# Operating manual

## *TRACK-Leader II, SECTION-Control, TRACK-Leader TOP*

Version: 20110414

30302432-02-EN

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Read and follow these operating instructions.

Keep these operating instructions in a safe place for later reference.

# Imprint

**Document**

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# 1 For your safety

## 1.1 Basic safety instructions

Please read the following safety instructions carefully before using the equipment for the first time.

- Read the operating manual for the connected machine and follow the safety precautions.

## 1.2 Intended use

The TRACK-Leader II, SECTION-Control and TRACK-Leader TOP software may only be used in conjunction with agricultural equipment and machinery. The software may only be used away from public roads, during field operations.

## 1.3 Layout and meaning of warnings

All safety instructions found in these Operating Instructions are composed in accordance with the following pattern:

| | |
|---|---|
|  | **WARNING**<br>This signal word identifies medium-risk hazards, which could potentially cause death or serious bodily injury, if not avoided. |

| | |
|---|---|
|  | **CAUTION**<br>This signal word identifies low-risk hazards, which could potentially cause minor or moderate bodily injury or damage to property, if not avoided. |

| |
|---|
| ***NOTICE***<br>This signal word identifies actions which could lead to operational malfunctions if performed incorrectly.<br>These actions require that you operate in a precise and cautious manner in order to produce optimum work results. |

There are some actions that need to be performed in several steps. If there is a risk involved in carrying out any of these steps, a safety warning will appear in the instructions themselves.

Safety instructions always directly precede the step involving risk and can be identified by their bold font type and a signal word.

**Example**

1. **NOTICE! This is a notice. It warns that there is a risk involved in the next step.**
2. Step involving risk.

## 1.4 User requirements

- Learn how to operate the terminal correctly. The terminal must not be operated by anyone who has not read the Operating Instructions.

- Please read and carefully observe all safety instructions and warnings contained in these Operating Instructions and in the manuals of any connected machines and farm equipment.
- If there is anything within these Operating Instructions that you do not understand, please do not hesitate to contact us or your dealer. Müller-Elektronik's Customer Services department will be happy to assist you.

# 2 Product description

The TRACK-Leader II ISOBUS system for parallel trace navigation is a modern guidance system which is tailored to the needs of agriculture. The system enables precise driving in parallel tracks in accordance with a pre-defined A-B guidance tramline.

Regardless of the application which is launched, a course direction can be enabled in the header area of the display screen. This enables the driver to maintain the tractor and machine on the right track intuitively and effortlessly, even in poor visibility.

When SECTION-Control is enabled, the software switches to enable different sections. In this way, the driver can concentrate on other tasks, as the software switches sections automatically.

## 2.1 Performance description

Enabling different modules enables you to use different functions of the software.

In addition to TRACK-Leader II, you can also enable SECTION-Control and/or TRACK-Leader TOP. TRACK-Leader II is however a prerequisite for all of these further stages.

SECTION-Control and TRACK-Leader TOP operate independently of each other, and can even be enabled separately.

**Stage 1: TRACK-Leader II**

- Navigation along a laid-out trace with the help of a light bar
- Obstacle warning
- Saving of field data in two formats

**Stage 2a: SECTION-Control**

- Automatic boom section control

**Stage 2b: TRACK-Leader TOP**

- Automatic vehicle steering along laid-out tramlines

**Stage 2c: HEADLAND-Control**

- Tramlines for working with headlands
- Separate treatment of headlands and field interiors

## 2.2 System requirements

Your system must fulfill the following criteria in order to be able to use the software:

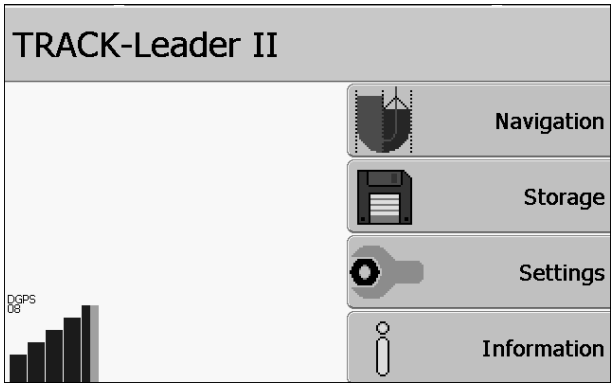
- Spraying task calculation software - minimum version 6.0e
- Terminal software - minimum version 3.50
- For TRACK-Leader TOP - Steering task calculation iBox - minimum version 02-112

## 2.3 Screen structure

Your display screen will look slightly different, depending on the modules that you have enabled.

### 2.3.1 Start screen structure

The Start screen appears when you launch the application.




*TRACK-Leader II start screen*

The start screen allows you:

- To switch to further screens.
- To read the status of the GPS signal.

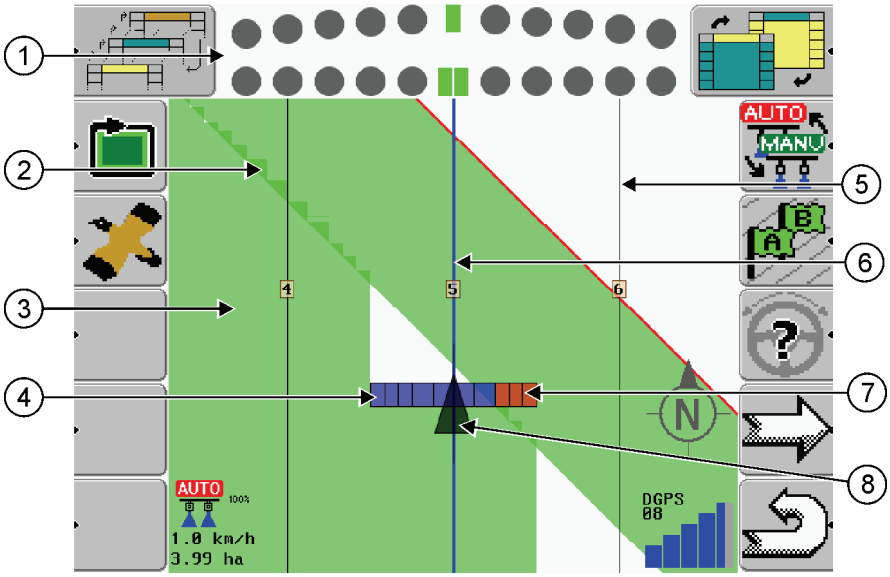
**Controls**

| Function icon | Function |
|---|---|
|   | To switch to the Preparations screen. |
|   | Switch to the "Storage" screen. |
|   | Switch to the "Settings" screen. |
|   | Switch to the "Information" screen. |

### 2.3.2 Structure of work screen

The work screen contains all of the information you will need in order to work with the software.

The following figure shows the information on the work screen.




*Work screen*

| | | | |
|---|---|---|---|
| 1 | **Light bar**<br>Displays the current and future position | 5 | **Tramline**<br>Track that the tractor is following or will follow |
| 2 | **Overlap**<br>Areas which are treated twice are marked in dark green | 6 | **Enabled tramline**<br>Tramline which the tractor is currently following or will shortly follow. Marked in blue. |
| 3 | **Travelled or treated surfaces**<br>Travelled and treated surface areas are marked in light green | 7 | **Disabled sections**<br>Marked in red. |
| 4 | **Enabled sections**<br>Marked in blue. | 8 | **GPS antenna direction arrow**<br>The position of the arrow can differ in relation to the linkage icon depending on the machine swath width |

The work screens can also display different function icons. The function icons which appear are dependent on whether you enable SECTION-Control in the settings or not.

## Travelled and treated surfaces

The surfaces to the rear of the machine icon are marked in green. This green color can have any of the following meanings, depending on the configuration:

- Travelled surface
  If you are only using TRACK-Leader II, the travelled surface is marked. This is marked regardless of whether or not the machine treated the surface during this travel.
- Treated surface
  If you are using SECTION-Control, the treated surfaces are marked. Surfaces over which the machine has travelled but which have not been treated are therefore not marked.

If you want the software only to mark treated surfaces in green, proceed as follows:

- Enable SECTION-Control

or

- Mount and enable the operating position sensor
  The operating position sensor recognizes that an agricultural device has been enabled, and transmits this information to the terminal.

### 2.3.3 Prescription maps

Prescription maps contain detailed information on the setpoints in different areas of your field.

Each setpoint is displayed on the screen in a different color.

The colors with which the setpoints are displayed are dependent on the acreage card you are using.

The setpoint is automatically adjusted when moving from one area to another.

The current setpoint can be seen on the upper right of the display screen.

You can change the current setpoint in the ISO-Spritze application or using the ME-multi-function grip in 10% steps. This change is applied to all setpoints in the prescription maps.

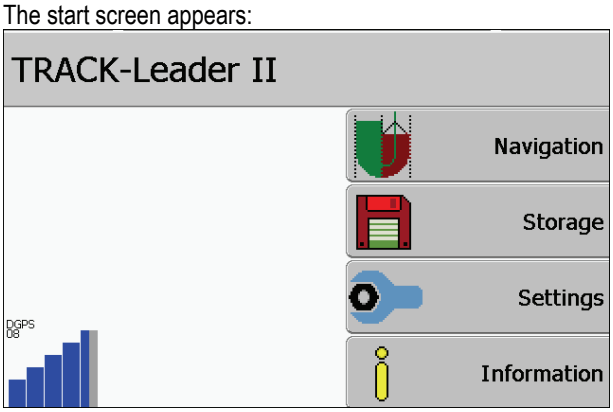
In order to display a prescription map on the SECTION-Control or TRACK-Leader II display screen, you will need to save the prescription map in a task for the ISO Task Manager.

# 3 Basic control principles

## 3.1 Initial start-up

**Procedure**

1. - Switch on the terminal.
2. Wait until all applications and job computers have been loaded.
3. - Open the "Selection menu" application.
4. Select "TRACK-Leader".
   ⇨ The start screen appears:




⇨ You have now started TRACK-Leader II.

## 3.2 Controls

This chapter will provide you with an overview of all of the function icons which appear in the software, as well as their function.

