



TAG88

User Guide

*Automated GNSS Land
Leveling System*



Foreword

Toknav Information Technology Co., Ltd. specializes in digital construction and precision agriculture solutions. Our systems enhance efficiency, reduce material waste, improve management, and ensure quality in construction and agricultural operations.

This manual guides proper installation, highlights critical warnings, and provides operational instructions to maximize your proficiency with the AG808 Beidou Navigation Leveling System. Thoroughly review this manual to deepen your understanding of the system and its capabilities. All information, diagrams, and applications herein reflect the latest updates at the time of publication. The company reserves the right to modify content without prior notice.

For feedback or inquiries, contact our sales or technical support teams.

System Advantages

Beidou Navigation Leveling System combines satellite positioning with intelligent control software to enable fully automatic 3D grade control. The system uses GNSS RTK technology to track the grader's real-time position and orientation, comparing it with digital design models to guide operations through visual, numerical and audio feedback - achieving millimeter-level accuracy without survey stakes.

This innovative solution works in complex terrains 24/7, requiring minimal operator experience while eliminating rework. Its modular design integrates project management, equipment monitoring and real-time earthwork calculations to optimize productivity.

By automating grade control, the system boosts efficiency by over 30% and significantly improves profitability for earthmoving contractors. The technology represents a cost-effective solution for precision grading across construction, mining and agricultural applications.

Working Principles

The Beidou Navigation Leveling System utilizes satellite positioning data transmitted from base stations to controllers, which perform real-time computations to determine the grader blade's position relative to a reference plane. Based on this comparison, the system automatically adjusts the hydraulic cylinders - retracting them to lower the blade for cutting when above the plane, or extending to raise it for filling when below - enabling continuous, precise grading that transforms uneven terrain into a perfectly level surface through iterative cutting and filling operations.

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Safety Information

General Precautions: Before installing the equipment, it is your responsibility to carefully read and familiarize yourself with the steps and methods described in the manual. This manual does not recommend the use of special or specific methods and procedures that may cause personal injury or equipment damage. Most accidents are caused by failure to comply with safety regulations.

1. Before installing and using the system, please read and familiarize yourself with the operation manual provided by the equipment manufacturer or get instructions from a mechanic.
2. All work is carried out around heavy machinery. Please be extra careful about safety on the construction site.
3. The system is installed externally or internally on the machinery. It is prohibited to install or dismantle the system while the machinery is in operation.
4. The installation of system components should not affect the operator's line of sight and operating actions.
5. Keep body parts and clothing away from running machinery parts.
6. When welding, cutting, and grinding, pay attention to eye protection and wear safety goggles.
7. Hydraulic hoses may have a large pressure even when the machinery is turned off, so please protect your body and clothing.
8. When welding, please use appropriate welding methods and protective measures. After welding, apply rust preventive to all affected areas.
9. To prevent vandalism or theft, movable components should be removed at night and stored in transportation containers.

Note: When welding, be sure to disconnect all power sources of the machinery.

Warning: It is prohibited to weld around hydraulic hoses or certain specific components while the machinery is in operation.

Note: All installation support brackets need to be strong and durable to prevent excessive equipment vibration that may cause detachment.

Note: Keep the transportation container dry. Moisture may damage certain components.

1. Product Overview

No.	Figures	Name	Account
1		Tablet	1
2		ECU	1
3		Gnss antenna	1
4		Steering Wheel	1
5		Tablet Holder	1
6		Antenna base	1
7		Power cable	1
8		Hydraulic valve cable	1
9		Gnss antenna cable	1
10		Radio Antenna	1

2. Equipment Installation

2.1 GNSS Antenna Installation

The installation of the GNSS antenna is particularly important in the entire satellite flat-ground system, and selecting a suitable installation position is a prerequisite for ensuring the flat-ground effect. Due to the different models and appearances of the flat-ground machines, the installation position should also be installed according to the actual situation. When installing, it is necessary to note that the GNSS antenna must be placed directly above the center position of the flat-ground machine scraper, as shown in the figure below. When installing the GNSS antenna, the antenna suction cup can be selected for fixed installation. It is recommended that customers elevate the antenna installation position and use a flange to fix it firmly for better flat-ground effect.



