USER GUIDE

SAG10

PHEREFIX

www.spherefixgnss.com

contact@spherefixgnss.com

+86-19928452984 (Simon) +86-19022028323 (Sunky)

PHEREFIX

SAG10

AUTONOMOUS STEERING SYSTEM USER GUIDE

Guangzhou Spherefix Navigation Technology Co., Ltd.

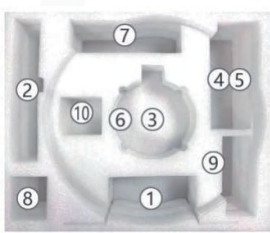
Contents

1. Introduction

Developed by Guangzhou Spherefix Navigation Technology Co., Ltd., the SAG10 Autonomous Steering System is a precision agriculture platform device strictly designed to relevant standards. It uses high-precision satellite positioning, click-precise control technology, and vehicle-model precise control algorithms to enable agricultural machinery to automatically drive along planned routes and is widely used in field operations like sowing, plowing, ridging, and intertillage.

The SAG10 is the main on-board platform of our precision agriculture product line. It features modular design to cut after-sales and user costs. Its electric power-steering control technology eliminates the need to alter the agricultural machinery's hydraulic components, ensuring easy and quick installation. Moreover, it's very simple to operate, allowing farmers to quickly master its use.

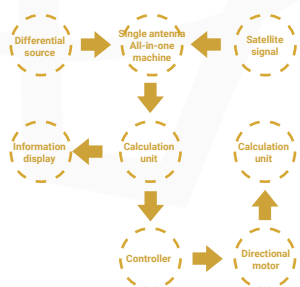
1. Receiver
2. Tablet
3. Motor and driver
4. Main cable
5. Tablet power cable
6. Steering wheel
7. Screw accessory package
8. Tablet Holder
9. Certificate of conformity,list
10. Camera (optional)
11. Radio Antenna



**The system mainly comprises three components: Receiver, a vehicle - mounted Android Tablet, and an electric steering - wheel device. It's a BeiDou agricultural machinery automatic navigation and driving system product for agricultural machinery fields, created using self - navigation, positioning, and embedded technologies.*

2. Principle and main parameters

First, measure and calculate the agricultural machinery's dimensional parameters, create a 3D vehicle model in a computer, and set the working path in the navigation display and calculation unit. Then, use a GNSS receiver to get the machinery's real-time position, speed, and attitude information, and monitor the front wheel's steering angle with an angle sensor. Next, calculate in real-time the lateral displacement and heading angle errors between the current position and the preset path. Finally, the motor control module adjusts the steering wheel to correct the machinery's direction. During operation, the automatic driving system continuously performs "measurement and control" to make the machinery's trajectory closely match the reference path.



MAIN PARAMETER	
Tablet memory	32G
Screen resolution	10 inches 1024 * 600
Straightness accuracy	≤ 2.5cm
row - spacing accuracy between passes	≤ 2.5cm
Base station signal coverage	Mobile base station signal coverage ≥ 5km Fixed base station signal coverage ≥ 15km
input voltage	12VDC
GNSS receiver	BDS, GPS, GLONASS
Radio communication	410-470MHz

INDICATOR LIGHT	
Power	The red light being on indicates that the power is connected, and the number of times the red light flashes represents the radio channel number
Differential	A flashing green light indicates that differential data transmission has started, with a default frequency of once per second.
satellite	The number of flashes indicates the number of acquired satellites.
Digtal display tube	The digital tube displays the current radio channel number, cycling from 0 to 9, and can be operated via the channel switch button.

** The working voltage is recommended to be powered by a 12V supply to ensure normal equipment operation. Also, ensure correct power cord connection to prevent power failures or equipment damage.*

3. Installation Precautions

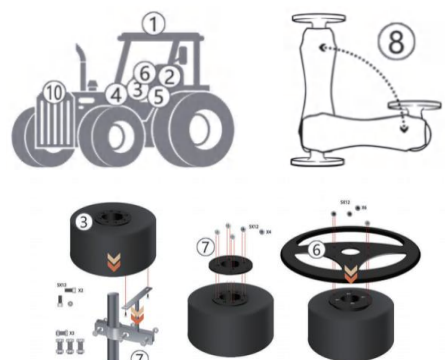
Use a RAM mount to install the display terminal within easy reach of the operator.

For tractors without a cab, protect the equipment from sun exposure and rain, and avoid drops or impacts.

3.1. Installation Notes

1. Power Off First: Always disconnect power before connecting or disconnecting cables.
2. Handle the Screen Gently: Don’ t touch the display with hard objects.
3. Follow Connection Instructions: Connect devices per the manual’s guidance.

