

**USER GUIDE**

# SAG10

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 **PHEREFIX**

# SAG10

AUTONOMOUS STEERING SYSTEM USER GUIDE



Guangzhou Spherefix Navigation Technology Co., Ltd.

## Legal Notice

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### 3. Software & Hardware Limitations

The performance of the SAG10 Autonomous Steering system may vary depending on the hardware equipment, operating environment, network connection, and user operating habits. The company does not guarantee that the system will work in all environments or meet all user requirements.

### 4. Third-Party Responsibility

Sphrefix assumes no liability for claims, damages or disputes arising from the integration or use of non-Sphrefix hardware, software or services. It is the user's obligation to validate interoperability, safety and security before connecting any third-party component.

### 5. Document Revision Policy

This manual may be updated without notice to document product enhancements, new features or procedural refinements. Always consult the Sphrefix website or technical support for the most current revision before installation or operation.

## Precautions

Prior to operating the SAG10 Autonomous Steering System, study this manual thoroughly to ensure rapid, correct and safe deployment. Sphrefix disclaims all liability for incidents, malfunctions or damage resulting from disregard of, or deviation from, the procedures and warnings described herein.

Note: The presence or absence of an explicit caution does not imply the total elimination of risk; exercise sound judgment at all times.

## 1. Warnings

The notices below identify critical hazards that, if disregarded, may lead to severe personal injury.

- (1) Inspect all cabling for cuts, fraying or other damage prior to every use; compromised conductors can trigger electrical failure or fire.
- (2) Follow the prescribed wiring diagrams and pin-outs exactly; never improvise connections.
- (3) Always isolate the power source before attaching or detaching any harness or connector.
- (4) Verify the supply voltage matches the system rating (12 V DC or 24 V DC nominal) before energizing the unit.

## 2. Precautions

Neglecting the following guidelines can lead to premature component failure or permanent damage.

- (1) Affix the terminal firmly within the operator's line of sight using the supplied RAM mount; ensure it does not obstruct controls or visibility.
- (2) Install all hardware strictly in accordance with the provided procedures—personal judgment must not override documented methods.
- (3) Apply only moderate force when routing cables or seating connectors; over-torque can fracture housings or conductors.
- (4) Protect the display from drops, shocks or collision with tools or cargo.
- (5) Operate the touchscreen with fingers or approved stylus; metallic or sharp implements will scratch or crack the surface.
- (6) Carry out periodic inspections: verify antenna orientation, connector tightness and sensor cleanliness to maintain peak performance.

(7) For prolonged storage, disconnect all power leads, seal the unit in its anti-static bag and place it in a cool, dark and moisture-free location to maximize service life.

## 3. Operator Qualifications and Conduct

To guarantee safe, lawful and effective use of the SAG10 system, the following conditions are mandatory:

- (1) The operator shall demonstrate full literacy of this manual and the ability to comprehend every operational and safety directive contained herein.
- (2) Operation is strictly restricted to persons who have reached the age of majority; minors are expressly forbidden from assuming control.
- (3) Alcohol, narcotics or any substance that impairs judgment or reflexes must not be present in the operator's system while the unit is active.
- (4) Do not engage the system when fatigued; drowsiness compromises reaction time and decision-making accuracy.
- (5) Boarding or disembarking the vehicle is prohibited while the SAG10 is executing an automated manoeuvre.
- (6) Use on public thoroughfares or in areas accessible to the general public is not permitted; confine operation to enclosed or private agricultural fields only.

## 4. Operating Environment Requirements

To maintain peak performance and preserve safety, observe the following site requirements:

- (1) Position the equipment so that it is well clear of strong electromagnetic fields, high-voltage transmission corridors, radio or television masts, tall structures, airport facilities, and any other sources likely to cause RF interference or signal shading.

(2) Confine operations to open fields devoid of bystanders, livestock, or obstructions, and verify that no unauthorized personnel or vehicles are present within the active work zone before engaging the system.

## Post-Sale Warranty Exclusions

Spherefix' s warranty obligations do not extend to the following circumstances:

1. Damage or defects arising from installation, operation, or maintenance performed by any person or entity not expressly authorised by Spherefix.
2. Malfunctions or deterioration traceable to the operator's failure to observe the procedures, warnings, and safety instructions set forth in this manual.
3. Repairs necessitated by force-majeure events—including, but not limited to, natural disasters, lightning, electrical surges, collisions, or other external impacts beyond Spherefix's control.
4. Any impairment resulting from unauthorised disassembly, alteration, substitution, or removal of original components or firmware. Such actions immediately void all warranty coverage, and Spherefix assumes no liability for subsequent damage.
5. Normal wear-and-tear failures or damage to consumable external parts (e.g., cables, connectors, seals) that occur during routine operation.
6. Any consequence, loss, or injury arising from operation that deviates in any way from the instructions and specifications contained herein.

## Contents

<b>Legal Notice</b> .....	01
1. Intellectual-Property Declaration .....	01
2. Limitation of Liability .....	01
3. Software & Hardware Limitations .....	01
4. Third-Party Responsibility.....	02
5. Document Revision Policy .....	02
<b>Precautions</b> .....	02
1. Warnings .....	03
2. Precautions.....	03
3. Operator Qualifications and Conduct.....	04
4. Operating Environment Requirements .....	04
<b>Post-Sale Warranty Exclusions</b> .....	05
<b>1. Manual Scope and Purpose</b> .....	08
<b>2. Equipment list</b> .....	08
<b>3. Core Component Overview</b> .....	10
3.1. SAG10 Tablet Assembly.....	10
3.2. Motor Assembly.....	10
3.3. Smart Receiver Assembly.....	11
3.4. Other Kit .....	12
<b>4. Hardware Installation</b> .....	12
4.1. Tablet .....	12
4.2. Motor Installation .....	13
4.3. Smart Receiver Mounting .....	14

<b>5. Software Orientation .....</b>	<b>13</b>
5.1. Launching the Application .....	13
5.2. Main-Screen Symbols – Detailed Legend .....	14
5.3. Screen Icons – Quick Reference .....	15
5.4. The interface in software settings:.....	16
<b>6. Software Workflow .....</b>	<b>16</b>
6.1. Software Licence Activation .....	16
6.2. Configuring Correction Sources .....	17
6.3. Vehicle Parameter Configuration .....	19
6.4. Implement Profile Setup .....	22
6.5. Vehicle Calibration .....	23
6.6. Guidance Line Creation .....	25
6.7. Equipment Parameter Debugging .....	27
<b>7. Other Features .....</b>	<b>28</b>
7.1. Day/Night Mode Toggle .....	28
7.2. Coverage Pattern Toggle .....	29
7.3. Scale Control .....	29
7.4. Parameter Review .....	29
7.5. Guidance-Line Sharing .....	30
7.6. U-TURN .....	31
<b>8. Specification .....</b>	<b>35</b>
8.1. Tablet Display.....	35
8.2. Driving Motor.....	38
8.3. Smart Receiver.....	40

## 1. Manual Scope and Purpose

This handbook is your authoritative companion for the Spherefix SAG10 Autonomous Steering System.

- (1) It presents a concise inventory of every component shipped with the kit, enabling instant verification that no item is missing.
- (2) It clarifies the function and significance of each hardware element, giving you the insight required for correct placement and wiring.
- (3) It delivers a step-by-step walkthrough of the software interface, ensuring you can configure, calibrate and operate the system with confidence.
- (4) It consolidates technical specifications, environmental limits and compatibility data, providing the reference you need to secure reliable performance across diverse operating conditions.

## 2. Equipment list

(1) The standard list is as follows:

NO.	Name	Quantity	Picture
1	Tablet	1	
2	Tablet bracket	1	
3	Switch mounting bracket	1	
4	U-shaped card	1	

NO.	Name	Quantity	Picture
5	Smart receiver	1	
6	Receiver mounting plate	1	
7	Steering wheel	1	
8	Motor	1	
9	Mount Bracket and Screw Pack	1	
10	Spline adapter	1	
11	Camera	1	
12	Power Cable	1	
13	Main cable	1	
14	Lining	1	
14	Outer box	1	

(2) Optional list:

NO.	Name	Quantity	Picture
1	Radio Antenna	1	

Note: Unless explicitly specified otherwise, the standard configuration is supplied by default.

### 3. Core Component Overview

This chapter mainly introduces the functions of main accessories.

#### 3.1. SAG10 Tablet Assembly

The SAG10 rugged tablet serves as the system's central brain. It ingests real-time GNSS and inertial data, executes guidance algorithms, presents the operator interface, and transmits precision steering commands to the actuator.



The tablet kit contains the following:

NO.	Name	Quantity	Picture
1	Tablet	1	
2	Tablet bracket	1	
3	Switch mounting bracket	1	
4	U-shaped card	1	

#### 3.2. Motor Assembly

The electromechanical actuator is the system's steering authority. Whenever the vehicle drifts from the programmed track, the actuator receives real-time correction commands from the SAG10 tablet and applies precise torque to the steering column to restore the desired course.



The motor kit contains the following:

NO.	Name	Quantity	Picture
1	Steering wheel	1	
2	Motor	1	
3	Mount Bracket and Screw Pack	1	
4	Spline adapter	1	

### 3.3. Smart Receiver Assembly

The high-precision receiver ingests multi-constellation satellite signals via its integrated GNSS engine, then parses position, velocity and timing data for immediate delivery to the SAG10 tablet. An on-board inertial measurement unit continuously captures vehicle attitude, enabling tightly coupled GNSS/INS fusion for robust guidance in challenging environments.



NO.	Name	Quantity	Picture
1	Smart receiver	1	
2	Receiver mounting plate	1	

### 3.4. Other Kit

Radio antenna, which is an optional accessory, is mainly used to receive differential data from the radio base station and transmit the differential data to the radio module.



NO.	Name	Quantity	Picture
1	Radio Antenna	1	

## 4. Hardware Installation

### 4.1. Tablet

Affix the SAG10 tablet to the right-hand side of the cab using the supplied RAM mount; adjust the arm so the display remains within the operator's primary line of sight without obstructing vehicle controls.



Note: The tablet can be installed in a place that is convenient for the user to operate.

## 4.2. Motor Installation

- (1) Center the front wheels, shut down the engine, and extract the factory steering wheel.
- (2) Select the spline adapter that matches the tractor's column and slide the actuator onto it; secure the adapter with the original retaining nut.
- (3) Bolt the supplied motor bracket to a rigid part of the steering column or dash support, ensuring the actuator is free of axial or radial strain.
- (4) Mount the dedicated steering wheel onto the actuator hub and torque the fasteners to specification.

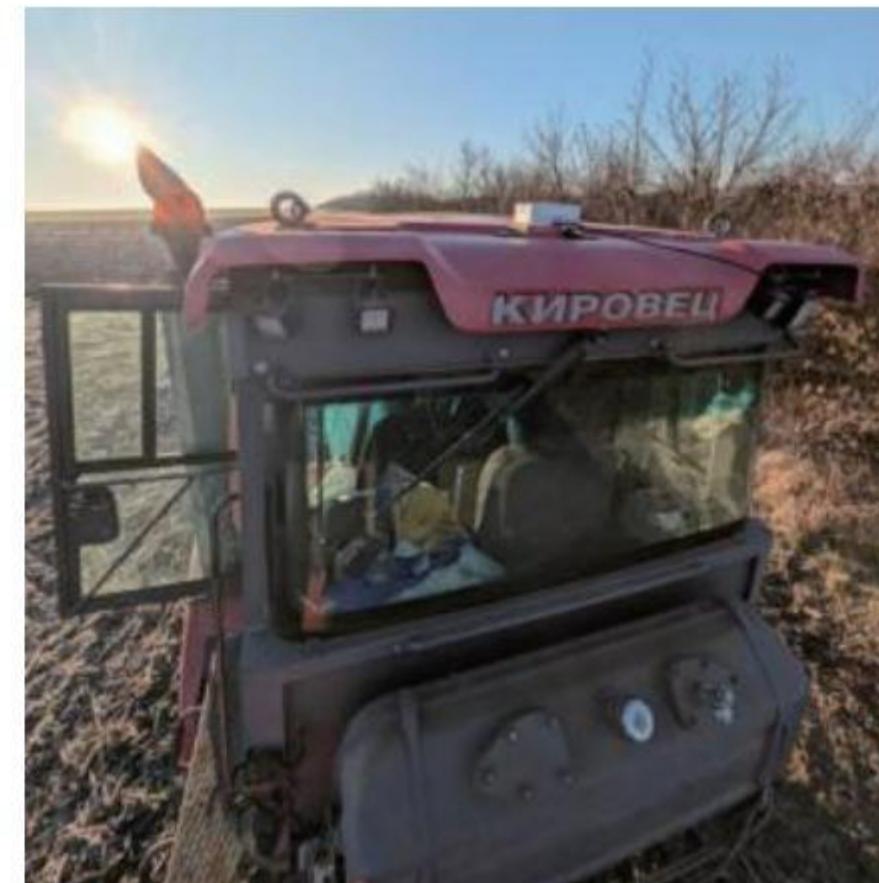


Note:

- (1) Use only the spline adapter specified for your tractor's steering column; mismatch may deform or fracture the column.
- (2) Secure the bracket rigidly—ensure the motor is never exposed to sustained vertical or longitudinal loads during operation.

## 4.3. Smart Receiver Mounting

Fasten the receiver plate to the cab roof using the supplied 3 M adhesive pad; ensure the plate is level and the receiver is seated firmly before pressing the adhesive into place.



Note:

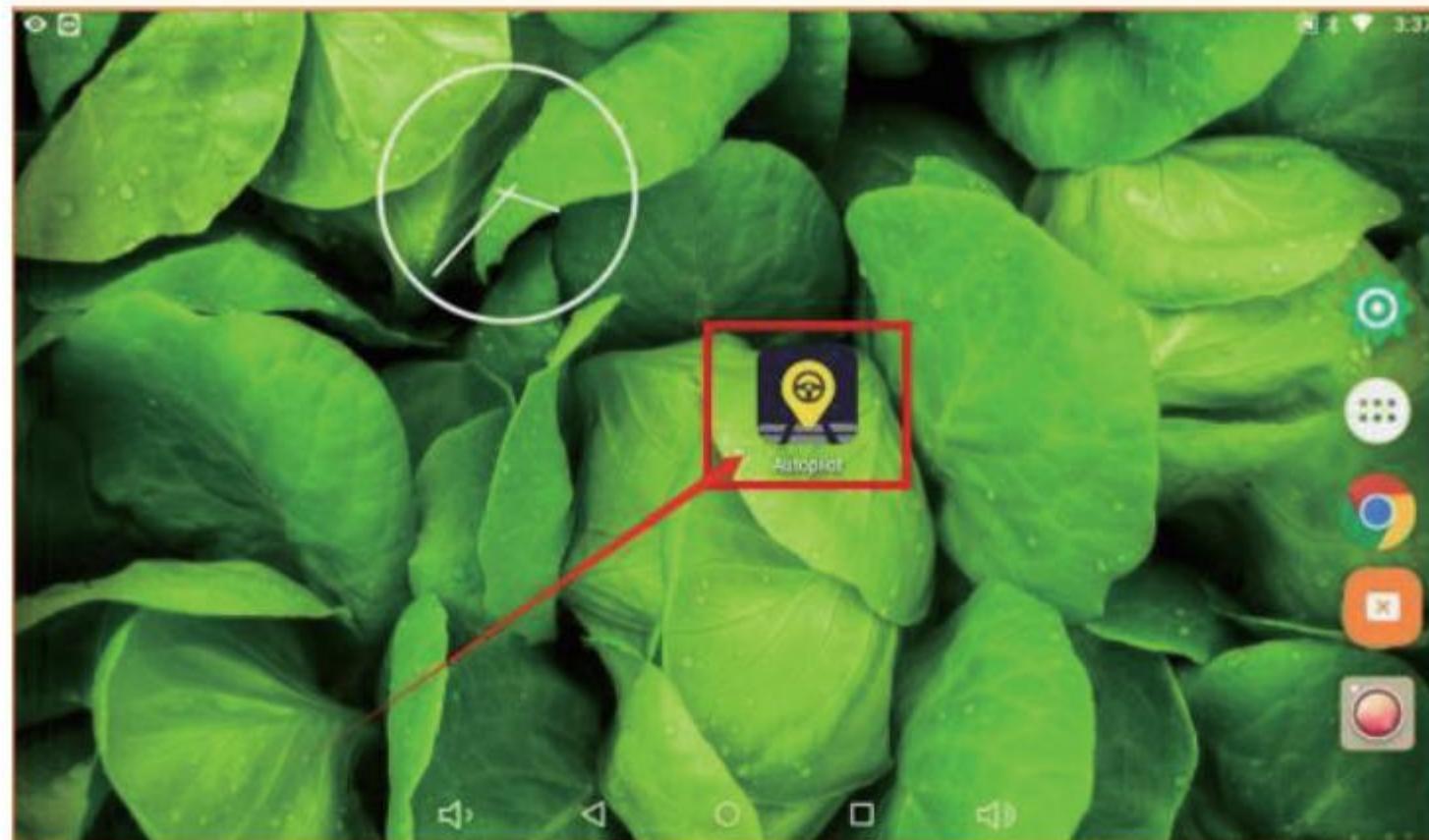
- (1) Position the receiver as close as practicable to the tractor's longitudinal centerline for optimal GNSS geometry.
- (2) Orient the cable connector toward the rear of the machine to maintain proper antenna alignment.
- (3) On conventional front-steer tractors, no single fixed point is mandated—follow (1) and (2) above.
- (4) On articulated machines, place the receiver forward of the cab, ahead of the articulation joint.