### TRACK-Leader II and SECTION-Control function icons

| Function icon | Function |
|---|---|
| | Compute the field borders<br>The field borders are computed on the basis of the recorded travel. |
| | View entire field |
| REC | Record travel<br>Only appears when SECTION-Control is disabled and no operating position sensor is mounted. |
| REC | End travel recording |
| AUTO MANU | Switch between manual and automatic mode<br>Only appears when SECTION-Control is enabled. |

| Function icon | Function |
|---|---|
| | Create A-B tramline in "Parallel" navigation mode.<br>In other modes, the function icon will appear differently, but will still be in the same position. |
| | To switch to the "GPS calibration" screen<br>Appears when you have not set a Reference point 1, or when the GPS signal is not calibrated. |
| | To switch to the "GPS calibration" screen<br>Only appears when you have calibrated the GPS signal. |
| | Enable 3D view |
| | Enable 2D view |
| | Continue. |

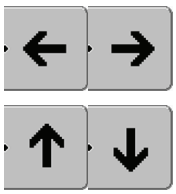
### TRACK-Leader TOP

The following function icons display on the work screen when the "TRACK-Leader TOP" automatic steering is disabled. For information which appears when "TRACK-Leader TOP" is enabled, please see Chapter: TRACK-Leader TOP automatic steering [→ 56].

| Function icon | Function |
|---|---|
| | TRACK-Leader TOP automatic steering is disabled or unavailable. |
| | Steer vehicle to the left.<br>The function key does not operate when TRACK-Leader TOP is disabled. |
| | Steer vehicle to the right.<br>The function key does not operate when TRACK-Leader TOP is disabled. |

### Obstacles

| Function icon | Function |
|---|---|
| | To switch to the obstacle detection screen or detect obstacles. This function icon has different functions depending on the context. |

| Function icon | Function |
|---|---|
|  | Shift the position of the obstacle.<br>**WARNING**: These function keys can only be used to shift obstacles when these appear during obstacle detection. Do not confuse these function keys with the arrows which steer the vehicle during automatic steering. |

### Calibrate GPS signal

| Function icon | Function |
|---|---|
|  | Set a reference point |
|  | Calibrate GPS signal |
|  | Shift tramlines to the current position of the vehicle<br>If a tramline moves alongside the current line of travel, this can be shifted back to its actual position. |

### HEADLAND-Control

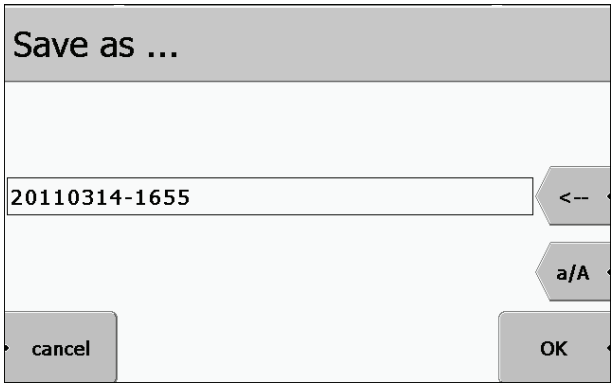
| Function icon | Description | This happens when you press the function key beside the icon |
|---|---|---|
|  | Headland management is disabled and has never been enabled in this field before.<br>The field borders have not been recorded. | Cannot be pressed. |
|  | Headland treatment is possible, but not enabled.<br>First appears when the field borders are recorded. | The headland is displayed. |
|  | Headland treatment is enabled.<br>SECTION-Control only treats the interior of the field. Swathwidths are switched off when passing over a headland.<br>Parallel navigation within the field is enabled. | Parallel navigation in headlands is enabled. |

| Function icon | Description | This happens when you press the function key beside the icon |
|---|---|---|
|  | Parallel navigation in headlands is enabled.<br>SECTION-Control only treats the headlands. Swathwidths are switched off when passing over the interior of the field. | Parallel navigation within the field is enabled. |

## 3.3 Inputting data

You will need to enter numbers and letters when entering field names or registration information.

The data entry screen is used for this purpose.




*The data input screen when saving*

**Controls**

| Function icon | Function |
|---|---|
|  | Delete character |
|  | Switch between upper and lower case |
|  | Cancel input |
|  | Confirm input |

**Procedure**

1.  - Select the desired characters.
2.  - Transfer the selected characters.
   ⇨ The characters have been transferred. The cursor shifts one position forward.
3. Input further characters.

4. 

- Once you have entered all of the characters, confirm the input.

## 3.4 Use the screen light bar

The screen light bar is provided in order to help the driver to follow the tramline. This indicates to the driver when he has moved off the trace and also once he has returned to the track.

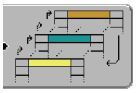
The following types of display screen light bars are available:

- The screen light bar in graphic mode
- The screen light bar in text mode

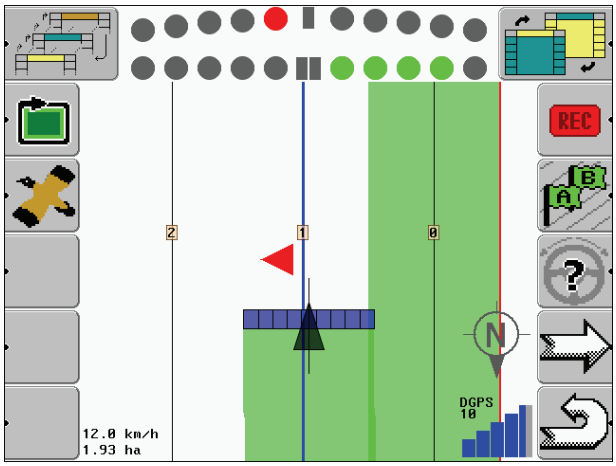
In addition to the screen light bar, a direction arrow appear on the screen, which indicates the correct steering direction.

**Procedure**

To enable the screen light bar:

1. 
- Press until the screen light bar appears in the header of the display screen.

### 3.4.1 The screen light bar in graphic mode




*Screen light bar - graphic mode*

The screen light bar in graphic mode consists of two bars:

- The current deviation from the tramline is displayed in the lower bar.
- The deviation is displayed at a specific distance in the upper bar. See the "Preview [→ 21]" parameter.

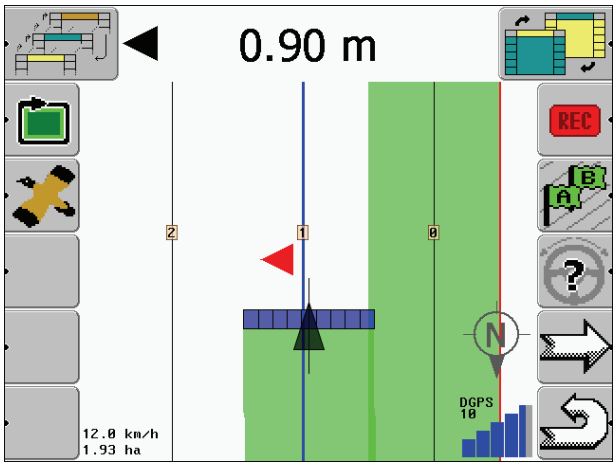
Each circle indicates a specific deviation in centimeters. See the "Sensitivity [→ 21]" parameter.

As the angle of travel can vary for technical reasons, the sensitivity value is doubled for display in the preview bar.

When steering, the aim should be to ensure that the central squares remain lit.

### 3.4.2 The screen light bar in text mode

In text mode, the screen light bar indicates how many meters you are from the tramline. This also indicates the direction which you must steer in order to return to the trace. There is no preview in text mode.



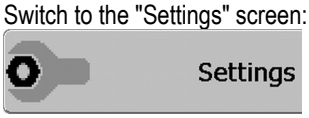

*Screen light bar - text mode*

# 4 Configuration

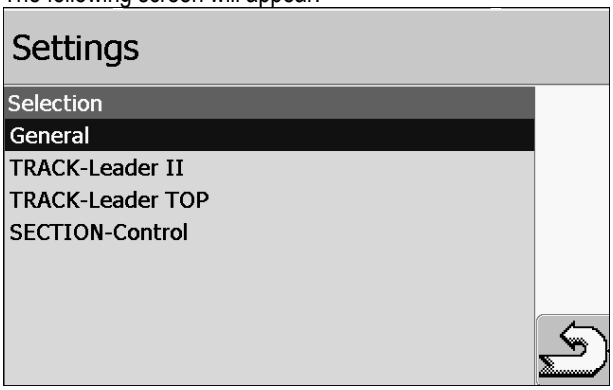
This chapter will show you how to configure the application.

**Procedure**

1. Switch to the "Settings" screen:




⇨ The following screen will appear:




2. Click on the line with the desired application.

⇨ A list of parameters appears.

The following sub-chapter provides an explanation of these parameters.

## 4.1 General settings

### SECTION-Control

This parameter determines whether SECTION-Control is enabled or disabled.

Depending on whether activate SECTION-Control or not, you will need to configure different settings.

- "Yes"
  SECTION-Control is enabled. Machine data such as swathwidth are automatically transferred from the connected job computer.
- "No"
  SECTION-Control is disabled. TRACK-Leader II is enabled. The machine data must be input manually.

### 4.1.1 General settings when SECTION-Control is switched on

#### Connection with TM

This parameter determines whether data are exchanged with the ISO Task Manager application.

- "Yes"
  Data such as field borders, A-B lines and reference points are exchanged between SECTION-Control and the TaskManager application. SECTION-Control only then operates when a task is initiated in TaskManager.
- "No"
  No data are exchanged between SECTION-Control and the TaskManager application.

You should set "No" when the TaskManager application is running in "SC mode". Otherwise, it will not be possible to load and treat fields.

### Acoustic warnings

This parameter determines whether a warning tone sounds when in the vicinity of field borders and recorded obstacles.

- "Yes"
- "No"

### Trace transparency

This parameter determines whether and how overlaps are displayed on the screen.

- „0“
  Overlaps are not displayed.
- „1“ – „6“
  Intensity of colors with which overlaps are marked.
- „3“
  Default

### Show grid

Displays a grid on the navigation screen.

The distances between the grid lines will differ according to the input swathwidth. The grid lines are aligned along the North-South and East-West axes.

### Smoothen course

If the GPS receiver mounted on the roof of the tractor cab swings sharply, the driving route displayed on the screen can appear very jagged.

The "Smoothen course" option smoothens out the displayed driving route.

The requirements in this user guide are only applicable when using a A100 GPS antenna. Other settings may be correct when using other GPS antenna.

- "Yes"
  When you are using TRACK-Leader TOP and the A100 GPS antenna is connected to the steering job computer.
- "No"
  When you are not using TRACK-Leader TOP and the GPS antenna is connected to the terminal.

### Machine model

This parameter determines how the position of the machine is calculated when driving around a curve.

This setting will affect the way in which the machine is displayed on screen, as well as the way in which it functions.

- "Self-propelled"
- "trailed"
- "deactivated"

### Run demo mode

Starts a simulation of the application.

## 4.1.2 General settings when SECTION-Control is switched off

### No. of sections

Input the number of sections.

Each section is displayed as a portion of the spray bar on the navigation display screen.

### Operating position sensor

Is an operating position sensor mounted on the machine?

- "Yes"
- "No"

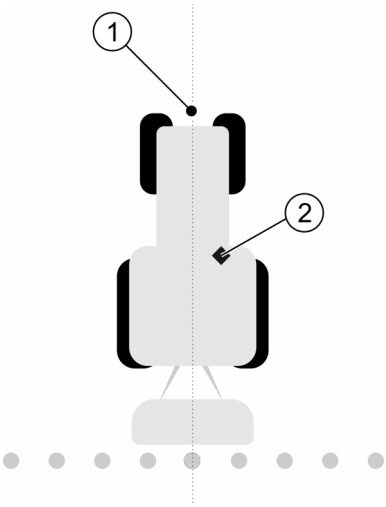
### Inverted sensor logic

Is the sensor logic of the operating position sensor inverted?

- "Yes" - Treatment recording begins when the operating position sensor is not busy. This will end when the operating position sensor is busy.
- "No" - Treatment recording begins when the operating position sensor is busy. This will end when the operating position sensor is no longer busy.

### GPS antenna left/right

In the event that the GPS receiver is not positioned on the longitudinal axis of the vehicle, this offset must be set here.




*Longitudinal axis of the vehicle and GPS receiver*

| | | | |
|---|---|---|---|
| 1 | **Longitudinal axis of the vehicle** | 2 | **GPS Receiver**<br>To the right of the longitudinal axis of the vehicle |

- Input a negative value, e.g.: **- 0.20m**
  if the GPS receiver is positioned to the left of the longitudinal axis.

- Input a positive value, e.g.: **0.20m**
  if the GPS receiver is positioned to the right of the longitudinal axis.

### GPS antenna front/rear

Distance of the GPS receiver from the treatment point. The treatment point may for example be the spray bar when spraying a field.

- Input a negative value. e.g.: **- 4.00m**
  If the GPS receiver is to the rear of the treatment point, you should input a negative value.
- Input a positive value, e.g.: **4.00m**
  If the GPS receiver is forward of the treatment point, you should input a positive value.

## 4.2 Configuring TRACK-Leader II

### External light bar

Is an external light bar connected to the serial connector (RS232)?

- "Yes"
- "No"

### Screen light bar

Display screen light bar type.

- "Graphic Mode"
- "Textmode"

### Tramline numbering

This parameter determines whether and how the implemented tramlines are numbered.

