FJDynamics

FJDynamics Autosteering Kit

Software User Manual

Safety Instructions

Before using this FJDynamics Autosteering Kit (shorten as the kit), please read the entire contents of the *“FJDynamics Autosteering Kit Software User Manual"* carefully, and keep in mind when operate it.

Operator Requirements

1. Persons under the age of 18 are prohibited from operating.
2. Drunk driving is prohibite
3. Fatigued driving is prohibited.
4. Drivers must obtain the relevant driving license required by the local laws.

Operation Environment

1. Please drive in an open area far from the crowd and ensure that there are no irrelevant personnel and vehicles in the operation area.
2. Please stay away from people, livestock, obstacles, electric wires, tall buildings, airports, signal towers, etc. So as not to interfere with the signal and affect the operation.
3. Please work in good weather (not extreme weather such as heavy rain, heavy fog, snow, lightning, strong wind, etc.);
4. When the kit is under the testing, calibration, adjustment, or automatic steering, please ensure that there are no people or obstacles near the running track to prevent personal injury or property damage.

Operation Rules

1. During driving or operating, it is strictly prohibited to get on or off the vehicle during driving.
2. The vehicle must be kept under monitoring by the driver to ensure timely intervention.

3. When the vehicle equipped with this kit is driving on public roads or public areas, please ensure that the kit is powered off.

Checking

1. Make sure to have enough fuel in the driving vehicle.
2. Ensure that the parameters in the kit are calibrated before the automatic driving operation.
3. Make sure the antenna and angle sensor are installed properly. If there is any movement, please calibrate it again before using it.
4. Please do not use worn or damaged cables. Please purchase and replace new cables in time.

Others

1. Do not disassemble the product yourself, or it will affect the warranty service.
2. The equipment damages caused by force majeure (lightning strike, high voltage, collision), are not included in the free maintenance service.
3. Please connect the device strictly according to the instructions in the manual. For cables such as data cables, you need to pinch the root of the plug and insert it gently. Do not pull it hard or even rotate it, which may cause needle breakage.
4. When supplying power to this product (the kit), please pay attention to the power supply requirements of the device (controller and electric steering wheel power rating is 10-30V).

Contents

Chapter I About This Document

1 Purpose

This document describes how to use the FJDynamics autosteering kit for agricultural vehicles. The language used in the document is concise, and the operation process is simple and clear, so that the user can learn to perform each operation easily, quickly and accurately.

2 Technical Support

Users will be provided with the technical support and upgrade services by FJ Dynamics Technology Co., Ltd. for a long time from the date of purchase of this product.

Official website of FJ Dynamics: https://www.fjdynamics.com/

Chapter II Product Overview

1 Introduction

Launched by FJ Dynamics, FJDynamics Autosteering Kit for agricultural vehicles supports assistant straight driving and fully unmanned transformation. The kit can not only control the steering to provide driving assistance for the vehicle, but also realize the fully unmanned transformation of agricultural vehicles through the control of the vehicle's accelerator, brake, clutch, gearbox, and operation components. The kit is composed of the in-vehicle display and control terminal, GNSS high-precision positioning equipment, steering motor, angle sensor, attitude sensor, communication antenna, cable harness and so on. Among them, the in-vehicle control terminal is equipped with the auto steering driving software independently developed by FJ Dynamics.

2 Main Components

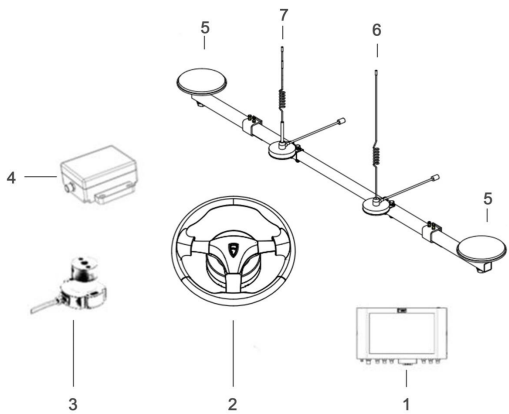

Figure 2.2.1 Main components

1. Control Terminal

An interface of human-computer interaction, acting as vehicle control and communication terminal.

2. Steering Wheel

It provides steering control in vehicles.

3. Angle Sensor

It monitors the wheel rotation angle to determine the direction of the vehicle in real-time.

4. IMU

All-terrain data compensation is achieved to ensure the accuracy of agri-robots in sloping fields and high-speed operating environments.

5. GNSS Antenna

It receives satellite data to obtain vehicle latitude and longitude.

6. 4G Antenna

It realizes communication with cellular data (4G). (Item ⑥ is the 4G antenna and it is shorter than item ⑦)

7. Radio Antenna

It realizes communication with Portable Base Station (RTK).

Precaution for the Installation of Antenna

1. Do not disassemble the antenna or plugin/out the cable when the power is on.
2. When installing antennas outdoors, proper lightning protection should be taken to prevent lightning strikes.
3. During the outdoor installation of the base station equipment, the base station host should be waterproofed.
4. When using or testing, the base station radio antenna must be placed in the outdoor open environment.

5. The transmitting station may generate heat during use. Please be careful to avoid burns.

6. Avoid or reduce unnecessary coverings on the surface of the station and maintain a good ventilation environment.

Chapter III Hardware Operation Instructions of Control Terminal

1 Hardware Interface Description of Control Terminal

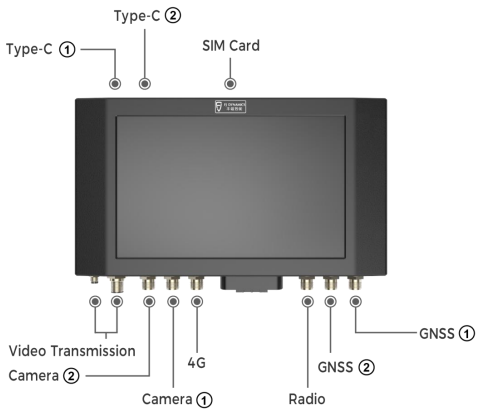

Figure 3.1.1 Hardware interface description of control terminal

Chapter IV Software Operation Instructions of Control Terminal

1 Workflow Overview

In order to make it easier for users to understand the operation and use of the software, this document describes the operation procedure and related auxiliary functions of the operating workflow of the kit from a new user's perspective. A new user needs to complete the installation, configuration and preparatory operations before using the kit for the first time and smoothly entering the auto steering driving

2 Commissioning

The initial commissioning process of FJDynamics Autosteering kit is as follows:

Select a language → Register and log in to your account → Enter installation information → Connect to RTK → Set vehicle parameters → Calibrate the angle sensor → Calibrate the whole vehicle → Complete commissioning

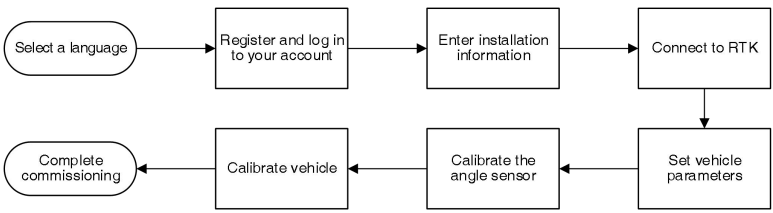

Figure 4.2.1 Initial commissioning workflow

2.1 Selecting a Language

Turn on the in-vehicle control terminal and select a language for this kit. tap Next step. The screen for registration and login is displayed.

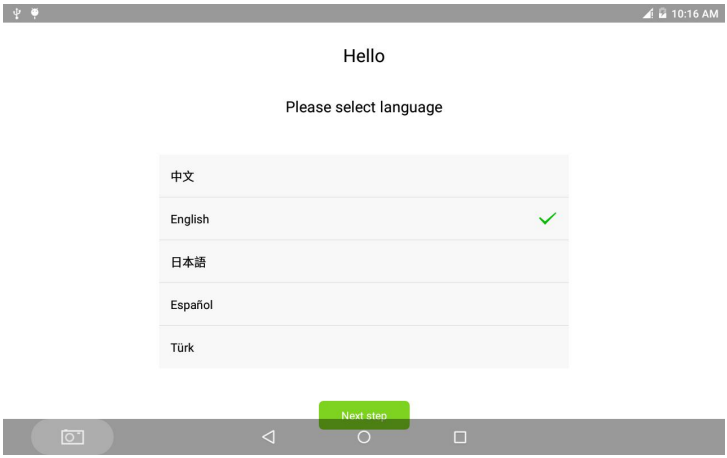

Figure 4.2.2 Selecting a language

2.2 Register/Login

After completing the language settings, you will enter the registration and login screen.

Account Registration: You are required to register an account for the initial use of the kit. tap Register immediately. On the displayed screen, enter your email address, verification code, and password, and tap I agree in User Privacy Policy.

Account Login: If you have an account registered, you can log in directly by entering your user name (email address) and password to enter the home screen of the kit.

Forgot Password: allows you to enter the password resetting screen when you forgot your password. Enter your email address, verification code, and new password. Then, tap Login to enter the home screen of the kit.

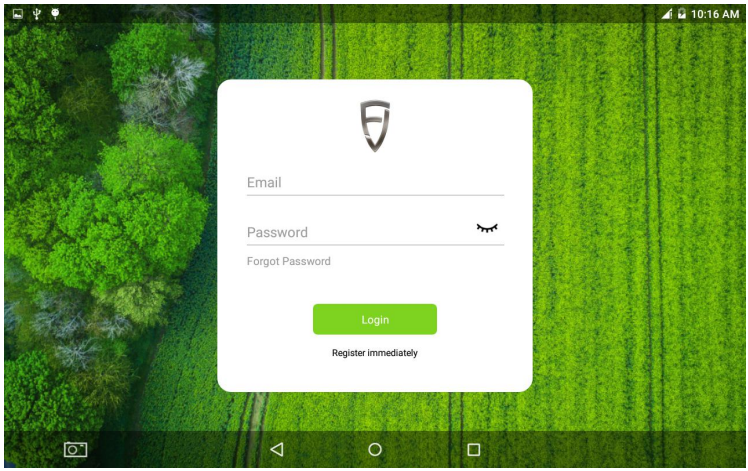

Figure 4.2.3 Home screen of login and registration

2.3 Entering Installation Information

After successfully registering and logging in for the first time, you need to enter related installation information, user information and Auto-kit information. Please note that the initial information you have entered will directly or indirectly affect your after-sales service. Therefore, please strictly follow the following procedure:

Step 1： Enter user information after the successful user registration and tap **Next step**.

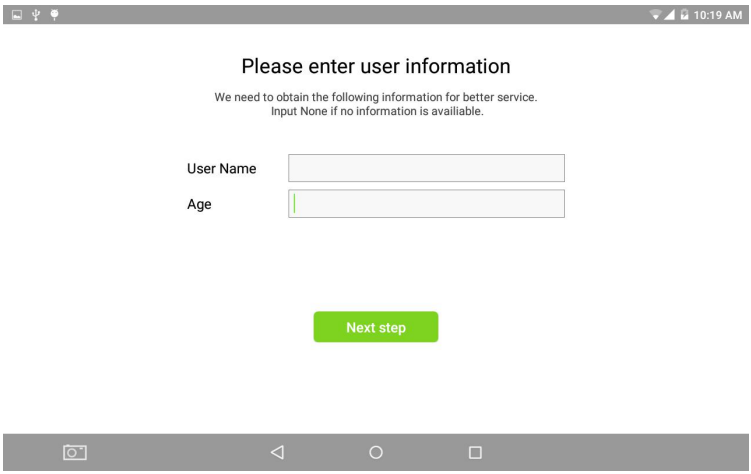

Figure 4.2.4 Entering user information

Step 2：Enter this information and tap Next step. The screen for entering agricultural vehicle information is displayed.

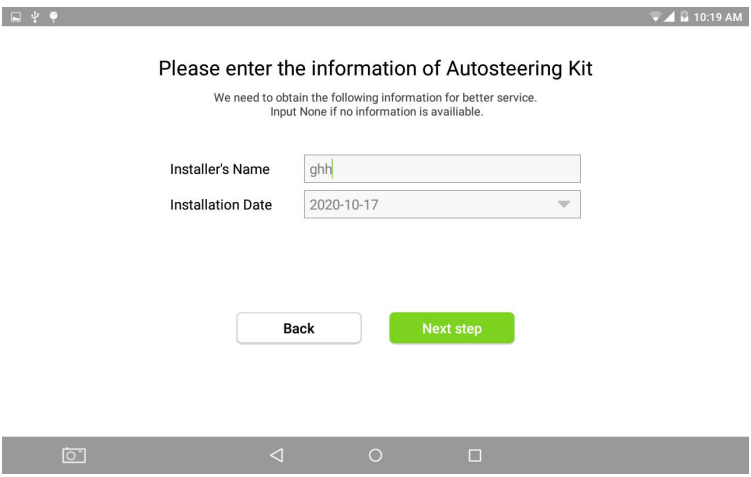

Figure 4.2.5 Entering Auto-kit information

Step 3：Specify all parameters about the agricultural vehicle and tap **Save**. The home screen is displayed.

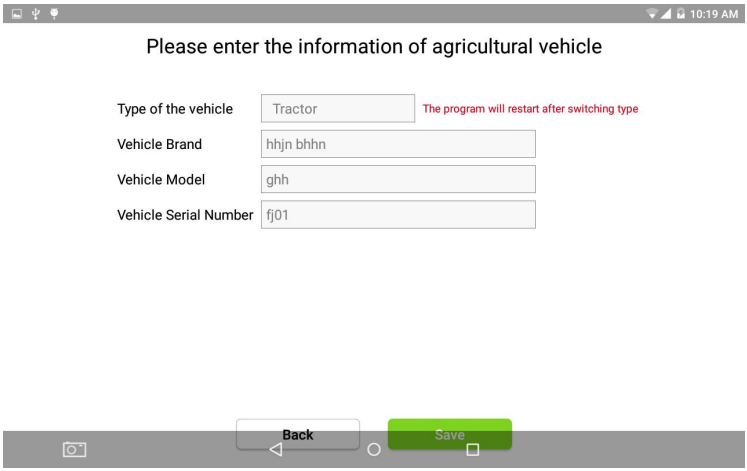

Figure 4.2.6 Entering agricultural vehicle information

After you select a type of the vehicle, the kit will directly enter the corresponding agricultural vehicle kit. Please select the type of the vehicle you will actually use.

2.4 Home Screen

After successfully logging in to the system, you will enter the home screen. You can view the network connection status and operation status in real time. Your account login record will be automatically saved locally. Therefore, you can directly enter the home screen of the kit every time you open the kit.