## 5. Software Orientation

### 5.1. Launching the Application

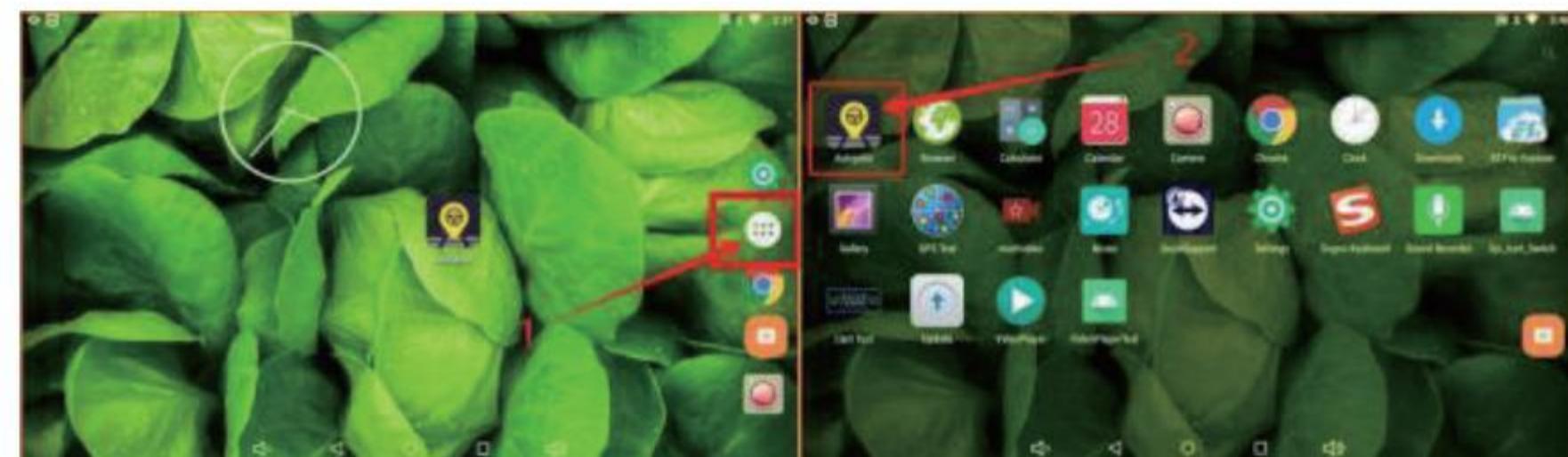
#### Method 1 – Desktop Shortcut

Once the SAG10 terminal has completed its boot sequence, locate the Autopilot icon on the home screen and tap it to open the guidance application.

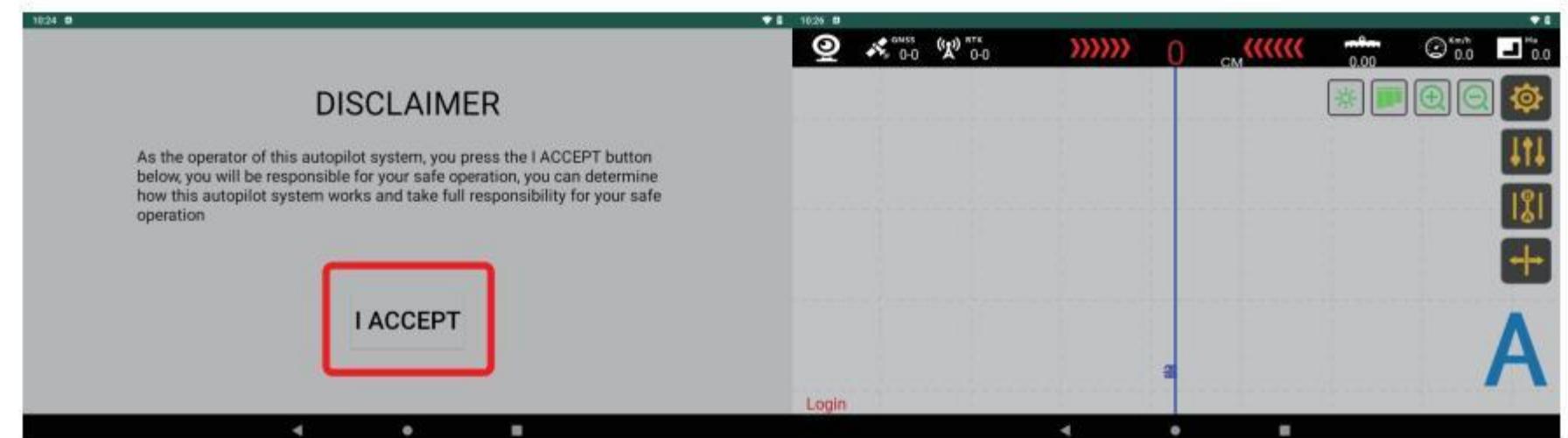


#### Method 2 – App Drawer

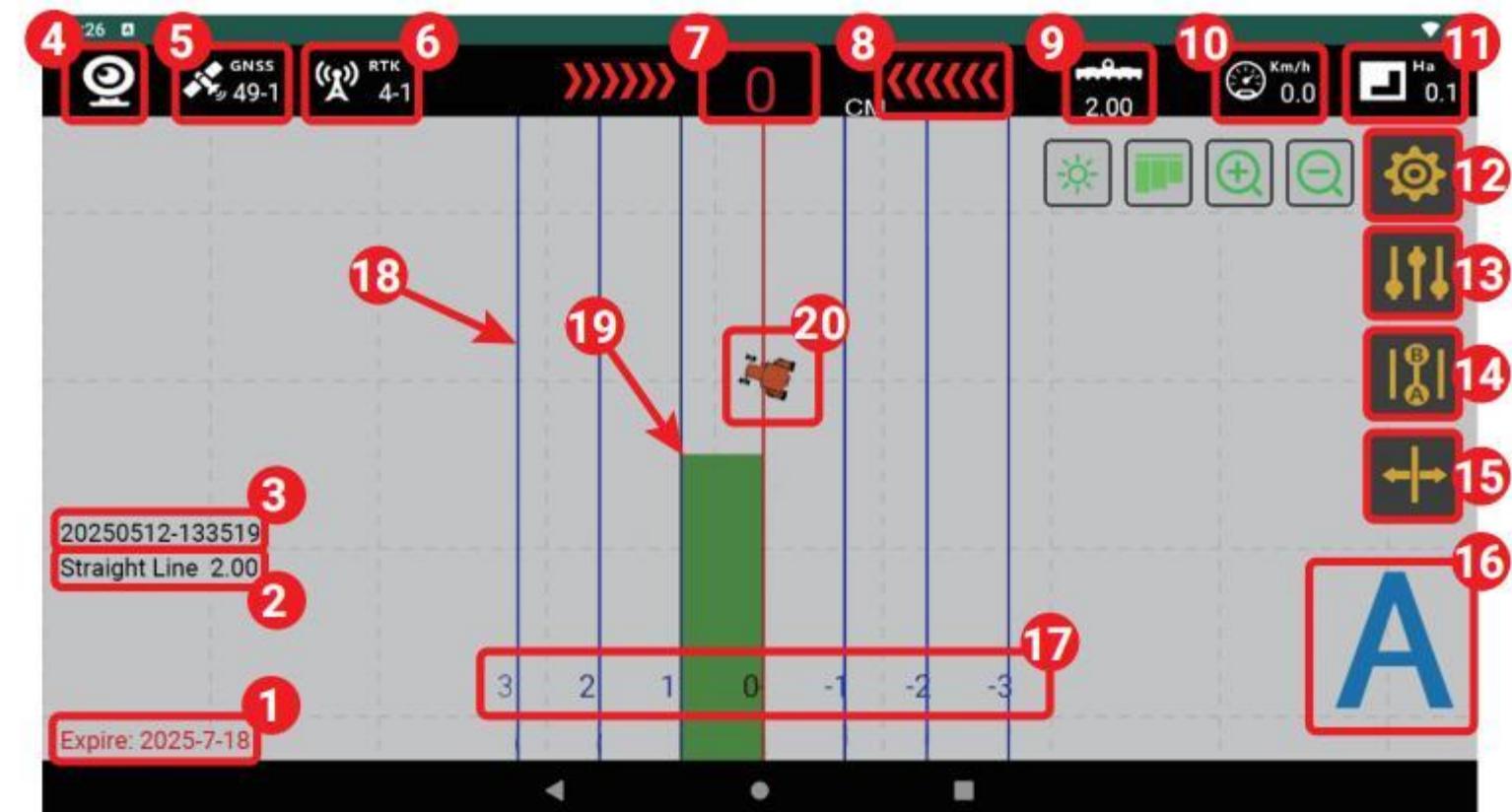
If the Autopilot icon is not visible on the home screen, swipe up (or press the app-drawer key) to open the Android application menu, then locate and tap the Autopilot icon to launch the program.



Once the application has loaded, tap I ACCEPT to advance to the main operating screen. (Layout elements may differ slightly depending on configuration history and user customisation.)



### 5.2. Main-interface Symbols – Detailed Legend



- (1) Display the current software registration validity period;
- (2) Display the navigation line type of the current operation;
- (3) Display the name of the current operation;
- (4) Camera on and off button;
- (5) Number of satellites and IMU status of the device (1 is valid, 0 is invalid);
- (6) The differential status of the device (1 is single point, 2 is pseudorange, 4 is fixed, 5 is floating) and the current differential age (normal status ≤3);

- (7) The distance between the vehicle and the navigation line;
- (8) The direction of the vehicle from the navigation line;
- (9) The width of the implement;
- (10) The real-time speed of the vehicle;
- (11) The area where the device is working;
- (12) System setting button;
- (13) U-TURN setting button;
- (14) New job button;
- (15) Navigation line editing operation button;
- (16) Start \ End Autopilot button;
- (17) Serial number of the navigation line;
- (18) Path and position of the navigation line;
- (19) The trajectory of the operation;
- (20) Position of the vehicle.

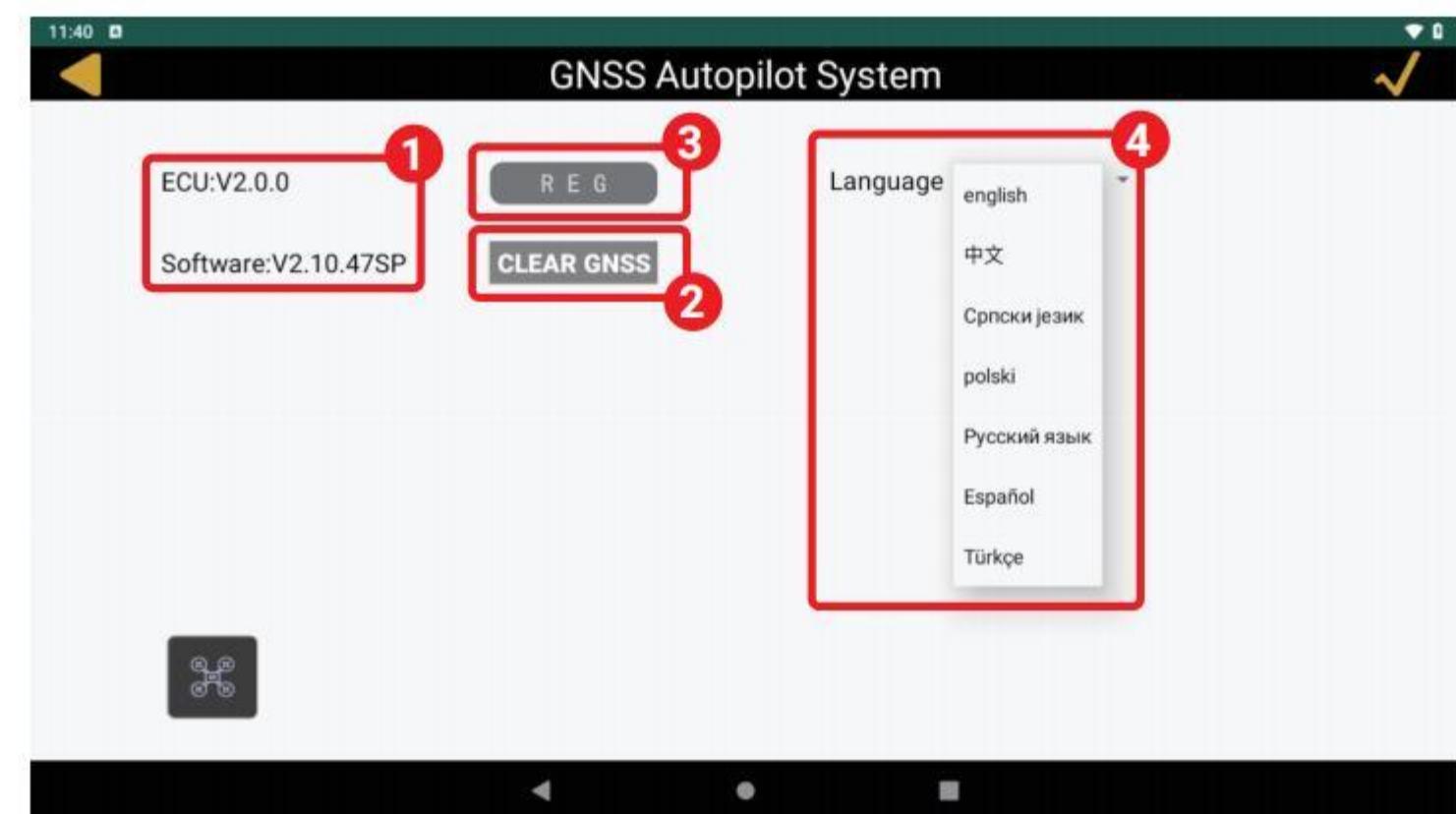
### 5.3. Screen Icons – Quick Reference



- (1) Set vehicle parameters;
- (2) Set implement parameters;
- (3) Calibrate vehicle status;
- (4) Real-time status of equipment;

- (5) Equipment parameter debugging;
- (6) Software settings;
- (7) Base station connection;
- (8) Navigation line sharing;
- (9) ISOBUS settings (under development).

### 5.4. Software Setting Interface:

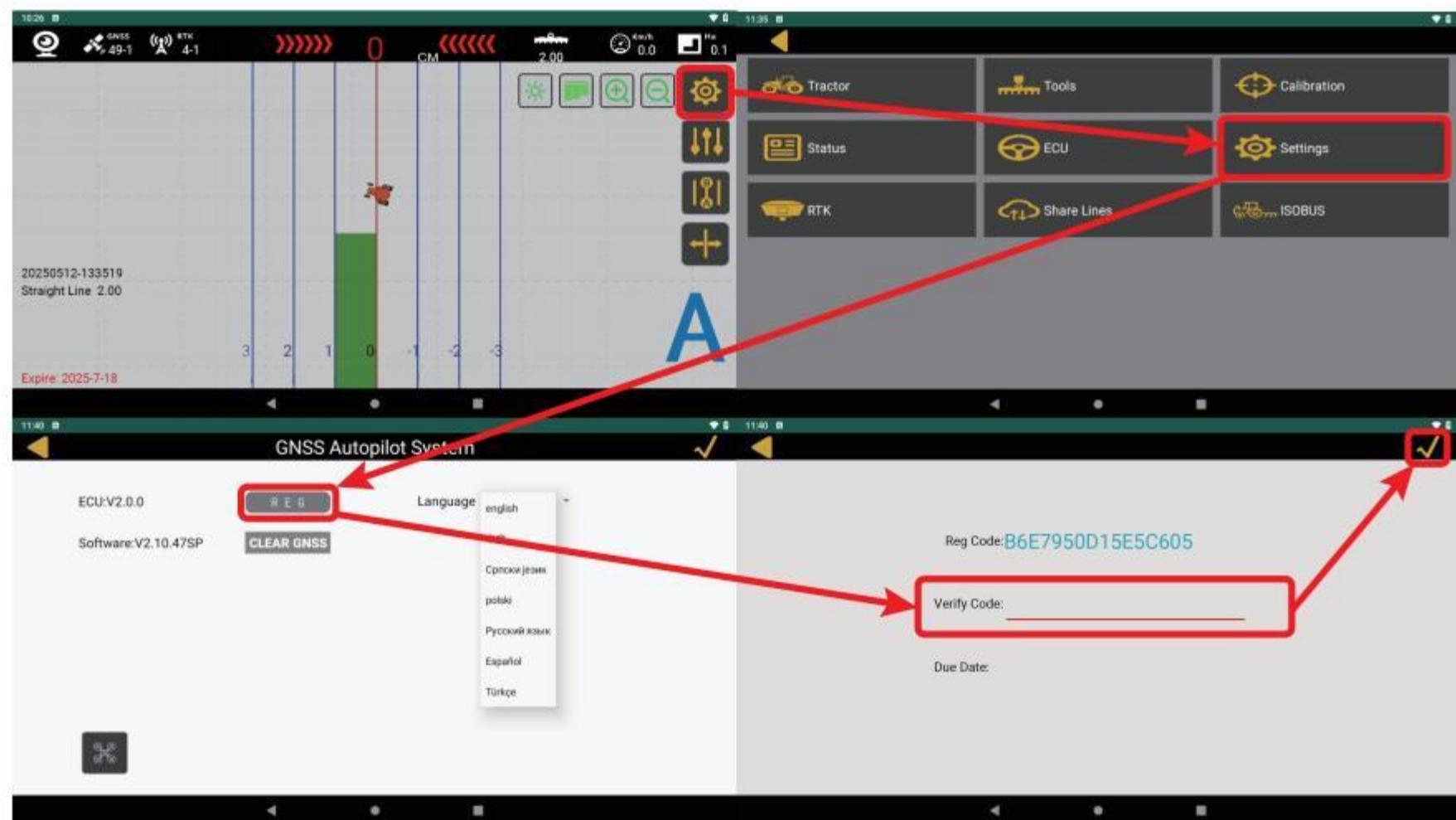


- (1) Software and ECU version numbers;
- (2) Board reset button;
- (3) Software registration button;
- (4) Language switch.