- "absolute"
  Tramlines have fixed numbers. The main A-B tramline is numbered 0. The tramlines to the left and right of this A-B tramline are numbered.
- "relative"
  The tramlines are re-numbered each time that the machine enables a new tramline. The enabled tramline is always numbered 0.

### Sensitivity

Sets the sensitivity of the light bar.

How many centimeters of deviation are required for a LED to light on the light bar?

- Default: 30cm

### Preview

This parameter determines the number of meters in front of the vehicle at which the preview display of the display screen light bar will compute the future position of the vehicle.

- Default: 8m

See also: The screen light bar in graphic mode [→ 16]

### Swinging angle

The program uses a defined angle from which the vehicle can swing from a trace. If the vehicle travels at a lower angle of deviation from a track, this will not be recognized as a new current track.

- Default: 30 degrees
- Value for TRACK-Leader TOP: 70 degrees

### Dist. contour points

Points are continuously saved when recording the "A-B tramline" in contour mode. The more the points, the more precise the contour line. This does however slow down the operation of the terminal.

The parameter defines the distance between the points. The optimal value can differ per field, and per machine.

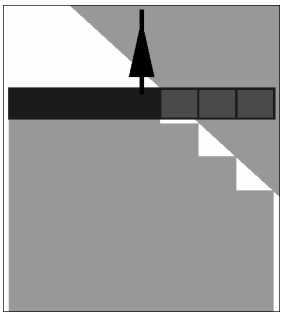
- Default: 500 cm

## 4.3 Configuring SECTION-Control

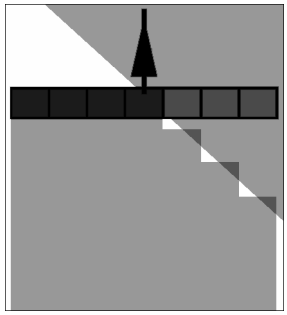
### Degree of overlap

The degree of overlap when treating a wedge-shaped area.

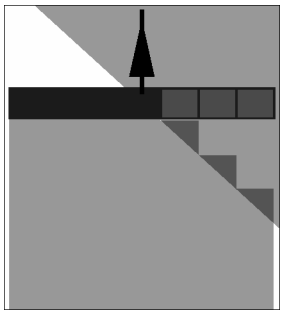
The set "degree of overlap" is influenced by the outlying sections by means of the "Tolerance of overlap" parameter.



0% degree of overlap



50% degree of overlap



100% degree of overlap

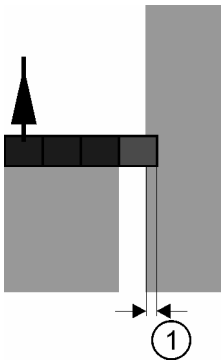
- 0% - Each section is only switched on when exiting a treated area when the vehicle has completely exited the area. When travelling across a treated surface, the section is first switched off when the section extends up to 1% over the treated surface.
- 50% - Each section is only switched on when exiting a treated area when 50% of the vehicle has exited the area. When travelling across a treated surface, the section is first switched off when the section extends up to 50% over the treated surface. At a "degree of overlap" of 50%, the "tolerance of overlap" function has no effect.
- 100% - Each section is only switched on when exiting a treated area when 1% of the vehicle has exited the area. When travelling across a treated surface, the section is first switched off when the section extends up to 100% over the treated surface.

### Tolerance of overlap

"Tolerance of overlap" refers to the tolerance of the outlying sections to overlaps, when travelling in parallel and when intruding exceeding the field borders on headlands.

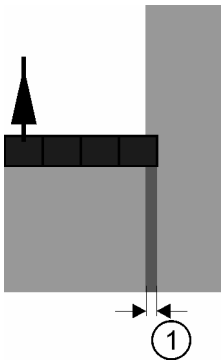
The "tolerance of overlap" only applies to the outermost left and right sections. No other sections are affected by this parameter.

The following illustrations show how the "tolerance of overlap" parameter works with a "degree of overlap" of 0%. In both illustrations, the surface is overlapped by 25cm. The set tolerance of overlap can be seen underneath the illustrations.




Tolerance of overlap 0cm

In this case, the section is immediately switched off.




Tolerance of overlap 30cm

In this case, the section is not switched off, as the current overlap is lower than 30cm.

(1) This area is overlapped. 25cm in both cases.

- **Recommendation**: Set the "tolerance of overlap" to 30cm when using the A100 GPS antenna.
- Tolerance 0 cm
  The outermost section is switched on or off when entered or exited by the track being travelled.
- Other values
  The outermost section is switched off when the overlap exceeds the value.
- Maximum value
  Half of the section width of the outermost section.

### Inactivity

Two parameters are possible:
- Inactivity of On
- Inactivity of Off

For both parameters, you will need to indicate how much time must pass before a section valve reacts to a signal from the terminal. Inactivity is thus the time which elapses until the opening pressure of a nozzle is increased (when switching on) or shut off (when switching off).

This value is required for automatic section switching. This is dependent on the type of section valve.

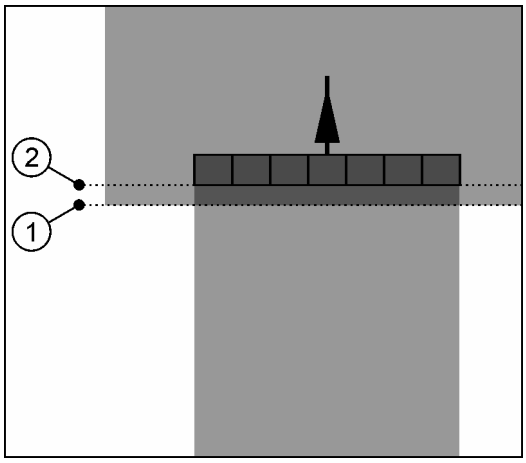
**Example**

When a section passes over an already treated surface during field spraying, this must be immediately switched off. To do this, the software sends a signal to the section valve to switch off. As a result, the pressure in the section valve is shut off. There is then no further flow from the nozzles. This lasts for approx. 400 milliseconds.

The result is that the section applies an overlap for a length of 400 milliseconds.

In order to prevent this, the parameter "Inactivity of Off" must be set to 400 Ms. Now, the signal is sent to the section valve 400 milliseconds earlier. As a result, the application can be interrupted or restarted at exactly the right point in time.

The illustration below shows how the inactivity function works. The illustration shows actual behavior, not the display on the screen.




*Inactivity of Off is set to 0. A too brief delay time results in overlapping application.*

| | | | |
|---|---|---|---|
| 1 | At this point, the section valve receives a signal to shut off | 2 | At this point, the field sprayer stops application. |

- "Inactivity of On"
  Enter the delay when switching a section on.
  e.g.
  - 400 ms solenoid valve
  - 1200 ms electrically actuated valve
- "Inactivity of Off"
  Enter the delay when switching a section off.
  e.g.
  - 300 ms solenoid valve
  - 1200 ms electrically actuated valve

## 4.4 Configuring TRACK-Leader TOP

The following parameters must be set in order to use TRACK-Leader TOP:

### GPS receiver height

Place the GPS antenna at a distance from the ground.

Required for: TRACK-Leader TOP

### Offset devices

Displacement of towed equipment. For when towed equipment travels offset from the tractor.

If this parameter is allocated any value other than 0, the following occurs:
- A red tramline appears on the work screen. TRACK-Leader TOP will follow the red tramline.
- The machine icon and the linkage icon are shifted to the input value.

Required for: TRACK-Leader TOP
- Input a positive value, e.g.: **0.30m**
  if the towed equipment is offset to the right.

- Input a negative value, e.g.: **-0.30m**
  if the towed equipment is offset to the left.
- Input "0"
  if using SECTION-Control.

**Reaction speed**

Reaction speed and aggressiveness of the automatic steering. The higher the value, the sharper the steering movements.

## 4.5 Calibrating Inactivity of On and Inactivity of Off

***NOTICE***

**Chapter for advanced users**
Before reading this Chapter:

- Learn how to operate the terminal.
- Learn how to operate the SECTION-Control.

The "Inactivity of On" and "Inactivity of Off" parameters are already calibrated for working with the majority of field sprayers.

**When to calibrate?**

These parameters must be calibrated in the following cases:

- When the field sprayer switches on too early or too late when travelling across an already treated area
- When the field sprayer switches on too early or too late when exiting an already treated area

### 4.5.1 Calibration phases

Calibration consists of several phases:

1. Calibration preparations
2. Travelling the field for the first time
3. Travelling the field for the second time
4. Marking the application borders
5. Computing correction values
6. Correcting the "Inactivity of On" and "Inactivity of Off" parameters

The phases are explained in detail in the following chapters.

### 4.5.2 Calibration preparations

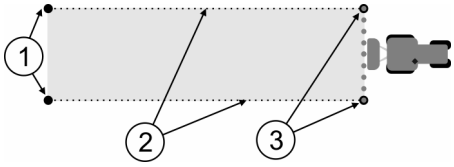
You will need the following equipment and personnel in order to perform the calibration:

- Two observers - two people who will mark the treated areas with stakes.
- Tools for marking the treated areas:
  - Barrier tape, approx. 200 - 300 m
  - 8 stakes for marking out the field
- Field sprayer with tank loaded with clean water.

### 4.5.3 First travel

In this phase of the calibration, you will need to travel across the field along a track.

The illustration below shows the points which must be marked before and after the travel. Instructions on how to do this are given beneath the illustration.




*Results of the first travel*

| | | | |
|---|---|---|---|
| 1 | **Stakes**<br>To mark the outer ends of the sections prior to travel | 3 | **Stakes**<br>To mark the outer ends of the sections after travel |
| 2 | **Barrier tape between the stakes**<br>To mark the borders of travel | | |

**Procedure**

To prepare the field for inactivity calibration:

1. Start a new navigation with SECTION-Control.
2. Position the field sprayer at the start of the travel. The travel must not be positioned close to the field border, in order to give you sufficient space for the second travel.
3. Extend the linkages.
4. Mark the ends of the outer sections with stakes.
5. Travel 100 - 200 m in a straight line before beginning to apply the clean water.
6. After 100 - 200 m, stop and switch off the field sprayer.
7. Save the travel in the TRACK-Leader. This will enable the calibration to be repeated.
8. Mark the ends of the outer sections with stakes.
9. Connect the stakes with barrier tape. This marks the borders of travel across the field.
10. Fix the barrier tape to the ground with stones or earth.

⇨ You have now performed the first travel, and marked the application borders.

### 4.5.4 Second travel

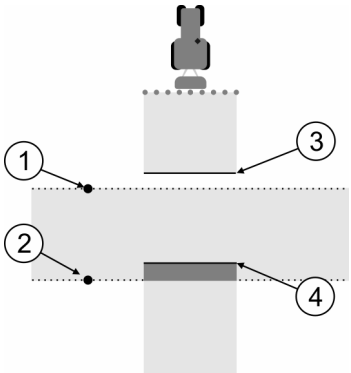
In this phase, you will need to treat the area which you travelled through in the first travel at a 90° angle.

| | |
|---|---|
| | **⚠ CAUTION** |
| | **Injury from the travelling field sprayer**<br>Observers who are assisting with the calibration are at risk of being struck by the linkages.<br>◦ The observers should be made properly aware of this risk. Such hazards should be explained to them.<br>◦ Ensure that the observes maintain a sufficient distance from the spray linkages at all times.<br>◦ Stop the sprayer immediately if an observer is too close to the sprayer. |

In this phase, you will require the help of one or two further people. These people will observe the travel and the behavior of the field sprayer, and mark out the application borders.

They should be appropriately assigned and warned of the potential dangers.

The illustration below shows where the observers must stand and the objectives that they should achieve.




