



Ti7

USER MANUAL

V100R003.E01



HEXAGON
AGRICULTURE

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DO NOT PRINT

Introduction

This manual contains important information on how to install, configure and use the Ti7, as well as security information.

- Carefully read this User Manual before connecting the equipment;
- To ensure your safety, please observe the instructions contained in the User Manual and Safety Manual issued by the manufacturer of agricultural machinery.

The symbols used in this manual have the following meanings:

Type	Description
 DANGER	Indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.
 WARNING	Indicates a potential hazard or misuse situation which, if not avoided, may result in minor or moderate injury, material, financial loss and environmental damage, or all of them.
 IMPORTANT	Important information that should be observed, so that the equipment to be used in a technically correct and efficient way.

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Safety instructions

The following instructions are intended to inform users about the risks inherent in the operation of Ti7 and how to avoid them.



WARNING

Use Ti7 for agricultural and forestry purposes only. Do not use the equipment in any other type of vehicle.

Is not allowed to:

- Use it outside the restrictions imposed in this manual;
 - Open the equipment with tools, except as permitted in writing by technical assistance;
 - Modify or alter the product;
 - Use the Ti7 with obvious damage or defects;
 - Use it with accessories from other manufacturers without approval.
-



WARNING

Ti7 must not be used without the user having knowledge of the correct use of the equipment. Misuse may lead to personal injury and damage.



DANGER

The unauthorized modification of the vehicle for assembly or installation of the product can change the functioning and safety of the agricultural machinery.



WARNING

Verify the results of measurements after fall or improper use, transfer or modification of the product, or its storage for long periods of time.

Care and Precautions

- It is not recommended the use of Ti7 during lightning storms, due to the risk of being struck by lightning;
- Keep a safe distance to electrical installations and components;
- If the equipment is long standing and unused it is recommended turning off all the components and cables;
- To clean your monitor, use a soft cotton tissue with 50% isopropyl alcohol. Use the moistened cloth on the monitor. For better visualization of the dirt and finger marks, clean the monitor when it is switched off.

Disposal

Incorrect disposal of the product can cause the following problems:

- Release of poisonous gases, in the case of combustion of polymers;
- Improper use of the product, imposing bodily risks;
- Contamination of the environment.



WARNING

Ti7 should not be mixed with household waste.

Dispose the product appropriately in accordance with the regulations in force in the country of use.

1 System Overview

The Ti7 is a complete system of precision agriculture guidance which features the following functions:



GUIDANCE



FERTILIZER VARIABLE
RATE CONTROLLER



SEED
MONITORING



SEEDING
CONTROLLER



SPRAYER
SECTION CONTROL



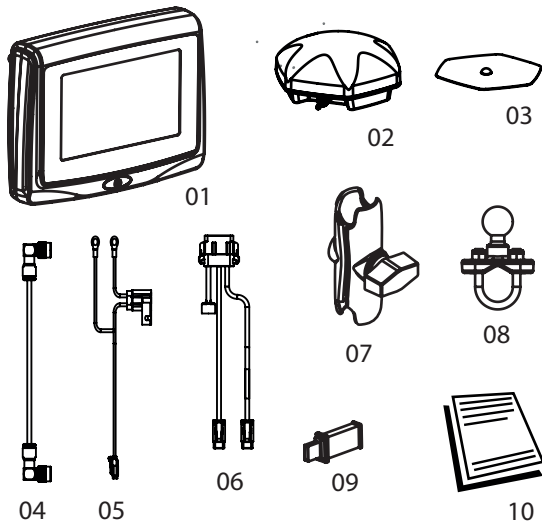
AUTO PILOT



IMPORTANT

The images in this manual are only for reference. Individual screens and icons may differ from the current items.

1.1 System components



Item	Description
1	Ti7 Monitor
2	GNSS Antenna
3	Antenna fixation plate
4	Antenna cable
5	Power cable
6	Horn
7	Arm - mounting bracket
8	Ball - mounting bracket
9	USB Flash Drive
10	Product documentation

1.2 Views



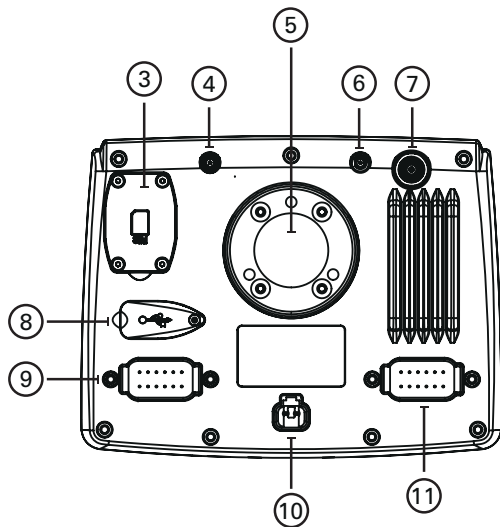
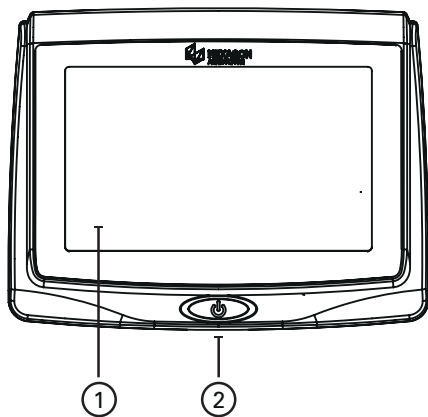
WARNING

Touch screen operation

The Ti7 is designed to be used with the touch of your fingers on the screen of the monitor. Do not operate with sharp objects, such as pens or screwdrivers as these may damage and affect the warranty of your equipment.

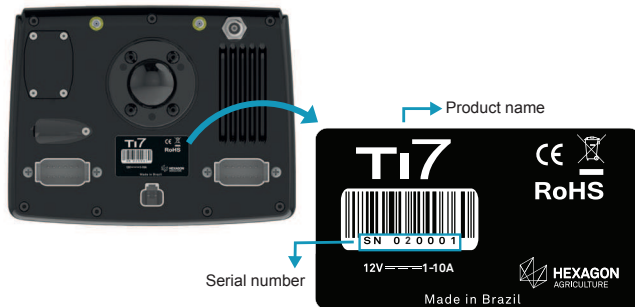
Type	Description
1	7" color touch screen
2	Power button
3	SIM card slot
4	GPRS connection
5	Fixing bracket
6	Wi-fi connection

Type	Description
7	GNSS antenna connection
8	USB interface for data transfer
9	CAN communication port
10	Power connection (12V)
11	Connection of inputs and outputs



1.3 Product identification

The indication of the type (model) and your product serial number are on a label on the back of Ti7. Record the type and serial number in your manual and always inform this data when connecting the service center.



2 Installation

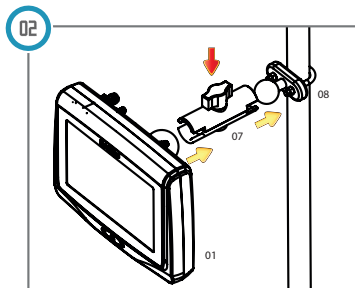
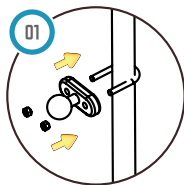


WARNING

The installation of the equipment must be carried out by a qualified technician.
Read the safety instructions before performing the installation steps.

2.1 Ti7 Install

Find an appropriate location to assemble the Ti7 monitor, which must be within reach of the operator when seated in a normal operating position and apparent in front of the operator's field of vision.



1. Mount the ball support at the desired location of the vehicle. To mount the ball involves the arc around the tube, insert the base and secure with hex nuts. Use a socket wrench for better grip.



WARNING

Do not assemble the Ti7 in a place where it can be reached by an airbag.

2. Connect the mounting arm ball and the monitor support, fixing firmly through the clip;
3. Position it in a location visible to the operator and verify that the assembly is tight and secure;
4. Connect the power cable to a battery or location indicated by the manufacturer of the machine and the other end to the back of Ti7.
5. Connect the horn cable in the connector indicated by number 11.

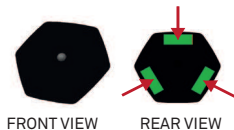
2.2 Antenna install



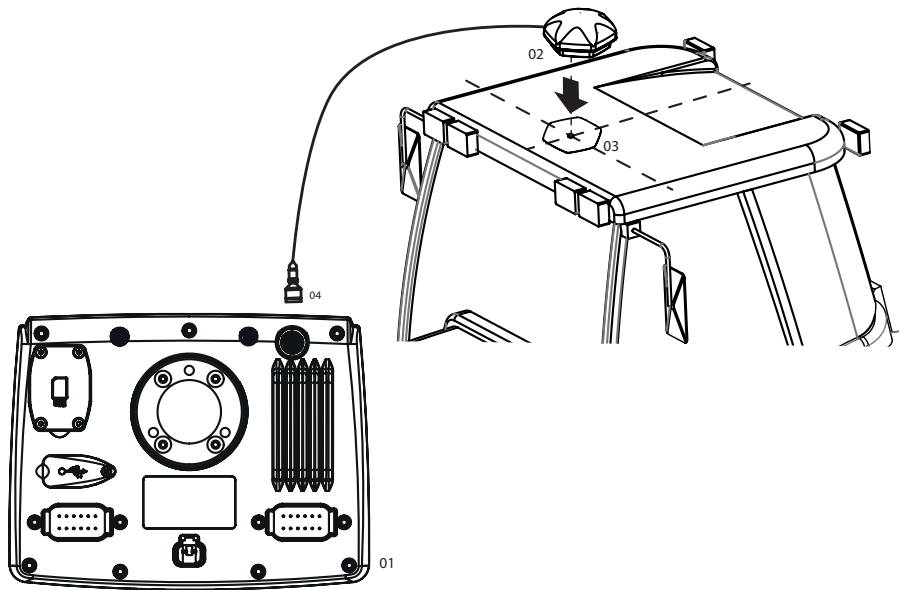
WARNING

Clean the roof of the cabin to prepare the antenna install. The product recommended for cleaning is isopropyl alcohol.

1. The Ti7 antenna should be mounted on the roof of the vehicle, preferably in the center line of the vehicle and further possible on the flat part of the ceiling;
2. The installation area must be clean and dry;
3. Attach the GNSS antenna on the roof of the vehicle. It has magnets that fixate on the metal roof of the vehicle. In case of vehicles with non-metallic roof, use a metal bracket for fixation. In this case, glue the double-sided tape on the back of the bracket as shown in the picture. Remove the plastic protective tape and paste on the vehicle roof.



4. The cable must not be cut, twisted, or excessively bent, because its execution may be degraded and the system may fail. The cable must be connected correctly behind the Ti7. The antenna should be mounted horizontally and not inclined to ensure optimum reception of GNSS signal.

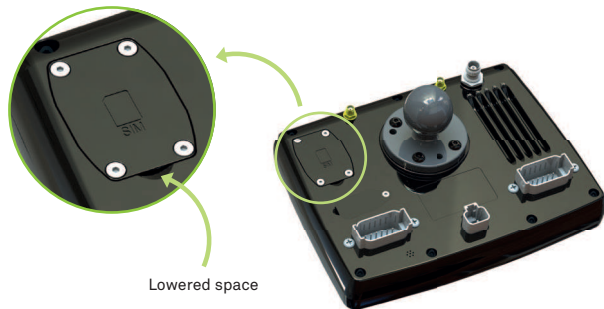


2.2 SIM card install

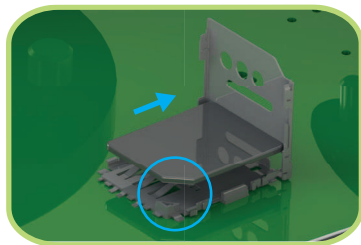
To access the remote communication in systems equipped by internal modem, it is required to use a SIM card.

To install it proceed the following way:

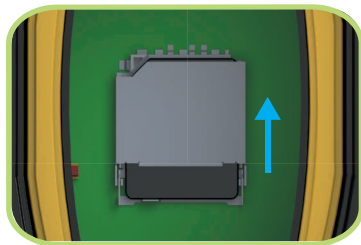
In the rear part of Ti7, remove the four screws indicated in the figure below. Use the lowered space to facilitate opening the cover.



Pull the fitting down and open at 90 degrees.



Insert the SIM card in the slot, checking the right positioning thereof, close the opening and push upwards until hear the clamping.




3 Running the Ti7 for the first time

3.1 Connecting your monitor







WARNING

It is recommended to start the vehicle before starting the trip computer.

To turn the monitor on, press and hold the power button  on the front of the module for 1 second. The working section screen appears on the display of the Ti7.



1. You can select an existing section or create a new section. To add a new section, press the button New;
2. A new window will appear “New Work Section.” Touch  **OK**;
3. Click New to insert the name of the Farm with a maximum of 12 letters. Confirm the name and press  **OK** to enter the name of the Field;
4. Click New to insert the name of the Field with a maximum of 12 letters. Confirm the name and press  **OK** to enter the name of the Activity;
5. Click New to insert the name of the Activity with a maximum of 12 letters. Confirm the name and press  **OK** to go back to work section screen;
6. By activating the box Open last job on start the work section screen will no longer appear when connecting the equipment, starting directly in the operating window, and in the last section;



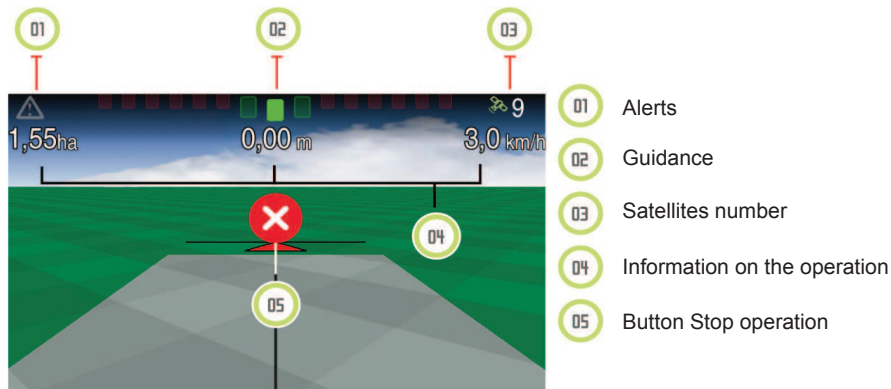
IMPORTANT

To disable the option “Open last job on start “, select the Work Section button in the settings menu.

7. Click  **OK** to save and complete the operation performed.

3.2 Main Navigation Screen

After selecting the working section, the operation screen is displayed. During operation there will be visible only the information and features displayed in the figure below, in order to provide a broader view of the field.



3.2.1 Menu buttons on the left of the screen

When you drag your finger from the left corner of the screen to the center, you will see a tab with buttons.

Guidance

Buttons for settings of the reference lines Guidance.

View

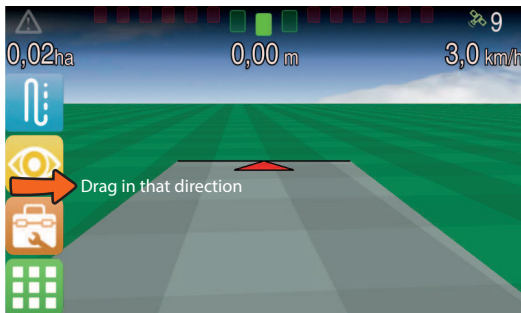
Buttons for Guidance View Form, screen intensity and delete trace.

