Agres
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TECHNOLOGICAL PROGRESS IN AGRICULTURE

# GEONAVE
## NAVIGATION SYSTEM


CROP SPRAYERS


ORCHARD SPRAYERS


SPREADERS


SEEDERS




tecomec

**GeoNave 31**

*original instructions*

**INSTRUCTION MANUAL**

Warning: do not use the item before having read the instruction manual

EN

# GeoNave 31

1 — Last update: 7 April 2021

Agres Sistemas Eletronicos

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# 1. Introduction


- What is GeoNave?
- Licenses


This user's guide gather important information that the user must know before installing, configuring and using the GeoNave system, ensuring the correct use in all possible situations.

Initial recommendations:

- Read this guide carefully before connecting the GeoNave system.
- To ensure the user safety, observe all the instructions contained in this guide and in the user manual, as well as in the safety manual of the agricultural machinery in which the GeoNave system will be installed.
- The images shown in this guide are for illustrative purposes only. The items described in the images may vary from their actual display.

# 1.1. What is the GeoNave?

GeoNave is an agricultural positioning system, which uses GNSS navigation system to control the path of an agricultural machinery in the field. Navigation is carried out on parallel, straight or curved paths, requiring a starting and an ending point.

The system allows several operations to be carried out in the field, such as the following.

- Soil preparation
- Seeding
- Fertilizing
- Spraying
- Harvesting

The information generated and stored on the GeoNave system allows efficient and strategic management of the entire agricultural operation, optimizing productivity.

The following are some of the benefits provided by the GeoNave system.

- Simple operation;
- Easy installation;
- Resistance to high temperatures and chemical products;
- Resistance to overloads – such as motor starting -, short circuit, improper connection;
- Connectors sealed against dust and water;
- Color touch screen, with application path record and indication of possible overlaps;
- LED lightbar independent of the LCD;
- Navigation in straight, curves or *Shapefile* projects paths;
- Delimitation of boundaries;

- Data download and software update through pendrive.

Using the license features ISO 31, which includes section control and spraying flow control, the GeoNave system offers an even bigger list of benefits.

- Elimination of spraying overlap and failure;
- Automatic control of shutdown and reopening of up to 9 spraying sections;
- Monitoring the application quality (speed, flow);
- Multiple nozzles and pattern configurations;
- Work option with 2 and 3 way valves (with or without return line);
- Work option with 2 and 3 wire valves;
- Various spraying license options (optional use of flowmeter, regulation valve, section valve, etc.);
- Detailed information record of application.

# 1.2. Licenses

The GeoNave system has a licensing mechanism through which available features are enabled. Contact our Support and Technical Assistance team for more details.

The following table details available features for each GeoNave model.

| | Navigation | Spraying | | | | | | Rate | | IsoPoint Signal |
|---|---|---|---|---|---|---|---|---|---|---|
| Model | Virtual Guide Light Bar | Implement | | Flow control | | Section Shut-off | | Fixed | Variable | |
| | | Crop | Orchard | Manual | Automatic | Manual | Automatic | | | |
| ISO 30 | X | | | | | | | | | 1 |
| ISO 31VP | X | X | | X | X | X | X | X | X | 1 |
| ISO 31OVP | X | | X | X | X | X | X | X | X | 1 |

This manual describes the features of licenses ISO 31.

# 2. System Components

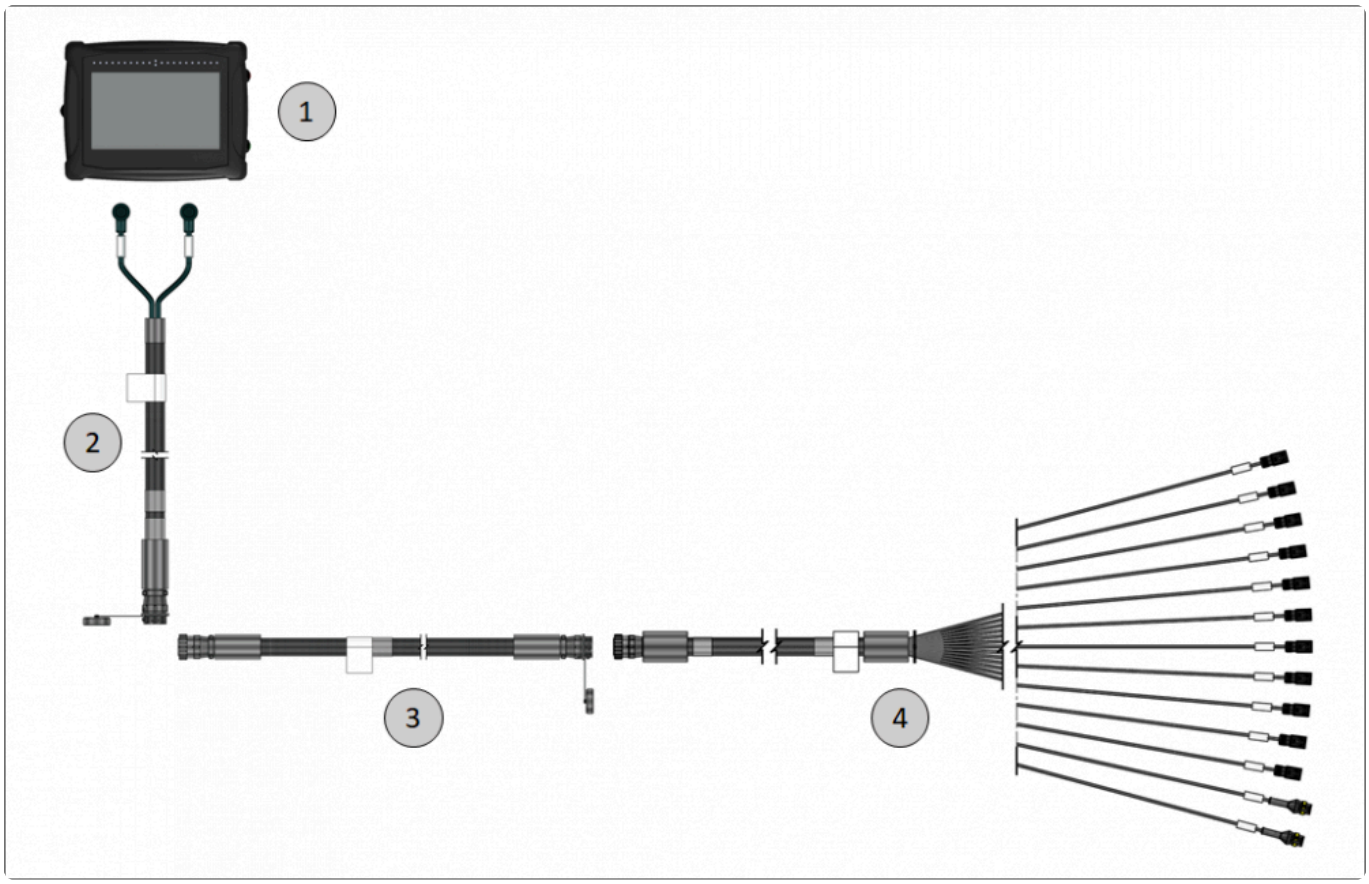
The GeoNave system with license ISO 31 has the following components shown in the image below.

## Display installation



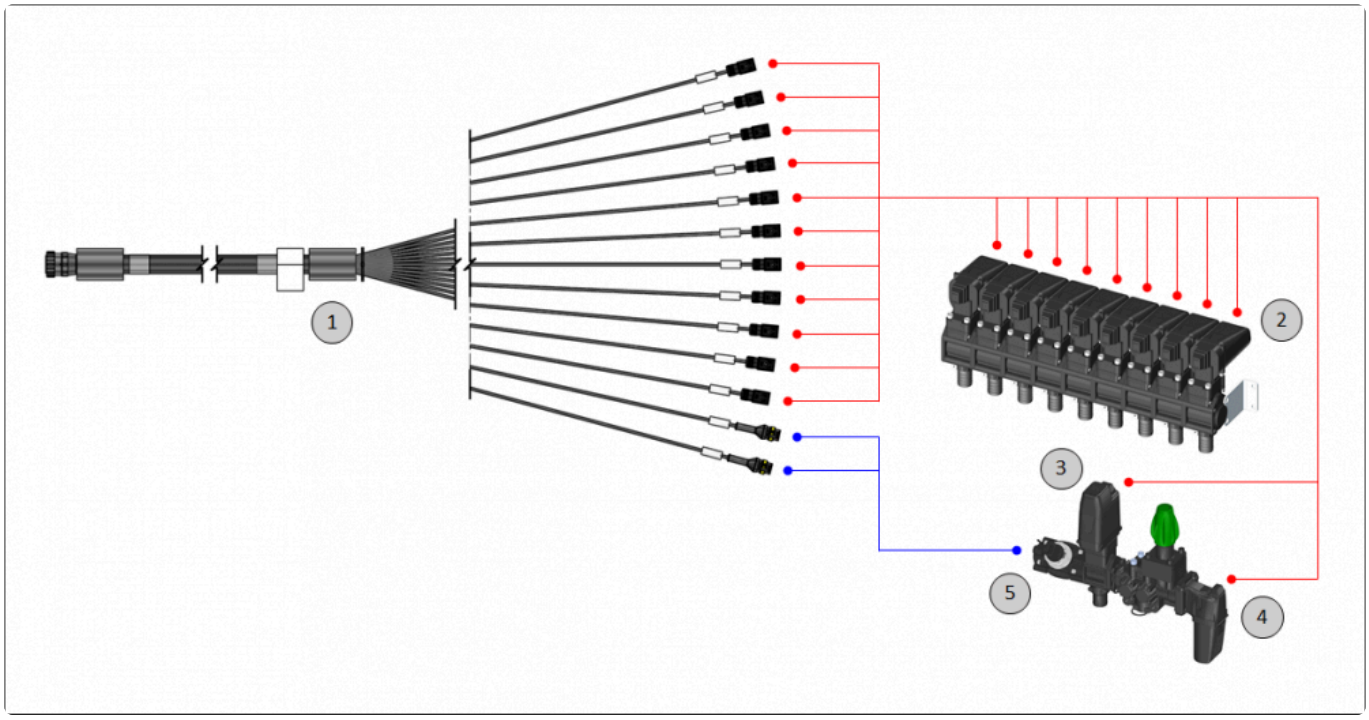

| Item | Description |
|---|---|
| 1 | GeoNave display |
| 2 | GNSS antenna cable |
| 3 | GNSS antenna with magnetic base |
| 4 | Accessory for fixation of the GNSS antenna with double sided adhesive pad |
| 5 | Display power cable |
| 6 | Battery connection cable with fuse holder |
| 7 | Trio of suction cups of display fixation set |
| 8 | Articulated arm of display fixation set |
| 9 | Pendrive |

## Connecting the display to the sprayer cable




| Item | Description |
|---|---|
| 1 | GeoNave display |
| 2 | Sprayer cabin cable |
| 3 | Sprayer cable extender, if necessary.<br>• Available lengths: 5 and 10 meters. |
| 4 | Sprayer implement cable |

## Connecting the sprayer implement cable to the implement




| Item | Description |
|---|---|
| 1 | Sprayer implement cable |
| 2 | Control of up to 9 section valves |
| 3 | Regulation valve |
| 4 | Main control valve |
| 5 | Flowmeter |

# 3. Security Instructions


- Recommended Use
- Cleanliness and Care
- Disposal of Components


This section covers the recommended safety instructions for the correct and safe use of the GeoNave system.

Always follow the instructions highlighted on attention and information warnings according to the descriptive examples presented below. The information provided in these warnings aim to minimizing the risk of injury and material damage.

> ! **Attention warning**: Informs the reader of an important security issue related to the GeoNave system use. Possible warned accidents, if not avoided, can result in property damage and serious bodily injury, including death.

> ✻ **Information warning**: Provides the reader relevant information regarding the guide, such as links between topics and screen types.

# 3.1. Recommended Use

The following are the recommended instructions for the correct and safe use of the GeoNave system, informing the user of main risks of its misuse.

> ✻ The GeoNave system should only be used in agricultural machinery, such as tractors, sprayers, seeders, fertilizers, subsoilers, trucks and so on.

> ! Check with the agricultural machinery manufacturer for the correct installation of the GeoNave system. Changes not recommended by the machinery manufacturer may cause failures in machinery operation and safety.

> ! The GeoNave system must not be handled by users unaware of its proper operation. Incorrect handling can cause bodily injury, malfunction and material damage.

> ! Do not use the system during lightning storms. There is high risk of electric discharges reach the system with possible physical damage to people and equipment.

The following user actions are not recommended.

- Equipment use outside stipulated recommendations of this guide;
- Equipment use combined with accessories from other manufacturers;
- Open or disassemble parts of the equipment using tools, unless expressly authorized by Support and Technical Assistance team;
- Modify system components, such as harnesses and their connectors;
- Equipment use with easily identifiable damages or faults.

# 3.2. Cleanliness and Care

The user must properly follow cleaning and care instructions for the GeoNave system, in order to ensure that its integrity and reliability is maintained as long as possible.

! Do not use abrasive products to clean the display screen. Products with ammonia can damage the glass that makes up the screen.

✻ To clean the display screen, use a cotton flannel slightly moistened with 50% isopropyl alcohol.

✻ To clean the other components of the system, use a dry soft cloth, or slightly moistened with water and mild soap.

! Do not spray any cleaning liquid directly on the display housing or GNSS antenna.

! Do not immerse the display or GNSS antenna in any type of liquid. Infiltrations can occur and compromise electronic circuits, with risk of fire and serious accidents.

✻ Keep all system components clean after use, thereby increasing their service life.

# 3.3. Disposal of Components

If any component of the GeoNave system becomes unusable the following disposal recommendations are strongly requested to be followed.

✻ Dispose of the display, antenna, cables and any other parts of the system in accordance

with the country’s current regulations.

! Incorrect disposal, especially when associated with household waste, can generate serious problems such as the release of poisonous gases in case of burning of raw materials, in addition to soil and watershed contamination.

# 4. Technical Data


- Display GeoNave
- GNSS


The technical data of GeoNave system components are described in this section, such as electronics, mechanics and environmental.

# 4.1. GeoNave Display

## Technical Data

| | |
|---|---|
| **Display LCD** | TFT active matrix<br>RGB<br>7”(152 × 91 mm)<br>800×480 pixels |
| **Processing unit** | ARM Cortex M4<br>180 MHz |
| **RAM** | 64MB SDRAM |
| **Storage** | 8GB |
| **Approximate weight** | 1200 g |
| **Temperature** | -20 ~ 70 ° C |
| **Supply voltage** | 9~ 16 V |
| **Maximum current** | 42 A |
| **Maximum current in *stand by*** | < 100 mA |
| **Interfaces** | 2x CAN 2.0B / J1939<br>1x USB 2.0<br>1x RS232 |
| **Inputs** | 4x Digital inputs / frequency NPN/ PNP (configurable via software), max. 200 mA<br>1x *Wake up* function input<br>3× 4-20 mA analog inputs (license dependent function)<br>2x Differential analog inputs (24-bit A / D converter) for weight scale (license dependent function) |
| **Outputs** | 4x *High side* 12VREF outputs, max. 2 A<br>1× 5VREF output, max. 1 A<br>11x H bridge outputs for sprayer valves, max. 3.5 A peak (license dependent function) |
| **GNSS** | GPS+ GLONASS L1 |
| **Housing** | ABS |
| **Protection degree** | IP65 |

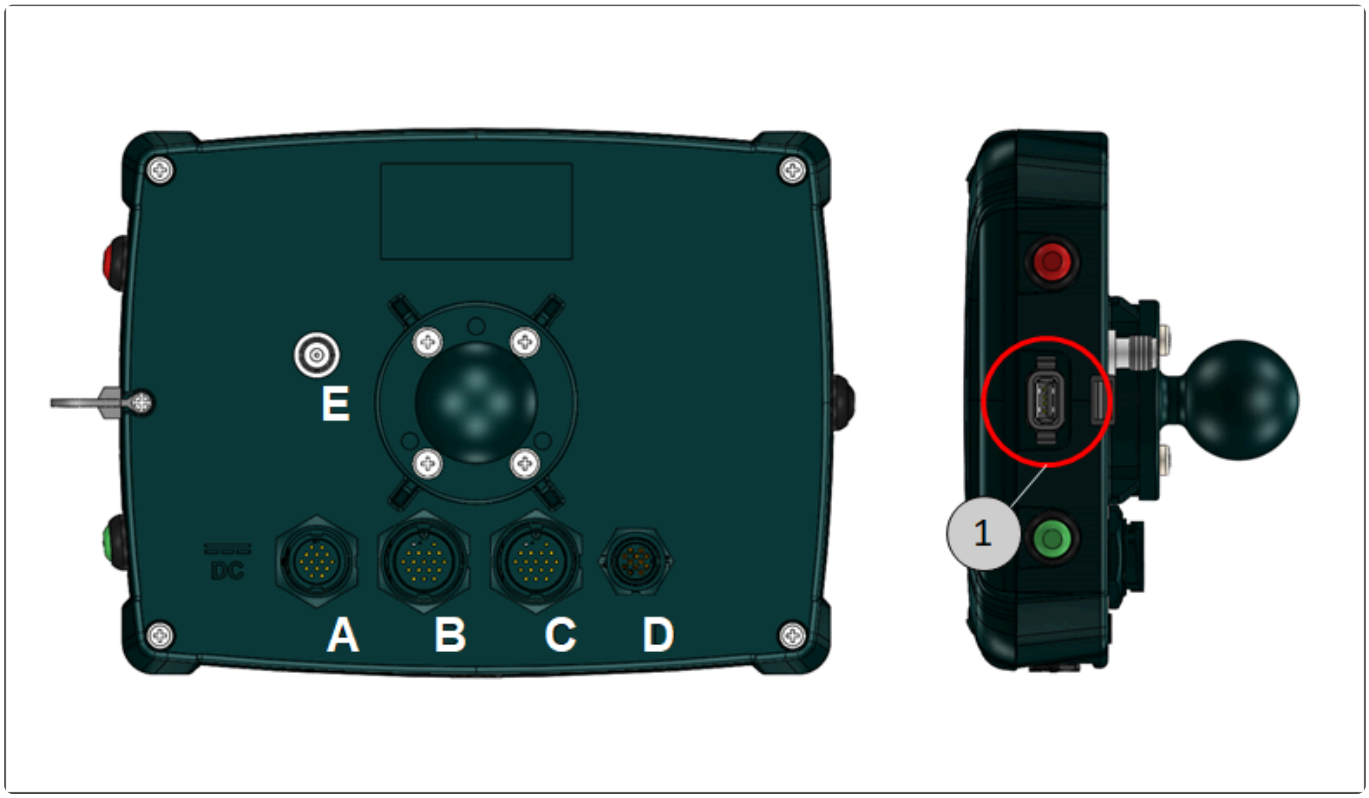
## Dimensions

The image below shows the GeoNave display dimensions, with values in mm.




## Connectors

The GeoNave display has 6 connectors, 5 of them arranged on the housing rear face and 1 connector on the right side. The following image display all connectors.



| Connector | Description |
|---|---|
| **A** | Power connector, circular 14-pin. |
| **B** | Valves and sensors connector, 18-pin circular. |
| **C** | Valves and sensors connector, 18-pin circular. |
| **D** | Communication connector, circular 12-pin. |
| **E** | GNSS antenna connector, model TNC 50 Ω. |
| 1 | Pendrive connector, model USB 2.0. |

# 4.2. GNSS

The GeoNave system has several settings related to GNSS accuracy. These configurations are selectable through IsoPoint licenses, which must be acquired by the user in order to obtain the desired agricultural operation accuracy. Contact our Support and Technical Assistance team for more details.

The table below contains information about the GNSS accuracy of each available IsoPoint license.

| Product / Service | | IsoPoint1 | IsoPoint2 | IsoPoint 3L | IsoPoint3 | IsoPoint3 PRO | IsoPoint4 |
|---|---|---|---|---|---|---|---|
| **Technology** | | L1 | L1 / L2 | L1 / L2 / LBAND | L1 / L2 / LBAND | L1 / L2 / LBAND | L1 / L2 / RTK |
| **Absolute accuracy** | **RMS** | 1.5 m | 1.2 m | 40 cm | 4 cm | 2.5 cm | 1 cm + 1 ppm |
| | **95%** | – | – | 50 cm | 5 cm | 3 cm | 1 cm + 1 ppm |
| **Pass-to-Pass accuracy** | **95%** | 30 cm | 20 cm | 15 cm | 3 cm | 2 cm | 1 cm + 1 ppm |
| **Convergence time** | | N/A | N/A | < 5 min | 30 min | < 18 min | N/A |

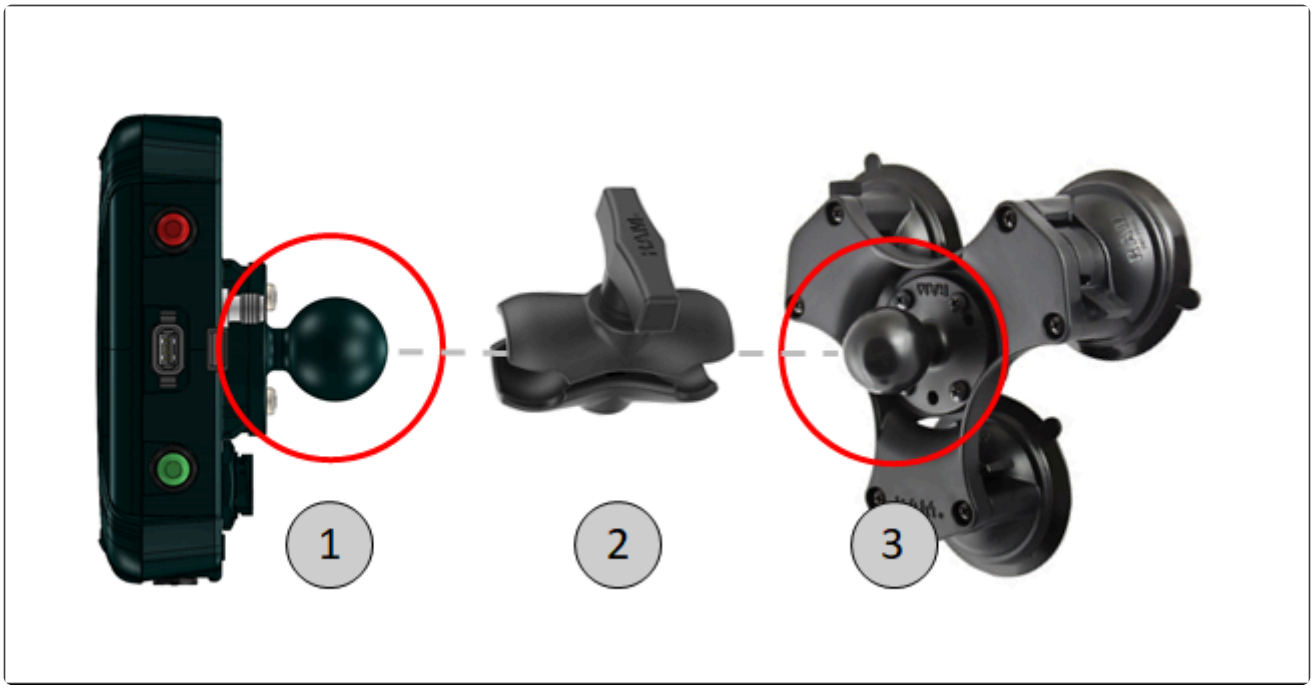
# 5. Installation


- Display Fixation
- GNSS Antenna
- Connections
- Diagnosis


GeoNave system installation on an agricultural machine must follow the recommendations contained in this section.

# 5.1. Display Fixation

The GeoNave system is supplied with a set of three suction cups, which must be used to adhere to a flat surface, preferably the agricultural machinery cabin window. The fixation set has an articulated arm (2), which must be connected to the two spheres, one from the trio of suction cups (3) and the other attached to the display (1), as shown in the image below.

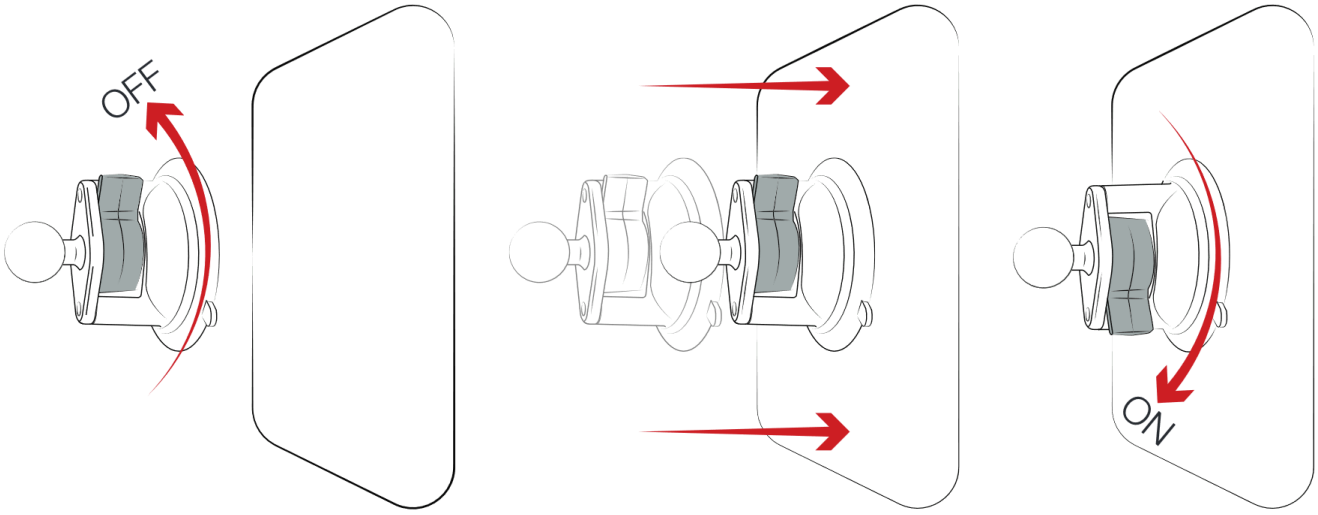



The following is a description of how to use the display fixation kit.

## Trio of suction cups

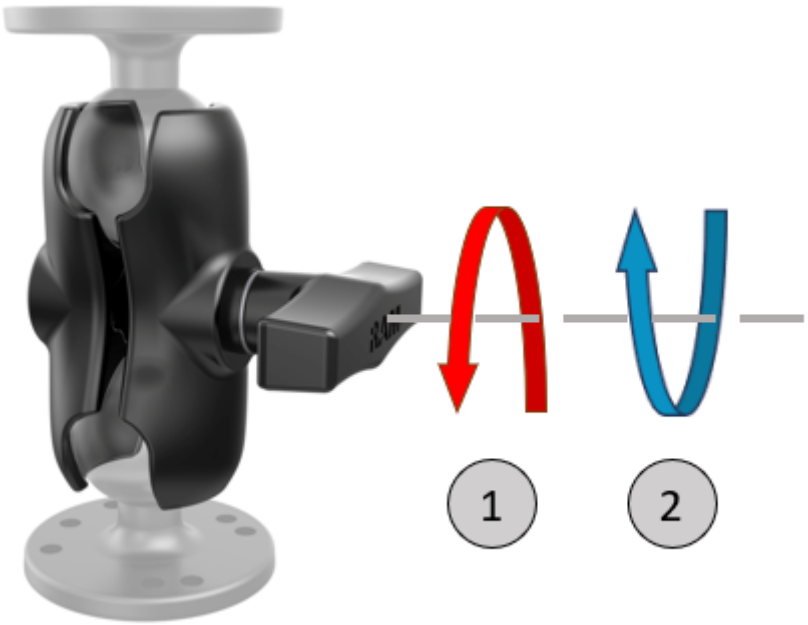
1. Find a flat and smooth area to place the suction cups, preferably one of the machinery cabin windows;
2. Clean the area with a cloth and mild soap;
3. Dry the area well before placing the suction cups, ensuring that it is free of dust;
4. Set the three suction cups in open position “OFF”;

5. Place the three suction cups on smooth and flat parts of the surface;
6. Press the suction cup against the surface and turn the three suction cup control to closed position “ON” to fix and secure the assembly.




## Articulated arm

1. Unscrew the handle (1) until the arm ends are able to embrace the two rubber balls from the trio of suction cups and the display;
2. Adjust the display position in order to obtain the most comfortable and proper viewing;
3. Screw the handle (2) until the whole assembly is firm and in the desired position.



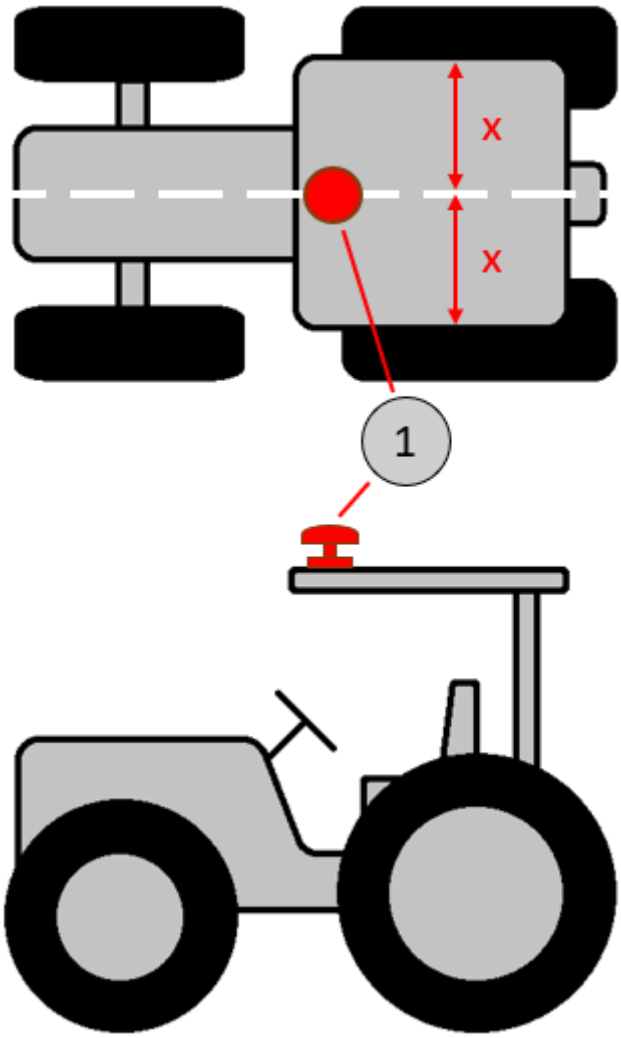

For tractors without cabin, the set of suction cups must be installed on the machine front bonnet, in order that the three suction cups adhere completely to the surface, which

must be as flat and smooth as possible. The surface must be clean, dry and free of dust.

# 5.2. GNSS Antenna

GNSS antenna installation is a simple process, but the installation details are extremely important for the correct functioning of the GeoNave system.

- The antenna has a magnetic base, which attaches strongly to ferromagnetic metal surfaces.
- If the surface is not magnetic, the circular metal plate accessory for non-magnetic surfaces must be glued using the double-sided tape already attached to it. The surface must be clean and dry for good adhesion.
- The installation location of the antenna must be as flat as possible, and aligned with the machine's chassis, preventing the antenna from tilting in any direction.
- Obstructions to the sky view should be avoided, such as tractor exhaust and air filter, in order not to compromise signal reception from satellites.
- Avoid installing the GNSS antenna close to the machine's radio antennas, which can cause interference and consequent loss of signal quality.
- Avoid installing in locations subject to a lot of vibration during operation.
- The antenna 1 should preferably be installed on the agricultural machine roof, centralized in relation to the vehicle longitudinal axis and as far forward as possible, as shown in the image below. It is recommended to use a measuring tape to position correctly.
- Do not cut, twist or bend the GNSS antenna cable, avoiding degradation and loss of satellite signal.

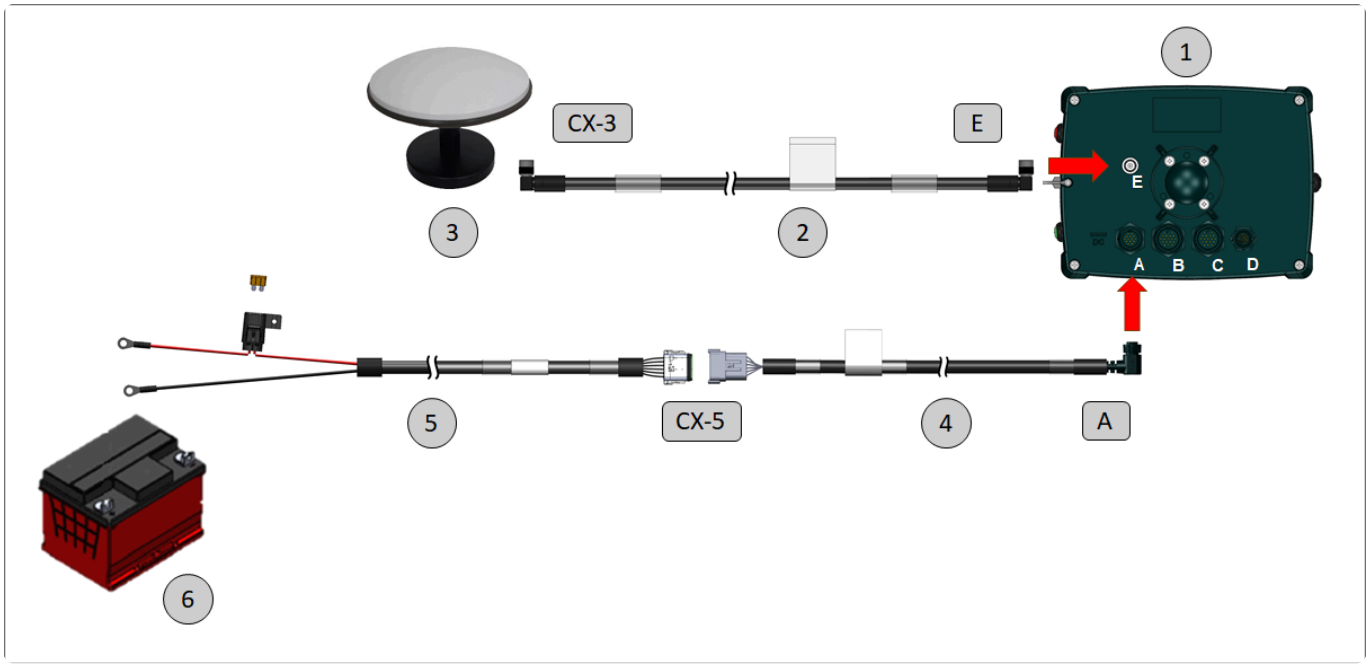



# 5.3. Connections

The cable and connectors of GeoNave display have labels that easily identify the proper connections that must be made. Couple connectors identified with the same inscriptions for correct installation.

### Installing the display and GNSS antenna

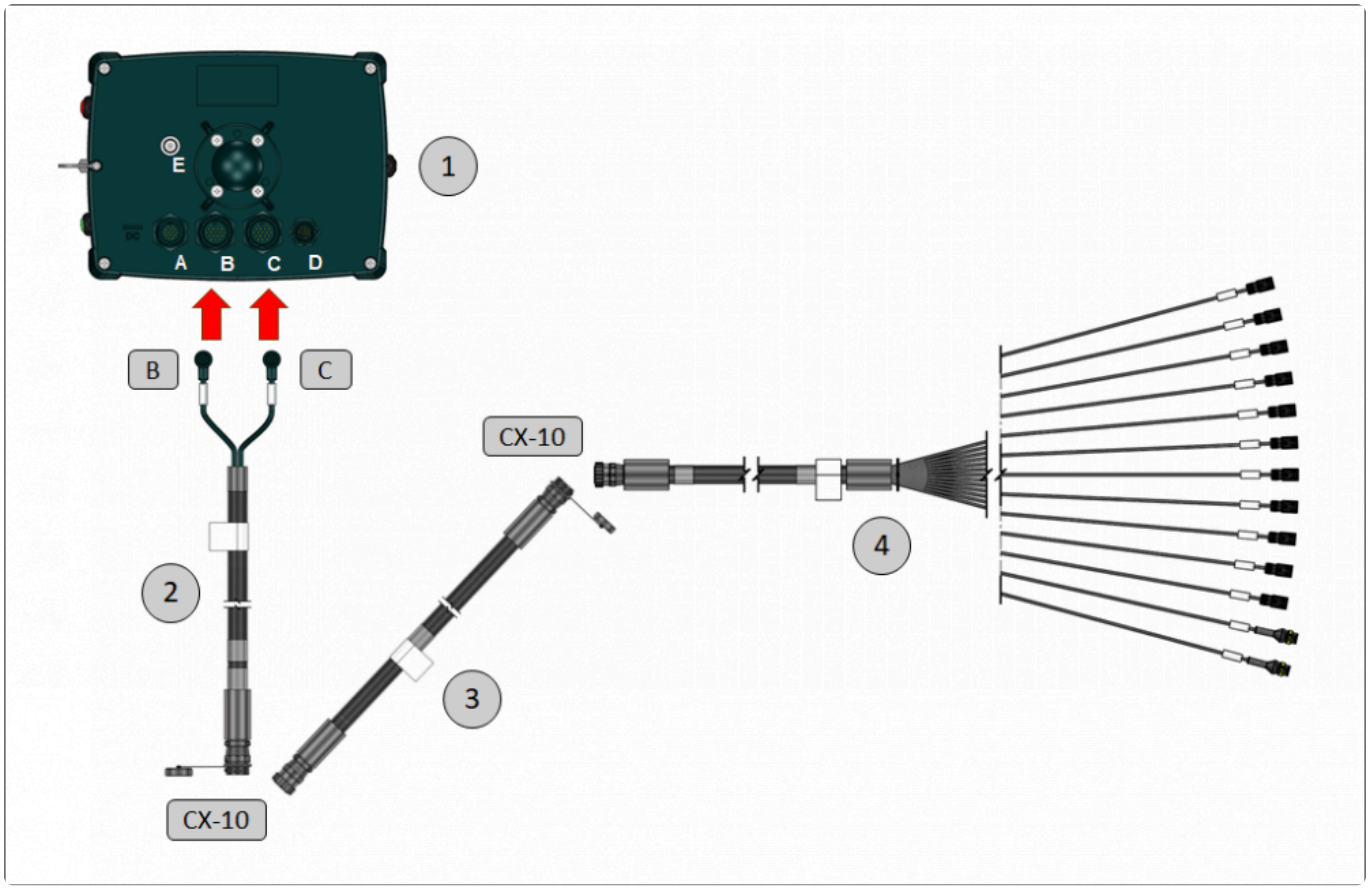
The following image illustrates the required connections to instal the GeoNave display and GNSS antenna on the tractor.




| Item | Description |
|---|---|
| 1 | GeoNave display |
| 2 | GNSS antenna cable |
| 3 | GNSS antenna |
| 4 | Display power cable |
| 5 | Battery connection cable with fuse holder |
| 6 | 12 V battery |

## Connecting the display to the sprayer cable

GeoNave display connection to the sprayer cable must follow the schematic shown below.




| Item | Description |
|---|---|
| 1 | GeoNave display |
| 2 | Sprayer cabin cable |
| 3 | Sprayer cable extender |
| 4 | Sprayer implement cable |

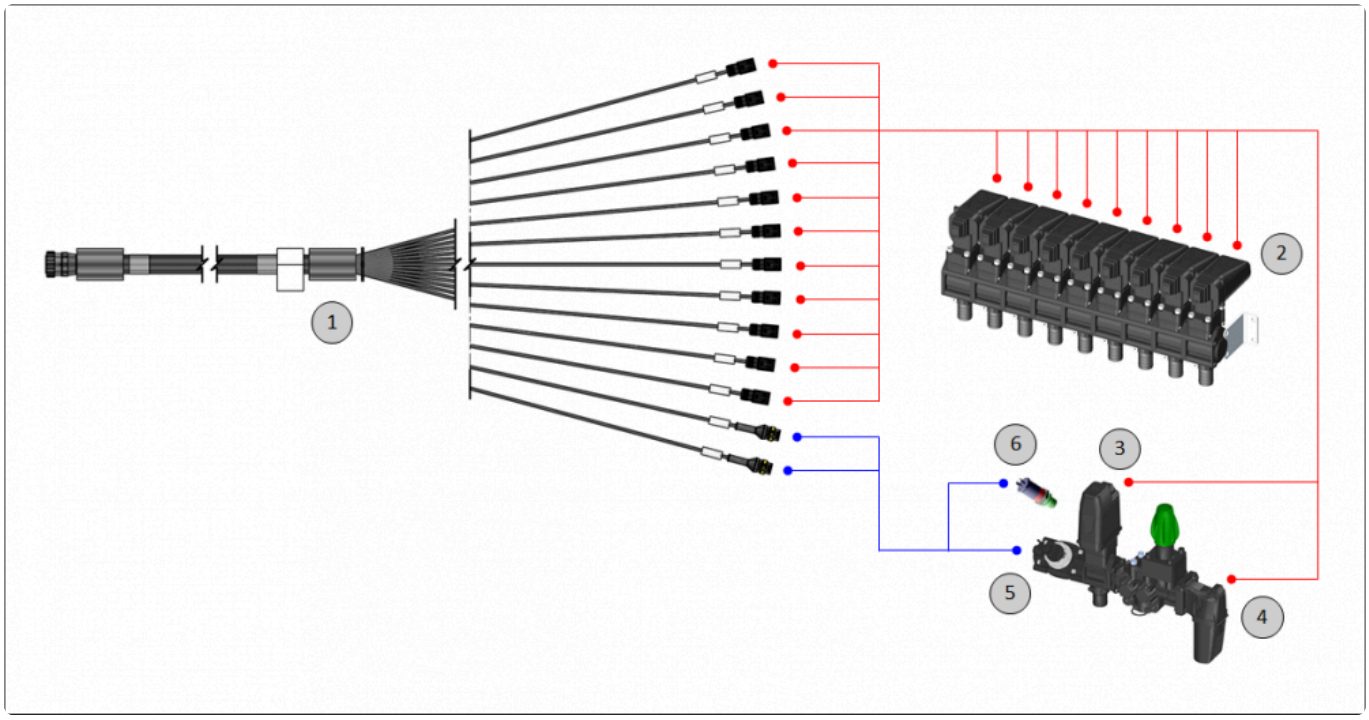
## Connecting the sprayer implement cable to the implement

There are several sprayer implement configurations according to valve model, number of sections, presence of regulating valve, main valve, flowmeter and other sensors. For each configuration it is possible to have a different cable kit, using the items described on System Components.

Following are some examples of GeoNave system configurations for spraying.

**Example 1: Crop Sprayer, 2-wire valves, DIN 43650-B connectors**

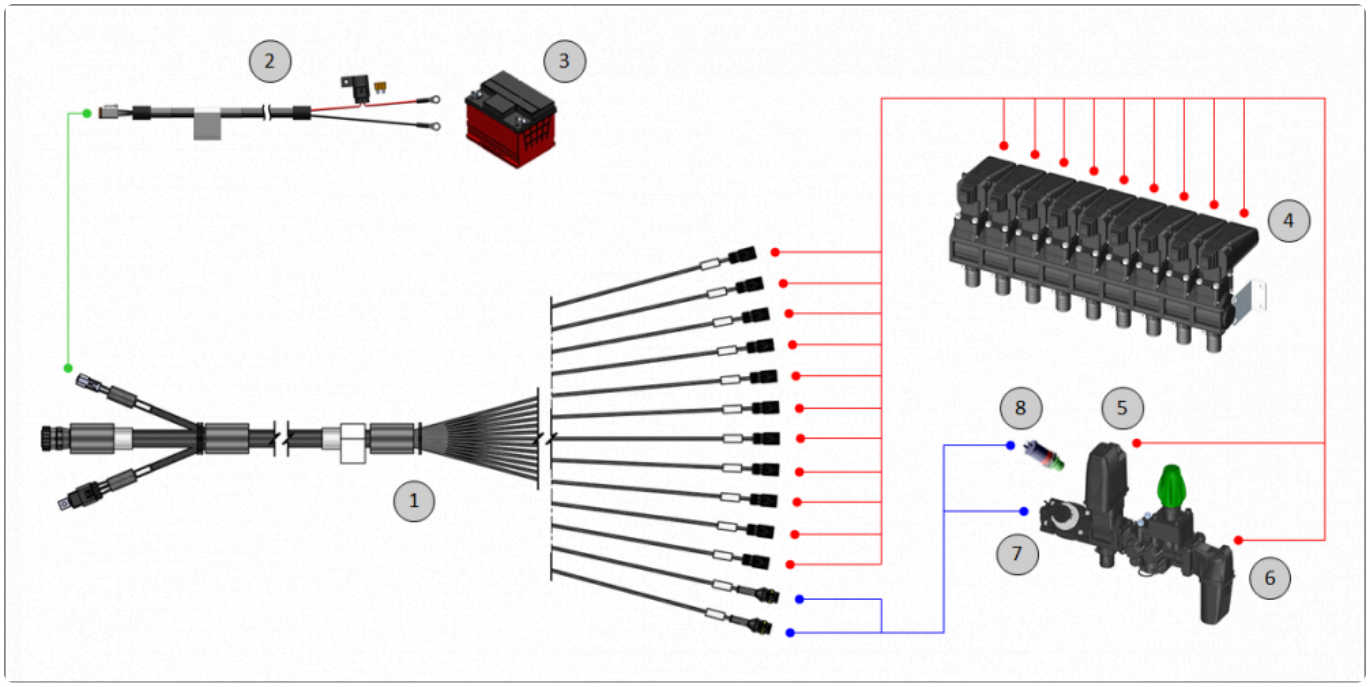
- 9 x Section valve 2-wire DIN 43650-B
- Main control valve 2-wire DIN 43650-B
- Regulation valve 2-wire DIN 43650-B
- Flowmeter 3-wire Amp Superseal
- Pressure transducer 3-wire Amp Superseal




| Item | Description |
|---|---|
| 1 | Sprayer implement cable<br>• C00902226 – 9 x Section valve<br>• C00902228 – 5 x Section valve |
| 2 | 9 x Section valve 2-wire DIN 43650-B connector |
| 3 | Regulation valve 2-wire DIN 43650-B connector |
| 4 | Main control valve 2-wire DIN 43650-B connector |
| 5 | Flowmeter 3-wire Amp Superseal connector |
| 6 | Pressure transducer 3-wire Amp Superseal connector |

**Example 2: Crop Sprayer, 3-wire valves, DIN 43650-B connectors**

- 9 x Section valve 3-wire DIN 43650-B
- Main control valve 3-wire DIN 43650-B
- Regulation valve 2-wire DIN 43650-B
- Flowmeter 3-wire Amp Superseal
- Pressure transducer 3-wire Amp Superseal

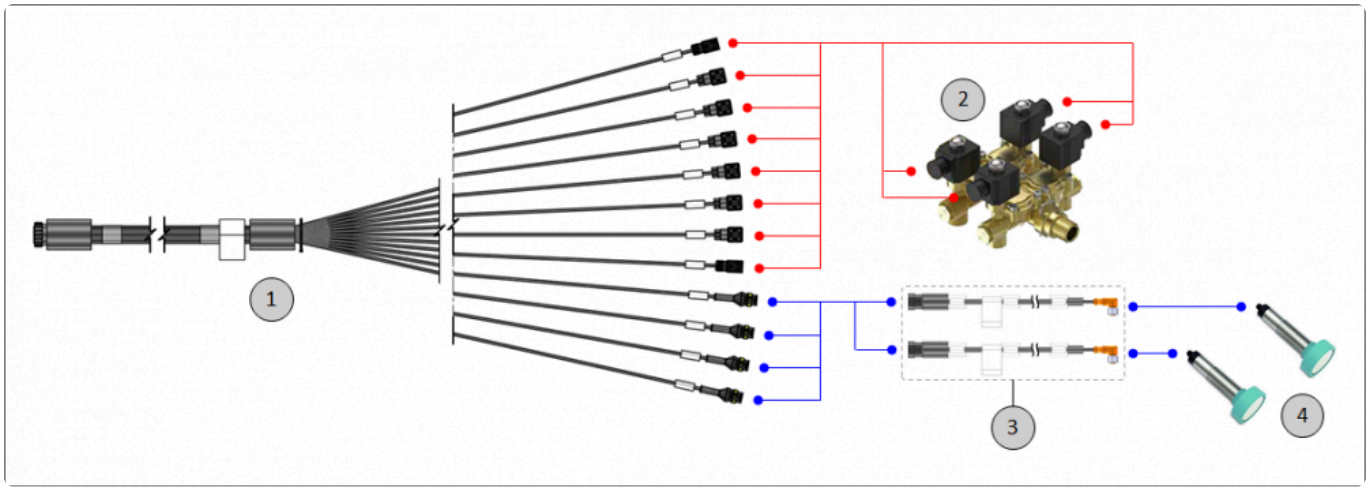



| Item | Description |
|---|---|
| 1 | Sprayer implement cable<br>• C00902227 – 9 x Section valve<br>• C00902238 – 5 x Section valve |
| 2 | Power cable for 3-wire valves |
| 3 | 12 V battery |
| 4 | 9 x Section valve 3-wire DIN 43650-B connector |
| 5 | Regulation valve 2-wire DIN 43650-B connector |
| 6 | Main control valve 3-wire DIN 43650-B connector |
| 7 | Flowmeter 3-wire Amp Superseal connector |
| 8 | Pressure transducer 3-wire Amp Superseal connector |

**Example 3: Orchard sprayer, solenoid valves and optional ultrasonic sensors**

- up to 6 x Section valves with solenoid DIN 43650
- 2 x Orchard ultrasonic sensors 5-wire M12 (optional)

Note: Requires Orchard spraying license

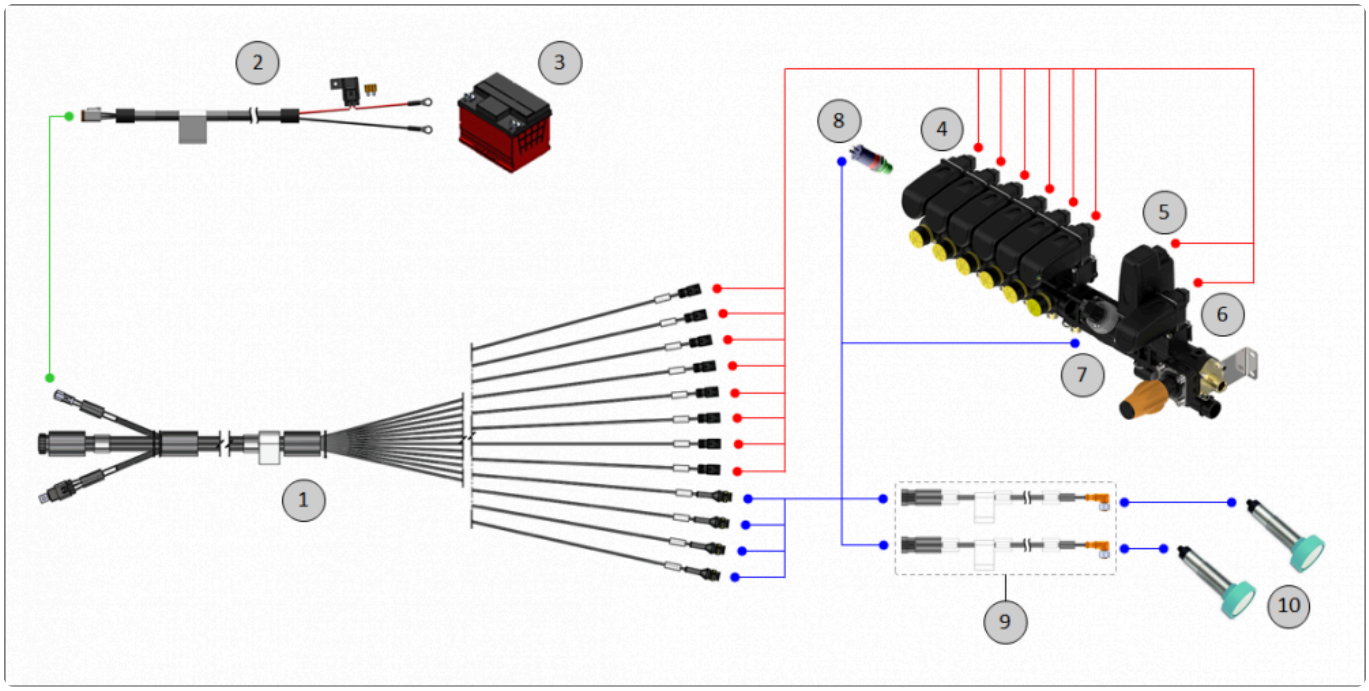



| Item | Description |
|---|---|
| 1 | Sprayer implement cable – C00902230 |
| 2 | up to 6 x Section valve with solenoid DIN 43650 connector |
| 3 | 2 x Orchard ultrasonic sensor adapter 5-wire M12 connector |
| 4 | 2 x Orchard ultrasonic sensor 5-wire M12 connector |

**Example 4: Multirow sprayer, up to 6 sections 3-wire valves with DIN 43650-B connectors and optional ultrasonic sensors**

- up to 6 x Section valve 3-wire DIN 43650-B
- Main control valve 3-wire DIN 43650-B
- Regulation valve 2-wire DIN 43650-B
- Flowmeter 3-wire Amp Superseal
- Pressure transducer 3-wire Amp Superseal
- 2 x Orchard ultrasonic sensor 5-wire M12 (optional)

Note: Requires Orchard spraying license




| Item | Description |
|---|---|
| 1 | Sprayer implement cable – C00902231 |
| 2 | Power cable for 3-wire valves |
| 3 | 12 V battery |
| 4 | 6 x Section valve 3-wire DIN 43650-B connector |
| 5 | Regulation valve 2-wire DIN 43650-B connector |
| 6 | Main control valve 3-wire DIN 43650-B connector |
| 7 | Flowmeter 3-wire Amp Superseal connector |
| 8 | Pressure transducer 3-wire Amp Superseal connector |
| 9 | 2 x Orchard ultrasonic sensor adapter 5-wire M12 connector |
| 10 | 2 x Orchard ultrasonic sensor 5-wire M12 connector |

# 5.4. Diagnosis

Diagnosis of correct installation of GeoNave system license ISO 31 should be performed as follows.

## GNSS signal

To verify that the GNSS is operating correctly, follow the sequence described below.

1. Make sure that the GNSS antenna is without obstructions and located with good satellite view;
2. Turn on the GeoNave display;
3. Access the Information> Satellites screen;
4. Check that the diplayed screen data is close to the ideal values, according to the table below.

| Information | Value |
|---|---|
| Data from GPS | Internal GPS [1] |
| Signal Quality | Great |
| HDOP | Less than 1.0 |
| Used Satellites | Greater than or equal to 8 |
| Longitude | Value between -180.00000000 and +180.00000000 |
| Latitude | Value between -90.00000000 and +90.00000000 |

[1] **GPS external** when GNSS correction base station is present.

## Spraying

The diagnosis of spraying functionalities must be carried out in the menu Settings> Spraying> Diagnostics, following descriptions of corresponding topics.

- Valves
- Simulation

# 6. GeoNave basics


- Switching ON and OFF
- Touch sensitive buttons
- Configuration screens
- Navigation screen
- Guidance lightbar
- Application button
- Autopilot button


This section describes the basics of how the GeoNave system works, including the function of each button, lightbar and every screen type.

# 6.1. Switching ON and OFF

## Switching the GeoNave display ON

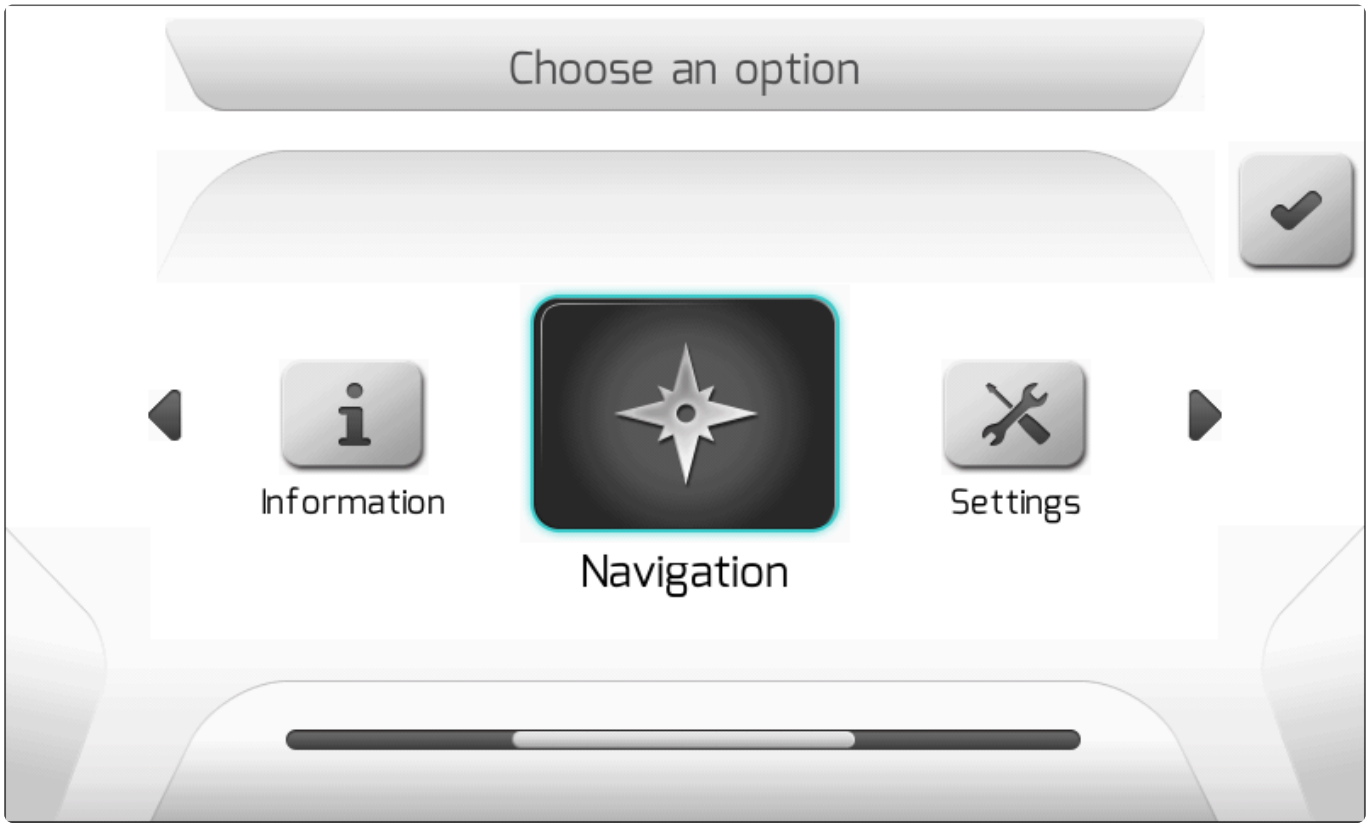
To switch ON the GeoNave display, after correctly following all the steps described in the Installation section, press the black button 1 positioned on the display left side, as shown in the image below. A short beep will be heard, indicating that the system has been switched on.




The system initialization screen will appear, containing the manufacturer's logo, then the loading screen for all system configurations is shown.

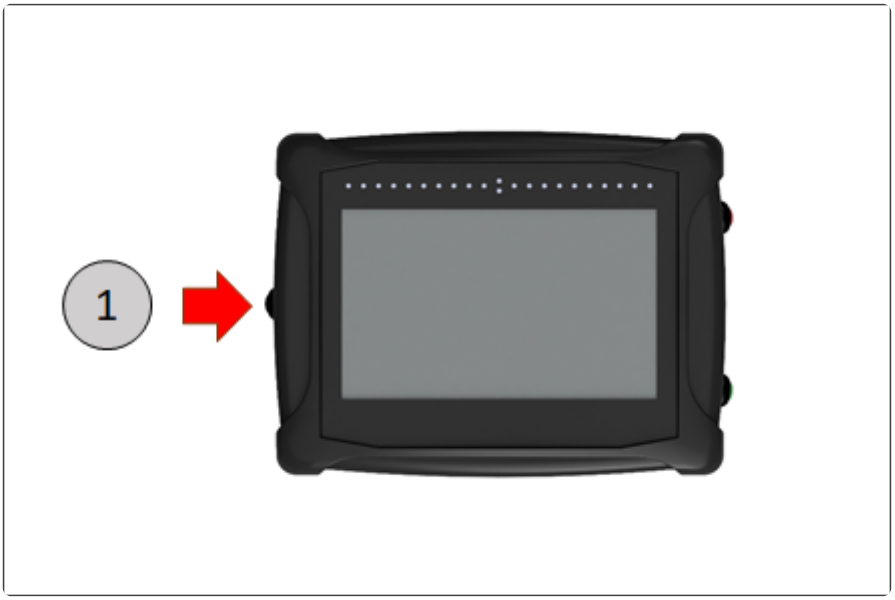



Finally, the system's initial screen is shown, containing the three main menus – Information, Navigation and Settings.

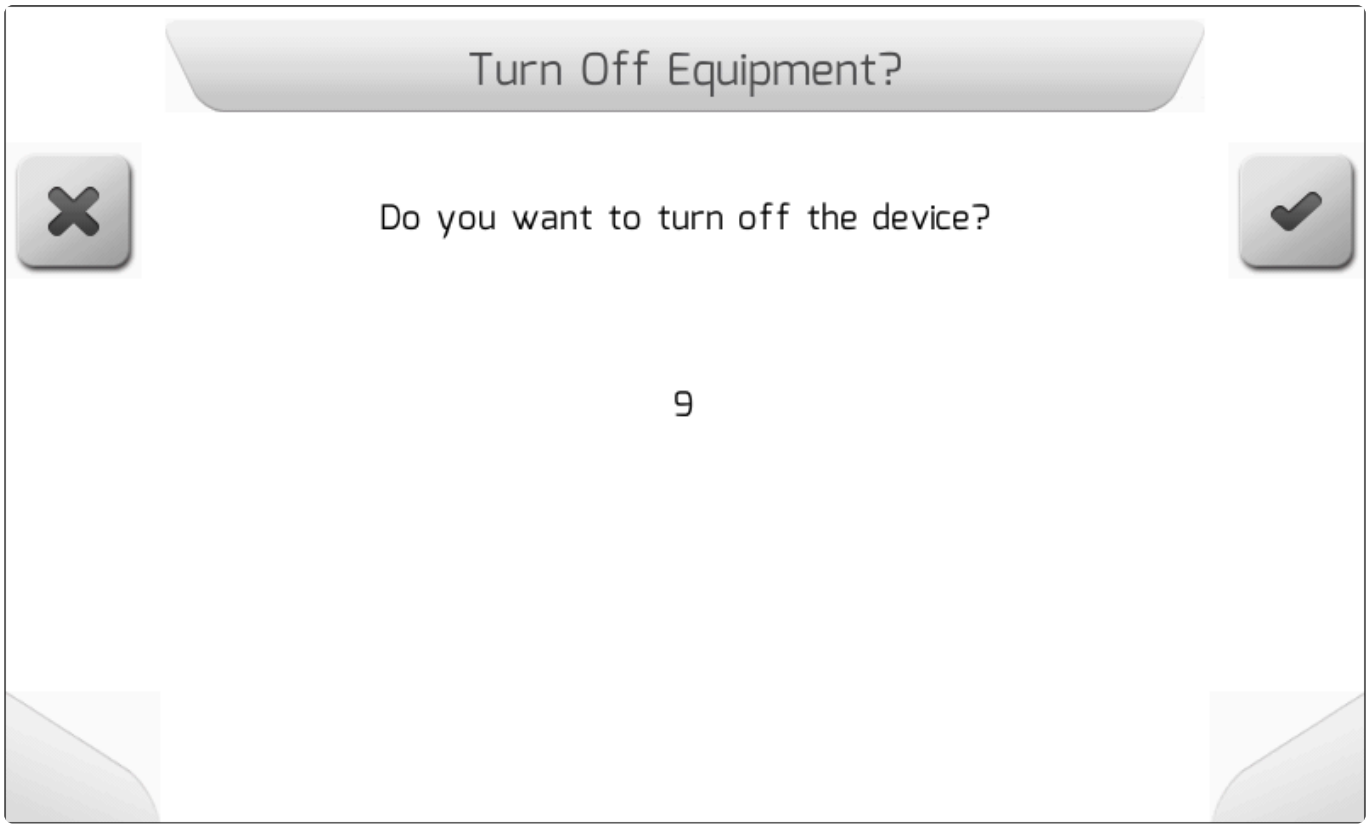


# Switching the GeoNave display OFF

The procedure for switching OFF the GeoNave display is equally simple. Press the black button 1 positioned on the left side of the display, as shown in the image below.




A short beep will be heard and the following screen will be shown, including a 10 seconds countdown for automatic shutdown.




During the countdown:

- If the user does not press any key within 10 seconds, the system will automatically shut down.

- If the user presses the Confirm button  , shutdown will occur instantly.
- If the user presses the Cancel button  , the shutdown process ends and the system returns to the previous screen.

When an event is open on the navigation screen, it is not possible to switch off the GeoNave through the black side button.

Do not switch off the GeoNave display by disconnecting the power cables. There may be loss of information about the work in progress, in addition to electrical damage to the system.

# 6.2. Touch sensitive buttons

The GeoNave system screens have several types of touch sensitive buttons, each with specific functions on every type of screen. The following tables shows possible states that a button can assume on the screen and also a description of every button type.

## Button states

Buttons can have 4 states, described in the table below with the example of point A marking button.

| State | Image | Description |
|---|---|---|
| **Normal** |  | Normal button state, without been pressed by the user. Indicates also that the function activated by the button is not active. |
| **Pressed** |  | Button state while the user touches the screen. |
| **Active** |  | Indicates that the function activated by the button is active. |
| **Flashing** |  | Indicates the next action the user must take, by pressing the flashing button. |

## Button types

The following describes button types that can be found on the GeoNave system screens.

### Configuration screen buttons

| Button | Description |
|---|---|

| | |
|---|---|
|  | Information menu |
|  | Information > Satellites menu |
|  | Information > Equipment menu |
|  | Navigation menu |
|  | Navigation > Build Field menu |
|  | Navigation > Open Event menu |
|  | Settings menu |
|  | Settings > Spraying menu |
|  | Settings > Work menu |
|  | Settings > Auto Steering menu |
|  | Settings > Fertilization menu |

| | |
|---|---|
|  | Settings > Memory menu |
|  | Settings > RTK Configuration menu |
|  | Settings > Advanced menu |
|  | Return to previous screen |
|  | Go to the next screen |
|  | Confirm a selection or setting |
|  | Cancel a selection or setting |
|  | Select the option above |
|  | Select the option below |
|  | Select the option on the left |
|  | Select the option on the right |
|  | Edit parameter value |
|  | Increase parameter value |
|  | Decrease parameter value |
|   | Switch off parameter function |
|  | View item information |

| | |
|---|---|
|  | View item information |
|  | Load file from pendrive to internal memory |
|  | Delete file from internal memory |
|  | Download file from internal memory to pendrive |

## Spraying navigation and simulation screen buttons

| Button | Description |
|---|---|
|  | Exit navigation or simulation |
|  | Activate spraying |
|  | Access spraying settings button pages |
|  | Select fixed spraying rate 1 |
|  | Select fixed spraying rate 2 |
|  | Select manual spraying rate |
|  | Select automatic section shut-off |
|  | Select manual section shut-off |
|  | Switch data in the information bar |
|  | Access settings menu |
|  | Edit parameter value |
|  | Select above option; increase manual spraying rate |

| | |
|---|---|
|  | Select below option; decrease manual spraying rate |
|  | Select the option on the left |
|  | Select the option on the right |
|  | Change the button page |
|  | Marks point A, or starting point, of a guidance |
|  | Marks point B, or ending point, of a guidance |
|  | Pause guide navigation |
|  | Resume guide navigation |
|  | Enter the position adjustment menu |
|  | Start boundary marking |
|  | Pause boundary marking |
|  | Resume boundary marking |
|  | Finish boundary marking |
|  | Change to 2D view |
|  | Change to 3D view |
|  | Change zoom level |
|  | Increase demo speed |
|  | Decrease demo speed |

### Spraying section buttons

Spraying section buttons shown at the bottom of spraying navigation and simulation screens have a variable image width according to the sections number (1 to 9) and can assume the states shown below.

| State | Description |
|---|---|
|  | Section without overlap, switched on, applying |
|  | Section without overlap, switched on, not applying |
|  | Section without overlap, switch off |
|  | Overlapping section, switched on, applying |
|  | Overlapping section, switched on, not applying |
|  | Overlapping section, switched off |

# 6.3. Configuration screens

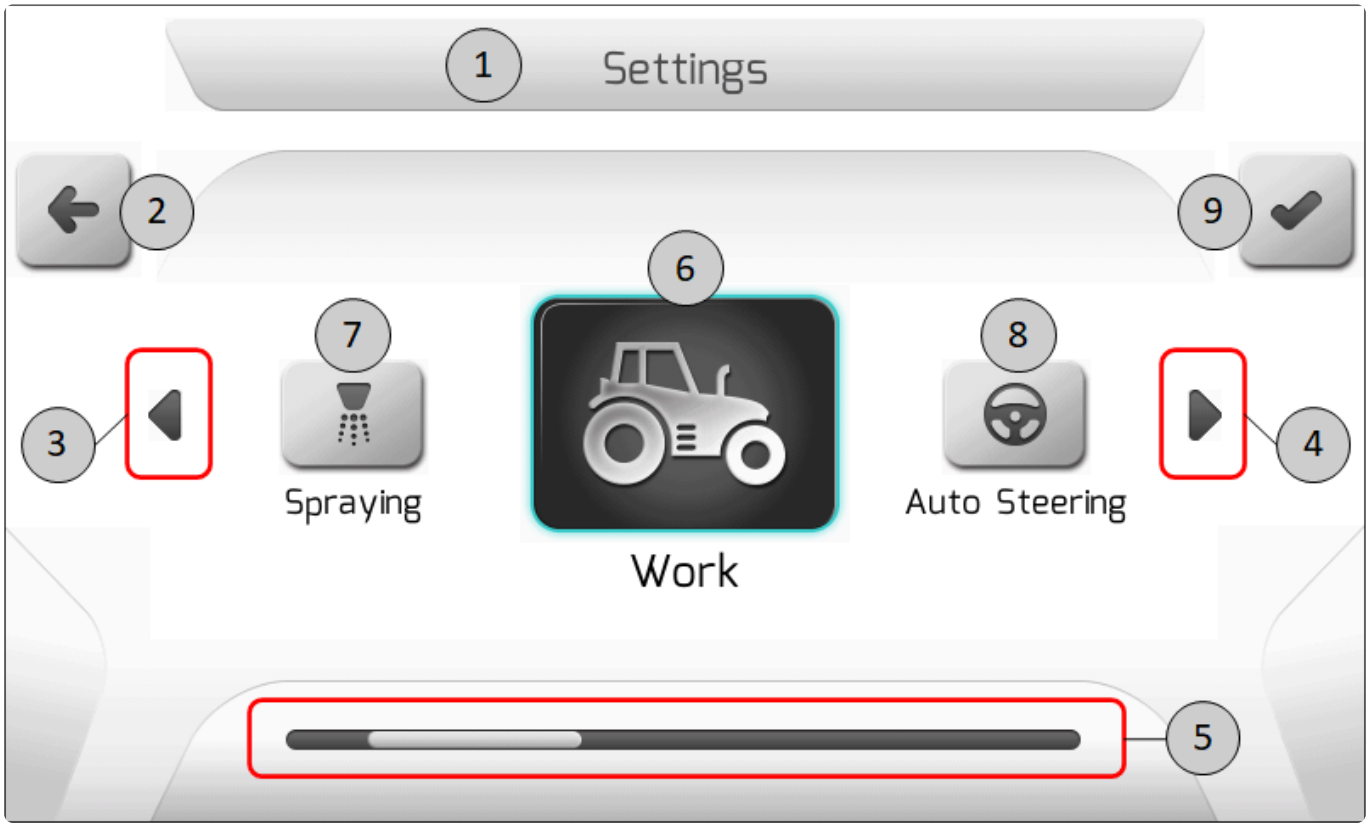
- Horizontal menu
- Vertical menu
- Simple list
- Double list
- Text editing
- Value editing
- Value editing with image
- Date editing
- Entering password
- Vertical choice
- Files handling
- Information
- Information with confirmation
- Loading
- Actuators diagnosis

GeoNave system configuration screens have several standard models. Each model is presented in the following sections, together with a brief function description of each item.

# 6.3.1. Horizontal menu

The Horizontal menu template screen is used to navigate between the GeoNave main system menus. The template consists of graphic items, touch sensitive buttons – some representing menus accessible by touching the screen, title and side scroll bar.

The following is an example image of the Horizontal menu – Settings menu screen, detailing each item in its composition.



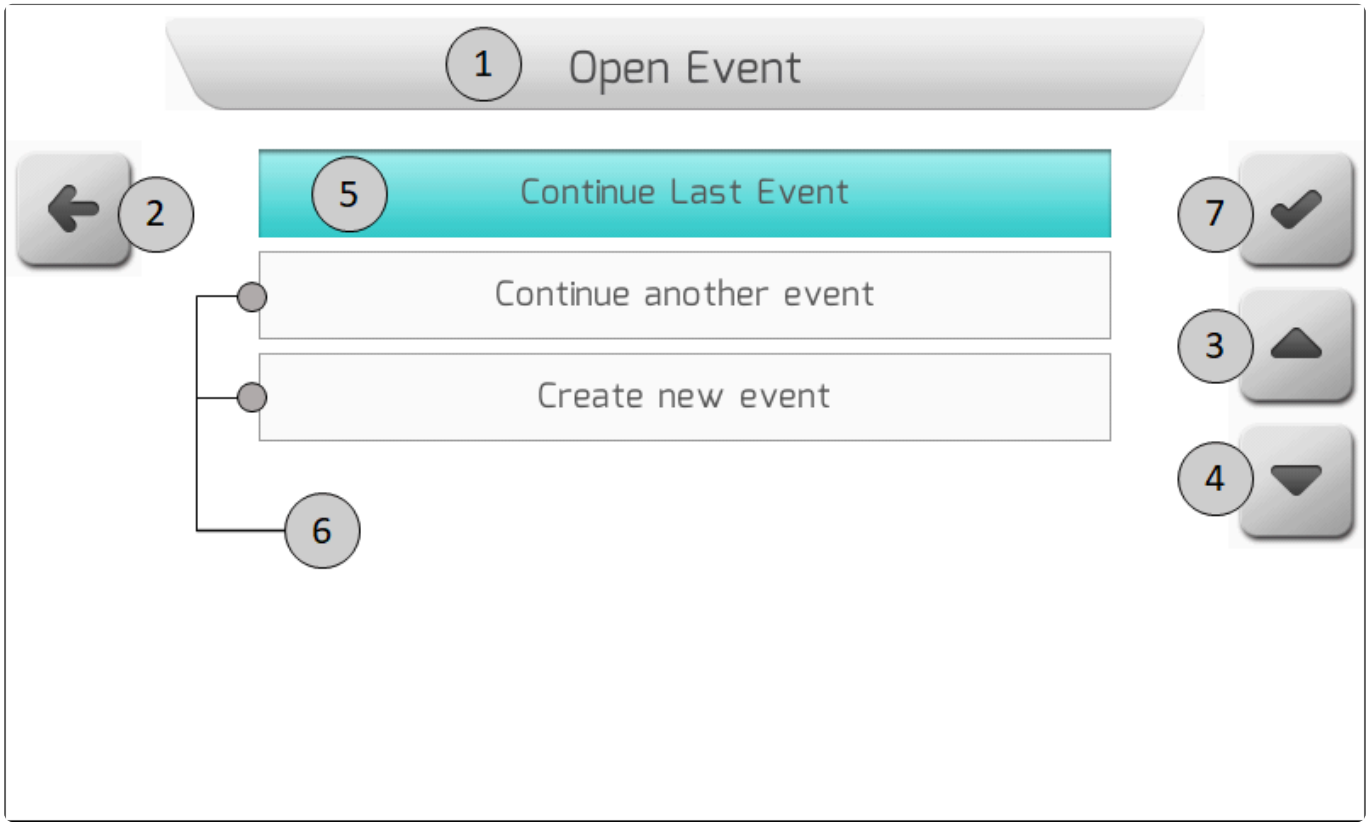

| Item | Description |
|---|---|
| 1 | Horizontal menu title bar, containing title text. |
| 2 | Touch sensitive button to return to previous screen. |
| 3 | Touch sensitive area to scroll the horizontal menu to the left. |
| 4 | Touch sensitive area to scroll the horizontal menu to the right. |
| 5 | Horizontal scroll bar, graphically indicating the position of the selected item within the total items number. |
| 6 | Touch sensitive button to enter the selected item. In the example, Work menu will be displayed. |
| 7 | Touch sensitive button to select the item to the left of the horizontal menu. |

| | |
|---|---|
| 8 | Touch sensitive button to select the item to the right of the horizontal menu. |
| 9 | Touch sensitive button to confirm current selection. In the example, Work menu will be displayed. |

# 6.3.2. Vertical menu

The Vertical menu screen template is used to list submenus one below the other. The template is composed of graphic items, touch sensitive buttons, title, and the submenus listed in rectangular boxes. All of these boxes are also touch sensitive, so that the corresponding option is selected when touched.

The image below represents an example of a Vertical menu – Open Event screen, detailing each item in its composition.



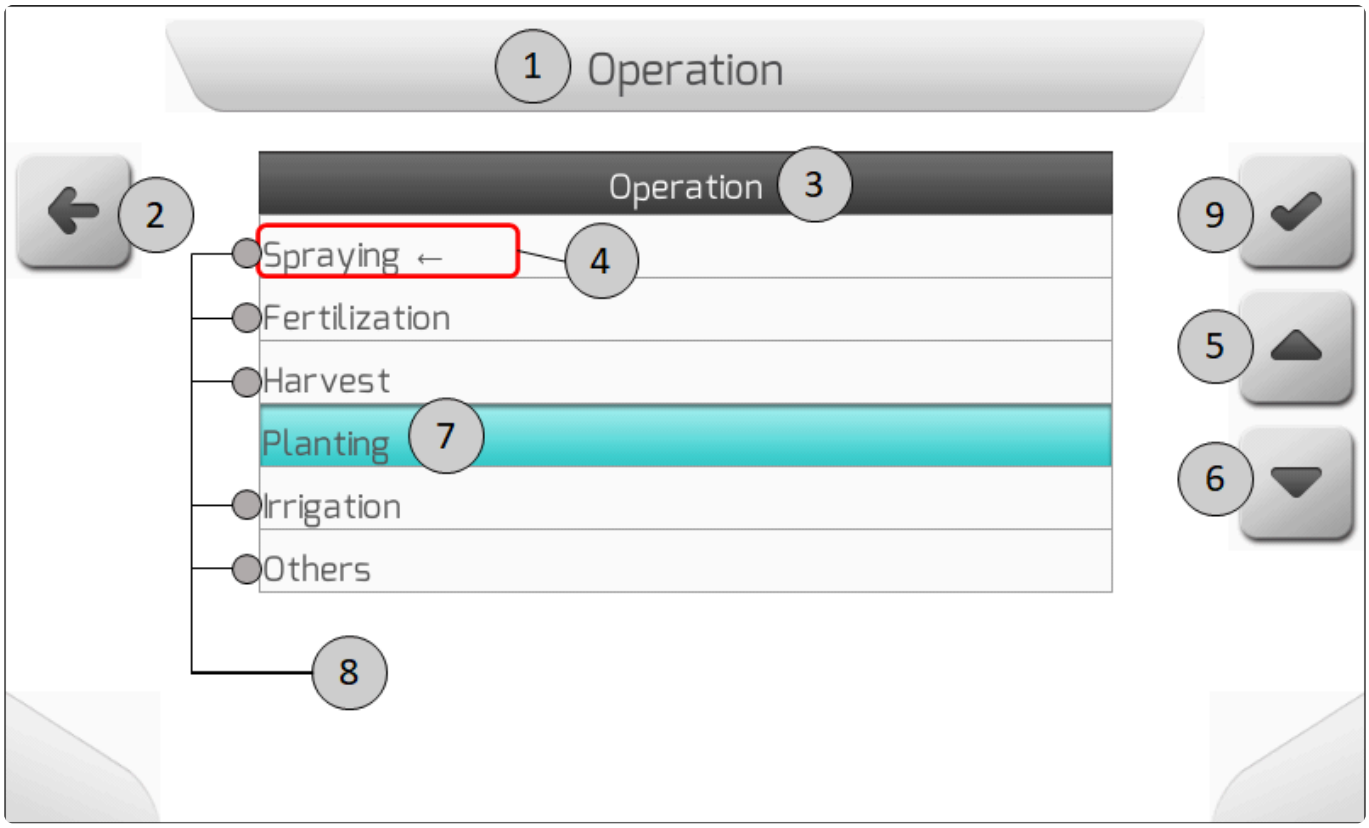

| Item | Description |
|---|---|
| 1 | Vertical menu title bar, containing title text. |
| 2 | Touch sensitive button to return to previous screen. |
| 3 | Touch sensitive button to select the item above the currently selected one, marked with blue background. |
| 4 | Touch sensitive button to select the item below the currently selected one, marked with blue background. |
| 5 | Selected submenu, highlighted with blue background. |

| | |
|---|---|
| 6 | Other unselected submenus, presented with white background. The rectangular submenu area is touch sensitive and corresponding option is selected when touched. |
| 7 | Touch sensitive button to confirm current selection. When touched, will be displayed the screen of the selected submenu, marked with blue background. |

# 6.3.3. Simple list

The Simple list screen template is normally used to set a parameter value that has several selectable options, which are presented in a single column table. Each table row represents a possible parameter setting value.
The template is composed of graphic items, touch sensitive buttons, title and single column table, containing possible parameter values.

The image below represents an example of a Simple list screen – Operation parameter screen, detailing each item in its composition.




| Item | Description |
|---|---|
| 1 | Simple list screen title bar, containing title text. |
| 2 | Touch sensitive button to return to previous screen. |
| 3 | Table title, containing parameter name with graphite background. |
| 4 | Currently configured parameter value, shown with an arrow on its right. |

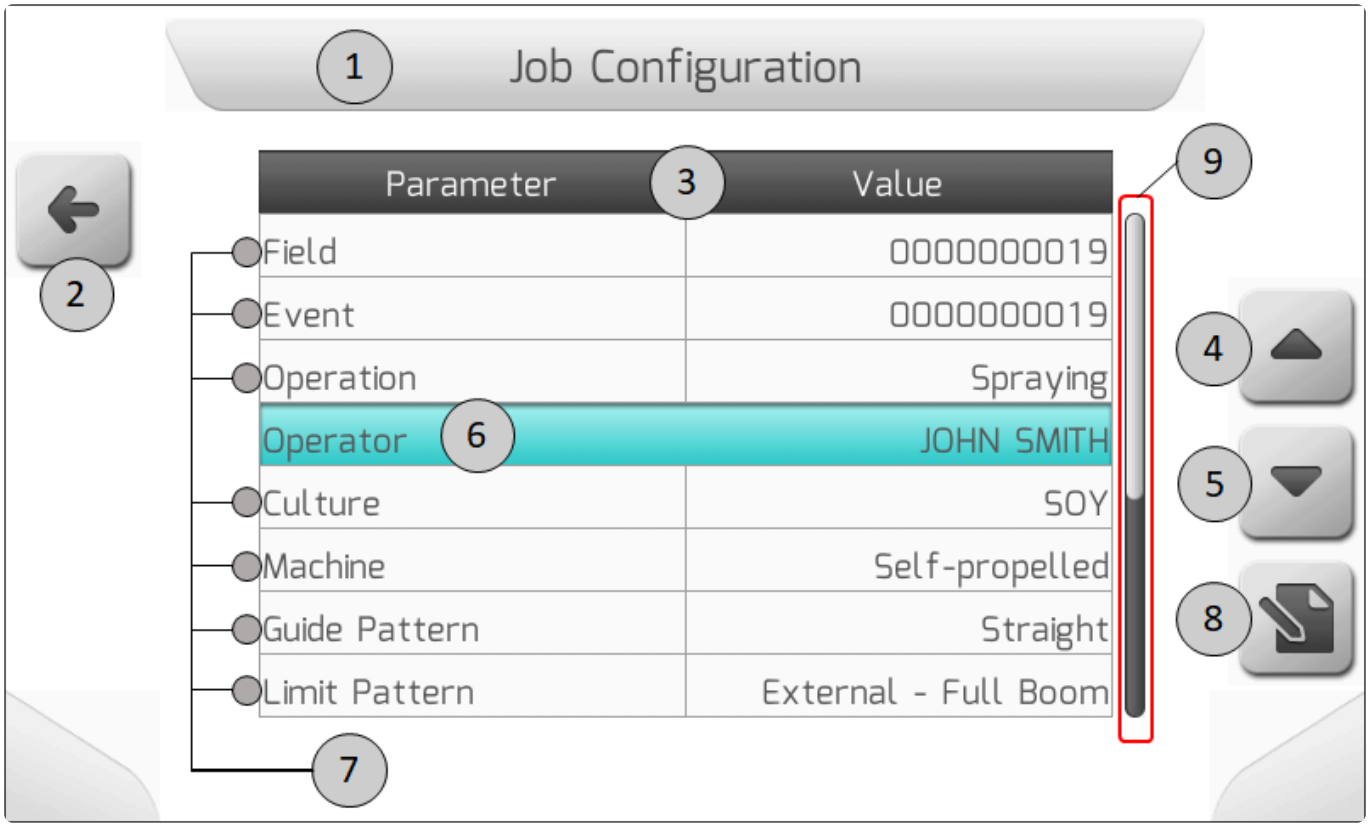
| | |
|---|---|
| 5 | Touch sensitive button to select the option above the currently selected one, marked with blue background. |
| 6 | Touch sensitive button to select the option below the currently selected one, marked with blue background. |
| 7 | Selected option, highlighted with blue background. |
| 8 | Other unselected options, which are presented with white background. The rectangular area of each option is touch sensitive, and the corresponding table row is selected when touched. |
| 9 | Confirm button to save parameter new value. |

After confirmation, Saving Parameter screen will be displayed. In this screen, parameter new value will be saved in the GeoNave system. After that, the next screen that will be displayed is the simple list source screen.

# 6.3.4. Double list

The Double list screen template is used to display items or parameters that compose a settings menu or submenu. The main feature of this screen template is a two columns table, the left column represents the parameters or item name. The right column shows the current parameter value, or the action to be performed for the menu item.
The template consists of graphic items, touch sensitive buttons, title and a two-column table containing menu or submenu items and/or parameters.

The following image shows an example of a Dual list – Job Configuration screen, detailing each item in its composition. In the example, the selected item is a parameter – Operator, so the action button shown on the screen is the Edit button  .




| Item | Description |
|---|---|
| 1 | Dual list screen title bar, containing title text. |
| 2 | Touch sensitive button to return to previous screen. |
| 3 | Table title line, containing the text “Parameter” in the first column and “Value” in the second. |
| 4 | Touch sensitive button to select the option above the currently selected one, marked with blue background. |
| 5 | Touch-sensitive button to select the option below the currently selected one, marked with blue background. |
| 6 | Option selected, highlighted with blue background. |
| 7 | Other unselected options, which are presented with white background. The rectangular area of each option is touch sensitive, and the corresponding row in the table is selected when touched. |
| 8 | Touch sensitive button that performs the action related to the selected parameter or item. |
| 9 | Vertical scroll bar, graphically indicating currently displayed list position within total items number. |

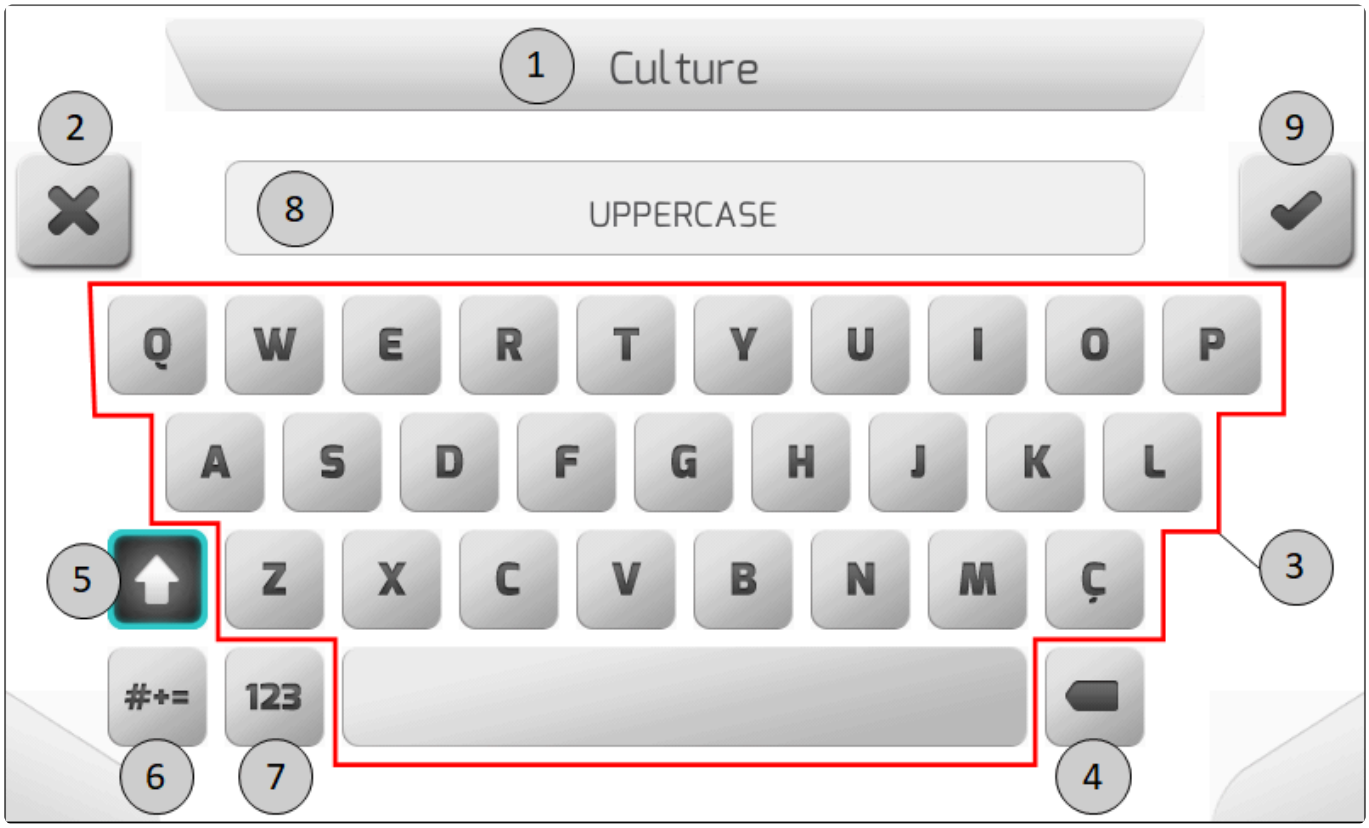
# 6.3.5. Text editing

The Text editing screen template is used to enter a textual parameter value. The screen is basically composed of typing keyboards, graphics items, touch sensitive buttons, title and typed text viewing area.

The maximum text size of a parameter value is 40 characters.

There are four keyboard models available. In the examples below, the Culture parameter setting screen is presented and described.

## Uppercase keyboard




| Item | Description |
|---|---|
| 1 | Text editing screen title bar, containing the name of textual parameter being edited. |
| 2 | Touch sensitive button to return to previous screen. |
| 3 | Standard QUERTY uppercase keyboard with space bar. |
| 4 | *Backspace* key, used to erase last entered character. |
| 5 | *Shift* key in active state, to switch to lowercase keyboard. |
| 6 | Special character keyboard switching key. |
| 7 | Numeric keyboard switching key. |
| 8 | Typed text viewing area. |

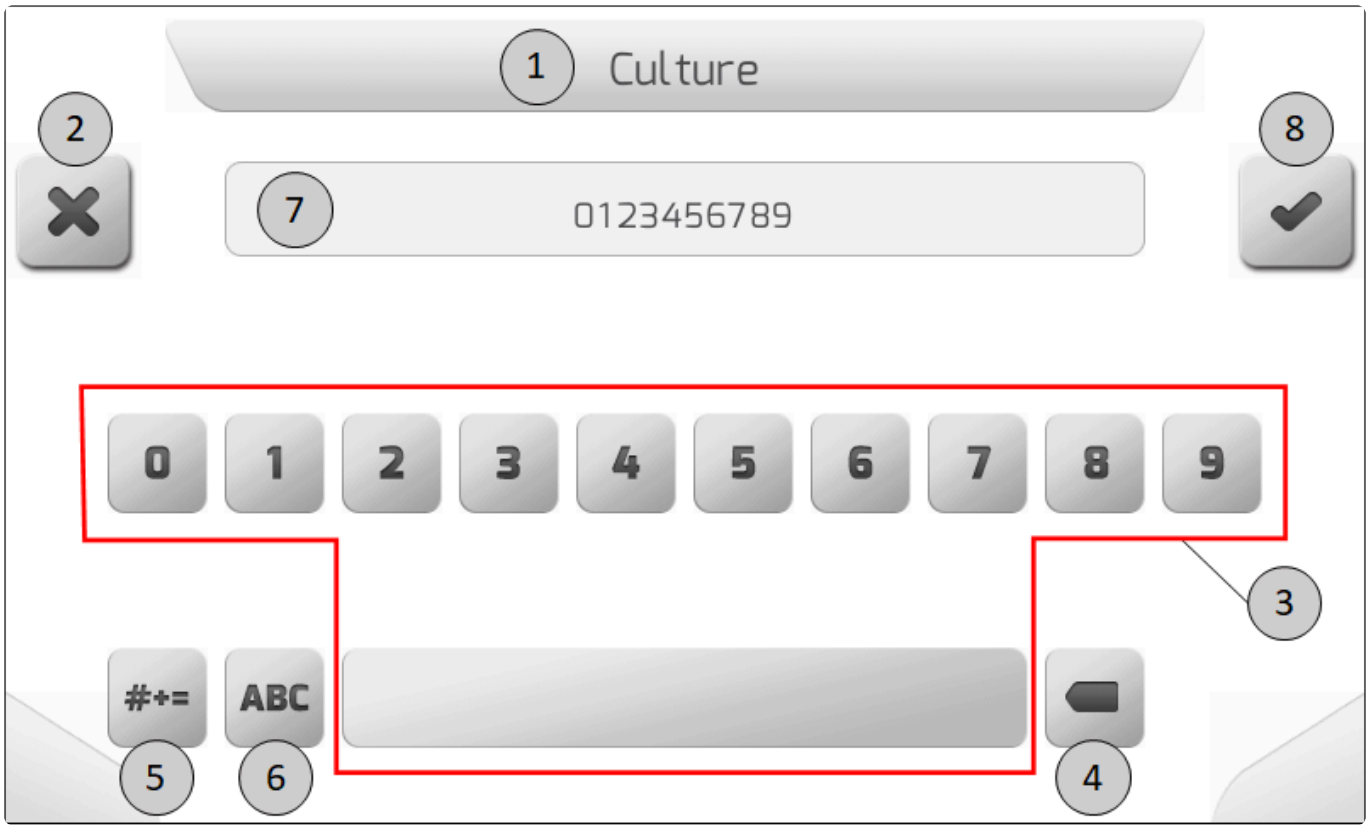
| | |
|---|---|
| 9 | Confirm button to save the parameter new textual value. |

## Lowercase keyboard



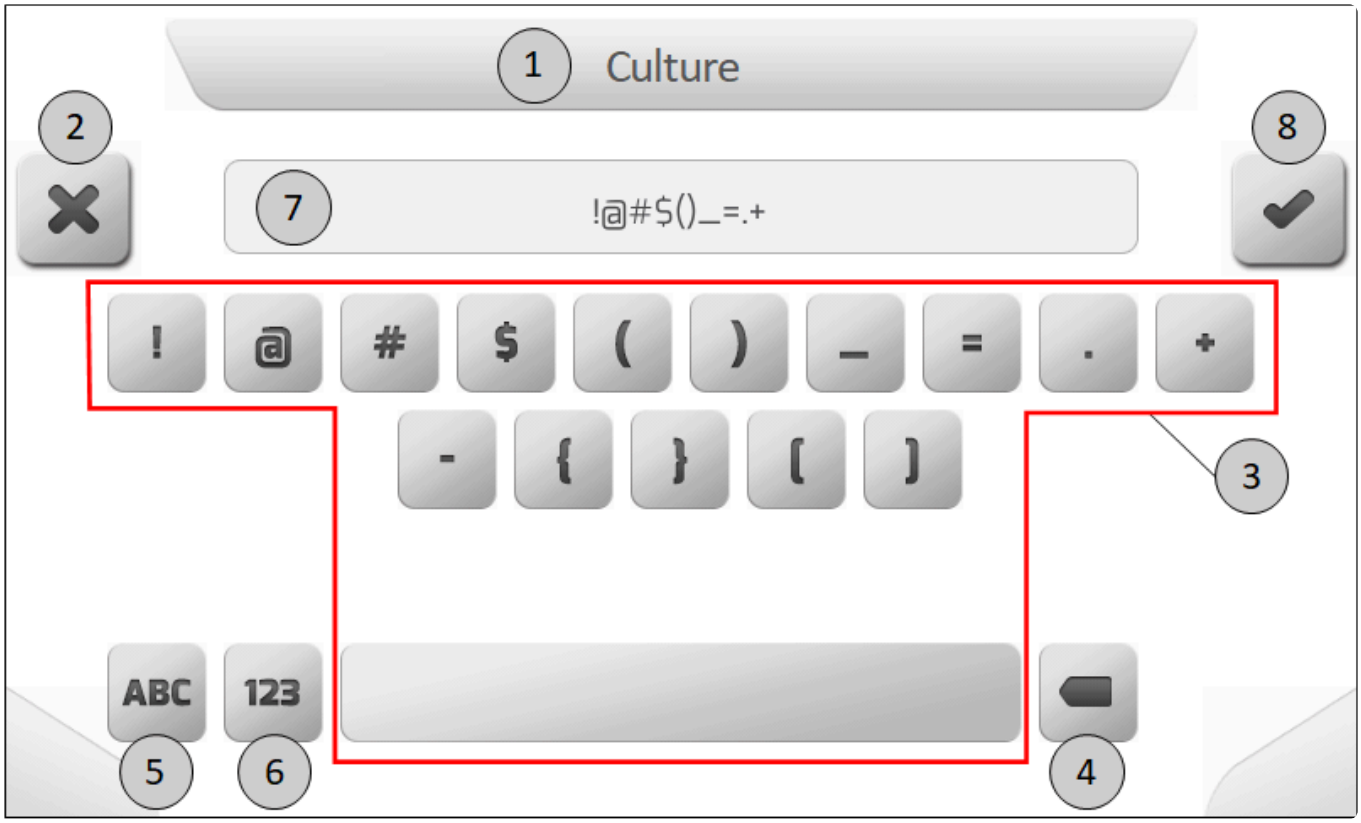

| Item | Description |
|---|---|
| 1 | Text editing screen title bar, containing the name of textual parameter being edited. |
| 2 | Touch sensitive button to return to previous screen. |
| 3 | Standard QUERTY lowercase keyboard with space bar. |
| 4 | *Backspace* key, used to erase last entered character. |
| 5 | *Shift* key in the normal state, to switch to uppercase keyboard. |
| 6 | Special character keyboard switching key. |
| 7 | Numeric keyboard switching key. |
| 8 | Typed text viewing area. |
| 9 | Confirm button to save the parameter new textual value. |

## Numeric keypad




| Item | Description |
|---|---|
| 1 | Text editing screen title bar, containing the name of textual parameter being edited. |
| 2 | Touch sensitive button to return to previous screen. |
| 3 | Numeric keyboard with space bar. |
| 4 | *Backspace* key, used to erase last entered character. |
| 5 | Special character keyboard switching key. |
| 6 | Uppercase keyboard switching key. |
| 7 | Typed text viewing area. |
| 8 | Confirm button to save the parameter new textual value. |

## Special character keyboard




After confirmation, for any keyboard pattern, Saving Parameter screen will be displayed. In this screen, parameter new textual value will be saved in the GeoNave system. After that, the next screen that will be displayed is the text editing source screen.

# 6.3.6. Value editing

The Value editing screen template is used to modify a numeric parameter value. The screen consists of numeric keypad, graphic items, touch sensitive buttons, title and entered value viewing area.

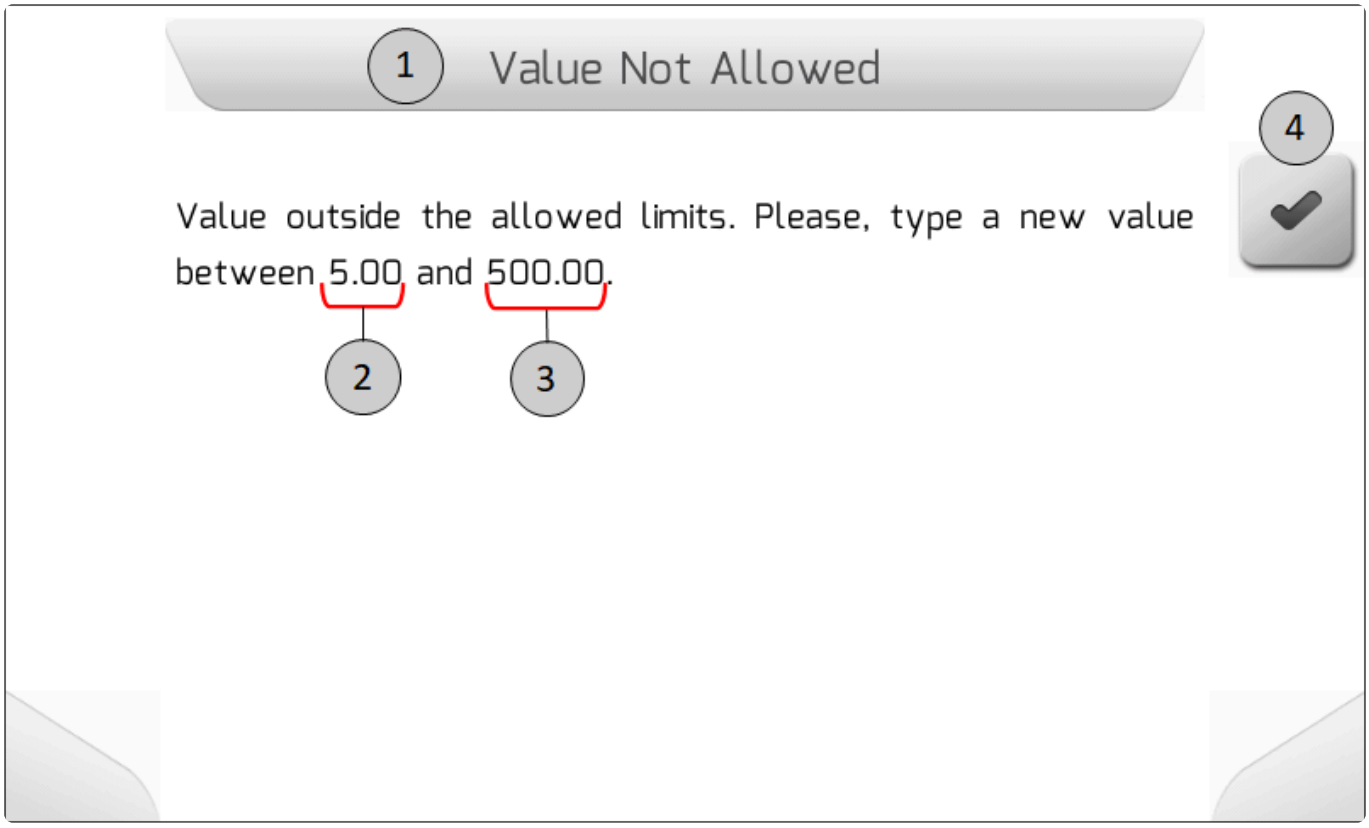
The image below represents an example of a Value editing screen, to change the Spacing Nozzles parameter numerical value.




| Item | Description |
|---|---|
| 1 | Value editing screen title bar, containing the name of numeric parameter being edited. |
| 2 | Touch sensitive button to return to previous screen. |
| 3 | Numeric keypad for entering parameter value. Contains decimal point key, positive or negative sign key and thousands key. |
| 4 | *Backspace* key to erase the last digit. |
| 5 | *Clear* key to delete the entire entered value. |
| 6 | Entered value viewing area. |
| 7 | Confirm button to save the parameter new numerical value. |

After confirmation  , the Saving Parameter screen will be displayed. In this screen, parameter new numerical value will be saved in the GeoNave system. After that, the next screen that will be displayed is the value editing source screen.

The minimum and maximum possible values varies according to the parameter being edited. The following Information screen will be displayed if the user enters a value outside the valid range, informing the correct values that the parameter can assume.

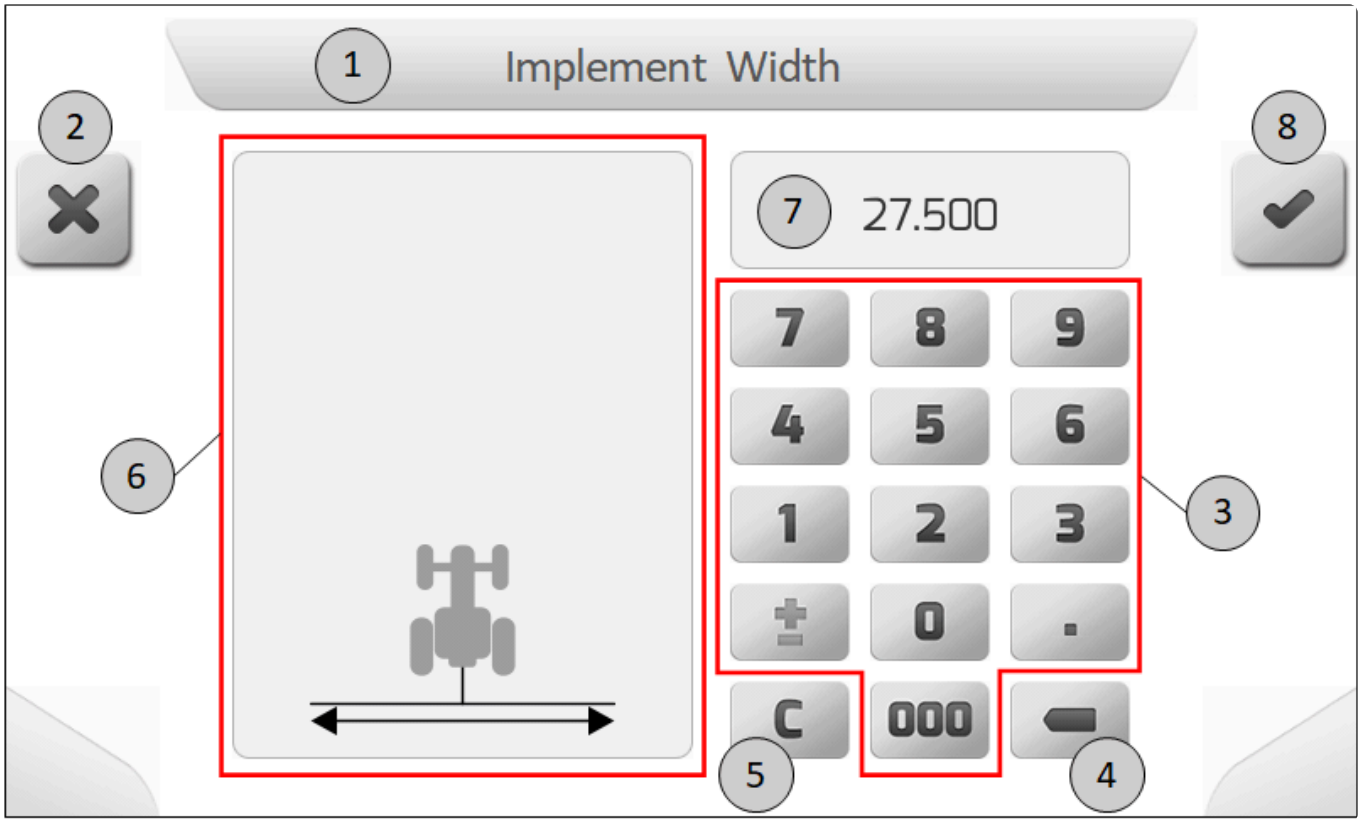



| Item | Description |
|---|---|
| 1 | Screen title bar, containing the text “Value Not Allowed”. |
| 2 | Parameter minimum possible value. |
| 3 | Parameter maximum possible value. |
| 4 | Confirm button to accept information. |

# 6.3.7. Value editing with image

The Value editing with image screen template is used to modify a numerical parameter value also presenting an image of what the parameter physically represents on the machine. The template consist of numeric keypad, graphics items, touch sensitive buttons, title, entered value viewing area and an image that physically represents the parameter.

The image below represents an example of a Value editing with image screen, to change the Implement Width parameter numerical value.

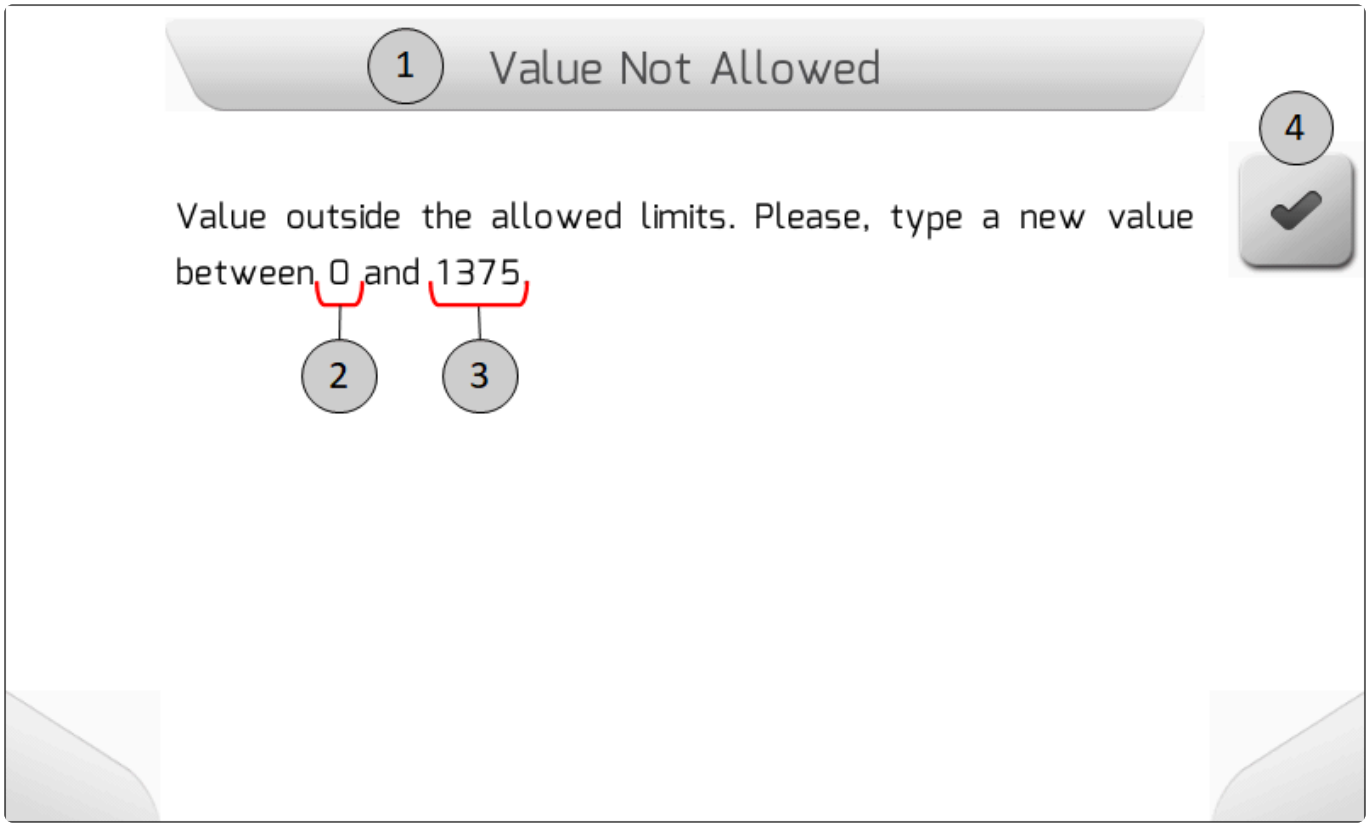



| Item | Description |
|---|---|
| 1 | Value editing screen title bar, containing the name of the numeric parameter being edited. |
| 2 | Touch sensitive button to return to previous screen. |
| 3 | Numeric keypad for entering the value. Contains decimal point key, positive or negative sign key and thousands key. |
| 4 | *Backspace* key to erase the last digit. |
| 5 | *Clear* key to delete the entire entered value. |
| 6 | Image that physically represents the machine parameter. |
| 7 | Entered value viewing area. |
| 8 | Confirm button to save the parameter new numerical value. |

After confirmation  , the Saving Parameter screen will be displayed. In this screen, parameter new numerical value will be saved in the GeoNave system. After that, the next screen that will be displayed is the value editing source screen.

The minimum and maximum possible values varies according to parameter being edited. The following Information screen will be displayed if the user enters a value outside the valid range, informing the

correct values that the parameter can assume.

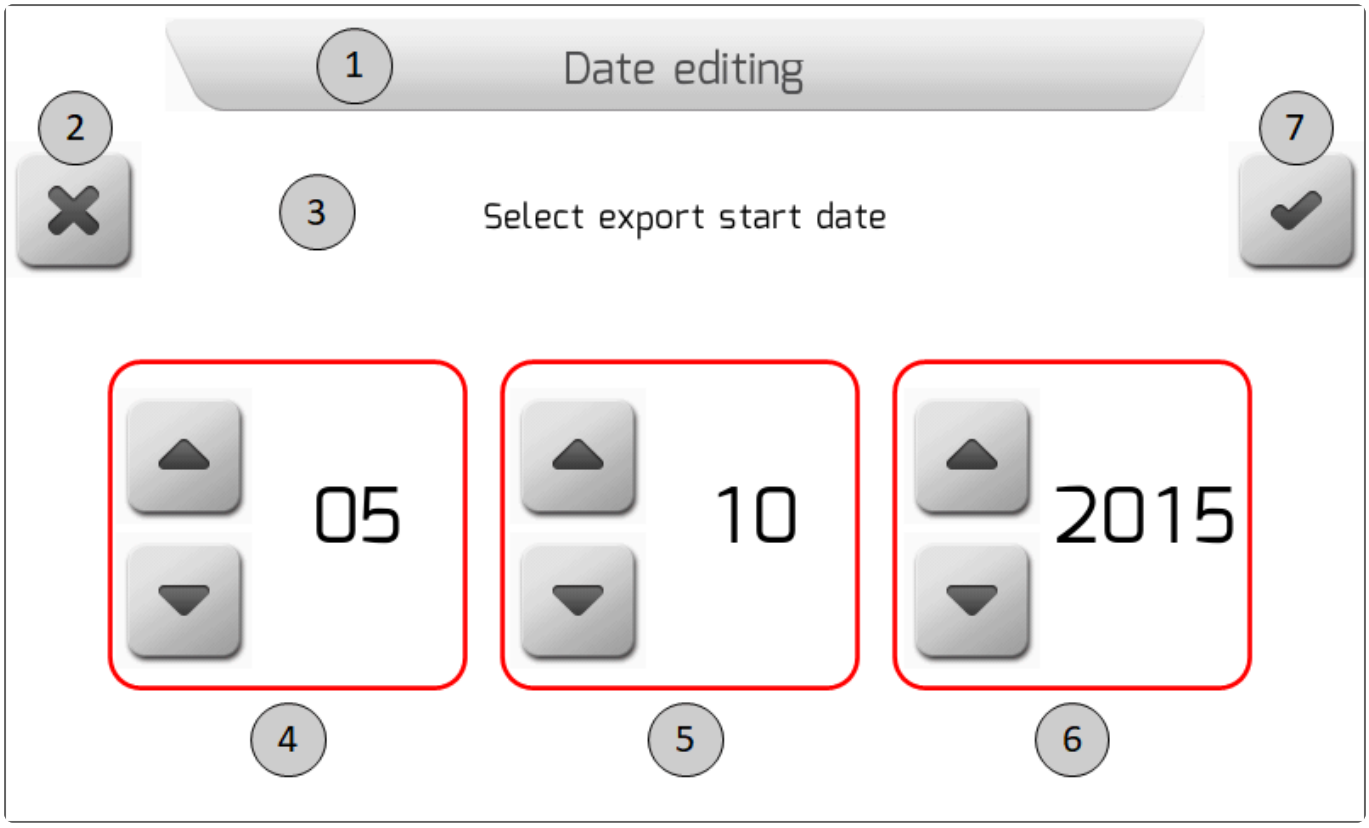



| Item | Description |
|---|---|
| 1 | Screen title bar, containing the text “Value Not Allowed”. |
| 2 | Parameter minimum possible value. |
| 3 | Parameter maximum possible value. |
| 4 | Confirm button to accept information. |

# 6.3.8. Date editing

The Date editing screen template is used to select date components – day, month and year. The setted date is usually used to select beginning and end of a period for exporting event files.

The following image shows an example of a Date editing screen, detailing each item in its composition.

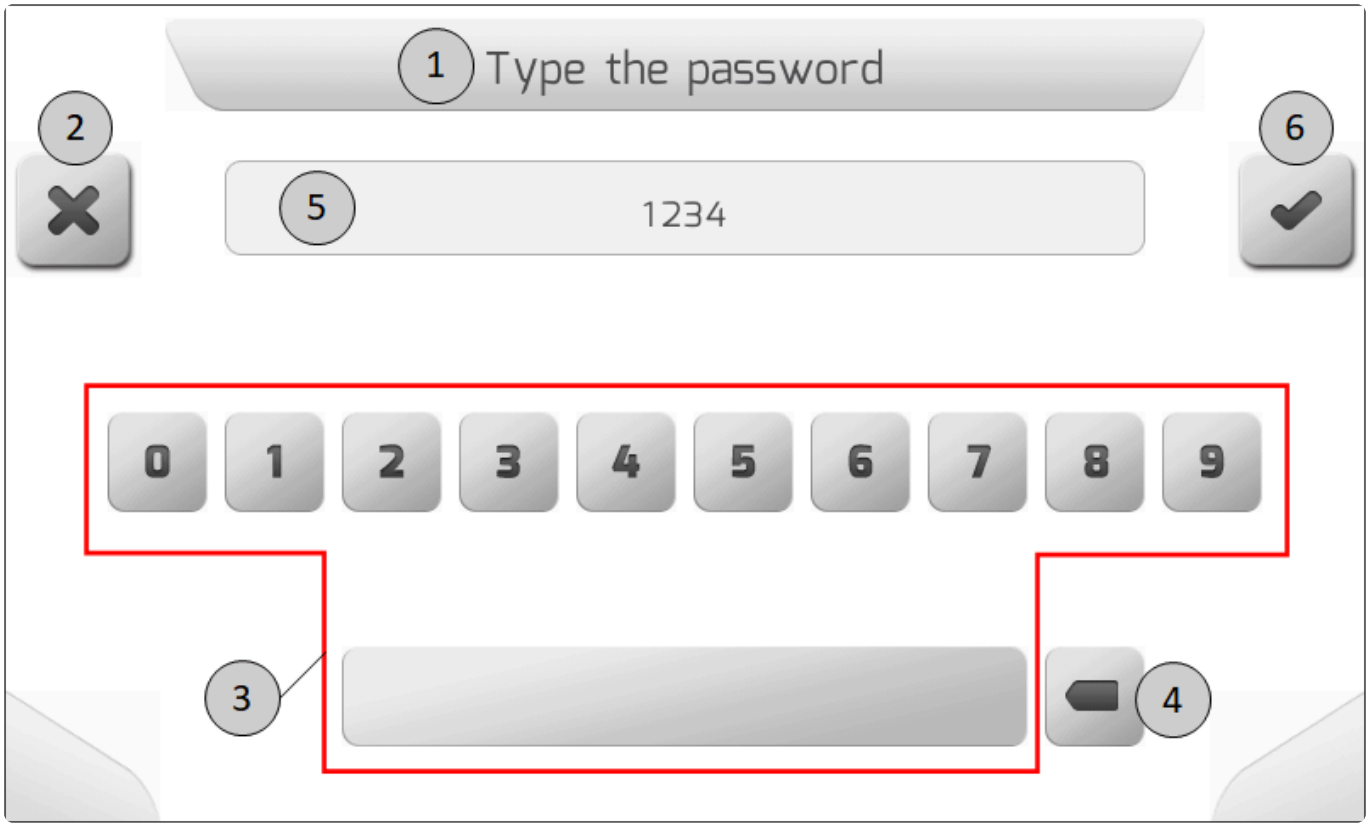



| Item | Description |
|---|---|
| 1 | Date editing screen title bar, containing “Date edit” text. |
| 2 | Touch sensitive button to return to previous screen. |
| 3 | Text asking for date selection. |
| 4 | Touch sensitive buttons to increase and decrease the day, which is shown on buttons right side. |
| 5 | Touch-sensitive buttons to increment and decrement the month, which is shown on buttons right side. |
| 6 | Touch-sensitive buttons to increase and decrease the year, which is shown on buttons right side. |
| 7 | Confirm date selection button. |

# 6.3.9. Entering password

The Entering password screen template is used to enter the password to access GeoNave restricted system menus. The template consist of numeric keypad, graphic items, touch sensitive buttons, title and entered password viewing area.

The entered password must have 4 numeric digits, and its default value is “1514”.




| Item | Description |
|---|---|
| 1 | Entering password screen title bar, containing “Type the password” text. |
| 2 | Touch sensitive button to return to previous screen. |
| 3 | Numeric keypad with space. |
| 4 | *Backspace* key to erase the last digit. |
| 5 | Entered password viewing area. |
| 6 | Confirm button, to confirm the password entry and access the restricted menu. |

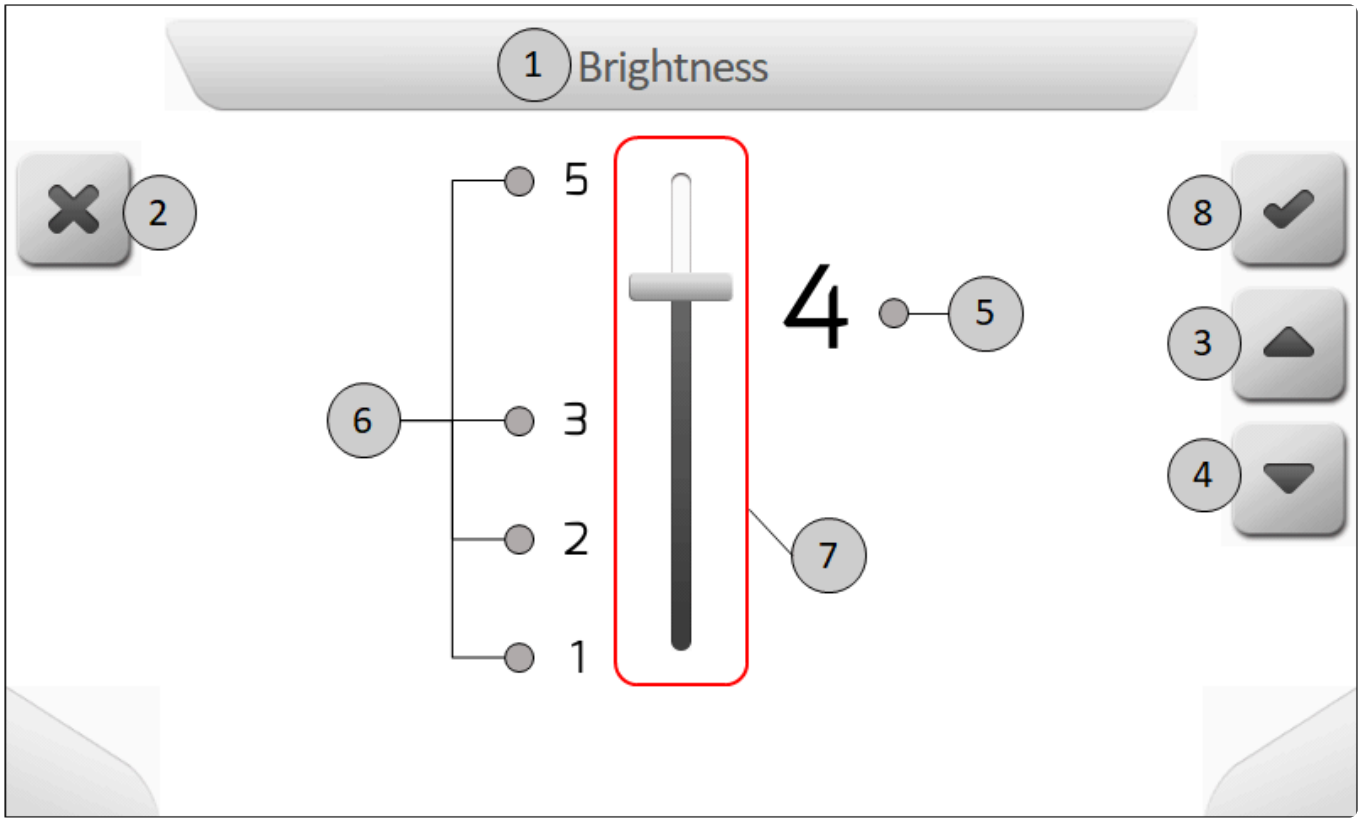
If the entered password is incorrect, after confirmation  the system will return to the previous screen.

# 6.3.10. Vertical choice

The Vertical choice screen template is used to set a parameter that has numerical values in a predetermined range. The template consist of graphic items, touch sensitive buttons, title and vertical bar representing the values selector.

In the example below, a Vertical choice screen is shown, showing each component of the Brightness

parameter screen.




| Item | Description |
|---|---|
| 1 | Vertical choice screen title bar, containing the name of parameter being edited. |
| 2 | Touch sensitive button to return to previous screen. |
| 3 | Touch sensitive button to select the value above the currently selected one, highlighted on the right. |
| 4 | Touch-sensitive button to select the value below that currently selected one, highlighted on the right. |
| 5 | Selected value, highlighted with larger font on the right side. |
| 6 | Other unselected values. |
| 7 | Graphical representation of vertical parameter value selector. |
| 8 | Confirm new parameter value. |

After confirmation  , the Saving Parameter screen will be displayed. In this screen, parameter new numerical value will be saved in the GeoNave system. After that, the next screen that will be displayed is the vertical choice source screen.

# 6.3.11. Files handling


- Field list
- Events list
- List of files
- Downloading files

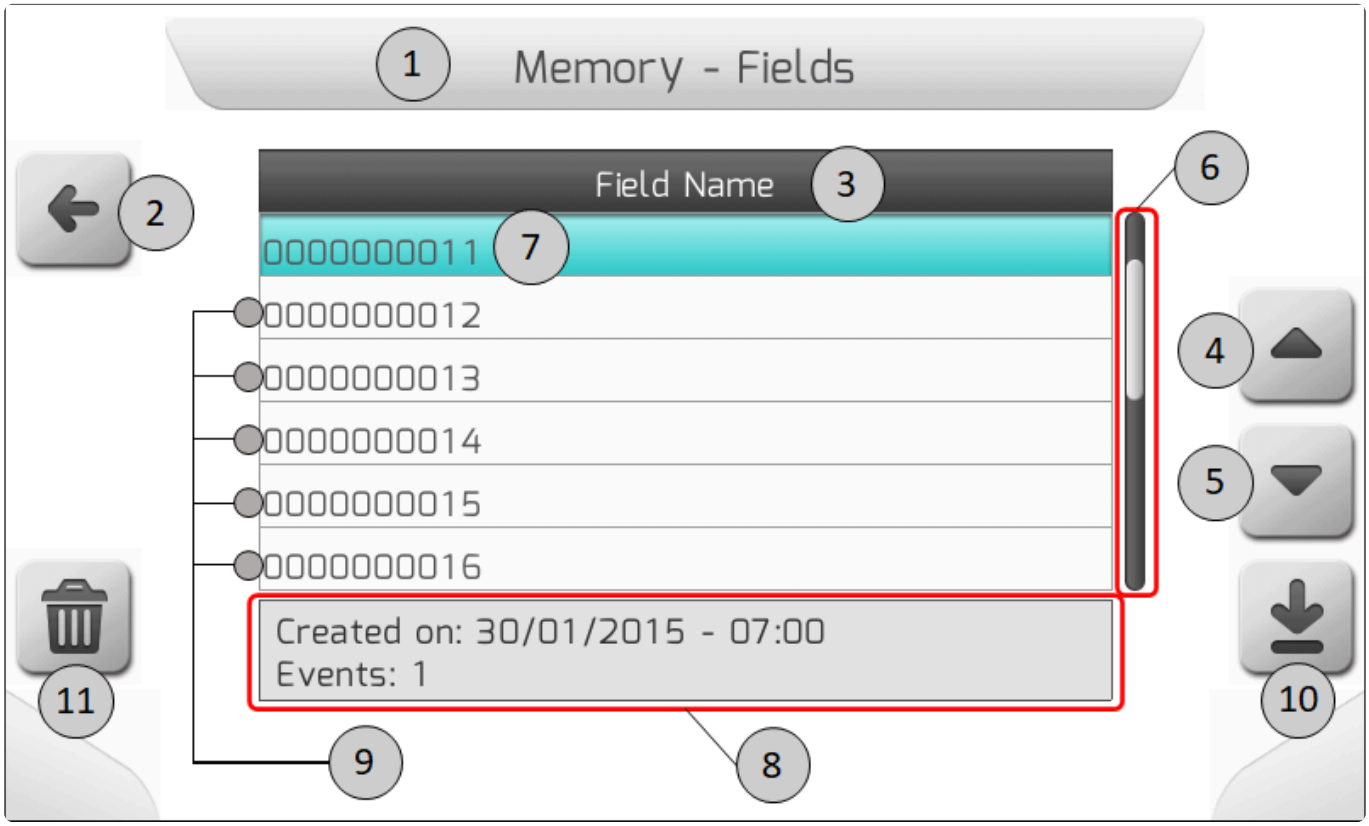

The file handling screens are used to load and download files between internal memory and flash drive, in addition they also show file information.

The screen templates for the GeoNave system files handling are detailed below.

# 6.3.11.1. Field list

The Field list screen template is used to present all fields currently contained in the internal memory of the GeoNave system, for file management purposes. Consist of graphic items, touch sensitive buttons, title, single column table containing the list of field names and side scroll bar. The screen also has a summary box with information from the field file selected in the table.

The image below represents an example of the Fields list screen template, detailing each item in its composition.




| Item | Description |
|---|---|

| | |
|---|---|
| 1 | Field list screen title bar, containing “Memory – Fields” text. |
| 2 | Touch sensitive button to return to previous screen. |
| 3 | Title line of simple column table, containing “Field Name” text. |
| 4 | Touch sensitive button to select the field above the currently selected one, marked with blue background. |
| 5 | Touch sensitive button to select the field below the currently selected one, marked with blue background. |
| 6 | Vertical scroll bar, graphically indicating the position of the currently displayed list within the total fields number. |
| 7 | Selected field, highlighted with blue background. |
| 8 | Field summary information box, informing creation date / time and number of events. |
| 9 | Other unselected fields, which are presented with white background. The rectangular area of each field is touch sensitive, and the corresponding table row is selected when touched. |
| 10 | Touch sensitive button to download selected field file from internal memory to a flash drive. |
| 11 | Touch sensitive button to delete selected field file. |

When pressing the delete button  the Information with confirmation screen appears with details of field data, before deleting the file permanently, as shown in the image below.



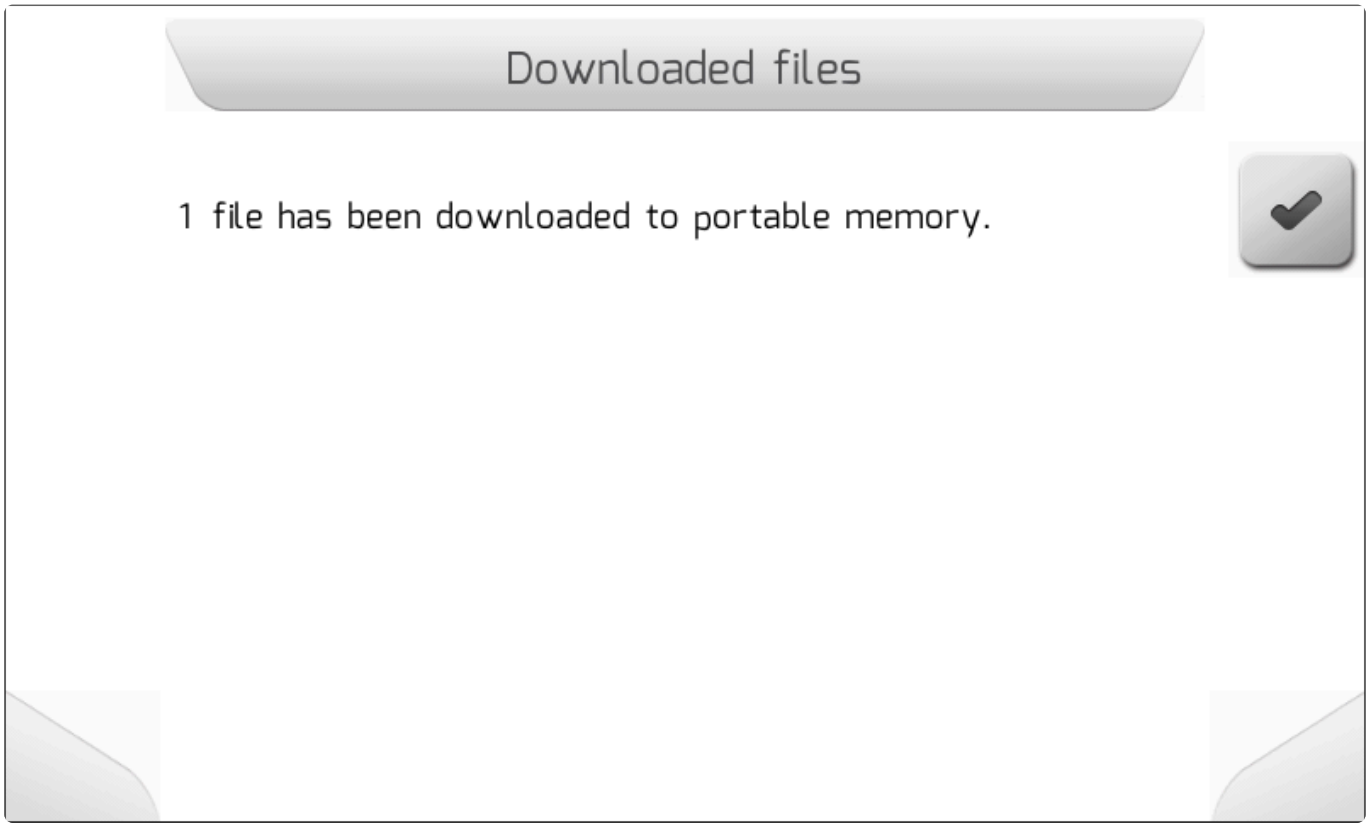

| Item | Description |
|---|---|
| 1 | Confirmation screen title bar, containing “Delete field?” question. |
| 2 | Touch sensitive button to cancel file delete operation and return to previous screen. |
| 3 | Question text if the user wants to delete the field and all its events. |
| 4 | Red background area to draw attention that the field will be erased. Field name information, creation date / time and number of events are displayed. |
| 5 | Confirm button to delete field. |

Also on the Field list screen is possible to export the field file to a flash drive by pressing the download button .

If the flash drive is disconnected when the button is pressed, Information template screen with an error message is shown.



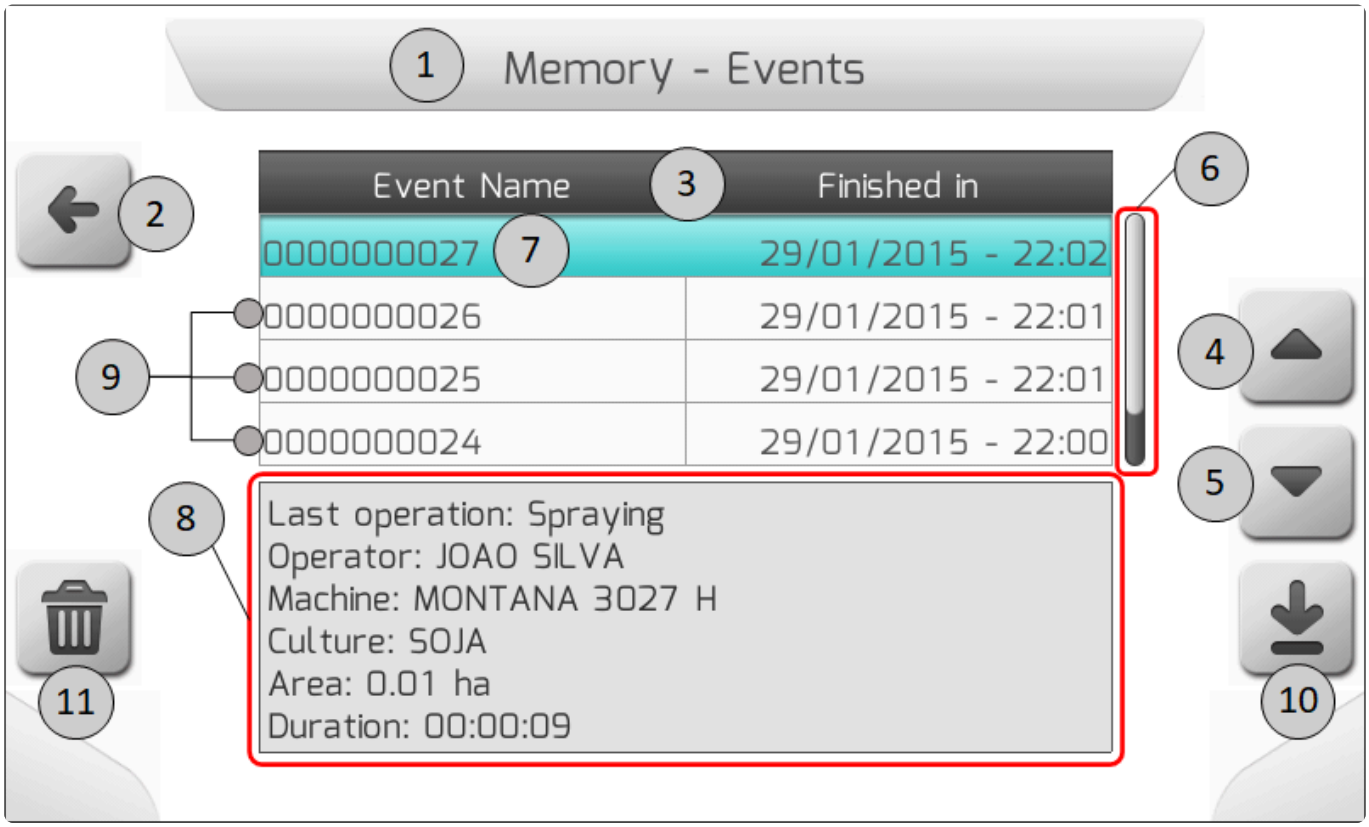

If the flash drive is correctly connected to the USB interface of GeoNave display then the field file will be downloaded and the screen described in Downloading files will be presented for each event of the field. Finally, after exporting the files, a new screen with Information template will inform the number of files that were actually downloaded to the flash drive, as illustrated in the following image.



# 6.3.11.2. Events list

The Events list screen template is used when is necessary to present all the events of a field contained in the internal memory of the GeoNave system, for file management purposes. Consist of graphic items, touch sensitive buttons, title, side scroll bar and a two-column table containing the list of event names and end date. The screen also has a summary box with information from the event file selected in the table.

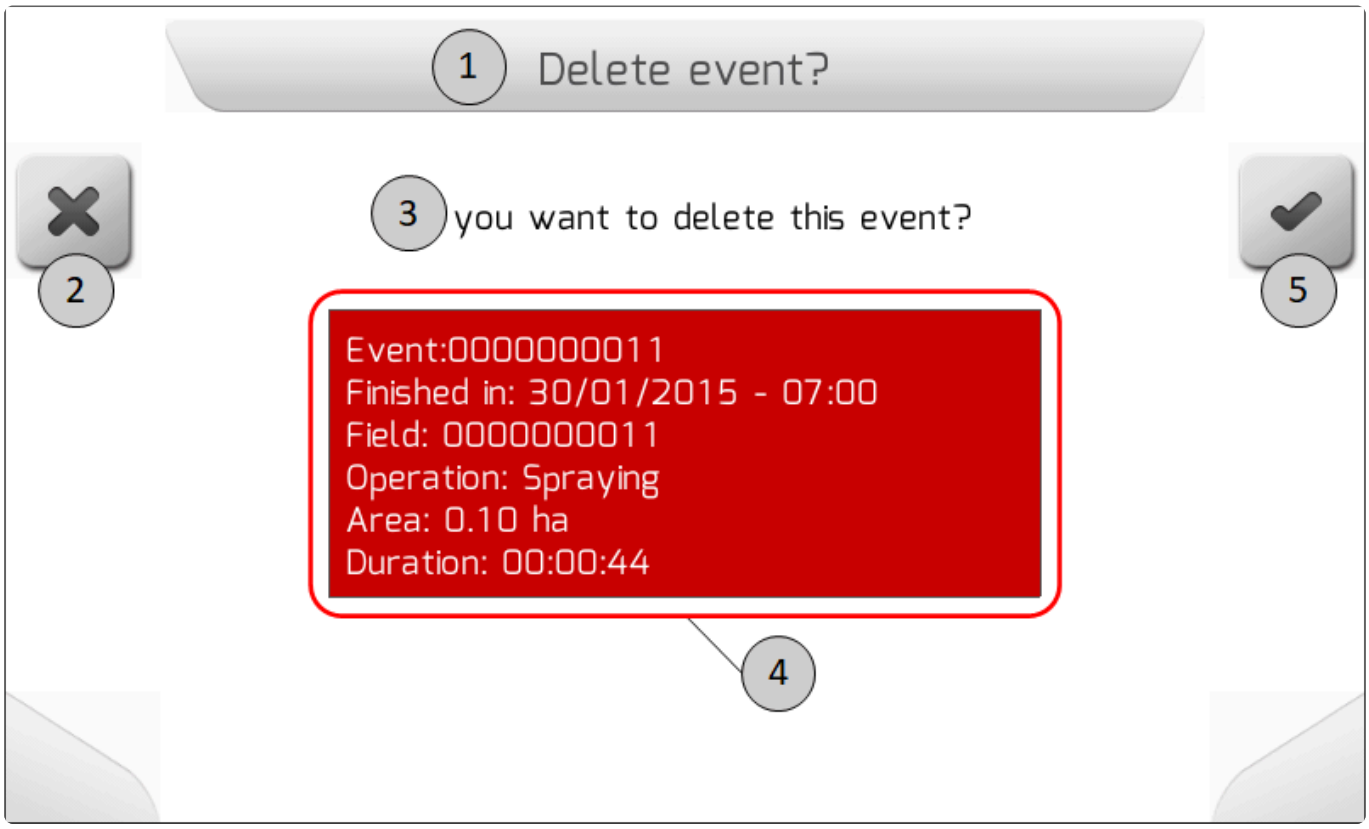
The following image shows an example of the Events list template screen, detailing each item in its composition.




| Item | Description |
|---|---|
| 1 | Event list screen title bar, containing “Memory – Events” text. |
| 2 | Touch sensitive button to return to previous screen. |
| 3 | Table title line, containing the “Event name” text in the first column and “Finished in” in the second. |
| 4 | Touch sensitive button to select the event above the currently selected one, marked with blue background. |
| 5 | Touch sensitive button to select the event below the currently selected one, marked with blue background. |
| 6 | Vertical scroll bar, graphically indicating the position of the currently displayed list within the total events number. |

| | |
|---|---|
| 7 | Selected event, highlighted with blue background. |
| 8 | Event summary information box, informing: operation, operator name, machine name, culture, applied area and event duration. |
| 9 | Other unselected events, which are presented with white background. The rectangular area of each event is touch sensitive, and the corresponding table row is selected when touched. |
| 10 | Touch sensitive button to download the selected event file from internal memory to a flash drive. |
| 11 | Touch sensitive button to delete selected event file. |

When pressing the delete button  the Information with Confirmation screen appears with details of event data, before permanently deleting the file, as shown in the image below.



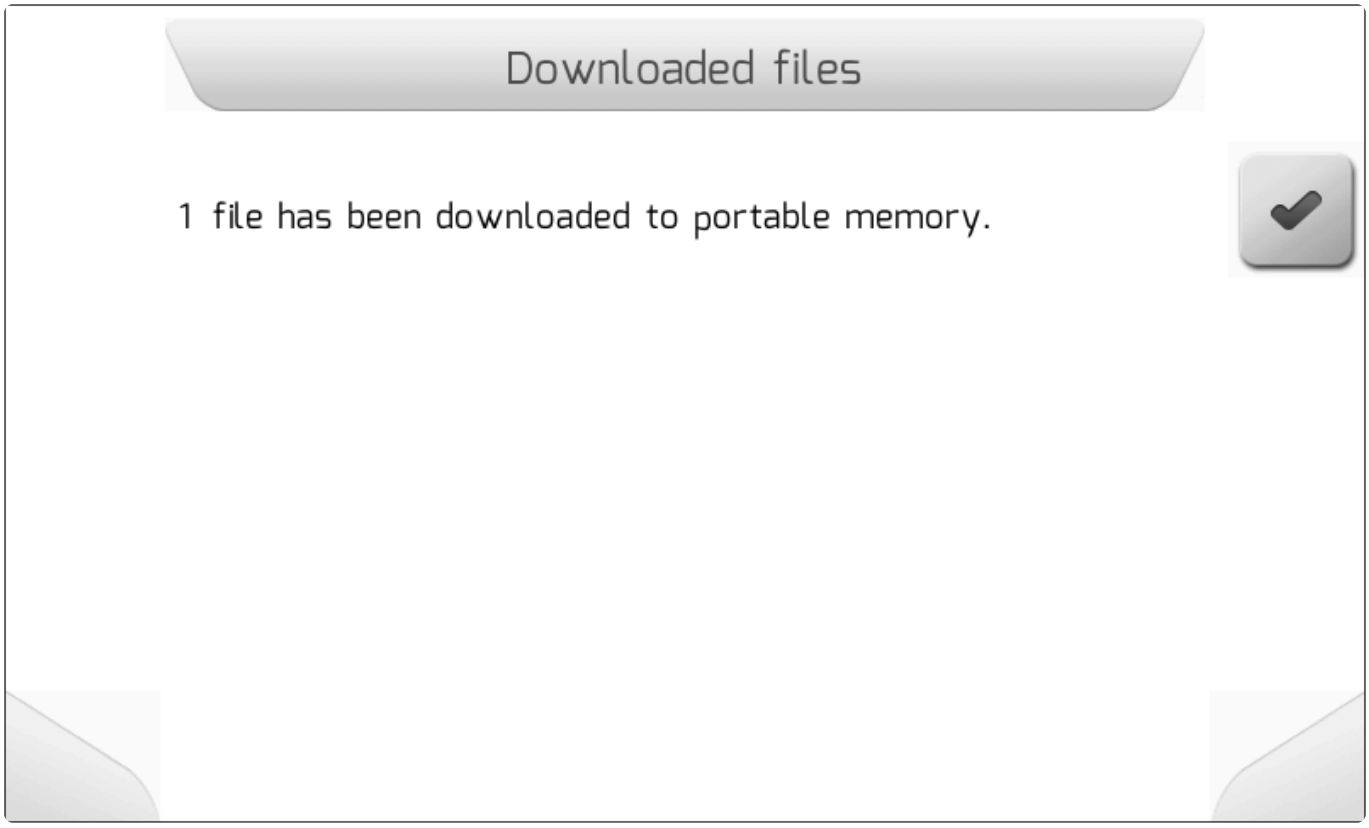

| Item | Description |
|---|---|
| 1 | Confirmation screen title bar, containing “Delete event?” question. |
| 2 | Touch sensitive button to cancel file delete operation and return to previous screen. |
| 3 | Question text if the user wants to delete the event. |
| 4 | Red background area to draw attention that the event will be erased. Event information are displayed: name, date / time of completion, field to which the event is related, operation name , applied area and event duration. |

| | |
|---|---|
| 5 | Confirm button to delete event. |

Also on the Events list screen is possible to export an event file to a flash drive by pressing the download button  .
If the flash drive is disconnected when the button is pressed, the Information template screen with an error message is shown.



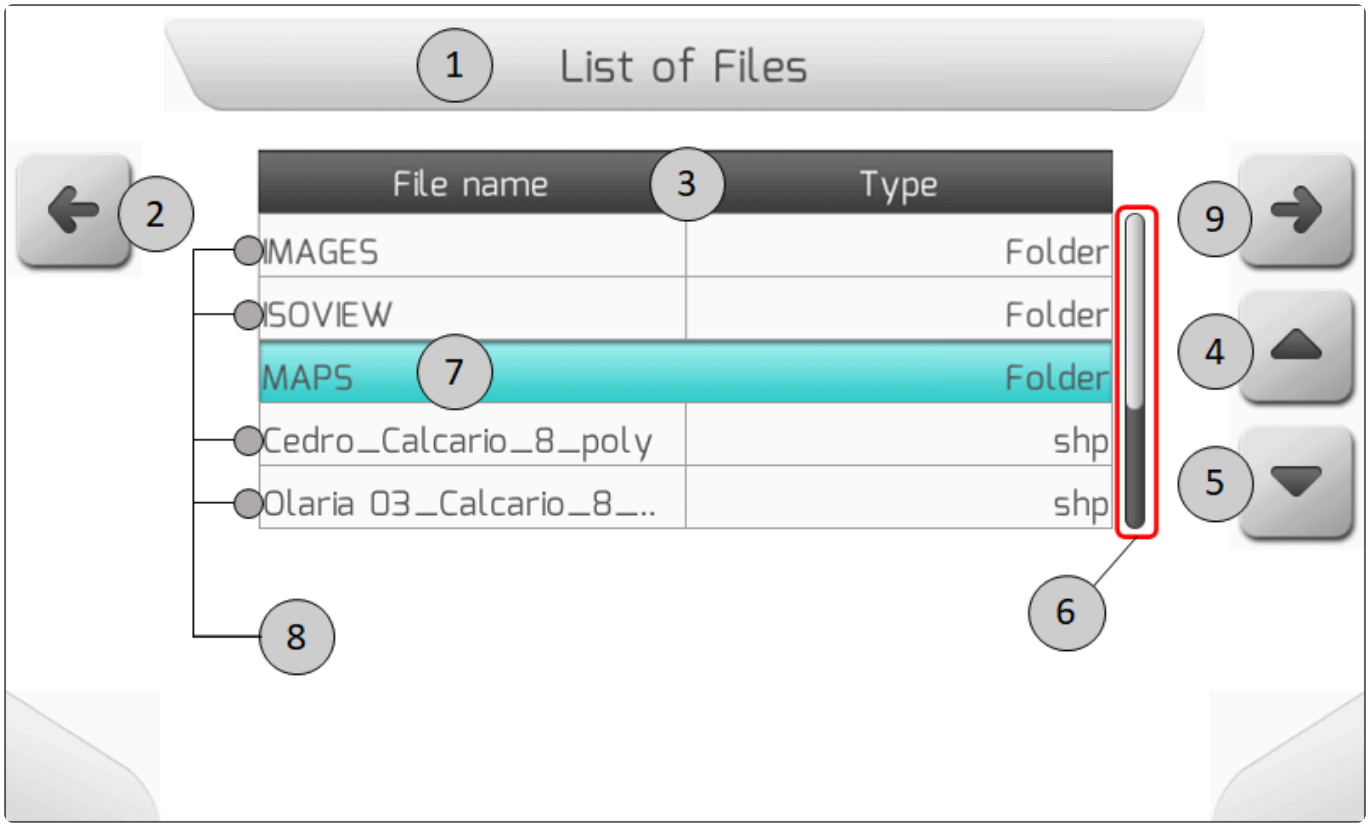

Once the flash drive is correctly connected to the USB interface of GeoNave display then the event file will be downloaded and the screen described in Downloading files will be presented. Finally, after exporting the file, a new screen with Information ttemplate will inform the number of files that were actually downloaded to the flash drive, as illustrated in the following image.




# 6.3.11.3. List of files

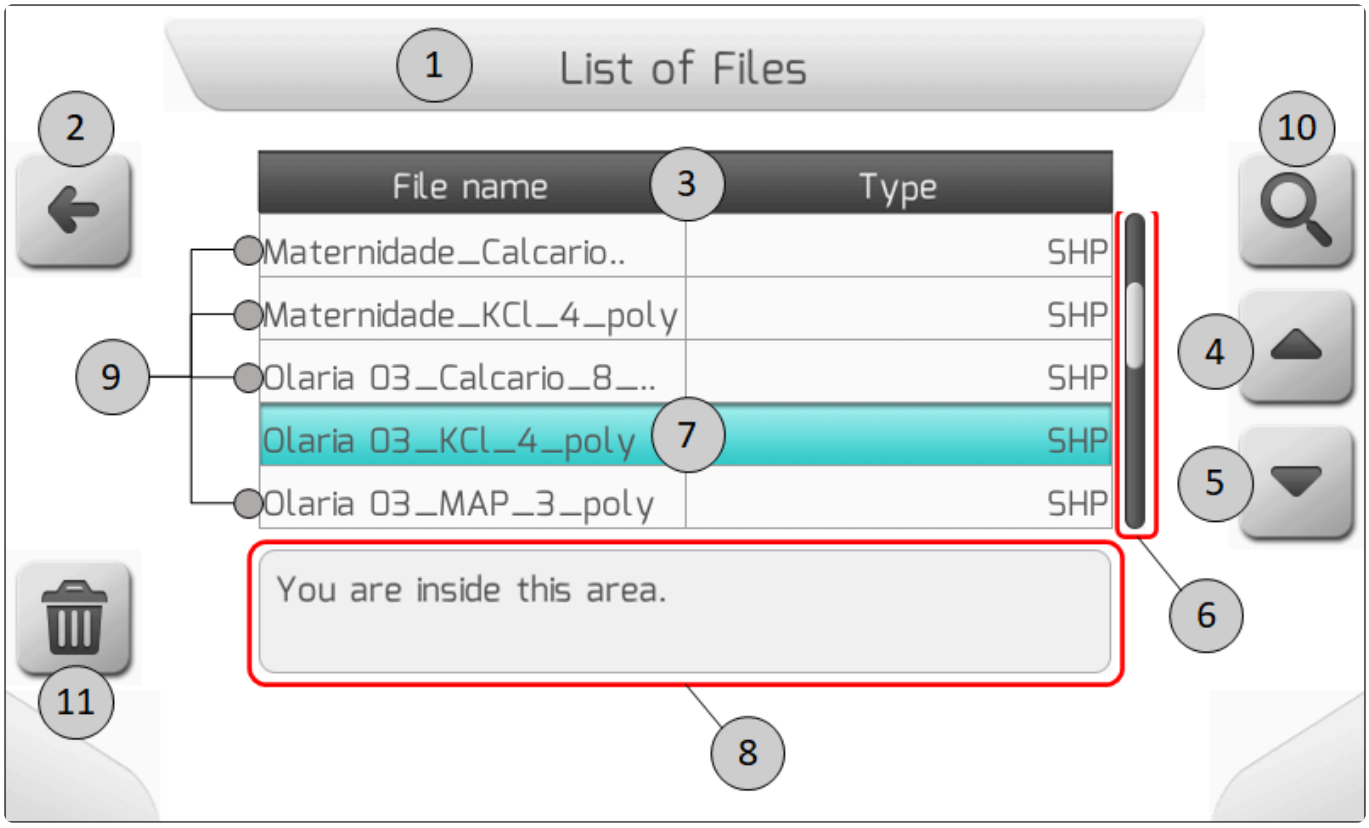
The List of files template screen is used to manage folders or files of a specific type, contained in the internal memory of GeoNave system or flash drive. The list of folders and files is presented in a two-column table. The first column lists the folders and files names, while the second shows the item type – whether it is a folder or the file extension.
The screen template consists of graphic items, touch sensitive buttons, title, a side scroll bar and a two-column table containing the list of folders and files. The screen configuration of touch sensitive buttons may vary according to the menu context in which the file list screen is displayed.

The following is an image of the screen that represents the list of folders and files present in a flash drive. In this example there are 3 folders and several files with “shp” extension in the flash drive root folder, which are being displayed on the screen. The selected option is a folder, so no additional information is shown at the screen bottom.




| Item | Description |
|---|---|
| 1 | List of files screen title bar, containing “List of Files” text. |
| 2 | Touch sensitive button to return to previous screen. |
| 3 | Table title line, containing “File name” text in the first column and “Type” in the second. |
| 4 | Touch sensitive button to select the item above the currently selected one, marked with blue background. |
| 5 | Touch sensitive button to select the item below the currently selected one, marked with blue background. |
| 6 | Vertical scroll bar, graphically indicating the position of the currently displayed list within the total folders or files number. |
| 7 | Selected item, highlighted with blue background. |
| 8 | Other unselected items, which are presented with white background. The rectangular area of each item is touch sensitive, and the corresponding table row is selected when touched. |
| 9 | Touch sensitive button to perform action with the selected item. In the example, the forward button will change the screen to the list of files contained in the folder “Maps”. |

Another possible template of the List of files screen is shown below. In this example are listed the *Shapefile* files contained within the Maps folder of GeoNave system’s internal memory, after copying the Maps folder shown in the previous image from the flash drive to the internal memory.

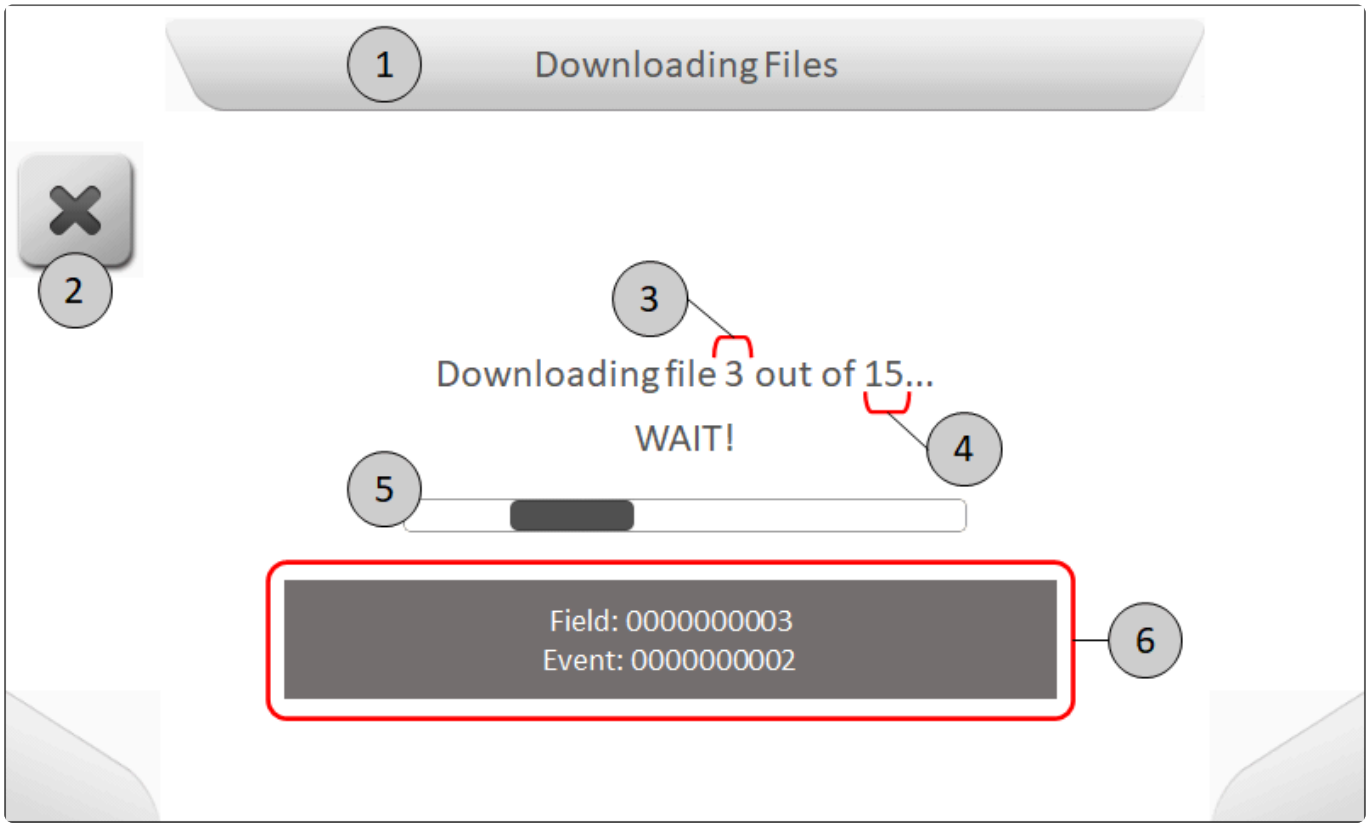



| Item | Description |
|---|---|
| 1 | List of file screen title bar, containing “List of Files” text. |
| 2 | Touch sensitive button to return to previous screen. |
| 3 | Table title line, containing the “File Name” text in the first column and “Type” in the second. |
| 4 | Touch sensitive button to select the item above the currently selected one, marked with blue background. |
| 5 | Touch sensitive button to select the item below the currently selected one, marked with blue background. |
| 6 | Vertical scroll bar, graphically indicating the position of the currently displayed list within the total files number. |
| 7 | Selected item, highlighted with blue background. |
| 8 | File data description area. |
| 9 | Other unselected files, which are presented with white background. The rectangular area of each item is touch sensitive, and the corresponding table row is selected when touched. |
| 10 | Touch sensitive action button for the selected file. In the example, as the file is a SHP variable rate, the button switches to map display screen. |
| 11 | Touch sensitive action button for the selected file. In the example, the button switches to internal memory file deletion screens. |

# 6.3.11.4. Downloading files

The Downloading files screen template is a variation of the Loading template, used to display information when downloading files from GeoNave system's internal memory to a flash drive.
The template consist of graphic items, a touch sensitive button, title, file counter and total file number, a flashing progress bar and a currently downloading information box.

The following is an example of Downloading files screen, detailing each item in its composition.

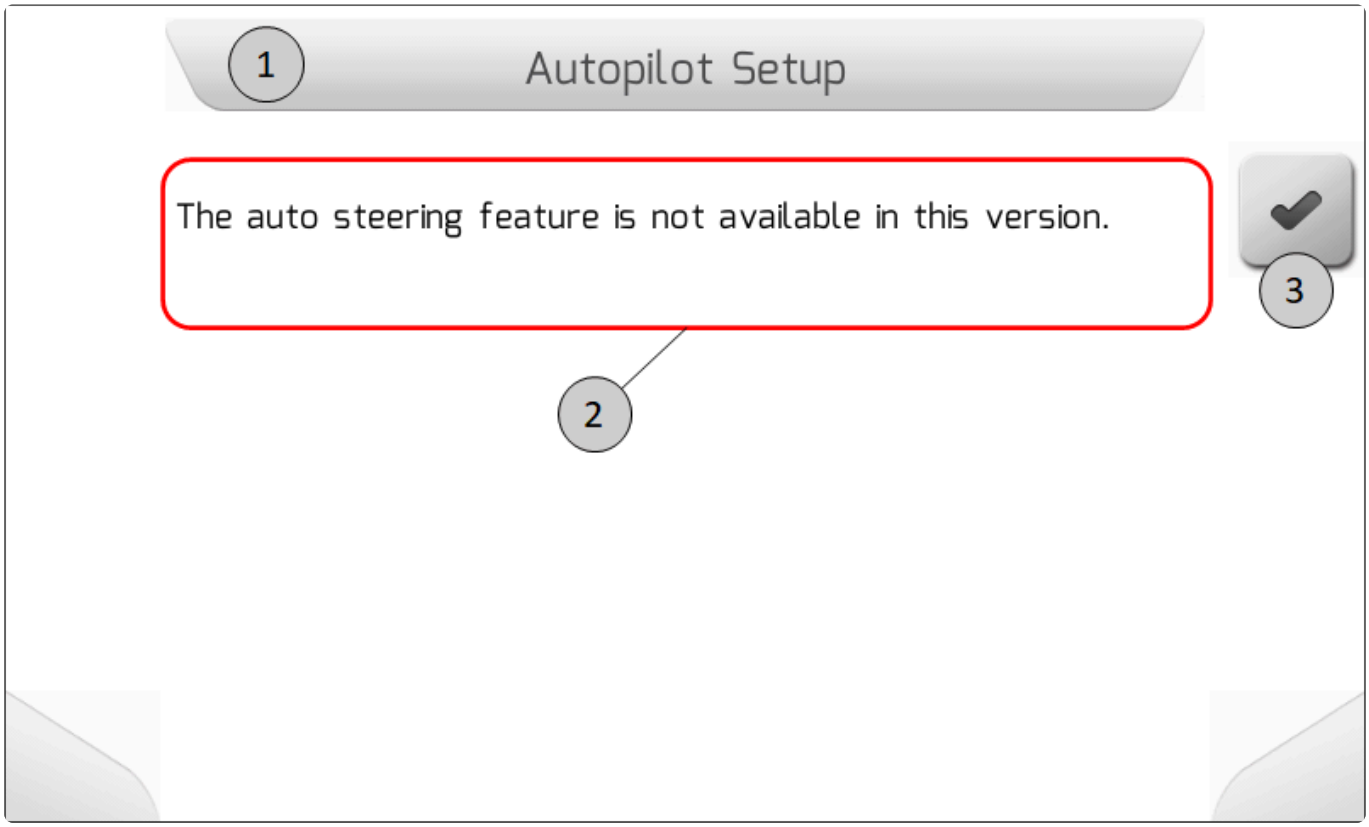



| Item | Description |
|---|---|
| 1 | Downloading files screen title bar, containing "Downloading Files" text. |
| 2 | Button to cancel the download. |
| 3 | Counter of file number being downloaded. |
| 4 | Total number of files to be downloaded. |
| 5 | Flashing progress bar. |
| 6 | Box containing the field name and the event being downloaded. |

# 6.3.12. Information

The Information screen template is used to present a system message or alert to the user. The screen template consist of graphic items, title, message text, and touch sensitive button for confirmation.

The following is an example of Information screen – absence of autopilot license, detailing each item in its composition.

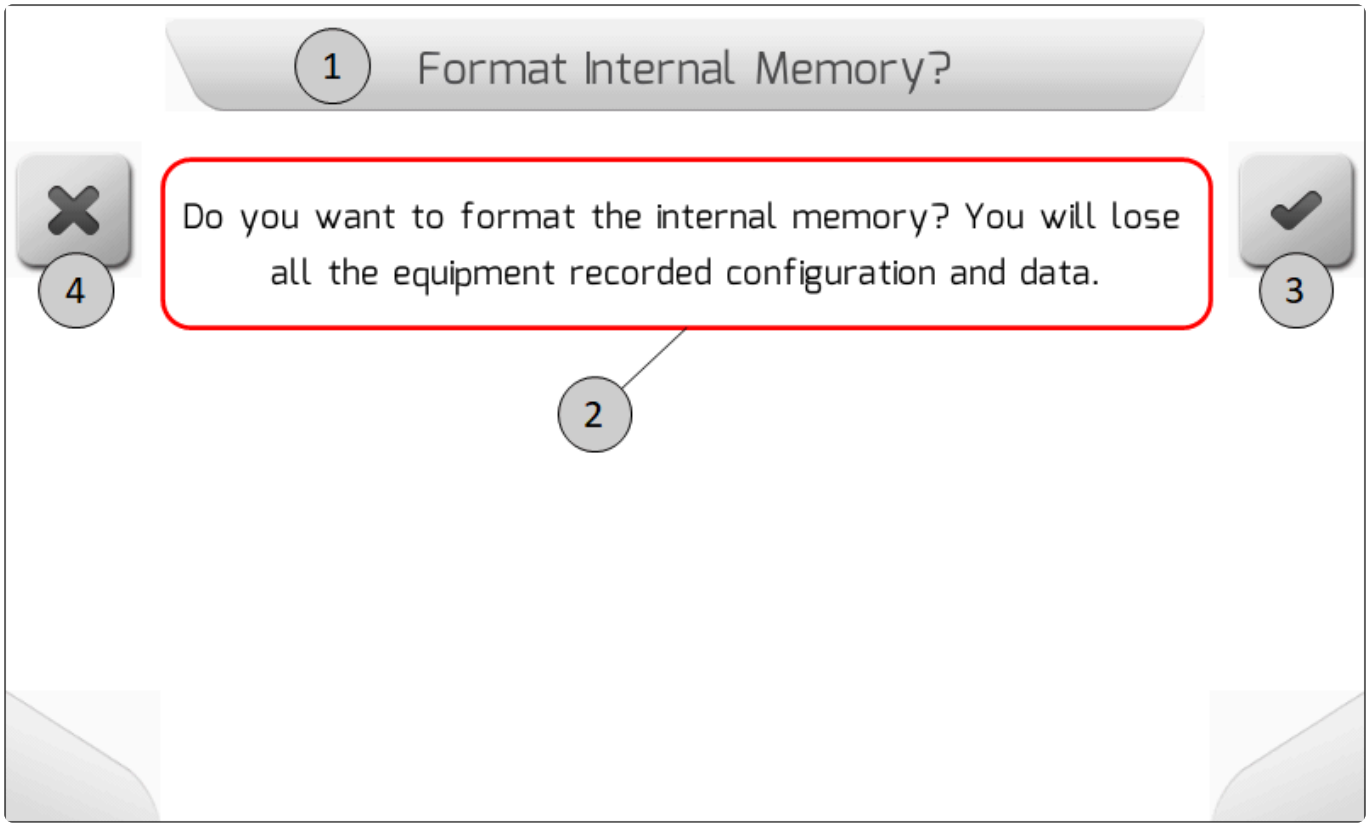



| Item | Description |
|---|---|
| 1 | Information screen title bar, containing the message title text. |
| 2 | Message or information alert text. |
| 3 | Touch sensitive button to confirm information. |

# 6.3.13. Information with confirmation

The Information with confirmation screen template is used to ask the user to answer a question, presented in text form. The screen template consist of graphics items, title, question message text and touch sensitive buttons.

The following is an example of Information with Confirmation screen – before formatting the internal memory of the GeoNave system, in order to alert the user that information will be lost with the operation.

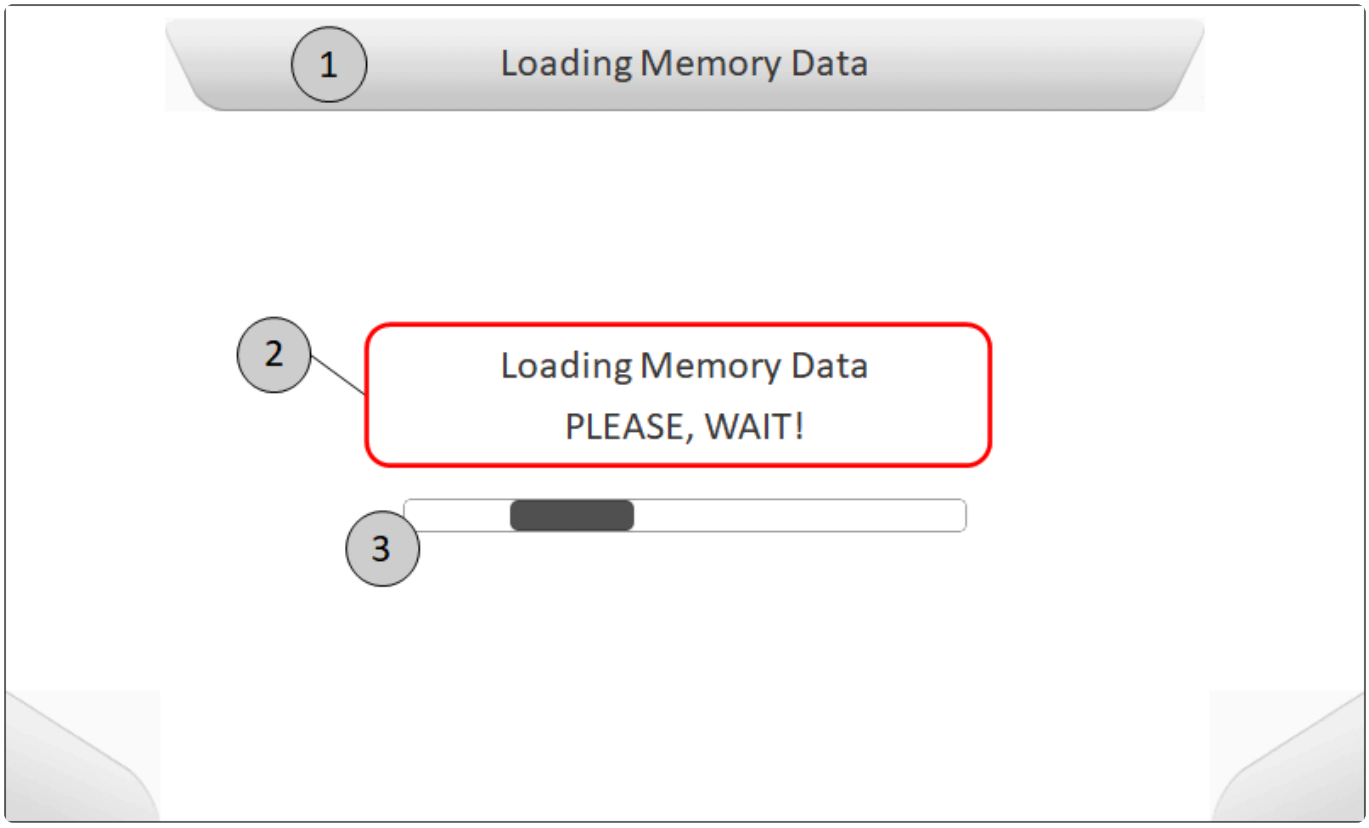



| Item | Description |
|---|---|
| 1 | Information with confirmation screen title bar, containing the message title text. |
| 2 | Message or alert text of the question asked to the user. |
| 3 | Touch sensitive button to confirm. In the example, when pressed, the user confirms the intend to format the internal memory. |
| 4 | Touch sensitive button to cancel. In the example, when pressed, the user cancels the internal memory formatting operation. |

# 6.3.14. Loading

The Loading screen template is used when the GeoNave system performs a screen transition for which it is required to check the internal memory before the screen data are displayed. The template consists of graphic items, title, loading informative text and an intermittent progress bar.

The Loading screen template that appears after entering the memory menu is shown and described below.

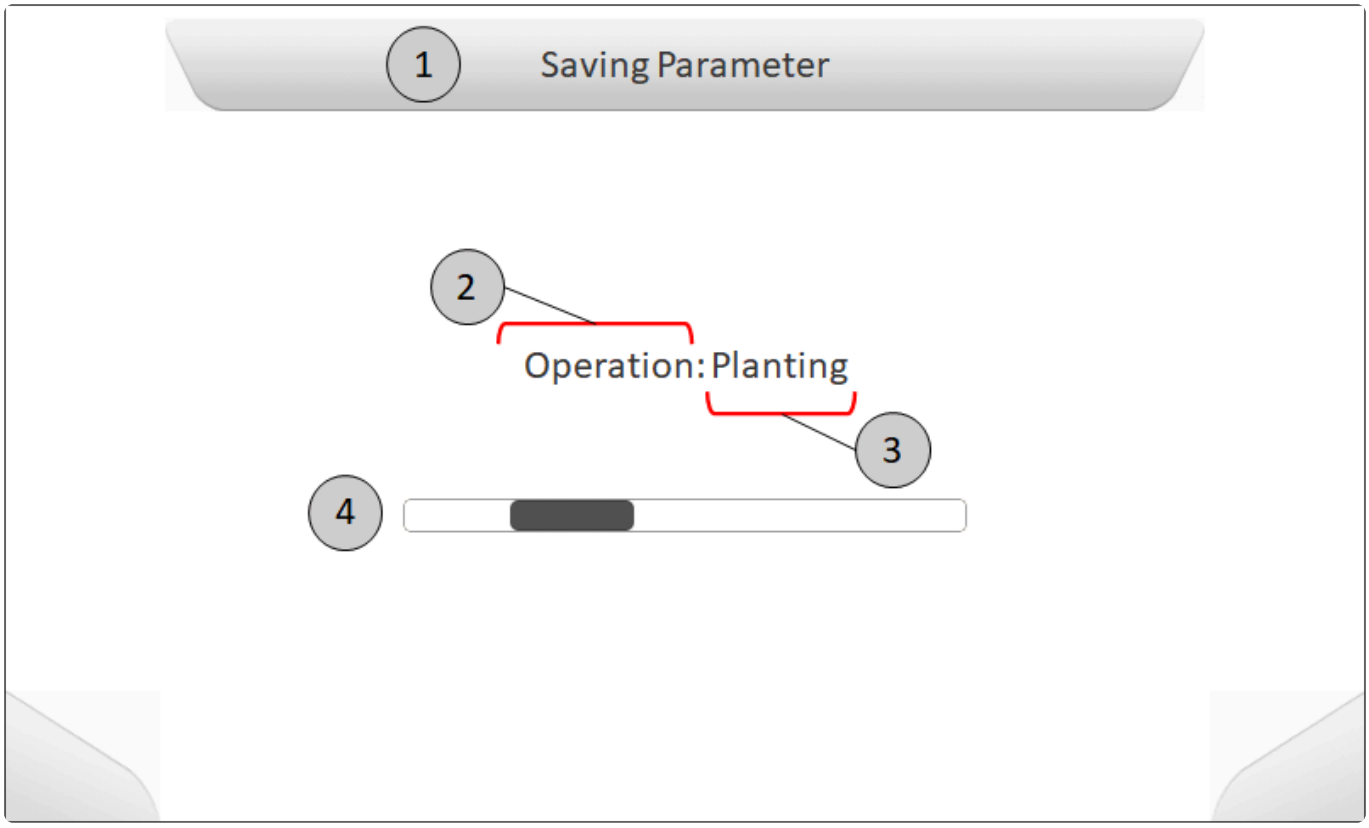



| Item | Description |
|---|---|
| 1 | Loading screen title bar, containing the upload title text. |
| 2 | Informative text describing the loading procedure. |
| 3 | Flashing progress bar. |

# 6.3.14.1. Saving parameter

Saving parameter is a Loading screen template with some distinctions. The screen is displayed whenever a parameter must be saved in the GeoNave system internal memory, after its value has been modified.

The Save parameter screen has the following format, shown and detailed in the image below, which shows the example of saving the parameter “Operation” with the value “Planting”“.



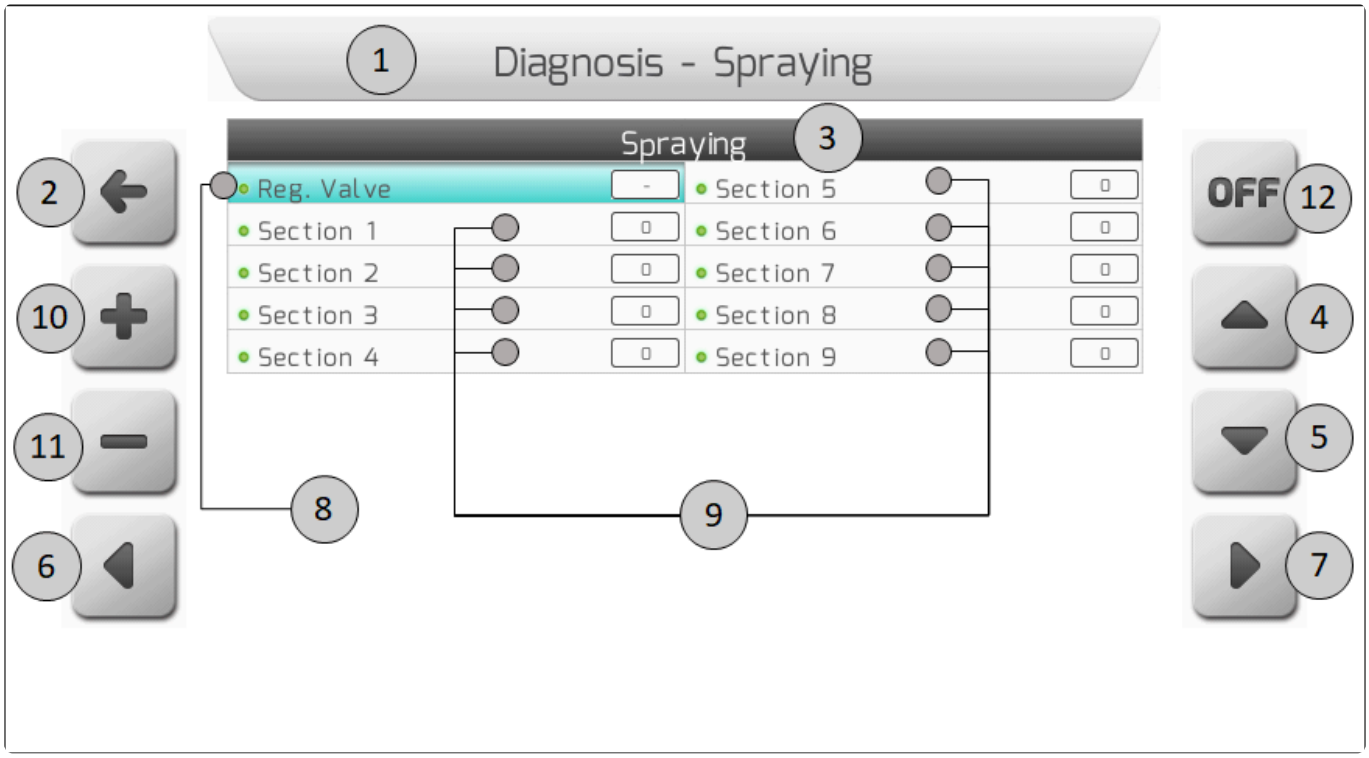

| Item | Description |
|---|---|
| 1 | Saving parameter screen title bar, containing “Saving Parameter” text. |
| 2 | Name of the parameter being saved. |
| 3 | Value of the parameter being saved. |
| 4 | Flashing progress bar. |

# 6.3.15. Actuators diagnosis

The Actuator diagnosis screen template is used to show the system available actuators for a specific application. The main feature of this screen template is a table with two columns containing the same type of information. In the column left region is shown a symbol whose color indicates the status of the GeoNave system communication with the actuator. The text next to the icon defines the name of the actuator and the rectangular area in the column right region shows the actuator state.
The template consists of graphic items, touch sensitive buttons, title and a two-column table containing items that describe the actuator state.

The following figure shows an example of Actuator diagnosis screen – Spraying Diagnosis screen, detailing each item in tis composition. In the example, the selected item is the main control valve (Reg. valve), so that the valve shut-off button 

appears on the screen.




| Item | Description |
|---|---|
| 1 | Actuators diagnosis screen title bar, containing the title name text. |
| 2 | Touch sensitive button to return to previous screen. |
| 3 | Table title line, containing the text referring to the actuators application. |
| 4 | Touch sensitive button to select the option above the currently selected one, marked with blue background. |
| 5 | Touch sensitive button to select the option below the currently selected one, marked with blue background. |
| 6 | Touch sensitive button to select the option to the left of the currently selected one, marked with blue background. |
| 7 | Touch sensitive button to select the option to the right of the currently selected one, marked with blue background. |
| 8 | Selected option, highlighted with blue background. |
| 9 | Other unselected options, which are presented with white background. The rectangular area of each option is touch sensitive, and the corresponding table row is selected when touched. |
| 10 | Touch sensitive button to enable the corresponding actuator increment / opening function. |
| 11 | Touch sensitive button to enable the corresponding actuator decrement / close function. |
| 12 | Touch sensitive button to disable the corresponding selected actuator. |

# 6.4. Navigation screen


- Header
- Map area
- Alert board
- Information board
- Side buttons
- Footer
- Settings during navigation


The GeoNave system Navigation screen is the main screen used during the equipment intended work. It contains all the information relevant to field work, agricultural machine, working area, applied product and navigation equipment itself.

The image below shows an example of a ISO 31 system navigation screen, configured for spraying operation.

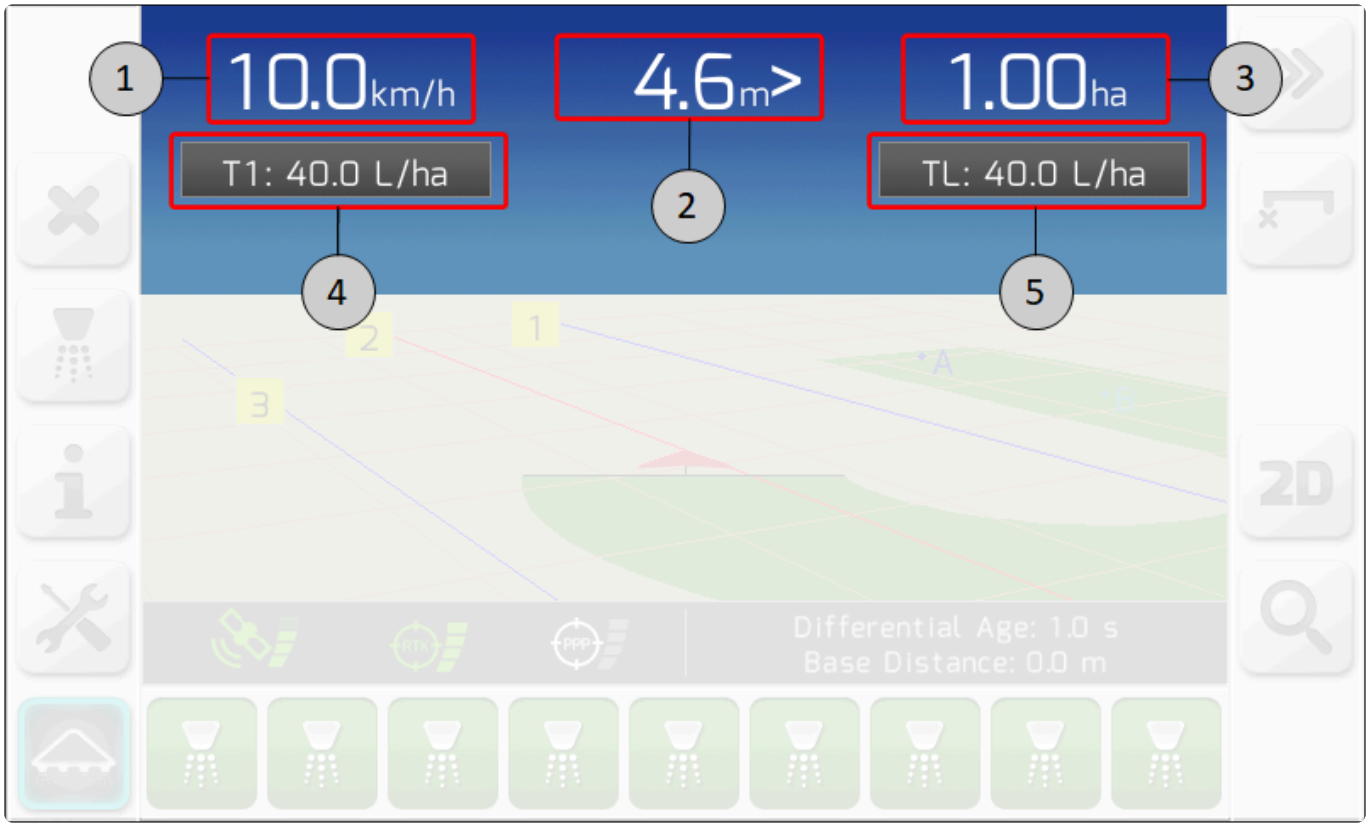



In the following topics will be detailed each part that composes the navigation screen.

# 6.4.1. Header

In the navigation screen header, which in the 3D representation shows the sky composing the image horizon, are presented basically three informations: machine speed on the left, deviation from the guide in the center and applied area on the right.

The image below highlights the navigation screen header and details the items in its composition.



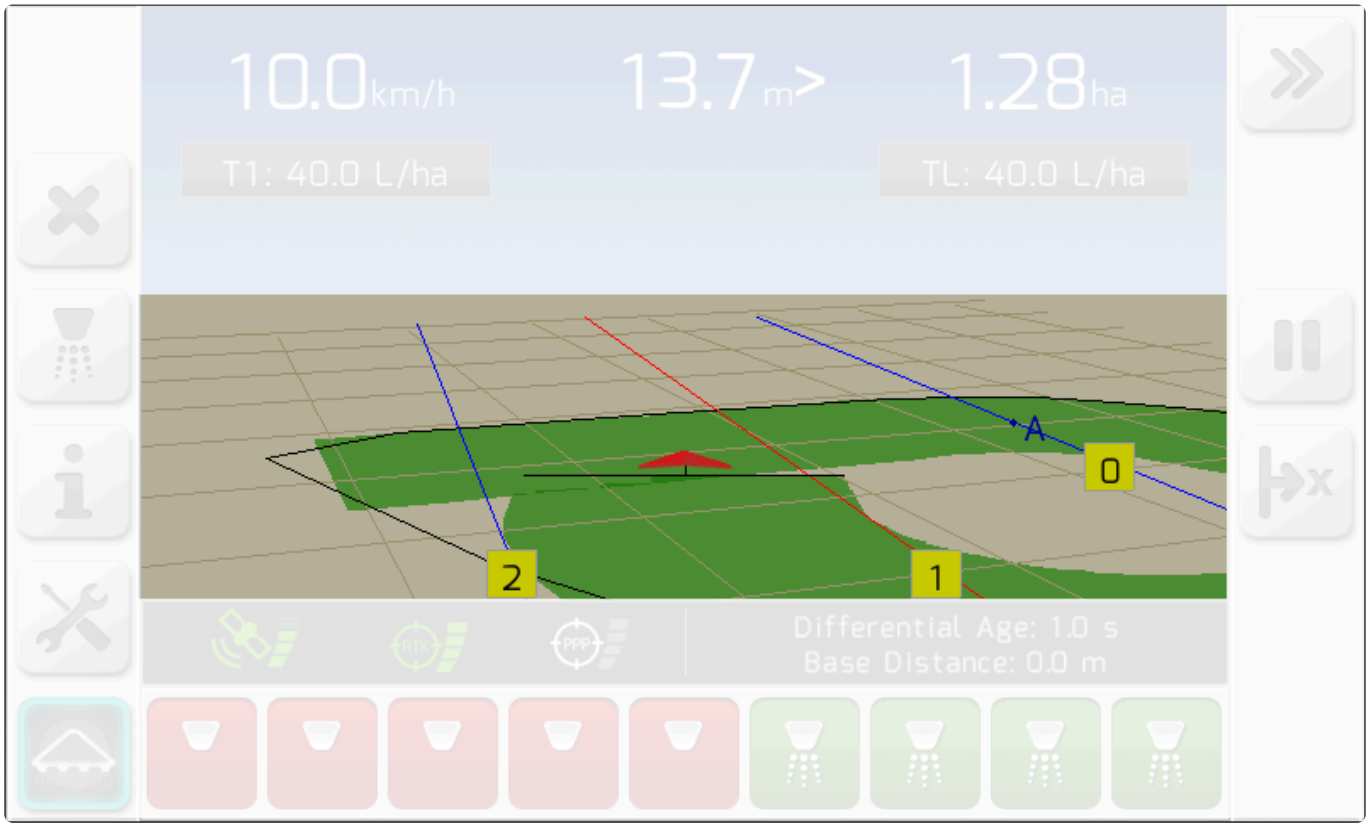

| Item | Description |
|---|---|
| 1 | Speed, displayed in km/h. |
| 2 | Deviation from the guide, presented in meters or centimeters. The “>” and “<” are shown respectively on the deviation value right and left side, indicating the side to which the operator must turn the machine’s steering wheel to correct the deviation. |
| 3 | Covered area, presented in ha (hectares). |
| 4 | Selected target application rate, shown in L/ha. In the example it is the fixed rate 1 (T1). |
| 5 | Read application rate (TL), presented in L/ha. |

# 6.4.2. Map area

- Grid, Perspective and Zoom
- Trail
- Guides
- Boundary

The navigation screen map area, highlighted in the image below, is composed of several items that allow the user to graphically visualize the operation being done in the field. The map consists of the following elements.

- Triangle that identifies the agricultural machine, coupled to a “T” shaped bar that identifies the implement.
- Grid which identifies machine movement and zoom level.
- Trail, in green color, which identifies the area that has already been applied with the implement width.
- Numbered guide lines, which identify the machine path to run parallel lines on the ground.
- Points A and B of original guide.
- Pause point.
- Boundary area, which marks the area where application must be carried out.



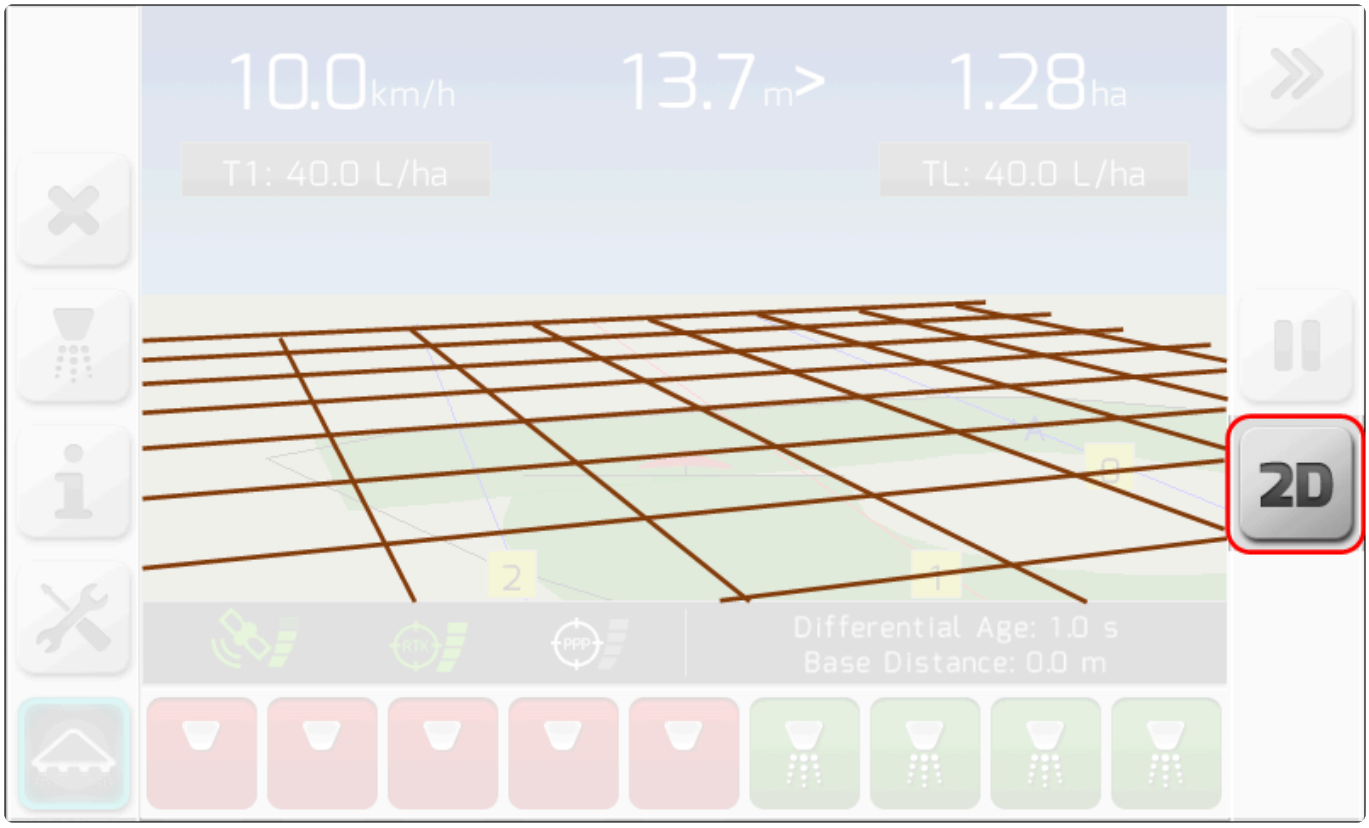

The main components of the Map area are detailed below.

# 6.4.2.1. Grid, Perspective and Zoom

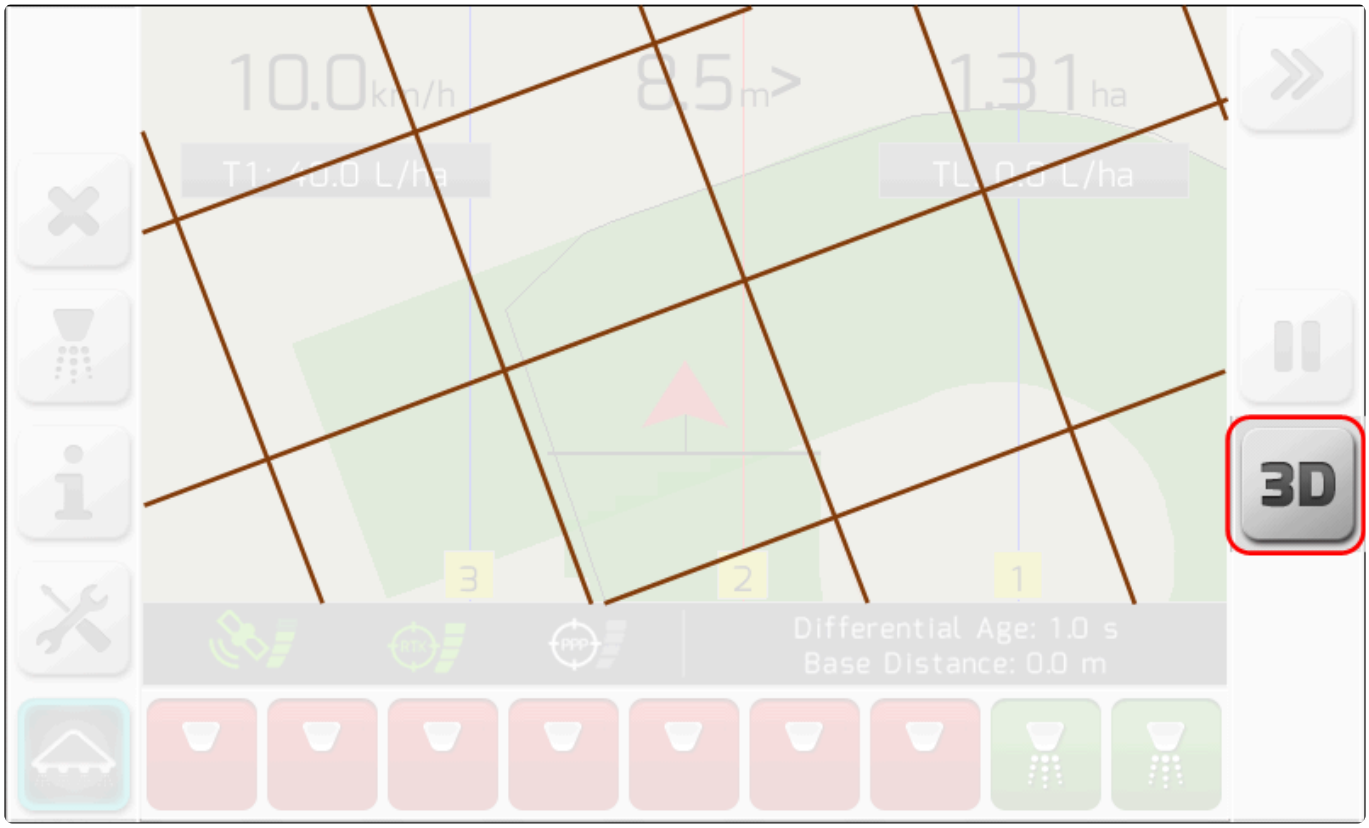
The grid is an important component of the navigation map, giving the user movement perspective and depth. Grid square size varies according to zoom level set by the user, grid lines shift according to machine speed and direction.

In the images below, the Map area grid has its lines highlighted and is shown for 3D and 2D viewing perspectives. On the navigation screen, the buttons 2D and 3D, highlighted in the images below, are used to switch between the two perspectives.

### Grid in 3D perspective



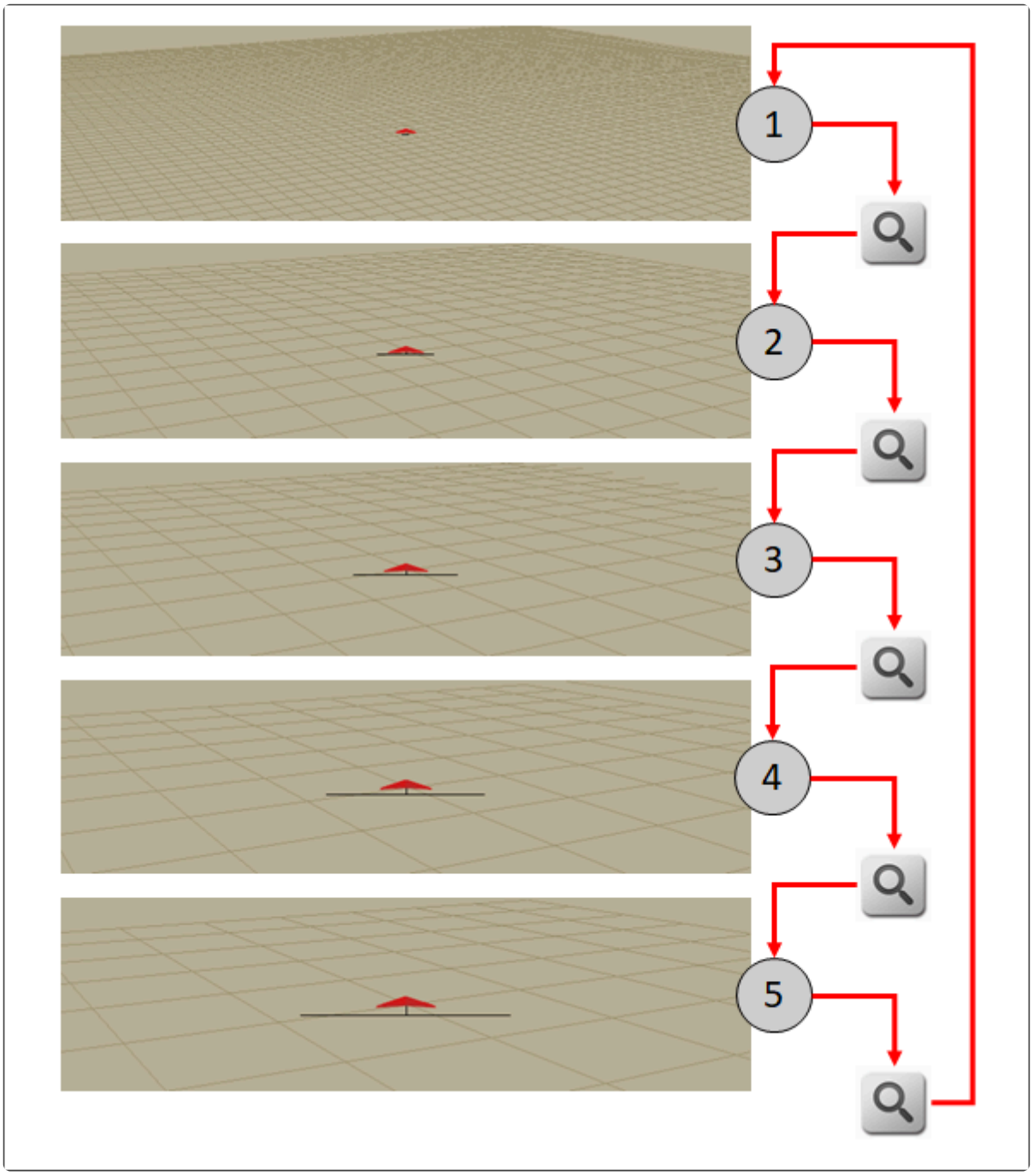

## Grid in 2D perspective




## Zoom levels

The following images display zoom levels sequence in the navigation area. When pressing the button

 , zoom level is changed cyclically within this sequence. Grid and machine representation are modified in size, causing depth perspective to be changed.

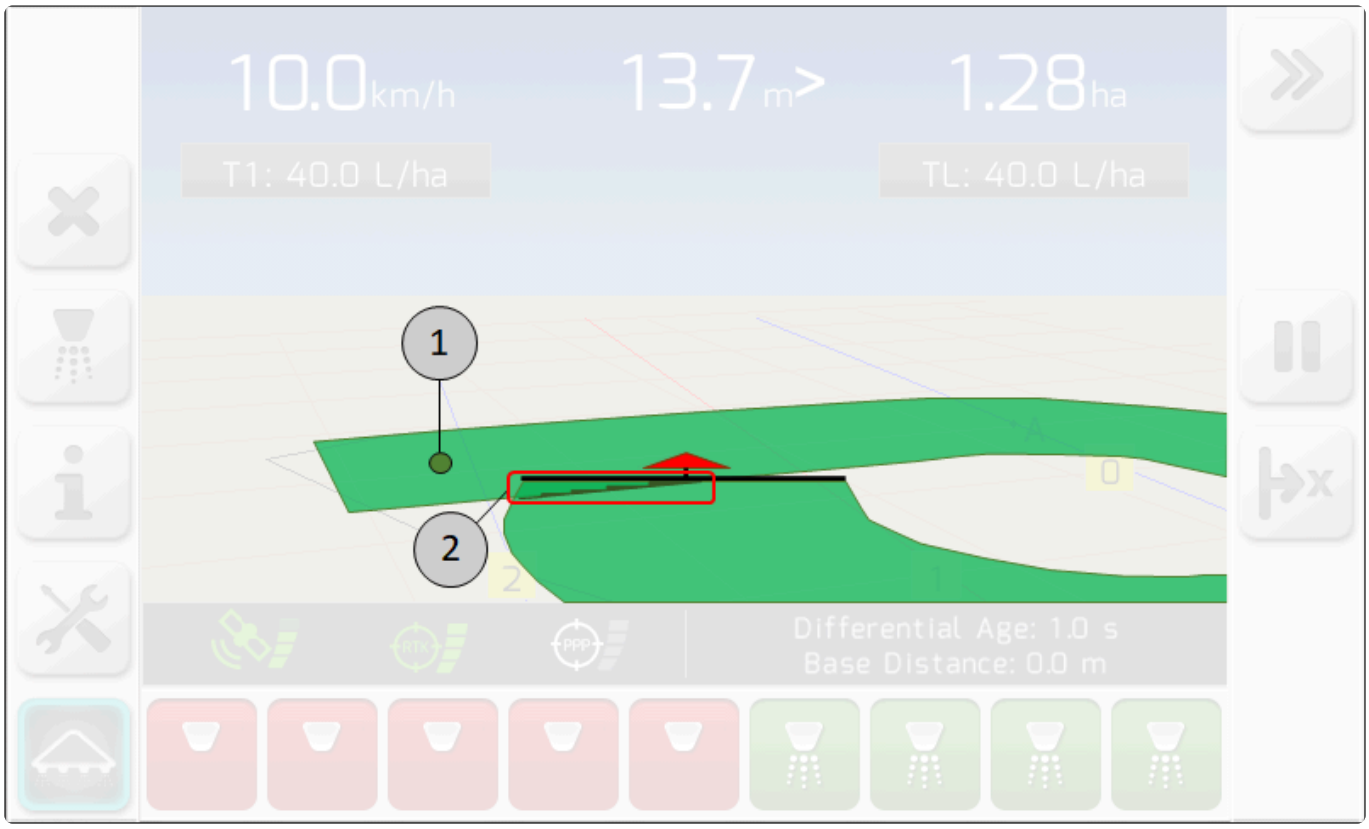



# 6.4.2.2. Trail

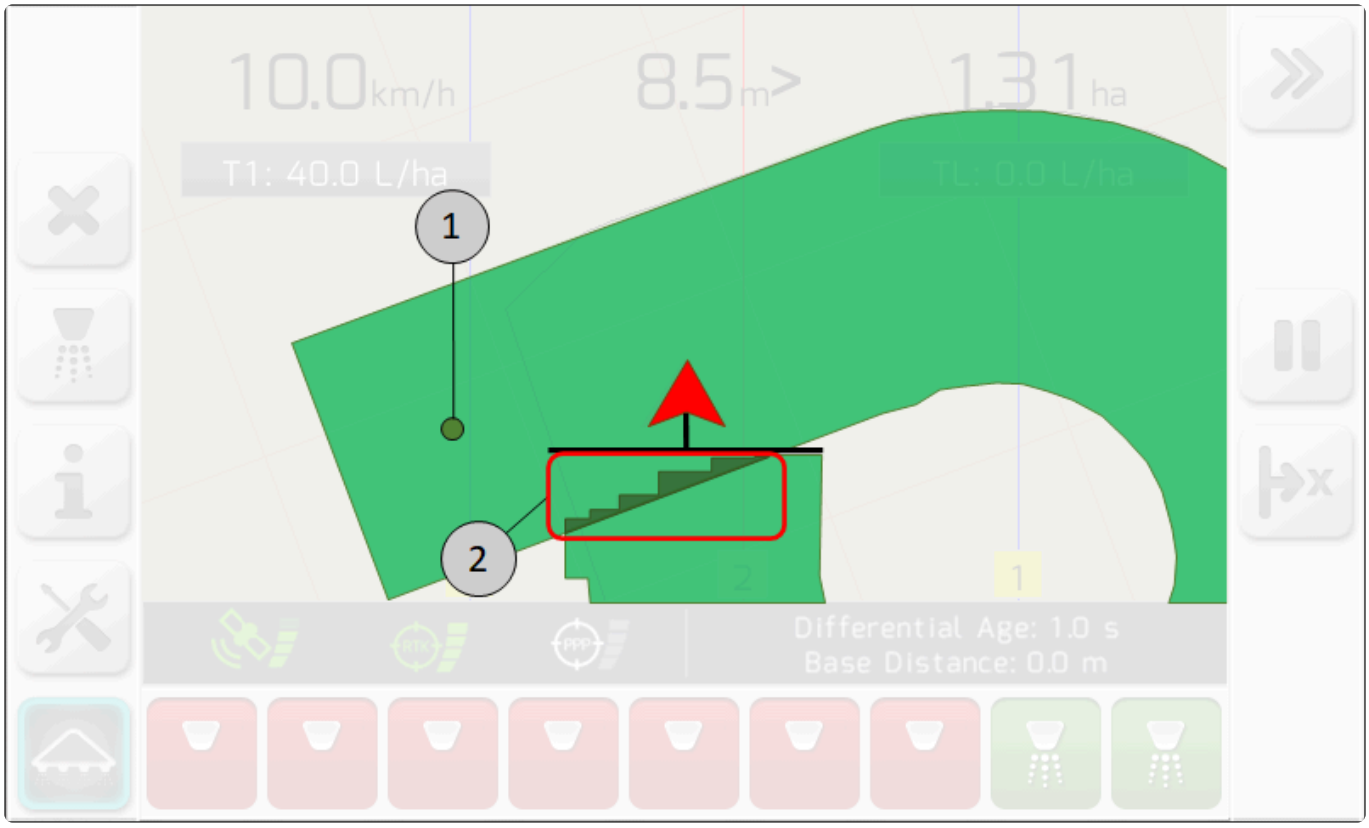
The map area filled with green color is called Trail, it represents the area that was effectively applied during agricultural operation. For example, area sown with soybeans, area sprayed with pesticides or area in which a fertilizer was applied.
Trail area is filled according to the configured implement width, which is graphically represented by the implement bar drawn behind the machine triangle. When the trail is over a not yet applied area the filling color is light green. If an area has been applied more than once, then the green filling color becomes darker with each new pass, indicating that there was an overlap.

In the two images below, examples of trails are shown, in 3D and 2D perspectives. The area marked with (1) represents the first application trail, while an overlap occur in the area marked with (2).