*Travel 2*

| | | | |
|---|---|---|---|
| 1 | Position of Observer 1 | 3 | This line marks the position at which the nozzles should begin spraying when the machine exits the treated area. |
| 2 | Position of Observer 2 | 4 | This line marks the position at which the nozzles should stop spraying when the machine enters the treated area. |

**Procedure**

☑ The tank should be filled with clean water.

☑ The observers should stand at a safe distance from the linkages of the field sprayer.

☑ Navigation is started using the first travel.

☑ SECTION-Control should be in automatic mode.

1. Position the field sprayer at a distance of approx. 100 m from, and an angle of 90° to, the travelled area.
2. Drive at a constant speed (e.g.: 8 km/h) over the already treated area. Apply the water as you do so.
3. The observers must stand on the previously marked travel borders at a safe distance from the linkages.
4. The observers must observe the points at which the field sprayer stops and starts spraying, as it passes along the already travelled points.

⇨ You will now know how the sprayer behaves when travelling along an already treated area.

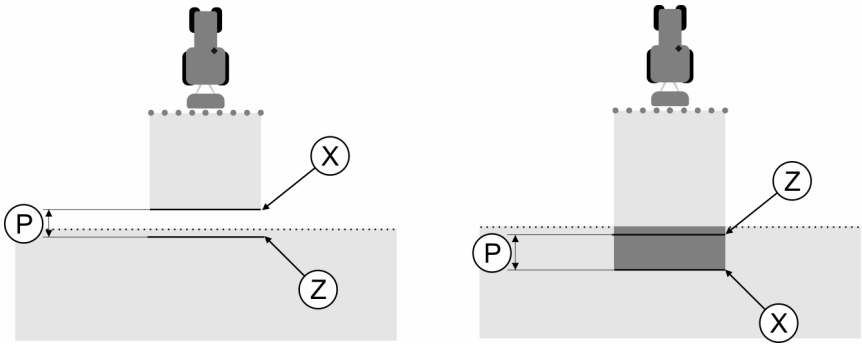
You may wish to repeat this process several times in order to ensure the accuracy of the results.

### 4.5.5 Marking the application borders - for Inactivity of On

In this phase, you will need to mark where your sprayer begins application when you exit a treated area. You must also determine where application should begin in future.

This will tell you whether the sprayer is switching on too early, or too late.

The illustrations below show the lines which you will need to mark in the field in order to be able to compute the "Inactivity of On" parameter.




*Lines for the "Inactivity of On" parameter. Left: Sprayer switches on too late. Right: Sprayer switches on too early.*

| | | | |
|---|---|---|---|
| P | Distance between desired application line Z and actual application line X | X | Actual application line<br>This is where the sprayer begins application. |
| | | Z | Desired application line<br>This is where the sprayer should begin application.<br>A slight overlap of 10 cm should be planned due to the pressure build-up time. |

In both cases (left and right), the "Inactivity of On" parameter is wrongly set:

- Left: Sprayer switches on too late. The inactivity period must be increased.
- Right: Sprayer switches on too early. The inactivity period must be reduced.

**Procedure**

1. Compare the markings in the field with the computations.

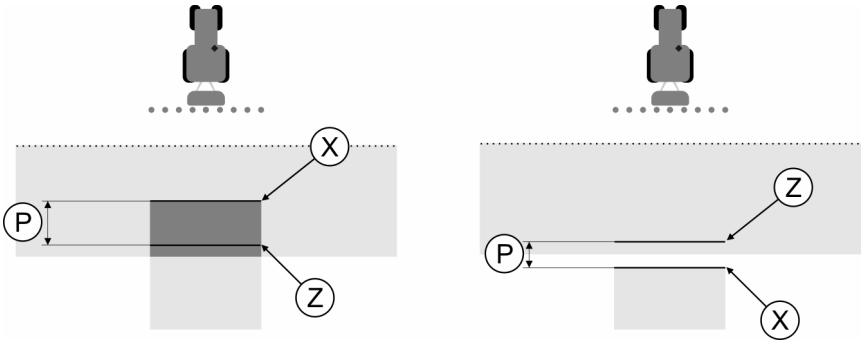
⇨ You now know whether the sprayer is switching on too early, or too late.

### 4.5.6 Marking the application borders - for Inactivity of Off

In this phase, you will need to mark where your sprayer stops application when you enter a treated area. You must also determine where application should stop in future.

This will tell you whether the sprayer is switching off too early, or too late.

The illustrations below show the lines which you will need to mark in the field in order to be able to compute the "Inactivity of Off" parameter.




*Lines for the "Inactivity of Off" parameter. Left: Sprayer switches off too late. Right: Sprayer switches off too early.*

| | | | |
|---|---|---|---|
| P | Distance between desired application line Z and actual application line X | X | Actual application line<br>This is where the sprayer should stop application. |
| | | Z | Desired application line<br>This is where the sprayer should stop application.<br>A slight overlap of 10 cm should be planned due to the pressure release time. |

In both cases (left and right), the "Inactivity of Off" parameter is wrongly set:

- Left: Sprayer switches off too late. The inactivity period must be increased.
- Right: Sprayer switches off too early. The inactivity period must be reduced.

**Procedure**

1. Compare the markings in the field with the computations.

⇨ You now know whether the sprayer is switching off too early, or too late.

### 4.5.7 Computing correction values

In the final phase, you will need to determine:

- Which parameters must be altered.
- Whether the current inactivity must be increased or reduced.

You must now compute the number of milliseconds by which to adjust the wrongly set parameter.

To do this, you will need to calculate a so-called correction value.

In order to be able to compute the correction value, you need to find out how fast the field sprayer was travelling. This speed must be computed in cm/milliseconds.

The following tables lists a number of speeds and their computation into cm/ms:

| Speed in km/h | Speed in cm/ms |
|---|---|
| 6 km/h | 0.16 cm/ms |
| 8 km/h | 0.22 cm/ms |
| 10 km/h | 0.28 cm/ms |

**Procedure**

The correction value should be calculated as follows:

1. **[Distance P]: [Speed of field sprayer] = Correction value**

2. The currently set "Inactivity of On" or "Inactivity of Off" parameter must then be corrected by this value.

### 4.5.8 Changing the Inactivity parameter

You must now adjust the "Inactivity of On" and 'Inactivity of Off" parameters.

**Procedure**

1. Alter the parameters using the following rule of thumb:
   - If the sprayer switches on too late, it needs more time. The inactivity period must be increased.
   - If the sprayer switches on too soon, it needs less time. The inactivity period must be reduced.
2. Compute a new value for the Inactivity parameter.
   Perform this step separately for the "Inactivity of On" or "Inactivity of Off" parameters
   If the field sprayer switches on or off too late:
   Increase the current inactivity period by the correction value
   If the field sprayer switches on or off too early:
   Reduce the current inactivity period by the correction value

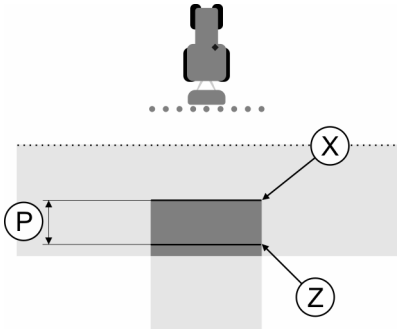
**Example**

A field sprayer travels at a speed of 8 km/h. This corresponds to 0.22 cm/ms.

After the second travel, the distance P is measured. This is 80 cm.

The "Inactivity of Off" parameter is currently set to 450 ms.

The field sprayer switches off too late when travelling over a treated surface. Point Z lies in front of Point X along the direction of travel. The lines are marked as in the illustration below:




*When travelling over the treated surface, the field sprayer switches off too late*

1. Compute the correction value
   **[Distance P]: [Speed of field sprayer] = Correction value**
   80 : 0,22 = 364
2. Compute the new value for the "Inactivity of Off" parameter.
   If the field sprayer switches off too late, "Inactivity of Off" must be increased by the correction value:
   364 (correction value) + 450 (set "Inactivity of Off") = 814 (new "Inactivity of Off")
3. Insert value 814 for the "Inactivity of Off" parameter.

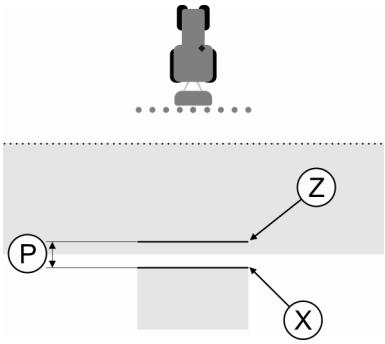
**Example**

A field sprayer travels at a speed of 8 km/h. This corresponds to 0.22 cm/ms.

After the second travel, the distance P is measured. This is 80 cm.

The "Inactivity of Off" parameter is currently set to 450 ms.

The field sprayer switches off too early when travelling over a treated surface. Point Z lies behind Point X along the direction of travel. The lines are marked as in the illustration below:




*When travelling over the treated surface, the field sprayer switches off too early.*

1. Compute the correction value
   **[Distance P]: [Speed of field sprayer] = Correction value**
   80 : 0,22 = 364
2. Compute the new value for the "Inactivity of Off" parameter.
   If the field sprayer switches on or off too late, "Inactivity of Off" must be reduced by the correction value:
   450 (set "Inactivity of Off") - 364 (correction value) = 36 (new "Inactivity of Off")
3. Insert value 36 for the "Inactivity of Off" parameter.

# 5 Operating procedures

In this Chapter, you will learn about general operating procedures.

This will provide you with an overview of the operation of the software.

The individual operation steps are described in detail in other sections of these directions for use.

## 5.1 When working a field for the first time

When working a field for the first time, there will be no data which you can retrieve.

Proceed in the following way:

1. Start a task in the ISO Task Manager application.
   You can skip this step if you are using ISO Task Manager in so-called "SC mode" or do not want to use SECTION-Control.
2. Drive to the field
3. Prepare the navigation
   - Select nav mode [➞ 34]
   - Set the tramline width [➞ 35]
   - Set the tramline interval [➞ 35]
4. Start navigation
   - Set Reference point 1 [➞ 39]
   - Detect field borders [➞ 43]
   - Create A-B tramline [➞ 44]
   - Detect obstacles [➞ 45]
   - Treat the field [➞ 46]
5. Save field data [➞ 51]
   - Save in standard format
   - Export in GIS format
   - If you use the ISO Task Manager, do not save the task. Tasks are automatically saved by ISO Task Manager.

Please refer to the Chapters below for how to perform individual tasks.

**NOTICE**

**GPS signal drift when working with no RTK correction signal**
Excessive time intervals between major tasks can cause drift in the GPS signal. In this event, subsequent operations will be extremely imprecise.

- Always perform the following tasks as close to each other as possible:
  Set Reference point 1
  Detect field borders
  Create A-B tramline

## 5.2 When performing further work in a field

You should proceed as follows when you want to work in a field in which you have previously worked and whose field data you have stored on the USB stick:

1. Start a task in the ISO Task Manager application

   You can skip this step if you are using ISO Task Manager in so-called "SC mode" or do not want to use SECTION-Control.

2. Drive to the field
3. Load the field data [→ 51]

   (Skip this step if you start the task with ISO Task Manager. The field data is loaded automatically)

4. Prepare the navigation
   - Select nav mode [→ 34]
   - Set the tramline width [→ 35]
   - Set the tramline interval [→ 35]
5. Start or continue the navigation
   - Start navigation [→ 37]
   - Calibrate GPS signal [→ 41]
   - Treat the field [→ 46]
6. Save field data [→ 51]
   - Save in standard format
   - Export in GIS format
   - If you use the ISO Task Manager, do not save the task. Tasks are automatically saved by ISO Task Manager.

Please refer to the Chapters below for how to perform individual tasks.

# 6 Prepare the navigation

## 6.1 Select nav mode

Navigation mode determines how the tramlines are created.

Navigation mode is selected in the Preparations screen.