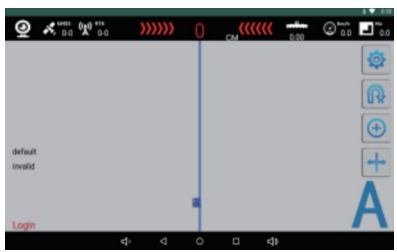
4. Pre-Season Check: Check for normal operation, ensure the installation position hasn’ t shifted, and verify the control system is working before the working season.
5. Power Supply: The equipment requires a DC12V supply.
6. Lightning Protection: Take proper lightning protection measures.
7. Damage from Fortuitous Causes: Damage from lightning, high voltage, or collision isn’ t covered under our free repair service.
8. No Disassembly: Disassembling the product voids the warranty.
9. No Unattended Operation: Don’ t leave the cab unattended during autonomous driving.
10. Open-Field Use: Use the system in open, unobstructed areas.
11. Avoid Interference Sources: Keep away from strong electromagnetic fields, high-voltage lines, and broadcast towers during use.



**After installing the Navigation System on agricultural machinery, since the Receiver is added on the roof, be cautious of the antenna's safety when the machinery enters or exits a garage or drives under height-restricted areas to avoid collision damage.*

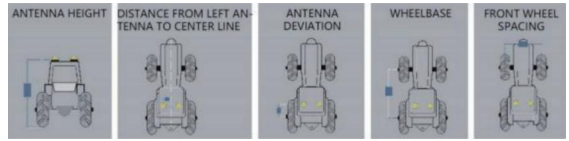
4. Software Settings Configuration

1. Open the "Autopilot" software → Read the disclaimer → Click "I accept".
2. Check the 4G/5G signal in the top-right corner of the tablet, then check the satellite count (normally around 40) in the top-left corner, along with the differential and heading status (which should be "fixed"). Also, check if there' s a red date in the bottom-left corner (no date means permanent validity). Open the settings.



4.1. Vehicle Settings

Go to Main Interface → Settings → Admin (password: 1234) → Vehicle Settings. The installer should measure in order with a standard tape measure, input the dimensions, and click "Done" . This is used for the first-time calibration after installing the navigation system. If the navigation antenna isn' t dismantled post-calibration, these settings need no further adjustment.



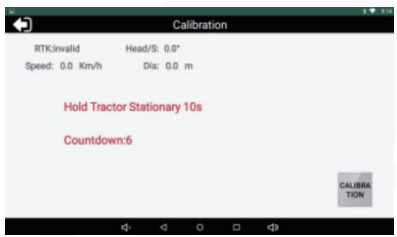
4.2. Implement Agricultural Tool Settings

Access via Main Interface → Settings → Admin (password: 1234) → Agricultural Tool Settings. After measuring, input the actual width of the attached agricultural tool, adjustable according to specific conditions.

**This is the initial calibration setting after installing the navigation system. Once completed, no further changes are needed unless other agricultural tools are replaced.*

4.3. Navigation Calibration

Go to Main Interface → Settings → Navigation Calibration. Click "Start Calibration" and follow system prompts. This is for initial setup after installation. If navigation isn' t removed after calibration, settings need no further adjustment.



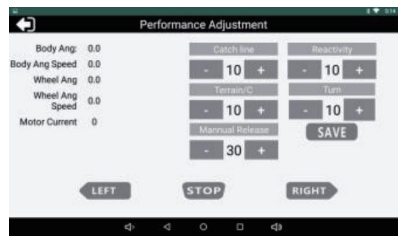
4.4. BeiDou Positioning

Go to Main Interface → Settings → BeiDou Positioning.

This section displays real-time system parameters, including signal strength, positioning status, vehicle speed and angle, as well as latitude and longitude.

4.5. ECU Settings

Go to Main Interface → Settings → ECU Settings. This section is for fine-tuning vehicle hardware, addressing differences caused by varying tractors or unknown factors. After installing the navigation system, you can control the steering wheel’ s left, right, and stop functions in real-time here, including remote control.

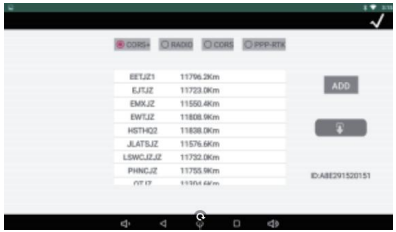


**Don’ t start the tractor while the navigation device is operating. If the vehicle stalls, power off the device before restarting the vehicle, and then power on the device again.*

5. Base Station Setting

5.1. Option 1-CORS+

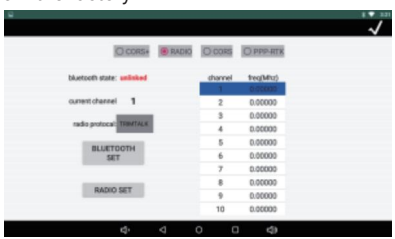
Go to Main Interface → Settings → Network Differential Correction. Click “Refresh” , select a nearby base station, and confirm. (If no nearby base station is available, switch to a paid CORS base station.) Note that non-professionals should not adjust the base station settings.