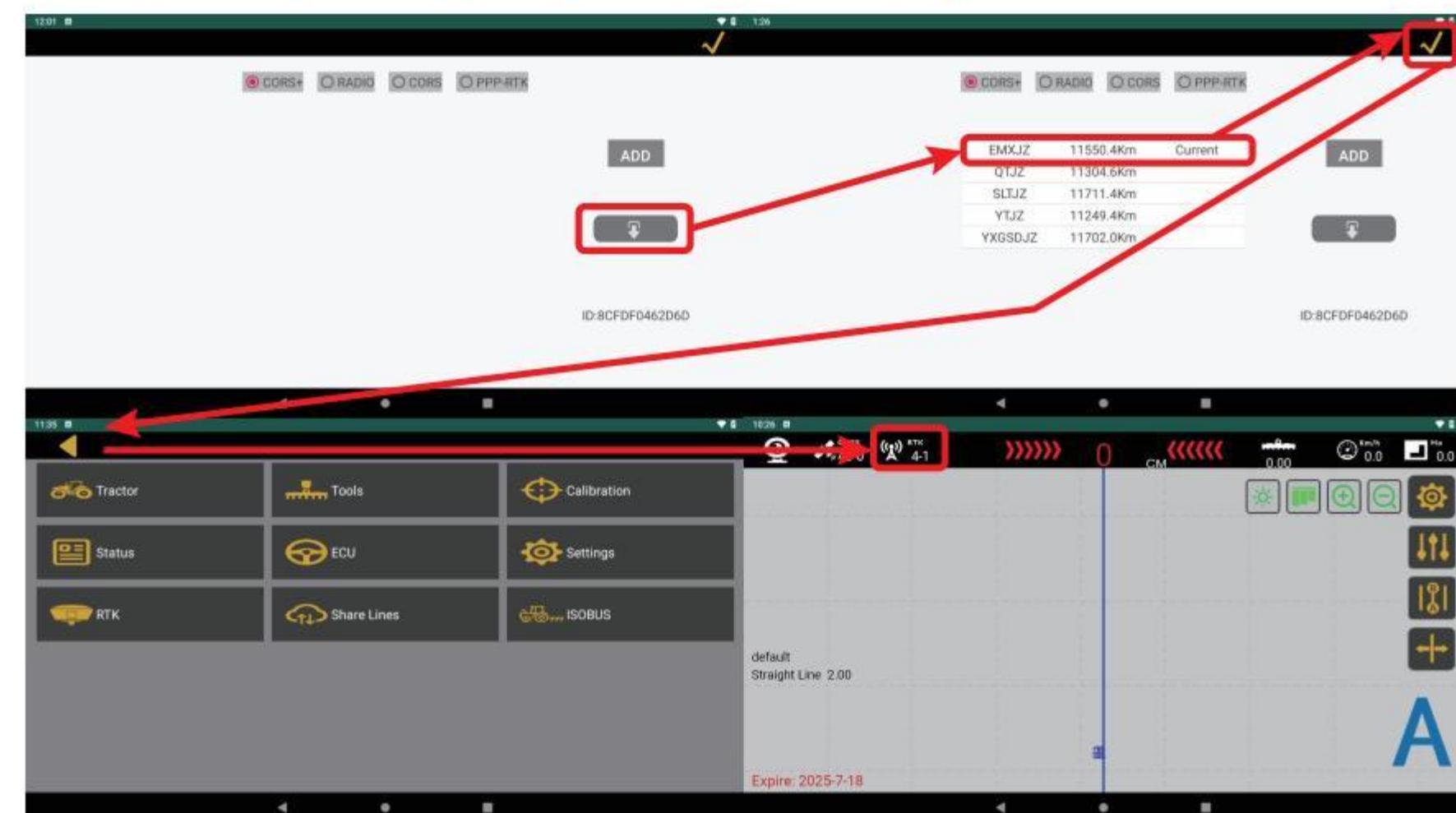
## 6. Software Workflow

### 6.1. Software Licence Activation

- (1) From the Home screen choose Settings.
- (2) Select Registration.
- (3) Enter the 20-character licence key supplied by your Spherefix distributor or technical support team.
- (4) Apply



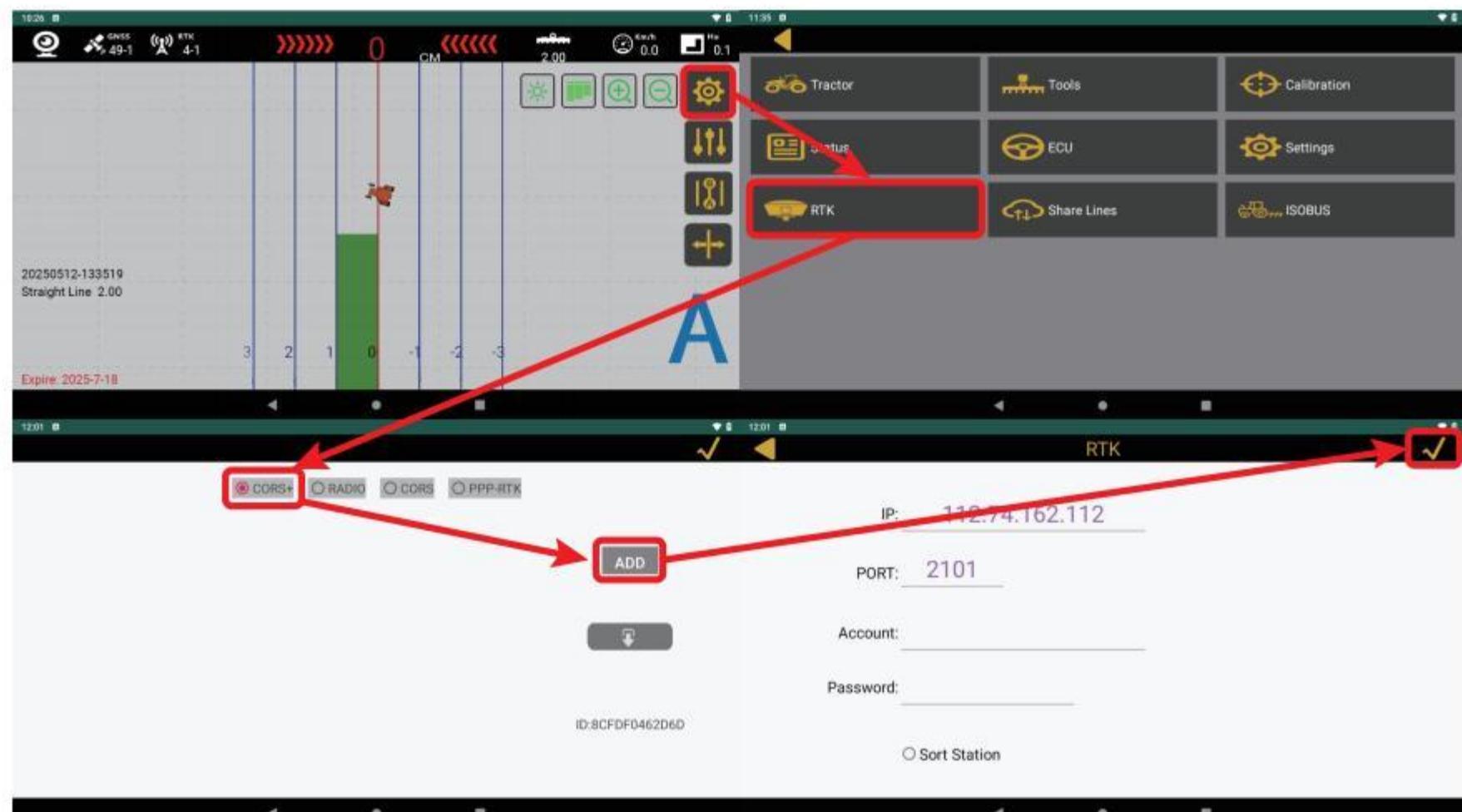
the status bar should read 4-X (with  $X \leq 3$ ).



## 6.2. Configuring Correction Sources

### (1) CORS+ Setup

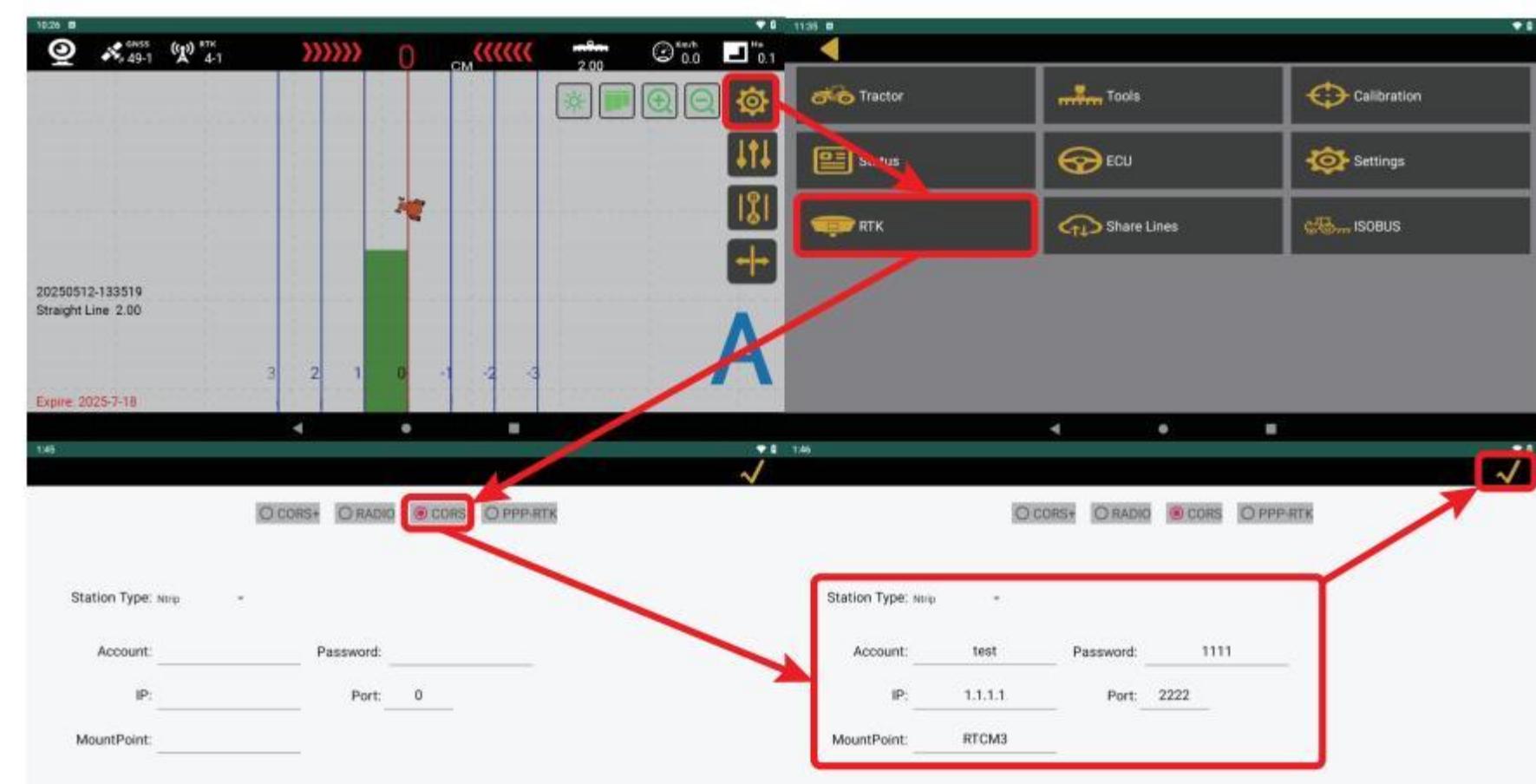
Home → Settings → RTK → CORS+ → ADD → verify the default parameters and tap Confirm without alteration.



Note: X indicates how many seconds have elapsed since the last differential packet arrived from the base station.

### (2) CORS Configuration

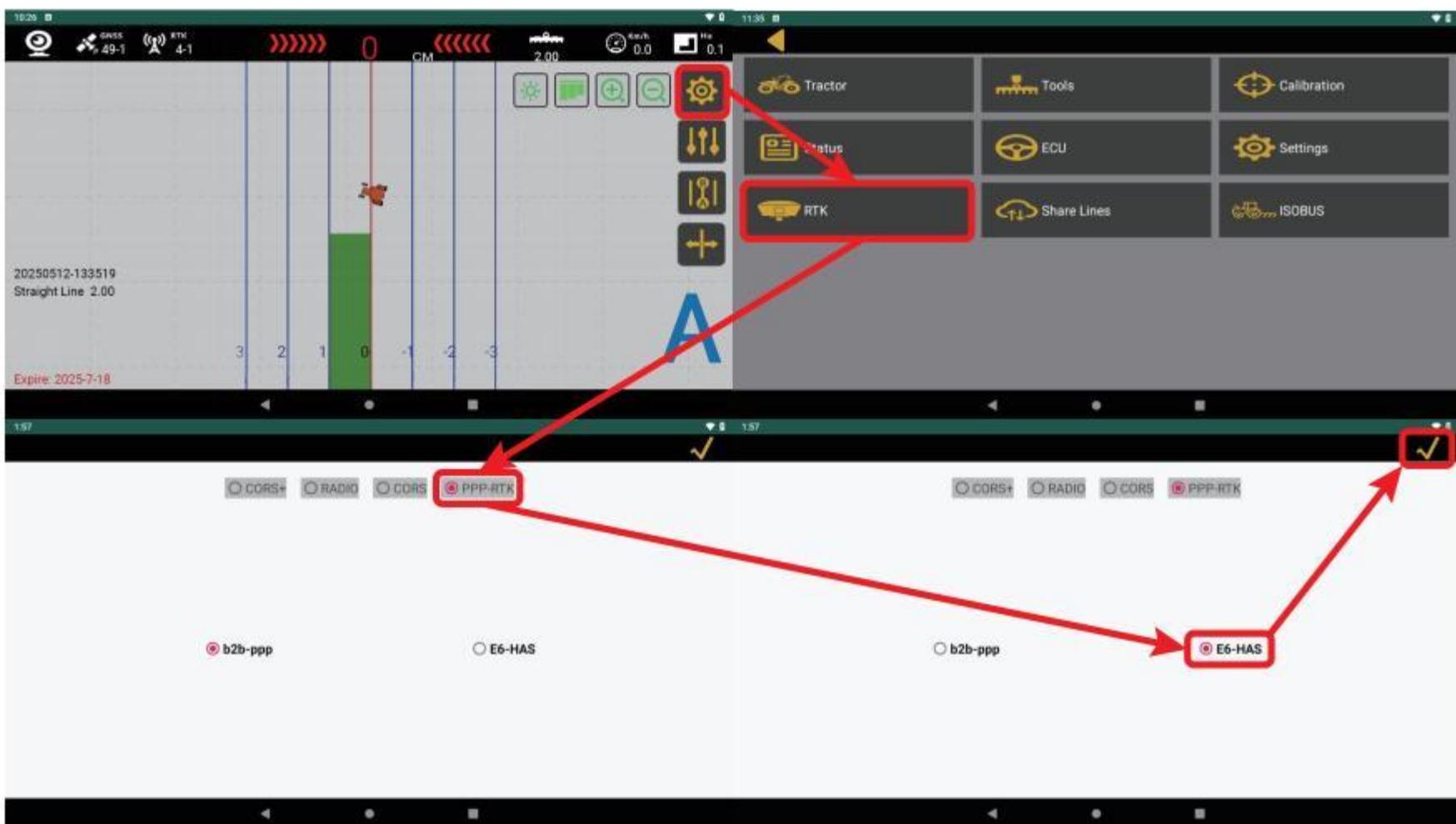
- ① Home → Settings → RTK → CORS.
- ② Input the server address, port number, username and password supplied by your CORS provider.
- ③ Tap Confirm.



Next, tap Refresh, choose the closest base-station mount point, and press Confirm. Return to the main screen;

### (3) PPP-RTK Configuration

- ① Home → Settings → RTK → PPP-RTK.
- ② Choose E6-HAS from the list of satellite-based services.
- ③ Tap Confirm.