The following navigation modes are available:

- Parallel nav mode
- Smoothed contour nav mode
- Identical contour nav mode
- A Plus nav mode [0.0000°]

### 6.1.1 Parallel nav mode

The parallel nav mode is also known as A-B mode.

Use this mode when you want to treat the field in parallel, straight lines of travel.

### 6.1.2 Smoothed contour nav mode

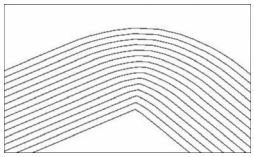
Mode purpose: Curved tramlines, no overlap.

In smoothed contour nav mode, the curvature of each tramline curve is altered. The tramlines are more acute on one side, and rounder on the other.

This thus prevents overlapping. The disadvantage of this navigation mode is that lines of travel which are widely separated from the A-B tramline will eventually become very acute.

If you notice that the tramline is excessively acute, delete the tramline and create a new A-B tramline. The tramlines are then re-computed.

**Example**



Tip: Create the A-B tramline so that the inside of the curve is as close as possible to the field border.

### 6.1.3 Identical contour nav mode

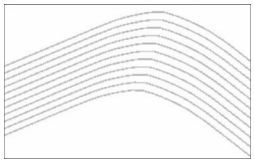
Mode purpose: Curved tramlines with identical curvatures

In identical contour navigation mode, there is no variation in the curvature. Only use this mode for gentle curves.

The disadvantage of this navigation mode is that the distance between the tramlines will eventually become too large. It will then no longer be possible to treat the field accurately using the track-to-track process.

If you notice excessive distances between the tramlines, delete the tramline and create a new A-B tramline.

**Example**



### 6.1.4 A Plus navigation mode

This mode allows you to manually input the geographical direction in which the tramlines should be implemented. To do this, simply input the direction in degrees (between 0° and 360°), and the tramlines are automatically implemented, parallel to each other.

- 0° North
- 180° South
- 90° East
- 270° West

This mode is particularly useful when you know the exact direction in which you need to work in your field.

This mode enables multiple machines to work at the same along precisely parallel tramlines.

## 6.2 Setting tramlines

This Chapter will shown you how to work with tramlines.

Tramlines are the lines displayed on the display screen which help you to drive precisely along the desired line of travel.

### 6.2.1 Setting the tramline width

The tramline width is the distance between two tramlines.

The preset tramline width is the swathwidth, and this can be adjusted for individual tasks.

**Example**

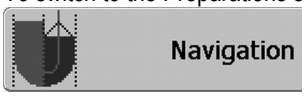
Field sprayer swathwidth = 18 m

You will want to ensure that nothing is left out during field treatment.

Set the tramline width to 17.80 m, for example. The field is then treated with a 20 cm overlap.

**Procedure**

1. To switch to the Preparations screen:




2.  - Click on "Tramline width".
3.  - Enter the desired tramline width.
4.  – Confirm this input.

### 6.2.2 Setting the tramline interval

You can set the tramline interval on the preparations screen.

This enables you to set the the interval at which the tramlines are displayed in bold.

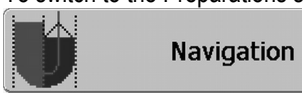
This will make it easier for you to drive along each second or third track.

**Example**

If you input the number "2", every second tramline is displayed in bold, whereas inputting the number "3" will display every third tramline in bold, etc.

**Procedure**

1. To switch to the Preparations screen:




2.  - Click on "Interval".
3.  -Set the desired tramline interval.
4.  - Confirm your entry.

## 6.3 Setting the headland width

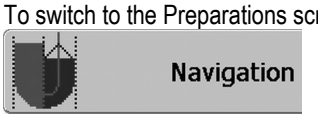
The width of the headlands can be set as a multiplication of the tramlines.

A tramline will in this case be as wide as the overall swathwidth of the machine.

The overall swathwidth of the machine must always be used as the basis for calculating the width of the headland. This will even apply when you disable the outer sections in the machine's job computer. You should be aware of this when setting the headland width.

**Procedure**

1. To switch to the Preparations screen:




2. Click the "Headland tramlines" parameter.
3. Set the number of tramlines which will comprise the headland.

⇨ You have now set the width of the headland.

# 7 Start navigation

You have two options when starting navigation:

- Start a new navigation
- Continue a started navigation

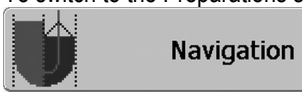
## 7.1 Start a new navigation

You can start a new navigation in the following cases:

- When you are working a field for the first time.
- When you load the field data for a known field. In this case, all old travel routes are deleted. You can however re-use the field borders, tramlines and obstacles.

**Procedure**

1. To switch to the Preparations screen:




2. Set all of the displayed parameters.
3. Press "New".

⇨ The work screen appears.

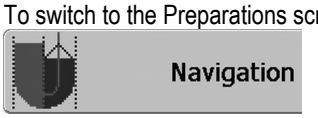
## 7.2 Continue a started navigation

You can continue a navigation in the following cases:

- When you interrupted the treatment of a field.
- When you exited the application.
- When you have loaded the data for a field.

**Procedure**

1. To switch to the Preparations screen:




2. Set all of the displayed parameters.
3. Press "Contin.".

⇨ The work screen appears.

## 7.3 Start travel recording

You do not need to read this Chapter if:

- SECTION-Control is enabled
- You have an operating position sensor

If you use SECTION-Control or have mounted an operating position sensor, the software will not know when your equipment (e.g. sprayer) is working and when it is not. You will therefore need to tell the software when you begin the task.

Recording the travel routes enables you to see the parts of the field which you have already travelled through on the display screen.

**Procedure**

☑ You have now started a navigation.

1. 

- Record travel.

   ⇨ The function icon is red: 


   ⇨ A green track appears behind the tractor icon. You are marking your travel route.

## 7.4 Calibrating DGPS

DGPS means "Differential signal Global Positioning System".

This system is use to determine the position of the vehicle.

**Problem description**

Throughout the course of the day, the positions of the Earth and satellites change as these orbit in space. The computed position of a point will as a result shift. This shift means that the position will after a certain time no longer be current.

This phenomenon is called drift, and can be minimized.

For your purposes, this means that all of the field borders and tramlines which you create during a day will have shifted after a few hours.

**Solution to the problem**

There are two ways of compensating for drift:

- Using Reference point 1 - By setting a Reference point 1 and calibrating the GPS signal each time before starting work. A free way to use the A100 GPS antenna which provides an accuracy of up to +/- 30 cm.
- By using a correction signal. A chargeable service provided by the GPS provider. Only for use in conjunction with a very accurate GPS antenna. The GPS signal must be re-calibrated automatically and at regular intervals. This enables an accuracy of less than five centimeters.

### 7.4.1 GPS with no correction signal

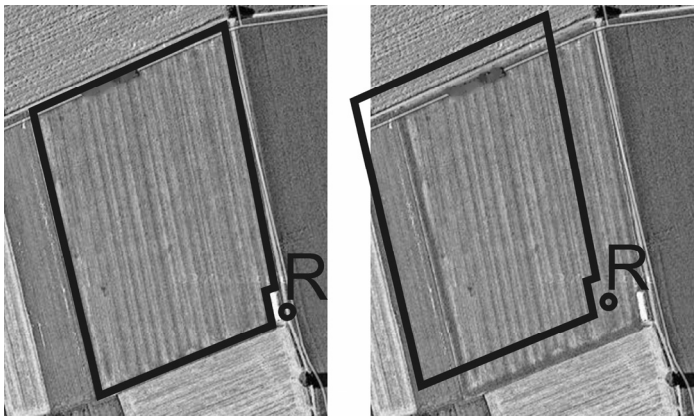
If your GPS does not use a correction signal, you will need to calibrate the GPS signal every time before starting work.

The more precisely you do this, the more precisely your system will operate. Conversely, the less precise the GPS calibration, the less precisely the system will be able to determine the position of the vehicle.

**What do you need a reference point for?**

A reference point will enable you to compare your current GPS coordinates with the saved GPS coordinates and compensate for any drift (displacement).

Calibrating the GPS signal establishes a fixed point on the ground. This is the so-called Reference point 1. When the GPS signal is calibrated, the stored coordinates of the Reference point are compared and matched with the current coordinates.




*Left - Field with calibrated GPS signal; Right - Field with no calibrated GPS signal*

If you do not set a reference point nor calibrate the GPS signal each time before starting work, the following will happen:

- The saved GPS coordinates for the field borders, tramlines, etc. will differ from the actual values.
- As a result, you may miss treating parts of the field which are outside of the field borders according to the GPS.

In order to ensure maximum precision, you must:

- Set a reference point for each field and for each treatment.
- Calibrate the GPS signal before each treatment.

## Setting Reference point 1

Reference point 1 – a point close to the field. This is used to compare the stored and actual position of the field.

The coordinates of the GPS antenna are crucial when setting the reference point.

**When should this be set?**

A "Reference point 1" should be set in the following cases:

- When you are working a field for the first time.

**Setting this correctly**

When setting the reference point, you will require a fixed point whose position will not alter over time. This can for example be a tree, a landmark or a manhole cover.

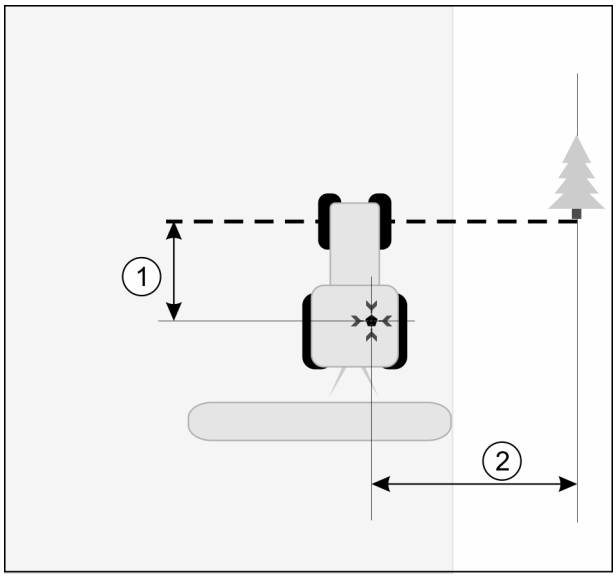
This point is required in order to position the tractor in exactly the same position for future GPS signal calibrations.

***NOTICE***

**Data loss due to the lack of a reference point**
If you are unable to locate the reference point in the future, the recorded data will be unusable.

- Always note the precise position of the reference point for each field!

The illustration below shows a possible position of the tractor when setting the reference point:




*Tractor when setting the reference point*

| | | | |
|---|---|---|---|
| • | GPS antenna on the roof of the tractor cab | | Position of the reference point |
| 1 | Distance between the GPS antenna and the Y-axis point on the roadside | 2 | Distance between the GPS antenna and the X-axis point on the roadside |
| - - - | Line from a fixed point on the road | | |

**Procedure**

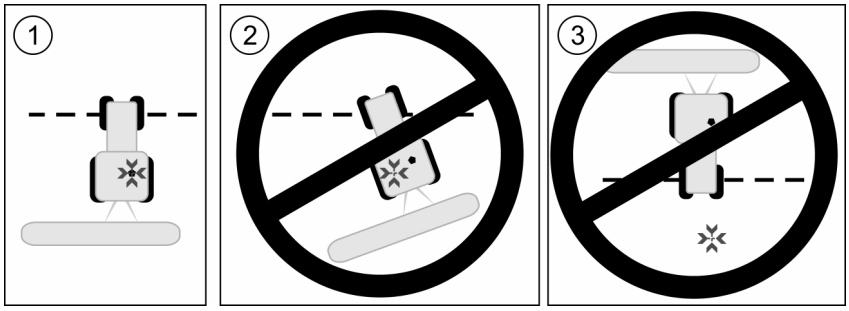
☑ When you are working a field for the first time.

