacity battery, supporting 25 hours of continuous operation without frequent recharging. Its industrial aluminum alloy body, with IP68 protection rating, supports 1.5 m free fall, and operates within a temperature range of -25°C to 60°C, adapting to various outdoor all-weather construction scenarios. The lightweight overall design, combined with a magnetic mounting structure, eliminates complex setup—power on and start working right away, with easy assembly, disassembly, and portability.

The device is widely suitable for various earthmoving scenarios, including farmland infrastructure and urban engineering projects. With its high precision, durability, and intelligent performance, the EX30 reshapes the industry benchmark for construction efficiency and cost.

1.2 Product Description

1.2.1 Appearance Description

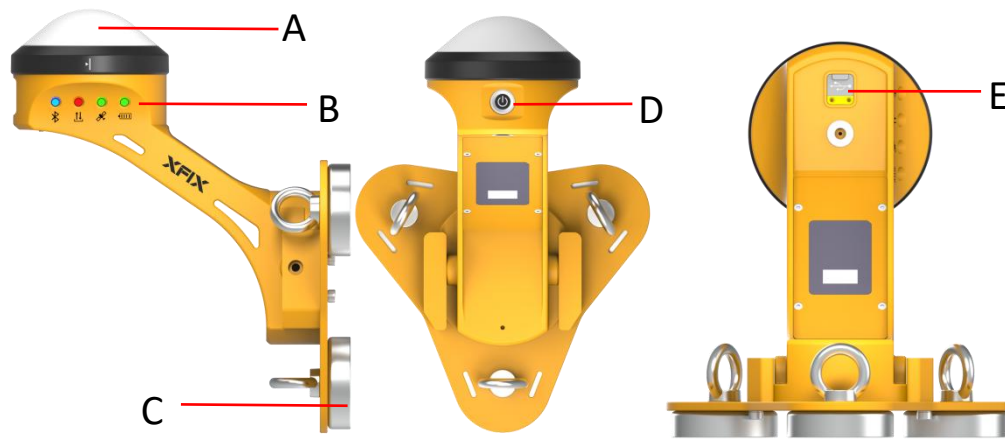


Figure 1-1 EX30 Appearance Diagram

A:High-precision GNSS antenna

B:Indicator light group

C:Strong magnet

D:Power button

E:Type-C charging port

1.2.2 Dimensions

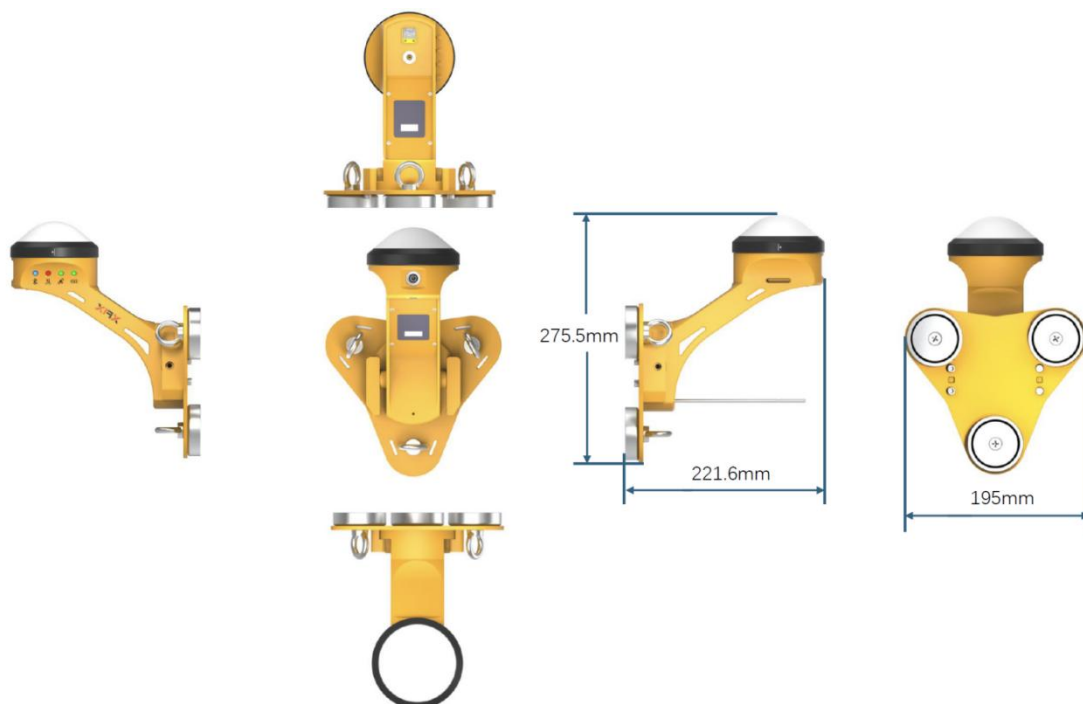


Figure 1-2 EX30 Dimension Diagram (Tolerance: ± 0.3 mm)

1.2.3 Indicator Light Group Description

Table 1 Table 1-1 Indicator Light Group Description

Diagram	Indicator Name	Function
	Power Indicator	Steady green during operation: Normal operation Flashing red during operation: Low battery Steady green while charging: Charging complete Steady red while charging: Charging in progress
	Satellite Indicator	Flashing: Satellite signal received
	Data Link Indicator	Flashing: Differential data received
	Bluetooth Indicator	Steady on: Bluetooth connected

1.2.4 Power Button Instructions

- (1) Battery level check: Press and hold the power button for 1 second. After the four indicators flash, the current battery level will be displayed. Each indicator represents approximately 25% of the battery level.
- (2) Power on: When the device is off, press and hold the power button for 3 seconds until the power indicator turns steady green. The Leveling Instrument is now powered on.
- (3) Power off: When the device is on, press and hold the power button for 5 seconds until all indicators turn off. The Leveling Instrument is now powered off.

1.2.5 Charging Instructions

- (1) While charging, the power indicator stays steady red. When charging is complete, it turns steady green.
- (2) The Leveling Instrument supports fast-charging adapters with adaptive dynamic current adjustment.
- (3) Charging specifications:
 - USB PD 12V/1.25A
 - 5V/3A
- (4) Charging time: approximately 4.5 hours

Note: To ensure personal and device safety, please use the original adapter supplied by the manufacturer, or a compliant power adapter with 3C certification, to power and charge this device.

1.2.6 Applicable Environment Description for EX30

The EX30 is a Global Navigation Satellite System (GNSS) receiver. Satellite signal reception is affected by objective environmental factors such as signal obstruction, electromagnetic interference, extreme weather, and terrain/landform conditions. If the following external environmental factors cause positioning deviation, signal interruption, or functional abnormality, these are not considered device hardware failures. Any related losses arising therefrom shall be borne by the user, and the device supplier shall not assume joint liability for compensation. Once the external environment returns to normal, the device can resume normal positioning operations. The following scenarios may significantly reduce positioning accuracy or even fail to achieve fixed high-precision solutions:

- (1) Environments with severe satellite signal obstruction: indoors, canyons, dense forests, high-rise building clusters, under bridges, shadow areas of large structures, etc. In such environments, the device may remain in a "float solution" state for extended periods and become unusable. If the Leveling Instrument is mounted on the topmost part of the excavator arm, with the antenna slightly higher than the arm itself, the positioning performance can be significantly improved.
- (2) Environments with strong multipath effects: high-voltage steel towers, large construction steel frames, large water/ice surfaces, glass curtain walls of tall buildings, etc. Multipath effects cannot be eliminated by differential correction, which may reduce measurement accuracy.
- (3) Environments with strong electromagnetic interference: high-voltage transmission lines, substations, radar stations, high-power radio stations, industrial RF equipment, welding machines, wind farms, charging station clusters, large motors, frequency converters, etc.
- (4) Extreme atmospheric anomalies: severe convective weather (heavy rain, typhoons, thunderstorms), ionospheric storms, periods of intense solar activity (magnetic storms), etc.

2 Base Station Usage

The EX30B base station can provide differential signal coverage within a 5 km radius for the leveling instrument even without public network access, as shown in Figure 2-1 below. The specific operating procedures are as follows:



Figure 2-1 EX30B Physical View

2.1 Base Station Setup

The user needs to provide a tripod or a fixed mounting base for the base station. The base station should be set up in an open area with an unobstructed view of the sky, away from sources of interference, on a stable and secure base, and at a relatively high elevation.

Important: The base station must not be moved during operation. If the base station is displaced, the coordinate points in the current job will shift as a whole. After the base station is moved, it must be reconfigured via the software.

Depending on whether the tripod or base is removed daily, there are two setup options, each with different rules for using project files:

- (1) Base retention and reuse option: After each day's work, the base station is removed and taken away, while the tripod or concrete fixed base remains in place. The next day, the base station is placed back to its original position and powered on. No reconfiguration is required, and the existing project file can continue to be used until the tripod or base is shifted.
- (2) Full dismantling and rebuild option: After each day's work, both the base station and the tripod are dismantled and removed from the site. Upon returning the next day, the base station must be set up and reconfigured from scratch. Due to the change in base station coordinates, the coordinate points in the project file created on the previous day will shift and become invalid. A new project file must be created on that day.

2.2 Base Station Configuration

After placing the base station on the tripod, install the radio antenna, firmly insert the waterproof plug into the charging port, and press and hold the power button to power on. Base station configuration can be performed in two modes: simultaneous configuration with the leveling instrument, or separate configuration.

(1) Simultaneous configuration of base station and leveling instrument:

- ① Connect to the leveling instrument via Bluetooth: Press and hold the power button on the leveling instrument to power it on. Open the APP and tap Bluetooth, as shown in Figure 2-2. This enters the Device Management screen, as shown in Figure 2-3. Tap Connect next to the corresponding SN number. The leveling instrument SN is printed on the device label.
- ② Connect to the base station via Bluetooth: Tap Bluetooth again. This time, as shown in Figure 2-4, switch to the BASE tab, then tap Connect next to the corresponding SN number. The base station SN is printed on the device label.

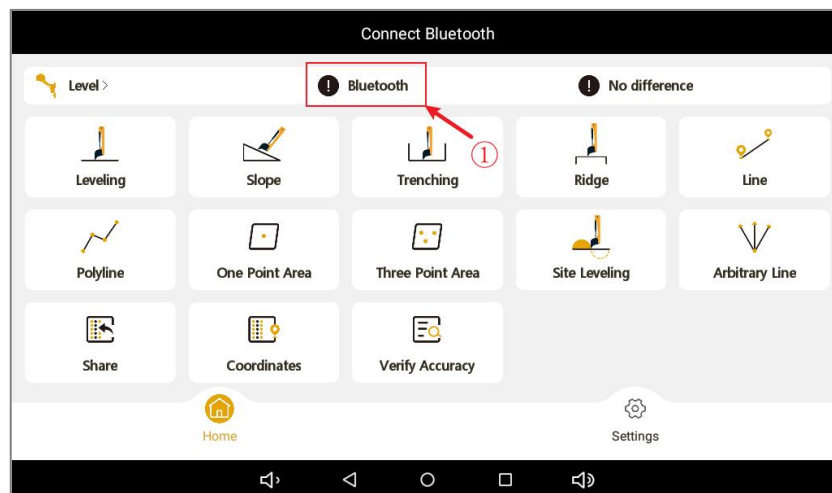


Figure 2-2

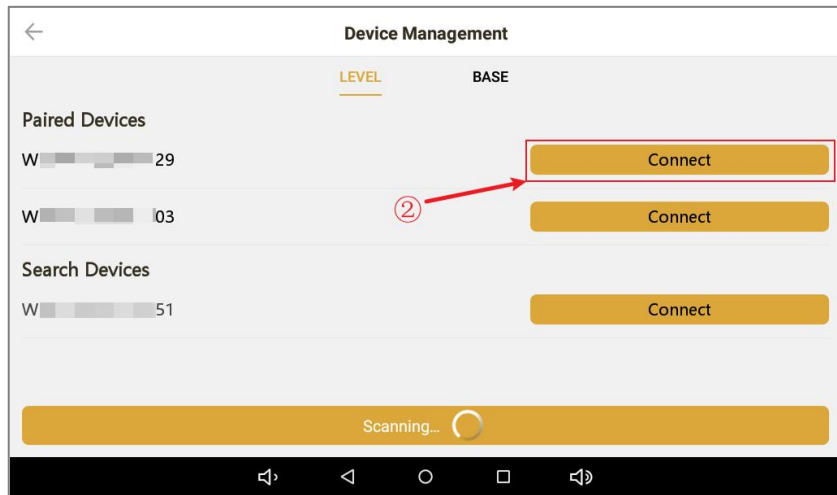


Figure 2-3

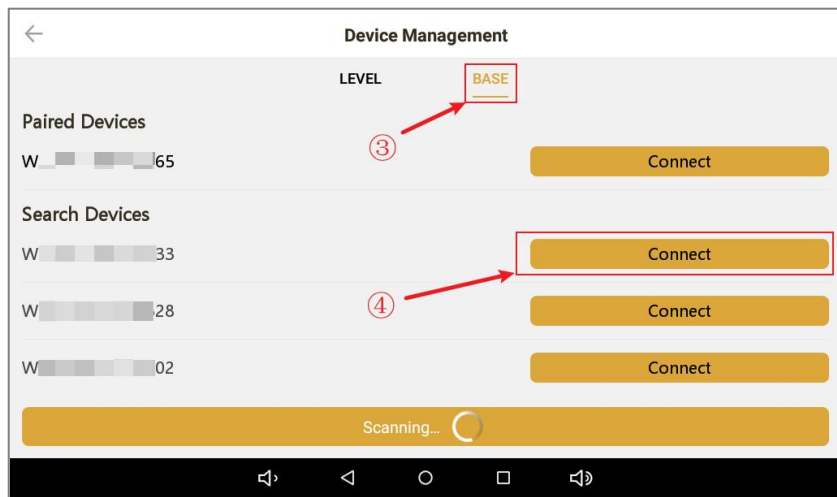


Figure 2-4

- ③ Start the base station: Tap the Base Station interface, as shown in Figure 2-5, to enter the 'Base Station Config' screen, as shown in Figure 2-6. Then tap 'Work Mode'.

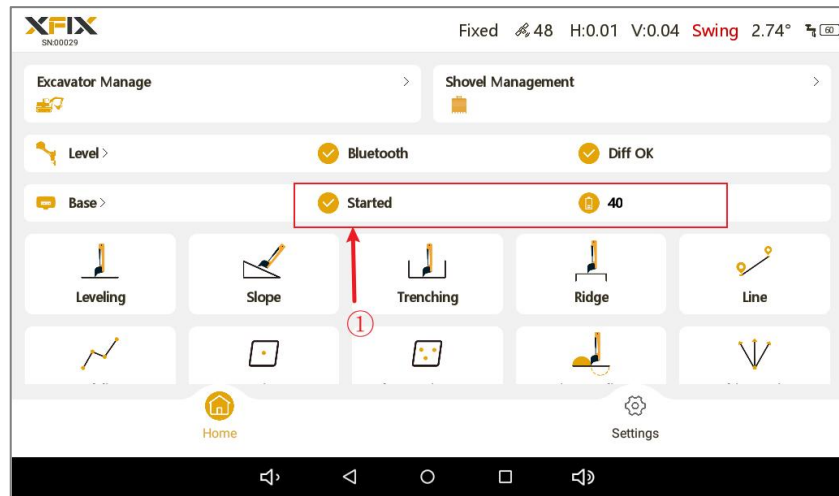


Figure 2-5



Figure 2-6

- ④ Navigate to 'Mode Configuration', as shown in Figure 2-7. Tap 'Apply' at the bottom. The base station will acquire the current coordinates. Wait for approximately 1 minute for the base station to complete startup, as shown in Figure 2-8. After the base station starts successfully, 'Configuration Successful' will appear, as shown in Figure 2-9.

Mode Configuration

Work Mode: Base Station

Station Name: W5 300039

Start Mode: Start with current position coordinates

lon: 139.41 Degrees

lat: 35.007 Degrees

Measure Point Ellipsoid Height: 91.46 m

☐ Advanced Options

Apply

Figure 2-7

Mode Configuration

Work Mode: Base Station

Station Name: W5 300039

Start Mode: Start with current position coordinates

lon: 139.41 Degrees

lat: 35.007 Degrees

Measure Point Ellipsoid Height: 91.46 m

☐ Advanced Options

Apply

Configure base station startup coordinates

Configuration completed, waiting for the base station to start ..

Close

Figure 2-8

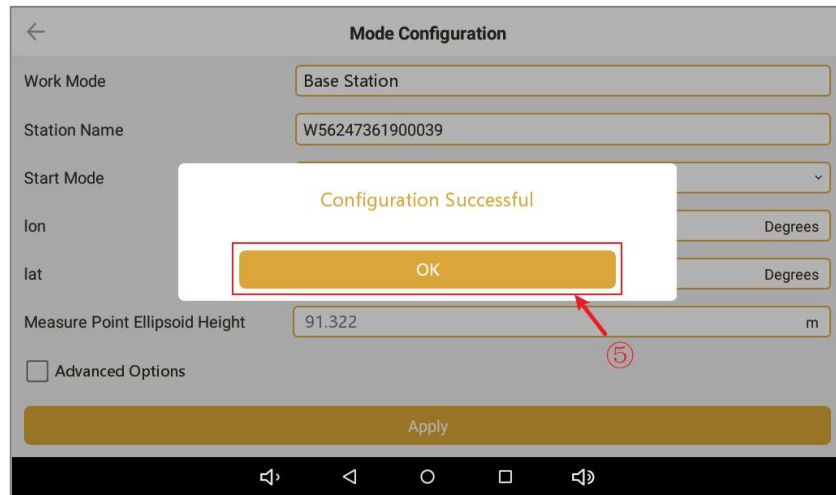


Figure 2-9

- ⑤ Configure the radio: Tap 'Data Link', as shown in Figure 2-10, to enter the 'Data Link' screen, then tap 'Apply' at the bottom, as shown in Figure 2-11. In the pop-up window 'Config success, Is it applied to leveling equipment?', tap 'Confirm', as shown in Figure 2-12.

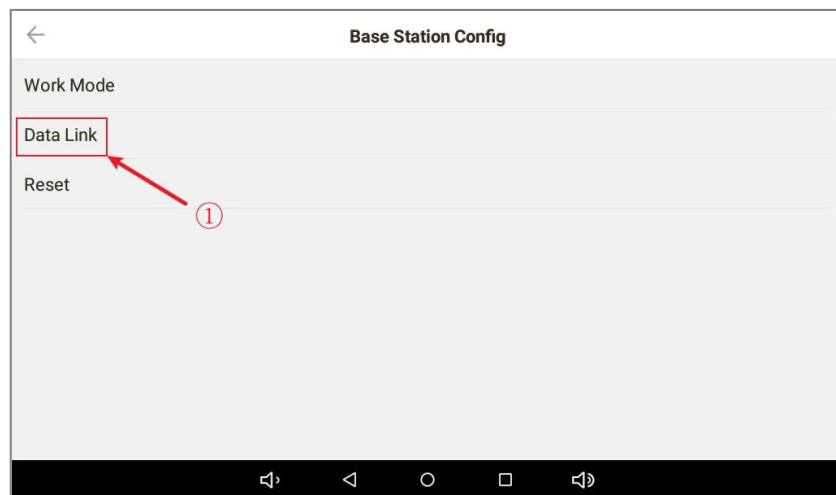


Figure 2-10

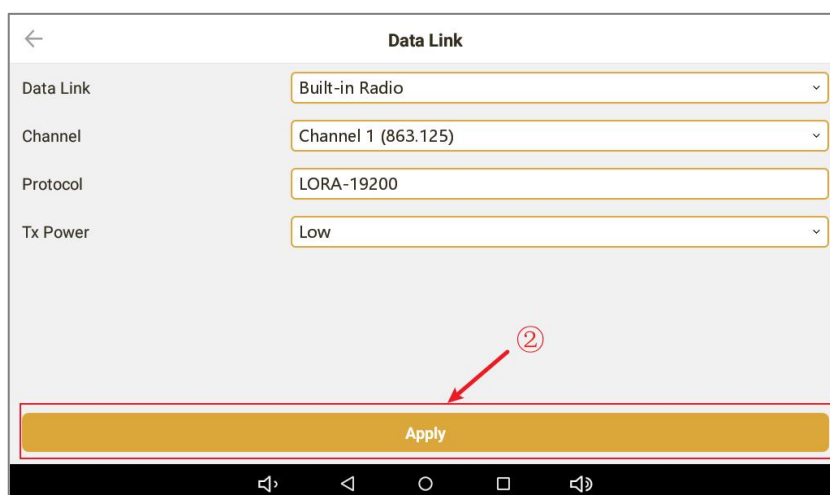


Figure 2-11

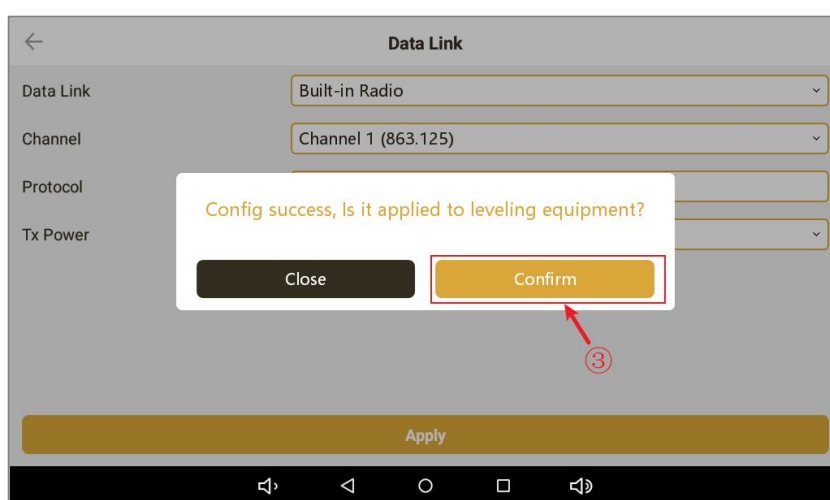


Figure 2-12

(2) Separate configuration of base station and leveling instrument:

- ① Configure the base station independently: Follow steps 2 through 4 in the simultaneous configuration section (1) of this subsection, with reference to Figure 2-3 through 2-12.
- ② Configure the leveling instrument independently: Perform step 1 in the simultaneous configuration section (1) to connect to the leveling instrument via Bluetooth. Return to the Home screen, tap the differential setting item 'No Difference', as shown in Figure 2-13, then tap 'Difference Source' and select 'Built-in Radio'. Choose the radio channel that matches the base station, then tap 'Apply' as shown in Figure 2-11. The leveling instrument configuration is now complete.