Tools

Perimeter Marking;
Flags and lines marking.

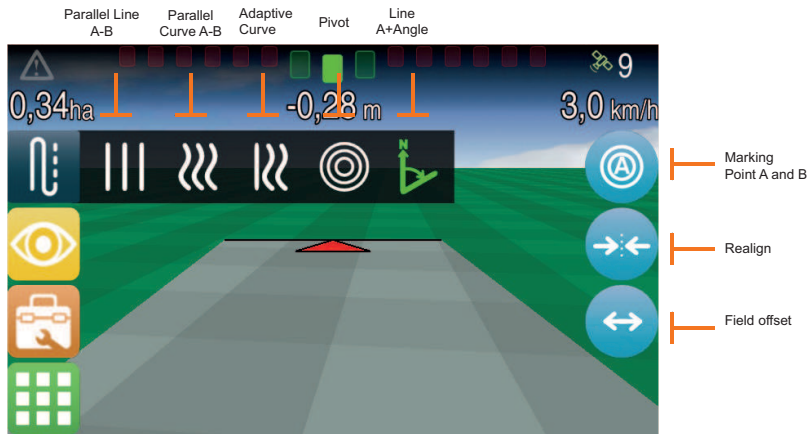
Configuration Menu

Access to the main menu.



3.2.2 Guidance Menu

When pressing the guide button, five types of lines are available. In the menu on the right, the row orientation buttons are displayed.

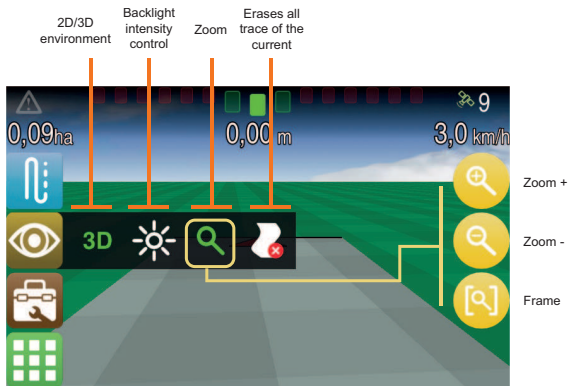


IMPORTANT

Further explanations on the functionality of the buttons above, see chapter Guidance.

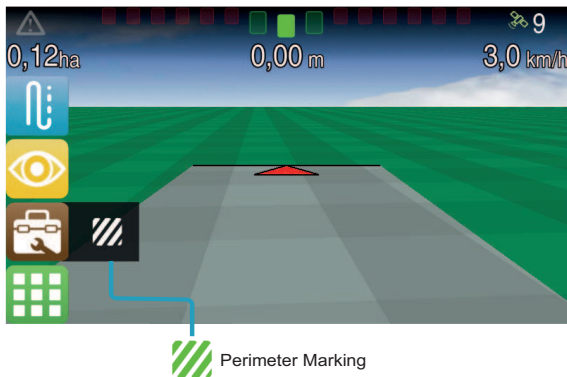
3.2.3 Display Menu

When pressing the display button, you can change the viewing environment 2D to 3D, change the screen brightness and clear the trace of the current section.



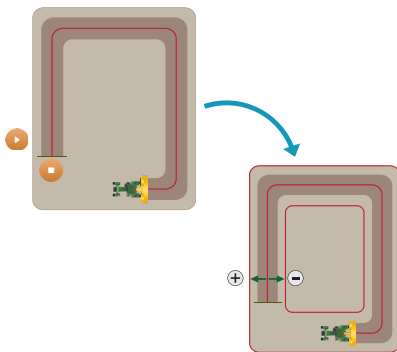
3.2.4 Tool Menu




In the button Tool Menu, these functions related to Perimeter Marking, trace and flag are available.



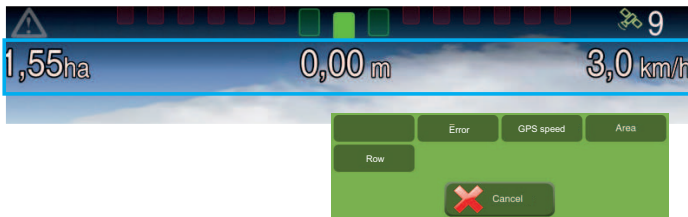
3.2.4.1 Perimeter Marking

With the Tool Menu it is possible to delimit the perimeter of an area. To do this, proceed as follows:



1. Press the button  Perimeter and then press  **Start**;
2. Enter the name of the new map;
3. Enter the lateral displacement (m) for marking the perimeter. For positive values the line is shifted out of the agricultural vehicle marking and for negative values the line is shifted into the markup; For example, if you are operating an 18-meter bar sprayer inside the field, add 9 meters positive for the sprayer pass over the field end line.
4. At the end of the perimeter marking, press  **Stop**.

3.2.5 Information settings



On the operational screen there can be displayed up to 4 information. To modify them, press and hold for 2 seconds up on the information. A new window opens for selection of information to be displayed. Information options vary according to the implement setting in use.

To add new information, press for 2 seconds in the marked area with rectangles in the figure above.

To delete, press for 2 seconds over an information and click on the button that does not contain information.

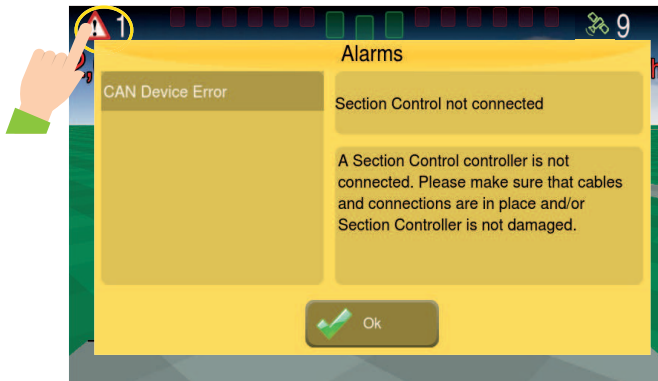
3.2.6 Alarms



IMPORTANT

Before starting any operation, make sure that no alert is active.

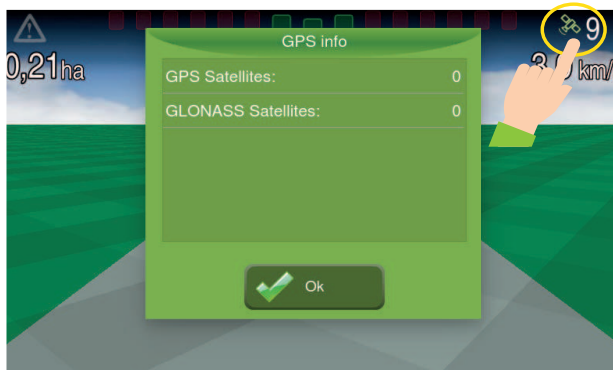
In case of any alert, press the alert icon. A bar will be displayed with information relating to the alert and how to solve a problem.



Information	Description
Motor	Motor is not spinning at the speed indicated.
Speed	Operation out of the speed range.
Diff	GNSS could not synchronize Diff.
GPS without communication	Ti7 can't communicate with the GNSS.
GPS synchronizing	GNSS is synchronizing with the satellites or looking for satellites
CAN	Indicates that there is some error in the CAN connection, and may be the lack of any connected device, any device connected that shouldn't be, or even if a device is in conflict with another.
External Power Supply	External power supply is faulted in some driver.
Seed Monitoring	Error in some activity out of Seed Monitoring.
Energy	Battery voltage is low.

3.3 GPS information

Press the GPS signal button in the upper right corner of the screen for GPS information.

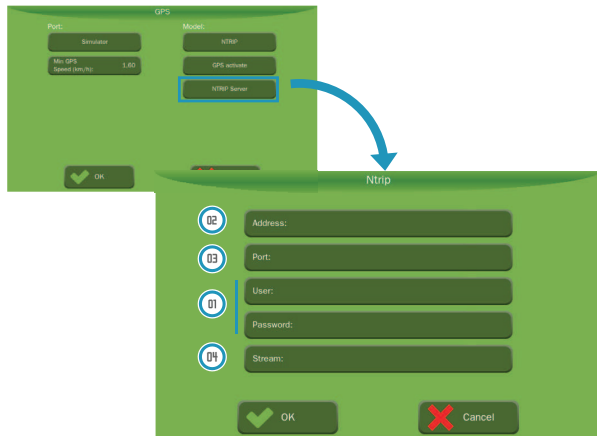


3.4 NTRIP Server

NTRIP is an RTK service which correction is transmitted over the Internet using the 3G network available.


To enable support NTRIP, press on the GPS button in configuration menu. The system mode should be advanced to the GPS button becomes available. In GPS model select NTRIP.

The configuration button NTRIP server will be available on the GPS screen.



1. Enter the user and password data (1);
2. Enter the address (2) and its server port (3);
3. In Stream (4) the points of closest correction your location will be listed. Select the desired location and presione OK.

3.4 Turning off your monitor

Press the on/off button on the front of the module until the confirmation box appears. Select  **Yes** and wait until the screen turns off.



WARNING

Do not disconnect the monitor from power before the screen turns off completely.

4 Setting

IMPORTANT

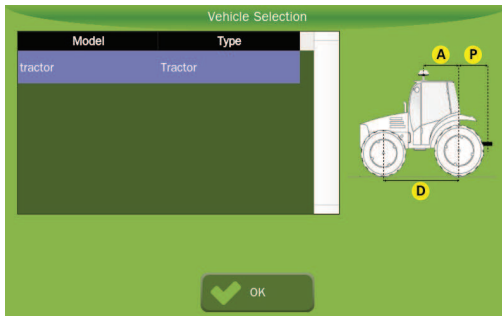
When starting for the first time only the Vehicle, Implement and Work Section buttons will be enabled. So that the Guidance, Auto pilot, Planting, Spraying and Fertilization buttons are active it must be first made the activation and registration of the vehicle and implement.



Function	Description
Guidance	Guidance related settings.
Auto Steering	Settings related to the electric and hydraulic auto pilot.
Fertilization	Dosing and input of fertilization settings.
Spraying	Dosing and spray nib settings.
Planting	Planting related settings.
Vehicle	Selection of the vehicle that will be used in the operation.
Implement	Selection of the equipment that will be used in the operation and execution of tests.
GNSS	Inactive in normal mode.
Jobs	Selection of the location (folder) in which there are written the data collected by the monitor.
Files	Location to extract data and/or insert maps via usb flash drive.
Settings	Displays information about the Ti7.
Start	Enters the operation mode of the Ti7.

4.1 Vehicle

Select the vehicle, an illustration of it will be shown.



IMPORTANT

If there are none vehicles created, you will not be able to access the Settings Menu of the Autopilot.







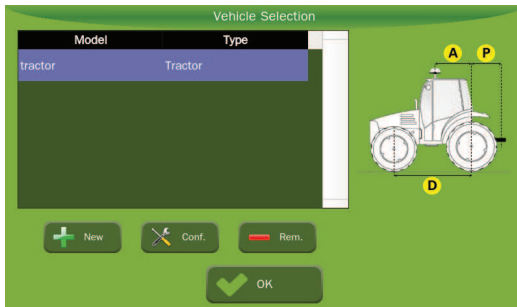
WARNING

If selected a wrong vehicle or with wrong information all work may be incorrect.

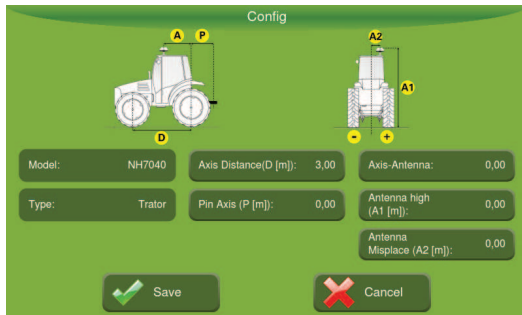
4.1.1 Inserting a new vehicle

To insert a new vehicle, follow the steps below:

1. Enter the settings screen and press the button  **Settings**;
2. On the Settings screen, click **Advanced** System module;
3. Confirm the operation by clicking  **OK**;
4. Enter the screen  **Vehicle**;
5. Select button  **New**.






6. Enter your vehicle measures in meters. For measurements less than 1 meter, insert the value in fractional form. For example, for a measurement of 60 cm insert the value of 0.60. Before taking the measures, make sure the vehicle is on level ground and straight, with the center line of the body parallel to the wheels.






7. After introducing all necessary measures of the Vehicle, press  **Save**.

4.1.2 Configuring the vehicle

1. Verify if the Ti7 is in the **Advanced** System Module;
2. Enter the screen  **Vehicle**;
3. Select button  **Settings**;
4. Edit the desired fields;
5. Press  **Save**.

4.1.3 Removing the vehicle

1. Verify if the Ti7 is in the **Advanced** System Module;
2. Enter the screen  **Vehicle**;
3. Select the Vehicle you want to remove;
4. Press button  **Remove**;
5. Confirm the operation by pressing  **OK**.


4.2 Implement

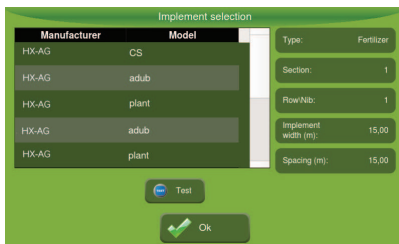


IMPORTANT




According to the implement selected there are enabled or disabled functions in the Settings Menu. For example, when selecting light bar it will only be enabled the function Guide and Auto pilot (if a Vehicle is configured).

To select an implement proceed as follows:

1. Select the type of implement in the box in the left of the screen;
2. Verify if the information is correct, and then tap  **OK**.



4.2.1 Adding, deleting, and editing new implements

1. Enter the Settings screen and press button  **Setting**;
2. On the Settings screen, click **Advanced** System Module;
3. Confirm the operation by pressing  **OK**;
4. Select button  Implement.

Implement selection

Manufacturer	Model
HX-AG	CS
HX-AG	adub
HX-AG	plant
HX-AG	adub
HX-AG	plant

Type: Fertilizer

Section: 1

Row/Nib: 1

Implement width (m): 15,00


Spacing (m): 15,00

+ New ✂ Edit 🔄 Test - Delete

✔ Ok

- To add, press **+ New**;
- Enter the requested data and press **✔ Create**;
- Enter the settings of the agricultural Vehicle and press **✔ Save**;
- To edit the data, tap **✂ Edit**;
- Edit data and press **✔ Save**;
- To eliminate the implement, click **- Delete**;
- Confirm the operation by pressing **✔ Yes**.

4.2.2 Tests

By pressing  **Test** you have access to tests relating to registered implements.



IMPORTANT

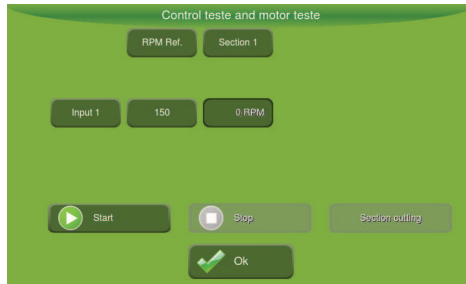
In tests using implement hydraulic motor, place the Vehicle with the motor in the rotation recommended by the manufacturer (i.e., 1,800 RPM on a tractor) for a minimum flow of 48 l/ min in the hydraulic system.

Motor Actuator

Test to verify if the hydraulic motors are working properly.

