Operating Manual

TRACK-Leader II

SECTION-Control

Version: 01/2008

175_4613-EN

Contents

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1. Introduction

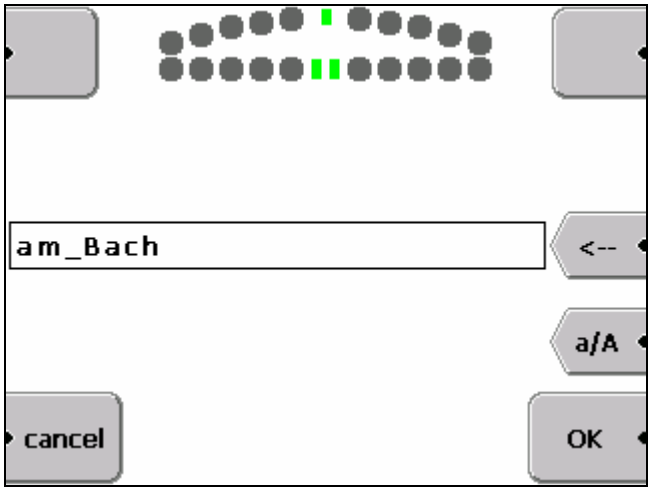
1.1. Program versions

TRACK-Leader II	The basic functionality of parallel and contour driving.
SECTION-Control (optional)	The functionality of automatic boom-section switching. The boom sections and the total swath width are determined automatically.

All functions are included in the program and can be used for 50 hours without having to register as long as you have the configuration required.

1.2. Entering numbers and letters

You may have to use numbers and letters when entering field names and for registration information. The screen pictured below will be displayed.



Letters and numbers can be selected and confirmed at the current cursor position using the scroll wheel. Scroll until the letter required appears in the cursor and then press the scroll wheel.

Use the key on the right beside the input field to delete a character. Enter a blank using the key on the left. Press the a/A key to switch between upper and lower-case characters.

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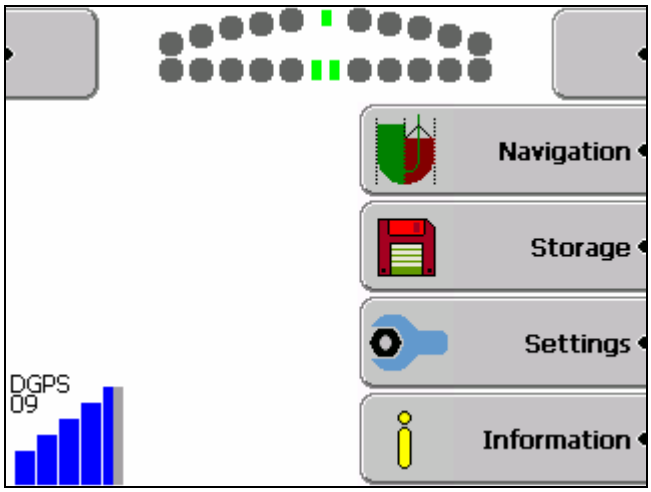
1.3. Initial display



Menu item	*Description*
Navigation	Begin new or continue navigation already started
Storage	Store and download field data If here is shown "..." instead of Navigation, the settings in SC-Conf are not available (see 5).
Settings	Program settings
Information	Information on program versions and registration

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2. Navigation

The menu item navigation enables new navigation to be started or navigation which has already been started or downloaded to be continued.

2.1. Start navigation

Before starting navigation you have to select the field to be processed in the memory. We differentiate between fields processed and fields where work has been interrupted (see **3. Storage**)

Navigation can be started directly if the field is being processed for the first time using the system.

Start by pressing the 

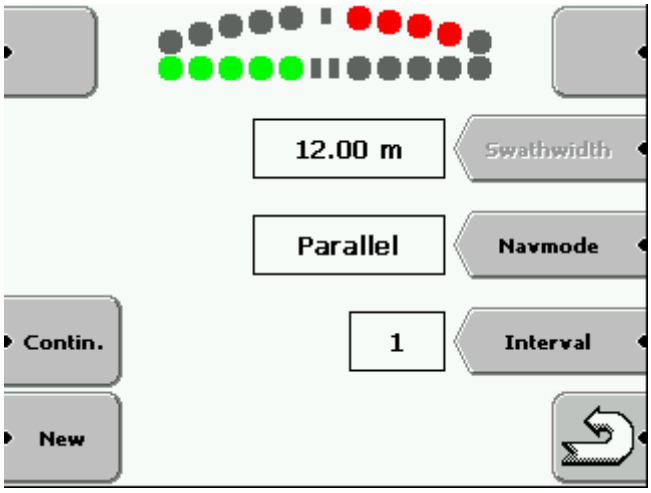
key.

Press this 

key as well if the last transaction (green marking) on the field downloaded is to be deleted. The border lines, guidance tracks and obstacles remain.

To continue an interrupted process, press the 

key.



The 

button displays the pre-set swath width on your device. Press this button to alter the swath width. This activates the adjacent field which is highlighted green. You can now alter the swath width using the scroll wheel.

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The button 

displays the pre-set navigation mode. Press the button and use the scroll wheel to alter this if required. Navigation modes are:

Navigation modes:

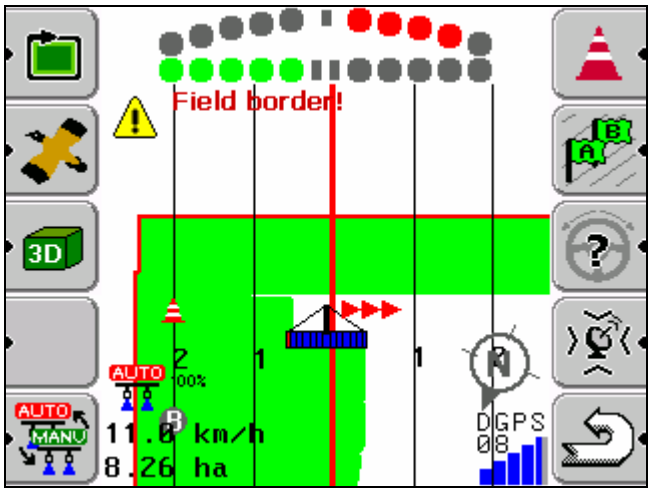
Mode	*Description*
Parallel	Also called A – B mode. A point at the beginning and one at the end of the track is entered. These are then connected and operation is directed along this line. The parallel tracks are set at a distance equal to the swath width.
Contour	For the contour mode a line is entered. This can also represent a curve. It is then projected in both directions and forms the track.

The 

button marks the spacing of tracks in which you are driving, in case you are not going track by track. In the bed interval the tracks to the left and right are highlighted as being next, so that you always know which track is e.g. the third one (seen from the last track operated).

2.2. Navigation monitor

The navigation monitor consists of the display area in the middle, the key bars to the right and left, the header area (example diagram: field sprayer) and information on the status on the lower part of the display.



