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1. Introduction

This manual contains important information on how to install, configure, and use the display. To access the complete manual with all other display features and products, download the document version available from the Hexagon Agriculture website support (https://hexagonagriculture.com/support/manuals).

Initials informations:

- Carefully read this user manual before turning the display on;
- To ensure your safety, observe the instructions contained in the User Manual and the Safety Manual issued by the manufacturer of the farming machinery;
- The images in this manual are purely illustrative. Screens and visual elements may differ from the actual items.

The symbols used in this manual have the following meanings:

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>!</td>
<td>Warning: Indicates a potentially hazardous situation or misuse which, if unavowed, may result in minor to moderate injury, material loss, financial loss and/or environmental loss.</td>
</tr>
<tr>
<td>!</td>
<td>Danger: Indicates an imminently hazardous situation which, if unavowed, may result in serious injury or death.</td>
</tr>
<tr>
<td>i</td>
<td>Important: Important information that must be observed so that display is used in a technically correct and efficient manner.</td>
</tr>
</tbody>
</table>
2. Safety instructions

- **Allowed usage**
- **Use risks**
- **Electromagnetic compatibility**

### 2.1 Allowed usage

The following instructions aim to inform users about the inherent risks to display operation as well as how to avoid them.

**Warning**
Only use the display computer on vehicles with farming purposes such as tractors, sprayers, planters, fertilizer applicators, subsoilers, trucks, among others.

**It is not allowed:**

- Using outside the restrictions imposed in this manual;
- Opening the device with tools, except with technical support's written permission;
- Modifying or altering the product;
- Using the display with obvious damage or defects;
- Using the display with accessories from other manufacturers without approval.

**Warning**
The display must not be used without the user being aware of the correct product usage. Its incorrect usage may result in personal injury, breakdown, and damage.

**Danger**
Unauthorized modification of the vehicle for mounting or installing the display may alter the operation and safety of the agriculture machinery.

**Warning**
Verify the integrity of the results of the display's measurements after a fall or misuse, transport, modification, or when stored for long periods of time.

### 2.2 Use risks

- Use of the display is not recommended during thunderstorms due to the risk of being struck by lighting;
- Keep a safe distance from electrical installations and components;
- In case the product will not be used for a long time, it is recommended to disconnect all components and cables;
- To clean the display's monitor, use a soft cloth moistened with 50% isopropyl alcohol.

Incorrect disposal of the display may cause the following problems:

- Release of poisonous gases in case of polymer burning;
- Improper product use, resulting in serious physical harm;
- Contamination of the environment.

**Warning**
The display must not be mixed with household waste. It must be disposed of in accordance with regulations in force in the country of use.

### 2.3 Electromagnetic compatibility

**Electromagnetic compatibility**

Radiation and electrostatic discharge, without causing electromagnetic disturbances to other devices.

**Warning**
Electromagnetic radiation may cause disturbances in other devices. Although this product fully meets the strictest regulations and standards in force, Hexagon Agriculture cannot completely exclude the possibility of interference with other devices.
There is a risk that interference may occur in other devices if the instrument is used with accessories from other manufacturers such as computers, laptops, radios, non-standard cables, external batteries, etc.

Recommendations:

- **Only use devices and accessories recommended by Hexagon Agriculture.** When used with this instrument, such accessories meet the strictest requirements of the regulations and standards in force;

- **Consider the information on electromagnetic compatibility provided by computer and transceiver radios during their use;** Monitor measurement results when operating in areas with disturbances caused by electromagnetic radiation, as these may lead to incorrect results. *Although this product fully meets the strictest regulations and standards in force, Hexagon Agriculture cannot completely exclude the possibility of interference in the instrument caused by intense electromagnetic radiation emitted, for example, by radio transmitters, generators, electric cables, etc.*

- **Always connect both ends of the cables during use.** If the instrument is used with cables connected only to one end, the permissible level of electromagnetic radiation may be exceeded and the correct operation of the instrument may be affected;

- **Do not operate the product with radio devices or mobile phones near fuel stations, chemical facilities, areas with explosion hazards, medical devices, or aircraft.** The electromagnetic fields caused by using the product with radio devices or mobile phone may cause interference in other devices, facilities, aircraft, and medical instruments such as heart rate regulators or hearing aids. Electromagnetic radiation might even affect humans and animals. Although the product meets the regulations and standards in force, Hexagon Agriculture cannot completely exclude the possibility of other devices being disturbed or people and animals being affected.
3. Displays overview

3.1 Overview of the display HxGN AgrOn Ti5

The HxGN AgrOn Ti5 is a complete precision farming guidance system with the following functions:

3.1.1 System components

1. Display's monitor
2. GNSS antenna
3. Antenna support
4. Antenna cable
5. Power cable
6. Arm - mounting bracket
7. Clamp - mounting bracket
8. Pendrive
9. Documentation

3.1.2 Views

Warning: The display was designed to be used with the touch of your fingers on the screen. Do not operate with sharp objects such as pens or screwdrivers as this may damage and affect the warranty of your product.

1. 5-inch color touchscreen
2. Power button
3. CAN communication port
4. USB interface
5. Fixing bracket
6. GNSS antenna connection
3.1.3 Product identification

The product type (model) and serial number are indicated on a label on the back of the display. Record the type and serial number in your manual and inform them when contacting technical support.

![Product identification](image)

**Important**

You can also check your device’s serial number accessing the Configuration menu – System settings – About.

3.1.4 CAN connector pinout

1. Voltage output Vcc
2. CAN High
3. Buzzer output
4. Voltage output Vcc
5. Battery + (Main supply)
6. Serial RS232 TX
7. Battery - (Main supply)
8. Serial RS232 RX
9. Sensor input
10. GND
11. GND
12. CAN Low

![CAN connector output](image)

3.2 Overview of the HxGN AgrOn Ti7

The display is a complete precision farming guidance system with the following functions:

![General application](image)

3.2.1 System components
1. Display's monitor
2. GNSS antenna
3. Antenna support
4. Antenna cable
5. Power cable
6. Arm - mounting bracket
7. Clamp - mounting bracket
8. Pendrive
9. Documentation

3.2.2 Views

Warning
The display was designed to be used with the touch of your fingers on the screen. Do not operate with sharp objects such as pens or screwdrivers as this may damage and affect the warranty of your product.

1. 7-inch color touchscreen
2. Power button
3. SIM card slot
4. GPRS connection
5. Fixing bracket
6. Wi-Fi antenna connection
7. GNSS antenna connection
8. USB interface
9. CAN communication port
10. Power connection (12V)
11. Input and output connection

3.2.3 Product identification

The product type (model) and serial number are indicated on a label on the back of the display. Record the type and serial number in your manual and inform them when contacting technical support.

3.2.4 CAN connector pinout
### Connector A

1. Power Output  
2. CAN 1 High  
3. Power Output  
4. CAN 2 High  
5. Power Output  
6. Serial 1 RS232 TX  
7. GND  
8. Serial 1 RS232 RX  
9. GND  
10. CAN 2 Low  
11. GND  
12. CAN 1 Low

### Connector Power

1. Battery - (Main Supply)  
2. Battery + (Main Supply)

![Connector A and Connector Power](image)

### Connector B

1. Power Output  
2. Sensor M Input  
3. Buzzer Output  
4. Sensor A Input  
5. Power Output  
6. Serial 2 RS232 TX  
7. GND  
8. Serial 2 RS232 RX  
9. Sensor B Input  
10. GND  
11. GND  
12. Sensor P Input

![Connector B](image)
4. Equipment’s installation

4.1 Displays’s fixation

**Warning** The display installation must be performed by a qualified technician. Read the safety instructions before performing the installation steps.

**Ti5 display fixation**

Choose an appropriate location for securing the display monitor within reach of the operator while seated in a normal operating position and in front of the operator’s field of vision.

![Display installation](image1)

**Warning** Do not mount the display where it can be struck by an airbag.

To perform the installation, proceed as follows:

1. Mount the clamp to the desired location in the vehicle;
2. Connect the clamp to the monitor (01) and the support ball (02), firmly securing using the handle;
3. Position the assembly in a location visible to the operator and check if it is firm and secure;
4. Connect the power cable to a battery or to a location indicated by the vehicle manufacturer and connect the other end to the back of the display;

**Ti7 display fixation**

Choose an appropriate location for securing the display monitor within reach of the operator while seated in a normal operating position and in front of the operator’s field of vision.

![Display installation](image2)

**Warning** Do not mount the display where it can be struck by an airbag.

To perform the installation, proceed as follows:

1. Mount the clamp to the desired location in the vehicle. To mount the clamp, wrap the bow around the tube, insert the base, and fasten with hex nuts. Use a socket wrench for better tightening;
2. Connect the clamp ball and the monitor to the mounting arm, firmly securing using the handle;
3. Position the assembly in a location visible to the operator and check if it is firm and secure;
4. Connect the power cable to a battery or to a location indicated by the vehicle manufacturer and connect the other end to the back of the display;  
5. Connect the horn cable to the input/output connector.

4.2 SIM card installation

| Warning | The viability of installing the SIM card should be checked by a qualified technician for the Ti5 display. |

To enable remote communication on systems equipped with an internal modem, a SIM card is required.

| Important | Only required in Wi-Fi + Mobile network version. |

To install the SIM card, proceed as follows:

1. On the back of the display, remove the four screws as shown in the figure. Use the lowered space to make it easier to open the lid;

2. Pull the insert down and open to a 90-degree angle;

3. Insert the SIM card into the slot, ensuring its proper positioning;
4. Close the opening and push up until you hear the locking sound;

5. Put the back lid on and screw the removed screws.

4.3 Antenna installation

| Warning | The display antenna must be mounted on the roof of the vehicle, preferably front and center on the flat part of the roof;  
The antenna must be mounted horizontally and must not be tilted in order to ensure the best GNSS signal reception;  
It is necessary to keep the antenna as far away as possible from obstacles in order to ensure that the signal is received in all directions;  
A clear view of the sky to the horizon in all directions is recommended for the ideal reception of satellites, as obstacles close to the antenna prevent the reception of signals;  
Keep the GNSS antenna as far away from the radio antennas as possible;  
If the antennas are installed too close to each other there may be interaction between the antennas and a consequent loss of sensitivity. |

To install the antenna, proceed as follows:

1. Clean and dry the roof of the vehicle to prepare the installation. We recommend isopropyl alcohol;
2. Check if the installation area on the roof is clean and dry;
3. Attach the GNSS antenna. It has magnets that attach to the vehicle's metallic roof. In case it is not metallic, use a metal bracket for fastening, using double-sided tapes on the back of the holder. Remove the plastic protection and make it adhere to the roof of the vehicle;

4. Connect the antenna cable to the back of the display. The cable cannot be cut, twisted, or excessively bent, as its performance may be degraded causing the system to fail.

*Figure - Ti5 display antenna installation*

*Figure - Ti7 monitor display antenna installation*
5. Running display for the first time

**Warning**
We recommend starting the vehicle before turning the display on.

### 5.1 Starting the device

To turn the monitor on, proceed as follows:

1. Press the **On** Button on the front panel of the display for one second;
2. The display will show the screen for selecting **Language**, **Time Zone**, and **Theme**;
3. Enter the desired settings and confirm;
4. If operating in the quick launch mode, when starting your display for the first time, the new work session setup wizard will show. Go to topic [New job section on fast start mode](#);
5. If operating in the conventional launch mode, go to next topic [Job section](#).

**Important**

The fast start mode is only available for the display with solely and exclusively the **Guidance** activated. To enable or disable this function, select the **Fast mode ON/OFF** option located on the right side of the work session list. The display will always start in the same startup mode it was operating in when it was turned off (quick launch mode or conventional launch mode).

![Language and time zone selection](image)

**Figure - Language and time zone selection**

### 5.2 Shutting down the monitor

To shutdown the monitor of your display, proceed as follows:

1. Press the **Off** button on the front of the module;
2. A confirmation message will be displayed;
3. Confirm the operation by selecting **Yes**;
4. Wait for the screen to turn off.

**Warning**

Do not remove the power source without the screen turning off completely.
6. Job section

A job section consists of the combination of various information that characterize a performed job, such as the performed activity, in which farm, in which field, etc.

In order to operate the display, there must always be a running work session, which may have been previously created or completely new. For this reason, when the device is turned on, the system directs the user to the Job section management screen.

The Job section management may also be accessed at any time by the used through the Configuration menu.

Job section in conventional mode

From this screen one may select, delete, or create a new job section.

Job section on fast start mode

The job section on fast start mode is only available for the displays with solely and exclusively the Guidance activated. To enable or disable this function, select the Fast mode ON/OFF option located on the right side of the job section list. The display will always start in the same startup mode it was operating in when it was turned off (fast start mode or conventional mode).

From this screen one may select, delete, or create a new job section, enable or disable the fast start mode, or view the settings of the last implement used.

6.1 Selecting a job section

Job section selection is the same for both launch modes. See topic Job section.

To select a job section, proceed as follows:

1. Select a Job section among those presented on the screen;
2. Press OK to start the operation.

Regardless of the Job section selected from the list, display will always use the settings for the last implement used. To check the current values, on fast start mode they are displayed in the indicator boxes on the right side of the screen.
6.2 Inserting a job section

The way to create a new job section will depend on the type of startup:

- If operating in conventional mode, go to next topic New job section in conventional mode.
- If operating in fast mode, go to topic New section on fast start mode.

6.2.1 New job section in conventional mode

To create a new job section in conventional mode, proceed as follows:

1. On the Job section screen, select option New;
2. A message will be displayed informing the necessary input fields for creating a new job section;
3. Click OK to confirm reading the message;
4. The list of farms is presented;
5. Select a farm from the list or select New to insert a new farm;
6. Enter the farm name and select OK to confirm;
7. Confirm the name presented on the list and click OK to select;
8. The list of fields is presented;
9. Select a field from the list or select New to insert a new field;
10. Enter the field name and select OK to confirm;
11. Confirm the name presented on the list and click OK to select;
12. The list of activities is presented;
13. Select an activity from the list or select New to insert a new activity;
14. Enter the activity name and select OK to confirm;
15. Confirm the name presented on the list and click OK to select;
16. The new job section is created.

Important: The Farm, Field, and Activity fields only allow names with at most twelve characters. There cannot be work sessions with the same name (Farm, Field, and Activity).

Warning: When the Open last session when starting box is activated, the work session screen will no longer be displayed when the device is started. Instead, it will start directly at the operation window for the last used work session.

6.2.2 New job section on fast start mode

To create a new job section on fast start mode, proceed as follows:

1. Click on New;
2. On the Implement and Vehicle screen, insert the implement’s width and the distance from the vehicle’s antenna to the implement;
3. Confirm the operation selecting the Save option;
4. A message informing that the new job section has been created will be displayed;
5. Confirm you have read the message by selecting OK;
6. The operation screen will be displayed.
6.3 Removing a job section

To remove a job section on fast start mode, proceed as follows:

1. Select a **Job section** among those presented on the screen;
2. Select option **Delete**;
3. A confirmation message will be displayed;
4. Confirm the operation by selecting **Yes**;
5. The Job **section** is deleted.

---

**Important**
The system will not allow deleting the **Job section** currently in use.
7. Operation screen

The operation consists of the main screen where the activities are in fact executed according to all the configured parameters and activations.

The display operation screen changes to suit the context of use that depends on the vehicle and related activity. For example, truck-type vehicles performing trips use the **Mode of operation with routes**, while tractors in the field use the **Mode of operation with lightbar**.

---

**Warning**

In case alerts exist, they will be displayed above the operation screen before execution begins.

---

**Operation screen with lightbar**

During operation, in order to provide a broader view of the field, only the following information and features will be visible:

1. Alerts
2. Notifications bar
3. Connectivity information
4. Operation bar
5. Lightbar
6. Suspended operation
7. Operation information

---

**7.1 Upper bar**

**7.1.1 Alerts**

---

**Important**

Before starting any operation, make sure that there are no active alerts.

Alerts are displayed automatically on the screen during the operation. The operator may close them, but if the condition which triggered the alert continues to occur, the alert will be displayed on the top of the screen.

Slide the notification bar downwards to visualize the list of notifications and to preview the messages. Slide the bar upwards to close it again.

---

**Important**

When a notification message is clicked on, it is removed from the notification list but is still accessible through the alert icon on the upper left corner.

Click on the alert icon to access all active alarms and to obtain more detailed information on how to troubleshoot the problem.
The following alarm categories are issued by the display:

- GNSS information;
- Odometer information;
- CAN information (connection to the drivers);
- Power supply;
- Anticide;
- Speed limit;
- Memory;
- Planting monitor;
- Auto steering;
- Fertilization;
- Seed controller;
- Sprayer;
- SIM Card;
- CPU temperature;
- Chat messages;
- Routes.

### Warning

Anti-lock alarms are issued when the temperature and/or memory reach critical levels. In this situation, the user is informed of the required procedure. In case the message is ignored, operation is suspended.

#### 7.1.1.1 Alert descriptions

<table>
<thead>
<tr>
<th>Name</th>
<th>Summary</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Monitoring alert</td>
<td>Rule violated</td>
<td>A monitoring rule has been violated. Contact your supervision.</td>
</tr>
<tr>
<td>High temperature</td>
<td>High system temperature</td>
<td>Operation suspended due to overheating. Turn off device, let it cool for a few minutes, and then turn it on again. Contact technical support if the problem persists.</td>
</tr>
<tr>
<td>Scale</td>
<td>Communication error</td>
<td>The system is unable to communicate with the weighing module. Ensure that the cable is connected and has not been damaged.</td>
</tr>
<tr>
<td>Incompatible Titanium database</td>
<td>Incompatible Titanium database</td>
<td>Incorrect version of the Titanium database, which may cause strange behavior and failure. If this occurs, please restore the factory settings to create a correct version.</td>
</tr>
<tr>
<td>Virtual fence</td>
<td>Out of bounds</td>
<td>You are outside the operating area. Please return to the allowed area.</td>
</tr>
<tr>
<td>GNSS connection</td>
<td>Disconnected GNSS antenna</td>
<td>Please ensure that the cable is properly connected.</td>
</tr>
<tr>
<td>--------------------------</td>
<td>---------------------------</td>
<td>---------------------------------------------------</td>
</tr>
<tr>
<td>Input controller</td>
<td>Outside the speed range</td>
<td>You are operating outside the speed range deemed appropriate for good input application. You may improve the speed range by changing the system calibration.</td>
</tr>
<tr>
<td>Input controller</td>
<td>Motor stopped</td>
<td>The system is unable to detect motor movement. Ensure that the hydraulic system is on, the motor speed sensor is connected, and no other alarms are active.</td>
</tr>
<tr>
<td>Input controller</td>
<td>No auxiliary power</td>
<td>The input control driver is not getting power to start the motor. Check the auxiliary power cord connections.</td>
</tr>
<tr>
<td>Input controller</td>
<td>Desired rate not reached</td>
<td>The system is unable to reach the recommended dosage. If you have not received an alert that the operation is outside the speed range, the calibration or the minimum and maximum motor speed parameters may be wrong.</td>
</tr>
<tr>
<td>Liquid controller</td>
<td>Outside the speed range</td>
<td>You are operating outside the proper speed range for good application. You can improve the speed range by altering the spray nozzle.</td>
</tr>
<tr>
<td>Liquid controller</td>
<td>Desired rate not reached</td>
<td>The system is unable to reach the spray recommendation. If you have not received an alert that the operation is outside the speed range, the selected nozzle may be incorrect or there may be a problem with the pump.</td>
</tr>
<tr>
<td>Seed controller</td>
<td>Outside the speed range</td>
<td>You are operating outside the proper speed range for good planting. You can improve speed range by changing the seed disks.</td>
</tr>
<tr>
<td>Seed controller</td>
<td>Motor stopped</td>
<td>The system is unable to detect motor movement. Ensure that the hydraulic system is on, the motor speed sensor is connected, and no other alarms are active.</td>
</tr>
<tr>
<td>Seed controller</td>
<td>No auxiliary Power</td>
<td>The seed control driver is not getting power to start the motor. Check the auxiliary power cord connections.</td>
</tr>
<tr>
<td>Seed controller</td>
<td>Desired rate not reached</td>
<td>The system is unable to reach seed recommendation. If you have not received an alert that the operation is outside the speed range, the calibration or the minimum and maximum motor speed parameters may be wrong.</td>
</tr>
<tr>
<td>Short-circuit</td>
<td>Short-circuit</td>
<td>A short-circuit has been detected involving the red/black power fires of either the CAN bus or the seed sensors. Ensure that the cables are not damaged.</td>
</tr>
<tr>
<td>Incompatible monitoring database</td>
<td>Incompatible monitoring database</td>
<td>Incorrect monitoring database version, which may cause strange behavior and failure. Please, update to an appropriate version. Insert a pendrive with an updated database and login with user hxgnguest (blank password). Go to Menu &gt; System Settings &gt; About &gt; Update Database.</td>
</tr>
<tr>
<td>Manual anticide application error</td>
<td>Empty line</td>
<td>Please ensure that the anticide tank is not empty and the sensor is not obstructed.</td>
</tr>
<tr>
<td>CAN device error</td>
<td>Gate controller disconnected</td>
<td>The gate controller configured for this implement is disconnected. Ensure that the CAN bus cables are properly connected and that the module is not damaged.</td>
</tr>
<tr>
<td>CAN device error</td>
<td>Controller disconnected</td>
<td>The input or seed variable rate controller configured for this implement is disconnected. Ensure that the CAN bus cables are properly connected and that the module is not damaged.</td>
</tr>
<tr>
<td>CAN device error</td>
<td>Controller disconnected</td>
<td>The logic controller configured for this implement is disconnected. Ensure that the CAN bus cables are properly connected and that the module is not damaged.</td>
</tr>
<tr>
<td>CAN device error</td>
<td>Anticide controller disconnected</td>
<td>The anticide controller configured for this implement is disconnected. Ensure that the CAN bus cables are properly connected and that the module is not damaged.</td>
</tr>
<tr>
<td>CAN device error</td>
<td>Liquid controller disconnected</td>
<td>The liquid controller configured for this implement is disconnected. Ensure that the CAN bus cables are properly connected and that the module is not damaged.</td>
</tr>
<tr>
<td>CAN device error</td>
<td>Section cut off</td>
<td>The section cut controller configured for this implement is disconnected. Ensure that the CAN bus cables are properly connected and that the module is not damaged.</td>
</tr>
<tr>
<td>CAN device error</td>
<td>Description</td>
<td></td>
</tr>
<tr>
<td>------------------</td>
<td>-------------</td>
<td></td>
</tr>
<tr>
<td>Transport driver disconnected</td>
<td>The transport module configured for this implement is disconnected. Ensure that the CAN bus cables are properly connected and that the module is not damaged.</td>
<td></td>
</tr>
<tr>
<td>Planting monitor disconnected</td>
<td>The planting monitoring module configured for this implement is disconnected. Ensure that the CAN bus cables are properly connected and that the module is not damaged.</td>
<td></td>
</tr>
<tr>
<td>Monitoring disconnected</td>
<td>The monitoring module configured for this implement is disconnected. Ensure that the CAN bus cables are properly connected and that the module is not damaged.</td>
<td></td>
</tr>
<tr>
<td>Automatic pilot controller disconnected</td>
<td>The automatic pilot controller configured for this implement is disconnected. Ensure that the CAN bus cables are properly connected and that the module is not damaged.</td>
<td></td>
</tr>
<tr>
<td>Depth gauge disconnected</td>
<td>The depth gauge configured for this implement is disconnected. Ensure that the CAN bus cables are properly connected and that the module is not damaged.</td>
<td></td>
</tr>
<tr>
<td>Automatic pilot driver error</td>
<td>Initialization error</td>
<td></td>
</tr>
<tr>
<td>Anticide error</td>
<td>Empty line</td>
<td></td>
</tr>
<tr>
<td>Communication failure</td>
<td>Communication failure</td>
<td></td>
</tr>
<tr>
<td>GNSS - Low precision</td>
<td>Number of available GNSS satellites too low.</td>
<td></td>
</tr>
<tr>
<td>GNSS - Low precision</td>
<td>No GLIDE</td>
<td></td>
</tr>
<tr>
<td>GNSS - Low precision</td>
<td>No RTK</td>
<td></td>
</tr>
<tr>
<td>GNSS - Low precision</td>
<td>No SBAS</td>
<td></td>
</tr>
<tr>
<td>GNSS - Low precision</td>
<td>Inactive TERRASTAR</td>
<td></td>
</tr>
<tr>
<td>GNSS - Low precision</td>
<td>TERRASTAR-C not synced</td>
<td></td>
</tr>
<tr>
<td>GNSS - Low precision</td>
<td>TERRASTAR-L not synced</td>
<td></td>
</tr>
<tr>
<td>GNSS without communication</td>
<td>No communication with GNSS hardware</td>
<td></td>
</tr>
<tr>
<td>GNSS syncing</td>
<td>Syncing GNSS</td>
<td></td>
</tr>
<tr>
<td>Module</td>
<td>Description</td>
<td>Message</td>
</tr>
<tr>
<td>-------------------------</td>
<td>-----------------------------------------------------------------------------</td>
<td>------------------------------------------------------------------------</td>
</tr>
<tr>
<td><strong>Guide</strong></td>
<td>End of guide</td>
<td>The system is approaching the end of the guide. Get ready to maneuver the vehicle.</td>
</tr>
<tr>
<td>Guide - Loading</td>
<td>Guide is loading</td>
<td>The selected guide is loading. This alert will automatically disappear as soon as the guide is loaded and the automatic pilot is ready for use. Please wait.</td>
</tr>
<tr>
<td>Joystick</td>
<td>No joystick commands</td>
<td>The system is not reading joystick commands. Please ensure that the cables are properly connected.</td>
</tr>
<tr>
<td>Speed limit</td>
<td>Speed limit exceeded</td>
<td>The speed limit has been exceeded. Please slow down.</td>
</tr>
<tr>
<td>Login</td>
<td>Login before operating the vehicle</td>
<td>Please login before moving or operating the vehicle in any way.</td>
</tr>
<tr>
<td>Full memory</td>
<td>Insufficient memory</td>
<td>The available memory is insufficient thus the operation has been suspended. Close this work session and start a new one.</td>
</tr>
<tr>
<td>Insufficient memory</td>
<td>No available space</td>
<td>There is no space available thus the operation has been suspended. Export your flash files, then delete them from the system to free up space.</td>
</tr>
<tr>
<td>Satellite modem</td>
<td>Satellite modem not connected</td>
<td>Please ensure that the cable is properly connected.</td>
</tr>
<tr>
<td>Fertilizer monitor</td>
<td>Line without fertilizer</td>
<td>Ensure that the fertilizer bin is not empty and that the sensor is not dirty.</td>
</tr>
<tr>
<td>Seed monitor</td>
<td>Line without seeds</td>
<td>Ensure that the seed container is not empty and that the sensor is not dirty.</td>
</tr>
<tr>
<td>Monitoring Ç Incorrect task</td>
<td>Select new task</td>
<td>According to the parameters set, no task has been selected or the current task does not match. Indicate a new task on the monitoring screen.</td>
</tr>
<tr>
<td>Ntrip</td>
<td>Intermittent corrections</td>
<td>The Ntrip client connected successfully, but is not receiving enough corrections. Ensure that the Internet connection is working.</td>
</tr>
<tr>
<td>Ntrip</td>
<td>Disconnected</td>
<td>There was a problem connecting to the Ntrip server. Please go to the Ntrip status screen (Menu &gt; GNSS &gt; Ntrip Status) for more information.</td>
</tr>
<tr>
<td>Odometer</td>
<td>Close to the limit</td>
<td>The system is approaching the established distance limit. You must be careful not to damage the implement when the limit is reached.</td>
</tr>
<tr>
<td>Odometer</td>
<td>Limit reached</td>
<td>The system has exceeded the established distance limit. You must be careful not to damage the implement.</td>
</tr>
<tr>
<td>Autosteering pilot</td>
<td>Outside the speed range</td>
<td>You are operating out of the proper speed range.</td>
</tr>
<tr>
<td>Autosteering pilot</td>
<td>Displacement direction solution</td>
<td>The double antenna solution did not converge.</td>
</tr>
<tr>
<td>Autosteering pilot</td>
<td>Steer Direct communication</td>
<td>The automatic pilot driver is not receiving messages from the motor. Please ensure that the cables and connections are correct.</td>
</tr>
<tr>
<td>Autosteering pilot</td>
<td>Failure during alignment</td>
<td>The error or the angle in relation to the line is too high. Activate the device near the trajectory to be followed or change the safety parameters in the General Settings menu.</td>
</tr>
<tr>
<td>Autosteering pilot</td>
<td>No auxiliary battery</td>
<td>The automatic pilot is not receiving auxiliary power from the battery. Ensure the cables and connections are correct.</td>
</tr>
<tr>
<td>Autosteering pilot</td>
<td>Encoder hall reading</td>
<td>Inconsistent sensor reading.</td>
</tr>
<tr>
<td>Autosteering pilot</td>
<td>Electric pilot precision</td>
<td>It was not possible to estimate the vehicle trajectory. Please drive close to twenty meters performing smooth maneuvers.</td>
</tr>
<tr>
<td>Autosteering pilot</td>
<td>Unknown wheel position sensor</td>
<td>The system is unable to read the wheel positioning. The sensor may be disconnected or the cable may be broken. Check the installation of the wheel positioning sensor.</td>
</tr>
<tr>
<td>Autosteering pilot</td>
<td>Disengaged steering wheel</td>
<td>It is not possible to estimate the vehicle trajectory. Please drive close to twenty meters performing smooth maneuvers.</td>
</tr>
<tr>
<td>Autosteering pilot</td>
<td>Manual operation detected</td>
<td>The system has detected an external action on the steering wheel. If you did not move the steering wheel, it is possible that the sensitivity parameter is set incorrectly.</td>
</tr>
</tbody>
</table>
| Autosteering pilot      | Driver over-heating                                                          | The activation system is overheating. This may be due to excessive stress or due to high external temperature. Modifications to the aggressiveness...
<table>
<thead>
<tr>
<th>Condition</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Autosteering pilot failure</td>
<td>The system is unable to establish proper communication with the automatic pilot controller. Check the CAN communication cables.</td>
</tr>
<tr>
<td>Shut off remotely</td>
<td>The automatic pilot button or footswitch has been triggered.</td>
</tr>
<tr>
<td>Very rough terrain</td>
<td>The system is unable to maintain the trajectory due to excessive cabin swings. Ensure the inclination compensation module is securely attached.</td>
</tr>
<tr>
<td>GNSS precision loss</td>
<td>The system has lost GNSS positioning accuracy. Ensure that there are no obstacles near the antenna.</td>
</tr>
<tr>
<td>Autosteering pilot - control message error</td>
<td>The automatic pilot system is not receiving GNSS information as expected. Please ensure that the GNSS is syncing before attempting to operate the automatic pilot.</td>
</tr>
<tr>
<td>Pneumatic tire pressure not reached</td>
<td></td>
</tr>
<tr>
<td>Insufficient ports</td>
<td>The system is configured to use both the monitoring driver and the CAN ISOBUS, but only one CAN is available. Please reconfigure the system to identify which will be used.</td>
</tr>
<tr>
<td>Little memory</td>
<td>The system is operating with little available space. Export your flash files, then delete them to free up space.</td>
</tr>
<tr>
<td>Little available memory</td>
<td>The system memory is almost fully occupied. If you proceed, the system will become slow. Exit the current work session and start a new one.</td>
</tr>
<tr>
<td>Plates are off</td>
<td>Ensure that the plate sensor is working properly and that the hydraulic is correctly engaged.</td>
</tr>
<tr>
<td>Unresponsive sensor</td>
<td>The system is not reading the sensor. Please ensure that the cables and connectors are properly installed and/or the sensor is not damaged.</td>
</tr>
<tr>
<td>Critical system temperature</td>
<td>The system is overheating and the operation has been suspended. Turn the device off and contact technical support.</td>
</tr>
<tr>
<td>Power supply Çlow voltage</td>
<td>There is a problem with the battery to which the device is connected. The voltage is too low or with above normal oscillation. This is common while starting the tractor with the device turned on. In this case, it is recommended to start the tractor with the display turned off and only turn it on afterwards.</td>
</tr>
<tr>
<td>Power supply Çhigh voltage</td>
<td>There is a problem with the battery to which the device is connected. The voltage is too high or with above normal oscillation. This is common while starting the tractor with the device turned on. In this case, it is recommended to start the tractor with the display turned off and only turn it on afterwards.</td>
</tr>
<tr>
<td>Power supply Çcritically low voltage</td>
<td>There is a problem with the battery to which the device is connected. The voltage is low, which generally happens when the tractor is started with the device turned on. If this is the case, it is recommended to restart the tractor and then the controller.</td>
</tr>
<tr>
<td>External Wi-Fi disconnected</td>
<td>The external Wi-Fi adaptor configured for this device is not connected. Please ensure that the adaptor is connected and not damaged.</td>
</tr>
</tbody>
</table>

### 7.2 Connectivity information

For further **GNSS information**, click on the icon located in the upper right corner.

![Figure - Connectivity information](https://via.placeholder.com/150)

The information presented is:
- **GNSS**
  Displays the total number of connected satellites. When pressed, it displays a window with details. When used Novatel models, shows the information on the location's accuracy, which allows more accurately identify the positioning of the vehicle. For information details, access topic [GNSS](#).

- **Mobile**
  Indicates connectivity to mobile data networks. For details, access topic [Mobile data config](#).

- **Cloud**
  Indicates the display is online and authenticated on the Hexagon Agriculture services.

- **Wi-Fi**
  Indicates whether or not the display is connected to a Wi-Fi network. When pressed, it displays details about the network connection. For configuration details, access topic [Wi-Fi](#).

- **Local**
  Indicates whether the display is connected to the customer’s local service.

| Important | Only the options according to the configurations of each display and according to the contracted products will be visible. |

### 7.3 Lightbar

The lightbar is displayed at the top of the operation screen and displays the deviation of the vehicle from the guide being executed. The squares represent the LEDs that light up when the configured offset is reached. Visually they light up right or left indicating the deviation side. The sensitivity in meters of the 5 center position LEDs are configurable by the operator, as shown in the [Parameters](#) topic.

![Figure - Light bar in operation](image)

### 7.4 Information configuration

Up to three pieces of information may be displayed on the operations screen.

To modify or enter the presented information, proceed as follows:

1. Click for two seconds on the information you want to change;
2. A new window will be presented with the possible options as shown in the figure;
3. Select the information you want to display;
4. The window is closed and the selected information is presented.

![Figure – Information configuration](image)

| Important | If there is no information, just follow the same procedure above, pressing the empty space to select the information you want to display, as indicated in the center of the figure below. To do the inverse, simply select the empty information so that it disappears on the screen. |
To make the current time available on the operation screen, select **Time** as one of the information options.