Procedure:

1. Actuate the hydraulic system of the vehicle and place in the rotation of work;
2. Press **▶ Start**;
3. Reduce the reference value until the read value does not coincide with the set value anymore. This read value is the RPM Min. value;
4. Increase the reference value until the read value does not coincide with the set value anymore. This read value is the RPM Max. value;
5. Verify if the readings are consistent with the reference;
6. Press **◻ Stop** at the end.

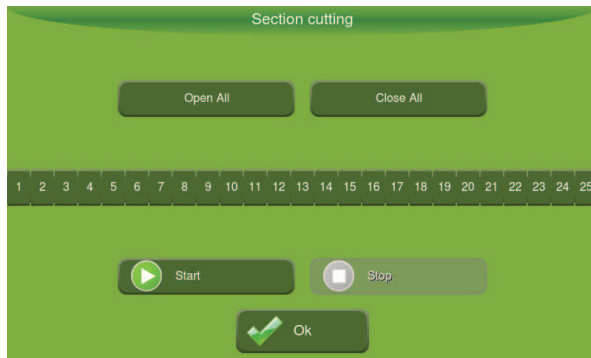


Section cutting test



IMPORTANT

Test available only for planters equipped with clutches.



Procedure:

1. Press **▶ Start**;
2. Press the buttons to check the operation: Open all, Close all or;
3. Individually select each section that you want to turn on or off by tapping the number of each;
4. Press **◻ Stop** after checking operation.

Seed Sensors

Test performed to check or install the entries and modules that are connected to the sensors.


Available in two modes:

Modes	Description
Test	Used to verify if the rows are connected correctly to the doors of the modules, triggering the sensors through the passage of seeds or fertilizer.
Installation	Used for automatic settings of the inputs on the modules those are connected to each seed and fertilizer sensor (if available).

Procedure:

Planting monitor instalattion test

Row:	-	Mode:	Test
Module:	-	Restart	
Input:	-		
Tested input:	0		
Need input:	25		
Available Input:	54		

 Ok

1. Press **Restart**;
2. Place seed or fertilizer in order to trigger the sensor and check which input, and line module has been activated;
3. Verify if that is correct.

Installation mode procedure:

Planting monitor installation test

Row:	-	Mode:	Installation	Box:	Seed	02
Module:	-		01		Start	03
Input:	-				Stop	
Tested input:	0				Back	
Need input:	25				Skip	
Available input:	54					

Ok

5. Press the box mode (1) to change to Installation;
6. Select the Seed box or Fertilizer box (2);
7. Press Start (3);
8. It will be indicated in which line number must be triggered the sensor;
9. Insert at least 3 seeds. It will be identified automatically the input module the sensor is connected to;
10. After the test ends, the next row will begin to be shown and so on.

Flowmeter Calibration



Procedure:

1. Configure the Reference (PPS) with the average value of working pressure of the spray nib used. For example, if you are using a spray nib that works from 2 to 6 BAR, fit the PPS for reading 4 BAR in the gauge;
2. Place the sprayer in the rotation and the collection container in the correct position;
3. Adjust the time using the arrow keys and press **▶Start**;
4. Finished the count, the system automatically closes sections;

5. Verify if the value on the flowmeter is close to the reference value;
6. Multiple the value collected from a nib (or average, in the case of using two or more burners) by the total number of nibs and notify the Volume to the on-board computer;
7. The on-board computer will inform the Relation (PPL).

Seed Calibration

This simulator has the function to verify:

- the operation of the seed dosage hydraulic motors;
- wheel speed;
- correct detection of the number of seeds in each row.

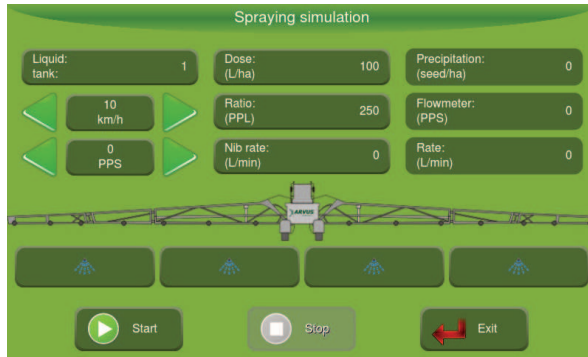


Procedure:

1. Enter the RPM reference for hydraulic motors;
2. Select the number of the section that will be active in simulation;
3. Select the wheel section number which will be used as a reference speed;
4. Press **▶ Start**;
5. Verify if the counters and motors are working properly;
6. Press **Stop**;
7. Verify if the number of seeds read by the sensor and collected are equal;
8. If the values are more than 5% apart, adjust the Sensor Adjustment value (%), stating the calculated difference in percentage. Follows formula for calculation:

$$\text{Sensor Adjustment (\%)} = \left(\frac{((\text{Seeds Collected})}{(\text{Seeds Read on Sensor})} - 1) \right) \times 100$$

Spraying simulator



Procedure:

1. Set the minimum and maximum flow in **Nib rate**;
2. Enter the value of the Dose (L/ha);
3. Turn on the water pump and put the spray on work rotation;
4. Press **Start**;

5. Put the value of Reference in "0" PPS and increase gradually, making sure that the value of the **Flowmeter (PPS)** follows, until the pressure gauge located on the hydraulic command indicates the minimum amount of pressure for the spray nib used or until the range of application is satisfactory;
6. Repeat the process from the minimum value until the pressure gauge indicates the maximum amount of pressure or the range of application is satisfactory, taking care to ensure that the value of the **Flowmeter (PPS)** follows the reference;
7. If the value of the speed (km/h) is not compatible, make the exchange of nibs for different flow rates.



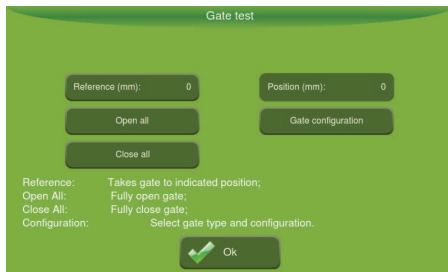
IMPORTANT

As the flow rate of the system is different for each type of nib, this procedure should be repeated every time there is a change in the spray tip.

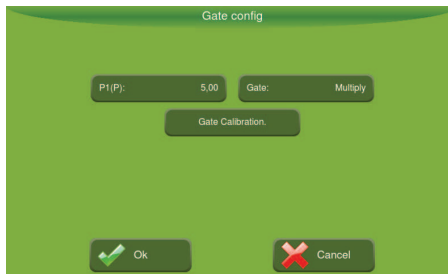
Gate Test (Optional function)

Procedure:

1. Enter the Reference to trigger the gate to the desired position;
2. Tap **Open all** to open completely the gate;
3. Tap **Close all** to close completely the gate;
4. Check the current position of the gate in the Position box;



5. Select Gate Configuration to select the Gate type (Fixed, 2 or multiple stag-



6. For gain adjustment, set a reference value on the Gate Test screen and wait for the gate to reach such reference:
 - Increase the gain if the gate stops too far from reference,
 - Decrease the gain if the gate fails to stabilize near the reference.



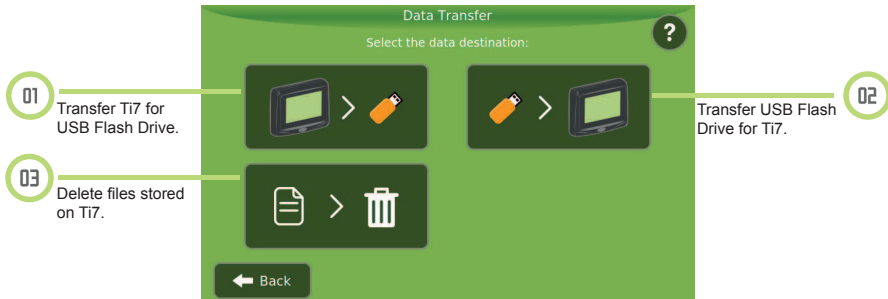
IMPORTANT

If the values of the position are reversed, the position of the sensor should be reversed.

7. Press Gate Calibration, to calibrate the gate;
8. Tap Next so that the gate is closed.

4.3 Exporting and importing data

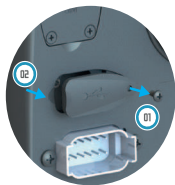
Data transfer between the Ti7 and a USB flash drive is made by the menu Settings - Files.




4.3.1 Transfer Ti7 for USB Flash Drive

To export the data with field information stored in Ti7 for USB flash drive, follow these steps:

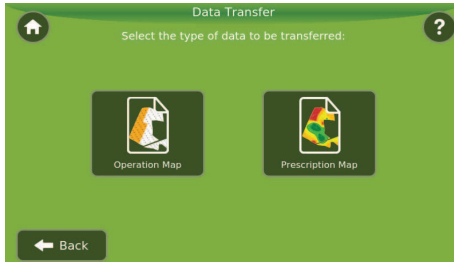
1. The USB interface is located on the back of Ti7. Remove the protective cap screw and use the recessed area to facilitate the opening thereof. Insert a compatible USB flash drive into the USB port.




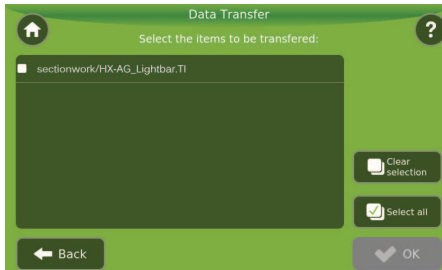
2. Touch the button,  Export to USB.
3. Select the type of data to be transferred: Operation Map or Prescription map.

Operation map: Map containing information collected by Ti7 such as seed sensor line to line, date and time of GPS, tractor error in relation to the guide, application of seeds, fertilizer, liquid, application wide, tractor speed, alarms, data collection once per second and more.

Prescription map: Maps with application recommendations.



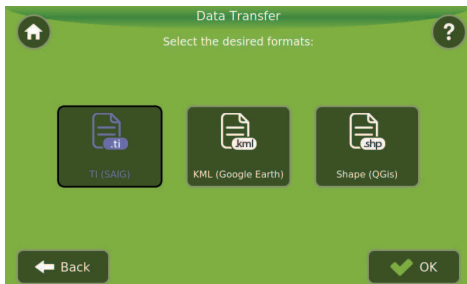
4. When selecting **operation map** is listed items that can be transferred. Choose one item or more and press  OK.



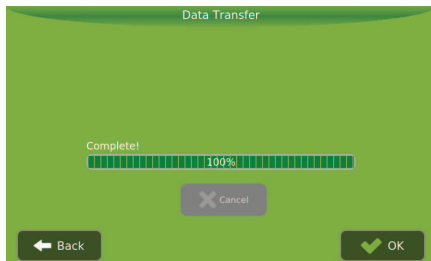
5. On the next screen are offered the options to export data. Operation map data can be exported in the following formats:


- Ti (SAIG) files;
- Google Earth kml files;
- shapefile shp, dbf, prj and shx files.

It is possible to select more than one format for export.



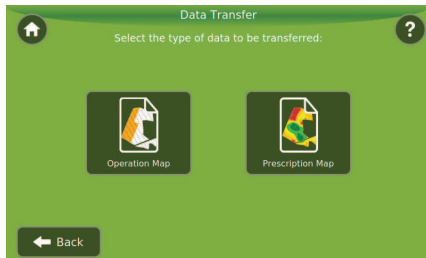
6. After selecting the desired formats press  **OK**.



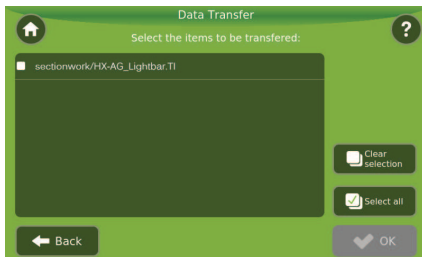
7. Press  OK again to complete the process.

You can also export the prescription maps. In this case, follow the procedure below:

1. Press Prescription Map;



1. Select the map to be downloaded and press  OK;




3. Wait for the transfer and press  OK.

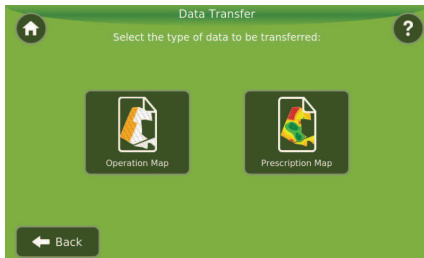
4.3.2 Transfer USB Flash Drive for Ti7

To import the data stored in the USB Flash drive for the Ti7, follow these steps:

1. The USB interface is located on the back of Ti7. Remove the protective cap screw and use the recessed area to facilitate the opening thereof. Insert a compatible USB flash drive into the USB port.



2. Select  Import Files the pen drive for T17.
3. Select the type of data to be transferred: Operation Map or Prescription map.

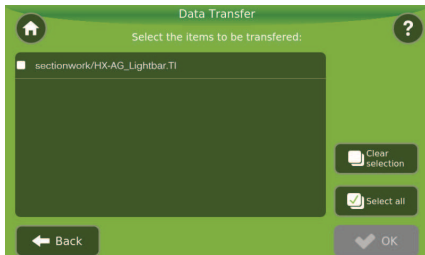




IMPORTANT

Importing the Operation Map used to load maps for simulation.

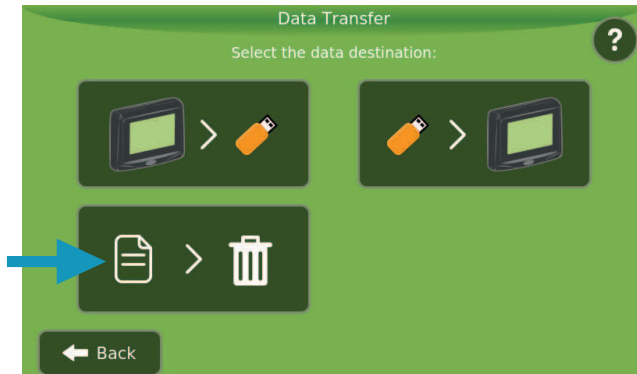
4. Select the map to be downloaded and press OK;





5. Wait for the transfer and press OK.

4.3.3 Ti7 delete data

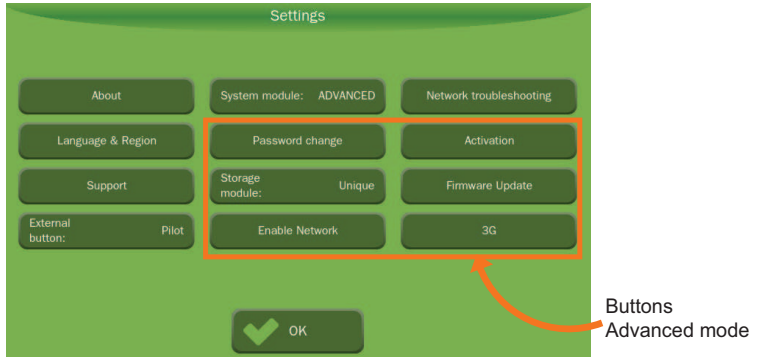
To delete Ti7 data come into File menu and select “**Delete Files.**”



1. Select the type of file you want to delete in map application or recommendation map.
2. Select the item and press  OK.
3. Wait for the progress and press  OK.

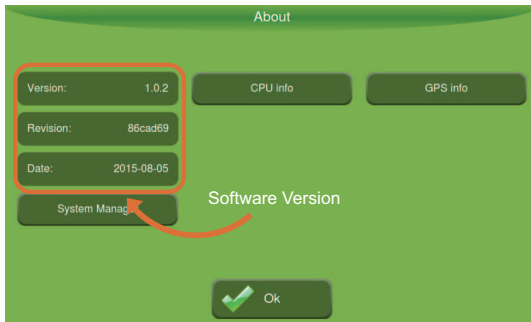
4.4 Settings

On the settings screen general system data are available.