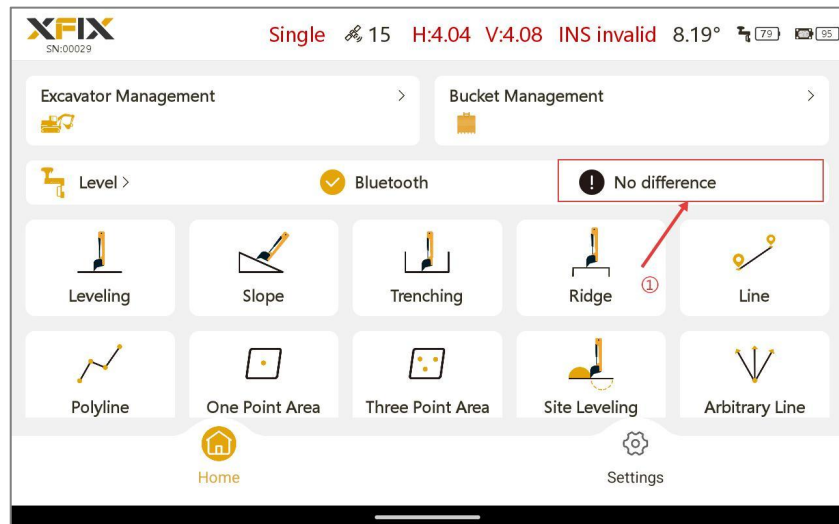


Figure 2-13

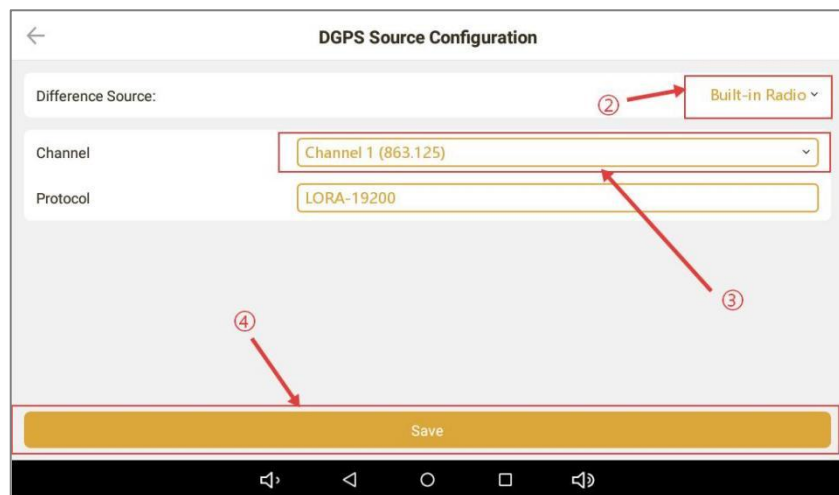


Figure 2-14

- ③ When you see 'Fixed' displayed in the information bar above the leveling instrument, it means the base station is working normally.

2.3 Daily Use

- (1) Scenario where the tripod or base has not been moved: After each day's work, remove only the base station for charging, leaving the tripod and fixed base in place. The next day, place the base station back, power it on, and start working directly—no reconfiguration is required. Existing project points remain unchanged and can continue to be used.
- (2) Scenario where the tripod or base is completely removed: After each day's work, remove both the base station and the tripod from the site. The next day, set up the base station again. After powering on the base station and ensuring it is stable, repeat step ③ 'Start the base station' in section 2.2 Base Station Configuration above. Once configured, the base station must not be moved. Because the base station position has changed, the coordinate points in the project will shift accordingly. The project created before the base station was moved can no longer be used, and a new project must be created.

3 Leveling Instrument Use

3.1 Bluetooth Connection to EX30

When the newly installed software is run and system permissions on the phone are granted, it defaults to the 'Home' screen, as shown in Figure 3-1 below. You can tap 'Connect Bluetooth' at the top of the 'Home' and 'Settings' screens to enter the Bluetooth device management screen and complete the Bluetooth device connection. Alternatively, you can tap 'Settings' to enter the settings screen, as shown in Figure 3-2, then tap 'Bluetooth Device Management' to enter the device management screen, as shown in Figure 3-3, where you can connect the leveling instrument and base station via Bluetooth separately.

When you enter the device management screen, it automatically starts scanning for nearby Bluetooth devices. You can also tap 'Start Scan' at the bottom to search. In the list of discovered Bluetooth devices, find the Bluetooth name of the corresponding device (default is the host ID, e.g., W50000000000001; the host ID can be found on the device label). After selecting the Bluetooth name, tap 'Connect' on the right. When the connection is successful, a connection success message will appear.

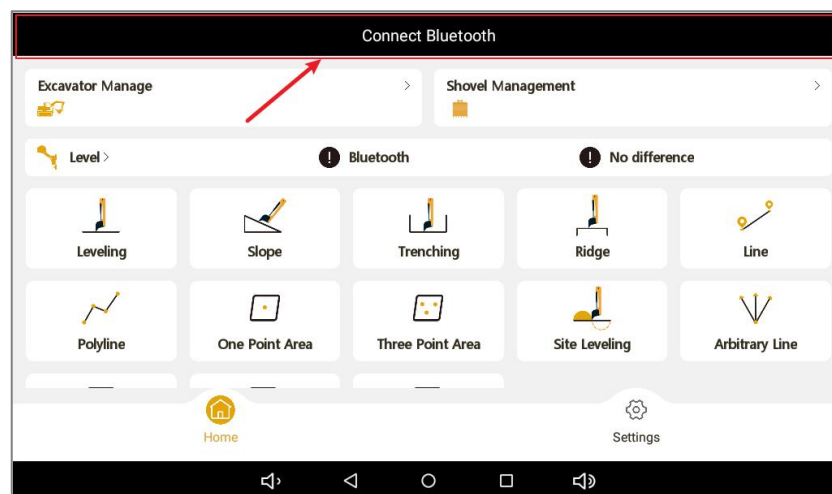


Figure 3-1

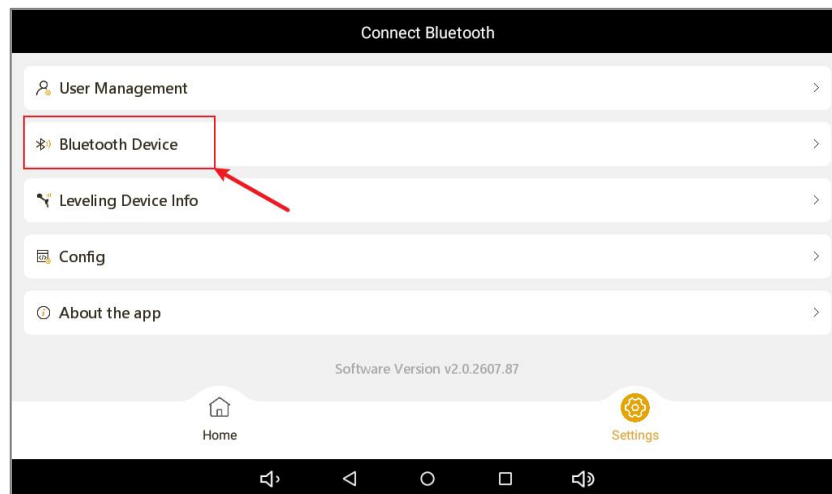


Figure 3-2

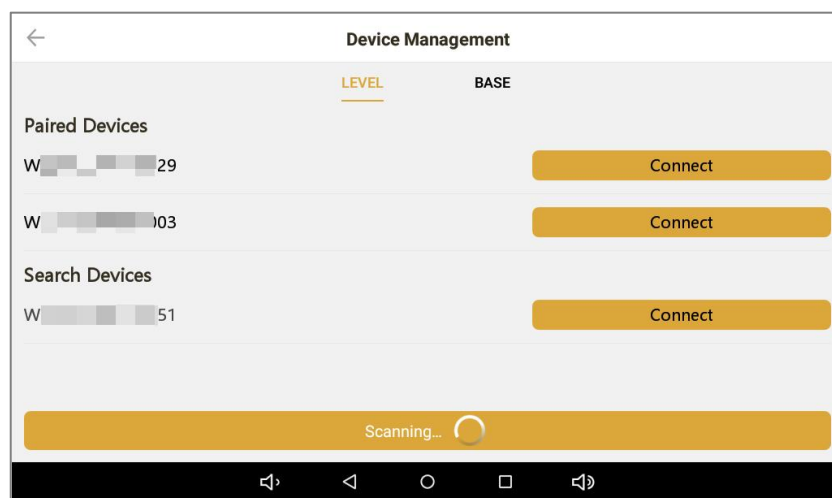


Figure 3-3

3.2 Configuring the Differential Source

- (1) Using the EX30B base station to provide differential data: For detailed operation steps, see section 2.2 Base Station Configuration.
- (2) Using a third-party differential forwarding platform:
 - ① After connecting to the leveling instrument via Bluetooth, tap the leveling instrument differential configuration 'No Difference' on the 'Home' screen, as shown in Figure 3-4.

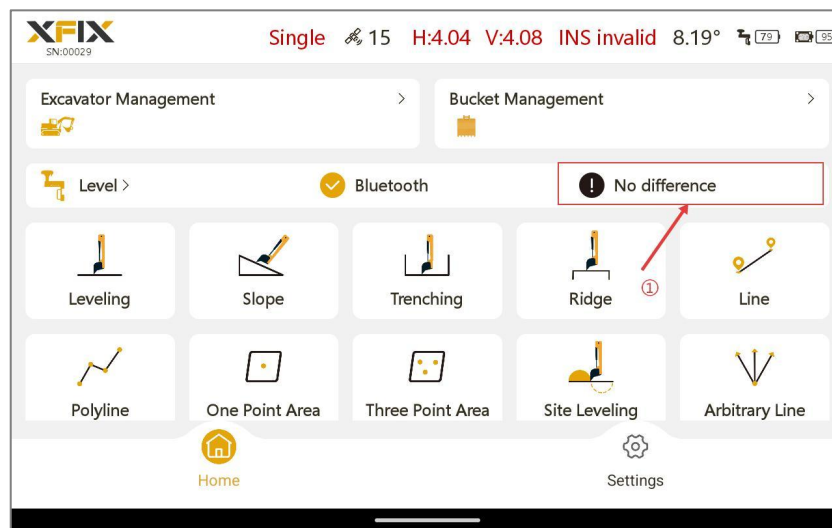


Figure 3-4

- ② Tap 'Difference Source', tap 'Custom CORS', then tap 'New'.

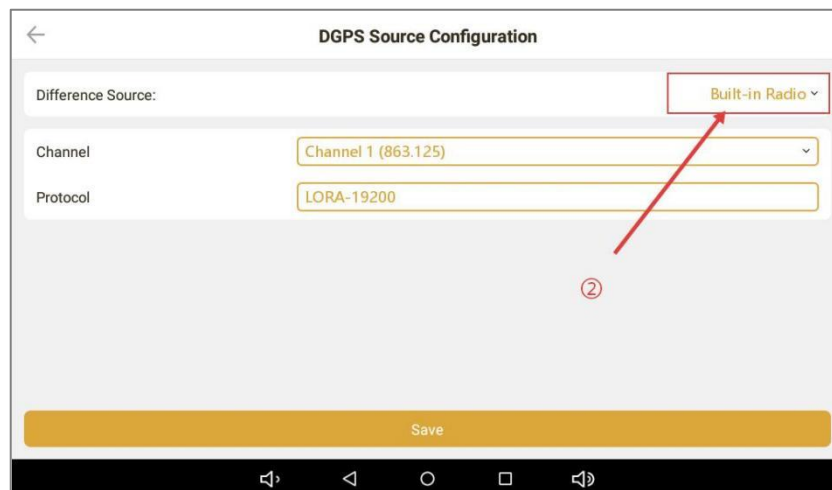


Figure 3-5

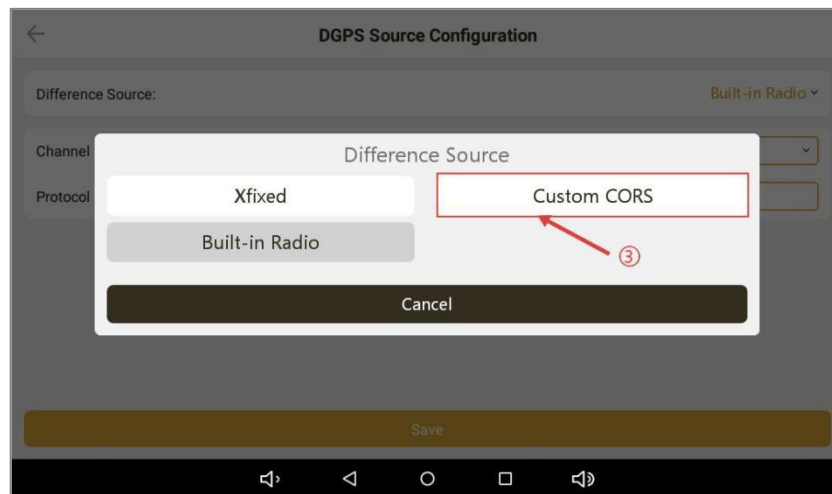


Figure 3-6

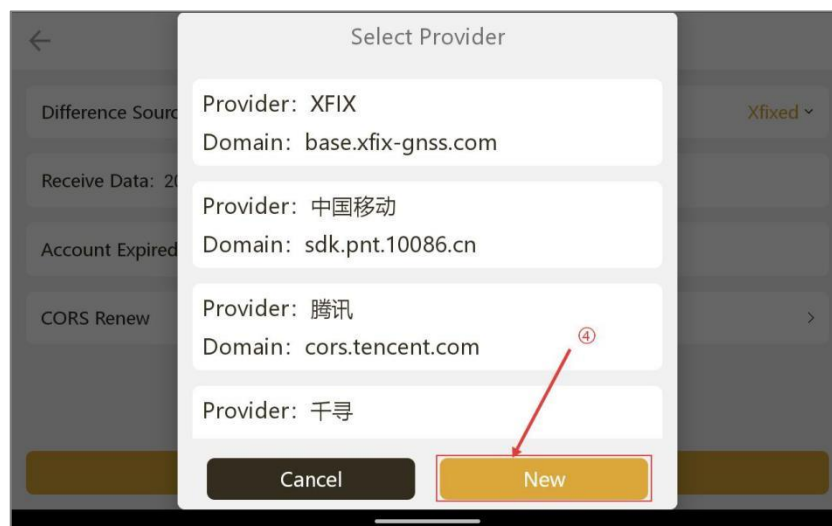


Figure 3-7

- ③ Enter the CORS name, then tap 'Confirm'. Enter the 'Domain', 'Port', 'Username', 'Password', and 'Mount Point'. Tap the arrow to list the mount points, and after entering all information, tap 'Save'.

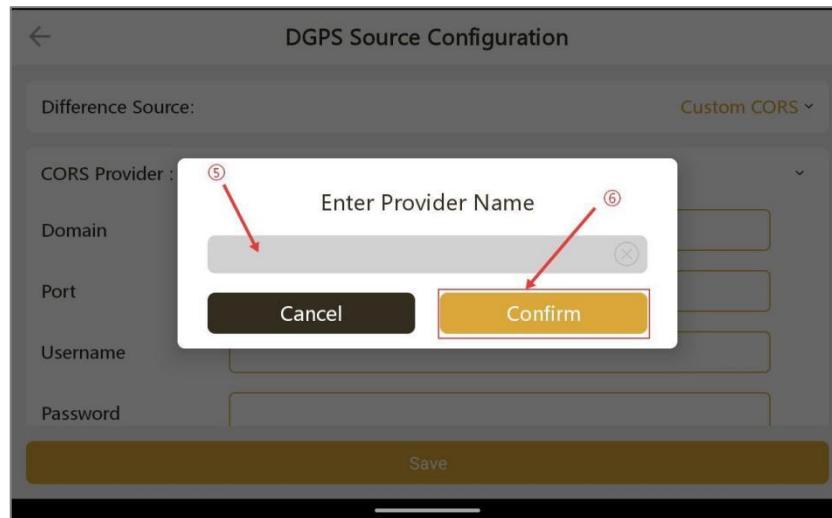


Figure 3-8

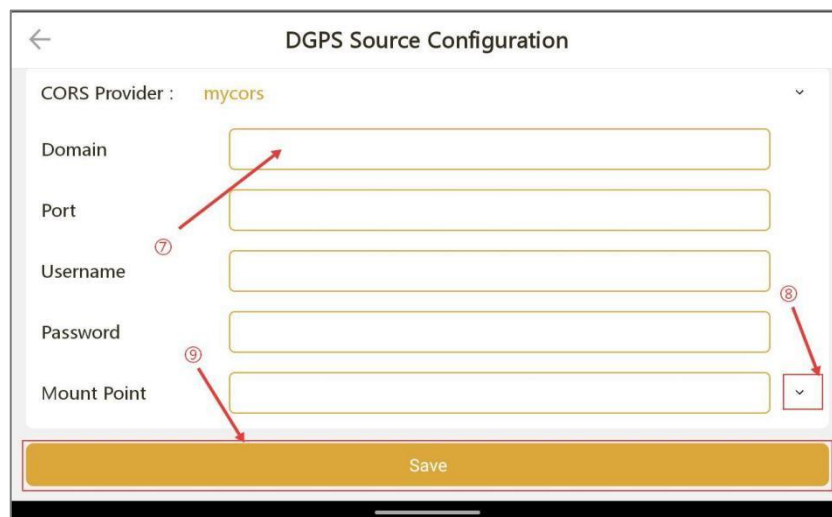


Figure 3-9

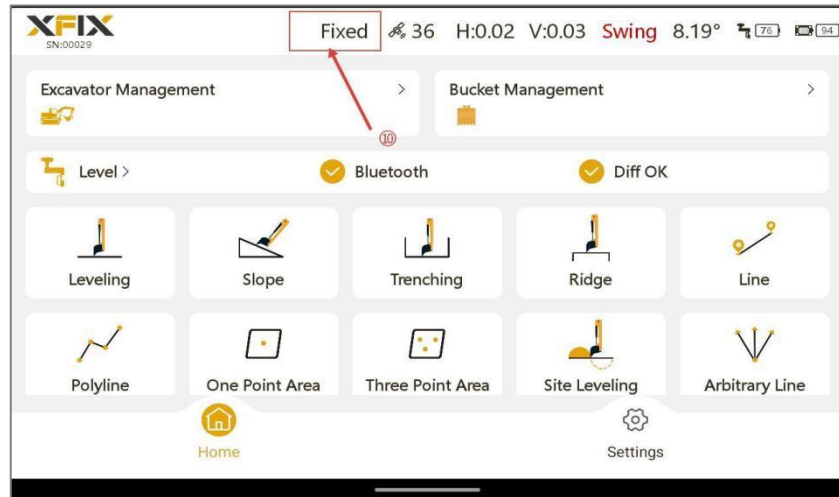


Figure 3-10

3.3 Leveling Instrument Fixed Solution

- (1) Stand in an open and relatively unobstructed area. Stay away from interference sources such as vehicle-mounted satellite signal jammers, high-voltage transmission lines, high-power radio stations, and frequency converters. Also keep away from obstructions like excavators, metal buildings, and metal scaffolding.
- (2) Receive satellite signals. Press and hold the black power button on the EX30 for 3 seconds to power it on. Open the XFIX app, connect to the EX30 via Bluetooth, hold the EX30 with the GNSS antenna facing upward, and wait for a few seconds. The status displayed at the top of the XFIX app will change from 'Invalid, Search' to 'Single, INS invalid', as shown in Figure 3-11, indicating that the device is receiving satellite signals. If it keeps displaying 'Invalid', check whether both ends of the signal cable connecting the GNSS antenna are loose.