## Trail – 3D perspective



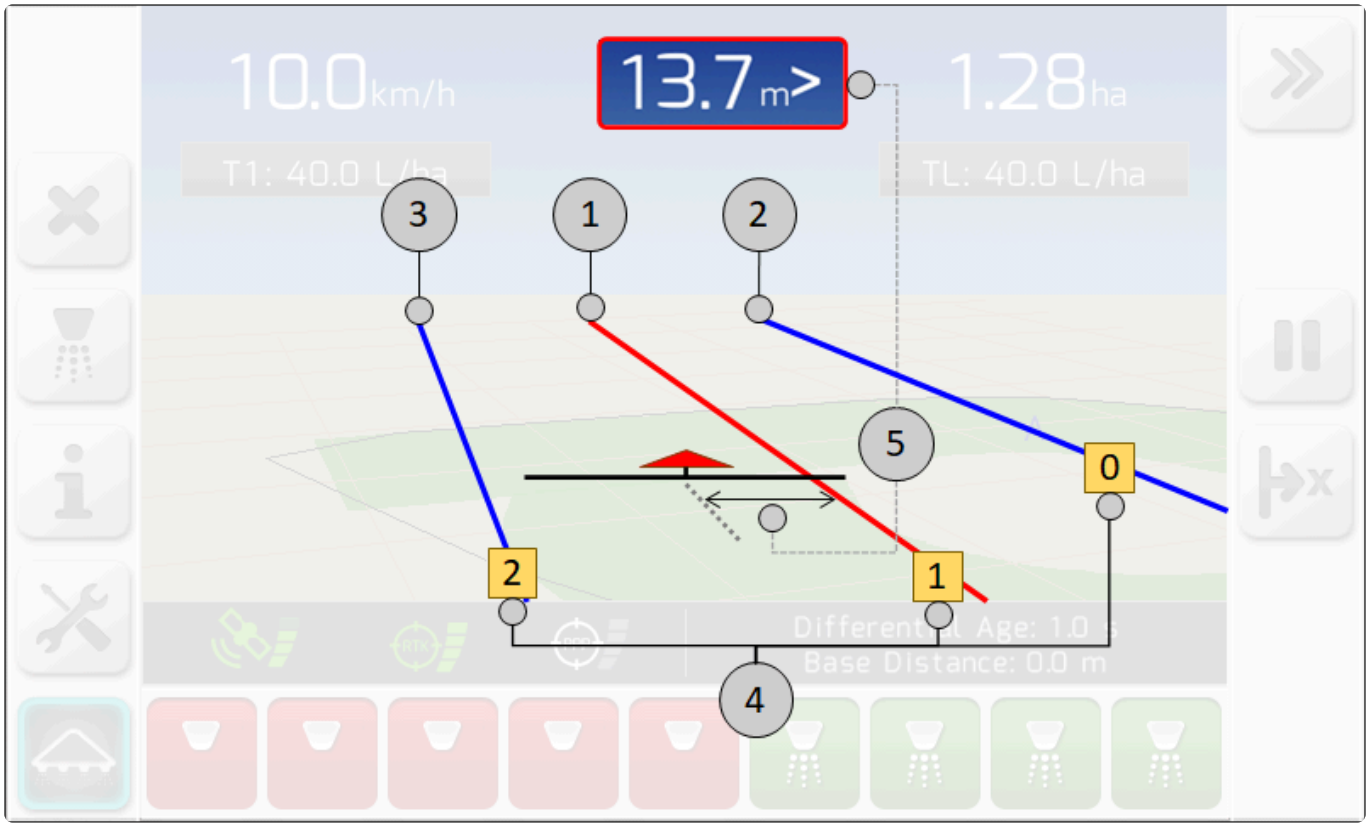

## Trail – 2D perspective




# 6.4.2.3. Guides

Guides are virtual lines that represent the path that the machine must follow in order to carry out the agricultural application operation in parallel lines. The GeoNave system displays three guide lines on the navigation screen. The center line, marked in red, is the target guide and closest to the machine current position. The other two lines marked in blue represent the parallel guides, to the right and to the left of the target guide, which are naturally the next guides to be followed after the field end maneuver.

The following is an image showing the details of the navigation screen guides in the map area.

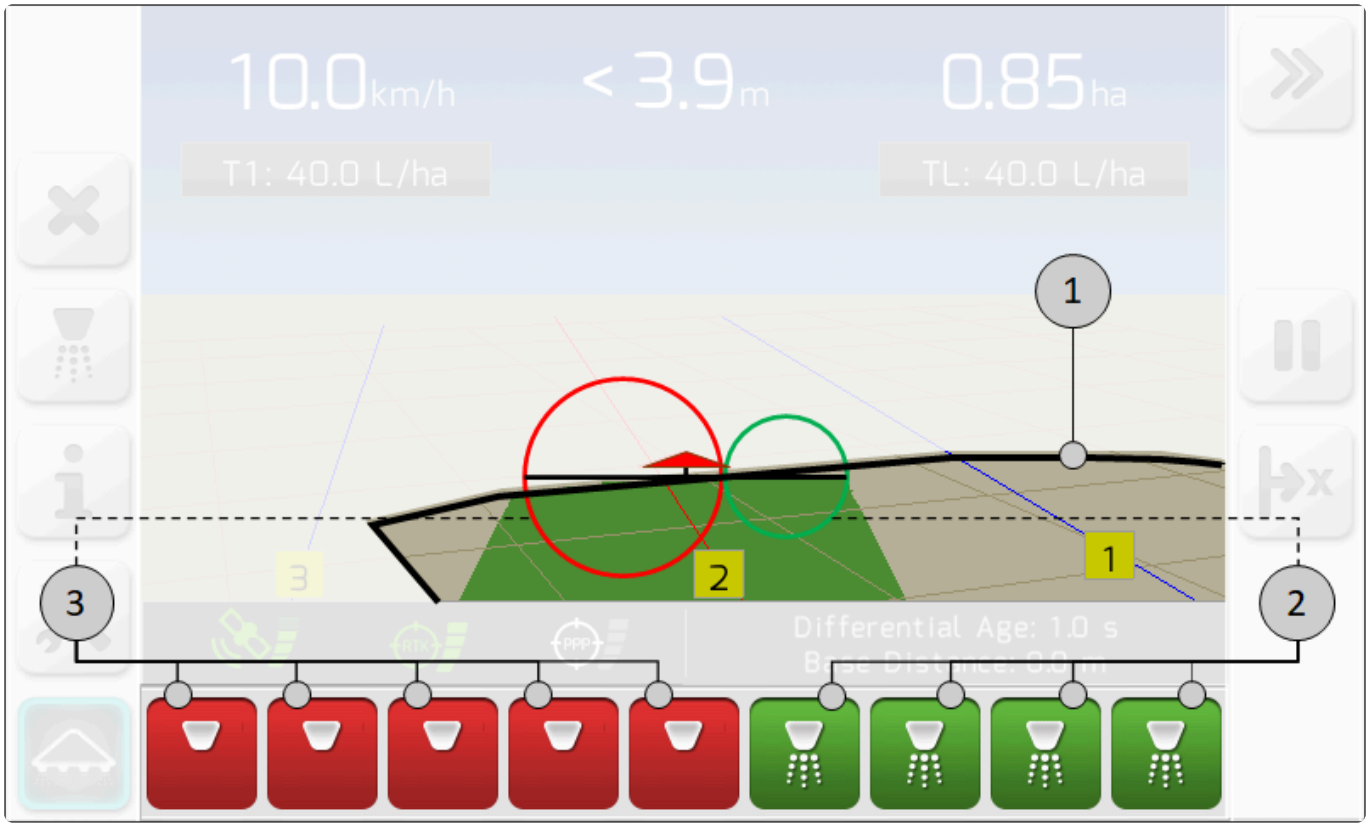



| Item | Description |
|---|---|
| 1 | Target guide, drawn as a solid red line, representing the machine closest guide. |
| 2 | Next parallel guide to the right of the target guide, drawn as a solid blue line. |
| 3 | Next parallel guide to the left of the target guide, drawn as a solid blue line. |
| 4 | Number that identifies the parallel guides, in relation to the initial A-B guide, or zero guide. Positive numbers represent guides to the right of A -> B direction. Negative numbers represent guides to the left of A -> B direction. |
| 5 | Deviation from the target guide graphical representation. |

# 6.4.2.4. Boundary

The Boundary is a virtual area delimited by the user on GeoNave system, outside of which application is not desired. In the navigation screen map area, the boundary is shown with a solid black line.

The following image shows an example of Boundary 1 delimited in a field, in which the spraying operation is being carried out in a machine with 9 sections. In the image is possible to observe that the sections within the boundary area 2 are in green state and applying, and sections outside the boundary area 3 are in red state and not applying.




# 6.4.3. Alert Board

In the navigation screen, when a system event occurs a rectangular frame is displayed, containing text referring to the event alert. The rectangular area with a gray background can contain one or two text lines.

The following is an example of an alert board (1), that occurs when point B of straight guide is marked.

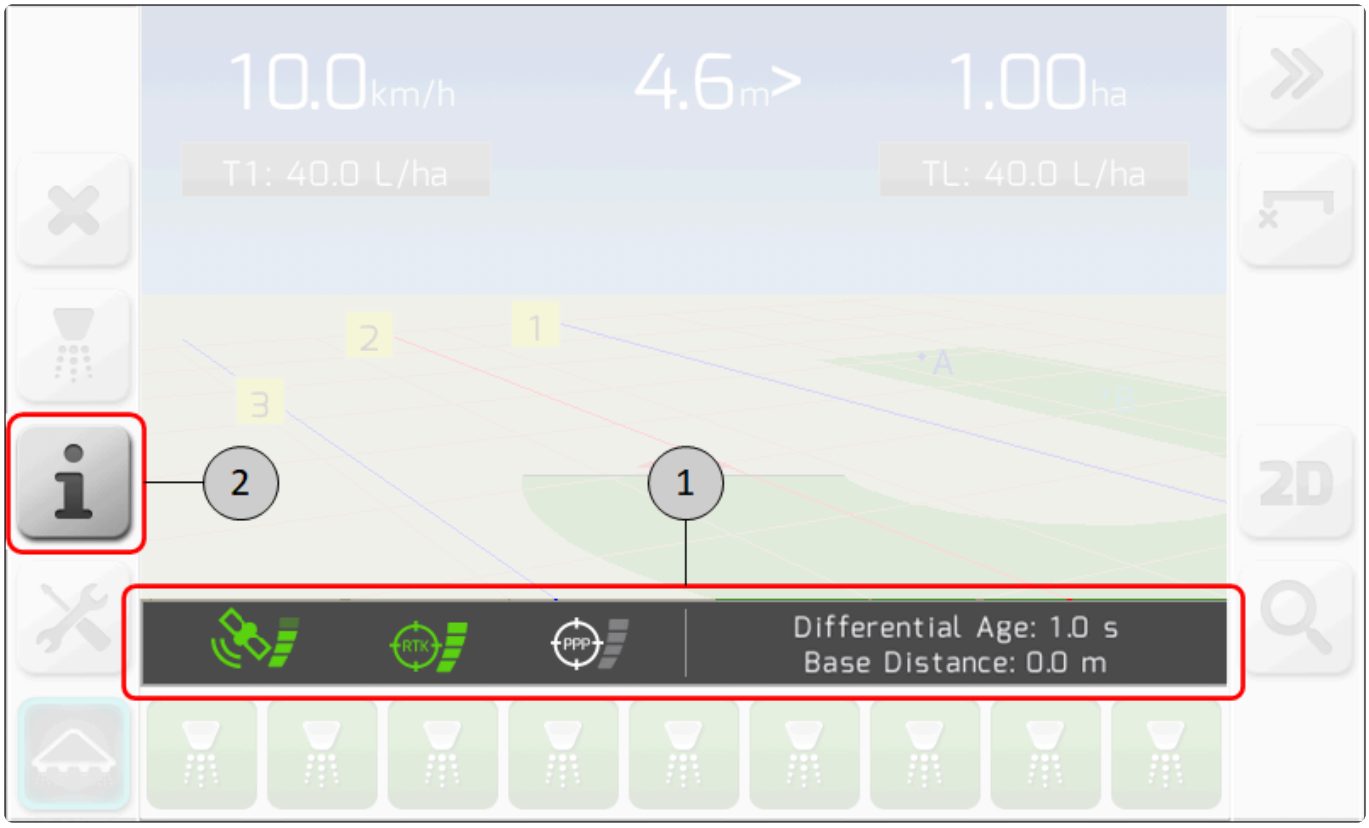



# 6.4.4. Information board

Near the navigation screen bottom is the information board. Through this board is possible to view several important information during navigation operation, without the need to return to GeoNave system configuration menus.

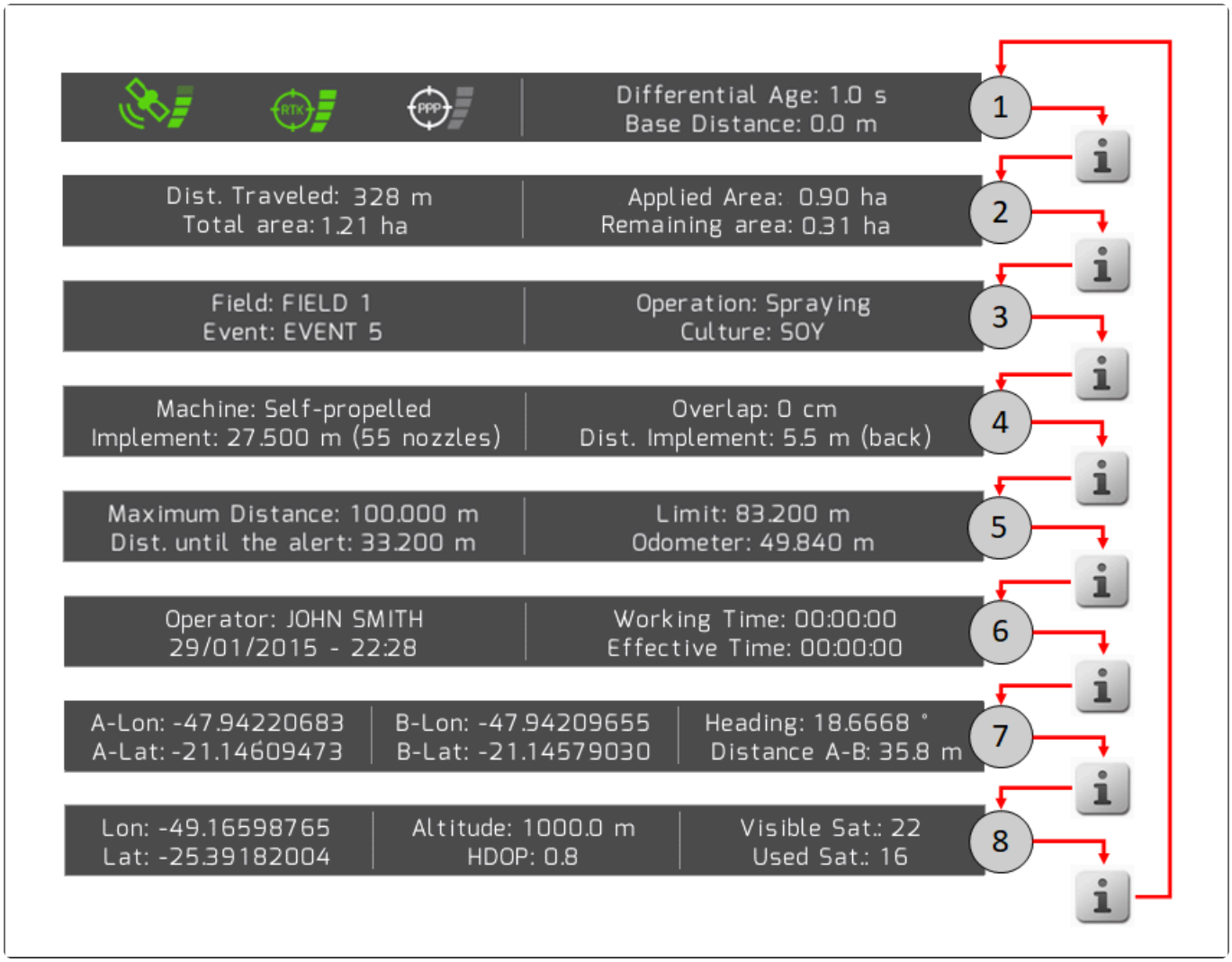
In the navigation screen composition, the information board (1) is shown as in the following image.

When pressing the information button (2), the information page shown in the board changes.




The following are images of pages sequence in ISO 31 system information board, including the description of each item in its composition.

Note: The page 5 is shown only for irrigation operation.

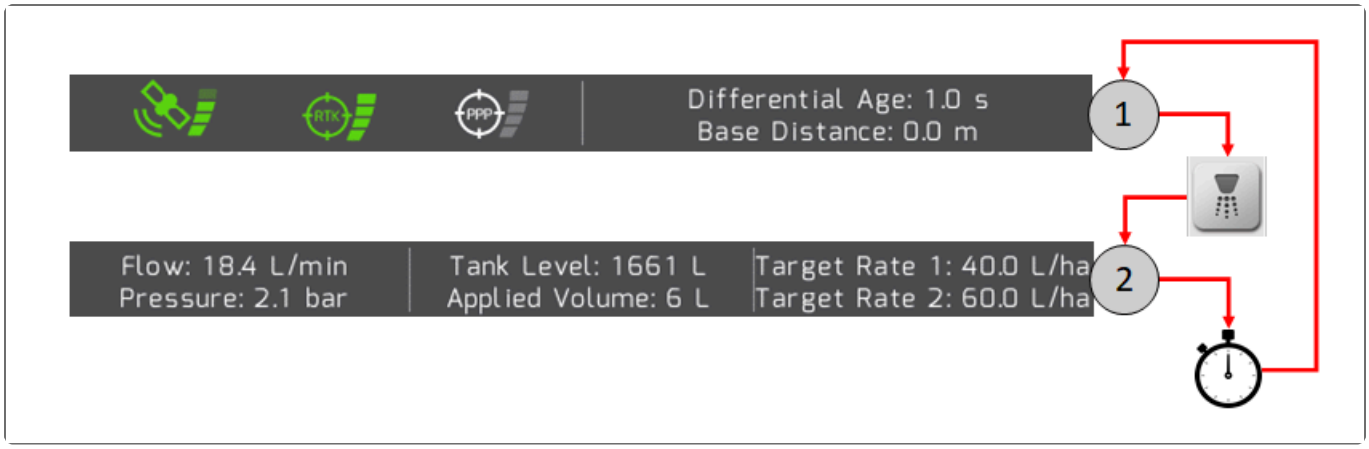



| Page | Item | Description |
|---|---|---|
| 1 |  | Satellites Signal Quality icon |
| |  | RTK correction quality icon |
| |  | Paid correction signal quality icon |
| | Differential Age | Time in seconds since last signal correction message (when configured) |
| | Base Distance | Distance from RTK base (when configured) to GNSS antenna |
| 2 | Dist. Traveled | Operation distance traveled so far |
| | Total area | Boundary total area |
| | Applied Area | Applied area |
| | Remaining Area | Difference between boundary total area and applied area |
| | Applied Volume | Applied volume |
| | Remaining Volume | Difference between total volume to cover the boundary and applied volume |
| 3 | Field | Field file name used |

| | | |
|---|---|---|
| | Event | Event file name used |
| | Operation | Operation being performed |
| | Culture | Culture name |
| 4 | Machine | Configured machine name |
| | Implement | Configured value of implement width parameter (for spraying, includes the nozzles number) |
| | Overlay | Configured value of overlap parameter |
| | Dist. Implement | Configured implement value of antenna distance parameter |
| 5 | Maximum Distance | Value of Maximum distance parameter, configured in  |
| | Dist. until the alert | Distance from irrigation application start to alert distance, set in  |
| | Limit | Remaining distance to reach Maximum Distance (hose length) |
| | Odometer | Distance traveled since pressing the odometer reset button  |
| 6 | Operator | Configured operator name |
| | DD / MM / YYYY – HH: MM | Current date and time |
| | Working time | Total work time since event opening |
| | Effective Time | Effective working time, in which there has been application |
| 7 | A-Lon | Longitude in degrees of point A of straight guide |
| | A-Lat | Latitude in degrees of point A of straight guide |
| | B-Lon | Longitude in degrees of point B of straight guide |
| | B-Lat | Latitude in degrees of point B of straight guide |
| | Heading | Straight guide heading angle |
| | Distance A-B | Distance between straight guide points A and B |
| 8 | Lon | Longitude in degrees of current GNSS point |
| | Lat | Latitude in degrees of current GNSS point |
| | Altitude | Altitude in meters of current GNSS point |
| | HDOP | Horizontal dilution precision of GNSS |
| | Visible Sat. | Number of visible GNSS satellites |
| | Used Sat. | Number of GNSS satellites used |

In Spraying operation, by pressing the spraying settings button  on the navigation screen, the information board assumes for a short time the configuration shown on page 2 of the image below, containing information related to the application. After, the information board returns to its initial state

1.




| Page | Item | Description |
|---|---|---|
| 1 |  | Satellites Signal Quality icon |
| |  | RTK correction quality icon |
| |  | Paid correction signal quality icon |
| | Differential Age | Time in seconds since last signal correction message (when configured) |
| | Base Distance | Distance from RTK base (when configured) to GNSS antenna |
| 2 | Flow | Fluid flow rate through the flowmeter, in L/min |
| | Pressure | Calculated spraying system pressure |
| | Tank Level | Current spraying tank level, in L |
| | Applied Volume | Total volume of fluid applied in the current event |
| | Target Rate1 | Fixed target rate 1 configured in the selected spraying job |
| | Target Rate1 | Fixed target rate 2 configured in the selected spraying job |

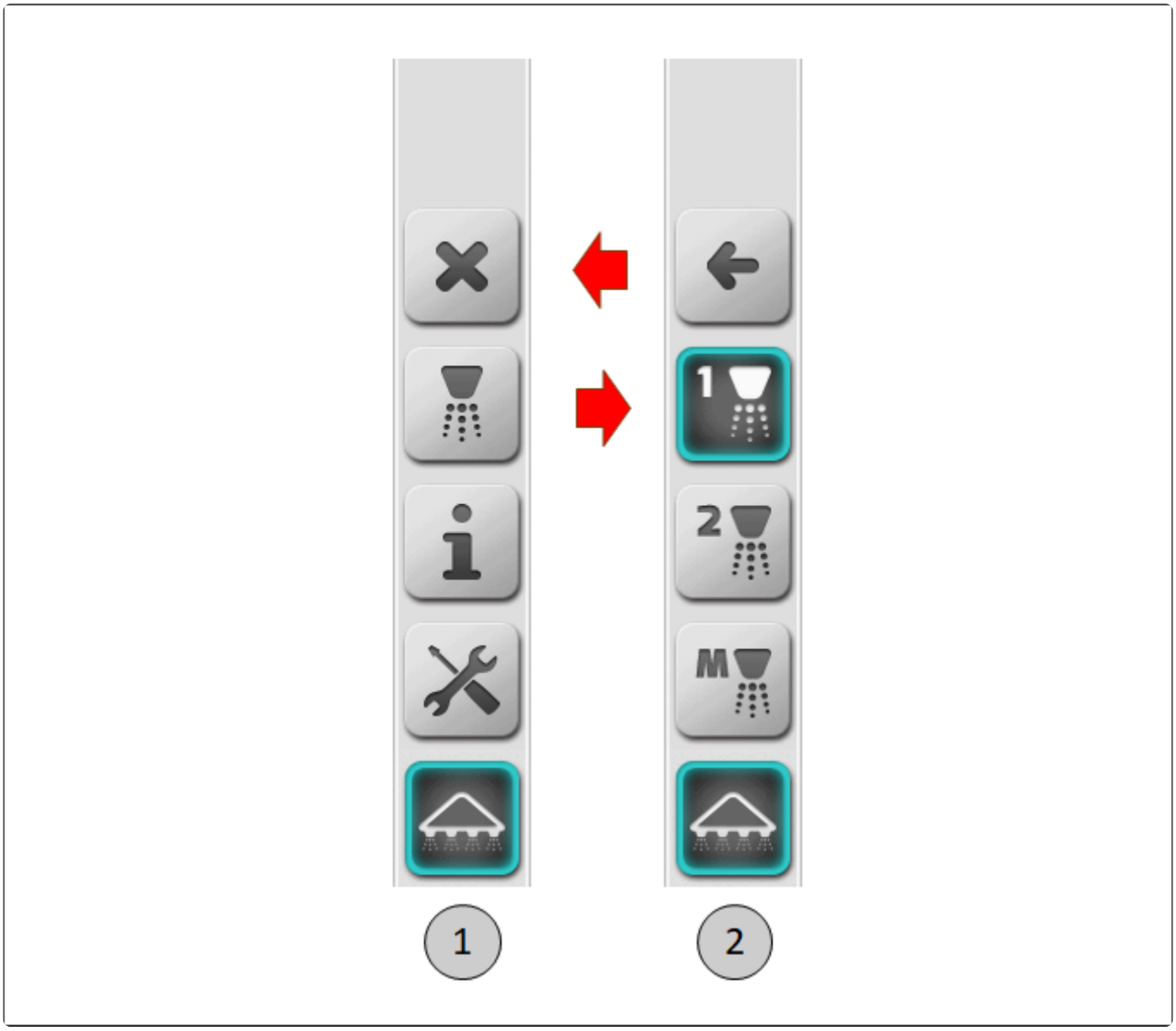
# 6.4.5. Side buttons

The Navigation screen has two button bars, on left and right sides of the map area. Touch sensitive buttons allow the user to perform a series of relevant actions to agricultural operation, access information, configure parameters, among other features.

## Side button bar – Left

The left side button bar has variable button layout according to the selected Operation.

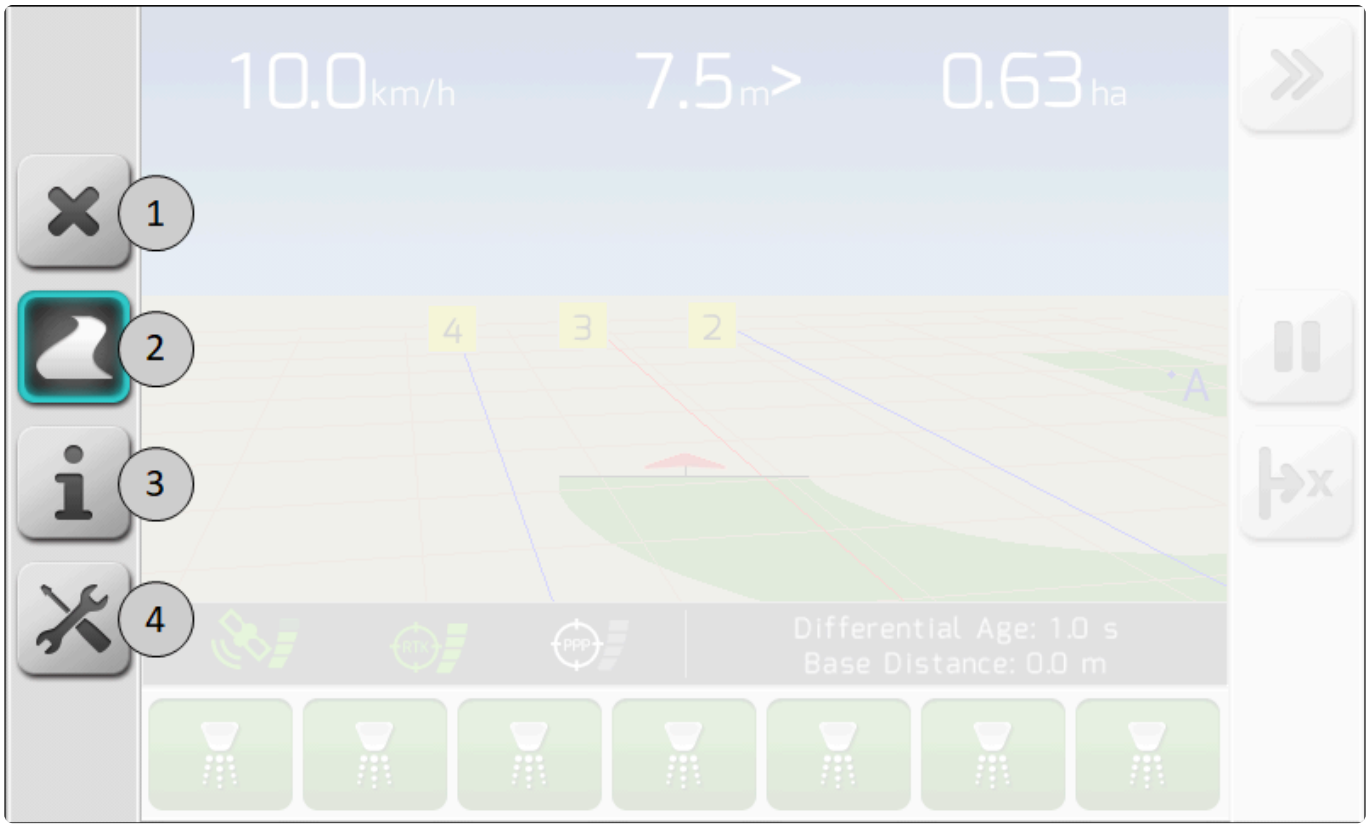
**1) Operation = Spraying**




| Configuration | Button | Description |
|---|---|---|
| 1 | | End current navigation event |
| | | Access spraying settings button -> Goes to configuration 2 |
| | | Change information board page |
| | | Access settings during navigation menu |
| | | Enable spraying |
| 2 | | Return from the spraying settings buttons> Return to the configuration 1 |

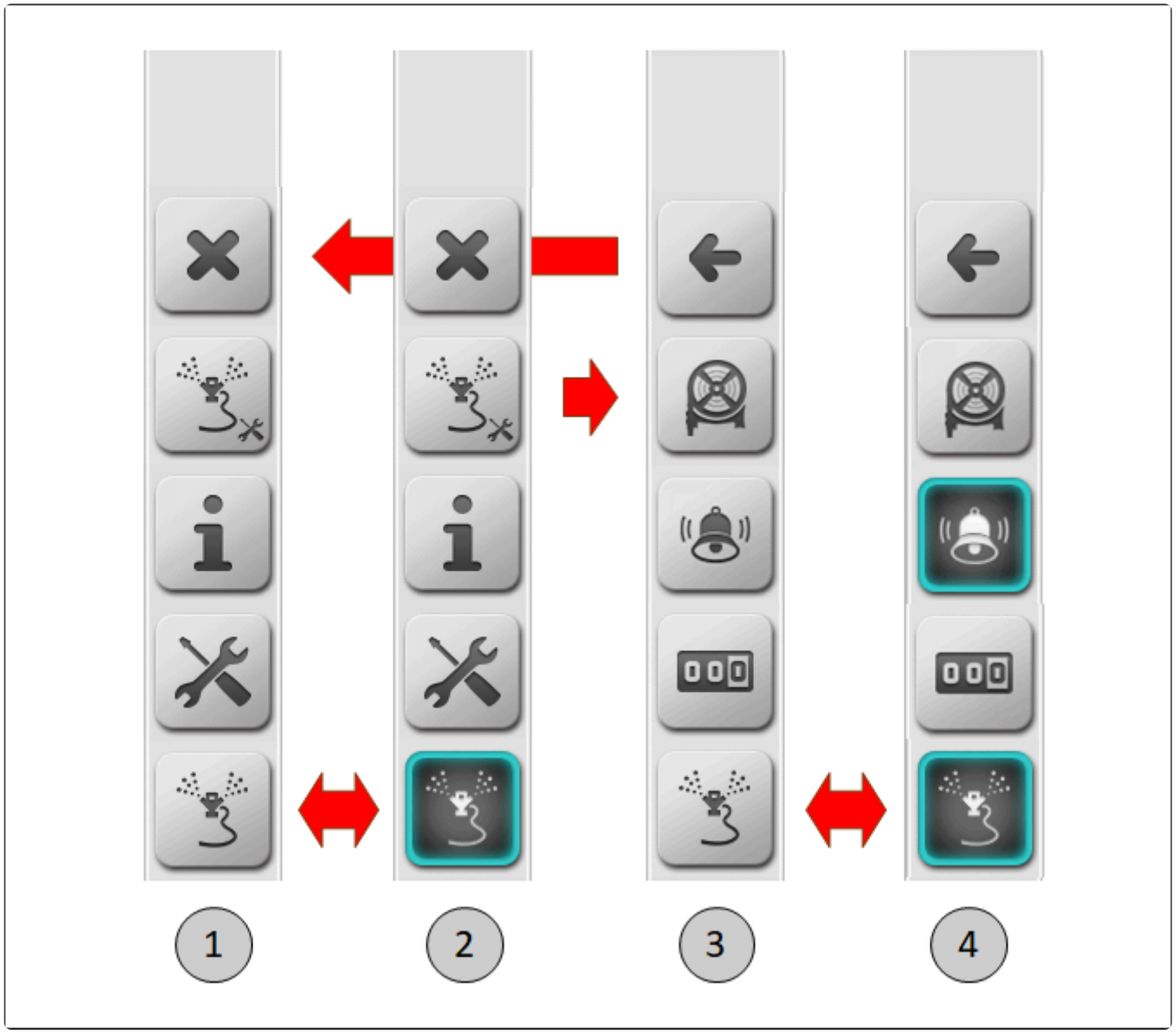
| | | |
|---|---|---|
| |  | Selects fixed spraying rate 1 |
| |  | Selects fixed spraying rate 2 |
| |  | Select manual spraying rate |
| |  | Enable spraying |

**2) Operation = Fertilizing, Harvesting, Planting, Other**




| Item | Description |
|---|---|
| 1 | Cancel button, to end current navigation event |
| 2 | Trail button, to enable or disable application trail |
| 3 | Information button, to change Information board page |
| 4 | Settings button, to access Settings during navigation menu |

**3) Operation = Irrigation**




| Configuration | Button | Description |
|---|---|---|
| 1 | | End current navigation event |
| | | Switch to irrigation settings -> Goes to configuration 3 |
| | | Change information board page |
| | | Access settings during navigation menu |
| | | Enable irrigation -> Goes to configuration 2 |
| 2 | | End current navigation event |

| | | |
|---|---|---|
| |  | Switch to irrigation settings -> Goes to configuration 4 |
| |  | Change information board page |
| |  | Access settings during navigation menu |
| |  | Disable irrigation -> Returns to configuration 1 |
| 3 |  | Return from irrigation settings -> Return to configuration 1 |
| |  | Opens maximum irrigation distance setting screen |
| |  | Opens irrigation alert setting screen |
| |  | Reset irrigation odometer |
| |  | Enable irrigation -> Go to configuration 4 |
| 4 |  | Return from irrigation settings -> Return to configuration 2 |
| |  | Opens maximum irrigation distance setting screen |
| |  | Opens irrigation alert setting screen |
| |  | Reset irrigation odometer |
| |  | Disable irrigation -> Returns to the configuration 3 |

# Side button bar – Right

The right side button bar has variable button layout according to system settings. The image below shows an example of right side button bar.




In Spraying operation, when spraying settings are accessed via the button , the right side button bar assumes the following layout, according to the rate selected by buttons , , and from the left side button bar.

| Selected rate | Button | Description |
|---|---|---|
| | | Select automatic section shut-off |
| | | Select manual section shut-off |
| | | Select automatic section shut-off |
| | | Select manual section shut-off |
| | | Select automatic section shut-off |
| | | Select manual section shut-off |
| | | Increase manual rate (opens the regulating valve) |

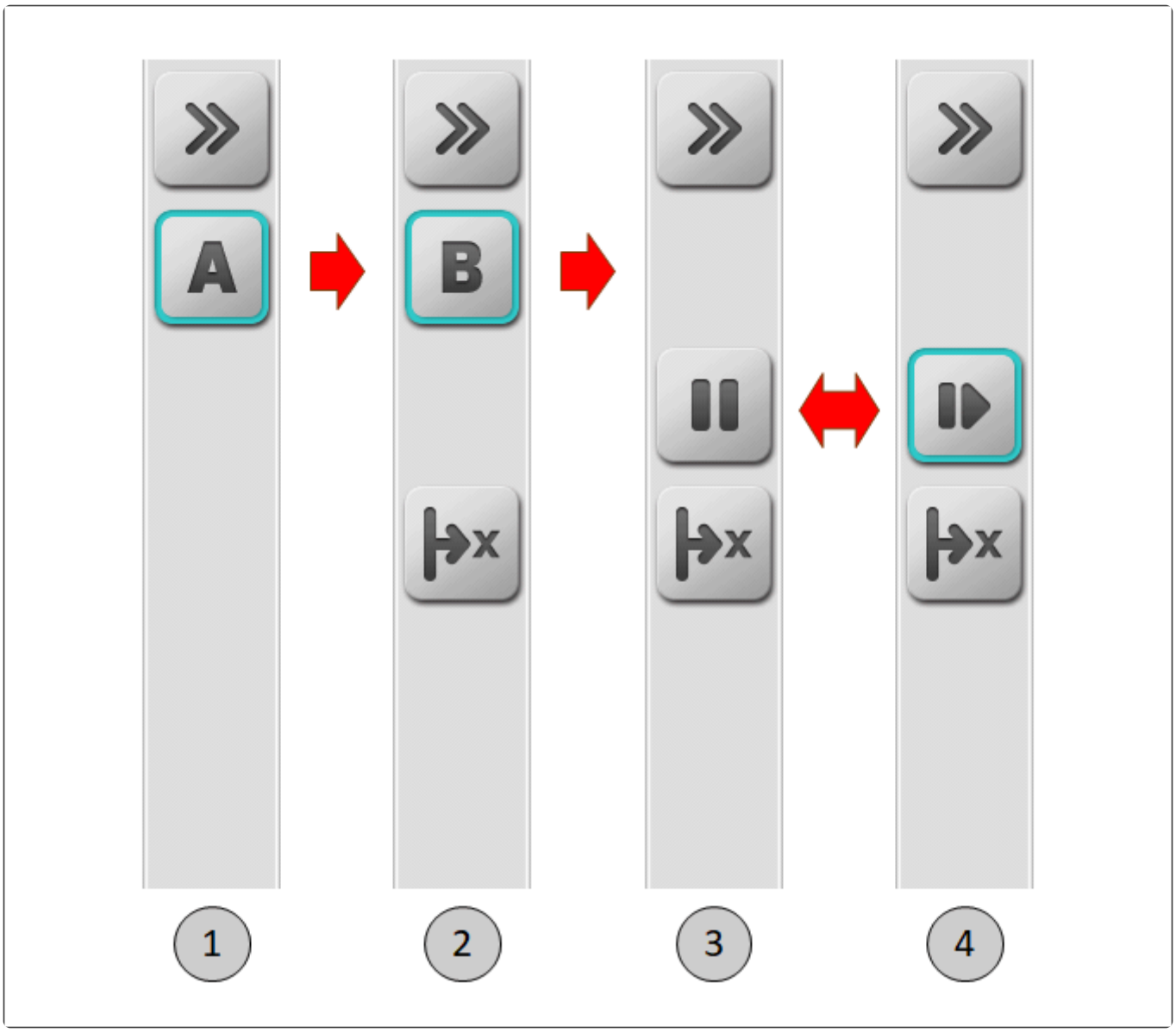
| | | |
|---|---|---|
| |  | Decrease manual rate (closes the regulating valve) |

For other operations, and also when spraying settings are not activated by the button  , right sidebar buttons are arranged on three pages. To navigate between pages, the user must press the page switch button  .

## Page 1

The first buttons page has a variable layout according to configured Guide Type.

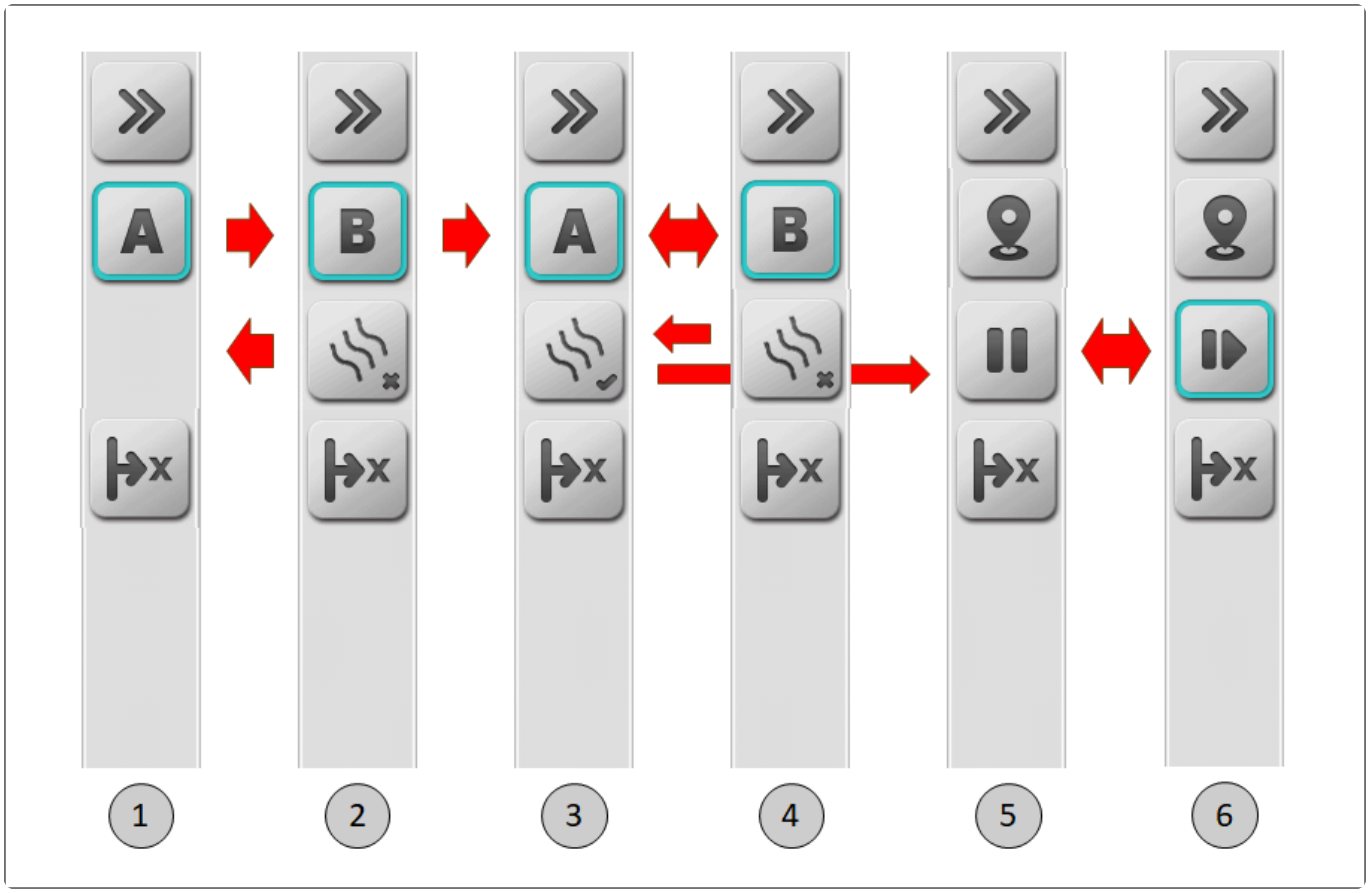
**1) Guide Type = Straight or Curved**




| Configuration | Button | Description |
|---|---|---|

| | | |
|---|---|---|
| 1 |  | Switch to **Page2** of right buttons sidebar |
| |  | Mark point A of guide -> Goes to configuration 2 |
| 2 |  | Switch to **Page2** of right buttons sidebar |
| |  | Mark point B of guide -> Goes to configuration 3 |
| |  | Opens position adjustment menu |
| 3 |  | Switch to **Page2** of right buttons sidebar |
| |  | Pause guide navigation -> Goes to configuration 4 |
| |  | Opens position adjustment menu |
| 4 |  | Switch to **Page2** of right buttons sidebar |
| |  | Resume guide navigation -> Returns to configuration 3 |
| |  | Opens position adjustment menu |

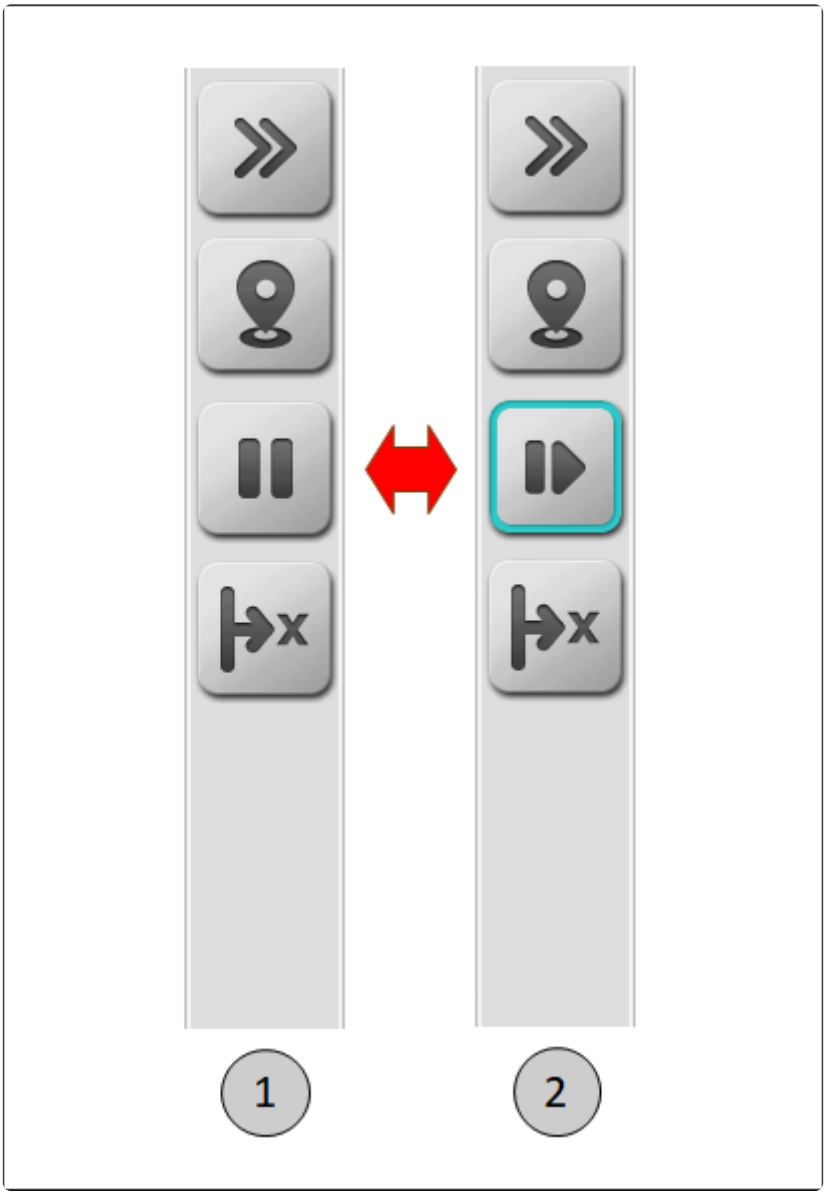
**2) Guide Type = Free**




| Configuration | Button | Description |
|---|---|---|
| 1 | » | Switch to **Page2** of right buttons sidebar |
| | A | Mark point A of first guide -> Goes to configuration 2 |
| | →x | Opens position adjustment menu |
| 2 | » | Switch to **Page2** of right buttons sidebar |
| | B | Mark point B of first guide -> Goes to configuration 3 |
| | ≈ | Cancel first guide marking -> Returns to configuration 1 |
| | →x | Opens position adjustment menu |
| 3 | » | Switch to **Page2** of right buttons sidebar |
| | A | Mark point A of current guide -> Goes to configuration 4 |

| | | |
|---|---|---|
| |  | Finalize free guide -> Goes to configuration 5 |
| |  | Opens position adjustment menu |
| 4 |  | Switch to **Page2** of right buttons sidebar |
| |  | Mark point B of current guide-> Returns to configuration 3 |
| |  | Cancel current guide marking -> Returns to configuration 3 |
| |  | Opens position adjustment menu |
| 5 |  | Switch to **Page2** of right buttons sidebar |
| |  | Opens map and current location screen |
| |  | Pause guide navigation -> Goes to configuration 6 |
| |  | Opens position adjustment menu |
| 6 |  | Switch to **Page2** of right buttons sidebar |
| |  | Opens map and current location screen |
| |  | Resume guide navigation -> Returns to configuration 5 |
| |  | Opens position adjustment menu |

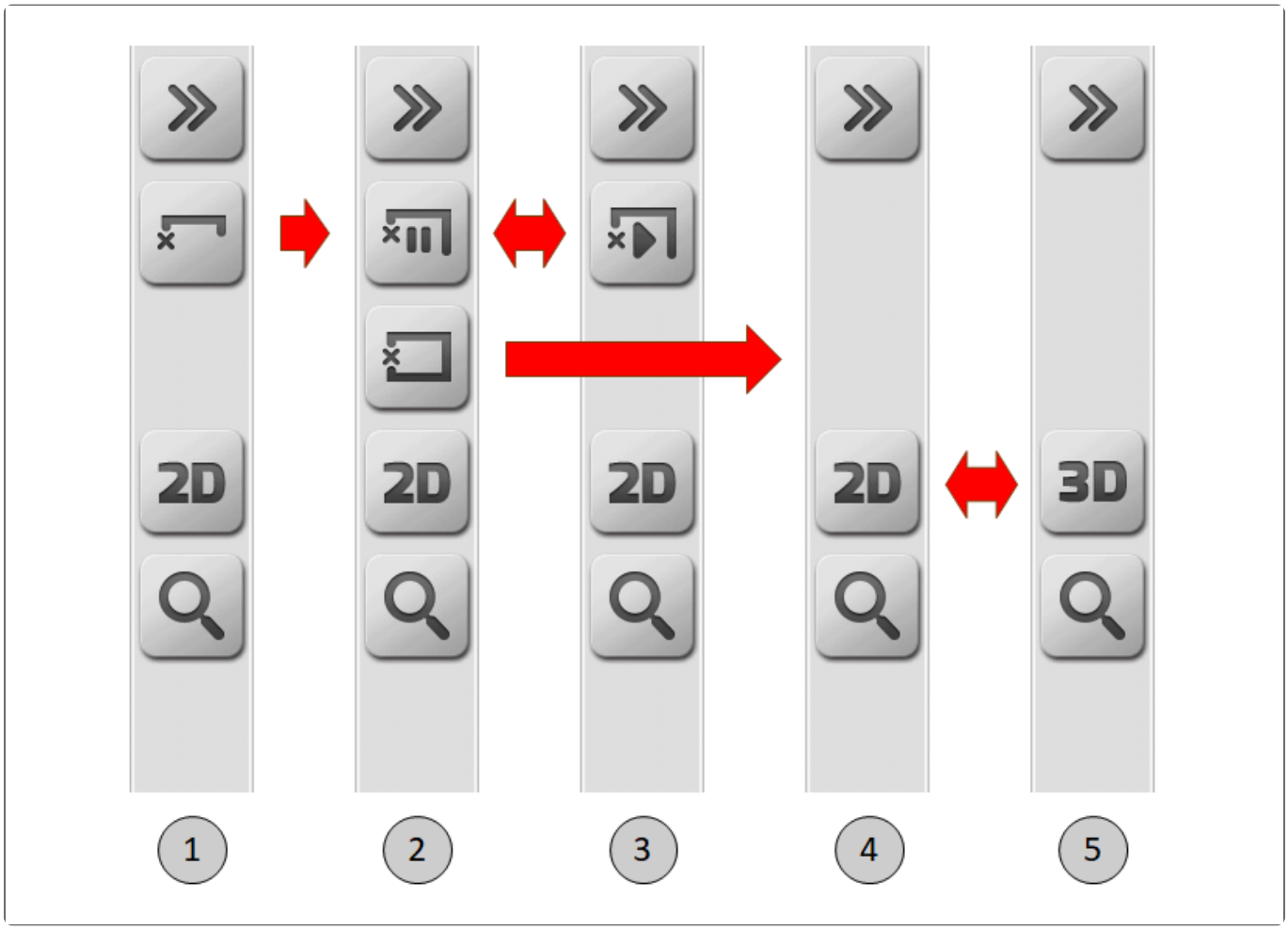
**3) Guide Type = Project**




| Configuration | Button | Description |
|---|---|---|
| 1 |  | Switch to **Page2** of right buttons sidebar |
| |  | Opens map and current location screen |
| |  | Pause guide navigation -> Goes to configuration 2 |
| |  | Opens position adjustment menu |
| 2 |  | Switch to **Page2** of right buttons sidebar |
| |  | Opens map and current location screen |

| | | |
|---|---|---|
| | | Resume guide navigation -> Returns to configuration (1) |
| | | Opens position adjustment menu |

## Page2




| Configuration | Button | Description |
|---|---|---|
| 1 | | Switch to **Page1** (if demo mode is not activated) or **Page3** (if demo mode is activated) of right buttons sidebar |
| | | Start new boundary definition -> Goes to configuration (2) |
| | 2D | Switch navigation map view to 2D |
| | | Switch between zoom levels on navigation map |
| 2 | | Switch to **Page1** (if demo mode is not activated) or **Page3** (if demo mode is activated) of right buttons sidebar |

| | | |
|---|---|---|
| |  | Pause boundary definition -> Goes to the configuration 3 |
| |  | End boundary definition -> Goes to configuration 4 |
| |  | Switch navigation map view to 2D |
| |  | Switch between zoom levels on navigation map |
| 3 |  | Switch to **Page1** (if demo mode is not activated) or **Page3** (if demo mode is activated) of right buttons sidebar |
| |  | Resume boundary definition -> Returns to configuration 2 |
| |  | Switch navigation map view to 2D |
| |  | Switch between zoom levels on navigation map |
| 4 |  | Switch to **Page1** (if demo mode is not activated) or **Page3** (if demo mode is activated) of right buttons sidebar |
| |  | Switch the navigation map view to 2D -> Goes to configuration 5 |
| |  | Switch between zoom levels on navigation map |
| 5 |  | Switch to **Page1** (if demo mode is not activated) or **Page3** (if demo mode is activated) of right buttons sidebar |
| |  | Switch navigation map view to 3D -> Returns to configuration 4 |
| |  | Switch between zoom levels on navigation map |

## Page3

Page 3 of the right side buttons bar is displayed only when one of the Demonstration modes is enabled.



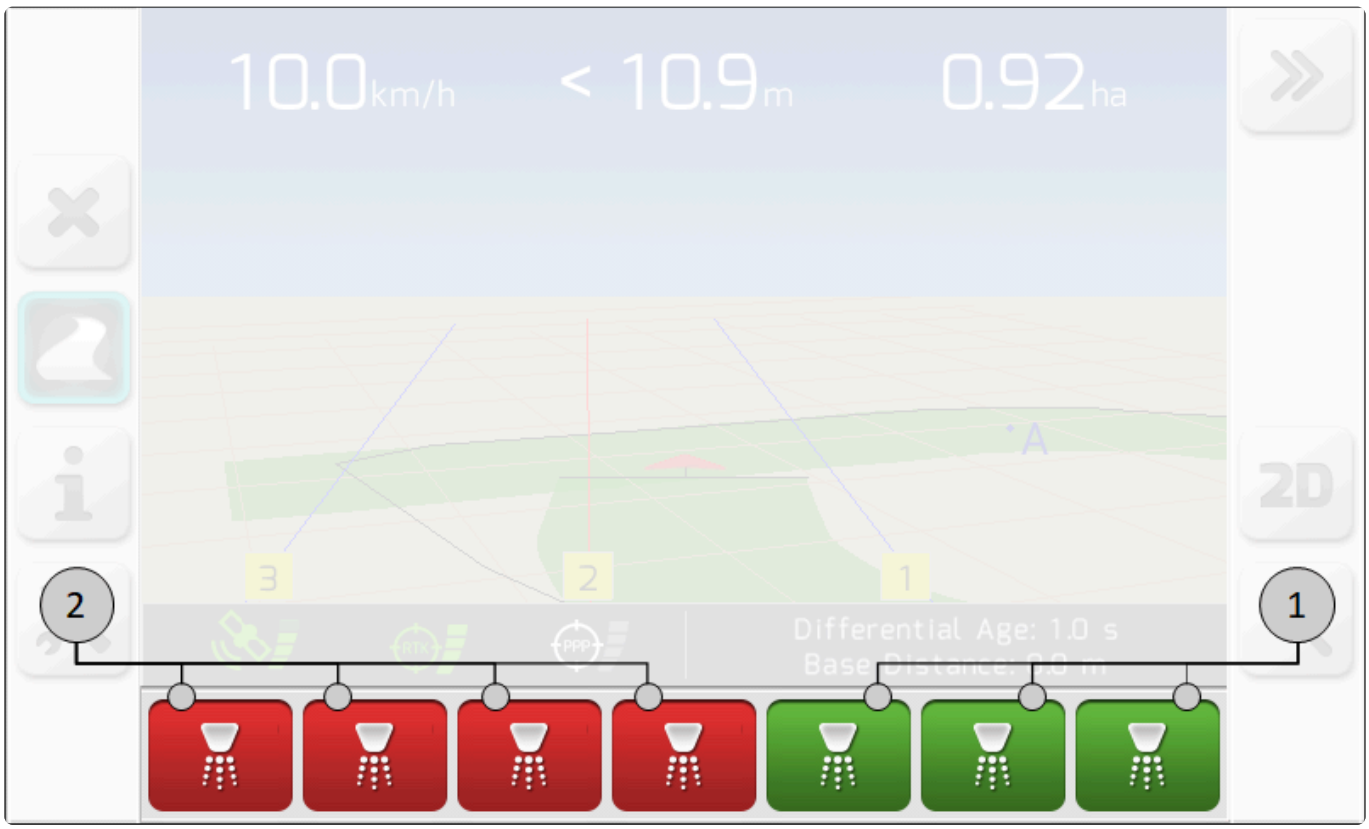

| Configuration | Button | Description |
|---|---|---|
| 1 |  | Switch to **Page1** of right buttons sidebar |
| |  | Increase demonstration speed by 0.5 km/h. |
| |  | Decrease demonstration speed by 0.5 km/h. |

# 6.4.6. Footer

Just below the information board is the navigation screen footer. This area is mainly used to present spraying or fertilizing application sections state, for licenses ISO 31, ISO 32, ISO 34 and ISO 35.
In licenses ISO 31, only spraying operation has section status shown. For other operations, the operation name is shown, as in the example below for harvesting operation.




In spraying operation, the states of the configured sections are shown. The following image illustrates an example of spraying sections state. If a section can be opened at the moment (not in overlapping area, or within boundary area), the section image appears with a green background (1). If the section must be closed (it is in an overlapping area, or outside boundary area) the section image is shown with a red background (2).



The button width varies according to the configured sections number (1 to 9), and can assume the following states.

| state | Description |
|---|---|
|  | Section without overlap, switch on, applying |
|  | Section without overlap, switch on, not applying |
|  | Section without overlap, switch off |
|  | Overlapping section, switch on, applying |
|  | Overlapping section, switch on, not applying |
|  | Overlapping section, switch off |

The footer also takes on a different configuration during irrigation operation. While the hose laying down procedure is carried out in the field, the hose length-limiting ruler is presented including visual alerts, as shown in the image below.



# 6.4.7. Settings during navigation

Screen type = Double List

During navigation is possible to make several GeoNave system configurations, through the Settings during navigation menu.

To access the menu, the user must press the settings button  , as shown in the following image.




Double List screen containing several configuration and diagnostic items will be shown, as represented in the images below.







# 6.5. Guidance lightbar

The GeoNave system monitor has a set of 22 high brightness LEDs, 4 green (central), 6 yellow, 6 orange and 6 red, which form the agricultural navigation system lightbar.
The lightbar is used to guide the agricultural machine navigation on the guides. The operator's objective

when observing the lightbar is to turn the machine's steering wheel in the direction indicated by the LEDs and with the intensity based in the number of LEDs that are turned on in this direction.

The image below shows the LEDs lightbar (1) in the GeoNave display housing.




In this other image below, an example of straight line navigation is shown. The deviation from the guide is 80 cm to the right. In this way, the lightbar guides the user to turn the steering wheel a little to the left, to correct the deviation smoothly. The symbol "<" represents the same direction indicated by the lightbar therefore to the left of the deviation value.




Another example shown in the image below illustrates the lightbar for a large deviation from the guide. You can see that all LEDs on the right of the lightbar are turned on, indicating that the operator must turn the steering wheel all the way in this direction.




When the autopilot license is active, the lightbar is also used to indicate the autopilot status when is engaged. In addition to the agricultural machine’s triangle turning green, the lightbar assume the configuration shown in the following image.




# 6.6. Application button

On the right side of the GeoNave display housing, there is a red button called Application Button. This button has the function of turning on and off the application operation being performed by the system. On license ISO 30, the button enables and disables trail marking, similarly to the trail touch sensitive button  .

Application button position is shown below (1) in the GeoNave display housing.




# 6.7. Autopilot button

On the right side of the GeoNave display housing, there is a green button called Autopilot Button. When the autopilot license is enabled on the system, the button has the function of engage and disengage the autopilot system. On license ISO 31, the pilot button has no defined function.

Autopilot button position is shown below 1 in the GeoNave display housing.

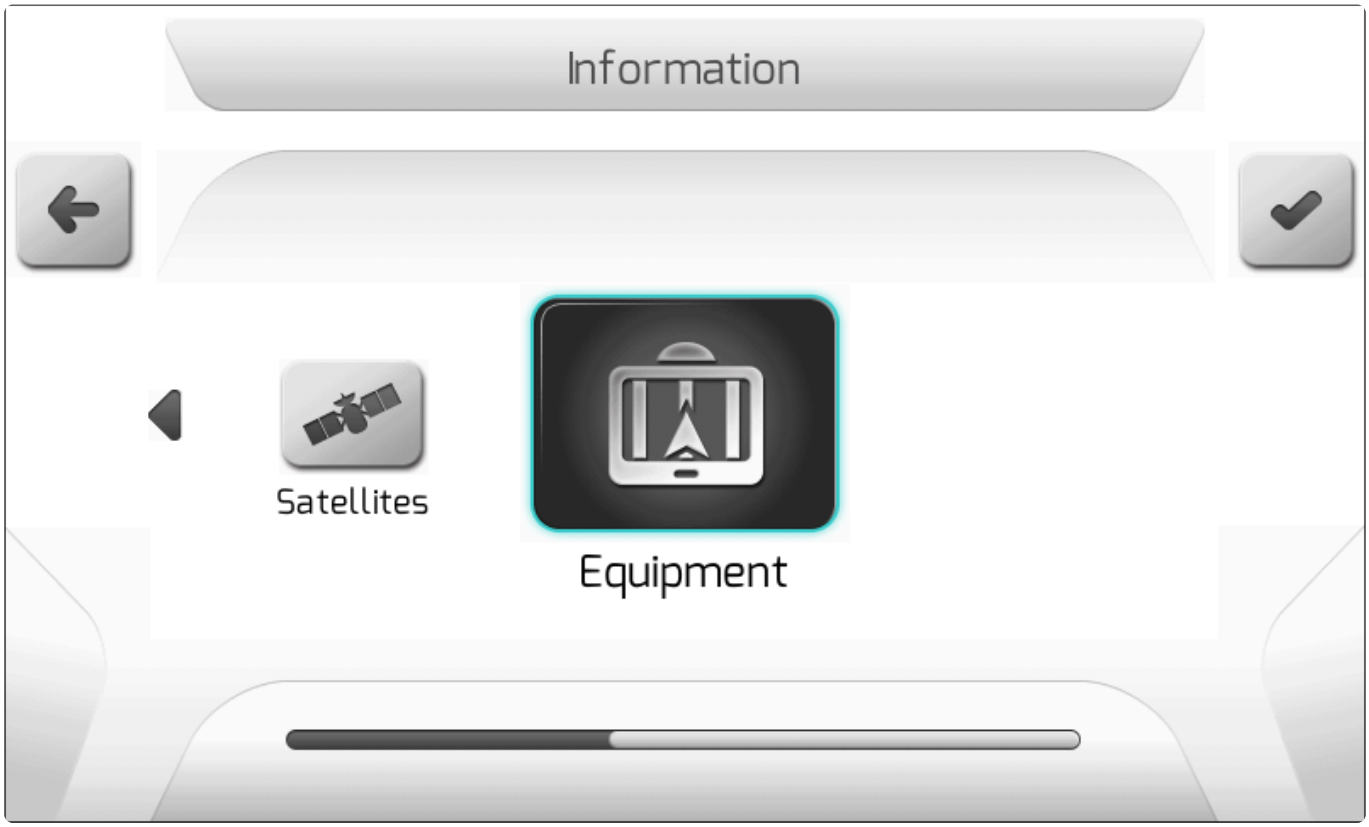


# 7. Information Menu

Screen type = Horizontal menu

- Satellites
- Equipment

The information menu is used to view data related to the GeoNave system, such as hardware data, software version, satellite data, among others. Composed of two areas – Satellites and Equipment, the menu layout is shown in the image below.




# 7.1. Satellites

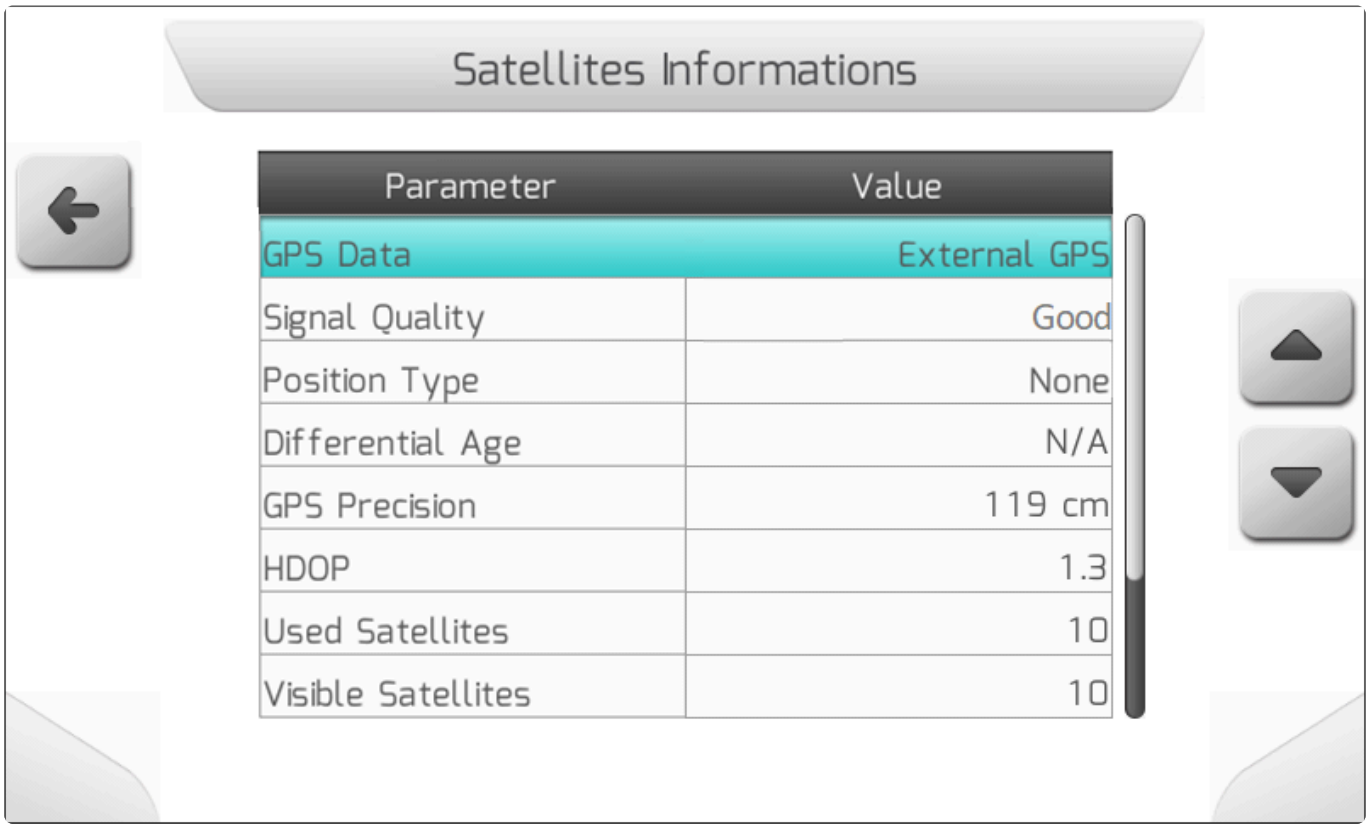
Screen type = Double list

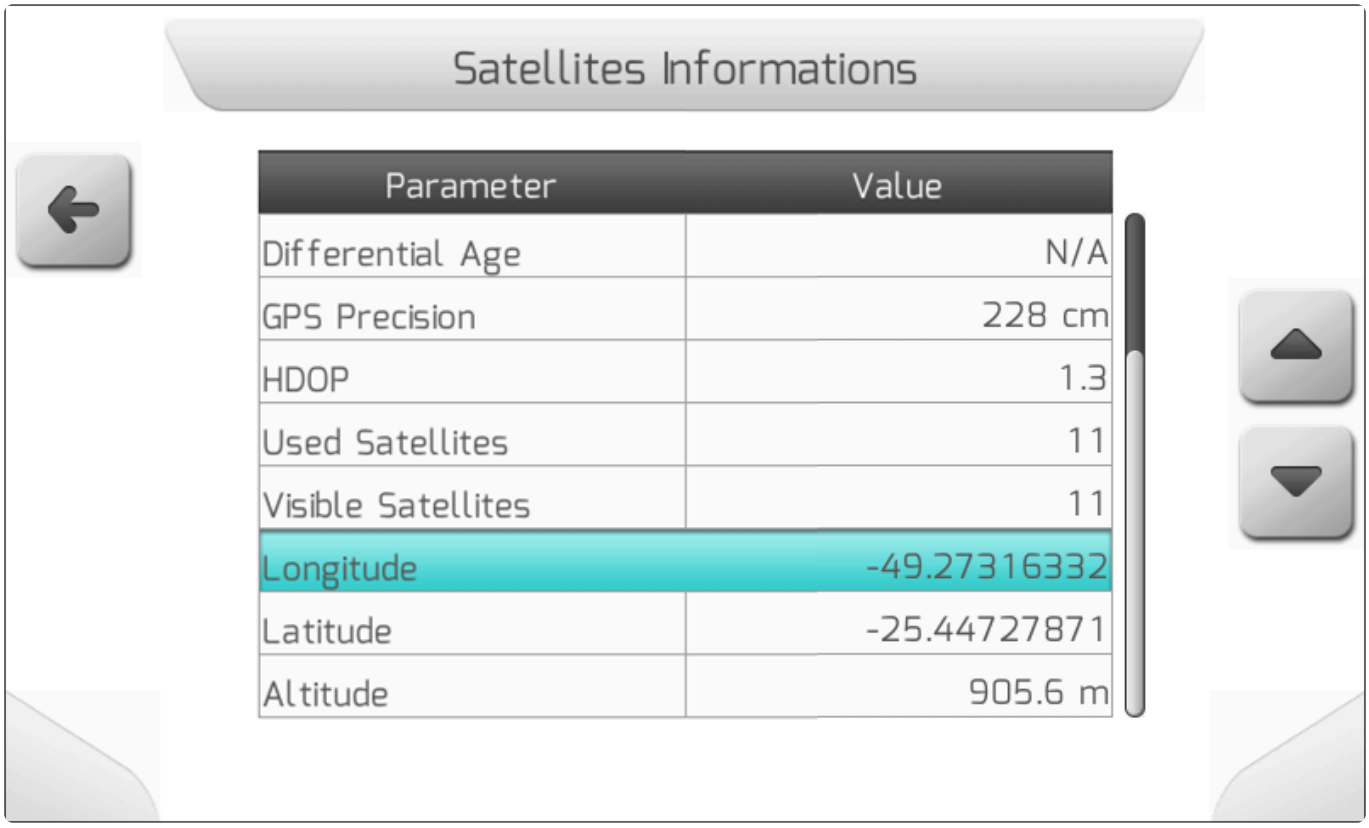
- GPS Data
- Signal Quality
- Position Type
- Differential Age
- IsoPoint 3
- IsoPoint 3 date
- GPS Precision

- HDOP
- Used Satellites
- Visible Satellites
- Longitude
- Latitude
- Altitude

The satellite information menu present various information regarding GNSS satellite. In this menu is possible to diagnose the current satellite signal reception quality.

The following images illustrate the satellite information menu items.






In the next topics, will be detailed each item in its composition.

# 7.1.1. GPS data

The GPS data item tells the user which type of GNSS is been used by the GeoNave system. The value options for this information are as follows.

| Data from GPS | Description |
|---|---|
| **Without GPS source** | There are no GNSS sources available for the system to operate. |
| **Internal GPS** | The system is using the GeoNave display GNSS internal receiver. |
| **External GPS** | The system is using an external GNSS radio receiver, which communicates with the GeoNave display through CAN interface. |
| **Restarting GPS** | Condition when the GNSS receiver finds no signal for a long time, the system automatically restart. |
| **Emulated GPS** | When demo modes are enabled. |

# 7.1.2. Signal Quality

Signal Quality information allows the user to check the quality level of the GNSS signal reception of the GeoNave system. This item can assume the values described in the following table, which also includes the signal icon shown in the navigation screen Information Board for each condition.

| Signal Quality | Description | Sign Icon |
|---|---|---|
| **No signal** | There is no GNSS signal in the system, or the antenna is not connected. |  |
| **Weak** | GNSS signal quality is lower than acceptable, it is not recommended to operate the system in this condition. For this status to be displayed:<br>• Number of satellites used < 8 e HDOP > 2.0 |  |
| **Medium** | GNSS signal quality is at a level considered medium. For this status to be displayed:<br>• Number of satellites used < 8 e HDOP between 1.0 and 2.0 |  |
| **Good** | GNSS signal quality is at a level considered good. There are two condition for this status to be displayed:<br>• Number of satellites used < 8 e HDOP < 1.0<br>• Number of satellites used > = 8 and HDOP between 1.0 and 2.0 |  |
| **Great** | GNSS signal quality is great, ideal for the correct operation of the system. For this status to be displayed:<br>• Number of satellites used > = 8 and HDOP < 1.0 |  |
| **Demonstration** | When demo modes are enabled. |  |

# 7.1.3. Position Type

Position Type information is related to signal correction of IsoPoint systems. The following table details each possible value of this parameter, and the status of RTK corrections icon at the navigation screen Information Board for each condition.

| Position Type | Description | Icon RTK |
|---|---|---|
| **none** | There is no GNSS signal in the system, or the antenna is not connected. |  |
| **No Correction** | The GNSS signal is ok, but there are no signal corrections available. |  |
| **PsrDiff (40 cm)** | Temporary condition after losing communication with RTK base. |  |
| **RT-20 (20 cm)** | RTK corrections available in *narrow_float* condition with 20 cm accuracy. |  |
| **RT-2 (1 cm)** | RTK corrections available in *narrow int* condition with 1 cm accuracy. |  |
| **Awaiting PPP** | Paid signal license available, and ongoing convergence fixes. |  |
| **PPP (4cm)** | Paid signal available and convergence corrections completed, 4 cm accuracy. |  |

# 7.1.4. Differential Age

The Differential Age value refers to the elapsed time since last signal correction was received by the GNSS of the GeoNave system, for paid signal (IsoPoint 3) or for RTK (IsoPoint 4). The value is displayed in seconds when corrections are available, otherwise the text “N/A” (not applicable) is shown.

# 7.1.5. IsoPoint 3

When a paid signal license is active for the GNSS receiver of the GeoNave system, the IsoPoint 3 item will be displayed in the satellite information menu. The textual values of IsoPoint 3 signal information are listed in the following table according to subscription status and signal convergence, together with PPP icon status corresponding to each option.

| IsoPoint 3 | Subscription | Convergence | Icon PPP |
|---|---|---|---|
| **Disabled** | Not identified | N / A |  |
| **Searching Signal** | OK | Not started |  |
| **Converging** | OK | Converging signal |  (flashing bar) |
| **OK sign** | OK | Signal OK |  |

If there is no active paid license, the icon PPP will be displayed as  .

# 7.1.6. IsoPoint 3 date

The satellite information menu shows IsoPoint 3 date information when there is an active paid signal license for the GeoNave system GNSS receiver. Represents the expiration date of IsoPoint 3 subscription in DD/MM/YYYY format, and its values are listed in the following table according to IsoPoint 3 subscription status.

| IsoPoint 3 date | Subscription |
|---|---|
| **Unknown** | Not identified |
| **DD/MM/YYYY** | OK |

# 7.1.7. GPS Precision

GPS accuracy information, measured in centimeters, reflects signal quality received by the GeoNave system GNSS receiver. The lower its value, the greater the coordinates precision.

# 7.1.8. HDOP

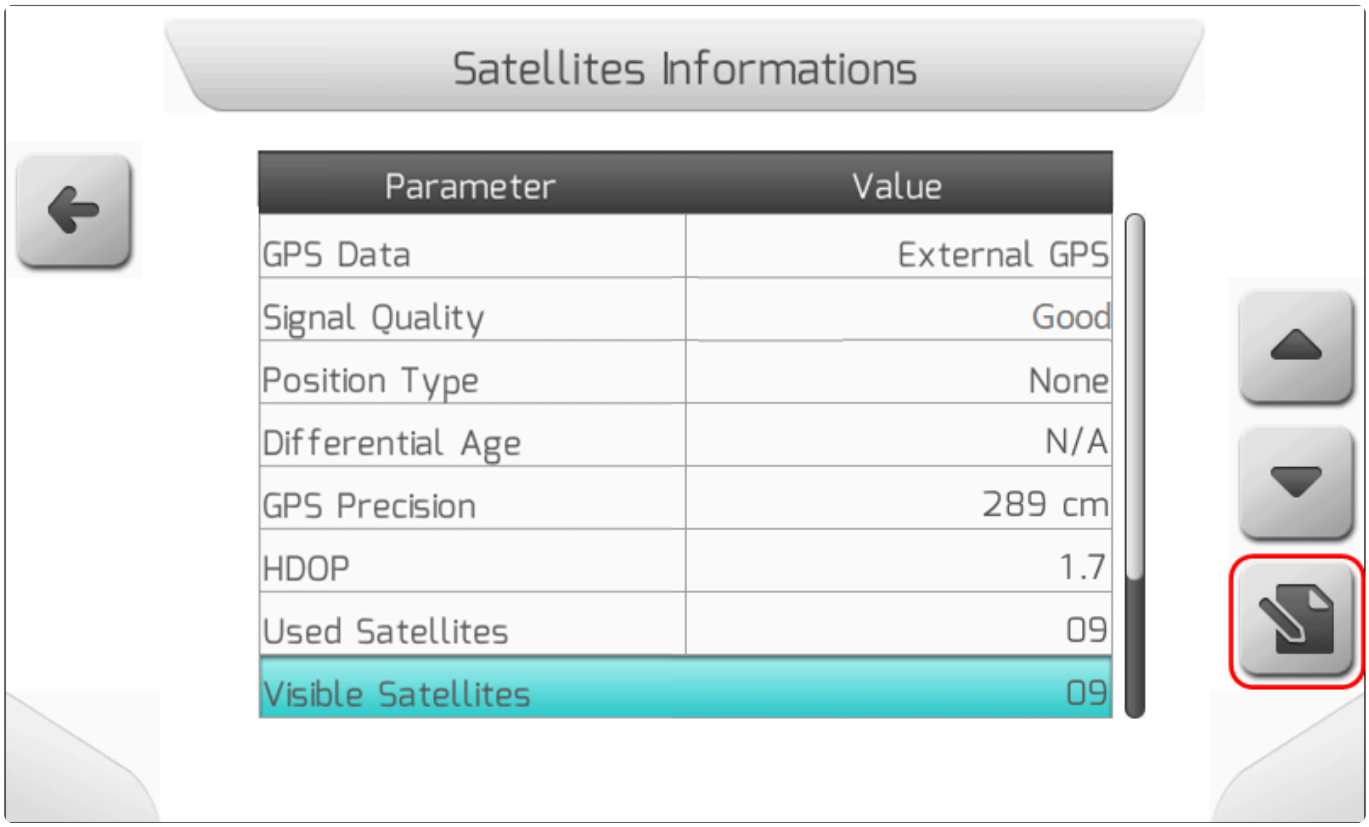
HDOP is a commonly used parameter to analyze signal quality of a GNSS. Its value reflects how widespread in the celestial dome is the satellite constellation currently visible by the system. The more spread, the better system precision, and the lower HDOP value.
The HDOP values considered optimal are below 1.0.

# 7.1.9. Used Satellites

The number of Used Satellites is an important parameter for GNSS system accuracy. The greater the satellites number used in the solution, the more accurate the coordinates presented by the system.
The value considered optimal by the GeoNave system is greater than or equal to 8 satellites used in the solution.

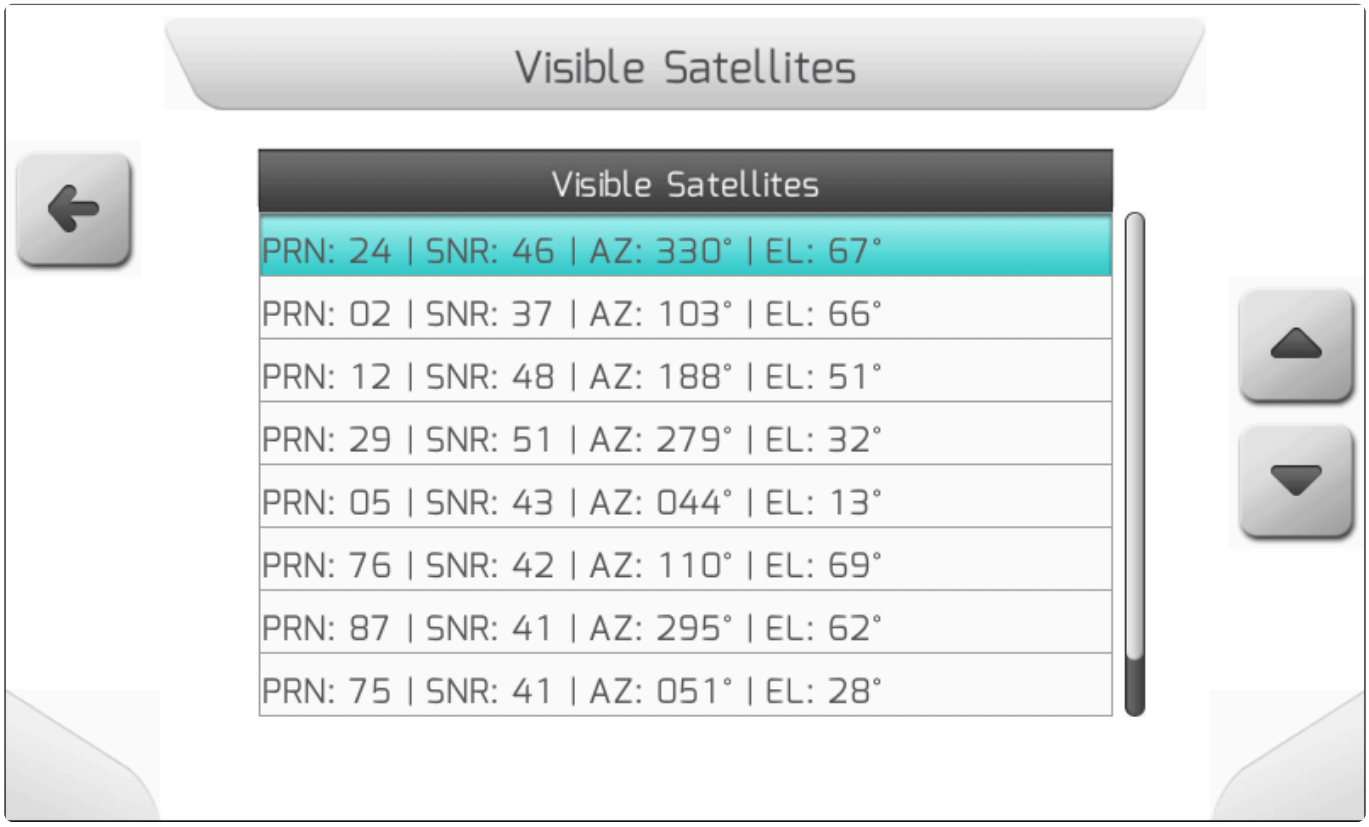
# 7.1.10. Visible Satellites

The Visible Satellites screen is accessed from satellite information menu, as shown in the image below.



Screen type = Simple list

By touching the button  , the following screen appears.




The table shown four informations for each satellite, as described below.

| Data | Description |
|---|---|
| **PRN** | Name that identifies the satellite in the constellation. |
| **SNR** | Signal-to-noise ratio of satellite signal. The higher the value, the better the signal reception is. |
| **AZ** | Azimuth, represents the clockwise angle in relation to the north at which the satellite is positioned in the sky. Value between 0 and 360 degrees. |
| **EL** | Elevation, represents the angle of satellite's elevation in the sky in relation to the horizon (0 degrees), up to the zenith (90 degrees). |

# 7.1.11. Longitude

Longitude represents the distance in degrees of a point on the Earth's surface in relation to the Greenwch Meridian, which is the imaginary line that separates the Earth in Western (West) and Eastern (East) hemispheres. The longitude value can vary between -180 (West) and +180 (East) degrees.

# 7.1.12. Latitude

Latitude represents the distance in degrees of a point on the Earth's surface in relation to the Equator, which is the imaginary line that separates the Earth in Northern and Southern hemispheres. Latitude varies between -90 (South) and +90 (North) degrees.

# 7.1.13. Altitude

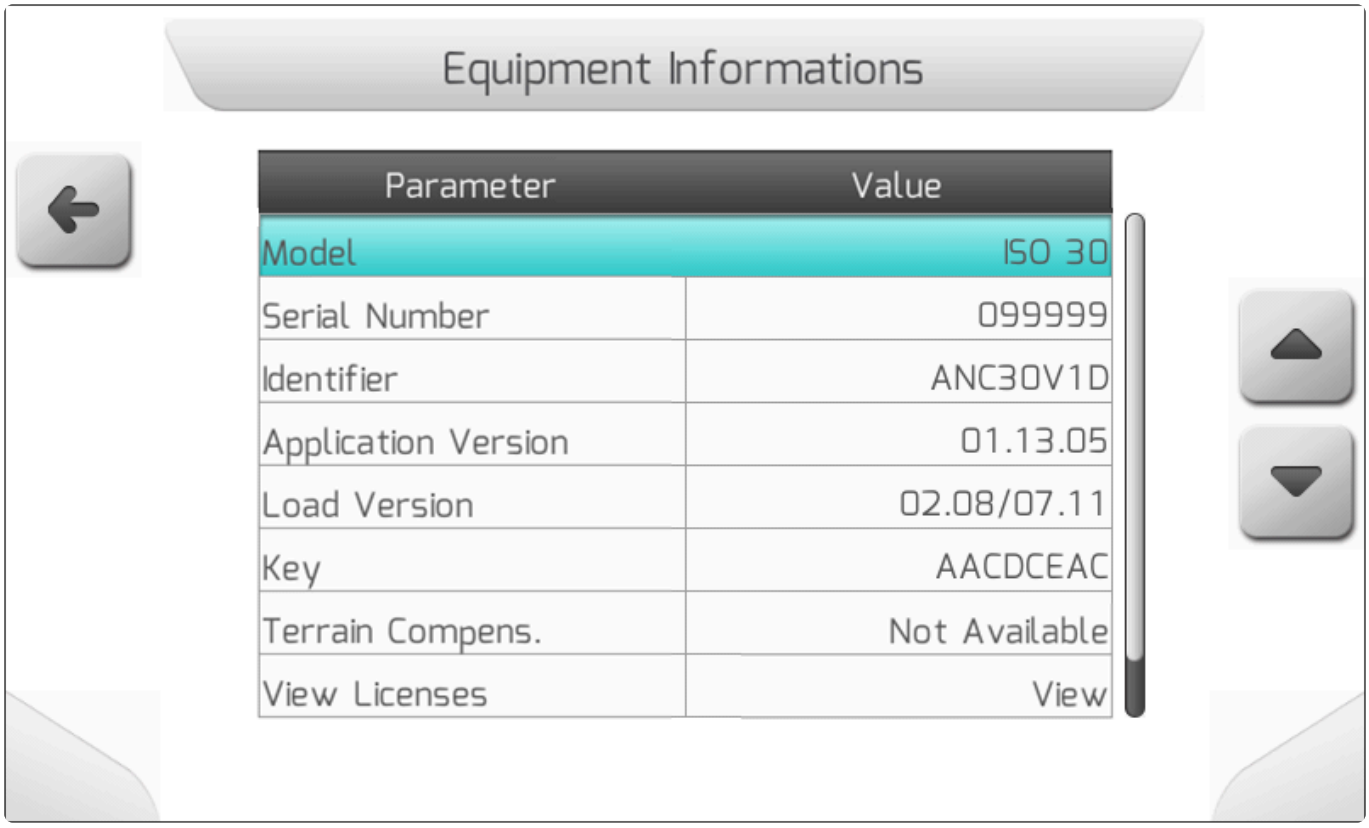
Altitude represents the vertical distance from sea level. Its value is given in meters and can be positive (above sea level) or negative (below sea level).

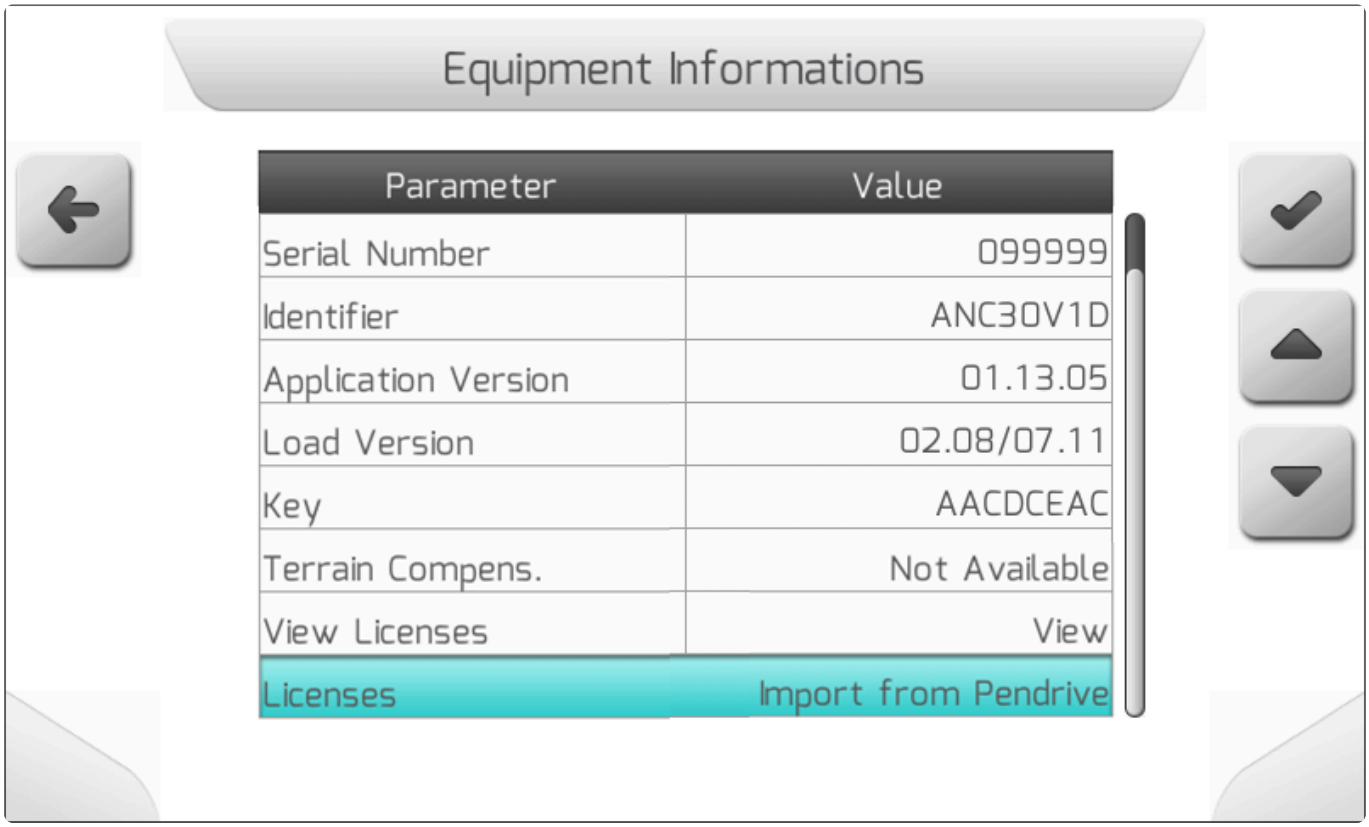
# 7.2. Equipment

Screen type = Double list

- Model
- Serial number
- Identifier
- Application Version
- Load Version
- Key
- Internal GPS.
- View Licenses
- Import Licenses

The equipment information menu presents data regarding product version and license of GeoNave system. The information is shown as in the following images.




The details of each item of equipment information menu are presented in subsequent topics.

# 7.2.1. Model

The Model item shows the license name currently configured in the GeoNave system. The model is

always presented with the prefix ISO, followed by the number that identifies the software license, according to the Licenses topic description.

It is possible that a license has more than one feature, so the Model field text will be showing all licenses numbers concatenated. For example, if the currently configured license has the Spraying (section shut-off + flow control) and Fertilization features simultaneously, without a variable rate license, the text shown will be “ISO 31FP-34F”.

# 7.2.2. Serial number

The Serial Number item shows the production serial number of the GeoNave display, which is unique for each device. The serial number consists of a 6 digits number.

# 7.2.3. Identifier

The Identifier item shows the code that identifies the GeoNave display hardware model. The identifier consists of a 8 digits alphanumeric code.

# 7.2.4. Application Version

The Application Version item identifies which software version is loaded on the GeoNave display. Composed of three fields separated by dots, the application version is an extremely important information to identify system available functionalities, and also to correctly diagnose issues related to field operation.

# 7.2.5. Load Version

The Load Version item identifies the two loading software (*bootloader*) versions of the GeoNave system. The first item, before the slash “/”, composed of two numeric fields separated by a dot, represents the first stage load version. The second item, after the slash “/”, also composed of two numeric fields separated by a dot, identifies the second stage load version.

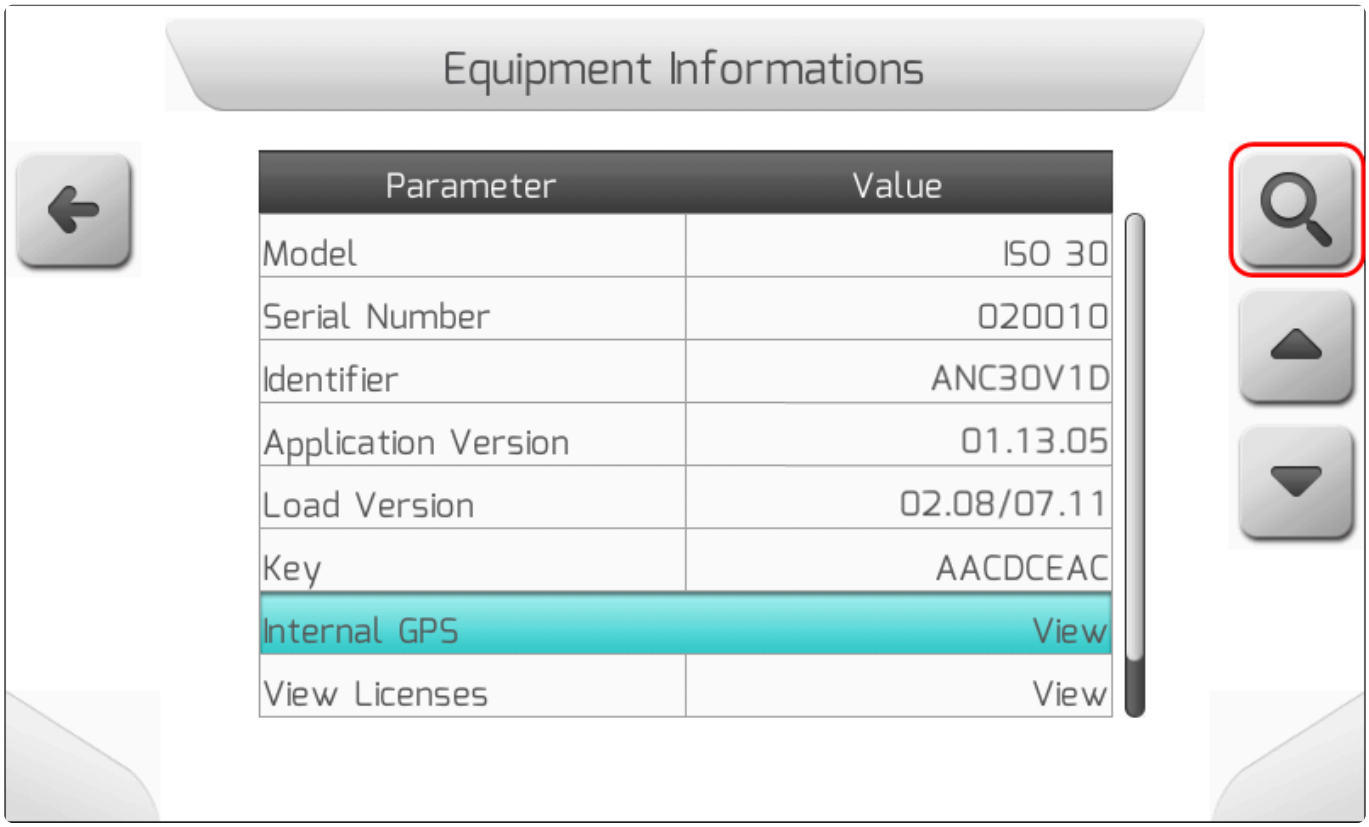
# 7.2.6. Key

Like the Serial Number, the Key is a unique identifier that each equipment has, used for managing and generation of GeoNave system software licenses. Its value consists of a 8 digits alphanumeric code.

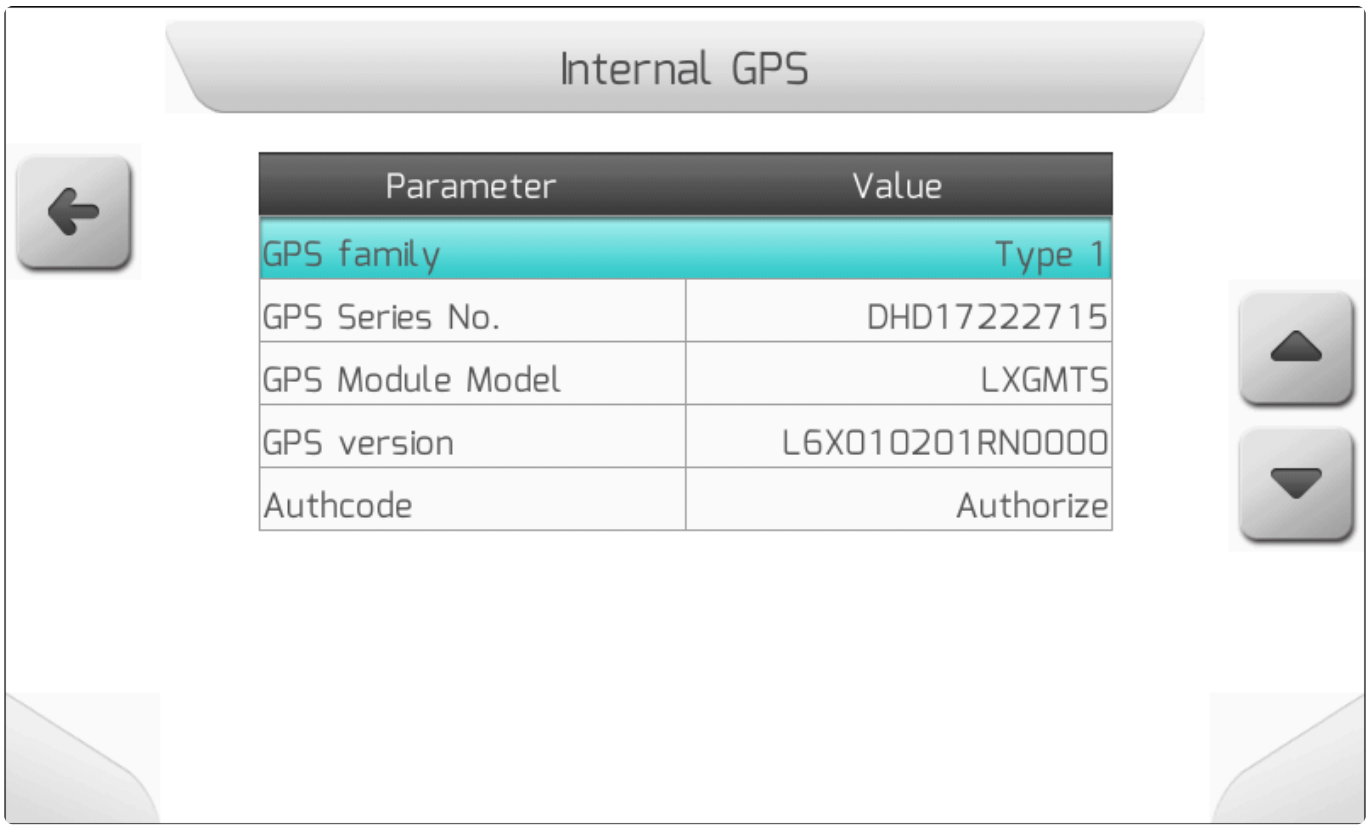
# 7.2.7. Internal GPS

Within the equipment information menu, the Internal GPS item is a submenu that presents version and license information of GeoNave display internal GNSS receiver.

When Internal GPS item is selected, the preview button  is shown, as highlighted in the following image.

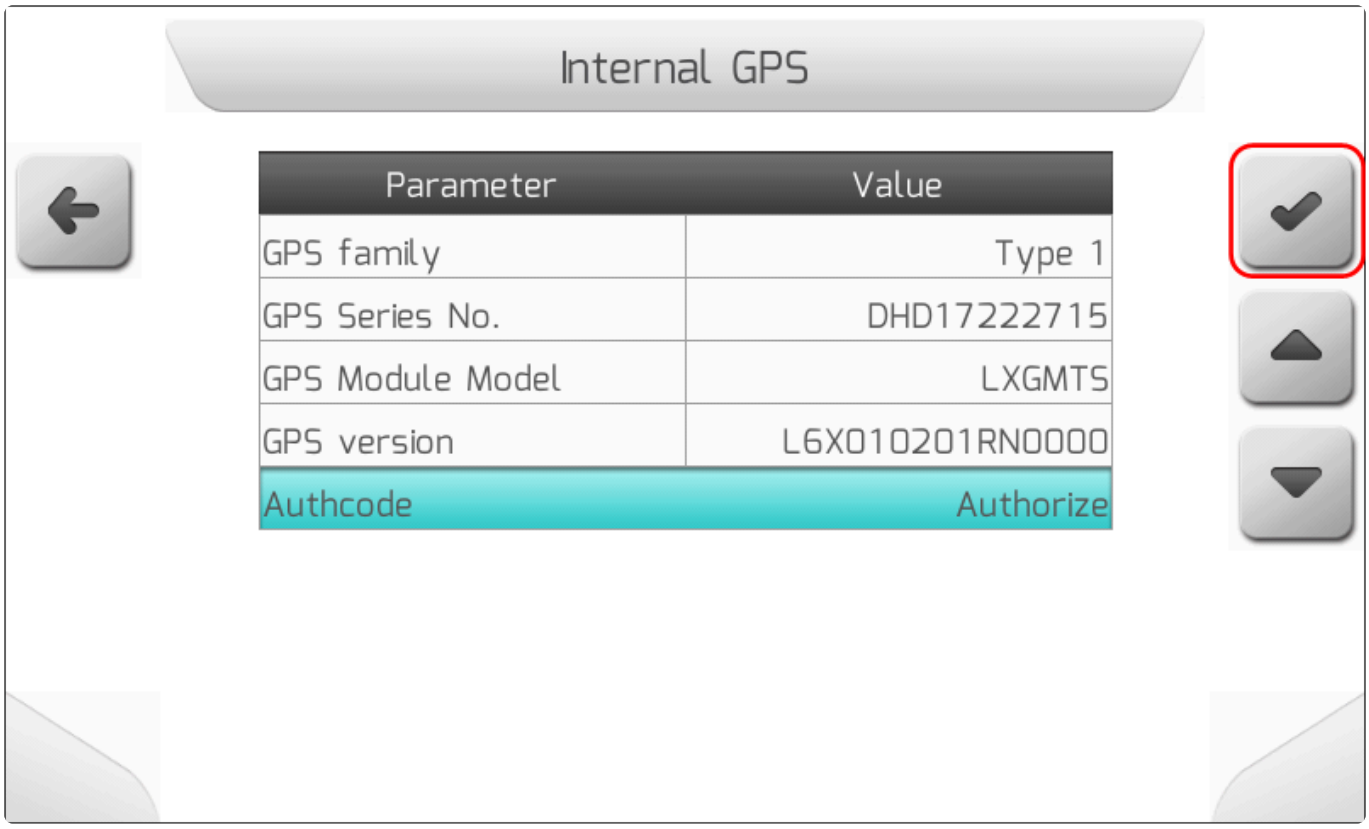



The image below represents the Internal GPS submenu, which appears after touching the button highlighted above.



| Item | Description |
|---|---|
| **GPS family** | GNSS receiver family identifier. The value is shown with “Type” text followed by family identifier number. |
| **GPS Series No.** | GNSS receiver hardware serial number. The code is unique for each device, and its value consists of alphanumeric digits. |
| **GPS Module Model** | GNSS receiver license model. Identifies which features are available on the receiver, and its value consist of alphanumeric digits. |
| **GPS Version** | GNSS receiver software version. Its value consists of alphanumeric digits. |
| **Authcode** | Submenu for entering the authentication code of a new license for the GNSS receiver. |

When the Authentication Code item is selected, the confirm button  is displayed, as shown in the following image.




By clicking on the button, the Entering password system screen will be displayed. If the password is entered correctly, the submenu for entering the internal GNSS authentication code fields will be displayed. The submenu is described in the following topic.

# 7.2.7.1. Authorization Code

Screen type = Double list

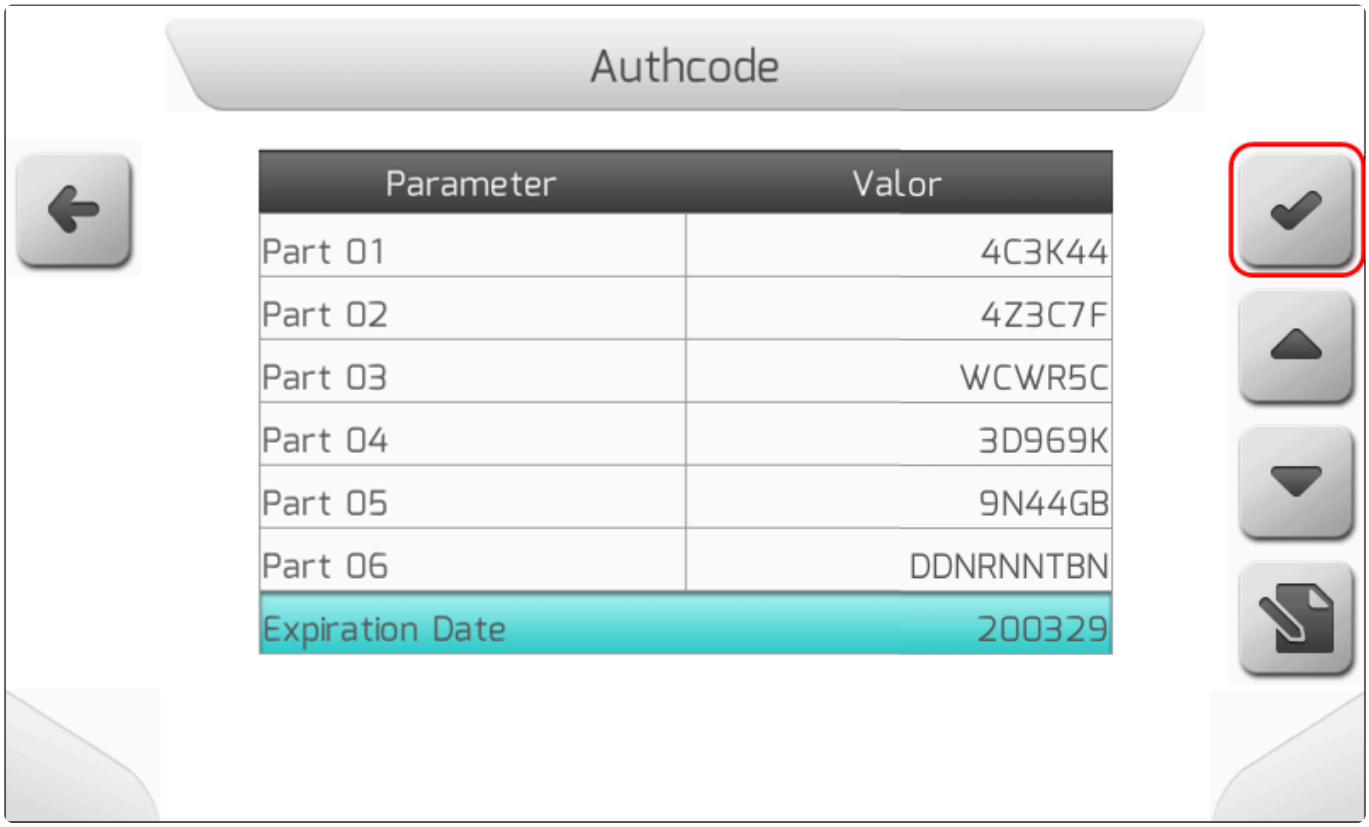
The Authorization Code item screen is composed of 7 editable fields of Text Editing type, in which the

user must enter each part of the internal GNSS license authorization code.

The authorization code is formed by 7 alphanumeric text separated by commas, all capital letters, as in the example below. Each part arranged between commas must be inserted individually in each one of the fields that composes the screen.

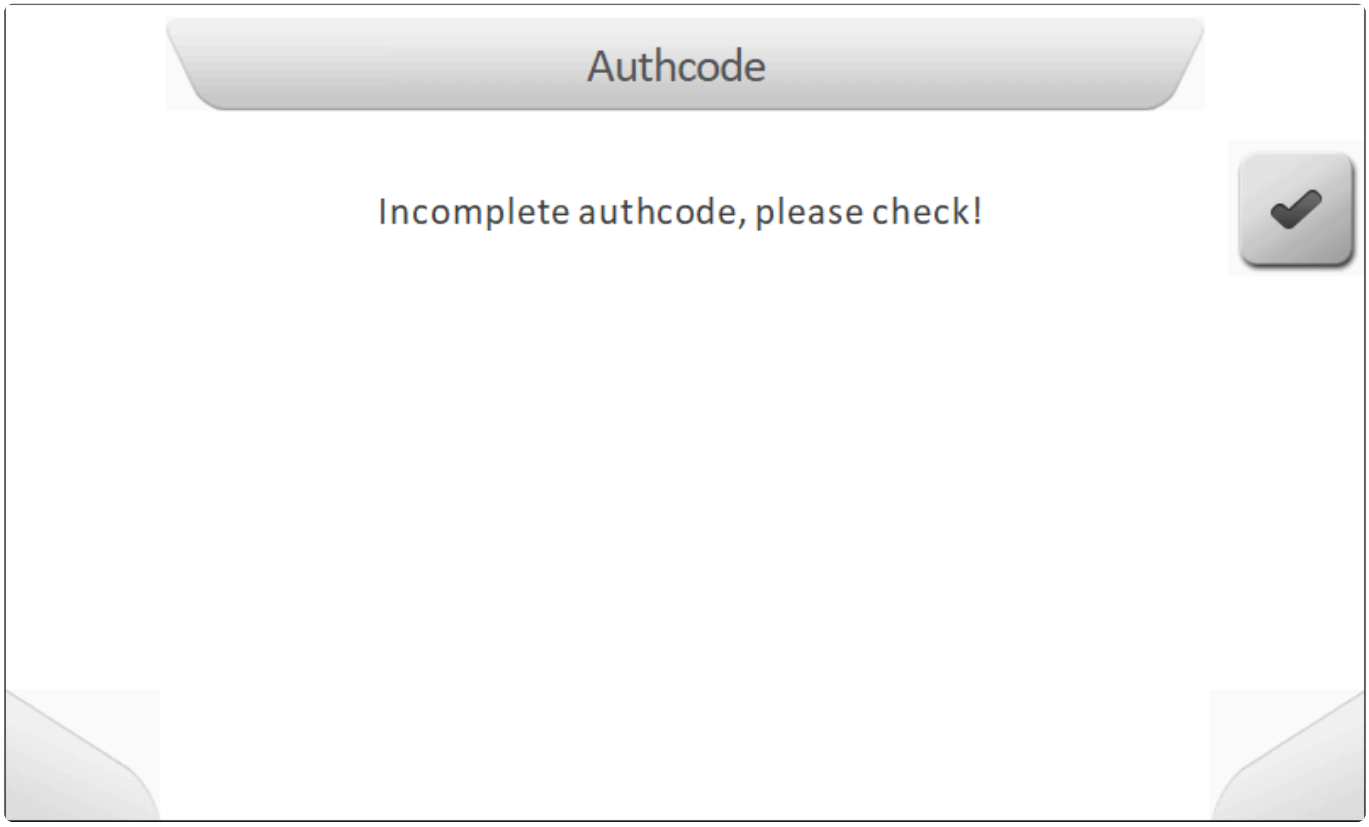
**4C3K44,4Z3C7F, WCWR5C, 3D969K, 9N44GB, DDNRNNTBN, 200329**

The image below shows how the license from the above example should be inserted in the authorization code screen, detailing eace item in its composition.

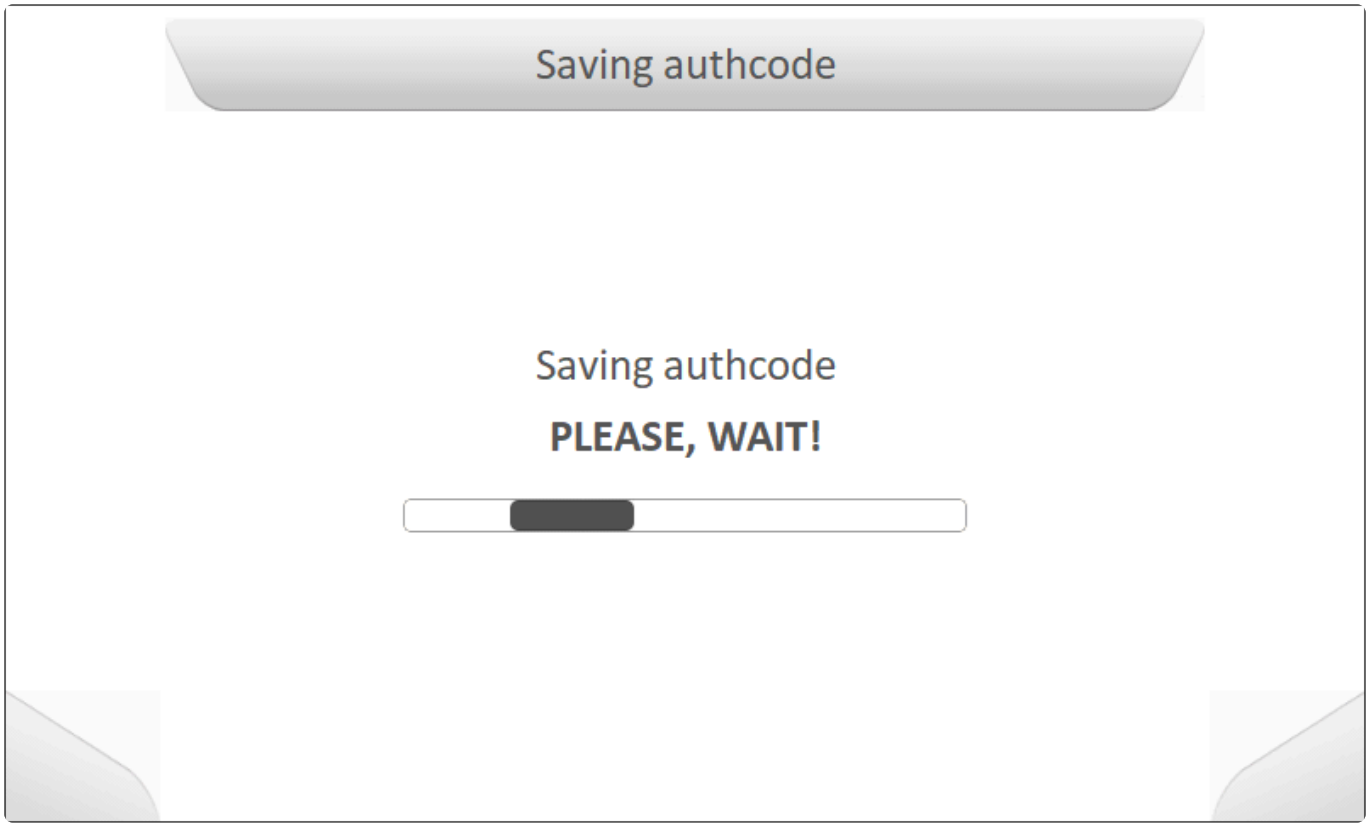



| Item | Description |
|---|---|
| **Part 01** | First part of the authorization code. Must contain 6 alphanumeric characters, all uppercase letters. |
| **Part 02** | Second part of the authorization code. Must contain 6 alphanumeric characters, all uppercase letters. |
| **Part 03** | Third part of the authorization code. Must contain 6 alphanumeric characters, all uppercase letters. |
| **Part 04** | Fourth part of the authorization code. Must contain 6 alphanumeric characters, all uppercase letters. |
| **Part 05** | Fifth part of the authorization code. Must contain 6 alphanumeric characters, all uppercase letters. |
| **Part 06** | Sixth part of the authorization code, which identifies the license type. Formed by uppercase letters and numeric digits. |
| **Expiration Date** | Authorization code expiration date, in the format YYMMDD (year, month and day, all with 2 numeric digits). This is the only field that can remain empty. |

When pressing the confirm button  highlighted in the figure above, the system will validate the authentication code entered. If the number of characters in all mandatory fields is invalid, the following Information screen error message will be shown.




If the validity of all mandatory fields is confirmed, a Loading like message will be shown, informing that the code is being saved in the GNSS receiver.




In this saving step, a new verification of the code content is performed by the GNSS receiver. If the code is invalidated by the receiver, a Information screen will be displayed, informing that an error occurred, as shown in the following image.

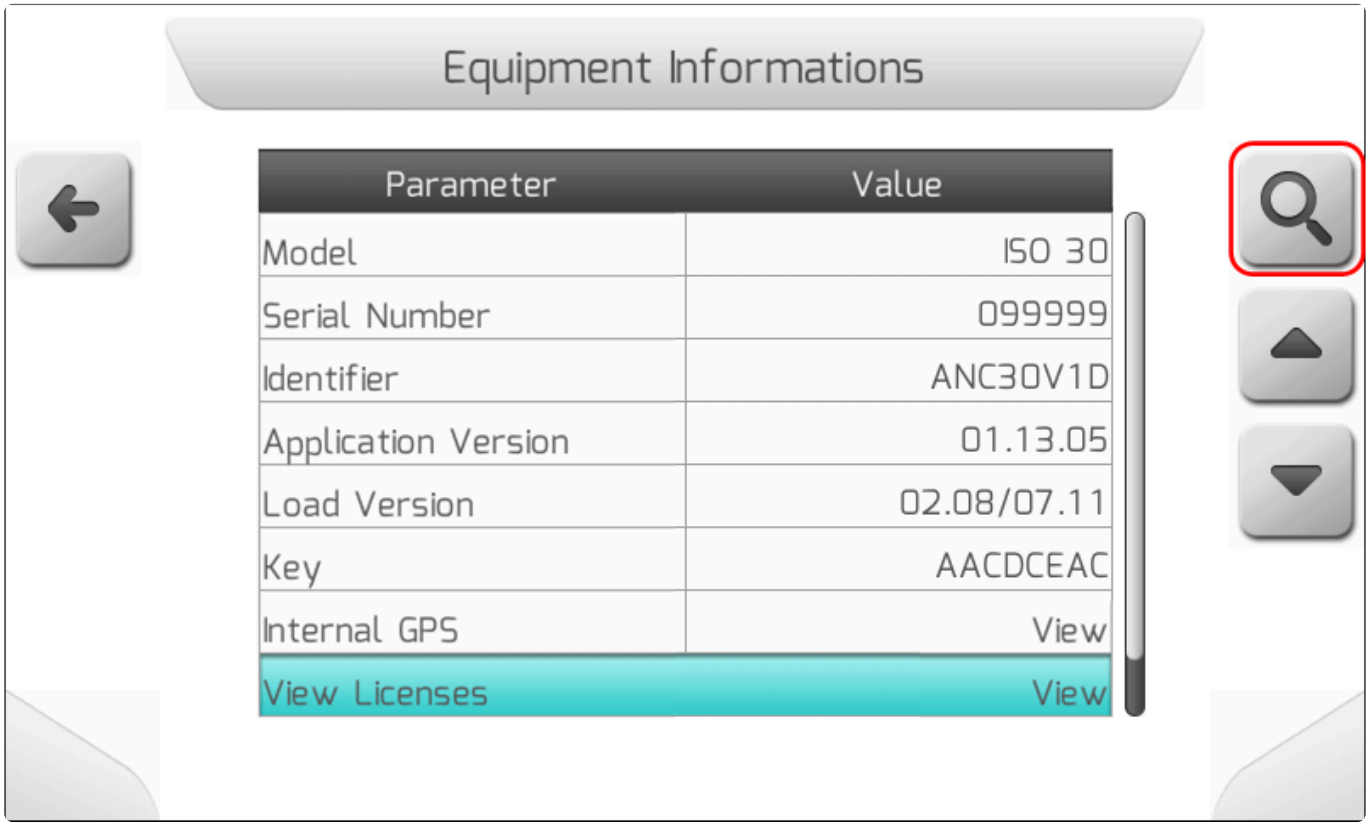



If the validation process is positive, the authentication code will be saved at the receiver and the license will be used.

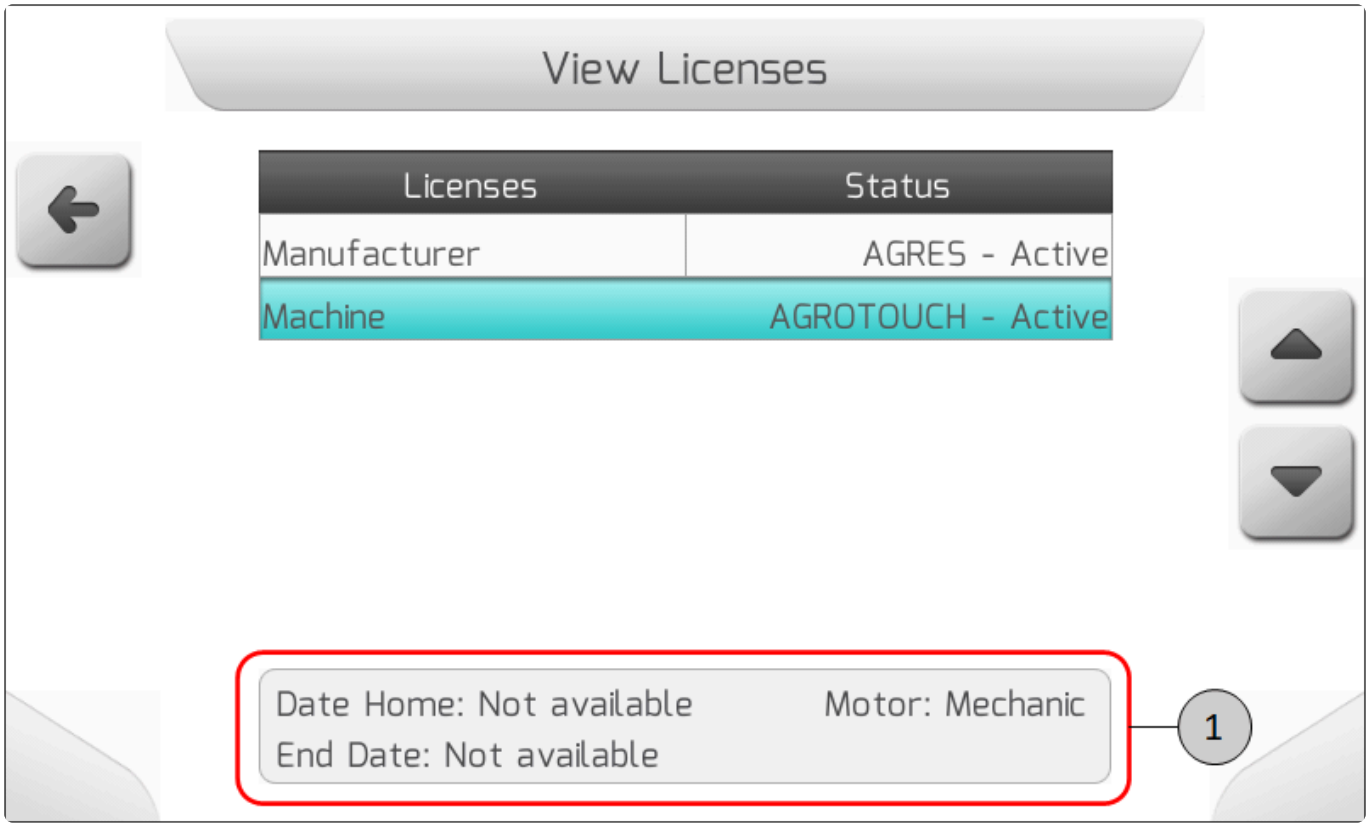
# 7.2.8. View Licenses

In the equipment information menu there is a View Licenses submenu, which shows details of the license available in the GeoNave system.

When selecting the View Licenses item, the preview button  is displayed, as highlighted in the image below.




When the button is pressed, the View Licenses submenu appears, containing the items detailed in the following image.




The Double list screen displays license names in the first column. In the second column the license parameter name is shown, followed by the license status, which can have the following values.

- **Active** – Active and valid license.
- **Future** – License that has activation future date.
- **Expired** – Expired license.

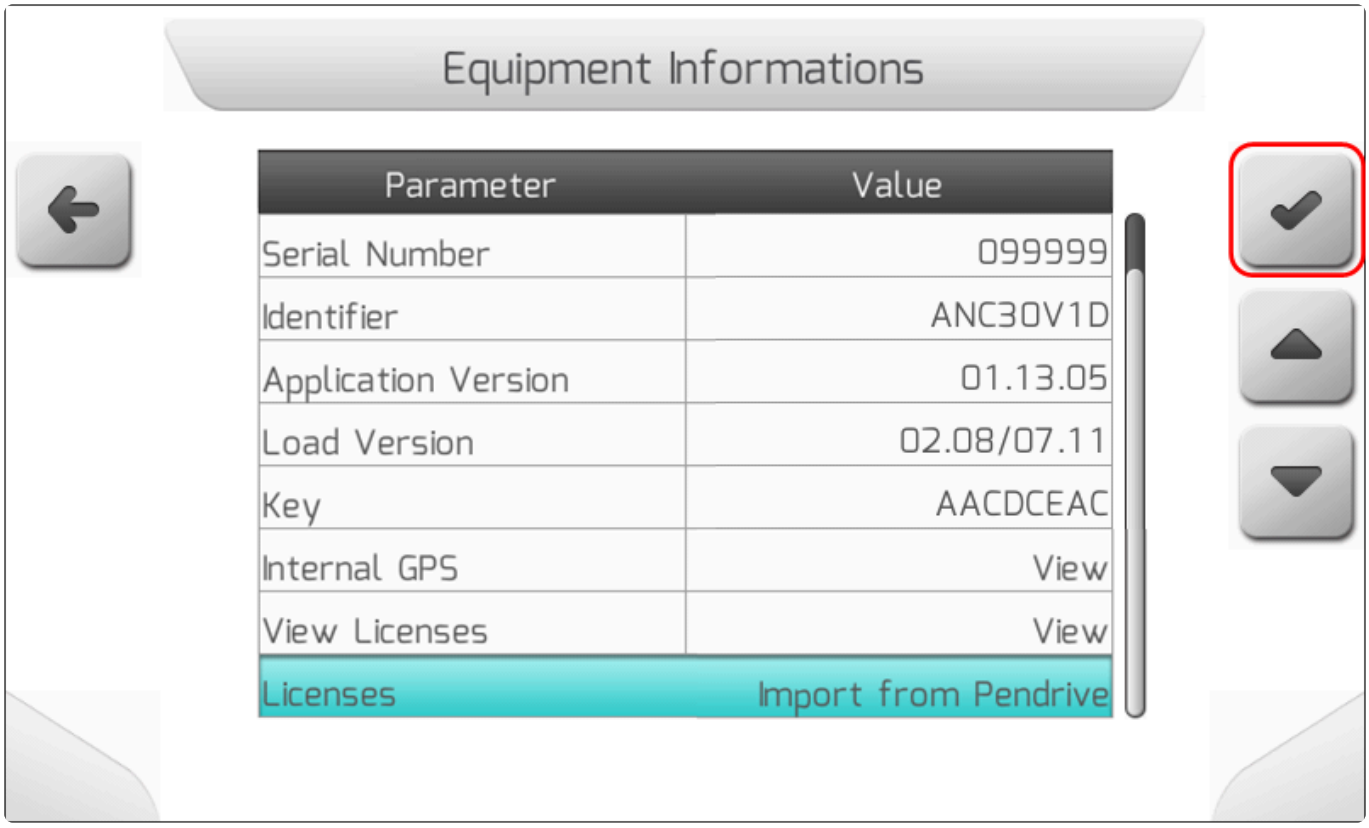
At the screen footer is also shown an information board (1) which contains license start and end dates, and information regarding motor type, if the license has this parameter.

In the example in the image above, the selected license is named **Machine**, has a parameter named **AGROTOUCH**, it is **Active**, **Not available** start and end dates (lifetime license) and refers to a machine with **mechanical** motor.

# 7.2.9. Import Licenses

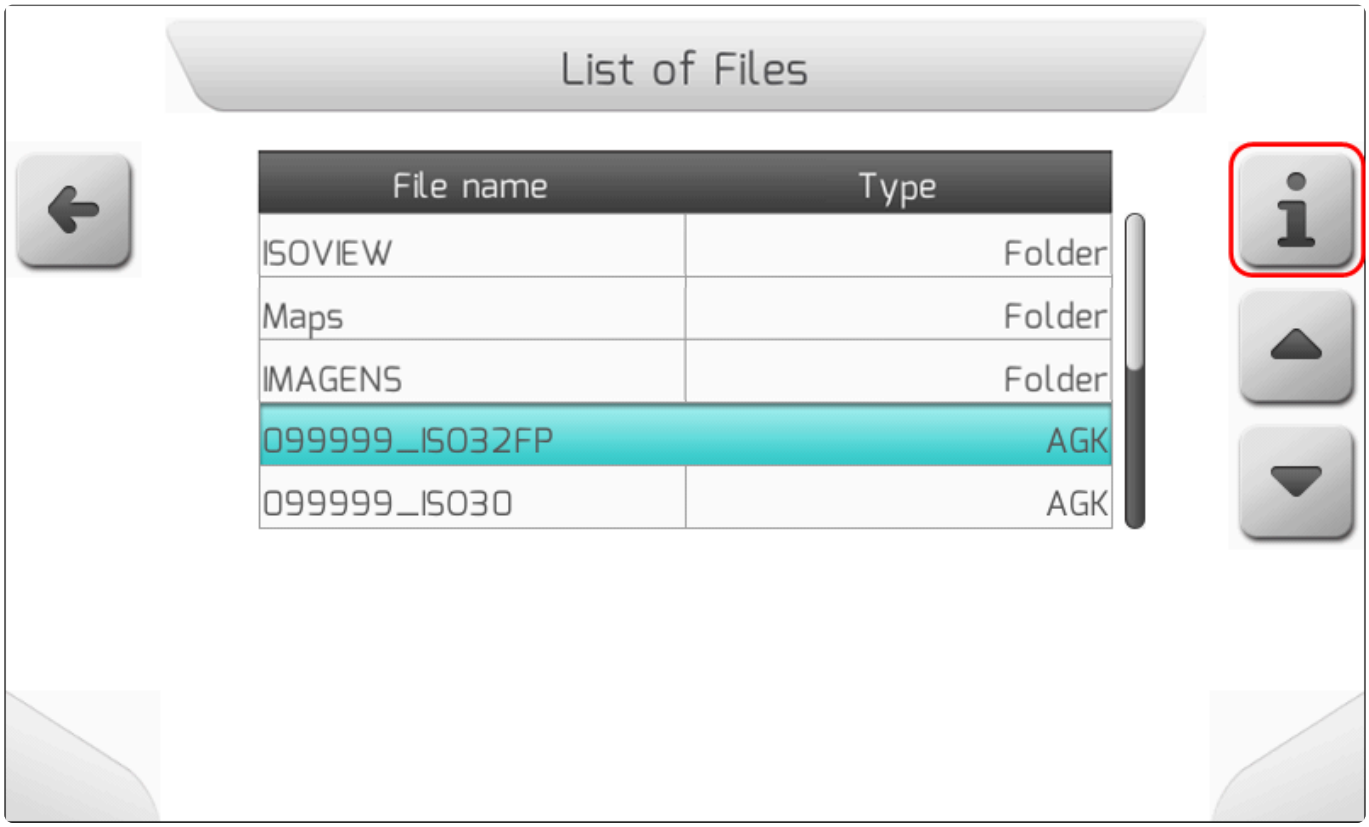
The equipment information menu has the Import Licenses submenu, through which the user can import license file with “AGK” extension via flash drive, introducing new features in the GeoNave system.

Once the Licenses item is selected in the menu, the confirm button is shown as in the following image.

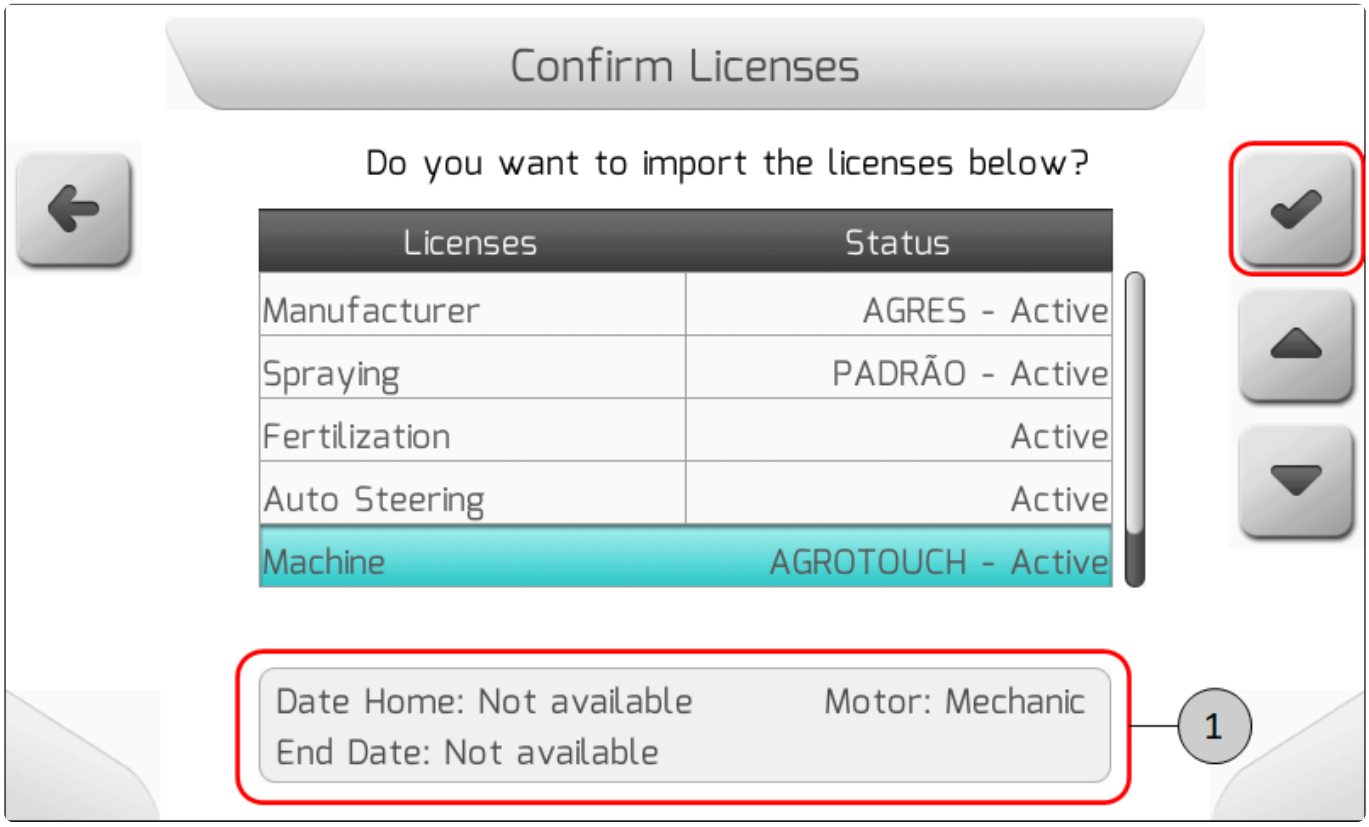



> GNSS signal is required to access the Import Licenses menu, as the licenses import depends on system date and time.

When pressing the button, if the GNSS signal is available, a File List template screen will be displayed listing AGK files, as shown in the image below.

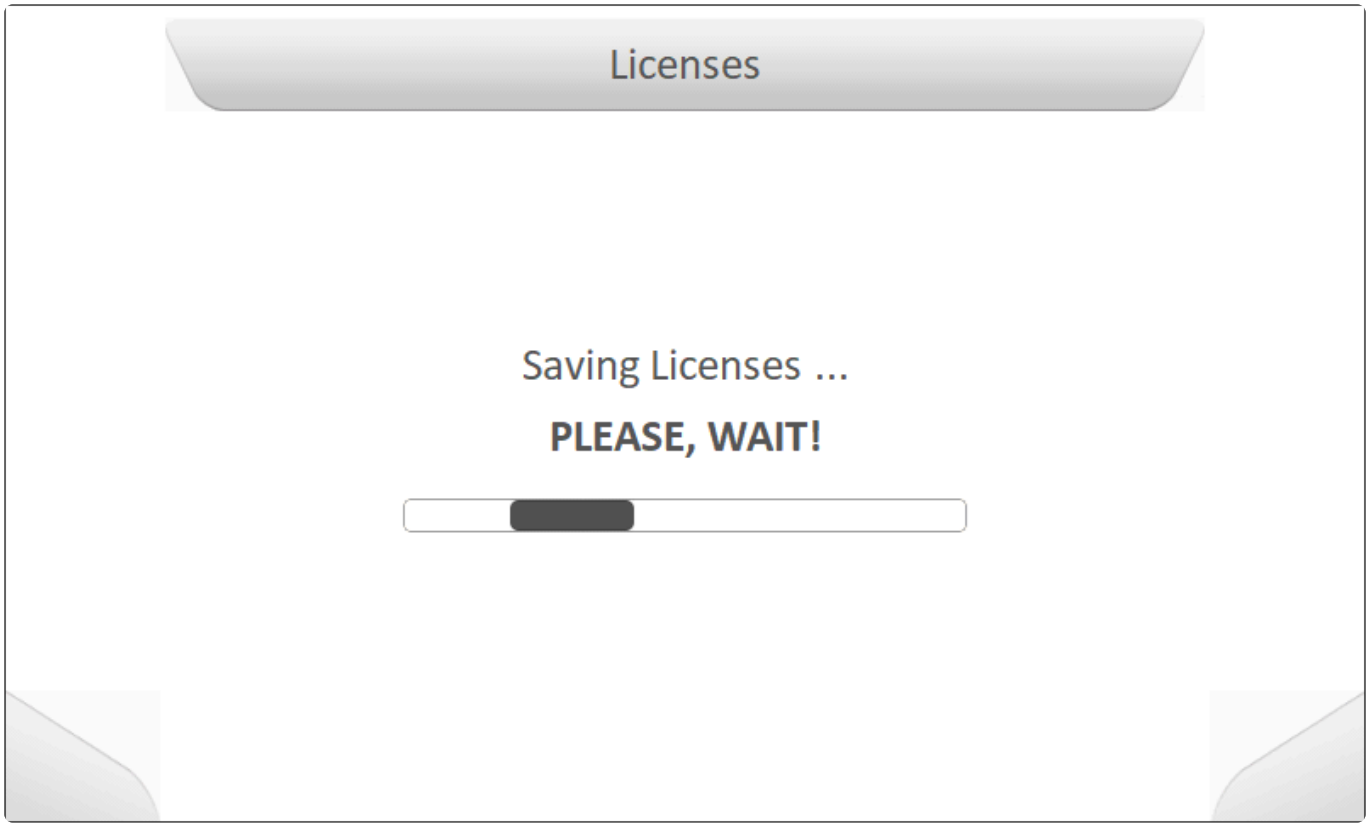


Selecting the “AGK” license file in the list and pressing the information button  , the screen displayed next regards license import confirmation, showing license functionalities in the same way as in the View Licenses menu, as shown in the image below.

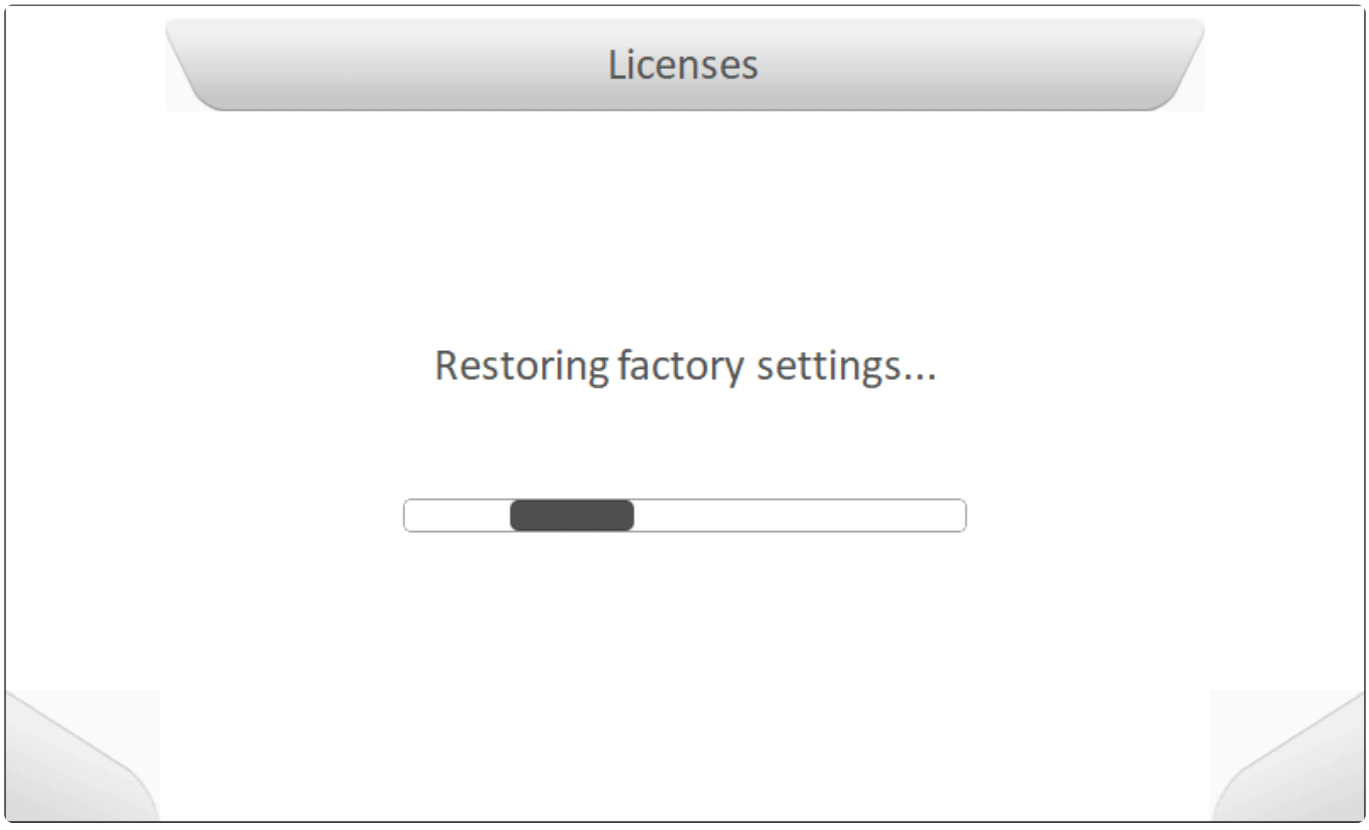



As in the View Licenses menu, the screen displays the file features. Selecting one of the features, the table at the bottom of the screen 1 is shown, containing license start and end dates and the motor type information, if the license has this parameter.

Pressing confirm button  , the license file will be imported and the following Loading screen will be displayed, informing that the license is being saved in the system memory.




If the manufacturer's license is replaced, all GeoNave system settings will be restored to factory default. The following Loading screen will be displayed, informing of the restoration.




Finally, after the correct license file import, the user will be asked to remove the flash drive, as shown below. When removing flash drive, the GeoNave display will be automatically switched off and the user must perform the switching on procedure as described in Switching ON and OFF.

## Attention!!!

Please remove the pen drive!

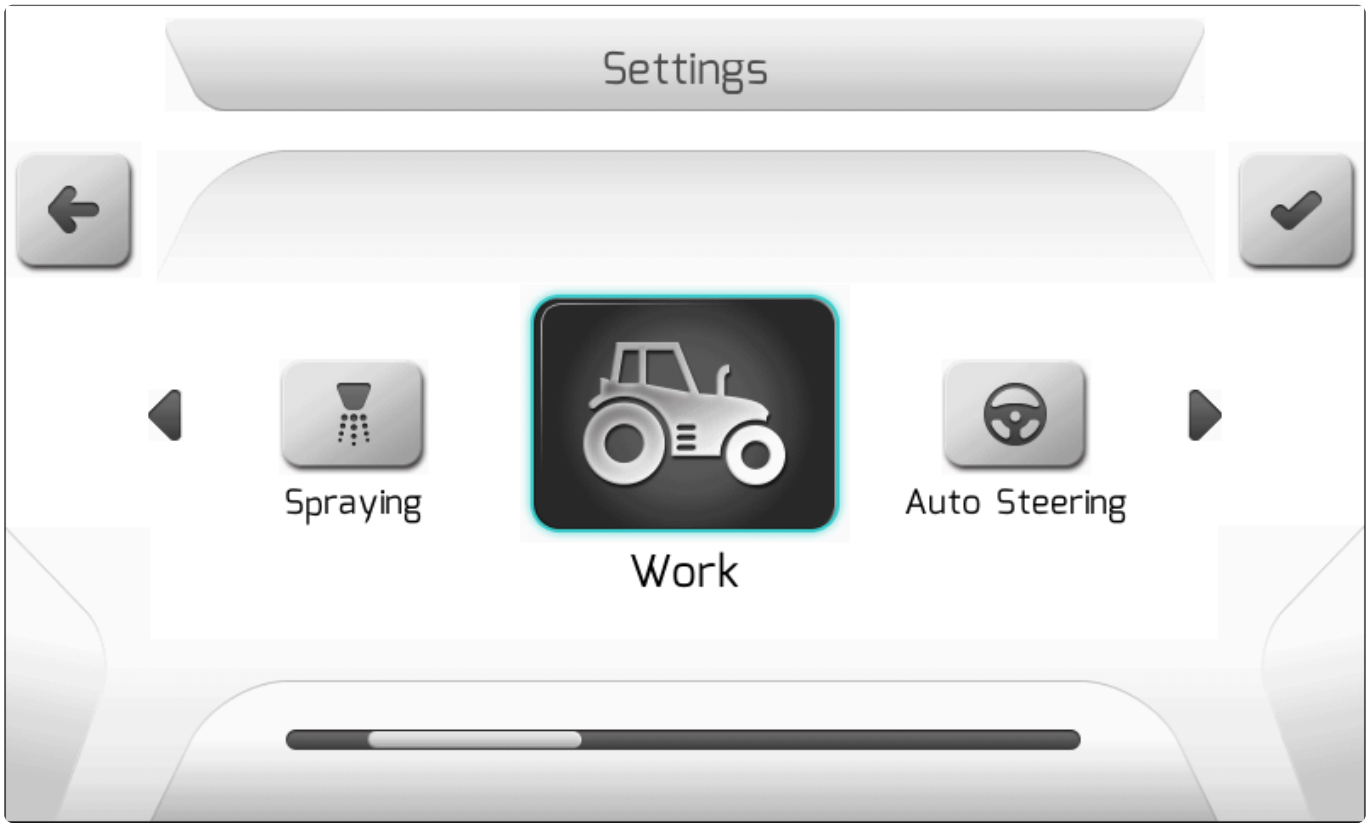
# 8. Settings Menu

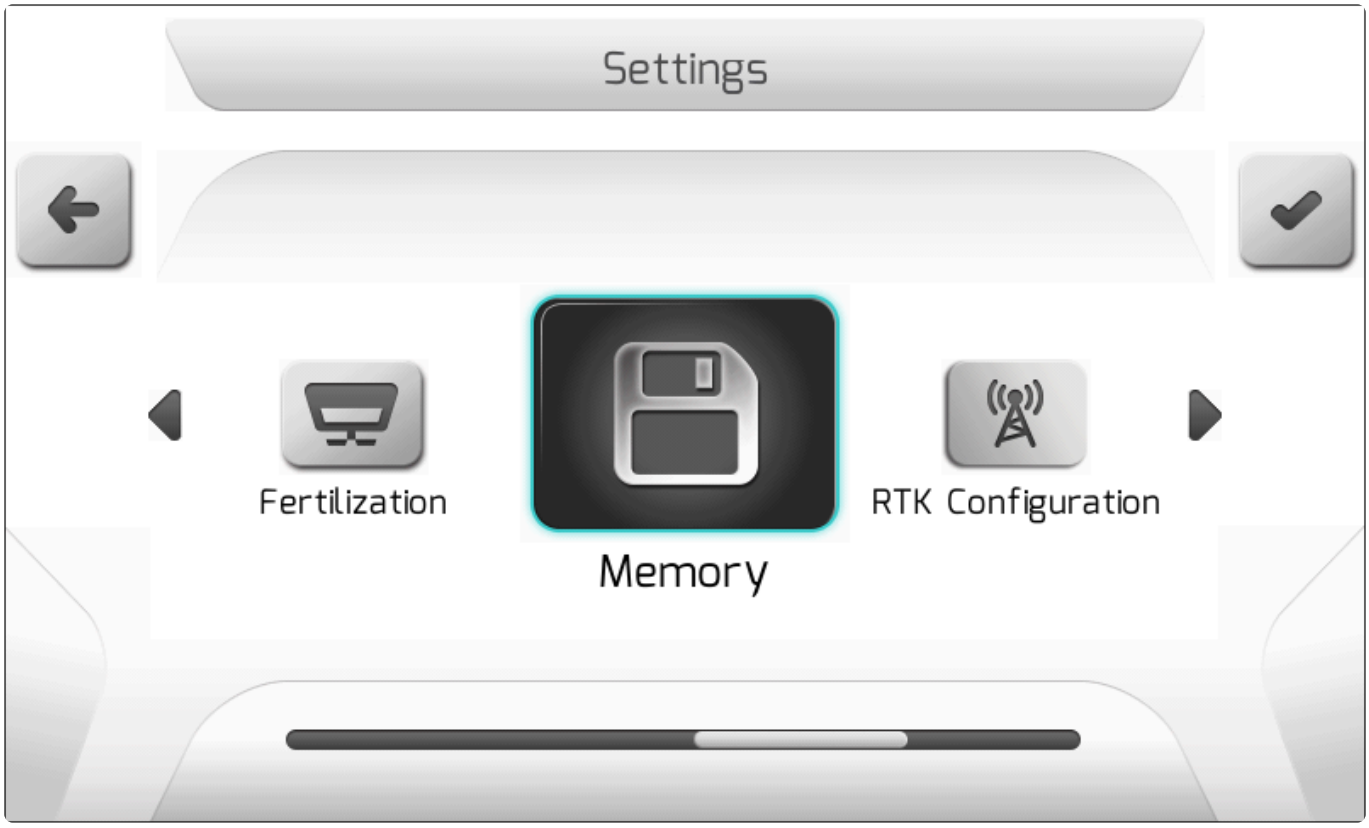
Screen type = Horizontal menu

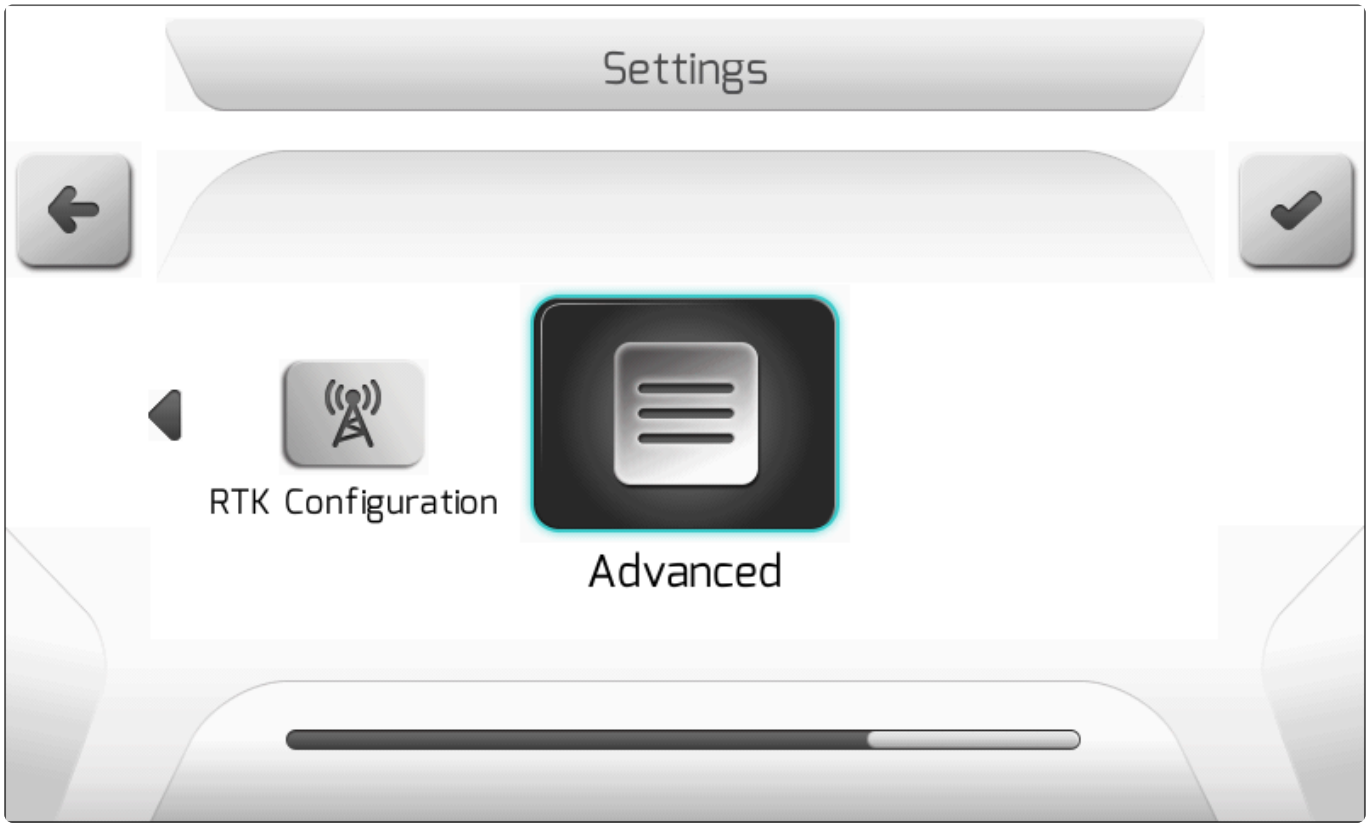
- Spraying
- Work
- Auto Steering
- Fertilization
- Memory
- RTK Configuration
- Advanced

The Settings menu contains several areas to make all necessary settings for the GeoNave system to operate according to recommended user specifications, in a specific agricultural operation. In this menu, the user configures parameters of agricultural machine, operator, implement and GeoNave display itself, in addition to managing files and system memory.

The following are images of Settings menu.





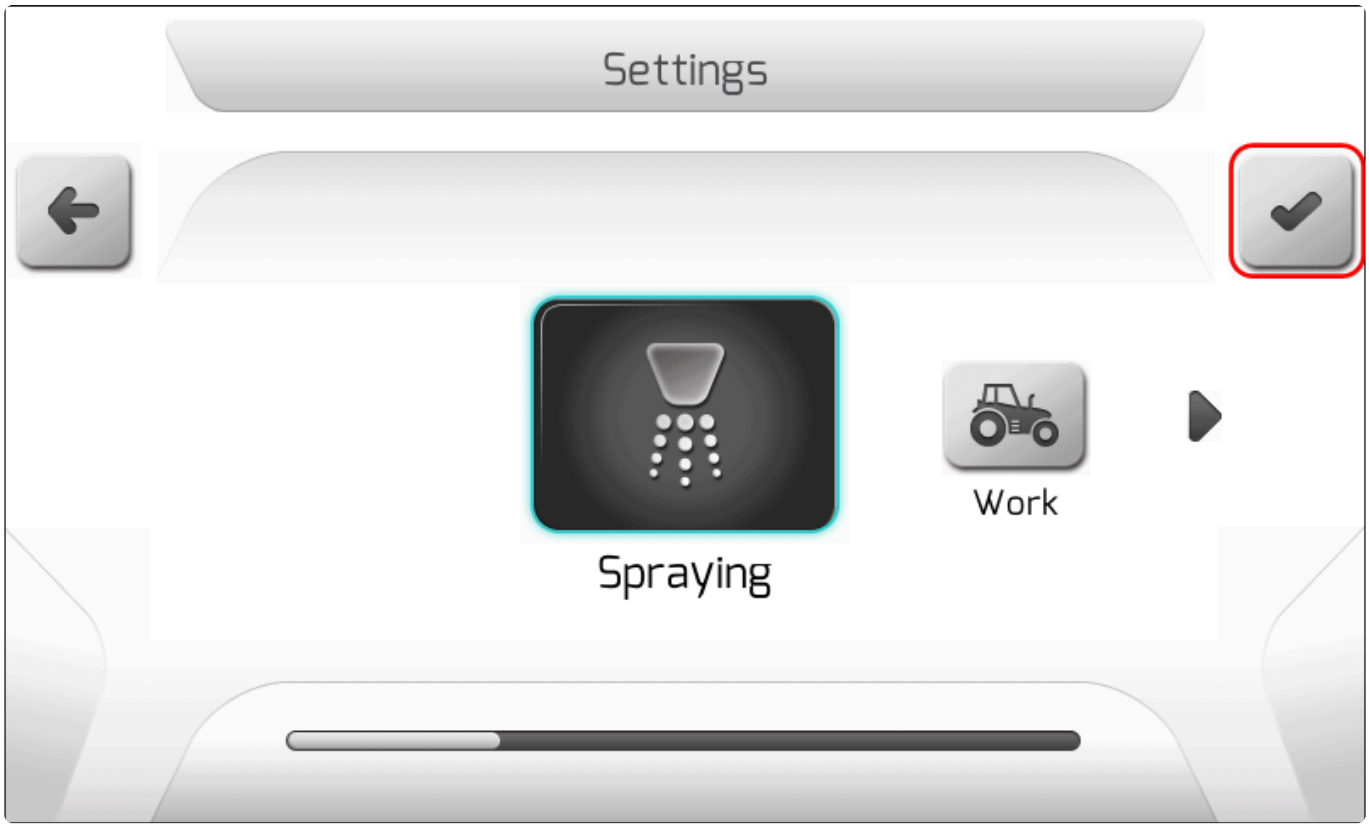

# 8.1. Spraying

Screen type = Vertical menu

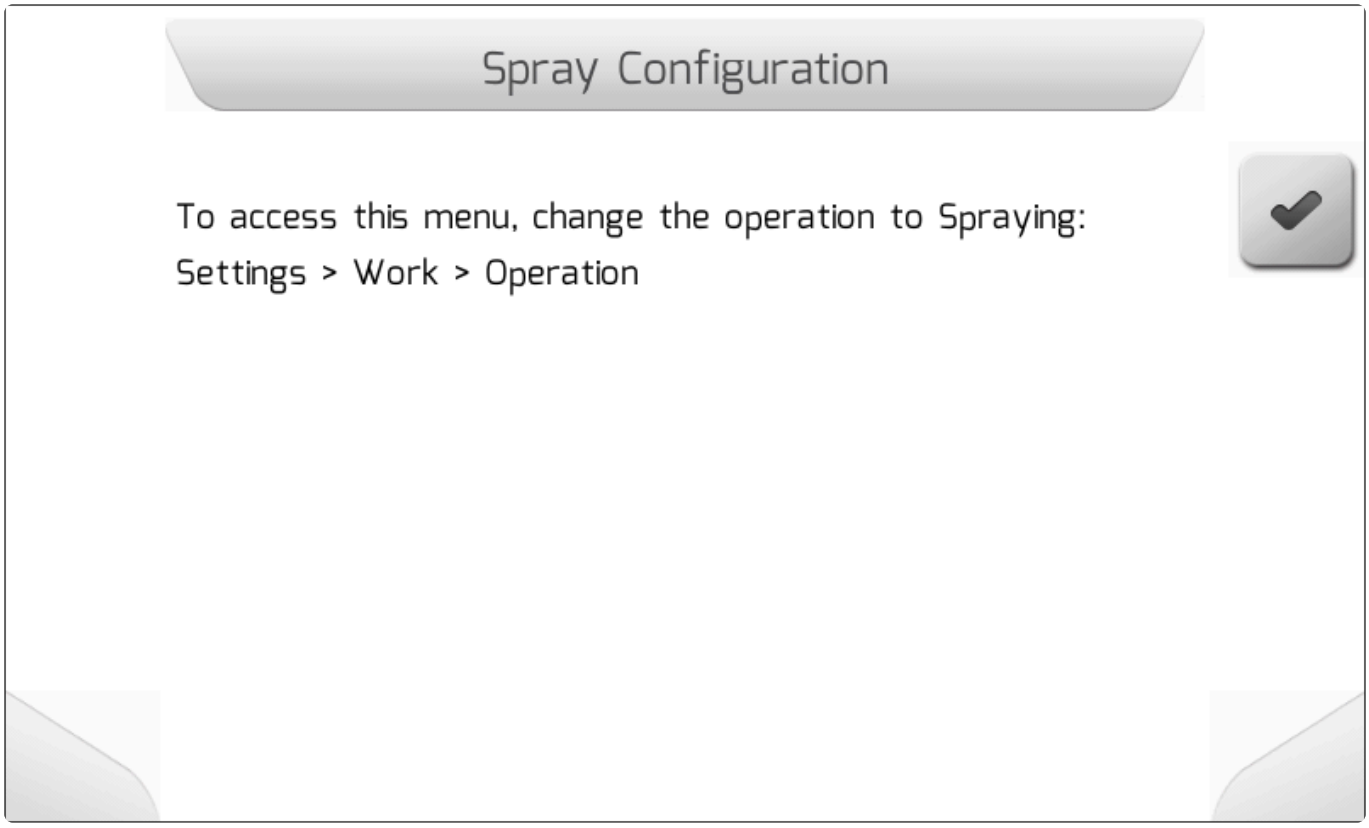
- Works
- Boom
- Valves
- Sensors
- Tank
- Diagnosis
- Advanced Settings

> The menu in its complete spraying configuration is shown only if spraying license is available – ISO 31, ISO 32, ISO 35, ISO 37. For other licenses, the menu will be presented in a simplified form, containing only Boom settings area.

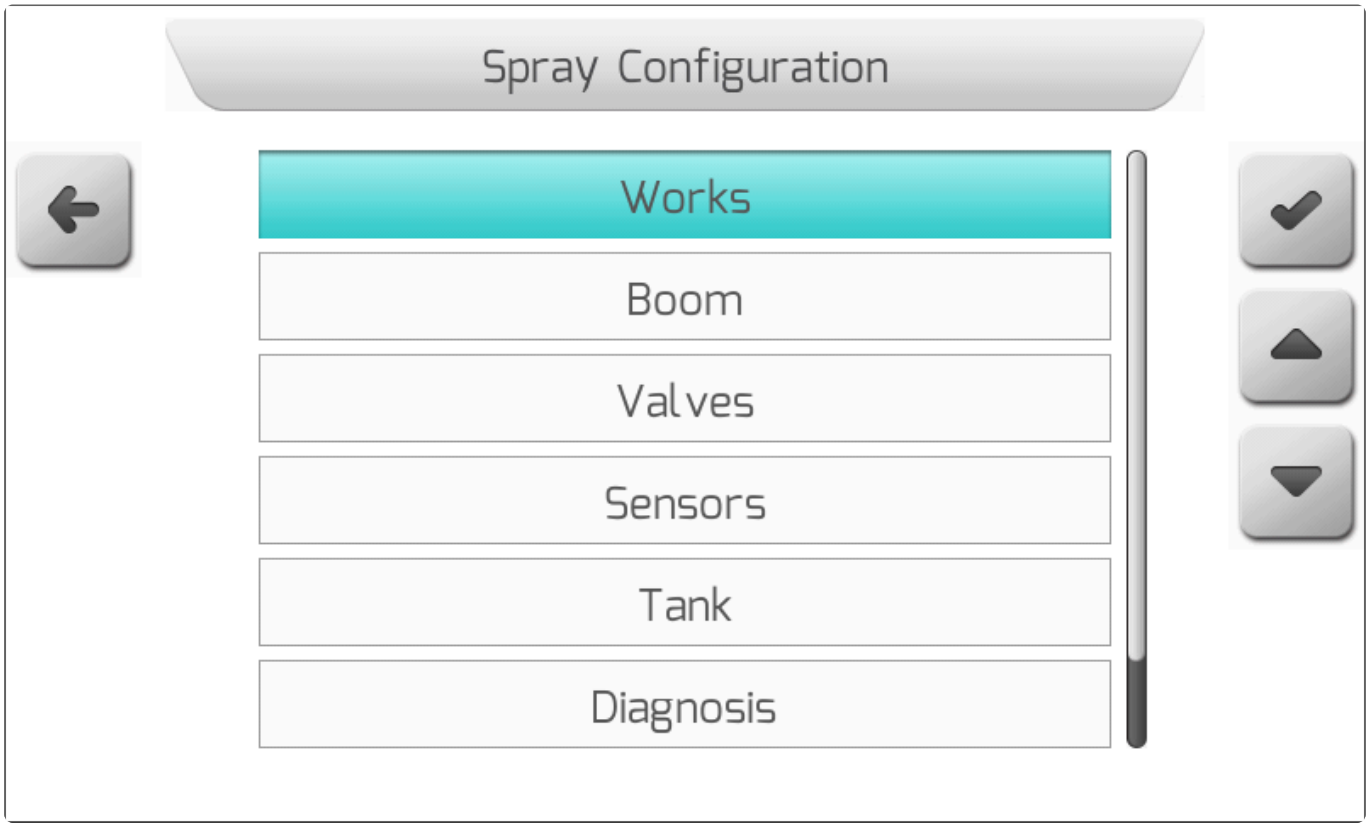
Within the settings menu, this is the area for parameters configuration, performing diagnostics and calibrations related to the Sprayer implement. To access the menu, the user must select Spraying and press the confirm button , as shown in the image below.

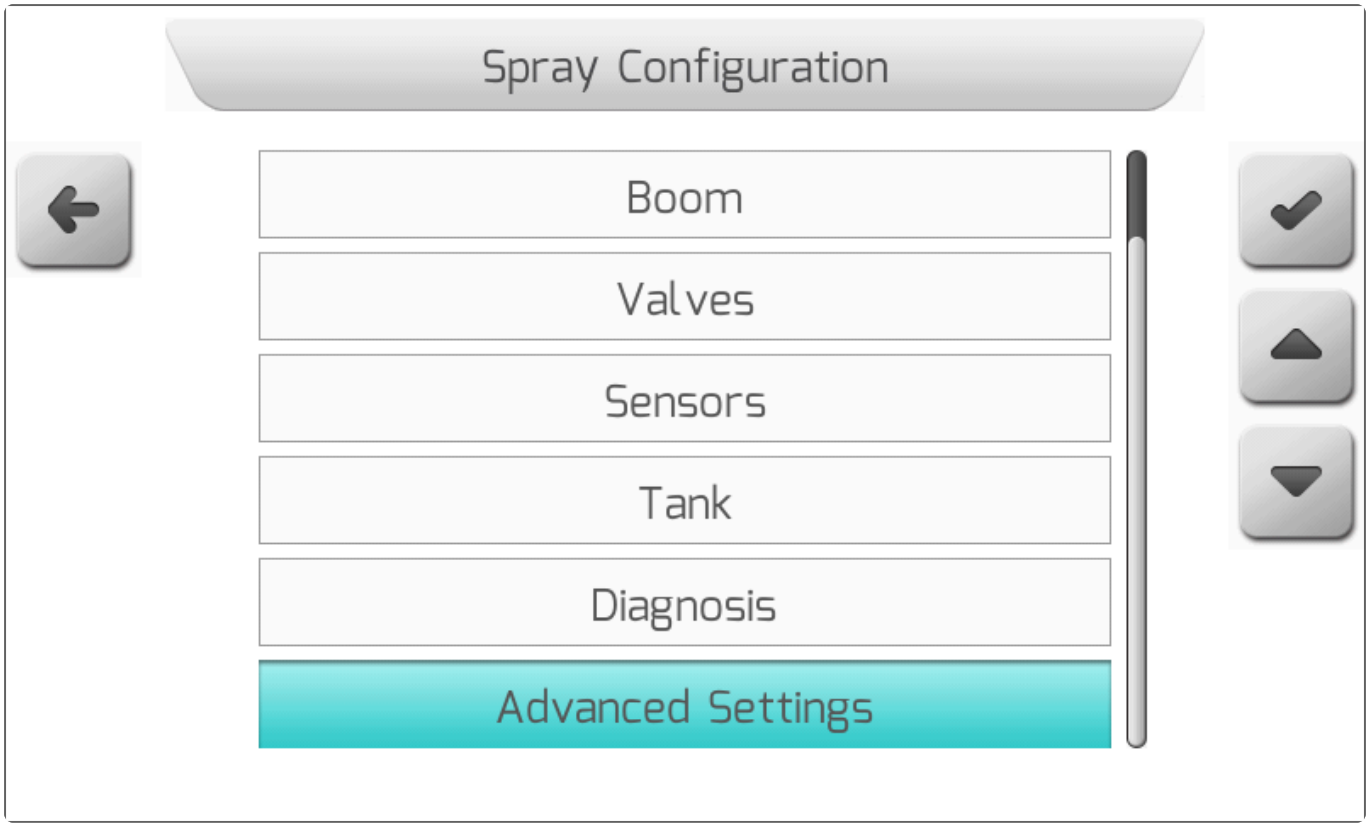



If Operation is set to a value other than Spraying, Information alert will appear asking to change the parameter value, as shown in the following image.




If Operation value is Spraying, Vertical Menu Spray Configuration screen will appear, as shown in the following images.





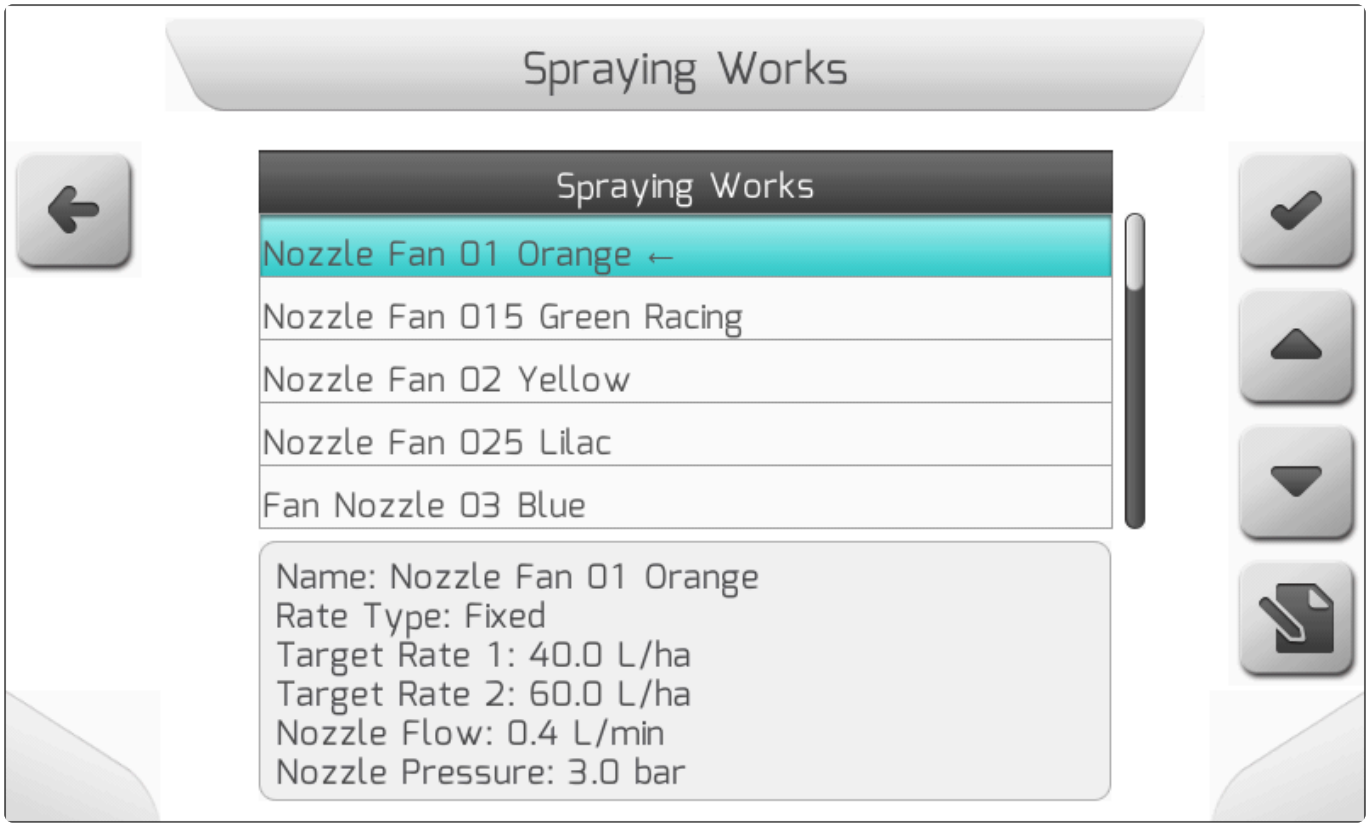

In the next topics, each areas that composes the Spraying settings menu will be detailed.

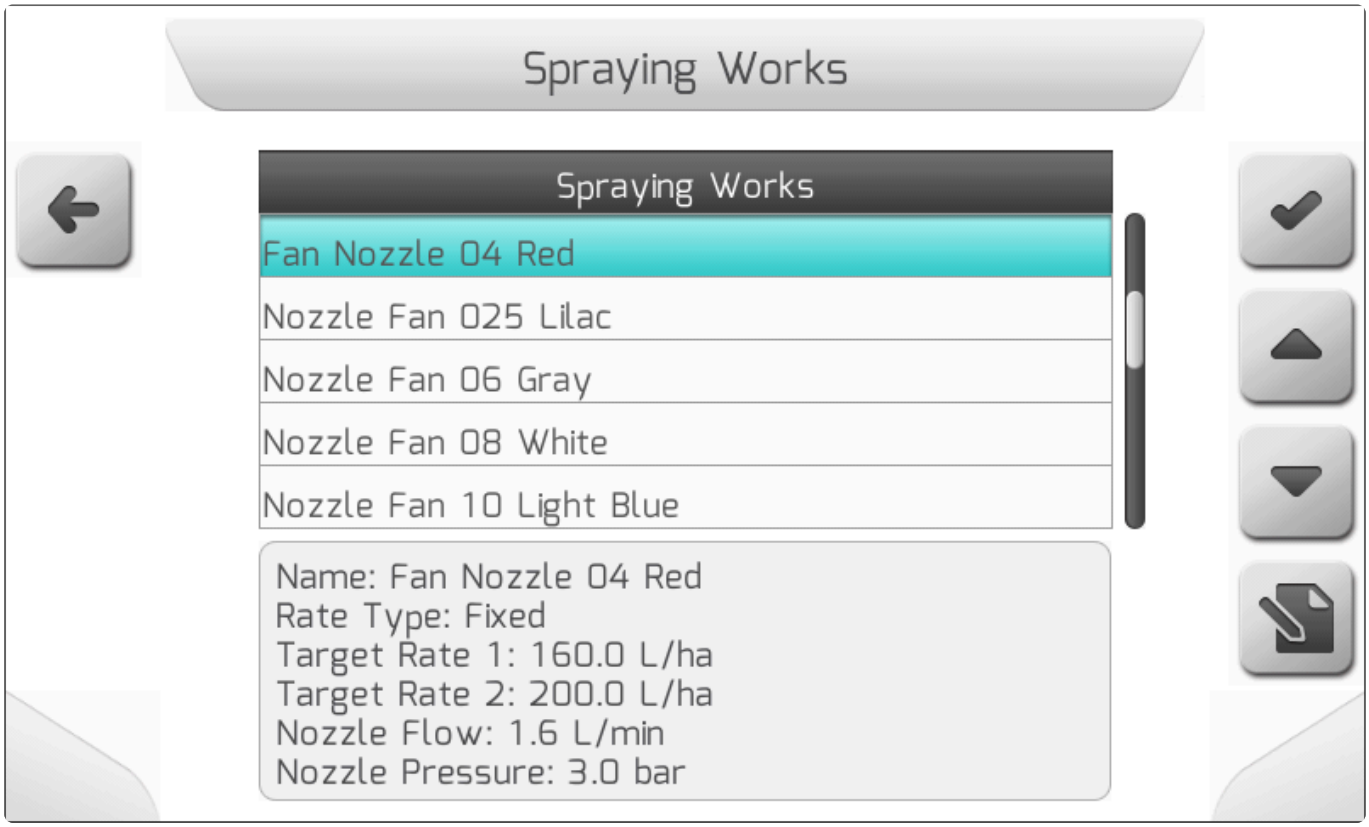
# 8.1.1. Works

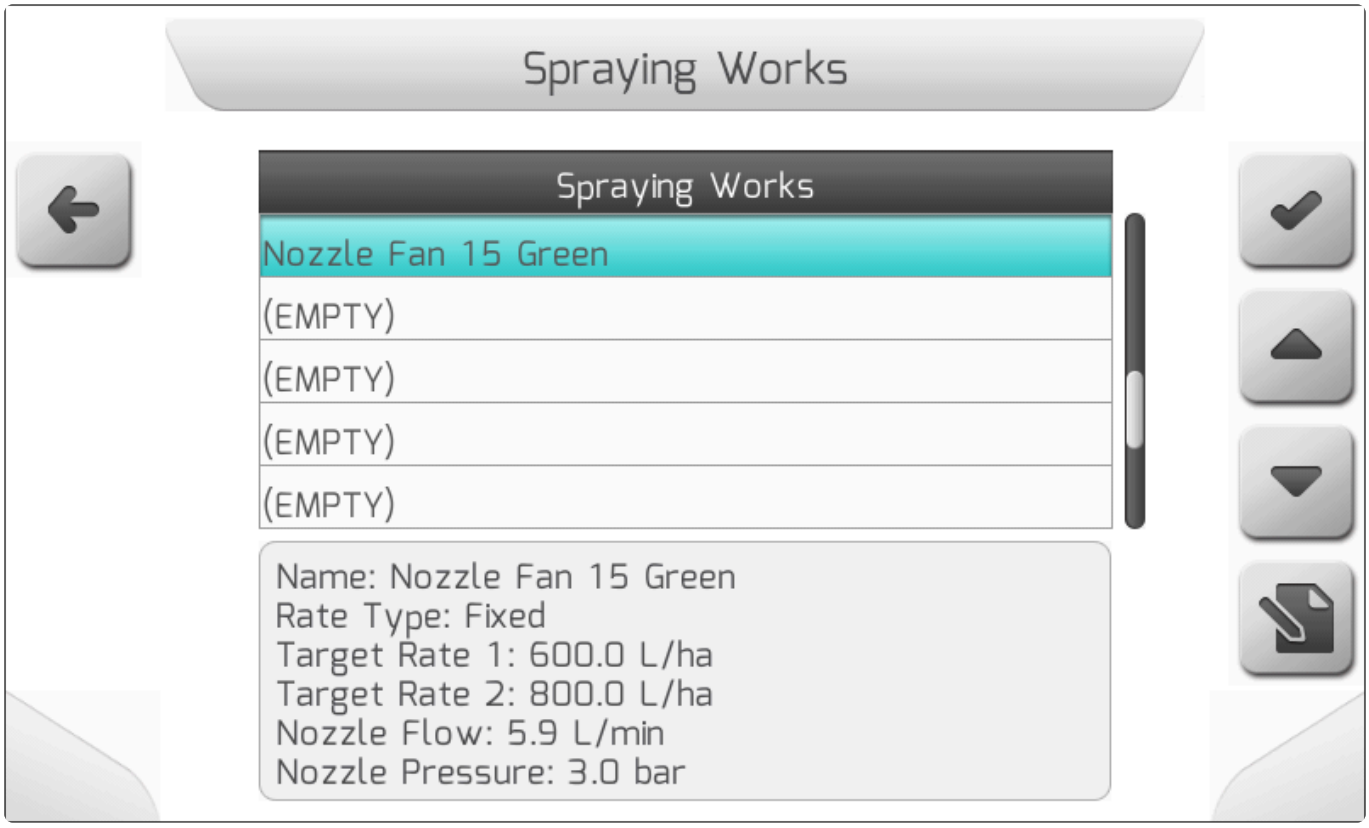
Screen type = Simple list

The GeoNave system with ISO 31 spraying licenses allows configuring up to 20 parameter structures called Spraying Works. Each work is related to a spraying nozzle model, and informs the system of nozzle flow and pressure data, as well as information on target rates that will be used in the application when this work is selected.

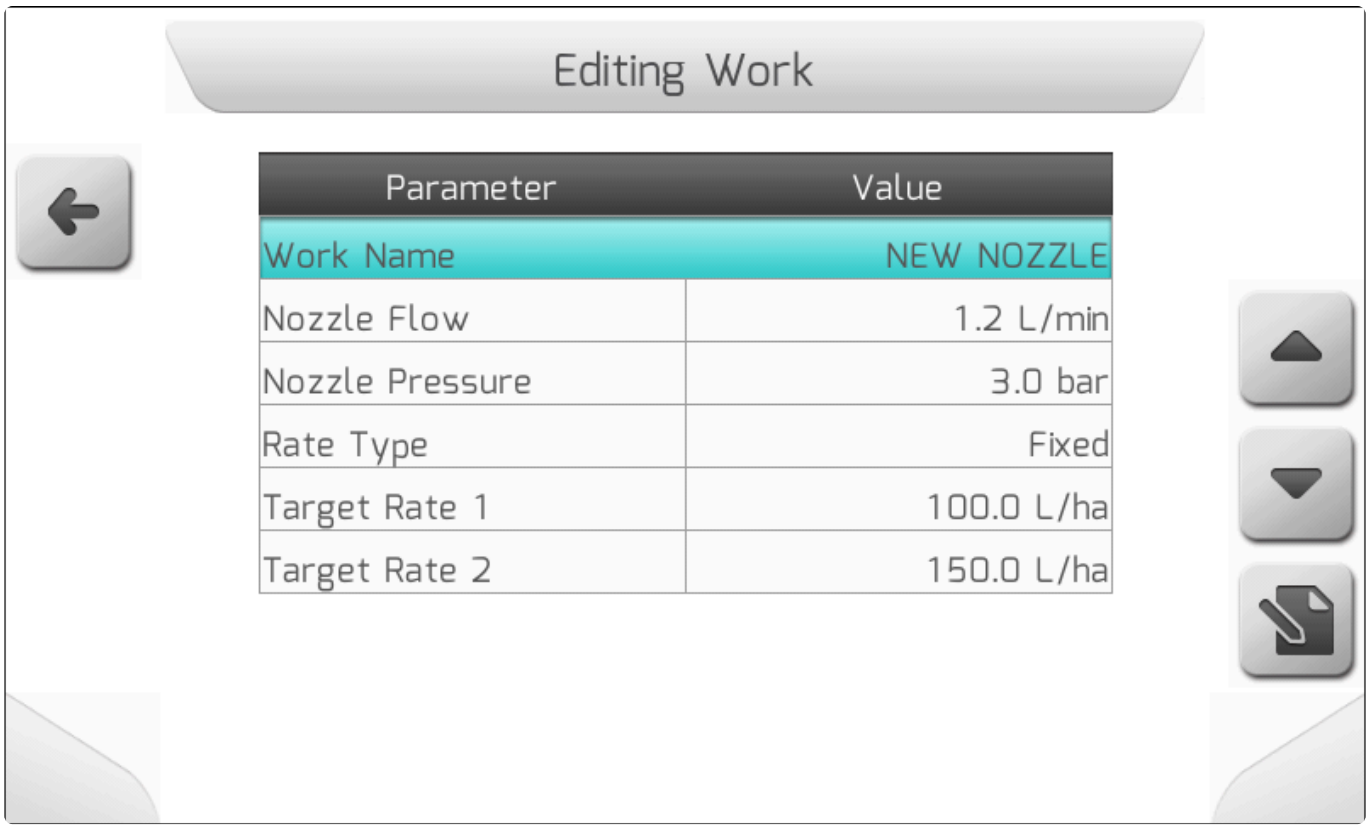
Initially the system suggests in the first 11 list positions the data of most used nozzle models for operations with boom spraying implement, as shown in the following images. The remaining 9 positions are initially empty.
Selecting a spraying work, Simple list screen presents in its footer an information board with spraying work parameters.


Spraying Works
Spraying Works
Nozzle Fan 01 Orange ←
Nozzle Fan 015 Green Racing
Nozzle Fan 02 Yellow
Nozzle Fan 025 Lilac
Fan Nozzle 03 Blue
Name: Nozzle Fan 01 Orange
Rate Type: Fixed
Target Rate 1: 40.0 L/ha
Target Rate 2: 60.0 L/ha
Nozzle Flow: 0.4 L/min
Nozzle Pressure: 3.0 bar


Spraying Works
Spraying Works
Fan Nozzle 04 Red
Nozzle Fan 025 Lilac
Nozzle Fan 06 Gray
Nozzle Fan 08 White
Nozzle Fan 10 Light Blue
Name: Fan Nozzle 04 Red
Rate Type: Fixed
Target Rate 1: 160.0 L/ha
Target Rate 2: 200.0 L/ha
Nozzle Flow: 1.6 L/min
Nozzle Pressure: 3.0 bar




Pressing the edit button , Double List screen appears as shown in the image below, allowing the user to configure each of the spraying works parameters individually.



## Work Name

Work name is usually inserted with text that identifies the used nozzle model. For example: Fungicide nozzle; Blue Cone nozzle; etc.

## Nozzle Flow

Nozzle flow nominal value, normally set by nozzle manufacturer for different pressures. The flow rate for the operation used pressure must be entered in this parameter.

## Nozzle Pressure

Nozzle pressure nominal value, normally set by nozzle manufacturer. The approximate pressure to be used in the operation must be entered in this parameter.

## Target Rate 1

> Target Rate 1 does not appear in the menu if the spraying license does not have flow control functionality or the flowmeter is set to 0 (Not available) or the Rate Type is set to Variable.

Represents the application target rate value selectable on the navigation screen by pressing fixed spraying rate button 1  .

## Target Rate 2

> Target Rate 2 does not appear in the menu if the spraying license does not have flow control functionality or the flowmeter is set to 0 (Not available) or the Rate Type is set to Variable.

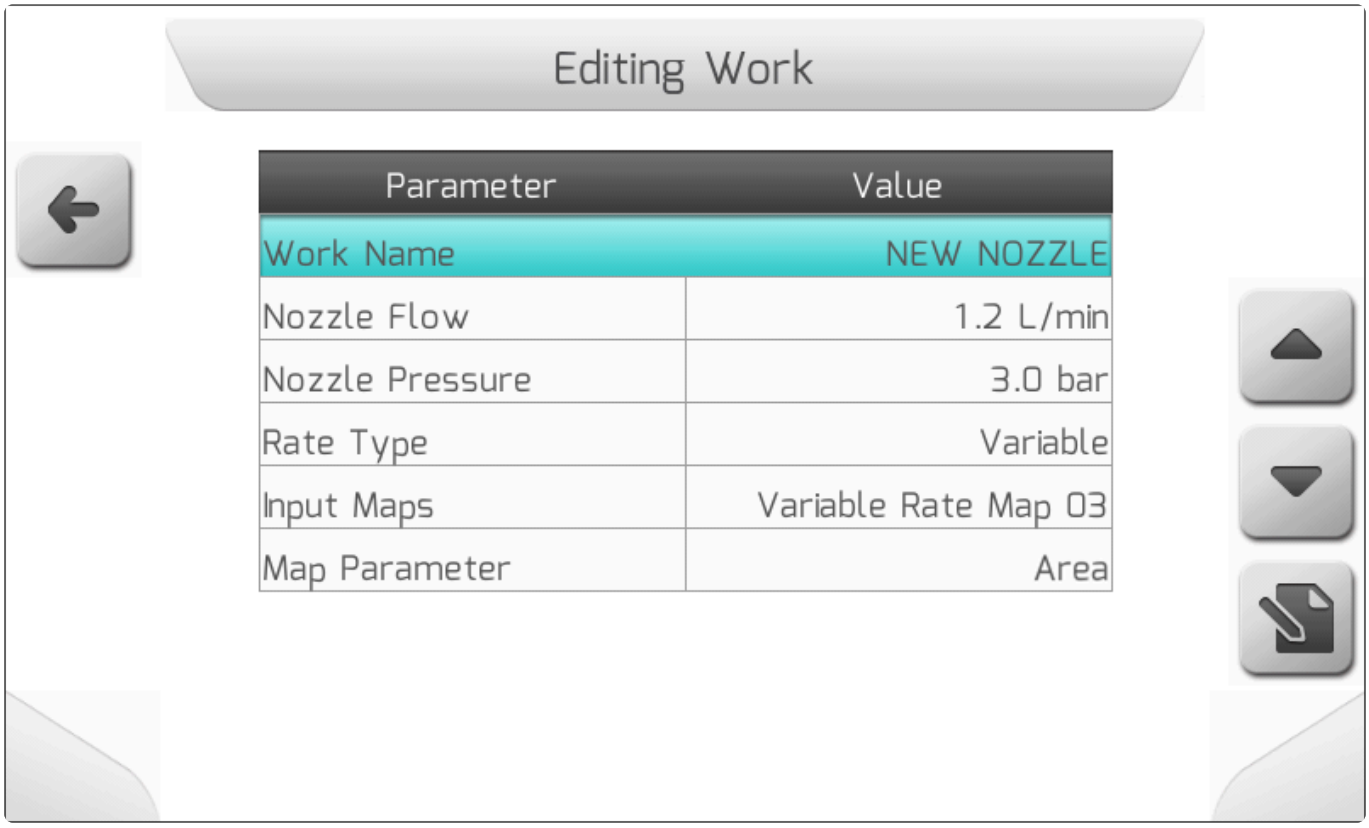
Represents the application target rate value selectable on the navigation screen by pressing fixed spraying rate button 2  .

## Rate Type

> If the GeoNave system license does not have the Variable Rate feature enabled, the Rate Type parameter will not be displayed, and the rate type will be Fixed.

Rate Type that will be used in spraying operation – **Fixed** or **Variable**. If it is configured as a **Fixed** rate, the two target rate values 1 and 2 will be selectable by the user on navigation screen. If rate type is

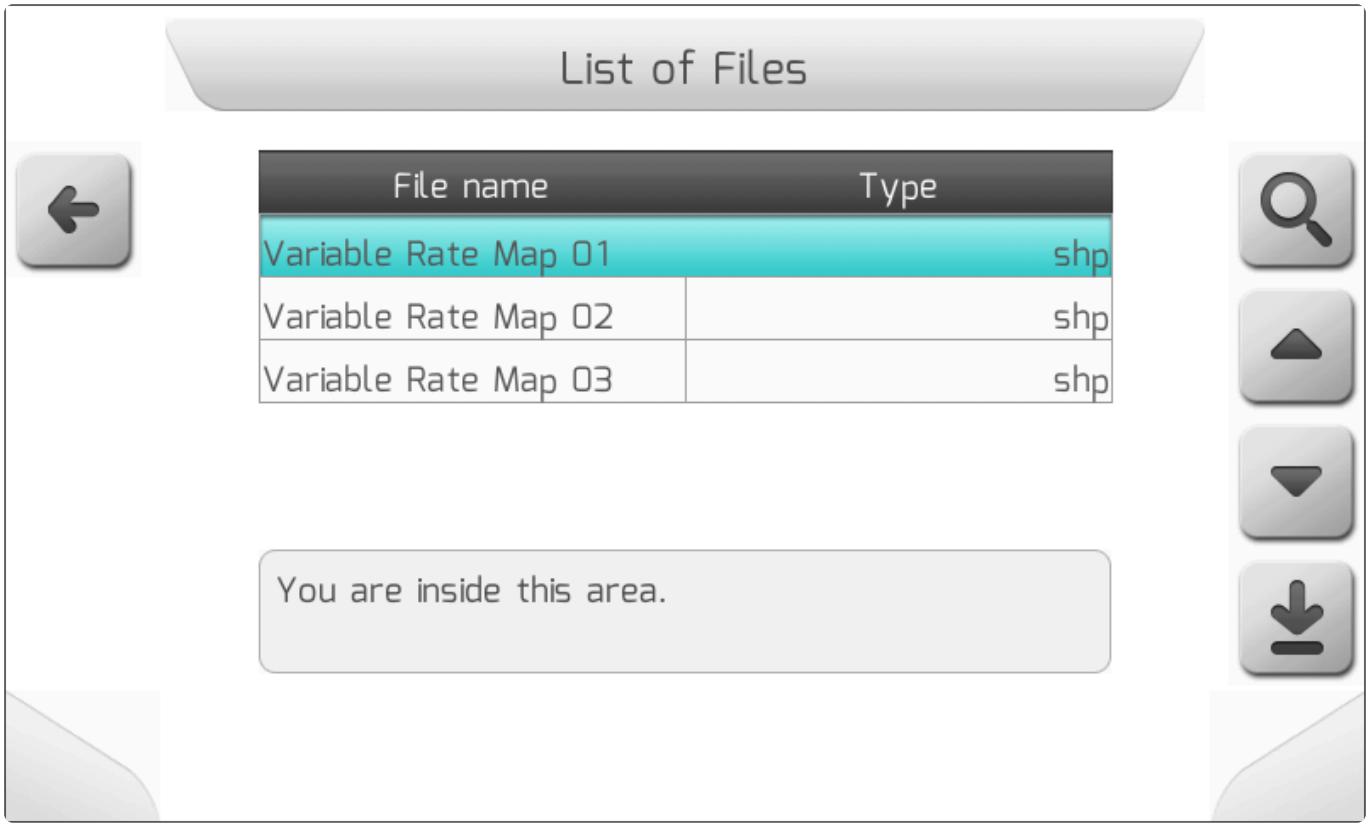
**Variable**, the spraying work edit menu will include two new lines: **Input Maps** and **Map Parameter**, as shown in the following image.



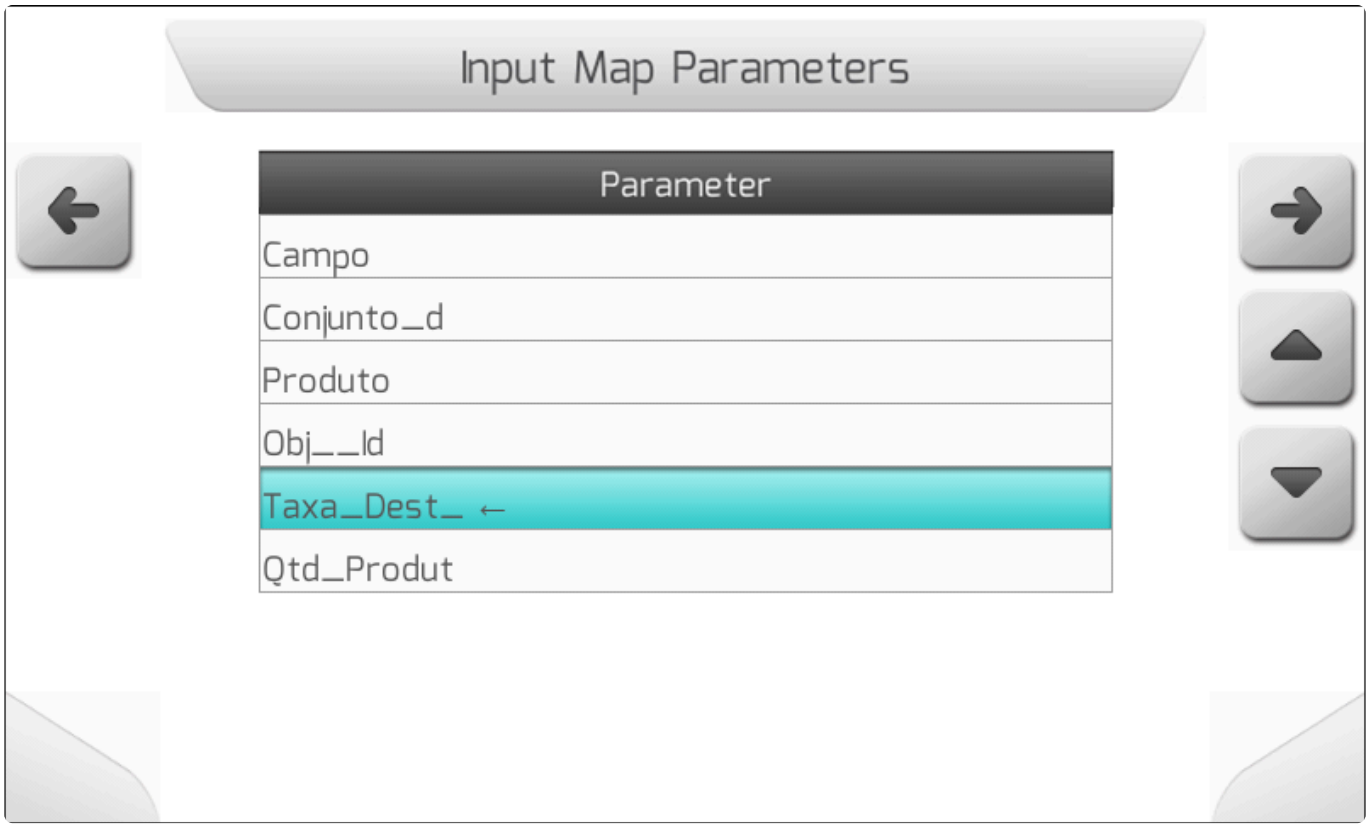

**Input Maps**

> If the GeoNave system license does not have the Variable Rate feature enabled, or if the Rate Type parameter is set to Fixed, the Input Maps and Map Parameter parameters will not be displayed.

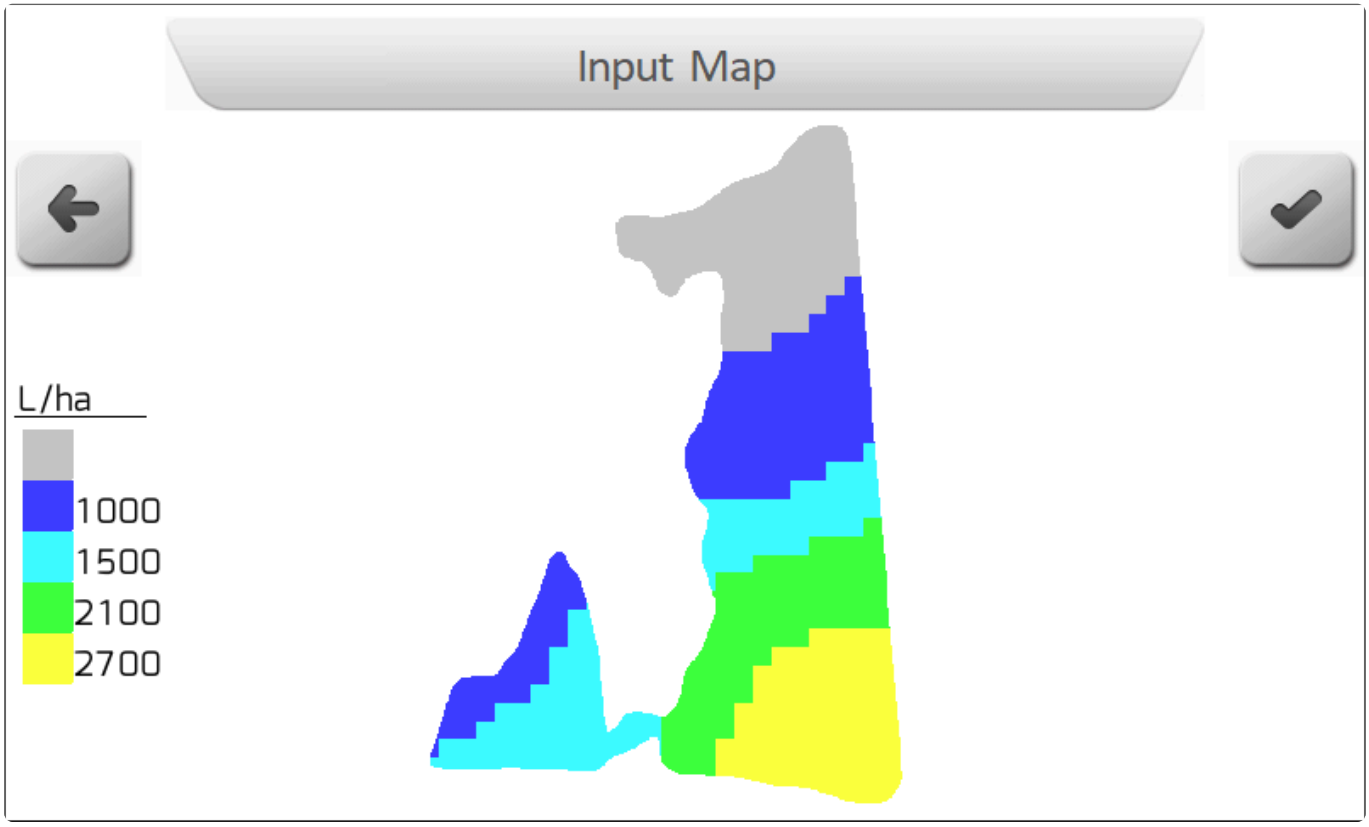
Selecting Input Maps item and pressing the edit button  , File List of variable rate *Shapefile* maps present in the internal memory for user selection will be displayed, as shown in the image below.




Selecting a map and pressing view button  , the list of *Shapefile* map parameters is loaded so that the user can select the item corresponding to the rate of each map polygon. The image below shows the Input Map Parameters list.



When selecting the parameter and pressing the forward button , after data loading, the map screen will be displayed with areas in different colors, representing each application rate range in L/ha, as shown in the following image.




If it is not the correct map, the user must press the return button and select another map. If the map is the desired one, the confirm button must be pressed, loading the map in the spraying work.

# 8.1.2. Boom

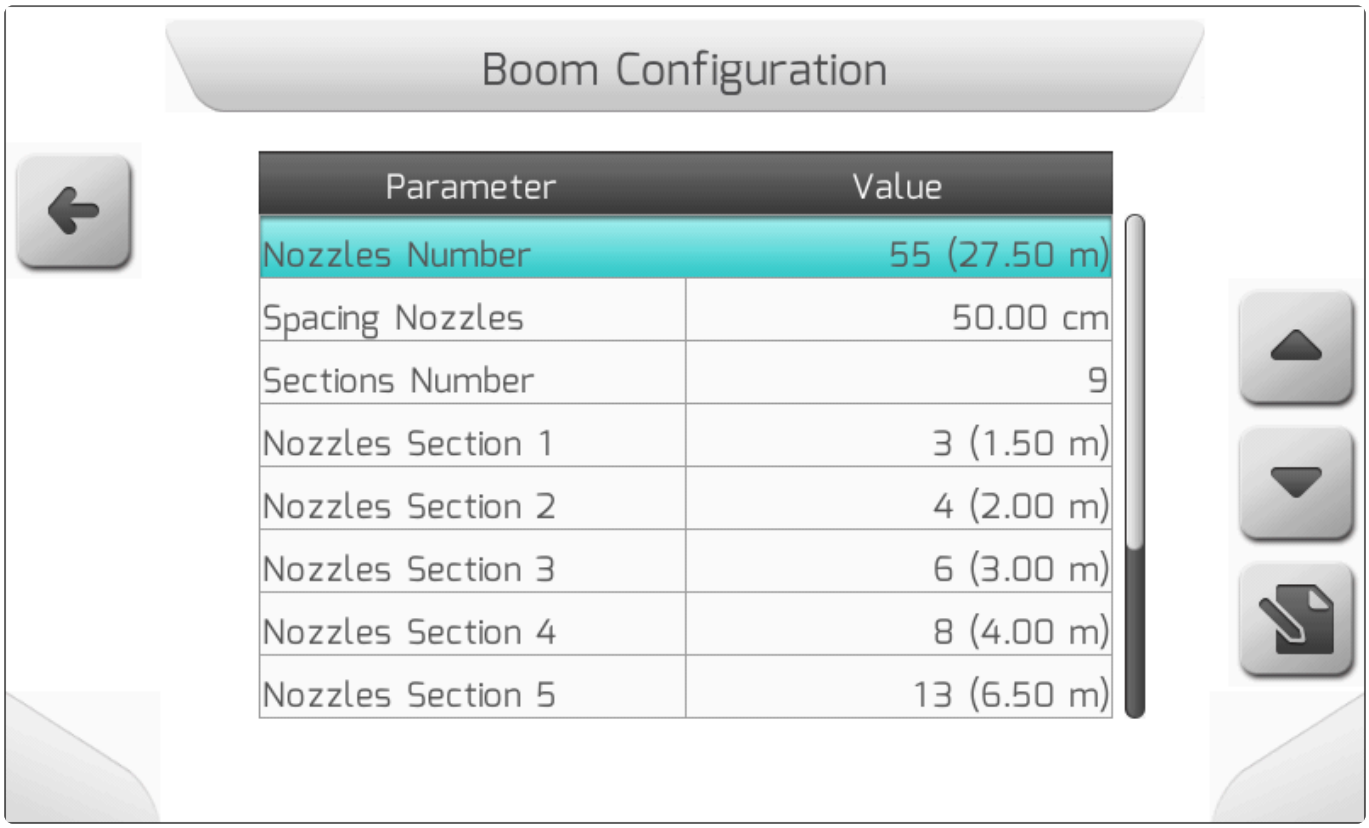
Screen type = Double list

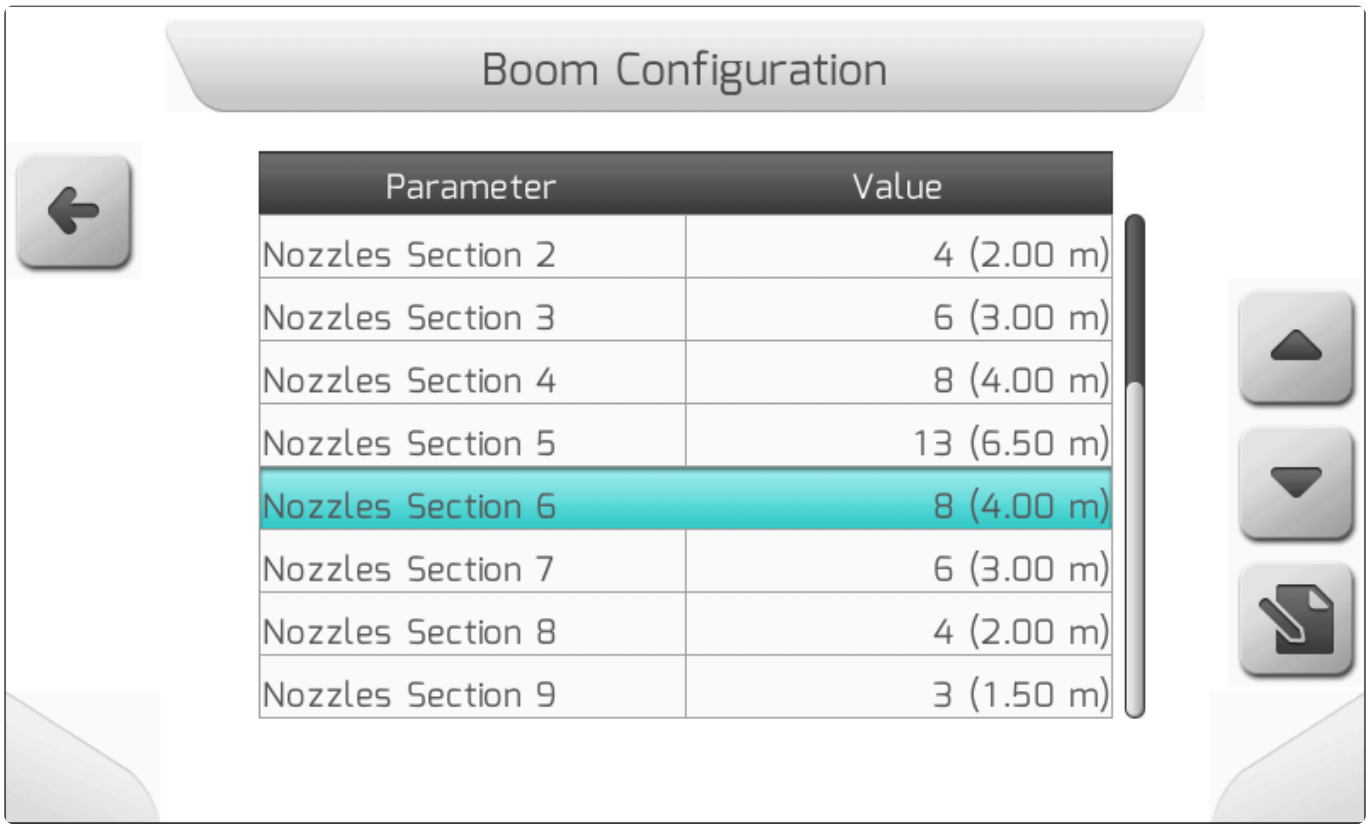
- Nozzles Number
- Spacing Nozzles
- Sections Number
- Number of Nozzles Section

The boom settings menu includes the parameters that define the sprayer implement boom dimensions, number of sections and nozzle arrangement in each section.

The number of menu lines identified with the text “Nozzles Section N”, where N is the section number,

varies according to configured sections number and in each line, enclosed in parentheses, is shown the implement width that the corresponding nozzles number will cover in the application.
The following images show the example of the boom settings menu for 9 sections.




In the next subtopics will be detailed each item in the boom settings menu.

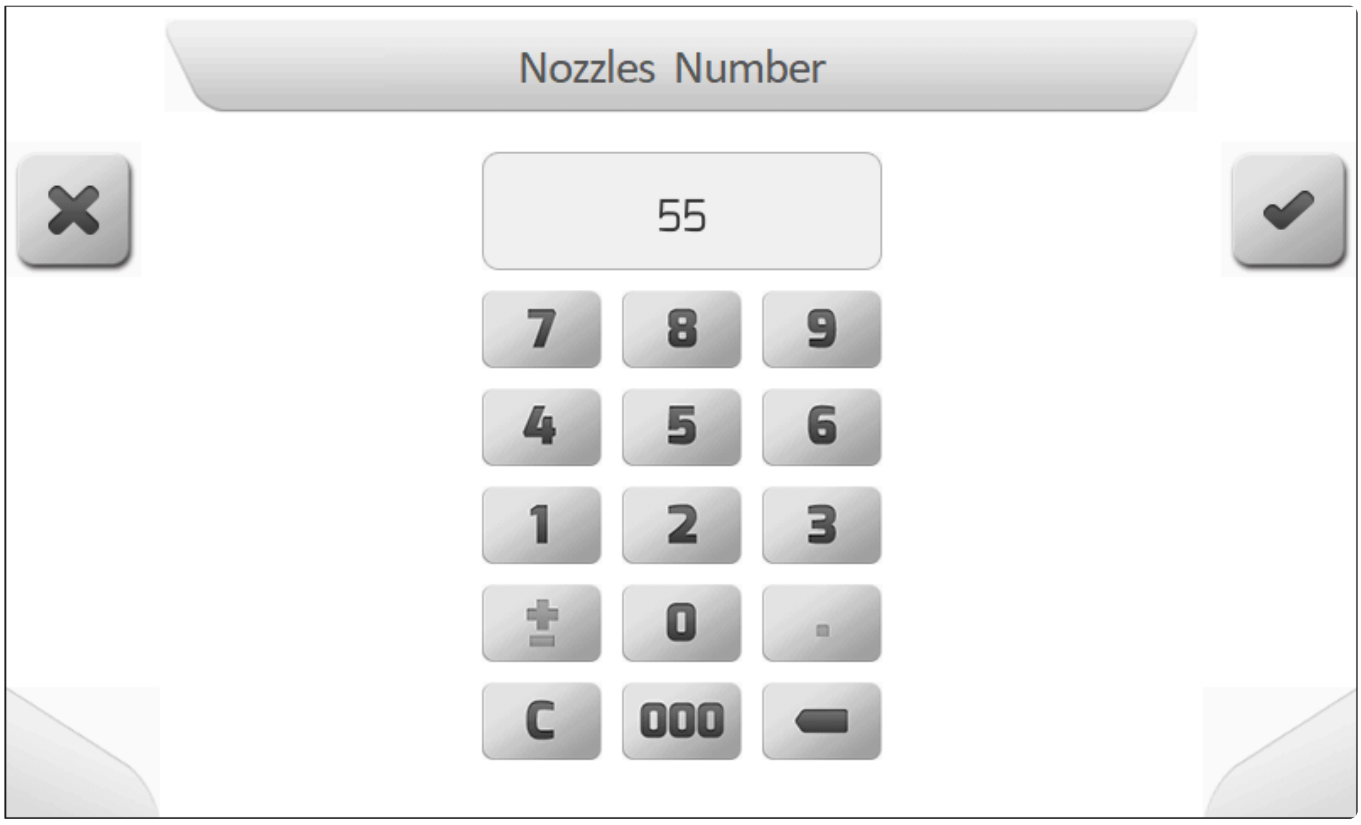
# 8.1.2.1. Nozzles Number

- Screen type = Value editing

- Decimal places = None
  Minimum value =2
  Maximum value =255

The Nozzles Number parameter tells the GeoNave system how many spraying nozzles characterize the implement boom. The value will later be used to distribute the total nozzles number between the sprayer sections.