2.2 Radio Antenna Installation

The vehicle radio antenna is used to receive radio signals transmitted by mobile base stations. When installing, it can be placed on the roof of the vehicle and fixed with the suction cup at the bottom of the vehicle radio antenna, as shown in the figure below:



2.3 Cable Installation

Install it according to the diagram of the vehicle-mounted mobile terminal. The solenoid valve control line controls the lifting and lowering of the hydraulic cylinder of the grader. In order to avoid the lifting and lowering being opposite to the actual situation during installation, you can use an external lifting switch for debugging. If it is opposite to the actual situation, swap the positions of the two ports of the control line and then fix them.

Note:

- (1) Choose a suitable position for wiring;
- (2) The solenoid valve control line and the antenna cable are routed separately, and try to avoid them entangling with each other.



2. Equipment Installation

2.4 Display & Controller Installation

The display is the main device for the system to interact with the driver. It should be installed in a position in the cab that is convenient for the driver to operate, such as the right side or front of the cab seat. There are tractor-provided screw holes inside the cab for fixing the mounting bracket. If there are no holes, you can drill holes in the appropriate position for fixing, and then fix the display on the bracket.



2.5 Base Station Setup(Optional)

Power with a 12V battery and place in an open area.

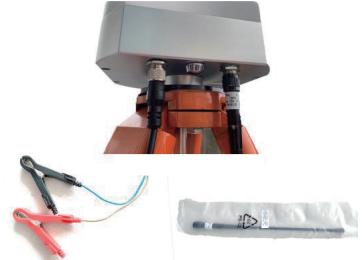
Ensure antenna height $\geq 1.5\text{m}$ with 360° unobstructed views.

Monitor indicators: If the base station is working normally, the indicator will be like, POW (steady), SA (steady), LINK (blinking).

The base station radio coverage range is 2-3km. It is important to note that the distance between the vehicle terminal and the base station should not exceed its operating coverage range during operation. The specific coverage range is related to the height of the base station radio antenna and the surrounding environment.

The actual operating range shall prevail.

Pay attention to the loss of battery power. The base station voltage cannot operate normally when it is lower than 6V. The Pow indicator light flashes falsely, indicating low power.



3. Software Operation

3.1 Software Interface Overview



3.2 Main Interface

Key Functions:

+/-: Fine Adjustment: $\pm 1\text{cm}$ per click.

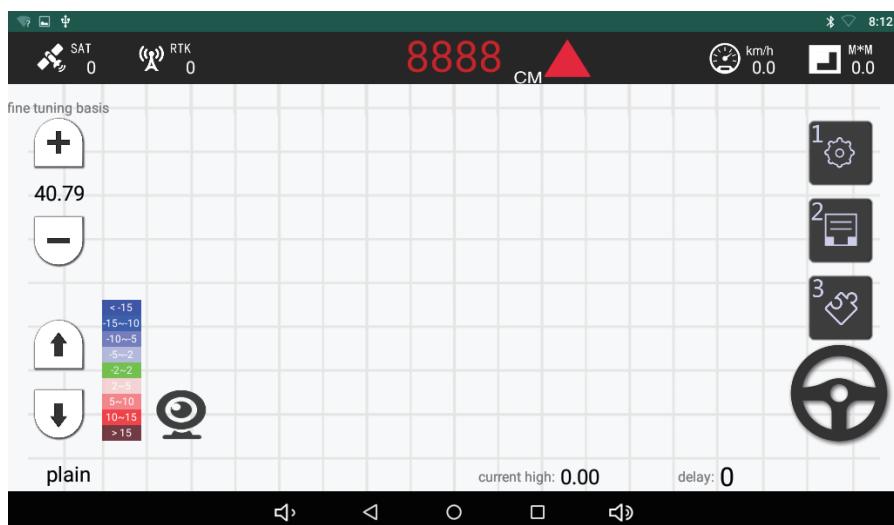
Blade Control: Manual raise/lower.

Settings: Base station, satellite parameters.

Reference Plane: Set horizontal plane

Auxiliary Tools: Measure terrain elevation.

 Start/Stop Operation.



3. Workflow

3.3 Base Station Configuration

Figure 1: The system settings menu provides access to four key configuration modules: Base Station Setup, Satellite Positioning Data, Mode Selection, and System Settings

Figure 2: The base station configuration offers three connection options. For network differential mode:

Navigate to Settings > Network Differential from the main interface

Tap Refresh to scan for nearby base stations

Select an available station and confirm

Note: Non-professionals are not allowed to debug the website settings. If you make a mistake, choose to exit.