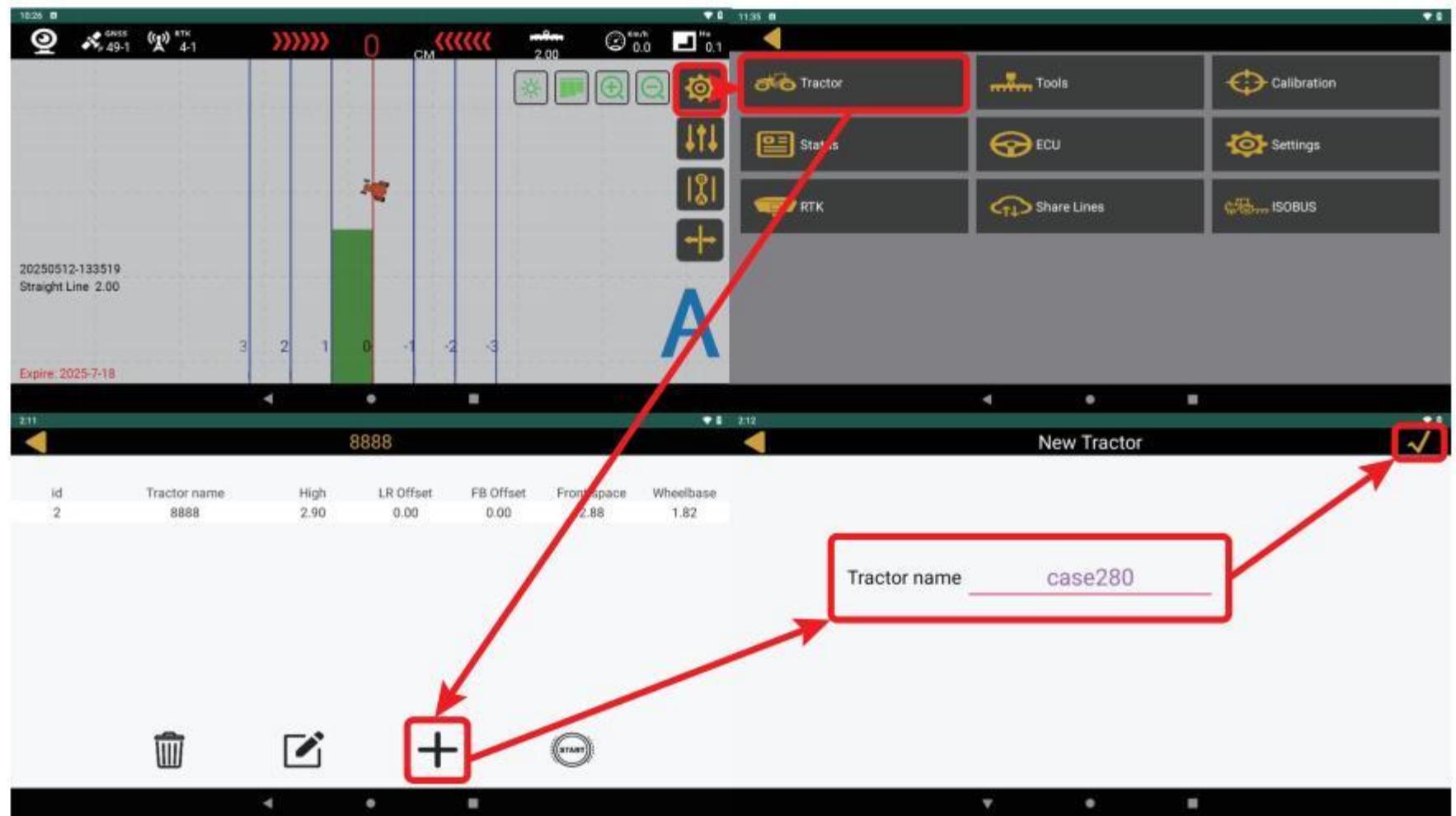


#### Notes:

- (1) Region-specific defaults: choose b2b-ppp when operating in Asia; use E6-HAS in all other regions.
- (2) PPP-RTK is a zero-cost, satellite-delivered service delivering about 10 cm accuracy.
- (3) Service interruptions may occur during operator-side optimization or constellation maintenance; Spherafix provides no advance notice for such events.

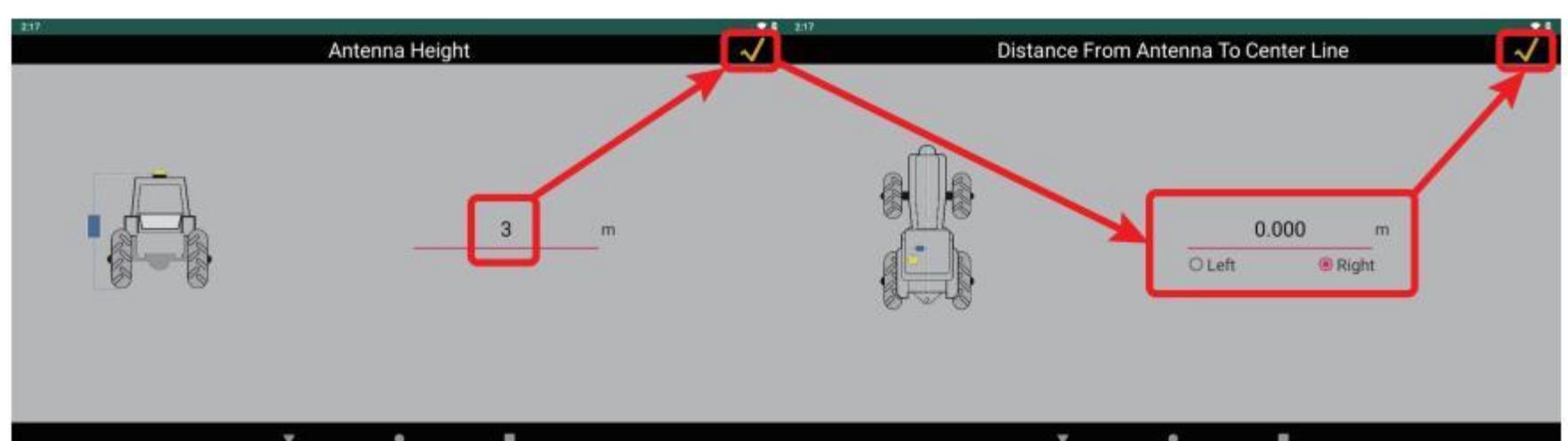
## 6.3. Vehicle Parameter Configuration

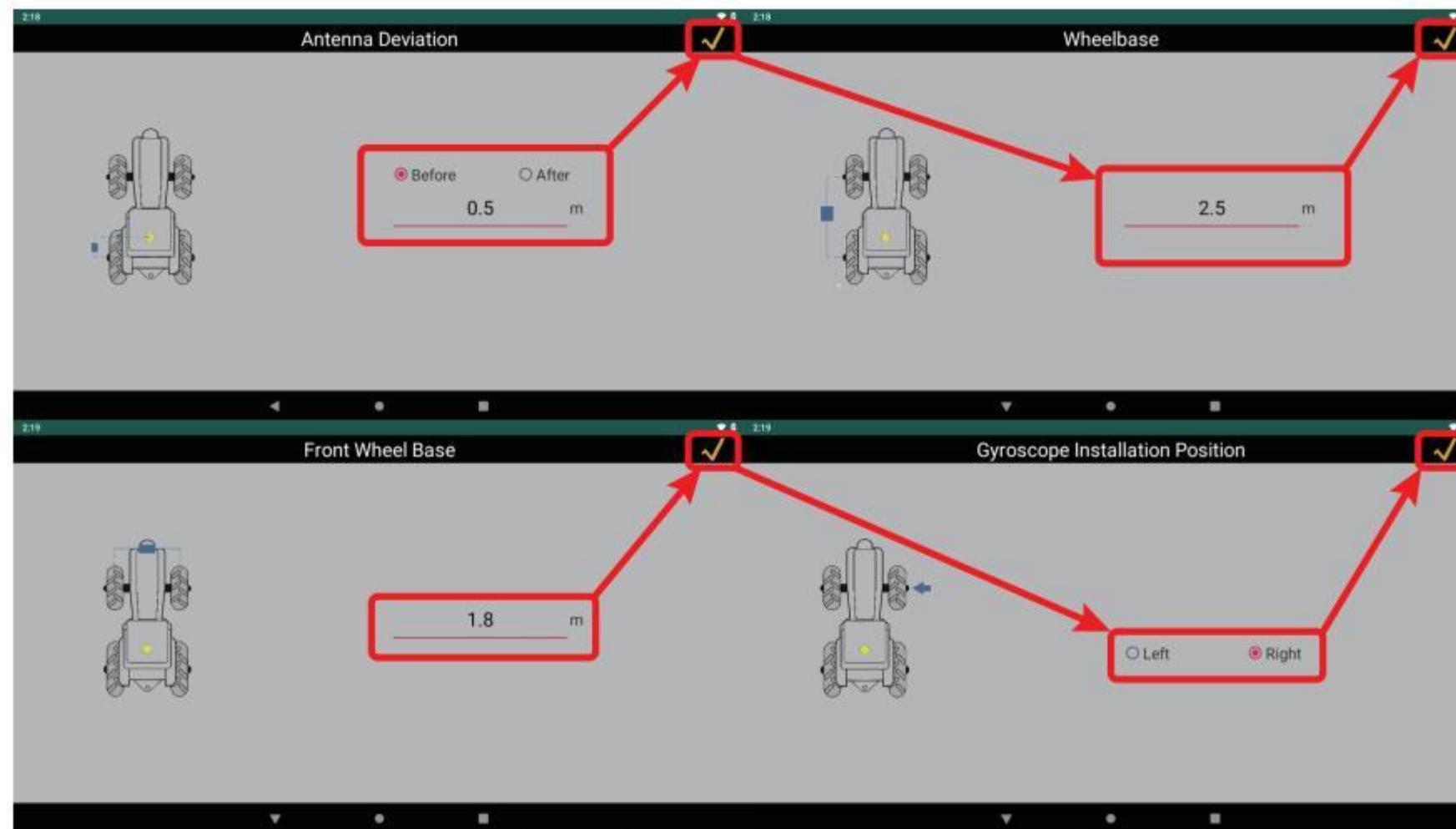
- ① From the main interface, open Settings → Tractor.
- ② Tap "+", enter a concise tractor name, then press Confirm to continue.



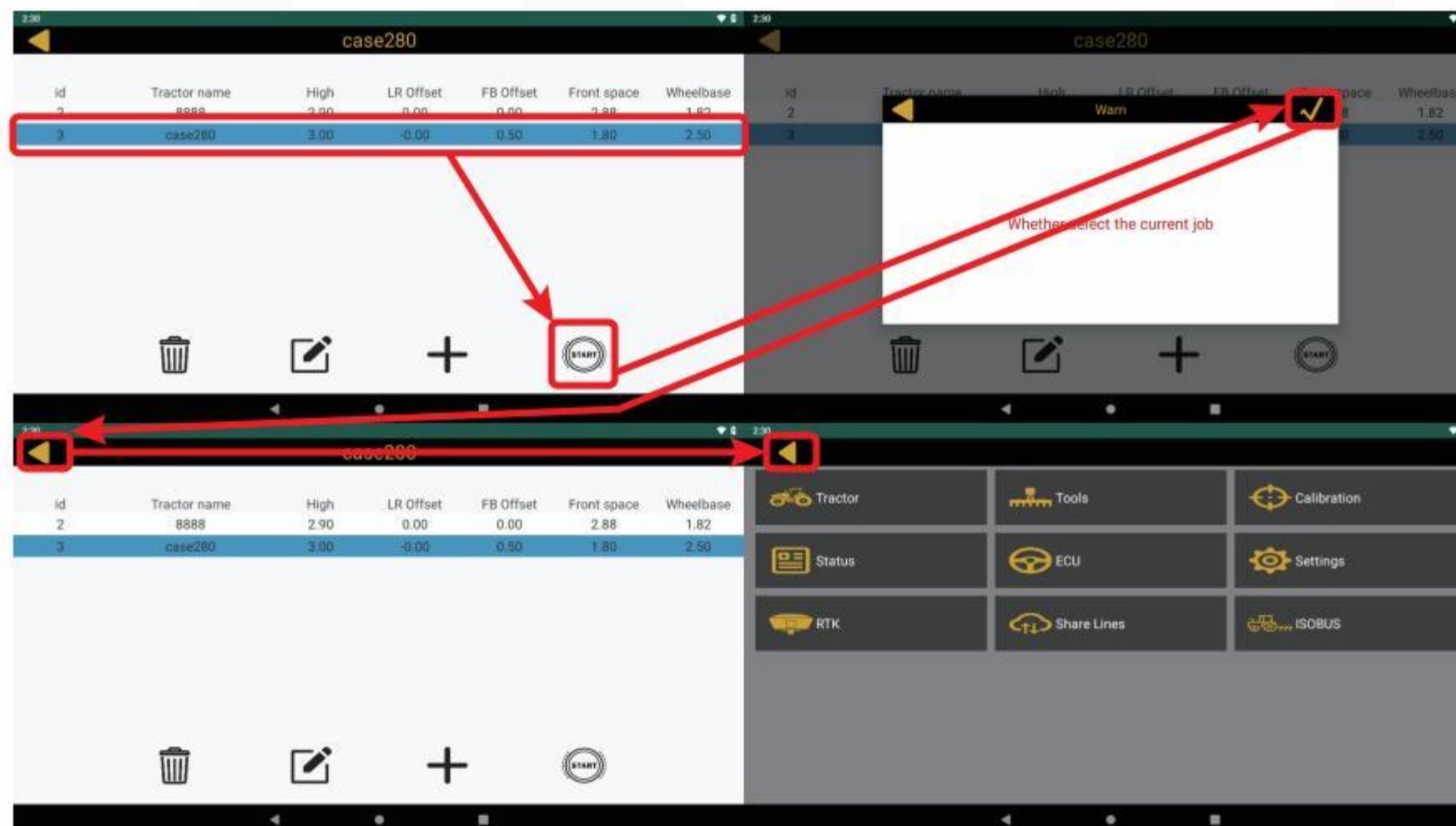
Continue by entering the following dimensions in sequence:

- Antenna height above ground
- Antenna lateral offset from the tractor's centerline
- Antenna longitudinal offset from rear-axle centre
- Wheelbase (front axle centre to rear axle centre)
- Front track width
- IMU mounting location (default: right side when no front-axle IMU is present)
- Tap Confirm when all values are entered to advance to the next step.





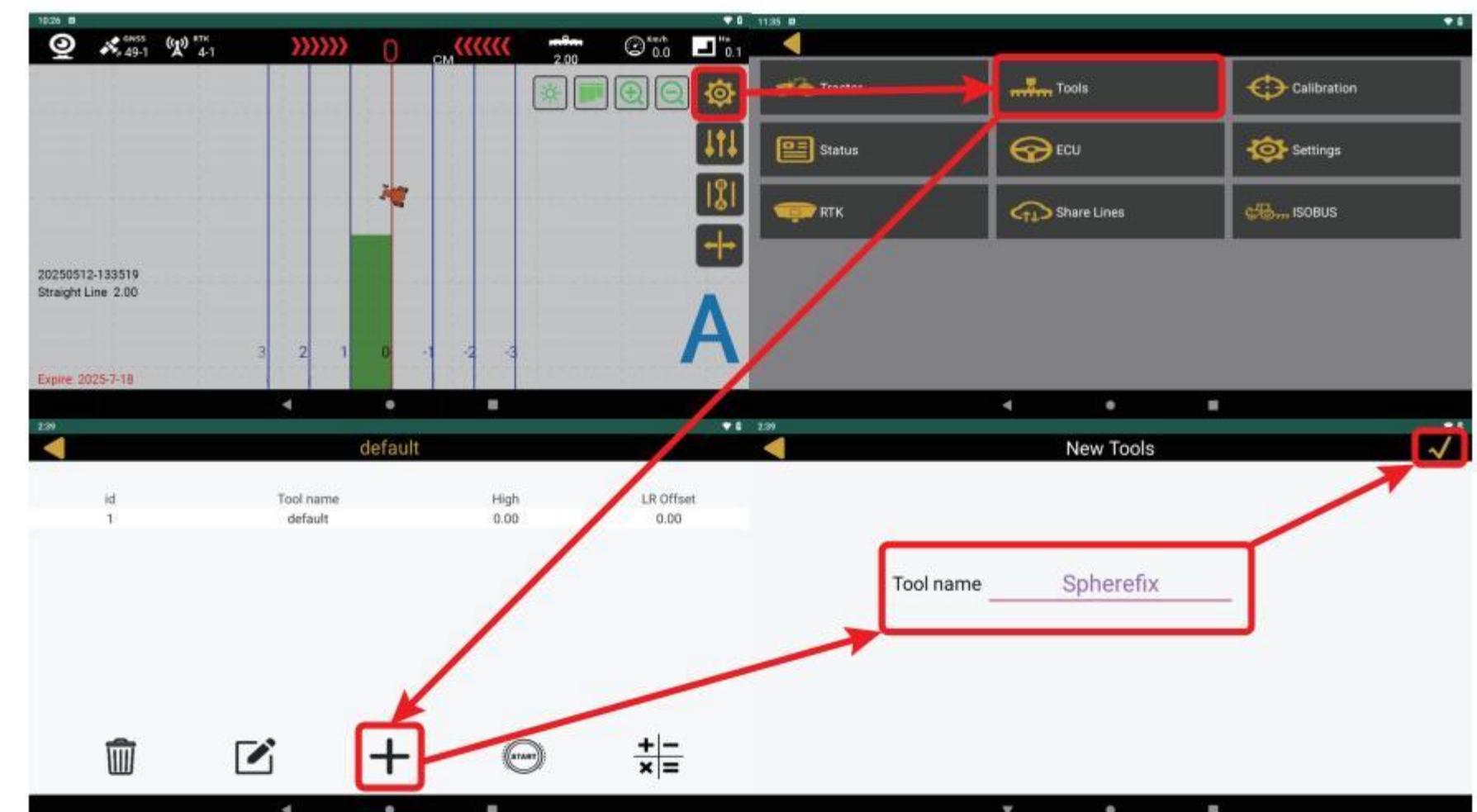
Select the tractor parameters → Tap START → Tap Confirm to use the newly added tractor parameter model → Tap Back to return to the menu → Tap Back to return to the main interface.



Note: Measure every dimension on the tractor itself and enter the exact values.