### 7.5 Main menu

When dragging your finger from the left corner of the screen to the center, a tab will be displayed with the main menu buttons.

#### 7.5.1 Guide

Guidance types are used to define a guideline on the field. The display operates with the following:

<table>
<thead>
<tr>
<th>Icon</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>🌺</td>
<td>Wayline management</td>
</tr>
<tr>
<td>🌺</td>
<td>Parallel line</td>
</tr>
<tr>
<td>🌺</td>
<td>Parallel curve</td>
</tr>
<tr>
<td>🌺</td>
<td>Adaptive curve</td>
</tr>
<tr>
<td>🌺</td>
<td>Pivot</td>
</tr>
<tr>
<td>←</td>
<td>Line A + Angle</td>
</tr>
</tbody>
</table>

For further explanations on each guide item, refer to topic **Guidance**.

#### 7.5.2 Visualization

By clicking on the **Visualization** option, the options for visual presentation of the job on the operation screen are presented.
**Change environment**
Alternates the visualization on the operation screen between 2D and 3D.

**Brightness**
Alters the brightness of the display screen.

**Zoom**
Increases or decreases the zoom on the operation screen.
You can zoom in and out of the maps using the pinch gestures, making it quicker and easier for the user to zoom in and out.

**Delete trail**
Clears the trace, total input, and deletes the area processed in the current session.

### 7.5.3 Tools

In the **Tools** option, functions related to perimeter and flag marking are available.

For further details, access the following topics:
- **Markers**
- **Perimeter**
- **Drift position**

### 7.5.3.1 Markers

In the **Tools** option, you can place flag-type markers on the map to mark the location of obstacles or other points of
interest such as rocks, holes, anthills, and wet areas.

<table>
<thead>
<tr>
<th>Icon</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image" alt="Marker function icon" /></td>
<td>Marker function</td>
</tr>
<tr>
<td><img src="image" alt="Create new marker icon" /></td>
<td>Create new marker</td>
</tr>
<tr>
<td><img src="image" alt="Manage markers icon" /></td>
<td>Manage markers</td>
</tr>
<tr>
<td><img src="image" alt="Create new marker layer icon" /></td>
<td>Create new marker layer</td>
</tr>
</tbody>
</table>

To use the markers, proceed as follows:

1. Press on the **Marker** option and then on the **Flag** icon to mark the desired location.

   **Important**
   In this option, the system will create the markers grouped in a layer with the default name given by the system. The marker name and color cannot be changed. If you want the mark in a layer with a specific name, you must select it in advance as described below.

To create different layers of markers with specific names, you must create them in advance before using them on the map. To do so, proceed as follows:

1. Press on the **Marker** option and then press the **Manage markers** icon;
2. In the layer manager, press option **Create new marker layer**;
3. Insert a new name for the layer and confirm. Example: anthills or holes. The name cannot be changed later;
4. The new layer is not displayed on the list;

   **Important**
   When you select the layer, you can see a drawing of the marker which indicates the color that the system associated with the layer. You cannot change the color. For each new layer, a new marker color is associated by the system.

5. Select the layer whose markers you wish to visualize on the field or to which you want to add a new marker and press **OK**;
6. On the operation screen, when you press the **Marker** icon a marker will be placed according to the color of the layer which was pre-selected in the manager.

   **Important**
   In the layer manager it is possible to select multiple layers at the same time to visualize all the markers on the Field. However, when you click on the flag icon, only one layer will be edited. The new marker will be created on the layer indicated with the pencil icon.
Important: It is possible to import/export the flag maps on the file transfer screen. For more information, check the [Files chapter](#).

### 7.5.3.2 Perimeter

On the **Tools** option it is possible to delimit an area's perimeter. In order to do so, proceed as follows:

1. Press the **Perimeter** option and then press the option to **begin** marking;
2. Insert the name of the new **map** and press **OK** to confirm;
3. Inform the **lateral displacement** (m) for marking the perimeter and press **OK** to confirm;
4. The system will begin marking the perimeter;
5. When you finish marking, press the **stop** option;
6. The system will display a message to confirm creating the new map and the option to load it;
7. Press **OK** to load the map.

**Important**

For positive values, the line is moved outside of the farming machine's marking, and for negative values the line is moved inside the marking. For example, if you are operating a sprayer with an 18-meter bar from inside the field, add nine positive meters so that the sprayer passes over the line at the end of the field.

**Figure - Perimeter**

**Important**

The display will remove loops made while tracing the perimeter.

**Figure - Removing perimeter loops**

It is possible to import a ready-made perimeter file into the on-board computer, see the topic [Importing files](#).

### 7.5.3.3 Drift position

In the **Tools** option, it is possible to use the **Drift position** feature to demarcate a known field position and later use it to sync the GNSS position.

<table>
<thead>
<tr>
<th>Icon</th>
<th>Description</th>
</tr>
</thead>
</table>

User manual - Machine Automation Solution - V3R004
### New marker

In order for the Drift position feature to be available, there must be a GNSS signal.

In order to insert a new marker or perform the adjustment, the vehicle cannot me in operation or in motion.

### New position

To mark a new position, proceed as follows:

1. Position the tractor where you want to add the marker;
2. On the Operation screen, select the **Tools** option;
3. Press the **Drift position** option;
4. Select the **New marker** option;
5. Select **Yes** to confirm the insertion;
6. The system draws a mark on the floor of the operation screen.

Be sure to physically mark the demarcated location (by inserting a stake or other marking medium).

### Position adjustment

This option will only be available if there is a previously made mark on the field.

To adjust the position, proceed as follows:

1. Position the tractor on the same physical location on the field where the marked was inserted;
2. On the operation screen, select the **Tools** option;
3. Press the **Drift position** option;
4. Select the **Position adjustment** option;
5. The system will correct the GNSS position, bringing the marked to the indicated location.

To use the position adjustment, the vehicle cannot be more than thirty meters from the marker.

### Undo the adjustment

This option will only be available in case the used has made a position adjustment.

To undo a position adjustment, proceed as follows:

1. On the operation screen, select the **Tools** option;
2. Press the **Drift position** option;
3. Select the **Undo position adjustment** option;
4. The system goes back to the GNSS position prior to the adjustment.

### 7.5.4 Configuration menu

On the **Configuration menu** all the application parameter settings are made available.

| **Important** | To view all the available settings, alter the system mode to **Advanced**. |
| **Important** | When you start the system for the first time, only the **Vehicle**, **Implement**, and **Job section** options will be available. In order for the **Guidance**, **Auto steering pilot**, **Fertilisation control**, **Sprayer control**, and **Planting control** options to be active, it is necessary to activate the display and to register the vehicle and implement. |

---

**Figure - Configuration menu**

<table>
<thead>
<tr>
<th>Function</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Guidance</td>
<td><strong>Guidance</strong> settings.</td>
</tr>
<tr>
<td>Auto steering</td>
<td><strong>Auto steering</strong> settings.</td>
</tr>
<tr>
<td>Fertilisation control</td>
<td>Dosage or map <strong>settings</strong> and calibration of the fertilisation input.</td>
</tr>
<tr>
<td>Sprayer control</td>
<td>Dosage and spray nozzle <strong>settings</strong>.</td>
</tr>
<tr>
<td>Planting control</td>
<td>Planting <strong>settings</strong>.</td>
</tr>
<tr>
<td>Bait control</td>
<td>Bait control <strong>settings</strong>. This shows on the planting button position.</td>
</tr>
<tr>
<td>Vehicle</td>
<td><strong>Selection of the vehicle</strong> to be used on the operation.</td>
</tr>
<tr>
<td>Implement</td>
<td><strong>Selection of the implement</strong> to be used on the operation and for performing tests.</td>
</tr>
<tr>
<td>GNSS</td>
<td>GNSS <strong>settings</strong>, Inactive on normal mode.</td>
</tr>
<tr>
<td>Job section</td>
<td><strong>Selection of the directory</strong> in which to save the data collected by the monitor.</td>
</tr>
<tr>
<td>Files</td>
<td><strong>Selection of the location</strong> to extract the data and/or insert maps using a pendrive.</td>
</tr>
<tr>
<td>System settings</td>
<td>Shows the <strong>System settings</strong>.</td>
</tr>
<tr>
<td>Operate</td>
<td>Enters <strong>operation</strong> mode.</td>
</tr>
</tbody>
</table>

---

### 7.6 Context bar

Some system features enable a black bar at the bottom of the operation screen, usually displaying the controls and information for using these applications. To access the bar for a feature, proceed as follows:

1. On the **Operation** screen, with one touch, drag the bottom of the screen upwards;
2. The bar will be displayed.

---

**Important** In case the operator is using more than one system feature that includes a bar, the current bar will need to be dragged from right to left in order to view the other feature bar, and so on.
The following features/products present a bar:

- Auto steering;
- Bait control;
- Odometer;
- Fertilisation control;
- Planting monitor;
- Sprayer control;
- Machine monitoring.
8. GNSS

**Important** The system mode must be set to Advanced so that the GNSS option is made available.

The GNSS settings are available on the **Configuration menu – GNSS**.

**Important** The visible fields can be different according to the selected **GNSS** model.

---

### Port

Serial GNSS communication port. Three options are available:

- **Internal**: display GNSS module;
- **External**: external GNSS, model must be **External GGA** or **External RMC**;
- **Simulator**: for use with the internal GNSS simulator.

### Minimum GNSS speed

Enter the minimum speed in which the vehicle will be considered to be in movement.

### Model

Select the GNSS model used on your device. The available options are:

- **External GGA**: NMEA external GNSS. Messages provided and recommended frequencies: GGA (minimum 5Hz and desirable up to 20Hz), VTG (minimum 5Hz and desirable 20Hz), and ZDA (1Hz);
- **External RMC**: NMEA external GNSS. Messages provided and recommended frequencies: RMC (highest possible up to 20 Hz), GGA (1Hz), and ZDA (1Hz);
- **Max7/8**: L1 e GPS + Galileo + GLONASS para Max 8 e GPS + GLONASS para Max 7;
- **Max 8 BeiDou**: L1 e GPS + Galileo + BeiDou;
- **NTRIP**: OEM628 L1+L2 with NTRIP;
- **Novatel**: OEMStar L1 and Glide;
- **Novatel NO GLIDE**: OEMStar L1;
- **Novatel SBAS**: OEMStar L1+SBAS;
- **OEM617**: L1+L2 and Glide, dual antenna;
- **OEM617 NTRIP**: L1+L2 with NTRIP, dual antenna;
- **OEM628**: L1+L2 and Glide;
- **OEM628 PPP**: L1+L2 and Terrastar-C paid signal;
- **OEM628 PPP BASIC**: L1+L2 and Terrastar-L paid signal;
- **OEM628 SBAS**: L1+L2 and SBAS;
- **OEM7**: L1 and Glide (L2 available under activation);
• OEM7 DUAL ANTENNA PPP: TerraStar-C paid signal;
• OEM7 DUAL ANTENNA PPP BASIC: TerraStar-L paid signal;
• OEM7 NTRIP: L1+L2 with NTRIP;
• OEM7 PPP: L1+L2 e sinal pago Terrastar-LC;
• OEM7 PPP BASIC: L1+L2 and TerraStar-L paid signal;
• OEM7 SBAS: L1+SBAS;
• OEM7 RTK: L1+L2 with RTK;
• RTK: OEM628 with RTK;
• Simulator: simulator (external or internal, configurable through the door).

**Important**
When using TerraStar-L, TerraStar-C, TerraStar-C Pro, RTK or NTRIP correction signals, an alarm will indicate that the accuracy is low if the correction service is not active or the position estimate has not yet converged.

**Baud**

**Important**
This configuration will only be available when selecting the following GNSS models: *External GGA, External RMC, RTK, and OEM7 RTK.*

**GPS simulator**

**Important**
This option will only be available in case selected the *Simulator Model* option.

In this option the desired file must be selected to run the simulation. The simulation is shown on the operation screen.

**Activate GNSS**
Important

This configuration will only be available for all Novatel GNSS models (Novatel, Novatel NO GLIDE, Novatel SBAS, OEM617, OEM617 NTRIP, OEM628, OEM628 PPP, OEM628 PPP BASIC, OEM628 SBAS, OEM7, OEM7 DUAL ANTENNA PPP, OEM7 DUAL ANTENNA PPP BASIC, OEM7 NTRIP, OEM7 PPP, OEM7 PPP BASIC, OEM7 SBAS, OEM7 RTK, RTK).

Enter the activation code to release GNSS board models:

![Activate GNSS](image)

**Figure - Activate GNSS**

### NMEA output

Important

This setting is only available for the Novatel and OEM (without RTK correction) GNSS models.

The NMEA output is a serial output that may be used to availability NMEA messages for the Novatel GNSS for external devices, see topic [NMEA output](#).

### NTRIP output

Important

This setting will only be available for the NTRIP GNSS model, which in turn are only available for the display Ti7 device.

NTRIP is a RTK service for which the correction is transmitted through the Internet, using the available 3G or Wi-Fi networks. See topic [NTRIP](#).

### Firmware update

Important

This configuration will only be available for all Novatel GNSS models (Novatel, Novatel NO GLIDE, Novatel SBAS, OEM617, OEM617 NTRIP, OEM628, OEM628 PPP, OEM628 PPP BASIC, OEM628 SBAS, OEM7, OEM7 DUAL ANTENNA PPP, OEM7 DUAL ANTENNA PPP BASIC, OEM7 NTRIP, OEM7 PPP, OEM7 PPP BASIC, OEM7 SBAS, OEM7 RTK, RTK).

This option is useful for manually updating the GNSS firmware:

![Firmware update](image)
When the device starts, if there is a firmware update available, the device will ask if you wish to update to the newest version.

**RTK ASSIST**

This setting will only be available for the GNSS model OEM628 NTRIP, OEM628 RTK, OEM7 NTRIP and RTK.

This option can be **Disabled** or **Enabled**. When enabled, it allows Novatel's GNSS models to maintain centimeter accuracy during a drop in connection with RTK data, usually caused by radio signal blind spots or cellular network connectivity interruptions. RTK ASSIST works until corrections are recovered, the 20 minute time limit is reached or the position accuracy decreases beyond a defined limit. The RTK ASSIST service is available by subscription.

**Speed filter**

This setting will only be available for the GNSS model **Max7**, **Max7/8** and **Max8BeiDou**.

This option can be **Off** or **On**. Enables an intelligent speed filter. Very useful in regions with low visibility of satellites, and / or in high forests.

**Steadyline**

This setting will only be available for the GNSS model with RTK/NTRIP.

This option reduces the position jumps that may occur when a GNSS receptor alters the positioning modes. This effect is visible when a receptor switches from a high-precision RTK position solution to a less accurate solution such as PPP (TerraStar), DGPS, SBAS + GLIDE, or even autonomous GLIDE™ and when the receiver retrieves the high precision solution. Smooth transitions are extremely important for precision farming applications, for which sudden jumps are damaging.
8.1 NTRIP server

**NTRIP** is a RTK service in which the correction is transmitted through the Internet, using the available 3G or Wi-Fi network.

**Important**
The system mode must be set to **Advanced** so that the GNSS option is made available.

**Important**
This configuration will only be available when selecting the GNSS models: NTRIP, OEM7 NTRIP or OEM617 NTRIP, which are only available for AgrOn Ti7 equipment. RTK must be enabled, otherwise an alert will be displayed on the operation screen.

To access NTRIP support, proceed as follows:

1. Press the **GNSS** option in the **Settings** menu;
2. In the **GNSS model**, select **NTRIP, OEM7 NTRIP** or **OEM617 NTRIP**;
3. Select the NTRIP option that has been enabled.

To find out the status of the NTRIP service, go to the **NTRIP Status** topic.
To enter the NTRIP server data, go to the **NTRIP server** topic.

### 8.1.1 NTRIP status

**NTRIP status**: indicates whether or not NTRIP is connected. If it is disconnected, it informs the reason.

To check the status of the NTRIP, proceed as follows:

1. In **GNSS Model** select **NTRIP, OEM7 NTRIP** or **OEM617 NTRIP**;
2. Select the **NTRIP** option that has been enable;
3. Select the **NTRIP Status** option.
The possible states are:

- Connected;
- Connected - intermittent corrections;
- Disconnected;
- Incorrect username or password;
- Incorrect base (or too distant);
- Missing GGA messages;
- Not configured;
- Internal error or no connection.

- **Base position (lat,long)**
  Indicates in which latitude and longitude position the NTRIP base is sending the corrections.

- **Timestamp correction**
  Time of the last correction received from the base.

- **GGA timestamp**
  Time of the last vehicle position reference sent to the base.

### 8.1.2 NTRIP Server

NTRIP server: where the server connection data is configured.

To enter the NTRIP data, proceed as follows:

1. In GNSS Model select NTRIP, OEM7 NTRIP or OEM617 NTRIP;
2. Select the used option called NTRIP;
3. Select the NTRIP Server option;
4. Enter the User and Password data;
5. Enter the Address and Port;
6. In Stream, the nearest correction points will be listed. Select the desired location and press OK.
8.2 NMEA Output

The NMEA output is a serial output that may be used to circulate NMEA messages for the Novatel GNSS for external devices.

---

**Important**

The NMEA output is unavailable for GNSS with RTK correction.

**Important**

The NMEA output uses the Serial 2 output of the chicoteTi7 display (Connector B), and a suitable cable is required.

To activate this output, proceed as follows:

1. In **Settings menu**, select option **GNSS**;

   **Important**

   The system mode should be advanced so that the GNSS option becomes available.

2. In **GNSS model**, select one of the **Novatel** (without RTK correction);
3. Select the **NMEA output** option that has become available;
4. The system will open the settings screen;
5. On the **NMEA output** screen, press the **Baud** option;

---
6. Select the output rate among the predefined values of 4800, 9600, 19200, 38400, 57600, and 115200bps and press OK;

**Warning**  
Messages are restricted by the baud so that the port can always transmit messages without loss of characters.

7. Select the output messages that must be sent and their transmission frequency, which will be restricted by the previously chosen baud. This will allow external devices to use this data, which have a standardized format, in their operation.

The message options are:

<table>
<thead>
<tr>
<th>Important</th>
<th>The frequencies of 1Hz, 2Hz, 5Hz, 10Hz are available. For Novatel models of series 6 and 7 there is also the option of 20Hz.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>- GGA;</td>
</tr>
<tr>
<td></td>
<td>- GSA;</td>
</tr>
<tr>
<td></td>
<td>- GST;</td>
</tr>
<tr>
<td></td>
<td>- GSV;</td>
</tr>
<tr>
<td></td>
<td>- RMC;</td>
</tr>
<tr>
<td></td>
<td>- VTG;</td>
</tr>
<tr>
<td></td>
<td>- ZDA.</td>
</tr>
</tbody>
</table>

8. Ensure your information was entered correctly and press **OK**.

**Important** The GSV messages send data from at most four satellites per message, so multiple messages may be needed for complete information.

**Important** The compatibility module is available for the **OEM** and **Novatel** models.

The **Compatibility mode** is used to transmit the desired GAA correction quality parameter, regardless of the actual correction quality of the GNSS board. It is critical in order to work on third-party devices. Generally, planter controllers accept the NMEA signal, which reports the high-precision correction (RTK) quality and stops whenever the system changes for less accurate correction.

8.3 Operation

On the operation screen, through the connectivity symbols, it is possible to view the status of the GNSS system.

<table>
<thead>
<tr>
<th>Icon</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image1.png" alt="Icon1" /></td>
<td>Indicates that GNSS is active, synchronized and the accuracy is in accordance with the selected model.</td>
</tr>
<tr>
<td><img src="image2.png" alt="Icon2" /></td>
<td>Indicates that the GNSS system is active, synchronized, but adequate accuracy has not yet been reached.</td>
</tr>
</tbody>
</table>
Indicates that the GNSS system is active, but is not synchronized.

Indicates that the system is not communicating with the GNSS module.

By pressing the **GNSS** icon, it is possible to view the total number of satellites connected to the system, and it is also possible to see a detail of the information.

---

**Important**

The information below is valid for Novatel receivers only and does not consider altitude, only horizontal coordinates.

When using Novatel models, information regarding location accuracy will be presented, which allows for more accurate identification of vehicle positioning. According to technical information about Novatel models on displays, horizontal accuracy is the probability that a measured point is within an area centered on the average coordinate over time. For this reason, the **Average Square Root Distance (DRMS)** is applied to define a 65% probability that this point will remain in this region and this value is calculated in all received position packages. This precision is used as a trigger to transition the GNSS synchronization status to converged.

---

*Figurae - Details GNSS*
9. Vehicle

To select a vehicle, proceed as follows:

1. Select the **Vehicle** option on the **Configuration menu**;
2. Select the desired vehicle on the box to the left of the screen;
3. Ensure the settings are correct and press **OK**.

<table>
<thead>
<tr>
<th>Warning</th>
<th>Incorrect vehicle selection may compromise the entire validity of the work.</th>
</tr>
</thead>
</table>

![Figure - Vehicle selection](image)

<table>
<thead>
<tr>
<th>Important</th>
<th>If no vehicles have been created, it will not be possible to access the <strong>Configuration menu</strong> for the auto steering pilot.</th>
</tr>
</thead>
</table>

9.1 Inserting a new vehicle

<table>
<thead>
<tr>
<th>Important</th>
<th>Feature available only in <strong>Advanced</strong> mode.</th>
</tr>
</thead>
</table>

To enter a new vehicle, proceed as follows:

1. Select the **Vehicle** option in the **Configuration menu**;
2. Select option **New**;
3. Select the **Vehicle type** and enter the required settings;
4. Confirm the operation selecting **Save**.

![Figure - Vehicle settings](image)

The following parameters must be set:

- **Wheelbase**
  Distance, in meters, from the center of the rear axis to the Center of the front axis. Fundamental for calculating the control routine.

- **Antenna axis**
  Distance, in meters, from the center of the rear axis to the antenna. Fundamental to the tilt compensation system, for approaching the line, and for working on the curved guides.
- **Pin axis**
  Distance, in meters, from the center of the rear axis to the center of the rear pin.

<table>
<thead>
<tr>
<th>Important</th>
</tr>
</thead>
</table>
| - For the treadmill tractor, the vehicle axis is considered to be at the center of the treadmill. Thus, this should be the starting point for measuring the distances to the center of the pin (P in meters) to the center of the antenna (A in meters);  
- For the self-propelled, the distance from the axis to the pin equals the distance from the axis to the section closes to the spray bar. In this case, the g'p'czk'u'p'g'ho r'go gpvu configuration should be zeroed;  
- As for the truck, the axis distance equals the distance from the axis to the application line. |

- **Antenna height**
  Distance, in meters, from the ground to the center of the antenna. Fundamental for the tilt compensation system and for line parallelism.

- **Antenna offset**
  Distance, in meters, from the antenna lateral offset. Fundamental for line parallelism.

| Warning | Enter your vehicle measurements in meters. For measurements smaller than one meter, enter the value fractionally. For example, given a 60 centimeter measurement, enter 0.60. Before taking the measurements, ensure the vehicle is in level ground and in straight position, with the center line parallel to the wheels. |

**9.2 Editing the vehicle**

| Important | Feature available only in Advanced mode. |

To edit a vehicle, proceed as follows:

1. Select the **Vehicle** option in the **Configuration menu**;
2. Select the vehicle you wish to edit on the list;
3. Select the **Configuration** option;
4. Alter the desired fields in the **Vehicle configuration** screen;
5. To confirm, select the **Save** option.

**9.3 Removing the vehicle**

| Important | Feature available only in Advanced mode. |

To remove a vehicle, proceed as follows:

1. Select the **Vehicle** option in the **Configuration menu**;
2. Select the vehicle you wish to remove;
3. Select the **Delete** option;
4. Confirm the operation selecting the **Save** option.
10. Implement

| Important | Depending on the selected implement, features may be enabled or disabled on the display. For example, when selecting the Guidance, only the Guidance and auto steering pilot features will be enabled (in case there is a vehicle configured). |

To select an implement, proceed as follows:

1. Select the Implement option in the Configuration menu;
2. Select the desired implement in the box to the left of the screen;
3. Ensure the settings are correct and press OK.

10.1 Inserting a new implement

| Important | Feature available only in the Advanced mode. |

To enter a new implement, proceed as follows:

1. Select the Implement option in the Configuration menu;
2. Select the New option;
3. Enter the initial implement data, such as Type, Manufacturer, and Model and press Create;
4. Enter the farming implement settings and press Save.

![Figure - Entering a new implement](image)

**Warning** Enter the implement measurements in meters. For measurements smaller than one meter, insert the value fractionally. For example, given a 60 centimeter measurement, enter 0.60. Before taking the measurements, ensure the implement is in level ground and in straight position.

For more details on the configuration of each implement, check the related activities:

- Sprayer implement configuration, see the topic Configuring the sprayer implement.
- Fertilizer implement configuration, see the topic Configuring the fertilizer implement.
- Linear actuator implement configuration, see the topic Configuring the actuator implement.

10.2 Editing the implement

| Important | Feature available only in Advanced mode. |

To edit an implement, proceed as follows:

1. Select the Implement option in the Configuration menu;
2. Select the implement you wish to edit on the list;
3. Select the Edit option;
4. Alter the desired fields;
5. To confirm, select the **Save** option.

| Important | If the implement is already created, some fields may be ready-only. |

### 10.3 Removing the implement

| Important | Feature available only in **Advanced** mode. |

To remove an implement, proceed as follows:

1. Select the **Implement** option in the **Settings menu**;
2. Select the implement you wish to remove;
3. Select the **Delete** option;
4. Confirm the operation selecting option **Yes**.

### 10.4 Testing the implement

To have access to the tests related to an implement, proceed as follows:

1. Select the **Implement** option in the **Configuration menu**;
2. Select the implement you wish to test;
3. Select the **Test** option;
4. The system will present the test options for the selected implement.

| Important | For tests using the implement hydraulic motors, use the motor speed recommended by the manufacturer (e.g., 1800RPM for a tractor) in order to have a minimum 48l/min flow in the hydraulic system. |

To view details about the tests, check the specific topics:

- Implement tests for the planting control activity, topic [Planting tests](#);
- Implement tests for the Formicide bait Control activity, topic [Formicide tests](#);
- Implement tests for the Fertilization Control activity, topic [Fertilization tests](#);
- Implement tests for the Spray control activity, topic [Spray tests](#);
- Implement tests for the Linear Actuator control activity, topic [Actuator tests](#).
11. Guidance

The navigation aid systems allow input economy and better use of the work area, once they minimize the overpass during input application and culture treatments.

They have the following work precisions up to 95% of the time:

<table>
<thead>
<tr>
<th>Use this setting</th>
<th>For</th>
</tr>
</thead>
<tbody>
<tr>
<td>GNSS L1 - GPS+Glonass</td>
<td>28 cm (15 min each pass)</td>
</tr>
<tr>
<td>GNSS L1/L2 - GPS+Glonass</td>
<td>15 cm (15 min each pass)</td>
</tr>
<tr>
<td>GNSS L1/L2 with TerraStar</td>
<td>4 cm (absolute)</td>
</tr>
<tr>
<td>RTK</td>
<td>2 cm (absolute)</td>
</tr>
</tbody>
</table>

11.1 Settings

The following settings are available:

- **Width (in meters)**
- **Sensitivity (in meters)**
- **Side overlap (in meters)**
- **Activity overlap: Yes or No**
- **Overlap rate (%)**
- **Wayline settings**
- **Reverse detector**
- **Odometer: On or Off**
- **Perimeter**
- **Erase perimeter**
- **Coverage info outside map**

11.1.1 Parameters

To alter the light bar parameters, proceed as follows:

1. Access the **Guidance** option from the **Configuration menu**;
2. Select the parameter you wish to alter;
3. Enter the desired values;
4. Press **OK** to confirm the operation.

The following parameters are available for setting:

- **Width (in meters)**
  Indicates the width of the stride according to the selected implement.

  **Important** This parameter can only be altered here for the Guidance product. For the others products, the...
- **Lateral overlap (in meters)**
  Overlap the application (reassemble). Used mainly in sprayer implements.

- **Activity overlap (Yes or No)**
  Reapplies to an already treated area, overlapping the activity on the application map. For example, if an implement passes over an area where it has already been applied, it does not shut off and continues application normally, thus overlapping application in that area.

- **Overlap rate (in %)**
  The Overlap rate parameter is only enabled when the Activity overlap is set to No. Insert the overlap percentage needed for the application or a section shuts off automatically. For example, if the overlap rate is adjusted at 50% and the section has a 4-meter length, when 2m of overlap are reached, the implement will shut off. The Overlap rate is calculated based on the implement width.

  **Important**
  The Overlap rate parameter must be set even if No is selected for the overlap, because there is an acceptable rate that the implement cannot avoid so that it can detect that it is over an already treated area.

### 11.1.2 Wayline settings

This screen is divided into two types of settings. It contains the settings for saving the guide in the operation, and also for the parameters used for curves and maneuver detection, as described in the following topics.

- The user can determine the standard way he wants the display to save a new guide that is generated. See the Saving mode topic.
- The user can determine the operating logic of the Realign option, used on the operation screen with an active guide. See the Realign configuration topic.
- The user can determine the operating logic of the Nudge option, used on the operation screen with an active guide. See the Manual adjustment topic.
The user can configure the automatic detection parameters for the equipment to use when generating a guide. See the Advanced settings topic.

**11.1.2.1 Saving mode**

The type of guide saving must be previously defined. To define the way the guides are saved, proceed as follows:

1. Select the Guidance option in the Configuration menu;
2. Select the Wayline settings option.
3. Select the option in the frame on the left.

The following saving options are available:

- **Automatically save**
  By selecting this option, the system will automatically save the guide without asking the user for a name. A name is given by the system comprising a numeric system containing the date followed by other numbers.

- **Never save**
  By selecting this option the system will never save the created guide. This way, the guide will be available for saving as a temporary guide.

- **Always ask**
  By selecting this option, the system will always ask if you want to save the guide. An option to edit the filename will open and you will be able to save the guide.

**11.1.2.2 Realign mode**

The Realign option is presented on the operation screen, when working with an active guide, see the topic working with an active guide.
Two different behaviors are possible when selecting this option, it is necessary to previously configure the default behavior as described below.

To define the behavior of the realignment option, proceed as follows:

1. Select the Guidance option in the Configuration Menu;
2. Select the option Guidance settings;
3. Select the default option in the middle frame.

The following behavior options are available:

- **Move the guide position by moving the GNSS position**
  This option is selected by default. In this option when the Realign button is clicked on the operation screen, the equipment adjusts the position of the GNSS of the guide to the current position where the vehicle / antenna is located, thereby moving the guide to the zero error position.

  **Important** In this option, as the positions of the guides are changed, it is not possible to return the position of the original guide. If you intend to work again in the area already applied using the same guides, it is advisable to use the other behavior that would be to realign by moving the position of the guide.

- **Move the position of the guide by creating a new guide**
  When the user selects this behavior, when selecting the Realign button on the operation screen, the equipment will draw a new original guide similar to the previous one in the same location where the vehicle / antenna is located and new parallels will be drawn. The previous original guide can be accessed again in the guide manager, if it has been saved.

  **Important** In this option, the visual result for the user is the same as the previous option, the movement of the guide aligned to the vehicle, but here in fact a new guide was created.

### 11.1.2.3 Manual adjustment mode

The Manual adjustment option is presented on the operation screen, when working with an active guide, see the topic working with an active guide.

Two different behaviors are possible when selecting this option, it is necessary to previously configure the default behavior as described below. This option is similar to Realign, but instead of using the vehicle/antenna location for the
adjustments, here they are made according to the values and direction manually indicated by the operator.

![Figure - Manual adjustments](image)

To define the behavior of the realignment option, proceed as follows:

1. Select the **Guidance** option in the **Configuration Menu**;
2. Select the option **Guidance settings**;
3. Select the default option in the right frame.

![Figure - Guidance settings](image)

The following manual adjustment options are available:

- **Guide adjustment by changing the position of the GNSS**

  This option is selected by default. In this option when the **Manual adjustment** button is activated on the operation screen, the equipment has manual controls so that the operator can adjust the position of the GNSS, the adjustment is made every 2 centimeters to the side indicated by the user.

  **Important**

  The position of the GNSS is adjusted and the original guide and its parallels remain the same.

- **Guide adjustment by changing the position of the guide**

  When the user selects this behavior, when selecting the **Manual Adjustment** button on the operation screen, the equipment has manual controls so that the operator can move the guide in the direction and distance he wants. In this case, a new original guide similar to the previous one will be created according to the side and distance indicated by the operator and new parallels will be drawn. The previous original guide can be accessed again in the guide manager, if it has been saved.

  **Important**

  The position of the guide is adjusted, creating a new original and parallel guide.

### 11.1.2.4 Advanced configuration

To change the **Curve configuration**, proceed as follows:

1. Access the **Guidance** option in the **Configuration menu**;
2. Select the **Guidance settings** option;
3. Select the **Advanced settings** option;
4. Enter the values for the curve configurations;
5. Press **OK** to confirm the operation.

![Figure - Guidance settings]

The following parameters are available for setting:

**01 - Maneuver detection**

The maneuver detection settings affect how the device detects that the vehicle has performed a **U** movement to exit a guide line and enter another. This detection is used to automatically determine modifications to the adaptive guide, thus saving operator actions.

- **Angle delta (degrees)**
  Determines the vehicle direction variation relative to the guide line needed to characterize exiting that guide line.

- **Distance (meters)**
  Is the limit to the **U** movement distance that can be removed automatically.

For example, the display will consider that the operator finalized capturing the adaptive curve and will generate new lines based on the new reference as soon as the vehicle direction varies more than 100 degrees (delta angle) in the last 15 meters (distance).

It is important to note that the course during the **U** movement will automatically be removed and will not be present in both the modified guide line and its parallel lines.

**02 - Adaptive detection**

Important: The process of modifying the current guide line when an adaptive guide line is used requires the operation to be enabled. If it is not, the process will never begin. If it is disabled after modification begins, it will be finalized and incorporated into the current guide line and its parallels.

- **Error (meters)**
  Expected error to consider capturing a new line.

- **Distance (meters)**
  Distance to consider capturing a new line.

**Situation 1**

For the **adaptive detection**, the operator enters the parameters used to begin and end capturing a new modification of the adaptive curve. For example, using the data in the figure, as soon as the operator drives over 5m (**Distance**) with an error lower than 0.3m (**Error**), the approximation to the guide line will be classified as successful and the display will begin capturing the modification of the guide line.
Situation 2

However, this will not be visible to the operator yet. After this initial stage, if the vehicle drives over 5m (Distance) with an error larger than 0.3m (Error), the user's intention of modifying the current guide line will be detected and the new trajectory will be visible along with the old guide line.