The image below shows the screen for nozzles number setting.




# 8.1.2.2. Spacing Nozzle

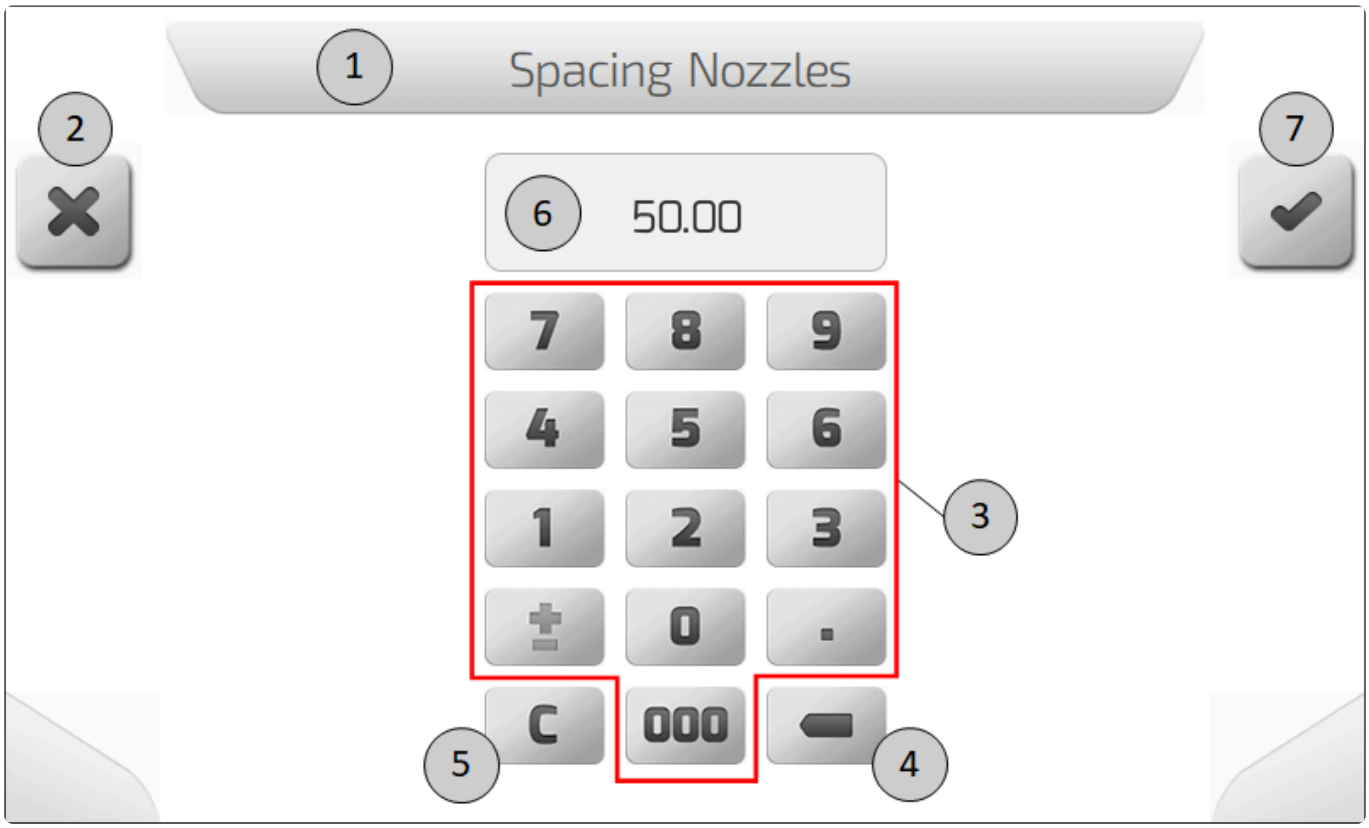
- Screen type = Value editing

- Decimal places =2
  Minimum value = 5.00 cm

Maximum value = 181.00 cm

Spacing Nozzle parameter defines the sprayer nozzles arrangement on the implement boom, this implies that nozzles are evenly spaced and therefore have the same spacing value.

The following image shows the screen for spacing nozzle setting.



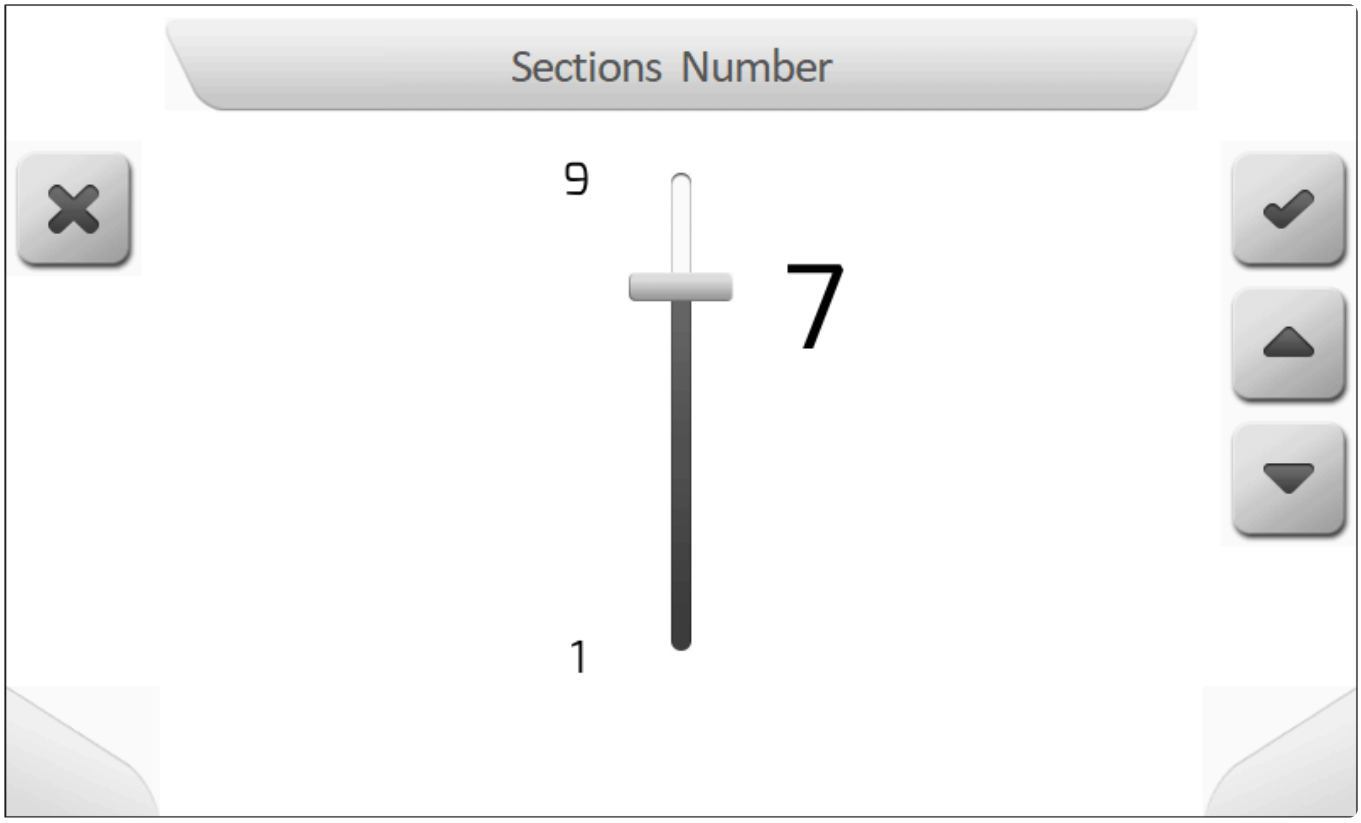

# 8.1.2.3. Sections Number

Screen type = Vertical choice

Minimum value =1
Maximum value =9

Sections number defines in how many parts the sprayer implement boom is divided, so that there will be a section valve for each section and its respective nozzles.

The image below shows the screen for sections number setting.

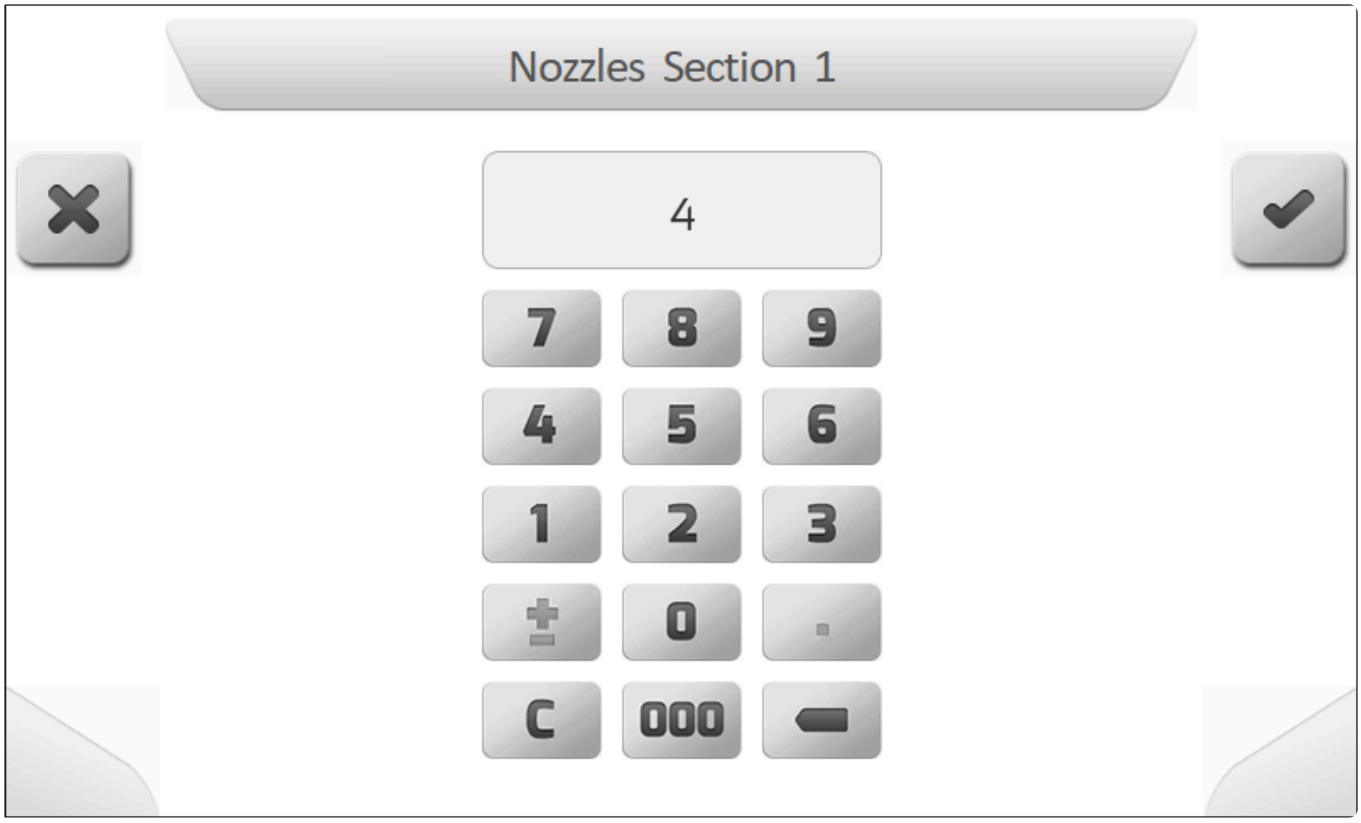



# 8.1.2.4. Number of Section Nozzles

- Screen type = Value editing

- Decimal places = None
  Minimum value =1
  Maximum value = Calculated

The Number of Section Nozzles setting establishes how the distribution of the total number of nozzles is carried out between spraying sections. The following is an example of the number of nozzles configuration screen for section 1.




The total sum of the number of nozzles of each individual section cannot exceed the total nozzles number, the GeoNave system recalculates the number of nozzles for the sections below the one currently being configured, according to last changed value.

For example, considering a configuration with a total number of 10 nozzles and a number of sections equal to 3. When configuring the first section with 4 nozzles, sections 2 and 3 will automatically be filled with 3 nozzles each, dividing the remaining 6 nozzles equally between them.
In the same example, if afterwards the user tries to configure the second section with 6 nozzles, the system will alert that nozzles number is invalid, as there will be no remaining nozzles for third section.
On the other hand if the configuration of the second section is carried out with 5 nozzles, third section will automatically assume the value of 1 nozzle, thus completing total sum of 10 nozzles of the implement.

# 8.1.3. Valves

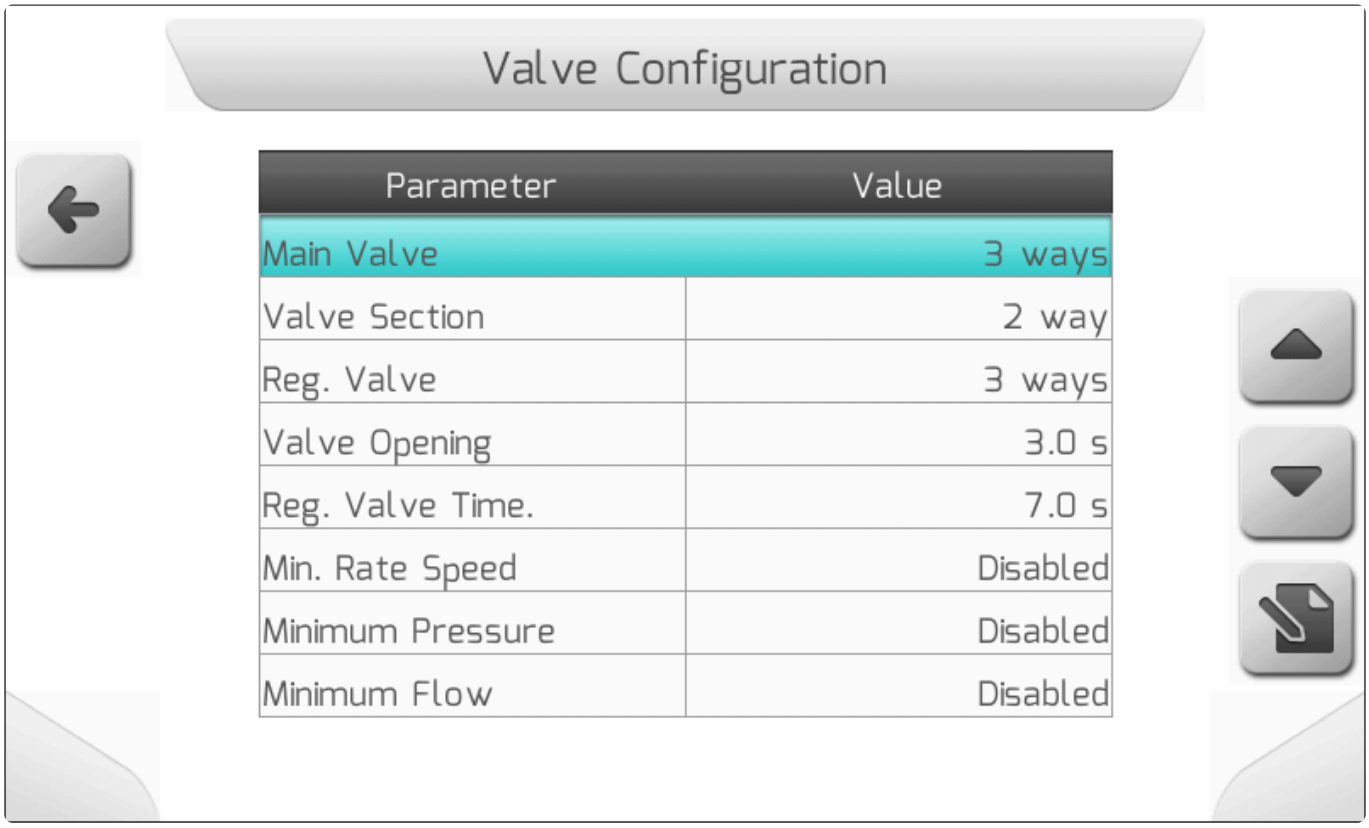
Screen type = Double list

- Main Valve
- Valve Section
- Regulating Valve
- Valve Opening
- Regulation Valve Time
- Minimum Rate Speed
- Minimum Pressure

- Minimum Flow

The Valves settings menu contains the parameters related to the electric valves of the sprayer implement used in conjunction with the GeoNave system.

Parameters shown in the menu depend on the GeoNave system licenses and also on some parameters settings.
The image below shows an example of valve settings menu in its most complete form.



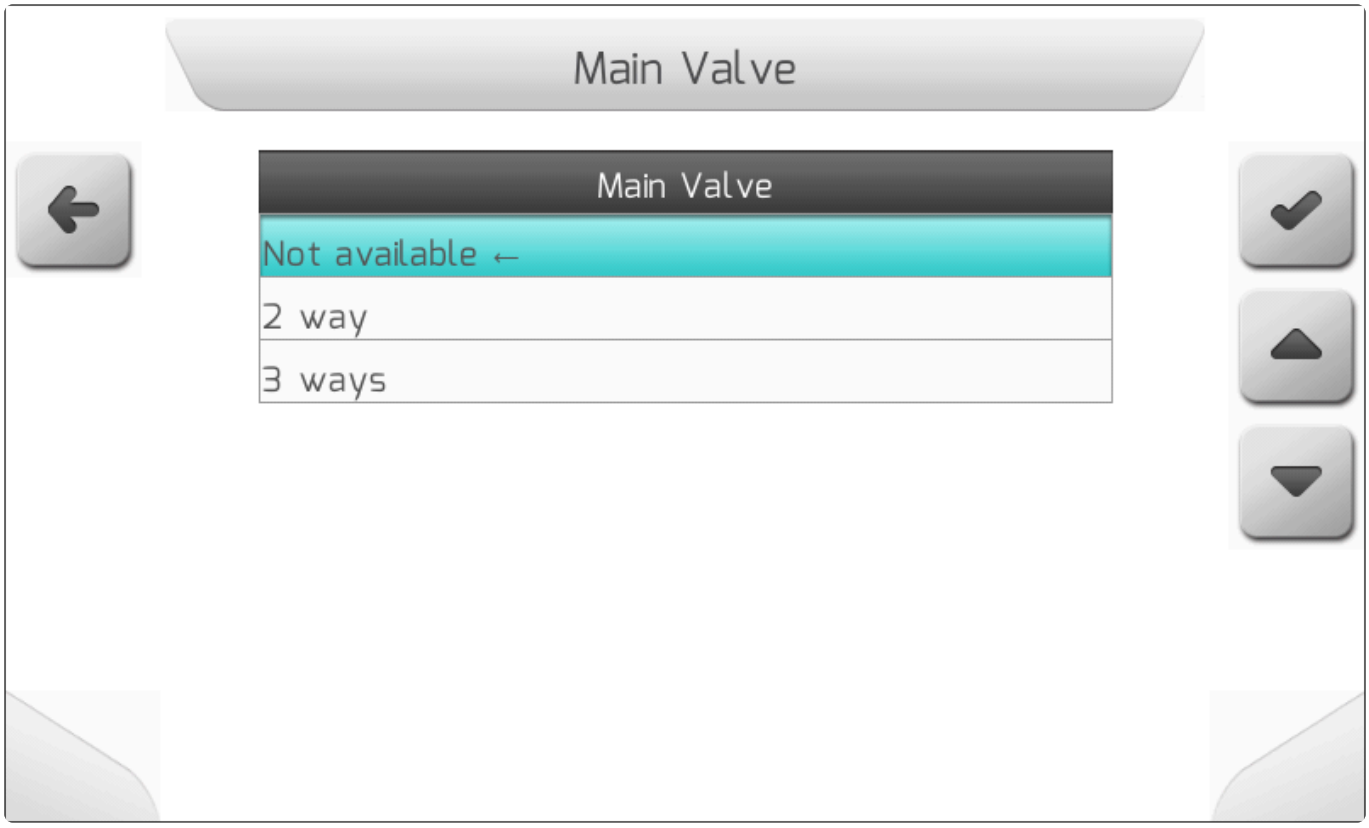

In the next subtopics will be detailed each item in the Valves settings menu.

# 8.1.3.1. Main Valve

Screen type = Simple list

The main valve, when available in the sprayer implement, when closed it is responsible for diverging fluid flow to tank, before all other valves, ensuring that the spraying shut-off is done quicker and more efficiently, providing also greater protection to the hydraulic sprayer pump.

The Main Valve parameter of valve settings menu configures the main valve type that may be present in the sprayer implement. The image below shows Main Valve setting screen.



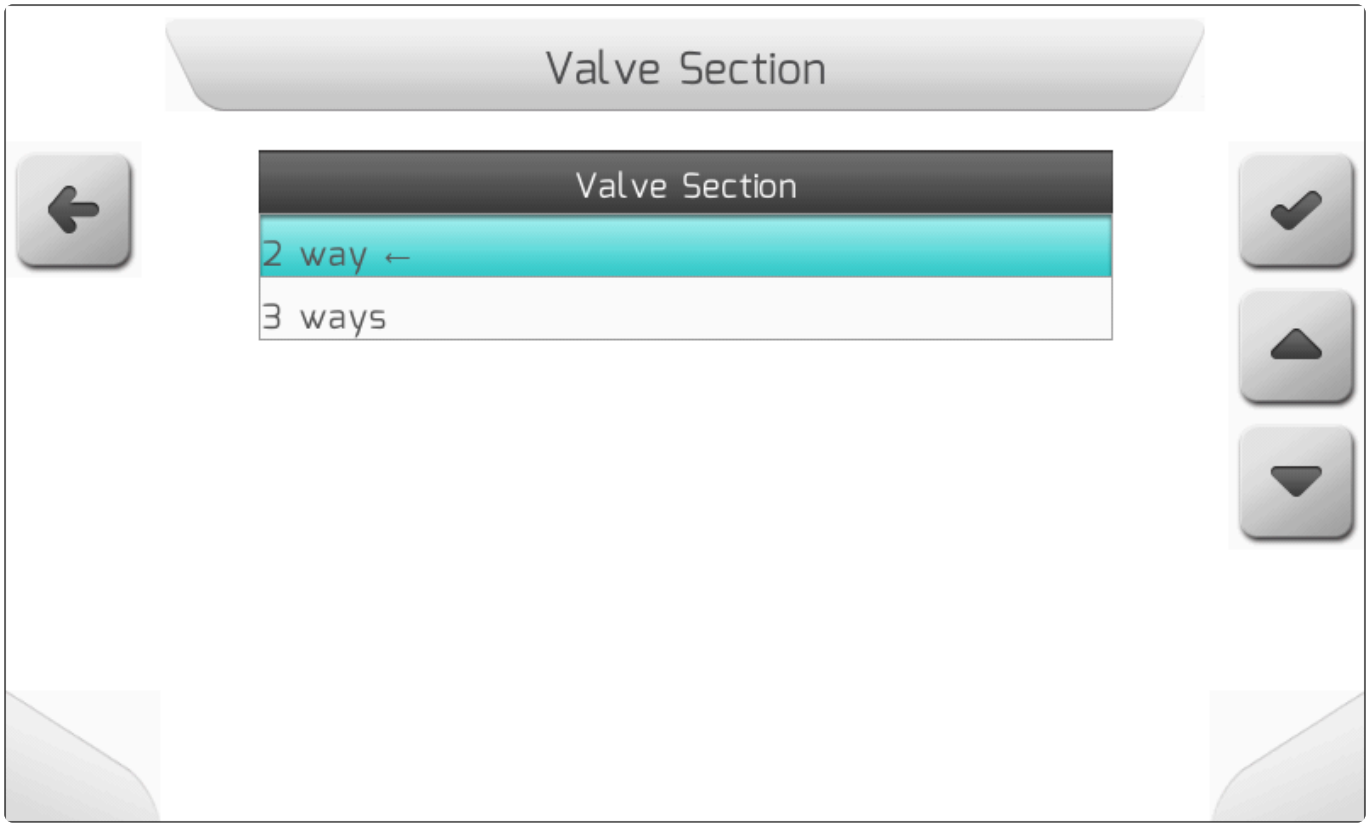

| Value | Description |
|---|---|
| **Does not have** | The implement does not have a main valve. |
| **2 ways** | Main valve with 2 hydraulic ports scheme – when valve piston is closed, flow is directed to section valves. |
| **3 ways** | Main valve with 3 hydraulic ports scheme – when valve piston is opened, flow is directed to section valves. |

# 8.1.3.2. Valve Section

Screen type = Simple list

The section valves open and close the flow in parts of the sprayer implement boom. In this way the GeoNave system is able to perform, through electrical commands, the shut-off of nozzles controlled by the corresponding section valve, when, for example, the whole section is over an area already sprayed or outside the boundary area, thus saving spraying fluid and avoiding phytotoxicity process.

In the valve configuration menu, Valve Section parameter allows the user to configure valve section type present in the sprayer implement valve control. The image below shows Valve Section setting screen.




| Value | Description |
|---|---|
| **2 ways** | Section valve with 2 hydraulic ways, with no calibrated return – when the section is closed, the flowmeter measurement decreases. |
| **3 ways** | Section valve with 3 hydraulic ways, with calibrated return – when the section is closed and the return is properly calibrated, the flowmeter measurement remains constant. |

# 8.1.3.3. Regulation Valve

Screen type = Simple list

If the GeoNave system license does not have Flow Control feature – licenses **ISO 31FS** and **ISO 31VS** -, the Regulation Valve parameter will always be set to **Not available** value, indicating that flow control will not be performed.

The regulation valve is responsible for controlling the fluid flow that passes through the spraying system, normally combined with the reading performed by the Flowmeter. The GeoNave system uses electrical interfaces to open or close the valve, according to the target rate in L/ha required by the user, enabling spraying operation to be done uniformly throughout the area and regardless of speed.

In the valve configuration menu, Regulation Valve parameter allows the user to configure valve type present in the sprayer implement valve control. The image below shows Regulation Valve setting screen.




| Value | Description |
|---|---|
| **Not available** | The implement does not have a regulation valve. |
| **2 ways** | Regulating valve with 2 hydraulic ways – when the valve piston is opened, the flow section valves increases. |
| **3 ways** | Regulating valve with 3 hydraulic ways – when the valve piston is opened, the flow section valves decreases. |

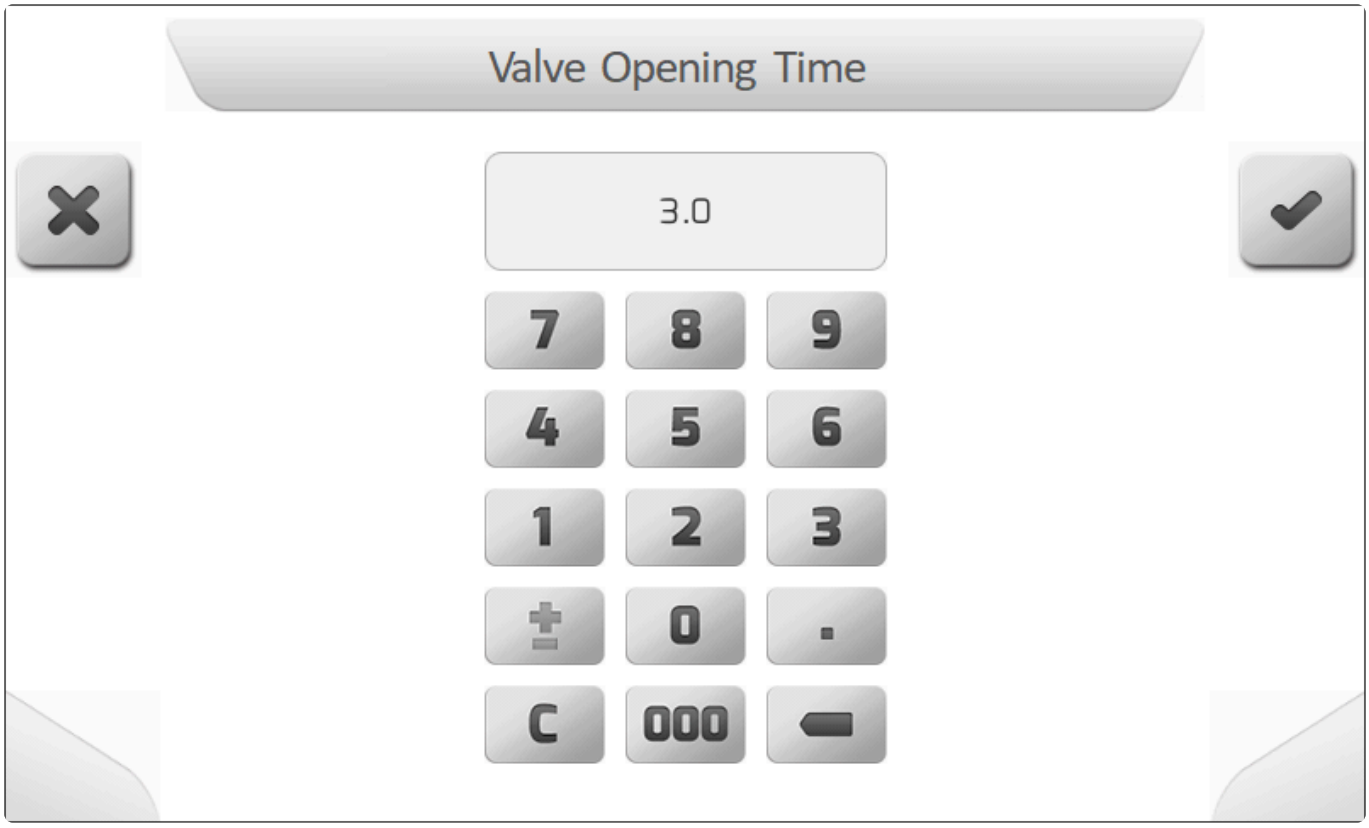
# 8.1.3.4. Valve Opening

Screen type = Value editing

Decimal places =1
Minimum value = 0.1 s
Maximum value = 10.0 s

The Valve Opening parameter defines the time in seconds to fully open implement section valves, according to nominal value of used valve model. This time is used by the GeoNave system to anticipate the electrical opening command sent to the valves, before starting to fill the navigation screen trail.

The following image shows Valve Opening parameter setting screen.




# 8.1.3.5. Regulating Valve Time

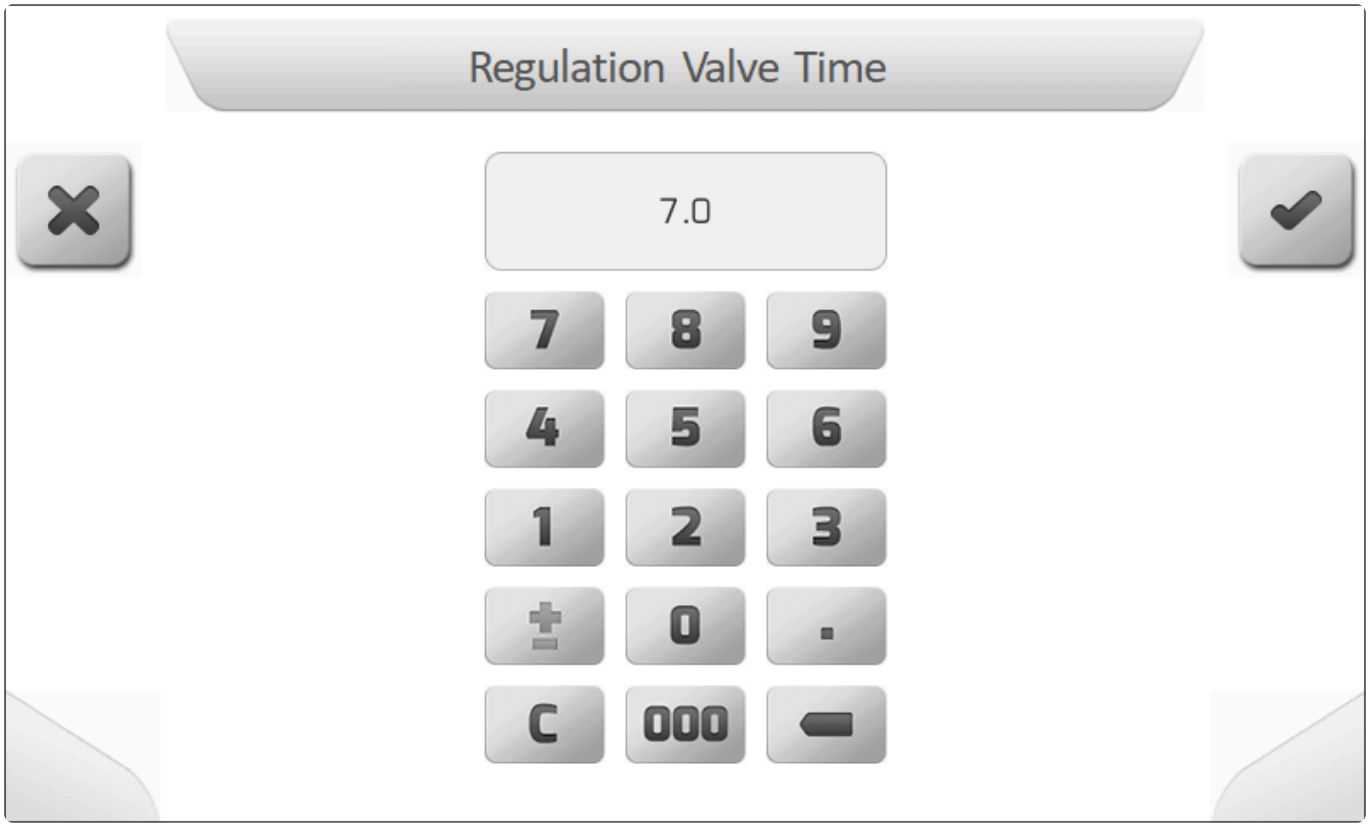
Screen type = Value editing

If the GeoNave system license does not have Flow Control functionality – licenses **ISO 31FS** and **ISO 31VS** -, or if the parameter Regulation Valve is configured as **Not available**, the Regulation Valve Time parameter will not be present in the valve settings menu.

Decimal places =1
Minimum value = 0.5 s
Maximum value = 60.0 s

Regulation Valve Time parameter is used to define total opening and closing time of spraying implement regulation valve, according to nominal value of used valve model. The GeoNave system uses this value to optimize the performed regulation valve control to maintain the target rate.

The following image shows Time Regulation Valve parameter setting screen.



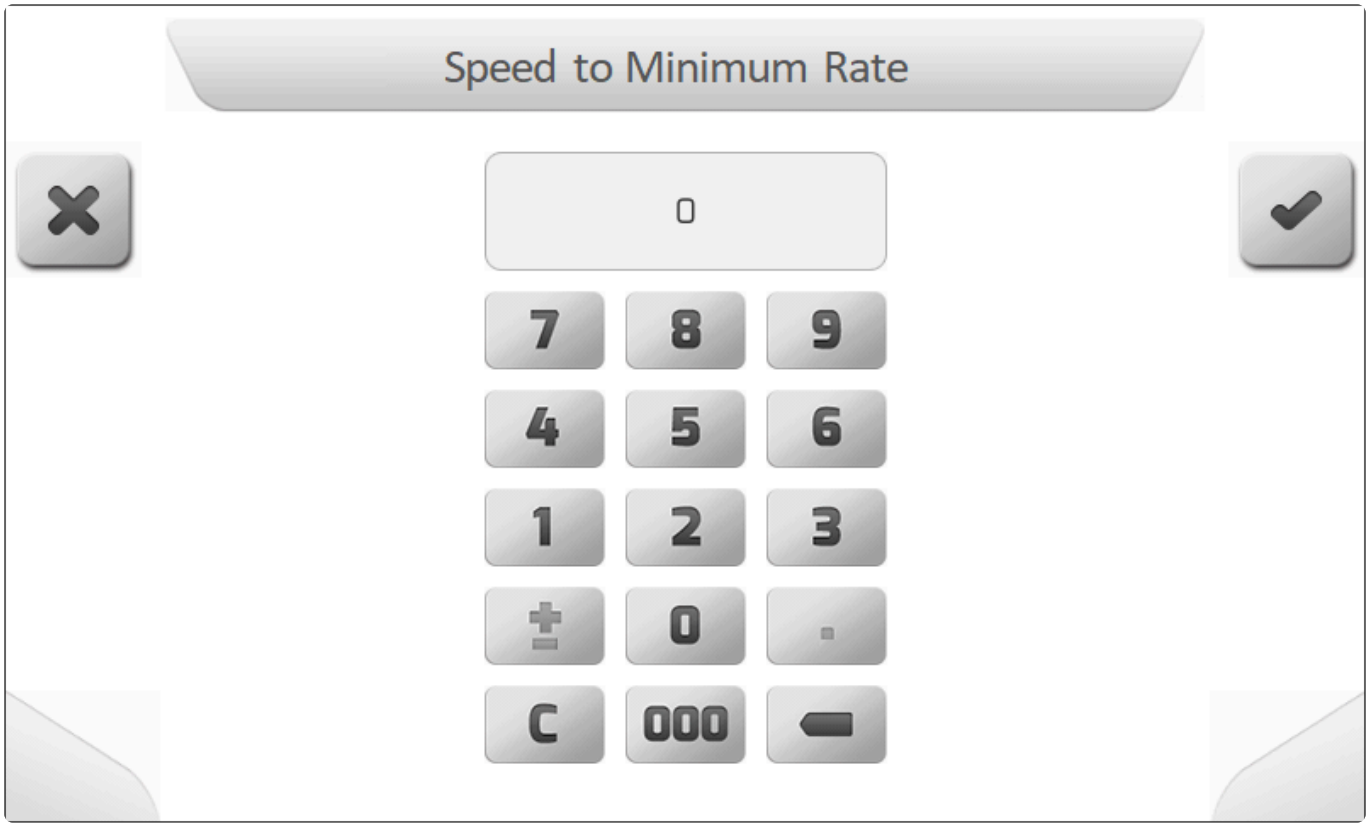

# 8.1.3.6. Minimum Rate Speed

Screen type = Value editing

Decimal places = None
Minimum value = 0 (parameter disabled)
Maximum value = 20 km/h

There are situations in which spraying operation requires implement nozzles formed cone or jet spray to maintain its configuration at all times, even when machine speed is reduced. To address these cases, the GeoNave system implements Minimum Rate Speed parameter. When its value is greater than zero, system calculation performed in L/ha will consider the speed in km/h configured in this parameter, even if machine speed is lower. The read rate in L/ha will be momentarily higher than the target rate, however spraying droplet configuration will be maintained, meeting application requirements.

The image below shows Minimum Rate Speed parameter setting screen.




✻ Minimum Rate Speed operates in conjunction with Minimum Pressure and Minimum Flow.

! When using Minimum Rate Speed, Minimum Pressure and Minimum Flow, the equipment may apply a higher rate than desired if the configured values are overestimated, which may generate phytotoxicity and/or insufficient spraying.

# 8.1.3.7. Minimum Pressure

✻ Screen type = Value editing

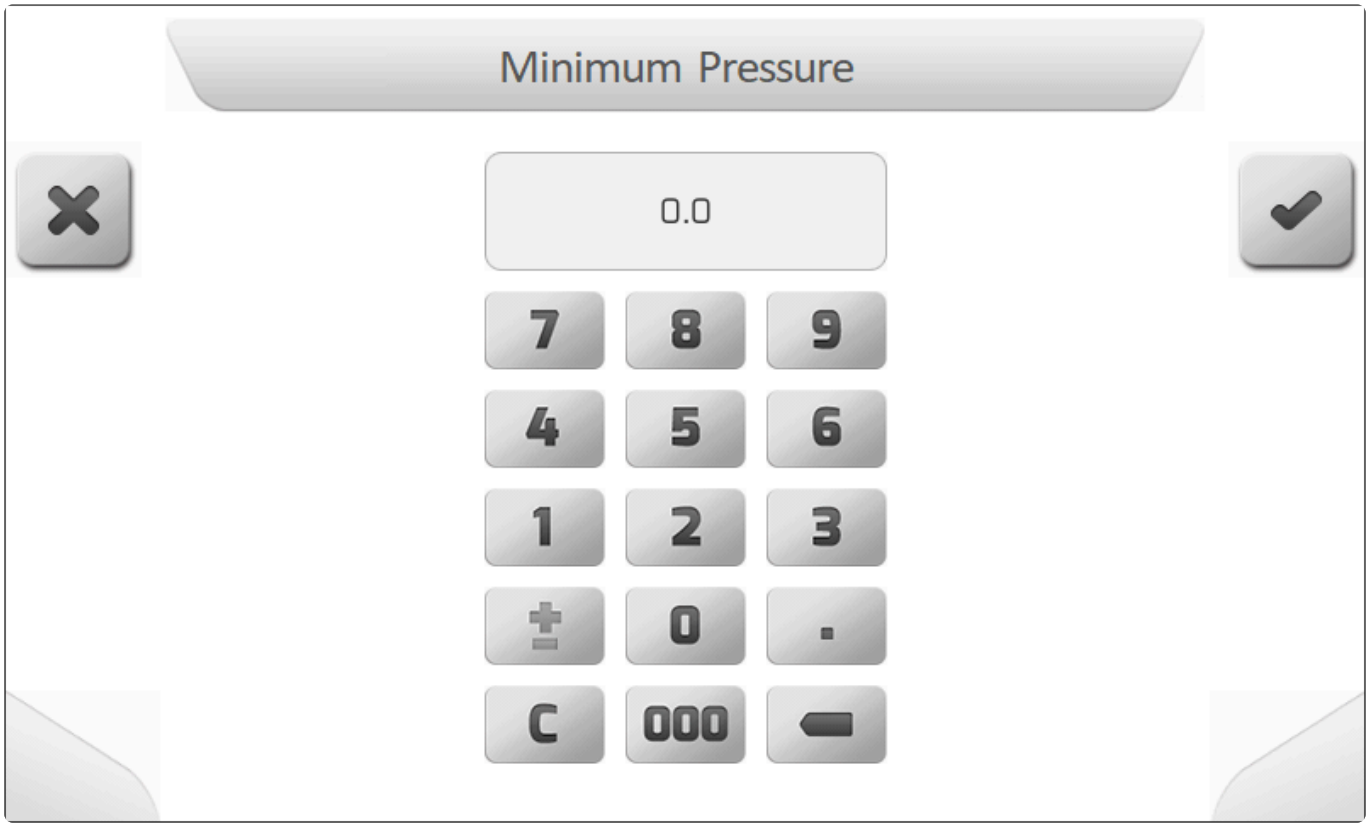
✻ If Flowmeter parameter is configured with value **0 (flowmeter disabled)**, the Minimum Pressure parameter will not be shown in the valve settings menu.

✻ Decimal places =1
Minimum value = 0.0 (parameter disabled)
Maximum value = 50.0 bar

The Minimum Pressure parameter allows the user to configure a minimum pressure value in bar, calculated by the GeoNave system, with which spraying operation will be performed. Even if the read

rate in L/ha is momentarily higher than the target rate, the system will not allow the pressure to fall below specified parameter value, thus meeting user's application requirements.

The image below shows Minimum Pressure parameter setting screen.




✻ Minimum Rate Speed operates in conjunction with Minimum Pressure and Minimum Flow.

! When using Minimum Rate Speed, Minimum Pressure and Minimum Flow, the equipment may apply a higher rate than desired if the configured values are overestimated, which may generate phytotoxicity and/or insufficient spraying.

# 8.1.3.8. Minimum Flow

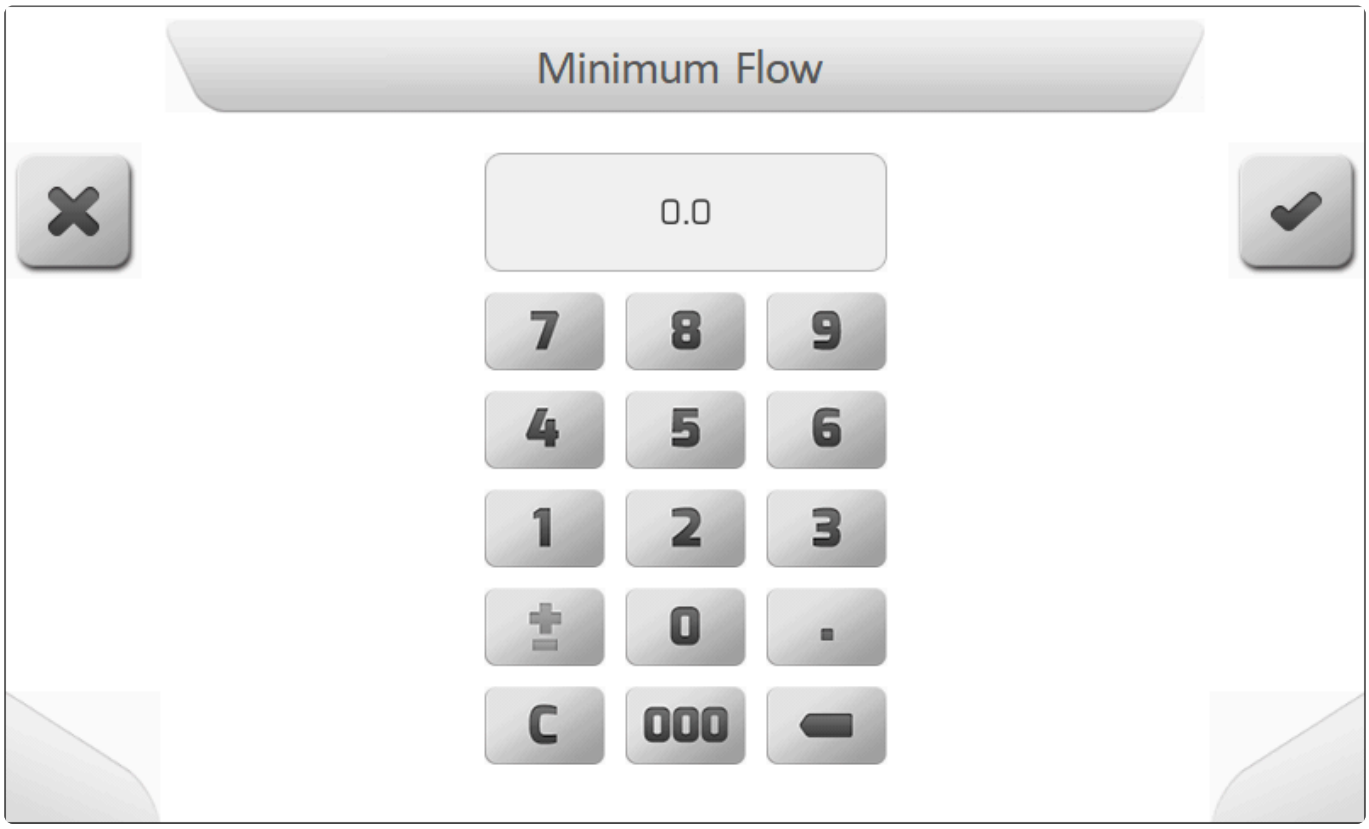
✻ Screen type = Value editing

✻ If Flowmeter parameter is configured with value **0 (flowmeter disabled)**, the Minimum Flow parameter will not be shown in the valve settings menu.

Decimal places =1
Minimum value = 0.0 (parameter disabled)
Maximum value = 100.0 L / min

The Minimum Flow parameter allows the user to configure a minimum flow value in L/min, read from the flowmeter, with which the spraying operation will be performed. Even if the read rate in L/ha is momentarily higher than the target rate, the system will not allow the flow rate to fall below specified parameter value, thus meeting user's application requirements.

The image below shows Minimum Flow parameter setting screen.




Minimum Rate Speed operates in conjunction with Minimum Pressure and Minimum Flow.

When using Minimum Rate Speed, Minimum Pressure and Minimum Flow, the equipment may apply a higher rate than desired if the configured values are overestimated, which may generate phytotoxicity and/or insufficient spraying.

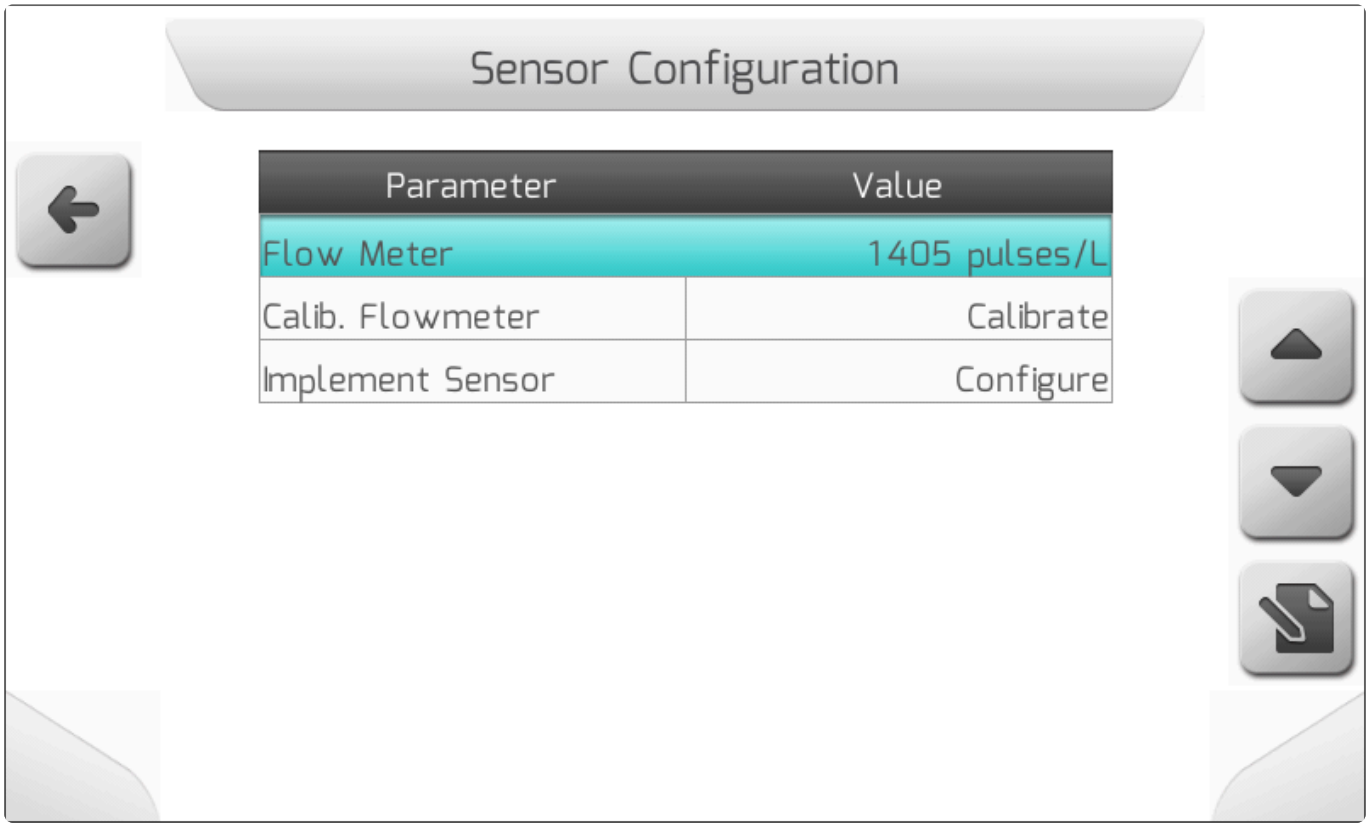
# 8.1.4. Sensors

Screen type = Double list

- Flowmeter
- Flowmeter Calibration
- Implement Sensor

Sensor configuration menu contains sensors related parameters that integrate the sprayer implement used in conjunction with the GeoNave system.

The image below shows an example of sensor configuration menu in its most complete form.




The following subtopics detail each item in its composition.

# 8.1.4.1. Flowmeter

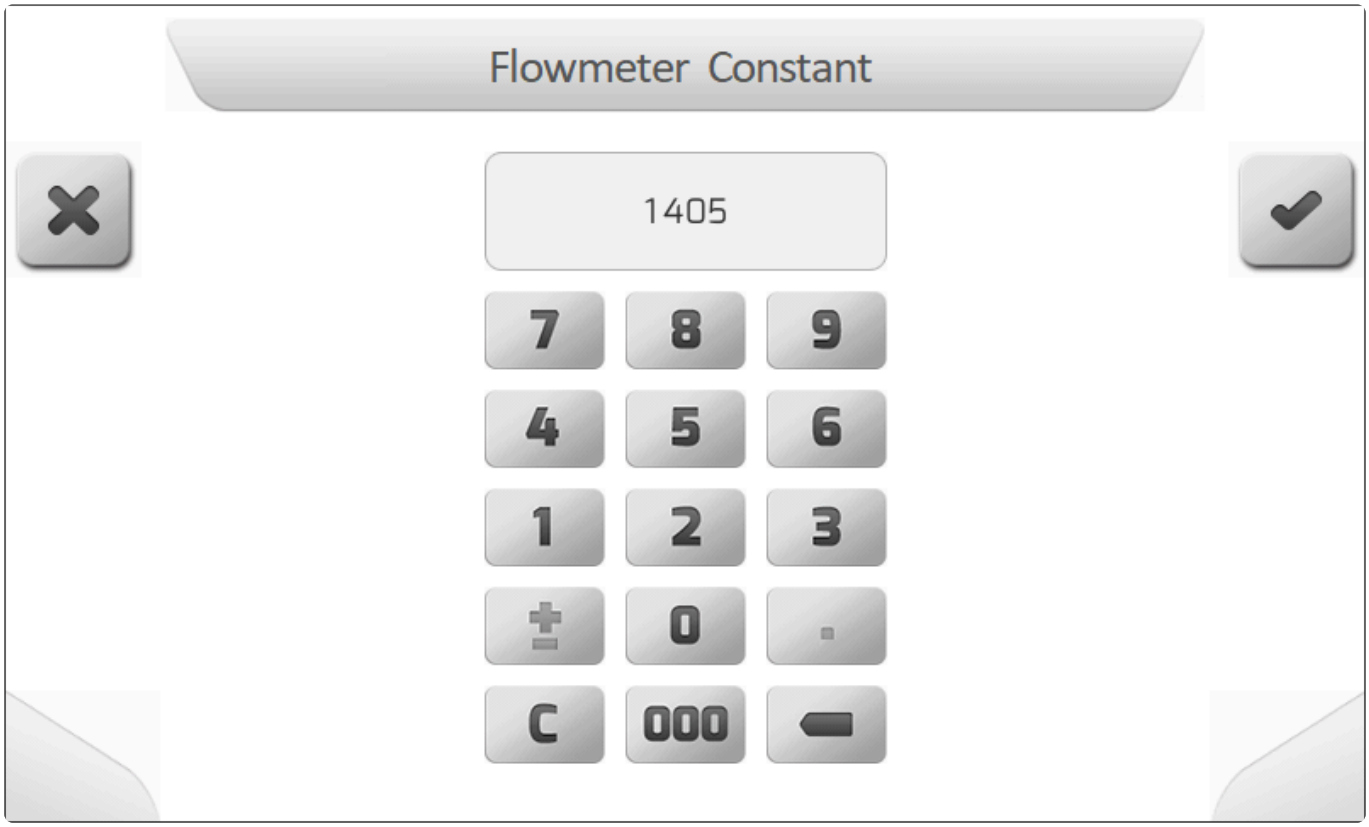
Screen type = Value editing

Decimal places = None
Minimum value = 0 (flowmeter disabled)
Maximum value = 50000 pulses/L

Flowmeter is a sensor responsible for measuring fluid flow that is passing through the spraying circuit controlled by the GeoNave system. The read value is used as calculations input to carry out the flow control, through the Regulation Valve which opens or closes the flow to achieve the desired target rate. The flowmeter is usually defined by the nominal value of its constant, measured in pulses/L, a value that

should be used as a starting point for the procedure of Flowmeter calibration in the sprayer system.

The flowmeter constant value can also be manually edited using the Flowmeter Constant parameter, and its configuration screen is shown in the image below.



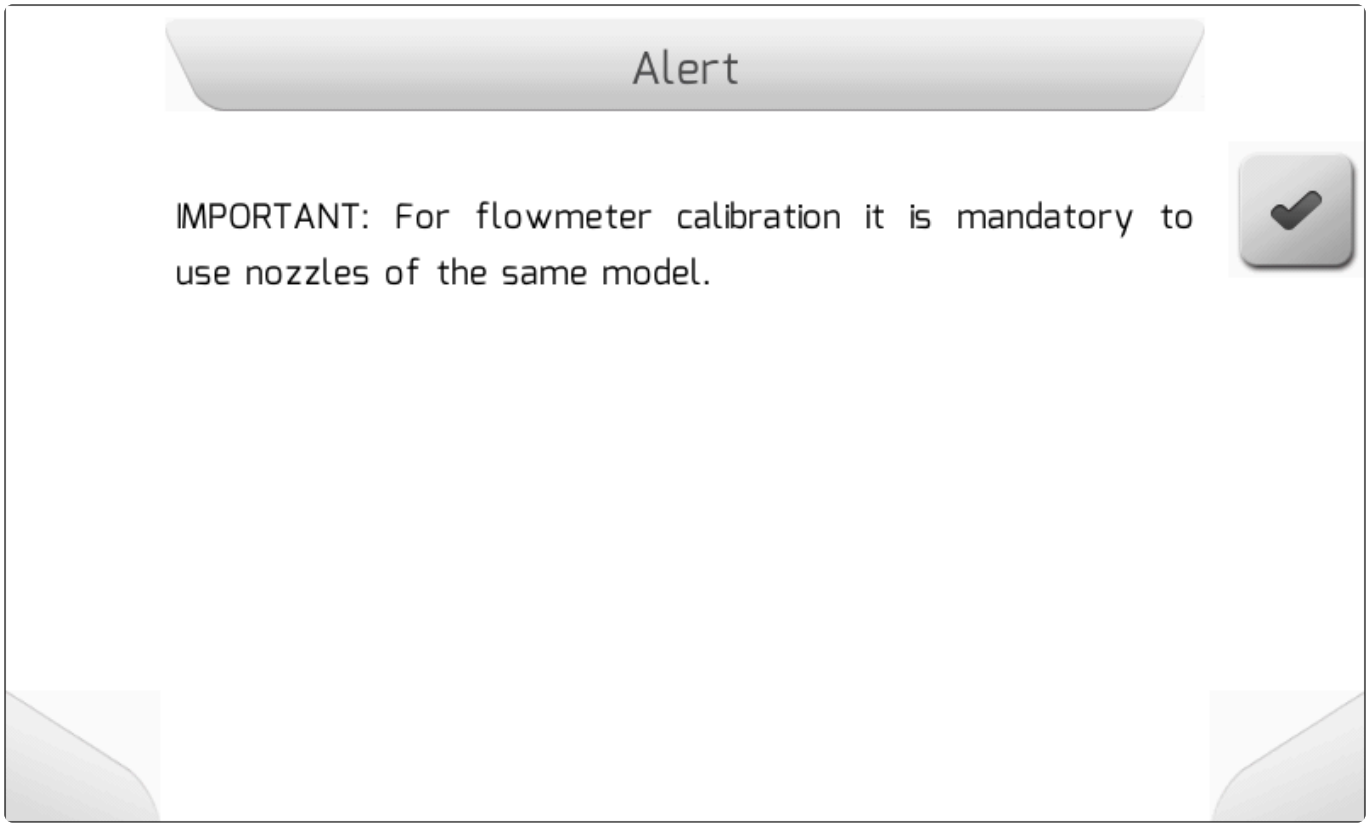

# 8.1.4.2. Flowmeter Calibration

Screen type = Information > Double list > Saving parameter

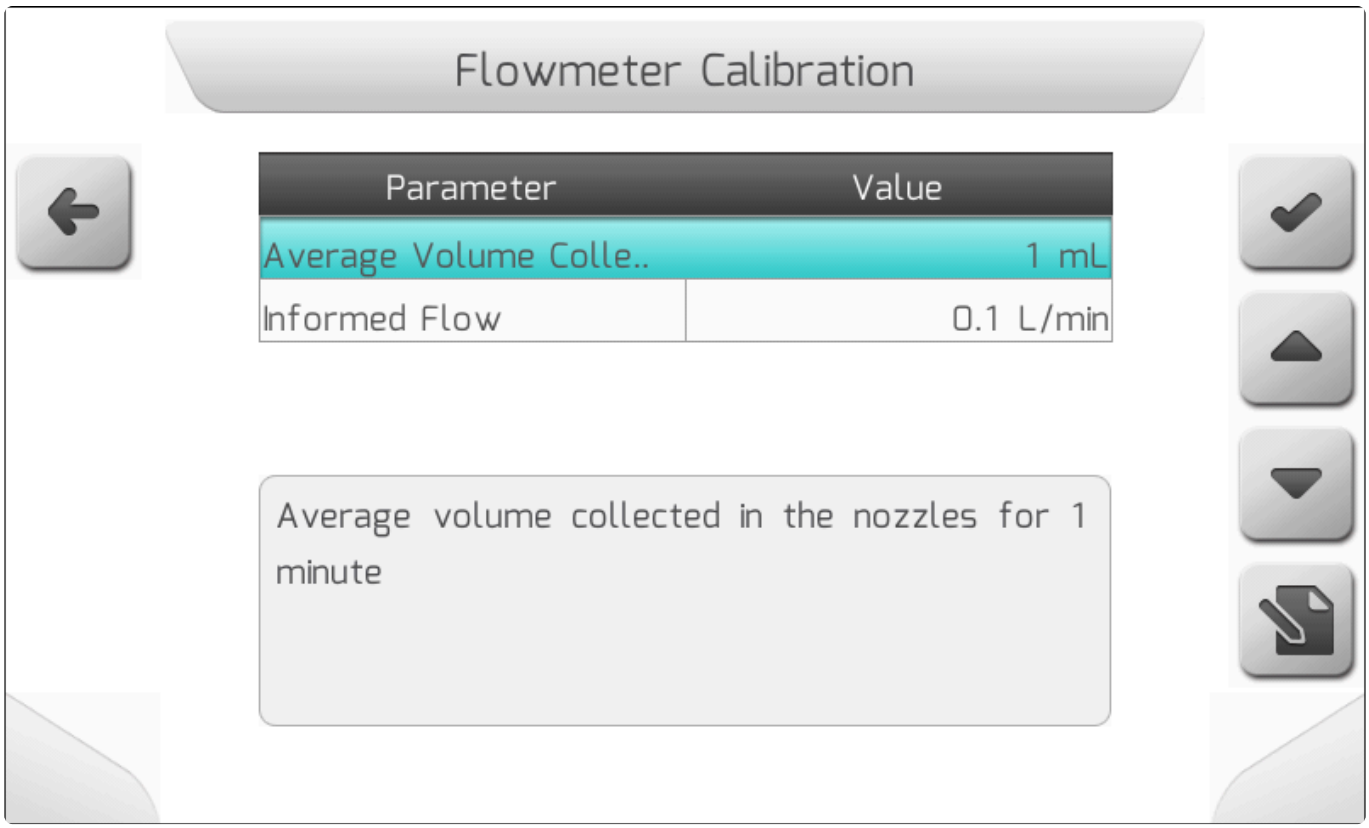
If theFlowmeter parameter is configured with value **0 (flowmeter disabled)**, the Flowmeter Calibration item will not be present in the sensor menu.

Flowmeter calibration procedure is extremely important for the correct flow control performed by the GeoNave system. If the calibration is not done properly, the target rate in L/ha presented by the system will not represent the correct value recommended for the application. The consequences may include product underdose, phytotoxicity due to overdosing, as well as problems in calculations regarding the sprayer tank volume in relation to covered area.

When selecting the Flowmeter Calibration item in the sensor configuration menu and pressing the edit button , initially an Information alert screen will appear, as shown below, recommending that for the calibration to be done correctly is required to use all spraying nozzles of the same model.




Pressing the confirm button  , the screen for entering the values for flowmeter constant calibration will appear, as shown in the image below.




| Parameter | Description |
|---|---|

| | |
|---|---|
| **Average Volume Collected** | Average volume collected value in mL performed with a graduated cup for 1 minute, editable by the button  .<br>• Screen type = Value editing<br>• Decimal places = None<br>• Minimum value = 1 mL<br>• Maximum value = 5000 mL |
| **Informed Flow** | Flow in L/min informed by the GeoNave display on the Simulation spraying screen, editable by button  .<br>• Screen type = Value editing<br>• Decimal places =1<br>• Minimum value = 0.1 L / min<br>• Maximum value = 100.0 L / min |

When setting **Average Volume Collected**, is important that samples are taken from at least 1 nozzle in each section for 1 minute. The greater the number of samples, the better the calibration procedure accuracy.

The value of **Informed Flow** must be observed on the Simulation of spraying screen while keeping all sections open and selecting the target rate and approximate speed at which the operation will be performed in the field. When the value presented in **Flow** information becomes stable, its value must be written down and entered in the **Informed Flow** field of the flowmeter calibration screen.

After the two values of the calibration screen have been entered, press the confirm button  . The system will automatically perform the calculation of the new Flowmeter Constant, and update its value in the corresponding parameter.

# 8.1.4.3. Implement Sensor

Screen type = Double list

Implement Sensor settings related to sensor menu follow the same screens presented in the Work setting item, accessible through the topic Implement Sensor.

# 8.1.5. Tank

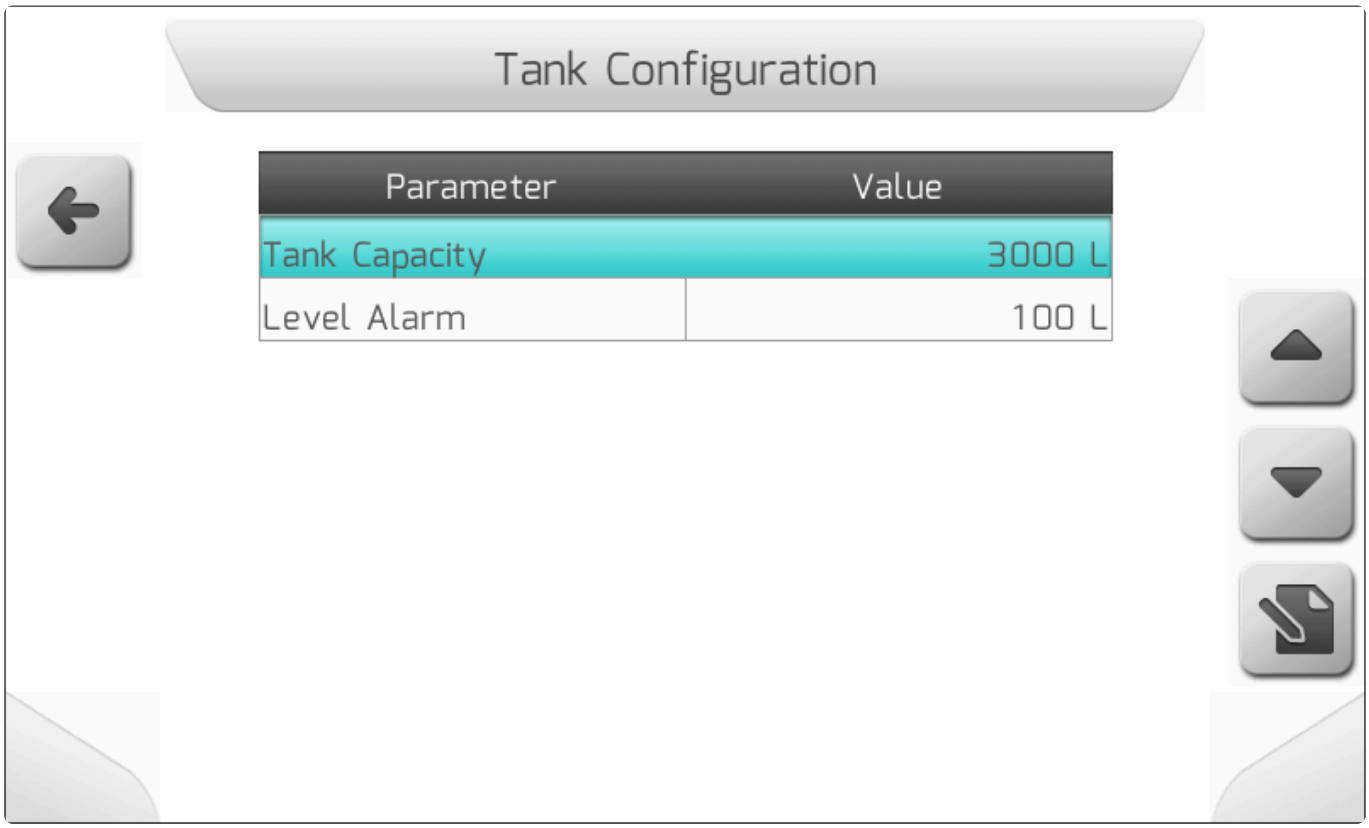
Screen type = Double list

- Tank Capacity

- Level Alarm

If Flowmeter parameter is configured with value **0 (flowmeter disabled)**, the Tank menu will not appear in the spraying settings menu.

The Tank settings menu contains the parameters related to the tank that stores the spraying fluid, as shown in the following image.




The following subtopics present the details of each parameter in the menu composition.

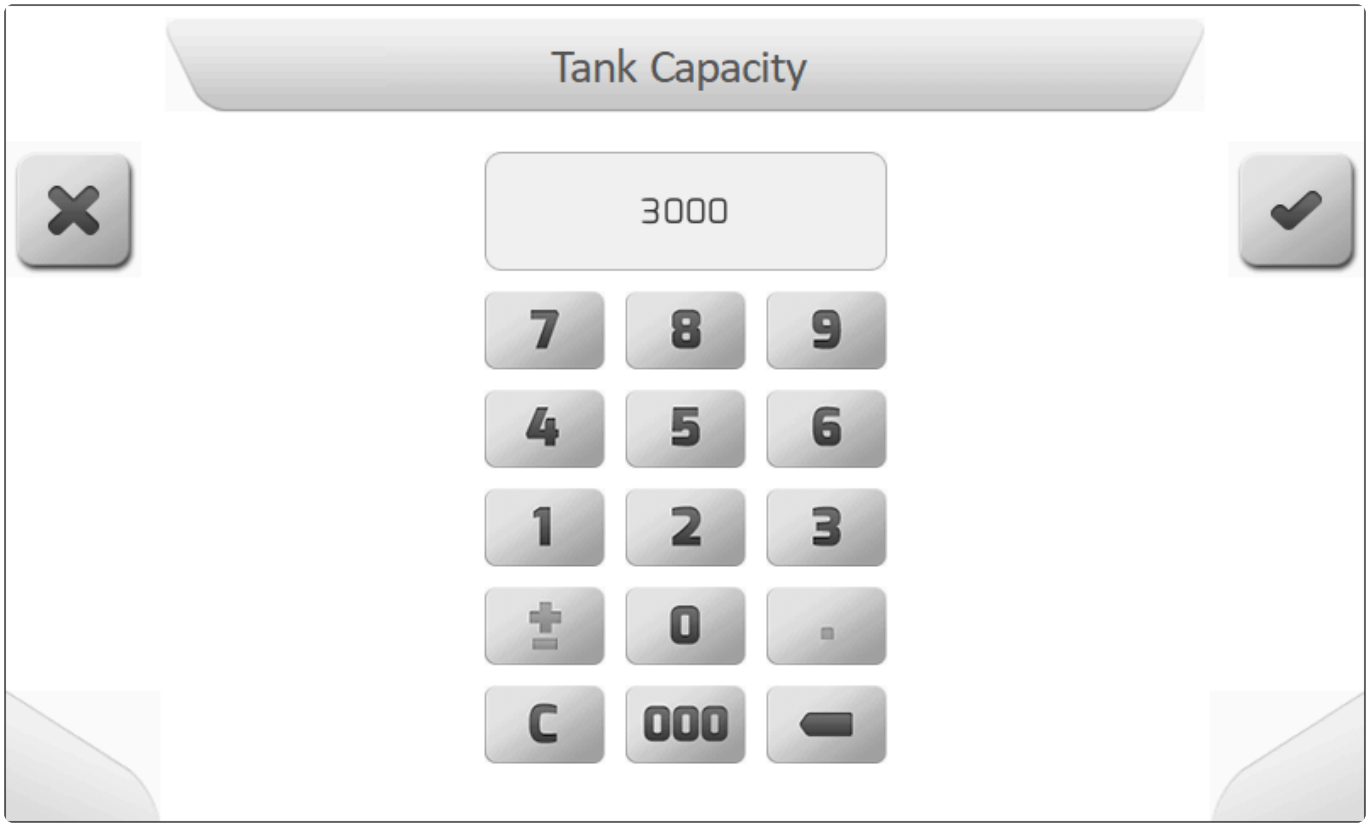
# 8.1.5.1. Tank Capacity

Screen type = Value editing

Decimal places = None
Minimum value = 100 L
Maximum value = 50000 L

Tank Capacity parameter value tells the GeoNave system the total volume of the sprayer implement tank. From the configured value, the system is able to show the current tank level during application and notify the user through Level Alarm when the fluid is about to finish.

The following image shows Tank Capacity parameter setting screen.




The GeoNave system does not have an analog tank level sensor, so calculation is made based on the initial level informed by the user when filling up or changing the level of the tank on the navigation screen, decreasing the amount of fluid that passed through the flowmeter so far. In order for the calculation to be performed as accurately as possible is important that Flowmeter Calibration is done properly.

# 8.1.5.2. Level Alarm

Screen type = Value editing

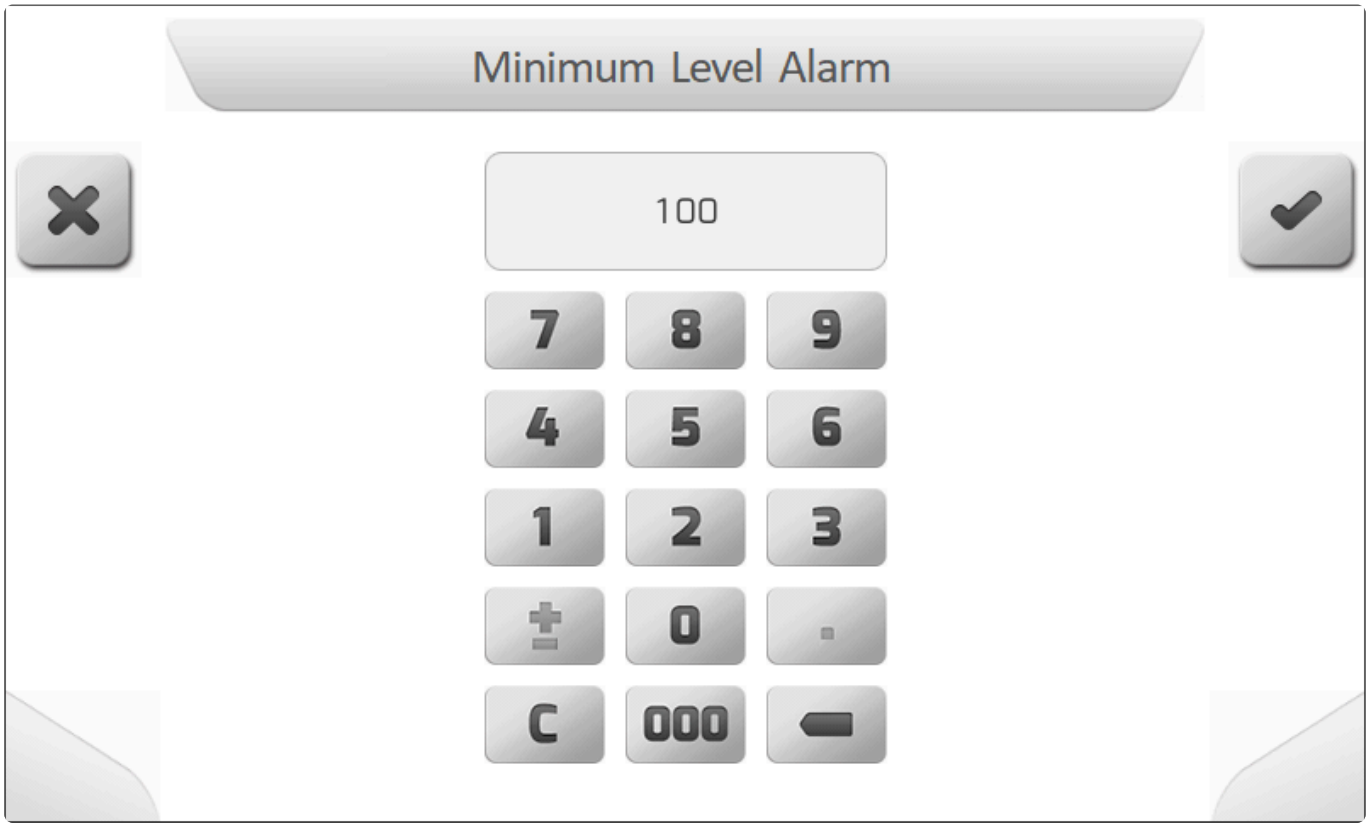
Decimal places = None
Minimum value = 0 (level alarm disabled)
Maximum value = Tank Capacity setting value

Level Alarm parameter defines the tank level below which the GeoNave system must inform the user that the spraying fluid is ending. The alarm is carried out through visual and audible information on the navigation screen, presenting the message **Low tank level** at the Alert Board, and beeping intermittently.

When the tank level reaches zero, the Alert Board message on the navigation screen will change to **Empty tank** and will keep beeping intermittently. The main spraying switch, however, will not be turned off automatically and the user must manually stop spraying operation.

For some spraying pump models, such as diaphragm pumps, dry operation is not recommended. It is important for the user to monitor through system alarms the tank level, to avoid sprayer implement damage.

The Level Alarm parameter setting screen is shown in the image below.




The GeoNave system does not have an analog tank level sensor, so calculation is made based on the initial level informed by the user when filling up or changing the level of the tank on the navigation screen, decreasing the amount of fluid that passed through the flowmeter so far. In order for the calculation to be performed as accurately as possible is important that Flowmeter Calibration is done properly.

# 8.1.6. Diagnosis

Screen type = Vertical menu

- Valves

- Simulation

If Flowmeter parameter is configured with value **0 (flowmeter disabled)**, the Spraying Diagnostics menu will show only the Valves area option, Simulation area will no appear.

Diagnosis menu enables the user to perform various tests in order to analyze the correct operation of the spraying implement components.

The image below shows the spraying diagnostics menu screen.



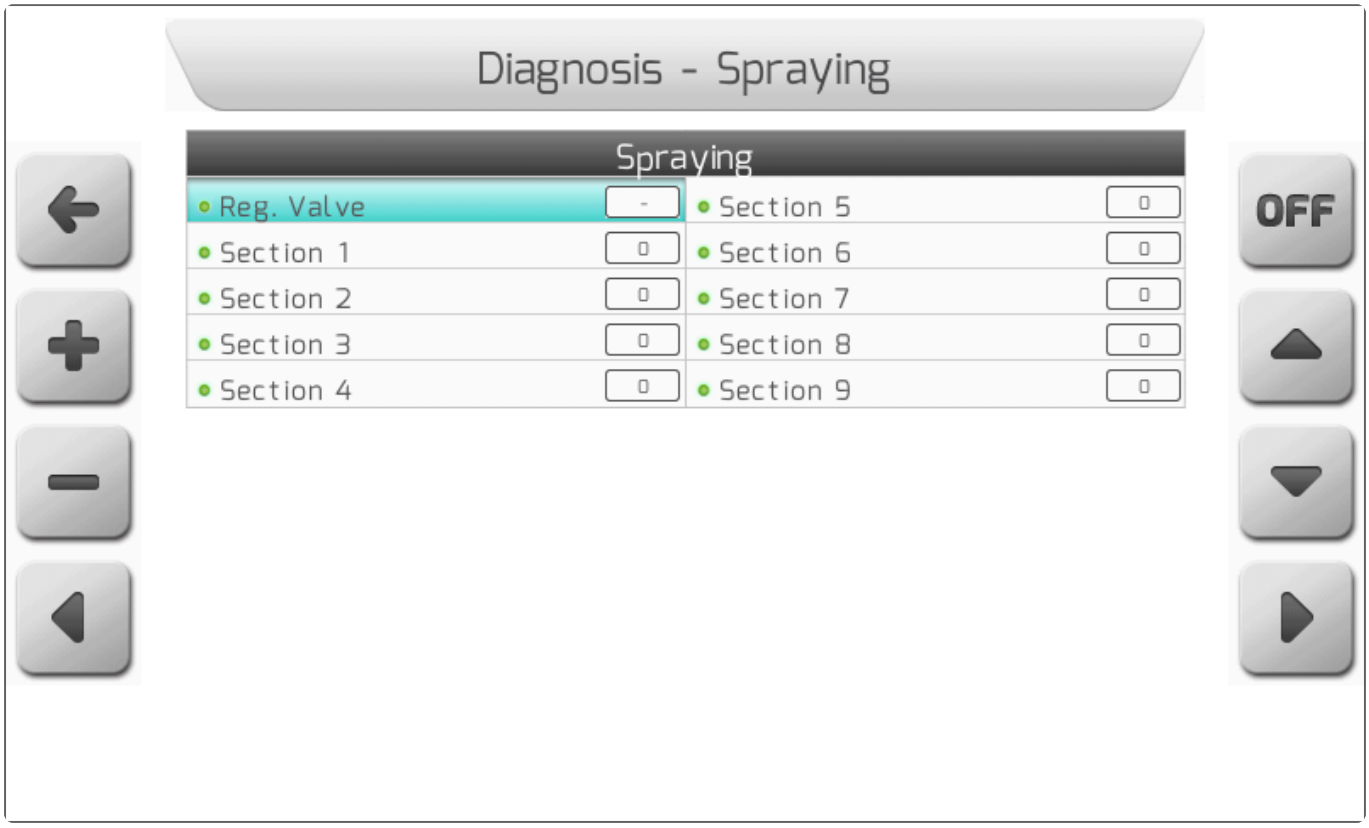

# 8.1.6.1. Valves

Screen type = Actuators diagnosis

If Regulation Valve parameter is configured with value **Not available**, or if the GeoNave system license does not have Flow Control feature – licenses ISO 31FS and ISO 31VS, the Target Rate configuration parameter will not be available for editing.

The Valves diagnosis area allows the user to individually check the correct operation of each of the spraying implement component valves. Valves actuation is performed manually, with the equipment outside its normal spraying operation and in a stationary position.

The following image shows the Valve diagnostics screen of a system example with main valve, regulation valve, and 9 section valves.




- The four arrow keys – , , , – should be used to navigate in the menu and select the valve to be activated.
- The increment button opens the selected valve, its status is displayed on the right side of the valve name as **1** for Main Valve or Section Valves, or **OPEN** for Regulation Valve.
- The decrement button closes the selected valve, its status is displayed on the right side of the valve name as **0** for Main Valve or Section Valves, or **CLOSE** for Regulation Valve.
- To stop Regulation Valve operation, press the valve off button OFF.

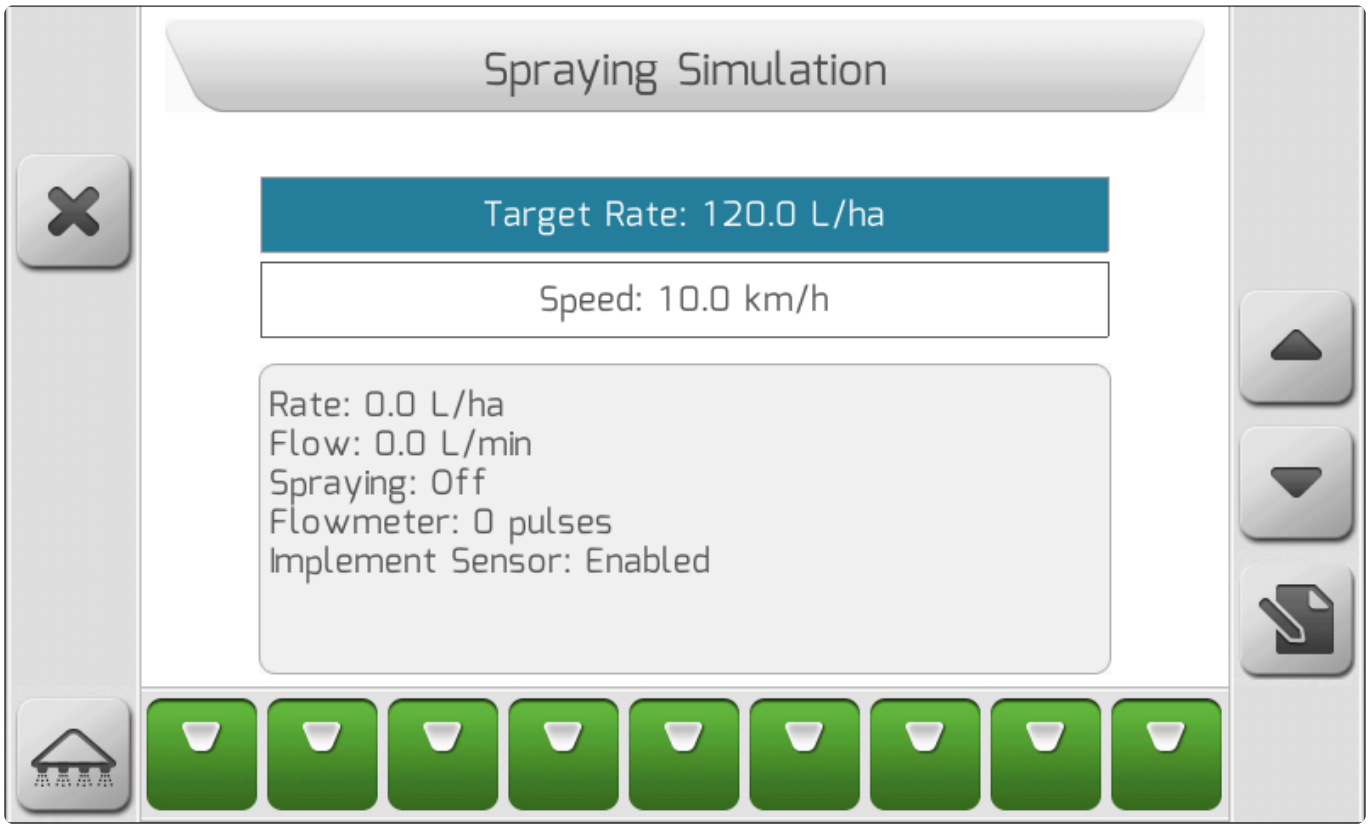
# 8.1.6.2. Simulation

If Flowmeter parameter is configured with value **0 (flowmeter disabled)**, the Spraying Diagnostics menu will show only the Valves area option, Simulation area will not appear.

Spraying Simulation screen is used to perform various tests of the sprayer implement components, with the equipment outside its normal spraying operation and in a stationary position. Below a short list of test that can be performed through this screen.

- Flowmeter Calibration
- Nozzle tests
- Adjusting the calibrated return – for 3-way Section Valves
- Miscellaneous diagnosis

The image below shows the Spraying Simulation screen, detailing each item in its composition.




| Item | Description |
|---|---|
| **Target Rate** | Fixed target rate at which simulation will occur, editable by the button  . A rate value should be selected close to what will be used for effective spraying operation in the field.<br>• Screen type = Value editing<br>• Decimal places = None<br>• Minimum value = 10 L/ha<br>• Maximum value = 1000 L/ha |
| **Speed** | Machine speed to perform the simulation, editable by the button  . A speed value selected must be close to that used in the effective spraying work in the field.<br>• Screen type = Value editing<br>• Decimal places = 1<br>• Minimum value = 1.0 km/h<br>• Maximum value = 150.0 km/h |
| **Rate** | Rate in L/ha read from the spraying system, considering the Flowmeter Constant currently configured. |
| **Flow** | Flow in L/min of the spraying system, considering the Flowmeter Constant currently |

| | |
|---|---|
| | configured.<br>• Flow value must be used in the field **Informed Flow** of Flowmeter Calibration. |
| **Spraying** | Main spraying switch status – **Off** or **On**. The status can be changed by Application Button, or by the touch sensitive button to switch on the spraying  . |
| **Flowmeter** | Value of pulses/min read from the flow meter.<br>• This value must be used to diagnose whether the flowmeter is operating correctly. |
| **Implement Sensor** | Implement Sensor configuration status – **Able** or **Disabled**. |
| **Section switch buttons** | Touch sensitive buttons for operating the sections, at the bottom of the Spraying Simulation screen. The width of the buttons depends on currently configurated sections number – 1 to 9. The buttons can assume the following states.<br>•  – Section open and applying<br>•  – Section open and not applying<br>•  – Closed section |

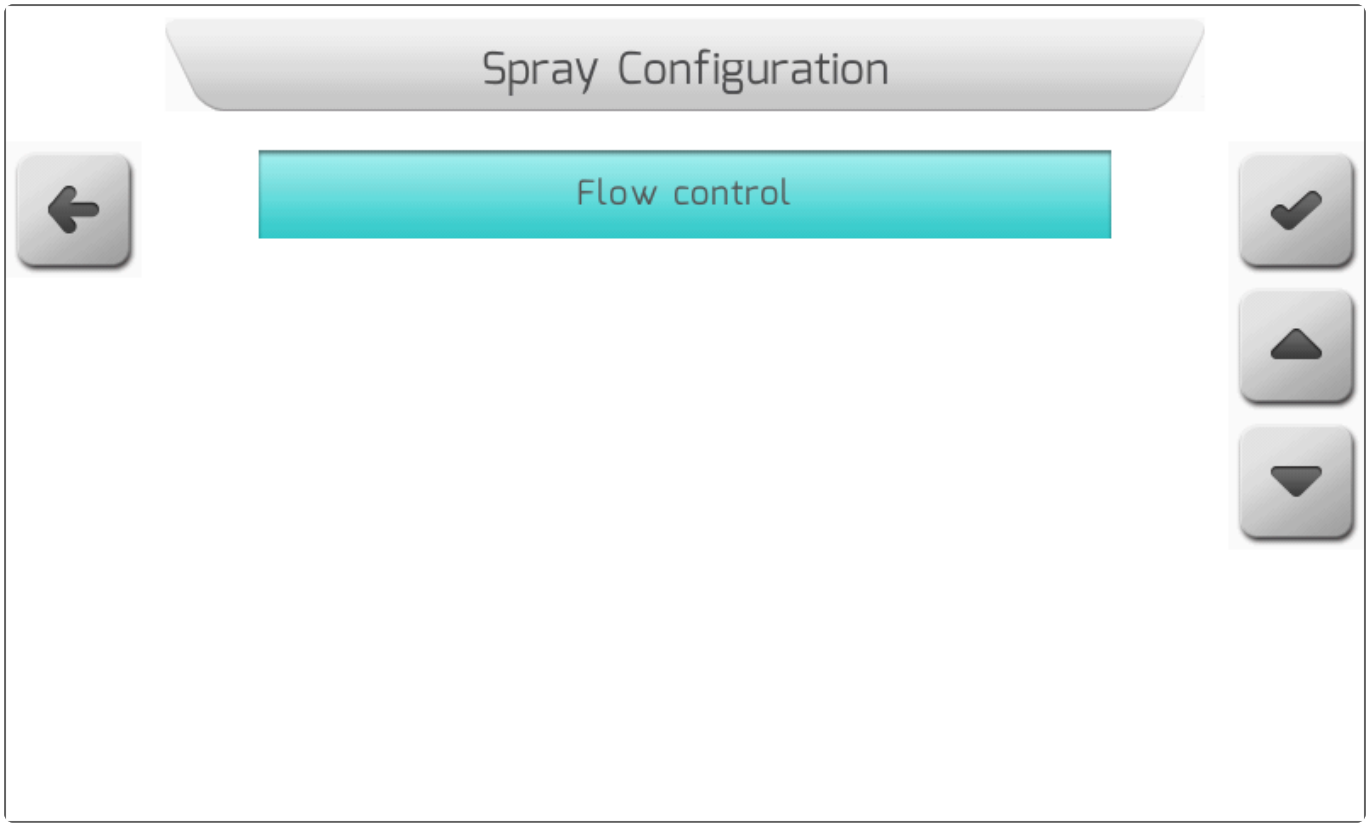
# 8.1.7. Advanced Settings

Screen type = Vertical Menu

If Flowmeter parameter is configured with value **0 (flowmeter disabled)**, or if the Regulation Valve is configured with value **Not available**, or even if GeoNave system license does not have Flow Control feature – licenses ISO 31FS and ISO 31VS, the Advanced Settings area will not be available in the spraying settings menu.

The spraying settings menu includes the Advanced Settings area, accessible by the user using a password. Parameters shown in this area should be changed only if system flow and pressure are not stable.

Selecting the Advanced Settings option in the spraying menu and pressing the confirm button  , the user's password will be required on the Entering password screen. By typing the correct password and confirming, the Advanced Settings menu screen will be displayed, as shown in the image below.



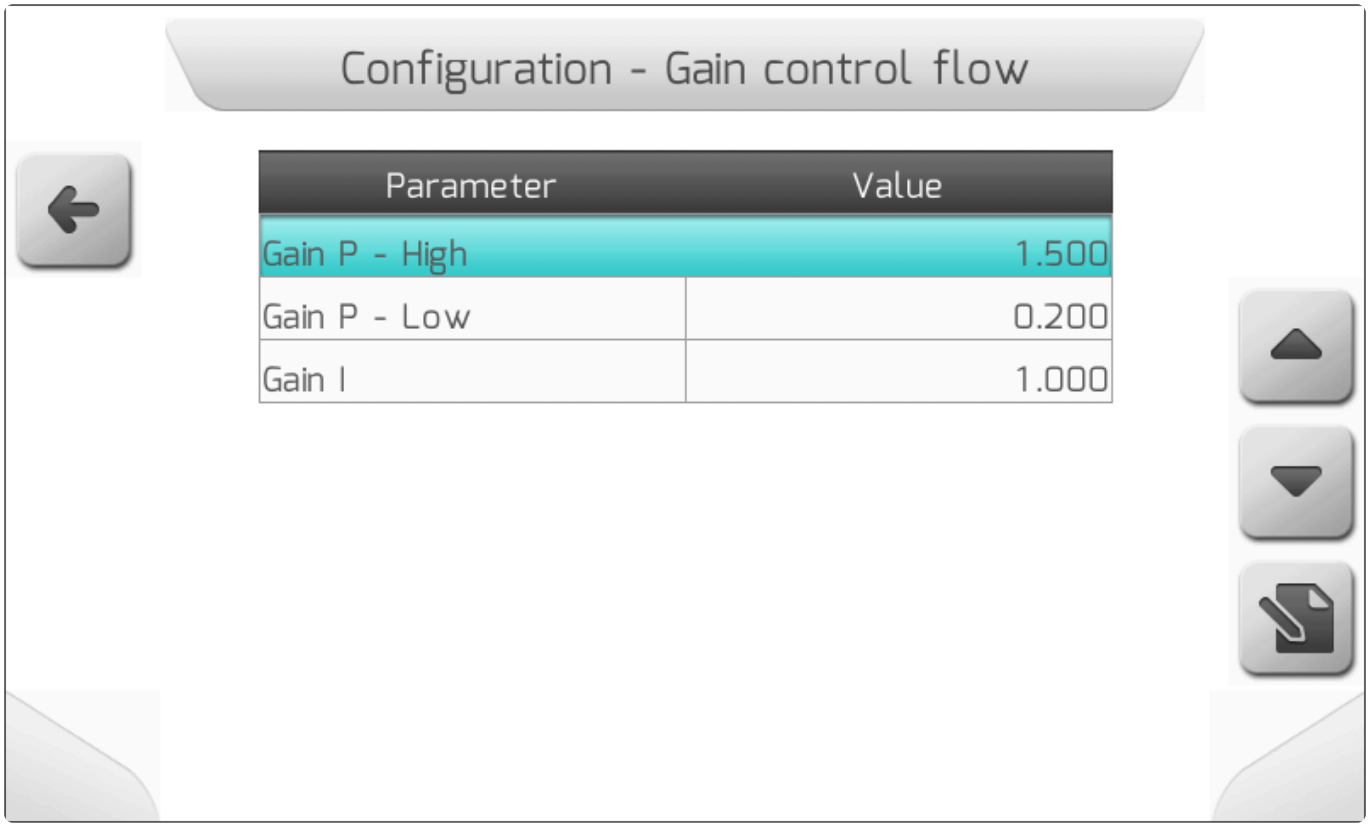

The next subtopic describe the items that composes the Advanced Settings menu.

# 8.1.7.1. Flow Control

Screen type = Double list

The parameters that composes the Flow Control menu are responsible for fine adjustments of the flow control performed by the GeoNave system, using the flowmeter as a sensor and the regulation valve as actuator. The gain values should be changed only if the flow and pressure of the system, during normal spraying operation, do not remain stable.

The image below shows the Flow Control menu screen, with a description of possible gains to be edited.




| Gain | Description |
|---|---|
| **P Gain – High** | High flow Proportional control gain. Change its value when the system is operating in an oscillatory manner, and the difference between flow read and target flow is greater than 3 L/min.<br>• Screen type = Value editing<br>• Decimal places =3<br>• Minimum value = 0.001<br>• Maximum amount = 100,000 |
| **P Gain – Low** | Low flow Proportional control gain. Change its value when the system is operating in an oscillatory manner, and the difference between flow read and target flow is less than 3 L/min.<br>• Screen type = Value editing<br>• Decimal places =3<br>• Minimum value = 0.001<br>• Maximum amount = 100,000 |
| **I Gain** | Integrative control gain. Change its value to smooth regulation valve opening and closing, according to previously configured parameters.<br>• Screen type = Value editing<br>• Decimal places =3<br>• Minimum value = 0.001<br>• Maximum amount = 100,000 |

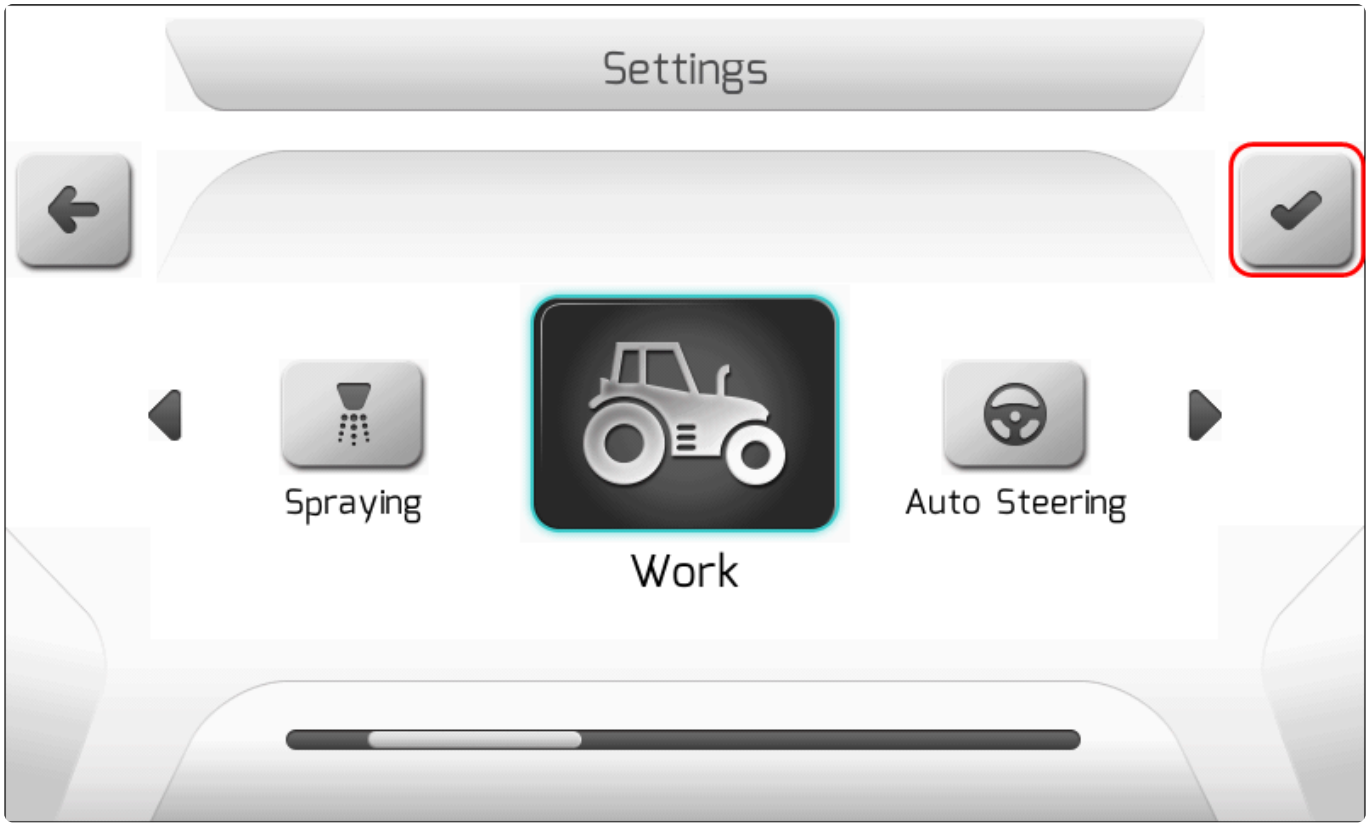
# 8.2. Work

Screen type = Double list

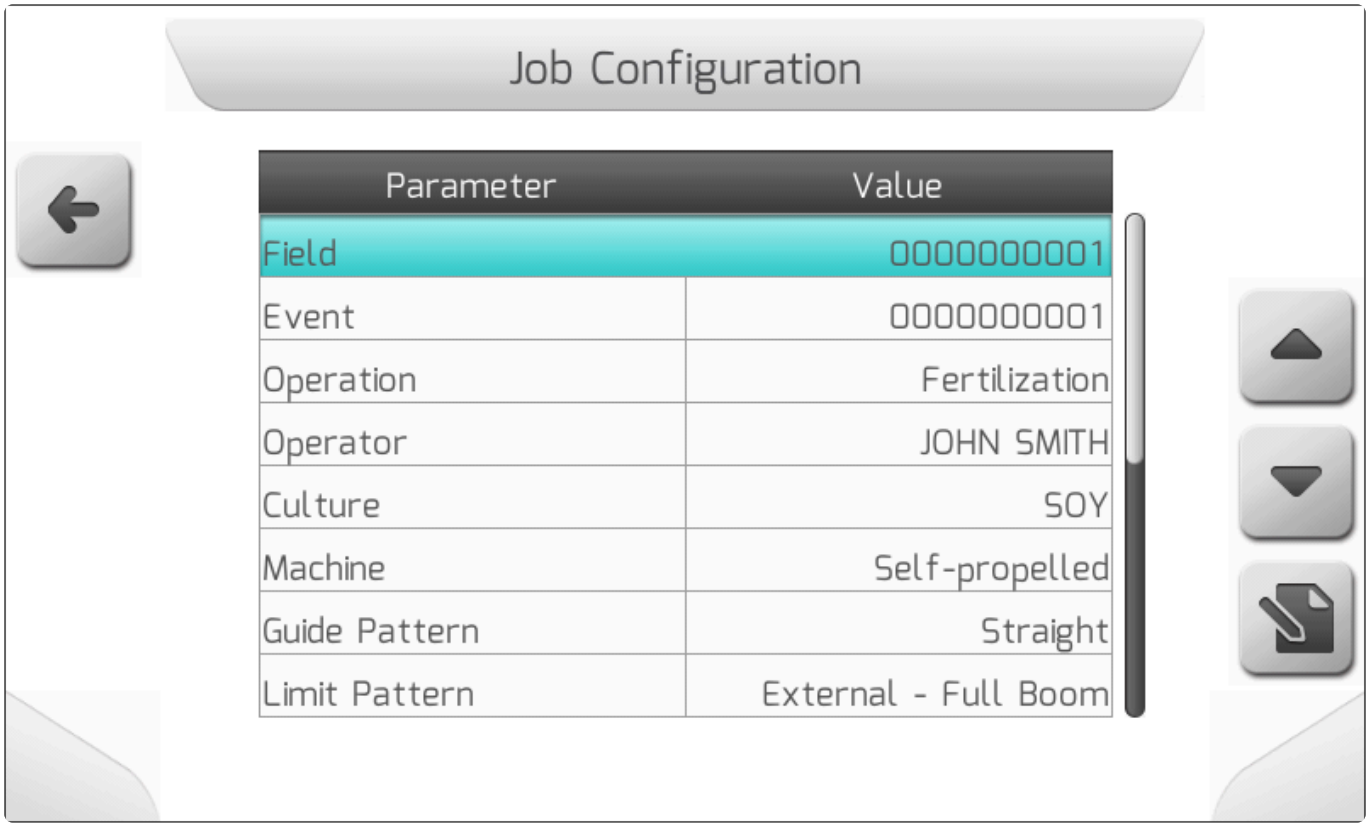
- Field
- Event
- Operation
- Operator
- Culture
- Machine
- Guide Pattern
- Limit Pattern
- Implement
- Hitch Type
- Implement Sensor
- Implement Distance
- Lateral offset
- Overlap
- Antenna – Hitch Distance
- Hitch – Ground Contact Distance
- Hitch – Boom Distance

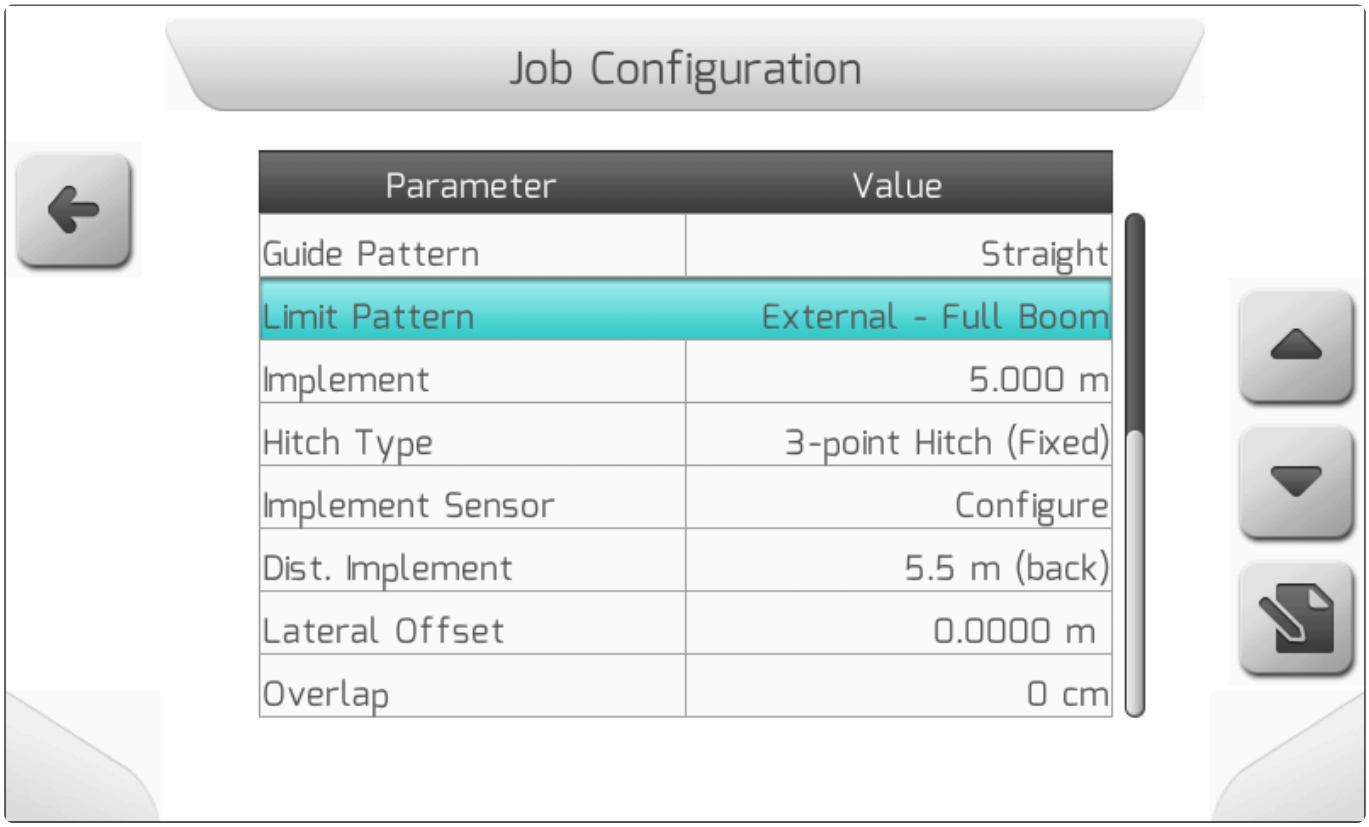
The Work parameter area, inside the settings menu, is a menu where the user can found the GeoNave system settings concerning agricultural machine, operator, culture, various operation parameters, among other relevant work items.

To access the menu, the user must select the Work item and press the confirm button  , as shown in the image below.




Then the Work settings menu will be displayed, as shonw in the images below.




The Work settings menu has some peculiarities, listed below.

- If the Operation is configured as Spraying, the Implement is shown with its value in meters, followed by the Number of Nozzles value between parenthesis. If the Operation is not configured as Spraying, the number of nozzles will not be displayed.

- If Hitch Type parameter is set to 3-point Hitch (Fixed), the Implement Distance is displayed in the menu.

- If Hitch Type parameter is configured as Drawbar, 3 other parameters are shown in the menu.
  - Antenna – Hitch Distance
  - Hitch – Ground Contact Distance
  - Hitch – Boom Distance

In the next topics, each areas that composes the Work settings menu will be detailed.

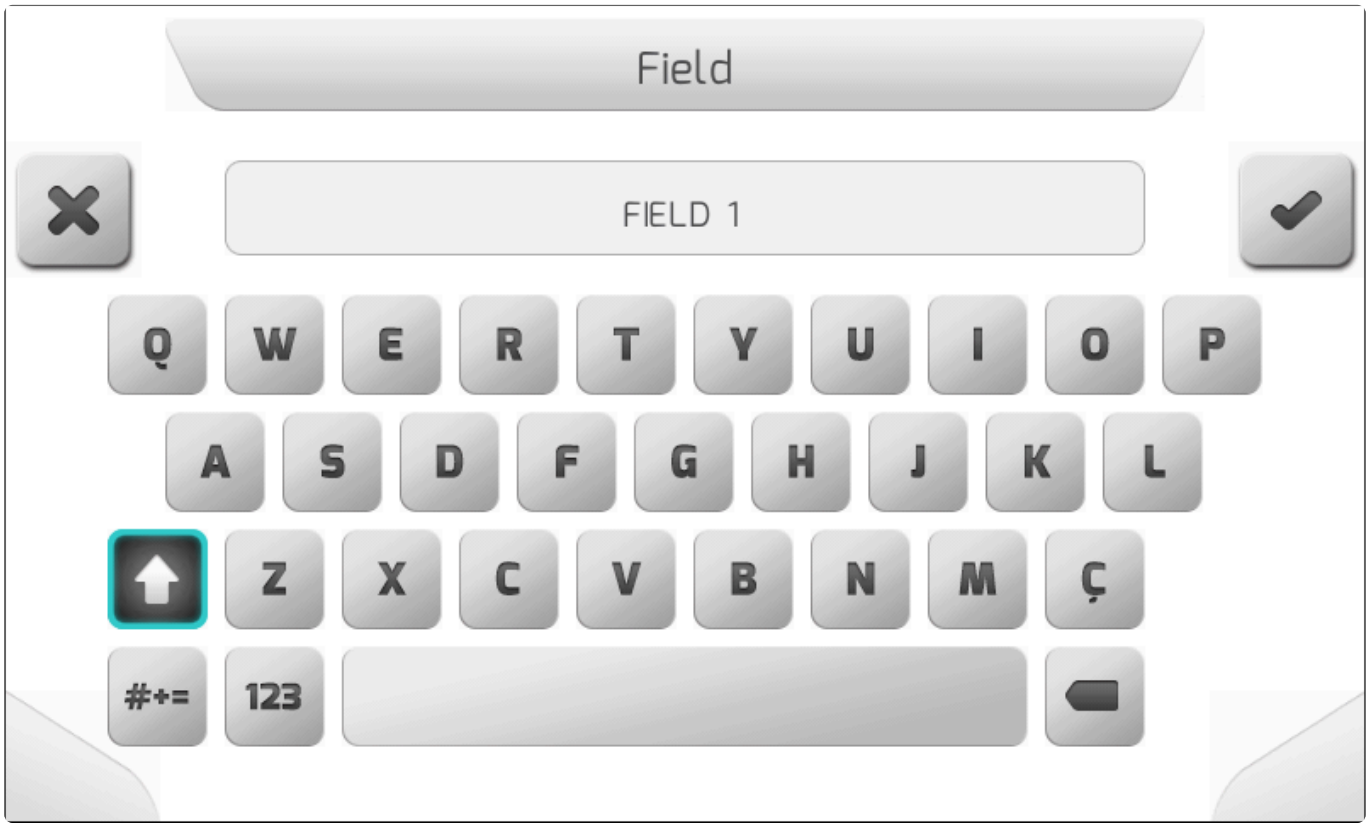
# 8.2.1. Field

Screen type = Text editing

Maximum text size = 40 characters

Field parameter defines the name of the area in which agricultural operations will be carried out. It is also used to name the field file that will be saved in the internal memory and later can be downloaded to a flash drive for viewing on the IsoFarm platform.

The image below shows the field name configuration screen.



# 8.2.2. Event

Screen type = Text editing

Maximum text size = 40 characters

Event name identifies the agricultural operation that will be carried out in a field. The parameter is also used to name the event file that will be saved in the internal memory and later can be downloaded to a flash drive for viewing on the IsoFarm platform.

The screen for configuring the event name is shown in the following image.

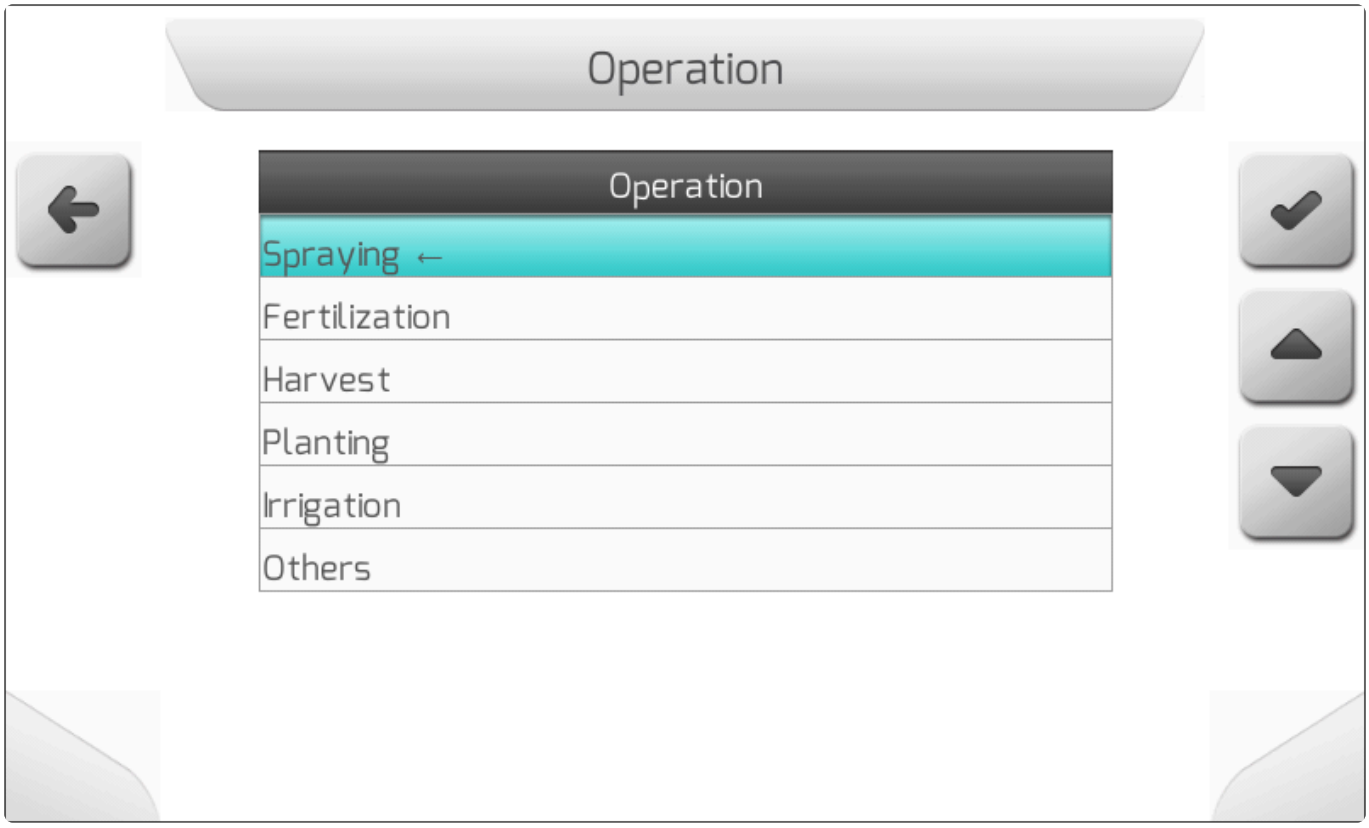



# 8.2.3. Operation

Screen type = Simple list

Operation parameter defines the implement type that will be used in collaboration with the GeoNave system. According to the chosen operation, system menus and navigation screen assume different settings.

Operation parameter can assume one of the values shown in the image below.




# 8.2.4. Operator

Screen type = Text editing

Maximum text size = 40 characters

Operator parameter is used to identify the name of the person who will operate the agricultural machine on which the GeoNave system is installed.

The screen for setting the Operator name parameter is shown in the following image.




# 8.2.5. Culture

✻ Screen type = Text editing

✻ Maximum text size = 40 characters

The Culture parameter identifies the plant cultivation in the area in which the agricultural operation is being carried out by the GeoNave system.

The screen for setting the Culture name parameter is shown in the following image.




# 8.2.6. Machine

Screen type = Text editing

Maximum text size = 40 characters

The Machine parameter defines the agricultural machinery model name in which the GeoNave system is installed.

The figure below shows the Machine name parameter setting screen.

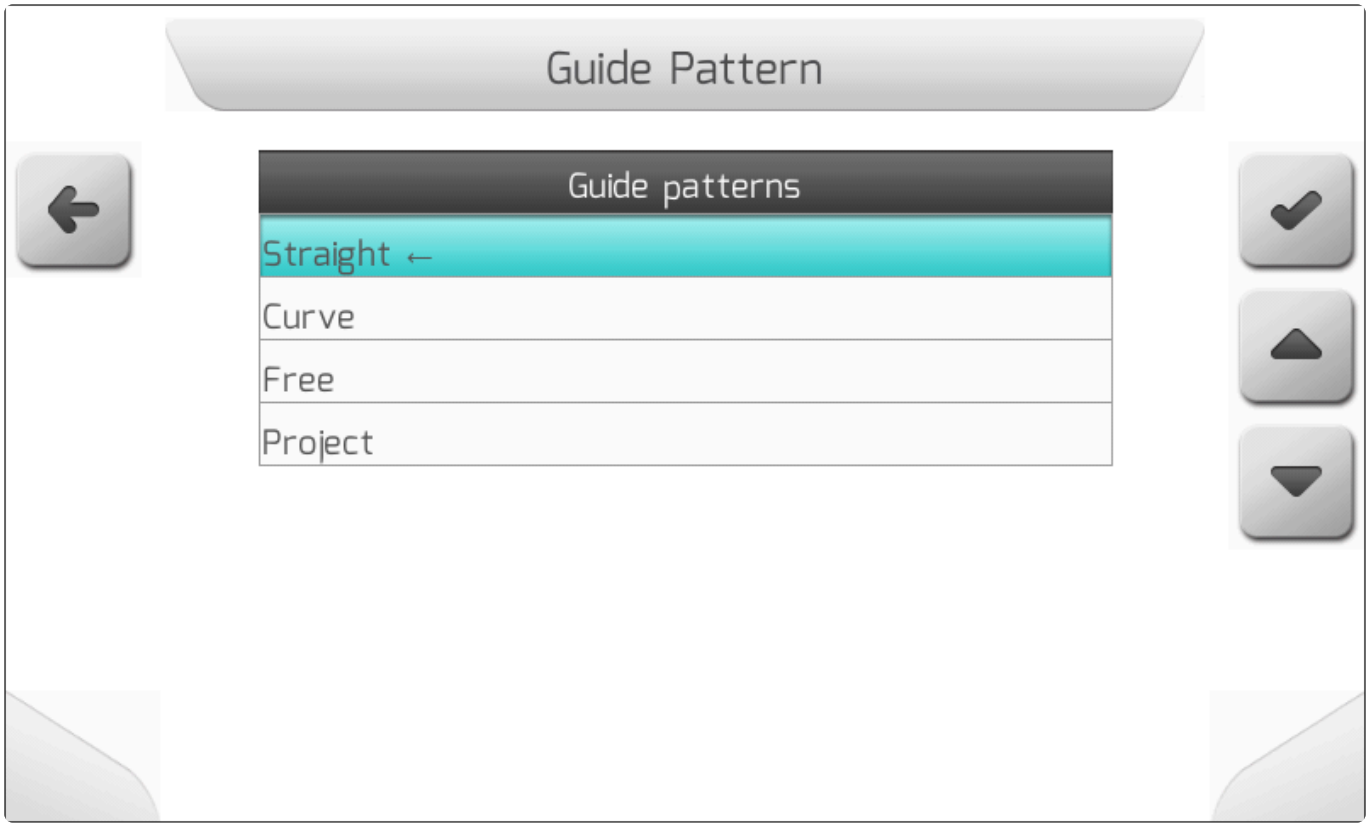



# 8.2.7. Guide Pattern

Screen type = Simple list

The Guide Pattern parameter determines which guide lines will be used during navigation in a field. Depending on the type of guide selected, the system menus and the navigation screen assume different settings.

The possible values for the Guide Type parameter are shown in the following image.



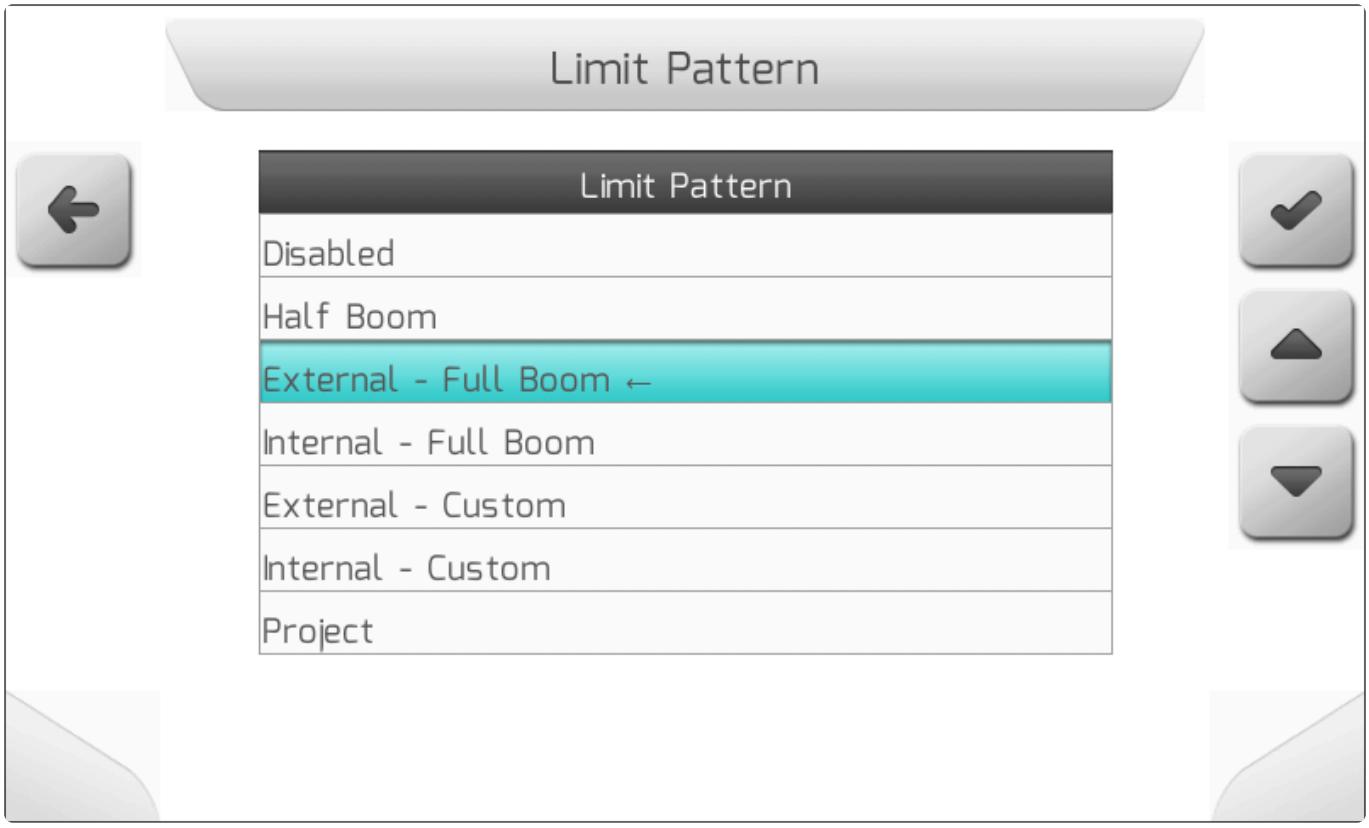

Details on using each of the guide options are found at Create a Guide.

# 8.2.8. Limit Pattern

Screen type = Simple list

The Limit Pattern parameter defines how the boundary line will be generated during navigation in a field. Depending on the type of limit chosen, system menus and navigation screen assume different settings.

The possible values for the Limit Pattern parameter are shown in the following image.




Details on the use of each of the limit options are found in Create a Boundary.

# 8.2.9. Implement

Screen type = Value editing with image

Decimal places =3
Minimum value = 1,000 m
Maximum value = 50,000 m

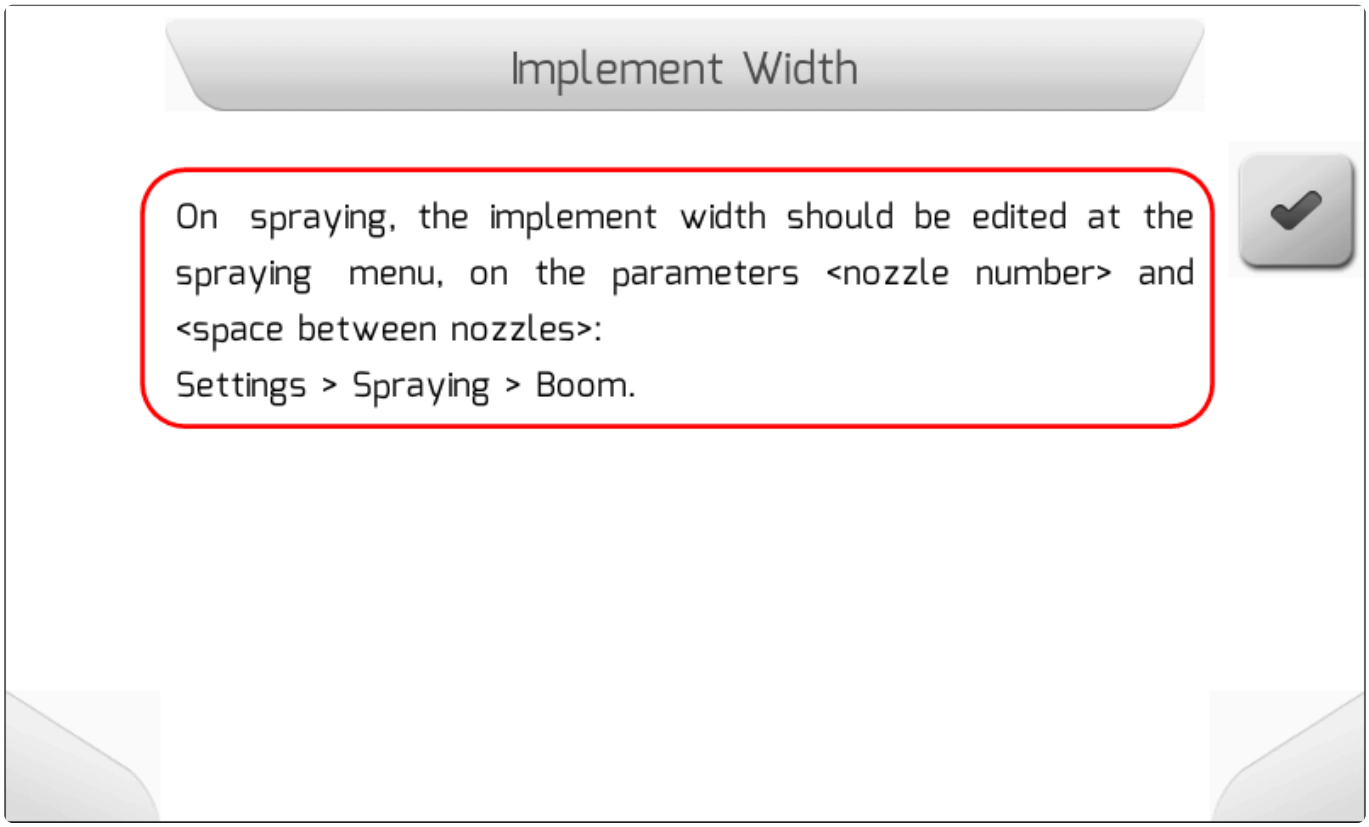
Implement parameter sets the width of the agricultural implement used in the GeoNave system operation. Together with the Overlap parameter, the implement width defines the distance between the parallel navigation guides that the machine must travel to fill the entire field area with the agricultural operation being performed.

The following are some considerations about the implement parameter.

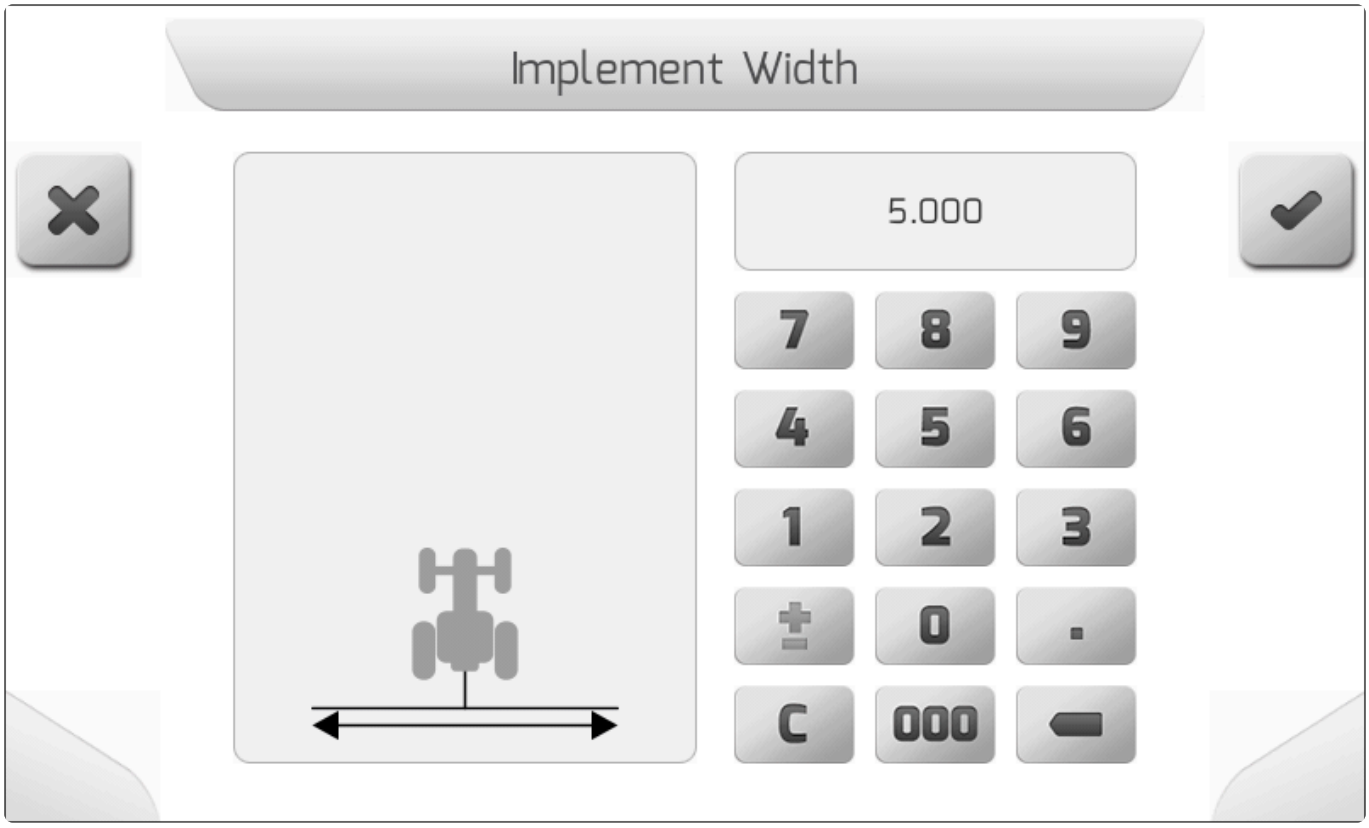
- If Operation parameter is configured as Spraying, the Implement parameter is shown with its value in meters, followed by the Number of Nozzles value between parenthesis. If Operation parameter is not configured as Spraying, the number of nozzles will not be displayed.

- If Operation parameter is configured as Spraying, the Implement parameter value cannot be edited in the Work menu. Its value will be the result of the multiplication between the values of Number of

Nozzles and Nozzle Spacing parameters. When touching the edit button  , the alert screen shown below will be displayed.




- If Operation parameter is not configured as Spraying, the screen for editing implement width value will be displayed as shown in the following image. The screen contains the self-explanatory image of its meaning.

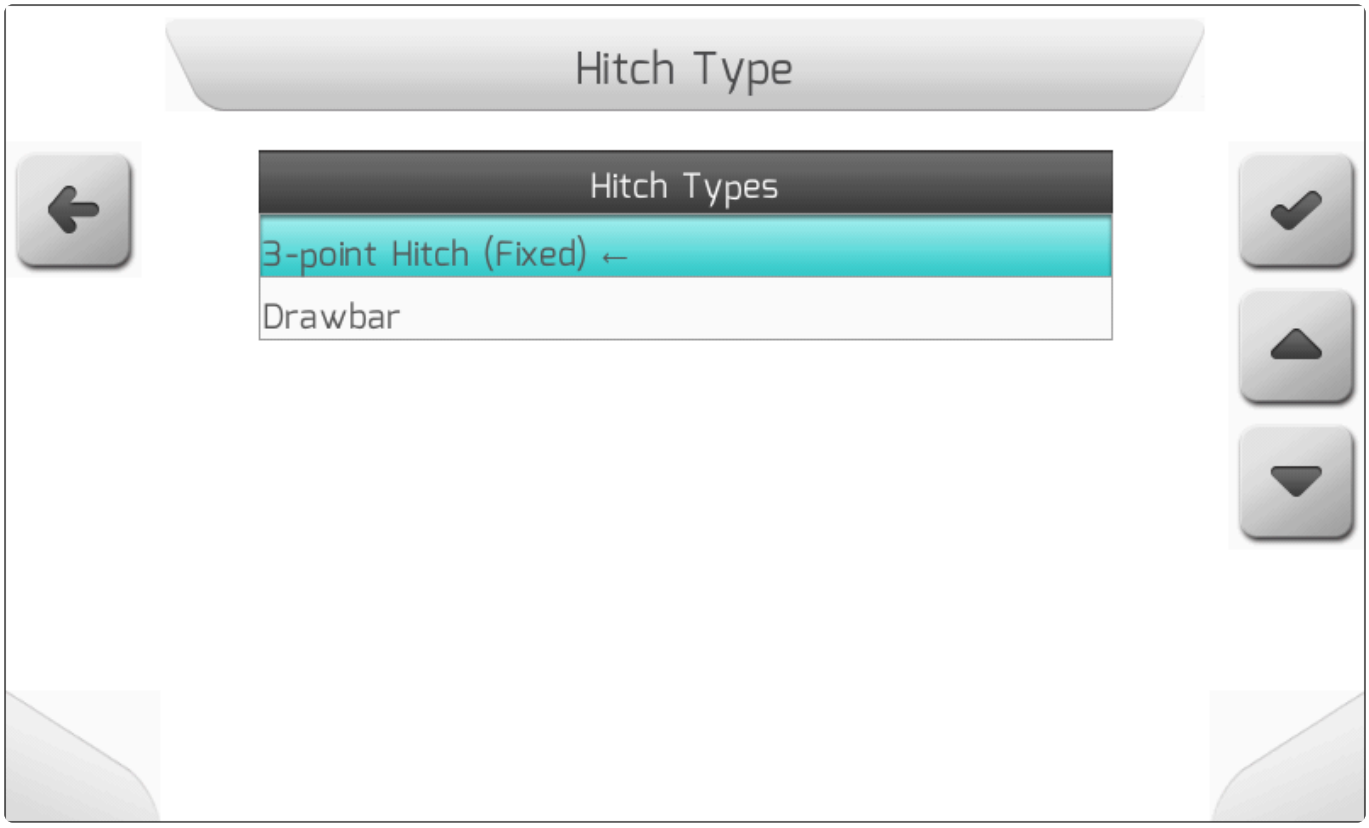



# 8.2.10. Hitch Type

Screen type = Simple list

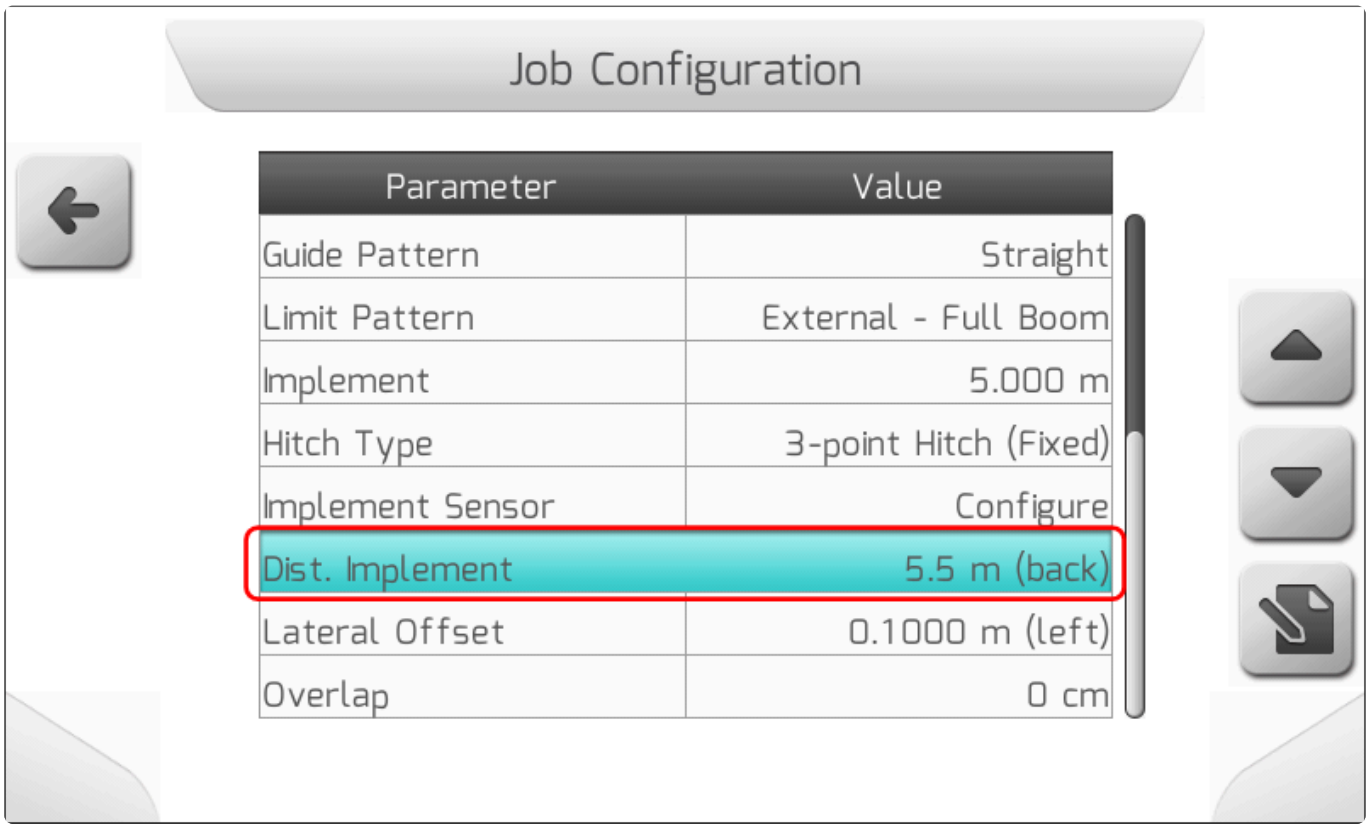
The Hitch Type parameter tells the GeoNave system how the implement is mechanically attached to the tractor. Depending on the type of coupling selected, system menus and navigation screen assume different settings.

The following image shows the Hitch Type configuration screen.




Below are some considerations about the Hitch Type parameter.

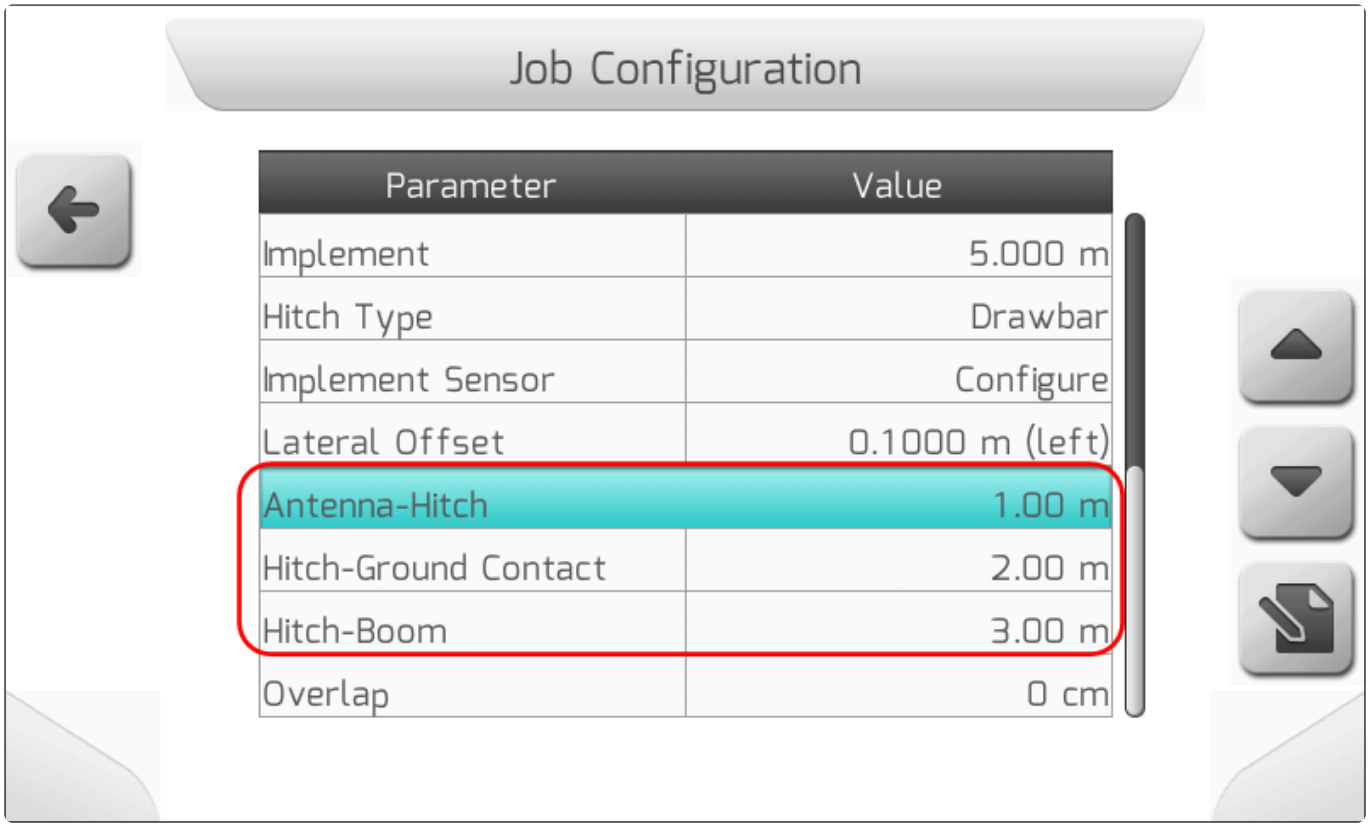
- If the Hitch Type parameter is set to **3-point Hitch (Fixed)**, the parameter of Implement Distance is displayed in the menu, as shown in the following image.




- If the Hitch Type parameter is set to **Drawbar**, 3 other parameters are displayed in the menu

referring to the implement dimensions in relation to the tractor.

- Antenna – Hitch distance
- Hitch – Ground Contact distance
- Hitch – Boom distance




# 8.2.11. Implement Sensor

Screen type = Double list

Implement Sensor parameter is used to configure the installation of an inductive sensor that identifies implement lifting position – whether it is lowered or raised. This type of sensor is commonly used in sowing implements, due to the fact that the implement plants the seed in the path only when lowered. When identifying the implement sensor in the state **Down**, the GeoNave system automatically turn on the trail, without the need for any action by the user. And, in the same way, when detecting the implement in the state **Lifted up**, the trail is automatically turned off.

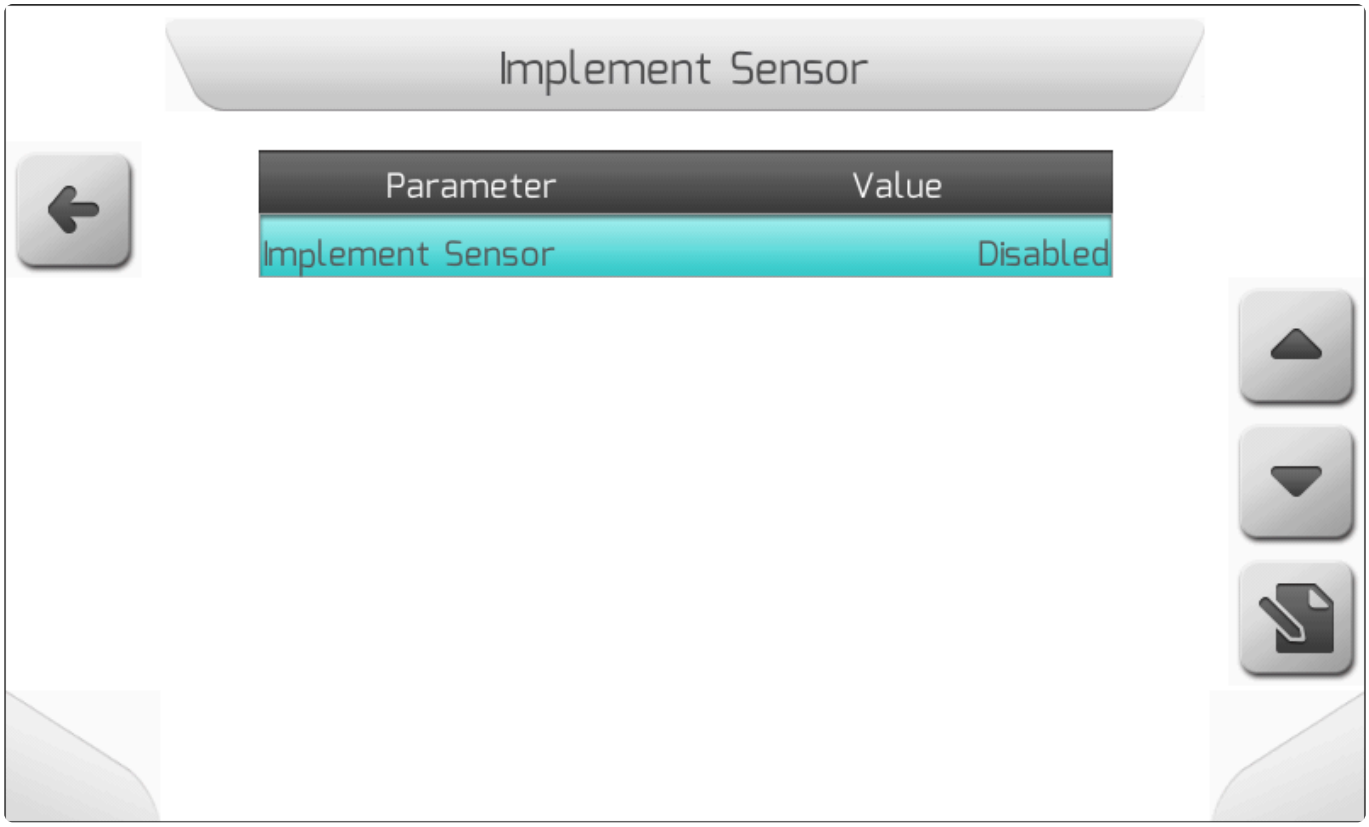
The possible values for Implement Sensor parameter are shown in the table below.

| Value | Description |
|---|---|
| **Disabled** | The implement sensor is not connected to the GeoNave system, and its function is disabled. |
| **Enabled – CX-8** | The implement sensor is functional and connected to the CX-8 connector on the rear face of GeoNave display. |
| **Enabled –** | The implement sensor is functional and connected to the CX-9 connector on the rear face of |

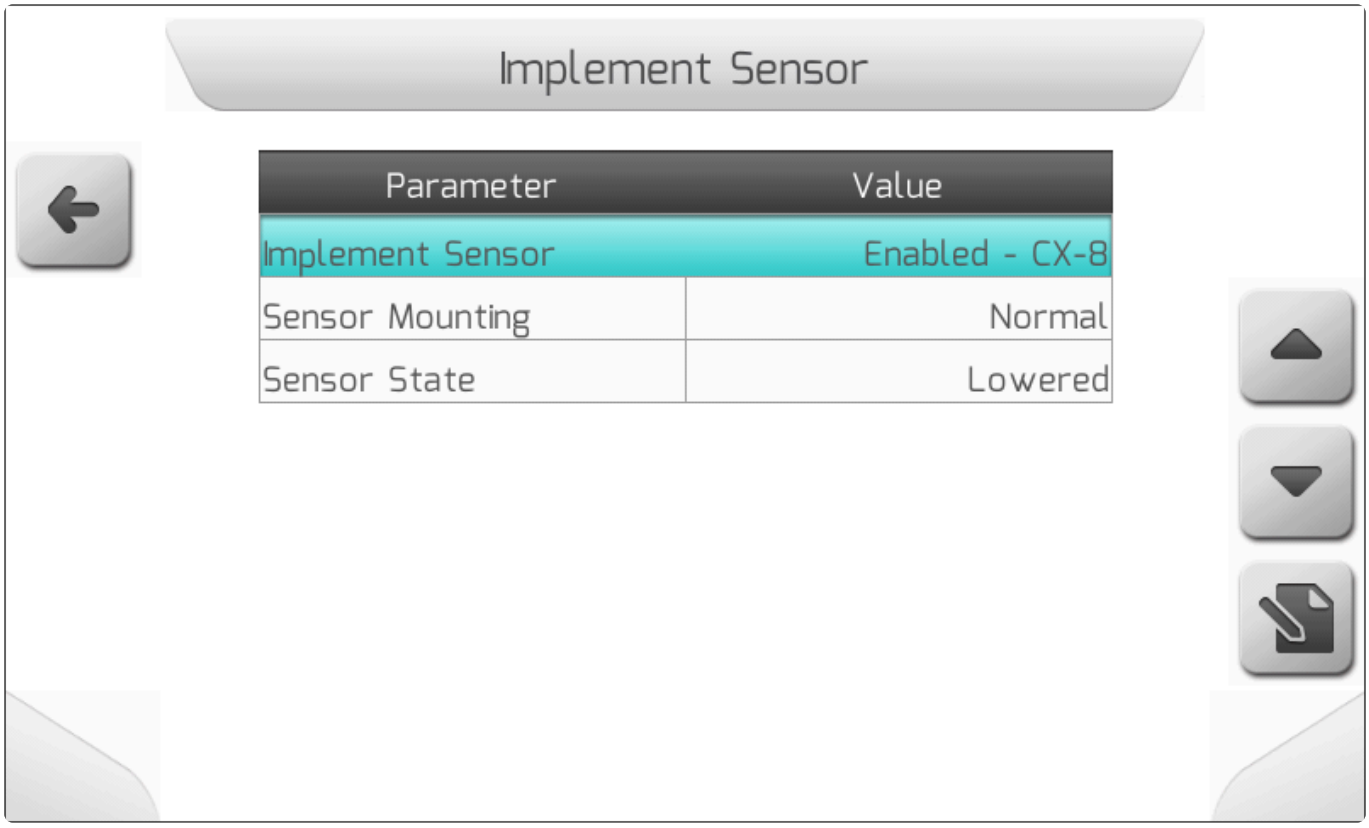
| | |
|---|---|
| **CX-9** | GeoNave display. |

Depending on the value of the Implement Sensor parameter, the configuration screen assumes different lines number.

- Disabled – Only the line **Implement Sensor** is shown, as detailed in the following image.

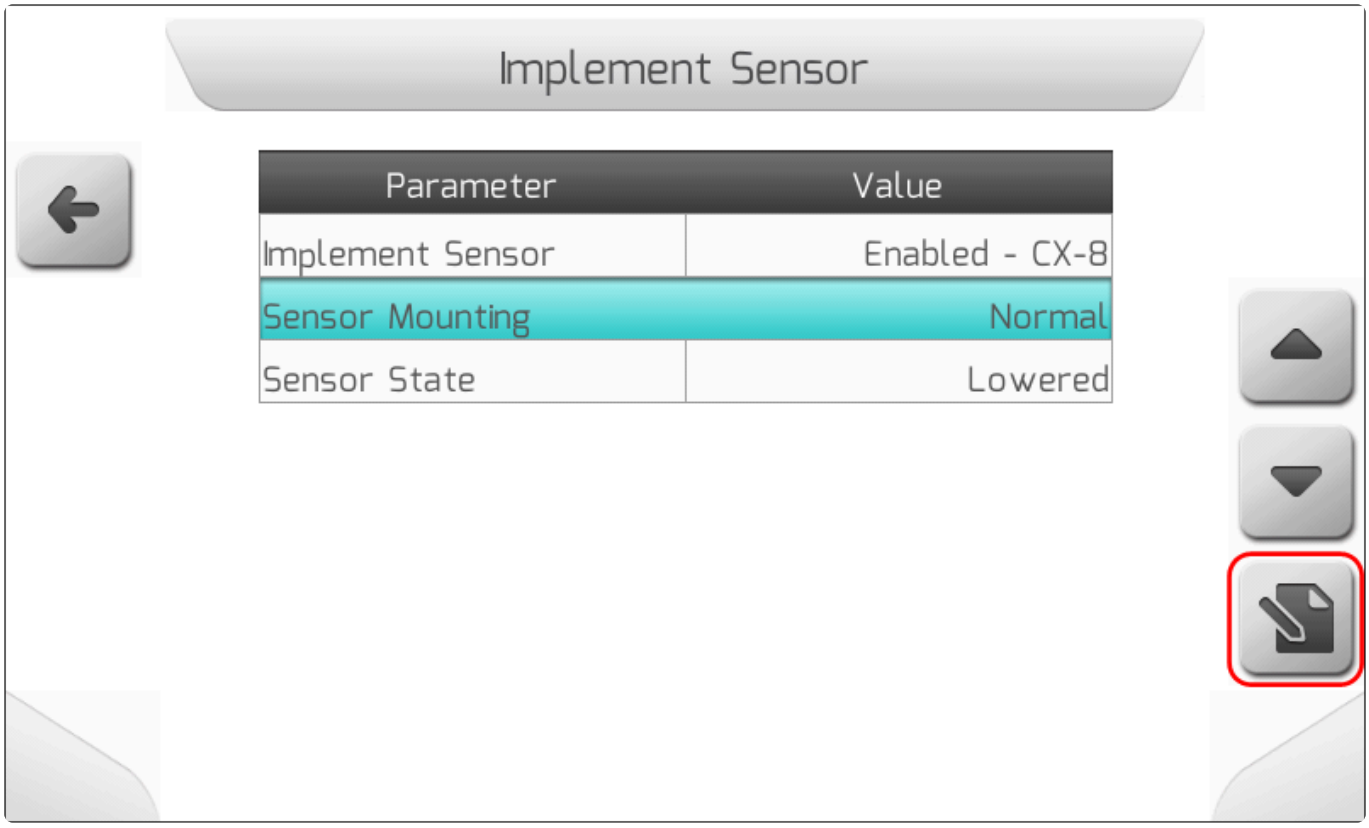



- Enabled – CX-8 or Enabled CX-9 – In addition to Implement Sensor line, Sensor Assembly and Sensor Status lines are displayed, as shown in the image below.

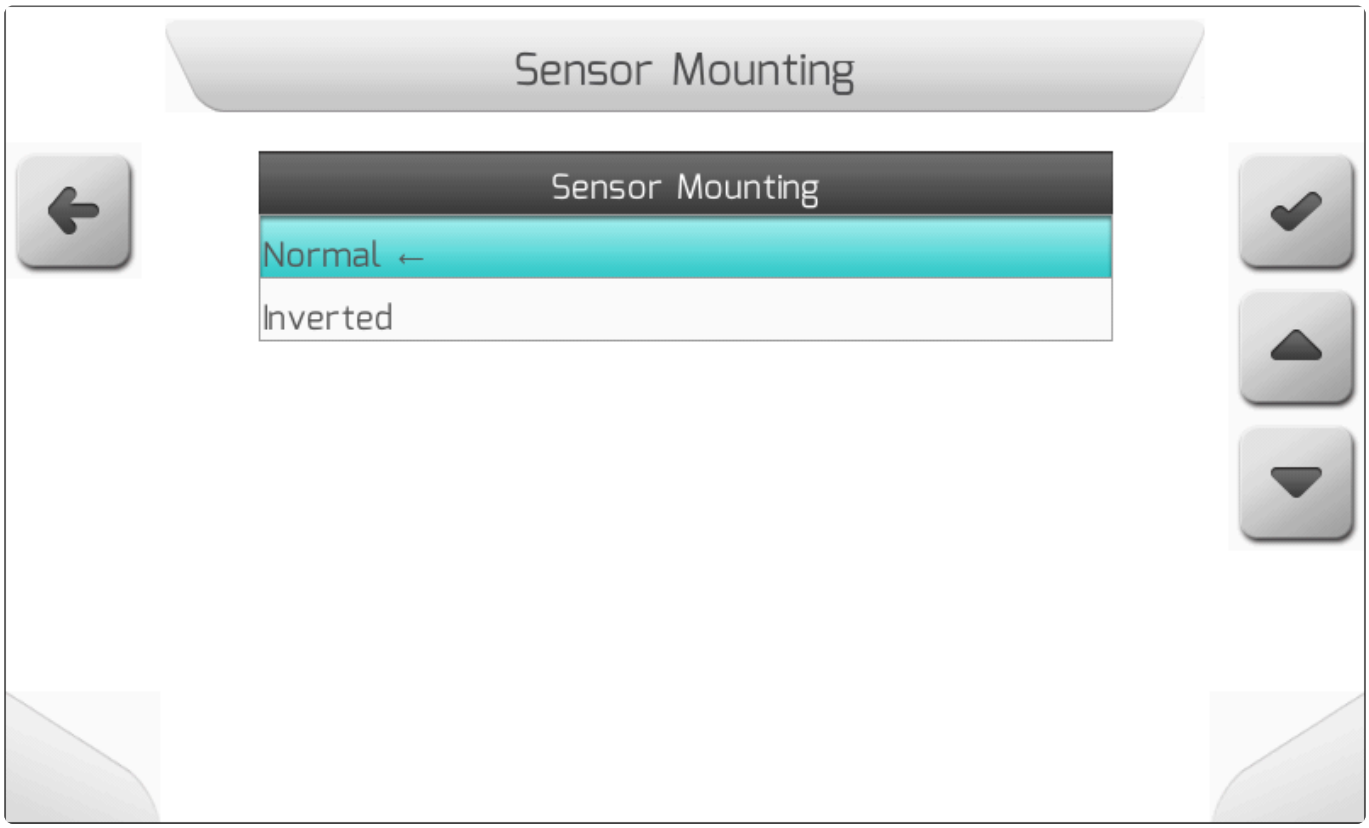



The Sensor Assembly subparameter is a configuration used to inform the GeoNave system of the detection logic for the inductive sensor. For **Normal** assembly, the implement is considered as **Lowered** when the inductive sensor identifies some metallic surface. For the **Inverted** assembly, logic goes in the opposite way.

To access Sensor Assembly subparameter screen, select the item on the Implement Sensor screen and press the edit button  , as shown in the image below.




Sensor Assembly subparameter screen is then displayed, as shown in the following image.




The third line of Implement Sensor parameter screen represents the inductive sensor reading state, depending on the chosen assembly. The following table shows the Sensor State value according to the detection of the metallic surface by the inductive sensor and the sensor assembly configuration.

| Sensor Mount | Detected metal surface | Sensor State |
|---|---|---|
| Normal | No | Lifted up |
| Normal | Yes | Lowered |
| Inverted | No | Lowered |
| Inverted | Yes | Lifted up |

# 8.2.12. Implement Distance

Screen type = Value editing with image

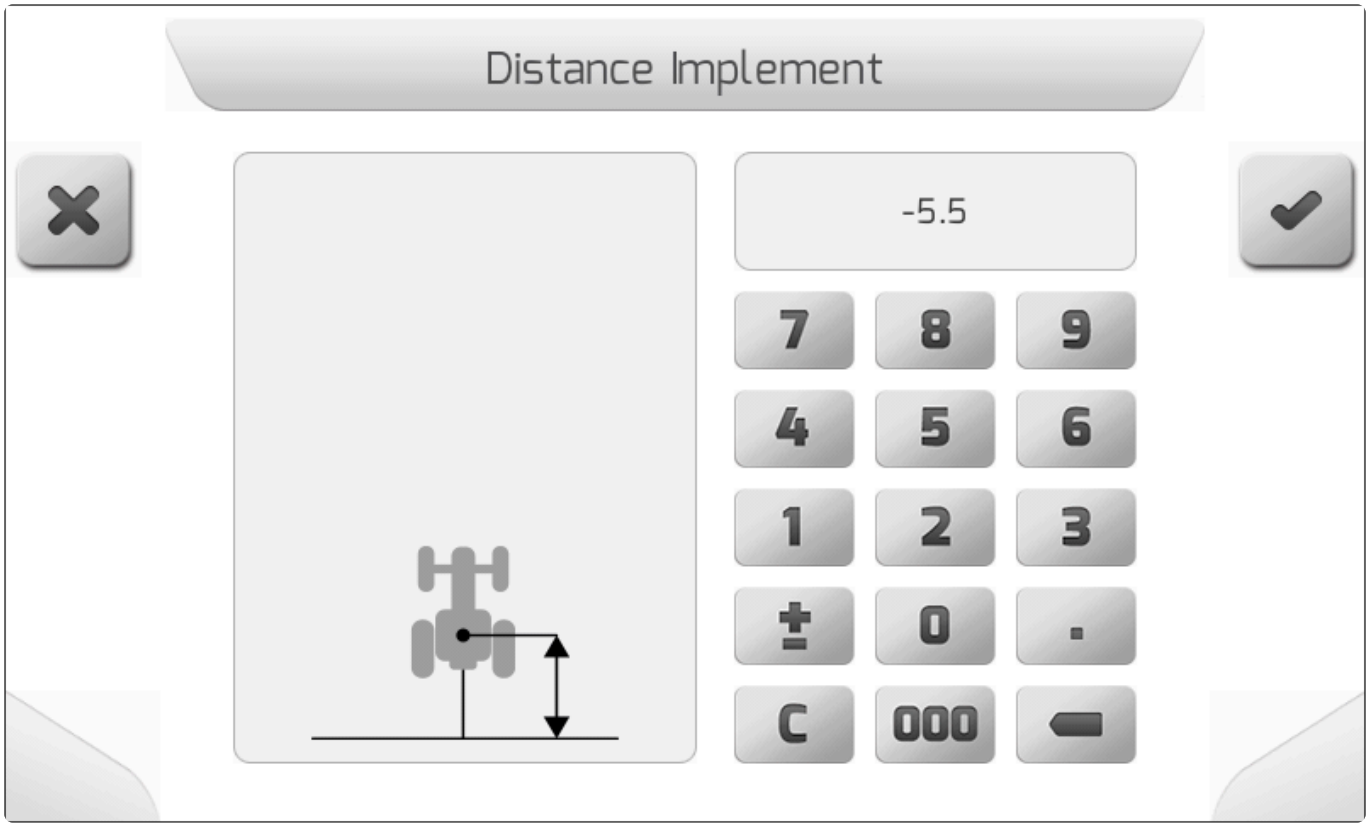
Decimal places = 1
Minimum value = -30.0 m (30.0 m behind)
Maximum value = 9.9 m (9.9 m for front)

Implement Distance parameter represents the distance, measured on the longitudinal axis of the tractor, between the GNSS antenna and the effective line of the implement (for example, the nozzle line of a sprayer). The value is used to inform the GeoNave system the exact location in which the agricultural application is taking place, so that the trail graphic representation is consistent with reality.

Implement Distance parameter appearance within the Work menu is conditioned to the Hitch Type parameter set to **3-point Hitch (Fixed)**.

The implement distance values, measured in meters, can be positive or negative. Positive values represent that the implement is in front of the GNSS antenna. Negative values mean that the implement is behind the GNSS antenna.

Implement Distance parameter setting screen is shown below, containing the self-explanatory image of its meaning.




# 8.2.13. Lateral Displacement

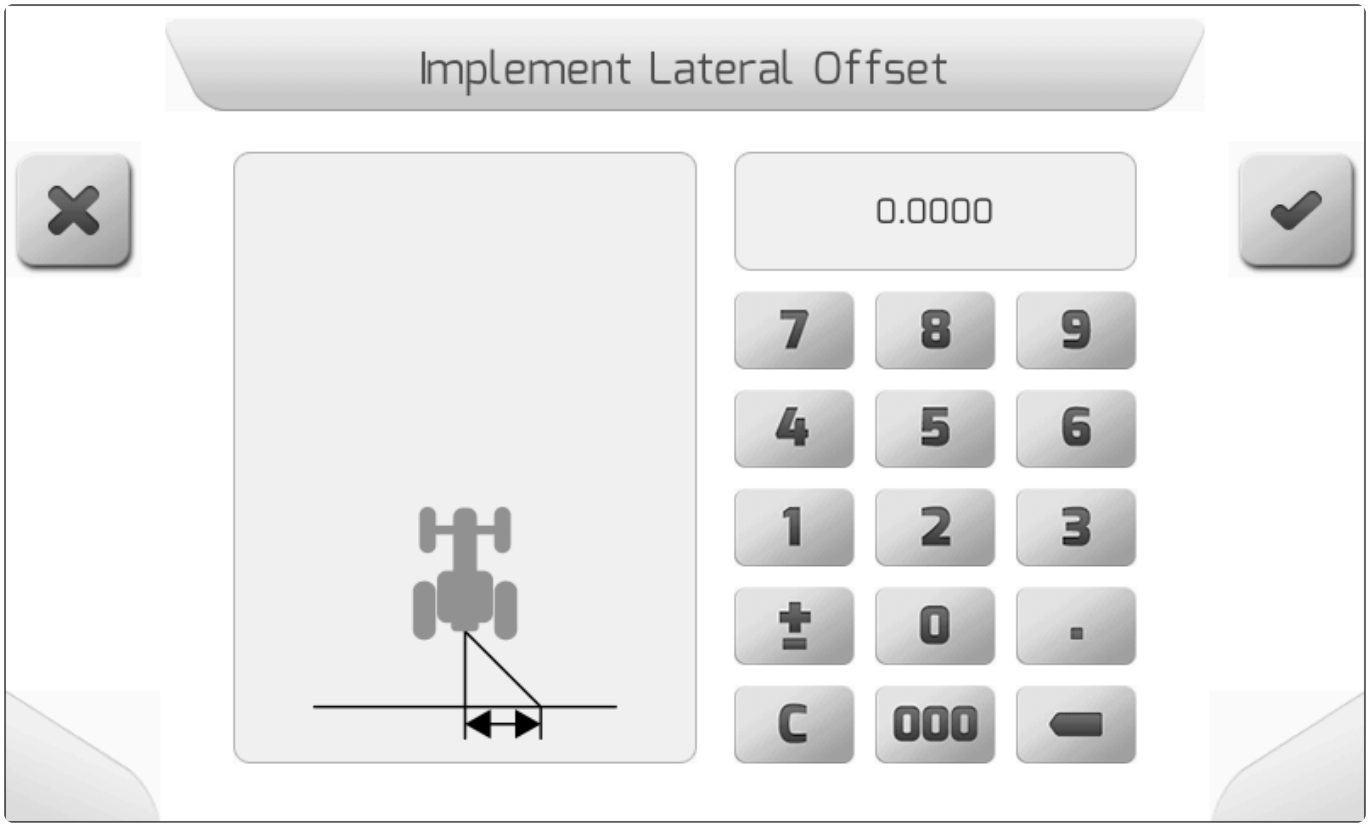
Screen type = Value editing with image

Decimal places = 4
Minimum value = -5.0000 m (5,000 m to the left)
Maximum value = 5.0000 m (5,000 m to the right)

Lateral Offset parameter is used to configure the existing misalignment between implement center point and tractor longitudinal axis. In operations with GNSS IsoPoint 3 and IsoPoint 4 signal correction, the lateral displacement is a very important configuration to avoid flaws and overlaps in parallel guides application. Especially in these cases, the displacement value must be measured with the aid of a measuring tape.

Measured in meters, the lateral displacement value can be positive or negative. Positive values represent that the center of the implement is offset to the right of the tractor axis. Negative values mean that the center of the implement is to the left of the axis.

The image below shows the Lateral Displacement parameter setting screen, including the self-explanatory image of its meaning.




# 8.2.14. Overlap

Screen type = Value editing with image

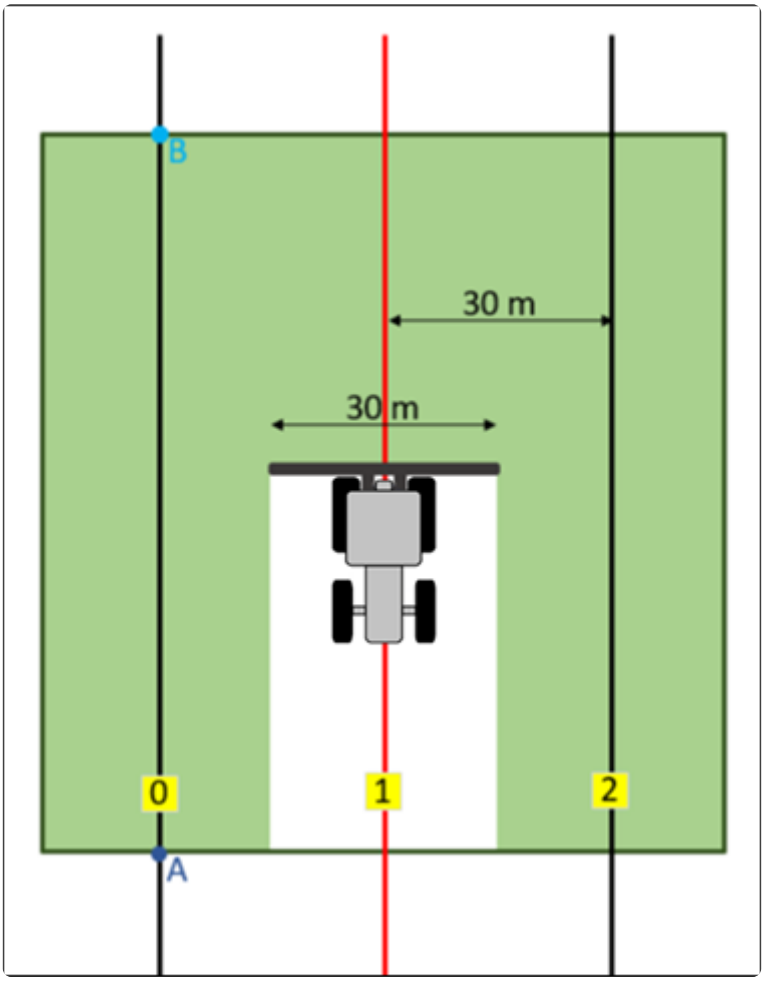
Decimal places = None
Minimum value = 0 cm
Maximum value = 250 cm

Overlap parameter has to be set intentionally by the user in order to create an overlapping area between each of the navigation guides. One of the most common examples of its use is in spraying operation, so that the overlap compensates possible application failures due to spraying drift caused by the wind.
The overlap value is measured in centimeters, on the same line as the implement boom, transversely in relation to the tractor axis.

Considering a 30-meter wide implement, 2 examples of Overlap parameter use are presented.

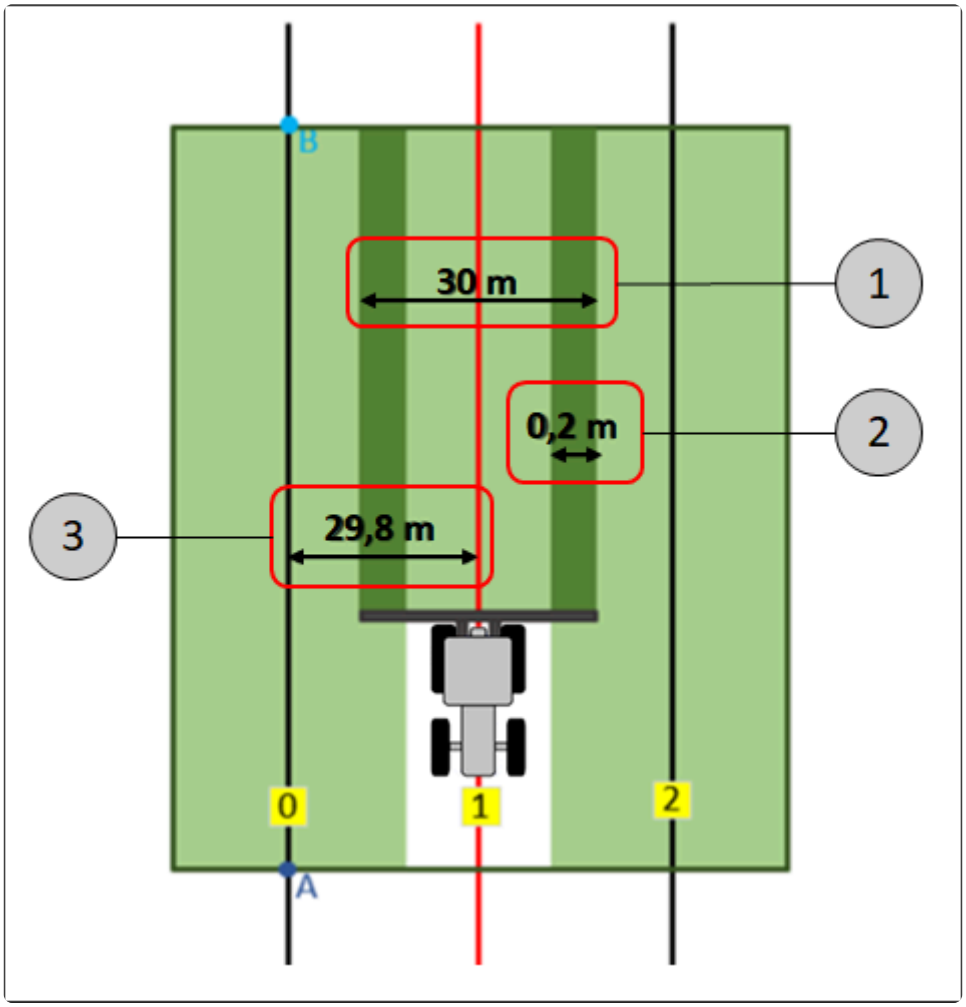
## Example 1 – Overlap = 0 cm

In case where there is no overlap, the distance between the navigation guides is equal to the Implement width, as shown in the following image.

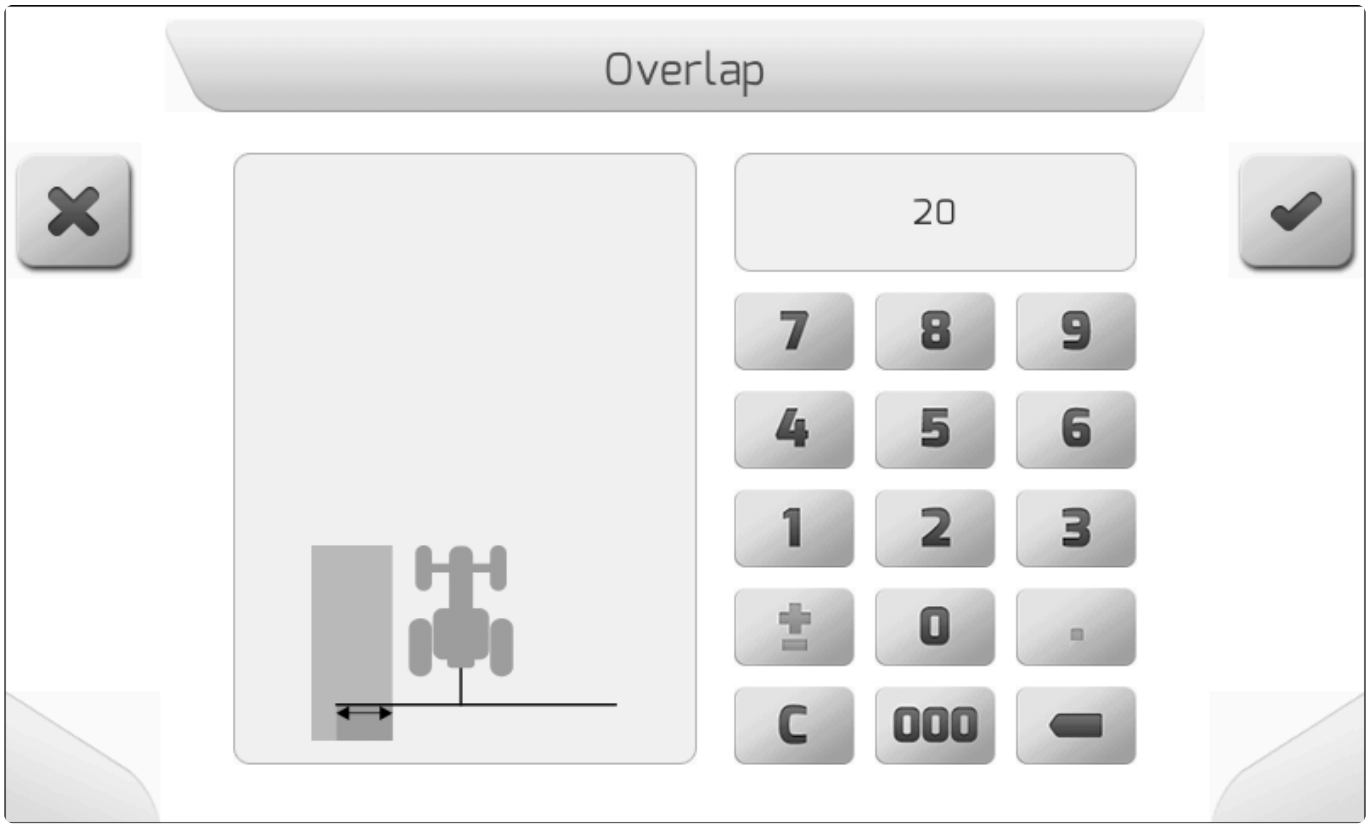



## Example 2 – Overlap = 20 cm

When the overlap is greater than zero, the distance between the guides will be the difference between the Implement width (1) and the Overlap value (2). In the example: (30.0 m – 0.2 m) = 29.8 m (3). The image below illustrates the effect of the overlap in parallel guides trail.




Overlap parameter setting screen is shown in the image below, including the self-explanatory image of its meaning.



# 8.2.15. Antenna – Hitch Distance

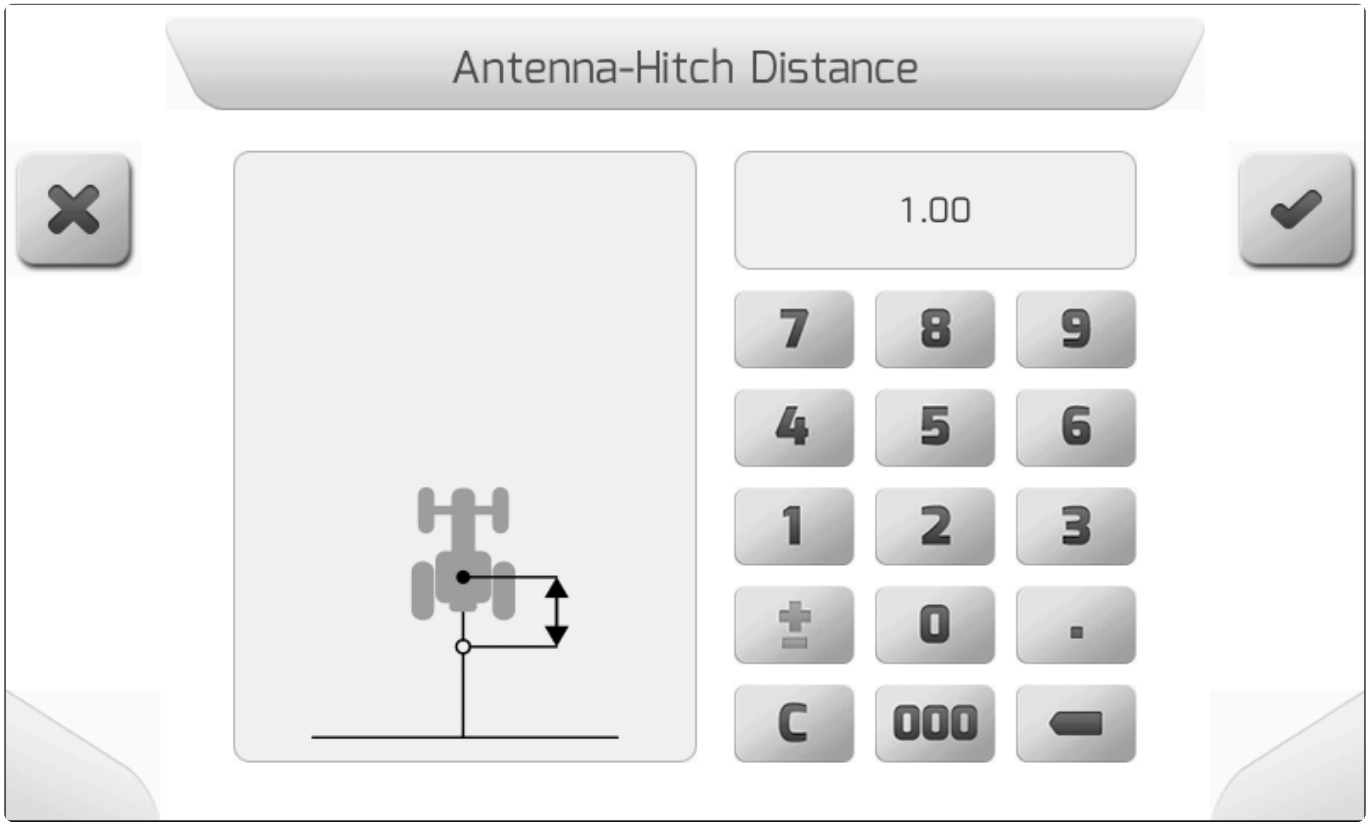
- Screen type = Value editing with image

- Decimal places = 2
  Minimum value = 0.10 m
  Maximum value = 10.00 m

Antenna – Hitch parameter corresponds to the distance in meters, measured on the tractor's longitudinal axis, between GNSS antenna and tractor hitch point for dragging implements. In conjunction with other two parameters – Hitch – Ground Contact Distance and Hitch – Boom Distance, the GeoNave system builds the drawbar implement geometry shown graphically on the navigation screen.

Antenna – Hitch Distance parameter presence within the Work menu depends on the Hitch Type parameter setting as **Drawbar**.

The image below shows the Antenna – Hitch Distance parameter setting screen, containing the self-explanatory image of its meaning.



# 8.2.16. Hitch – Ground Contact Distance

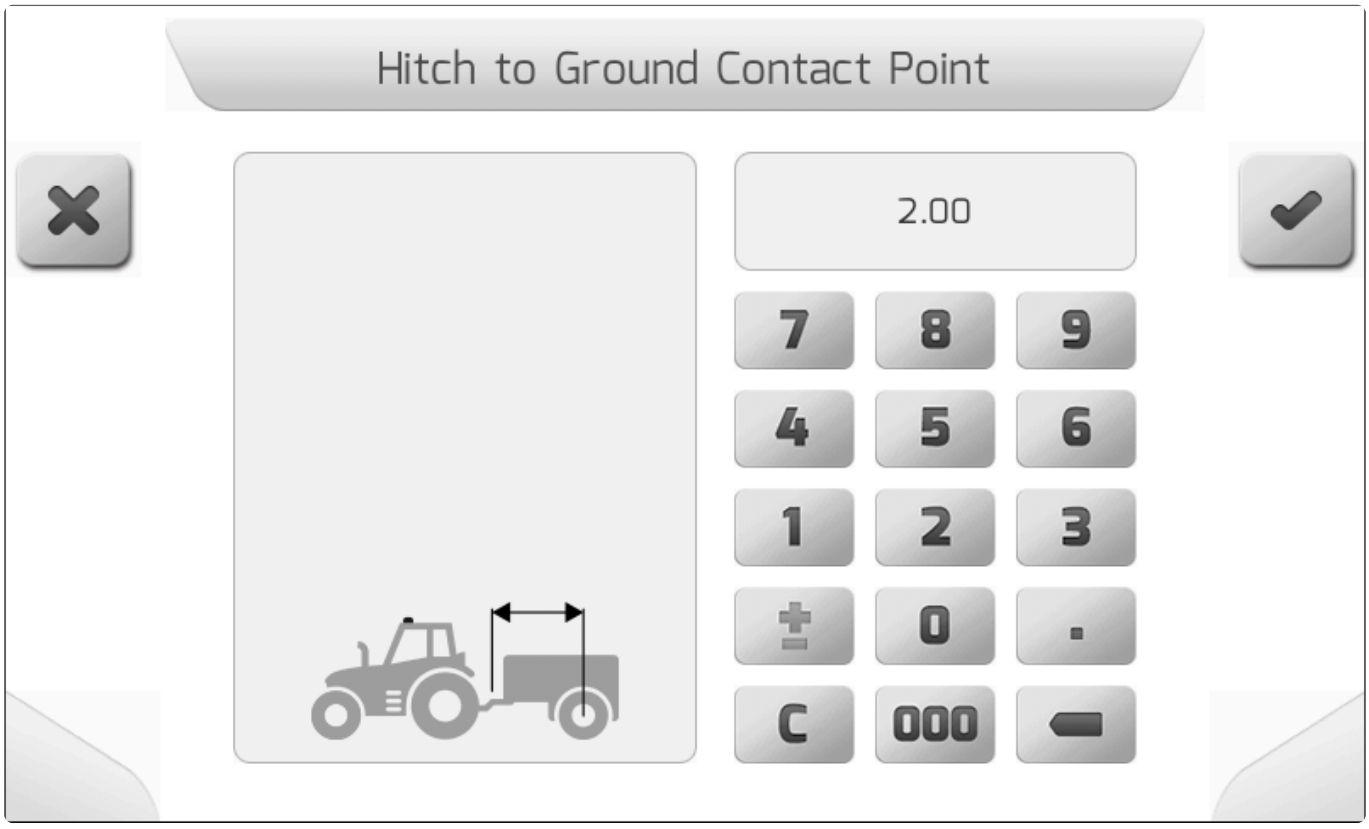
- Screen type = Value editing with image

- Decimal places = 2
  Minimum value = 0.30 m
  Maximum value = 20.00 m

Hitch – Ground Contact Distance parameter defines the distance in meters, measured on the tractor's longitudinal axis, between the tractor hitch point for dragging implements and the center of the implement wheel. In conjunction with other two parameters – Antenna – Hitch Distance and Hitch – Boom Distance, the GeoNave system builds the drawbar implement geometry shown graphically on the navigation screen.

Hitch – Ground Contact Distance parameter presence within Work menu depends on the Hitch Type parameter setting as **Drawbar**.

The image below shows the Hitch – Ground Contact Distance parameter setting screen, containing the self-explanatory image of its meaning.



# 8.2.17. Hitch – Boom Distance

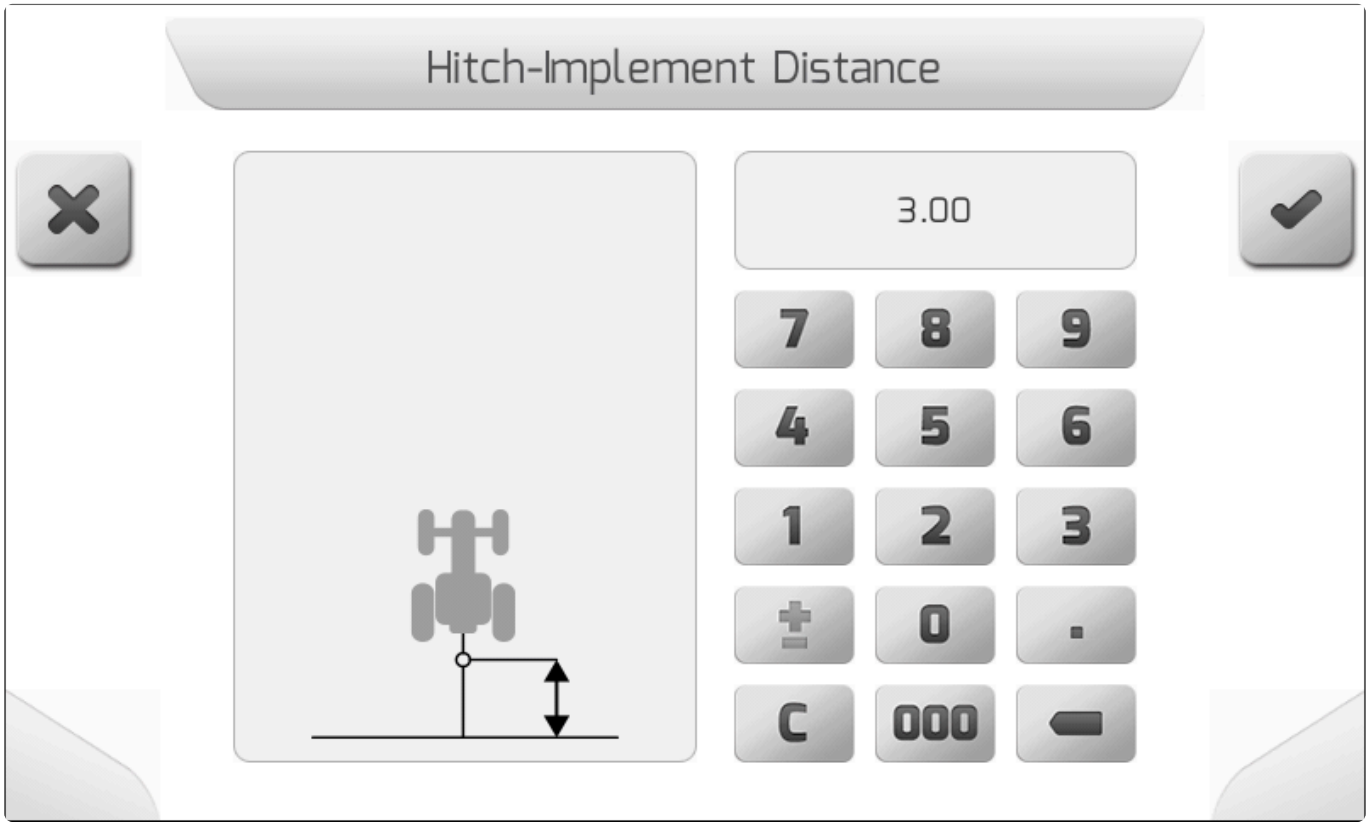
Screen type = Value editing with image

Decimal places = 2
Minimum value = 0.10 m
Maximum value = 20.00 m

Hitch – Boom Distance parameter characterizes the distance in meters, measured on the tractor's longitudinal axis, between tractor hitch point for dragging implements and the effective implement line (for example, the spraying nozzle line). The value is used to inform the GeoNave system the exact location in which the agricultural application is taking place, so that the trail graphic representation is consistent with reality. In conjunction with other two parameters – Antenna – Hitch Distance and Hitch – Ground Contact Distance, the GeoNave system builds the drawbar implement geometry shown graphically on the navigation screen.

Hitch – Boom Distance parameter presence within Work menu depends on the Hitch Type parameter setting as **Drawbar**.

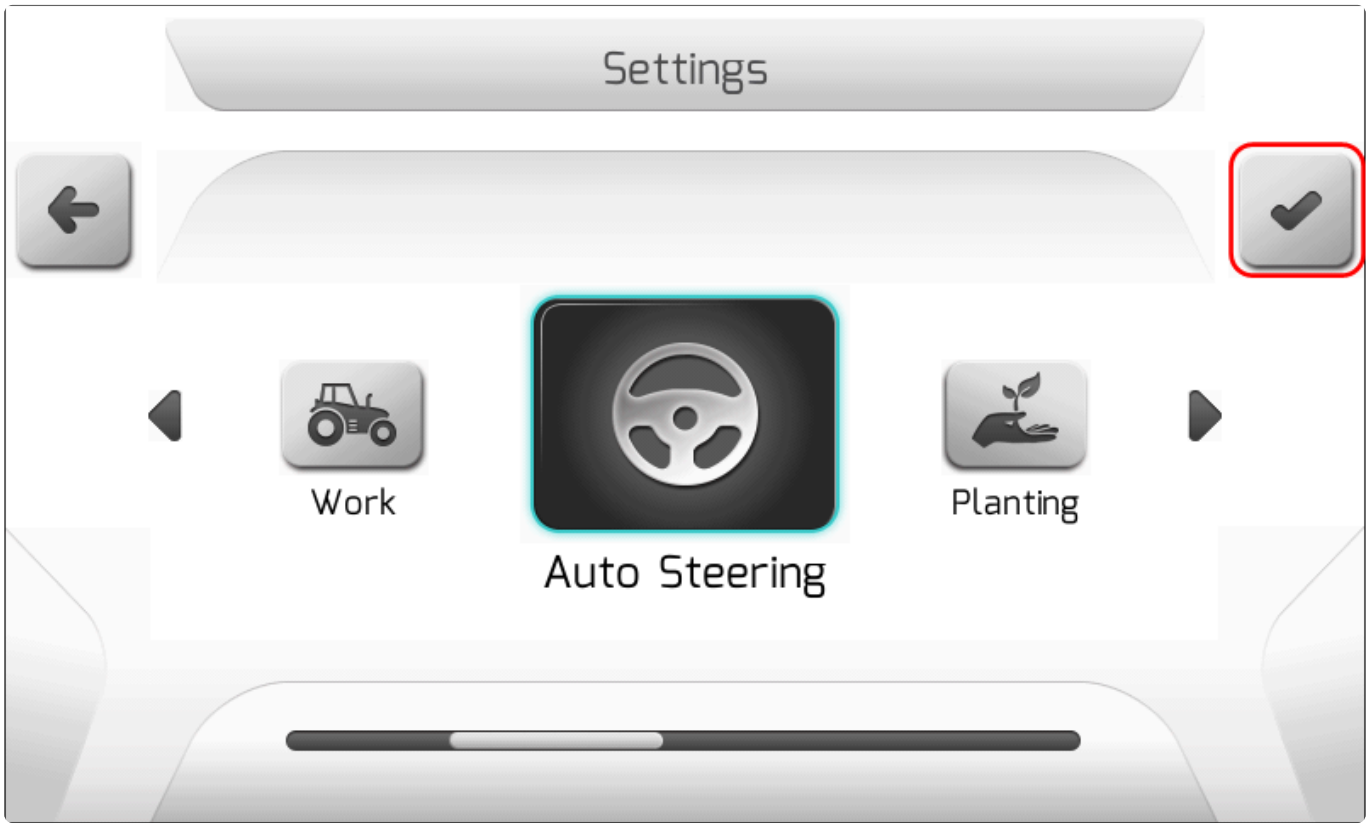
Hitch – Boom Distance parameter setting screen is shown in the image below, containing the self-explanatory image of its meaning.



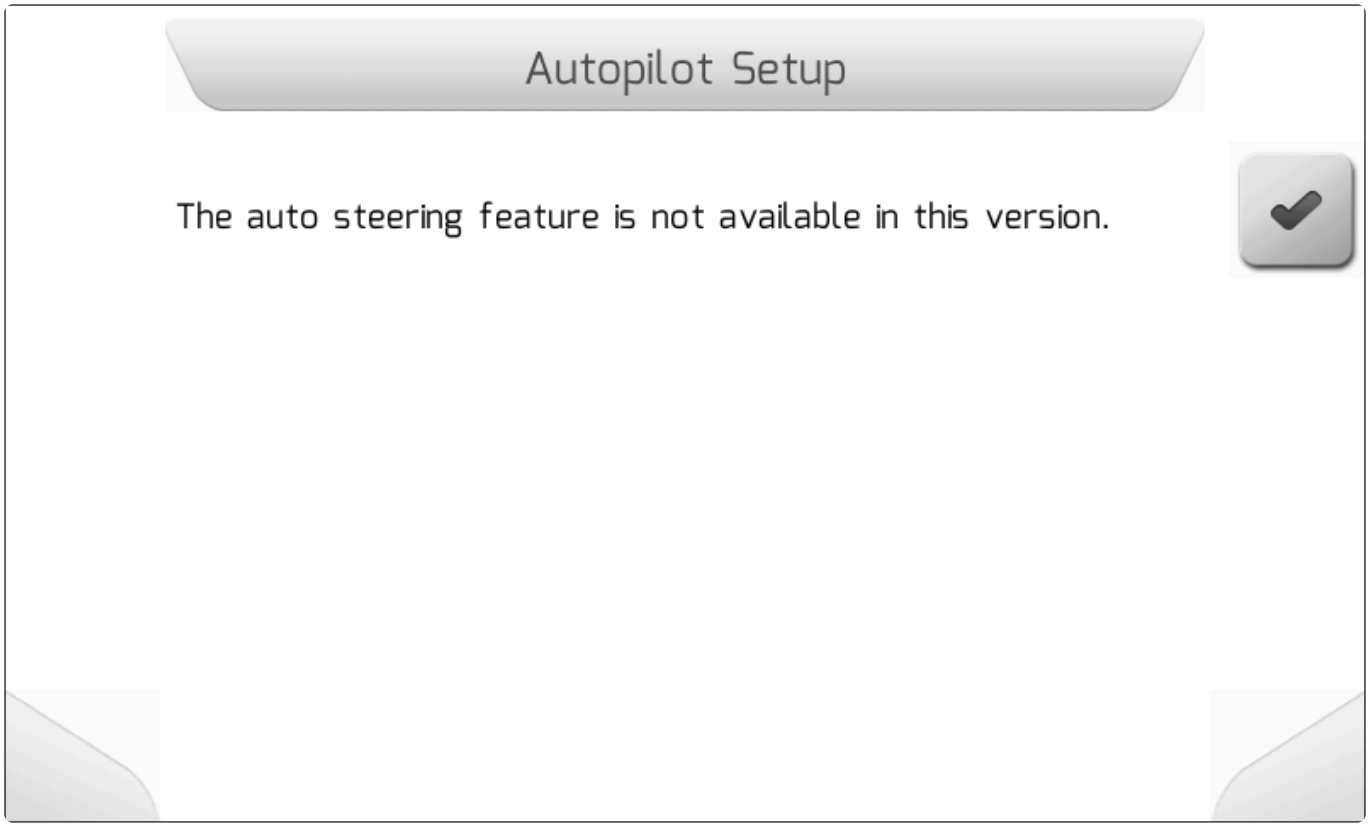
# 8.3. Auto Steering

Settings menu also includes the Auto Steering parameter area. This menu is used to perform GeoNave system settings referring to the Auto Steering feature such as tractor dimensions, type of release system, steering control parameters, among others. The Auto Steering calibration routine is also available.

To access the menu, the user must select the Auto Steering item and press the confirm button  , as shown in the image below.




When the ISO 31 license is configured in the GeoNave system, the Auto Steering settings menu is not available. When trying to access it, the following Information screen appears.

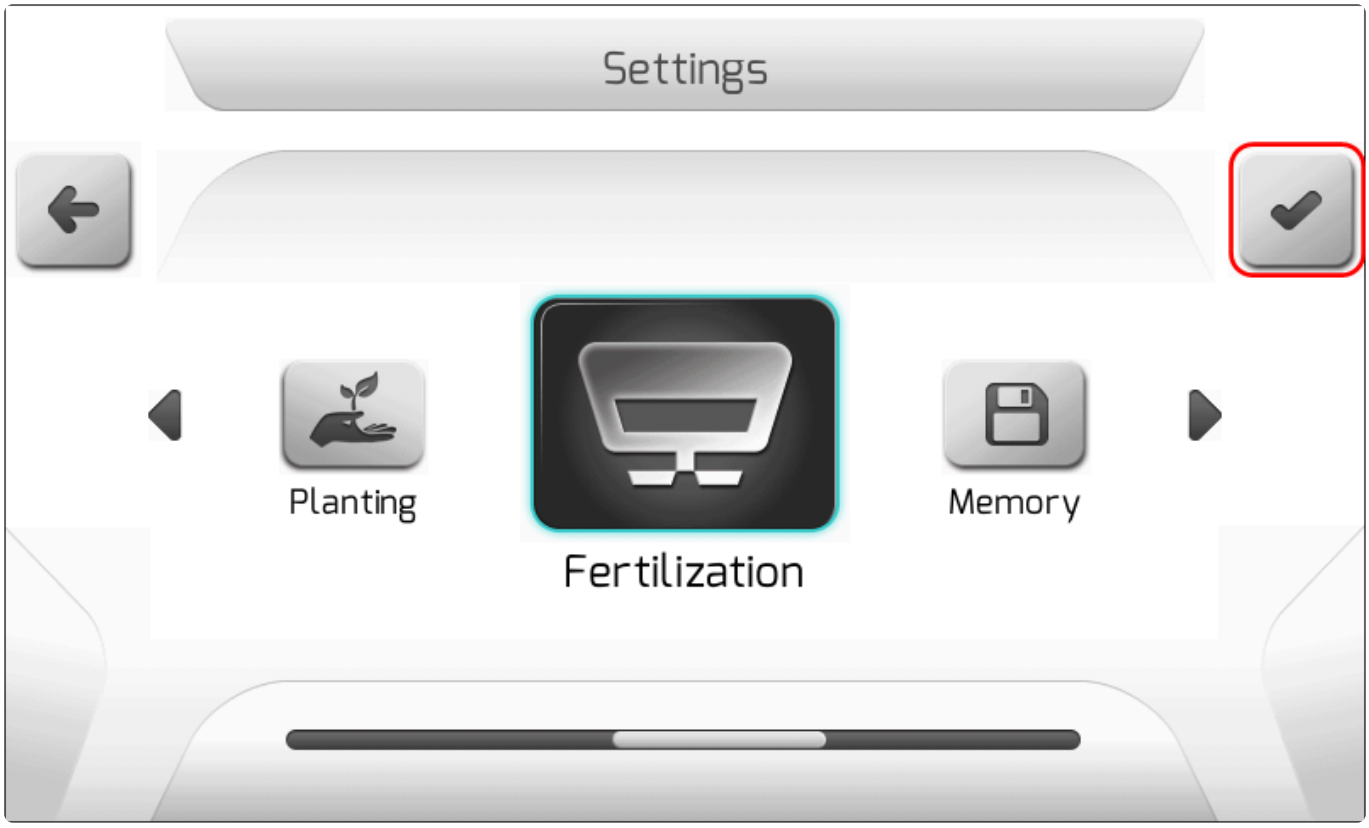



To activate the Auto Steering functionality on your agricultural machinery, contact our sales team and purchase your ISO 33, ISO 32, ISO 35 or ISO 37 license. Our salespeople are trained to indicate the ideal kit for a wide variety of machine models.

# 8.4. Fertilization

Settings menu also includes the Fertilization parameters area. This menu is used to perform GeoNave system settings referring to the solid fertilizers application control, for implements controlled by belt, gravity or both, with monitoring or control of the spreading disc rotation. The calibration routines of the system components are also available.

To access the menu, the user must select the Fertilization item and press the confirm button , as shown in the image below.




When the ISO 31 license is configured in the GeoNave system, the Fertilization settings menu is not available. When trying to access it, the following Information screen will be displayed.




To activate the Fertilization feature on your agricultural machinery, contact our sales team and purchase your ISO 34 or ISO 35 license. Our salespeople are trained to

indicate the ideal kit for a wide variety of attachment models.

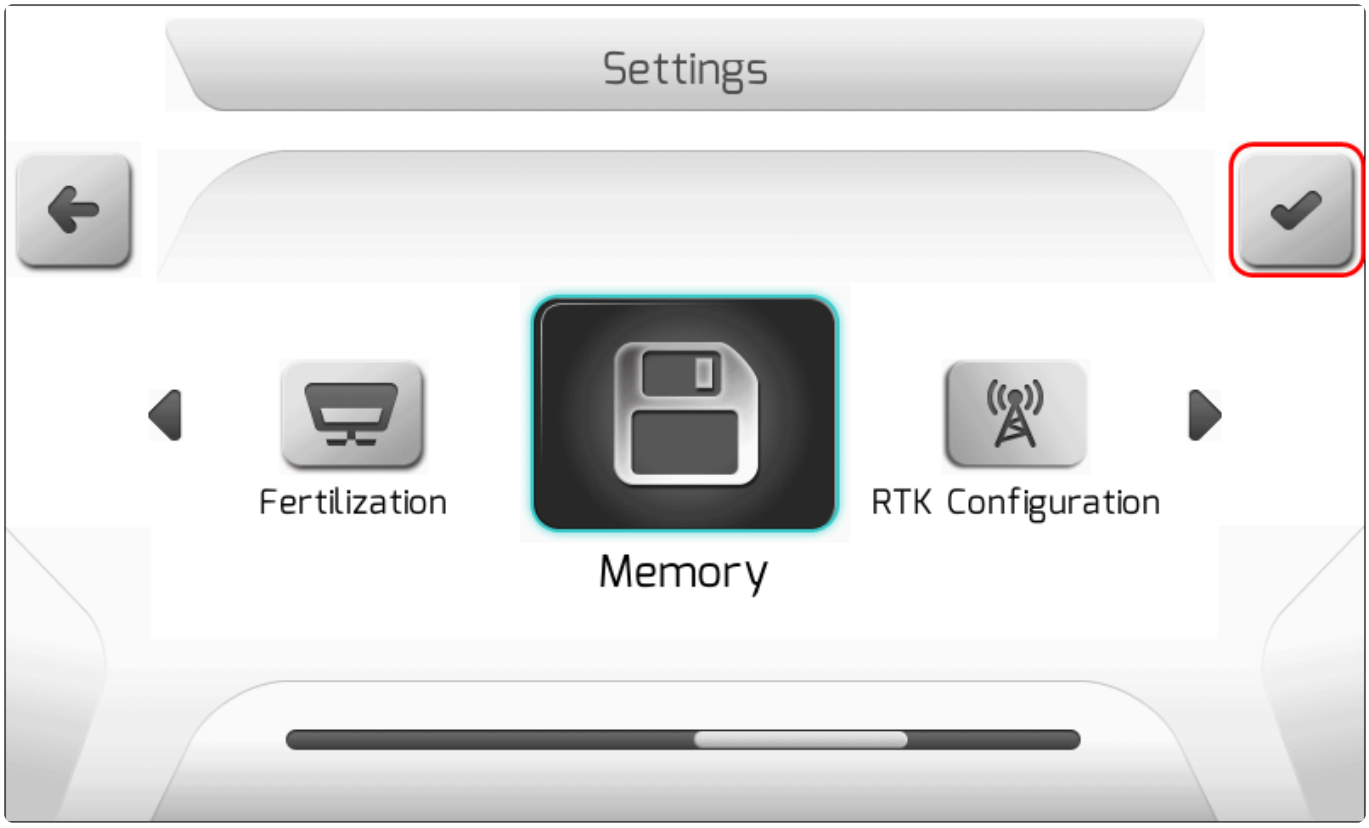
# 8.5. Memory

Screen type = Double list

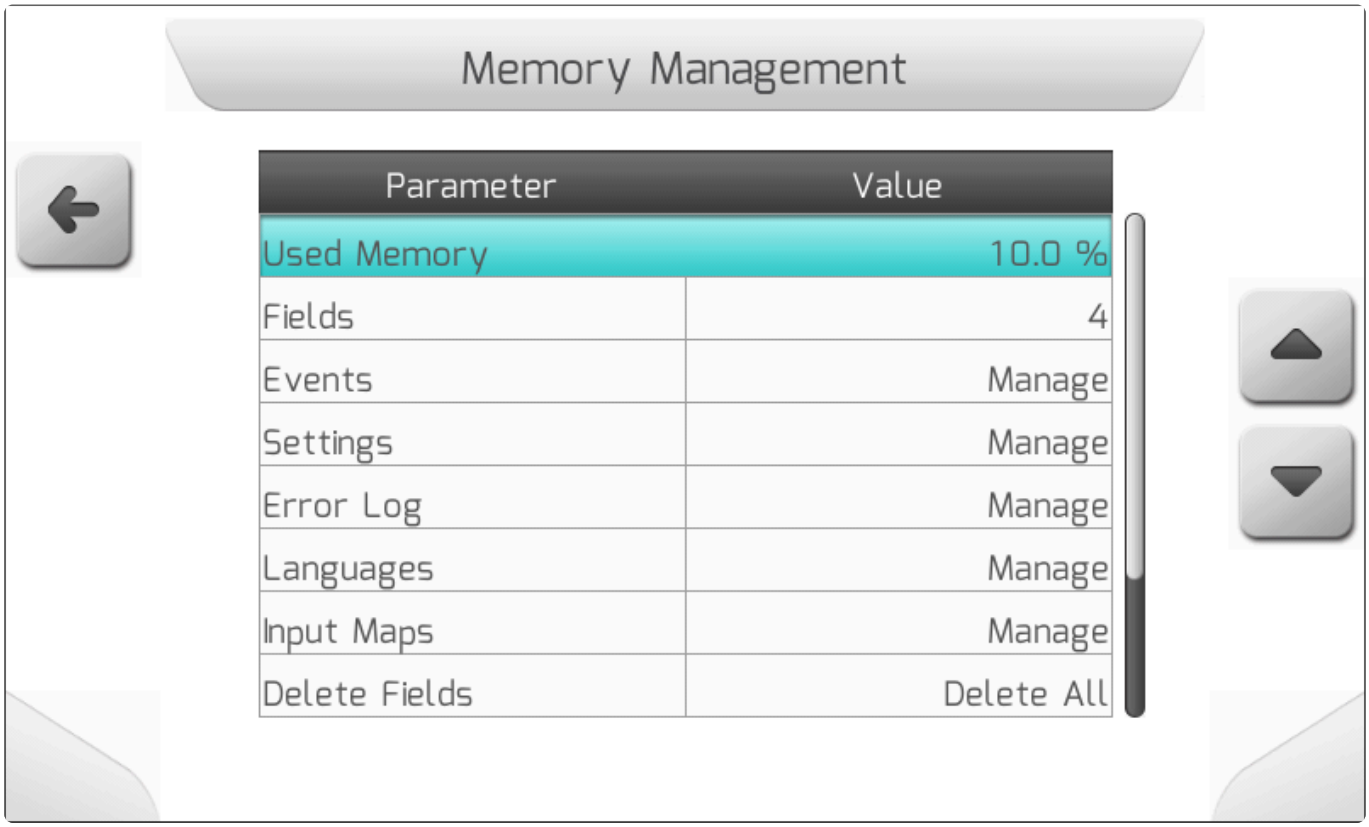
- Used Memory
- Fileds
- Events – Manage
- Settings – Manage
- Error Logs – Manage
- Languages - Manage
- Input Maps – Manage
- Delete Events
- Delete Fields
- Delete Error Logs
- Internal Memory – Format

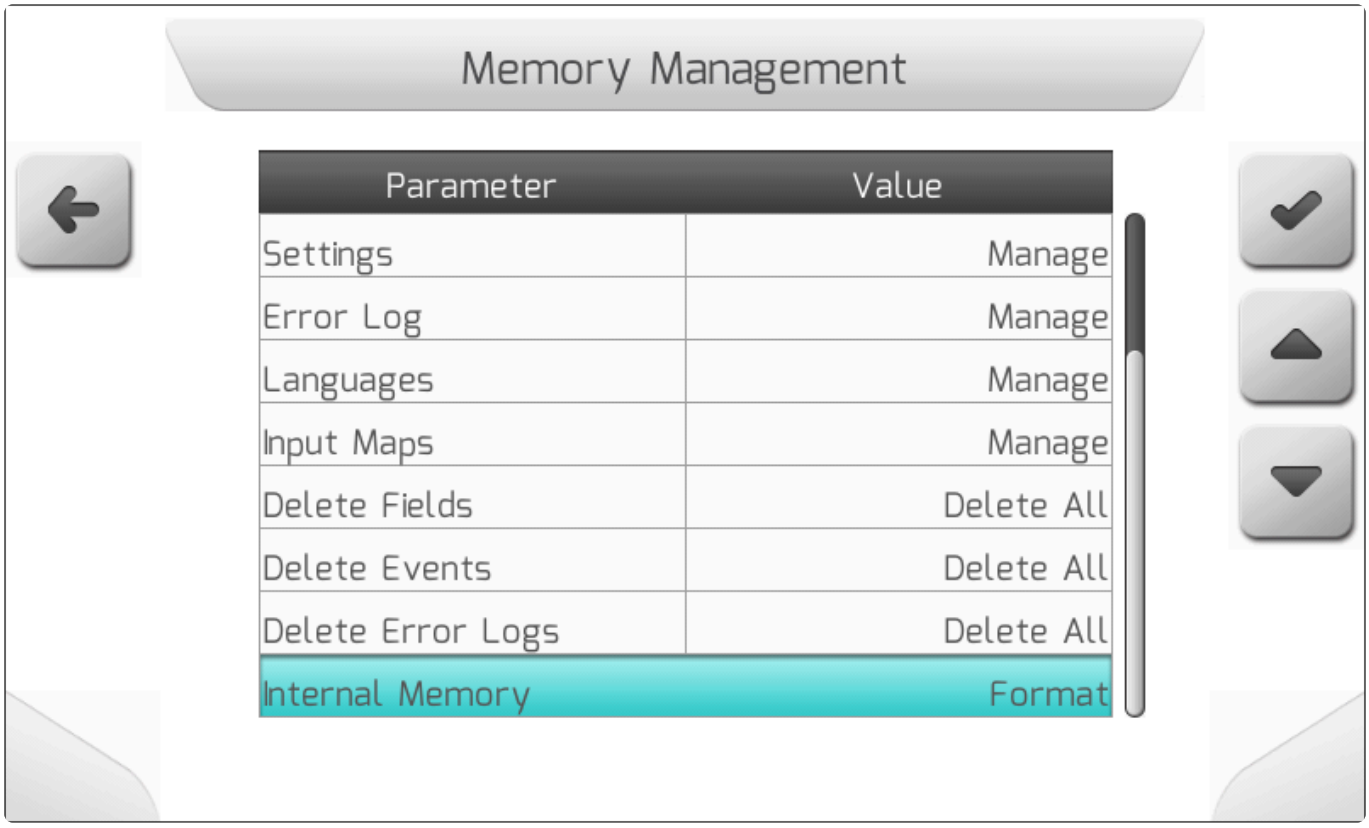
The Settings menu also has the Memory area. In this menu is possible to manage the files that composes the GeoNave system and also the file set of operations carried out by the display in its various agricultural applications. It is possible to transfer files between the GeoNave internal memory and a flash drive, through an USB connector.