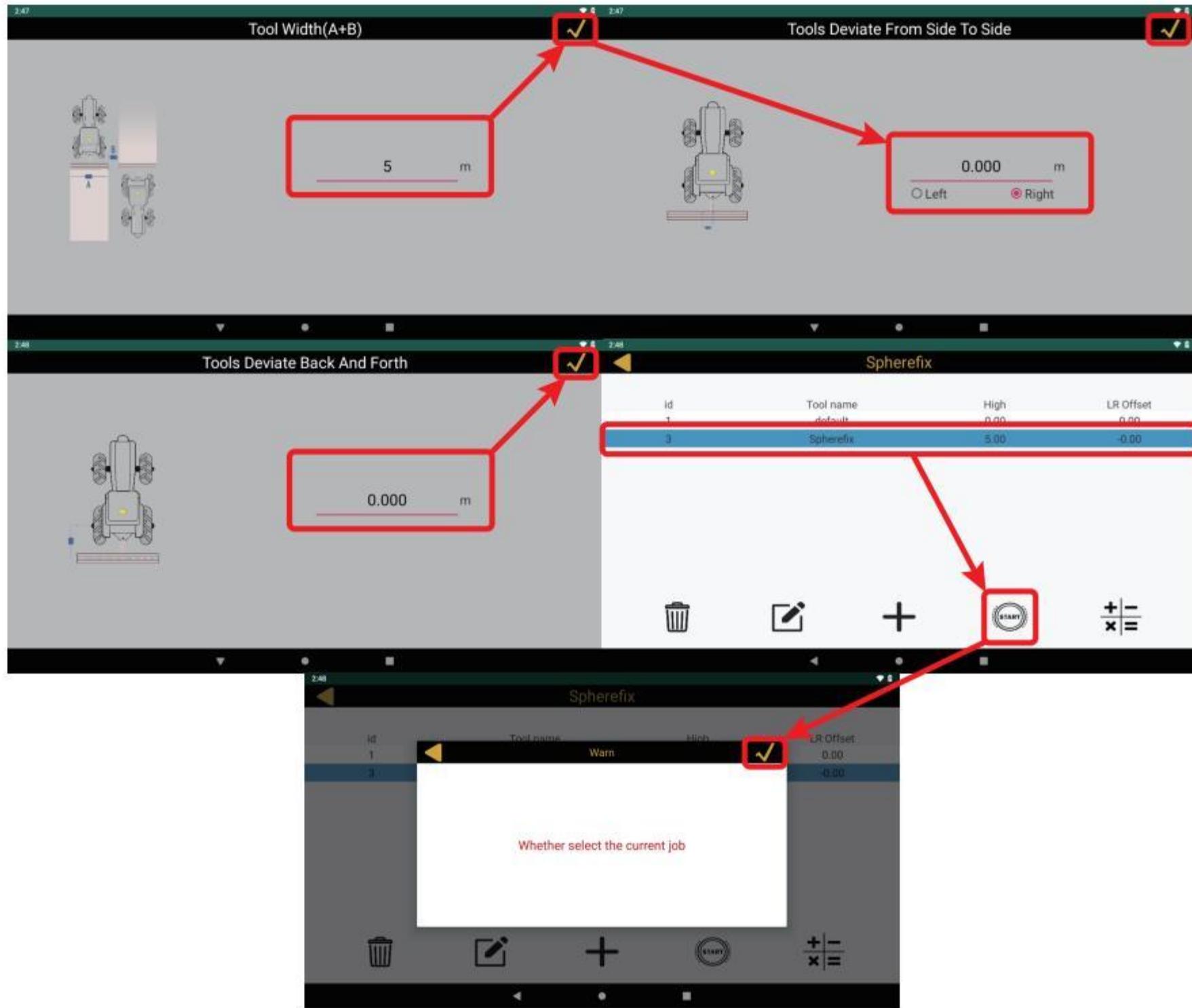
## 6.4. Implement Profile Setup

- ① From the main screen, open Settings → Tools
- ② Tap “+”, assign a clear implement name, then tap Confirm to continue.

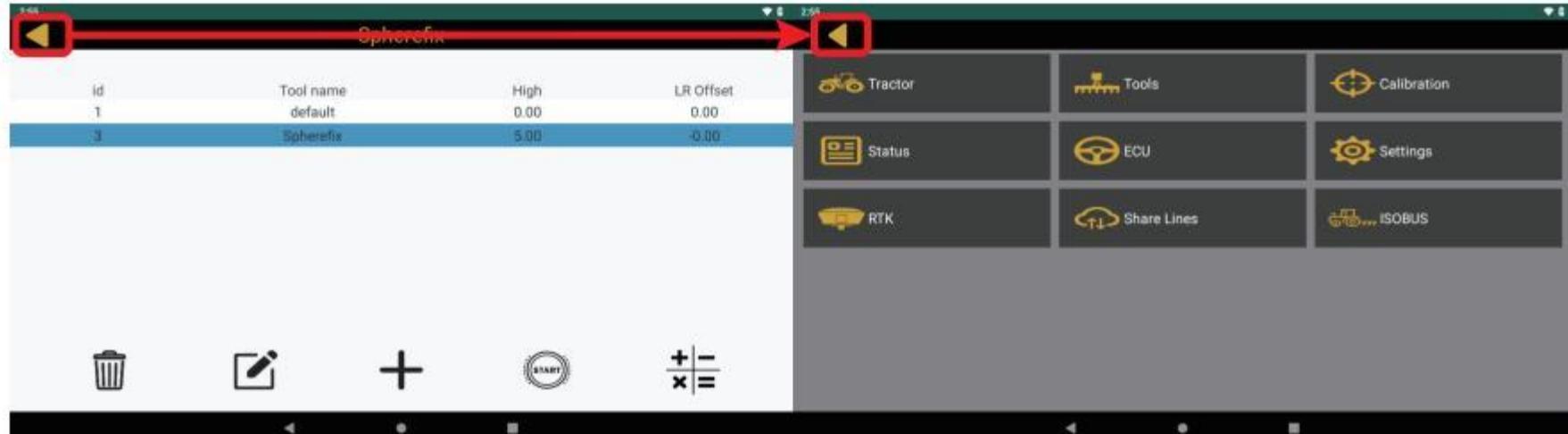


Proceed as follows:

- ① Input the Tool width (A + B) and tap Confirm.
- ② Enter the implement's lateral offset from the tractor centerline and tap Confirm.
- ③ Supply the distance from the rear-axle centre to the implement's effective working point (feature under continuous development) and tap Confirm.
- ④ Select the newly created tool profile, press START, then Confirm to commit the settings and exit the wizard.



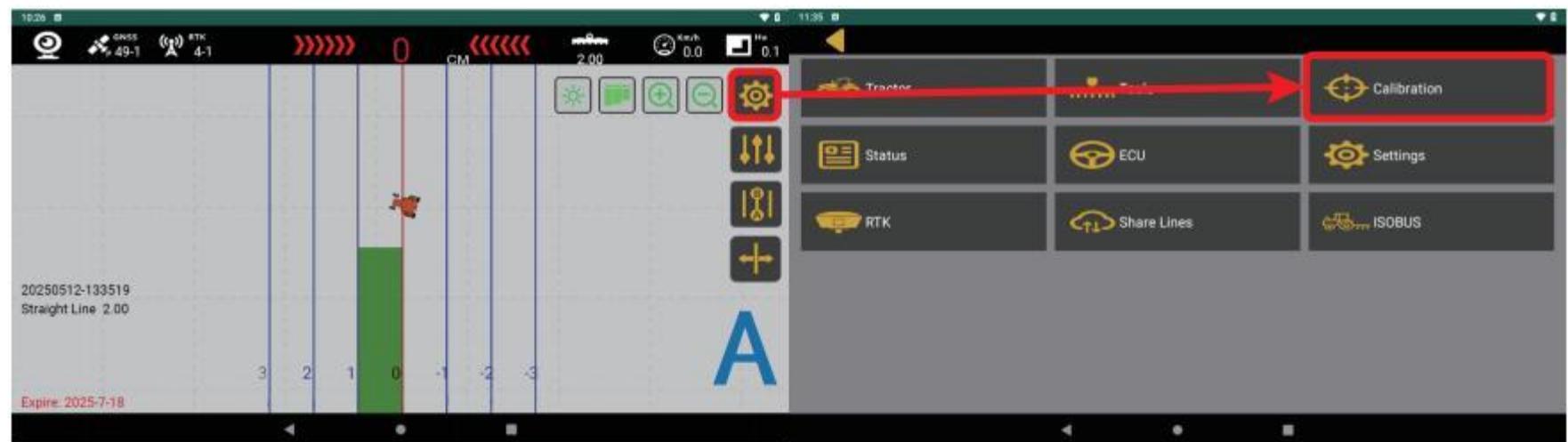
① Click Back to return to the menu interface  
 ② Click Back to return to the main interface.



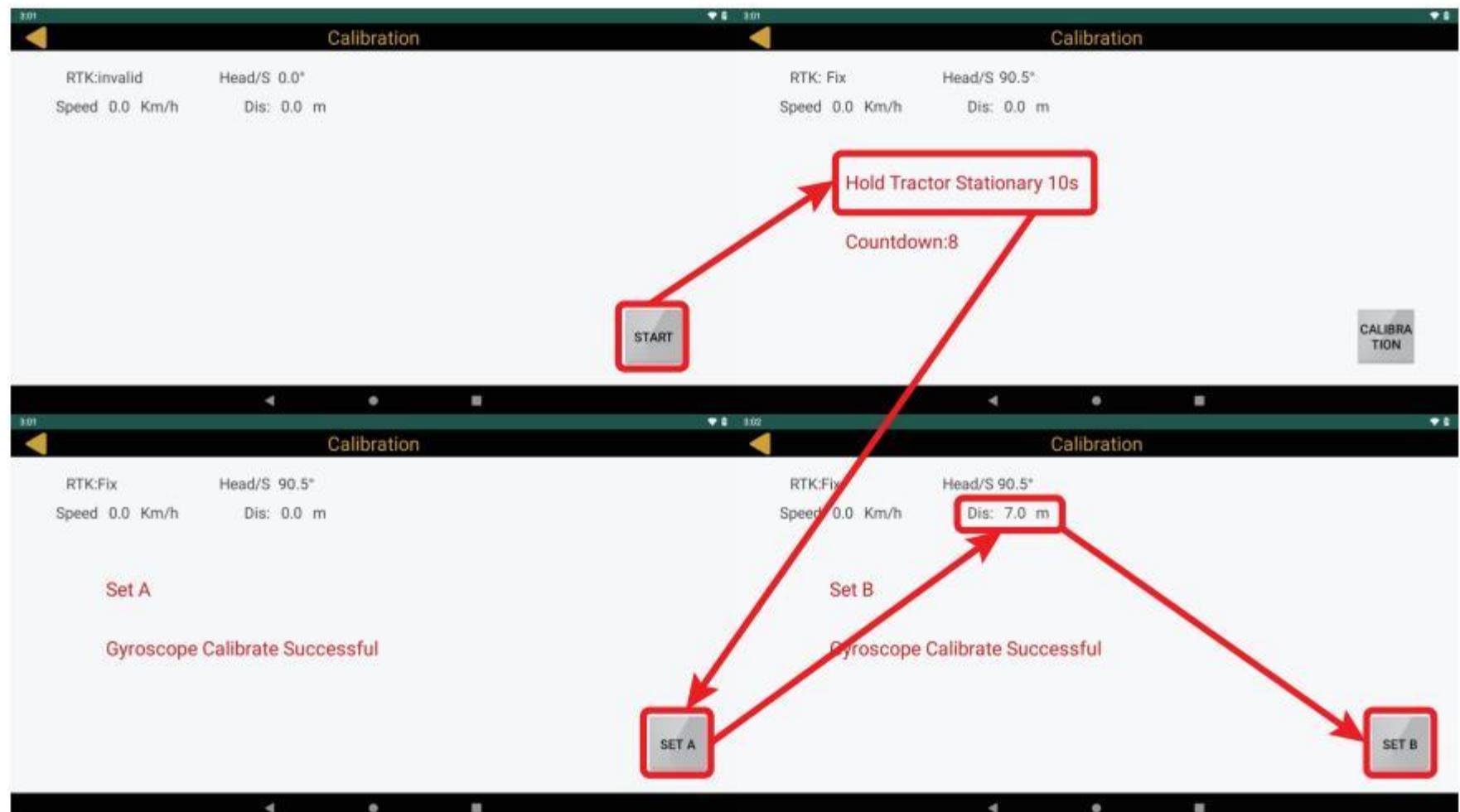
## 6.5. Vehicle Calibration

① Position the tractor on a level, straight path at least 50m in length and come to a complete stop.

② From the main interface, open Settings → Tap Calibration to enter the calibration wizard.

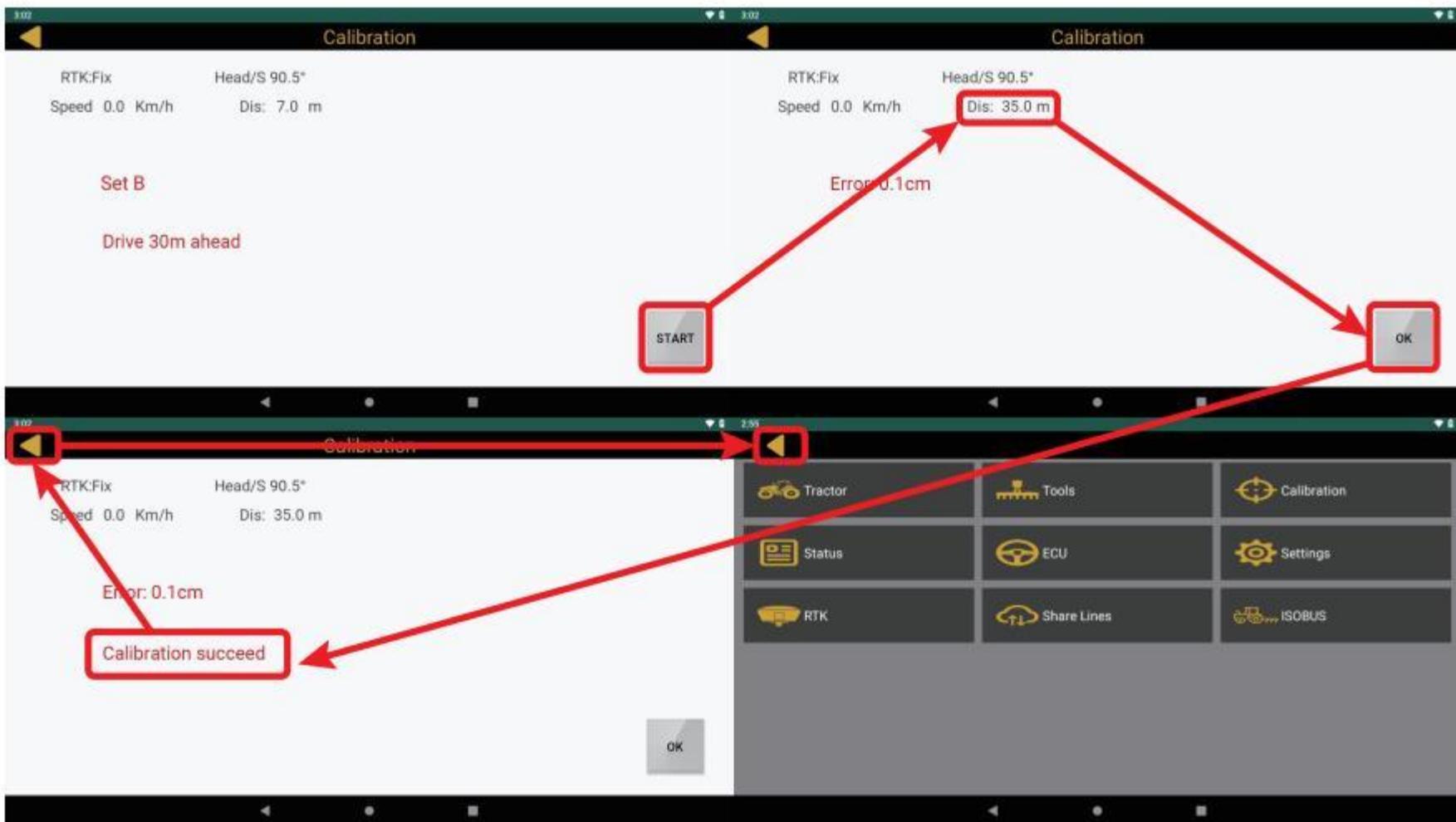


③ With the tractor at a standstill, tap START in the lower-right corner.  
 ④ After a 10-second countdown, SET A appears; press it, then manually drive straight ahead.  
 ⑤ Once you have travelled more than 5 m, SET B will appear—bring the tractor to a halt and tap SET B.



⑥ After pressing SET B, tap START, release the steering wheel, and let the tractor roll straight at roughly 5 km/h.  
 ⑦ When the covered distance exceeds 30 m, click OK and stop the vehicle. A "Calibration succeed" banner appears on the main interface.

⑧ Tap the back arrow twice to exit the wizard and return to the main interface.



## 6.6. Guidance Line Creation

- ① From the main interface, press New Job to open the job-configuration page.
- ② Tap “+” to enter the job editor.
- ③ Assign a job name, choose the desired guidance pattern, then hit Confirm to return to the map view.
- ④ Drive to the starting edge of the field and, when stationary, press A (lower-right corner) to record the first reference point.
- ⑤ Drive to the opposite headland and, once stationary, press B (lower-right corner) to record the second reference point.
- ⑥ With both points set and the tractor aligned, tap the steering-wheel icon to engage auto-steer and begin the automated pass.



- ⑦ Click the red button in the lower right corner to stop the operation.