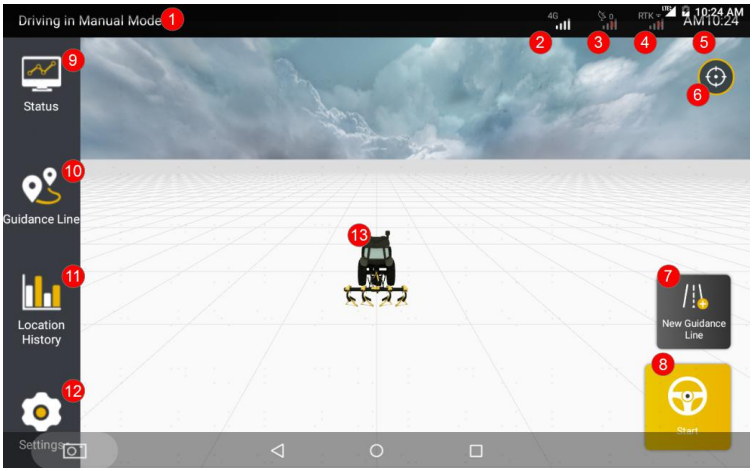

Figure 4.2.7 Home Page

1. Current driving mode

It shows the current drving mode, including manual drving mode and autosteering drving.

2. **4G Signal**

4G Signal, the mobile network signals, shows the real-time cellular data communication of

the autonomous driving system.

3. GNSS Signal

GNSS signal, the satellite signal, shows the connection status of the system.

4. RTK Signal

The RTK signal is the carrier phase differential signal. It includes two modes of the portable base station and network RTK, showing the differential signal strength in real-time.

5.Time

Android system time, users can manually changed the time zone in Android

system.

6. Perspective switch

Fix the perspective of three-dimensional view by tapping the button.

7.New Guidance Line

Set new guidance line by tapping this shortcut button.

8. Autosteering Start / Stop Button

Tap to start or stop the vehicle.

9. Status

Tap the "STATUS" to access the real-time information and current status of agricultural machines.

10. Guidance Line

Tap the “Guidance line” to access the Baseline detailed page for checking, adding, selecting and deleting guidance line.

11. Location History

Tap the “LOCATION HISTORY” to access the operation data, it includes Date, Spacing, Acreage, Mileage, Velocity and operative route.

12. Settings

Tap “SETTINGS” to access Parameter Settings, RTK Settings, Trouble Checking, System

Upgrade, and Version.

13. Vehicle

It shows the movement of vehicles in real-time.

2.5 Connecting to RTK

After successfully entering the home screen, you need to connect the kit to the RTK. Perform the following operations to connect the kit to the RTK:

Step 1： Choose Settings > RTK settings. The RTK settings screen is

displayed.

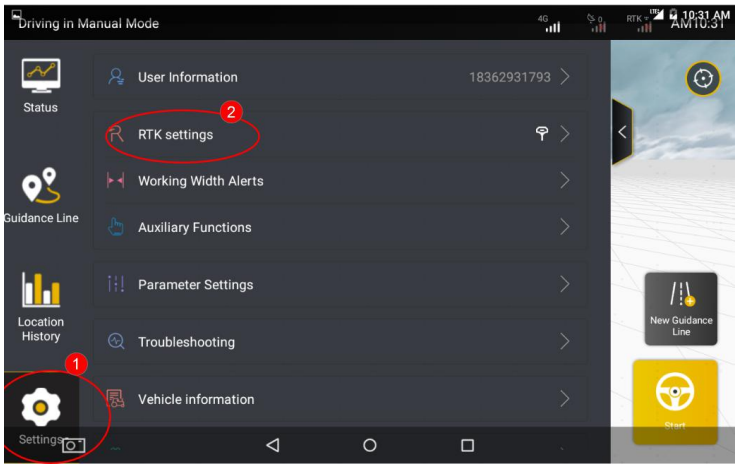

Figure 4.2.8 Settings list

Step 2: Select the RTK connection mode you want to use.

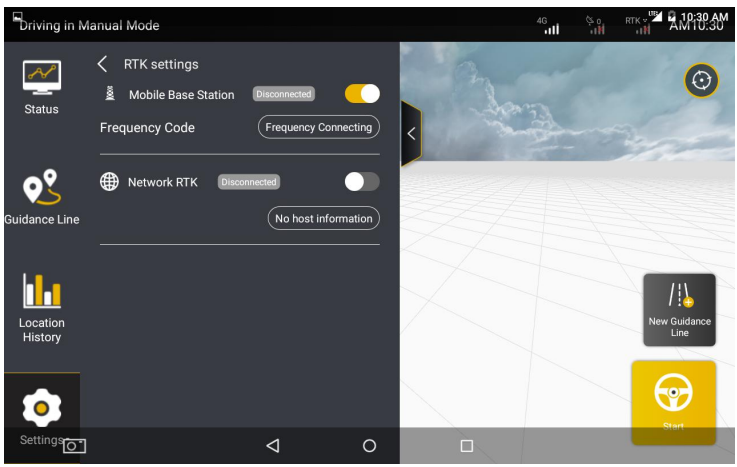

Figure 4.2.9 Connecting to RTK

This kit can be connected to base station RTK or Internet RTK. The kit is connected to a mobile base station by default. You can switch the connection mode by using the **Enable/Disable** switch. If the kit is switched to the RTK mode, this mode will be displayed by default in your next login.

·If you want to connect mobile base station RTK, please enable **Mobile Base Station**. Then, tap **Frequency Connecting**. In the displayed dialog box, enter the required frequency code of the connected base station. (For details about the rules for entering the base station's frequency code, refer to the Base Station User Manual.) s

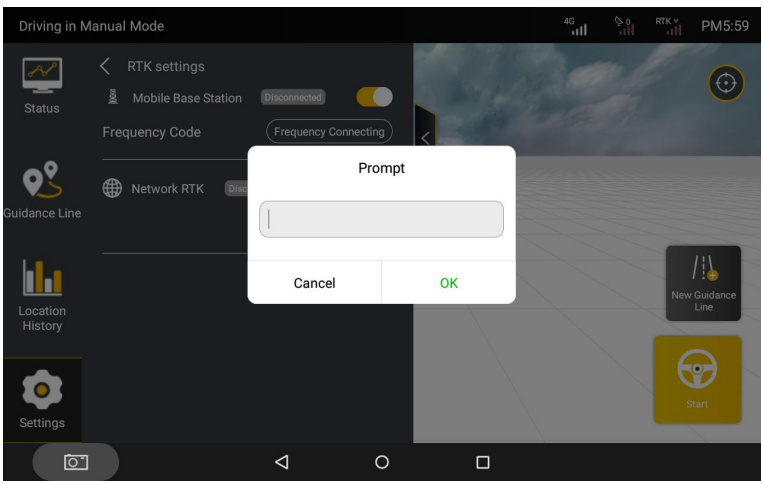

Figure 4.2.10 Entering the frequency code

· If you want to connect Internet RTK, please enable **Internet RTK** and tap **Connect**. In the displayed dialog box, enter your Ntrip domain name and account information.

Ntrip domain name information: Specify **Host** and **Port** and tap Get Source. The port with the strongest signal matching the kit will be automatically displayed by default in **Source Node**, which indicates that Ntrip domain information is completed.

Ntrip account information: Enter your account information in **Account** and **Password** after specifying Ntrip domain information. Then, tap **Connect** to connect to the corresponding Internet RTK.

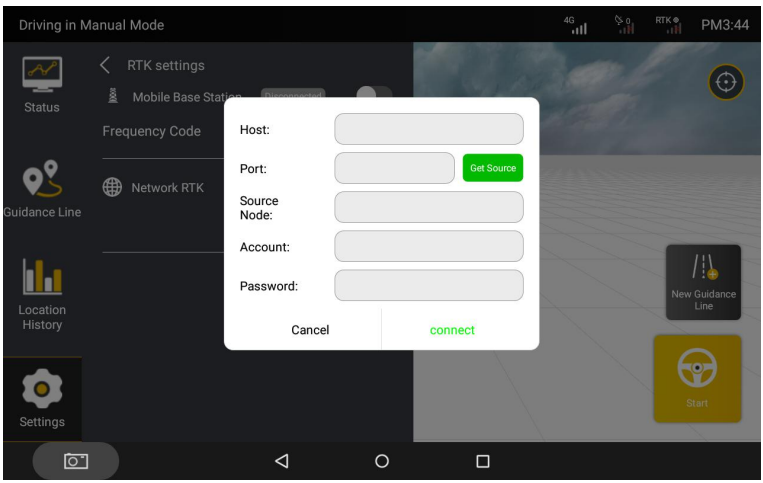

Figure 4.2.11 Connect Network RTK

Notes for RTK connection:

1. It will take up to 3 minutes to connect to the frequency of base station, and please be patient.

2. If the RTK connection always fails, please try to switch to the RTK connection twice. If the fault persists, please check whether the RTK is displayed abnormally by choosing **Settings** > **Troubleshooting**, as shown in the following figures.

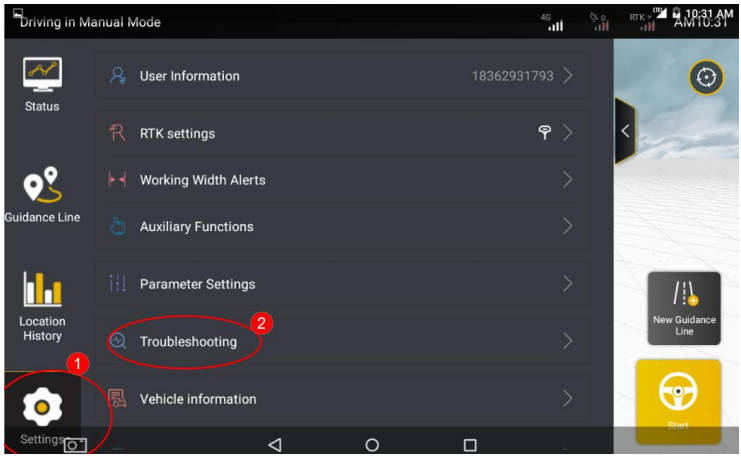

Figure 4.2.12 Setting list

Troubleshooting：

The troubleshooting detection is divided into two states, the green one means passing the test, and the red one means failing.

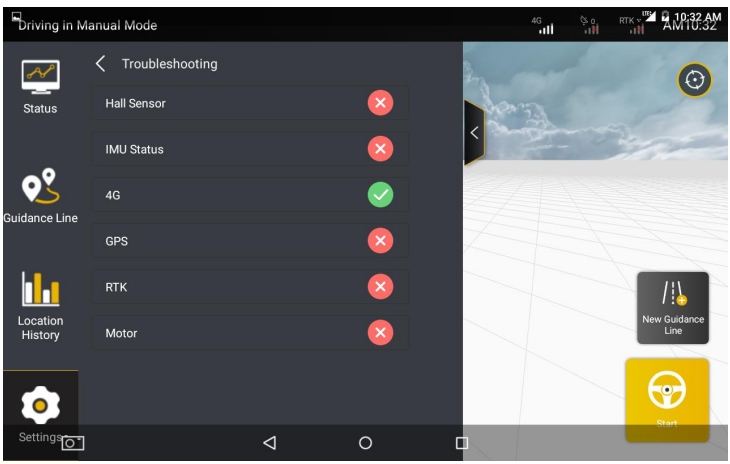

Figure 4.2.13 Troubleshooting

2.6 Setting Vehicle Parameters

After entering the home screen of the kit, perform the following operations to set vehicle parameters:

Step 1: From the sidebar, choose **Settings** > **Vehicle Information.**

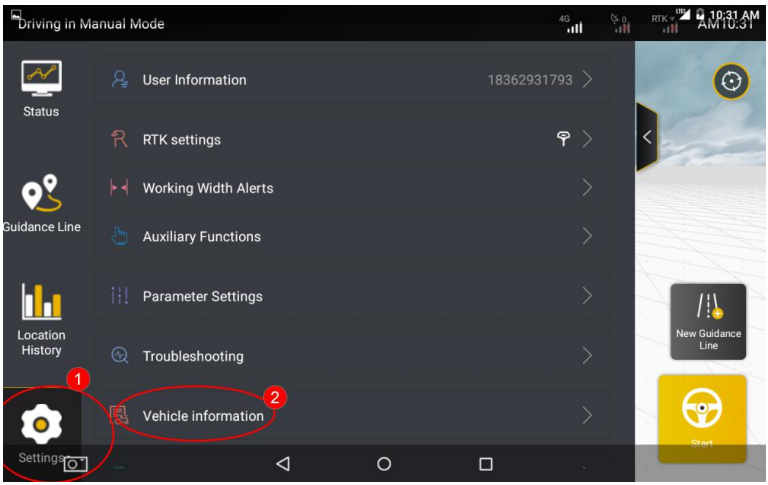

Figure 4.2.14 Setting List

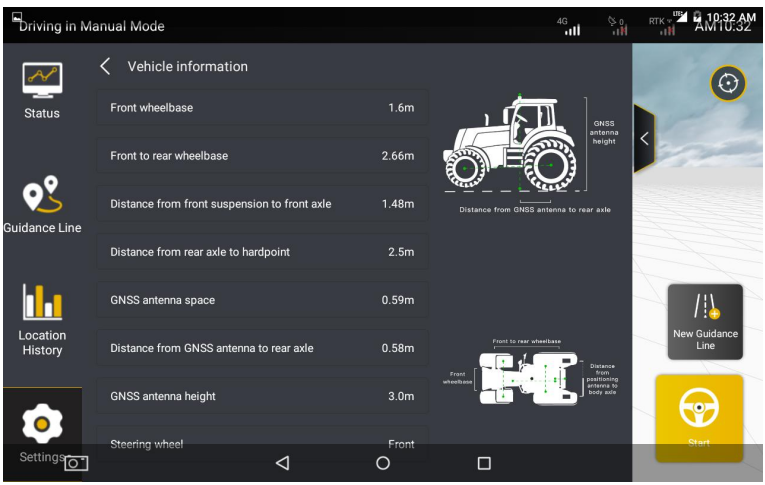

Figure 4.2.15 Vehicle information

*For details about the measurement operations, please check the corresponding commissioning instruction video.

2.7 Calibratig Angle Sensor

After completing vehicle parameter settings, you need to calibrate the angle sensor. Perform the following operations to calibrate the angle sensor:

Step 1: Choose **Settings** > **Parameter Settings**.

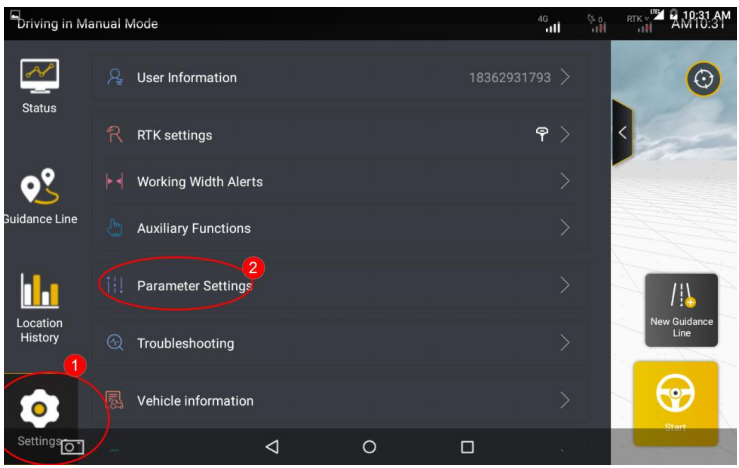

Figure 4.2.16 Setting list

Step 2: Tap “**Angle Sensor Calibration**” in the detailed page of parameter settings.