Figure 3-11

- (3) Receive differential correction data (hereinafter referred to as "differential data"). Wait a few seconds. After the phone obtains the differential data via the mobile network, it transmits the data to the EX30 through Bluetooth. The status displayed at the top of the XFIX app will switch from 'Single' to 'Fixed', as shown in Figure 3-12, indicating that the phone has a stable network connection and is receiving differential signals. If it keeps displaying 'Single', check whether the phone's mobile network is working properly and whether the system has granted the app permission to use mobile data. For some phones, you may also need to enable the permission for "allowing Bluetooth to transfer mobile network data".



Figure 3-12

- (4) Calibrate the tilt measurement function (inertial navigation module). Hold the EX30 with the mushroom-type GNSS antenna facing the sky, and move the device smoothly within a range of 3 meters (the worse the environmental conditions, the farther you need to walk). When the status displayed at the top of the XFIX app changes from 'Fixed, Swing' to 'Fixed, INS GOOD', as shown in Figure 3-13, it indicates that the EX30 device is ready for normal use in the current environment.

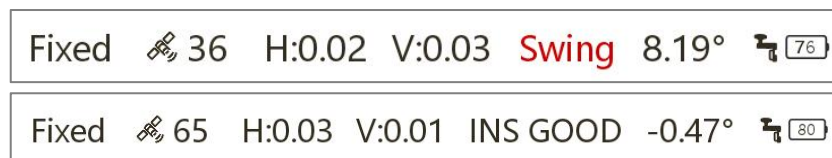


Figure 3-13

3.4 Calibration

The leveling instrument should be installed on the top of the excavator arm, on the same side as the cab, with the indicator lights facing the cab. For first-time use, the leveling instrument must be calibrated in an open outdoor area. Currently, the leveling instrument can be used alone with two calibration modes: Simple Mode and Professional Mode. When used together with a Attitude Unit, there is one additional calibration mode:

- (1) Simple Mode: Used with the leveling instrument alone (no Attitude Unit).
Measurement must be performed on a horizontal hard surface.
- (2) Professional Mode: Used with the leveling instrument alone (no Attitude Unit).
The bucket is suspended in the air during measurement, suitable for all scenarios.
- (3) Bucket Sensor Combination Mode: The leveling instrument is used together with a Attitude Unit for calibration, suitable for all scenarios.

3.4.1 Simple Mode Calibration

- (1) Adjust the excavator posture.
 - ① Drive the excavator onto a horizontal hard surface and park it securely. (**The ground between the plumb point and the bucket tip must be level**; slopes will affect measurement accuracy and may even cause calibration failure—the steeper the slope, the greater the impact.)
 - ② Operate the bucket to curl inward, retract the arm, and lower the boom, as shown in Figure 3-14.
 - ③ Clean the contact surface. Before installation, thoroughly clean the corresponding magnetic attachment area on the top of the excavator arm.



Figure 3-14

- (2) Ensure that the leveling instrument has achieved 'Fixed' and 'INS GOOD'. Perform the steps in section 3.3 Leveling Instrument Fixed Solution to confirm that the status bar at the top of the app displays 'Fixed' and 'INS GOOD' before proceeding with installation and calibration, as shown in Figure 3-15. **The device must reach the 'Fixed, INS GOOD' status at least once before calibration to obtain high-precision positioning information.** During calibration, the display may switch to 'Swing' – you can ignore this, as it does not affect the calibration.



Figure 3-15

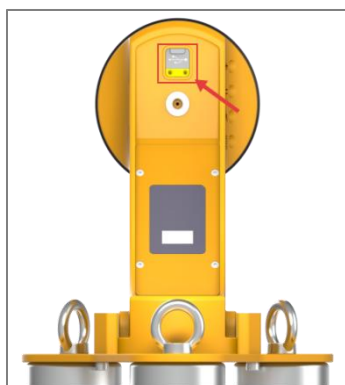
(3) Install the leveling instrument.

- ① Mount the main unit on the top of the excavator arm, ensuring that the antenna is slightly higher than the highest point of the arm and tilted forward at an appropriate angle toward the front of the excavator. The antenna mounting position is shown in Figure 3-16. Make sure that during operation (within the commonly used working area), the antenna has a better open-sky view (the antenna always faces the sky as much as possible) to ensure stable satellite signal reception. After installation, shake the unit to confirm it is firmly attached.



Figure 3-16

- ② Firmly insert the rubber plug into the charging port to protect against dust and water, as shown in Figure 3-17(a).
- ③ Install the plumb rod, as shown in Figure 3-17(b).



(a)



(b)

Figure 3-17

- ④ Install the plumb bob setter. Magnetically attach the plumb bob setter to the

side, and pass the plumb line through the center groove of the plumb rod. The installation position is shown in Figure 3-18(a). Remove the protective cover from the tip of the plumb bob, as shown in Figure 3-18(b). Gently pull the plumb line downward and place the plumb bob inside the bucket.



(a)



(b)

Figure 3-18

- (4) Adjust the excavator posture. Slowly raise the boom, extend the arm forward, **curl the bucket outward to its mechanical limit position**, then lower the boom so that the bucket tip just touches the horizontal ground (avoid inserting the tip into the ground or deforming the bucket due to curling, which could affect the measurement). The device posture is shown in Figure 3-19. **Note:** Ensure there are no obstructions (e.g., fuel lines, bearings) along the plumb line direction to prevent the plumb line from being snagged during calibration, which could affect measurement accuracy.



Figure 3-19

- (5) Pull the plumb line downward until the plumb bob lightly touches the ground, as shown in Figure 3-20. The calibration preparation is now complete.



Figure 3-20

- (6) Open the XFIX software calibration parameter interface.

- ① Open the XFIX app and tap 'Excavator Management' as indicated by the arrow, as shown in Figure 3-21.
- ② Tap 'New' at the bottom of the 'Excavator' screen, as shown in Figure 3-22. This redirects to the parameter configuration page, as shown in Figure 3-23. Enter the excavator name, then tap 'Next' at the bottom.

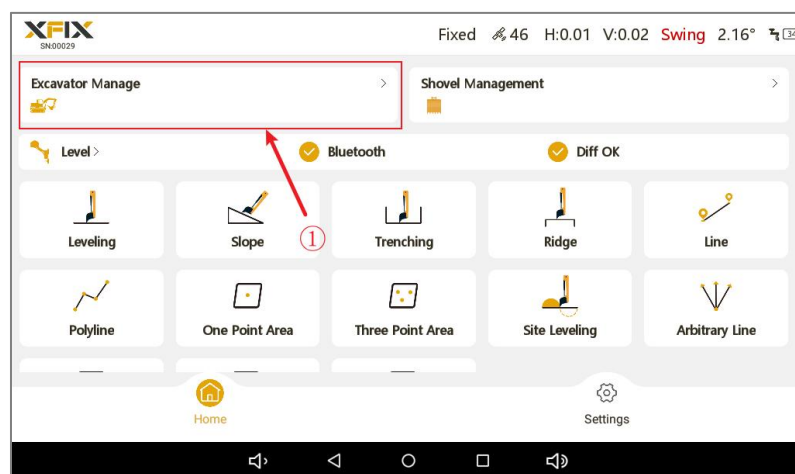


Figure 3-21

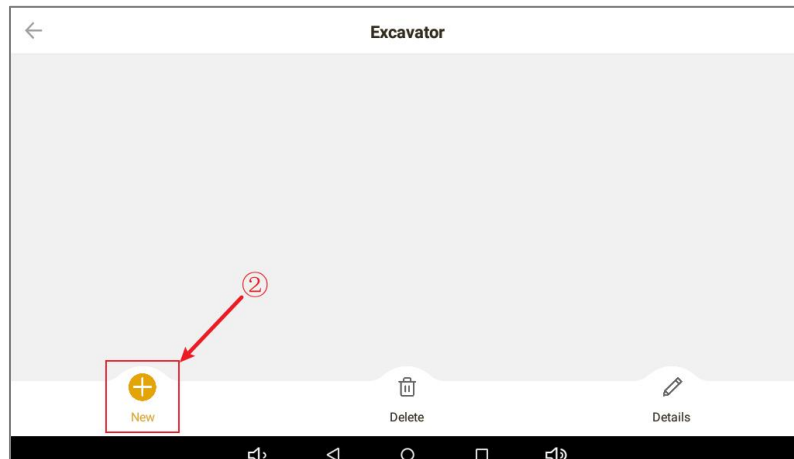


Figure 3-22

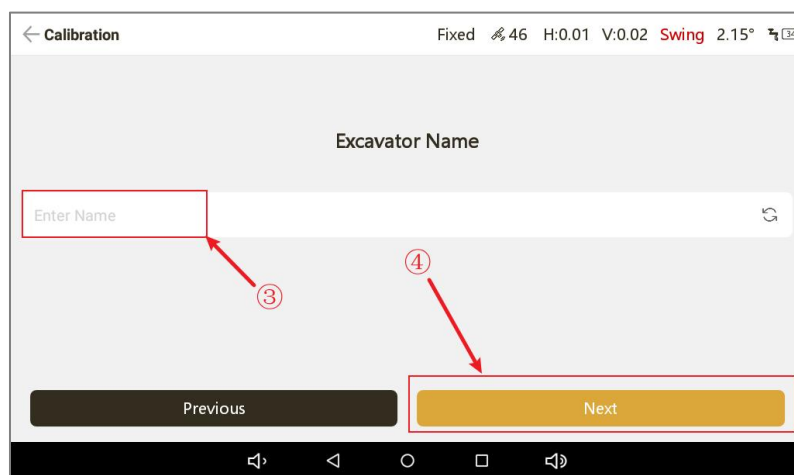


Figure 3-23

- ③ Select the calibration mode as 'Simple Mode (requires level hard ground)'

Note:

- During the process of measuring and entering calibration parameters, **do not move the excavator**. If moved, the measured parameters will become invalid.
- While entering calibration parameters, the status at the top of the software must remain '**Fixed**'.
- If the status prompt at the top of the software switches from 'INS GOOD' to 'Swing', this change **does not affect the normal entry of calibration parameters**, and you may continue with the subsequent steps.

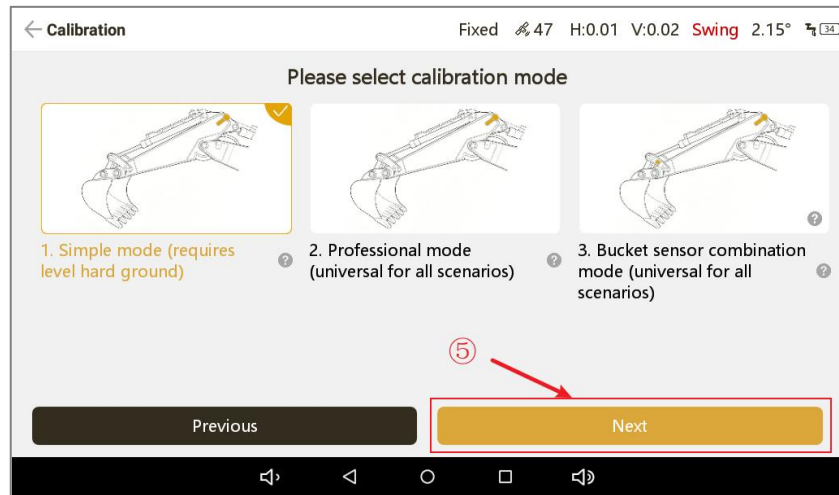


Figure 3-24

(7) Measuring and entering the vertical height **HA**.

Enter the **HA** vertical height input screen, as shown in Figure 3-25. Note that the default unit for all measurements is meters; do not enter values in centimeters.

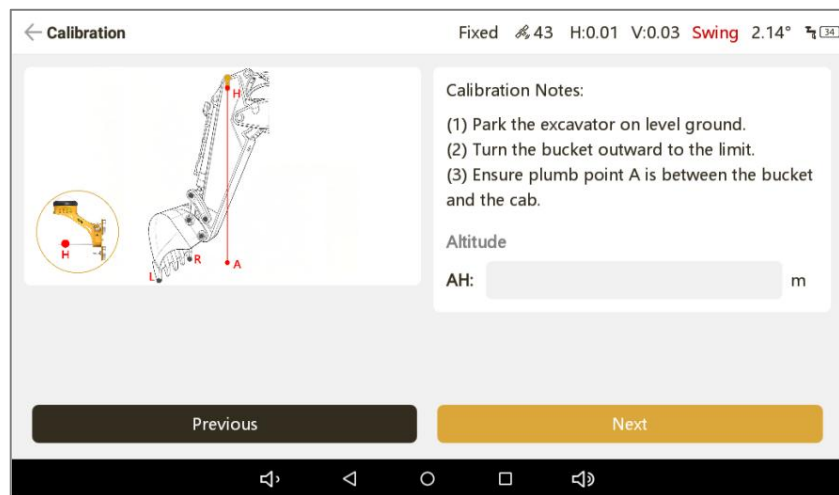


Figure 3-25

During measurement, place one end of the tape measure on the plumb rod, as shown in Figure 3-26(a). Confirm the contact point of the plumb bob with the ground when it is stationary, then gently push the plumb bob aside and straighten the tape measure to the contact point, as shown in Figure 3-26(b). After entering the vertical height **HA**, tap 'Next' at the bottom.



(a)



(b)

Figure 3-26

Notes:

- For oversized excavators, the plumb line or tape measure may not be long enough. If the tape measure is insufficient, measure a section first, mark the plumb line, then measure the remaining distance. If the plumb line is too short, you may use a tape measure while the device is stationary to help identify the projected point on level ground, and measure directly to that point.
- The ground between the plumb bob and the bucket tip must be level. The greater the ground slope, the poorer the calibration accuracy, which may cause the calibrated bucket tip position to deviate from the actual tip position. In such cases, the ground must be re-leveled and calibration performed again.

- (8) Measure and enter the distance **AR** from the plumb bob to the right bucket tip, then tap 'Next' at the bottom, as shown in Figure 3-27.

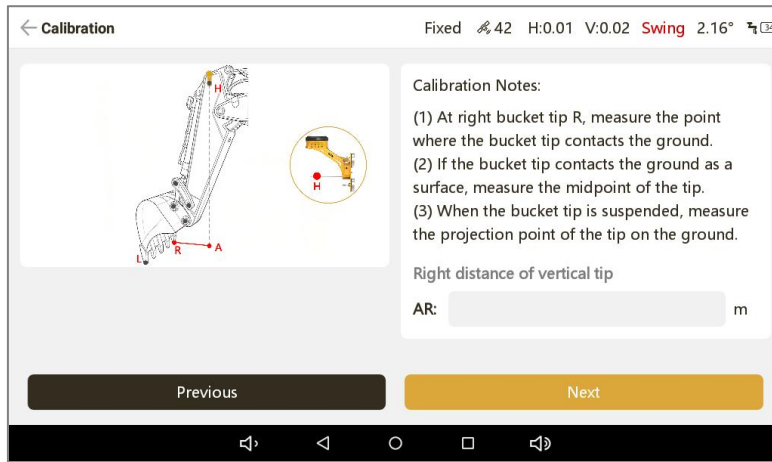


Figure 3-27

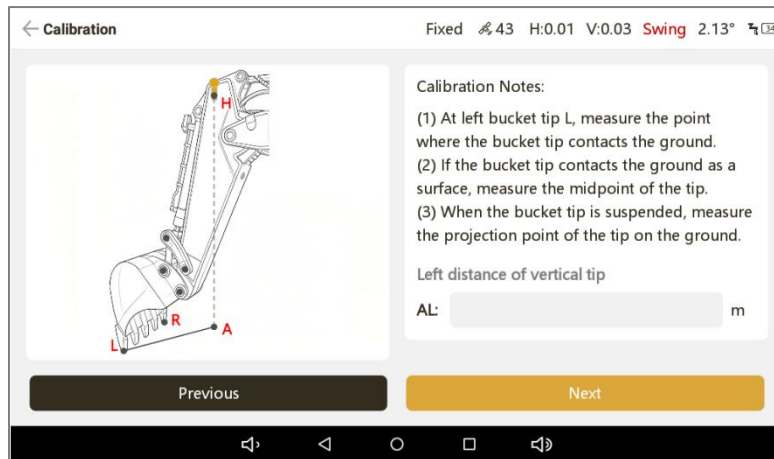
Notes:

- One end of the tape measure should be precisely aligned with the contact point between the bucket tooth tip and the ground, at the center point of the bucket tip. The bottom of the tape measure must be clear of dirt, gravel, or other debris to ensure a clean and interference-free measurement reference, as shown in Figure 3-28.
- When the left and right bucket tips are of different lengths, only one can touch the ground while the other is suspended in the air. When measuring the suspended tip, measure its vertical projection onto the ground (i.e., the point on the ground directly below it). During operation, prioritize using the bucket tip that touched the ground during calibration.



Figure 3-28

- (9) Measure and enter the distance **AL** from the plumb bob to the left bucket tip, then tap 'Next' at the bottom, as shown in Figure 3-29.



(a)



(b)

Figure 3-29

- (10) Measure and enter the distance **LR** between the left and right bucket tips, then tap 'Next' at the bottom, as shown in Figure 3-30.

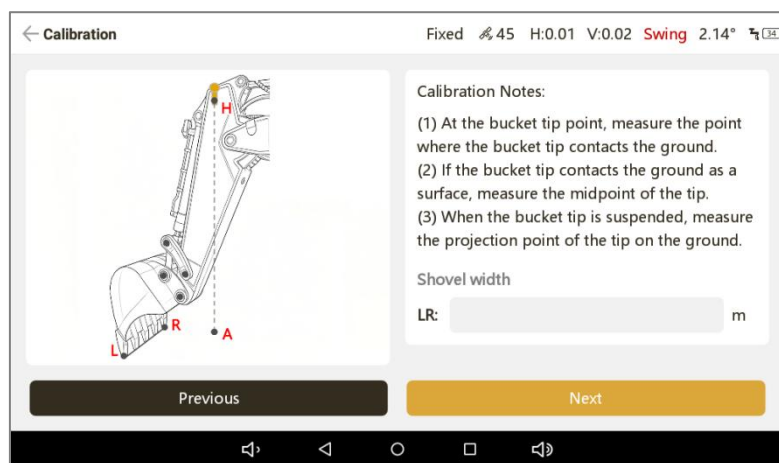


Figure 3-30



Figure 3-31

- (11) The software will display a pop-up message 'Configuration Successful', indicating that the calibration parameter measurement and entry are complete. The next step is to verify whether the calibration is successful. Uneven ground or bucket tip sinking caused by abnormal hydraulic systems may result in poor accuracy after calibration. Tap 'Verify Accuracy' on the 'Home' screen, curl the bucket outward to its limit, and use the left bucket tip to measure the same point three times, then calculate the extreme accuracy value.

3.4.2 Professional Mode Calibration

(1) Adjust the excavator posture as shown in Figure 3-32.



Figure 3-32

(2) Connect to the leveling instrument app for calibration.

- ① Clean the contact surface. Before installation, thoroughly clean the corresponding magnetic attachment area on the arm. The device is attached to the side of the arm via strong magnets, as shown in the figure above.
- ② Power on the leveling instrument, open the XFIX app, and connect to the leveling instrument via Bluetooth. (For details, see section 3.1 Bluetooth Connection to EX30.)
- ③ Tap 'Excavator Management', as shown in Figure 3-33, to enter the excavator management screen, as shown in Figure 3-34.
- ④ Tap 'New' at the bottom to check the current solution status and INS status, as shown in Figure 3-35. Before calibration, the solution status must reach 'Fixed' and the INS status must reach 'INS GOOD'. Hold the leveling instrument with the antenna facing the sky and move it back and forth until INS GOOD is achieved. Once the conditions are met, it will automatically proceed to the next step, as shown in Figure 3-36.

Note: During calibration, if the status prompt at the top of the software switches from 'INS GOOD' to 'Swing', you can ignore it—this does not affect the subsequent calibration.