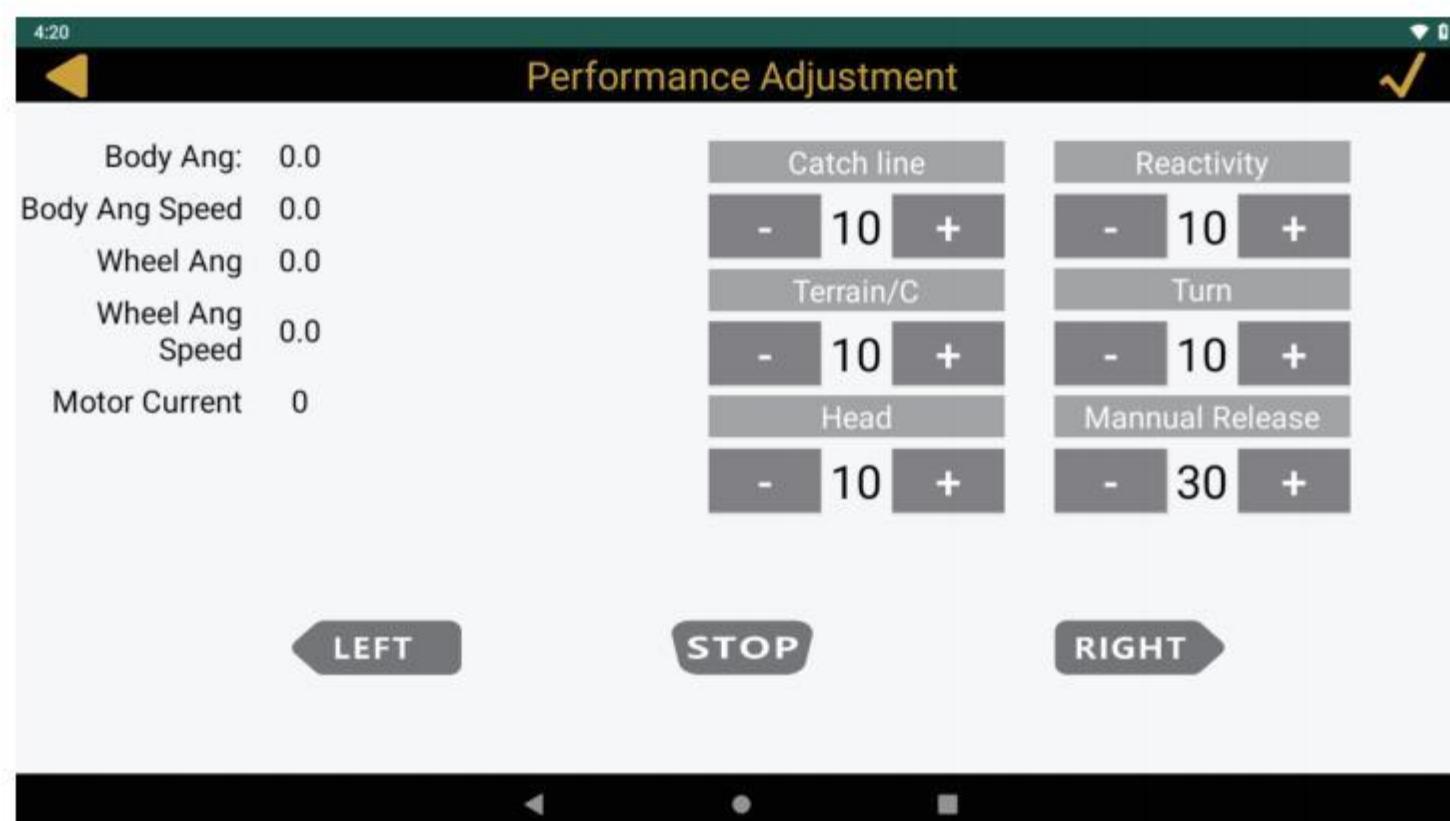


Note: When setting the navigation line, you need to set the coordinates at both ends of the plot. Do not set the coordinate points in the middle of the plot.



## 6.7. Equipment Parameter Debugging

This part is mainly responsible for fine-tuning the vehicle hardware (solving some differences caused by different tractors and unknown factors).



- (1) Catch line: governs aggressiveness when joining the guidance line; lower = gentler entry, range 0–20.
- (2) Reactivity: dictates how quickly the system corrects on-line drift; lower = slower response, range 0–20.
- (3) Terrain/C: counteracts side-hill drift; steeper slopes require lower values, range 0–20.

- (4) Turn: sets motor angular speed; lower = slower wheel movement, range 0–20.
- (5) Head: influences lateral-error recovery; lower = faster correction, range 0–20.
- (6) Manual Release: defines steering-wheel release torque; lower = lighter feel, range 0–30.
- (7) LEFT: momentary left motor jog for testing.
- (8) STOP: instant motor halt for safety checks.
- (9) RIGHT: momentary right motor jog for testing.

Note:

- ① Use the LEFT, STOP and RIGHT buttons to verify correct motor wiring and mechanical orientation.
- ② Set Manual Override within the recommended band; too low a value may allow the steering wheel to freewheel under load, too high a value can make manual takeover difficult.
- ③ If backlash is felt or wheel response is sluggish, raise the Turn sensitivity.
- ④ When cross-track corrections lag, increment Reactivity gradually.
- ⑤ At elevated ground speeds, excessive oscillation can be damped by increasing the Head (Heading Gain) value.

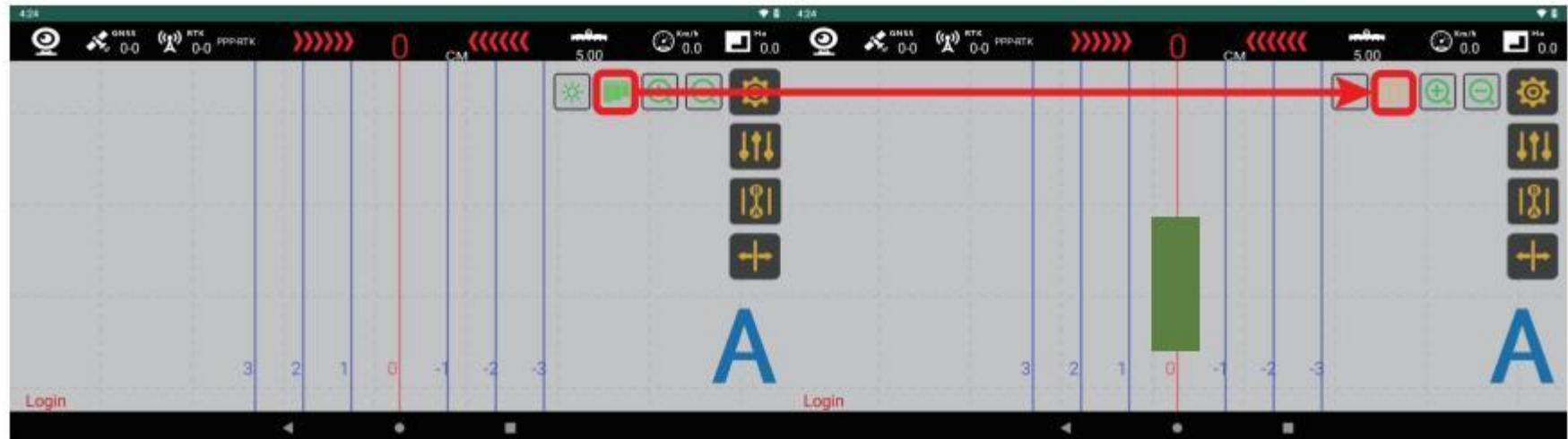
## 7. Other Features

### 7.1. Day/Night Mode Toggle



## 7.2. Coverage Pattern Toggle

Use this icon to enable or disable the on-screen coloured swaths that indicate treated and untreated areas.



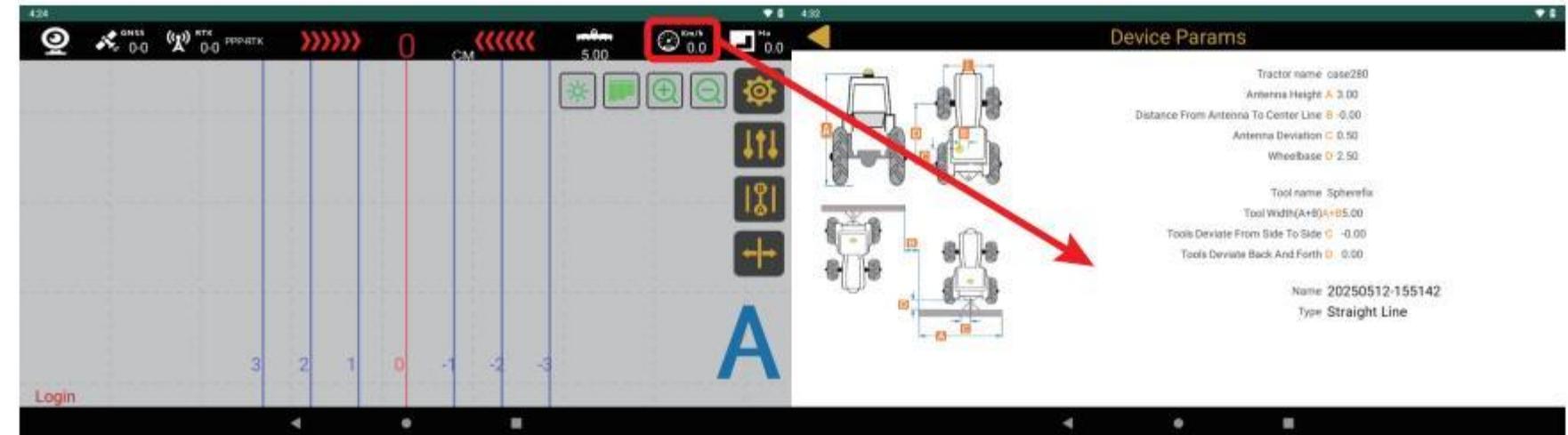
## 7.3. Scale Control

Use the on-screen +/– buttons to enlarge or reduce the map view to the desired magnification level.



## 7.4. Parameter Review

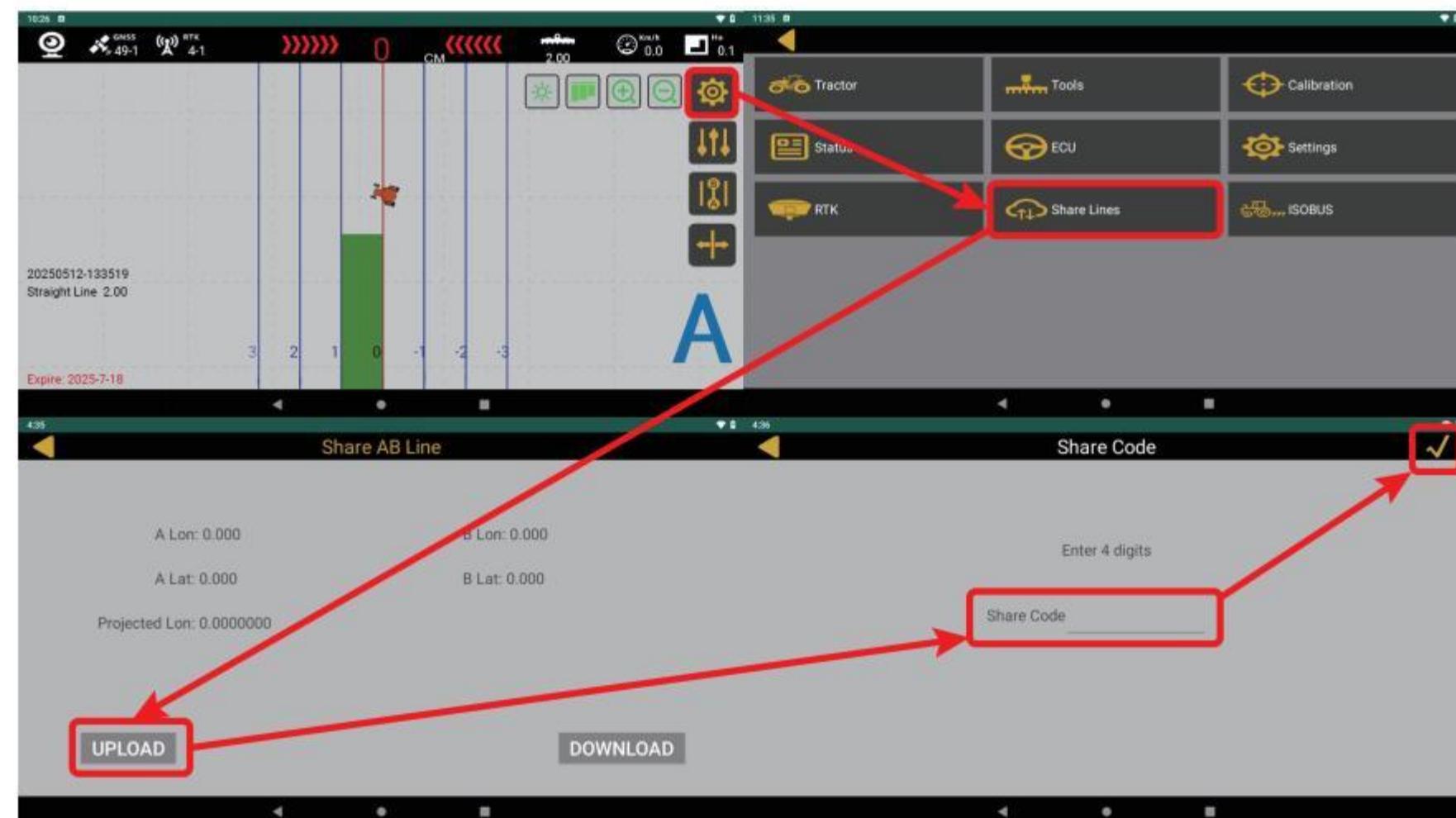
Tap the speed-information icon to display the current vehicle profile and implement settings in real time.



## 7.5. Guidance-Line Sharing

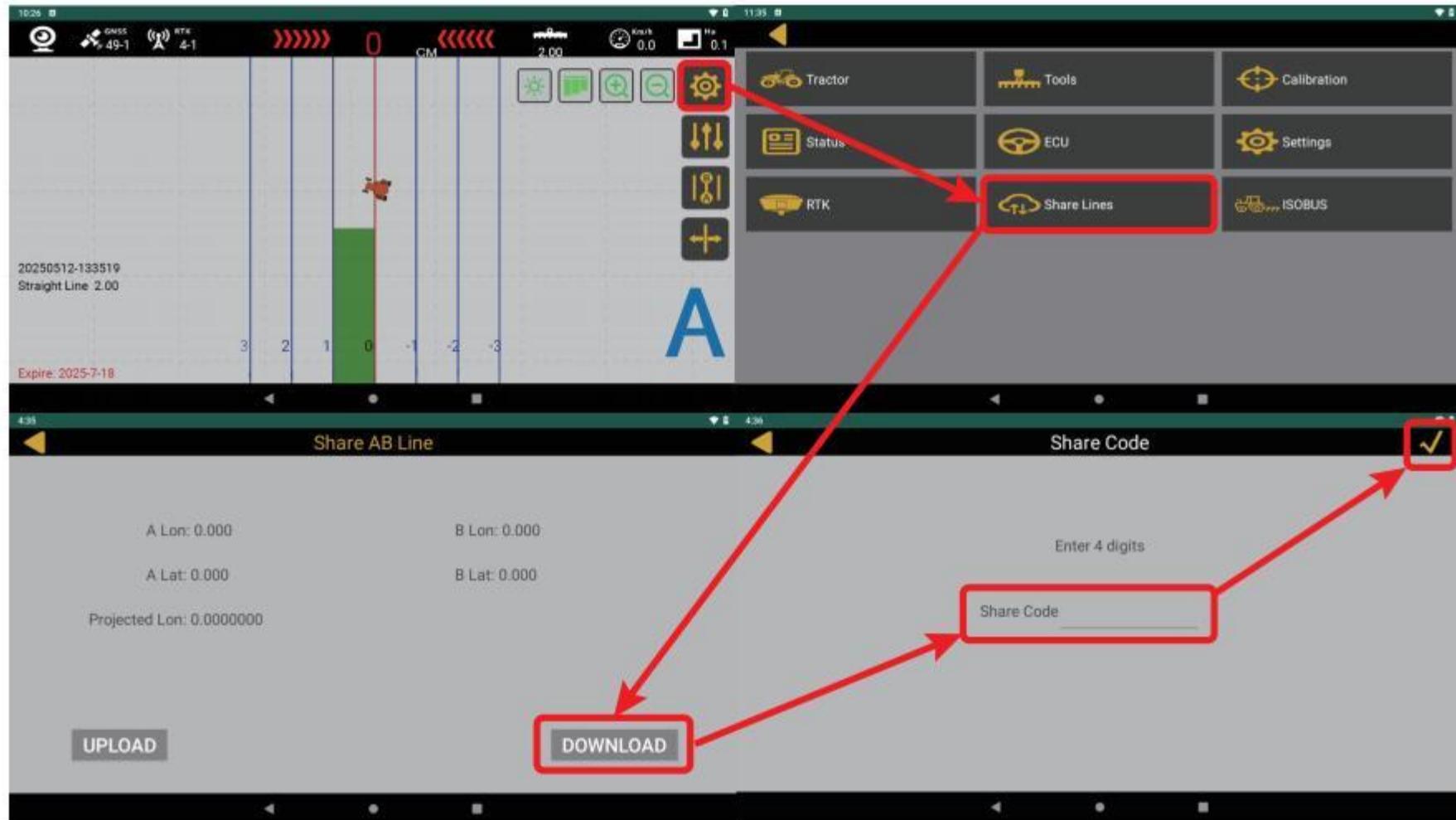
Uploading from the first device:

- ① Main Interface → Settings → Share Lines.
- ② Choose UPLOAD.
- ③ Enter a unique four-digit share code.
- ④ Tap Confirm.



Downloading to the second unit:

- ① Main Interface → Settings → Shared Line.
- ② Choose DOWNLOAD.
- ③ Key in the same four-digit share code provided by the first device.
- ④ Tap Confirm.



Note: Generate a new four-digit share code for each sharing session to prevent accidental overwrites and ensure data integrity.