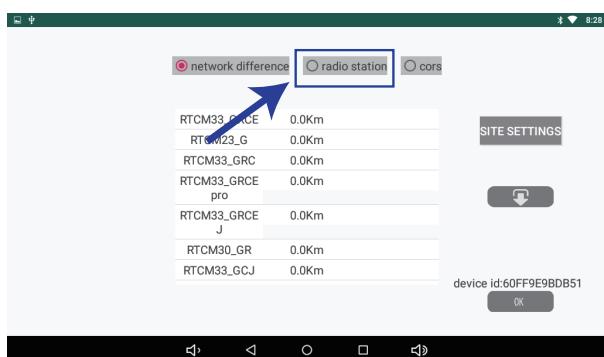


Figure 1

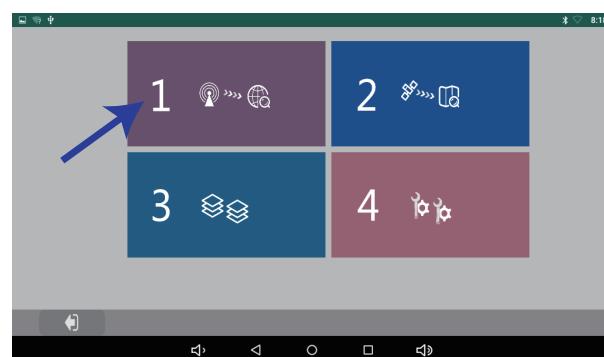


Figure 2

Figure 3: Choose one of three base station settings (radio base station): Enter from the main interface - Settings - Radio Base Station

Note: This function requires a factory-installed radio module.

Figure 4: Choose one of three base station settings (CORS) from the main interface - Settings - CORS: This step requires contacting the dealer - the dealer contacts the company's remote specialist.

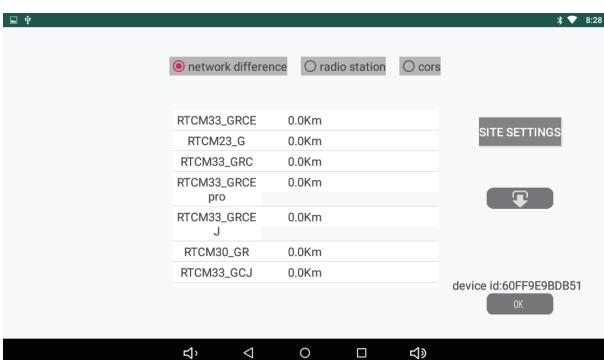


Figure 3

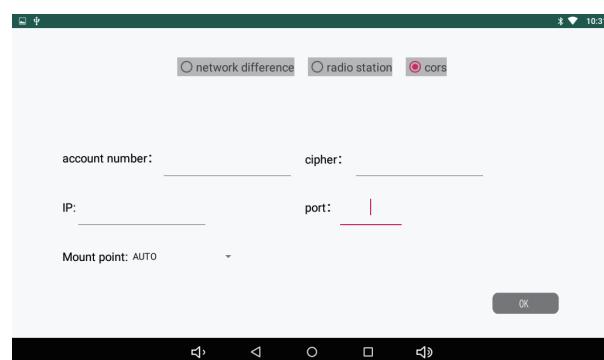


Figure 4

Figure 5: Satellite Positioning: Monitor real-time parameters: satellite count, longitude/latitude, elevation, speed.

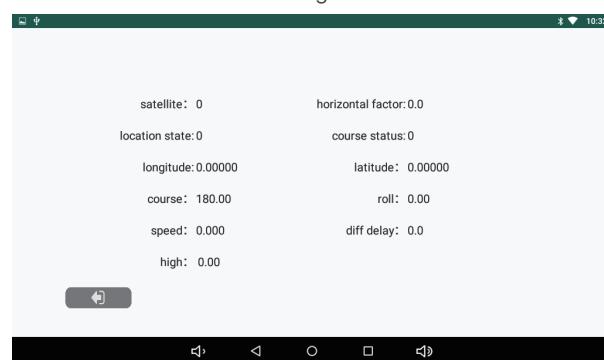


Figure 5

4. Other Functions

4.1 Mode Selection

Figure 6: Available mode

1. Plane Mode (Flat Surface)

2. Single Slope Mode (One-Way Gradient)

3. Dual Slope Mode (Two-Way Gradient)

Single Slope Mode Setup:

1. Calibrate Point A at the highest field position.

2. Calibrate Point B at the lowest field position.

3. Enter the elevation difference (e.g., 20 cm if A is higher than B) → Set Elevation → Exit.

Dual Slope Mode Setup:

Follow the same steps as Single Slope Mode, but add Point C to measure elevation difference between A & C.