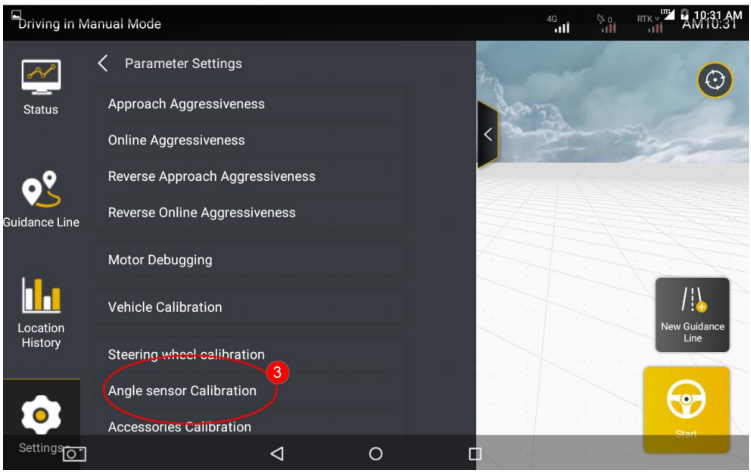

Figure 4.2.17 angle sensor calibration

Step 3: User needs to select the sensor type after getting into the angle sensor setting page.

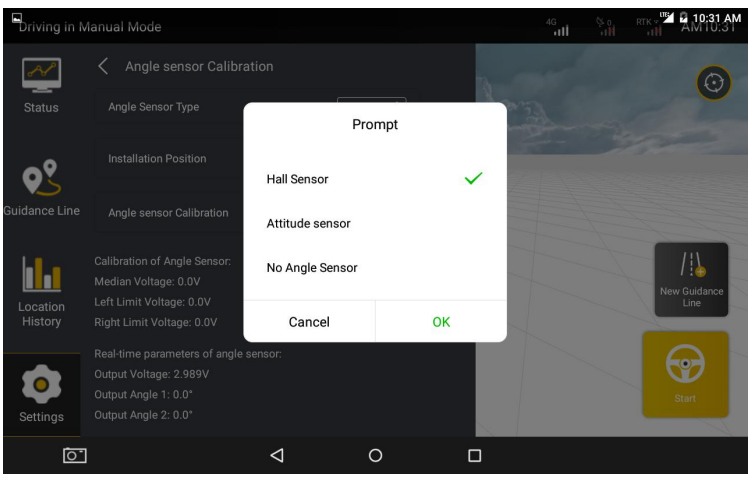

Figure 4.2.18 Select angle sensor type

·If the selected type is "**Hall Sensor**", then the user needs to select the installation position of the angle sensor. After selecting the installation location, click "Calibrate" to directly enter the calibration process. Please follow the prompts in the following interface to calibrate. Rotate the steering wheel according to the process "leftmost-rightmost-center" and tap “OK” after each action finished.

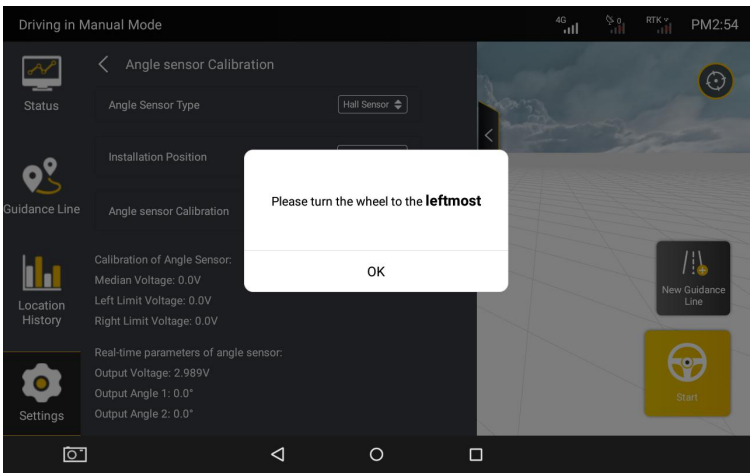

Figure 4.2.19 Turning the wheel to the leftmost

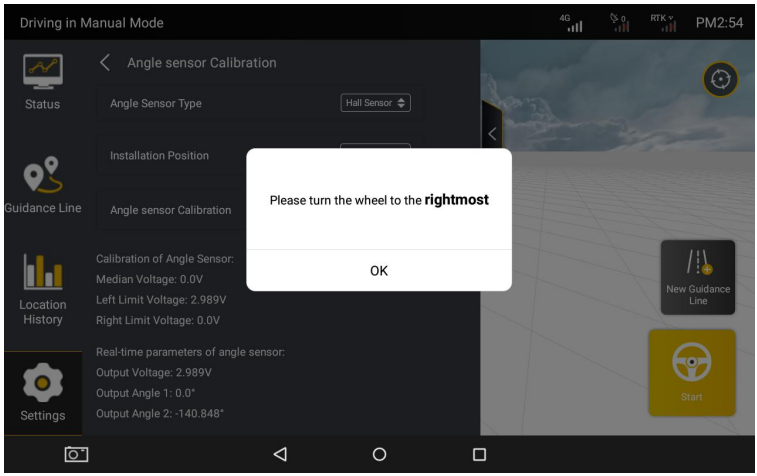

Figure 4.2.20 Turning the wheel to the rightmost

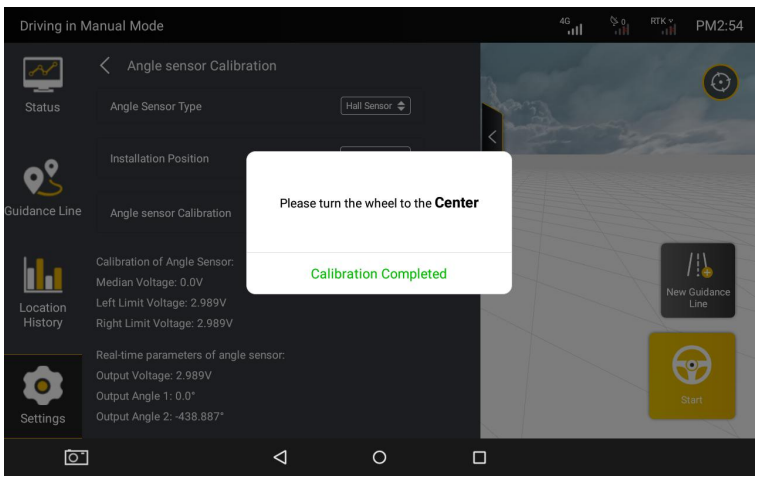

Figure 4.2.21 Turning the wheel to the center

·If the angle sensor type is selected as "**attitude sensor**", please then select the installation position of your angle sensor.

Note: when you choose “attitude sensor”, you shoule drive straight for 15-20m in manual mode to complete data convergence everytimes you open the system.

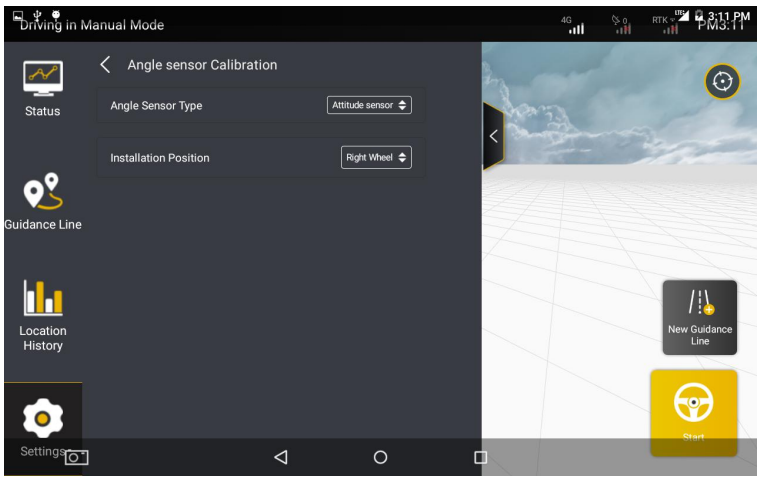

Figure 4.2.22 attitude sensor

·If the angle sensor type is selected as "**no angle sensor**", after selecting "no angle sensor", enter its interface as shown below.

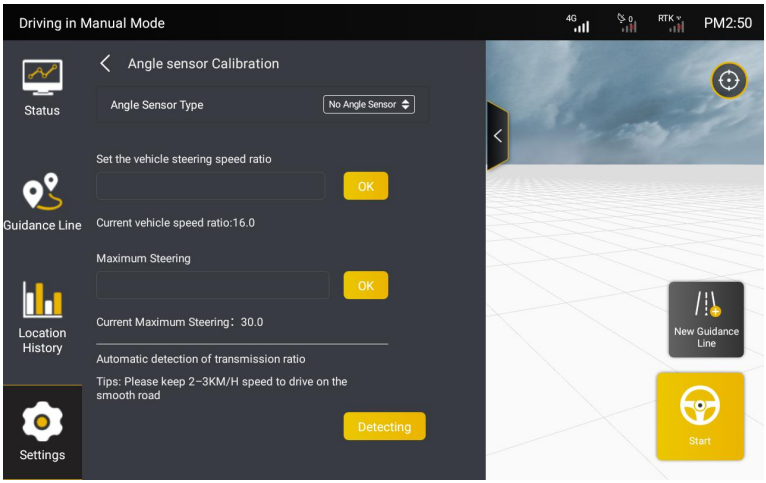

Figure 4.2.23 No angle sensor

After entering the setting screen for no angle sensor, put the vehicle's gear into the low gear first. Then, tap **Detect** and step on the accelerator to make the agricultural vehicle run straight for about 20 m on a level surface freely at a low speed (2–3 km/h) until the **Detection Succeeded** prompt box is displayed. Then, the vehicle steering speed ratio is automatically detected and the setting of no angle sensor is completed.

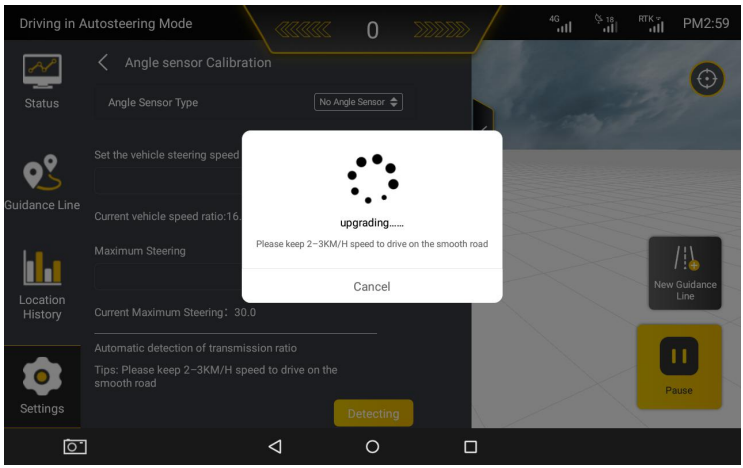

Figure 4.2.24 Detecting the speed ratio

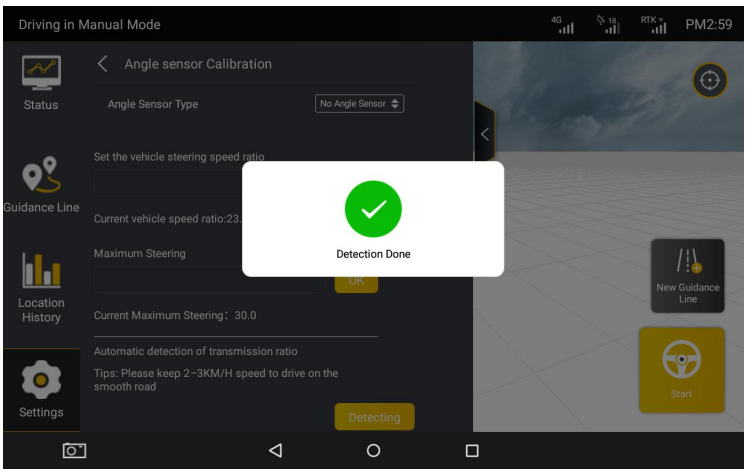

Figure 4.2.25 Detect finished

If the sensor type is switched, the device needs to be restarted after the sensor is switched to take effect.

2.8 Vehicle Calibration

After angle sensor calibration finished, you need to calibrate vehicle to correct working offset . Perform the following operations to calibrate vehicle:

Step 1: On the displayed **Settings** screen, tap the **Parameter Settings.**

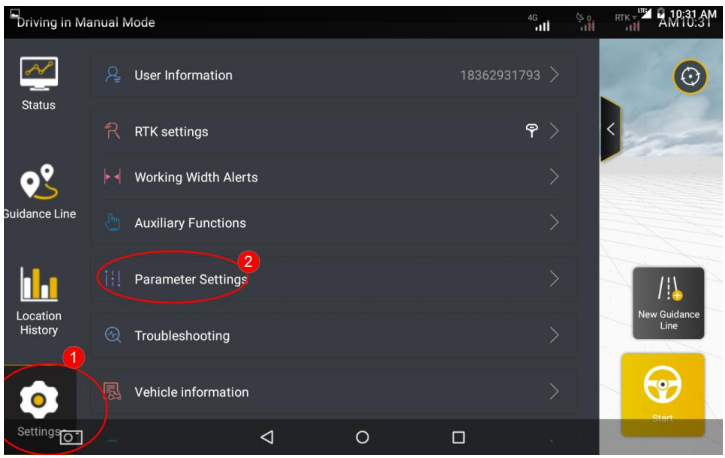

Figure 4.2.26 Setting List

Step 2: Tap into "**Vehicle Calibration**" in the parameter page.