Situation 3

If the vehicle drives over 5m (Distance) with an error lower than 0.3m (Error), it will be detected that the operator deviated from an obstacle and wished to return to the old guide, so the capture will be finalized and the guide line will be modified, as will its parallels.

03 - Curve detection

Parameters for filtering (pilot navigation) and smoothing the guide lines obtained when using adaptive guides and curves.

- **Between points**
  
  For this parameter, instead of using all the saved points to generate the reference path, the display will generate a smoother path by keeping a distance between consecutive points as indicated in the **Between points** field. High values may prevent closed curves (small radii) from being considered when generating the final path.

  **Important** The value of this parameter will only be considered when the **Activate distance filter** option is selected.

- **Spline points**
  
  This parameter smoothes the final trajectory by inserting intermediary points on the curve to be shown to the operator. High values may prevent closed curves (small radii) from being considered when generating the final path. However, increasing it causes a larger processor load and slowness in calculating the parallel lines. The recommended value is 3.

  **Important** The value for this field will only be considered when the **Activate noise filter** option is selected. Typical values vary between 10 and 20.

- **Noise filter**
  
  With this parameter the final path is smoothed by eliminating noise and vibrations obtained while capturing the desired guide. Reducing this value will yield a smoother path, which will make the pilot perform softer maneuvers as well. However, the path may be different from expected. Increasing the value, the filtration is reduced, yielding a path closer to the actual points obtained while capturing the guide. However, noise and vibrations in the points will not be removed, which may result in abrupt maneuvers.

  **Important** The value for this field will only be considered when the **Activate noise filter** option is selected. Typical values vary between 10 and 20.

- **Minimum radius**
  
  This value corresponds to the smallest curve radius that can be comfortably made without causing damage to the vehicle or implement. In this field you can enter a radius value more appropriate for your vehicle. For example, in generating a new curve, in case there is a trajectory with a radius smaller than this value, the display will smooth the affected area to make it possible for the pilot to pass.

  **Important** The value for this field will only be considered when the **Activate distance filter** option is selected. Typical values vary between 10 and 20.

- **Activate distance filter**
  
  If this option is enabled, the device will take into account the **Between points** value, otherwise it will be ignored.

- **Activate noise filter**
  
  If this option is enabled, the device will take into account the **Noise filter** value, otherwise it will be ignored.

11.1.3 Reverse detector
Enable this function to detect when the vehicle is in reverse.

To alter the automatic reverse detection settings, proceed as follows:

1. Access the Guidance option from the Configuration menu;
2. Select the Reverse detector option;
3. Press the Detect reverse option to alternate between Yes and No;
4. Press OK to confirm the operation.

<table>
<thead>
<tr>
<th>Warning</th>
<th>For using the automatic pilot, the reverse detector must be activated.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Important</td>
<td>In case you want to inform the display that the reverse direction is inverted, simply select the Invert direction option.</td>
</tr>
<tr>
<td>Important</td>
<td>It is recommended to keep the Reverse detector active for correctly marking the trail.</td>
</tr>
</tbody>
</table>

![Reverse detector](Image)

**Figure - Reverse detector**

On the operation screen, while the display detects reverse, a red backwards arrow will show. When the display is detecting forward movement, a green forward arrow will show for ten seconds, as shown in the figure below.

![Reverse detector in operation](Image)

**Figure - Reverse detector in operation**

![Operation](Image)

**Figure - Operation**

<table>
<thead>
<tr>
<th>Warning</th>
<th>If the implement is performing the opposite motion to that indicated by the arrows on the screen, the operator must simply press the arrow to indicate that the movement is inverted. The occurrence of a false movement is more common at first GNSS syncing or after the</th>
</tr>
</thead>
</table>
vehicle has been stationary for a long time. However, it can occur even with the vehicle in motion.

11.1.4 Odometer

The Odometer function is intended to measure the distance traveled by the vehicle using the GNSS positions and allows controlling the applied area by loading maps into the system.

In sugarcane mills, for example, it is used to control the stretch of the vinasse hoses, avoiding the need for markers (flags) and eliminating the risk of breakage. To enable or disable the odometer, proceed as follows:

1. Access the Guidance option from the Configuration menu;
2. Select the Odometer option to alter between On and Off;
3. Press OK to confirm the operation.

**Important** To learn how to use the odometer and its features in operation, check topic Monitoring the operation.

The Odometer function is to measure the distance traveled. The number that shows indicates the distance already traveled by the vehicle and the range below shows the relation between traveled and total distance. The range will be green while the distance is normal, yellow when the traveled distance reaches the alert range and red when the distance exceeds the maximum limit. Pressing the alarm icon (bell), the operator may indicate the distance for which an alert is emitted. Pressing the ruler length icon (ruler), the operator may indicate the total route distance. The reset icon zeros the odometer to start over.

![Odometer Interface](image)

**Figure - Fertilization operation**

11.1.5 Perimeter

The perimeter function is used to load the saved perimeters.

**Important** In order for the Perimeter and Clear perimeter options to be enabled, the Guidance option must be selected first. The perimeters are saved through the operation screen, on the Tools menu.

To load a perimeter, proceed as follows:

1. Access the Guidance option from the Configuration menu;
2. Select the Perimeter option (item 01);
3. Among the items available, select the perimeter you wish to load (item 02);
4. Press OK (item 03);
5. Press OK to confirm the operation.

To clear the loaded perimeter, select the Clear perimeter option.
11.1.6 Apply outside map

The **Apply off the map** function is used to indicate whether the application should exceed the perimeter limits or not.

- **On**
  The equipment will not cut the application when leaving the area of the defined perimeter.

- **Off**
  The application will be suspended automatically when the vehicle exceeds the perimeter limit.

To change the configuration, proceed as follows:

1. Access the **Guidance** option from the **Configuration menu**;
2. Select the **Apply off the map** option to alter between **On** and **Off**.

![Figure - Apply off the map](image)

11.2 Operation

The operation is started by selecting the suspended operation option in the center of the operations screen.

| Important | The application will only begin when the implement moves and exceeds the minimum speed set for the GNSS. |

Select the type of operation you desire, see the available types on the following topics.

11.2.1 Creating a guide line

| Important | Before starting the operation, it is important to ensure the vehicle and implement dimensions are correct. |
| Warning | In order for the guide to work properly, the GNSS must be operating properly. Do not start while the GNSS Syncing, GNSS without communication, No Glide, or No RTK alert show, or while the device is connected to less than four satellites. |

Guidance types are used to define a guide line in the field. Display operates with:

- Parallel line;
- Parallel curve;
- Adaptive curve;
- Pivot;
- Line A + Angle.

| Warning | To set the way of saving the guide, visit topic **Guide settings**. |

11.2.1.1 Parallel line

The A-B linear trajectory is used to define a line in the field to which all work lines will be parallel.
Configuring trajectory

<table>
<thead>
<tr>
<th>Icon</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image" alt="Guide icon" /></td>
<td>Guide</td>
</tr>
<tr>
<td><img src="image" alt="Parallel line icon" /></td>
<td>Parallel line</td>
</tr>
<tr>
<td><img src="image" alt="Point A icon" /></td>
<td>Point A</td>
</tr>
<tr>
<td><img src="image" alt="Point B icon" /></td>
<td>Point B</td>
</tr>
</tbody>
</table>

To draw the guide line, proceed as follows:

1. On the operation screen, select the **Guide** option on the left side menu;
2. Select the trajectory mode as **Parallel line**;
3. Position your vehicle on the field over the point where you wish to start and press **Point A** to mark the beginning of the line;
4. Drive until the end point on the field and press **Point B** to mark the end of the trajectory.

**Warning**
The smallest distance between points of line A-B is of 30 meters. The longest distance between points A-B will be 20km.

**Important**
You can cancel a guide creation by selecting the option with an "X" at any time.

At the end of this procedure, the reference line 0 (zero) is created, as well as the parallel lines on both sides of the reference. Lines to the right will be positive (+) and lines to the left will be negative (−). Consider that point A is behind the vehicle and point B is ahead. Even if you do not drive straight between points A and B, the references to this guide will be taken only from two points marked.

![Figure - A-B line](image)

**11.2.1.2 Parallel curve**

Parallel curve A-B is used when you wish to work on an area with smooth curves. This option stores the actual trajectory you made between points A and B, instead of creating a straight line between them. All following guide lines will be parallel to the original curve. The current curve and the parallel curves immediately to the right and to the left are shown.

**Configuring trajectory points**

<table>
<thead>
<tr>
<th>Icon</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image" alt="Guide icon" /></td>
<td>Guide</td>
</tr>
<tr>
<td><img src="image" alt="Parallel curve icon" /></td>
<td>Parallel curve</td>
</tr>
<tr>
<td><img src="image" alt="Point A icon" /></td>
<td>Point A</td>
</tr>
<tr>
<td><img src="image" alt="Point B icon" /></td>
<td>Point B</td>
</tr>
</tbody>
</table>
To draw the guide, proceed as follows:

1. On the operation screen, select the **Guide** option on the left side menu;
2. Select the trajectory mode as **Parallel curve**;
3. Position your vehicle on the field over the point where you wish to start and press **Point A** to mark the beginning of the curve;
4. Drive to the end point on the field and press **Point B** to mark the end of the trajectory.

**Warning**
The smallest distance between points A and B is of 30 meters. The longest distance between points A-B will be 20km.

**Warning**
In case reference curve A-B intersects with itself, a closed circuit will be created with the curve inside the intersection.

**Figure - Parallel curve**

### 11.2.1.3 Adaptive curve

The adaptive curve pattern provides guidance along the curve and updates the orientation after each curve considering the deviations that have been made. To record a deviation, it is necessary to be inside the set adaptive detection requirements. The device continuously records the course and provides guidance to match the last course performed.

#### Configuring trajectory points

<table>
<thead>
<tr>
<th>Icon</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image" alt="Guide Icon" /></td>
<td><strong>Guide</strong></td>
</tr>
<tr>
<td><img src="image" alt="Adaptive Curve Icon" /></td>
<td><strong>Adaptive curve</strong></td>
</tr>
<tr>
<td><img src="image" alt="Point A Icon" /></td>
<td><strong>Point A</strong></td>
</tr>
<tr>
<td><img src="image" alt="Point B Icon" /></td>
<td><strong>Point B</strong></td>
</tr>
</tbody>
</table>

To draw the guide line, proceed as follows:

1. On the operation screen, select the **Guide** option on the left side menu;
2. Select the trajectory mode as **Adaptive curve**;
3. Position your vehicle on the field over the point where you wish to start and press
11.2.1.4 Pivot

Use the pivot guidance mode in areas that use central pivot irrigation. With this option, the work lines are concentric circles defined by three route points.

**Configuring the trajectory points**

<table>
<thead>
<tr>
<th>Icon</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image" alt="Guide Icon" /></td>
<td>Guide</td>
</tr>
<tr>
<td><img src="image" alt="Pivot Icon" /></td>
<td>Pivot</td>
</tr>
<tr>
<td><img src="image" alt="Point A Icon" /></td>
<td>Point A</td>
</tr>
<tr>
<td><img src="image" alt="Point B Icon" /></td>
<td>Point B</td>
</tr>
<tr>
<td><img src="image" alt="Point C Icon" /></td>
<td>Point C</td>
</tr>
</tbody>
</table>

To draw the guide, proceed as follows:

1. On the operation screen, select the **Guide** option on the left side menu;
2. Select the trajectory mode as **Pivot**;
3. Position your vehicle at the beginning of the curve trajectory;
4. Press **Point A**;
5. Drive to route point B and press **Point B**;
6. Drive to route point C and press **Point C**.
Points A, B, and C may be pressed at any point in the circumference. Parallel circumferences are generated from the one determined by the points ABC, according to the implement width.

11.2.1.5 Line A + Angle

The Line A + Angle trajectory is used to define a line in the field to which all work lines will be parallel and is defined through an initial route point and an angle with north or with an existing guide.

Configuring trajectory points

<table>
<thead>
<tr>
<th>Icon</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>🗂</td>
<td>Guide</td>
</tr>
<tr>
<td>📈</td>
<td>Line A+Angle</td>
</tr>
<tr>
<td>🌙</td>
<td>Point A</td>
</tr>
</tbody>
</table>

To draw the guide line, proceed as follows:

1. On the operation screen, select the Guide option on the left side menu;
2. Select the trajectory mode as Line A + Angle;
3. Position your vehicle on the field over the point where you wish to start;
4. Press the Point A to have access to the configuration screen for the reference angle;
5. It is possible to chose as reference guide North or a previously saved guide;
6. If you choose north as the reference, it is necessary to inform the deviation angle for creating a new guide. The angle is a value from 0 to 360, where 0 points to the North;
7. If you choose the existing guide field, it is necessary to choose one of the listed guides and then enter the deviation angle for creating a new guide. The angle is a value from 0 to 360, where 0 refers to the chosen guide;
8. Press OK.

![Important](https://example.com/important.png)

The saved guides that may be used as reference are only those of type Parallel line A-B.

At the end of this procedure, a reference line 0 (zero) is created, as well as parallel lines in both sides. Lines to the right will be positive (+) while lines to the left will be negative (-).
11.2.2 Working with an active guide

**Important**

The Realign, Manual adjustment, and Disable guide options will only be visible when a guide is loaded into the field.

<table>
<thead>
<tr>
<th>Icon</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image" alt="Icon" /></td>
<td>Realign the position of the GNSS (antenna / vehicle)</td>
</tr>
<tr>
<td><img src="image" alt="Icon" /></td>
<td>Realign the guide position (antenna / vehicle)</td>
</tr>
<tr>
<td><img src="image" alt="Icon" /></td>
<td>Manually adjust the position of the GNSS (2 in 2 cm)</td>
</tr>
<tr>
<td><img src="image" alt="Icon" /></td>
<td>Manually adjust the position of the guide (distance informed)</td>
</tr>
<tr>
<td><img src="image" alt="Icon" /></td>
<td>Disable active guide</td>
</tr>
</tbody>
</table>

11.2.2.1 Realign

The Realign function can have two different behaviors according to what the user has configured, see the realignment configuration topic.

![Figure - Realign procedure](image)

**Realign the guide by moving the GNSS position**

The GNSS system is subject to information variation. It is recommended to use the Realign GNSS function if, after pausing the operation for a while, the guide does not show the same location as before when you start over again. This function transfers the GNSS position guide automatically until the point where the antenna/vehicle is, aligning it with the guide (zero error).

To perform a realignment GNSS adjustment, proceed as follows:
1. With the guide active, click on icon **Realign (with GNSS image)**;
2. The guide is adjusted according to the vehicle's antenna position.

**Important**
In this option, as the positions of the guides are changed, it is not possible to return the position of the original guide. If you intend to work again in the area already applied using the same guides, it is advisable to use the other behavior that would be to realign by creating a new guide.

**Realign the guide by creating a new guide**

A new original guide similar to the previous one is drawn in the same location where the vehicle / antenna is located and new parallels will be drawn. The previous original guide can be accessed again in the guide manager, if it has been saved.

To perform a realignment guide adjustment, proceed as follows:

1. With the guide active, click on icon **Realign (with guide image)**;
2. A new guide appears at the vehicle's antenna position.

**Important**
In this option, the visual result for the user is the same as the previous option, the movement of the guide aligned with the vehicle, but here in fact a new guide was created and using the previous original guide it is possible to repeat the work in the field.

**11.2.2.2 Manual adjustment**

**Move the guide by manually adjusting the GNSS position**

Field displacement is used to move the line 2 cm at a time to the right or to the left. It is recommended when it is necessary to make a fine adjustment to the line that may have dislocated.

**Important**
As the position of the GNSS is changed, it is not possible to access the original guide again, if the intention is to reuse the guides to do another job in the area already worked, use the other option for this button, which creates a new guide.

To displace the field guide, proceed as follows:
1. With the guide active, press option **Manual adjustment**;
2. Arrows for adjusting the displacement will be presented on the top of the screen;
3. Pulse the arrows for the desired direction.

**Important**
Each time the arrow is pressed, the line is moved 2cm to the chosen side.

**Figure - Manual adjustment GNSS**

**Move the guide by manually adjusting the position of a new guide**

Manual guide adjustment is used to create a new guide according to the user-defined value to the left or right. Recommended when it is necessary to make a larger adjustment on the line.

**Figure - Manual adjustment procedure**

To displace the field guide, proceed as follows:

1. With the guide active, press option **Manual adjustment**;
2. Arrows for adjusting the displacement will be presented on the top of the screen;
3. Press the arrows for the desired direction for 1 second.
4. Enter in the keyboard the distance you want the guide to be moved in that direction.
5. Press **OK** to confirm the operation.

**Important**
In this case, a new guide similar to the original is being drawn in the indicated location.
11.2.2.3 Disable guide

This option is used to disable a guide that is active.

**Important**

This button does not delete the guide from the system, it only unloads it from the field so that the user can create a new guide or load another one from the **Guide manager**.

To unload a guide from the field, proceed as follows:

1. With the guide active, press the *Unload guide* option;
2. An option asking if you wish to deactivate the guide will be shown;
3. Select *Yes* to confirm the operation.

11.2.3 Managing guides

The **Wayline management** screen allows managing some functions, such as:

- View information on a guide;
- Load a previously saved guide to the field;
- Save a temporary guide. See topic **Save guide**;
- Import a guide. See topic **Import guide**;
- Export a guide. See topic **Export guide**;
- Delete a guide. See topic **Delete guide**.

**Guide list**

On the management screen it is possible to visualize the list of guides that have been created in all work sessions on the same field.
All guides created for the same field from the current work session are visible, so it is possible to use a guide saved in another work session but for the same physical location.

When selecting a guide from the list, the system presents the following information on it:

- Guide name;
- Name of the farm where the guide was created;
- Name of the field where the guide was created;
- Guide type;
- Data of creation of the guide.

By clicking on the **View details option**, you are able to preview the guide according to its type (curve, angle, or pivot, for example). On the list it is possible to recognize the **Active guide** on the field through the icon marked with a lightning image.

The visualized guides may be filtered by **Guide type**:

- Curve;
- Linear;
- Pivot;
- Angle;
- Adaptive;
- Line map.

**Important** Line maps are not created through the operation screen. They are only available on the list through guide importing. See topic **Import guide**.

**Line map**

Guides of type **Shape file** actually correspond to a set of lines known as a **Line map**. On the on-board computer, the map can only appear through importing and can be externally created in three ways:

- It can be created in an office using a specific software;
- It can be created by exporting a guide from the on-board computer that the user exported in a **Line map** format. See topic **Export guide**;
- It may be a guide created in an on-board device from a manufacturer other than Hexagon Agriculture. In this case, if there is incompatibility, the guide is imported as a **Line map**.

To learn how to import a **Line map** to the on-board computer, check topic **Import guide**.
11.2.3.1 Save guide

Important This feature will only be available if the selected guide is temporary.

When a new guide is created, if the user had selected guide saving options Never save or Always ask and denied saving the guide, it will still be available in the Wayline management as a temporary guide and the user will have a chance to save it again.

Important

While the active guide is not saved, it can be accessed as a temporary guide. However, in case a new guide of the same type is created, the previous temporary guide will be lost and replaced by the new one. The system allows one temporary guide of each guide type. To ensure you can access it again, save your temporary guide.

Warning When you try to save a guide with the same name as a previously saved one, you will be asked if you wish to overwrite it.

Important To configure the way of saving guides, visualize top Managing guides.

<table>
<thead>
<tr>
<th>Icon</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Guide</td>
</tr>
<tr>
<td></td>
<td>Guide management</td>
</tr>
<tr>
<td></td>
<td>Save</td>
</tr>
</tbody>
</table>

To save a temporary guide to the system, proceed as follows:

1. On the operation screen, select the Guide option followed by Wayline management;
2. Select the temporary guide you wish to save from the list of guides;
3. Select option Save;
4. If kvj g^g o r qtct("i w£ g u"pco g=
5. Press OK to confirm.

Figure - Save guide

11.2.3.2 Import guide

In this option it is possible to import guides to display to use them at a later time.

<table>
<thead>
<tr>
<th>Icon</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Guide</td>
</tr>
<tr>
<td></td>
<td>Guide management</td>
</tr>
</tbody>
</table>
To import guides through the **Guide manager**, proceed as follows:

<table>
<thead>
<tr>
<th>Important</th>
<th>First insert the pendrive with the guide(s) you wish to import.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>On the operation screen select the <strong>Guide</strong> option followed by <strong>Guide management</strong>;</td>
</tr>
<tr>
<td>2.</td>
<td>Select option <strong>Import</strong>;</td>
</tr>
<tr>
<td>3.</td>
<td>The system will show the pendrive files that can be imported;</td>
</tr>
<tr>
<td>4.</td>
<td>Select the desired files and press <strong>OK</strong> to confirm;</td>
</tr>
<tr>
<td>5.</td>
<td>Wait for the progress bar to finalize importing.</td>
</tr>
</tbody>
</table>

![Figure - Import guide](image)

**Warning**

Beware of the following restrictions when loading a line map:

- The display imports existing lines on your map, but does not create the parallel lines;
- Your map must contain at least 75 points to be imported.

The imported guides will show on the list of guides.

| Important | In case the imported guide has the same name of a previously saved guide, a number will be added to the end of the file name. The previously saved guide will not be overwritten. |

If the imported guide was created in a Hexagon Agriculture display, it can be imported as an **Original guide** or as a **Line map**, depending on how it was exported. See topic [Export guide](#).

| Important | If the guide was created on an on-board device from a manufacturer other than Hexagon Agriculture and is incompatible, the guide(s) will always be imported as a **Line map**. |

### 11.2.3.3 Export guide

| Important | This feature will not be available if the selected guide is temporary. |

This option allows exporting guides from the display to a pendrive.

| Important | The export format is a shape file (.shp). |
Guides can be exported in two ways:

**Original guide**

In this case, only the original guide is exported, without its parallels. In this format, the equipment recognizes the original guide and may import it again in the same format, then create the parallels.

---

**Important**

This option is not available for exporting a Line map, in which case it is impossible to know which is the original guide.

---

**Line map**

Exports the set of guides (original + parallels) according to the set number of guides to the left and to the right. Exporting creates a **Line map**, for which it is no longer possible to identify the original guide.

<table>
<thead>
<tr>
<th>Icon</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>📁</td>
<td>Guide</td>
</tr>
<tr>
<td>🛠</td>
<td>Guide management</td>
</tr>
<tr>
<td>🔄</td>
<td>Export</td>
</tr>
</tbody>
</table>

To export guides through the **Guide manager**, proceed as follows:

---

**Important**

First insert the pendrive for exporting the guide(s).

---

1. On the operation screen, select the **Guide** option followed by **Guide management**;
2. Select the guide you wish to export from the list of guides;
3. Select option **Export**;
4. Select the desired option: **Original guide (proprietary)** or **Parallel guides (generic)**;
5. If the **Original guide** option is selected, wait for the exporting on the next screen;
6. If the **Parallel guides** option is selected, specify the number of lines to the right or to the left and press **OK**;
7. Wait for the file transfer.
11.2.3.4 Edit guide name

**Important**

This feature will not be available if the selected guide is temporary.

This option allows editing the name of a saved guide.

<table>
<thead>
<tr>
<th>Icon</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>📝</td>
<td>Guide</td>
</tr>
<tr>
<td>🛠</td>
<td>Guide management</td>
</tr>
<tr>
<td>✍️</td>
<td>Edit</td>
</tr>
</tbody>
</table>

To edit a guide name through the **Guide manager**, proceed as follows:

1. On the operation screen, select the **Guide** option followed by **Guide management**;
2. Select the guide you wish to edit from the list of guides;
3. Select the **Edit** option;
4. Edit the name of the temporary guide;
5. Press **OK** to confirm.

**Important**

It is not possible to save a guide with the same name of a preexisting guide; the maximum number of characters is 32.

**Warning**

When editing a guide name with the same name as preexisting guide, you will be asked if you want to overwrite it.
11.2.3.5 Delete guide

**Important**
This feature will not be available if the selected guide is temporary.

This option allows deleting a previously created guide.

<table>
<thead>
<tr>
<th>Icon</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image1" alt="Guide Icon" /></td>
<td>Guide</td>
</tr>
<tr>
<td><img src="image2" alt="Guide Management Icon" /></td>
<td>Guide management</td>
</tr>
<tr>
<td><img src="image3" alt="Delete Icon" /></td>
<td>Delete</td>
</tr>
</tbody>
</table>

To edit a guide name through the **Guide manager**, proceed as follows:

1. On the operation screen, select the **Guide** option followed by **Guide management**;
2. Select the guide you wish to delete on the list of guides;
3. Select the **Delete** option;
4. Press **Yes** to confirm;
5. Wait for the operation to be confirmed.

**Warning**
Be sure you want to delete the guide. It will be deleted from all the work sessions in the same field.
## 12. Auto steering

The purpose of the Auto steering is to ensure greater accuracy in the route and to minimize overpass during input application and crop treatment.

| Important | Product available only upon activation. |
| Warning   | The Auto steering must only be used in farming machinery, and its installation is not described in this manual since it must be done by qualified technicians. |
| Important | For proper operation, check the wear of the steering components. When turning the steering wheel, the wheels should start moving. Otherwise, refer to the vehicle manufacturer's maintenance manual. |
| Warning   | A GNSS signal is required in order for the Auto steering to work. In case the device loses GNSS connection, even momentarily, the automatic pilot will be disabled automatically. |

When entering automatic pilot option for the first time, it is necessary to alter the installed pilot type, and this is only possible if there is a preconfigured vehicle.

| Warning | Only authorized technical personnel entering a support password can perform this step. |

To change the pilot type, follow the steps:

1. In the Configuration menu, press option **Settings**;
2. Select option **Support** and enter the password. Press **OK**;
3. Confirm to return to the Configuration menu and then press **Auto steering**;
4. Select option **Support**;
5. Select option **Auto steering configuration**;
6. Press the field **Type pilot** (image 03) and choose the type of automatic pilot. Press **OK**.

See in the following topics the specific settings and adjustments for each type of pilot:

- **Hydraulic pilot**
- **Electric pilot**
- **PVED pilot**
- **Crawler pilot**

### 12.1 Hydraulic pilot

To use the Auto steering on your device, perform the following steps in order:

1. To be able to use the Auto steering, you need to have a preconfigured vehicle. Follow the steps in topic **Inserting a new vehicle**;
2. Check if the Auto steering is **On**. Go to the Settings Menu and choose the option **Autosteering**;
3. Then, activate the reverse detector, see topic **Reverse detector**;
4. Perform the curve settings as described in topic **Advanced configuration**;
5. In the Support mode, select the proper pilot type, see topic **Setting the pilot type**;
6. In the Support mode, configure the parameters for that specific pilot, according to the topic **Configuring the hydraulic pilot**;
7. Perform the installation tests, see topic **Testing the pilot installation**;
8. In the Advanced mode, make the calibrations required for operation, see topic Calibration.
9. If necessary, perform adjustments, see topic Adjustment.
10. Operate as indicated in the Operation topic.

Important
The main operational problems of the pilot are usually linked to the driver’s position and error in the informed dimensions of the vehicle, such as: antenna axis, distance between pins and antenna displacement, paying close attention to the negative and positive side.

12.1.1 Auto steering config

Warning
Only authorized technical personnel with an assistance password can perform this step.

To alter these auto steering pilot settings, follow the steps below:

1. In the Configuration menu, press the Settings option;
2. Select the Support option and enter the password. Press OK;
3. Confirm to return to the Configuration menu and press the Auto steering;
4. Select the Support option (image 01);
5. Select the Auto steering configuration option (image 02);
6. Select the type of pilot;
7. Alter the settings as desired and confirm.

Figure - Auto steering configuration

Important
Make sure you have selected the Hydraulic Pilot in the Pilot Type field. and positive side.

Setting parameters

- **Type pilot**
  Alters the selected pilot type.

- **Calibration**
  Informs the type of curve to be used to estimate the calibration parameters for the HP sensor. This is always disabled.

- **Maximum wheel position calibration (%)**
  Alters the maximum wheel position during the last curve. With 100% it will go to maximum, and with values below 100 avoid that the wheel is controlled in its maximum position.

- **Configuration reset**
Erases all the data for the selected pilot.

- **GPS emulator**
  Uses the pilot driver as GPS simulator. Widely used in fairs and demonstrations (one needs to mount the cabling).

- **Calibration number of turns for each side**
  Decreases the number of turns for the calibration when the space is small. Normally, when calibrating the pilot performs three curves, one more closed, on intermediary, and one more open. For small spaces, this parameter may be altered so that only two curves are performed (in this case, the more open curve is not performed) or just the more closed curve.

- **Orientation compensation**
  Algorithm that improves the steering estimation and directly affects the pilot's response time (mainly the input). The YES field is used to designate the active algorithm and NO for the disconnected algorithm.

- **Motor PPR**
  Used only on the Electric Pilot.

- **Drift filter**
  Used only on the Electric Pilot.

- **GPS min. quality**
  Basically the pilot will not turn on if the GNSS signal is not above the minimum value according to what is selected here. Allows to select four types of signals: high precision (more basic correction, Glide, of Novatel); (signal with no correction at all, with high error), pay signal (TERRASTAR) and RTK (best possible accuracy using the RTK correction).

  **Warning**
  The smaller the value, the more the pilot tends to move the wheels, mainly when passing through holes and changes in terrain slopes. The larger the value, the more stable the wheel becomes, but the pilot tends to zigzag.

### 12.1.2 Installation testing

For the hydraulic pilot, the following tests will be available on the main auto steering screen:

01. Wheel position sensor installation, see topic [Sensor installation];
02. Hydraulic installation, see topic [Hydraulic installation];
03. Installation INS, see topic [INS install].

![Auto steering](image)

**Figure - Hydraulic install**

### 12.1.2.1 Sensor installation

**Warning**
Test performed only for the hydraulic pilot.
This option assists in checking the operation and installation of the wheel position sensor. The **PWM** field shows the gross value reading, which varies from 0 to 36000. It is important that, when the vehicle wheels are aligned, the value in this field is in the intermediate reading range. Avoid values close to 0 and 36000. If necessary, reposition the sensor to suit the recommended reading range. To do so, simply remove the sensor from the holder and reposition by rotating 180 degrees.

**Important**

The **PWM** must have a minimum variation of 9000. For example, if the steering wheel is all the way to the left and the PWM value is 15000 and then all the way to the right and the value is 24500, there was a 9500 variation, thus satisfying this requirement.

The **Angle (degrees)** field shows the reading for the wheel position sensor converted into degrees. When turning the steering wheel to the right, the value must be positive, and to the left it must be negative.

![Figure - Sensor install](image)

**Figure - Sensor install**

To check the wheel sensor operation, proceed as follows:

1. Press **Start**;
2. Observe if there are no skips in the reading of the **Angle (degrees)** field and if the value is evenly changed (it is not necessary to turn the steering wheel too much for the value to change).

**Important**

If there is a problem in reading, it is recommended to change the sensor position or modify the coupling rod.

**Warning**

The wheel sensor pre-calibration is required in order to properly calibrate the hydraulic part. If you experience any problems with the wheel sensor, ask a qualified technician for help performing the pre-calibration.

12.1.2.2 Hydraulic installation

**Warning**

Test performed only for the hydraulic pilot.

This option assists in checking the operation and installation of the hydraulic valve.

![Figure - Valve install](image)

**Figure - Valve install**

**Warning**

Before performing the dead band, ensure the valve start cable (item 03548) is properly installed and is not inverted. To do so, in the HV controller test, press **Start** and enter a reference of 25 degrees. The wheel should go right, if it goes left, the cable is inverted.
Dead band

Identifies the minimum voltage that must be applied to the valve for it to start moving the wheels. The system will automatically increase the voltage applied to the valve terminals from zero until wheel movement is detected (variation of about 0.5°).

Warning
Fq²pqVwug"v g"uvgtlip "y j ggnqt"o qg"v g"xg j lern u"y j ggnu"f wlli "v j g"guv0

To perform the test, proceed as follows:

1. Align the vehicle's wheels;
2. Accelerate to 1500 rpm;
3. Press Start and wait for the test to end. The steering wheel will turn right and left automatically. The value in the Dead band field will be modified to the calibrated value and the Start option will be modified.

Important
The Dead band after calibration is around 300. In case the value is very different, it is recommended to perform the test again.

HV control test

The purpose of this test is to check the proper operation of the wheel control system, as well as the correct installation of the hydraulic valve:

- **K valve**
  Hydraulic valve response rate
  - Low values will cause the system to be slow, as well as display a larger error following the reference;
  - High values indicate a faster response and reduction in position error, however values too high tend to make the wheels oscillate.

- **Reference**
  Value that indicates the position (in degrees) to which the wheel will go during the test.
  - Positive values make the wheel turn right;
  - Negative values make the wheel turn left.

Warning
For security reasons, the entered values are limited to the -15° to 15° range.

- **Position**
  Indicates the wheel position detected by the sensor.

To perform the test, proceed as follows:

Warning
Ensure that the wheel sensor is working properly. In case the wheels turn to the opposite side or there is any other unforeseen event, immediately turn off display to avoid damage.

1. Press Start;
2. Alter the Reference values (positive and negative). Positive values will make the wheel turn right, while negative values make it turn left;
3. Observe the response. In case it is slow or the difference between the values for the Position and Reference fields are larger than one (1), increase the value of the K valve field. In case the direction oscillates too much to reach the reference, reduce the value in the K valve field.

12.1.2.3 INS installation

The values shown on the following screen depend on the current vehicle position.
To perform the installation, proceed as follows:

1. Position the vehicle horizontally and press **Start**;

2. Tilt the vehicle to the right. The **Roll** reading must be positive. By tilting the vehicle to the left, the **Roll** must be negative;

3. Position the vehicle on sloping ground. With the front of the vehicle tilted down, the **Pitch** reading must be negative. With the front tilted up, the **Pitch** must be positive;

4. The **Yaw** reading will only be different than zero with the vehicle in motion.

**Warning**

Check if the Yaw, Pitch and Roll readings stabilize quickly after stopping the vehicle. In case this does not occur or there are inconsistencies with the read values, check if there is a problem with mounting the driver or any defective components.

### 12.1.3 Advanced mode
12.1.3.1 Control

Warning
Only authorized technical personnel with advanced visualization passwords can perform this step.

To adjust the controls, proceed as follows:

1. In the Settings menu, press the System settings option;
2. Select the Advanced option and enter the password. Press OK;
3. Confirm to go back to the Settings menu and press Automatic pilot;
4. Select the Control option (image 01);
5. Set the desired parameter values (image 02);
6. Confirm the operation.

To refine the system adjustment, check the following topics:

- Overshoot, see topic Overshoot.
- Aggressiveness, see topic Aggressiveness.
- Sensitivity, see topic Sensitivity.
- Speed gain, see topic Speed gain.
- Curve aggressiveness, see topic Curve aggressiveness.
- Adjustment recommendations see topic Adjustment recommendations.