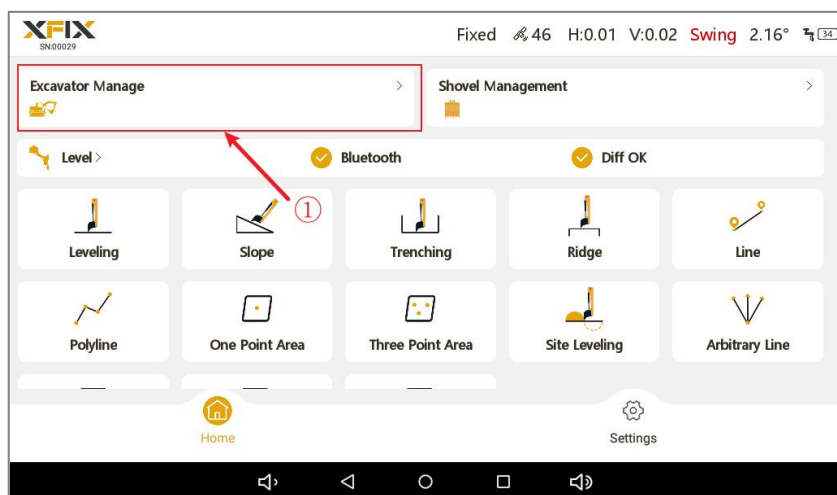


Figure 3-33

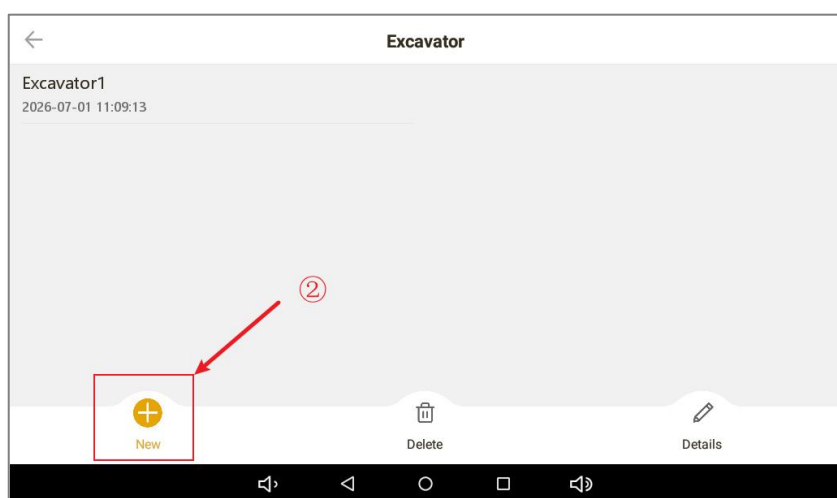


Figure 3-34

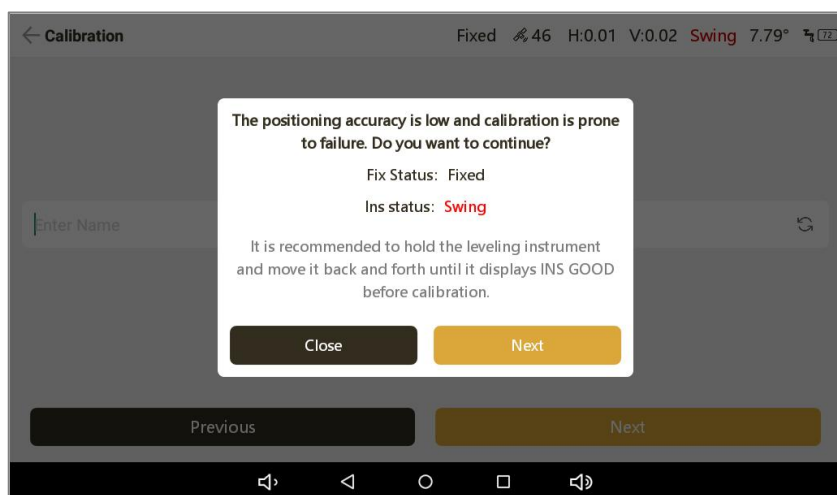


Figure 3-35

- ⑤ Enter the excavator name, then tap 'Next' at the bottom to proceed to the calibration mode selection screen, as shown in Figure 3-37. Select the third option '2. Professional mode (universal for all scenarios)'. The question mark icon on the right can be tapped to view detailed instructions for this mode, as shown in Figure 3-37 and Figure 3-38. This calibration mode has no site restrictions and can be used in all scenarios.

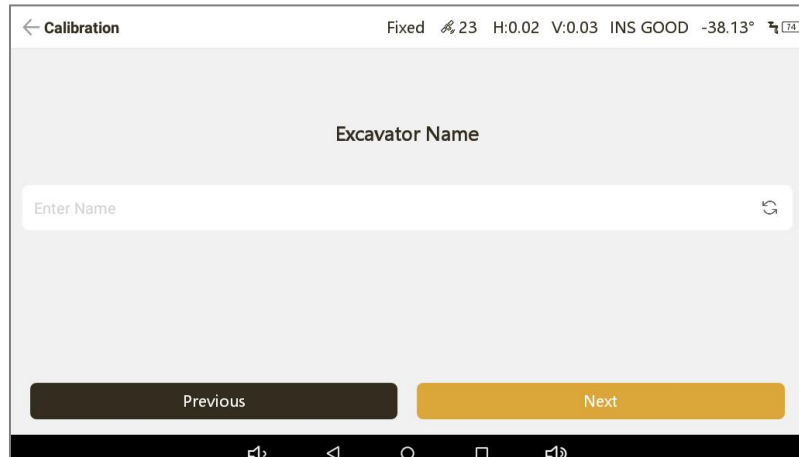


Figure 3-36

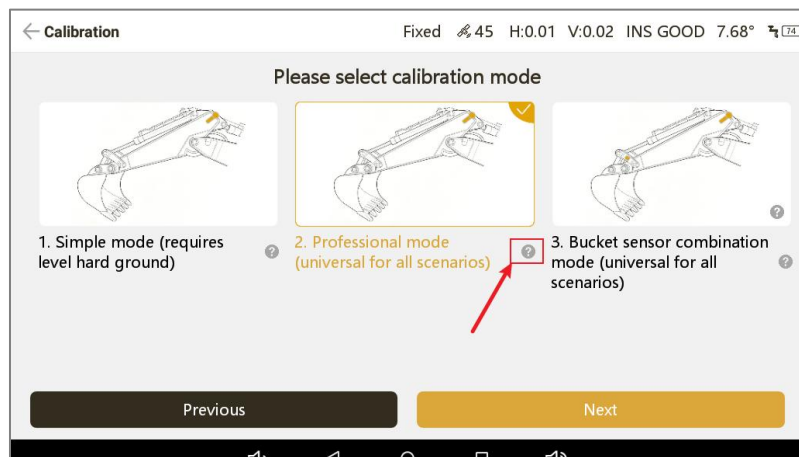


Figure 3-37

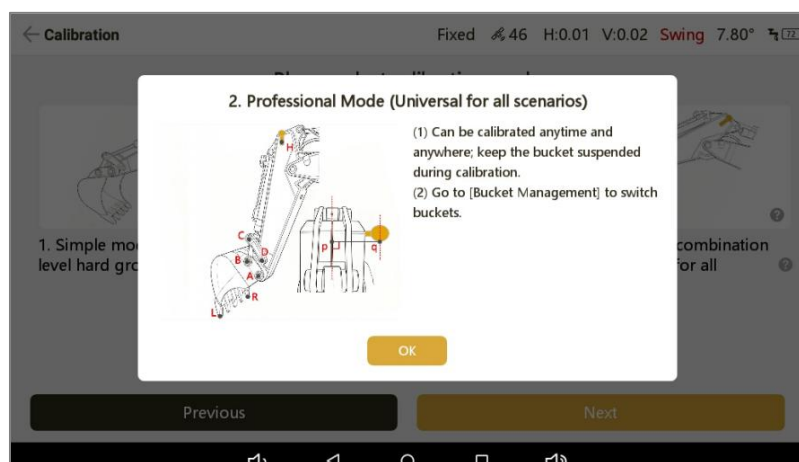


Figure 3-38

- ⑥ Attach the leveling instrument to the top of the arm, install the plumb rod and the plumb bob setter, and pull the plumb bob down to the bucket for subsequent measurements, as shown in Figure 3-39.



Figure 3-39

(3) Measurement of vertical height **HA**.

Measure **HA** and **pq**, as shown in Figure 3-40. **HA** is the distance from the plumb rod to the axis of the **A**-pivot, and **pq** is the distance from the centerline of the arm to the antenna center. **Pay attention to the measurement units.** Tap the **pq** input field, and the diagram above will switch in real time. Tap the question mark icon to the right of 'Measured Diagram' to open the measured diagram, as shown in Figure 3-42.

← Calibration Fixed 46 H:0.01 V:0.02 Swing 8.66° ?

Calibration Notes:

(1) Measure with the tape measure pulled straight; point A is the center of the rotating shaft.

(2) Point p is on the symmetry axis of the forearm; point q is the tangent point between the tape measure and the antenna.

Unit : m

HA: pq:

Previous Next

Figure 3-40

← Calibration Fixed 49 H:0.01 V:0.02 Swing 8.67° ?

Calibration Notes:

(1) Measure with the tape measure pulled straight; point A is the center of the rotating shaft.

(2) Point p is on the symmetry axis of the forearm; point q is the tangent point between the tape measure and the antenna.

Unit : m

HA: 3.2 pq:

Previous Next

Figure 3-41

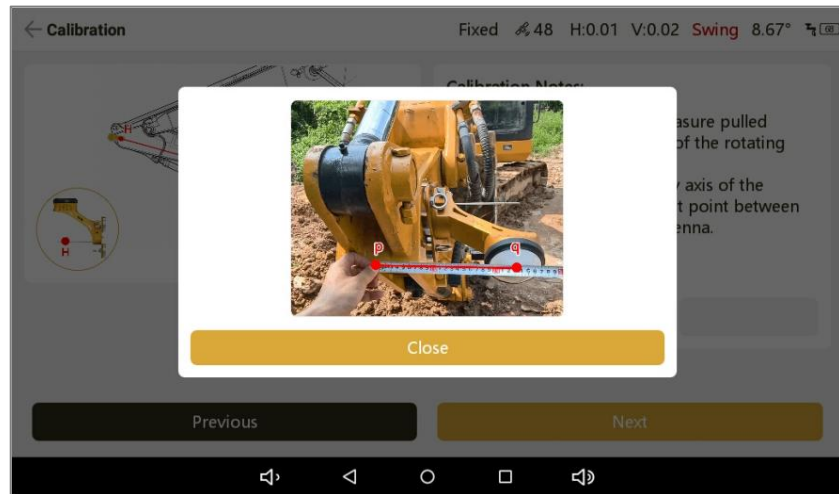


Figure 3-42

- (4) Adjust the excavator posture, keep the bucket suspended, and make the **A** and **B** pivot axes of the bucket nearly horizontal for subsequent measurements.



Figure 3-43

(5) Measure the bucket parameters.

- ① The bucket parameter interface is shown in Figure 3-44. When a specific parameter input field is selected, the corresponding 'Measured Diagram' will appear in the lower right corner of the schematic diagram. Tap the question mark icon on the right to view the measured diagram for that specific parameter, as shown in Figure 3-45.

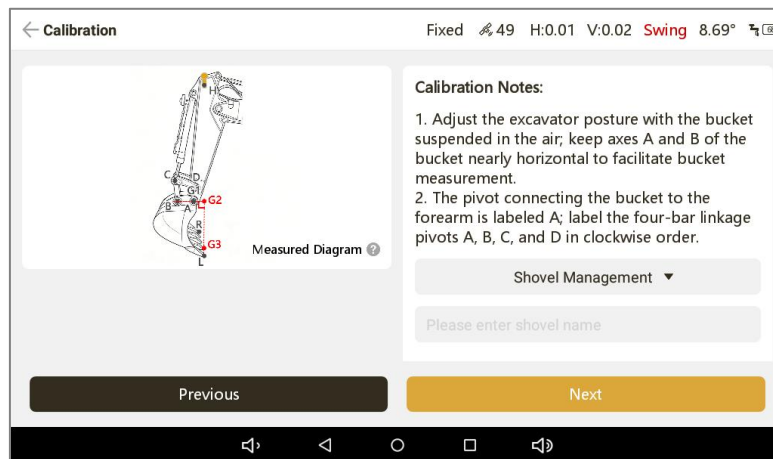


Figure 3-44

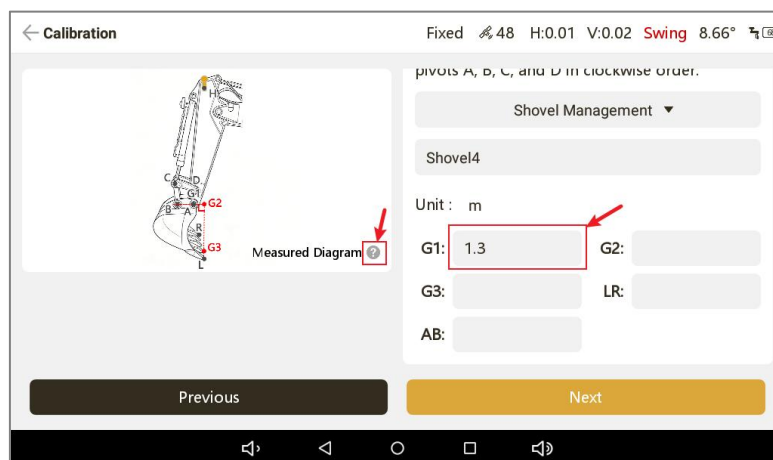


Figure 3-45



(a)



(b)

Figure 3-46

- ② To measure **G1**, **G2**, and **G3**, use a tape measure with an auxiliary measuring tool, as shown in Figure 3-46(a). Roughly measure the distance from the **A**-pivot to the bucket tip with the tape measure (e.g., estimate it as 84 cm), then adjust the midpoint of the right-side window on the auxiliary measuring tool to a round number on the tape measure (e.g., 90 cm), as shown in Figure 3-46(b). Align the upper end of the tape measure parallel to the **A** and **B** pivot axes, and let the other end hang straight down (slightly longer than the bucket tip). Slowly shift the tape measure toward the **B**-axis until the lower end just touches the bucket tip. Read the corresponding scale on the tape measure at the **A**-pivot as **G1** (Figure 3-47(a)), the value at the upper opening of the auxiliary measuring tool as **G2** (Figure 3-47(b)), and the intersection of the line connecting the left and right bucket tips with the tape measure as **G3** (Figure 3-47(c)).



(a)



(b)



(c)

Figure 3-47

Note: Measurement errors for the bucket can be corrected using the 'Fine-Tune Bucket' function in 'Intelligent Calibration'. If the tape measure touches the ground,

raise the excavator arm and bucket before taking measurements.

- ③ **LR** is the distance between the midpoints of the left and right bucket tips, and **AB** is the distance between the **A** and **B** pivot axes of the bucket. After tapping a data input field, tap 'Measured Diagram' to view the corresponding measured diagram. After entering all data, tap 'Next' at the bottom.
- (6) Adjust the excavator posture, keep the bucket suspended, curl the bucket fully outward, and position the **A** and **D** pivot axes of the bucket to the left of the plumb line. Keep the plumb line as close as possible to the **A** and **D** axes for easy measurement, as shown in Figure 3-48.



Figure 3-48

- (7) Measure the distance **A1y** from the midpoint of the arm **A**-pivot to the plumb line plane, then tap 'Next' at the bottom, as shown in Figure 3-49. You may first measure the width of the arm **A**-pivot to find its midpoint, then use the plumb line as a reference, place the tape measure horizontally, and read it perpendicularly. An auxiliary measuring tool can be used to help align with the plumb line, as shown in Figure 3-50.

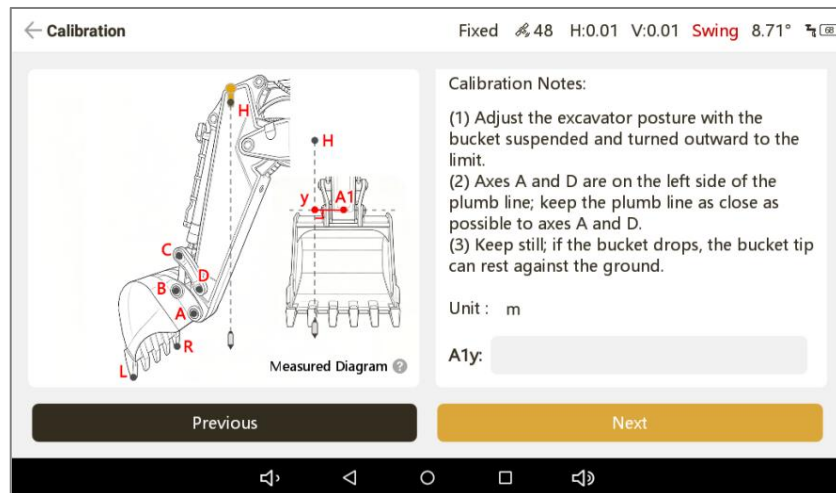


Figure 3-49

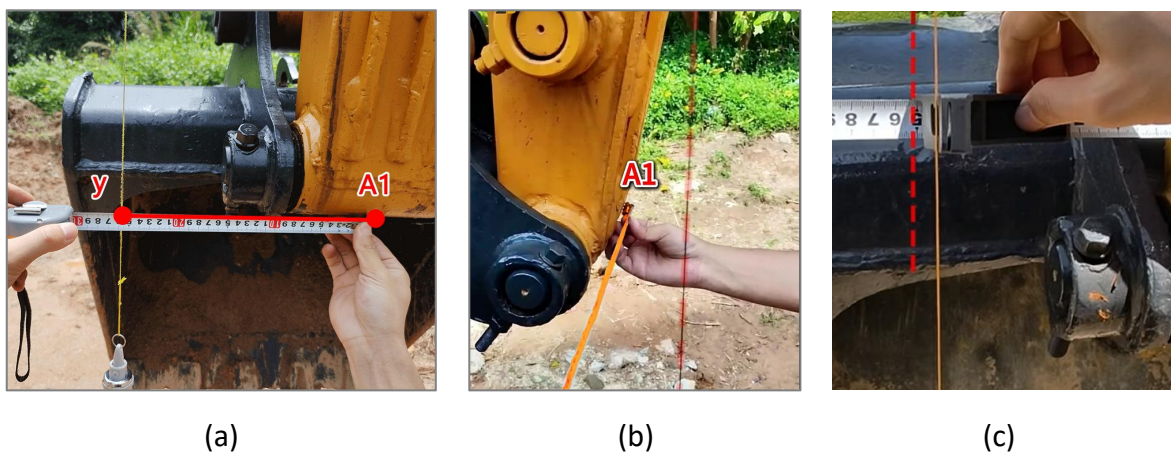


Figure 3-50

- (8) Measure the distance **Ax** from the **A**-pivot axis to the plumb line plane, and the distance **Dx** from the **D**-pivot axis to the plumb line plane, as shown in Figure 3-52. Use the plumb line as a reference, place the tape measure horizontally, and read it perpendicularly. An auxiliary measuring tool can be used to help align with the plumb line, as shown in Figure 3-53.

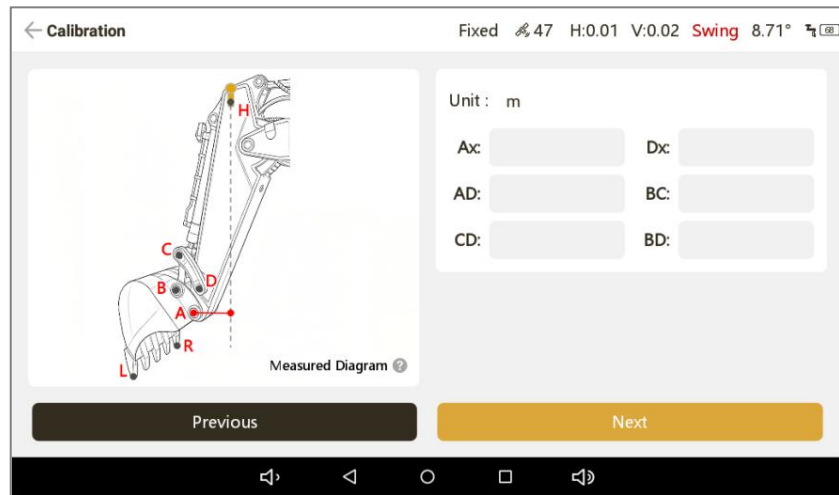


Figure 3-51



(a)



(b)

Figure 3-52



(a)



(b)

Figure 3-53

- (9) Measure the distances between the **A** and **D** pivot axes, the **B** and **C** pivot axes,

the **C and D** pivot axes, and the **B and D** pivot axes, as shown in Figure 3-54, then tap 'Next'.