4.4.1 About

It informs the version of the Ti7 software, the temperature of the processor (CPU) and the screen (LCD) and brings information on the GNSS data.



4.4.2 Language and Region

In this screen, it is possible to choose the language of information visualization in the Ti7.

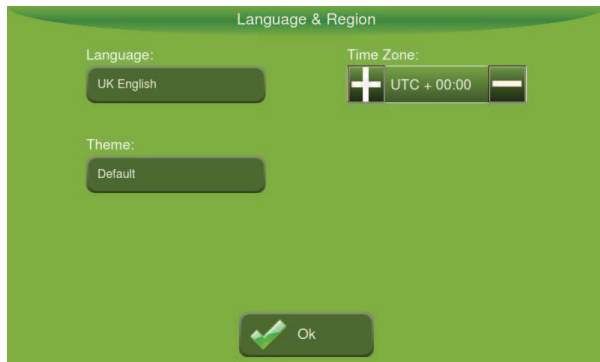
To select the language, touch the language and region button.

1. Select the language desired.
2. Press OK.

For time zone specified in Time Zone:

Press + and - to inform local time. Each touch changes the offset of the time by 15 minutes from the UTC (Coordinated Universal Time).

In theme, you can select the maps, trace and overlap colors.



4.4.3 System Module

Allows modifying the mode by entering the password for normal or advanced.

Normal: Level where the end user has access only to the basic functions of operation. It is the level dedicated to the operator.

Advanced: Allows access to advanced settings and implement issues. It is the level dedicated to the technician.

4.4.4 Support

Access to the installation configuration, settings and advanced tests for specialized technicians.

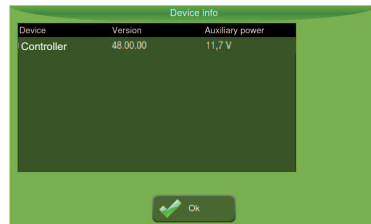
4.4.5 Network Troubleshooting

Display of drivers connected to the CAN network

Commands	Description
OK	All function drivers are connected.
NC, X	Function driver number X is not in the network.
EX, X	Spare Driver X in the network.
Conflict	Two drivers with the same address.
Not installed	Implement does not require this type of driver.



- 01 Clears the address of all devices connected to the CAN.
- 02 Checking of the FW version.
Checking of the Power Supply voltage.



The information of the table below is available only for users in advanced system module:

Information	Description
Password change	Allows you to change the password of access to the Advanced Mode.
Storage module	Single - A single file per section of work. Diary - Splits per day of operation.
Activation	Enter the activation of new implements.
Enable network	Enables Remote Connection (3G or GPRS)
Firmware Update	Drives software update. Available only for skilled technicians.
3G	More information in section 4.4.7.

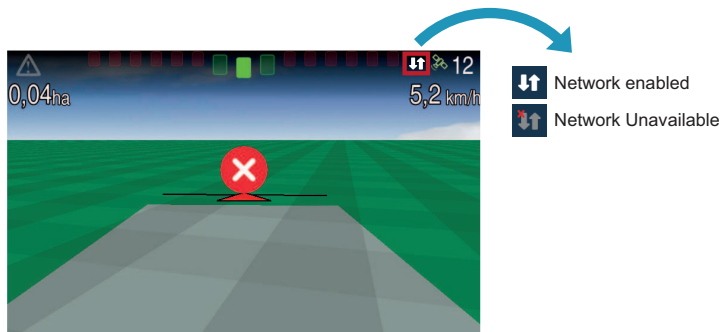
4.4.6 Settings 3G network

1. Enter the configuration menu and press the Settings button.
2. On the Settings screen, press Advanced Mode.
3. Press the button **3G**.



4. Press the “Detect Settings Automatically”, so that the data indicated as number 2 are filled in automatically. This option may not be available on all models of SIMCard 3G.
5. Fill the data given to 2, if these were not detected automatically. This information is provided by the mobile internet service provider.
6. Place the state as Active (3) to enable the network.

The screen operations, the top bar will be available 3G network icon, which can have two states:



5 Guidance

Navigation aid systems allow for the economy of inputs and better use of the work area, once they minimize overpassing during application of inputs and treatment of culture.

Feature the following working precision by up to 95% of the time:

Use this configuration	For
GNSS L1 - GPS+Glonass	28 cm (passages up to 30 min.)
GNSS L1/L2 - GPS+Glonass	15 cm (passages up to 30 min.)
GNSS L1/L2 with TerraStar	4 cm (absolute)
RTK	2 cm (absolute)

5.1 Setting

The setting for guidance is available in the Settings Menu Guidance button.

Guidance

Width: (m)	10,00	Curve Configuration	02	
Sensibility: (m)	0,15	Reverse Detector	03	
Side overlap (m):	0,00	Odometer	On	04
Activity Overlap:	No	Perimeter	05	
Overlap rate (%)	100	Erase perimeter		

Ok Cancel

5.1.1 Parameters

To change the value of a parameter, field 1 of the figure above, press the desired option, and then type the value in the window.

5.1.1.1 Width

Indicate the value of the width of the passing according to the implement selected.

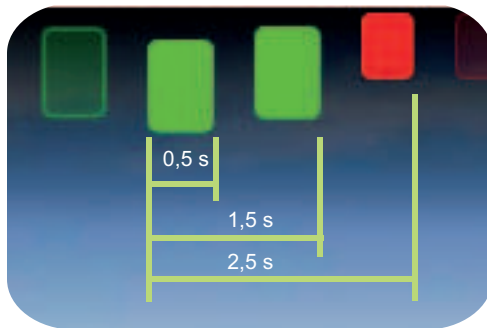
5.1.1.2 Sensibility (m)

Specify the deviation necessary to light an LED guidance.

This value is associated with the 5 LEDs of the central position of the guidance. For other LEDs, the on-board computer divides the remaining width value passing between each of the LEDs. To:

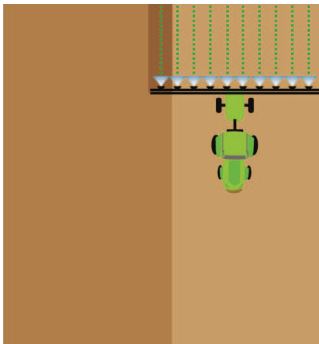
- increase sensitivity, decrease spacing;
- decrease sensitivity, increase spacing.

Example: to enter a sensitivity of 15 cm type 0.15.



5.1.1.3 Side overlap

Overlap application (remount). Mainly used in the sprayer implements.



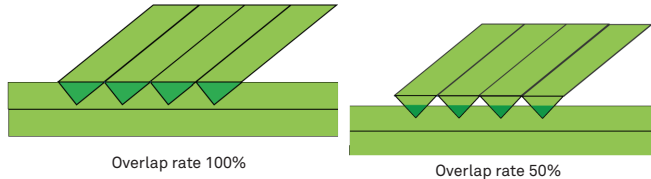
5.1.1.4 Activity Overlap

Apply again in area already applied, overlapping the activity on application map.

5.1.1.4 Overlap rate (%)

Apply the percentage of overlap necessary for the implementation or a section to turn off automatically.

For example: To put the overlap rate in 50% and the section having length of 4 m, when superimposing over 2 m, this section will be switched off.



5.1.2 Curve configuration

Curve Configuration

01

Maneuver Detection:

Angle Delta (degrees) 100

Distance: (m) 15

02

Adaptative Detection:

Error: (m) 0,00

Distance: (m) 0,00

03

Curve detection:

Between Points: (m) 0,00

Spline Points: 0

Curve Filter: 0,00

Minimum Radius: 0,00

Ok

Cancel

5.1.2.1 Maneuver Detection

The maneuver detection is the point at which the system detects that the agricultural vehicle has reached the end of the row. To indicate this maneuver, the operator must turn the tractor more than 90 degrees indicating that it is coming back.

Enter the Delta angle (degrees) and the distance in meters between lines so that the onboard computer finalizes the capture of an adaptive curve (detects the movement of U at the end of the row).

For example, as shown above, the Ti7 will consider that the operator has completed the capture of adaptive and will generate new rows based on the new reference, so the tractor direction ranges over 100 degrees (Delta angle) in the last 15 meters of displacement (Distance).

5.1.2.2 Adaptive Detection

In adaptive detection, the operator enters the parameters used to start capturing a new adaptive curve. For example, using data from the figure above, so the operator travels a distance higher than 5m (distance) with an error higher than 0.30m (Error), the Ti7 will start capturing a new adaptive.

5.1.2.3 Curve Detection

Parameter to filter (pilot navigation) and smooth the curve obtained.

Between points

In the detection of curves between points, the onboard computer performs a pre-filtering of points obtained upon acquisition of the curve. The operator enters the minimum distance between the two points. In the figure above, Ti7 will use only the points captured every 3m to generate the reference curve

Spline Points

Softens the final trajectory inserting intermediate points on the curve to be displayed to the operator. This parameter does not affect the driver's behavior; however, raising it brings in a greater load on the processor and slowness in the calculation of parallels. Recommended value 3.

Curve Filter

The curvature filter serves to soften the curvature in the control of the pilot. If the value used is 1 m, for example, the curvature used in control will be the average of the points 1 m forward from the current position.

Minimum radius

The minimum radius is the smallest radius that can be done comfortably without causing damage to the Vehicle or implement. In this field you can enter the value of the radius more suitable to your Vehicle.

For example, in generating a new curve, if it has a path with a radius lower than indicated, Ti7 softens the affected region to make it driveable by the pilot. If you wish to disable the function, you can put zero in this parameter.

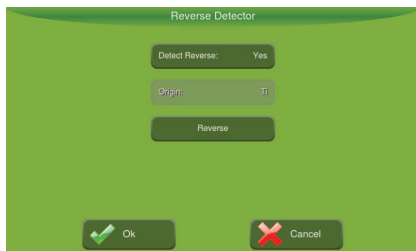
5.1.3 Reverse Motion Detection

Enable this feature so that Ti7 detects automatically when the tractor is in reverse.

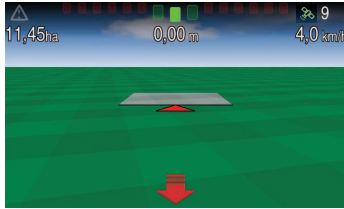


IMPORTANT

It is recommended to keep this option active for the correct marking of the trace and so the auto pilot functions well after a reverse.




In the Operation screen, while Ti7 is detecting reverse, a button with a red arrow downward indicating the reverse detection will be available. If the tractor is moving forward, not backwards, the operator should click this button to make this indication.



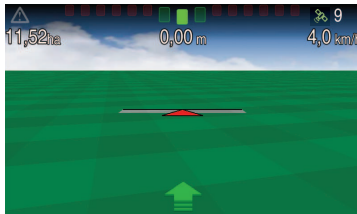
When starting a movement forward, a green up arrow indicating this movement will appear. This arrow will be available for 10 seconds.



WARNING

Press the icon  to indicate the correct movement if the tractor is moving backwards not forward.

The occurrence of a false move is more common to the first GNSS timing or after a long period stopped of the tractor. But it can happen even with the moving tractor.



5.1.4 Odometer

The operator enters the maximum distance and the point at which they want to receive the alarm. The system shows the progress of distance and alert when is near the maximum limit thereof online. It can be used in other operations or as a simple odometer.

To enable the function leave On in the Guidance menu.

5.1.5 Perimeter

For selection of perimeters already saved, press the Perimeter button and select the desired area.



To clear the perimeter , press the erase perimeter .

5.2 Types of guidance



IMPORTANT

Before starting the operation, it is IMPORTANT to verify if the dimensions of the Vehicle and implement are correct.



WARNING

For the Guidance to work correctly, it is needed to verify if the GNSS is presenting the correct operation. Do not start while the alerts “Synchronizing GNSS,” “GNSS without communication,” “DIFF” are shown, or with number of satellites below 4.

Types of guidance serve to define a row in the field. The Ti7 operates in:

- Line A–B;
- Line A+Angle;
- Parallel Curve A–B;
- Adaptive Curve;
- Pivot.

5.2.1 Parallel Line A-B





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



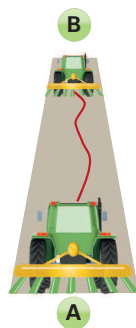
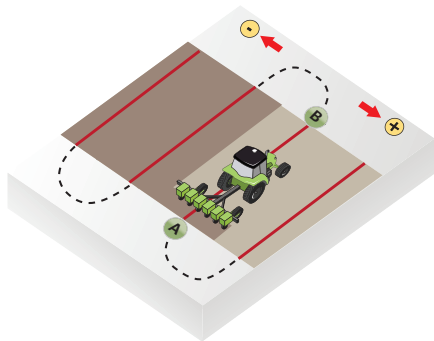
WARNING

The linear trajectory must be set before the self-direction is used.

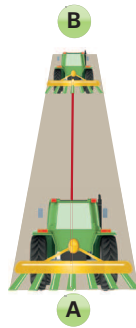
Configuring path points

1. On the operation screen, tap the button  **Guidance**;
2. From the submenu, select the trajectory mode as  **Linear**;
3. Position your Vehicle in the field about the point where you want to start and press  **Point A** to mark the beginning of the row;
4. Drive to the desired end point in the field and press  **Point B** to mark the end of the trajectory. The shortest distance between the route points A and B is 30 meters.

At the end of this procedure it is created a reference row 0 (zero) and parallel rows to both sides. Rows on the right will be positive (+) and the rows on the left will be negative (-). Consider point A is behind the tractor and point B ahead of it. Even if between point A and B do not cross a rectilinear path, references to this guide are taken only from two points made.



WAY DONE







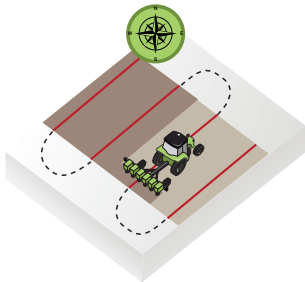
Guide read by Ti7

5.2.2 Line A+Angle

The linear trajectory A + Angle is used to define a row in the field in which all rows of work are parallel and are defined through an initial route point and a defined angle towards north.

Configuring path points

1. On the operation screen, tap the button  **Guidance**;
2. From the submenu, select the trajectory mode as  Line A + Angle;
3. Position your Vehicle in the field about the point where you want to start and press  **Point A** to mark the beginning of the row;
4. Press button  **Point B** and enter the degree. The reference row uses as a base the North-South row.







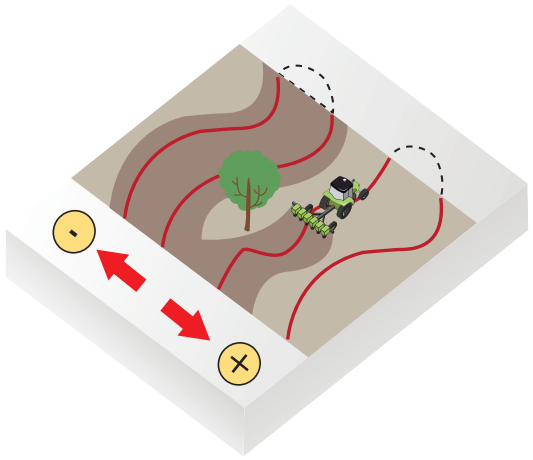
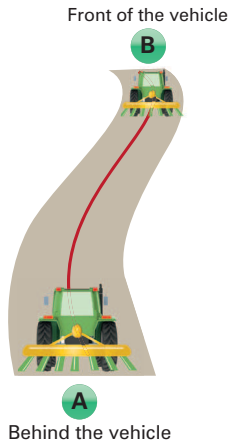
At the end of this procedure it is created a reference row 0 (zero) and parallel rows to both sides. Rows on the right will be positive (+) and the rows on the left will be negative (-).