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The display area is a schematic representation of the machine and an overview of the area processed, which is coloured green.
The display area is always aligned to the direction of travelling, i.e. the top section of the display is always ahead of the vehicle. The size of this section is variable and can be zoomed out or scaled down at any time using the scroll wheel. The monitor in the diagram is a 2D representation. A 3D representation can be selected, displaying the section in travelling direction from a perspective view.

In the bottom left-hand corner the current speed and the size of the field (after driving round) are displayed.
In the right-hand corner at the bottom the GPS status information is displayed. In the example diagram, 8 is the number of satellites and the correction signal status is shown to be “GPS”. This status should display at least “DGPS” in order to achieve sufficient accuracy. Systems with RTK display either “TK Fix“ or “RKT Float“ at this position. The bar diagram indicates the internal DOP value of the GPS signal. The full bar diagram indicates a DOP value equal to or better than 1.

If the quality of the GPS signal drops to "GPS" or lower, the number of satellites is less than four or the bar diagram is not displaying any values, the program automatically switches into manual operation! A switched-on alarm appears on the display. Switching back to automatic mode must be carried out manually.

The lines on the display illustrate the current guidance tracks. They aren’t displayed until you have specified an A-B line or contour line using the 

key. The red line is the current line recognised. The adjacent tracks are numbered consecutively in each direction.

Monitor – light bar, external light bar

The light bar consists of 2 elements: the bar for the current deviation on the bottom and above that the bar for the steering preview.

Current deviation from the track is indicated by the number of lights corresponding to the pre-set sensitivity (see **Settings - TRACK-Leader**). This means that if current sensitivity is set at 30 cm then the picture on the top indicates a deviation of 90 cm to the track.

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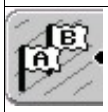
The steering preview calculates a deviation from the track at a specific, pre-set distance, 8 m being the standard. As the driving angle can vary somewhat for technical reasons, double the sensitivity value is used for the display on the preview bar.

Description of keys

Key	*Description*
	Key for calculating the field border To delete the field border press the key for 3 seconds.
	Key for the bird's eye view
 	Switching between 2D and 3D representation
 	Recording key for storing the track travelled (only available with TRACK-Leader II, not with SECTION-Control)
 	Switching between manual/automatic spraying modes. In automatic mode the program controls the switching of the sprayer. In manual mode the driver switches manually and the program stores only the status.
	Starts recording obstacles To delete obstacles press the key for 3 seconds
	Key for specifying navigation points. Points A and B in parallel driving mode Start/Stop the line in contour driving mode To delete the guidance tracks press the key for 3 seconds.
	Starts automatic steering (only available with TRACK-Leader TOP)
 	Calibration key for calibrating the signal according to a reference point. The grey key indicates that currently the signal is not calibrated. Red means that a calibrated signal is in use. If a red arrow next to the key flashes, the reference point should be re-calibrated

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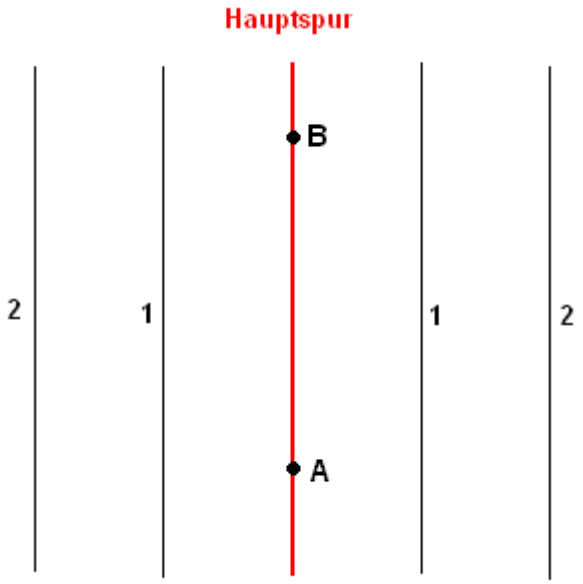
2.2.1. Guidance modes

The *TRACK-Leader II* program supports the following guidance modes:

- Parallel driving (A – B)
- Contour driving (contour line)

Parallel driving

Parallel driving, also known as A – B driving, works with straight lines on the field. Before operation two points on the line, points A and B must be specified.



These points should be as far apart as possible in order to calculate the tracks accurately.
After the main line has been defined by both points the parallel lines are projected in both directions on the basis of the current swath width, displayed and numbered consecutively,

After start-up press the  key, in order to set the A point. Before the end of the field press the  key once again. This sets the B point. The guidance tracks appear automatically on the screen.

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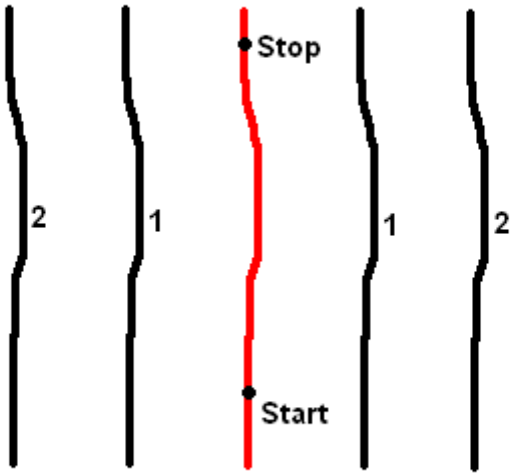
Adjusting the A-B track

By pressing the  key in the calibration menu of the GPS signal, the A-B tracks are adjusted in accordance with the current deviation from the guidance track. The key must be pressed for 3 seconds. The navigation monitor appears automatically.

To delete the guidance tracks press the  key for 3 seconds.

Contour driving

With contour driving the program continuously records points which lie between a start and a stop point and in this way generally a main track is recorded. These points are set by pressing the ***Navigation point*** key once for the start point and once for the stop point.



The main line is projected to both sides in exactly the same way as the parallel line and the new lines are numbered consecutively. The sections in front of and behind the start and stop points continue as straight lines, so that you don’t have to work on the field without guidelines. The direction of these lines is determined in accordance with the direction of the start and stop point.

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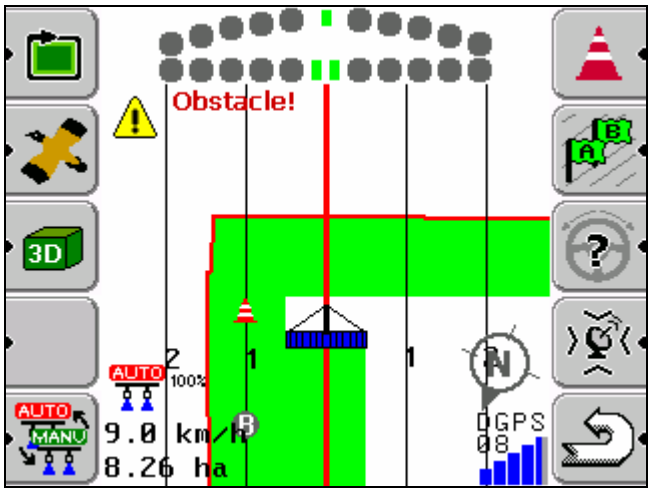
2.2.2. Field circumnavigation

Using field circumnavigation you can record the boundary and the size of a field directly with your parallel driving system. Directly after driving round the field for the first time press the Directly after driving round the field for the first time press the  key. The field's outer contour will then be calculated and displayed in the background key. The field's outer contour will then be calculated and displayed in the background.