1. Identify a fixed point at the entrance to the field. This can for example be a tree, a landmark or a manhole cover.
2. Draw a line from the fixed point on the road.
3. Position the tractor such that both its front wheels are on the line.
4. Note the distance between the point and the tractor.
   This distance must always be the same for future GPS calibrations.
5. Start a new navigation.
6.  - Press
7.  - Press
8.  - Press
   ⇨ The program determines the current position over a period of 15 seconds, and saves this as "Reference point 1". The reference point must be set precisely at the position of the GPS antenna.
   ⇨ Any existing reference points and signal calibrations are thus deleted.
   ⇨ The work screen then displays the reference point icon beneath the machine icon: 

⇨ You have now set "Reference point 1".

## Calibrate GPS signal

When calibrating the GPS signal, the GPS antenna must be in the exact same position as that when setting the Reference point.



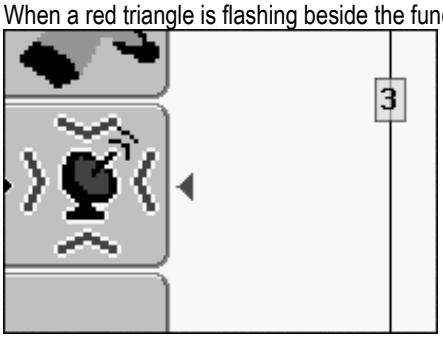

*Position of the GPS antenna in relation to the reference point when calibrating the GPS signal*

| | |
|---|---|
| | Position of the reference point |
| | GPS antenna on the roof of the tractor cab |

**When to calibrate?**

You will need to calibrate the GPS signal in the following instances:

- Each time before starting work
- When a red triangle is flashing beside the function icon 

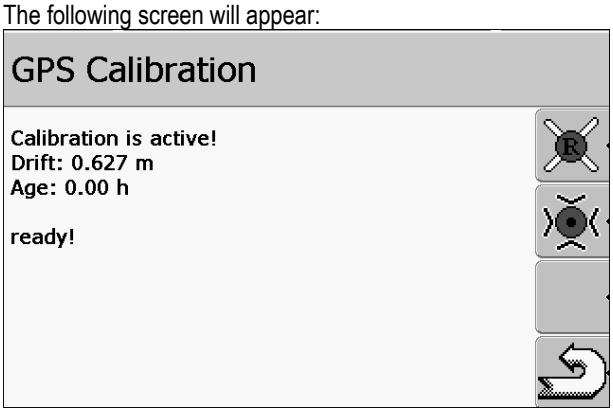



- When you find that a deviation is shown on the display screen when driving down a lane.

**Procedure**

1. Drive to "Reference point 1" at the entrance to the field.
2. Position the tractor such that both its front wheels are on the line.
   The tractor must be positioned at the same angle as when the reference point was set. The distance from the fixed point on the roadside must be the same as when the reference point was set.
3.  - Press.
4.  - Press.
5.  - Press.
   ⇨ The program determines the current position over a period of 15 seconds. Re-calibrating the reference point overwrites the old calibration.

⇨ The following screen will appear:




**6.**  - Back

⇨ The function icon  is now red.

The GPS calibration screen now displays the following parameters:

- Drift
  Displays the reference point drift since the reference point was set. All field data will be shifted by this value. Drift is re-computed when the GPS signal is calibrated.
- Age
  How many hours have passed since the GPS signal was last calibrated. Hour segments are displayed in decimal fractions after the decimal point. For example: 0.25 h = Quarter of an hour = 15 minutes

## 7.4.2 DGPS with correction signal

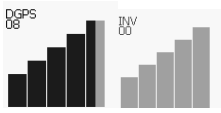
When using an RTK correction signal, you need neither set a reference point nor calibrate the GPS signal. The position of the tractor is continuously corrected by the RTK provider by means of a correction signal.

## 7.4.3 Checking the DGPS signal quality

The quality of the GPS signal can vary widely depending on your geographic position.

You can see the GPS signal quality on the following screens:

- On the start screen
- On the work screen




The DGPS connection displays the following information:

- Bar chart
  Indicates the quality of the connection. The higher the number of blue bars, the better the connection.
- Number of connected satellites
- Correction signal status

This status should always at least display "DGPS", in order to ensure sufficient accuracy. RTK systems will display either "RTK Fix" or "RKT Float".

SECTION-Control will switch to manual mode in the following cases:

- When the DGPS signal status is "GPS" or lower
- When the number of satellites is lower than four.
- The bar chart does not display

This is shown by an alarm message on the screen.

You should manually activate automatic mode once the GPS connection improves.

## 7.5 Detect field borders

You must detect the field borders for each new field.

You can detect these field borders while treating the headlands.

Depending on whether or not you are working with an RTK correction signal, you can:

- Possibility 1:
  Applicable in both cases.
  - Travel around the field.
  - Allow the field borders to be computed on the basis of the tramlines which are created during this travel.
  - Treat the interior of the field.
- Possibility 2:
  Recommended with RTK correction signal only.
  - Treat the interior of the field.
  - Travel around the field.
  - Allow the field borders to be computed on the basis of the tramlines which are created during this travel.

  This method also works without an RTK correction signal, although you will need to calibrate the GPS signal before treating and calculating the field borders. This is because the GPS position drift occurs between the start of work and the computation of the field borders.

**Procedure 1**

If you first want to travel around the field, you should create the field borders as follows:

☑ You have set and calibrated "Reference point 1". (if you are working with no RTK correction signal)

1. Start a new navigation.
2. Turn on the mounted or attached equipment.
3. 

- Press when this function icon appears on the work screen.
   The function key allows you to inform the software that you are going to start to work. If SECTION-Control is enabled, or if you have mounted an operating position sensor, this function icon will not appear.
4. Start your route around the field.
   ⇨ After travelling a few centimeters, you will see that a green track appears beneath the device bar on the display screen. This track marks the area which has been treated.

⇨ If no green track appears, this may be due to the following reasons:
a) You forgot to switch on the tractor-mounted equipment (SECTION-Control)
b) You forgot to press the function key 

(TRACK-Leader II).

5. Travel around the entire field.
6. End the travel route at the starting point. The travel route must be a closed circuit.
7.  - Press once you arrive back at the starting point.

⇨ A red line drawn around the field is now shown on the navigation display screen. This is the field border.

**Procedure 2**

If you first want to treat the field, you should create the field borders as follows:

☑ You must have an RTK correction signal.

1. Start a new navigation.
2. Turn on the mounted or attached equipment.
3. 

- Press when this function icon appears on the work screen.
If SECTION-Control is enabled, or if you have mounted an operating position sensor, do not press this function key. This is provided for you to inform the software that you are going to start to work.
4. Start the field work.
   ⇨ After travelling a few centimeters, you will see that a green track appears beneath the device bar on the display screen. This track marks the area which has been treated.
   ⇨ If no green track appears, this may be due to the following reasons:
   a) You forgot to switch on the tractor-mounted equipment (SECTION-Control)
   b) You forgot to press the function key 

(TRACK-Leader II).
5. Treat the field.
6. After completing treatment, travel around the field.
7.  - Press once you arrive back at the starting point.

⇨ A red line drawn around the field is now shown on the navigation display screen. This is the field border.

## 7.6 Create A-B tramline

The A-B tramline is the first tramline which you will create. All further tramlines are computed and designated on the basis of the A-B tramline.

You must create the A-B tramline for each navigation mode.

**When should you create this?**

You can create the A-B tramline any time once you have set the reference point. For example, during the first travel around a field.

### 7.6.1 Creating an A-B tramline in the Parallel and Contour navigation modes

**Procedure**

1. Drive the tractor to the start point of the desired A-B tramline.
2.  or  - Define point A.
   - ⇨ Point A is set.
   - ⇨ The Flag A is colored green on the function icon.
3. Drive to the end of the field.
4.  or  - Define point B.
   - ⇨ Point B is set.
   - ⇨ The Flag B is colored green on the function icon:
      or 
   - ⇨ Points A and B are connected with a line. This line is called the "A-B tramline" and is marked on the display screen with two small A and B icons.
     In Parallel mode, the A-B tramline is straight.
     In Contour mode, the A-B tramline is curved.
   - ⇨ Tramlines are projected, displayed and numbered in both directions on the basis of the current tramline width and the selected navigation mode.

### 7.6.2 Create a A-B tramline in A Plus navigation mode

**Procedure**

1. Drive the tractor to the start point of the desired A-B tramline.
2.  - Press.
   - ⇨ The data input screen appears.
3. The current direction of the tractor (in degrees) is displayed in the data input screen.
4. Input the desired direction of the A-B tramline in degrees.
   - ⇨ The A-B tramline is created in the defined direction.

## 7.7 Detect obstacles

When there are obstacles in your field, you can detect their position. In this way, you will always receive a warning before any collision can occur.

You can detect obstacles while working in a field.

You will receive a warning in the following cases:

- When you are less than 20 seconds (at your current speed) from the obstacle
- When you are closer than two swathwidths from the detected obstacle, or if you have exceeded a field border

The warning always consists of two elements:

- A graphical warning in the upper left-hand corner of the work screen

– "Field border"

– "Obstacle"

- Acoustic signal

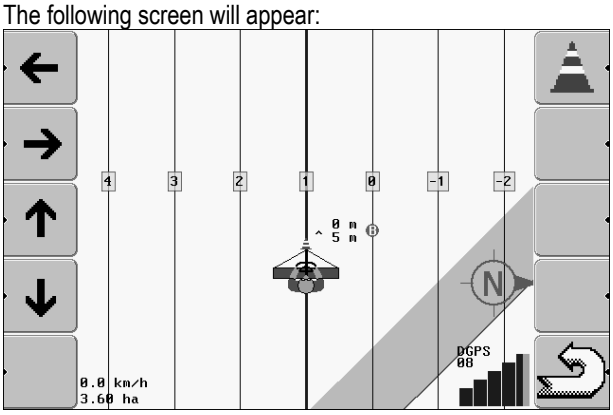
**Procedure**

☑ You have now started a navigation.

1.  - Press.

2.  - Press.

⇨ The following screen will appear:




The display screen shows a schematic illustration of the machine and driver, the obstacle and the distance from the obstacle to the GPS antenna.

3. Determine the distance of the obstacle from the current position of the tractor using the arrows. Since TRACK-Leader II knows the position of the tractor, it can determine the position of the obstacle in the field.

4.  - Save the position of the obstacle in the field.

⇨ The obstacle now appears on the work screen.

## 7.8 Operation while working

### 7.8.1 Changing the work mode

If SECTION-Control is enabled, you can work in one of two modes:

- Automatic mode
- Manual mode

**Controls**


Switch between manual and automatic mode

#### Automatic mode

Automatic mode has the following features:

- Automatic section switching during overlaps

### Manual mode

Manual mode has the following features:

- The equipment (e.g. the sprayer) must be manually switched. The results are recorded.

## 7.8.2 Changing the work screen display

You can change the display of the work screen in several ways.

**Controls**

| Control element | Function |
|---|---|
|  | Zoom in and out. |
|  | View entire field |
|   | Enable 3D view |
|   | Enable 2D view |

## 7.8.3 Shift tramlines

Use this function if you are on the desired line of travel but the position of the tractor is shown beside the track on the terminal.

You can shift tramlines in parallel and contour modes.

**Procedure**

☑ You have now started a navigation

1.  - Press.
2.  - Press.
3.  - Continue pressing for 3 seconds in order to shift the tramlines to your current position.

⇨ The tramline is then shifted.

## 7.8.4 Deleting tramlines

You can delete tramlines and create new ones at any time.

**Procedure**

1.  or  - Continue pressing for three seconds.

⇨ The tramlines are deleted.