5.2. Option 2-Radio base station

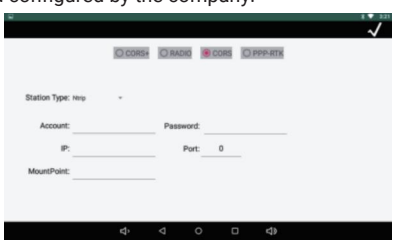
Enter from the main interface→Settings→Radio Base Station.

This function requires the company to install a radio module from the factory.



5.3. Option 3-Cors base station

Enter from the main interface→Settings→CORS Base Station from the main interface, enter the account and password configured by the company.



5.4. Option 4-PPP-RTK mode

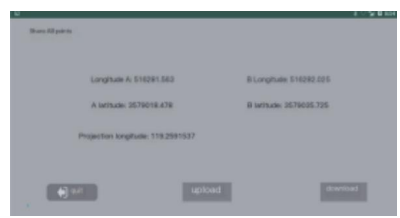
B2Band E6-HAS modes can be selected (will be supported in the new version of the software).

*Verify the account details carefully. After setting, click OK, exit the software, reopen it, and wait 5-120 seconds until the main screen shows “Fixed”.

6. Software Functions

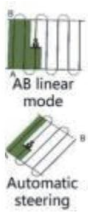
6.1. Shared AB Points

Go to Main Interface → Settings → Shared AB. Enter a 4-digit combination for saving or downloading to easily access it later. Avoid simple combinations like 1234, 1111, or 0000.



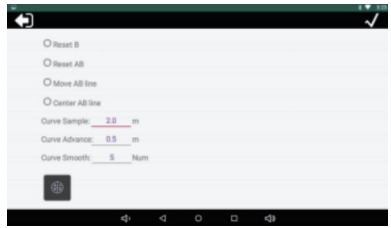
6.2. How to Create a New Task and AB Line

Select "New Task" to create a new task. You can rename the task. The default name is the current date. Drive the tractor into the field, park it by the edge with the front facing the direction of work, and ensure the rear-mounted farm tool is next to the field edge. Click the "A" button on the screen to set point A. Then, drive the tractor to the other end of the field in the direction of the vehicle's head and stop. Click the "B" button on the screen to set point B. This completes the AB-line setup for the field operation. (A and B are the required AB points.)



6.3. Introduction to AB Line Functions

After setting point B for a task, an error may be found. If point B was selected incorrectly, it can be reset. Resetting AB involves recalculating the AB line in a job record. AB line slight shift refers to the left/right movement of the AB line based on the input value when crossing it. Move AB line to the current or homepage shortcut line. When there's a slight error in the current task, it can adjust the overall navigation line deviation, not just a single line displacement.

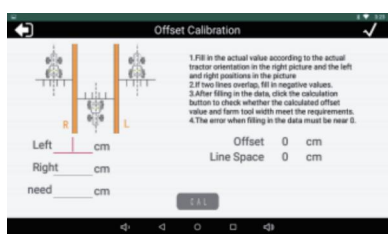


6.4. AB Line Handover Line Calculation

The handover line, also known as a connecting or combination line, has simplified operations for users via one-click calculation, offering significant technical support.

After setting points A and B, the B-point icon in the screen' s bottom-right corner becomes a steering wheel. Manually turn the tractor around, then enable autopilot and align it with the displayed route. The smaller the upper error value, the straighter the operation. When reaching the field end, click the bottom-right steering wheel icon to disable autopilot. Manually turn the tractor around and repeat the process.

**For unused functions, avoid setting them arbitrarily. Contact technical staff promptly if encountering unsolvable issues. Never set them on your own; improper settings may cause system failure.*



7. Common Faults and Solutions Reference

Fault 1: System Positioning Failure

Solution:

1. Check for antenna blockages, loose connections, or controller disconnections.
2. Move the vehicle to an open area if it's in a garage or under heavy obstructions.

Fault 2: No Network Connection

Solution:

1. Check the tablet's 4G connection via the notification shade.
2. Switch to the optimal carrier network.

Fault 3: Differential Display Shows Single Point or Excessive Lag

1. Drive to an open area if there are obstructions.
2. If the issue persists, check the following:
(1) Inspect vehicle equipment cables for proper connections.
(2) For mobile base stations, check signal light status.
(3) For network base stations, contact personnel to check power supply or disconnections.
(4) Restart the device and observe.
(5) If the problem continues, contact technical staff.

Fault 4: Large Displayed Error and Steering Wheel Oscillation During Autonomous Driving.

Solution:

1. Check the installation position of the antenna and install it close to the rear axle center.
2. Check if pitch and roll values are too high, and adjust the installation position or replace the main unit.
3. Check and adjust the sensitivity values.
4. If the working area is uneven and the vehicle’ s front axle lacks counterweight, add weight to prevent front-end lift.
5. Verify vehicle parameter accuracy by remeasuring.
6. Inspect the vehicle for steering wheel play or hydraulic issues, adding hydraulic oil or repairing as needed.