The calculation can only function when you spray while driving round, or with *TRACK-Leader II* when you press the record key

2.2.3. Obstacles – warning and recording

Obstacle detection is in operation when you have stored obstacles or a field boundary. A forecast based on the double swath width of the current track is calculated and detects when you are approaching an obstacle or the field boundary. If you come nearer than 20 seconds to the obstacle a warning signal is set off and a warning appears on the display (see screen shot). This can be either "Attention, field border" or "Attention, obstacle.



Recording obstacles

Press the  key once to enter obstacles. The display shows a schematic representation of the machine with the driver, the obstacle and directly beside it the distance.

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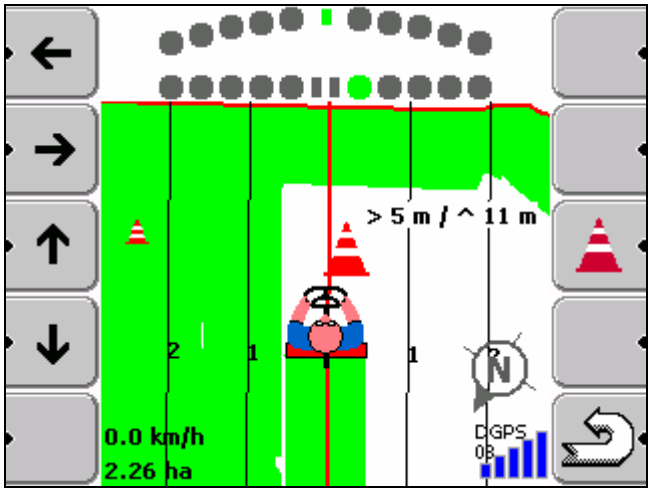

Using the keys on the left hand side of the monitor you can now determine the distance of the obstacle from your location. By pressing the  key again, the obstacle is stored at the position entered by you. Use the  key to terminate the entry. The recorded obstacles are stored together with the boundaries and the driving tracks. To delete all obstacles, press the  key for 3 seconds.

2.2.4. Calibrating the GPS signal

Due to the natural drift of the GPS signal, deviation between recorded driving tracks and my current position can occur. This can become evident when, for example, you are standing squarely in a tram line but the monitor indicates a deviation. This inaccuracy can be reduced by means of calibration.

For the calibration you require a reference point on the approach to the field which you can drive to at any time and which has to be defined as accurately as possible, e.g. by marking the approach with a white cross. To set the reference point or to calibrate the reference point, steer the front wheel of the tractor towards this marked point.

.

Calibration is started using the  key on the navigation monitor.

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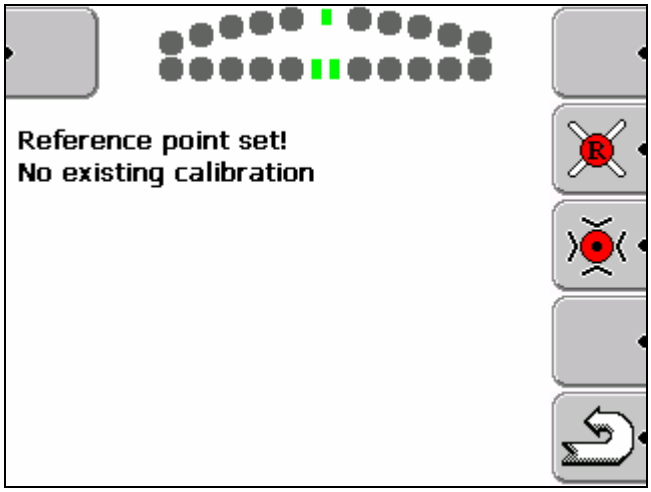
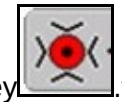
The reference point is set by pressing the  key. For 15 seconds the program then records the current position and stores it as the reference point. Any existing signal calibrations are eliminated at this point.

If you want to set a new reference point for the field, press  for 3 seconds. **NOTE:** Afterwards you must re-enter the field borders, obstacles and guidance tracks.

Setting the reference point

Calibration



Press the calibration key  .to calibrate the reference point. Here too the program records the current position for 15 seconds. The old calibration is eliminated each time the reference point is calibrated.

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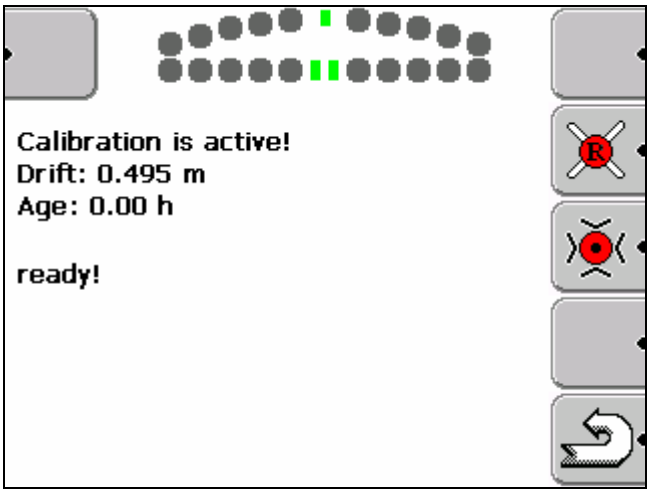
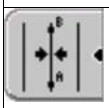
After calibration



Description of keys

Key	*Description*
	Reference point key for setting the reference point for a field. Press the key for 3 seconds to delete the reference point.
	Calibration key calibrates the GPS signal on the basis of the pre-set reference point.
	Track correction key calibrates the driving track in accordance with the current deviation from the memorised A-B track. Press the key for 3 seconds in order to adjust the track. (Key is only available in parallel mode and when an A-B-track has been memorised.) Siehe 2.2.1 Guidance modes

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2.2.5. Operating procedure

2.2.5.1 Operation on the farm PC without a GIS system

- **Settings**

  Before operation can begin the machine has to be selected and the machine data entered. (see 4.)

  Select field

  Press the 

key to access the memory overview. The stored fields are displayed when you press the  key. Here you can select the field required using the scroll wheel (see 3 Memory). Press  .to return to the start screen.

  If you are working on the field for the first time using TRACK-Leader II and SECTION-Control omit this point and start directly with the 

key (see 3. memory).

- **Start**

  Start navigation with the 

key. If you want to continue an interrupted job, confirm the next query with 

. Press 

to start a new process (see 2. Navigation).

- **Set reference point / calibrate reference point.**

  Deviation can occur due to the natural drift of the GPS-signal. For this reason the system operates with a reference point (see 2.2.4).

- **Delete irrelevant field data**

  Delete any field data no longer required as follows:

  - To delete field borders press the  key for 3 seconds.

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- To delete tracks press the  key for 3 seconds.
- To delete obstacles press the  key for 3 seconds.