## 7.9 Working with headlands with HEADLAND-Control

The HEADLAND-Control module (also known as Headland Management) enables the headland area to be treated separately from the rest of the field.

**Advantages**

Headland management has the following advantages:

- You can treat the headland after treating the center of the field. In this way, no spray residue remains in the machine after treating the headland.
- SECTION-Control switches off the sections which enter the headland area when the field is being treated.
- When working on the headland, tramlines for parallel navigation are displayed.

**Restrictions**

Headland management has the following restrictions:

- When working with headlands, the TRACK-Leader TOP automatic steering system cannot be used. The driver must steer the vehicle himself, manually.
- Headland Management always applies across the entire swathwidth. If sections are switched off in the sprayer job computer, the entire swathwidth is nevertheless used as a basis.

**Controls**

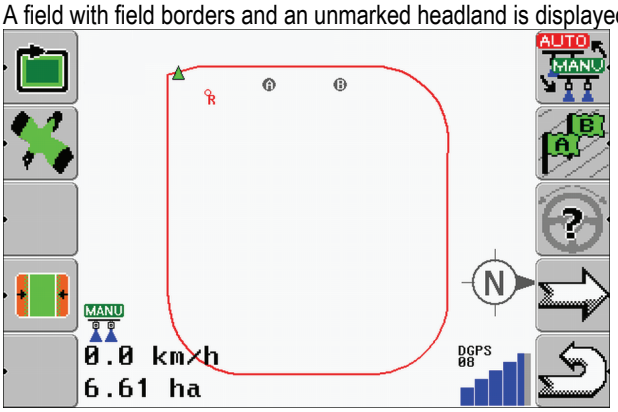
There is a function icon on the work screen which changes its appearance when pressed. The table below shows the different formats which the icon can have, what these mean, and what happens when you click on the icon.

| Function icon | Description | This happens when you press the function key beside the icon |
|---|---|---|
|  | Headland management is disabled and has never been enabled in this field before.<br>The field borders have not been recorded. | Cannot be pressed. |
|  | Headland treatment is possible, but not enabled.<br>First appears when the field borders are recorded. | The headland is displayed. |
|  | Headland treatment is enabled.<br>SECTION-Control only treats the interior of the field. Swathwidths are switched off when passing over a headland.<br>Parallel navigation within the field is enabled. | Parallel navigation in headlands is enabled. |
|  | Parallel navigation in headlands is enabled.<br>SECTION-Control only treats the headlands. Swathwidths are switched off when passing over the interior of the field. | Parallel navigation within the field is enabled. |

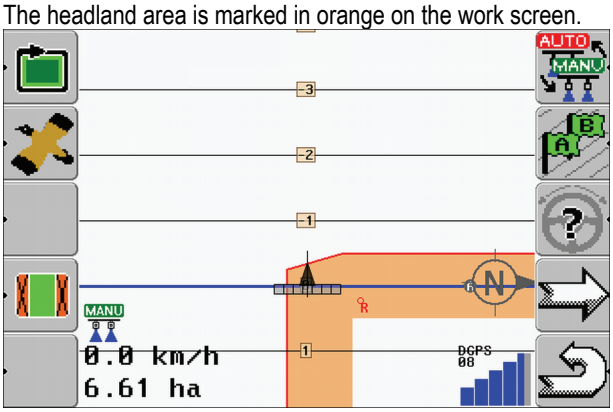
**Procedure**

When treating a field once again, you can treat the headland as follows:

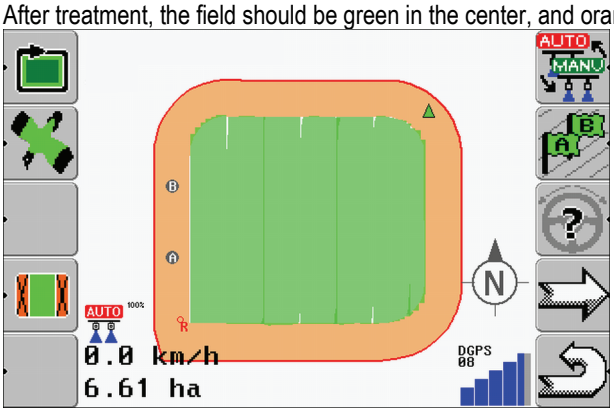
1. You will need to load the field data for the field to be treated. [→ 51]
2. Setting the headland width. [→ 36]
3. Start a new navigation.
   ⇨ A field with field borders and an unmarked headland is displayed.




4.  - Press in order to display the headland on the display screen.
   ⇨ The function icon  will appear.
   ⇨ The headland area is marked in orange on the work screen.



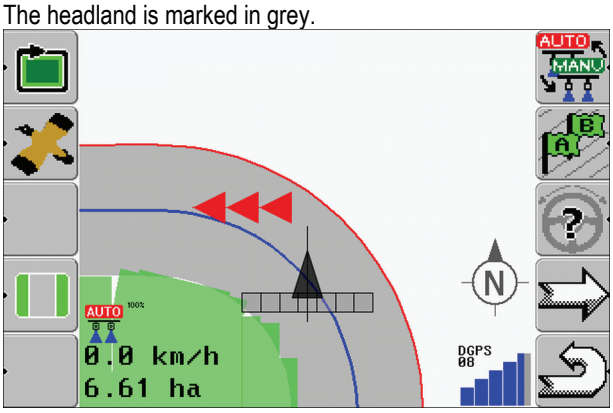

5. Treat the interior of the field. Use the tramlines to do so.
   ⇨ After treatment, the field should be green in the center, and orange on the outside:




6.  - Press in order to enable headland parallel navigation.

⇨  - displays on the work screen.

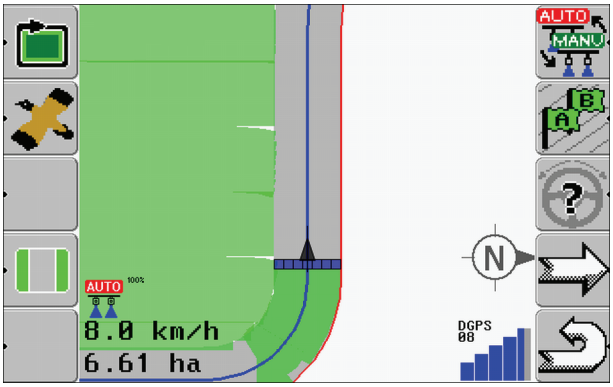
⇨ The headland is marked in grey.




⇨ A tramline appears in the headland.

7. Position the machine at a point in the field from which the field can be exited once treatment is completed.

8. Treat the headland.

⇨ 


9. After completing the treatment of the headland, leave the field and save the field data.

# 8 Save field data

Field data can be saved for each field on which you work.

Field data consists of the following information:

- Field borders
- Reference point 1
- Tramlines
- Lines of travel
- Detected obstacles

All field data will be saved together on the USB flash drive.

## 8.1 Saving and loading field data

If you save the field data created during treatment to the USB flash drive, you can use this field data with other ME-applications.

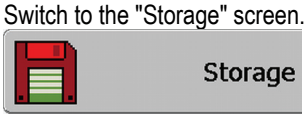
For example:

- TaskManager
- FIELD-Nav

### 8.1.1 Save field data

**Procedure**

1. Switch to the "Storage" screen.




2.  - Press.

   ⇨ The data input screen appears.

3. Enter a name under which the field data will be saved.

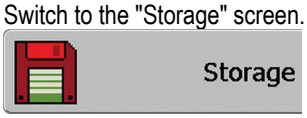
⇨ The data is saved in the "ngstore" folder on the USB flash drive.

### 8.1.2 Load the field data

Always load the field data before working on an already worked field.

**Procedure**

1. Switch to the "Storage" screen.




2.  - Press.

   ⇨ The "Load record" screen will appear.

3.  - Click on the desired field.

⇨ An overview of the field will appear on the "Storage" screen.

### 8.1.3 Discard field data

When discarding field data, all information in the temporary memory of the terminal is deleted.

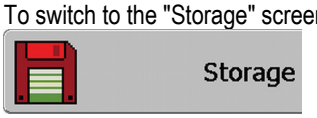
You must delete the field data for a file after treating this in order to be able to work on a new field. If you do not do this, the software will assume that you want to treat the first field once again.

**NOTICE**

**Data loss**
Once field data is discarded, it cannot be retrieved.

- Save all important field data before discarding this.

**Procedure**

1. To switch to the "Storage" screen:


2.  - Press.

⇨ The field data for the currently loaded field are discarded.

## 8.2 Export and import field data for GIS

If you document your work in GIS format, you can open and process the field data in a GIS program on your PC.

### 8.2.1 Exporting field data for GIS

**Procedure**

1. Switch to the "Storage" screen.


2. 

– Press.
   ⇨ The data input screen appears.
3. Enter a name under which the field data will be exported.

⇨ The data is saved in the "**NavGuideExport**" folder on the USB flash drive.

### 8.2.2 Importing field data from GIS

**Types of GIS field data**

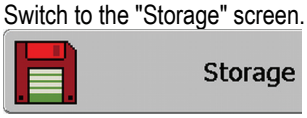
- Background surfaces
- Obstacle lines
- Obstacle points

**Procedure**

☑ You will first need to create the directory "**NavGuideGisImport**" on the USB flash drive.

☑ All of the data which you want to import can be found in the "**NavGuideGisImport**" folder on the USB flash drive. The folder must have no sub-directories.

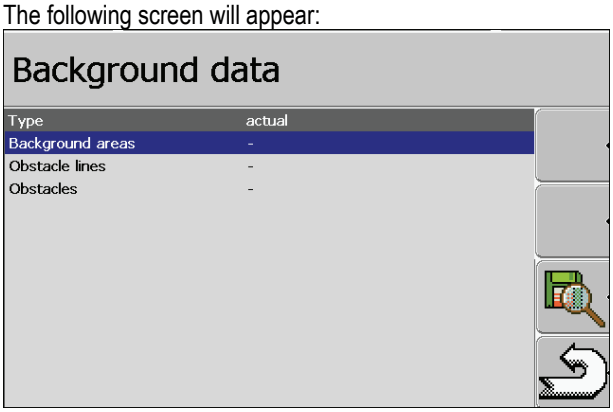
1. Switch to the "Storage" screen.




2. 

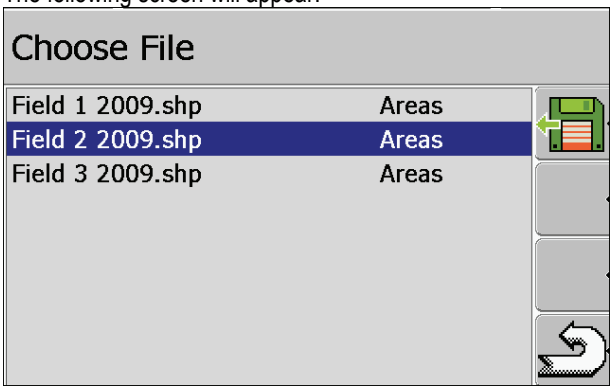
- Press.

⇨ The following screen will appear:




3. Click on the desired GIS field data type.

⇨ The following screen will appear:




The left column shows the names of the files containing the field data. The right column shows the GIS field data types. The naming of the files will depend on you, and the way in which you use the GIS system.

4. Mark lines containing the required data.

5. 
- Press.

⇨ The background data is loaded.

## 8.3 Rearrange data

The aim of rearranging your data is to speed up the operation of the terminal.

The data saved on the USB flash drive are sorted so that the terminal can access this data more rapidly.

**Procedure**

1. Switch to the "Storage" screen.

2. 
- Press.

⇨ The "Load record" screen will appear.

3.  - Press.

⇨ The "Data administration" screen will appear.

4.  - Click on "Data rearrangement".