(a)



(b)



(c)



(d)

Figure 3-54

- (10) Complete the calibration, then tap 'Confirm' to verify accuracy, as shown in Figure 3-55. To verify accuracy, use the left bucket tip to measure the same point three times with different arm postures. The accuracy verification results are shown in Figure 3-56. **Note: If the elevation accuracy range (max-min) for small excavators is within 3 cm, and for large excavators within 6 cm (± 3 cm accuracy), the calibration is considered successful, and you may tap 'Close'.**

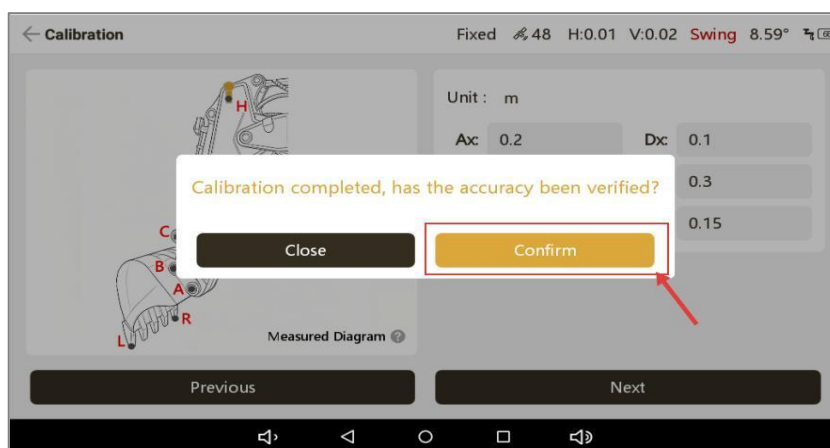


Figure 3-55

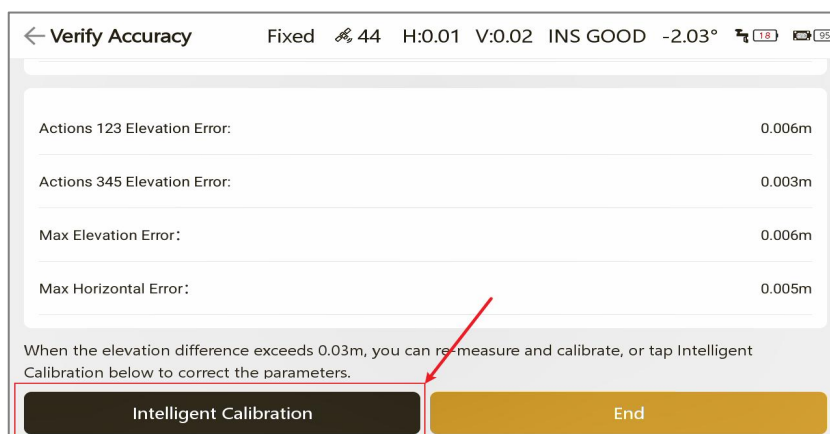


Figure 3-56

- (11) If the elevation accuracy does not meet the requirement, tap 'Intelligent Calibration', as shown in Figure 3-56 above. Tap 'Fine-Tune Bucket', as shown in Figure 3-57, and then tap 'Confirm' in the pop-up window.

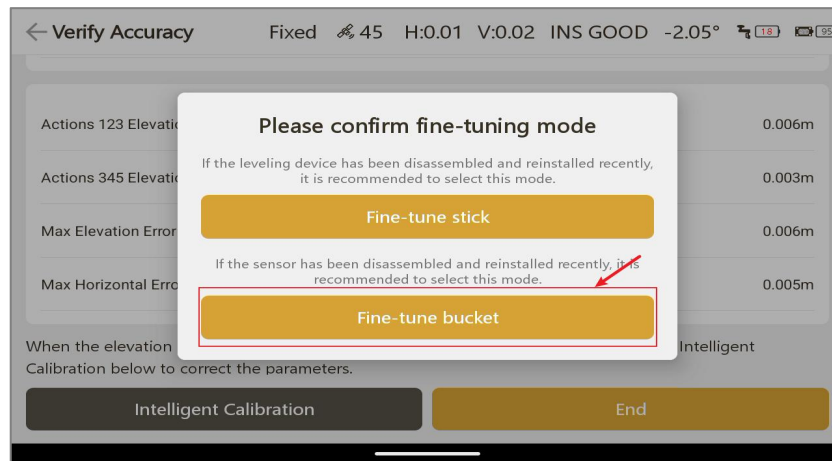


Figure 3-57

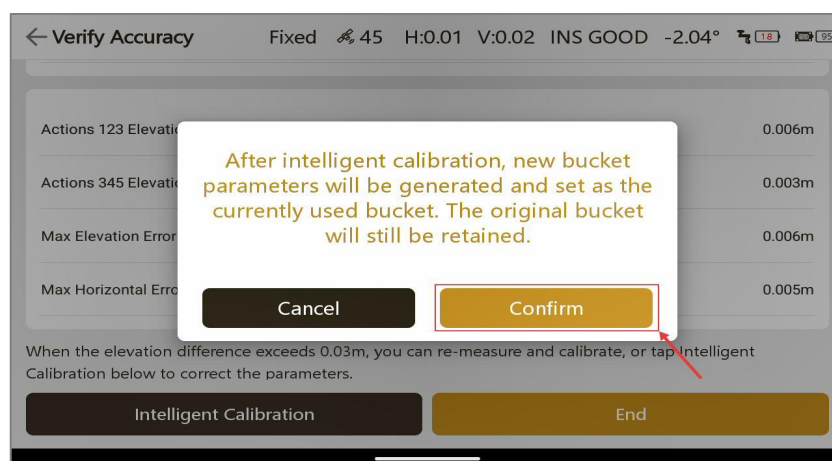


Figure 3-58

- (12) Intelligent Calibration – Fine-Tune Bucket: Follow the on-screen instructions and use the left bucket tip to measure the same point 9 times with different arm postures. The software will calculate a new bucket through its algorithm. After intelligent calibration, the new bucket will be automatically set as the current bucket. The old bucket will be retained in 'Bucket Management' and can be restored if needed.

- (13) After completing intelligent calibration, verify the accuracy again. If the accuracy meets the requirement, the device is ready for normal use. If the accuracy still does not meet the requirement after fine-tuning the bucket, the measurement parameters must be re-checked, paying special attention to any reading errors in the critical parameters such as **pq**, **Dx**, **Ax**, and **A1y**.

3.4.3 Bucket Sensor Combination Mode Calibration

- (1) Install the Attitude Unit. For detailed sensor parameters, refer to the *Attitude Unit User Manual*. The sensor should be installed on the same side as the leveling instrument. The completed installation is shown in Figure 3-59.
- ① Clean the excavator control lever (the mounting position for the bucket attitude sensor).
 - ② Remove the red protective film from the 3M adhesive on the back of the base, and mount the base at the center of the control lever.
 - ③ Pre-bend the metal clamp along the contour of the control lever to fit its shape, adjust the rubber pad positions, and secure them to the bent sections behind the control lever. Tighten the screws using the supplied screwdriver. **Note: The clamp connector should be positioned above the control lever, as shown in the figure, to avoid collision with the arm when the arm is extended outward.**
 - ④ Attach the sensor with the arrow pointing upward using the supplied screws and screwdriver. Tighten all four screws. The excess part of the clamp should be pressed under the sensor. The sensor installation orientation is shown in Figure 3-59. **Note: Make sure to firmly insert the waterproof plug into the charging port on the right side of the sensor after each installation.**
 - ⑤ After installation, press the power button briefly to power on. The green LED will flash for 1 minute and then turn off, indicating the sensor is in standby mode awaiting Bluetooth connection. If no Bluetooth connection is established within 12 hours, the sensor will automatically power off.
 - ⑥ During daily use, press the power button briefly to power on and wait for the Bluetooth connection to be established.



Figure 3-59

(2) Adjust the excavator posture as shown in Figure 3-60.



Figure 3-60

(3) Connect the leveling instrument and enter the app for calibration.

- ① Clean the contact surface. Before installation, thoroughly clean the corresponding magnetic attachment area on the arm. The device is attached to the side of the arm via strong magnets, as shown in the figure above.
- ② Power on the leveling instrument, open the XFIX app, and connect to the leveling instrument via Bluetooth. (For details, see section 3.1 Bluetooth Connection to EX30.)
- ③ Tap 'Excavator Management', as shown in Figure 3-61.

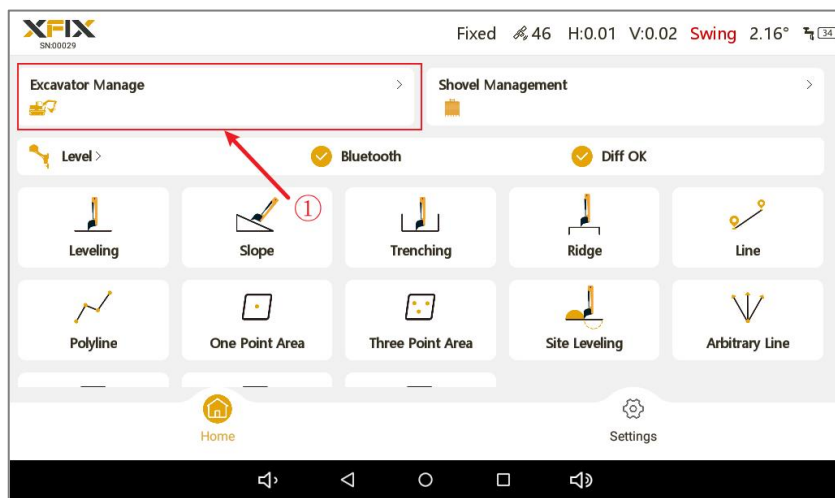


Figure 3-61

- ④ In the excavator management screen, as shown in Figure 3-62, tap 'New' at the bottom to check the current solution status and INS status, as shown in Figure 3-63. Before calibration, the solution status must reach 'Fixed' and the INS status must reach 'INS GOOD'. Hold the leveling instrument with the antenna facing the sky and move it back and forth until INS GOOD is achieved. Once the conditions are met, it will automatically proceed to the next step, as shown in Figure 3-64.

Note: During calibration, if the status prompt at the top of the software switches from 'INS GOOD' to 'Swing', you can ignore it—this does not affect the subsequent calibration.



Figure 3-62

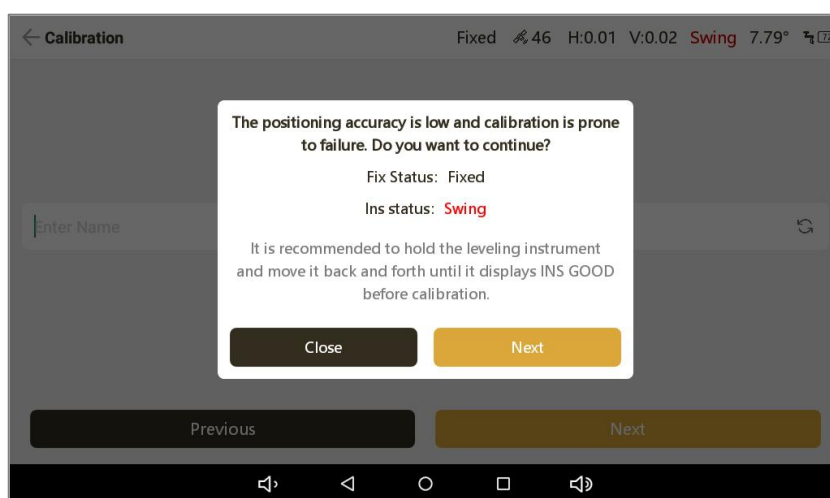


Figure 3-63

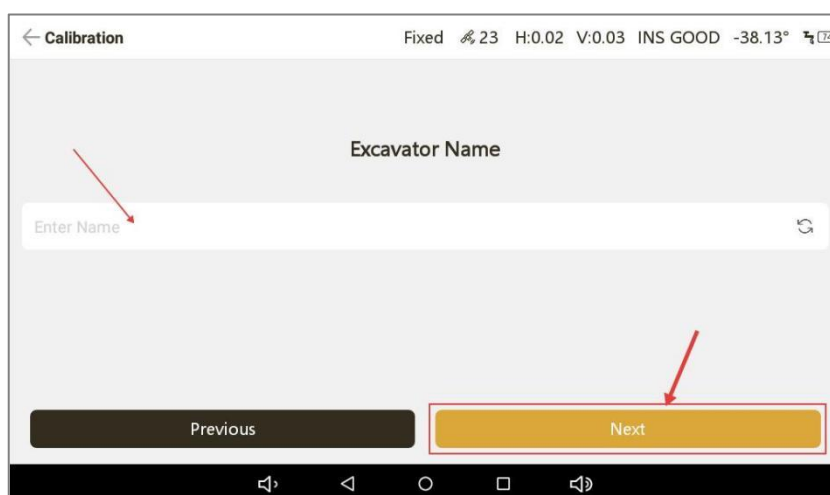


Figure 3-64

- ⑤ Enter the excavator name, then tap 'Next' at the bottom to enter the calibration mode selection screen, as shown in Figure 3-65. Select the third option '3. Bucket sensor combination mode (universal for all scenarios)'. The question mark icon on the right can be tapped to view detailed instructions for this mode, as shown in Figure 3-66. This calibration mode has no site restrictions and can be used in all scenarios.

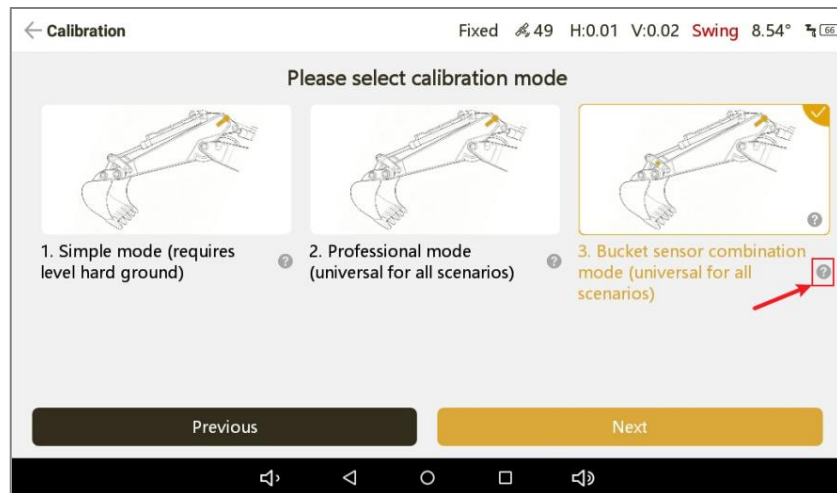


Figure 3-65

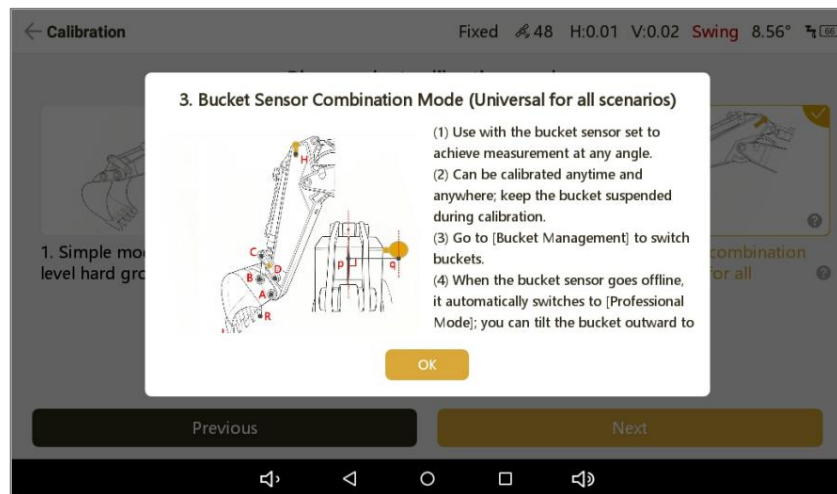


Figure 3-66

(4) Connect the bucket attitude sensor.

- ① Tap 'Next' at the bottom of Figure 3-65 above. The sensor status confirmation screen will appear, as shown in Figure 3-67. Tap 'Search Devices' to bring up the sensor selection screen, as shown in Figure 3-68. Tap the sensor ID to begin Bluetooth pairing.

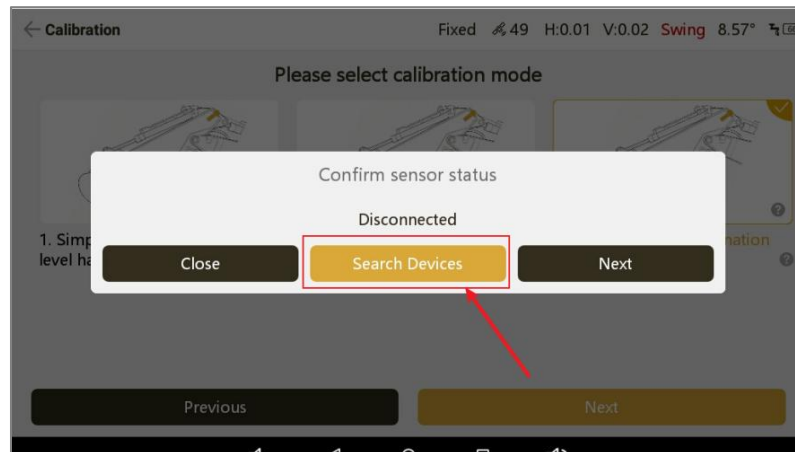


Figure 3-67

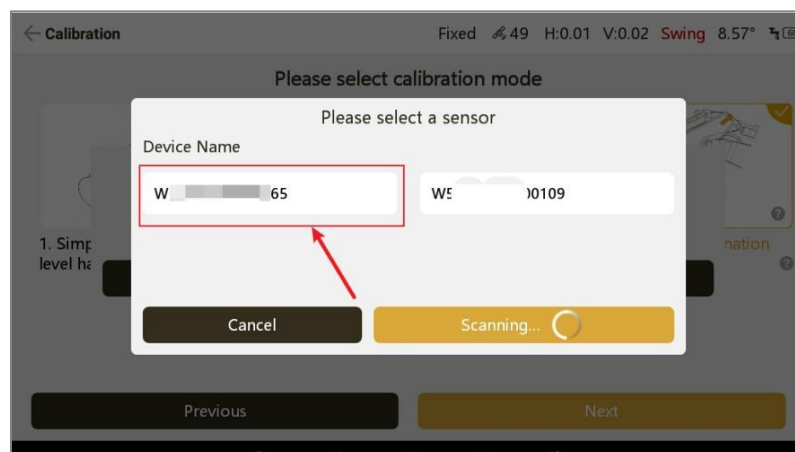


Figure 3-68

- ② Wait a few seconds for Bluetooth pairing to complete, as shown in Figure 3-69, then tap 'Next'.

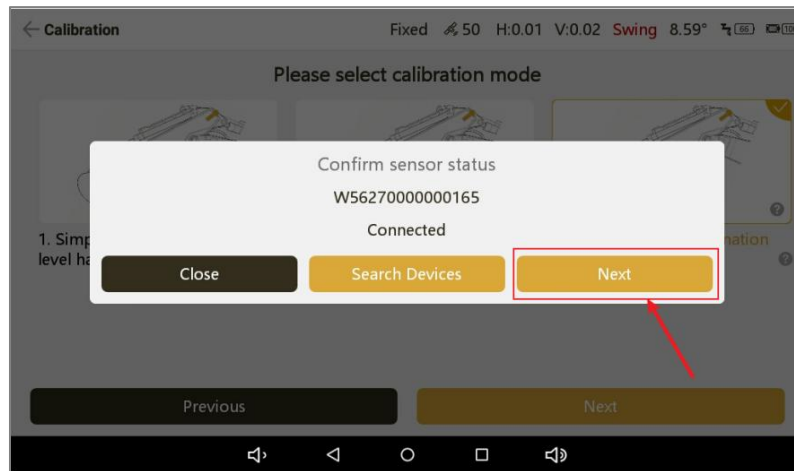


Figure 3-69

- ③ Attach the leveling instrument to the top of the arm, install the plumb rod and plumb bob, and pull the plumb bob down to the bucket for subsequent measurements, as shown in Figure 3-70.



Figure 3-70

(5) Measurement of vertical height **HA**.

Measure **HA** and **pq**, as shown in Figure 3-71. **HA** is the distance from the plumb rod to the axis of the **A**-pivot, and **pq** is the distance from the centerline of the arm to the antenna center. **Pay attention to the measurement units.** Tap the **pq** input field, and the diagram above will switch in real time, as shown in Figure 3-72. Tap the question mark icon to the right of 'Measured Diagram' to open the measured diagram, as shown in Figure 3-73.