Overshoot

Overshoot controls the rate in which the vehicle will drive on the guide line and the rate in which the vehicle will end as it approaches the line. The default value is zero and must only be altered if you cannot eliminate the overshoot through Aggressiveness and Sensitivity.

- Overshoot can be defined between 0 and 200%. By default it has a zero value, which means it is disabled.
- Increasing the value, the pilot converges more aggressively to the line. There is a tendency to increase overpass.
Decreasing the value, the pilot converges more gently to the line, reducing overshoot.

As an adjustment orientation, it is recommended to modify the value from zero to 100. If the system still presents overshoot, the value must be reduced. In case it aligns without overshooting but away from the line, increase the value.

**Aggressiveness**

Aggressiveness controls the rate in which the vehicle attacks the guide line and how it keeps itself on the line. It can be defined between zero and 200. The default setting is 100.

- When, for example, the farming vehicle exceeds the guide line, it is necessary to reduce the aggressiveness. High values tend to make the vehicle zigzag;
- When the vehicle takes time to reach the guide line, it is necessary to increase aggressiveness. A value too low tends to make the pilot align faster and thus take more time to converge on the guide line.

**Sensitivity**

Sensitivity controls the rate in which the vehicle turns and its sensitivity when it is on the line. It mainly acts over the line.

- When, for example, the vehicle oscillates over the application line, it is necessary to reduce sensitivity. A high value tends to make the vehicle respond more quickly to small ground variations, possibly causing a zigzag trajectory.
- When the farming vehicle does not follow the application line, it is necessary to increase sensitivity. A value too low tends to make the vehicle take longer to respond to error variations.

**Speed gain**

Speed gain adjusts the gains (**Aggressiveness**, **Sensitivity**, and **Overshoot**) automatically based on vehicle speed.
In case the application has great speed variations during the operation, adjust the gain to 100% and adjust the aggressiveness, sensitivity, and overshoot options when operating at 7km/h to the values that best adapt to your needs. After this initial adjustment, use the pilot on a different speed range and observe the response;

- In case the pilot is slowly converging to a zero error, increase the speed gain;
- In case the pilot is oscillating, reduce the speed gain. When the speed gain is set to zero, the system will alter the gains automatically based on vehicle speed (ideal for applications with low speed variations of around 3km/h).

In case the application has great speed variations during the operation, adjust the gain to 100% and adjust the aggressiveness, sensitivity, and overshoot options when operating at 7km/h to the values that best adapt to your needs. After this initial adjustment, use the pilot on a different speed range and observe the response;

- In case the pilot is slowly converging to a zero error, increase the speed gain;
- In case the pilot is oscillating, reduce the speed gain. When the speed gain is set to zero, the system will alter the gains automatically based on vehicle speed (ideal for applications with low speed variations of around 3km/h).

### Curve aggressiveness

This option adjusts the gain increase and loss on the curves.

- When, for example, the farming vehicle opens on the curve (larger radius), it is necessary to increase curve gain;
- When the farming vehicle is closing the curve (smaller radius), it is necessary to reduce the curve gain.

### Adjustment recommendations

Follow the steps below as control adjustment suggestions:

1. **Observe the entry (linear guide)**

   Activate the pilot after it is properly calibrated with the factory gain values:

   - Aggressiveness: 100
   - Sensitivity: 100
   - Overshoot: 0

   **Warning** Perform the adjustment close to the working speed.

<table>
<thead>
<tr>
<th>Field response</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>If the response oscillates with a zigzag trajectory, the response is aggressive (quick wheel movement) or exceeds the line (&lt;30cm).</td>
<td>Reduce the <strong>Aggressiveness</strong> and the <strong>Sensitivity</strong> together until you have a stable and secure response.</td>
</tr>
<tr>
<td>If the response is slow, slowly converges to zero error, and the alignment is away from the reference line.</td>
<td>Increase the <strong>Aggressiveness</strong> and <strong>Sensitivity</strong> together until you have a stable and secure response.</td>
</tr>
</tbody>
</table>
2. **Aggressiveness and Sensitivity Adjustment**

   After obtaining a stable and secure entry response, adjust the Aggressiveness and the Sensibility separately to obtain the best performance possible:
   
   - Increase the aggressiveness for a larger "attack" on the line during entry. In case the pilot is too aggressive or presents large overpass, reduce the parameter value;
   - During operation over the line, in case the pilot is acting too much on the wheels with a tendency to zigzag, reduce the sensitivity value;
   - If it takes too long to respond to land slopes or tends to go parallel with the line with an error over 1cm, increase the sensitivity.

3. **Overshoot Adjustment**

   If it is difficult to reconcile a good entry time with a good response time over the line and in case the pilot still presents overshoot upon entry:
   
   - Alter the overshoot value from 0 to 100;
   - In case the overshoot is still high, reduce the value;
   - In case the pilot is away from the line, increase the value.

4. **Curve Gain Adjustment**

   Firstly, aggressiveness and sensitivity must be adjusted during operation of a linear guide:
   
   - If the trajectory is always more open than the reference, increase the gain;
   - If the trajectory is always more closed than the reference, reduce the gain.

   **Warning**

   The Maximum saturation, Minimum saturation, and Maximum delta values (available in the General settings option) directly affect the curve gain response. Low values for these parameters tend to make the response slow. Increasing curve gain, in this case, will not improve performance.

### 12.1.3.2 General configuration

**Important**

Only authorized technical personnel with an advanced visualization password can perform this step.

To adjust the general settings, proceed as follows:

1. In the Configuration menu, press option Settings;
2. Select the Advanced option and enter the password. Press OK;
3. Confirm to return to the Configuration menu and then press Auto steering;
4. Select the General configuration option (image 01);
5. Alter the parameters as desired (image 02);
6. Confirm the operation.
Security parameters

- **Override gain**
  Adjusts the effort needed by the operator to resume steering the vehicle from the automatic pilot. The larger the value, the more difficult it is. The smaller, the more easy (0-1000).

- **Error sec. (meters)**
  Blocks the automatic pilot use in case the vehicle positioning error is above the configured value, thus avoiding abrupt maneuvers.

- **Angle sec. (degrees)**
  Blocks the automatic pilot use in case the vehicle positioning error is above the configured value, thus avoiding abrupt maneuvers.

- **Wheel alarm (degrees)**
  Checks the wheel sensor operation and, in case of anomaly, disables the auto steering.

- **Alarm behavior**
  Indicates if the automatic pilot alarms will turn the operation off or not (section cut, fertilizing, etc).

- **Maximum speed allowed**
  Corresponds to the value that the user uses as cutting speed in the operation. If the equipment is operating above the set maximum speed, the autopilot can not be switched on. If the equipment exceeds the maximum speed set with the autopilot on, it will be disarmed.

- **Road mode inactive time**
  It corresponds to the time configurable by the operator so that the pop up warning appears. This warning relates to autopilot downtime.

Operation parameters

- **Maximum saturation (degrees)**
  Maximum steering angle at low speeds.

- **Minimum saturation (degrees)**
  Maximum steering angle at high speeds (25km/h).

- **Maximum delta (degrees)**
  Maximum speed for changing wheel direction.

**Important**

Low values for these parameters tend to harm entry and the pilot response on a curved guide (slowness to perform maneuvers).
Warning  High **Minimum saturation** and **Maximum delta** values may cause abrupt vehicle movement, which impairs operation safety on high speeds.

**PWM C control logic**
Configuration of the third output of the steering driver. It is possible to configure the MOTOR C output when using hydraulic auto steering.

Important  The **PWM C control logic** field will only be available upon activation of the Hydraulic Pilot.

### 12.2 Electric pilot

To use the Auto steering on your device, perform the following steps in order:

1. To be able to use the Auto steering, you need to have a preconfigured vehicle. Follow the steps in topic [Inserting a new vehicle](#).

   **Warning** Whenever a new vehicle is created, all the automatic pilot configuration, calibration, and adjustment steps must be performed again.

2. Check if the Auto steering is **On**. Go to the **Settings Menu** and choose the option **Autosteering**.
3. Then, activate the reverse detector, see topic [Reverse detector](#).
4. Perform the curve settings as described in topic [Advanced configuration](#).
5. In the Support mode, select the proper pilot type, see topic [Setting the pilot type](#).
6. In the Support mode, configure the parameters for that specific pilot, according to the topic [Configuring the electric pilot](#).
7. Perform the installation tests, see topic [Testing the pilot installation](#).
8. In the Advanced mode, make the calibrations required for operation, see topic [Calibration](#).
9. If necessary, perform adjustments, see topic [Adjustment](#).
10. Operate as indicated in the **Operation** topic.

**Important** The main operational problems of the pilot are usually linked to the driver's position and error in the informed dimensions of the vehicle, such as: antenna axis, distance between pins and antenna displacement, paying close attention to the negative and positive side.

### 12.2.1 Auto steering config

**Warning** Only authorized technical personnel with an assistance password can perform this step.

**Warning** Attention to adjusting the **Drift filter** for the use of the Electric Pilot.

To alter these auto steering pilot settings, follow the steps below:

1. In the **Configuration menu**, press the **Settings** option;
2. Select the **Support** option and enter the password. Press **OK**;
3. Confirm to return to the **Configuration menu** and press the **Auto steering**;
4. Select the **Support** option (image 01);
5. Select the **Auto steering configuration** option (image 02);
6. Alter the settings as desired and confirm.
Make sure you have selected the **Electric Pilot (Hexadrive)** in the **Pilot Type** field.

**Setting parameters**

- **Type pilot**
  Alters the selected pilot type, as described in topic **Type pilot**.

- **Calibration**
  Informs the type of curve to be used to estimate the calibration parameters for the HP sensor. This is always disabled.

- **Maximum wheel position calibration (%)**
  Alters the maximum wheel position during the last curve. With 100% it will go to maximum, and with values below 100 avoid that the wheel is controlled in its maximum position.

- **Configuration reset**
  Erases all the data for the selected pilot.

- **GPS emulator**
  Uses the pilot driver as GPS simulator. Widely used in fairs and demonstrations (one needs to mount the cabling).

- **Calibration number of turns for each side**
  Used only in the **Hydraulic pilot**.

- **Orientation compensation**
  Algorithm that improves the steering estimation and directly affects the pilot's response time (mainly the input). The YES field is used to designate the active algorithm and NO for the disconnected algorithm.

- **Motor PPR**
  Alters the type of motor used in the hexdrive. The latest motor has 133 pulses, while the oldest had 60 pulses.

- **Drift filter**
  The wheel position for the electric pilot is estimated using a series of information from the GNSS and the gyroscope. This reading may be noisy and it is necessary to filter the data to obtain a reliable value. The drift filter value serves to smooth the wheel angle estimation. This is only available for electric pilot settings.

**Important**

Usually used between 250 and 500. It should only be changed if it is in low speed, increase it to 500. It is necessary to ensure that the hexdrive is well fixed and well calibrated and the aggressiveness and sensitivity has already been changed and the pilot continues to oscillate,
only in this case it is recommended to change this value, usually increasing.

- **GPS min. quality**
  Basically the pilot will not turn on if the GNSS signal is not above the minimum value according to what is selected here. Allows to select four types of signals: high precision (more basic correction, Glide, of Novatel); (signal with no correction at all, with high error), pay signal (TERRASTAR) and RTK (best possible accuracy using the RTK correction).

| Warning | The smaller the value, the more the pilot tends to move the wheels, mainly when passing through holes and changes in terrain slopes. The larger the value, the more stable the wheel becomes, but the pilot tends to zigzag. |

### 12.2.2 Installation testing

For the electric steering pilot, the following tests will be available on the main auto steering screen:

01. Hexdrive installation, see topic [Electric Pilot install](#).
02. Installation INS. See topic [INS install](#).

![](image)

**Figure - Hexdrive Tests**

#### 12.2.2.1 Hexdrive installation

| Warning | Test performed only for the electric pilot. |

To run the electric pilot installation test, press Auto steering → HexDrive install.

![](image)

**Figure - Hexdrive installation**

**Gain adjustment**

In this option it is possible to test the starting and perform the steering wheel position control adjustment.
To perform the gain adjustment, proceed as follows:

1. Turn the steering wheel all the way to the left and press *Save reading*;
2. Turn the steering wheel all the way to the right and press *Save reading*;
3. Return the steering wheel to the starting position, with the wheels directed forward;
4. Press *Start*;
5. Alter the *Reference* value to positive and negative values (values in the wheel movement range, as determined in steps 1 and 2) and observe the response:
   - For each *Ref* variation, the pilot must respond. If the variation has to be right (over 1.0), in order for the pilot to start responding it is necessary to change the *Kp vel* value for the steering wheel to follow the reference;
   - If the *Kp vel* value is too high, the steering wheel will shake and it will be necessary to reduce the value;
   - If the steering wheel is too slow, increase the *Kp pos* value;
   - If the positioning error is high (difference between the *Reference* and *Position* values), increase the *Kp pos* value;
   - If the over-sign is high or there is system instability, reduce the *Kp pos* value.
6. At the end of the test, the value in *Reference* needs to be the same as the position.

**Dead band test**

Identifies the minimum voltage that needs to be applied to the actuator in order to start wheel movement.

- **Warning**: Do not use the steering wheel or change wheel positions during the test.
- **Warning**: Ensure the area surrounding the steering wheel is clear, since it may make sudden movements during the test and hurt the operator if he or she is close to the steering wheel.

To perform the test, proceed as follows:

1. Align the wheels with the main axis of the vehicle (pointing forward);
2. Press *Start* and wait for the test to end. The steering wheel will turn right and left automatically. The *Dead band* value will be modified to the calibrated value and the *Start* option will be modified.

- **Important**: The Dead band value after calibration should be around 210. If the value found it too different from this, it is recommended to redo the test.
12.2.2.2 INS installation

The values shown on the following screen depend on the current vehicle position.

![Image: INS installation](image1)

To perform the installation, proceed as follows:

1. Position the vehicle horizontally and press **Start**;
2. Tilt the vehicle to the right. The **Roll** reading must be positive. By tilting the vehicle to the left, the **Roll** must be negative;

![Image: Roll](image2)

3. Position the vehicle on sloping ground. With the front of the vehicle tilted down, the **Pitch** reading must be negative. With the front tilted up, the **Pitch** must be positive;

![Image: Pitch](image3)

4. The **Yaw** reading will only be different than zero with the vehicle in motion.

![Image: Yaw](image4)

**Warning**

Check if the **Yaw**, **Pitch** and **Roll** readings stabilize quickly after stopping the vehicle. In case this does not occur or there are inconsistencies with the read values, check if there is a problem with mounting the driver or any defective components.
12.2.3 Advanced mode

12.2.3.1 Control

Warning: Only authorized technical personnel with advanced visualization passwords can perform this step.

To adjust the controls, proceed as follows:

1. In the Settings menu, press the System settings option;
2. Select the Advanced option and enter the password. Press OK;
3. Confirm to go back to the Settings menu and press Automatic pilot;
4. Select the Control option (image 01);
5. Set the desired parameter values (image 02);
6. Confirm the operation.

To refine the system adjustment, check the following topics:

- Overshoot, see topic Overshoot.
- Aggressiveness, see topic Aggressiveness.
- Sensitivity, see topic Sensitivity.
- Speed gain, see topic Speed gain.
- Curve aggressiveness, see topic Curve aggressiveness.
- Adjustment recommendations see topic Adjustment recommendations.

Overshoot

Overshoot controls the rate in which the vehicle will drive on the guide line and the rate in which the vehicle will end as it approaches the line. The default value is zero and must only be altered if you cannot eliminate the overshoot through Aggressiveness and Sensitivity.

- Overshoot can be defined between 0 and 200%. By default it has a zero value, which means it is disabled.
- Increasing the value, the pilot converges more aggressively to the line. There is a tendency to increase overpass.
- Decreasing the value, the pilot converges more gently to the line, reducing overpass.

As an adjustment orientation, it is recommended to modify the value from zero to 100. If the system still presents overshoot, the value must be reduced. In case it aligns without overshooting but away from the line, increase the value.

![Figure - Overshoot]
**Aggressiveness**

Aggressiveness controls the rate in which the vehicle attacks the guide line and how it keeps itself on the line. It can be defined between zero and 200. The default setting is 100.

- When, for example, the farming vehicle exceeds the guide line, it is necessary to reduce the aggressiveness. High values tend to make the vehicle zigzag;
- When the vehicle takes time to reach the guide line, it is necessary to increase aggressiveness. A value too low tends to make the pilot align faster and thus take more time to converge on the guide line.

![Decrease aggressiveness](image1)  ![Increase aggressiveness](image2)

*Figure - Agressiveness*

**Sensitivity**

Sensitivity controls the rate in which the vehicle turns and its sensitivity when it is on the line. It mainly acts over the line.

![Decrease sensitivity](image3)  ![Increase sensitivity](image4)

*Figure - Sensibilidade*

- When, for example, the vehicle oscillates over the application line, it is necessary to reduce sensitivity. A high value tends to make the vehicle respond more quickly to small ground variations, possibly causing a zigzag trajectory.
- When the farming vehicle does not follow the application line, it is necessary to increase sensitivity. A value too low tends to make the vehicle take longer to respond to error variations.

**Speed gain**

Speed gain adjusts the gains (Aggressiveness, Sensitivity, and Overshoot) automatically based on vehicle speed.

- In case the application has great speed variations during the operation, adjust the gain to 100% and adjust the aggressiveness, sensitivity, and overshoot options when operating at 7km/h to the values that best adapt to your needs. After this initial adjustment, use the pilot on a different speed range and observe the response;
- In case the pilot is slowly converging to a zero error, increase the speed gain;
In case the pilot is oscillating, reduce the speed gain. When the speed gain is set to zero, the system will alter the gains automatically based on vehicle speed (ideal for applications with low speed variations of around 3km/h).

**Curve aggressiveness**

This option adjusts the gain increase and loss on the curves.

- When, for example, the farming vehicle opens on the curve (larger radius), it is necessary to increase curve gain;
- When the farming vehicle is closing the curve (smaller radius), it is necessary to reduce the curve gain.

**Adjustment recommendations**

Follow the steps below as control adjustment suggestions:

1. **Observe the entry (linear guide)**

   Activate the pilot after it is properly calibrated with the factory gain values:

   - Aggressiveness: 100
   - Sensitivity: 100
   - Overshoot: 0

   **Warning**
   
   Perform the adjustment close to the working speed.

<table>
<thead>
<tr>
<th>Field response</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>If the response oscillates with a zigzag trajectory, the response is aggressive (quick wheel movement) or exceeds the line (&lt;30cm).</td>
<td>Reduce the Aggressiveness and the Sensitivity together until you have a stable and secure response.</td>
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<tr>
<td>If the response is slow, slowly converges to zero error, and the alignment is away from the reference line.</td>
<td>Increase the Aggressiveness and Sensitivity together until you have a stable and secure response.</td>
</tr>
</tbody>
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2. **Aggressiveness and Sensitivity Adjustment**
After obtaining a stable and secure entry response, adjust the Aggressiveness and the Sensibility separately to obtain the best performance possible:

- Increase the aggressiveness for a larger "attack" on the line during entry. In case the pilot is too aggressive or presents large overpass, reduce the parameter value;
- During operation over the line, in case the pilot is acting too much on the wheels with a tendency to zigzag, reduce the sensitivity value;
- If it takes too long to respond to land slopes or tends to go parallel with the line with an error over 1cm, increase the sensitivity.

3. **Overshoot Adjustment**

If it is difficult to reconcile a good entry time with a good response time over the line and in case the pilot still presents overshoot upon entry:

- Alter the overshoot value from 0 to 100;
- In case the overshoot is still high, reduce the value;
- In case the pilot is away from the line, increase the value.

4. **Curve Gain Adjustment**

Firstly, aggressiveness and sensitivity must be adjusted during operation of a linear guide:

- If the trajectory is always more open than the reference, increase the gain;
- If the trajectory is always more closed than the reference, reduce the gain.

**Warning**

The *Maximum saturation*, *Minimum saturation*, and *Maximum delta* values (available in the *General settings* option) directly affect the curve gain response. Low values for these parameters tend to make the response slow. Increasing curve gain, in this case, will not improve performance.

### 12.2.3.2 Calibration

**Important**

Only authorized technical personnel with an advanced visualization password can perform this step.

**Important**

Before starting the calibration procedure, ensure the vehicle dimensions are properly set (*Wheelbase*, *Antenna height*, and *Antenna offset*).

To perform the calibration, proceed as follows:

1. In the *Configuration menu*, press the *System settings* option;
2. Select the *Advanced* option and enter the password. Press *OK*;
3. Confirm to return to the *Configuration menu*, then press *Auto steering*;
4. Select the *Calibration* option;
5. Perform the calibration step by step according to the descriptions in the following topics.

On the calibration screen, it is possible to configure the following device parameters:

- *Control driver position* (ATCD);
- *Accelerometer/Gyro calibration* - relative position between the control driver and the vehicle;
- *Gyroscope*;
- *Wheel sensor test*;
- *Clockwise and counterclockwise*. 
Calibrating the driver position

Choose the correct driver installation position and press **Next**.

**Warning**
- Install the driver on a flat surface;
- Install the driver on the same structure and, if possible, close to the antenna;
- Never install the driver on a hard surface or the antenna on a dampened surface;
- Always screw the driver onto the vehicle’s frame.

![Driver position](image)

**Calibrating the accelerometer**

Determines the relative position (rolling and pitching angles) between the vehicle and the drive installation position.

**Warning**
- Perform the tests with the motor in work rotation;
- Do not swing the vehicle during this step;
- This step is performed in two parts and the vehicle will be moved and should return to the same location, thus it is recommended to mark the ground where the vehicle wheels are positioned;
- Perform the tests at a flat location;
- Whenever the driver is removed from its position (for cleaning or any other purpose), the accelerometer calibration must be re-done, even if the device has been placed in the same location.
To perform the calibration, proceed as follows:

1. Increase the motor rotation for working rotation (1500-2000rpm);
2. Press the vehicle image to the left and wait ten seconds;
3. Wait until the vehicle image to the right is green;
4. Position the vehicle in the same place, however in the opposite direction (for example, if the vehicle is facing north, it must now face south);
5. Press the vehicle image to the right and wait ten seconds;
6. As soon as both images are green, a window will be displayed showing the values found. Press OK to save and press Next.

**Important** If the result shows some angle (rolling or pitching) larger than ten degrees, it is recommended to re-evaluate the installation position (the tilt compensation may not operate as expected).

**Calibrating the gyroscope**

The purpose is to estimate errors in the data provided by the gyroscopes.

**Warning**

- Do not move or swing the vehicle during the test;
- This test is performed automatically whenever the vehicle is stopped.

To perform calibration, proceed as follows:

1. Press the **Calibrate Gyroscope** option;
2. After twenty seconds a window will show with the values found. Confirm with OK so that the data is saved.

**Important** Values higher than 5 degrees/second may indicate component malfunctioning.

**Calibrating the wheel sensor test**

In this stage, the current position of the wheels is read.

To perform the calibration, proceed as follows:
1. Position the wheels in the central position and press **Save Reading Center**;
2. Position the wheels all the way to the left and press **Save Reading Left**;
3. Position the wheels all the way to the right and press **Save Reading Right**;

![Figure - Wheel position](image)

4. Position the wheel in the central position to enable the test commands;
5. Make sure there are no obstacles near the wheels and that the vehicle is stopped;
6. Press **Test** starting;
7. A test confirmation screen will show.

To proceed with the wheel calibration procedure, perform the steps according to the topic **Wheel position calibration**.

**Calibrating the wheel position**

**Important**
Before performing this step, first perform the **Wheel Sensor Calibration**. This step requires the vehicle to be in motion, requiring a wide, unobstructed are for completion.

**Warning**
Before starting the test, consider the following facts: clockwise means to turn to the right, and counterclockwise means to turn to the left.

To perform the calibration, proceed as follows:

1. Set the vehicle in a circular clockwise motion and press **Start**;
2. Keep the same steering wheel position until the end of the test;
3. Once the second circle is completely green, press **Stop**;
4. Press **Next**;

![Figure - Clockwise calibration](image)

5. Now set the vehicle in a circular counterclockwise motion and press **Start**;
6. Keep the same steering wheel position until the end of the test;
7. Once the second circle is completely green, press **Stop**;
8. A window will be displaced with the values calculated during calibration. Press **OK** to save the data.

**Important**
Proper values depend on the vehicle type, geometry, and other factors. For sprayers it would be something above 2000, and for tractors, between 400 and 800.
12.2.3.3 General configuration

**Important**
Only authorized technical personnel with an advanced visualization password can perform this step.

To adjust the general settings, proceed as follows:

1. In the **Configuration menu**, press option **Settings**;
2. Select the **Advanced** option and enter the password. Press **OK**;
3. Confirm to return to the **Configuration menu** and then press **Auto steering**;
4. Select the **General configuration** option (image 01);
5. Alter the parameters as desired (image 02);
6. Confirm the operation.

**Security parameters**

- **Override gain**
  Adjusts the effort needed by the operator to resume steering the vehicle from the automatic pilot. The larger the value, the more difficult it is. The smaller, the more easy (0-1000).

- **Error sec. (meters)**
  Blocks the automatic pilot use in case the vehicle positioning error is above the configured value, thus avoiding abrupt maneuvers.
• **Angle sec. (degrees)**
Blocks the automatic pilot use in case the vehicle positioning error is above the configured value, thus avoiding abrupt maneuvers.

• **Wheel alarm (degrees)**
Checks the wheel sensor operation and, in case of anomaly, disables the auto steering.

• **Alarm behavior**
Indicates if the automatic pilot alarms will turn the operation off or not (section cut, fertilizing, etc).

• **Maximum speed allowed**
Corresponds to the value that the user uses as cutting speed in the operation. If the equipment is operating above the set maximum speed, the autopilot can not be switched on. If the equipment exceeds the maximum speed set with the autopilot on, it will be disarmed.

• **Road mode inactive time**
It corresponds to the time configurable by the operator so that the pop up warning appears. This warning relates to autopilot downtime.

**Operation parameters**

• **Maximum saturation (degrees)**
Maximum steering angle at low speeds.

• **Minimum saturation (degrees)**
Maximum steering angle at high speeds (25km/h).

• **Maximum delta (degrees)**
Maximum speed for changing wheel direction.

**Important**
Low values for these parameters tend to harm entry and the pilot response on a curved guide (slowness to perform maneuvers).

**Warning**
High **Minimum saturation** and **Maximum delta** values may cause abrupt vehicle movement, which impairs operation safety on high speeds.

• **PWM C control logic**

**Important**
Used only on the **Hydraulic Pilot**.

**12.3 PVED pilot**
PVED - CL is a closed-loop steering controller for proportional valves in the Danfos actuator family. It is designed to meet the requirements of the electro-hydraulic steering function for any wheeled vehicle.

It complies with the CAN-bus communication standard J1939 and interfaces between the display and the valve.

**Warning**
The PVED Pilot is only compatible with the Ti7 display.

**Important**
For the PVED type pilot some problems or parameters may only be available in the specific valve manual.

To use the PVED Auto steering on your device, perform the following steps in order:

1. To be able to use the Auto steering, you need to have a preconfigured vehicle. Follow the steps in topic [Inserting a]
Whenever a new vehicle is created, all the automatic pilot configuration, calibration, and adjustment steps must be performed again.

2. Check if the Auto steering is On. Go to the Settings Menu and choose the option Autosteering;
3. Then, activate the reverse detector, see topic Reverse detector;
4. Perform the curve settings as described in topic Advanced configuration;
5. In the Support mode, select the proper pilot type, see topic Setting the pilot type;
6. In the Support mode, configure the parameters Kalman gains, according to the topic Configuring Autosteering;
7. In the Support mode, configure the parameters for that specific pilot, according to the topic Configuring PVED pilot;
8. Perform the installation tests, see topic Testing the pilot installation;
9. In the Advanced mode, make the calibrations required for operation, see topic Calibration;
10. If necessary, perform adjustments, see topic Adjustment;
11. Operate as indicated in the Operation topic.

The main operational problems of the pilot are usually linked to the driver's position and error in the informed dimensions of the vehicle, such as: antenna axis, distance between pins and antenna displacement, paying close attention to the negative and positive side.

12.3.1 Auto steering config

Only authorized technical personnel with an assistance password can perform this step.

To alter these auto steering pilot settings, follow the steps below:

1. In the Configuration menu, press the Settings option;
2. Select the Support option and enter the password. Press OK;
3. Confirm to return to the Configuration menu and press the Auto steering;
4. Select the Support option (image 01);
5. Select the Auto steering configuration option (image 02);
6. Alter the settings as desired and confirm.

Make sure you have selected the PVED-CL in the Pilot Type field.

Available parameters

- **Type pilot**
  Alters the selected pilot type, as described in topic Type pilot.

- **Kalman gains**
  See the topic Kalman gains.
- **Maximum wheel position calibration (%)**
  Alters the maximum wheel position during the last curve. With 100% it will go to maximum, and with values below 100 avoid that the wheel is controlled in its maximum position.

- **Configuration reset**
  Erases all the data for the selected pilot.

- **GPS emulator**
  Uses the pilot driver as GPS simulator. Widely used in fairs and demonstrations (one needs to mount the cabling).

- **Calibration number of turns for each side**
  | Important | Not used in the PVED Pilot. |

- **Motor PPR**
  | Important | Not used in the PVED Pilot. |

- **Drift filter**
  | Important | Not used in the PVED Pilot. |

- **GPS min. quality**
 Basically the pilot will not turn on if the GNSS signal is not above the minimum value according to what is selected here. Allows to select four types of signals: high precision (more basic correction, Glide, of Novatel); (signal with no correction at all, with high error), pay signal (TERRASTAR) and RTK (best possible accuracy using the RTK correction).

  | Warning | The smaller the value, the more the pilot tends to move the wheels, mainly when passing through holes and changes in terrain slopes. The larger the value, the more stable the wheel becomes, but the pilot tends to zigzag. |

12.3.1.1 Kalman gains

  | Important | Make sure you have selected the **PVED-CL** in the **Pilot Type** field. |

12.3.2 PVED config

  | Warning | Only authorized technical personnel using an **Advanced support** password can perform this step. |
Important

Make sure you have selected the PVED-CL in the Pilot Type field.

To alter the auto steering PVED pilot settings, follow the steps below:

1. In the Configuration menu, press the Settings option;
2. Select Auto steering in Configuration Menu;
3. Select the Support option, you must be in Assistance mode;
4. Select the PVED Configuration option, you must be PVED-CL selected;
5. Alter the settings as desired and confirm.

Available parameters

- Operation status
  Describes the main variables regarding the current state of the valve and its basic operation, see the Status operacional topic.

- Get parameters
  Enables direct access to valve parameters, see the Get parameters topic.

- Set parameters
  Enables direct writing to valve parameters, see topic Set parameters topic.

- Advanced parameters
  Allows you to configure special parameters for valve operation, see the Advanced parameters topic.

- Status
  Displays the data sent by the valve in the status message, see the Status topic.

12.3.2.1 Operation status

It describes the main variables related to the current state of the valve and its basic operation.

Available parameters

- Selected device
  Indicates which device is currently controlling the valve (handwheel, external controller, primary controller, joystick).

- High priority status
  If it exists, it indicates where the high priority control device (joystick or similar) is mapped.

- Low priority status
  If it exists, it indicates where the low priority control device (joystick or similar) is mapped.

- Set point controller
If it exists, it indicates where the external control device (display) is mapped.

- **Current mode**
  Current mode of operation.
  - Fault - nothing works.
  - Calibration - it does not control via external controller, but it does enable calibration functions.
  - Reduced - does not control via external controller.
  - Operational - all available features.

- **Active program**
  Set of parameters in use (each program is a version of parameter values, for example, valve gains, calibration parameters, etc.).

- **Reduced mode state**
  Confirms that the valve is in reduced mode.

- **Error severity**
  Indicates the severity of the last error presented by the valve.

- **Error code**
  Displays the code for the last error.

### 12.3.2.2 Get parameters

It allows direct access to the valve parameters, because not all are exposed to the user directly.

![Get parameter](image)

**Figure - Get parameter**

| Important | For more details on the parameter list, refer to the valve manual. |

### 12.3.2.3 Set parameters

| Important | You must be in calibration mode to change parameters |

It allows direct writing to the valve parameters, because not all are exposed to the user directly.
12.3.2.4 Advanced parameters

It allows configuring special parameters for valve operation.

**Available parameters**

- **Sensor check override timeout (ms)**
  Measure of time after the user exceeds the minimum sensor verification speed.

- **Sensor check minimum speed (rpm)**
  Minimum speed that the steering wheel needs to be subjected to in order to engage the pilot. It is a safety measure to ensure that the steering wheel sensor is functioning correctly before engaging the pilot.

- **Kp**
  Valve gain (proportional to the aggressiveness by which the valve tries to reach the reference). It may be necessary to adjust it to the vehicle if very fast or very slow movements are detected in the valve.

- **Maximum port flow (%)**
  Percentage of maximum valve flow.

- **Setpoint amplification**
  Fine adjustment of the valve position control.

- **Spool offset**
  Fine adjustment of the central position of the valve needle.

- **Calibration enter**
  Enter calibration mode. It can be used to modify any parameter depending on the error code if it is in failure mode.

12.3.2.5 Status

It displays the data sent by the valve in the status message (Valve protocol manual, p. 23).

12.3.3 Installation testing

**Important**

Make sure you have selected the PVED-CL in the Pilot Type field.

Para executar o teste de instalação do Piloto PVED-CL, proceda da seguinte forma:

1. Select the Autosteering option in the Settings menu;
2. Select the option Installation INS;
3. The system presents the parameters for configuration;
4. Perform the tests as indicated below;
5. Press OK to confirm.

| Important | The values presented here depend on the position of the vehicle, but the parameters Giro X, Giro Y and Giro Z, have their typical values up to 2.0000, while the fields Roll offset and Pitch offset have their typical values up to 10.00. |

To perform the installation testing, proceed as follows:

1. Position the vehicle horizontally and press Start;
2. Tilt the vehicle to the right. The Roll reading must be positive. By tilting the vehicle to the left, the Roll must be negative;

![Figure - Roll](image)

3. Position the vehicle on sloping ground. With the front of the vehicle tilted down, the Pitch reading must be negative. With the front tilted up, the Pitch must be positive;

![Figure - Pitch](image)

4. The Yaw reading will only be different than zero with the vehicle in motion.

![Figure - Yaw](image)

| Warning | Check if the Yaw, Pitch and Roll readings stabilize quickly after stopping the vehicle. In case this does not occur or there are inconsistencies with the read values, check if there is a problem with mounting the driver or any defective components. |

### 12.3.4 Advanced mode

Go to the Settings menu and enable Advanced mode to access new options in Autosteering.