- **Circumnavigation**

  First of all drive round the field with the machine switched on. The borders are calculated directly after driving round using the  key (see 2.2.2). In TRACK-Leader II mode press the  key before driving round the field.

- **Set guidance tracks**

  Whilst driving round, the points A and B can be set on the track on which work is to be continued by means of the  key (see 2.2.1). The guidance tracks are now set.

- **Set obstacles**

  Obstacles can be saved during operation (see 2.2.3).

- **Save field data**

  After work has been completed on the field or the process has been interrupted, the calculated data must be saved (see 3). The job is now completed.

2.2.5.2 Operation on the farm PC with a GIS system

The field data from the GIS-System are on the USB stick and can be downloaded using the  key. Select the field which is to be processed and download it on to the main memory (see 3.2.). Continue as for operation without a GIS system. Once work has been completed, save the calculated data on the USB stick using the  key. They can now be called up from the GIS System on the farm PC.

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3. Memory

2 memories are provided on the USB stick for storing field borders, guidance tracks, processed areas and obstacles:

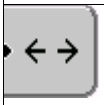
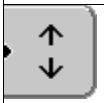
System memory

The field data are stored on the USB stick. The farm PC has no GIS system.

GIS memory

This memory is for the transfer of data to a GIS system on the farm PC. The data are stored in shape file format in the directory Wav Guide Export. The coordinate format of the exported data is always WGS 84.

Description of keys

Key	*Description*
	Save key for storing a field in the system memory (USB stick)
	Download key for downloading a stored field from the system memory (USB stick)
	Save key for storing a field in the GIS memory (USB stick)
	Download key for downloading the GIS data entered on the farm PC from the GIS-memory (USB stick).
	East-west key for scrolling a section of the display in an east-west direction
 	North-south key for scrolling a section of the display in an north-south direction Deletes the current field data including circumnavigation, tracks, obstacles and the reference point.

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Key	Description
	Search key Runs a search from the memory for a field which is to be downloaded. An alpha-numeric search can be carried out.
	Data administration key for reorganising the memory data and for deleting all recorded tracks on the stored field data..

3.1. Operation with the system memory

In this case the farm PC has no GIS system.

3.1.1. No field data stored

The first time the TRACK-Guide is used to process a field, the name of the field is allocated when the data is saved. In this case the job is started directly with 

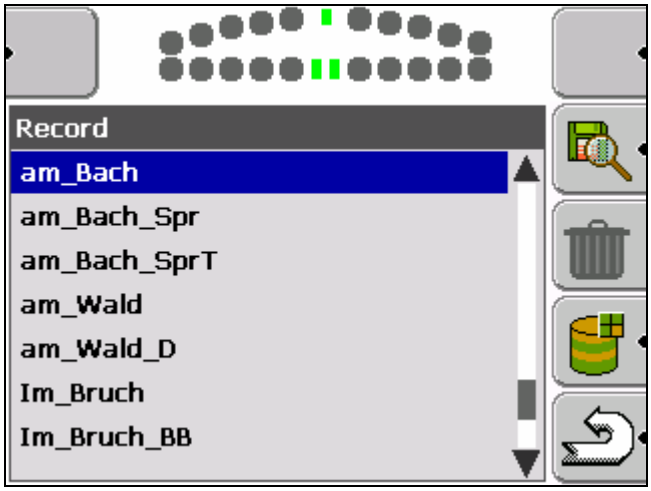
(see also 3.1.2)

3.1.2. Field data stored

Press the 

key to access the memory overview. Once the  key has been pressed all the fields stored in the system memory are displayed. Select the field required using the scroll wheel and download it by pressing on the scroll wheel

Field menu



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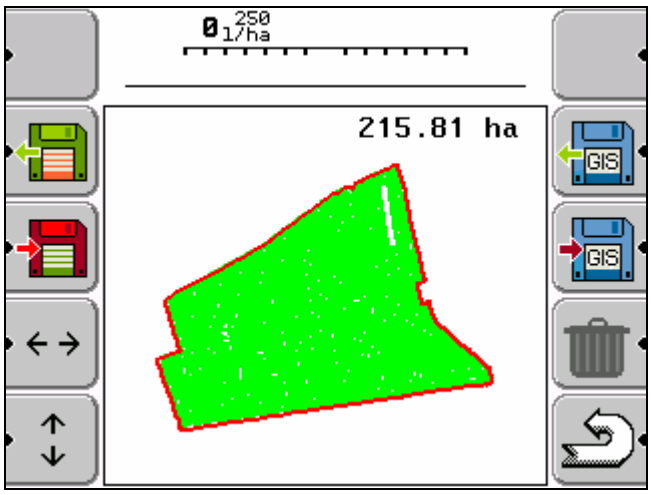
Fields no longer required can be deleted using the key  .

Press the  key to search the records in alpha-numerical order for a specific file.

Selected field



You will see the complete field. It is aligned to the north. To look at details of the field use the scroll wheel to zoom out or scale down a section. If you want to look at another section of the field, you have to press either the north-south key or the east-west-key and turn the scroll wheel simultaneously.

Return to the start mask by pressing the  key. The job will then be started directly with 

. The further process is described in 2. Navigation.

.

3.1.3. 3.1.3 Store field data

Once work on the field has been completed, the data determined must be stored, otherwise the machine will not start up on the next field. In this case the machine is outwith the field boundaries of the field last processed.

Press the  key to leave the navigation monitor. This takes you directly to the memory

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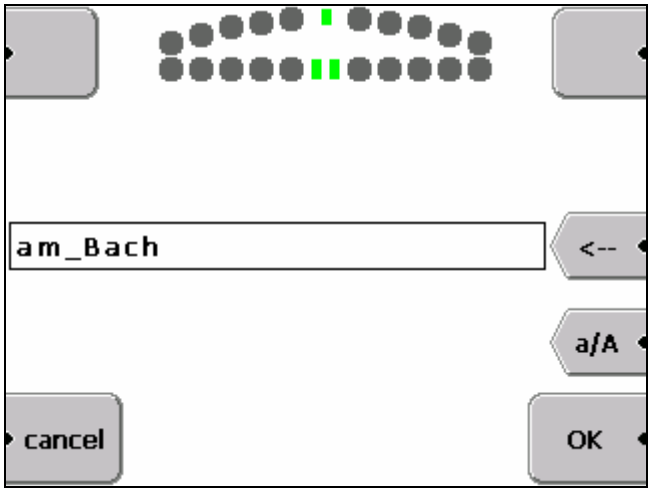
menu.

Press the  key to start the memory process. The field name has to be entered at this point (see 1.2).



Press  to save the field in the system memory on the USB stick. The field can be named according to a particular job (for example: “at the stream Sp”, Sp standing for field sprayer). If only part of the field could be processed, the following name could, e.g. be used: “at the stream Sp P”, P standing for partly processed. Once the remaining area has been processed, the “P” can be removed and the field saved under “at the stream Sp”.