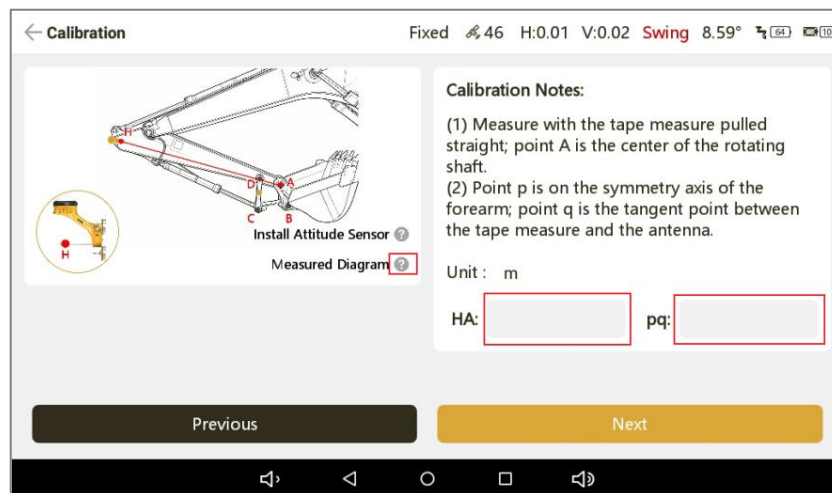


Figure 3-71

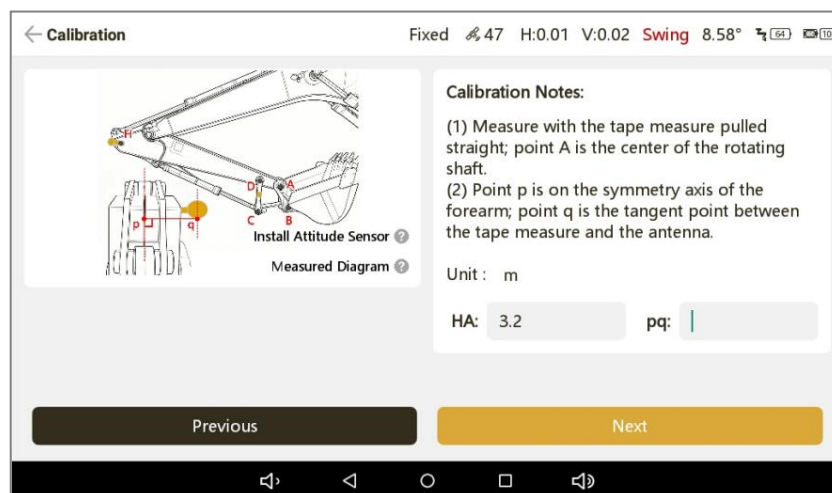


Figure 3-72

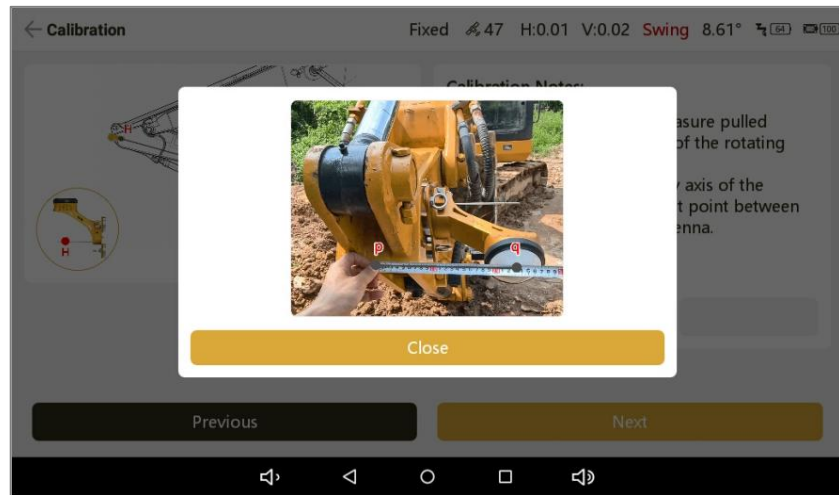


Figure 3-73

- (6) Adjust the excavator posture, keep the bucket suspended, and make the **A and B** pivot axes of the bucket nearly horizontal for subsequent measurements.

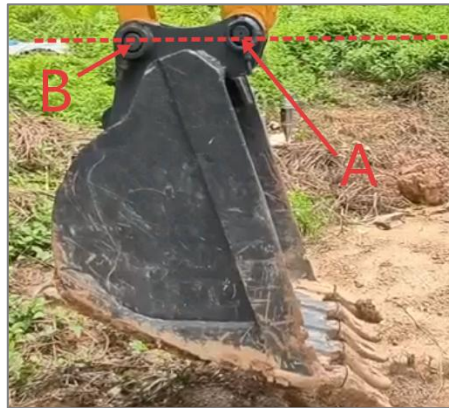


Figure 3-74

(7) Measure the bucket parameters.

- ① The bucket parameter interface is shown in Figure 3-75. When a specific parameter input field is selected, the corresponding 'Measured Diagram' will appear in the lower right corner of the schematic diagram. Tap the question mark icon on the right to view the measured diagram for that specific parameter, as shown in Figure 3-76.

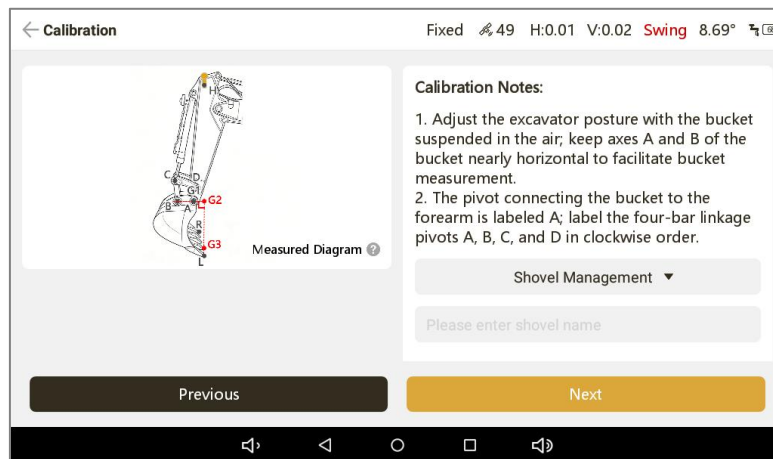


Figure 3-75

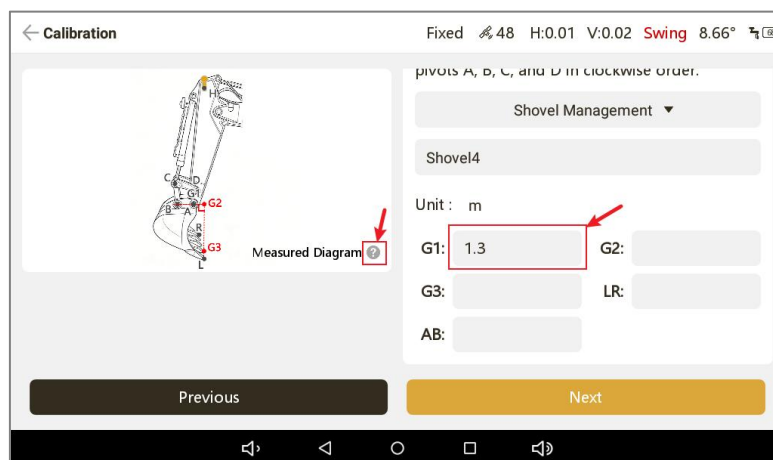


Figure 3-76



(a)

(b)

Figure 3-77

- ② To measure **G1**, **G2**, and **G3**, use a tape measure with an auxiliary measuring tool, as shown in Figure 3-77(a). Roughly measure the vertical distance from the **A**-pivot to the bucket tip with the tape measure (e.g., estimate it as 84 cm), then adjust the midpoint of the right-side window on the auxiliary measuring tool to a round number on the tape measure (e.g., 90 cm), as shown in Figure 3-77(b). Align the upper end of the tape measure with the **A** and **B** pivot axes, and let the other end hang straight down (slightly longer than the bucket tip). Slowly shift the tape measure toward the **B**-axis until the lower end just touches the bucket tip. Read the corresponding scale on the tape measure at the **A**-pivot as **G1** (Figure 3-78(a)), the value at the upper opening of the auxiliary measuring tool as **G2** (Figure 3-78(b)), and the intersection of the line connecting the left and right bucket tips with the tape measure as **G3** (Figure 3-78(c)).

Note: Measurement errors for the bucket can be corrected using the 'Fine-Tune Bucket' function in 'Intelligent Calibration'. If the tape measure touches the ground, raise the excavator arm and bucket before taking measurements.

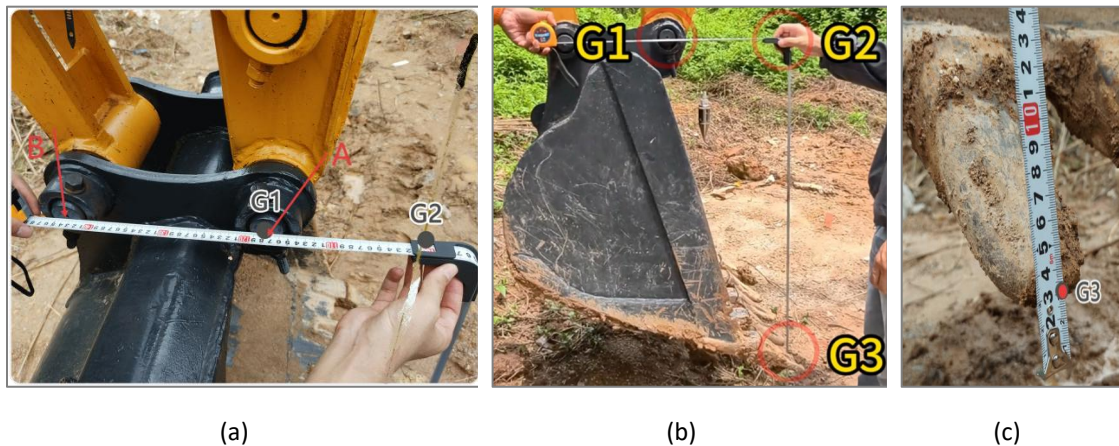


Figure 3-78

- ③ LR is the distance between the midpoints of the left and right bucket tips, and **AB** is the distance between the **A** and **B** pivot axes of the bucket. After tapping a data input field, tap 'Measured Diagram' to view the corresponding measured diagram. After entering all data, tap 'Next'.

- (8) Adjust the excavator posture, keep the bucket suspended, curl the bucket fully outward, and position the **A and D** pivot axes of the bucket to the left of the plumb line. Keep the plumb line as close as possible to the **A and D** axes for easy measurement, as shown in Figure 3-79.



Figure 3-79

- (9) Measure the distance **A1y** from the midpoint of the arm **A**-pivot to the plumb line plane, then enter it and tap 'Next' at the bottom, as shown in Figure 3-80. You may first measure the width of the arm **A**-pivot to find its midpoint, then use the plumb line as a reference, place the tape measure horizontally, and read it perpendicularly. An auxiliary measuring tool can be used to help align with the plumb line, as shown in Figure 3-81.

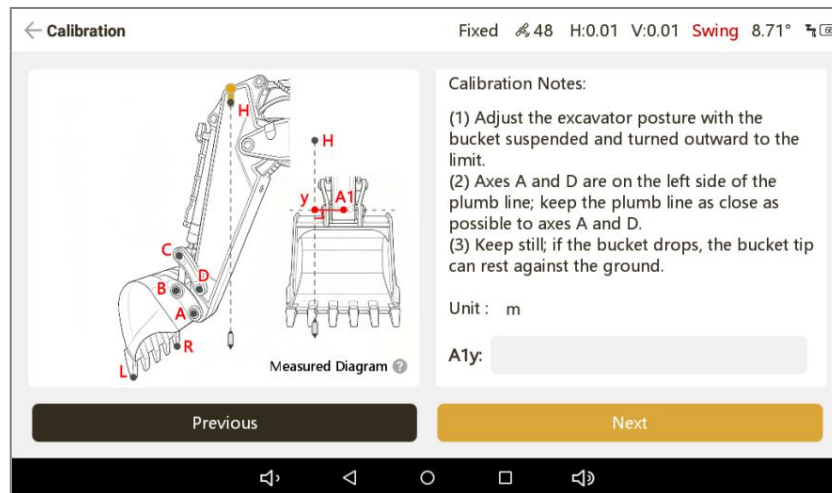


Figure 3-80

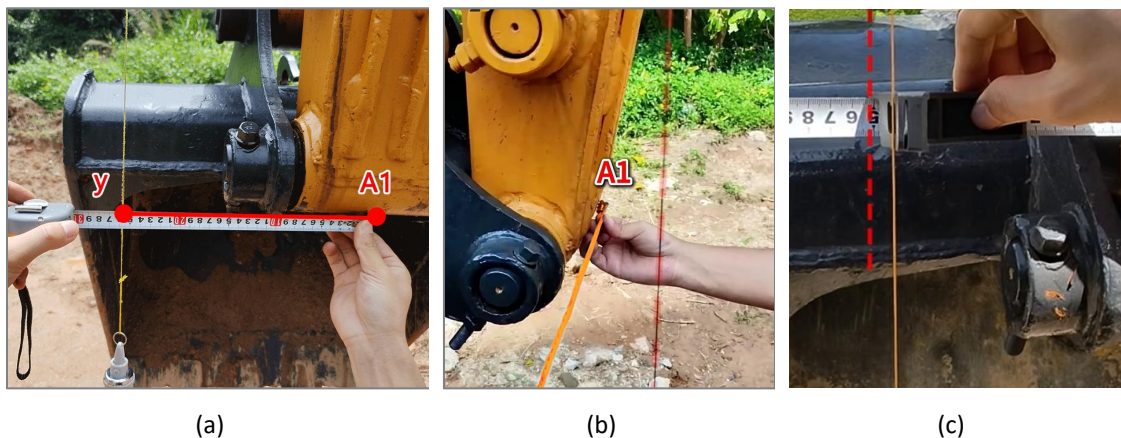


Figure 3-81

- (10) Measure the distance **Ax** from the **A**-pivot axis to the plumb line plane, and the distance **Dx** from the **D**-pivot axis to the plumb line plane, as shown in Figure 3-82. Use the plumb line as a reference, place the tape measure horizontally, and read it perpendicularly. An auxiliary measuring tool can be used to help align with the plumb line, as shown in Figure 3-83.

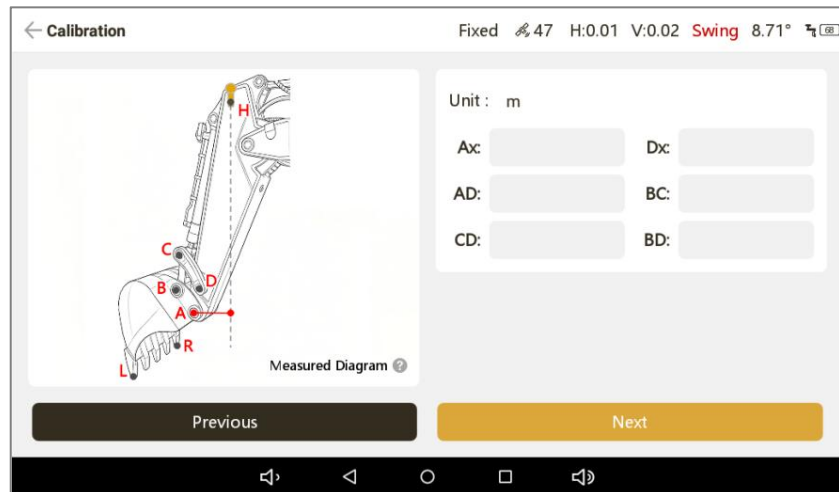


Figure 3-82



(a)



(b)

Figure 3-83



(a)



(b)

Figure 3-84

- (11) Measure the distances between the **A** and **D** pivot axes, the **B** and **C** pivot axes,

the **C and D** pivot axes, and the **B and D** pivot axes, as shown in Figure 3-85, then tap 'Next'.



(a)



(b)



(c)



(d)

Figure 3-85

- (12) Complete the calibration, then tap 'Confirm' to verify accuracy, as shown in Figure 3-86. To verify accuracy, use the left bucket tip to measure the same point five times with different arm postures. The accuracy verification results are shown in Figure 3-87. **Note:** If the elevation accuracy range (max-min) for small excavators is within 3 cm, and for large excavators within 6 cm (± 3 cm accuracy), the calibration is considered successful, and you may tap 'Close'.

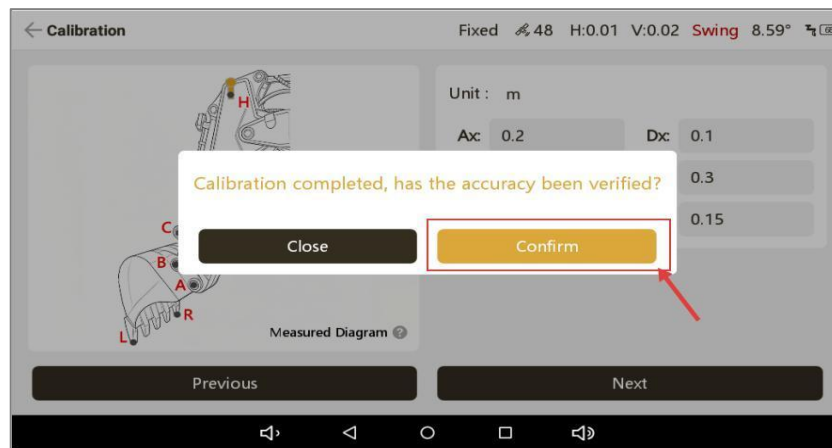


Figure 3-86

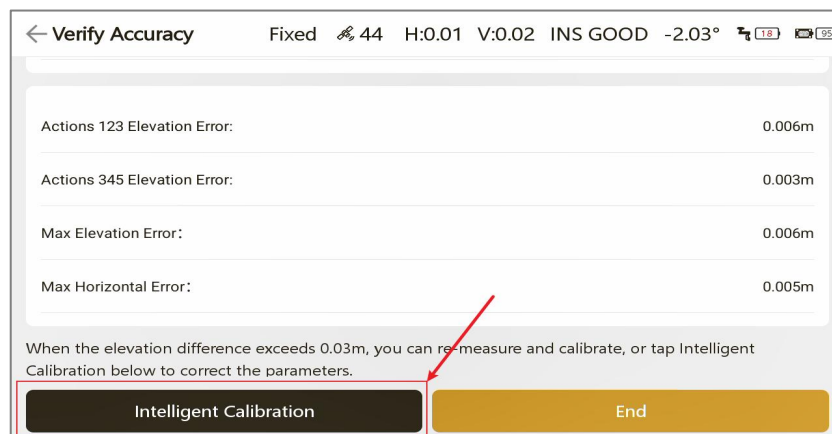


Figure 3-87

- (13) If the elevation accuracy does not meet the requirement, tap 'Intelligent Calibration', as shown in Figure 3-87 above. Tap 'Fine-Tune Bucket', as shown in Figure 3-88, then tap 'Confirm' in the pop-up window.

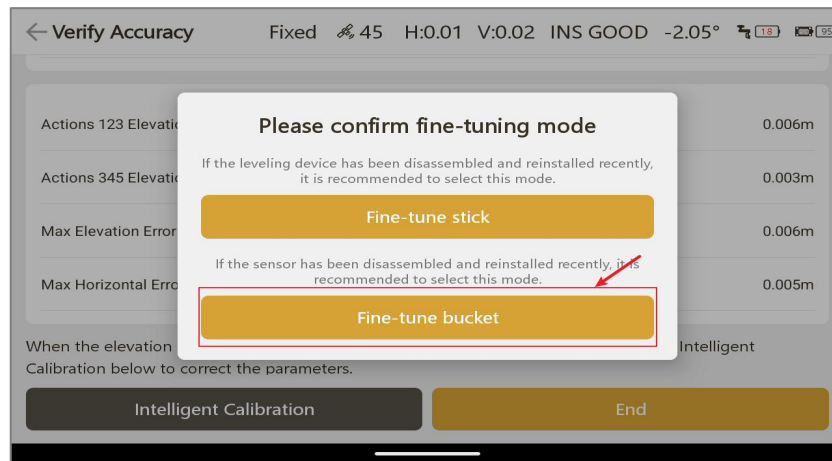


Figure 3-88

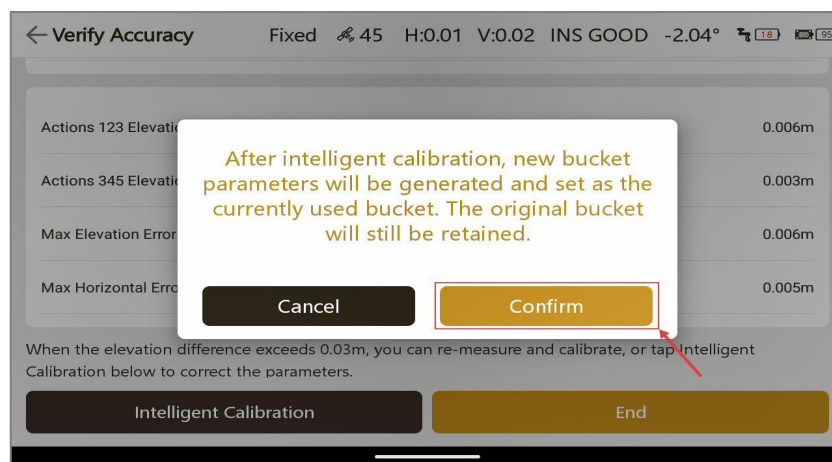


Figure 3-89

- (14) Intelligent Calibration – Fine-Tune Bucket: Follow the on-screen instructions and use the left bucket tip to measure the same point 9 times with different arm postures. The software will calculate a new bucket through its algorithm. After intelligent calibration, the new bucket will be automatically set as the current bucket. The old bucket will be retained in 'Bucket Management' and can be restored if needed.