5.2.3 Parallel Curve A-B

The parallel curve A-B is used when you want to work with an area of soft curves. This keeps the exact path between points A and B, instead of creating a straight line. All the following guidelines will match the reference row, leaving visible only the reference row and the reference in which the tractor is passing.

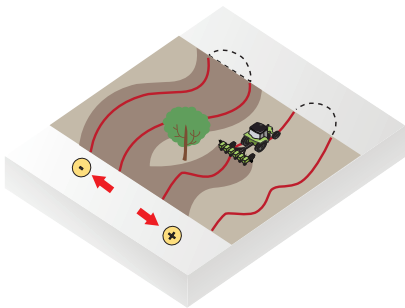
Configuring path points

1. On the operation screen, tap button  **Guidance**;
2. From the submenu, select the trajectory mode as  **Parallel curve**;
3. Position your Vehicle in the field about the point where you want to start and press  **Point A** to mark the beginning of the row;
4. Drive to the desired end point in the field and press  **Point B** to mark the end of the trajectory. The shortest distance between the route points A and B is 30 meters.







5.2.4 Adaptive Curve

The adaptive curve pattern provides guidance along the curve and updates guidance after each furrow considering any deviation that has been carried out. To record a deviation, it is required to be within the adaptive detection requirements in Guidance. It continuously records the path and provides guidance that is equal to the last path held.

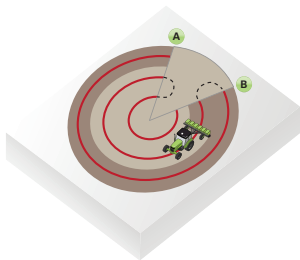


Configuring path points





1. On the operation screen, tap  **Guidance**;
2. From the submenu, select trajectory mode as  **Adaptive Curve**;
3. Position your Vehicle in the field about the point where you want to start and press  **Point A** to mark the beginning of the row;
4. Drive to the desired end point in the field and press  **Point B** to mark the end of the trajectory. The shortest distance between the route points A and B is 30 meters.

5.2.5 Pivot

Use the pivot orientation mode in areas that use central pivot irrigation. With this pattern you can drive concentric circles around the central pivot.







Configuring path points

1. On the operation screen, tap  **Guidance**;
2. From the submenu, select trajectory mode as  **Pivot**;
3. Position your Vehicle at the beginning of the curve trajectory;
4. Click  **Point A**;
5. Do a full turn and click  **Point B**;
6. Another way to configure the trajectory is providing the latitude and longitude of the center point.

5.3 Erasing the reference rows

The reference rows stored in the Ti7 can be erased simultaneously. Once erased these cannot be retrieved.



Procedure

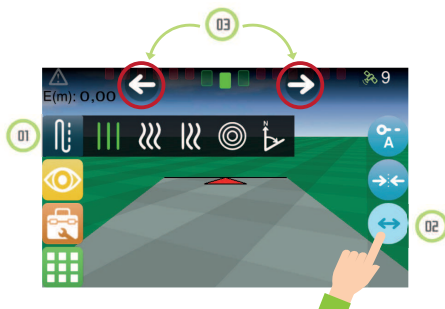
1. On the operation screen, tap  **View**;
2. From the submenu, select button  **Clear**;
3. In the dialog box that appears tap  to confirm the deletion or
4. Tap to  cancel the operation.

5.4 Field offset

The field offset is used to move the row 2 cm each click, either to the left or to the right. It is recommended when it is necessary to make a fine adjustment on the row that may have moved.

Procedure



1. On the operation screen, tap the button  **Guidance**;
2. Tap the type of the desired direction
3. Press the icon  Field offset.
4. Press the arrows to the offset desired direction.

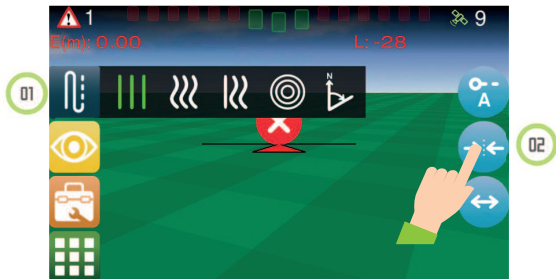


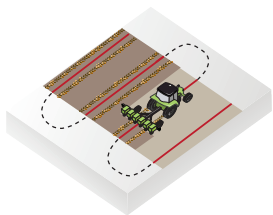
5.5 Re-align

The GNSS system is subject to variations of information. It is recommended to use the function Re-align when stopping operation for some time and if when starting the line doesn't shown in the same location. Function Realign transfers the line about the point where the antenna/tractor is, aligning it with the guide (zero error).

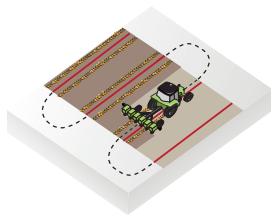
Procedure

1. On the operation screen, tap  **Guidance**;
2. From the submenu, select button  **Re-align**.

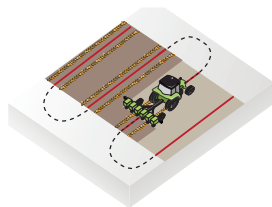




01 Tractor working over the row.



02 After a few hours, when start working the row is not in the same location (trace).



03 With the tractor on the right trace, press Realign so that the row comes back to be aligned with the tractor antenna.

6 Autopilot

The auto pilot function is to ensure greater accuracy in the path and minimize overrun during application of inputs and treatment of culture.



IMPORTANT

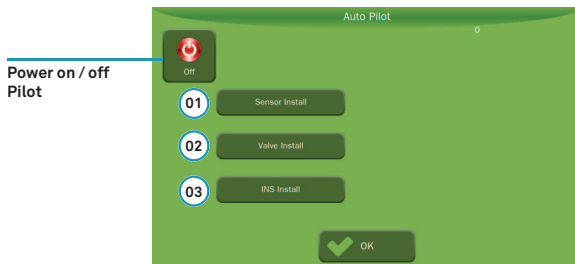
For proper operation, check the wear on steering components. When turning the steering wheel, the wheels should begin to move. Otherwise, see the maintenance manual of the vehicle manufacturer.

6.1 Status autopilot

Icon	Description
	Pilot on - Machine is on and controlling the direction .
	Enabled pilot - Equipment is suitable for operation
	Blocked pilot - Equipment can not be fired Critical alarm occurrence (which prevents operation) Error and angle to the elevated guide
	Pilot without communication - No communication with the control driver “ ATCD “

6.2 AutoPilot configuration

6.2.1 Hydraulic Pilot configuration



6.2.1.1 Procedure for sensor install

Assists in operation checking and wheel sensor installation .

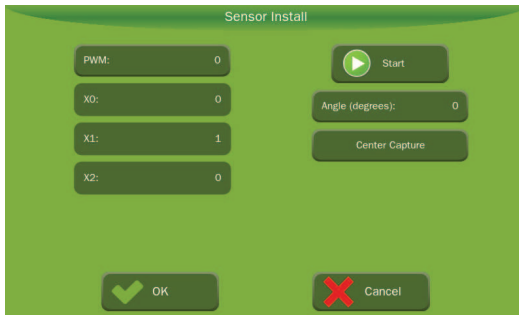
PWM: Shows the reading of the gross value which varies from 0 to 36000.

It is important that, when the vehicle wheels are aligned, the value read in this field is in the middle of reading range. Avoid values close to 0 and 36000. If necessary, reposition the sensor to suit the recommended reading range. Simply remove the sensor from the holder and reposition it in the opposite position.

The PWM should have a minimum range of 9000. For example, when the steering wheel is all to the left and has a PWM value of 15,000 and all to the right at 24,500, we obtained a range of 9,500 complying with the condition.

Angle (degrees): Shows the sensor reading converted to angle. When turning the wheel to the right, the value must be positive, negative to the left.

If you want to test the actuation, without performing calibration, and reading to the right is getting a negative value, you can change the value x1 to -1.



How to check the functioning

1. Let the vehicle wheels aligned and press Center Capture;
2. Press Start;
3. Note if there is no skip in the reading in the field angle (degrees) and if the value is modified evenly (there is no need to turn the steering wheel a lot in order to change the value). If there are problems in the reading, it is recommended to change the sensor installation position or modify the coupling rod.

6.2.1.2

Procedure for valve install

Valve Install

Dead Band:

Start

Dead Band L: 250 Dead Band R: 250

VH Control Test:

Start

k Valve: 120 Ref: 0 Pos: 0

Ok Cancel

Assists in the health check and installation of the hydraulic valve

Dead zone test

Identifies the minimum tension that must be applied in the actuator, so that it starts the movement of the wheels.

How it works:

The system will automatically raise the voltage applied to the terminals of the valve from zero until it detects the movement of the wheels (variation of about 0.5°).

How to proceed:

1. Align the vehicle wheels;
2. Speed at 1500 rpm;
3. Press Start;
4. Wait until the test ends, the value in the field Dead zone will be changed to the calibrated value and the button Start will have its state modified.



WARNING

Do not use the steering wheel or change the position of the vehicle wheels during the test.



IMPORTANT

The value obtained for the Dead Zone after calibration, stays around 300, it is recommended to retake the test in case the value is very different.

VH Controller Test

Verification test of the correct operation of the wheel control system and certify the correct installation of the hydraulic valve.

Field	Description
K valve	Response speed of the hydraulic valve. <ul style="list-style-type: none">• Low values will cause the system to slow down as well as have a higher error in the reference follow-up.• High values, one obtains a faster response and reduction of the position error, however, too high values tend to cause the wheel to oscillate.
Ref.	Value that indicates the position (in degrees) to which the wheel will go during the test. <ul style="list-style-type: none">• Positive values make that the wheel rotate to the right;• Negative values make that the wheel rotate to the left. For safety matters, the values typed are limited in the range of -15° to 15°.
Pos.	Indicated the position of the wheel provided by the sensor.

How to proceed:



WARNING

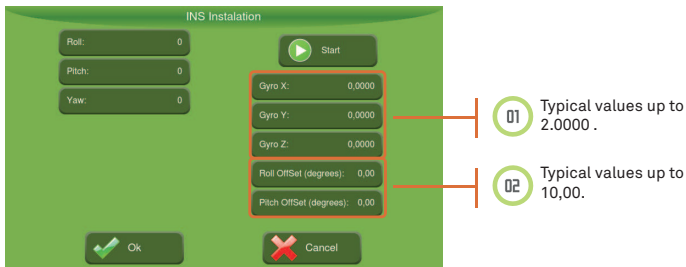
Make sure that wheel sensor is working properly.

If the wheels rotate to the opposite side than expected, or some other unforeseen occurs, turn off equipment immediately to prevent damage.

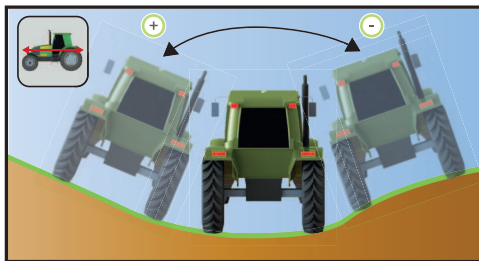
1. Press **▶ Start**;
2. Change the values of the field ref. (positive and negative). Positive values will make the wheel turn right, negative values to the left;
3. Observe the answer, if it is slow or the differences between the value read in the field Pos. and Ref. are greater than 1, increase the value of the valve K field. If the direction is moving alone, reduce the value in K valve.

6.2.1.3 Procedure for INS install

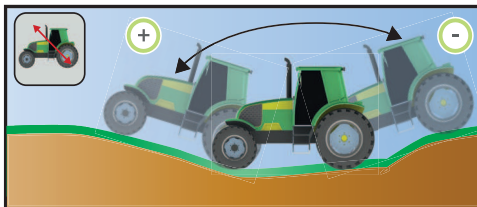
The values shown in the screen as follow depend on the current position of its tractor.



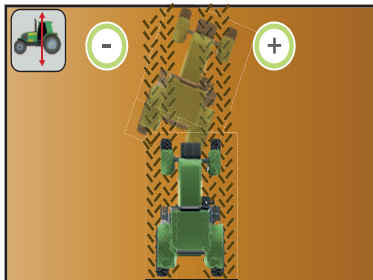
1. Position the tractor horizontally, and press start.
2. Tilt the tractor to the right. Roll Reading should go to a negative value, turning to the left, Roll reading should go to a positive value.



3. Turn the tractor forward. The Pitch reading must be a negative value. Turn back so that the Pitch reading is a positive value.



4. The yaw reading will only be different from zero with the vehicle in movement.



Clockwise: +
Anticlockwise: -

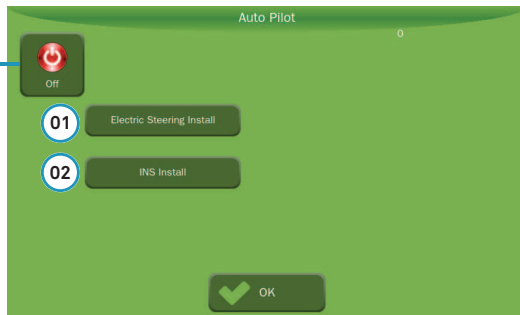


WARNING

Check if the value shown when leaving the tractor stopped quickly stabilizes and there is no overrun (go to a high reading and then go decreasing). If this occurs, or there is disagreement in the read values, check for problems in assembling the driver or any defective component.

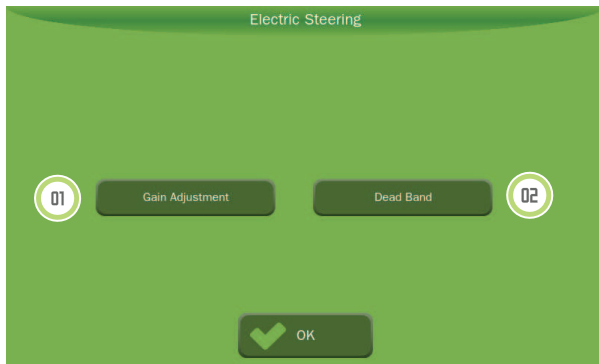
6.2.2 Electric Pilot configuration

Power on / off
Pilot



6.2.2.1 Electric Pilot installation

To execute the electric pilot test installation press Menu -> Electric Steering Install.



Dead Band Test

Identify the minimum voltage that must be applied to the actuator, so that they start the movement of the wheels.

1. Align the wheels with the main axis of the tractor (pointing forward);
2. Press Start;
3. Wait until the finish test, the value in the Dead Zone field will be modified to the calibrated value and the Start button will have its modified state.



WARNING

Do not use the steering wheel or change the position of the wheels of the vehicle during the test.



WARNING

Make sure that the next region of the steering is free
The direction during the test can make sudden movements and hurt the operator if it is next to steering wheel.



IMPORTANT

The value obtained for the Dead Zone after calibration, is around 300, is recommended to retake the test if the value is very different.

Gain Adjustment

Tests the actuation and performs the motor position control setting.