Access to the Memory menu is done by selecting the corresponding item in the Settings menu, as shown in the following image.




The Memory menu consists of the items shown in the images below, each item will be detailed in the next topics.






# 8.5.1. Used Memory

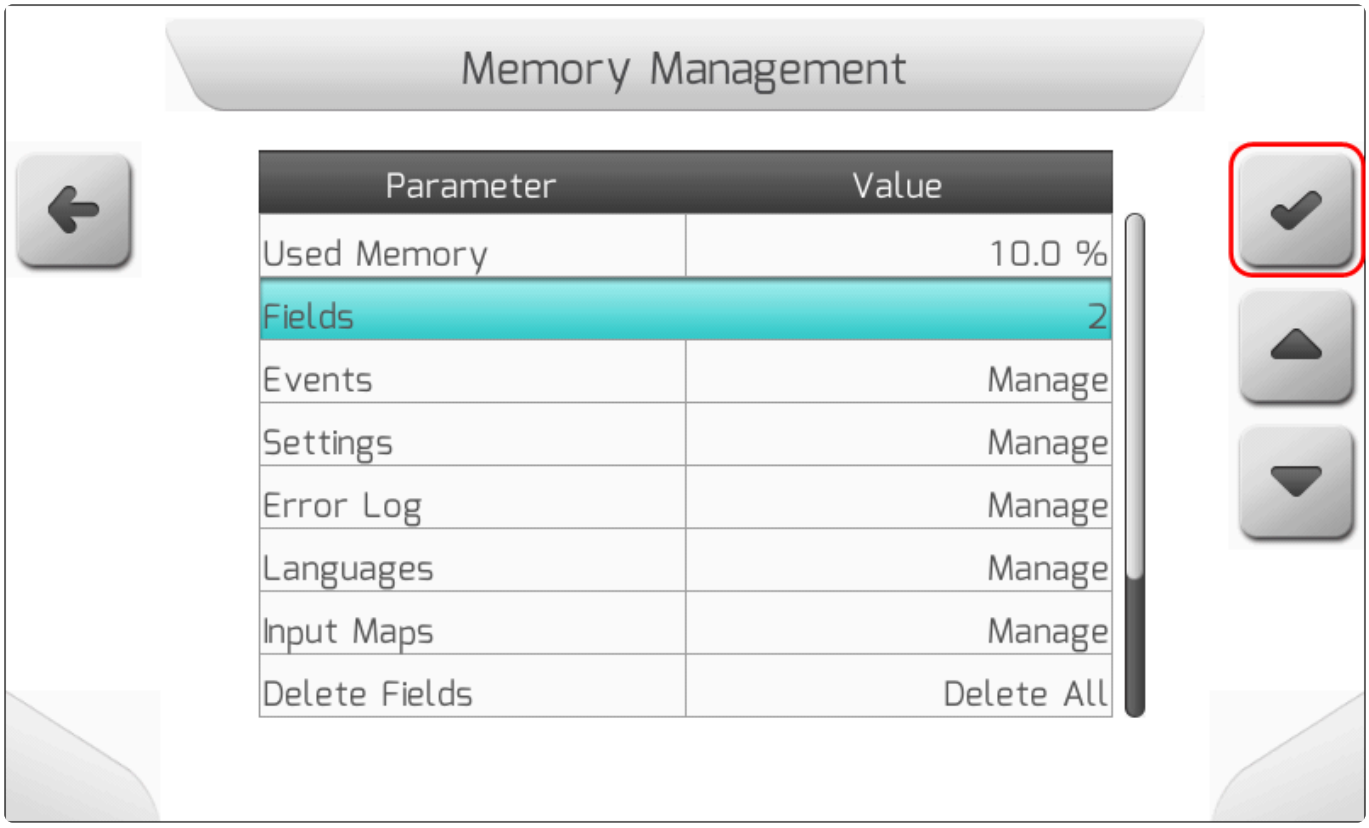
Used Memory informs the user about the percentage value of the GeoNave system internal memory used at the moment. The internal memory has a total storage space of 8 GB, for navigation files (fields, events), input maps (guide maps, variable rate, boundary) and GeoNave system configuration files. The memory required for the GeoNave system files, which includes the necessary system files for its correct functioning, is 10%.

# 8.5.2. Fields

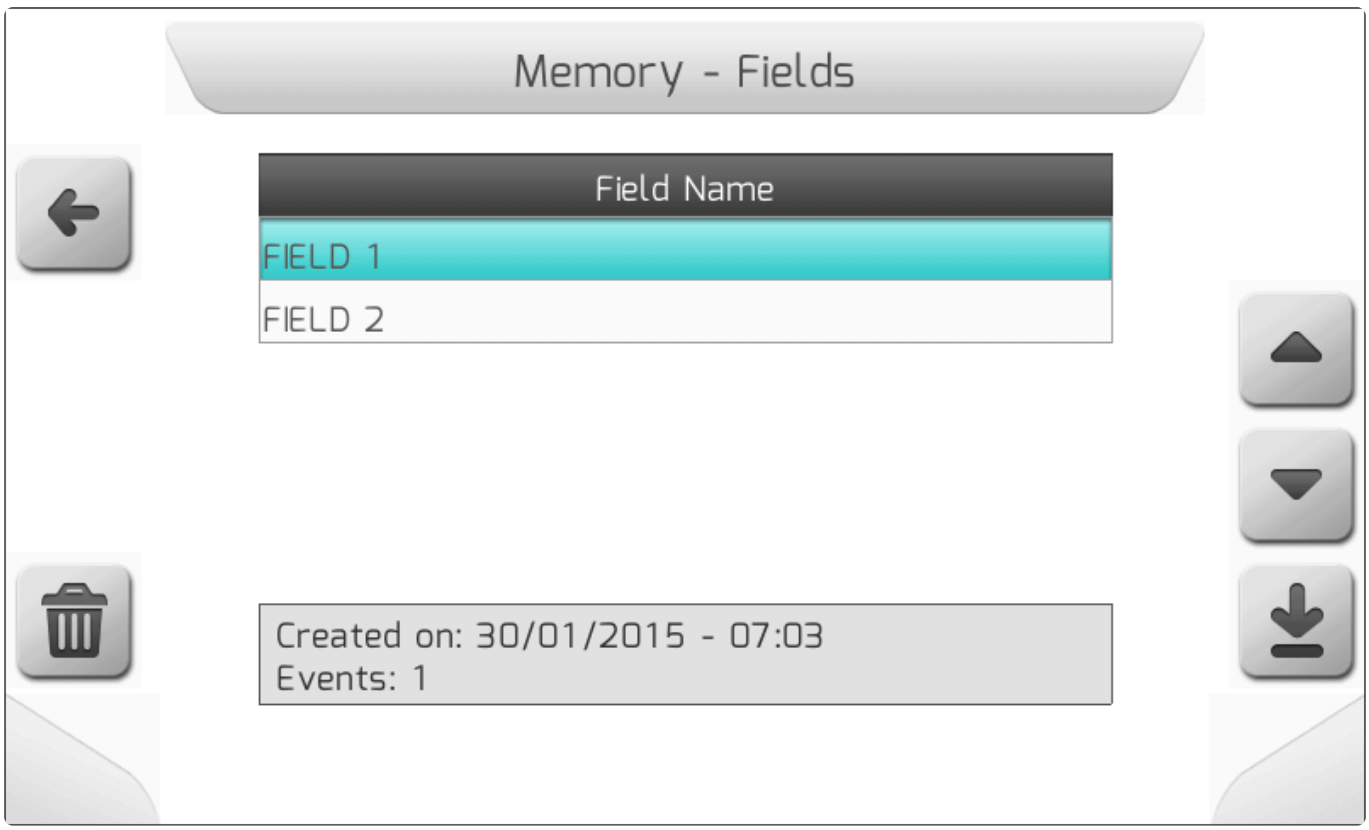
Screen Type = Field list

In the Memory settings menu, the Fields area enables the GeoNave system's Field files management.

Selecting the Fields item and pressing the confirm button  , as shown in the following image, Field list screen will be displayed.




On the detailed Field list screen, the user visualizes the names of all fields loaded in the internal memory, their creation date, and the number of events associated to each field. The screen allows the user to delete a specific field from the internal memory using the button , and also export it to a flash drive via the button . As shown in the image below:

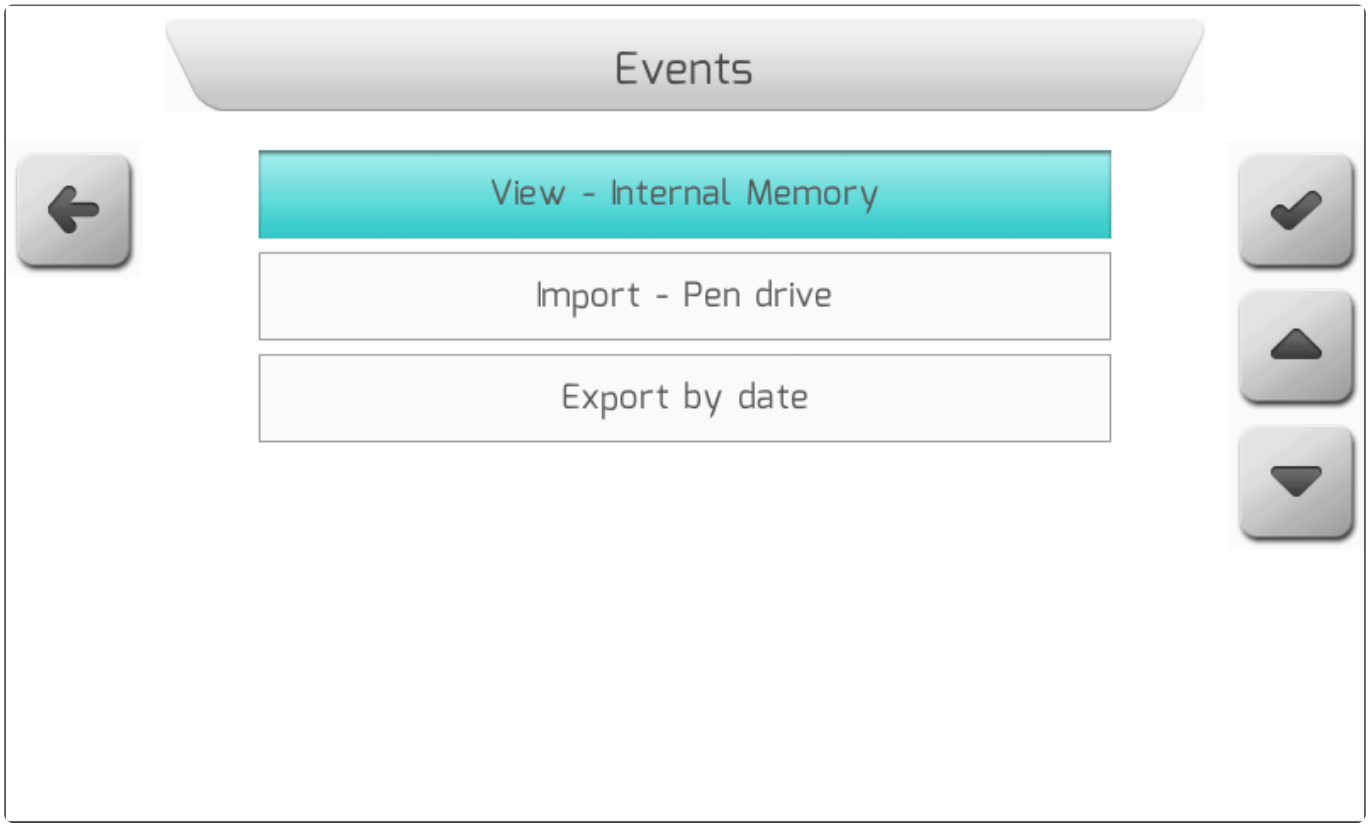


# 8.5.3. Events – Manage

Screen Type = Vertical menu

- View – Internal Memory
- Import – Pen drive
- Export by date

Events management screen consists of three areas, through which the user can view, import and export event files created by the GeoNave system. The image below shows the Events menu screen.

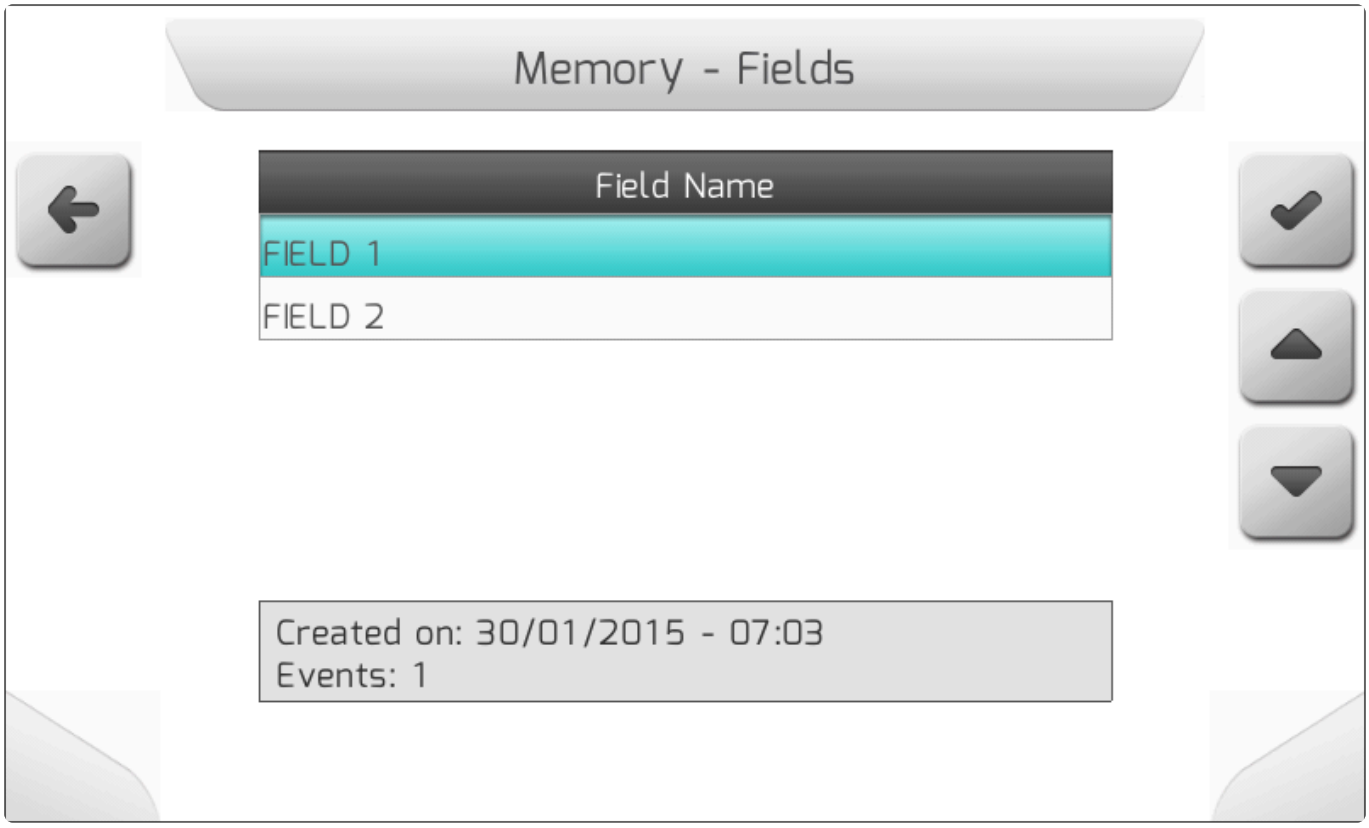



# 8.5.3.1. View – Internal Memory

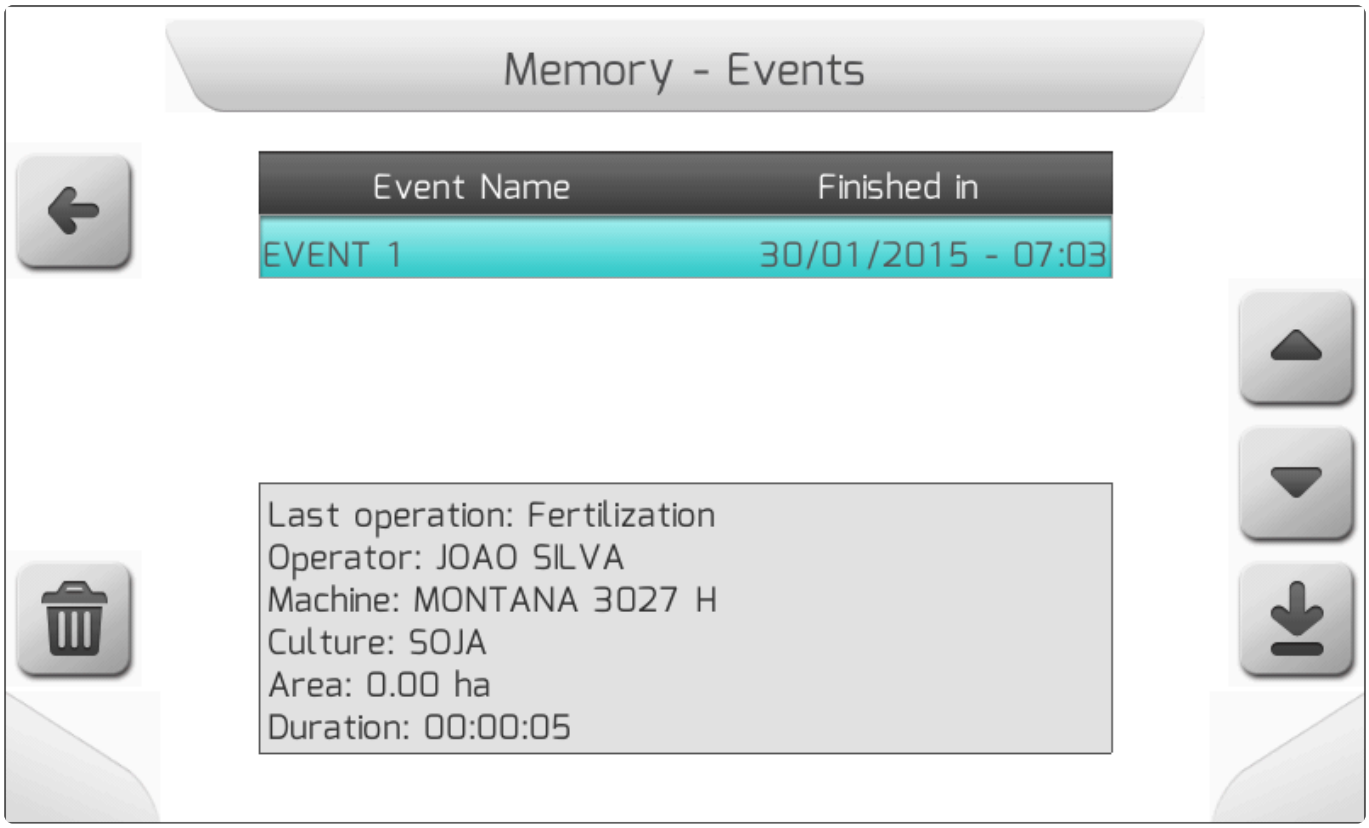
Screen Type = Field list > Events list

In the View – Internal Memory area of the event management, the user has access to the data of the event files loaded in the internal memory of the GeoNave display.

When selecting View – Internal Memory item in the Events menu and pressing the confirm button  , the Field list is displayed, as shown in the image below, in this screen the user must select the field that contains the event from which the information is required.




After selecting a field and clicking the confirm button again , the Events list of the selected field is then displayed, as shown in the following image. In this screen the user can view the event data, delete the file using the button , and download the file in a flash drive by the button . The screen sequences of these procedures are presented in the topic Events list.



# 8.5.3.2. Import – Pen drive

Screen Type = Vertical menu

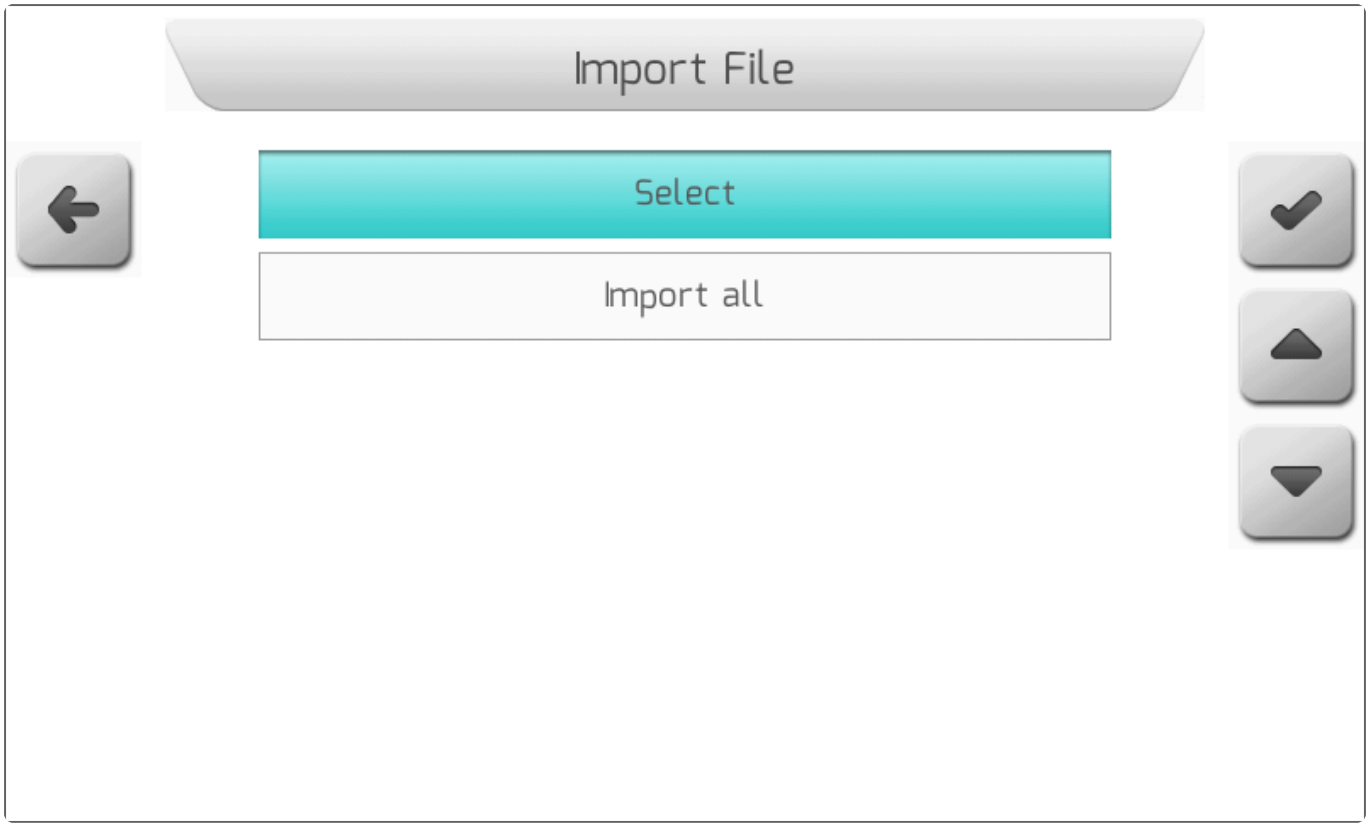
- Select
- Import All

The Import – Pen drive area of the event management is used to import event files, and the corresponding field files, from a flash drive to the GeoNave internal memory. In this way, operations already performed by the same equipment or another GeoNave display can be imported. This allows that, for example, operation performed by one machine is completed by another.

In the Events menu, select the option Import – Pen drive and press the confirm button  . If a flash drive is not connected an Information screen will be displayed, as shown in the image below.



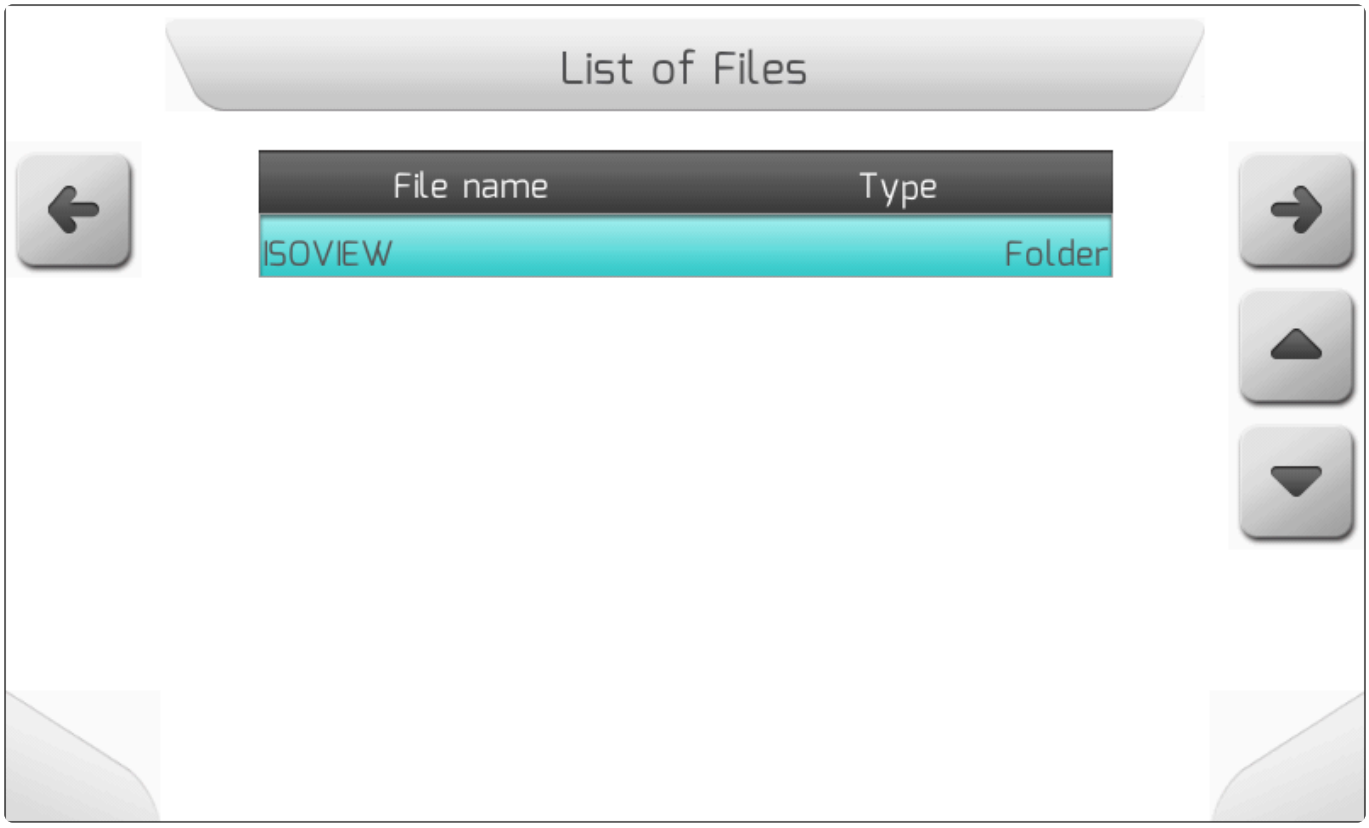

If the portable memory is correctly connected to the USB interface, a new Vertical Menu is presented containing two options, as shown in the following image. In the first option – Select – allows the user to choose what file will be imported into the internal memory. In the second – Import all – all navigation files found in the flash drive will be imported into the internal memory.




# 8.5.3.2.1. Select

Screen Type = List of files

Choosing the Select option from the Import – Pen drive menu and pressing the confirm button  , the List of file screen will be displayed, as shown in the image below, which allows the user to browse between flash drive folders and file structure.



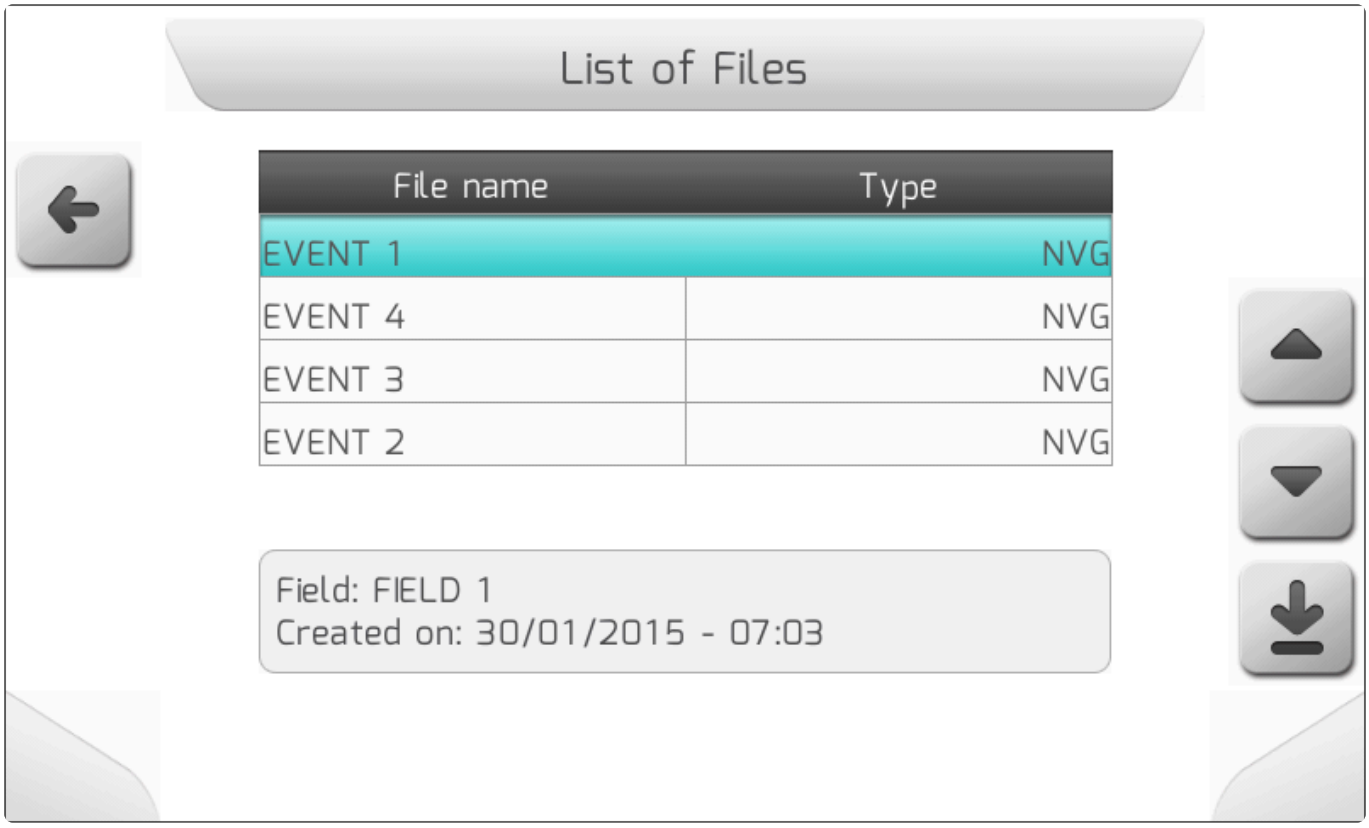

Event files exported by the GeoNave system have “.NVG” extension, and will be organized with the following folder configuration in the flash drive.

**GeoNave/SERIAL_NUMBER/FIelds/FIELD_NAME/EVENT_NAME.NVG**

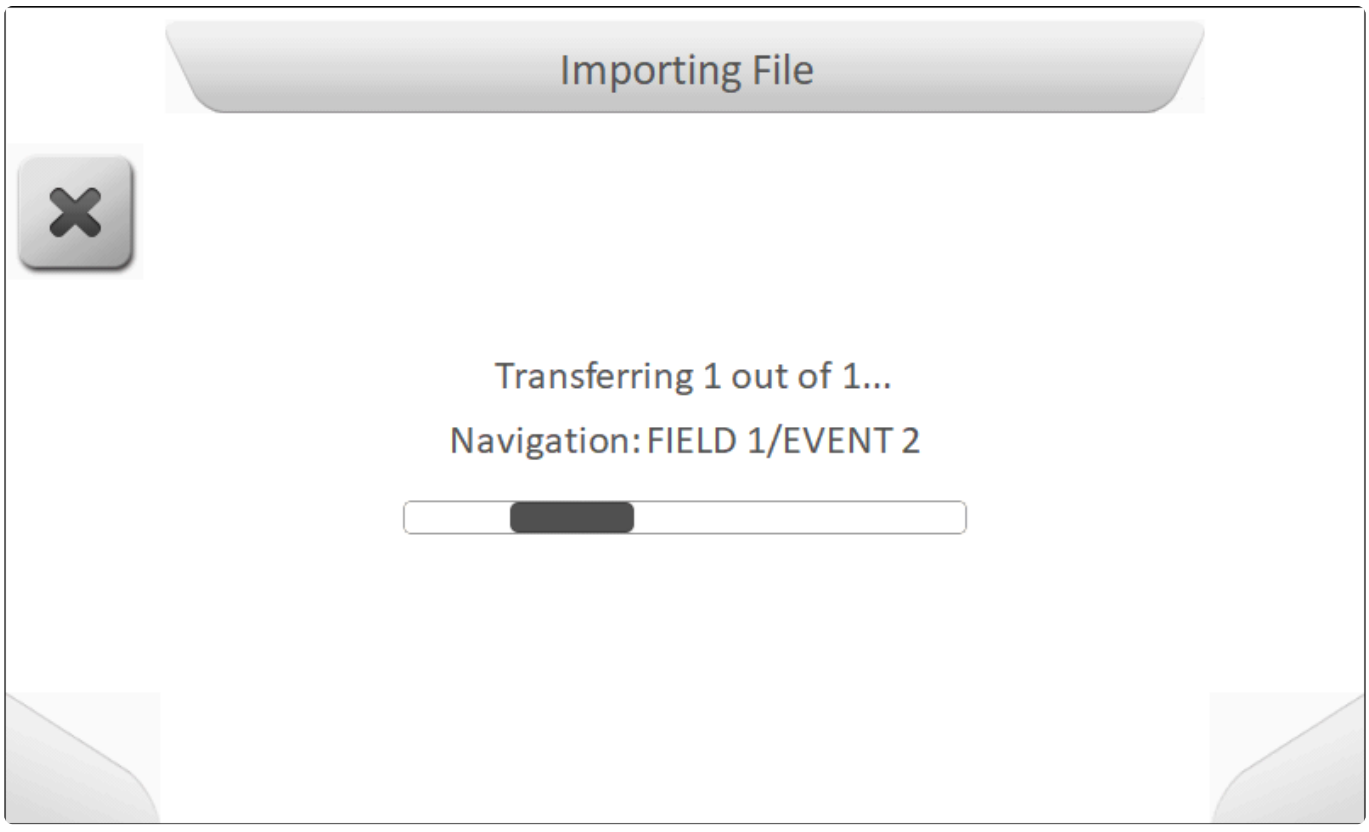
Where:

- **SERIAL_NUMBER** – Serial number of the equipment.
- **FIELD_NAME** – Folder with the field name in which the event was created.
- **EVENT_NAME.NVG** – Name of the exported operation file, which is composed of the event name followed by the extension “.NVG”.

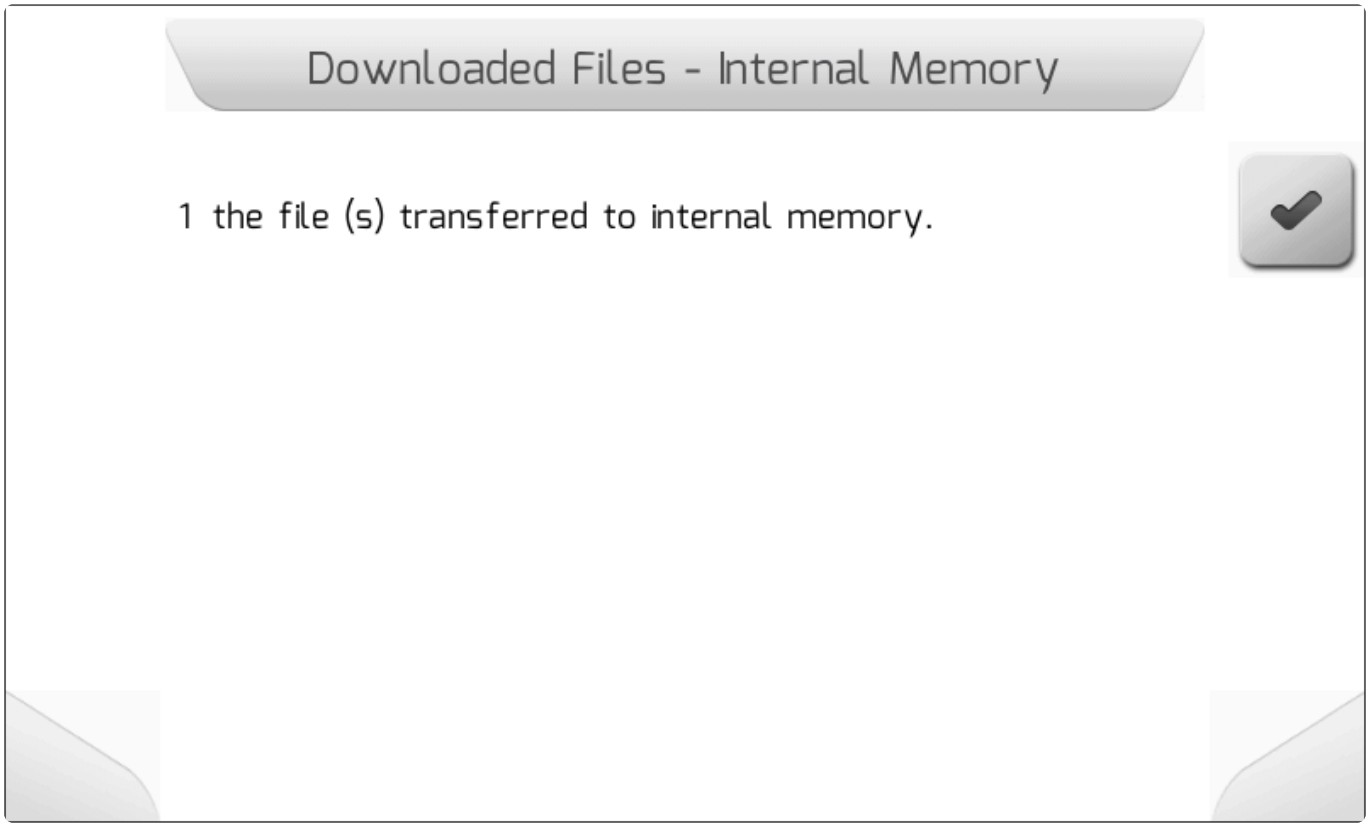
The user can browse the flash drive folders to find the NVG file to import into the internal memory. The following image shows the NVG list of files in the flash drive for a given field.




Selecting one of the NVG files from the list and pressing the load button  , the file will be imported into the GeoNave internal memory. While the file is being imported, the Loading screen is displayed, as shown in the image below, containing the number of files to be transferred, counter of files already transferred and the field and event name of the NVG file being transferred.



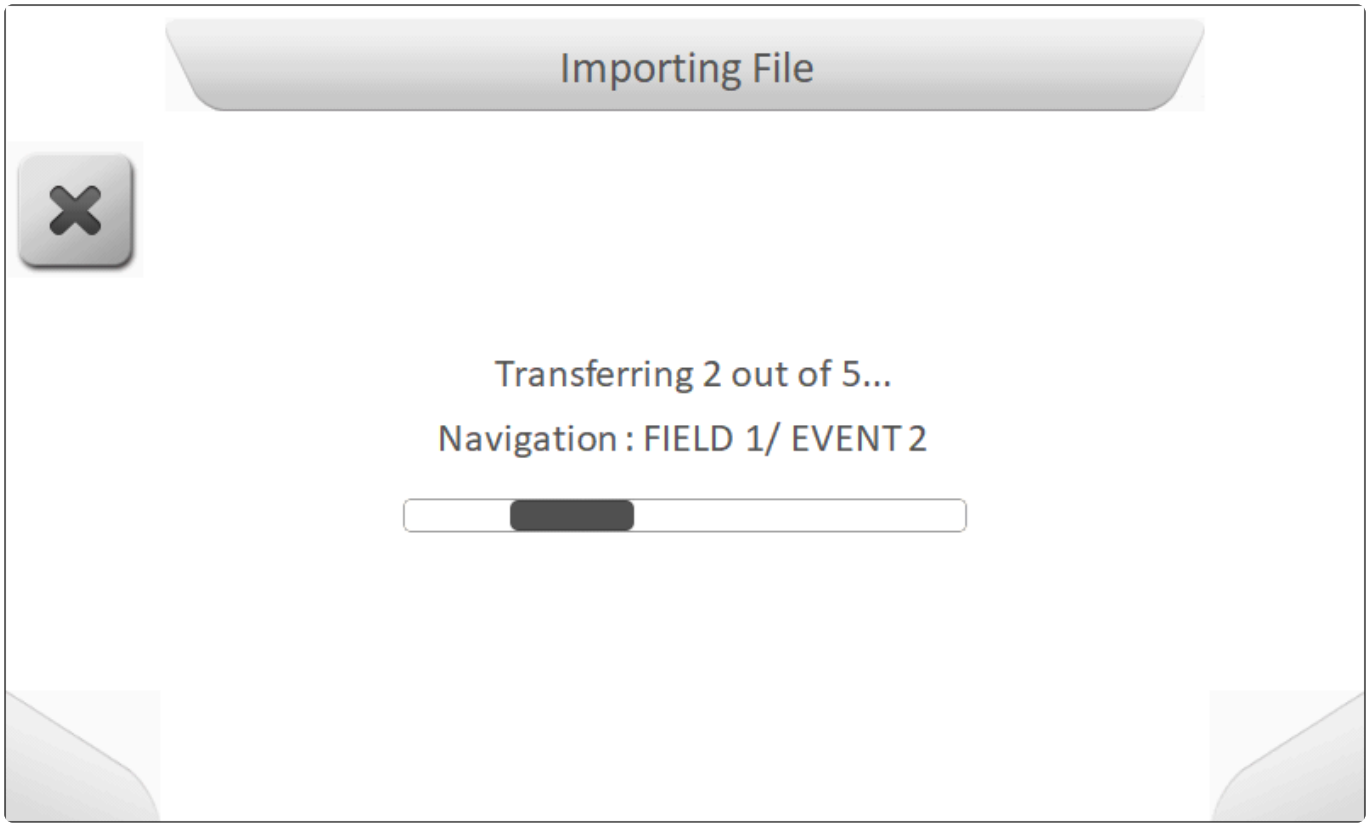
Once the import ends, the Information screen will indicate that the file has been loaded to the internal memory, as shown in the following image.



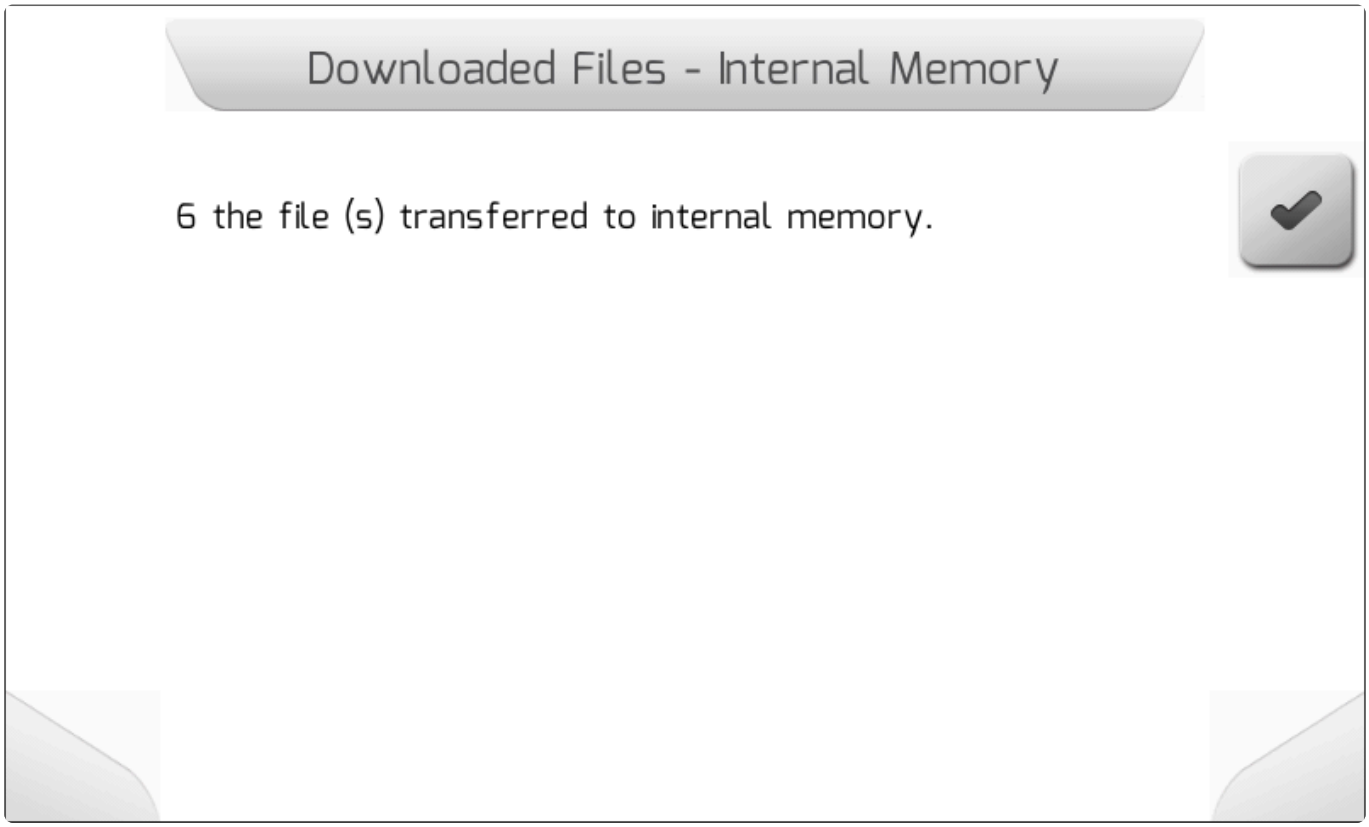

# 8.5.3.2.2. Import All

Screen type = Loading > Information

Selecting the Import All option from the Import – Pen drive menu and pressing the confirm button , all NVG files that the GeoNave system find in the folder structure of the flash drive will be imported into the internal memory.
While the files are being imported, the Loading screen will be shown, as in the image below, containing the number of files to be transferred, counter of files already transferred and the field and event name of the NVG file being transferred.




Once the import ends, an Information screen indicating the number of files actually imported into the GeoNave internal memory will be displayed, as shown in the following image.

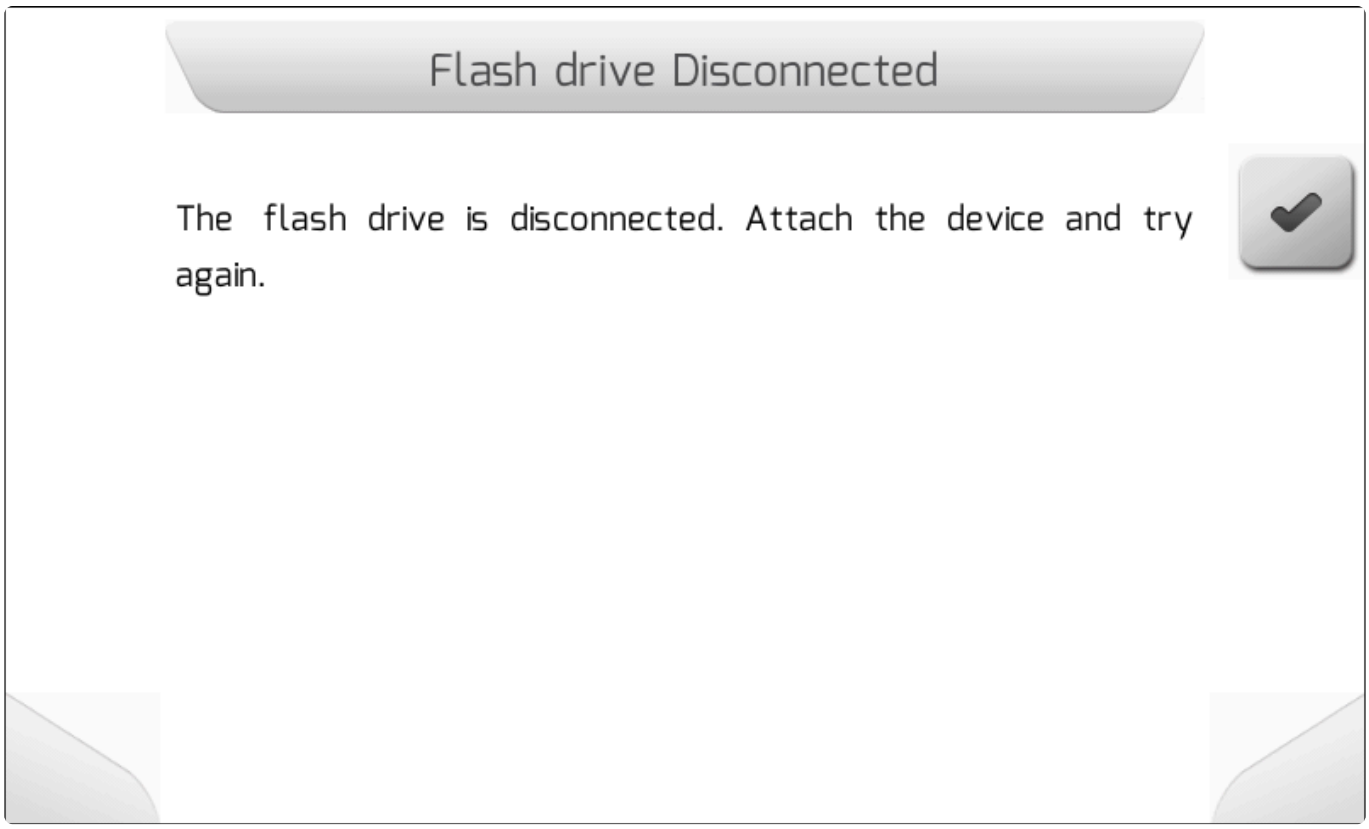


# 8.5.3.3. Export by date

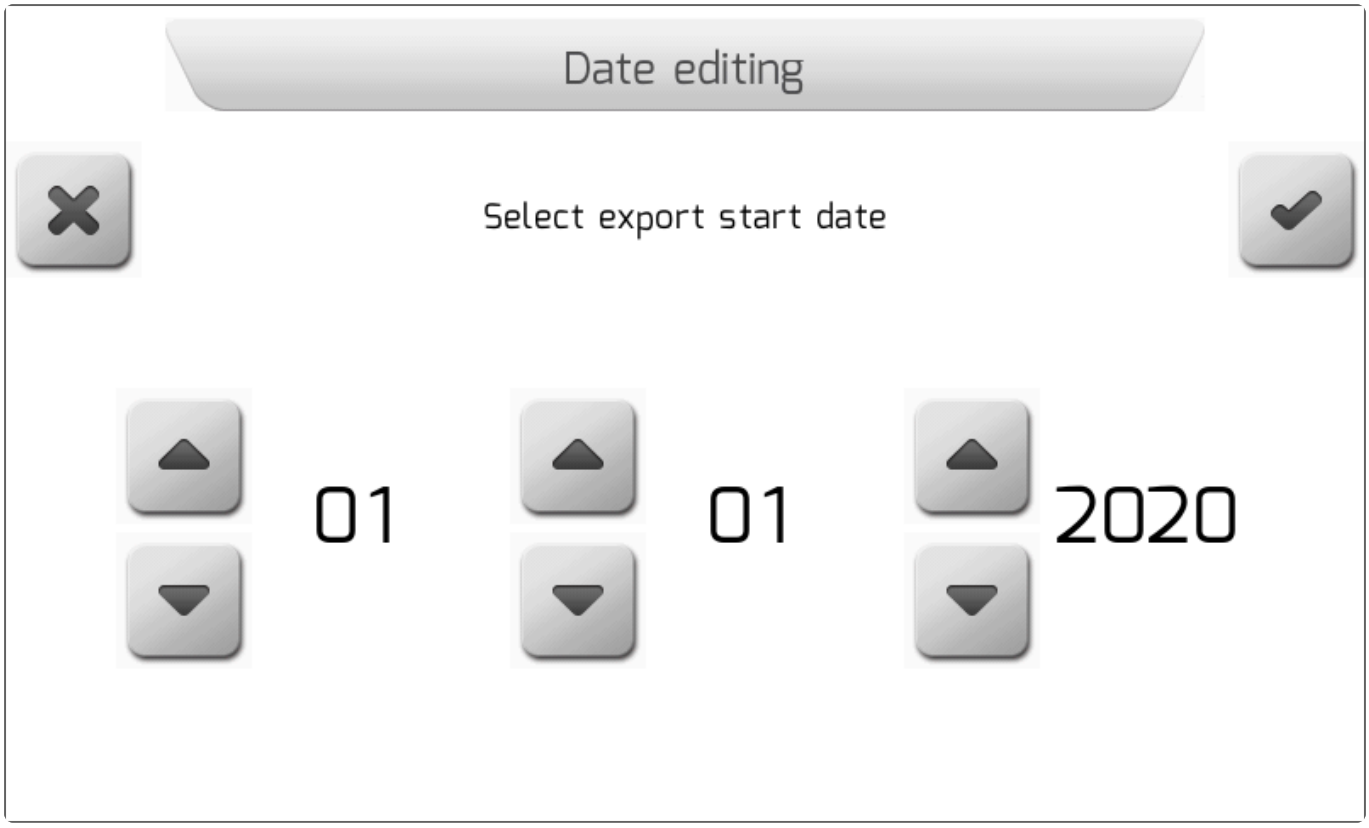
Screen type = Date editing > Loading > Downloading files > Information

In the Export by date area of the event management, the user can export the NVG files of the operations that were performed in a certain period of time. The user selects the search start and end dates, and the GeoNave system scans the internal memory in search of fields and events between these two dates, and exports them as NVG files to a flash drive.

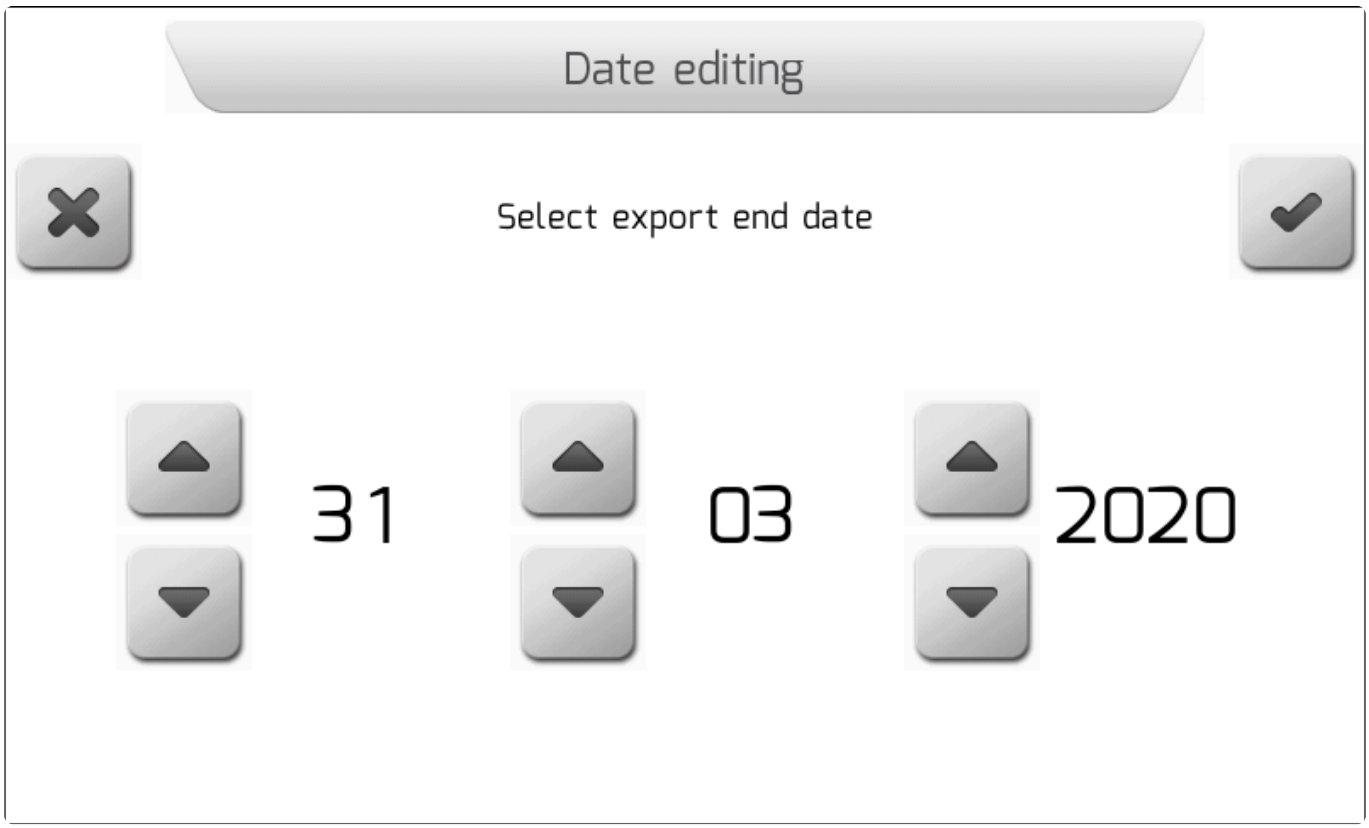
The user must select from the Events menu the option Export by date and press the confirm button  . If the portable memory is not connected, an Information screen will be displayed, as shown in the image below.




If the portable memory is correctly connected to the USB interface, the Date editing screen will be displayed where the user can select the initial export date, as shown in the image below.

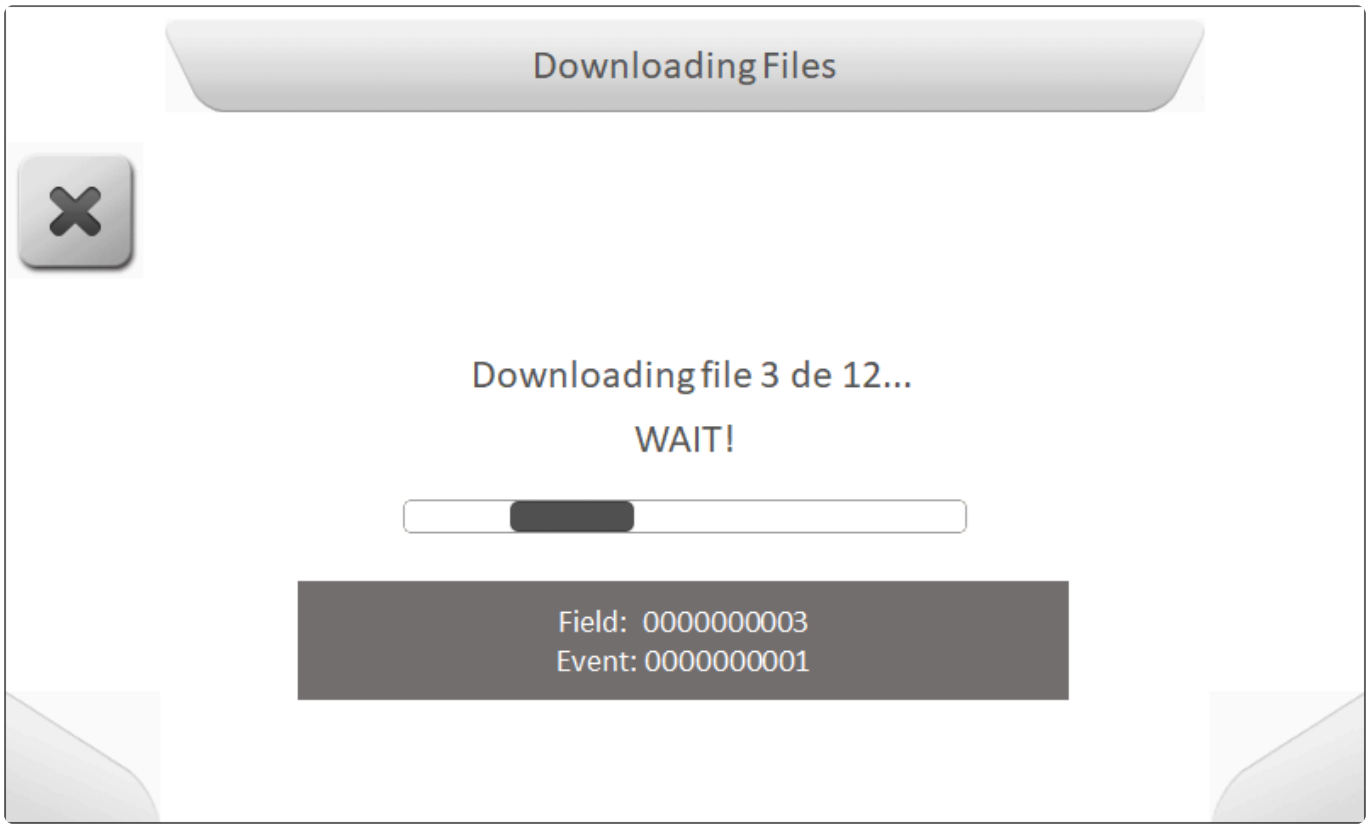



After selecting the start date, pressing the confirm button  , the final export date will be requested, in a new Date Editing screen, as shown in the following image.

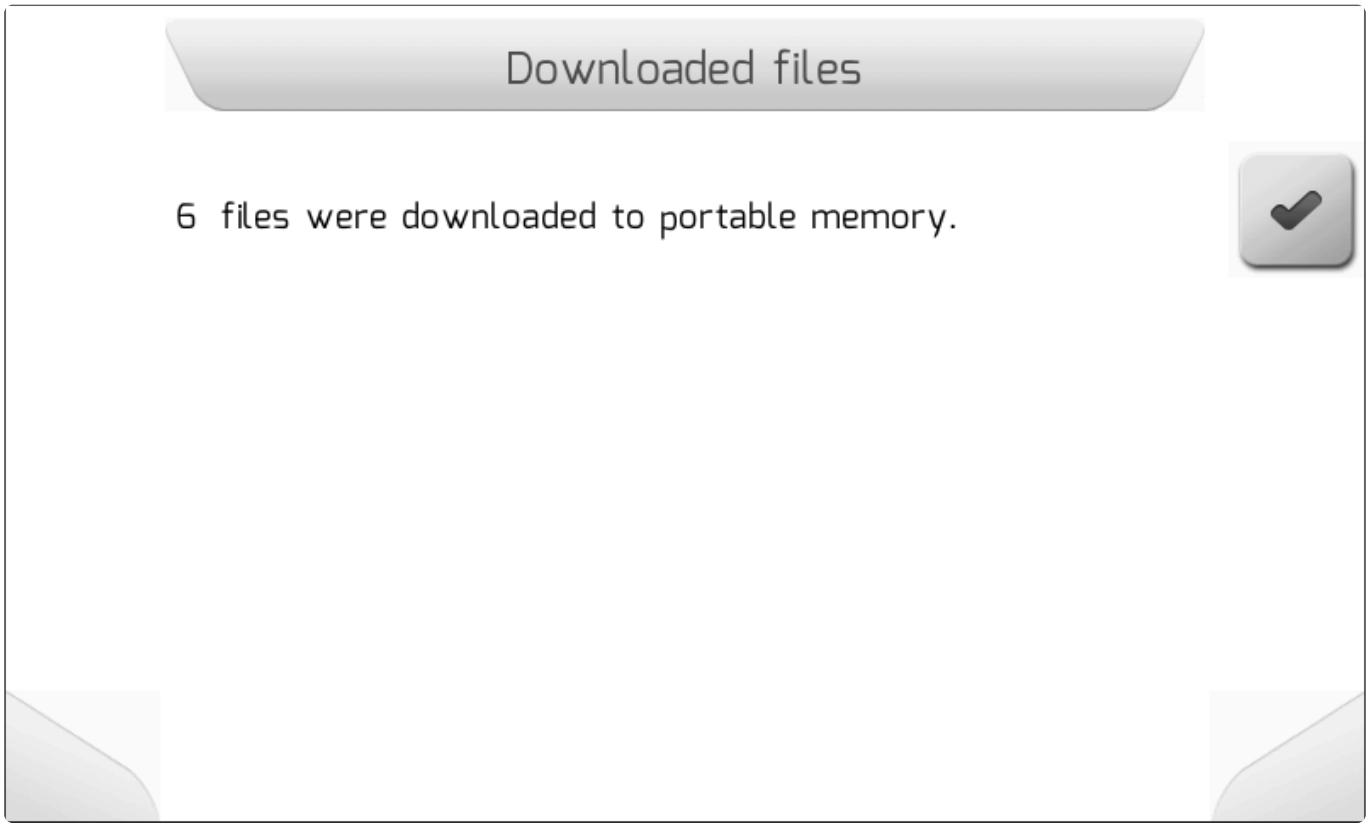



After selecting the end date and pressing the confirm button again  , the GeoNave system will

search the internal memory and export, as NVG files, the events corresponding to the indicated period. During the export, will be displayed the Downloading Files screen, for each of the NVG file found, as shown in the image below.




At the end of the export, an Information indicating the number of files actually downloaded to the flash drive will be displayed, as shown in the following image.

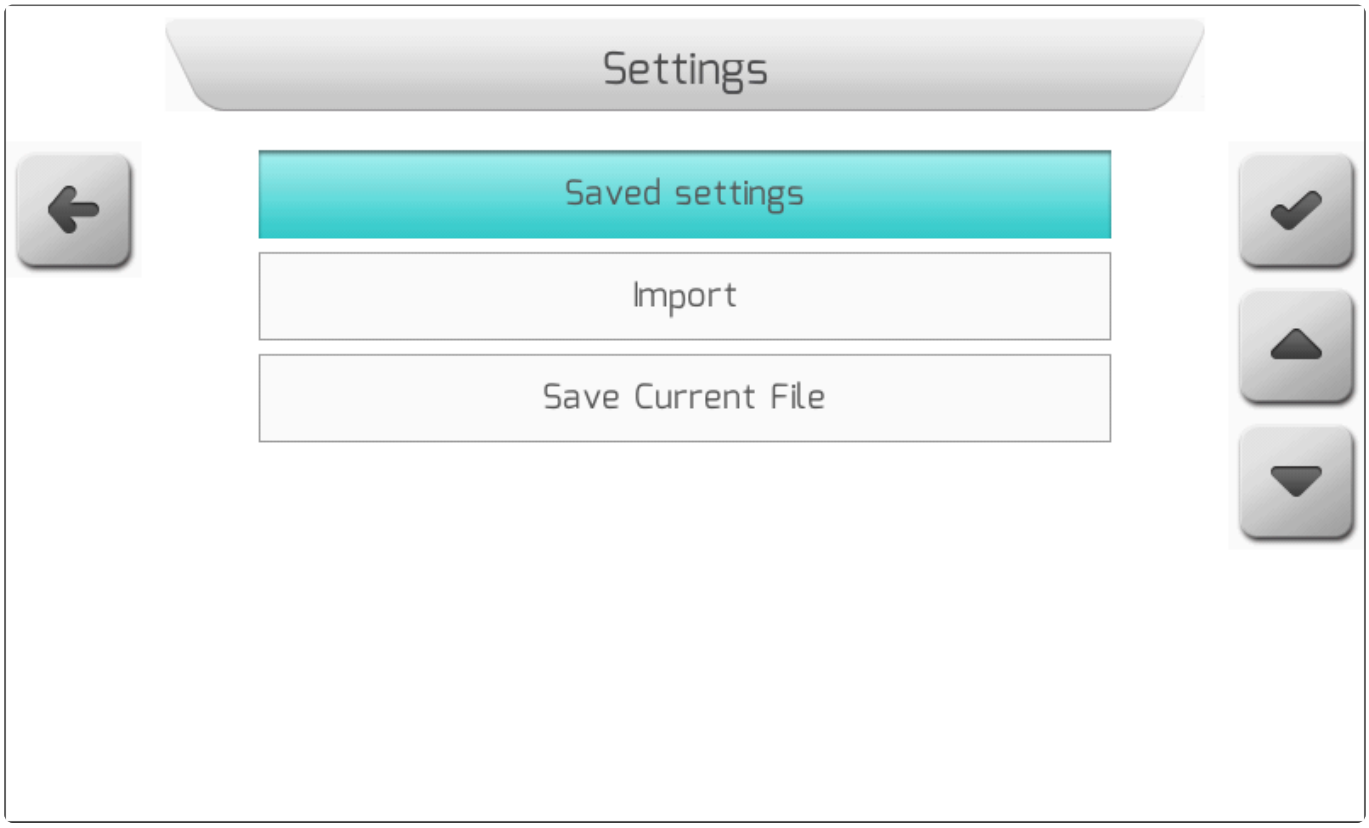


# 8.5.4. Settings – Manage

Screen Type = Vertical menu

- Saved settings
- Import
- Save Current File

The Settings management menu consists of three areas, through which the user can select, import and save files with ".CFG" extension, which contain the settings of the GeoNave system parameters. The image below shows the Settings menu screen.

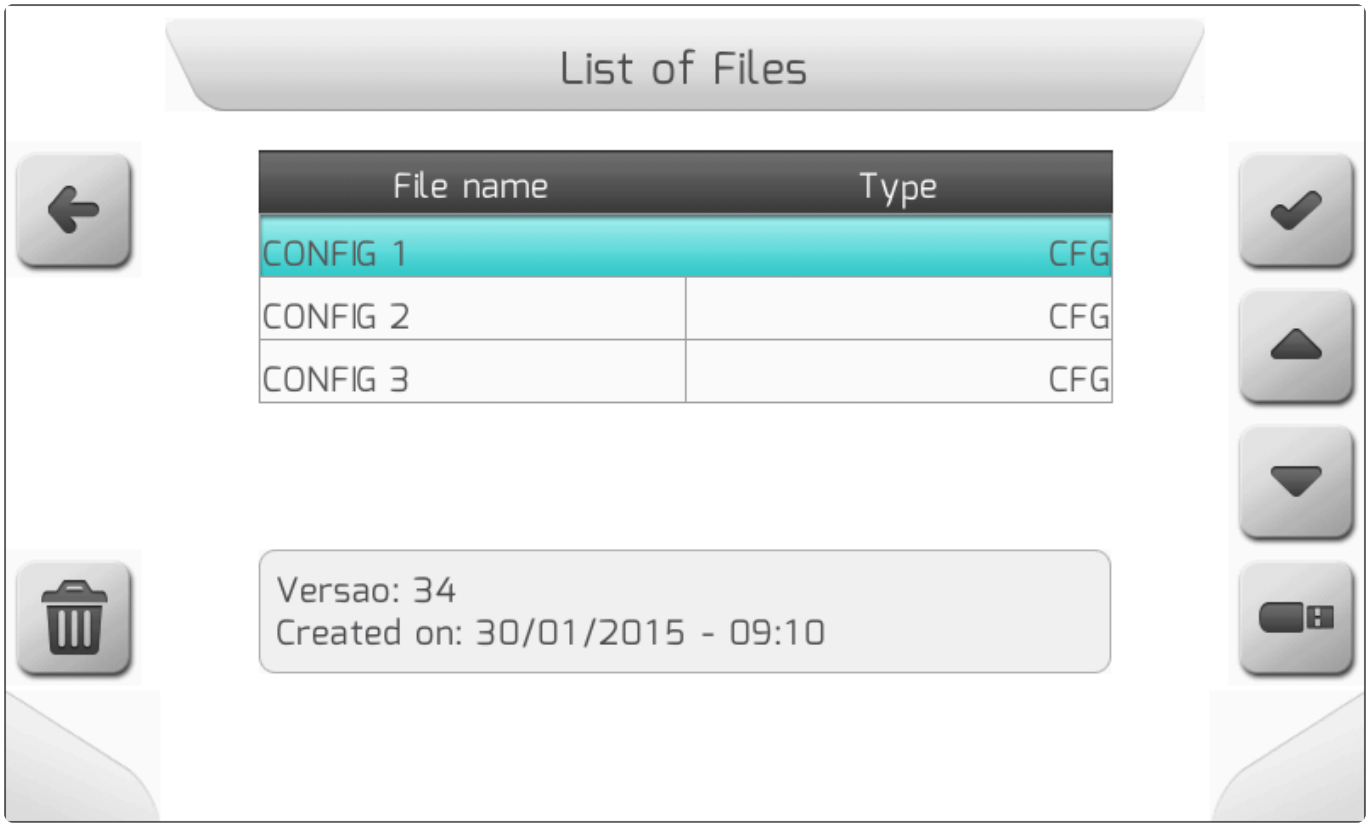



# 8.5.4.1. Saved settings

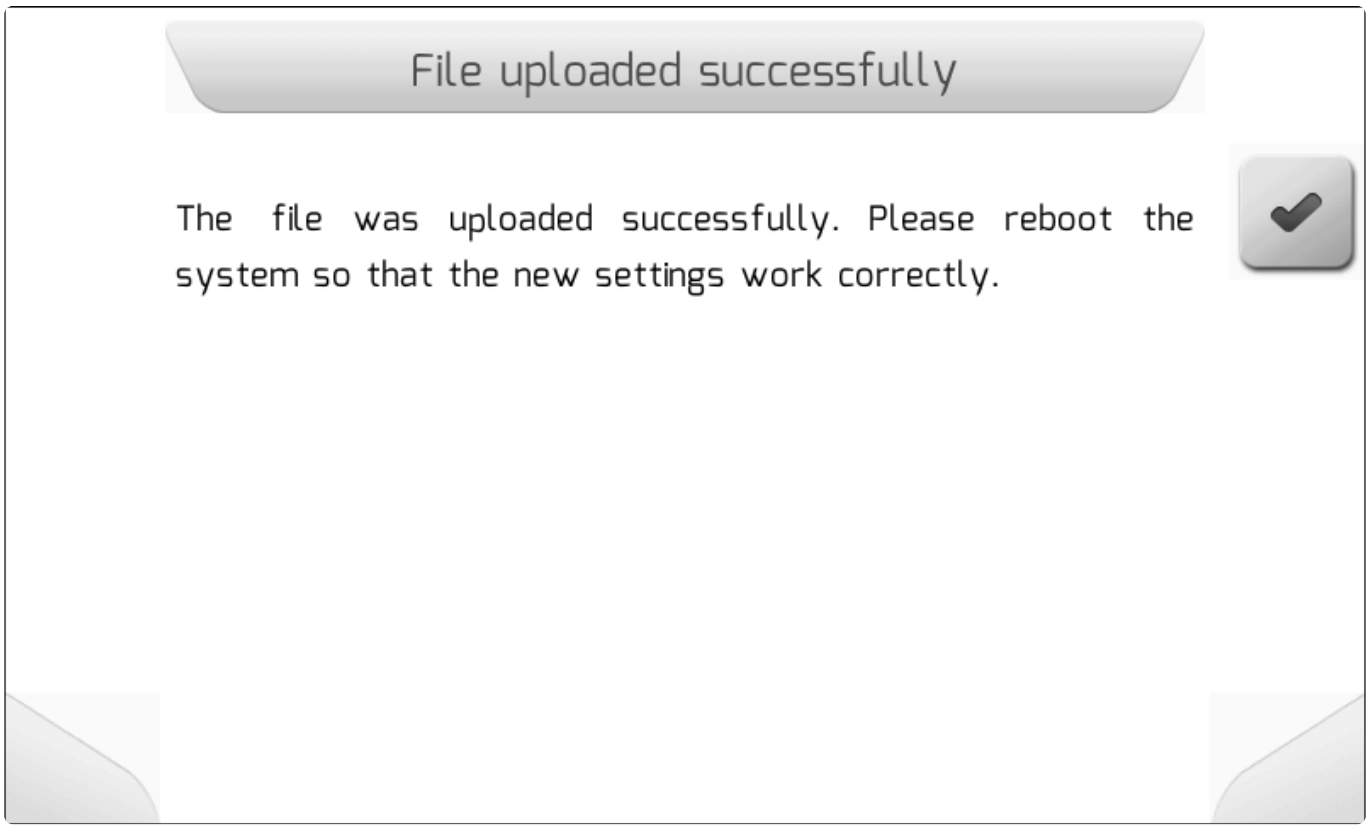
Screen Type = List of files

In the Saved Settings area of the settings management, the user can view, delete, export, and load configuration files stored in the GeoNave internal memory.

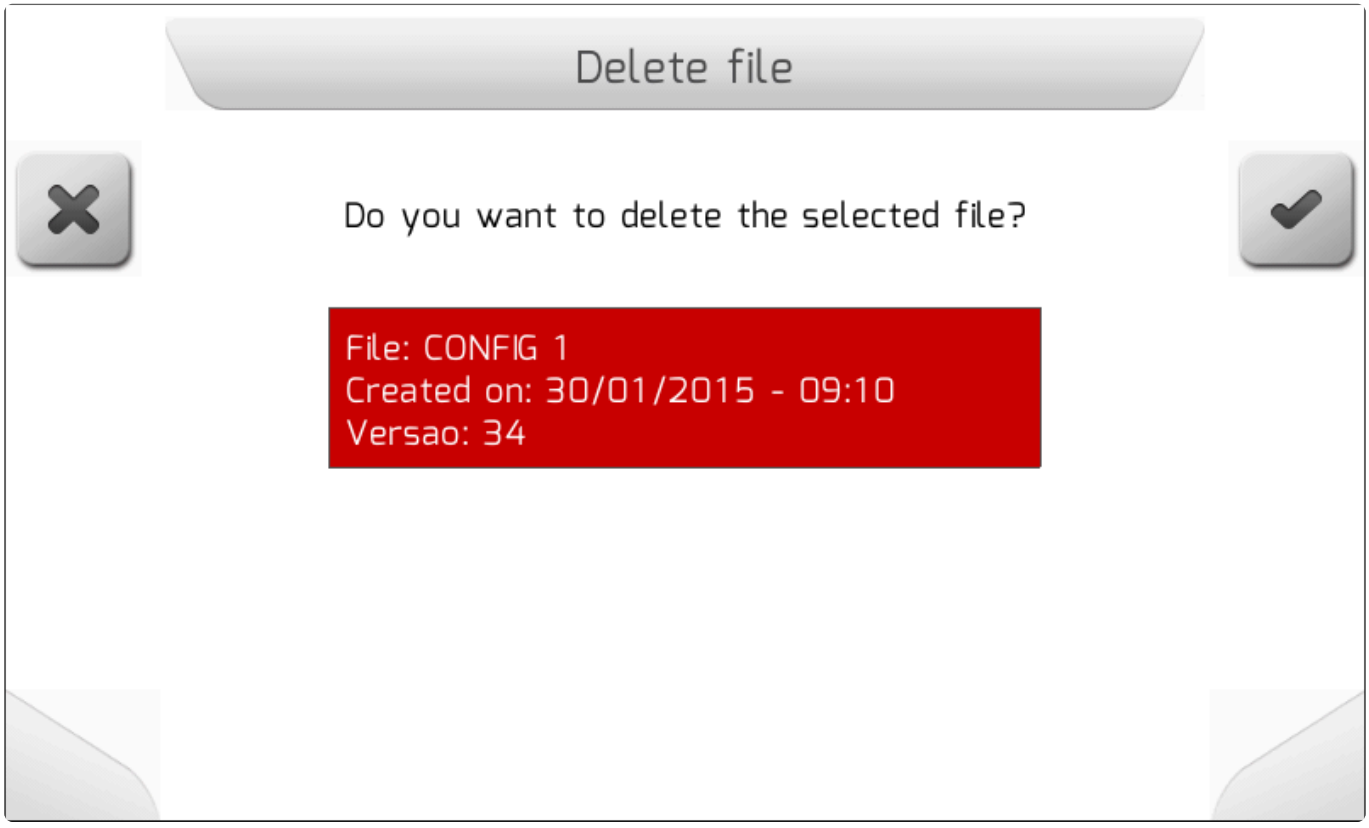
When selecting the item in the Settings – Manage menu and pressing the confirm button  , a File list screen will be displayed, as the following image, listing the CFG files saved in the internal memory. The file data description area shows the CFG file version and its creation date and time.



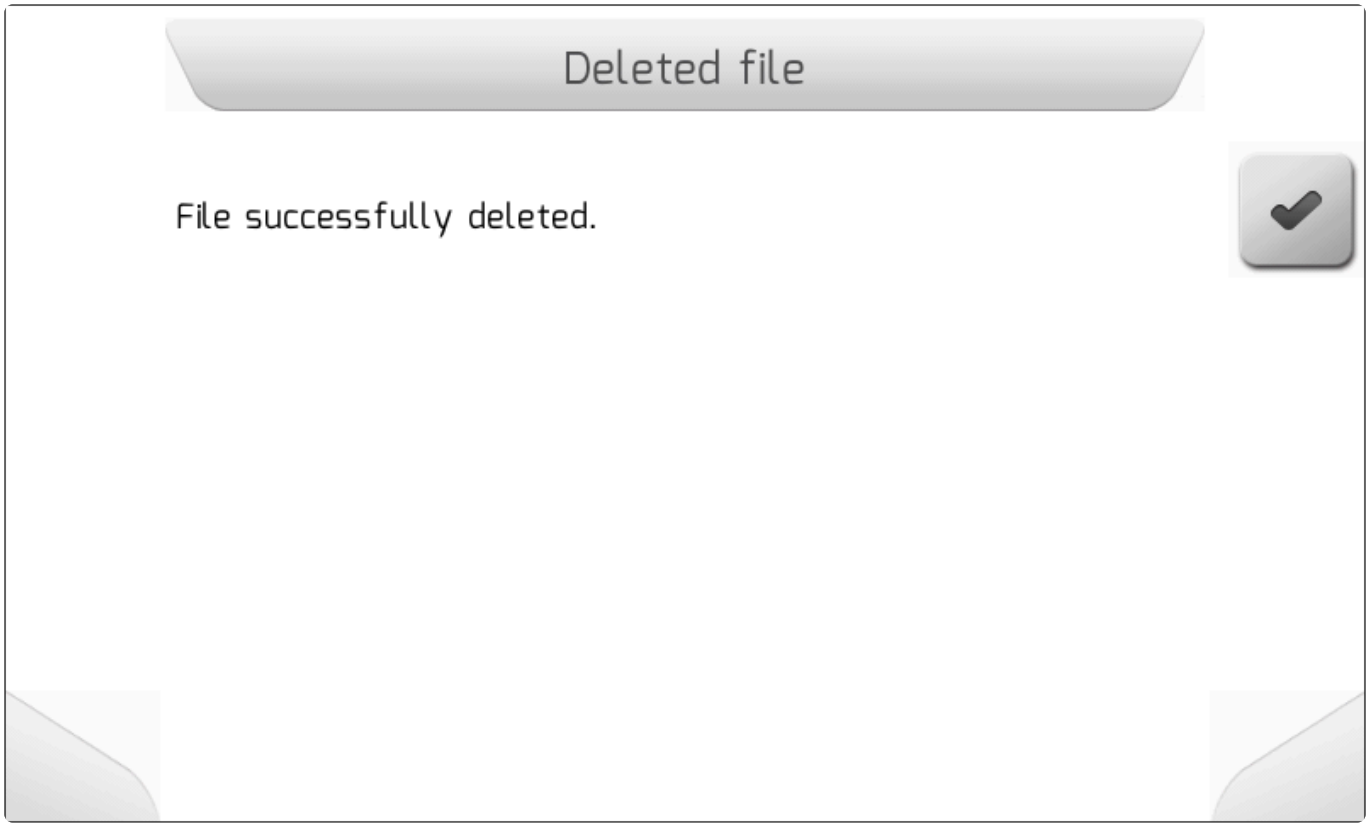

Selecting a settings file and pressing the confirm button again  , the file data will be loaded into the GeoNave system. Then an Information screen with the message of successful loading will be displayed, requesting the user to restart the system for the new settings to be effective, as shown in the image below.



Also in the Saved Settings area, the user can delete a CFG settings file through the button  . When pressing the button, the screen of the following image will be shown, containing a table with a red background to draw attention to the deletion and informing the CFG file name, creation date and time, and file version.



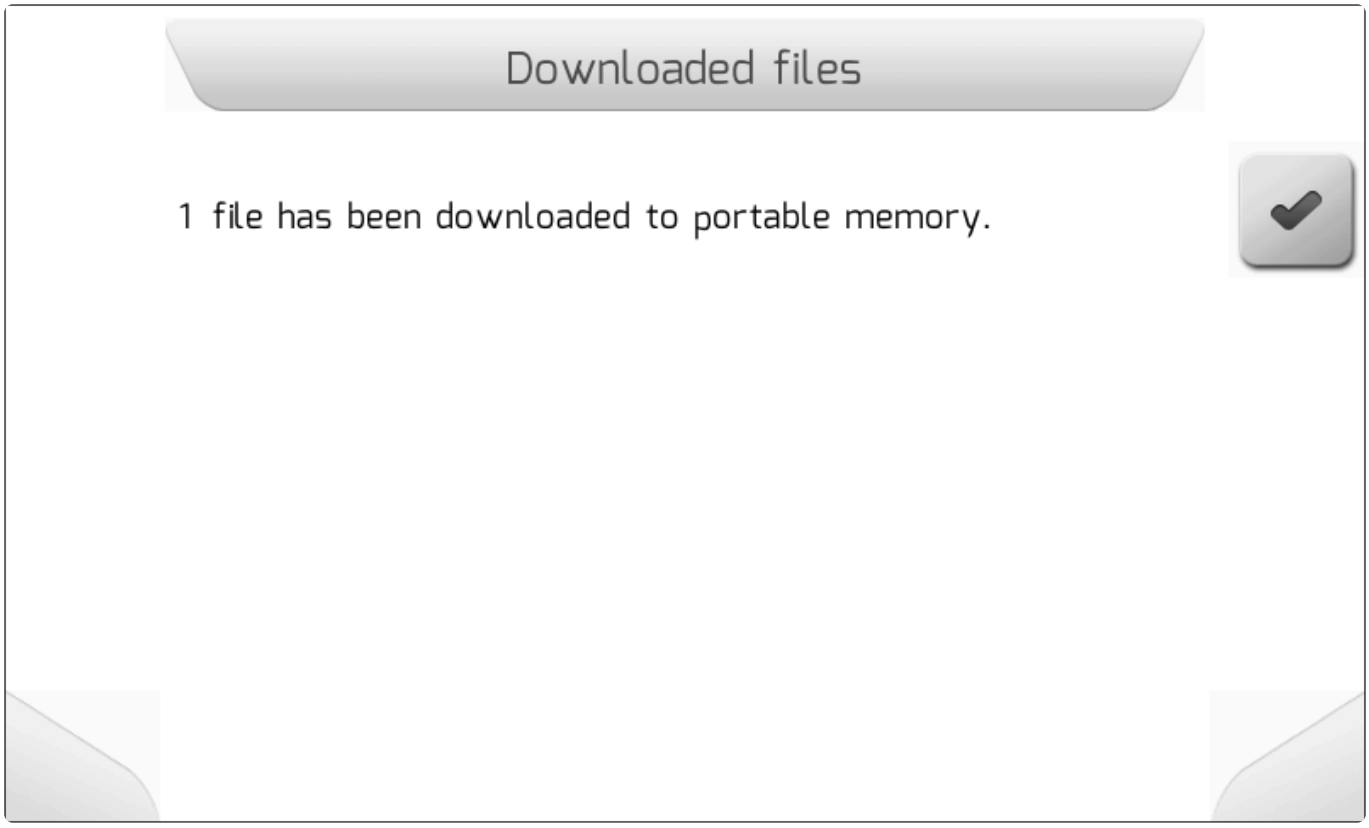

If the user presses the cancel button  , the deletion will not be performed and the system will return to the previous screen. If the confirm button is pressed  , the settings file will be deleted from the internal memory and a confirmation screen will be displayed, as shown in the image below.




Still in the Saved Settings area, the user can also export a CFG file to a flash drive by the button . If a flash drive is not connected, the Information screen will be displayed, ad shown in the image below.




If the flash drive is correctly connected to the USB interface, the CFG file is downloaded, then Information screen confirming the export will be displayed, as shown in the following image.




# 8.5.4.2. Import

Screen Type = Vertical menu

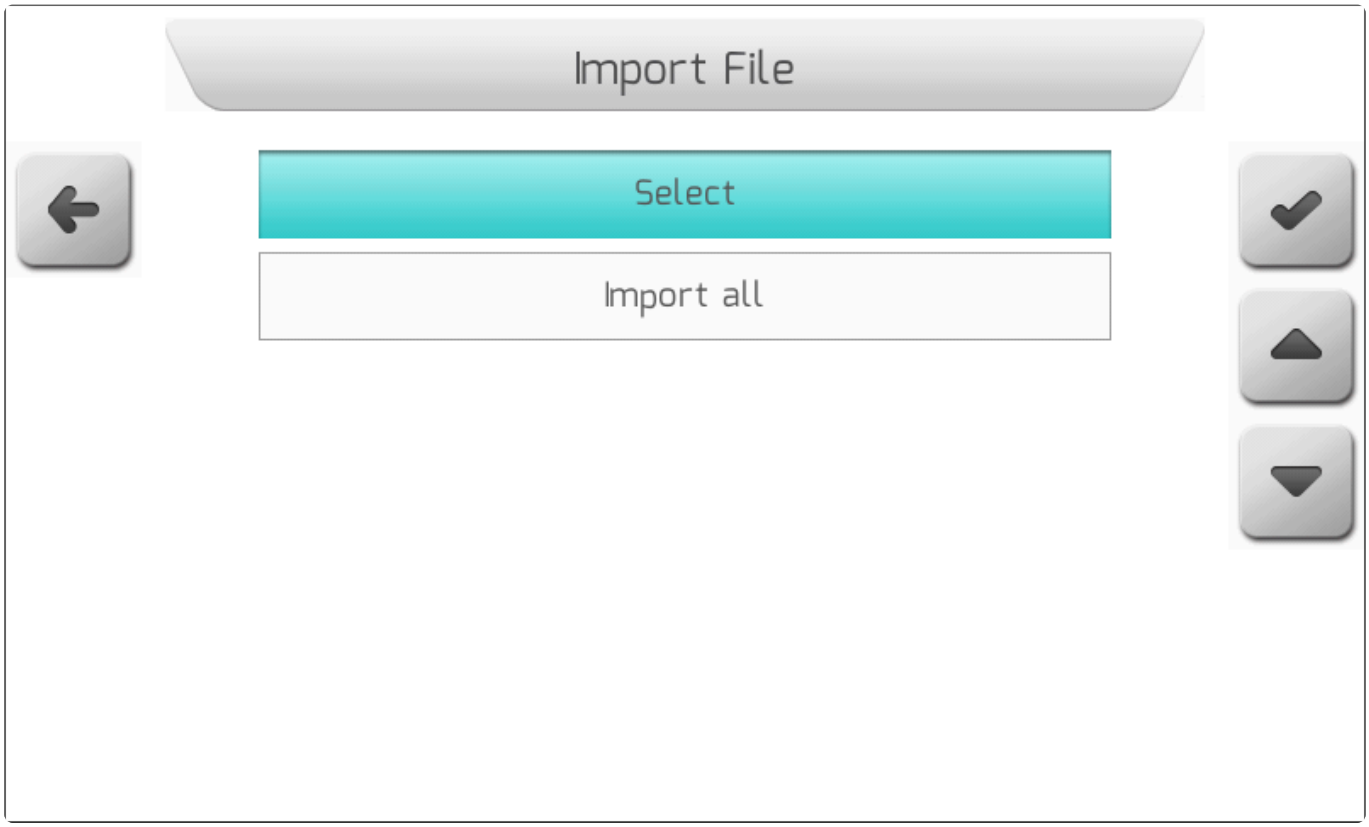
- Select
- Import All

The Import area is used to import configuration files from flash drive (*pen drive*) to the GeoNave internal memory. In this way is possible to easily carry the configurations of a GeoNave display to another.

In the Settings – Manage menu, select the Import option and press the confirm button . If a flash drive is not connected, an Information screen will be displayed, as shown of the following image.



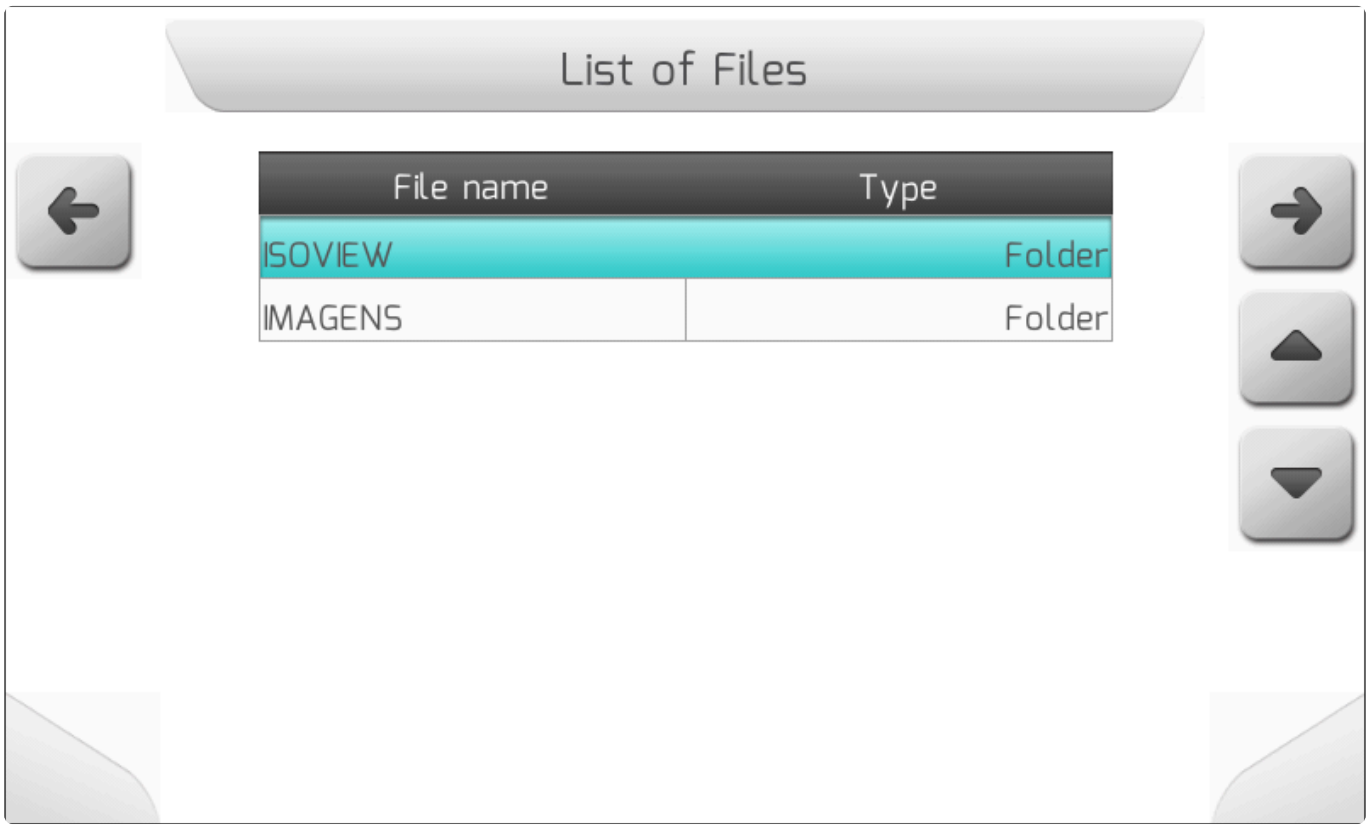

If the flash drive is correctly connected to the USB interface, a new Vertical menu appears containing two options, as shown in the image below. In the first option – Select – allows the user to choose what file will be imported into the internal memory. In the second – Import all – all configuration files found in the flash drive will be imported into the internal memory.



# 8.5.4.2.1. Select

Screen Type = List of files

Choosing the Select option from the import menu and pressing the confirm button , the List of file screen will be displayed, as shown in the image below, which allows the user to browse between flash drive folders and file structure.



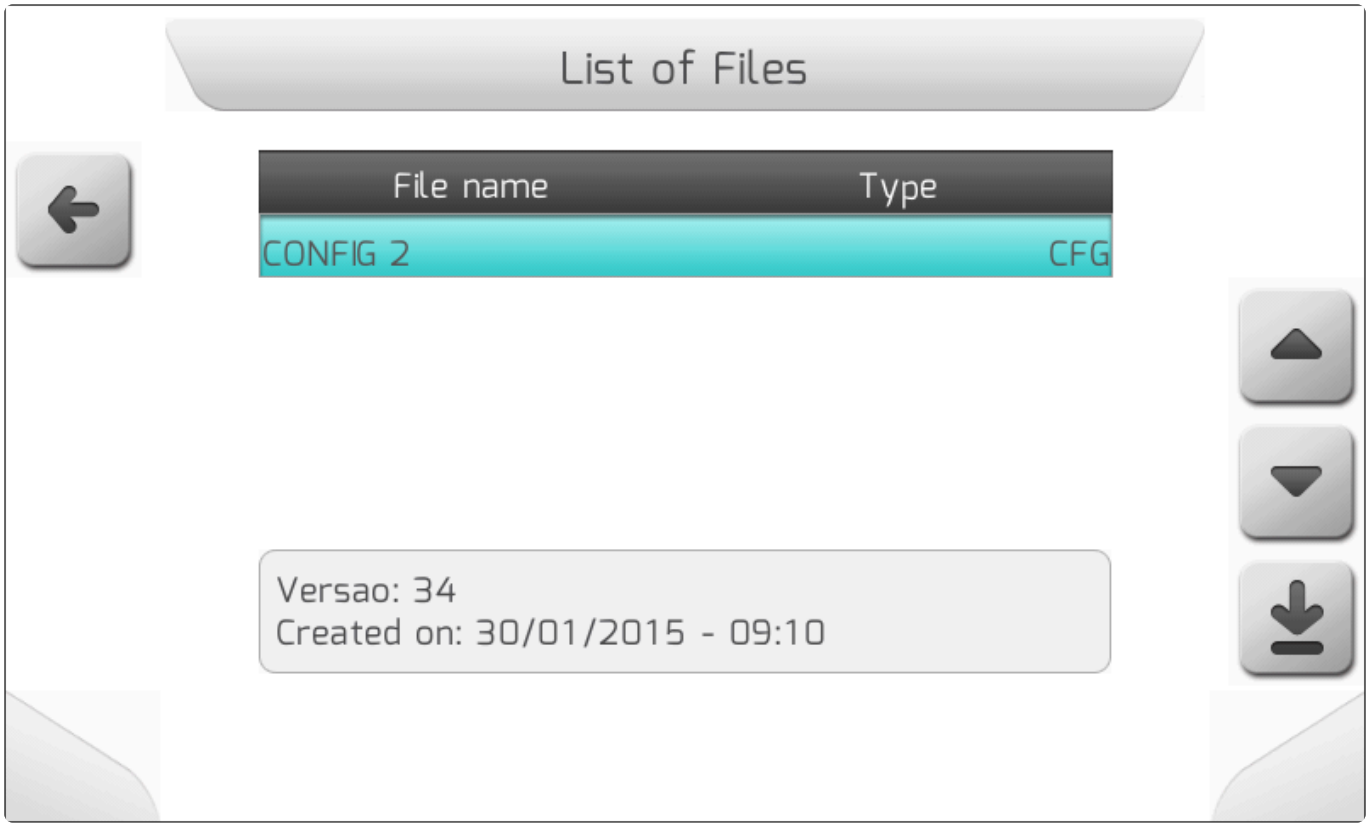

Configuration files exported by the GeoNave system have ".CFG" extension, and will be organized with the following folder configuration in the flash drive.

**GeoNave/SERIAL_NUMBER/CONFIG/CONFIGURATION_NAME.CFG**

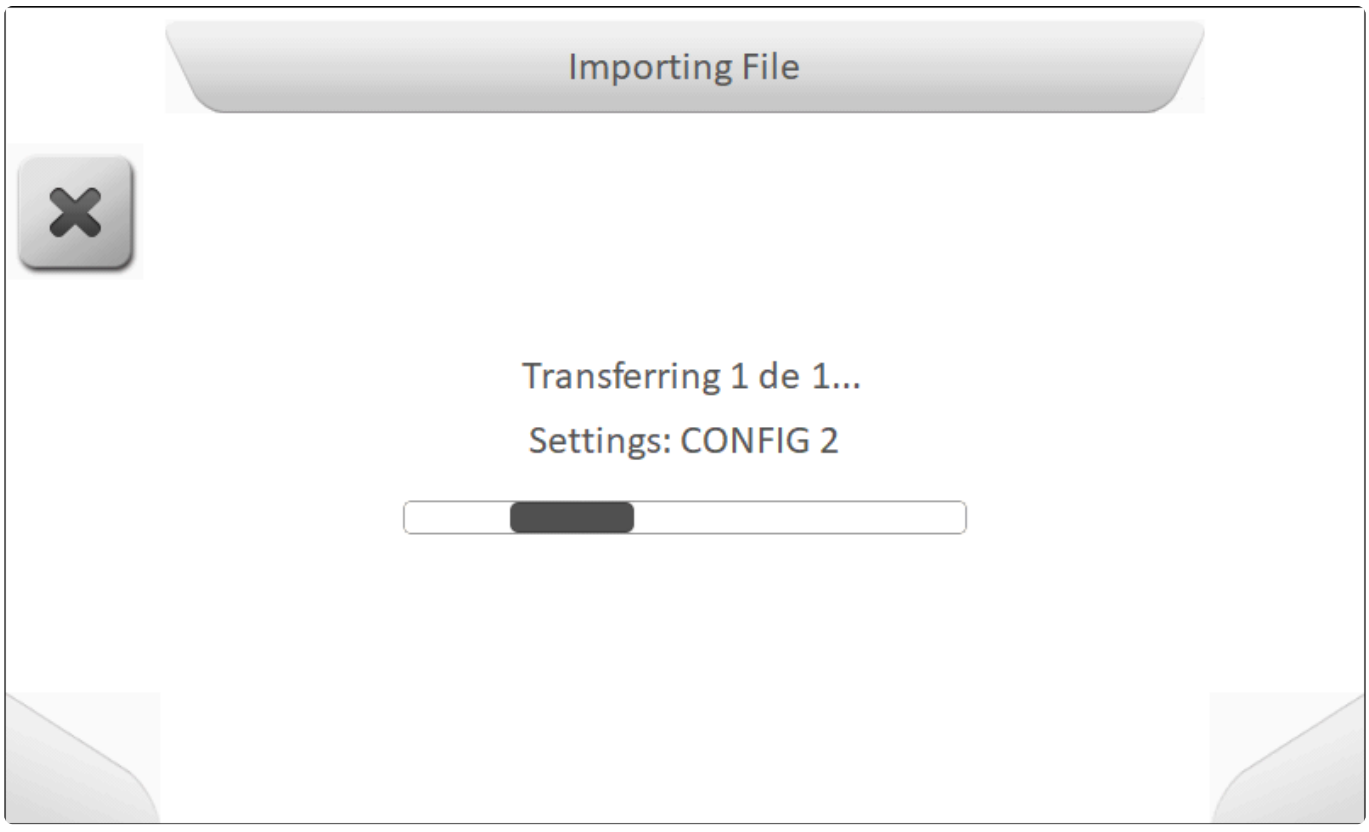
Where:

- **SERIAL_NUMBER** – Serial number of the equipment.
- **CONFIGURATION_NAME.CFG** – Name of exported settings file, with extension ".CFG".

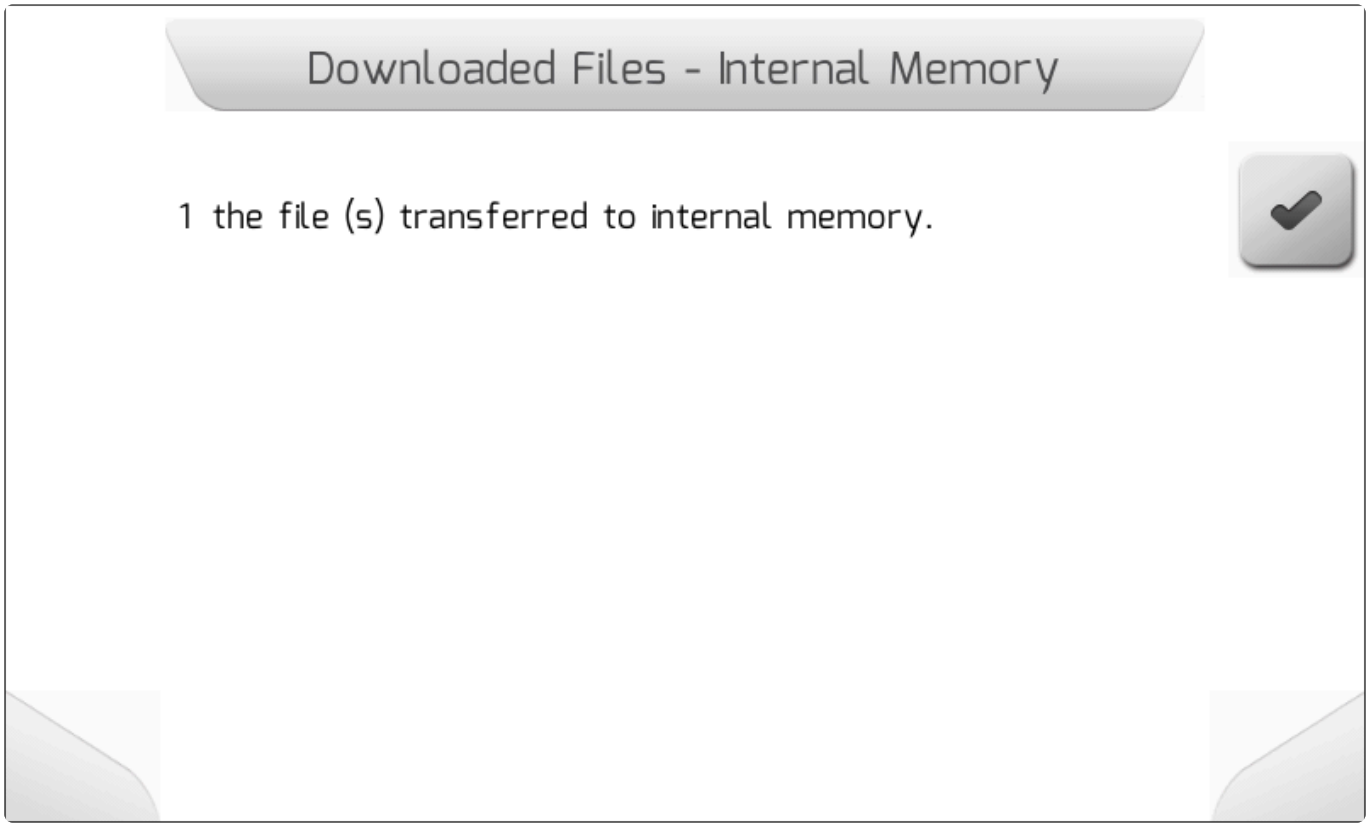
The user can browse the flash drive folders to find the CFG file to import into the internal memory. The following image shows the CFG list of files in the flash drive.




Selecting one of the CFG files from the list and pressing the load button  , the file will be imported into the GeoNave internal memory. While the file is being imported, the Loading screen is displayed, as shown in the image below, containing the number of files to be transferred, counter of files already transferred and the CFG file name being transferred.



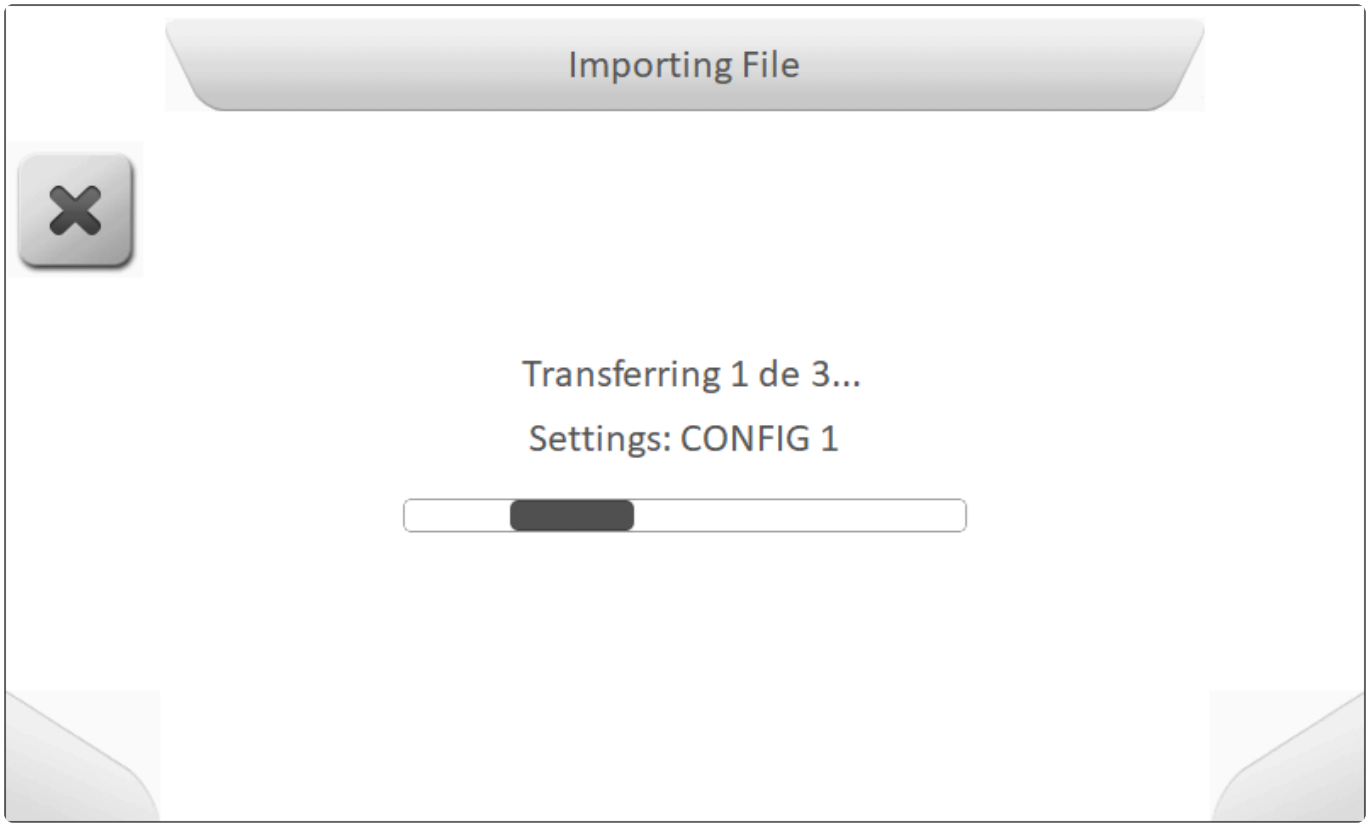
Once the import ends, the Information screen will indicate that the file has been loaded to the internal memory, as shown in the following image.



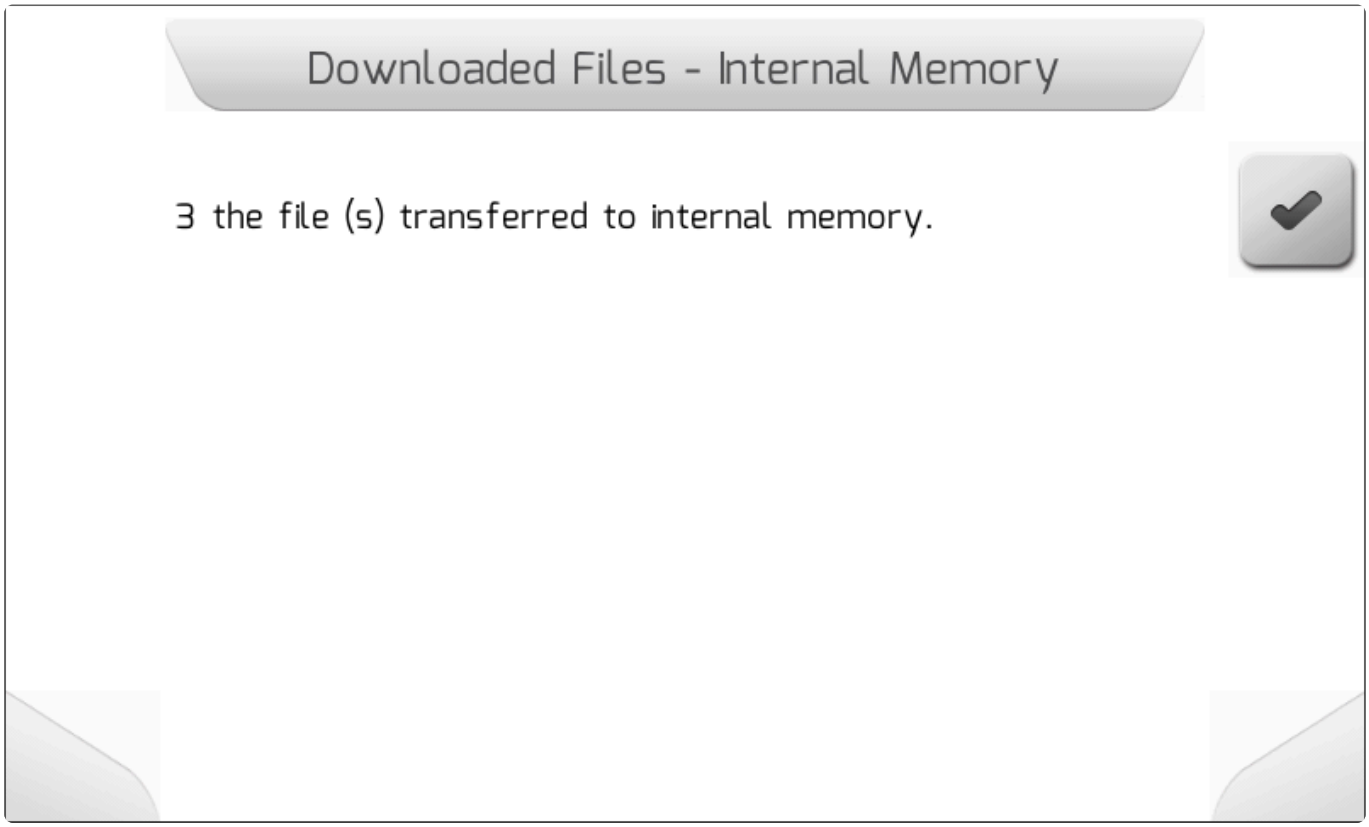

# 8.5.4.2.2. Import All

Screen type = Loading > Information

Selecting the Import All option from the Import menu and pressing the confirm button , all CFG files that the GeoNave system find in the folder structure of the flash drive will be imported into the internal memory.
While the files are being imported, the Loading screen will be displayed, as shown in the image below, containing the number of files to be transferred, counter of files already transferred and the field and event name of the CFG file being transferred.




Once the import ends, an Information screen indicating the number of files actually imported into the GeoNave internal memory will be displayed, as shown in the following image.

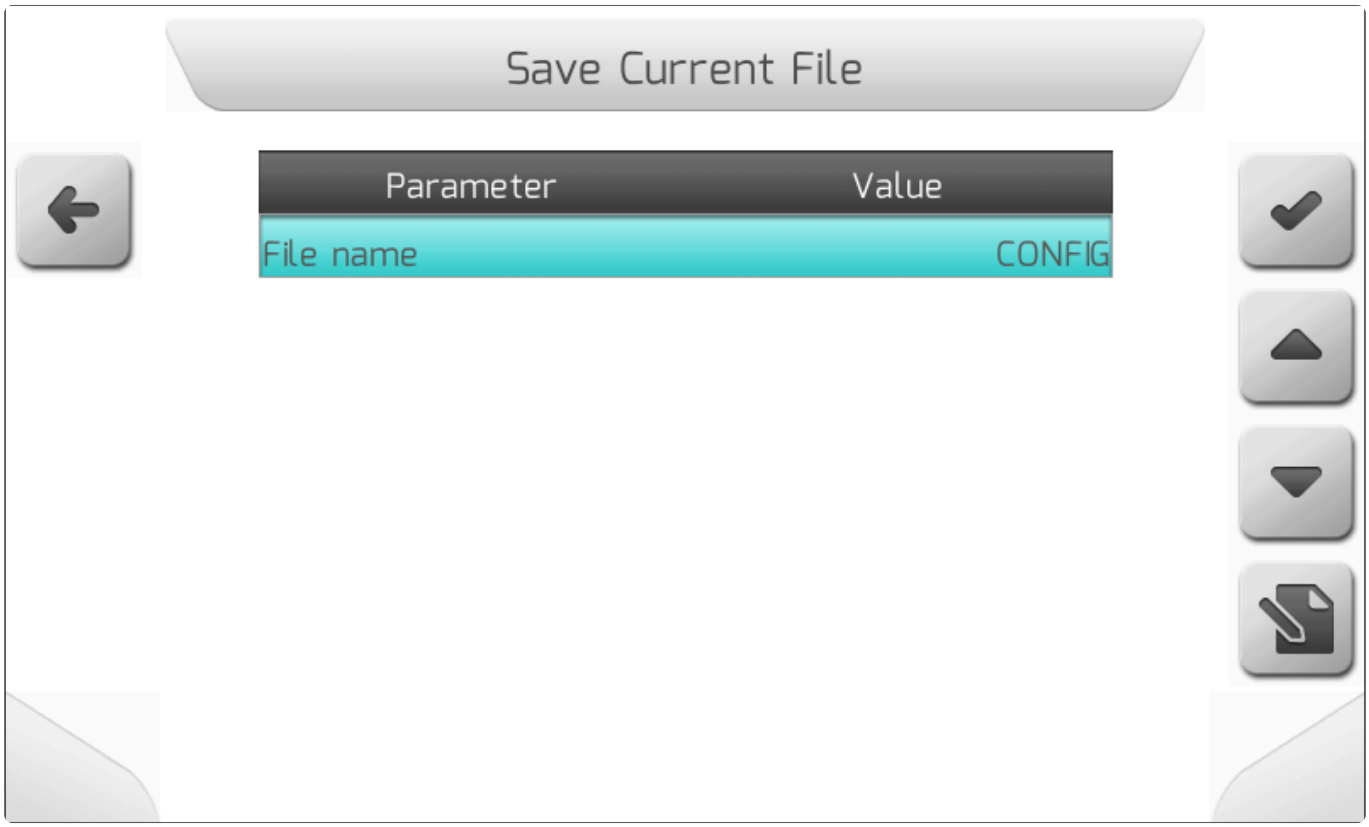


# 8.5.4.3. Save Current File

Screen type = Double list > Loading > Information

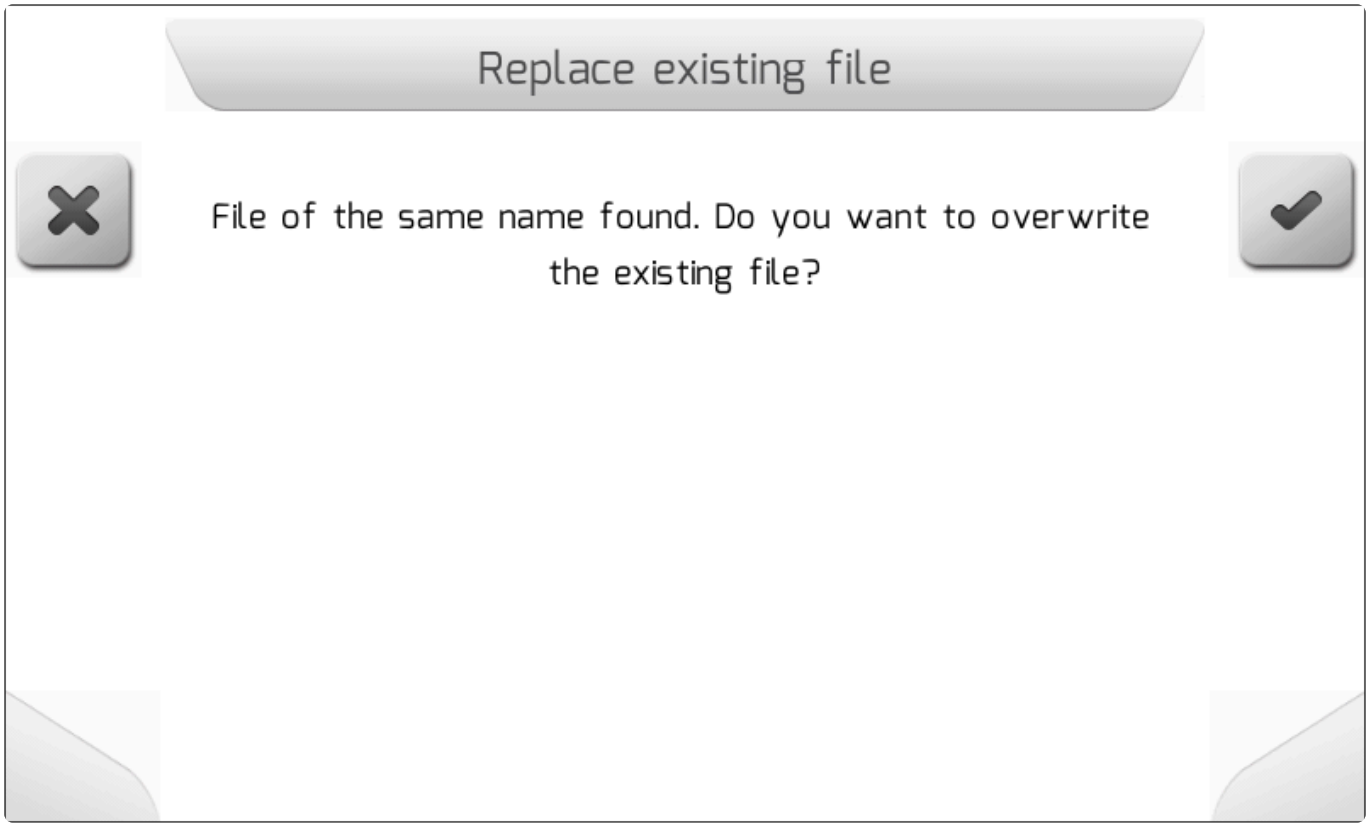
In the Save Current File area of the settings management, the user can create a file with an editable name to store the current GeoNave system settings.

Selecting the item in the Settings – Manage menu and pressing the confirm button  , the Double List screen will be displayed, as shown in the image below, containing the file name to be saved.

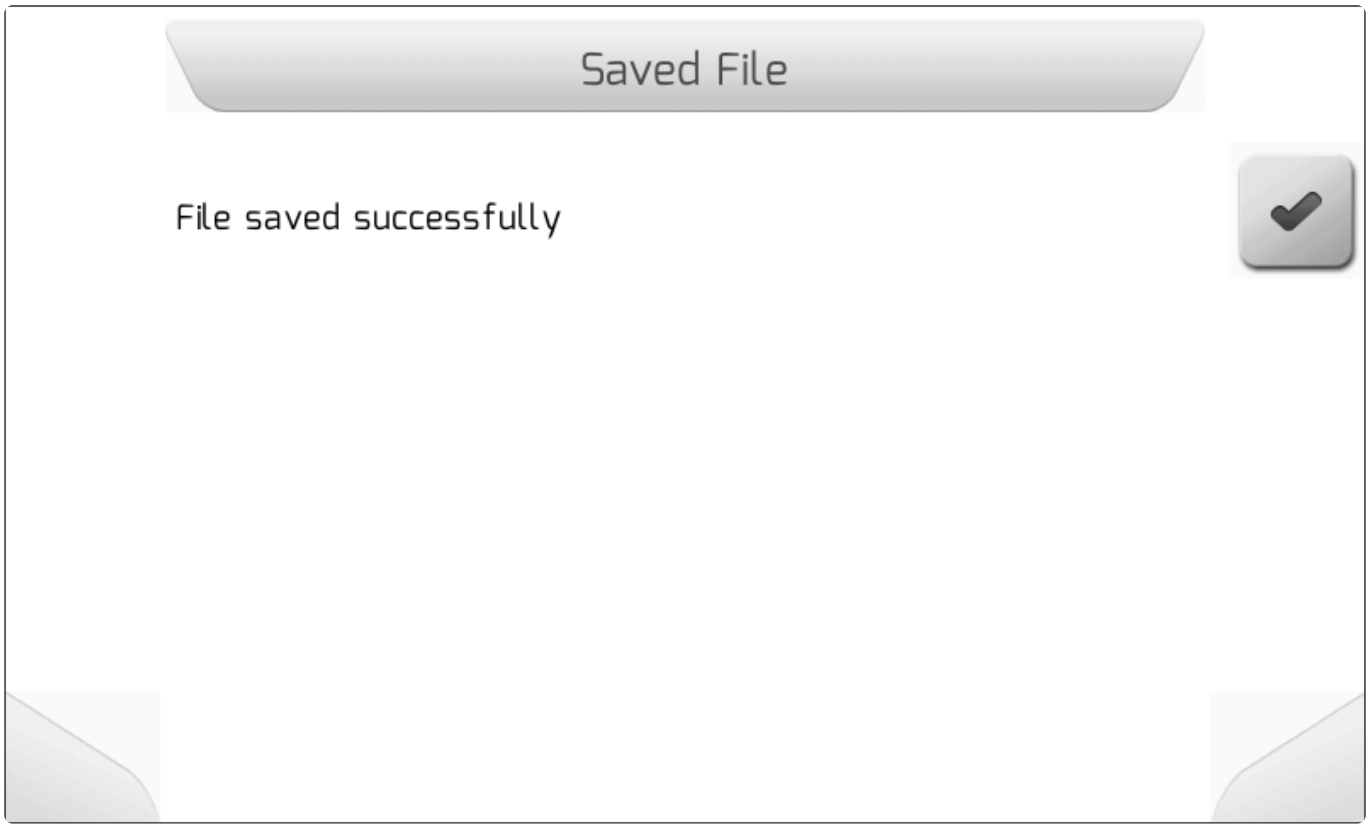



The CFG file name suggested by the GeoNave system will be “CONFIG”, but the user can change the name by pressing the edit button  , the Text editing screen will be displayed.

After editing the file name and pressing the confirm button  , if the CFG file name entered already exists in the internal memory, the Information with confirmation screen asking the user if the existing file should be replaced, as shown in the following image.




In this case, pressing the cancel button the replacement will not be performed, and the system will return to the previous screen. If the confirm button is pressed, the file will be replaced with the current system settings. Following, an Information screen indicating the success of the operation will be displayed, as shown in the following image.



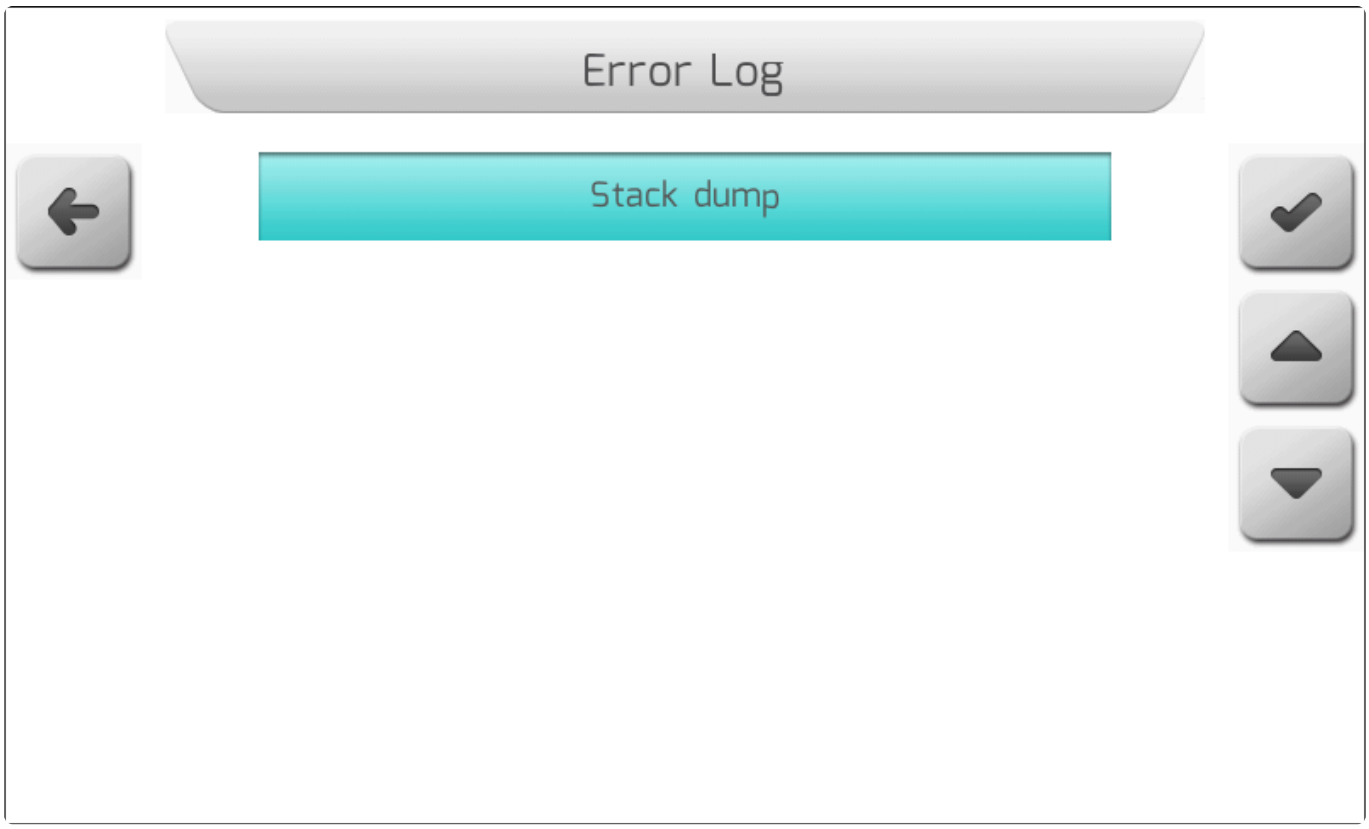
If the CFG file name entered is not present in the internal memory, when pressing the confirm button  the new file CFG will be saved in the internal memory and the same screen as the previous image will be displayed.

# 8.5.5. Error Logs – Manage

Screen Type = Vertical menu

The GeoNave system store files of possible internal errors that may happen during operations. The generated files are called *Logs* Error and can be downloaded for later submission to the Engineering team at Geoline for the correct diagnosis. The *logs* error messages are Stack Dump type files.

Within the Memory Settings menu, the Error Logs management area features the Stack Dump item, in which the user finds the files and also downloads them to a flash drive.
The image below shows the Error Logs menu screen.



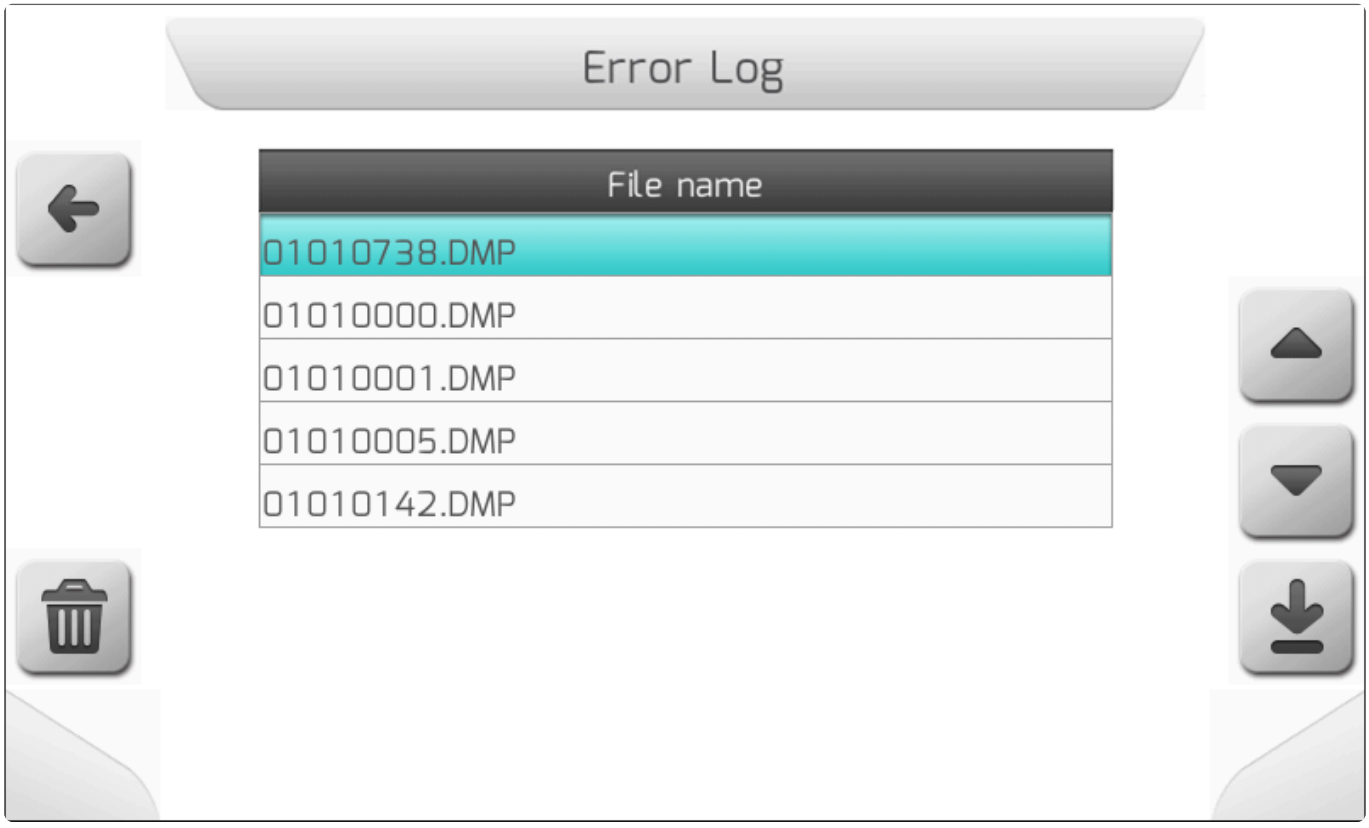

# 8.5.5.1. Stack dump

Screen Type = List of files

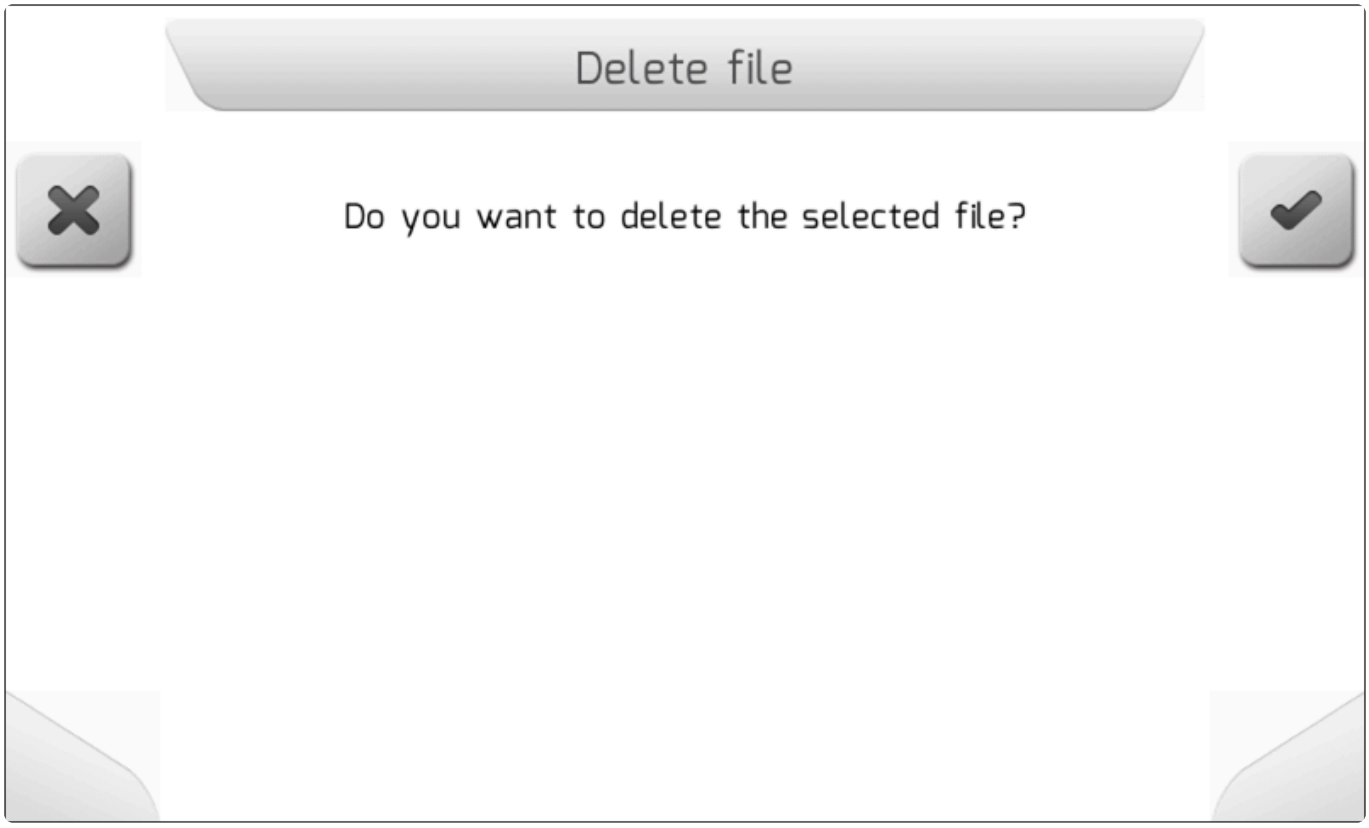
In the Stack Dump area of the Error Log menu, the user can delete and export stack dump files stored in

the GeoNave internal memory.

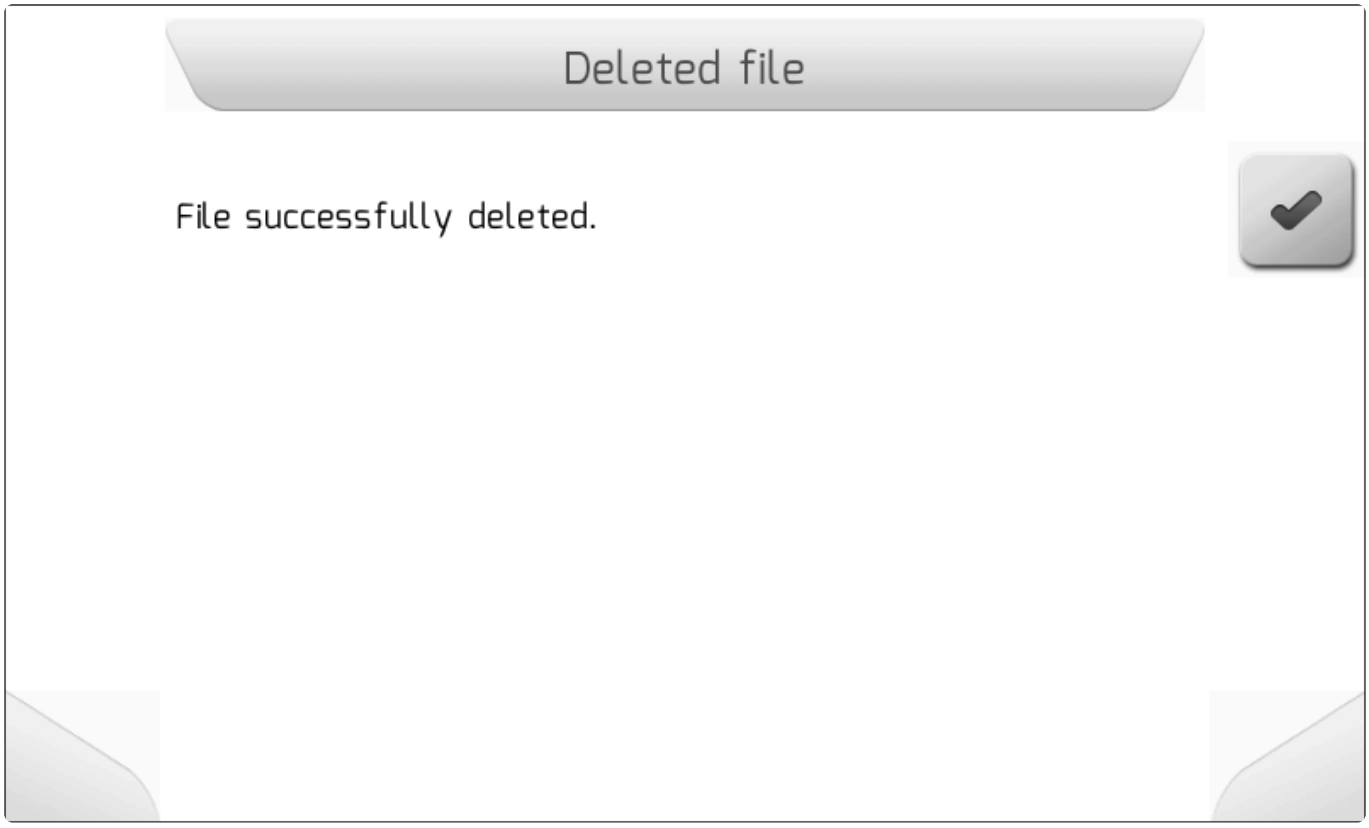
When selecting the item in the Error Logs – Manage menu and pressing the confirm button  , File List screen will be displayed, as shown in the following image, listing the DMP files saved in the internal memory.



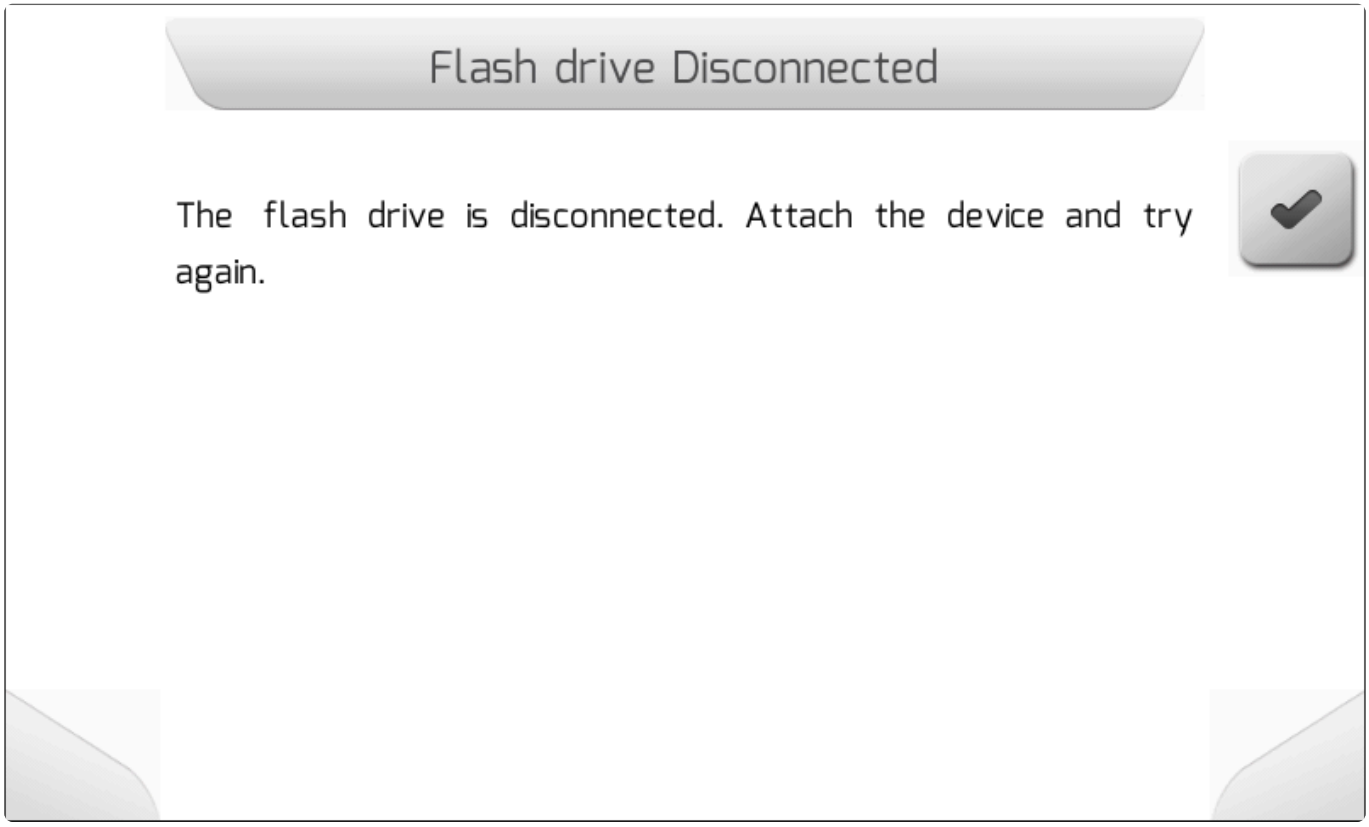

When selecting a stack dump file and pressing the delete button  , the Information with Confirmation screen will be displayed, as shown in the following image, asking if the user really wants to delete the DMP file selected from the internal memory.



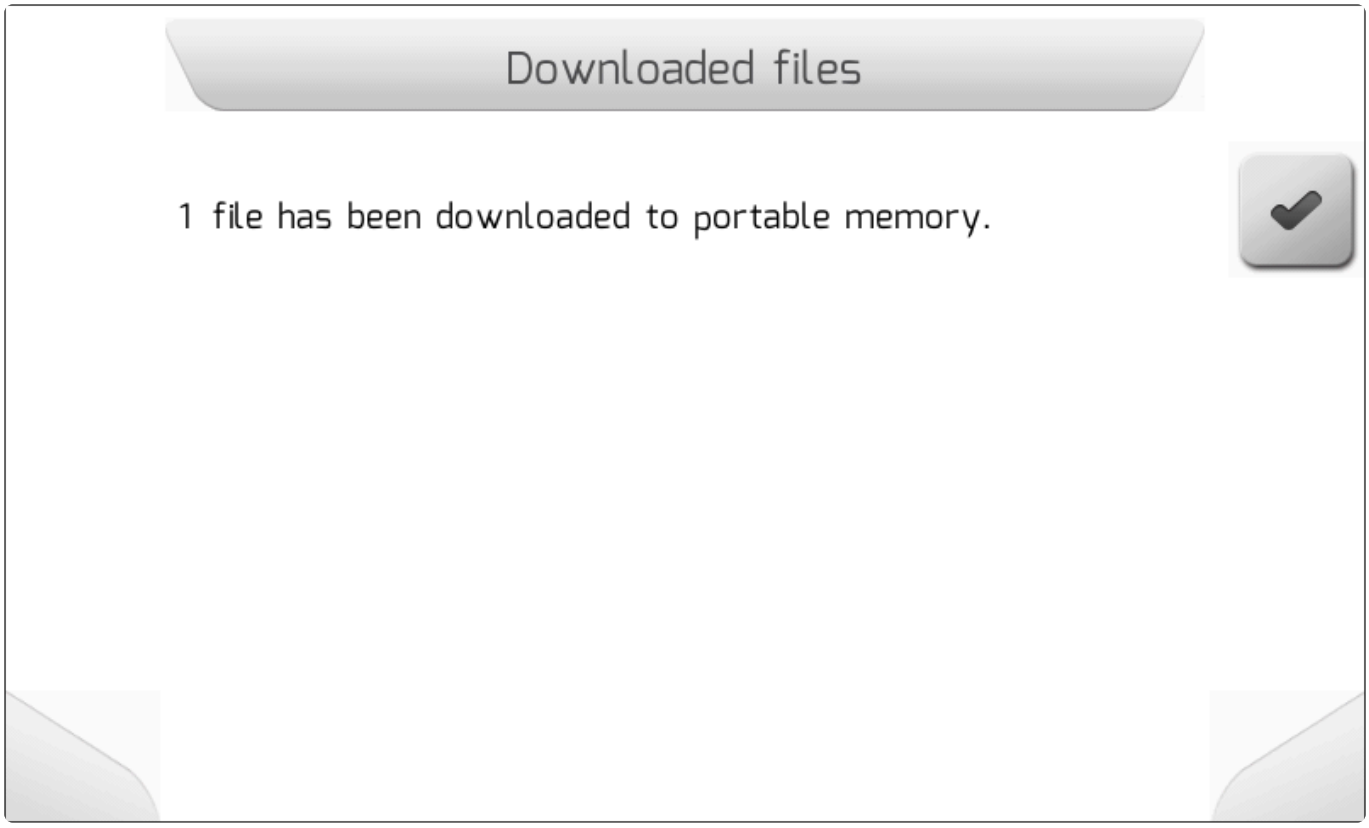

If the user presses the cancel button , the deletion will not be performed and the system will return to the previous screen. If the confirm button is pressed , the stack dump file will be deleted from the internal memory and the confirmation screen will be displayed, as shown in the image below.



Also in the Stack Dump area, the user can also export a DMP file to a flash drive using the download button  . If a flash drive is not connected, the Information screen will be displayed, as shown as in the image below.




If the flash drive is correctly connected to the USB interface, the file DMP will be downloaded, then the Information screen confirming the export will be displayed, as shown in the following image.



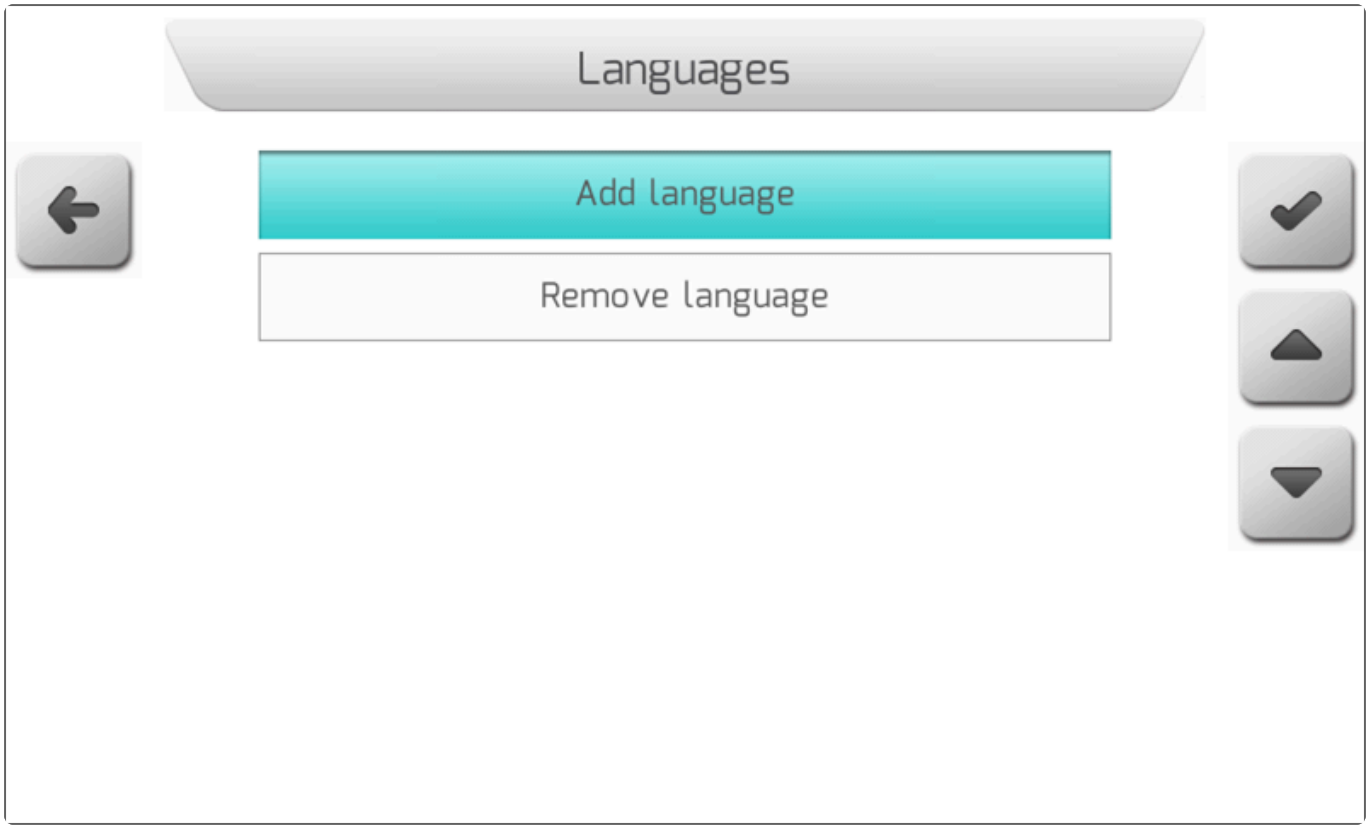

# 8.5.6. Languages - Manage

Screen Type = Vertical menu

- Add language
- Remove language

The GeoNave system has up to 5 languages available for displaying screens and information, two of which are configurable by the user through the Language management area, and the remaining three languages are fixed - Portuguese, English and Spanish.

The Language management menu consists of two areas, through which the user can add and remove languages in the two configurable positions from **I18N.LNG** files, available on official website Geoline. The image below shows the Language menu screen.




# 8.5.6.1. Add Language

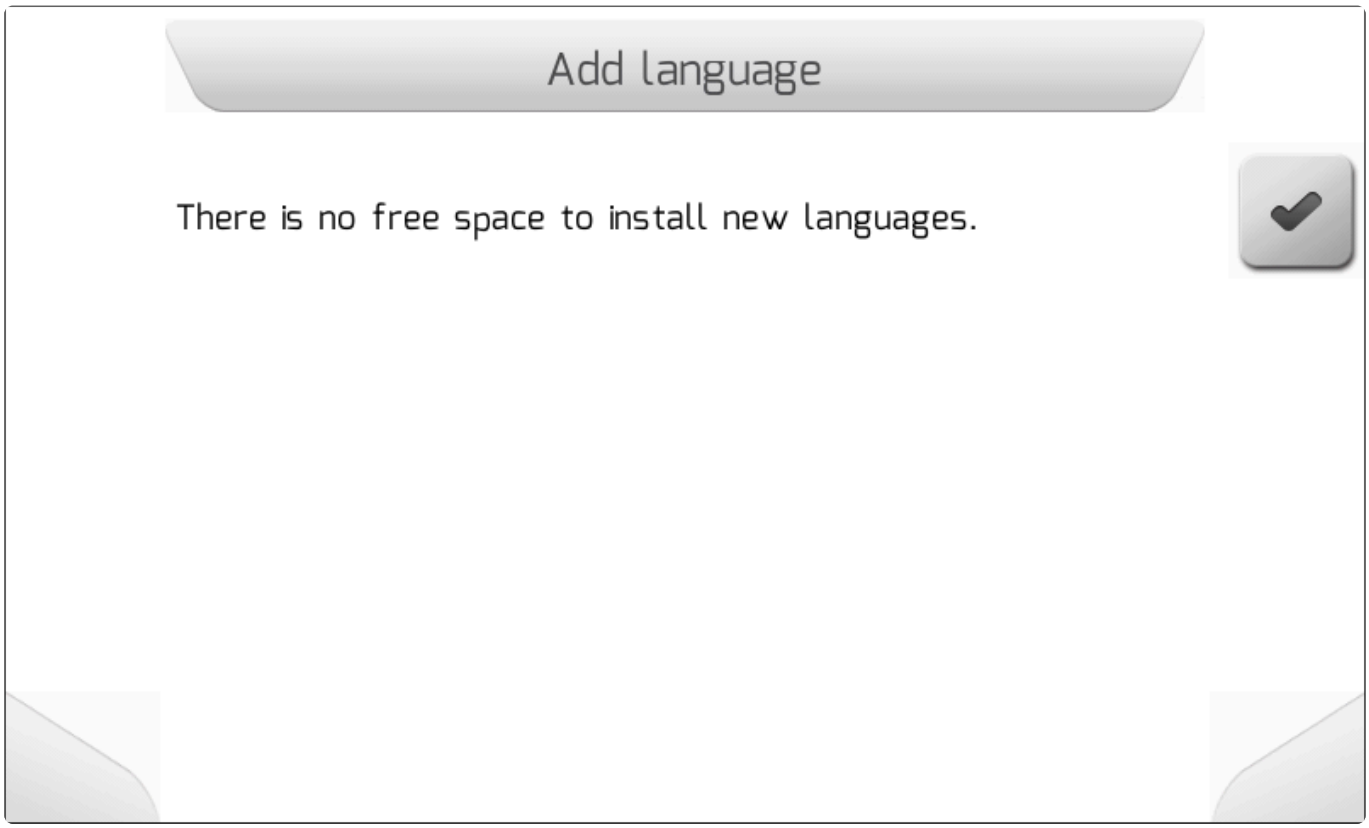
Screen Type = Simple list

In the Add Language area of the language management menu, the user can add a new language in one of the two configurable positions of the GeoNave system.

In the menu Languages - Manage, select the Add Language option and press the confirm button . If a flash drive is not connected, or if the **I18N.LNG** file is not available in the root folder of the flash drive, an Information screen will be displayed, as shown in the following image.

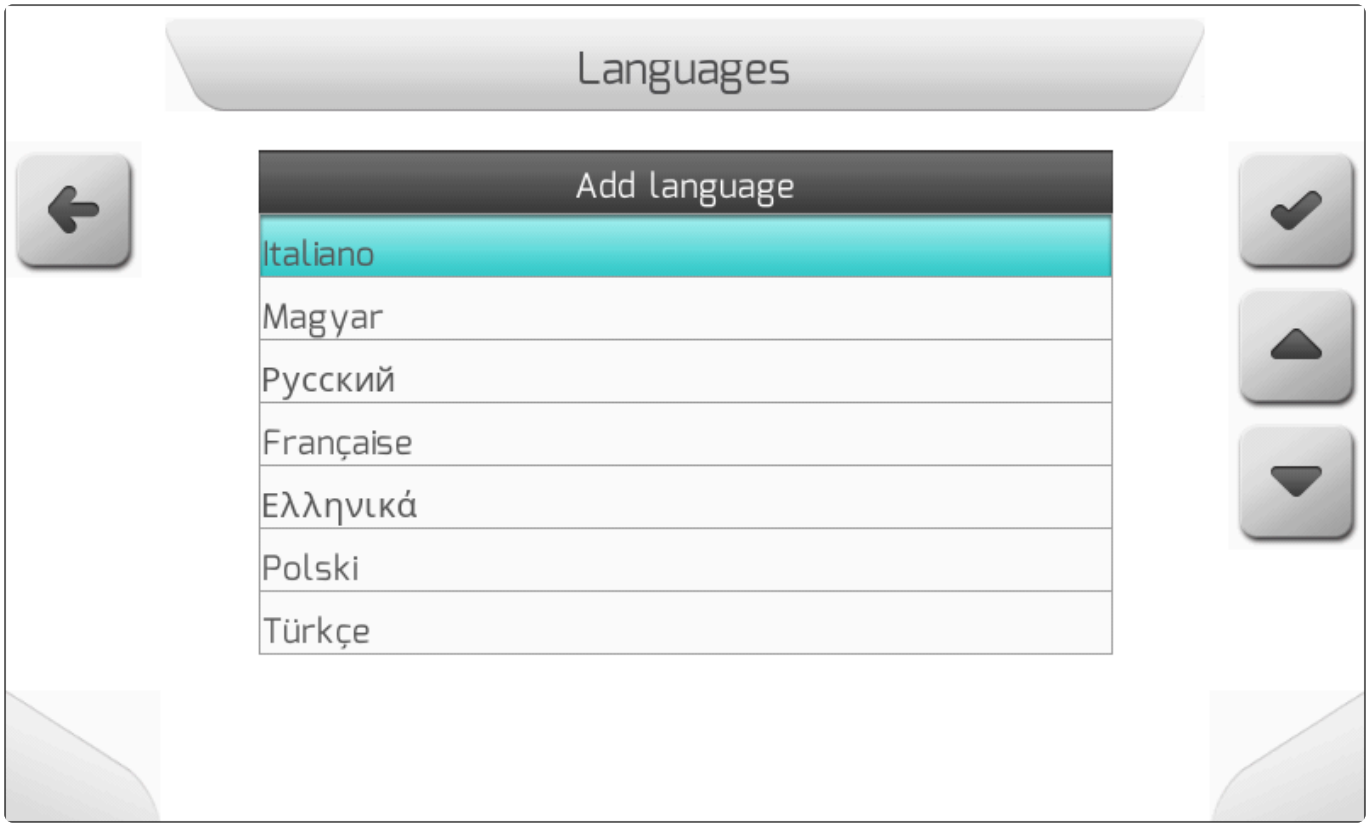



If the flash drive is correctly connected to the USB interface and the **I18N.LNG** file is loaded in the root folder of the flash drive, the system checks whether any of the two configurable language positions are available. If both positions are occupied, the following message is displayed.

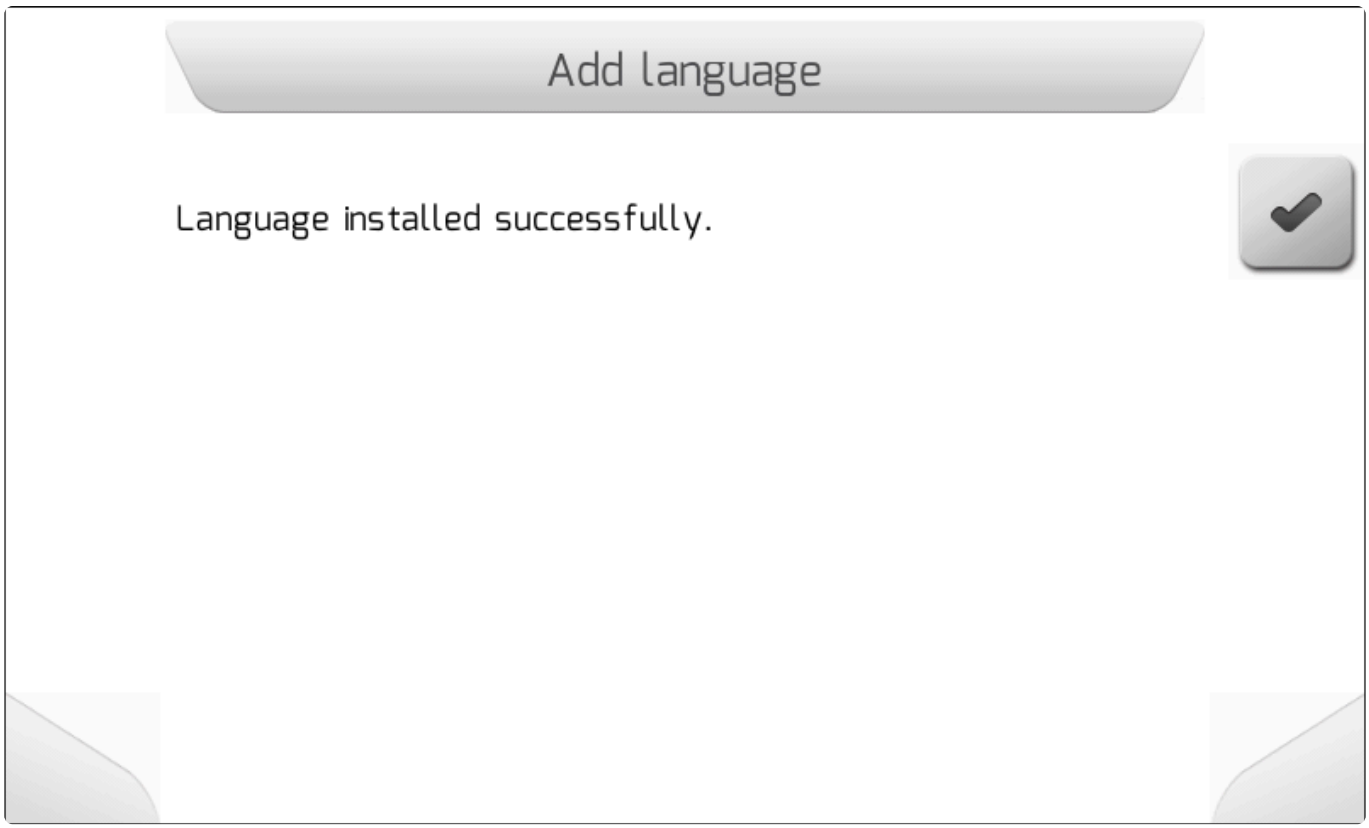



If any of the positions is available, a Simple List screen is displayed, according to the image below, containing the names of configurable languages (written in the corresponding language) of the

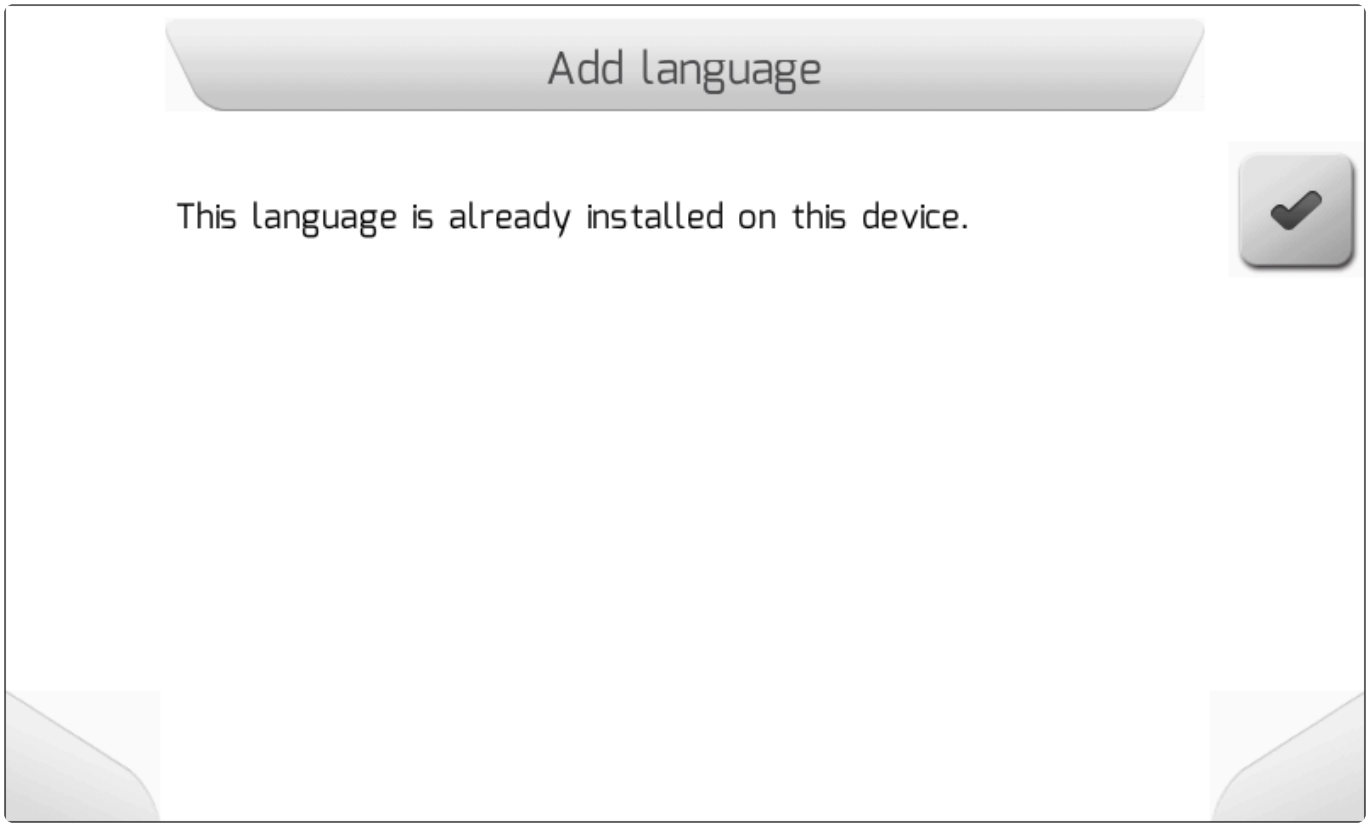
**I18N.LNG** file. Fixed languages - Portuguese, English, Spanish – are not listed.




Selecting a language and pressing the confirm button again  , the language will be installed on the GeoNave system. Then an Information screen with the message of successful installation will be displayed, as shown in the image below.



If the selected language is already installed on the GeoNave display, an Information screen will be displayed, as shown in the following image.




To check and select the newly installed language, the user must access the Language parameter on the advanced settings screen.

# 8.5.6.2. Remove Language

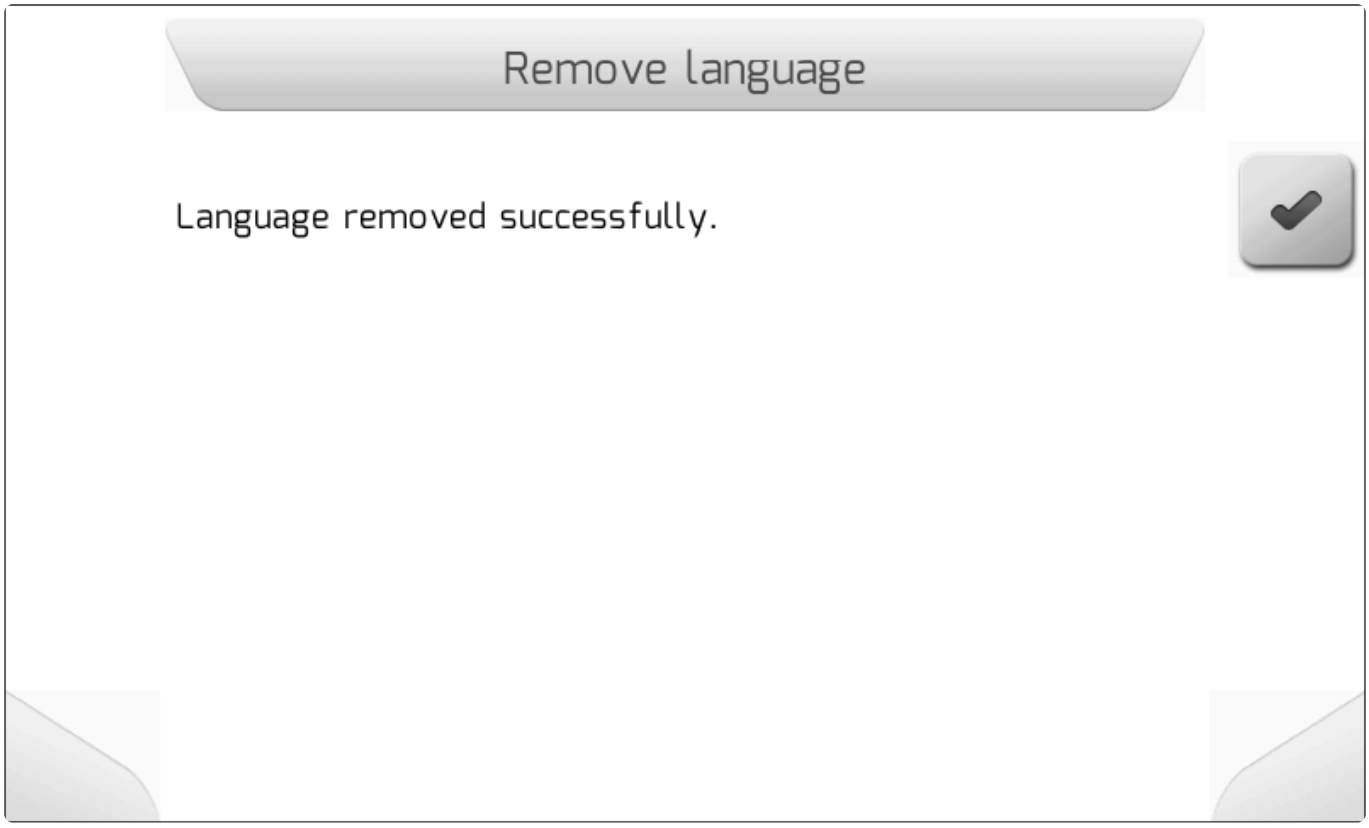
Screen Type = Simple list

In the Remove Language area of the language management menu, the user can uninstall a configurable language from the GeoNave system.

The user must select the language to be removed and press the confirm button  . The Information with Confirmation screen will be displayed, as shown in the following image, asking if the user really wants to remove the language.




If the user presses the cancel button , the removal will not be performed and the system will return to the previous screen. If the confirm button is pressed , the language will be uninstalled from the GeoNave system and the confirmation screen will be presented, as shown in the image below.



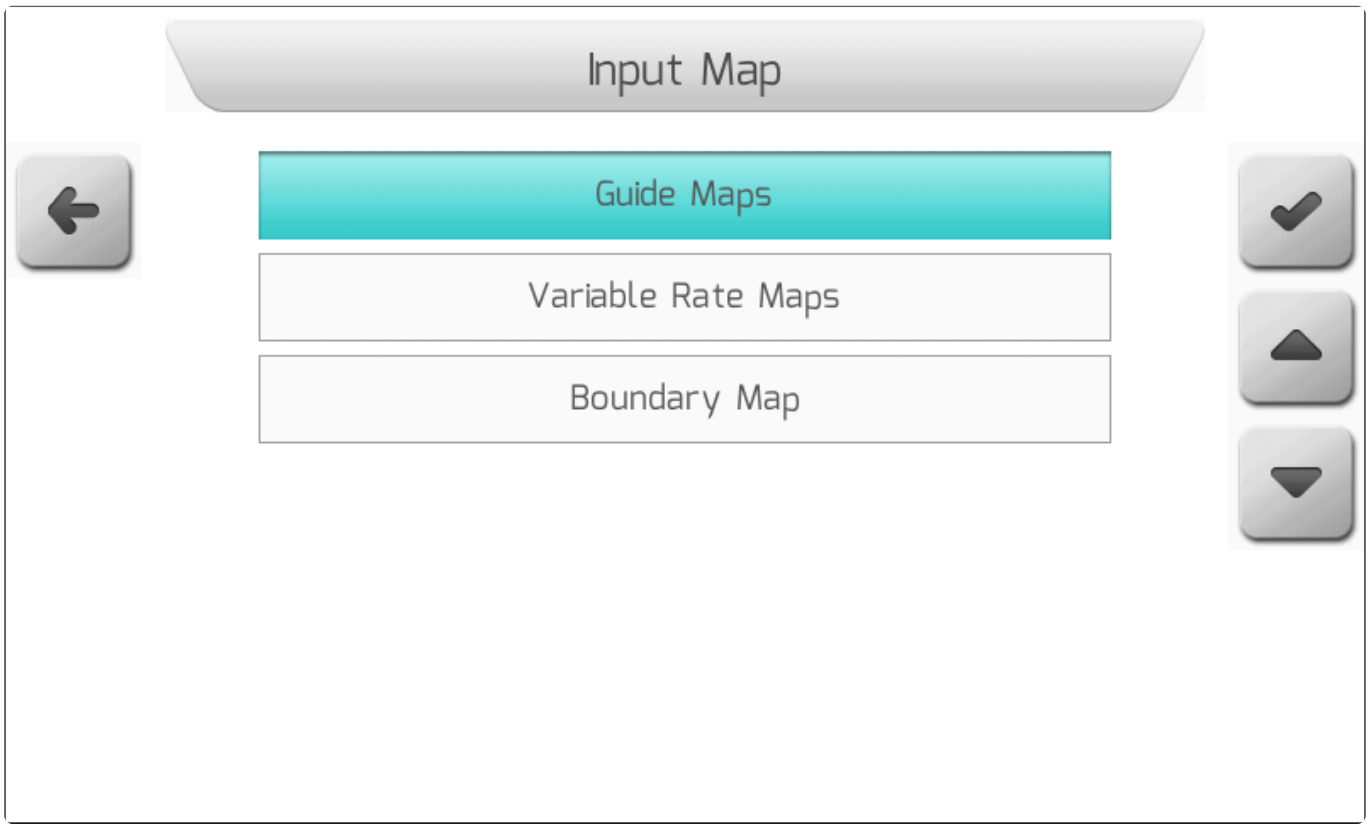
If the language that is currently configured is selected and removed, the GeoNave system will be reconfigured in English.

# 8.5.7. Input Map – Manage

Screen Type = Vertical menu

- Guides Map
- Variable Rate Map
- Boundary Map

The Input Map management screen is divided into three areas, one for each type of input map – Guides, Variable Rate, Boundary. In these areas the user can view the maps from the internal memory and also import the map files from a flash drive to the internal memory.
Each map, in *Shapefile* standard, consists of a set of three files with ".SHP", ".DBF" and ".SHX" extensions and must follow the technical documentation available at ESRI – Shapefile.
The image below shows the Input Map menu screen.

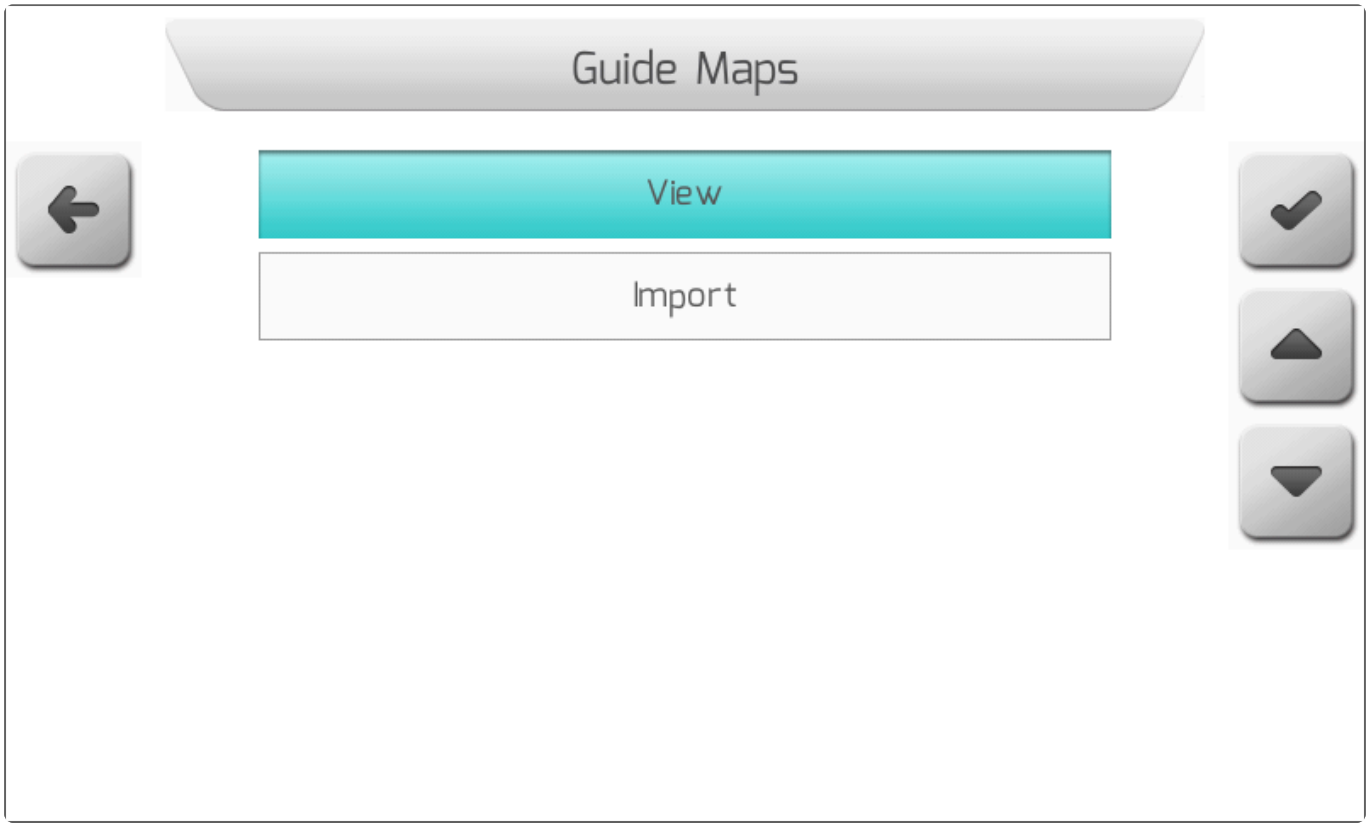



# 8.5.7.1. Guide Map

Screen type = Vertical menu

- View
- Import

Guide Map management screen consists of two areas, through which the user can view and import *Shapefile* files of guides. The following image shows the Guide Map menu screen.

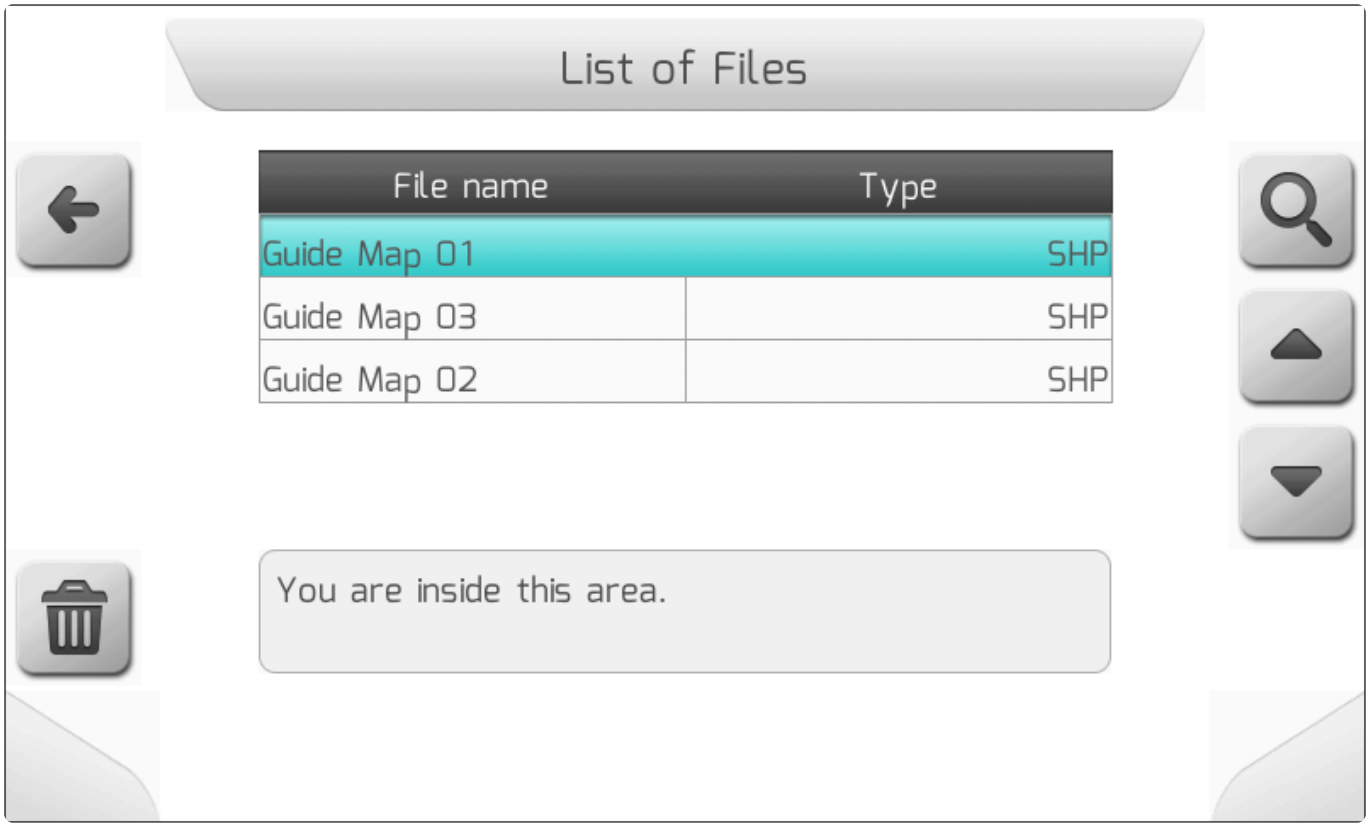



# 8.5.7.1.1. View

Screen Type = List of files

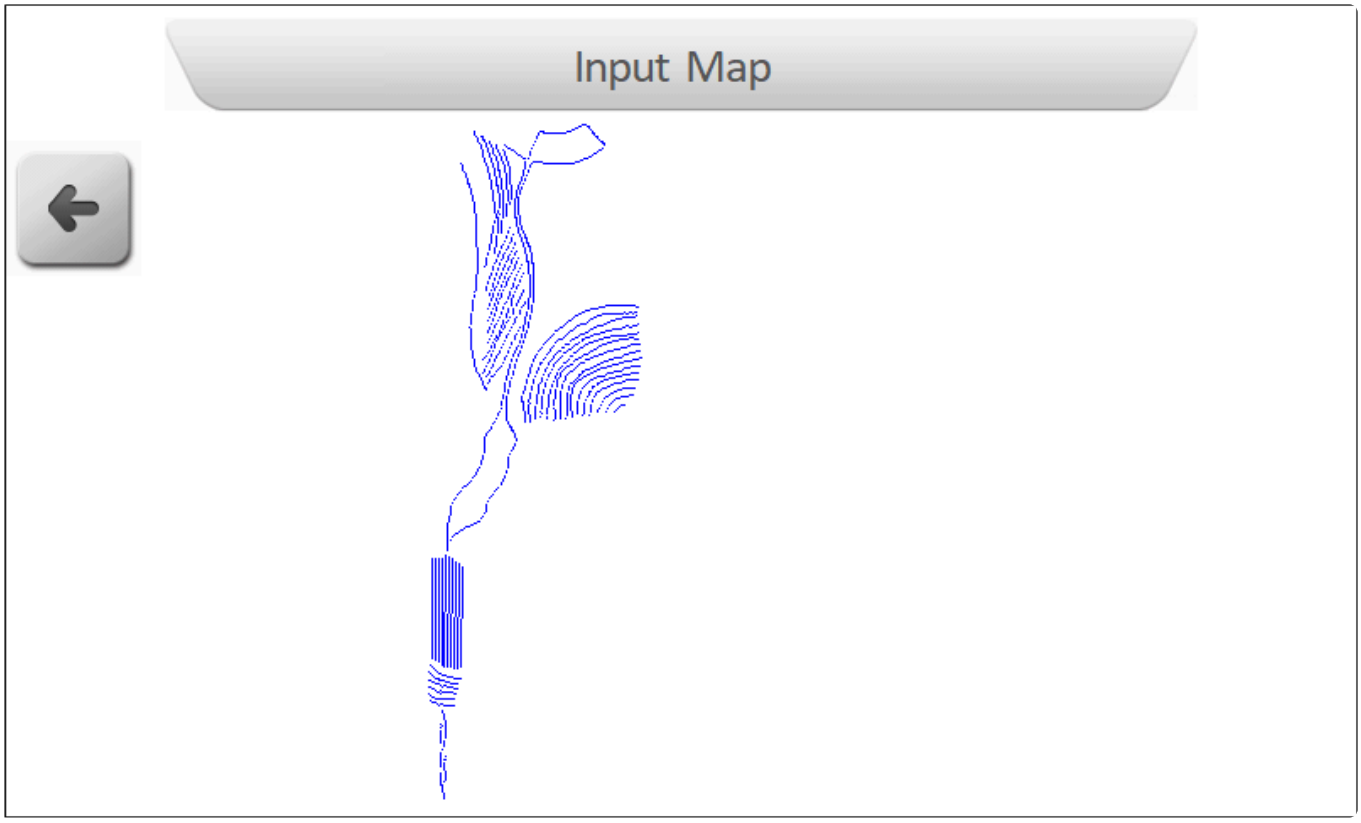
In the View area of the guide map management, the user has access to *Shapefile* files of guides loaded into the GeoNave internal memory.

When selecting the item in the Guides Maps menu and pressing the confirm button  , the List of files screen will be displayed, as shown in the following image, in this screen the user must select the guide map that contains the information to be displayed.



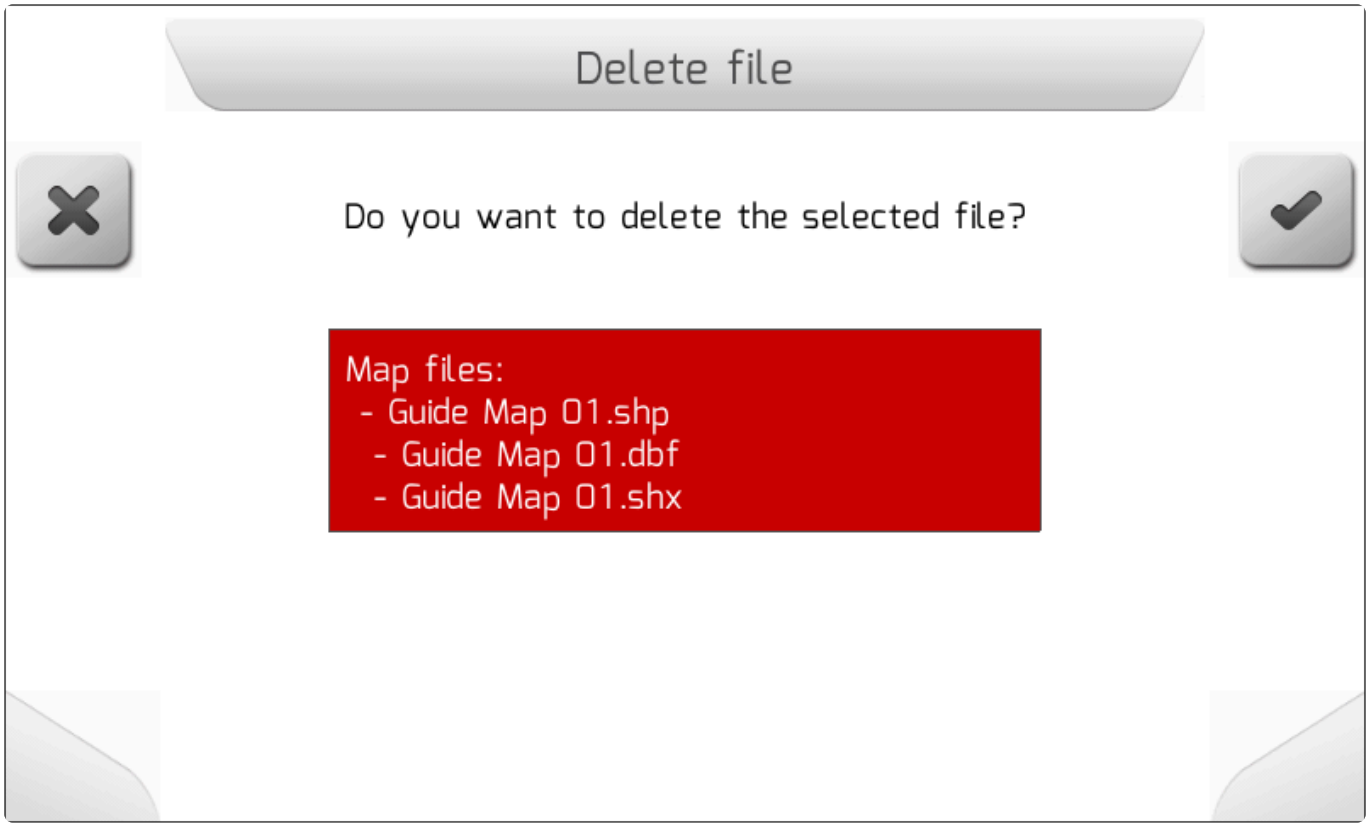

*Shapefile* files of guide maps are shown in a table and are organized in the internal memory with the same folder structure from the flash drive. The user can browse the internal memory folders in order to find the wanted SHP file. When selecting the desired file, the distance from the current GNSS coordinates to the map area will be displayed at the bottom of the screen.

Pressing the preview button  , the Loading screen with the text “Loading file” will be displayed while the file is uploaded from the internal memory. After loading, the guide map will be displayed on the screen as shown in the image below.

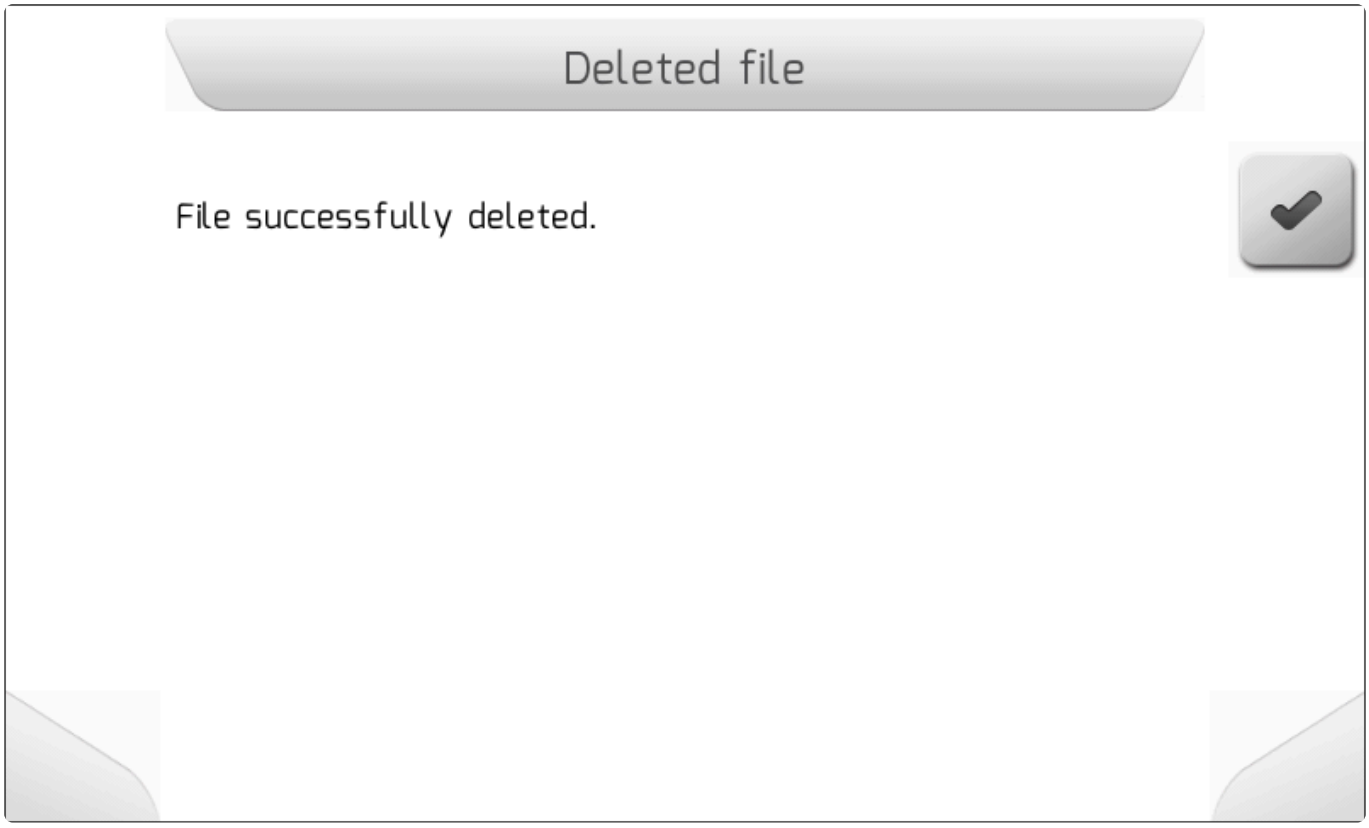



When pressing the back button  the system returns to the previous screen.

Also in the View area, the user can delete a guide map file using the delete button  . If the user press it, a screen containing an information board with red background will be displayed, informing the names of the 3 files (SHP, DBF, SHX) that composes the guide map.




If the user presses the cancel button , the deletion will not be performed and the system will return to the previous screen. If the confirm button is pressed , the guide map file will be deleted from the internal memory and the confirmation will be displayed, as shown in the following image.



# 8.5.7.1.2. Import

Screen Type = Vertical menu

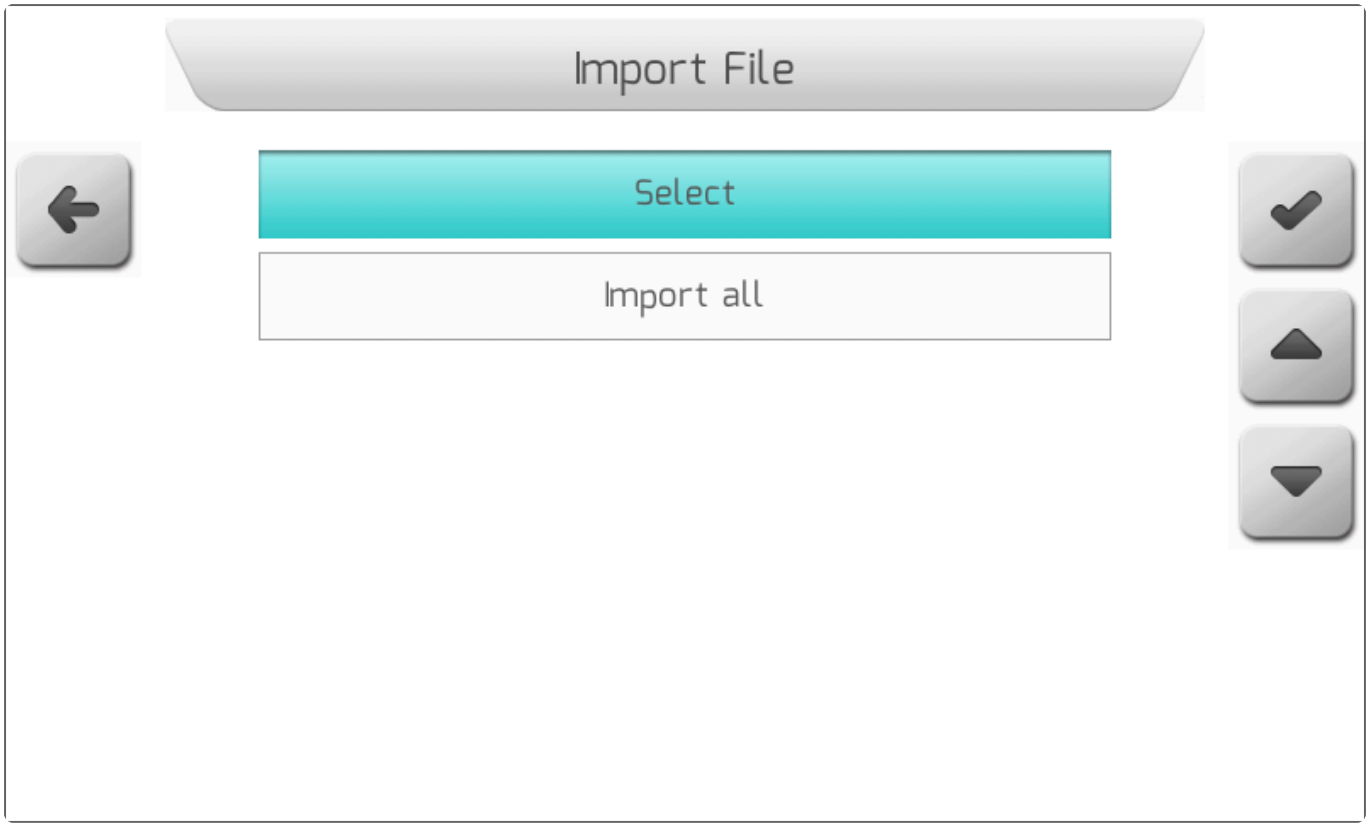
- Select
- Import All

The Import area is used to import guide map files from flash drive (*pen drive*) to the GeoNave internal memory. Once loaded into the internal memory, is possible to use the maps as navigation guides.

In the Guides Maps menu, select the Import option and press the confirm button  . If a flash drive is not connected, an Information screen will be displayed, as shown of the following image.



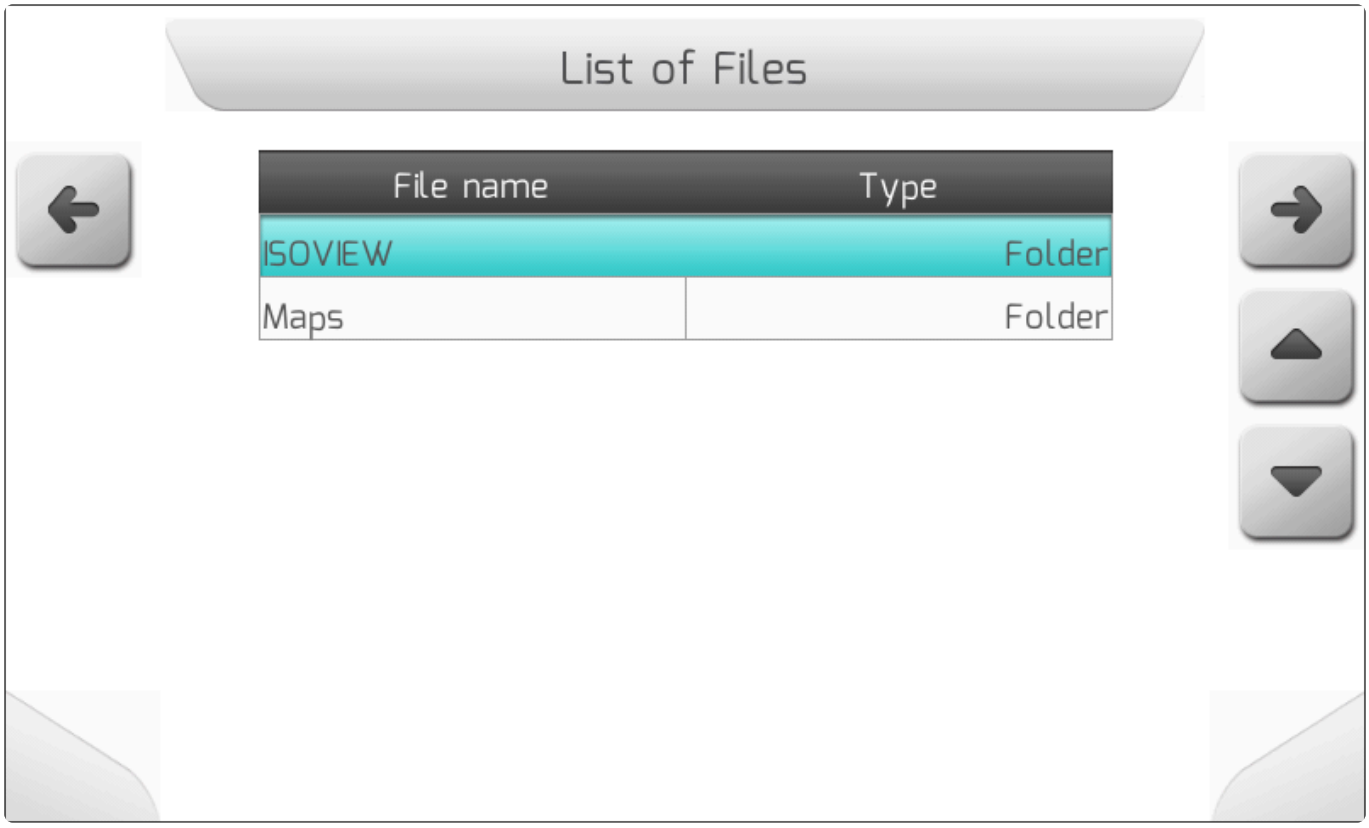

If the flash drive is correctly connected to the USB interface, a new Vertical menu appears containing two options, as shown in the image below. In the first option – Select – allows the user to choose what file will be imported into the internal memory. In the second – Import all – all guide map files found in the flash drive will be imported into the internal memory.



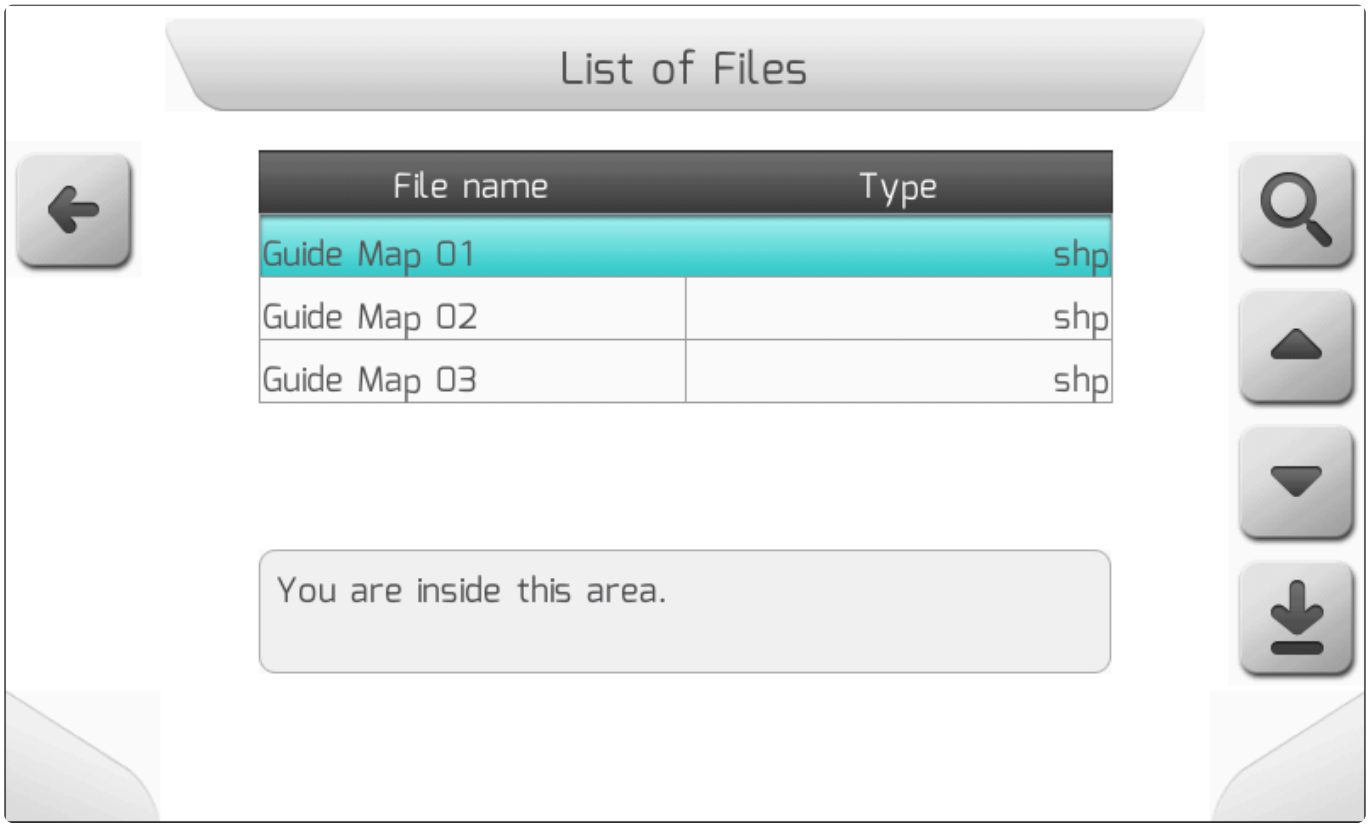

# 8.5.7.1.2.1. Select

Screen Type = List of files

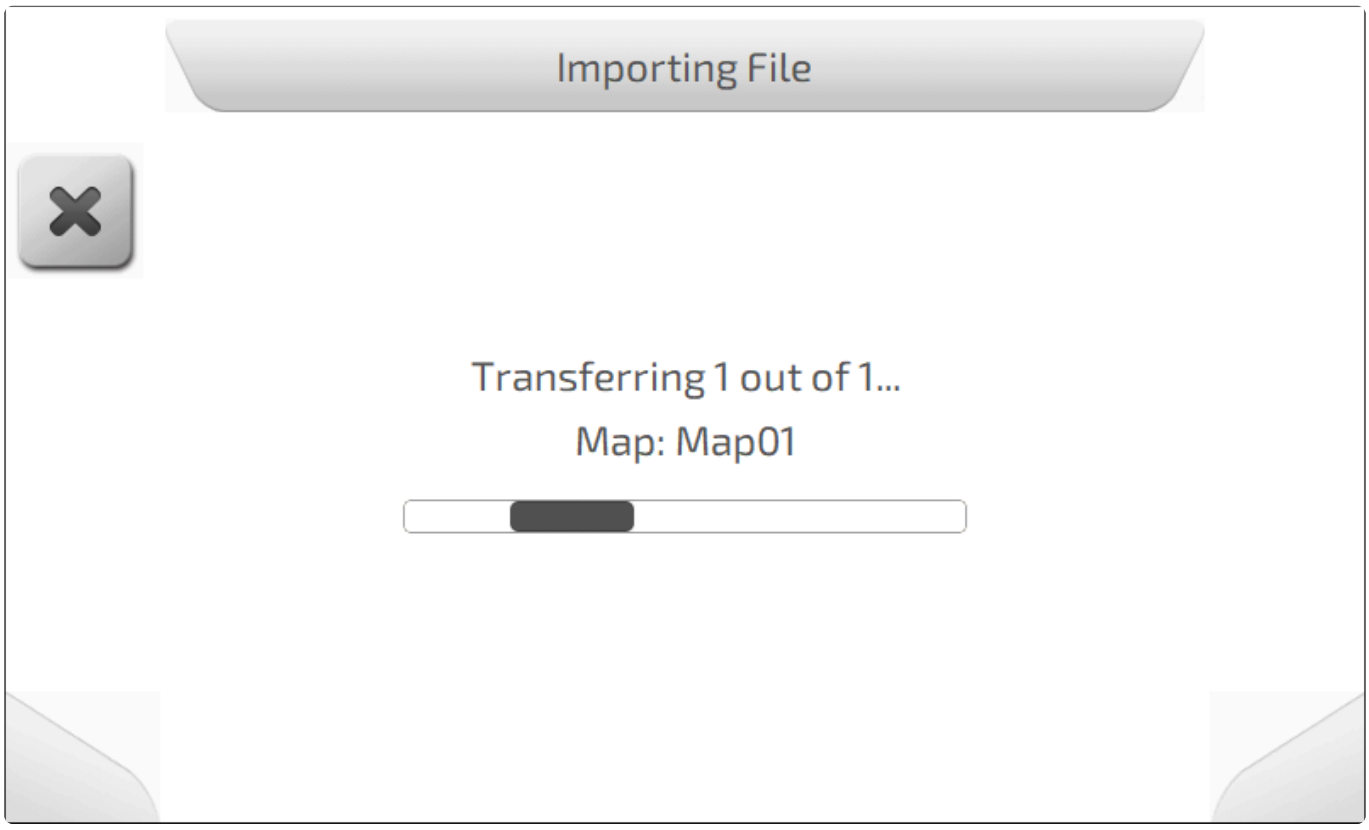
Choosing the Select option from the import menu and pressing the confirm button  , the List of files screen will be displayed, as shown in the image below, which allows the user to browse between flash drive folders and file structure.