- (15) After completing intelligent calibration, verify the accuracy again. If the accuracy meets the requirement, the device is ready for normal use. If the accuracy still does not meet the requirement after fine-tuning the bucket, the measurement parameters must be re-checked, paying special attention to any reading errors in the critical parameters such as **pq**, **Dx**, **Ax**, and **A1y**.

3.4.4 Verify Accuracy

The entry to the 'Verify Accuracy' function is located in the function bar on the 'Home' screen, as shown in Figure 3-90. After calibration or intelligent fine-tuning, a pop-up will appear prompting you to enter. Before collecting points, you need to swing the arm left and right until the XFIX app displays 'Fixed' and 'INS GOOD' again. Then, follow the prompts to change the excavator posture and use the left bucket tip to measure the same point, as shown in Figure 3-91.

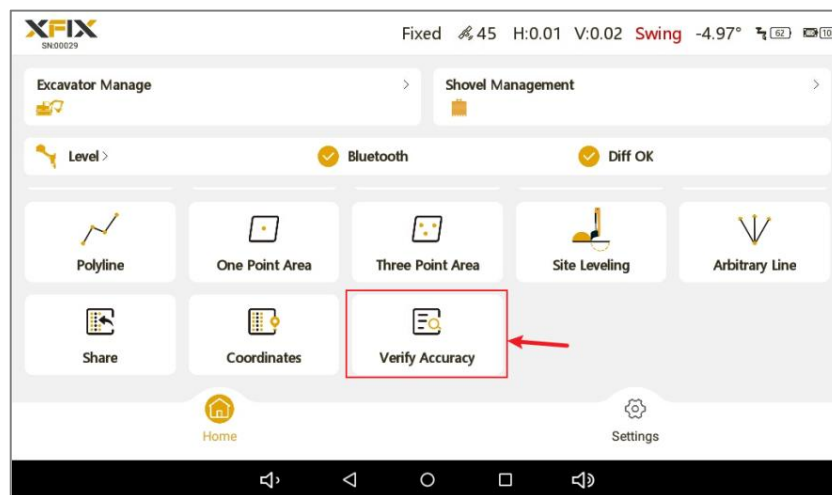


Figure 3-90



Figure 3-91

The accuracy acceptance criteria for measurement reports are as follows: If the elevation accuracy range (max-min) for small excavators is within 3 cm, and for large excavators within 6 cm (± 3 cm accuracy), the accuracy is considered acceptable. The main factors that may cause accuracy failure include:

- (1) Calibration factors: Uneven ground during Simple Mode calibration, or excessive measurement errors in geometric parameters. In such cases, a complete recalibration or an intelligent fine-tuning is required.
- (2) Human operational factors: The bucket tip was not precisely aligned to the same test point during data collection.
- (3) Excavator factors: Loose connections at the bucket tip or bucket linkage structure, causing the bucket tip to deviate from the calibrated reference position during operation.
- (4) Differential factors: Poor quality of the third-party CORS differential data source, resulting in continuous fluctuations in positioning coordinates.

After the accuracy verification is passed, install the anti-slip pads to prevent the device from tilting or shifting due to prolonged vibration during operation.

- (1) Peel off the protective film from the anti-slip pads.
- (2) Attach the anti-slip pads tightly to the corresponding arm area where the magnet is mounted. Note that the U-shaped opening on the lowest pad should face upward, while the U-shaped opening on the other pad should be installed at an approximate 45° tilt, as shown in Figure 3-92.
- (3) After aligning to the correct position, press firmly on the anti-slip pads for more than 30 seconds to completely expel the air underneath, ensuring the pads are fully adhered to the arm surface.



Figure 3-92

3.4.5 Intelligent Calibration

'Verify Accuracy' must be completed before performing Intelligent Calibration. Tap 'Verify Accuracy' on the Home screen, as shown in Figure 3-93. After the accuracy verification is complete, tap 'Intelligent Fine-Tune', as shown in Figure 3-94, then tap 'Fine-Tune Bucket', as shown in Figure 3-95.

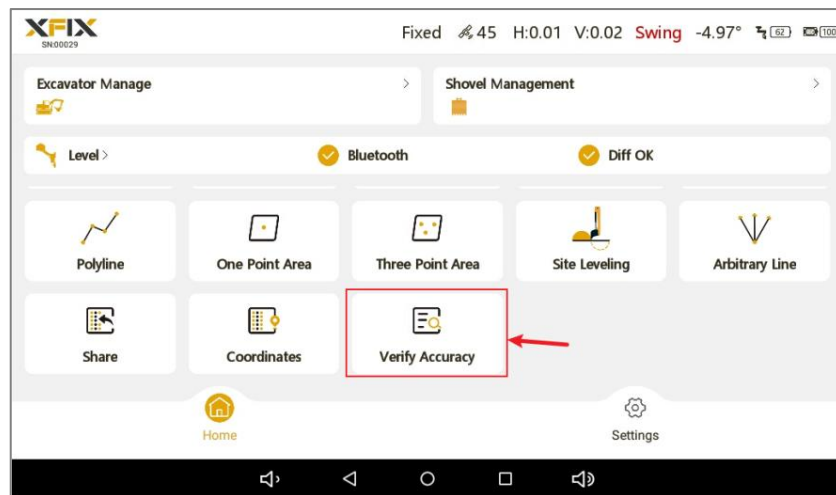


Figure 3-93

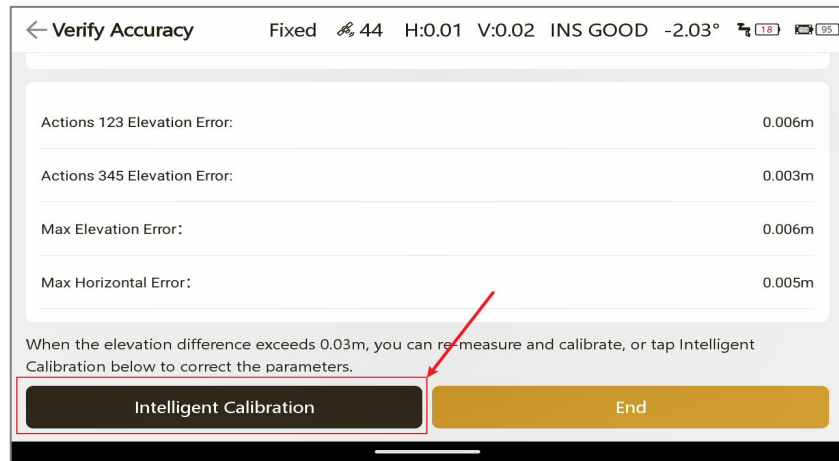


Figure 3-94

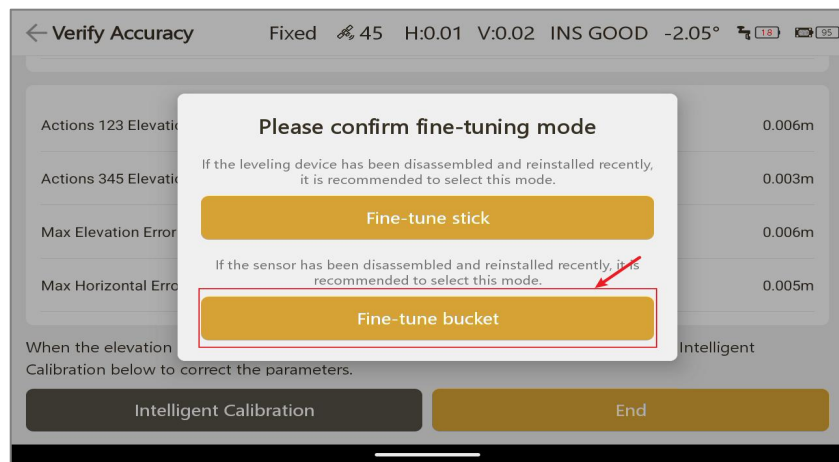


Figure 3-95

In the pop-up window, tap 'Confirm', enter the bucket name, and follow the on-screen instructions to use the left bucket tip to measure the same point 9 times with different arm and bucket postures, as shown in Figure 3-96. After the data collection is complete, the software calculates a new bucket through its algorithm. The new bucket generated after Intelligent Calibration will be automatically set as the current bucket. The old bucket will be retained in 'Bucket Management' and can be restored if needed.

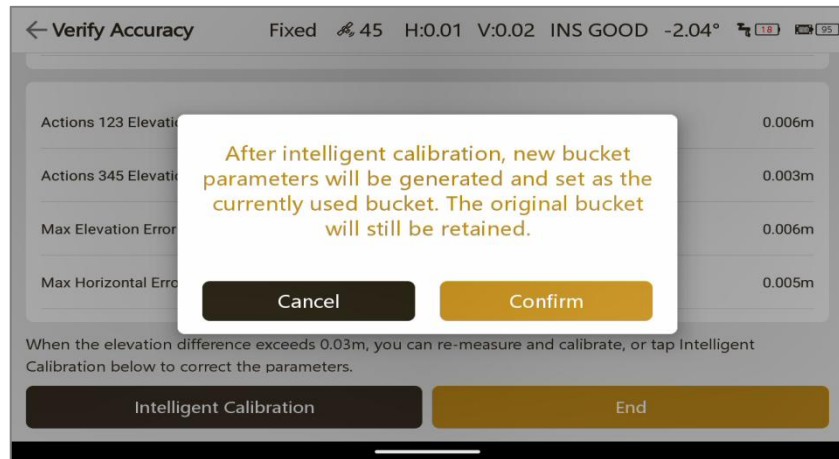


Figure 3-96

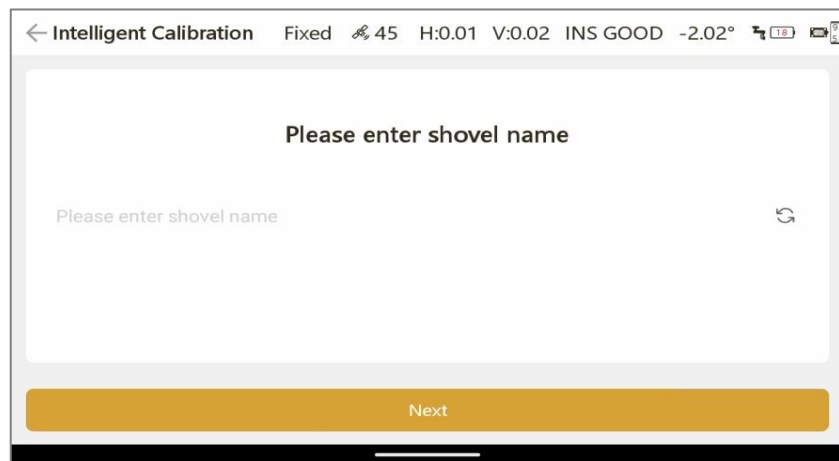


Figure 3-97

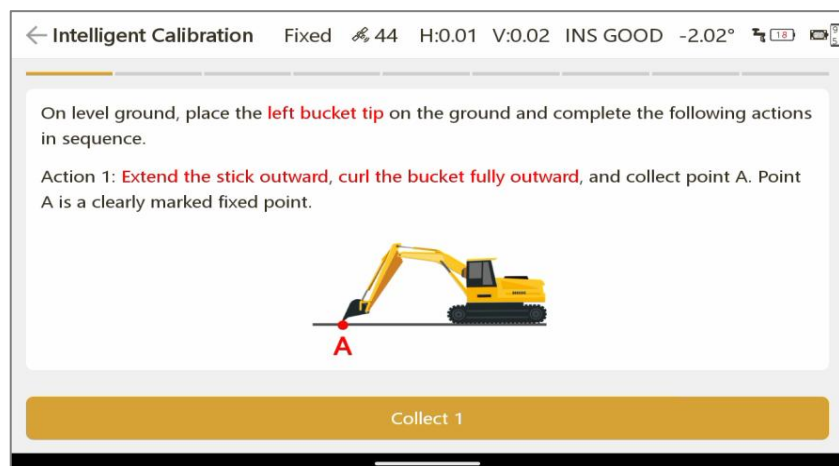


Figure 3-98

The Arm Fine-Tuning function is effective only when the bucket parameters have been entered accurately. It is intended for scenarios where the device has been properly calibrated but, after some use, the leveling instrument has shifted due to vibration or installation offset, resulting in accuracy errors. This function relies on the algorithm to recalculate the arm parameters and generate a new set of calibration parameters for immediate application.

During the initial calibration phase, there is a higher probability of errors in the bucket parameters. If accuracy is abnormal, priority should be given to using Bucket Fine-Tuning. If the accuracy still fails to meet the requirement after fine-tuning, the easily mis-measured arm parameters such as **pq**, **Dx**, **Ax**, and **A1y** must be re-measured to identify and correct any reading deviations.

4 Software Usage

4.1 Top Information Bar

The 'Status Information Bar' at the top of the 'Home' and 'Settings' screens displays the current status of the leveling instrument. On the 'Home' screen, it shows both the Bluetooth connection status and the differential data source status. A yellow checkmark icon indicates that the device is connected via Bluetooth and that a differential data source is connected, as shown in Figure 4-1.

Tap the information bar to enter the 'Positioning Info' screen, where you can view positioning information, base station information, satellite view, and SNR, as shown in Figure 4-2, Figure 4-3, Figure 4-4, and Figure 4-5. Tap the battery icon to enter the 'Device Management' screen to view the Bluetooth connection status, as shown in Figure 4-6.

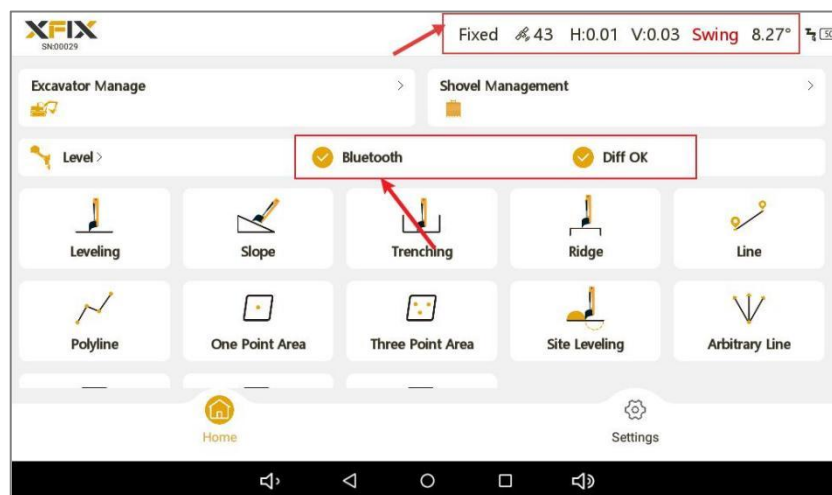


Figure 4-1

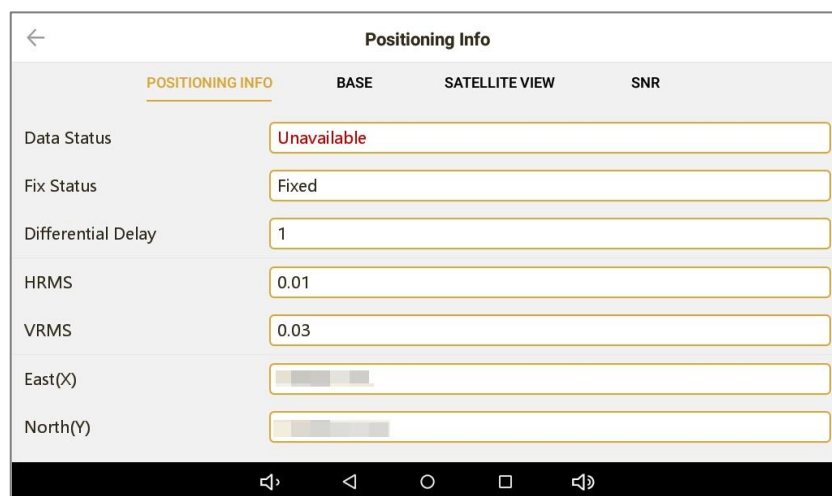


Figure 4-2

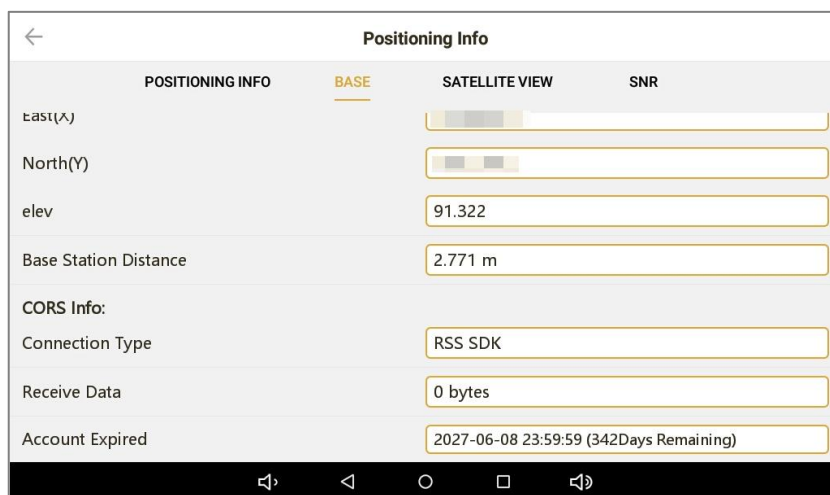


Figure 4-3

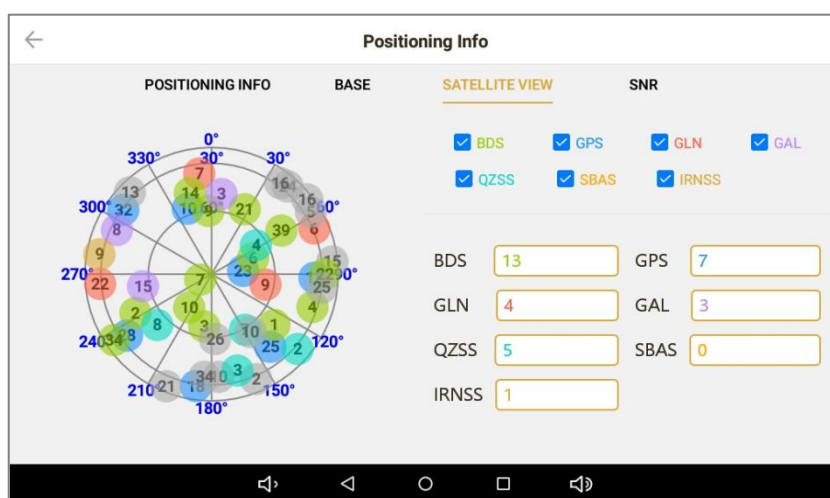


Figure 4-4

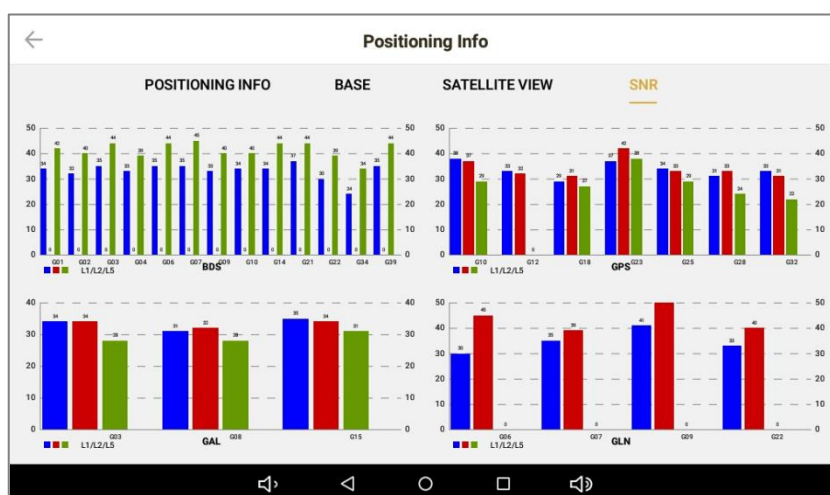


Figure 4-5

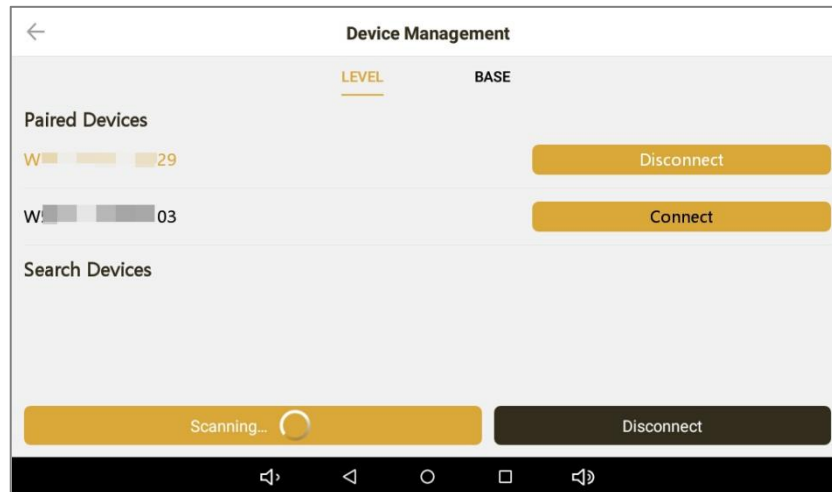


Figure 4-6

Note: The checkboxes on the right side of the Satellite View in Figure 4-4 are not related to enabling or disabling satellite systems.