## 7.6. U-TURN

(1) The SAG10 supports two U-turn strategies:

- ① Automatic
- ② Manual

(2) Guidance line setting

- ① From the Main Interface, tap New Operation to open the job screen;
- ② Select New Navigation Line to display the operation-mode list;
- ③ Choose U-Turn, enter a descriptive job name, and press Confirm; the map window will appear;
- ④ Drive the tractor to the first headland and, when stationary, press A to mark the start point.
- ⑤ Proceed to the opposite headland and press B to mark the end point—this completes the U-turn reference line.

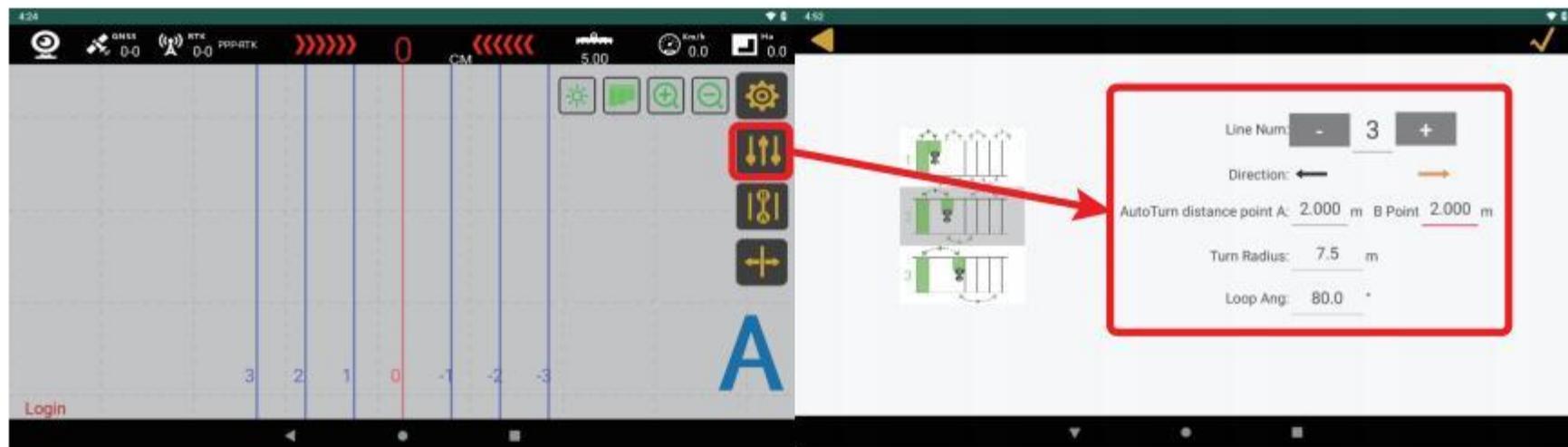


Note: When setting the navigation line, you need to set the coordinates at both ends of the plot. Do not set the coordinate points in the middle of the plot.

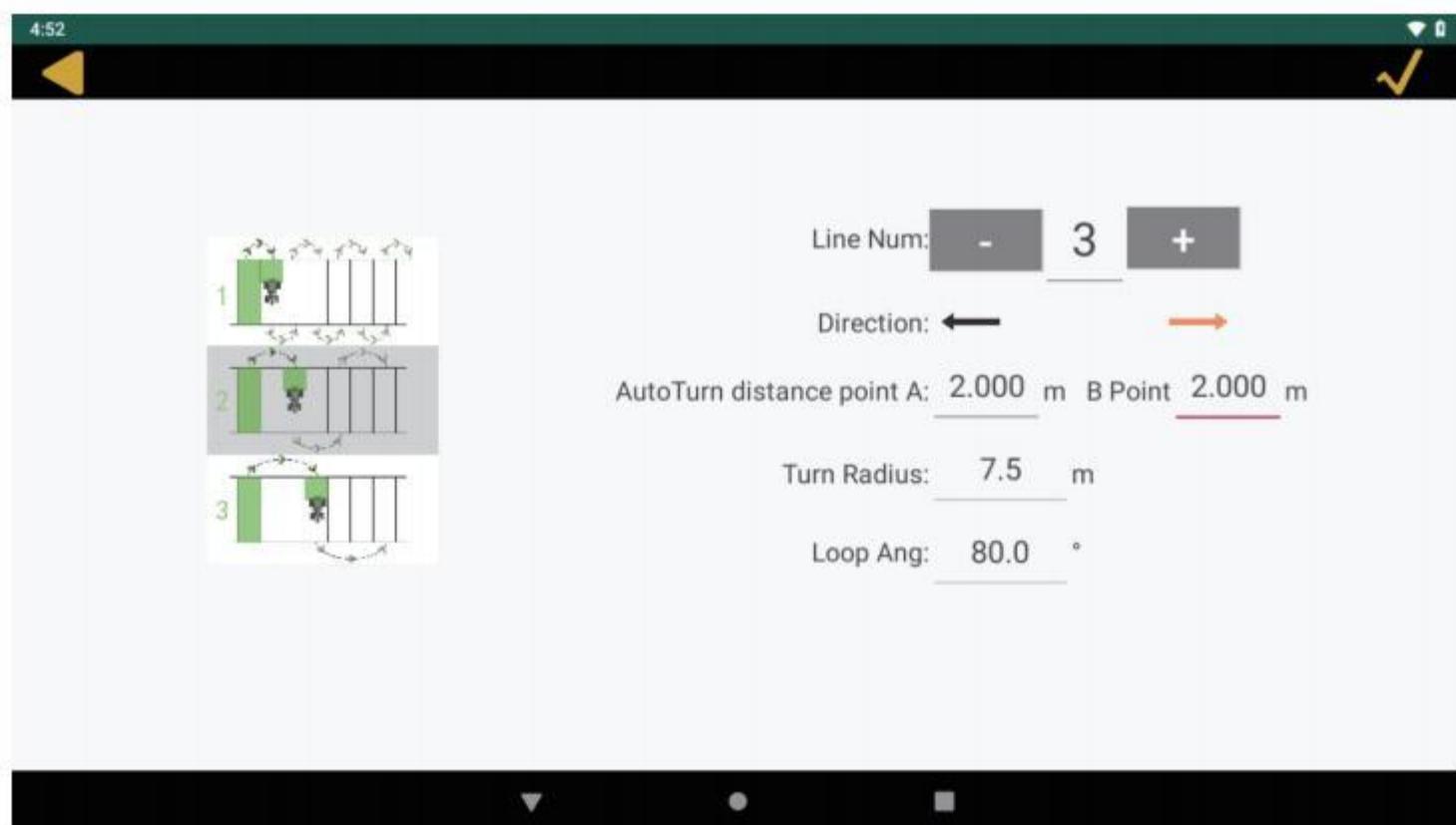


(3) U-turn parameter setting

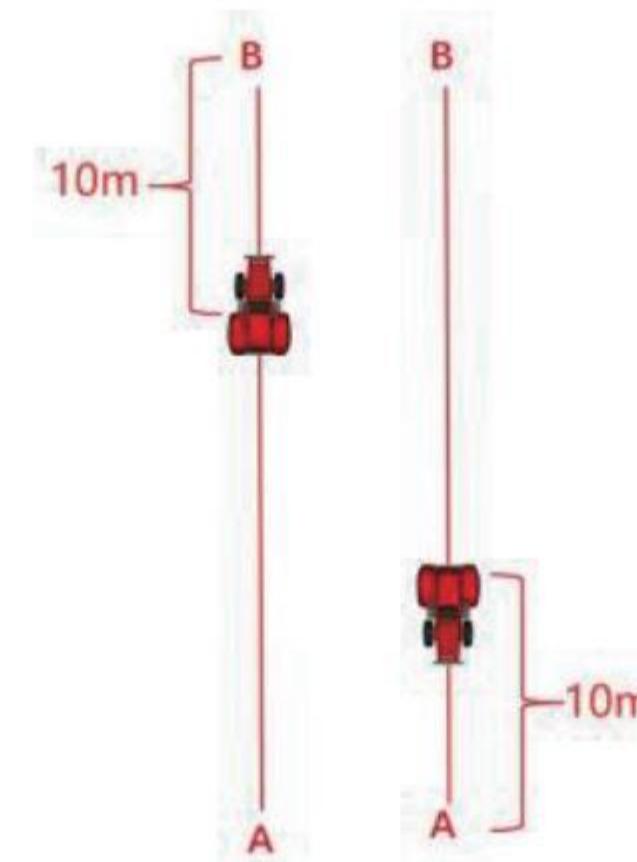
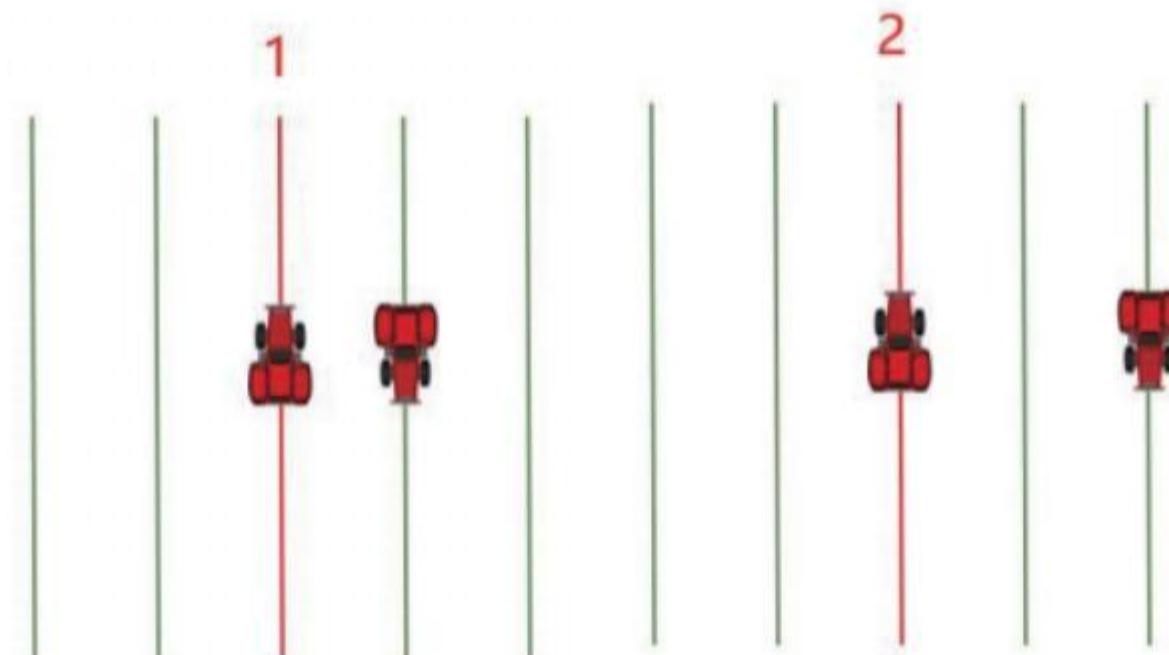
Once the U-turn line is defined, tap the U-Turn icon on the main screen to open the parameter window.



Parameter setting interface introduction:



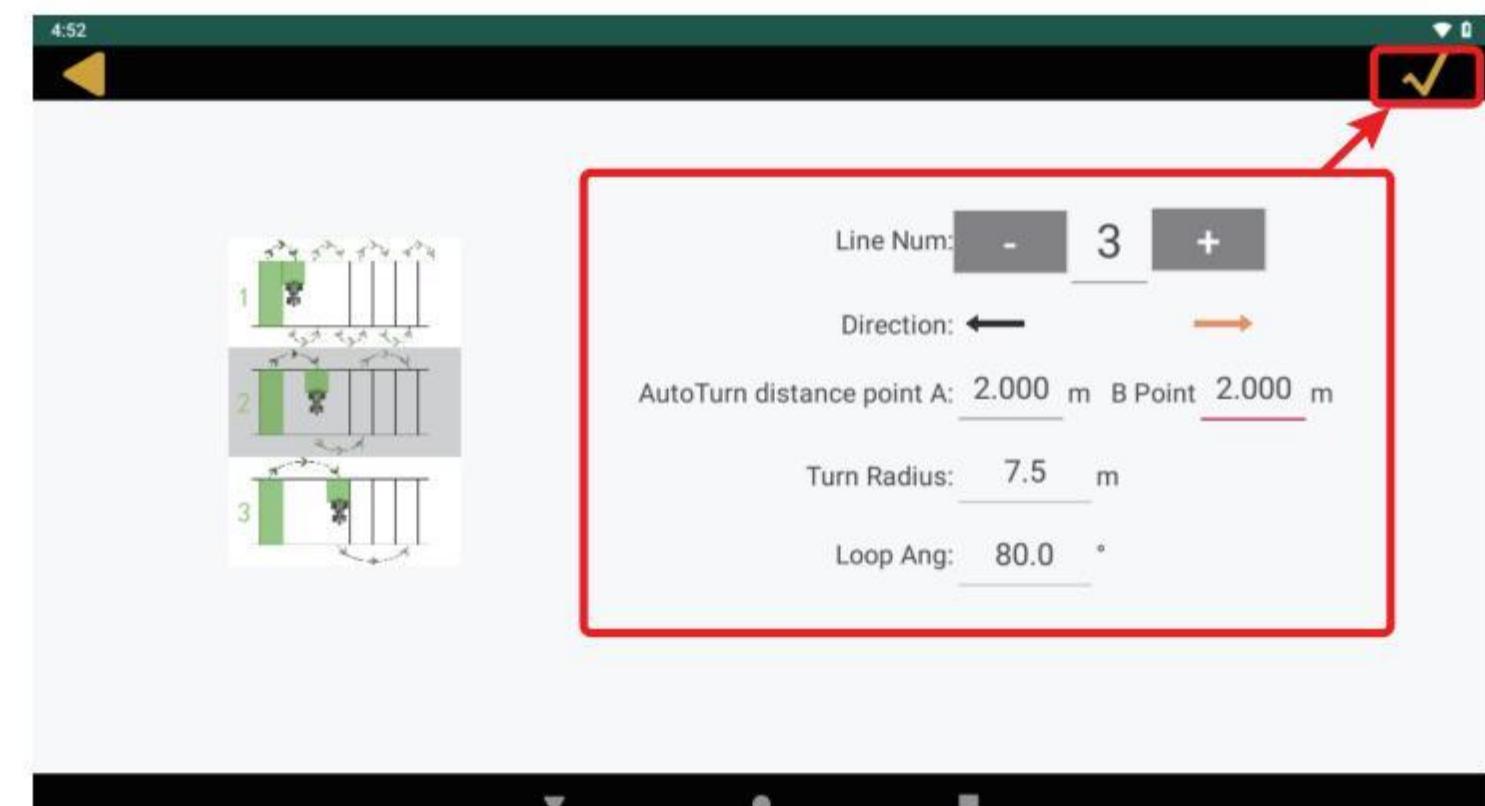
Line Num: selects the guidance line the tractor will re-enter after completing the U-turn.

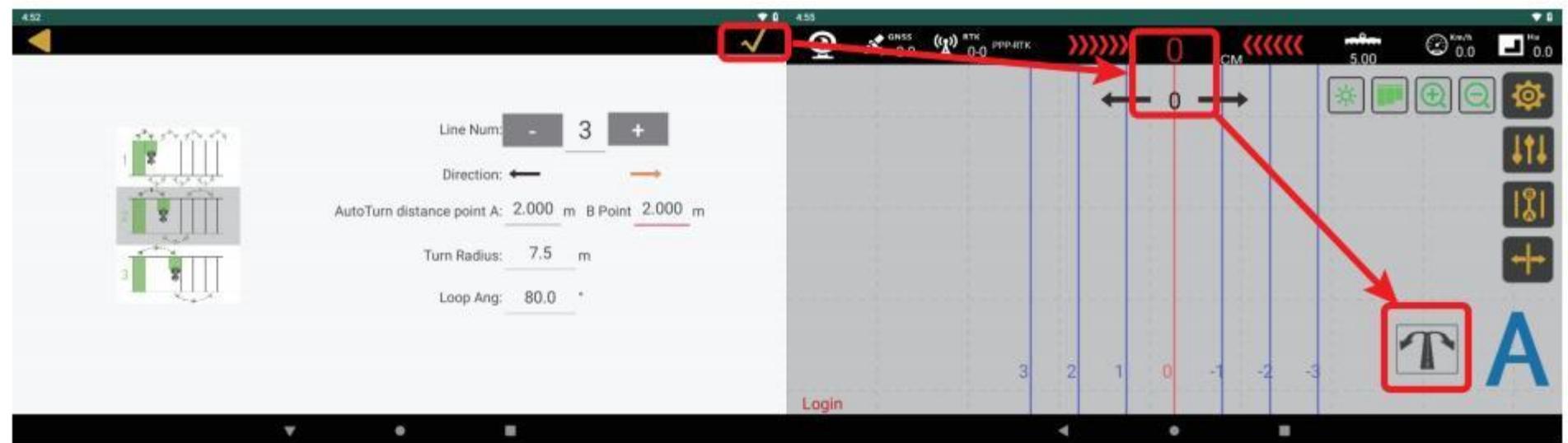


Turn Radius: the programmed radius for the U-turn arc; adjust to match tractor and implement geometry.

#### (4) Mode Selection

- ① Automatic – once all U-turn parameters are set, press OK to begin the fully automated operation.
- ② Manual – after pressing OK, return to the main screen. If you wish to take control, tap the highlighted turn zone to reveal and activate the Manual steering button.





## 8. Specification

### 8.1. Tablet Display

#### 8.1.1. Introduction

The SAG10 vehicle-mounted computer is built around an industrial-grade core that hosts dual RS-232 ports, one RS-485 channel, and two CAN buses (fully supporting J1939, CANopen, and ISO 15765). A CVBS camera input, native ISOBUS-VT compatibility, and a high-speed communication backplane let the same unit plug straight into any VT-capable machine. The result is a single, compact platform ready for precision-ag, construction, transport, mining, or warehouse applications with minimal integration effort.