The screenshot shows a green-themed control interface titled "Gain Adjustment". It contains the following elements:

- Instruction 1: "1- Position the wheel all the way to the left and press 'Save Reading'"
- Two input fields: "Left Position: 51,450,114" and "Right Position: 51,450,114"
- A "Save Reading" button
- Instruction 2: "2- Manual gain adjustment."
- Input fields for "Ref: 0" and "51,450,114"
- A "Start" button with a play icon
- Input fields for "Kp Vel: 12.00", "Ki Vel: 0.01", and "Kp Pos: 10.00"
- "OK" button with a green checkmark icon
- "Cancel" button with a red X icon

1. Position the wheel fully to the left and press **Save Reading**.
2. Position the wheel fully to the right and press **Save Reading**.
3. Please **Ref** with an average value between the left and right position.;
4. Tap **Start** to activate the test.
5. Change the value of the **Ref** to positive and negative values and observe the response.
 - For each pulse variation the pilot has to answer. If you happen to vary greatly (0-10) for the pilot begin to answer it is necessary to change the value of Kp. Vel. so that the motor becomes faster and it begins to pulse control pulse;
 - If the value of Kp. Vel. is too high the wheel will be tremendous and it is necessary to reduce the amount of gain;
 - If slow response, increase the value of Kp Pos;
 - If high position error (difference values of fields Ref and Pos) increase the value of Kp Pos;
 - If overshoot or high instabiade system, reduce the value of Kp Pos.
6. At the end of the test the read value of the field Ref. Have to match the position.

6.2.2.2

INS install

See item 6.2.1.3 Procedure for INS install.

6.3 Setting advanced system Module

The following options are available in advanced system module: Gain scale, calibration and General configuration

So that the buttons are accessible proceed as follows:

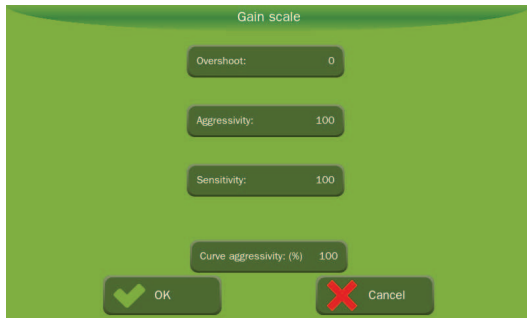
1. Enter the setup screen and press the button Setting.
2. In the information screen, click on Advanced Module System.
3. Confirm the operation in OK.
4. Select the button Autopilot.

The configurations in advanced mode are equal to hydraulic and electric pilot.

6.3.1 Control

To refine the system adjustment, there are three parameters:

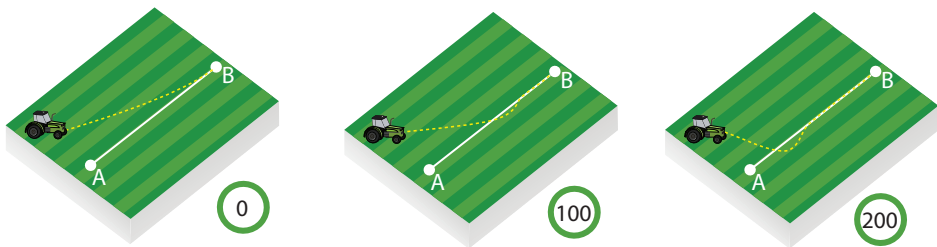
- Overshoot;
- Aggressiveness;
- Sensibility.



Overshoot

The overshoot controls the rate that the vehicle will drive at the row and the rate that the vehicle will end as it approaches the line. The default value is zero, and must change it only if you cannot eliminate the over signal through the Aggressiveness and Sensitivity.

The overshoot can be set from 0 to 200%. Increasing the value is, for example, has a tendency to increase over-crossing and decreasing, we reduce over-crossing. As adjustment guidance it is recommended to change it from 0 to 100. Thus, if the system still present over signal, the value should be decreased. If he aligns without over-passing, but far from the row, increase the value.

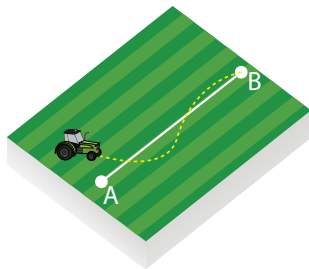


Aggressiveness

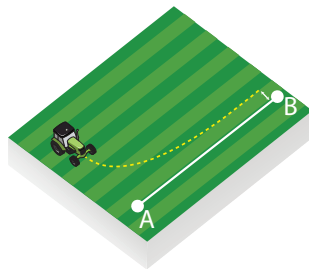
Aggressiveness controls the rate that the vehicle attacks the row and how it keeps in row. It can be set between 0 and 200. The default setting is 100.

When, for example, the agricultural vehicle moves the application row it is necessary to reduce the aggressiveness.

When the vehicle takes a while to achieve the application row it is necessary to increase the aggressiveness.



Decrease aggressiveness



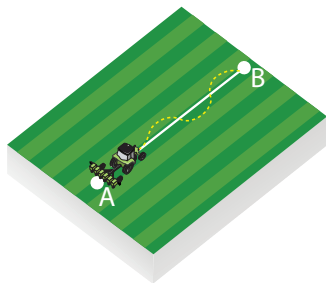
Increase aggressiveness

Sensibility

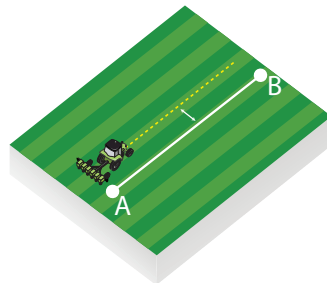
The sensibility controls the rate that the vehicle turns and sensibility when it is on the row.

When, for example, the vehicle oscillate over the application row, it is necessary to reduce the sensibility.

When the agricultural vehicle does not follow the application row, it is necessary to increase the sensibility.



Decrease sensibility

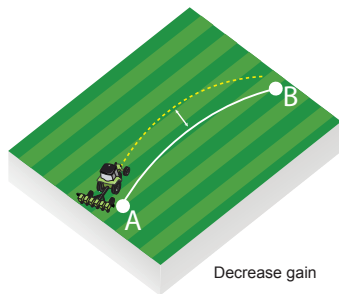


Increase sensibility

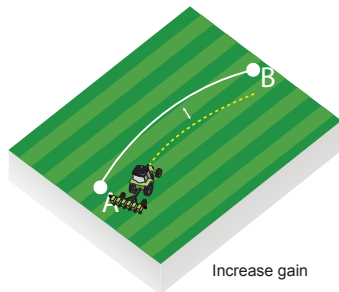
Curve gain (%)

When, for example, the agricultural vehicle opens on the curve, it is necessary to increase the curve gain.

When the agricultural vehicle is closing the curve, it is necessary to reduce the curve gain.



Decrease gain



Increase gain

6.3.2 Autopilot calibration




WARNING

Before starting the test, watch out the following facts:

- Do not rock the vehicle during this step.
 - As the test is performed in two steps, it is necessary to move the vehicle and it is advised to make markings on the floor so the tests are carried out without changing too much the prominent soil characteristics.
 - Perform the tests at a flat level.
 - Whenever the driver has been removed from its position (either for cleaning or any other purpose) this step must be redone, even if the device has been set in the same location.
-

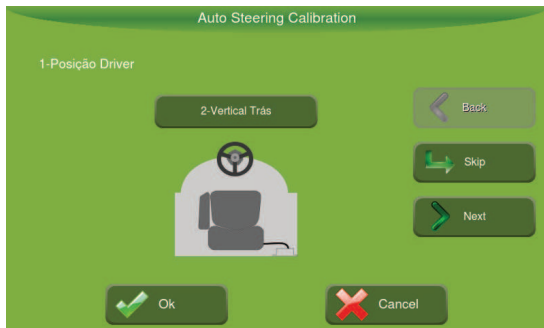
Step 1 – Driver position

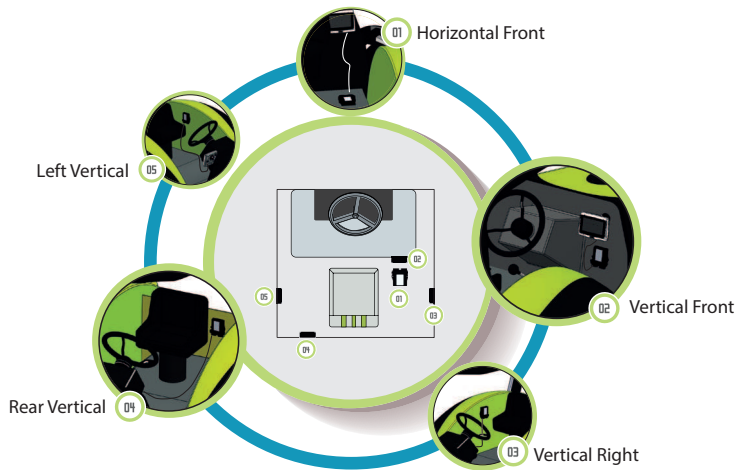
1. Choose the correct position of the driver installation and press the button  **Next**.




WARNING

- Install the driver on a flat surface;
- Install the driver in the same structure and if at all possible near the antenna;
- Never install the driver on a hard surface and antenna in an area with shock absorbers;
- Always screw the driver in the tractor frame

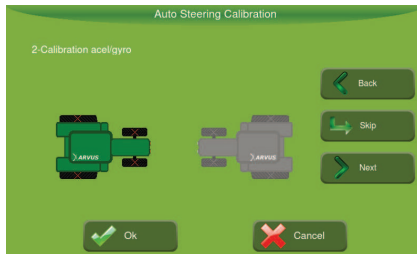





Position
Horizontal  Output cables from the front

Vertical Position  Output cable towards the ground.

Step 2 - Accelerometer Calibration



1. Raise the engine rotation for the work (1500-2000 rpm);
2. Tap the left tractor image and wait 10 seconds;
3. Wait for the right tractor image be enabled (green).
4. Place the vehicle in the same place, however, in the opposite direction (if, for example, the tractor has the front towards the north, now he must be going south).
5. Press the right tractor image and wait 10 seconds;
6. Once both images are green, a window will appear showing the values found. Press OK to save and press the  Next button.

Step 3 - Gyroscope Calibration

Objective estimation errors present in the data provided by gyroscopes.

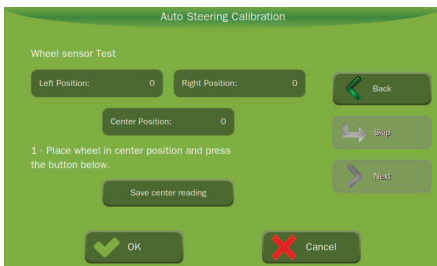
1. Press the button “Calibrate Gyro”.
2. After 20 seconds, a window with the values found will be shown. Confirm with OK so that the data are saved.



Step 4 - Clockwise and counterclockwise calibration

1. Perform the wheel position readings.
2. Place wheel in center position and press “Save Center Reading.”

3. Place wheels fully to the left and press “Save Left Reading”
4. Place wheels fully to the right and press “Save Right Reading.”



Steps 5 and 6 - Clockwise and Counterclockwise



WARNING

Before starting the test, watch for the following facts:

Clockwise means performing a curve to the right, counterclockwise a curve to the left.

In the Hydraulic pilot, the pilot must start the calibration with the steering wheel turned. To do this, turn the steering wheel a turn for each side.



IMPORTANT

This step requires that the vehicle is in motion, a large area is required, without obstacles for its completion.

1. With the vehicle in rectilinear motion, press start;
2. Turn the steering wheel quickly to the left direction (counterclockwise test) and after finishing, make sure not to cause/allow movement on the steering wheel;
3. Once the started test circle is fully painted in green, press Stop:
4. Press **> Next**;

Step 5

1. With the vehicle in rectilinear motion once again, press start;
2. Turn the steering wheel quickly to the left direction (clockwise test) and after finishing, make sure not to cause / allow movement on the steering wheel;
3. Once the started test circle is fully painted in green, press Stop:
4. A window with the calculated values during calibration will be displayed by pressing the Ok button, the data is saved, on the Cancel button, the data is discarded.



WARNING

It is recommended to fine-tuning the calibration value in PWM Control. If the value of the relationship is very close to zero (less than 0.2) redo calibration and/or check the sensor installation position.

6.3.3 General Config

Parameter	Value	Category
Motor Wheel Gain:	0	
K hand	1.000	Safety parameters
K released:	50	
Max Sat: (degrees)	20	Operating Parameters
Min Sat: (degrees)	7	Operating Parameters
Error Seg (m):	0	Safety parameters
Angle Seg (degrees):	0	Safety parameters
Max Delta (degrees/sec):	0,00	Operating Parameters
Wheel Alarm (degrees):	0,00	Safety parameters

Ok Cancel

● Safety parameters ● Operating Parameters

Safety Parameters

K hand: Parameter to adjust the manual of the equipment disarm (operator acting as a director with power).

Wheel Alarm: Checks operation of wheel sensor in case of malfunction, turn off the pilot.

Error Seg: Lock the driver's use if the error is above the set.

Angle Seg: Blocks using the pilot market the angular error in relation to the guide, is set up .

Operating Parameters

Max Sat: Maximum steering angle at low speeds .

Min Sat: Maximum steering angle at high speed (25km / h) .

Max Delta: Wheel rotating speed.



IMPORTANT

Low values for these parameters tend to impair the driver's input and the response curve guide (slowness to perform maneuvers).



WARNING

Sat high values of Min and Delta Max can cause sudden movements of equipment , which affect the safe operation at high speeds .

6.4 Operation

In the Operation screen, verify if the icon is active.



IMPORTANT

If the icon is disabled, select Menu> Auto pilot and check for the connected icon.

To actuate the electric or hydraulic autopilot, press Power on the operating screen. To turn off, press the button, force the steering wheel by hand to leave the Autopilot mode or use the pedal to turn on/off.

The bottom bar in the operating screen you can set the parameters overshoot, aggressiveness and sensitivity.



7 Fertilization




IMPORTANT

You can only enter the Settings by selecting the implement Manure Spreader/Limestone Spreader or Planter/Fertilizer.

The rate application process aims to equalize the soil nutrients and, with this, optimize the use of resources.

7.1 Configuration

3. Enter the screen Settings and press button  Fertilization;
3. If the equipment has more than one feeder, it will appear in tabs at the top (Input Box 1, Input Box 2, etc.) Do the settings of each input.
3. On the Fertilization screen, choose the desired rate type.

Fertilization

Fertilizer Container 1

Fix rate (kg/ha): 500

Fertilizer Calibration: Insumo1

 Ok

Prescription/Map

Fix Rate Variable Rate Map Fix Rate

Area_Pivo




mapa1

recom


teste

Dose 1: (Kg/ha) 500

Dose 2: (Kg/ha) 1.000

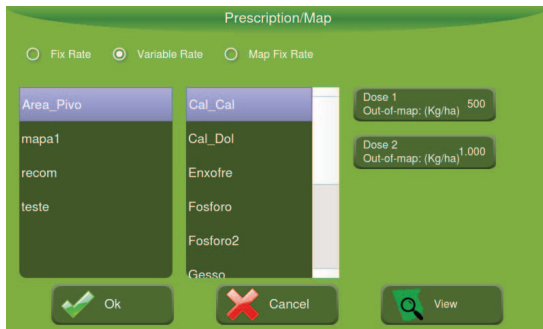
 Ok  Cancel  View

7.1.1 Fix Rate

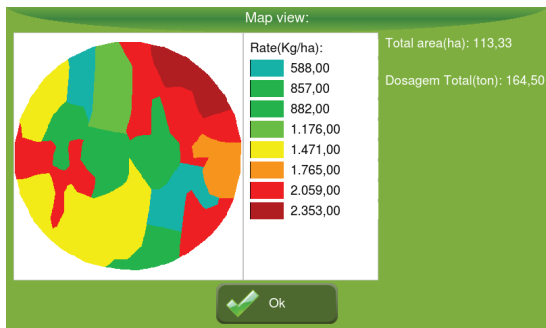
1. Fill the primary dosing in Kg/ha, that corresponds to Setpoint 1 in the lower bar of the Operation screen;
2. Fill the secondary dosing in Kg/ha, that corresponds to Setpoint 2 in the lower bar of the Operation screen;
3. Click  **OK**.