When the top positioning status displays 'Fixed', the satellite positioning system is ready. When connected to the leveling instrument indoors, the initial positioning status is 'Invalid'. When connected outdoors, the initial positioning status is 'Single' and 'No DGPS'. After receiving differential data, the status will sequentially change to 'Different', 'Float', and finally stabilize at 'Fixed'.

The status information displayed in the 'Status Information Bar' is described as follows (from left to right):

- Leveling instrument satellite solution status and differential delay time:
 - 'Fixed': Achieves the highest accuracy, suitable for formal measurement operations.
 - 'Float': Reduced accuracy; not recommended for high-precision operations, only suitable for rough positioning.
 - 'Different': Reduced accuracy; not recommended for high-precision operations, only suitable for rough positioning.
 - 'Single': No differential data received; measurement results may have meter-level errors.
 - 'Invalid': The leveling instrument is not receiving satellite signals. Please move it to an outdoor open-sky environment.
 - 'Differential Delay': The lower the better. If it exceeds 5 seconds, the satellite count will no longer be displayed and the differential delay will be shown instead.
- Inertial measurement status: The initial status of the inertial measurement module is 'Swing', with the value showing the current tilt angle of the arm. Rotate the excavator back and forth and slowly swing the arm left and right until 'INS GOOD' is displayed, indicating that the inertial measurement module calibration is complete and measurement can begin.
- Satellites: The number of satellites within visible range.
- Instrument battery: Device battery level information.

Note: If 'Invalid' is displayed for an extended period after connection, move the leveling instrument to an outdoor open-sky environment. If 'Single' and 'No DGPS' are displayed for an extended period, check the phone's network status or the base station operating status.

4.2 Leveling

Tap 'Leveling' on the 'Home' screen to enter the leveling job list interface, as shown in Figure 4-7. Tap 'New' at the bottom, enter the job name, and tap 'Next' to enter the reference point selection screen. Three types of jobs are available: 'Leveling', 'Fill', and 'Cut', as shown in Figure 4-8. Here we take leveling as an example: select 'Leveling', tap 'Next' at the bottom, and enter the reference point collection screen. Select the appropriate bucket tip for collection. (When collecting the reference point, if the excavator body is tilted, one side of the bucket tip will touch the reference point first. Using that side for measurement will yield greater accuracy.)

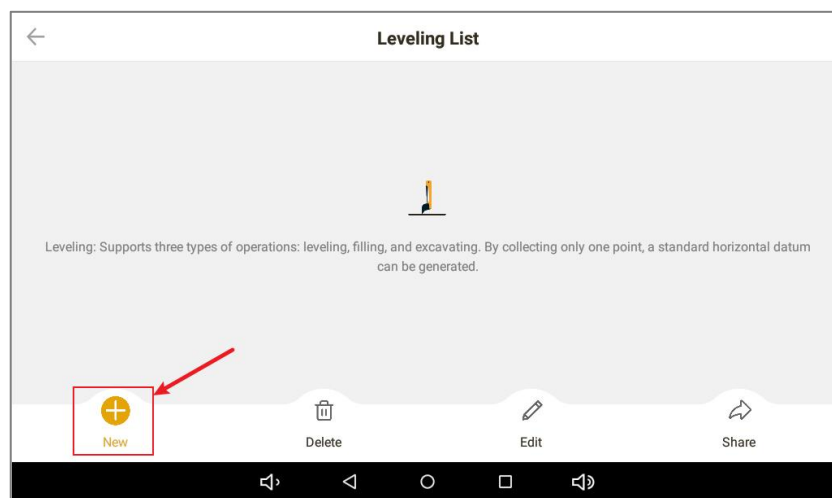


Figure 4-7

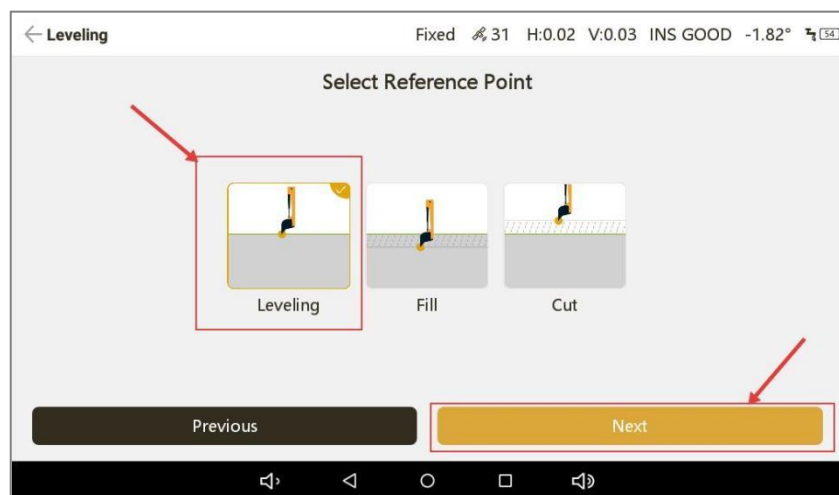


Figure 4-8

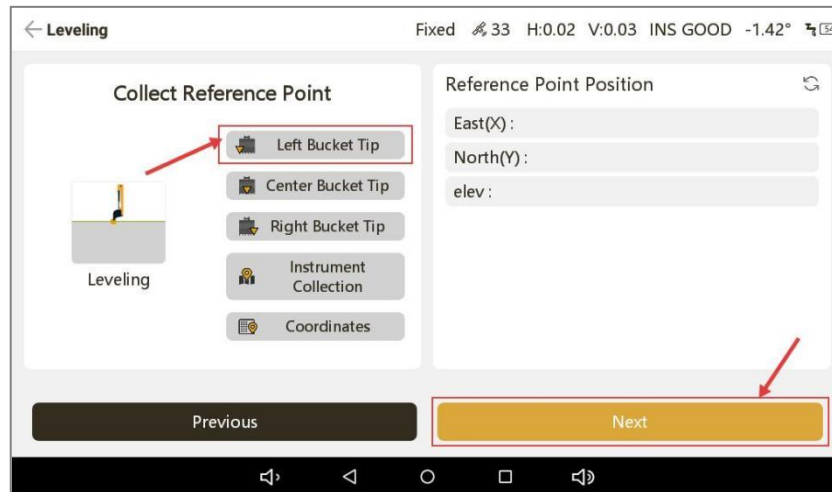


Figure 4-9

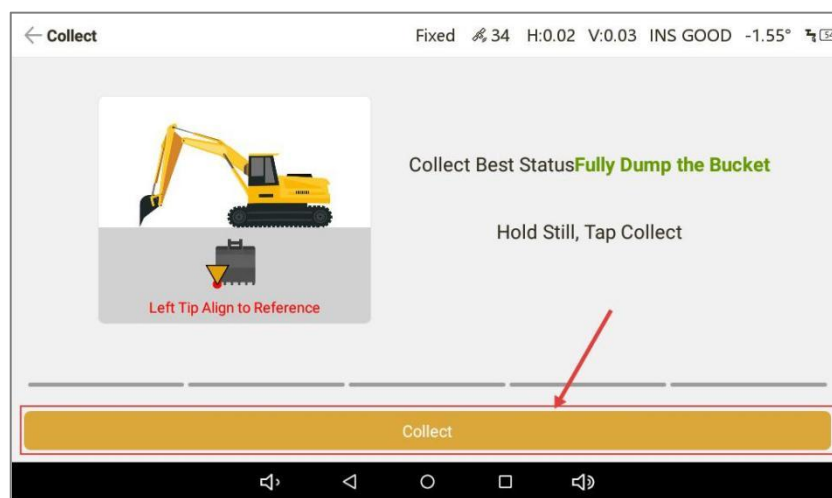


Figure 4-10

Tap 'the corresponding bucket tip' to enter the collection screen. When the INS status at the top of the screen displays 'Swing', the XFIX Excavator Leveling Instrument EX30 is in an unconverged inertial measurement state, and you need to swing the excavator arm left and right to calibrate the inertial measurement. When the top information bar displays 'INS GOOD', the EX30 inertial measurement is ready for use, and you can collect the current position coordinates, as shown in Figure 4-10 above. After collection is complete, it will automatically return to the reference point position screen. Tap 'Next' at the bottom to proceed.

Enter the job operation screen, as shown in Figure 4-11. At the top of the screen, you can select the corresponding bucket tip (Left, Center, or Right) as the displayed reference point, showing the distance from that tip to the leveling plane. Below the bucket tip icon, the screen displays the EX30's lateral tilt angle (with the excavator arm movement direction as the longitudinal axis), which can be considered the excavator's lateral tilt angle. The center displays the vertical distance from the

current bucket tip position to the reference plane. As long as the INS GOOD status is maintained, the position of the instrument relative to the reference plane can be determined, enabling rapid leveling. If the leveling instrument is above the reference slope, the required excavation depth (▼) is shown; if it is below the reference slope, the required fill height (▲) is displayed.

The Map Switch button (with 📍) on the right can be used to turn the map on or off. When the map is enabled, the display interface is shown in Figure 4-12. You can tap 🗨 on the map interface to locate the current position coordinates, and tap 📍 to locate the current project position. Use two fingers to pinch and zoom on the screen.

In the job operation, tap 🔊 to toggle the audio feedback on or off. When the INS status indicates that you need to 'Swing', the job interface will show that data is unavailable and no audio feedback will be played, as shown in Figure 4-13. When the bucket tip is above the reference plane by more than 5 cm, the audio feedback plays a woodblock tapping sound at 2-second intervals. When the distance between the bucket tip and the reference plane is within 5 cm, a beeping sound is emitted at 2-second intervals. When the bucket tip is below the reference plane by more than 5 cm, the audio feedback plays a ticking sound, one beep every 2 seconds.

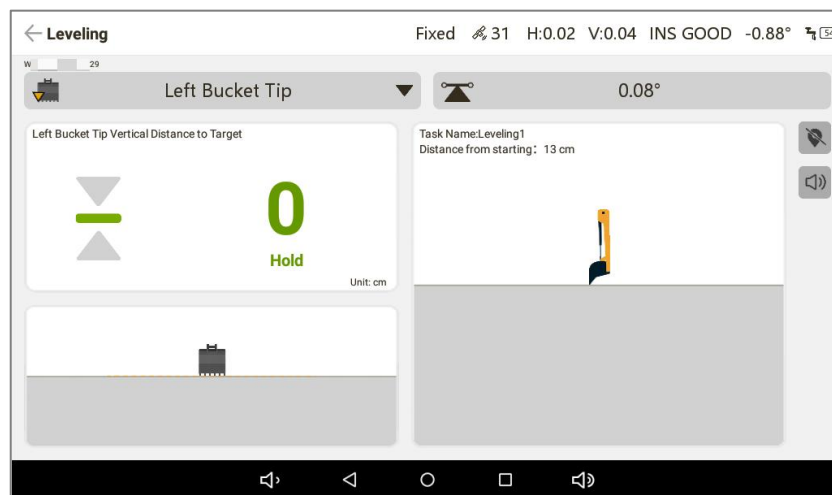


Figure 4-11

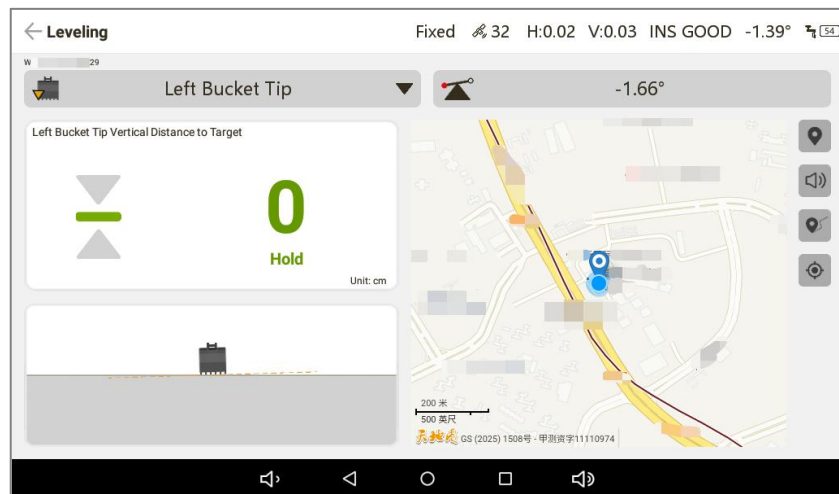


Figure 4-12

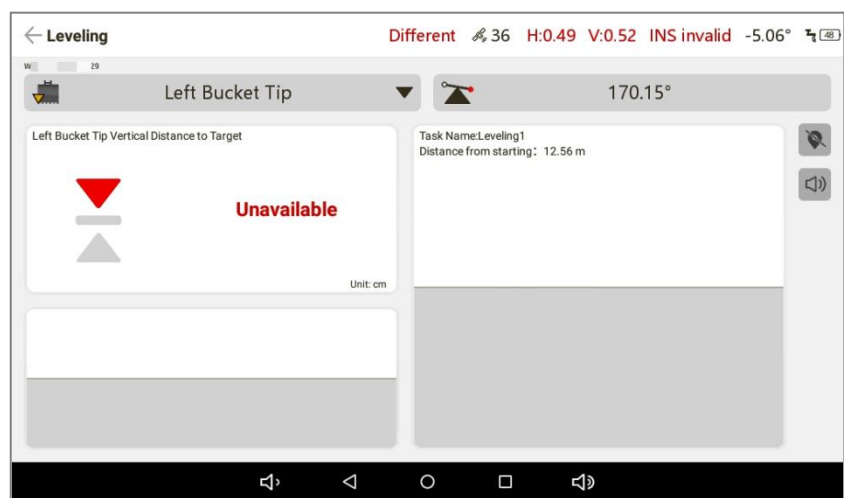


Figure 4-13

4.3 Slope

Tap 'Slope' on the 'Home' screen to enter the slope job list interface, as shown in Figure 4-14. Tap 'New' at the bottom, enter the job name, and tap 'Next' to enter the slope type selection screen, as shown in Figure 4-15. Take 'Down Slope' as an example, then tap 'Next' to enter the collection screen. Swing the excavator arm until the top information bar displays 'INS GOOD', then select the appropriate bucket tip for collection, as shown in Figure 4-16.

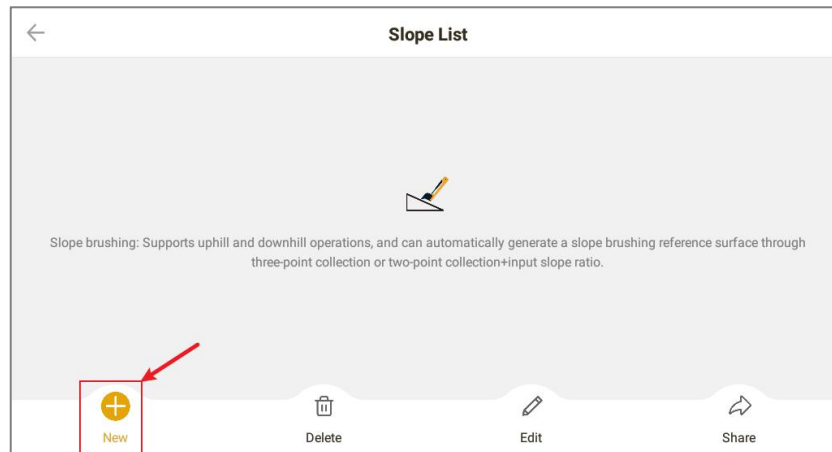


Figure 4-14

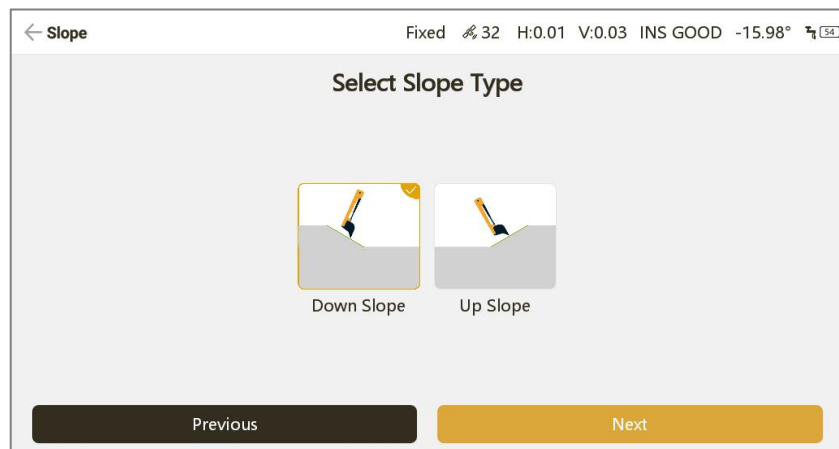


Figure 4-15

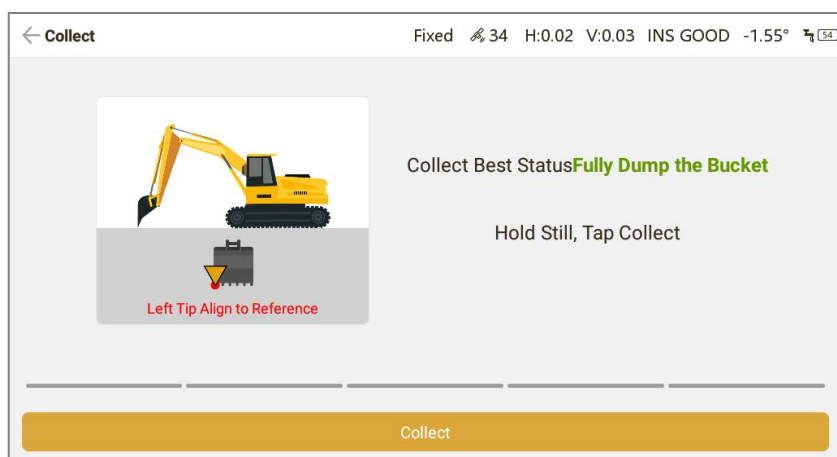


Figure 4-16

Using the left bucket tip as an example, follow the software instructions to collect points **A**, **B**, and **C** in sequence (collecting coordinates with the left bucket tip means using it as the reference point; the same applies to the center or right bucket tip), as shown in Figure 4-17, Figure 4-18, and Figure 4-19. In a 'Down Slope' job, the elevation of point **C** must be lower than that of points **A** and **B** (in an 'Up Slope' job, point **C** must be higher than points **A** and **B**). When collecting point **C**, you need to specify whether it is the bottom point of the slope; you may choose to set it or not. You can also enter the 'Slope Ratio (i)' and 'Slope Height (H)' for corresponding configuration. The 'Slope Width' can be entered as needed or left unspecified. Points **A**, **B**, and **C** are any three non-collinear points on the slope used to generate the reference plane.

After point collection is complete, if you need to re-collect points **A**, **B**, or **C**, you can tap 'the corresponding bucket tip' on the corresponding coordinate point collection page to re-collect them. Alternatively, you can select existing point coordinates from the 'Coordinates' to use as points **A**, **B**, and **C**.

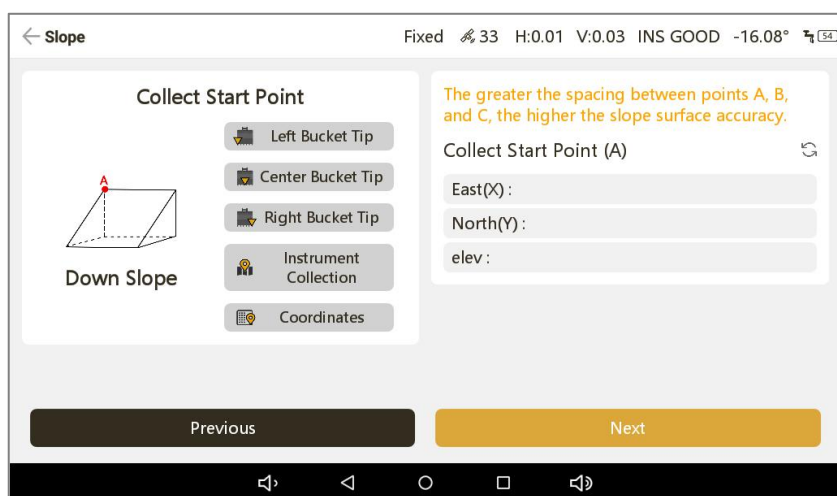


Figure 4-17