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3.2. Operation with the GIS memory

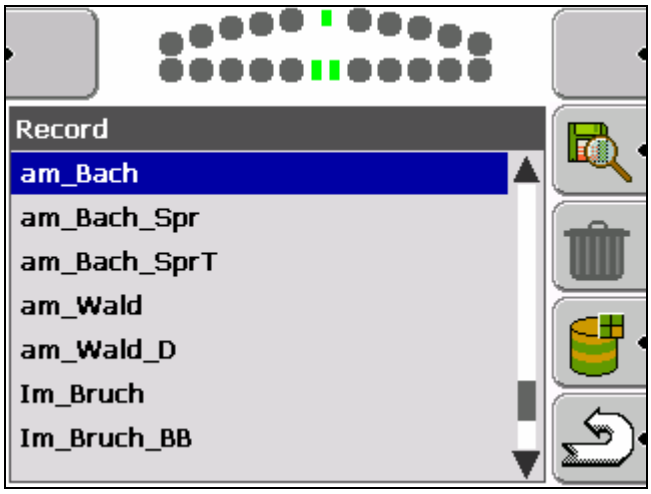
In this case the farm PC has a GIS system.

3.2.1. Download field data

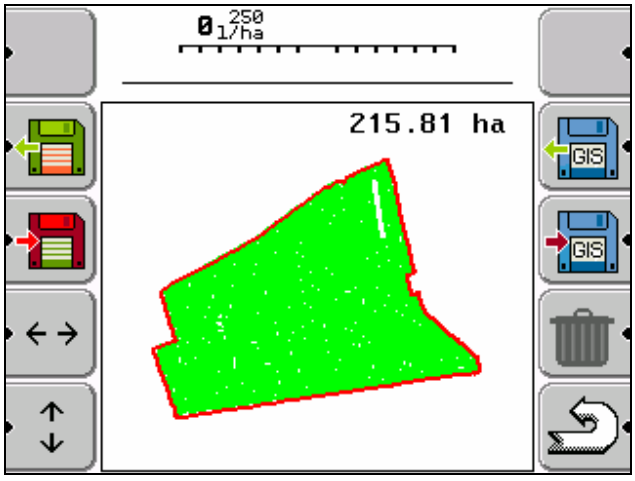
The GIS data from the GIS system on the farm PC are stored on the USB stick. Press the 

key to access the memory overview. All field stored on the GIS memory are displayed when you press the 

key. Here you can select the field required using the scroll wheel and download it by pressing on the scroll wheel.



Field data no longer required can be deleted using the  key.



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You see the complete field. It is aligned to the north. To look at details of the field use the scroll wheel to zoom out or scale down a section. If you want to look at another section of the field, you have to press either the north-south key or the east-west-key and turn the scroll wheel simultaneously.

.

Return to the start mask by pressing the  key. The job will then be started directly with the 

.key. The further process is described in 2. Navigation

3.2.2. Store field data

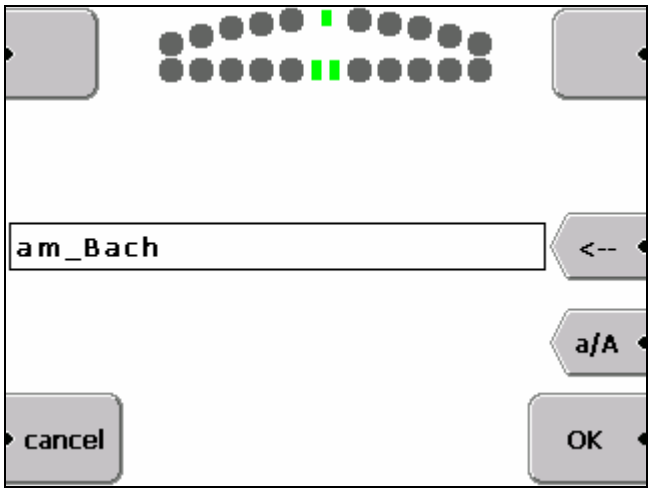
Once work on the field has been completed, the data determined must be stored, otherwise the machine will not start up on the next field. In this case the machine is outwith the field boundaries of the field last processed.

Press the  key to leave the navigation monitor. This takes you directly to the memory menu.

Press the 

key to start the memory process. With 

the field is stored in the GIS memory on the USB stick.



The calculated data can now be called up from the GIS system on the farm PC.

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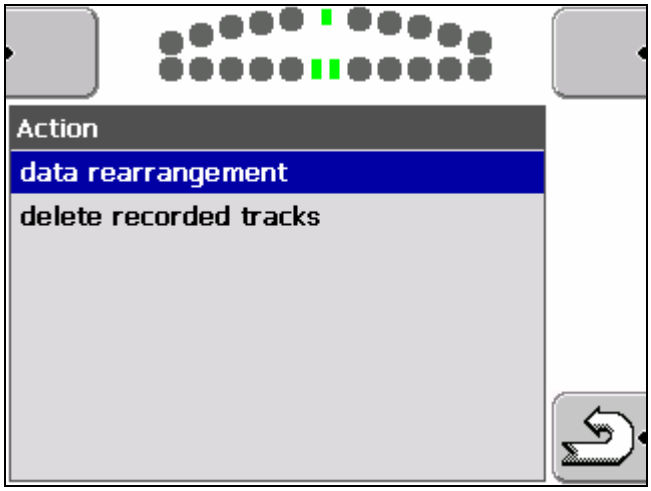
3.3. Data administration

Press the  key to go to the menu point data administration.



Data rearrangement

In order to ensure optimal performance, the entire memory in the terminal has to be reorganised at regular intervals. This should be carried out at least once a year or when prompted.

Delete recorded tracks

All recorded tracks in the memory (green areas) are deleted.

Now the field data consists only of the circumnavigation, the A-B or contour tracks, the obstacles and the reference points.

This command is used e.g. at the end of the season to delete the data no longer required.

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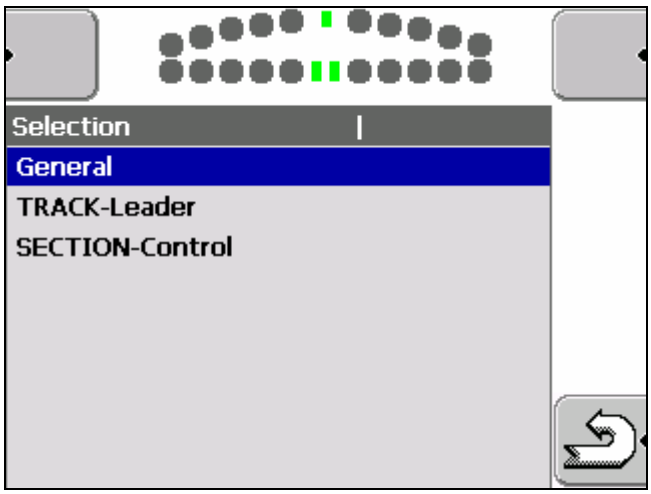
4. Settings

The settings are divided into different categories for a clearer representation:

- General
- TRACK-Leader
- SECTION-Control

In addition you can store and download these settings on the USB stick. This is useful for service technicians or in case you have more then one device on which you wish to use the same settings,

Select one of the options with the scroll wheel and confirm this by pressing the scroll wheel.