#### 8.1.2. Technical Features

- (1) Powerful, stable and reliable automotive-grade processor.
- (2) Designed in accordance with industrial standards, complies with IP67 requirements, and is suitable for harsh outdoor environments.
- (3) Equipped with a high-performance quad-core processor, 1.2 GHz main frequency, 2 GB RAM, 16 GB ROM.
- (4) Rich communication interfaces meet a variety of application needs, including CANBus, Serial, etc.

- (5) Waterproof USB data interface allows direct plug-and-play.
- (6) Wide-range power input 6–36 V DC; the system does not restart during vehicle ignition and incorporates over-current, over-voltage and other protection functions.
- (7) Compact fan-less design, rational internal layout, effective heat dissipation.
- (8) Easy to install, compatible with RAM and other vehicular brackets.
- (9) 10.1-inch capacitive touchscreen, supports multi-touch, 1024 × 600 resolution, 750 nits brightness, clearly readable in strong sunlight.
- (10) Operating system: Android 6.0.1.

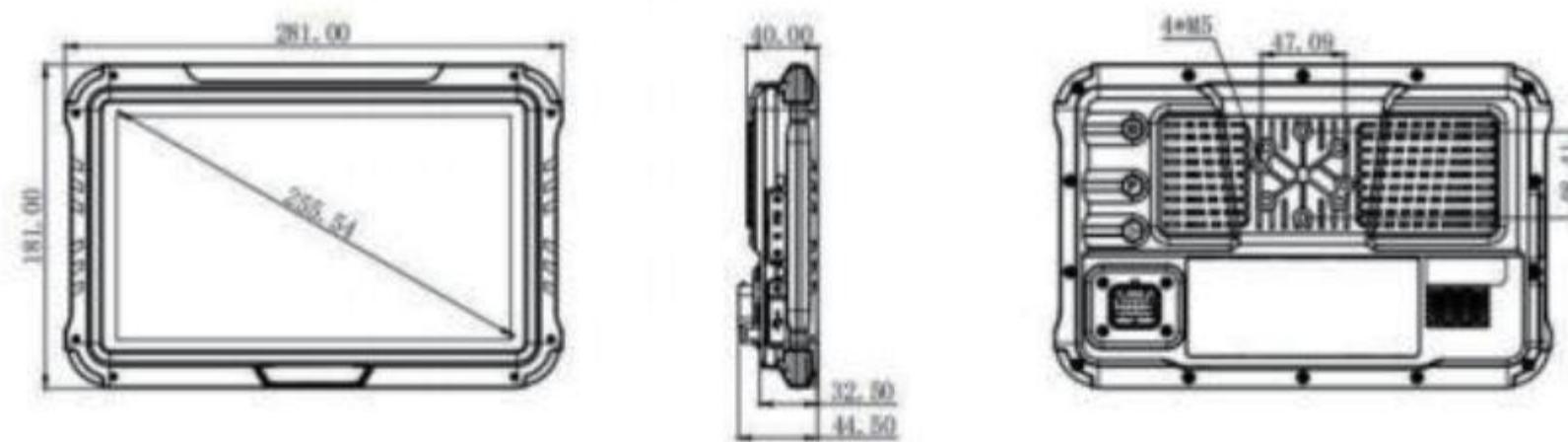
#### 8.1.3. Technical Parameters

Steering wheel	Quad-core, 1.2GHz 2G RAM 16G ROM Android 6.0.1
Display	10.1", 1024*600px, 750cd/ m <sup>2</sup> 5-Point Capacitive Multi-touch Screen
Communication	2.4GHz Wifi, IEEE 802. 11 b/g/n BT 4.0, BLE 4G/LTE Built-in Speaker
I/O Interface	RS-232*2 RS-485*1 CAN*2 (Supports J1939, CANopen, ISO15765) DI*2, DO*3 USB 2.0*1 CVBS Camera*1 12V DC OUT*1

Power Management	9-36V DC Input Ignition Control
Rugged Feature	IP65 Vibration & Shock: MIL-STD-810 Road Vehicle Standard: ISO16750 Humidity 95%, Non-condensing Operation Temperature: -20°C ~ +70°C Storage Temperature: -40°C ~ +85°C
Mechanical Spec	Dimension (W*H*D): 281*181*42mm Weight: 1.5kg
Button	Power Key*1, Function Key*2
Connector Type	Standard Industry Waterproof Connector (26pin)

6	OUTPUT1	19	RJ45-RX-
7	OUTPUT2	20	RS232-RX1
8	GND	21	GPIO-INPUT1
9	RS485-A	22	CAMERA-0
10	RS485-B	23	CAMERA-PWR-12V
11	CAN2-H	24	RS232-TX2
12	CAN2-L	25	RJ45-TX+
13	OUTPUT3	26	RJ45-TX+

### 8.1.5. Dimensional drawing



#### 8.1.4. Interface Definition



Amphenol-26	Pin	Amphenol-26	Pin
1	B+	14	RS232-TX1
2	B1-	15	GPIO-INPUT2
3	ACC	16	CAMERA-1
4	CAN1-H	17	RS232-RX2
5	CAN1-L	18	RJ45-TX-

## 8.2. Driving Motor

### 8.2.1. Introduction

The SAG10 steering actuator integrates drive and control in a single, compact unit that delivers high torque while keeping weight and size to a minimum. It communicates over CAN or RS-232 and supports both position- and speed-control modes, making it the core steering component of the SAG10 Autonomous Steering System.

### 8.2.2. Technical Features

- (1) Runs quietly with minimal heat build-up.
- (2) Designed for zero routine maintenance.

(3) IP65-rated, resisting dust and water ingress in demanding agricultural conditions.

(4) Unified drive-and-control architecture delivers a clean installation with fewer cables.

### 8.2.3. Technical Parameters

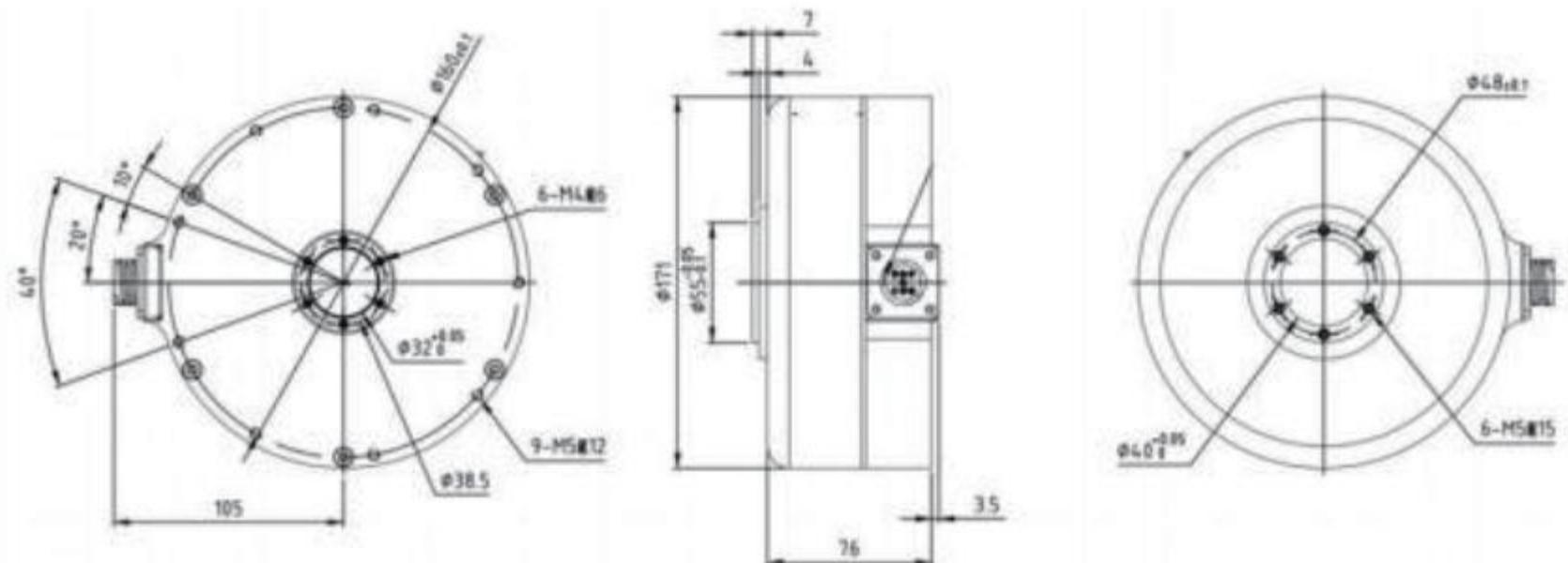
Electrical parameters	Voltage: 9-28V Rated power: 50W Rated current: 10A Undervoltage protection: 7V Overvoltage protection: 32V Instantaneous current: 20A
Physical properties	Rated torque: 7N*m Instantaneous torque: 13N*m Weight: <5kg Dimensions: 170mm*80mm Operating temperature:-25° ~ +55° Storage temperature: -35° ~ +65° Rated speed: 80rpm
Other	Communication: RS232/CAN Signal feedback: linear value encoder Protection level: IP65

### 8.2.4. Interface Definition



Aviation plug-7	Pin
1	IN+
2	IN-
3	TX
4	RX
5	GND
6	CAN-H
7	CAN-L

### 8.2.5. Dimensions



## 8.3. Smart Receiver

### 8.3.1. Introduction

The SAG10 Smart Receiver is a high-precision, all-in-one GNSS unit that integrates an advanced GNSS board, radio modem, high-accuracy IMU, and related modules. It is purpose-built for precision agriculture, construction equipment, and autonomous driving applications.

### 8.3.2. Technical Features

(1) Delivers centimetre-level accuracy with low power draw by tracking Beidou, GPS, GLONASS, Galileo and QZSS signals

across multiple frequencies for reliable performance in challenging environments.

- (2) Supports full-system, full-frequency RTK positioning and dual-antenna heading; optional single-Beidou operation is available.
- (3) Integrates a wireless modem compatible with transparent and TRIMTALK protocols, ensuring seamless interoperability with third-party GNSS radios.
- (4) Accepts 9–36 V DC input and includes reverse-polarity protection.
- (5) Compact, IP67-rated housing withstands dust and water ingress.
- (6) On-board high-precision gyroscope delivers accurate attitude data.
- (7) Uses industry-standard connectors for reliable data exchange.
- (8) Automatically recognises and processes RTCM differential corrections.

### 8.3.3. Technical Parameters

Signal tracking	<p>Channel: 1408 channels</p> <p>BDS B1I/B2I/B3I</p> <p>GPS L1C/A/L2P(Y)/L2C/L5</p> <p>GLONASS G1/G2</p> <p>Galileo E1/E5a/E5b</p> <p>QZSS L1/L2/L5</p> <p>Cold start time: &lt;30s</p> <p>Initialization time: &lt;5s (typical value)</p> <p>RTK initialization reliability: &gt;99.9%</p> <p>Recapture: &lt;1s</p>
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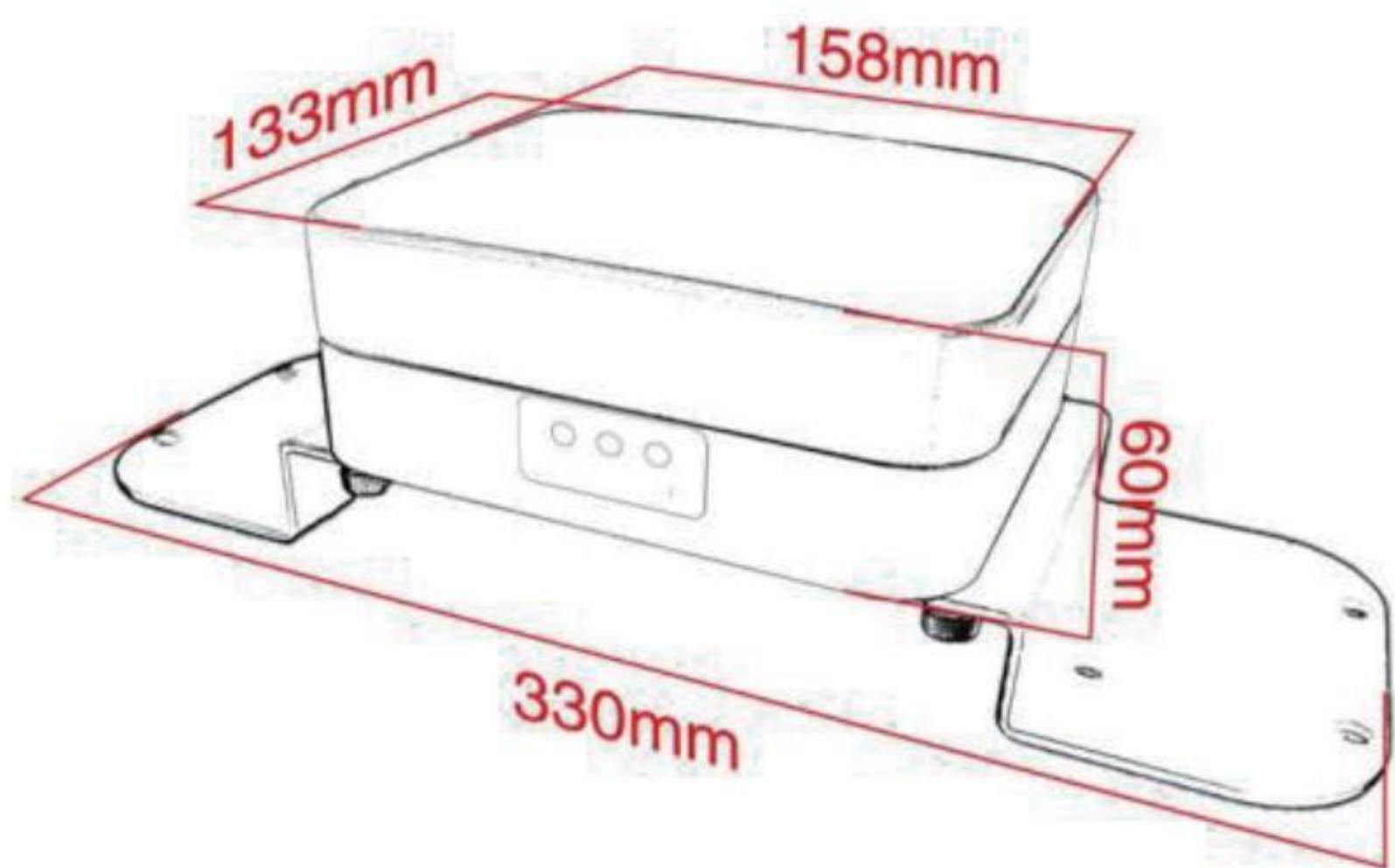
Accuracy index	<p>Single point positioning:</p> <p>Plane: 1.5m</p> <p>Elevation: 2.5m</p> <p>RTK accuracy:</p> <p>Plane: <math>\pm(8+1.0 \times 10^{-6} \times D)</math>mm</p> <p>Elevation: <math>\pm(15+1.0 \times 10^{-6} \times D)</math>mm</p> <p>Speed accuracy: 0.03m/s</p> <p>GNSS Heading accuracy: <math>(0.2/R)^\circ</math></p> <p>GNSS Roll / pitch accuracy: <math>(0.4/R)^\circ</math></p> <p>Gyro-GNSS fusion heading accuracy: 0.5°</p> <p>Angular velocity measurement range: <math>\pm 400^\circ/s</math></p> <p>Acceleration range: <math>\pm 8g</math></p> <p>Data update rate: 1~100Hz</p>
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Electrical parameters	<p>Power consumption: <math>\leq 4.0W</math></p> <p>Power supply voltage: 9~36VDC</p>
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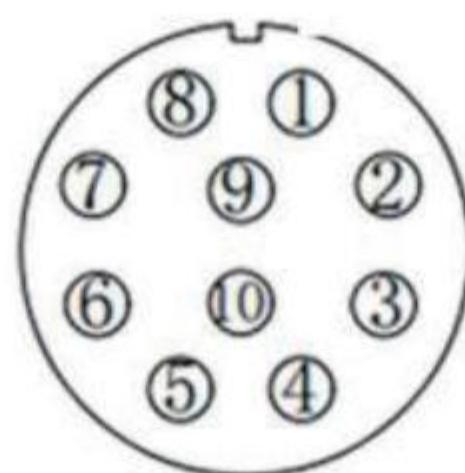
Physical performance	<p>Working Temperature: <math>-45^\circ C \sim +75^\circ C</math></p> <p>Storage Temperature: <math>-55^\circ C \sim +85^\circ C</math></p> <p>Dimension: 182mmx181mmx70mm</p> <p>Indicator lights: 1 power light, 1 differential signal light, 1 satellite light.</p> <p>Protection level: IP67, with excellent dustproof and waterproof performance.</p> <p>Shock and vibration: the equipment will work without serious damage when hit by a free fall from a height of 2 meters to the ground.</p> <p>Weight: &lt;1.2Kg</p>
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Data interface	<p>Data output: NMEA-0183, binary code data</p> <p>Refresh rate: 1~20Hz optional</p> <p>Baud rate: 9600~460800</p> <p>WEIPU connector: including one for power supply, two for RS232, one for CAN</p> <p>Difference format: RTCM3.0/3.2</p>
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### 8.3.5. Dimensions



### 8.3.4. Pin Definition



Aviation plug-10	Pin
1	VCC
2	GNSS-TX
3	GNSS-RX
4	GND
5	GND
6	GNSS-RX
7	GNSS-TX
8	VCC
9	IMU-TX
10	IMU-RX