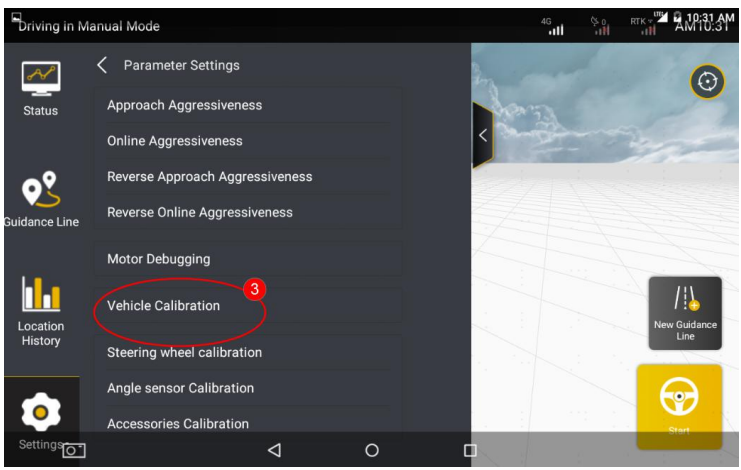

Figure 4.2.27 Vehicle Calibration

Step 3: Tap “Start Calibration” in the vehicle calibration page, and then getting into the calibrating process.

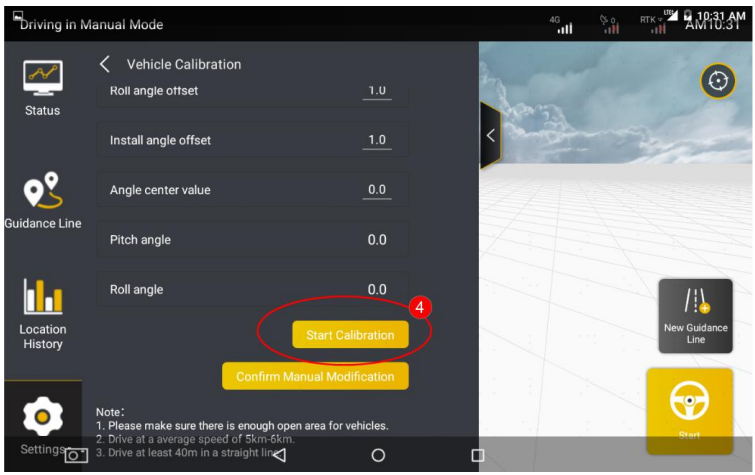

Figure 4.2.28 Start Calibration

Step 4: On the calibration screen, carefully read the current calibration step displayed. Then, determine Points A and B exactly as prompted on the screen. Move the agricultural vehicle to the starting point and tap **Comfirm Point A** on the screen.

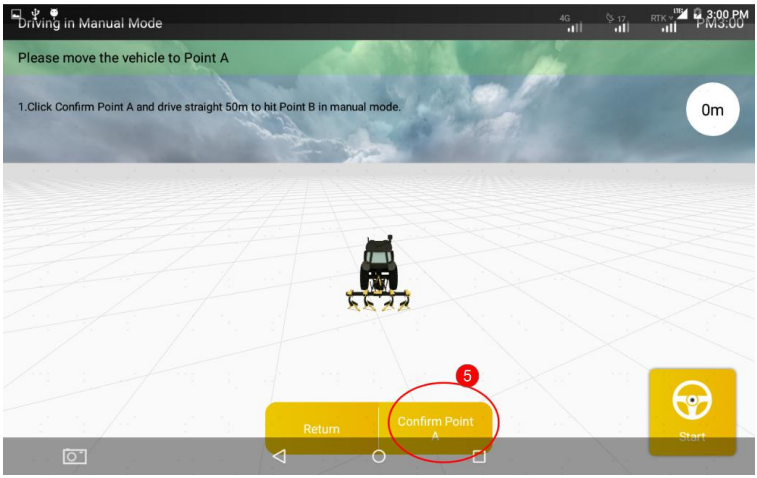

Figure 4.2.29 Comfirm Point A

Step 5: After comfirming Point A, manually drive the vehicle straight for 50m and Comfirm Point B.

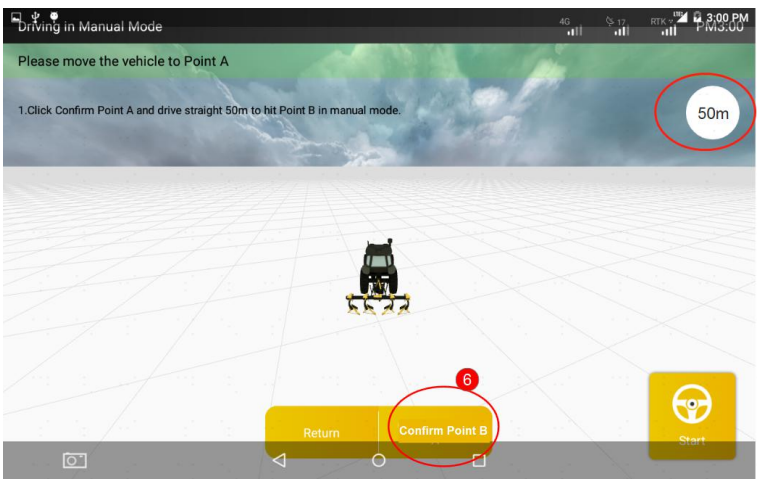

Figure 4.2.30 Comfirm Point B

·During the driving towards Point B, the distance traveled will be displayed on the upper right corner of the screen in real time. You can check whether the current distance from Point A meets the distance requirement of **50m** based on this value.

Step 6: After comfirming Point B, please follow the instructions in **Step 3** on the screen to manually turn the vehicle around and make it return to Point B on the guidance line just comfirmed (with the front end of the vehicle facing Point A). After the adjustment is completed, tap **Start** to make the vehicle run to Point A in the auto steering driving mode according to the guidance line just comfirmed.

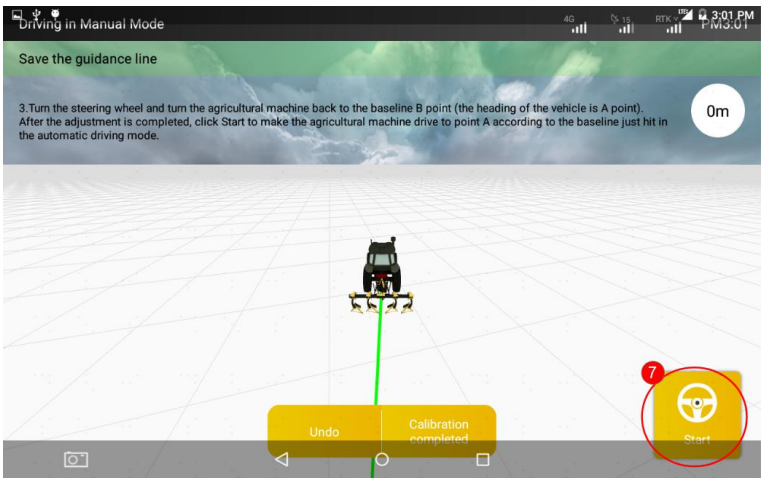

Figure 4.2.31 Starting auto steering driving after turning around

Step 7: tap **Stop** after the vehicle arrives at Point A in the autosteering driving mode.

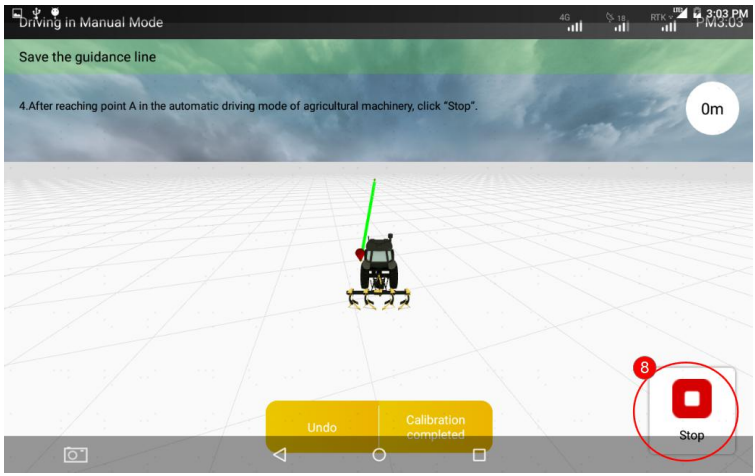

Figure 4.2.32 Stopping auto steering driving

Step 8: Manually turn the vehicle around to make it return to Point A on the guidance line (with the front end of the vehicle facing Point B). Then, tap **Start** to make the vehicle run from Point A to Point B in the auto steering driving mode.

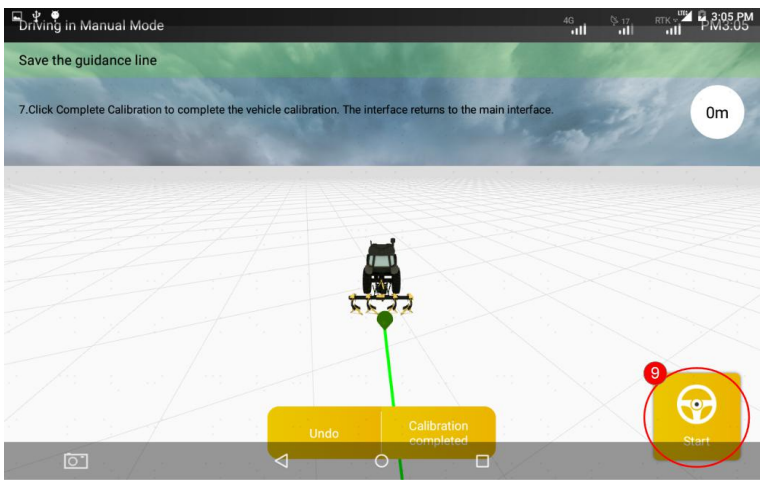

Figure 4.2.33 Manually turning around and start the auto-working

Step 9: After the vehicle reaches Point B in the auto steering driving mode, tap **Stop** to stop the current auto steering driving operation.

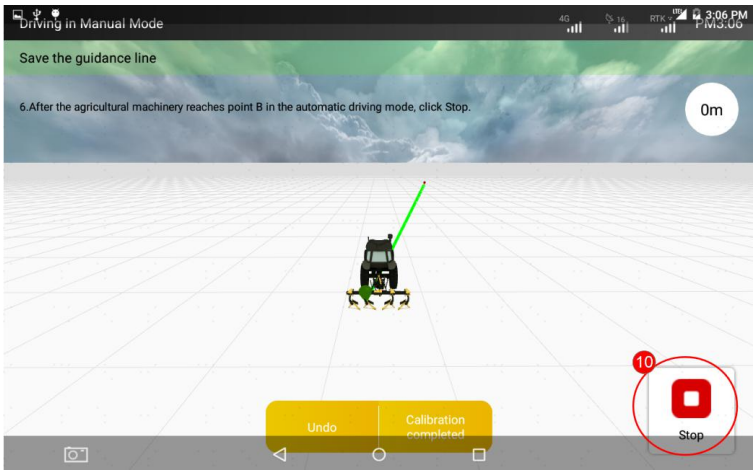

Figure 4.2.34 Stop autosteering driving after reaching the point A

Step 10: tap **Calibrating completed** to complete the vehicle calibration and return to the home screen.

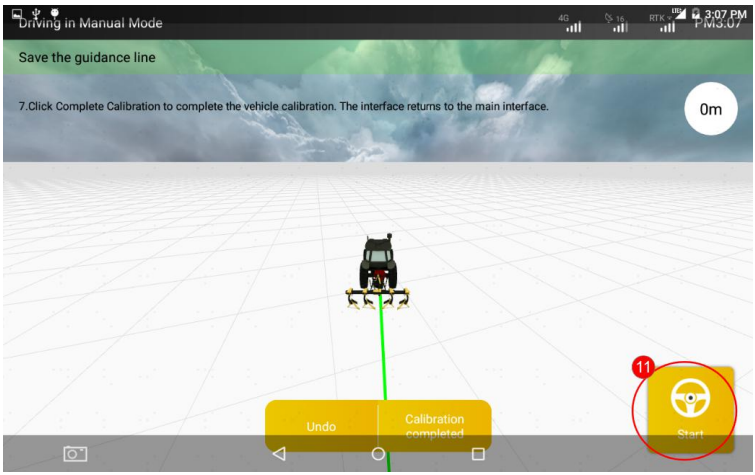

Figure 4.2.35 Calibration finished

After completing the above steps of commissioning, you can start to use control terminal for intelligent operations.

3 Preparatory Operations

Confirm RTK connection → Add new guidance line → Import the guidance line → Select operating mode → Start autosteering driving

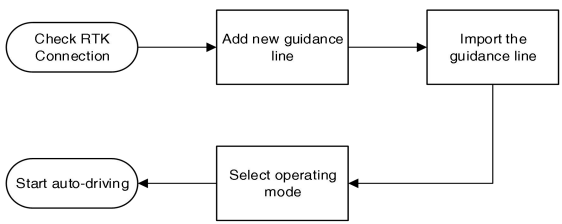

Figure 4.3.1 Preparatory operation procedure

3.1 Check RTK Connection

Confirm the current connection to the RTK before performing preparatory operations.

(1) Check whether the current RTK connection mode is correct.

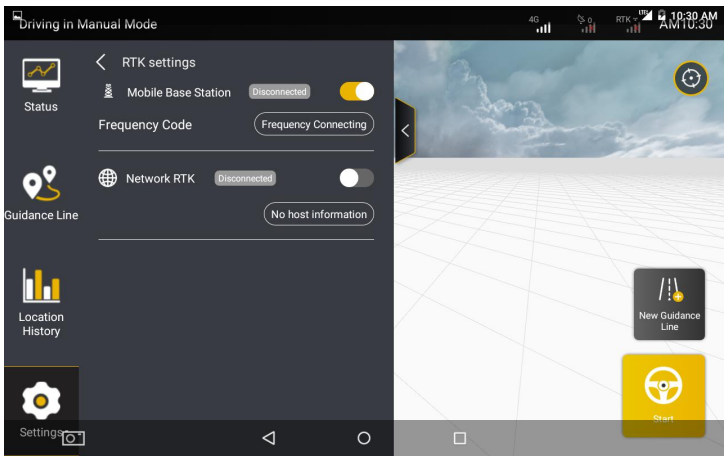

Figure 4.3.2 RTK Settings

(2) Check whether the current RTK connection is stable.

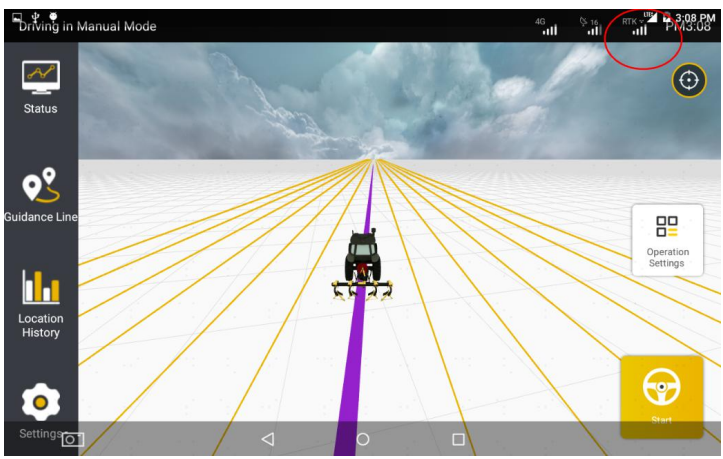

Figure 4.3.3 Home page

Check if the RTK signal display in the status bar is full, or if **RTK Status** in **Real-time Status** is **4**.