7.1.2 Variable rate

1. Select the map;
2. Select the recommendation.



3. The inputs will be applied as recommendation of the map;
4. In order to visualize the map and Dosage, click on View.



5. Enter the desired value in Dosage off the map (kg/ha) or enter "0" to cut the application; this value corresponds to the Setpoint 1 on the bottom bar of Operations screen;
6. Enter the desired value in a secondary Dosage off the map (kg/ha); This value corresponds to the Setpoint 2 in the bottom bar of Operations screen;
7. Click on Ok.

7.1.3 Map Fix Rate

1. Select a map;
2. Enter the primary dosage in Kg/ha; that corresponds to the Setpoint 1 on the bottom bar of Operations screen;
3. Enter the secondary dosage in Kg/ha; that corresponds to the Setpoint 2 on the bottom bar of Operations screen;
4. When the operation occurs inside the map this dosage is applied (independent of the recommendation of the map being different). When leaving the map the application will be switched off and there is no input application;
5. It is possible to use a map created by the Perimeter function on Operations screen > Activities.

7.1.4 Calibration




Inputs

Insumo1 (1)	Dose (kg/ha):	500,00
Insumo2 (1)	Min Speed (km/h):	2,40
Insumo3 (1)	Max Speed (km/h):	48,00

+ New 🔧 COnf. - Rem.

✓ Ok ✗ Cancel

Select the input that will be calibrated and press  **Conf.**

 **IMPORTANT**

Inputs can vary in size and/or density. Whenever possible there should be made calibration for any mode of operation (fixed rate or variable rate).

Procedure for fixed gate



 **IMPORTANT**

In tests using hydraulic motors of the implement, place the Vehicle with the motor in the rotation recommended by the manufacturer (i.e. 1,800 RPM on a tractor) so that it has a minimum flow of 48l/min. in the hydraulic system.




WARNING

1. Adjust the time using the arrows to the right and left.

Never use a time less than forty seconds.

2. With the tractor in work rotation and the hydraulic command triggered, press Start. Make sure the speed of the hydraulic motor is close to the reference speed (manufacturer is 150 RPM), with few variations.
3. The on-board computer will do a countdown of time and will automatically shut off at the end of the countdown. With the aid of a suitable scale, enter the weight of the material collected in Kg.

Calibration procedure for 2-stage and multiple gates

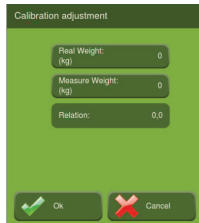
1. Mark the Multi-Calibration field with a “v”;
2. Select Low gate and enter the desired time for collection;
3. With the tractor in work rotation and the hydraulic command triggered, press  **Start**;
4. Collect the input and weigh it with the aid of a suitable scale.
5. Enter the weight in the Ti7;
6. Select High gate and redo the above steps;
7. Click OK and check the speed ranges for minimum and maximum recommendations of the map.

Fine-tune of input calibration

For calibration correction a fine-tuning can be made.

Procedure

1. Clean the weight and area accumulated on the screen Operations > Shortcuts > Cleaning;
2. Apply a known quantity of input;
3. Enter the actual weight (weight of the amount of input applied);
4. Enter the weight reading on the monitor (total weight of the input marked in Input on the operation screen);
5. Reapply a known quantity of fertilizer, and verify if the weight applied is close to the total input read by the monitor (+/- 5%). If not, redo the above procedure.



Calibration adjustment

Real Weight: (kg) 0

Measure Weight: (kg) 0

Relation: 0.0

Ok Cancel

1. In the Fertilization screen, click on Input Calibration.
2. Enter a dosage in Kg/ha.

After calibration, insert the minimum dosage and the maximum dosage of the selected map to check the operating speed range (km/h) that the system can operate.

7.2 Operation

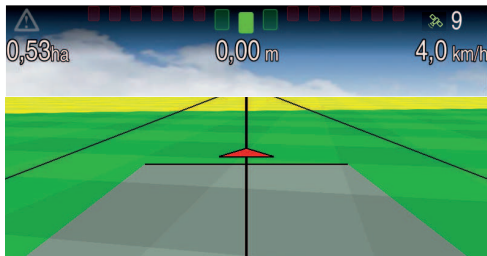
7.2.1 Start operation

Press button in the center of the screen to start the operation.

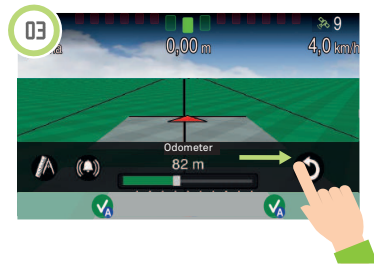
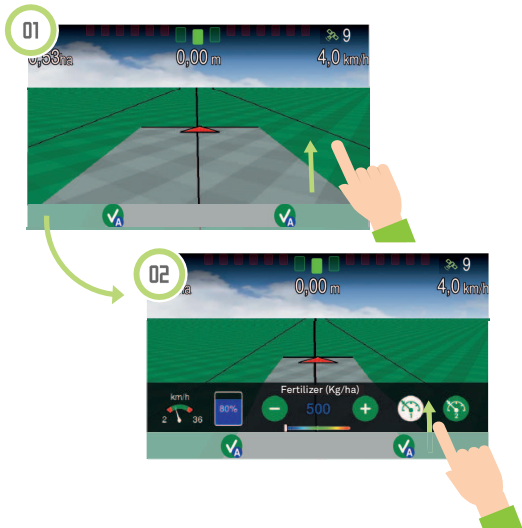
The suspended operation button only starts to operate as soon as you meet the following requirements:

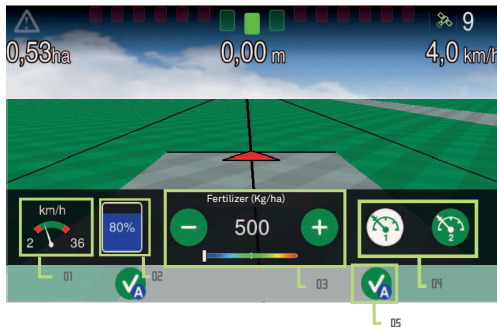
- The implement moves;
- is above the cutting speed; and
- within the operating speed range.

Once met the requirements, the application will start automatically and the trail will be drawn.



To aid in the operation, the system offers bottom bars with some features. To access them, drag your finger in the direction from the bottom up. In the first movement the bar with the sections will appear. When there is only one section of this bar does not appear. In the second stage, the second bar with the lateral movement to the right will appear odometer functionality.





The bottom bar presents the following functions:

01 km/h 

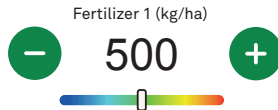
The pointer shows the recommended operating range for the speed (green) as well as the maximum and minimum limits for the application (red).

02 Tank Level  

The user configures in liters or kilograms how much fueled the machine and the system deducts what has already been applied, indicating the current level of the tank. When the value falls below 10%, the tank is in red as a warning. To put a new value in liters or kilograms, press on the tank level icon.

03 Central Menu

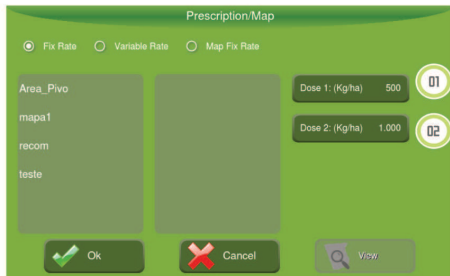
The recommendation appears in kg/ha. It can be changed in real time via side menu “-” and “+”. The decrease is 5 kg / ha. The range below the number indicates how much is being applied.



The range center is the value of the recommendation. When the indicator is more to the right, the implement is applying more than recommended and when is more to the left, less than recommended.




04 Setpoints “1” and “2”

Configurable through Fertilization menu give access to predefined doses by the user. It is possible to switch between the two whenever needed, simply press on the desired recommendation.

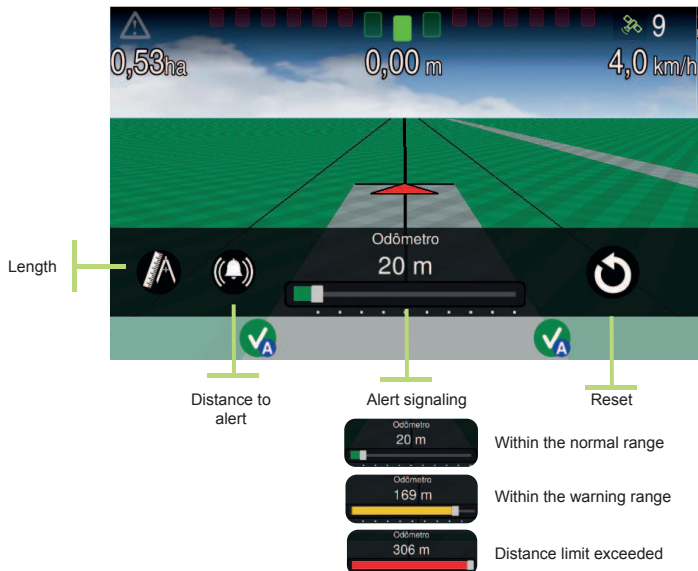


05 Sections

The sections may present the following status:

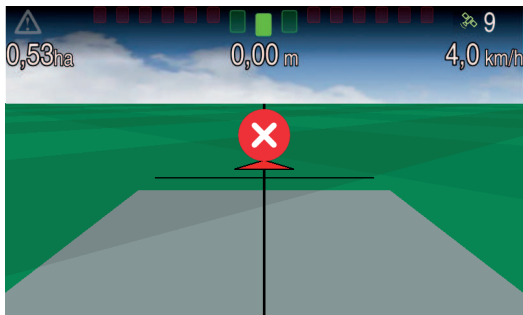
Icon	Description
	Off manually
	On automatically
	Off automatically

Odometer function



7.2.2 Suspend application

To suspend the application, press the center of the screen. The suspended operation button will appear in the center of the screen confirming the cessation of input application. During the period in which the operation is suspended the trail is not drawn on the map.

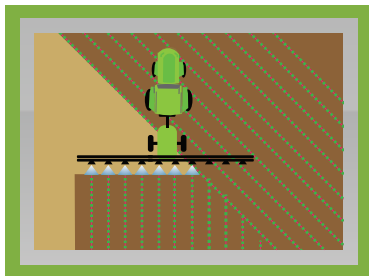


IMPORTANT

It is possible to suspend the operation using one button or a pedal.

8 Spraying

The spraying implement performs automatic control of the spraying bars, minimizing overlap in the input application and makes automatic control of the applied flow, ensuring the recommended doses, even with variations of the engine operating speed. Also, it does the automatic closing of the section, avoiding the excess spraying.



8.1 Configuration

IMPORTANT

You can only enter the Settings by selecting the implement Sprayer or Planter which applies liquid pesticides.

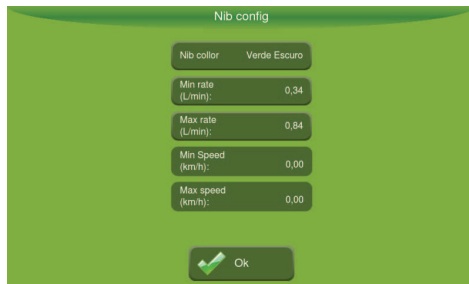


If the equipment has more than one feeder, it will appear in tabs at the top, being required to make a setting for each one.

8.1.1 Map/Recommendation

Check instructions of item 6.1.

8.1.2 Nib Configuration



The screenshot shows a green-themed configuration screen titled "Nib config". It contains five rows of settings, each with a label and a value:

Parameter	Value
Nib collar	Verde Escuro
Min rate (L/min):	0,34
Max rate (L/min):	0,84
Min Speed (km/h):	0,00
Max speed (km/h):	0,00

At the bottom of the screen is an "Ok" button with a green checkmark icon.

Through the specifications of the nib manufacturer, insert the fields color, minimum flow and maximum flow.



More Settings are available in the Implements Menu > Test > Spray Simulator and Flowmeter Calibration.

8.2 Operation

8.2.1 Start operation

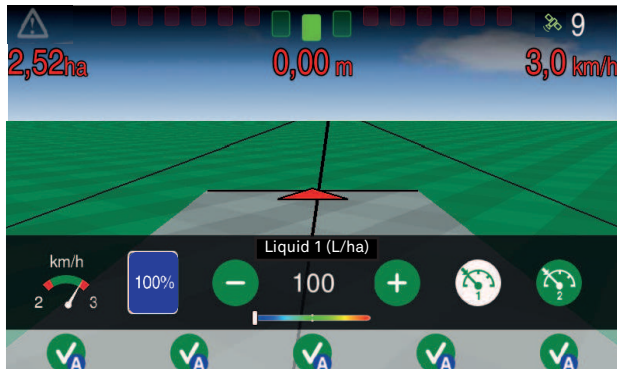
Press the button in the center of the screen to start the operation.

The suspended operation button only starts to operate as soon as you meet the following requirements:

- The implement moves;
- is above the cutting speed; and
- within the operating speed range.

Once met the requirements, the application will start automatically and the trail will be drawn.

On the operation screen, choose appropriately the information you want to have on the screen.

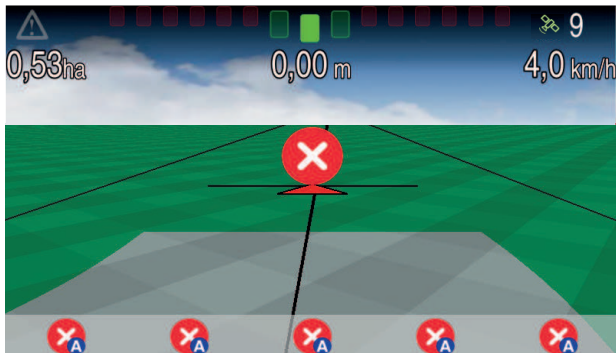


To see the spray bar at the bottom of the screen, drag from the bottom to the top. On the side click on and to **+** increase or **-** decrease 5 L/ha the dosage.

For knowledge of the functionality of the other buttons, check item 6.2.1

8.2.2 Suspend application

To suspend the application, press the center of the screen. The suspended operation button will appear in the center of the screen confirming the cessation of input application. 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 one button or a pedal.

8.2.3 Section Control

Shutdown and automatic activation of the sections is done to the extent that the sprayer goes into applied and non-applied areas, respectively. When a section overlaps the above percentage configured, it turns off automatically. When a section is not overlapping anymore the application is connected automatically.