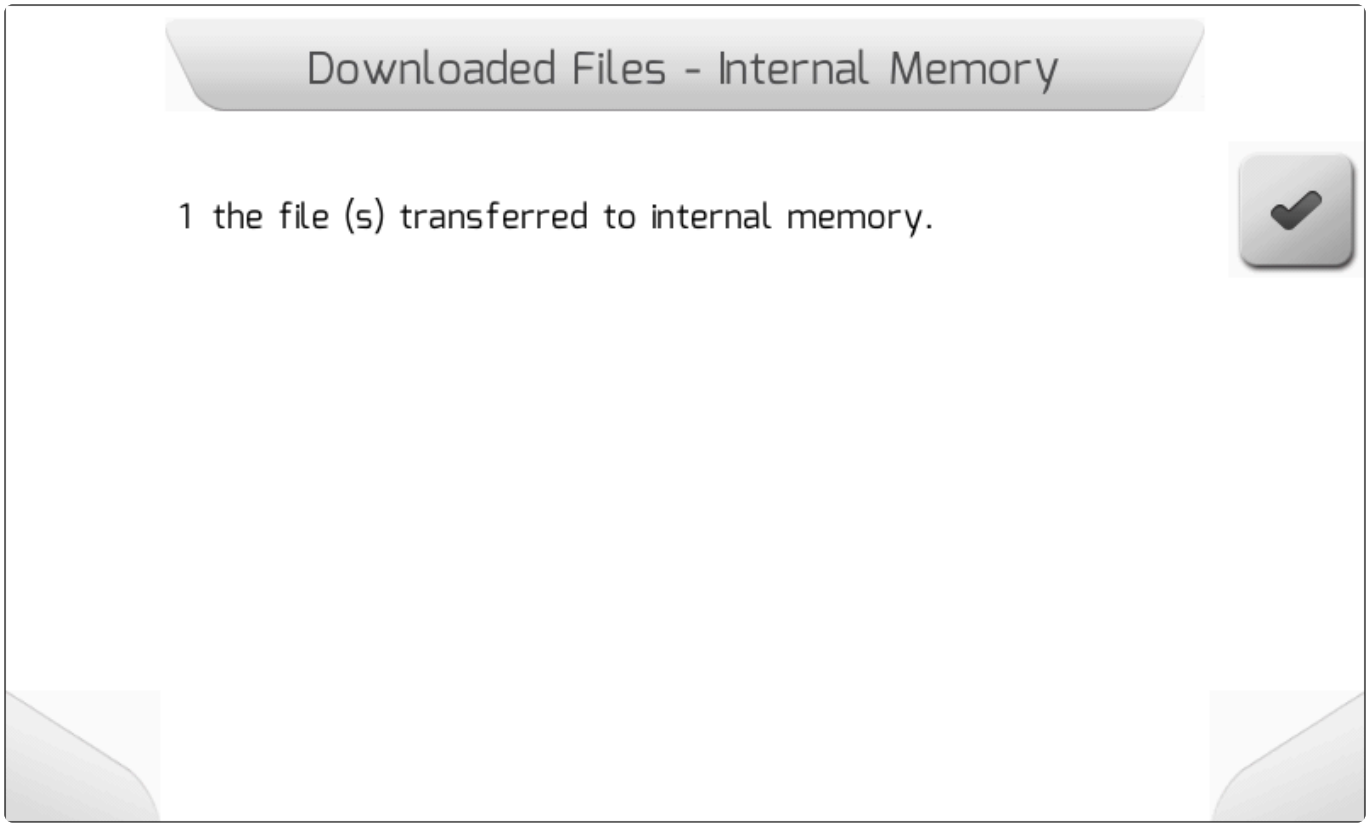

Guide maps are composed of three files with extensions “.SHP”, “.DBF” and “.SHX” and are organized in the flash drive as defined by the user. The user can browse the flash drive folders to find the correct guide map file to import into the internal memory. The following image shows the guide map list of files in the flash drive. The file data description area shows the distance from the current GNSS coordinates to the map area.



Selecting one of the SHP guide maps from the list and pressing the load button  , the file will be imported into the GeoNave internal memory. While the file is being imported, the Loading screen is displayed, as shown in the image below, containing the number of files to be transferred, counter of files already transferred and the map file name being transferred.




Once the import ends, the Information screen will indicate that the file has been loaded to the internal memory, as shown in the following image.

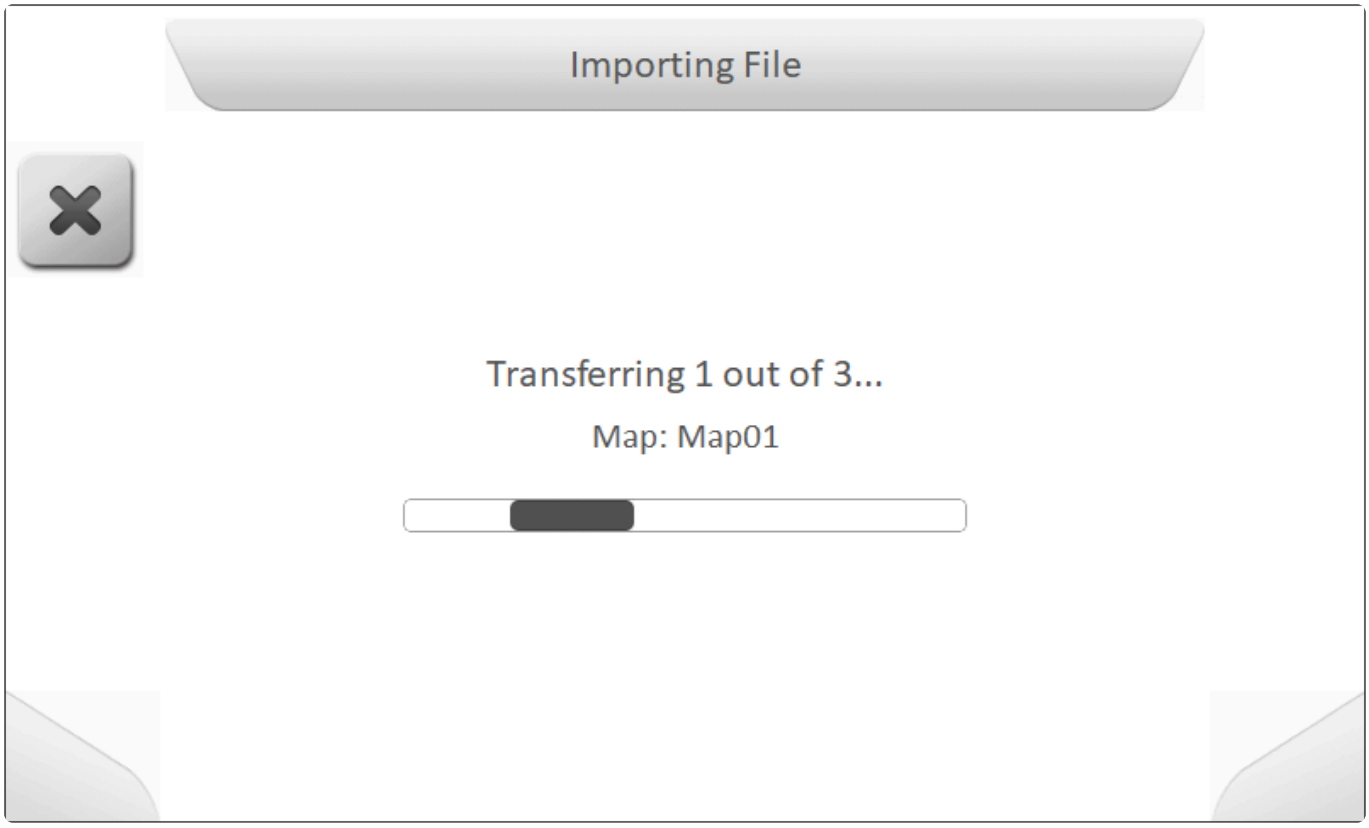



In the same way as described for the View menu, the user can view the guide map by pressing the view button on the file list screen.

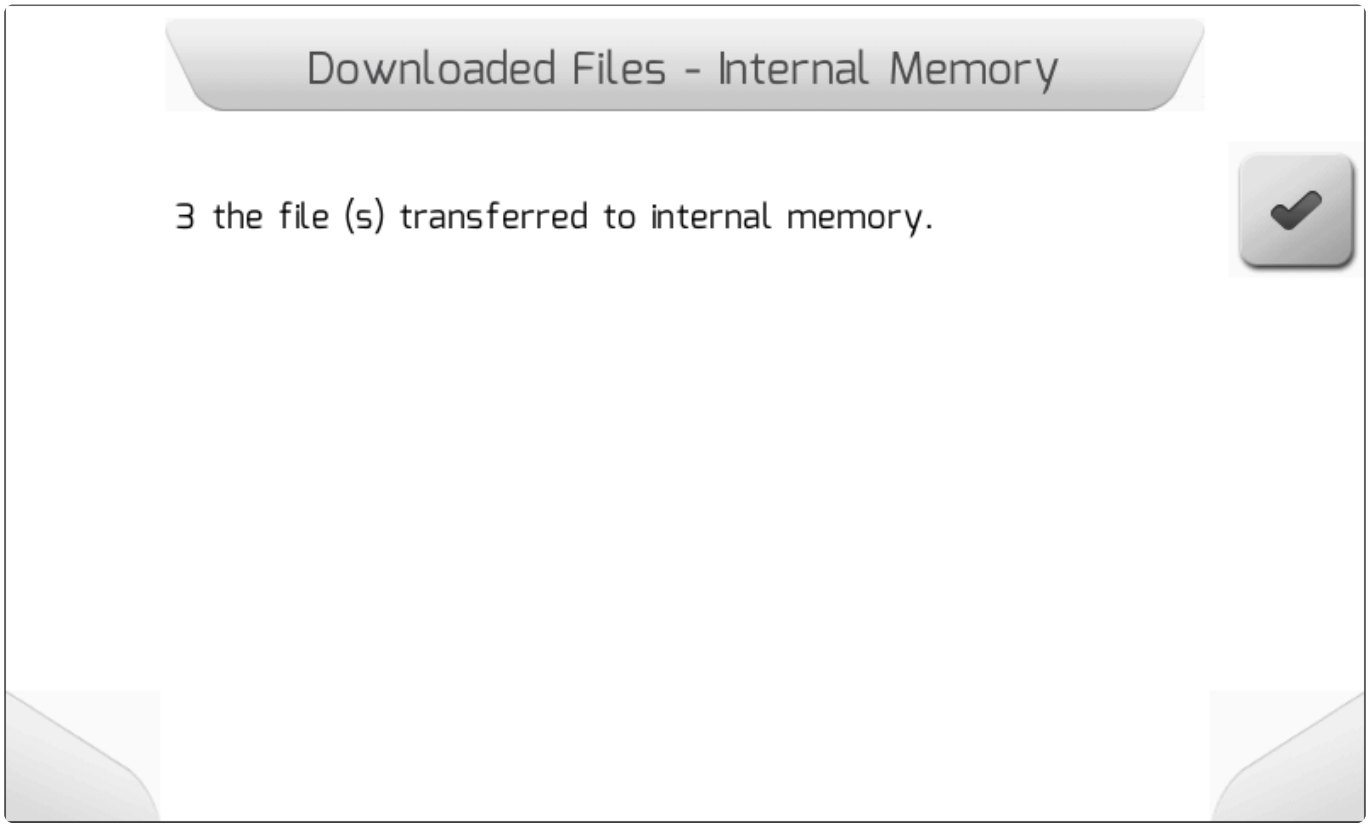
# 8.5.7.1.2.2. Import All

Screen type = Loading > Information

Selecting the Import All option from the Import menu and pressing the confirm button , all guide map files that the GeoNave system find in the folder structure of the flash drive will be imported into the internal memory.
While the files are being imported, the Loading screen will be displayed, as shown in the figure below, containing the number of files to be transferred, counter of files already transferred and the map file name being transferred.




Once the import ends, an Information screen indicating the number of files actually imported into the GeoNave internal memory will be displayed, as shown in the following image.

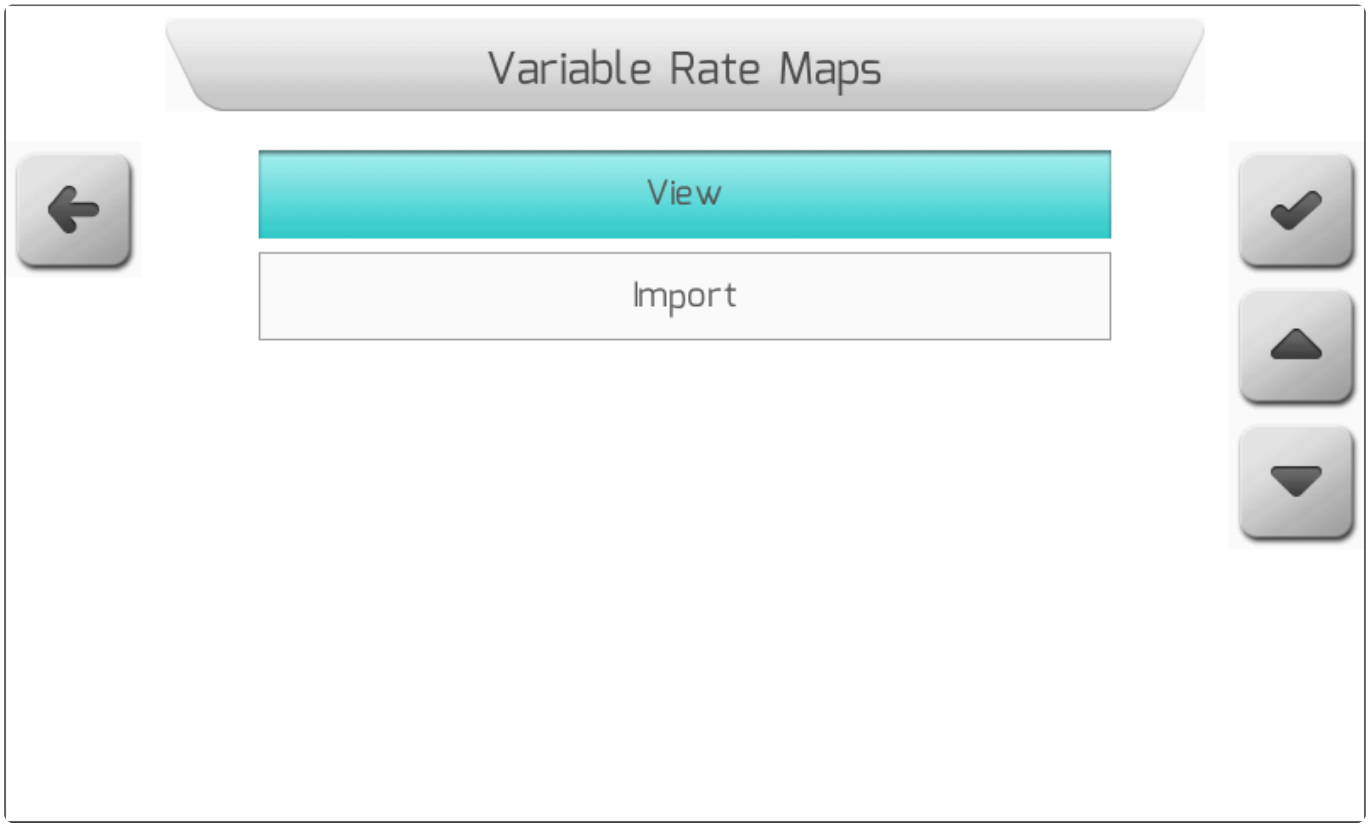


# 8.5.7.2. Variable Rate Map

Screen type = Vertical menu

- View
- Import

The Variable Rate Map management screen consists of two areas, through which the user can view and import *Shapefile* files of variable rate maps. The image below shows the Variable Rate Map menu screen.

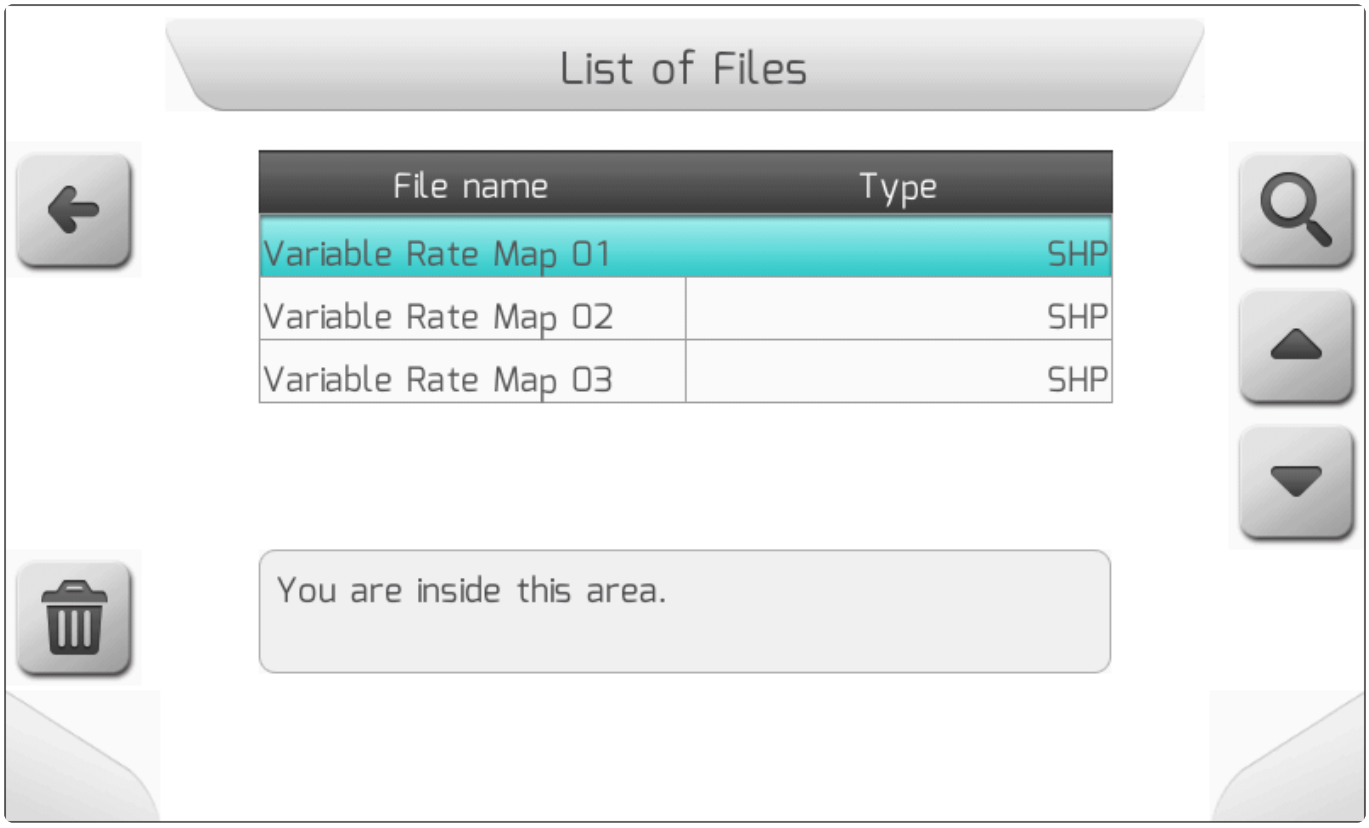



# 8.5.7.2.1. View

Screen Type = List of files

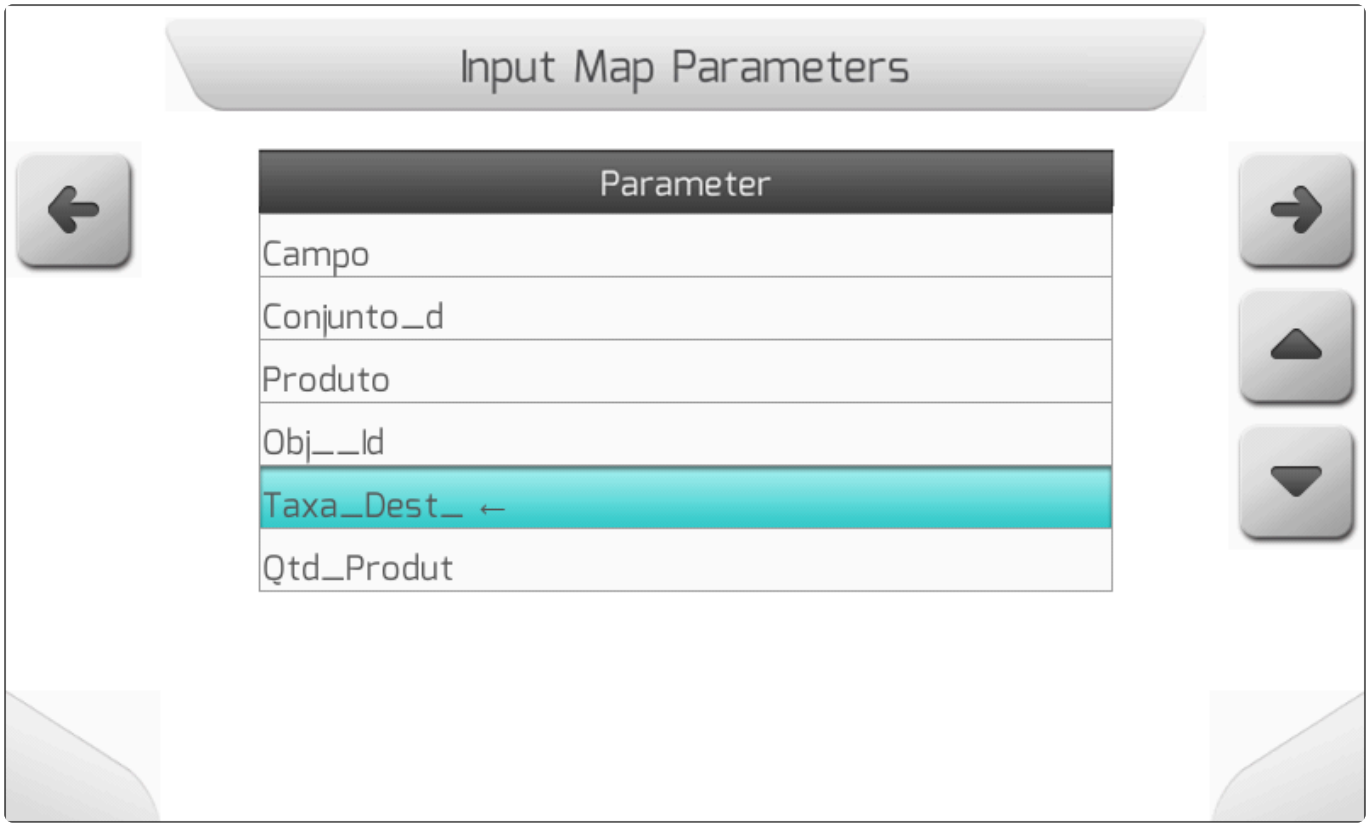
In the View area of the variable rate map management, the user has access to *Shapefile* files of variable rates map loaded into the GeoNave internal memory.

When selecting the item in the Variable Rate Maps menu and pressing the confirm button  , the List of files screen will be displayed, as shown in the following image, in this screen the user must select the variable rate map that contains the information to be displayed.

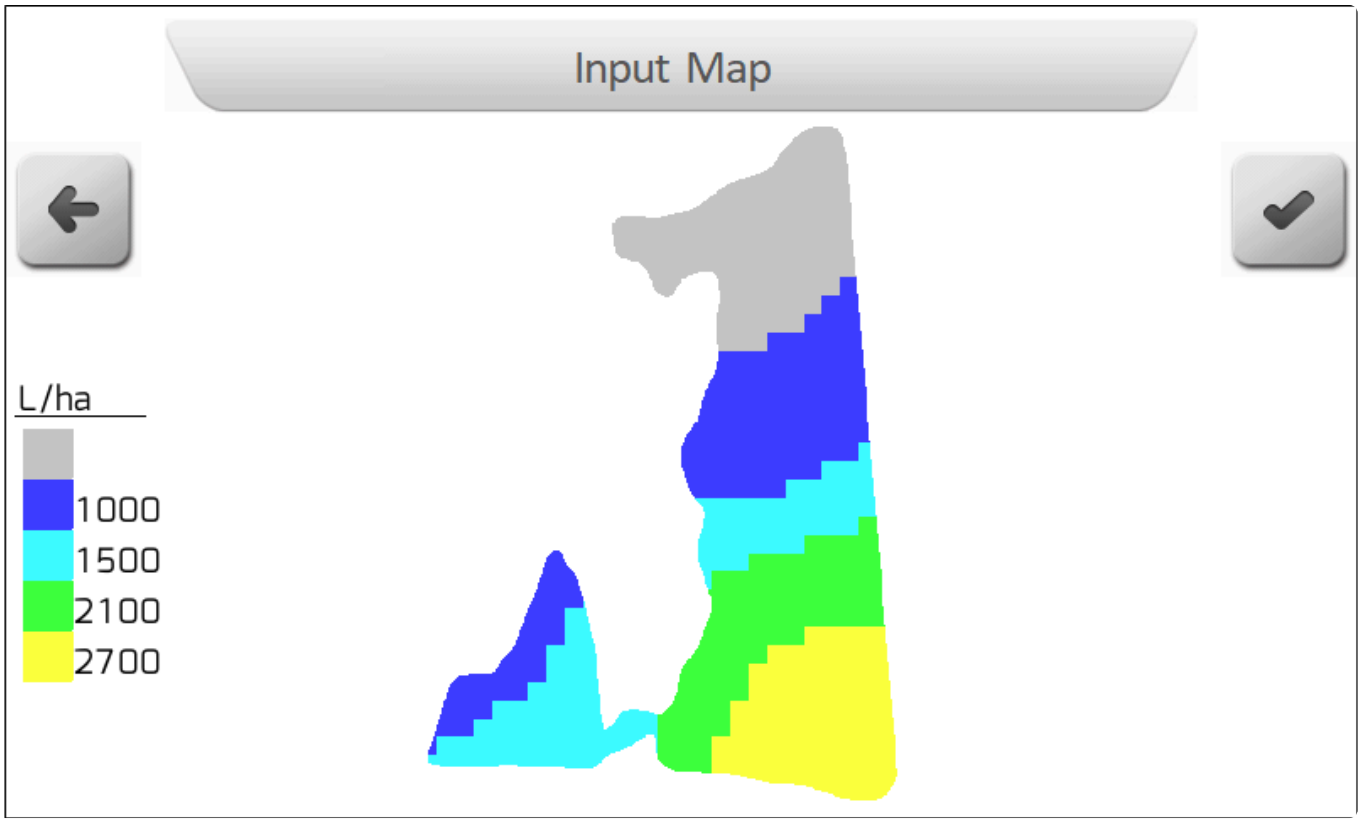



*Shapefile* files of variable rate maps are shown in a table and are organized in the internal memory with the same folder structure from the flash drive. The user can browse the internal memory folders in order to find the wanted SHP file. When selecting the desired file, the distance from the current GNSS coordinates to the map area will be displayed at the bottom of the screen.

Pressing the preview button  , the parameters screen of the input map is presented as in the image below, through which the user must select the information contained in the file with extension “.DBF” that will be used to generate the polygon map.



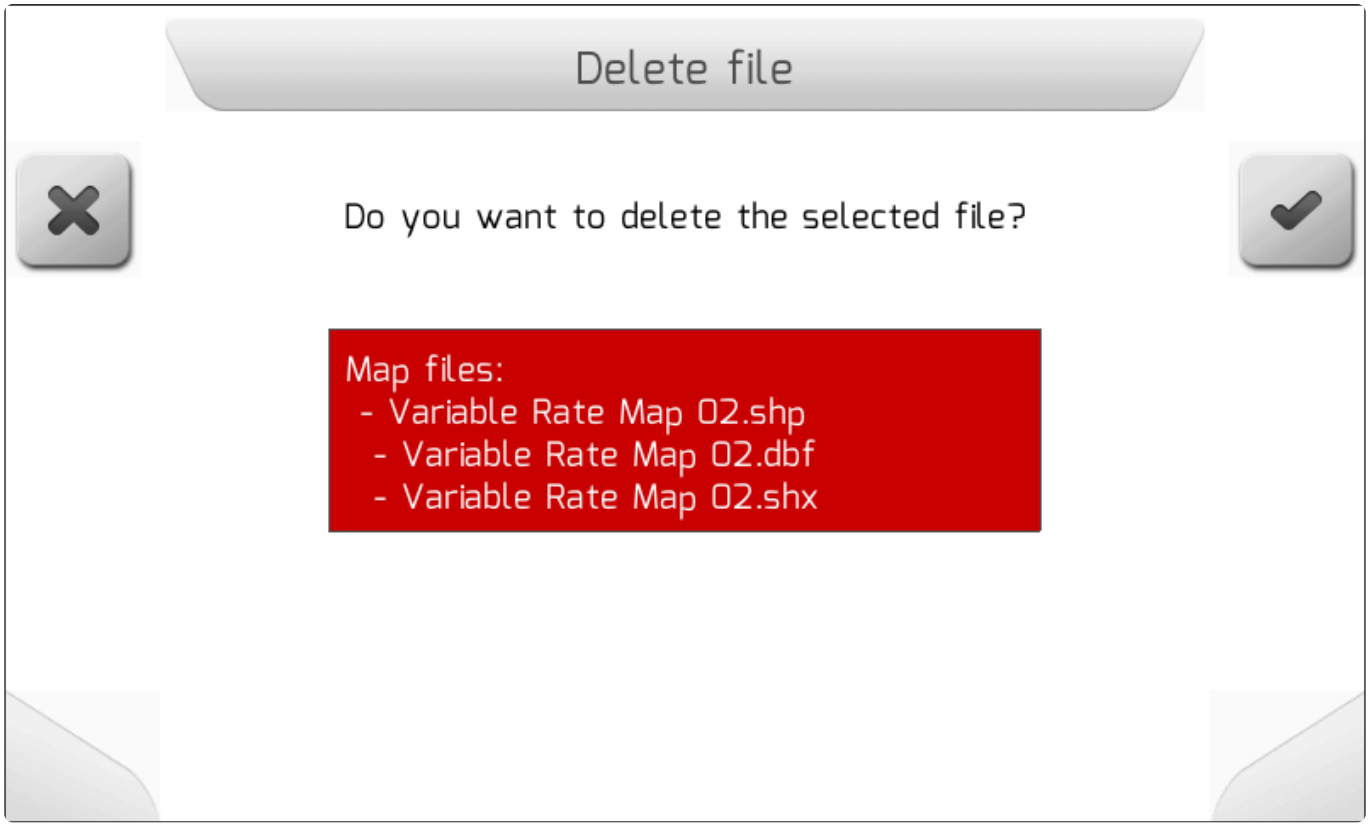

When pressing the forward button  , the Loading screen with the text “Loading file” will be displayed while the file is uploaded from the internal memory so that the variable rate map is displayed on the screen. After loading, the map appears on the screen as shown in the following image.



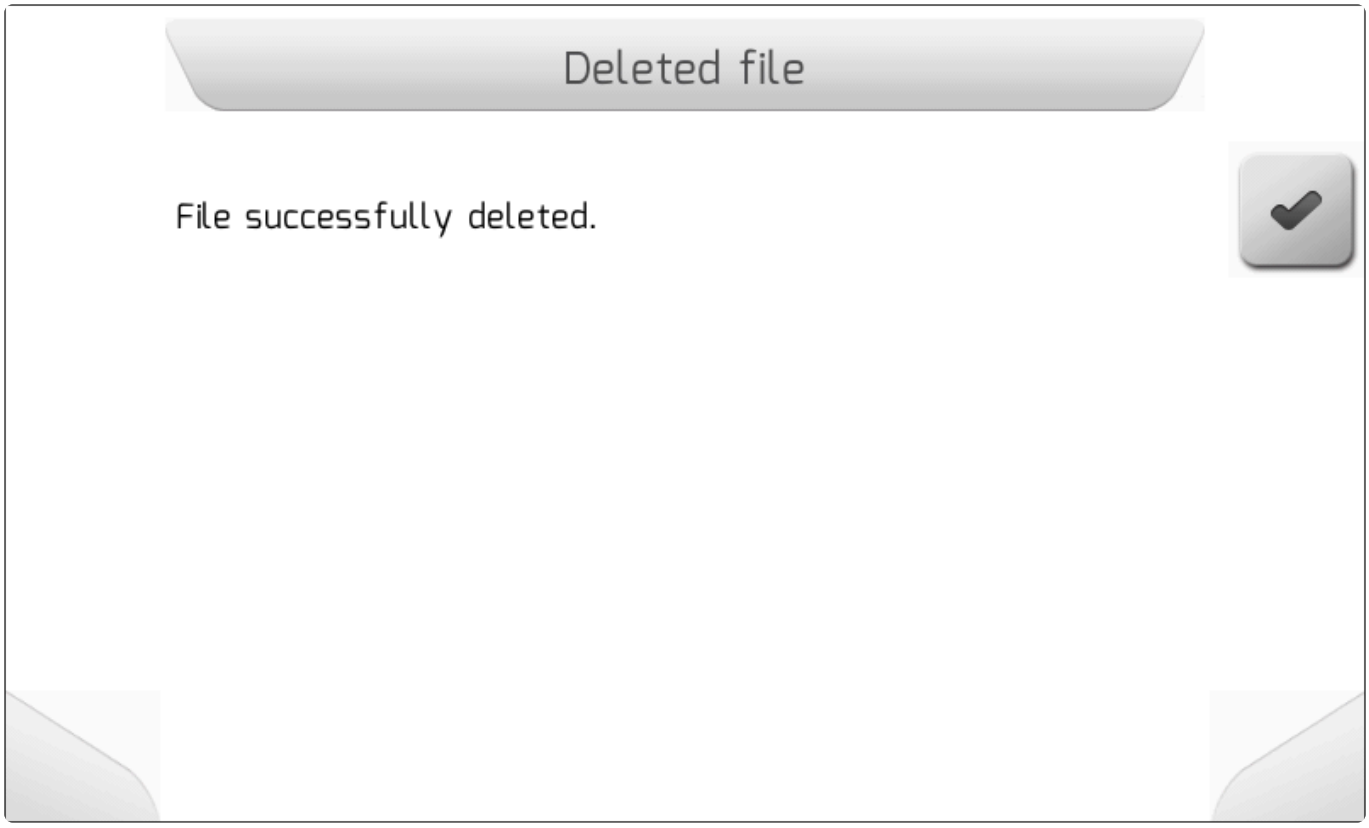

Variable rate map display screen contains a legend that indicates the map colors for each range of the

chosen parameter. On this screen, pressing the back button  returns to the previous screen.

Also in the View area, the user can delete a variable rate map file using the delete button  . When pressing it, a screen containing an information board with red background will be displayed, informing the names of the 3 files (SHP, DBF, SHX) that composes the variable rate map.




If the user presses the cancel button  , the deletion will not be performed and the system will return to the previous screen. If the confirm button is pressed  , the variable rate map file will be deleted from the internal memory and the confirmation will be presented, as shown in the following image.




# 8.5.7.2.2. Import

Screen Type = Vertical menu

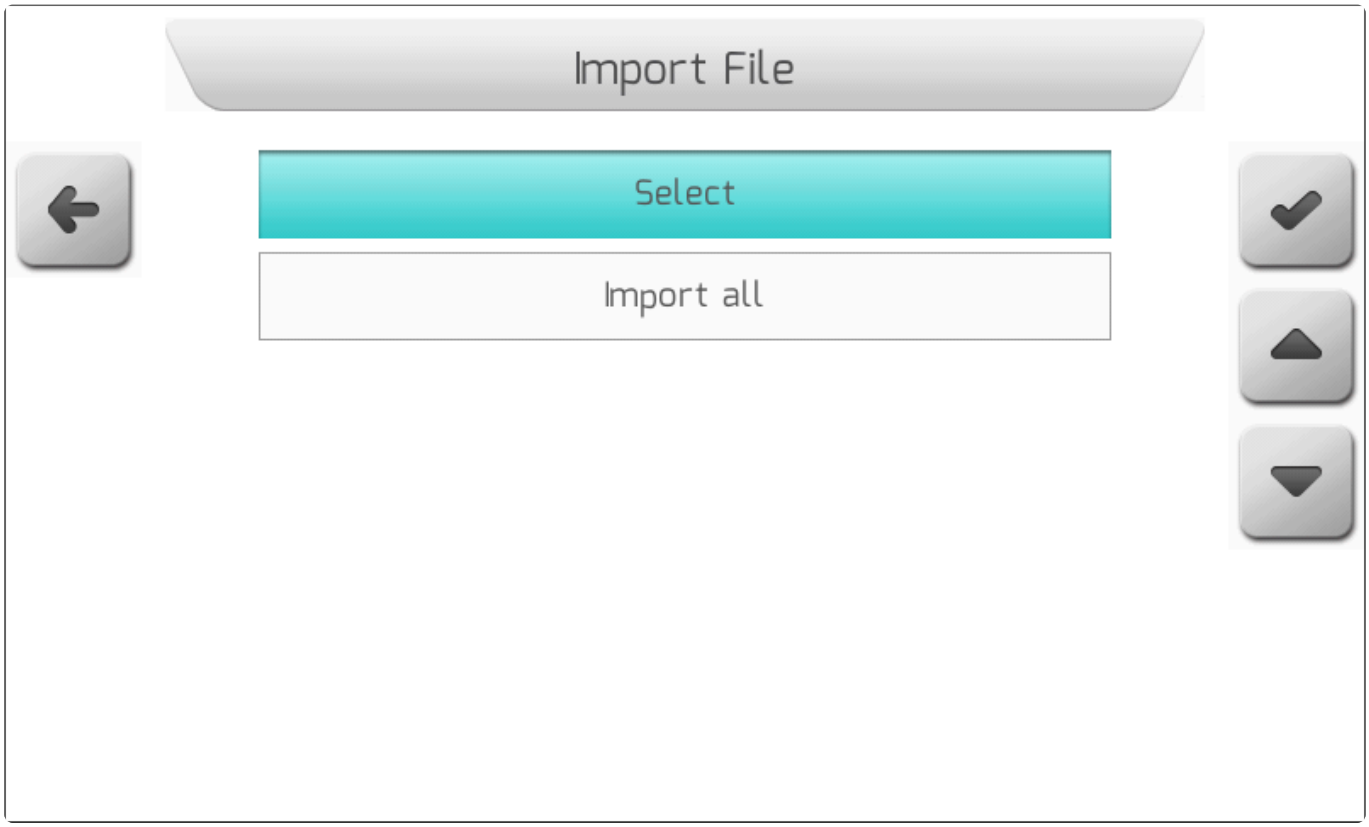
- Select
- Import All

The Import area is used to import variable rate map files from flash drive (*pen drive*) to the GeoNave internal memory. Once loaded into the internal memory, is possible to use the maps as source of different target rates for each point in the corresponding field area.

In the Variable Rate Maps menu, select the Import option and press the confirm button . If a flash drive is not connected, an Information screen will be displayed, as shown of the following image.



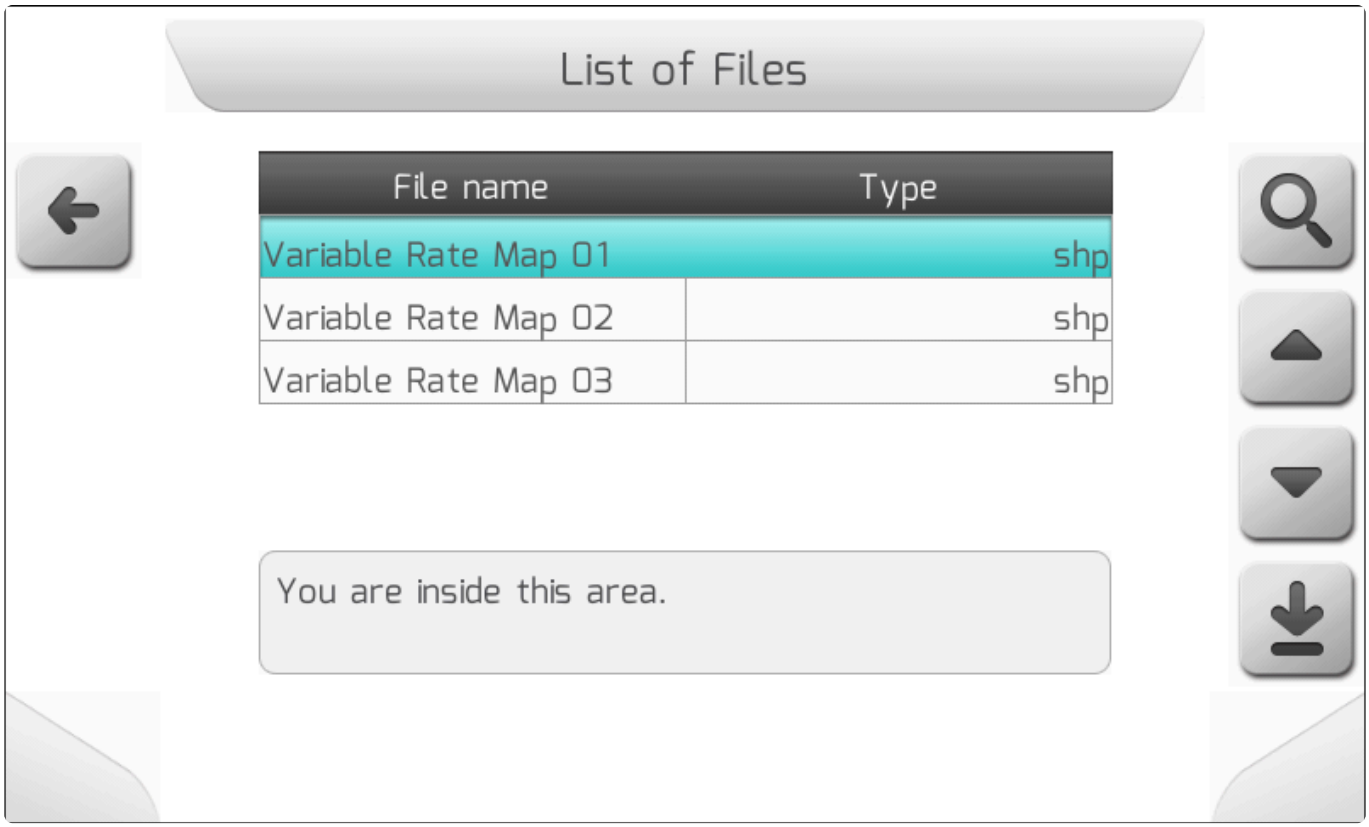

If the flash drive is correctly connected to the USB interface, a new Vertical menu appears containing two options, as shown in the image below. In the first option – Select – allows the user to choose what file will be imported into the internal memory. In the second – Import all – all variable rate map files found in the flash drive will be imported into the internal memory.



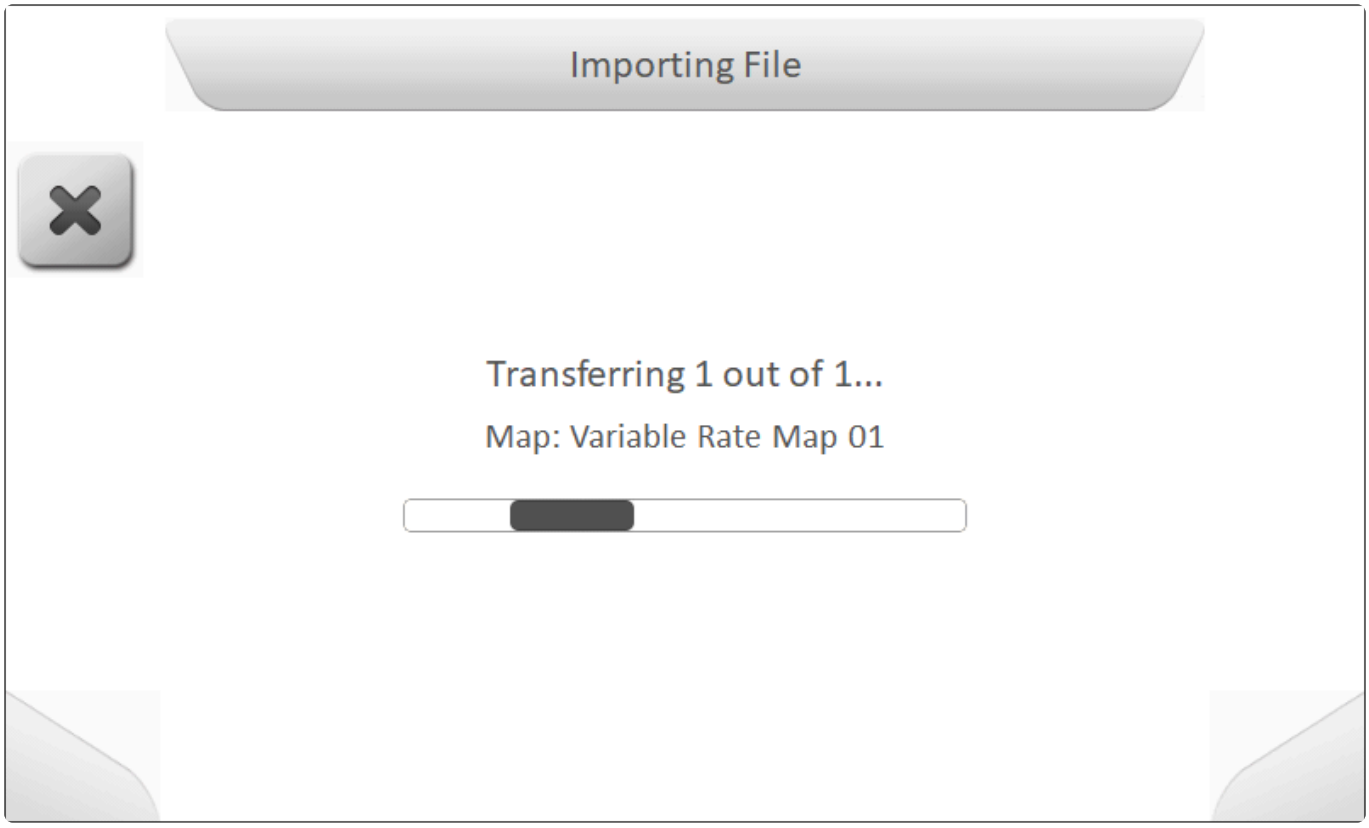
# 8.5.7.2.2.1. Select

Screen Type = List of files

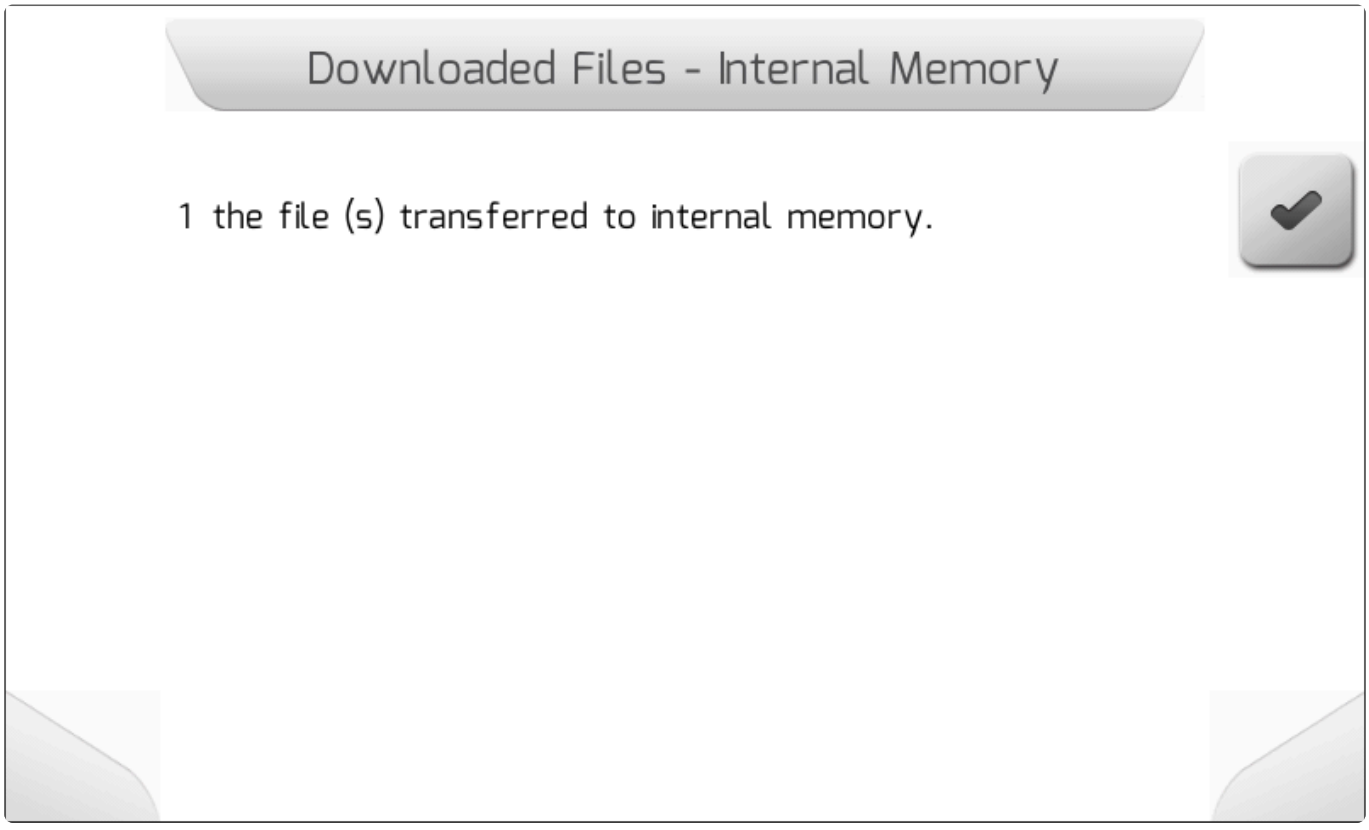
Choosing the Select option from the import menu and pressing the confirm button , the List of files screen will appear, as shown in the image below, which allows the user to browse between flash drive folders and file structure.
Variable rate maps are composed of three files with extensions “.SHP”, “.DBF” and “.SHX” and are organized in the flash drive as defined by the user. The user can browse the flash drive folders to find the correct variable rate map file to import into the internal memory. The following image shows the variable rate map list of files in the flash drive. The file data description area shows the distance from the current GNSS coordinates to the map area.




Selecting one of the SHP variable rate maps from the list and pressing the load button , the file will be imported into the GeoNave internal memory. While the file is being imported, the Loading screen is displayed, as shown in the image below, containing the number of files to be transferred, counter of files already transferred and the map file name being transferred.




Once the import ends, the Information screen will indicate that the file has been loaded to the internal memory, as shown in the following image.

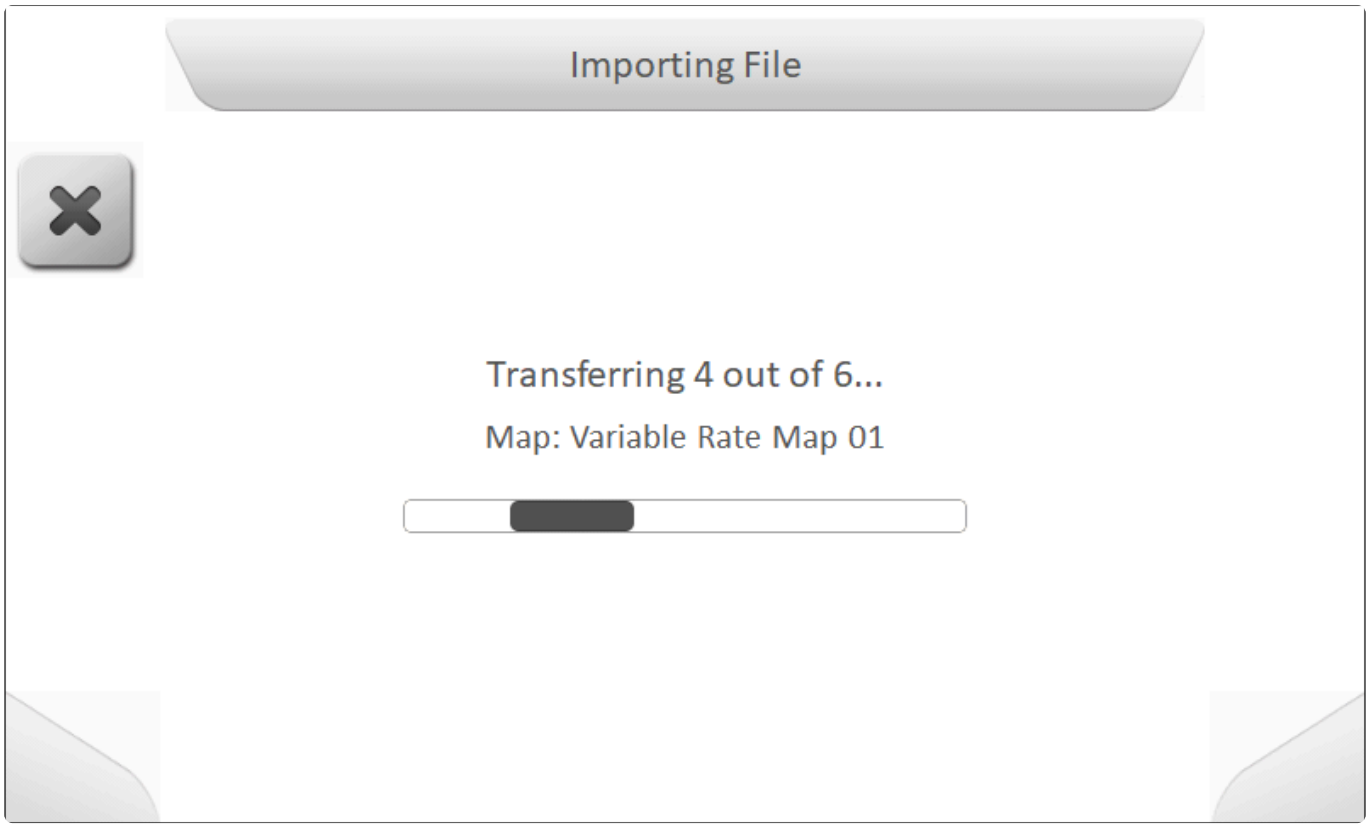



In the same way as described for the View menu, is possible to view the map of one of the *Shapefile* variable rate parameters by pressing the view button on the file list screen.

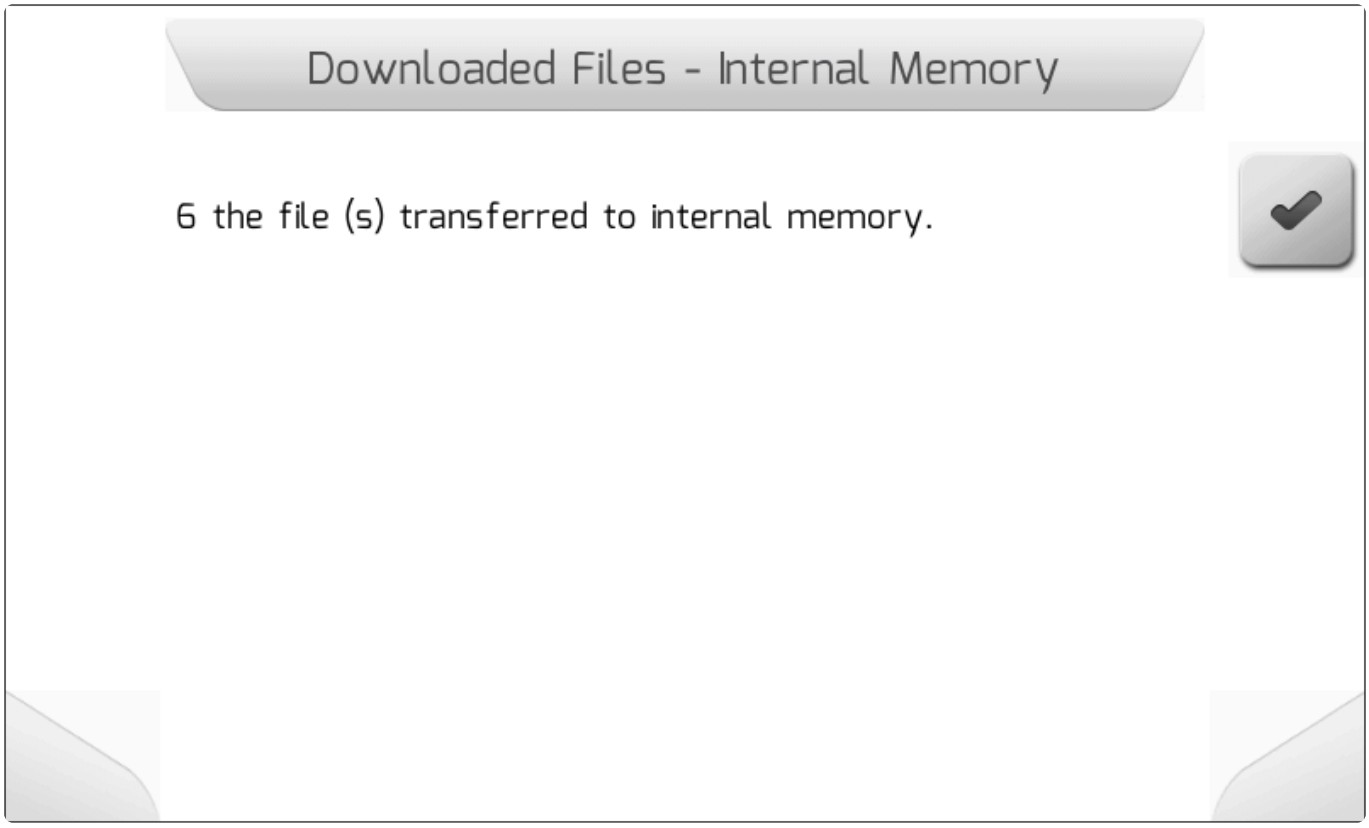
# 8.5.7.2.2.2. Import All

Screen type = Loading > Information

Selecting the Import All option from the import menu and pressing the confirm button , all variable rate map files that the GeoNave system find in the folder structure of the flash drive will be imported into the internal memory.
While the files are being imported, the Loading screen will be displayed, as shown in the image below, containing the number of files to be transferred, counter of files already transferred and the map file name being transferred.




Once the import ends, an Information screen indicating the number of files actually imported into the GeoNave internal memory will be displayed, as shown in the following image.

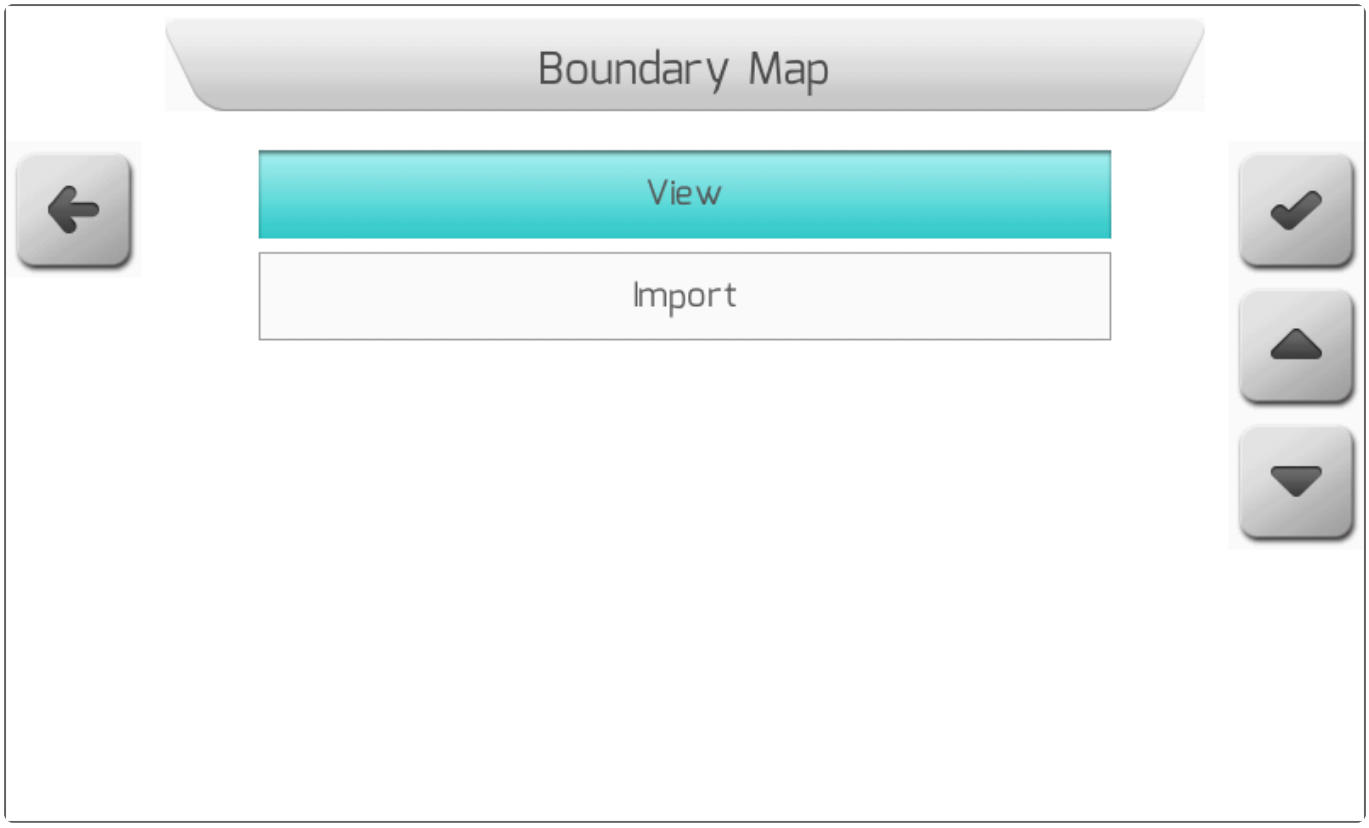



# 8.5.7.3. Boundary Map

Screen type = Vertical menu

- View
- Import

The Boundary Map management screen consists of two areas, through which the user can view and import *Shapefile* files of boundary maps. The image below shows the Boundary Map menu screen.

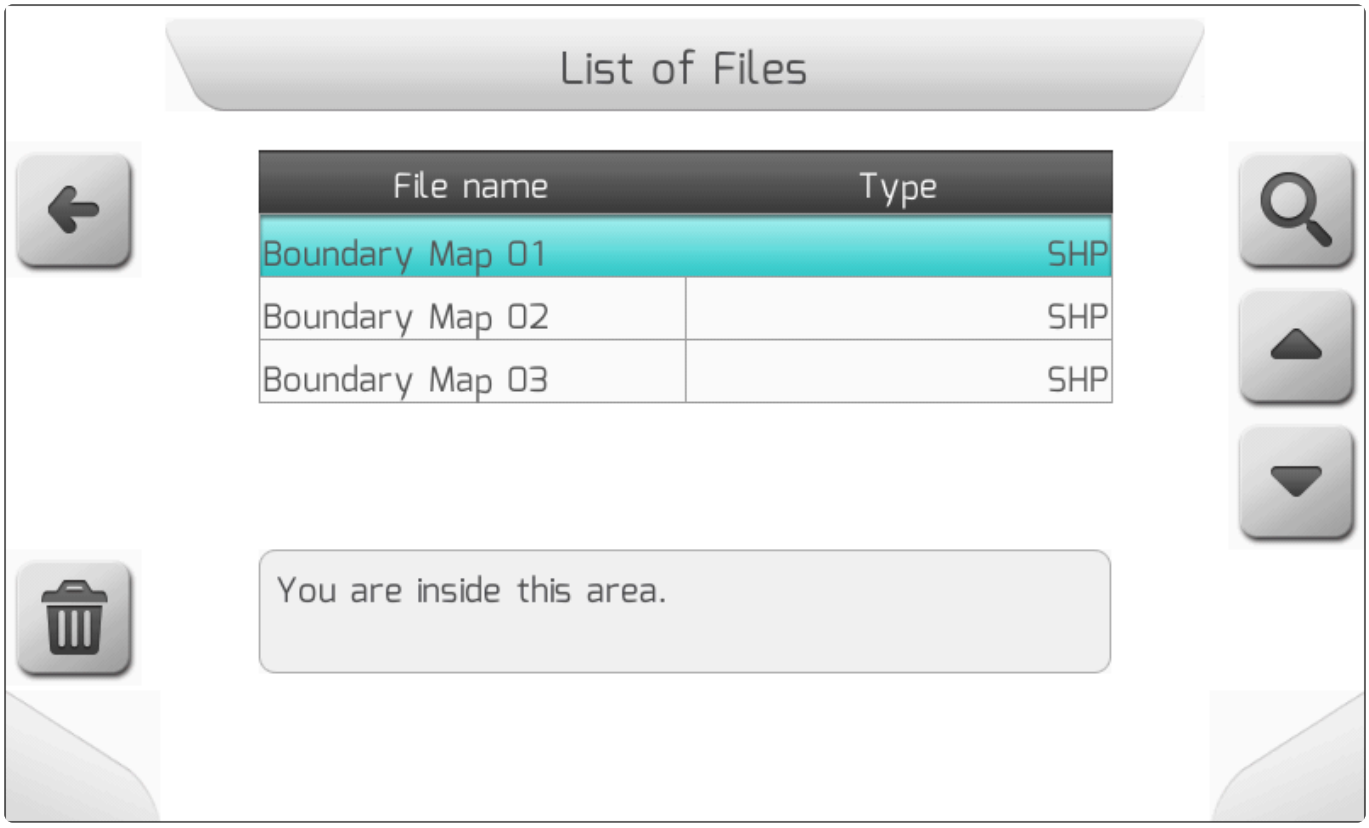



# 8.5.7.3.1. View

Screen Type = List of files

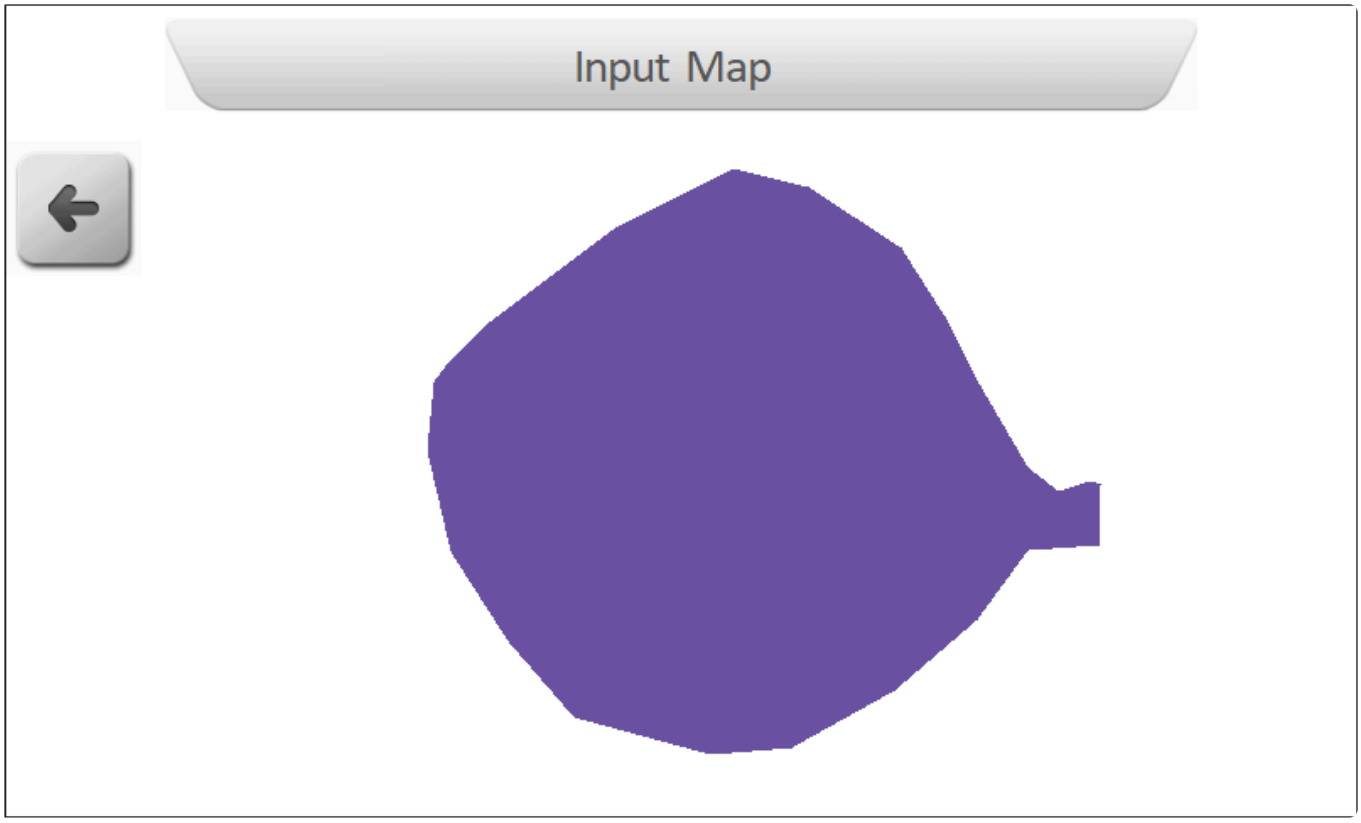
In the View area of the limit map management, the user has access to *Shapefile* files of boundary loaded into the GeoNave internal memory.

When selecting the item in the Limit Maps menu and pressing the confirm button  , the File List will be displayed, as shown in the following image, in this screen the user must select the boundary map that contains the information to be displayed.



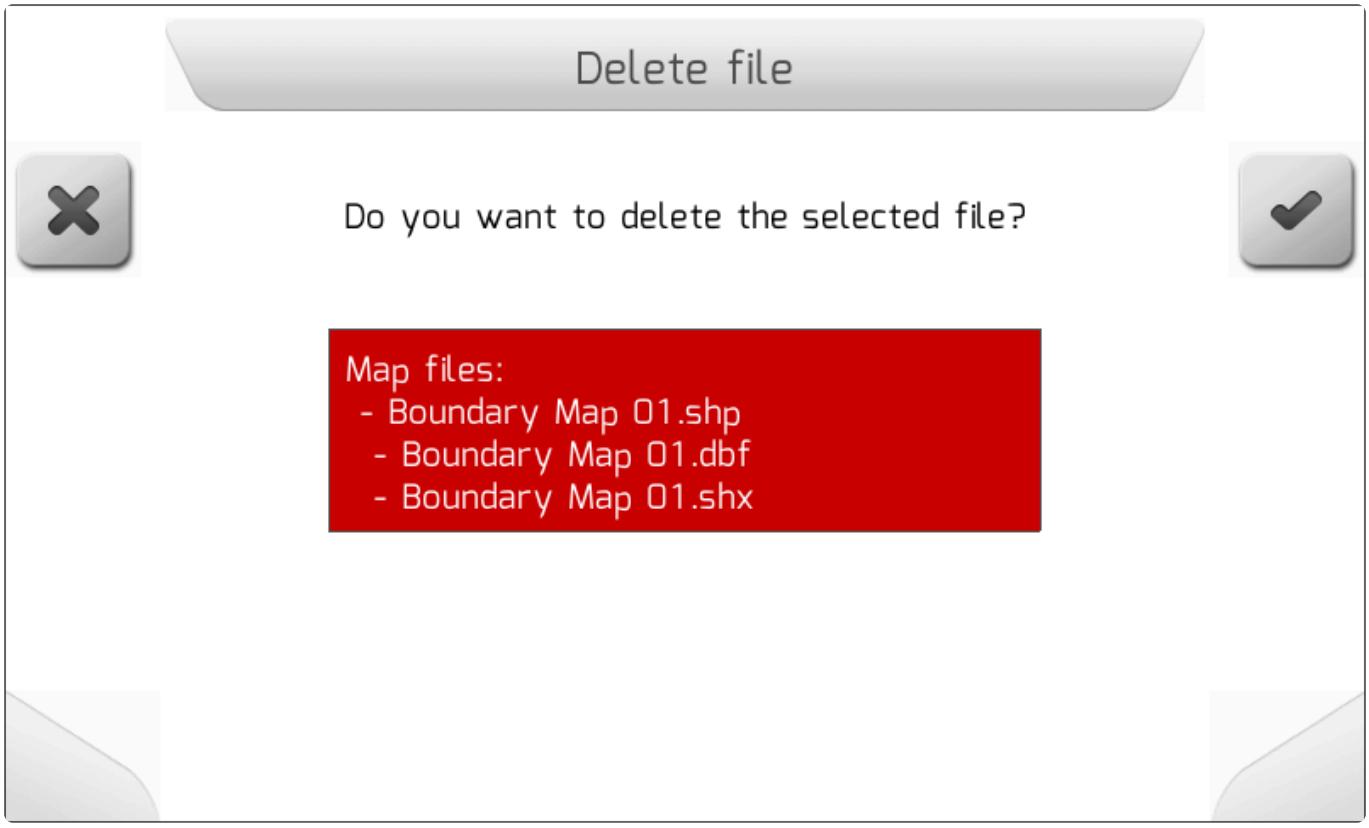

*Shapefile* files of boundary maps are shown in a table and are organized in the internal memory with the same folder structure from the flash drive. The user can browse the internal memory folders in order to find the wanted SHP file. When selecting the desired file, the distance from the current GNSS coordinates to the map area will be displayed at the bottom of the screen.

Pressing the preview button  , the Loading screen with the text “Loading file” will be displayed while the file is uploaded from the internal memory so that the boundary map is displayed on the screen. After loading, the boundary map is displayed on the screen as shown in the image below

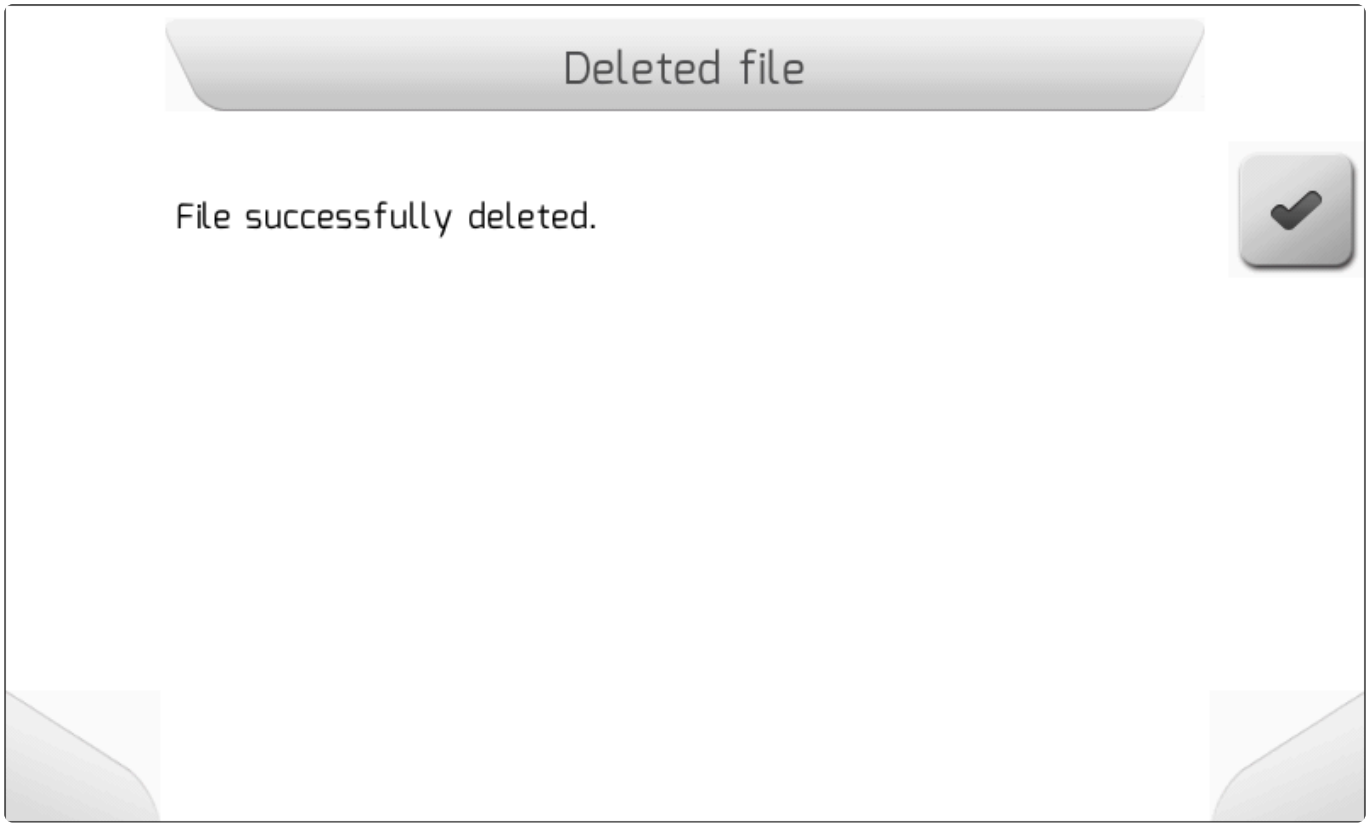



When pressing the back button  the system returns to the previous screen.

Also in the View area, the user can delete a boundary map file using the delete button  . When pressing it, a screen containing an information board with red background will be displayed, informing the names of the 3 files (SHP, DBF, SHX) that composes the boundary map.




If the user presses the cancel button , the deletion will not be performed and the system will return to the previous screen. If the confirm button is pressed , the boundary map file will be deleted from the internal memory and the confirmation will be presented, as shown in the following image.



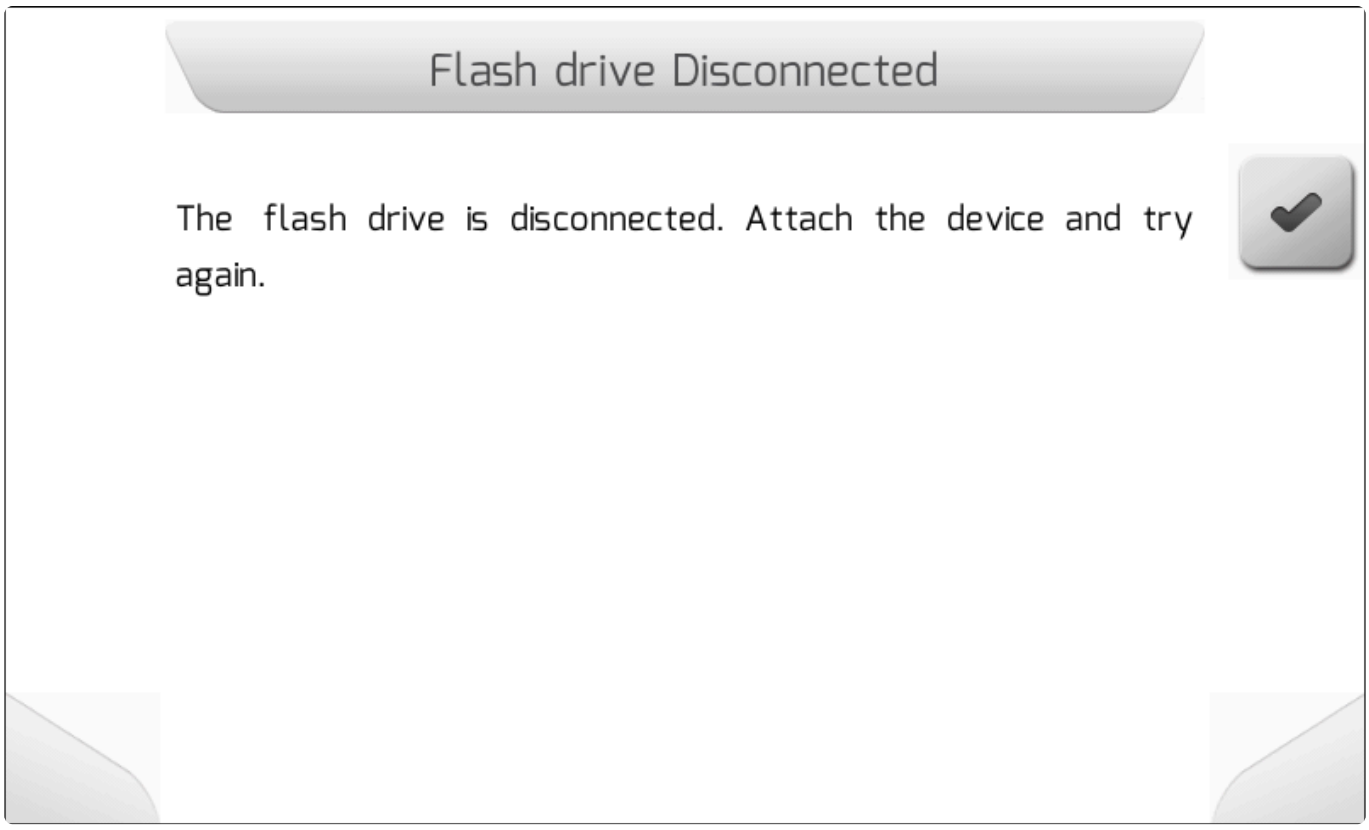
# 8.5.7.3.2. Import

Screen Type = Vertical menu

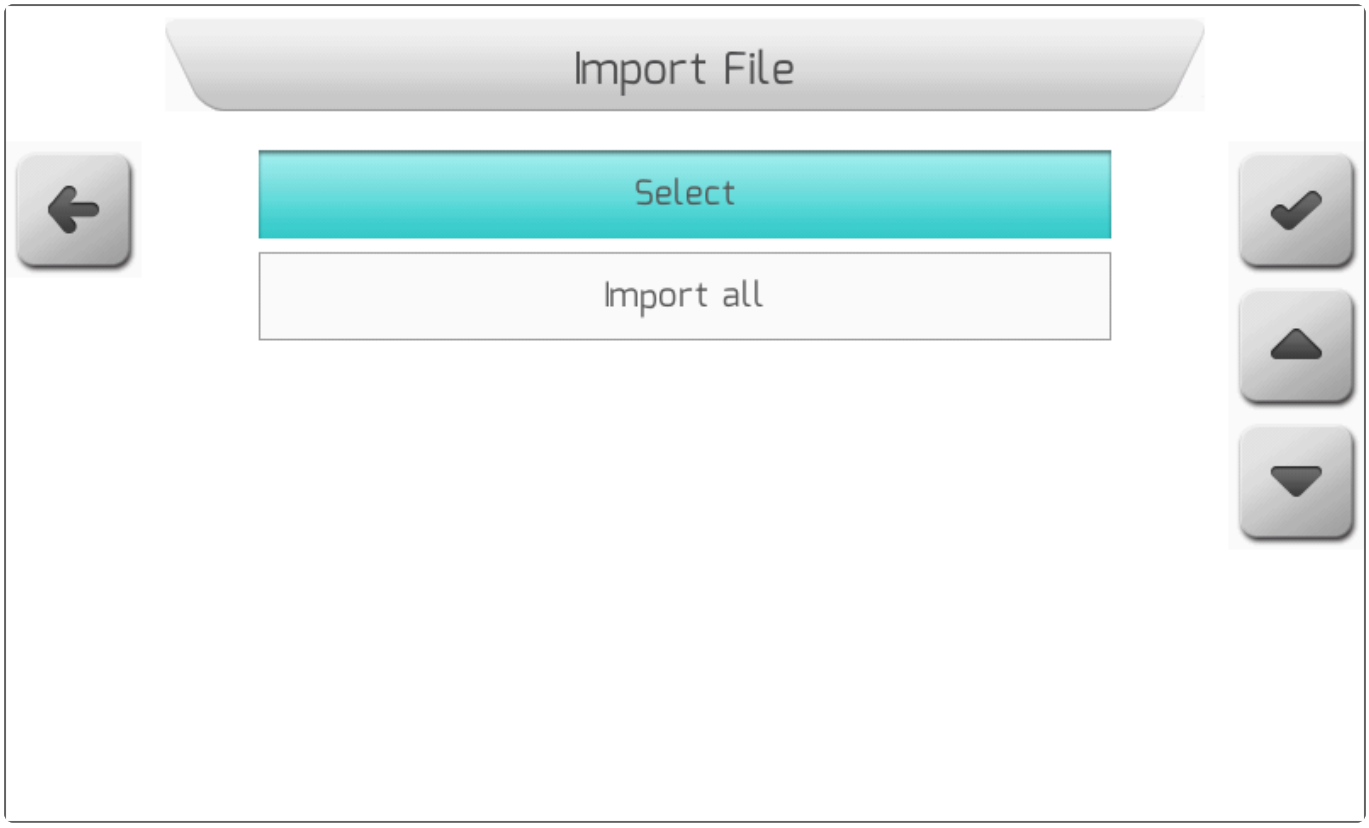
- Select
- Import All

The Import area is used to import boundary map files from flash drive (*pen drive*) to the GeoNave internal memory. Once loaded into the internal memory, is possible to use the maps as a boundary area in navigation.

In the Boundary Maps menu, select the Import option and press the confirm button  . If a flash drive is not connected, an Information screen will be displayed, as shown of the following image.



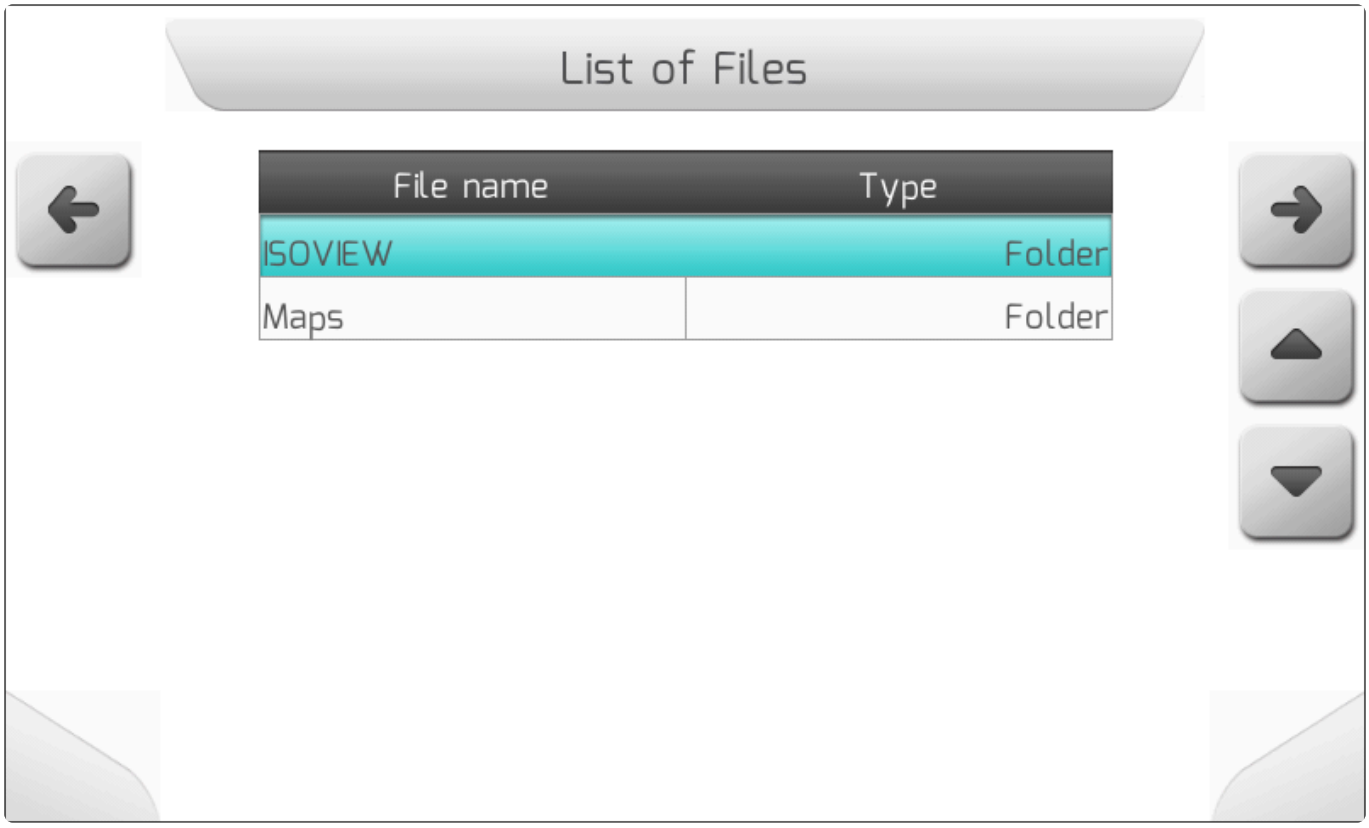

If the flash drive is correctly connected to the USB interface, a new Vertical menu appears containing two options, as shown in the image below. In the first option – Select – allows the user to choose what file will be imported into the internal memory. In the second – Import all – all boundary map files found in the flash drive will be imported into the internal memory.



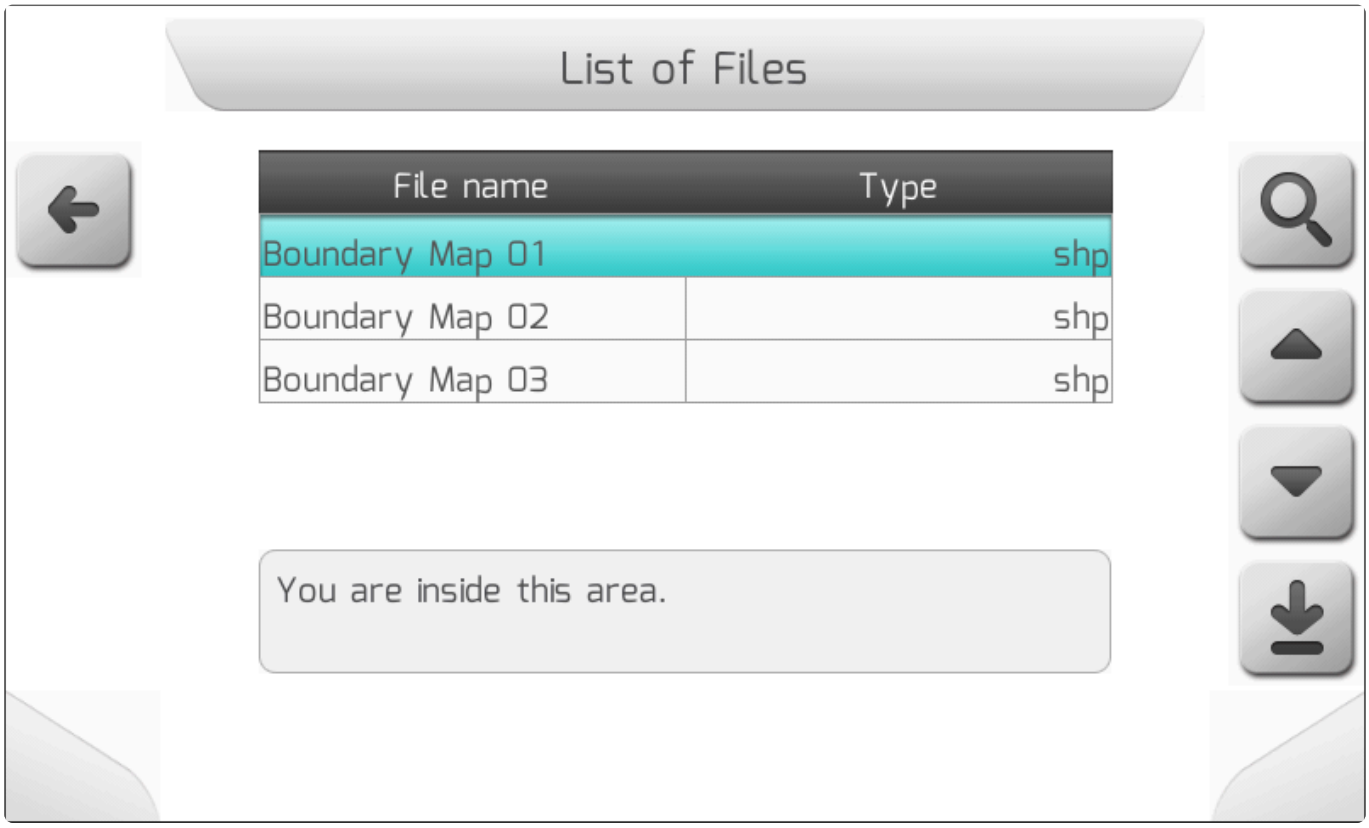

# 8.5.7.3.2.1. Select

Screen Type = List of files

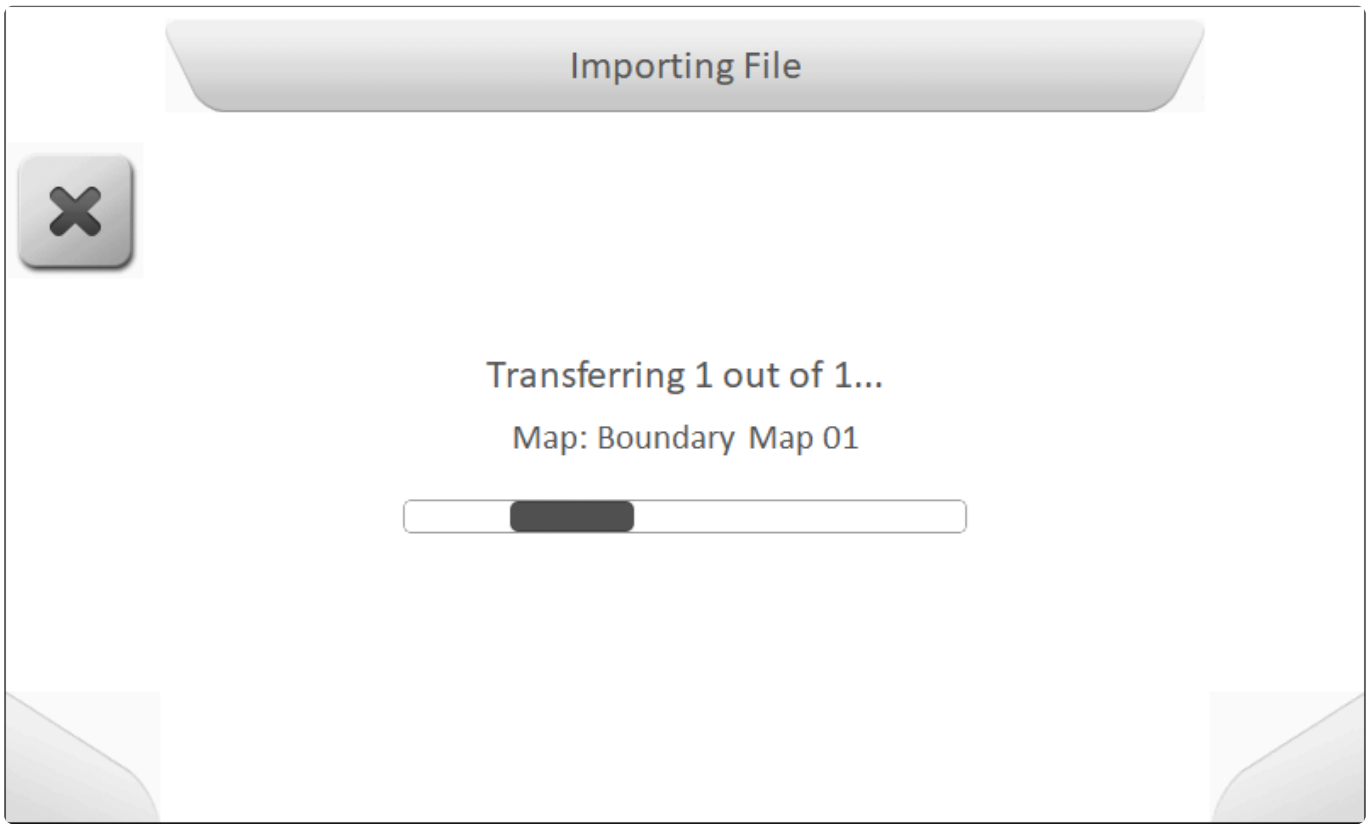
Choosing the Select option from the import menu and pressing the confirm button  , the List of files screen will appear, as shown in the image below, which allows the user to browse between flash drive folders and file structure.



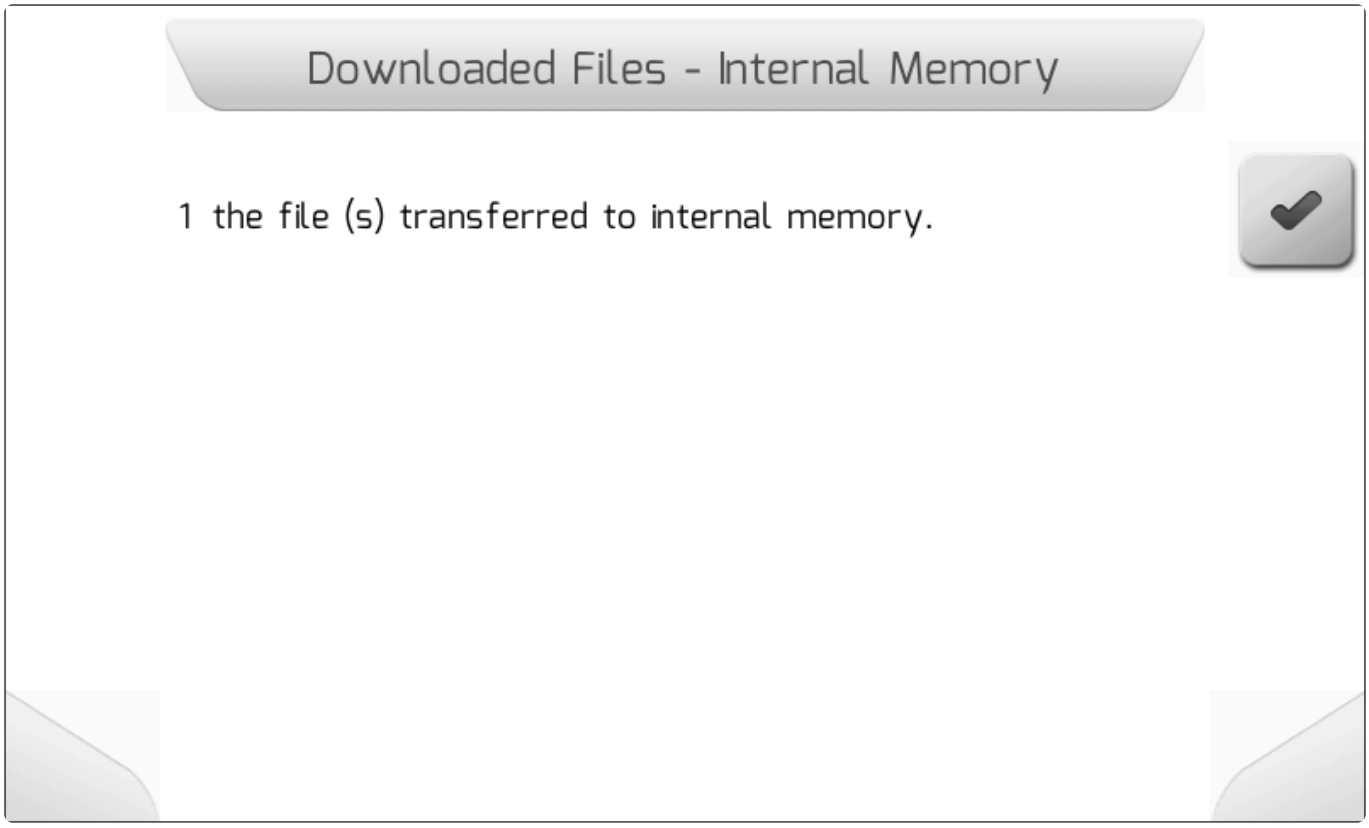

Boundary maps are composed of three files with extensions “.SHP”, “.DBF” and “.SHX”, and are organized in the flash drive as defined by the user. The user can browse the flash drive folders to find the correct boundary map file, to import into the internal memory. The following image shows the boundary map files in the flash drive. The file data description area shows the distance from the current GNSS coordinates to the map area.



Selecting one of the SHP boundary maps from the list and pressing the load button  , the file will be imported into the GeoNave internal memory. While the file is being imported, the Loading screen is displayed, as shown in the image below, containing the number of files to be transferred, counter of files already transferred and the map file name being transferred.




Once the import ends, the Information screen will indicate that the file has been loaded to the internal memory, as shown in the following image.

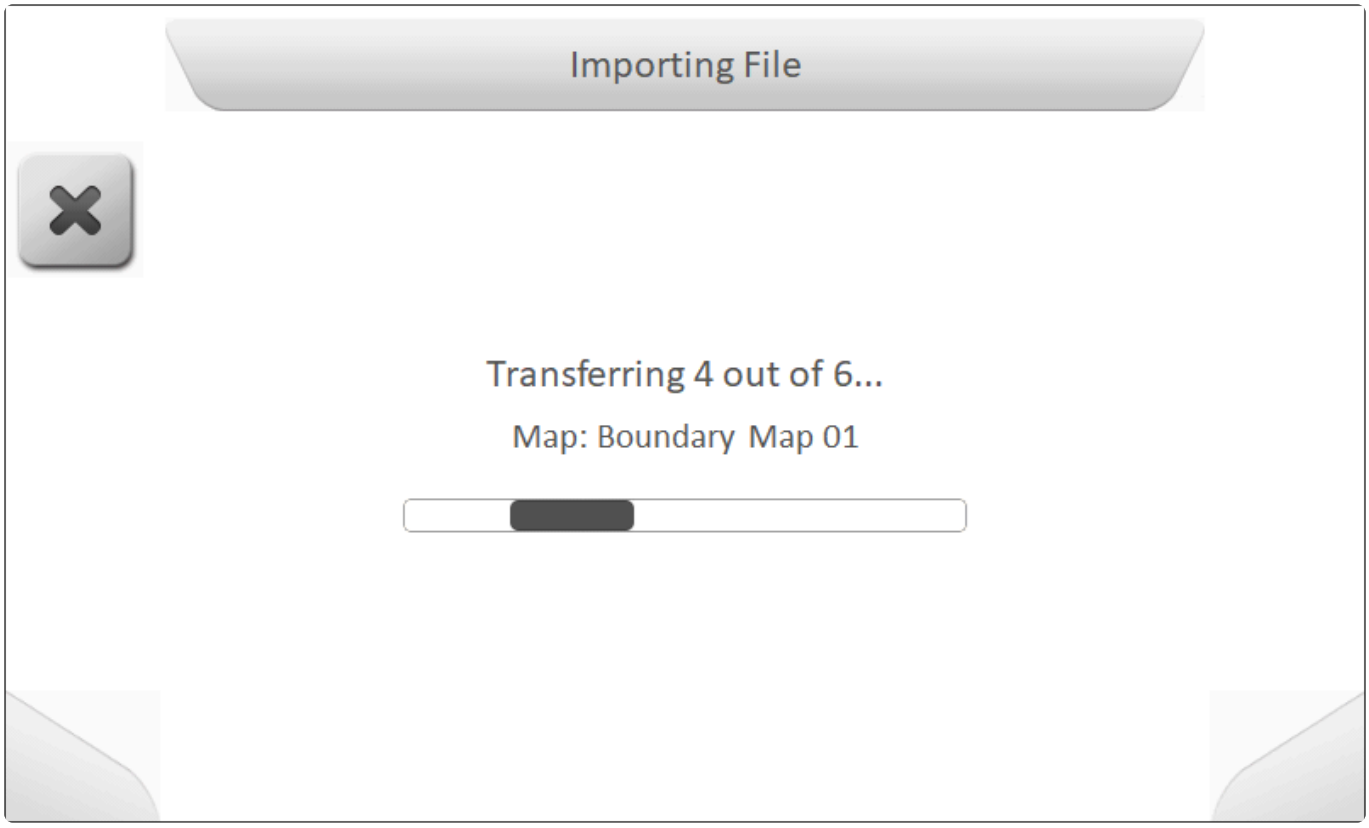



In the same way as described for the View menu, is possible to view the boundary map by pressing the view button on the file list screen.

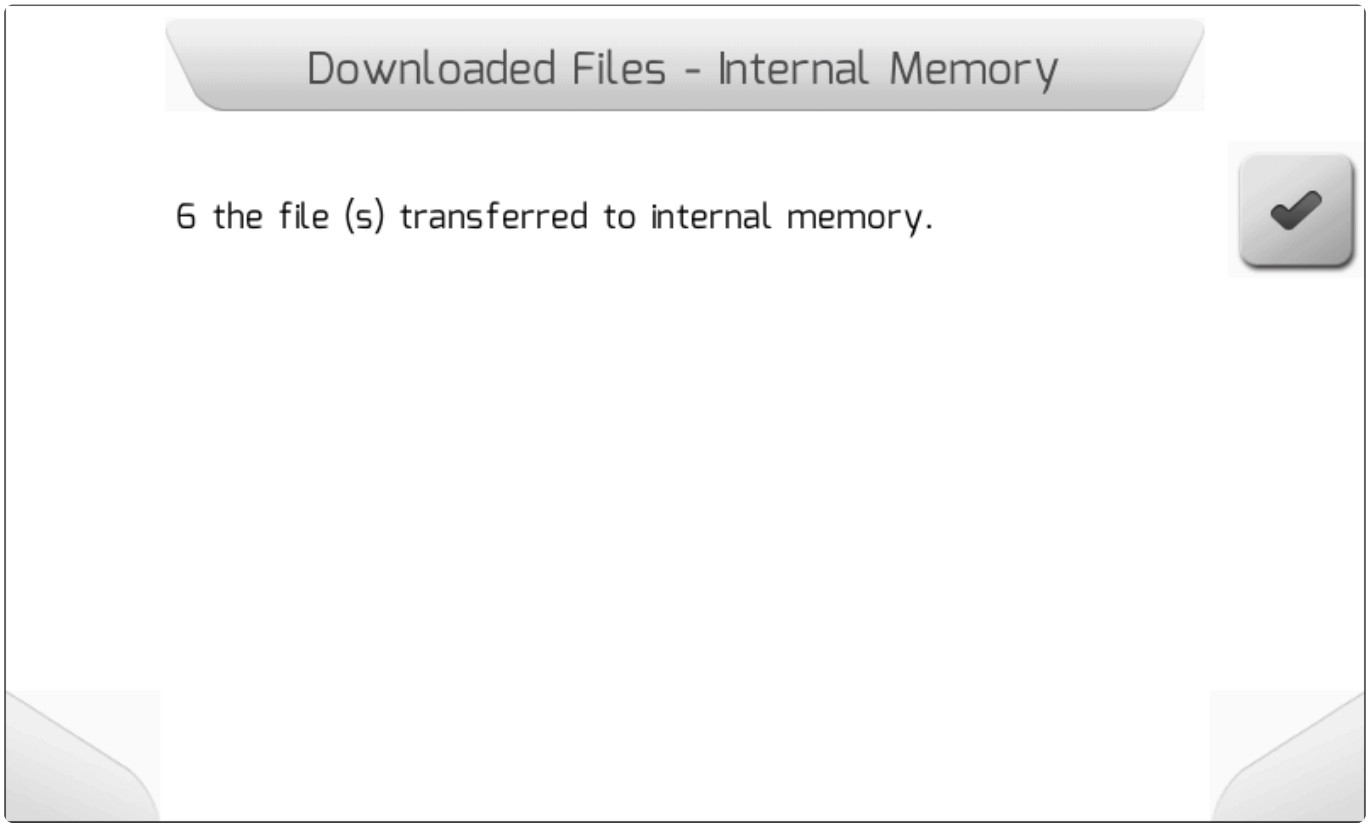
# 8.5.7.3.2.2. Import All

Screen type = Loading > Information

Selecting the Import All option from the import menu and pressing the confirm button , all boundary map files that the GeoNave system find in the folder structure of the flash drive will be imported into the internal memory.
While the files are being imported, the Loading screen will be displayed, as shown in the image below, containing the number of files to be transferred, counter of files already transferred and the map file name being transferred.



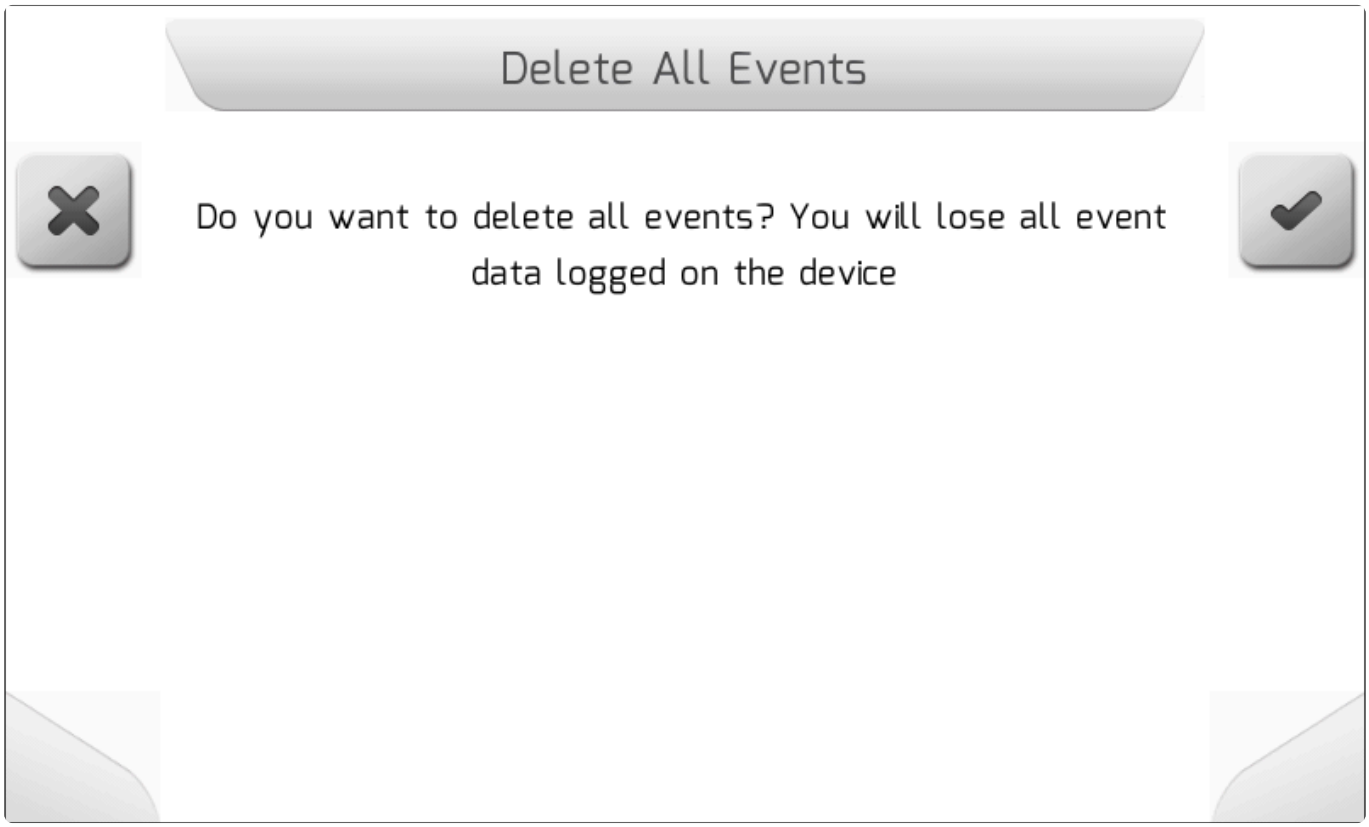

Once the import ends, an Information screen indicating the number of files actually imported into the GeoNave internal memory will be displayed, as shown in the following image.



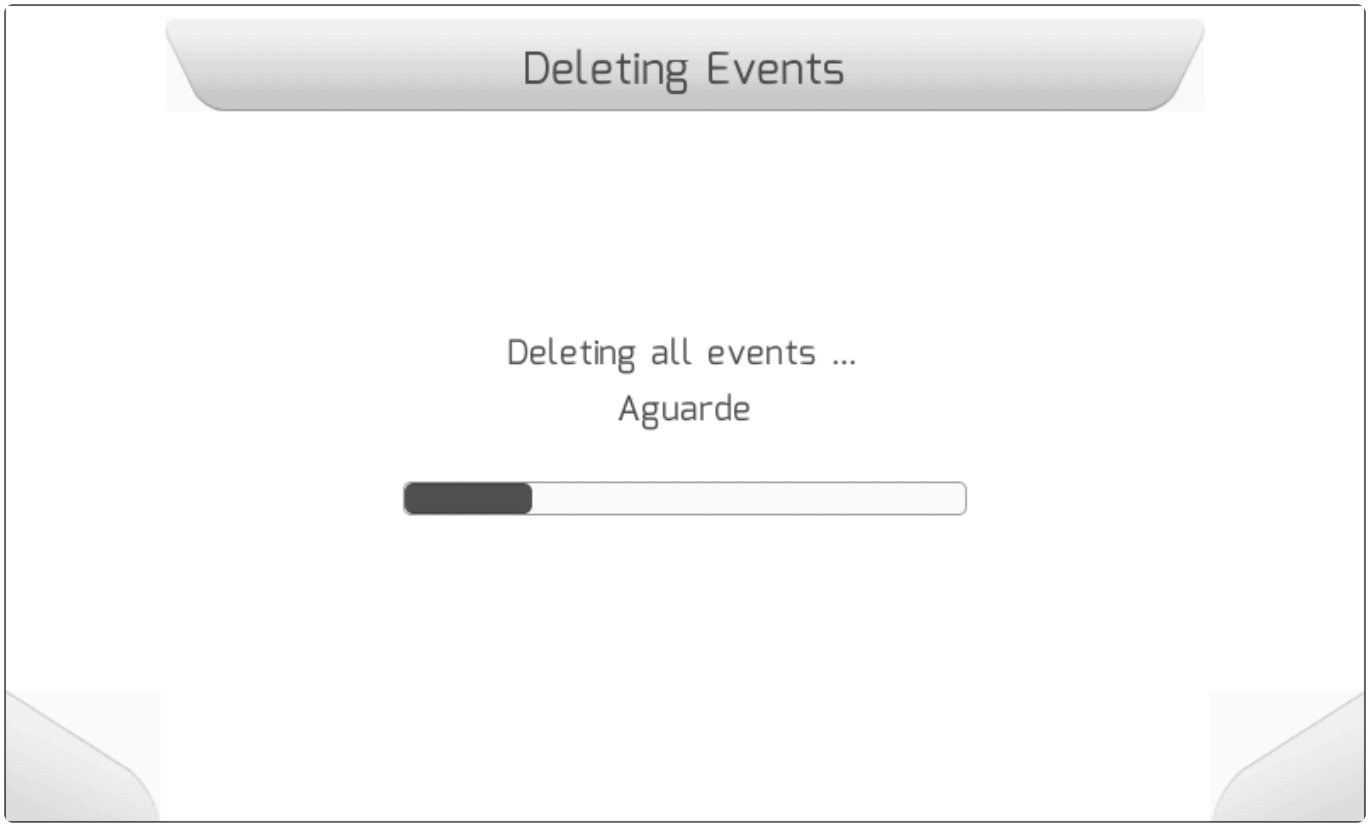
# 8.5.8. Delete Events

Screen type = Information with confirmation

The Delete Events area within the Memory settings menu is used to remove simultaneously all event files from the GeoNave internal memory. When selecting the Delete Events item and pressing the confirm button , the Information with confirmation screen will be displayed, as shown in the following image, asking for the user to confirm the intention to delete all events.




If the user presses the cancel button , the deletion will not be performed and the system will return to the previous screen. If the confirm button is pressed , the Loading screen with the text “Deleting all events…” will be displayed, as shown in the image below, while all event files are being deleted from the internal memory. After the operation is completed, the system will return to the previous screen.



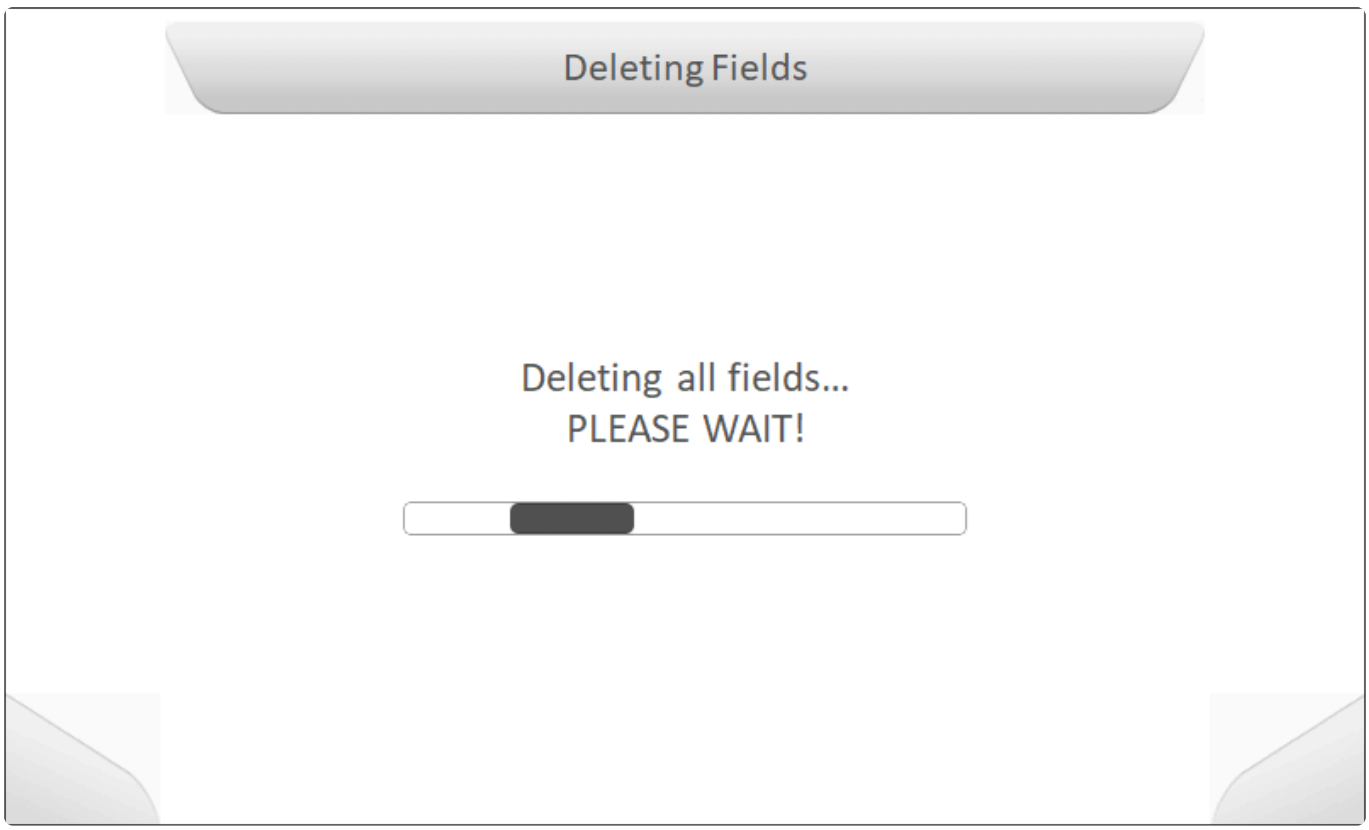

# 8.5.9. Delete Fields

Screen type = Information with confirmation

The Delete Fields area within the Memory settings menu is used to remove simultaneously all fields files from the GeoNave internal memory. When selecting the Delete Fields item and pressing the confirm button  , the Information with confirmation screen will be displayed, as shown in the following image, asking for the user to confirm the intention to delete all fields from the system.



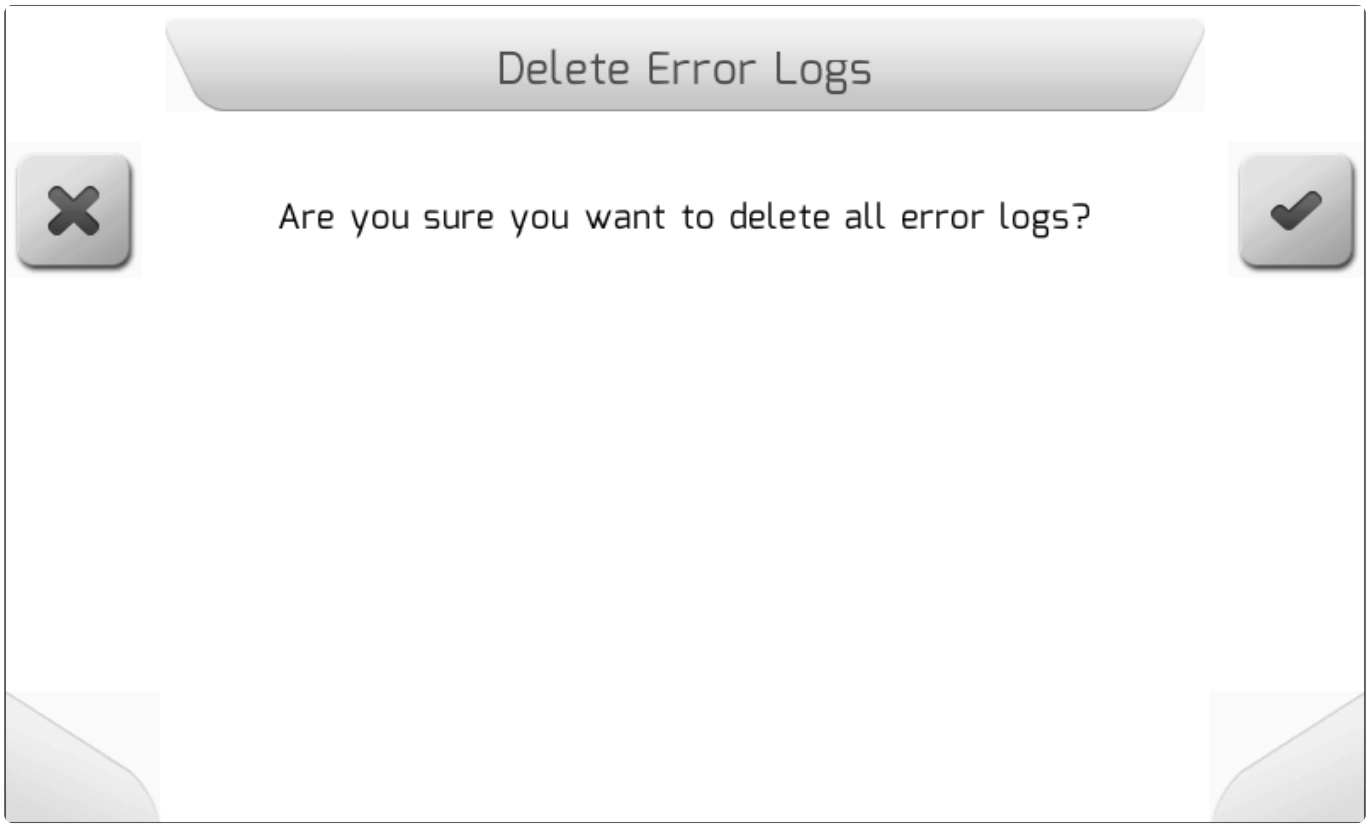

If the user presses the cancel button , the deletion will not be performed and the system will return to the previous screen. If the confirm button is pressed , the Loading screen with the text “Deleting all fields…” will be displayed, as shown in the image below, while all fields files are being deleted from the internal memory. After the operation is completed, the system will return to the previous screen.



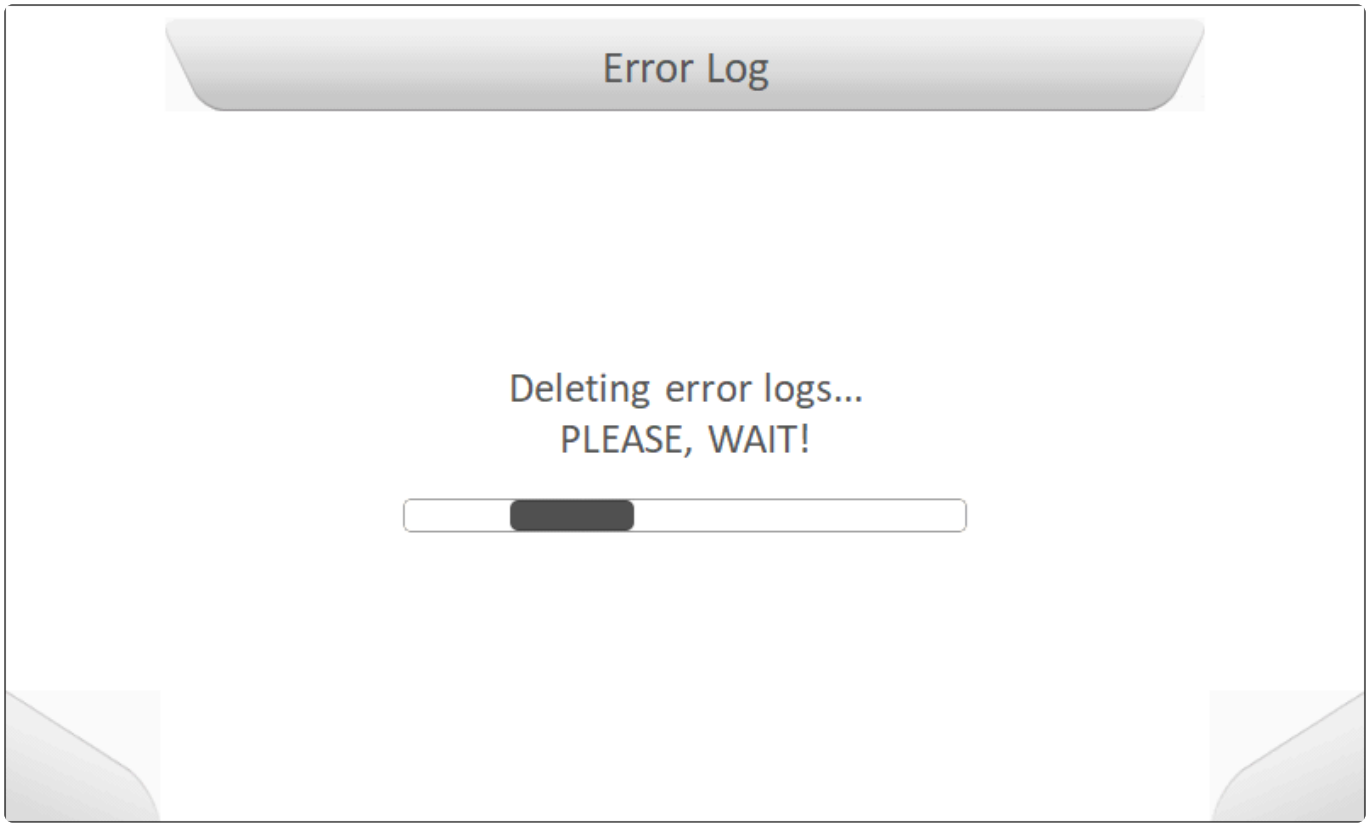
# 8.5.10. Delete Error Logs

Screen type = Information with confirmation

The Delete Error Logs area within the Memory settings menu is used to remove simultaneously all stack dump files from the GeoNave internal memory. When selecting the Delete Error Logs item and pressing the confirm button , the Information with confirmation screen will be displayed, as shown in the following image, asking for the user to confirm the intention to delete all error logs from the system.



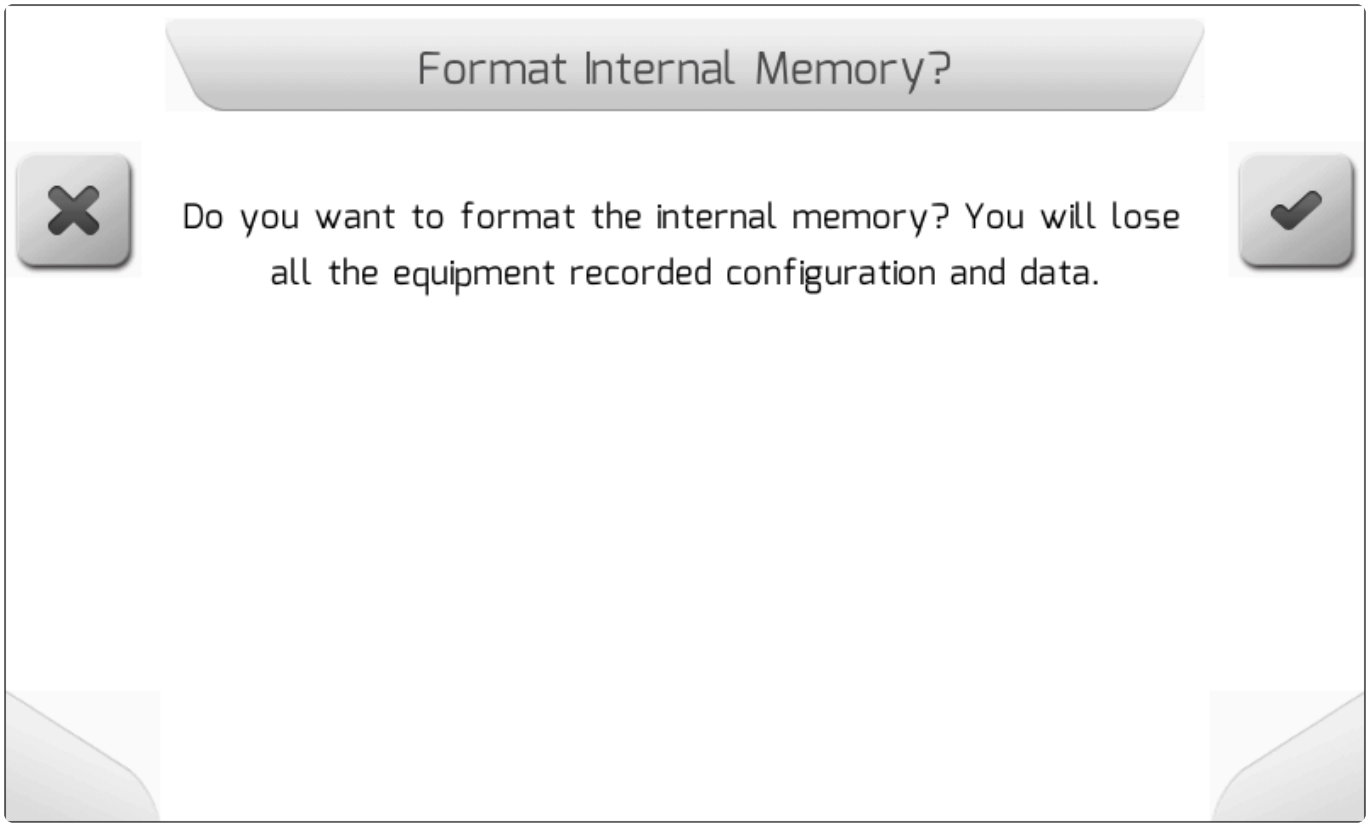

If the user presses the cancel button , the deletion will not be performed and the system will return to the previous screen. If the confirm button is pressed , the Loading screen will be displayed with the text “Deleting all fields…”, as shown in the image below, while all error logs files are being deleted from the internal memory. After the operation is completed, the system will return to the previous screen.



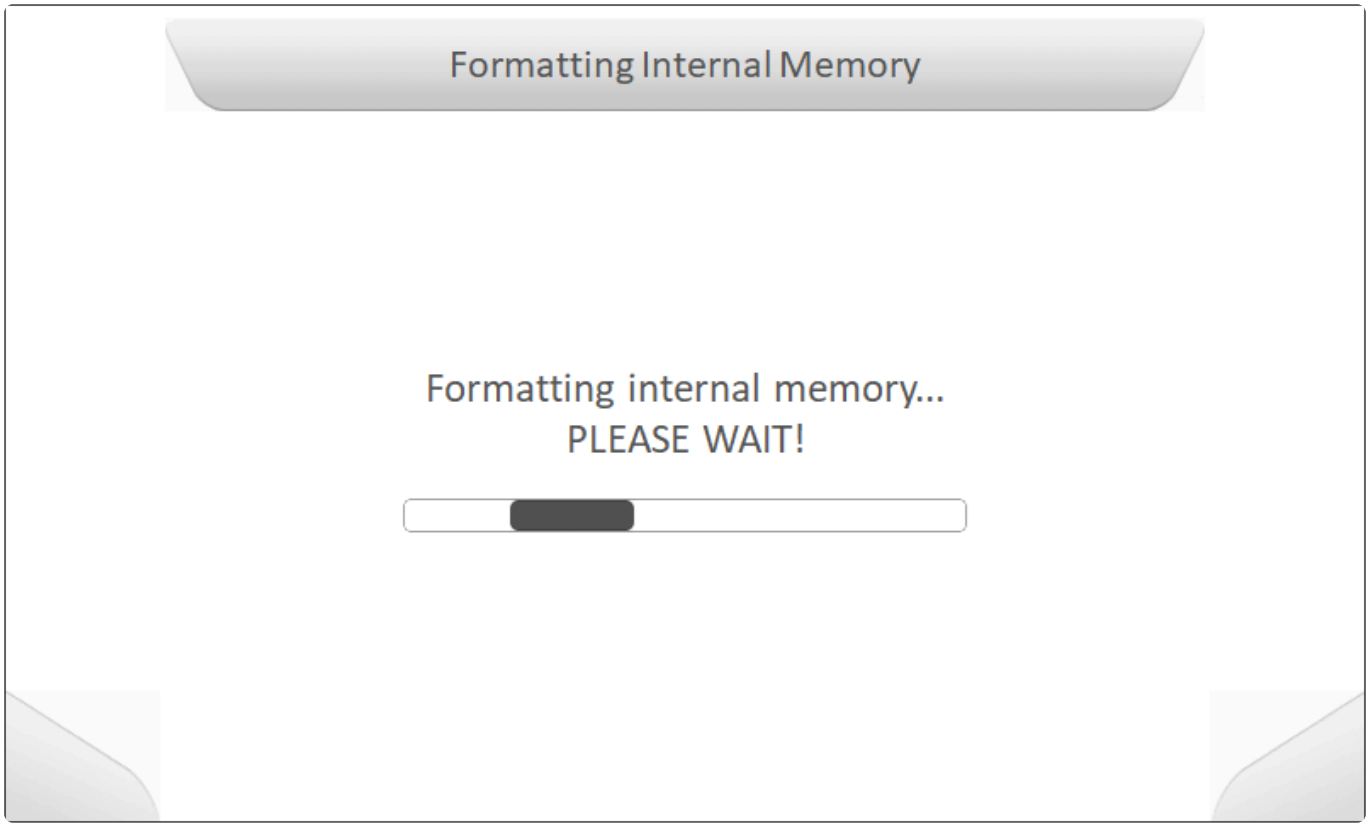

# 8.5.11. Internal Memory – Format

Screen type = Information with confirmation > Entering password

The GeoNave systems allows the user to format the internal memory through the Internal memory – Format area, accessible in the settings menu by selecting the corresponding option, and pressing the confirm button . The Information with confirmation screen will be displayed, as shown in the image below, asking for the user to confirm the intention to format the internal memory, causing all the equipment data to be erased.




If the user presses the cancel button , formatting operation will not be performed and the system will return to the previous screen. If the confirm button is pressed , the Entering password screen will be displayed, as yet another measure of protection against unwanted data loss. If the user enters the correct password and presses the confirm button again, it is then shown the Loading screen with the text “Formatting internal memory…” while the internal memory is formatted. After completing the formatting process, the system will return to the previous screen.

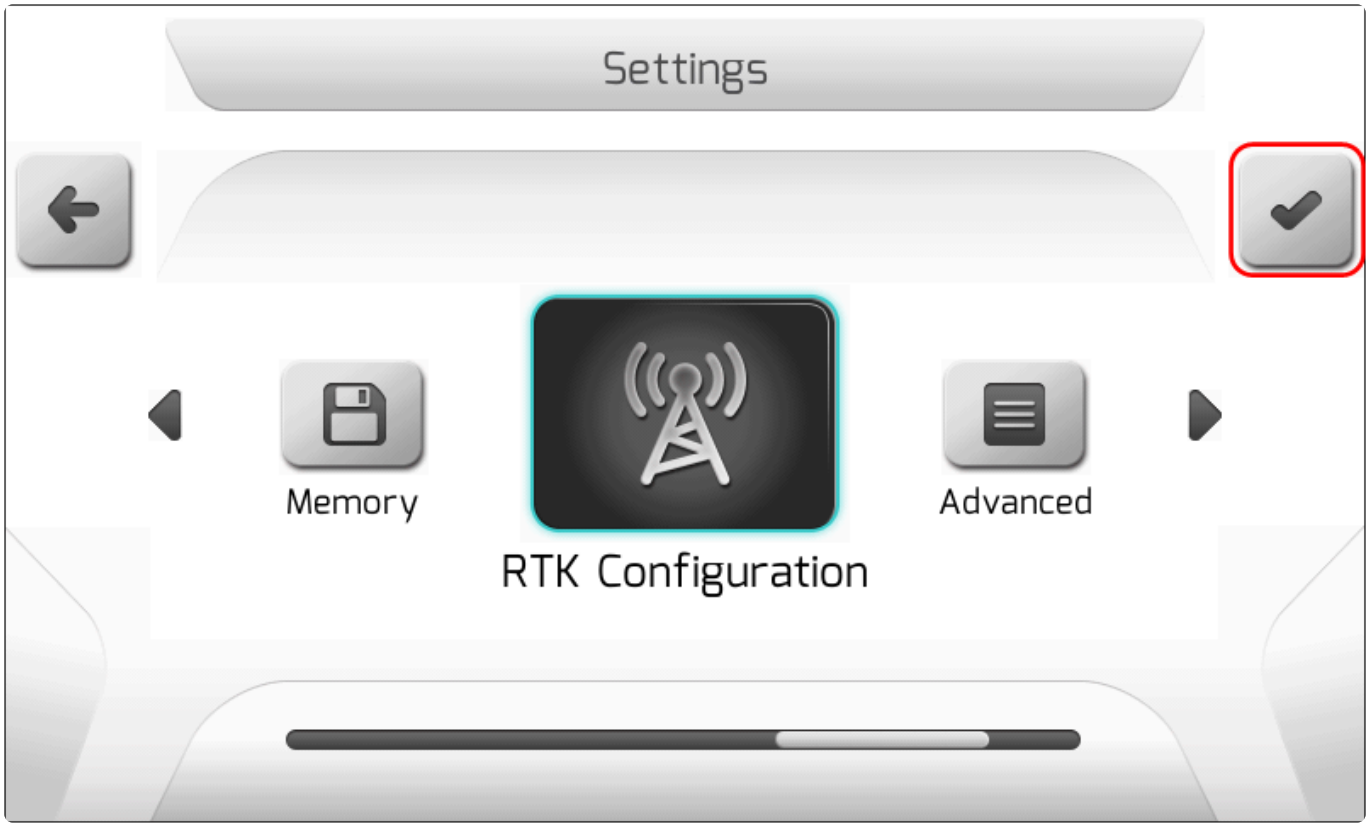



# 8.6. RTK Configuration

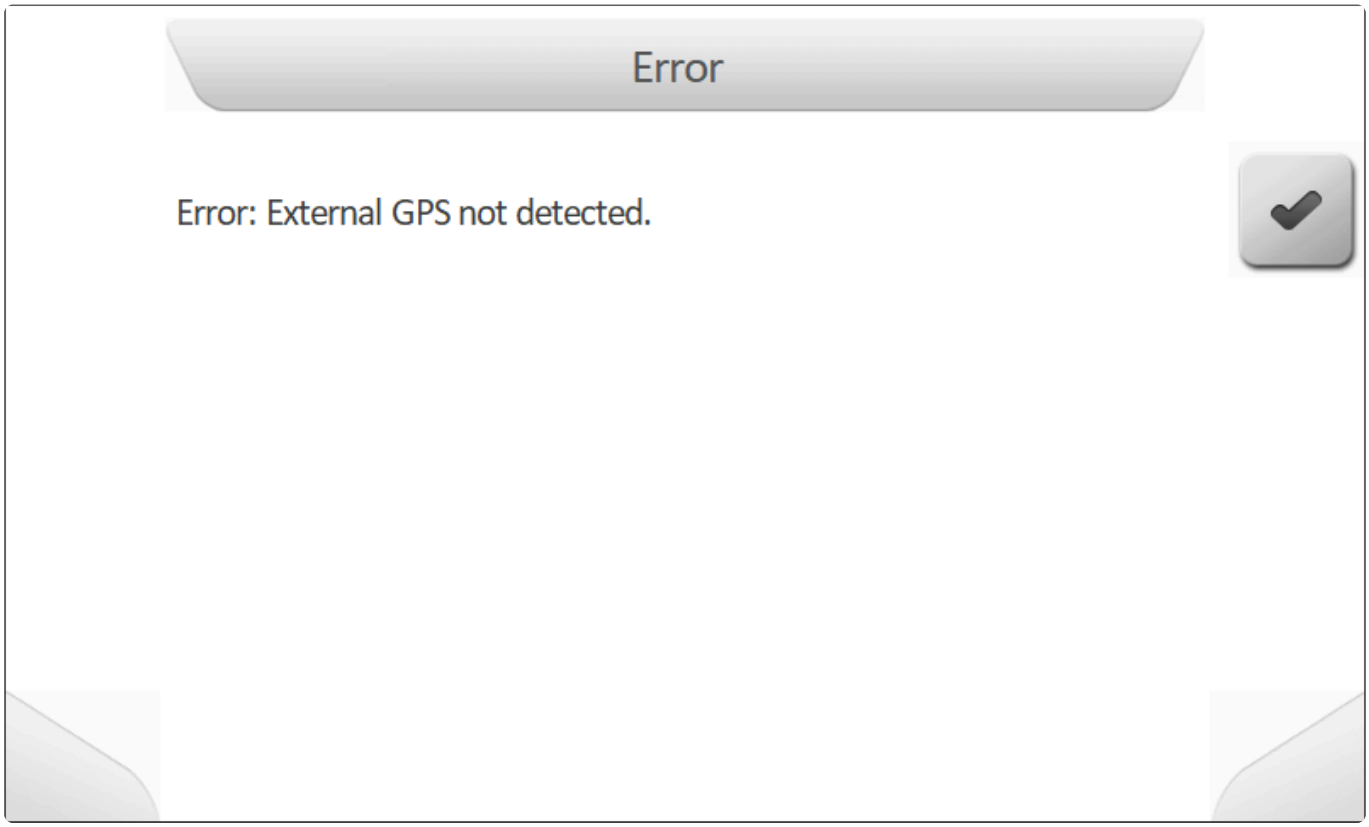
Screen type = Double list

Within the Settings menu is the RTK Configuration area, settings of this menu allow the GeoNave system to use the terrain compensator to receive GNSS signal corrections via radio (mode ***Rover***), and also turn it into a RTK base corrections transmitter (mode **Base**).

Access to the RTK Configuration menu is performed by selecting the corresponding item in the Settings menu and pressing the confirm button , as shown in the following image.




If the terrain compensator is not available in the system, when trying to access the menu, an Information screen warning about the non-detection of external GPS, as shown in the image below.




Once the terrain compensator is correctly connected, the RTK Configuration menu is presented. The menu options arrangement depends on the currently configured parameters, further explanation on this will be given in the next topics.

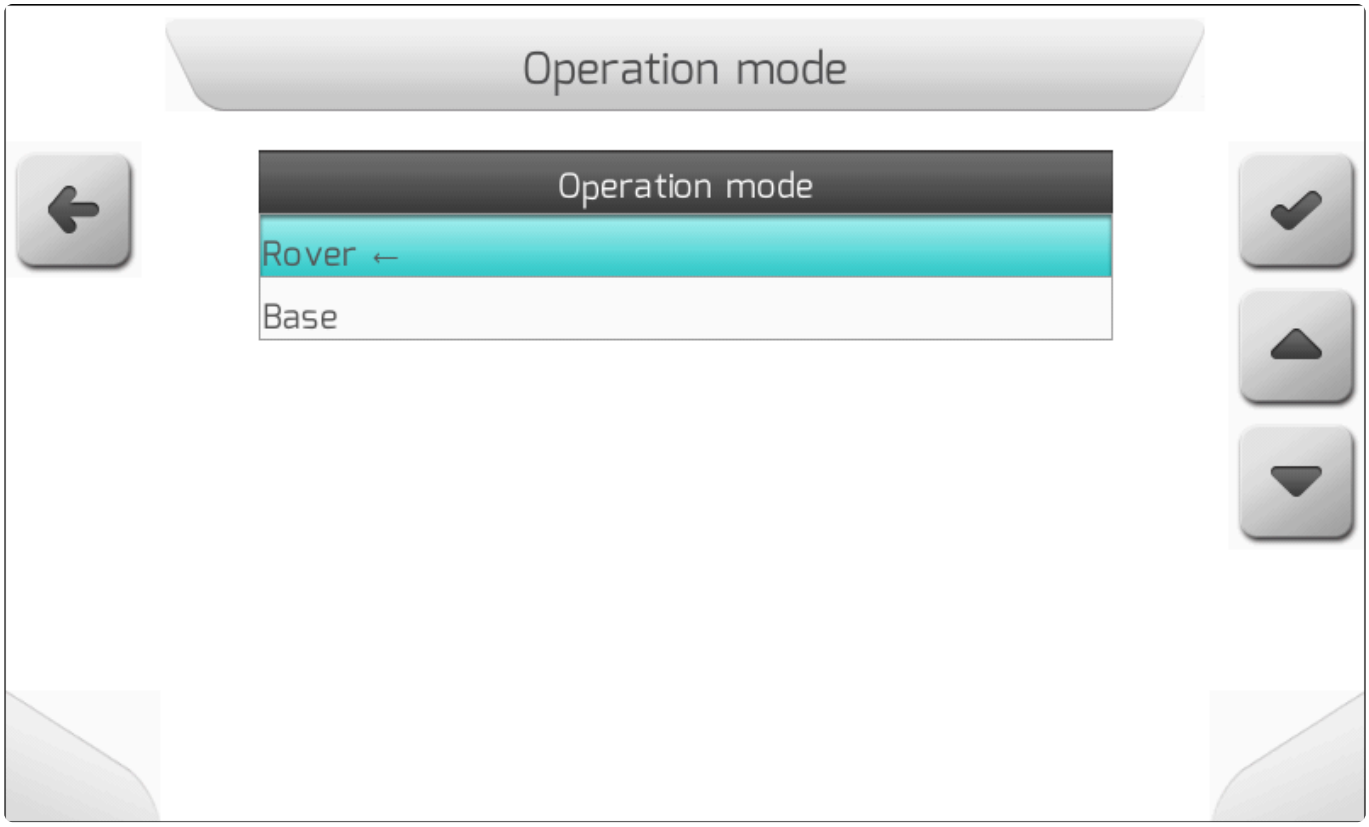
# 8.6.1. Operation mode

Screen type = Simple list

- Base
- *Rover*

The Operating Mode parameter in the RTK Configuration menu defines how the terrain compensator will operate regarding RTK signal corrections. The same compensator can operate as ***Rover*** or how **Base**.

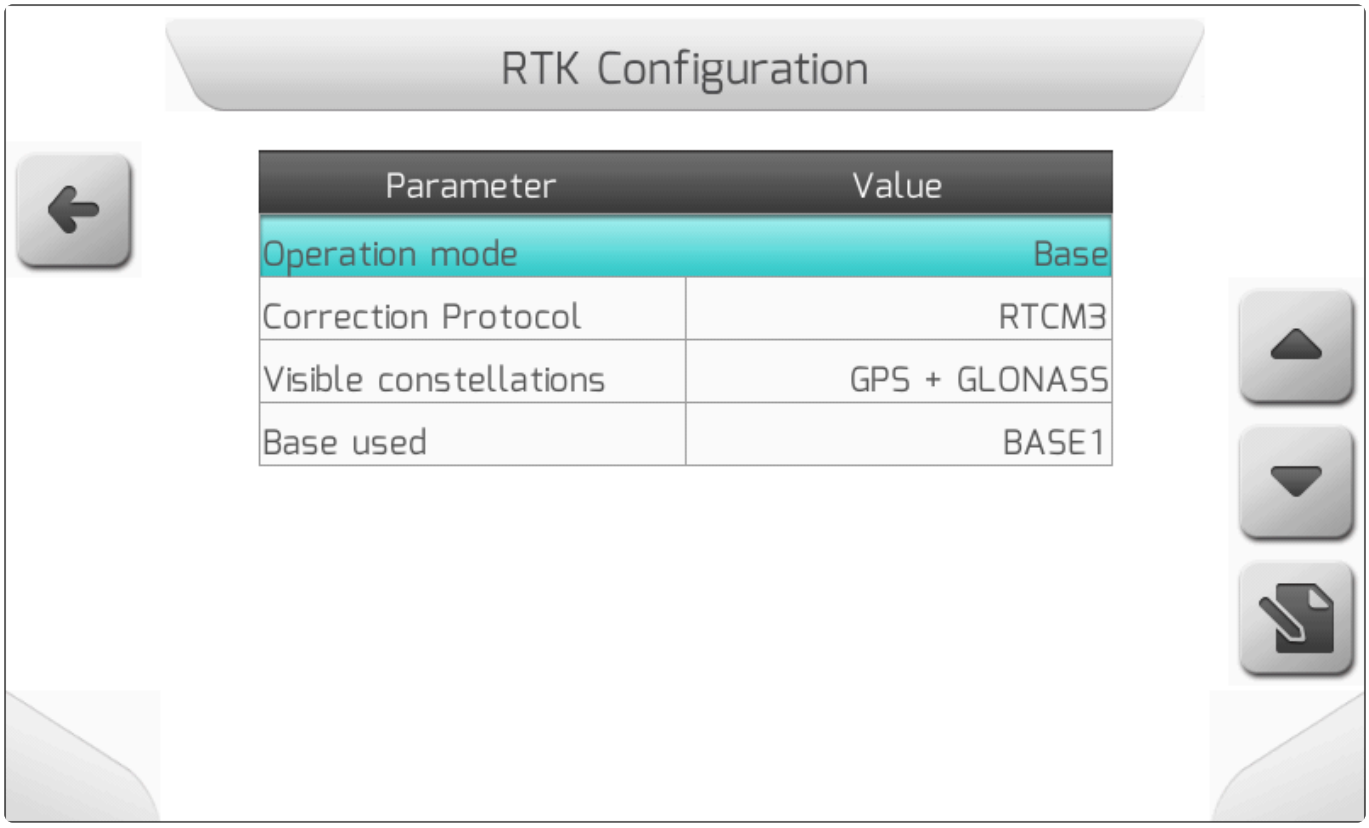
When selecting the Operation Mode item and pressing the edit button , the parameter configuration screen will be displayed, as shown in the image below.




# 8.6.1.1. Base

- Correction Protocol
- Visible constellations
- Base used

When the Operation Mode parameter is set to **Base**, the RTK Configuration menu contains the items shown in the following image.

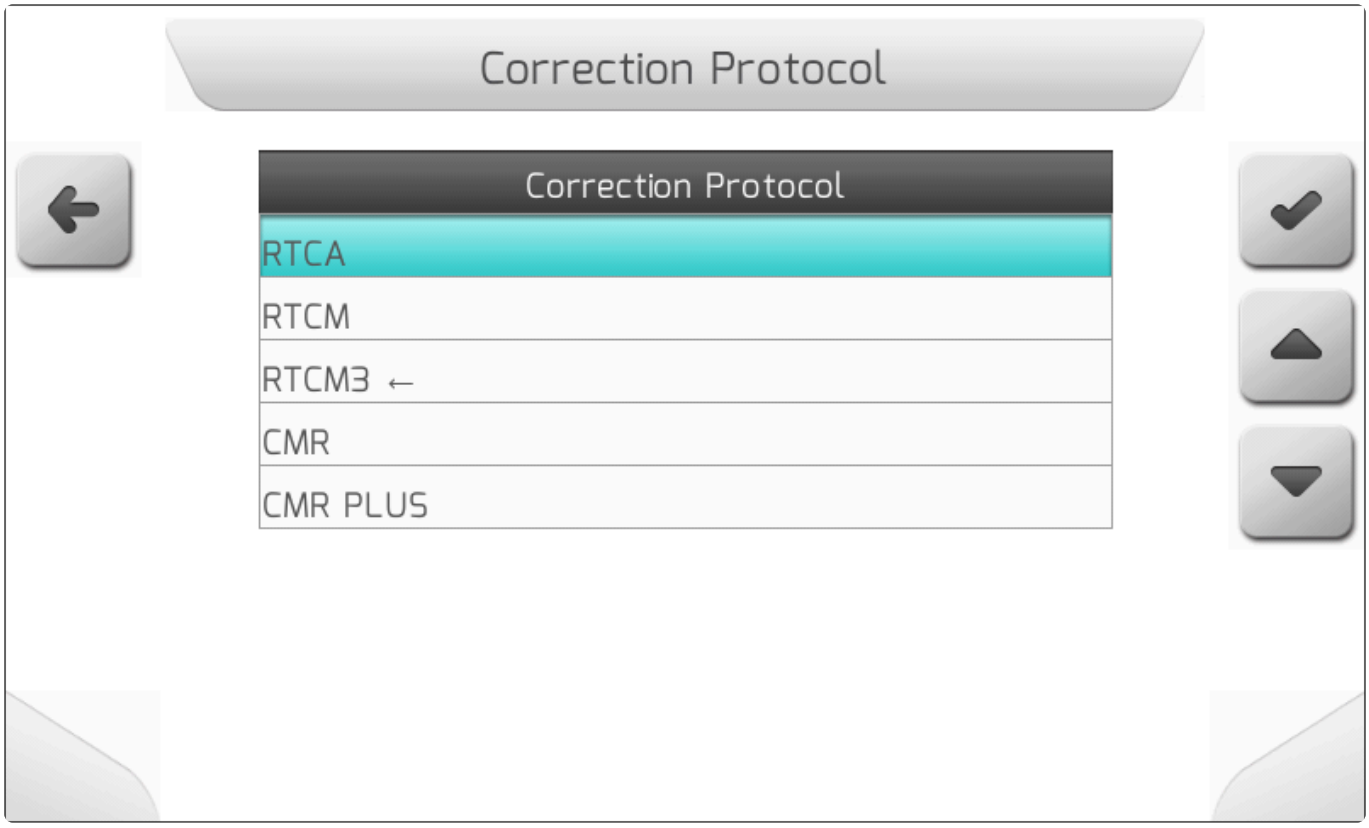



# 8.6.1.1.1. Correction Protocol

Screen type = Simple list

Within RTK signal corrections, the GeoNave systems can operate in 5 different correction message protocols. This versatility allows integration with several manufacturers of RTK bases and *rovers*.

The image below shows the 5 options available for the RTK Base Correction Protocol parameter.




# 8.6.1.1.2. Visible constellations

Screen type = Simple list

RTK signal corrections include data from several satellites visible by the Base GNSS antenna. Through the configuration of Visible constellations is possible to select if the satellites used to send corrections belong only to the constellation of **GPS**, or **GPS + GLONASS** simultaneously.

Visible constellations parameter configuration screen is shown in the image below.



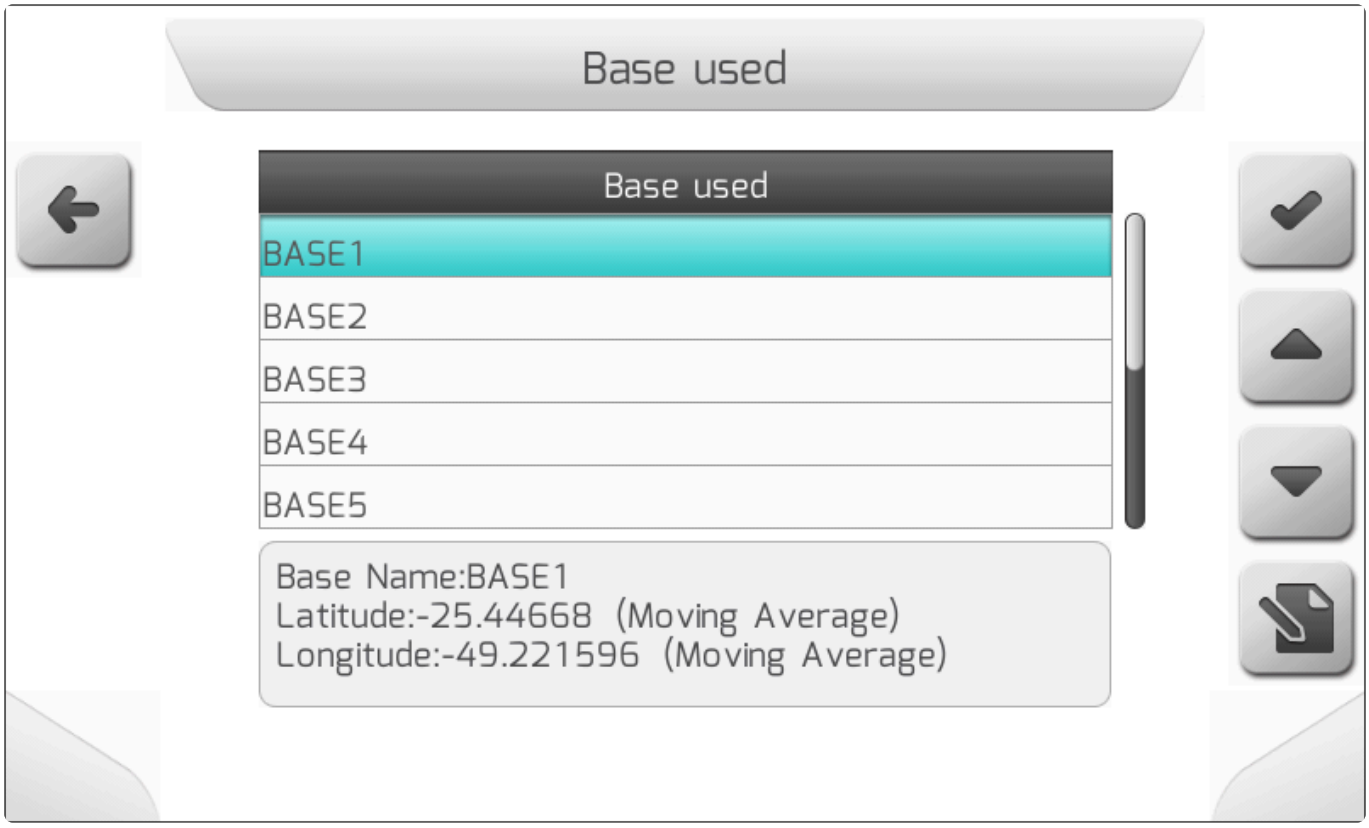

# 8.6.1.1.3. Base Used

Screen type = Simple list

- Base Name
- Base Type
- Average Time
- Latitude
- Longitude

In the Base Used configuration item is provided a list in which the user can save up to 10 different RTK base coordinates in the GeoNave system. This flexibility allows the use of the same base ground compensator in several different locations previously demarcated (for example, with a georeferenced point) where the GNSS antenna will be fixed.

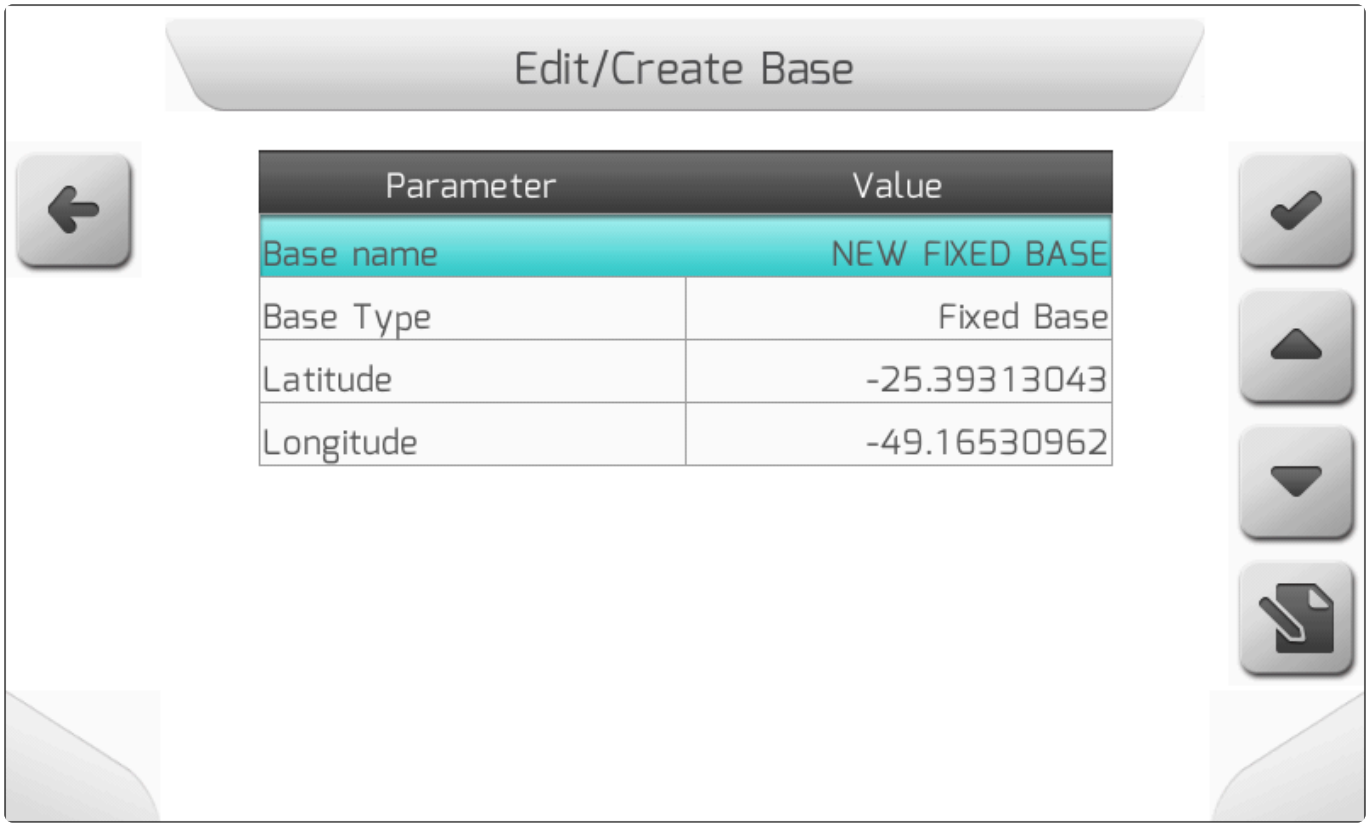
Initially all 10 list positions are empty and the base name text is **(EMPTY)**. After setting up the RTK bases, the list shows the names of bases entered by the user. The following image shows the RTK base list screen.




When selecting a position and pressing the edit button , the Edit/Create Base screen is displayed. The items that compose the screen are variable according to the Base Type parameter setting.

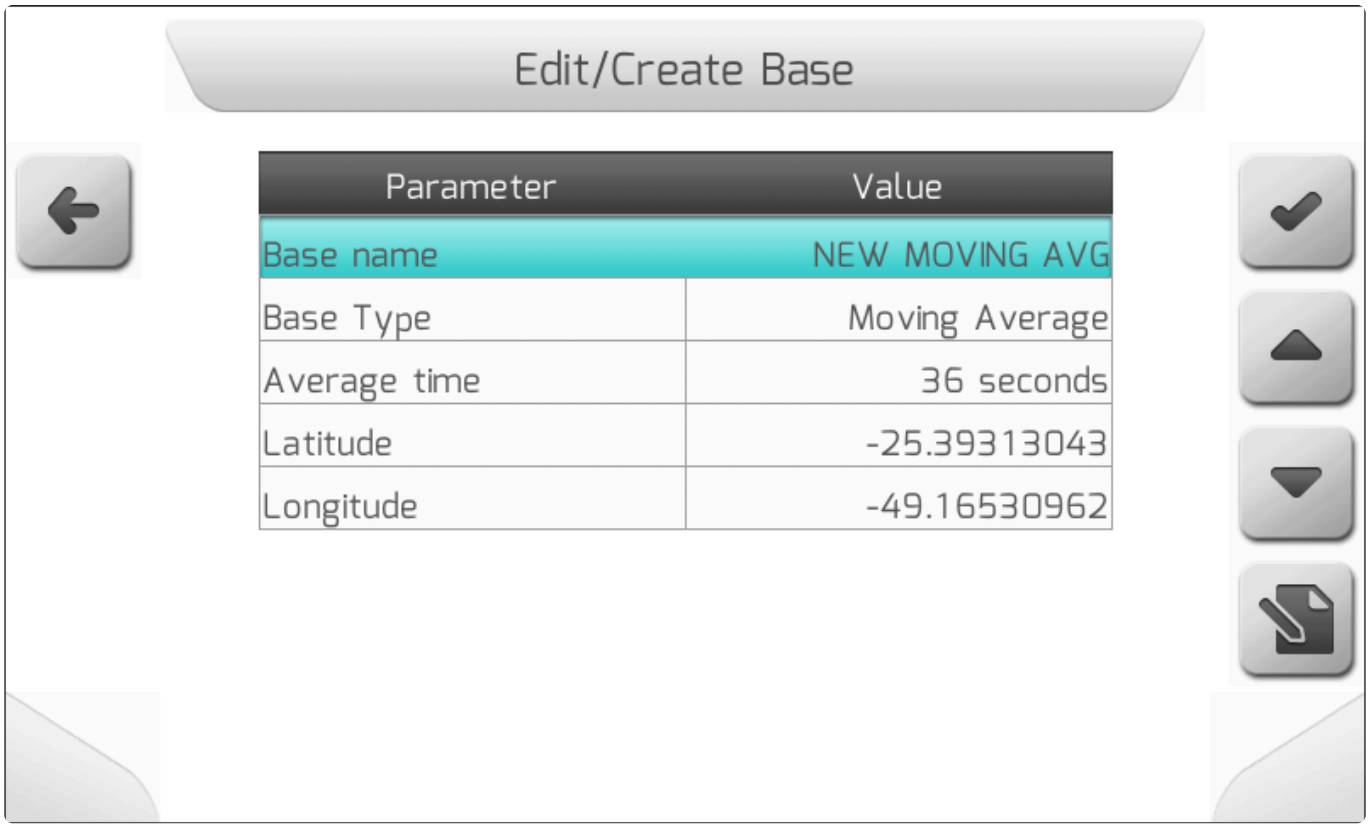
## Base Type = Fixed Base

In the Fixed Base configuration, Latitude and Longitude parameters of the base coordinates are editable by the user via the button .
The following image shows the Edit/Create Base menu in this configuration.




## Base Type = Moving Average

When the Base Type is set to Moving Average, Latitude and Longitude parameters edit buttons are no longer visible. The user must select the Average Time, so that the calculation of the moving average is performed before a new fixed base is saved in the system.
The image below illustrates the Edit/Create Base menu in the Moving Average setting.



Setting the RTK base configurable parameters through the edit button and then pressing the confirm button , the base will be saved at the selected list position.

If the Base type parameter chosen is Moving Average, after pressing the button confirm the selected average time will be counted. After the averaging time has elapsed, the resulting coordinates will be saved in the corresponding position.

# 8.6.1.1.3.1. Base Name

Screen type = Text editing

Maximum text size = 40 characters

The Base Name parameter is used to identify the RTK base that will be saved in the corresponding list position.
When the base is used in several different locations is important that the name refers to the location where the GNSS antenna will be positioned, for example, the nearest field name or any other reference.

The image below shows the Base Name parameter setting screen.



# 8.6.1.1.3.2. Base Type

Screen type = Simple list

The RTK base can be configured in two ways – Fixed Base or Moving Average.

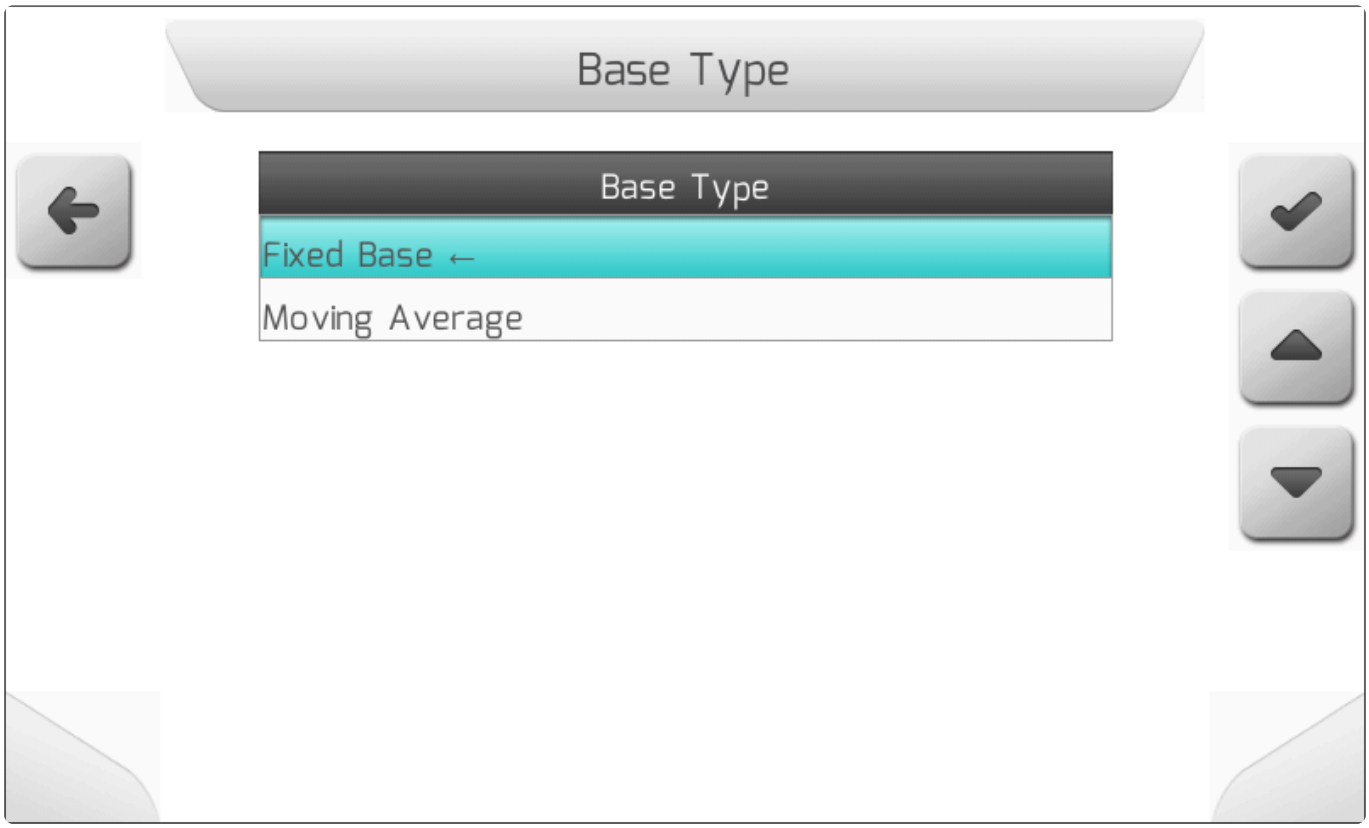
## Fixed Base

Fixed Base configuration assumes that the user knows the GNSS coordinates of the exact location where the antenna will be installed – for example, a georeferenced point, or a point already used previously. The coordinates must be entered correctly in Latitude and Longitude parameters.

## Moving average

To configure a base as Moving Average, the user must determine the time used by the system to calculate the average, and enter the desired value in the Average Time parameter. This option is normally used when the GNSS is positioned over a point with coordinates still unknown.

Base Type parameter setting screen is shown in the following image.

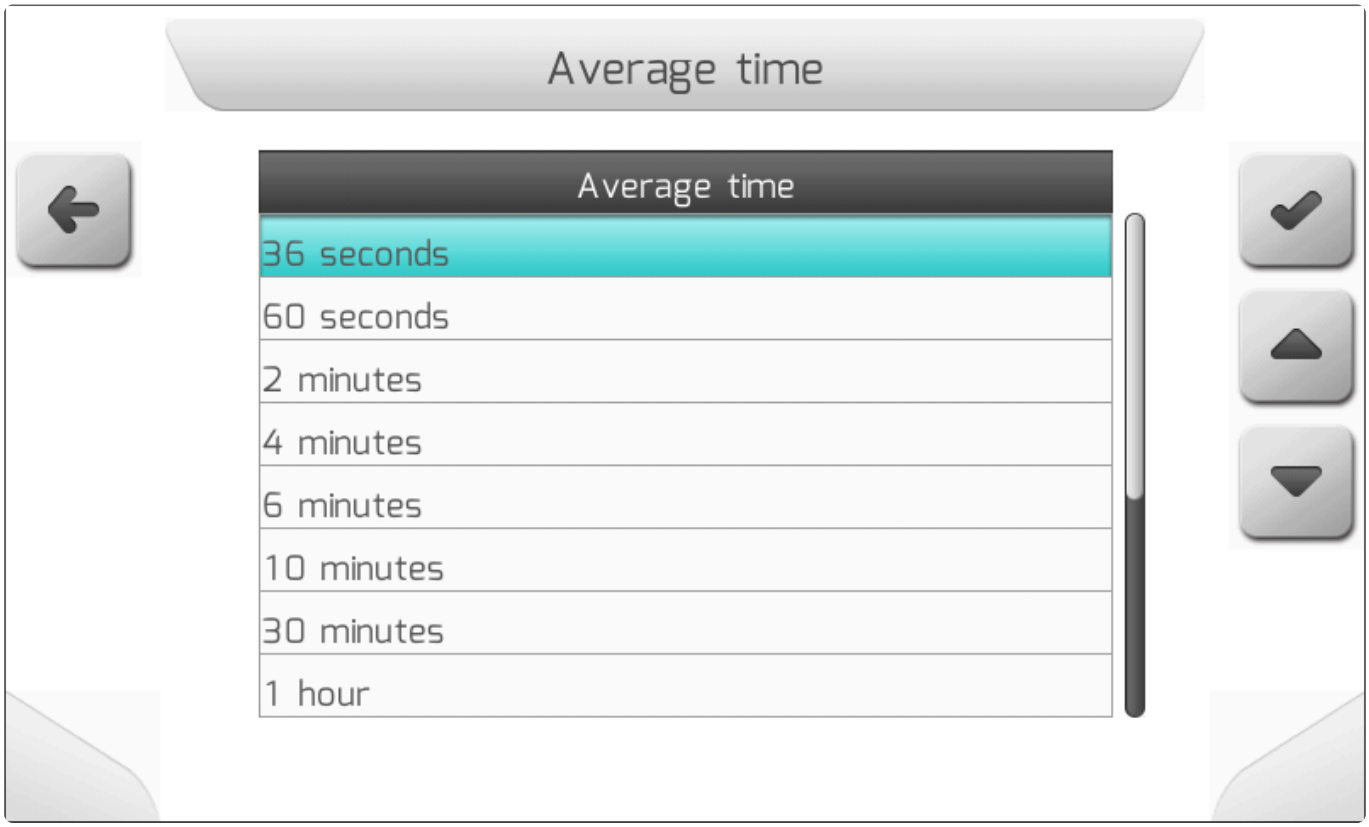


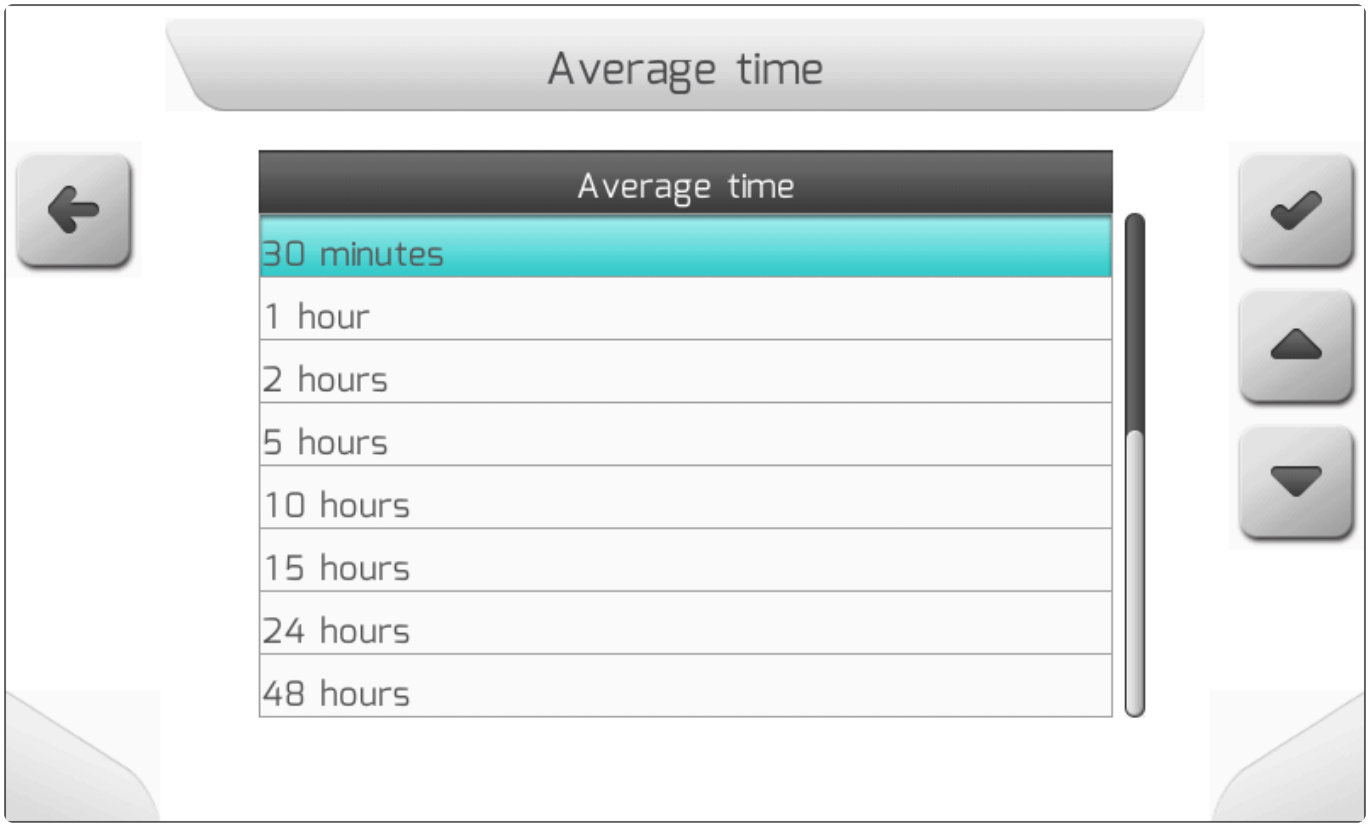
# 8.6.1.1.3.3. Average Time

Screen type = Simple List

When the Base Type parameter is set to Moving Average, the Average Time is displayed on the Create/ Edit Base screen. The user must determine the time used by the GeoNave system to average the RTK base coordinate values, with values between **36 seconds** and **48 hours**. The longer the time chosen, the more accurate the calculated coordinates.

The images below show the Average Time setting screen, with all options available for the parameter.





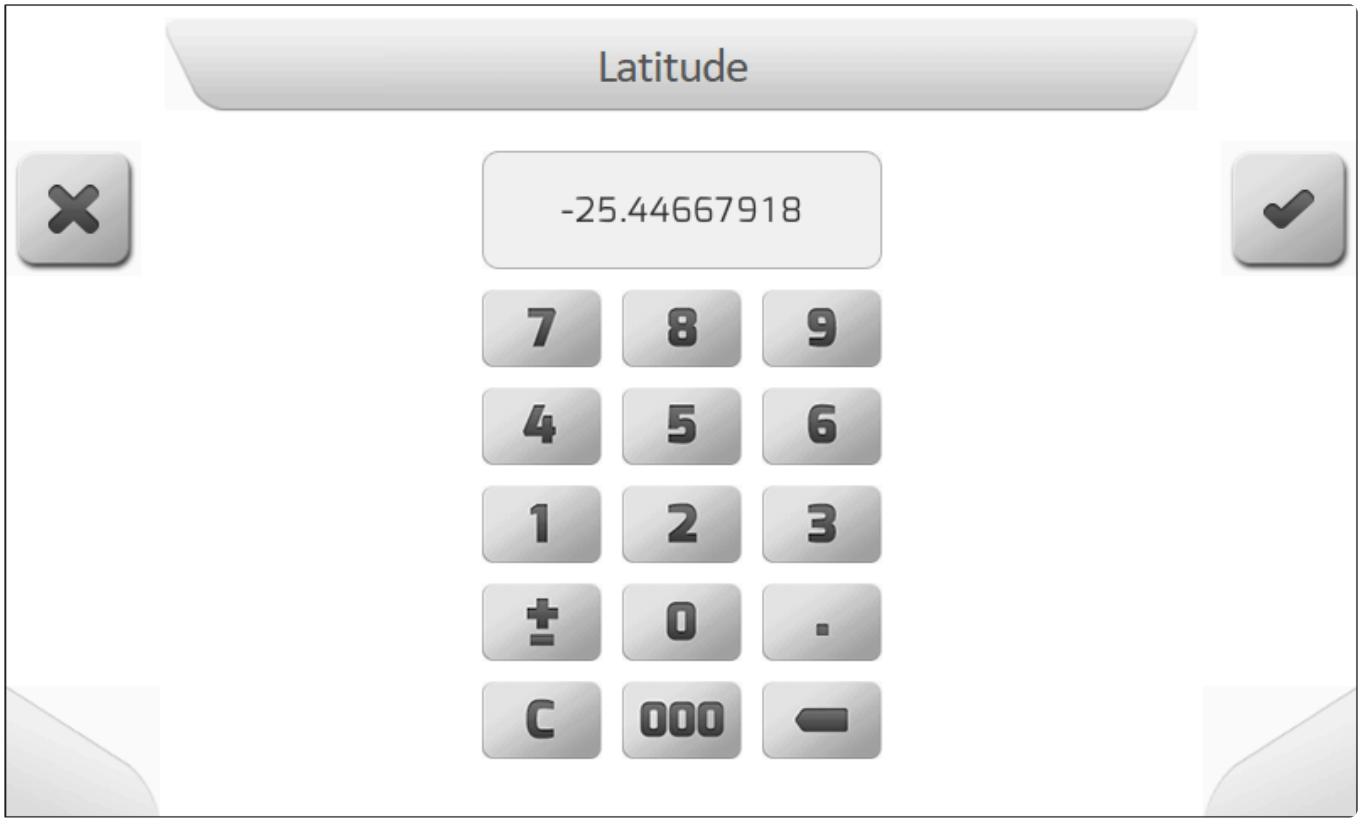

# 8.6.1.1.3.4. Latitude

- Screen type = Value editing

- Decimal places = 8
  Minimum value = -90.00000000
  Maximum value = 90.00000000

If the Base type parameter is set to Fixed Base, the Latitude parameter of the base fixed point will be available for editing on the Create/Edit Base screen. The Latitude value is measured in degrees, with 8 decimal places.

The Latitude parameter setting screen is shown in the image below.



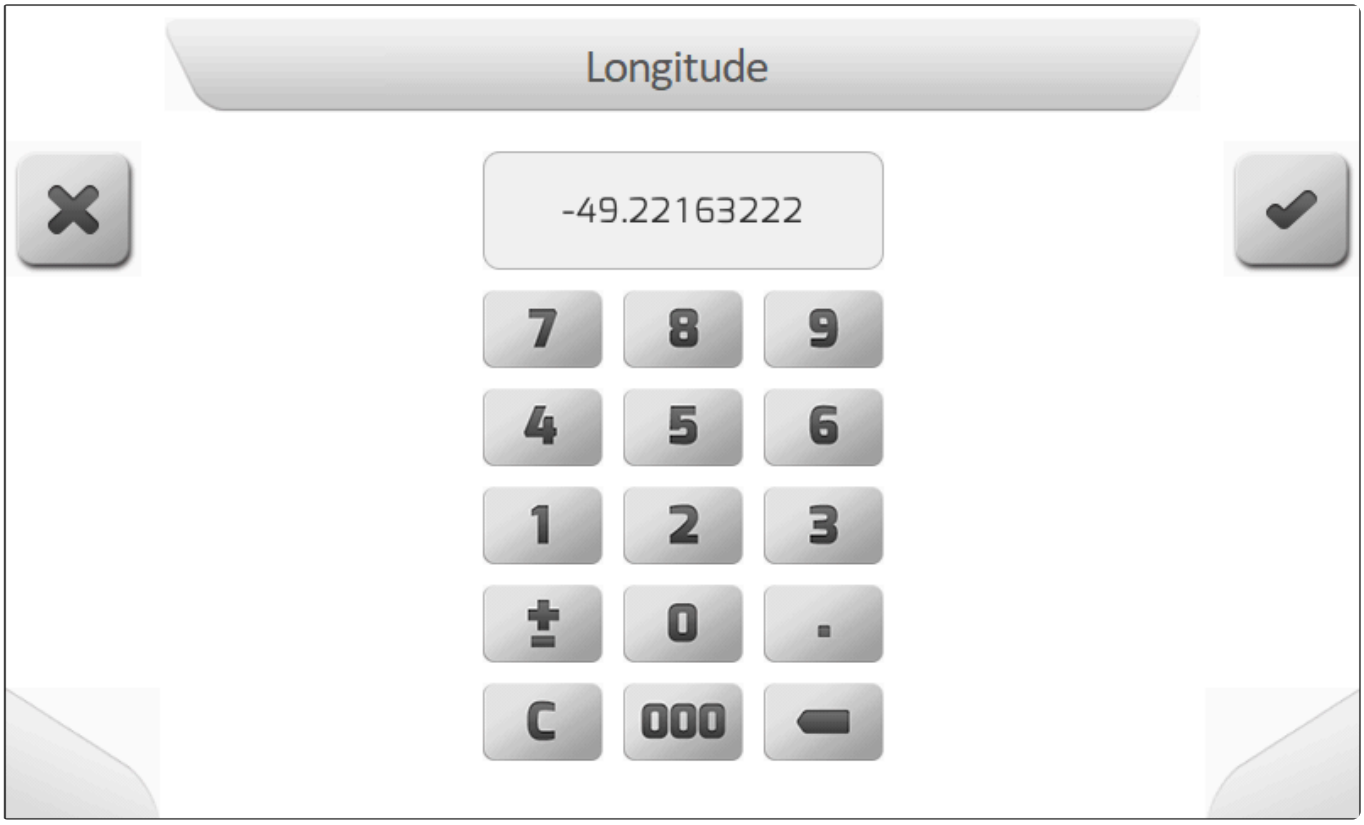

# 8.6.1.1.3.5. Longitude

Screen type = Value editing

Decimal places = 8
Minimum value = -180.00000000
Maximum value = 180.00000000

If the Base type parameter is set to Fixed Base, the Longitude parameter of the base fixed point will be available for editing on the Create/Edit Base screen. The Longitude value is measured in degrees, with 8 decimal places.

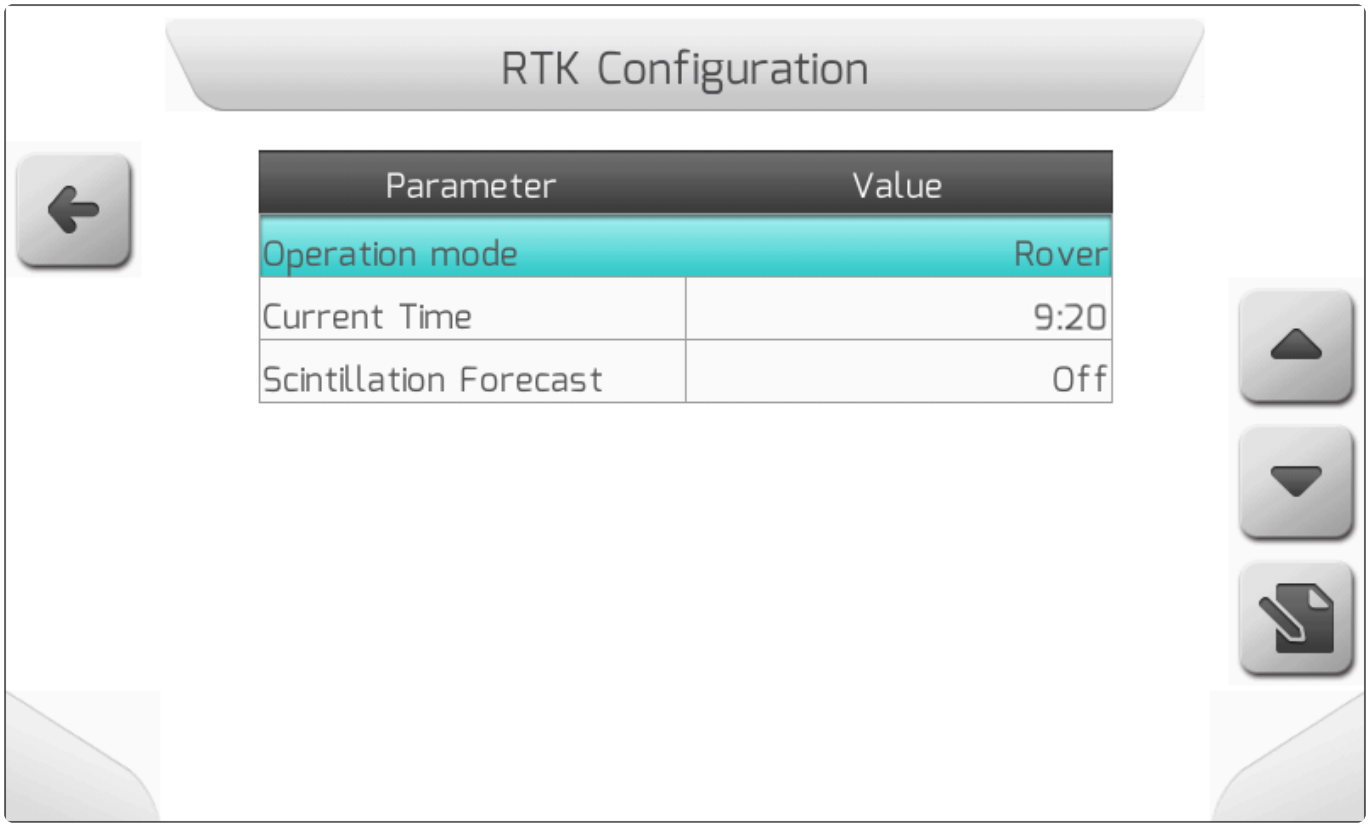
The Longitude parameter setting screen is shown in the image below.




# 8.6.1.2. Rover

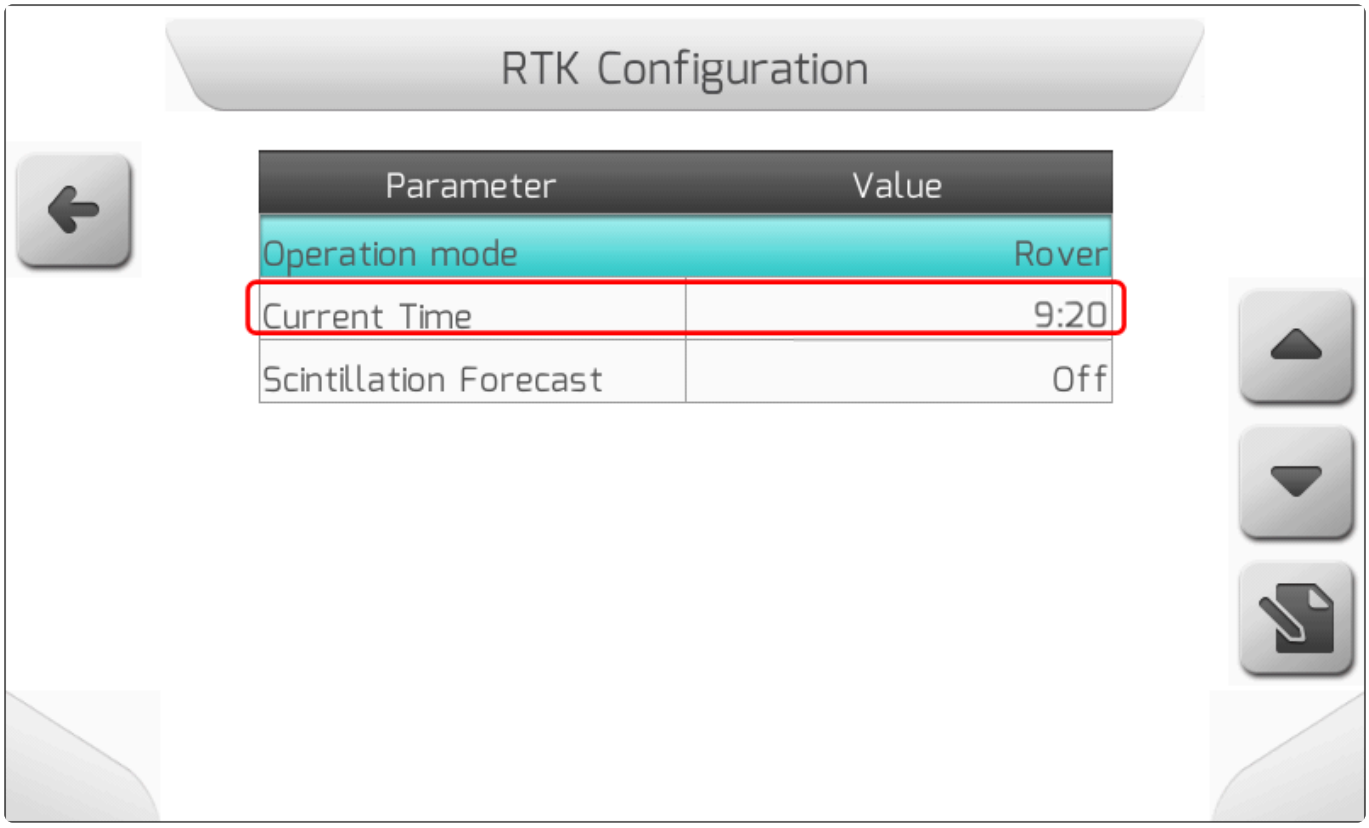
If the Operation Mode parameter is set to ***Rover***, the RTK Configuration menu will be displayed with the items shown in the image below.

- Current Time
- Scintillation Forecast




# 8.6.1.2.1. Current Time

When the Operation Mode is set as ***Rover***, the Current Time received from GNSS satellites is displayed in the items list. The time shown takes into account the settings of Timezone and DST – Daylight saving time.
The following image shows an example of Current Time displayed in the items list.




If the GNSS is absent, the text “No GPS signal” will be displayed.

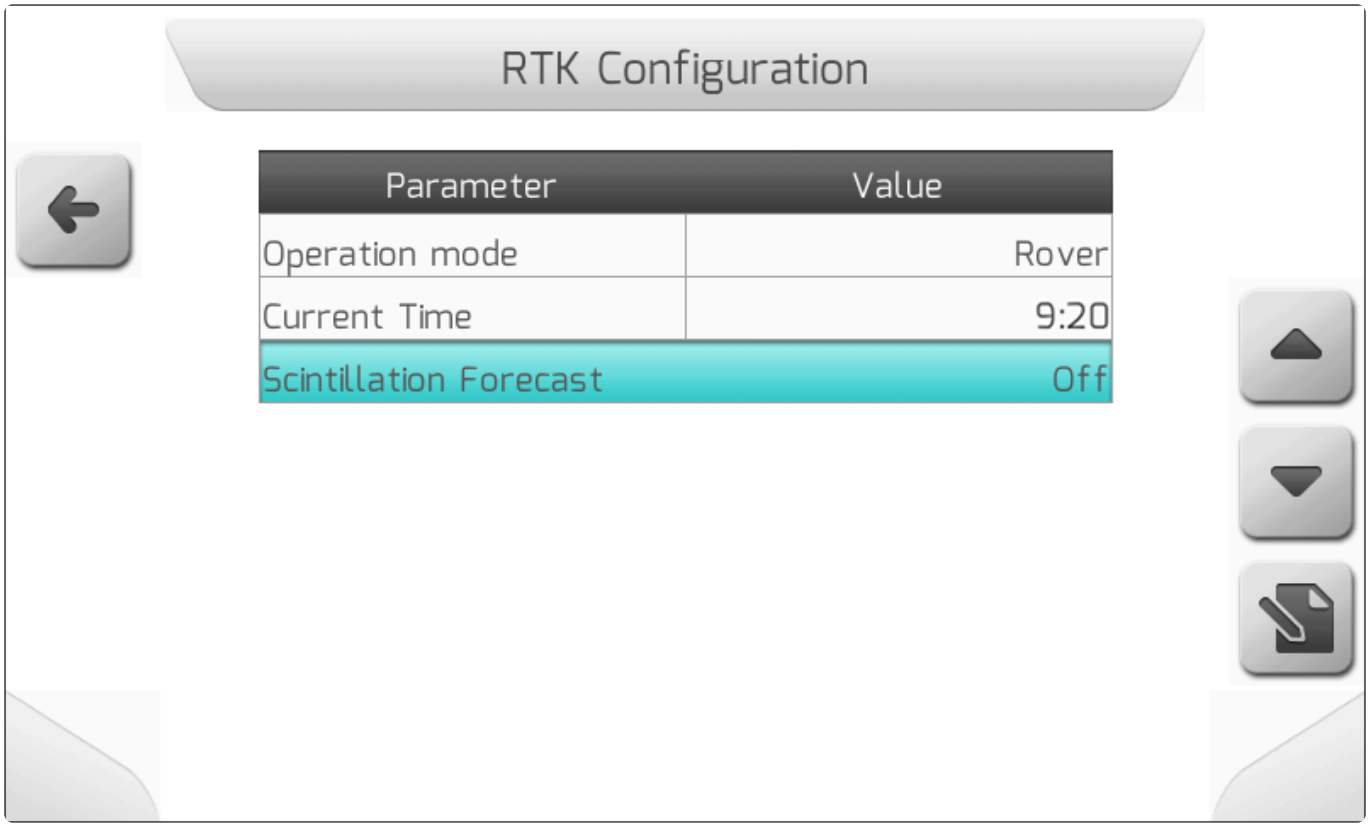
# 8.6.1.2.2. Scintillation Forecast

Screen type = Simple list

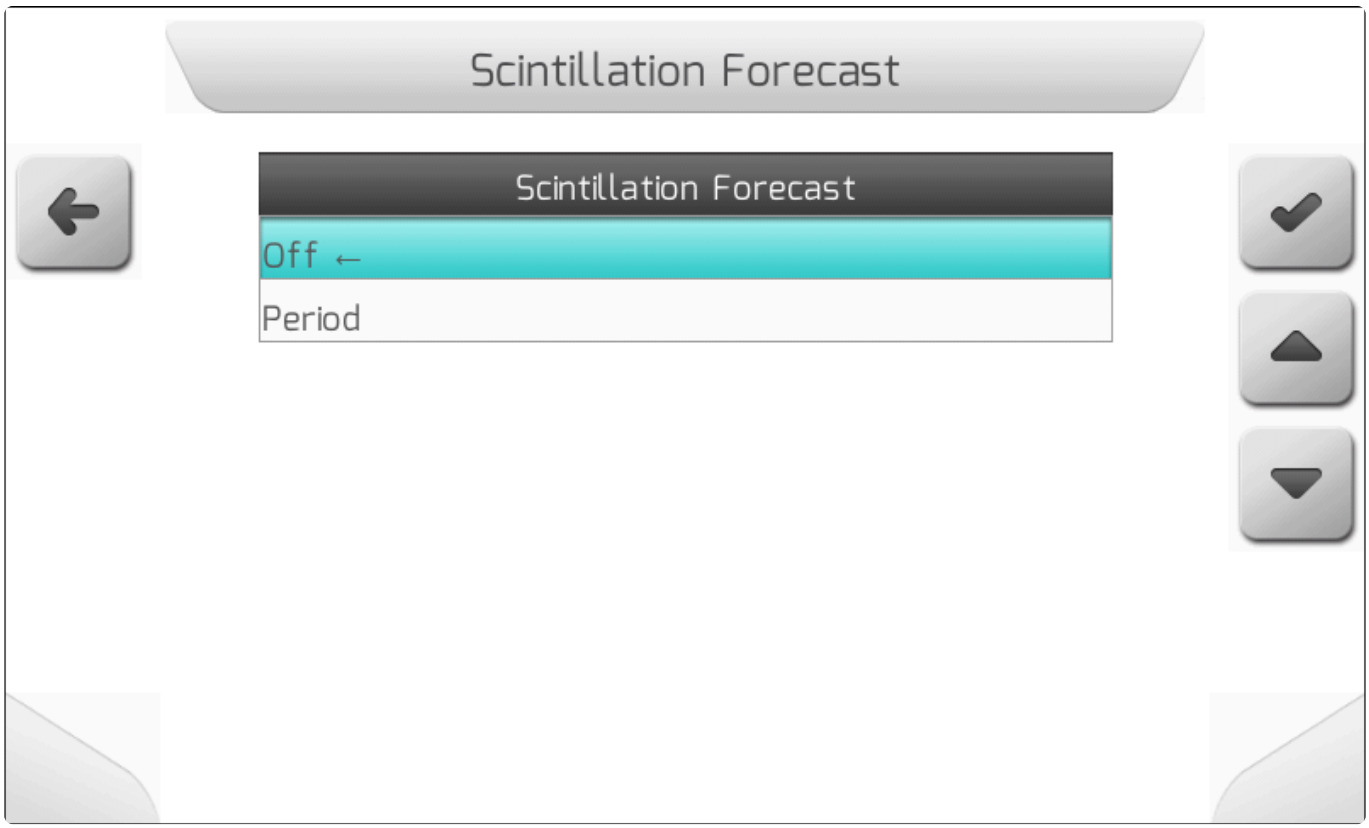
The GNSS technology can be harmed by some natural phenomena, mainly solar flares and anomalous variations in the thickness of the terrestrial ionosphere. One of these phenomena is Scintillation, which seriously compromises the accuracy of the GNSS coordinates, even more when the system is corrected by a RTK base.
One way to minimize the effect of Scintillation in *rovers* RTK is to replace the RTK corrections with a paid signal (IsoPoint 3), since this type of correction uses several bases spread across the globe and manages to minimize the Scintillation effect of a certain geographical point.

The GeoNave system has the Scintillation Forecast feature, through which it is possible to determine a scheduled start time of the daily Scintillation phenomena and the duration time in which RTK corrections will be disabled, causing the position to be automatically corrected during this period by the IsoPoint 3 paid signal.

If the Scintillation Forecast parameter is disabled, the RTK Configuration menu is shown as in the following image.

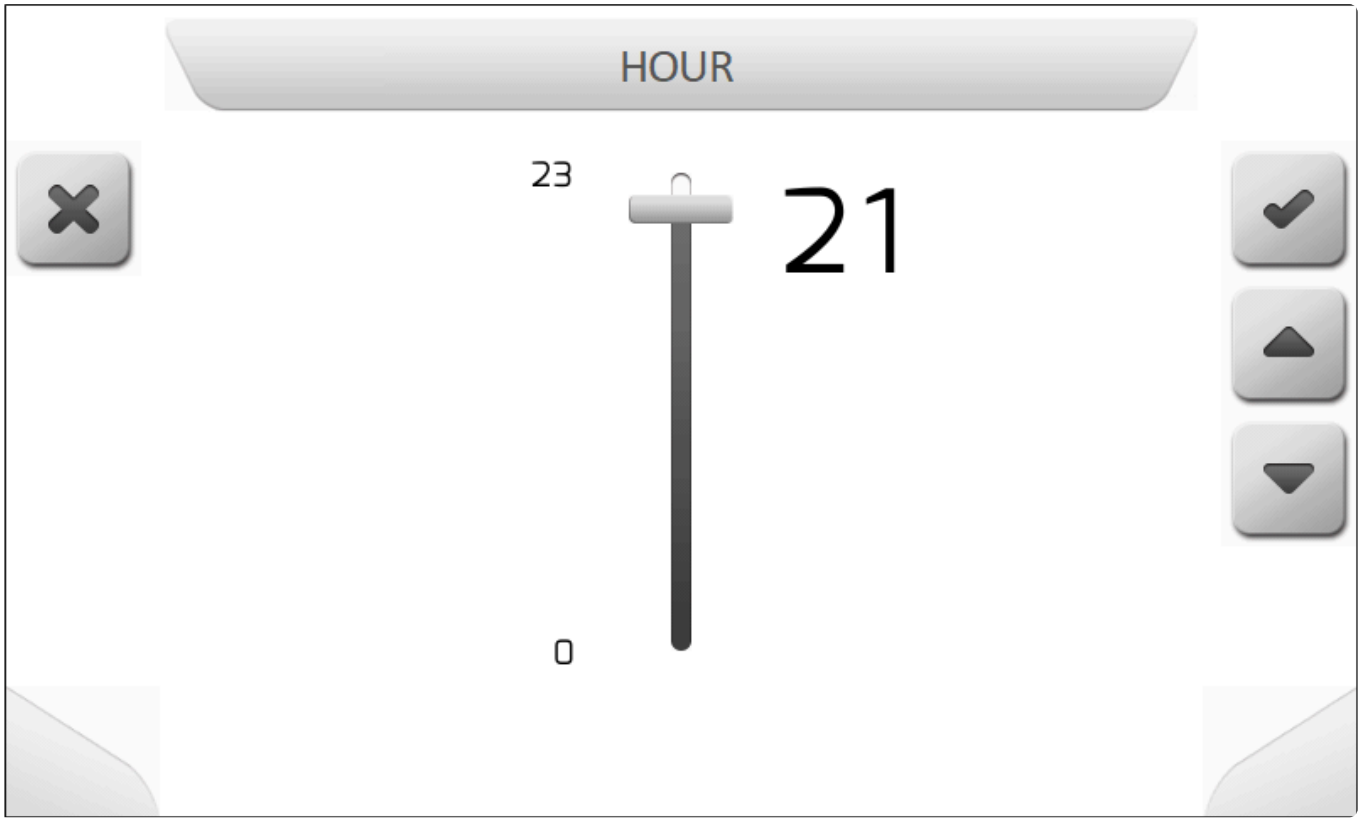


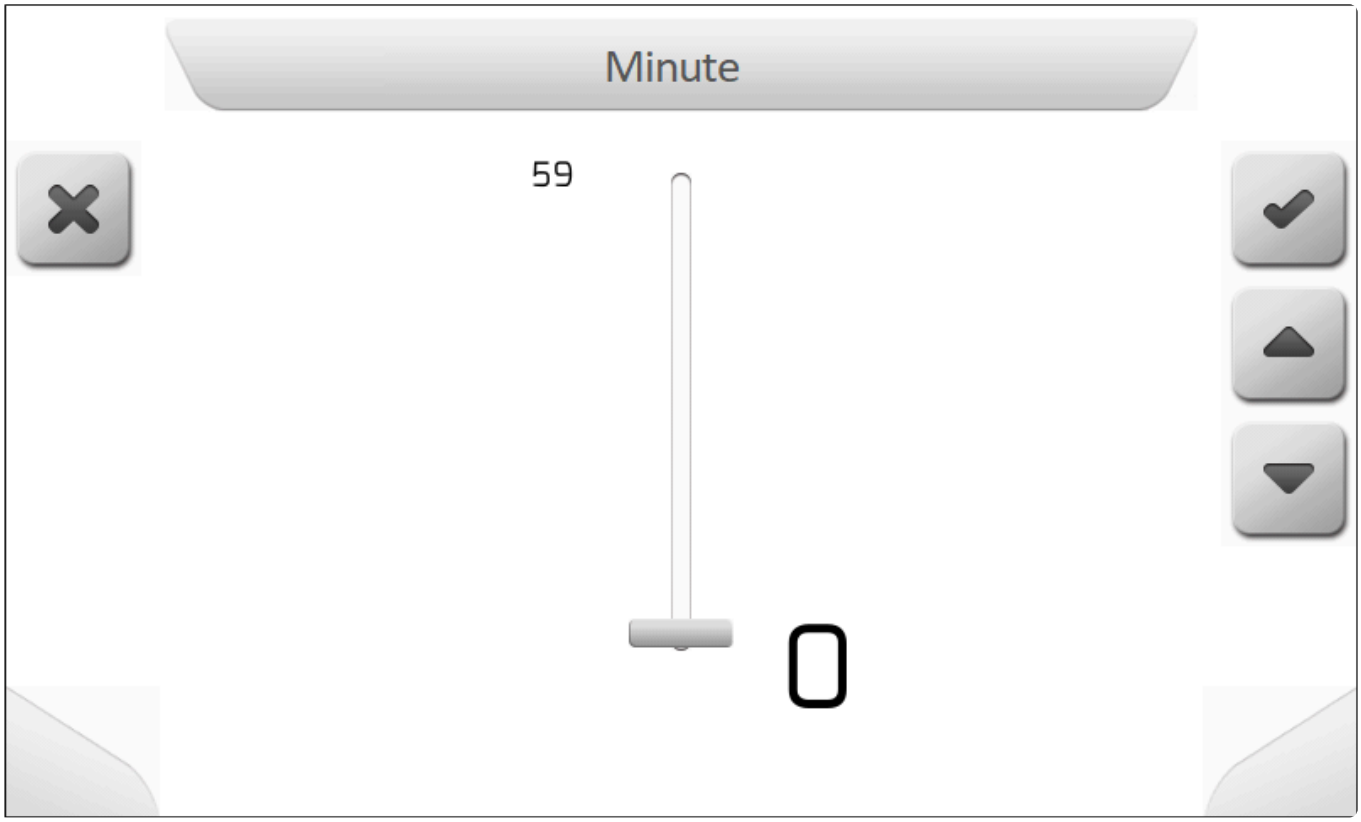

Pressing the edit button  , the Scintillation Forecast setting screen will be displayed, as shown in the image below.



## Start Time

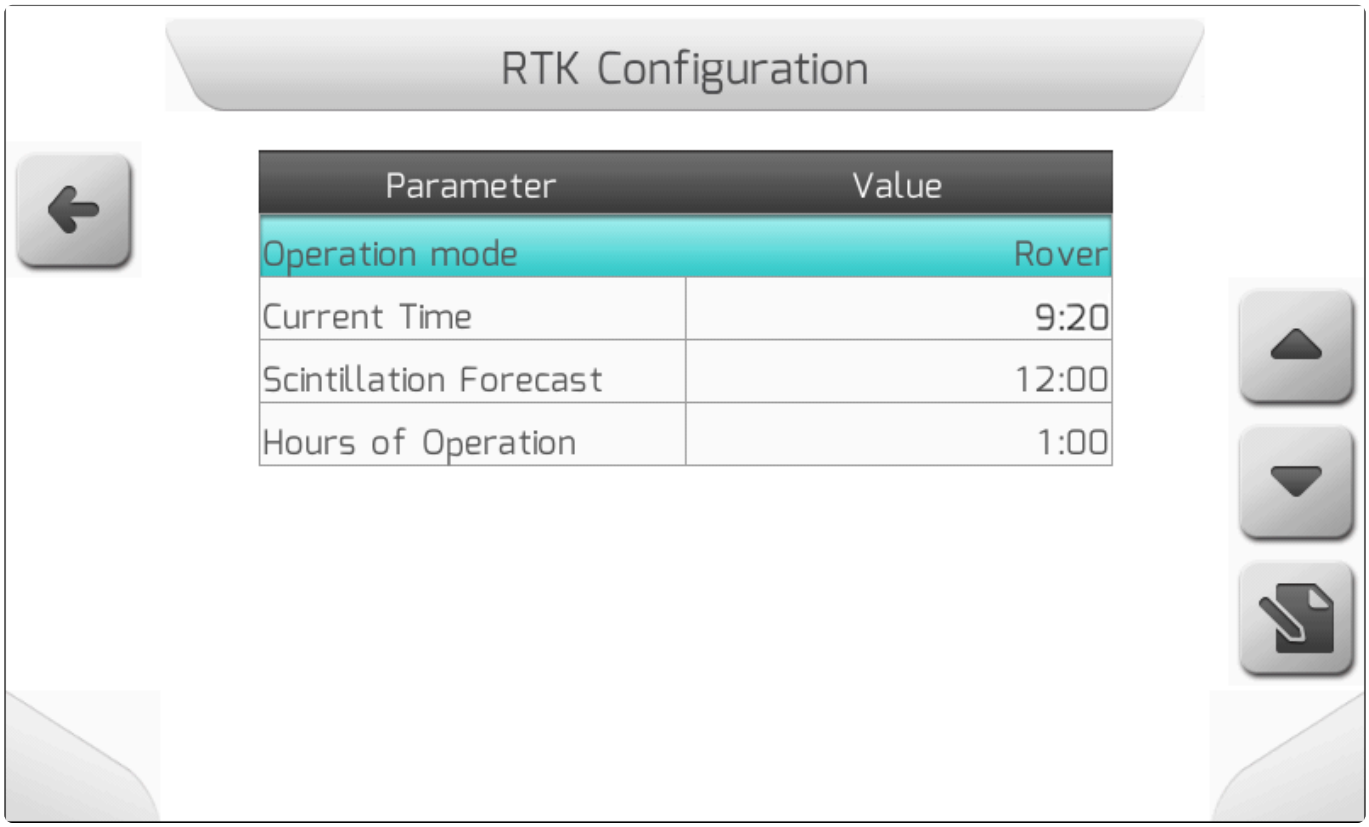
Selecting the option **Period** and pressing the confirm button  , the user will be asked to configure the start time of the Scintillation Forecast, through two screens of Vertical choice, for hours and minutes, as shown in the images below.