3.2 Adding New Guidance Line

After confirming the connection to the RTK, you can start setting points. You can follow the prompts to complete setting points A and B to save a new guidance line, and import the new guidance line to the current operation, as follows:

·Linear Mode

Step 1: Tap "**New Guidance Line**" in the home page to start the procedure for creating a new baseline.

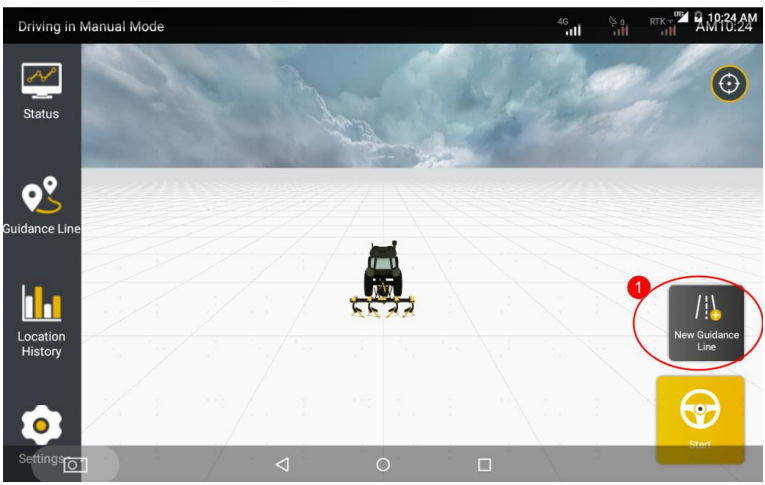

Figure 4.3.4 Home Page

·Or tap the sidebar "**Guidance Line**" to expand the baseline details page, and tap "**Add**" in the interface on the baseline details page to start the process of creating a new baseline.

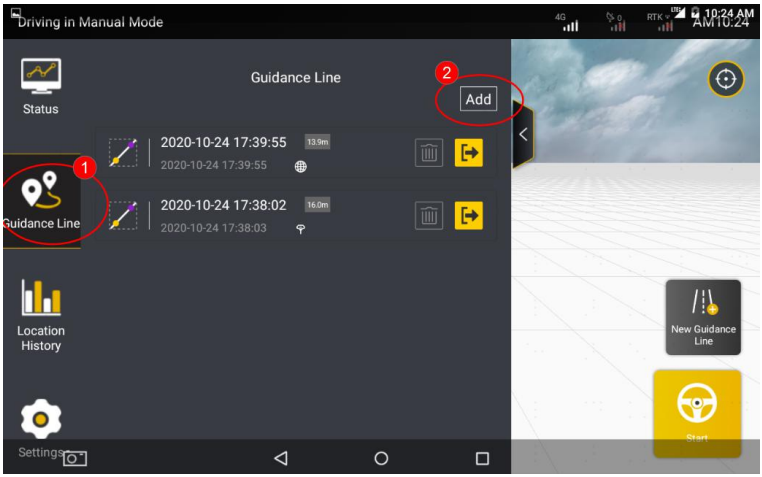

Figure 4.3.5 Guidance Line List

Step 2: Move the vehicle to the starting point of the operation, and tap **Comfirm Point A** on the screen of control terminal to determine the current position as Point A of the new guidance line. After comfirming Point A, manually drive the vehicle straight for 15–20 m.

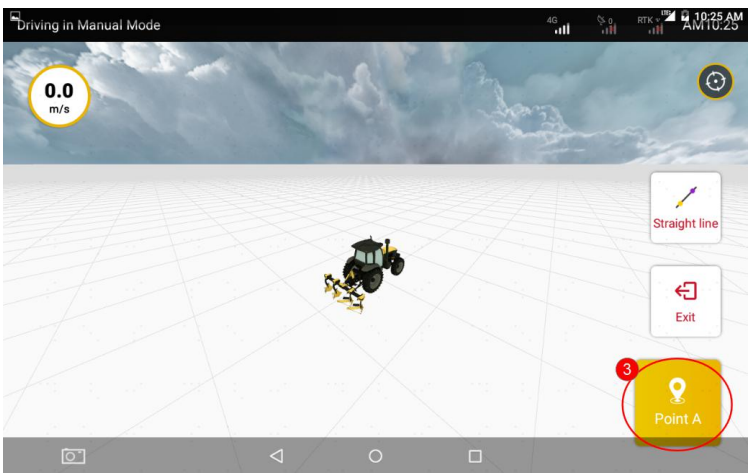

Figure 4.3.6 Comfirming Point A

Step 3: Brake the vehicle and tap Comfirm Point B on the screen of the in-vehicle control terminal to determine the current position as Point B on the guidance line.

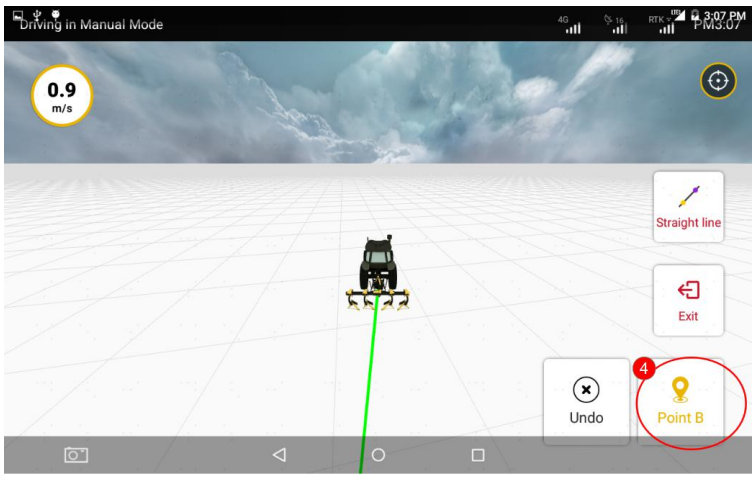

Figure 4.3.7 Comfirming Point B

Step 4: After comfirming Point B, please tap **Import** and enter the guidance line name in the prompt. Then go back to the list of guidance lines after naming the new line. And the newly added guidance line will be displayed on the top of the list.

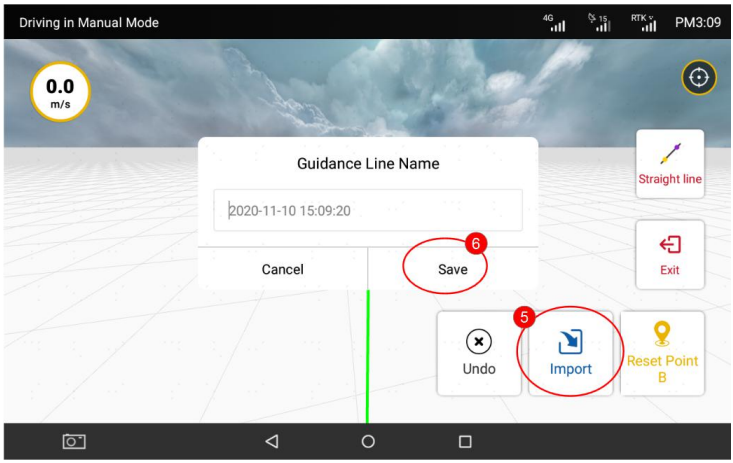

Figure 4.3.8 Import Guidance Line

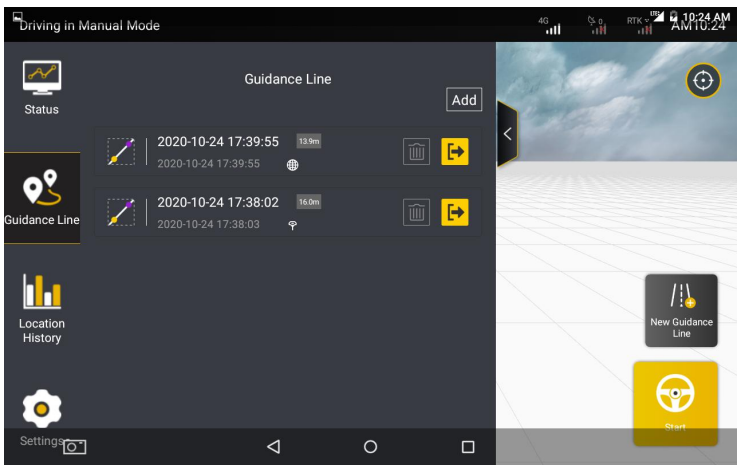

Figure 4.3.9 Guidance Line List

·Curve Mode：

Step 1: Tap "**New Guidance Line**" in the home page to start the procedure for creating a new baseline.

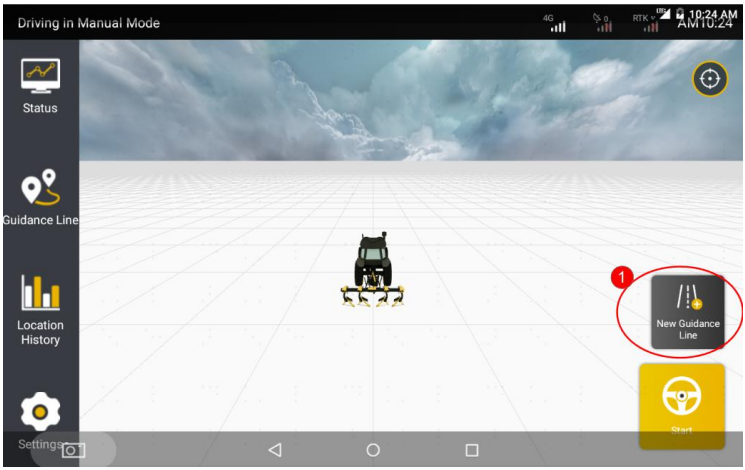

Figure 4.3.10 Home Page

·Or tap the sidebar "**Guidance Line**" to expand the baseline details page, and tap "**Add**" in the interface on the baseline details page to start the process of creating a new baseline.

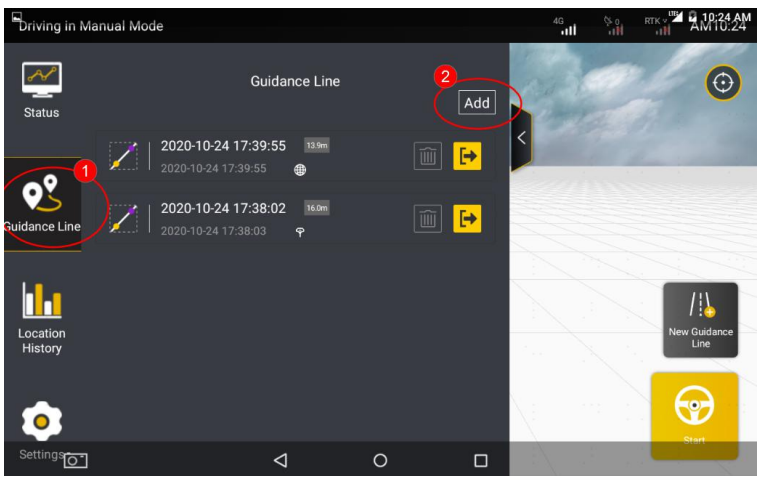

Figure 4.3.11 Guidance Line List

Step 2: On the displayed Guidance Line setting page, tap **Straight Line** to switch the plotting mode to the curve.

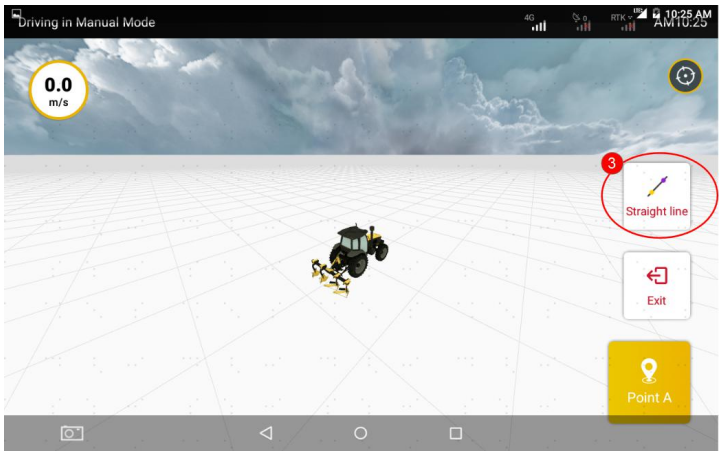

Figure 4.3.12 Switch plotting mode to the curve

Step 3: After switching to the curve mode, please move the vehicle to the starting point of the operation, and tap **Comfirm Point A** on the screen to comfirm the current position as Point A on the curvilinear guidance line.

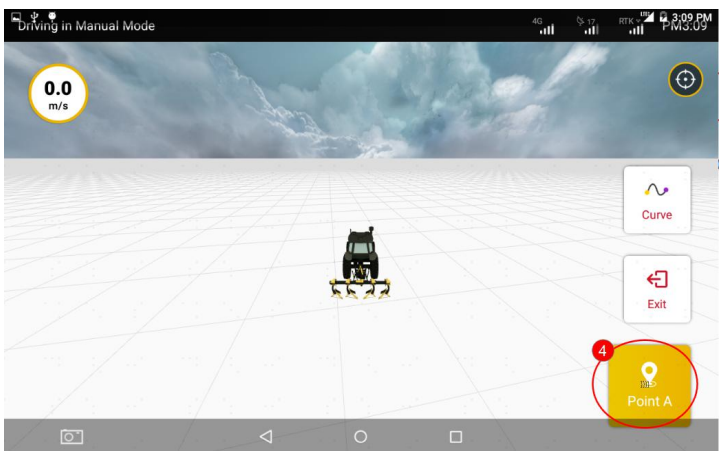

Figure 4.3.13 Comfirming Point A

Step 4: After confirming Point A, please directly curve the vehicle's path to the ending point of another side you want to determine (for example, from the starting point to the other field edge) in manual mode and tap **Comfirm Point B**.