Unter 4.4 finden Sie Informationen zum SECTION-Control Configurator.

4.1. General settings

If you acknowledge the SECTION-Control with “yes”, both TRACK-Leader II and SECTION-Control are activated. If you acknowledge the SECTION with “no“, only TRACK-Leader II is activated.
Press on the scroll wheel to select SECTION-Control. To switch between “yes“ and “no“, turn the scroll wheel. Press the scroll wheel to store the new setting.

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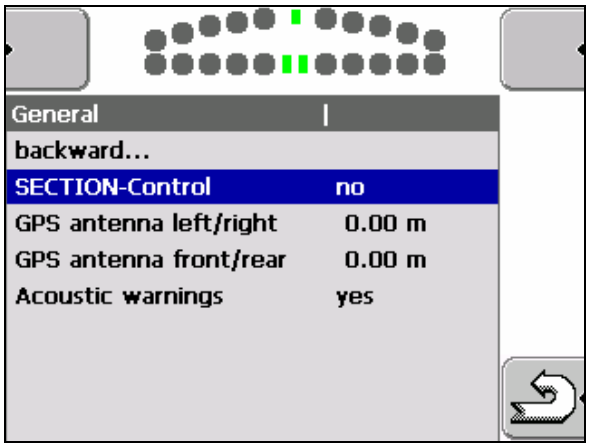
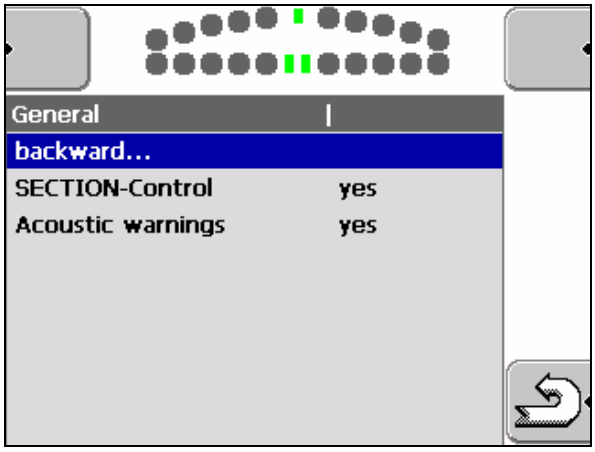
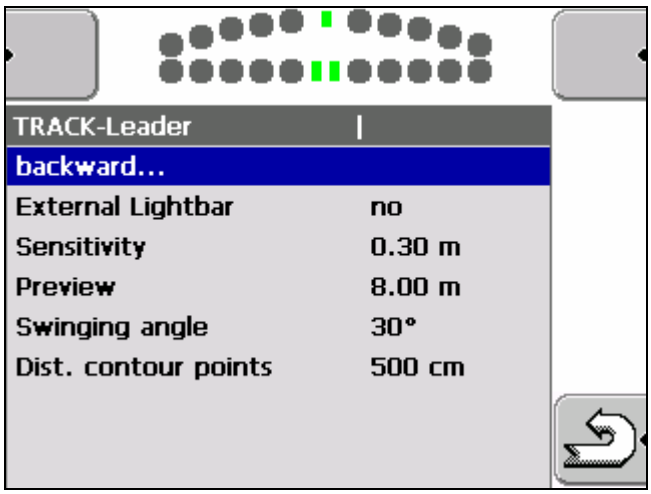




Setting	*Option*
SECTION-Control	
Yes	SECTION-Control is activated Data, e.g. the position of the GPS receiver and the boom sections are transferred automatically from the machine. This is the basis for SECTION-Control.
No	SECTION-Control is not activated TRACK-Leader II is in operation Machine data are set manually
GPS antenna left/right	If the GPS antenna is not positioned on the longitudinal axis of the vehicle, the misalignment must be set here.
GPS antenna front/back	If the GPS antenna is not positioned in the middle of the vehicle, the misalignment must be set here.
Acoustic warning	Option as to whether an acoustic warning signal should also be sent out in the case of obstacles.



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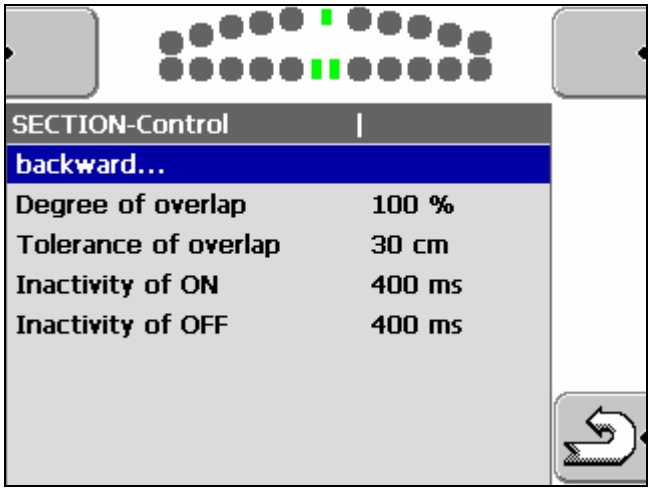
Setting	*Description*
External light bar	Switch on this option if you have connected an external light bar to the serial interface.
Sensitivity	Sets the sensitivity of the light bar. In the example for each 50 cm deflection one more point on the light bar is switched on. Standard: 50 cm.
Preview	If the light bar has a preview display, the width of the preview is set here. Standard: 8 m
Swinging angle	The program assumes that over a defined angle the vehicle will swing on to a track. If the vehicle drives with less angle deviation to a track, this will be recognised as a new track. Standard: 30 Grad.
Overlap	An intentional overlapping of two adjacent tracks in operation can be set here in cm. The overlapping required often depends on the accuracy of the GPS receiver and the type of application.
Distance contour points	When the contour line is being recorded, points are continuously stored. To limit the number of points when using receivers with a high hertz frequency the minimum distance between 2 points can be set here. Standard: 500 cm

SECTION-Control – settings



Setting	*Description*
Degree of overlapping	The degree of overlapping from the sprayer and the area already processed, so that the sprayer can be activated/deactivated. Permitted settings are 0%, 50% und 100 %.
Overlapping tolerance	The permissible overlapping of two adjacent tracks in operation can be

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Setting	*Description*
	set here in cm.
Inertia on	Set here to delay machine switch-on. e.g. magnetic valve armature 400 ms electromotive armature 1200 ms
Inertia off	Set here to delay machine switch-off. e.g. magnetic valve armature 300 ms electromotive armature 1200 ms

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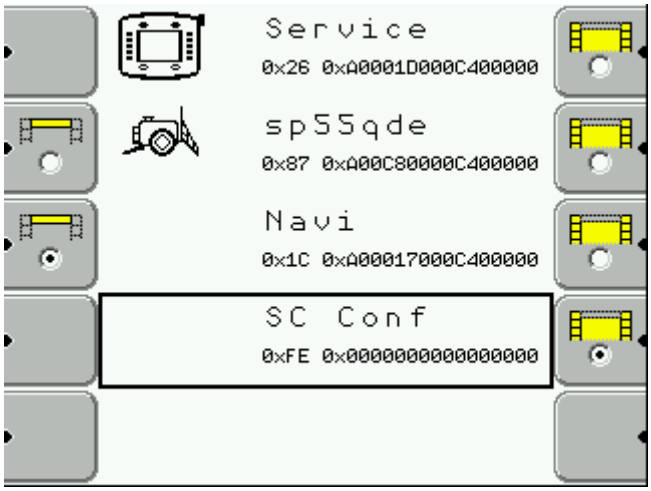
5. SECTION-Control Configurator

The function of the SECTION-Control Configurator is to set the parameters for devices which support SECTION-Control. The example used in this description is a sprayer with 12 boom sections.