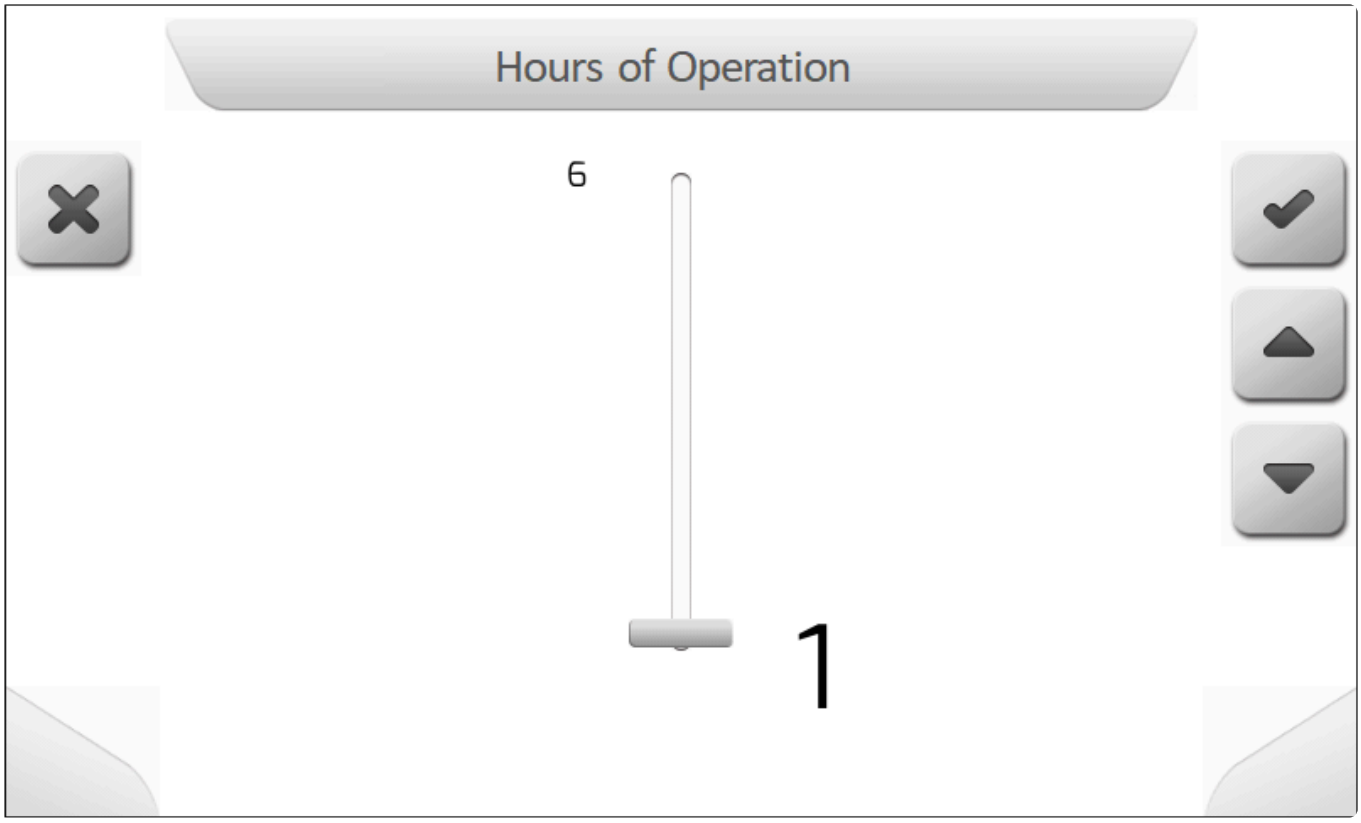



## Hours of Operation

After configuring the start time for Scintillation Forecast, the RTK Configuration screen will be displayed as shown in the following image. A new field called Hours of Operation will appear, through which the user decides for how many hours, between 1 and 6, the Scintillation Forecast will be effective.




Selecting Hours of Operation item and pressing the edit button  , a Vertical choice screen will be displayed, to configure the number of hours of the Scintillation Forecast feature, as shown in the following image.




After configuring the number of operating hours, the Scintillation Forecast setting will be completed and will be effective in the established time period defined by the user.

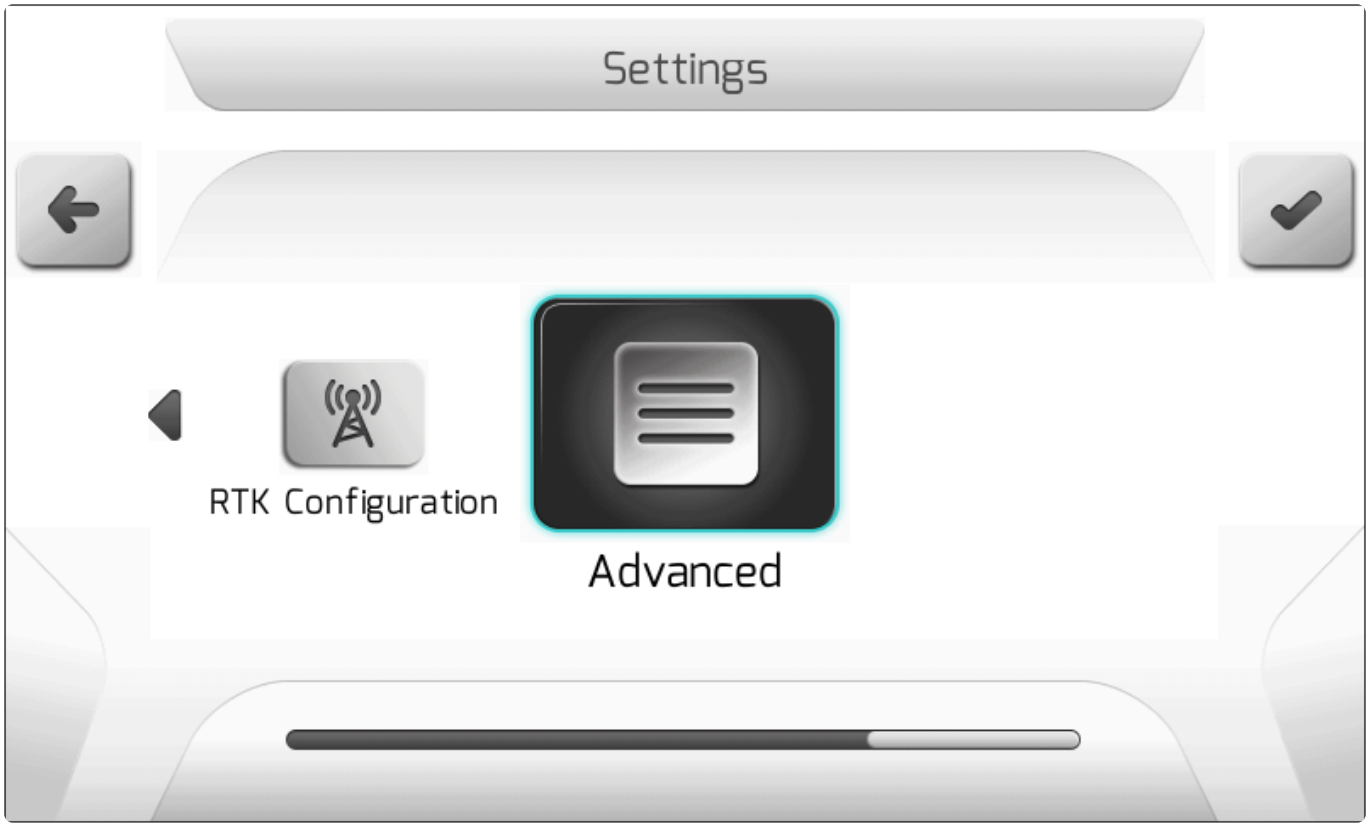
# 8.7. Advanced

Screen type = Double list

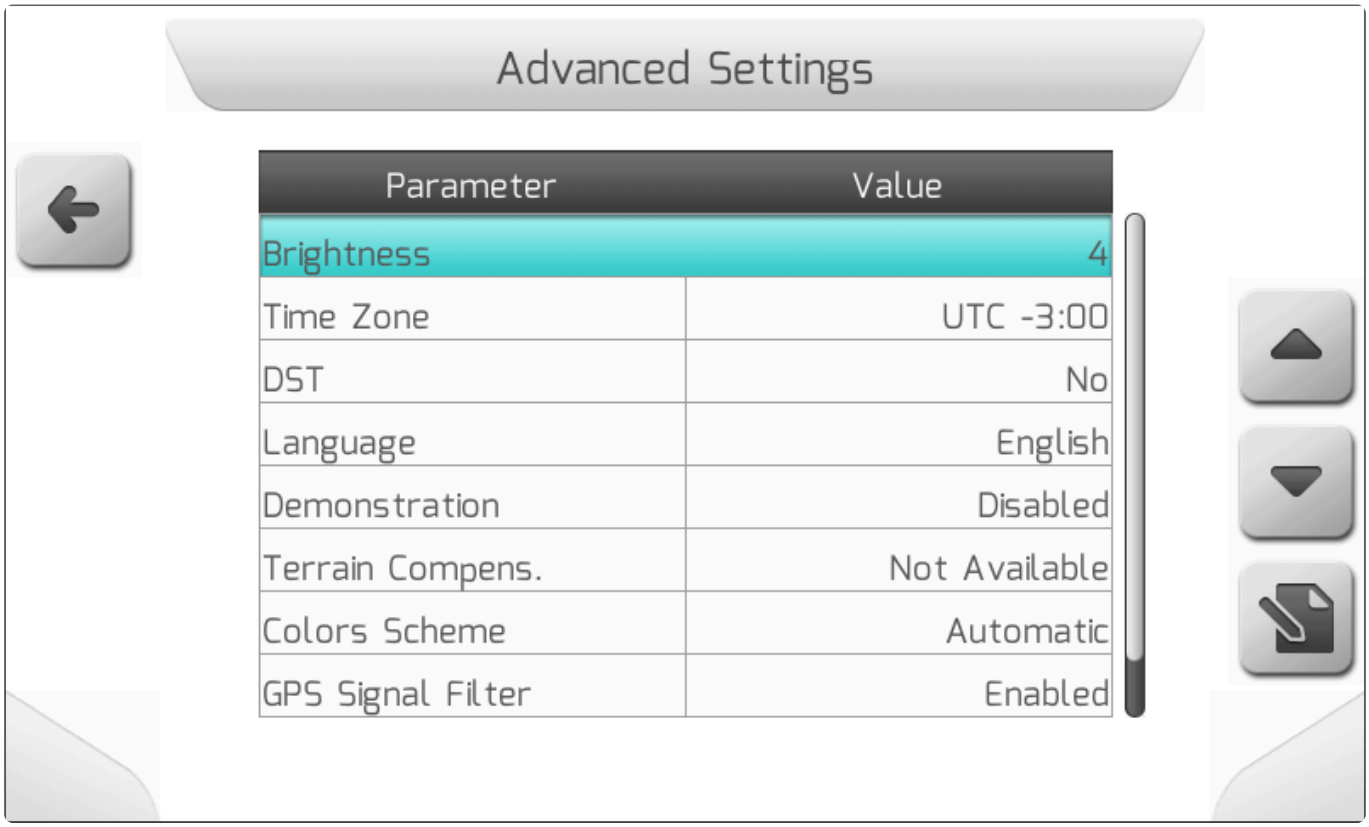
- Brightness
- Time zone
- DST
- Language
- Demonstration
- Terrain Compensation
- Colors scheme
- GPS Signal Filter
- Navigation Options
- Show Accuracy

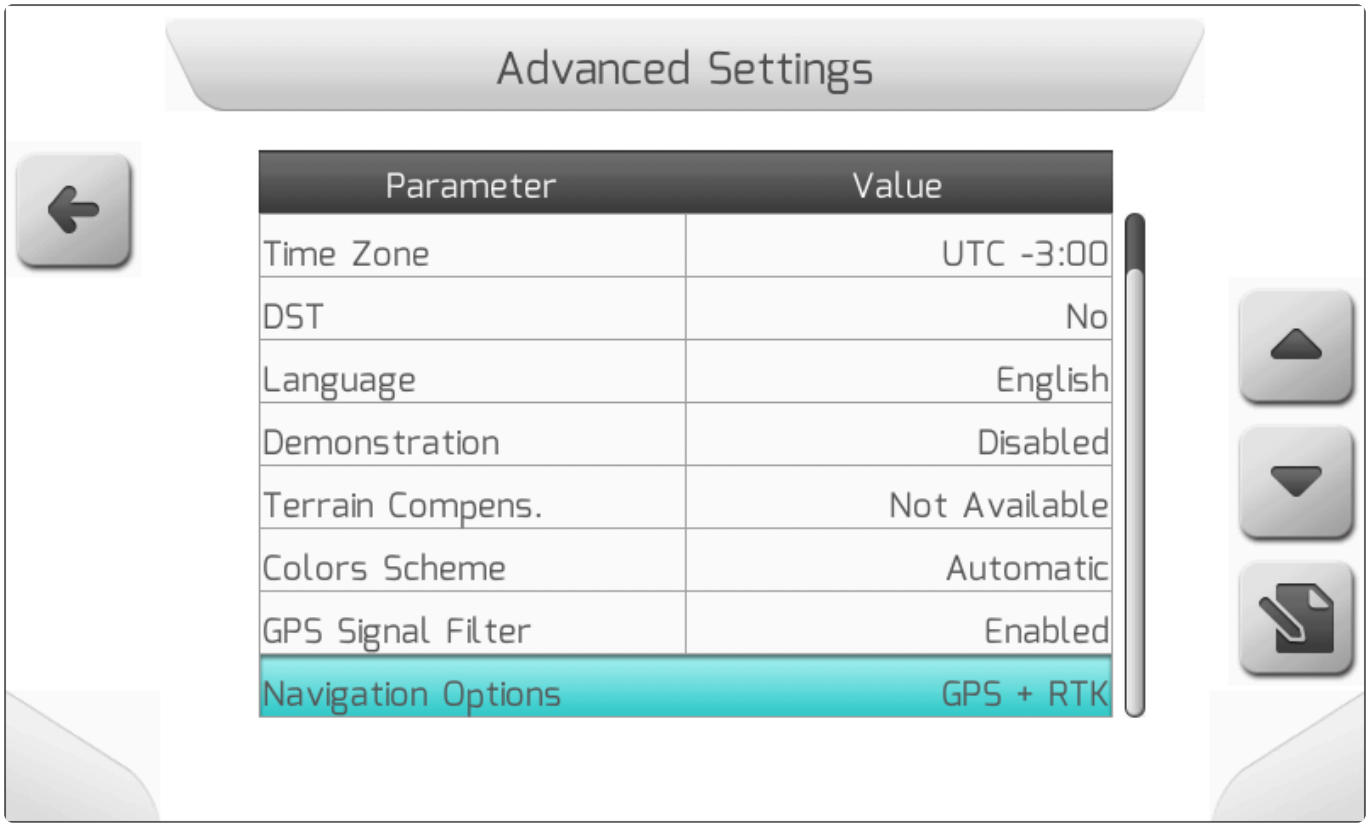
In the Settings menu, the Advanced area is where advanced GeoNave system parameters are set.

Advanced menu access is done by selecting the corresponding item in the Settings menu, as shown in the following image.




The Advanced menu contains the items shown in the images below, each item will be detailed in the next topics.





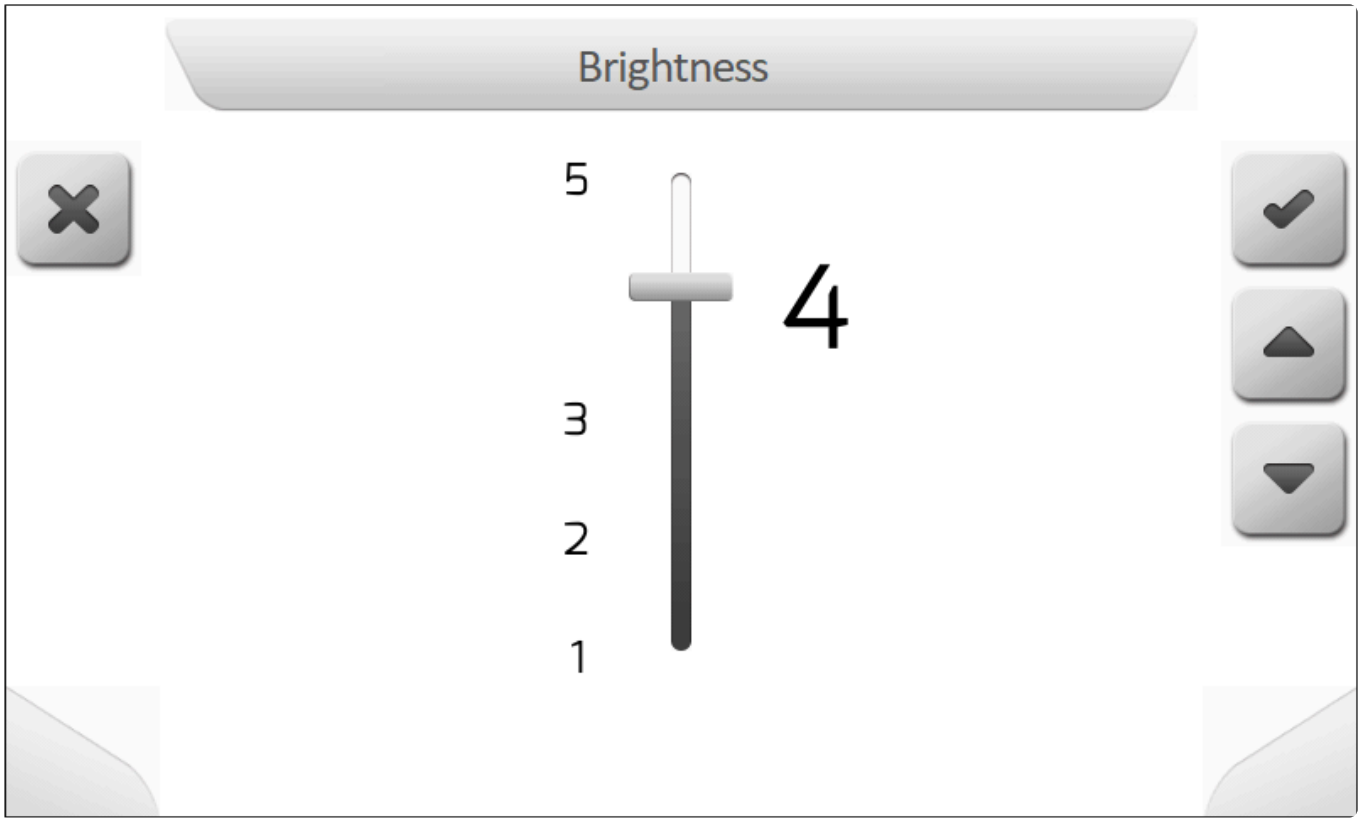

# 8.7.1. Brightness

Screen type = Vertical choice

Minimum value =1
Maximum value =5

The Brightness parameter is found in the Advanced Settings menu, which is used to set the luminous intensity of the GeoNave LCD screen's background and also of LEDs Guidance lightbar. Brightness should be adjusted according to the visual comfort level desired by the user.

The image below shows the Brightness setting screen.




While the Brightness value is changed on the Vertical choice, the LCD background luminous intensity is changed to allow user perception. If the cancel button is pressed, the previous value is resumed and the change is undone. If the confirm button is pressed, the new Brightness value is saved in the system.

# 8.7.2. Time zone

Screen type = Simple list

Minimum value = UTC-12
Maximum value = UTC+14

The Time Zone parameter within the Advanced Settings establishes the meridian region of the globe in which the GeoNave system will operate and together with the DST – Daylight saving time parameter, define local time within the international standard UTC (Coordinated Universal Time).

The Time Zone setting screen is shown in the following image.




# 8.7.3. DST

Screen type = Simple List

The Daylight Saving Time parameter, in the Advanced Settings, is where the user defines whether the legislation that advances the clocks of 1 hour is/isn't active. Together with the Timezone parameter, local time in international standard UTC (Coordinated Universal Time) is defined in the GeoNave system.

The image below shows the Daylight Saving Time setting screen.




# 8.7.4. Language

Screen type = Simple list

In the Advanced Settings menu the user will find the area for setting the GeoNave system language. All screens, messages and texts displayed on the display follow the configured language.

The following image shows the Language parameter setting menu, each language displayed in the menu is written in its own language.

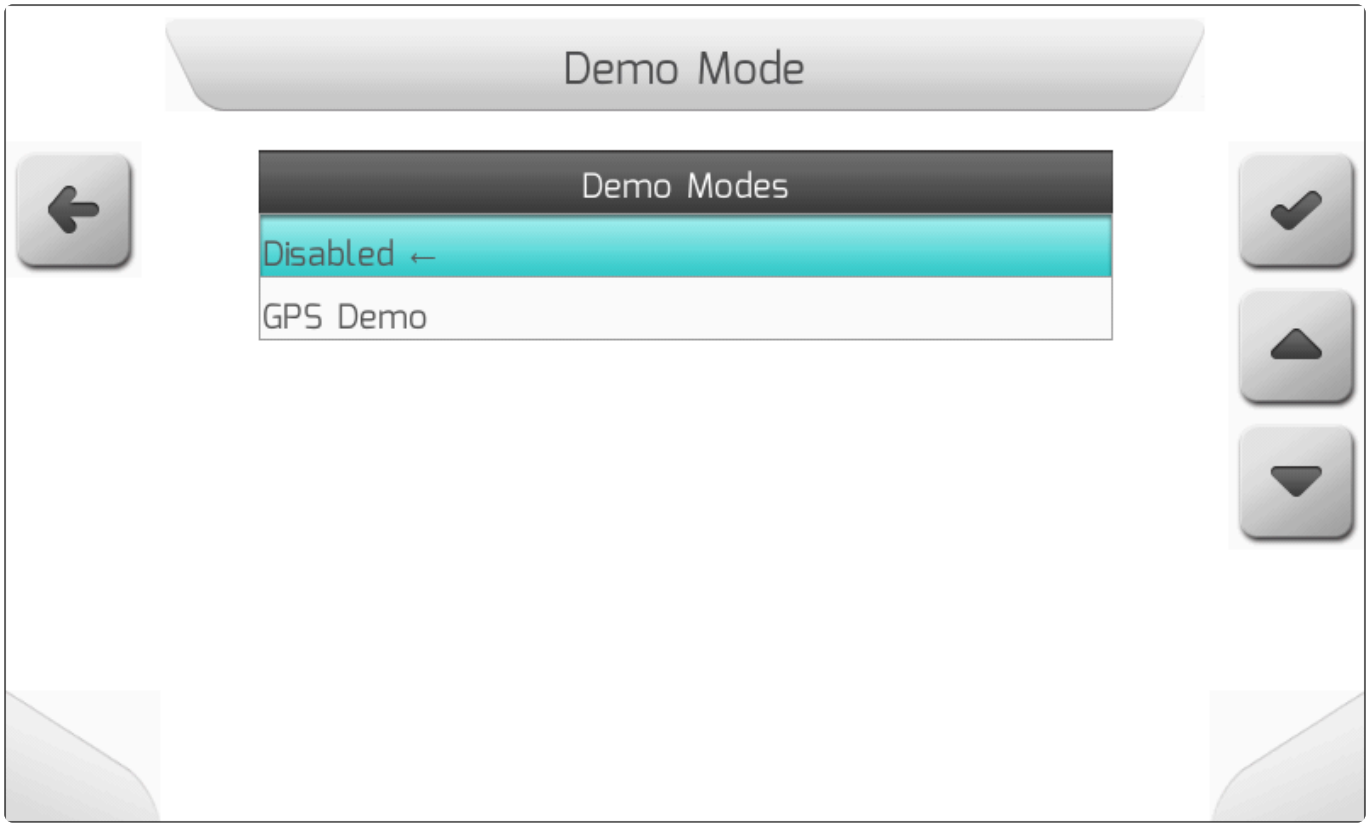



# 8.7.5. Demonstration

Screen type = Simple list

The Demonstration parameter, in the Advanced Settings menu, allows the GeoNave display to be used in simulation mode. Even without signal from the antenna, the GNSS coordinates are generated by the system, enabling the presentation of real operation features. The Demonstration allows to use the monitor for training, or presentations at fairs and events.

The image below shows the Demonstration setting menu for ISO 31 licenses.



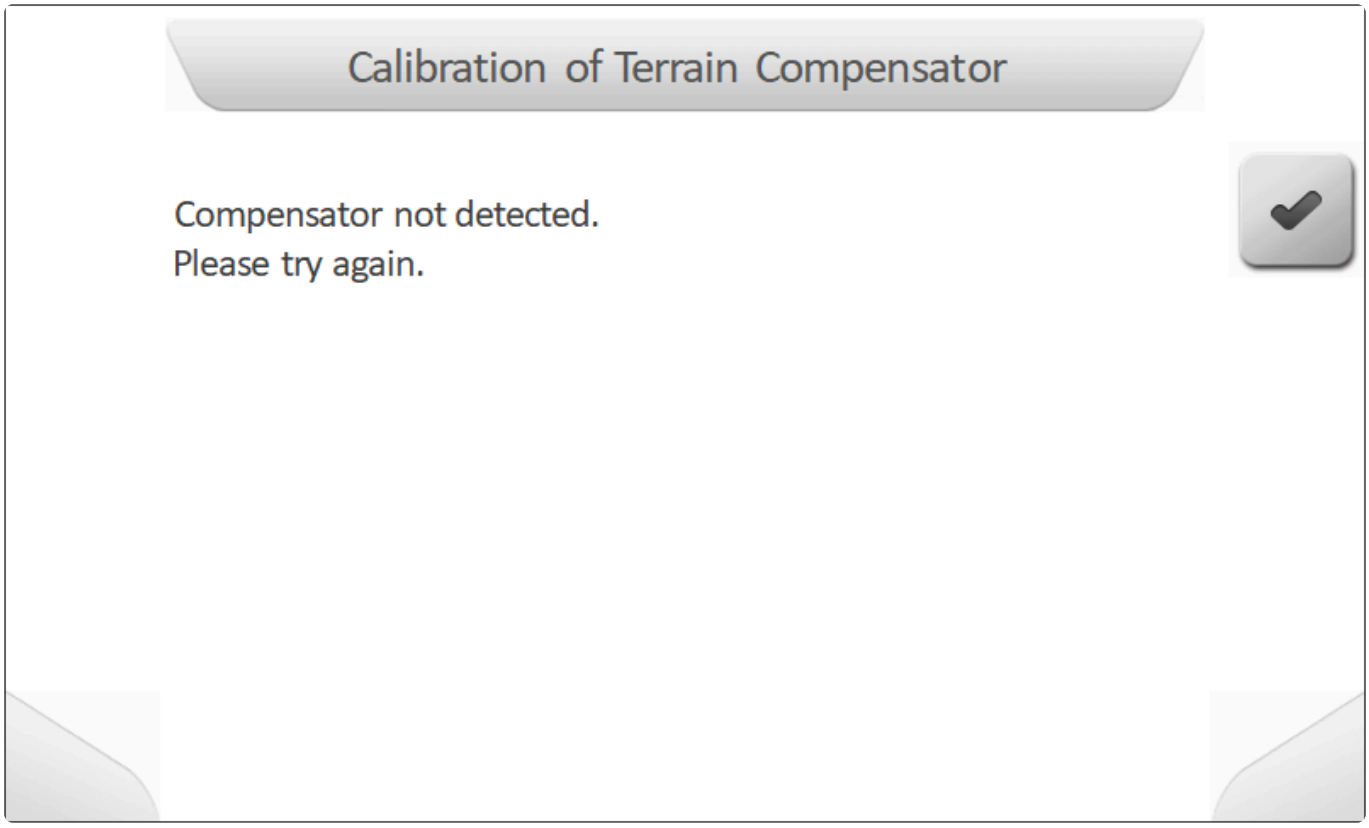

# 8.7.6. Terrain Compensator

Screen type = Double list

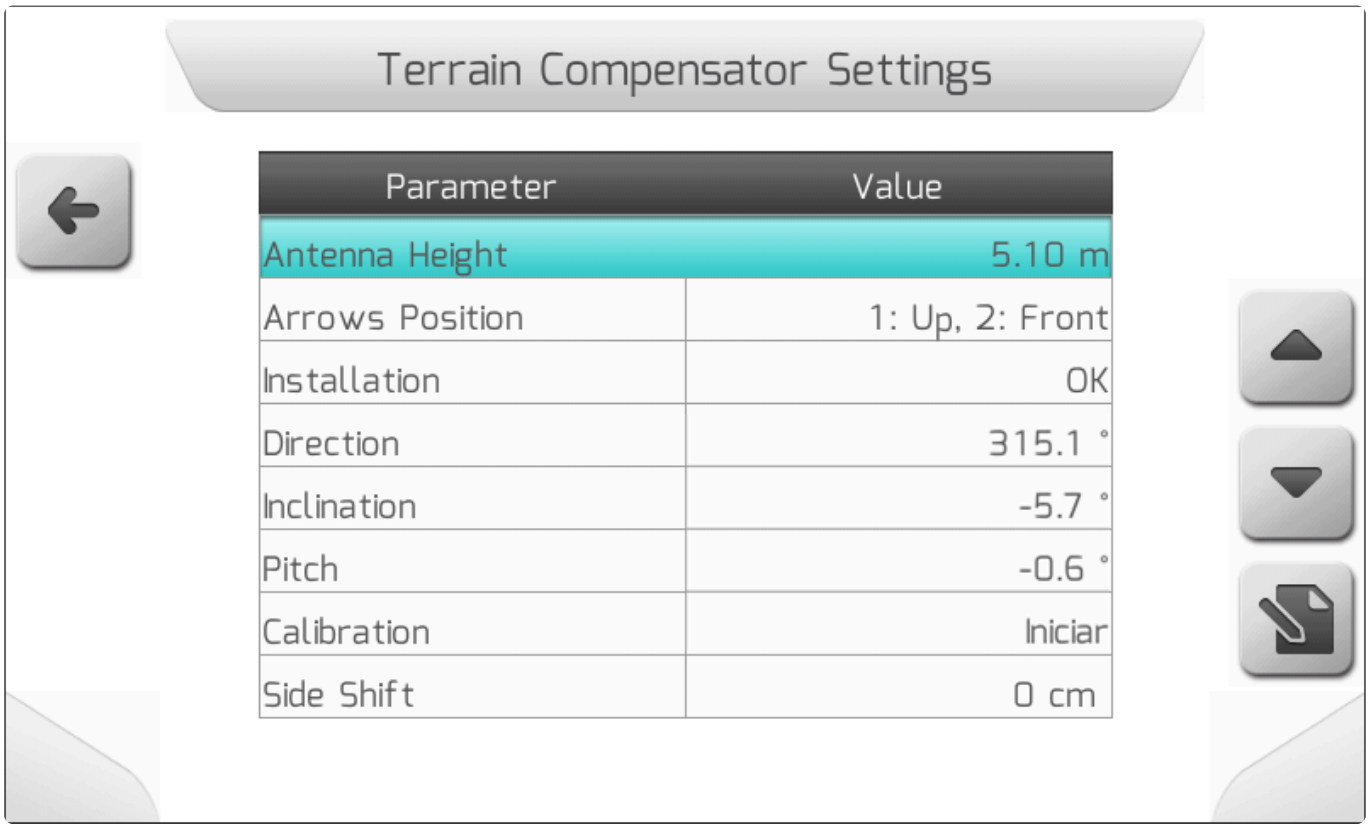
- Antenna Height
- Arrows Position
- Installation
- Direction
- Inclination
- Pitch
- Calibration
- Side Shift

The Terrain Compensator settings area, in the Advanced Settings menu, is normally available only on GeoNave system with Auto Steering feature, but if the user wishes to improve the system accuracy is possible to purchase separately the accessory.

Selecting the option in the advanced settings menu and pressing the confirm button , if the terrain compensator is not connected, an Information screen will be displayed, as shown in the following image.




Once the terrain compensator is correctly connected to the system, a set of configurations and information regarding its installation will be listed in the Terrain Compensator menu, as shown in the image below. Each item will be detailed in the next topics.

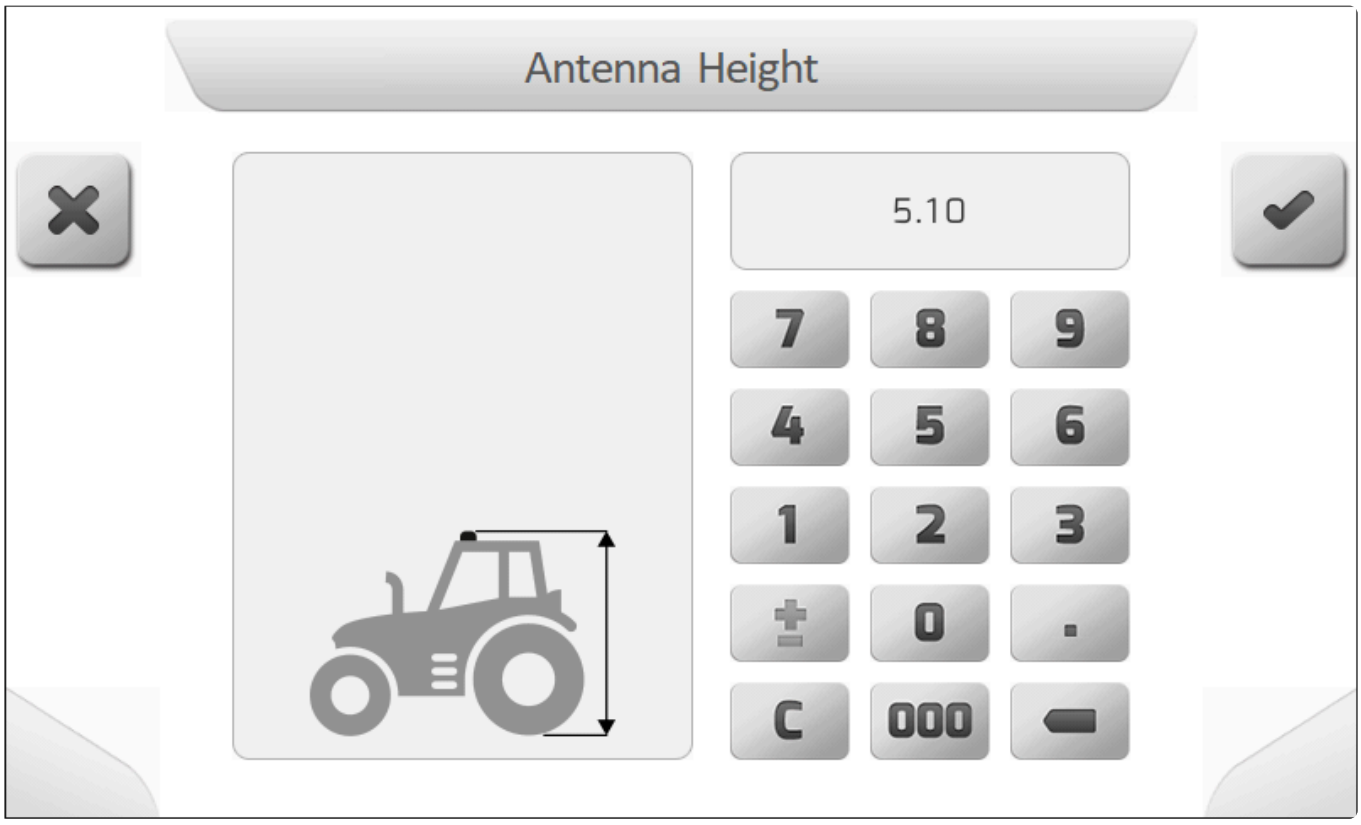


# 8.7.6.1. Antenna Height

Screen type = Value editing with image

The Antenna Height parameter in the terrain compensator settings tells the GeoNave system how high, in relation to the ground, is the GNSS antenna positioned on the tractor's roof, which must be measured with the aid of a measuring tape. It is very important that the Antenna Height is configured correctly, so that the compensation of the terrain inclination is done properly.

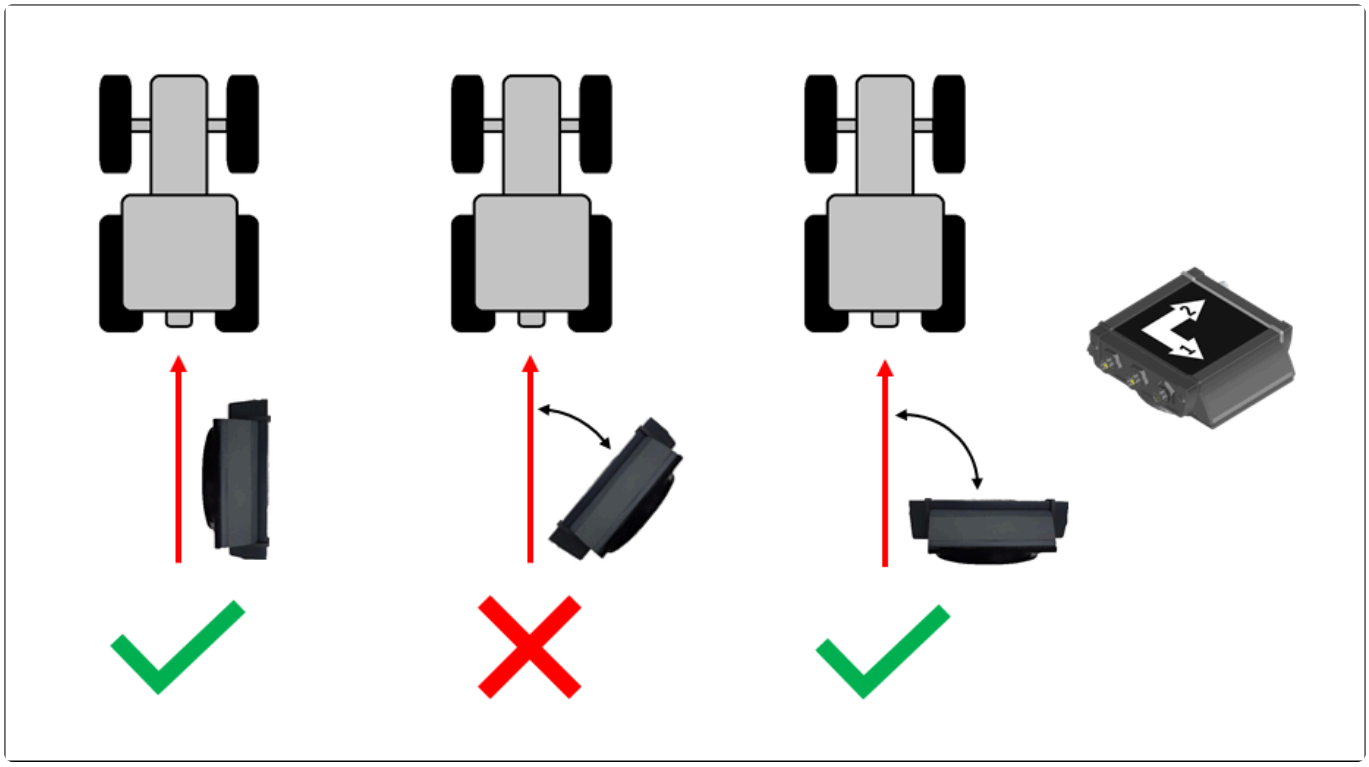
The following image shows the Antenna Height setting screen, including self-explanatory image of its meaning.

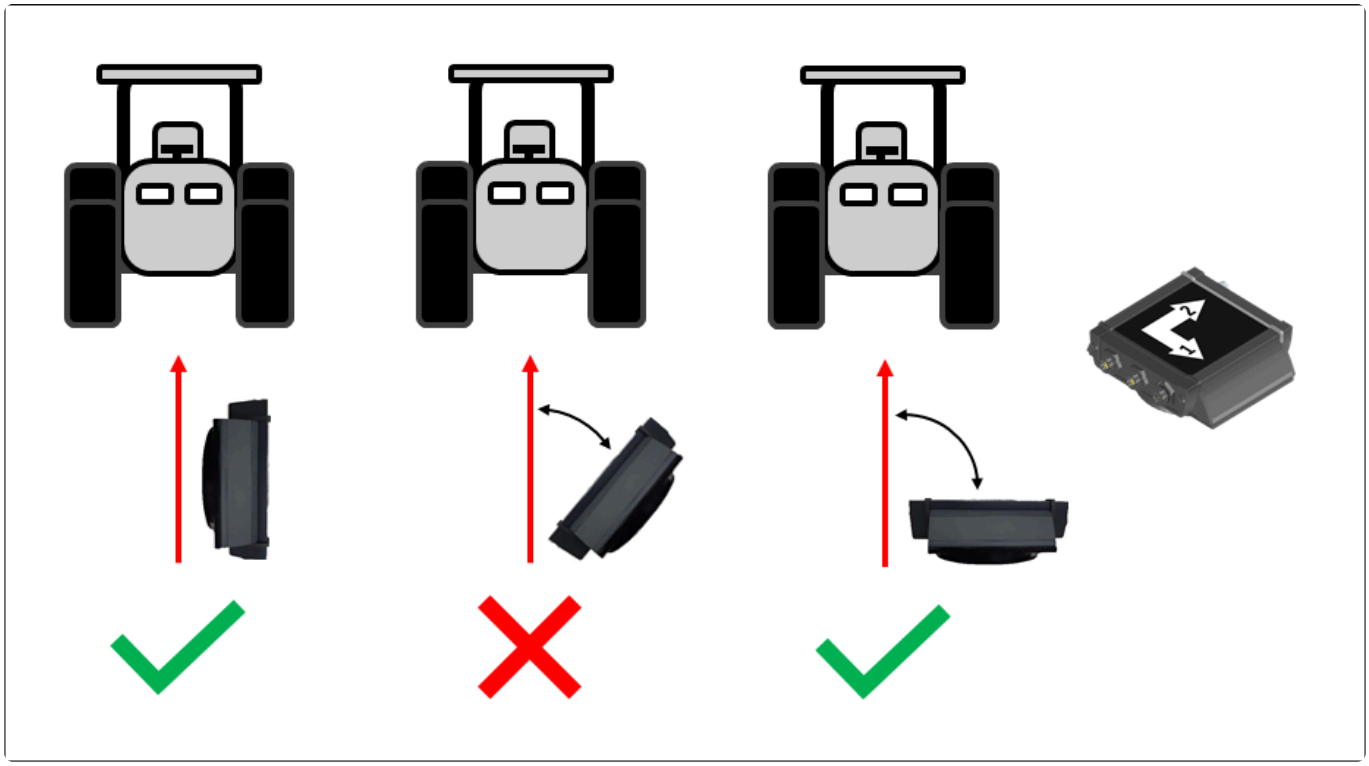



# 8.7.6.2. Arrows Position

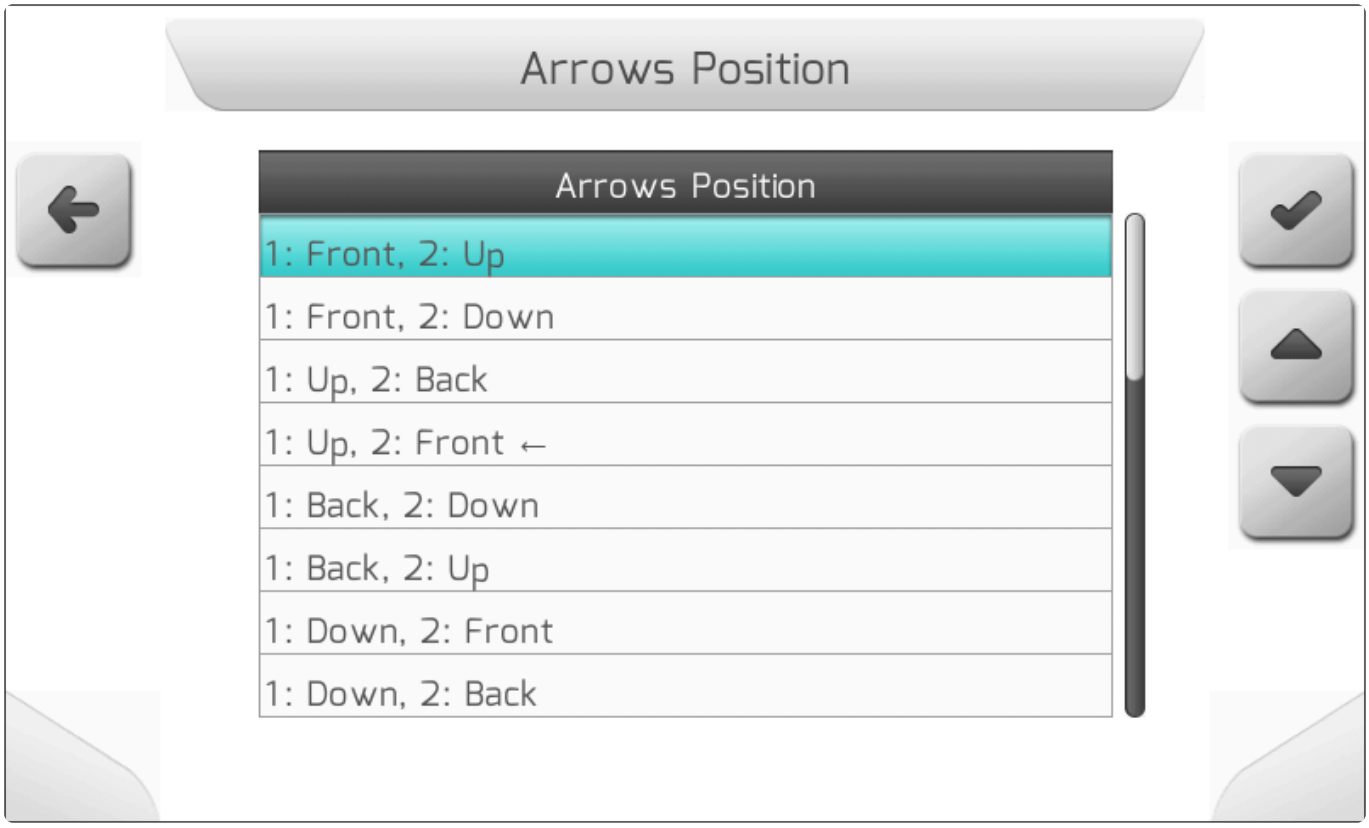
Screen type = Simple list

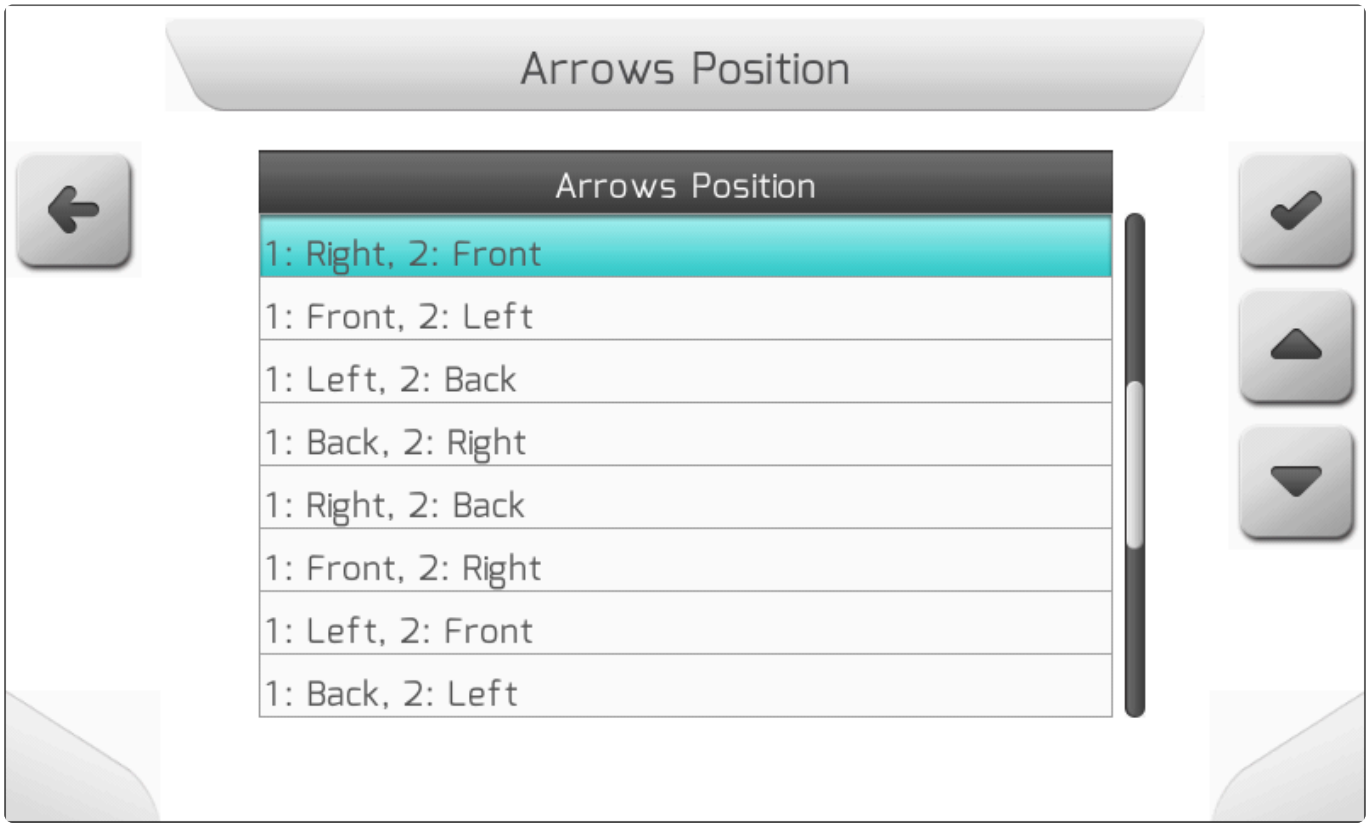
In the terrain compensator setting the user will find the Arrows Position parameter. The user will observe two arrows draw in the compensator housing, identified with numbers 1 and 2, arranged perpendicularly to each other. The installation of the terrain compensator must be done in order that the arrows are either perpendicular or parallel to the longitudinal axis of the tractor. If the arrows and the axis are not aligned, terrain compensation functionality will be seriously compromised.
The images below show examples of terrain compensator installation according to the arrows position.





The Arrows Position parameter screen has 24 configurations, in which the position of arrows 1 and 2 are always shown in relation to tractor’s longitudinal axis in forward direction. The following images show all the possible options.


Arrows Position
Arrows Position
1: Front, 2: Up
1: Front, 2: Down
1: Up, 2: Back
1: Up, 2: Front ←
1: Back, 2: Down
1: Back, 2: Up
1: Down, 2: Front
1: Down, 2: Back


Arrows Position
Arrows Position
1: Right, 2: Front
1: Front, 2: Left
1: Left, 2: Back
1: Back, 2: Right
1: Right, 2: Back
1: Front, 2: Right
1: Left, 2: Front
1: Back, 2: Left

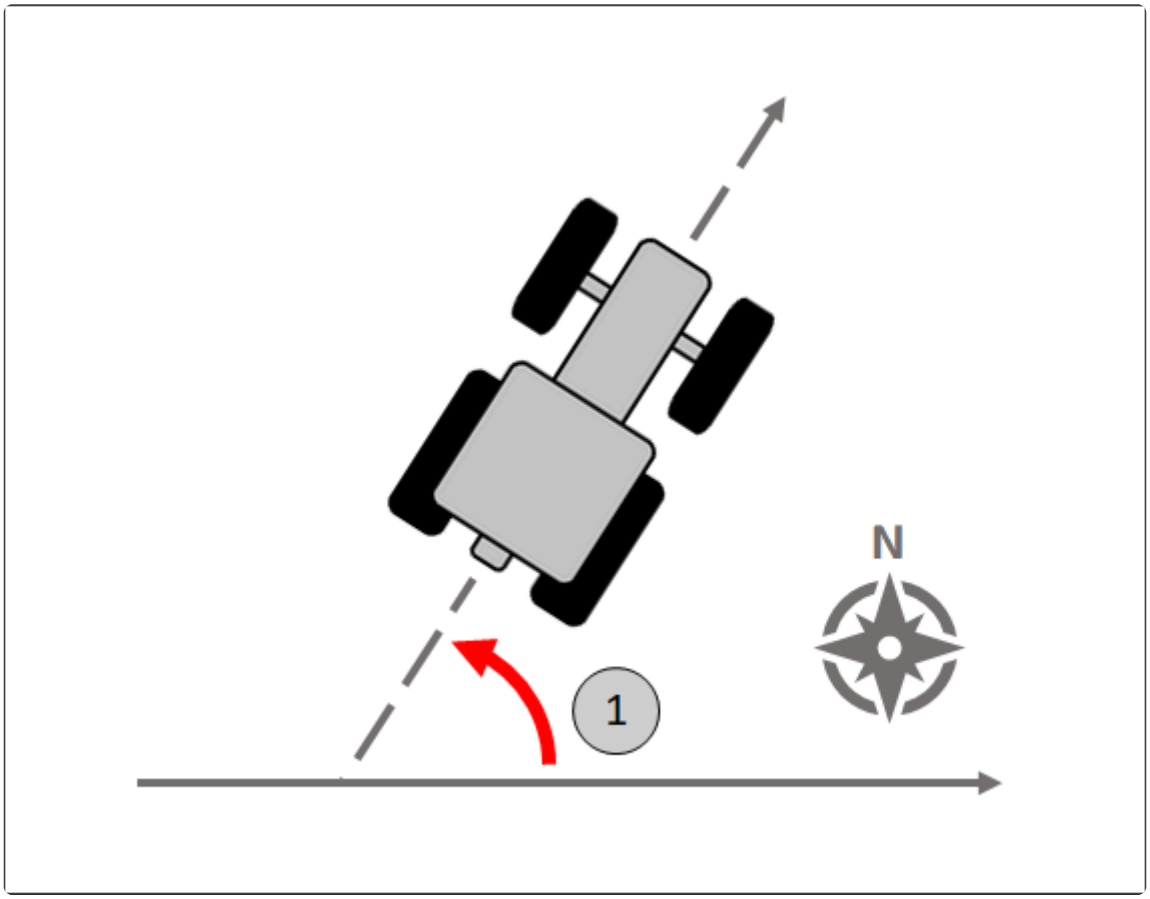



# 8.7.6.3. Installation

The Installation information shows the user whether the terrain compensator is correctly installed in relation to the configured Arrows Position. The electronics responsible for compensating the terrain slope detects whether the compensator position is valid or not. If the displayed value is **MISTAKE** then terrain compensation will not be active. If the value is **OK** then terrain compensation will be effectively correcting the terrain slope.

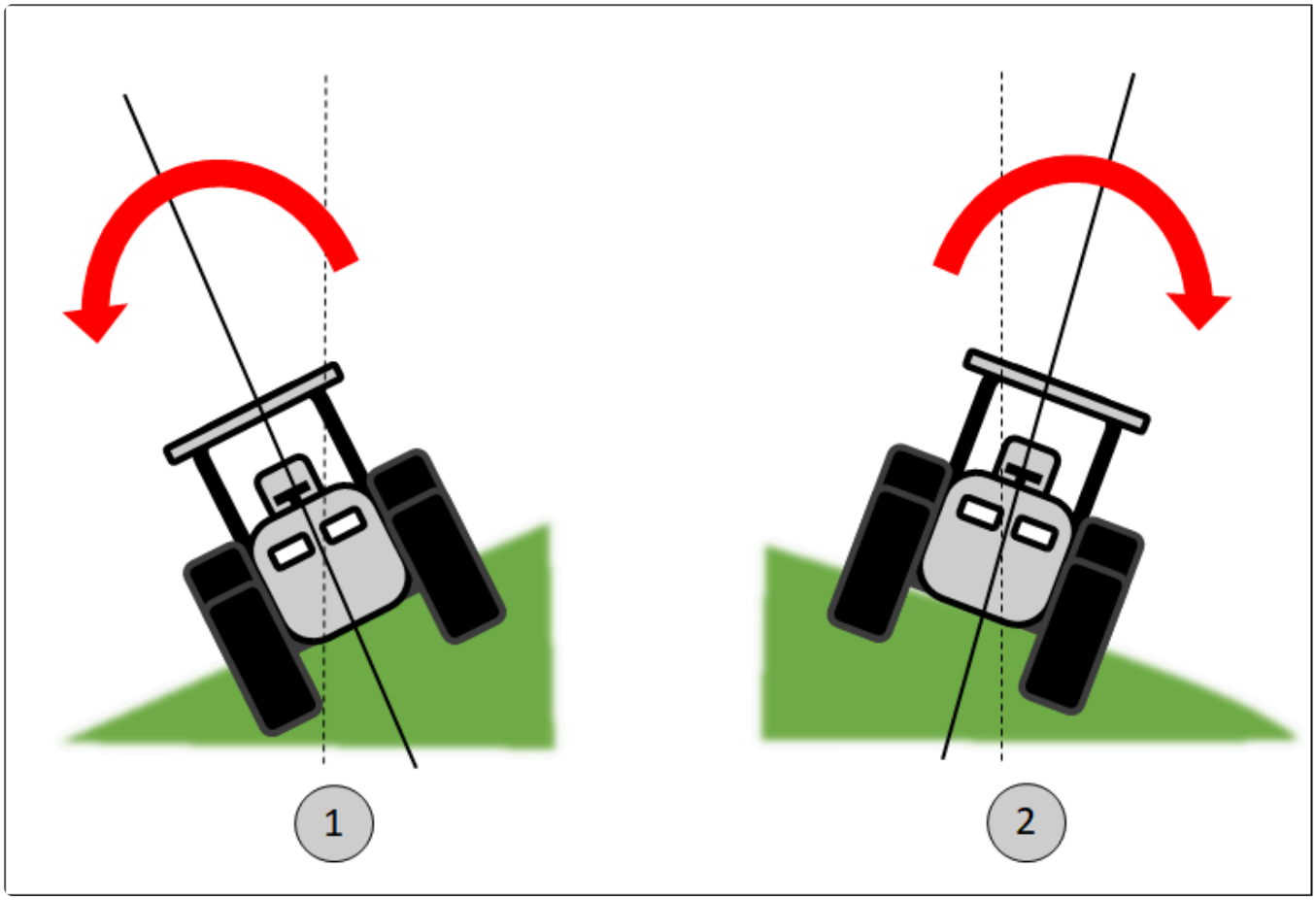
# 8.7.6.4. Direction

Direction value shown in the terrain compensator settings screen represents the instantaneous angle that the tractor's longitudinal axis, facing the front of the machine, makes with the East direction, in a counterclockwise rotation. The image below illustrates the Direction angle (1).



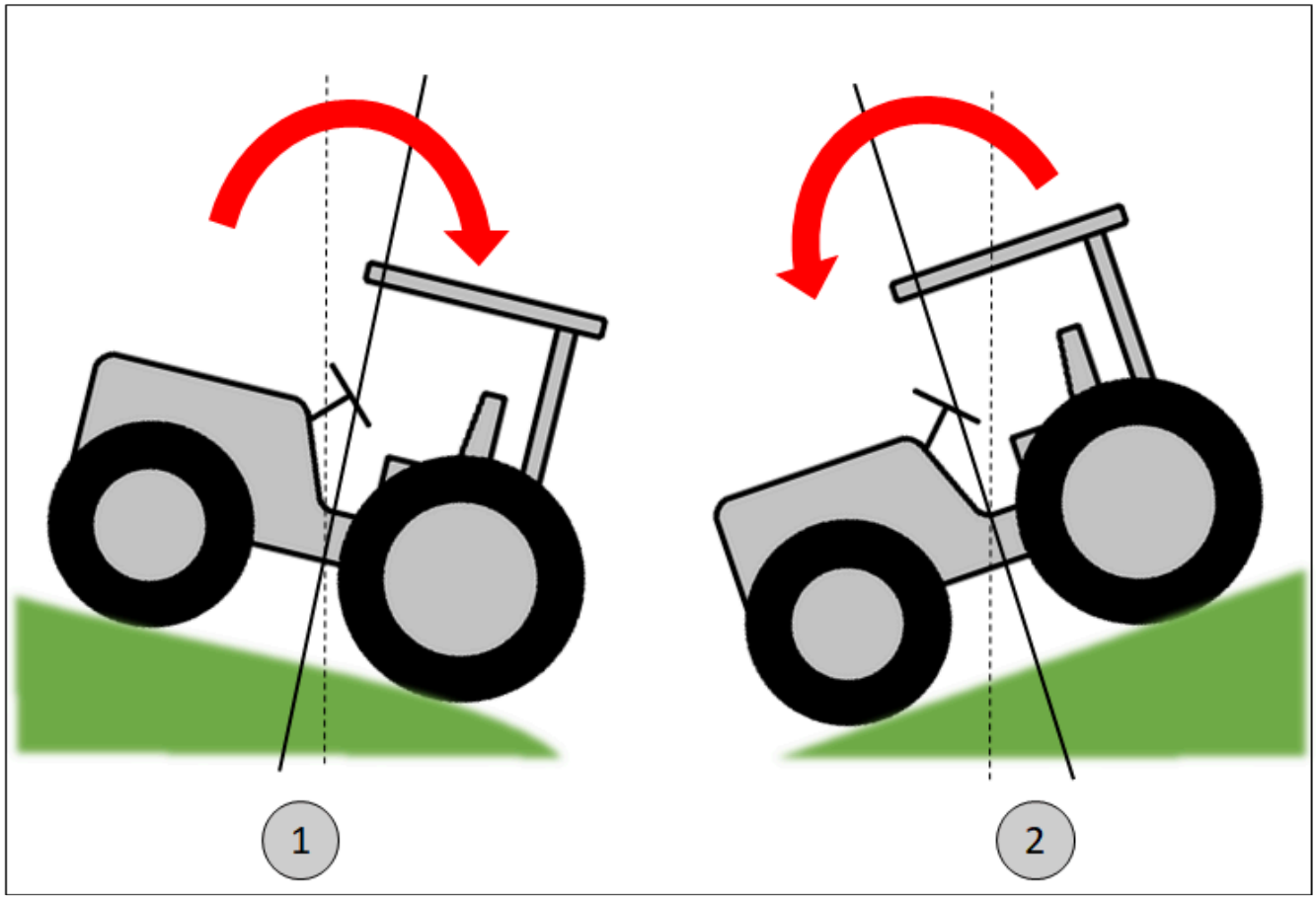

# 8.7.6.5. Inclination

The Inclination, shown in the terrain compensator settings menu, represents the instantaneous angle of the tractor's lateral inclination, being positive in 1 and negative in 2, as shown in the image below.




# 8.7.6.6. Pitch

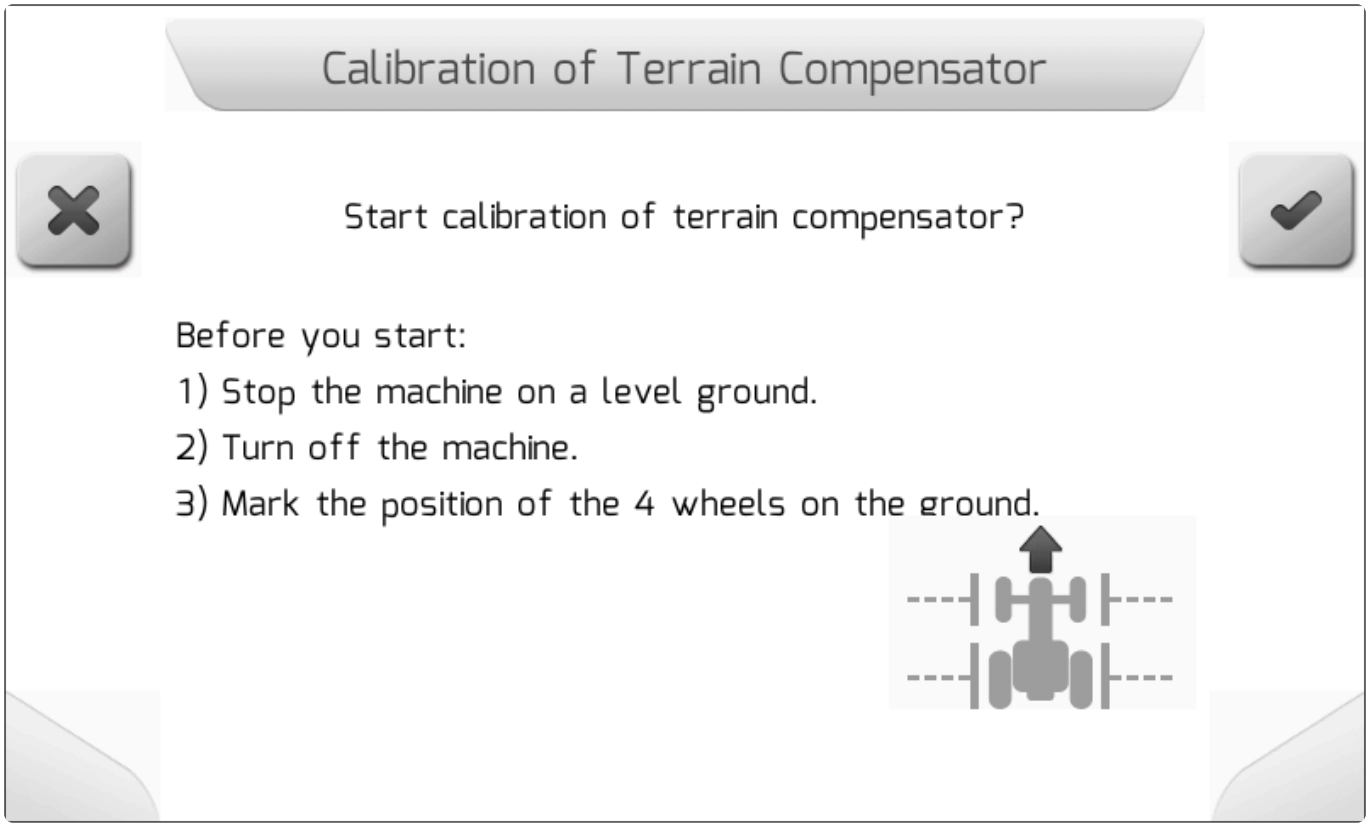
In the terrain compensator settings menu, the *Pitch* angle represents the instantaneous frontal inclination of the tractor, being positive in 1 and negative in 2, as shown in the image below.




# 8.7.6.7. Calibration

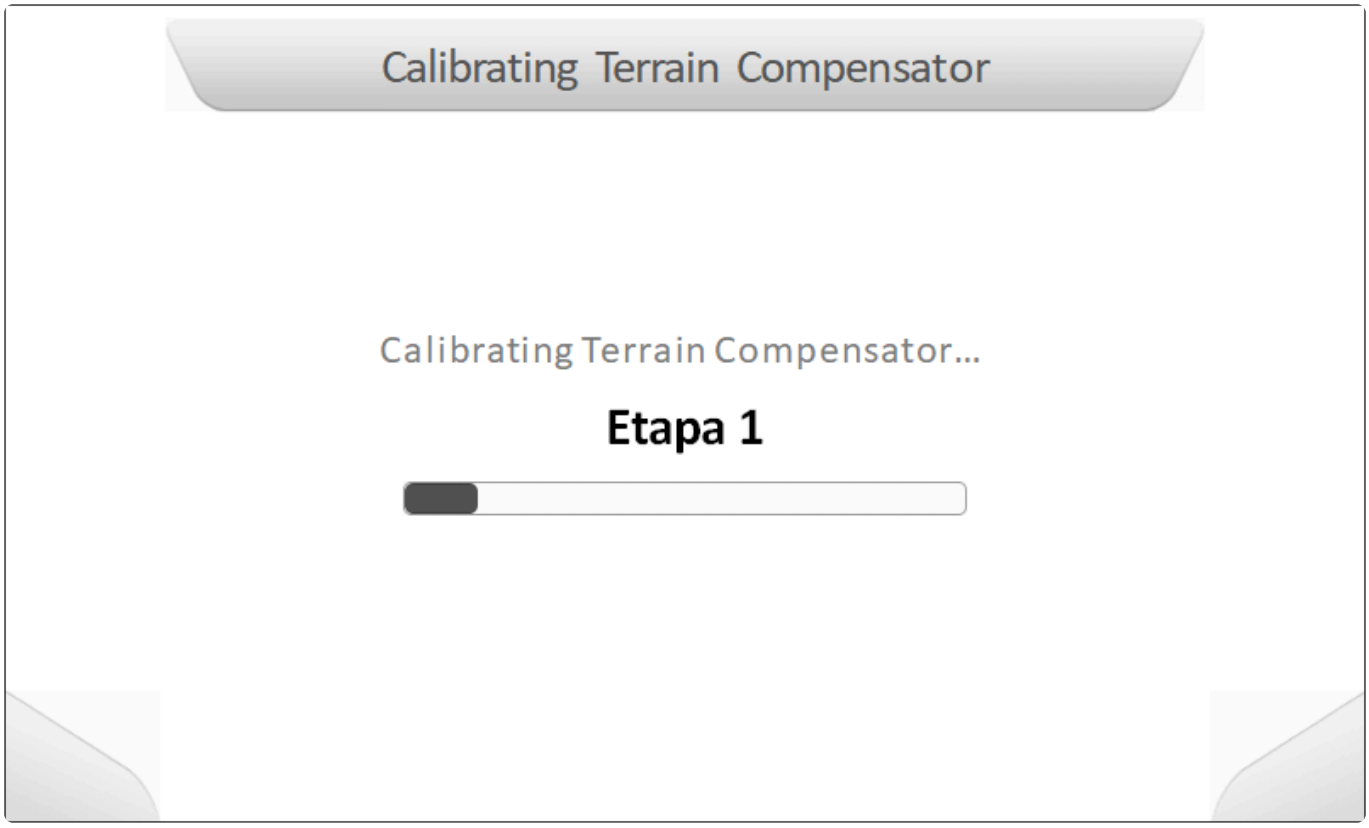
In the terrain compensator settings menu, the user will find the Compensator Calibration area. The procedure is required for the GeoNave system to identify all parameters related to the physical installation of the compensator and will allow the system to perform accurate and correct reading of steering, inclination and pitch angles.

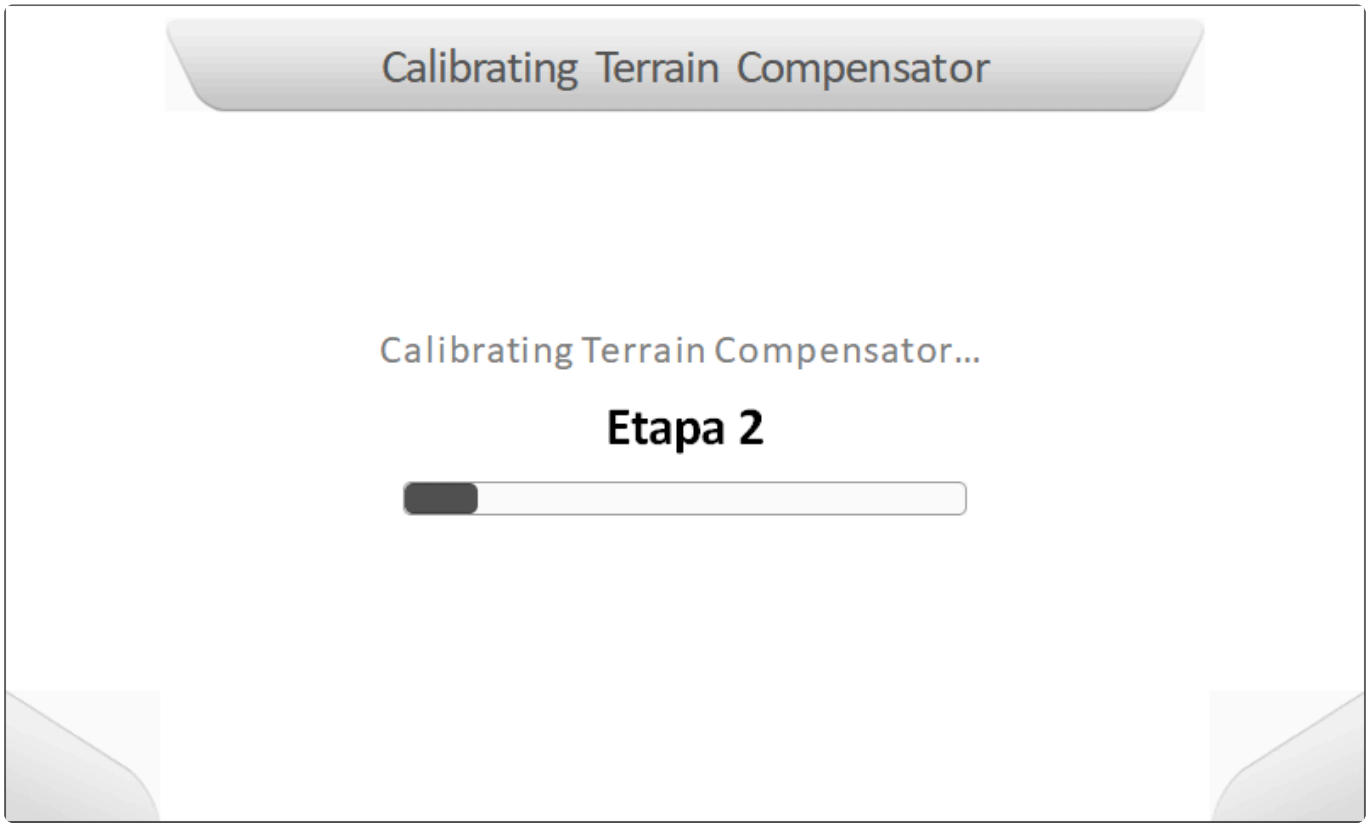
When Selecting the item in the menu and pressing the confirm button  , the screen for the start of calibration steps 1 and 2 will be presented, in which the procedures must be performed with the tractor in the direction of travel, as shown in the following image.



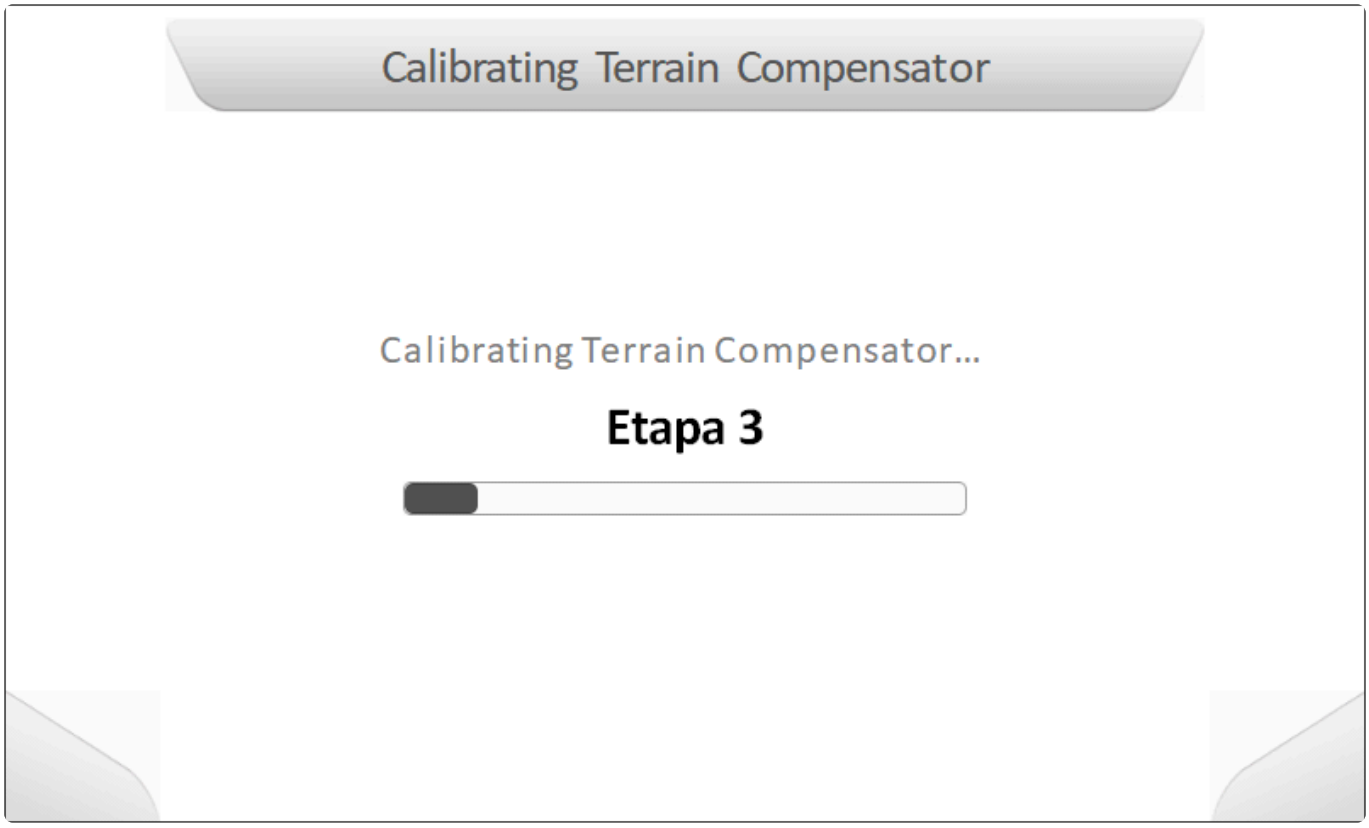

The screen informs the user of a list of three items required before calibration begins. The machine must be stationary on a level ground, with the engine turned off and the user must draw “T” marks on the ground, aligned with each of the tractor’s 4 wheels axle.

Pressing the confirm button  , Step 1 of the calibration will begin, in which the electronic components are calibrated for approximately 1 minute. Afterwards, step 2 will begin automatically, where the machine/compensator set inclination in the direction of travel will be calculated. The images below show the Loading screens referring to calibration steps 1 and 2.

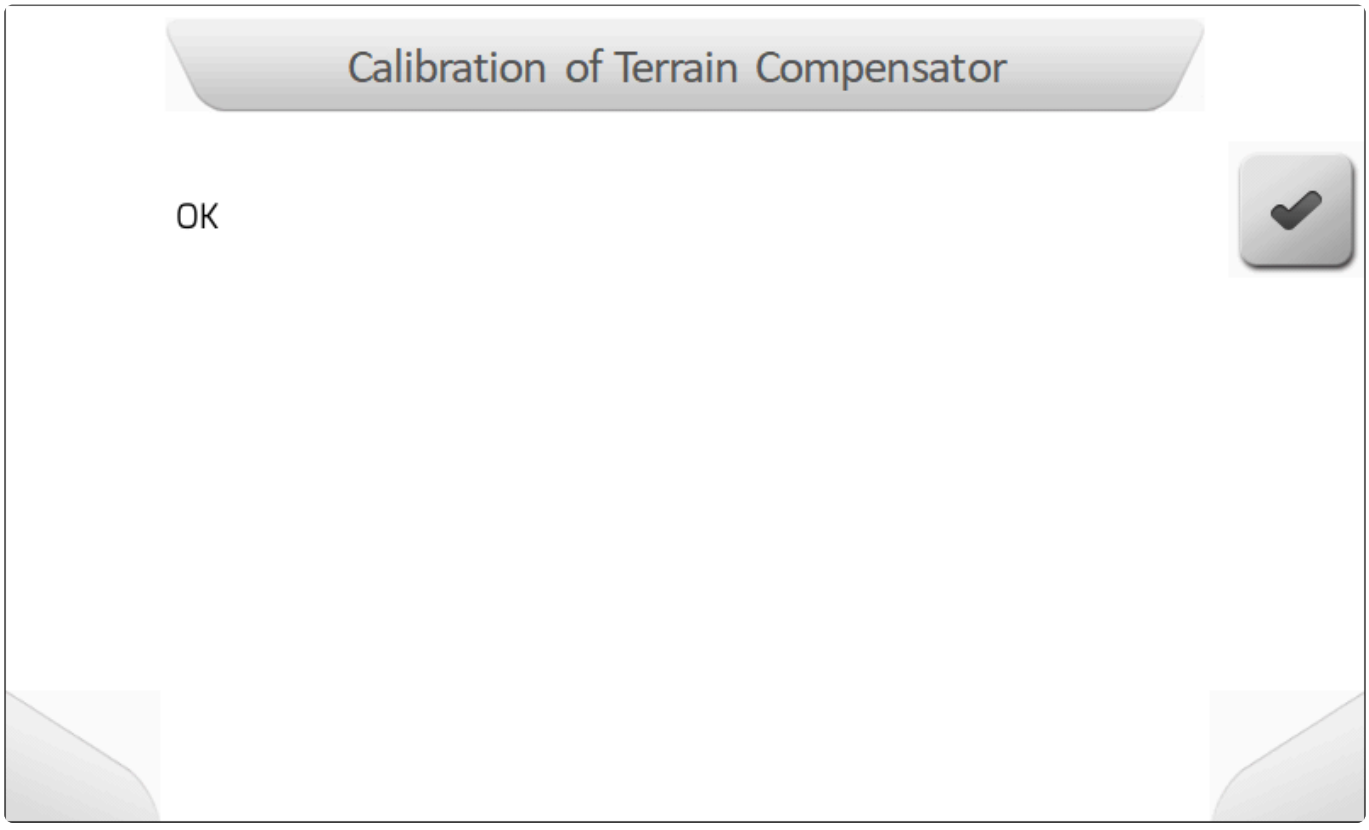


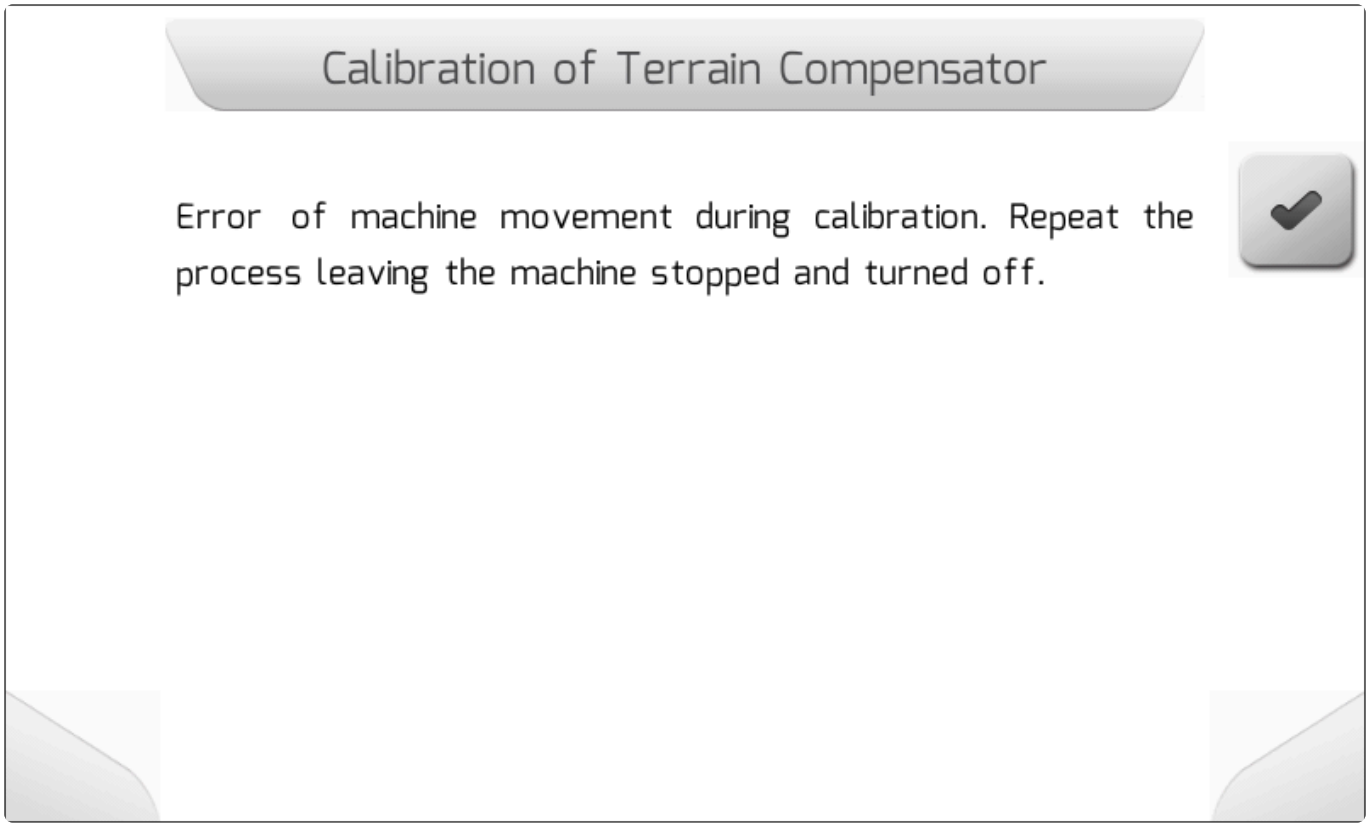

After step 2 completion, the screen of step 3 beginning will be displayed. The user is asked to move the machine and return to the same alignment as before but in the opposite direction of travel, making the 4 wheels align again with the marks on the ground. Once again, the machine must be turned off, and press the confirm button  .




At the end of step 3, an Information screen will be displayed indicating the calibration operation success, as shown in the image below.




If during any of the three stages there is some movement of the tractor or of the terrain compensator housing, the calibration process will detect the improper movement and the process will end with an error, as shown in the following image.




# 8.7.6.8. Side Shift

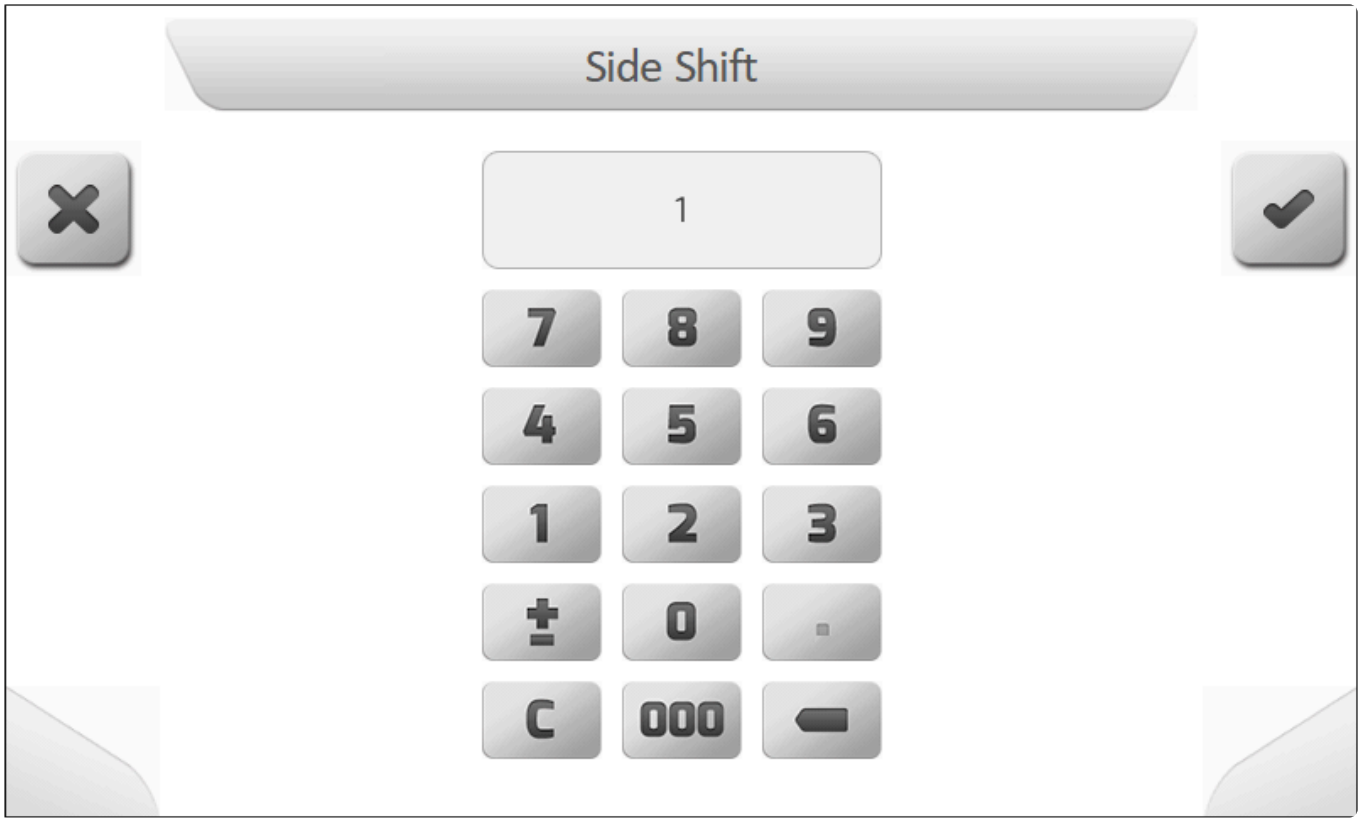
Screen type = Value editing

Decimal places = 0
Minimum value = -100 cm (1 m to the right)
Maximum value = 100 cm (1 m to the left)

The Side Shift parameter of the antenna in the terrain compensator settings is used to configure the offset in centimeters that exists between the center of the GNSS antenna and the tractor longitudinal axis. This parameter must be used in cases where it is not possible to install the antenna centered on the machine axis, always measure with the help of a measuring tape.

Measured in centimeters, the antenna Side Shift value can be positive or negative. Positive values represent that the center of the antenna is shifted to the tractor axis left. Negative values represent that the center of the antenna is shifted to the tractor axis right.

The following image shows the antenna Side Shift setting screen.

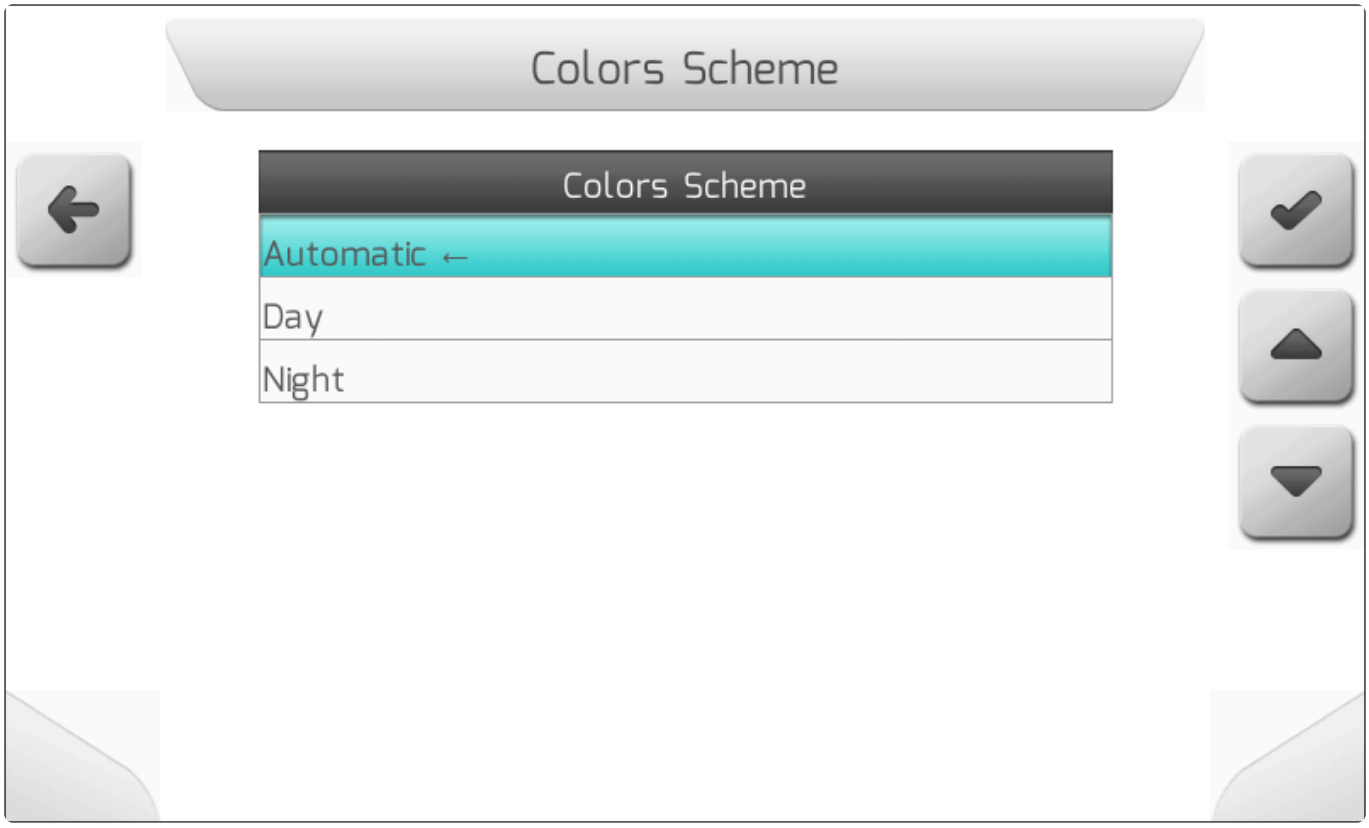



# 8.7.7. Color scheme

Screen type = Simple list

Color Scheme parameter, in the Advanced Settings menu, is used to configure the navigation screen colors according to one of the available modes – **Day** and **Night**, in order to always offer visual comfort to the machine operator in which the GeoNave system is installed. In **Automatic** mode, the color scheme used will be set as **Day** mode between 6h00 and 18h00 and as **Night** mode in the complementary period. **Night** mode also slightly reduces LDC screen and LED's lightbar luminous intensity.

The image below shows the Color Scheme setting screen.

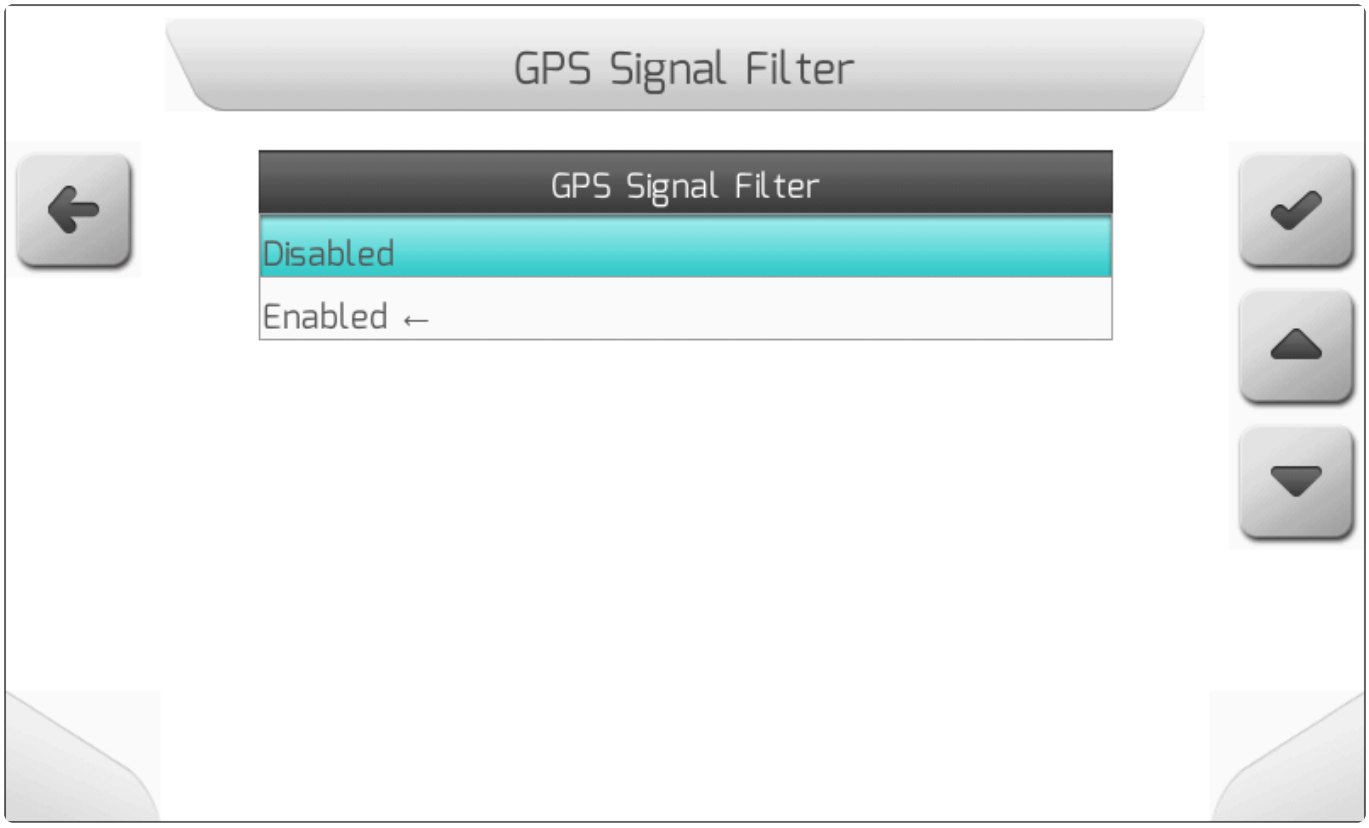



# 8.7.8. GPS Signal Filter

Screen type = Simple list

GPS Signal Filter parameter, in the Advanced Settings menu, configures the use of a *software* filter through which the GeoNave system decides whether the GNSS signal is sufficient or not for operation, based on its current quality. When the filter is **Enable**, if the value of HDOP is less than 2.0, the signal is considered OK; otherwise, the GNSS signal will be interrupted. With the filter **Disabled**, the value of HDOP is not considered.
GPS Signal Filter should be applied when the user does not want to operate with poor quality reception of the GNSS signal, for example near the riparian forest, in order to do not affect the operation accuracy.

The GPS Signal Filter setting screen is shown in the image below.

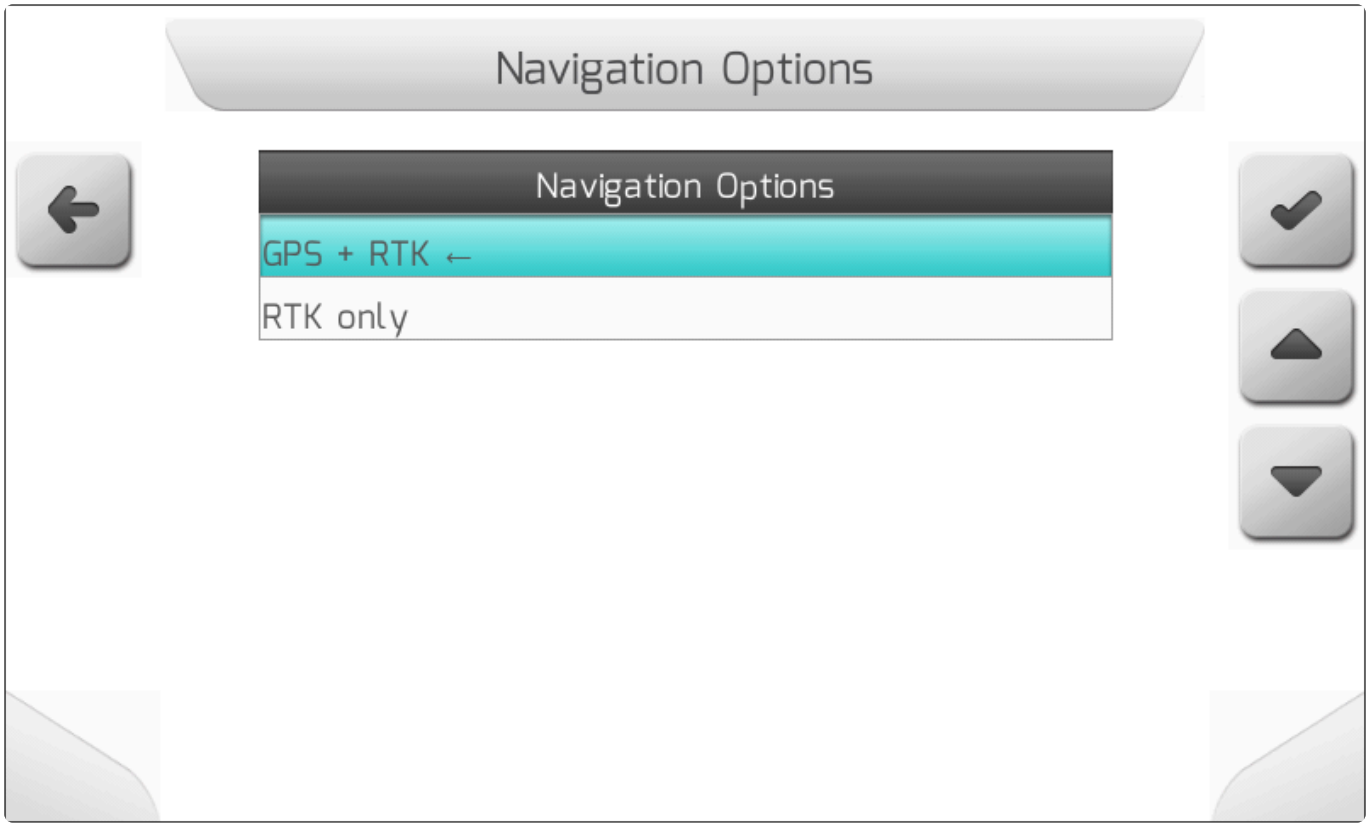



# 8.7.9. Navigation Options

Screen type = Simple list

In the Advanced Settings menu, the Navigation Options parameter defines how the Auto Steering operates regarding RTK signal correction on GeoNave systems with active license. When the parameter is set to **GPS + RTK**, the Auto Steering can be engaged regardless of the GNSS signal Position Type. If the parameter value is **Only RTK**, Auto Steering engagement will be conditioned to active RTK signal corrections, so the GNSS signal Position Type must have available RTK corrections.

The image below shows the Navigation Options setting screen.



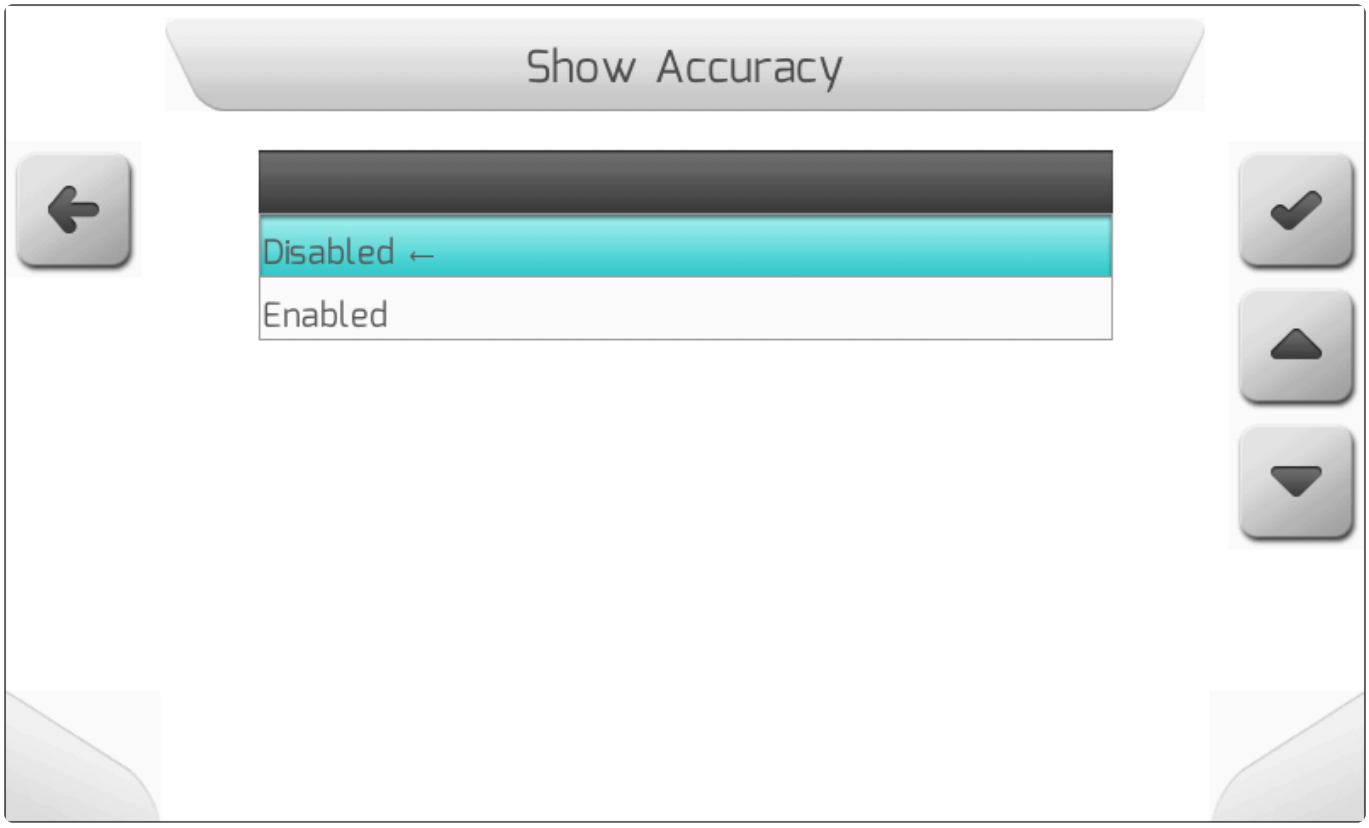

# 8.7.10. Show Accuracy

Screen type = Simple list

The Show Accuracy parameter, in the Advanced Settings menu, selects how Precision GPS, Differential Age and Distance from Base are displayed in the right area of the navigation screen Information Board. The following table shows how the Show Accuracy parameter is used in the information board data presentation, according to current GNSS signal Position Type.

| Position Type | Show Accuracy | Differential Age | Precision GPS | Base Distance |
|---|---|---|---|---|
| • **none**<br>• **No Correction**<br>• **PsrDiff (40 cm)** | **Disabled** | No | No | No |
| | **Enable** | N/A | **Yes** | No |
| • **RT-2-A (4 cm)**<br>• **RT-20 (20 cm)**<br>• **Awaiting PPP**<br>• **PPP (4cm)** | Indifferent | **Yes** | **Yes** | No |
| • **RT-2 (1 cm)** | Indifferent | **Yes** | No | **Yes** |

Show Accuracy parameter setting screen is shown in the following image.




# 8.8. Orchard

This section presents the particularities of the GeoNave system concerning spraying implement for orchard, including its functionalities and the procedure for the equipment configuration.

## License

Initially, in order that Orchard related features are available is required to have a *ISO 31O * (O = *Orchard*) license, so that the GeoNave display understand that it will be working with an orchard sprayer.

## Functionalities

Essentially, all the features of traditional boom spraying are available in orchard spraying. However, there are fundamental differences between the two machine types.

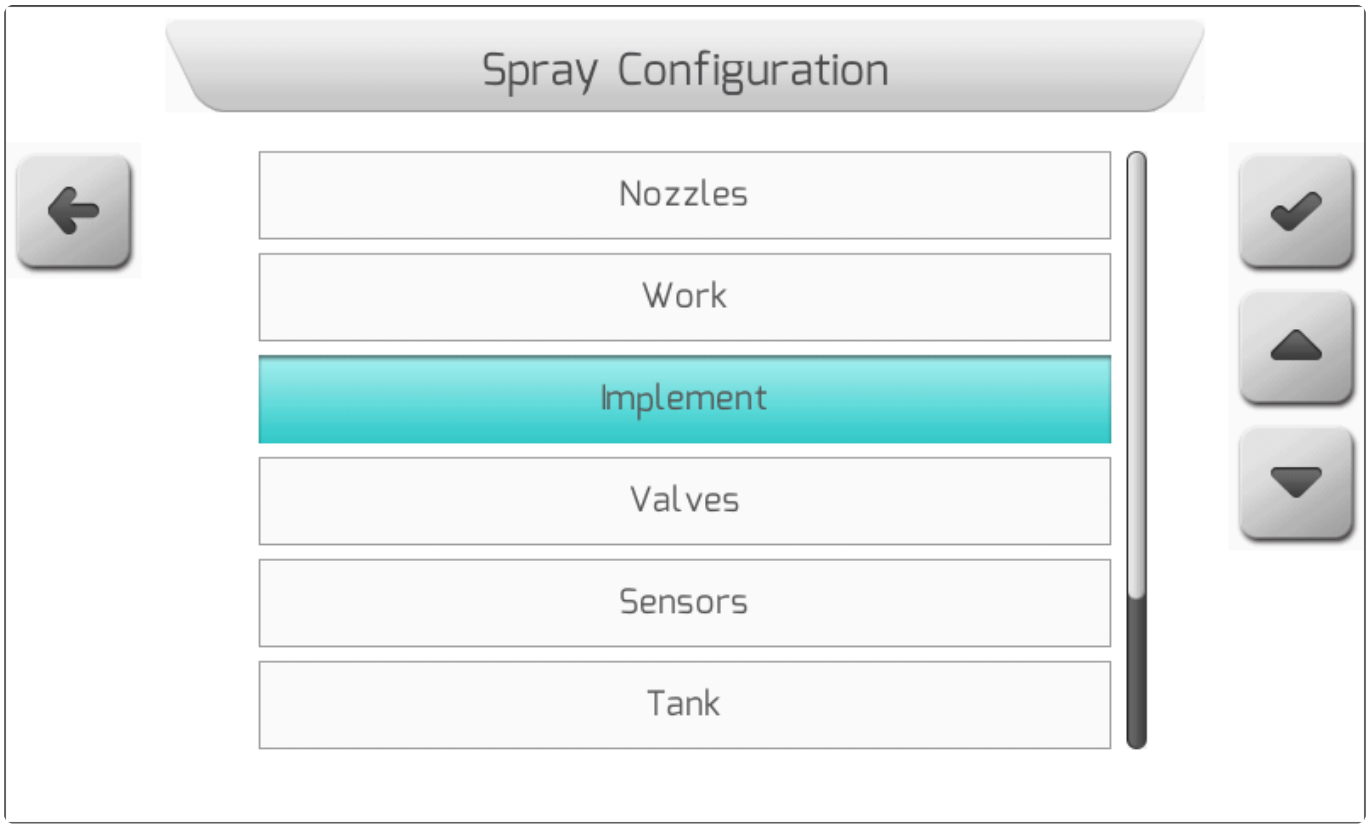
The main particular features of orchard system are the following:

- Single row implement;
- Multiple rows implement;
- Tree lines on the navigation screen;
- Ultrasonic sensors for sections shut-off;
- Implement configuration with multiple nozzle models;
- Standard nozzle model table + customizable models.

# Single row and Multiple rows

In an orchard, the field is divided into tree rows and sprayer implements can cover a single row or even more than one row at the same time.

To edit the implement settings, access the spraying menu: **Settings> Spraying**, select the option **Implement** and press the confirm button  .



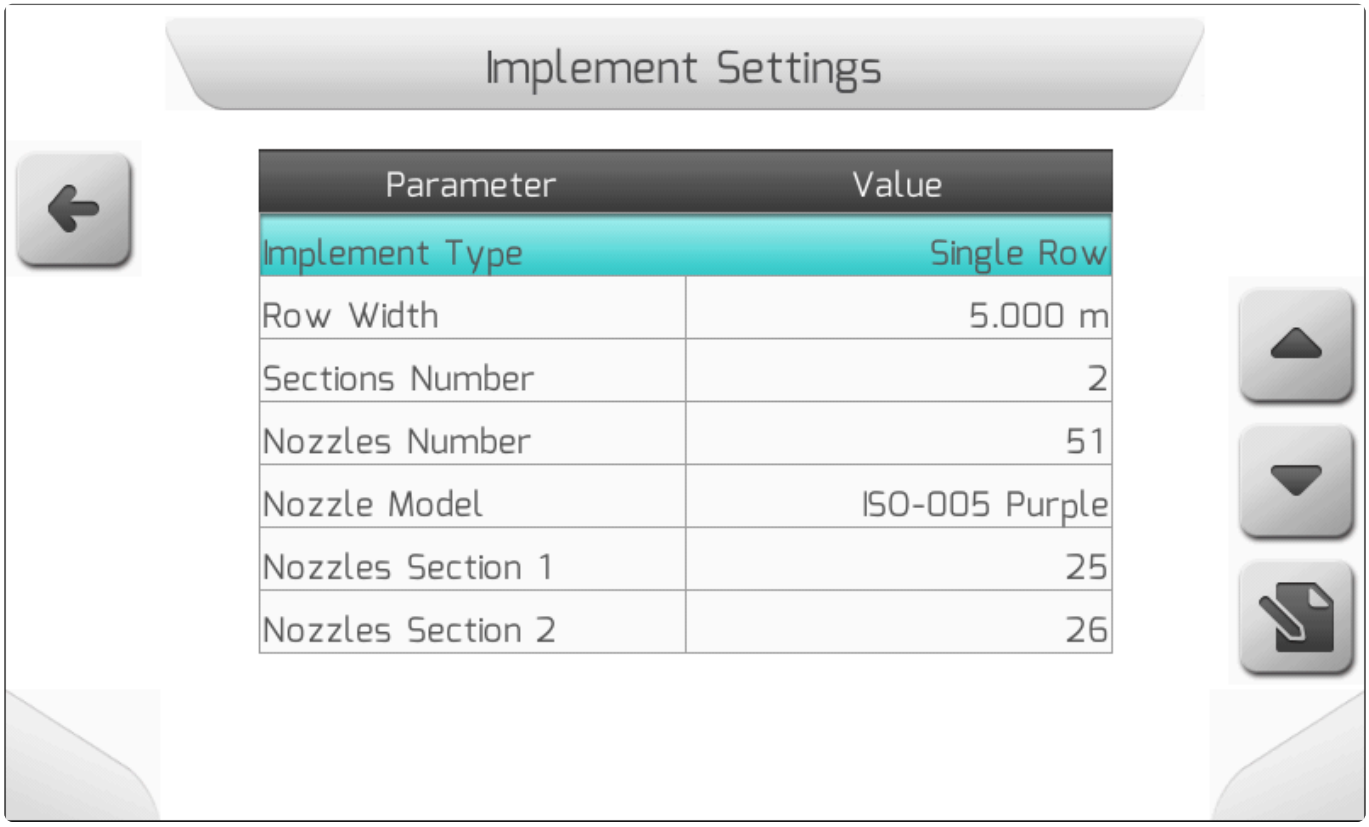

## Single Row

It is defined that a row has been covered when both sides of a tree were sprayed, a single row implement passes between two rows of trees and applies product to half of the tree on the right and half on the tree on the left, thus completing the row coverage.

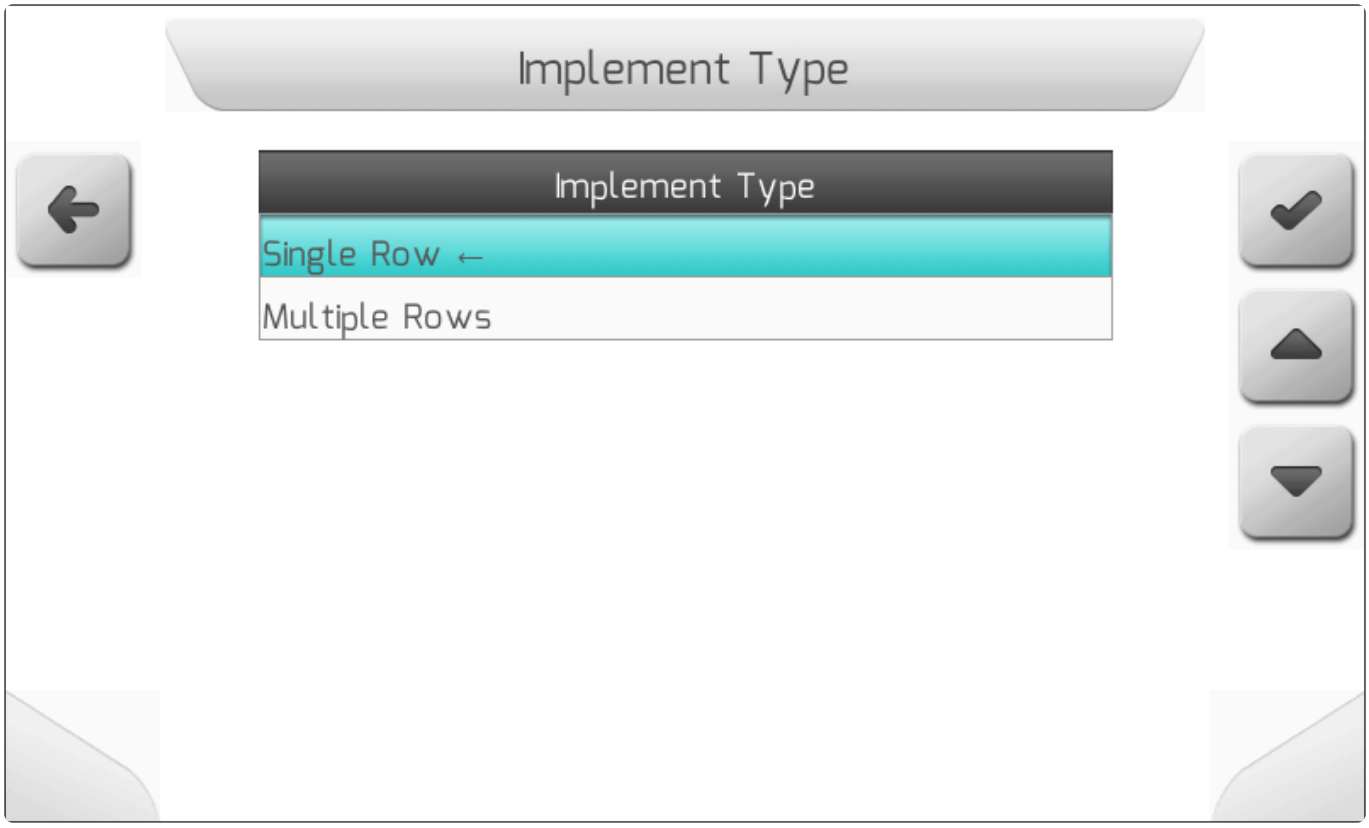
The following images show an example of a single row sprayer to visualize how the application takes place.



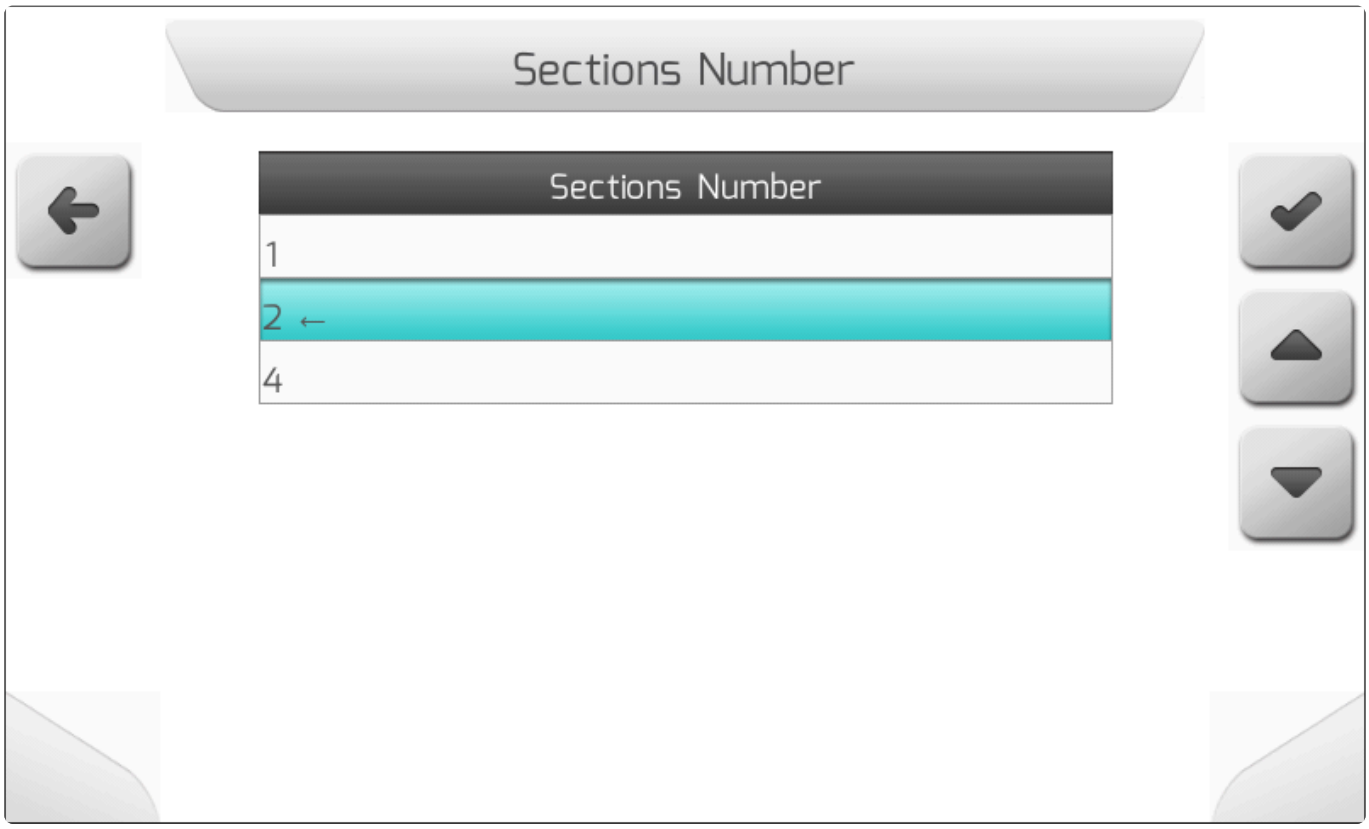
The first option in the **Implement** parameter list regards setting implement type, Single Row or Multiple Rows.




Access the parameter **Implement Type**, press the edit button  , select the option **Single Row** and press the confirm button  to confirm the selection.




This type of implement can be operated with one, two or four sections. When selecting single row implement, in the **Sections Number** menu, only these three options will be displayed, as shown in the image below.

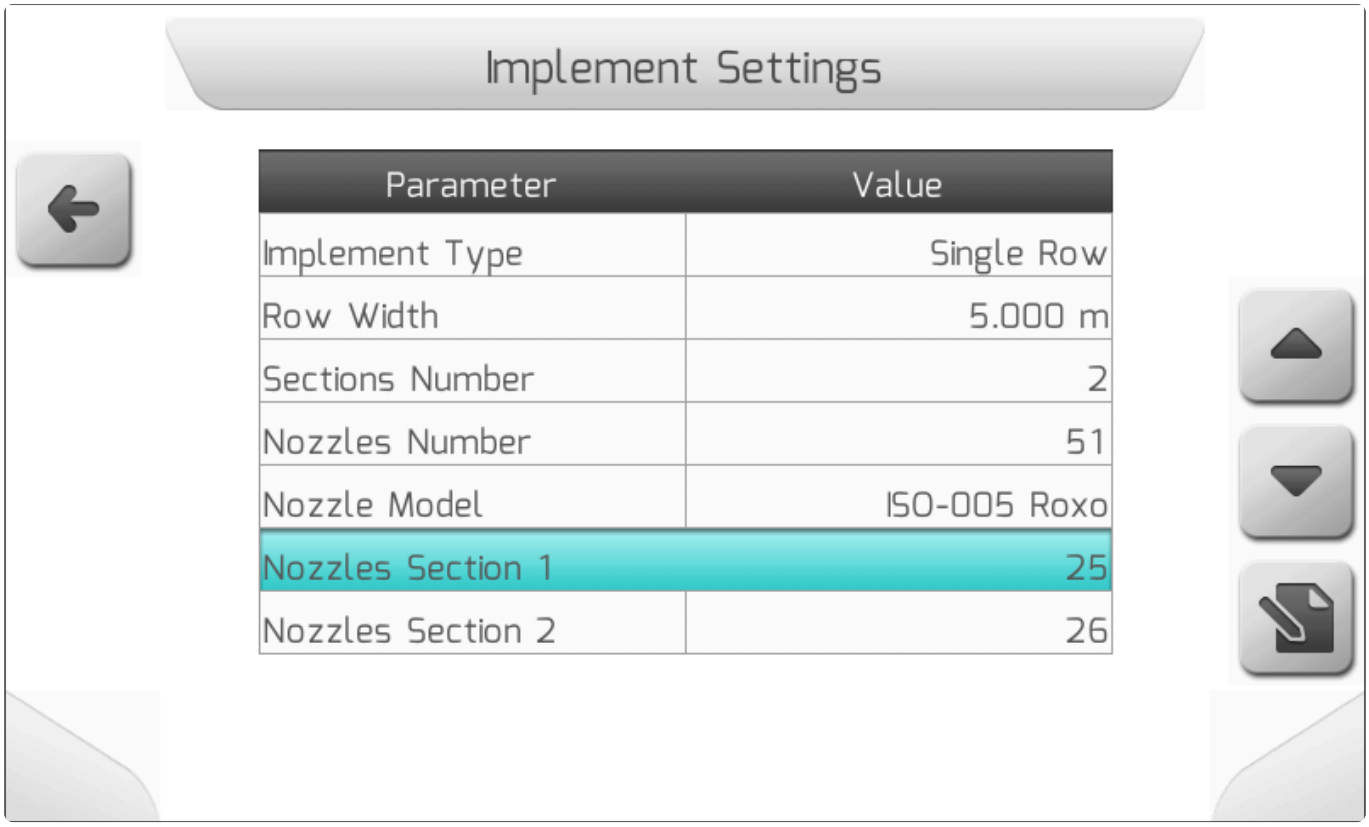



Select the implement sections number and press the confirm button  to confirm the selection.

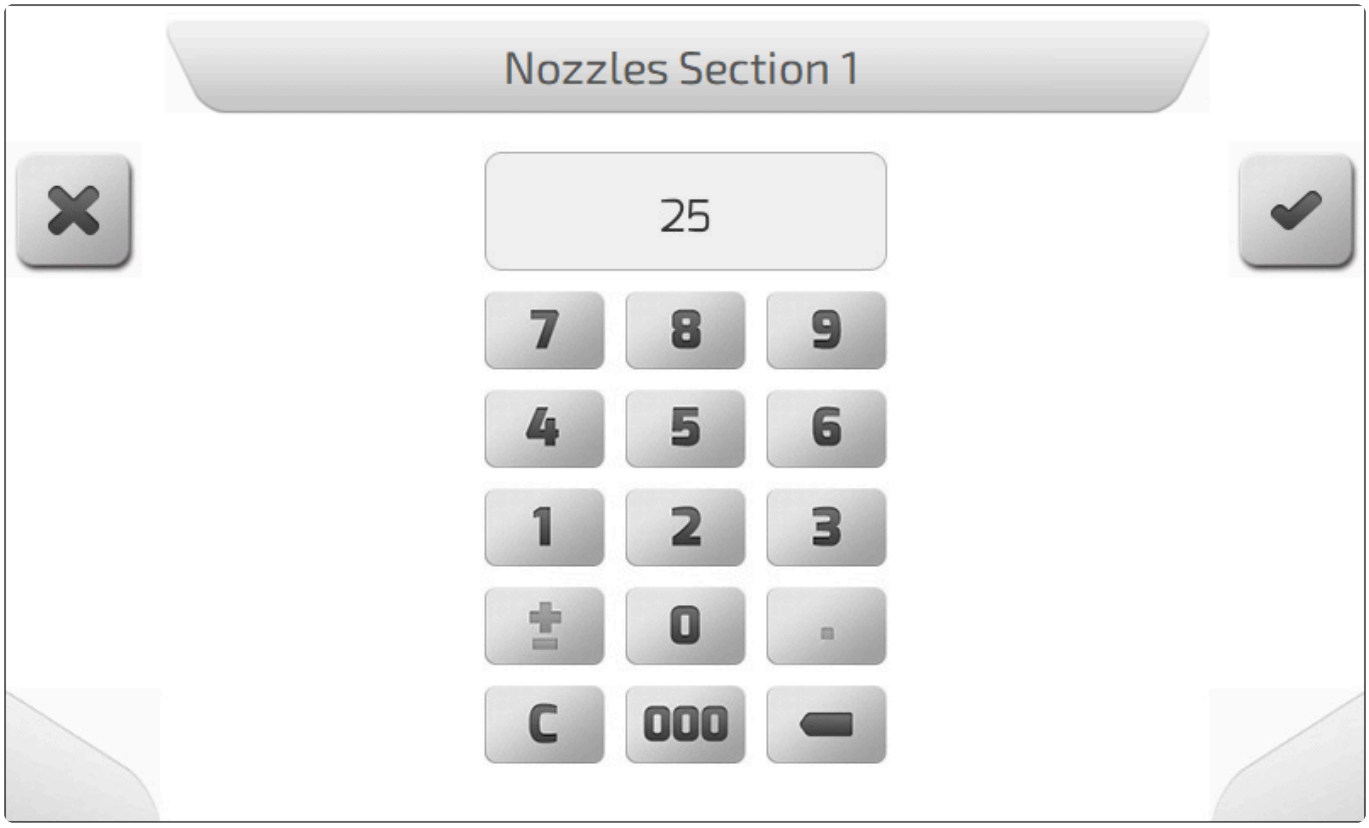
For the single row implement, the coverage percentage is fixed depending on the sections number. When selecting 1 section, coverage is 100%; for 2 sections, coverage of each section is 50%; and for 4 sections, each section covers 25% of the row.

In the **Implement** settings screen is also possible to configure the row width, the total nozzles number on the implement, the nozzles number of each section and the nozzle model used. This last option **will be available on this screen only when one nozzle model is configured**. This feature will be detailed further on.

The following example shows the configuration screen for a single row implement with a row width of 5 meters, 2 sections and 51 nozzles. To edit the number of nozzles in a section, go to the option **Nozzles Section N**, where **N** is the desired section number, and press the edit button  .




Enter the desired number of nozzles for the section and press the confirm button  to confirm the setting.




When only one nozzle model is configured, the GeoNave system will automatically fill the number of nozzles per section for all configured sections, but last section never will be editable by the user, as it is automatically filled in order to always use all nozzles configured in **Nozzles Number**. However, all previous sections can be edited, thus the value of the last section can be reduced or increased consequently.

## Multiple rows

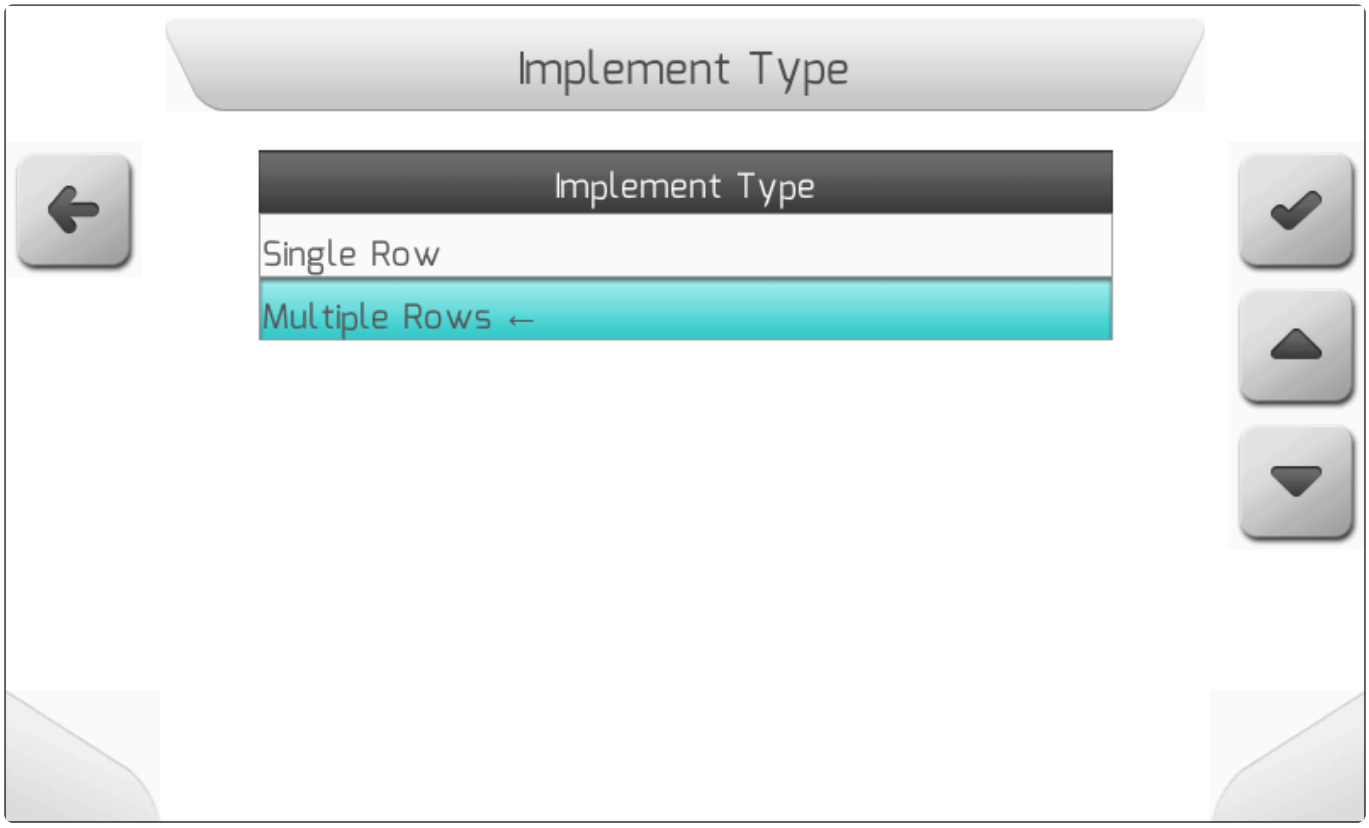
An implement that covers multiple rows is treated differently by the GeoNave system, because it can reach more trees in its extension. In addition, the spraying implement can have a larger number of sections, depending on its size.

An example of this type of sprayer is shown below.

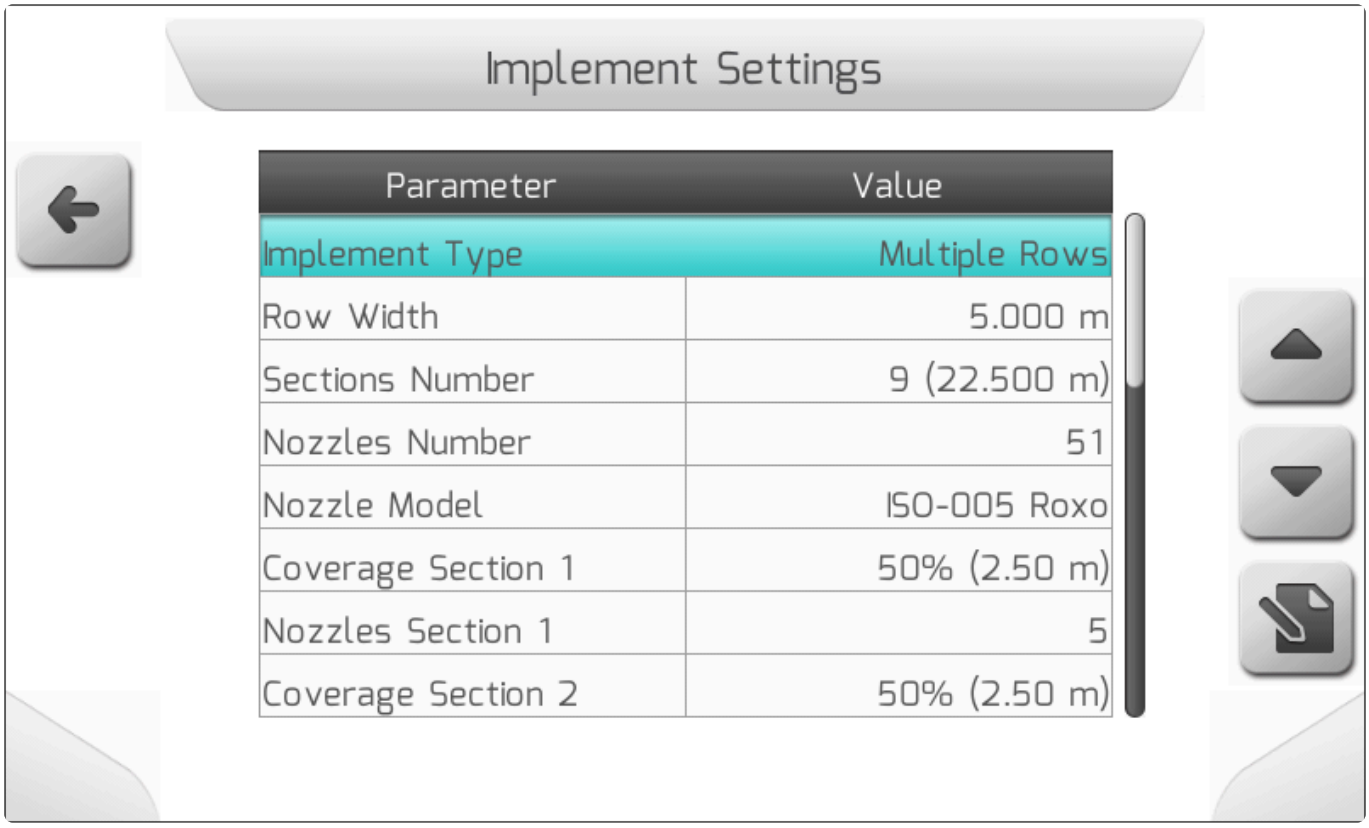


The implement is capable of spraying more than one row of trees simultaneously, and each section can cover a different portion of the row according to the needs of each application.

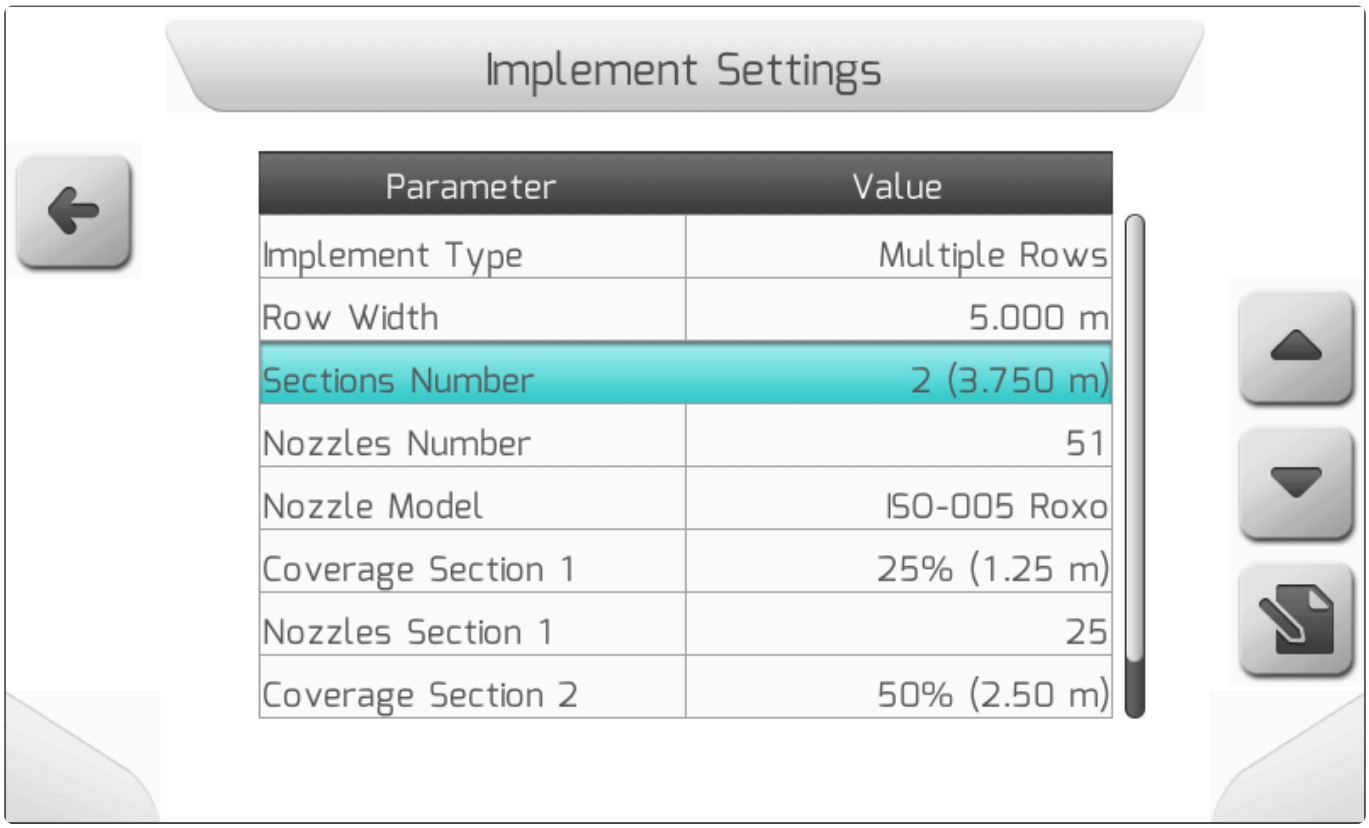
To use an implement with multiple rows coverage, simply select the option **Multiple Rows** in the **Implement type** menu.



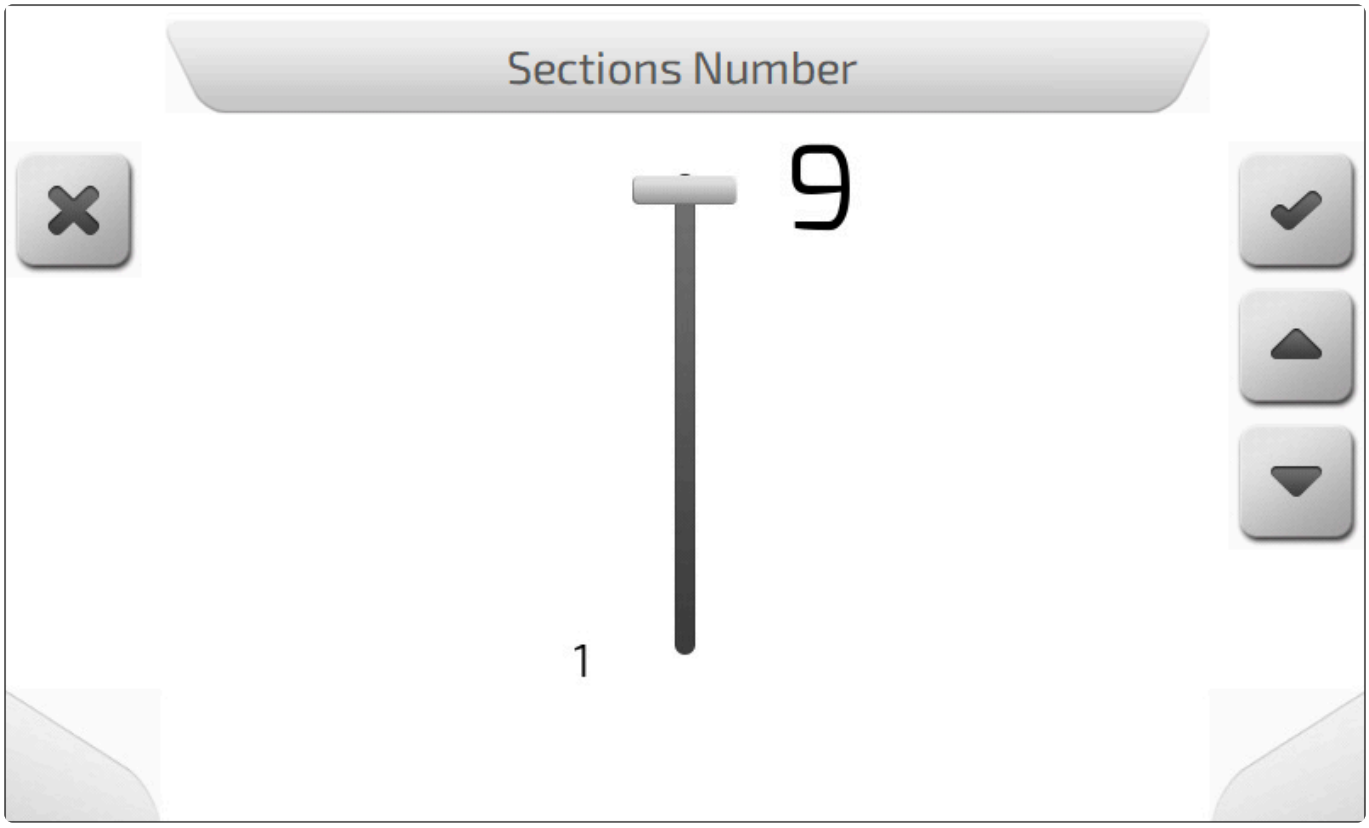

The **Implement** settings screen will be displayed as shown in the image below.



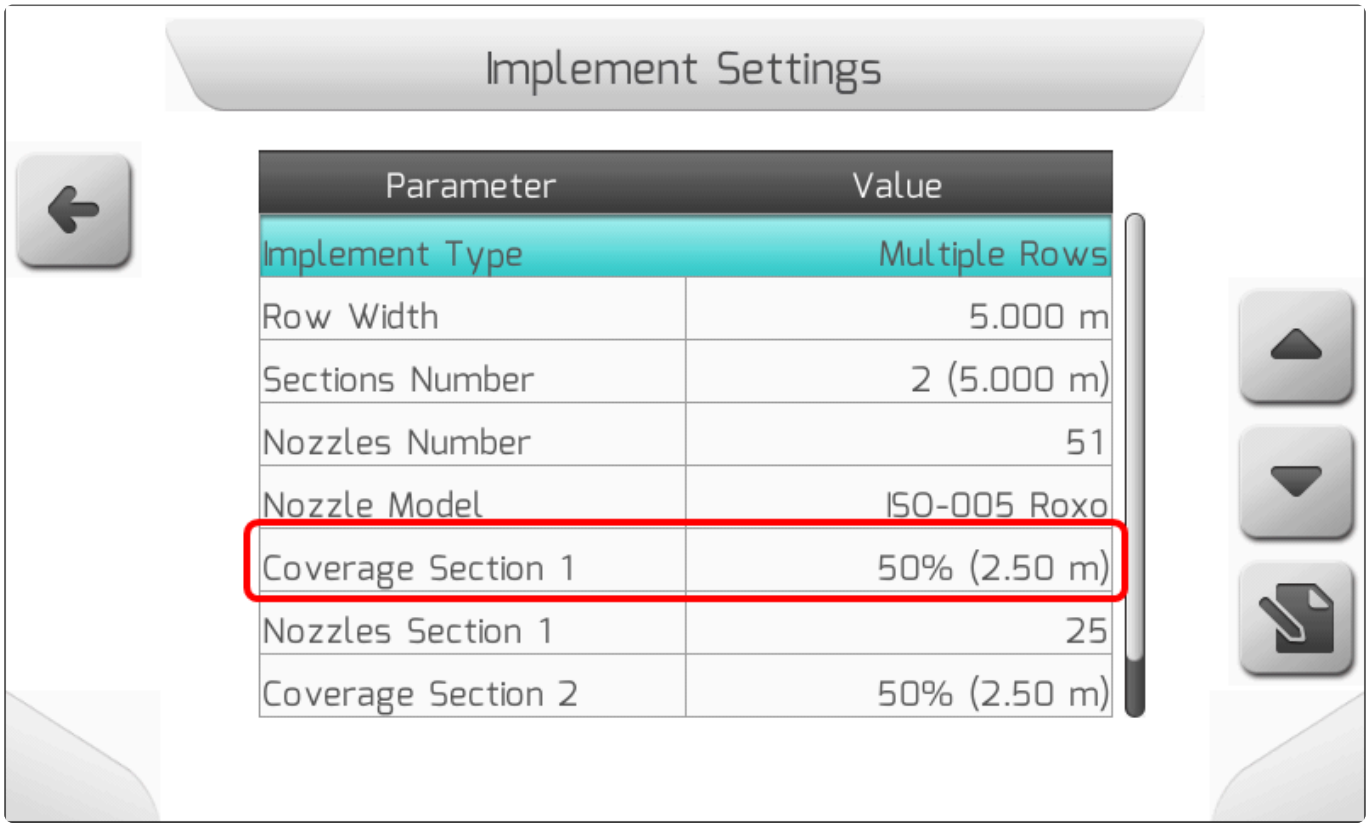

For multiple rows, the **Sections Number** menu can be configured to up to 9 sections.



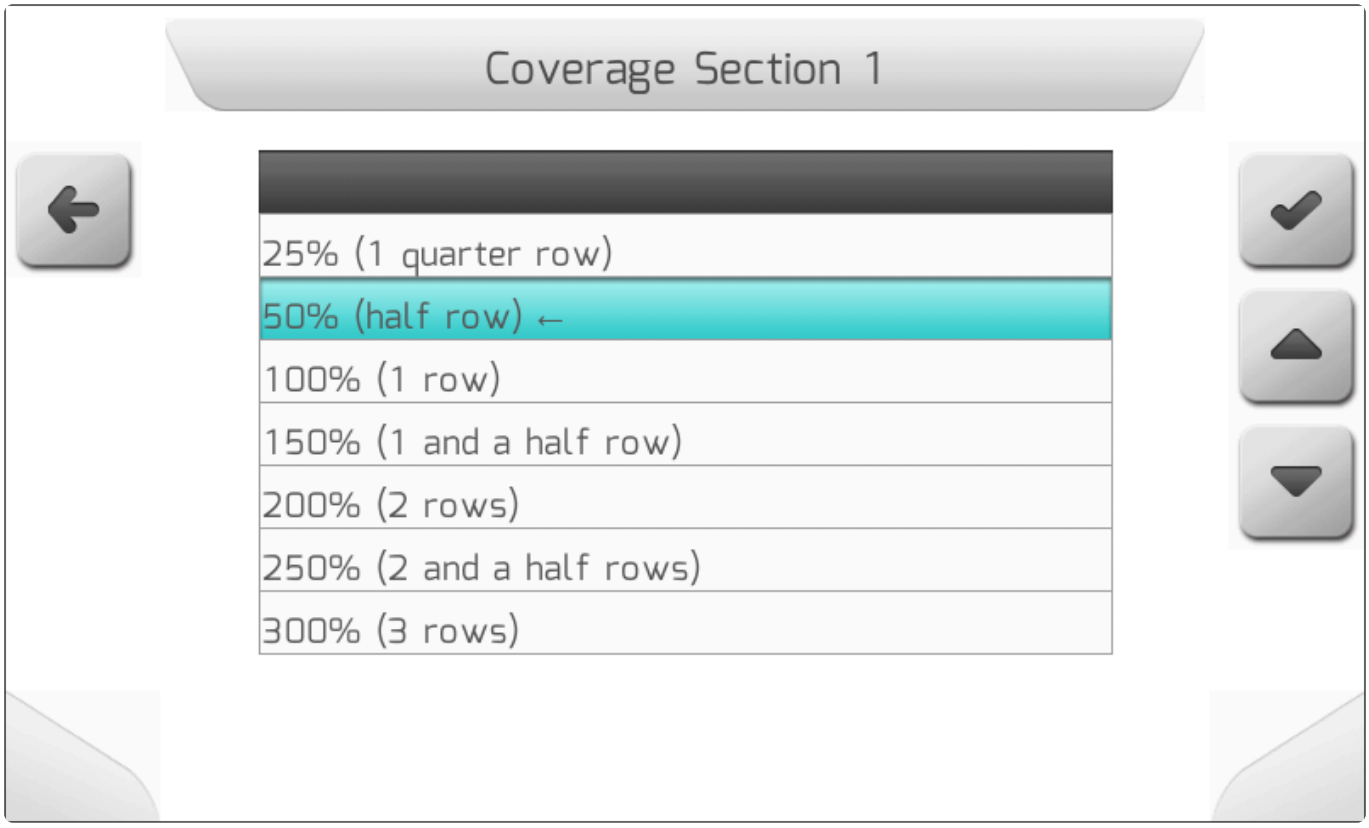

Select the desired number of sections and press the confirm button  to confirm the setting.




Now, in addition to the previous options, it is possible to choose the row width percentage that each section is able to cover.




When selecting one of the row coverage options, the menu below is displayed.




When selecting the percentage of the row width that the section will cover, the total width of the implement is recalculated.

In the single nozzle model setting, as in the single row case, the number of nozzles per section is calculated, and it is not possible to edit directly the number of nozzles in the last section.

## Tree Rows

In the Orchard spraying operation is important to know the location of the trees being sprayed. In the navigation screen, white dashed lines represent the trees lines on the map.

In the following example, a 9-section multi-row implement is configured. The first image shows an example of straight guides.

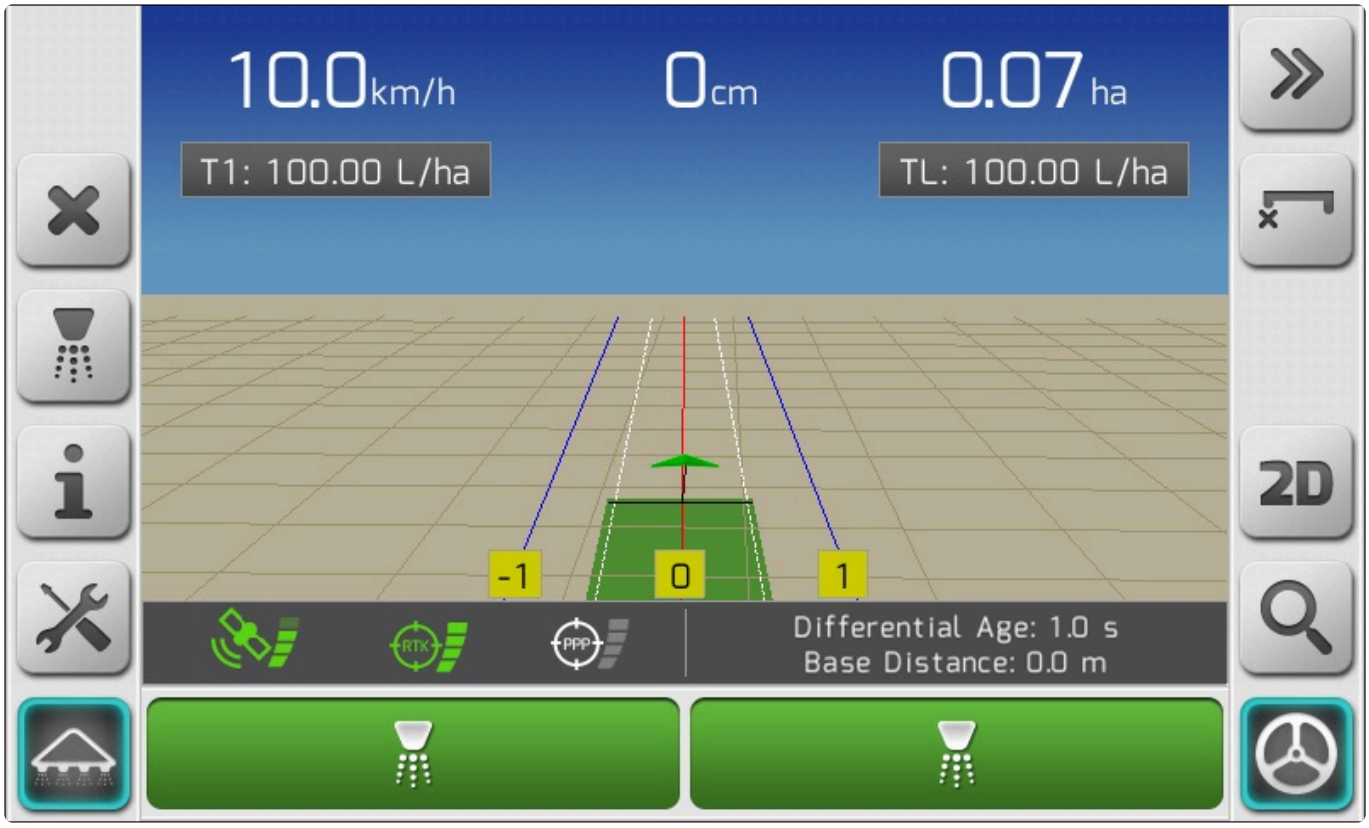



The second features curved guides.

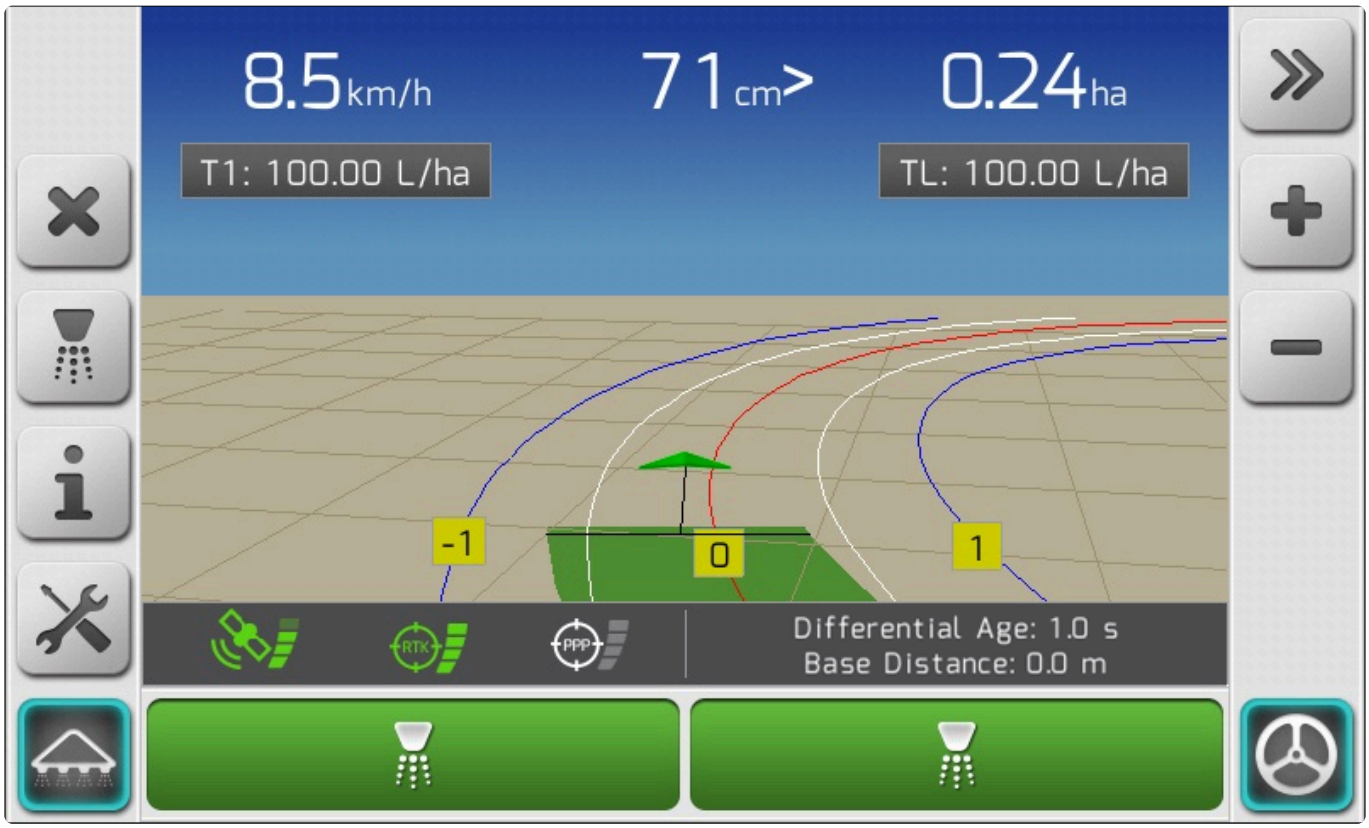



The same lines are generated for single row implement, both for straight and curved guides, as the examples below.

Straight lines:




Curved Lines:




Note that in the multiple row example, several trees lines appear, which are displayed according to the implement coverage capacity. For a single row there is only one tree line on each side of the implement.

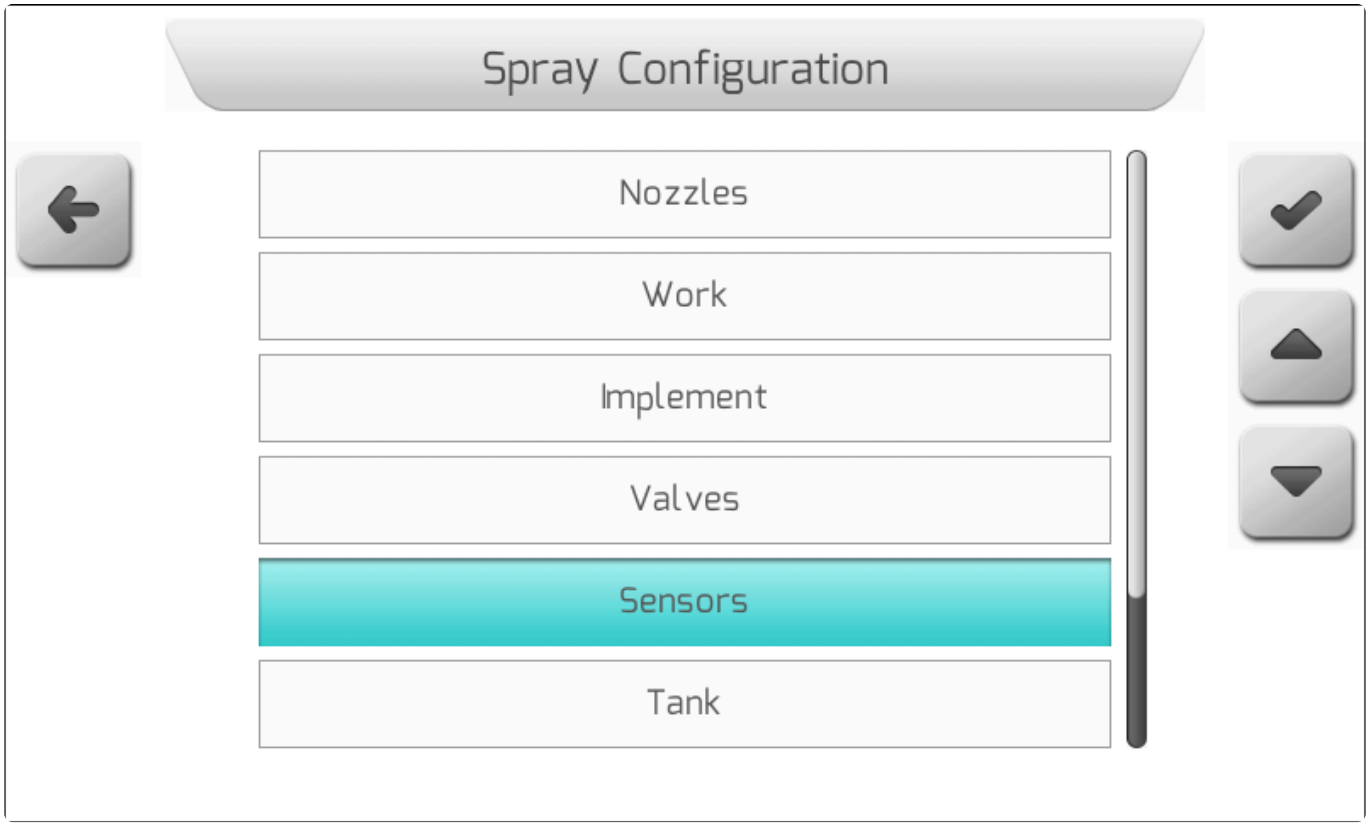
This line model will be displayed whenever a orchard license is active.

# Ultrasonic Sensors

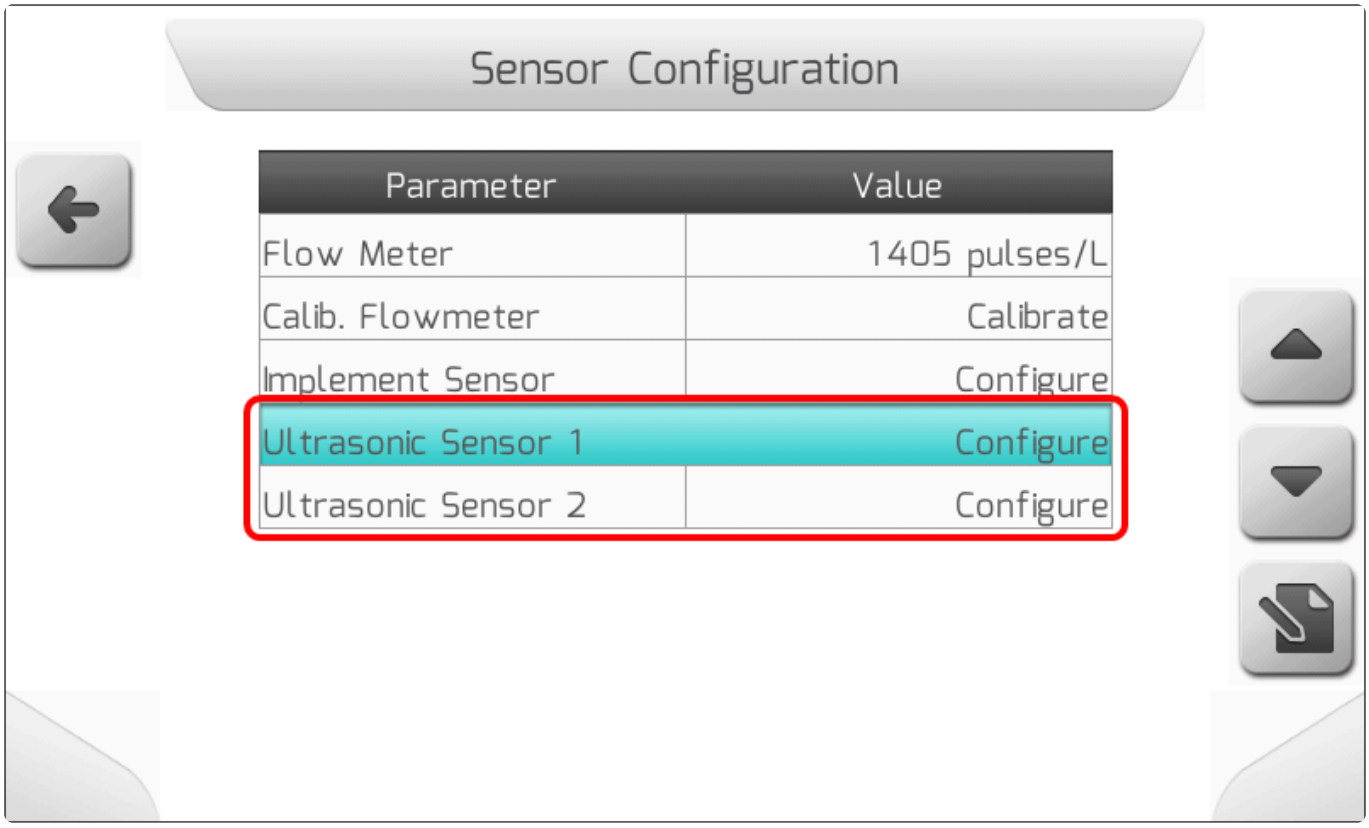
In an orchard application is possible to configure ultrasonic sensors to shut-off corresponding sections when there are no trees. It is possible to configure up to 2 sensors, which must be connected to connectors labeled **Sensor 3** and **Sensor 4** on the sprayer implement cable.

The ultrasonic sensors option will only be displayed in the **Sensors** menu when there is an active orchard license in the GeoNave system.

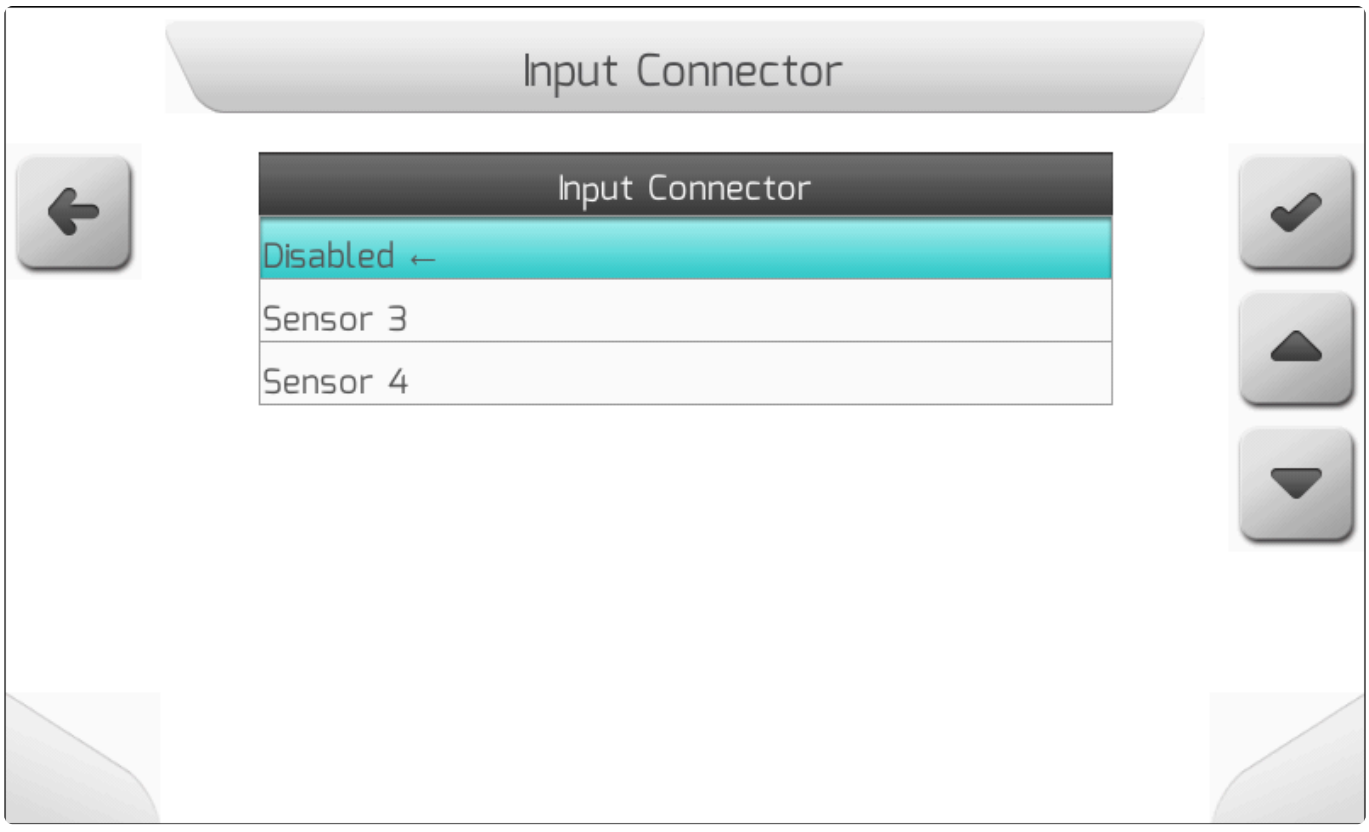
To configure an ultrasonic sensor access the menu **Settings> Spraying> Sensors**.




The settings for ultrasonic sensors 1 and 2 will be available in the options list.

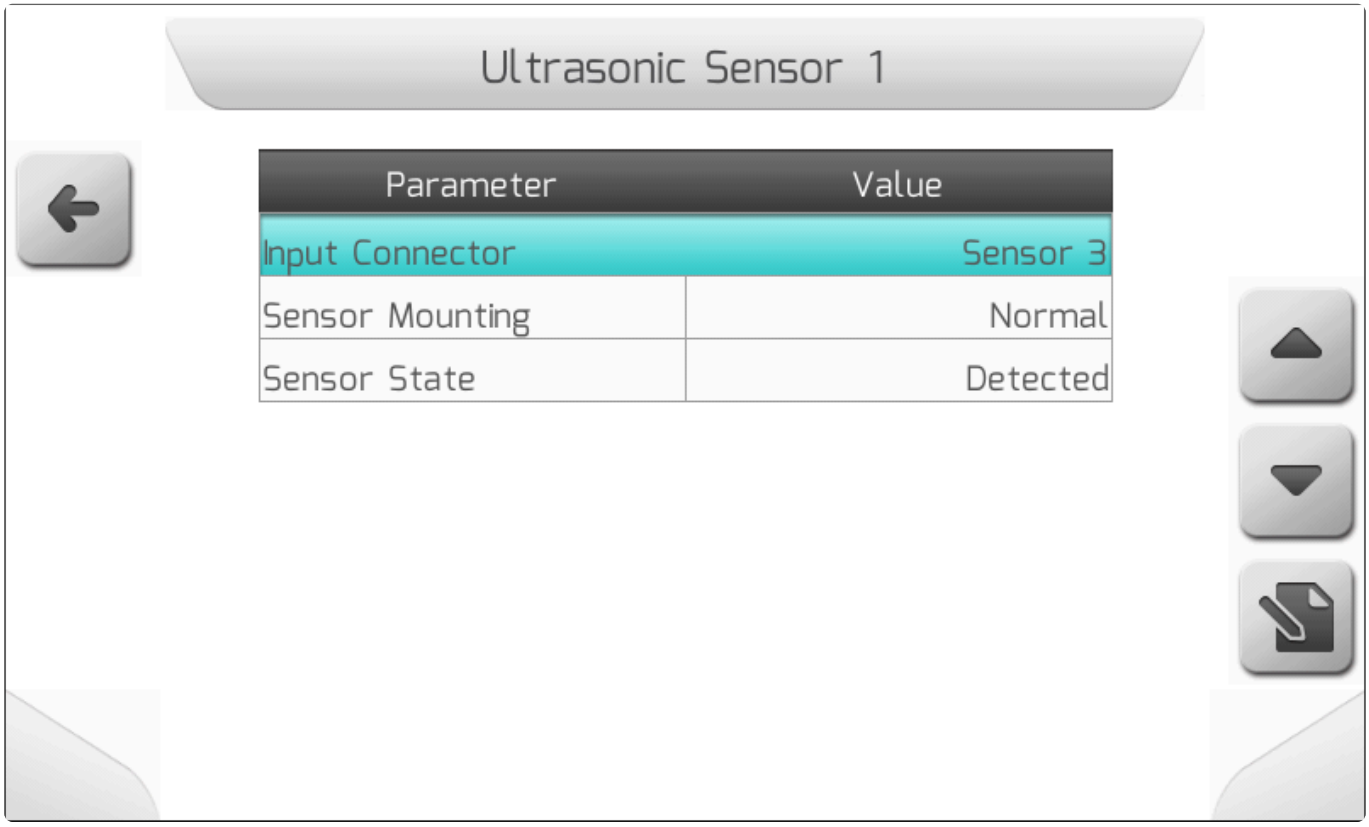



By default, initially both sensors are not configured. When opening any of the two editing screens, the **Disabled** option will be shown. Select one of the sensors and press the edit button  , choosing one of the available port options (**Sensor 3** or **Sensor 4**, depending on connection position on the cable, as mentioned earlier).



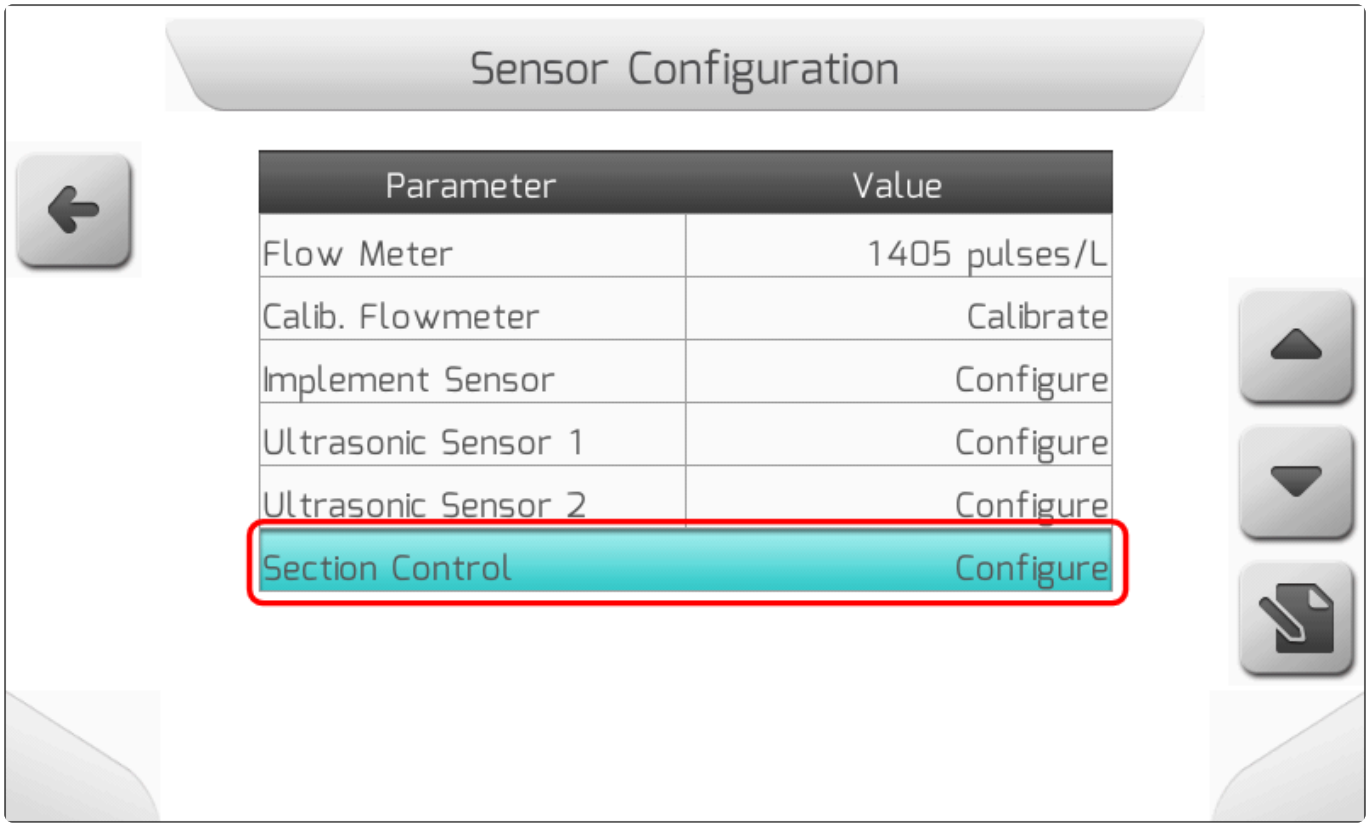
Choose an option and click the confirm button  , the sensor will be automatically linked to the selected input.

After confirming the settings, the following screen will be displayed.



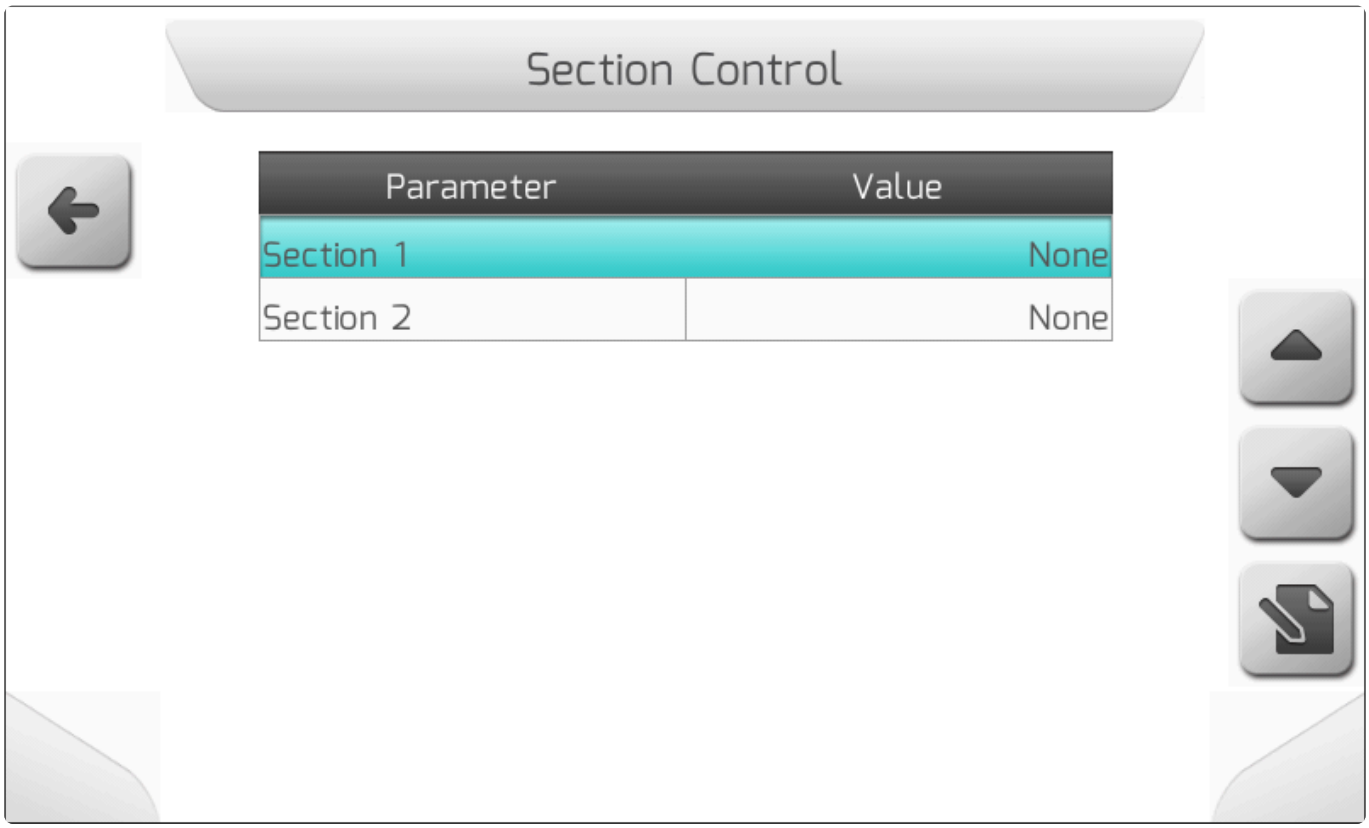

It is possible to configure whether the sensor will operate with normal or inverted logic, similarly to the Implement Sensor settings, and the sensor status is also shown, whether it is detecting an obstacle or not.

When configuring an ultrasonic sensor, the sensor setting screen gains another parameter line.



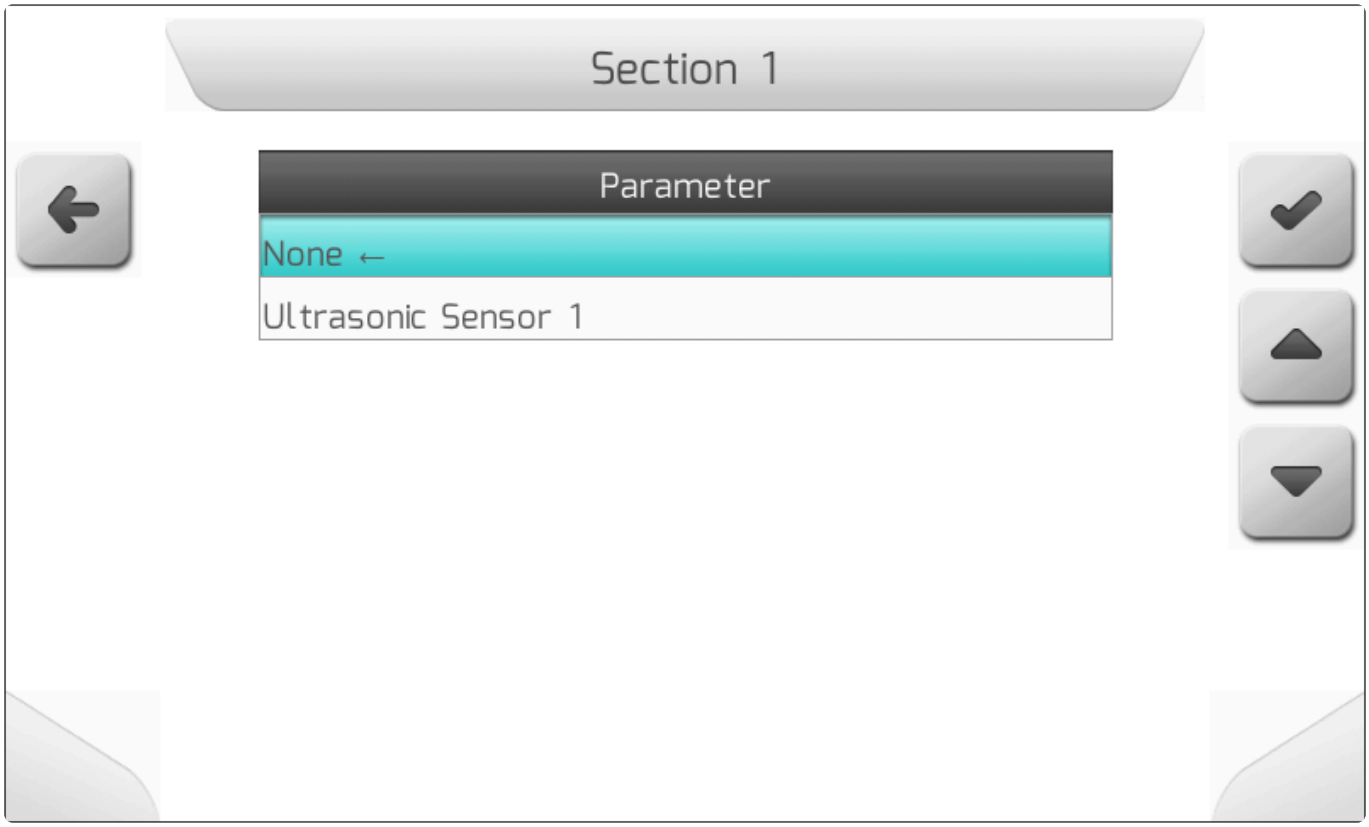

In the Section Control screen the user can configure which ultrasonic sensor will shut-off which section(s).

Upon entering this screen, the configured implement sections will be displayed.

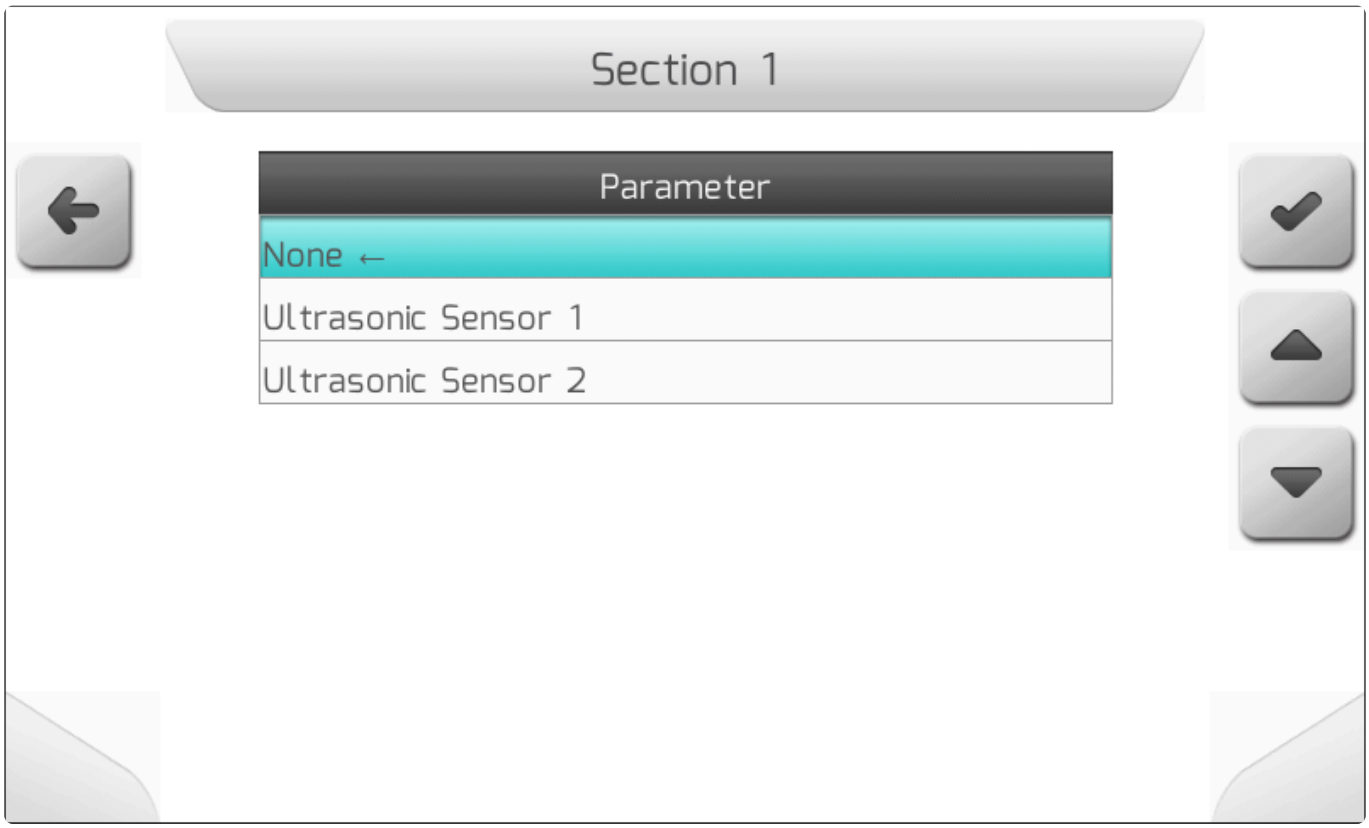



For each sections is possible to link an ultrasonic sensor, as long as it has been previously configured.

The following screen is displayed when editing one of the sections.



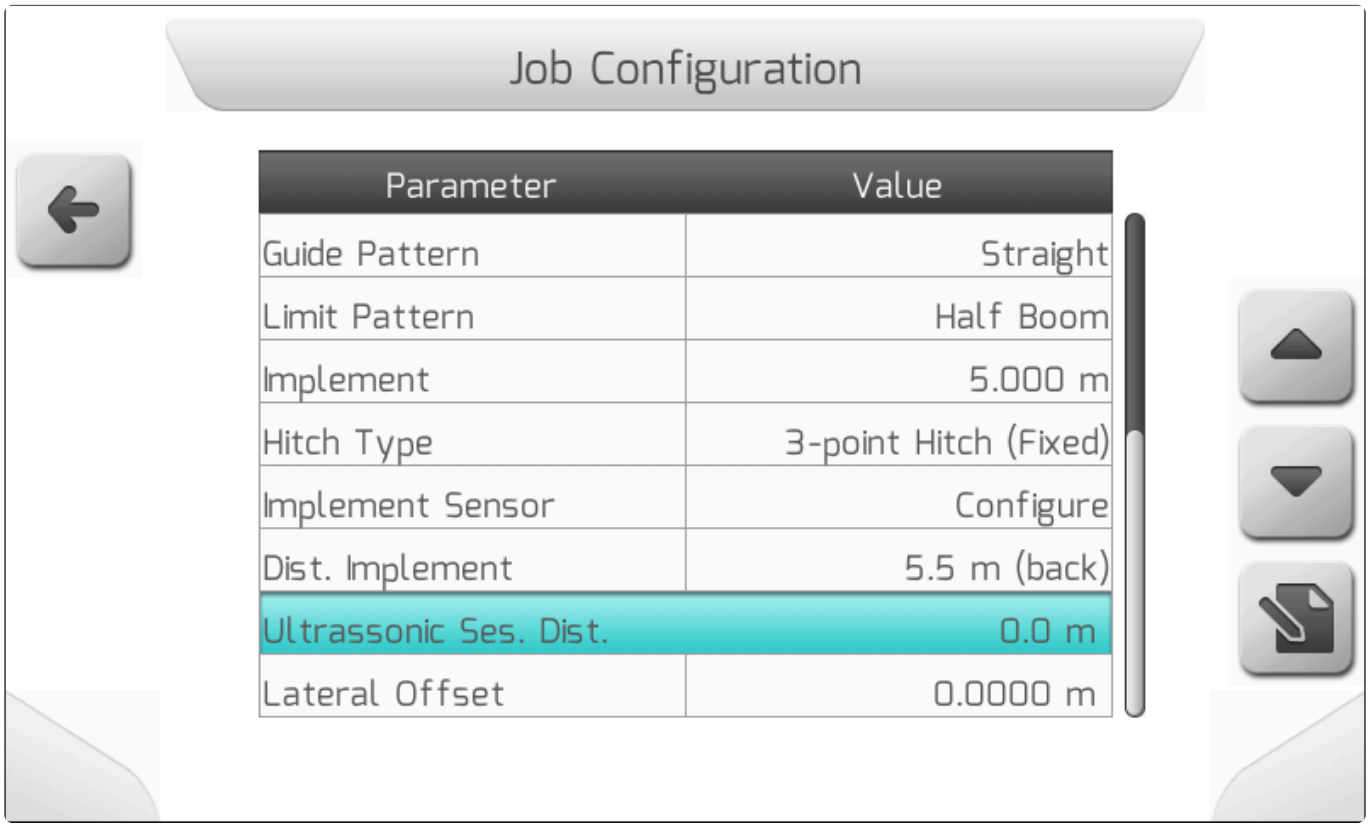

As an example, the image below shows the available options when both ultrasonic sensors have been configured.




In order to obtain a more precise section shut-off and opening, it is required to configure the sensors

distance from the GPS antenna, in the GeoNave display. This parameter allows the sections to be opened when the implement is passing through the tree and not when the sensor detects it.

To adjust this distance, configure at least one sensor, and go to the screen **Settings> Work**, select the option **Ultrasonic Ses. Dist.**, and press the edit button to set the desired distance.




This parameter initially is set with a value of 0. When editing it, a positive value means that the sensors are in front of the GNSS antenna and a negative value behind, similarly to the Implement Distance.

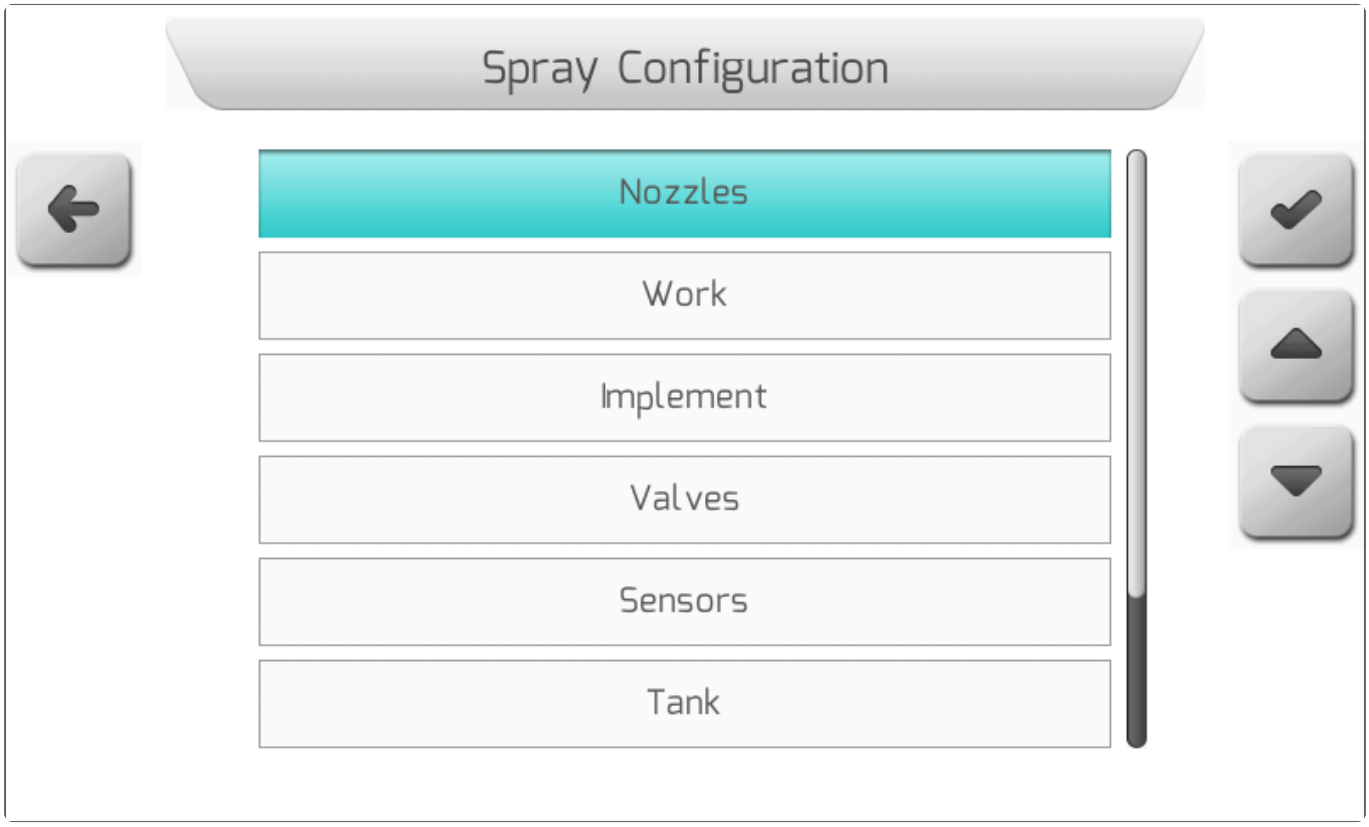
The following are some considerations regarding ultrasonic sensor configurations.

- Imagine the situation in which 8 sections are configured for a given implement. An ultrasonic sensor (ultrasonic sensor 1 or 2) is configured for each section. If, for example, the user changes the number of sections to 4, sections 5 to 8 will automatically be reconfigured to no ultrasonic sensors pairing. Thus, if immediately after the user returns to the previous configuration of 8 sections, sections 5 to 8 will appear **none**, being required to reconfigure the sensors that should control those sections.
- A section that has not been linked to an ultrasonic sensor, even when a sensor is configured, will be controlled by the section buttons at the bottom of the navigation screen, or by automatically shut-off sections when overlapping a trail or leaving a boundary.
- The distance between the ultrasonic sensors and the GNSS antenna cannot be individually configured for each sensor, the two sensors must be aligned in relation to the machine longitudinal axis.

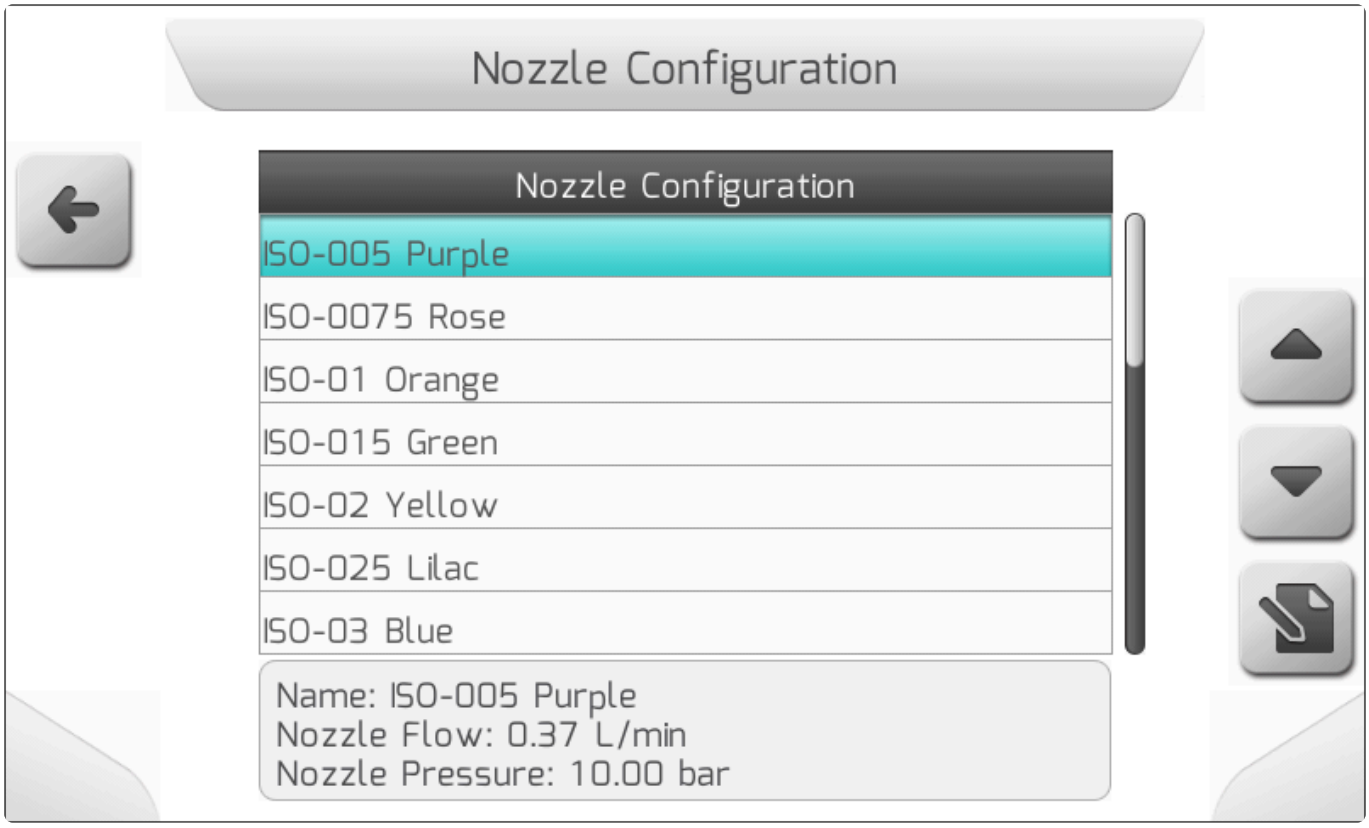
# Configuration of Multiple Nozzle Models in the Implement

The Orchard module supports multiple nozzle models in the same section. There is a table with the models available for use, containing standard factory models and some slots for creating personalized nozzles, according to every need. Standard nozzle models can also be edited as needed.

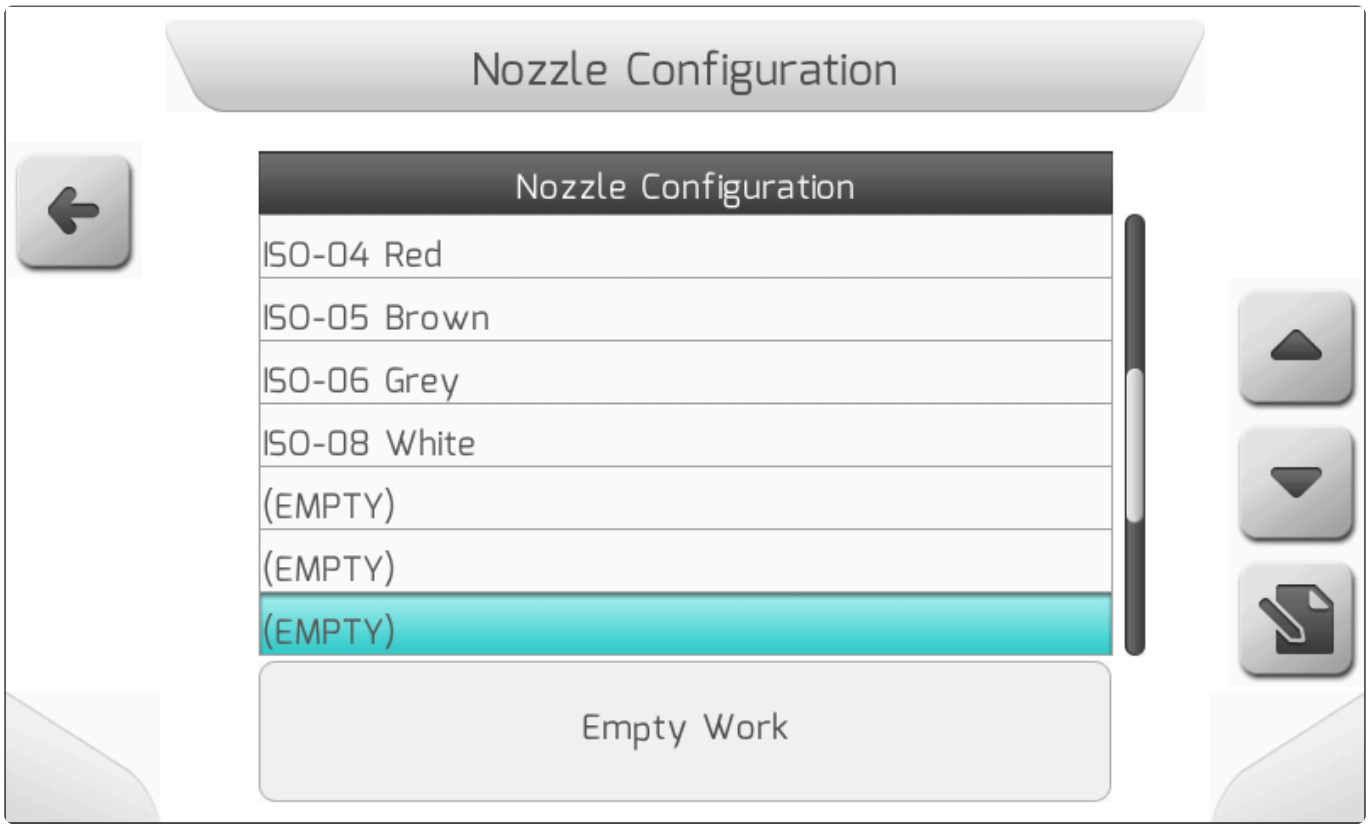
To access this table, access the **Settings> Spraying> Nozzles** menu.




The nozzle models list currently configured will then be displayed.



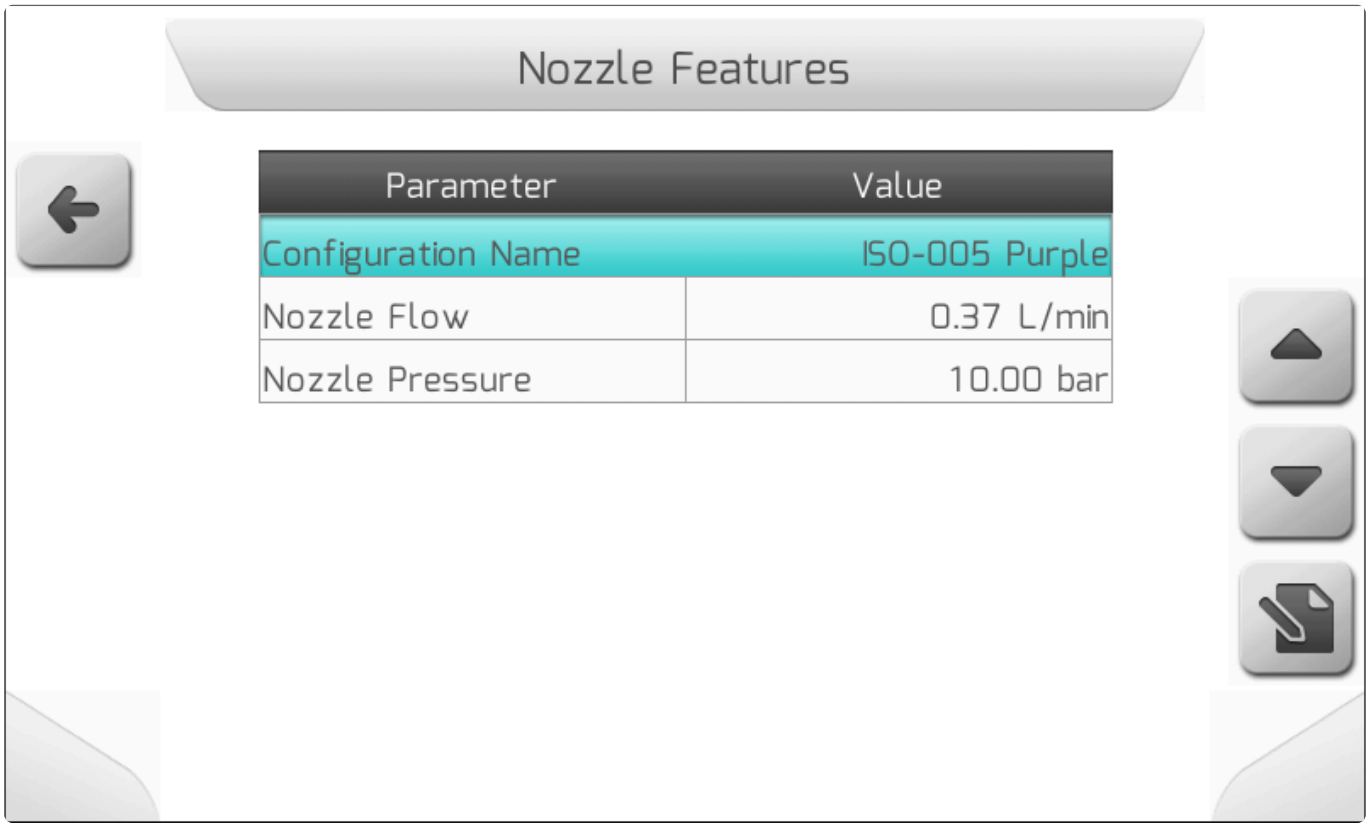

After standard templates, empty slots for custom templates will be displayed.



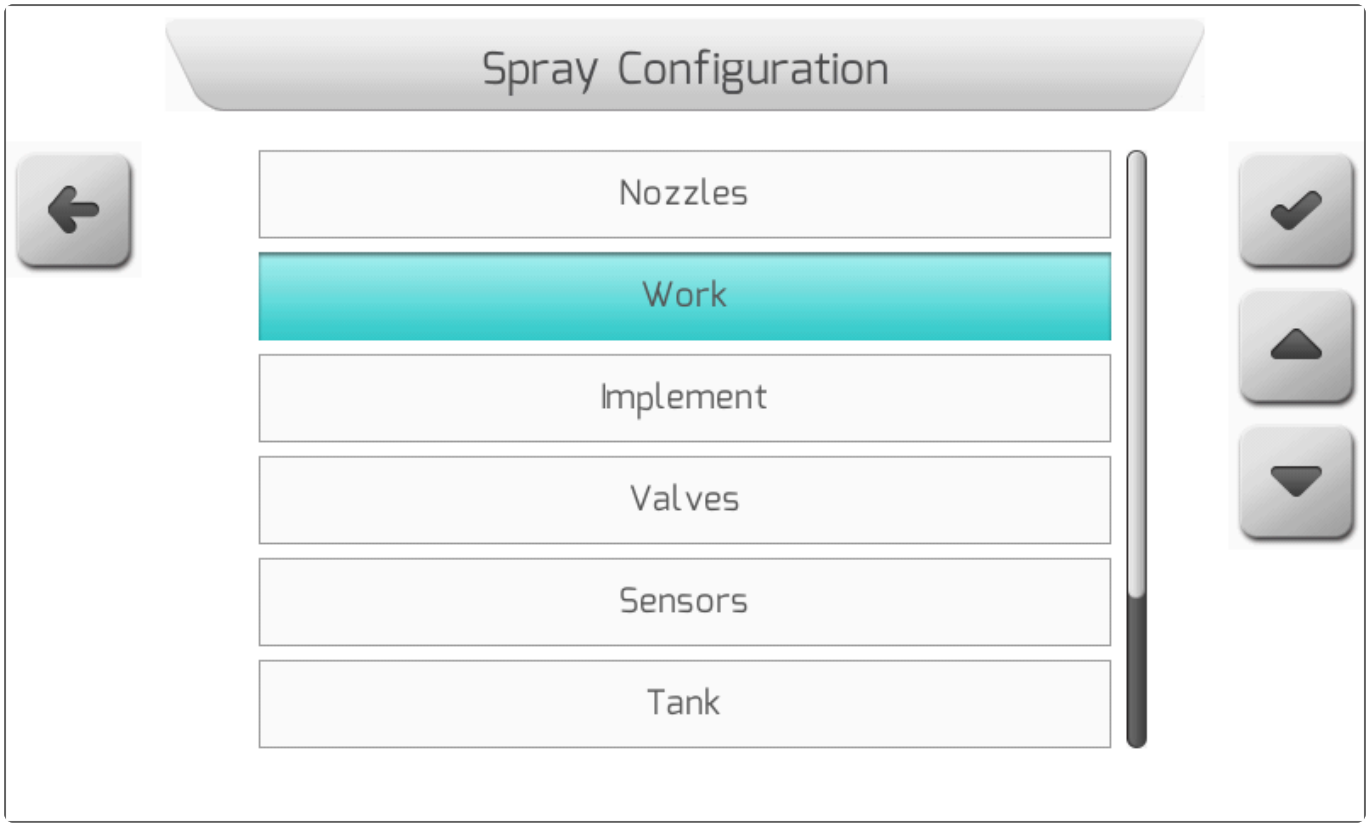

When browsing the nozzle models, informations about their characteristics are displayed at the bottom of the screen. It is important to keep these values consistent with the actual nozzle nominal pressure and flow values informed by the manufacturer, as these are used for calculations during system operation. If incorrect values are used as reference for calculation, it will result in wrong information to the user.

In this list is not possible to select the nozzle model, just edit the existing models and create custom models.

When editing one of the nozzles via the button  , a screen with the editable characteristics will be displayed.