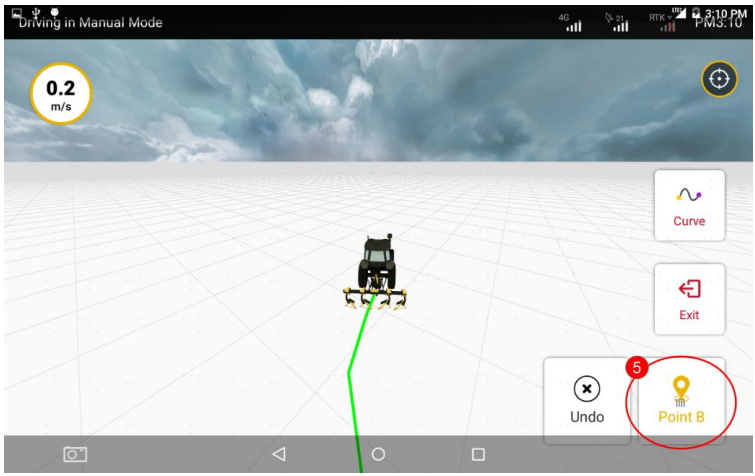

Figure 4.3.14 Comfirming Point B

Notes for the curve mode:

1. In the curvilinear mode, Point A is the starting point and Point B shall be a point on another field edge.

2. In multi-line mode, make sure to travel in the same line lengths as the curvilinear guidance line, or the route beyond the curvilinear guidance line will gradually tend to a straight line.

3. In curvilinear mode, after comfirming Point A, you cannot directly tap **Linear** to switch to linear mode. Please cancel the plotting before switching the mode.

Step 5: After comfirming point B, please tap Import and enter the new line's name, and then you can get into the curve mode working page.

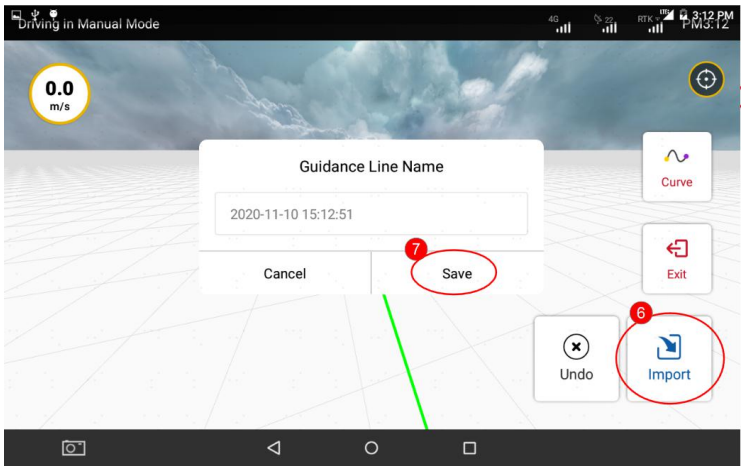

Figure 4.3.15 Import new guidance line

Step 6: The kit will automatically import this curvilinear guidance line to the current operation, as shown in the following figure.

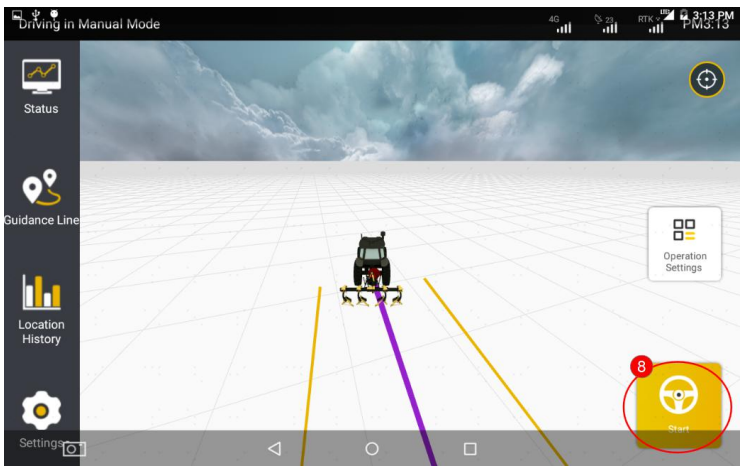

Figure 4.3.16 Auto-working in Curve mode

3.3 Import Guidance Line

You can directly import the required guidance line from the list of guidance lines to the current operation as follows:

Step 1: If you have already saved the guidance line before, please find out the line you want to import in the line you want to import in the list of guidance lines. And then tap **Import** buttom in the required guidance line tab to import the line to the current operation.

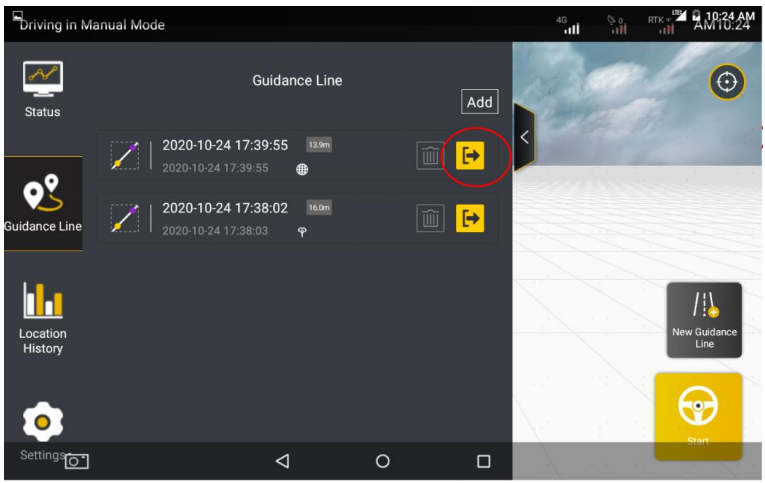

Figure 4.3.17 Guidance line list

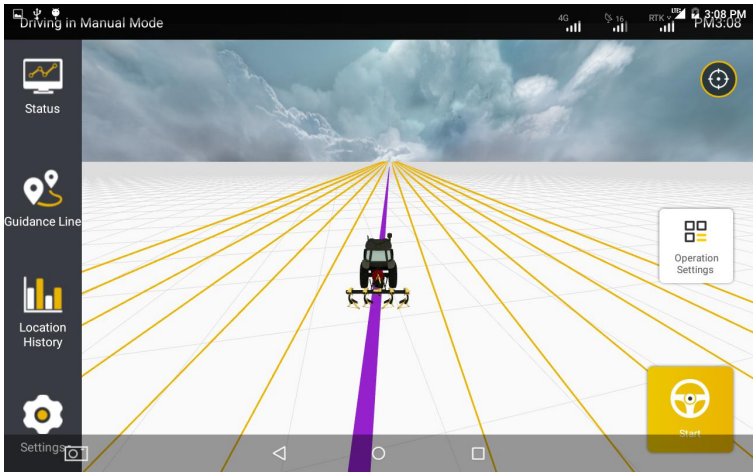

Figure 4.3.18 Guidance line imported

3.4 Selecting Operating Mode

After importing the guidance line successfully, you need to select operating mode. It can be single line mode or multi line mode. You can switch the operating mode before performing the autosteering driving operation or during the suspension of the autosteering driving operation according to the actual operation needs.

Multi Line Mode: refers to the auxiliary linear operation with the same spacing.

Single Line Mode: refers to the auxiliary linear operation with the free spacing.

After a guidance line is imported, **Multi Line Mode** is selected by default. You can switch the current operating mode by taping **Multi Line Mode**/**Single Line Mode** in the operating settings according to the woking needs.

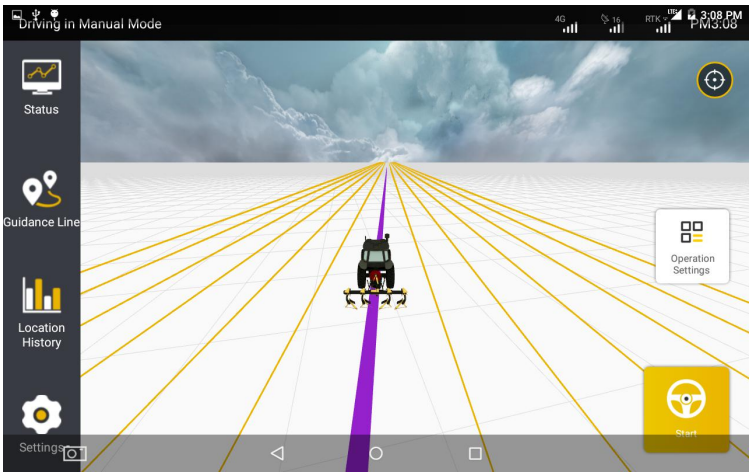

Figure 4.3.19 Muti line mode

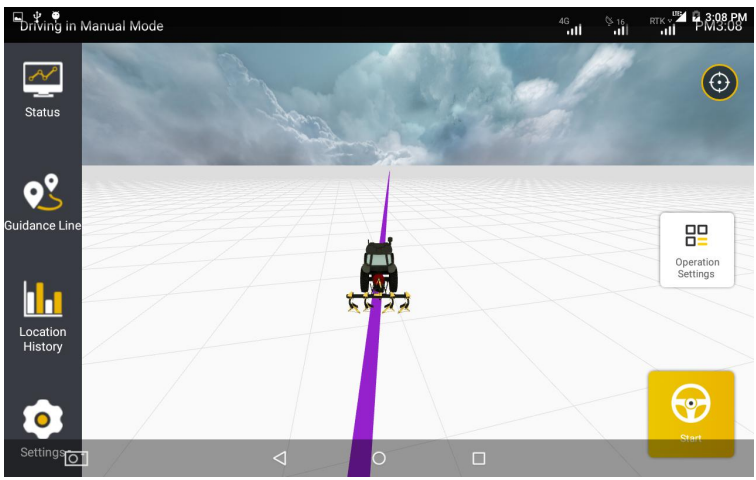

Figure 4.3.20 Single Line Mode

·If **Single Line Mode** is needed, please tap the button shows **Multi Line Mode** after importing a guidance line.

·If **Multi Line Mode** is needed, please enter into **Settings** > **Parameter Settings** > **Working width Alerts** to set the working width for the preparatory operation in multi line mode, as shown in the following figure.

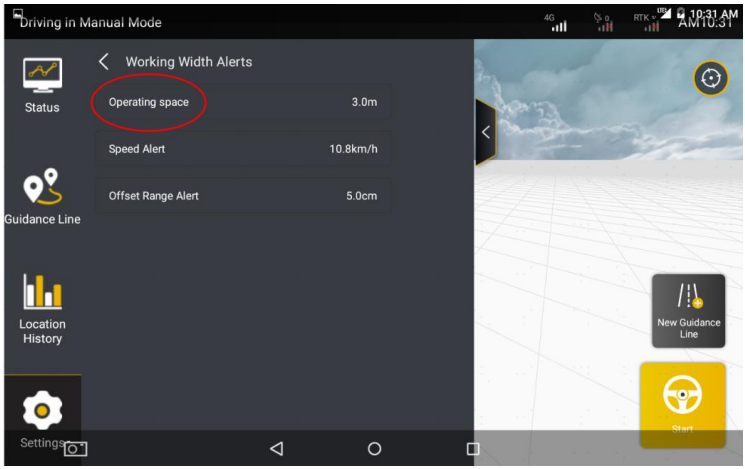

Figure 4.3.21 Setting the operating space

After setting the operating space, return to the operating page, and tap to switch the current operating mode to multi line mode. Then, tap **Start** to perform multi-line autisteering operations with the pre-set operating spacing.

3.5 Starting Autosteering Driving

3.5.1 Entering Autosteering Driving

After importing guidance line and setting the working mode, please tap “Start” in the screen and then enter into autosteering driving.

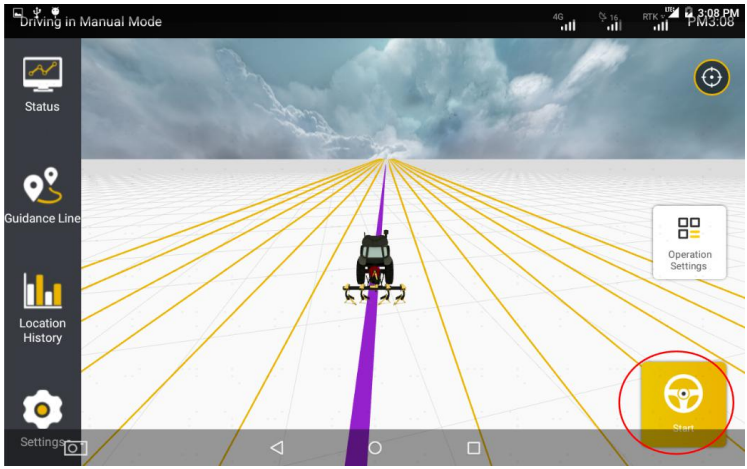

Figure 4.3.22 Starting Autosteering Driving

3.5.2 Adjustment in Operations

After completing the commissioning and preparatory operations in sequence as above, please import the guidance line to start the auto steering driving. You can perform the following adjustment during the auto steering driving according to the actual operation needs:

（1） Guidance Line Shift

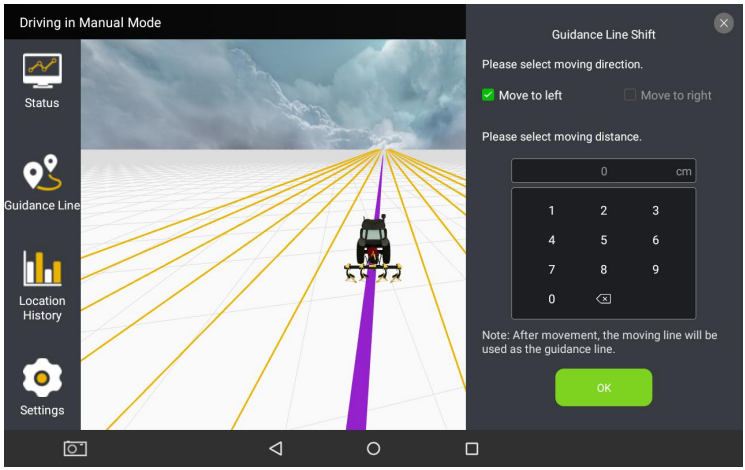

Figure 4.3.23 Guidance Line Shift

Before starting an operation or after suspending an intelligent operation, you can shift the guidance line in the current multi line mode according to the actual needs. Then, tap **Start/Continue** to enable the current operation to run along the adjusted guidance line.

1. Shift the guidance line. You can shift the guidance line in the current multi line mode by taping **guidance line shift** on the operation screen firstly. Specifically, you can then set the direction and distance in the current guidance line according to the actual needs. Then, tap **OK** to complete the settings after enter the adjusted distance.

2. tap **Start/Continue**. After shifting the current guidance line, please tap **Start/Continue** in the home screen, and the vehicle will enter into autosteering driving according to the adjusted guidance line.