- Control
To adjust the autopilot controls, see the Control topic.

- **Calibration**
  To perform the Autopilot calibration, see the Calibration topic.

- **General configuration**
  To adjust general configuration parameters, see the General configuration topic.

### 12.3.4.1 Control

**Warning**

Only authorized technical personnel with advanced visualization passwords can perform this step.

To adjust the controls, proceed as follows:

1. In the Settings menu, press the System settings option;
2. Select the Advanced option and enter the password. Press OK;
3. Confirm to go back to the Settings menu and press Automatic pilot;
4. Select the Control option;
5. Set the desired parameter values;
6. Confirm the operation.

**Available parameters**

- Overshoot, see topic Overshoot.
- Aggressiveness, see topic Aggressiveness.
- Sensitivity, see topic Sensitivity.
- Speed gain, see topic Speed gain.
- Curve aggressiveness, see topic Curve aggressiveness.
- Adjustment recommendations see topic Adjustment recommendations.

**Overshoot**

Overshoot controls the rate in which the vehicle will drive on the guide line and the rate in which the vehicle will end as it approaches the line. The default value is zero and must only be altered if you cannot eliminate the overshoot through Aggressiveness and Sensitivity.

- Overshoot can be defined between 0 and 200%. By default it has a zero value, which means it is disabled.
- Increasing the value, the pilot converges more aggressively to the line. There is a tendency to increase overpass.
- Decreasing the value, the pilot converges more gently to the line, reducing overpass.

![Figure - Overshoot](image)

As an adjustment orientation, it is recommended to modify the value from zero to 100. If the system still presents overshoot, the value must be reduced. In case it aligns without overshooting but away from the line, increase the value.
Aggressiveness

Aggressiveness controls the rate in which the vehicle attacks the guide line and how it keeps itself on the line. It can be defined between zero and 200. The default setting is 100.

- When, for example, the farming vehicle exceeds the guide line, it is necessary to reduce the aggressiveness. High values tend to make the vehicle zigzag;
- When the vehicle takes time to reach the guide line, it is necessary to increase aggressiveness. A value too low tends to make the pilot align faster and thus take more time to converge on the guide line.

![Decrease aggressiveness](image1) ![Increase aggressiveness](image2)

*Figure - Agressiveness*

Sensitivity

Sensitivity controls the rate in which the vehicle turns and its sensitivity when it is on the line. It mainly acts over the line.

- When, for example, the vehicle oscillates over the application line, it is necessary to reduce sensitivity. A high value tends to make the vehicle respond more quickly to small ground variations, possibly causing a zigzag trajectory.
- When the farming vehicle does not follow the application line, it is necessary to increase sensitivity. A value too low tends to make the vehicle take longer to respond to error variations.

![Decrease sensitivity](image3) ![Increase sensitivity](image4)

*Figure - Sensitivity*

Speed gain

Speed gain adjusts the gains (Aggressiveness, Sensitivity, and Overshoot) automatically based on vehicle speed.

- In case the application has great speed variations during the operation, adjust the gain to 100% and adjust the aggressiveness, sensitivity, and overshoot options when operating at 7km/h to the values that best adapt to your needs. After this initial adjustment, use the pilot on a different speed range and observe the response;
- In case the pilot is slowly converging to a zero error, increase the speed gain;
- In case the pilot is oscillating, reduce the speed gain. When the speed gain is set to zero, the system will alter the gains automatically based on vehicle speed (ideal for applications with low speed variations of around 3km/h).
Curve aggressiveness
This option adjusts the gain increase and loss on the curves.

- When, for example, the farming vehicle opens on the curve (larger radius), it is necessary to increase curve gain;
- When the farming vehicle is closing the curve (smaller radius), it is necessary to reduce the curve gain.

Adjustment recommendations
Follow the steps below as control adjustment suggestions:

1. **Observe the entry (linear guide)**

   Activate the pilot after it is properly calibrated with the factory gain values:

   - Aggressiveness: 100
   - Sensitivity: 100
   - Overshoot: 0

   **Warning** Perform the adjustment close to the working speed.

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<td>Reduce the Aggressiveness and the Sensitivity together until you have a stable and secure response.</td>
</tr>
<tr>
<td>If the response is slow, slowly converges to zero error, and the alignment is away from the reference line.</td>
<td>Increase the Aggressiveness and Sensitivity together until you have a stable and secure response.</td>
</tr>
</tbody>
</table>

2. **Aggressiveness and Sensitivity Adjustment**

   After obtaining a stable and secure entry response, adjust the Aggressiveness and the Sensitivity separately to obtain the best performance possible:

   - Increase the aggressiveness for a larger attack on the line during entry. In case the pilot is too aggressive or
presents large overpass, reduce the parameter value;

- During operation over the line, in case the pilot is acting too much on the wheels with a tendency to zigzag, reduce the sensitivity value;
- If it takes too long to respond to land slopes or tends to go parallel with the line with an error over 1cm, increase the sensitivity.

3. **Overshoot Adjustment**

If it is difficult to reconcile a good entry time with a good response time over the line and in case the pilot still presents overshoot upon entry:

- Alter the overshoot value from 0 to 100;
- In case the overshoot is still high, reduce the value;
- In case the pilot is away from the line, increase the value.

4. **Curve Gain Adjustment**

Firstly, aggressiveness and sensitivity must be adjusted during operation of a linear guide:

- If the trajectory is always more open than the reference, increase the gain;
- If the trajectory is always more closed than the reference, reduce the gain.

| Warning | The **Maximum saturation**, **Minimum saturation**, and **Maximum delta** values (available in the **General settings** option) directly affect the curve gain response. Low values for these parameters tend to make the response slow. Increasing curve gain, in this case, will not improve performance. |

### 12.3.4.2 Calibration

| Important | Only authorized technical personnel with an advanced visualization password can perform this step. |
| Important | Before starting the calibration procedure, ensure the vehicle dimensions are properly set (**Wheelbase**, **Antenna height**, and **Antenna offset**). |
| Important | Whenever entering the calibration screens, it will be necessary to turn the valve off and on again before the operation to disable the calibration mode. |

To perform the calibration, proceed as follows:

1. In the **Configuration menu**, press the **System settings** option;
2. Select the **Advanced** option and enter the password. Press **OK**;
3. Confirm to return to the **Configuration menu**, then press **Auto steering**;
4. Select the **Calibration** option;
5. Perform the calibration step by step according to the descriptions in the following topics.

On the calibration screen, it is possible to configure the following device parameters:

- **Control driver position** (ATCD);
- **Accelerometer/Gyro calibration**;
- **Gyroscope**;
- **Parâmetros operacionais**;
- **Wheel position calibration**;
- **Geometric parameters**;
- **Wheel sensor test**;
Calibrating the driver position

Choose the correct driver installation position and press Next.

**Warning**
- Install the driver on a flat surface;
- Install the driver on the same structure and, if possible, close to the antenna;
- Never install the driver on a hard surface or the antenna on a dampened surface;
- Scrub off any dirt or debris before installing.

![Driver Position Figure](image)

Calibrating the accelerometer

Determines the relative position (rolling and pitching angles) between the vehicle and the drive installation position.

**Warning**
- Perform the tests with the motor in working rotation;
- Do not swing the vehicle during this step;
- This step is performed in two parts and the vehicle will be moved and should return to the same location, thus it is recommended to mark the ground where the vehicle wheels are positioned;
- Perform the tests at a flat location;
- Whenever the driver is removed from its position (for cleaning or any other purpose), the accelerometer calibration must be re-done, even if the device has been placed in the same location.
To perform the calibration, proceed as follows:

1. Increase the motor rotation for working rotation (1500-2000rpm);
2. Press the vehicle image to the left and wait ten seconds;
3. Wait until the vehicle image to the right is green;
4. Position the vehicle in the same place, however in the opposite direction (for example, if the vehicle is facing north, it must now face south);
5. Press the vehicle image to the right and wait ten seconds;
6. As soon as both images are green, a window will be displayed showing the values found. Press **OK** to save and press **Next**.

**Important**

If the result shows some angle (rolling or pitching) larger than ten degrees, it is recommended to re-evaluate the installation position (the tilt compensation may not operate as expected).

**Calibrating the gyroscope**

The purpose is to estimate errors in the data provided by the gyroscopes.

**Warning**

- Do not move or swing the vehicle during the test;
- This test is performed automatically if the vehicle is stopped;

To perform calibration, proceed as follows:

1. Press the **Calibrate Gyroscope** option;
2. After twenty seconds a window will show with the values found. Confirm with **OK** so that the data is saved.
3. Press **Next**.

**Important**

Values higher than 5 degrees/second may indicate component malfunctioning.

**Calibrating operating parameters**

**Important**

Available only for PVED.
It allows to adjust the basic parameters that guarantee the valve operation, press Next when procedures done.

Available parameters

These settings are saved in the valve, they are not displayed.

- **Steering Wheel**
  It serves to indicate whether the steering wheel sensor is connected. Steering Wheel Angle Sensor, how it will report manual disarming.

- **Priority steering device (high or low)**
  Refers to the valve configuration indicating the source of the signal to be controlled, analog wheel sensor connected to the PVED, CAN sensor or unmapped. It is compatible only with the setup using analog sensors (AD1 or AD2), and the interface on which the sensor is installed must be correctly mapped.

- **Primary steered wheel signal**
  Wheel angle sensor signal. It depends on orbitrol. For example, if you turn left and the wheel goes the other way, change here.

- **High priority set-point controller**
  Fixed information - the display will control the valve via primary CAN, wich is our control.

- **Redundant steered wheel sensor**
  Informs the valve if there is a redundant sensor to detect steering column movements (steering wheel).

- **Vehicle speed signal**
  Informs that there is a CAN speed sensor present in the vehicle installation, don't change.

- **OSP Signal**
  Orbitrol signal amplifier, works as a steering assistant.

Calibrating wheel position

<table>
<thead>
<tr>
<th>Important</th>
<th>This step requires the vehicle to be in motion, requiring a wide, unobstructed are for completion.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Warning</td>
<td>Before starting the test, consider the following facts: clockwise means to turn to the right, and counterclockwise means to turn to the left.</td>
</tr>
<tr>
<td>Warning</td>
<td>Do not use the steering wheel or modify the vehicle's wheel position during the test.</td>
</tr>
</tbody>
</table>

To perform the calibration, proceed as follows:

1. Place the vehicle in a circular motion, turning the steering wheel as far as possible clockwise and press Start;
2. Keep the same steering wheel position until the end of the test;
3. Once the second circle is completely green, press Stop;
4. Press Next;

5. Now place the vehicle in a circular motion, turning the steering wheel as far as it will go counterclockwise and press Start;

6. Keep the same steering wheel position until the end of the test;
7. Once the second circle is completely green, press Stop;
8. A window will be displaced with the values calculated during calibration. Press OK to save the data.

**Important**
The appropriate values depend on the type of vehicle, geometry and other factors. For sprayers it would be something over 2000 and for tractors between 400 and 800.

**Calibrating geometric parameters**

**Important**
Available only for PVED.

It allows specifying dimensions and geometric parameters for correct valve configuration. The information is saved on the valve and not on the display. If you have the valve manual, you can use its information.

**Available parameters**

- Maximum wheel angle to the left (degrees)
Information resulting from the previous calibration.

- Maximum wheel angle to the right (degrees)
Information resulting from the previous calibration.

- **Vehicle length**
  Wheelbase, must conform to vehicle configuration. This value already comes from the valve, so if it is different from the value informed in the display configuration, an alarm will be presented for checking.

- **Valve type**
  Valve type PVED.

- **Steering type**
  Vehicle pivot point, front, back, middle and idle.

**Calibrating the wheel sensor test**

In this stage, the current position of the wheels is read.

To perform the calibration, proceed as follows:

1. Position the wheels in the central position and press **Save Reading Center**;
2. Position the wheels all the way to the left and press **Save Reading Left**;
3. Position the wheels all the way to the right and press **Save Reading Right**;
4. Position the wheel in the central position to enable the test commands;
5. Make sure there are no obstacles near the wheels and that the vehicle is stopped;
6. Press **Test** starting;
7. A test confirmation screen will show.

**Important**

When you click **Next**, the valve checks whether this value is correct or not, it must be an increasing or decreasing value, or a straight line going up or a straight line going down. 11162. In this case, it will be necessary to check the sensor installation. usually change u or rotate. remember the warranty.

**Calibrating dead zone**

**Important**

Available only for PVED.

Performs the automatic test. The valve will automatically raise the dead zone parameters. To do this, the valve must be in the calibration mode, and must be turned off/on for the calibration mode to be activated again.
The following calibration steps are:

1. Turn off the valve and select the option **The valve is off**.
2. Turn on the valve and select the option **The valve is on**.
3. Select the option **Start** calibration.
4. Once calibration has started, the valve will move to one side or the other.

**Important**

This movement is not controlled by our controller, it is performed autonomously by the valve.

5. In case of error, it is possible to restart the calibration.

**Important**

The default value for **Steering wheel position difference threshold** is normally 20, it is recommended to increase it from 5 to 5. Use when the message that the vehicle is moving appears. In calibration the system also stores the value returned to **Main spool position**, just to get feedback that it is changing.

### 12.3.4.3 General configuration

**Warning**

Only authorized technical personnel using an **Advanced mode** password can perform this step.

To adjust the general settings, proceed as follows:

1. In the **Configuration Menu**, press the **Settings** option;
2. Select the **Advanced** option and enter the password. Press **Ok**;
3. Confirm to return to the Settings Menu and then press **Auto steering**;
4. Select the **General configuration** option;
5. Change the parameters as required;
6. Confirm the operation.
Available security parameters

- **Override gain**
  Only PVED configuration on this screen. Adjusts the effort needed by the operator to resume steering the vehicle from the automatic pilot. The larger the value, the more difficult it is. The smaller, the more easy (0-1000).

  **Warning**
  When this value is changed, it is necessary to turn the valve on and off to be applied, the display itself will send a message.

- **Max. sec. error (degrees)**
  Blocks the automatic pilot use in case the vehicle positioning error is above the configured value, thus avoiding abrupt maneuvers.

- **Angle sec. (degrees)**
  Blocks the use of the pilot if the angular error, in relation to the guide, is above the configured one. By default comes 2 degrees.

- **Alarm behavior**
  Indicates if the automatic pilot alarms will turn the operation off or not (section cut, fertilizing, etc).

- **Maximum allowed speed**
  Corresponds to the value that the user uses as cutting speed in the operation. If the equipment is operating above the set maximum speed, the autopilot can not be switched on. If the equipment exceeds the maximum speed set with the autopilot on, it will be disarmed.

- **Road mode inactive time (min)**
  It corresponds to the time configurable by the operator so that the pop up warning appears. This warning relates to autopilot downtime.

Available operation parameters

- **Maximum delta (degrees)**
  Maximum speed for changing wheel direction.
A low value for maximum Delta tends to impair the entry and the response of the pilot in the curved guide (slow to perform maneuvers) and a high value can cause sudden movements of the vehicle, which impairs the safety of operation at high speeds.

### 12.4 Crawler pilot

The pilot for the crawler tractor has integration with the machine's Joystick, today we use it in the models of the brands Komatsu, Carterpillar, New Holland and John Deere (wheeled harvesters).

**Warning**

If reverse detection is not enabled, the integration will not work, only afterwards is it possible to configure the joystick.

To use the Auto steering on your device, perform the following steps in order:

1. To be able to use the Auto steering, you need to have a preconfigured vehicle. Follow the steps in topic [Inserting a new vehicle](#).

**Warning**

Whenever a new vehicle is created, all the automatic pilot configuration, calibration, and adjustment steps must be performed again.

2. Check if the Auto steering is On. Go to the Settings Menu and choose the option Autosteering;
3. Then, activate the reverse detector, see topic [Reverse detector](#);
4. Perform the curve settings as described in topic [Advanced configuration](#);
5. In the Support mode, select the proper pilot type, see topic [Setting the pilot type](#);
6. In the Support mode, configure the parameters for that specific pilot, according to the topic [Configuring the crawler pilot](#);
7. Perform the installation tests, see topic [Testing the pilot installation](#);
8. In the Advanced mode, make the calibrations required for operation, see topic [Calibration](#);
9. If necessary, perform adjustments, see topic [Adjustment](#);
10. Operate as indicated in the [Operation](#) topic.

**Important**

The main operational problems of the pilot are usually linked to the driver's position and error in the informed dimensions of the vehicle, such as: antenna axis, distance between pins and antenna displacement, paying close attention to the negative and positive side.

### 12.4.1 Auto steering config

**Warning**

Only authorized technical personnel with an assistance password can perform this step.

To alter these auto steering pilot settings, follow the steps below:

1. In the Configuration menu, press the Settings option;
2. Select the Support option and enter the password. Press OK;
3. Confirm to return to the Configuration menu and press the Auto steering;
4. Select the Support option (image 01);
5. Select the Auto steering configuration option (image 02);
6. Select the type of pilot;
7. Alter the settings as desired and confirm.
**Available parameters**

- **Type pilot**
  Alters the selected pilot type, as described in topic [Type pilot](#).

- **Calibration**
  Informs the type of curve to be used to estimate the calibration parameters for the HP sensor. This is always disabled.

- **Maximum wheel position calibration (%)**
  Alters the maximum wheel position during the last curve. With 100% it will go to maximum, and with values below 100 avoid that the wheel is controlled in its maximum position.

- **Configuration reset**
  Erases all the data for the selected pilot.

- **GPS emulator**
  Uses the pilot driver as GPS simulator. Widely used in fairs and demonstrations (one needs to mount the cabling).

- **Calibration number of turns for each side**
  Decreases the number of turns for the calibration when the space is small. Normally, when calibrating the pilot performs three curves, one more closed, on intermediary, and one more open. For small spaces, this parameter may be altered so that only two curves are performed (in this case, the more open curve is not performed) or just the more closed curve.

- **Motor PPR**
  Alters the type of motor used in the hexdrive. The latest motor has 133 pulses, while the oldest had 60 pulses.

- **Drift filter**
  The wheel position for the electric pilot is estimated using a series of information from the GNSS and the gyroscope. This reading may be noisy and it is necessary to filter the data to obtain a reliable value. The drift filter value serves to smooth the wheel angle estimation. This is only available for electric pilot settings.

- **GPS min. quality**
  Allows to select four types of signals: high precision (more basic correction, Glide, of Novatel); (signal with no correction at all, with high error), pay signal (TERRASTAR AR) and RTK (best possible accuracy using the RTK correction).

**Warning**

The smaller the value, the more the pilot tends to move the wheels, mainly when passing through holes and changes in terrain slopes. The larger the value, the more stable the wheel...
12.4.2 Installation testing

For the crawler tractor pilot, the following tests are available on the Pilot's main screen:

1. Installing the joystick, see topic Installing the Joystick.
2. INS installation, see INS installation topic.

12.4.2.1 Joystick install

This option assists in checking the operation and installation of joystick.

Warning
Before performing the dead band, ensure the valve start cable (item 03548) is properly installed and is not inverted. To do so, in the HV controller test, press Start and enter a reference of 25 degrees. The wheel should go right, if it goes left, the cable is inverted.

12.4.2.2 INS install

The values shown on the following screen depend on the current vehicle position.

To perform the installation, proceed as follows:

1. Position the vehicle horizontally and press Start;
2. Tilt the vehicle to the right. The Roll reading must be positive. By tilting the vehicle to the left, the Roll must be negative;
3. Position the vehicle on sloping ground. With the front of the vehicle tilted down, the Pitch reading must be negative. With the front tilted up, the Pitch must be positive.

4. The Yaw reading will only be different than zero with the vehicle in motion.

**Warning**

Check if the Yaw, Pitch and Roll readings stabilize quickly after stopping the vehicle. In case this does not occur or there are inconsistencies with the read values, check if there is a problem with mounting the driver or any defective components.

### 12.4.3 Advanced mode

#### 12.4.3.1 Control

**Warning**

Only authorized technical personnel with advanced visualization passwords can perform this step.

To adjust the controls, proceed as follows:

1. In the **Settings menu**, press the **System settings** option;
2. Select the **Advanced** option and enter the password. Press **OK**;
3. Confirm to go back to the **Settings menu** and press **Automatic pilot**;
4. Select the **Control** option;
5. Set the desired parameter values;
6. Confirm the operation.
Available parameters

- Overshoot, see topic Overshoot.
- Aggressiveness, see topic Aggressiveness.
- Sensitivity, see topic Sensitivity.
- Speed gain, see topic Speed gain.
- Curve aggressiveness, see topic Curve aggressiveness.
- Adjustment recommendations see topic Adjustment recommendations.

Overshoot

Overshoot controls the rate in which the vehicle will drive on the guide line and the rate in which the vehicle will end as it approaches the line. The default value is zero and must only be altered if you cannot eliminate the overshoot through Aggressiveness and Sensitivity.

- Overshoot can be defined between 0 and 200%. By default it has a zero value, which means it is disabled.
- Increasing the value, the pilot converges more aggressively to the line. There is a tendency to increase overpass.
- Decreasing the value, the pilot converges more gently to the line, reducing overpass.

As an adjustment orientation, it is recommended to modify the value from zero to 100. If the system still presents overshoot, the value must be reduced. In case it aligns without overshooting but away from the line, increase the value.

Aggressiveness

Aggressiveness controls the rate in which the vehicle attacks the guide line and how it keeps itself on the line. It can be defined between zero and 200. The default setting is 100.

- When, for example, the farming vehicle exceeds the guide line, it is necessary to reduce the aggressiveness. High values tend to make the vehicle zigzag;
- When the vehicle takes time to reach the guide line, it is necessary to increase aggressiveness. A value too low tends to make the pilot align faster and thus take more time to converge on the guide line.

Sensitivity

Sensitivity controls the rate in which the vehicle turns and its sensitivity when it is on the line. It mainly acts over the line.
• When, for example, the vehicle oscillates over the application line, it is necessary to reduce sensitivity. A high value tends to make the vehicle respond more quickly to small ground variations, possibly causing a zigzag trajectory.

• When the farming vehicle does not follow the application line, it is necessary to increase sensitivity. A value too low tends to make the vehicle take longer to respond to error variations.

**Speed gain**

Speed gain adjusts the gains (Aggressiveness, Sensitivity, and Overshoot) automatically based on vehicle speed.

• In case the application has great speed variations during the operation, adjust the gain to 100% and adjust the aggressiveness, sensitivity, and overshoot options when operating at 7km/h to the values that best adapt to your needs. After this initial adjustment, use the pilot on a different speed range and observe the response;

• In case the pilot is slowly converging to a zero error, increase the speed gain;

• In case the pilot is oscillating, reduce the speed gain. When the speed gain is set to zero, the system will alter the gains automatically based on vehicle speed (ideal for applications with low speed variations of around 3km/h).

**Curve aggressiveness**

This option adjusts the gain increase and loss on the curves.

• When, for example, the farming vehicle opens on the curve (larger radius), it is necessary to increase curve gain;

• When the farming vehicle is closing the curve (smaller radius), it is necessary to reduce the curve gain.

**Adjustment recommendations**
Follow the steps below as control adjustment suggestions:

1. **Observe the entry (linear guide)**

   Activate the pilot after it is properly calibrated with the factory gain values:
   - Aggressiveness: 100
   - Sensitivity: 100
   - Overshoot: 0

   **Warning** Perform the adjustment close to the working speed.

<table>
<thead>
<tr>
<th>Field response</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>If the response oscillates with a zigzag trajectory, the response is aggressive (quick wheel movement) or exceeds the line (&lt;30cm).</td>
<td>Reduce the Aggressiveness and the Sensitivity together until you have a stable and secure response.</td>
</tr>
<tr>
<td>If the response is slow, slowly converges to zero error, and the alignment is away from the reference line.</td>
<td>Increase the Aggressiveness and Sensitivity together until you have a stable and secure response.</td>
</tr>
</tbody>
</table>

2. **Aggressiveness and Sensitivity Adjustment**

   After obtaining a stable and secure entry response, adjust the Aggressiveness and the Sensibility separately to obtain the best performance possible:
   - Increase the aggressiveness for a larger "attack" on the line during entry. In case the pilot is too aggressive or presents large overpass, reduce the parameter value;
   - During operation over the line, in case the pilot is acting too much on the wheels with a tendency to zigzag, reduce the sensitivity value;
   - If it takes too long to respond to land slopes or tends to go parallel with the line with an error over 1cm, increase the sensitivity.

3. **Overshoot Adjustment**

   If it is difficult to reconcile a good entry time with a good response time over the line and in case the pilot still presents overshoot upon entry:
   - Alter the overshoot value from 0 to 100;
   - In case the overshoot is still high, reduce the value;
   - In case the pilot is away from the line, increase the value.

4. **Curve Gain Adjustment**

   Firstly, aggressiveness and sensitivity must be adjusted during operation of a linear guide:
   - If the trajectory is always more open than the reference, increase the gain;
   - If the trajectory is always more closed than the reference, reduce the gain.

   **Warning** The **Maximum saturation**, **Minimum saturation**, and **Maximum delta** values (available in the **General settings** option) directly affect the curve gain response. Low values for these parameters tend to make the response slow. Increasing curve gain, in this case, will not improve performance.

### 12.4.3.2 Calibration

**Important** Only authorized technical personnel with an advanced visualization password can perform this step.
Important

Before starting the calibration procedure, ensure the vehicle dimensions are properly set (Wheelbase, Antenna height, and Antenna offset).

To perform the calibration, proceed as follows:

1. In the **Configuration menu**, press the **System settings** option;
2. Select the **Advanced** option and enter the password. Press **OK**;
3. Confirm to return to the **Configuration menu**, then press **Auto steering**;
4. Select the **Calibration** option;
5. Perform the calibration step by step according to the descriptions in the following topics.

On the calibration screen, it is possible to configure the following device parameters:

- **Control driver position** (ATCD);
- **Accelerometer/Gyro calibration** – relative position between the control driver and the vehicle;
- **Gyroscope**;
- **Joystick setup**;
- **Joystick deadzone**.

**Calibrating the driver position**

Choose the correct driver installation position and press **Next**.

**Warning**

- Install the driver on a flat surface;
- Install the driver on the same structure and, if possible, close to the antenna;
- Never install the driver on a hard surface or the antenna on a dampened surface;
- Always screw the driver onto the vehicle’s frame.
Calibrating the accelerometer

Determines the relative position (rolling and pitching angles) between the vehicle and the drive installation position.

**Warning**

Before starting calibration, consider the following:

- Perform the tests with the motor in work rotation;
- Do not swing the vehicle during this step;
- This step is performed in two parts and the vehicle will be moved and should return to the same location, thus it is recommended to mark the ground where the vehicle wheels are positioned;
- Perform the tests at a flat location;
- Whenever the driver is removed from its position (for cleaning or any other purpose), the accelerometer calibration must be re-done, even if the device has been placed in the same location.

To perform the calibration, proceed as follows:

1. Increase the motor rotation for working rotation (1500-2000rpm);
2. Press the vehicle image to the left and wait ten seconds;
3. Wait until the vehicle image to the right is green;
4. Position the vehicle in the same place, however in the opposite direction (for example, if the vehicle is facing north, it must now face south);
5. Press the vehicle image to the right and wait ten seconds;
6. As soon as both images are green, a window will be displayed showing the values found. Press **OK** to save and press **Next**.
Important

If the result shows some angle (rolling or pitching) larger than ten degrees, it is recommended to re-evaluate the installation position (the tilt compensation may not operate as expected).

Calibrating the gyroscope

The purpose is to estimate errors in the data provided by the gyroscopes.

**Warning**
- Do not move or swing the vehicle during the test;
- This test is performed automatically if the vehicle is stopped;

To perform calibration, proceed as follows:

1. Press the **Calibrate Gyroscope** option;
2. After twenty seconds a window will show with the values found. Confirm with **OK** so that the data is saved.
3. Press **Next**.

Important

Values higher than 5 degrees/second may indicate component malfunctioning.

Calibrating the joystick setup

**Important**

Available only to the Crawler pilot.

In the Calibration screen, with the Joystick switch selected, you can set up the joystick positions (front and back) as well as lateral movement (the reading should increase if the joystick is moved to the right).

**Important**

The reverse detection pattern selected must be that of the auto steering (**Guidance > Reverse detector**).  

Important

The moment you step forward, the system checks if the center is close.
Calibrating the joystick deadzone

**Important**
Calibration of the dead zone should only be done if the stationary machine can perform lateral movements.

When starting, the machine will move laterally. The value 0.11 indicates the minimum rotation / movement speed of the machine for the calibration to be completed.

If the machine does not move sideways stopped, this value should be adjusted directly on the hydraulic calibration screen, empirically (0.6 is recommended, if the driver is very aggressive on the line, it should be reduced in steps of 0.05, otherwise increase in steps of 0.05).

**Important**
If necessary, change the dead zone value first before changing the aggressiveness and sensitivity values. Typical dead zone values are less than <0.07, typically 0.04 and gain typically 0.05.

![Image of joystick deadzone calibration](image)

**Figure - Joystick dead zone calibration**

12.4.3.3 General configuration

**Important**
Only authorized technical personnel with an advanced visualization password can perform this step.

To adjust the general settings, proceed as follows:

1. In the **Configuration menu**, press option **Settings**;
2. Select the **Advanced** option and enter the password. Press **OK**;
3. Confirm to return to the **Configuration menu** and then press **Auto steering**;
4. Select the **General configuration** option (image 01);
5. Alter the parameters as desired (image 02);
6. Confirm the operation.

![Image of general configuration](image)

**Figure - General configuration**
Security parameters

- **Override gain**
  Adjusts the effort needed by the operator to resume steering the vehicle from the automatic pilot. The larger the value, the more difficult it is. The smaller, the more easy (0-1000).

- **Error sec. (meters)**
  Blocks the automatic pilot use in case the vehicle positioning error is above the configured value, thus avoiding abrupt maneuvers.

- **Angle sec. (degrees)**
  Blocks the automatic pilot use in case the vehicle positioning error is above the configured value, thus avoiding abrupt maneuvers.

- **Wheel alarm (degrees)**
  Checks the wheel sensor operation and, in case of anomaly, disables the auto steering.

- **Alarm behavior**
  Indicates if the automatic pilot alarms will turn the operation off or not (section cut, fertilizing, etc).

- **Maximum speed allowed**
  Corresponds to the value that the user uses as cutting speed in the operation. If the equipment is operating above the set maximum speed, the autopilot can not be switched on. If the equipment exceeds the maximum speed set with the autopilot on, it will be disarmed.

- **Road mode inactive time**
  It corresponds to the time configurable by the operator so that the pop up warning appears. This warning relates to autopilot downtime.

Operation parameters

- **Maximum saturation (degrees)**
  Maximum steering angle at low speeds.

- **Minimum saturation (degrees)**
  Maximum steering angle at high speeds (25km/h).

- **Maximum delta (degrees)**
  Maximum speed for changing wheel direction.

**Important**
Low values for these parameters tend to harm entry and the pilot response on a curved guide (slowness to perform maneuvers).

**Warning**
High **Minimum saturation** and **Maximum delta** values may cause abrupt vehicle movement, which impairs operation safety on high speeds.
- **PWM C control logic**

  **Important**
  
  Used only on the *Hydraulic Pilot*. 
13. Fertilisation control

Important Feature available only after product activation.

The rate application process aims to equalize soil nutrients, thus optimizing the application of the resources.

To use fertilization control, you will need:

1. Configure a new implement, according to the topic Configuring the implement.
2. Test the created implement, according to the topic Testing the implement.
3. Configure the Spraying activity, according to the topic Configuring the activity.
4. Operate, as per Operation topic.

13.1 Implement

Important To perform the procedure below, you must be in Advanced mode.

To create a new implement, proceed as follows:

1. In the Settings menu, select the Implement option;
2. In the list of implements, select the New option;
3. Choose the Fertilizer type and enter the Manufacturer and Model name;
4. Confirm by selecting Create.

After creating the implement, the configuration screen is displayed.

Available parameters

- **Controllers number**
  Number of controllers of the same input. The layout of these controls will be next to each other. Calibration and recommendation are the same for all controls. When entering this information, the Module options and the Controls will be activated.

  Important This field cannot be edited after saving the implement settings.

- **Controller X**
  The number of controls presented corresponds to the number previously informed, it is necessary to configure each of the controls, according to the topic Configuring the controls. The most common fertilizer spreader is just one control.

- **Modules**
  Directs to the configuration of the modules, according to the topic Configuring the modules.

- **Hitch to application (m)**
  Distance in meters between the coupling pin of the implement to the tractor to the point of exit of input at the rear of the implement.
13.1.1 Controls

It is necessary to configure each of the fertilizer sections.

**Available parameters**

- **Row numbers**
  Enter the number of control lines.

  **Important**
  The most common fertilizer is one line.

13.1.2 Modules

Also in the fertilizer configuration screen, in the **Modules** option, it is where you configure which and how many different inputs are controlled, currently up to 3 different inputs are allowed.

**Available parameters**

- **Fertilizer control 1**
  By pressing this button, it is possible to switch between the Yes and No. options. Select Yes, if your fertilizer spreader applies at least one input at a time. This action will enable the button for configuration described below.

- **Fertilizer 1 config**
  In this option it is possible to configure parameters about input 1. See the topic [Input configuration](#) for more details.

- **Fertilizer control 2**
  By pressing this button, it is possible to switch between the Yes and No. options. Select Yes, if your fertilizer spreader applies at least one input at a time. This action will enable the button for configuration described below.

- **Fertilizer 2 config**
  In this option it is possible to configure parameters about input 2. See the topic [Input configuration](#) for more details.

- **Fertilizer control 3**
  By pressing this button, it is possible to switch between the Yes and No. options. Select Yes, if your fertilizer spreader applies at least one input at a time. This action will enable the button for configuration described below.
• **Fertilizer 3 config**  
  In this option it is possible to configure parameters about input 3. See the topic Input configuration for more details.

• **Fertilizer gate**  
  By pressing this button, it is possible to switch between the Yes and No. options. Select Yes, if your fertilizer spreader works with gate control. This action will enable the button for configuration described below.

  **Important**  
  Specific activation is required for the gate control to be available.

• **Gate configuration**  
  In this option it is possible to configure parameters about the gate control. See the topic Gate configuration for more details.

• **Disc control**  
  By pressing this button, it is possible to switch between the Yes and No. options. Select Yes, if your fertilizer spreader works with control spinners. This action will enable the button for configuration described below.

  **Important**  
  Specific activation is required for the gate control to be available. In addition, when choosing the Yes option, only one type of input can be automatically configured above.

• **Disc configuration**  
  In this option it is possible to configure parameters about the spinners control. See the topic Spinner configuration for more details.

• **General configuration**  
  In this option, general parameters of the fertilizer are configured. See the general configuration topic for more details.