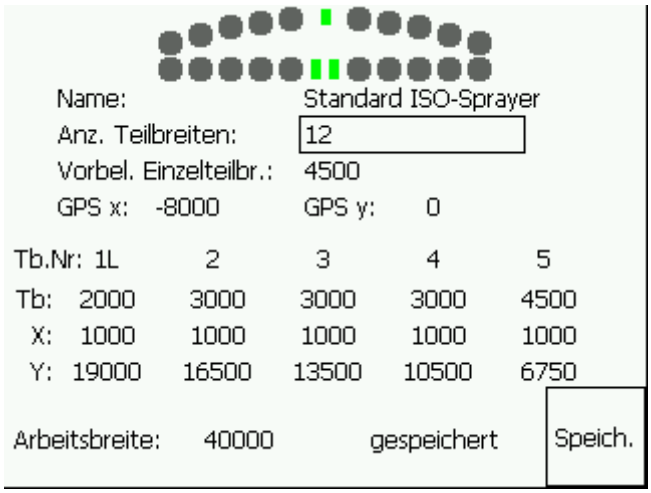
In the selection menu Diagr. 5-1 select **SC Conf** to call up the SECTION- Control configurator.



Diagr. 5-1 Selection menu

5.1 Input mask

Diagr. 5-2 illustrates the SECTION-Control Configurator's input mask which you will find after selecting. All values appearing in the input mask are those which were stored last.



Diagr. 5-2 Input mask

A framed value is always the value in focus and the one which can be altered immediately. With the incremental transmitter you can run through all alterable values in the direction of reading. To

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alter a value in focus press the incremental transmitter. A dialog field will appear in which the value can be changed by turning the incremental transmitter.
Note: All input values are in millimetres.

Press once again and the set value is transferred and the input window will disappear. All values visible in the input mask will then be updated automatically.

5.2 Input fields

Anz.Teilbreiten: enter here the required number of boom sections for your sprayer (see Diagr. 5-2).

Vorbel. Einzelteilbr: enter here the width of the single boom section, which is valid for the majority of the boom sections for your sprayer. This will save you making several entries.

GPS x: enter here the distance from the GPS antenna (NRP) to the spray bar in the direction of travelling.
GPS y: enter here the misalignment of the GPS antenna to the middle axis of the sprayer.
In the example you will find these values to be NRP_X and NRP_Y. Note the sign in front: in the example both values are negative.

In the line **Tb.Nr:** you will find the numbers for each boom section beginning with 1 and continuing through to the number you entered. The numbers mark the boom sections from left to right in the direction of travelling. For better orientation the boom section on the outside right is marked 1**L** and the one on the outside right is marked with e.g. 12**R**. If there are an uneven number of boom sections the middle boom section is marked with **M**. If the number is even the two in the middle have e.g. 6**C** 7**C**.

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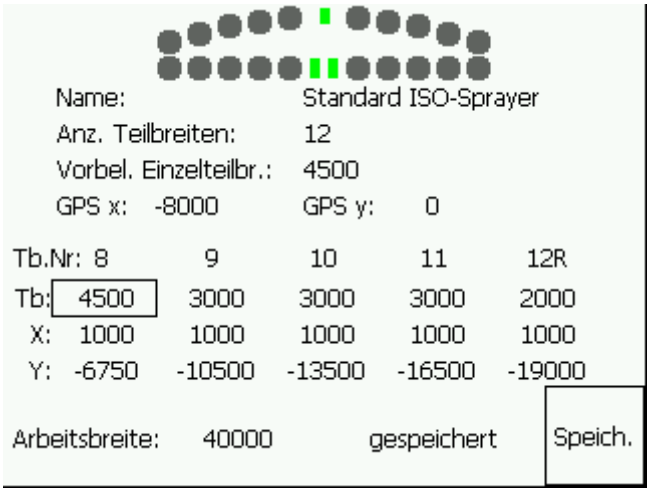

Diagr. 5-3 Input mask part 2

Line **Tb** (see Diagr. 5-3) contains the swath width of all boom sections. If necessary you can alter individual boom sections. During input symmetry is always forced. This means that when you change e.g. the third boom section, you automatically change the third last boom section to the same value. In this case too it saves entering several boom sections and at the same time avoids error.

Line **X:** here you will find the distance to the sprayer's reference point for each boom section in the direction of travel. As with most devices the boom sections all have the same value, the setting for Tb.Nr **1** is applied for all further boom sections. However if necessary you can alter individual values here as well. Here too symmetry is forced.

5.3 Calculated fields

Calculated fields cannot be altered directly.

Line **Y:** here you will find the y-coordinate for each boom section. This is the distance between the middle of a boom section and the reference point of the sprayer in transverse direction. ERP_Y in the example.

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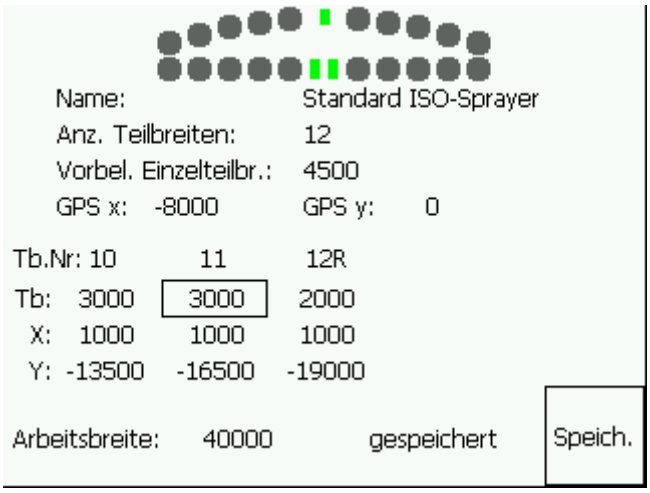
Swath width: here you will find a value which is the sum of all boom sections. This value must coincide with the value specified for the device. If this value is not the same as the total swath width, the entries for the individual boom sections have to be checked again.

Using the values entered

Once you have altered the values in the input mask as required, you have to store them in the terminal. To do so press the **Speich** key. Until this is done you will find the comment **nicht gespeichert** after the value for the swath width. Once the value has been stored in the terminal the comment **gespeichert** appears.

You can now use the sprayer with the parameters entered by switching the terminal off and then on again.