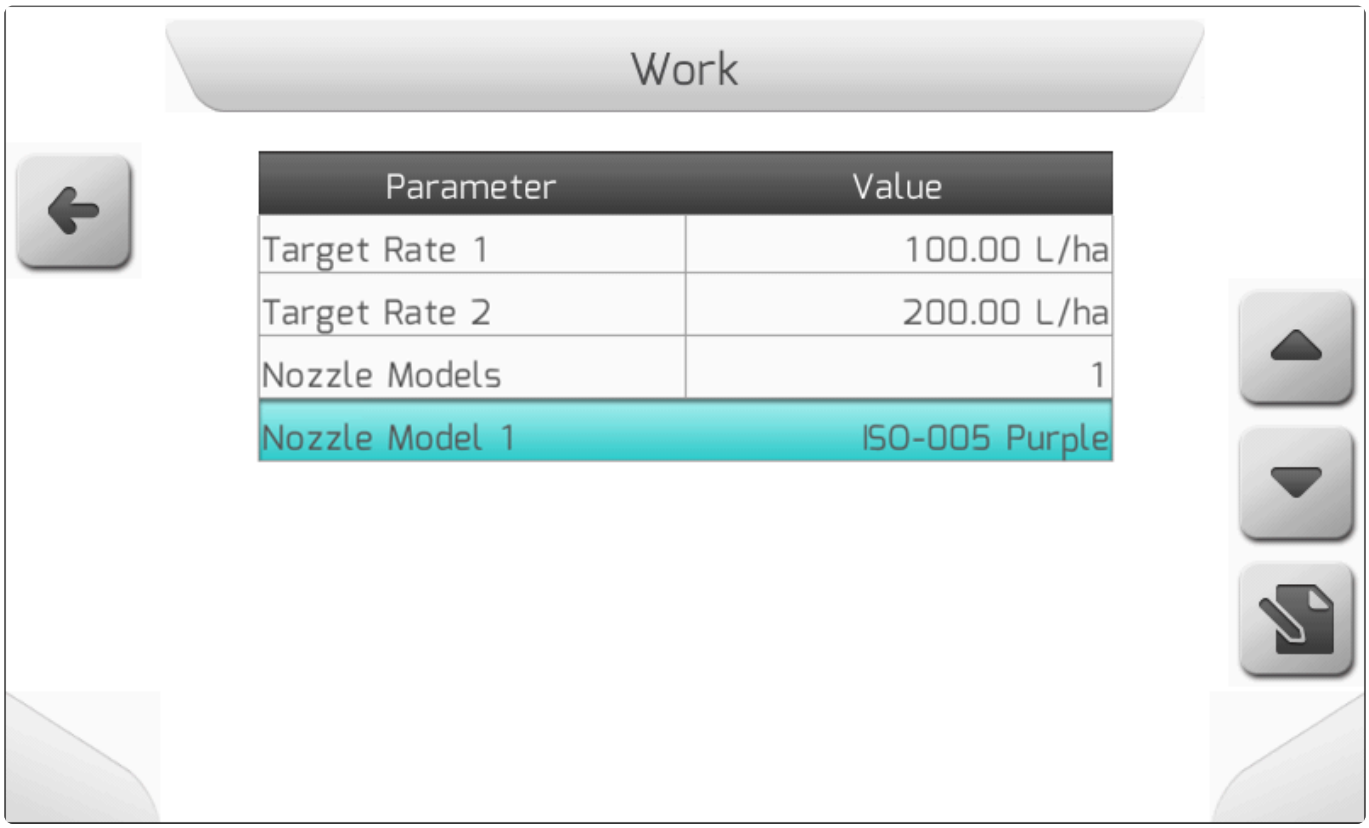



To select a nozzle model to be used, go to the **Settings> Spraying> Work** menu and press the confirm button  .



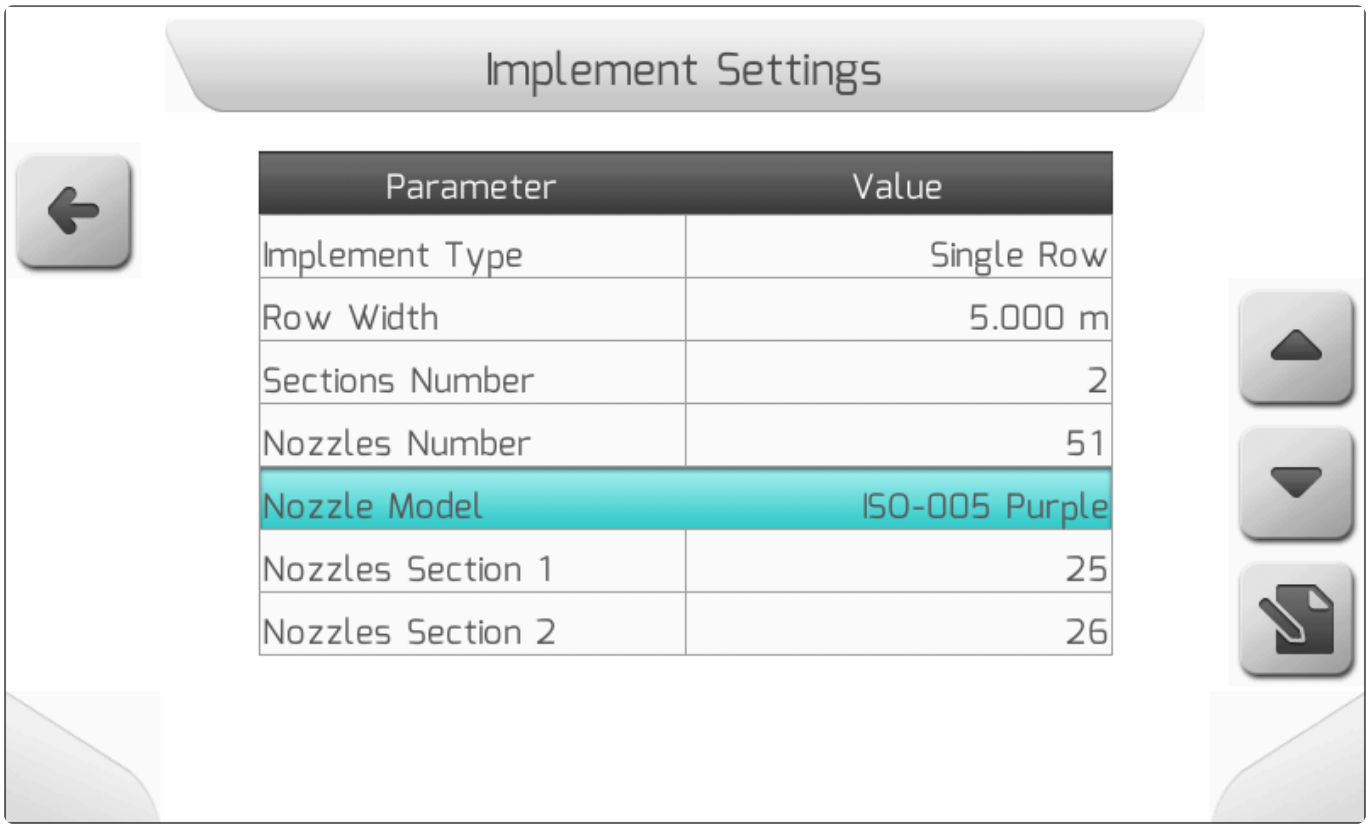

In the Work menu it is possible to edit the application rates, the number of nozzle models that will be used for the work and to select the nozzle models that will be used.

In the example below, a single nozzle model is configured.

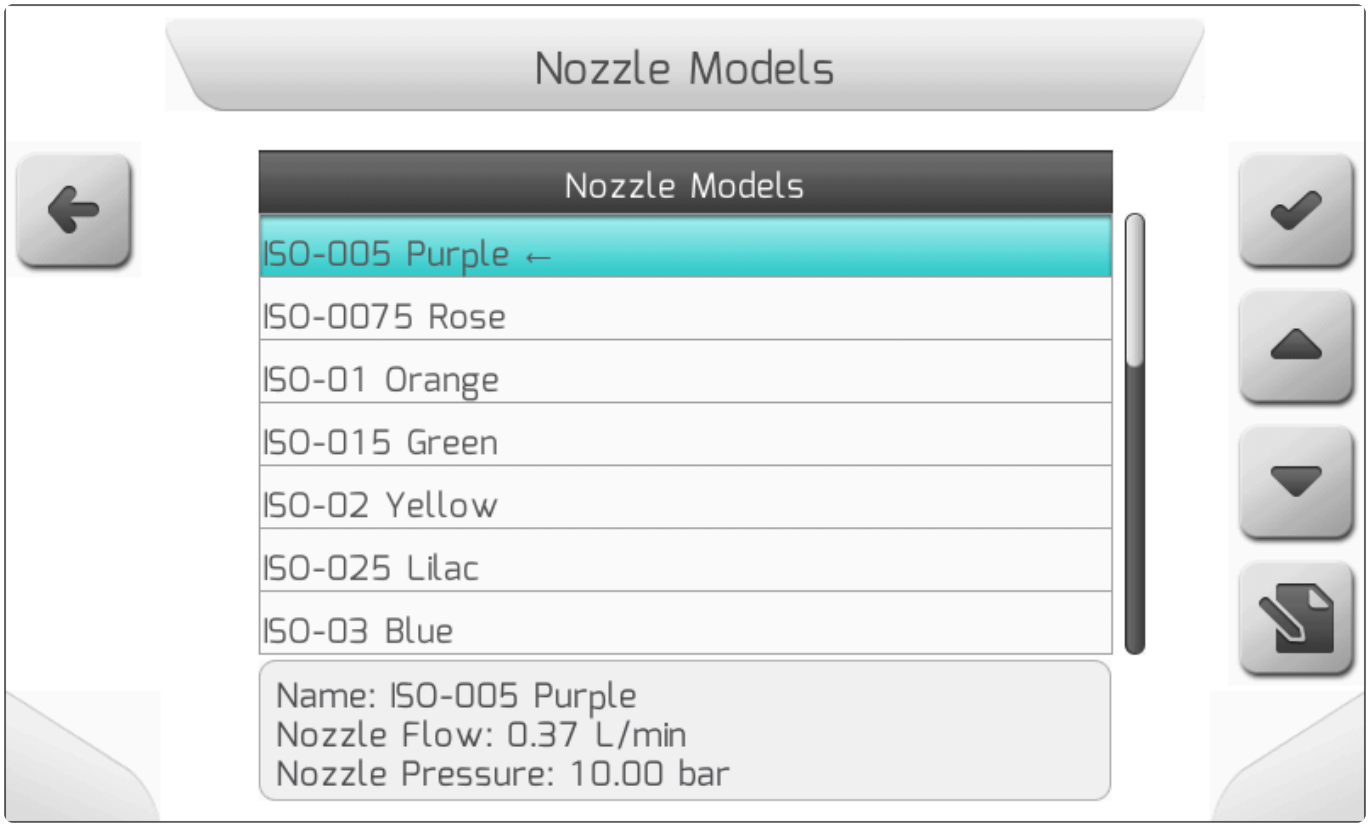



The nozzle **ISO-005 Purple** is configured according to factory default.

**When a single nozzle model is configured**, it will be used for all nozzles on the implement, and the model can be selected from different menus. The first is shown above, the second is in the **Nozzle Model** item from the **Settings> Spraying> Implement** menu.

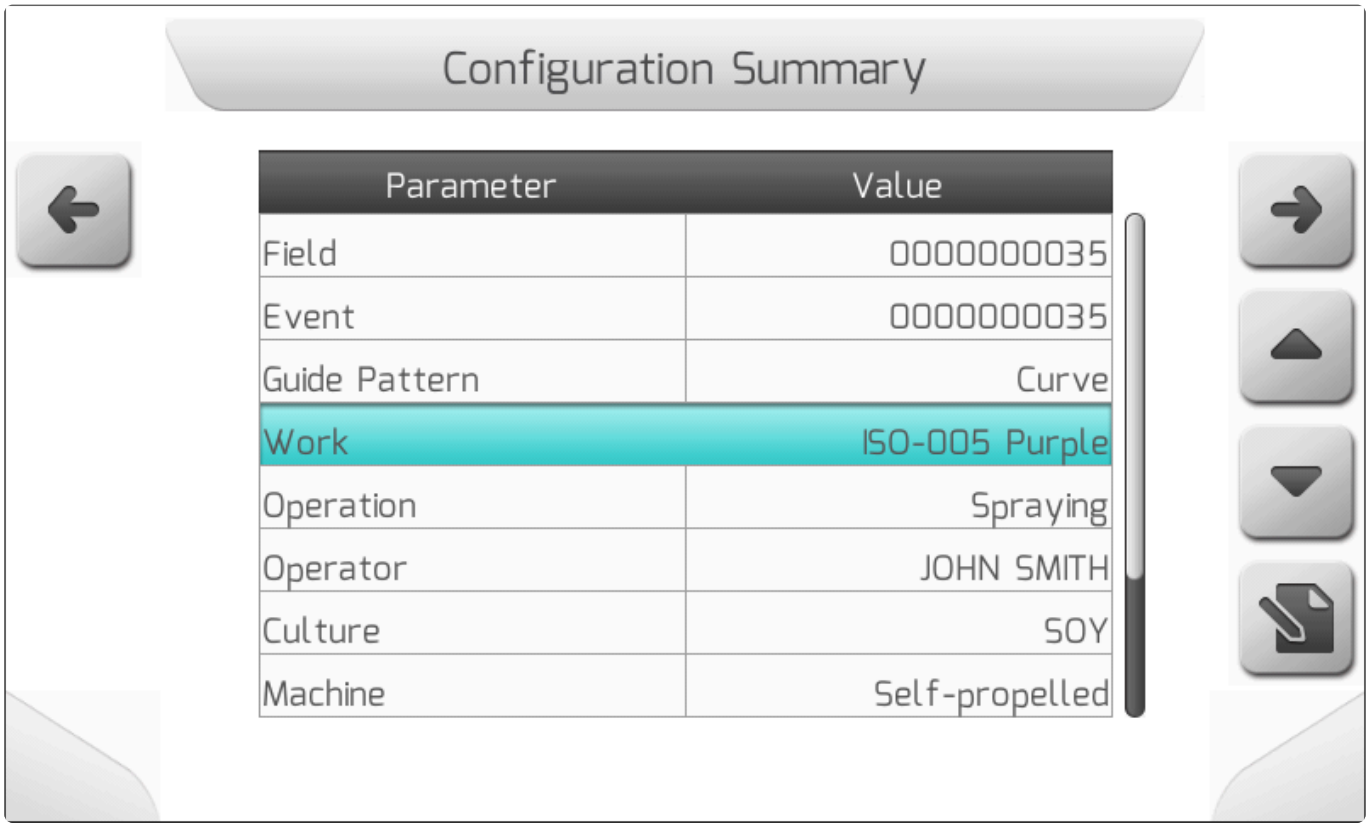



Clicking the edit button  , the nozzles list will be displayed and the user can select one from the available models (positions of the list that are filled in as **(EMPTY)** cannot be selected).

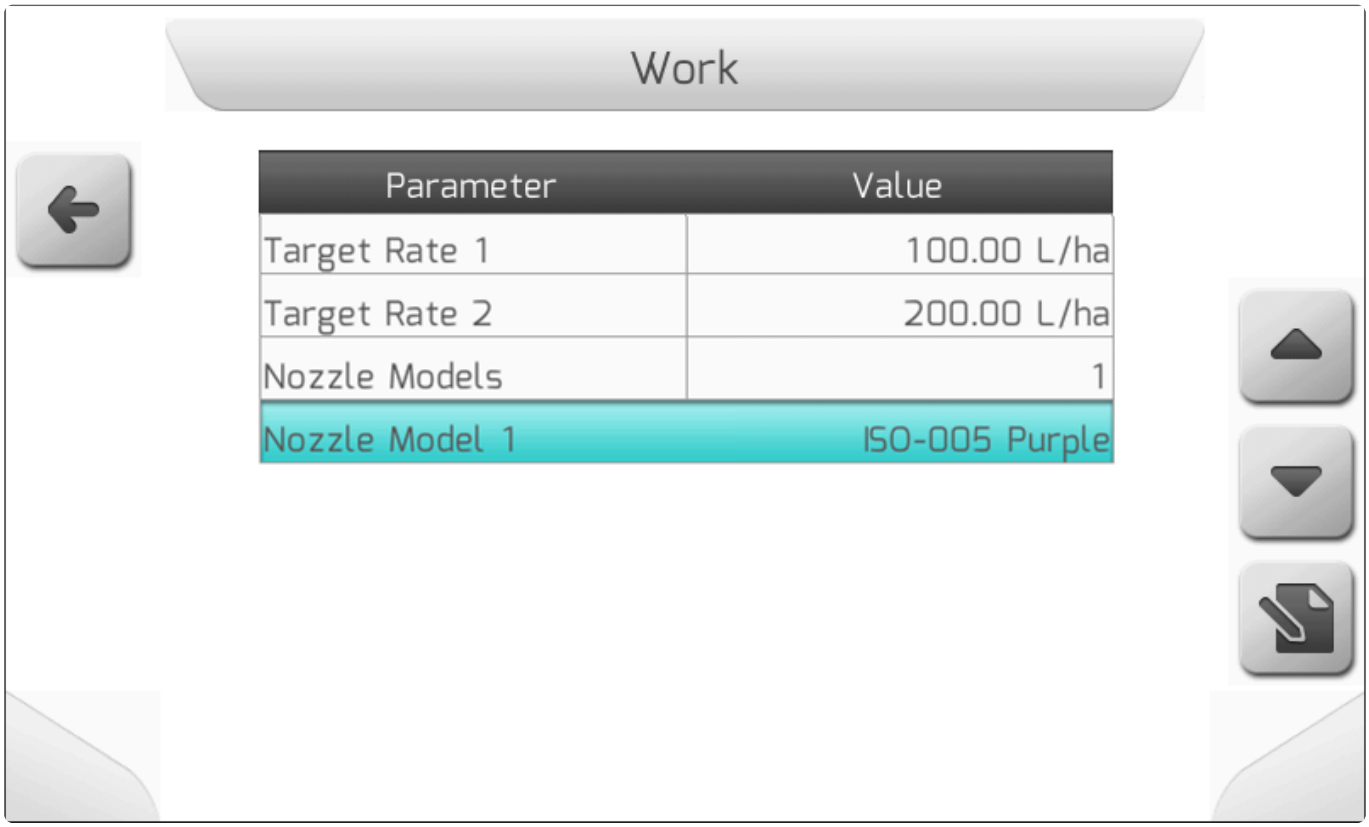



When clicking on the nozzle model editing option on the work screen (3 figures above), the previous screen will be displayed for model selection.

There is also a third location where the user can select and edit the nozzle model – the **Configuration Summary** menu. Accessible through the **Navigation> Build Field> Work** menu.

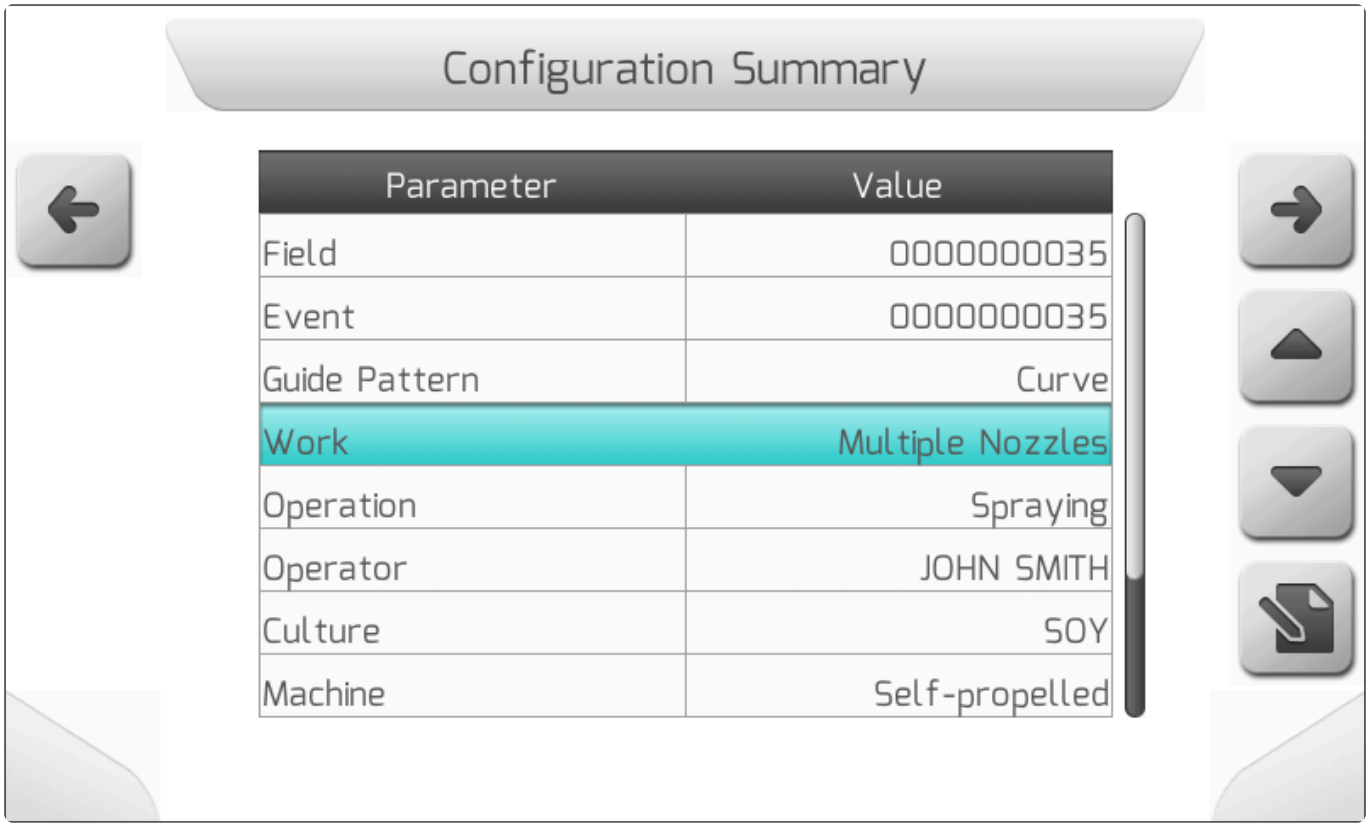


Configuring a single nozzle model, when clicking on the edit button  , the **Work** setup screen will be displayed.

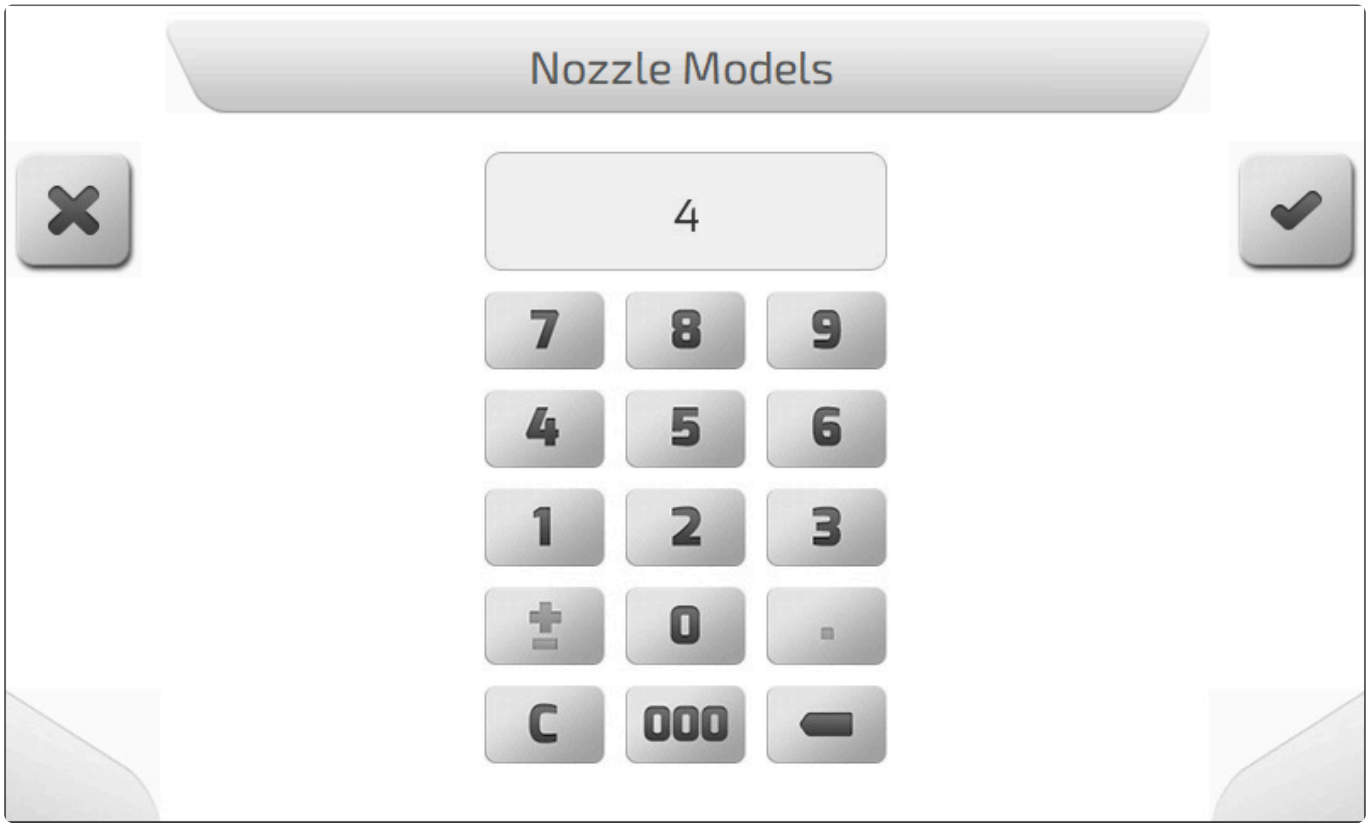



Where, in addition to the nozzle model, also application rates can be changed, if necessary.

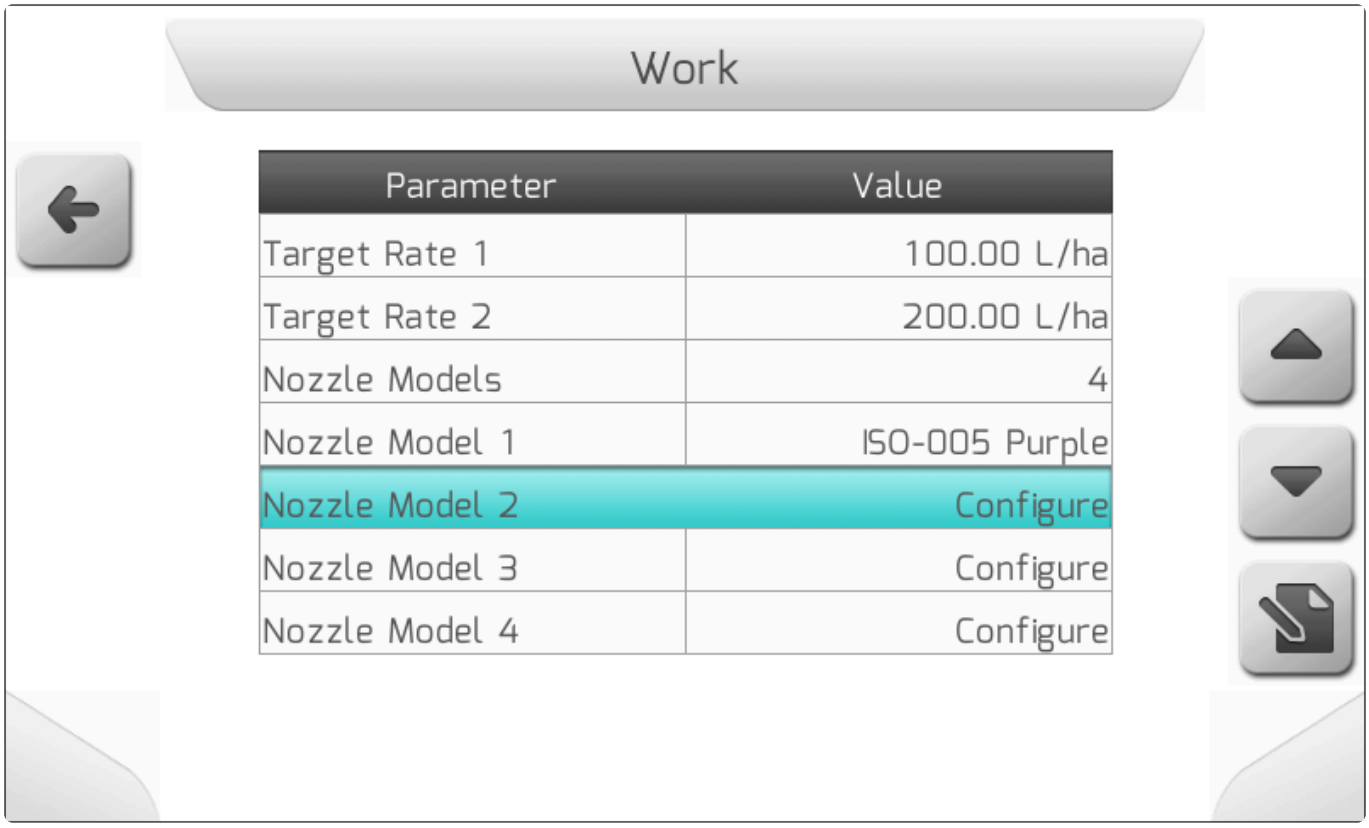
If multiple nozzle models are configured, the **Work** option from the navigation configuration summary screen will show the information **Multiple Nozzles**. In this situation, it will not be possible to edit the work on the Configuration Summary screen.




As an example of multiple nozzles configuration, 4 models will be used (the maximum allowed is 9 models), configured on the **Work** screen.



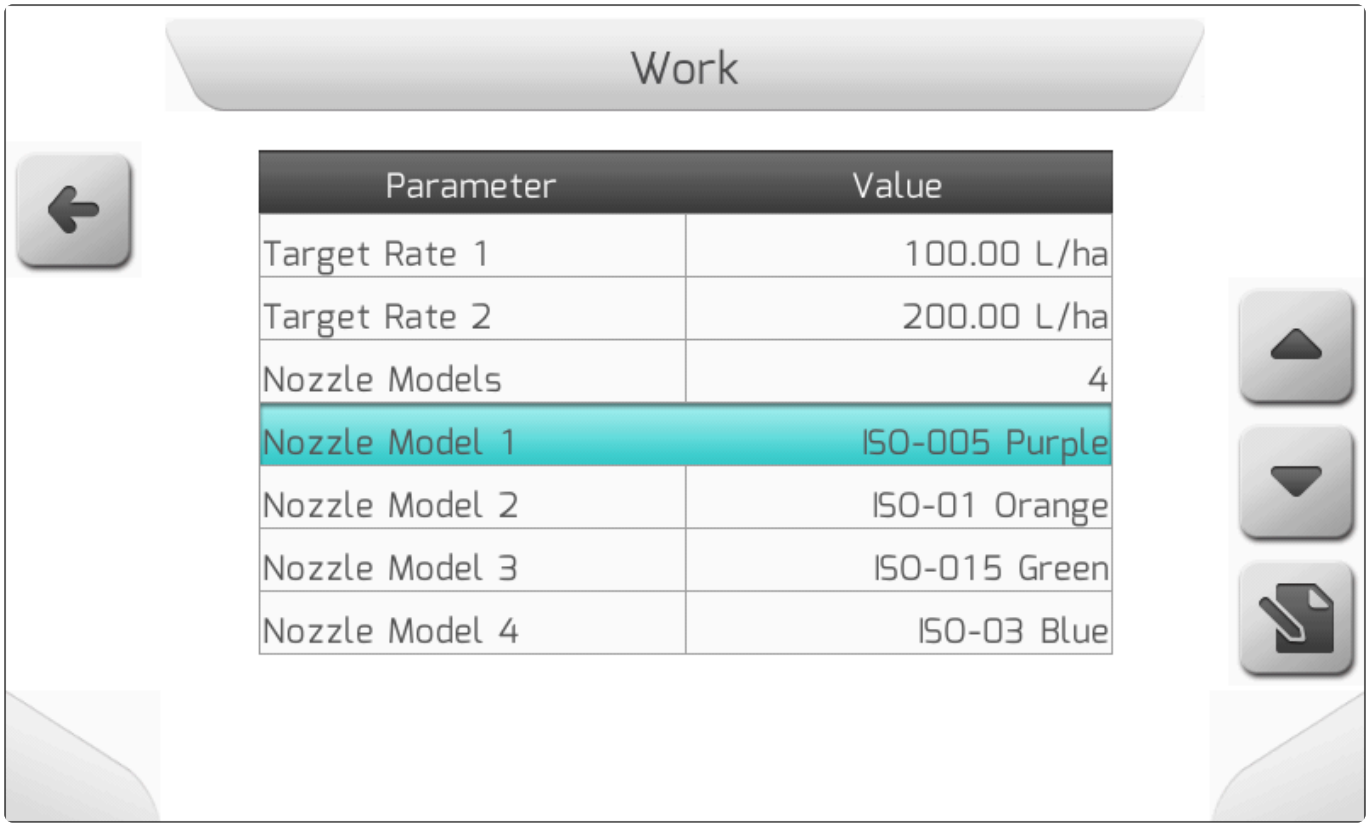

After confirming the parameter setting by pressing the confirm button  , the Work screen will be presented as follows.




By default new nozzle models are initially not configured. The GeoNave display makes no suggestion of models, it is the user's responsibility to perform this configuration.

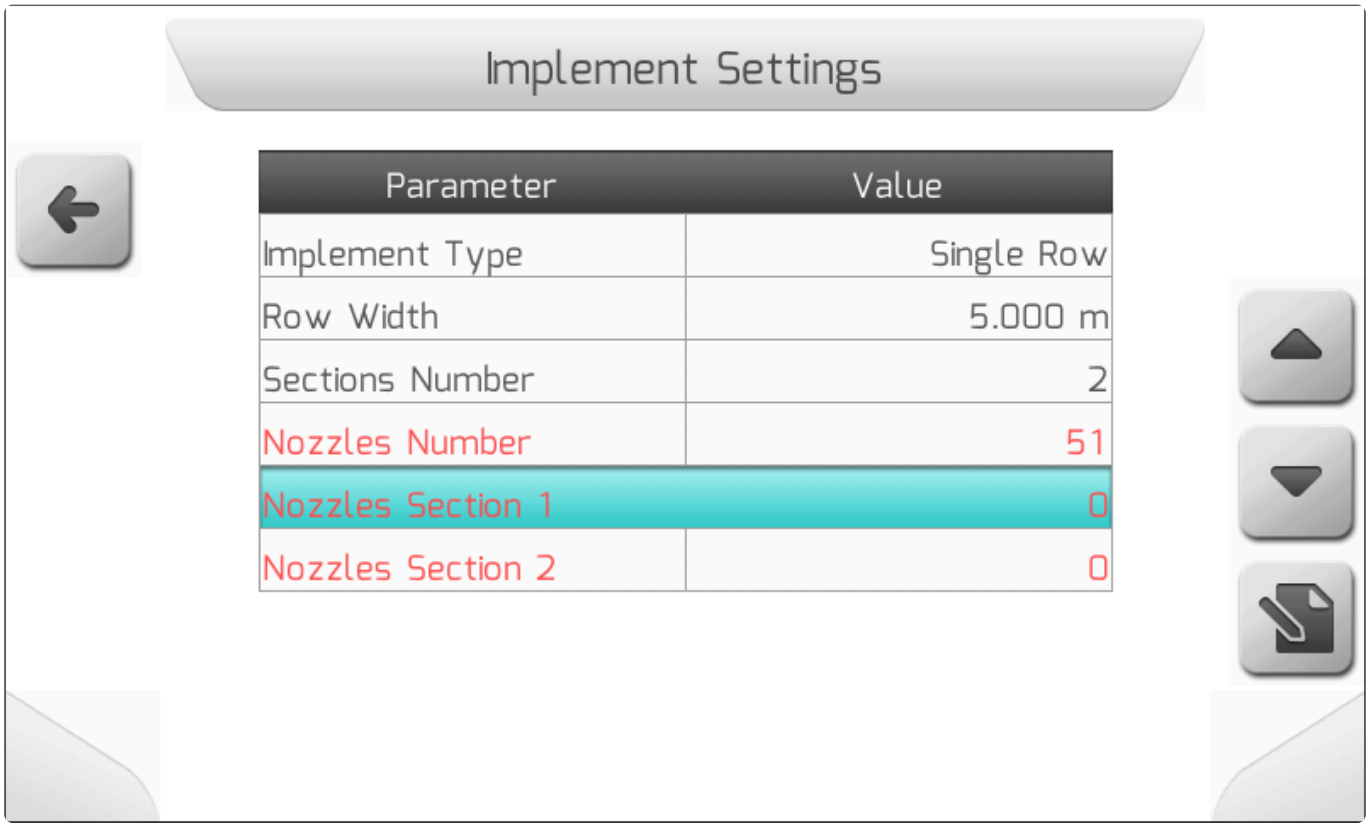
Added nozzles must be configured so that they can be selected for the operation. Nozzles that are not assigned to a valid model cannot be used on the implement.

As an example, the nozzle models have been selected as follows.



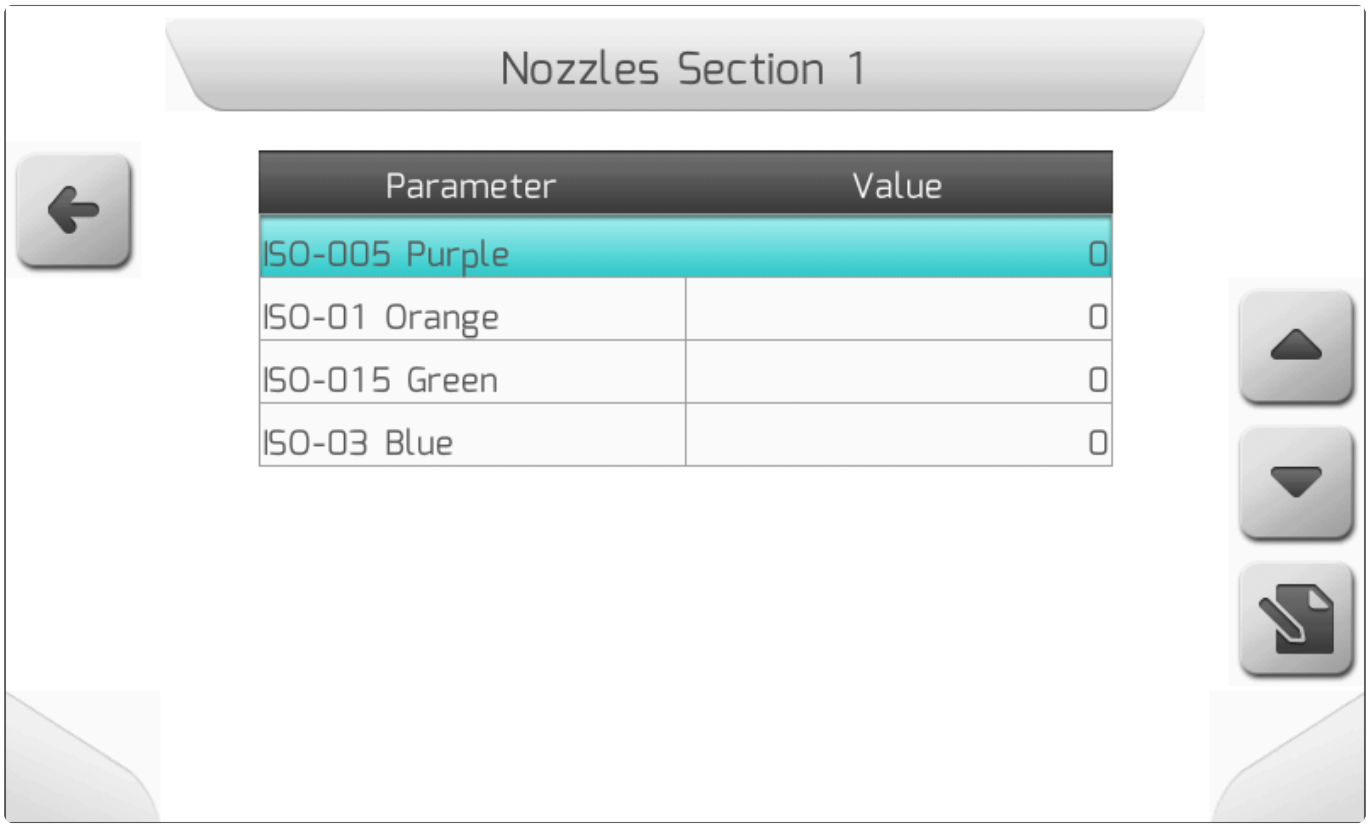

The multiple nozzle sections configuration will be exemplified below for a simple row case. The procedure for multiple rows is identical, as are the functionalities.

After configuring models 1, 2, 3 and 4, the user must access the implement settings screen at **Settings> Spraying> Implement**. The screen will be displayed as follows.



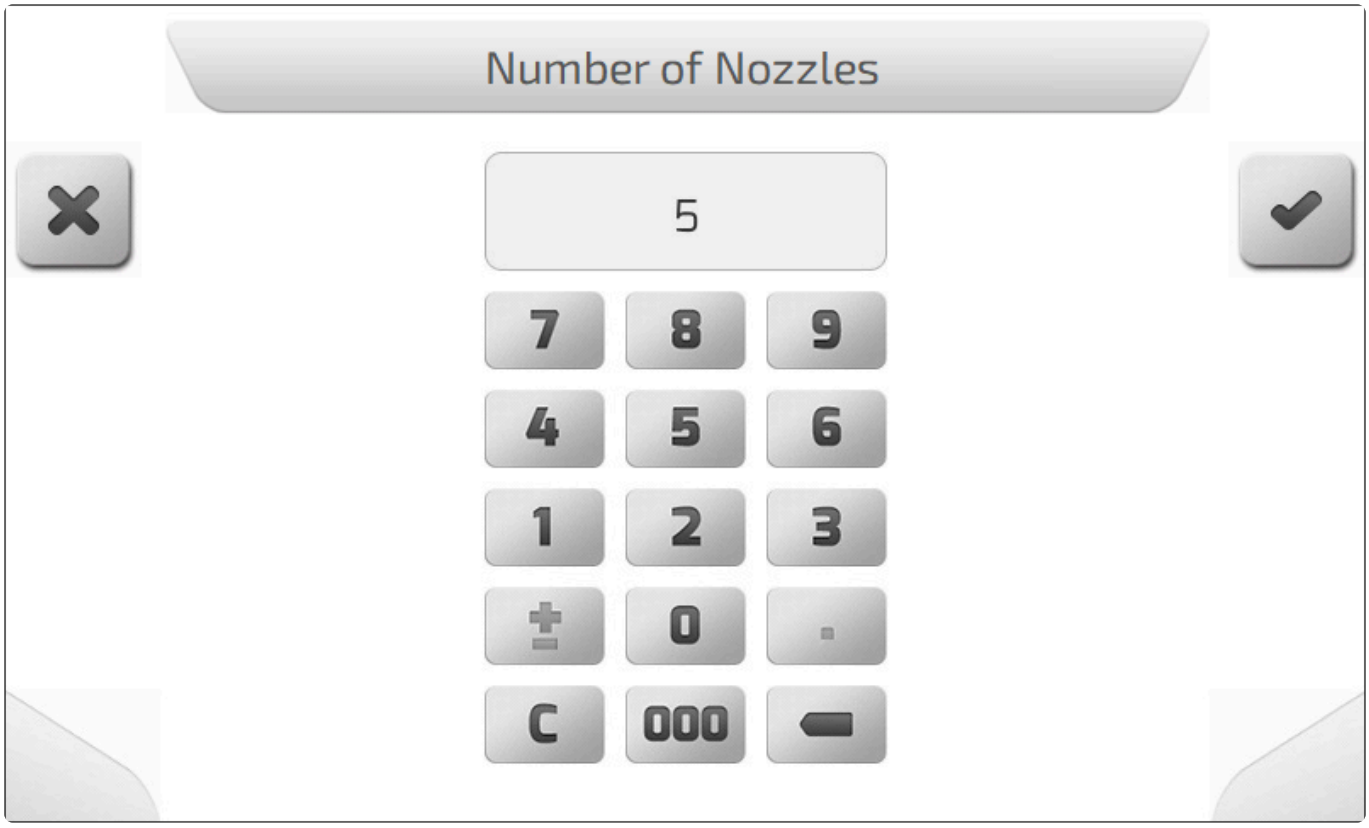
For multiple nozzles configuration, due to the fact that there are different nozzle models, the nozzles number per section is not suggested because it is not possible to predict the quantity of each nozzle model used in each section. The user must enter each quantity manually, the **Nozzles Number** in red indicates that the total nozzles number configured in the implement is less than the nozzles number that the implement will have (the GeoNave display does not allow any extrapolation of this number). After all the nozzles have been correctly configured for the sections, the **Nozzles Number** parameter will be displayed in green.

When selecting one of the sections for editing via the button  , the following screen will be displayed.

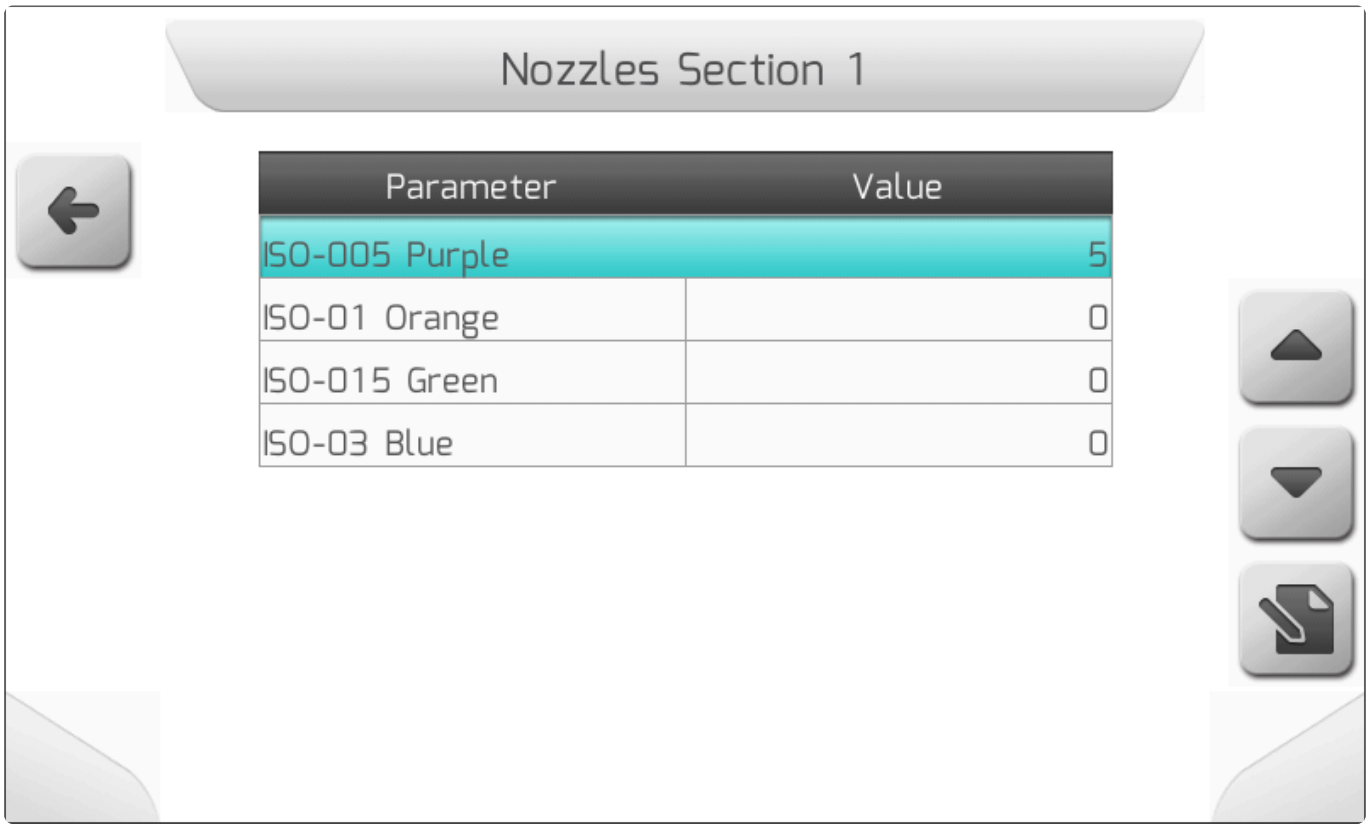



The number of items in this list will be higher or lower according to the configured number of nozzle models.

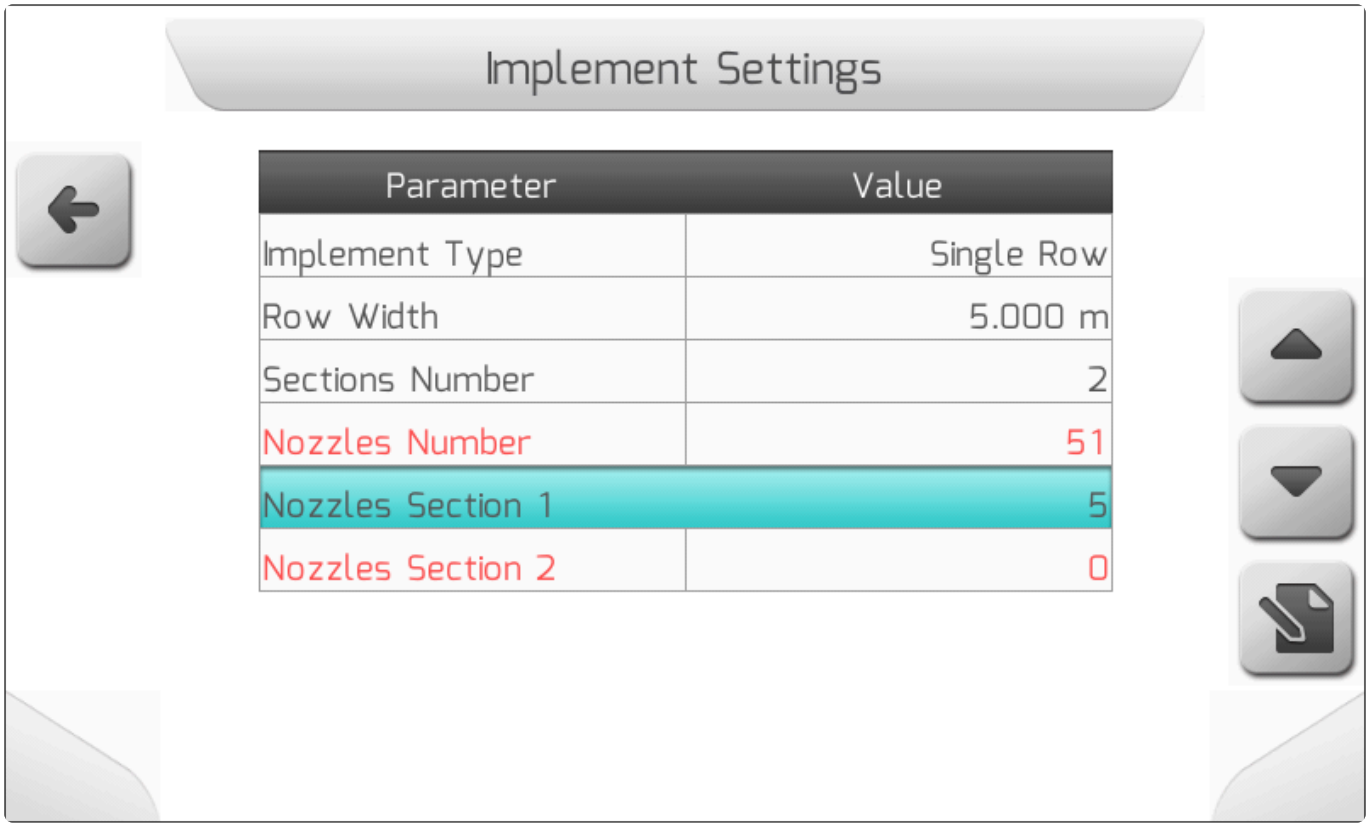
When you click on one of the nozzle models, the Value editing screen will be displayed to enter the nozzles number of this model that the section have (in the example, section1).



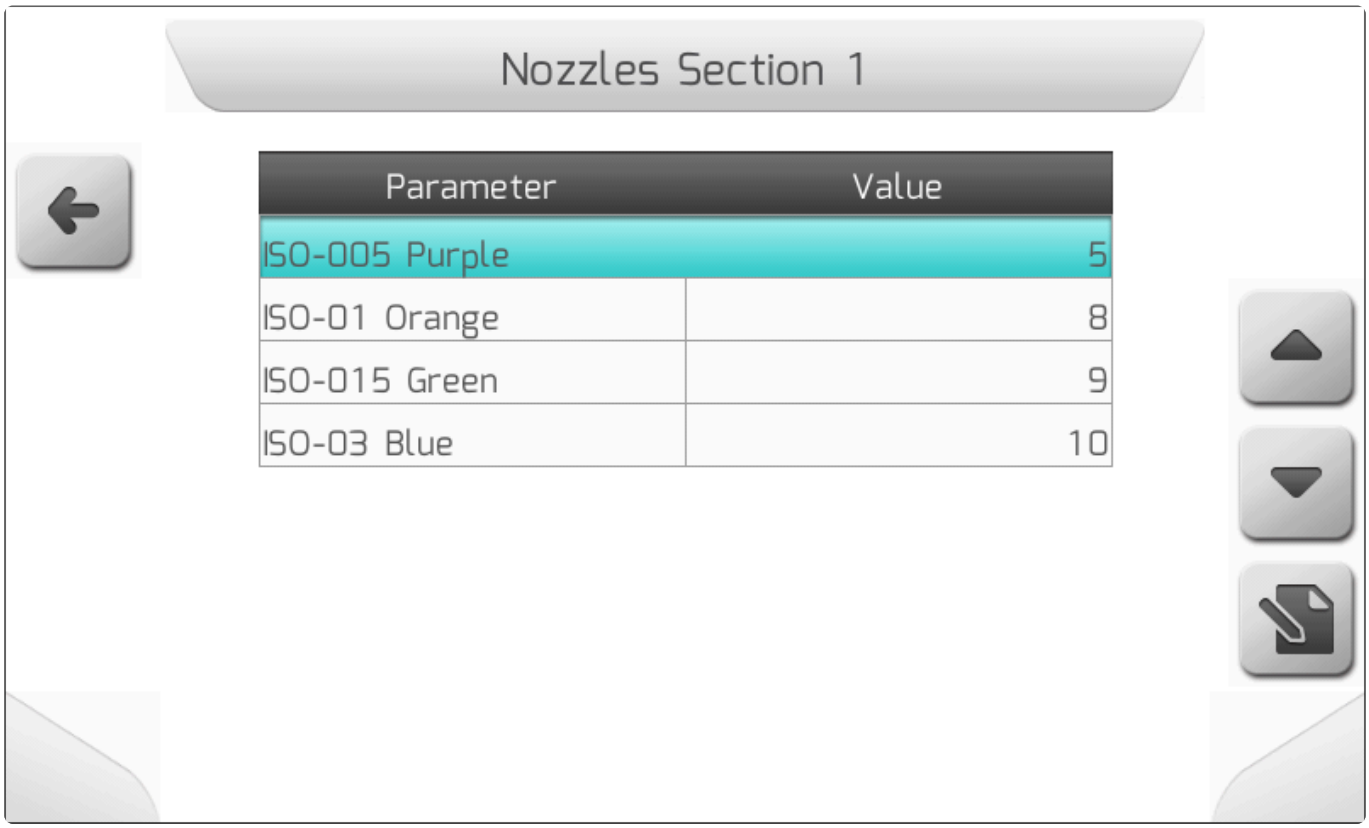

As an example, 5 nozzles of the **ISO-005 Purple** model have been configured.



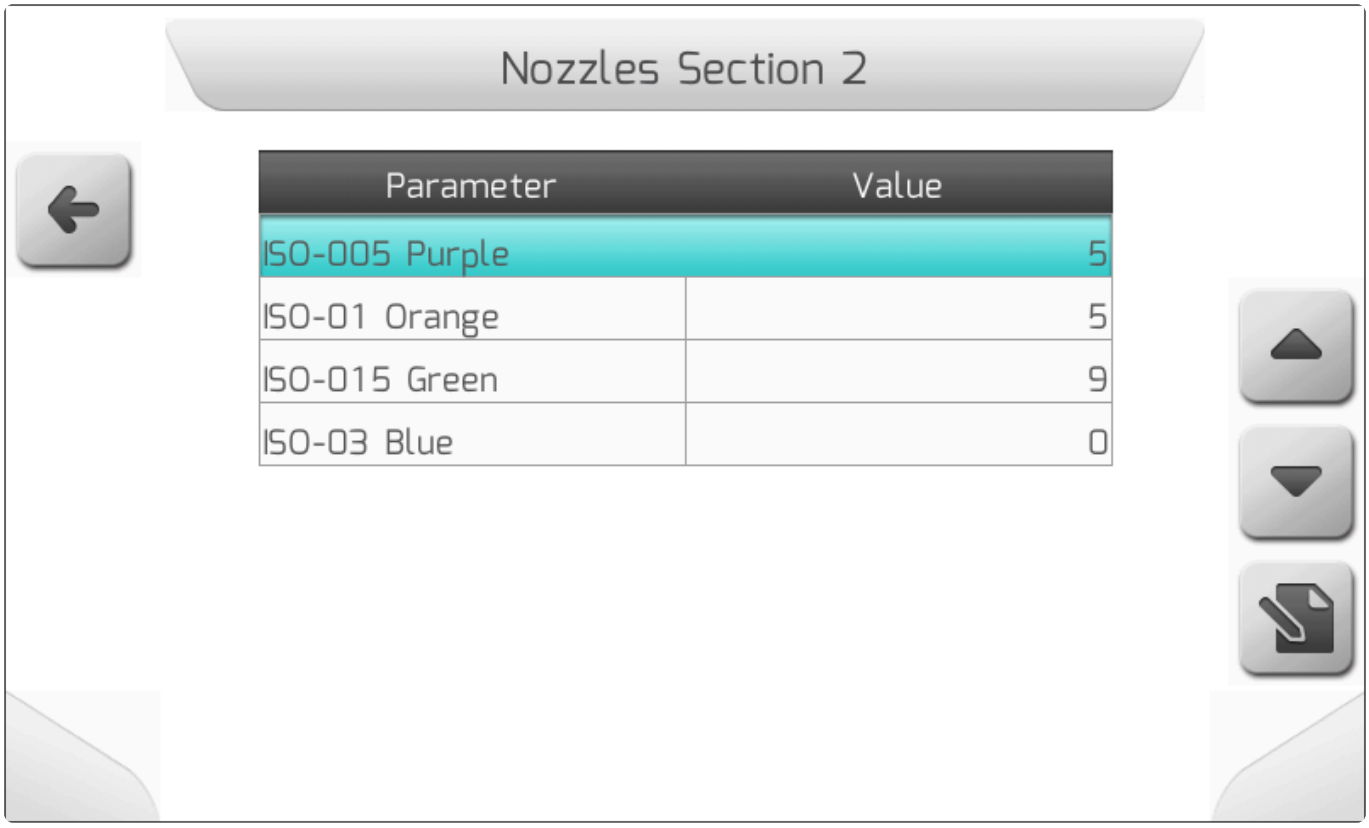

The total nozzles number per section will be the sum of the nozzles number configured in each section. So if returning to the previous screen immediately after setting up the first nozzle model, it will be displayed that section 1 has 5 nozzles, and the **Nozzles Number** parameter is still red.




The remaining parameter of section 1 were completed as follow to conclude the example.

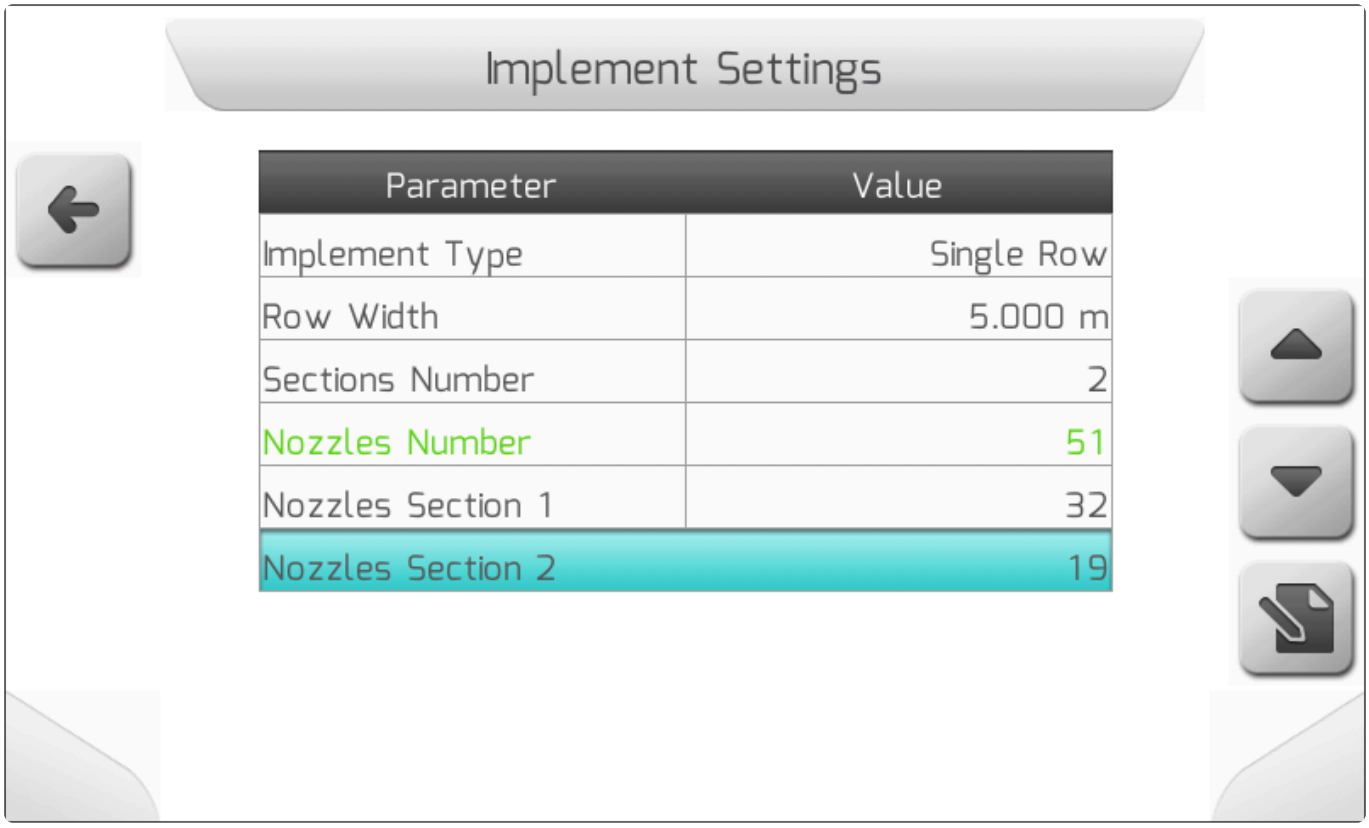



And for section 2 the following values were configured.

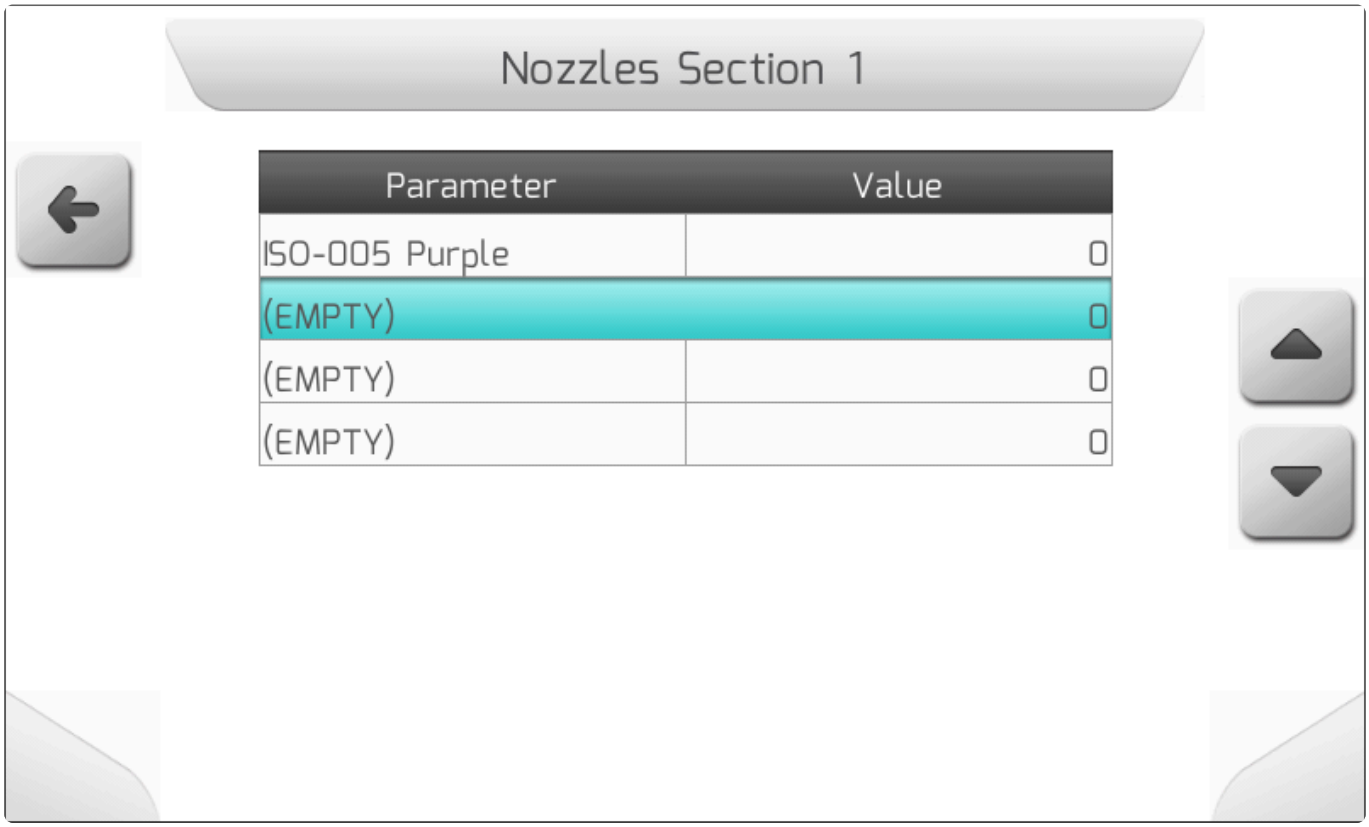



Note that one of the nozzle models was set with value 0. This configuration is possible, and the GeoNave display understands that there is no nozzle of that model in that section, allowing great flexibility for different applications.

When the setting is done correctly, the **Nozzles Number** parameter in the **Implement settings** screen will be displayed in green, indicating that the total number of nozzles configured is equal to the total nozzles number of the orchard implement.




**Note:** If nozzle models have not been assigned to all configured models, the screen for configuring the nozzle model numbers per section will be displayed as follows.




In this case, it will not be possible to edit a model whose value is configured as **(EMPTY)**.

**Note:** When, for example, 5 nozzle models are configured and all of them are linked to an existing

model. If after this configuration the user sets the number of models to 2, the models numbered 3 to 5 will be automatically reconfigured as **(EMPTY)** and if immediately after the user sets up 5 nozzle models again, the models numbered 3 to 5 will continue as **(EMPTY)**, so that the models settings must be done again.

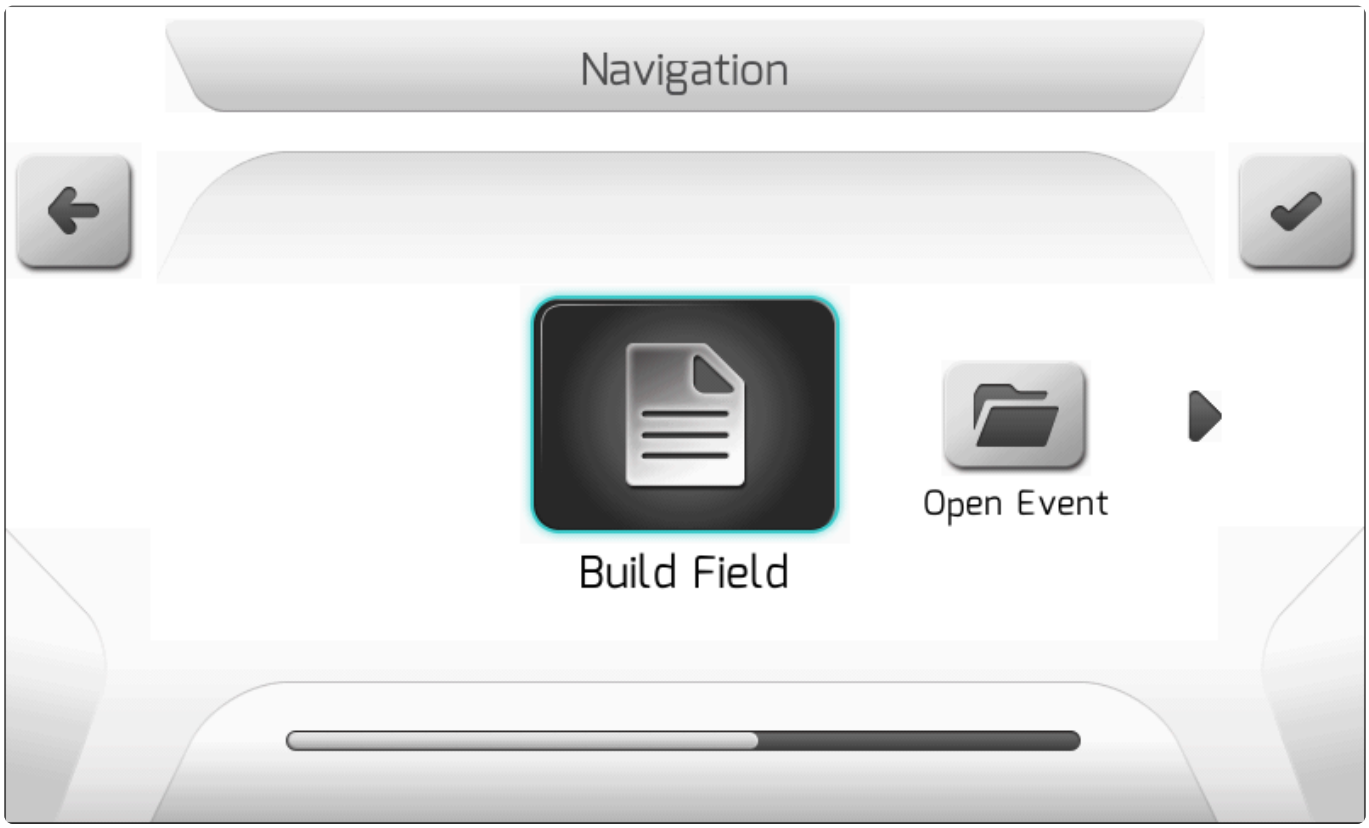
# 9. Navigation Menu

Screen type = Horizontal menu

- Build Field
- Open Event
- Configuration Summary

The Navigation menu consists of two main areas, through which the user effectively starts working with the GeoNave system, creating and opening field and event files. In the Build Field area, works are started in a field for the first time. While in the Open Event area, field files and events previously created are accessed.

The following image show the Navigation Menu screen.




# 9.1. Build Field

The Build Field menu is used to start a new job within an area. When creating a new field file, the first event file will also be created, whose names are chosen by the user.

When selecting the item in the Navigation Menu and pressing the confirm button  , the Configuration Summary screen will be displayed, through which the user confirms the work settings,

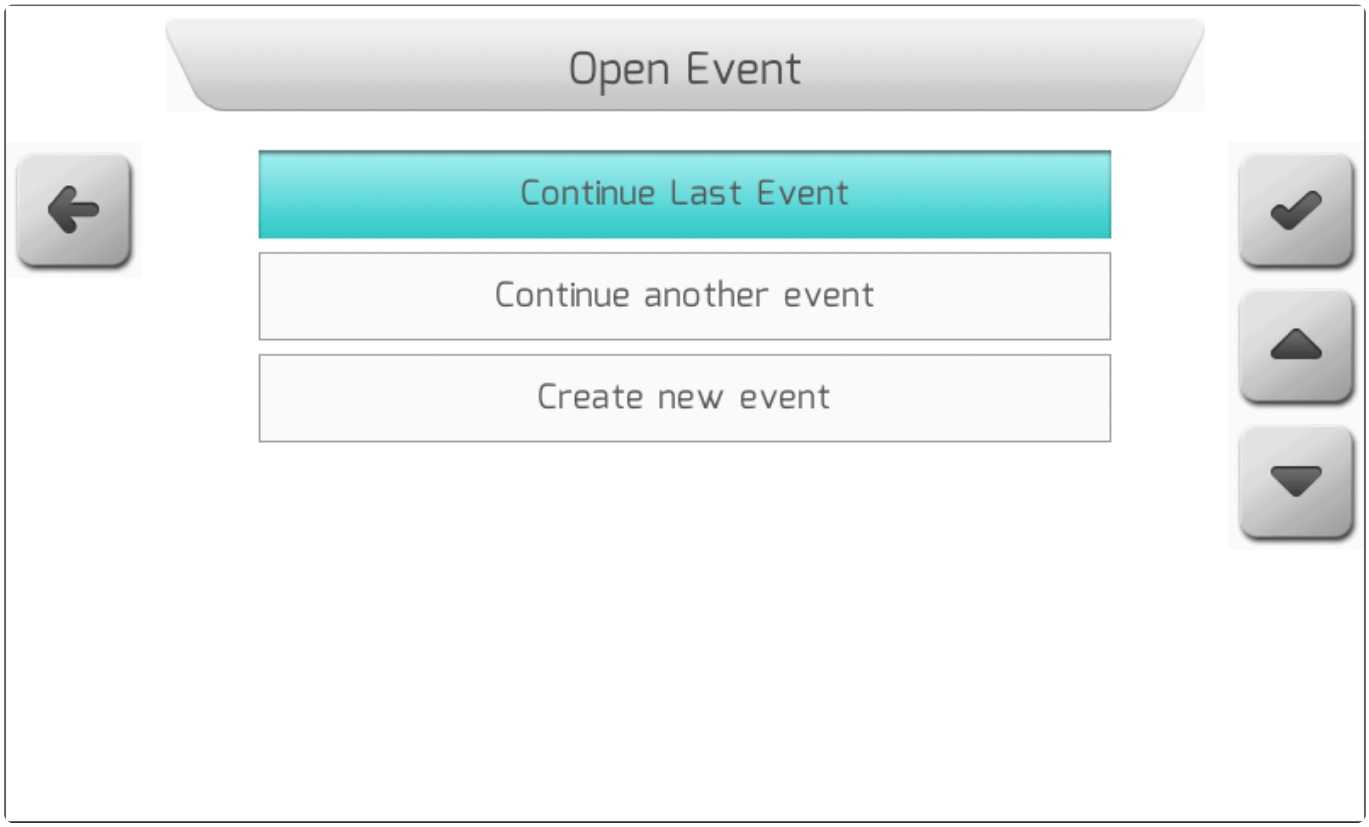
edits field and event name and also edit some of the settings, if necessary.

# 9.2. Open Event

Screen type = Vertical menu

- Continue Last Event
- Continue Another Event
- Create New Event

The Open Event menu screen consists of three areas, through which the user can continue to work on the last event being worked on, continue to work on another event already created, or create a new event in an existing field. The image below shows the Open Event menu screen.




# 9.2.1. Continue Last Event

Through the Continue Last Event area the user can resume the application of the last event being worked on and which was recently closed. When selecting the item in the Open Event menu and pressing the confirm button  , the Configuration Summary screen will be displayed, through which the user confirms the work settings of the last field/event file and is able to change some of the settings, if necessary.

# 9.2.2. Continue Another Event

Screen type = Field list > Events list

Continue Another Event area must be accessed when the user wants to open an event file already performed in an area of the property, to resume work possibly not completed the previous day.

Selecting the item in the Open Event menu and pressing the confirm button  , the Field List screen will be displayed, through which the user selects field and event file pair to continue working. After selecting the event file in the Events list and pressing the confirm button again  , the Configuration Summary screen will be displayed, through which the user confirms the work settings of the chosen field/ event file, being able to change some of the settings if necessary.

# 9.2.3. Create New Event

Screen type = Field list

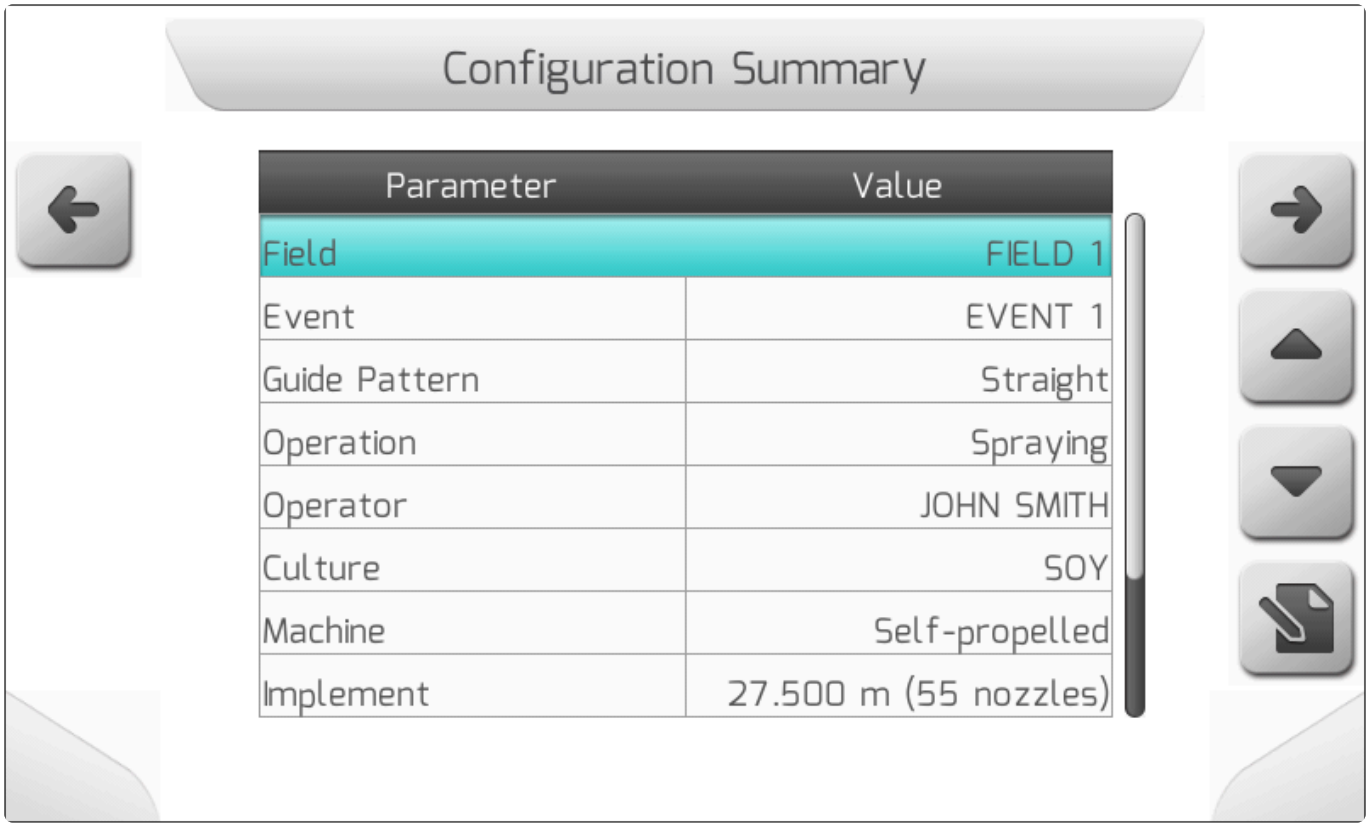
Through the Create New Event area the user can start a new work in a field that already exists in the GeoNave system memory, maintaining the same guides and limits that already exist in the field.

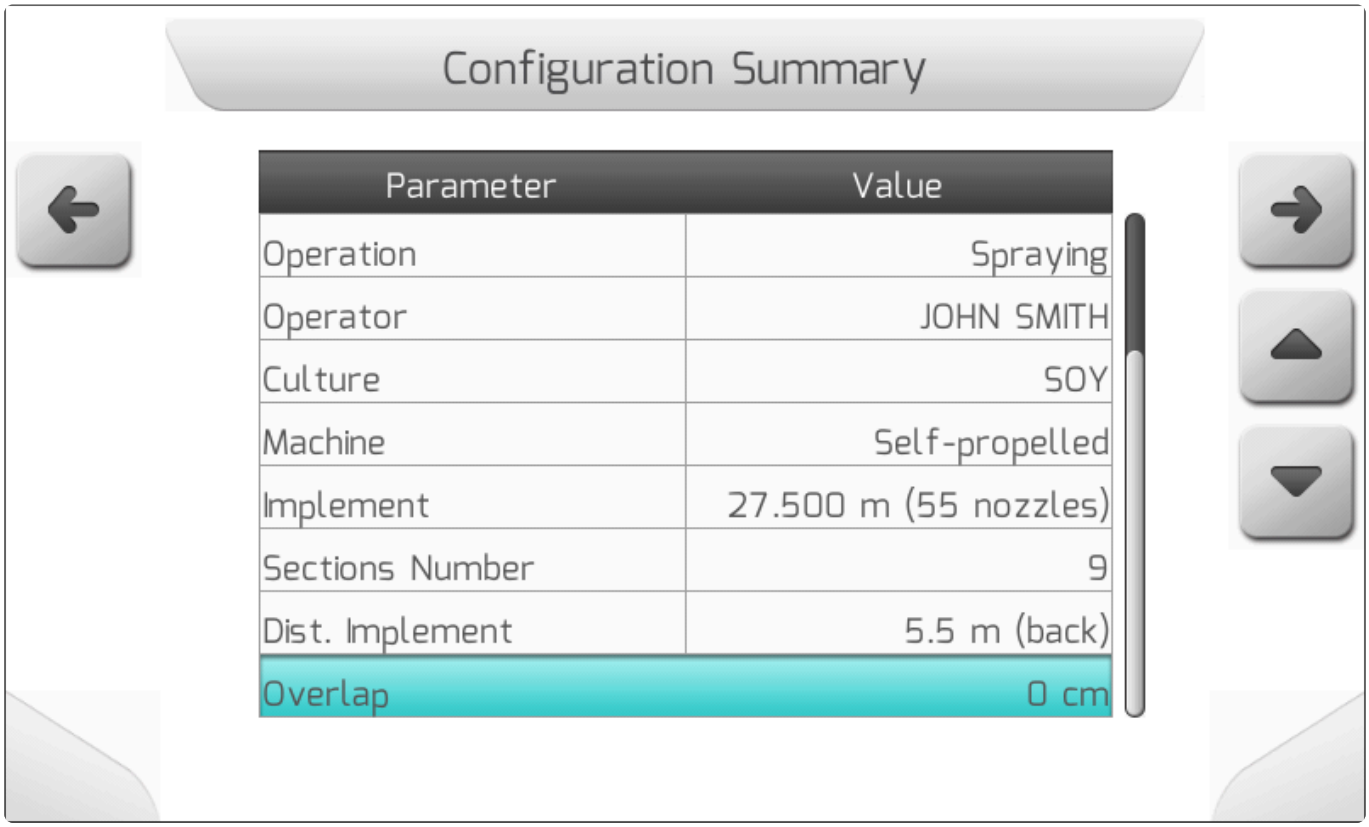
When selecting the item in the Open Event menu and pressing the confirm button  , the Field List screen will be displayed, through which the user selects the field file in which a new event will be created. Pressing the confirm button again  , the Configuration Summary screen will be displayed, through which the user confirms the work settings for the chosen field, modifies event name and also change some of the settings, if necessary.

# 9.3. Configuration Summary

Screen type = Double list

Configuration Summary screen is displayed from all the internal areas of the Navigation menu, when creating or opening an event file, inside a new or existing field. The screen presents the user with the main current GeoNave system settings that will be used at work. Some settings are editable, depending on how the event is being opened.
An example of the Configuration Summary screen is shown in the following images.




The list of items that composes the Configuration Summary varies according to the system settings. The following are the items available in the license ISO 30.

- **Field** – Name of the area in which the work will be performed.
  - Always available in the Configuration Summary.
  - Editable only in Create Field option.

    - It is not possible to create a field with the same name as another that already exists in the memory.

- **Event** – Name of the operation that will be performed in the field.
    - Always available in the Configuration Summary.
    - Editable only in Create Field or Create New Event options.
    - It is not possible to create an event with the same name as another that already exists in the memory.

- **Guide Pattern** – Guide lines pattern used during navigation.
    - Always available in the Configuration Summary.
    - Always editable.

- **Guides Map** – *Shapefile* file selection of the guides project.
    - Available and editable only for:
        - Create Field or Create New Event.
        - Guide Pattern = **Project**.

- **Operation** – Defines the implement application to be used.
    - Always available in the Configuration Summary.
    - Always editable.

- **Operator** – Name of who will operate the agricultural machinery.
    - Always available in the Configuration Summary.
    - Always editable.

- **Culture** – Culture name of the area in which the agricultural operation is being performed.
    - Always available in the Configuration Summary.
    - Always editable.

- **Implement** – Agricultural implement width.
    - Always available in the Configuration Summary.
    - Editable only for Operation = **Irrigation**.

- **Sections Number** – Number of spraying implement sections.
    - Available only for Operation = **Pulverization**.
    - Not editable.

- **Implement Distance** – Distance between the GNSS antenna and the implement.
    - Available only for Hitch Type = **3-point Hitch (Fixed)**.
    - Not editable.

- **Overlap** – Overlap between navigation guides.
    - Always available in the Configuration Summary.
    - Not editable.

After reviewing the settings shown in the summary and pressing the forward button  , the Information with confirmation screen will be displayed, the user must confirm to start navigation, as shown in the image below.




Pressing the cancel button  , the system will return to the previous screen. If the confirm button  is pressed, the navigation settings and data will be loaded and the Navigation screen will be displayed.

# 10. Operation


- Machine setting
- Starting a Work
- Ending a Work
- Creating a Guide
- Position Adjustment
- Pause/Resume Navigation
- Lightbar setting
- Creating a Boundary
- Main Sprayer switch on/off
- Toggle 2D/3D view
- Brightness setting
- Change Color Scheme
- Display GNSS Signal Quality
- Terrain Compensator setting
- Performing an Irrigation
- Sprayer Tank Filling
- Changing the Sprayer Tank Level


The following topics describe the various necessary steps for effective operation of the GeoNave system.

# 10.1. Machine setting

In order to correctly perform the agricultural machine setting for spraying operation in the GeoNave system, including tractor and implement parameters setting, some steps must be followed.

## Tractor

### Work settings

1. Configure Machine name.
2. Configure Hitch Type parameter.
    a. For Hitch Type = **3-point Hitch (Fixed)**, configure Implement Distance.
    b. For Hitch Type = **Drawbar**, configure:
        i. Antenna – Hitch Distance.
        ii. Hitch – Ground Contact Distance.
        iii. Hitch – Boom Distance.

# Implement

## Work settings

1. Configure Operation parameter as **Spraying**.
2. Configure Implement Sensor, if present.
3. Configure Overlap parameter.
4. Configure Lateral Displacement parameter.

## Spraying settings

1. Set up a spraying Work.
2. Configure implement Boom.
    a. Nozzles Number.
    b. Spacing Nozzle.
    c. Sections Number.
    d. Number of Nozzles Section.
3. Configure implement Valves.
4. Configure implement Sensors.
    a. Configure the nominal value of the Flowmeter constant.
5. Configure sprayer Tank.

### Calibrations

1. Flowmeter Calibration.
2. Adjust Flow Control parameters, if necessary.

# 10.2. Starting a Work

Starting a Work on the GeoNave system, all configurations must be carried out according to machine, operator and agricultural operation to be performed.

1. Configure agricultural Machine setting.
2. Configure agricultural Operation to be performed.
3. Configure Operator name who is driving the machine.
4. Configure Culture name that is being cultivated.
5. Select Guide Pattern to be followed while working.
6. Select Limit Pattern that should be used.
7. Choose how to start navigation.
    a. Build Field.
    b. Open Event.

# 10.3. Ending a Work

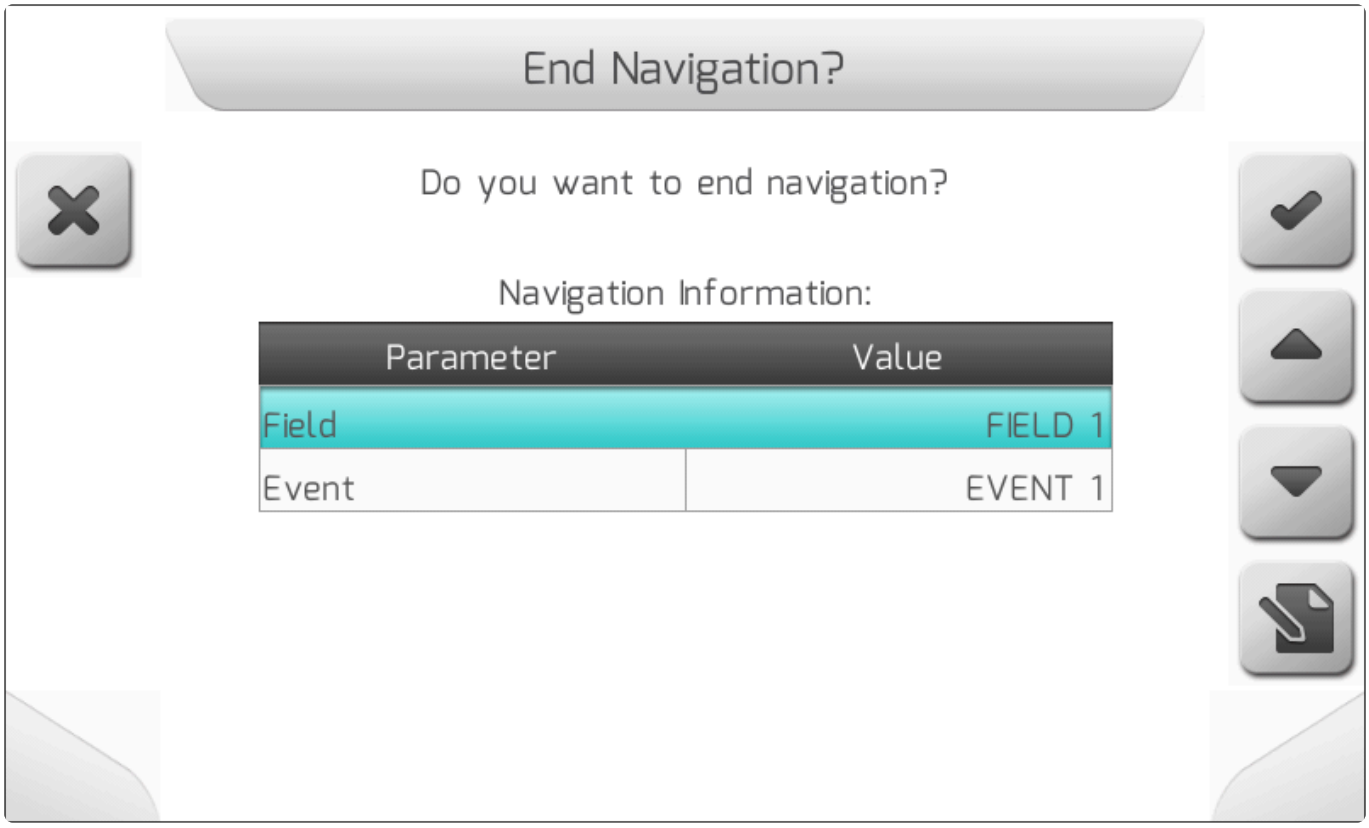
When a Work is open in the Navigation screen and the user wants to end it, press the cancel button

 , as shown in the image below.




If there is still no Trail, Guides or Boundary marked in the current navigation screen, pressing the cancel button will simply return to the previous screen, Configuration Summary screen.

If any of these items are present on the navigation screen, an Information with confirmation screen will be displayed, as shown in the following image, so that the user can confirm the navigation ending of the field and event currently open. Pressing the cancel button  , the system will return to the navigation screen. And pressing the confirm button  , the work ends with the currently configured field and event names.




In the confirmation screen above, depending on how the field and event were opened, the user is able to edit the files name before ending the work, selecting the item and pressing the edit button .

- **Field** – Editable if the job was created by the Build Field option .
- **Event** – Editable if the job was created by the Build Field or Create New Event options.

# 10.4. Create a Guide

- Marking Straight Guide Points
- Marking Curve Guide Points
- Marking Free Guide Points
- Select Guide Project

Guides are extremely important components for the execution of agricultural operations. They define the path that the machine must follow during application, so that the entire field area is treated, with minimal overlaps and lack of application.

## Use Guide menu

On the Settings during navigation menu, accessed by the button , if there is no active guide on the map the item **Guide Pattern** will show the currently selected pattern. If any guide is loaded on the map, the same item will be displayed with the label **Guide** and its value is presented with the following structure **Guide N – Pattern**, where **N** represents the sequential number of guide creation and **Pattern** is

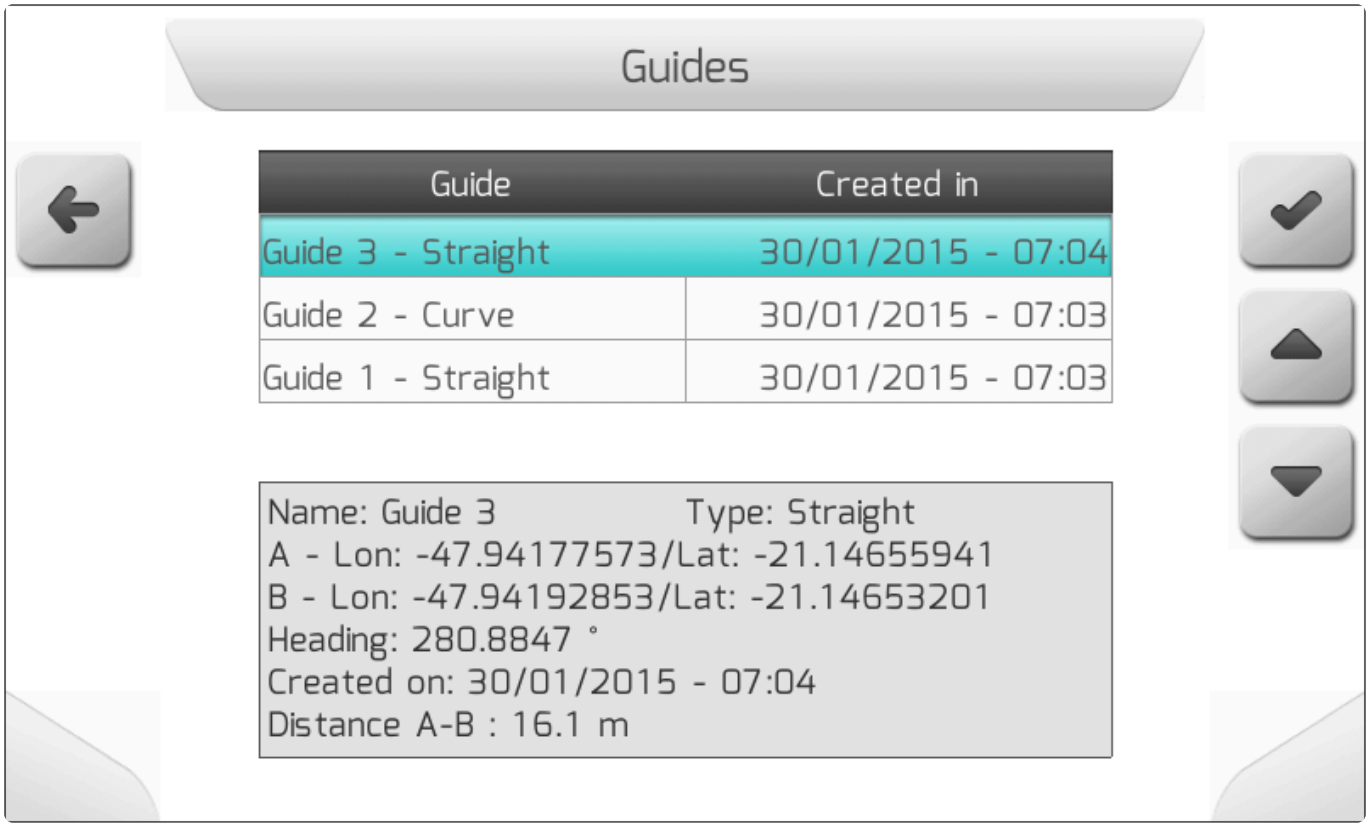
one of the values listed in the topic Guide Pattern.

Selecting the Guide Pattern/Guide item and pressing the edit button  , the **Use Guide** Vertical menu will be displayed containing three areas, as shown in the following image.




## Open Guide

In the Open Guide area, a File list will be displayed, containing the guides already created for the field that is currently open in navigation. The name of the guide is shown in the left column of the table, with structure **Guide N – Pattern**, where **N** represents the sequential number of guide creation, and **Pattern** is the guide pattern listed in the topic Guide Pattern. The right column shows date and time of guide creation. In the file data description area are presented various information regarding the guide, such as its name, type, coordinates of points A and B, date and time of creation, and the distance between points A and B. The following image shows an example of the Open Guide screen.



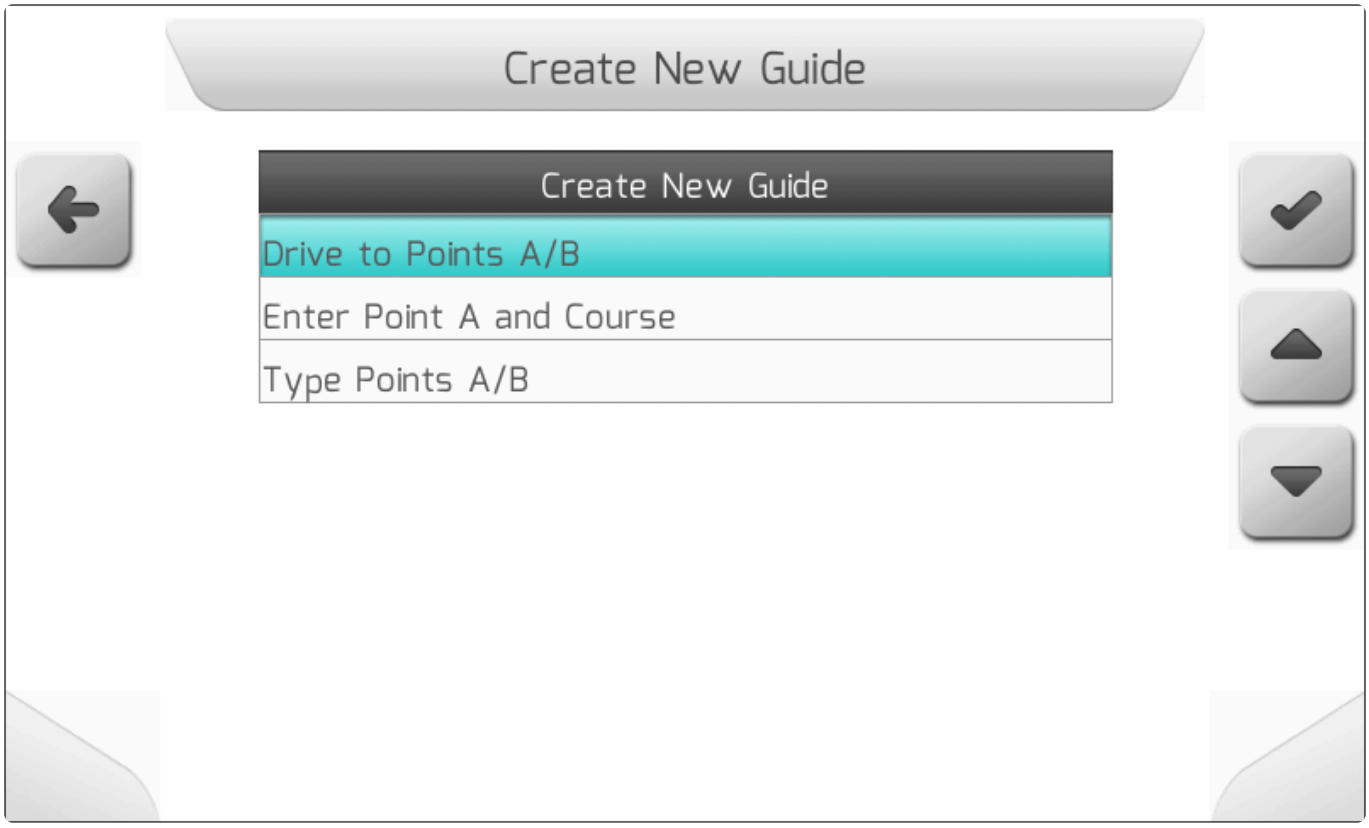

Selecting any of the listed guides and pressing the confirm button , the guide will be loaded and used on the navigation screen.

## Create New Guide

When choosing the Create New Guide area, Guide Pattern screen will be displayed to select which guide model the user wants to create in the field that is being used.

**1) Create Straight Guide**

Selecting **Straight** and pressing the confirm button , the Create Straight Guide screen is presented, with three options for creating the guide, as shown in the image below.

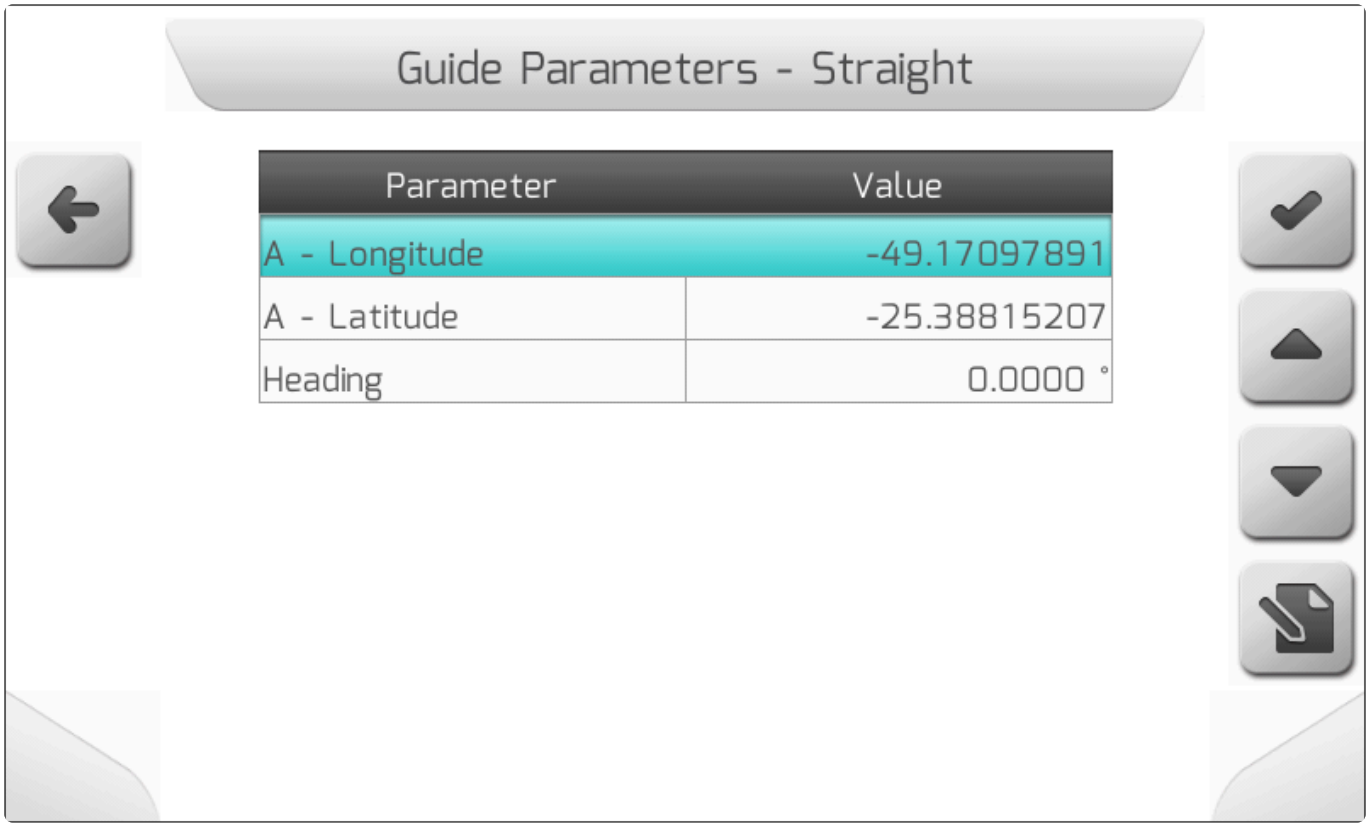



**a) Drive to Points A/B**

When selecting this option and pressing the confirm button , the guide will be restarted on the navigation screen. The point A button A will be available, and the user must follow the procedure shown in the Marking Straight Guide Points topic.

**b) Enter Point A and Course**

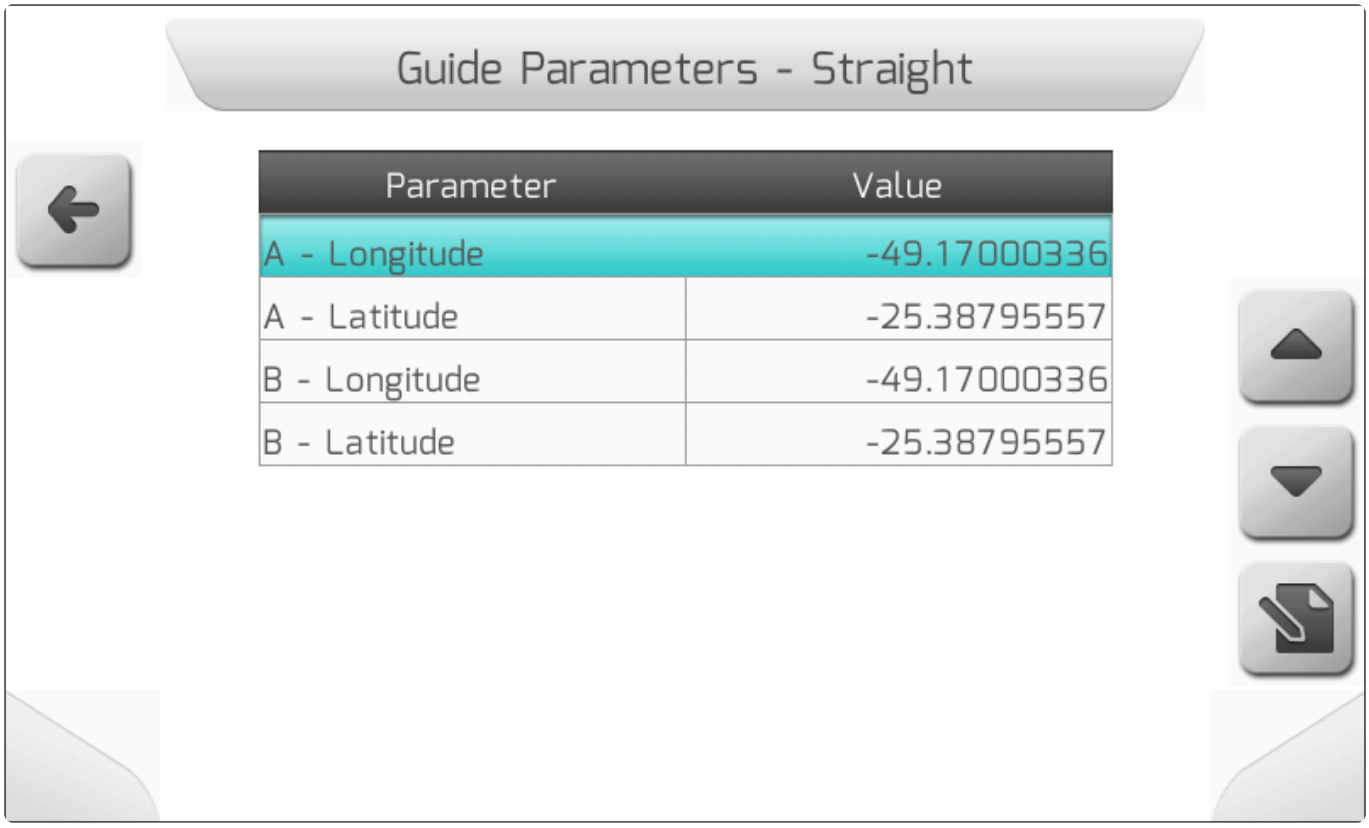
If the user has the point A coordinate values at hand – **Latitude** and **Longitude**, and also the **Course** angle value in relation to the north in clockwise direction, the option Enter Point A and Course should be used, as shown in the following image. After filling in the fields and pressing the confirm button , the guide will be created and displayed on the navigation screen.




**b) Type Points A and B**

This option should be used when the user has the coordinate values from point A and also from point B- **Latitude** and **Longitude**, as shown in the image below. After filling in the fields and pressing the confirm button , the new guide will be created and displayed on the navigation screen.

* The confirm button will be displayed only when the distance between points A and B is greater than 20 meters.




**2) Create Curve Guide**

When selecting the **Curve** guide pattern and pressing the confirm button , the guide will be restarted on the navigation screen, and the procedure described in Marking Curve Guide Points must be followed.

**3) Create Free Guide**

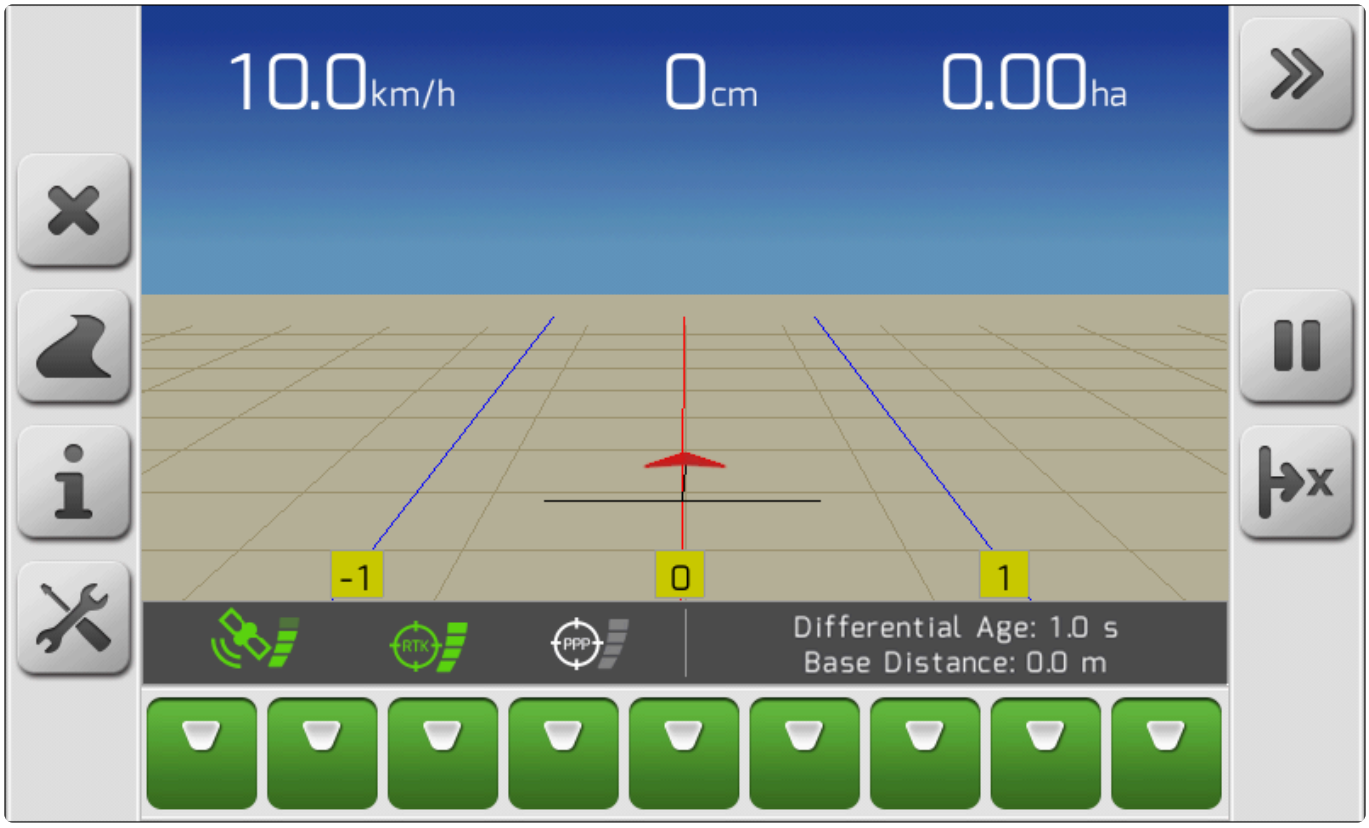
When selecting the **Free** guide pattern and pressing the confirm button , the guide will be restarted on the navigation screen, and the procedure described in Marking Free Guide Points must be followed.

**4) Open Guide Project**

When selecting the **Project** guide pattern and pressing the confirm button , the File list screen will be displayed, containing the *Shapefile* format guide projects available in the GeoNave internal memory. The selection of the guide project file is shown in Select Guide Design.

# 10.4.1. Marking Straight Guide Points

When the Guide Pattern is configured as **Straight**, the guide lines are created parallel to each other in the field, spaced by the difference between the Implement width and the Overlap, and extended infinitely to both sides, as shown in the image below.




**Straight Guides**

On the Navigation screen, initially press the button to mark point A  . A red dot will appear in the Map Area, identified by the letter **A**. Between this point and the triangle that represents the tractor there will be a straight dashed red line, which characterizes the distance between point A and the current GNSS position. In addition, an Alert Board with information **Point A: OK** will be displayed, as shown in the image below.




**Marking point A of the straight guide**

After moving more than 20 meters from point A, the button for marking point B  will be available on the navigation screen. If the button is pressed, the Loading screen will be shown with the information that the current guide is being saved, then returning to navigation screen. The point **A**, previously marked in red, will turn dark blue color. A light blue point identified by the letter **B** will also appear. The straight guide identified with the number 0 will then be defined and the navigation screen will display the guide lines as shown in the topic Guides. Will be also presented an Alert Board with information **Point B: OK**

# 10.4.2. Marking Curve Guide Points

When the Guide Pattern is configured as **Curve**, the guide lines are created parallel to each other, this way any point on a guide will be at the same distance to the adjacent curve in the field, which makes the design of each parallel lines different. The distance between the guides is always the difference between the Implement width and the Overlap.
Curved guides exist only in the space between points A and B, they are not extended to infinity as is done for straight guides. The image below illustrates an example of curved guides.




On the Navigation screen, initially press the button to mark point A 

. A red dot will appear in the Map Area, identified by the letter **A**. Between this point and the triangle that represents the tractor there will be a straight dashed red line, which represents the path taken since marking point A. In addition, an Alert Board with information **Point A: OK** will be displayed, as shown in the image below.

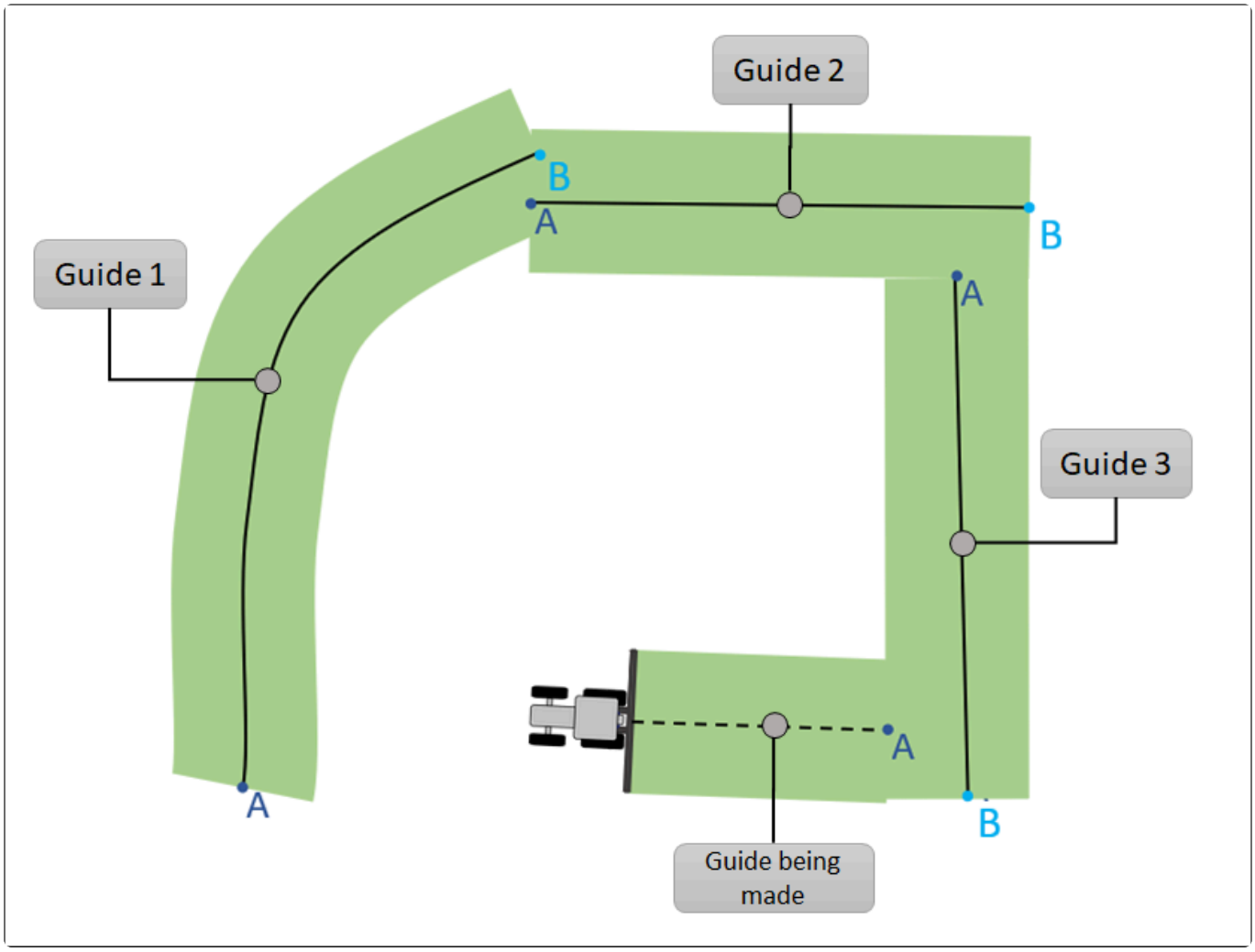


After moving more than 20 meters from point A, the button for marking point B  will be available on the navigation screen. If the button is pressed, the Loading screen will be shown with the information that the current guide is being saved, then returning to navigation screen. The point **A**, previously marked in red, will turn dark blue color. A light blue point identified by the letter **B** will also appear. The curved guide identified with the number 0 will then be defined and the navigation screen will display the guide lines as shown in the topic Guides. Will be also presented an Alert Board with information **Point B: OK**

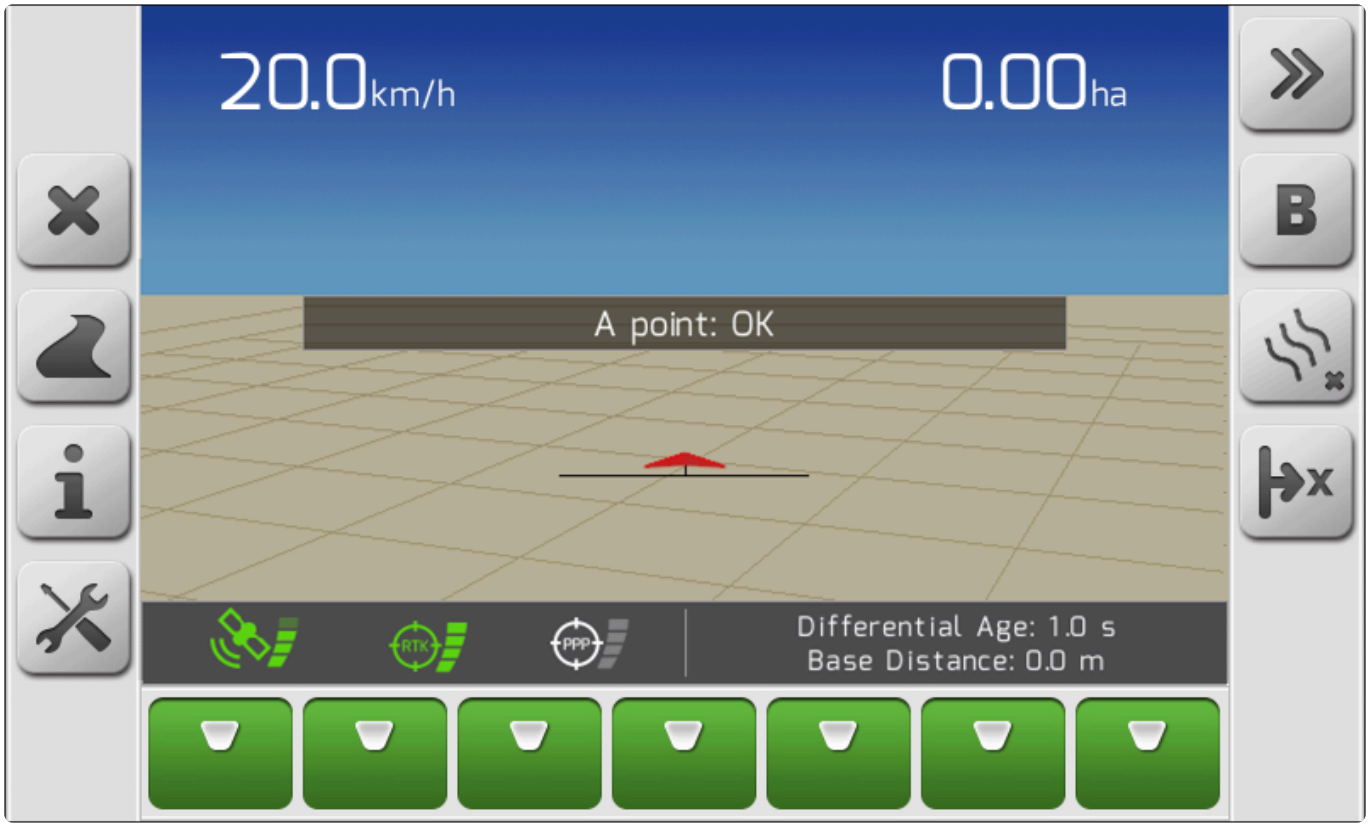
If the distance between points A and B is very large, it is possible that an Alert Board with the message **Calculating Parallel Curves ... Please wait** will be displayed, while parallel curves are calculated by the system. The same behavior can happen if the guide lines are quickly traveled in its perpendicular direction.

# 10.4.3. Marking Free Guide Points

When the Guide Pattern parameter is configured as **Free**, the user can generate the guides directly through the path taken by the machine in the field, allowing the user to create as many guide lines as necessary. In this guide pattern, the distance between the guides is not defined by the implement width and overlap parameters as for Straight and Curve guide patterns.
The image below shows an example of **Free** guide pattern.



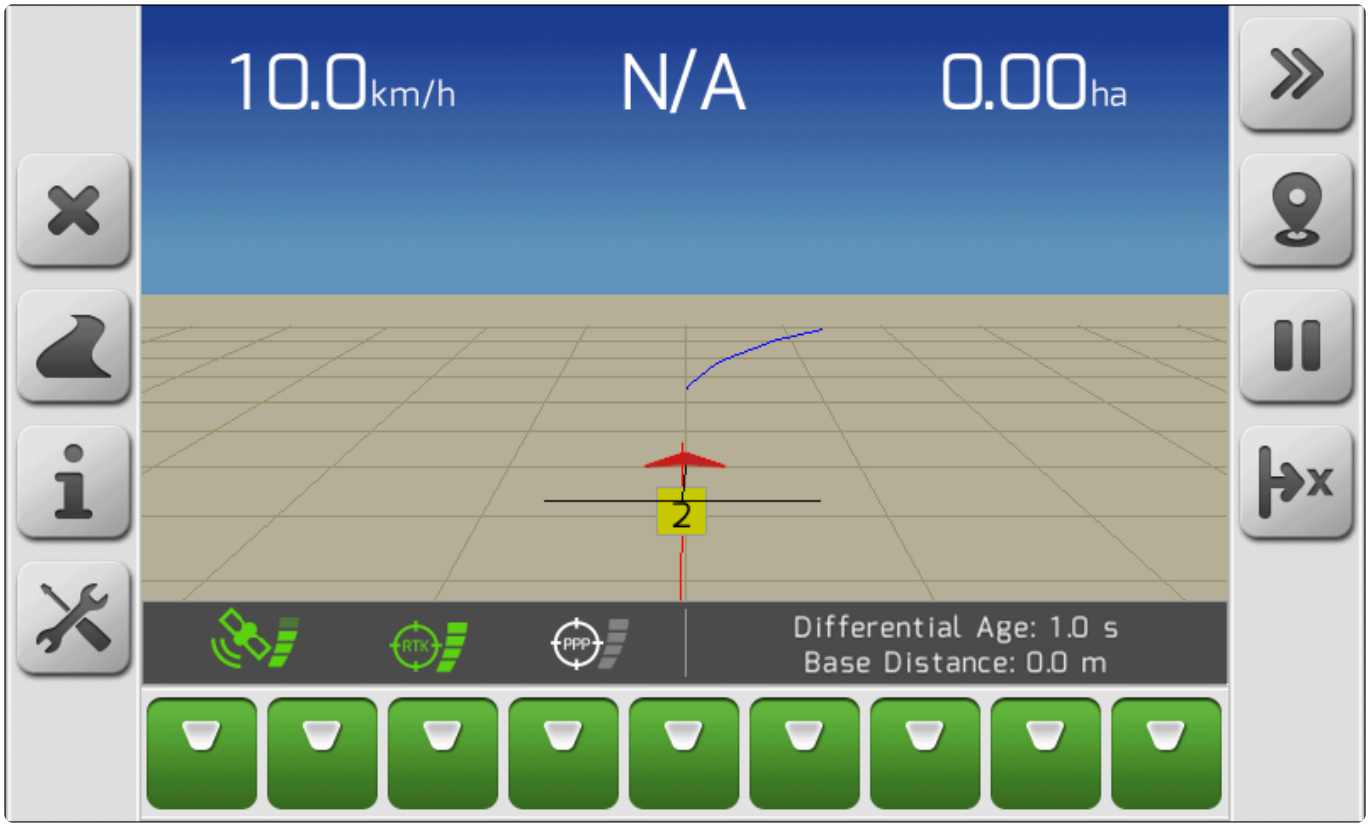

On the Navigation screen, initially press the button to mark point A  . A solid blue line will be drawn in Map Area following the path taken by the tractor from point A marked. In addition, an Alert Board with information **Point A: OK** will be displayed, as shown in the image below.



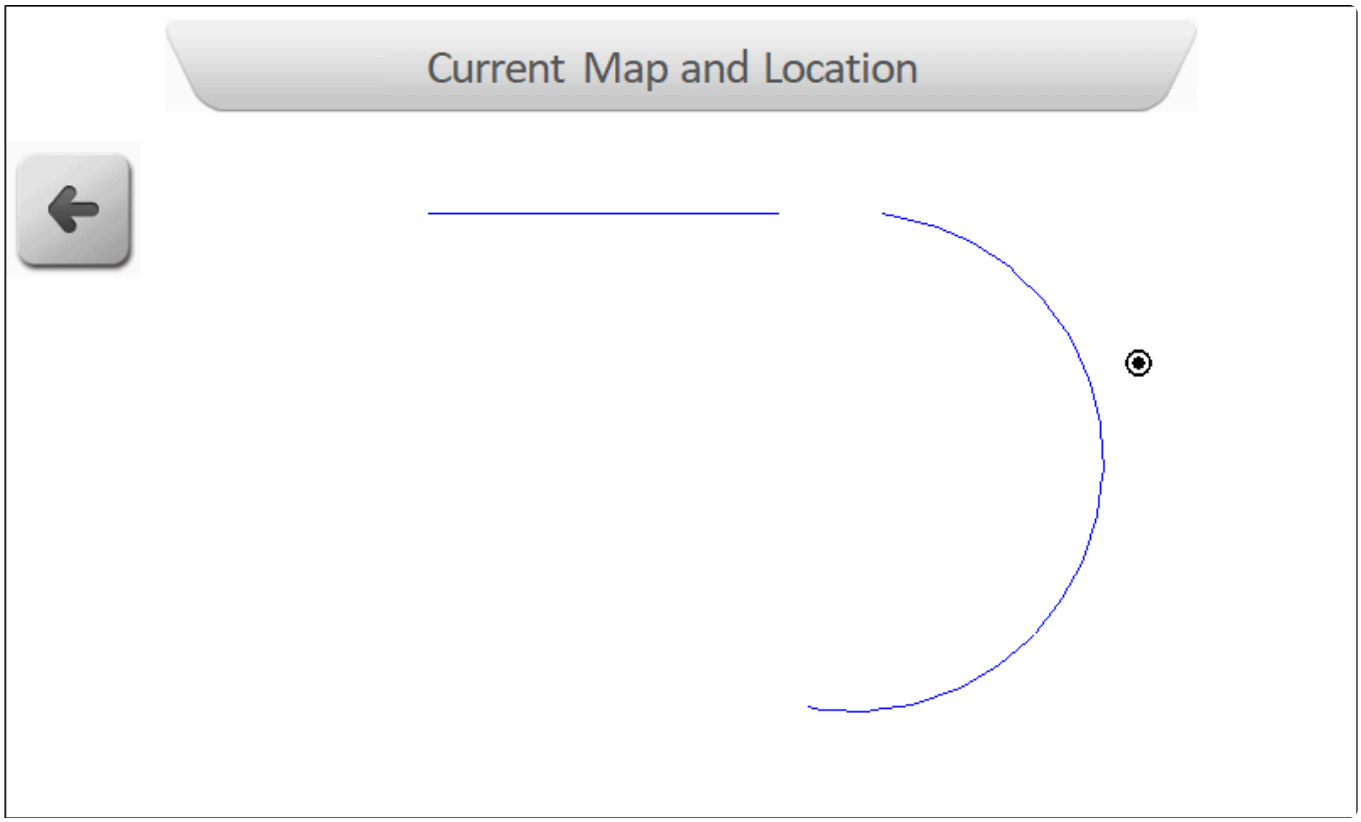

After moving more than 20 meters from point A, the button for marking point B  will be available on the navigation screen. If the button is pressed, an Alert Board with information **Point B: OK** will be displayed. This way, the first free guide will be defined, and the guide line will continue to be shown in blue until the end of the marking, which is done by pressing the finish free guide button  .

After pressing point A, it is possible at any time to cancel the current line marking by pressing the cancel free guide button  .

Once all the free guide lines were properly marked by repeating the procedure, to end the free guide and save it in the current field, press the finish free guide button  . The guide file will then be saved to GeoNave internal memory, and the line closest to the current GNSS coordinates will be displayed as a solid red line, as shown in the image below.



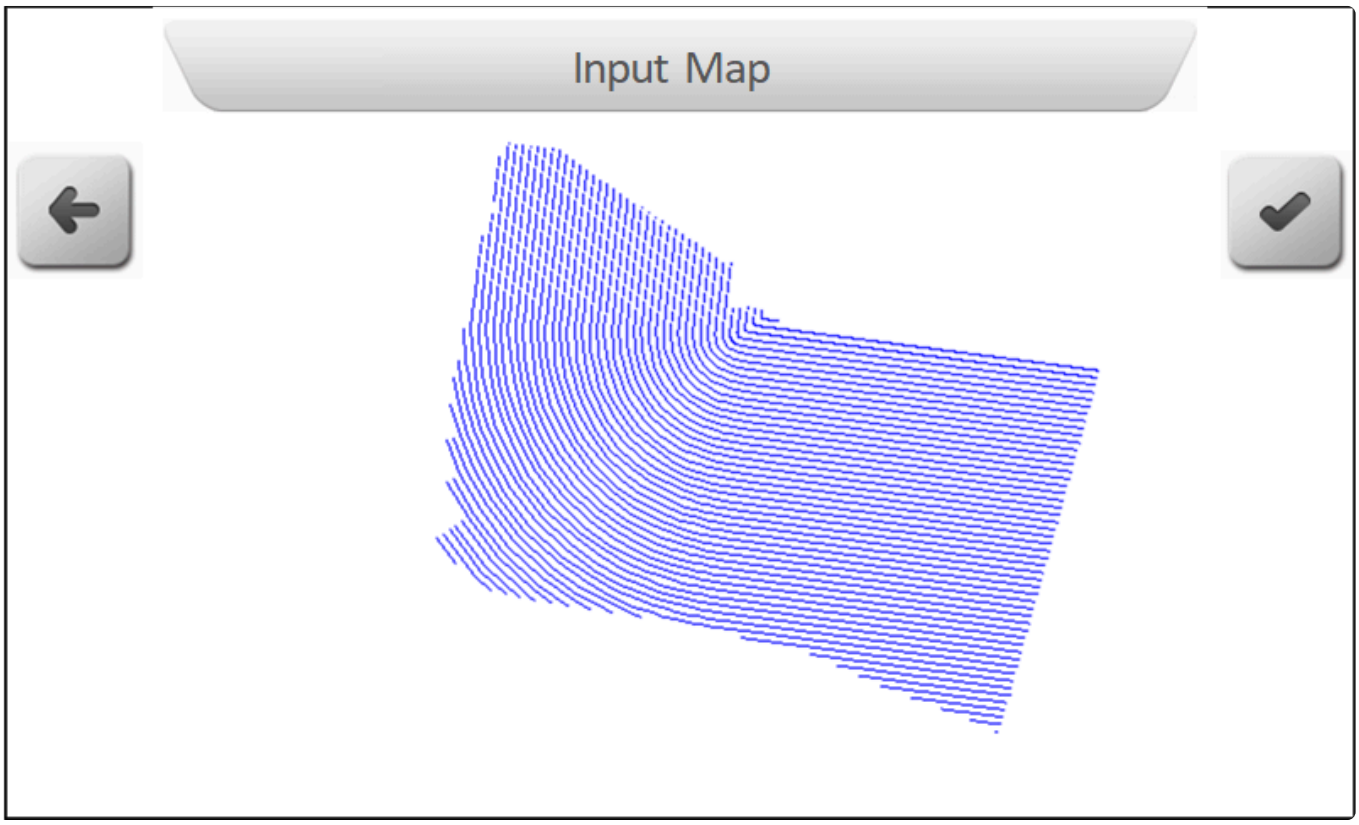

With the free guide defined, the side button bar on the right side of the navigation screen will show the button to view the current location on the free guide map  . Pressing the button, the Current Map and Location screen will be displayed, as shown in the image below.



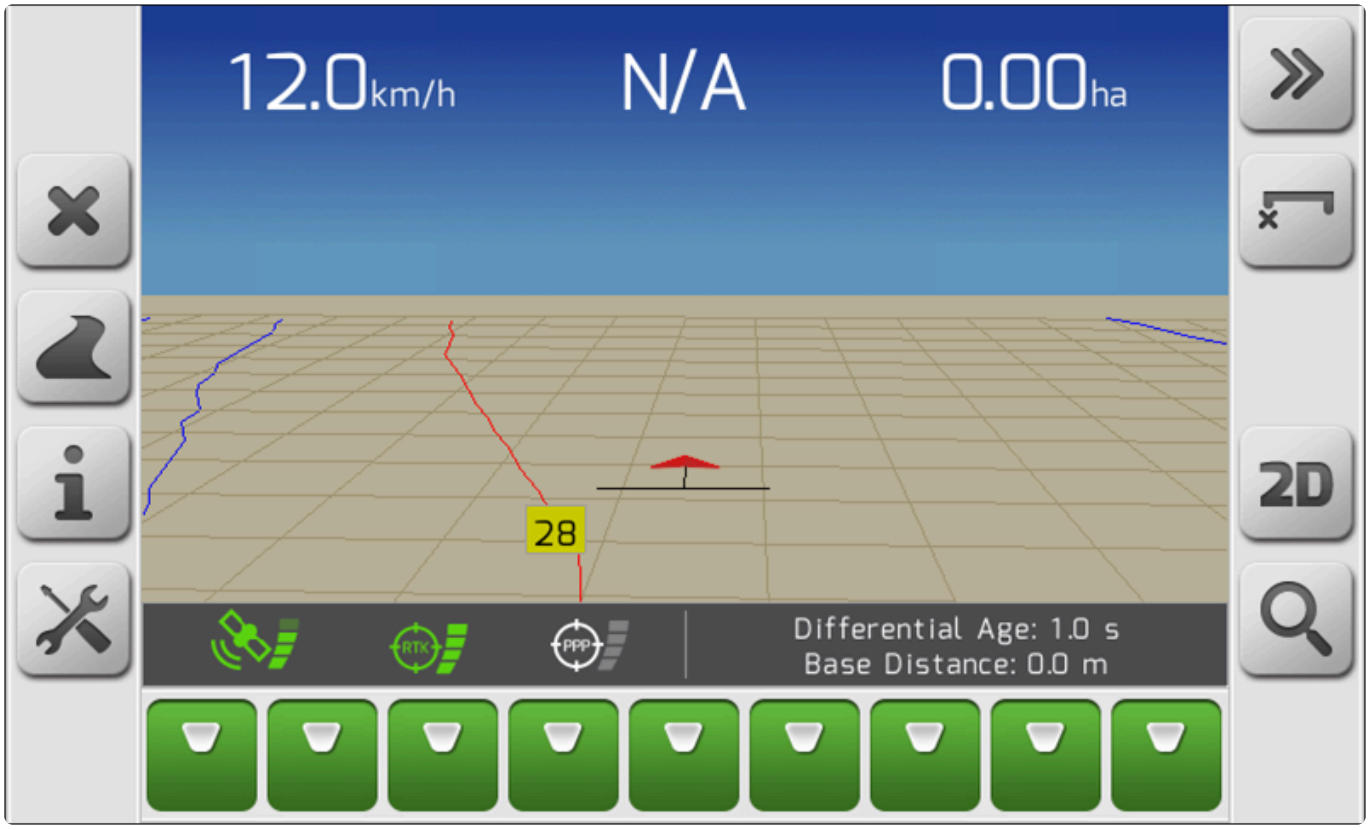
# 10.4.4. Select Guide Project

When the Guide Pattern is configured as **Project**, the guidelines follow the selected *Shapefile* project file. The guides project is created by specific computer software, in which the agronomist define the guides path according to terrain level curves, usually aiming to avoid erosion and aggradation due to rainwater accumulation.

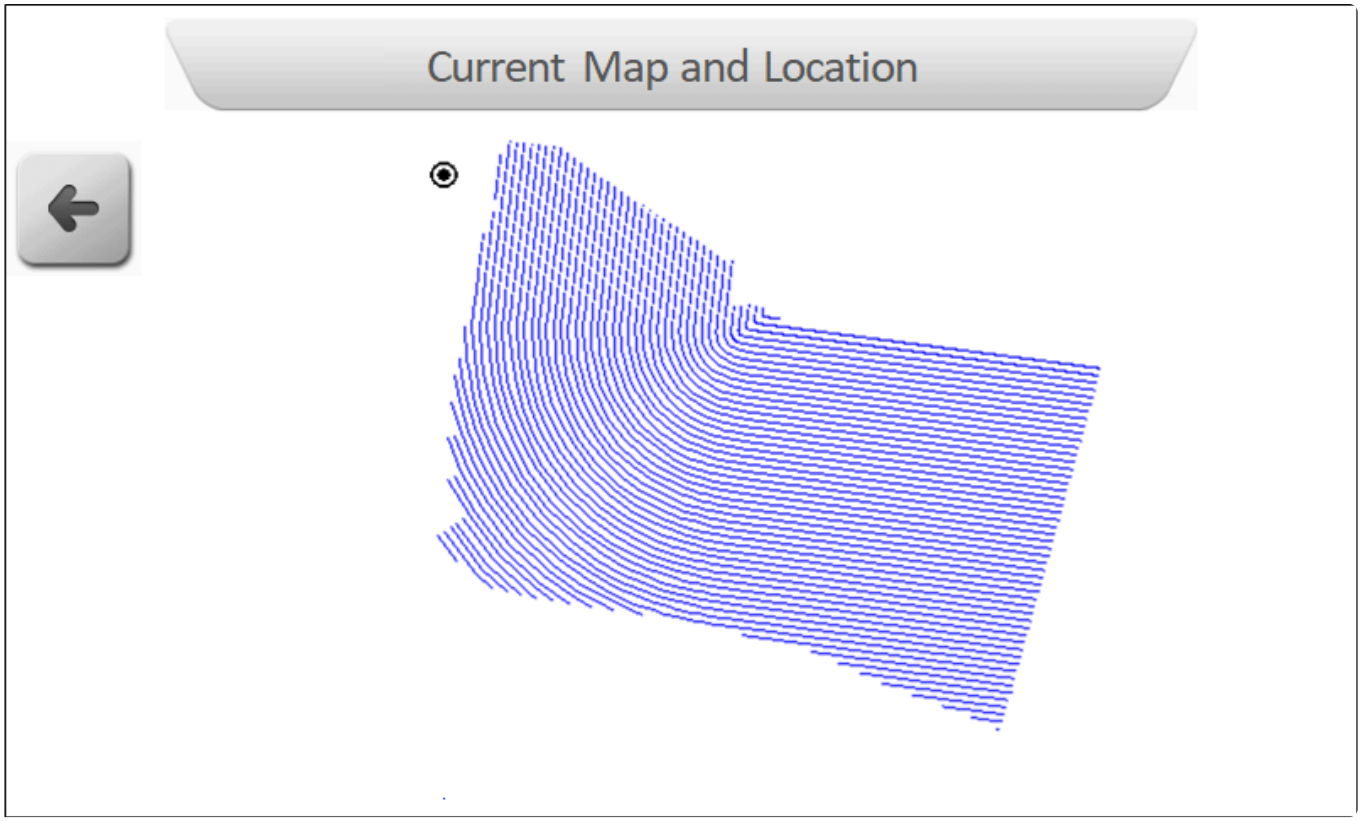
In the guide projects File List, select the desired **SHP** file and press the preview button  . The guide project map will be loaded into the memory and presented for user confirmation, via the Input Map screen, as shown in the example below.




If the user believes that the map shown is not the intended one, press the back button  to return to the previous screen and select another project. If the guide project is correct, by pressing the confirm button  the project guide will be saved and the guide map will be loaded on the navigation screen, as shown in the image below.




Once loaded the guide project in the field, the side button bar on the right side of the navigation screen will show the button to view the current location in the guide project map  . Pressing the button, the Current Map and Location screen will be displayed, as shown in the image below.



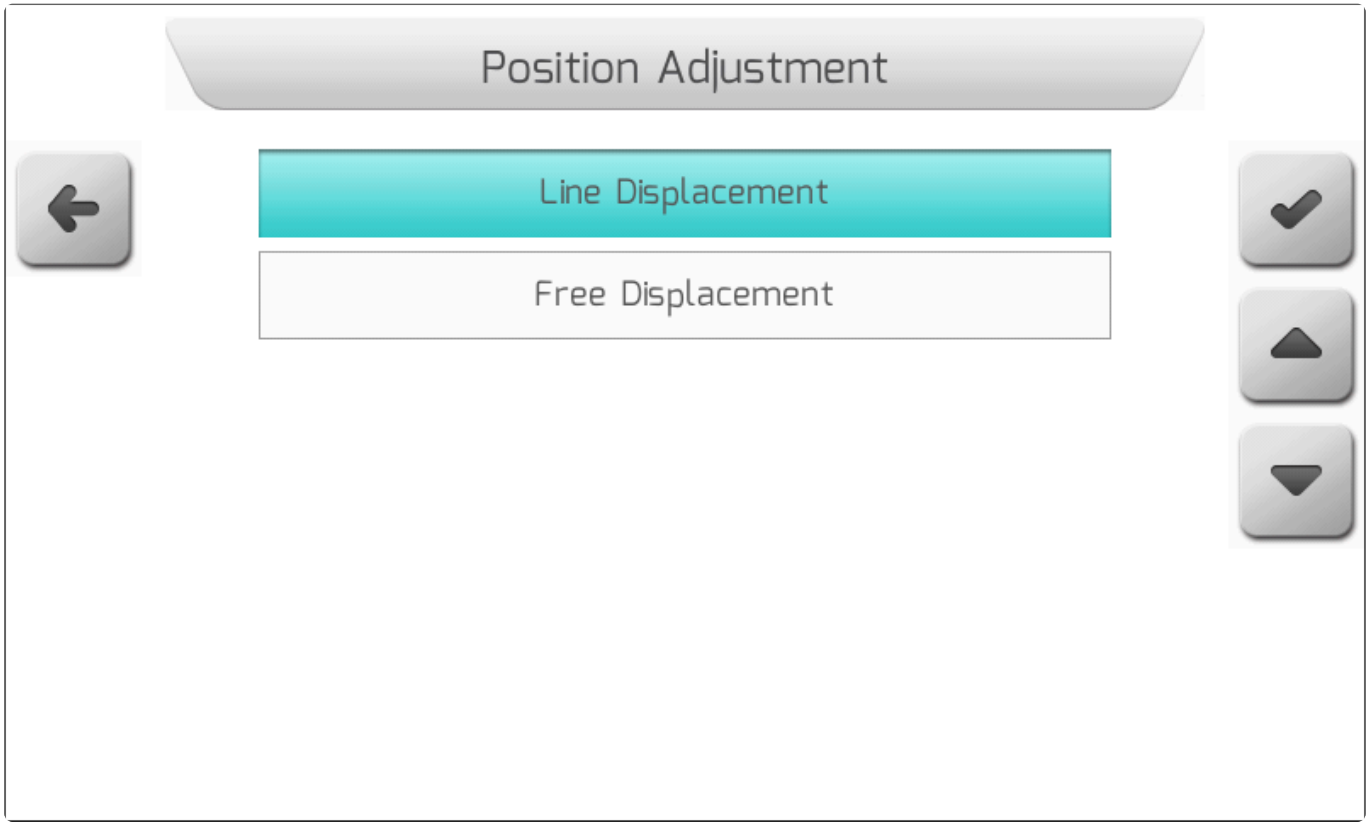
# 10.5. Position Adjustment

GNSS accuracy may change over time, especially for systems without IsoPoint signal correction. From one day to the next or even within a single event period, there can be considerable coordinate variations. To overcome the deviations inherent in the GNSS positioning, the GeoNave display disposes of position adjustment tools.

## Line Displacement

The Line Displacement is used to adjust the position of the GNSS coordinates to a point on the nearest guide line currently configured in the navigation. An example of this feature use is when the user verifies that, even after aligning the tractor wheels with previously realized physical tire track on the ground, the deviation shown on the navigation screen is different from zero. In this situation, the Line Displacement corrects the difference and positions the navigation map on the wanted track.

Pressing the position adjustment button  on the navigation screen, the Position Adjustment Vertical menu will be displayed, in which the user must select the Line Displacement option and press the confirm button  , as shown in the image below.



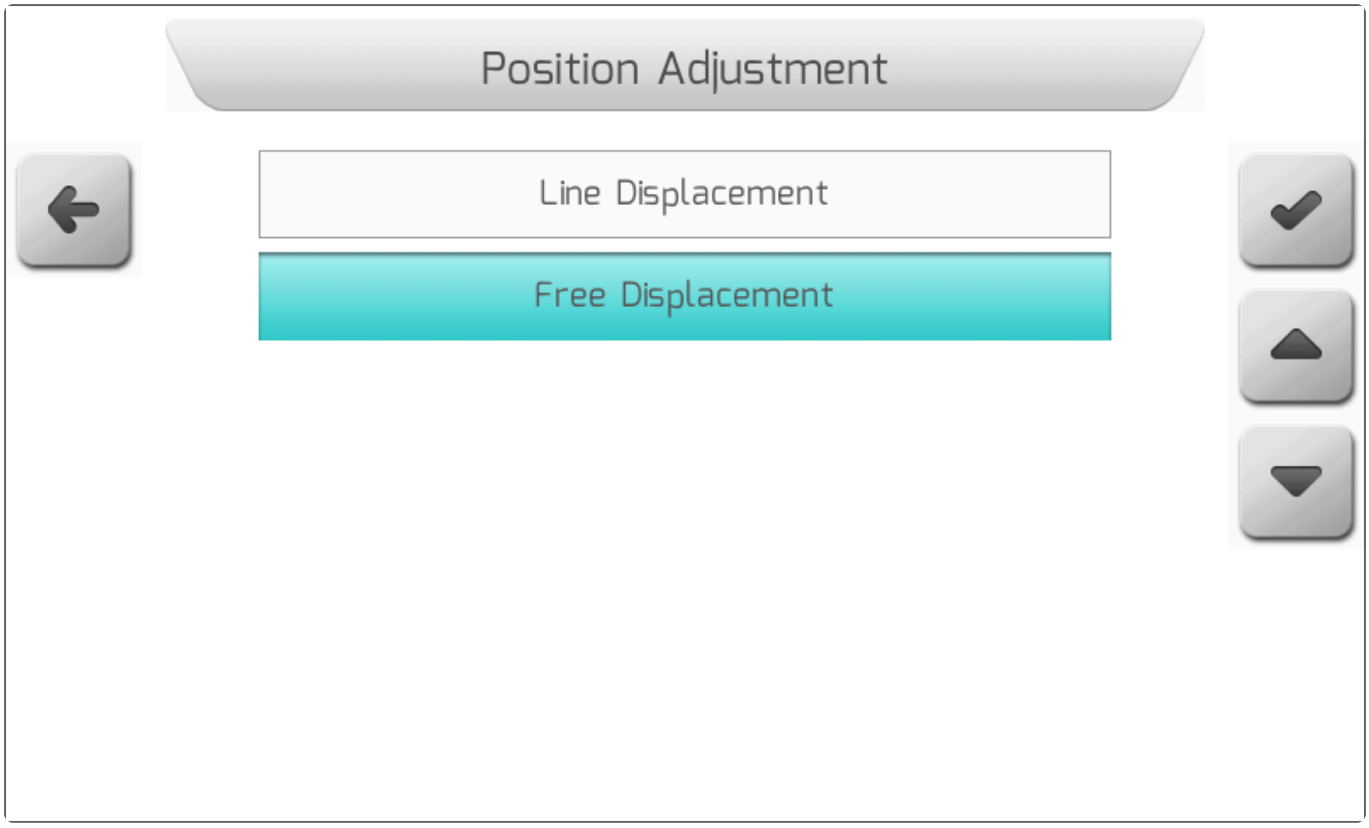

After pressing the confirm button, the GNSS coordinates will be moved perpendicular to the target guide line, shown in red on the screen. The navigation screen will show the Alert Board with message **Shift lines: OK**, as shown in the following image.




## Free Displacement

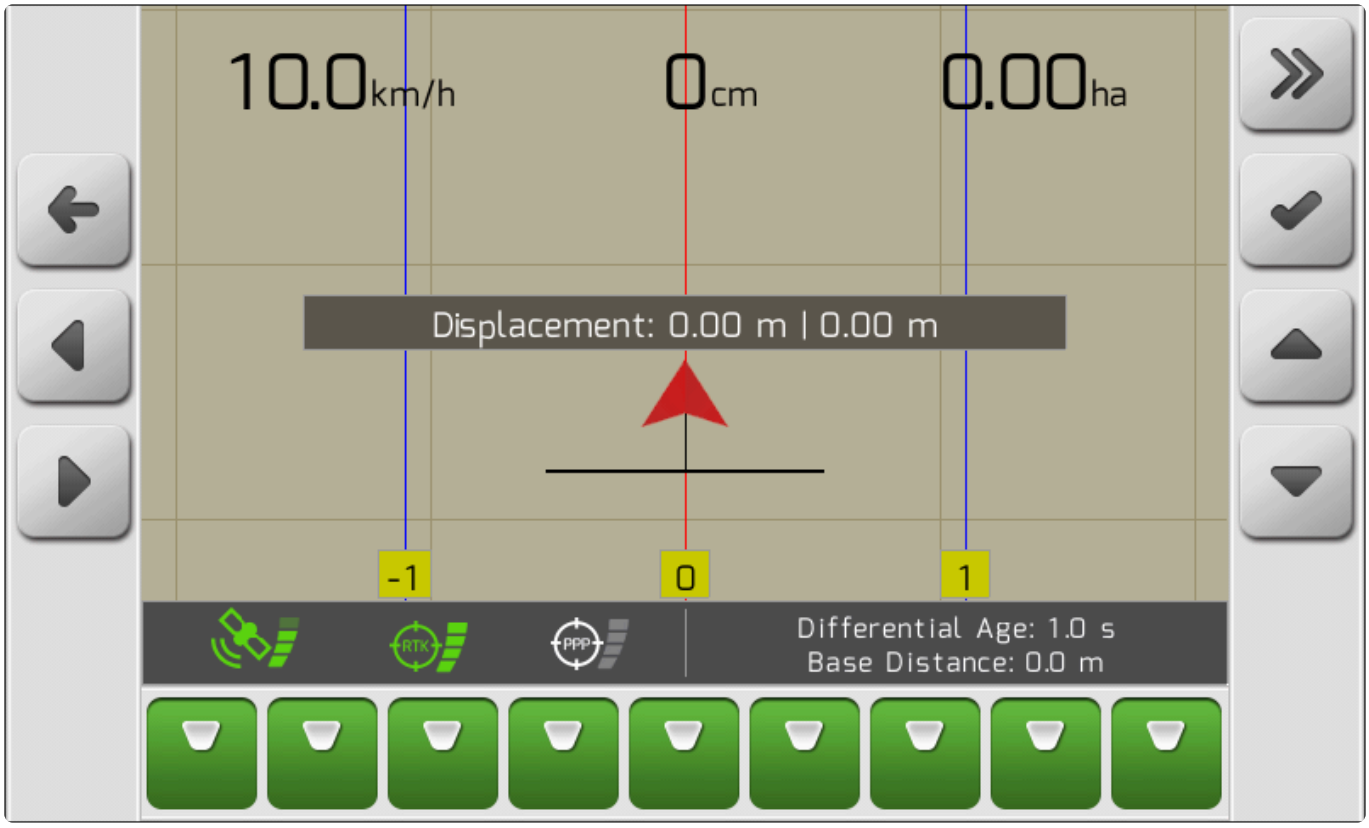
GNNS position can be changed in any direction, including in the direction of the guides themselves. A common situation in the field is when the application is carried out first in the field perimeter, also called the boundary application. Variations in the GNSS coordinates can lead to the condition that, when getting close to an applied area on the perimeter, it is noticed that there is a lack of application or an overlap of the implement boom in relation to the trail already made. In this type of situation, the Free Displacement tool can be used.

By pressing the position adjustment button  on the navigation screen, the Position Adjustment Vertical Menu will be displayed, in which the user must select the Free Moving option and press the confirm button  , as shown in the image below.




Ideally, free movement adjustment should be performed with machine stopped, so that it is possible to check correction of the observed differences.

After pressing the confirm button, the navigation screen will be displayed in 2D view. The two side button bars will assume the configuration shown in the image below, and an Alert Board will be displayed with the message **Displacement: 0.00 m | 0.00 m**.




With each press of one of the four scroll buttons, the navigation map will be moved 5 cm in the indicated button design direction, as shown in the following table. At the Alert Board, the accumulated value will be shown together with arrows indicating the total displacement in both directions.

| Button | Occupation | Alert Board Text |
|---|---|---|
|  | Map shifting of 5 cm to the right | **Displacement: → 0.05 m \| 0.00 m** |
|  | Map shifting of 5 cm to the left | **Displacement: ← 0.05 m \| 0.00 m** |
|  | Map shifting of 5 cm up | **Displacement: 0.00 m \| ↑ 0.05 m** |
|  | Map shifting of 5 cm down | **Displacement: 0.00 m \| ↓ 0.05 m** |

After setting the displacements using the four buttons to position the navigation map correctly aligned with the implement boom, when pressing the confirm button  the displacement will be saved and will be used in navigation from this moment on. The message **Free movement: OK** will be displayed on an Alert Board, as shown the image below.

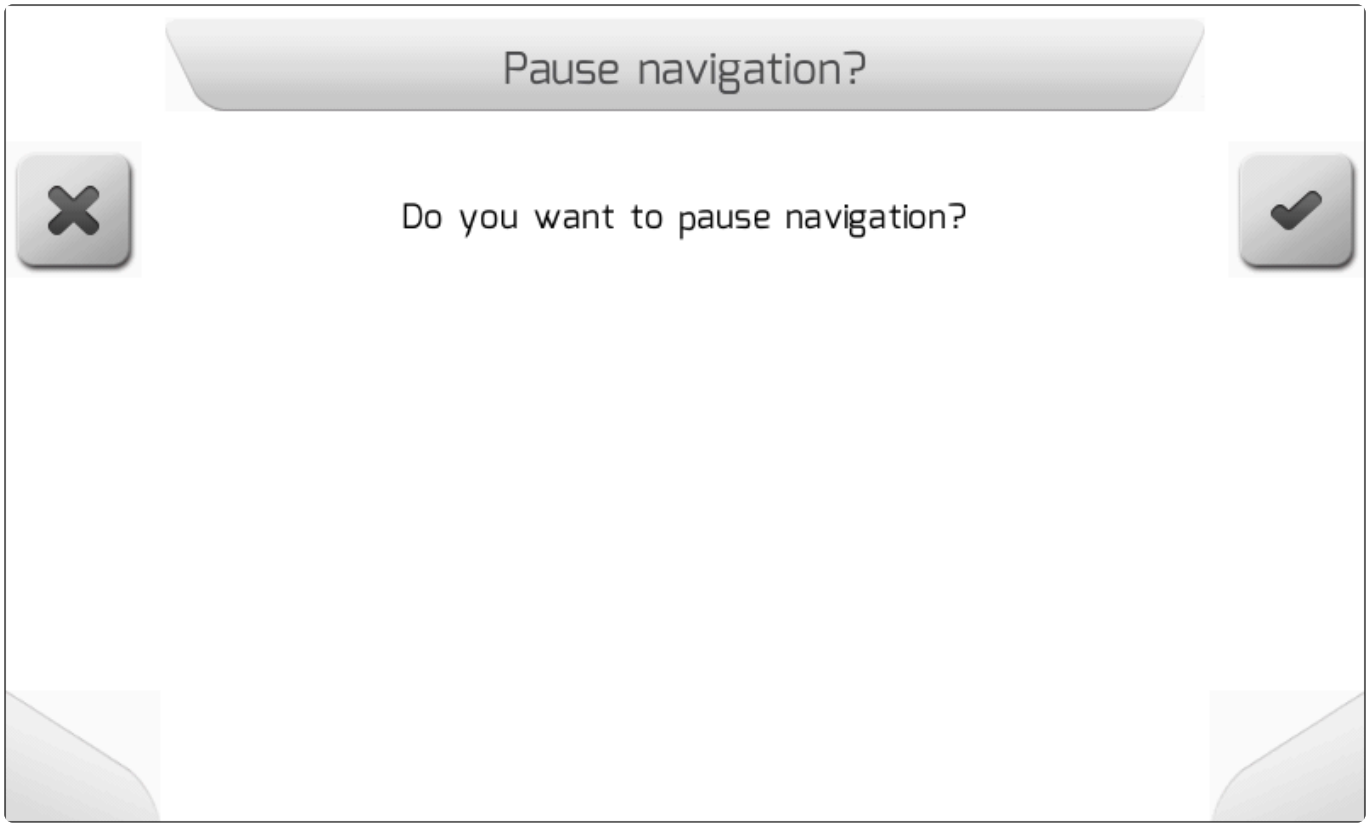



When ending a navigation with configured displacement, for both line displacement and free displacement, an Information with confirmation screen asking if the displaced guide should be saved in the field. If the user confirm, then the last field guide will be updated according to the offset value.

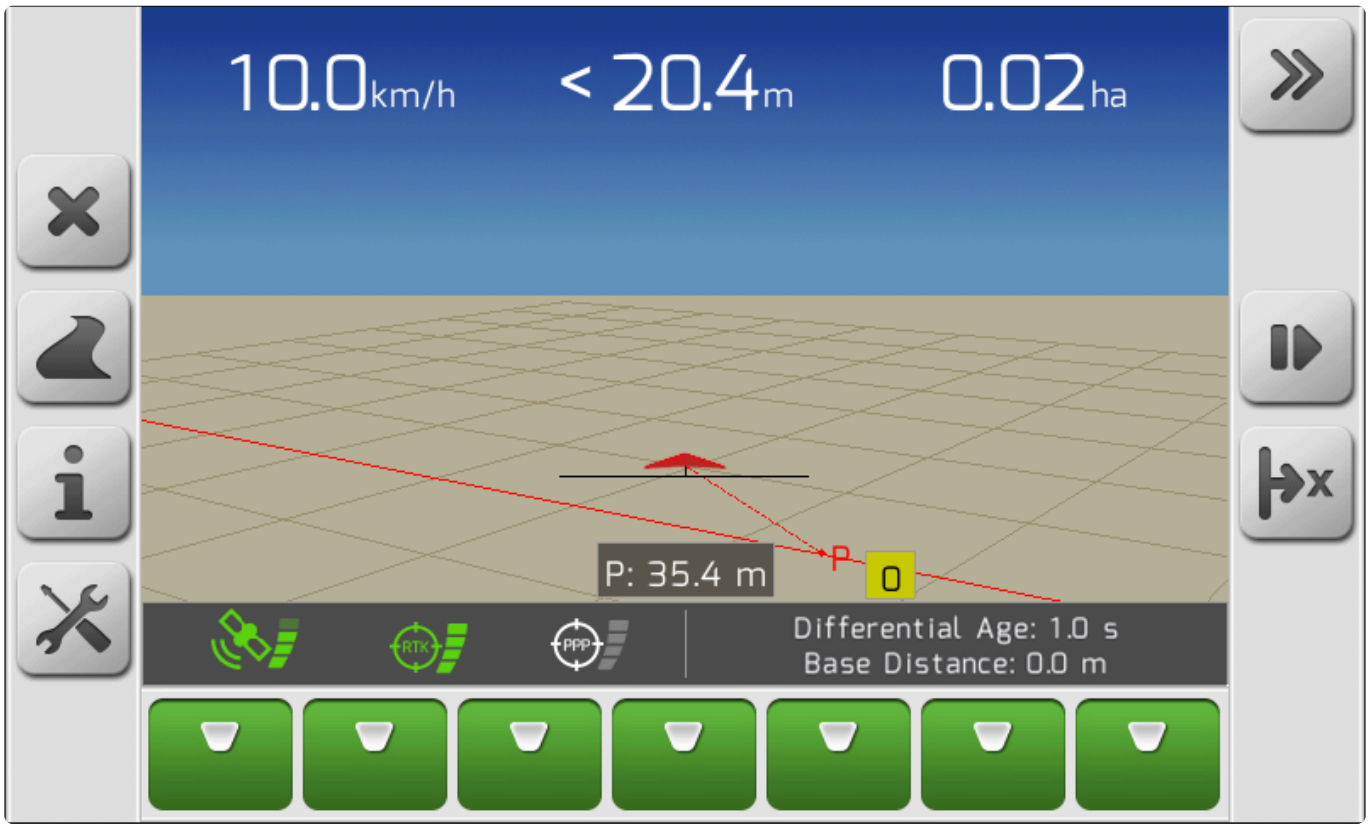
# 10.6. Pause/Resume Navigation

During an agricultural operation, it is quite common that the input being used in the application – sprayer fluid, fertilizers, seeds, etc. – runs out in the middle of a guide line. It becomes difficult for the operator to return to the same point at which the input ended without having any visual reference, especially for operations that do not leave visible ground marks, such as spraying in an area with already grown plants.
The GeoNave system has the Navigation Pause function for these situations, in which a pause point is marked on the navigation map, which helps the operator to return to the same position where the input ended after refueling.

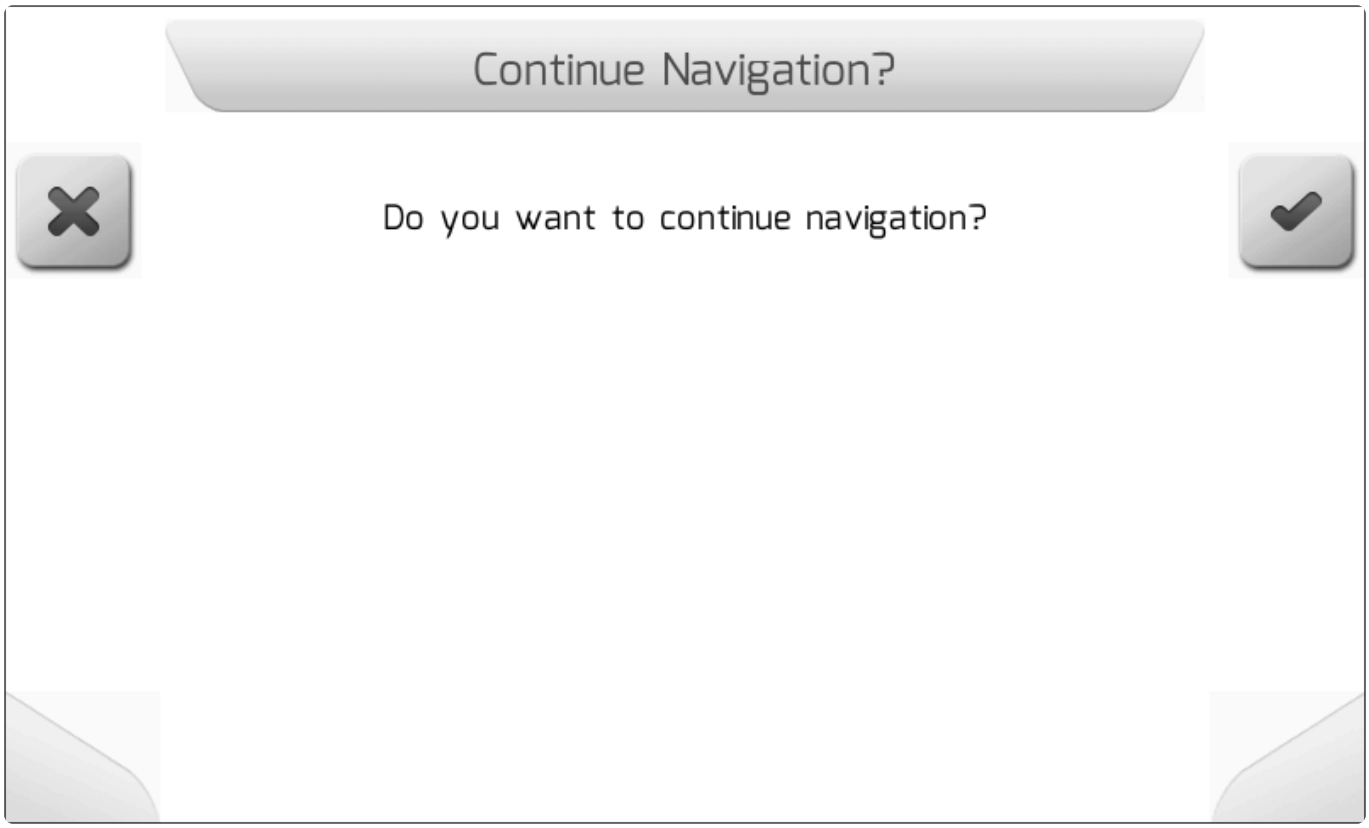
On the navigation screen, when there is an active guide, to pause navigation the user must press the pause button  . An Information with confirmation screen will be displayed for the user to confirm the navigation pause  , as shown in the image below. If the user presses the cancel button  , the navigation pause is not performed and the system returns to the previous screen.




Upon confirming the navigation pause, only the last guide on which the pause was made will be shown on the screen, in solid red line, and the deviation from Header will be calculated in relation to it. Between the pause point, marked on the screen in red and identified by the letter **P**, and the triangle that represents the tractor there will have a dashed line, indicating the direction of the pause point, and an information box will be shown with the distance to the pause point in the format **P: Distance**, as shown in the following image.



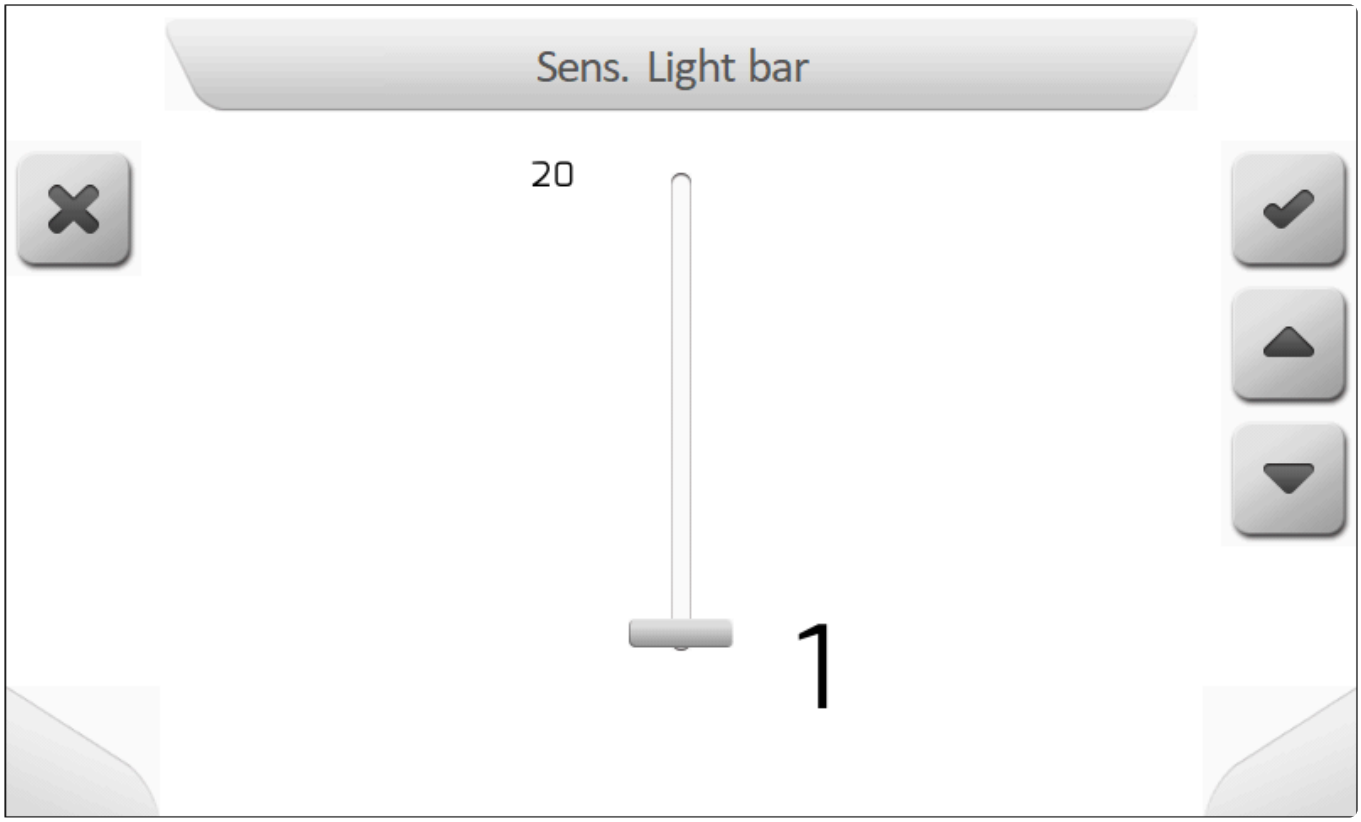
After returning to the place where the pause point was marked, to exit the pause state the user must press the resume navigation button . An Information with confirmation screen will be displayed asking confirmation on the navigation resumption , as shown in the following image. Pressing the cancel button , the pause will be maintained and the system will return to the previous screen.




After confirmation, the navigation screen will return to its standard state.

# 10.7. Lightbar setting

In the Settings during Navigation menu, the Lightbar Sensitivity parameter is used to configure Light Bar LEDs behavior according to deviation value and angle errors in relation to the target guide. The higher the sensitivity value, the more LEDs will light up for the same error values.
The Lightbar Sensitivity configuration screen is a Vertical choice screen type, with values between **1** and **20**, as shown in the image below.



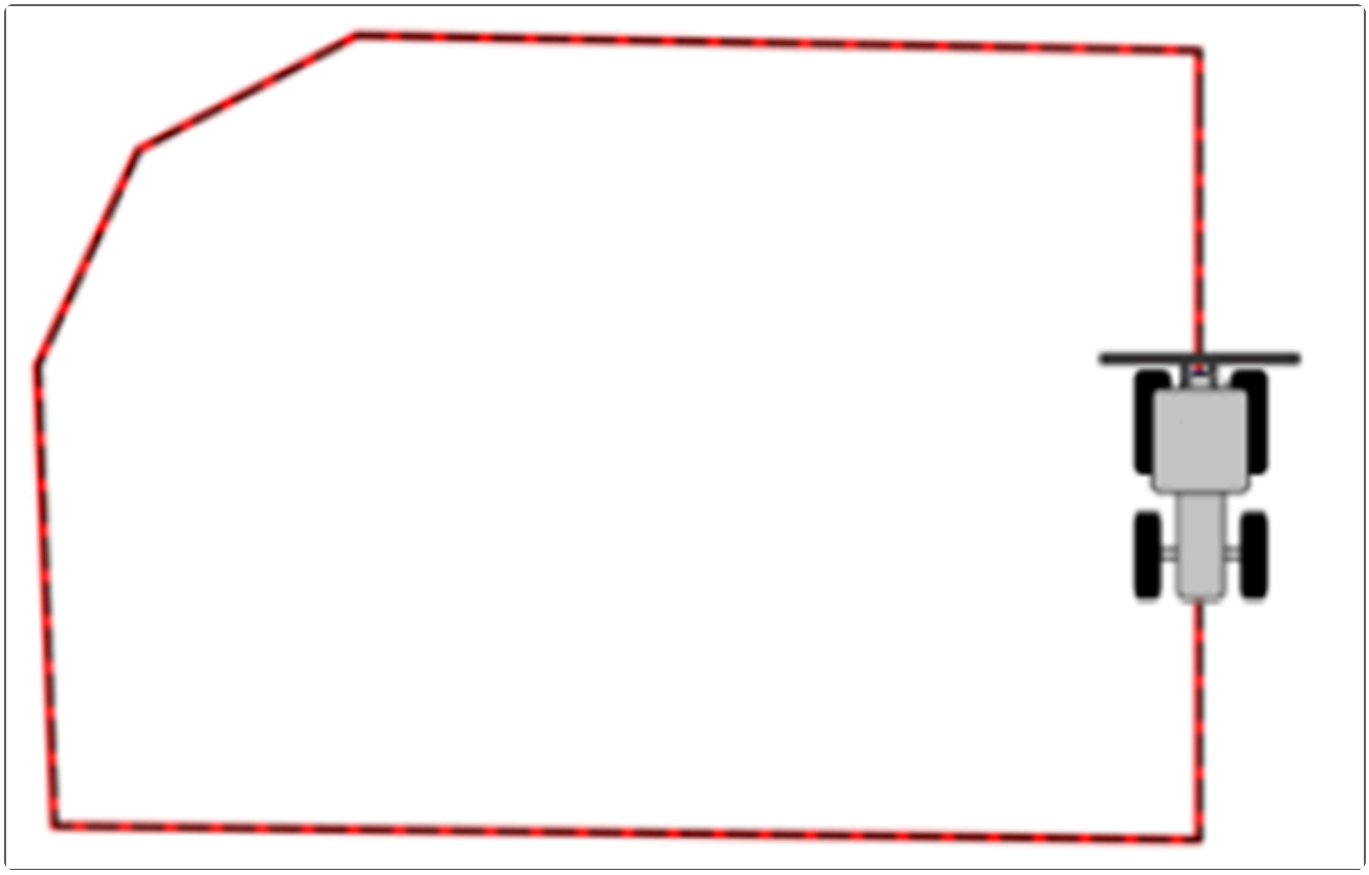

# 10.8. Create a Boundary

The Boundary corresponds to the field perimeter, the GeoNave system enables the user to draw a virtual line around the field, delimiting the useful area within which application must be performed. Boundary feature is recommended to be used with licenses that have section control – ISO 31, ISO 32, ISO 34, ISO 35 – since the functionality automatically closes sections when outside the area defined by boundary lines.

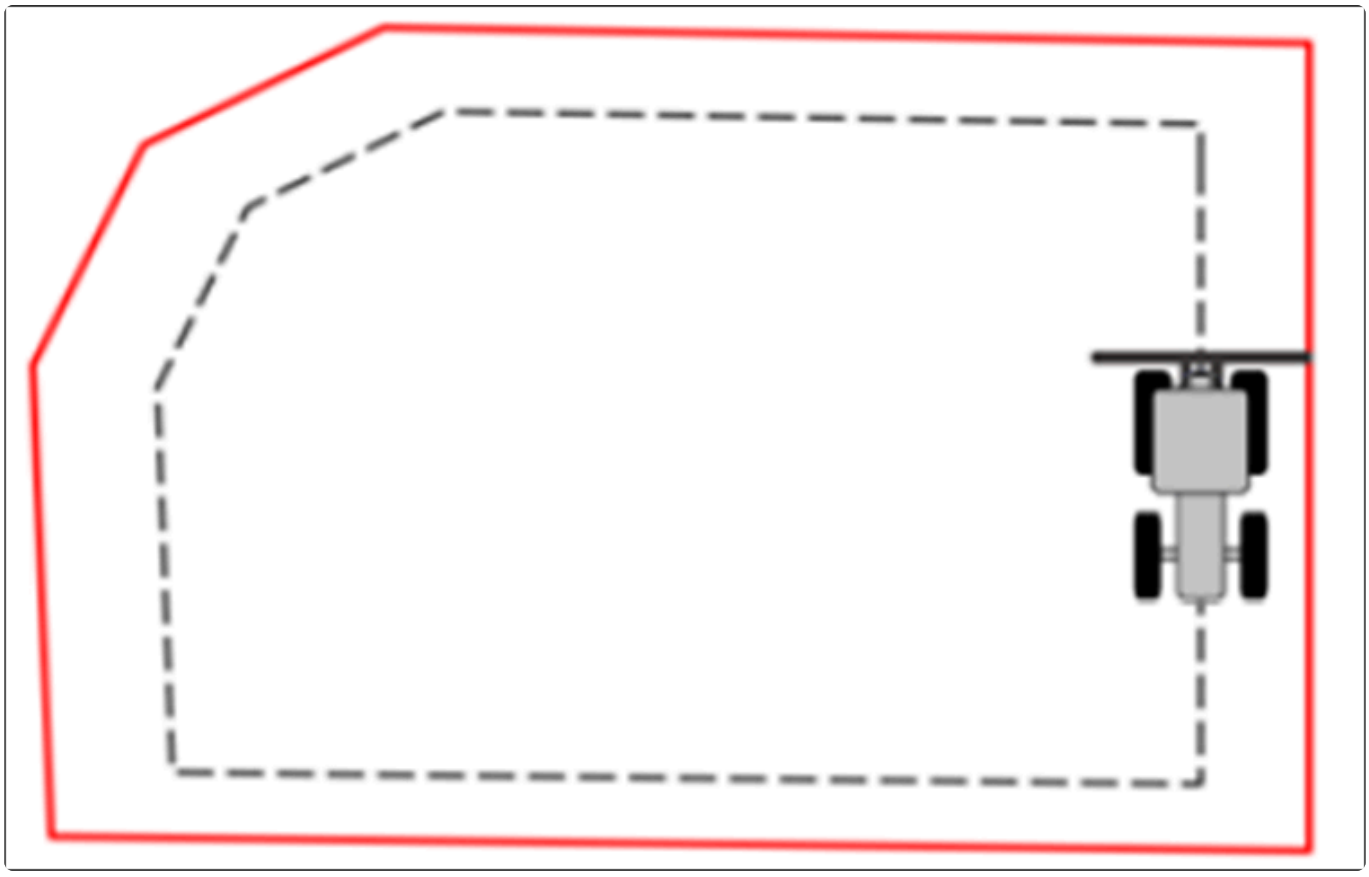
In the Settings during navigation menu, when the boundary is not yet defined, the Limit Pattern parameter will be shown, containing several options for boundary line creation.

With the exception of the **Project** limit type, the limit demarcation must be performed by the user, traveling with the machine directly over the field perimeter. The main difference between these types of Limit Pattern is the position in which the line is demarcated in relation to the implement boom center.

- **Half Boom** – The boundary line is demarcated exactly on the path taken by the implement boom center.

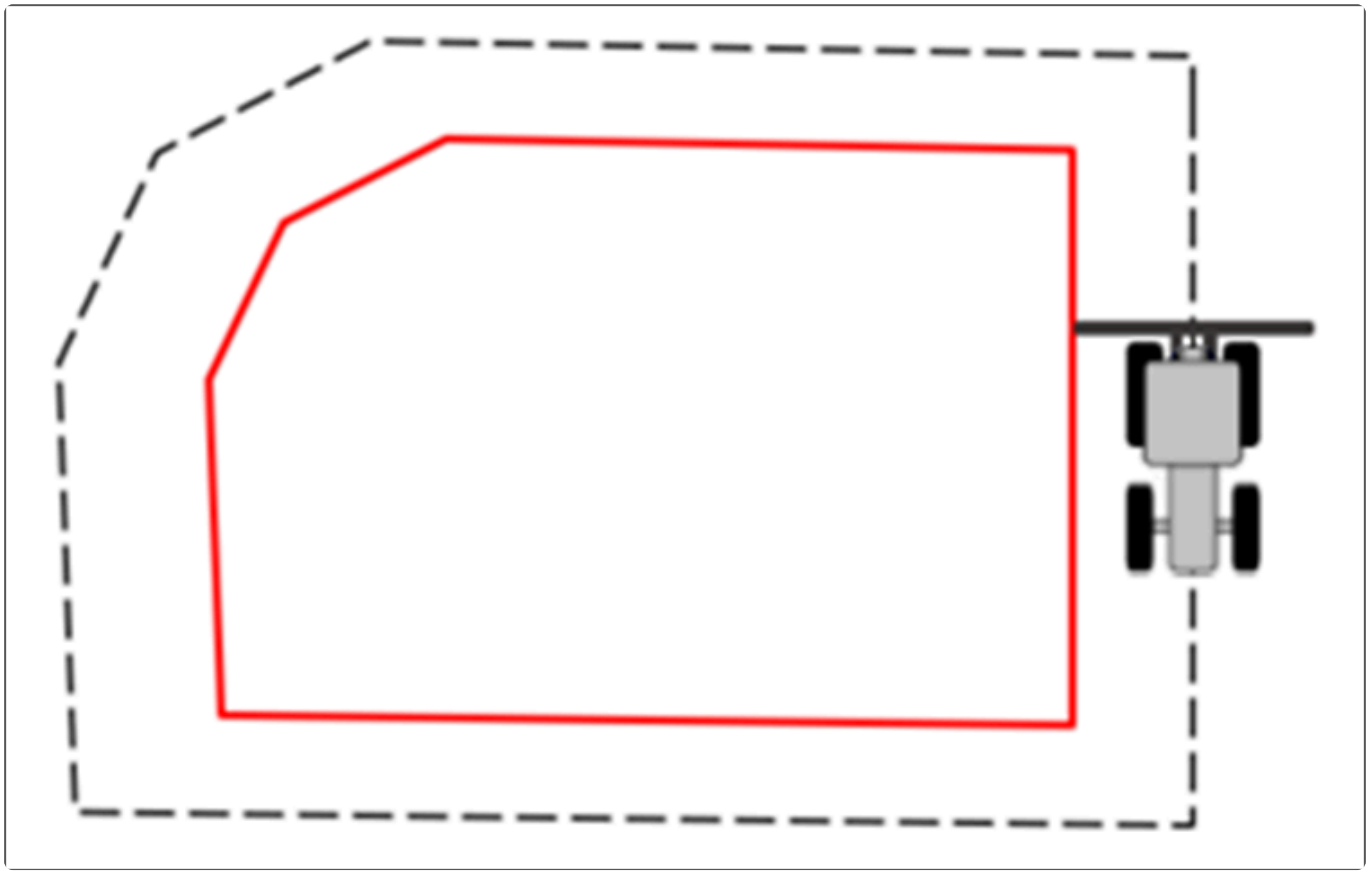


- **External – Full Boom** – The boundary line is demarcated at the implement boom outermost point, according to the direction (clockwise or counter-clockwise) performed in the field perimeter.

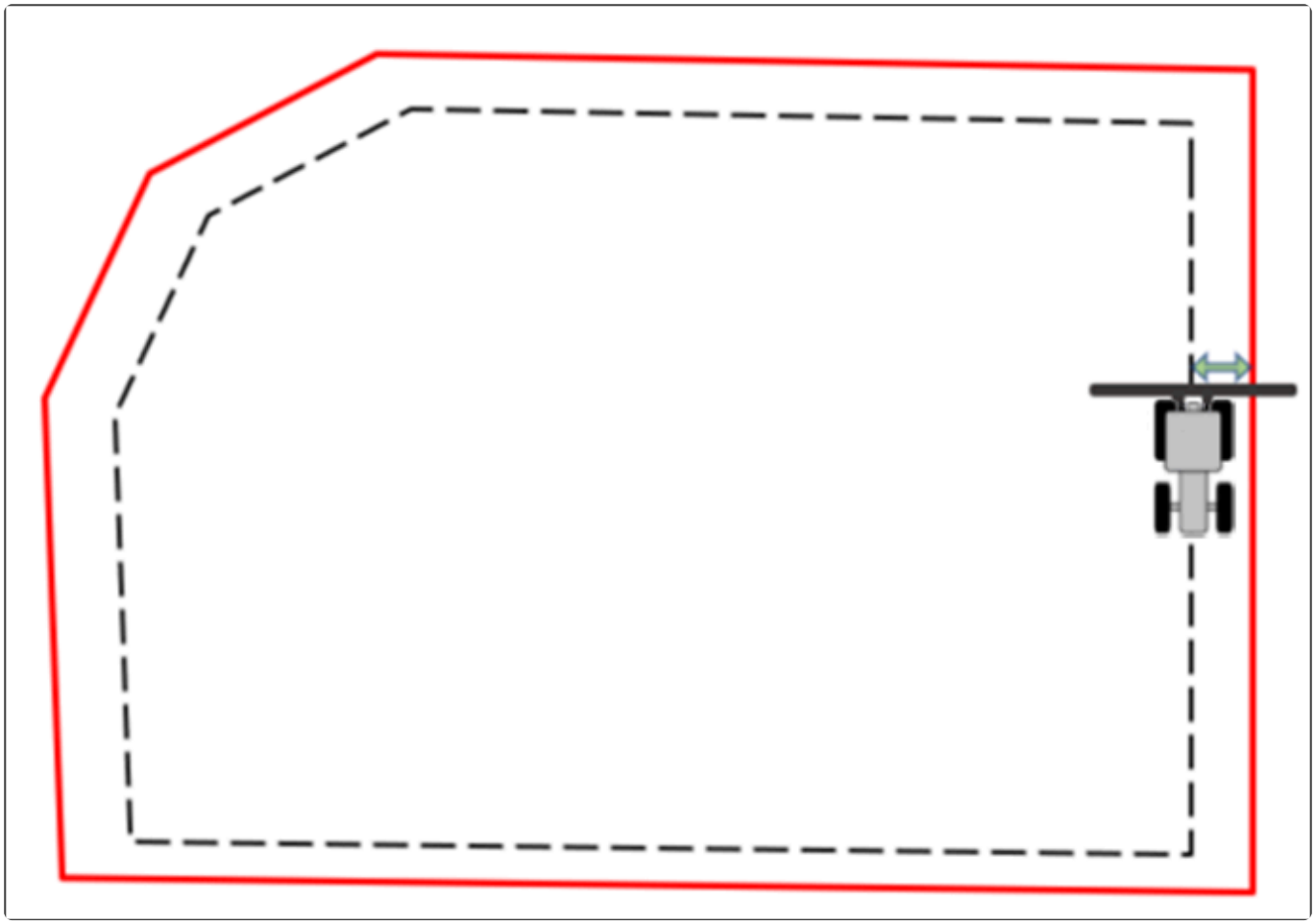


- **Internal – Full Boom** – The boundary line is demarcated at the implement boom innermost point,

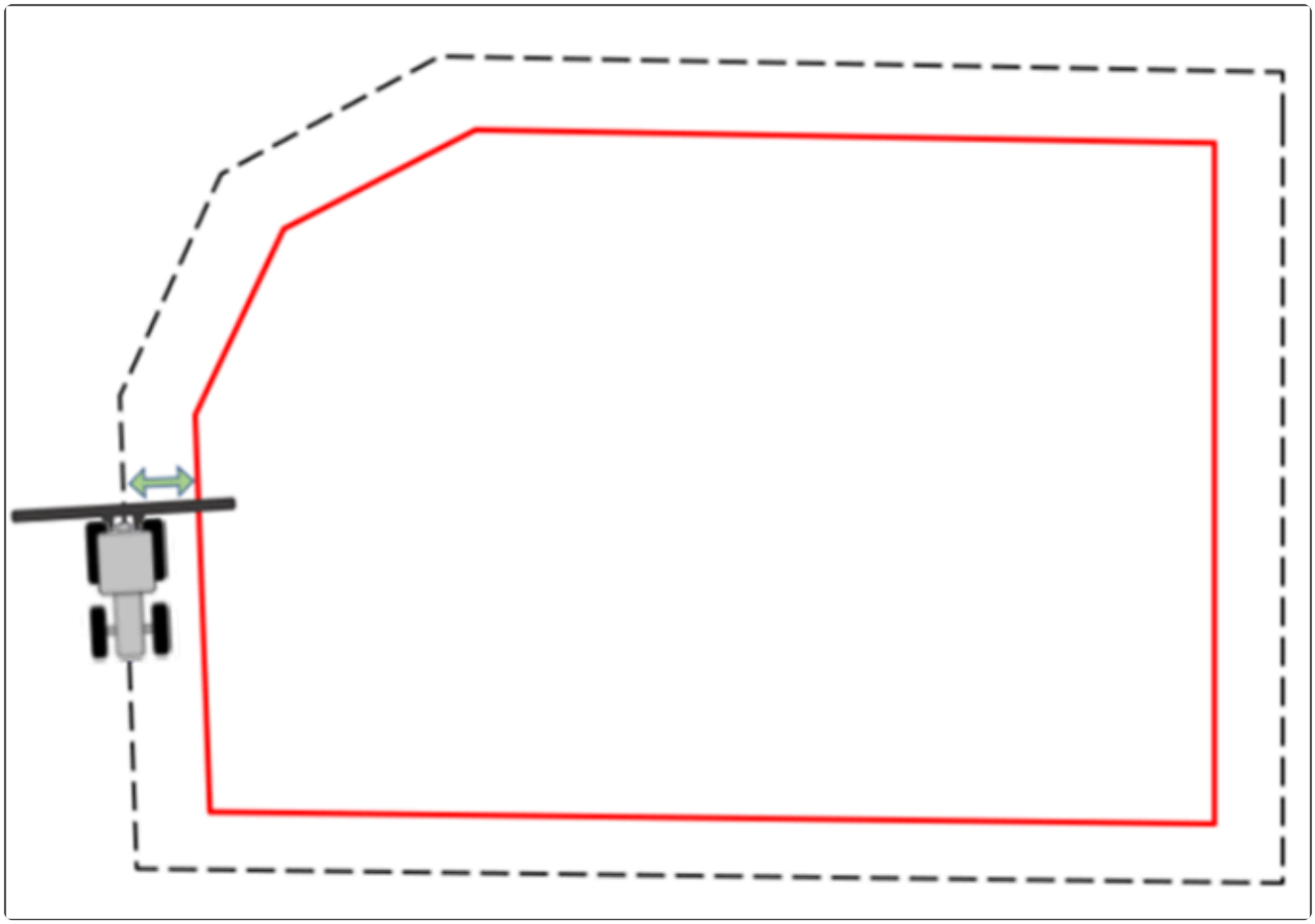
according to the direction (clockwise or counterclockwise) performed in the field perimeter.



- **External – Custom** – The limit line is demarcated at a distance determined by **Limit Shift** parameter, that will be enabled in the navigation settings menu if the limit pattern is **External – Custom**, measured from the implement boom central point towards its external end, according to the direction (clockwise or counter-clockwise) performed in the field perimeter.

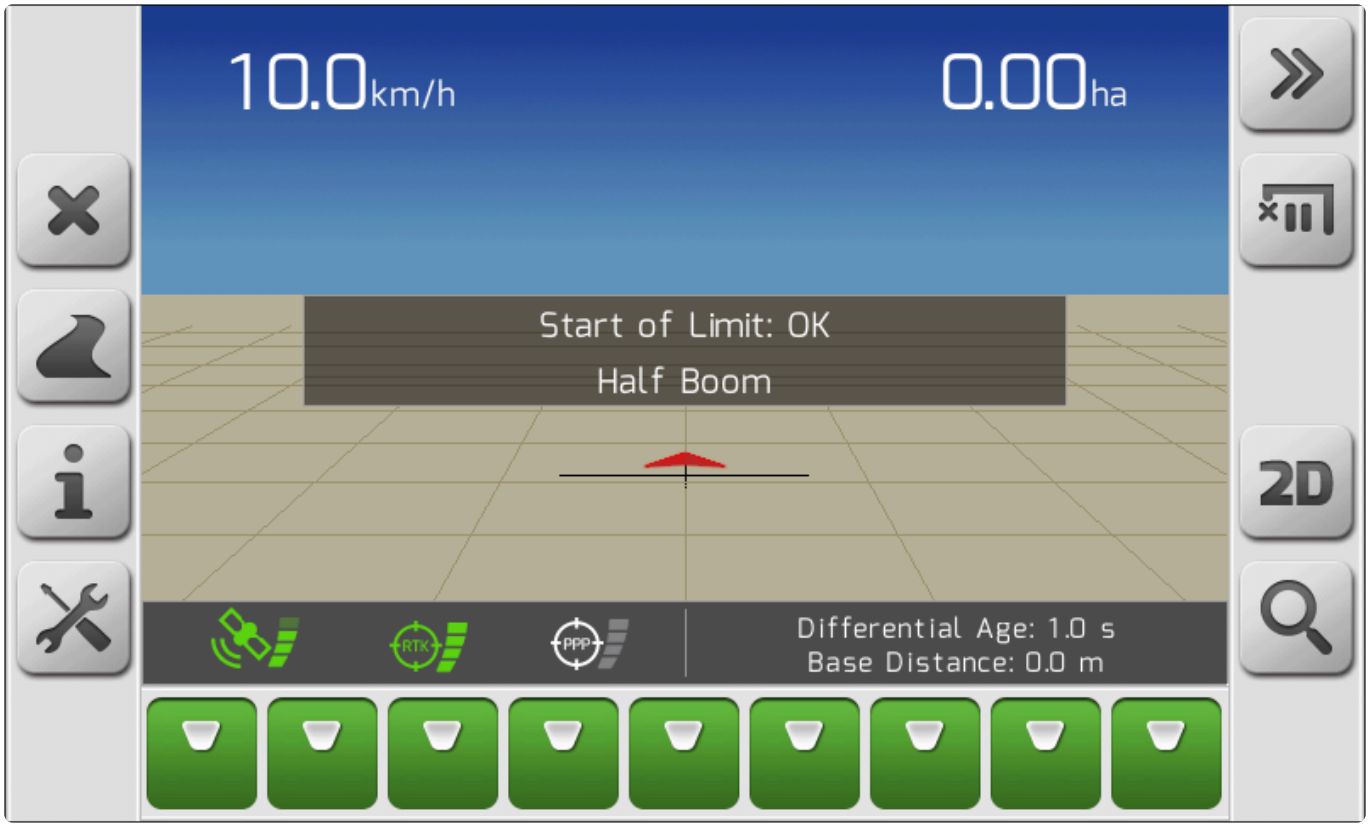


- **Internal – Custom** – The limit line is demarcated at a distance determined by **Limit Shift** parameter, that will be enabled in the navigation settings menu if the limit pattern is **Internal – Custom**, measured from the implement boom center point towards its inner end, according to the direction (clockwise or counter-clockwise) performed in the field perimeter.



## Start boundary delimiting

On the navigation screen, for limit patterns **Half Boom**, **External – Full Boom**, **Internal – Full Boom**, **External – Custom** and **Internal – Custom**, the start limit button will be present  . When pressing the button, a black dotted line is drawn on the navigation screen over the machine path. It will also show the Alert Board with the text **Limit start: OK** and the limit pattern just below. The following image illustrates the boundary delimitation start for a Half Boom example.

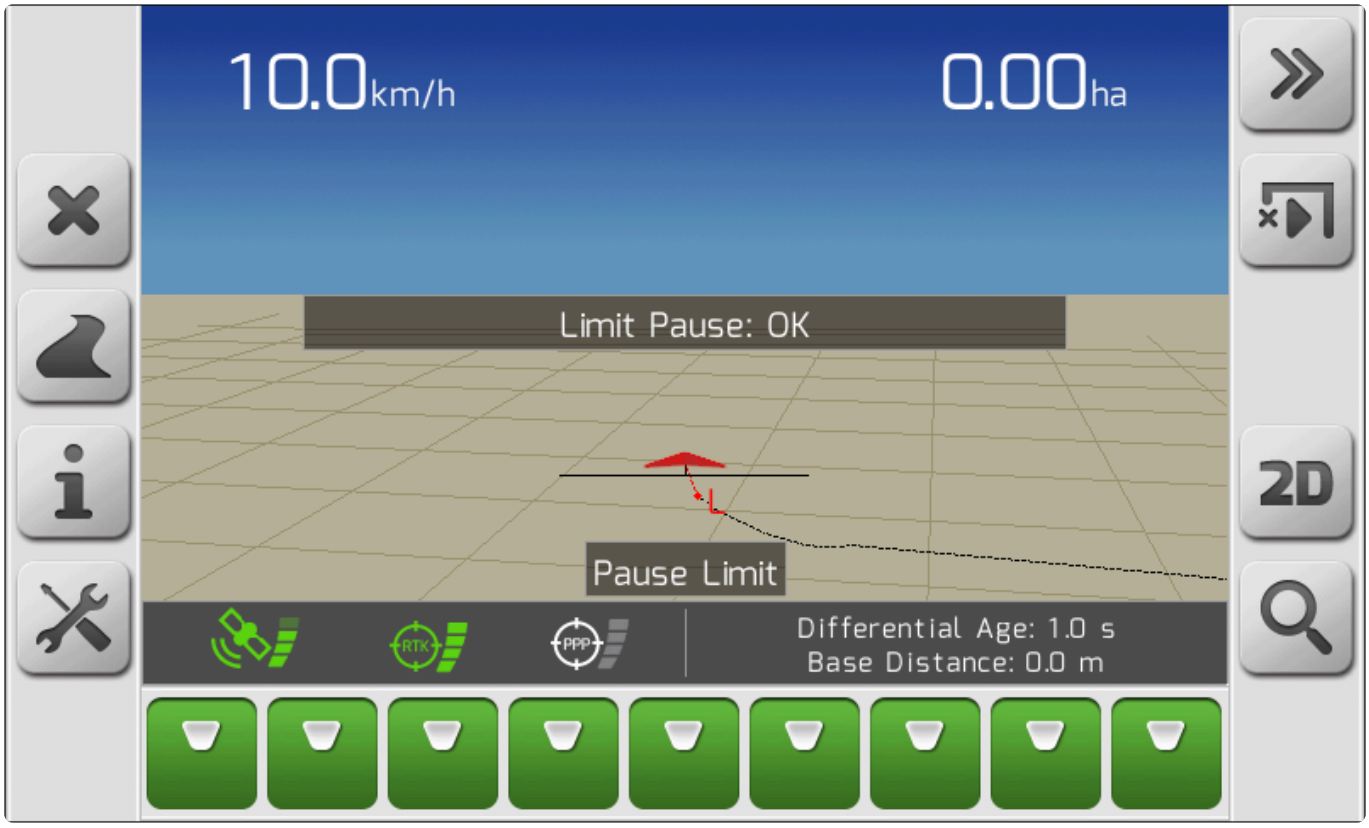



After delimiting the boundary starting point, the button bar on the right side of the navigation screen will show two other buttons. The pause boundary button and, if the machine is more than 20 meters away from the start point, the end boundary button .

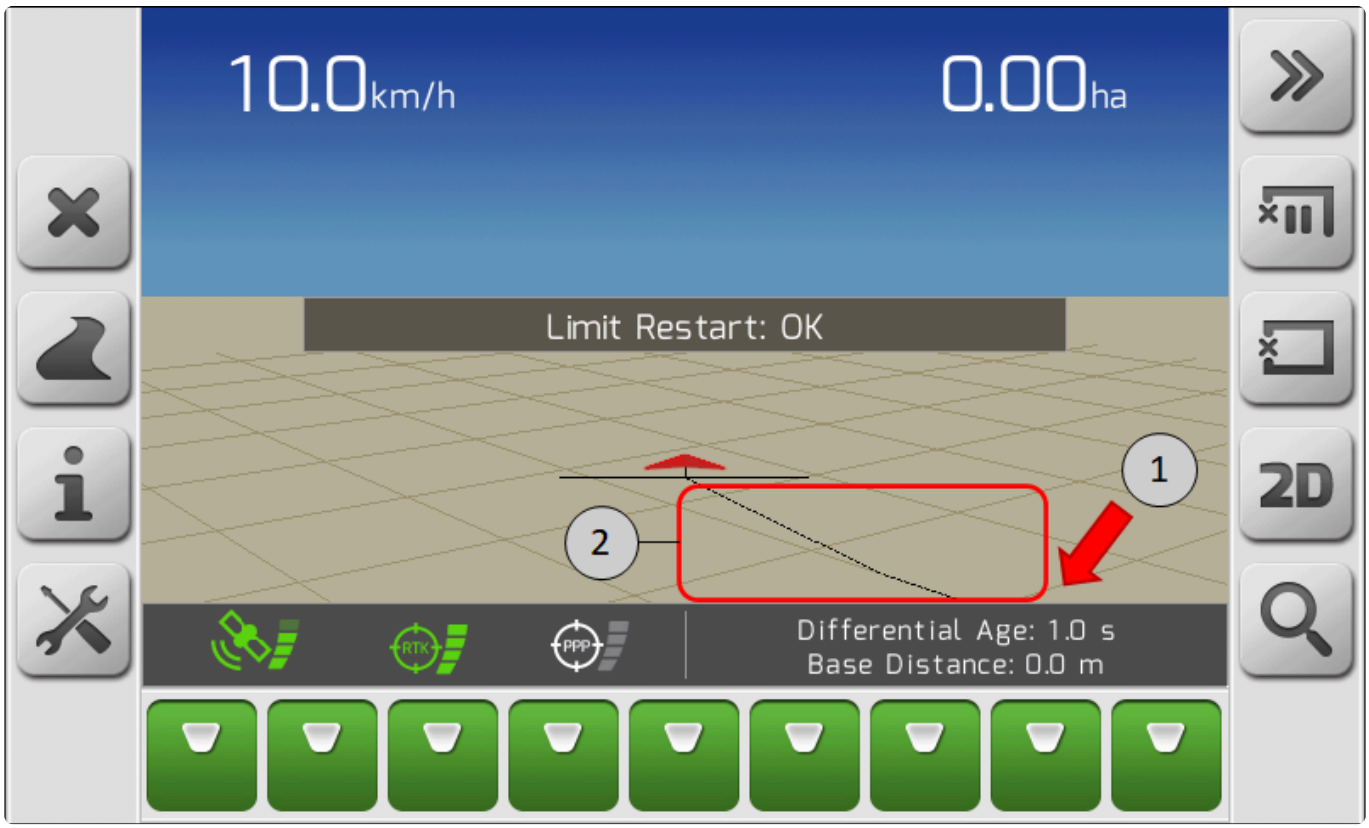
## Pause boundary delimiting

If during the boundary delimitation an obstacle is found in the path, such as trees, holes, stones, etc., the user can use the pause function to get around the obstacle.

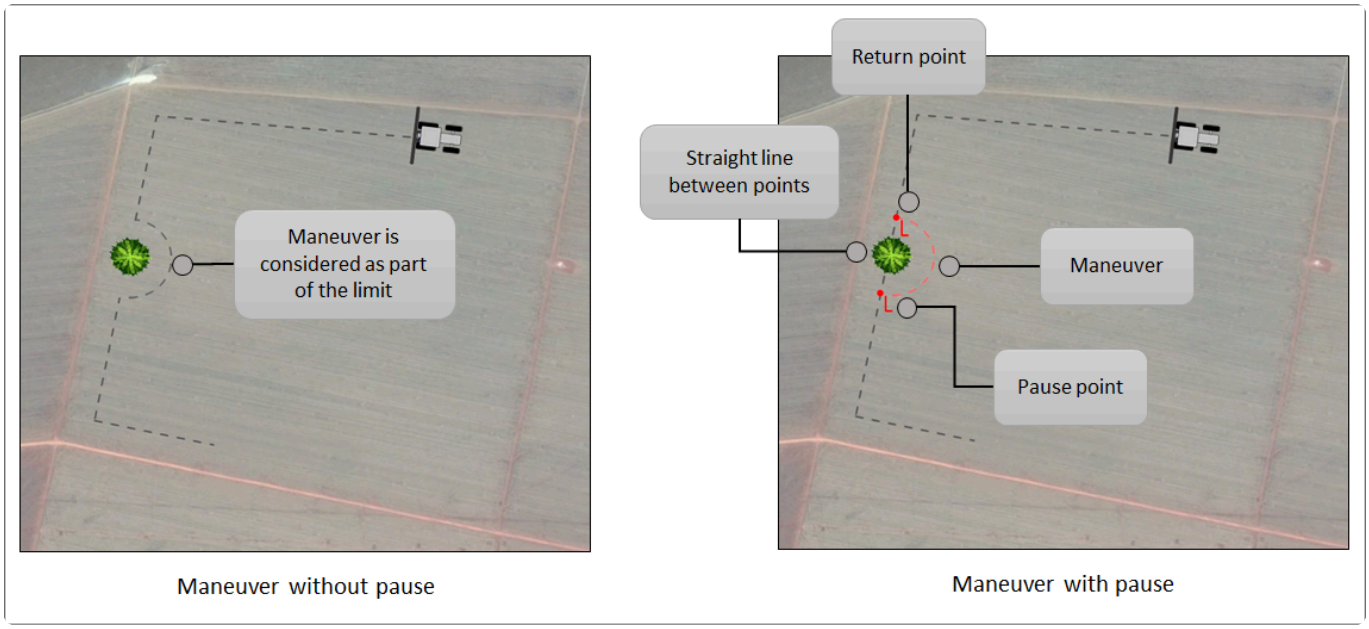
When pressing the pause boundary button , a red dot will appear on the map identified by the letter **L** and an Alert Board with the message **Limit Pause: OK**. The end boundary button will not be available, and the pause boundary button will be replaced by the resume boundary button . The image below shows the navigation screen during boundary delimitation pause.




To resume the delimitation, just press the resume boundary button  . The pause point **L** (1) will no longer be displayed in navigation screen and it will be linked with a straight line (2) to the current GNSS point of the implement boom center. An Alert Board will show the message **Limit Restart: OK**. The following image shows the navigation screen when resuming the boundary delimitation.



The maneuver to get around obstacles can be performed using the boundary pause function or not. The differences are illustrated in the images below.

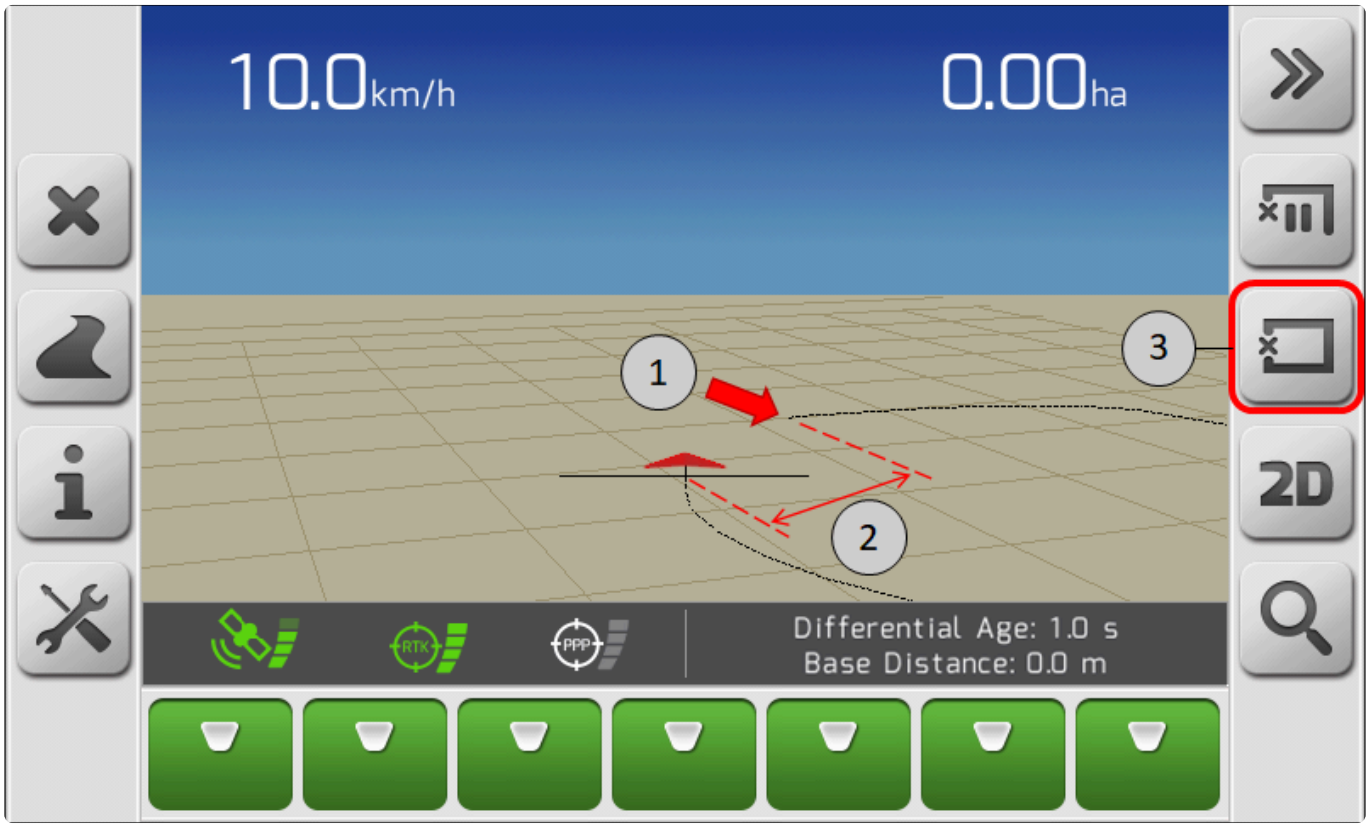



Maneuver without pause

Maneuver with pause

## Finalize boundary delimiting

The boundary delimiting finalization can be accomplished in two ways. The first is done automatically, when returning to a distance (2) less than 15 meters from the boundary start point (1), as shown in the following image. The second way is performed manually by pressing the end boundary button (3).