5. The following message will appear: "Ready".

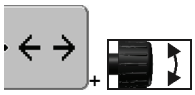
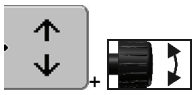
6. 

- Confirm.

## 8.4 Viewing documented travels

You can view and check the travel routes to see if you have left anything out.

**Controls**

| Function icon | Meaning |
|---|---|
|  | Move the cursor left and right |
|  | Move the cursor up and down |
|  | Zoom |

**Procedure**

1. Switch to the "Storage" screen
2. Load the desired field.
3.  - Zoom.
4.  or  - Continue pressing the function key.
5.  - Turn the rotary knob.

⇨ The selection is then shifted.

## 8.5 Deleting fields from the USB flash drive

You can delete entire fields, together with all of their associated data, from the USB flash drive.

**Procedure**

1. Switch to the "Storage" screen.
2.  - Press.

⇨ The "Load record" screen will appear.

3.  - Mark the desired field.

4.  - Delete the marked field.
   ⇨ The following message will appear: "Do you really want to delete this record?:"
5. Click "Yes" to confirm.

⇨ The name of the file containing the field data is removed from the table.

## 8.6 Deleting travel routes

You can delete the travel routes for all saved fields. The other field data will not be deleted.

You can perform this step at the end of the season, for example.

**Procedure**

1. Switch to the "Storage" screen.
2.  - Press.
   ⇨ The "Load record" screen will appear.
3.  - Mark the desired field.
4.  - Press.
5. The "Data administration" screen will appear.
6.  - Click on "Delete recorded tracks".
   ⇨ The following message will appear: "All treatment areas will be deleted! Continue?"
7. Click "Yes" to confirm.

# 9 TRACK-Leader TOP automatic steering

| | WARNING |
|---|---|
| | ◦ Read the enclosed "Ultra Guidance PSR ISO" directions for use before beginning to use the system. Pay particular attention to the information in the Chapter "Safety".<br>◦ Proceed with extreme care, particularly when using the automatic steering!<br>◦ Disable the automatic steering whenever anyone comes within 50 meters of the machine while it is operating. |

**Controls**

All function keys which are needed for the operation of the automatic steering appear directly on the work screen.

| Function icon | Function |
|---|---|
| | TRACK-Leader TOP automatic steering is disabled or unavailable. |
| | The steering job computer is fitted and configured, but there is an error.<br>Check the error message on the steering job computer application. |
| | Enable automatic steering.<br>The automatic steering can be activated, but is not yet active. |
| | Disable automatic steering.<br>The automatic steering is active. |
| | Steer vehicle to the left.<br>The function key does not operate when TRACK-Leader TOP is disabled. |
| | Steer vehicle to the right.<br>The function key does not operate when TRACK-Leader TOP is disabled. |

## 9.1 Driver tasks

The driver must perform the following tasks:

- The driver must pay attention to safety. The automatic steering system is blind. It cannot tell if anyone is approaching the machine. It cannot stop or take evasive action.
- The driver must brake and accelerate.
- The driver must perform turning.

## 9.2 Enabling and disabling automatic steering

| | |
|---|---|
| | **WARNING**<br>**Risk of traffic accident**<br>When the automatic steering is enabled, the vehicle may veer from the driving route and cause an accident. This may cause human injury, or even fatalities.<br>◦ Disable the automatic steering before travelling on public roads.<br>◦ Remove the steering motor from the steering wheel. |

**Procedure**

You can enable automatic steering as follows:

☑ You must first configure the steering job computer and TRACK-Leader TOP.

☑ You must first create the A-B tramline.

☑ You must have positioned the vehicle on a line of travel, and enabled a tramline.

☑ The work screen displays the function icon 

1. Position the steering motor with friction wheel on the steering wheel.
2.  - Press.

   ⇨ The function icon is replaced with the following function icon: 

   ⇨ The automatic steering is enabled.
3. When under way in the vehicle, the steering motor controls the vehicle in such a way that it proceeds along the active tramline.

**Procedure**

The are several ways of disabling the automatic steering:

1. Shift the steering wheel.

   or:

    - Press.

   ⇨ The automatic steering is disabled.

⇨ The function icon  is replaced with the following function icon: 

## 9.3 Drive parallel to the tramline

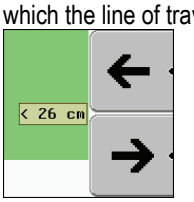
The automatic steering drives the vehicle along the active tramline.

You can make the vehicle drive parallel to the active tramline.

**Procedure**

To drive the vehicle parallel to the active tramline:

☑ The work screen displays the function icon 

1. Press  or  to make the vehicle drive parallel to the active tramline.
   ⇨ Information appears beside the function icon symbol indicating the distance and direction in which the line of travel has been shifted:
   

   ⇨ The steering motor controls the steering wheel.
2. The vehicle will drive parallel to the tramline until another tramline is activated.

## 9.4 Turning

When turning, the driver must take control of the steering and steer himself.

**Procedure**

You can make a turn as follows when automatic steering is enabled:

☑ The work screen displays the function icon:  . The automatic steering is enabled.

1. Take control of the steering wheel and perform the turning yourself.
   ⇨ The automatic steering is disabled automatically as soon as the steering wheel is moved.
   ⇨ The function icon  is replaced with the following function icon: 
2. Turning.
   ⇨ The next tramline is then activated if the angle between itself and the vehicle is smaller than the set "Swinging angle" parameter.
3.  - Enable steering once the next tramline is enabled.

# 10 Cooperation with other applications

All data which is created when working with TRACK-Leader II can also be used in other applications.

Examples:

- TRACK-Guide Desktop - Free program for viewing fields.
- FIELD-Nav - Navigation on public roads to fields or unloading points.
- FIELD-Nav Desktop - Chargeable program for operations and field administration. A part of FIELD-Nav.
- ISO Task Manager - Administers the tasks which are performed with TRACK-Leader II.

## 10.1 Cooperation with the ISO Task Manager

You can use SECTION-Control together with ISO Task Manager.

**Advantages**

- Field data and travel routes are transferred to ISO Task Manager. You can later export this data together with a task, and import this into an acreage card.
- Application maps (reference maps) can be produced

**Important**

In order to use both programs, please note the following:

- The "TM data coupling" parameter must be enabled.
- You must always start a task in the ISO Task Manager if you want to work with SECTION-Control.
- If you start a task using the ISO Task Manager, its field data will be automatically loaded from TRACK-Leader II. A precondition for this is that you have saved this on the USB flash drive.

## 10.2 Cooperation with FIELD-Nav

If you want to use TRACK-Leader II together with FIELD-Nav, you can do the following:

- You can let the application navigate you to the field entrance.

## 10.3 Cooperation with the sprayer job computer

In order to use the application with a job computer, such as the sprayer, you must activate the SECTION-Control feature.

**Method of function**

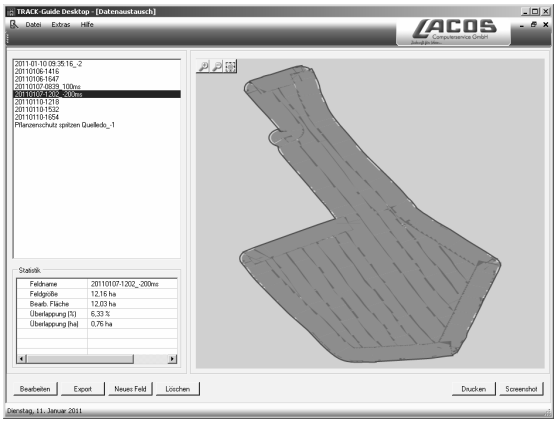
SECTION-Control in automatic mode signals the job computer when to switch the sections on and off.

## 10.4 Cooperation with TRACK-Guide Desktop

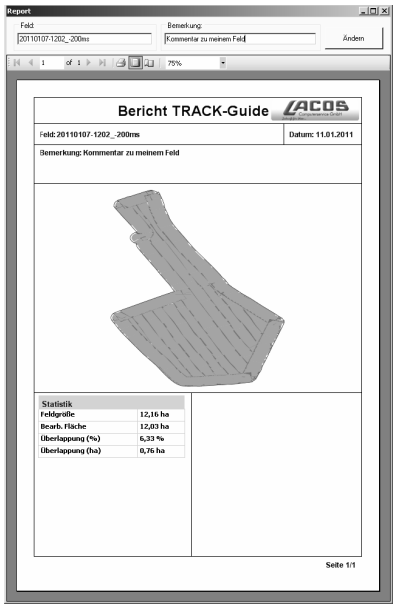
TRACK-Guide Desktop is a free program for PCs.

This allows you to:

- View work results
- Print reports for your customers




Program window




Report

You can find TRACK-Guide Desktop in the "Download" section of the website below: www.lacos.de

# 11 Procedure for dealing with error messages

| Error message text | Possible cause | How to fix the problem |
|---|---|---|
| Caution! The computer could not be started. Should this problem persist after rebooting, please contact our Service department. | The database could not be created on the USB flash drive. | Restart the terminal. |
| Active profile cannot be deleted! | An attempt was made to delete the currently selected machine profile. | Select another machine profile and then delete the desired machine profile. |
| An error has occurred while rearranging the computer. | The USB flash drive was removed during rearrangement. | Re-insert the USB flash drive and re-start the rearrangement |
| | The USB flash drive is full. | Delete unnecessary data from the USB flash drive and try again. |
| | The USB flash drive is faulty. | Request a new USB flash drive from the manufacturer. |
| DGPS configuration file not found! | The internal file containing the DGPS settings could not be found. | Contact our Service team in order to reinstall the software. |
| The test phase has expired. Please inform your dealer. | The test phase has expired. | Request a license.<br>Unlock the software. |
| No USB flash drive is inserted! | | Insert the USB flash drive. |
| Export failed! | The USB flash drive was removed before or during the export. | Re-insert the USB flash drive and re-start the export. |
| | The USB flash drive cannot be written to. | Disable write protection on the USB flash drive. |
| | The USB flash drive is full. | Delete unnecessary data from the USB flash drive and try again. |
| Error! | | Contact Customer services. |
| GPS has a fault! | The serial connection to the GPS antenna has been interrupted.<br>No further positions can be determined. | Check and re-connect the cable connections to the GPS antenna. |
| GPS signal is too weak! | The GPS signal quality is too weak, most likely due to obstructions. | Check the mounting of the GPS receiver and your actual position. The receiver must be in open view to the sky. |
| No DGPS available! | No DGPS is available due to signal obstruction. | Check the mounting of the GPS receiver and your actual position. The receiver must be in open view to the sky. |

| Error message text | Possible cause | How to fix the problem |
|---|---|---|
| | No DGPS is available due to a failure of the correction data service, e.g. EGNOS. | Check the general availability of the service. Check and set the correct EGNOS correction satellites. |
| No compatible format found for this application map. Please create a new format. | No suitable format was found for the application map content. No compatible format has been created. | The major formats have been provided. Other formats can be incorporated by the user themselves. |
| No profile available! | No machine profile is available! | Create a new machine profile. |
| DGPS configuration could not be read from the GPS receiver! | The serial connection to the GPS antenna has been interrupted. | Check and re-connect the cable connections to the GPS antenna. |
| e-Dif configuration could not be read from the GPS receiver! | The serial connection to the GPS antenna has been interrupted. | Check and re-connect the cable connections to the GPS antenna. |
| Settings could not be read from the Tilt module! | The serial connection to the GPS TILT module tilt sensor has been interrupted. | Check and re-connect the cable connections. |
| Save failed! | The USB flash drive was removed before or during the save. | Re-insert the USB flash drive and re-start the save process. |
| | The USB flash drive cannot be written to. | Disable write protection on the USB flash drive. |
| | The USB flash drive is full. | Delete unnecessary data from the USB flash drive and try again. |
| Invalid status! | | Contact Customer services. |