Diagr. 5-4 Input mask part 3

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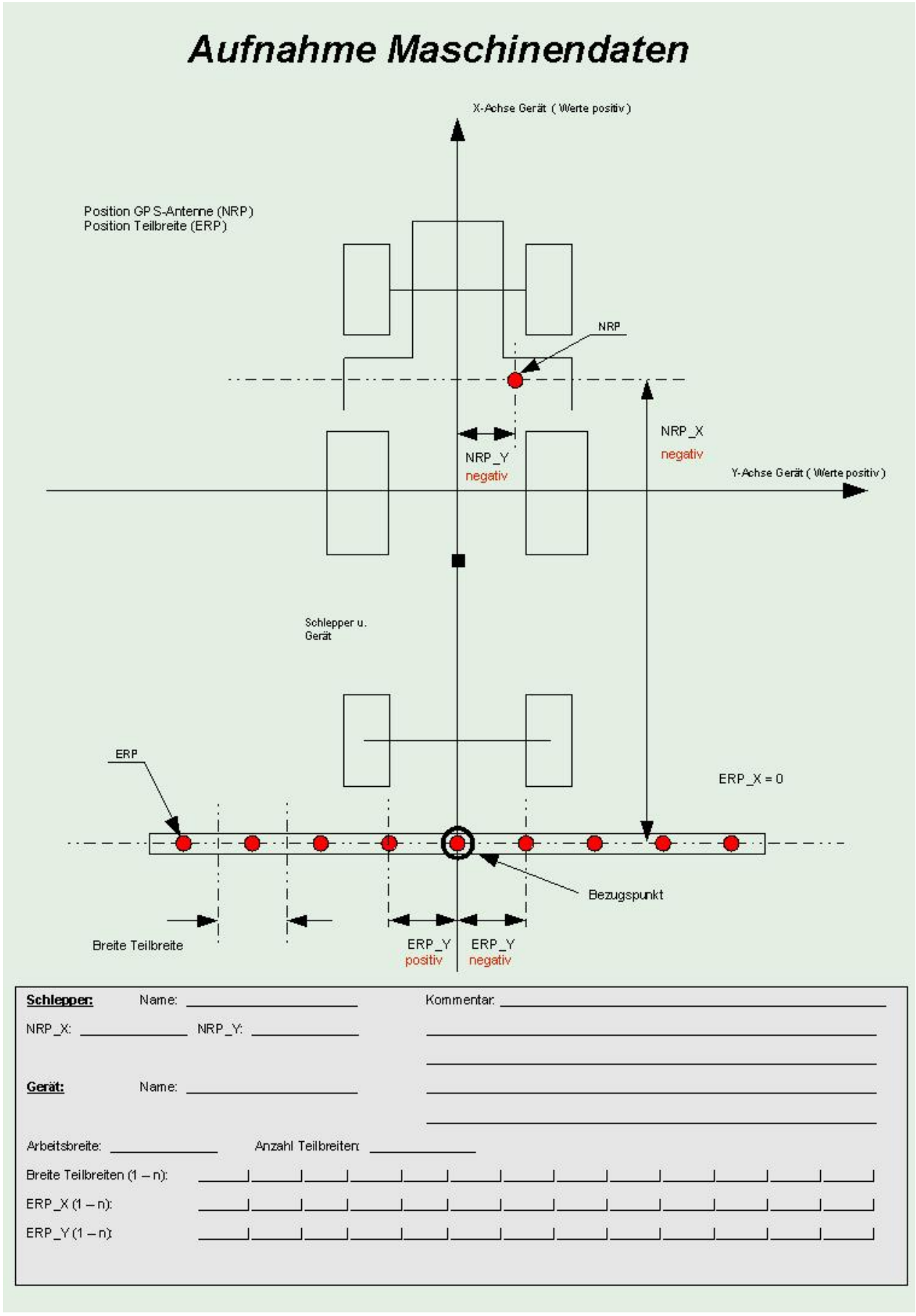

Diagr. 5-5 Schematic representation for recording machine geometry

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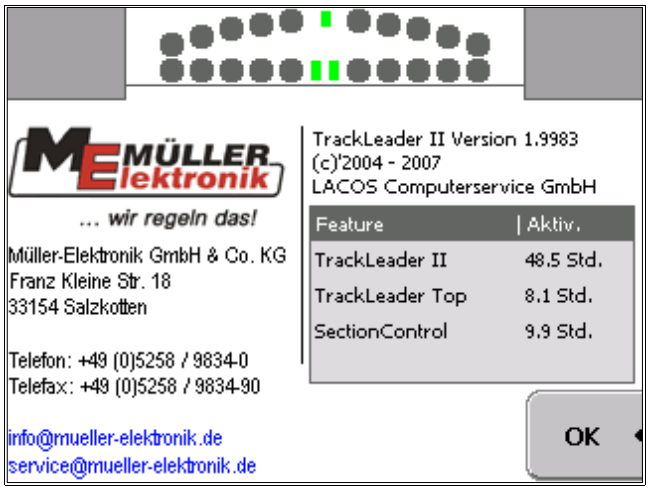
6. Information and registration

You will find the program and registration information under the menu item information. In general all functions can be used for up to 50 hours without registration. If after this time you don't register you will be deactivated.



To register a function select the required function using the scroll wheel and confirm your selection by pressing the scroll wheel. You will then receive an 18-letter code which you have to send to your dealer. If registration has been successful you will then in return receive a 10-digit code which you then have to enter.

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7. Mounting the GPS-Antenna

The GPS-antenna A100 supplied by ME is to be mounted on to the roof of the tractor. The position should be as far to the front as possible and in the centre (see photo), Shadows caused by vehicle parts (e.g. roof hatch) must be avoided, as the antenna requires interference-free reception.

On a metal roof secure the antenna with the magnetic base. On a plastic roof stick the metal plate supplied first of all on to the roof. If preferred, the magnetic base can be removed and the antenna screwed on directly.

Plug the connecting cable from the antenna into socket C on the TRACK-Guide terminal.

The antenna is equipped with a status LED, which indicates the quality of reception:

Red:	Power but the antenna has no GPS reception
Orange:	GPS reception
Green:	DGPS reception

With the initial start-up it can take up to 30 minutes before the antenna has reception. Each further start takes only about 1-2 minutes.

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8. Connecting and operating the external light bar

The external light bar (art. no. 30302490) is connected to plug C, between the GPS antenna and the terminal. The light bar is fixed by the suction base to the middle of the windshield in the driver's range of vision. Dampening the suction base slightly increases its hold.

Connection to the GPS antenna

Connection to the terminal

The external light bar must be activated in the settings (see 4.1).

With the keys  and  the intensity of the light can be adapted to the existing lighting conditions. This means that the glare can be reduced when driving in the dark.

The following alternatives are displayed on the monitor:

A light bar (all diodes are lit up)

One single light (only the outside one is lit).

Use the 

key to switch between the different display modes:

1. Forecast and deviation as a light bar

   (set as for the terminal see 2.2 **monitor light bar, external light bar**)

2. Forecast as a light bar and deviation as a single light spot.

3. Forecast as a single light spot and deviation a light bar.

4. Forecast and deviation as a single light spot.

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