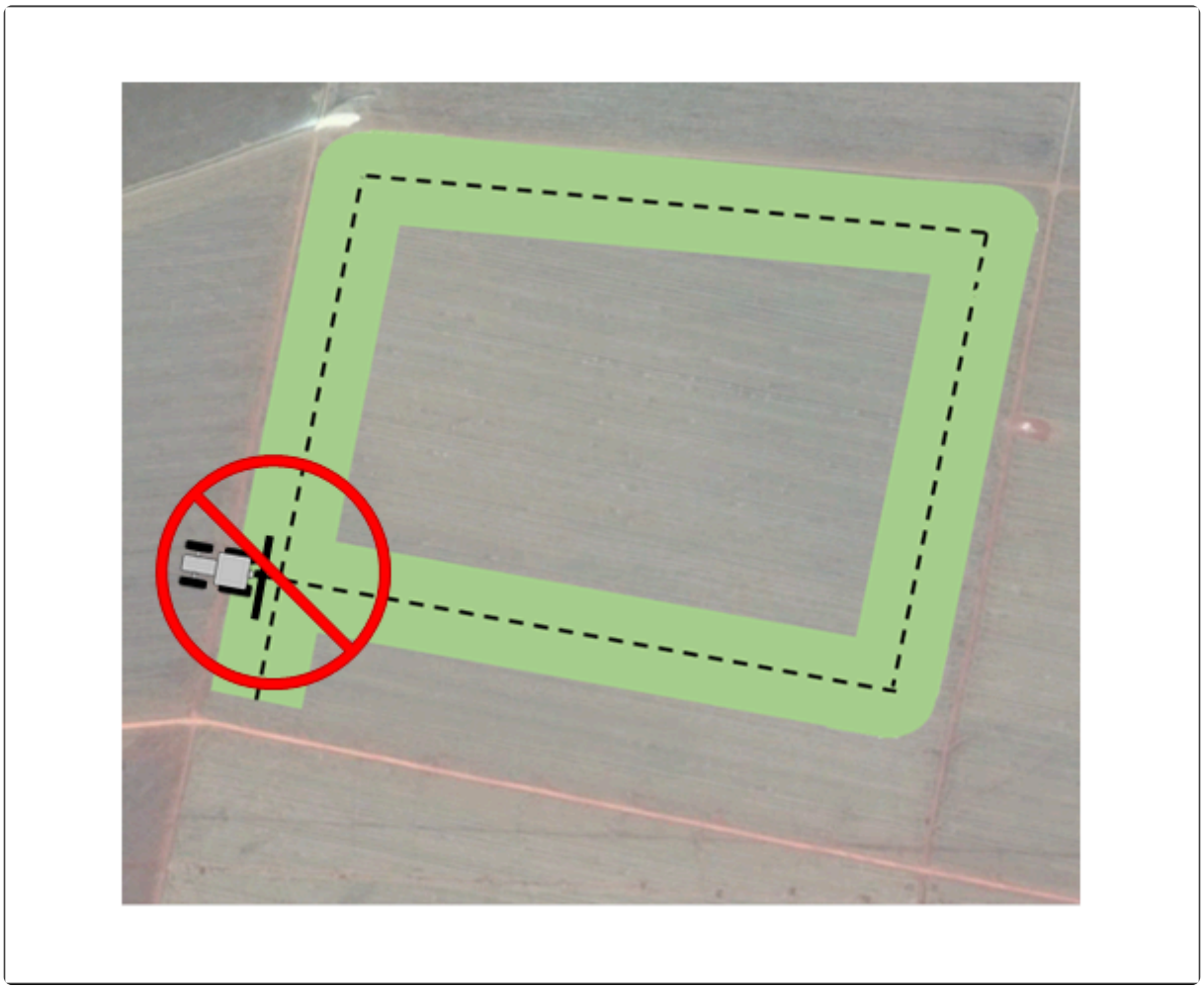

When the boundary is finalized, while the system is processing the boundary calculation, an Alert Board

with the message **Calculating boundary... Please wait!**. Then, after calculation, the alert board is updated with the message **End of boundary: OK**. The boundary line is then updated on the navigation screen, according to the Limit Pattern selected, changing from dashed to solid black. The Information Board is also updated, showing the boundary area data, according to the table below.

| Information | Description |
|---|---|
| **Total area** | Polygon area generated by the boundary line |
| **Applied Area** | Already applied area, within the boundary polygon |
| **Remaining Area** | Difference between **Total area** and the **Applied Area** |

## Invalid boundary

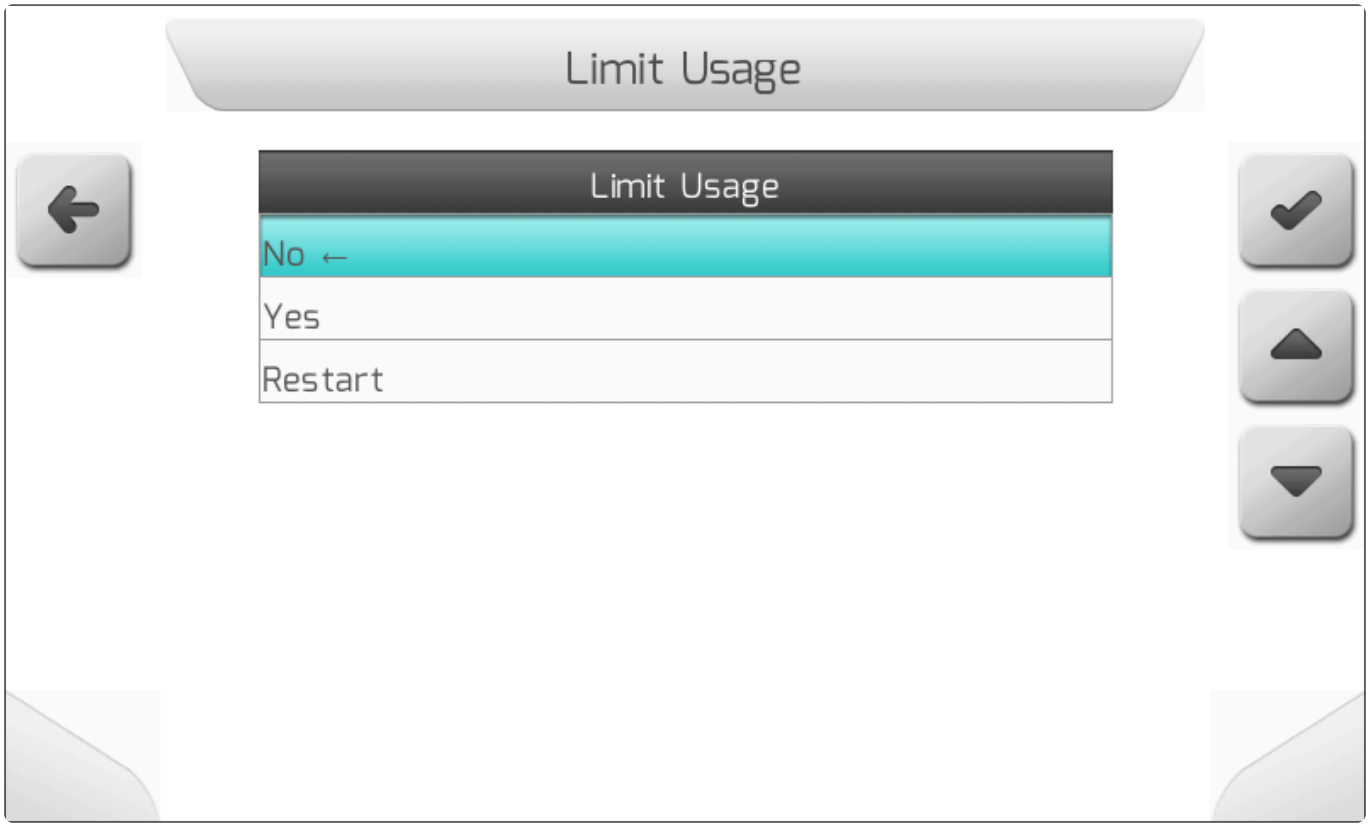
A Boundary delimitation is invalidated whenever it crosses the line of a boundary not yet finalized, as shown in the image below. The GeoNave system identifies the line crossing and cancels the delimitation operation, displaying the message **Invalid boundary** on an alert board.



## Limit Usage menu

When a boundary is properly delimited on the navigation screen, the **Limit Usage** item is displayed within the settings during navigation menu, as shown in the image below. Through this menu is possible to disable the boundary by the option **No**, enable by option **Yes**, and **Restart** for the demarcation of a

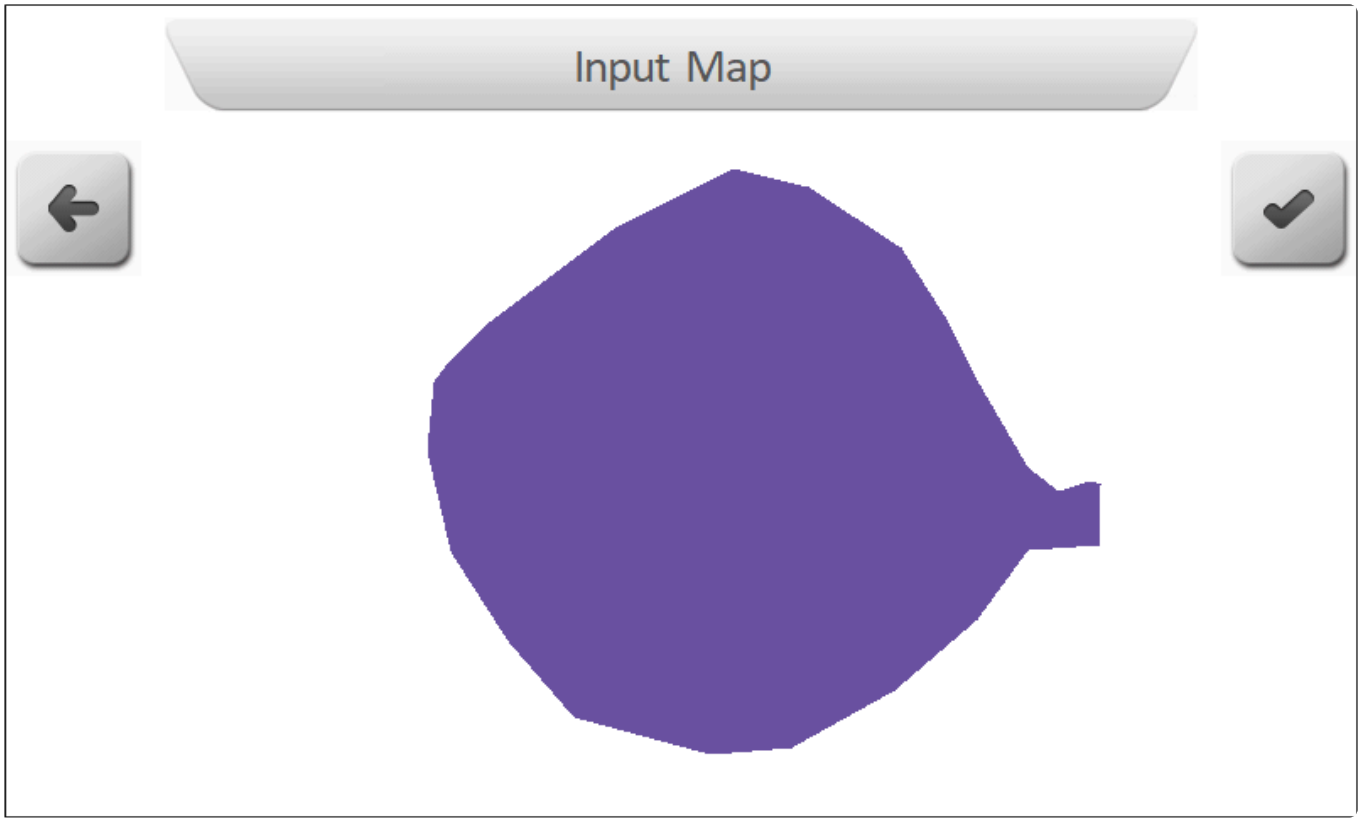
new boundary polygon.



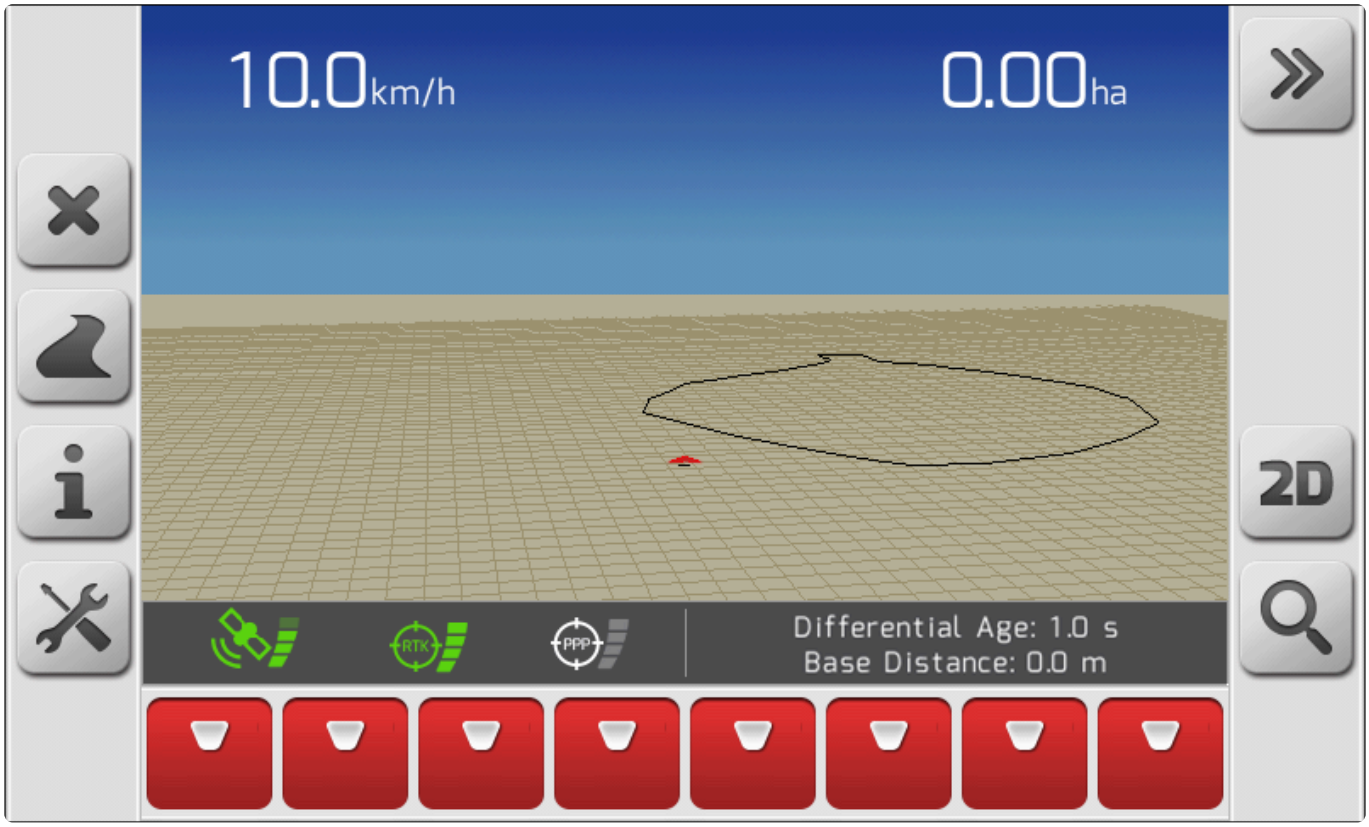

## Project boundary

When the Limit Pattern is configured as **Project**, the boundary polygon follows the selected *Shapefile* project file. The boundary project is created through a specific computer software, in which the agronomist determines the perimeter of the field in which the work will be performed.

At boundary projects File List, select the **SHP** file desired and press the preview button  . The boundary design map will be loaded into the memory and presented for user confirmation, via the Input Map screen, as shown in the example below.




If the user believes that the map shown is not the intended one, press the back button  to return to the previous screen and select another project. If the boundary project is correct, by pressing the confirm button  the map containing the boundary polygon will be loaded in the navigation screen, as shown in the image below.



# 10.9. Main Sprayer Switch on/off

On the GeoNave system navigation screen with licenses ISO 31, the Trail corresponds to effectively sprayed area, being filled with green in the screen according to the Implement width and sections state.

There are two options for turning the main sprayer switch on or off.

### Application button

The Application button is used to change the status of the main sprayer switch on the navigation screen, alternating between enabled and disabled.

### Touch sensitive sprayer activation button

On the Side button bar – Left is available a touch sensitive button for activating the sprayer. As with the application button, each time the button is pressed, the state of the main sprayer switch toggles between enabled and disabled.

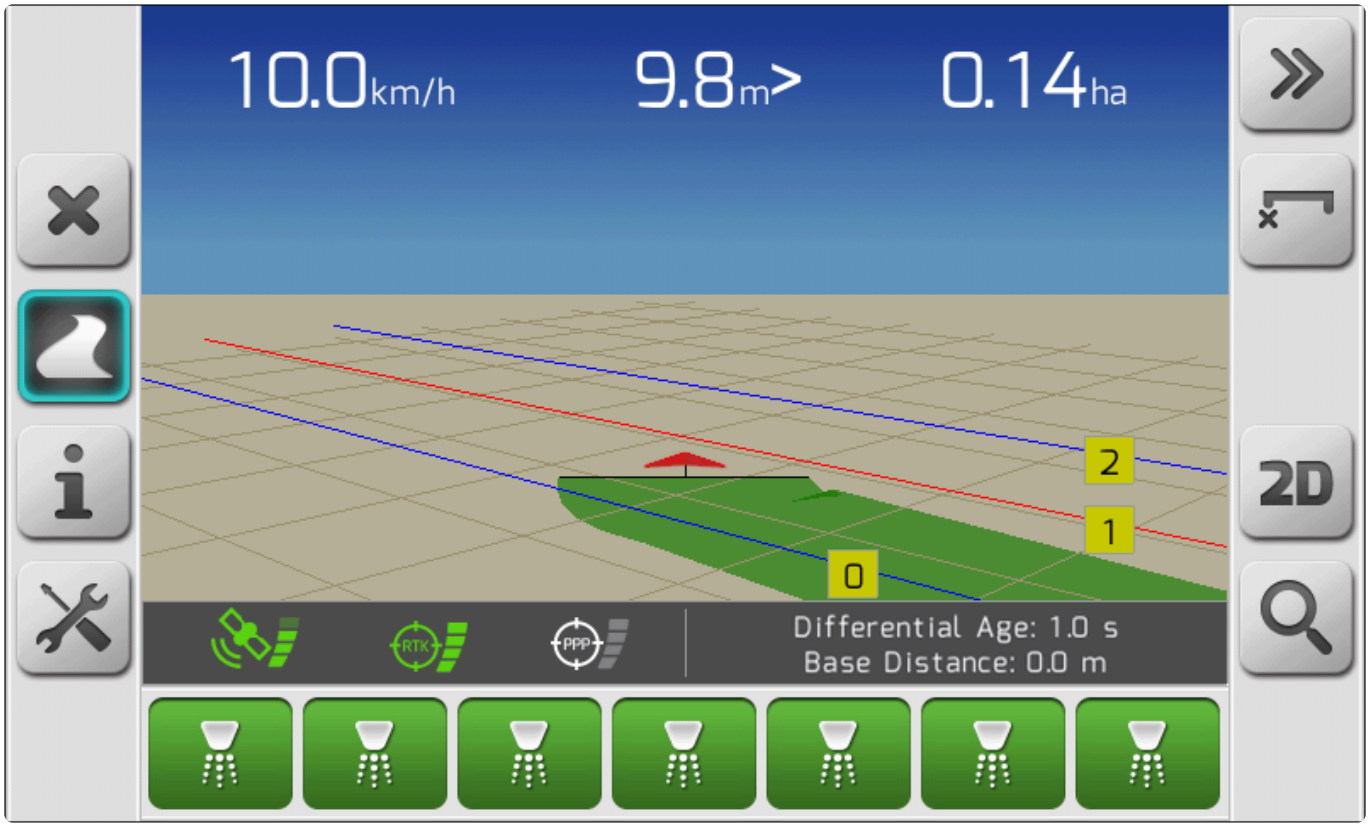
If the main switch is enabled, the button will be in its active state  . Otherwise, in the disabled state  .

# 10.10. Toggle 2D/3D View

The navigation screen can be displayed in two perspectives types: two dimensions (2D) or three dimensions (3D). The user can choose the perspectives that best suits the agricultural operation being performed.

### 3D → 2D

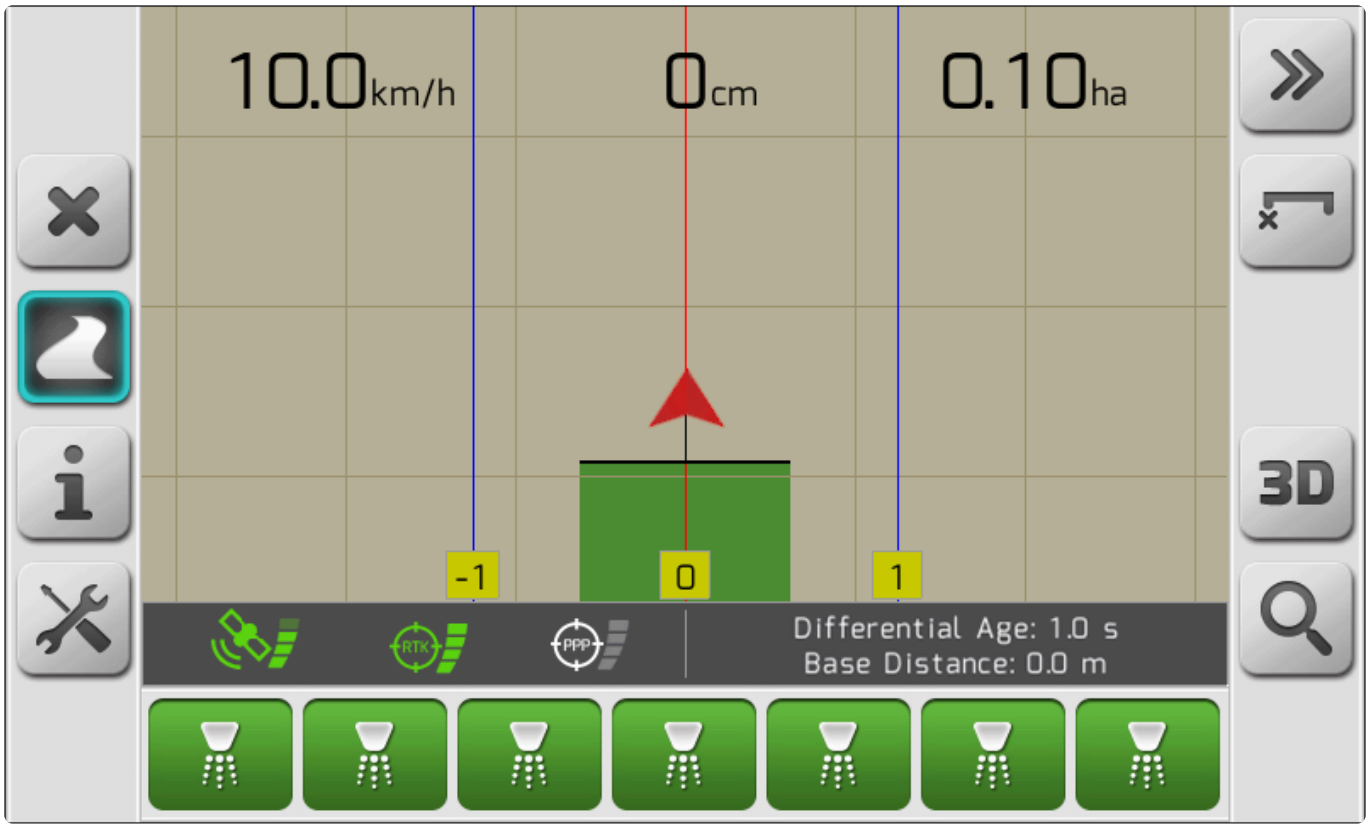
When the current perspective is in 3D, the right Side Buttons displays the button  , as shown in the image below. When pressed, the display changes to two dimensions.




## 2D → 3D

When the current perspective is in 2D, the right Side Buttons displays the button 

, as shown in the image below. When pressed, the display changes to three dimensions.



# 10.11. Brightness setting

The GeoNave displays allows the user to configure luminous intensity of LCD background and LEDs Lightbar, in order to provide the proper level of visual comfort.
There are two ways to configure the brightness.

### Settings menu> Advanced

The Brightness item from the menu allows the luminous intensity configuration before starting the navigation.

### Settings during navigation

On the Settings during navigation menu, the Brightness item will also be available, allowing the user to adjust system luminous intensity while work is in progress.

# 10.12. Change Color Scheme

In order to improve the user visual comfort, it is possible to change the system's color scheme according to time and ambient lighting conditions in which the GeoNave display will be used.
There are two ways to configure the color scheme.

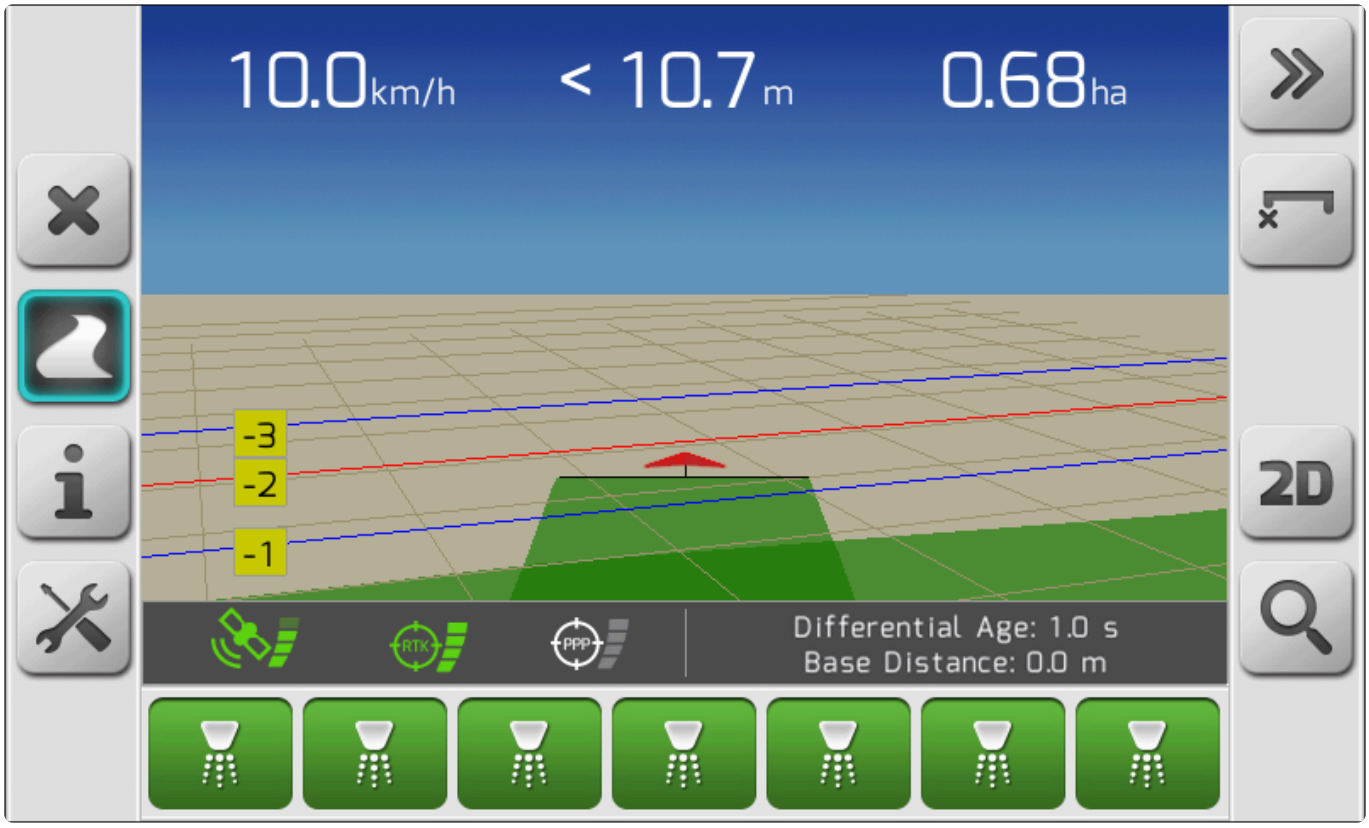
### Settings menu> Advanced

The Color scheme item in the menu allows the system colors configuration before starting navigation.

### Settings during navigation

On the Settings during navigation menu, the Color scheme item will also be available, allowing the user to adjust the system colors while the work is in progress.

The colors of the items on the navigation screen can be displayed in **Day** and **Night** mode. The images below show each configuration.







# 10.13. Display GNSS Signal Quality

GNSS signal quality evaluation is important to diagnose possible accuracy problems in agricultural operations. Through the information contained in the Satellite Information menu, as GPS Precision, HDOP, Used Satellites and Visible Satellites, the user can get an overview of the currently signal

condition received from satellites.

In addition to Satellite Information menu, this informations can be accessed through the item **Signal Quality** on Settings during navigation menu.

# 10.14. Terrain Compensator setting

Terrain compensator is a GeoNave system accessory which considerably improves the GNSS signal accuracy. Its settings are made in Settings > Advanced> Terrain Compensator menu, which is also accessible from the Settings during navigation menu.

To configure the terrain compensator, the following steps must be followed.

1. Configure Arrows Position parameter.
    a. Check Installation status, that should show **OK**.
2. Configure Antenna Height parameter.
3. Configure Antenna Side Shift parameter, in case of misalignment in relation to the tractor longitudinal axis.
4. Calibrate the terrain compensator, as demonstrated in Calibration topic.
5. Check the correct functioning of the three angles.
    a. Direction.
    b. Inclination.
    c. Pitch.

# 10.15. Performing an Irrigation

> Irrigation operation is not performed in conjunction with sprayer flow and sections control. The navigation files generated regard to the hoses positioning operation.

The Irrigation operation is normally used in sugarcane crop applications. In the proximity of sugarcane crop, it is common to find reservoirs of vinasse – one of the liquid by-products of the fractional distillation of fermented sugarcane juice, extremely rich in nutrients. Next to these reservoirs, there are large gauge hose reels, hundreds of meters long. The hoses are completely laid down in the field with tractors help, so that the vinasse application in high flow and with great lateral reach can be activated, while the hose is automatically retract by the reels mechanics, diffusing liquid fertilizer in a large area of the field.
The GeoNave system assists the operator in several stages of the Irrigation operation. First, in the process of hose laying down, informing through visual and audible alerts when the distance parameters related to the hose length have been reached, preventing damage and rupture. Also through the various Guide Patterns available, the system allows the user to perform a uniform application, without lack of application and overlaps, using the Implement width as the hose flow lateral reach.

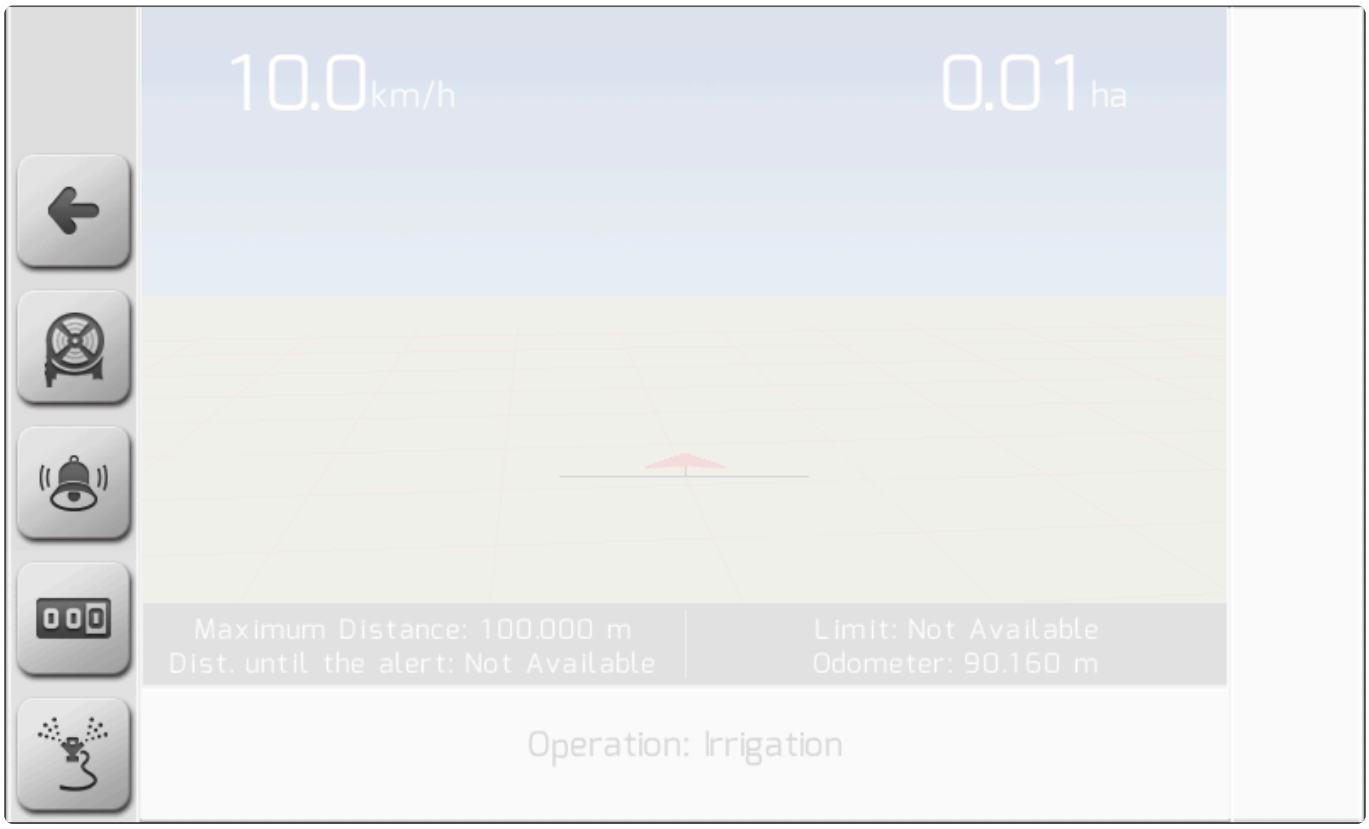
To configure the Irrigation operation on the GeoNave system, follow the steps described below.

## 1) Configure Implement Width

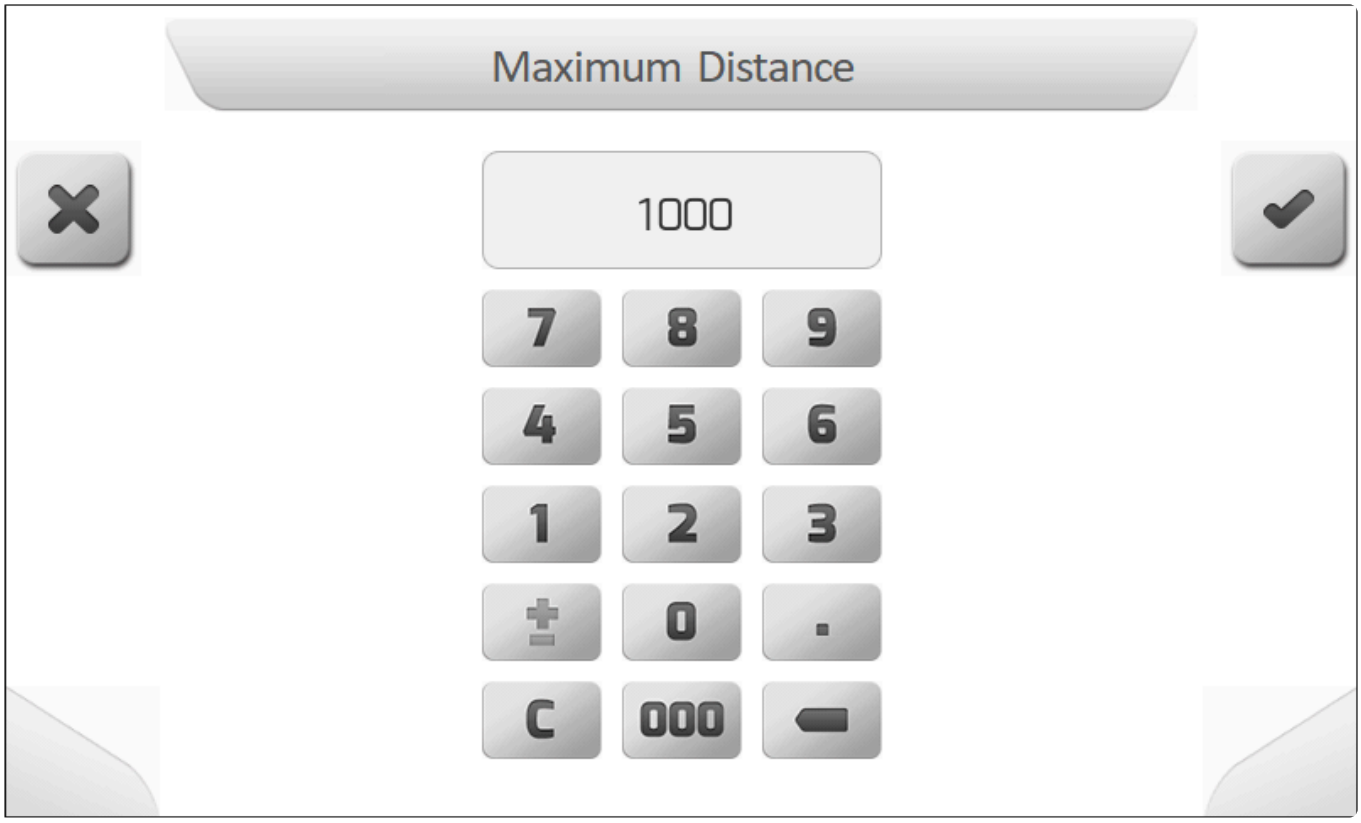
The Implement width will be used to fill the Trail performed during irrigation application.

## 2) Configure the Hose parameters

In the navigation screen, the irrigation settings button  will be available. Pressing the button, the left side button bar will assume the configuration shown in the image below.




The Maximum Distance setting button  allows to configure the hose total length with values between **1.000** and **2500,000** meters. The Maximum Distance setting screen is shown in the following image.




It is also possible to configure a distance to start visual and audible alert during the process of laying down the hose, through the Configure alert button  . Pressing the button, the Alert configuration screen will be displayed as shown in the following image.



## 3) Reset the Odometer

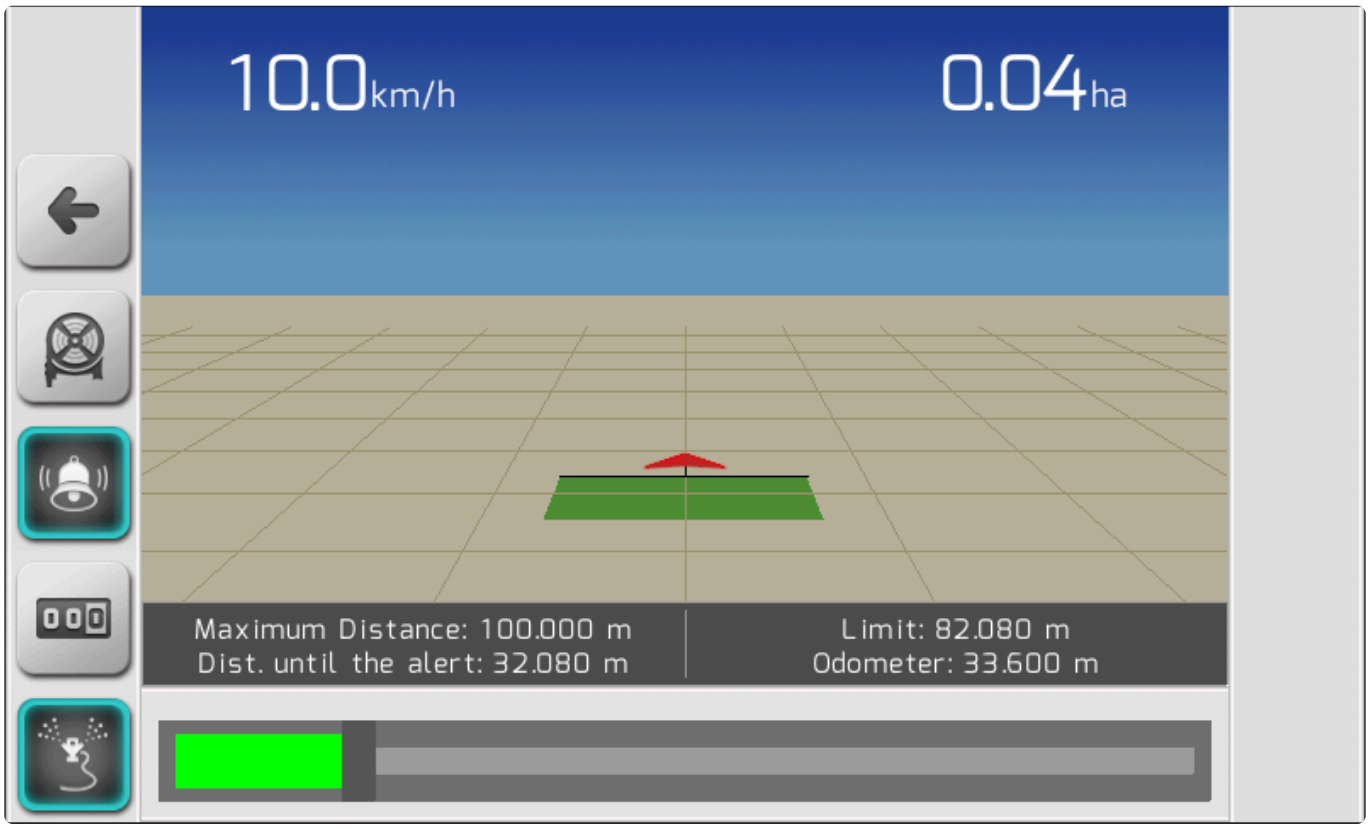
When the irrigation settings button  is pressed, the Information Board shows the Odometer value, which increases with tractor's displacement. To reset its value and start the hose laying down procedure, the odometer reset button must be pressed  .

## 4) Create a Guide

Before starting the irrigation operation, the user can perform the procedure described in Create a Guide, to guide the process of diffusing liquid fertilizer in the crop area.

## 5) Start Irrigation

Pressing the activate irrigation button  irrigation operation will start. Both Information Board and Footer are modified in the navigation screen, as shown in the image below. The trail is also shown, demarcating the area that will be applied when the hose is retract by the reels mechanics.




While the tractor lay down the hose, Information Board values and Footer graph are updated.

- **Distance to alert** decreases from configured value in the Alert menu until it reaches zero, then its displayed value changes to **ACHIEVED!**.
- The **Limit** distance value decreases starting from the value configured in the Maximum Distance until it reaches zero, then its displayed value changes to **ACHIEVED!**.

- The **Odometer** increases with tractor's displacement.
- The ruler in the footer graphic moves to the right, while the area to its left is colored according to the distance traveled from the moment the irrigation button  was pressed until the moment the Alert distance is reached.
    - Green: Up to half value of Alert distance.
    - Yellow: Between half and full value of Alert distance.
    - Red (flashing): From the total value of Alert distance, also an intermittent beep will be activated.

When the hose total distance is reached, the ruler is filled whit flashing red and also a constant beep is activated, warning that the hose may break.

# 10.16. Sprayer Tank Filling

> If the Flowmeter parameter is configured with value **0 (flowmeter disabled)**, the Fill Tank item will not be displayed in the Settings during navigation menu.

To fill the sprayer tank level, according to the Tank Capacity informed value, the user must select the item **Fill Tank** in the Settings during navigation menu, accessible on the navigation screen via the settings button  , and press the confirm button  .

> To complete the tank filling process, the machine must be stopped, and with the main sprayer switch off.

> The GeoNave system does not have an analog tank level sensor, so the calculation is based on the initial level informed by the user when completing or changing the tank level, decreasing the amount of sprayer fluid that passed through the flowmeter. To obtain a calculation as accurate as possible, it is important to correctly perform the Flowmeter Calibration.

# 10.17. Changing the Sprayer Tank Level

> If the Flowmeter parameter is configured with value **0 (flowmeter disabled)**, the Fill Tank item will not be displayed in the Settings during navigation menu.

To change the tank level, select the item **Tank Level** in the Settings during navigation menu, accessible on the navigation screen via the settings button  , and press the confirm button  . The Value

Editing screen will be displayed, allowing values from 0 L to the configured value of the Tank Capacity parameter.

> To complete the process of changing the tank level, the machine must be stopped, and with the main sprayer switch off.

> The GeoNave system does not have an analog tank level sensor, so the calculation is based on the initial level informed by the user when completing or changing the tank level, decreasing the amount of sprayer fluid that passed through the flowmeter. To obtain a calculation as accurate as possible, it is important to correctly perform the Flowmeter Calibration.

# 11. Firmware Update

The procedure for updating the GeoNave system *firmware* must be performed whenever a new update is available on the official website Geoline, or sent via email by our Technical Support team. It is very important to keep the equipment with the latest version, in order to correct any problems and appreciate new features.

For the update the user must use a flash drive of maximum 8 GB of storage capacity.

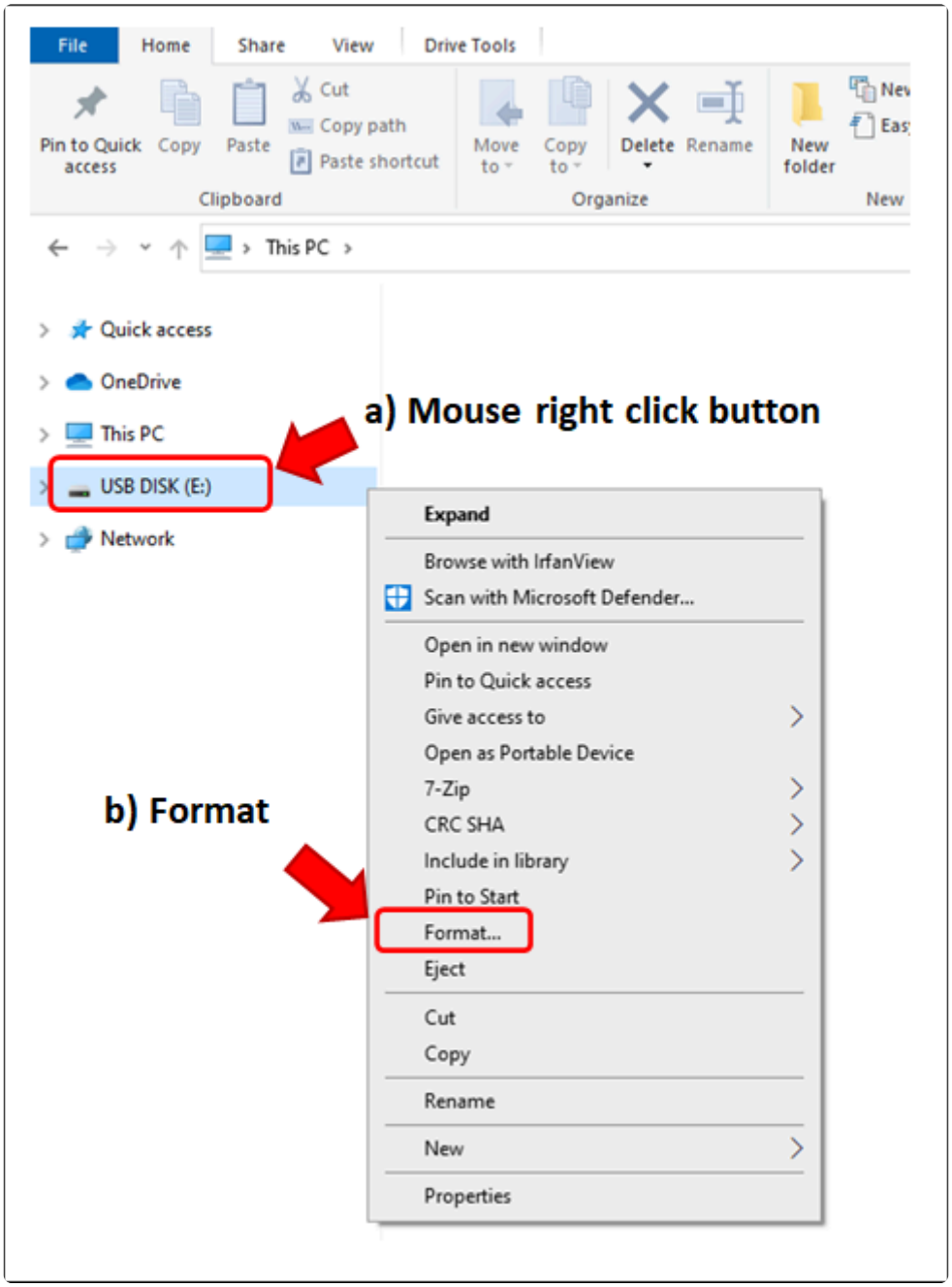
The steps described below must be followed to perform the *firmware* update.

**1)** *Download* the file with **.BIN** extension of the latest version sent via email or directly from the official website Geoline. Check with Geoline technical staff that the file corresponds to the latest version.

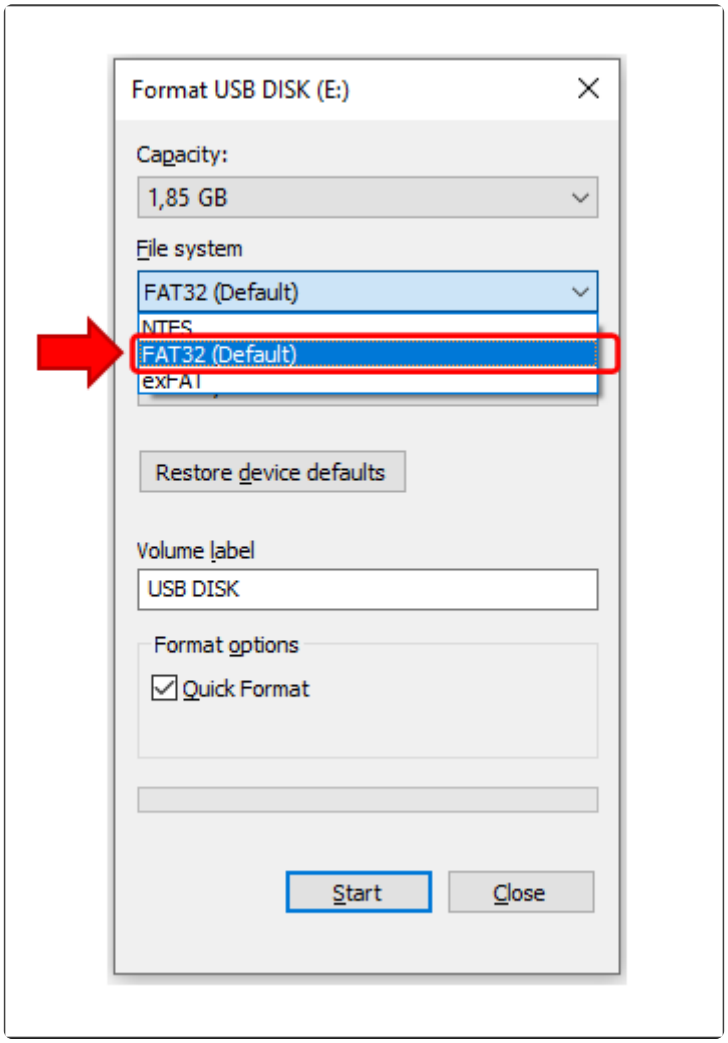
**2)** Format the flash drive using a computer.

**Attention:** This procedure will erase all files in the flash drive. Save all important files before formatting.

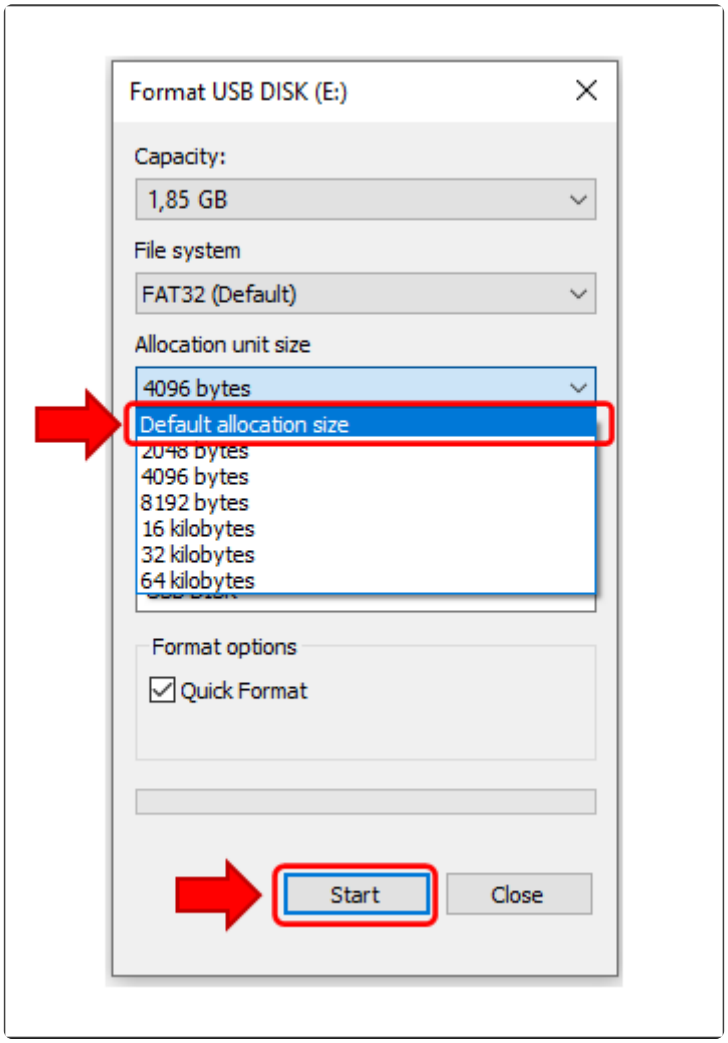
Connect the flash drive to be formatted to a computer USB port. Open Windows Explorer, right-click on the flash drive icon and select the option **Format**.



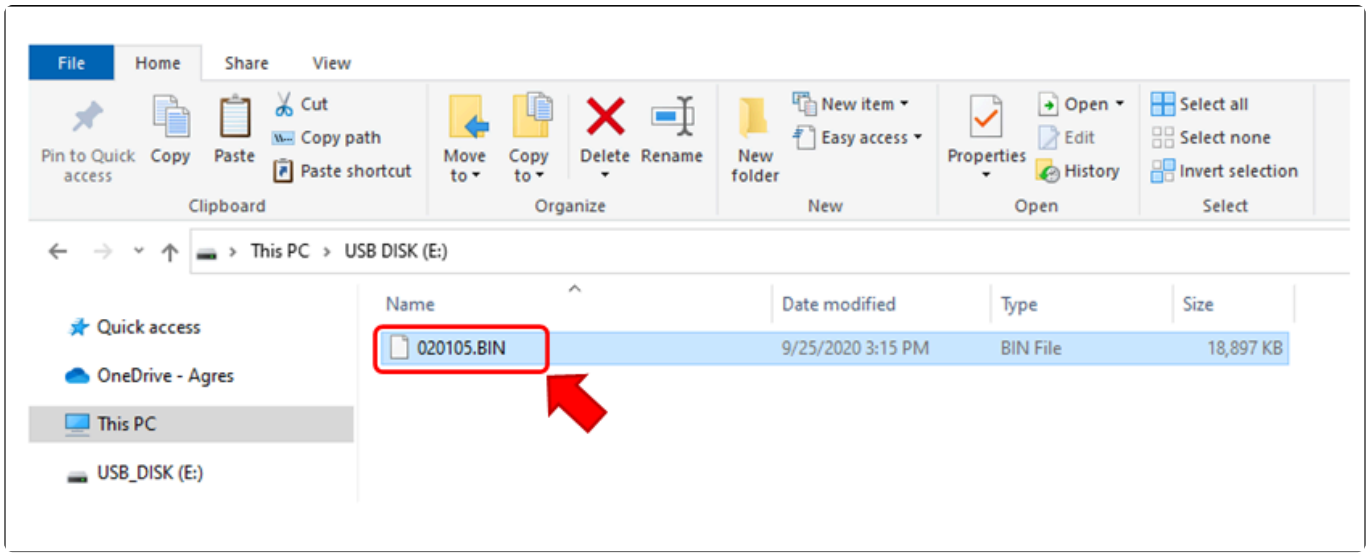

**3)** In the format window, the **File system** option should be the device **Default** (**FAT (Default)**, or **FAT32 (Default)**).




**4)** In the option **Allocation unit size** select **Default allocation size**. Click on the **Start** button to begin the formatting operation and wait until its conclusion.




**5)** After formatting, copy only the **.BIN** update file into the flash drive. It must be copied to device's **root folder** (no folder should be created in the flash drive).

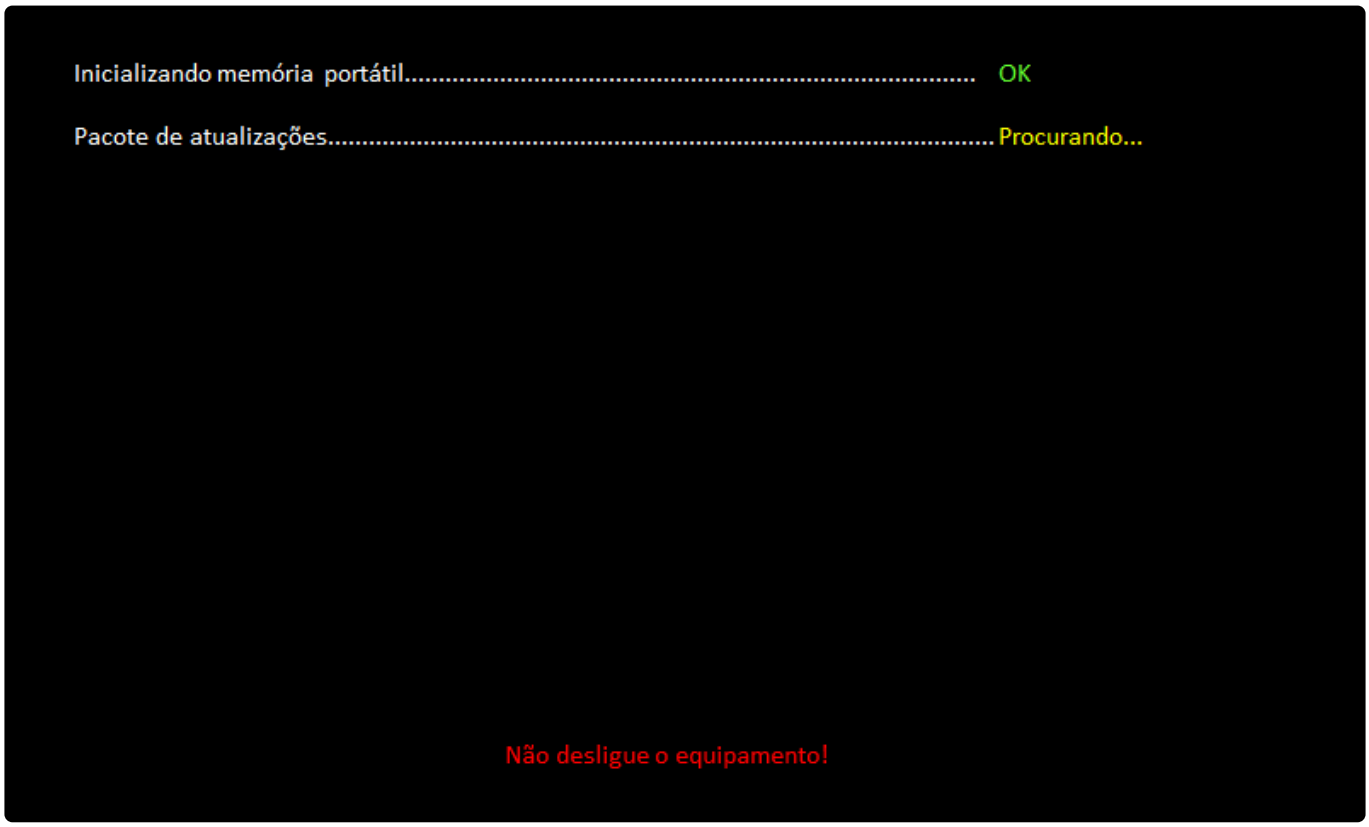



Once the file is correctly saved on the root folder, remove the flash drive from the computer.

**6) System update**

In the current version of the system, the update screen is presented in portuguese only.

With the GeoNave display **switched off**, insert the flash drive with the update file in the dislplay USB connector (right side), and switch on the display. The system will identify the flash drive file and perform the update automatically.



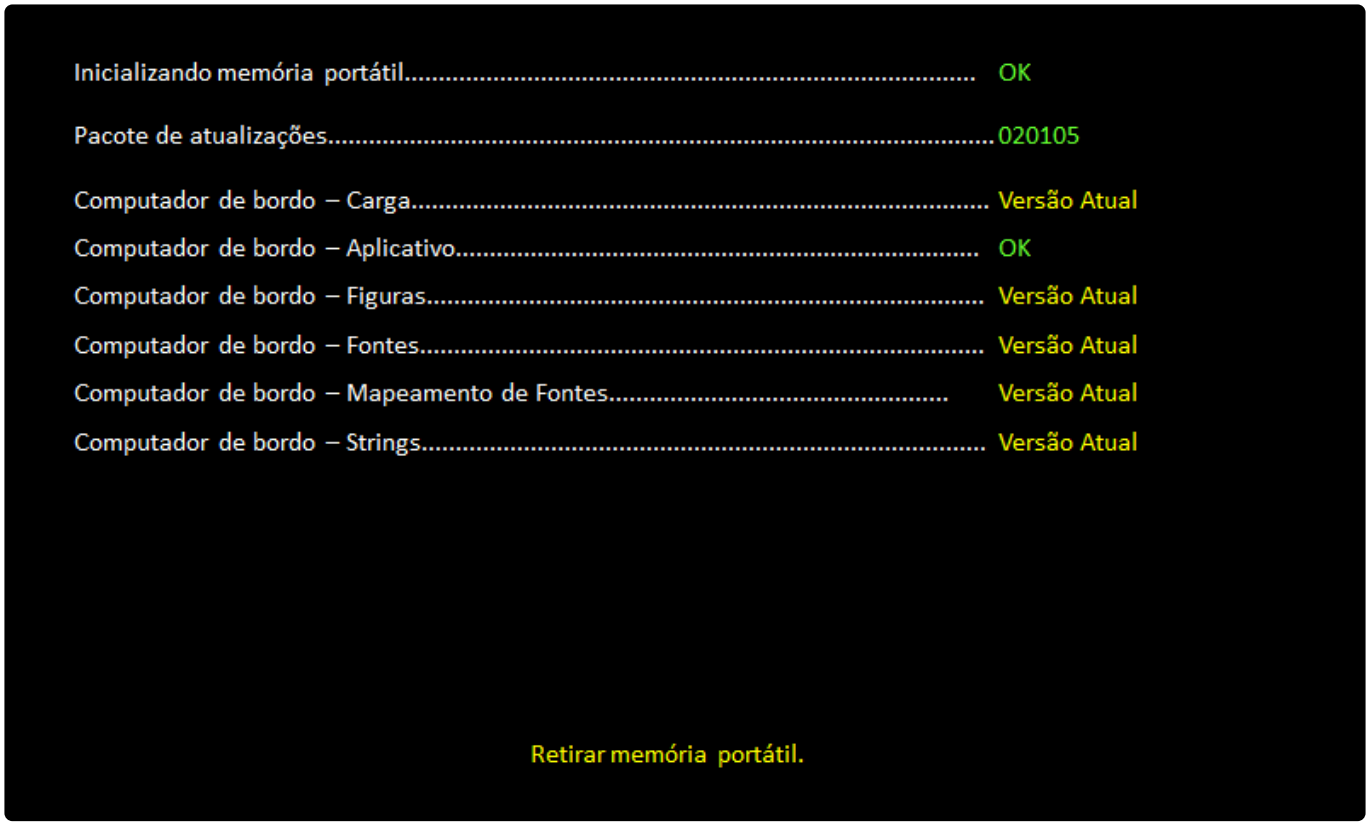

**Attention:** Do not disconnect the display from the power source during *firmware* update. Shutdown may corrupt the display's internal memory, requiring service intervention.

If the GeoNave system also have land compensator, perform the update with connected accessory, so that the *firmware* is properly updated.

Wait until conclusion of update process, the GeoNave display will check the *firmware* version of all existing components of the system, updating those with older versions than the ones in the **.BIN** update file.

During the update the display may automatically shut down. In this case, switch on the display again without disconnecting the flash drive.

After completing the update of all GeoNave system components, a message will be displayed on the screen to remove the flash drive (Retirar memória portátil).




At this point, disconnect the flash drive from the USB connector, causing the monitor to switch off automatically. Then, Switch on the display again.

**7) Checking if the version has been updated**

To verify that the version has been correctly installed on the system, access the Information> Equipment menu and check the Application Version information. The displayed version must be the same of the update **.BIN** file that was installed

# 12. IsoFarm Platform

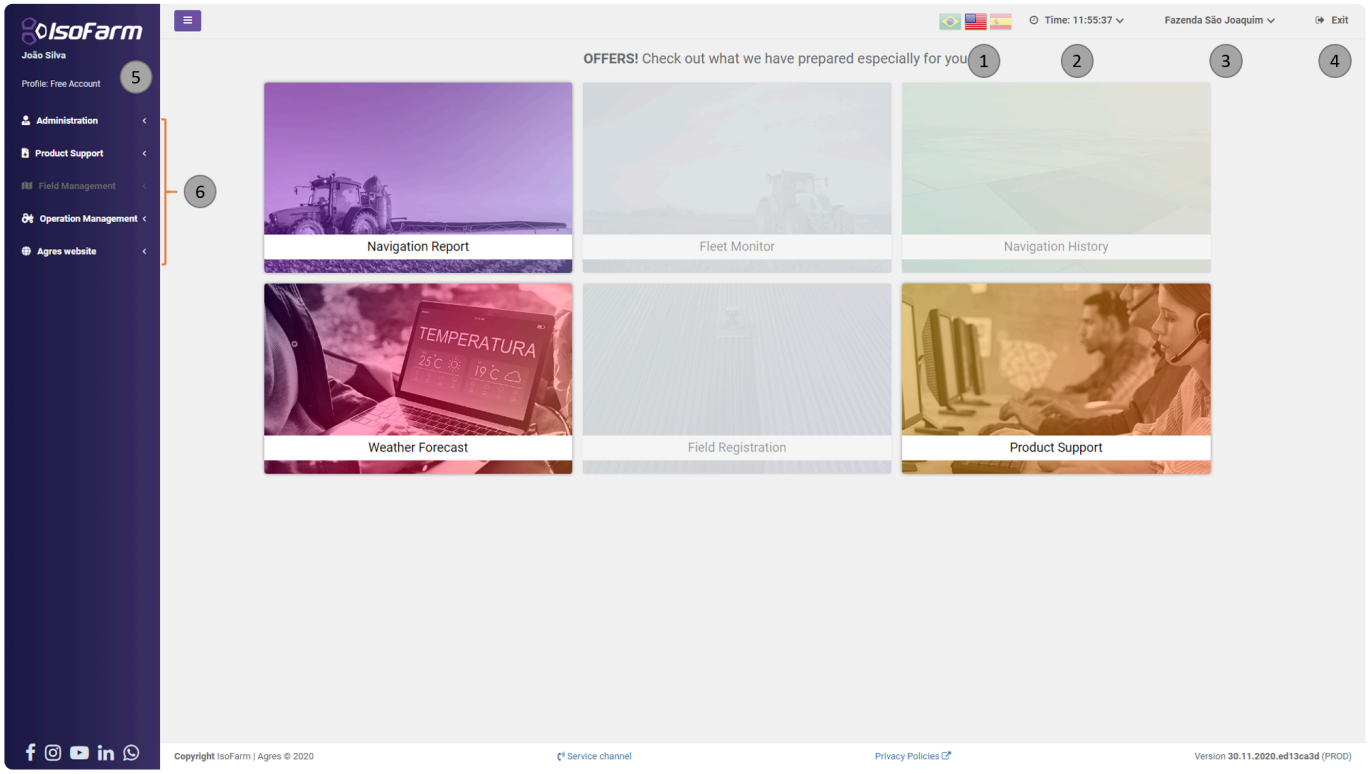
- Create an IsoFarm account
- Password recovery
- Change IsoFarm password
- Import an event from GeoNave
- Viewing an event from GeoNave

This section covers the IsoFarm platform general functionalities, used in the import and visualization of GeoNave navigation files.

> To login into IsoFarm Platform, enter email and password used in the platform registration.

> Google Chrome, Mozilla Firefox or Microsoft Edge browsers are recommended for a better portal experience.

Once the login is completed, the IsoFarm platform home screen will be displayed:




| Item | Description |
|---|---|
| 1 | Platform language selection |
| 2 | Display of remaining user session time |

| | |
|---|---|
| 3 | Company name informed during registration |
| 4 | Platform exit option |
| 5 | User account profile |
| 6 | Options menu |

Highlighted are the main features:

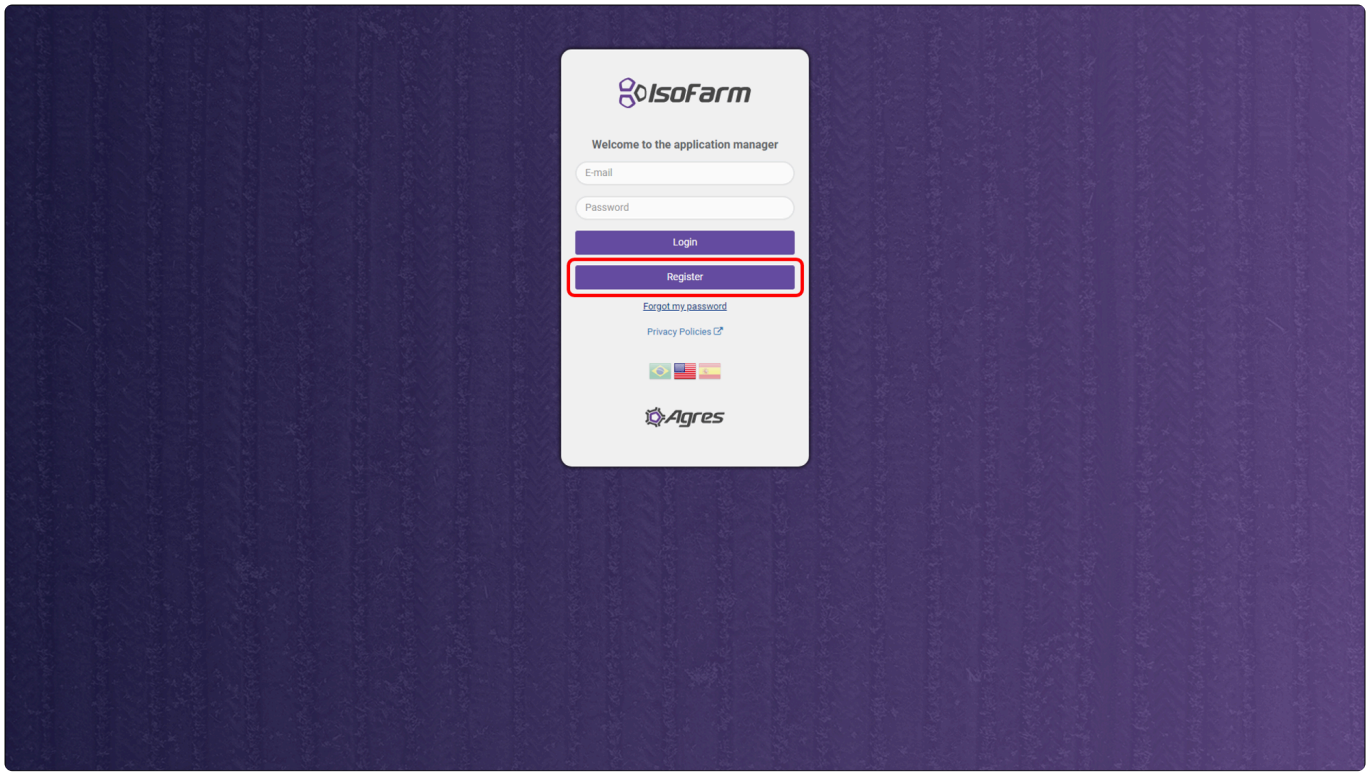
1. Navigation Report
    a. Loading GeoNave equipment navigation files.
2. Fleet Monitoring
    a. Monitoring of machine fleet in real time through the Geoline Telemetry system.
    b. Note: Only available to Premium users.
3. Navigation history
    a. Management of navigation reports stored in the cloud through machine and work date information.
    b. Note: Only available to Premium users.
4. Weather forecast
    a. High precision weather information and agronomic data for the next 5 days.
5. Field creation
    a. Field creation and management.
    b. Note: Only available to Premium users.
6. Technical support
    a. Manuals and video tutorials.

# 12.1. Create an IsoFarm account

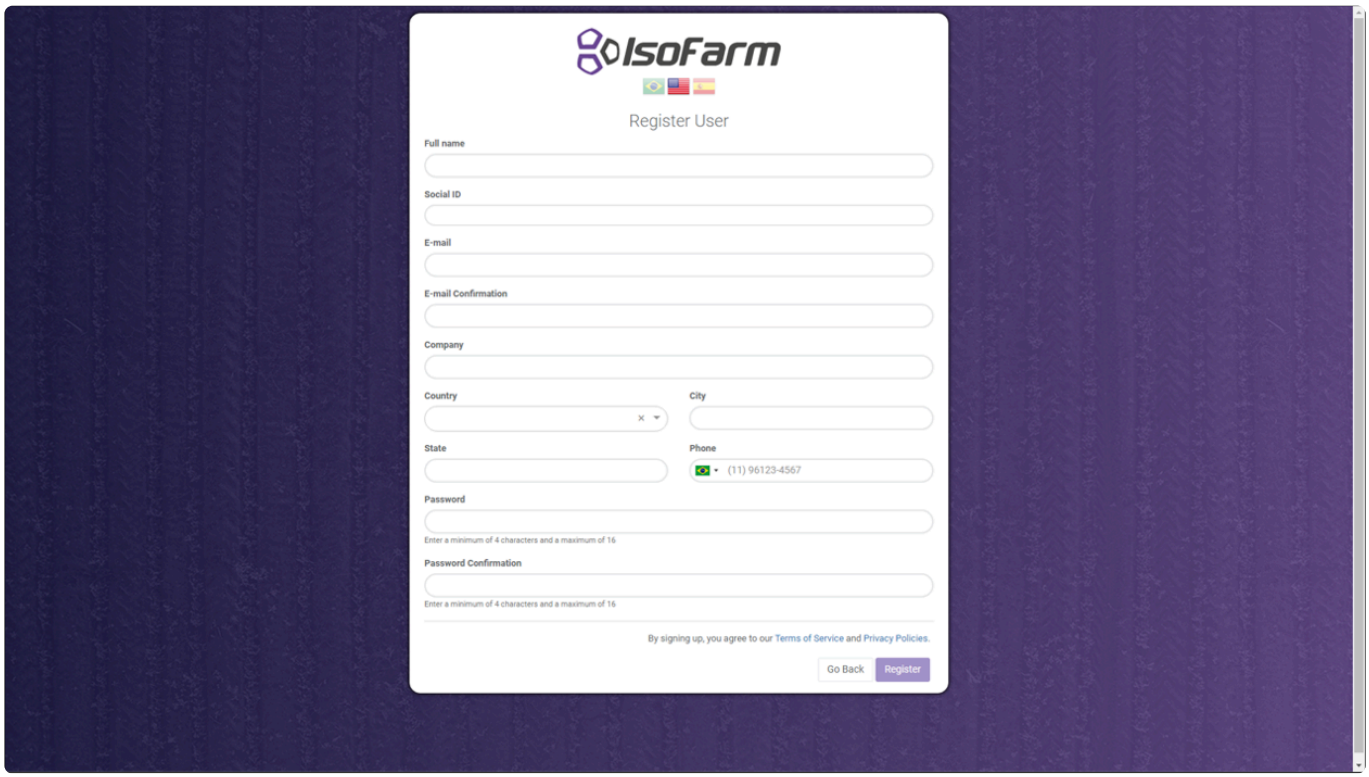
To be able to load the GeoNave navigation files, you must register on the IsoFarm platform. Registration is free and guarantees your data protection.

> The registration page is multilingual. Choose the language you are most familiar with.

Access the IsoFarm platform and choose the “Register” option.

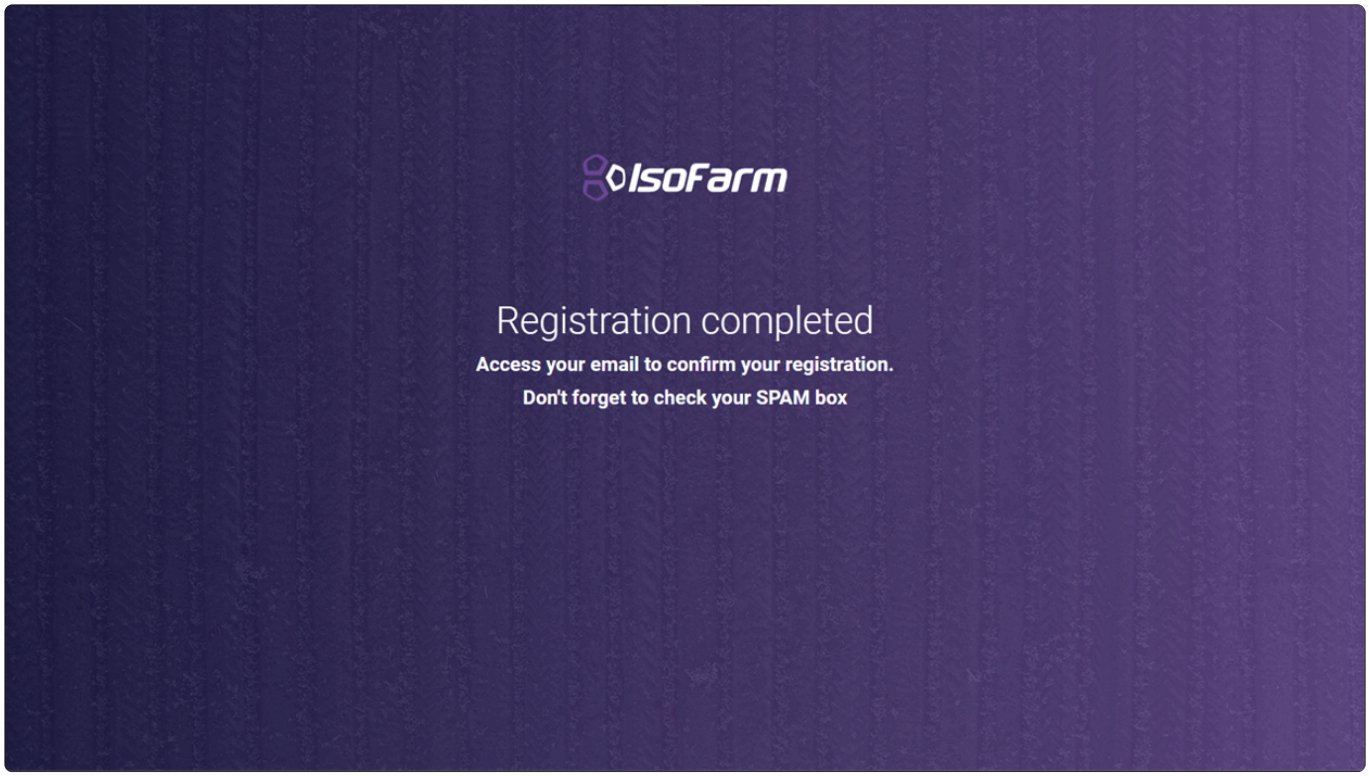



Fill in the required information.




> ! Your password must have between 4 and 10 characters.

After viewing the Portal Service Terms and Privacy Policies and filled all required data, choose the “Register” option and wait for the confirmation screen.



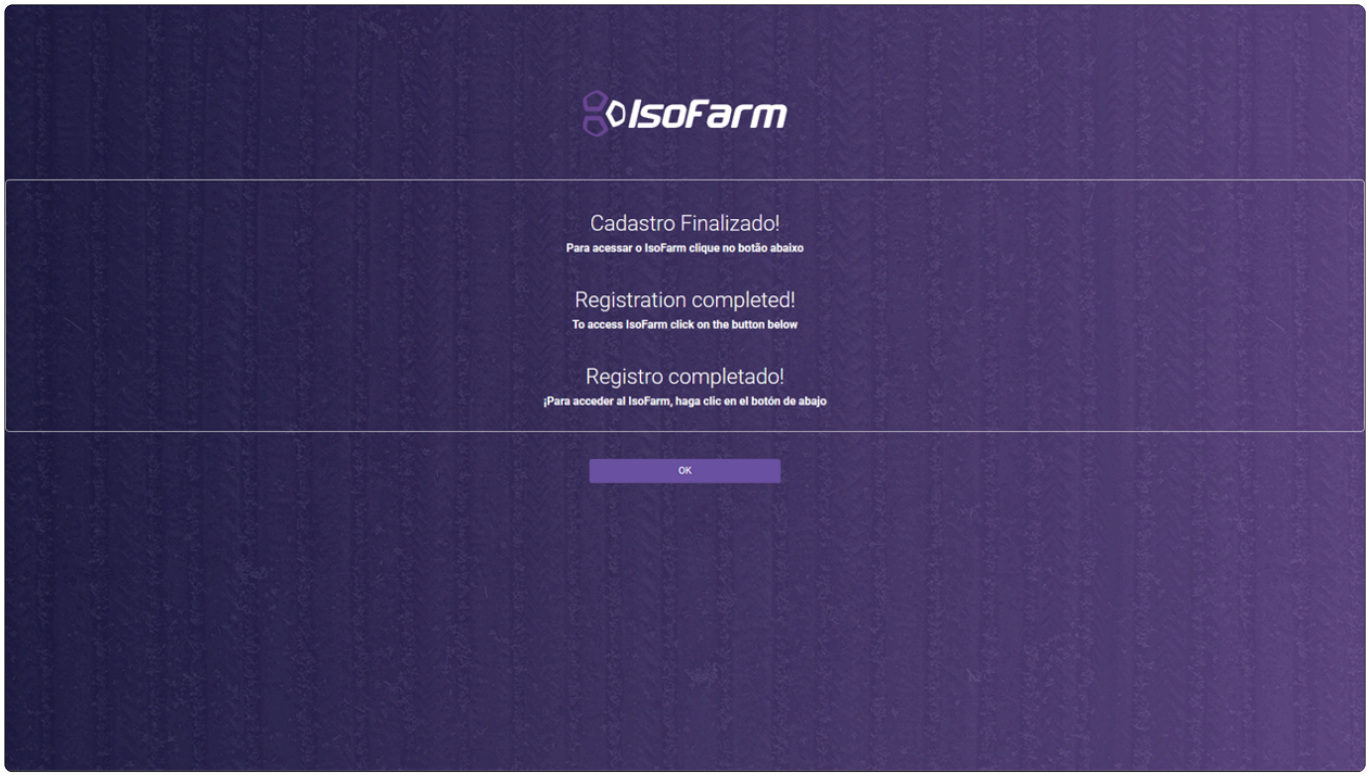

If there are any fields with incorrect information, alert messages will appear on the screen:




An account confirmation message will be sent to the email address used during registration.

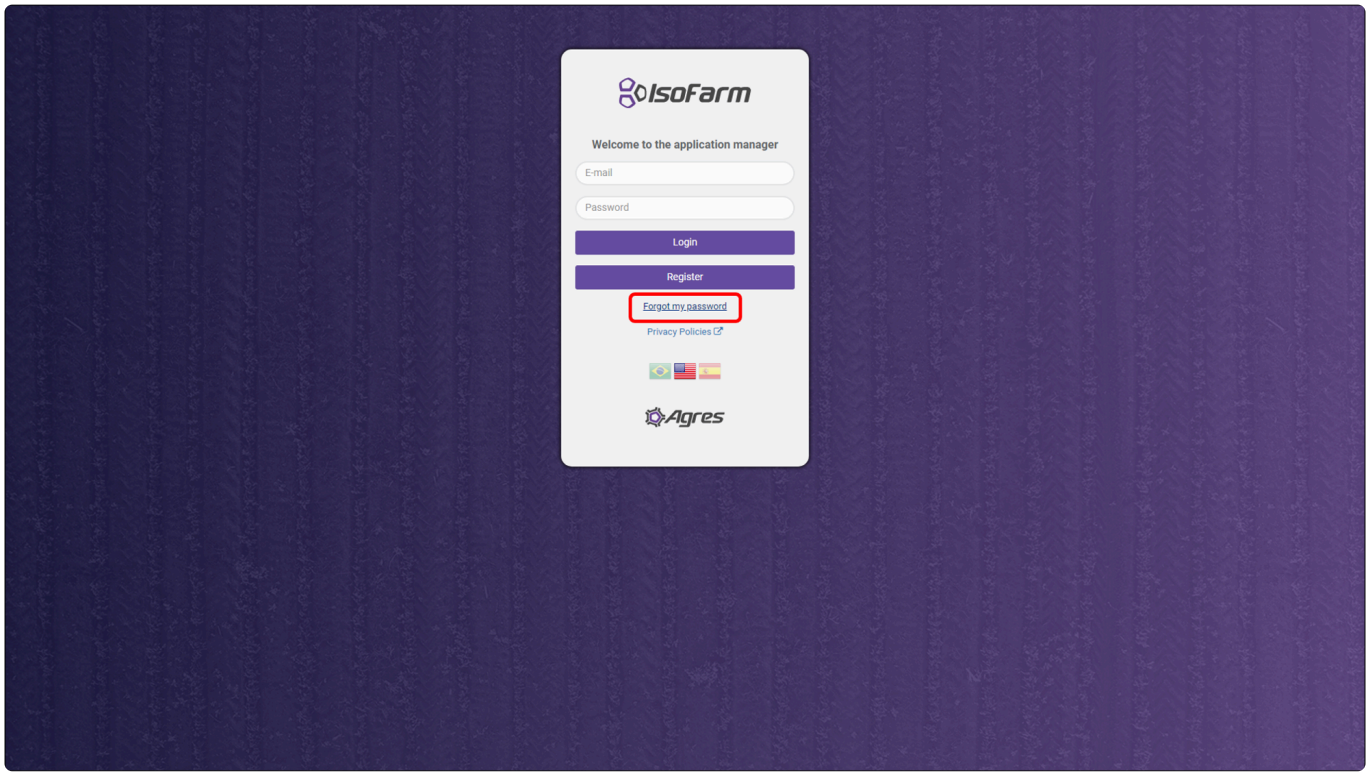
> ! If after 5 minutes the email doesn't appear in your inbox, check for e-mails from **webmaster@isofarm.com.br** in the **Spam** folder.

When you receive the confirmation email, click on the link at the end of the message to confirm your account registration. You will be redirected to the website and the registration confirmation screen will be displayed. Login can be done by clicking the "OK" button.

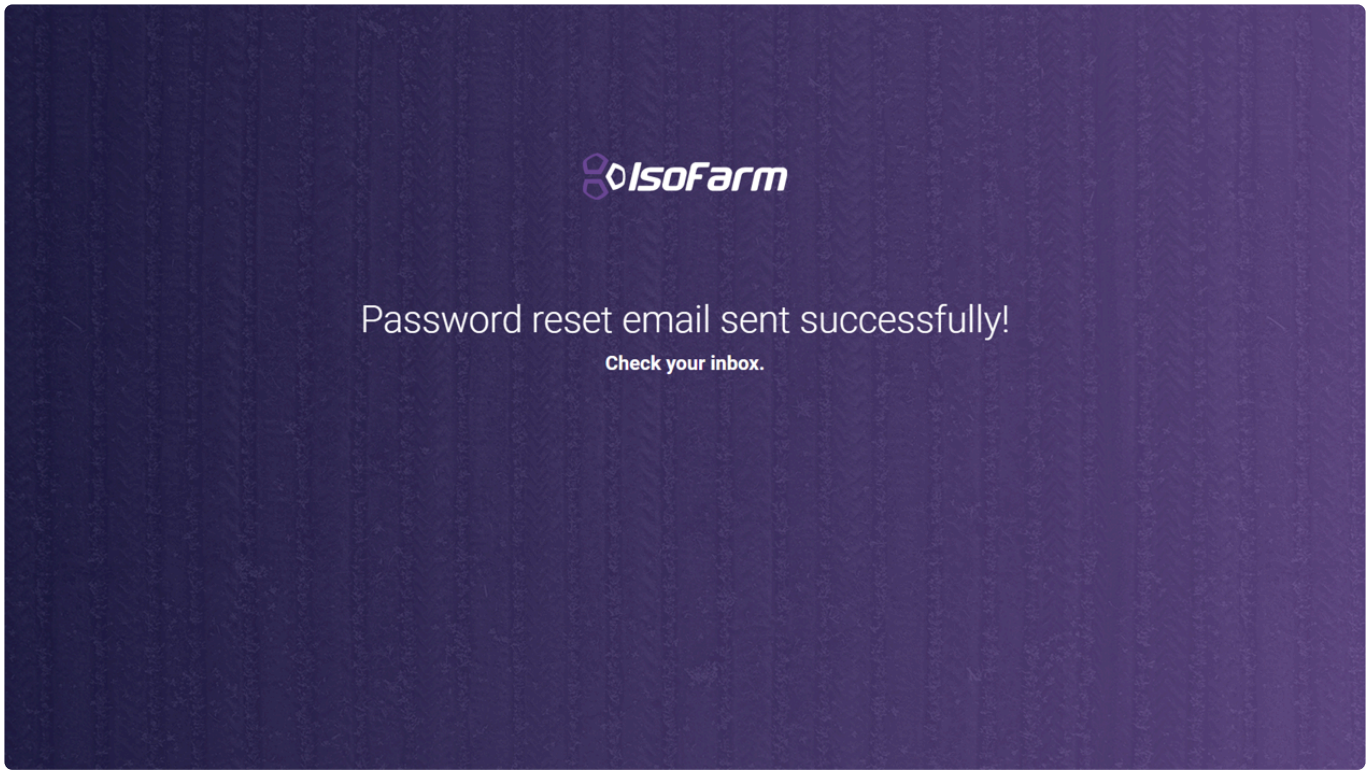



# 12.2. Password recovery

IsoFarm platform password recovery can be performed by selecting the “I forgot my password” option on the login screen.




Inform the email used during registration to recover your password, wait for the confirmation screen of the password reset email to appear.



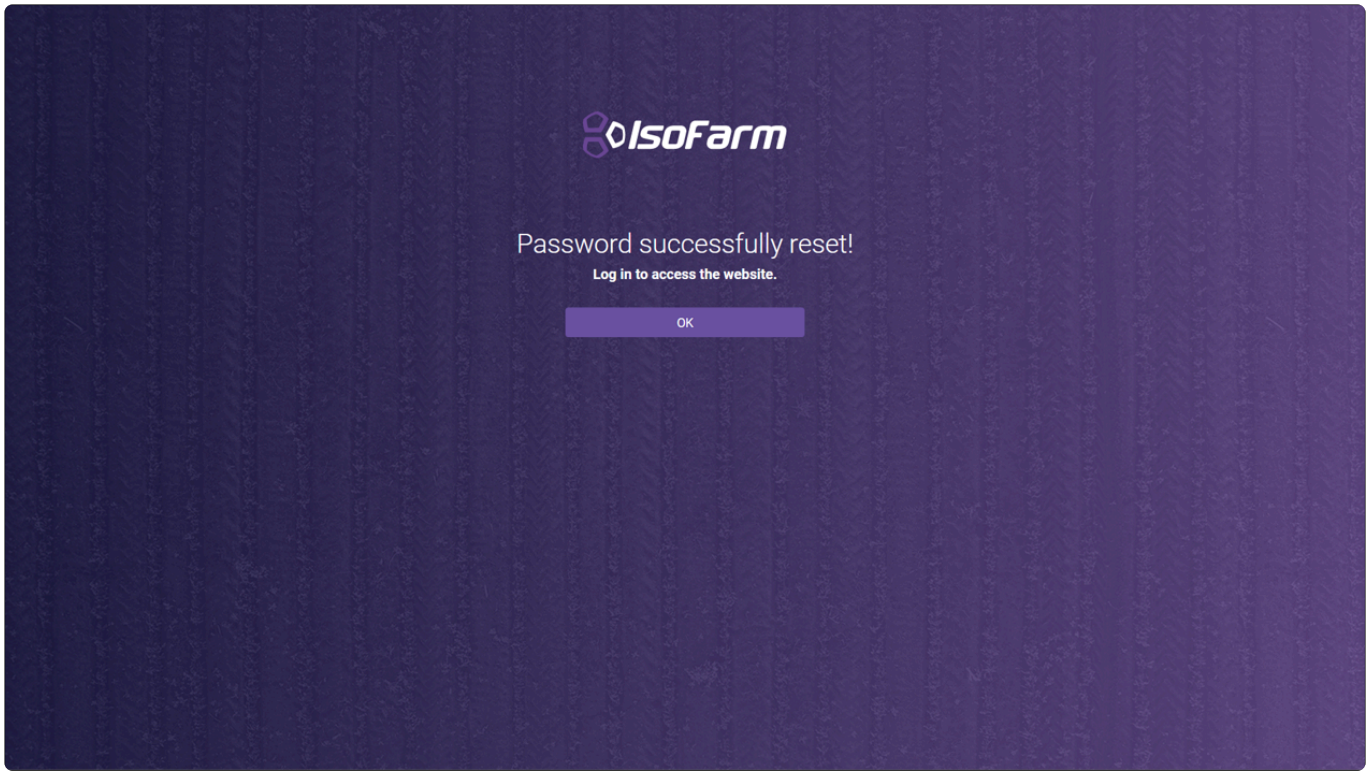

When you receive the email, click on the link at the end of the message to reset your password.

> ! If after 5 minutes the email doesn't appear in your inbox, check for e-mails from **webmaster@isofarm.com.br** in the **Spam** folder.

In the password reset screen, fill in the new password fields and select the option "Send".

> ! Your password must have between 4 and 10 characters.

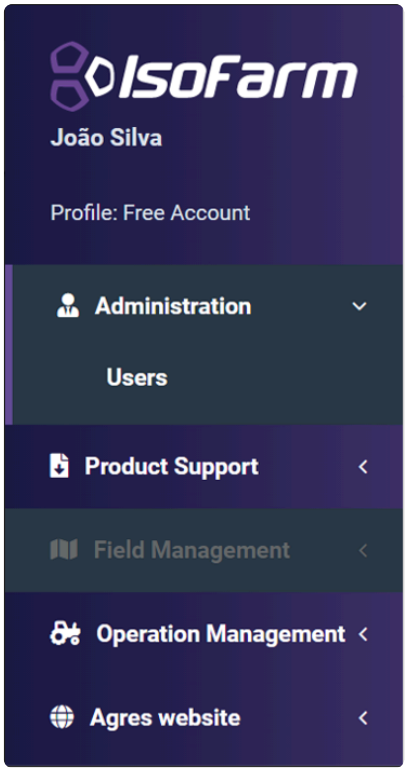
The password reset confirmation screen will be displayed. You can access the login screen by selecting the "OK" option.



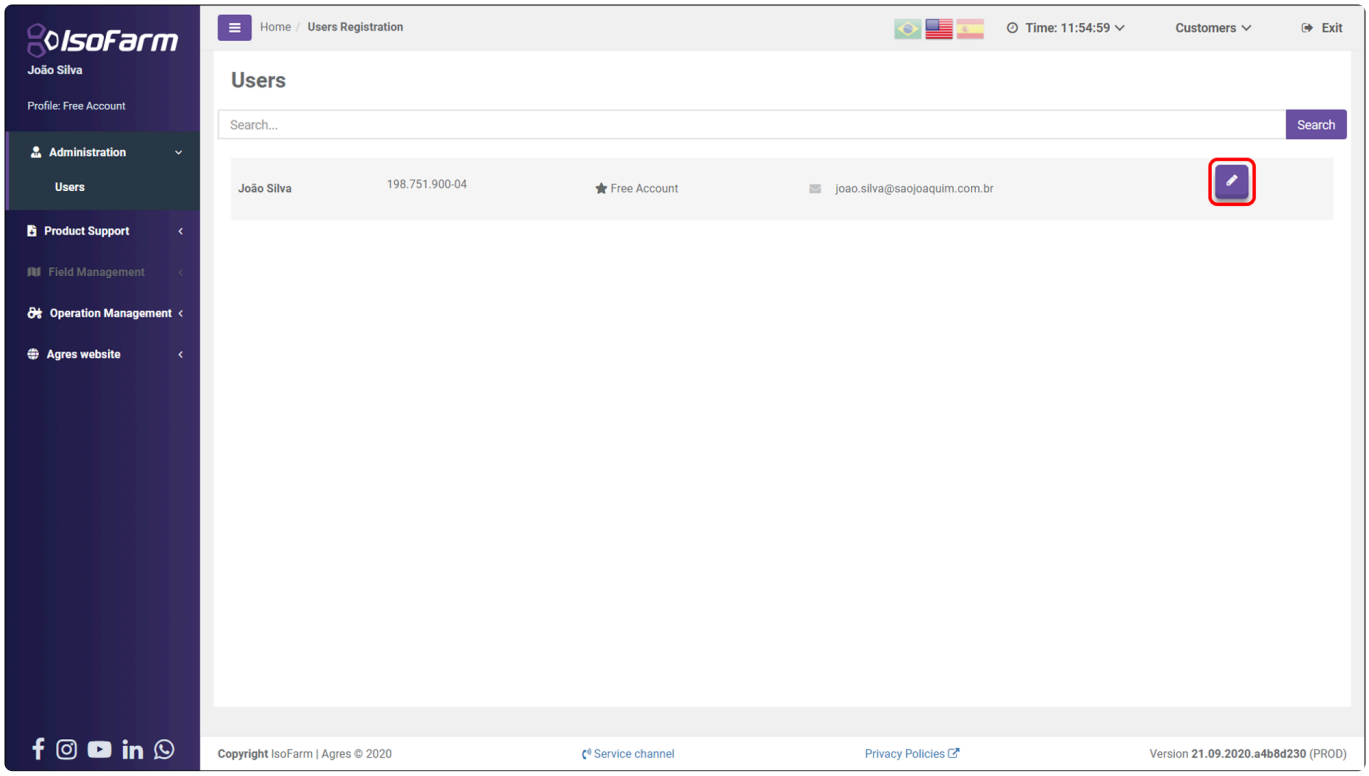

# 12.3. Change IsoFarm Password

You can change the password of your IsoFarm platform user via password recovery or through the steps below.

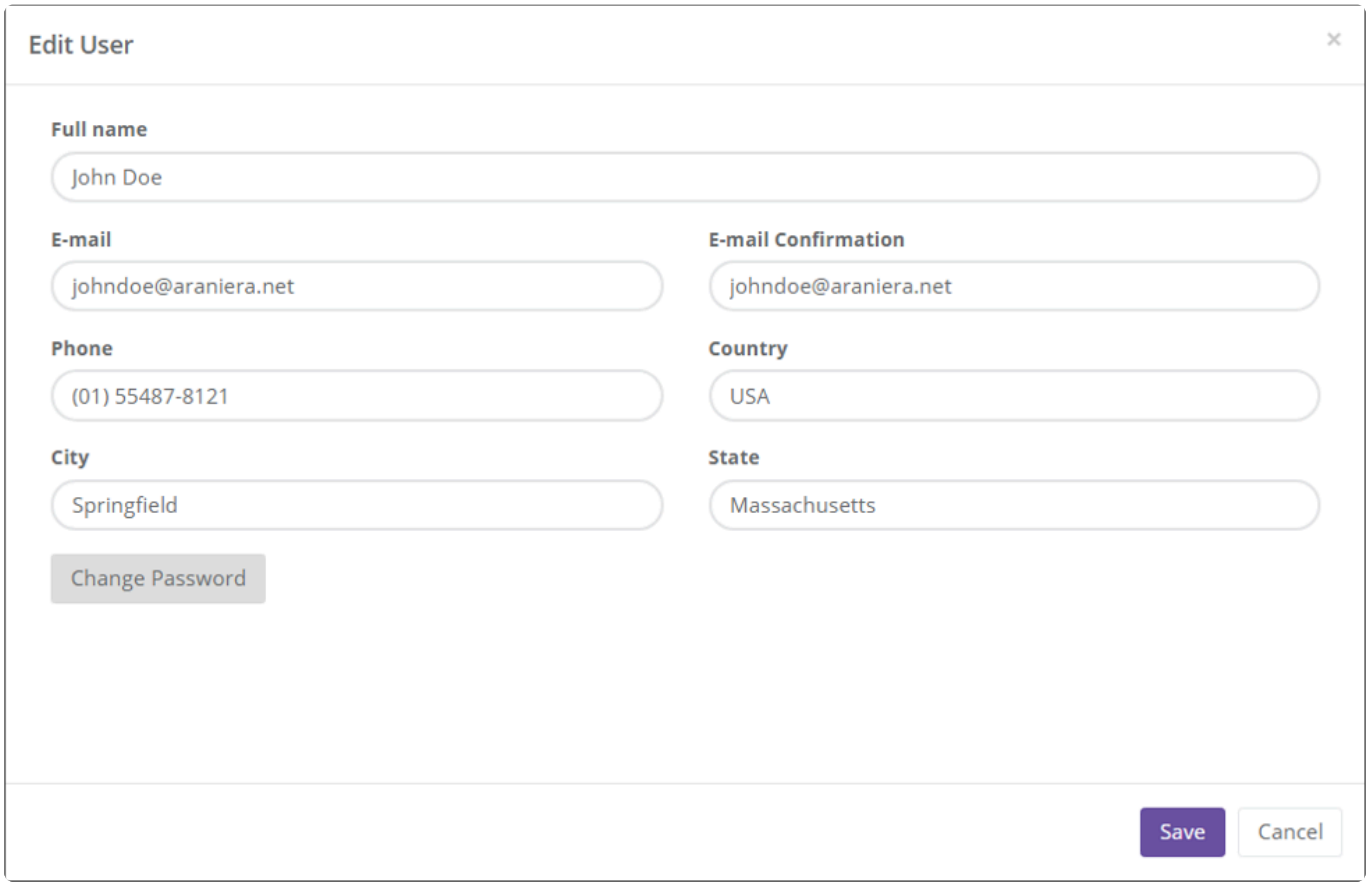
Login to the IsoFarm platform and select the “Administration/Users” option in the left side menu.




Select the edit user data option, as shown in the following image.

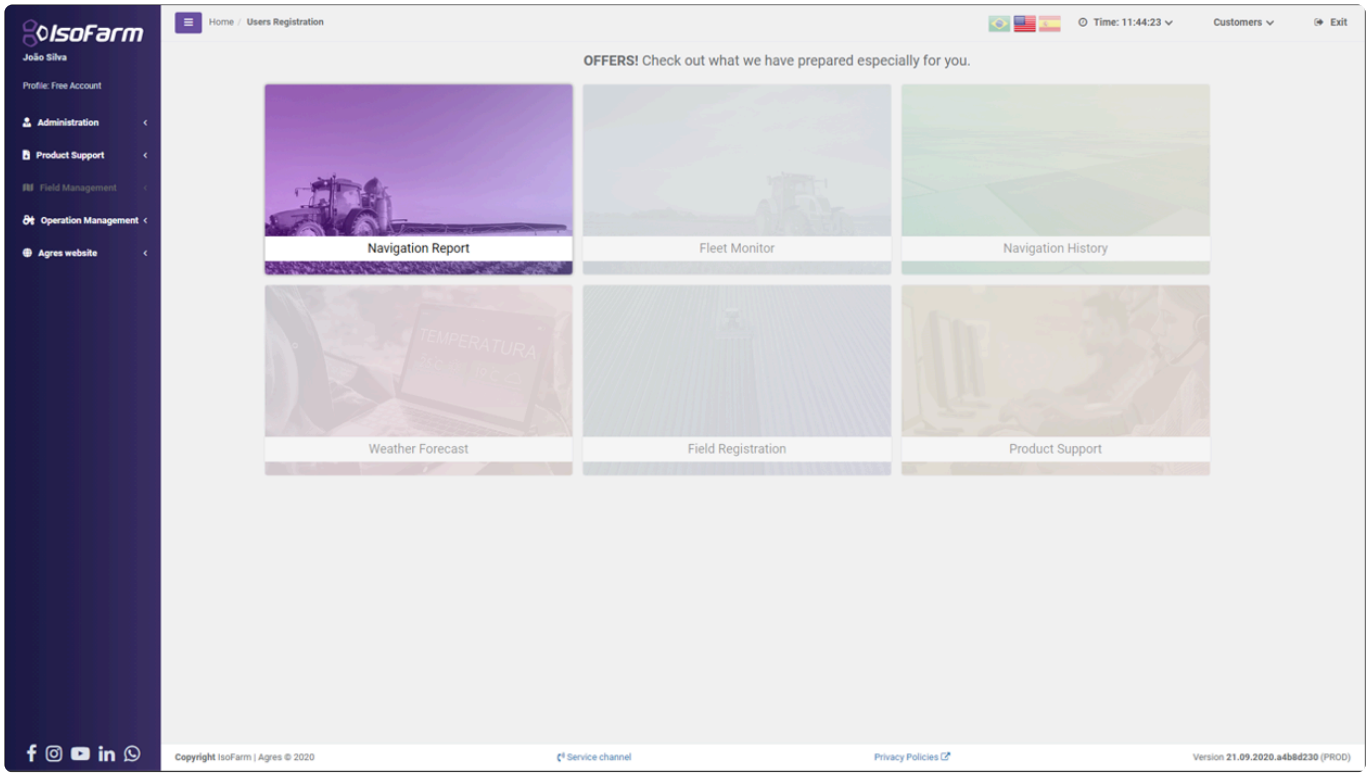



On the edit screen, select the “Change Password” option and fill in the new password fields, to complete the password change click on “Save”.

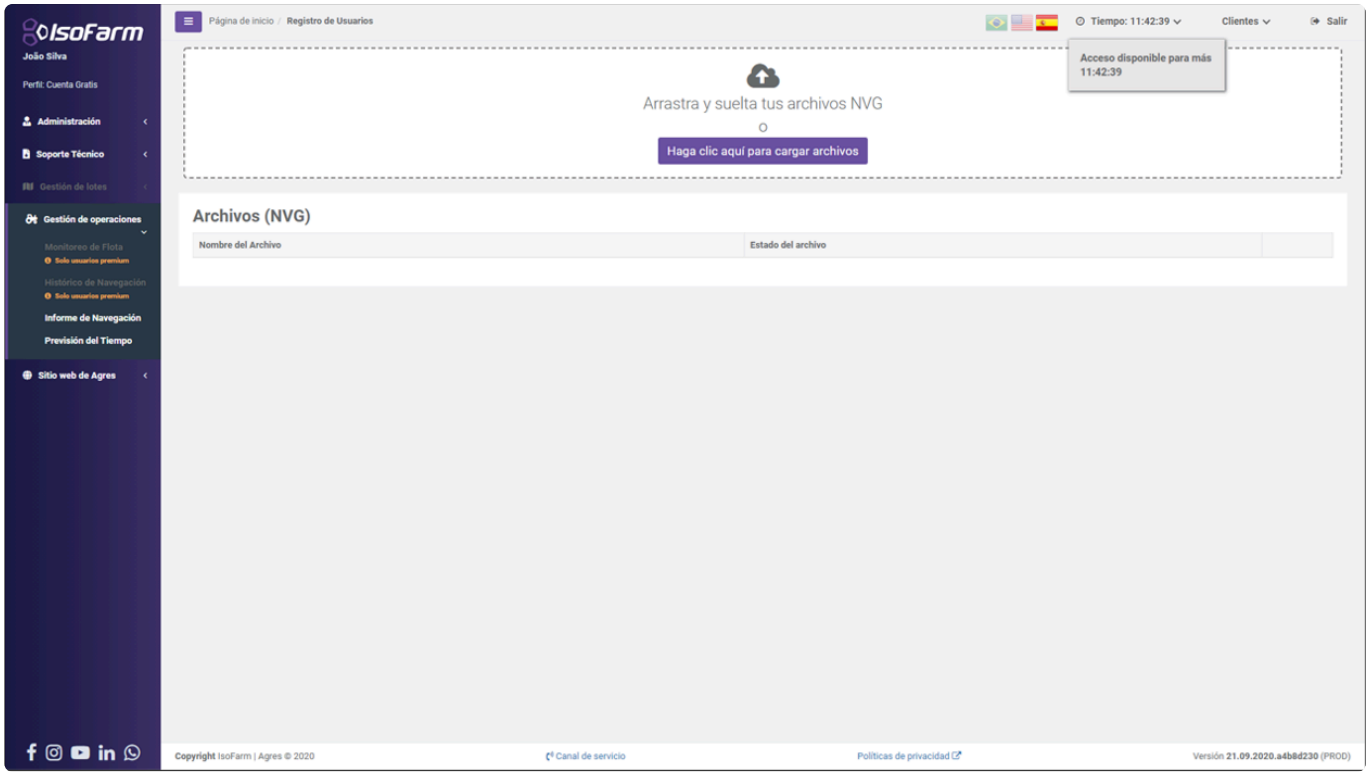


# 12.4. Import an event from GeoNave

The navigation file exported from the GeoNave display can be imported into the IsoFarm platform through the “Navigation Report” page.

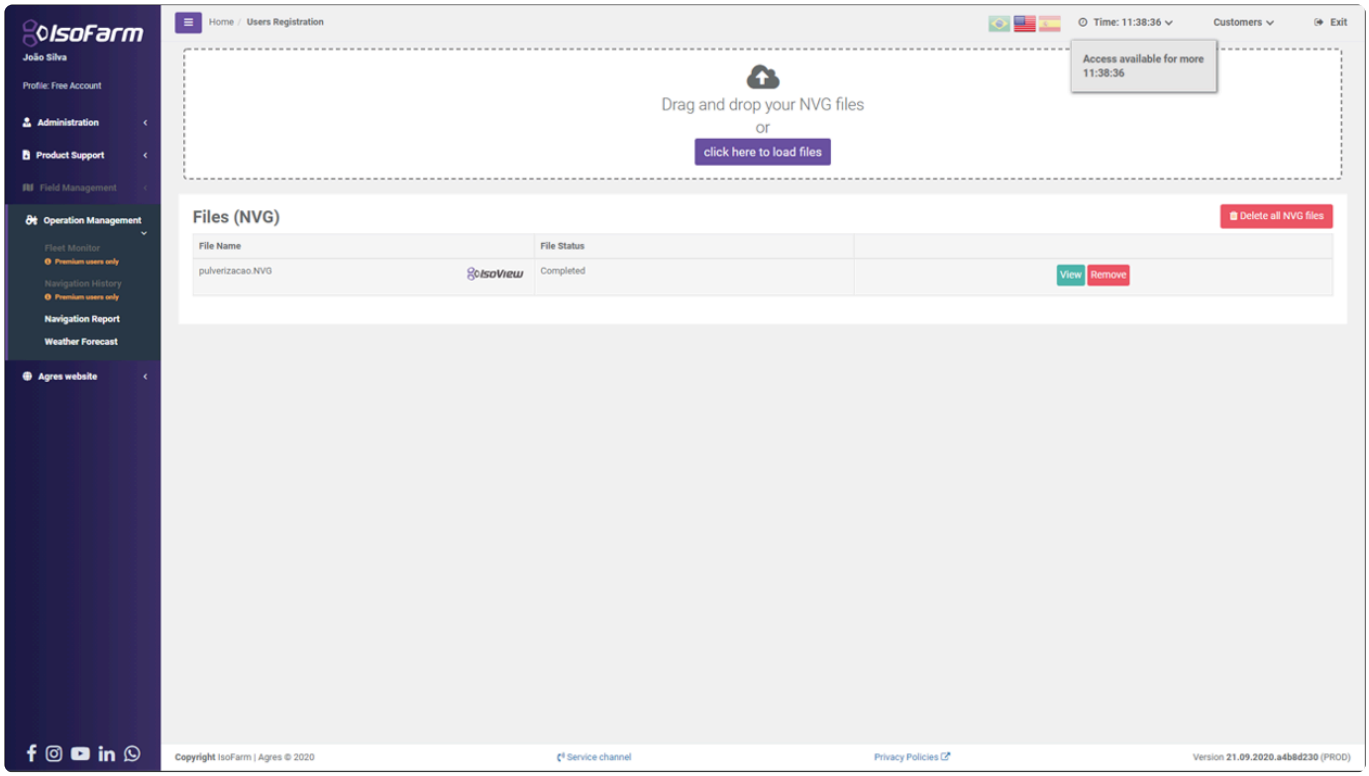



On the Navigation Report page, you can load one or more navigation files by dragging them in the highlighted area or by selecting the “click here to load files” option.



> Using the “click here to load files” option, computer’s file explorer will appear on the screen, the user must browse to file location, select it and click “Open”.

As soon as the files are selected, the processing will start and, as soon as it finishes, the files will appear in the processed files list.



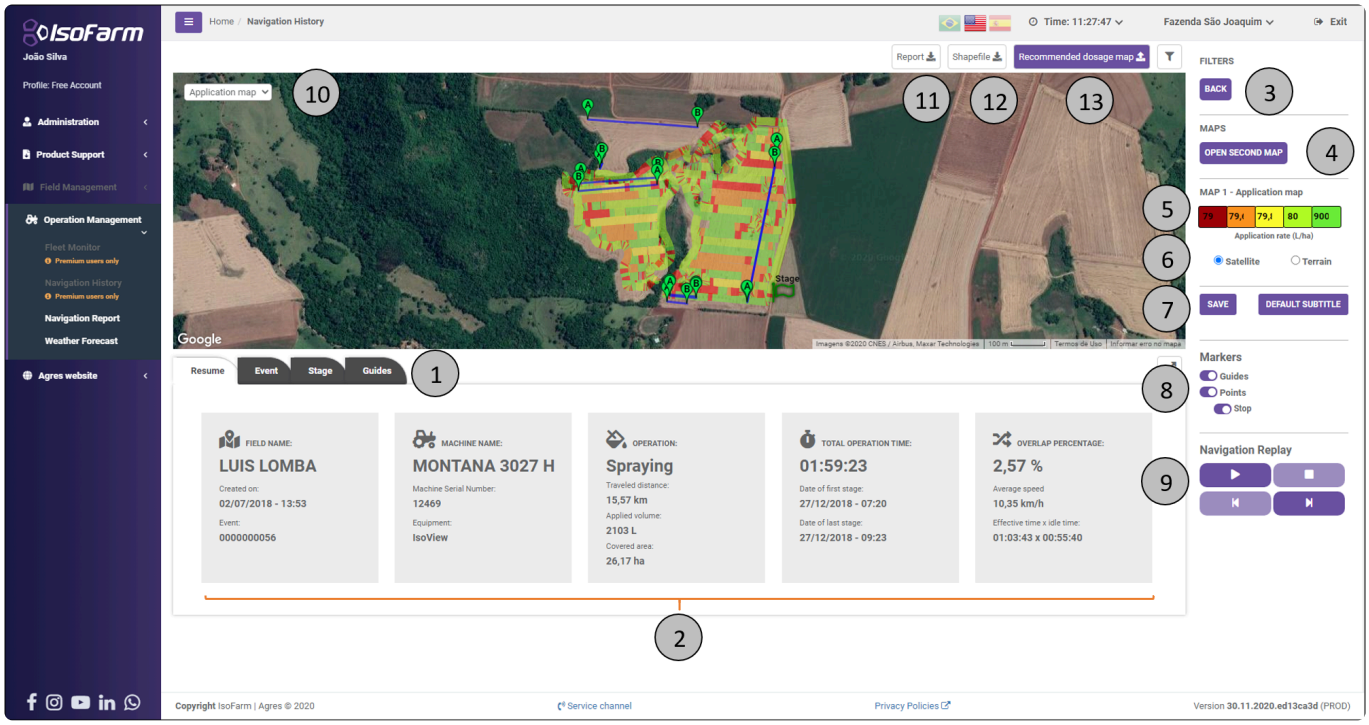

> Files uploaded to the platform remain available until the user’s session time expires. To view the files, the user must upload them again.

The navigation report can be viewed by selecting the “View” option. More information about viewing navigation reports is found in the section Viewing an event from GeoNave.

# 12.5. Viewing an event from GeoNave

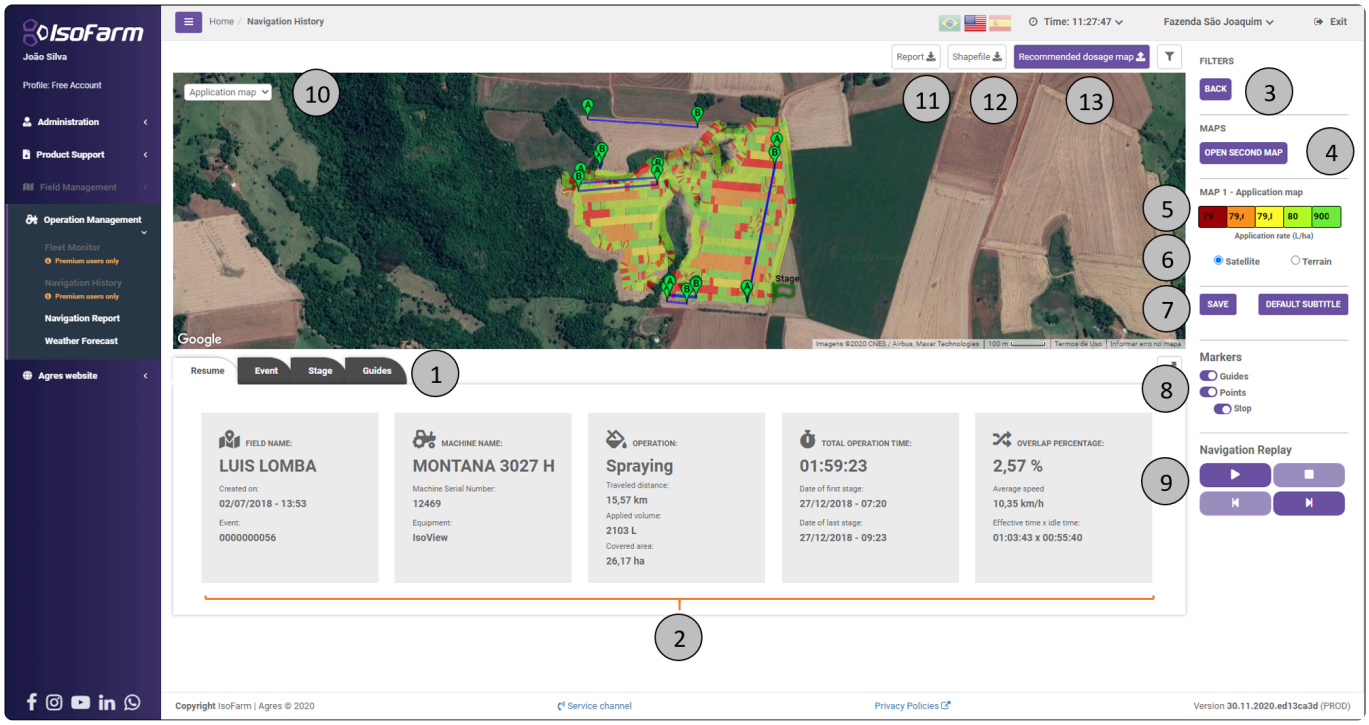
- Viewing general navigation history information
- Modify background map
- Change map
- View second map
- Modify map color legend
- Generate PDF report file
- Generate Shapefile file

By clicking “View” on one of the loaded events on Navigation report you will be redirected to the navigation history screen:




| Item | Description |
|---|---|
| 1 | Navigation history information selection tabs |
| 2 | Specific navigation history information |
| 3 | Return to the event import screen |
| 4 | Open the second map |
| 5 | Selection of the color legend values |
| 6 | Background map selection |
| 7 | Map type selection |
| 8 | PDF report generation |
| 9 | *Shapefile* file generation |

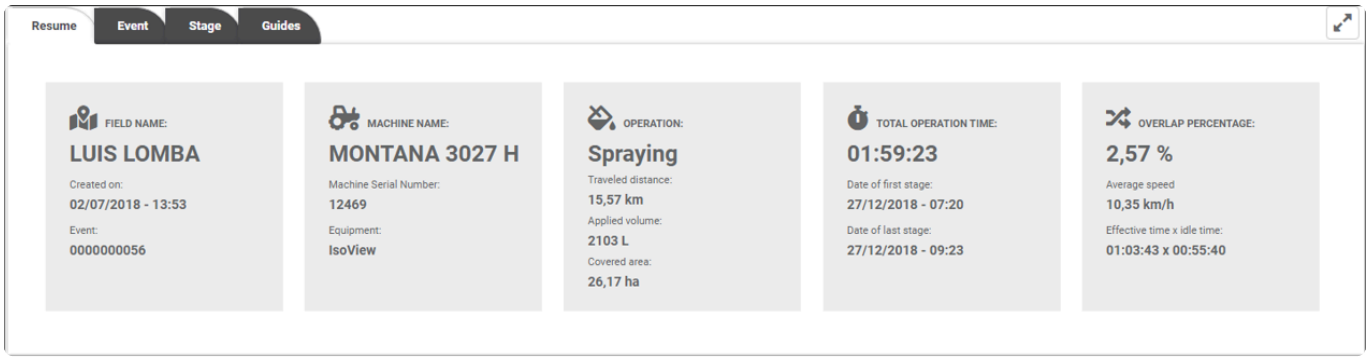
# 12.5.1. Viewing general navigation history information

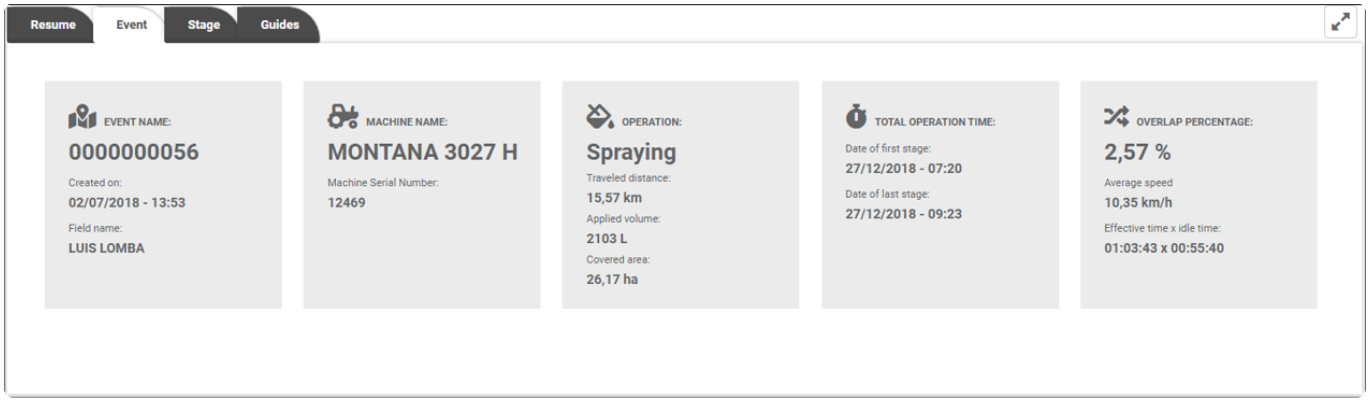


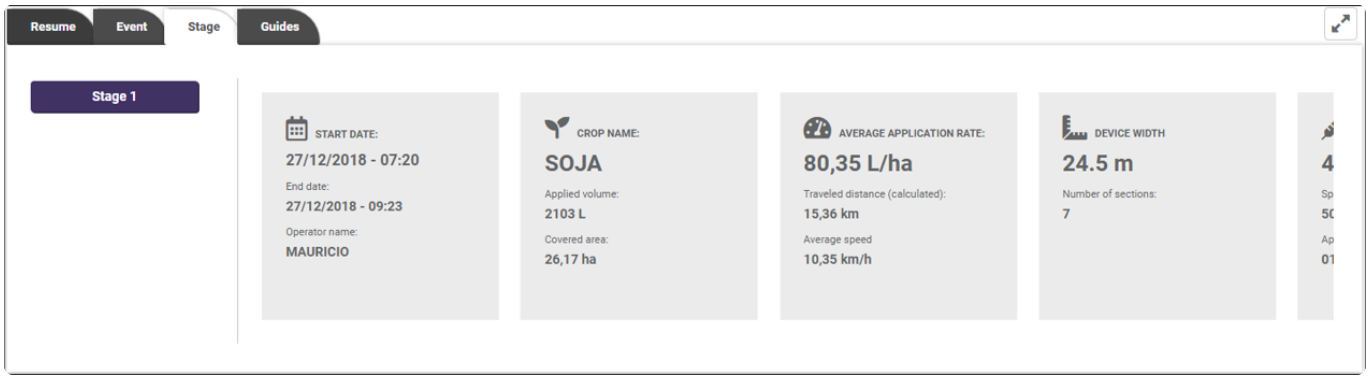

By default, the navigation history is loaded with the application map selected. The user can modify the highlighted map using the checkbox 7. The map is shown in the center of the screen, painted with the colors according to the defined scale 5.
The color scales correspond to the map's operating values. In a spraying application map, for example, the colors correspond to the application rate in *L/ha*.
The user can interact with the map by pressing and holding + mouse movement or keyboard arrow keys. *Zoom* control is performed by the mouse scroll wheel or double clicks of the left mouse button (zoom in) and double clicks of the right mouse button (zoom out).

The Resume, Event and Stage navigation information can be viewed in their respective tabs highlighted in 1. The information for each tab will be displayed in the region 2.

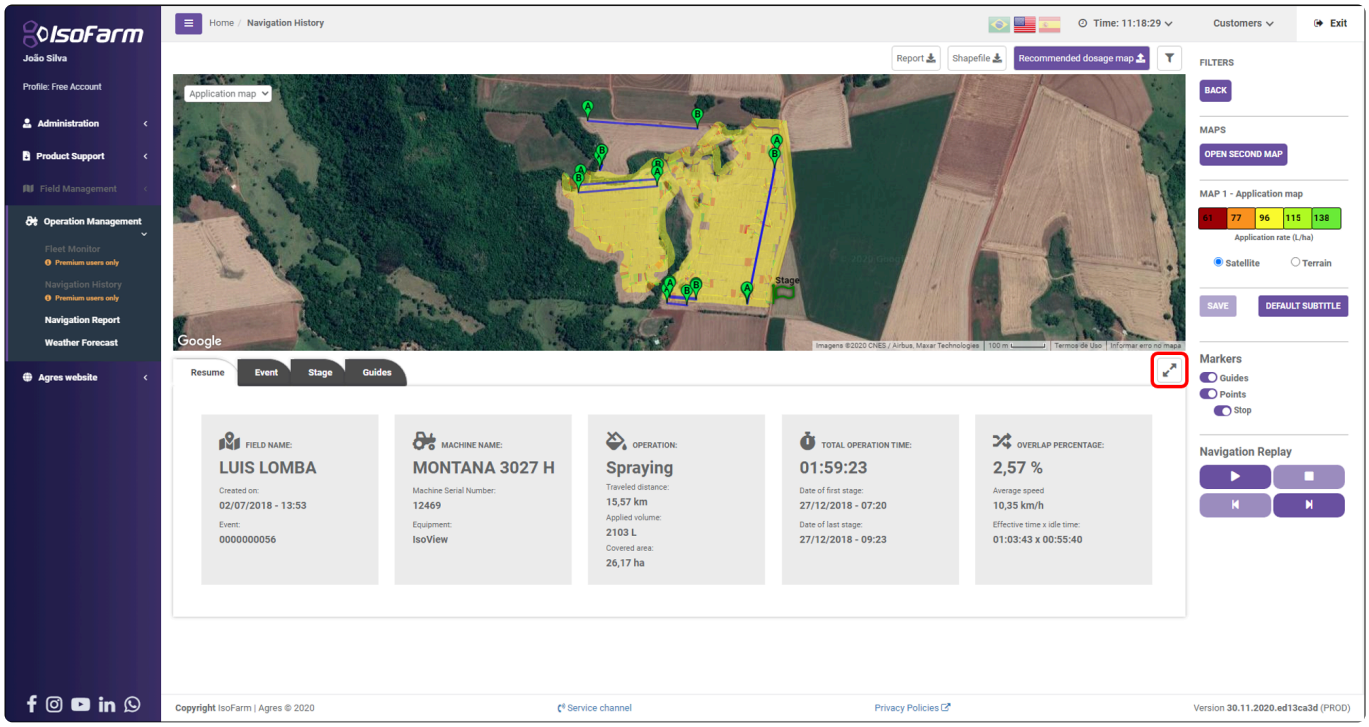
> The tabs are configured as horizontal scrolling bar. Use the mouse *scroll* in the region 2 to view all its content.

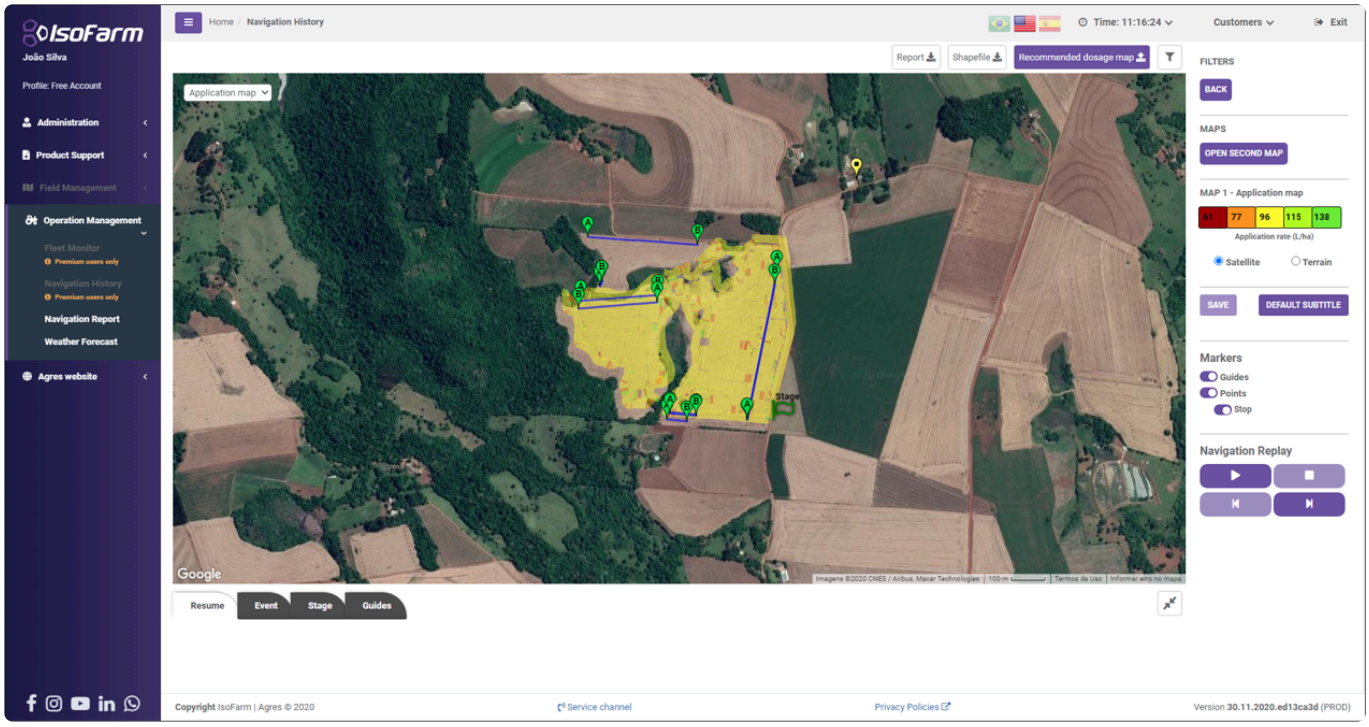




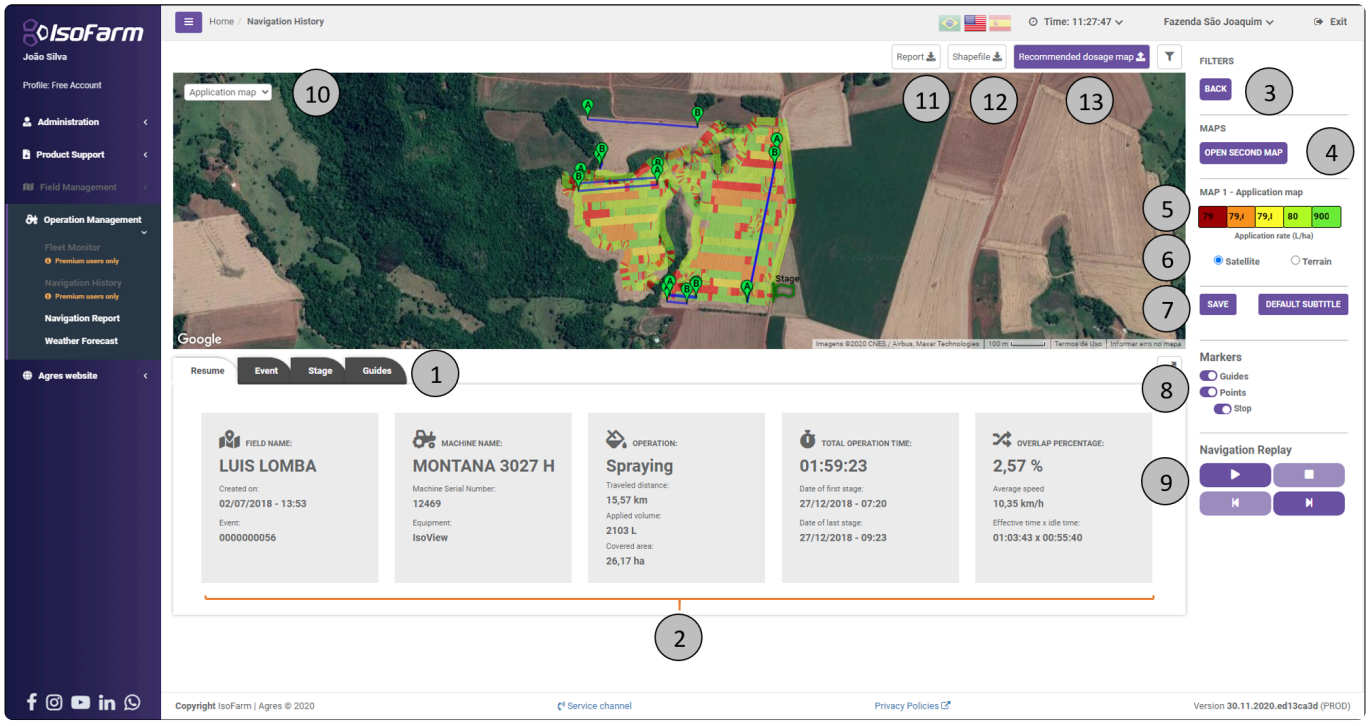

Using the map increase button you can hide specific navigation information and obtain an enlarged map screen:



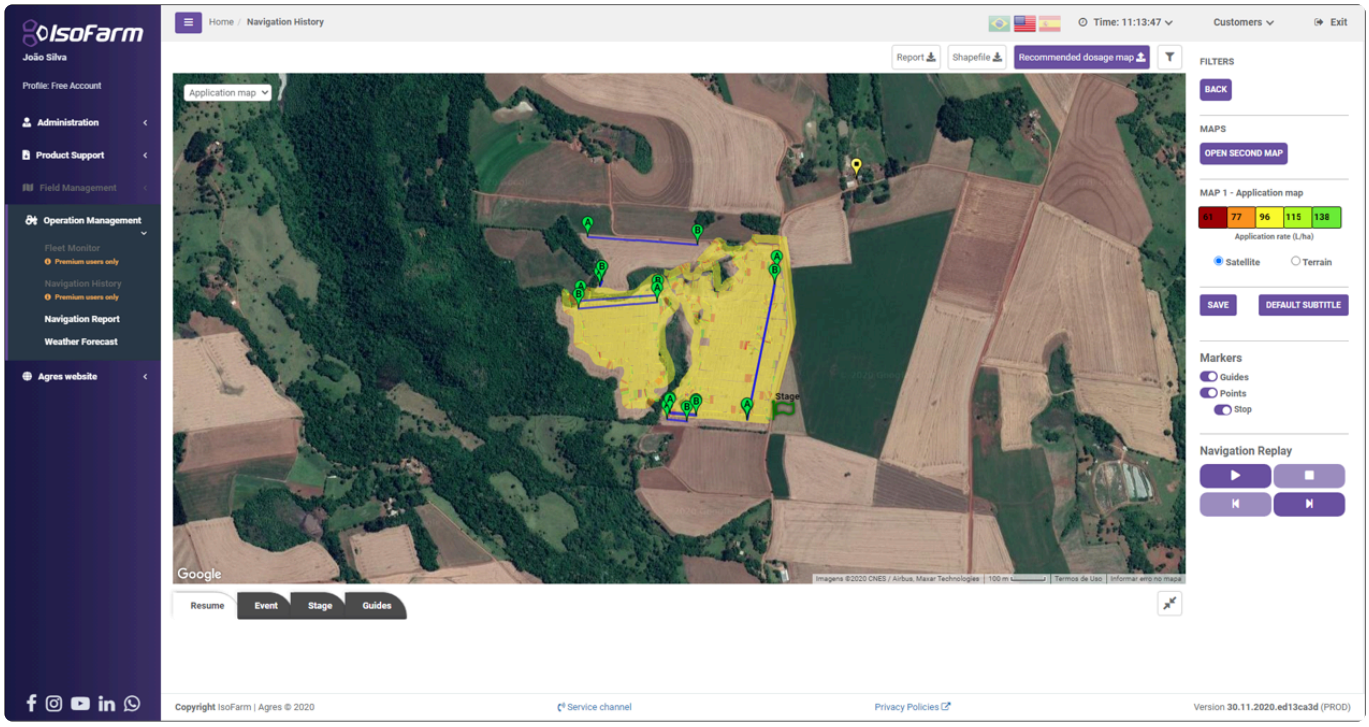


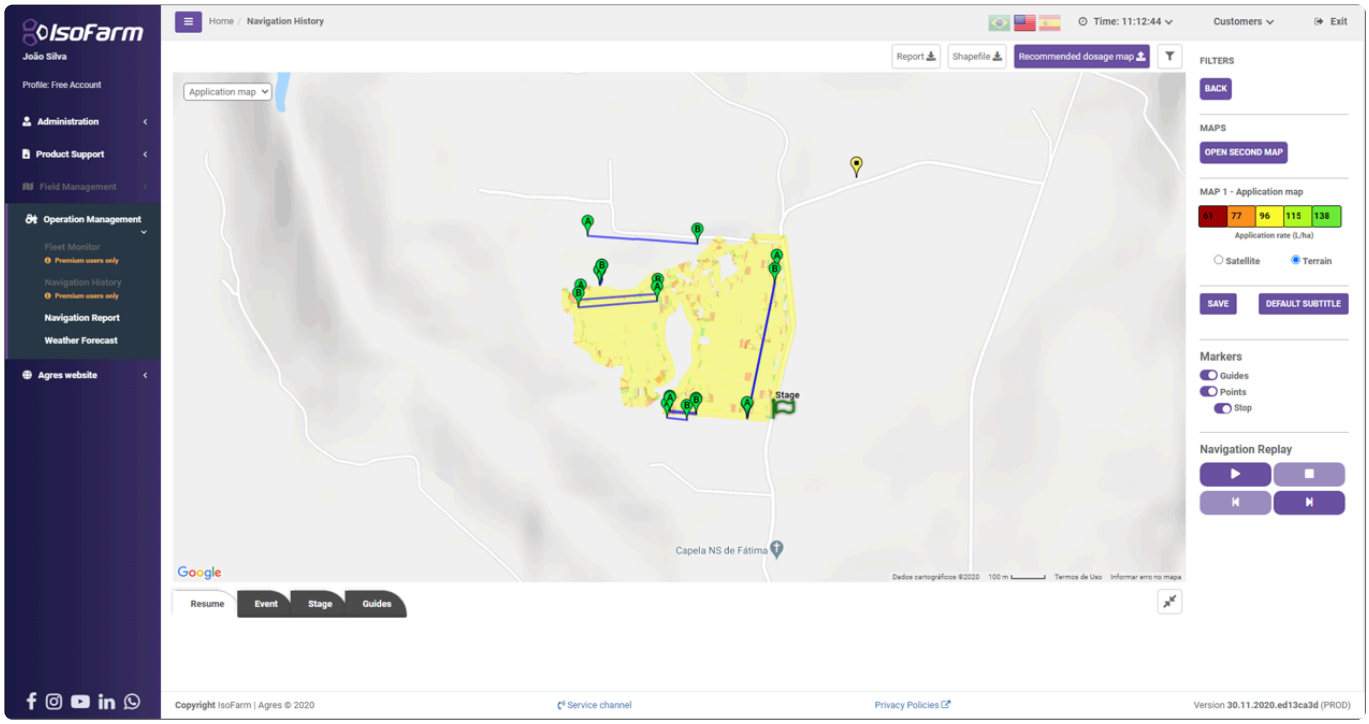

To return to the standard data presentation mode, simply press the button again.

# 12.5.2. Modify background map

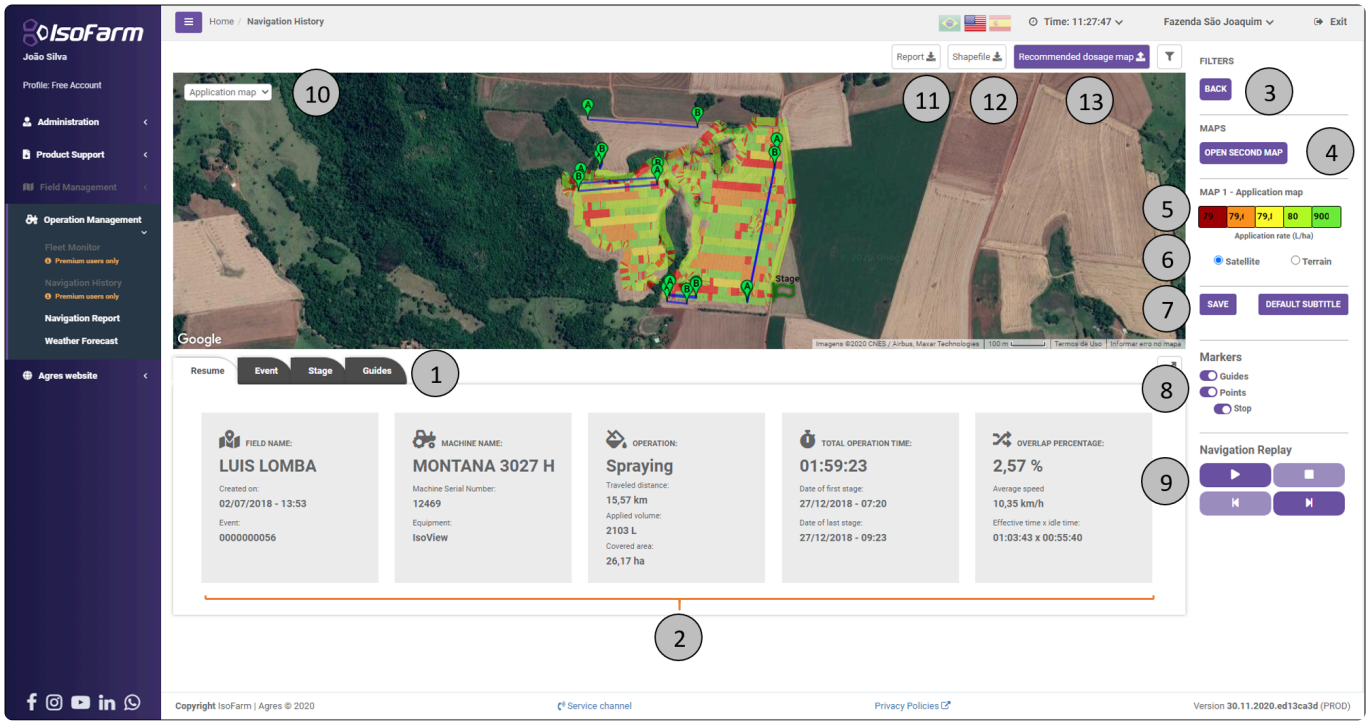



The map loading uses the satellite background by default and a terrain background option is offered. To modify the background map you can use the selection keys (6).




# 12.5.3. Change map

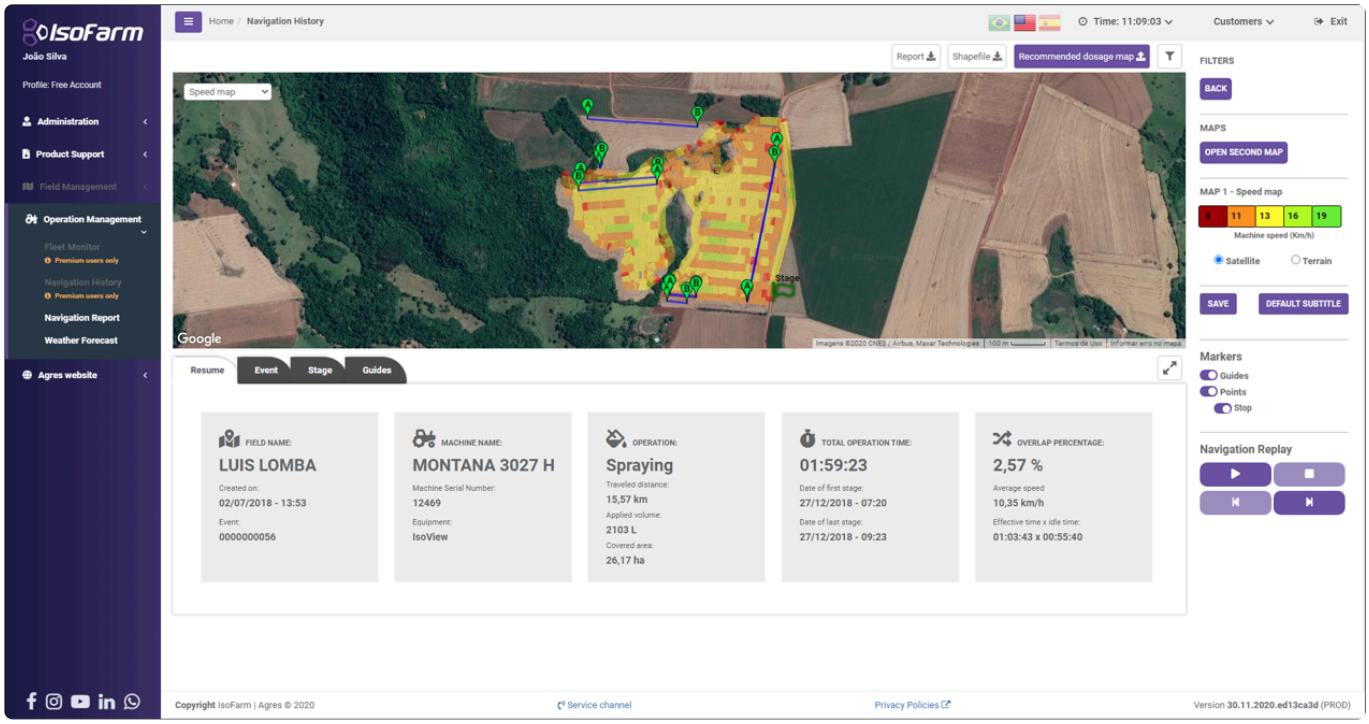



By default, the application map is loaded on the screen when viewing a navigation history. Through the checkbox (7) you can choose from the maps:

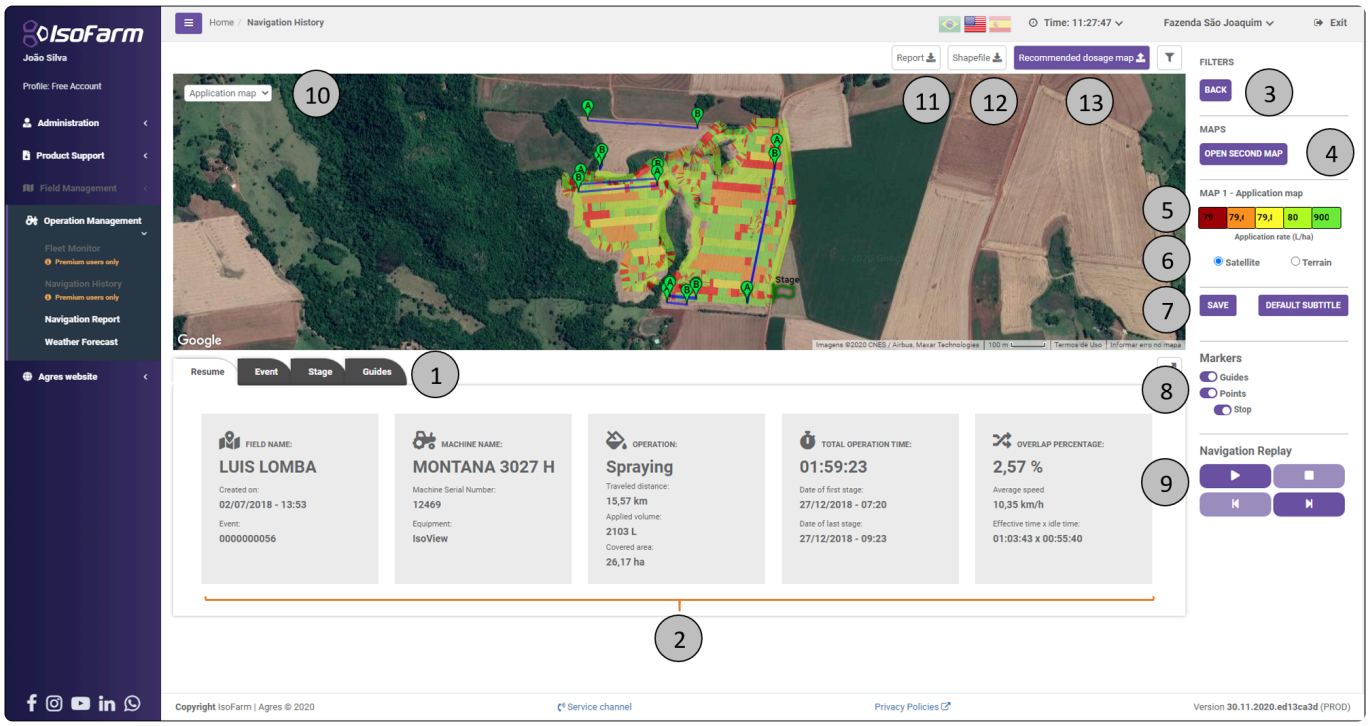
| Map | Information |
|---|---|
| Application | Color the map according to the applied rate values (Sprayer and Orchard) or distributed load (Fertilization) |
| Velocity | Color the map according to the machine speed during the work |
| Overlap | Color the map only at the application overlap points |

> ! The overlap map option is under development.

When changing the map, the information presented in the right side menu changes.




# 12.5.4. View second map

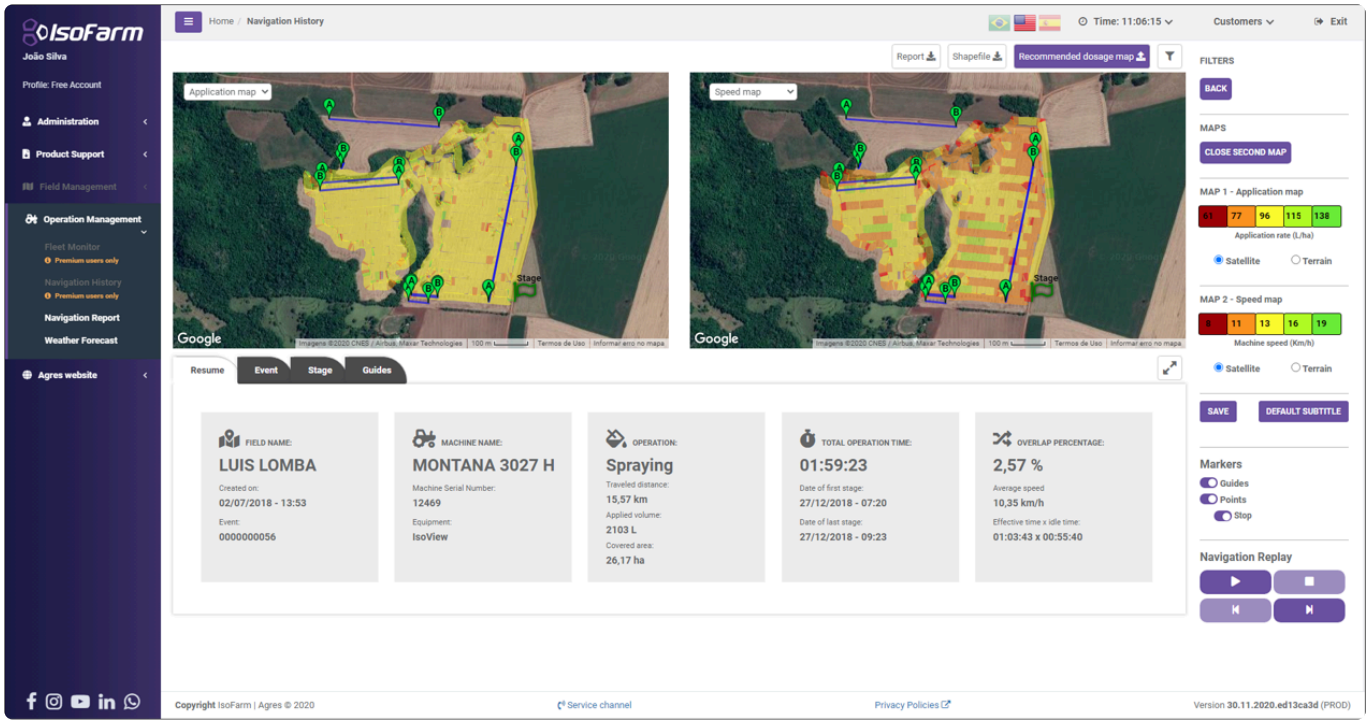



In order to facilitate the comparison between different maps of the same work, the second map can be opened via the button 4.

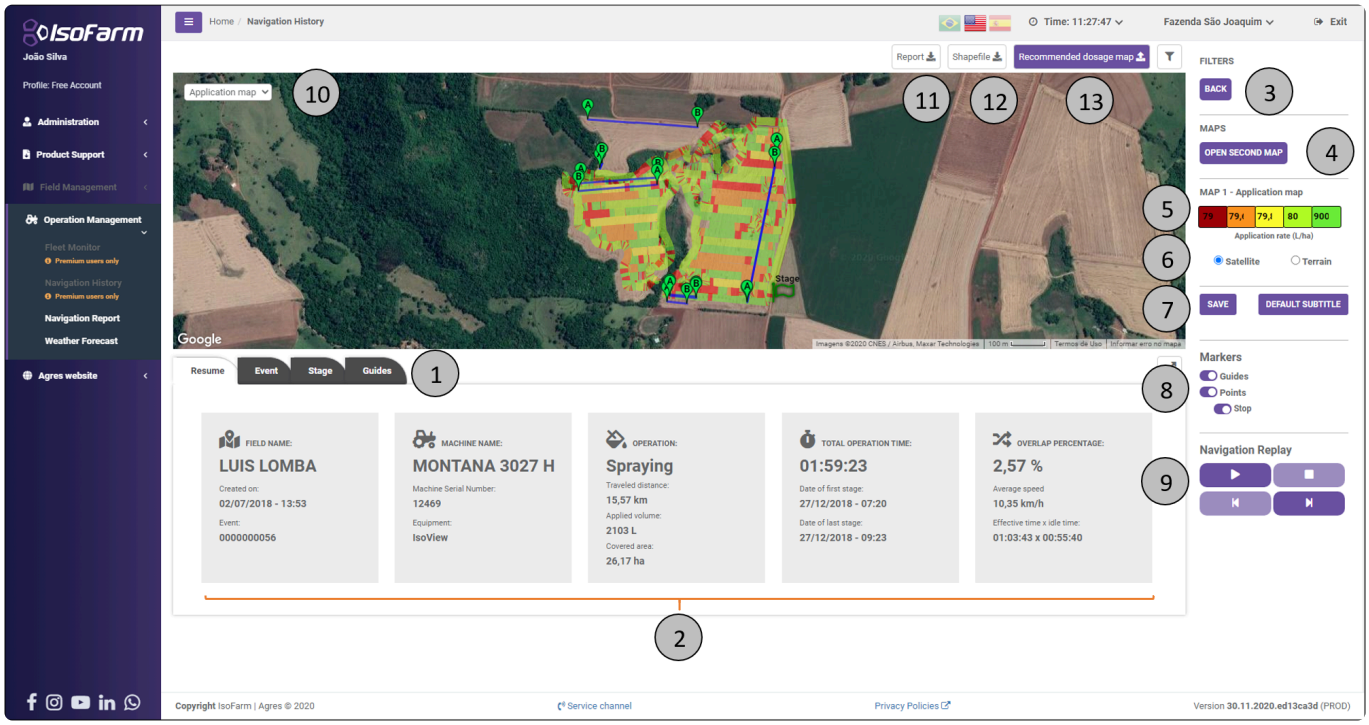
> By default, when the first map is the Application map, the Speed is opened as the second. If the Speed is the first map, the Application map will be the second.

The legend information and background map are treated individually for each map.

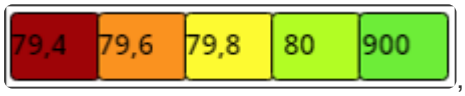
Changes in position and *zoom* performed on one of the maps are reflected on the other.



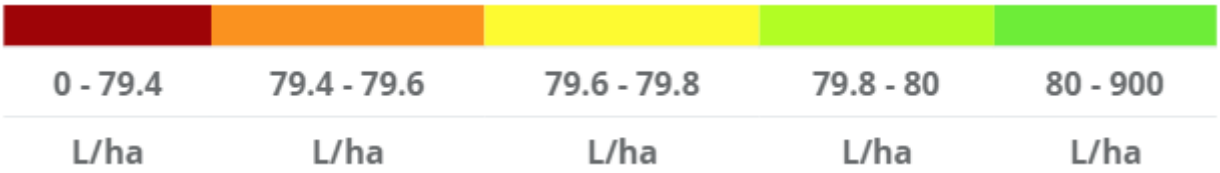

# 12.5.5. Modify map color legend



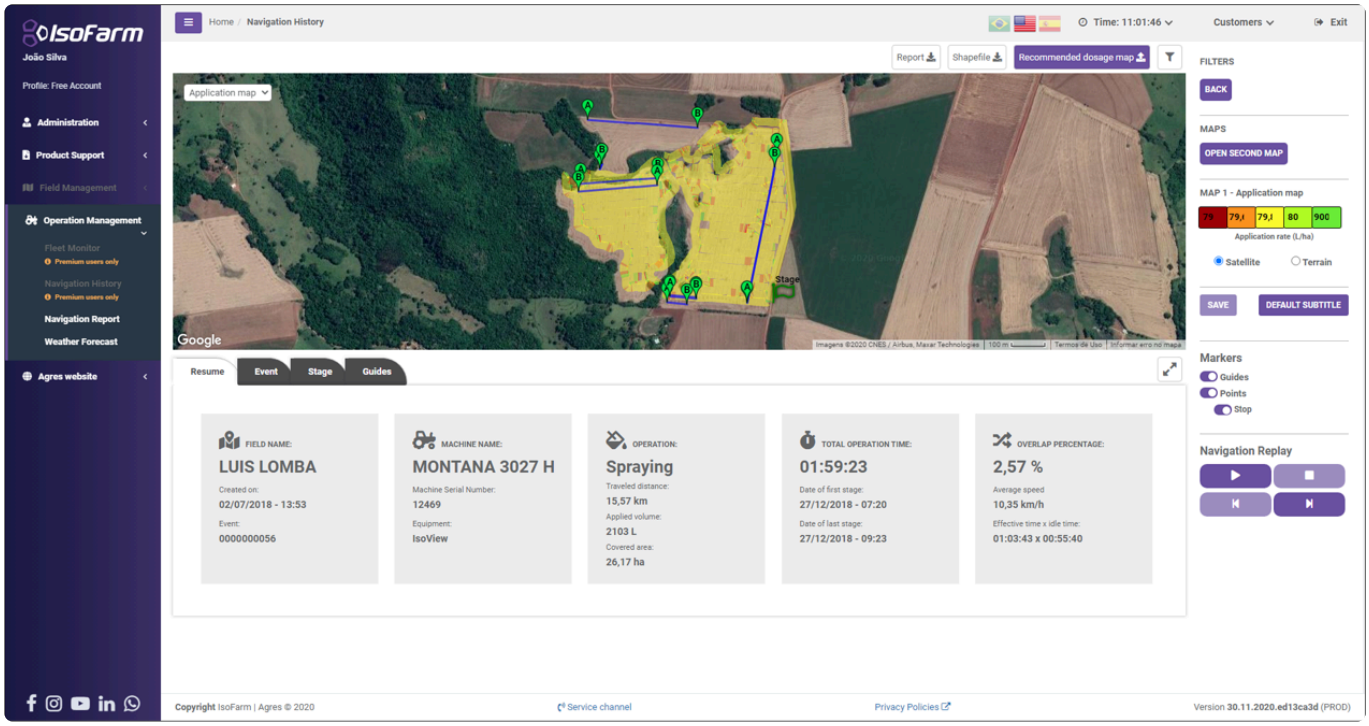

To modify the map color legend you must use the legend edit box 5.
You must adjust the legend according to the application rate used in the GeoNave during operation. Values must be entered in ascending order (smallest to largest). Let's consider a spraying application

example with legend configured with the following values 

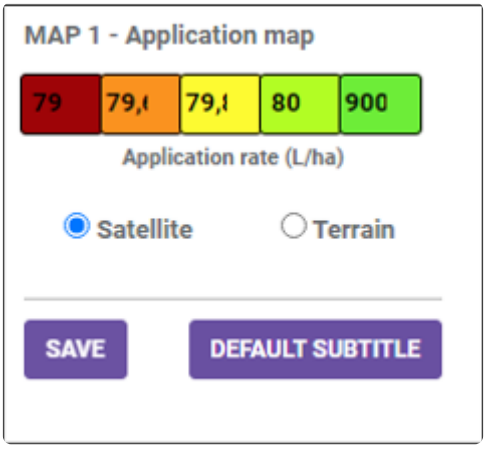
, will color the map according to the rate values below:




Resulting in the map color shown below:



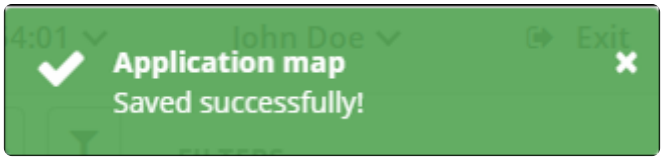

When you finish editing the legend values, just click on the “Save” option, which is displayed only when some value of the legend is modified.



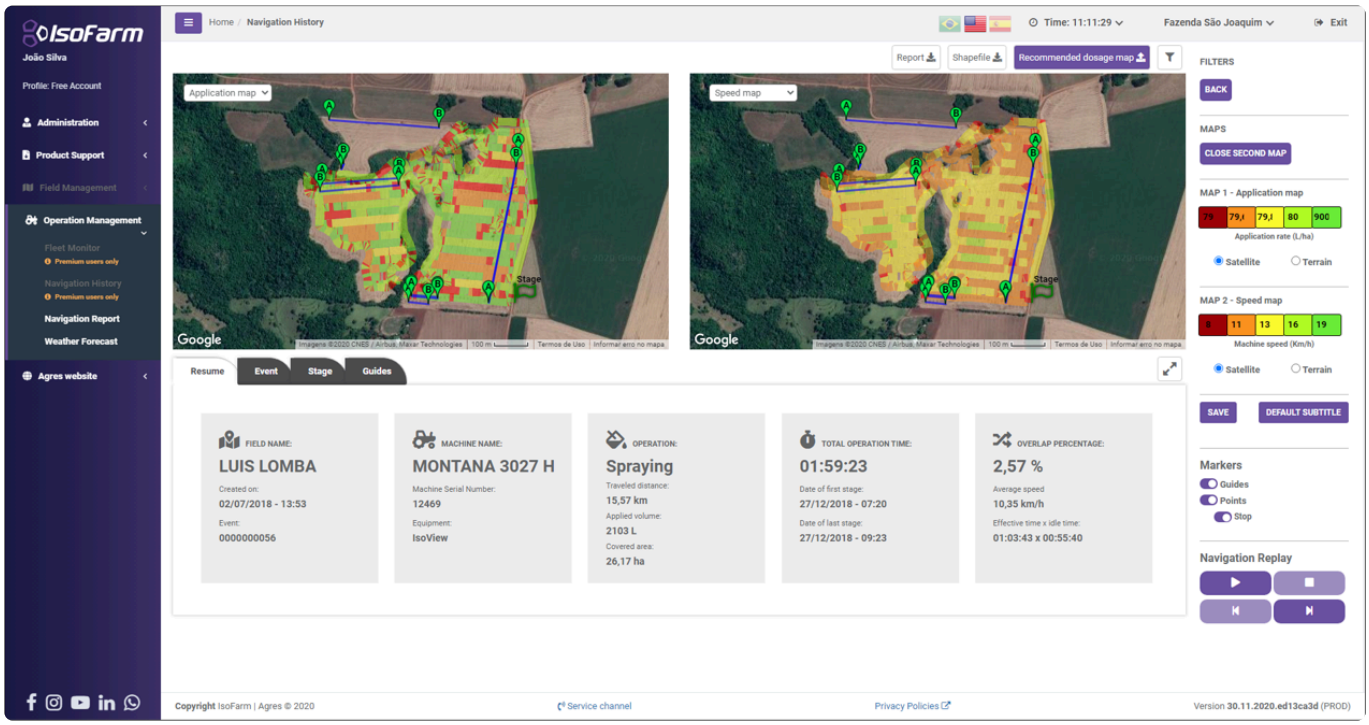

A saving information message will be displayed on the screen:



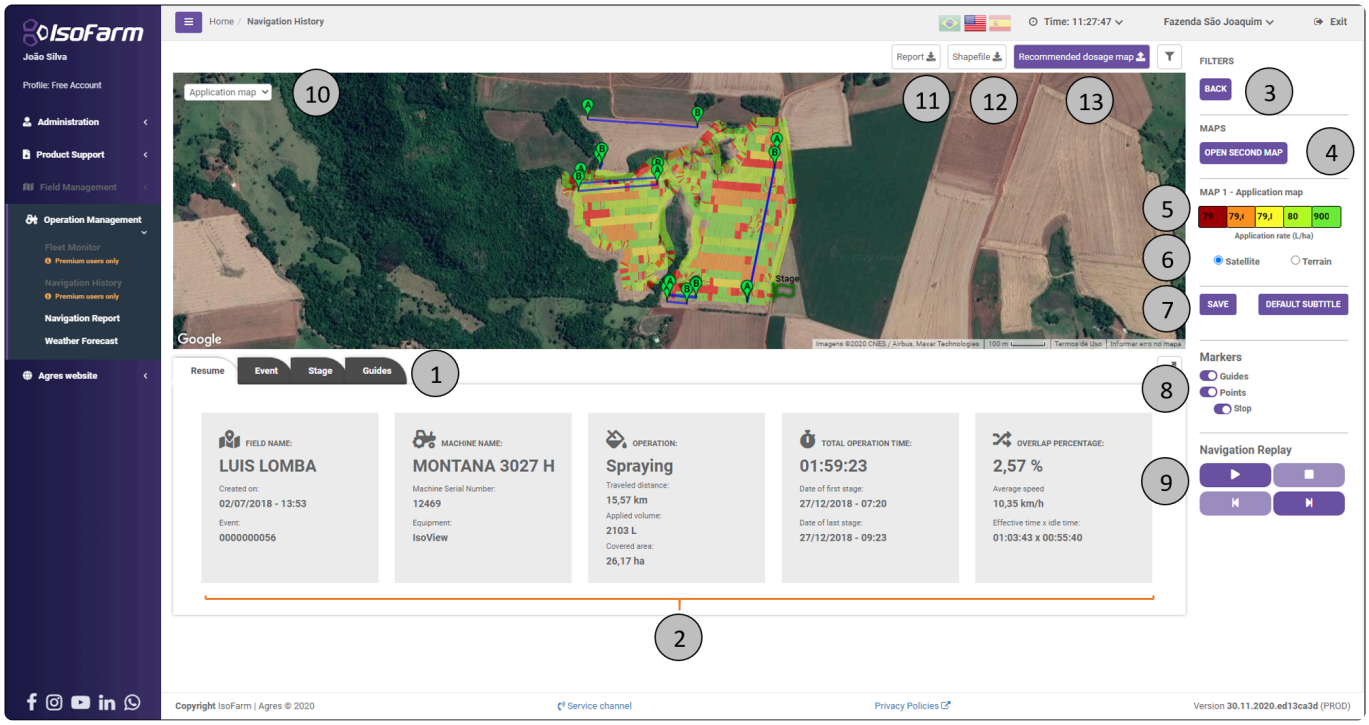

When the color processing is finished, a confirmation message will appear on the screen informing that the modifications have been implemented:



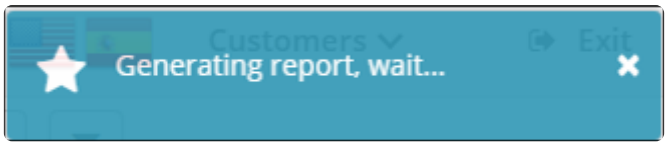

In preview mode with a second map open, both will have individual legend control, allowing you to compare application rate and speed information, for example:



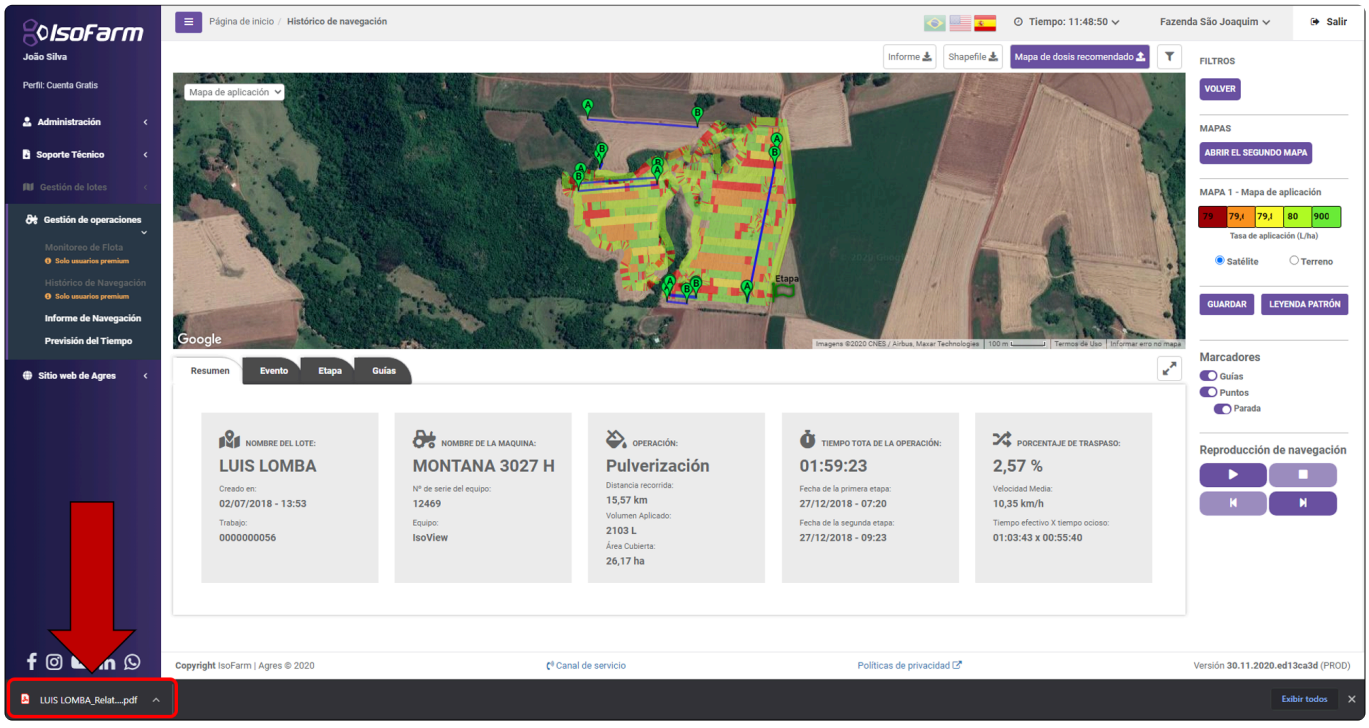

# 12.5.6. Generate PDF report file



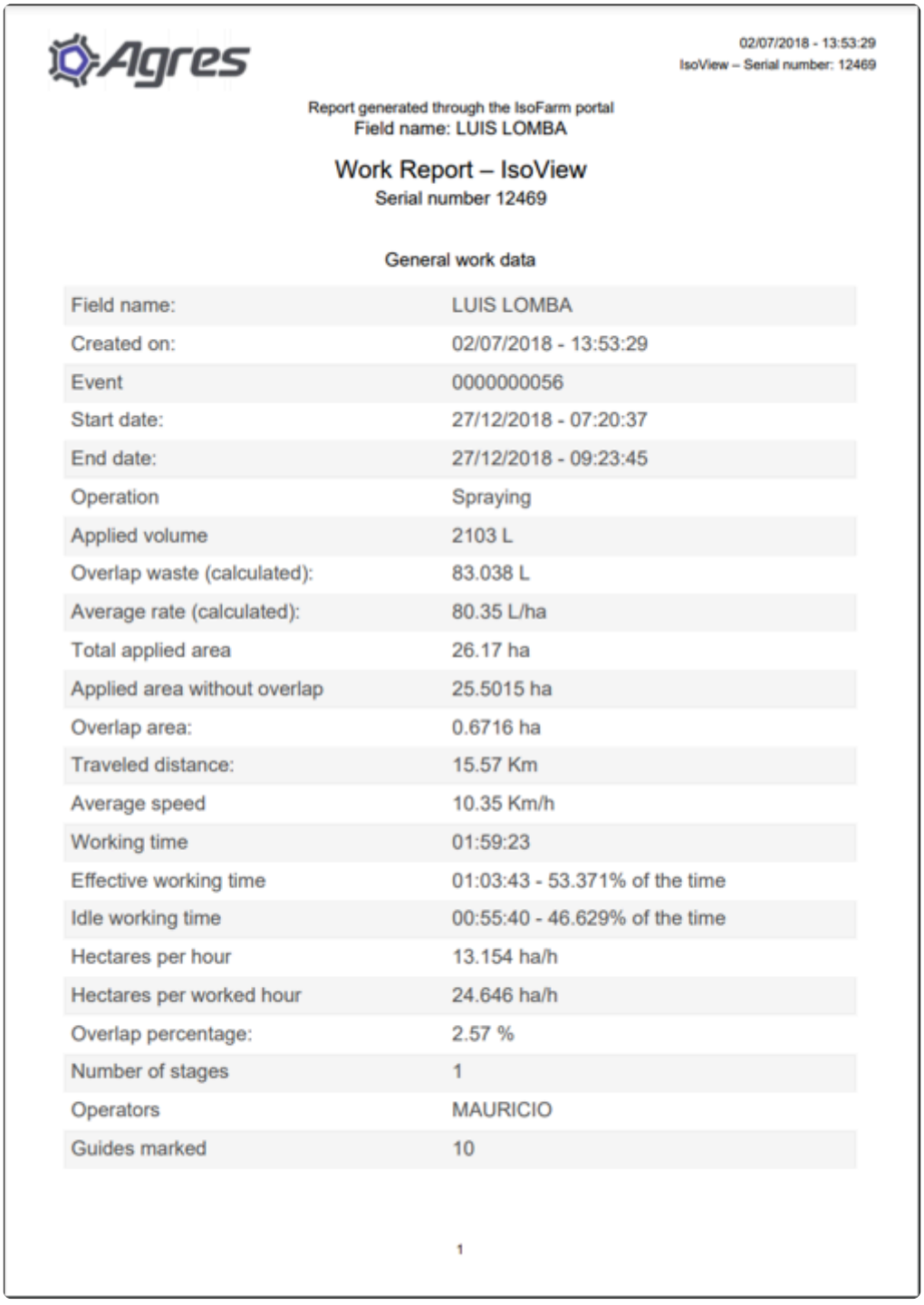

To check the complete information of the performed work you can download the PDF report by clicking on the Report button (8), after that a message will be displayed on the screen:




At the end of processing the report will be downloaded automatically:



General work data will be presented in the document first page:



02/07/2018 - 13:53:29
IsoView – Serial number: 12469

Report generated through the IsoFarm portal
Field name: LUIS LOMBA

## Work Report – IsoView

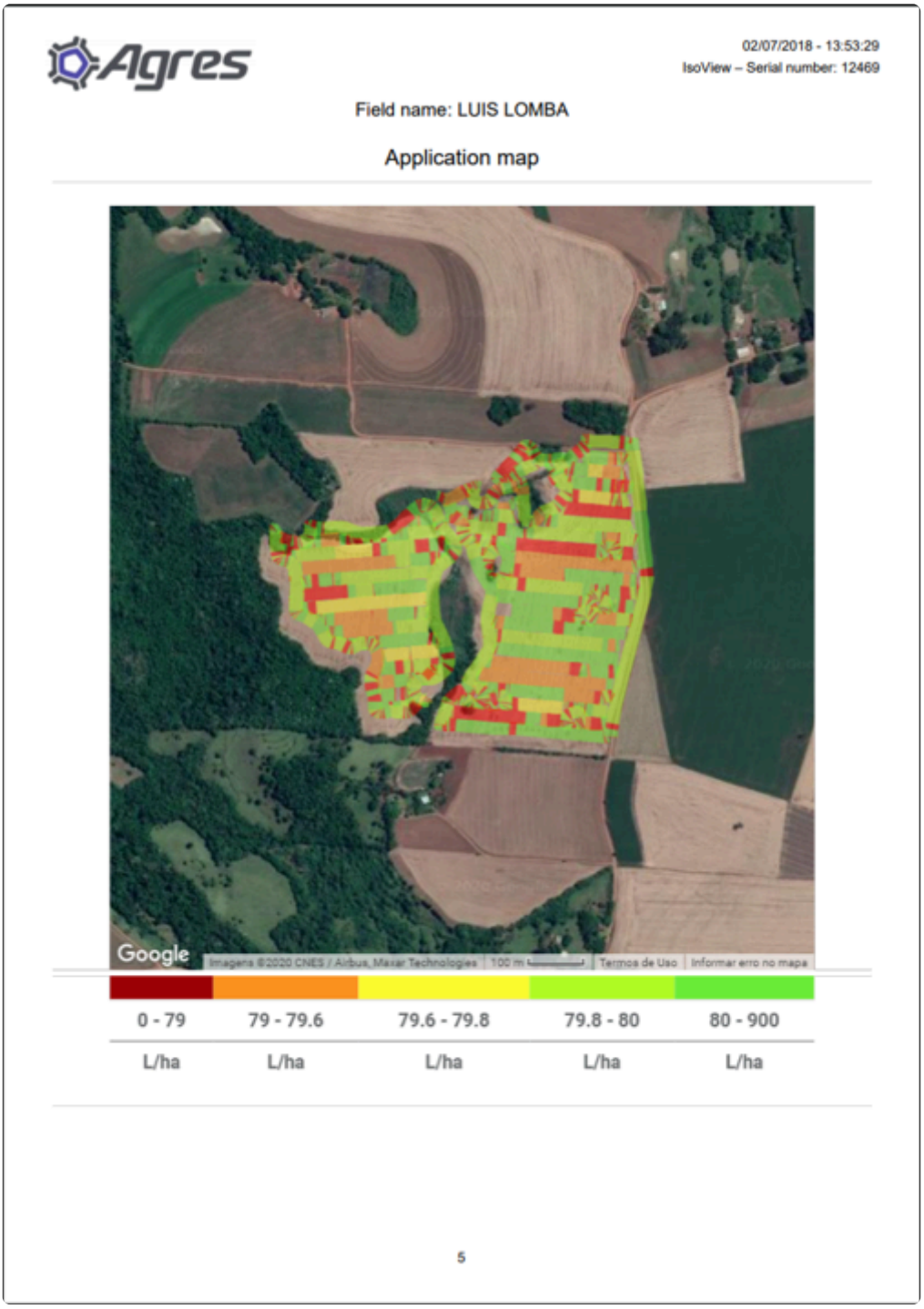
Serial number 12469

### General work data

| | |
|---|---|
| Field name: | LUIS LOMBA |
| Created on: | 02/07/2018 - 13:53:29 |
| Event | 0000000056 |
| Start date: | 27/12/2018 - 07:20:37 |
| End date: | 27/12/2018 - 09:23:45 |
| Operation | Spraying |
| Applied volume | 2103 L |
| Overlap waste (calculated): | 83.038 L |
| Average rate (calculated): | 80.35 L/ha |
| Total applied area | 26.17 ha |
| Applied area without overlap | 25.5015 ha |
| Overlap area: | 0.6716 ha |
| Traveled distance: | 15.57 Km |
| Average speed | 10.35 Km/h |
| Working time | 01:59:23 |
| Effective working time | 01:03:43 - 53.371% of the time |
| Idle working time | 00:55:40 - 46.629% of the time |
| Hectares per hour | 13.154 ha/h |
| Hectares per worked hour | 24.646 ha/h |
| Overlap percentage: | 2.57 % |
| Number of stages | 1 |
| Operators | MAURICIO |
| Guides marked | 10 |

1

On pages 2, 3 and 4 will be presented the Application, Speed and Overlap maps with their corresponding legends:




! The Overpass map presentation is under development.

The following pages show the Machine Configuration and Operation information:

02/07/2018 - 13:53:29
IsoView – Serial number: 12469

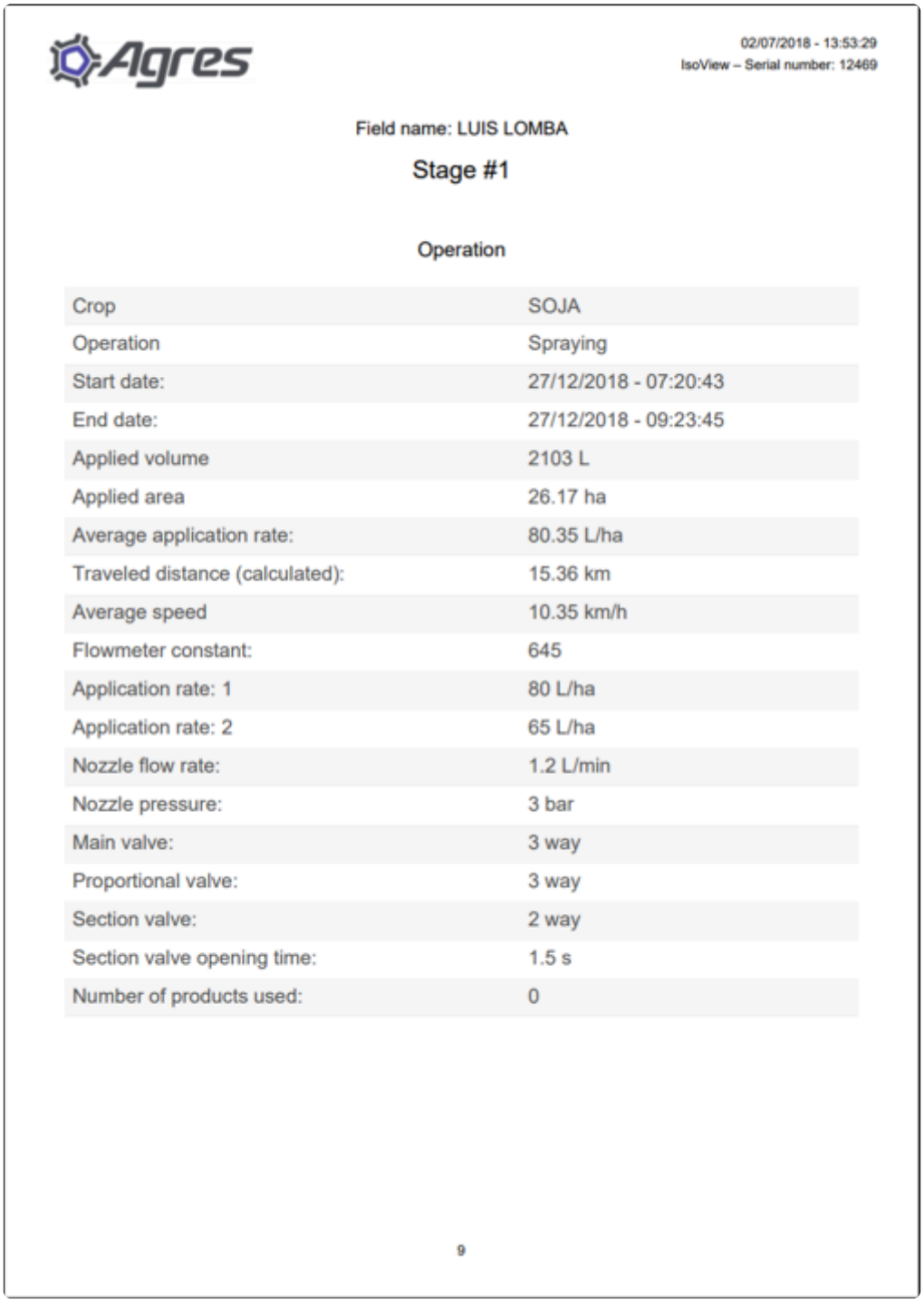
Field name: LUIS LOMBA

## Stage #1

### Machine Configuration

| | |
|---|---|
| Serial number | 12469 |
| Software version | 01.11 |
| Operator | MAURICIO |
| Machine | MONTANA 3027 H |
| Implement width: | 24.5 m |
| Implement overlay: | 0.15 m |
| Implement-Antenna distance: | 4.6 m (backward) |
| Number of sections: | 7 |
| Size of each section | 3.5m \| 3.5m \| 4m \| 2.5m \| 4m \| 3.5m \| 3.5m |
| Number of nozzles | 49 |
| Nozzle spacing: | 50 cm |
| Pilot command type: | Agres' Block |
| Pilot aggressiveness: | 4 |
| Hydraulic factor: | 150 |
| Wheelbase: | 3.8 m |

8



02/07/2018 - 13:53:29
IsoView – Serial number: 12469

Field name: LUIS LOMBA

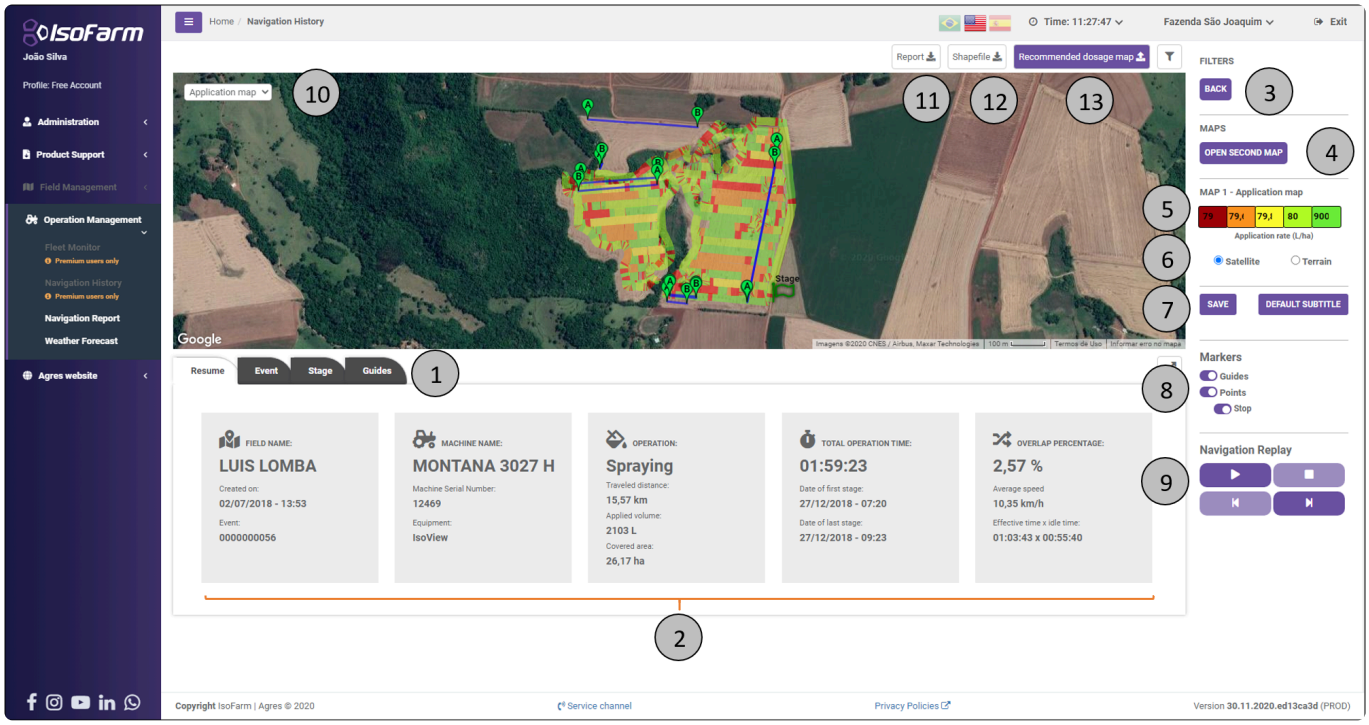
Stage #1

Operation

| | |
|---|---|
| Crop | SOJA |
| Operation | Spraying |
| Start date: | 27/12/2018 - 07:20:43 |
| End date: | 27/12/2018 - 09:23:45 |
| Applied volume | 2103 L |
| Applied area | 26.17 ha |
| Average application rate: | 80.35 L/ha |
| Traveled distance (calculated): | 15.36 km |
| Average speed | 10.35 km/h |
| Flowmeter constant: | 645 |
| Application rate: 1 | 80 L/ha |
| Application rate: 2 | 65 L/ha |
| Nozzle flow rate: | 1.2 L/min |
| Nozzle pressure: | 3 bar |
| Main valve: | 3 way |
| Proportional valve: | 3 way |
| Section valve: | 2 way |
| Section valve opening time: | 1.5 s |
| Number of products used: | 0 |

9

# 12.5.7. Generate Shapefile file

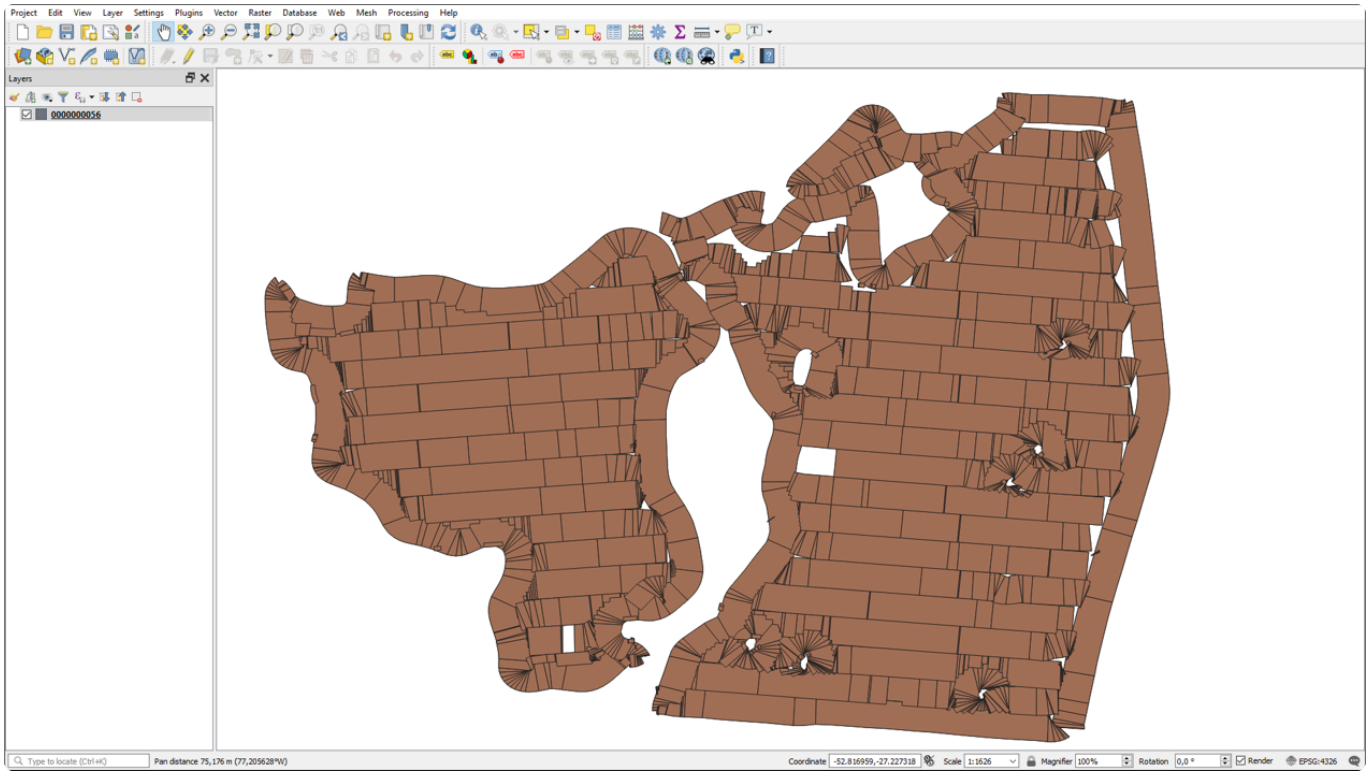



To download the *Shapefile* file containing Application and Speed maps select the option 9. The *download* will start automatically.

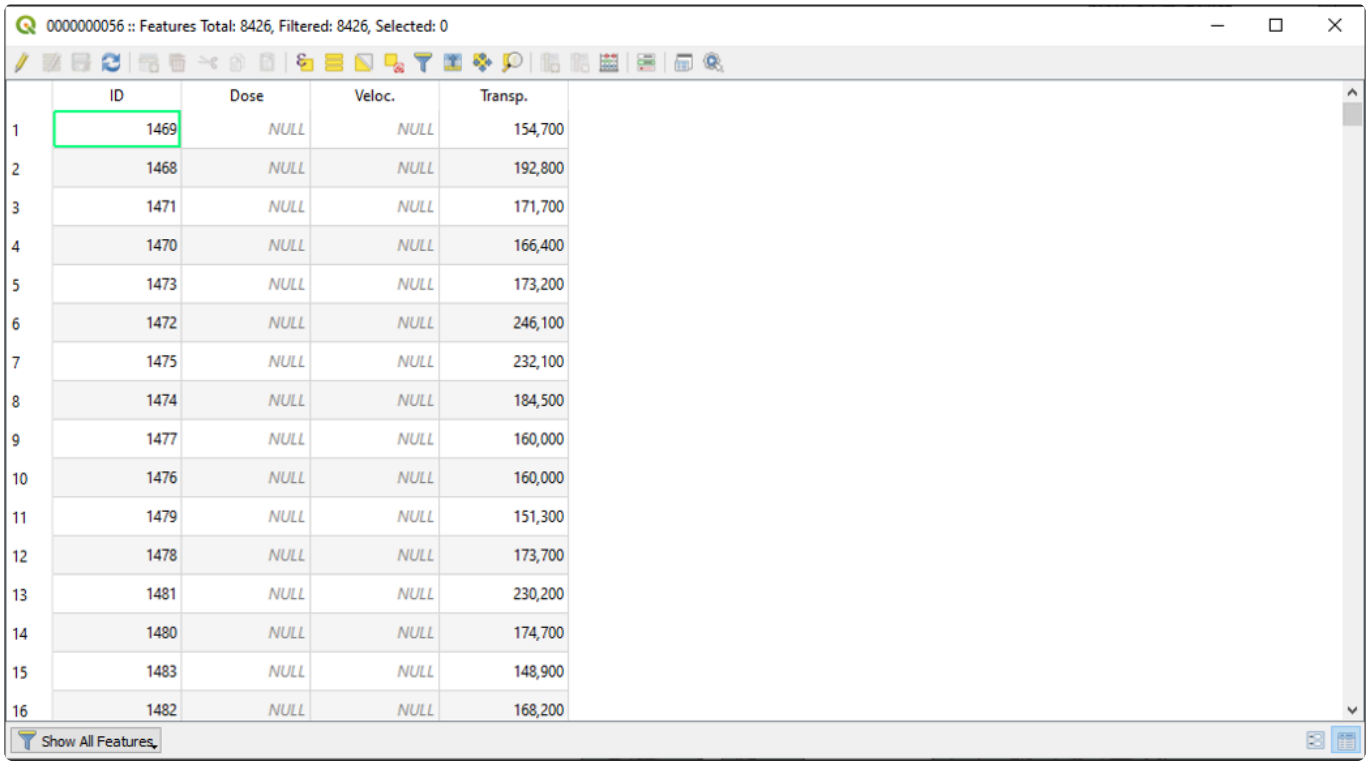
> The *Shapefile* file name will be the NVG file name that was uploaded in the platform.

Inside the *.zip* file there will be 4 files. For example, for the NVG by name “Field 1”:
*Field 1.dbf*
*Field 1.prj*
*Field 1.shp*
*Field 1.shx*

Open the files using a map visualization software of your choice. For example, using free software QGIS you can view the file:



In the *Shapefile* file generated by IsoFarm, application rate information is contained in the “Dose” field and machine speed in the “Velocity” field:

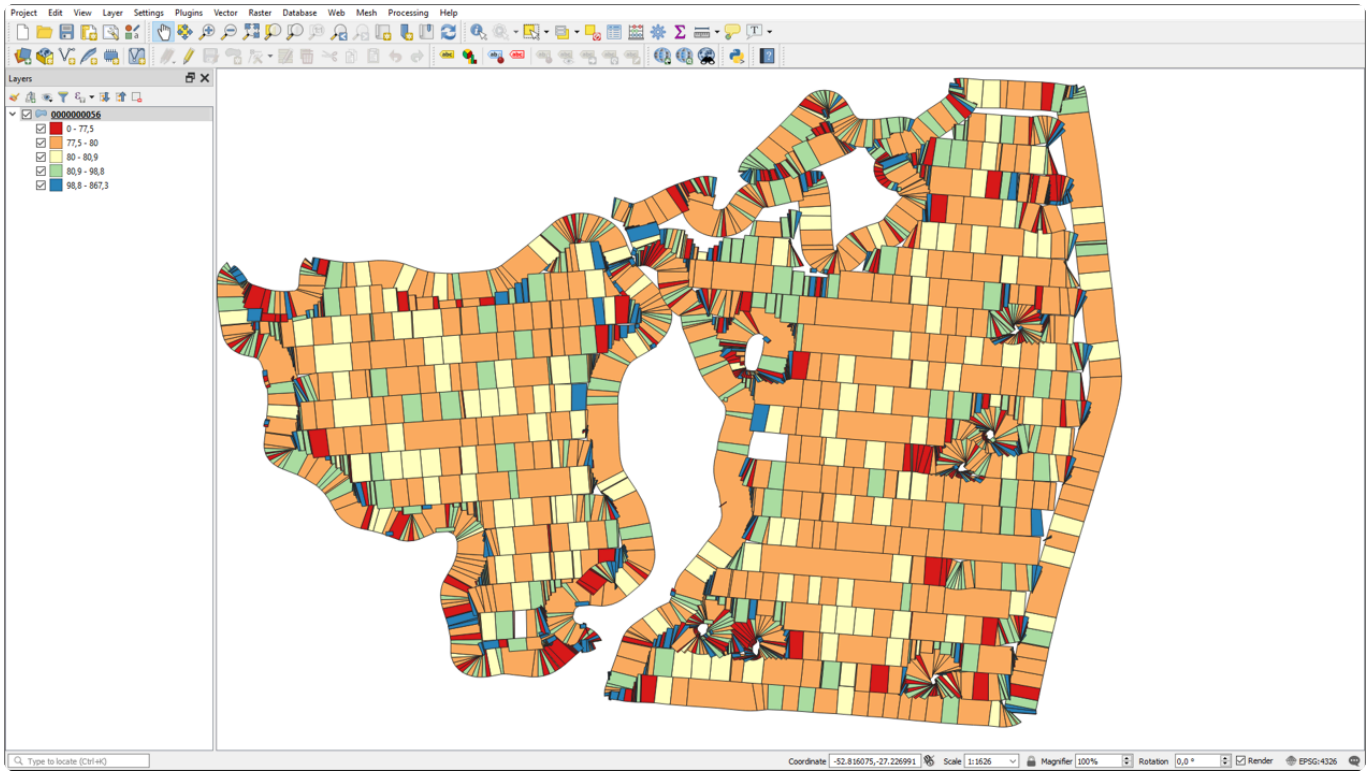


0000000056 :: Features Total: 8426, Filtered: 8426, Selected: 0

| | ID | Dose | Veloc. | Transp. |
|---|---|---|---|---|
| 1 | 1469 | NULL | NULL | 154,700 |
| 2 | 1468 | NULL | NULL | 192,800 |
| 3 | 1471 | NULL | NULL | 171,700 |
| 4 | 1470 | NULL | NULL | 166,400 |
| 5 | 1473 | NULL | NULL | 173,200 |
| 6 | 1472 | NULL | NULL | 246,100 |
| 7 | 1475 | NULL | NULL | 232,100 |
| 8 | 1474 | NULL | NULL | 184,500 |
| 9 | 1477 | NULL | NULL | 160,000 |
| 10 | 1476 | NULL | NULL | 160,000 |
| 11 | 1479 | NULL | NULL | 151,300 |
| 12 | 1478 | NULL | NULL | 173,700 |
| 13 | 1481 | NULL | NULL | 230,200 |
| 14 | 1480 | NULL | NULL | 174,700 |
| 15 | 1483 | NULL | NULL | 148,900 |
| 16 | 1482 | NULL | NULL | 168,200 |

Show All Features

For example, after modifying the map color legend, the “Dose” field obtained will be the following:


Project Edit View Layer Settings Plugins Vector Raster Database Web Mesh Processing Help
Layers
0000000056
0 - 77,5
77,5 - 80
80 - 80,9
80,9 - 98,8
98,8 - 867,3
Type to locate (Ctrl+K)
Coordinate -52.816075,-27.226991
Scale 1:1626
Magnifier 100%
Rotation 0,0 °
Render
EPSG:4326

# 13. Problems and Solutions

In this area the user gets information to make a self-diagnosis of possible problems with the GeoNave ISO 31 system.

| Problem | Possible solutions |
|---|---|
| The Display does not turn on. | • Check the correct connection of the tractor battery cable.<br>• Check the battery cable fuse.<br>• Check if the connection of power cable to battery cable is correct and fixed.<br>• Check if the connection of power cable to display is correct and fixed.<br>• Check if any of the cables are broken or don't have proper contact. |
| Touch screen does not respond. | • Restart the system switching off and on the display again. |
| GNSS signal weak or absent. | • Ensure that the GNSS antenna is aimed at the open sky. Obstructed places can weaken the GNSS signal.<br>• Check the correct GNSS antenna installation on the tractor roof.<br>• Check the GNSS antenna cable integrity, if there are no breaks or folds.<br>• Using a multimeter, check the 5 V voltage on the GNSS antenna cable.<br>• If the GNSS antenna is close to dense forest areas, disable the GPS Signal Filter. Note: Position accuracy is degraded by forest obstructions. |
| Flash drive not recognized. | • Ensure that the flash drive size is not larger than 8 GB.<br>• Format the memory as FAT32 and standard allocation size, as described in the Firmware Update. |
| The sprayer valves do not activate. | • Check that the sprayer cables connections are carried out correctly.<br>• Check if any of the cables are broken or don't have proper contact.<br>• Check the valves integrity by applying +12 V and -12 V directly to its terminals and checking the activation. |
| Sprayer control is unstable. | • Check if the sprayer cables connections are done correctly.<br>• Check if the flowmeter cable is broken or don't have proper contact.<br>• Disconnect the cable from the Regulating Valve when it's halfway. Then, check the stability of the flowmeter pulse reading in the Simulation spraying.<br>• Check if the Regulating Valve parameter is correctly configured (2 or 3 ways).<br>• Check if the connection cable with the Regulating Valve is broken or don't have proper contact.<br>• Check the Regulating Valve integrity by applying +12 V and -12 V directly to its terminals and checking the activation.<br>• Check the Flow Control parameters. |
| Unable to access the Fertilization menu | • Contact the commercial area to purchase the fertilization kit and license |

| | |
|---|---|
| | according to your machine. |
| Unable to access the Auto Steering menu | • Contact the commercial area to purchase the Auto Steering kit and license according to your machine. |

If any of the problems listed above persist, contact the Support and Technical Assistance team for a better diagnosis.

# 14. Support and Technical Assistance

At the official website Geoline the user will find supplementary content related to this manual, such as *download* latest software updates, training and video tutorials, to always obtain the best performance from your GeoNave system.

Whenever necessary, the customer can count on our trained technical teams to solve issues related to maintenance and parts/accessories.

## Maintenance

When defects or malfunctions are identified by the user in any GeoNave system component, it is required to call the Geoline Technical Assistance team or your reseller.
The data must contain the Model, Serial number, Identifier, Application Version, in addition to the customer's personal data, the purchase invoice and a report pointing out the defects or malfunctions found in the most detailed way possible.

Our trained technical staff will carry out an evaluation and will contact you as soon as possible, to determine the necessary actions to solve the indicated issues.

## Supplies

In case of need to purchase spare parts and accessories for the GeoNave system, the customer must contact the local reseller.

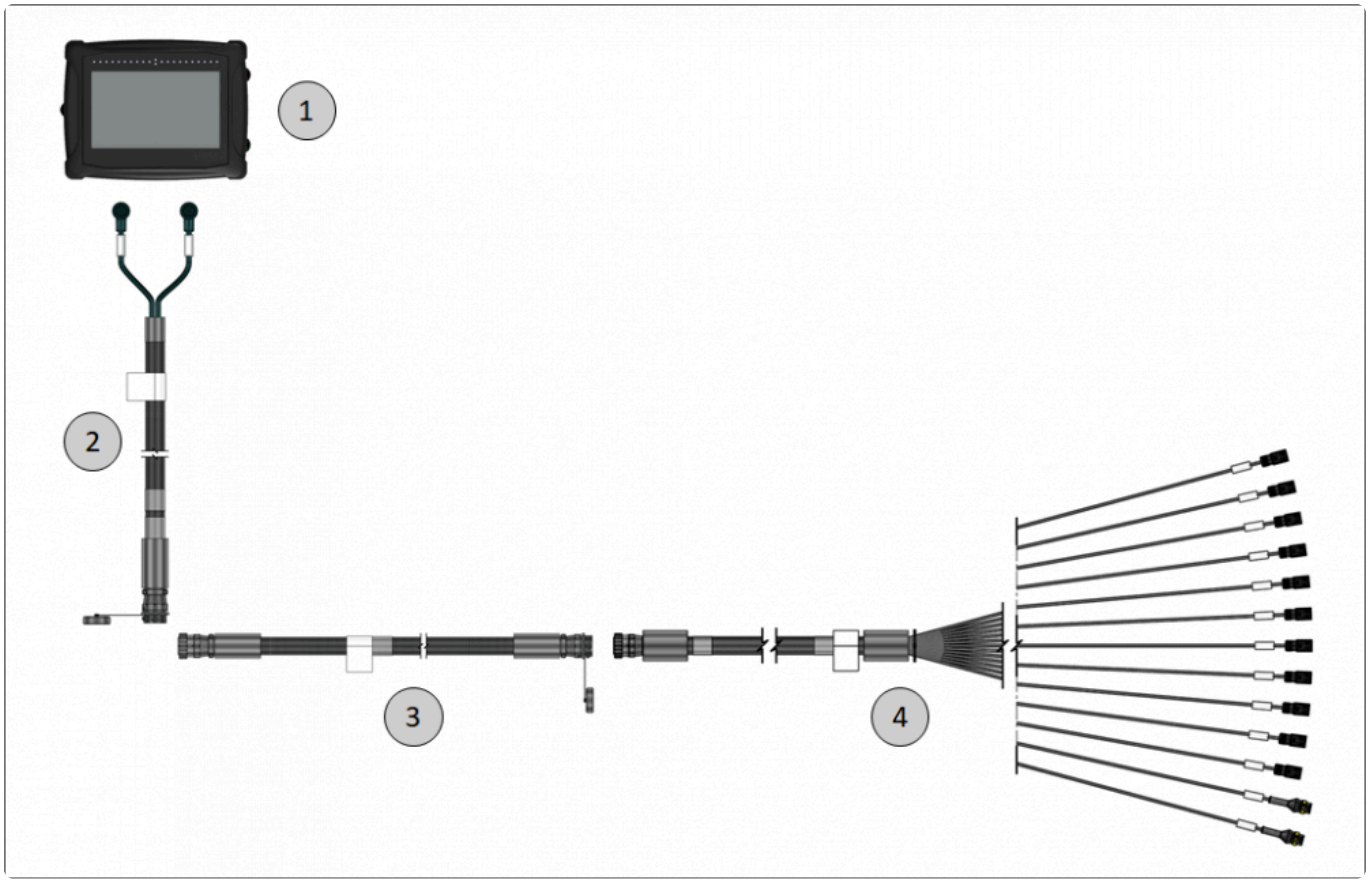
The images and tables below describe the GeoNave system components codes for spraying application.

### Display installation




| Item | Description |
|---|---|
| 1 | GeoNave display |
| 2 | GNSS antenna cable |
| 3 | GNSS antenna with magnetic base |
| 4 | Accessory for fixing the GNSS antenna with double sided adhesive pad |
| 5 | Display power cable |
| 6 | Battery connection cable with fuse holder |
| 7 | Trio of suction cups of display fixation set |
| 8 | Articulated arm of display fixation set |
| 9 | Pendrive |

## Connecting the display to the sprayer cable




| Item | Description | Code |
|---|---|---|
| 1 | GeoNave display | |
| 2 | Sprayer cabin cable | 5 meters – C00902222<br>10 meters – C00902223 |
| 3 | Sprayer cable extender, if required | 5 meters – C00902224<br>10 meters – C00902225 |
| 4 | Sprayer implement cable (see dedicated topic for detailed connection instructions) | Crop sprayer<br>• 2 – wire valves, 9 sections – C00902226<br>• 2 – wire valves, 5 sections – C00902228<br>• 3 – wire valves, 9 sections – C00902227 + C00902232 (valve power supply cable)<br>• 3 – wire valves, 5 sections – C00902238 + C00902232 (valve power supply cable) |
| | | Orchard<br>• Solenoid valves & Ultrasound, 6 sections – C00902230 + C00902233 (ultrasound sensor adapter)<br>• 2-wire valves & Ultrasound, 6 sections – C00902229 + C00902233 (ultrasound sensor adapter)<br>• 3-wire valves & Ultrasound, 6 sections – C00902231 + C00902232 (valve power supply cable) + C00902233 (ultrasound sensor adapter) |

# 15. Warranty terms & conditions

The european importer Tecomec S.r.l. guarantees that Agres GeoNave labeled products are covered against manufacturing defects during the following periods.

## Warranty periods

- Finished products – 2 years from Invoice date to end user
- Warranty on parts or reparation made during warranty period will end at the end of initial warranty period.

## Product warranty terms

1. The warranty period starts at the date of purchase. The guarantee will be applied upon presentation of the purchase invoice. The manufacturer, acting through the sales and technical assistance network, shall replace free of charge any defective component. The warranty does not modify the purchaser’s rights as established under legislation governing the consequences of defects in the product.
2. The technical staff will intervene as soon as possible within the time limits granted by organizational arrangements.
3. Any claim under the warranty, must include details of invoice or receipt showing the date of purchase.
4. The manufacturer excludes consumables and parts subject to normal wear and tear.
5. The guarantee excludes intervention for updating and improvement of product.
6. The warranty does not cover the tuning maintenance interventions which should occur during the period of guarantee.
7. Any damage caused during transport must be reported immediately to the carrier or warranty will be void.
8. The warranty does not cover any damage, direct or indirect, caused to people or things
9. The warranty is void in the event of:

- Obvious lack or wrong installation or maintenance.
- Use of not original spare parts or accessories
- Interventions carried out by non-authorized personnel.

## Returning goods

To have an effective guarantee, it is necessary to comply with the following requirements:

- The product must be delivered in the original packaging and with all the accessories (if applicable) in good condition.
- Provide a copy of the purchase invoice.
- Attach a letter in writing (from the distributor or user) explaining in detail the equipment failures

and / or anomalies, mentioning the device serial number.

- Get the official approval from the seller before returning any goods

# 16. Declaration of Conformity

Hereby, Agres declares that the GeoNave field computer is in compliance with the EMC Directive 2014/30/EU, RED Directive 2014/53/EU, RoHS Directive 2011/65/EU and their subsequent modifications and additions.

The full text of the EU declaration of conformity is available at the following internet address: www.agres.com.br/geonave



# 17. Glossary

**ABS** – Acrylonitrile Butadiene Styrene. Type of light and resistant plastic used in the construction of electronics cabinets.
**CAN** – *Controller Area Network*. Worldwide communication network used to interconnect automotive vehicle components and agricultural machinery.
**HDOP** – Dilution of horizontal precision. Characteristic used to measure the GNSS system accuracy.
**GB** – Gigabyte. 1 GB = 1,073,741,824 bytes.
**GLONASS** – *Globalnaya Navigatsionnaya Sputnikovaya System*. Russian constellation of GNSS.
**GNSS** – *Global Navigation Satellite System*. Set of all navigation satellite constellations available in Earth orbit.
**GPS** – *Global Positioning System* . American constellation of GNSS.
**IP65** – Degree of protection against dust and water jets.
**LED** – *Light Emitter Diode*. Small semiconductor lamp commonly used in electronic equipment.
**Pixel** – Dot, or smallest visible part of a liquid crystal display.
**PRN** – *Pseudo-Range Noise*. Number representing the satellite identifier in the available GNSS constellations .
**RGB** – *Red, Green, Blue*. Color system used in liquid crystal displays.
**RTK** – *Real Time Kinematics*. Signal correction system GNSS, usually using radio technology, which allows increase coordinates accuracy up to 1 to 2 cm.
**SNR** – *Sign-Noise Ratio*. Signal-to-noise ratio of the satellite signal, which represents the GNSS signal reception quality.
**TFT** – *Thin-Film Transistor*. Technology used in the construction of liquid crystal displays.
**UTC** – *Coordinated Universal Time*. International standard for defining globe time zones.

# 18. Contact

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C.F. e P.I. 01219320353 – Reg. Impr. di Reggio Emilia n° 01219320353

e-mail: info@tecomec.com
WEB: www.tecomec.com

# 19. Revision control

The following are the revision control changes of this manual, according to firmware version used.

## Revision 1 – Firmware version 02.01.06

| Change | Description |
|---|---|
| - | Initial guide version |

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01/2021