13.1.2.1 **Input control**

In the configuration of the input controller, you can configure the motor, speed and application at the boundary of the work area.

**Available parameters**

• **Dispenser capacity (kg)**  
  Enter the tank capacity in liters for the input being configured.

• **Dispenser min. level (%)**  
  Enter the minimum percentage of product you must have in the tank.

• **Motor config**  
  See the topic Motor for more details.

• **Speed config**  
  See the topic Speed for more details.

• **Perimeter application config**  
  Select this item to configure specific parameters for the application of the product at the boundary of the field. See the topic application on the boundary for more details.

**Motor**

Configure parameters referring to the motor references here.
Available parameters

- **PPR**
  It represents the number of pulses that the equipment reads at each turn of the encoder.

<table>
<thead>
<tr>
<th>PPR</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gearwheel with inductive sensor</td>
<td>22</td>
</tr>
<tr>
<td>Model encoder 02089</td>
<td>1024</td>
</tr>
<tr>
<td>Model encoder 02286</td>
<td>64</td>
</tr>
<tr>
<td>Crawler</td>
<td>38, 39</td>
</tr>
</tbody>
</table>

Important
If another wheel is used, the PPR must be equal to the number of teeth.

- **RPM mín.**
  Minimum RPM value. It must be configured after the motor start test, according to the topic **Motor start**

- **RPM max.**
  Maximum RPM value. It must be configured after the motor start test, according to the topic **Motor start**

13.1.2.2 General settings
In the general configuration screen it is possible to choose the speed reference based on the **GNSS** or the **Wheel**.

- **Speed reference**
  **GNSS** or **Wheel**. When selecting **GNSS**, we have the travel speed provided by GNSS and when selecting the **Wheel**, the speed is provided by the wheel sensor.

Anticipation parameters

- **Opening time (s)**
  Inform how long before the application starts, you want the valve to start opening, in order to guarantee the proper application of the dose. For example, imagine that the **Opening time** was configured here for an anticipation of 1 second, considering a scenario of a vehicle operating at 3m/s, when there is exactly 3 meters to enter the application area, the valve will already be opened. Changes in vehicle speed can cause an error in predictability.

![Figure - Example of early opening of the valve](image)

- **Closing time (s)**
  Inform how long before the end of the application you want the valve to anticipate its closure. For example, imagine that the **Closing time** was set here for an anticipation of 1 second, considering a scenario of a vehicle that is operating 3m/s, when exactly 3 meters is left to leave the application area, the valve will be closed.
• **Overlap on starting (m)**

Enter in meters the distance you want to overlap before entering an application area, if you are leaving an already applied area. For example, imagine that the **Overlap on starting** was set here to anticipate 1 meter, considering a scenario of a vehicle that is over an already applied area and will enter an unapplied area, when exactly 1 meter is missing to enter the area application, the valve will be opened, causing the application to overlap in this area of 1 meter.

• **Overlap on shut off (m)**

Enter in meters, the distance you want to overlap to enter an already applied area. For example, imagine that the **Overlap on shut off** was configured here for a delay of 1 meter, considering a scenario of a vehicle that is over an application area and will enter an already applied area, only after the vehicle enters for 1 meter in the area already applied, the valve will be closed, causing an overlap of the application in this area of 1 meter.

---

**Important**

The system adds the values programmed in the **Opening time + Overlap on starting** parameters when starting. For example, in the situation where the **Opening time** is programmed to be anticipated in 1 second, for a vehicle at 3m/s, the valve opening would occur when there are 3 meters to enter the unapplied area, but if was informed in the **Overlap on starting** parameter the value of 1 meter, the valve will be opened in advance at a distance of 4 meters which corresponds to 3 meters + 1 meter.
Important

The system subtracts the values programmed in the parameters **Closing time** + **Overlap on shut off** when switching off. For example, in the situation where the **Closing time** is programmed to be anticipated in 1 second, for a vehicle at 3m / s, the closing of the valve would occur when there are 3 meters to leave the application area, but if it was informed in the **Overlap on shut off** parameter the value of 1 meter, the valve will be closed in advance at a distance of 2 meters which corresponds to 3 meters - 1 meter.

![Figure - Example of closing and overlapping at the end together](image)

### Wheel and GNSS parameters

- **Cutting edge speed (km/h)**
  Inform the speed at which the vehicle should be at to turn off the application, it serves to avoid the accumulation of input in sudden braking.

- **Height sensor**
  It serves to detect whether the implement is available to work or not. When any presence is detected in front of the sensor, the implement is disabled and enabled again when there is nothing.
  - **Ignore**, does not use a sensor.
  - **Active height**, when the sensor is activated, consider the implement active.
  - **Active low**, when the sensor is activated, consider the implement inactive.

Important

It is not possible to manually enable the operation while the height sensor is activated.

### Wheel parameters

- **Wheel distance (m)**
  It is equivalent to the perimeter of the wheel. Enter in meters.

- **Wheel pulses**
  Number of pulses per rotation of the wheel speed sensor.

- **Section ref**
  Select **Dependent** when the entire machine speed reference depends on just one sensor, in this case, indicate in the next field which reference section. Select **By section** to indicate that each section has its reference individually, in this case, the **perimeters** and **PPR** of all sections must be the same.

- **Common section**
  If the **Dependent** option is selected in the previous field, it is necessary to inform the reference section here.
13.1.3 Tests

**Important**

In order to run the tests, you must first select the appropriate implement and be in Advanced mode.

To test the fertilizer, proceed as follows:

1. In the Settings menu, select the Implement option;
2. In the list of implements, select the fertilizer implement you want;
3. Select the Tests option;
4. The tests available for the fertilizer are presented;
5. Select the Motor actuator option, see the details in the topic Motor control test.

### 13.1.3.1 Motor actuator

The purpose of this test is to ensure the hydraulic motors are working properly.

To perform the test, proceed as follows:

1. Select the Motor actuator option;
2. Start the vehicle and put it in the working rotation;
3. Press Start;
4. Decrease the reference value until the value read no longer coincides with the established value. The read value is the Minimum RPM value;
5. Increase the reference value until the value read no longer coincides with the established value. The read value is the Maximum RPM value;
6. Check if the readings are compatible with the reference;
7. Press Stop to finish.

### 13.2 Activity settings

**Important**

It is only possible to access these settings when implements Fertilizer are selected.

To configure the Fertilisation control, proceed as follows:

1. Select option Fertilisation control from the Configuration menu;
2. Select the input you want to configure (if there is more than one);
3. Configure the dosage rate of the input;
4. Calibrate the input;
5. Enter the rotation speed of the plates, this field will only be available if the plate control is enabled on the
implement.
6. Press **OK** to confirm the operation.

Details on setting **Dosage rate** and **Input calibration** are in the subsequent topics.

<table>
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<tr>
<th>Warning</th>
<th>Dosage values are in Kg/ha.</th>
</tr>
</thead>
</table>

**Figure - Fertilisation control**

### 13.2.1 Recommendation

The **Dosage rate** corresponds to the amount of input that will be applied by that specific input container in one hectare. Three types of dosage rates can be used:

- **Fixed rate**
- **Variable rate**
- **Fixed rate with map**

For each input, two rate values may be preconfigured. Valid dosage rates are in Kg/ha.

#### 13.2.1.1 Fixed rate

The recommendation rate corresponds to the dosage that will be used by the fertilizer as a reference in the automatic application.

**Important** Seeing that for this type of rate a boundary map is not used, the fixed rate is applied throughout the traversed trajectory.

Two fixed values must be set for the **Fixed rate** which may be used during operation and will be available on the panel for quick access by the operator.

To set the **Fixed rate** values, proceed as follows:

1. Select option **Fertilisation control** from the **Configuration menu**;
2. Select option **Dosage type**;
3. Select option **Fixed rate**;
4. Enter the **rates** required;
5. Press **OK** to confirm the operation.

**Available parameters**

- **Primary dosage (kg / ha)**
  Dose that will be applied each time the user presses on the primary doser on the operation screen.

- **Secondary dosage (kg / ha)**
  Dose that will be applied each time the user presses on the secondary doser on the operation screen.
• **Application tolerance (%)**
  Percentage tolerance range to trigger the alarm. For example, for a rate of 1,000 kg/ha, and a tolerance of 50%, then the alarm will be displayed for 2 seconds when the dose drops from 500 kg/ha or exceeds 1,500 kg/ha.

| Important | This field is only available if the plate control is activated. |

### 13.2.1.2 Fixed rate with map

For the **Fixed rate with map** two fixed values must be set, the **Primary dosage** and the **Secondary dosage**, which may be used during operation and will be available on the panel for quick access by the operator. They are called dispensers.

| Important | Since a map is used for this type of rate, the map will serve as a boundary for input application. Nothing will be applied outside the map. |

To view the selected map with its total area, use option **View**. To configure the values for the fixed rate with map, proceed as follows:

1. Select option **Fixed rate with map**;
2. Select the desired map among those listed;
3. Select option **Primary dosage**;
4. Enter the desired value in Kg/ha and press **OK**;
5. Select option **Secondary dosage**;
6. Enter the desired value in Kg/ha and press **OK**;
7. Press **OK** to confirm the operation.

### 13.2.1.3 Variable rate

For the Variable rate, two fixed values must be set that may be used during operation and will be available on the panel for quick access by the operator. They are called dispensers. For the variable rate, a map is used. However, in this case the **Primary dosage** and **Secondary dosage** set in the system will be used outside the map boundaries. Inside the map boundaries, the values previously set on the map will be used.

| Important | In order not to apply the input outside the map, simply set the **Primary dosage** and **Secondary dosage** values to zero |

To view the selected map as well as its total area and set dosage, use option **View**.
To configure the **Variable rate** values, proceed as follows:

1. Select option **Variable rate**;
2. Select the desired map among those available;
3. Among the attribute options available, select the recommendation to be used;
4. Select option **Primary dosage** for outside the map boundaries;
5. Enter the desired value in kg/ha and press **OK**;
6. Select option **Secondary dosage** for outside the map boundaries;
7. Enter the desired value in kg/ha and press **OK**;
8. Press **OK** to confirm the operation.

### 13.3 Operation

#### 13.3.1 Start application

The operation is started by selection the suspended operation option in the center of the operation screen.

> **Important**  
Application will only start once the implement moves and exceeds the minimum speed set for the GNSS.

#### 13.3.2 Monitor application

The context bar is displayed by sliding the bottom of the operation screen with a drag upwards.

The features available for the **Fertilisation** implement are detailed below:
01 - Speedometer (km/h)

The green area represents the speed range indicated for the operation. The red ends represent the maximum and minimum values and the indicator shows the current speed.

02 – Tank level

The user indicates in liters or kilograms how much he put in the tank and the system discounts what is being applied, indicating the current tank level (in percentage). When the tank level goes below 10%, it turns red as an alert for the operator. To indicate a new supply, just press the tank icon.

```
Important
```

The total capacity of the tank is previously configured in the field Implement > Fertilizer > Configuration > Modules > Input configuration > Tank capacity.

03 – Input application statement

The number that shows is the recommended dosage for input application. This value may be altered in real time using the plus and minus options. The increase or decrease is of 5kg/h for each touch. The strip below shows the amount of input being applied: the middle of the strip equals the recommended value indicated above. If the marker is to the left, there is less than the recommended amount of input being applied, and if it is to the right, there is more than the recommended being applied.

04 – Dosing clocks

The clock values may be set through the Fertilization menu and give access to predefined doses for input application. It is possible to alternate between the two dosages whenever necessary by simply pressing the desired clock icon, which will alternate between numbers 1 and 2, indicating which dose is being used.

13.3.3 Suspend application

Press the center of the screen to suspend the operation. An image indicating that the operation is suspended is shown in the middle of the screen. During the period in which the operation is suspended, the trail is not drawn on the map.

```
Important
```

It is possible to suspend the operation using a button or a pedal, if installed.
14. Linear actuator

The minimum steps in the implement creation for operation are **Calibrate the encoder** and **Set actuator positions** in that order.

14.1 Implement

Feature available only in the **Advanced** mode.

To enter a new implement, proceed as follows:

1. Select the **Implement** option in the **Configuration menu**;
2. Select the **New** option;
3. Enter the initial implement data, such as **Type**, **Manufacturer**, and **Model** and press **Create**;
4. Enter implement width;

**Warning**
Enter the implement measurements in meters. For measurements smaller than one meter, insert the value fractionally. For example, given a 60 centimeter measurement, enter 0.60. Before taking the measurements, ensure the implement is in level ground and in straight position.

5. Configure section cut by following the **Section cut config**;
6. Configure driver by following the **Driver config**;
7. Run the tests by following the **Testing**;
8. Press **OK**.

The minimum steps for operation are **Calibrate the encoder** and **Set actuator positions** in that order.

14.1.1 Section Cut

The **Linear actuator** implement must be selected.

To access the section cut config, proceed as follows:

1. Select option **Configure section cut** from the **Implement configuration**;
2. Configure the options.
3. Press **OK**.
• **Activity overlap (Yes or No)**
  Reapplies to an already treated area, overlapping the activity on the application map. For example, if an implement passes over an area where it has already been applied, it does not shut off and continues application normally, thus overlapping application in that area.

• **Overlap rate (in %)**
  The Overlap rate parameter is only enabled when the Activity overlap is set to No. Insert the overlap percentage needed for the application or a section shuts off automatically. For example, if the overlap rate is adjusted at 50% and the section has a 4-meter length, when 2m of overlap are reached, the implement will shut off. The Overlap rate is calculated based on the implement width.

![100% Overlap rate](image1) ![50% Overlap rate](image2)

**Important**
The Overlap rate parameter must be set even if No is selected for the overlap, because there is an acceptable rate that the implement cannot avoid so that it can detect that it is over an already treated area.

• **Overlap in (in meters)**
  Enter the distance you want to overlap in meters before entering an application area if you are leaving an area already applied. For example, suppose that the overlap at start was set here to 1 meter in advance, considering a scenario of a vehicle that is over an already applied area and goes into an unapplied area, when exactly 1 meter is missing to enter the area application, the actuator will already open, causing application overlap in this area of 1 meter.

• **Overlap out (in meters)**
  Enter in meters, the distance you want to overlap as you enter an already applied area. For example, imagine that the override on shutdown was set here for a 1 meter delay, considering a scenario of a vehicle that is over an application area and goes into an already applied area, only after the vehicle enters by 1 meter In the area already applied is that the valve will be closed, causing an application overlap in this area of 1 meter.
14.1.2 Driver

**Important** The Linear actuator implement must be selected.

To access the driver config, proceed as follows:

1. Select option **Configure driver** from the Implement configuration;
2. Configure the options.
3. Press **OK**.

**Important** The minimum steps for operation are **Calibrate the encoder** and **Set actuator positions** in that order.

**Controller**

- **Proportional gain**
  
  It is the proportional gain of the flow controller. The field already comes with a default value of 50. If the application is taking too long to reach the reference, the gain value must be increased, and if the flow rate is oscillating it must be decreased.

- **Integral gain**
  
  It is integral gain of the speed controller. It is the integral gain of the flow controller. If the application is taking...
too long to reach the reference value, increase the integral gain value, and if the flow rate is oscillating decrease it. It is already populated with a suggested default value of 3.

- **Derivative gain**
  It is the derivative gain of the speed controller. If the application is overlapping the reference by more than 20% before stabilizing, increase this gain. If the application is taking too long to reach the reference, decrease this gain. It is already populated with a suggested default value of 2. It is suggested not to change this value or keep it at 0 (zero).

- **Set home/max positions**
  Where the actuator opening positions are recorded, see the topic [Home and max positions config](#). You must calibrate the encoder first.

### Encoder

- **Type**
  Read only field informing that the encoder is analog.

- **Input**
  Read only field informing which driver input pin is used for encoder readings.

- **Encoder calibration**
  Where is defined if the encoder has inverted logic or not. See topic [Encoder calibration](#).

### Actuator

- **Duty cycle (%)**
  Max time percentage the actuator is allowed to be active. The actuator's user manual recommends a maximum of 75%.

- **Deadband to open**
  The field indicates a minimum voltage value required for motor movement on forward direction. It is already populated with a default value of 280.

- **Deadband to close**
  The field indicates a minimum voltage value required for motor movement on backward direction. It is already populated with a default value of 380.

- **Deadband sleepness**
  The field indicates the intensity of deadzone compensation. Large values may cause motor stuttering. Low values may cause increased reference error and slow performance.

### 14.1.2.1 Operational positions

- **Important**
  The **Linear actuator** implement must be selected.
Before setting positions, it is important to have done the encoder calibration, as topic Encoder calibration.

To access config opening positions, proceed as follows:

1. Select option Configure driver from the Implement configuration;
2. Select the option Set home/max position;
3. Press + (plus) and - (minus) buttons until you reach the exact point where the gate closes completely;
4. Press the same button two more times.
5. Press Set home position;
6. Go back to the point where the gate was fully closed and now pressing the opposite button (to open) twice.
7. Press Set Minimum position;
8. Press + (plus) and - (minus) until the actuator it reaches the position where the gate is fully open.
10. Press OK to confirm.

If the actuator does not move during position setting, exit and re-enter the setting screen.

If the encoder logic is reversed, execute the same steps reversing the minus and plus signs. This will not work if before setting the positions, the encoder calibration has been performed.

The Linear actuator implement must be selected.

This step, must be done prior to Positions Config.
To access the driver config, proceed as follows:

1. Select option **Configure driver** from the **Implement configuration**;
2. Select the option **Encoder calibration**;
3. Press **left or right arrow button** and the linear actuator will move;
4. The system will ask if the actuator has retracted;
5. Select **Yes** or **No**.

**Attention** If you select **No**, the system understands that your actuator works with inverted logic.

**Important** No calibration is required for both sides, only if one side fails.

14.1.3 Tests

The purpose of this test is to ensure the hydraulic motors are working properly.
To perform the test, proceed as follows:

1. Select the Motor actuator option;
2. Start the vehicle and put it in the working rotation;
3. Press Start;
4. Decrease the reference value until the value read no longer coincides with the established value. The read value is the Minimum RPM value;
5. Increase the reference value until the value read no longer coincides with the established value. The read value is the Maximum RPM value;
6. Check if the readings are compatible with the reference;
7. Press Stop to finish.

14.1.4 Tank

Here you enter the tank capacity settings.

To access the tank config, proceed as follows:

1. Select option Tank from the Implement configuration;
2. Configure the options.
Available parameters

- **Dispenser capacity (%)**
  Enter the total tank capacity in percent.

- **Dispenser min. level (%)**
  Enter the minimum capacity level of the tank you operate. When this number is reached, the alarm below will be triggered.

- **Alarm severity**
  Choose from **Warning** or **Critical** to indicate the type of alarm you want to receive when the tank reaches the minimum capacity stated above.

14.1.4.1 Inputs

Since input density and/or grain sizes may vary, a calibration must be performed whenever possible for any operation mode, either **Fixed rate** or **Variable rate**.

To perform the **Calibration** for an input, proceed as follows:

1. Select option **Fertilisation** from the **Configuration menu**;
2. Select option **Input Calibration**;
3. Select one input to calibrate;
4. Select option **Config**.

**Important**
Check the calibration step-by-step in the following topics.

On the input screen, other than calibration you can also create a new input item or remove an existing input.

**Important**
You need to be on the **Advanced** visualization mode to be able to **Add** or **Remove** an input from the list.

When an input is selected, information on **Dosage**, **Minimum speed**, and **Maximum speed** indicated for operating that input are presented.

There are two types of calibration, namely **Fixed gate calibration** and **Multiple or two-stage gate calibration**.

**Important**
To view the Multiple or two-stage gate calibration option this feature must be activated on the display, otherwise only the Fixed gate will be available.

**Fixed gate calibration**

**Warning**
If using the plate control, the input calibration must be performed with the plates turned off or disabled.

To perform the calibration, proceed as follows:

1. Adjust the time using the right and left arrows;
2. **Warning**
   Never use a time smaller than 40 seconds.
3. With the vehicle in work rotation and the hydraulic command activated, press the option to **Start** the test;
4. The countdown will start and automatically stop when the time is up;
5. Inform the weight of the material collected during this time using an appropriate scale.
Warning

Normally, fertilizer applicators have a single line, while seed applicators have multiple lines. In this case, indicate the input weight collected in a single line.

Important

Ensure that the hydraulic motor speed is close to the reference speed. Factory setting is usually 150RPM, with little variation.

Figure - Fixed gate calibration

Multiple or two-stage gate calibration

To perform the calibration, proceed as follows:

1. Mark the Multicalibration option with a V;
2. Select the Low gate and enter the desired collection time;
3. With the vehicle in work rotation and the hydraulic command activated, press the option to Start the test;
4. The countdown will begin and will automatically stop when the time is up;
5. Enter the weight of the material collected in this time using an appropriate scale;
6. Select the High gate and repeat the previous steps;
7. Press OK to confirm and check the minimum and maximum speeds for the map recommendations.

Fine adjustments

To fine tune the performed calibrations, proceed as follows:

1. On the operation screen, select option View;
2. Select option Clear;
3. Confirm clearing the trail, the total input, and the applied area;
4. Apply a known amount of the input whose calibration you wish to fine tune;
5. In the calibration settings, select option **Fine tuning**;
6. Enter the input weight applied (**Actual weight**);
7. Enter the **Read weight** by the monitor (visible on the operation screen).

To verify, reapply a known amount of fertilizer and check if the applied weight (actual weight) is close to the weight read by the monitor (there may be a variation of around 5%). If it still is not close, redo the **Fine tuning** procedure. After calibrating and fine tuning, enter the **Dosage** to check the speed range (minimum and maximum) in which the system can operate.

### 14.2 Activity config

**Important** It is only possible to access these settings when implements **Linear Actuator** are selected.

To configure the **Fertilization**, proceed as follows:

1. Select option **Fertilization** from the **Settings menu**;
2. Select **Inputs** to select the input that will apply, by following the **Input** topic;
3. If necessary calibrate the input, by following **Input calibration** topic;
4. Enter recommended dose for application, by following **Recommendation** topic;
5. Configure dosage alarm, by following **Alarm configuration** topic;
6. Press **OK**.

![Image of Activity config settings]

### 14.2.1 Inputs

In this screen you can indicate which input will be used for fertilization and you can also calibrate the selected input.

To manager's input, proceed as follows:

1. Select option **Fertilization** from the **Settings menu**;
2. Select option **Inputs**;
3. Click on an input name;
4. Press OK to select an input.
5. Press + (plus) to create a new input, by following **New input**.
6. Press *edit (pencil)* to edit input name.
7. Press *trash* to delete an input.
8. Select *Calibrate* to calibrate an input, by following **Input Calibration**.

**Important**

Check the calibration step-by-step in the following topics: **Calibration input** and **Calibration fine tuning**.

### 14.2.1.1 New input

To create a new input, proceed as follows:

1. Select option *Fertilization* from the **Settings menu**;
2. Select option *Input*;
3. In the input list select + (plus);
4. Enter a name for the input;
5. Press OK.
6. The system pairs the calibration points screen;
7. To continue, proceed to the topic of **Calibration points**.
8. Press + (plus) to enter a calibration point;
9. Enter the calibration point in the keyboard.

**Important**

The values must be informed in percentages.
14.2.1.2 Calibration input

Since input density and/or grain sizes may vary, a calibration must be performed whenever possible for any operation mode, either Fixed rate or Variable rate.

There are two ways to calibrate an input:

**Calibration in Input option**

1 - To perform the Calibration for an input, proceed as follows:

1. Select option Fertilization from the Settings menu;
2. Select option Input;
3. Select the input you wish to calibrate;
4. Select option Calibrate.
5. Calibrate points, by following Calibration points topic.

**Calibration in Selected calibrate option**

2 - To perform the Calibration for an input, proceed as follows:
1. Select option **Fertilization** from the **Settings menu**;
2. Select option **Selected calibration**;
3. Calibrate points, by following **Calibration points** topic.

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<tr>
<th>Ícone</th>
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<td><img src="create.png" alt="Create new calibration point" /></td>
<td>Create new calibration point.</td>
</tr>
<tr>
<td><img src="delete.png" alt="Delete a calibration point" /></td>
<td>Delete a calibration point.</td>
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<td><img src="config.png" alt="Config a calibration point" /></td>
<td>Config a calibration point.</td>
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<td><img src="edit.png" alt="Edit ratio a calibration point" /></td>
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<tr>
<td><img src="fine.png" alt="Apply fine tuning" /></td>
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</tr>
<tr>
<td><img src="view.png" alt="View a fertilizer curve" /></td>
<td>View a fertilizer curve.</td>
</tr>
</tbody>
</table>

**14.2.1.3 Calibration points**

**Important** See the previous topics for how to get to the calibration point list.

To create a new calibration point, proceed as follows:

1. Press + (plus) to enter a calibration point;
2. Enter the calibration point in the keyboard;

**Important** In the first point enter exactly the minimum percentage value indicated, in this example is 6.9%. The minimum percentage is calculated using reported positions, as in the topic [Positions config](#).
3. Adjust calibration time;  

   ! Important 60 seconds recommended.

4. Press **Start**;

5. Wait for the calibration time, enter the collected value and press **OK**;

6. Repeat this procedure for at least 4 more different calibration points. See an example in the figure.

   ! [Calibration diagram]

7. After calibration points, you can see the fertilizer curve according to the machine characteristics. Select the specific button.

   ! [Fertilizer curve]

**14.2.1.4 Calibration fine tuning**

To fine tune the performed calibrations in Linear Actuator, proceed as follows:

1. On the operation screen, select option **View**;
2. Select option **Clear**;
3. Confirm clearing the trail, the total input, and the applied area;

   ! [Fine tuning interface]
4. Apply a known amount of the input whose calibration you wish to fine tune;

5. On the operation screen, select option **Menu Config**;

6. Select option **Fertilisation**;

7. Select option **Input**;

**Important** Make sure the Linear Actuator implement is selected.
8. Select the input whose calibration you wish to fine tune;
9. Select the option **Calibrate**.

10. The system displays the input calibration points;
11. Select the option **Fine tuning**;

12. The system presents the current estimated applied amount, press **OK**;

---

**Important**
The current applied amount displayed has been calculated since the last trail cleaning or last fine tuning application.
13. Enter the input real weight applied and press OK:

![Image of the input screen]

14. A message with the difference between the two values is displayed and confirmation of adjustment is requested, press Yes:

![Image of the confirmation screen]

15. The system adjusts the ratio values, press OK.

![Image of the ratio adjustment screen]

**Important**

To verify, reapply a known amount of fertilizer and check if the applied weight (actual weight) is close to the weight read by the monitor (there may be a variation of around 5%). If it still is not close, redo the Fine tuning procedure. After calibrating and fine tuning, enter the Dosage to check the speed range (minimum and maximum) in which the system can operate.

14.2.2 Recommendation

**Important**

It is only possible to access these settings when implements Linear Actuator are selected.

The Dosage rate corresponds to the amount of input that will be applied by that specific input container in one hectare. Two types of dosage rates can be used:

- Fixed rate;

User manual - Machine Automation Solution - V3R004
Variable rate.

Fixed rate

Seeing that for this type of rate a boundary map is not used, the fixed rate is applied throughout the traversed trajectory.

To set the application, proceed as follows:

1. Select option **Fertilization** from the **Settings menu**;
2. Select option **Recommendation**;
3. Enter **Recommendation**;
4. Press **Back**.

**Warning**

Dosage values are in Kg/ha.

Variable rate

For the **Variable rate**, a map is used. Outside map boundaries nothing is applied. Inside the map boundaries, the values previously set on the map will be used.

**Important**

Import a map before performing the following procedure, view **Import/ Export maps** topic.

To set the **Variable rate** value, proceed as follows:

1. Select option **Fertilization** from the **Settings menu**;
2. Select option **Recommendation**:
3. Select option **Variable rate**;
4. Select a map;
5. Select an attribute of map;
6. Select **Yes** or **No** in **Paint on screen**;

![Important](image)

If you select Yes, the perimeter marking is displayed on the operation screen.

7. Press **Back**.

### 14.2.3 Alarm configuration

**Dosage tolerance (%)**

Percentage tolerance range to trigger the alarm. For example, for a rate of 1,000 kg / ha, and a tolerance of 50%, then the alarm will be displayed for 2 seconds when the dose drops from 500 kg / ha or exceeds 1,500 kg / ha.

![dosage configuration](image)

### 14.3 Operation

The operation consists of the main screen where the activities are actually performed according to all configured parameters and activations.

#### 14.3.1 Start application

**Important**

You must be in a work section to start the operation, see the **Job section** topic.

![important](image)

Application will only start once the implement moves and exceeds the minimum speed set for the GNSS.
14.3.2 Monitoring application

Fertilization activity monitoring occurs during operation. Here you can configure the information for on-screen viewing and also access the context bar functionality.

GNSS status

In the operation screen, through the connectivity symbols, it is possible to view the state of the GNSS system.

<table>
<thead>
<tr>
<th>Ícone</th>
<th>Descrição</th>
</tr>
</thead>
<tbody>
<tr>
<td>![image]</td>
<td>Indicates that GNSS is active, synchronized, and accuracy conforms to selected model.</td>
</tr>
<tr>
<td>![image]</td>
<td>Indicates that the GNSS system is active, synchronized, but proper accuracy has not yet been achieved.</td>
</tr>
<tr>
<td>![image]</td>
<td>Indicates that the active GNSS system is not synchronized.</td>
</tr>
<tr>
<td>![image]</td>
<td>Indicates that the system is out of communication with the GNSS module.</td>
</tr>
</tbody>
</table>

By pressing the GNSS icon you can view the total number of satellites connected to the system, and you can also view a detail of the information.

Monitoring information

You can view up to three different information. Press for two seconds over one of the three available positions to display the information options.
Context bar

The context bar is accessed by sliding the bottom of the operation screen with an upward drag. Below is a detail of the controls available for fertilizer activity.

01 - Speedometer (km/h)
The green area represents the speed range indicated for the operation. The red ends represent the maximum and minimum values and the indicator shows the current speed.

02 – Input application statement
The number that shows is the recommended dosage for input application. This value may be altered in real time using the plus and minus options. The increase or decrease is of 5kg/h for each touch. The strip below shows the amount of input being applied: the middle of the strip equals the recommended value indicated above. If the marker is to the left, there is less than the recommended amount of input being applied, and if it is to the right, there is more than the recommended being applied.

03 – Tank level
The user indicates in kilograms how much he put in the tank and the system discounts what is being applied, indicating the current tank level (in percentage). When the tank level goes below 10%, it turns red as an alert for the operator. To indicate a new supply, just press the tank icon.

Alerts and Notifications

Important: Before starting any operation make sure no alerts are active.

Alerts are automatically displayed on the screen during operation. The operator may close them, but if the triggering condition of the alert continues to occur, it will be present at the top of the screen.

Swipe down the notification bar to view the notification list and preview messages. Slide the bar up to close it again.
Pressing the notification message will delete it from the notification list, but can still be accessed via the alert icon in the upper left corner.

Press the attention icon to access all active alarms for more detailed information on how to troubleshoot the problem.

Categories alarms:

- GNSS information;
- Odometer information;
- CAN information (driver connection);
- Power;
- Speed limit;
- Fertilization control;
- SIMCARD;
- Antilock (CPU temperature and memory).

Attention

Anti-lock alarms are issued when temperature and / or memory reach critical levels. In this situation, the user is informed of the procedure to be performed. If the message is ignored the operation is suspended.

14.3.3 Suspend application

Press the center of the screen to suspend the operation. An image indicating that the operation is suspended is shown in the middle of the screen. During the period in which the operation is suspended, the trail is not drawn on the map.

Important

It is possible to suspend the operation using a button or a pedal.
15. Sprayer control

| Important | Feature available only upon product activation. |

The Sprayer performs the automatic activation and shutdown of the spraying sections, minimizing overlap in input application and avoiding excessive spraying, thus ensuring the recommended doses even with speed variations when operating the machines.

![Figure - Sprayer](image)

15.1 Implement

15.1.1 Modules

15.1.1.1 Liquid settings

Liquid
Pressure calibration

To perform pressure reading calibration, proceed as follows:

1. Select the **Pressure unit** option to change the current pressure unit. The following message appears asking you to change the scale:

   ![Pressure unit changed. Please, insert the new values for points 1 and 2.](image)

2. Adjust the values of the pressure points in the **Pressure point 1** and **Pressure point 2** fields;
3. Select Voltage Point 1 (v) to adjust the value of the expected voltage corresponding to the pressure;
4. Select Voltage Point 2 (v) to adjust the value of the expected voltage corresponding to the pressure. This point must be different from point 1;

   **Important**
   According to the reading the voltage sensor curve will be drawn a line relating voltage and pressure. To calibrate, use the values from the data sheet of the pressure sensor used or read them manually.

5. Select **Input filter samples** to adjust the number of samples used to calculate pressure through a moving average filter.

15.1.2 Tests

**Important**
Feature only available in **Advanced** mode.

To access the tests related to the Sprayer, proceed as follows:

1. Select the Implement option in the Settings menu;
2. Select the Sprayer implement you want to test;
3. Select the Test option;
4. The system presents the test options for the selected implement.
5. Select the test you want.

   **Important**
   In tests using the implement's hydraulic motors, place the vehicle with the engine at the rotation recommended by the manufacturer (e.g. 1800 RPM on a tractor) so that it has a minimum flow rate of 48l/min in the hydraulic system.

15.1.2.1 Flowmeter calibration

**Important**
In order to be able to run the tests, you must select a **Sprayer** implement or a **Seeder** with liquid control.

**Warning**
This test can only be performed by a specialized technician, at the risk of damaging the system.
The purpose of this test is to check the flow meter calibration or to enter the flowmeter constant according to manufacturer data.

**Important**

Ensure you set the reference to a value within the system's operation range.

To run the test, proceed as follows:

1. Select the **Flowmeter calibration** option;
2. Configure the **Reference (PPS)** with the average work pressure for the used spray nozzle. For example, if you are using a spray nozzle that works from 2 to 6 BAR, adjust the PPS for reading 4 BAR in the gauge;

**Important**

In case you do not know the average work pressure for the spray nozzle, use the **Sprayer simulation** to find out.

3. Put the sprayer in working rotation and place the container in the correct position;
4. Adjust the time using the arrows and press **Start**;
5. The system will issue a calibration start alert and start counting the test time;
6. Check if the value read on the flow meter during calibration is close to the reference value;
7. After the test time is over, the system will close the sections automatically;
8. Inform the **Volume in Liters** to the display by multiplying the value collected from one nozzle (or the average value in case you use multiple nozzles) by the total number of nozzles;
9. The display will inform the **Ratio (PPL)**.

![Figure - Flow meter calibration](image)

### 15.1.2.2 Current test

**Important**

To perform the test, it is necessary to select the Sprayer type implement first.