Notes for guidance line shift:

1. Shift guidance line is available only in multi line mode.

（2） Switch Operating modes

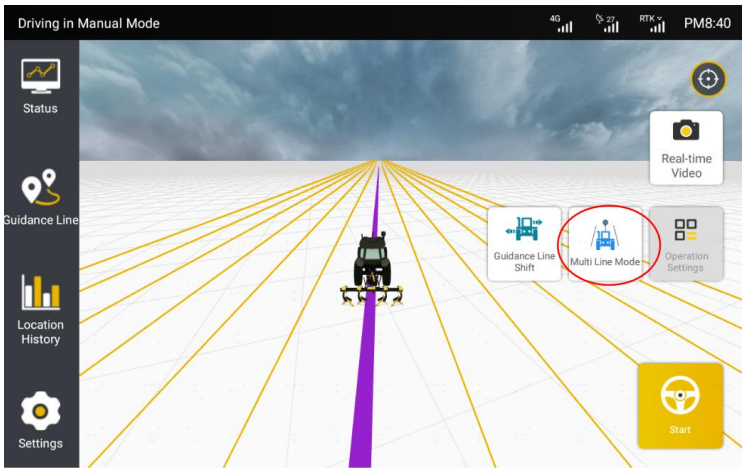

Figure 4.3.24 Switching operating modes

You can switch the current operating mode after importing the guidance line. Meanwhile, you can tap **Start/End** to control whether to enable vehicle autosteering driving.

1. Switch operating modes. You can switch the current auto steering driving mode by taping **Multi Line Mode/Single Line Mode** according to the actual needs.

Single Line Mode: refers to the linear operation without limiting the operating spacing.

Multi Line Mode: refers to the linear operation with the same operating spacing.

2. tap **Start/End**. After importing the guidance line, tap **Start** in the home screen, and the vehicle will enter the autosteering driving. tap **End**. The vehicle will exit the autosteering driving.

(3) Mark the Edge

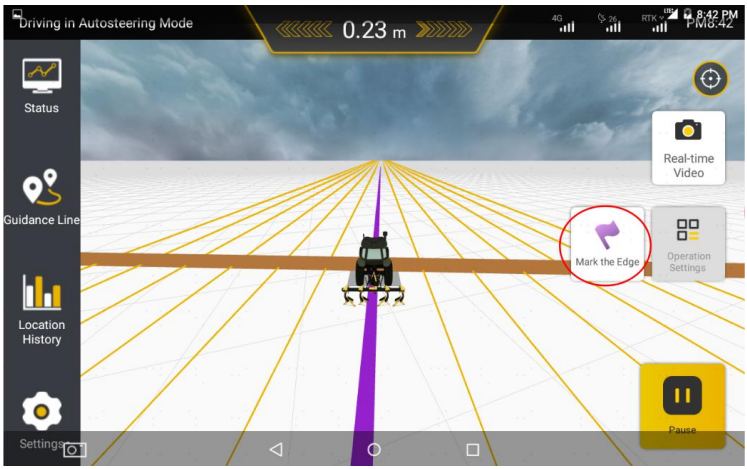

Figure 4.3.25 Marking the field edge

After importing guidance line or during the intelligent operation, you can enable the function of marking the field edge according to the actual needs. This function can alert the user when the vehicle is about to reach the field edge of another side, thereby effectively avoiding safety accidents especially in dark environment.

1. After importing the guidance line or during an intelligent operation, if you want to use this function, drive the vehicle to the field edge and tap **Mark the field edge** to mark the current position of the vehicle as the field edge.

2. The system will provide an alert sound and alert message for careful driving when the vehicle travels 20m away from the marked field edge.

3. When the system warns driver, you can tap **Pause** to suspend the current autosteering driving and resume the manual driving mode. Then, the alert sound and alert message will disappear immediately.

Notes for marking the field edge:

1. Only one field edge is allowed in the same direction.

In addition to completing commissioning and autosteering operations, you also can check the real-time status of the operating vehicle and undertake other system settings on the in-vehicle control terminal.

4 Other Functions

4.1 Status

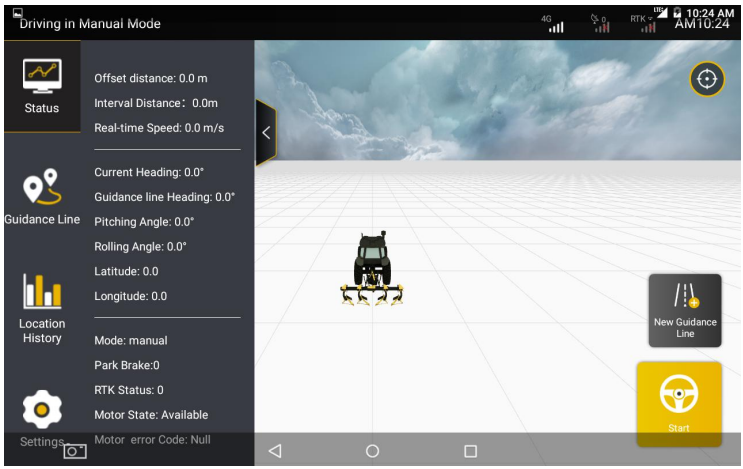

Figure 4.4.1 Status

Users click the "STATUS" to access the working status and operation of the vehicle.

Offset Distance: Offset distance of the vehicle;

Real-time Speed: Real-time speed of the vehicle;

Current Heading: Current heading angle of the vehicle;

Guidance Line Heading: The heading angle of the AB line;

Pitching Angle: the overall pitching angle of the vehicle;

Rolling angle: the overall rolling angle of the vehicle;

Longitude and Latitude: The real-time latitude and longitude of the vehicle;

Mode: Manual, automatic interval such as AB line, misalignment of heading, the distance of AB point is too small, heading update timeout, position update timeout, and heartbeat timeout;

Park Brake: Emergency braking;

RTK Status: The current status of RTK connection. The RTK connection is very stable when it shows the value of 4, otherwise, please check the working environment.

Motor Status: The status of the motor;

Motor Error Code: the error number when an error occurs;

4.2 Guidance Line

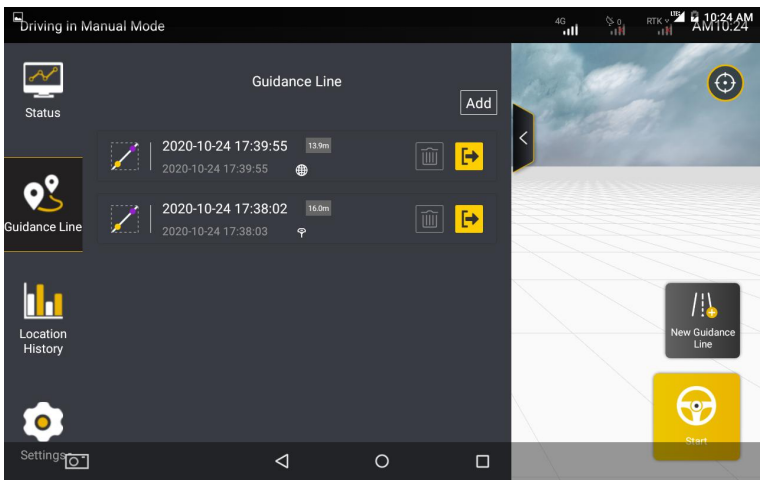

Figure 4.4.2 Guidance Line list

Users can click the "Guidance Line" to access the details, and view the list of guidance line.

1. Check the guidance line Information.

In the guidance line details page, users can view historical information incl. Using date, time, etc.

2. Delete the guidance line.

Users click the "DELETE" along with each saved baselines to delete it.

3. Import the Baseline.

During preparation, Users can select a certain baseline from the list and import it to the current operation.

4.3 Location History

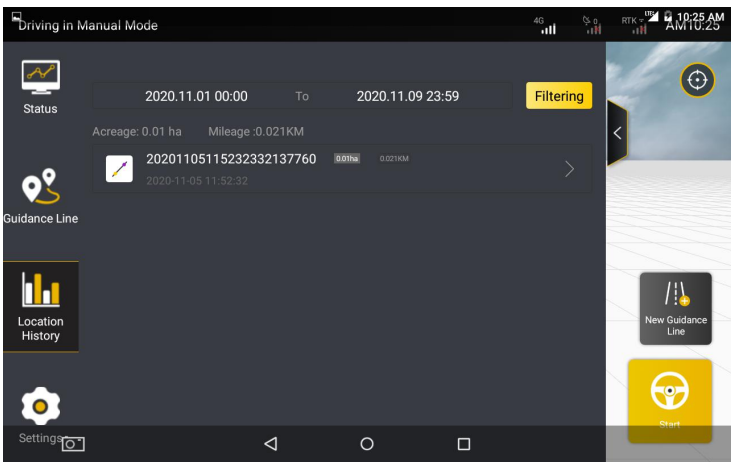

Figure 4.4.3 Operation Data

1. Check the Operation List

Users can check the information on each operation, ant tap each tab to access the detail of the historical route of the operation, including Spacing, Acre, Mileage, and Velocity and etc.

2. Filter the Job List

Users can filter the operation information by month. After the data is filled in, click “FILTERING” to refresh the list.

Precautions of operation data:

1. Historical operation data is the operation data accumulation of each Baseline.

2. The latest operation is placed on the top of the list, sorted by date.

3. The date on the list is the date on which the field was saved, not the date of the last job operation.

4. The acre and mileage are cumulative items of historical operations instead of a single data of the latest operation.

4.4 Settings

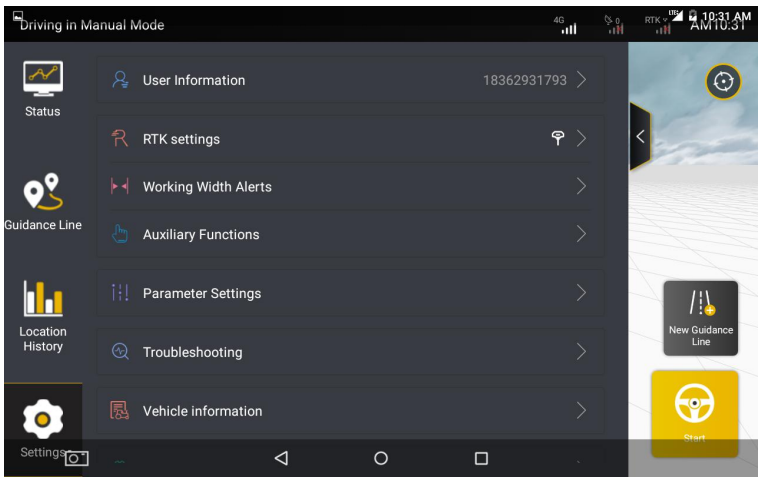

Figure 4.4.4 Setting list

4.4.1 RTK Settings

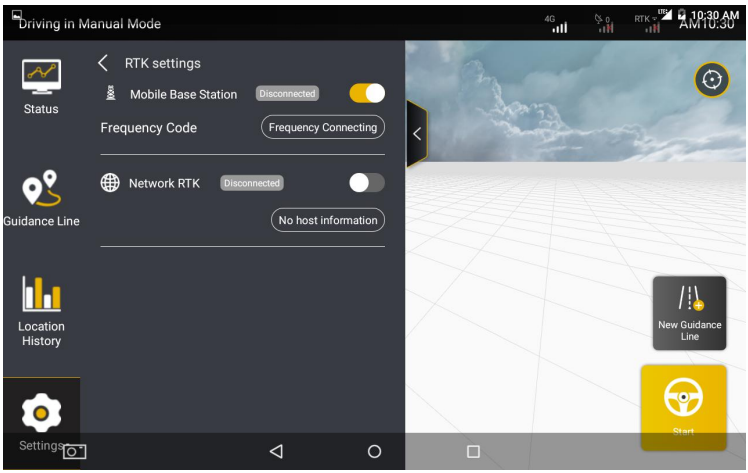

Figure 4.4.5 RTK Settings

RTK is such a technology that can ensure a centimeter-level high-precision positioning of the agricultural machinery. There are network RTK and mobile base station. Network RTK is provided by local telecom operators, while mobile base station service needs to purchase FJD base stations.

1. Before using the network RTK, users need to purchase the services from the local RTK service provider to get the ntrip account information.

2. Based on the premise that the above ntrip information is available, turn on the network RTK, click the connect button to enter your Ntrip information. Then, tap **Connect**. The system will automatically display a prompt box for you to enter domain name and account information. Then, tap **Get Source** to save the connection and finish the RTK settings.

3. After it has been successfully deployed, it will be automatically accessed by default the next time the system boots, if necessary, you can manually disconnect it.

4.4.2 Working Width Alerts

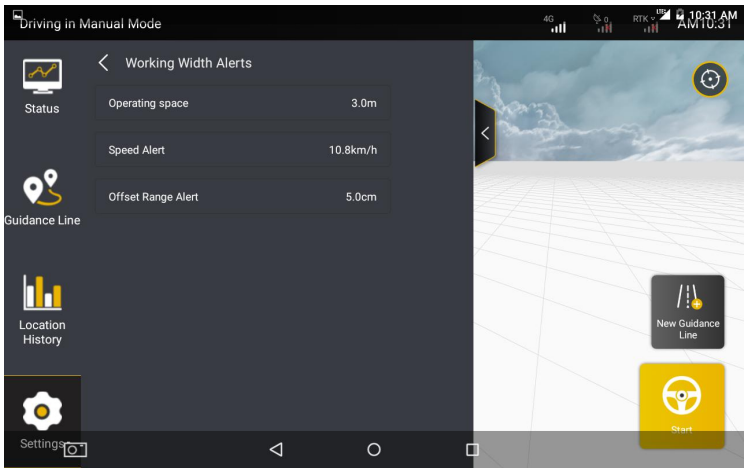

Figure 4.4.6 Working width alerts

On the displayed **Parameter Settings** screen, tap the **Working width Alerts** tab. The displayed details screen allows setting **Operating space**, **Speed Alert**, **Offset Range Alert**, and **Driving distance warning**. tap the item that needs to be set and enter the corresponding value.

Operating Spacing: indicates the distance between adjacent guidance lines in multi line mode.

Speed Alert: indicates the warning speed preset. It allows the system to prompt the driver to manually slow down the vehicle in auto steering driving mode in the case of speeding.

Offset Range Alert: indicates the warning offset preset for the vehicle in autosteering driving.

Vehicle Parameters

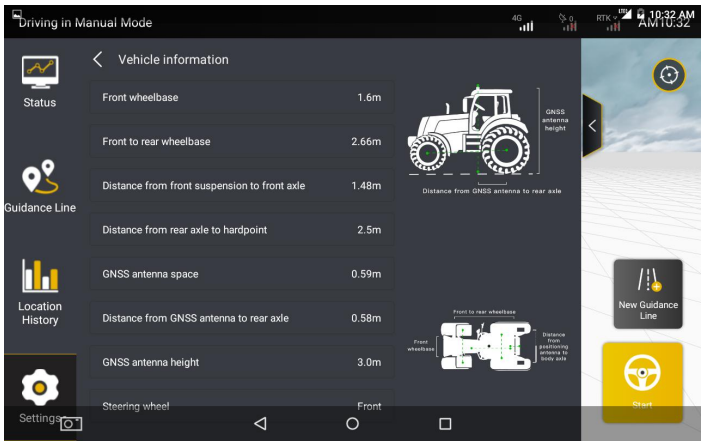

Figure 4.4.7 Vehicle parameter settings

Tap the **Vehicle Parameters** tab. On the displayed details screen, tap the required items and enter the corresponding vehicle data to complete vehicle parameter settings. For specific measurement details, please refer to the instruction video.