Figure 7: System Settings (Default Values):

Sensitivity: 1.8

Dead Zone: 2 cm

ECU Connection: ON

Mapping Threshold: 50 cm

Note: System settings should only be modified under the guidance of qualified technical personnel. Unauthorized adjustments may affect performance and operational safety.

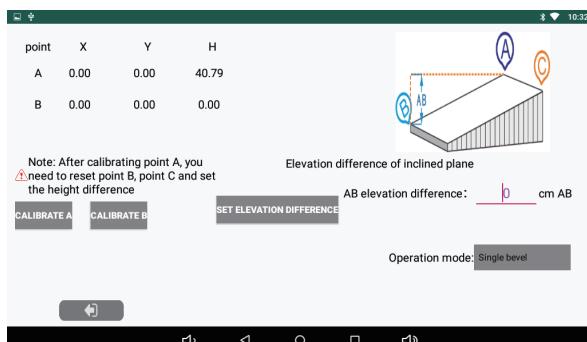


Figure 6

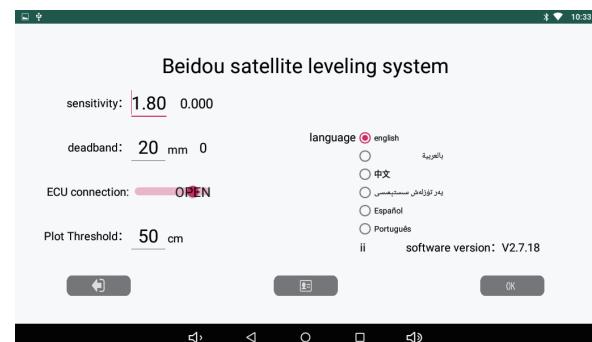


Figure 7

4. Creating a New Work Plane

Mode Introduction

After configuring "Machine Dimensions" and "Coordinate Conversion Parameters," proceed to set the work plane by:

Clicking the "Set Reference Plane" icon (bottom-right of main interface)

Selecting from two supported modes:

1. Plane Mode (Flat Surface)

2. Slope Mode (Inclined Surface)

As shown in the Figure 6

Plane Mode Setup

1. Click "Set Plane":

2. Switch working mode to plane mode.

3. Set "Offset" to "0" for new installations.

4. Click "Set Plane", the system collects sensor/GNSS data to calculate elevation.

5. Success/failure alerts appear based on error thresholds.(If the error is exceeded, the system will prompt the user that the setting has failed, and the system will re-collect data for calculation until the error range of the system is reached.

6. For precision: Use "Analyze Elevation" → Follow prompts to sample multiple surface points.)

7. Click "End" to auto-compute the optimal reference plane.

Slope Mode Setup

1. Switch to Slope Mode → Click "Set".

2. Calibrate key points as shown in the Figure(A/B for single slope; A/B/C for dual slope).

3. Input elevation differences between points.

Note: Slope Mode only supports "High-to-Low" or "Low-to-High" grading directions.

5. Exiting the System

Exiting the System

Method 1: Double-click the red triangle icon.

Method 2: Click the taskbar → Remove the application.



6. Operation Workflow

Pre-Leveling Steps

System Startup

- 1.Power on the tractor and wait for stable gauge readings before ignition;
- 2.Engage the PTO (Power Take-Off) at low speed;
- 3.Activate the controller and launch the satellite leveling software
- 4.Raise the grader blade to a 5-10 cm safety height(via controller or manual switch)
- 5.Turn off the controller to prevent misoperation.

Base Station Setup (Radio Mode Only)

- 1.Deploy the tripod in an open area within the work zone.
- 2.Connect cables, power on the base station, and set the frequency.

Grader Adjustment

- 1.Start the tractor, turn on the PTO shaft, turn on the controller,
- 2.lower the blade to 5-10 cm above ground for initial leveling.

Leveling Operation

Work Direction:

- 1.Always grade from high to low terrain, repeating passes for uniform leveling.
- 2.During grading operations, if excessive soil accumulation overloads the tractor, immediately raise the blade via the control interface or external switch to discharge material before resuming automatic mode; conversely, if insufficient soil cutting occurs, progressively lower the reference plane.

Post-Leveling Steps

Maintenance:

- Clean the blade to prevent rust.
- Store the grader in a dry, ventilated area, protected from rain and direct sunlight.

Inspection:

- Check all connections and components for damage or looseness.

Note: All equipment is weatherproof but benefits from proper storage to maintain performance.