The sprayer pump must not operate with a very high current, as this can damage it. In this test it is possible to see the voltage value associated with the PWM value. Therefore, it is possible to determine which would be the ideal working PWM to achieve the desired dose, without exceeding the safe voltage.

**Important**

Before starting the test, check according to the valve manufacturer, which current is necessary to open it completely and what is the maximum current supported by it without damaging it. The pump cannot operate outside the manufacturer’s specification.

To run the test, proceed as follows:

1. Select the **Current test** option;
2. Place the sprayer in the working rotation and connect the TDP or other hydraulic control to start pumping the product;
3. Keep the initial PWM at 100%, this indicates that the test will start by applying the maximum voltage to the valve;
4. Press **Start**;
5. The current value for that voltage is displayed.
6. Lower the PWM value if necessary, until the current shown is a value between the current required to open the valve completely and the value of the maximum current supported by it without damaging it.

For example, if the value required for full opening of the valve, indicated by the manufacturer, is 2A current and the maximum value supported by the valve is 3A current. The ideal is to keep the valve current between a value above 2A and below 3A.

Enter the percentage of PWM found in the **Maximum output rate (%)** field in the sprayer control parameters.

### 15.1.2.3 Sprayer simulation

<table>
<thead>
<tr>
<th>Important</th>
<th>In order to run the tests, you must first select the proper implement.</th>
</tr>
</thead>
</table>

The purpose of this test is to check the opening and closing of the section valves. The test screen simulates a sprayer in motion, enabling to check:

- The operation of the flow meter (reading);
- The dosage control given the speed variation; and
- The minimum and maximum flow rates for the spray nozzle used (operation limits).

To run the test, proceed as follows:

1. Select the **Sprayer simulation** option;
2. Enter the **dosage** value (L/ha);
3. Turn the water pump on and put the sprayer in work rotation;
4. Press **Start**;
5. Open and close one section at a time in order to check if all the valves are working properly, checking if the start order and the opening/closing logic are correct;
6. Set the reference value to **0 PPS** and gradually increase it, checking if the **Flowmeter (PPS)** follows, until the gauge in the hydraulic command indicates the minimum pressure value for the used spray nozzle or until the range of application is satisfactory;
7. Repeat the process from the minimum value until the gauge indicates the maximum pressure value or until the range of application is satisfactory, checking if the **Flowmeter (PPS)** follows the reference;
8. In case the speeds (km/h) are incompatible, change the nozzles for others with different flow rates.

![Sprayer simulation](image)

**Figure - Sprayer simulation**

<table>
<thead>
<tr>
<th>Important</th>
<th>Since the system flow rate is different for each type of nozzle, this procedure must be repeated every time there is a nozzle change.</th>
</tr>
</thead>
</table>

### 15.1.2.4 Manual operation

Manual operation is used, for example, when the GNSS is in trouble, preventing automatic spraying operation. In addition to the implement testing screen, manual operation can also be accessed directly from the operation screen through a specific icon in the context bar.
To perform manual spray control:

01 - Press the **Start** option to start manual control;
02 - Click on the sections to open or close;
03 - Click on the + and - to increase and decrease the opening of the control valve;
04 - Select **Open all** to open all sections at the same time or **Close all** to close them;
05 - Select the **Relief valve Mode** option to maintain automatic or manual control.
06 - **Relief valve**, select this option to open and close the valve, it is only possible to control the valve if the valve relief mode is manual.
07 - The **Pressure (BAR)** is displayed, so that the operator can check if it is necessary to open or close the valve.

### 15.2 Activity settings

**Important**  
It is only possible to enter the settings when selecting the Sprayer or Planter implement that applies liquid pesticides.

To configure the Spray Control, proceed as follows:

1. Select the Spray Control option in the Settings Menu;
2. Select the tank you want to configure (if there is more than one);
3. Configure the recommended dosage, according to the topic **Dosage rate**;
4. Configure the application nozzle, according to the topic **Nozzle configuration**;
5. After performing the dosage configuration and the nozzle configuration, confirm the operation by pressing **OK**.

The details of the configuration can be found in the subsequent topics.
15.2.1 Recommendation

The **Fixed rate** corresponds to the amount of input that will be applied for that specific input container in one hectare. Three types of dosage rates may be used:

- Fixed rate;
- Variable rate;
- Fixed rate with map.

For each input, two rate values may be preconfigured which can be used alternately during operation at the operator's discretion.

15.2.1.1 Fixed rate

Two fixed values must be set for the **Fixed rate** which may be used during operation and will be available on the panel for quick access by the operator. They are called dispensers. Seeing that for this type of rate a boundary map is not used, the fixed rate is applied throughout the traversed trajectory.

To set the **Fixed rate** values, proceed as follows:

1. Select option **Fertilisation control** from the **Configuration menu**;
2. Select option **Dosage type**;
3. Select option **Fixed rate**;
4. Select option **Primary dosage**;
5. Enter the desired value in Kg/ha and press **OK**;
6. Select option **Secondary dosage**;
7. Enter the desired value in Kg/ha and press **OK**;
8. Press **OK** to confirm the operation.

15.2.1.2 Fixed rate with map

For the **Fixed rate with map** two fixed values must be set, the **Primary dosage** and the **Secondary dosage**, which may be used during operation and will be available on the panel for quick access by the operator. They are called dispensers.

**Important** Since a map is used for this type of rate, the map will serve as a boundary for input application. Nothing will be applied outside the map.
To view the selected map with its total area, use option View. To configure the values for the fixed rate with map, proceed as follows:

1. Select option Fixed rate with map;
2. Select the desired map among those listed;
3. Select option Primary dosage;
4. Enter the desired value in Kg/ha and press OK;
5. Select option Secondary dosage;
6. Enter the desired value in Kg/ha and press OK;
7. Press OK to confirm the operation.

15.2.1.3 Variable rate

For the Variable rate, two fixed values must be set that may be used during operation and will be available on the panel for quick access by the operator. They are called dispensers. For the variable rate, a map is used. However, in this case the Primary dosage and Secondary dosage set in the system will be used outside the map boundaries. Inside the map boundaries, the values previously set on the map will be used.

Important

In order not to apply the input outside the map, simply set the Primary dosage and Secondary dosage values to zero

To view the selected map as well as its total area and set dosage, use option View.

To configure the Variable rate values, proceed as follows:

1. Select option Variable rate;
2. Select the desired map among those available;
3. Among the attribute options available, select the recommendation to be used;
4. Select option Primary dosage for outside the map boundaries;
5. Enter the desired value in kg/ha and press OK;
6. Select option Secondary dosage for outside the map boundaries;
7. Enter the desired value in kg/ha and press OK;
8. Press OK to confirm the operation.
15.2.2 Nozzle configuration

To configure the Nozzle configuration, proceed as follows:

1. Select the tank you wish to configure;
2. Select option Nozzle configuration;
3. Enter the color and the minimum and maximum flow rate (manufacturer's specifications);
4. Check the maximum and minimum speeds calculated automatically;
5. Press OK to confirm nozzle settings.

Figure - Nozzle configuration

15.3 Operation

15.3.1 Start application

The operation is started by selecting the suspended operation in the center of the operation screen.

**Important**
The application will only begin when the implement moves and exceeds the minimum speed configured for the GNSS.

Figure - Operation

15.3.2 Monitoring application

The context bar is displayed by sliding the bottom of the operation screen with a drag upwards. The features available for Spray Control are detailed below:

Figure - Spray control features
01 - Speedometer (km/h)
The green area represents the speed range indicated for the operation. The red ends represent the maximum and minimum values and the indicator shows the current speed.

02 – Tank level
The user indicates in liters or kilograms how much he put in the tank and the system discounts what is being applied, indicating the current tank level (in percentage). When the tank level goes below 10%, it turns red as an alert for the operator. To indicate a new supply, just press the tank icon.

03 – Input application statement
The number that shows is the recommended dosage for input application. This value may be altered in real time using the plus and minus options. The increase or decrease is of 5kg/h for each touch. The strip below shows the amount of input being applied: the middle of the strip equals the recommended value indicated above. If the marker is to the left, there is less than the recommended amount of input being applied, and if it is to the right, there is more than the recommended being applied.

04 – Dosing clocks
The clock values may be set through the Fertilization menu and give access to predefined doses for input application. It is possible to alternate between the two dosages whenever necessary by simply pressing the desired clock icon.

05 - Manual control
It takes you directly to the manual spray operation control screen, to learn more about this operation, see the topic Manual spray operation.

06 - Section demonstrator
A fertilizer applicator has no selection cut, but a controller. Pressing a section, you can turn it on or off automatically, but the operation can also automatically control the on/off when necessary.

<table>
<thead>
<tr>
<th>Ícone</th>
<th>Descrição</th>
</tr>
</thead>
<tbody>
<tr>
<td>✗</td>
<td>Manually turned off</td>
</tr>
<tr>
<td>✔</td>
<td>Manually turned on</td>
</tr>
<tr>
<td>✔海底</td>
<td>Automatically turned on</td>
</tr>
<tr>
<td>✗海底</td>
<td>Automatically turned off</td>
</tr>
</tbody>
</table>

15.3.3 Suspend application
Press the center of the screen to suspend the operation. An image indicating that the operation is suspended will be presented in the middle of the screen. While the operation is suspended. The trail will not be drawn on the map.

*Important*
It is possible to suspend the operation using a button or a pedal.
### 15.3.4 Section cut

**Important**
For this implement, the section cut is already configured.

The section cut presents both manual and automatic section control. For the manual section control, the operator determines which sections to close. It is possible to open or close the sections at any time, regardless of the state of other sections. For example, close one section between two open sections.

<table>
<thead>
<tr>
<th>Icon</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>❌</td>
<td>Manually closed</td>
</tr>
<tr>
<td>✓</td>
<td>Manually opened</td>
</tr>
<tr>
<td>✓️</td>
<td>Automatically opened</td>
</tr>
<tr>
<td>❌️</td>
<td>Automatically closed</td>
</tr>
</tbody>
</table>

To manually control the sections, press the red icon to close a section or press the green icon to open it.

**Important**
The trail on the screen between sections is not shown when a section is closed between two open sections.

For the automatic section control, the automatic opening and closing of sections is done as the planter enters in applied or not applied areas. The corresponding icons for open or closed section are presented with letter A (automatic) on the right.

- **Automatic closing**: the section overlaps more than the configured percentage.
- **Automatic opening**: the section does not overlap.

**Figure - Sprayer selection cut**

**Important**
It is possible to simultaneously display up to 25 sections in the control bar in an appropriate manner, above this value the sections may overlap and it is advisable to use the control automatically.

**Figure - Section cut with 25 sections**
16. Bait control

Important Feature available only upon product activation.

The application of bait control allows intermittent dosing as well as the setting of an extra dosage to be applied by the operator upon sighting anthills. The continuous dosage application is performed using the configured spacing, and the dosage calibration is done by product weight, ensuring correct dosages.

- Allows three manual dosages to be configured, besides setting the continuous dosage;
- The doses are by weight, not by time;
- Performs electronic calibration;
- Automatically calculates the distance between doses;
- Generates operation maps and calculates productive yields and times, and can be integrated with a forestry management system.

16.1 Implement

16.1.1 Tests

16.1.1.1 Bait control test

Important In order to run the tests, you must first select the appropriate implement.

Important Before performing the bait control test, it is necessary to set the dosage values (small, medium and large) on the screen of the Bait control, located in the Configuration menu.

Important The sensors displayed on the Bait control test screen are related to the settings previously made in the Bait control configuration.

The test screen of the bait control implement is used to verify the application of the dosages configured and the response of the respective sensors.

If the operator clicks the Systematic dosage button, the amount of formicide that has been configured for the system to be applied in an automated manner will be released. If you have enabled the use of sensors 1 and 2 in the Implement configuration screen, you will be informed of the detection of the triggering of these sensors.

For the other buttons, the amount of formicide configured for the localized application. Small, Medium and Large dosages will be released. By clicking on each sensor, the sensor is informed (if it exists).

If the implement has been configured with an applicator and unique sensor for localized dosing, M Sensor detection will be displayed. If the implement does not have a unique applicator and has Sensors 1 and 2, the detection of these sensors will be displayed.

16.2 Settings

Figure - Bait control test
Important

It is only possible to enter the **Bait control** when the product is selected.

To configure the bait control, select option **Bait control** from the Configuration menu. The following options are available:

- **Recommendation (Kg/ha)**
Enter the amount of anticide that will be applied per hectare.

- **Quantity per application**
Total amount of anticide that will be applied in each discharge adding all the continuous applicators.

**Warning**
In case there are two applicators, the amount applied for each nozzle will be this value divided by two.

- **Spacing between applications (m)**
Distance in meters between applications.

**Important**
The three settings above are related to each other and are automatically altered when a value is changes, always using the Recommendation field value as main reference. For example, if the user changes the Spacing between applications, the system automatically alters the value for Quantity per application so that the recommendation is reached. The same logic applied when the used alters the Quantity per application field, automatically altering the Spacing between applications to meet the recommendation.

- **Continuous dosage calibration**
Opens the calibration screen for the continuous applicators.

- **Small dosage (g)**
Small predefined dosage for applying the anticide.

- **Medium dosage (g)**
Medium predefined dosage for applying the anticide.

- **Large dosage (g)**
Large predefined dosage for applying the anticide.

- **Manual dosage calibration**
Opens the calibration screen for the manual applicator.

**Figure - Bait control configuration**

16.2.1 Calibration

The calibration for the continuous and manual applications is performed following the same steps.

To calibrate the anticide, proceed as follows:

1. Insert a collection bag on the continuous applicators or manual applicator exists in case of manual calibration;
2. Press **Start** to start collecting. Wait until the collection time ends. The system will stop automatically;
3. Weigh the collected anticide with a precision scale. Inform the on-board computer of the weight in grams;
4. In **Calculated calibration**, the amount applied in grams per meter will be shown;
5. Select **OK**.

![Figure - Bait control dosage calibration](image)

**16.3 Operation**

**16.3.1 Start operation**

The operation is started by selecting the suspended operation option in the center of the operation screen.

![Figure - Operation](image)

**Important** Application will only begin once the implement moves and exceeds the minimum speed set for the GNSS.

**16.3.2 Monitor operation**

The operation is started by selecting the suspended operation option in the center of the operation screen.

![Figure - Operation](image)

**Important** Application will only begin once the implement moves and exceeds the minimum speed set for the GNSS.

To view the lower part of the screen, drag it from the bottom to the top.

![Figure - Bait control operation](image)
On the lower bar there are the following options:

- **View of the anticide sensor bar for continuous and/or manual application**
  This option is available only for implements with installed sensors. If the sensor is not enabled, this bar will not show. The icons represented by numbers 1 and 2 represent the continuous dispensers, while M represents the manual dispenser. Three options are available: normal application, problematic application, and suspended application, as shown by the caption in the figure.

- **Level tank**
  The user indicates in liters or kilograms how much he refilled and the system will discount what is being applied, indicating the current level of the tank (in percentage). When the tank level falls below 10%, an alarm will be reported to the operator. To indicate a new supply value, just press on the tank figure.

  **Important**
  The total capacity of the tank is previously configured in the field Implement > Bait control > Configuration > Tank capacity.

- **Recommended dosage**
  The recommended dosage applied the same amount used in automatic application. The number that shows on the central part of the menu indicates the amount of anticide that is being applied.

- **Dosing clocks**
  The values for dosing clocks are set through the Bait control menu and give access to predefined dosages for applying anticide upon sighting anthills. It is possible to alternate among the three dosages whenever necessary simply pressing the desired clock icon. Indicator 1 refers to the small dosage, indicator 2, to the medium dosage, and indicator 3 to the large dosage. For implements with manual dispensers, the dosing clocks use this exit. For implements without this applicator, the predefined dosages are applied through the continuous applicators.

16.3.3 Suspend operation

Press the center of the screen to suspend the operation. A figure of an X indicating that the operation is suspended will be presented in the middle of the screen. While the operation is suspended, the trail will not be drawn on the map.

**Important**
It is possible to suspend the operation using a button or a pedal.
17. Planting control

17.1 Implement

17.1.1 Tests

17.1.1.1 Motor actuator

**Important**
To be able to run the tests, you must first select the proper implement.

**Hidraulic motor**

The purpose of this test is to ensure the hydraulic motors are working properly.

![Motor start test](image)

**Figure - Motor start test**

To perform the test, proceed as follows:

1. Select the Motor actuator option;
2. Press Start;
3. Decrease the reference value until the value read no longer coincides with the established value. The read value is the **Minimum RPM** value;
4. Increase the reference value until the value read no longer coincides with the established value. The read value is the **Maximum RPM** value;
5. Check if the readings are compatible with the reference;
6. Press Stop to finish.

**Section cutting**

The purpose of this test is to check the section opening and closing operation.

**Important**
Test available only for planters equipped with clutches.

To perform the test, proceed as follows:

1. Select the Motor actuator option;
2. Select the Section cutting option;
3. Press Start;
4. Press the buttons to check the operation: **Open all, Close all**; or
5. Individually select each section you wish to turn on and off by pressing the respective numbers;
6. Press Stop after ensuring they are operating properly.
17.1.1.2 Seed sensor

**Important**
To be able to run the tests, you must first select the proper implement.

The purpose of this test is to check or install the inputs and modules connected to the sensors.

They are available in two modes:

- **Test**
  Used to check if the lines are properly connected to the module ports, starting the sensors by passing seeds or fertilizer.

- **Installation**
  Used for the semi-automatic configuration of the inputs connected to each seed and/or fertilizer sensor.

**Test mode**

To perform the test, proceed as follows:

1. Select the **Seed sensor** option;
2. Select the **Restart** option;
3. Put seed or fertilizer so to start the sensor and check which input, module, and line was activated;
4. Check if it is correct.

**Installation mode**

To perform the installation mode test, proceed as follows:

1. Select the **Planting sensors** option;
2. Press the **Mode** box (item 01) to alternate to **Installation**;
3. Check if the box indicates **Seed** (item 02);
4. Press **Start** (item 03);
5. The number of the line where the sensor must start will be indicated;
6. Insert at least three seeds on the line. The module input to which the sensor is connected will be
automatically identified;
7. After the line test is finished, the next line will be presented for testing and so on.

**Figure - Planting monitor installation test**

### 17.1.1.3 Seed calibration

![Important](image)

In order to run the tests, you must first select the proper implement.

The purpose of this test is to check:

- The operation of the hydraulic seed dosing motors;
- Wheel speed; and
- The correct detection of the number of seeds on each line.

To run the test, proceed as follows:

1. Select the **Seed calibration** option;
2. Enter the RPM **Reference** for the hydraulic motors;
3. Select the **Section number** that will be active during the simulation;
4. Select the section number of the wheel that will be used as speed reference;
5. Press **Start**;
6. Check if the counters and the motors are working properly;
7. Press **Stop**;
8. Check if the number of seeds read by the sensor and the amount collected are the same;
9. In case the values diverge more than 5%, adjust the value in **Sensor adjustment (%)**, informing the calculated percentage difference. Use the following formula for calculation:

\[
\text{Sensor adjustment} \, \% = \left( \frac{\text{Seeds collected}}{\text{Seeds read}} - 1 \right) \times 100
\]

![Figure - Seed calibration](image)

### 17.2 Activity settings
To configure the planting, proceed as follows:

1. Select option **Planting control** from the **Configuration menu**;
2. Select the option that configures the **Fixed rate** for the input;
3. Enter the **Seed population**;
4. Enter the **Seed density**;
5. Enter the **Disc seed number**;
6. Enter the **Wheel perimeter**;
7. Configure the **Planting monitor**;
8. Configure the **Operating range**;
9. Press **OK**.

The following parameters are available for setting:

- **Map**
  Instructions in topic Dosage rate.

- **Population**
  When the fixed rate is activated, the population may be entered directly (p/ha) or through the **Density** field (seeds/m), with the **Spacing** (cm/seed) calculated automatically.

- **Disc seed number**
  This value refers to the amount of seeds needed to fill the holes in the dispenser disc.

- **Wheel perimeter (m)**

- **Operating range**
  Enter the minimum and maximum population values recommended for the selected map and check if the minimum and maximum operation speeds. When in operation, it will only be applied when in the given range.
17.3.1 Start operation

The operation is started by selecting the suspended operation option in the center of the operation screen.

**Important** Application will only begin once the implement is moving and exceeds the minimum speed set for the GNSS.

Figure - Operation

17.3.2 Monitor operation

During the operation, the user may follow the seed flow on the monitor. To learn the feature details, check topic [Planting monitor](#) below.

17.3.3 Suspend operation

Press the center of the screen to suspend the operation. An image indicating that the operation is suspended will be shown in the middle of the screen. While the operation is suspended, the trail will not be drawn on the map.

**Important** It is possible to suspend the operation using a button or a pedal.

Figure - Suspended planting operation

17.3.4 Section cut

**Warning** This option is available for seed and fertilizer controllers. This feature cannot be used for planting monitoring.

<table>
<thead>
<tr>
<th>Icon</th>
<th>Description</th>
</tr>
</thead>
</table>

User manual - Machine Automation Solution - V3R004 176 / 216
The section cut has a manual and an automatic section control.

For manual section control, the operator determines which sections to close. It is possible to open or close the sections at any time, regardless of the state of other sections. For example, you can close a section between to open sections. To manually control the sections, press the close icon manually to close a section or press the open icon manually to open the section and leave it open.

**Important**
The trail on the screen is not shown when a section is closed between two open sections.

For automatic section control, the sections are automatically opened or closed as the planter enters applied or not applied areas. Icons corresponding to open or closed sections are presented with letter A (automatic) on the right.

- **Automatic closing**
  The section overlaps exceeding the set percentage;

- **Automatic opening**
  The section does not overlap.

**17.3.5 Planting monitor**
Sensor adjustment

To adjust the sensor, check the procedure in topic Seed sensors.

Visualization

In option Planting control – Planting monitor, it is possible to choose which planting monitor visualization mode will be used: Standard or Advanced. In Standard mode, when you drag your finger from the bottom of the screen to the center, a planting monitor bar will be shown offering three visualization options:

- Visualization of the seed sensor bar;
- Visualization of the fertilizer sensor and the seed sensor bar.

Important Consult with a specialized technician to configure the implement and the bar visualizations.

Important If the implement has more than one type of fertilizer, the fertilizer sensor bar will present the two fertilizers in the same bar.

Each section is indicated by its number and icons, whose meanings are described in topic Monitor operation.

<table>
<thead>
<tr>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>▼▼▼▼▼</td>
<td>Rectangle with rounded corners - Fertilizer</td>
</tr>
<tr>
<td>▼▼▼〇〇</td>
<td>Rectangle with rounded corners - Seeds</td>
</tr>
</tbody>
</table>

These may contain the following color fills:

- Red - No application - problems;
- Blue - Operation suspended;
- Green - Normal application.

For indicating the state of each line, the following items may be viewed:

<table>
<thead>
<tr>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>▼▼▼〇〇</td>
<td>All lines are applying normally.</td>
</tr>
</tbody>
</table>
All lines are not applying.

One or more lines are not applying. For more information, press the icon. To exit this detailed visualization mode, move the bar downwards.

In advanced mode, the bars may be used to increase or decrease according to the density that is being applied in each line as a function of the recommended density. Green indicates the population is within the recommended, and red indicates it is below the recommended.

**Important**
The advanced visualization mode is only available for the seed monitor.

---

The lower bar shows all the planter lines. In case the planter has many lines, it is possible to zoom in for better visualization of the desired line.

**Figure - Planting monitor in advanced mode - density**

To do so, press the area of the required line and a bar with seven lines from this region will show, as illustrated in the figure below. To return to viewing all bars, move the zoom bar downwards. When there is a fault in the seed or fertilizer flow, the system will warn the user visually and soundly.

**Figure - Zoom of the lines**
### Tolerance

In option **Planting – Planting monitor**, enter the desired tolerance values. In **standard** visualization mode, the tolerances are considered at 30% regardless of the set values. In **advanced** visualization mode, the tolerances are considered according to this information.

#### 17.3.5.1 Doubles and skips

| Important | The planter must be configured to view this feature. |
| Important | Prerequisite for operation: seed sensor. |

Double and skips lines are considered planting errors. Doubles occur when more seeds than required are applied in a region, while skips occur when seeds cease to be applied in a region.

| Important | How to enable: Doubles and skips can only be enabled by a technician. |
| Important | Only in Advanced mode you can modify the detection sensitivity of doubles and skips. |

### Doubles

Occurs when a number of seeds falls above the required.

The percentage of doubles defines the tolerance in relation to the distance that the system considers a double.

Example: With a spacing of 1 meter between seeds, a second seed fell 50 cm earlier than expected. If the tolerance percentage is 40%, this second seed is considered a double, but if the percentage is at 60%, it will not be considered a double.

### Skips

Occurs when the expected seed is not cleared.
The percentage of failures defines the tolerance in relation to the distance that the system considers a skips.

Example: With a spacing of 1 meter between the seeds, a second seed fell 50 cm later than expected. If the tolerance percentage is 40% is considered a failure, however, if the percentage is at 60%, it will not be considered a failure.

![Figure - Diagram of skips lines](image)

There is a visual indicator in the operation screen with yellow and red lines. The upper yellow refers to the double lines. The lower red refers to skips lines.

![Figure - Visual indicator of doubles and skips lines](image)

Both the red and yellow lines will appear when they exceed the limit of the graph. When the line is totally yellow, it will indicate the number of double lines. When the line is completely red, it will indicate the number of skips lines.
18. Files

The display allows data transfer from or to a pendrive. This is useful to import or export data from/to your on-board computer to/from other display units. The following options are available for transfer:

- **Operation maps**
  Maps that contain information collected by the display such as seed sensors per line, GPS date and time, vehicle error relative to the guide, seed, fertilizer, and liquids application, application width, tractor speed, alarms, among others.

- **Prescription maps**
  Maps with application recommendations.

- **Waylines**
  Maps of operation lines in shape format with the purpose of using the same planned and standardized application trajectory.

- **Markers**
  Marcadores criados para indicação de pedras, buracos, formigueiros, áreas molhadas entre outros.

- **Settings**
  Settings to the display such as vehicle, implement, curve, GNSS, system, and interface settings.

Data transfer between the display and a pendrive is done in the Configuration menu – Files.

**18.1 Exporting data**

Insert a compatible pendrive into the USB port on the back of the display.

**Warning**

The display exports shape files in operations with covered area polygons.

**18.1.1 Exporting an operation map**

To export an application map, proceed as follows:

1. Select the **Files** option from the Configuration menu;
2. Select option **Export to USB**;
3. Select option **Operation map**;
4. Choose the items to be transferred.
5. Press OK;

6. Select the format to which you wish to export:
   - Display files (SAIG);
   - Google Earth kml files;
   - Shapefile (shp, dbf, prj e shx).

7. Press OK;

8. When the transfer is finished, press OK.

18.1.2 Exporting a prescription map

To export a recommendation map or line map, proceed as follows:

1. Select option Files from the Configuration menu;
2. Select option Export to USB;
3. Select option Prescription map or Line map;
4. Select the items you wish to export among those listed;
5. Press OK;
6. When the transfer is finished, press OK.

Warning

It is possible to select more than one file to export.

18.1.3 Exporting guides
To export a guide or a line map, proceed as follows:

1. Select option **Files** from the **Settings menu**;
2. Select option **Export to USB**;
3. Select option **Waylines**;
4. Select the desired option: **Original guide (proprietary)** or **Line map (generic)**;
5. If **Original guide** is selected, wait for exporting on the next screen;
6. If option **Parallel guides** is selected, delimit the number of lines to the right and to the left and press **OK**;
7. Wait for the file transfer.

**Warning**

It is possible to select more than one file to export.

**Figure - Data transfer - Items**

**Warning**

To learn more about the Original guide or Line map formats, see topic **Export guide**.

18.1.4 **Exporting markers**

To export markers, proceed as follows:

1. Select option **Files** from the **Configuration menu**;
2. Select option **Export to USB**;
3. Select option **Markers**;
4. Select the markers you wish to export among those listed;
5. Press **OK**;
6. When the transfer is finished, press **OK**.

**Warning**

You can select more than one file for export.

**Figure - Exporting markers**

18.1.5 **Settings**

To export settings, proceed as follows:

1. Select **Files** from the **Configuration menu**;
2. Select option **Export to USB**;
3. Select option **Settings**;
4. Select the settings you wish to export among those listed;
5. Press **OK**;
6. When the transfer is finished, press **OK**.

<table>
<thead>
<tr>
<th>Warning</th>
<th>It is possible to select more than one file to export.</th>
</tr>
</thead>
</table>

![Figure – Exporting settings](image)

### 18.1.6 Exporting pending files

<table>
<thead>
<tr>
<th>Warning</th>
<th>This field will only be enabled when the <strong>Send files to cloud automatically</strong> option is automatically selected.</th>
</tr>
</thead>
</table>

To export pending files, proceed as follows:

1. Select **Files** from the **Configuration menu**;
2. Select option **Export to USB**;
3. Select option **Exporting files**;
4. Select the settings you wish to export among those listed;
5. Press **OK**;
6. When the transfer is finished, press **OK**.

<table>
<thead>
<tr>
<th>Warning</th>
<th>It is possible to select more than one file to export.</th>
</tr>
</thead>
</table>

![Figure - Pending files list](image)

### 18.2 Importing data

To import data, proceed as follows:

1. Insert a compatible pendrive into the USB port on the back of the display;
2. Select option **Files** from the **Configuration menu**;
3. Select option **Import from USB**;
4. Select the type of data you wish to import:
   - Operation map;
   - Prescription map;
   - Guides;
   - Markers;
   - Settings.
5. Select the desired option and press OK;
6. When the transfer is finished, press OK.

**Warning** To learn more about importing guides, see topic Import guide.

**Important** To import a perimeter, select the Prescription map option.

### 18.3 Deleting data

To delete data stored in the display, proceed as follows:

1. Select option Files from the Configuration menu;
2. Select option Delete data;
3. Select option Operation map or Prescription map;
4. Select the items you wish to delete among those listed;
5. Press OK;
6. When the transfer is finished, press OK.
19. System settings

The general system settings are available in Configuration menu - Settings.

![System settings](image)

19.1 Modo normal

19.1.1 About

Shows the software version for the display, the processor (CPU) and screen (LCD) temperatures, the serial number, as well as shows information on the GNSS data, among others.

![About](image)

19.1.1.1 Version

Information about the system is composed of the following item set:

- Version;
- Revision;
- Serial number;
- Application version.

19.1.1.2 System manager

To access the system manager, proceed as follows:

1. Select option Settings from the Configuration menu;
2. Select option About;
3. Press the System manager button.
Update

Installing software update

| Important | To update the system manually it is possible to download the file to the pendrive through the website of Hexagon Agriculture, in the part of Support. |

In **Software update** the updates that have been automatically downloaded by the system and/or updates available through a pendrive are shown.

To perform the software update, proceed as follows:

1. Select **Update** on the **System manager** screen;
2. Select **Installing software update**;
3. Select the update you wish to install and select **Yes**;
4. The progress bar will be displayed;
5. Wait for the installation until the progress bar is complete.

Uninstalling software update

In **Uninstall software update** it is possible to uninstall the latest installed version.

Installing config update

In **Install config update** it is possible to install system settings.

| Important | This option is only available for displays in monitoring mode. |

Uninstalling config update

In **Uninstalling config update** it is possible to uninstall the latest installed settings.

Backup

It is possible to create data and settings backup from your display, restore backed-up settings, and delete backups. Furthermore, you can import or export a backup, thus passing information from one display to another.

**Figure - Backup**

<table>
<thead>
<tr>
<th>Backup</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>🔄 Restore Backup</td>
<td>No backup files available</td>
</tr>
<tr>
<td>☑ Create Backup</td>
<td></td>
</tr>
<tr>
<td>✖ Remove Backups</td>
<td>No backup files available</td>
</tr>
<tr>
<td>📦 Import Backups</td>
<td>No backup files available</td>
</tr>
<tr>
<td>🔍 Export Backups</td>
<td>No backup files available</td>
</tr>
</tbody>
</table>

Creating a backup

1. Select option **Create backup** to create a backup of the current display settings;
2. Confirm the operation by selecting **Yes**;
3. Wait for the process to finish and press **OK**.

Restoring a backup

1. Select option **Restore backup** to restore a backup;
2. Select the desired backup from the list;
3. Confirm the operation by selecting Yes;
4. Wait for the process to finish and press OK.

Removing a backup

1. Select option Remove backup to delete a backup;
2. Select the backup you wish to delete from the list. It is possible to select more than one backup;
3. Select option Remove in the upper right corner;
4. Wait for the process to finish and press OK.

Exporting a backup

1. Select option Export backup to export a backup to a pendrive;
2. Insert the pendrive into the display USB port;
3. Select the backup you wish to export from the list. It is possible to select more than one backup;
4. Select option Export in the upper right corner;
5. Wait for the process to finish and press OK.

Importing a backup

1. Select option Import backup to import a backup from a pendrive to the display;
2. Insert the pendrive into the display USB port;
3. Select the backup you wish to import. It is possible to select more than one backup;
4. Select option Import in the upper right corner;
5. Wait for the process to finish and press OK.

Collecting diagnostic information

When an error occurs and the display can no longer operate, the recovery mode will show on your screen. The diagnostic information obtained from the display must be sent to Hexagon Agriculture. To collect the data, proceed as follows:

1. Insert a pendrive into the display USB port;
2. Select option Collect diagnostics;
3. Confirm the operation.

Factory reset

Factory reset may solve problems and system crashes. With this procedure, the display settings and all adjustments will return to the factory default values. Before performing a factory restore, however, it is important to collect diagnostic information for Hexagon Agriculture.

About this system

Press this option to obtain version and revision information for the system manager and the operating system version. This information is useful for technical support.

Power off

Press this option to shut the display off. It is not possible to exit the system manager without pressing the Power off option.

19.1.1.3 CPU information
Indicates CPU temperature.

![CPU temperature](image1)

**19.1.1.4 Network information**

Documents the CPU's temperature.

Network information

When the device is **online**, the following information is also presented:

- Ethernet interface;
- MAC address;
- IP address.

![Network state](image2)

**19.1.1.5 Remote access**

Here it is possible to turn remote access on or off. When off, the display will not be viewed or operated remotely.

![Remote access](image3)

**19.1.1.6 Show activations**

Shows the list of features that are activated on the display.

![List of activations](image4)

**19.1.1.7 GNSS information**

Shows a list of information regarding the GNSS.
19.1.1.8 Legal information

Shows information on use licenses.

19.1.2 Language and region

In this option it is possible to select the visualization Language, to set the Time zone, and to select the color Theme for the display.

- **Language**
  Select the desired language and confirm.