Angle Sensor

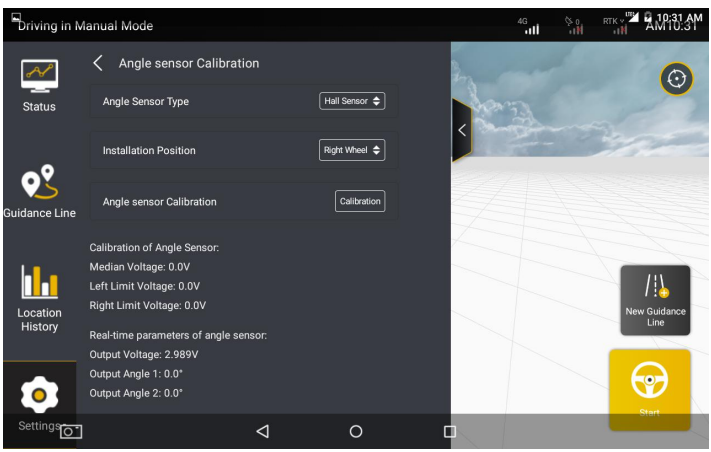

Figure 4.4.8 Angle sensor settings

Tap the Angle Sensor Calicration tab in parameter calibration page. On the displayed details screen, set **Angle Sensor Type**, **Installation Position** and tap **Calibration** to calibrate the angle sensor in this position. For details, see section 2.5 “Calibrate the angle sensor” in Chapter IV “Software Operation Instructions of In-vehicle Control Terminal.”

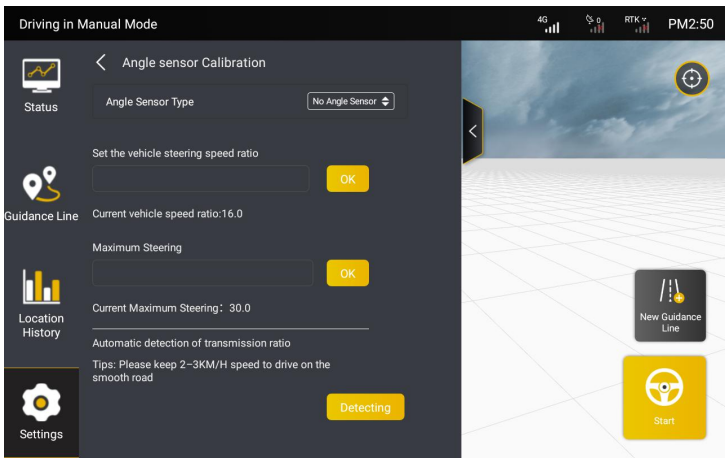

Figure 4.4.9 Settings for no angle sensor

Calibration of Accessories

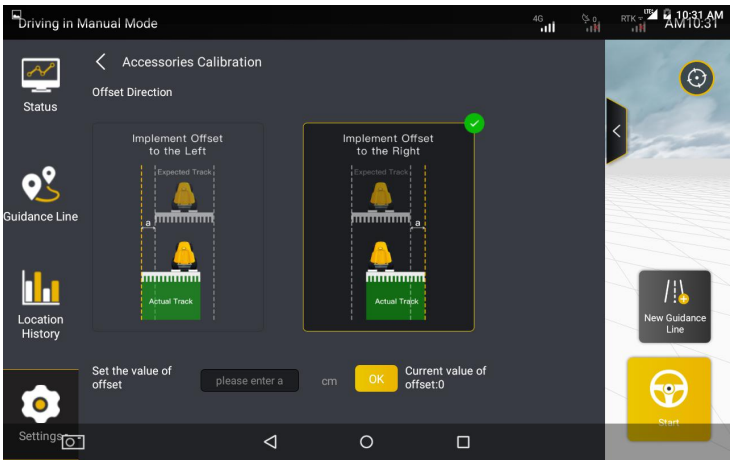

Figure 4.4.10 Settings for calibration of accessories

When autodriving path has a offset within 3 cm after the implement is equipped, please measure the value. If the autodriving path tends to the left comparing to the pre-set guidance line, please select "implement offset to the left" and enter the deviation value “a”, and then click "OK" to save the setting; if the autodriving path tends to the right, select "implement offset to the right" and enter the deviation value a, and click "OK".

Parameters Commissioning (for FAE Only)

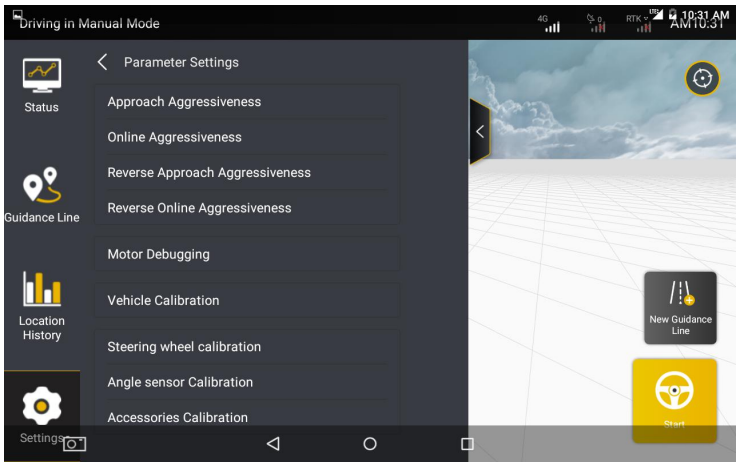

Figure 4.4.11 Parameter settings

Approach Aggressiveness: affects the time for the vehicle to enter the next guidance line when making a turn. The larger the value is, the shorter adjustment time the process needs. However, the driving instability is higher.

Online Aggressiveness: affects the linear driving accuracy of the vehicle. The smaller the value is, the higher the control degree, but the instability will increase accordingly. For example, the possibility of an “S” turn is greater.

Vehicle Calibration

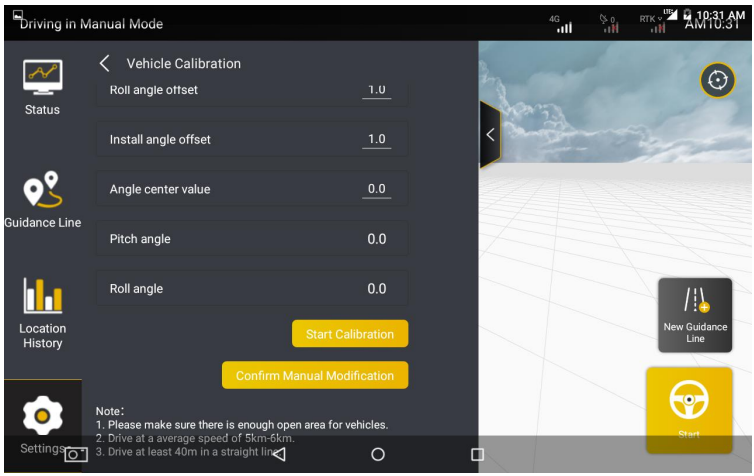

Figure 4.4.12 Vehicle calibration

For detailed operations, see section 2.8 “Vehicle Calibration” in Chapter IV “Software Operation Instructions of In-vehicle Control Terminal.”

4.4.1 Parameter Settings

Choose **Settings** > **Parameter Settings**. On the displayed screen, you can set **Vehicle Parameters**, **Angle Sensor**, and **Calibration of Accessories** to ensure operational accuracy.

4.4.3 Troubleshooting

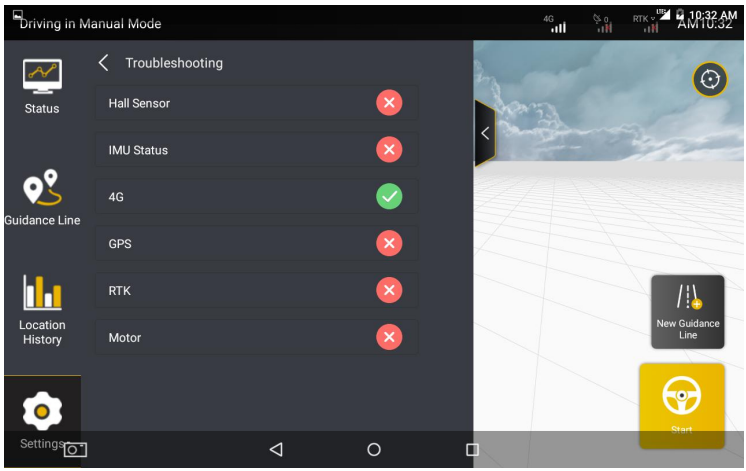

Figure 4.4.14 Troubleshooting

If encountering any problem during use, the user can enter "Troubleshooting" to perform software and hardware detection of the vehicle. The user can promptly adjust the fault items displayed as "×" in the screen, the interface is as shown in the figure above.

4.4.4 System Version (OTA Upgrade)

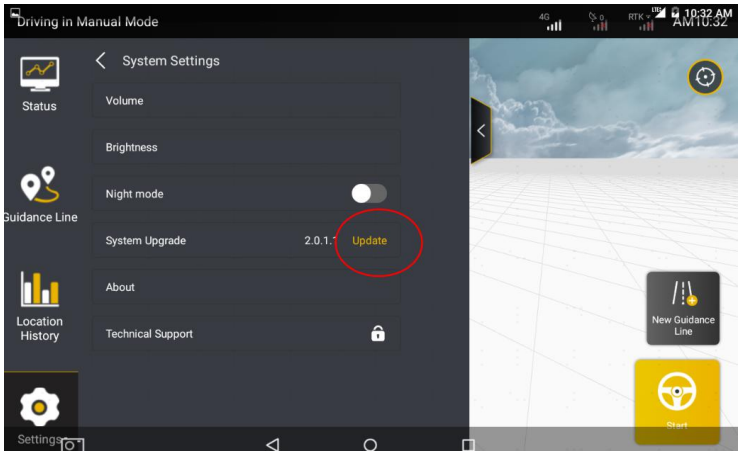

Figure 4.4.15 OTA Upgrade

When there is an update to the software version, you can perform the following operations to achieve a one-tap upgrade of the auto steering kit:

1. Turn on the in-vehicle control terminal of the autosteering kit. Make sure that the control terminal can access the Internet through network SIM card/WiFi network and that the network status is stable (please make sure the 4G antenna is connected properly).

2. If there is a new version, the system will automatically display a prompt for upgrade.

3. Tap **Confirm Update** in the prompt box to enter into the upgrade process.

4. Do not take any operation during the upgrade. You can check the upgrade progress through the displayed information and wait for its completion.

5. After the upgrade is successful, the system will display a prompt that the upgrade is successful and then automatically enter the new version.

6. If the upgrade fails, the system will prompt you to retry. tap **Retry** to re-upgrade the system.

Notes for OTA upgrade:

1. Ensure that the network status is stable throughout the upgrade process.

2. Do not power off the terminal during the upgrade process.

3. If you encounter any problems during the upgrade, please contact your local dealer for help or call the technical service hotline.

4.4.5 Other Settings

In addition to **Parameter Settings**, **RTK settings**, and **Troubleshooting**, the **Settings** screen allows setting and querying other general information such as **Volume**, **Brightness**, and device information.

Chapter V FAQs

No	Fault	Troubleshooting
1	"S" turn in autosteering operations	Check if the rolling angle and pitching angle data changes in real time.
		Calibrate the angle sensor
		Check whether the GNSS antenna installation connector is correct.
2	Steering wheel malfunction during autosteering operations	Check the brake status.
		Test the motor
		Power off and restart the vehicle.
		Check whether the angle sensor is installed correctly.
		Check whether the GNSS antenna installation connector is correct.
		Re-calibrate the angle sensor on the Settings screen.
3	No 4G signal	Check if the SIM card is inserted.
		Check if the 4G antenna is connected properly.

4	No RTK signal	When the mobile base station is connected, please check whether the base station is powered/used normally.
		When the Internet RTK is connected, please verify that 4G signals are normal.
		When the Internet RTK is connected, please verify that the Ntrip account is available.
5	Inconsistent line spacing in multi-line mode	Please verify that the vehicle parameters are entered correctly.
		Please verify that vehicle calibration in Settings is completed.
		Please re-calibrate the accessories.

Chapter VI Appendix

1 Main Hardware and its Specifications

No.	Assembly	Components	Specifications
1	Control Terminal	Control Terminal	Size: 300×190×43mm; 10.1-inch capacitive touch screen, LED backlight, 1280*800 pixels, 700cd/m2 LCD; Dual speaker; 2G RAM, 8G ROM; Various digital and analog output interfaces, etc. Power supply: 10-30V; RF signal, Positioning satellite and 4G signal etc.; Operating temperature: -30℃~+70℃; Storage temperature: -40℃~+85℃; IP rating: IP65; Relative Humidity: 0% to 95%, @40℃ (non-condensation) WIFI specification: 2.4GHz frequency band, frequency range: 2.4GHz-2.5GHz, output power: 14dB±1.5dB

2	Antenna Assembly	GNSS Antenna	Frequency range: GPS L1/L2, GLONASS L1/L2, BDS B1/B2/B3; Operating voltage: 3.3~12VCD; Operating current: ≤45mA; Size: 152*63mm
3		4G Antenna	Suction cup antenna: Frequency range: B1/B2/B3/B5/B8/B38/B39/B40/B41; VSWR: ≤2.0; Gain (dBi): 2±0.5; Impedance (Ω): 50; Polarization: Linear, Vertical; Antenna size: Φ370*82mm; Operating temperature: -20℃~+60℃
4		Radio Antenna	Suction cup antenna: Frequency range: 433/470MHz; VSWR: ≤2.0; Gain(dBi): 1±0.5; Impedance (Ω): 50; Polarization: Linear, Vertical; Antenna size: Φ490*82mm; Operating temperature: -20℃~+60℃
5	IMU	IMU	Power input: 5V; Acceleration accuracy: 0.09mg; Gyroscope accuracy: 0.004°/s; Heading angle accuracy: 1°; Roll and pitch angle: 0.5°
6	Angle Sensor	Angle Sensor	Power supply: 5V; Update frequency: typical 3.4KHz; Resolution: < 0.1°; IP rating: IP67; Operating temperature: -40℃~+85℃
7	Electric Steering Wheel	Steering Wheel	Power supply: 12V/24V; Peak torque: 20Nm (12V); 30Nm (24V); IP rating: IP65

8		Steering Motor (12V /24V)	Power supply: 12V/24V; Peak torque: 20Nm (12V); 30Nm (24V); IP rating: IP65
9		Splined Sleeve	Power supply: 12V/24V; Peak torque: 20Nm (12V); 30Nm (24V); IP rating: IP65

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