Manual shutdown of sections

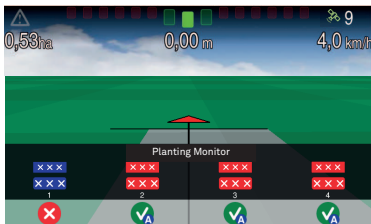
By dragging your finger on the inside of the screen to central direction, it opens a bar showing the sections and the situation of each.

In the figure below, the right section was turned off manually showing the symbol X. The other sections are functioning normally.



9 Planting

The monitoring system of planting allows for seed saving, avoiding failures and excess applications. In addition, it improves the utilization of the working area, bringing gains to culture because it enables the application of techniques of precision farming.



The system has the following characteristics:

- Population measurement (above and below the recommendation);
- Monitors up to 96 rows of seed or fertilizer;
- Failures and reduced duplication;
- Planting with variable rate;
- Elimination of excess planting;
- Control of different products (1 seed and 3 inputs);
- Improved calibration (set simply and quickly);
- Automatically opens and closes the clutches of the planter or disables the hydraulic motors driving the rows.

9.1 Configuration



IMPORTANT

You can only enter the Settings by selecting the Planter implement.

Planting

Map: PerimeterArea_Pivo

Population (p/ha): 50,000

Density (seed/m): 2,50

Spacing (cm/seed): 40,00

Pressure Ref.: 0,00

Disc seed Number: 22

Wheel perimeter (m): 1,00

Planting Monitor

Operation Range

Ok

Fields	Description
Map	Check instructions of item 6.1.
Population	When activated the fixed rate the population can be inserted directly (p/ha) or through the field Density (seed/m), being automatically calculated the Spacing (cm/seed).
No. of seeds on disk	It is the value for the filling of holes of the feeder disc.
Wheel circumference (m)	It is the value used if the speed is calculated through the wheel of the tractor or implement and not by GNSS.

Operating range

Operation Range:	
Population (p/ha):	100,000
Density (seed/m):	5,00
Min speed (km/h):	7,92
Max Speed (km/h):	158,40

Ok

Enter the minimum and maximum population values of the recommendation map selected and check the minimum and maximum speed for operation. At the time of operation it will only be applied within the range shown.

9.2 Operation

9.2.1 Start operation



Press the button in the center of the screen to start the operation.

The suspended operation button only starts to operate as soon as you meet the following requirements:

- The implement moves;
- is above the cutting speed; and
- within the operating speed range.

Once met the requirements, the application will start automatically and the trail will be drawn.

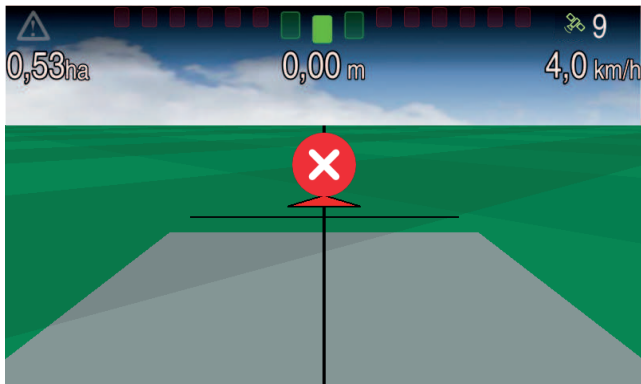


To see the display bar at the bottom of the screen, drag from the bottom to the top. On the side click on  and  to increase or decrease 5 L/ha the dosage.

For knowledge of the functionality of the other buttons, check item 6.2.1

9.2.2 Suspend application

To suspend the application, press the center of the screen. The suspended operation button will appear in the center of the screen confirming the cessation of input application. 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 one button or a pedal.

9.2.3 Planting Monitor



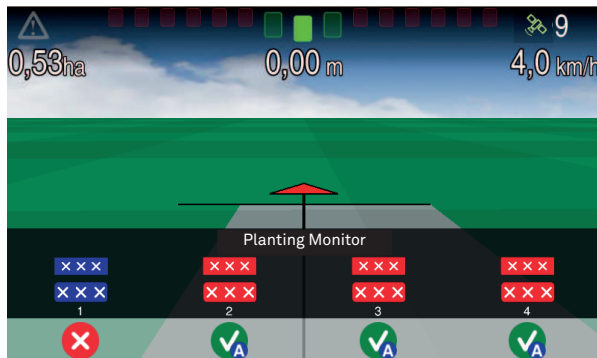
Sensor adjustment

To adjust the sensor check the procedure for Planting Sensors, described on page 43.

Preview

On the Planting screen it is possible to choose which of the Plating Monitor preview modes will be used: Standard or advanced.

In Standard mode by dragging your finger from the bottom to the center the planting monitor bar appears, as shown below.



Each section is indicated by the number and its icons, whose meaning is now described on page 117.

In standard mode planting monitor screen, the icons may be displayed as follows:



Square edges
Fertilizer






Round edges
Seed

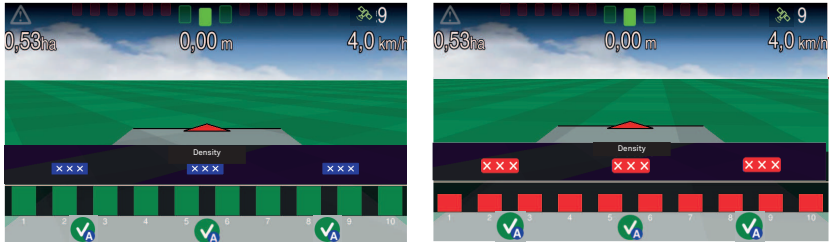
These may have the following filling of colors:

Color	Meaning
Red	It's not applying. With problems
Blue	Suspended operation.
Green	Normal application

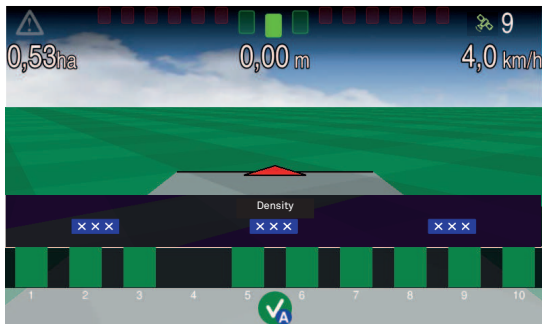
For the status indication of each row, the following icons may be visualized:

Icons	Meaning
	All rows are applying normally;
	All rows are not applying.
	One or more rows are not applying. For more information, press the icon.

In the advanced mode, the bars are visualized, which increase or decrease according to the density that it is being applied in each row due to the recommended one.



The green color indicates that the population is within the recommended and the red color is below the recommended.



When one of the bars does not show up in the screen, there is indication of failure of density in one of the rows.

Tolerance

Enter the values of tolerance desired. For Standard view, the tolerances are considered by 30% regardless of the saved values. For view in advanced mode, the tolerances are considered according to the information entered.

9.2.4 Section Cutting

Automatic Shutdown and Starting

The automatic shutdown and activation of the sections is done in so far as the planter goes into applied and non-applied areas.



Action	Motive
Automatic Shutdown	Section overlaps the configured percentage.
Automatic Activation	Section is not overlapping.

10 Technical Features

Monitor Data

Material: LCD Screen 7", 800X480 pixel, 256k colors touch screen

Dimension: 208 (L) X159 (A) X57 (C) mm

Weight: 1279 g

Supply voltage: 12VDC

Lightbar: 0.6A

Environmental Specification

Operating temperature: -20 to +60 [°C]

Storage temperature: -30 to +80 [°C]

Protection degree: IP67

Humidity: Up to 95%

Interfaces

CAN: 2 x Rear

USB: 1 x Rear

RS-232: 2 x Rear

Receiver

Channel Settings:

GPS L1, L2, L2C, L5

GLONASS L1, L2

BeiDou3 B1, B2

Galileo E1, E5a, E5b, AltBOC

SBAS

QZSS

L-Band

Horizontal position accuracy (RMS)

Simple Point L1 1,5 m

Simple Point L1/L2 1,2 m

NovAtel correction

SBAS4 0,6 m

DGPS 0,4 m

PPP 54 cm

RT-2® 1 cm + 1 ppm

Starting time < 10 sec.

Starting reliability > 99.9%

Measurement accuracy (RMS)

	GPS	GLO
Code C/AL1	4cm	8cm
Carrier Phase L1	0.5 mm	1 mm
Code P(Y) L2	6,8 cm	8 cm
Carrier Phase L2	1 mm	1 mm

Data rate

Measurements: 100 Hz

Positions: 100 Hz

Signal Requirement

L1 < 0.5 s (typical)

L2 < 1.0 s (typical)

Time for stating the calculation

Start in the cold: < 50 s

Start in the hot: < 35 s

Temporal accuracy

GPS: 20ns RMS

Speed Accuracy

< 0,03 m/s RMS

10 Technical Features

Speed Limit

515 m/s

Power (LNA) of the antenna outlet

Outlet voltage: 5V (nominal)

Maximum current: 100mA

Option of Firmware

GLIDETM

HSDPA Module

Technology:

HSPA+/HSDPA category 14

21.0 Mbps Downlink

HSPA+/HSUPA category 6

5.76 Mbps Uplink

UMTS

384.0 kbps Uplink/Downlink

EDGE

236.8 kbps Uplink

296.0 kbps Downlink

GPRS

GSM

Micro SIM

Bands:

800/850/900/AWG1700/1900/2100 MHz
HSDPA Potency Class 3 (+24dBm)
850/900 MHz GSM/GPRS/EDGE
GSM Potency Class 4 (+33dBm)
850/900 MHz GSM/GPRS/EDGE
EDGE E2 (+27dBm)
1800/1900 MHz GSM/GPRS/EDGE
GSM Potency class 1 (+30dBm)
1800/1900 MHz GSM/GPRS/EDGE
EDGE E2 (+26dBm)

Antenna:

Dimensions: 27.0 (L) x 87.5 (C) x 9.4 (D)
Frequencies: 850/900/1800/1900/2100 MHz
VSWR: < 2.0:1
Gain: 4 dBi
Impedance: 50 ohm
Connector: SMA

11 Troubleshooting

Problem	Solution
Ti7 won't turn on	Check: Power supply; Fuse; If the connections are firmly fixed; If the cable is not broken (do test with multimeter to check the voltage).
Problem with GNSS	Verify if the GNSS is in area with sight to the sky. In covered areas the signal is very low and cannot be located properly; Check the antenna cabling; Measure voltage of GNSS cable (5v); GNSS Port and Model correctly selected on GNSS menu.
Motor does not move	Perform testing and calibrations in Ti7; Correct hoses connections (pressure and tank); Check: If the command is fired to the right direction; If the operation is not stopped at Ti7; If the encoder is (flashing when turning), If it is below the cutting speed or the operation range.
Problems with map	Files SHP, SHX and DBF should be inserted in the same location as the flash drive; The map name cannot contain special characters and spaces; Avoid long name.

Problem	Solution
Spraying Problems	Perform calibration and simulation ; Check the filter ; Check wiring of valves and flow meter ; Make sure it is below the cutoff speed limit and operating range.
Application failure on input and output of copings.	Verify if the distances of the antenna-pin and pin-impliment are correct.
Nothing happens after starting the pilot sensor installation test	Check if the pilot driver is recognized on the network (information Menu> Network Diagnostic). If it is not found, check power and cable continuity. Perform inspection on the sensor power cable, checking continuity and if the tension between the pins “3” and “1” is 12V.
Nothing happens after starting the VH controller test.	Check if the pilot driver is recognized on the network (information Menu> Network Diagnostic). If it is not found, check power and cable continuity. Check continuity of the wheel sensor cable and hydraulic valve. Check the hydraulic system (if there is no reversed connections, etc.)
The wheel turned to the opposite side.	Invert the connectors of the valve terminal. If the problem persists, check the instructions in section hydraulic pilot - sensor install.
Problems in the pilot	Check reservoir oil level; Check for leaks; Check pilot driver fixation; Check sensor direction.

12 Glossary

CAN

The Controller Area Network is a network of internal communication that intercommunicates components within the Vehicle. It must guarantee delivery of messages, lack of conflicts between messages, minimum time for delivery, low cost and ability to operate reliably in a magnetic field environment.

DIFF

Diff is a method of correction of GNSS positioning. Without DIFF the pilot may not operate properly.

GNSS

The global positioning system is a satellite navigation system that provides a mobile receiver apparatus its position.

Latitude

The Latitude is the angle between the plane of the equator to the reference surface. The latitude is measured North and South from the equator, between 90° South, at the South Pole and 90° North.

Longitude

The longitude is measured along the Ecuador, and represents the distance between a point and the Greenwich Meridian. It is also measured in degrees, and goes from 0° to 180° degrees East or West.

Kg/ha

Kg per hectare.

L/ha

Liters per hectare.

L/min

Liters per minute.

PI/ha

Plants per hectare.

PPL

Pulse per liter.

PPS

Pulse per second.

Pulse

Electrical information provided by flowmeter.

Ratio

n the inputs it is the weight ratio applied on the hydraulic motor RPM. On spraying it is the number of flowmeter pulses on liters.

RPM

Revolutions per minute supplied by the hydraulic motor sensor.

Section

Set of nibs of the spray bar or the planting/fertilizing lines which can be disconnected or connected simultaneously.

Attachment A – Certificate of Warranty

Product description

Precision Farming Hexagon Agriculture Ti7.

Warranty

1. The Hexagon Agriculture ensures the proper functioning of the above products and which it markets, pledging to make in the period of twelve (12) months, as comprised by three (3) months of legal guarantee in addition to the nine (9) months offered by contract from the date of issuance of the respective invoice, repairs and replacements of parts and materials that present manufacturing defect checked under normal use and to the purposes for which they are intended, being responsible for the cost of parts to be replaced as well as by its manpower, falling back to the buyer the cost with the transport of technicians and/or send/return of the part for repair.

* Except for whips, sensors and connectors, where the term is 3 months.

1.1 Any defect that may be found in the product shall be immediately reported to the manufacturer, and such notification is formalized by electronic mail via the address comercial@hexagonagriculture.com and support@hexagonagriculture.com.

1.2. This Guarantee Agreement shall be submitted together with the relevant invoice, which will integrate it for all purposes and made.

Warranty Exclusion

2. The responsibility of Hexagon Agriculture will be deleted when:

- a. There is removal/alteration of the serial number or product identification label;
- b. Any removal of product seal;
- c. The product is connected to a voltage different from that laid down in the installation/operation manual;
- d. The product is put up in inappropriate place, at odds with the rules laid down in the installation/operation manual;
- e. The product is used in violation of rules laid down in the installation/operation manual, or even for purposes other than that to which it was intended;
- f. The product has suffered any kind of accident, provided that such claim is not due to the defect.

Warranty Limitation

3. The hereby granted warranty does not extend to damages and/or malfunction of the product identified above, when the following assumptions are met:
- a. Use and/or operation in disagreement with the operation manual;
 - b. Scratches, cracks, dents, deformation and/or any other damages resulting from accidents during transport or handling;
 - c. Failure to care for cleanliness and lubrication provided in the instruction manual, including the use of materials and chemicals not recommended by Hexagon Agriculture;
 - d. Failure to send the installation sheet signed to Hexagon Agriculture;
 - e. Operation with parts and dubious origin materials or of poor quality;
 - f. Alterations, repairs, assembly/disassembly, facilities/uninstalls performed by persons or technicians not accredited by Hexagon Agriculture;
 - g. Malfunction or failure due to problems of electricity supply;
 - h. Use of improper package in shipment of the product for repair;
 - i. Acts of God and force majeure;

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Ti7