- **Time zone**
  Press + and - to inform the local time. Each touch will alter time in 15 minutes from the UTC (Coordinated Universal Time).

- **Theme**
  Select the default or night theme for the operation screen and confirm.

19.1.3 System mode

This option allows alternating between Normal and Advanced mode. This operation may only be performed by entering a password.

To alter the System mode, proceed as follows:

1. Select option Settings from the Configuration menu;
2. Select option System mode;
3. Enter the password and press OK.

Normal mode

In this mode, the user only has access to basic features of the on-board computer. Used mainly by operators.

The following features are enabled in normal mode:

- About;
- Language and region;
- Support;
- External settings;
- System mode;
- Network troubleshooting.

**Advanced mode**

In this mode, other than the basic features in normal mode, the user has access to advanced features of the on-board computer. Used mainly by technicians.

The following features are enabled in advanced mode:

- Change password;
- Logging;
- Network;
- Activation;
- Firmware update;
- Access to the GNSS option in the Settings menu;
- Data synchronization;
- PLC;
- Add, edit, and remove vehicle;
- Add, edit, and remove implement.

**19.1.4 Support mode**

This option gives specialized technicians access to installation settings and advanced tests. This operation can only be performed entering a password.

To access the assistance options, proceed as follows:

1. Select option Settings from the Configuration menu;
2. Select option Support;
3. Enter the password and press OK.

The following features are enabled when Support is selected:

- Advanced file transfer;
- Implement motor test;
- Firmware test and Firmware transfer;
- Enable/disable Monitoring mode;
- Enable/disable Navigation mode with routes.

**19.1.5 Network troubleshooting**

Informs on the situations of the connections of the drivers connected to the CAN network and the display.

<table>
<thead>
<tr>
<th>Commands</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>OK</td>
<td>All function drivers are connected.</td>
</tr>
<tr>
<td>NC,X</td>
<td>Function driver number X is not on the network.</td>
</tr>
<tr>
<td>EX,X</td>
<td>Driver X is spare on the network.</td>
</tr>
</tbody>
</table>
The drivers that may be connected to the display are:

- Controller;
- Deep;
- Sprayer;
- Gate;
- Auto steering;
- Planting monitor;
- Transport;
- Machine monitor;
- Cutting section;
- Logic controller
- Ant killer controller.

- **Reset**
  Clears the address for all the devices connected to the CAN.

- **Device info**
  Shows the software version and the external power supply for the connected devices.

**Figure - Network troubleshooting**

### 19.2 Advanced mode

#### 19.2.1 Change password

**Important** Feature only available in **Advanced** mode.

This feature allows changing the password for accessing the **Advanced** mode. To change the password, proceed as follows:

1. Select option **Settings** from the **Configuration menu**;
2. Go to **Advanced mode**;
3. Select option **Change password**;
4. Enter the new password and confirm pressing **OK**.
19.2.2 Logging

Important Feature only available in Advanced mode.

This feature allows the user to choose how the log file for the events that occurred during the operation is stored. To select how the log file is stored, proceed as follows:

1. Select option Settings from the Configuration menu;
2. Go to Advanced mode;
3. Select option Logging.

The file may be stored in the following ways:

- **Single file**
  This way the log is saved in a single application file separated by work session and by implement type.

- **Daily**
  This way the application file is created for each day of operation.

- **Periodic**
  This way the used must choose a desired period among the options, namely 12 hours, 1 hour, 30 minutes, or 15 minutes.

The following options are also available for the user to choose:

- Log in even when the vehicle is stationary
- Log in even if you lose the GNSS signal

When selecting any form of storage other than the daily type, the following options are presented:

- Send files to the cloud automatically, in this case indicate the start date of the files you want to send.
- Automatically delete old files, in this case inform the files with how many days you want to delete.
19.2.3 Network

Important Feature available only for the Advanced mode.

To enable your display for the Mobile data and Wi-Fi, proceed as follows:

1. Select option Settings from the Configuration menu;
2. Go to Advanced mode;
3. Press Network;
4. Select the desired network.

For mobile network settings, see the topic Mobile connection.
For Wi-Fi settings, see the settings Wi-Fi topic.

19.2.3.1 Mobile data settings

By pressing the Mobile data button, the connection screen is displayed.

To configure the connection, proceed as follows:

1. Press the Detect settings automatically option so that the data indicated as number 02 in the figure above be automatically filled in. This option may not be available for all 3G SIM card models;
2. If the data were not detected automatically in the previous step, manually fill them with the information supplied by the mobile network service provider;
3. Set the network state as active to enable it.

On the upper bar of the operation screen, the Mobile network icon will become available and may present two states: Active and Inactive.
19.2.3.2 Wi-Fi network settings

**Important**

Some displays have two Wi-Fi connections: internal and external Wi-Fi. The internal Wi-Fi may be requested when the display is purchased, while the external Wi-Fi may be acquired at a later time. In this case, the Wi-Fi USB adapter must be approved.

By pressing the **Wi-Fi** button, the connection screen is displayed.

To configure the network, proceed as follows:

1. Select the Wi-Fi network;
2. Press **OK**.

**Important**

In case your Wi-Fi network is not listed, the Wi-Fi network access point can me manually enabled through button Enable access point. Enter the name if the network (SSID) and the password on the next screen.

On the upper bar of the operation screen, the Wi-Fi network icon will become available.

### 19.2.4 Activation

**Important**

Feature available only in the **Advanced mode**.

This feature allows new implements to be activated.

To perform the activation, proceed as follows:

1. Select option **Settings** from the **Configuration menu**;
2. Go to **Advanced mode**;
3. Select option **Activation**.

#### 19.2.4.1 Pendrive procedure

To activate a feature using a pendrive, proceed as follows:
1. Insert the pendrive with file "ActivationCode.sig";
2. Press Import;
3. Press Activate;
4. Check the success or failure message.

19.2.4.2 Manual procedure

To manually activate a feature, proceed as follows:

1. Fill in the H0 through H7 and Fix fields;
2. Press Import;
3. Press Activate;
4. Check the success or the failure message.

![Figure - Activation](image)

19.2.5 Firmware update

**Important** Feature available only in the Advanced mode.

This feature allows the user to update the driver firmware.

To update the firmware, proceed as follows:

1. Select option **Settings** from the Configuration menu;
2. Go to Advanced mode;
3. Select option **Firmware update**;
4. Select the desired device connected to the CAN network and press **Advance**;
5. On the following screen all the firmware valid for the selected driver will be listed;
6. Select the desired firmware and press **OK**.

![Figure - Firmware update](image)

19.2.6 External settings
On the external settings screen, it is possible to set the horn and the operation switches.

![Diagram](image)

**Figure - External settings - displays Ti7**

![Diagram](image)

**Figure - External settings - displays Ti5**

- **Internal buzzer**
  
  Turns the sound alarm on and off. If it is On, some alarms will be notified with beeps. If it is Off, the horn will never beep.

- **M sensor mode**

  
  The operation option is selected, the **Operation switch** button is disabled. If the **Auto steering** option is selected, the **Operation switch** is disabled.

  
  **Important**

  This option is only available for the display Ti5, since it only has one external switch. The display Ti7 always keeps the pilot and operation switches enabled.

- **Auto steering switch**

  The pilot switch is used to turn the automatic pilot on/off. It has the same states as the operation switch.

- **Operation switch**

  The operation switch is used to start/stop the operation. Select the **Momentary** option if your button is the kind that returns to the normal state after being pressed, and select option **Maintained** if your switch is the kind that maintains its state after being pressed.

  
  **Important**

  When buttons of type **Maintained** are used and the state of the button indicates that the operation is stopped or the automatic pilot is off, it will not be possible to turn them on through the screen. The button needs to be indicating the on state. The same occurs for **Momentary** buttons, because in this case the operator can always turn the operation or the pilot on/off either with the button or on the screen.

- **Operation signalizer**

  This option may be used when an output is required to connect with third-party equipment. When on, the output of the right external horn stops being a horn and starts to indicate the application status, i.e., twelve volts will be applied to the output if it is marking the trail, and zero volts when it is not marking the trail.

  
  **Warning**

  During device initialization, 12V pulses of short duration (less than 250ms) may be applied to this output.

- **Flag sensors A and B**

  This option enables two inputs to the device to mark indicators such as pits.
Important

The flag sensor buttons are only available for the display Ti7.

- **Primary CAN**
  This option you can select **Isobus** or **HxAg**.

### 19.2.7 Data synchronization

**Important**

Feature available only in the **Advanced** mode.

On the data syncing screen it is possible to configure automatic software updates. The automatic update is only possible if the display is connected to the Internet.

To configure data syncing, proceed as follows:

1. Select option **Settings** from the **Configuration menu**;
2. Go to **Advanced mode**;
3. Select option **Data synchronization**;
4. Enter the hostname. This field is factory filled with the default hostname.

**Important**

This server is also used for the Routes feature.

5. Select option **On** so that the update is ready for installation through the system manager. In the **Off** state it is not possible to update the software because there is no communication with the server;
6. In the **Period** (minutes) option, select the time interval in which the display will check for new updates.

**Important**

In the **Software version** and **Config version** options, it is possible to check the last updated version.

On the right side the following options are available:

- **Show update alert**
  Asks the user if he wishes to download the new update.

- **Download over mobile network**
  Select this field if you want the Ti to use the mobile network if it is unable to connect to the Wi-Fi network for the download.

- **Install automatically**
  The display automatically installs the software updates without asking the user for permission on the device boot following the update download.

### 19.2.8 RFIDs tags list
Important Feature available only in the **Advanced** mode.

On this screen it is possible to see the RFID tags read by the equipment.

To access the list, proceed as follows:

1. Select the **Settings** option in the **Configuration menu**;
2. Enter **Advanced mode**;
3. Select the **RFID tag list** option;
4. The system lists the RFID tags visible to the equipment.

Important The visible RFID tags are automatically displayed in the list, the update time is configurable. The range depends on the type of antenna used, power of the signal and the presence or absence of obstacles on the way, but it is usually in the range between +/- 2 meters.

---

**Figure - List of RFID tags**

<table>
<thead>
<tr>
<th>Icon</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image" alt="Update RFID tag list" /></td>
<td>Update RFID tag list</td>
</tr>
<tr>
<td><img src="image" alt="View RFID reader configuration" /></td>
<td>View RFID reader configuration</td>
</tr>
<tr>
<td><img src="image" alt="Stop the tag search service" /></td>
<td>Stop the tag search service</td>
</tr>
</tbody>
</table>

The following options are available:

- **Search for connected tags**
  When selecting this item, the system clears the list of tags that already existed and forces a new search for available devices.

- **View RFID reader settings**
  The RFID reader information is displayed.

- **Stop the update service**
  When the service is stopped, all tags already listed are deleted.
When clicking on an item in the list, the user is taken to the tag information screen, where he can define a new trailer, see the topic tag information for more details.

19.2.8.1 Information tag

The configurations of the tag selected in the list are presented. On this screen it is also possible to define a new trailer for tag allocation.

To change the trailer linked to the tag, proceed as follows:

1. Select the Settings option in the Configuration menu;
2. Enter Advanced mode;
3. Select the RFIDs tag list option;
4. Click on the tag you want to change;
5. The tag information screen is displayed;
6. Select the option to reset the trailer (icon);
7. Enter the trailer identifier on the keyboard;
8. Confirm the operation in the message;
9. The system updates the tag with the information provided.

**Important**

When a new trailer is written to the tag, all of its content is deleted, so that new content can be later recorded and associated with that new trailer.

**Important**

If it is not possible to update the tag, an error notification is displayed.

19.2.9 PLC

**Important**

Feature available only in the Advanced mode. e mediante ativação específica.
To access the list, proceed as follows:

1. Select the **Settings** option in the **Configuration menu**;
2. Enter **Advanced mode**;
3. Select the **PLC option**;
4. Select the **Trailer** or **Truck** option according to the vehicle.

### Truck

If you selected the **Truck** option, you can update the firmware, according to the topic [firmware update](#).

> **Warning**
> If the Truck device is not available, or working correctly, a message will be displayed when selecting this option.

### Trailer

If you selected the **Trailer** option, the list of devices connected via PLC will be displayed.

> **Warning**
> Devices that have a firmware version prior to version 2.2.0, will be presented in the list in order to have their firmware updated, but they will not be considered as active devices for use by software functionalities, as for example, in RMT (Raw Material Traceability).

The connection status can be:
• **Warning Sign**
  It means that the synchronization has been established and that the firmware is out of date, in which case you need to update it or you will not be able to access its settings.

  To update the firmware, proceed as follows:

  1. Select the device you want to update, for that, click on the serial number;
  2. Select the Firmware option that was enabled at the top;
  3. The system presents the screen for updating the firmware, proceed to the topic Updating the firmware.

  **Warning**
  This same update process must be carried out on the TWO devices on the list that belong to the same set, in the case of upgrading to the Trailer.

• **Check Sign**
  Indicates that synchronization has been established and that the firmware is up to date, if you want to access the settings:

  1. Select the device you want to configure for this, click on the serial number;
  2. Select the Settings option that was enabled at the top;
  3. The system presents the screen for configuring the device, proceed to the topic Update settings.

19.2.9.1 Firmware update

The firmware update of the devices can occur for both the **Trailer** and the **Truck**.

To update the firmware, proceed as follows:

  1. On the screen presented, select update via **OTA** or **PLC**;
  2. The system display the update progress bar;
  3. At the end of the update, a success message will be displayed.

  **Important**
  A message will be displayed in case the firmware is already updated, or if the update fails.

**Update via PLC**

Selecting this option, the system will send the firmware to the device via the PLC cable. To ensure the quality of the update, a more robust cable is required.
Update via OTA

By selecting this option, the system will attempt to connect to the Wi-Fi network configured to send the firmware to the device.

Important
It will not be necessary a robust PLC cable in this type of update, as it will only be used to communicate to the device the data of the network that will be used for update.

Warning
This same update process must be carried out on the TWO devices on the list that belong to the same set, in the case of upgrading to the Trailer.

19.2.9.2 Device config

Important
This procedure is only available for the trailer vehicle.

To configure a device, proceed as follows:

1. In the list of devices, select the one you want to configure by clicking on the serial number.

   Important
   It is not possible to configure devices with outdated firmware, in this case update the firmware according to the topic firmware update.

2. Select the Settings option in the right corner of the screen;

3. The configuration data for the selected device is displayed;

   Important
   To check the network the device is using for communication, see the topic firmware update.

4. Change the settings if you wish and select OK to confirm;
The following options are available:

- **Trailer Id**
  Enter the trailer identification code.

- **Trailer length in meters**
  Enter the size of the trailer in meters.

- **Trailer position**
  Number corresponding to the order of the trailer in the connection sequence, the trailer in position 1 corresponds to the one closest to the truck cabin.

- **Accelerometer sensitivity**
  It is the sensitivity of the device to return to operation when without power. The lower the value, the more sensitive, that is, with lower vibrations, the device will wake up and start operating again.
20. Assistance and remote access

To request remote assistance contact our technical assistance service. The technician will contact you to remotely operate your display. The technician can press buttons in your stead to perform the required actions or guide you to solve your problem.

The display is factory set with the remote access option enabled. If you wish for this option not to be available to Hexagon Agriculture, go to Configuration menu – System settings – About – Remote access and select Off.

The technician can give support in two ways:

- **Visualization mode**
  In this mode the technician guides the display operator to perform the assistance steps. The technician views your display screen, but cannot alter any data. Any click the technician makes is ignored and will not be sent to your device. Only the display user can operate the system.

- **Operation mode**
  In this mode the technician gives assistance by operating your display. In order for the technician to operate, a message will be sent through the display requesting operation access.

**20.1 Visualization mode**

To have remote access in Visualization mode, the technician needs to have the device’s serial number and access it through the web software that Hexagon Agriculture used to provide remote assistance. It is possible to identify that the Ti on-board computer is being visualized remotely by a technician through the visualization indicator icon on the bottom right corner of the screen.

If the remote access option is off, when a technician tries to visualize the device remotely, a message will be displayed on the display screen for the user to alter the remote access settings if he wants to allow visualization.

**20.2 Operation mode**

To allow remote access in Operation mode, proceed as follows:

1. The technician requests remote access authorization through a message on your display screen. The message informs the name and company of the user making the request;
2. Confirm the operation selecting Yes to authorized access;
3. Check if an operation icon such as the one on the figure is displayed in the bottom right corner of your operation screen.
Important

Remote access may be interrupted at any time by pressing the access icon on the bottom right corner of the screen. The display will display a message for the user to confirm access interruption.
21. Technical features

21.1 Display Ti7+

Monitor data

- Material: 7” "NEF;": 22Z6: 2"r1zgn","478rfeqrtu"y kj "qwej "pvgtlteg=
- Dimensions: 208 (W) X 159 (L) X 57 (H) mm;
- Weight: 1279g;
- Power supply voltage: 12VDC;
- Light bar current: 0.6A.

Environmental specification

- Operating temperature: -20 to +60 [°C];
- Storage temperature: -30 to +80 [°C];
- Humidity: 95% maximum.

Interfaces

- CAN: 2 x Back;
- USB: 1 x Back;
- RS-232: 2 x Back.

Models according to the GNSS module*

<table>
<thead>
<tr>
<th>Model</th>
<th>Ti7+ WH</th>
<th>Ti7+ WZ</th>
<th>Ti7+ WAS</th>
<th>Ti7+ WAD</th>
</tr>
</thead>
<tbody>
<tr>
<td>GNSS module</td>
<td>u-blox MAX M8Q</td>
<td>u-blox MAX-M8Q</td>
<td>Novatel OEM7500 simple</td>
<td>Novatel OEM7500 double</td>
</tr>
<tr>
<td>Channels</td>
<td>56 L1</td>
<td>14 L1</td>
<td>&gt; 181</td>
<td>&gt; 181</td>
</tr>
<tr>
<td>Constellations</td>
<td>GPS, GLONASS, SBAS, QZSS</td>
<td>GPS, GLONASS, SBAS</td>
<td>GPS, GLONASS, BeiDou, Galileo, SBAS, QZSS, L-Band, NavIC</td>
<td>GPS, GLONASS, BeiDou, Galileo, SBAS, QZSS, L-Band, NavIC</td>
</tr>
<tr>
<td>Simple point</td>
<td>2.50 m</td>
<td>1.50 m</td>
<td>L1 / L2 / 1.2 m</td>
<td>L1 / L2 / 1.2 m</td>
</tr>
<tr>
<td>SBAS</td>
<td>2.00 m</td>
<td>0.70 m</td>
<td>0.60 m</td>
<td>0.60 m</td>
</tr>
<tr>
<td>DGPS</td>
<td>-</td>
<td>-</td>
<td>0.40 m</td>
<td>0.40 m</td>
</tr>
<tr>
<td>PPP</td>
<td>-</td>
<td>-</td>
<td>TerraStar-L / 0,40 m</td>
<td>TerraStar-L / 0,40 m</td>
</tr>
<tr>
<td>RTK</td>
<td>-</td>
<td>-</td>
<td>0.01 m + 1 ppm</td>
<td>0.01 m + 1 ppm</td>
</tr>
<tr>
<td>Start in heat</td>
<td>1 s</td>
<td>1 s</td>
<td>35 s</td>
<td>35 s</td>
</tr>
<tr>
<td>Start in cold</td>
<td>26 s</td>
<td>26 s</td>
<td>50 s</td>
<td>50 s</td>
</tr>
<tr>
<td>Data rate</td>
<td>Measurements</td>
<td>up to 10 Hz</td>
<td>up to 10 Hz</td>
<td>20 Hz</td>
</tr>
<tr>
<td>Position</td>
<td>up to 10 Hz</td>
<td>up to 10 Hz</td>
<td>20 Hz</td>
<td>20 Hz</td>
</tr>
<tr>
<td>Temporal accuracy</td>
<td>30 ns</td>
<td>30 ns</td>
<td>&lt; 20 ns</td>
<td>&lt; 20 ns</td>
</tr>
<tr>
<td>Speed accuracy</td>
<td>0.05 m/s</td>
<td>0.05 m/s</td>
<td>0.055 m/s</td>
<td>0.055 m/s</td>
</tr>
</tbody>
</table>

Wi-Fi* and Bluetooth module

<table>
<thead>
<tr>
<th>Technology</th>
<th>Technical features</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wi-Fi</td>
<td>• WLAN 802.11 b/g/n</td>
</tr>
<tr>
<td>Bluetooth</td>
<td>• 2.1+EDR</td>
</tr>
<tr>
<td></td>
<td>• Power Class 1.5</td>
</tr>
<tr>
<td></td>
<td>• Full Support for BLE 4.0</td>
</tr>
</tbody>
</table>

* Equipment that is in the Wi-Fi only version will be identified with the "Wi-Fi only" label.

Mobile data (3G/4G) module*

<table>
<thead>
<tr>
<th>Technology</th>
<th>Bands</th>
</tr>
</thead>
<tbody>
<tr>
<td>LTE CAT-4</td>
<td>• Band 1 (2100 MHz)</td>
</tr>
<tr>
<td></td>
<td>• Band 3 (1800 MHz)</td>
</tr>
<tr>
<td></td>
<td>• Band 5 (850 MHz)</td>
</tr>
<tr>
<td></td>
<td>• Band 7 (2600 MHz)</td>
</tr>
<tr>
<td></td>
<td>• Band 8 (900 MHz)</td>
</tr>
<tr>
<td></td>
<td>• Band 28 (700 MHz)</td>
</tr>
<tr>
<td>UMTS (WCDMA)</td>
<td>• Band 1 (2100 MHz)</td>
</tr>
<tr>
<td>HSDPA</td>
<td>• Band 5 (850 MHz)</td>
</tr>
<tr>
<td>HSUPA</td>
<td>• Band 8 (900 MHz)</td>
</tr>
<tr>
<td>GPRS</td>
<td>• EGSM 900 (900 MHz)</td>
</tr>
<tr>
<td>EDGE</td>
<td>• DCS 1800 (1800 MHz)</td>
</tr>
</tbody>
</table>

* Module available only in versions with Wi-Fi + Mobile network.

Certifications

This device has no right to be protected against harmful interference and cannot cause interference with duly authorized systems.
22. FCC statement (applicable only in the USA)

Tests performed on the display have shown its compatibility with the limits for Class A digital devices, to the terms of Part 15 of the FCC rules. These limits are designed to offer reasonable protection against any harmful interference when the device is operated in a commercial environment.

This device generates, uses, and may radiate radiofrequency energy if it is not installed in accordance with the instruction manual supplied by the manufacturer, and may cause harmful interference to radio communications.

Operating this device in a residential area may cause harmful interference, in which case the user must correct the interference at his own expense.

**Warning**

Functional alterations or modifications not expressly approved by Hexagon Agriculture may void your warranty.
23. Compliance with European Directive 1999/5/EC (R&TTE)

By means of this term, Hexagon Agriculture declared that the display meets the basic requirements and other important provisions of Directive 1999/5/EC. The compliance declaration can be found at http://www.hexagonagriculture.com.

Class 1 device in accordance with European Directive 1999/5/EC (R&TTE). Can be marketed and put into operation without restriction in a Member State of the European Union.

**Warning** Relative compliance to countries whose regulations are not covered by European Directive 1999/5/EC must be approved before use and operation.

<table>
<thead>
<tr>
<th>Type</th>
<th>Frequency band [MHz]</th>
<th>Gain</th>
<th>Connector</th>
<th>Frequency band</th>
</tr>
</thead>
<tbody>
<tr>
<td>GNSS Receptor</td>
<td>L1: 1368 +/- 43 MHz L2: 1236 +/- 18 MHz</td>
<td>22 dBi</td>
<td>TNC JACK</td>
<td>L1: 1568.0 ± 43.0 MHz</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>L2: 1236.0 ± 18.3 MHz</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>L5, E5a: 1176.0 ± 12.0 MHz</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>E5b: 1207.0 ± 12.0 MHz</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>B2: 1191.8 ± 25.0 MHz</td>
</tr>
<tr>
<td>Cell phone</td>
<td>TEOGLAS</td>
<td>2.6 dBi</td>
<td>SMA-JACK</td>
<td>824 - 960</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1710 - 2170</td>
</tr>
</tbody>
</table>
# 24. Problems and solutions

<table>
<thead>
<tr>
<th>Problem</th>
<th>Solution</th>
</tr>
</thead>
</table>
| Display will not turn on | Check the power supply;  
Check the fuse;  
Check if the connections are secure;  
Check if the cable is not broken (use a multimeter to test the voltage). |
| GNSS problem | Check if the GNSS is in an area with sky-bound view. In covered areas, the signal will become too low and may not locate properly;  
Check the antenna cabling;  
Measure the GNSS cable voltage (5v);  
Check if the GNSS Port and Model are correctly selected on the GNSS menu. |
| Motor will not move | Perform display tests and calibrations;  
Check if the hose connections are correct (pressure and tank);  
Check if the command is in the right direction;  
Check if the operation is not stopped in the display;  
Check if the encoder is blinking when it turns;  
Check if the vehicle is not below the operation speed range. |
| Map problems | Within the pendrive, the SHP, SHX, and DBF files must be in the same location;  
The map name cannot contain special characters or spaces;  
The map name might be too long. |
| Sprayer problems | Perform calibration and simulation;  
Check the filter;  
Check the valve and flow meter cabling;  
Check if the vehicle is below the operation speed range. |
| Application failure when entering and exiting borders | Check if the antenna-pin and pin-implement distances are correct. |
| Nothing happens after starting the installation test for the pilot sensor | Check if the automatic pilot driver is recognized on the network (Settings menu – Network diagnosis). In case it is not found, check the power supply and cable continuity;  
Check if the tank oil level;  
Check for possible leaks;  
Check the sensor’s power cable for continuity and check that the voltage between pins “3” and “1” is of 12v. |
| Nothing happens after starting the HV control test | Check if the automatic pilot driver is recognized on the network (Configuration menu – Network diagnosis). In case it is not found, check the power supply and cable continuity;  
Check the wheel sensor and hydraulic valve cables;  
Check the hydraulic system (if there are no inverted connections, etc). |
| The wheel turned to the opposite side | Invert the connectors on the valve terminals. If the problem persists, check the instructions on the hydraulic pilot topic Sensor installation. |
| Pilot problems | Check the tank oil level;  
Check for possible leaks;  
Check the steering sensor. |
25. Glossary

CAN – The Controller Area Network is an internal communication network that intercommunicates components within the vehicle. It must ensure message delivery, the absence of message conflicts, minimum delivery times, low cost, and ability to operate reliably in an environment with electrical noise.

BEC – Sugarcane electronic newsletter.

DIFF – Method of correcting the GNSS positioning. Without it, the automatic pilot cannot operate properly.

GNSS – Name of the global positioning system. It is a satellite navigation system that provides a mobile receiving device its own position.

Latitude – Latitude is the angle between the equatorial plane and the reference surface. Latitude is measured in degrees North and South of the equatorial plane, between 90° South at the South Pole and 90° North at the North Pole.

Longitude – Longitude is measure along the equatorial plane and represents the distance between a point and the Greenwich Meridian. It is measured in degrees, from 0° to 180° East or West.

Kg/ha – Kilograms per hectare.

L/min – Liters per minute.

Pl/ha – Plants per hectare.

PPL – Pulses per liter.

PPS – Pulses per second.

Pulse – Electrical information provided by the flow meter or encoder.

Relation – For inputs, this is the relation between the applied weight over the hydraulic motor's RPM. For sprayer, it is the number of pulses of the flow meter over liters.

RPM – Rotations per minute provided by the hydraulic motor's sensor.

Section – Set of nozzles for the sprayer bar or of planting/fertilizing lines that may be opened or closed simultaneously.
**26. Warranty certificate**

**Product description**

Hexagon Agriculture display precision farming system.

**About the Warranty**

1. Hexagon Agriculture guarantees the proper functioning of the product(s) indicated above and that it markets, and commits, for a twelve-month period* as of the data of issuance of the respective invoice, comprised of the three months of legal warranty and nine months of contractual warranty, to repair and replace the parts and materials that present verified manufacturing defects under normal use conditions and for the purposes for which they are intended, taking responsibility for the cost of the part(s) to replaced, as well as for the required manpower, although the purchaser shall bear the technician travel costs and/or the costs for shipping the part(s) for repair.

*Except for whips, sensors, and connectors, for which the warranty period is of three months.

1.1. The manufacturer must be immediately notified of any defect found on the product. Such notification must be formalized via electronic correspondence through addresses comercial@hexagonagriculture.com and suporte@hexagonagriculture.com.

1.2. This warranty certificate will only be valid for products marketed and used in Brazil, and must be presented along with the respective Invoice, which will integrate it for all purposes.

**Warranty exclusions**

2. Hexagon Agriculture’s liability will be void when:

a) The product's serial number or identification label are removed/ altered;

b) The product seal is removed;

c) The product is connected to a voltage other than that specified in the installation/operation manual;

d) The product is placed in an improper location, in disagreement with the rules set forth in the installation/operation manual;

e) The product is used in disagreement with the rules set forth in the installation/operation manual, or for purposes other than that for which it is intended; and/or

f) The product has suffered any type of accident, provided such accident was not due to the defect.

**Warranty limitations**

3. The warranty hereby granted shall not extend to damages and/or malfunction of the above identified product(s) when the following hypotheses are verified:

a) Use and/or operation in disagreement with the operation manual;

b) Risks, cracks, dents, deformations, and/or any other types of damages resulting from accidents during transportation or handling;

c) Failure to observe the cleaning and lubrication instructions in the instructions manual, including the use of materials and chemical products not recommended by Hexagon Agriculture;

d) Not sending the signed installation form to Hexagon Agriculture;

e) Operation with parts and materials of dubious origin or of low quality;

f) Modifications, repairs, assemblies/disassemblies, installations/uninstalling carried out by persons or technicians not accredited by Hexagon Agriculture;

h) Use of improper packaging when sending the product for repair; and/or

i) Fortuitous and force majeure events.
27. Change control

Changes made in the manual according to new released versions and detected adjustments, listed here in descending order.

### Update to software version 2.24 and improvements (V300R009)

<table>
<thead>
<tr>
<th>Location of changes</th>
<th>Change description</th>
</tr>
</thead>
<tbody>
<tr>
<td>GNSS</td>
<td>Review and improvement of information on the GNSS topic.</td>
</tr>
<tr>
<td>Technical features</td>
<td>Added Ti7 + technical information.</td>
</tr>
<tr>
<td>Linear actuator</td>
<td>New fertilization implement.</td>
</tr>
</tbody>
</table>

### Update to software version 2.23 and improvements (V300R008)

<table>
<thead>
<tr>
<th>Location of changes</th>
<th>Change description</th>
</tr>
</thead>
<tbody>
<tr>
<td>PLC</td>
<td>Added new topic on the PLC item.</td>
</tr>
</tbody>
</table>

### Update to software version 2.21 and improvements (V300R007)

<table>
<thead>
<tr>
<th>Location of changes</th>
<th>Change description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Perimeter</td>
<td>Added information at the end of the topic on how to import a perimeter.</td>
</tr>
<tr>
<td>Logging</td>
<td>Updating the images and options available according to the selected storage.</td>
</tr>
<tr>
<td>NMEA Output</td>
<td>Added information about the frequencies available for configuring messages.</td>
</tr>
<tr>
<td>GNSS</td>
<td>Added the RTK Assist option and the Speed filter option.</td>
</tr>
</tbody>
</table>

### Update to software version 2.20 and improvements (V300R006)

<table>
<thead>
<tr>
<th>Location of changes</th>
<th>Change description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Guidance configuration</td>
<td>User option to select whether to move the guide instead of GNSS in the Realign and Manual adjustment option.</td>
</tr>
<tr>
<td>Active guide</td>
<td>The Realign and Manual Adjust buttons behave differently according to the settings made on the Virtual Guide.</td>
</tr>
<tr>
<td>NTrip Status</td>
<td>The Seconds since last update field has been removed</td>
</tr>
<tr>
<td>Section cut</td>
<td>Added the possibility to view up to 25 sections in the control bar, decreasing the size of the icon.</td>
</tr>
<tr>
<td>Network configuration</td>
<td>Removed support for Virtual Vista.</td>
</tr>
<tr>
<td>RFIDs tags</td>
<td>Added service that presents the connected tags and where you can change your settings.</td>
</tr>
<tr>
<td>Current test</td>
<td>New test added for the spray implement.</td>
</tr>
</tbody>
</table>

### Update for software version 2.19 and improvements (V300R004)

<table>
<thead>
<tr>
<th>Location of changes</th>
<th>Change description</th>
</tr>
</thead>
<tbody>
<tr>
<td>PVED Autosteering</td>
<td>New topics on PVED pilot, installation test, configuration and calibration.</td>
</tr>
<tr>
<td>Caterpillar pilot</td>
<td>Steering system: Caterpillar joystick support.</td>
</tr>
<tr>
<td>Doubles and skips</td>
<td>New seed sensor functionality, used to control planting errors.</td>
</tr>
</tbody>
</table>
### Update for software version 2.18 and improvements (V300R003)

<table>
<thead>
<tr>
<th>Location of changes</th>
<th>Change description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Connectivity information</td>
<td>When used Novatel models, shows the information on the GNSS position accuracy.</td>
</tr>
</tbody>
</table>

### Update for software version 2.17 and improvements (V300R002)

<table>
<thead>
<tr>
<th>Location of changes</th>
<th>Change description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sprayer pressure calibration</td>
<td>You can set/calibrate the sprayer sensor and show its reading in the cloud. Added the image of the new sprayer pressure calibration screen and field description.</td>
</tr>
<tr>
<td>General configuration</td>
<td>You can now configure the output that will be applied to the output of the MOTOR C when using the power steering. The image of the General configuration screen has been updated according to the new descriptions of the PWM C Control logic field.</td>
</tr>
<tr>
<td>Antenna installation</td>
<td>The antenna installation of the Ti5 and Ti7 displays were updated.</td>
</tr>
<tr>
<td>Displays overview</td>
<td>Merge the topics of the Ti5 display and Ti7 display.</td>
</tr>
<tr>
<td>Equipment's installation</td>
<td>Merge the topics of the Ti5 display and Ti7 display.</td>
</tr>
<tr>
<td>Technical features</td>
<td>Merge the topics of the Ti5 display and Ti7 display.</td>
</tr>
<tr>
<td>NMEA output</td>
<td>The NMEA output for Ti7 display uses Serial 2 and a suitable cable.</td>
</tr>
</tbody>
</table>

### Update for software version 2.16 and improvements (V300R001)

<table>
<thead>
<tr>
<th>Location of changes</th>
<th>Change description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Deleting data</td>
<td>The delete data option is now visible only in Advanced mode.</td>
</tr>
<tr>
<td>External settings</td>
<td>The external settings option will now be visible only in Advanced mode.</td>
</tr>
</tbody>
</table>